Supplementary material for the PhD thesis:

The GDH sum rule and extension to photoproduction off neutron targets in the Jülich-Bonn model

Carolin Schneider

1 Supplementary material for the JüBo2025 analysis

In the first part of this supplementary material, we list the full fit results of the "JüBo2025" analysis presented in Chapter 4 of the thesis. This includes the pion-induced and photon-induced data not shown within the thesis. The order is as follows:

- $\pi N \to \pi N$ partial waves together with the GWU-SAID WI08 solution.
- Scattering data for the inelastic pion-induced processes $\pi N \to \eta N$, $K\Lambda$ and $K\Sigma$.
- Photoproduction data for the processes $\gamma p \to \pi^0 p$, $\pi^+ n$, ηp, $K^+\Lambda^0$, $K^+\Sigma^0$ and $K^+\Sigma^0$.
- Multipole amplitudes for the photoproduction processes $\gamma p \to \pi^0 p$, $\pi^+ n$, ηp, $K^+\Lambda^0$, $K^+\Sigma^0$ and $K^+\Sigma^0$ with a comparison to the Bonn-Gatchina solution BG2019.

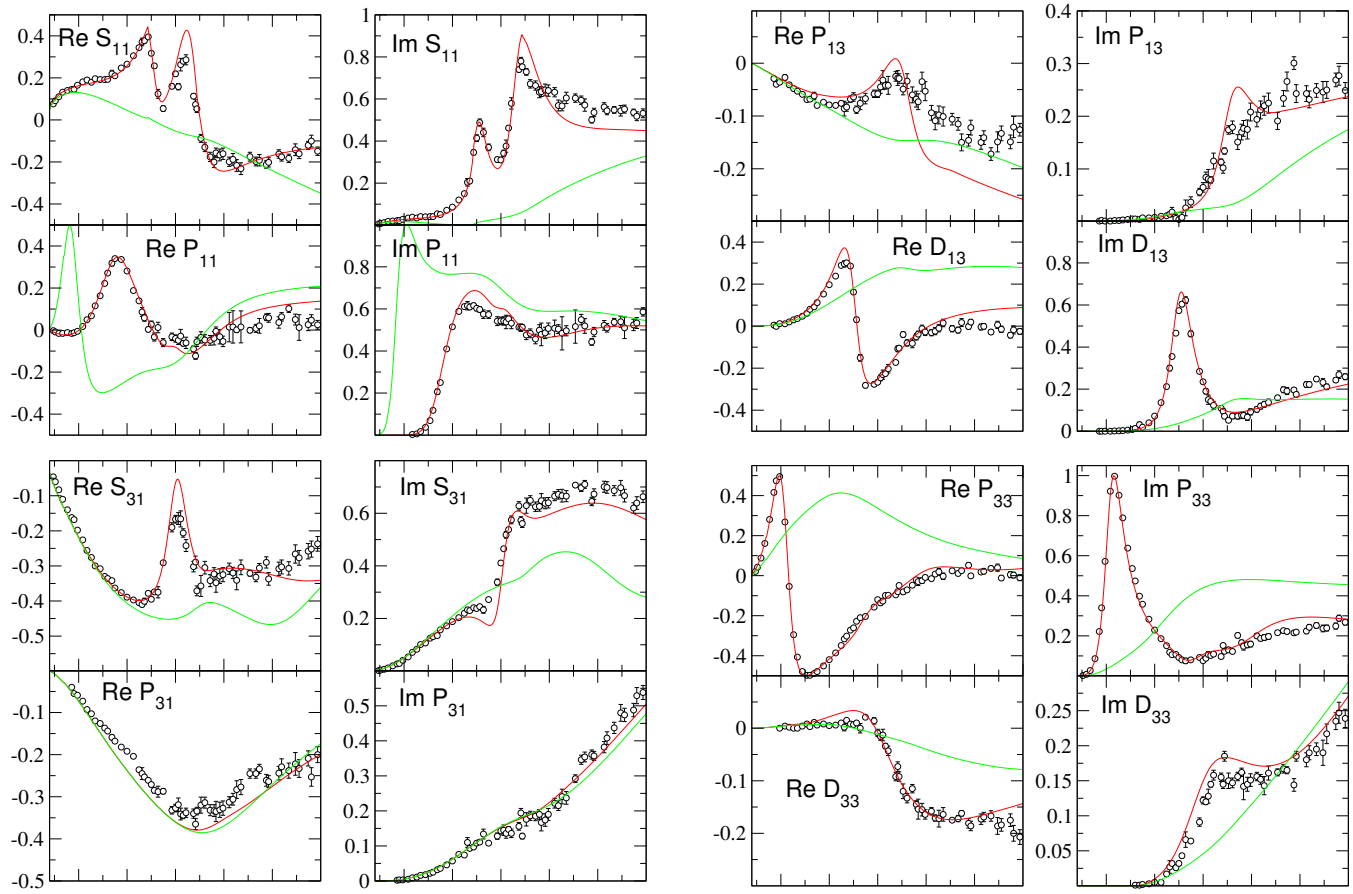


Figure 1: JüBo2025: red (solid) line, $T^{\rm NP}$: green line. Points: GWU-SAID WI08 solution (Phys. Rev. C 86, 035202 (2012)).

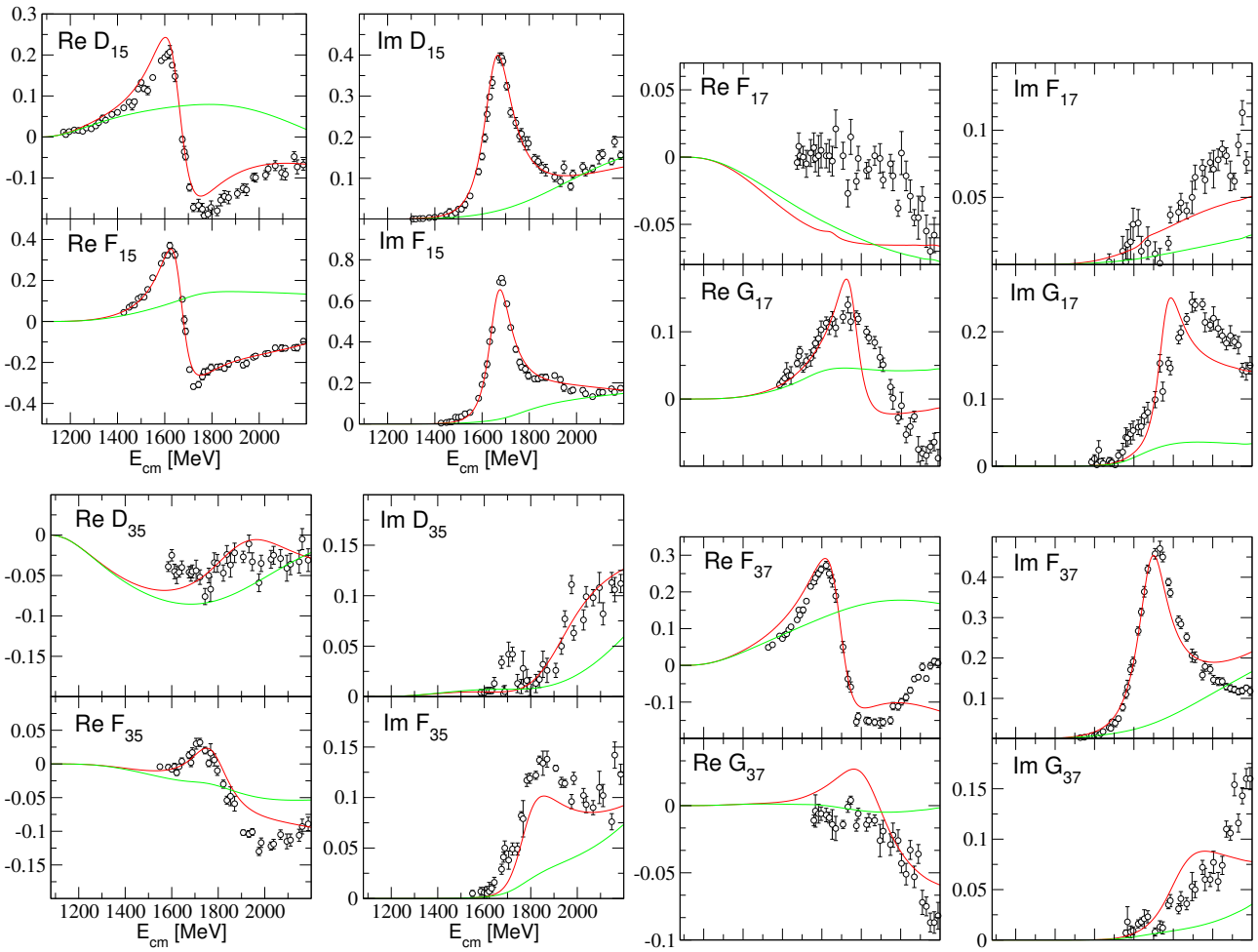


Figure 2: JüBo2025: red (solid) line, $T^{\rm NP}$: green line. Points: GWU-SAID WI08 solution (Phys. Rev. C 86, 035202 (2012)).

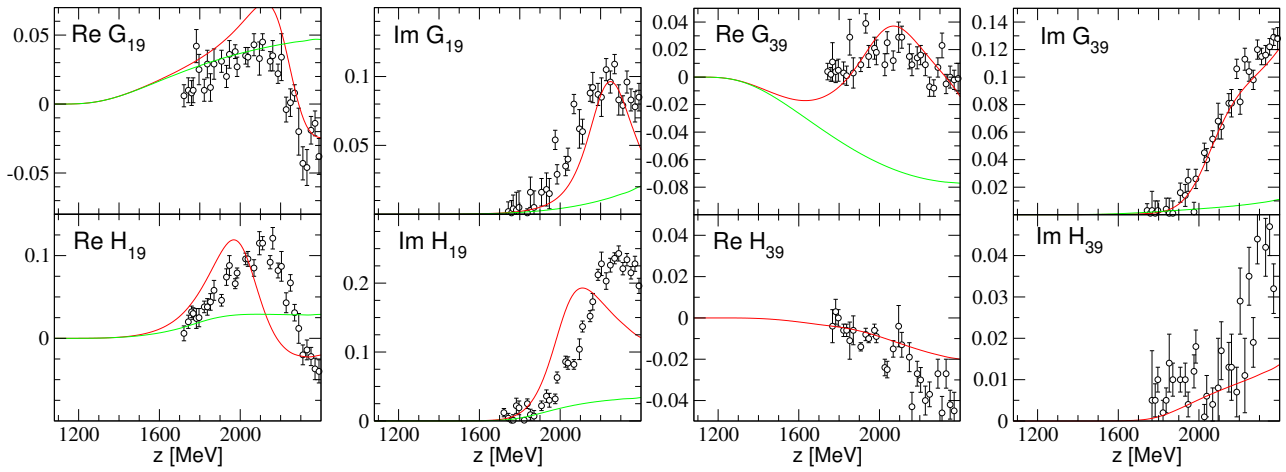


Figure 3: JüBo2025: red (solid) line, $T^{\rm NP}$: green line. Points: GWU-SAID WI08 solution (Phys. Rev. C 86, 035202 (2012)).

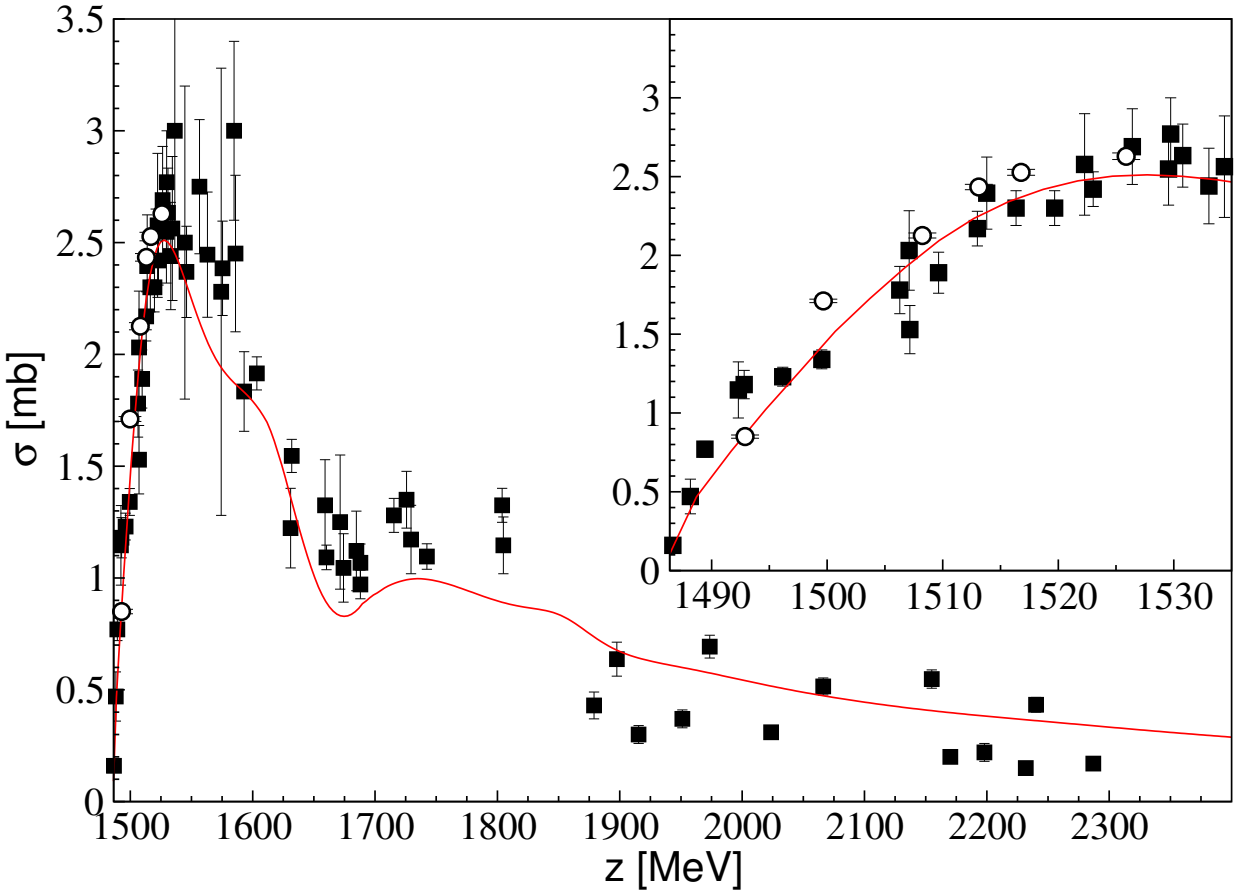


Figure 1: Total cross section of the reaction $\pi^- p \to \eta n$. Data: the filled squares indicate experiments accepted by the GWU/SAID group [1]; open circles fromRef. [2].

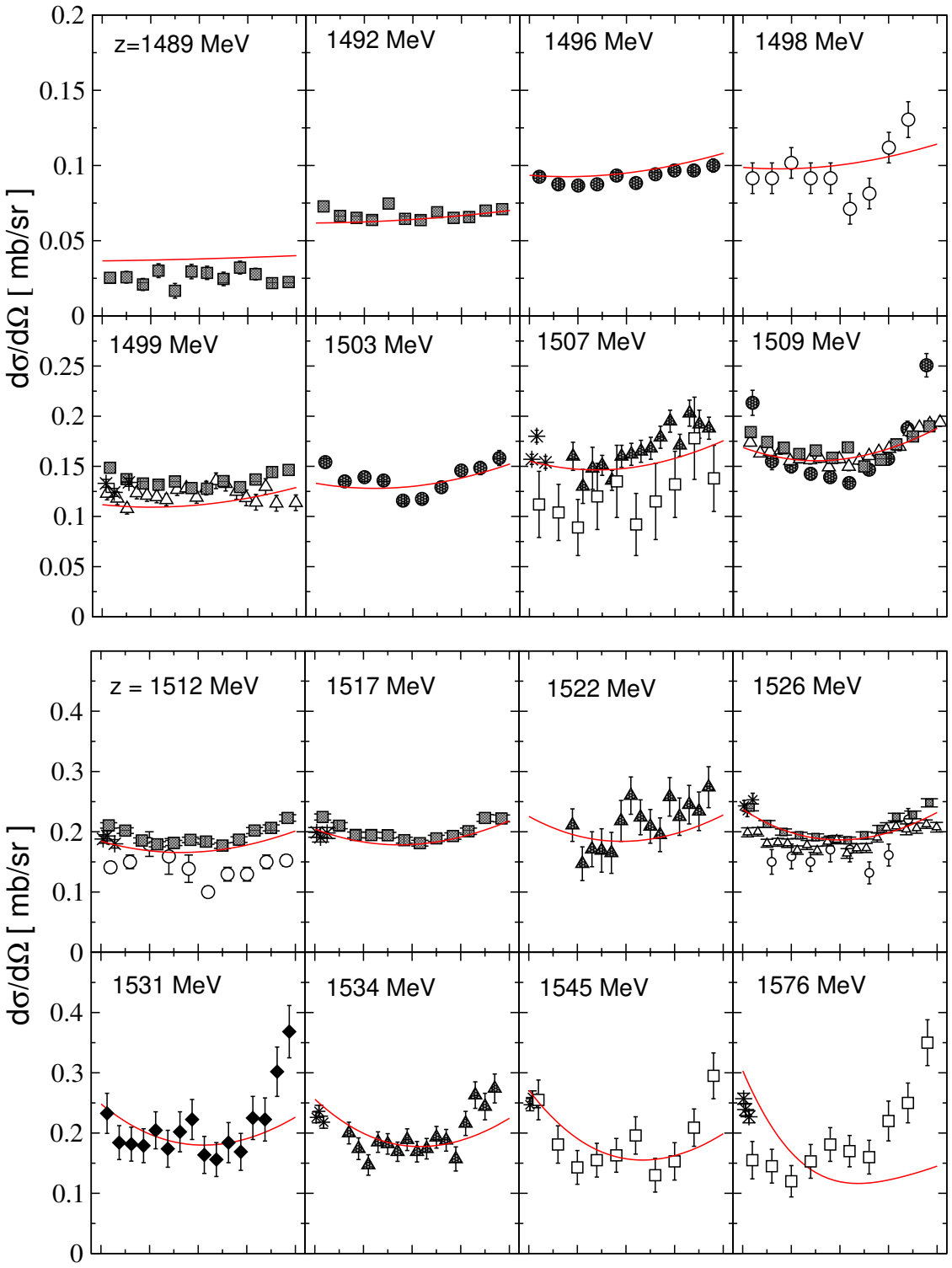


Figure 2: Differential cross section [1/3] of the reaction $\pi^- p \to \eta n$. Data: filled squares from Ref. [2]; filled circles from Ref. [3]; empty circles from Ref. [4]; empty triangles up from Ref. [5]; stars from Ref. [6]; filled triangles up from Ref. [7]; empty squares from Ref. [8]; filled diamonds from Ref. [9].

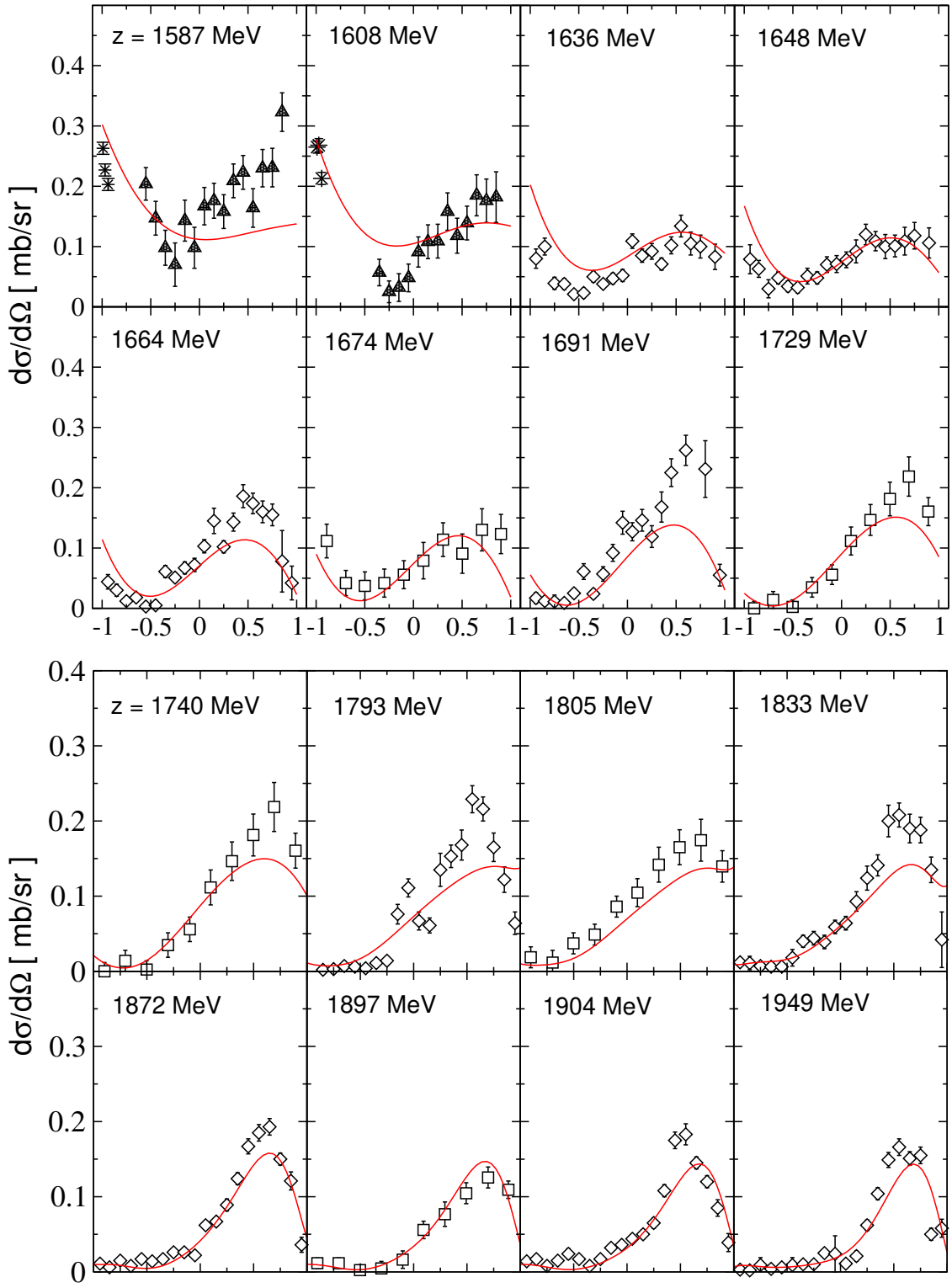


Figure 3: Differential cross section [2/3] of the reaction $\pi^- p \to \eta n$. Data: c.f. Fig. 2 and empty diamonds from Ref. [10].

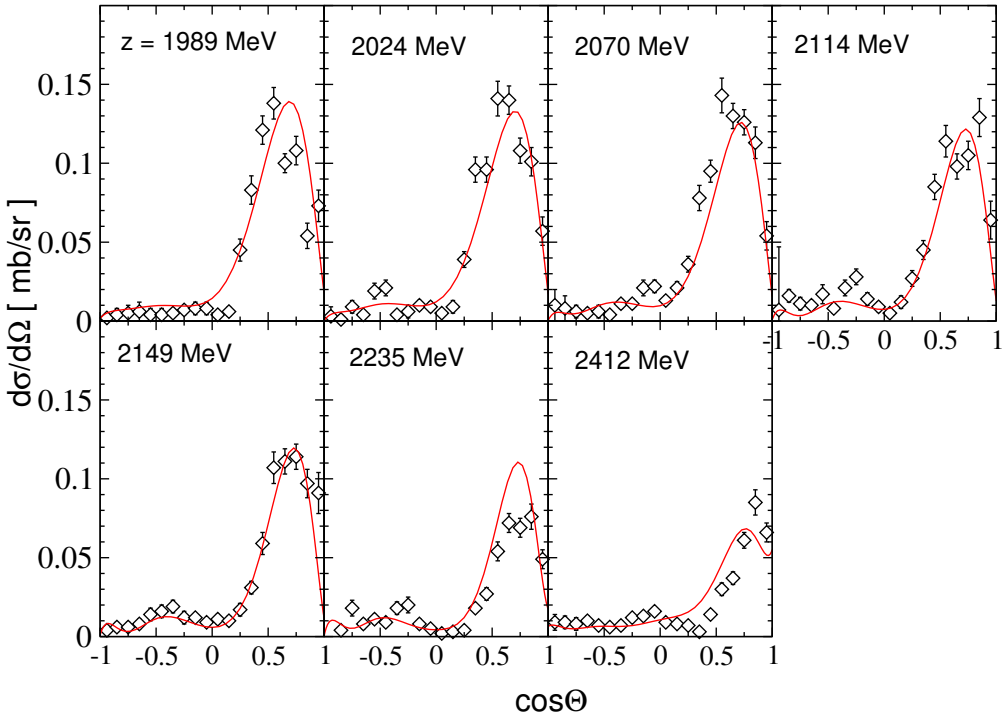


Figure 4: Differential cross section [3/3] of the reaction $\pi^- p \to \eta n$. Data: c.f. Fig. 3.

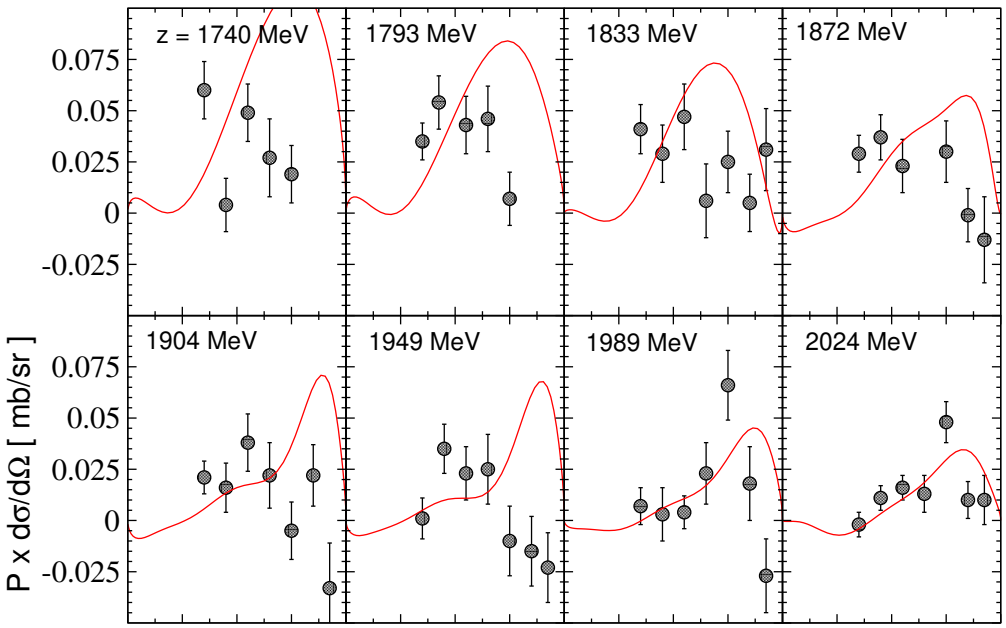


Figure 5: Polarization [1/2] of the reaction $\pi^- p \to \eta n$. Data: Ref. [11].

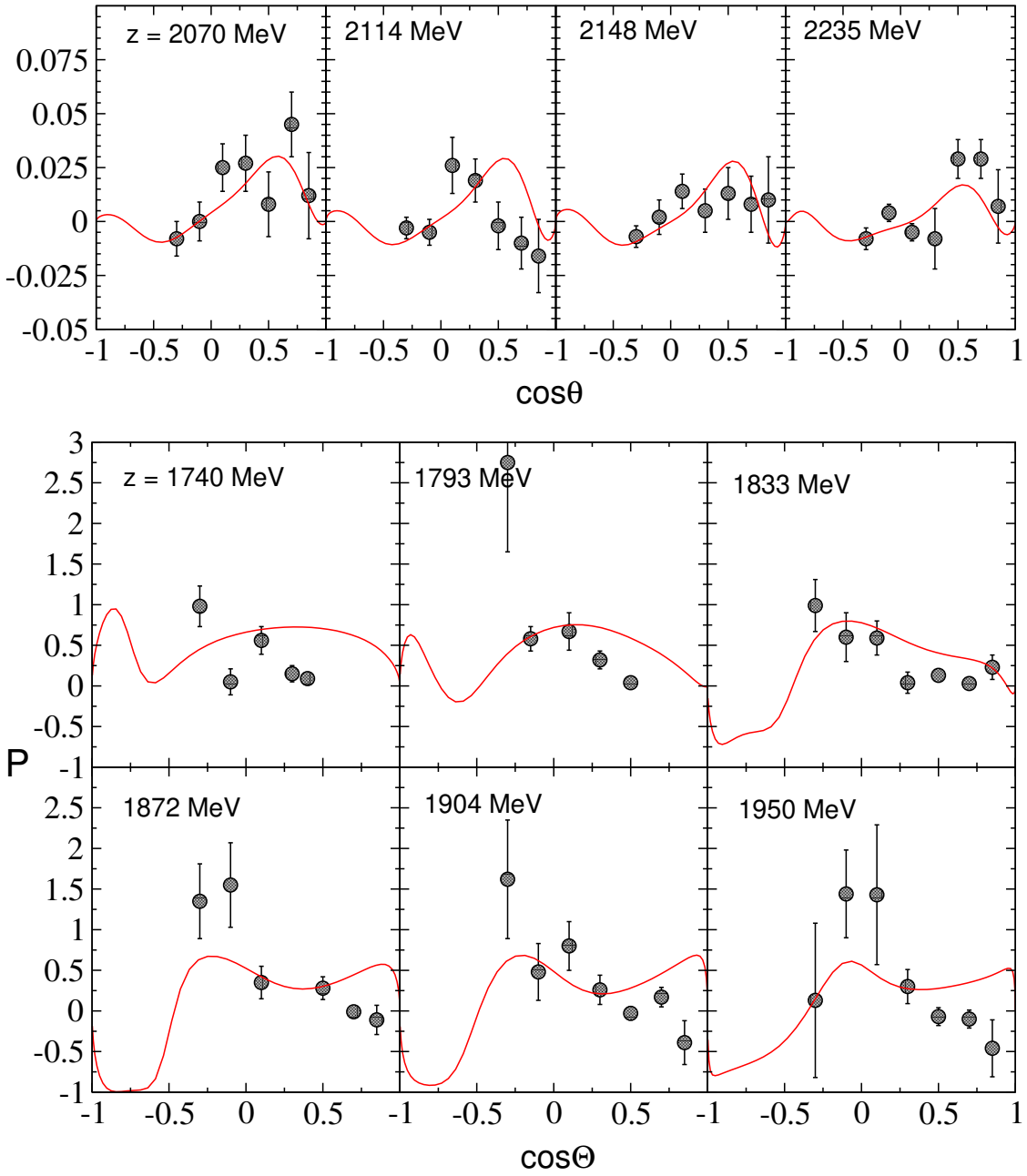


Figure 6: Polarization [2/2] of the reaction $\pi^- p \to \eta n$. Data: Ref. [11].

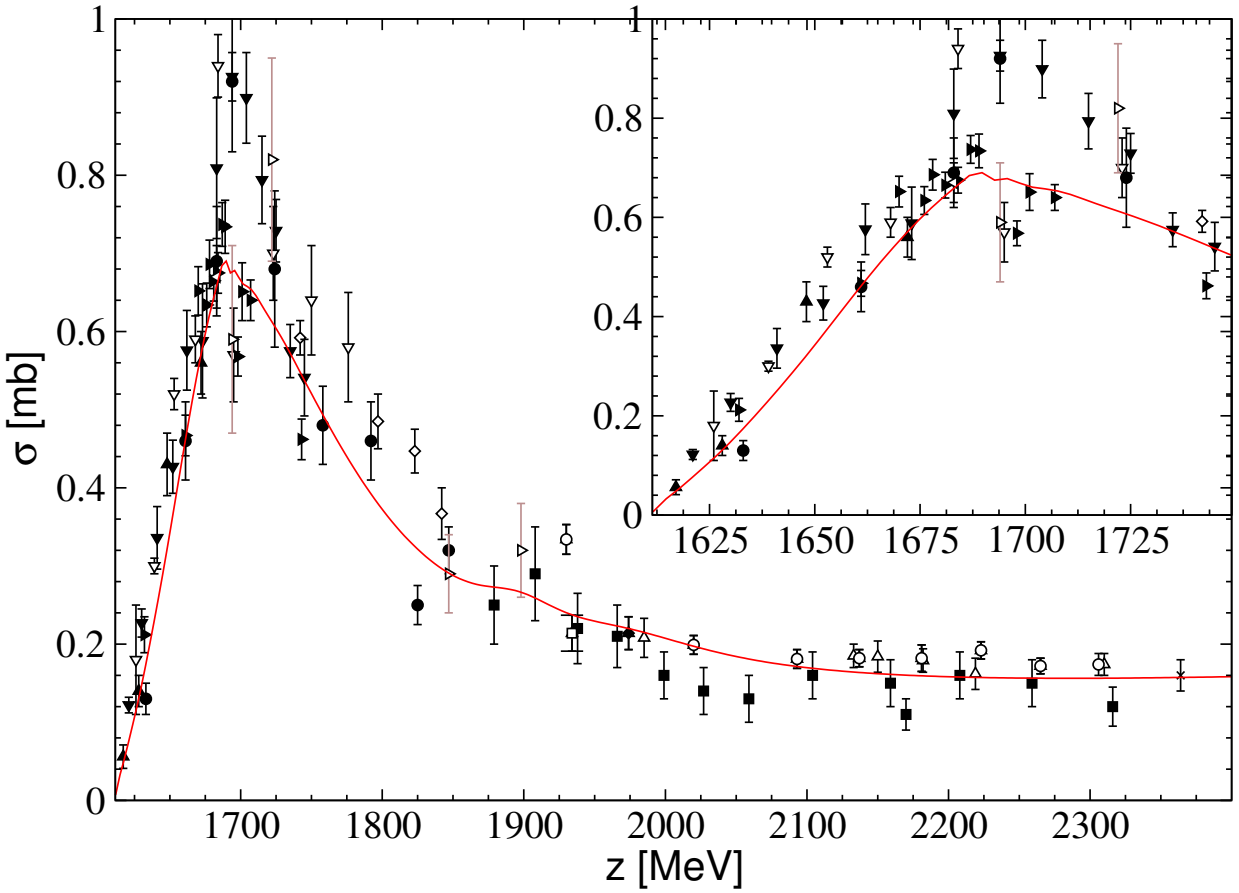


Figure 7: Total cross section of the reaction $\pi^- p \to K^0\Lambda$. Data: filled circles from Ref. [12]; filled squares from Ref. [13]; empty diamonds from Ref. [14]; empty triangles up from Ref. [15]; filled triangles up from Ref. [16]; filled triangles down from Ref. [21]; empty triangles down from Ref. [22]; filled triangles right from Ref. [17]; empty triangles left from Ref. [23]; empty triangles right from Ref. [24]; empty squares from Ref. [18]; filled diamonds from Ref. [19]; stars from Ref. [25]; for empty circles and crosses see Ref. [26].

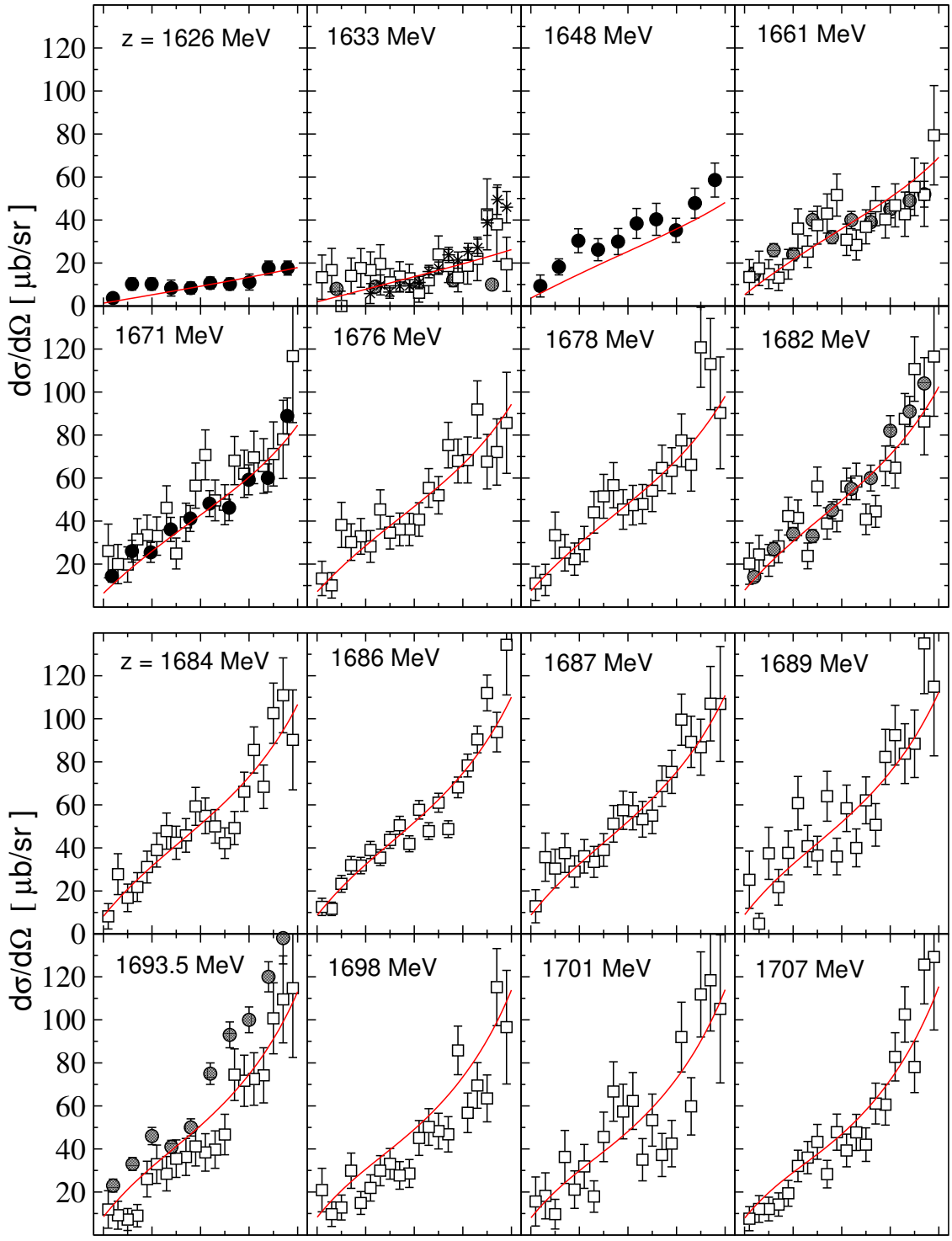


Figure 8: Differential cross section [1/3] of the reaction $\pi^- p \to K^0\Lambda$. Data: filled circles from Ref. [16]; empty squares from Ref. [17]; partially filled circles from Ref. [12]; stars from Ref. [18]; triangles from Ref. [14]; empty diamonds from Ref. [13]; partially filled squares from Ref. [15]; filled diamonds from Ref. [19].

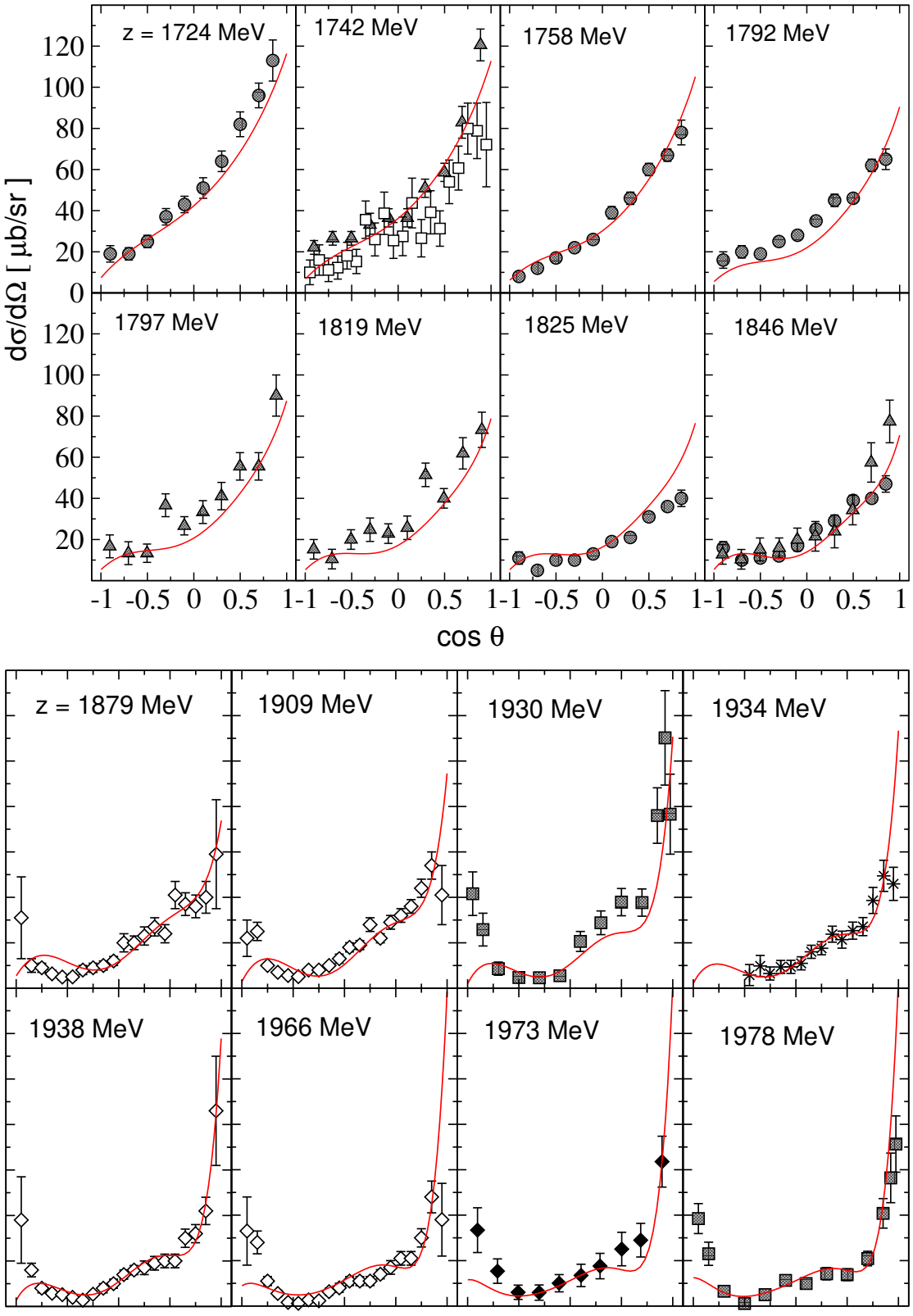


Figure 9: Differential cross section [2/3] of the reaction $\pi^- p \to K^0\Lambda$. Data: c.f. Fig. 8.

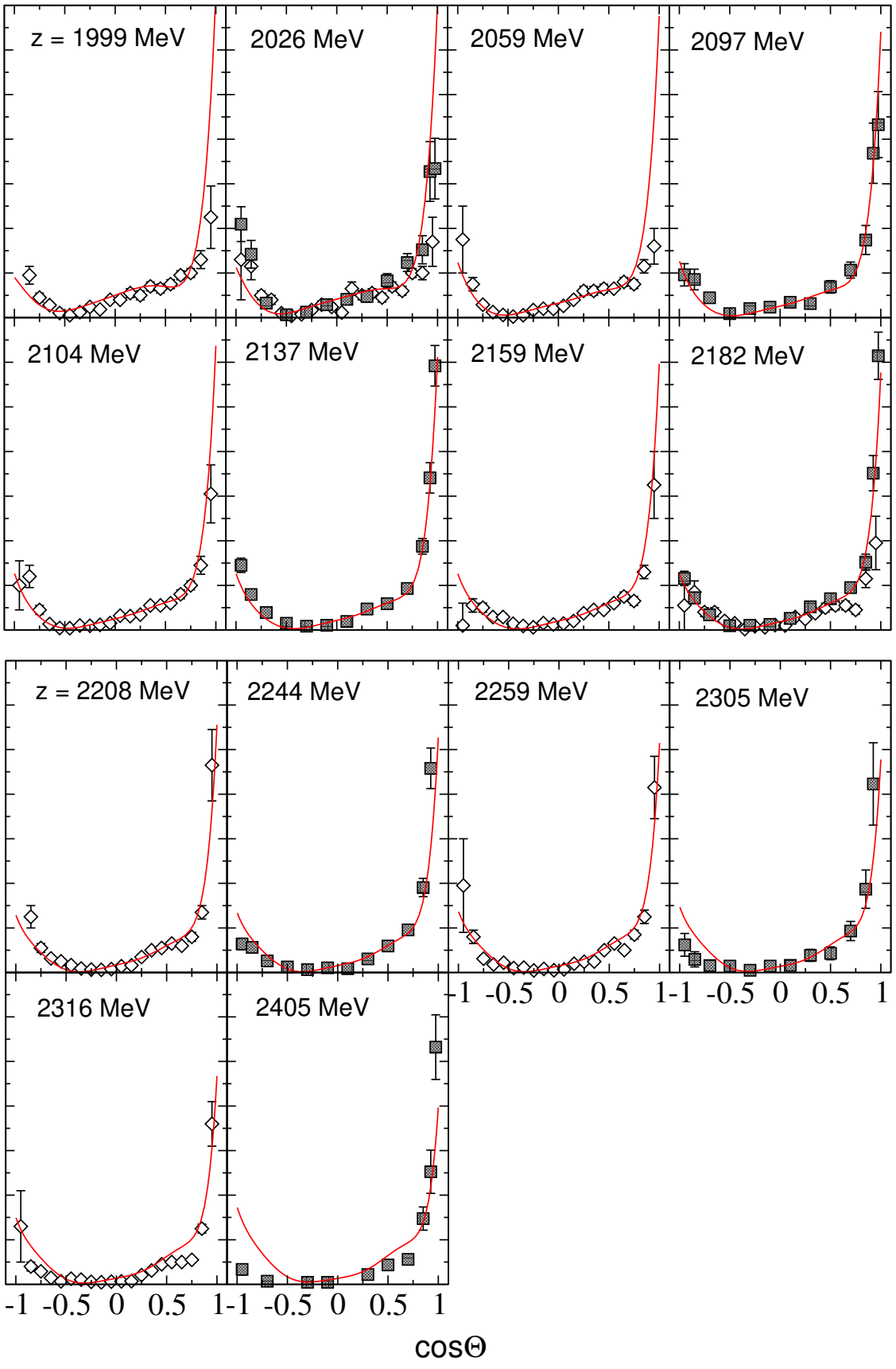


Figure 10: Differential cross section [3/3] of the reaction $\pi^- p \to K^0\Lambda$. Data: c.f. Fig. 8.

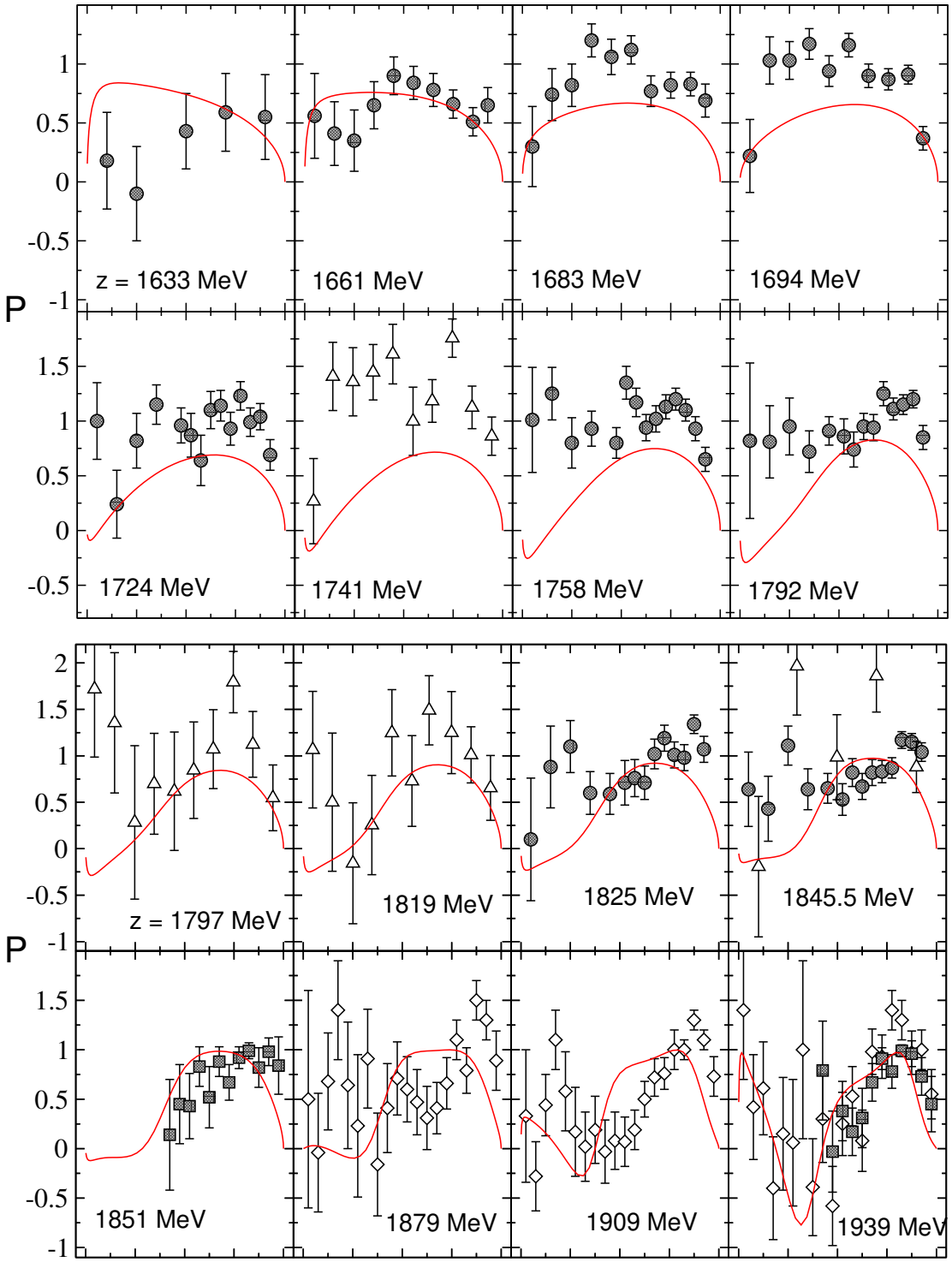


Figure 11: Polarization [1/2] of the reaction $\pi^- p \to K^0\Lambda$. Data: filled circles from Ref. [12]; empty triangles up from Ref. [14]; filled squares from Ref. [20]; empty diamonds from Ref. [13].

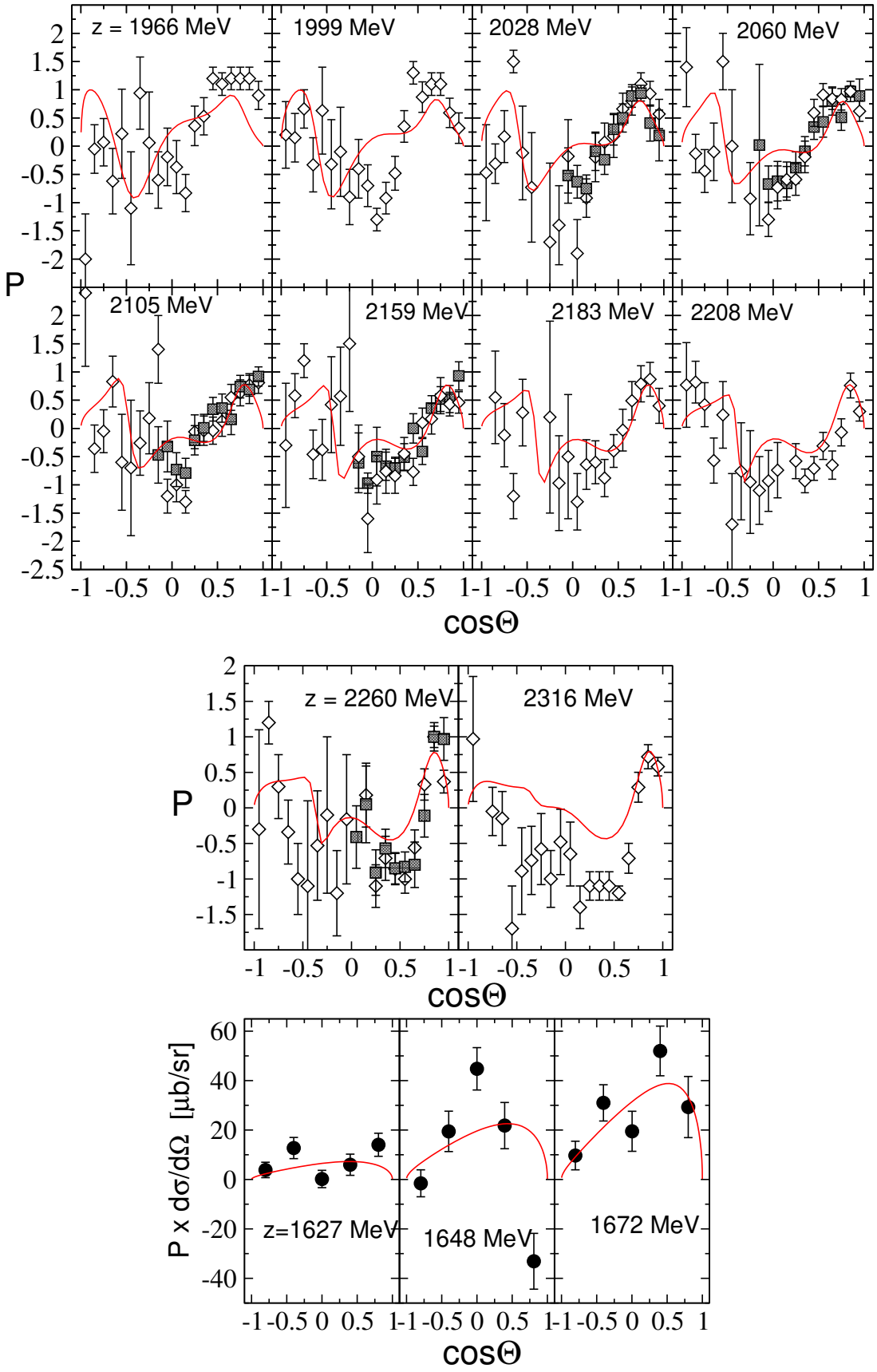


Figure 12: Polarization [2/2] of the reaction $\pi^- p \to K^0\Lambda$. Data: c.f Fig. 11.

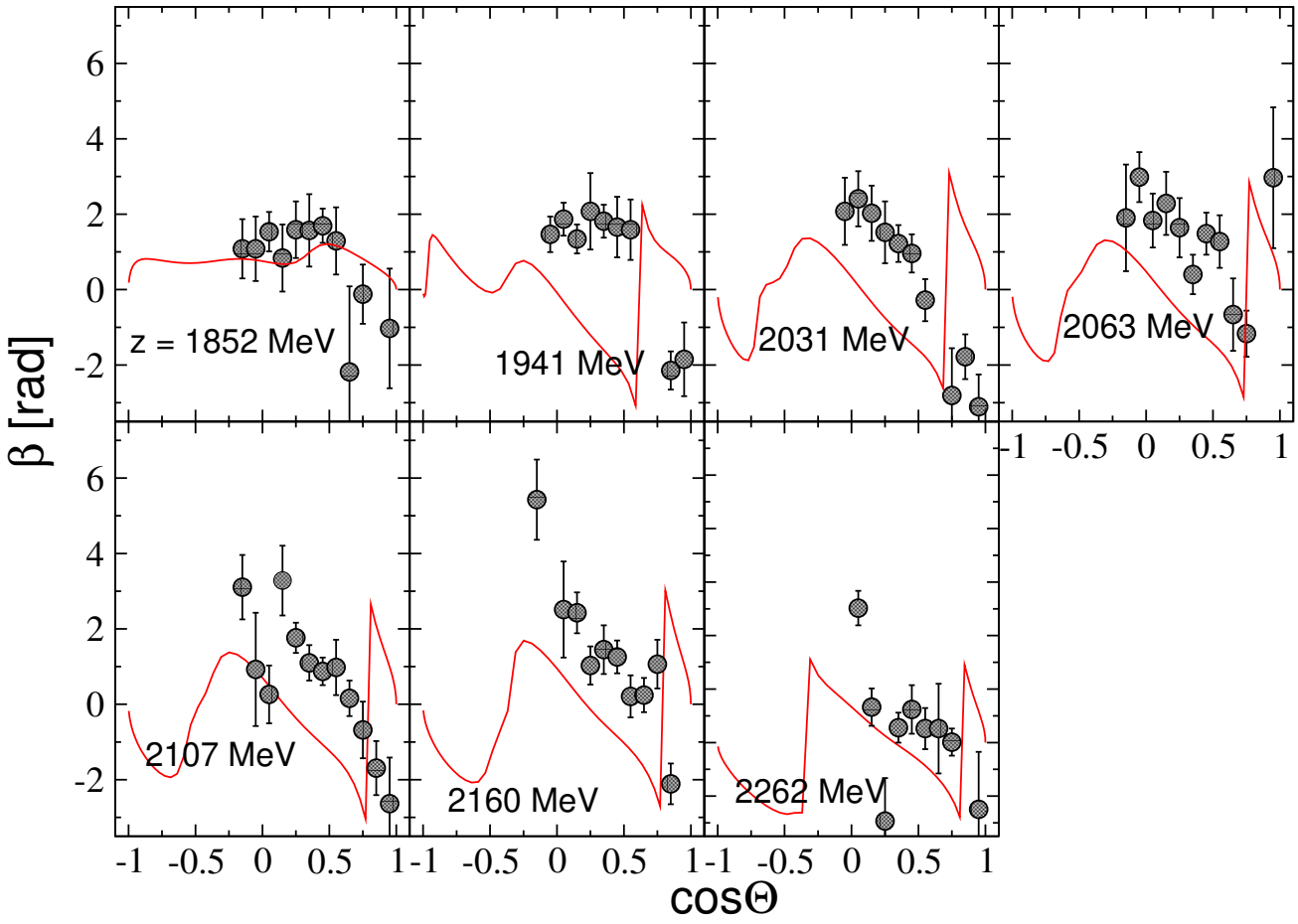


Figure 13: Spin-rotation parameter β of the reaction $\pi^- p \to K^0\Lambda$. Data: Ref. [20].

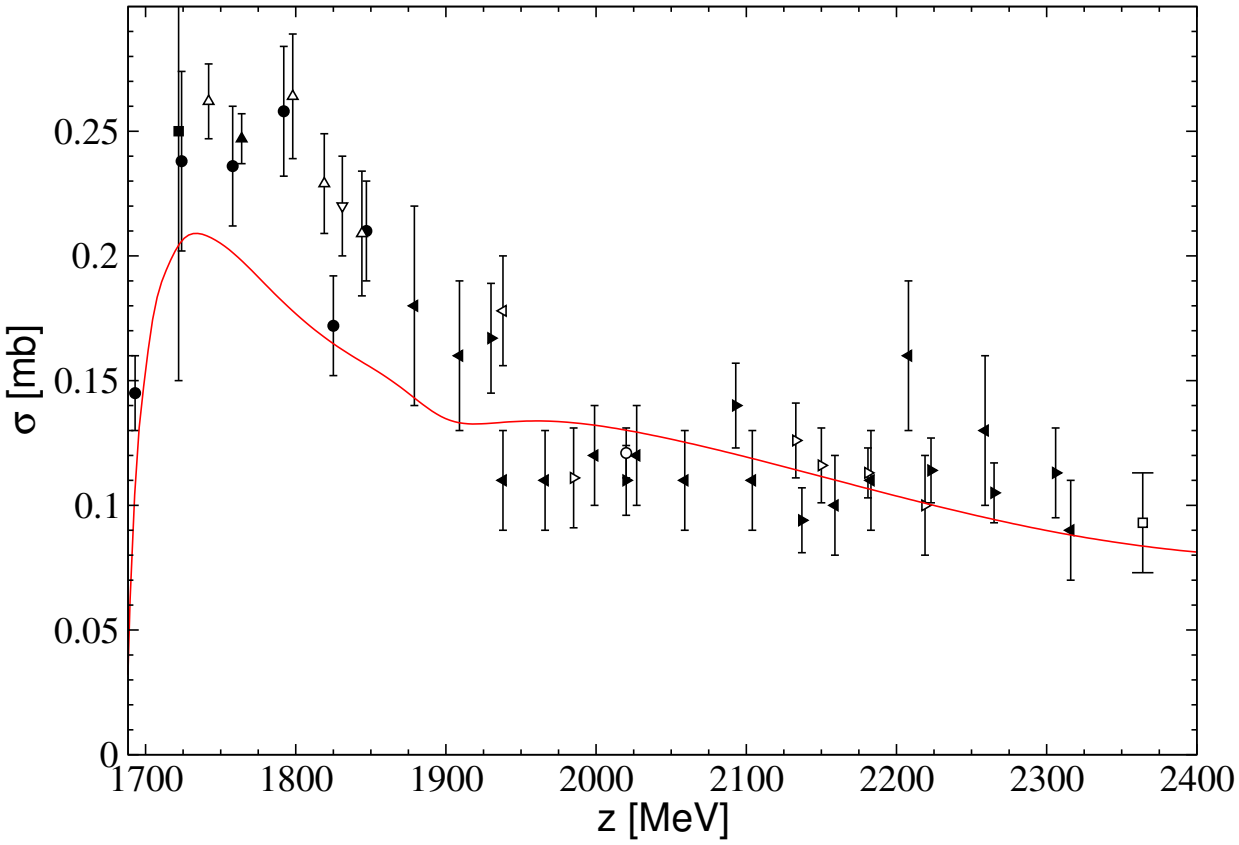


Figure 14: Total cross section of the reaction $\pi^- p \to K^0\Sigma^0$. Data: empty triangles up: Ref. [14]; empty triangles right: Ref. [15]; filled squares: Ref. [24]; empty triangles left: Ref. [19]; filled triangles up: Ref. [29] filled circles: Ref. [27]; empty circles: Ref. [30]; filled triangles left: Ref. [28]. For empty triangles down, filled triangles right, and empty squares see [26].

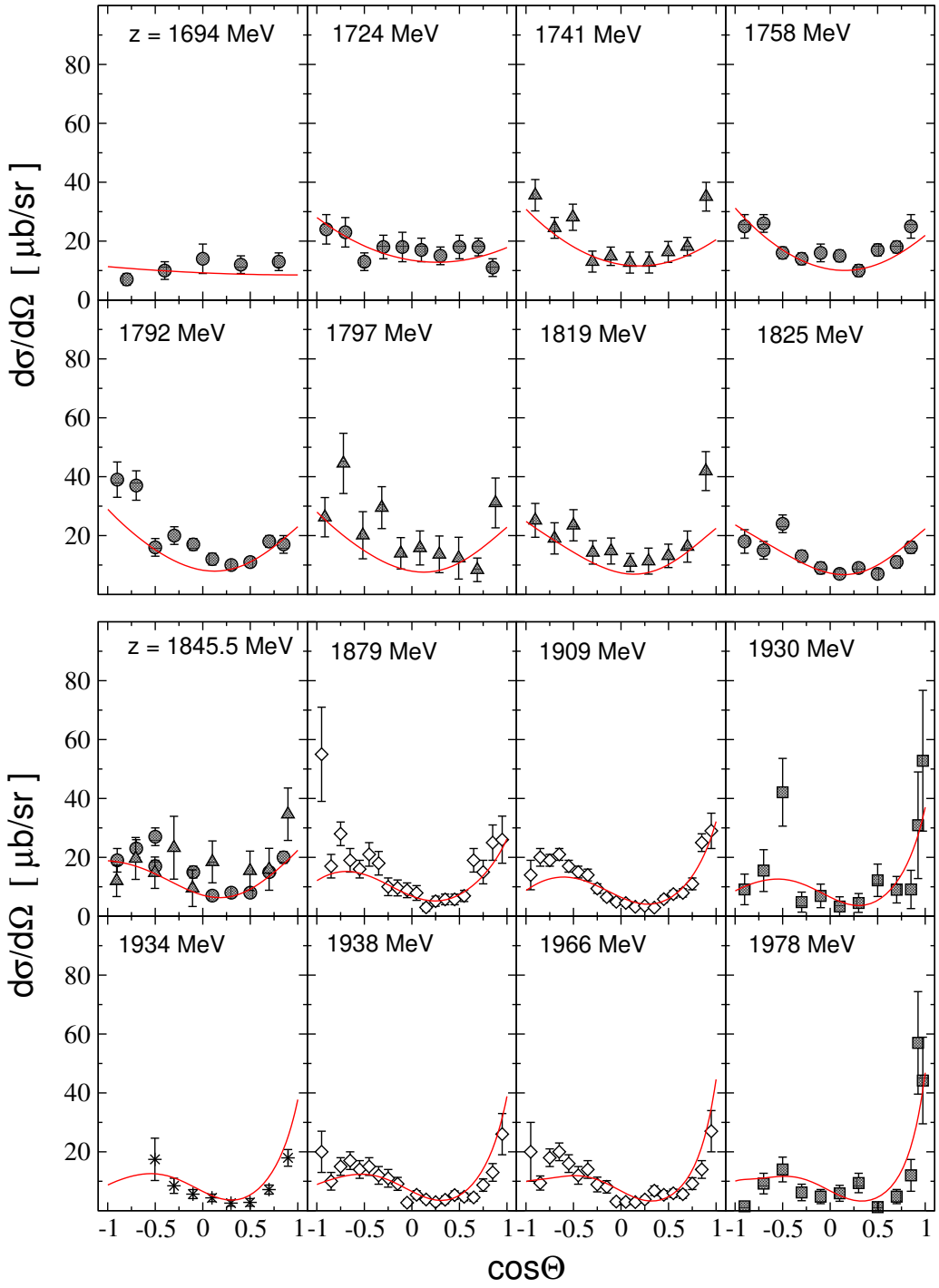


Figure 15: Differential cross section [1/2] of the reaction $\pi^- p \to K^0\Sigma^0$. Data: circles from Ref. [27]; up triangles from Ref. [14]; squares from Ref. [15]; diamonds from Ref. [28]; stars from Ref. [18].

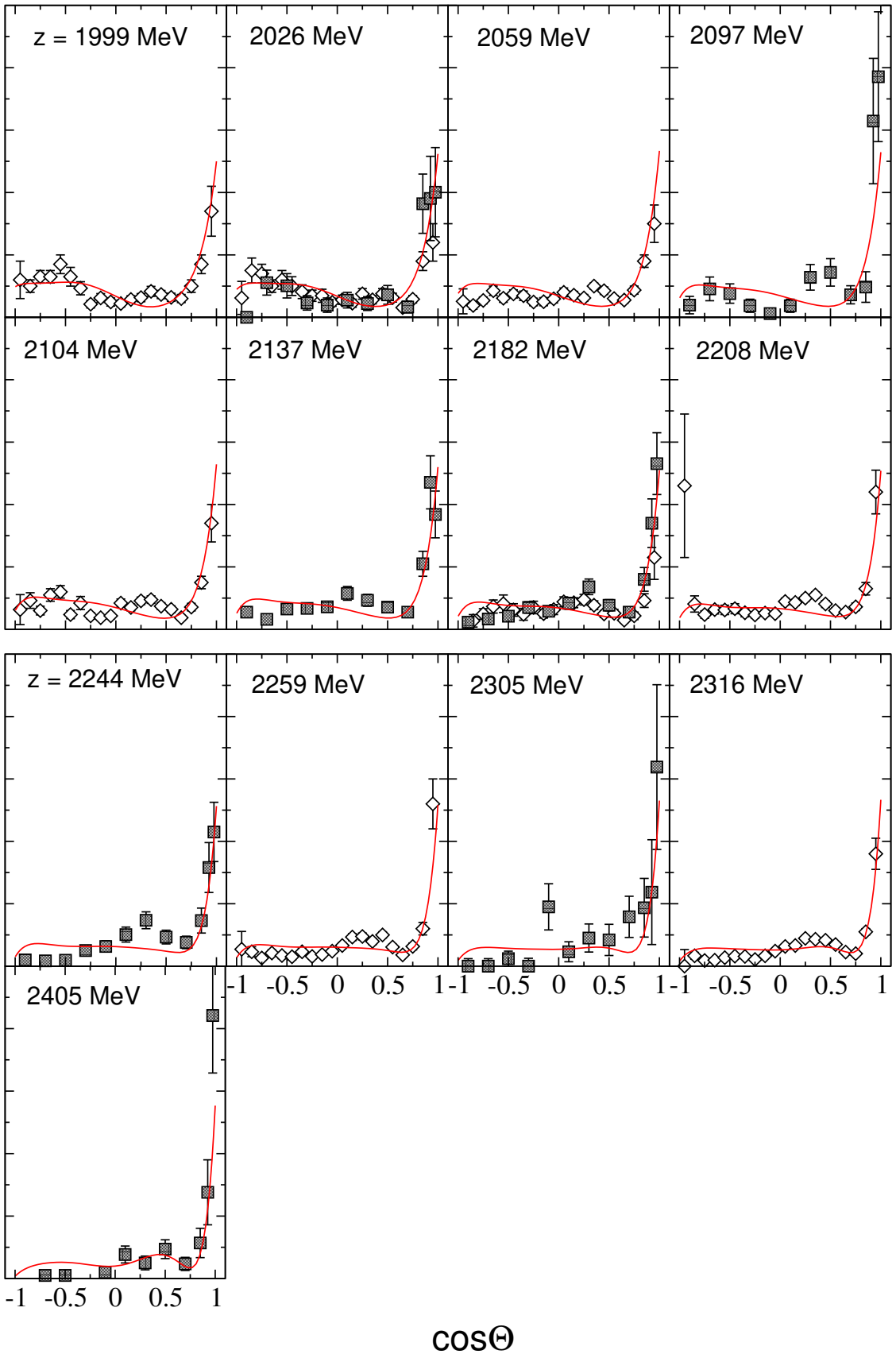


Figure 16: Differential cross section [2/2] of the reaction $\pi^- p \to K^0\Sigma^0$. Data: c.f. Fig. 15.

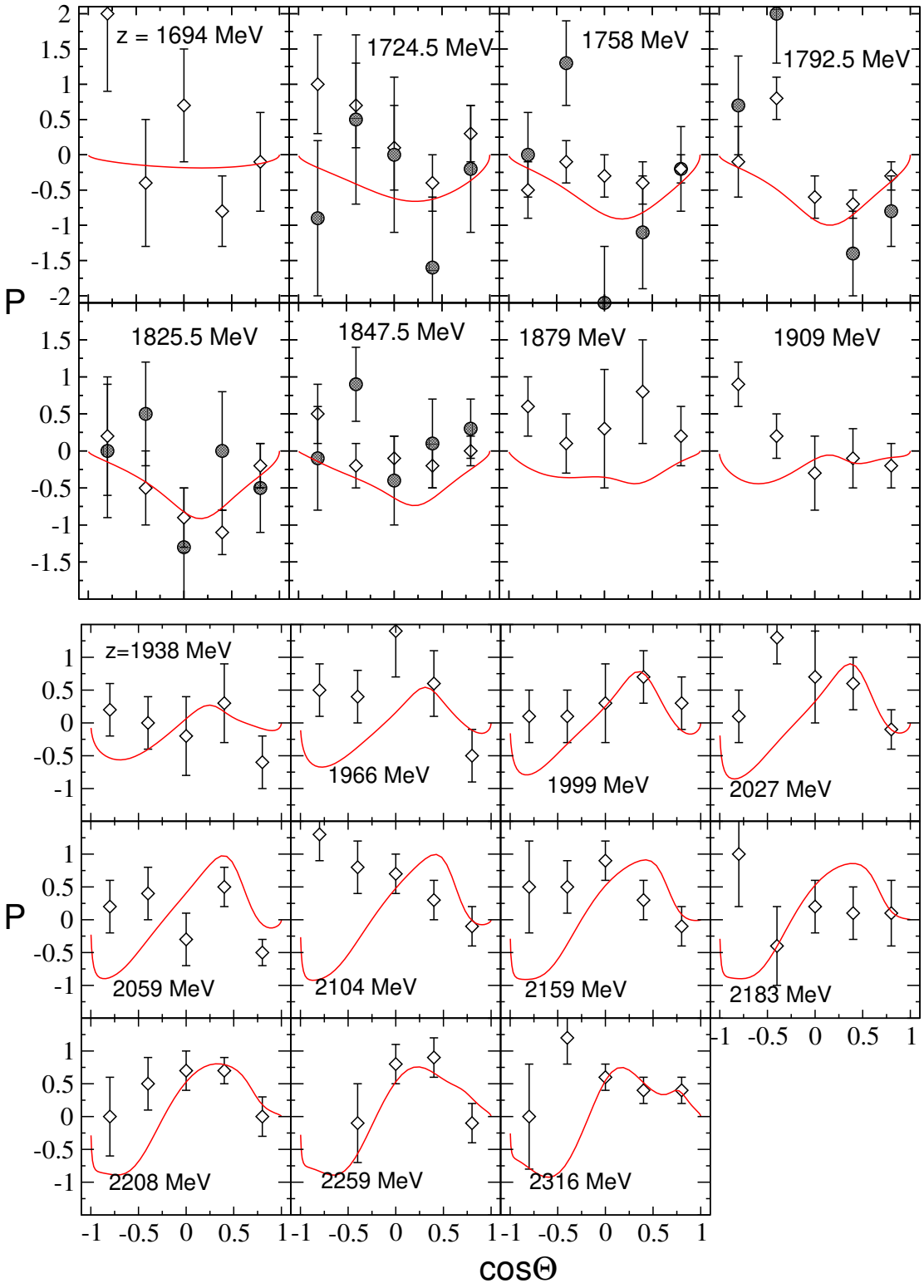


Figure 17: Polarization of the reaction $\pi^- p \to K^0\Sigma^0$. Data: circles from Ref. [27]; diamonds from Ref. [28].

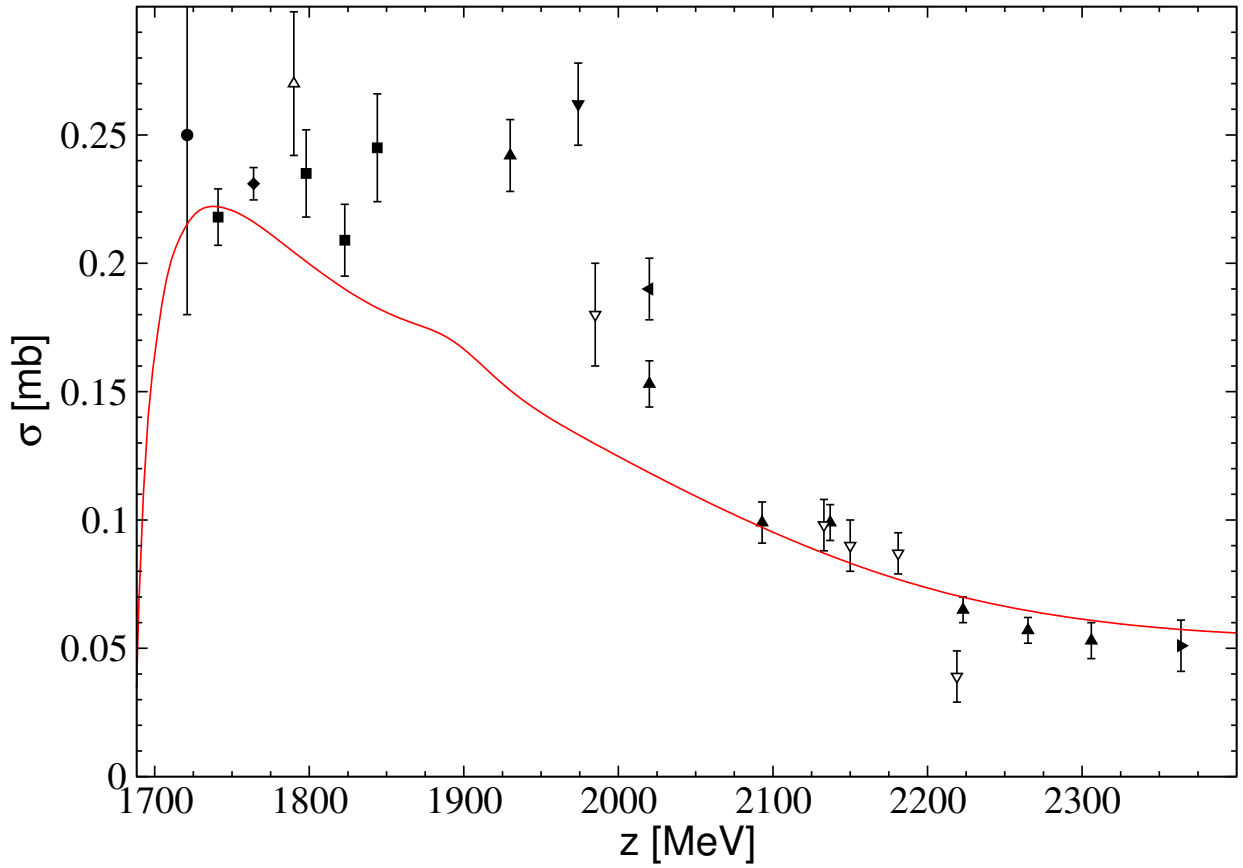


Figure 18: Total cross section of the reaction $\pi^- p \to K^+\Sigma^-$. Data: empty triangles down: Ref. [15]; filled circles: Ref. [24]; filled triangles down: Ref. [19]; filled triangles left: Ref. [30]; empty triangles up: Ref. [34]; filled squares: Ref. [32]; filled diamonds: Ref. [33]. For filled triangles up and filled triangles right see Ref. [26].

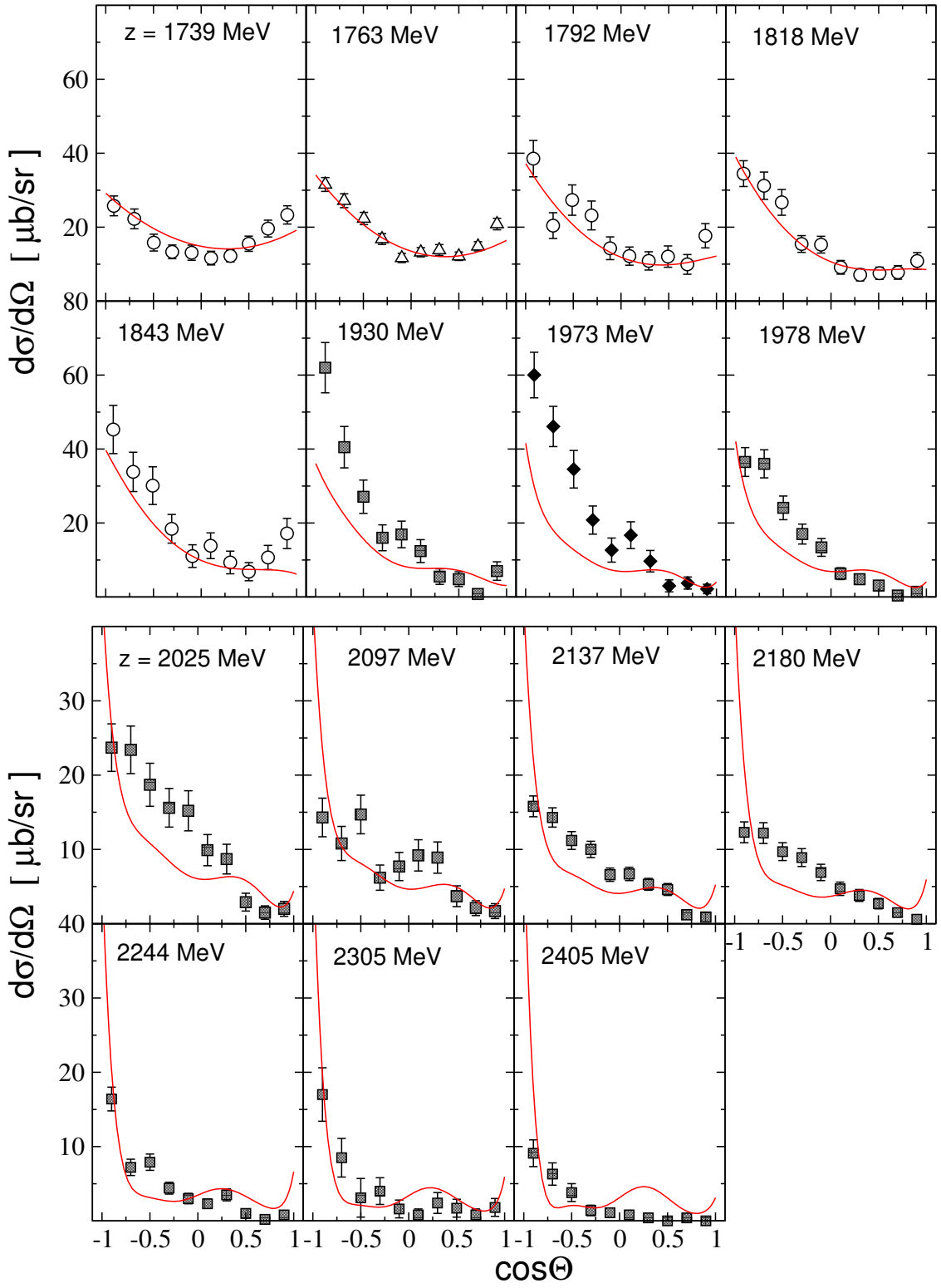


Figure 19: Differential cross section of the reaction $\pi^- p \to K^+\Sigma^-$. Data: circles from Ref. [32]; up triangles from Ref. [33]; squares from Ref. [15]; diamonds from Ref. [19].

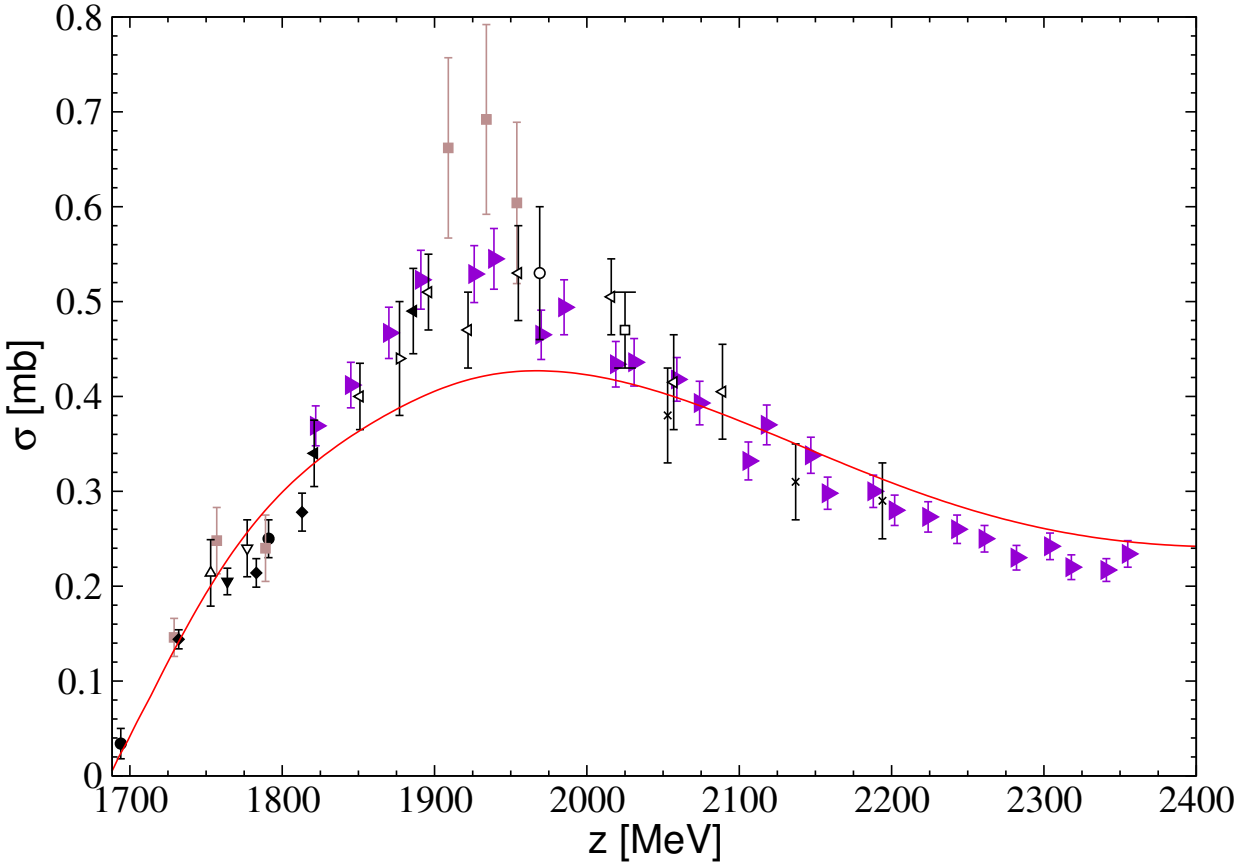


Figure 20: Total cross section of the reaction $\pi^+p \to K^+\Sigma^+$. Data: filled triangles right: Ref. [35]; filled squares: Ref. [40]; filled diamonds: Ref. [41]; empty triangles up: Ref. [47]; filled triangles down: Ref. [43]; empty triangles down: Ref. [48]; empty triangles left: Ref. [49]; empty circles: Ref. [50]; empty squares: Ref. [51]; crosses: Ref. [52]. For filled circles, filled triangles left and empty triangles right see Ref. [26].

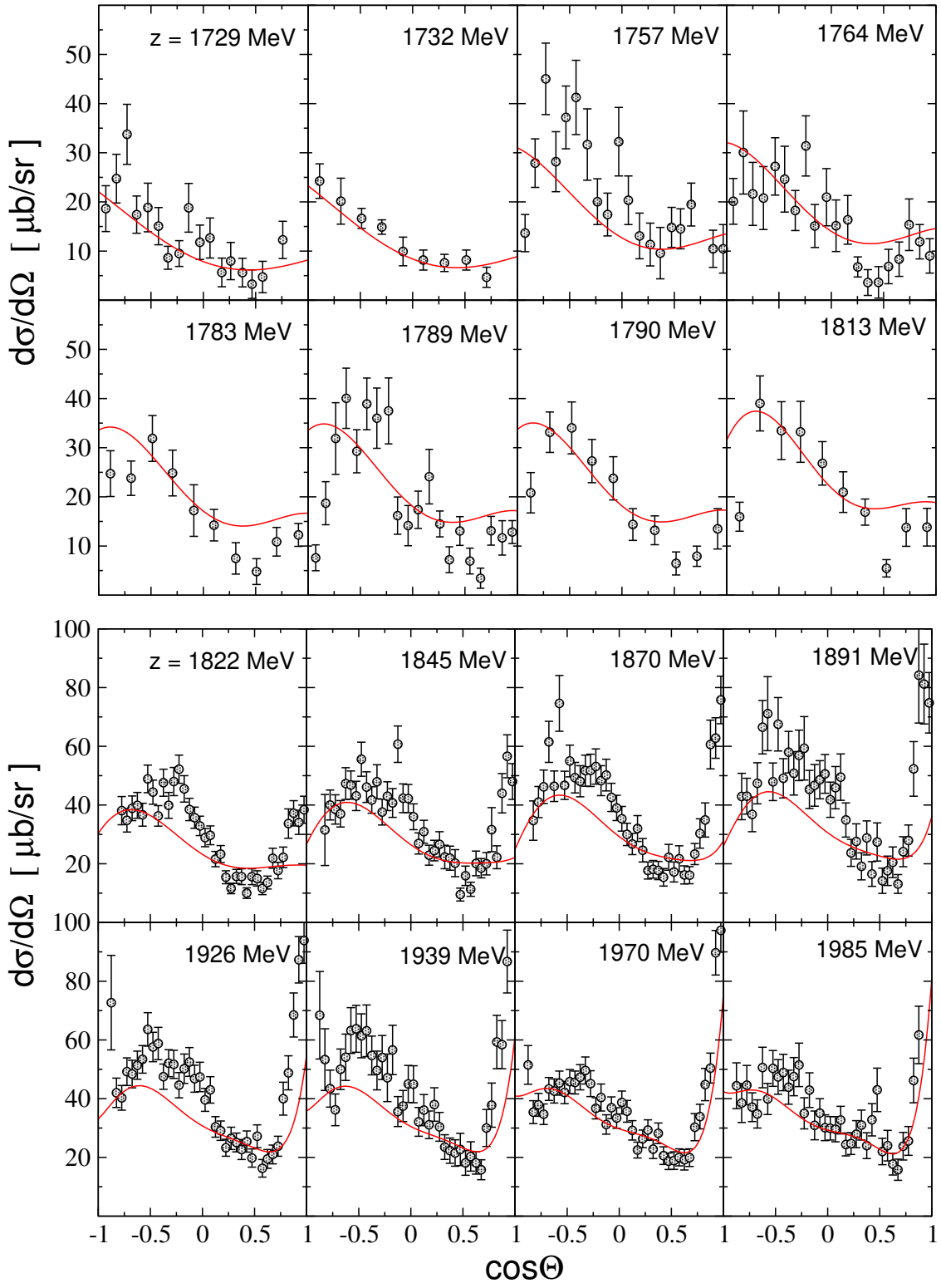


Figure 21: Differential cross section [1/2] of the reaction $\pi^+p \to K^+\Sigma^+$. Data: Ref. [35], except: $z = 1729$, 1757, 1789 MeV from Ref. [40]; $z = 1732$, 1783, 1813 MeV from Ref. [41]; $z = 1764$ MeV from Ref. [43]; $z = 1790$ MeV from Ref. [42].

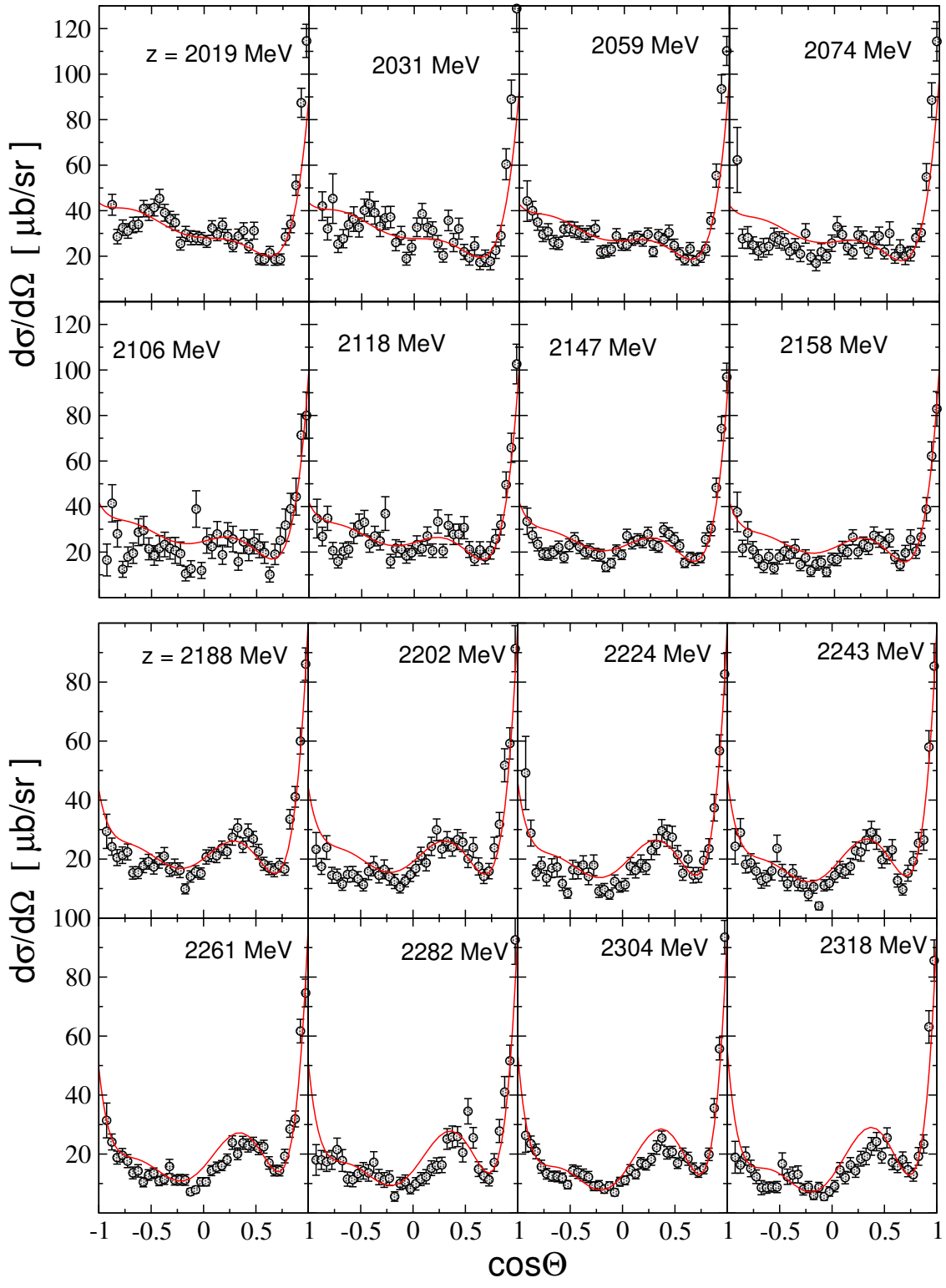


Figure 22: Differential cross section [2/2] of the reaction $\pi^+p \to K^+\Sigma^+$. Data from Ref. [35].

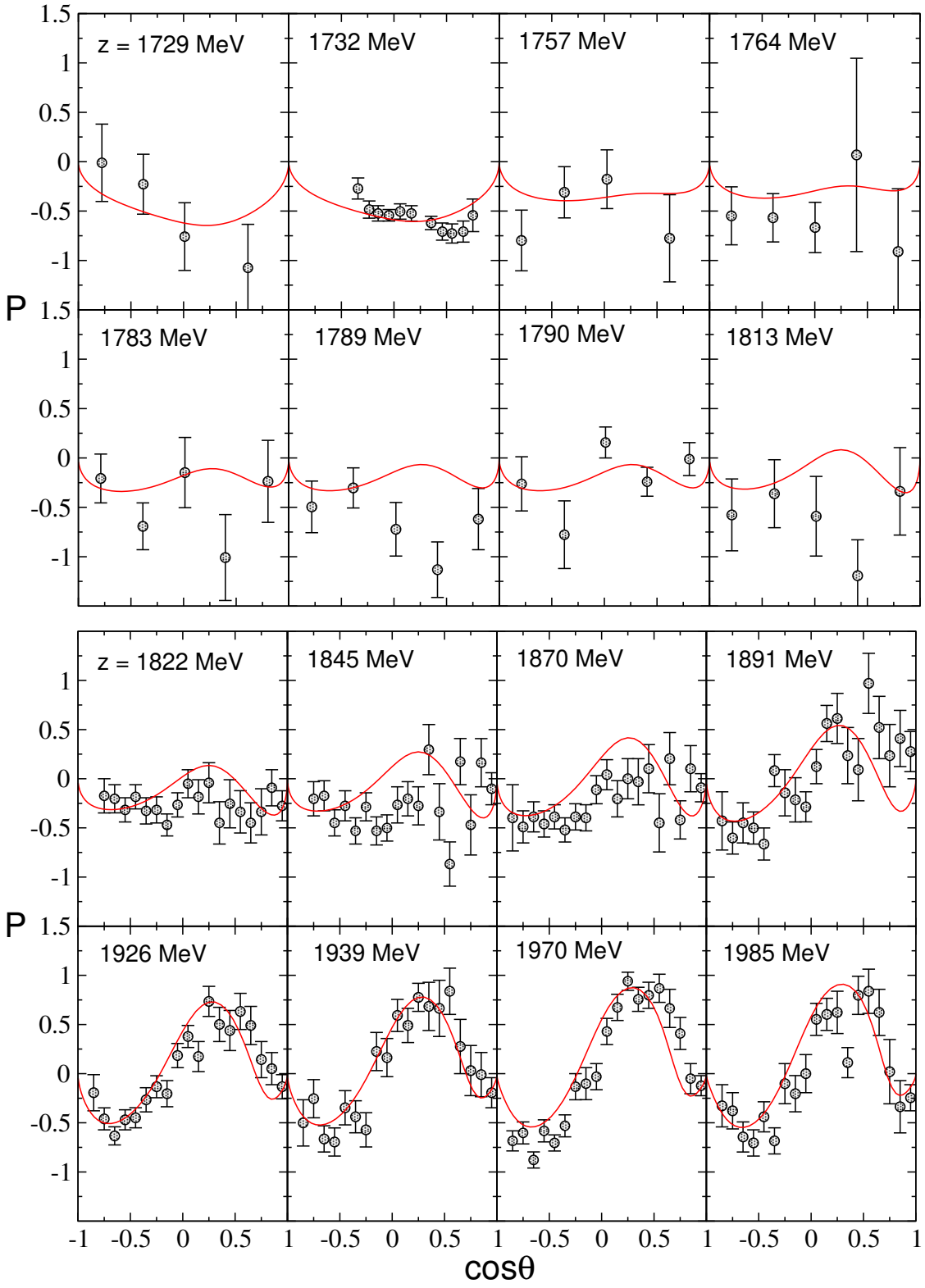


Figure 23: Polarization [1/2] of the reaction $\pi^+p \to K^+\Sigma^+$. Data: Ref. [35], except: z = 1729, 1757, 1789 MeV from Ref. [40]; z = 1783, 1813 MeV from Ref. [41]; z = 1764 MeV from Ref. [43]; z = 1790 MeV from Ref. [42]; z = 1732 MeV from Ref. [44].

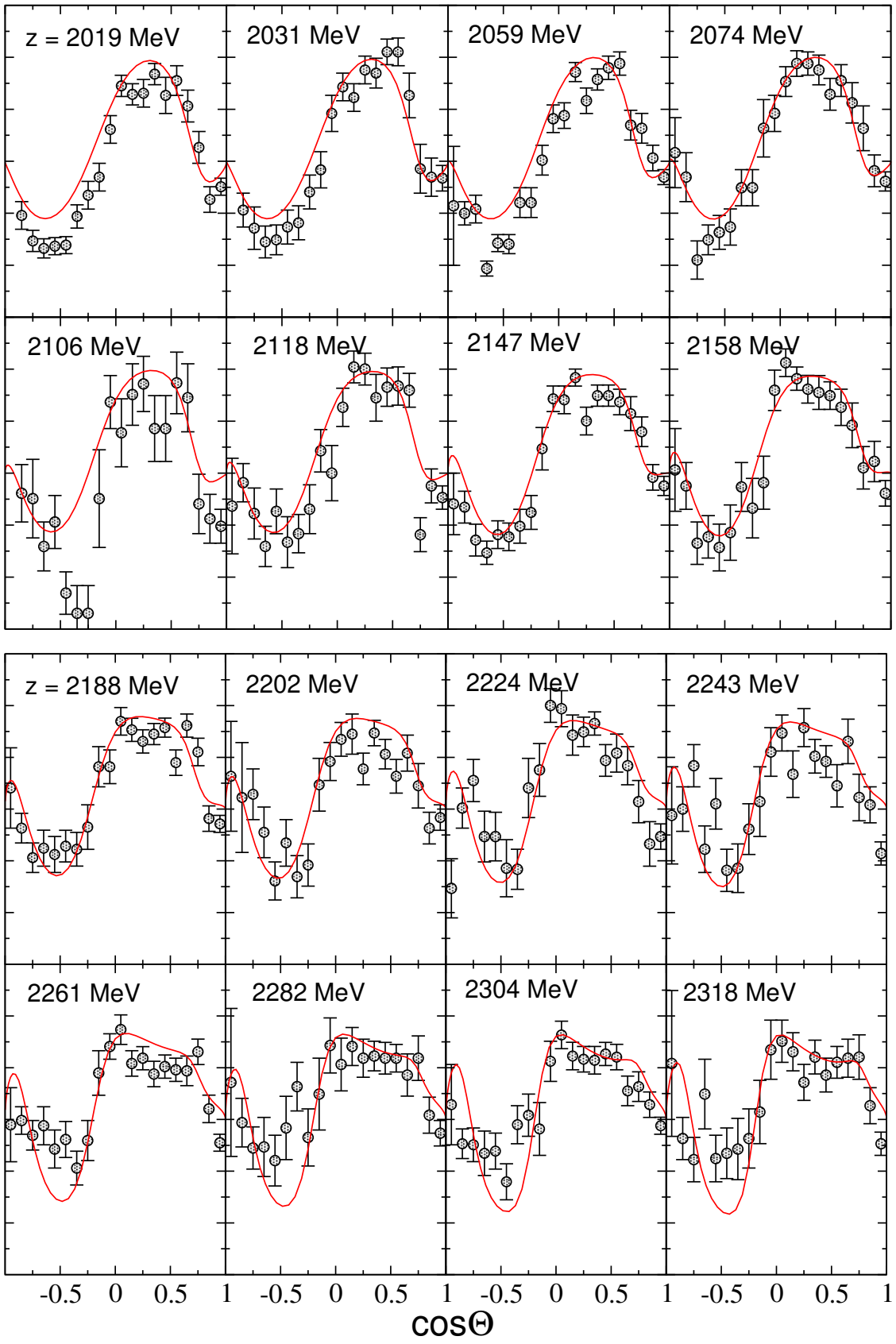


Figure 24: Polarization [2/2] of the reaction $\pi^+p \to K^+\Sigma^+$. Data: Ref. [35].

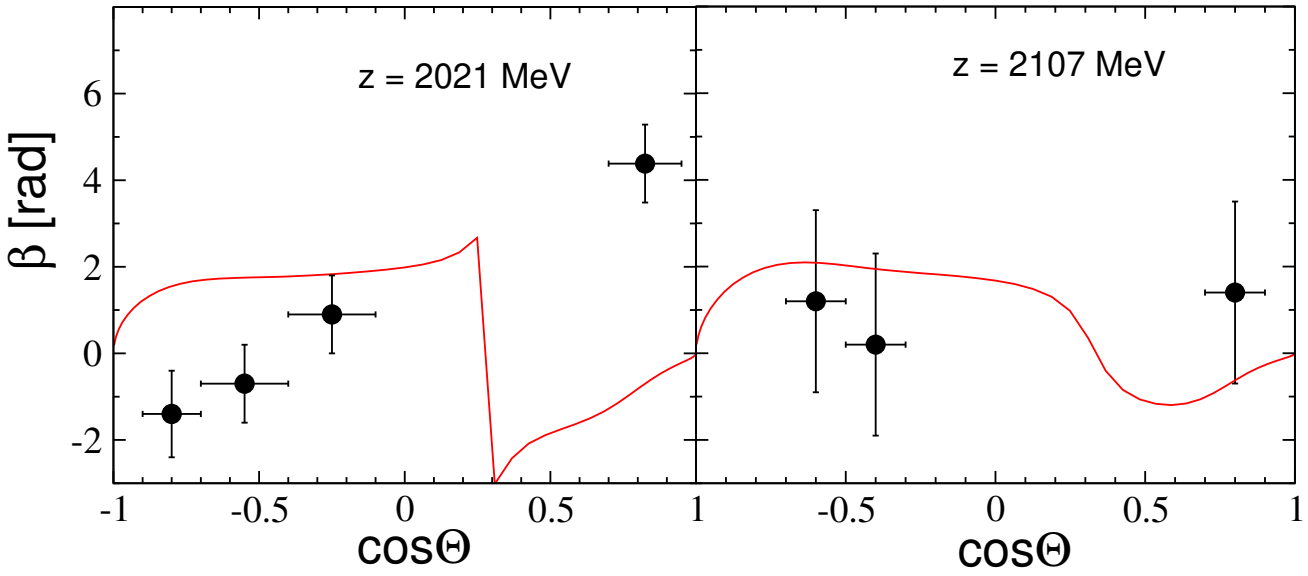


Figure 25: Spin-rotation parameter β of the reaction $\pi^+p \to K^+\Sigma^+$. Data: Ref. [37].

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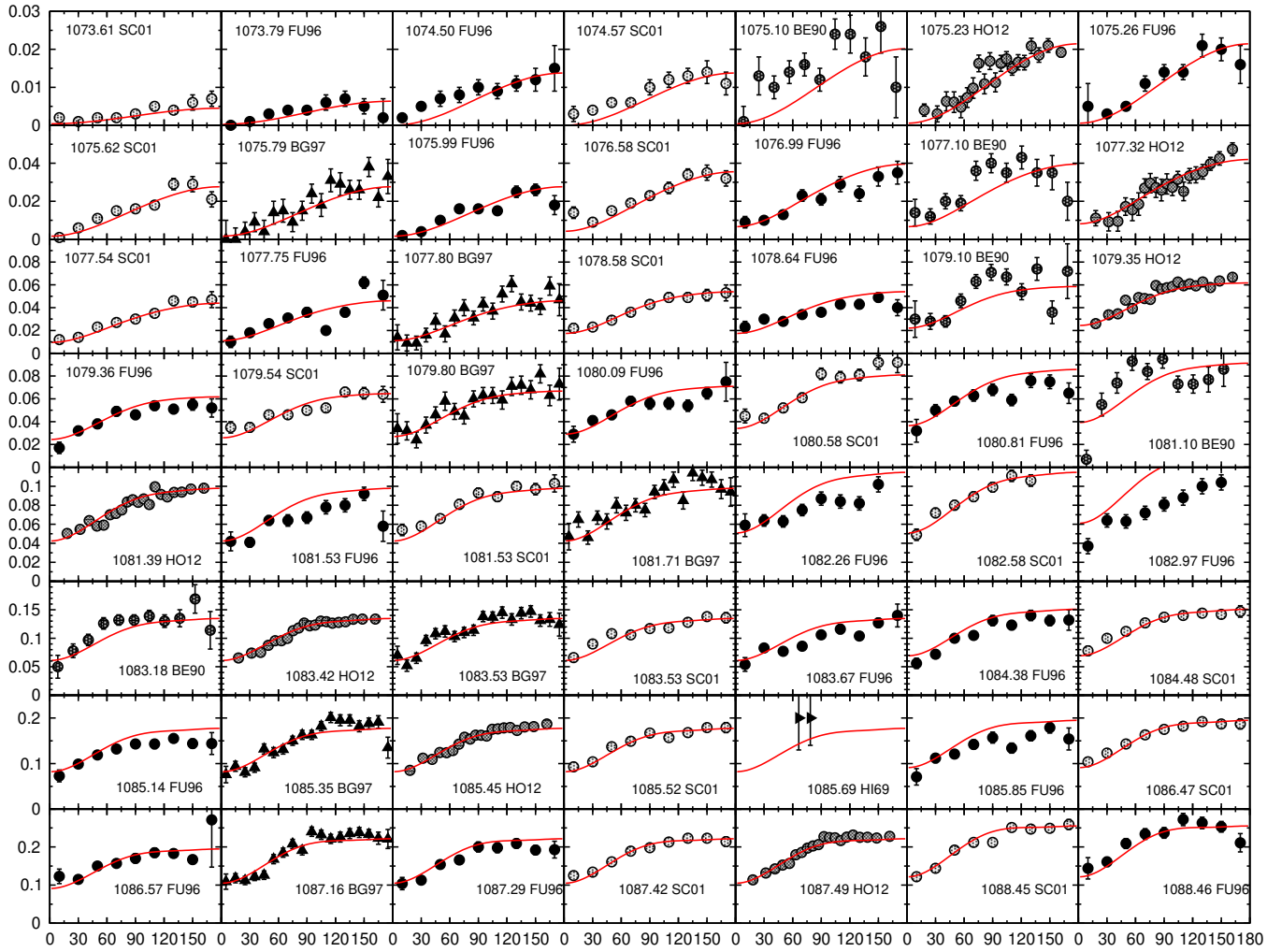
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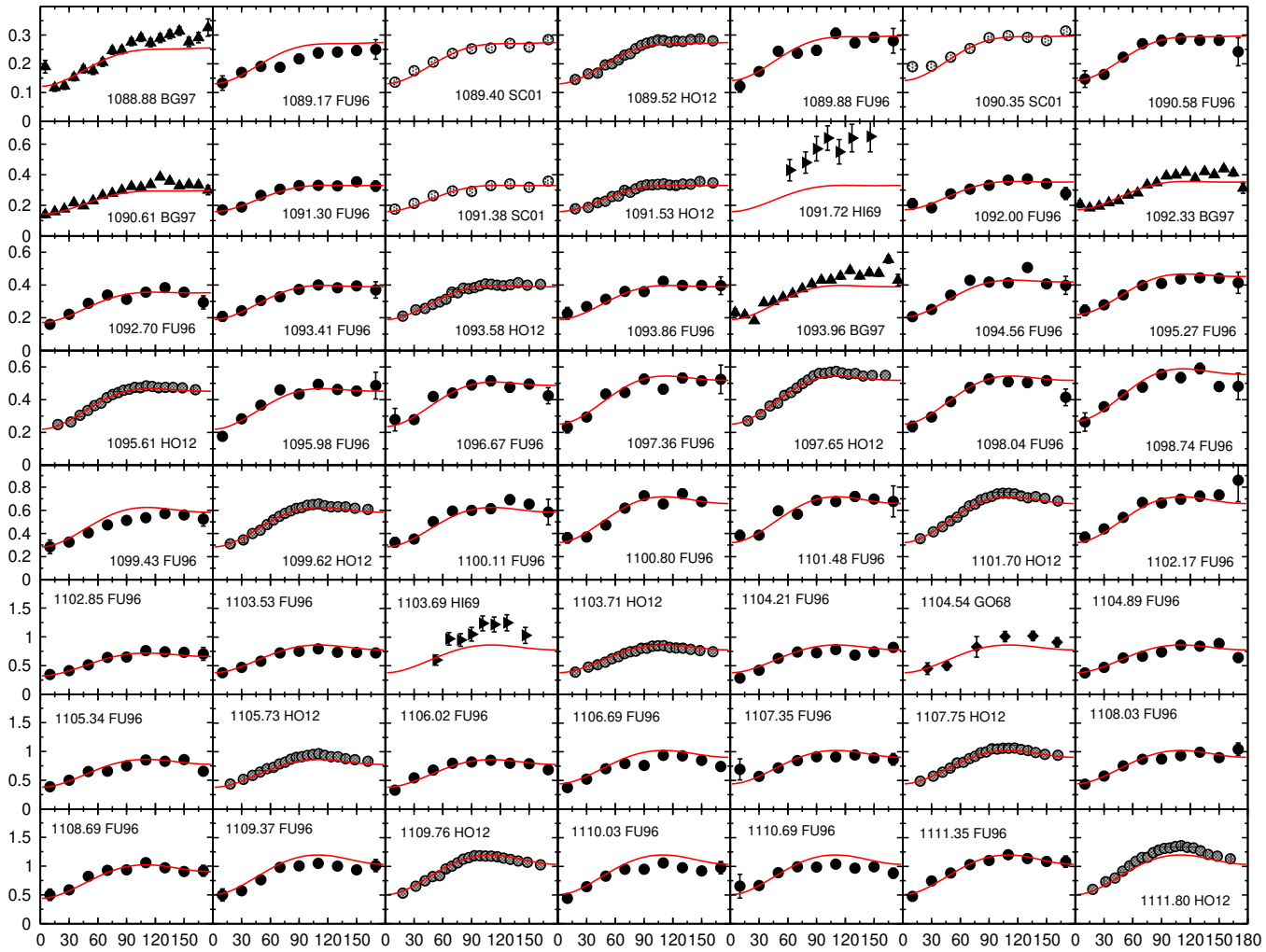
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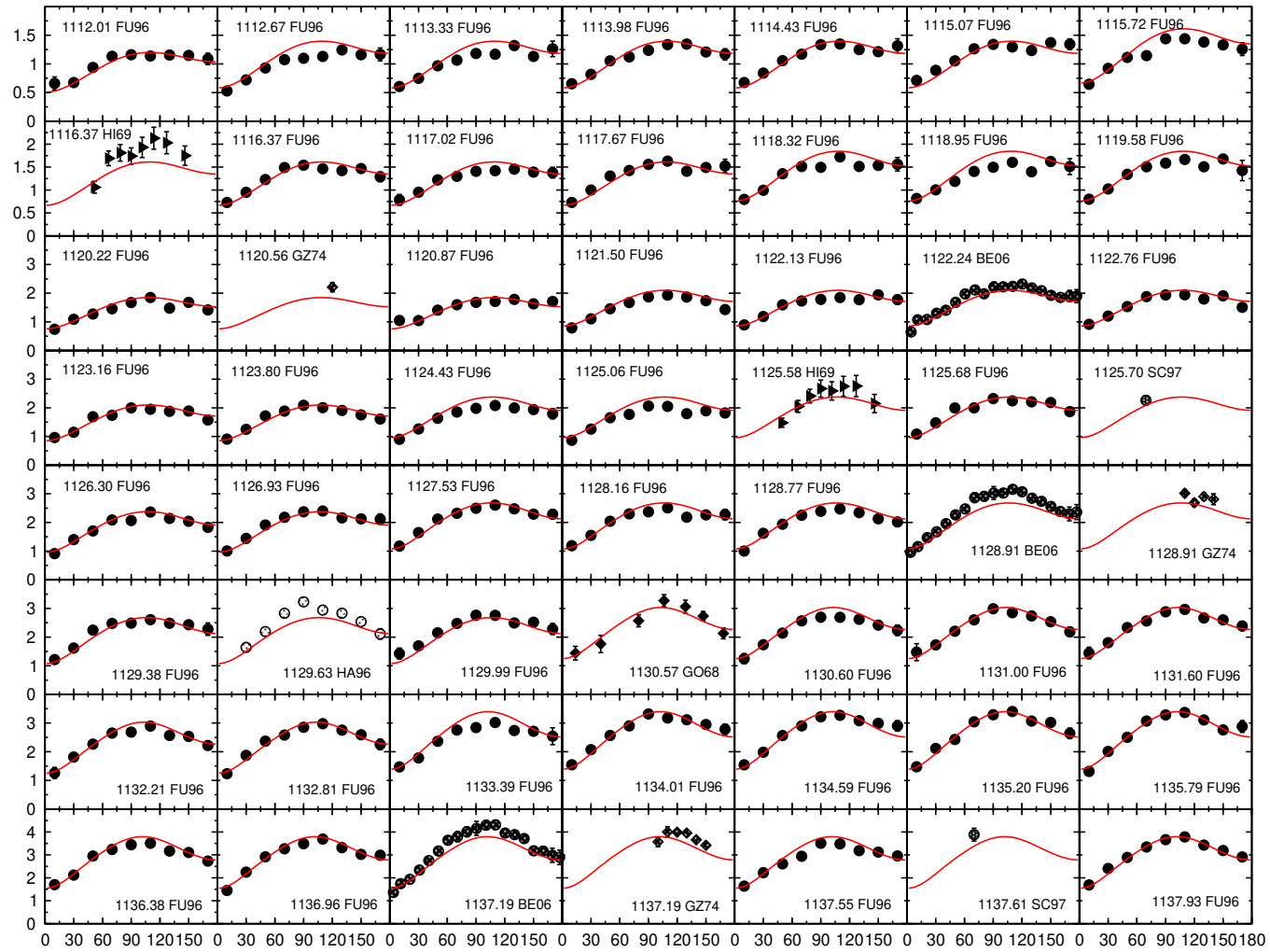
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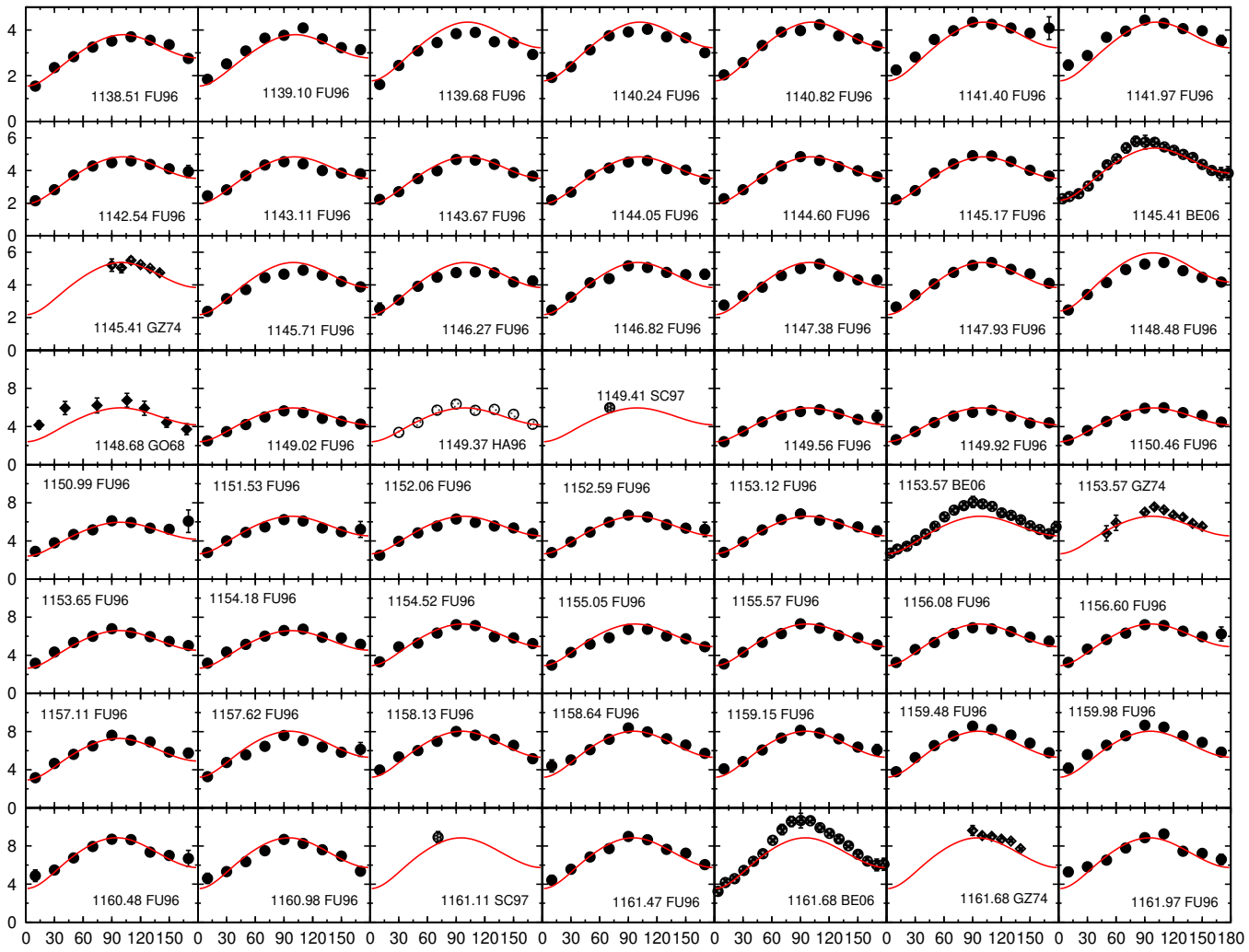
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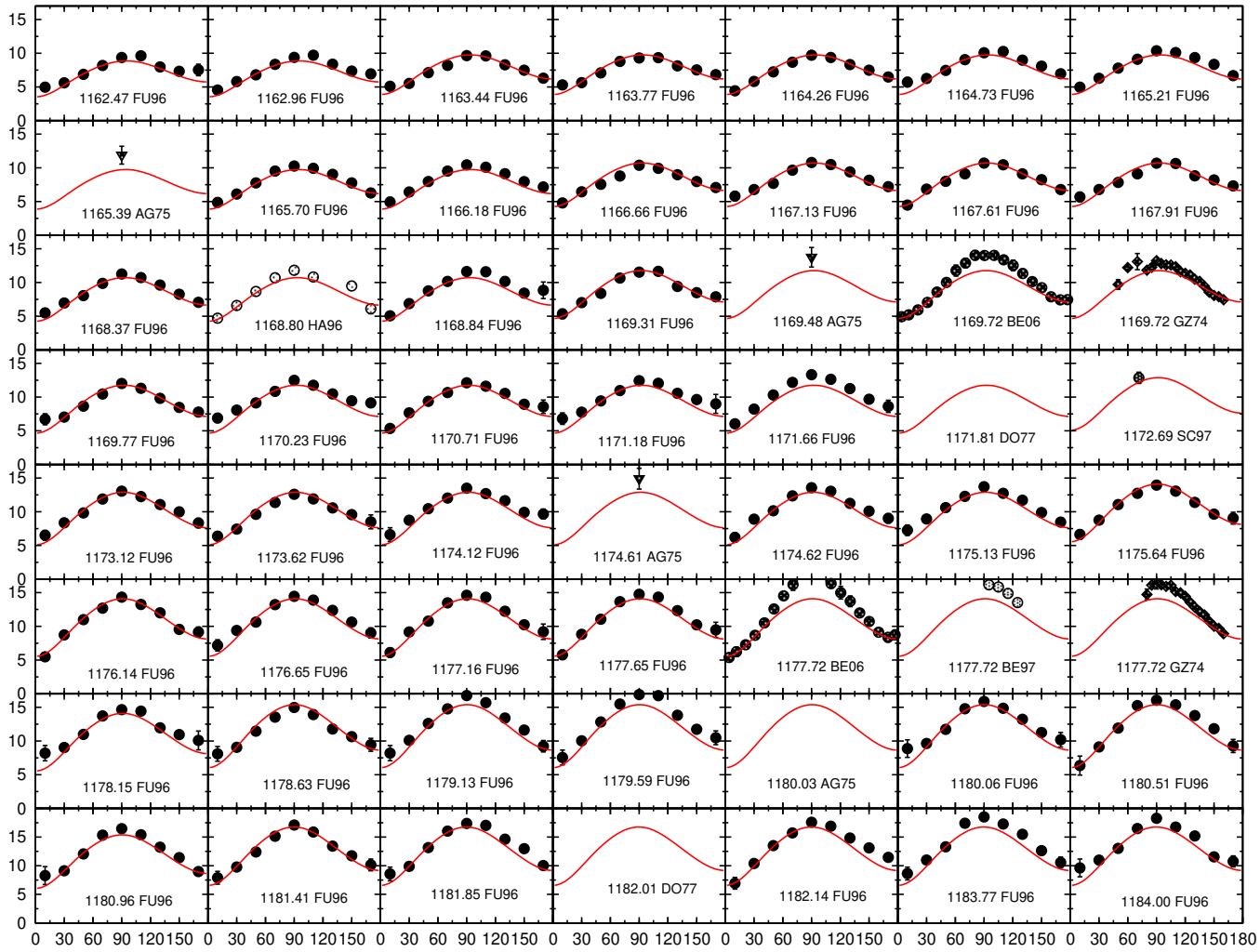
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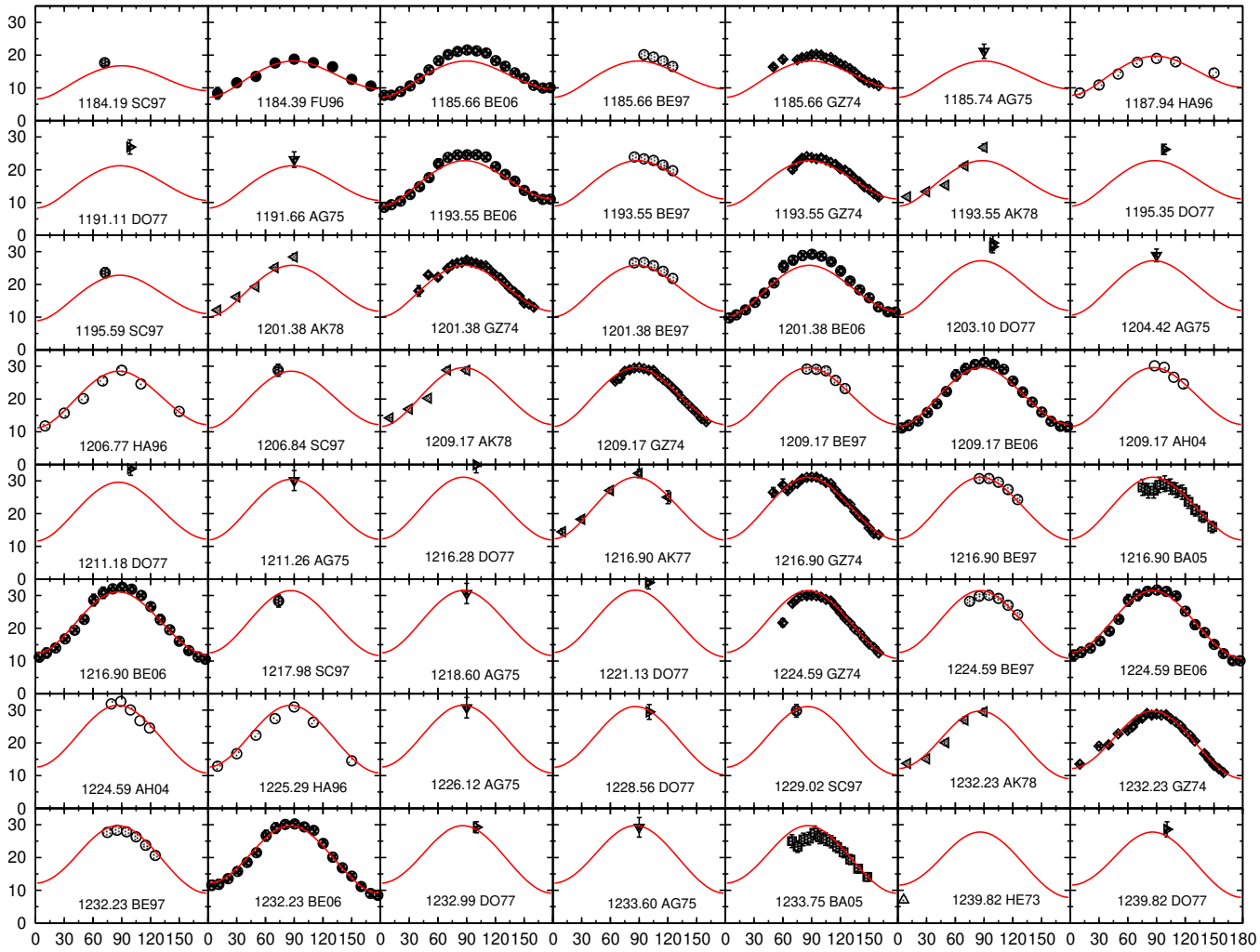

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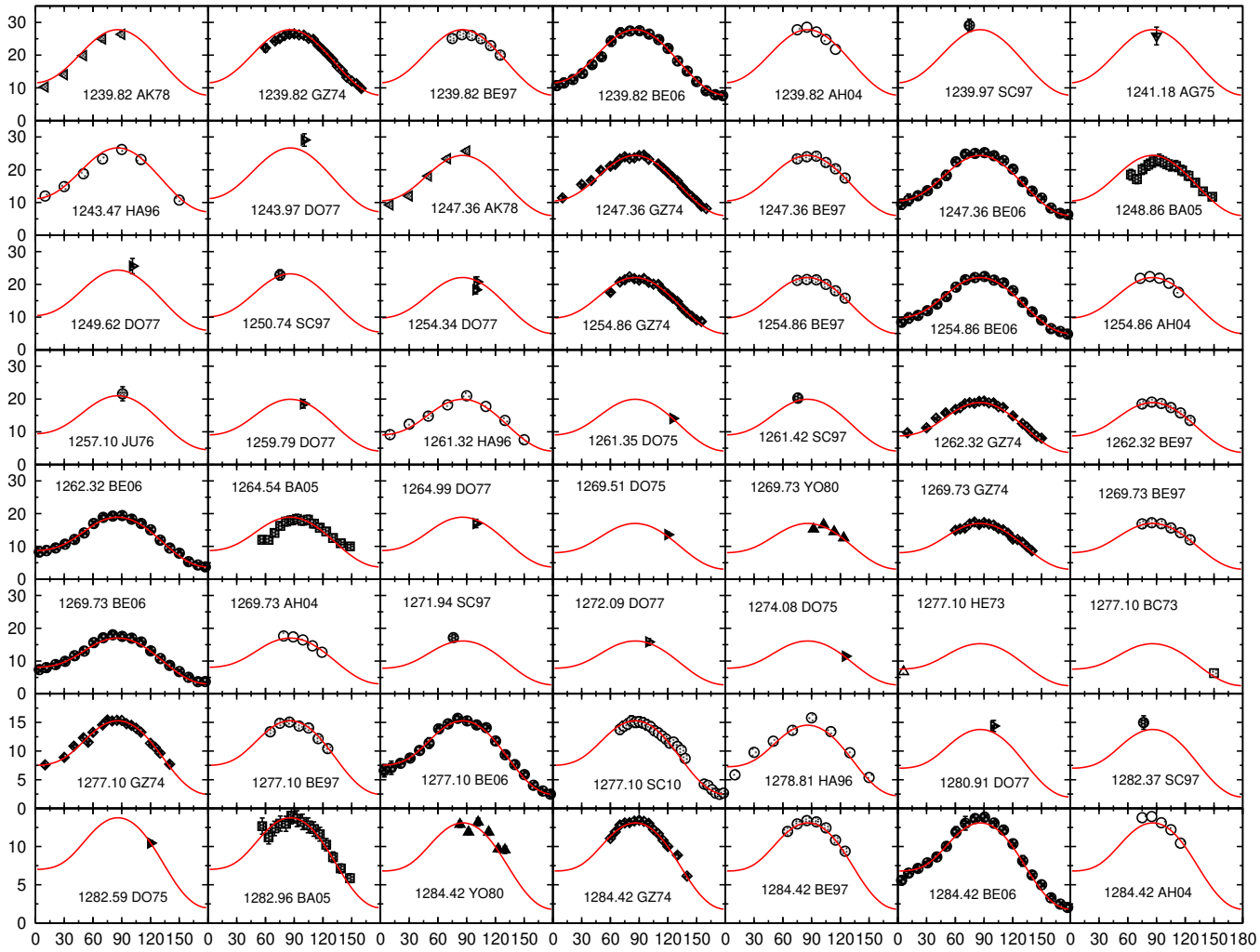

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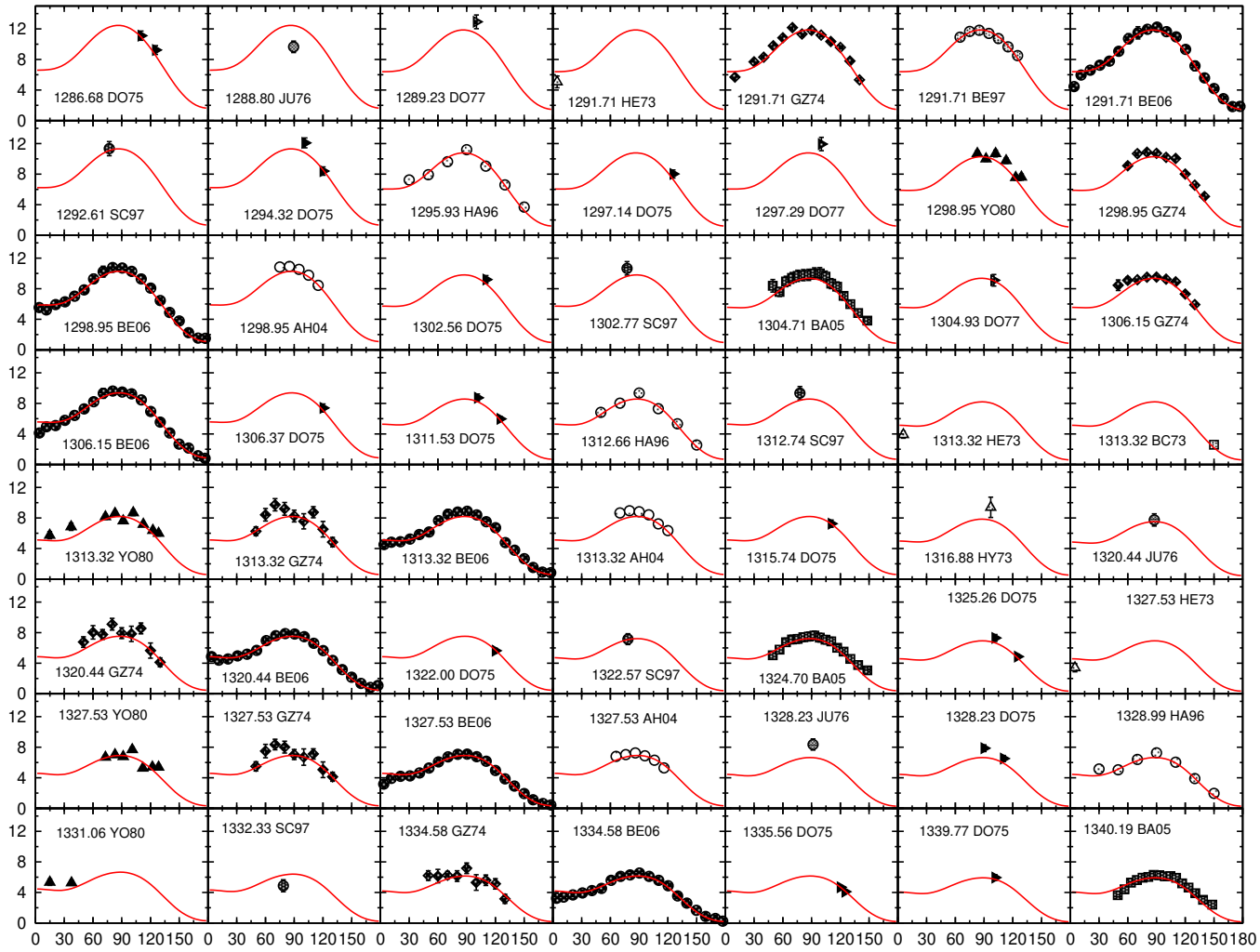

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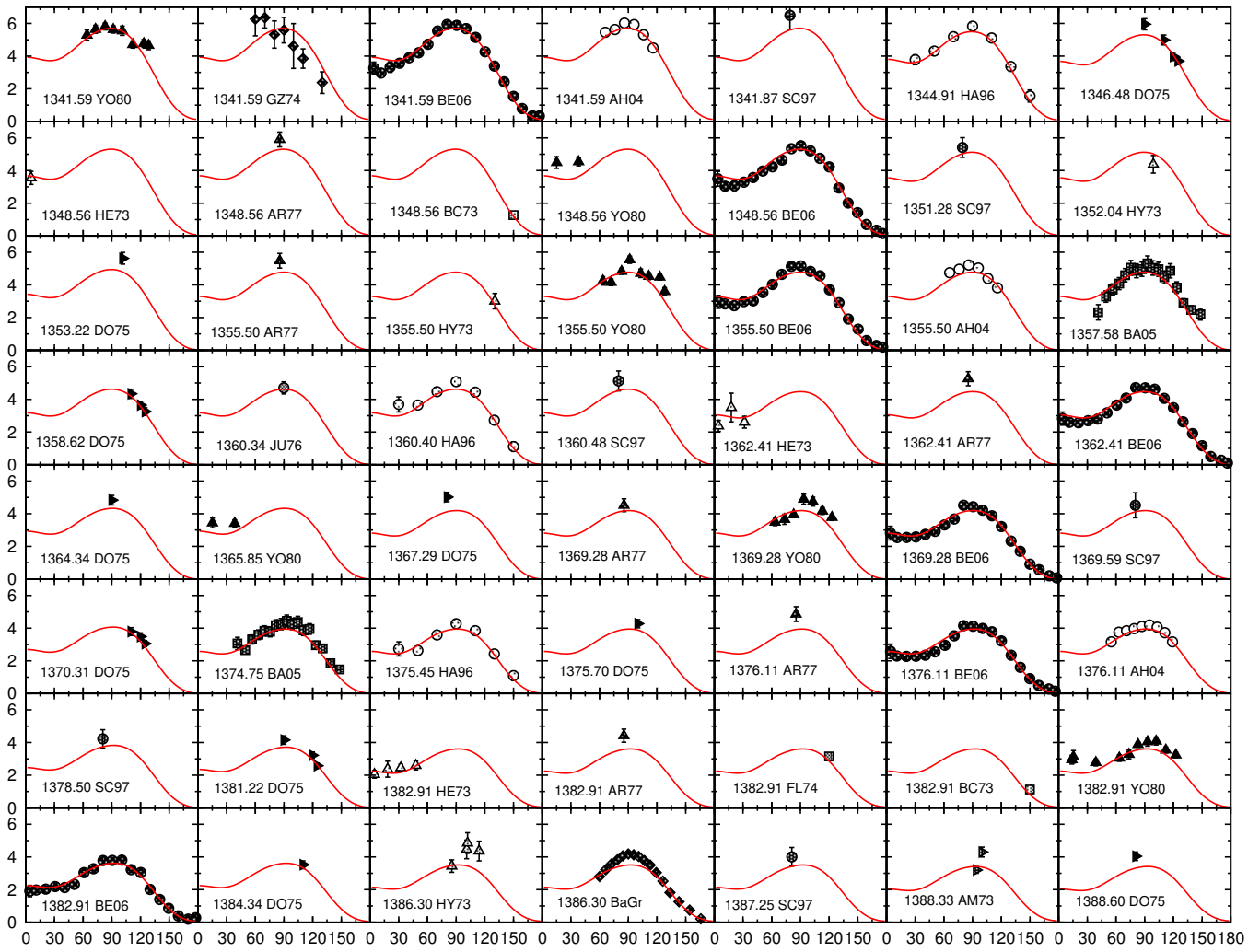

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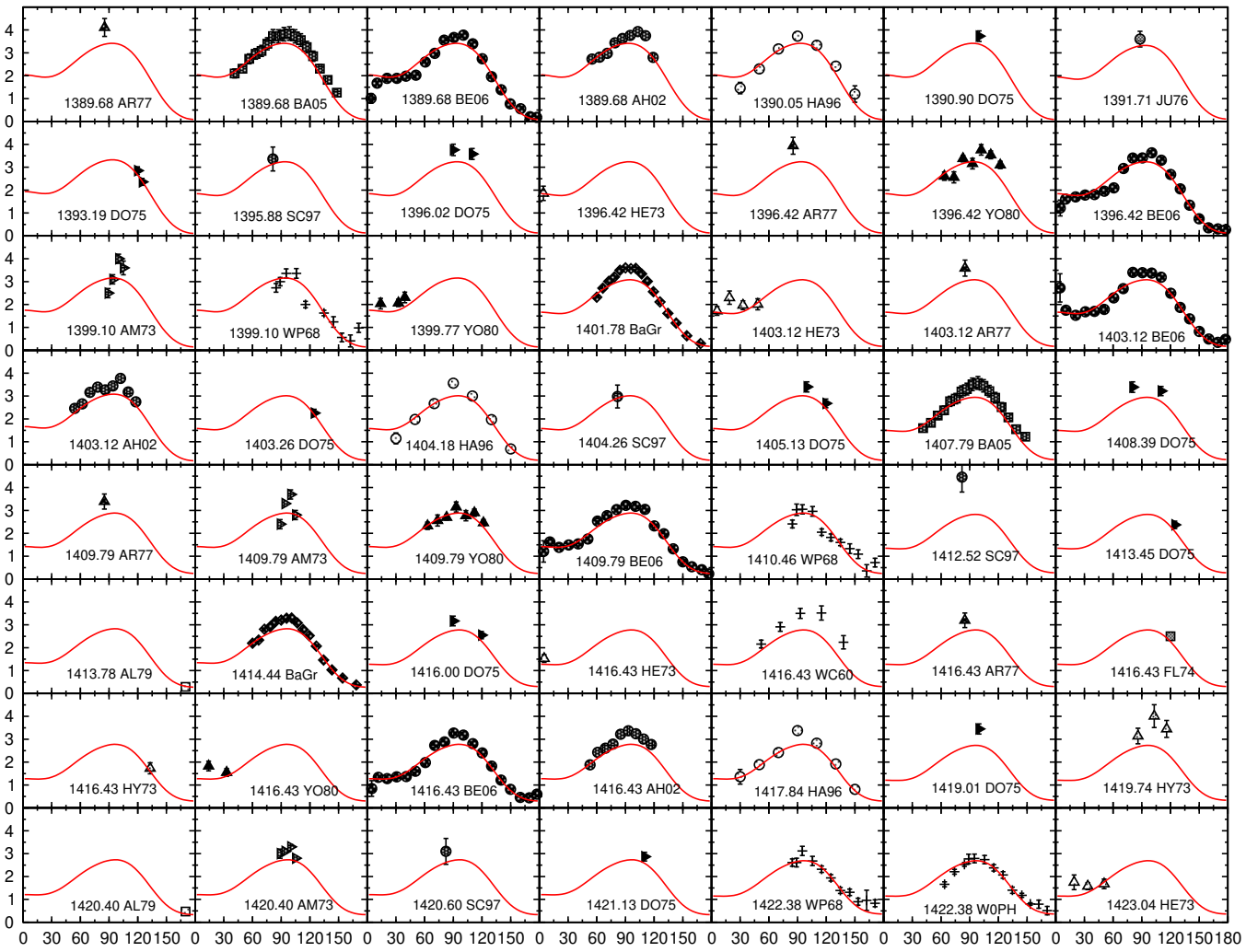

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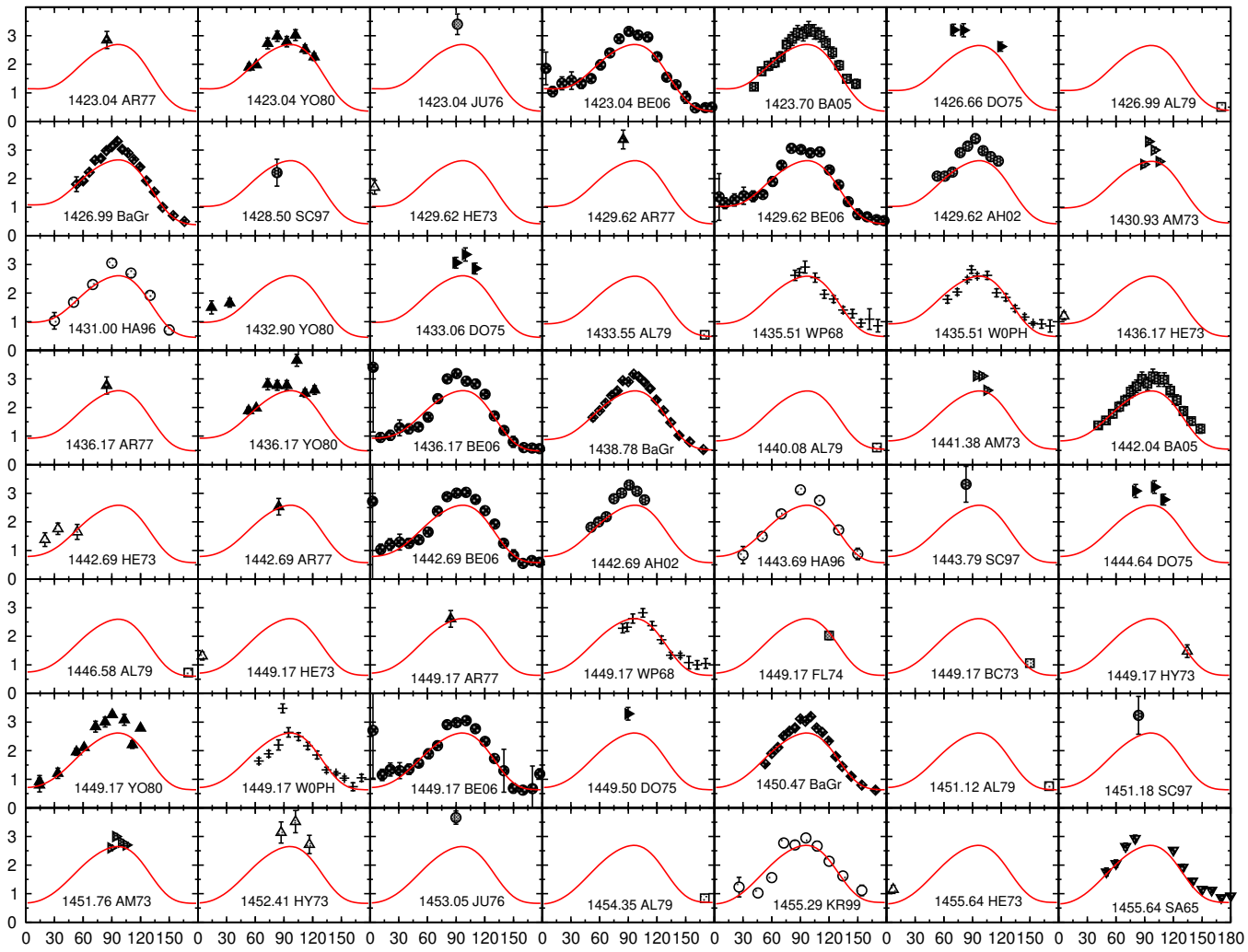

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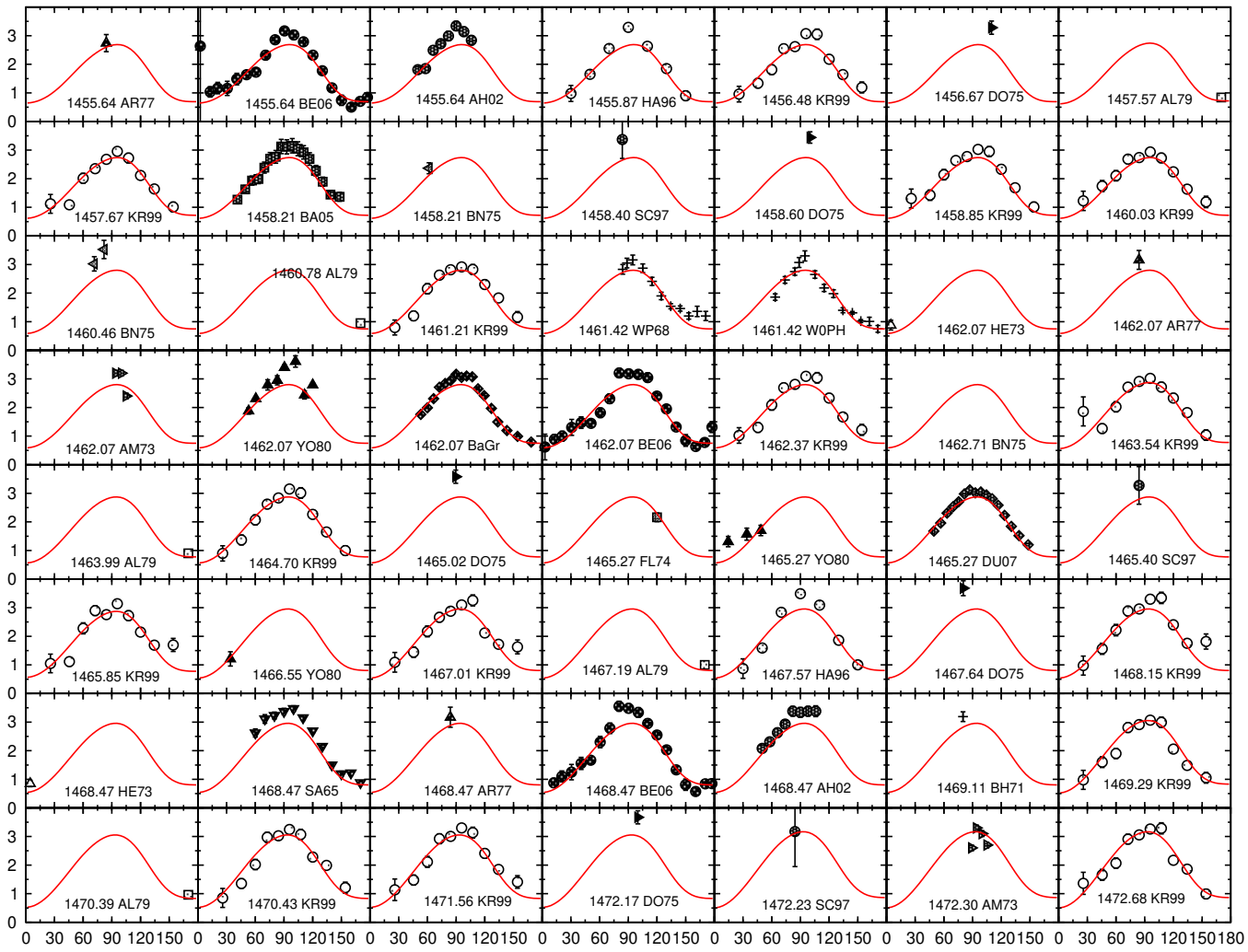

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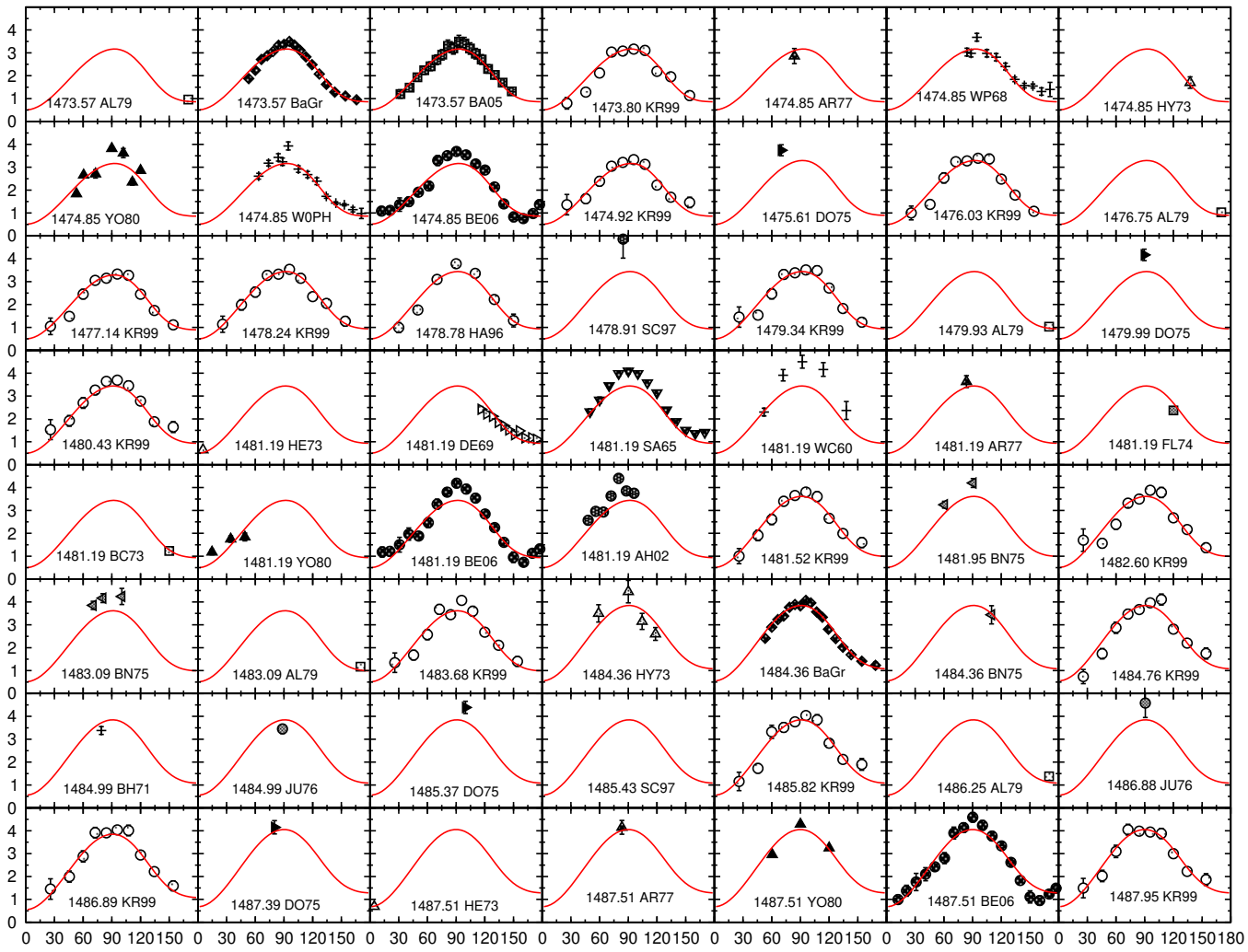

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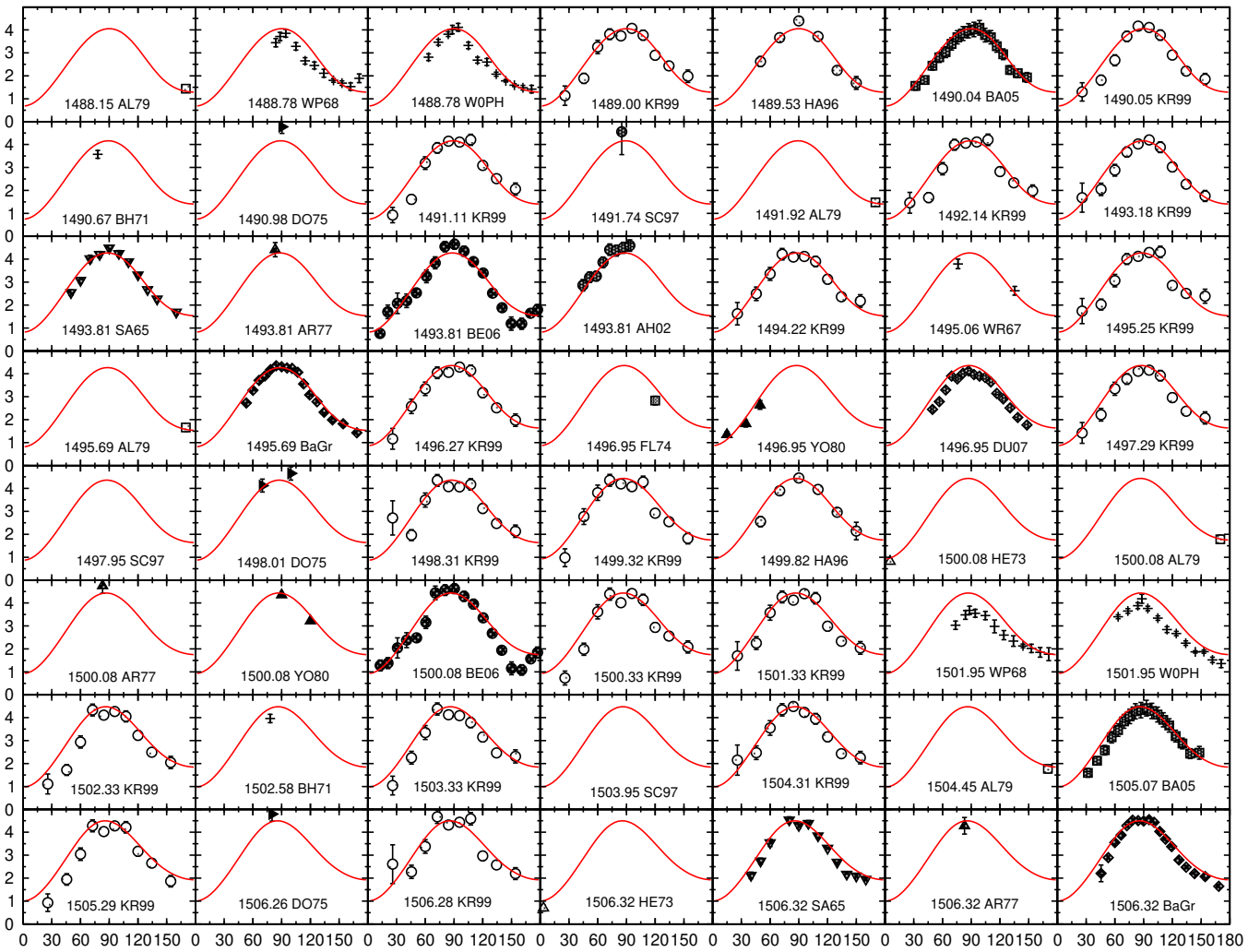

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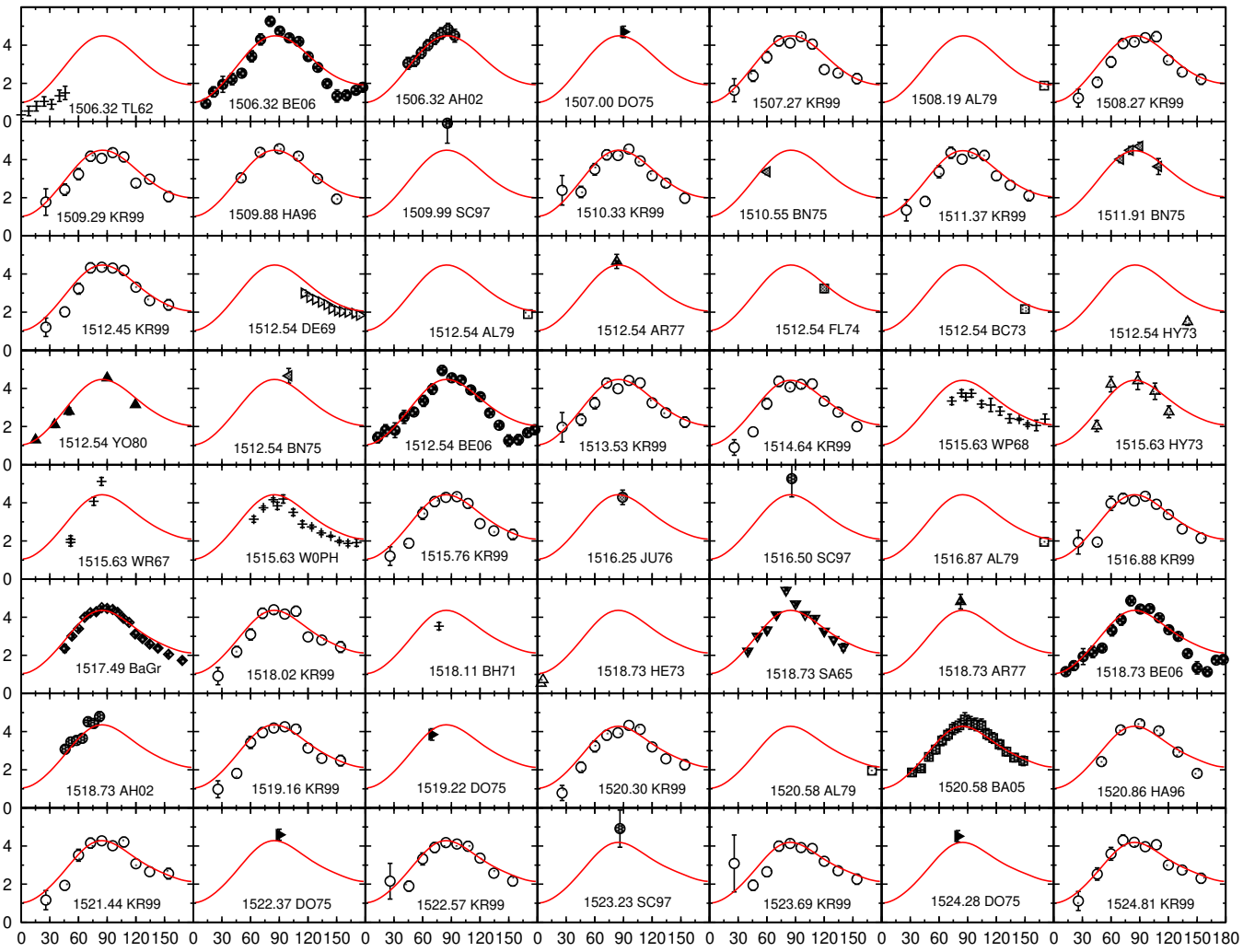

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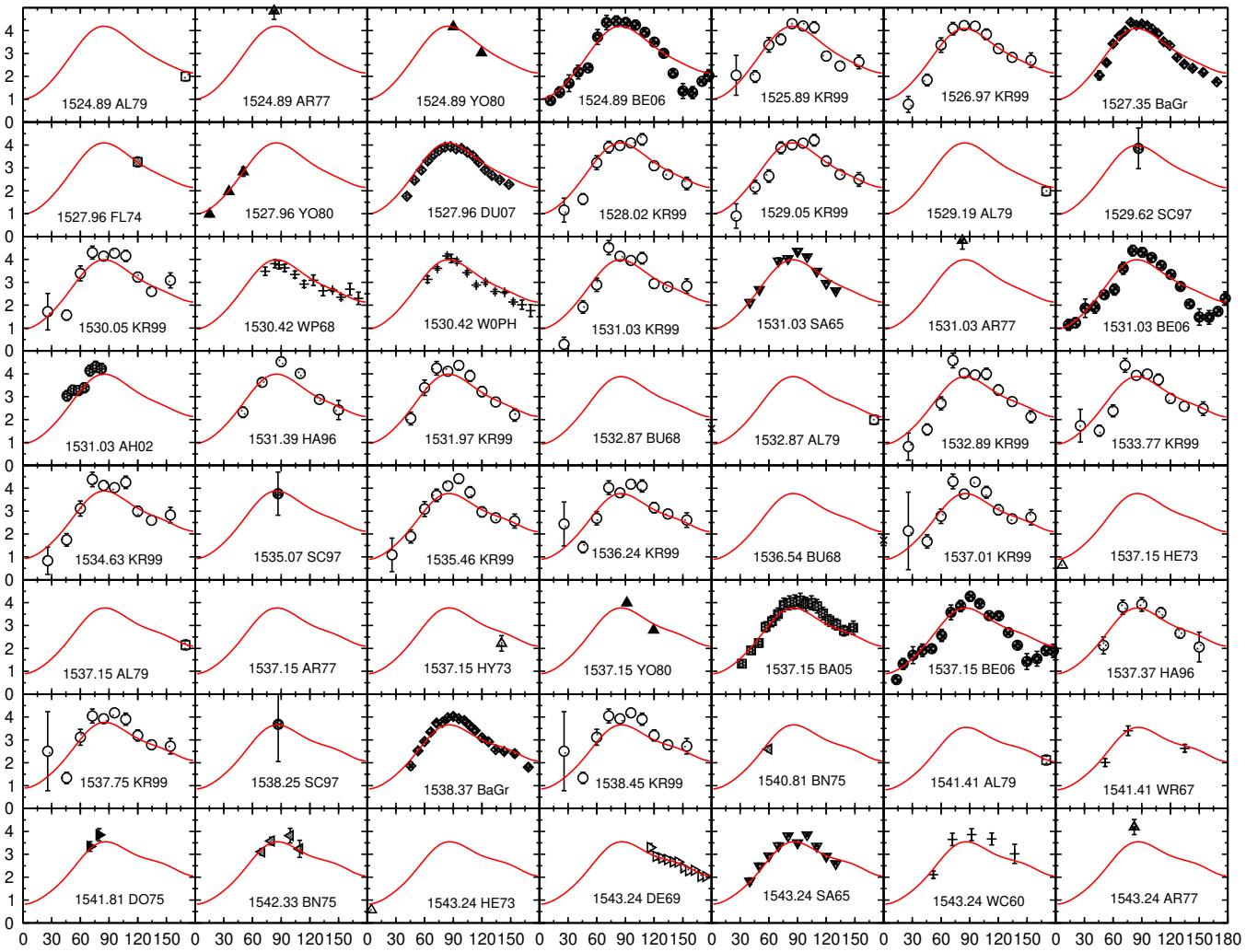

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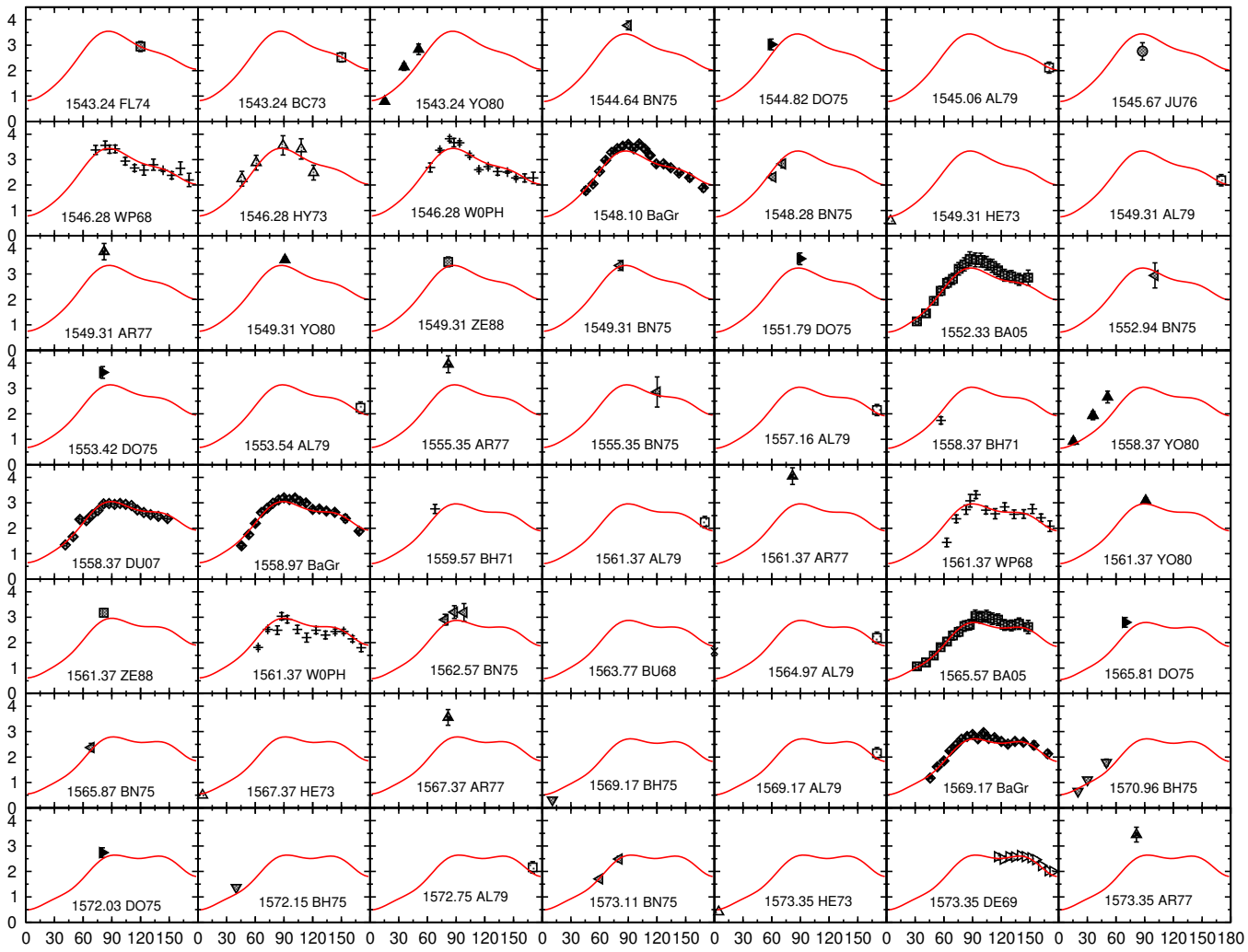

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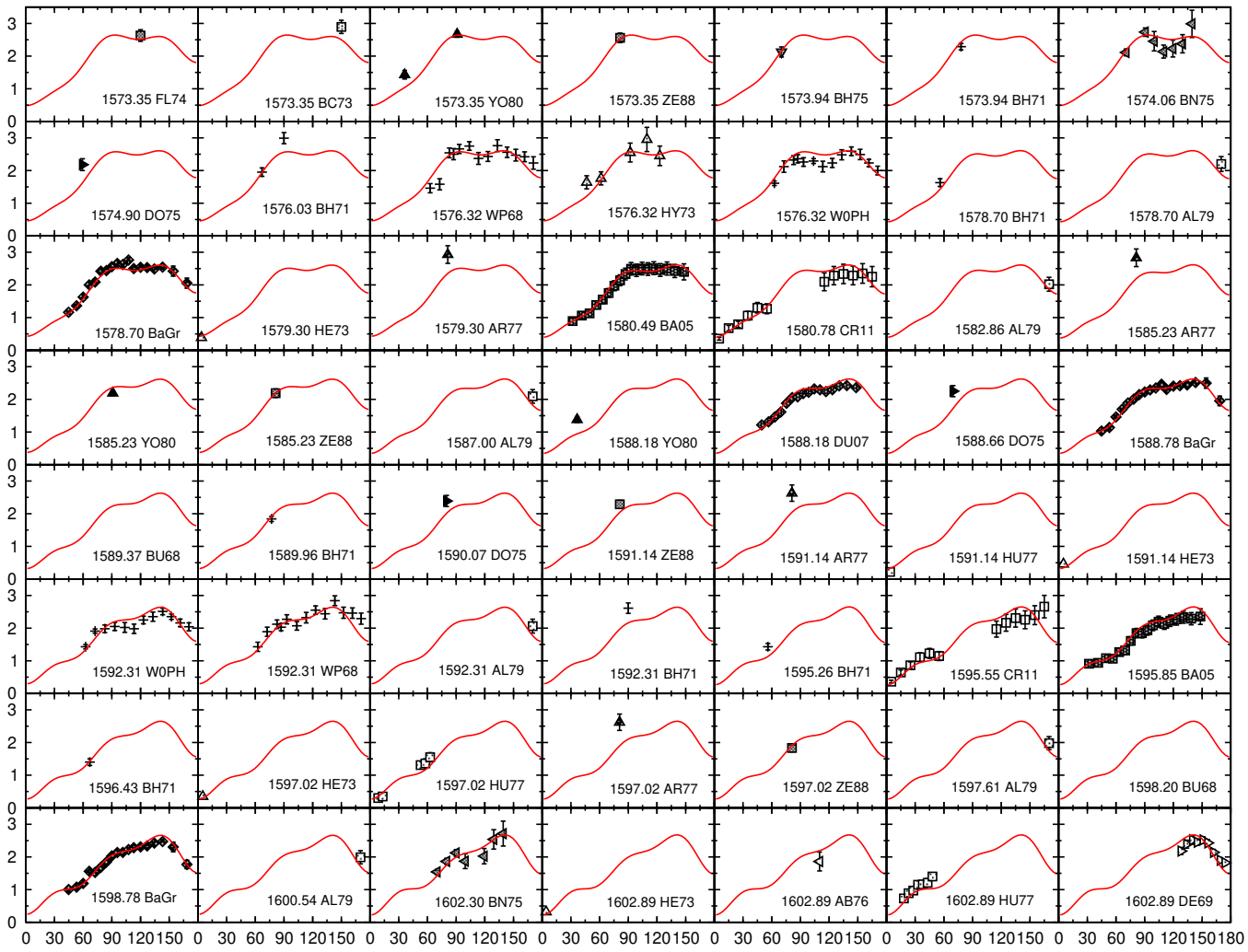

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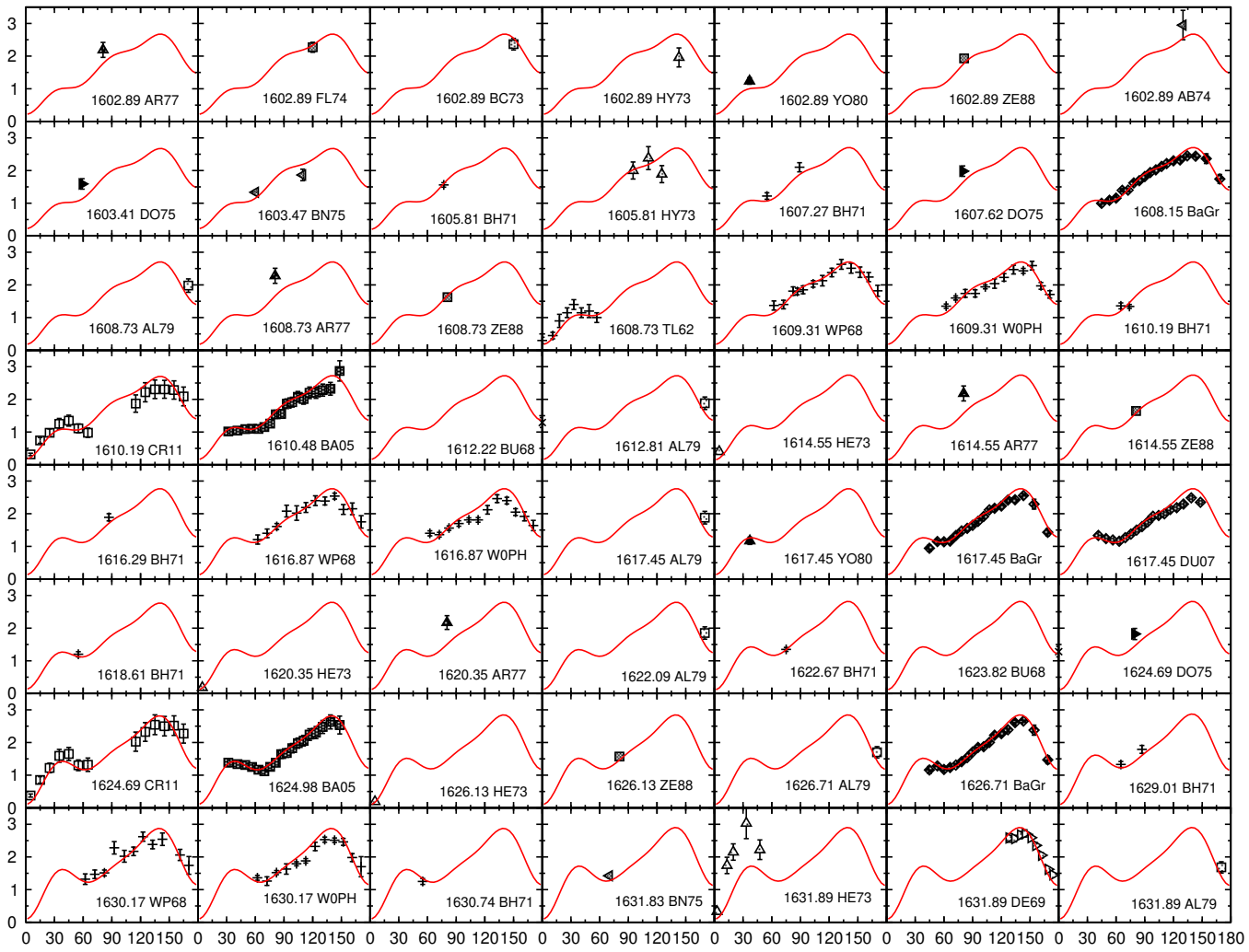

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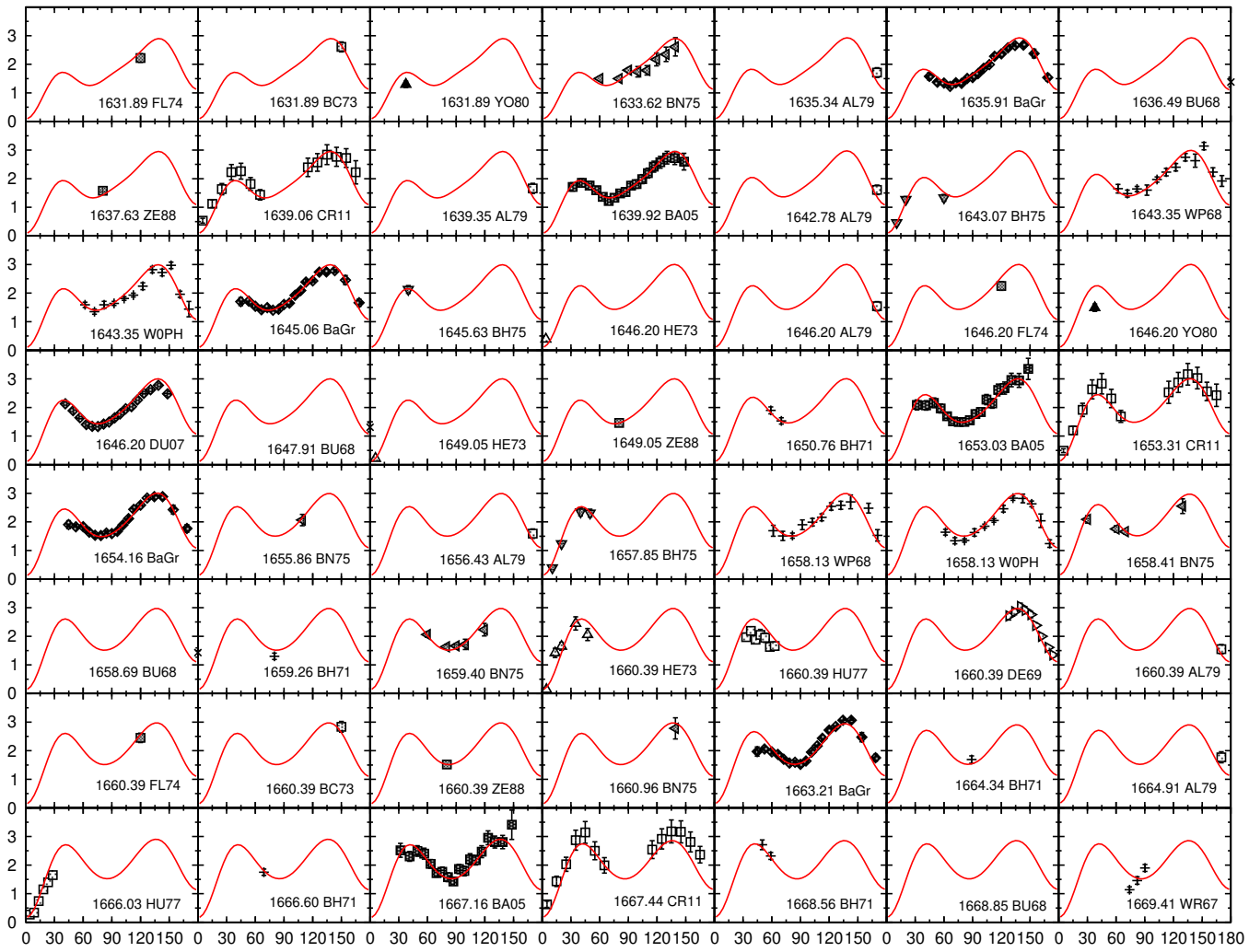

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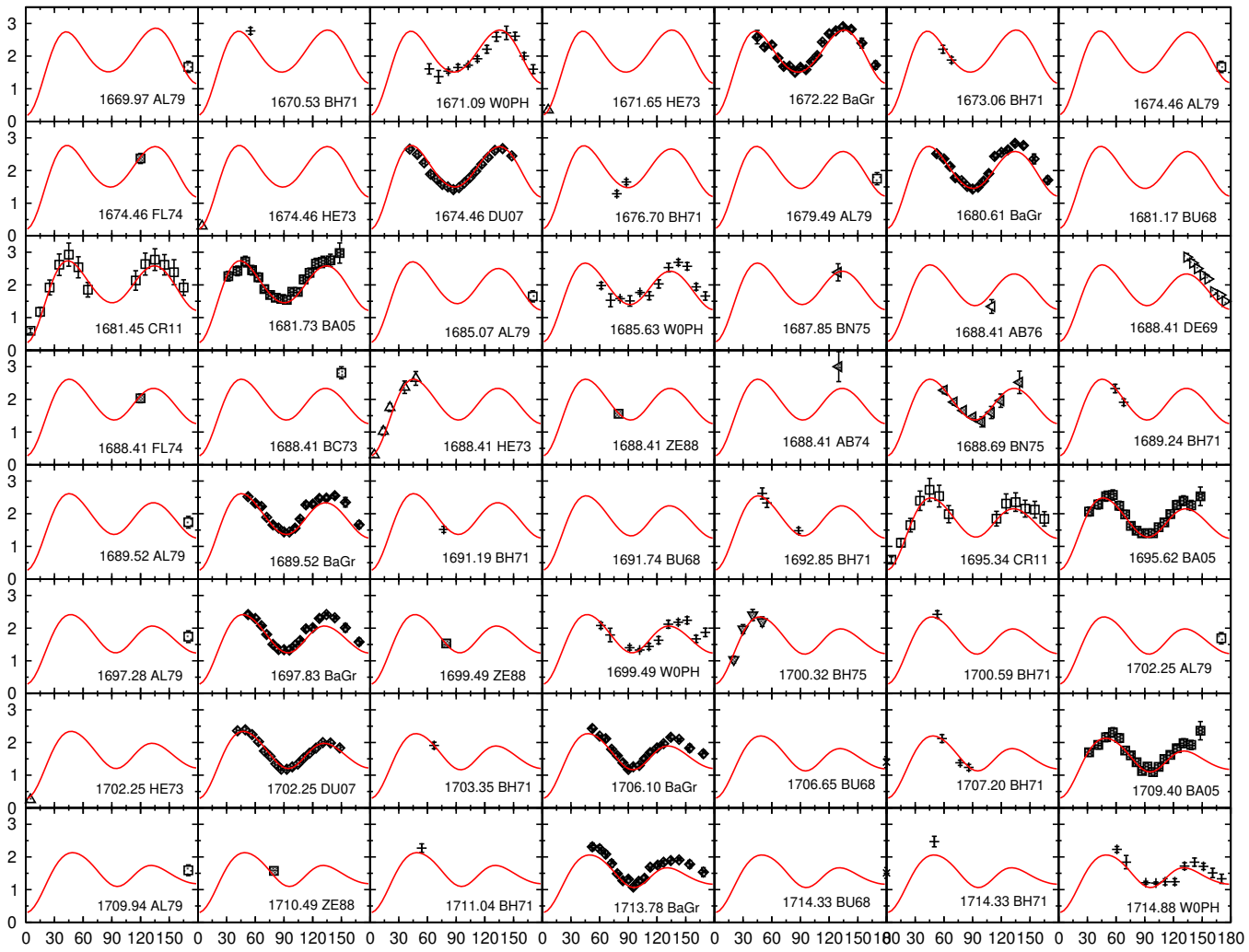

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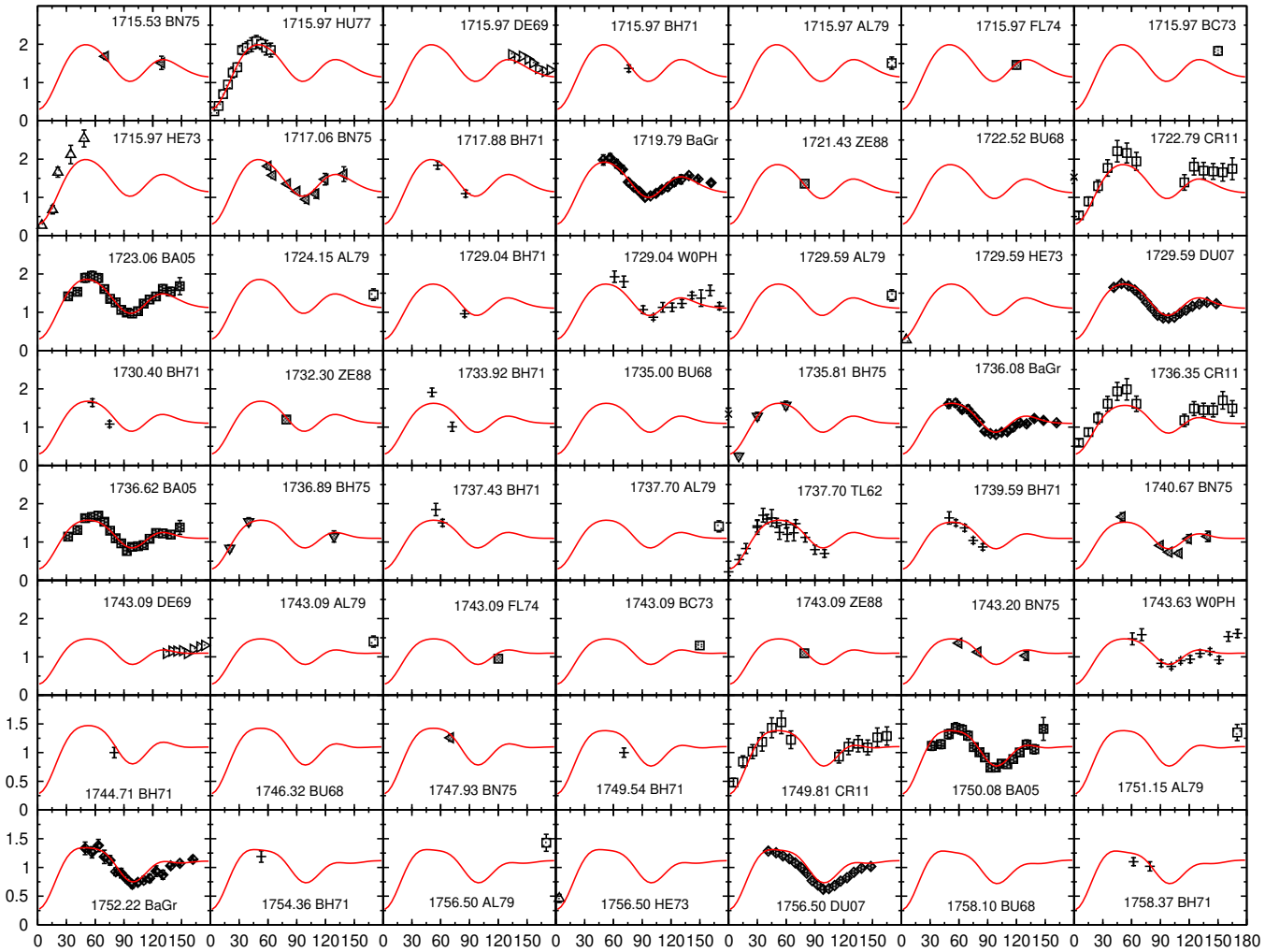

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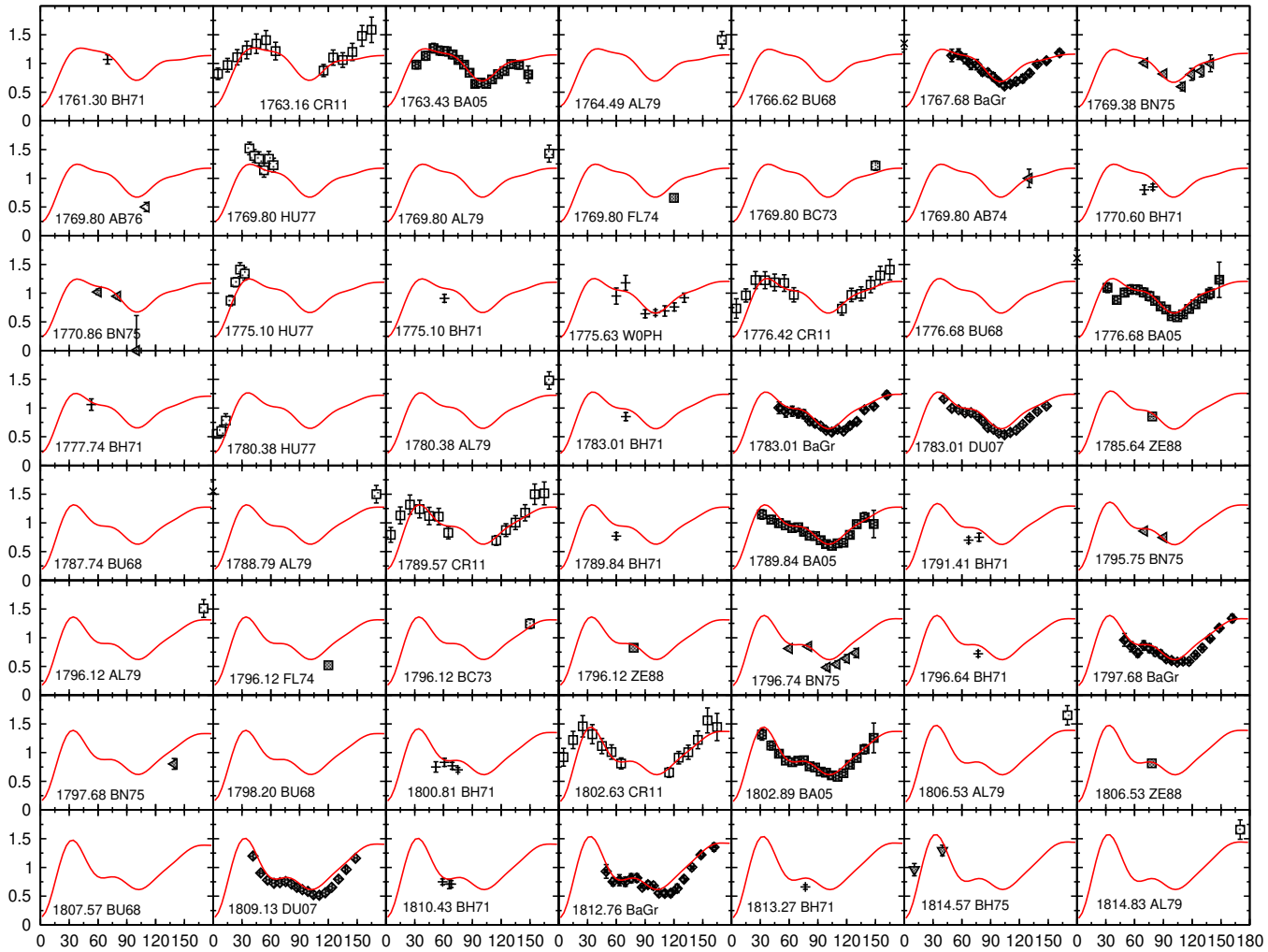

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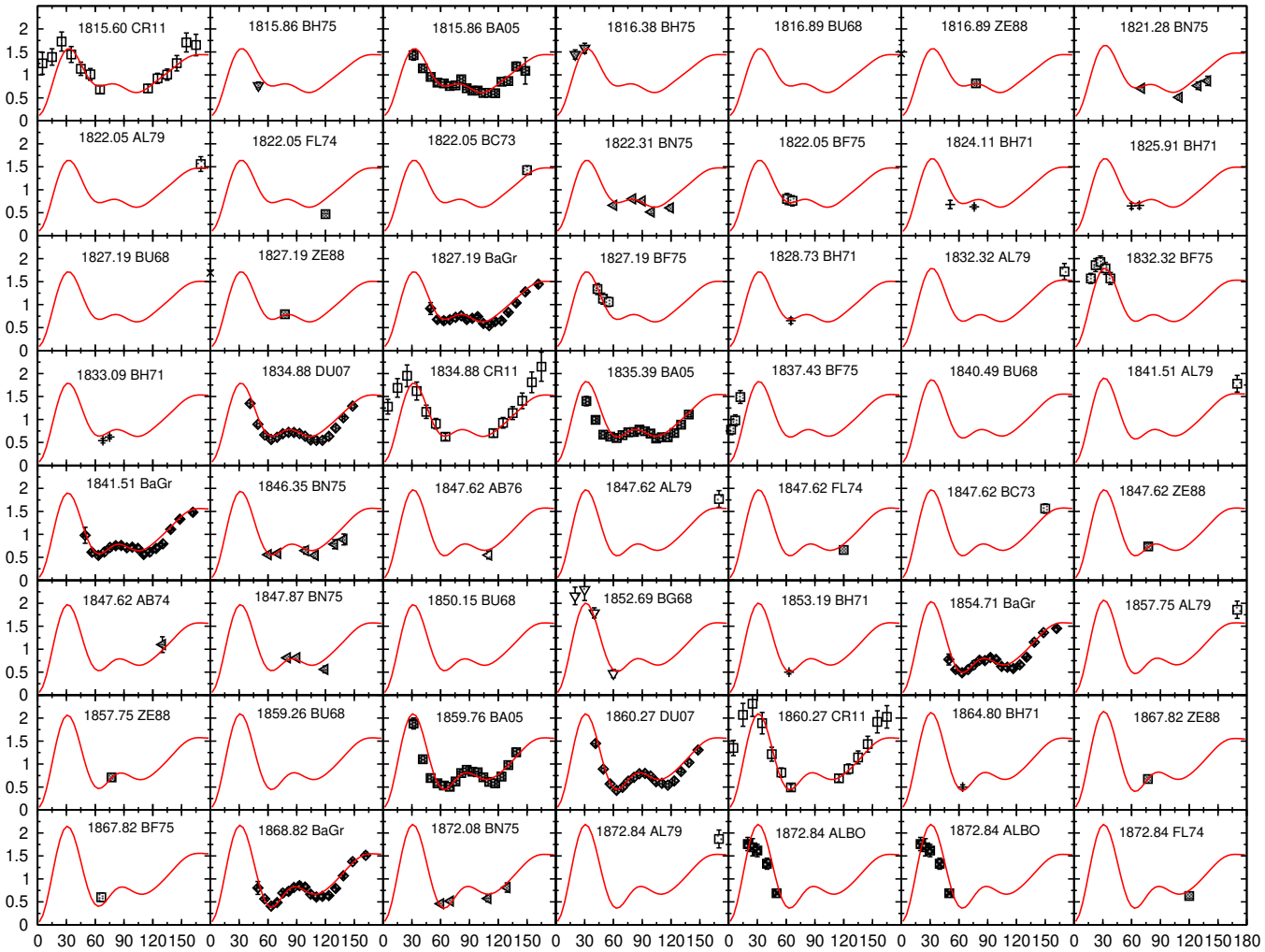

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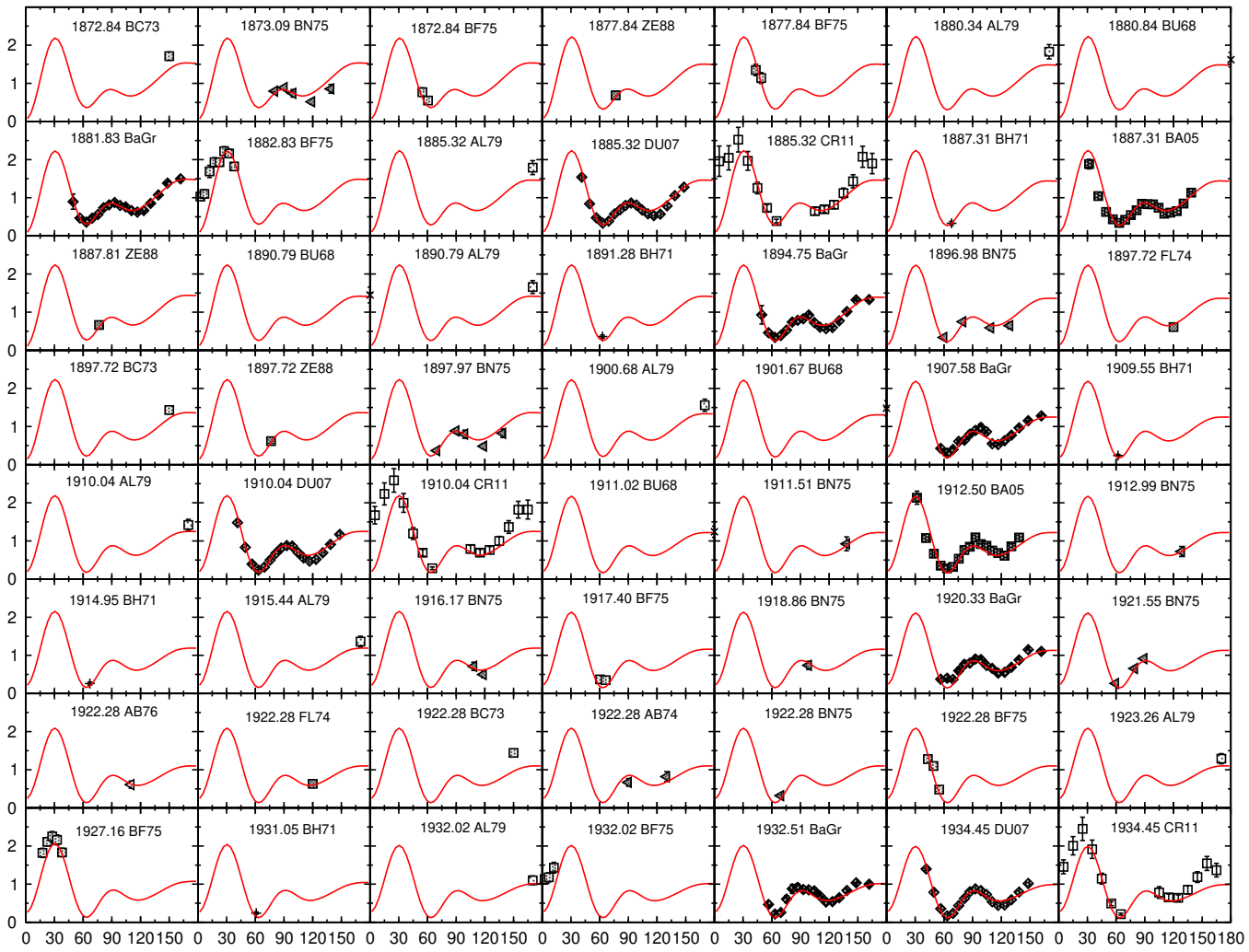

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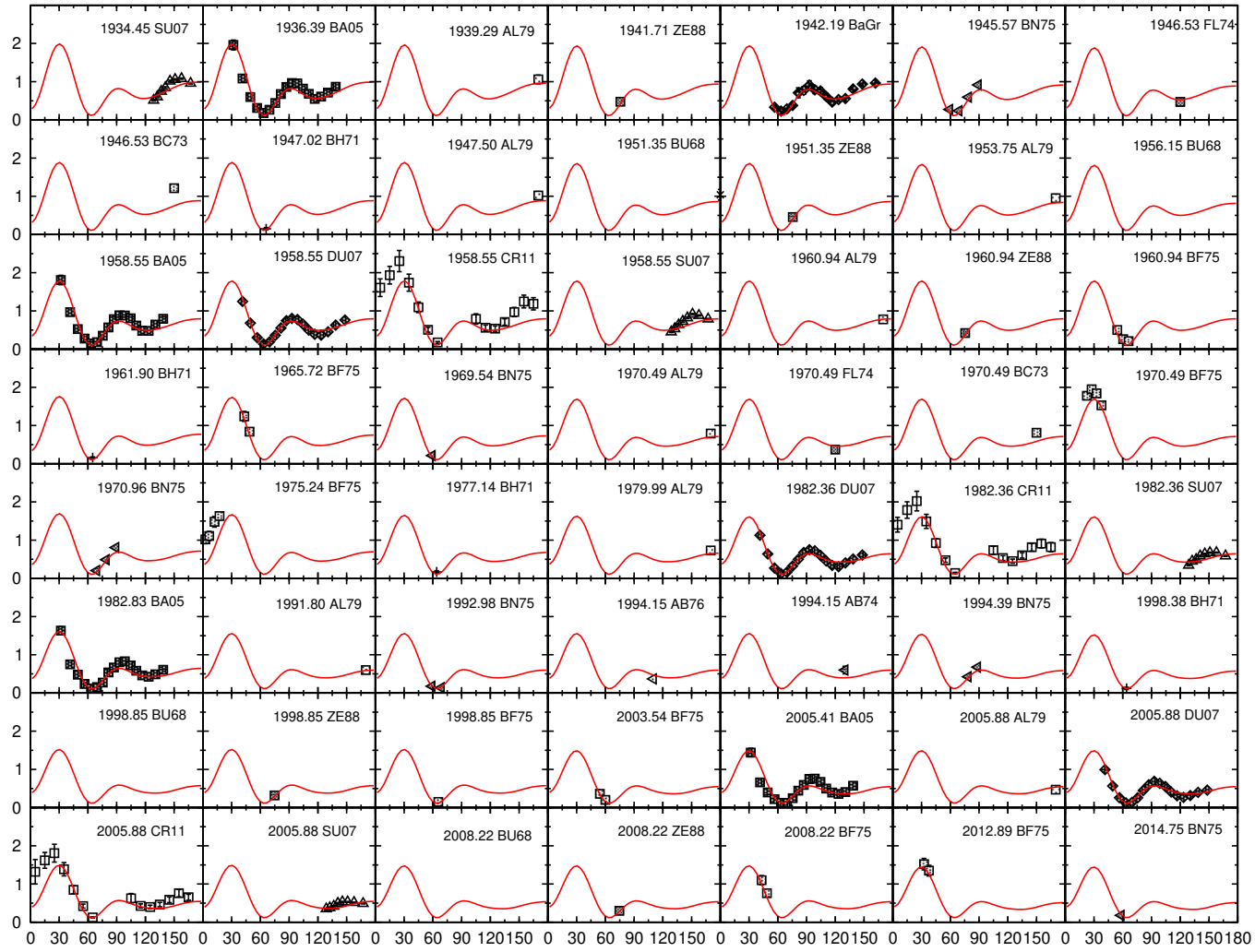

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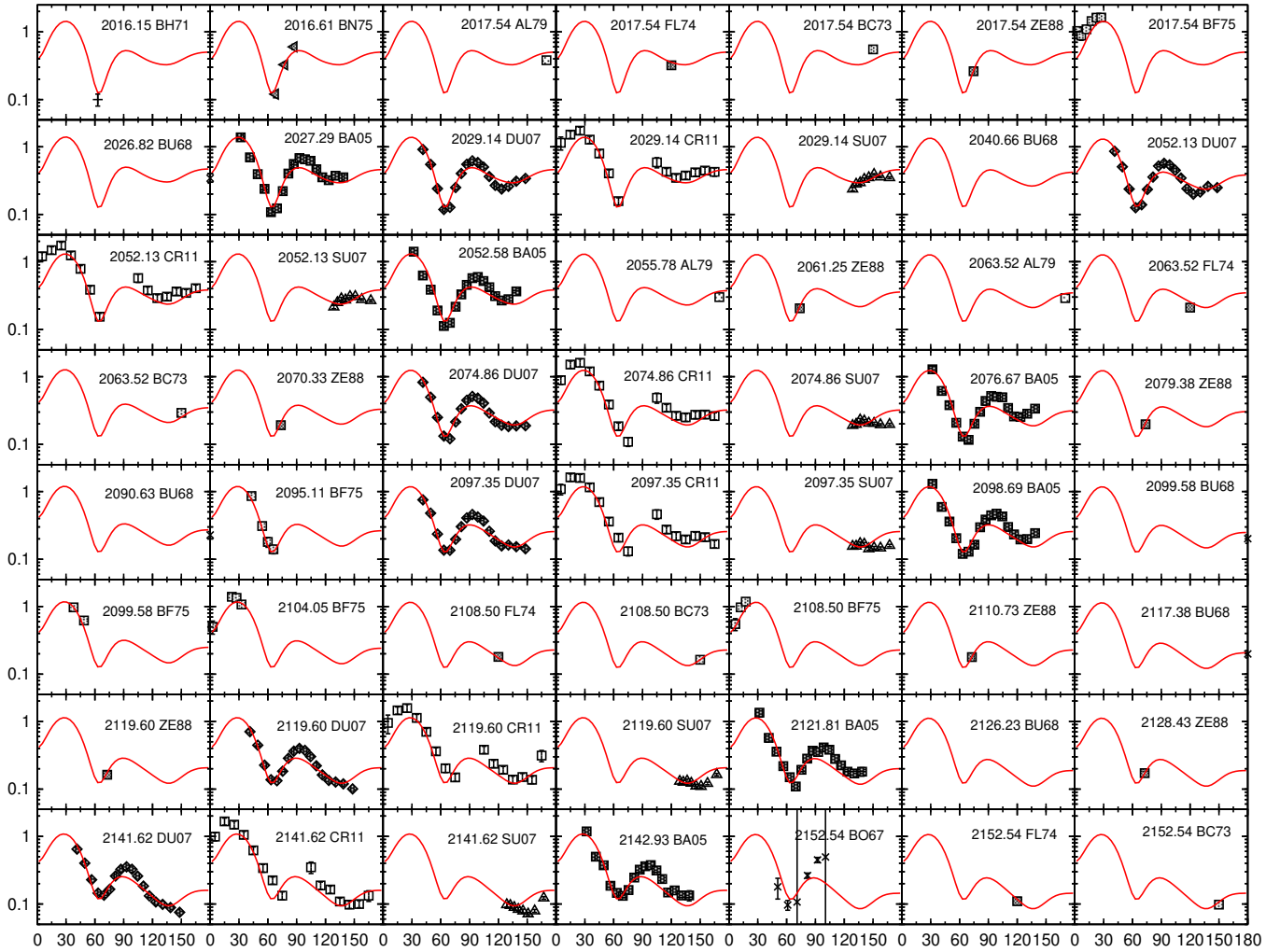

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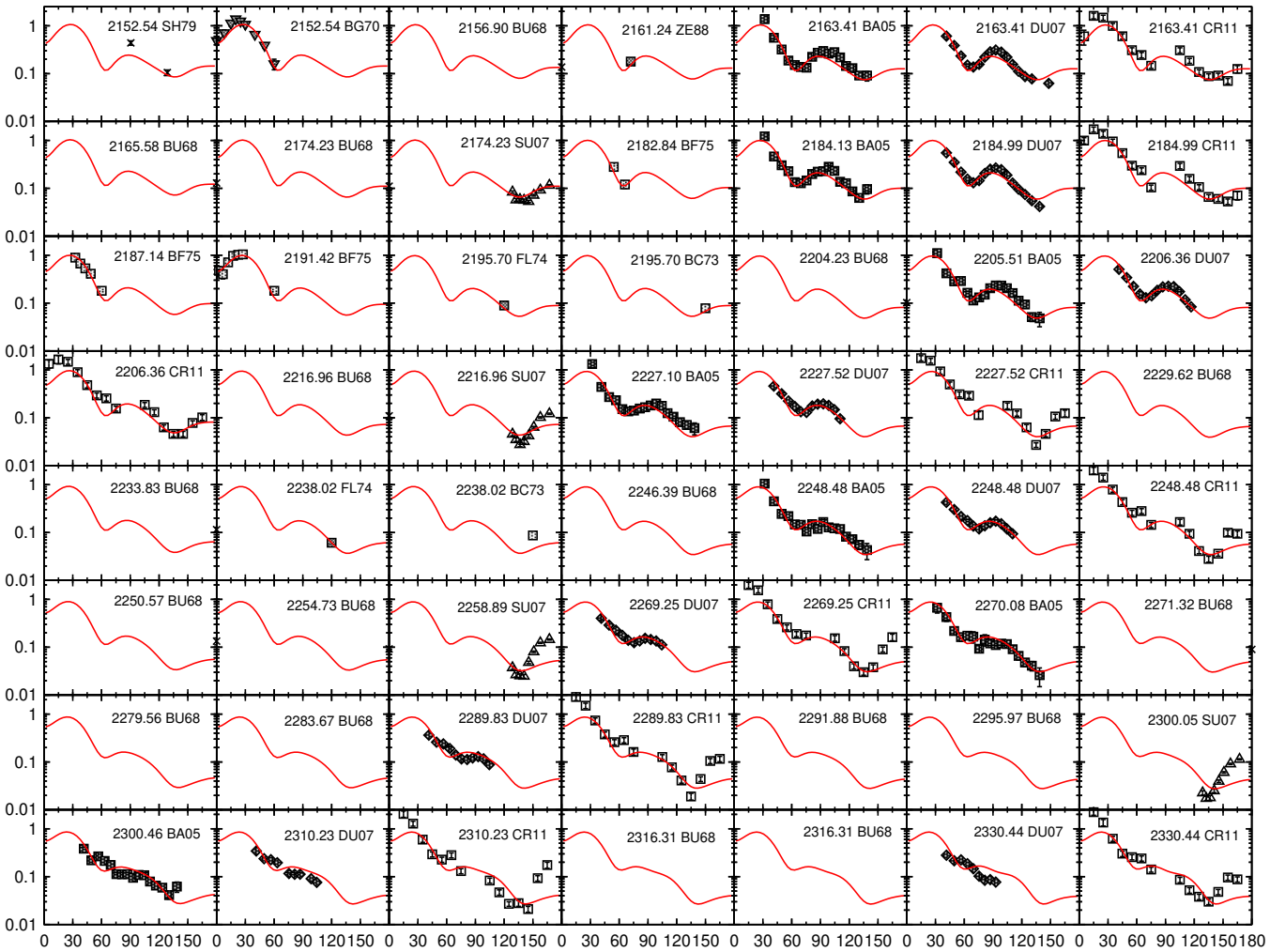

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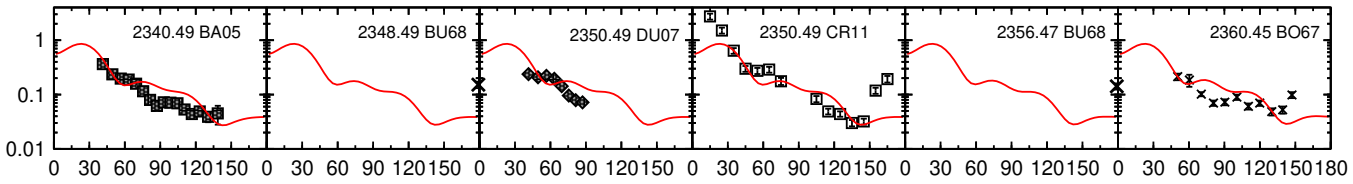

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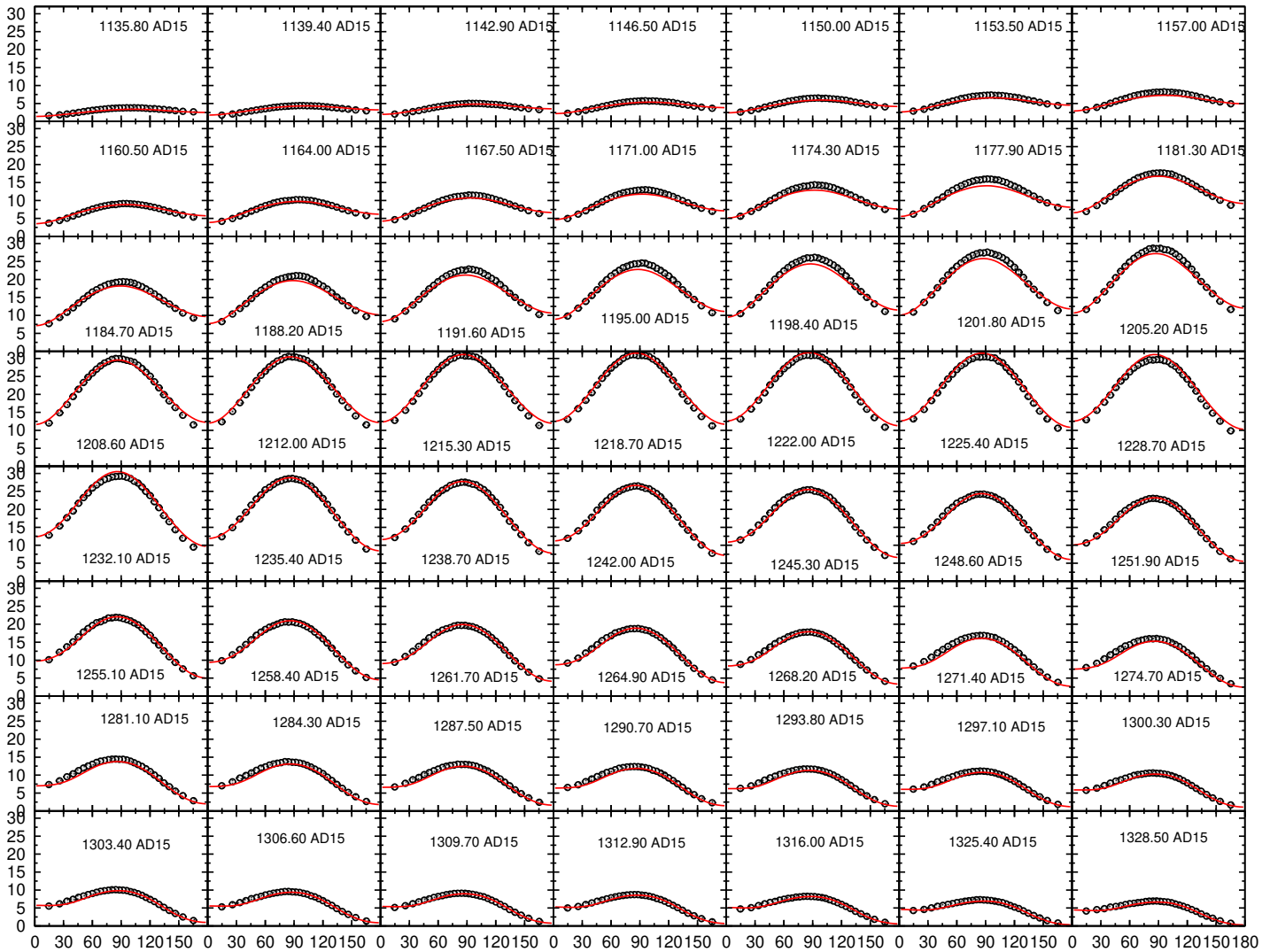

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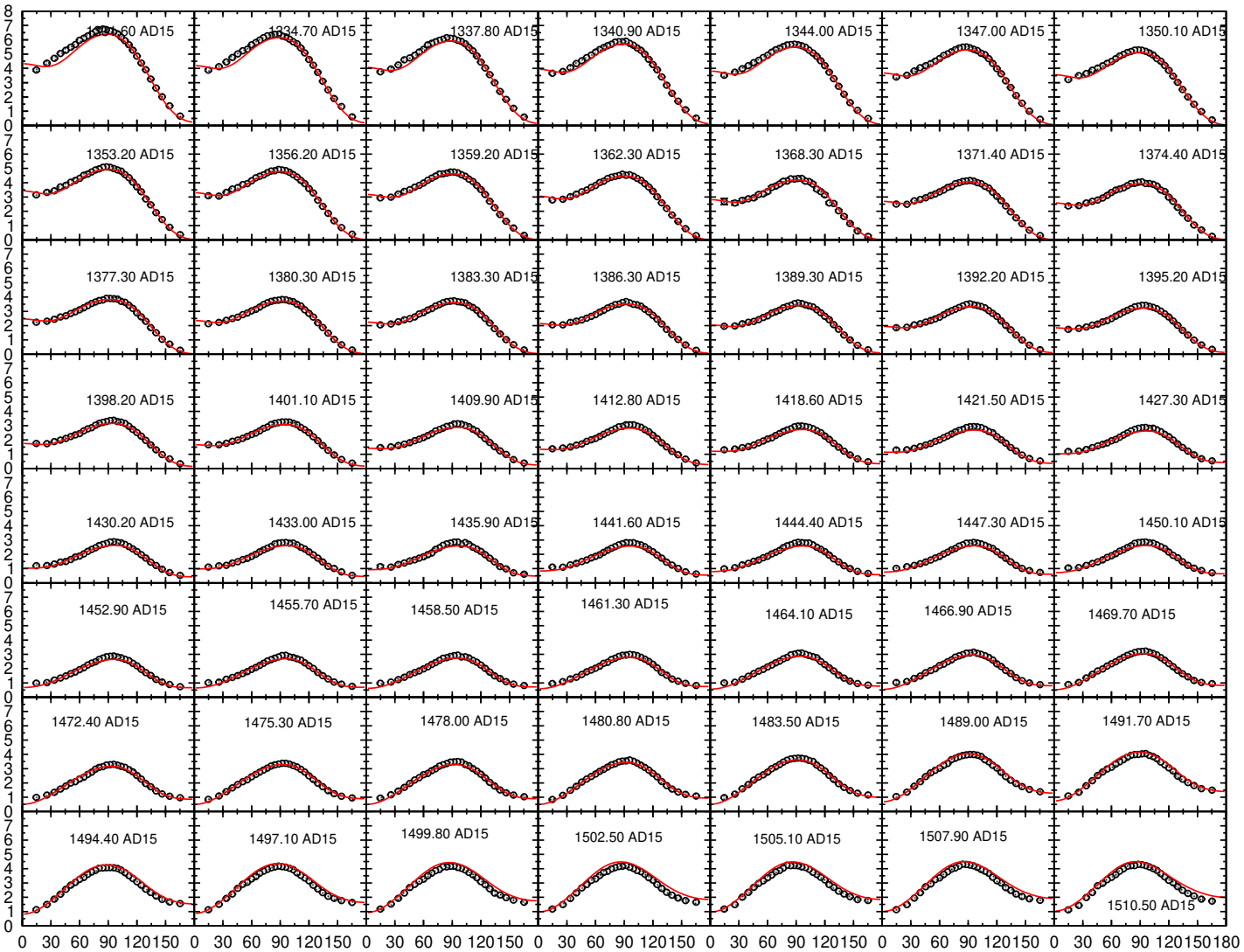

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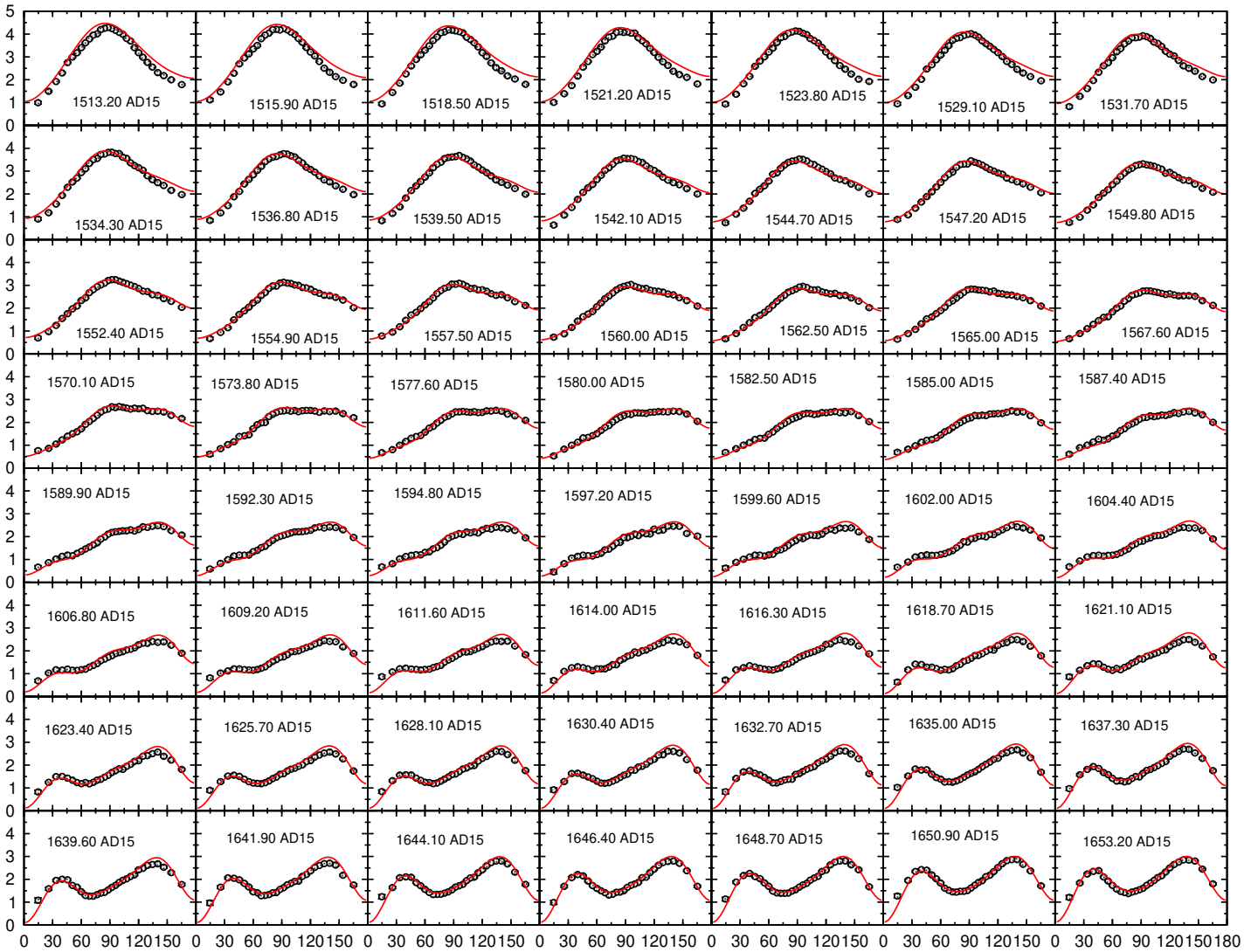

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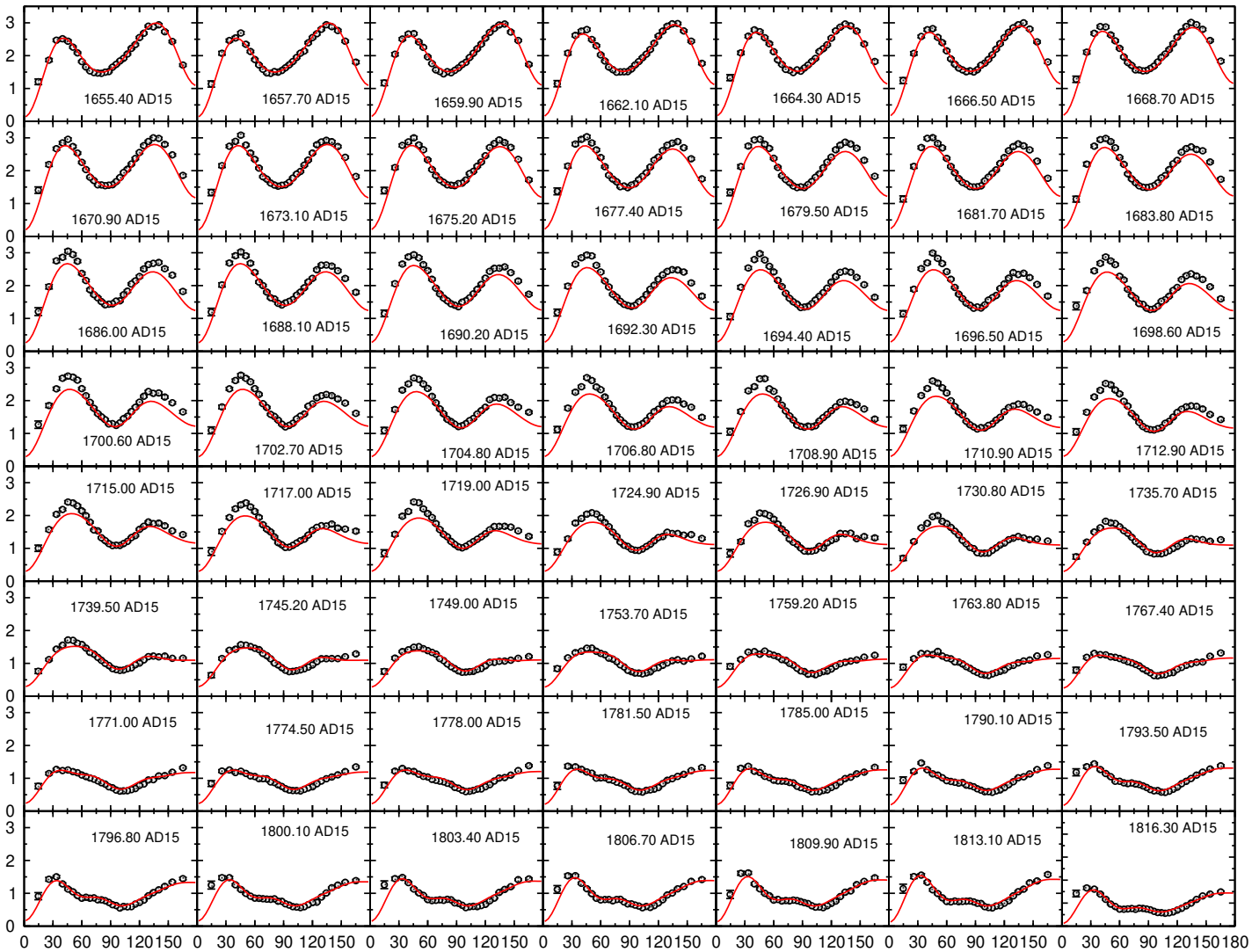

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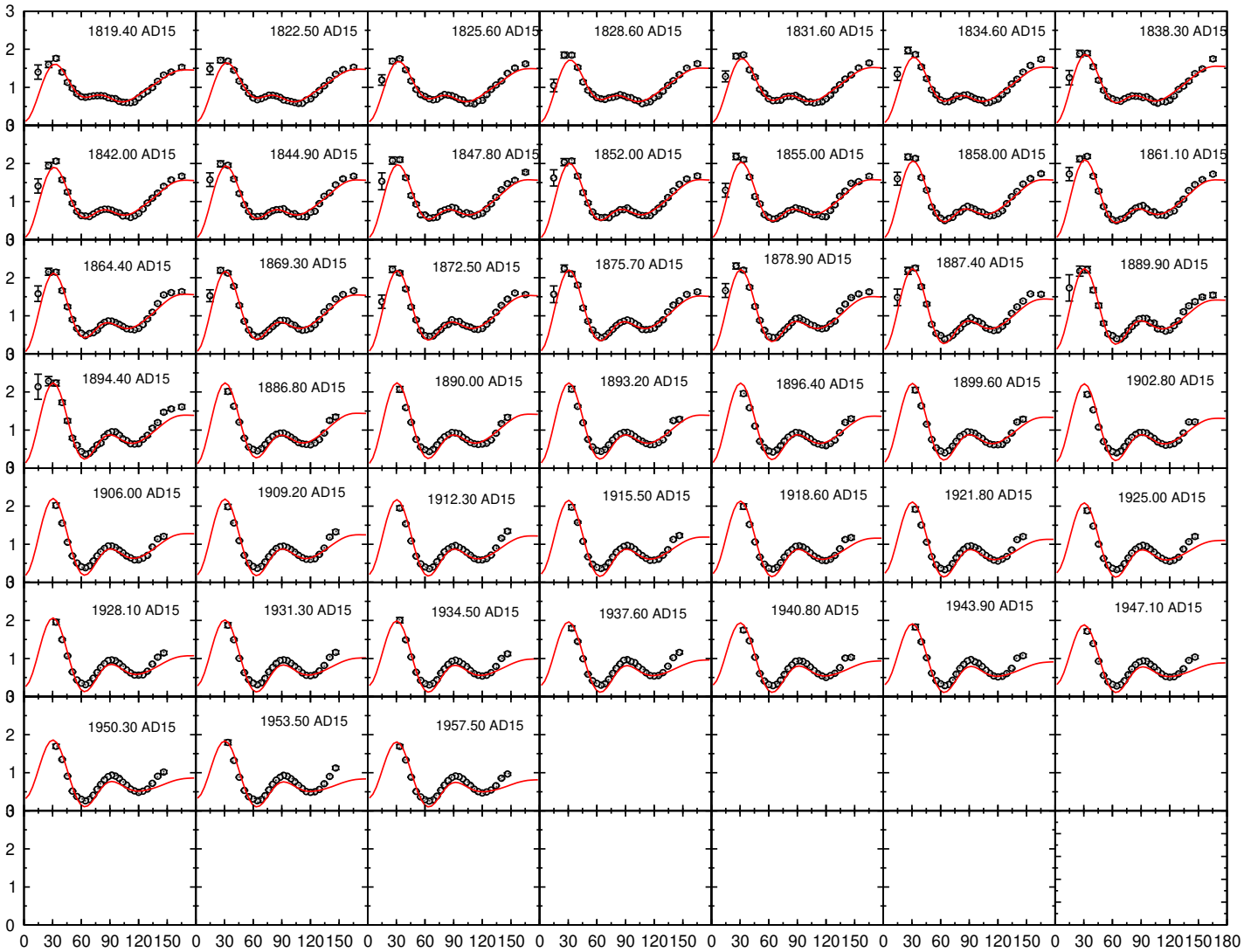

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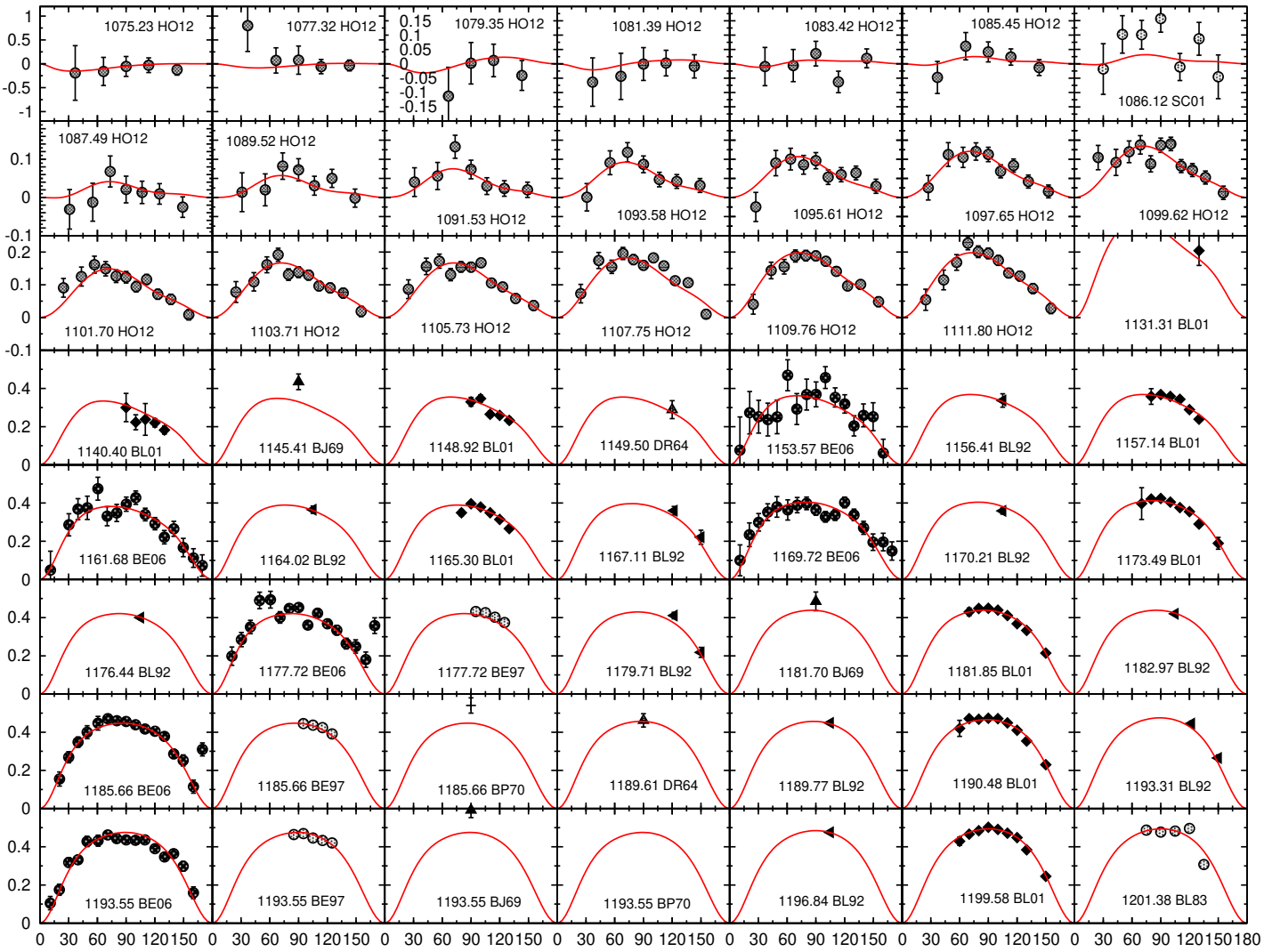

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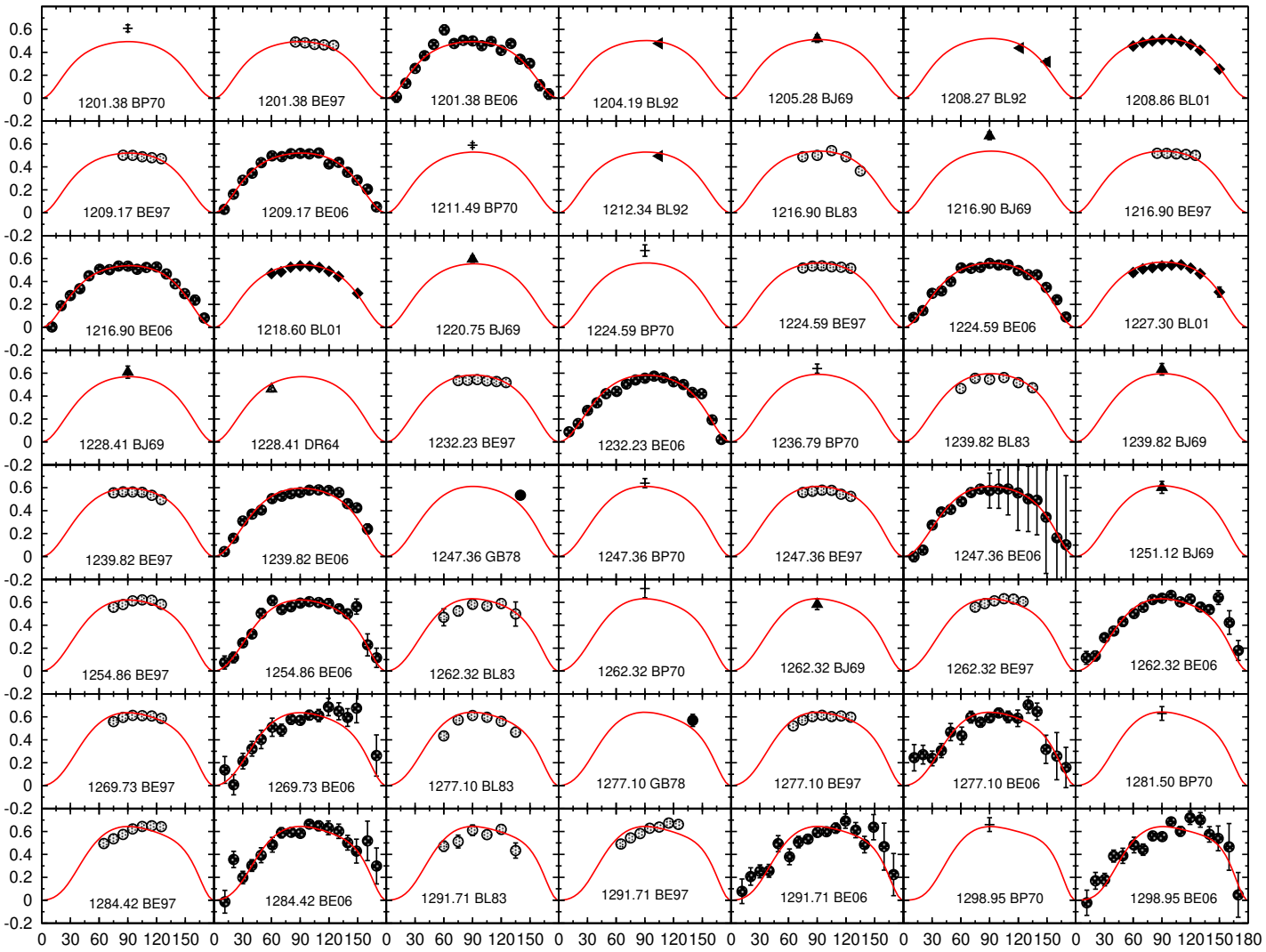

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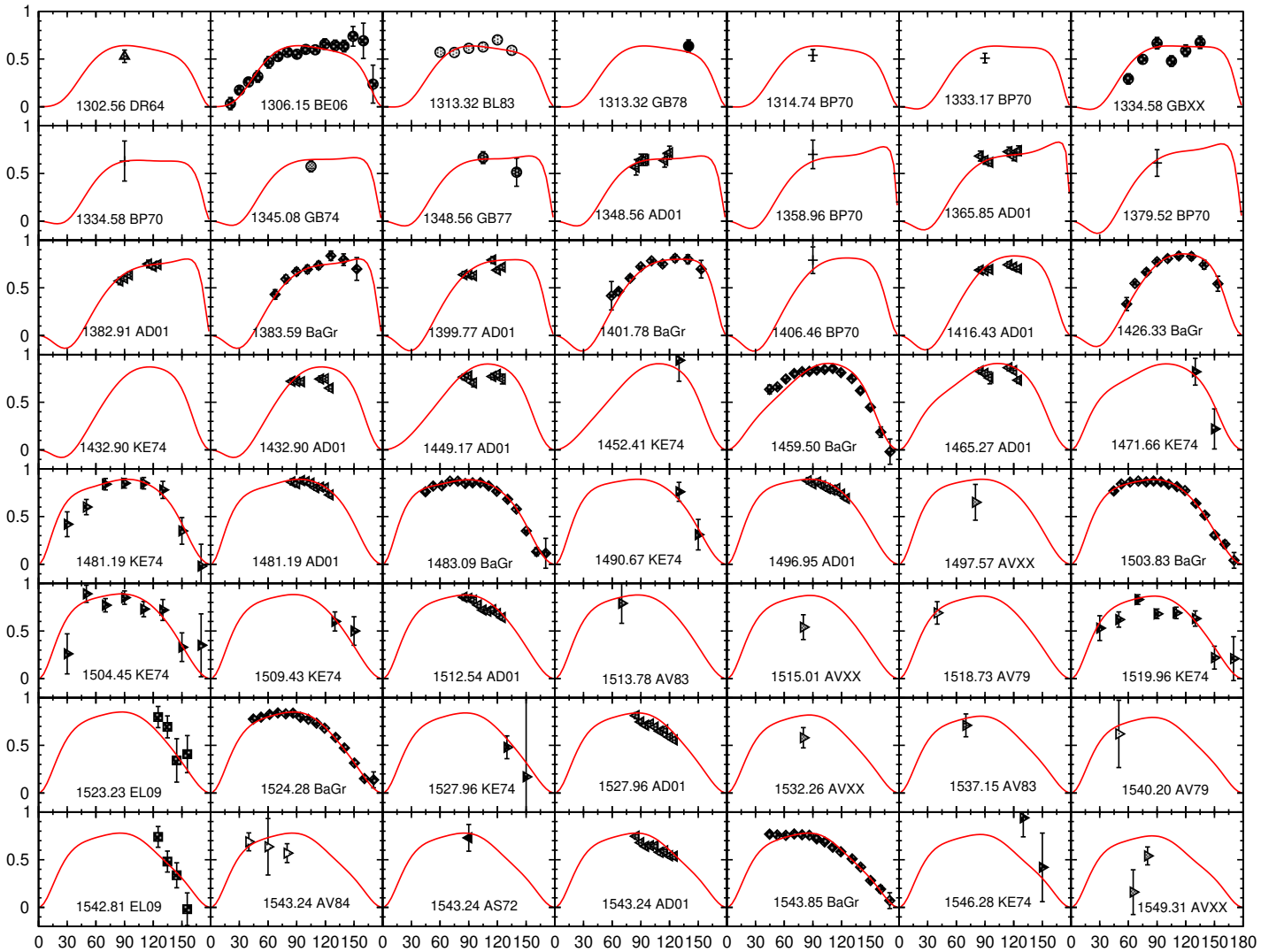

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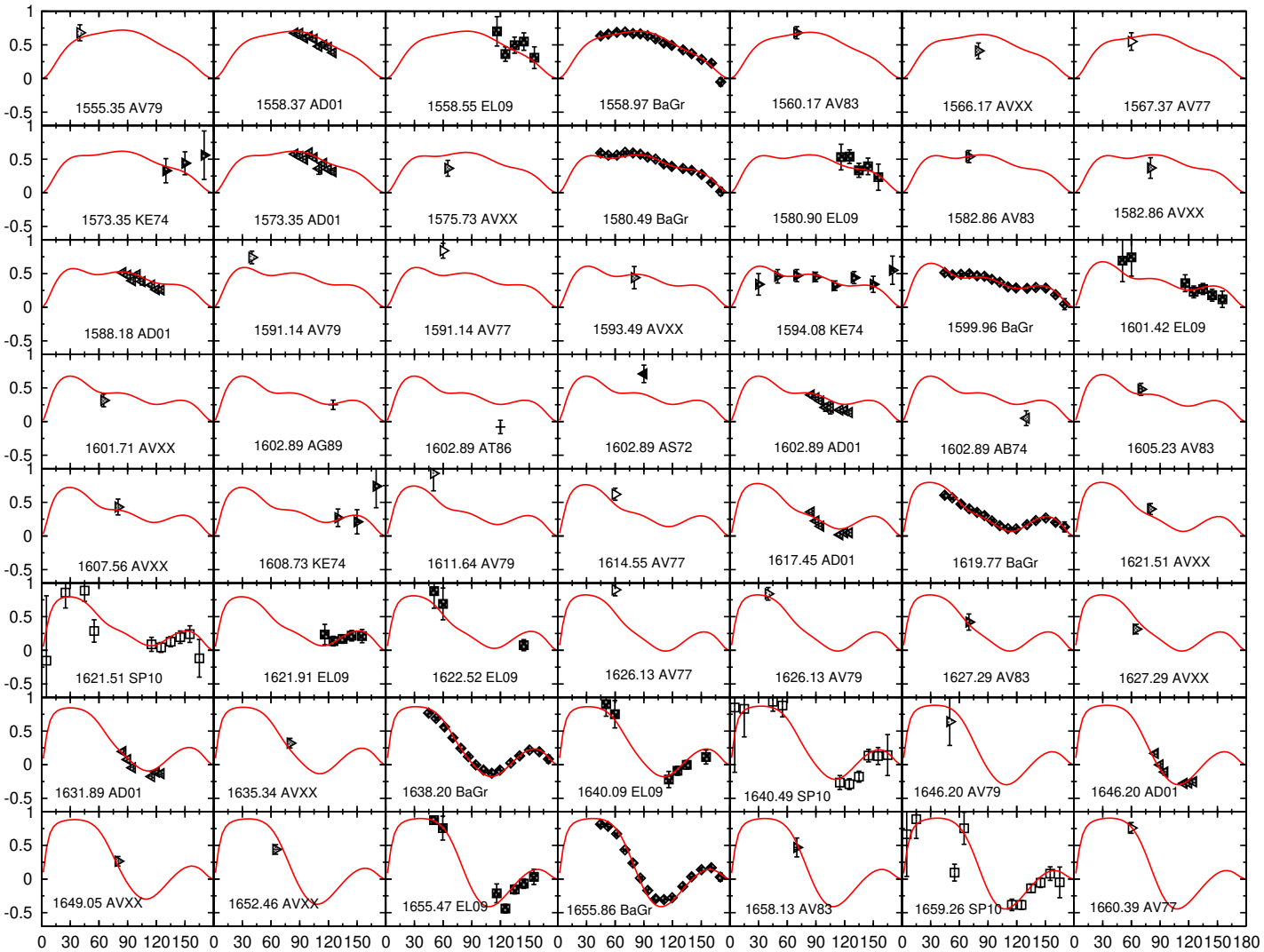

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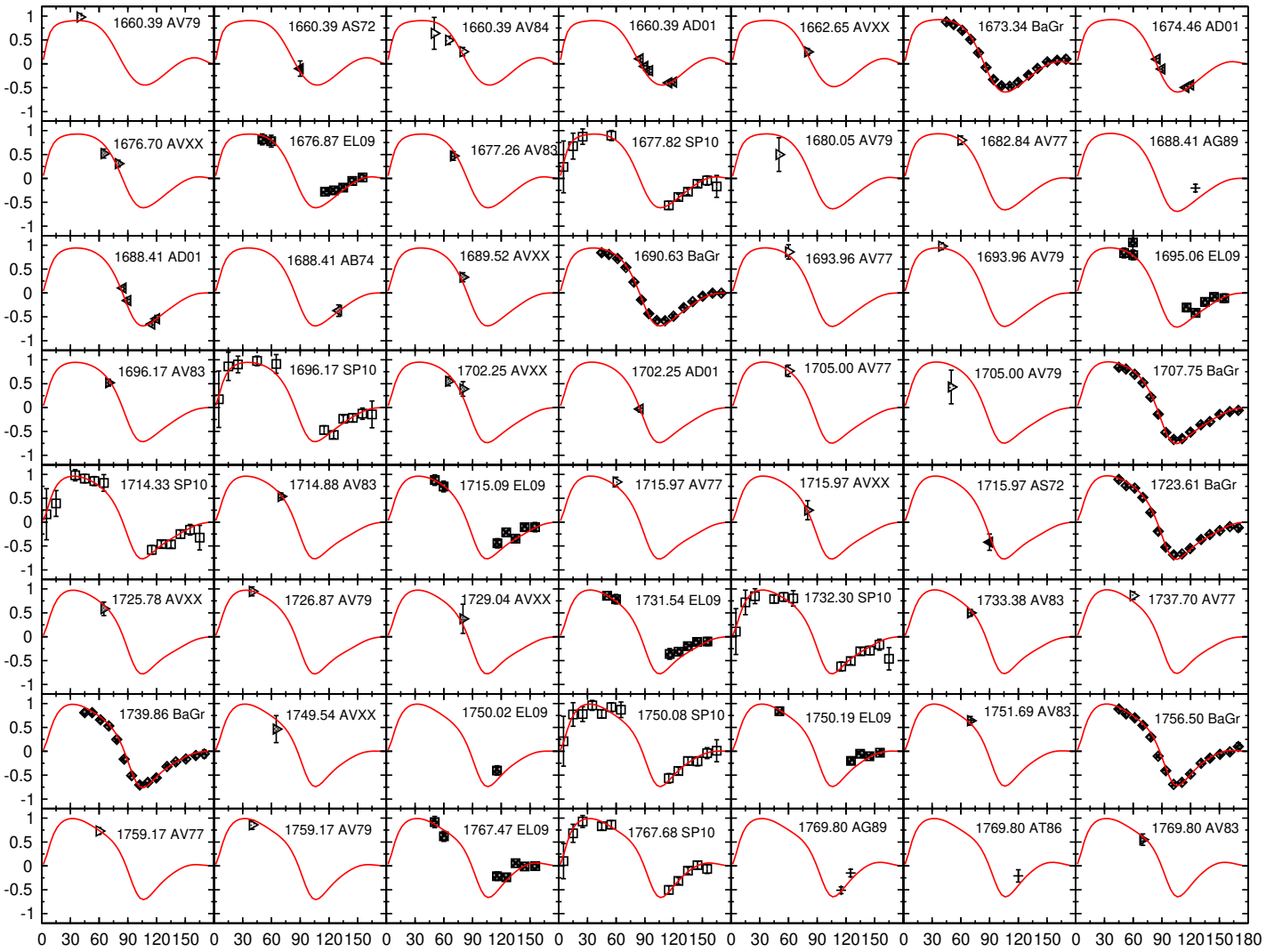

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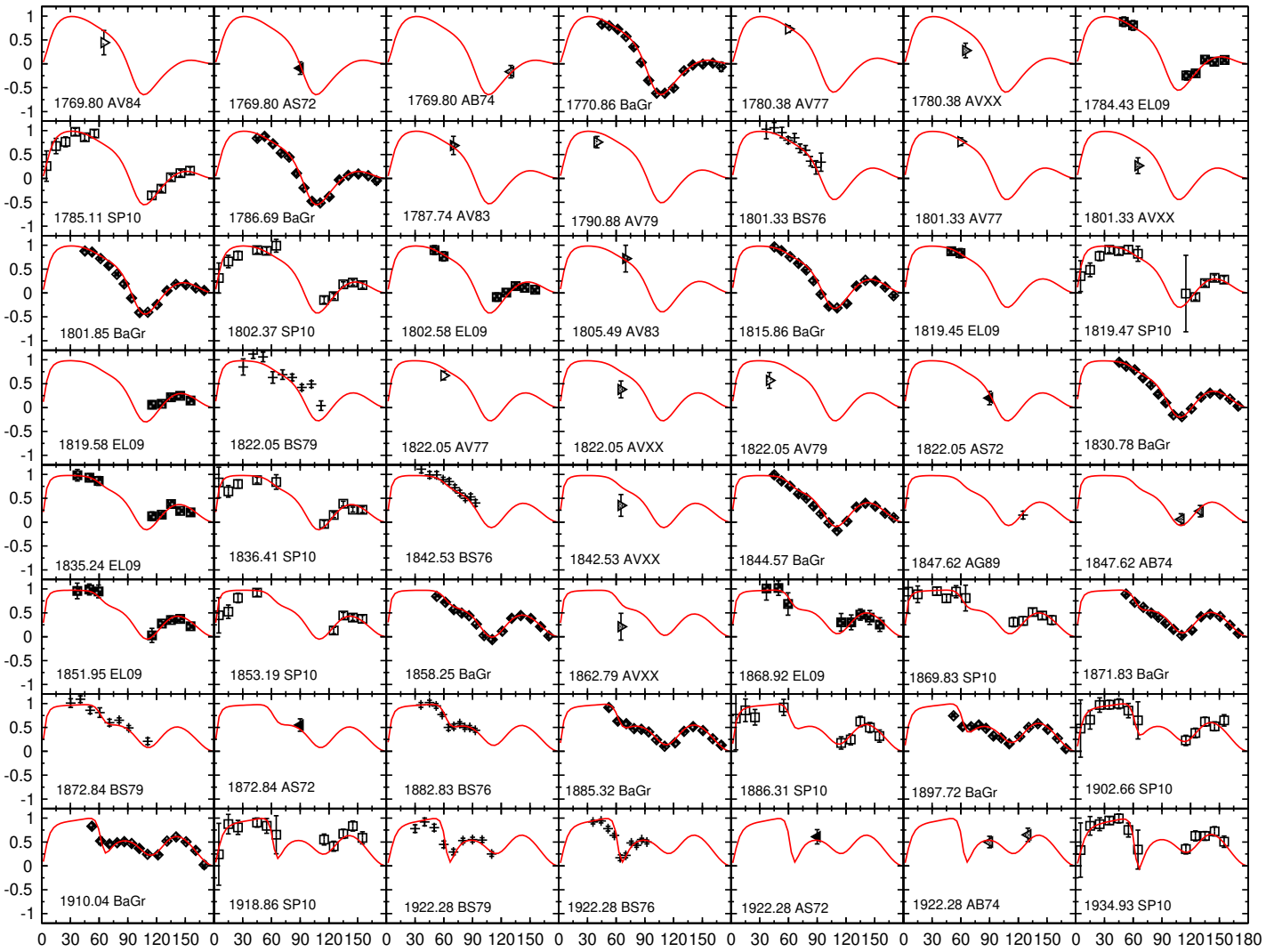

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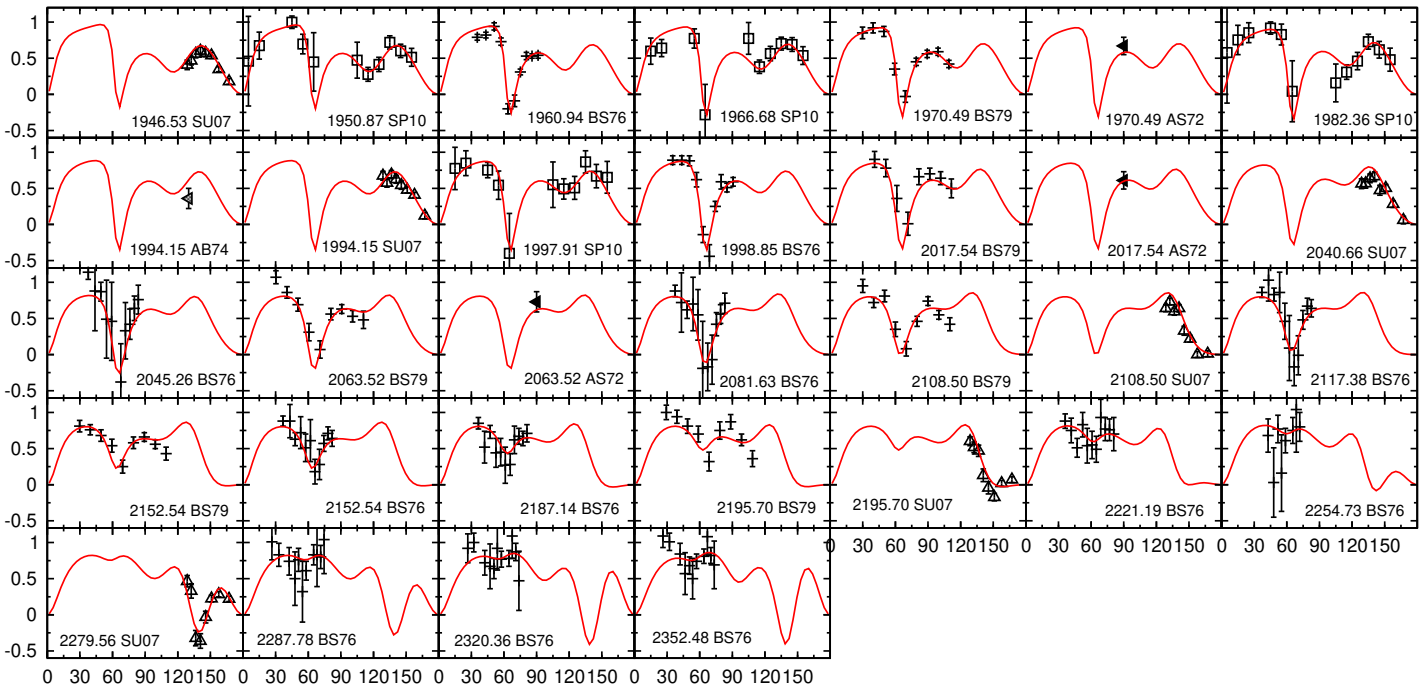

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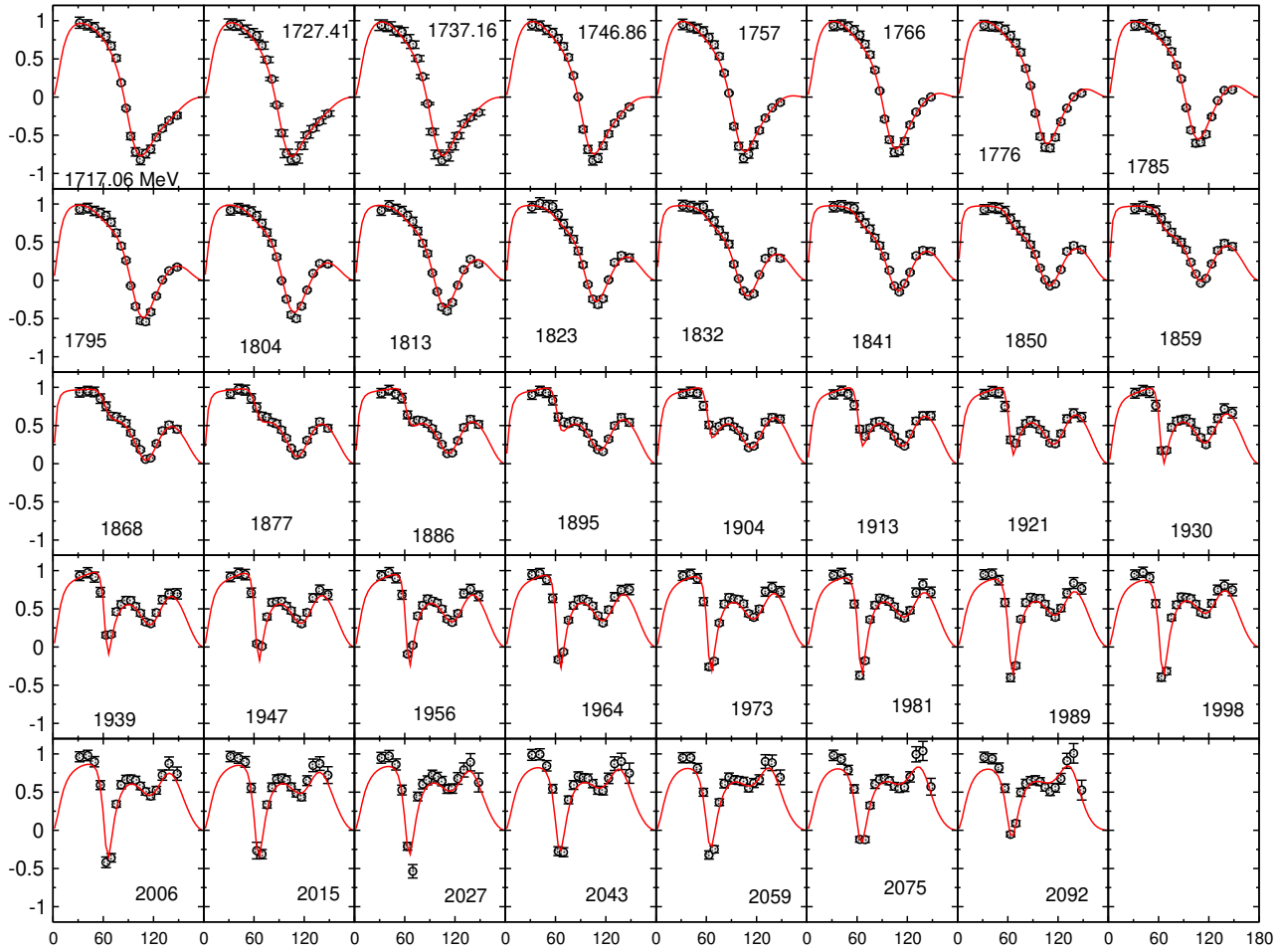
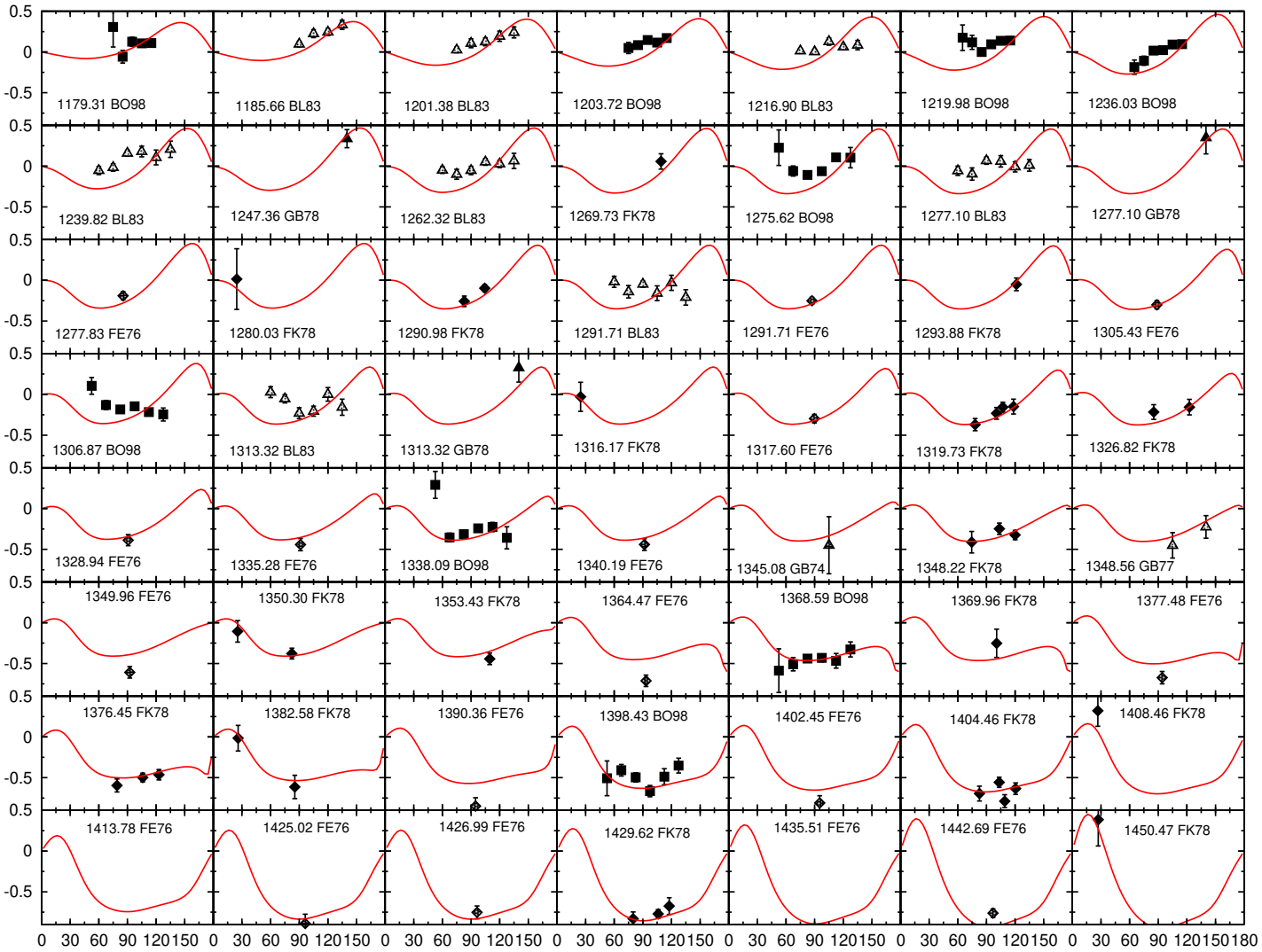
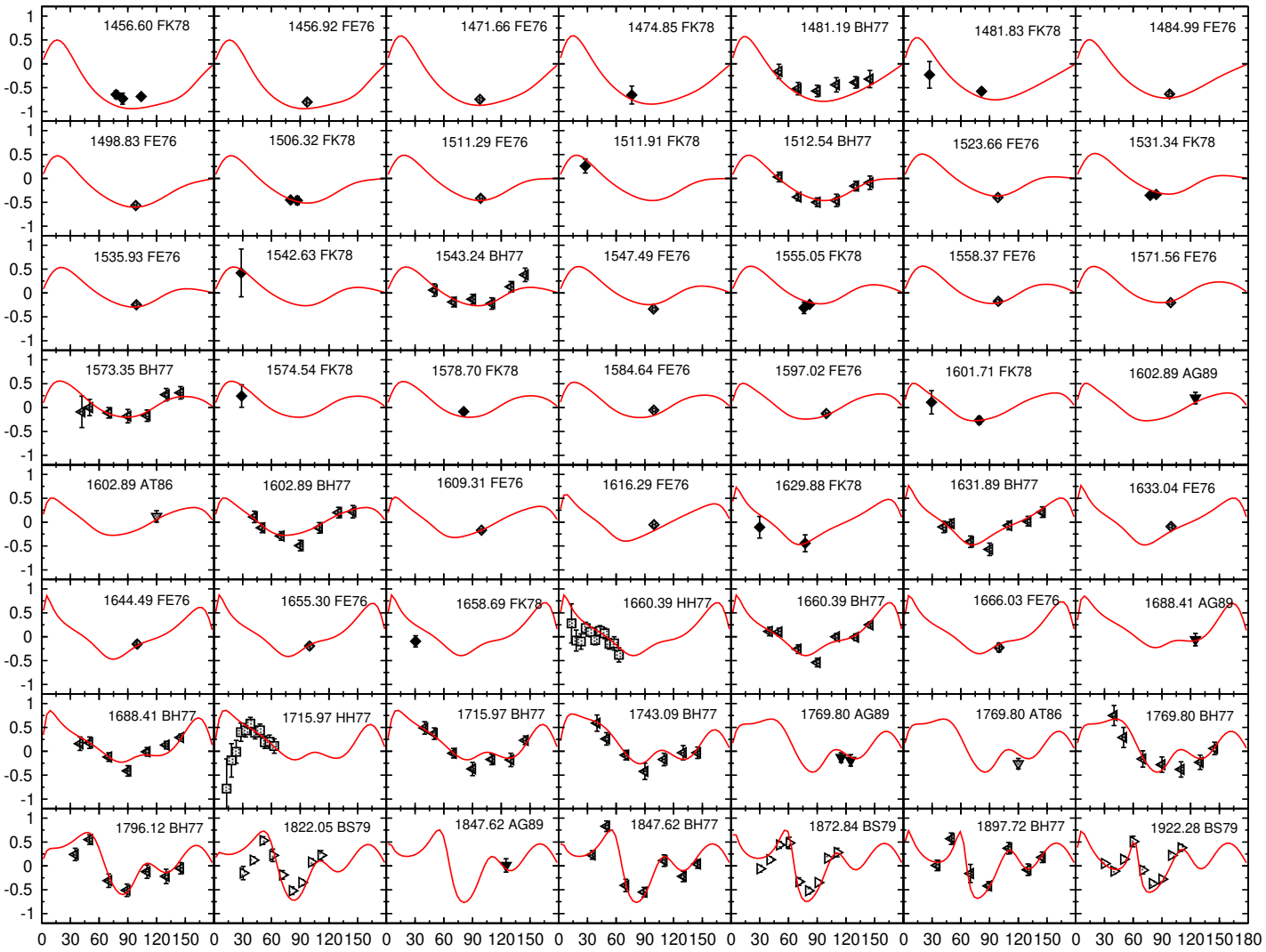
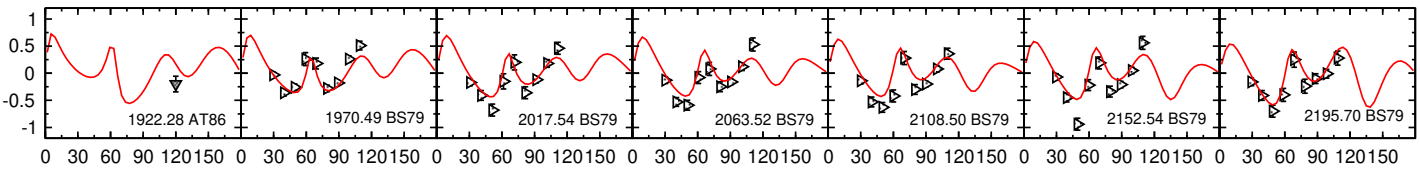
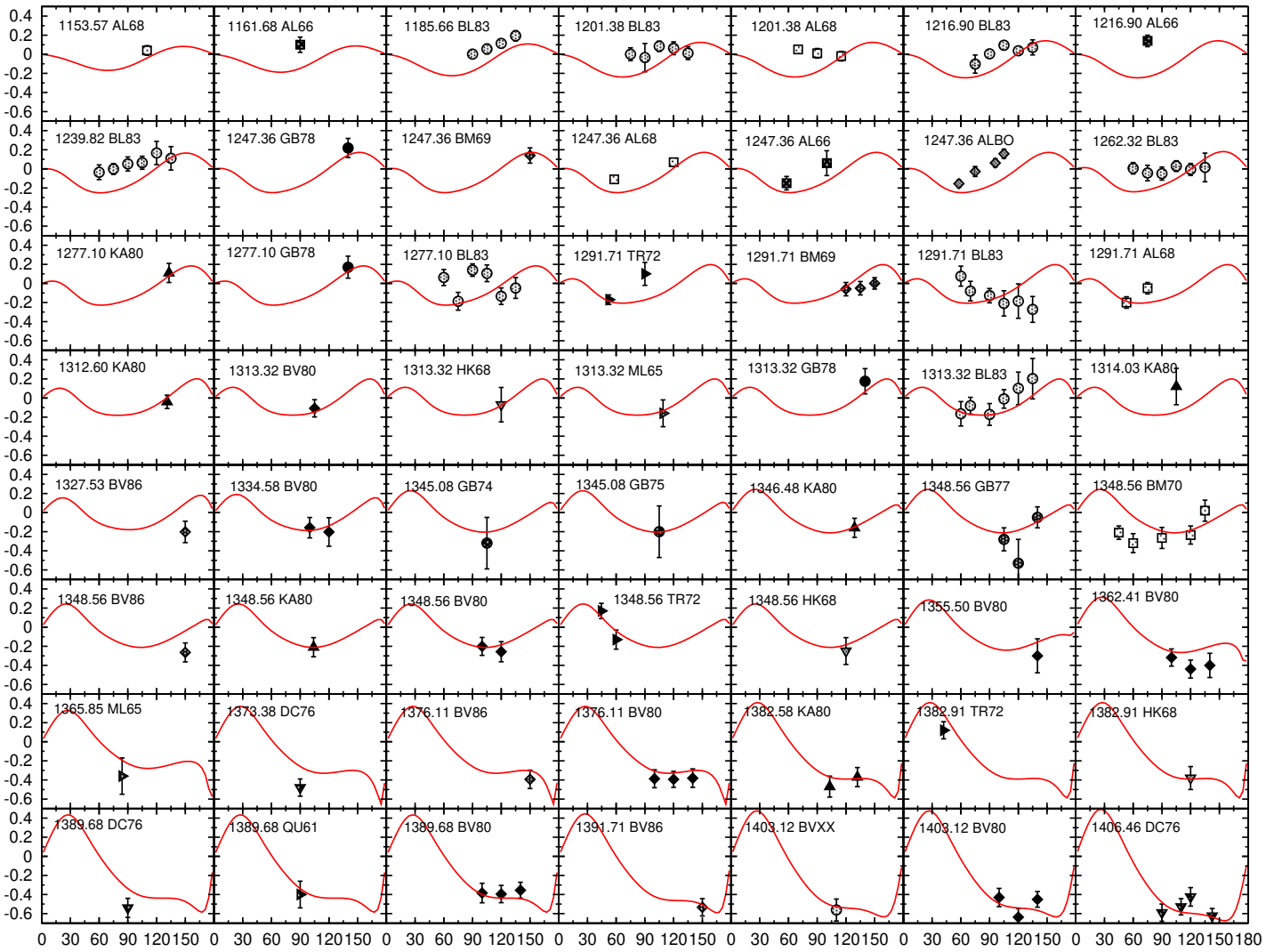


Figure 1: CLAS Dugger et al. (DU(13))

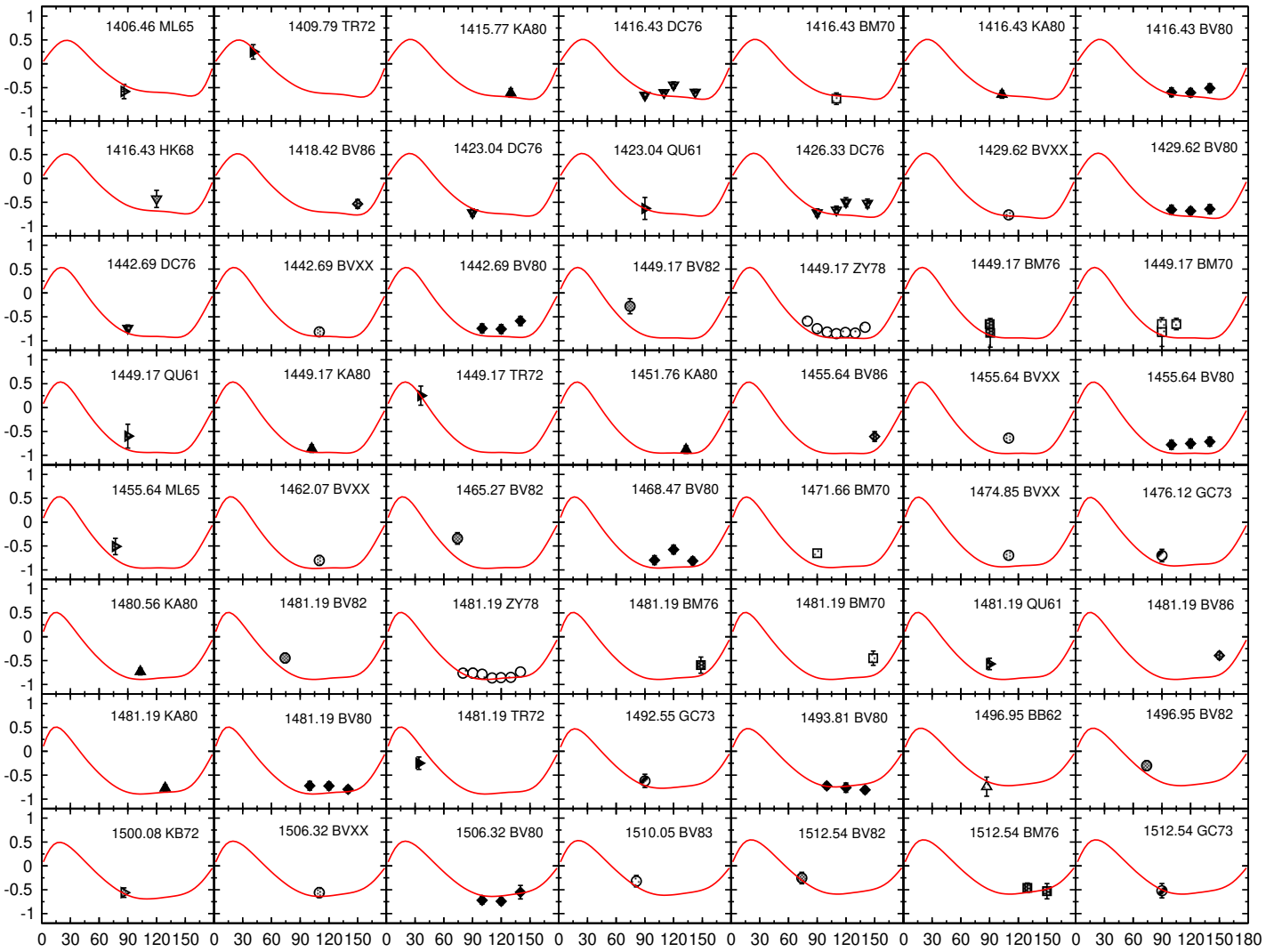

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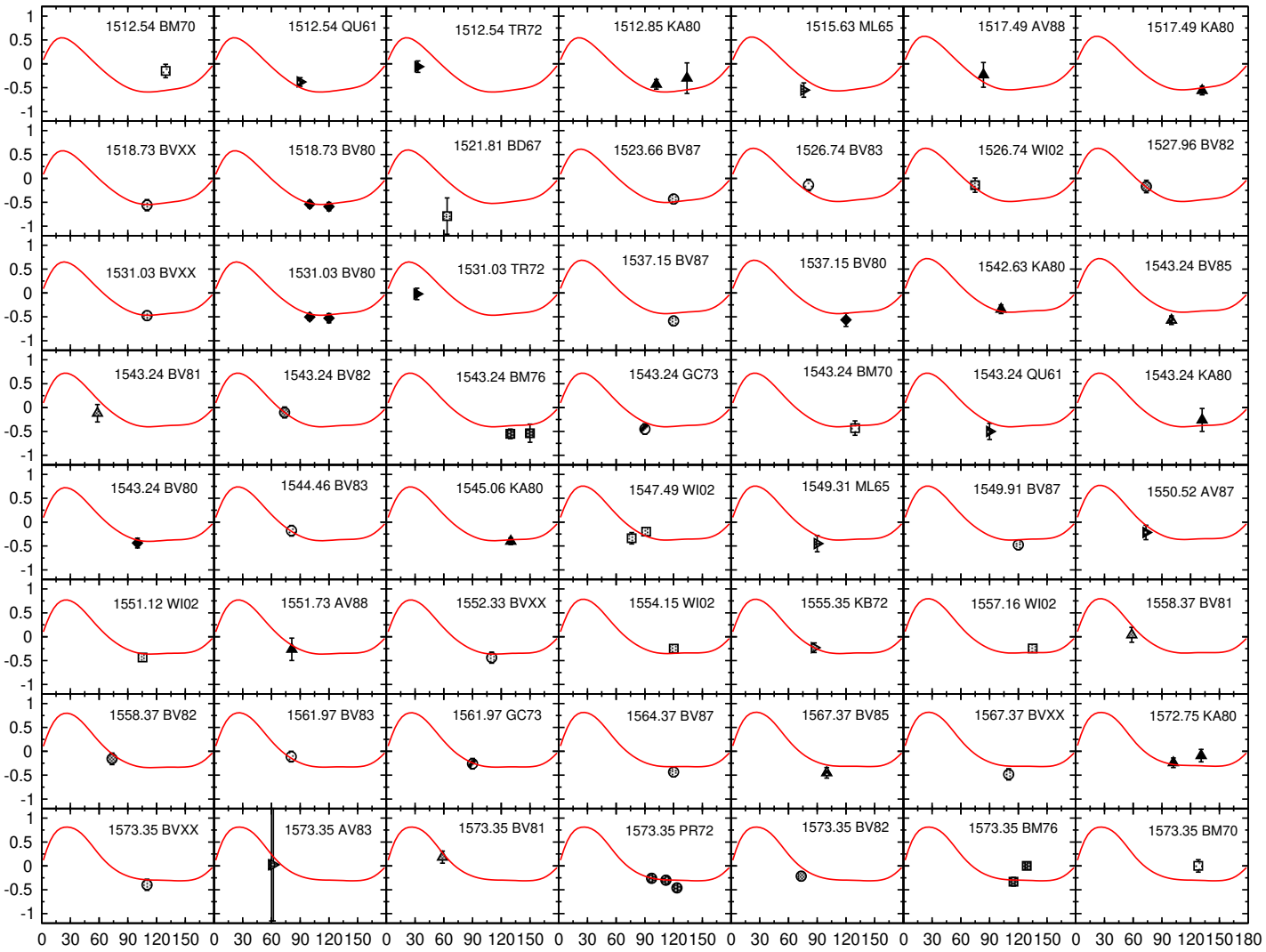

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1542.63 FK78
1543.24 BH77
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1573.35 BH77
1574.54 FK78
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1769.80 AG89
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1769.80 BH77
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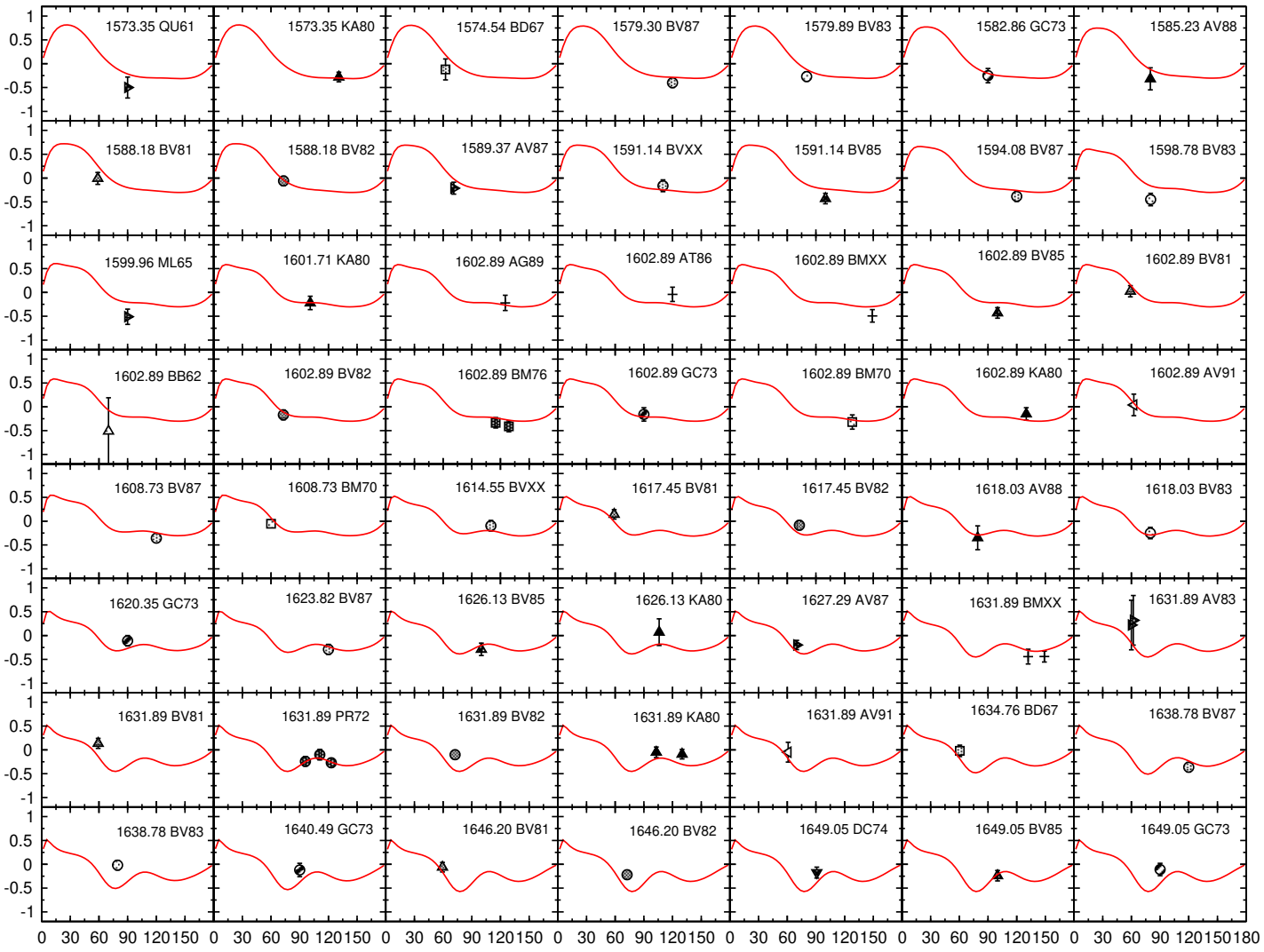

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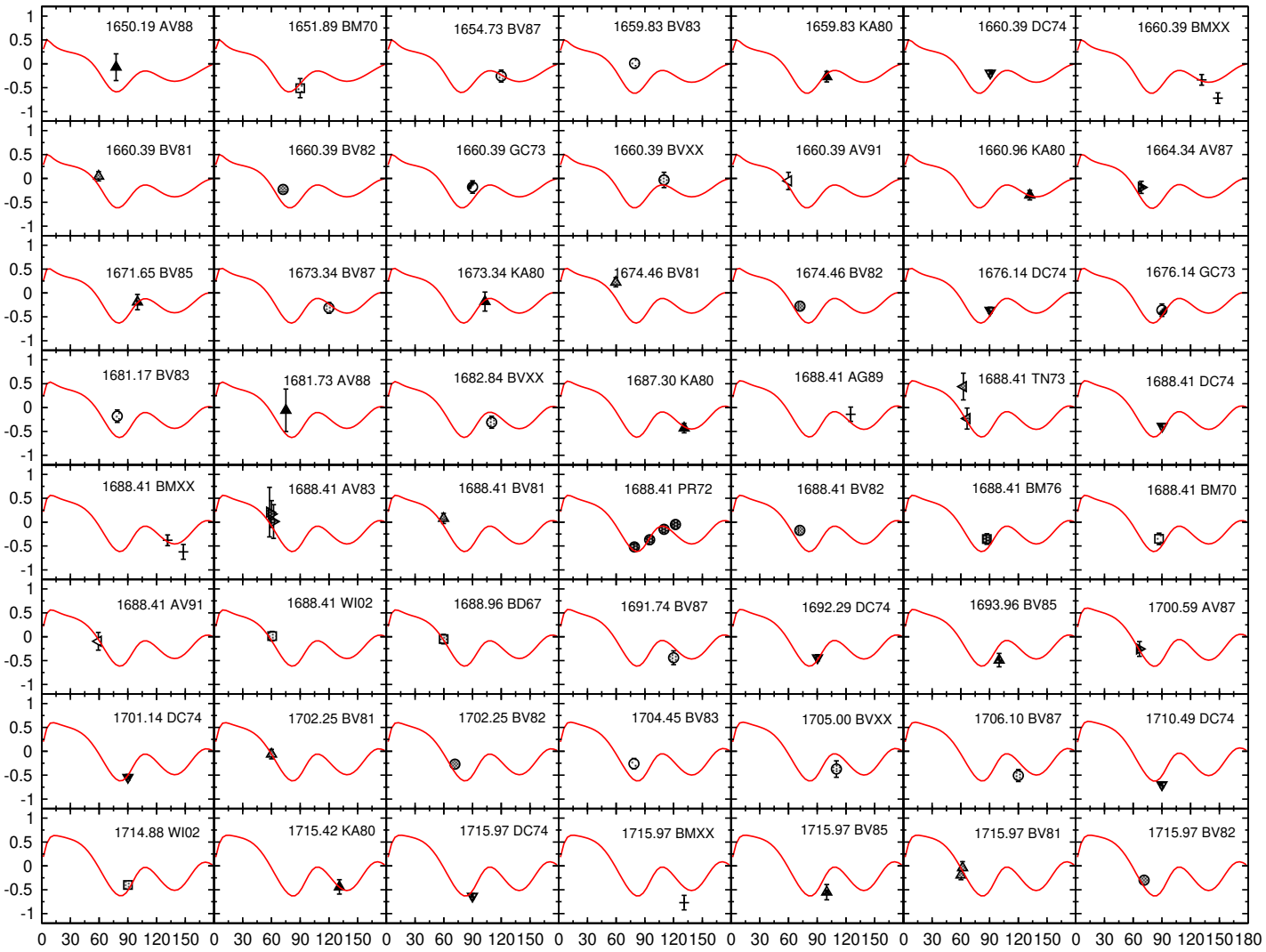

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1277.10 BL83
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1334.58 BV80
1345.08 GB74
1345.08 GB75
1346.48 KA80
1348.56 GB77
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1382.58 KA80
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1382.91 HK68
1389.68 DC76
1389.68 QU61
1389.68 BV80
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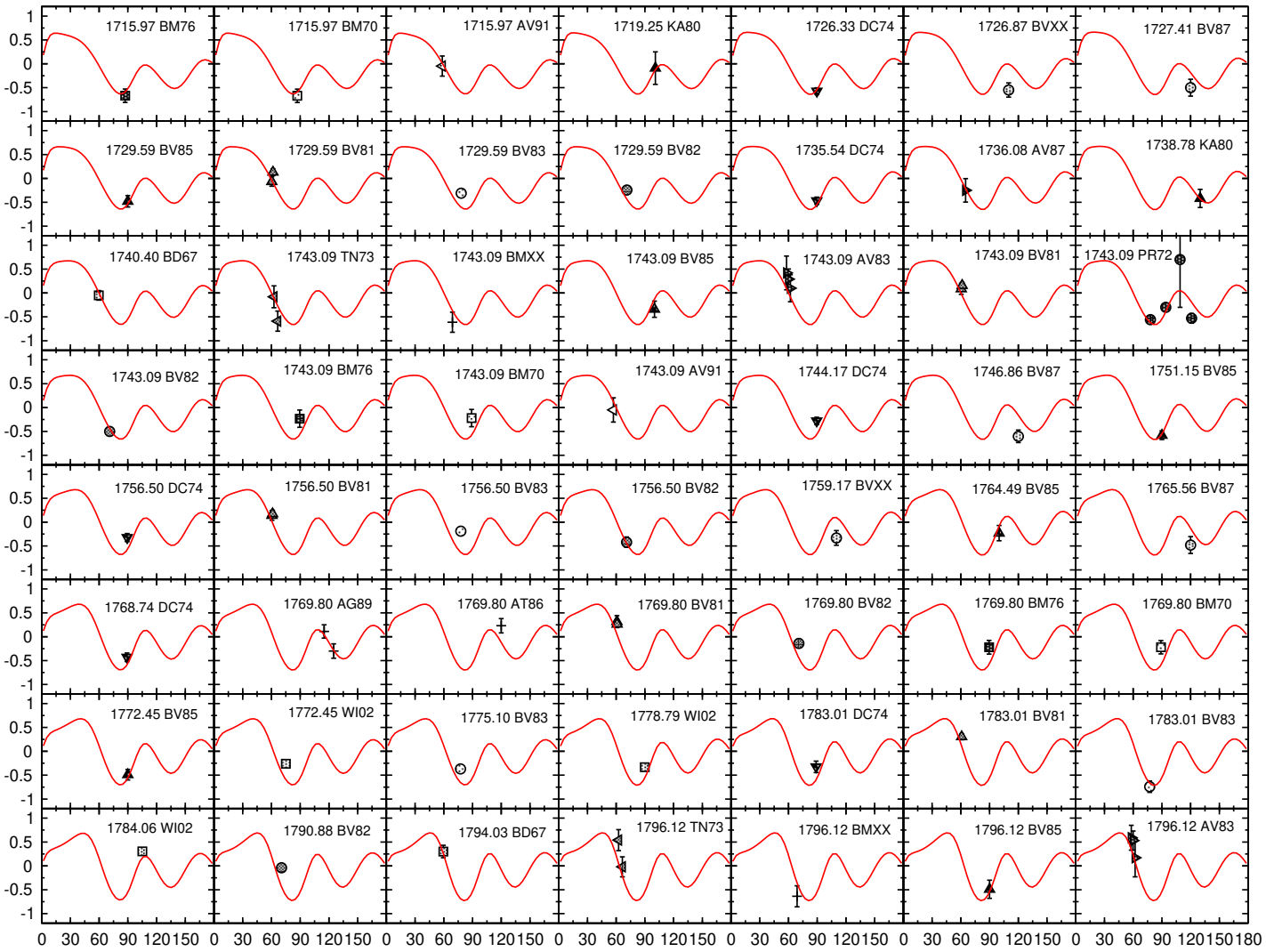
$\gamma p \to \pi^0 p$ Polarization P

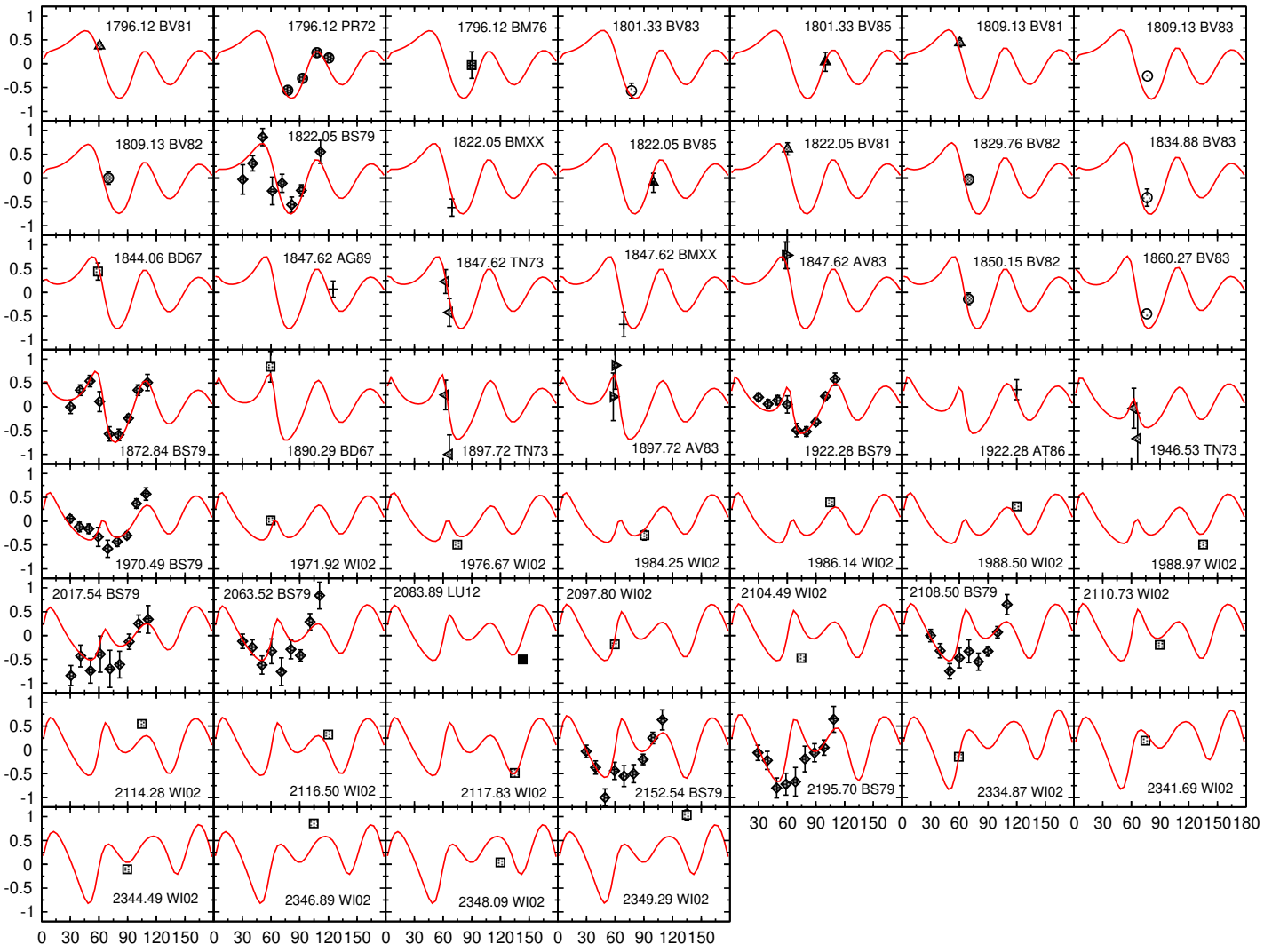


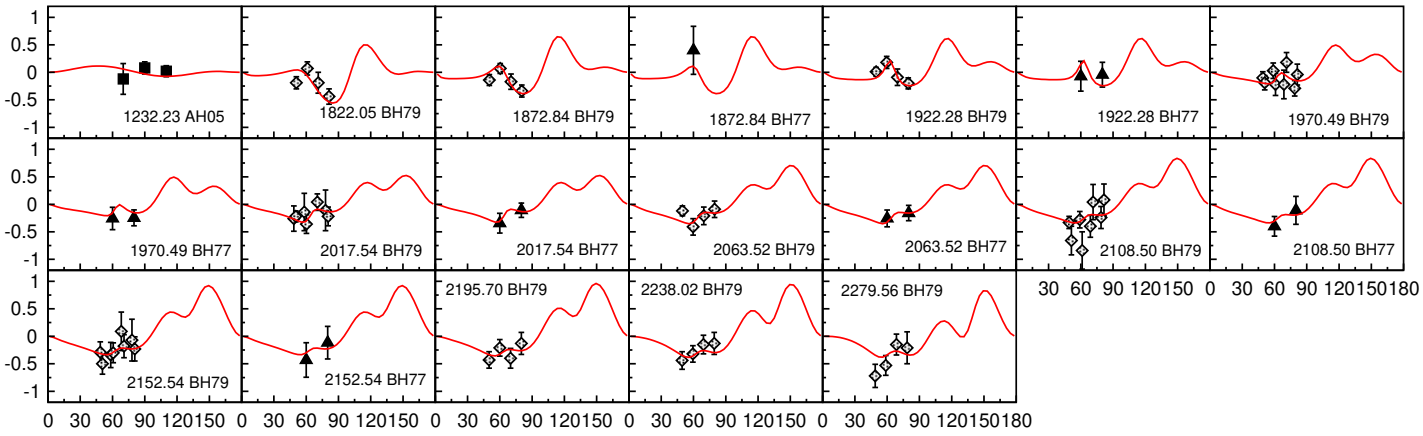

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2017.54 BH79
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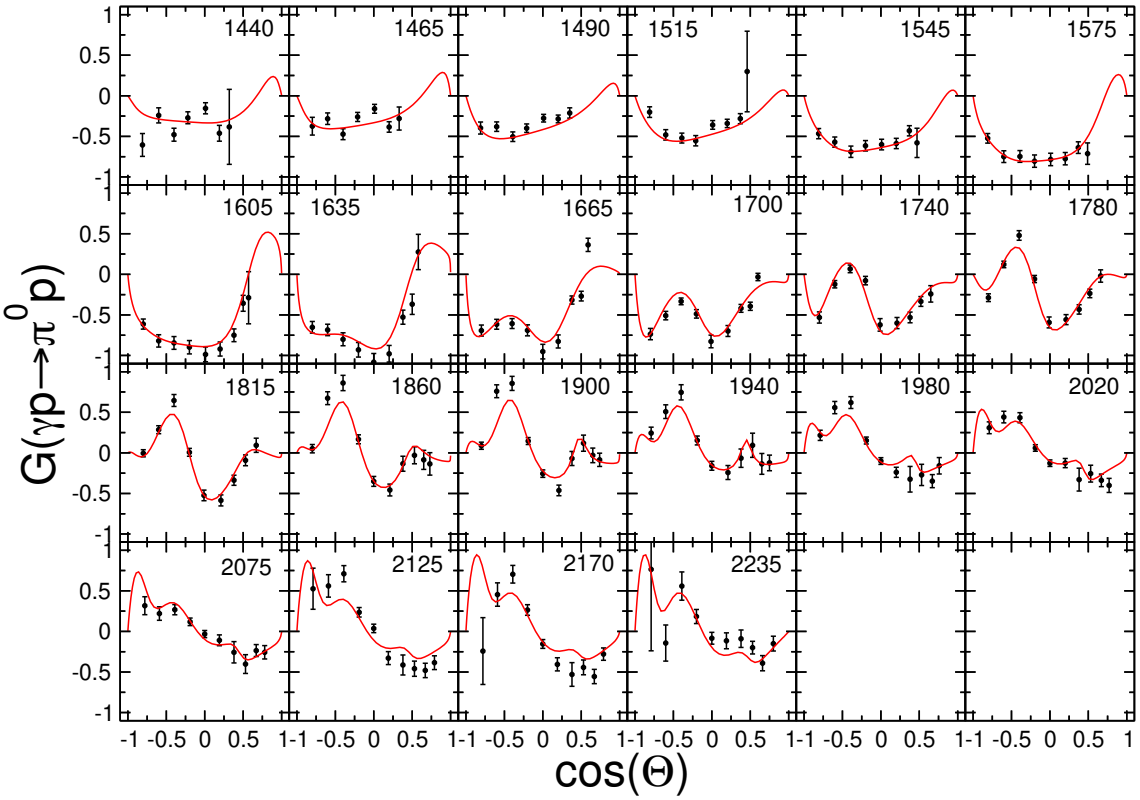
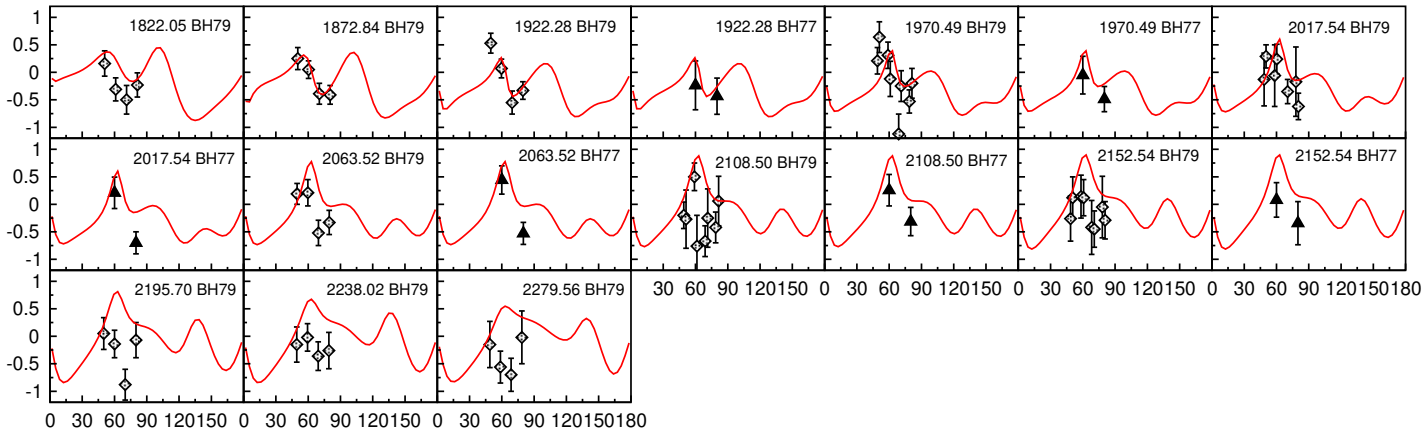
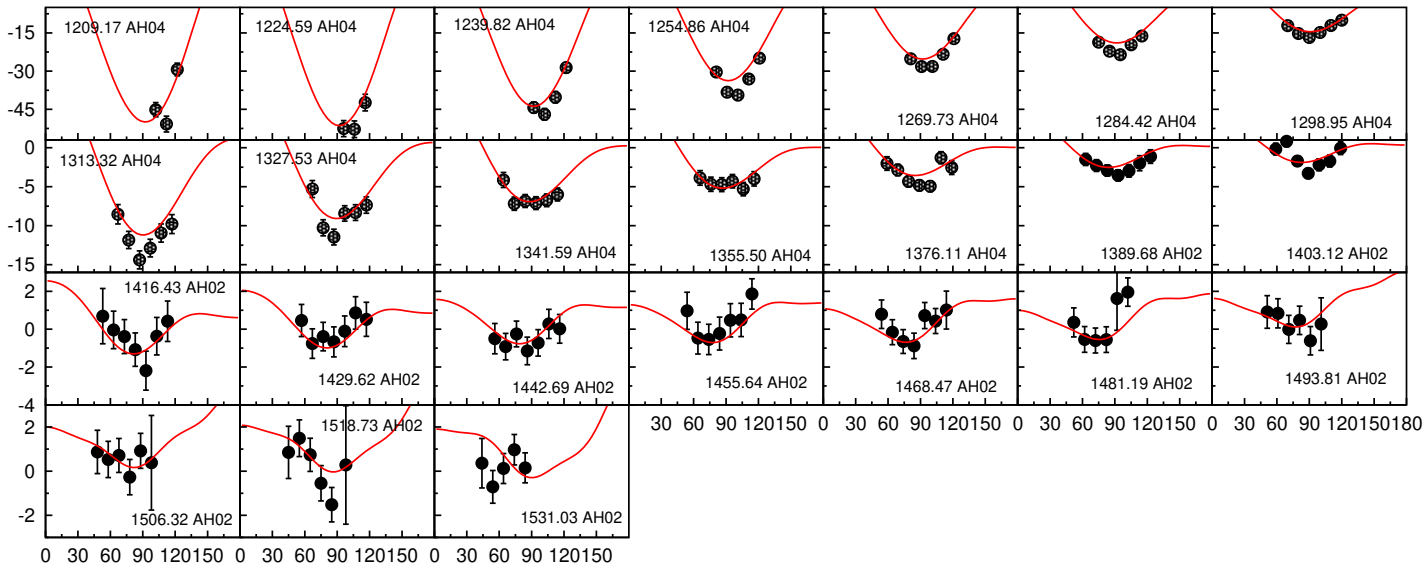


Figure 1: CLAS 2021 (N. Zachariou *et al.* Phys. Lett. B 817, 136304 (2021)


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1970.49 BH77
2017.54 BH79
2017.54 BH77
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2108.50 BH79
2108.50 BH77
2152.54 BH79
2152.54 BH77
2195.70 BH79
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-1
0 30 60 90 120150
0 30 60 90 120150180


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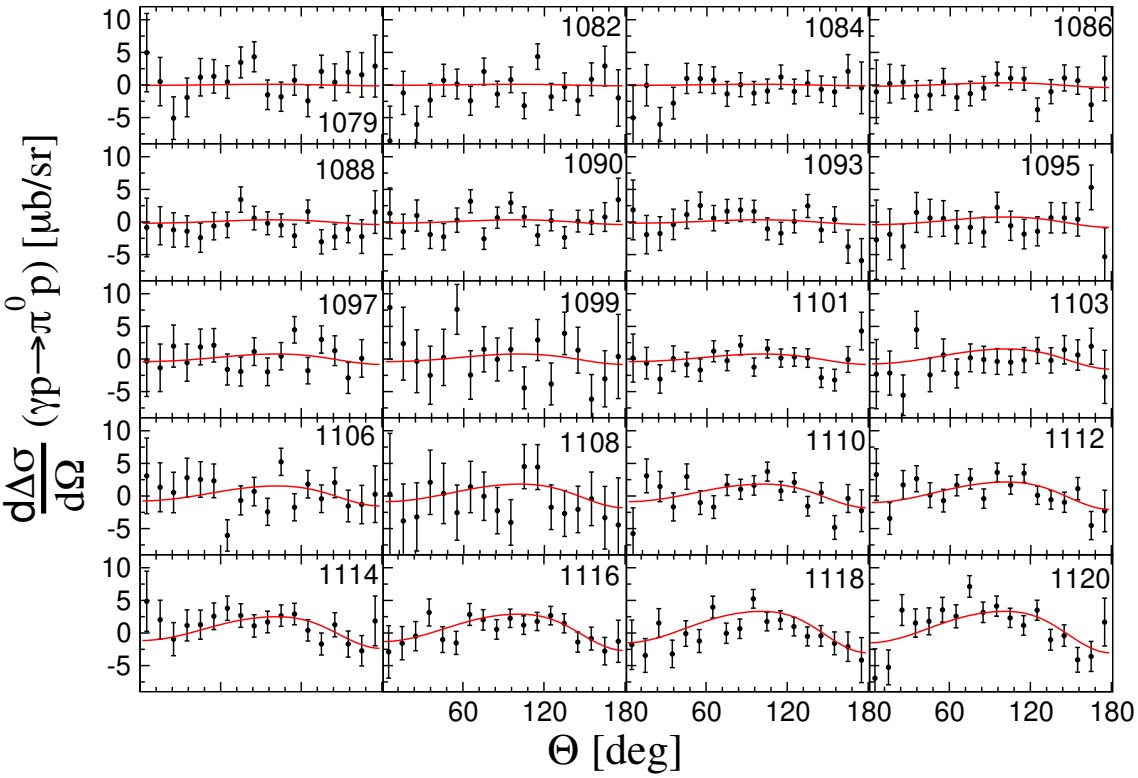


Figure 1: A2MAMI (E. Mornacchi *et al.* Phys. Rev. C 109, 055201 (2024)

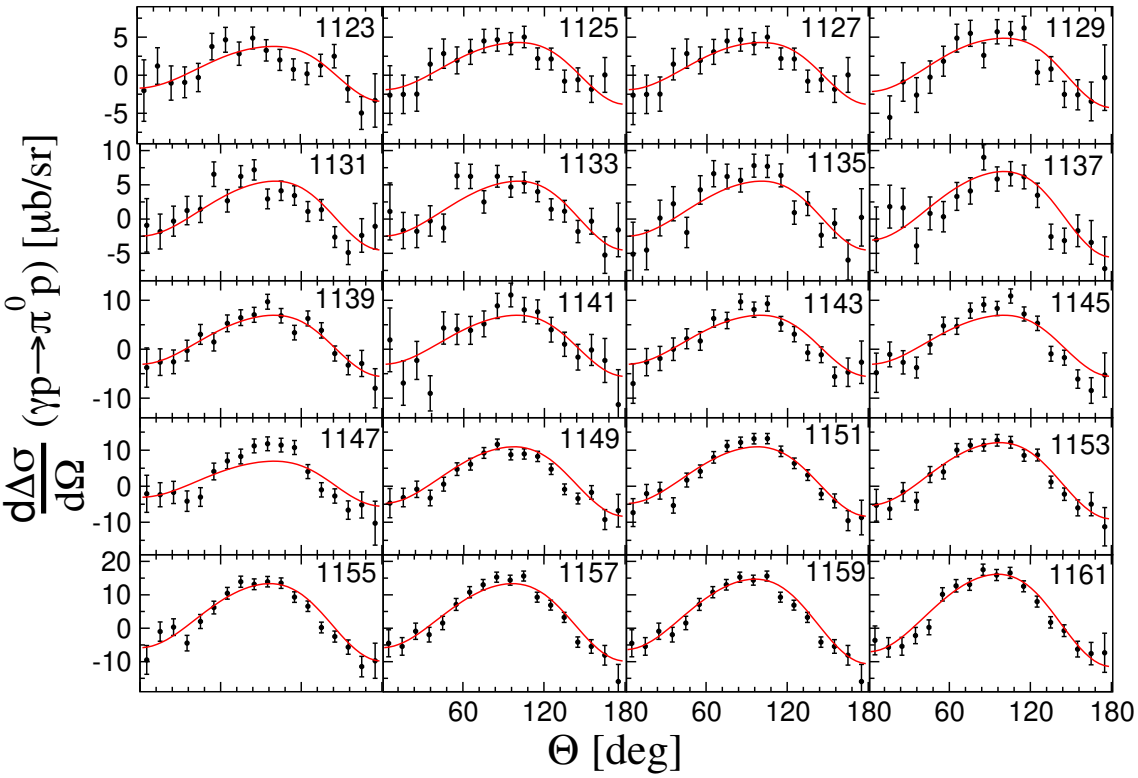


Figure 2: A2MAMI (E. Mornacchi *et al.* Phys. Rev. C 109, 055201 (2024)

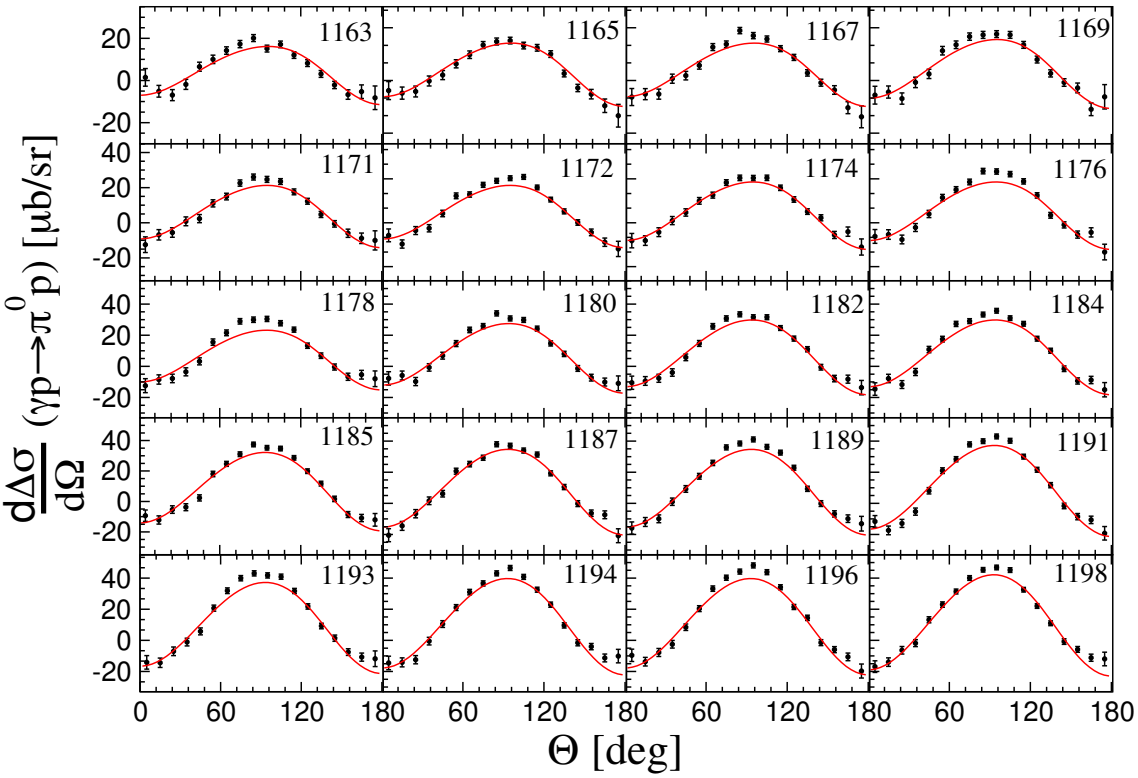


Figure 3: A2MAMI (E. Mornacchi *et al.* Phys. Rev. C 109, 055201 (2024)

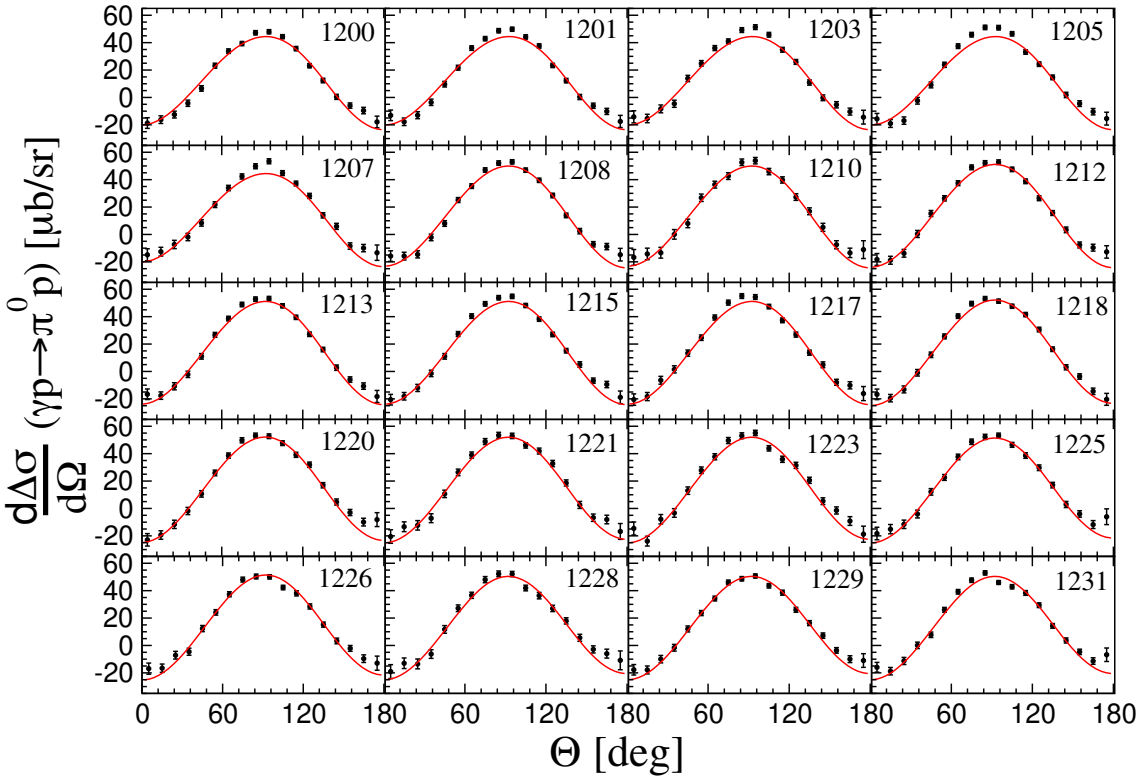


Figure 4: A2MAMI (E. Mornacchi *et al.* Phys. Rev. C 109, 055201 (2024)

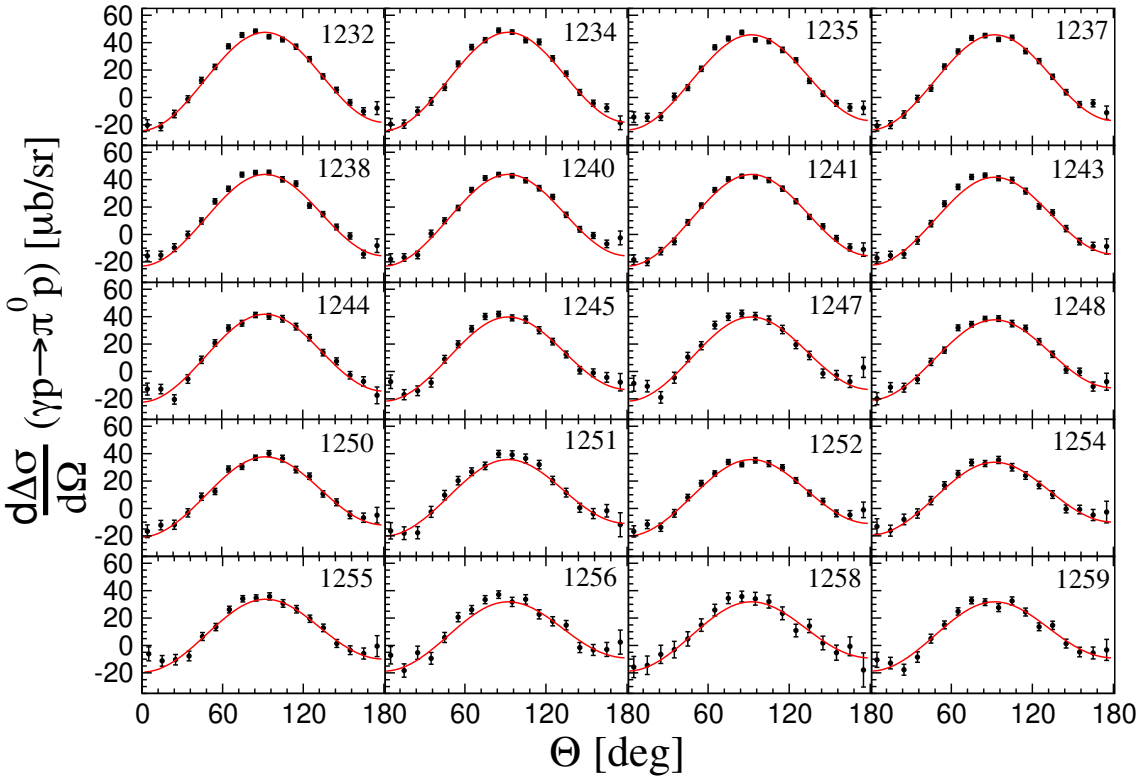


Figure 5: A2MAMI (E. Mornacchi *et al.* Phys. Rev. C 109, 055201 (2024)

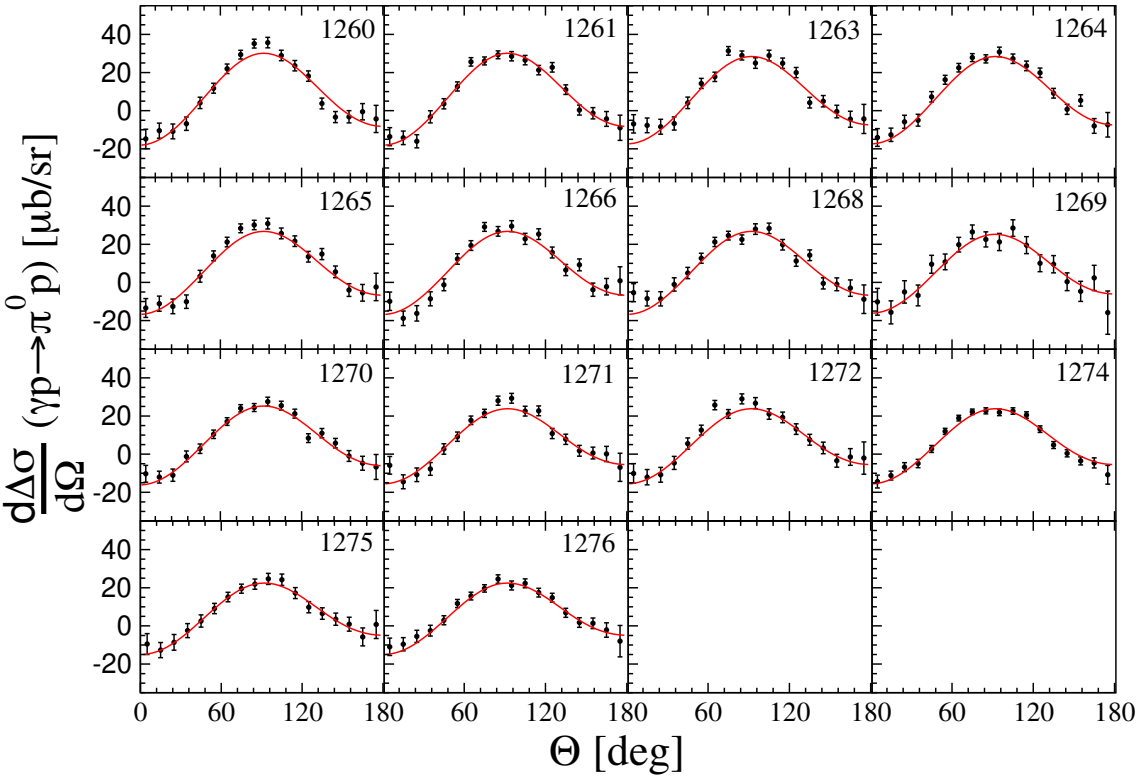
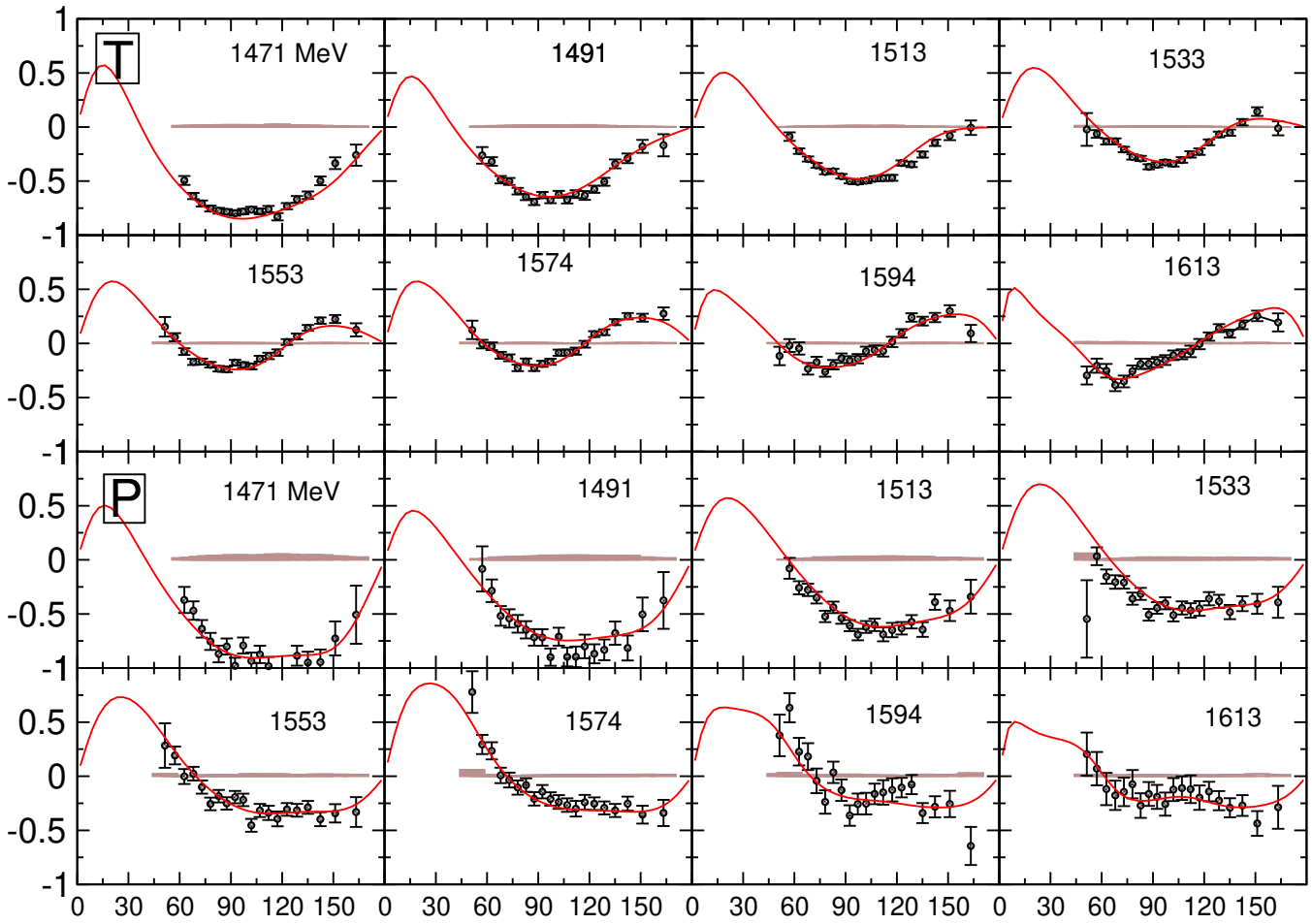
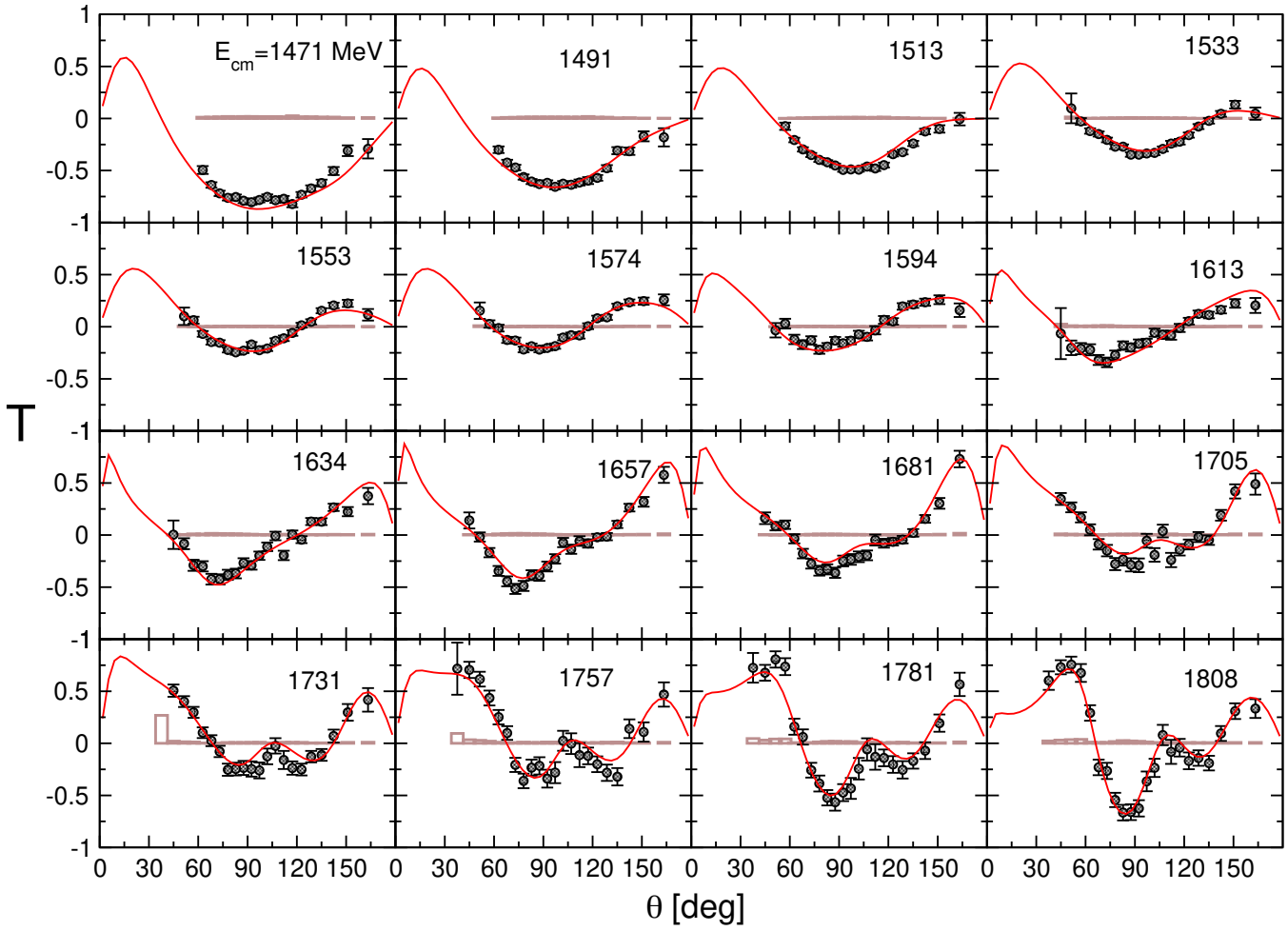
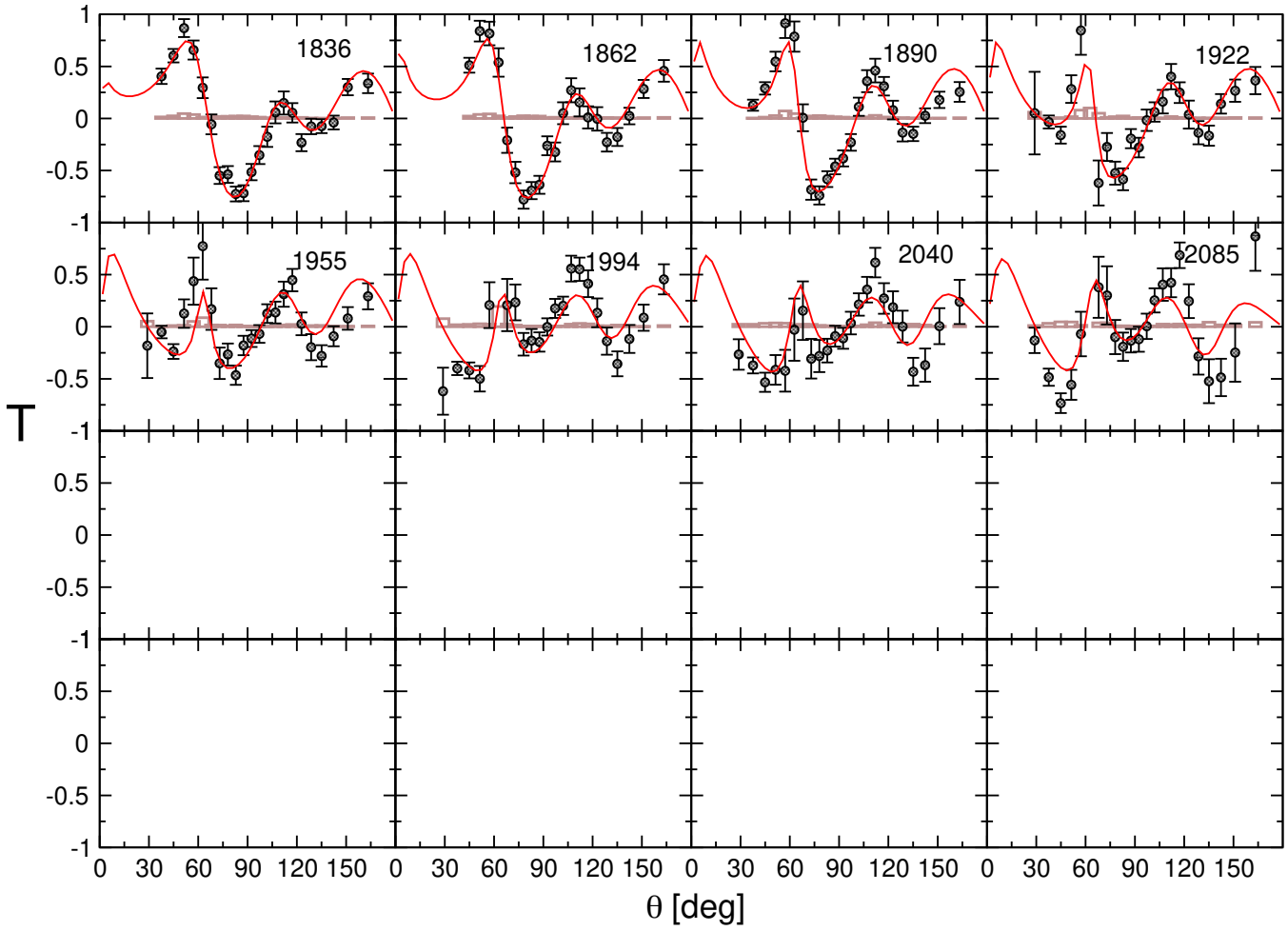
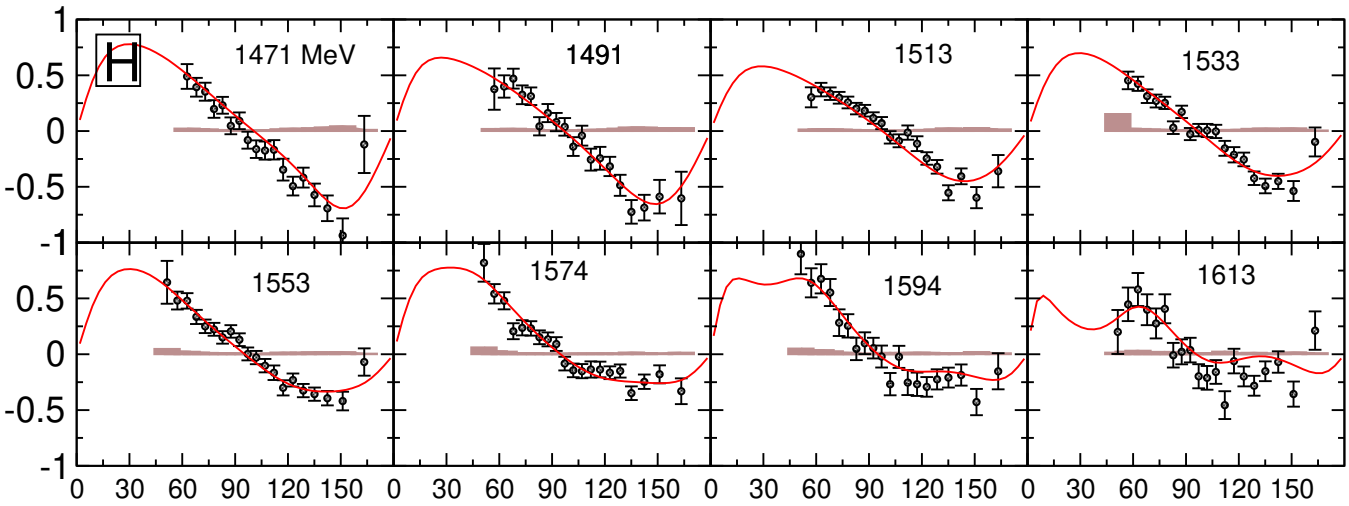


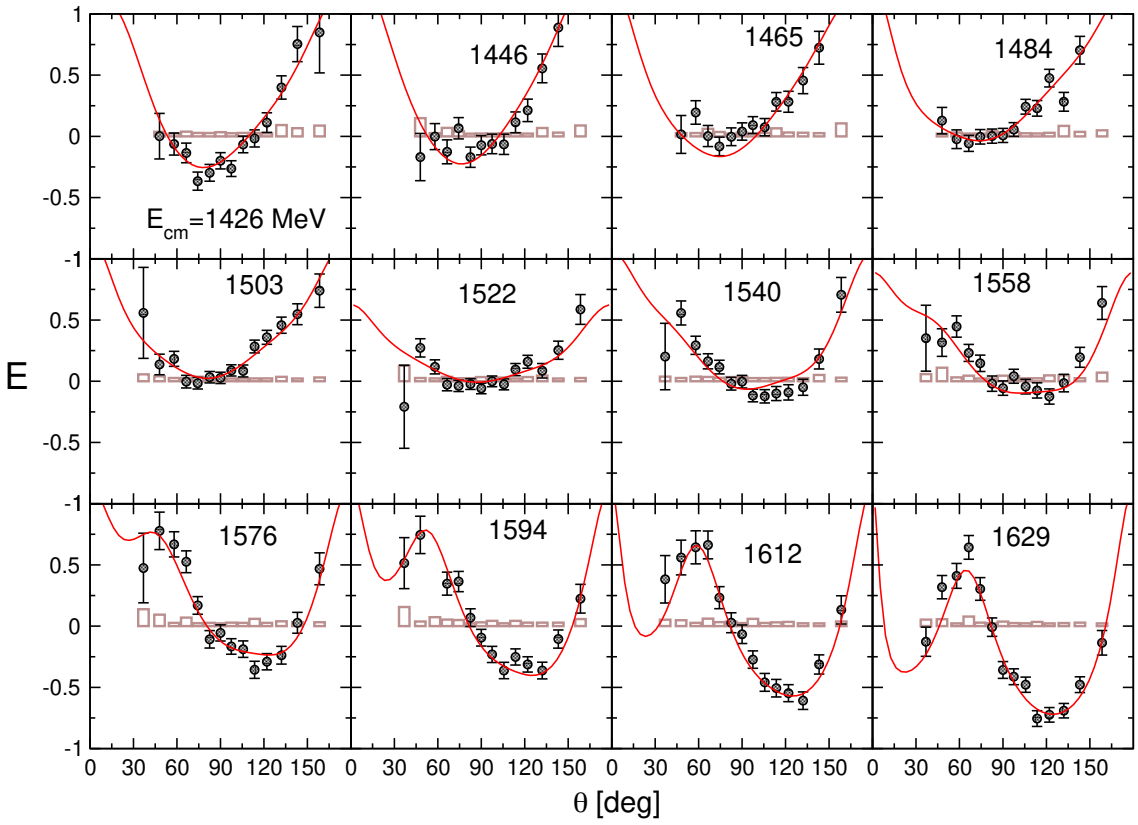
Figure 6: A2MAMI (E. Mornacchi *et al.* Phys. Rev. C 109, 055201 (2024)

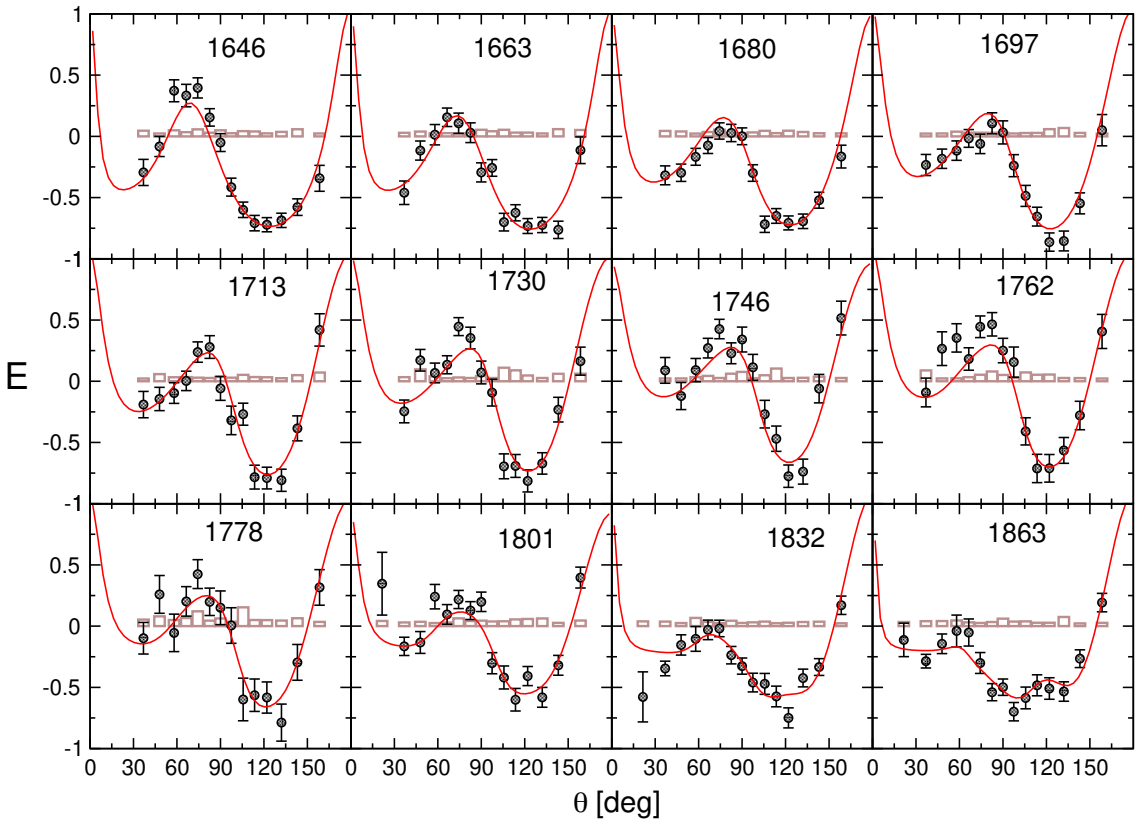

T
1471 MeV
1491
1513
1533
1553
1574
1594
1613
P
1471 MeV
1491
1513
1533
1553
1574
1594
1613
1
0.5
0
-0.5
-1
0 30 60 90 120 150

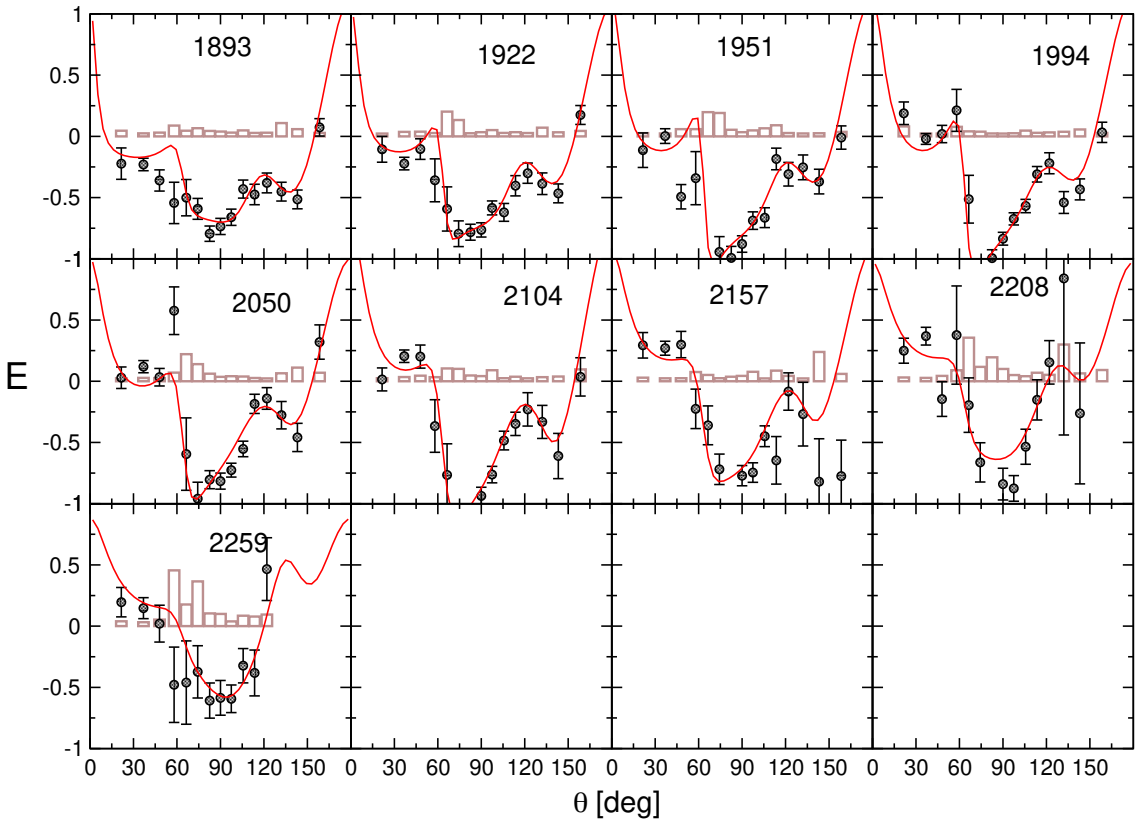

E_cm=1471 MeV
1491
1513
1533
1553
1574
1594
1613
1634
1657
1681
1705
1731
1757
1781
1808
T
θ [deg]

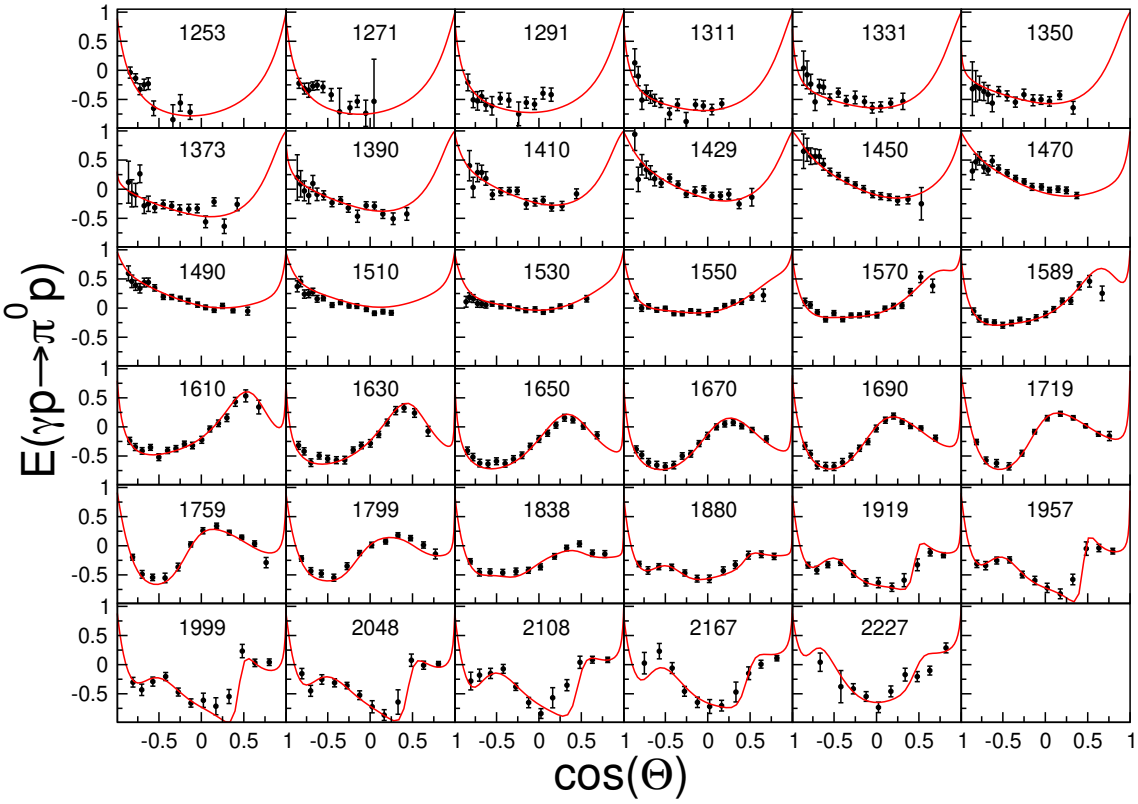

1836
1862
1890
1922
1955
1994
2040
2085
T
θ [deg]

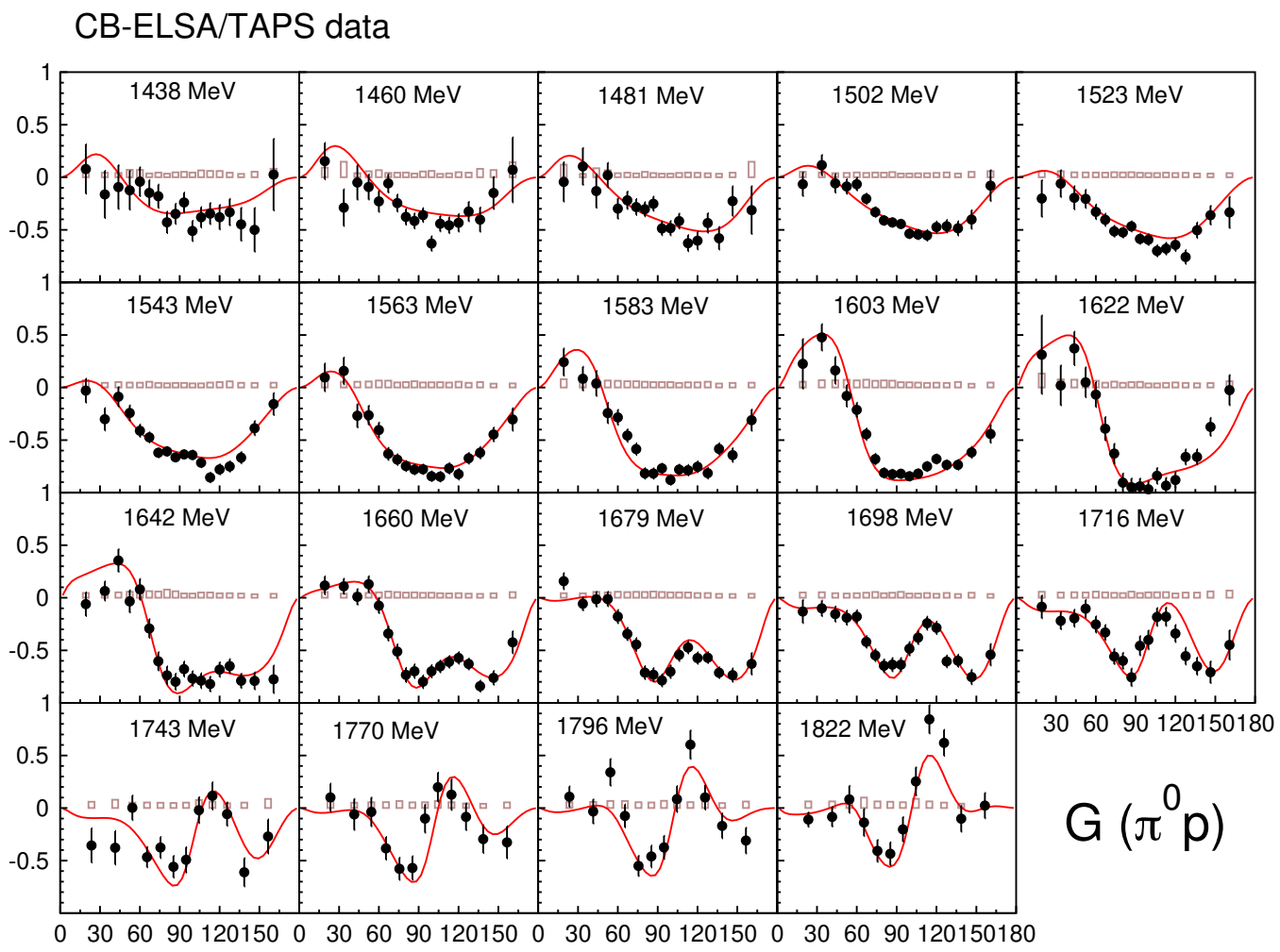

H
1471 MeV
1491
1513
1533
1553
1574
1594
1613
1
0.5
0
-0.5
-1
0 30 60 90 120 150

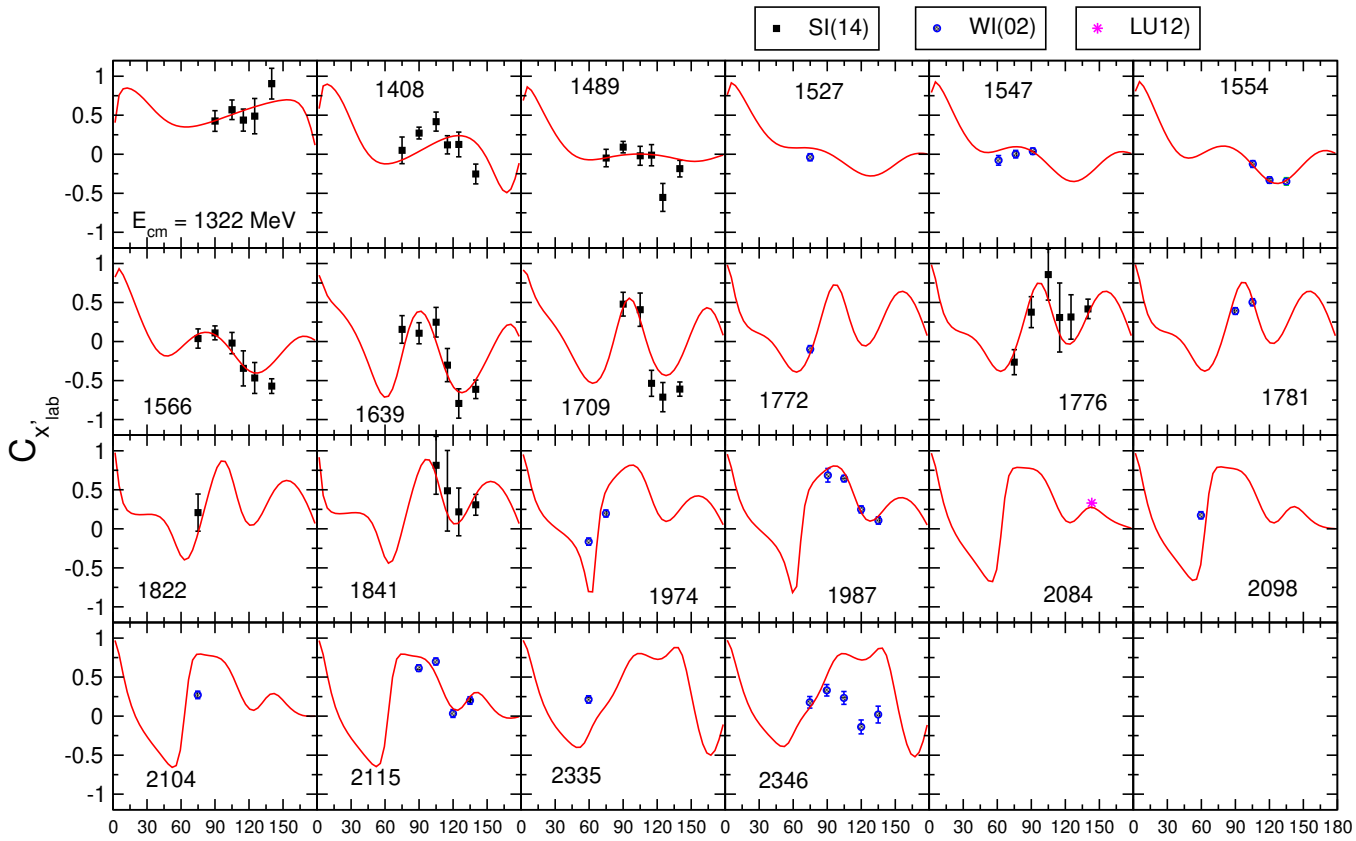

E
θ [deg]
E_cm=1426 MeV
1446
1465
1484
1503
1522
1540
1558
1576
1594
1612
1629

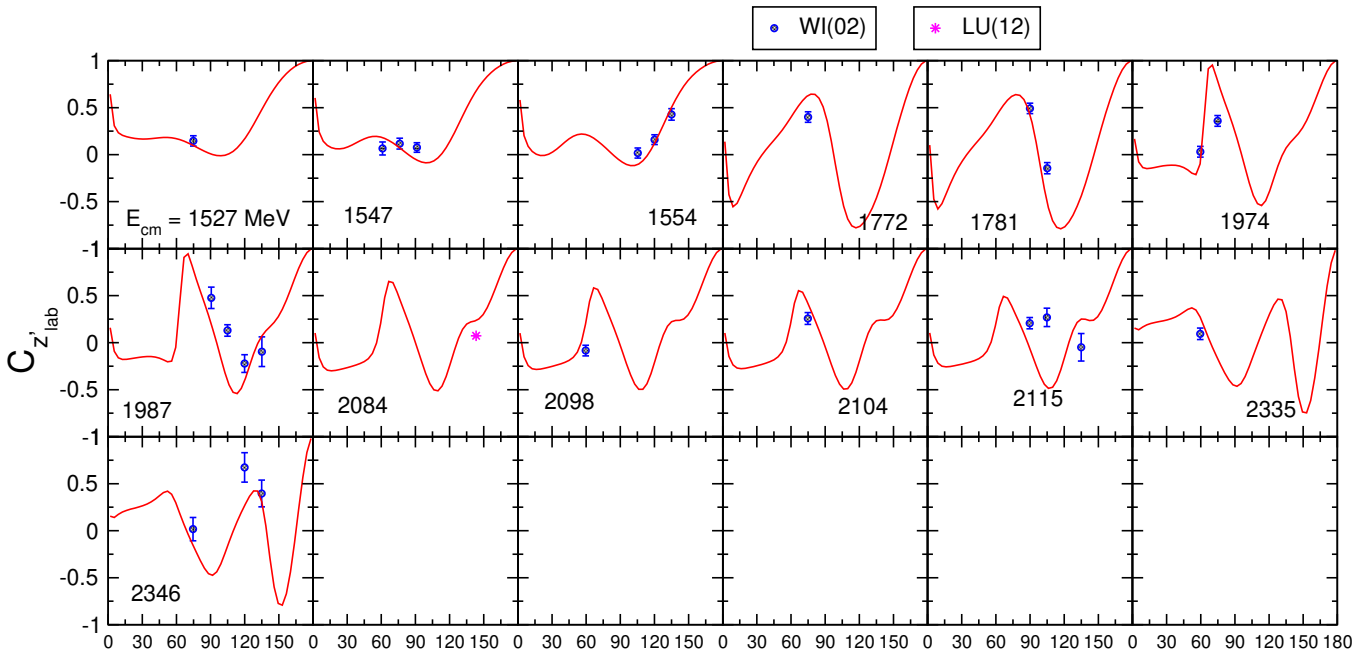

1646
1663
1680
1697
1713
1730
1746
1762
1778
1801
1832
1863
E
θ [deg]

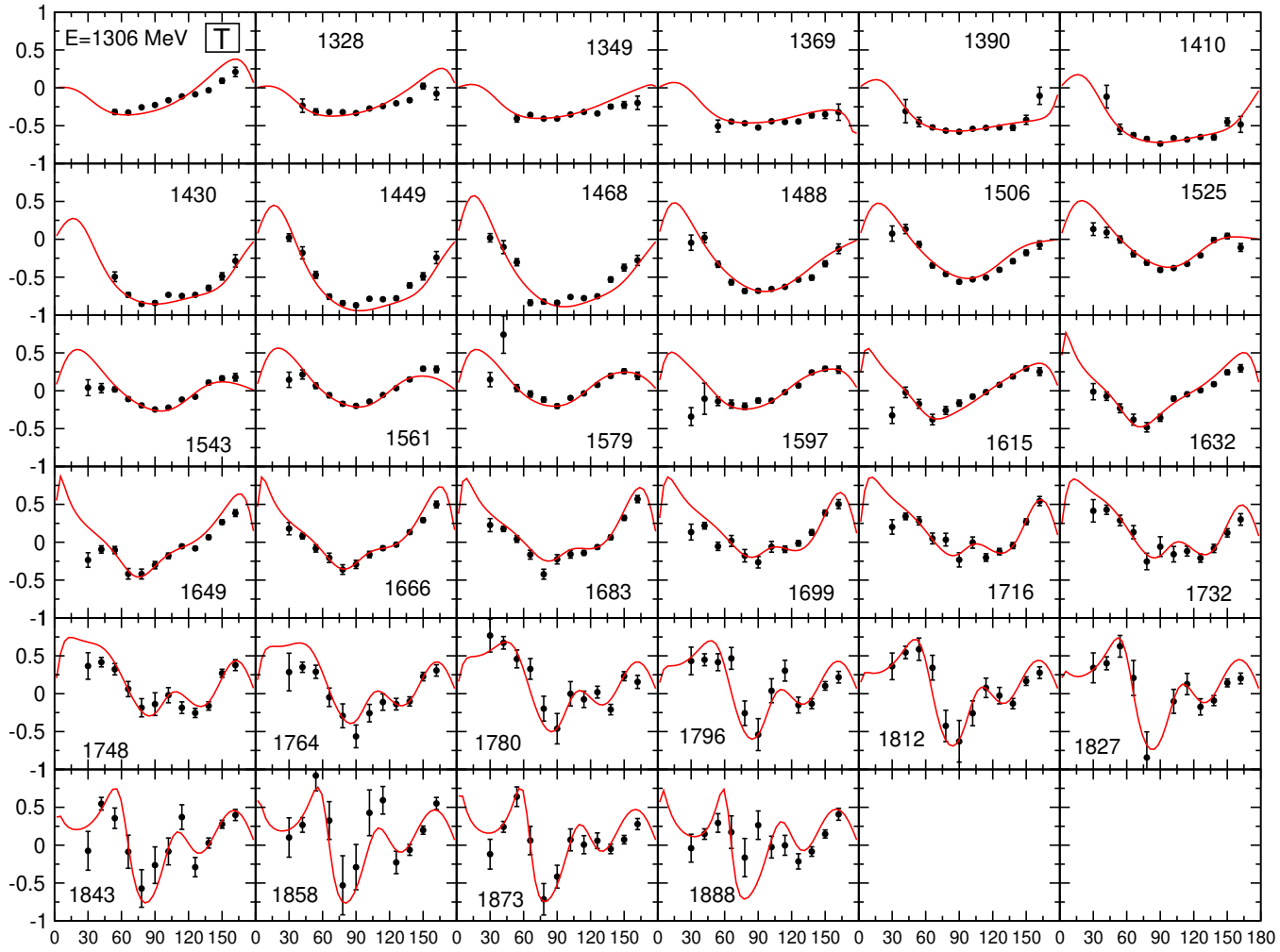

1893
1922
1951
1994
2050
2104
2157
2208
2259
E
θ [deg]
1
0.5
0
-0.5
-1
0 30 60 90 120 150

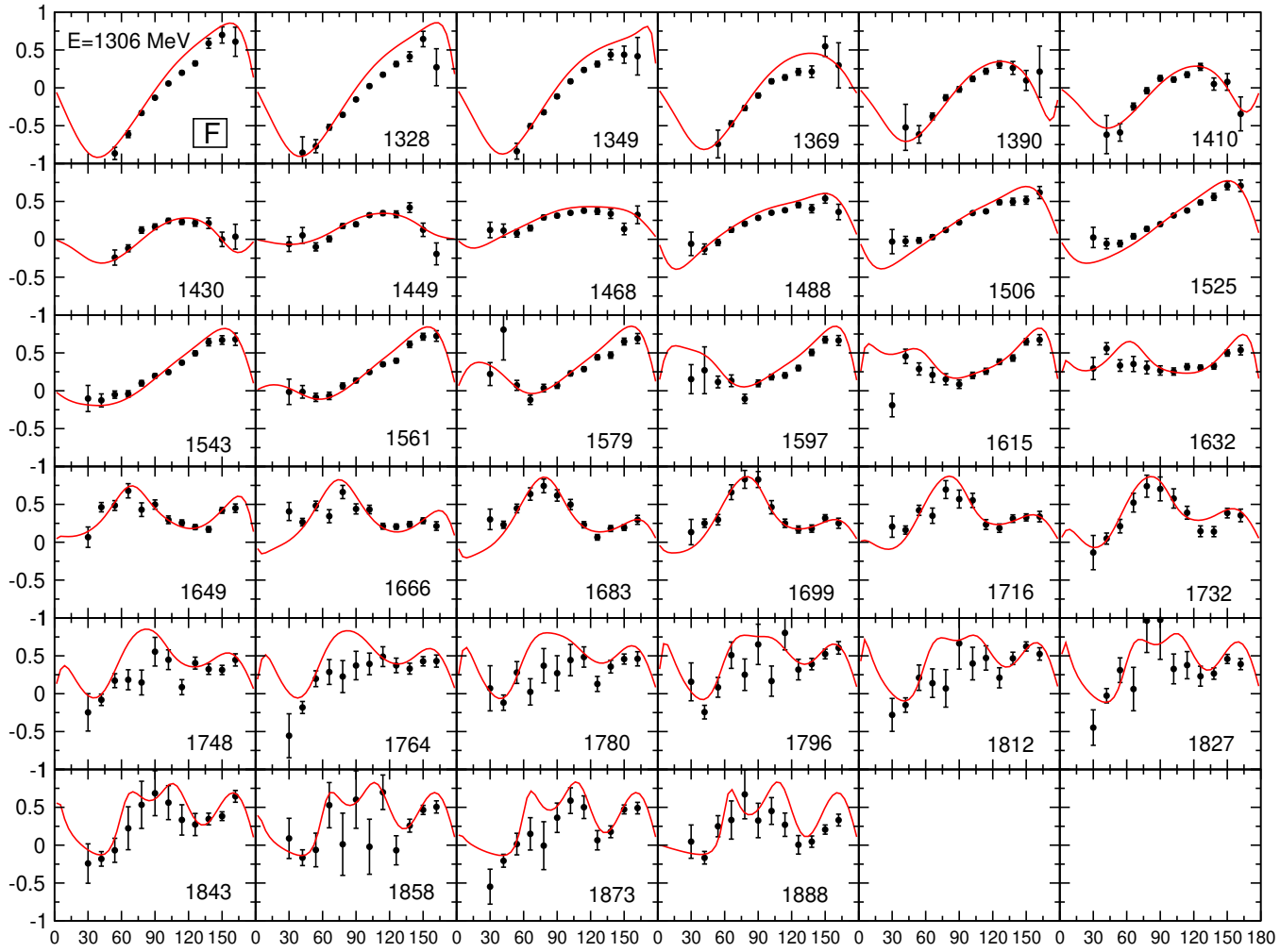

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1429
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1550
1570
1589
1610
1630
1650
1670
1690
1719
1759
1799
1838
1880
1919
1957
1999
2048
2108
2167
2227
E(γp→π0p)
cos(Θ)


CB-ELSA/TAPS data
1438 MeV
1460 MeV
1481 MeV
1502 MeV
1523 MeV
1543 MeV
1563 MeV
1583 MeV
1603 MeV
1622 MeV
1642 MeV
1660 MeV
1679 MeV
1698 MeV
1716 MeV
1743 MeV
1770 MeV
1796 MeV
1822 MeV
G (π0p)


SI(14)
WI(02)
LU12)
$C_{x'_{lab}}$
E_{cm} = 1322 MeV
1408
1489
1527
1547
1554
1566
1639
1709
1772
1776
1781
1822
1841
1974
1987
2084
2098
2104
2115
2335
2346


WI(02)
LU(12)
$C_{z'}$ lab
E_{cm} = 1527 MeV
1547
1554
1772
1781
1974
1987
2084
2098
2104
2115
2335
2346


E=1306 MeV
T
1328
1349
1369
1390
1410
1430
1449
1468
1488
1506
1525
1543
1561
1579
1597
1615
1632
1649
1666
1683
1699
1716
1732
1748
1764
1780
1796
1812
1827
1843
1858
1873
1888
1 0.5 0 -0.5 -1
0 30 60 90 120 150 180


E=1306 MeV
F
1328
1349
1369
1390
1410
1430
1449
1468
1488
1506
1525
1543
1561
1579
1597
1615
1632
1649
1666
1683
1699
1716
1732
1748
1764
1780
1796
1812
1827
1843
1858
1873
1888
1 0.5 0 -0.5 -1
0 30 60 90 120 150 180

Data references

- Differential cross section $\gamma p \to \pi^0 p$:
  - SC(01) MAIN SCHMIT, PRL87, 232501(2001), BE
  - FU(96) MAIN FUCHS, PLB368, 20(96), AHRENS,
  - BE(90) MAIN BECK, PRL65, 1841(90) REVISED 7
  - HO(12)PMAIN HORNIDGE, ARXIV:1211.5495, PRAK
  - BG(97) SAL BERGSTROM, PRC55, 2016(97),
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  - GO(68) LEBE GOVORKOV, SJNP6, 370(68)
  - GZ(74)1BONN GENZEL, ZP268, 43(74)
  - BE(06) MAIN BECK, EPJA28S1, 173(2006)
  - SC(97)PMAIN SCHNEIDER, PHD THESIS, 1997, AH
  - HA(96)PMAIN HAERTER, PHD THESIS, 1996, AHRE
  - AG(75) SACL ARGAN, NPA237, 447(75)
  - DO(77) LUND DOUGAN, ZPA280, 341(77)
  - BE(97) MAIN BECK, PRL78, 606(1997)
  - AK(78) LEBE ALEKSANDROV, SJNP28, 344(78)
  - AH(04) MAIN AHRENS, EPJA21, 323(2004)
  - AK(77) LEBE ALEKSANDROV, SJNP25, 43(77)
  - BA(05) BONN BARTHOLOMY, PRL94, 012003(2005)
  - HE(73) TOKY HEMMI, PLB43, 79(73)
  - JU(76) BONN M.JUNG, PRP HE-76-15 76
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  - YO(80) TOKY YOSHIOKA, NPB168, 222(80)
  - BC(73) BONN BECK, NPB60, 267(73)
  - SC(10) MAIN SCHUMANN, EPJA43, 269(2010)
  - HY(73) TOKY HEMMI, NPB55, 333(73)
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  - AM(73) LUND S.ALMEHED, CONF BONN 73
  - AH(02) MAIN AHRENS, PRL88, 232002(2002)
  - WO(68) CALT F.WOLVERTON, PH.D THESIS 68
  - AL(79) BONN ALTHOFF, ZPC1, 327(79)
  - WC(60) CALT WORLOCK, PR117, 537(60)
  - WO(68)PCALT F.WOLVERTON, PH.D THESIS 1968
  - KR(99) MAIN KRUSCHE, EPJA6, 309(1999)
  - SA(65) STAN DE.STAEBLER, PRB140, 336(65)
  - BN(75) DNPL BARTON, NPB84, 449(1975)
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  - BH(71) DNPL P.S.L.BOOTH, PRP DNPL P95 71
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- TL(62) CALT TALMAN, PRL9, 177(1962)
- BU(68) DESY BUSCHHORN, PRL20, 230(1968)
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- CR(11) BONN CREDE, PRC84, 055203(2011)
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- BG(68) DESY BRAUNSCHWEIG, PLB26, 405(1968)
- AL(79)1BONN ALTHOFF, ZPC1, 257(79)
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- BO(67) CEA BOLON, PRL18, 926(1967)
- SH(79) CORN SHUPE, PRD19, 1921(1979)
- BG(70) DESY BRAUNSCHWEIG, NPB20, 191(1970)
- AD(15) MAMI A2 Phys.Rev.C 92 024617 (2015)

- Beam asymmetry Σ $\gamma p \to \pi^0 p$:
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  - BJ(69) FRAS BARBIELLINI, PR184, 1402(69)
  - DR(64) STAN DRICKEY, PRB136, 543(64)
  - BE(06) MAIN BECK, EPJA28S1, 173(2006)
  - BL(92) LEGS BLANPIED, PRL69, 1880(1992), SA
  - BE(97) MAIN BECK, PRL78, 606(1997), PC 02-2
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  - GB(78) KHAR GORBENKO, SJNP27, 638(78)
  - GB(77)1KHAR GORBENKO, VANT2, 36(1977)
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  - AT(86) YERE ASATURYAN, JETPL44, 341(86)

- AB(74) YERE ABRAHAMIAN, PLB48, 463(1974)
- SP(10) BONN SPARKS, PRC81, 065210(2010)
- BS(76) DNPL BUSSEY, NPB104, 253(76)
- BS(79)1DNPL BUSSEY, NPB154, 492(79)
- SU(07) LEPS SUMIHAMA, PLB657, 32(2007)
- DU(13) Dugger *et al.* (CLAS Collaboration) PRC88, 065203, PRC89, 029901 (2014)

- Recoil Polarization $\gamma p \to \pi^0 p$:
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  - ML(65) STAN MALOY, PRB139, 733(65)
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  - BV(87) KHAR BRATASHEVSKI, SJNP46, 635(87)
  - WI(02) JLAB WIJESOORIYA, PRC66, 034614(2002
  - BV(85) KHAR BRATASHEVSKI, SJNP41, 960(85)
  - BV(81) KHAR BRATASHEVSKI, SJNP33, 538(81)
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  - AT(86) YERE ASATURYAN, JETPL44, 341(86)

- BM(76)1BONN BLUEM, ZPA278, 275(76)
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- TN(73) CEA TANAKA, PRD8, 1(73)
- BS(79)1DNPL BUSSEY, NPB154, 492(79)
- LU(12) JLAB LUO, PRL108, 222004(2012)
- Hartmann *et al.* (CBELSA/TAPS Collaboration) PRL 113, 062001 (2014), PLB 748, 212 (2015)

• Target asymmetry T $\gamma p \to \pi^0 p$:

- BO(98) BONN BOCK, PRL81, 534(1998)
- BL(83) KHAR BELYAEV, NPB213, 201(83)
- GB(78) KHAR GORBENKO, SJNP27, 638(78)
- FK(78) TOKY FUKUSHIMA, NPB136, 189(78)
- FE(76)1TOKY FELLER, NPB110, 397(76)
- GB(74) KHAR GORBENKO, JETPL19, 340(74)
- GB(77) KHAR GORBENKO, SJNP26, 167(77)
- BH(77) DNPL BOOTH, NPB121, 45(77)
- AG(89) YERE AGABABYAN, SJNP50, 834(89)
- AT(86) YERE ASATURYAN, JETPL44, 341(86)
- HH(77) BONN HERR, NPB125, 157(77)
- BS(79)1DNPL BUSSEY, NPB154, 492(79)
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• G $\gamma p \to \pi^0 p$:

- AH(05) MAIN AHRENS, EJPA26, 135(2005)
- BH(79) DNPL BUSSEY, NPB159, 383(79)
- BH(77)1DNPL P.S.L.BOOTH, ANNUAL REPORT 77
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• H $\gamma p \to \pi^0 p$:

- BH(79) DNPL BUSSEY, NPB159, 383(79)
- BH(77)1DNPL P.S.L.BOOTH, ANNUAL REPORT 77
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• Δ_{13} $\gamma p \to \pi^0 p$:

- AH(04) MAIN AHRENS, EPJA21, 323(2004), PEDR
- AH(02) MAIN AHRENS, PRL88, 232002(2002), PR
- A2MAMI (E. Mornacchi *et al.* Phys. Rev. C 109, 055201 (2024)

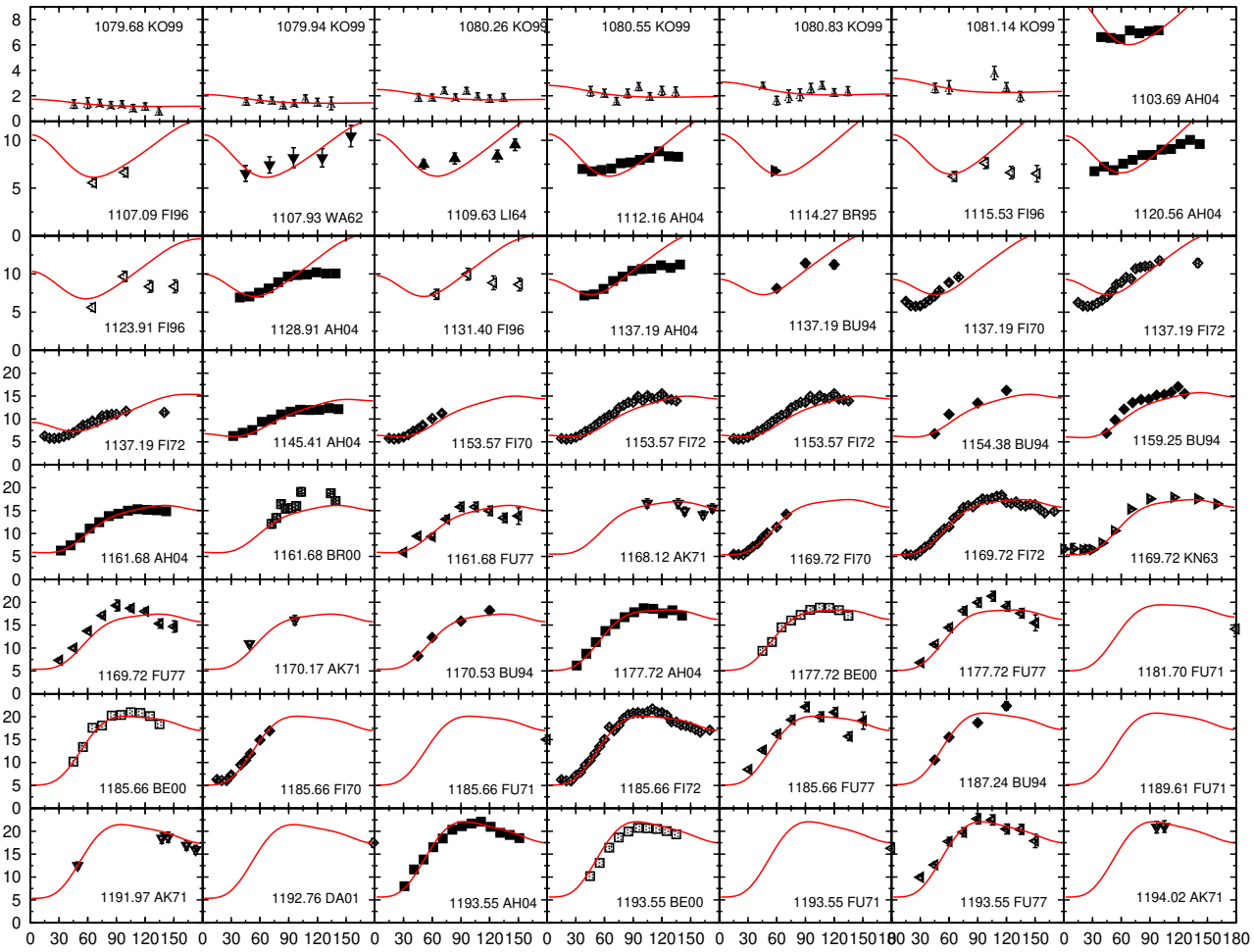
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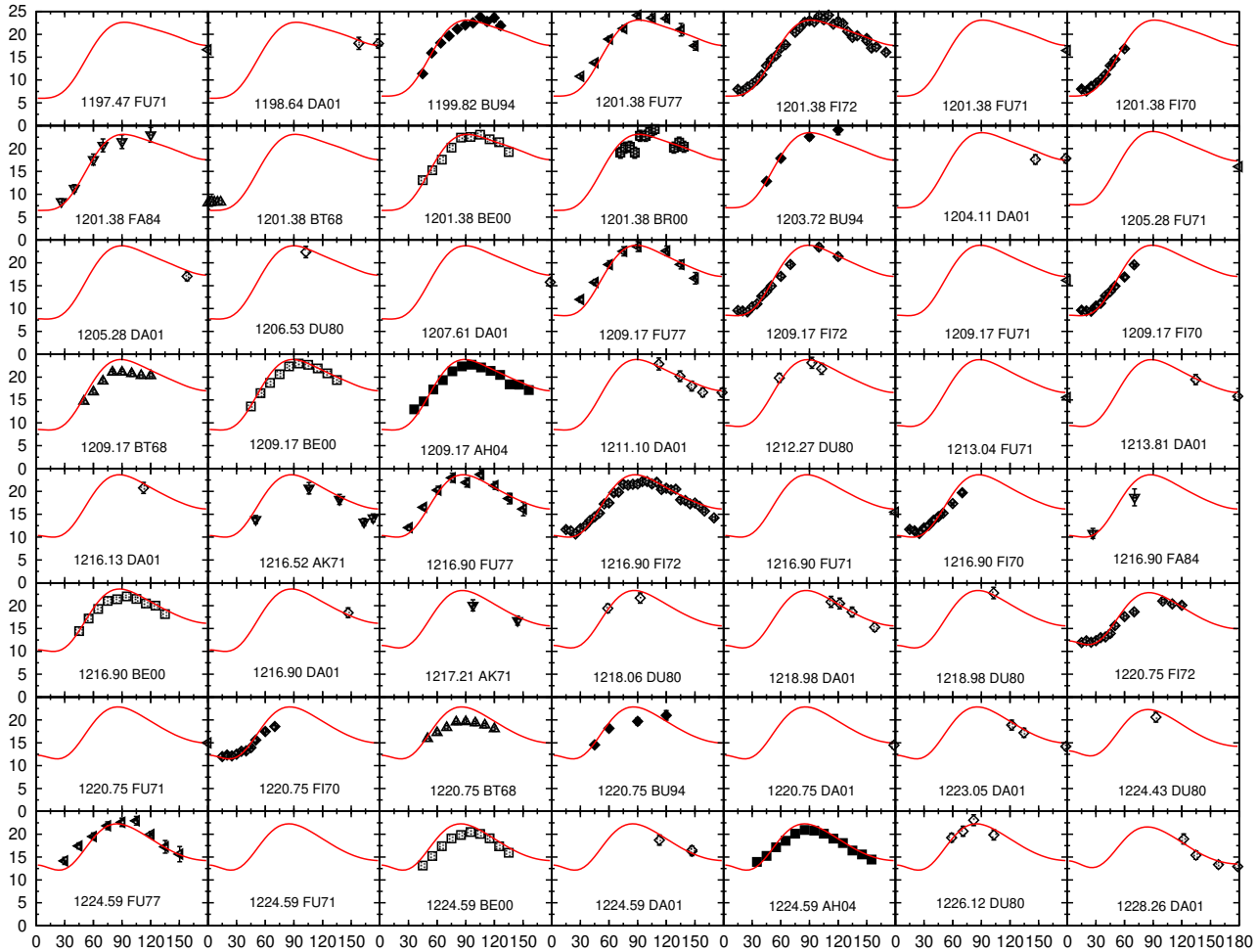
- GO(13): Gottschall *et al.* [CBELSA/TAPS Collaboration] PRL 112, 012003 (2014)
- Gottschall *et al.* [CBELSA/TAPS Collaboration] EPJA 57, 40 (2021)
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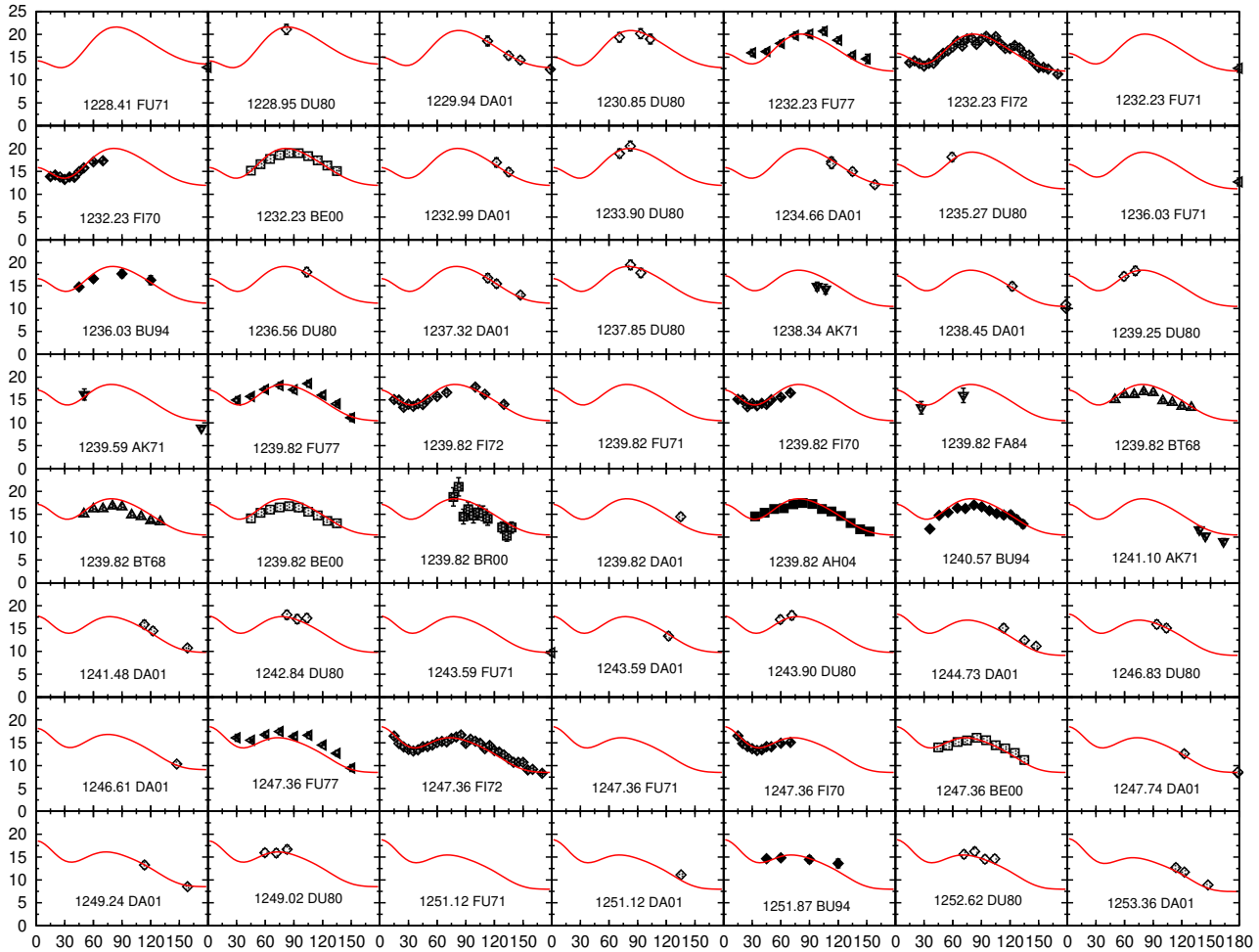
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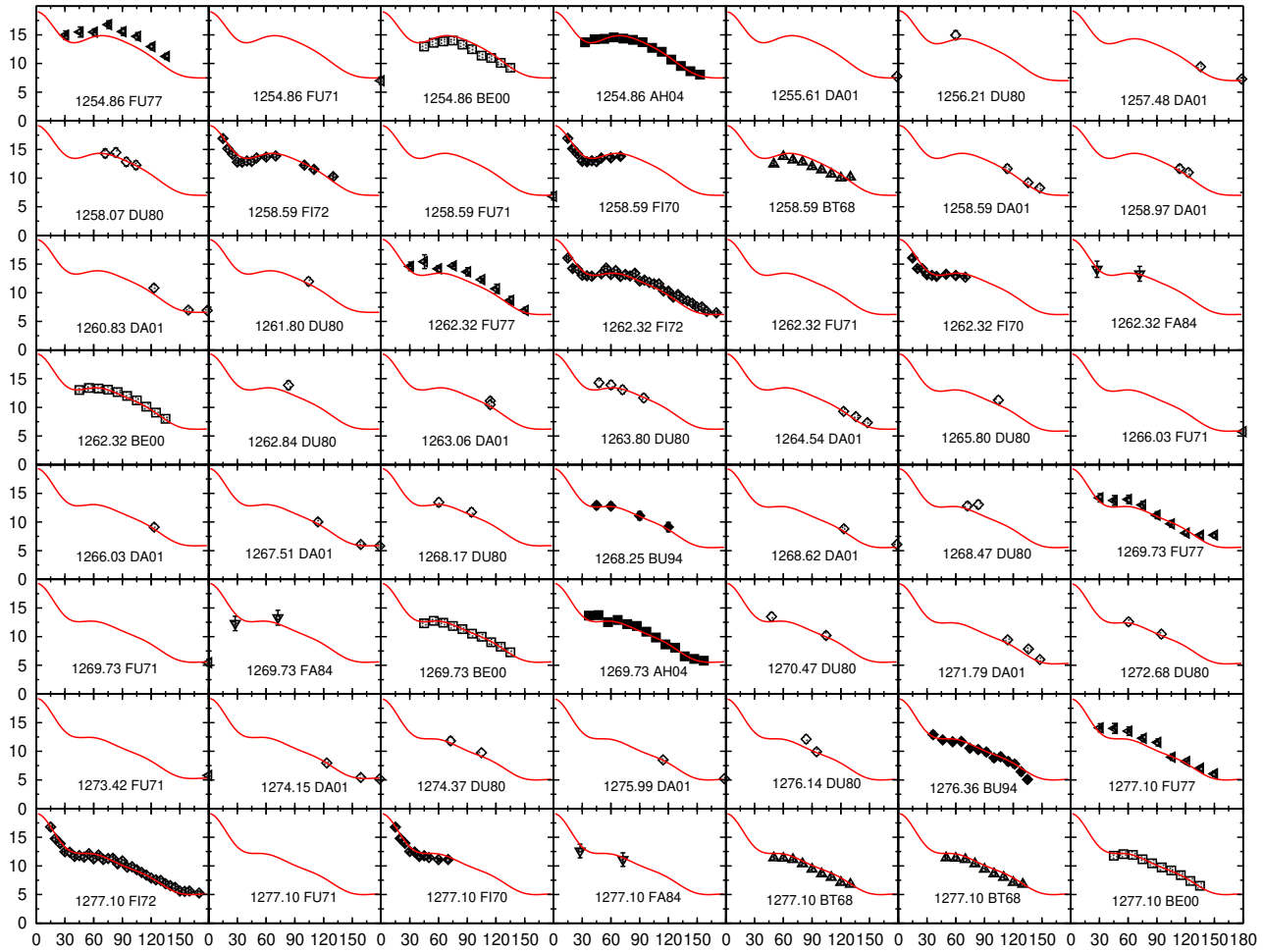
- SI13 Sikora *et al.* [A2 Collaboration at MAMI] PRL 112, 022501 (2013)
- WI02 Wijesooriya *et al.* [JLab Hall A Collaboration] PRC 66, 034614 (2002)
- LU12 *et al.* [GEp-III and GEp2γ Collaborations], Phys. Rev. Lett. 108, 222004 (2012)

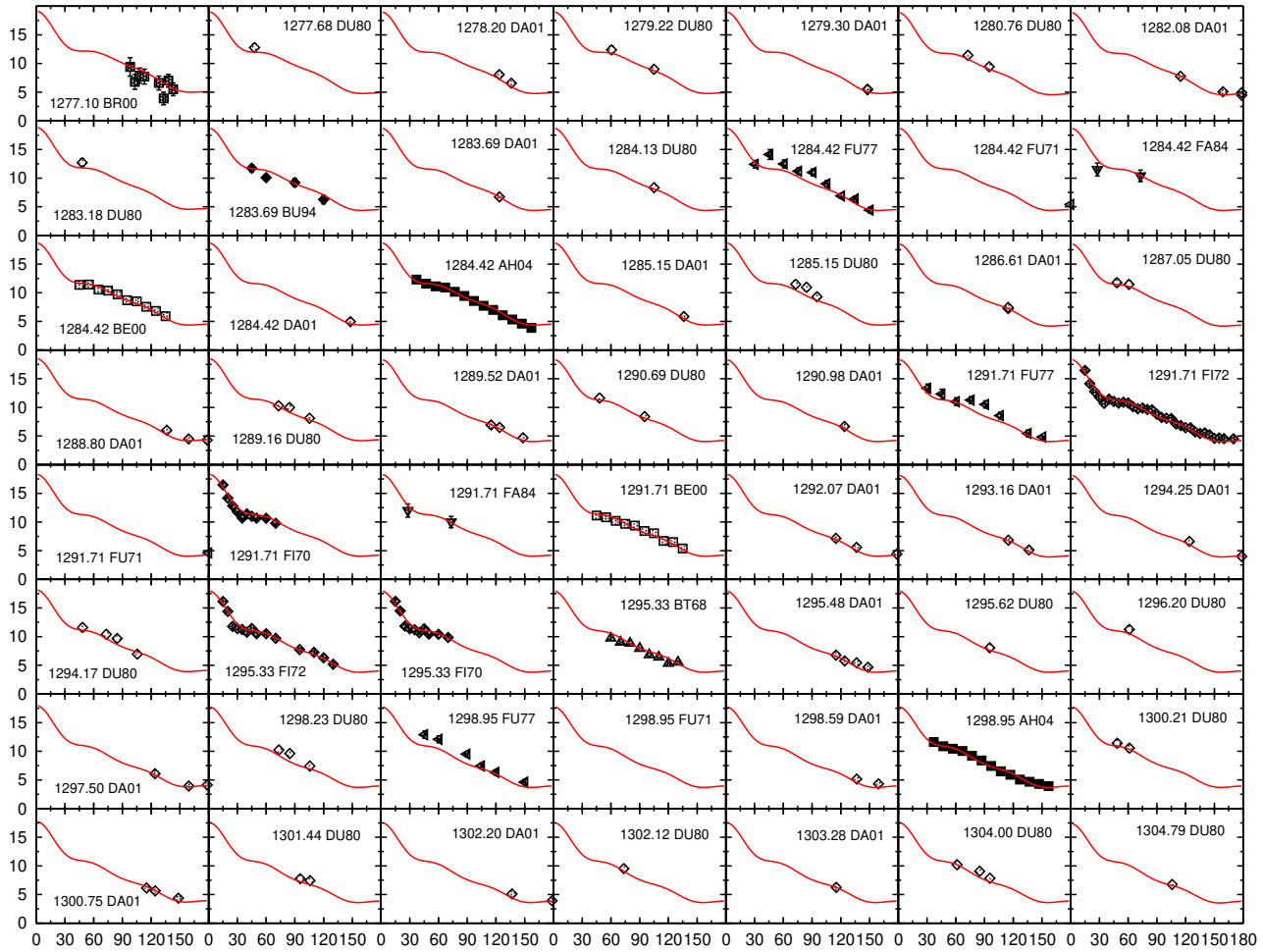
- C_z $\gamma p \to \pi^0 p$:
  - WI02 Wijesooriya *et al.* [JLab Hall A Collaboration] PRC 66, 034614 (2002)
  - LU12 *et al.* [GEp-III and GEp2γ Collaborations], Phys. Rev. Lett. 108, 222004 (2012)
- F $\gamma p \to \pi^0 p$:
  - J. R. M. Annand *et al.* [A2 and MAMI Collaborations] Phys. Rev. C **93**, 055209 (2016)

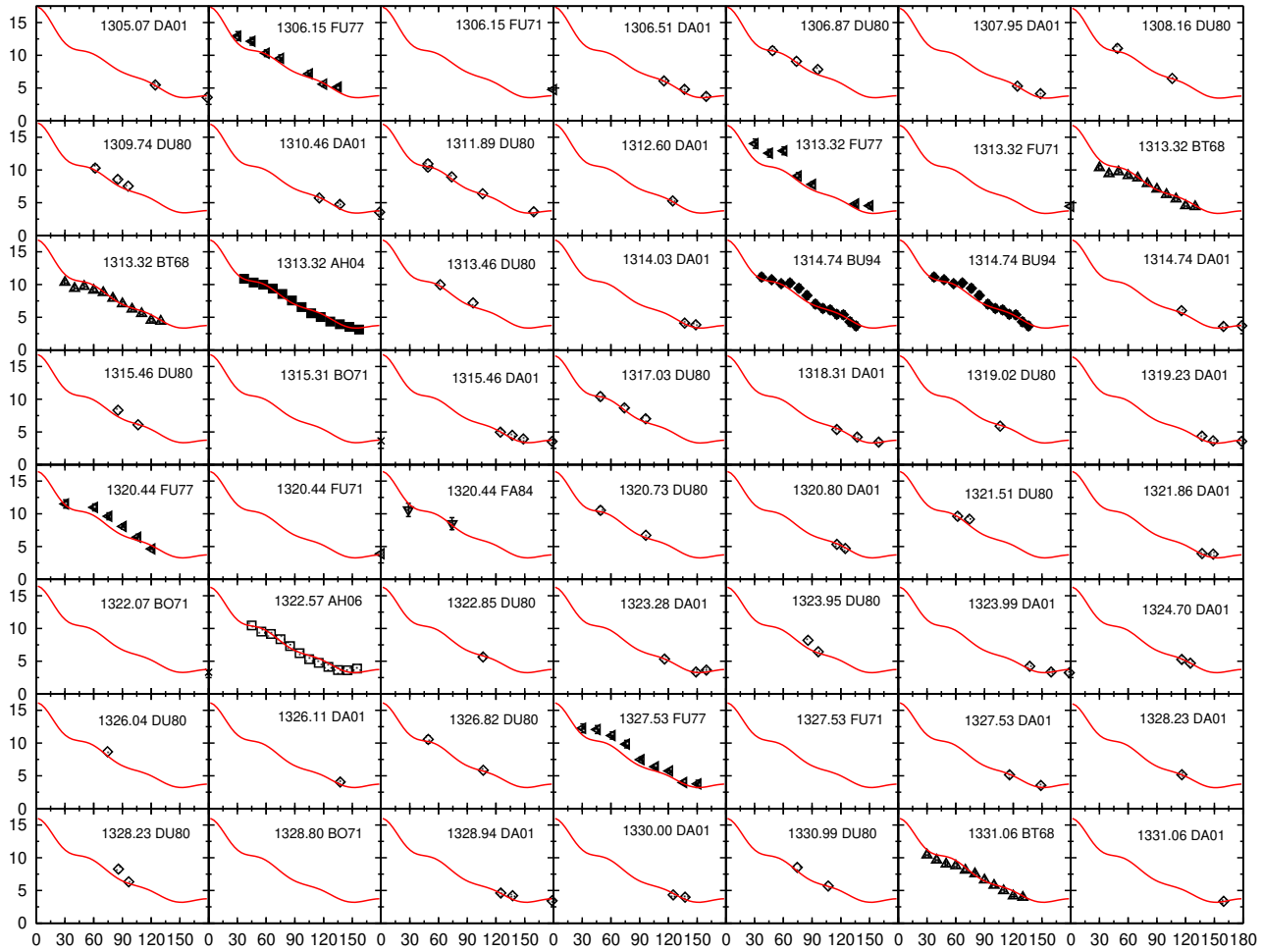

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1137.19 AH04
1137.19 BU94
1137.19 FI70
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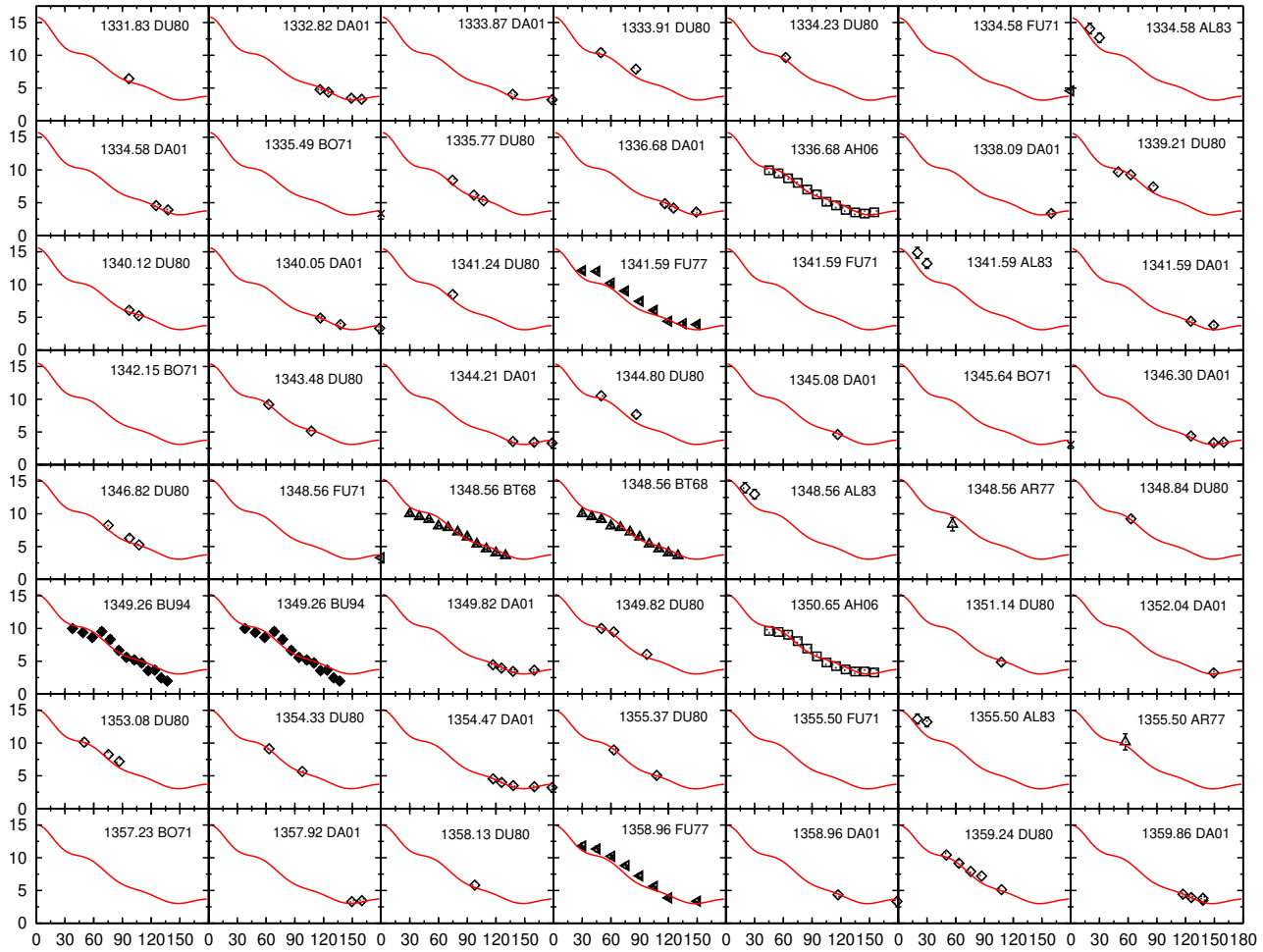

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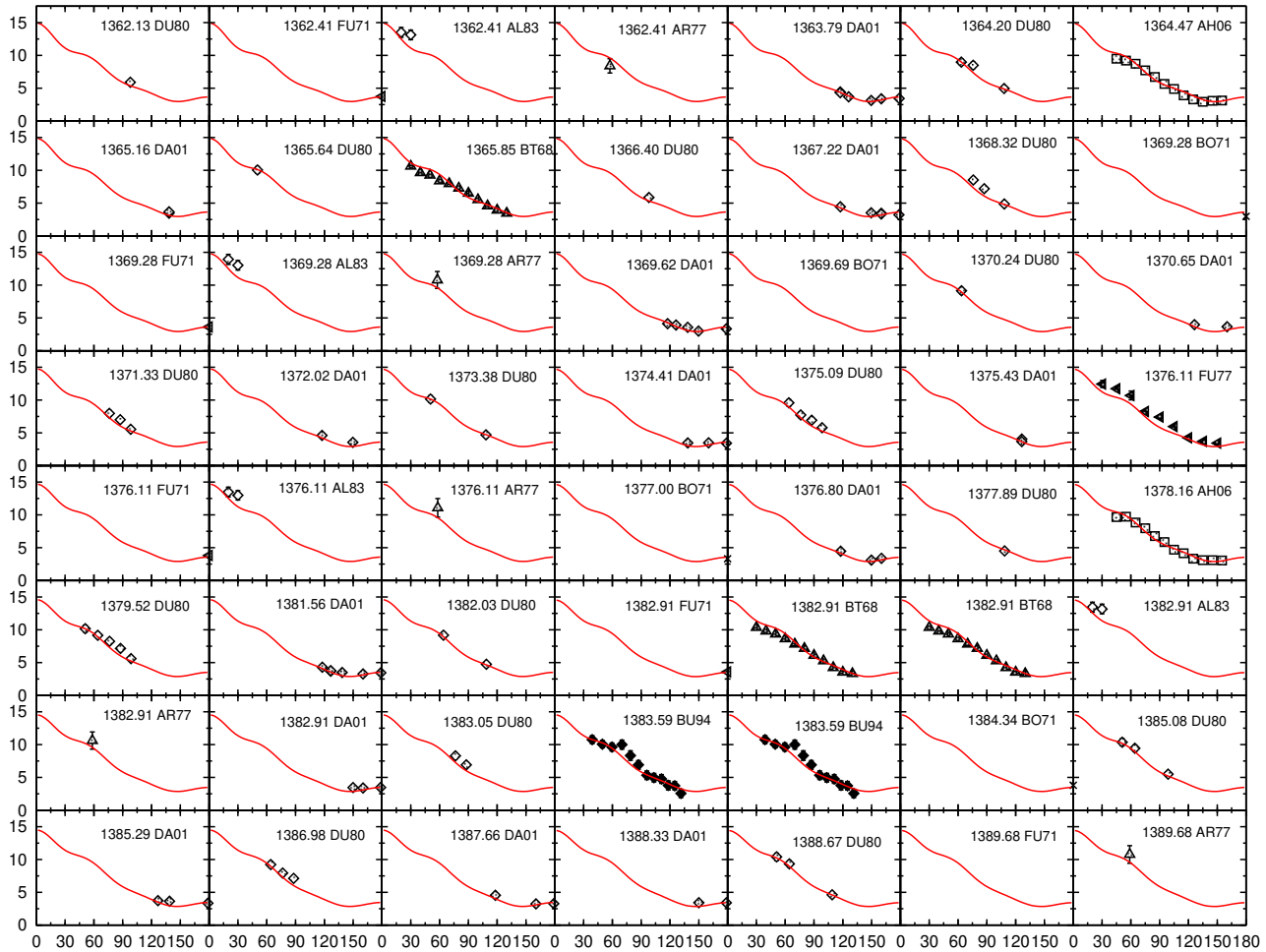

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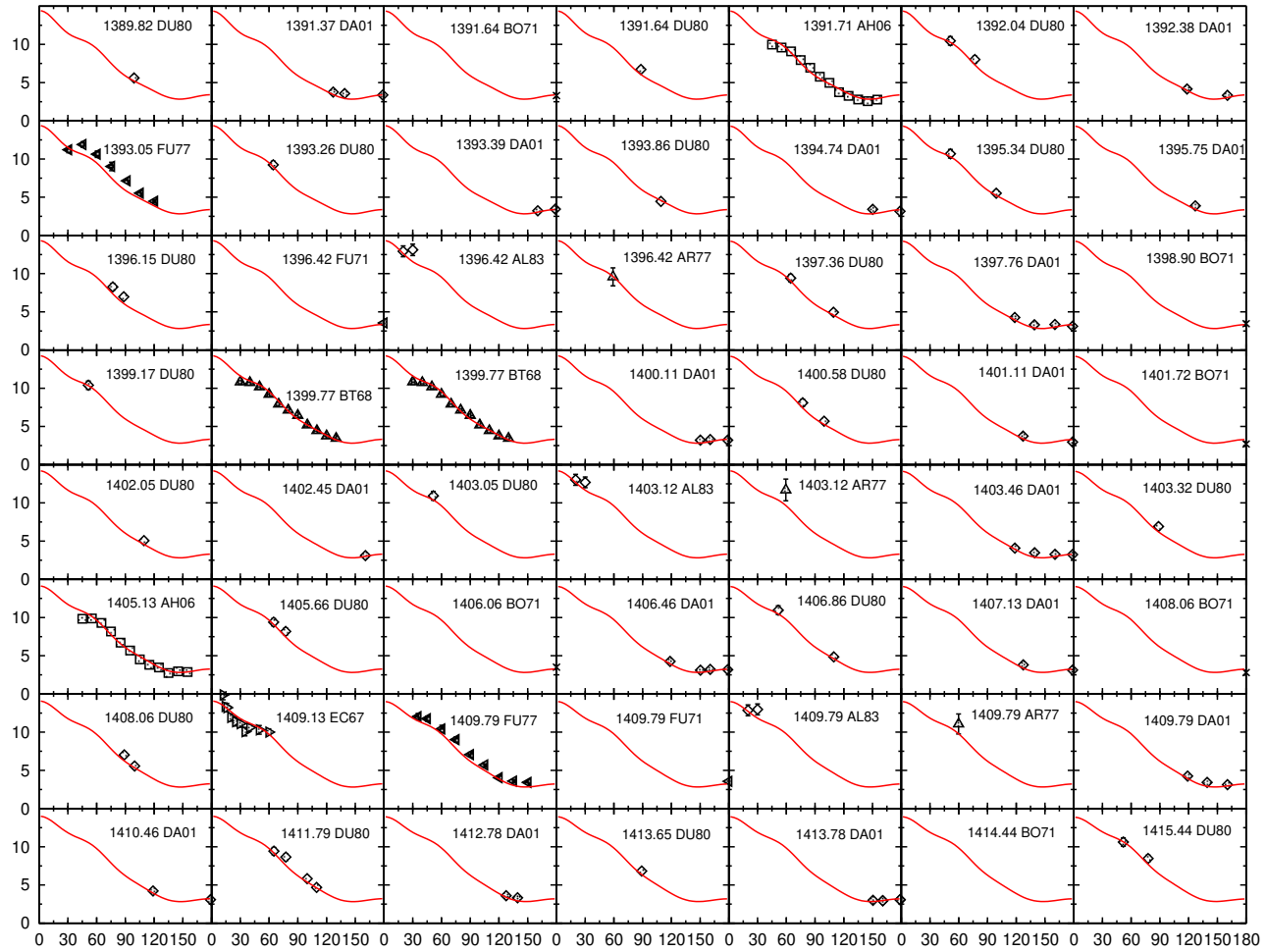

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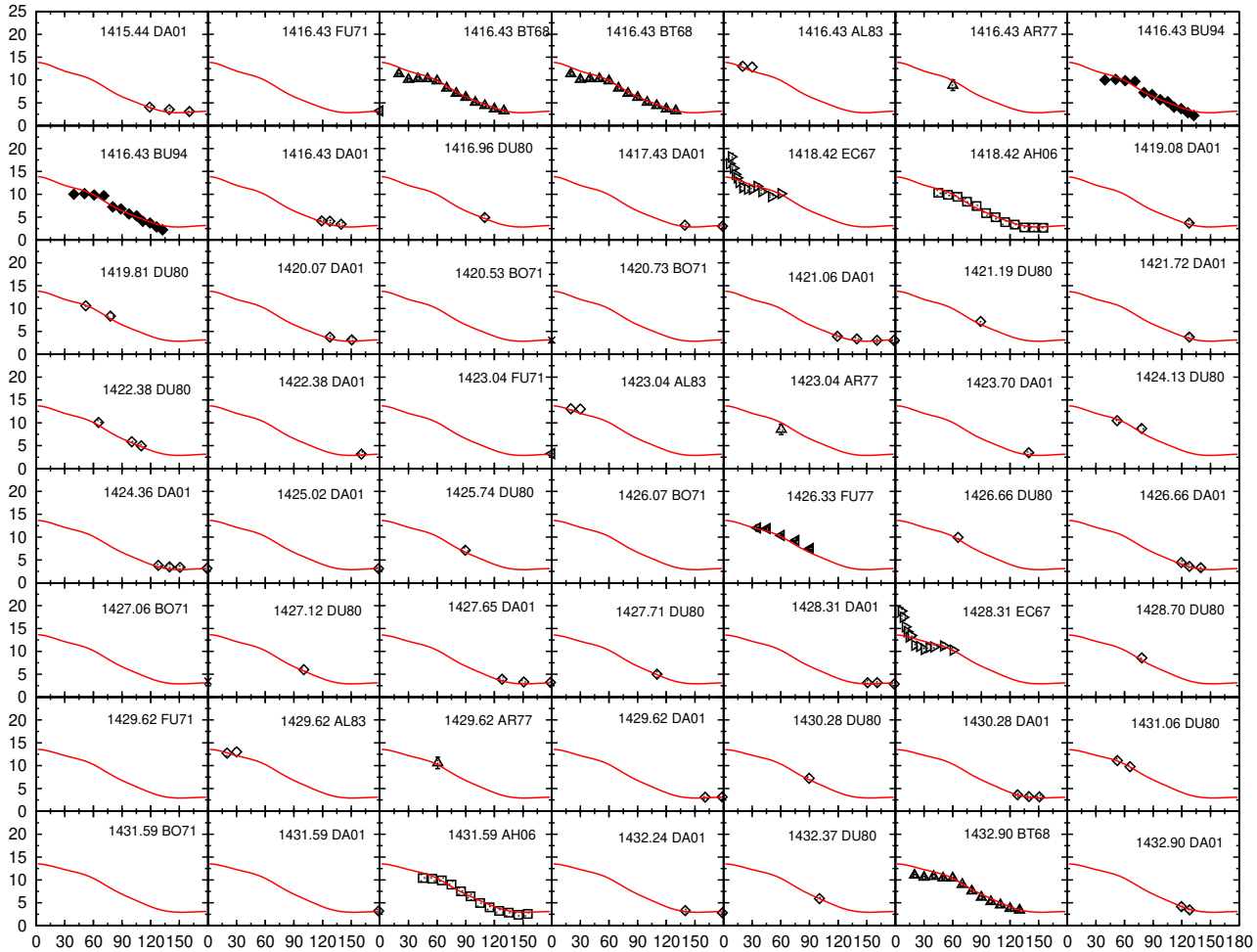

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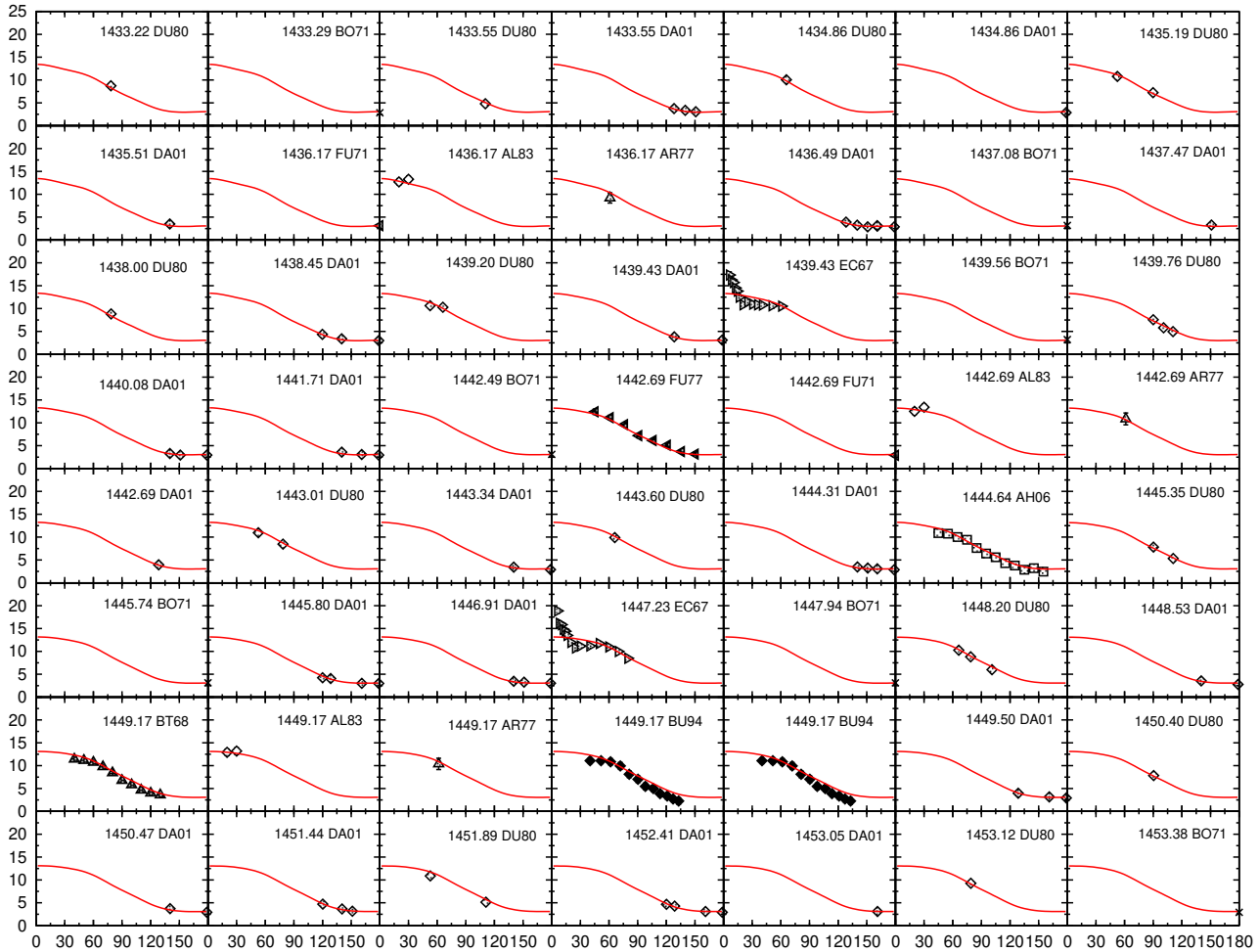

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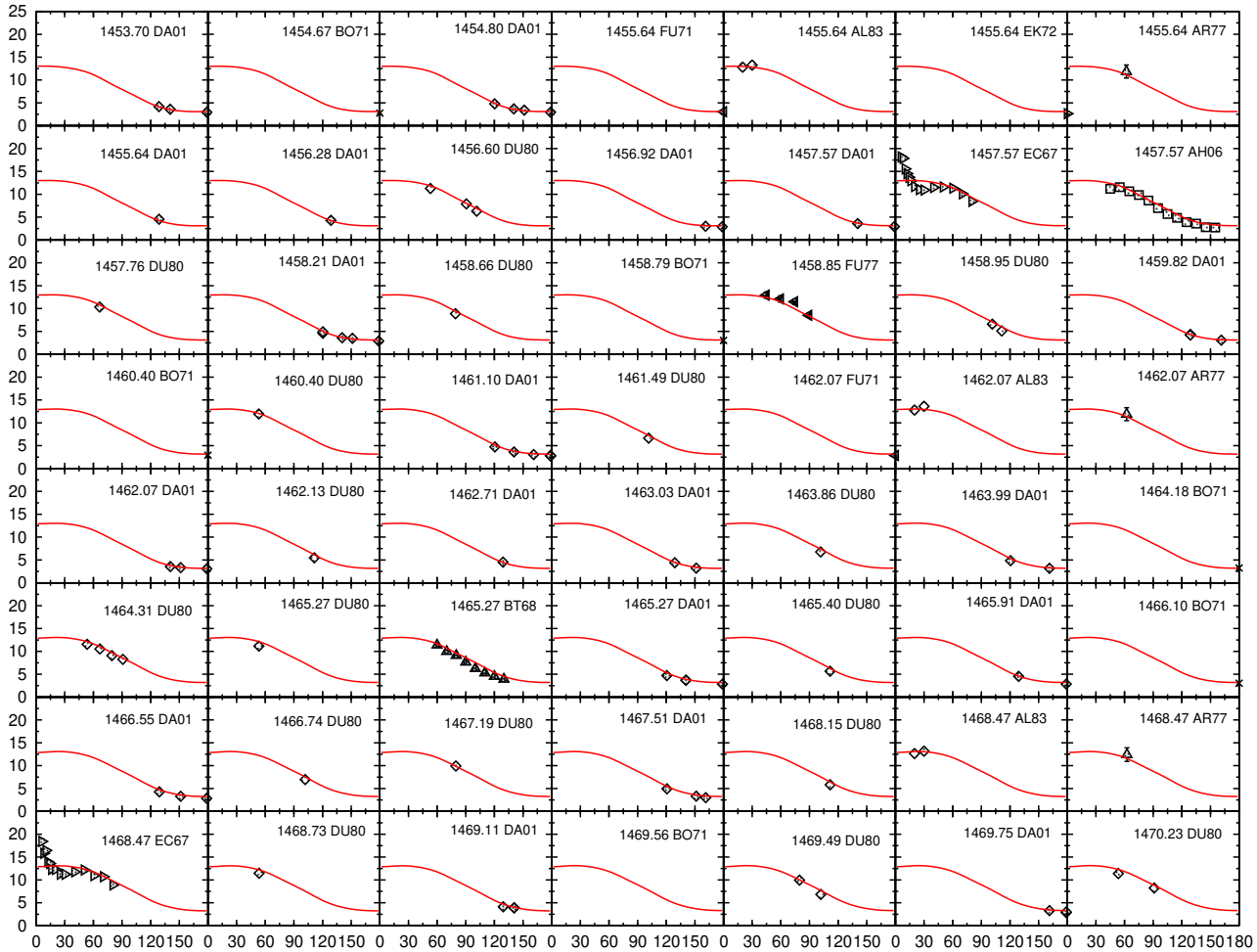

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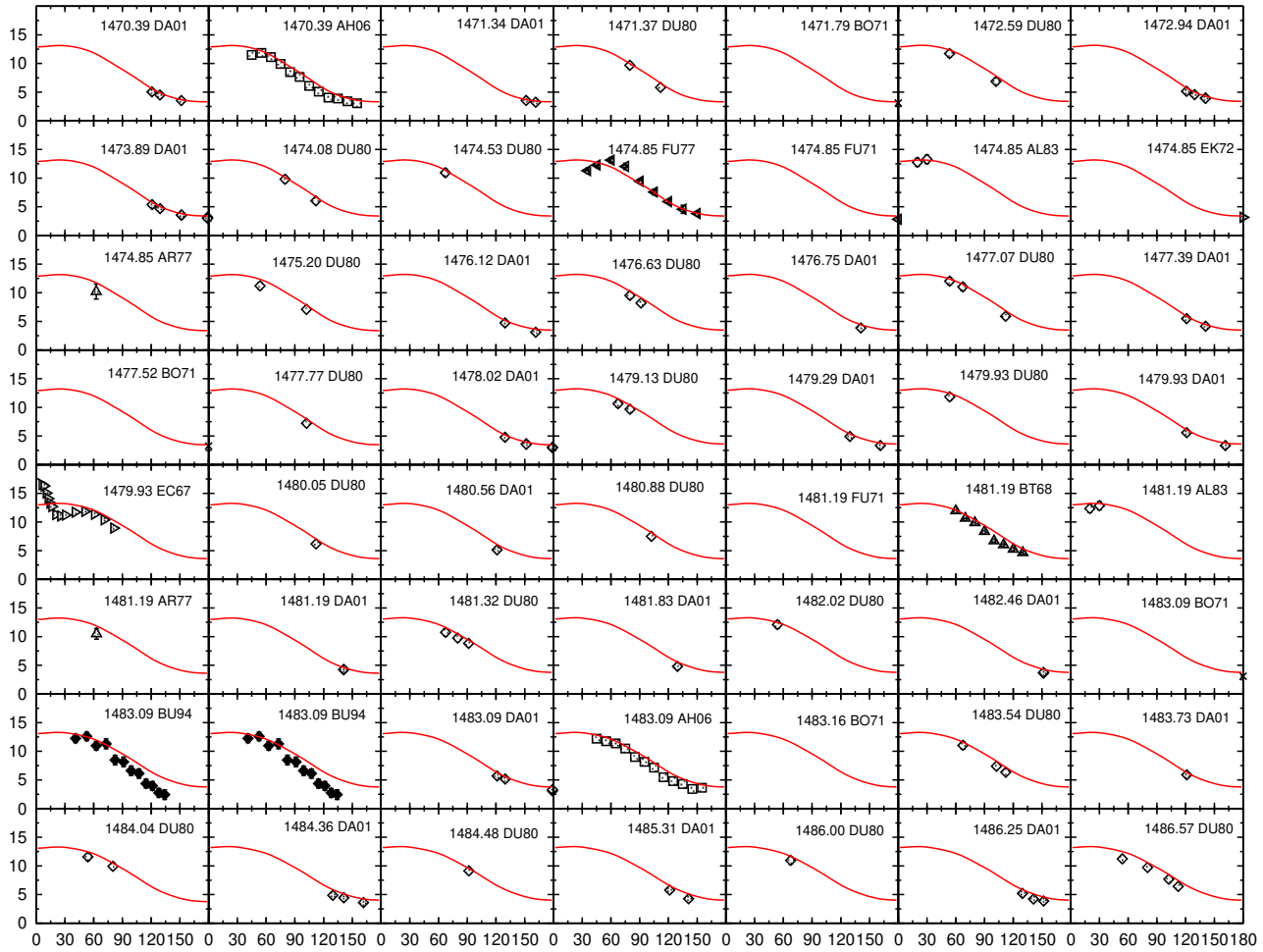

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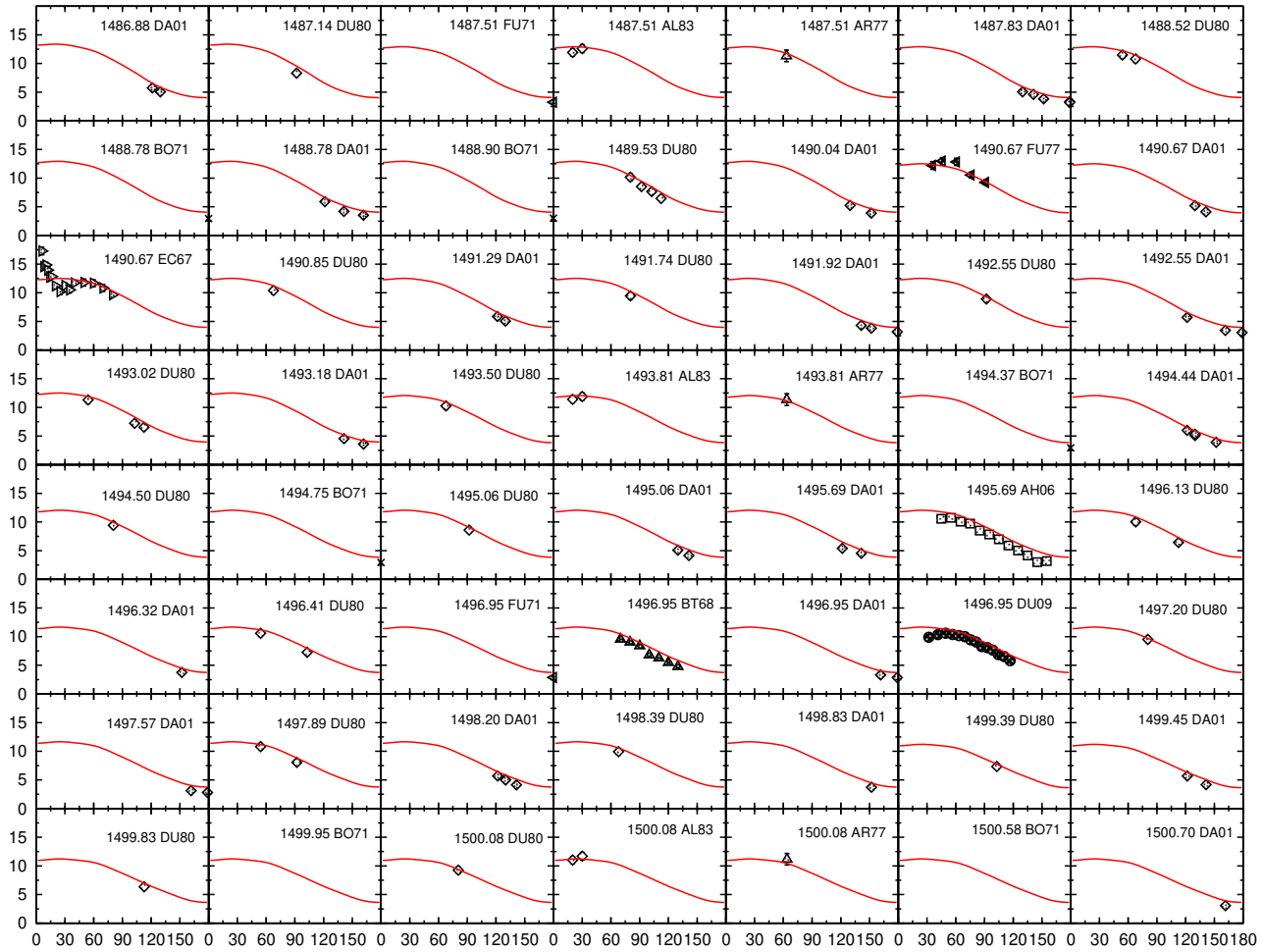

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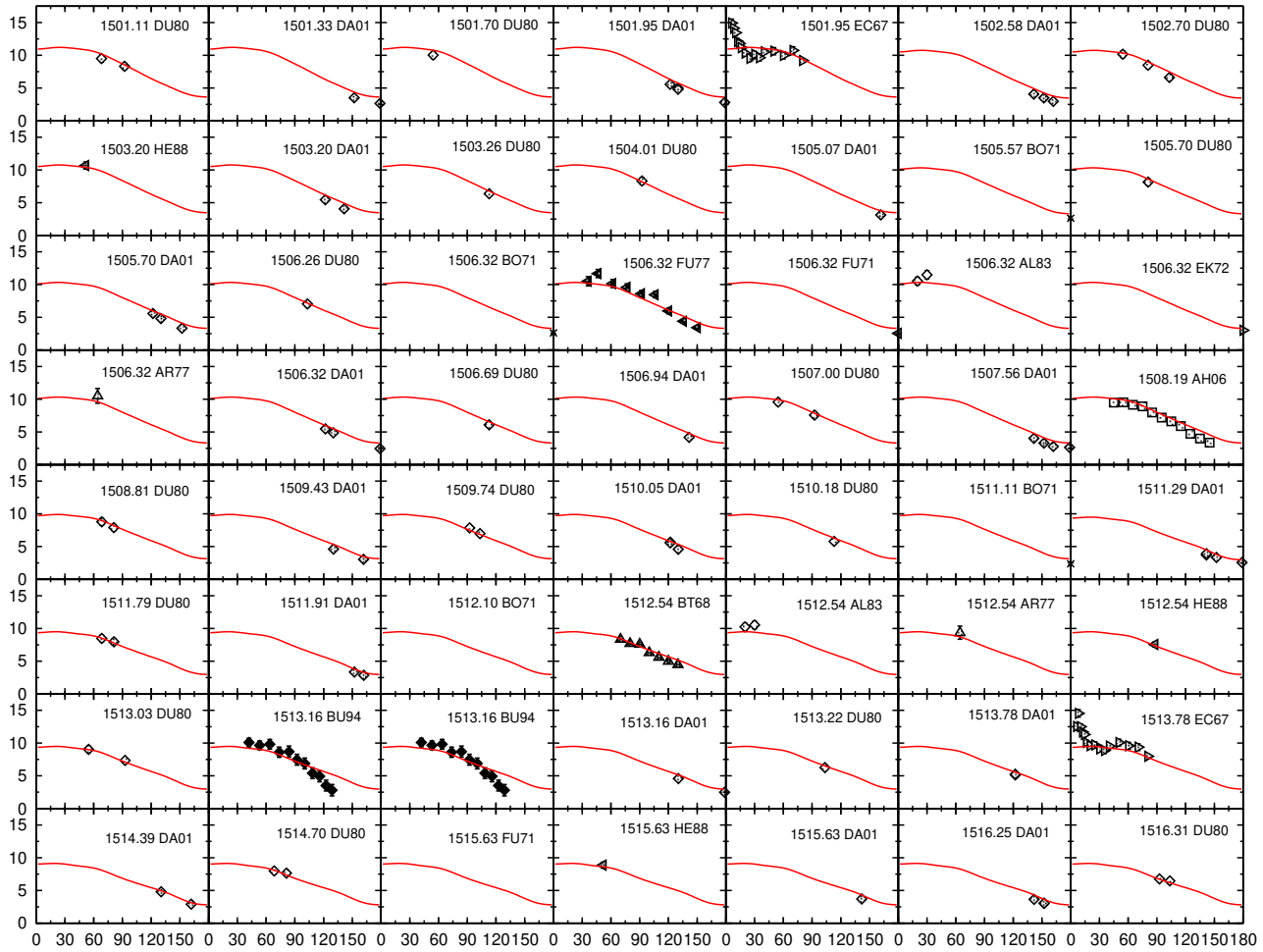

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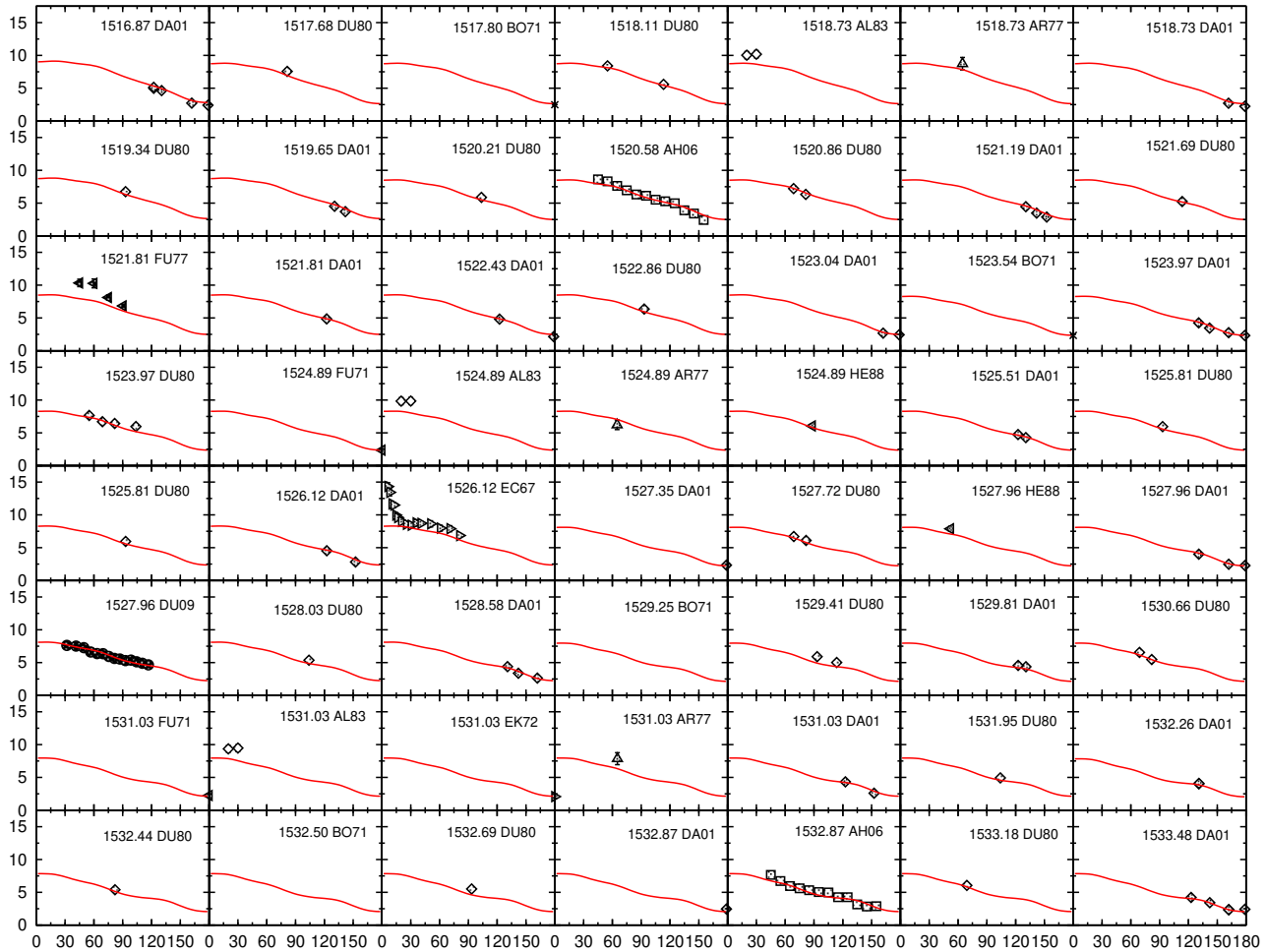

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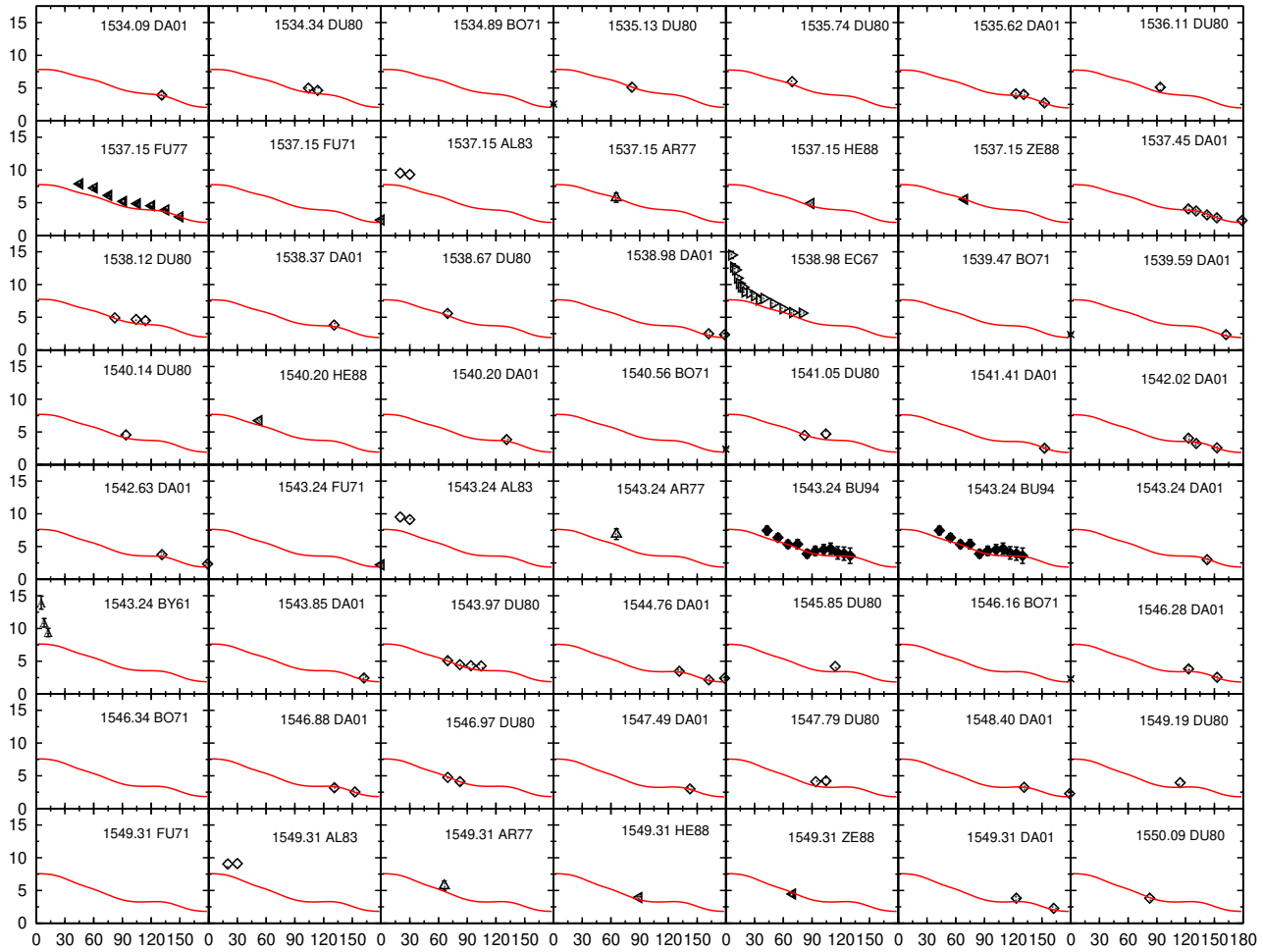

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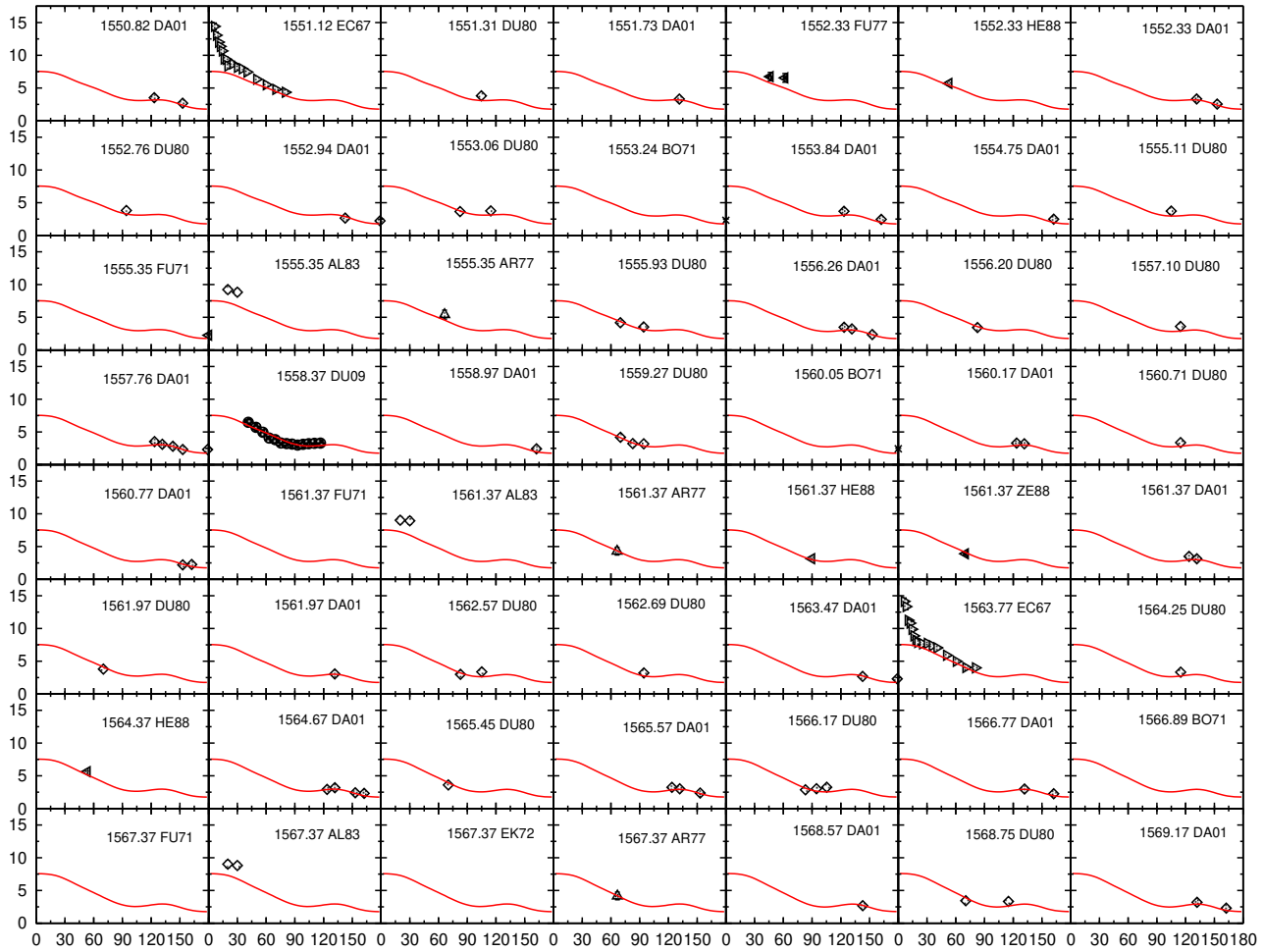

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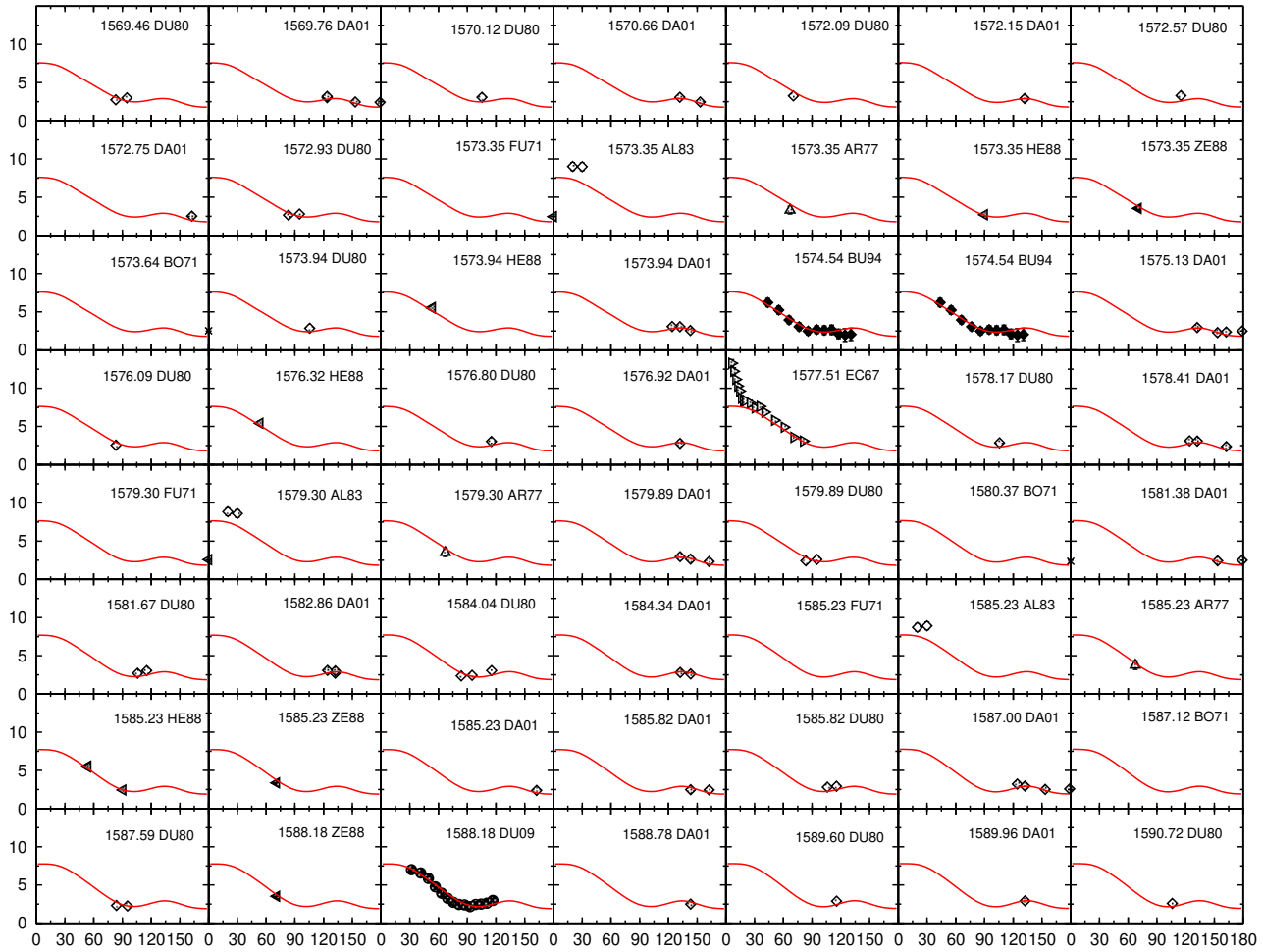

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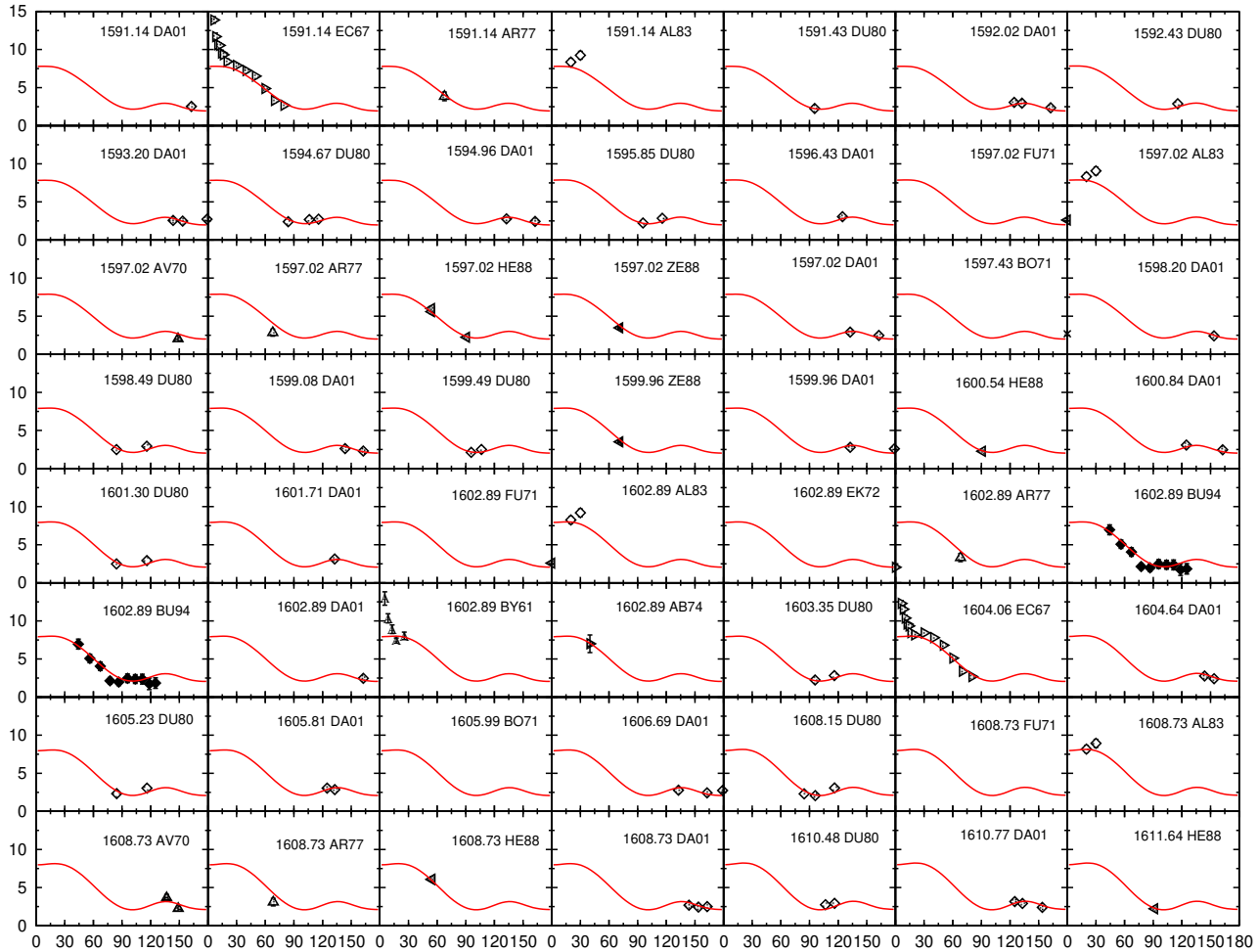

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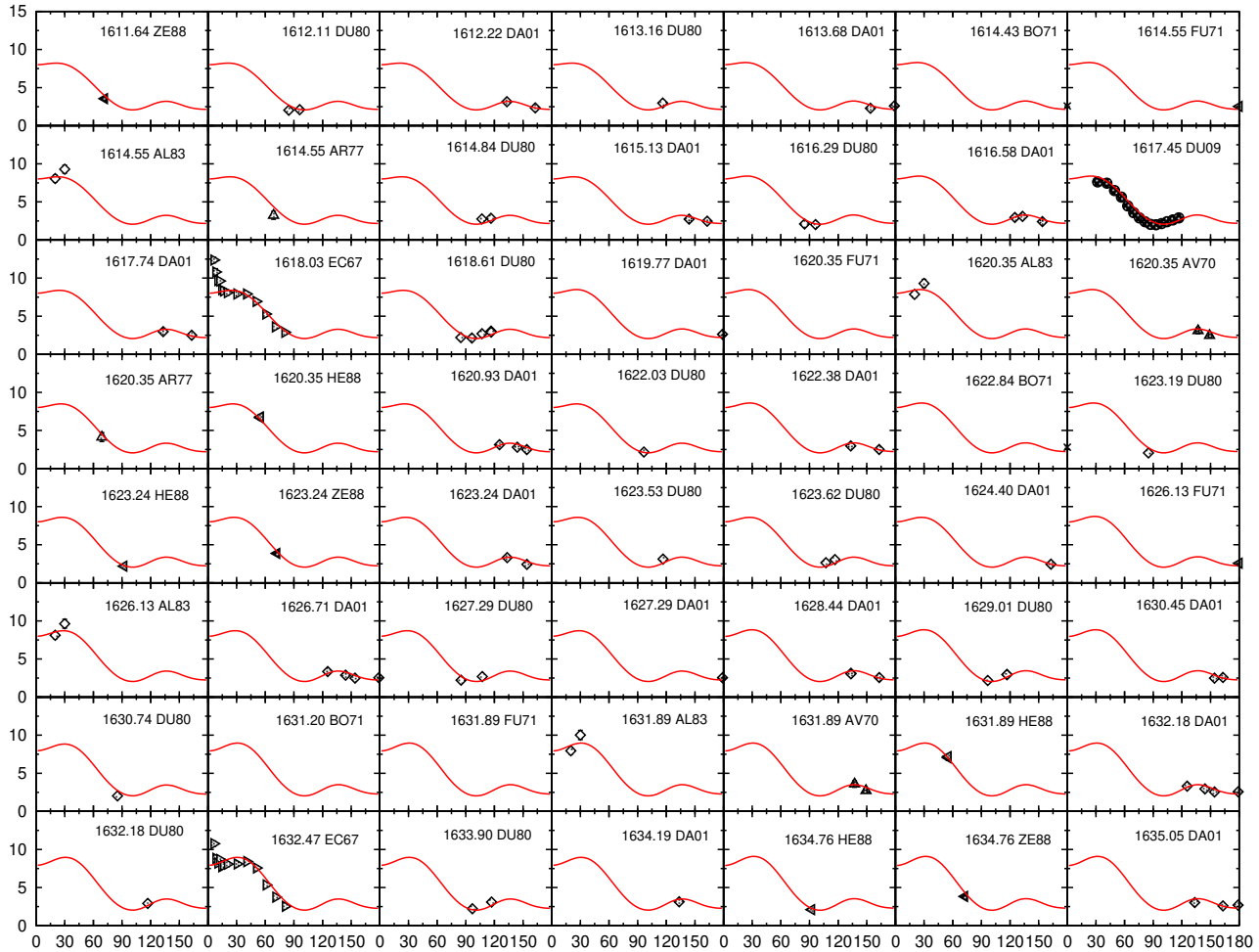

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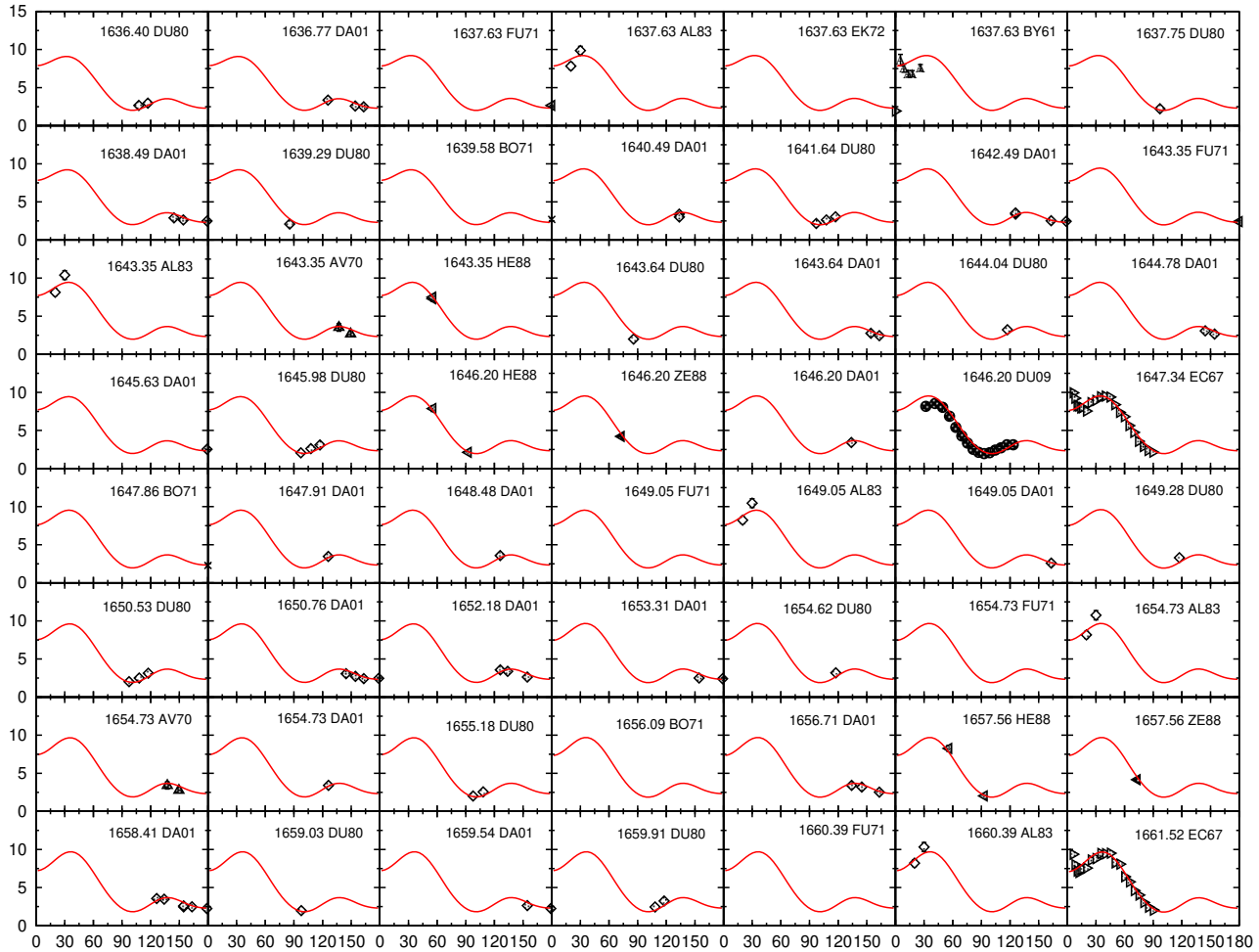

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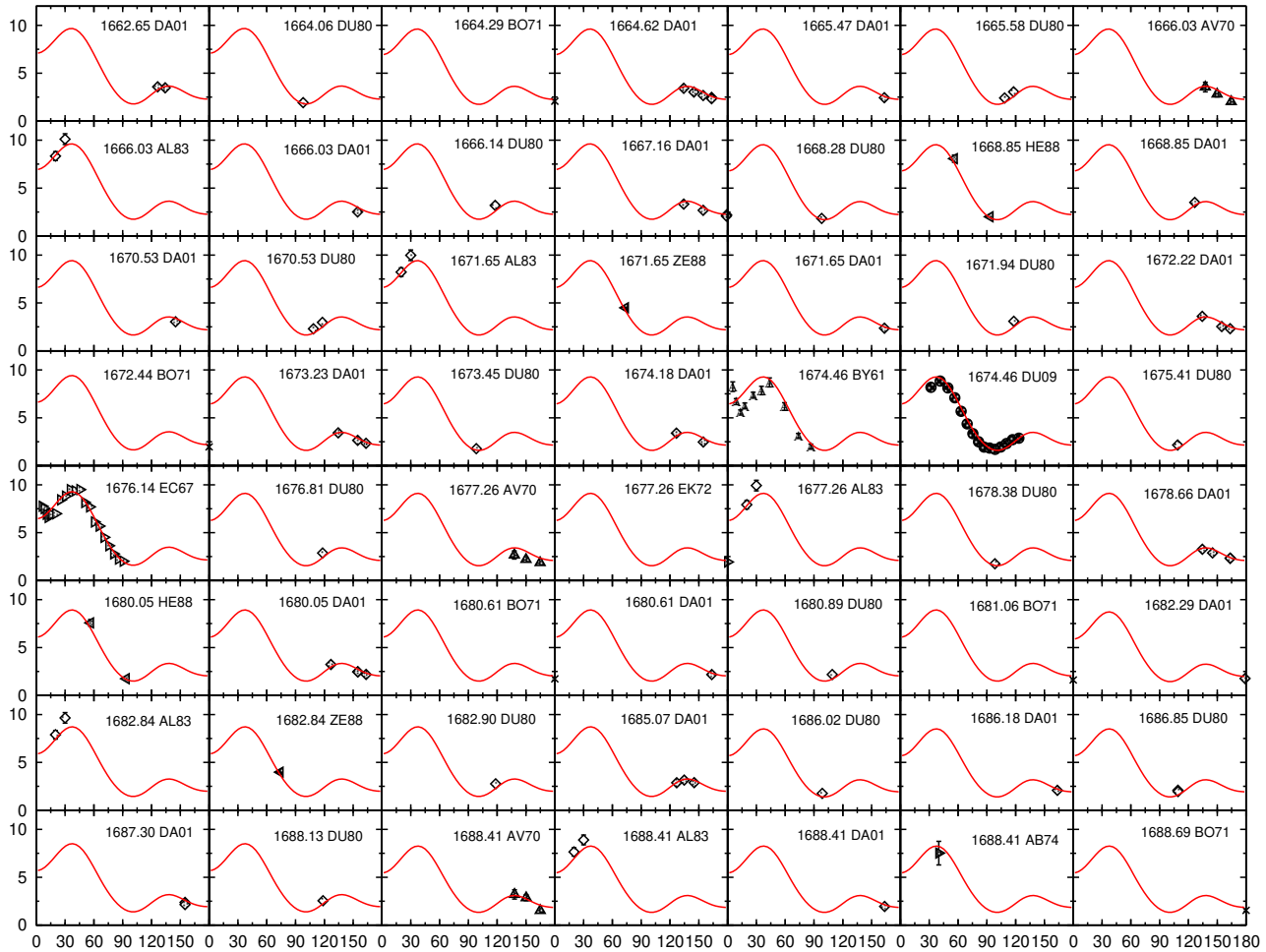

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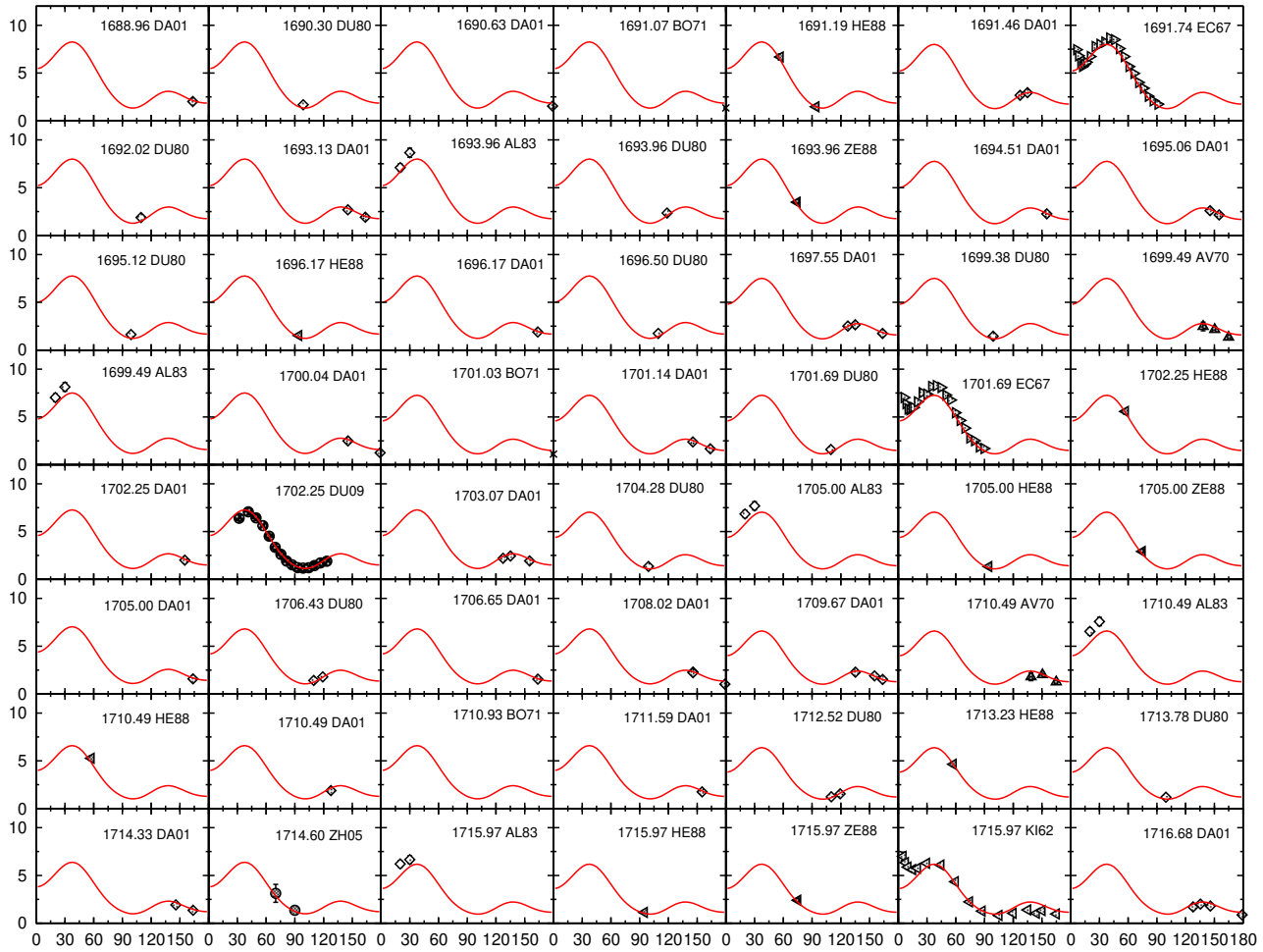

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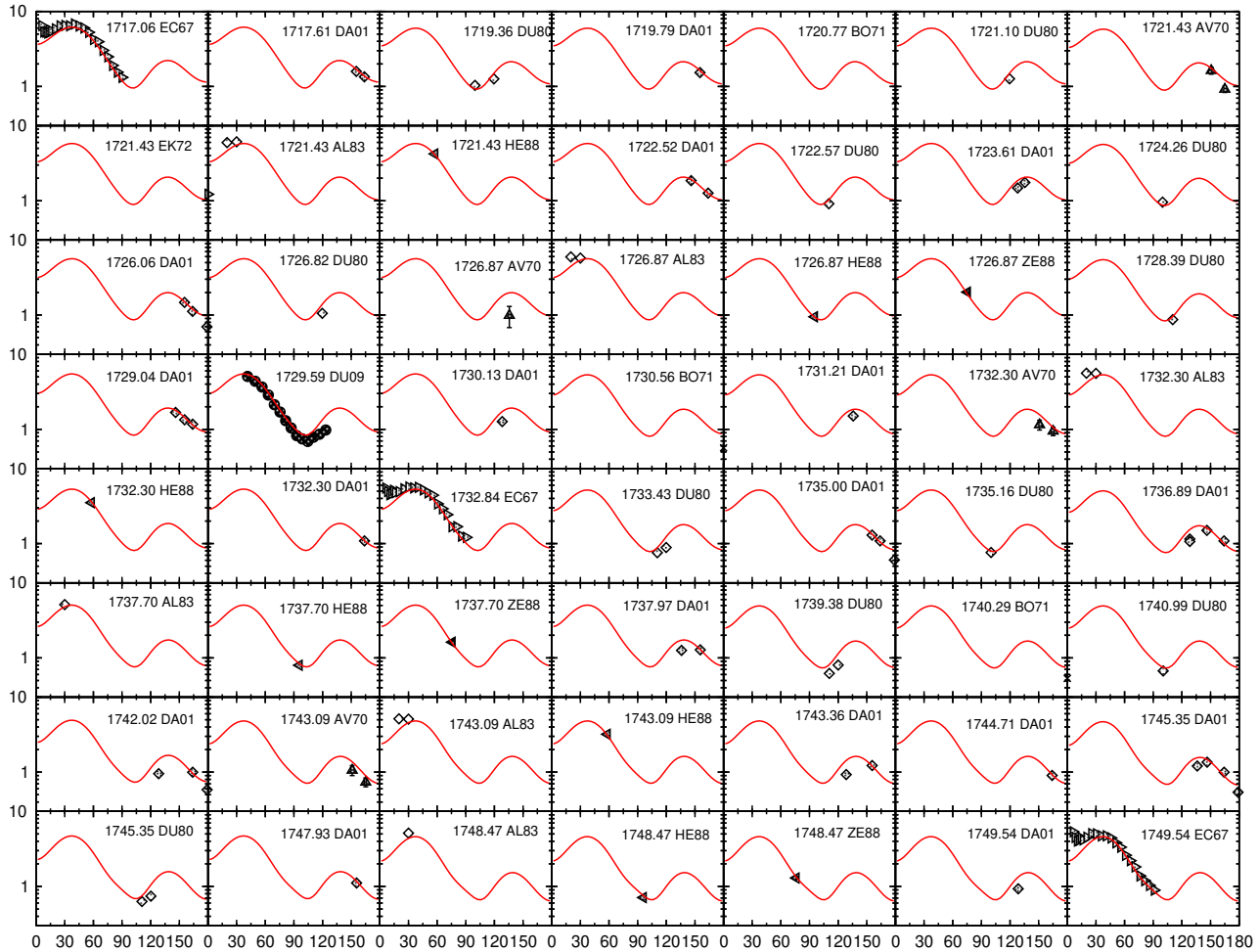

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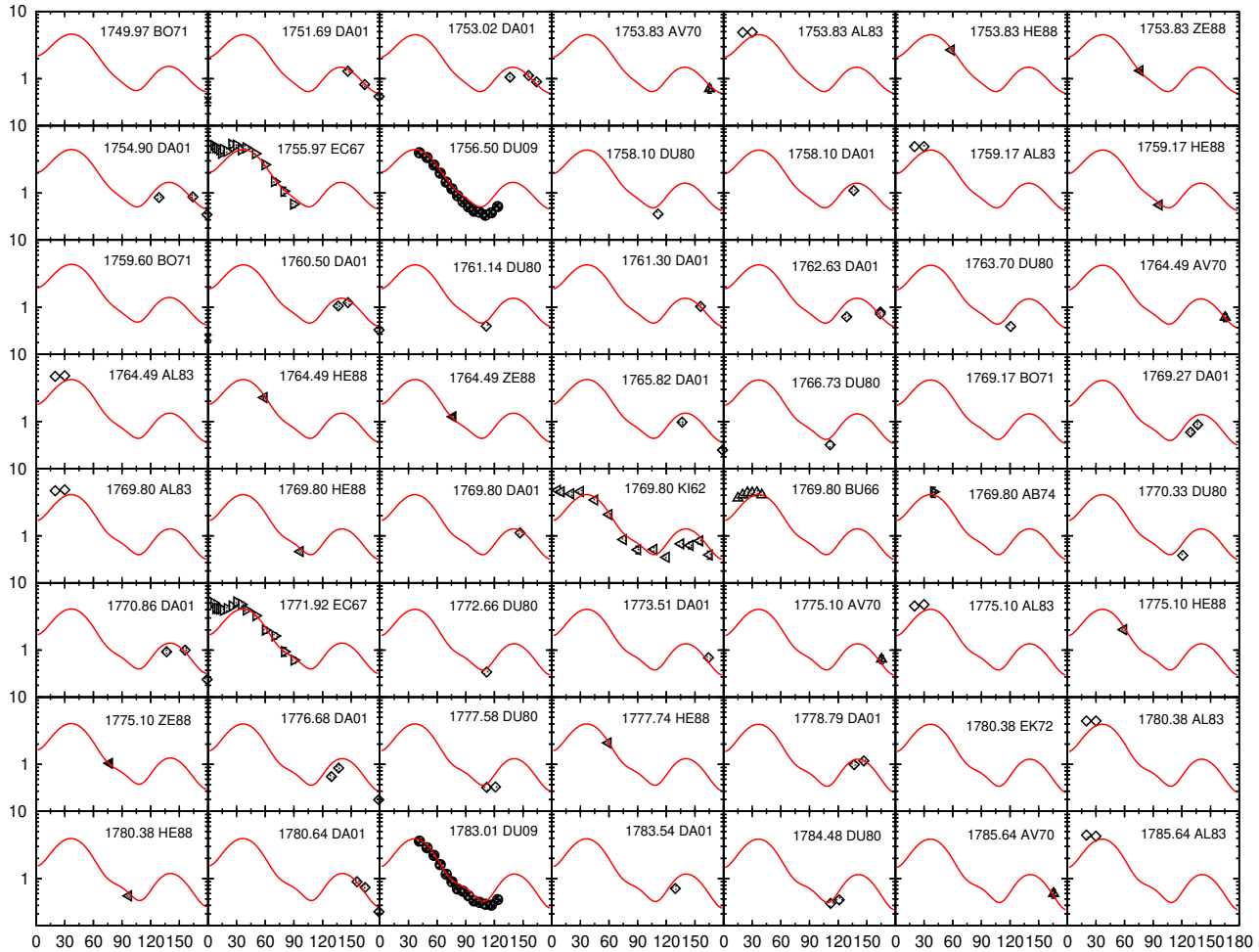

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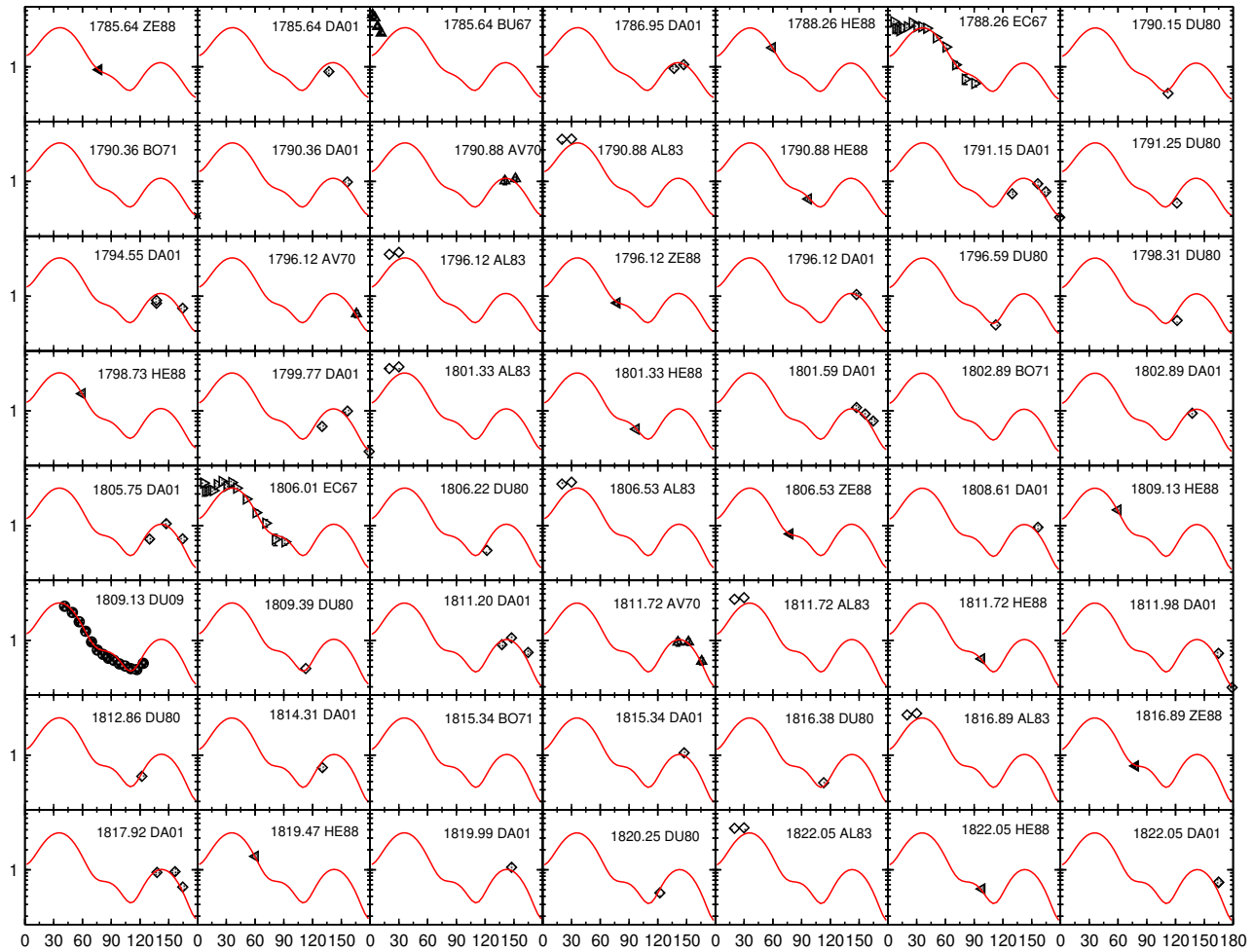

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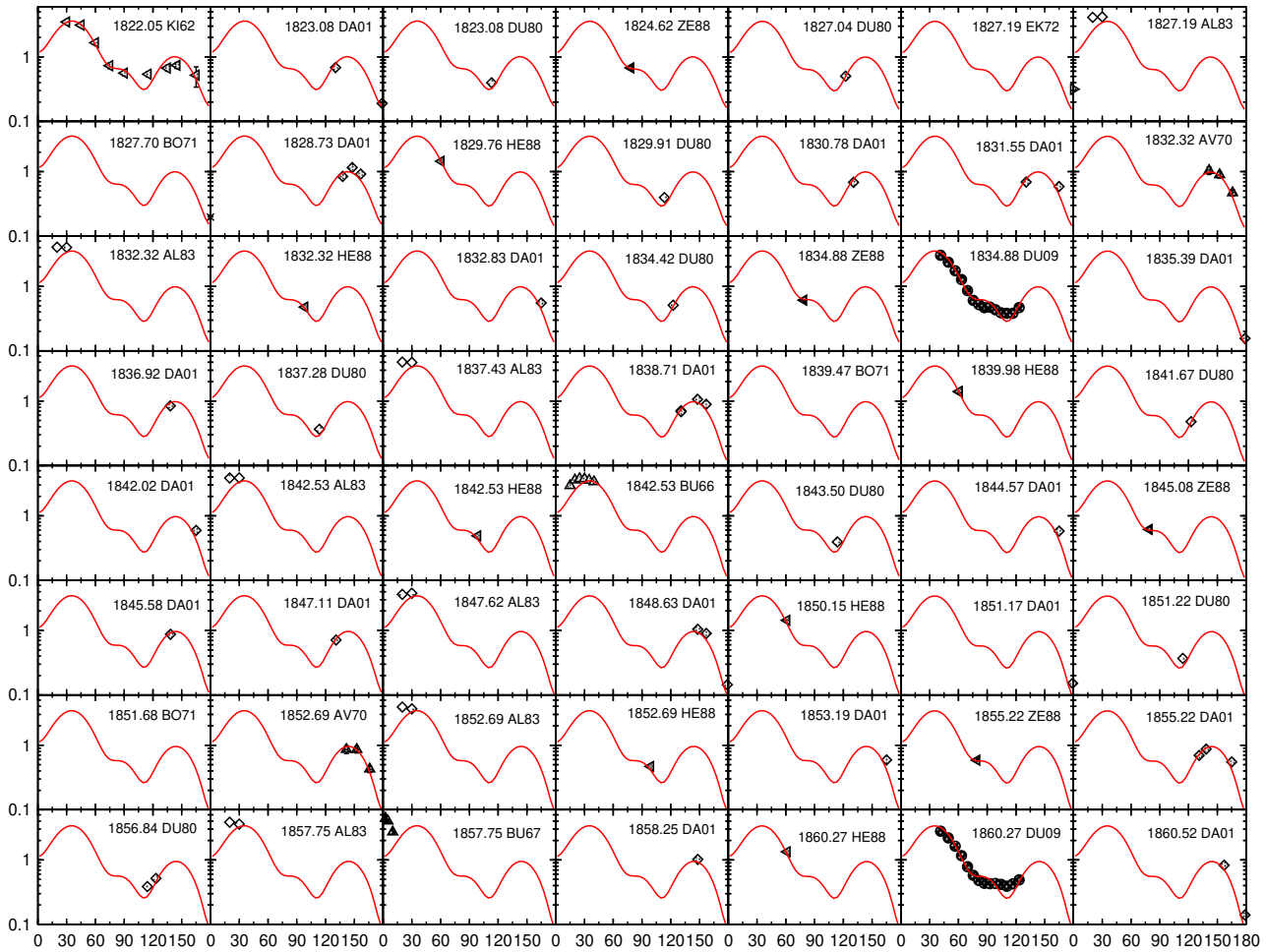

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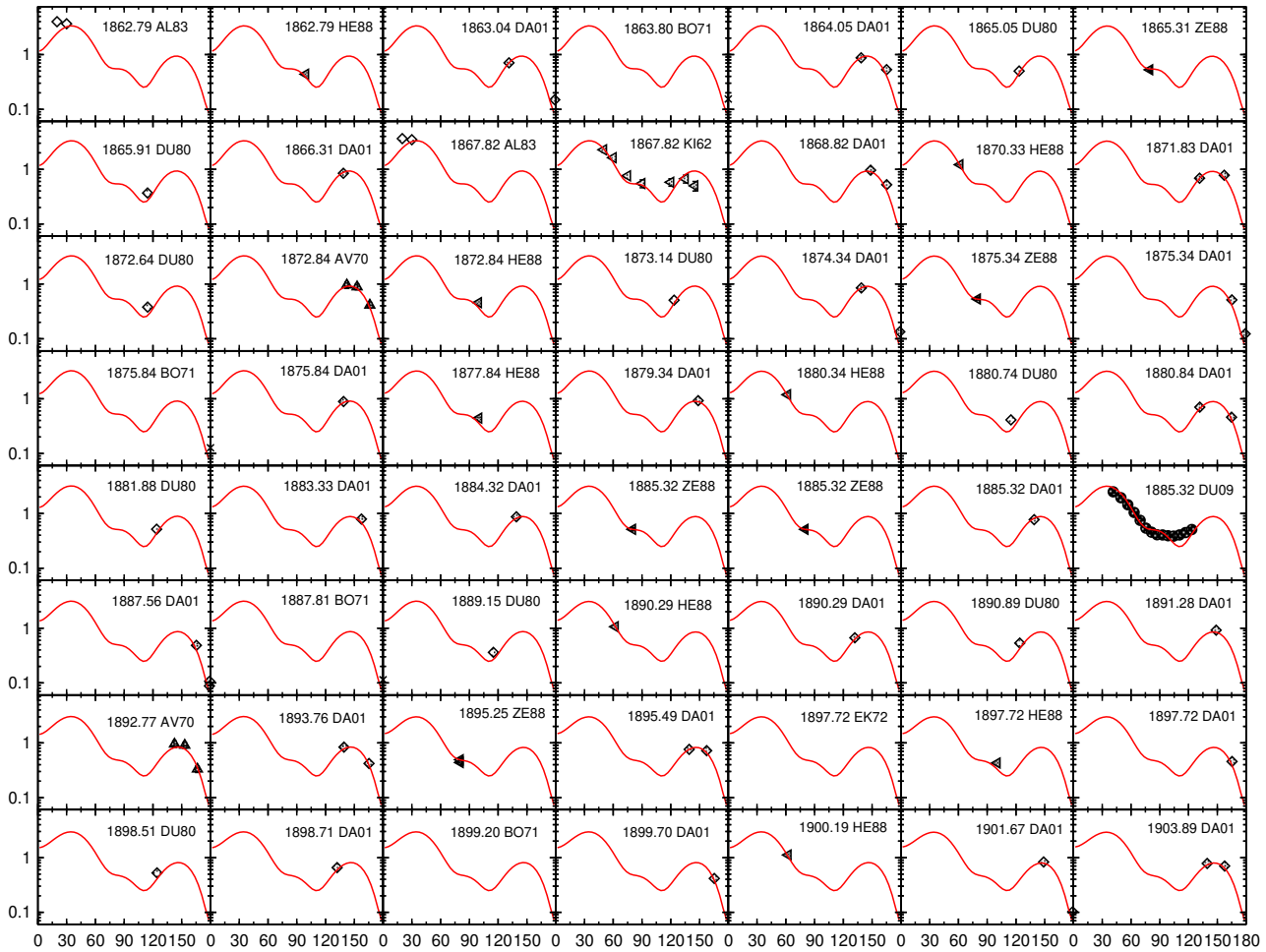

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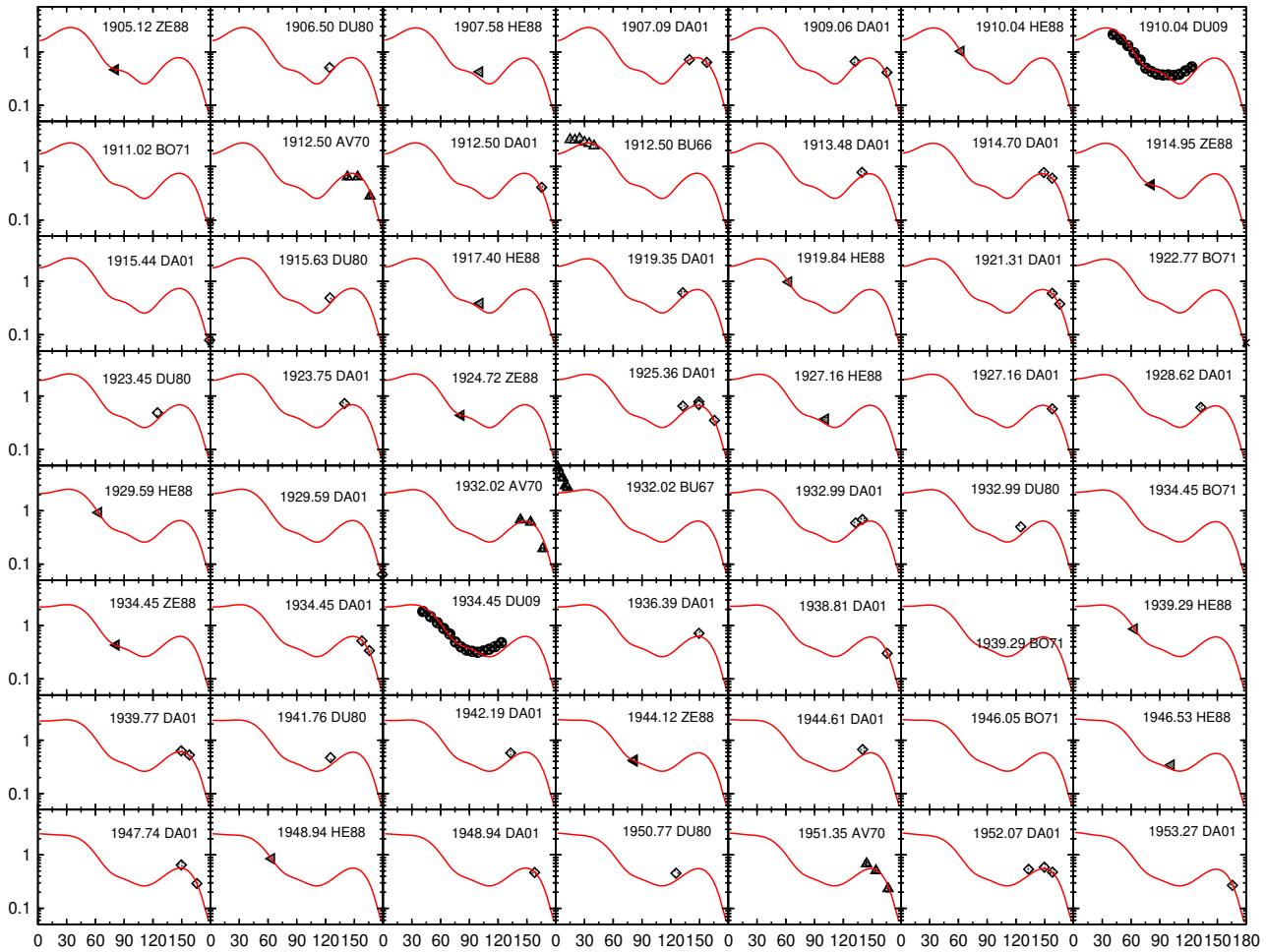

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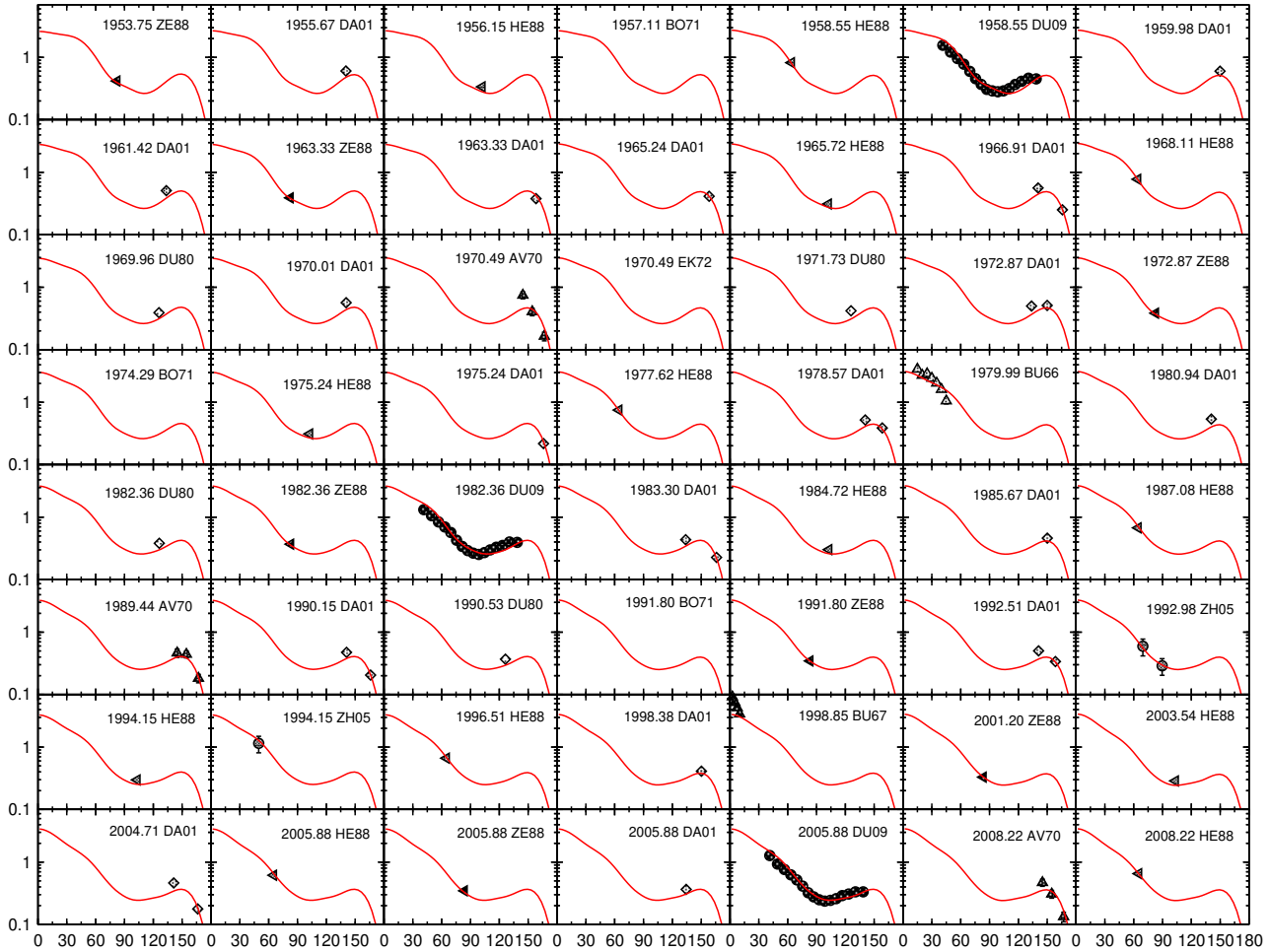

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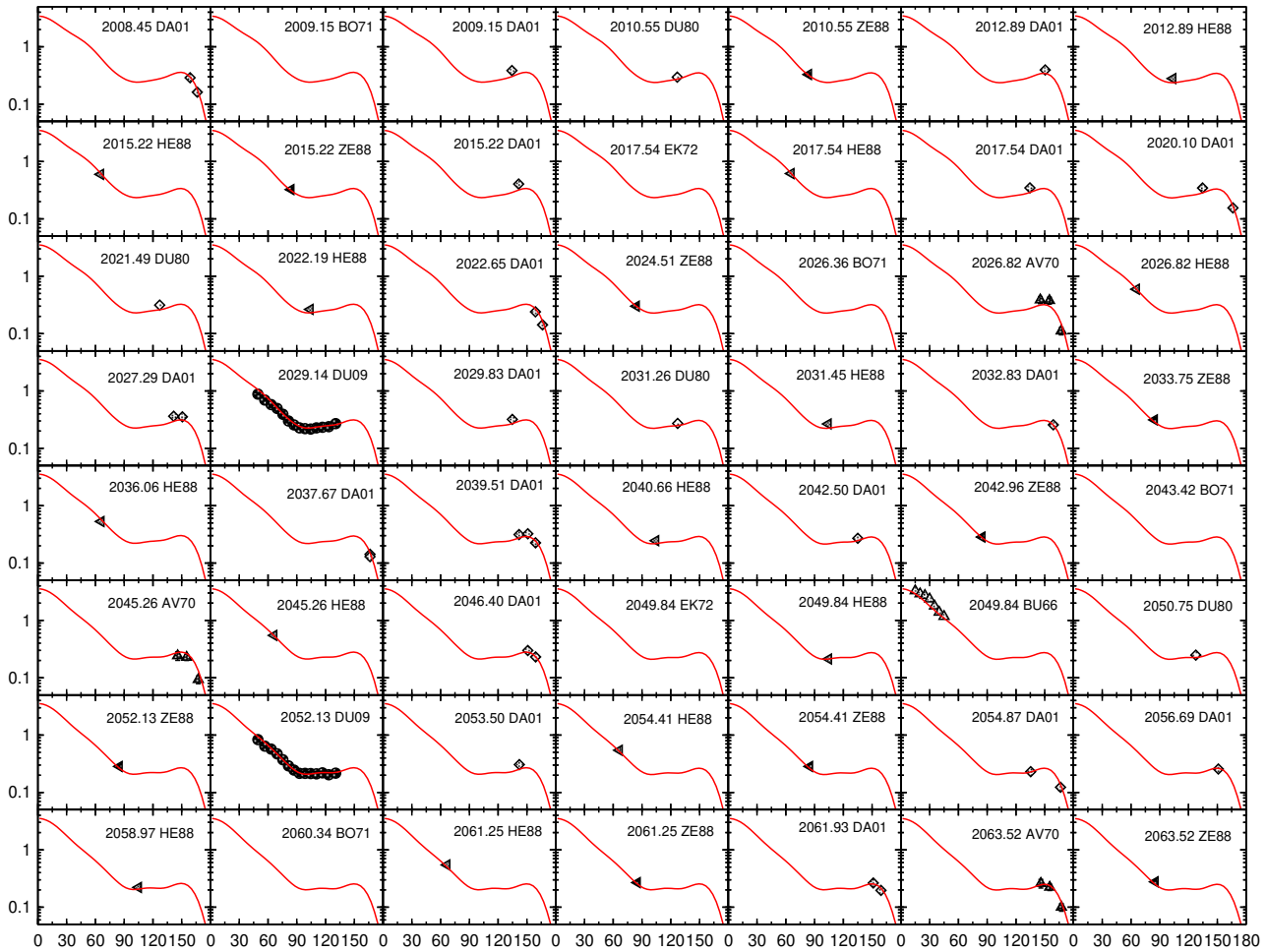

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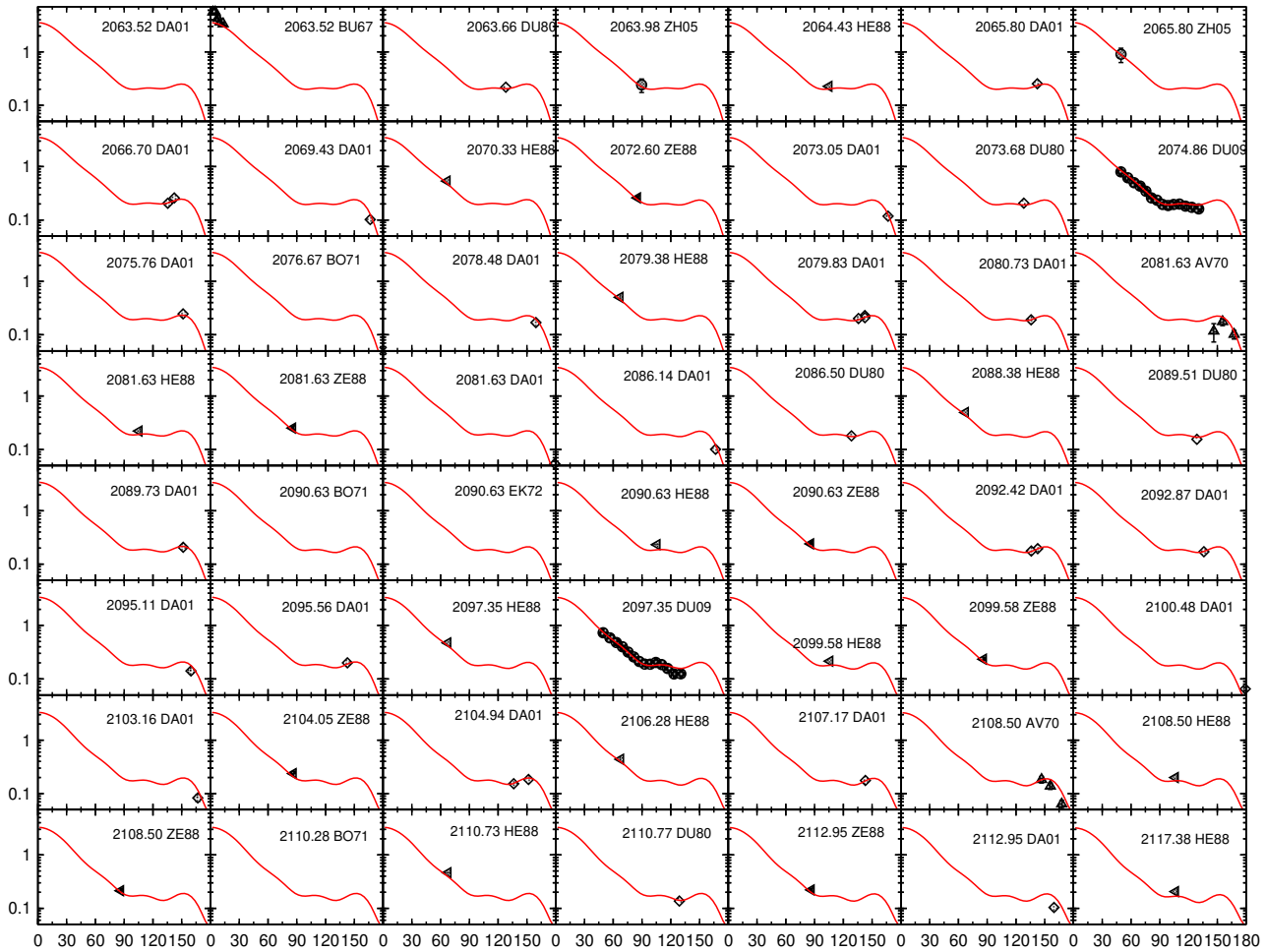

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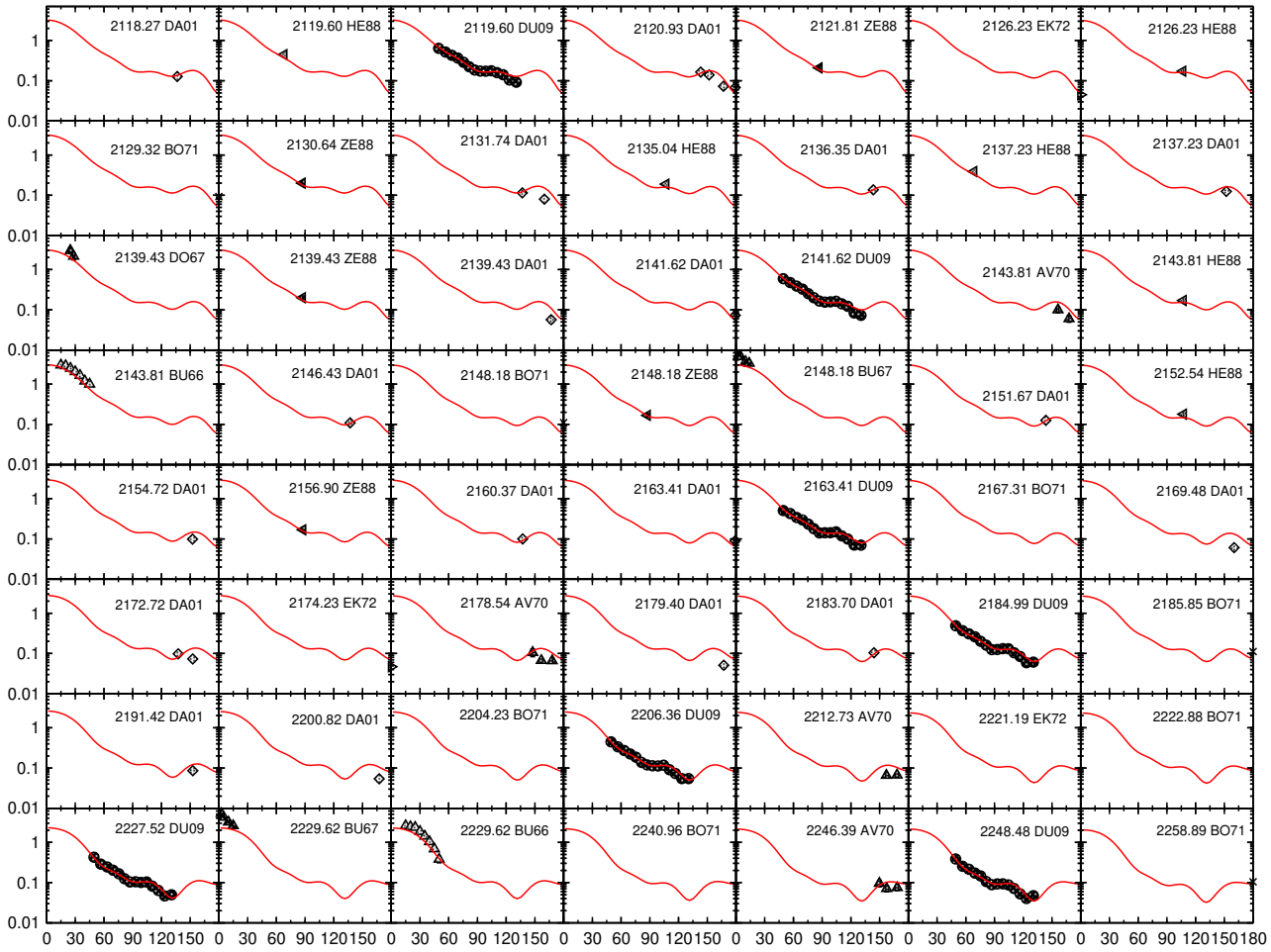

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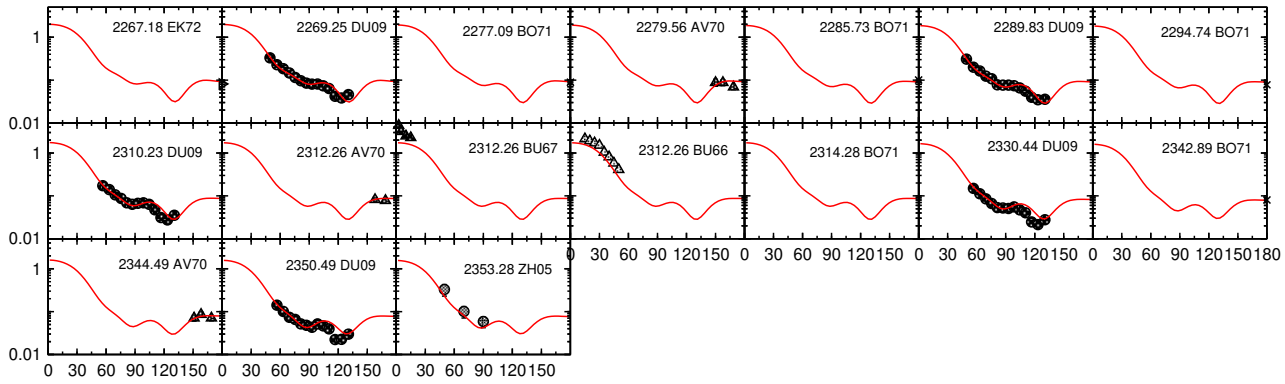

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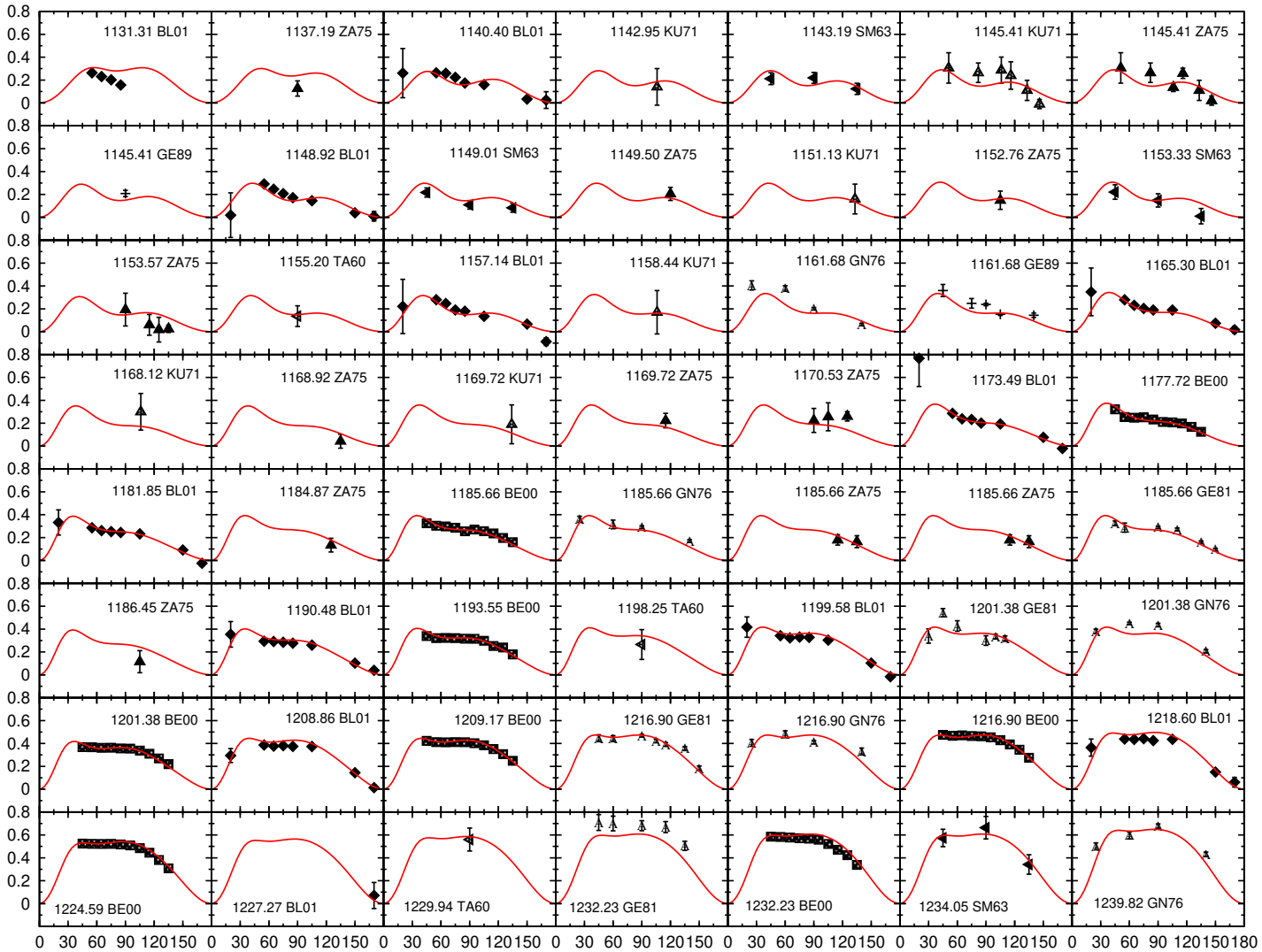

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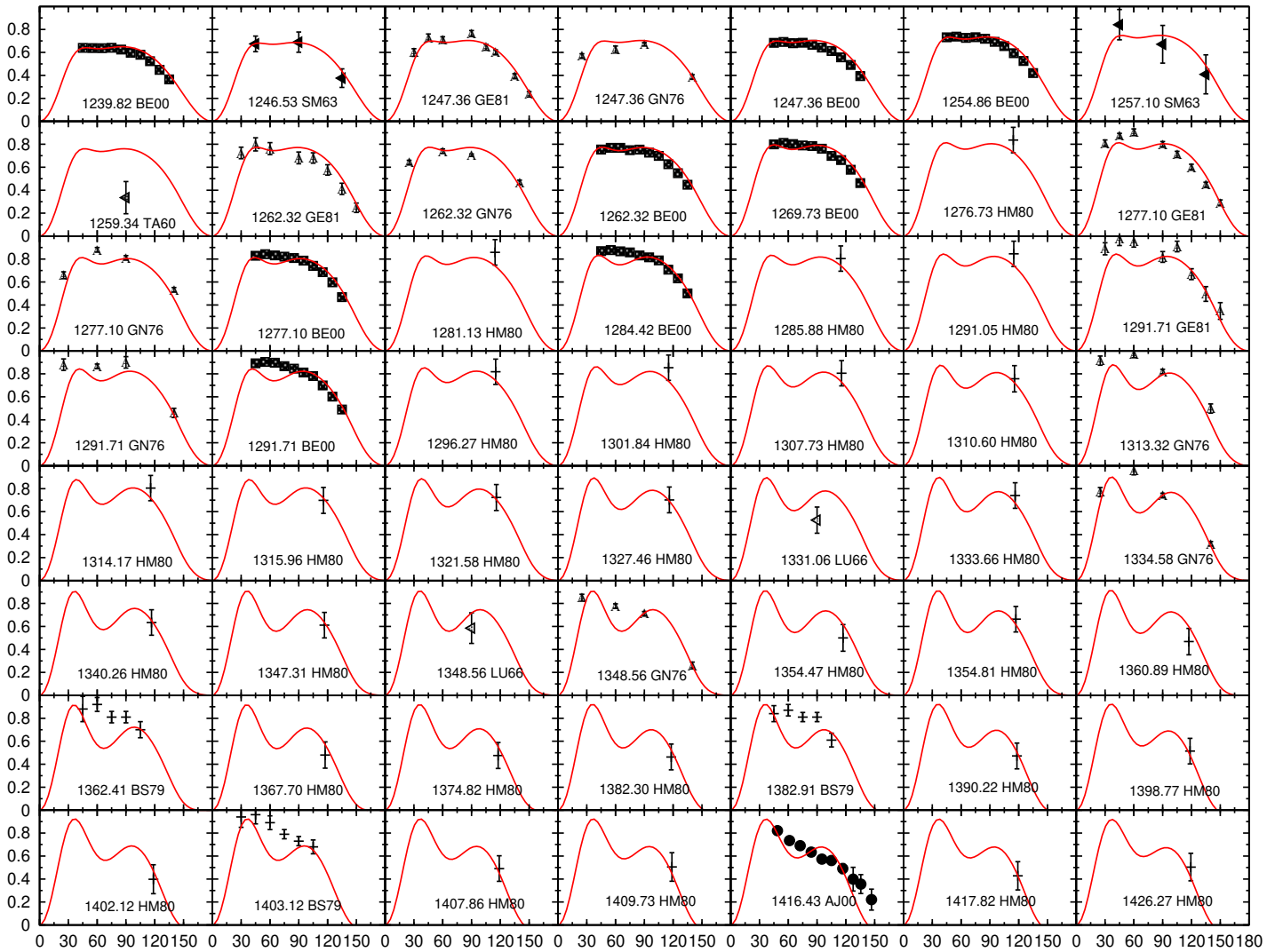

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2015.22 DA01
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2017.54 HE88
2017.54 DA01
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2022.65 DA01
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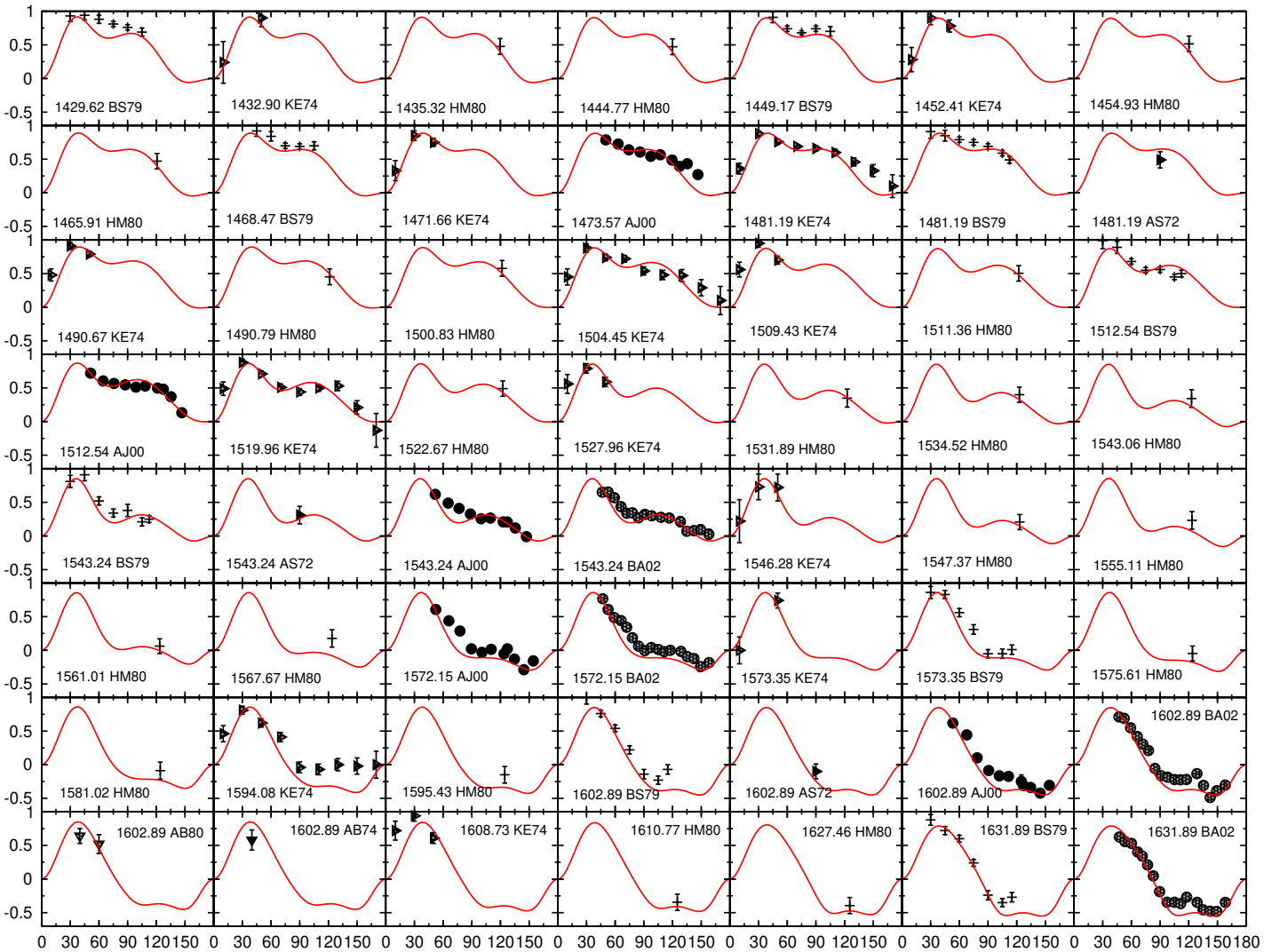

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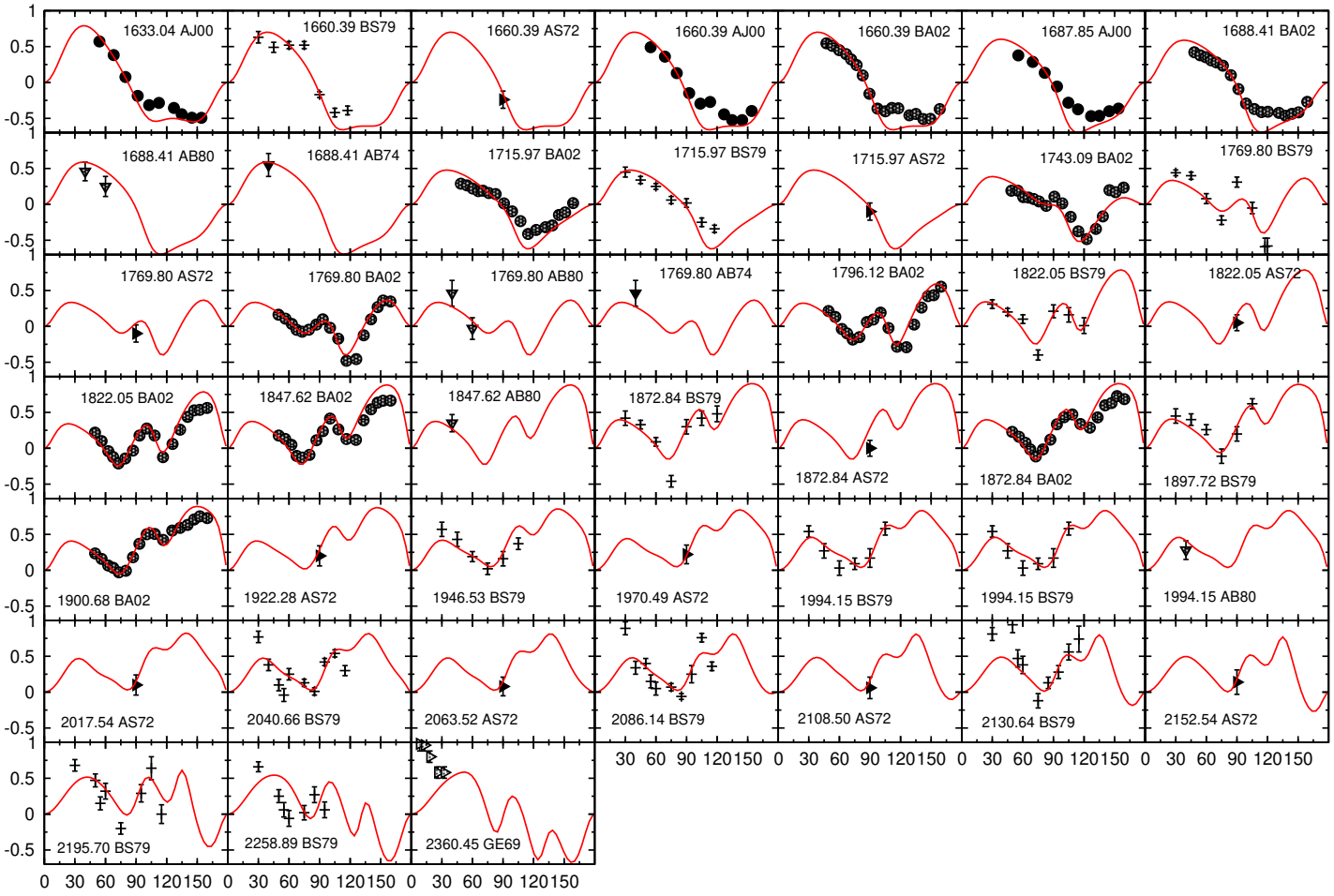

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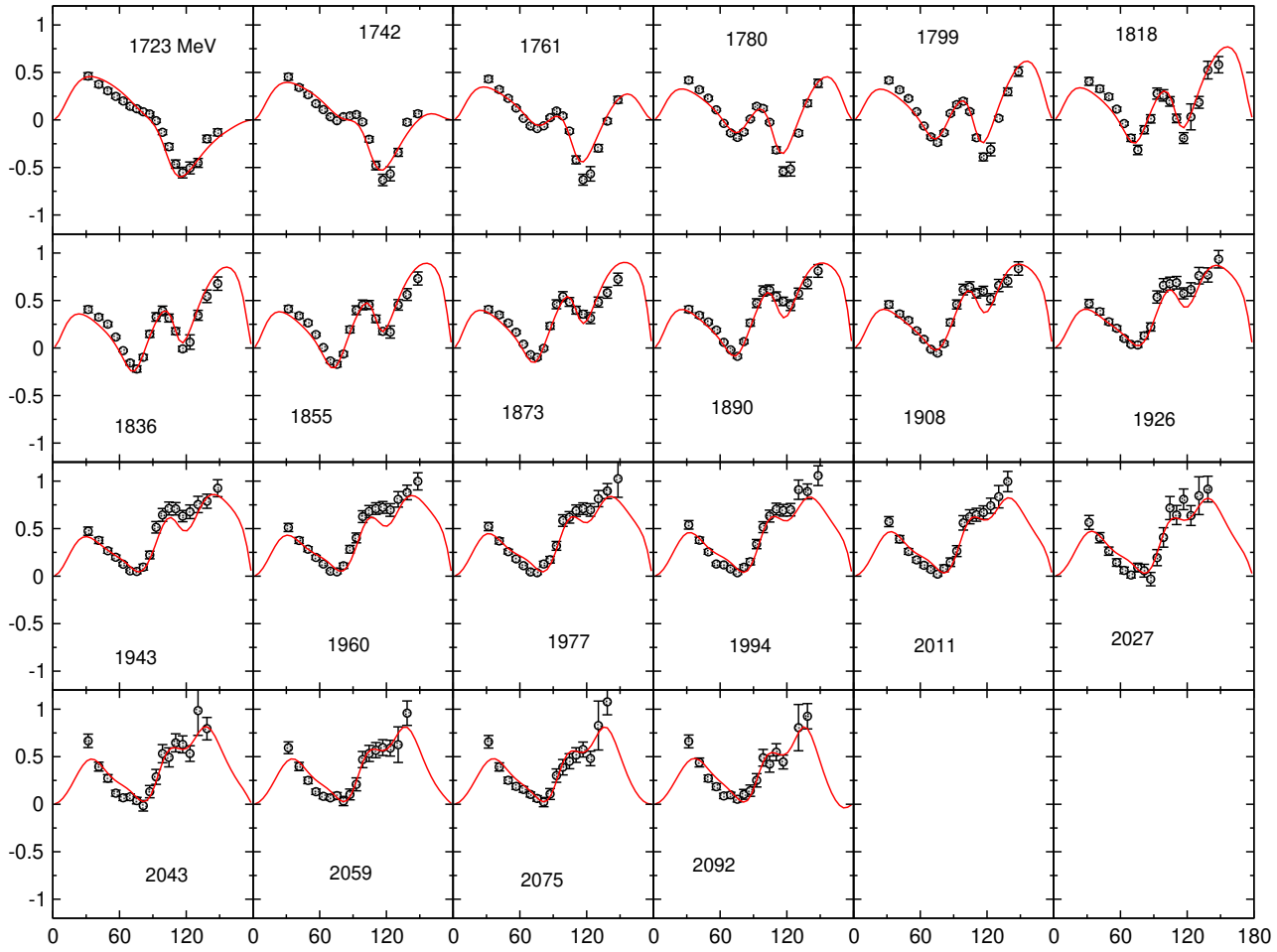
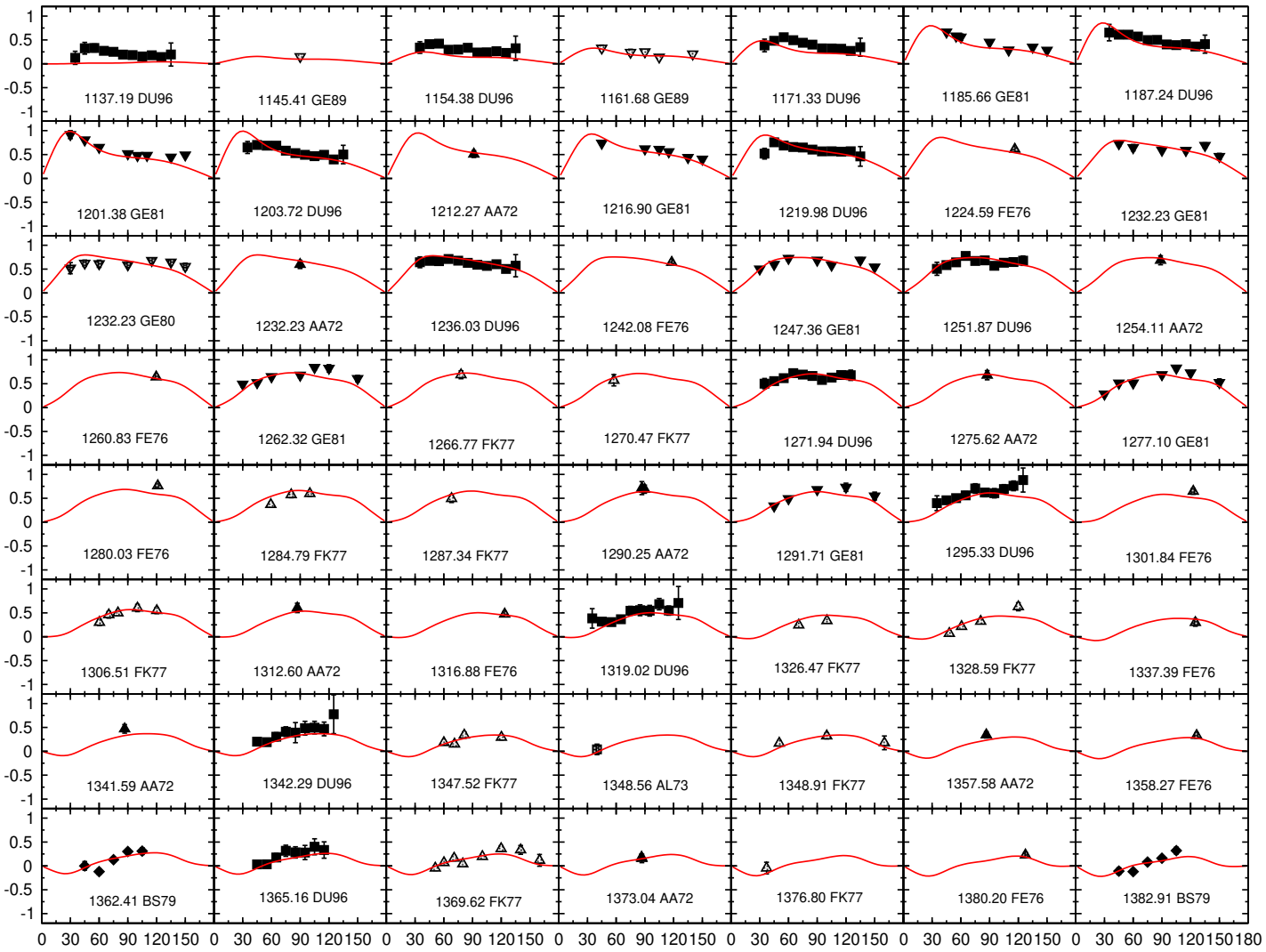
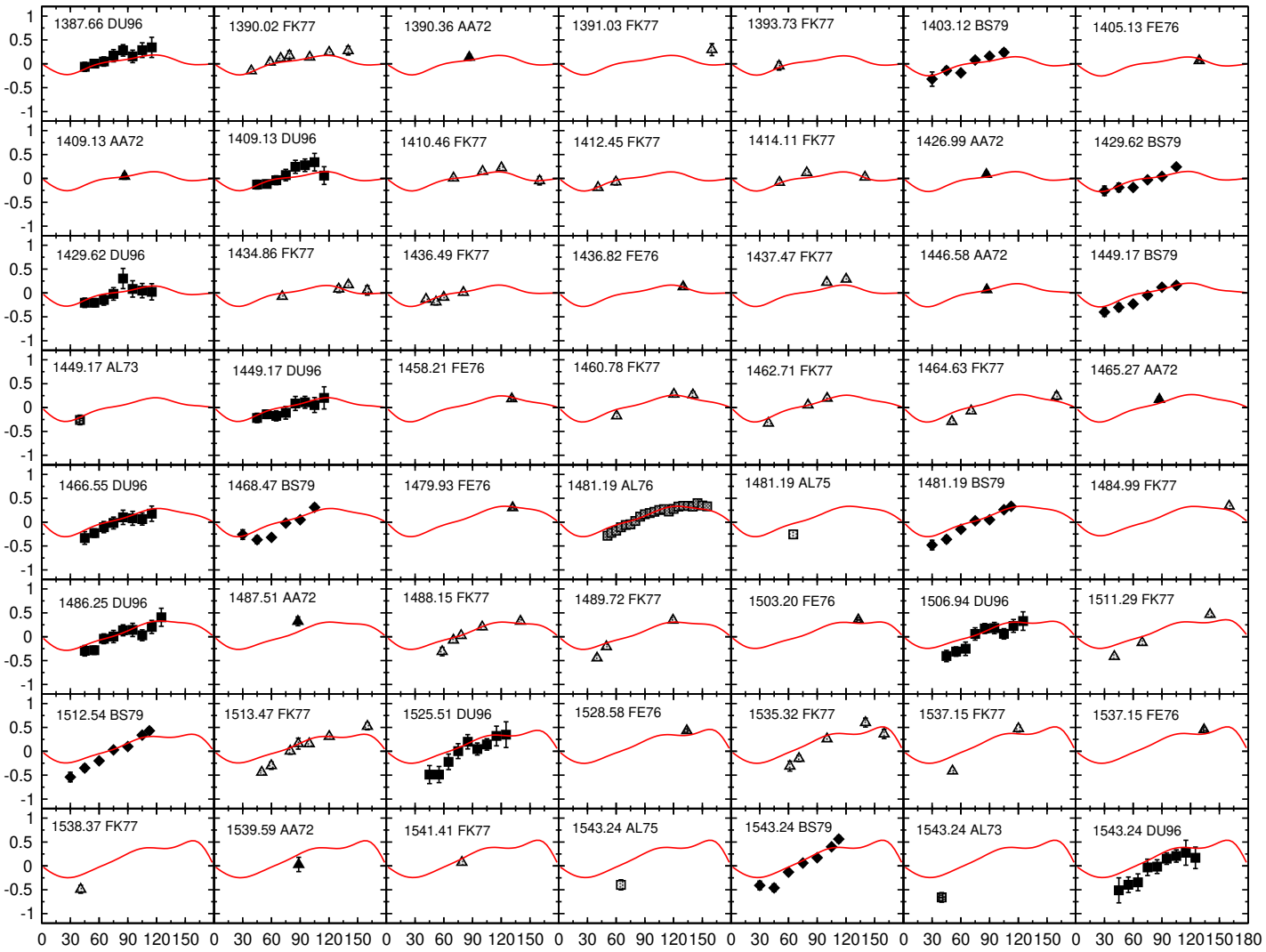
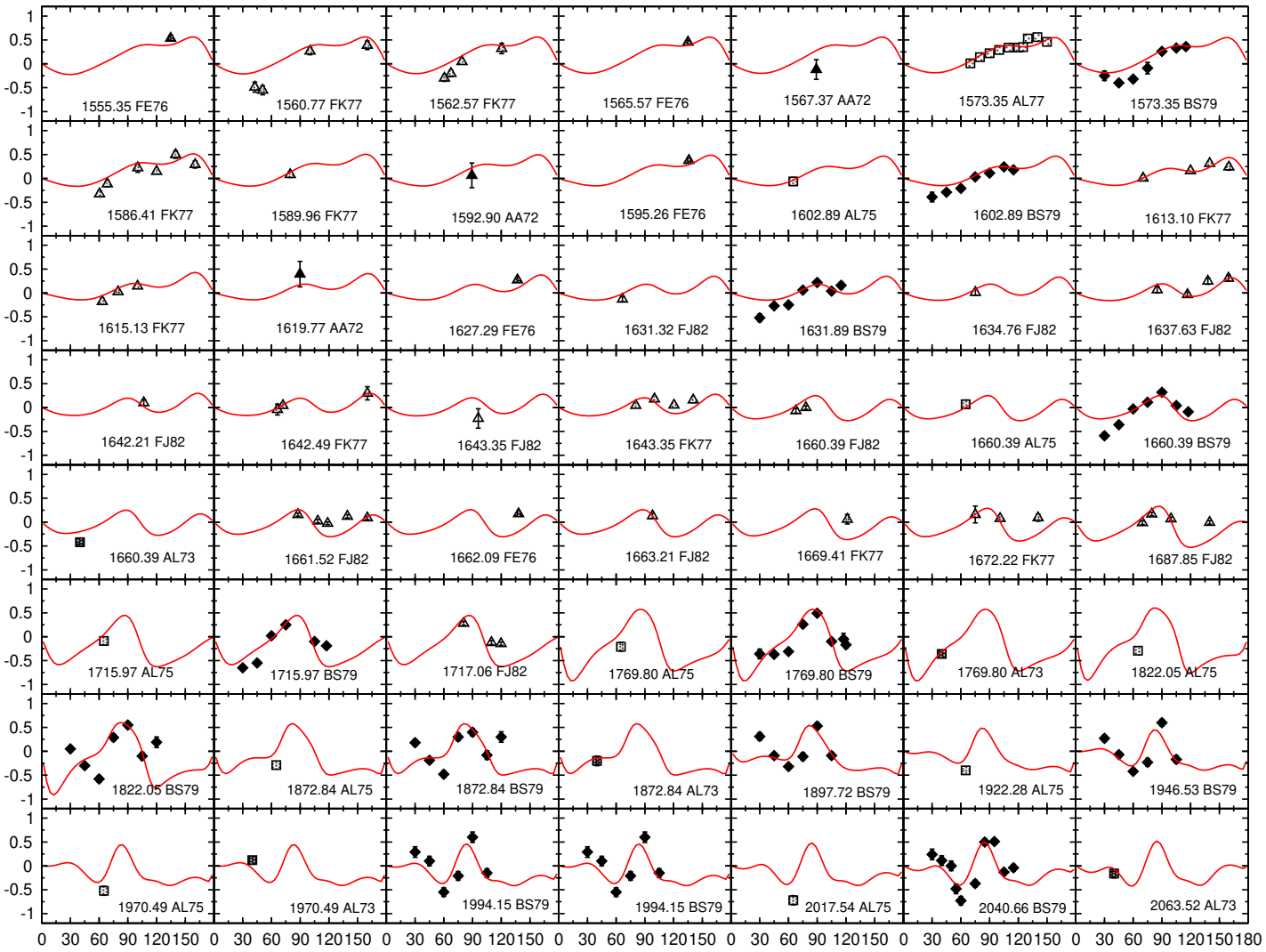
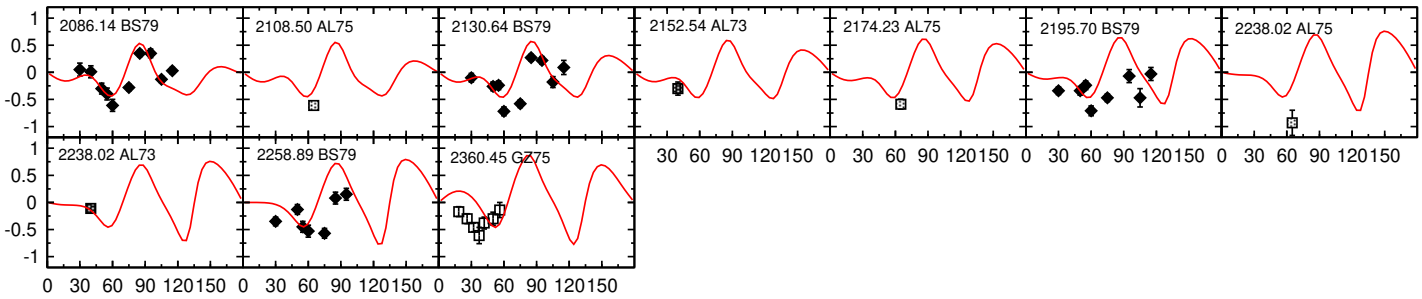


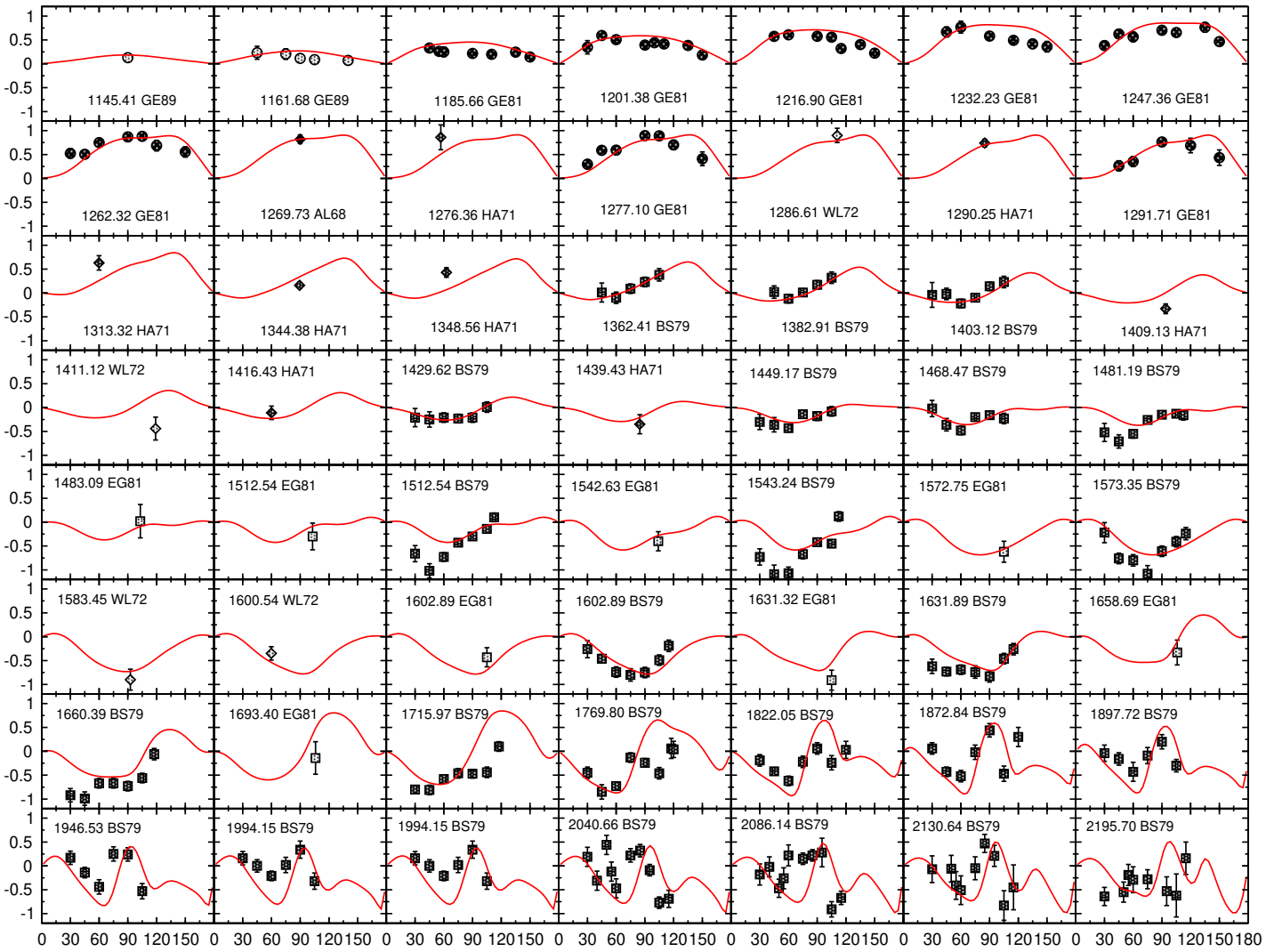
Figure 1: CLAS 2013 (Dugger et al., DU(13))

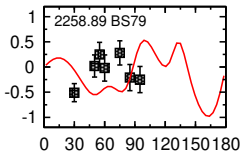

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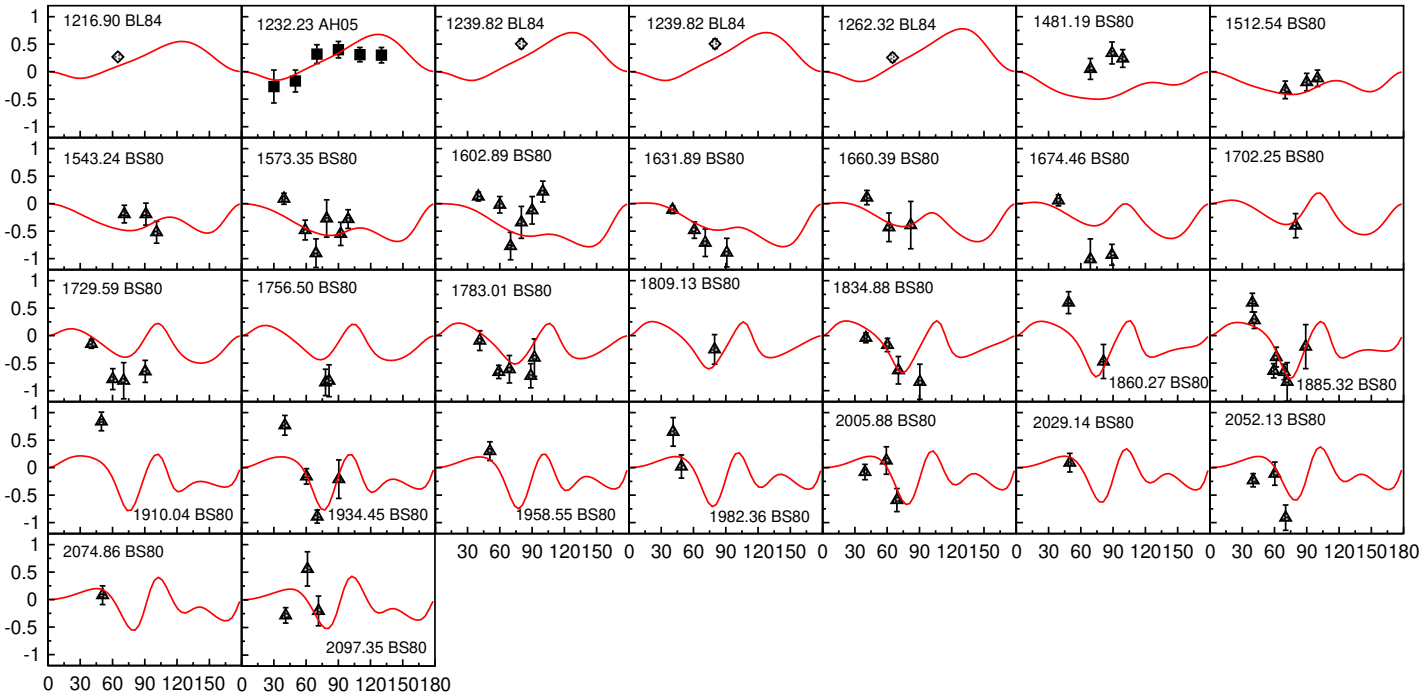

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1872.84 AL75
1872.84 BS79
1872.84 AL73
1897.72 BS79
1922.28 AL75
1946.53 BS79
1970.49 AL75
1970.49 AL73
1994.15 BS79
1994.15 BS79
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2063.52 AL73


2086.14 BS79
2108.50 AL75
2130.64 BS79
2152.54 AL73
2174.23 AL75
2195.70 BS79
2238.02 AL75
2238.02 AL73
2258.89 BS79
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0.5
0
-0.5
-1
0 30 60 90 120150


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1185.66 GE81
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1232.23 GE81
1247.36 GE81
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1348.56 HA71
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2258.89 BS79
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0.5
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-0.5
-1
0 30 60 90 120150180


1216.90 BL84
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1262.32 BL84
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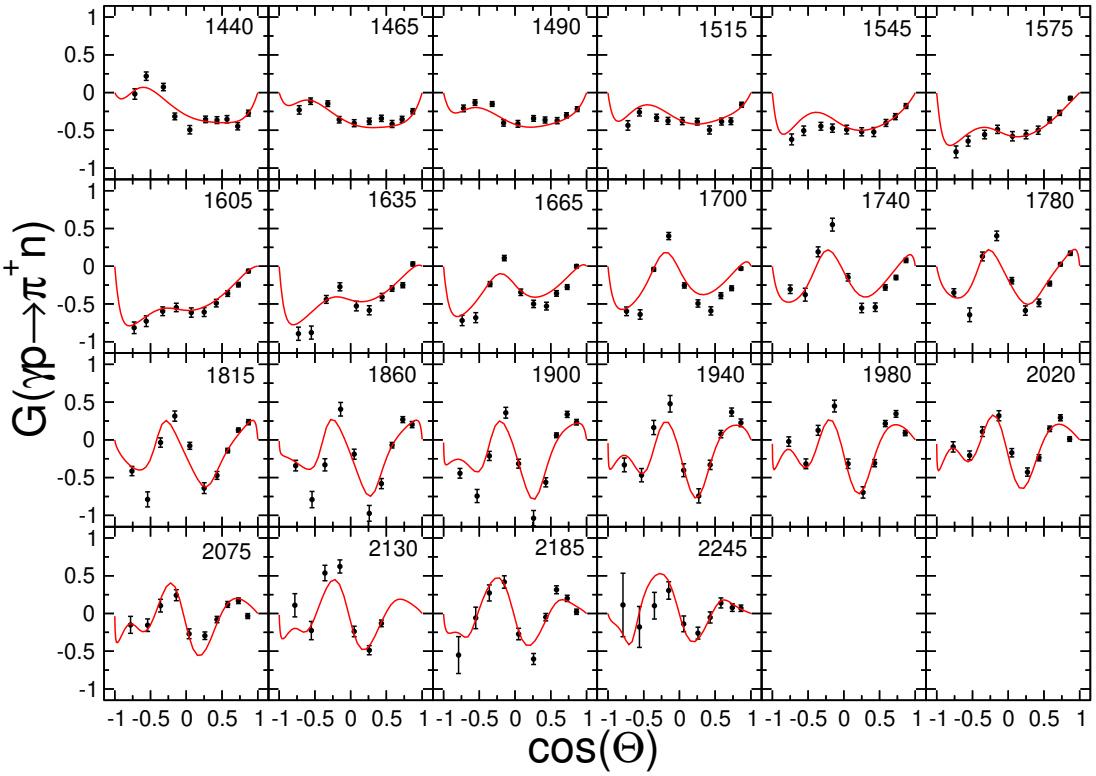
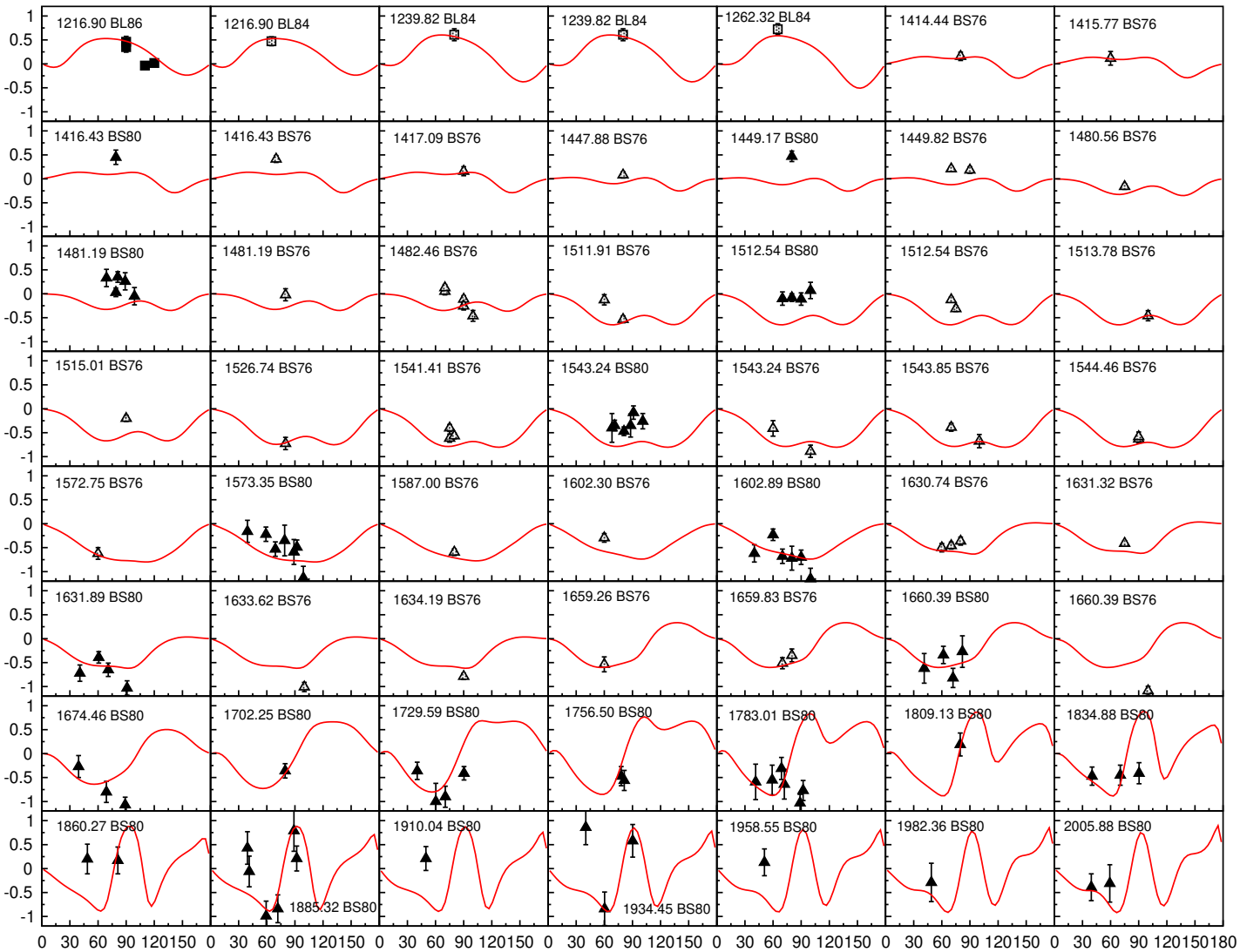
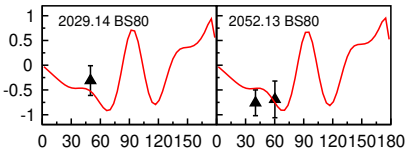
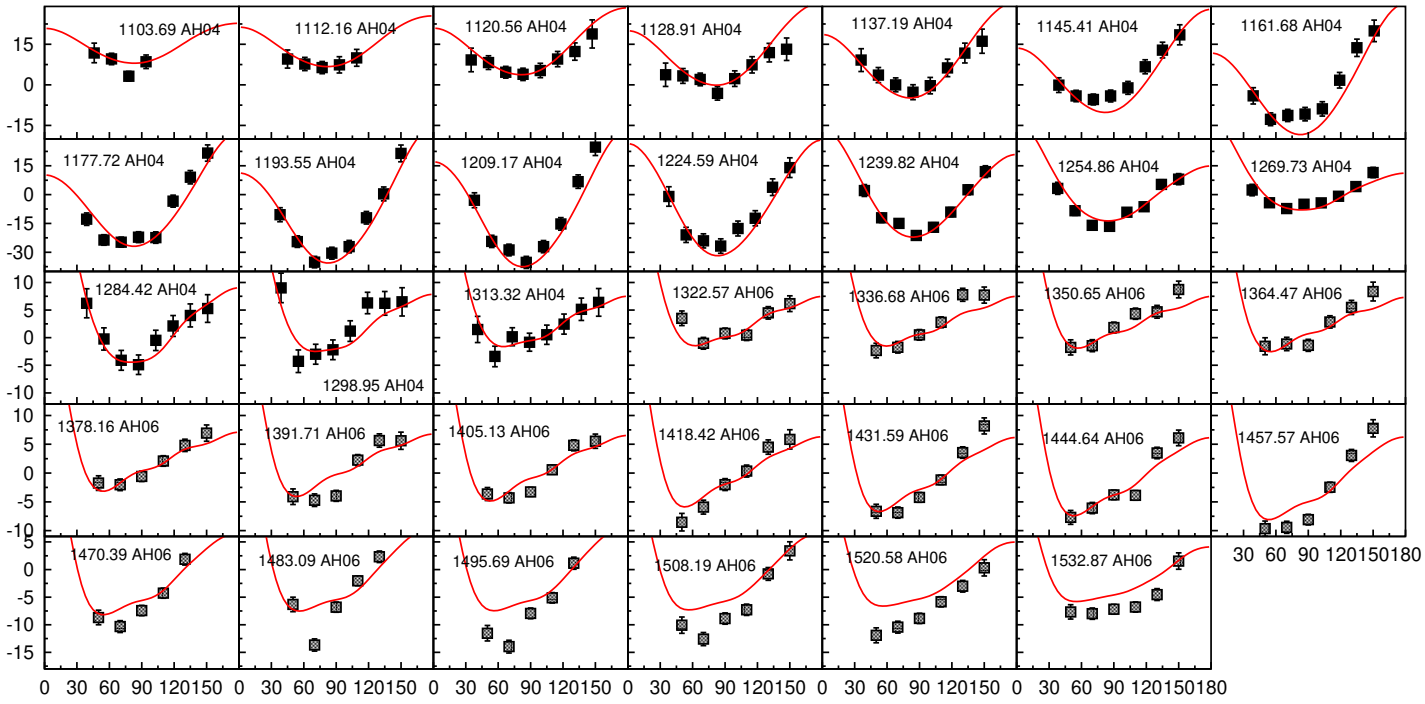
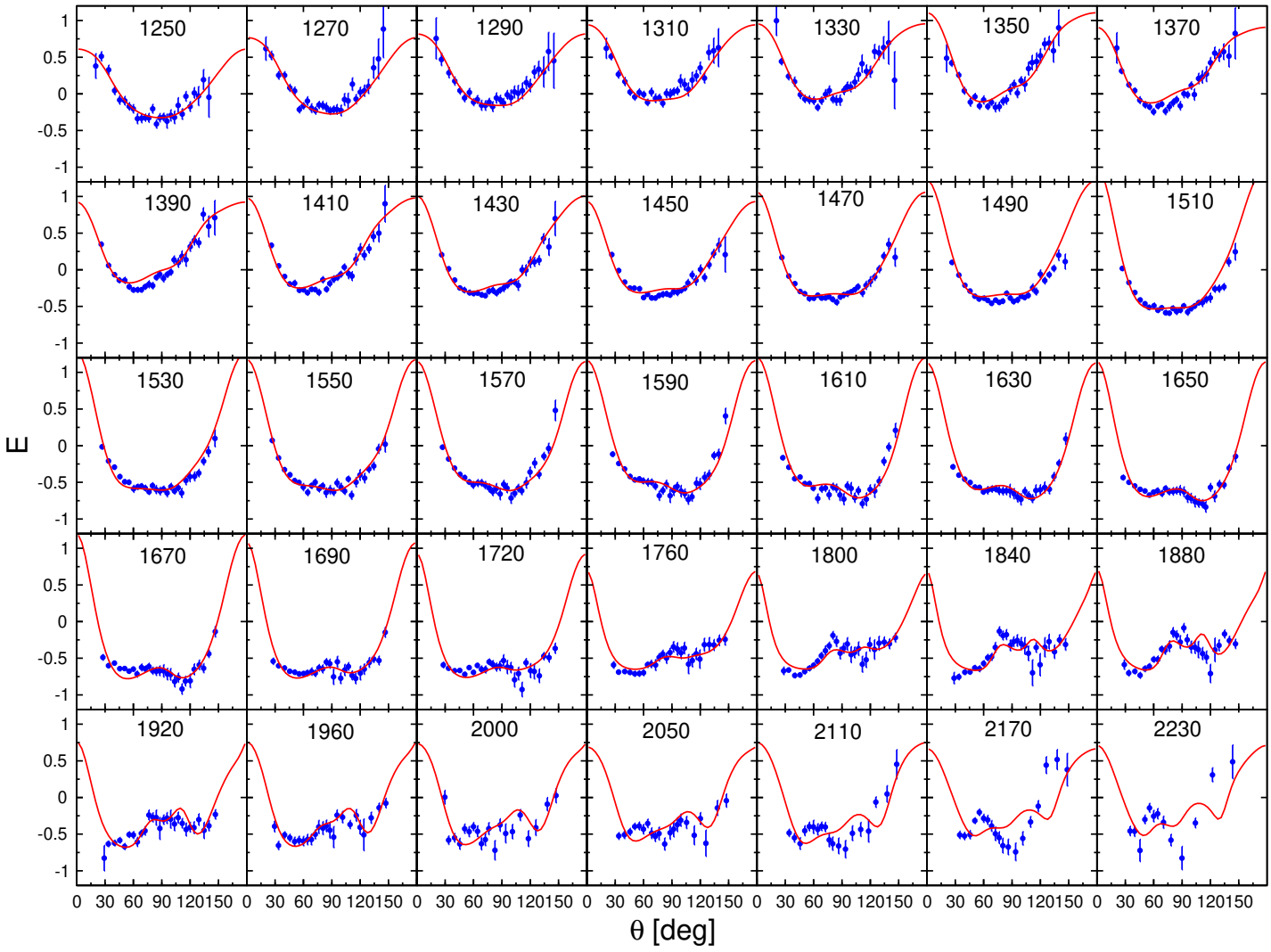


Figure 1: CLAS 2021 (N. Zachariou *et al.* Phys. Lett. B 817, 136304 (2021)


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1262.32 BL84
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1415.77 BS76
1416.43 BS80
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1417.09 BS76
1447.88 BS76
1449.17 BS80
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1481.19 BS80
1481.19 BS76
1482.46 BS76
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1587.00 BS76
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1634.19 BS76
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1660.39 BS80
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1958.55 BS80
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0
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0 30 60 90 120150 0 30 60 90 120150180


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Date references

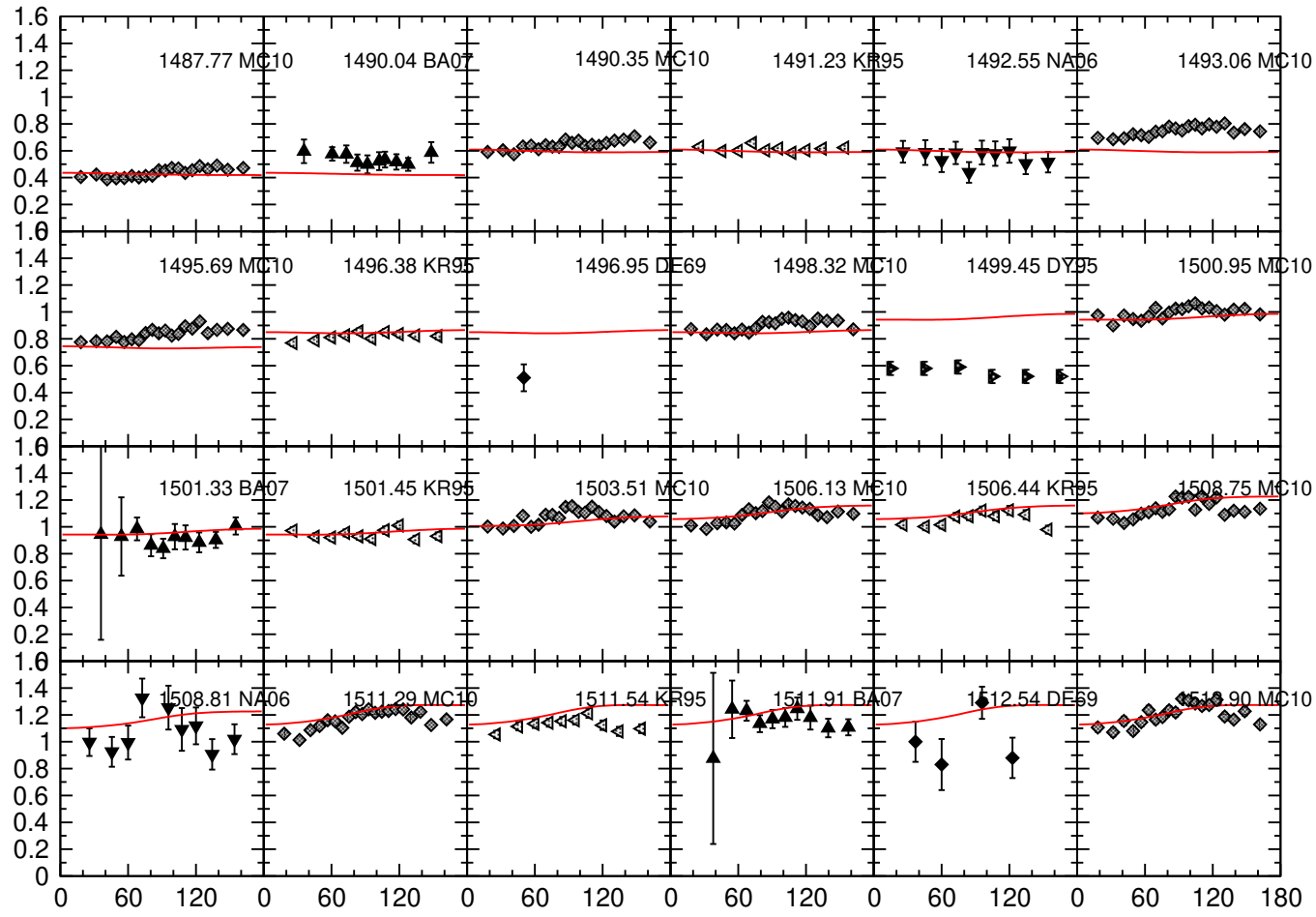
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  - FI(96) SASK FISUM, PRC53, 1278(96)
  - WA(62) ORSA WALKER, PRL8, 37(62)
  - LI(64) GLAS LEITH, PL8, 355(64)
  - BR(95) SASK BRINK, NPA587, 657(95)
  - BU(94) BONN BUECHLER, NPA570, 580(94)
  - FI(70) BONN FISCHER, NPB16, 119(70)
  - FI(72) BONN FISCHER, ZP253, 38(72)
  - BR(00) MAINZ BRANFORD, PRC61, 014603(2000),
  - FU(77) TOKY FUJII, NPB120, 395(77)
  - AK(71) LEBE ALEKSANDROV, SJNP12, 416(71)
  - KN(63) UCRL KNAPP, PR114, 605(63)
  - BE(00) MAINZ BECK, PRC61, 034604(2000)
  - FU(71) TOKY FUJII, PRL26, 1672(71)
  - DA(01) BONN DANNHAUSEN, EPJA11, 441(2001)
  - FA(84) SACL FAURE, NPA424, 383(84)
  - BT(68) ORSA BETOURNE, PR172, 1343(68)
  - DU(80) BONN E.J.DURWEN, PRP IR-80-7 80
  - BO(71) ORSA BOUQUET, PRL27, 1244(1971)
  - AH(06) MAINT AHRENS, PRC74, 054204 (2006)
  - AL(83) BONN ALTHOFF, ZPC18, 199(83)
  - AR(77) TOKY ARAI, JPSJ43, 363(77)
  - EC(67) CALT ECKLUND, PR159, 1195(1967)
  - EK(72) CORN EKSTRAND, PRD6, 1(1972)
  - DU(09) JLAB DUGGER, PRC79, 065206(2009)
  - HE(88) BONN HEISE, THESIS BONN-IR-88-06
  - ZE(88) BONN ZENZ, THESIS BONN-IR-88-12
  - BY(61) CALT J.H.BOYDEN, PH.D THESIS 1961
  - AV(70) CEA ALVAREZ, PRD1, 1946(70)
  - AB(74) YERE ABRAHAMIAN, PLB48, 463(1974)
  - BY(61) CALT J.H.BOYDEN, PH.D THESIS 1961
  - ZH(05) JLAB ZHU, PRC71, 044603(2005)
  - KI(62) CALT J.R.KILNER, PH.D THESIS 1962
  - BU(66) DESY BUSCHHORN, PRL17, 1027(1966)
  - BU(67) DESY BUSCHORN, PRL18, 571(1967)
  - DO(67) CEA DOWD, PRL18, 414(1967)
- Beam asymmetry Σ $\gamma p \to \pi^+ p$:
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  - ZA(75) TOMS ZABAEV, SJNP21, 286(75)
  - KU(71) TOMS KUZNETSOV, NCL1, 233(71)

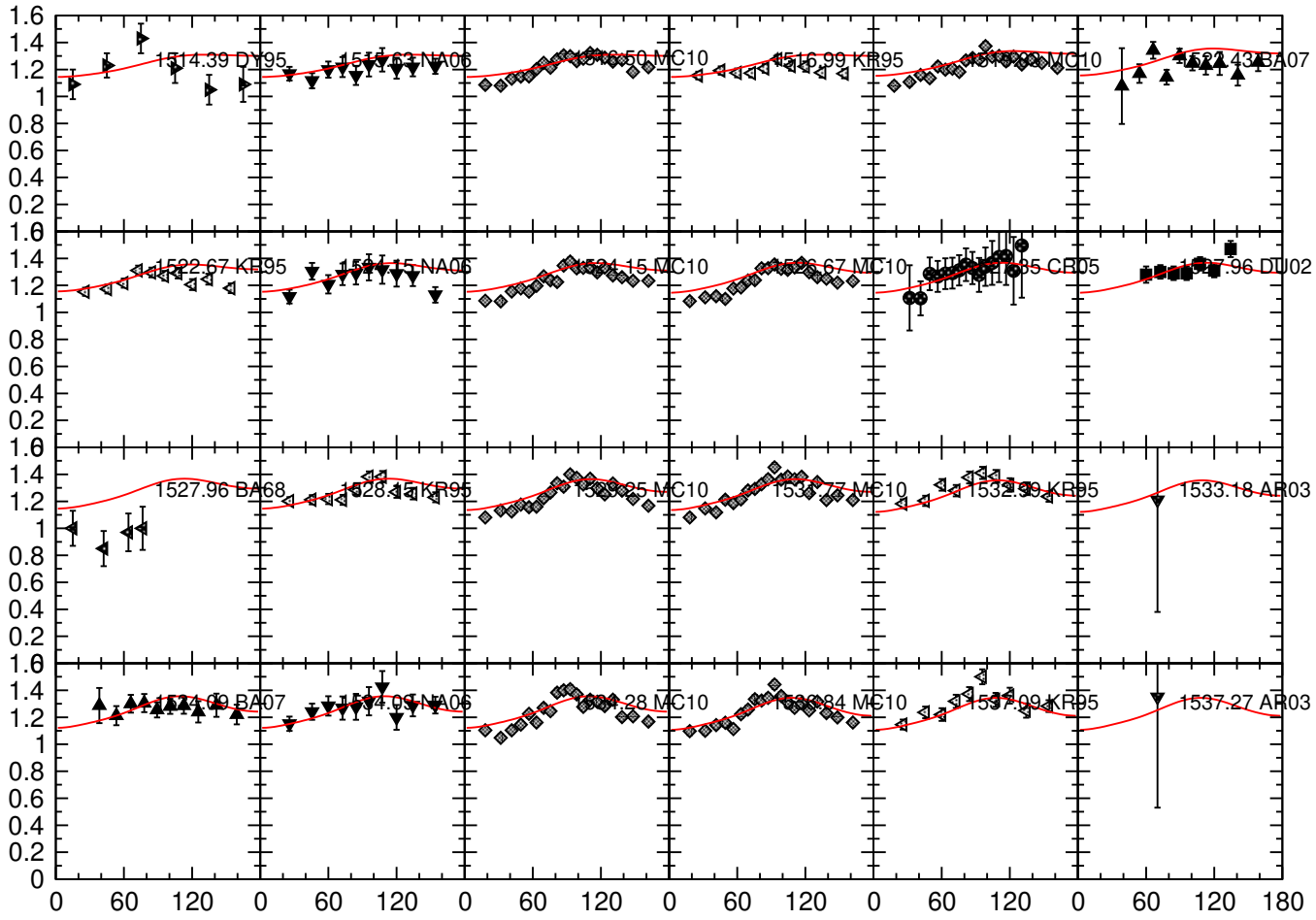
- SM(63) STAN SMITH, PR130, 2429(63)
- GE(89) KHAR GETMAN, VANT8, 3(1989)
- TA(60) STAN TAYLOR, PR117, 835(60)
- GN(76) KHAR GANENKO, SJNP23, 52(76)
- BE(00) MAINZ BECK, PRC61, 034604(2000)
- GE(81) KHAR GETMAN, NPB188, 397(81)
- HM(80)PBONN P.HAMPE, PRP IR-80-1 80
- LU(66) STAN LIU, PR144, 1093(66)
- BS(79) DNPL BUSSEY, NPB154, 205(79)
- AJ(00) GRAA AJAKA, PLB475, 372(2000), KUZNE
- KE(74) SLAC KNIES, PRD10, 2778(74)
- AS(72) CEA ALSPECTOR, PRL28, 1403(72)
- BA(02) GRAA BARTALINI, PLB544, 113(2002)
- AB(80) YERE ABRAHAMIAN, SJNP32, 66(1980)
- AB(74) YERE ABRAHAMIAN, PLB48, 463(1974)
- GE(69) SLAC GEWENIGER, PL29B, 41(1969)
- DU(13) Dugger *et al.* (CLAS Collaboration) PRC88, 065203, PRC89, 029901 (2014)

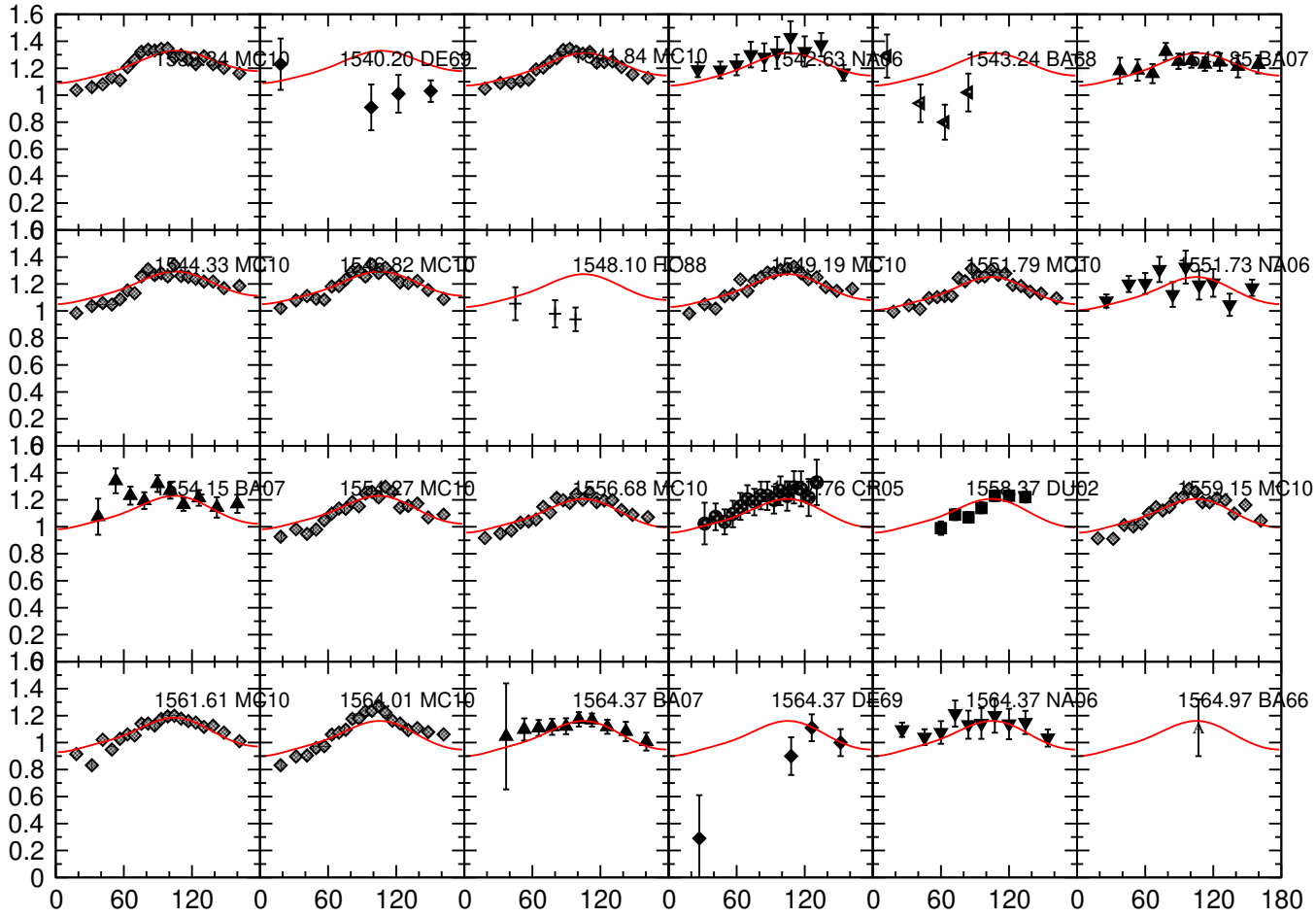
- Recoil Polarization $\gamma p \to \pi^+ p$:
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  - AL(68) BONN ALTHOFF, PLB26, 640(68)
  - HA(71) BONN U.HAHN, PRP PI1-143 71
  - WL(72) BONN W.WALLRAFF, PRP PIB1-162 72
  - BS(79) DNPL BUSSEY, NPB154, 205(79)
  - EG(81) TOKY EGAWA, NPB188, 11(81)
- Target asymmetry T $\gamma p \to \pi^+ p$:
  - DU(96) BONN DUTZ, NPA601, 319(1996)
  - GE(89) KHAR GETMAN, VANT8, 3(1989)
  - GE(81) KHAR GETMAN, NPB188, 397(81)
  - AA(72) TOKY ARAI, NPB48, 397(72)
  - FE(76) TOKY FELLER, NPB102, 207(76)
  - GE(80) KHAR GETMAN, SJNP31, 480(80)
  - FK(77) TOKY FUKUSHIMA, NPB130, 486(77)
  - AL(73) BONN ALTHOFF, NPB53, 9(73)
  - BS(79) DNPL BUSSEY, NPB154, 205(79)
  - AL(76) BONN ALTHOFF, PLB63, 107(76)
  - AL(75) BONN ALTHOFF, PLB59, 93(75)
  - AL(77) BONN ALTHOFF, NPB131, 1(77)
  - FJ(82) TOKY FUJII, NPB197, 365(82)
  - GZ(75) BONN GENZEL, NPB92, 196(1975)
- G $\gamma p \to \pi^+ p$:
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  - AH(05) MAINZ AHRENS, EJPA26, 135(2005)

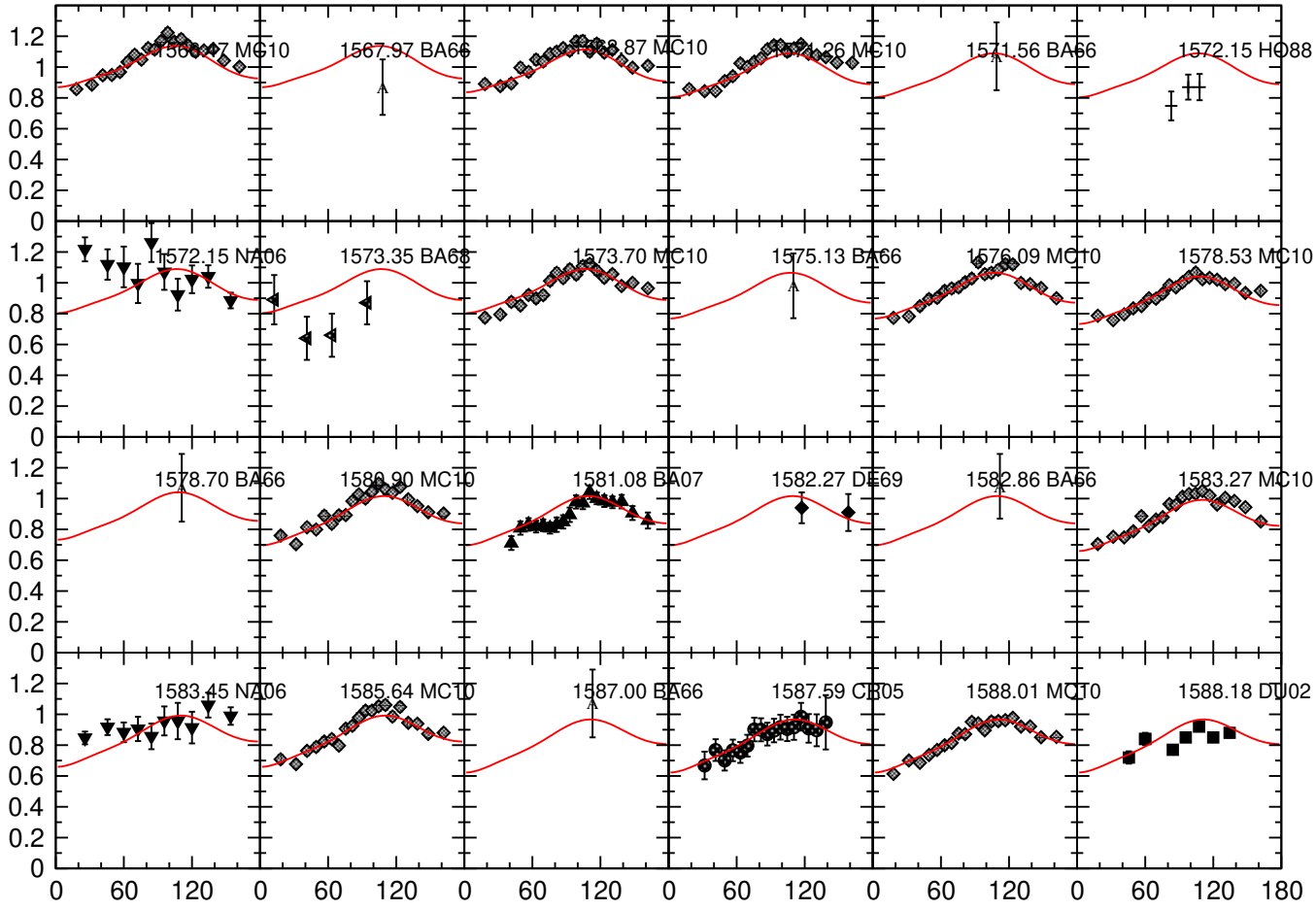
- BS(80) DNPL BUSSEY, NPB169, 403(80)
- CLAS 2021 (N. Zachariou *et al.* Phys. Lett. B 817, 136304 (2021)

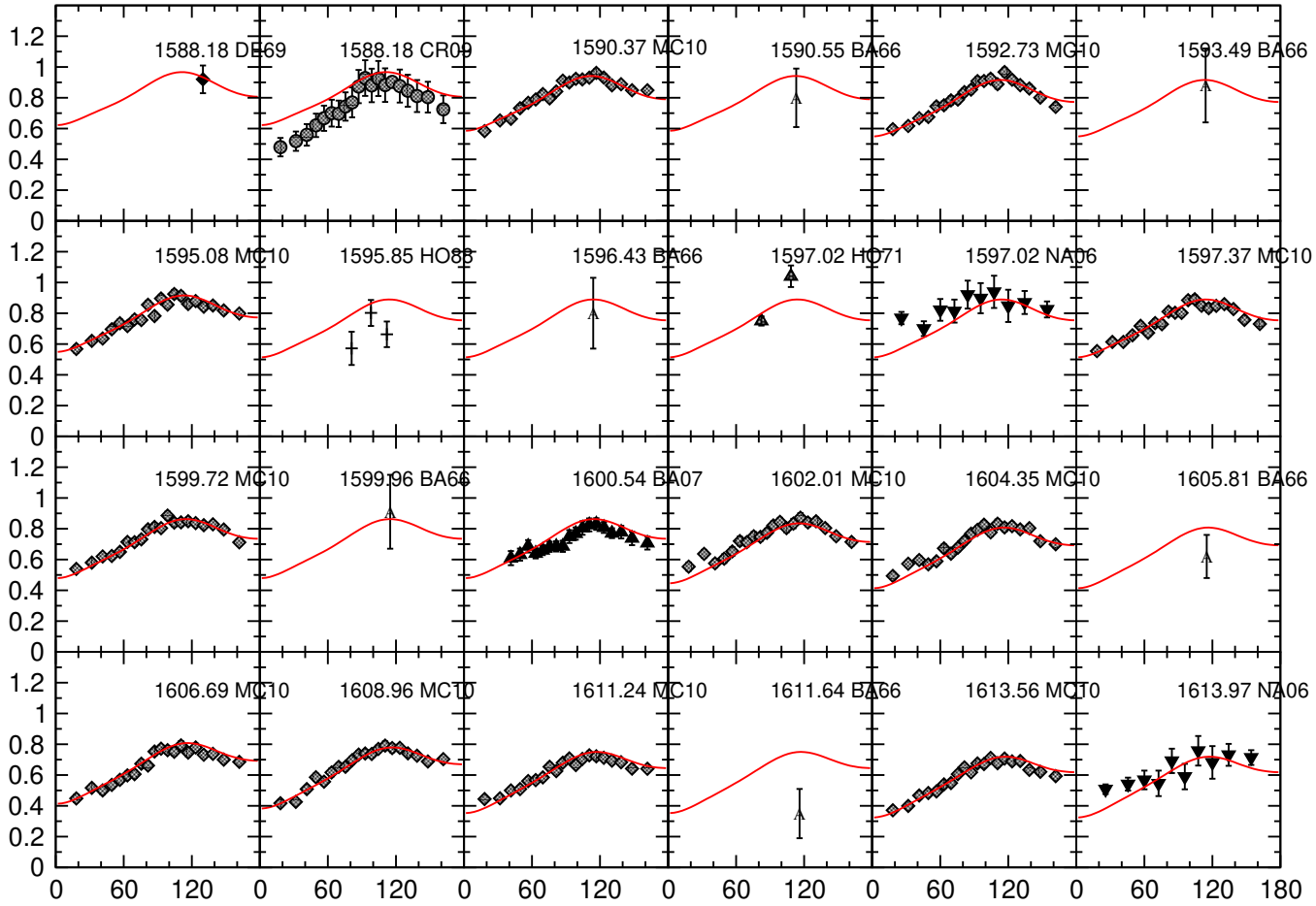
- H $\gamma p \to \pi^+ p$:
  - BL(86) KHAR BELYAEV, SJNP43, 947(86)
  - BL(84) KHAR BELYAEV, SJNP40, 83(84)
  - BS(76) DARE BUSSEY, PHYSIK DATEN 1977
  - BS(80) DNPL BUSSEY, NPB169, 403(80)
- Δ_{13} $\gamma p \to \pi^+ p$:
  - AH(04) MAINZ AHRENS, EPJA21, 323(2004)
  - AH(06) MAINZ AHRENS, PRC74, 054204 (2006)
- E $\gamma p \to \pi^+ p$:
  - Strauch *et al.*, CLAS PLB750, 53 (2015)

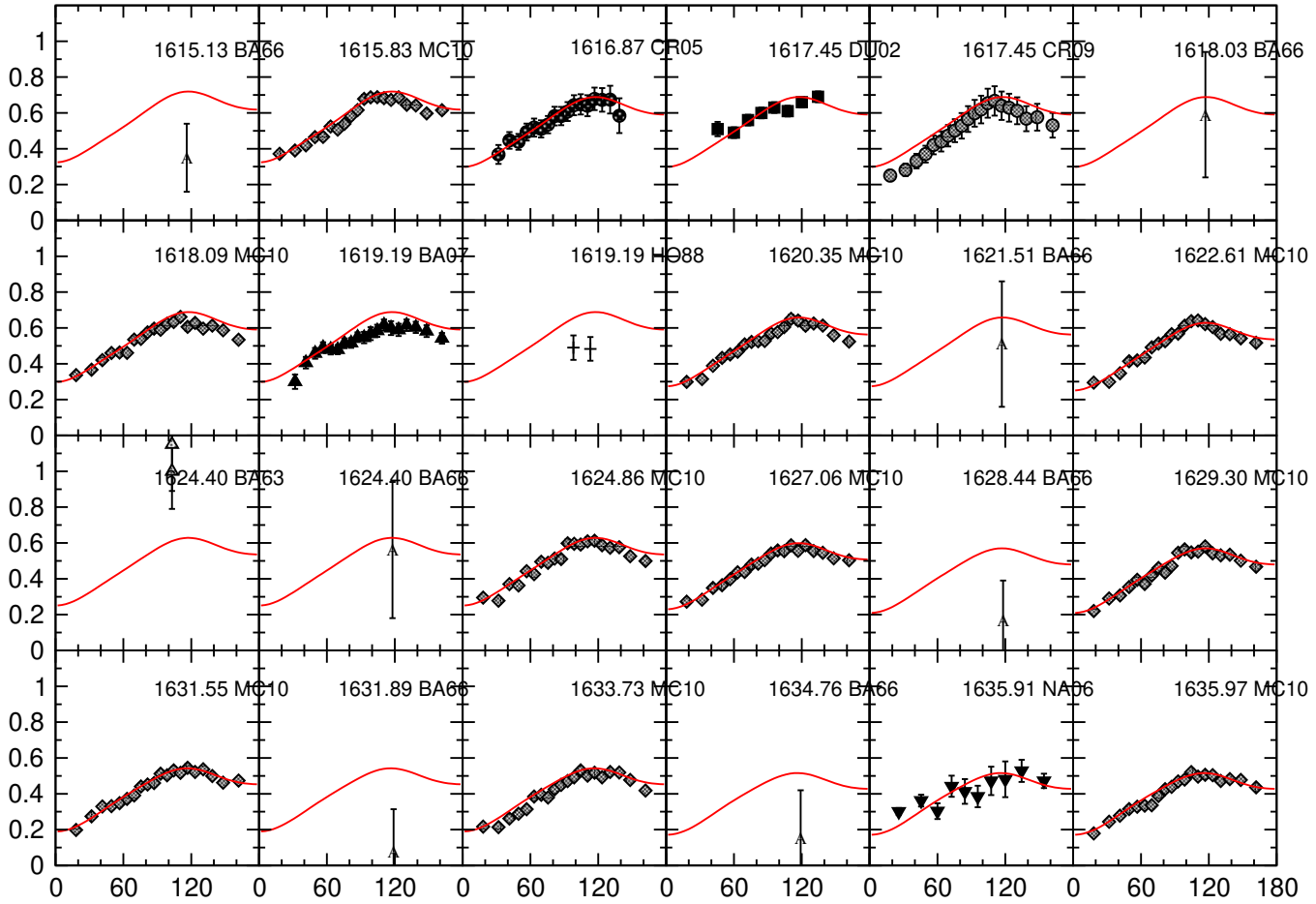

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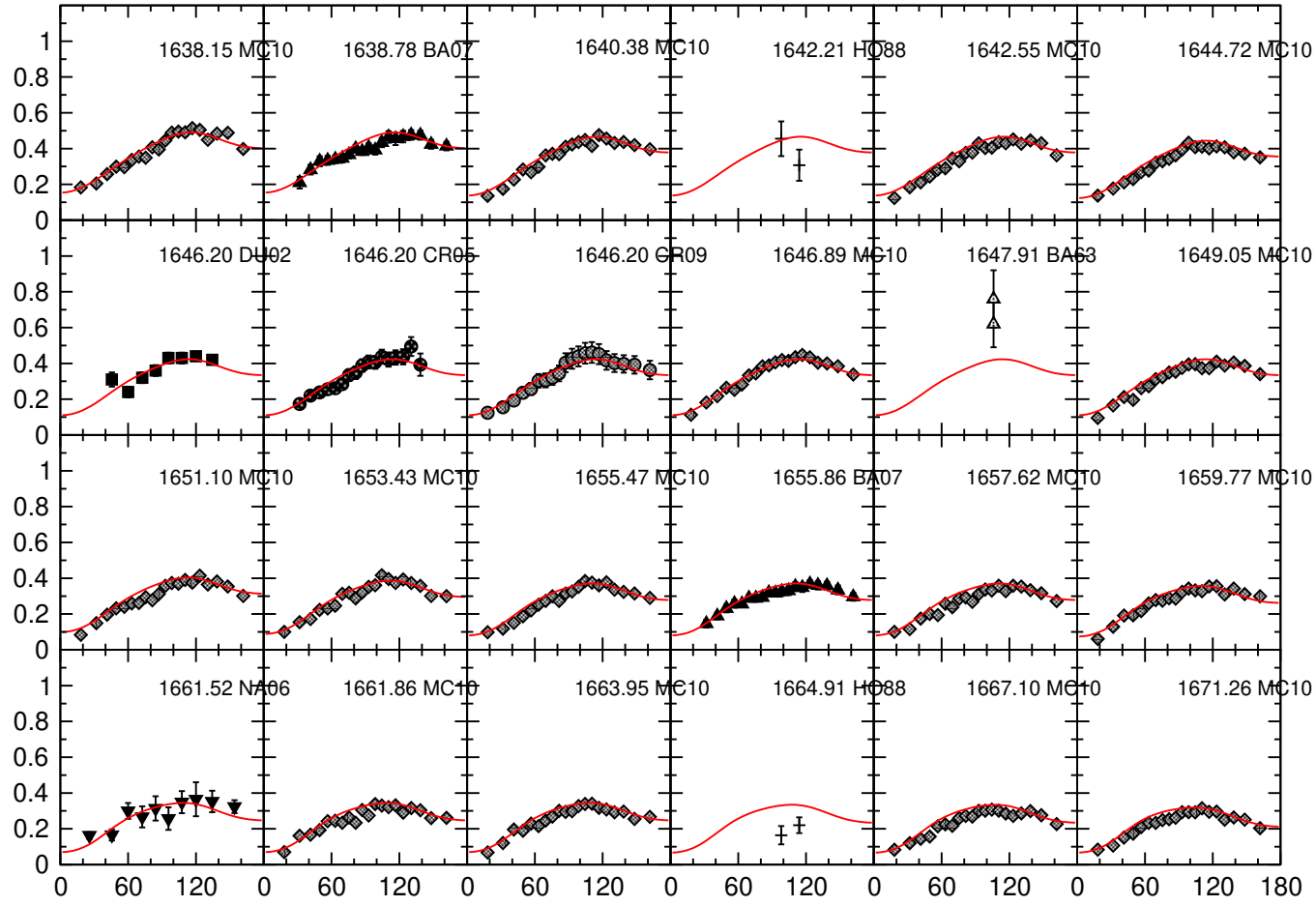

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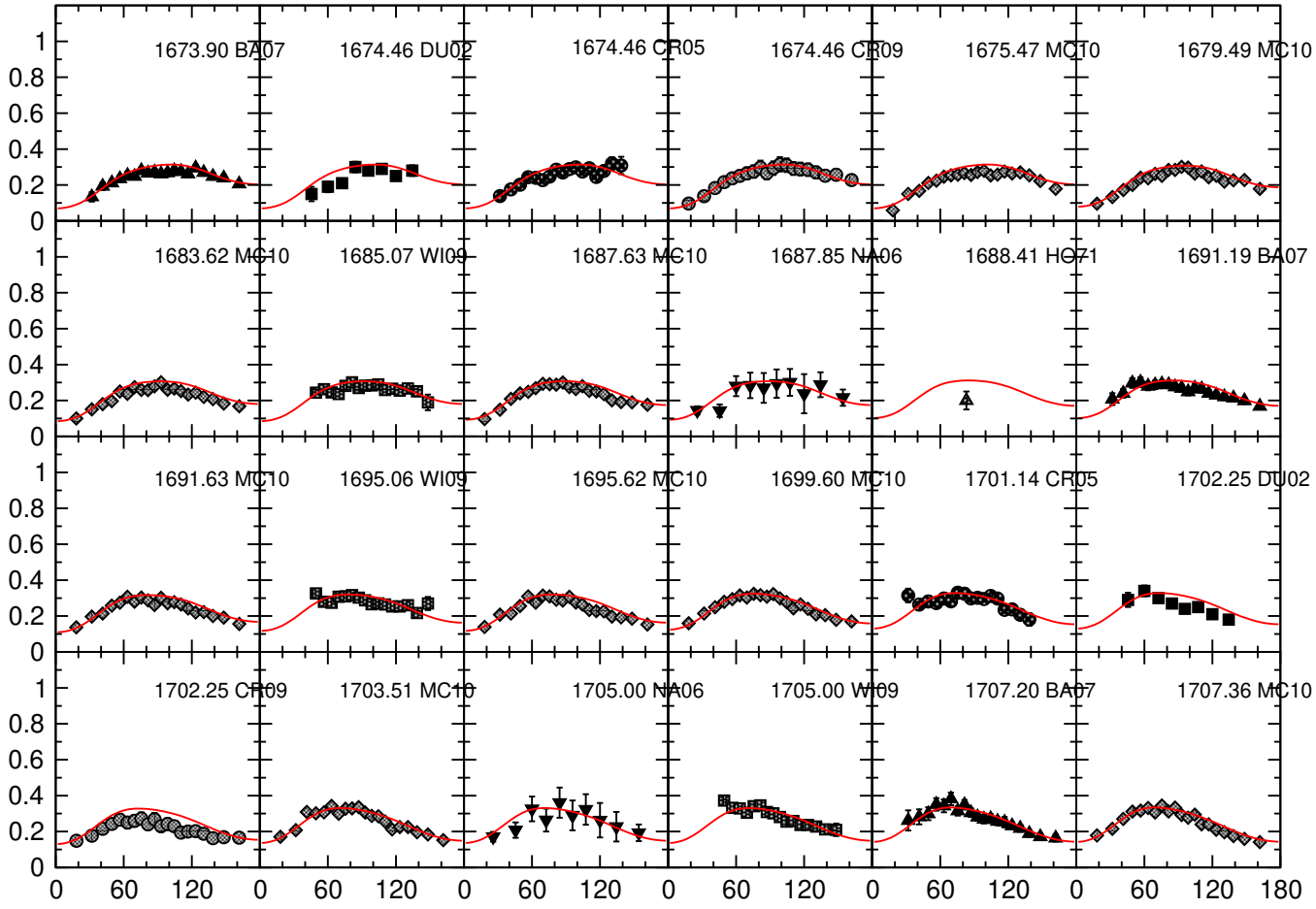

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1558.37 DU02
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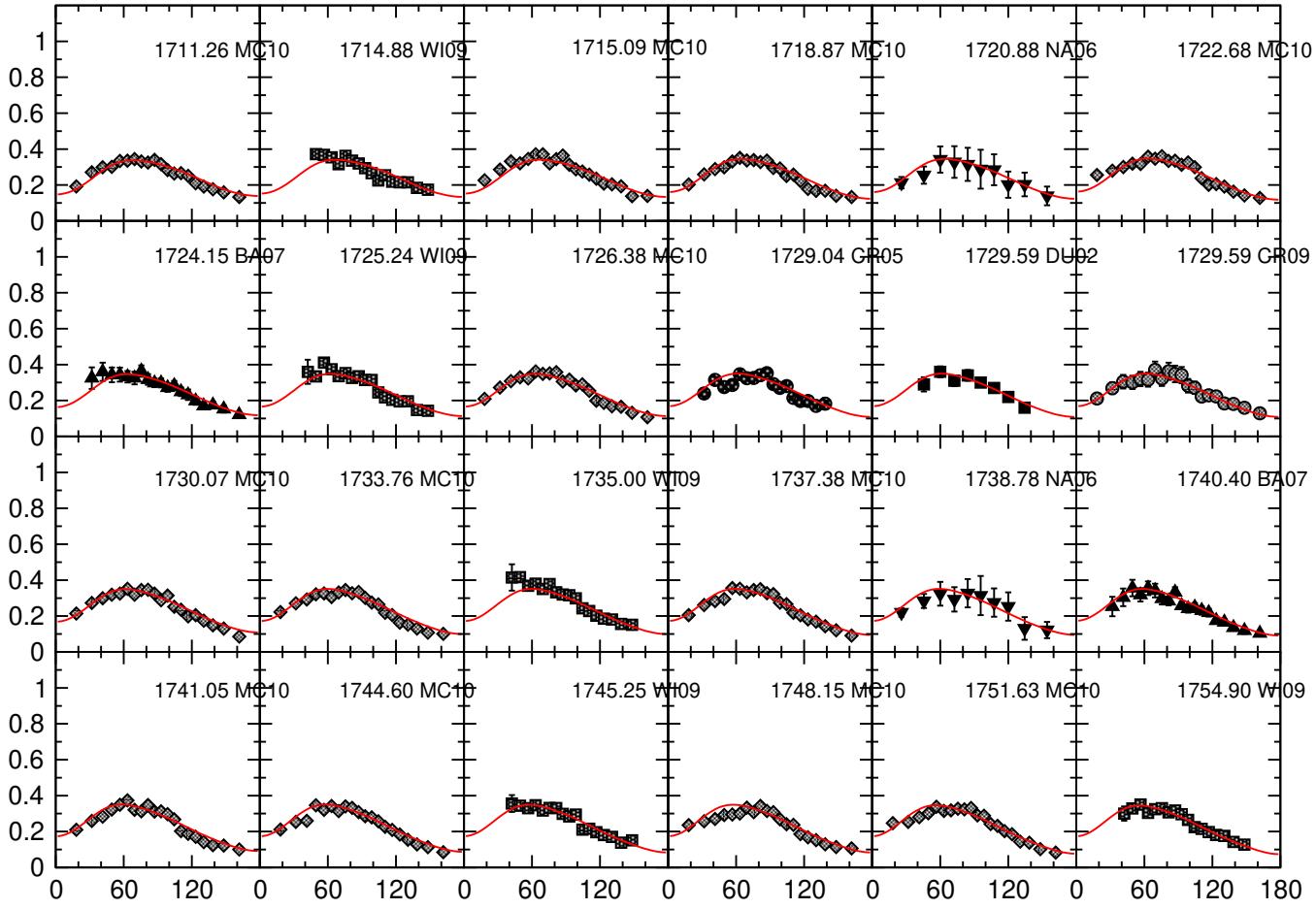

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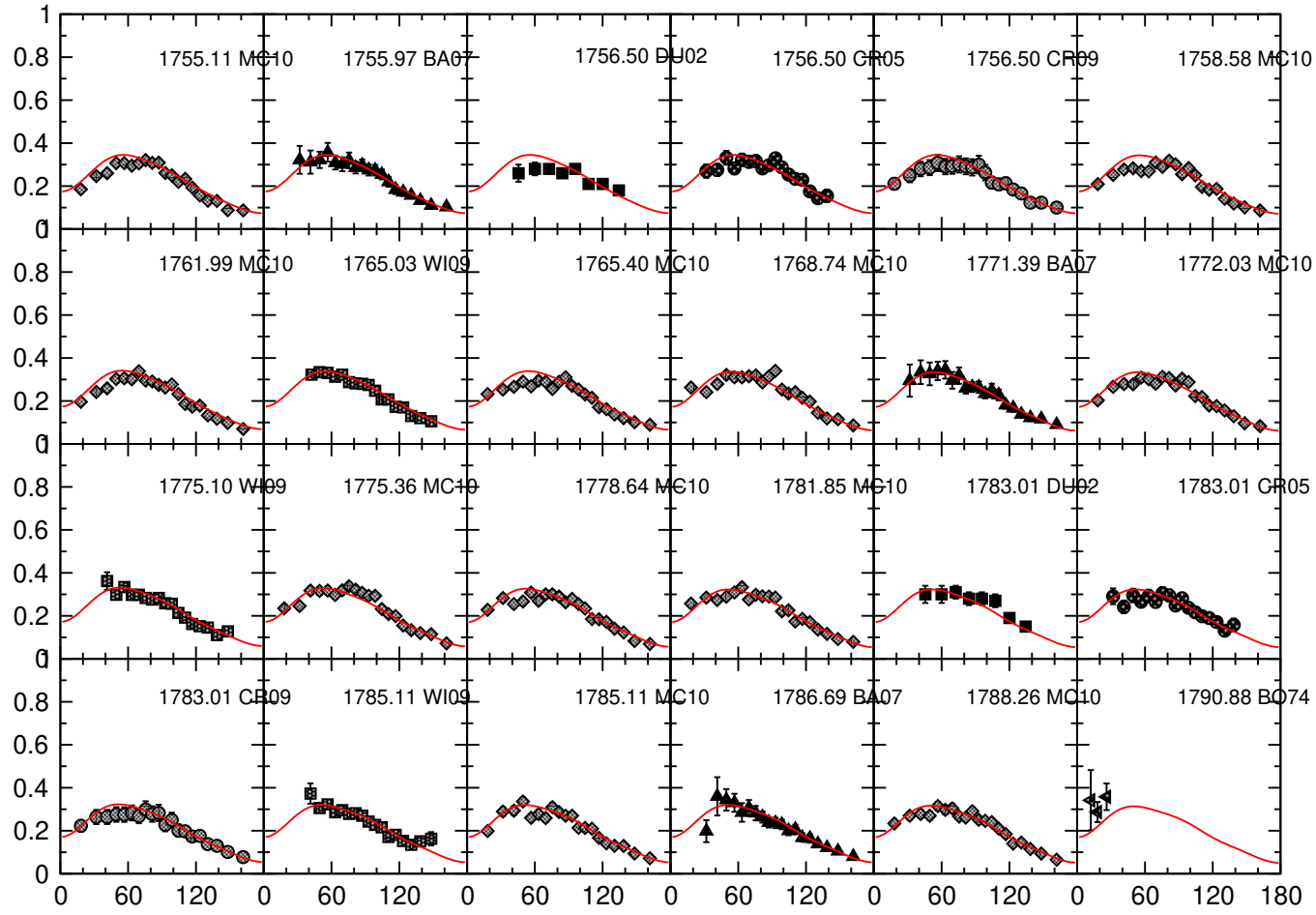

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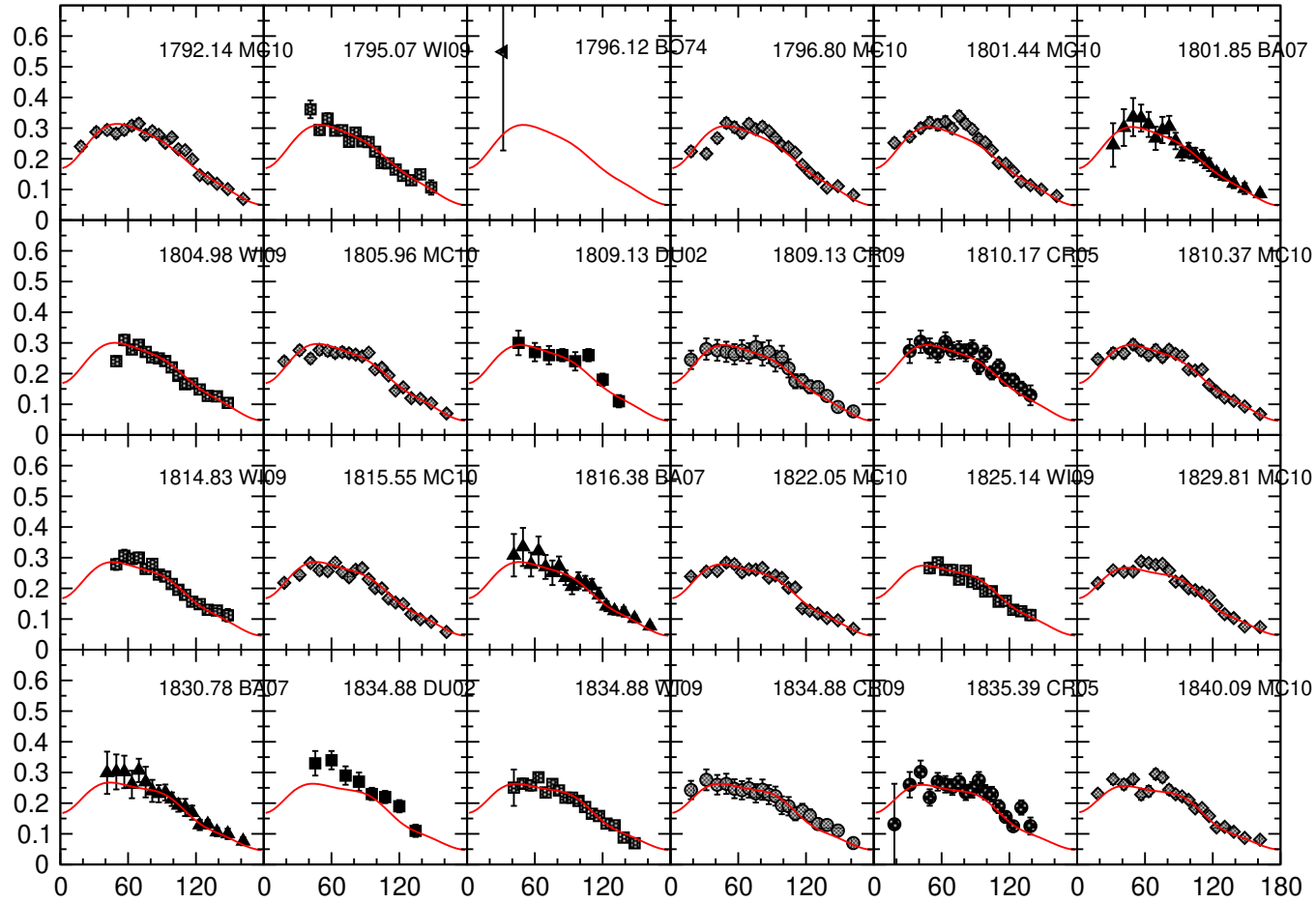

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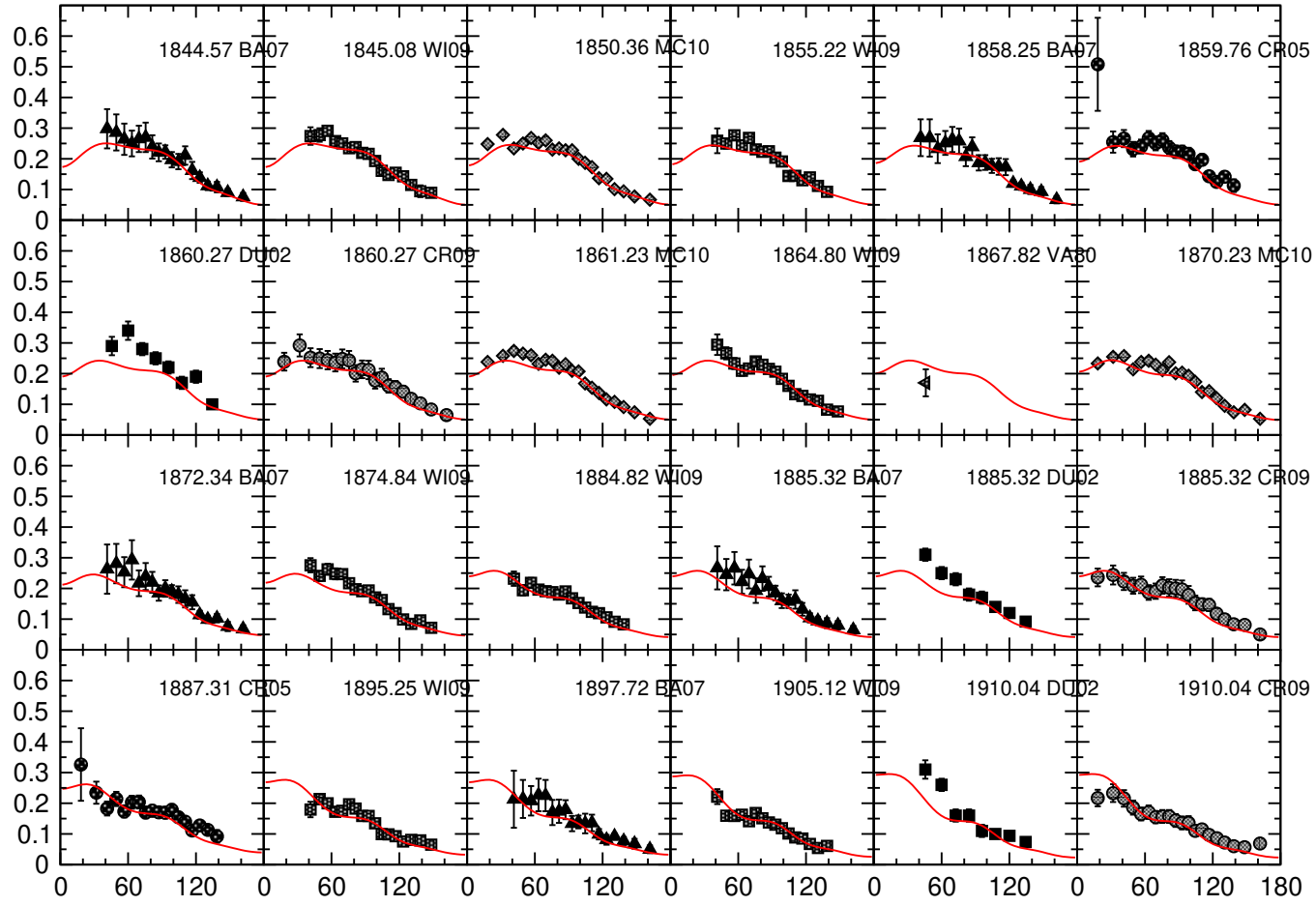

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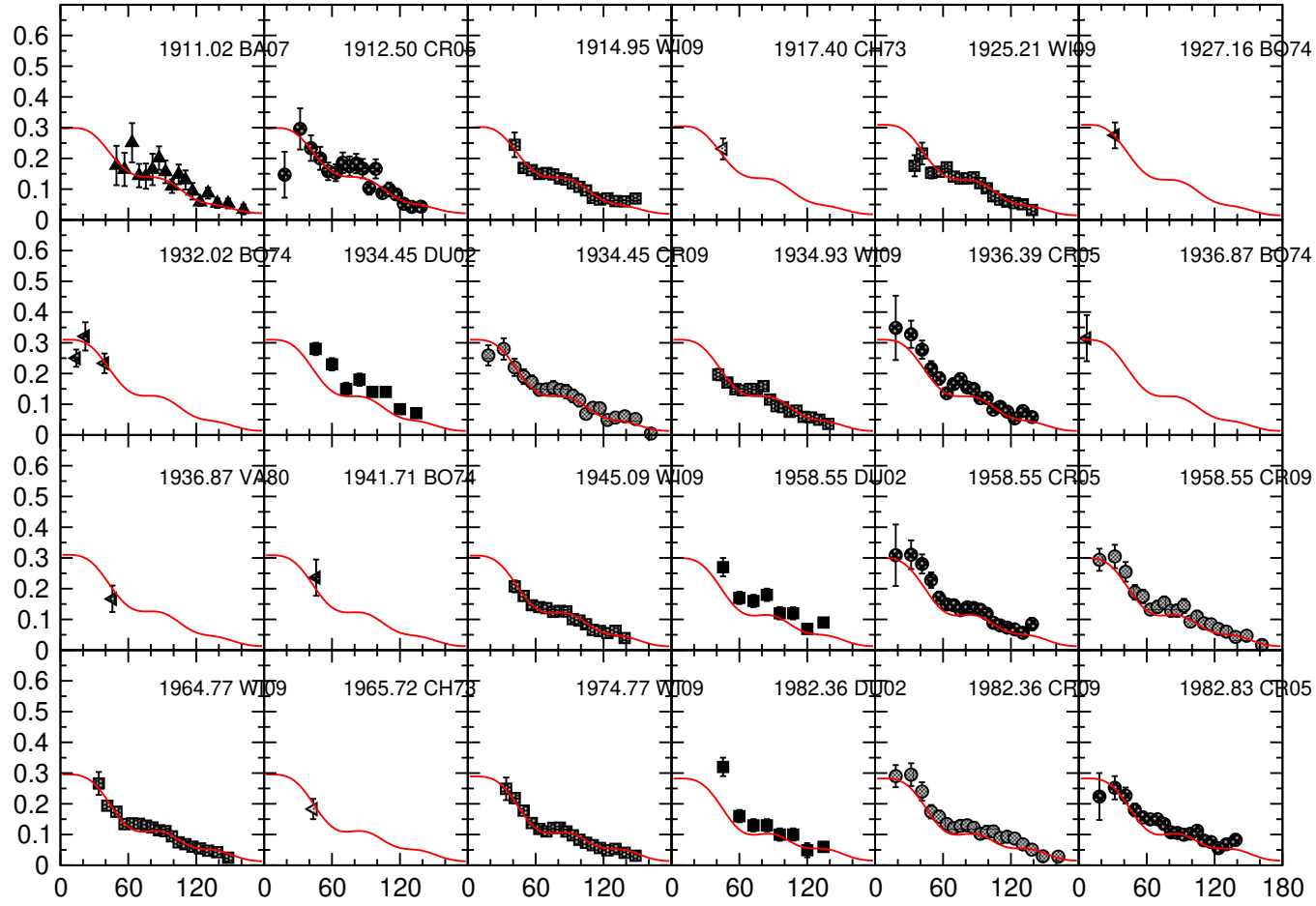

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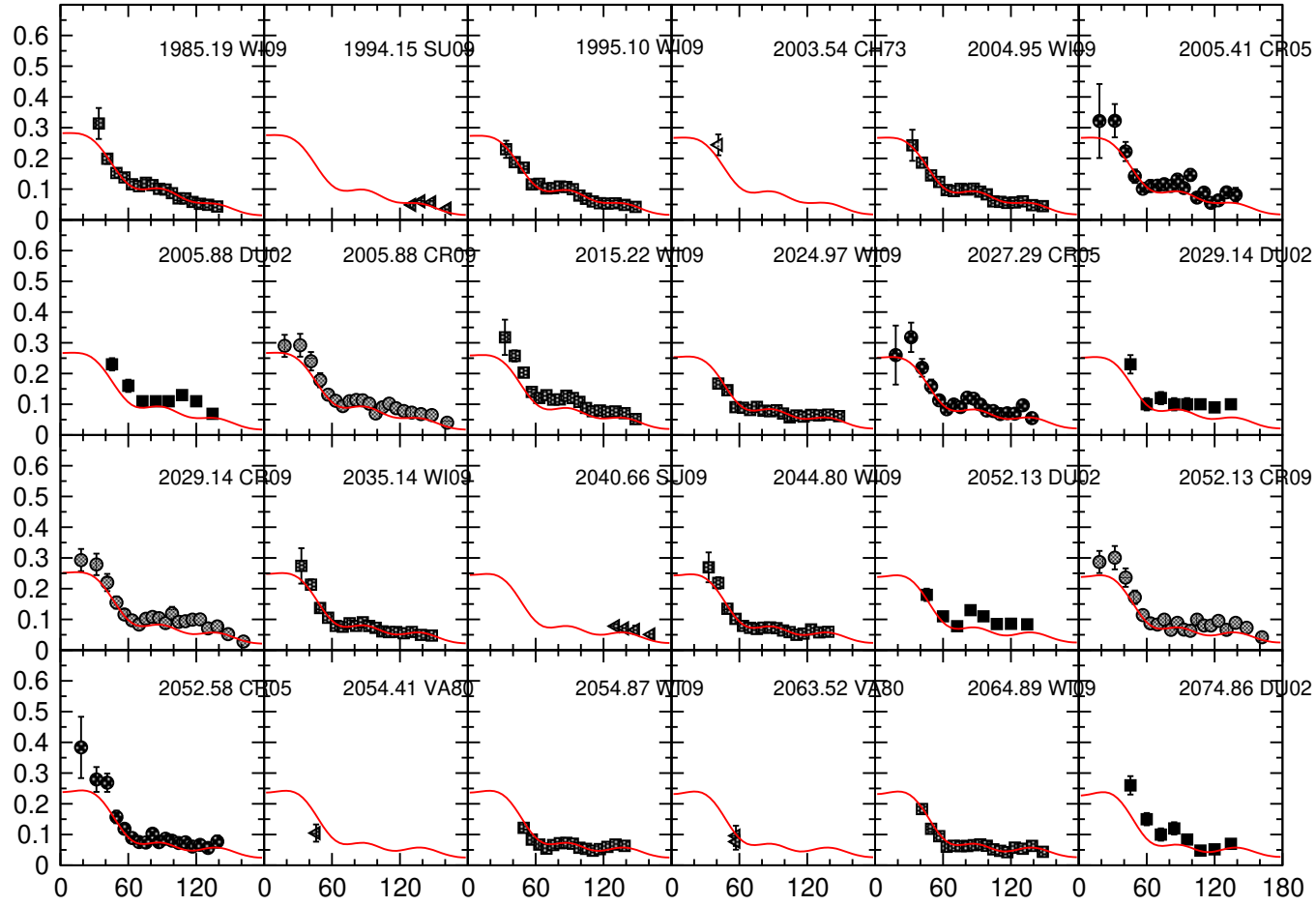

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1726.38 MC10
1729.04 CR05
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1729.59 CR09
1730.07 MC10
1733.76 MC10
1735.00 WI09
1737.38 MC10
1738.78 NA06
1740.40 BA07
1741.05 MC10
1744.60 MC10
1745.25 WI09
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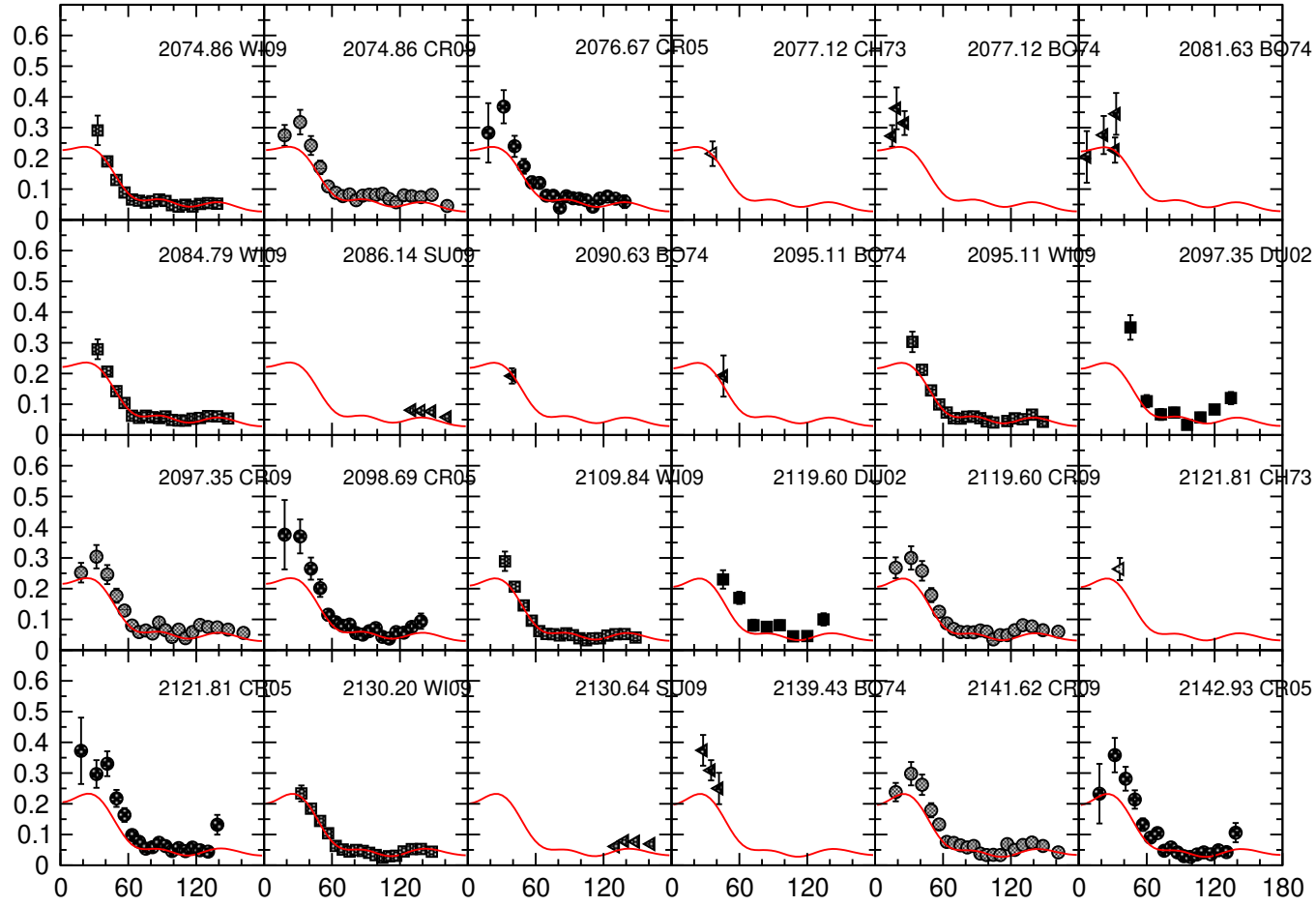

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1765.40 MC10
1768.74 MC10
1771.39 BA07
1772.03 MC10
1775.10 WI09
1775.36 MC10
1778.64 MC10
1781.85 MC10
1783.01 DU02
1783.01 CR05
1783.01 CR09
1785.11 WI09
1785.11 MC10
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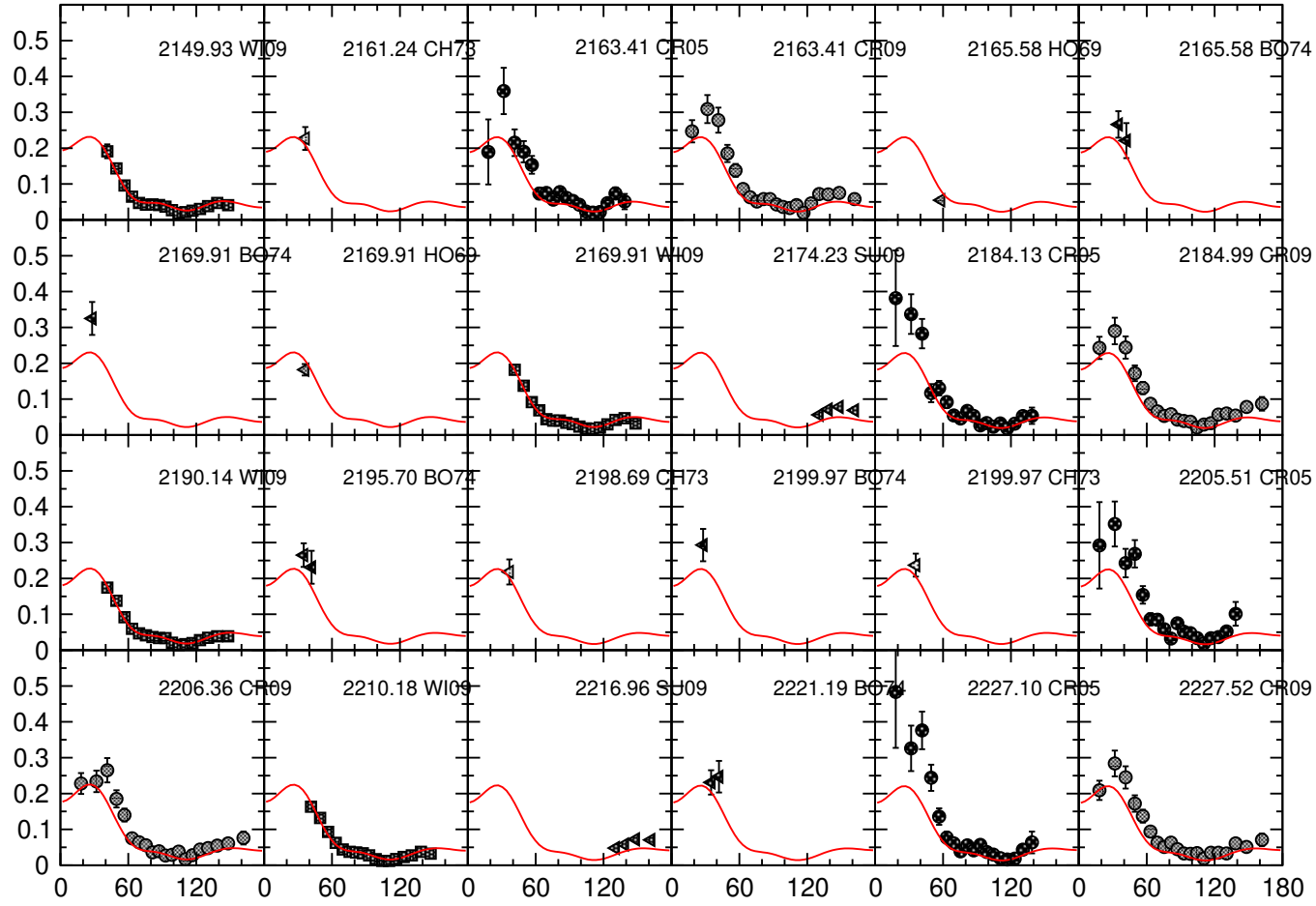

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1804.98 WI09
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1809.13 DU02
1809.13 CR09
1810.17 CR05
1810.37 MC10
1814.83 WI09
1815.55 MC10
1816.38 BA07
1822.05 MC10
1825.14 WI09
1829.81 MC10
1830.78 BA07
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1834.88 CB09
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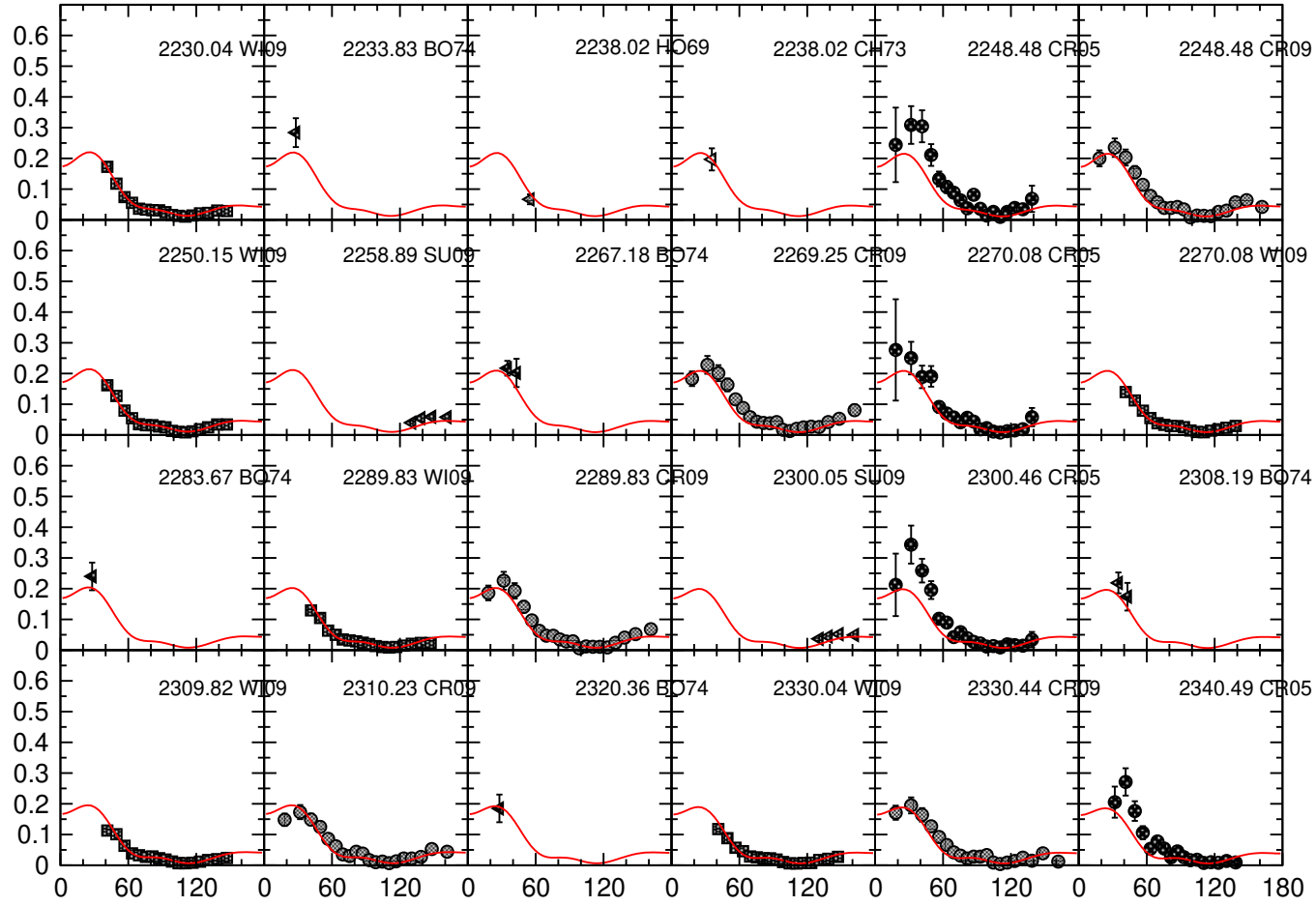

1844.57 BA07
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1858.25 BA07
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1860.27 CR09
1861.23 MC10
1864.80 WI09
1867.82 VA80
1870.23 MC10
1872.34 BA07
1874.84 WI09
1884.82 WI09
1885.32 BA07
1885.32 DU02
1885.32 CR09
1887.31 CR05
1895.25 WI09
1897.72 BA07
1905.12 WI09
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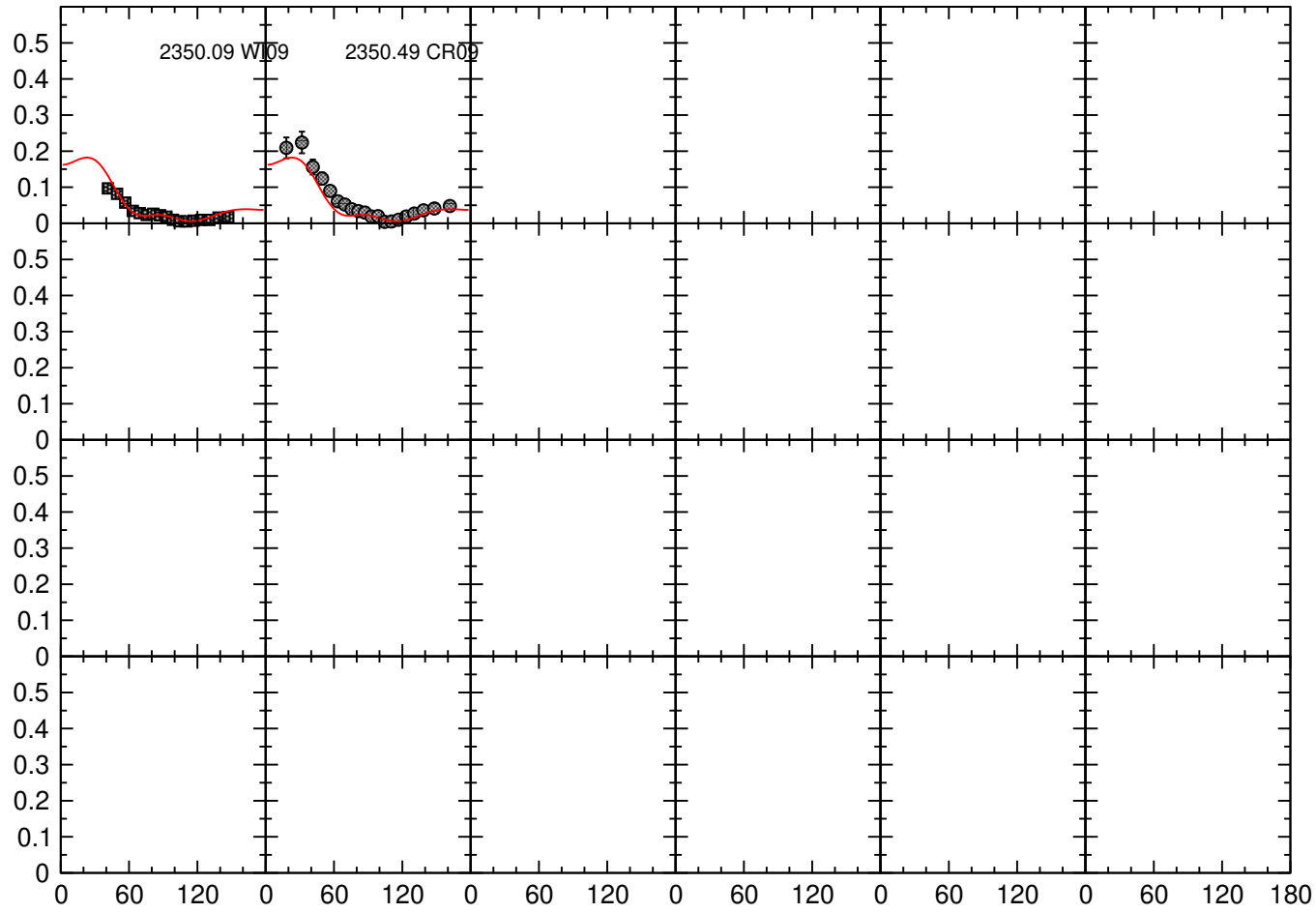

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1932.02 BO74
1934.45 DU02
1934.45 CR09
1934.93 WI09
1936.39 CR05
1936.87 BO74
1936.87 VA80
1941.71 BO74
1945.09 WI09
1958.55 DU02
1958.55 CR05
1958.55 CR09
1964.77 WI09
1965.72 CH73
1974.77 WI09
1982.36 DU02
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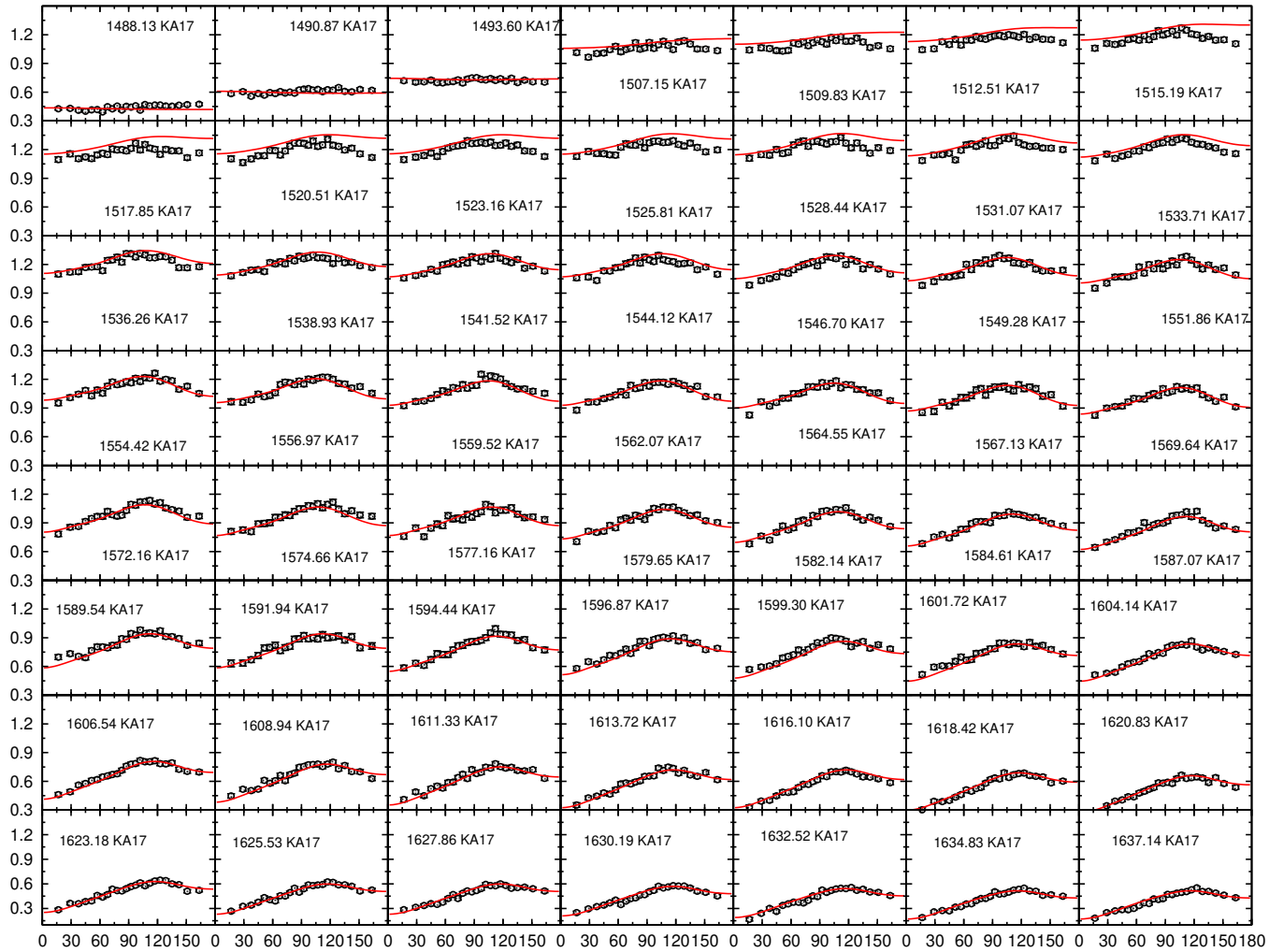

1985.19 WI09
1994.15 SU09
1995.10 WI09
2003.54 CH73
2004.95 WI09
2005.41 CR05
2005.88 DU02
2005.88 CR09
2015.22 WI09
2024.97 WI09
2027.29 CR05
2029.14 DU02
2029.14 CR09
2035.14 WI09
2040.66 SU09
2044.80 WI09
2052.13 DU02
2052.13 CR09
2052.58 CR05
2054.41 VA80
2054.87 WI09
2063.52 VA80
2064.89 WI09
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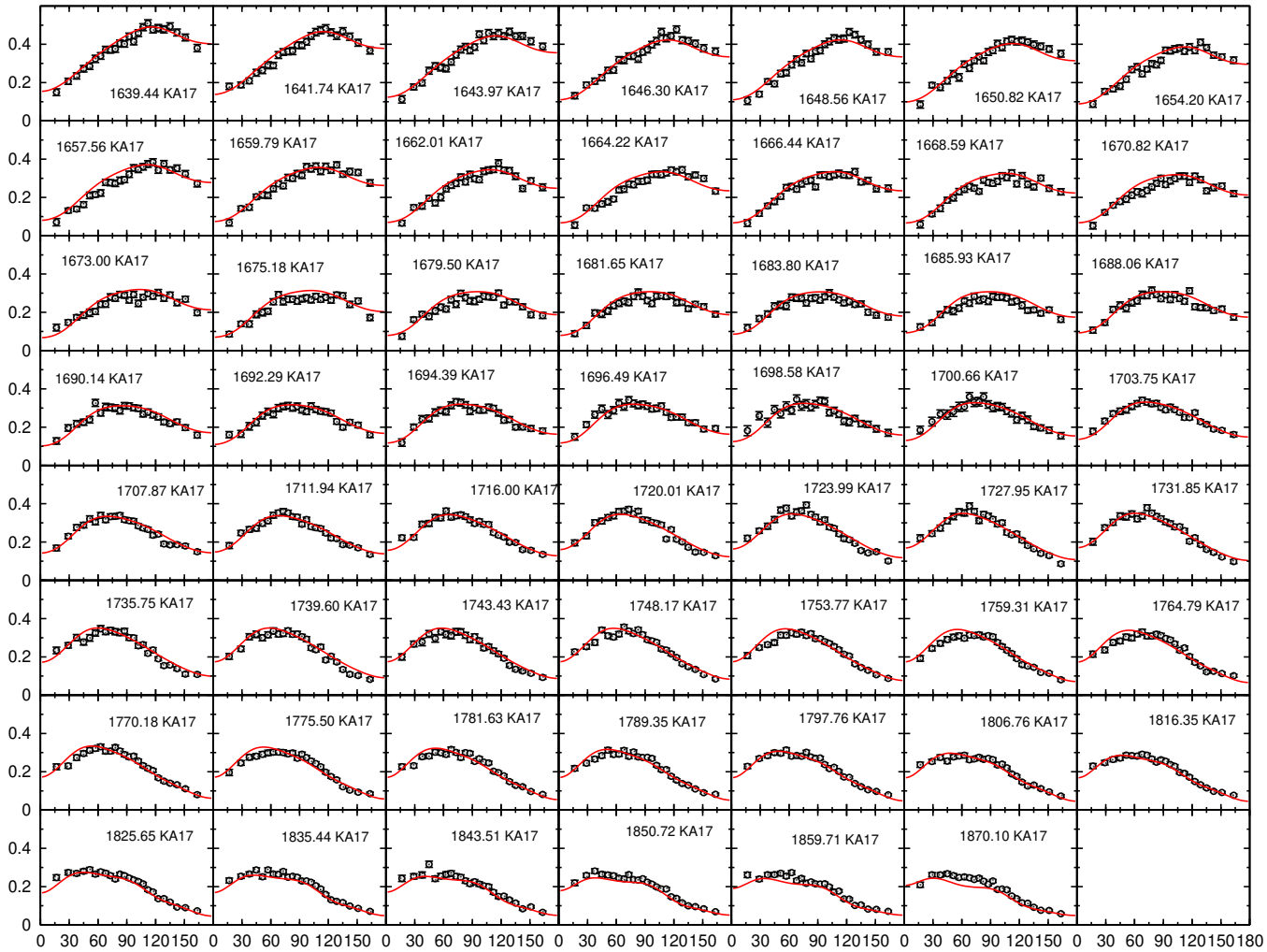

2074.86 WI09
2074.86 CR09
2076.67 CR05
2077.12 CH73
2077.12 BO74
2081.63 BO74
2084.79 WI09
2086.14 SU09
2090.63 BO74
2095.11 BO74
2095.11 WI09
2097.35 DU02
2097.35 CR09
2098.69 CR05
2109.84 WI09
2119.60 DU02
2119.60 CR09
2121.81 CH73
2121.81 CR05
2130.20 WI09
2130.64 SU09
2139.43 BO74
2141.62 CR09
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0
60
120
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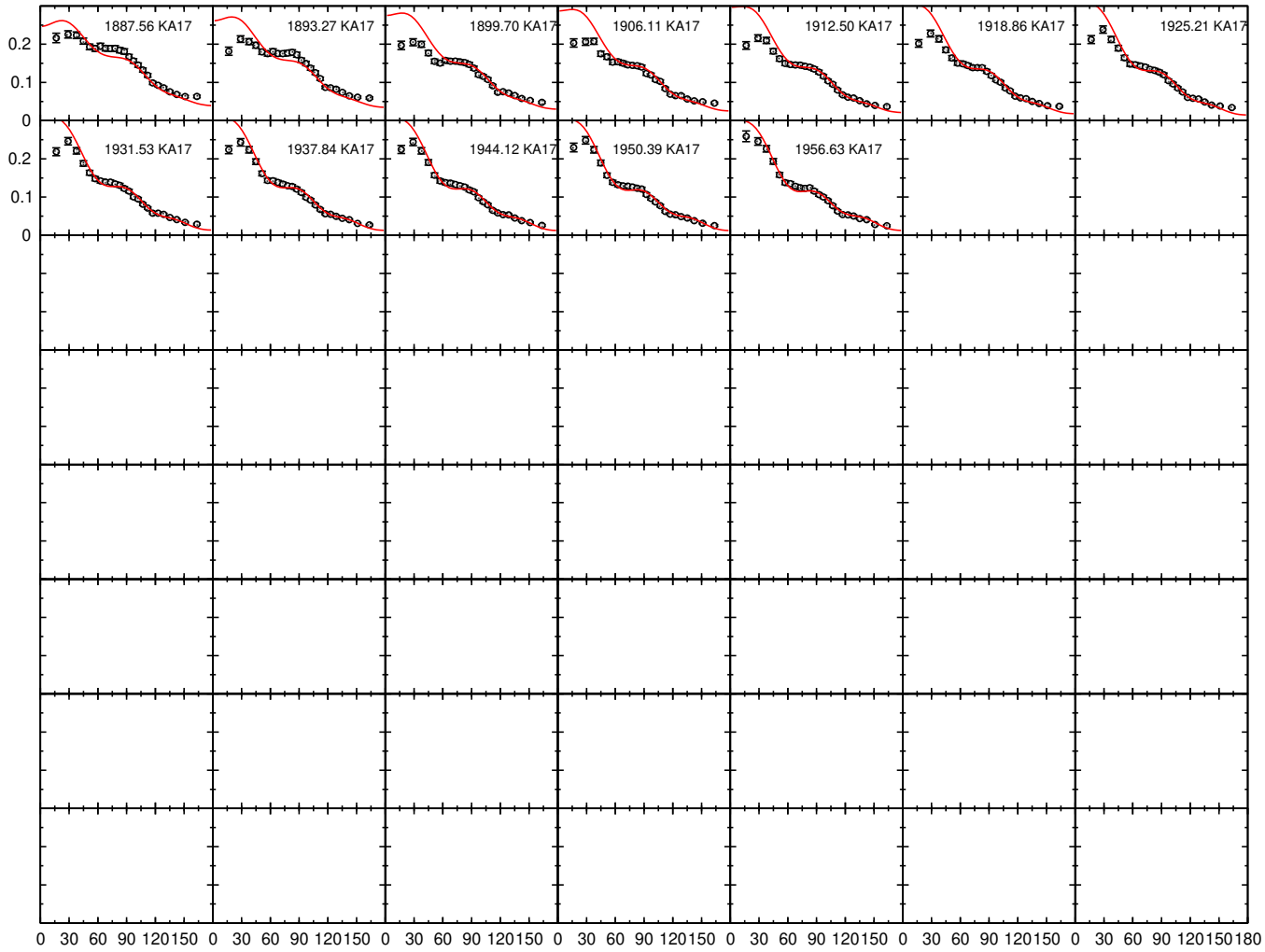

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2163.41 CR05
2163.41 CR09
2165.58 HO69
2165.58 BO74
2169.91 BO74
2169.91 HO69
2169.91 WI09
2174.23 SU09
2184.13 CR05
2184.99 CR09
2190.14 WI09
2195.70 BO74
2198.69 CH73
2199.97 BO74
2199.97 CH73
2205.51 CR05
2206.36 CR09
2210.18 WI09
2216.96 SU09
2221.19 BO74
2227.10 CR05
2227.52 CR09
0
0.1
0.2
0.3
0.4
0.5
0
60
120
180


2230.04 WI09
2233.83 BO74
2238.02 HO69
2238.02 CH73
2248.48 CR05
2248.48 CR09
2250.15 WI09
2258.89 SU09
2267.18 BO74
2269.25 CR09
2270.08 CR05
2270.08 WI09
2283.67 BO74
2289.83 WI09
2289.83 CR09
2300.05 SU09
2300.46 CR05
2308.19 BO74
2309.82 WI09
2310.23 CR09
2320.36 BO74
2330.04 WI09
2330.44 CR09
2340.49 CR05
0 0.1 0.2 0.3 0.4 0.5 0.6
0 60 120 180


2350.09 WI09
2350.49 CR09
0.5
0.4
0.3
0.2
0.1
0
0 60 120 180


1488.13 KA17
1490.87 KA17
1493.60 KA17
1507.15 KA17
1509.83 KA17
1512.51 KA17
1515.19 KA17
1517.85 KA17
1520.51 KA17
1523.16 KA17
1525.81 KA17
1528.44 KA17
1531.07 KA17
1533.71 KA17
1536.26 KA17
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1541.52 KA17
1544.12 KA17
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1549.28 KA17
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1613.72 KA17
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1637.14 KA17
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0.6
0.9
1.2
0 30 60 90 120 150 180


1639.44 KA17
1641.74 KA17
1643.97 KA17
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1648.56 KA17
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1748.17 KA17
1753.77 KA17
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1775.50 KA17
1781.63 KA17
1789.35 KA17
1797.76 KA17
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1816.35 KA17
1825.65 KA17
1835.44 KA17
1843.51 KA17
1850.72 KA17
1859.71 KA17
1870.10 KA17
0 0.2 0.4
0 30 60 90 120 150 180


1887.56 KA17
1893.27 KA17
1899.70 KA17
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1912.50 KA17
1918.86 KA17
1925.21 KA17
1931.53 KA17
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0.2
0 30 60 90 120150 180

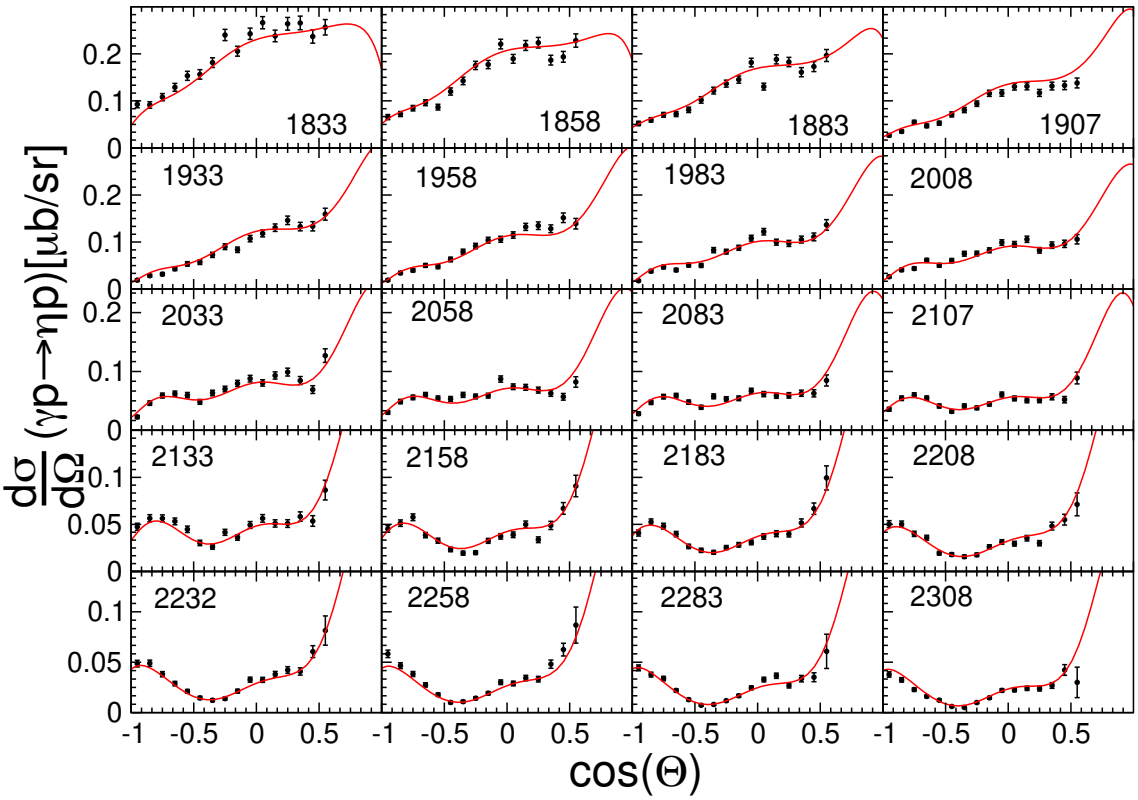
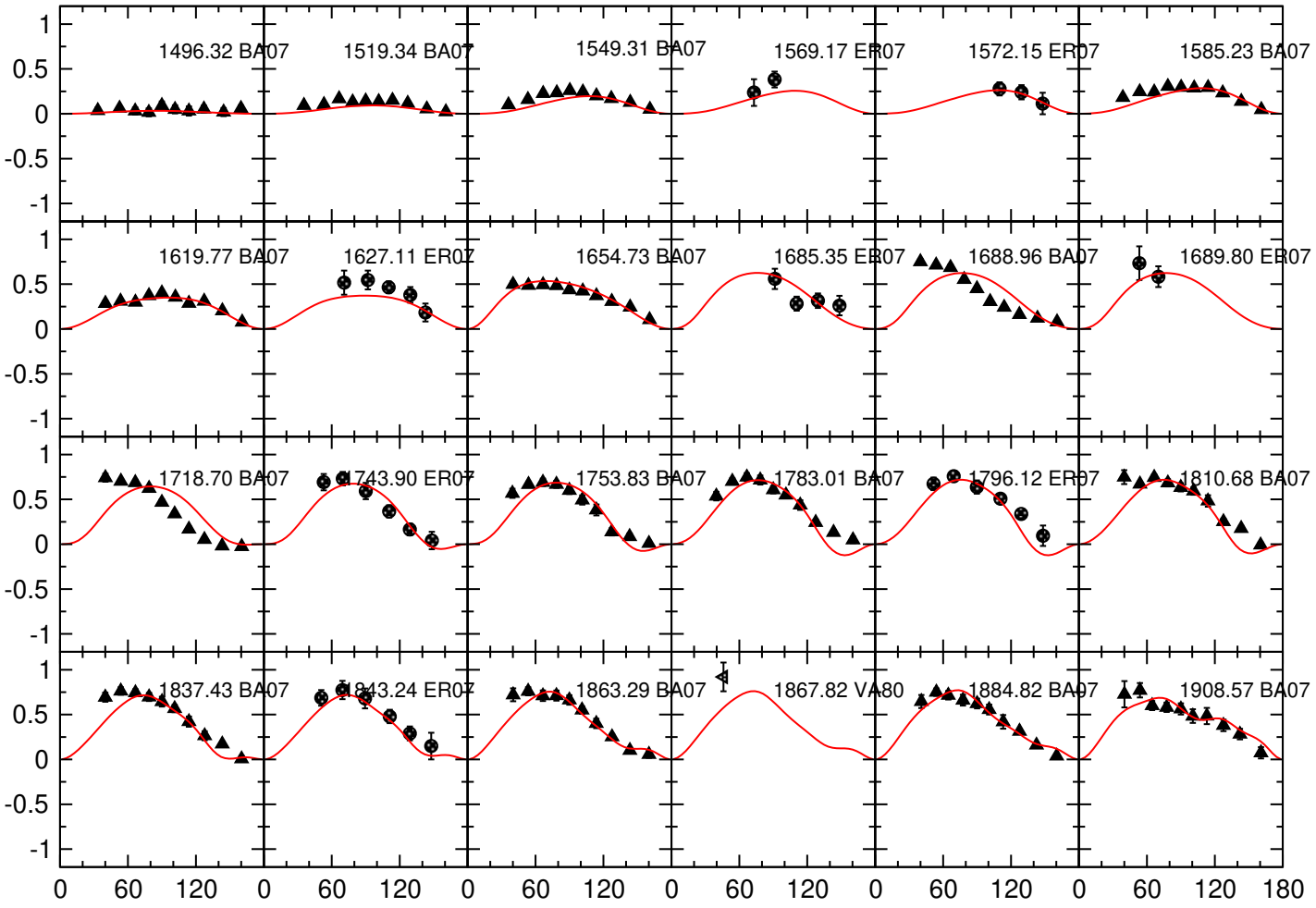
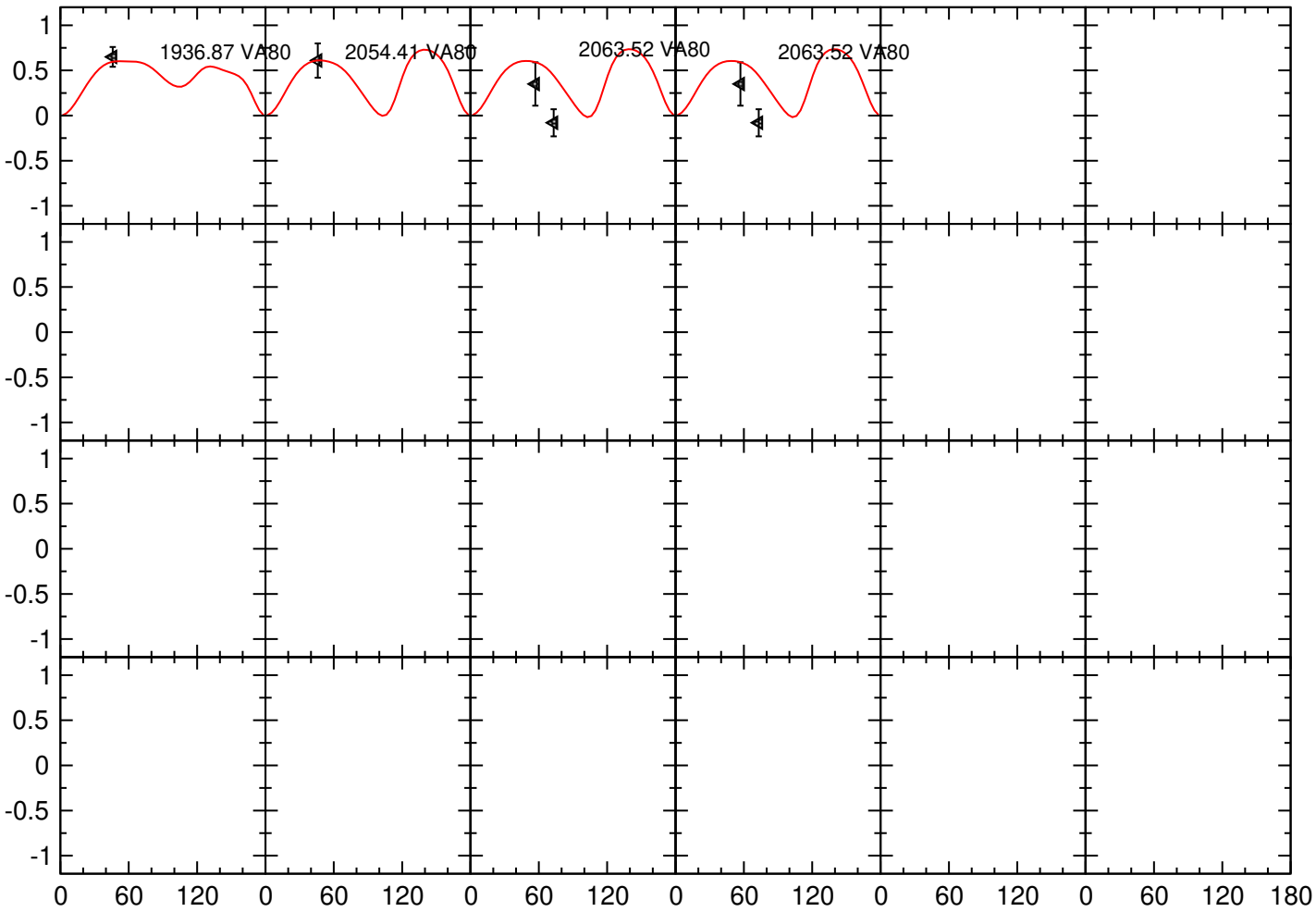


Figure 1: LEPS2022 (Hashimoto *et al.* Phys. Rev. C 106, 035201 (2022)


1496.32 BA07
1519.34 BA07
1549.31 BA07
1569.17 ER07
1572.15 ER07
1585.23 BA07
1619.77 BA07
1627.11 ER07
1654.73 BA07
1685.35 ER07
1688.96 BA07
1689.80 ER07
1718.70 BA07
1743.90 ER07
1753.83 BA07
1783.01 BA07
1796.12 ER07
1810.68 BA07
1837.43 BA07
1843.24 ER07
1863.29 BA07
1867.82 VA80
1884.82 BA07
1908.57 BA07
1
0.5
0
-0.5
-1
0
60
120
180


1936.87 VA80
2054.41 VA80
2063.52 VA80
2063.52 VA80
1
0.5
0
-0.5
-1
0
60
120
180

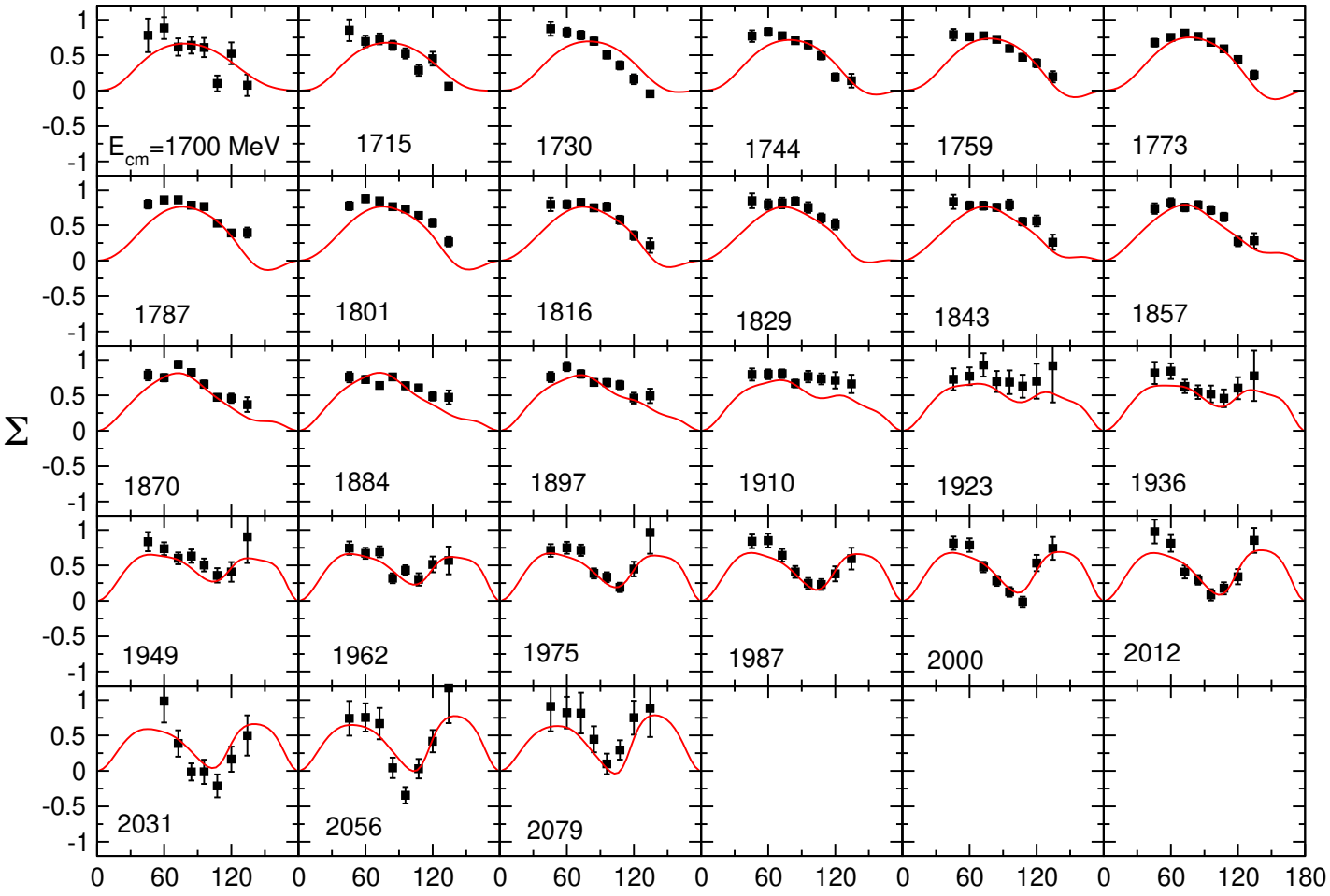
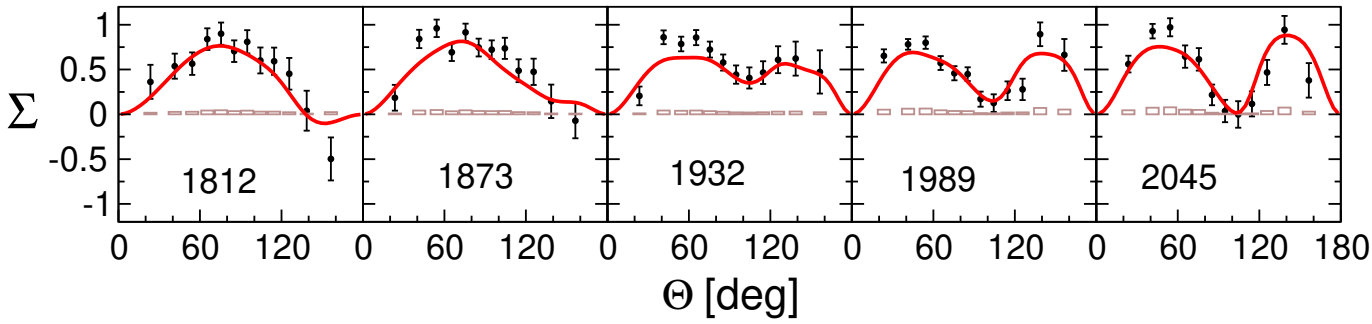


Figure 1: CLAS (Collins et al.) PLB 771, 213 (2017)



CBELSA/TAPS (F. Afzal et al.) PRL 125,152002 (2022)

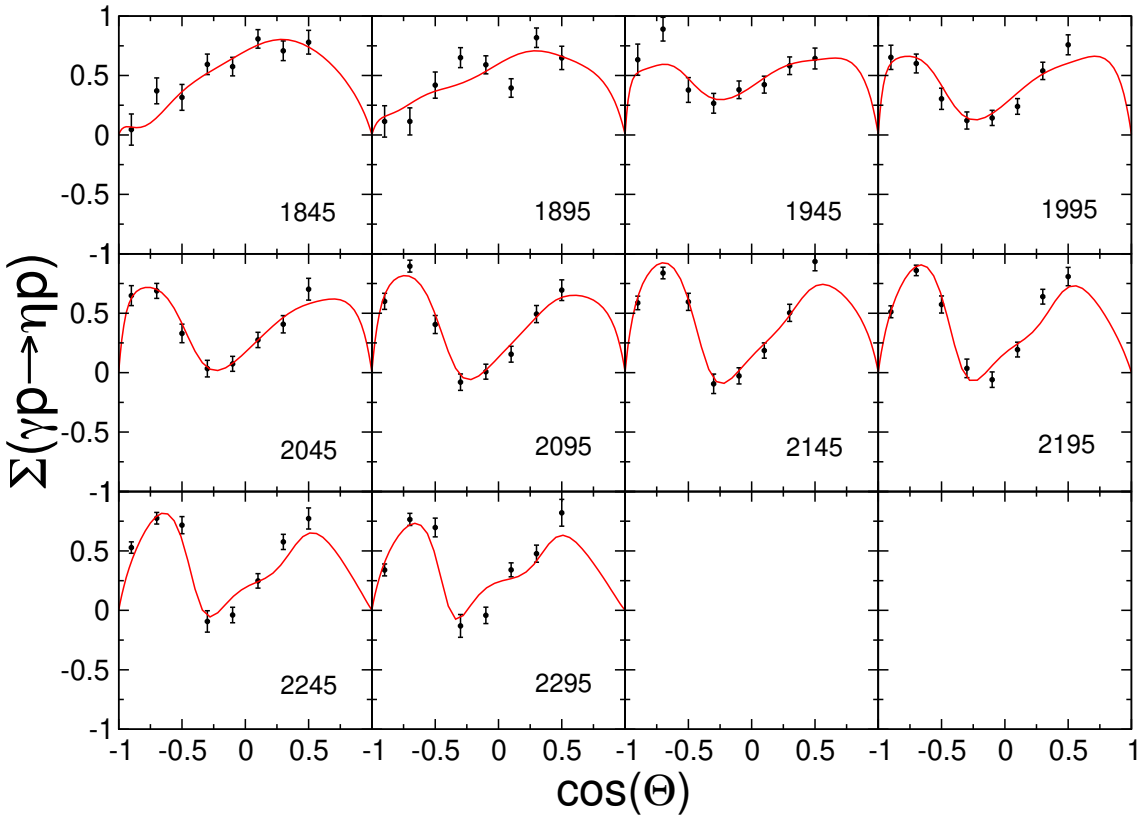
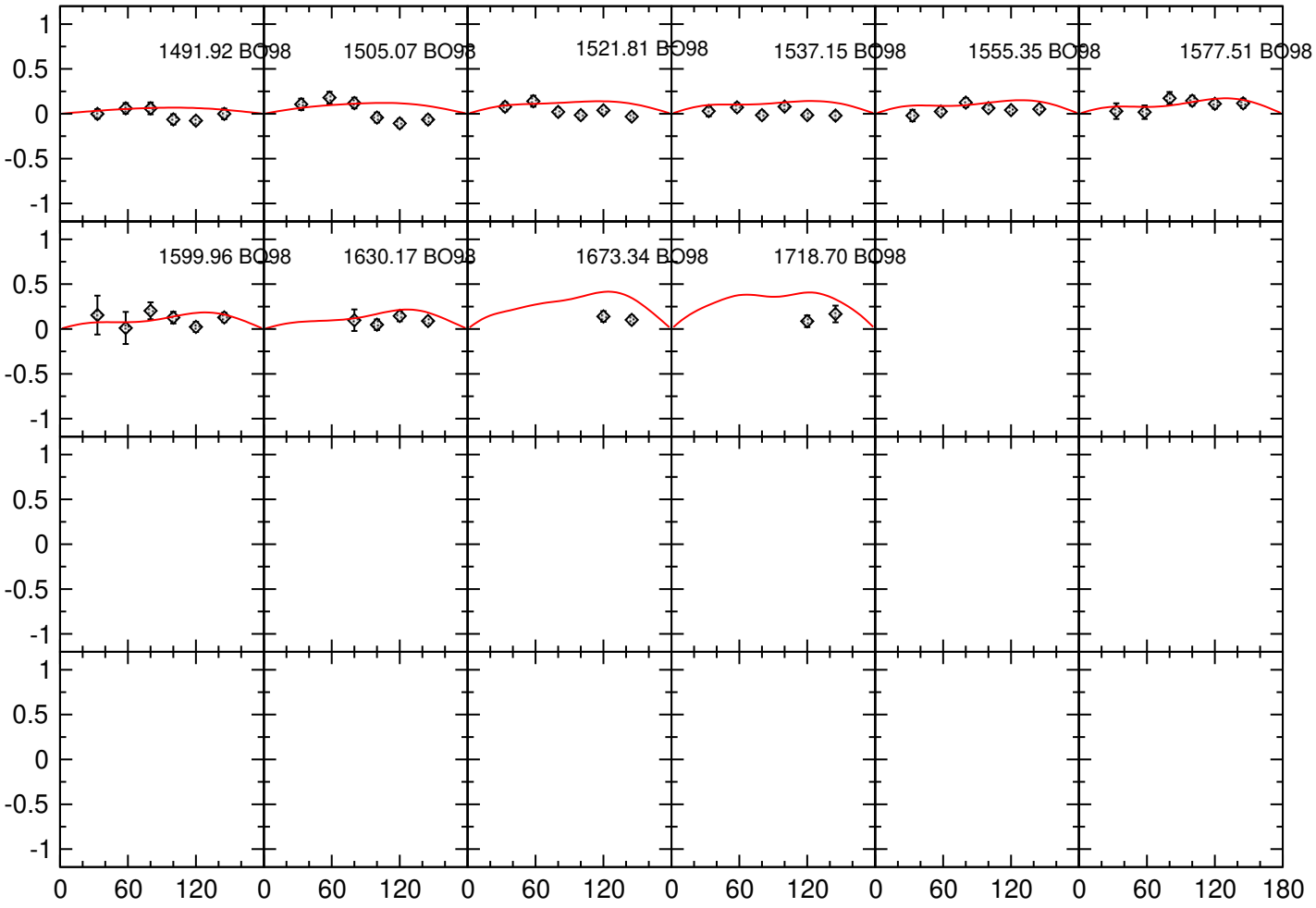
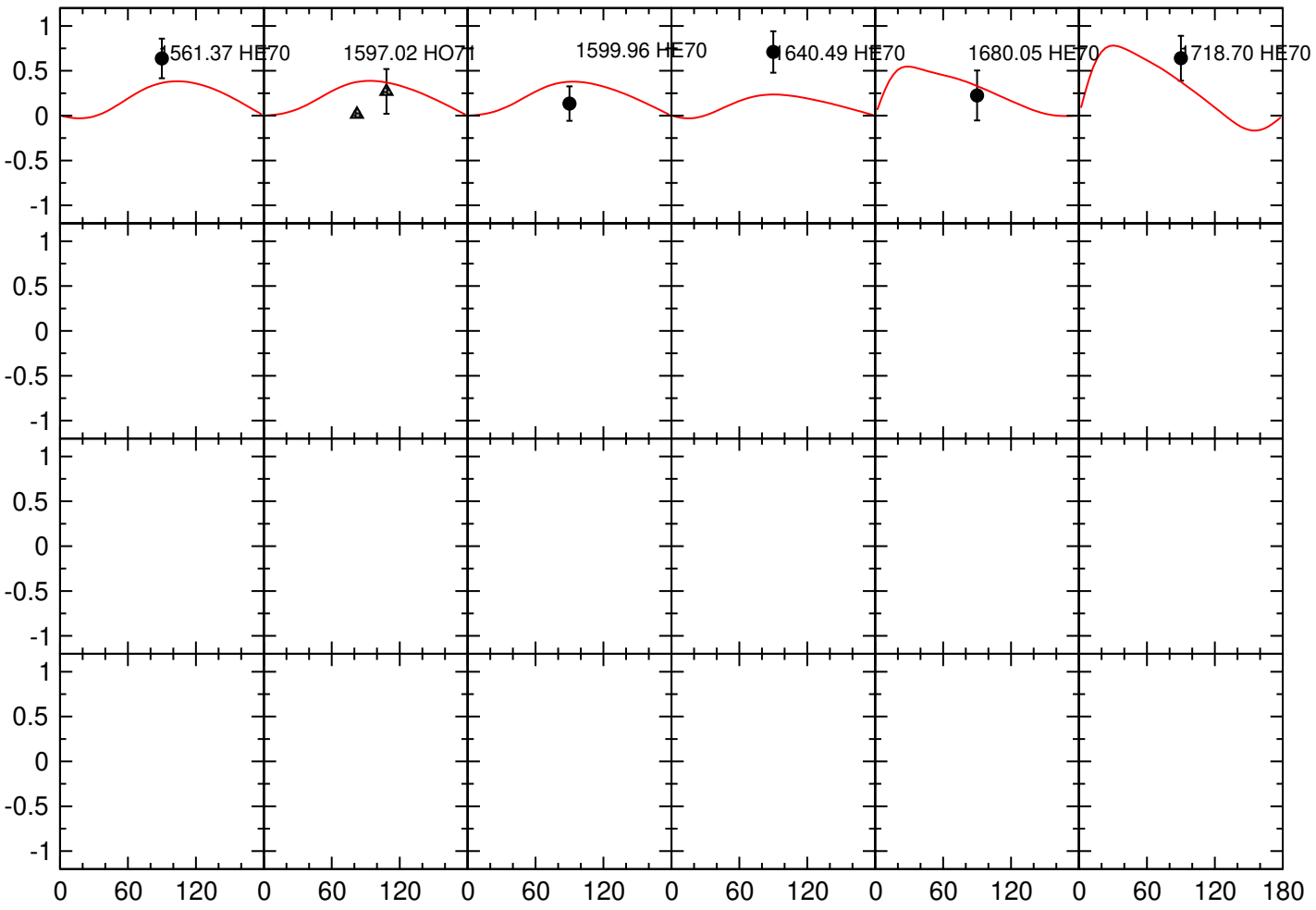
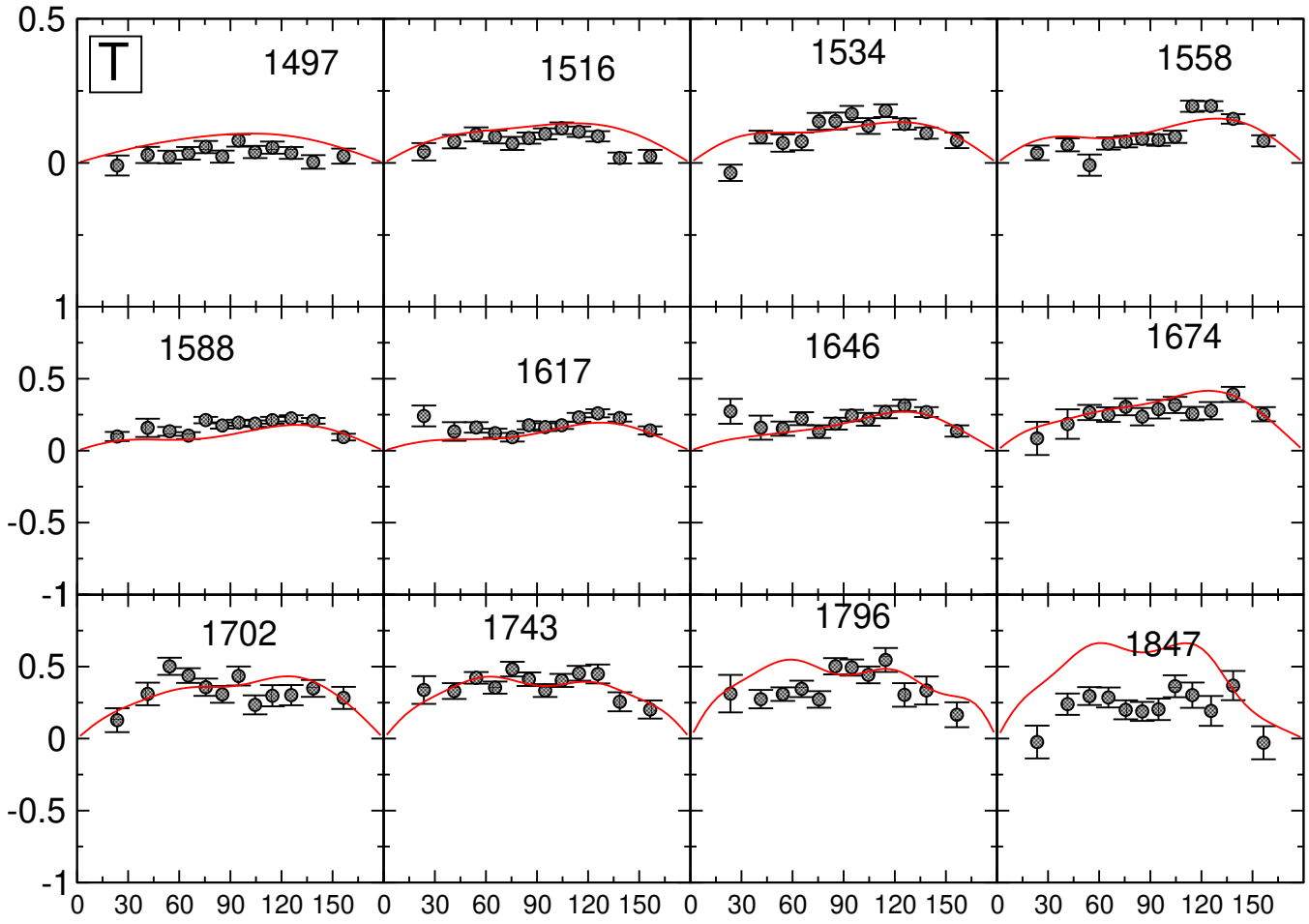
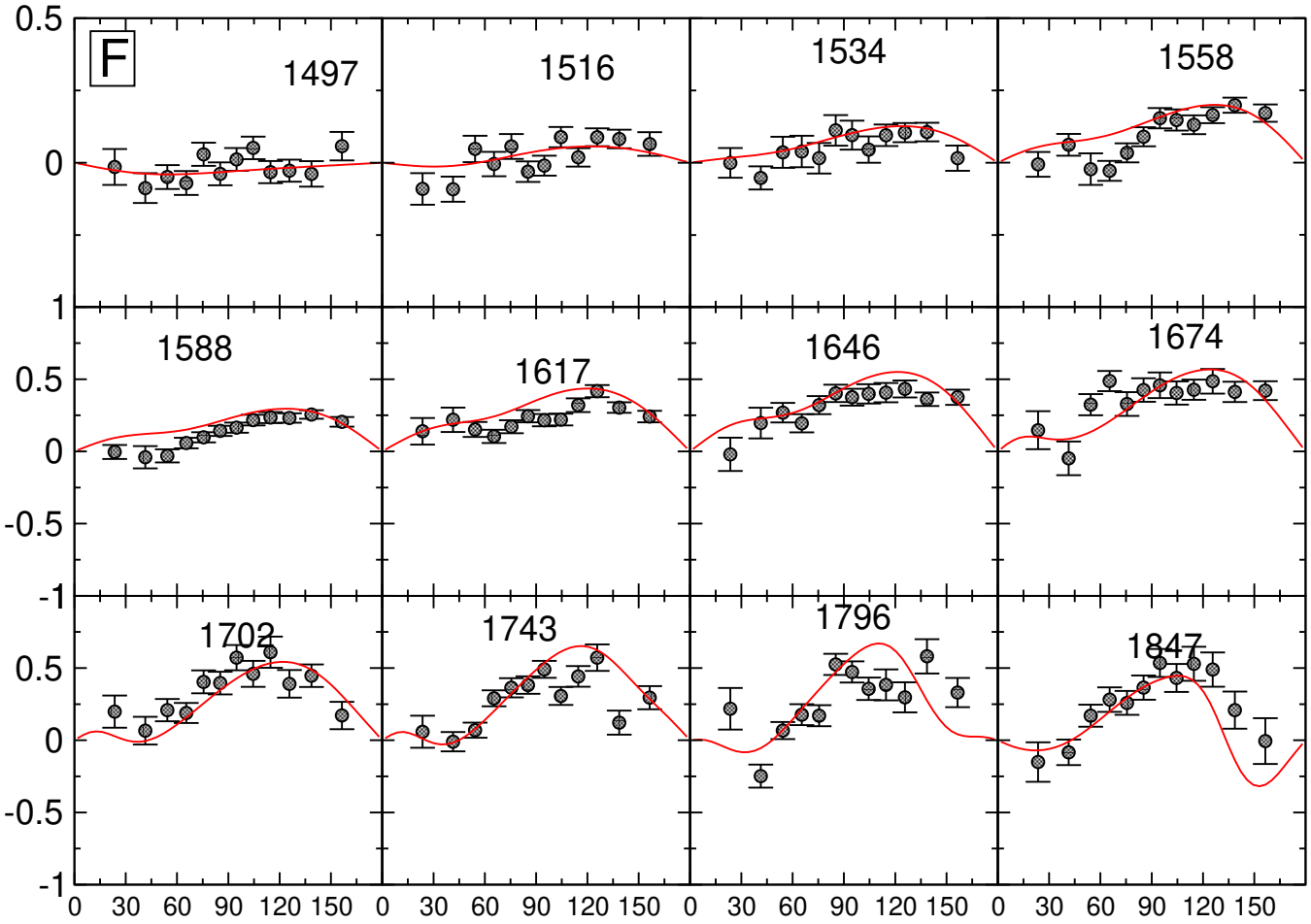


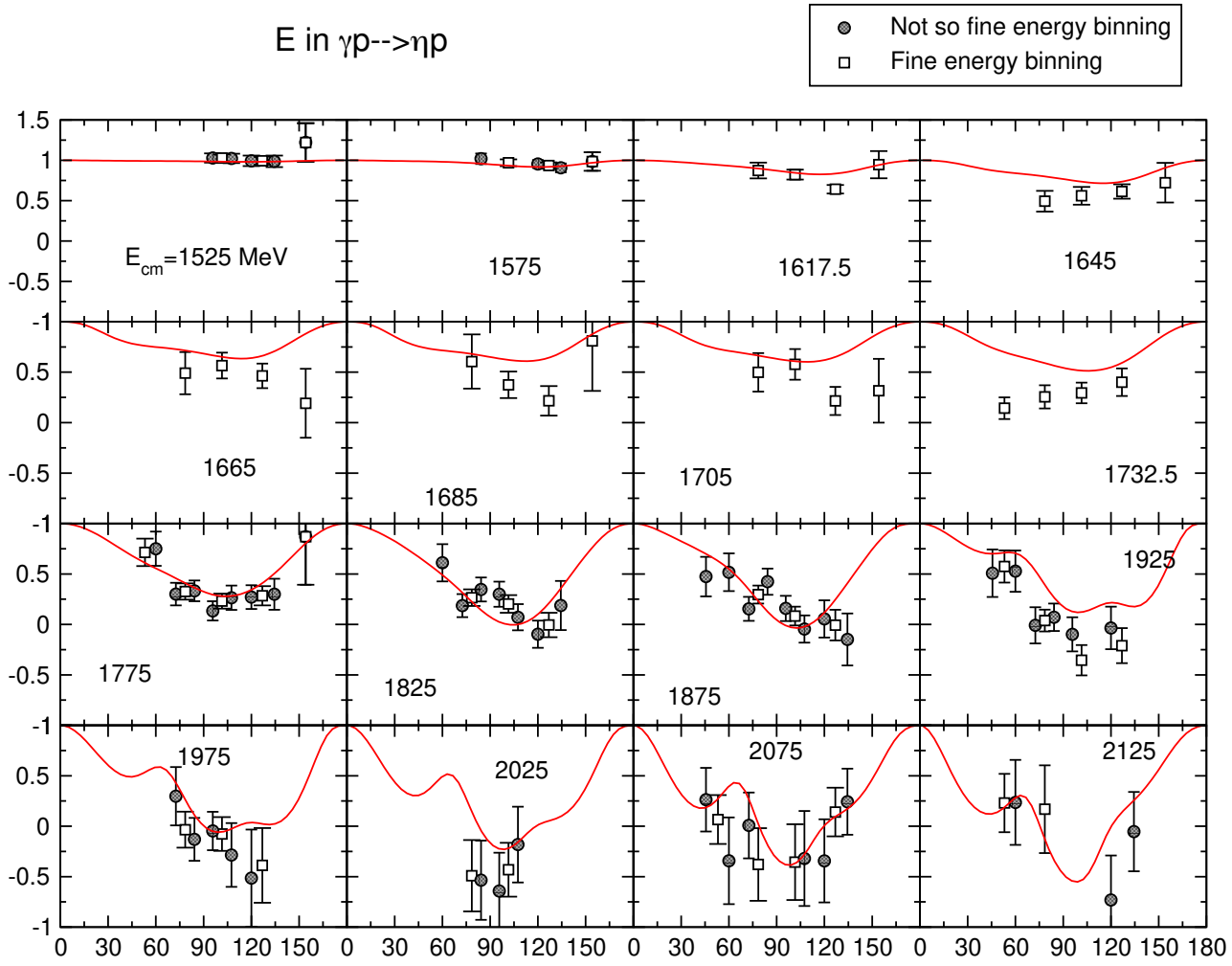
Figure 3: LEPS2022 (Hashimoto *et al.* Phys. Rev. C 106, 035201 (2022)

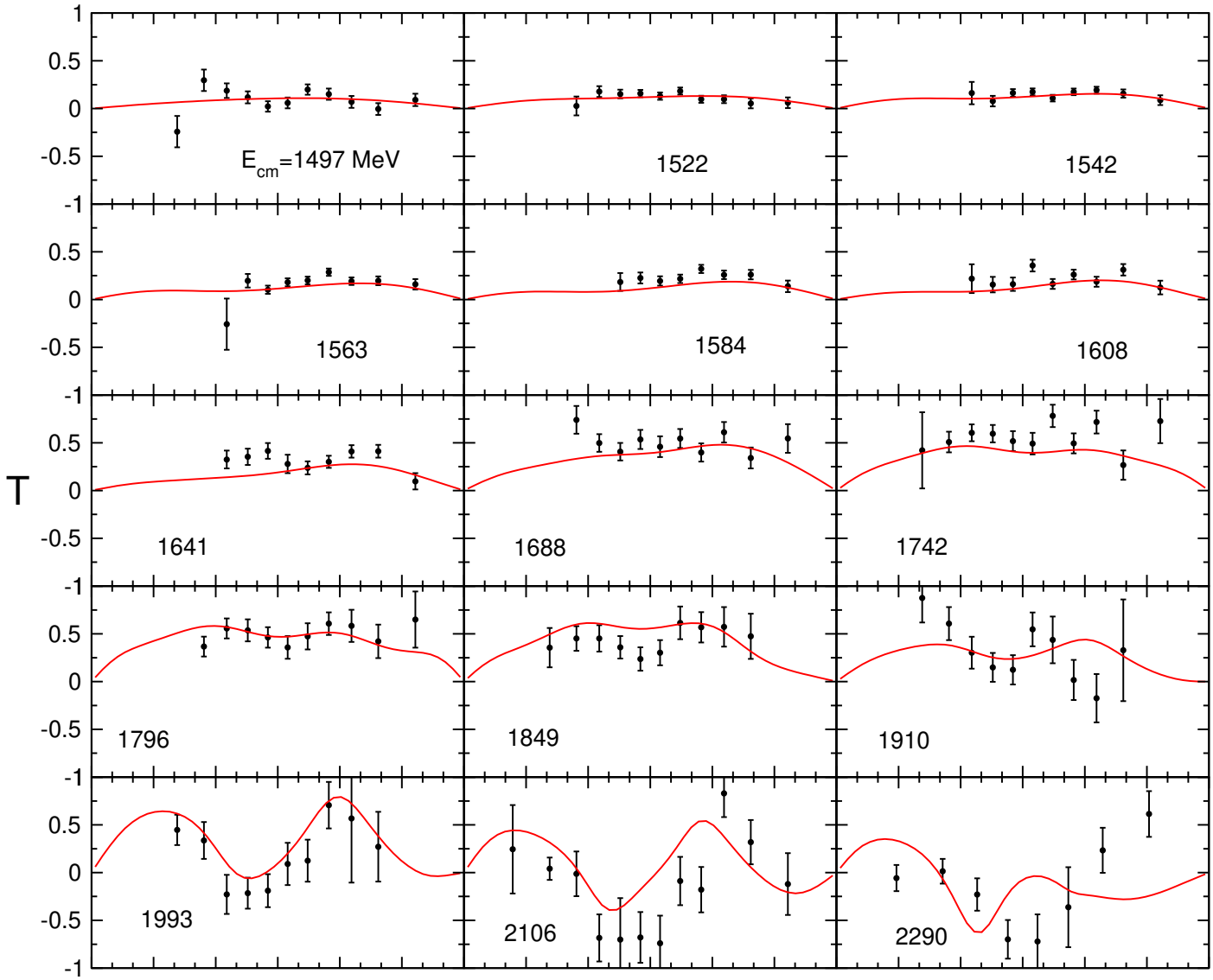

1491.92 BO98
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1555.35 BO98
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1599.96 BO98
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1673.34 BO98
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0
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-1
0
60
120
180

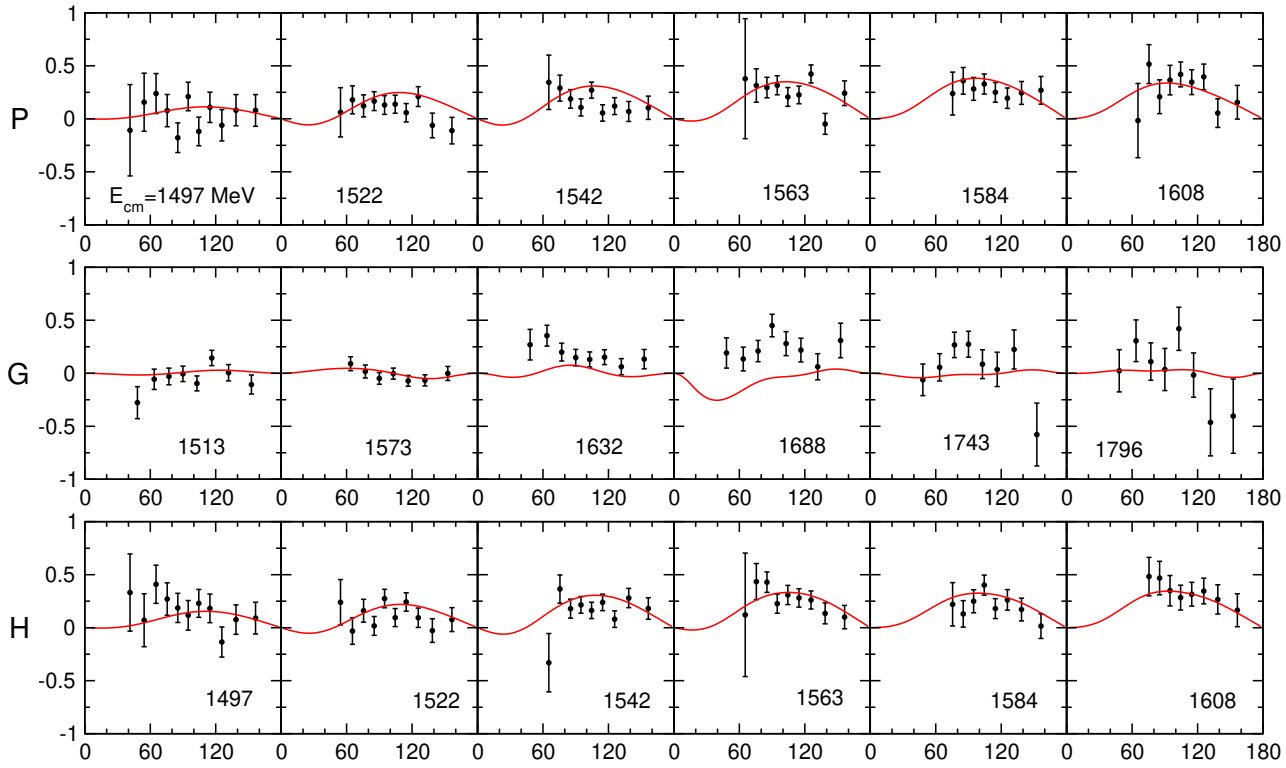

1561.37 HE70
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0.5
0
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0
60
120
180

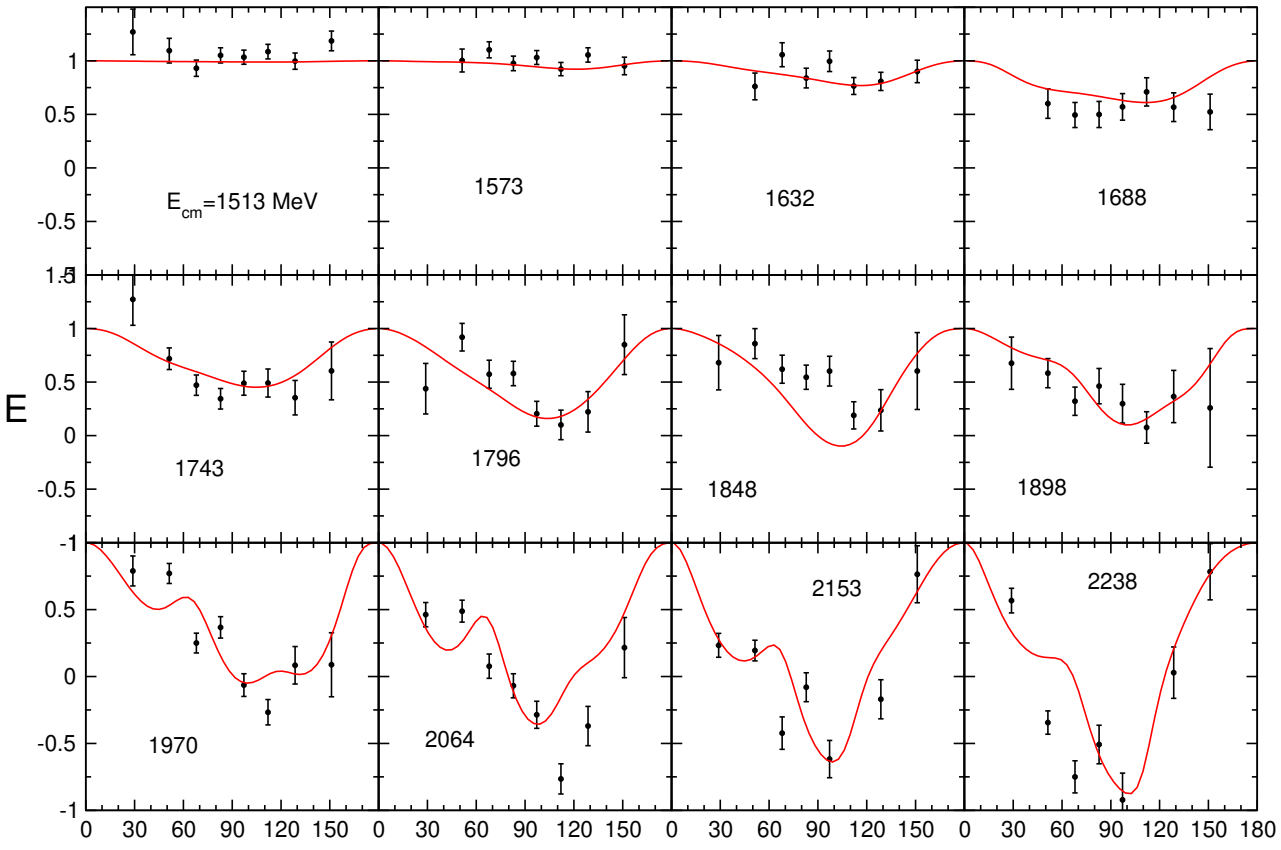

T
1497
1516
1534
1558
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1617
1646
1674
1702
1743
1796
1847
0.5
0
1
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0
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-1
0.5
0
-0.5
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0 30 60 90 120 150
0 30 60 90 120 150
0 30 60 90 120 150
0 30 60 90 120 150


F
1497
1516
1534
1558
1588
1617
1646
1674
1702
1743
1796
1847
0.5
0
1
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0
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0.5
0
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-1
0 30 60 90 120 150
0 30 60 90 120 150
0 30 60 90 120 150
0 30 60 90 120 150


E in γp-->ηp
Not so fine energy binning
Fine energy binning
E_cm=1525 MeV
1575
1617.5
1645
1665
1685
1705
1732.5
1775
1825
1875
1925
1975
2025
2075
2125


T
E_cm=1497 MeV
1522
1542
1563
1584
1608
1641
1688
1742
1796
1849
1910
1993
2106
2290
1
0.5
0
-0.5
-1


P
G
H
E_cm=1497 MeV
1522
1542
1563
1584
1608
1513
1573
1632
1688
1743
1796
1497
1
0.5
0
-0.5
-1
0
60
120
180


E
E_cm=1513 MeV
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1632
1688
1743
1796
1848
1898
1970
2064
2153
2238

Data references

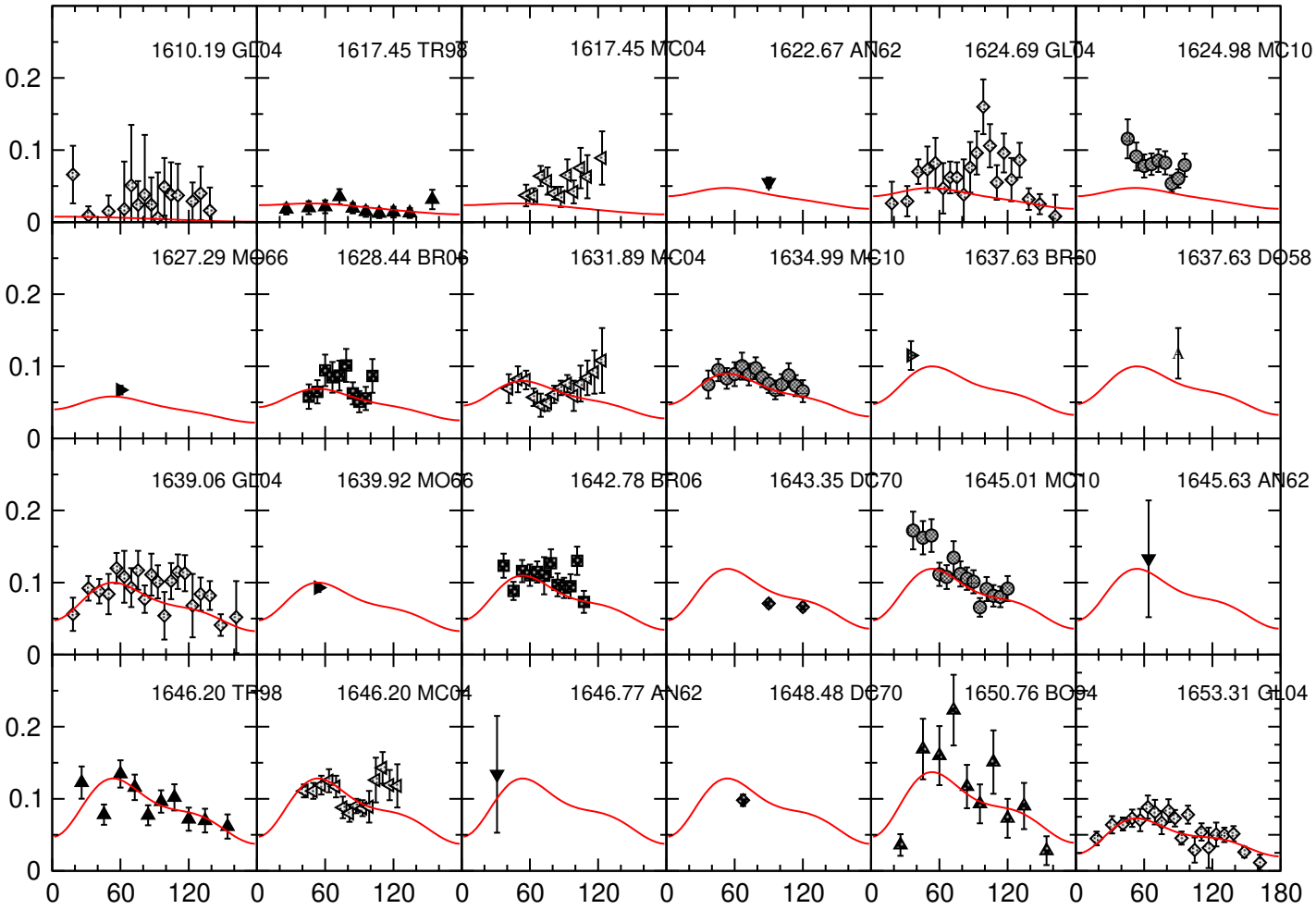
- Differential cross section $\gamma p \to \eta p$:
  - MC(10) MAIN MCNICOLL, PRC82, 035208(2010),
  - BA(07) GRAA BARTALINI, EPJA33, 169(2007)
  - KR(95) MAIN KRUSCHE, PRL74, 3736(1995),
  - NA(06) LNS NAKABAYASHI, PRC74, 035202(2006
  - DE(69)4ORSA DELCOURT, PLB29, 75(1969)
  - DY(95) MIT DYTMAN, PRC51, 2710(1995),
  - CR(05) BONN CREDE, PRL94, 012004(2005)
  - DU(02) JLAB DUGGER, PRL89, 222002(2002),
  - BA(68) FRAS BACCI, PRL20, 571(1968)
  - AR(03) MAIN AHRENS, EPJA17, 241(2003)
  - HO(88) TOKY HOMMA, JPSJ57, 828(1988)
  - BA(66) FRAS BACCI, PRL16, 384(1966)
  - CR(09) BONN CREDE, PRC80, 055202(2009),
  - HO(71) FRAS HONGOH, NCL2, 317(1971)
  - BA(63) FRAS BACCI, PRL11, 37(1963)
  - WI(09) JLAB WILLIAMS, PRC80, 045213(2009),
  - BO(74) DNPL BOOTH, NPB71, 211(1974)
  - VA(80) YERE VARTAPETYAN, SJNP32, 804(1980)
  - CH(73) FRAS CHRIST, NCL8, 1039(1973)
  - SU(09) LEPS SUMIHAMA, PRC80, 052201(2009),
  - HO(69) DNPL HOLT, LNC2, 69(1969)
  - KA(17) MAMI A2 Kashevarov et al. PRL 118, 212001 (2017)
  - Hashimoto *et al.* Phys. Rev. C 106, 035201 (2022)
- Beam asymmetry Σ $\gamma p \to \eta p$:
  - BA(07) GRAA BARTALINI, EPJA33, 169(2007)
  - ER(07) BONN ELSNER, EPJA33, 147(2007)
  - VA(80) YERE VARTAPETYAN, SJNP32, 804(1980)
  - Collins *et al.*, PLB 771, 213 (2017)
  - F. Afzal et al. (CBELSA/TAPS) PRL 125, 152002 (2022)
  - Hashimoto *et al.* Phys. Rev. C 106, 035201 (2022)
- Recoil Polarization $\gamma p \to \eta p$:
  - HE(70) CALT HEUSCH, PRL25, 1381(1970)
  - HO(71) FRAS HONGOH, NCL2, 317(1971)
  - J. Müller et al. (CBELSA/TAPS) PLB 803, 135323 (2020)
- Target asymmetry T $\gamma p \to \eta p$:
  - BO(98) BONN BOCK, PRL81, 534(1998)
  - Akondi *et al.* [A2 at MAMI Collaboration] PRL 113, 102001 (2014)
  - J. Müller et al. (CBELSA/TAPS) PLB 803, 135323 (2020)
- E $\gamma p \to \eta p$:

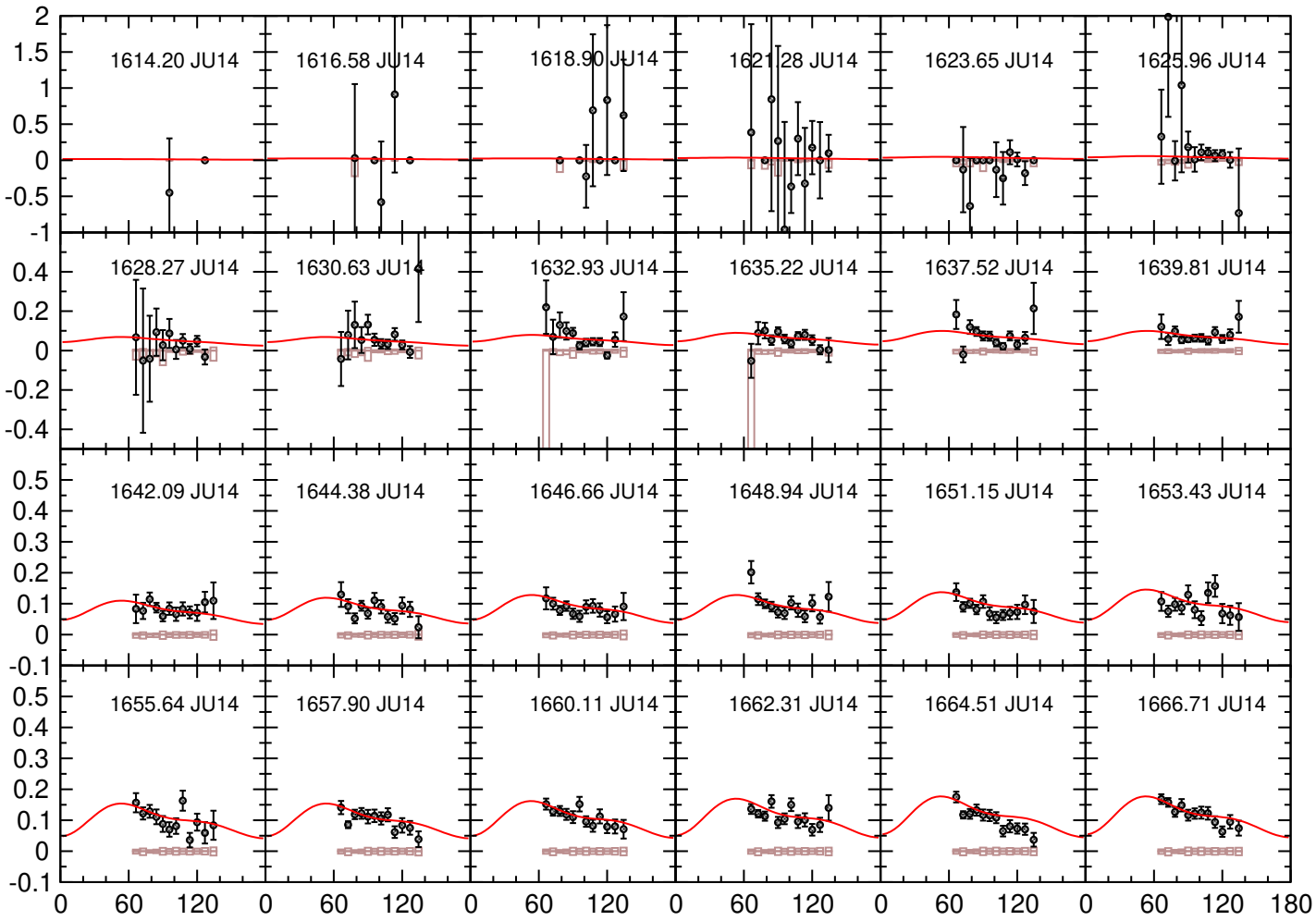
  - Senderovich *et al.* [CLAS Collaboration] PLB 755, 64 (2016)
  - J. Müller et al. (CBELSA/TAPS) PLB 803, 135323 (2020)

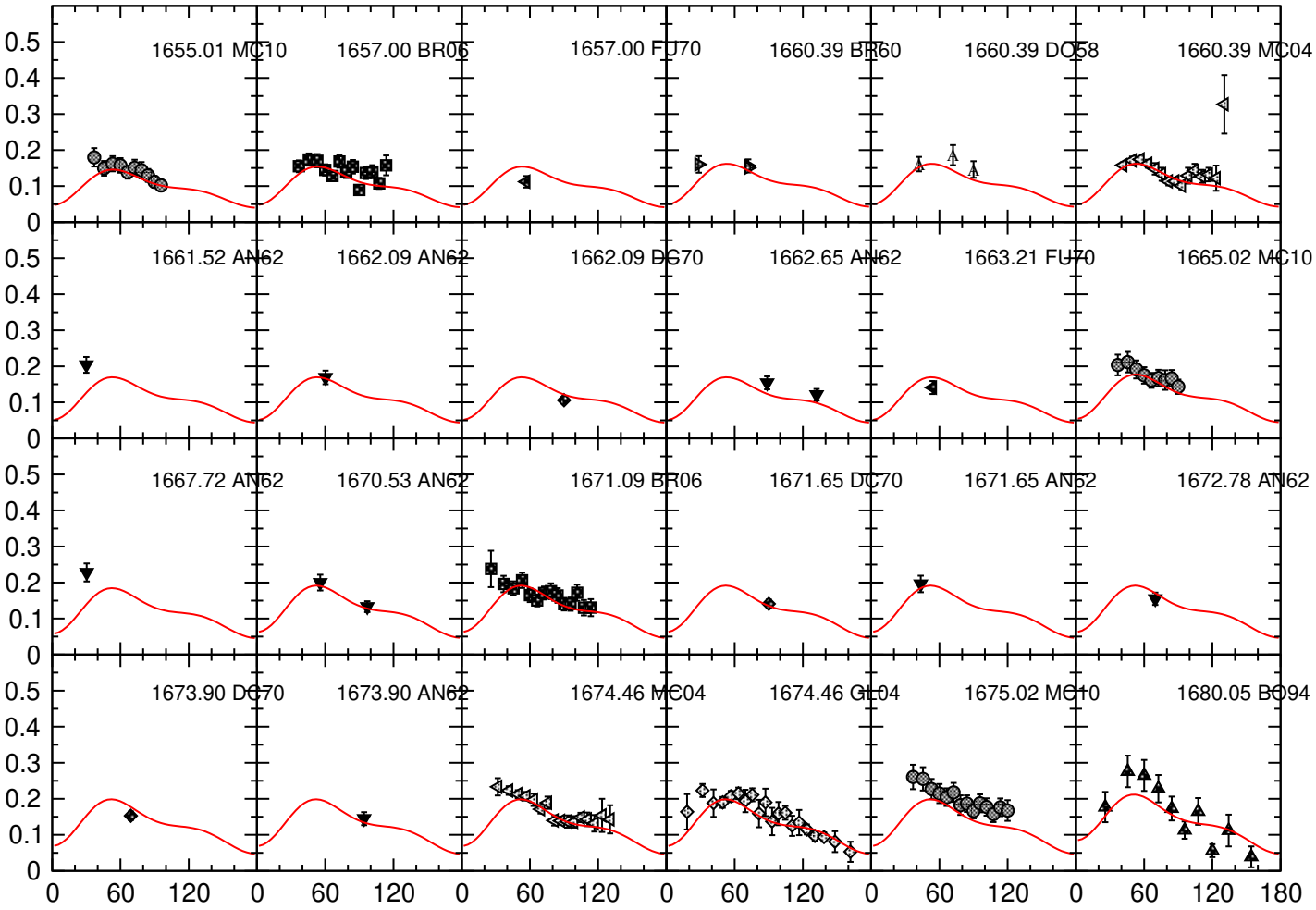
- F $\gamma p \to \eta p$:
  - Akondi *et al.* [A2 at MAMI Collaboration] PRL 113, 102001 (2014)

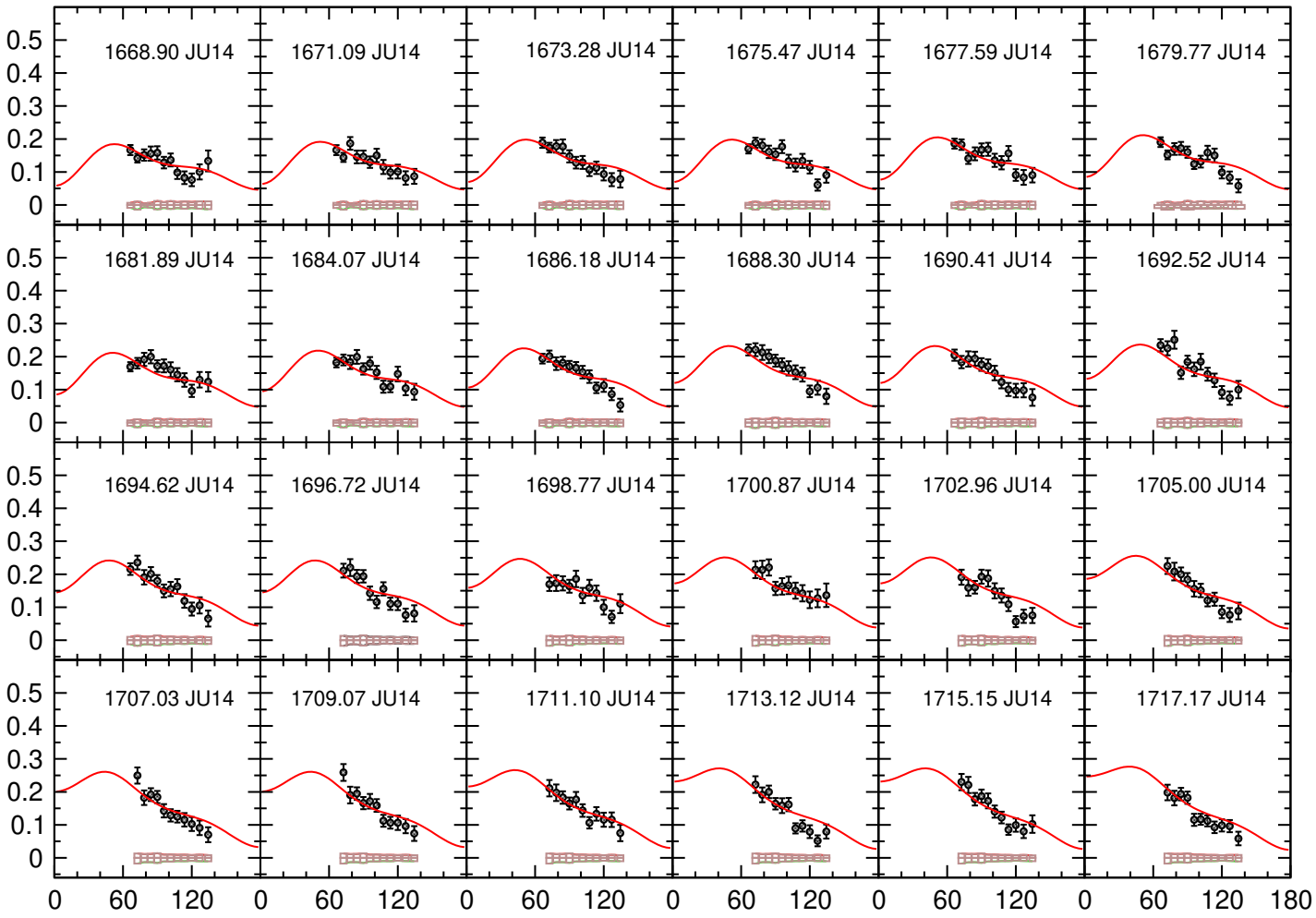
- G $\gamma p \to \eta p$:
  - J. Müller et al. (CBELSA/TAPS) PLB 803, 135323 (2020)

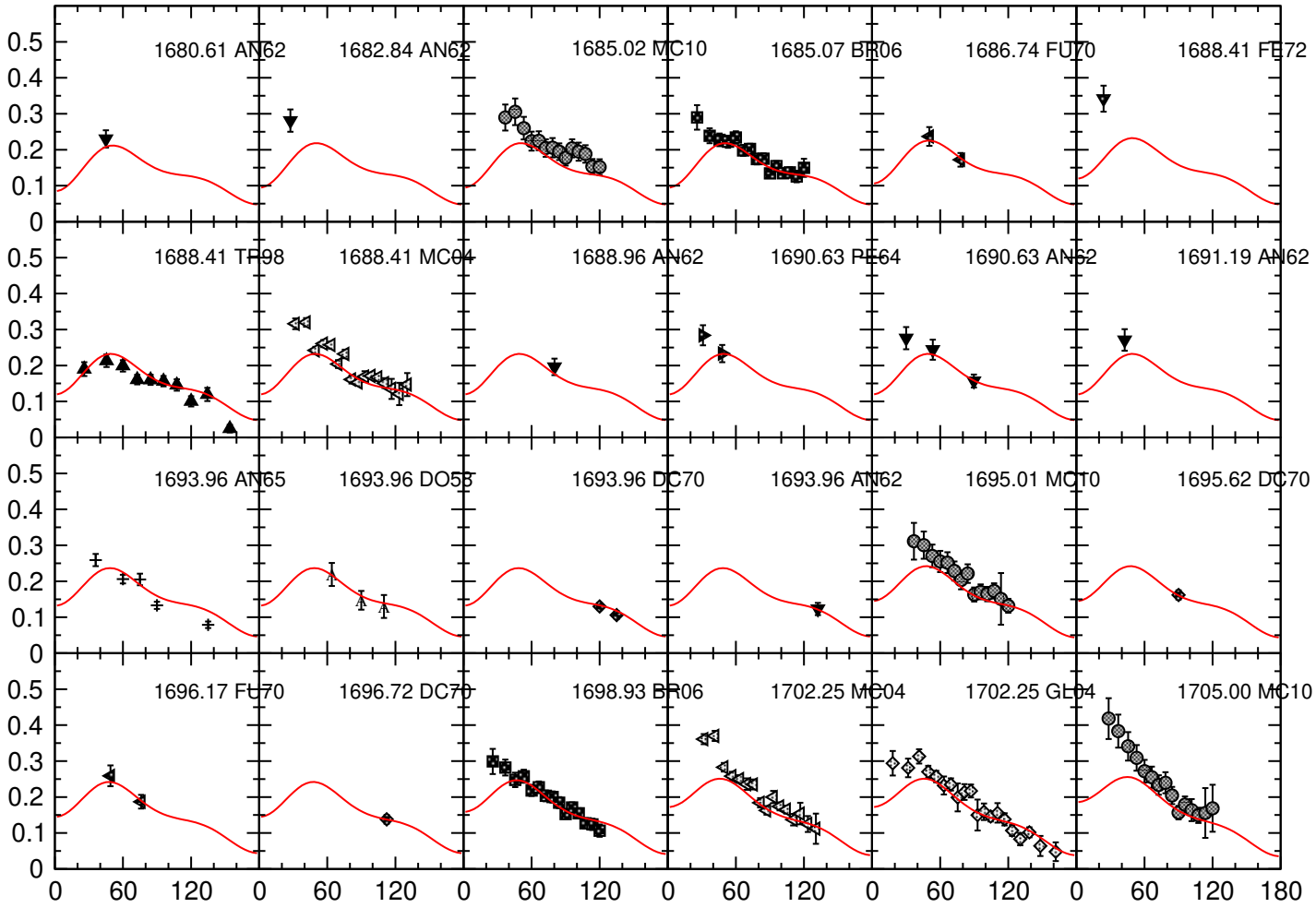
- H $\gamma p \to \eta p$:
  - J. Müller et al. (CBELSA/TAPS) PLB 803, 135323 (2020)

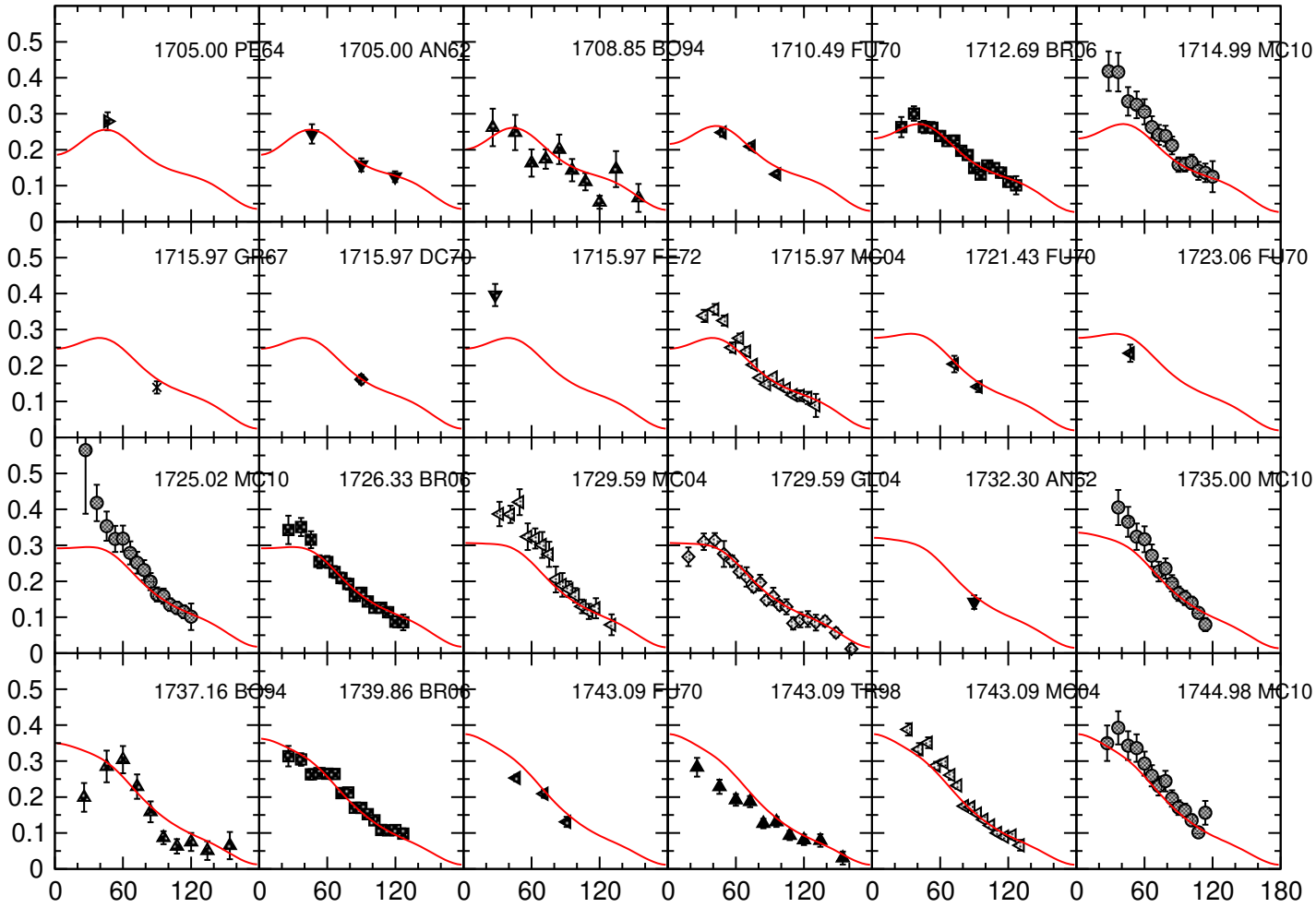

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1634.99 MC10
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1639.06 GL04
1639.92 MO66
1642.78 BR06
1643.35 DC70
1645.01 MC10
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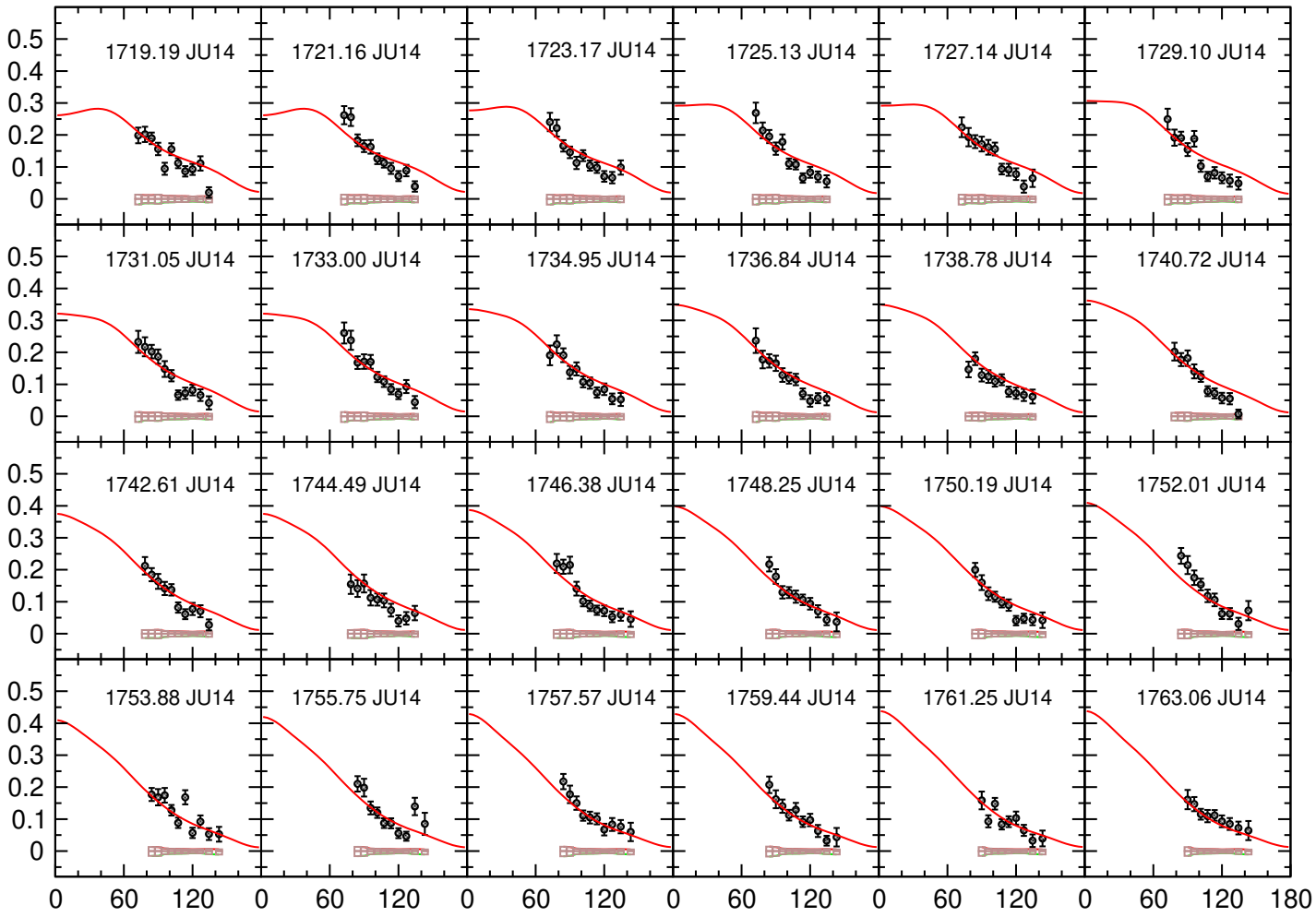

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1630.63 JU14
1632.93 JU14
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1637.52 JU14
1639.81 JU14
1642.09 JU14
1644.38 JU14
1646.66 JU14
1648.94 JU14
1651.15 JU14
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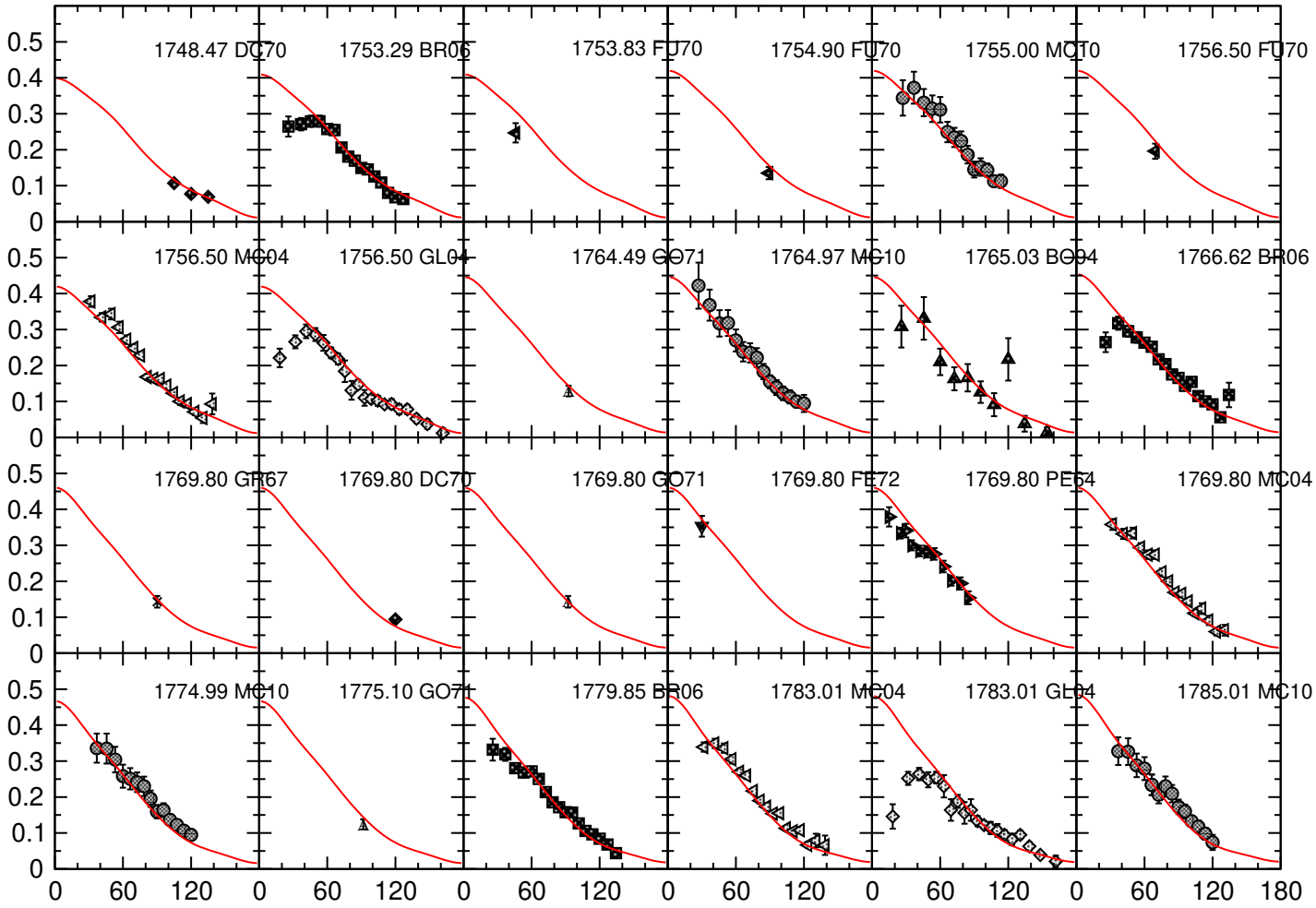

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1662.09 AN62
1662.09 DG70
1662.65 AN62
1663.21 FU70
1665.02 MC10
1667.72 AN62
1670.53 AN62
1671.09 BR06
1671.65 DG70
1671.65 AN62
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1673.90 DG70
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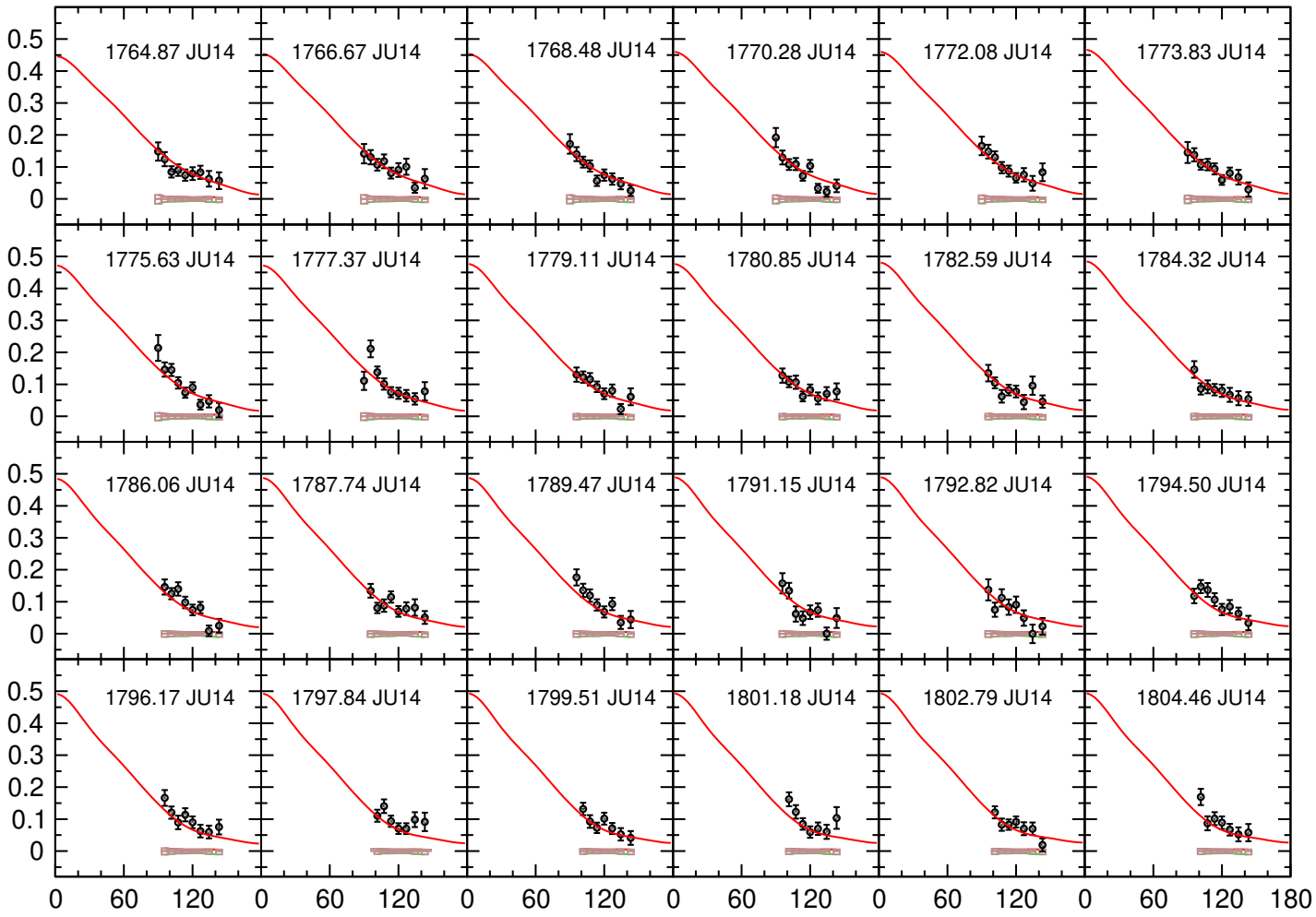

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1688.30 JU14
1690.41 JU14
1692.52 JU14
1694.62 JU14
1696.72 JU14
1698.77 JU14
1700.87 JU14
1702.96 JU14
1705.00 JU14
1707.03 JU14
1709.07 JU14
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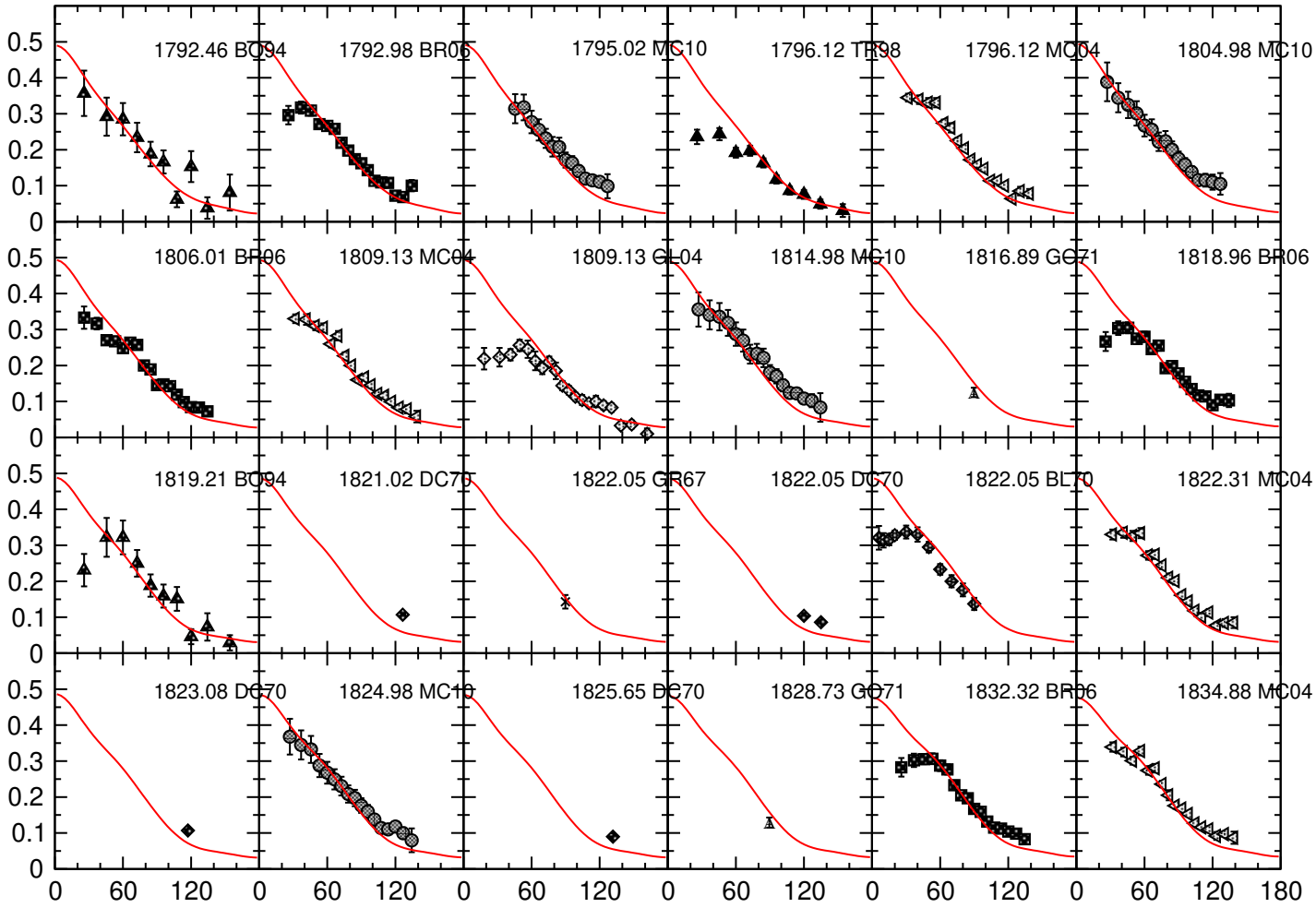

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1688.96 AN62
1690.63 PE64
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1691.19 AN62
1693.96 AN65
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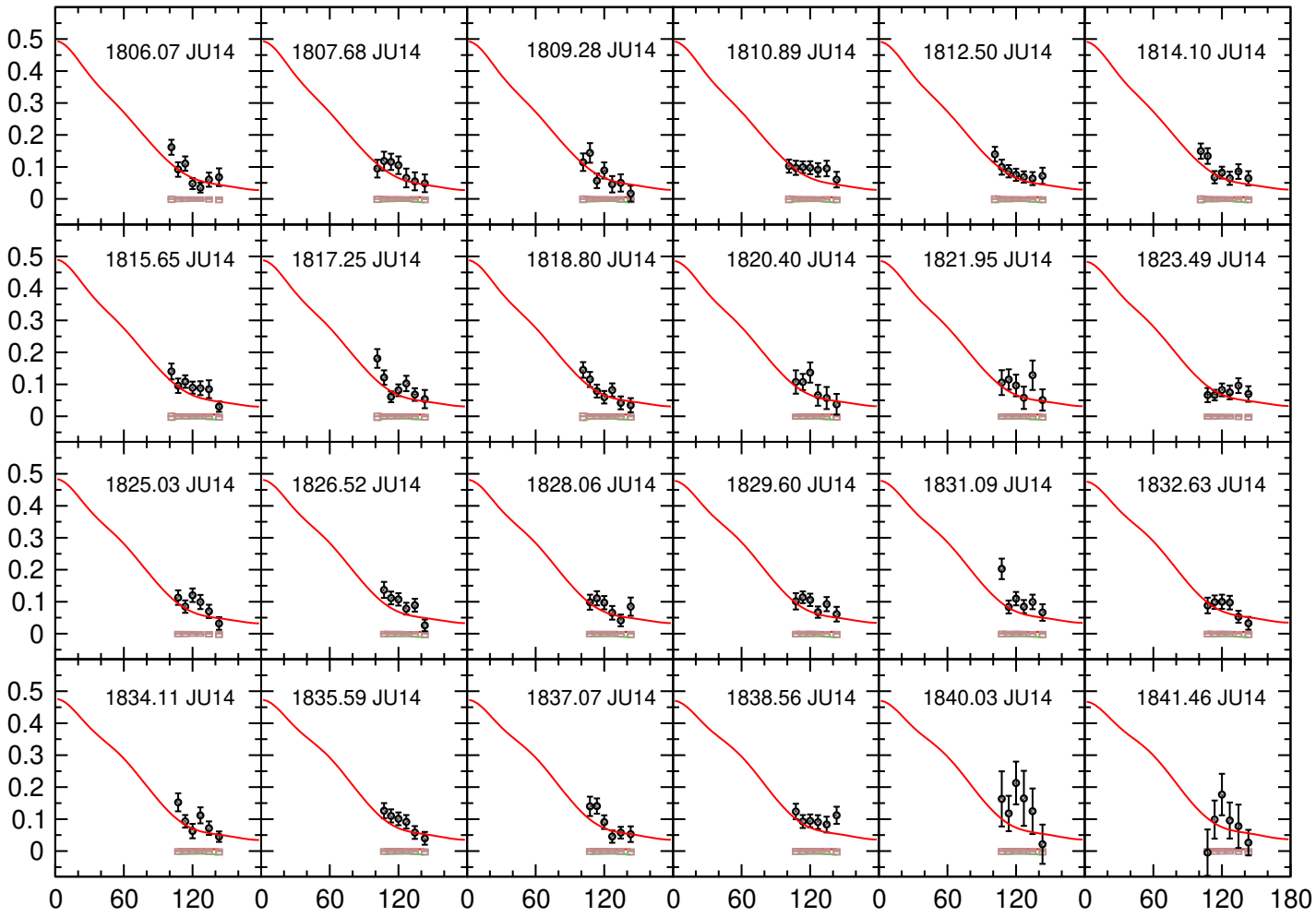

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1725.02 MC10
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1729.59 MC04
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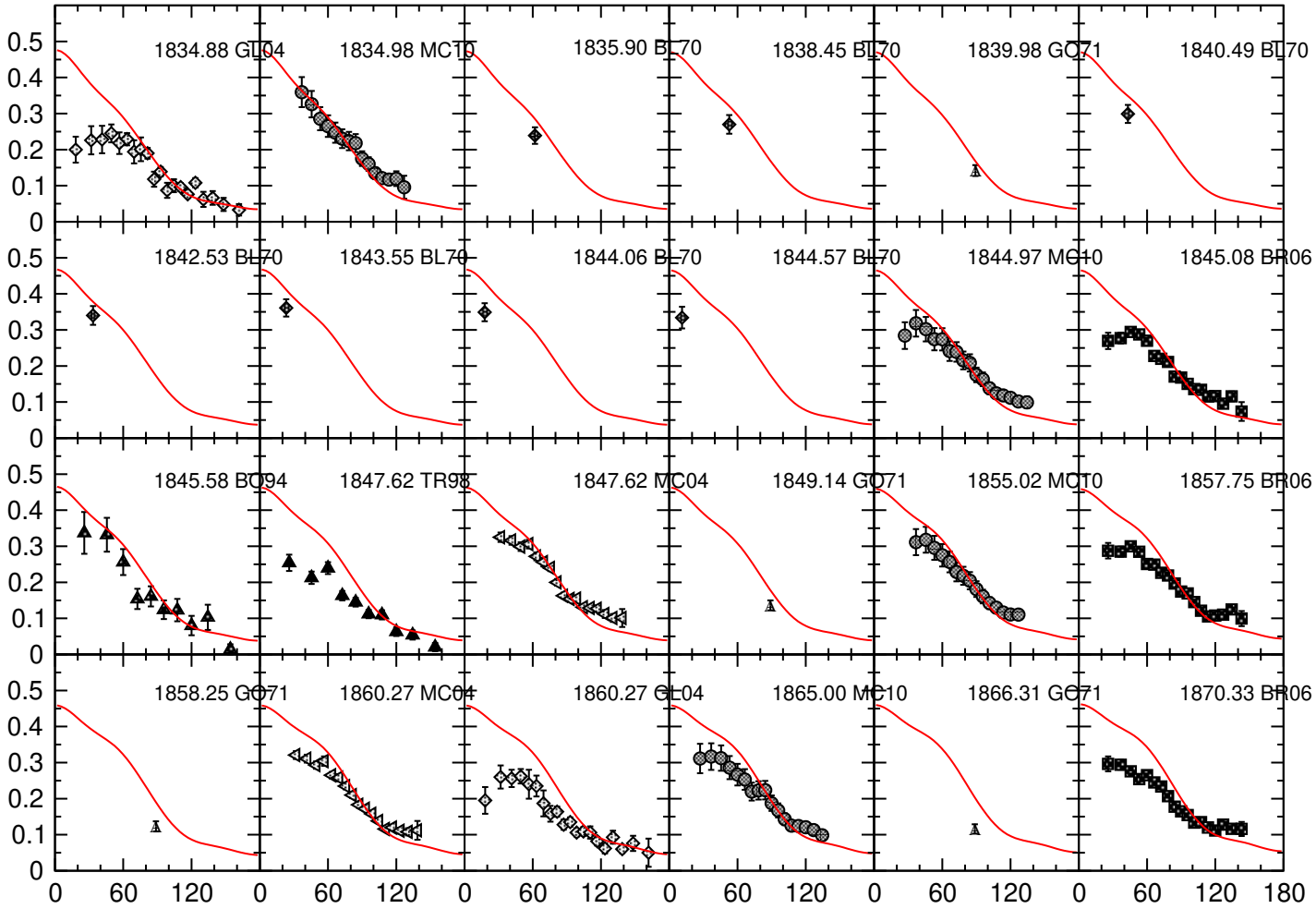

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1736.84 JU14
1738.78 JU14
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1742.61 JU14
1744.49 JU14
1746.38 JU14
1748.25 JU14
1750.19 JU14
1752.01 JU14
1753.88 JU14
1755.75 JU14
1757.57 JU14
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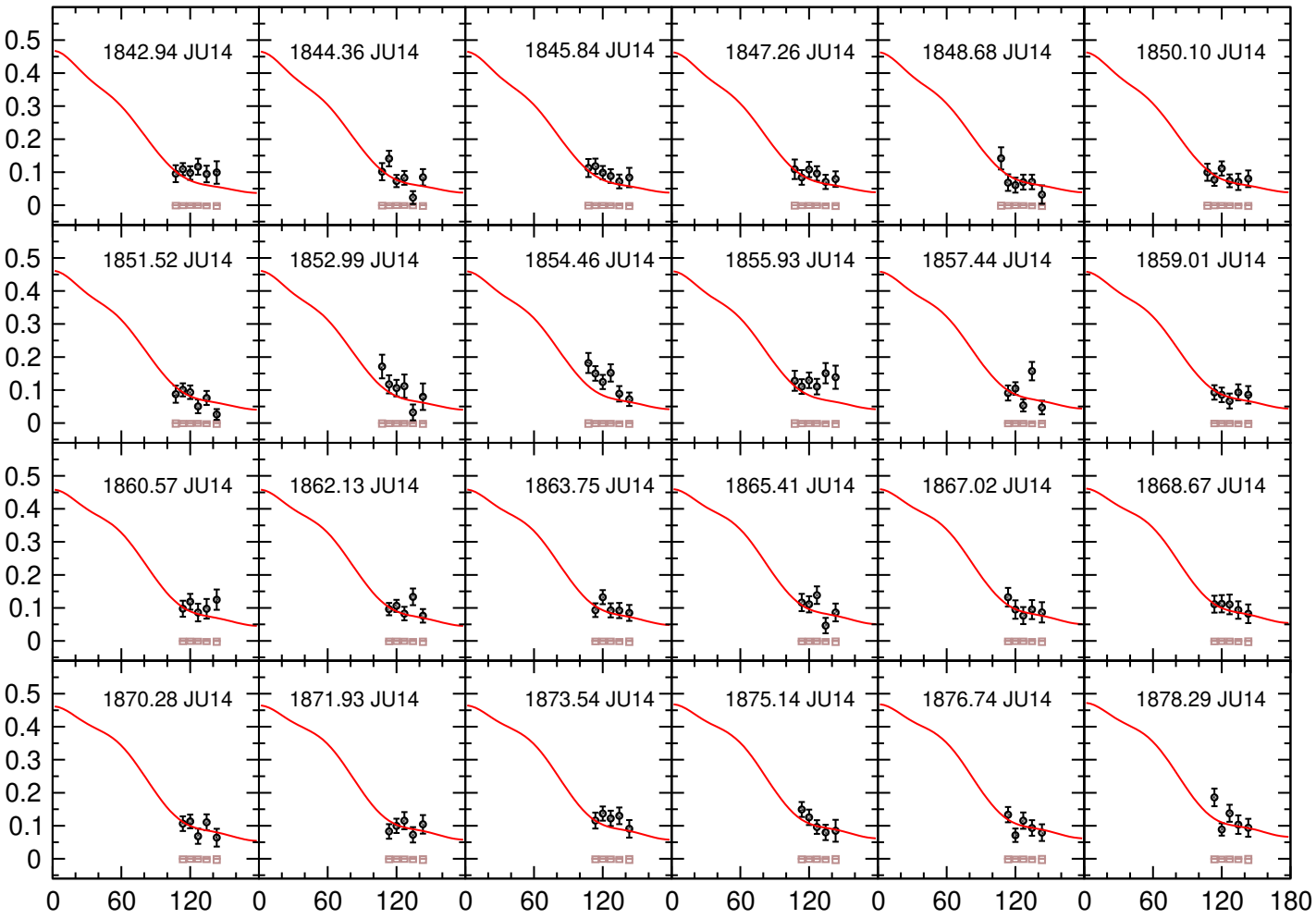

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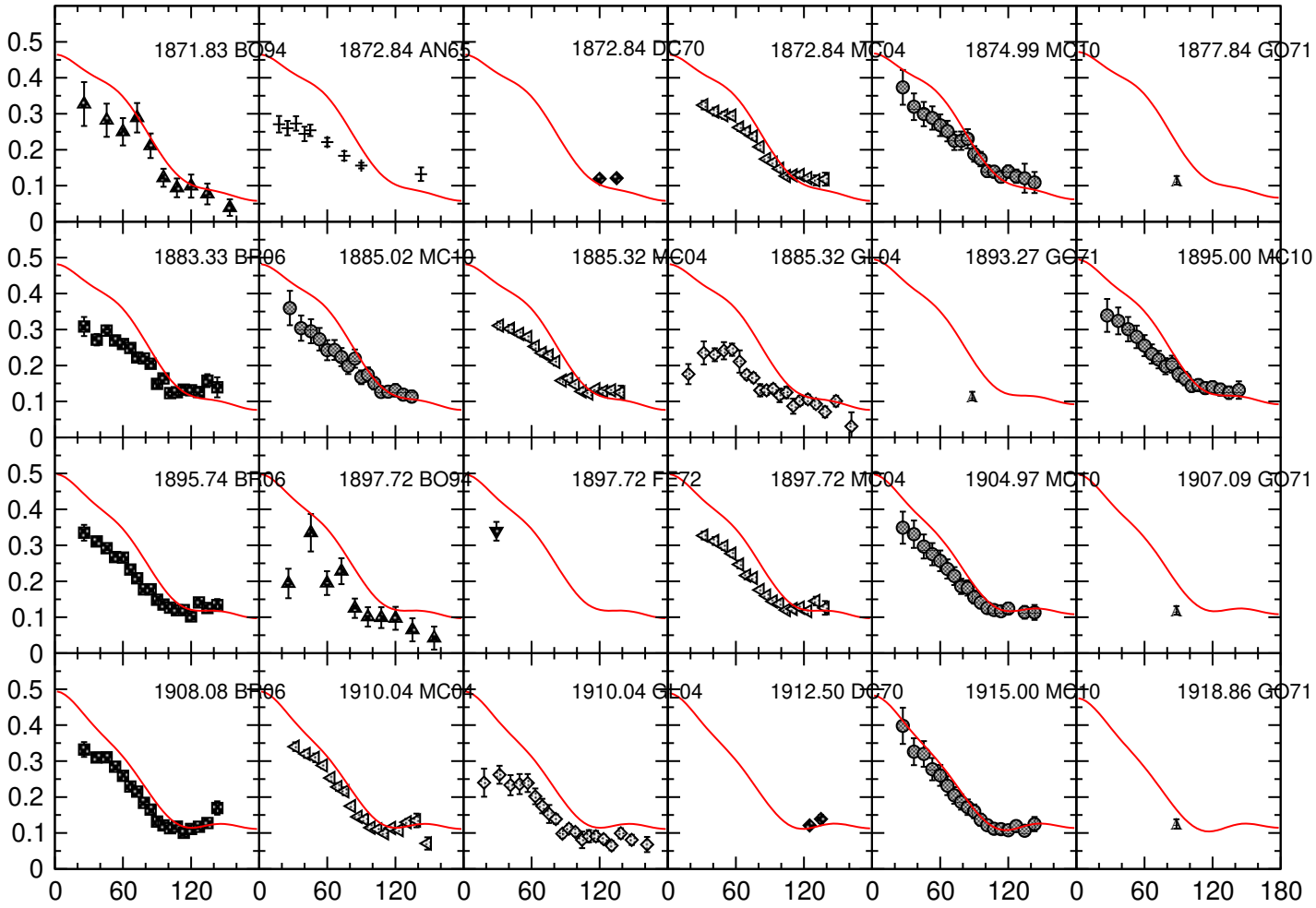

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1780.85 JU14
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1787.74 JU14
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1791.15 JU14
1792.82 JU14
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1796.17 JU14
1797.84 JU14
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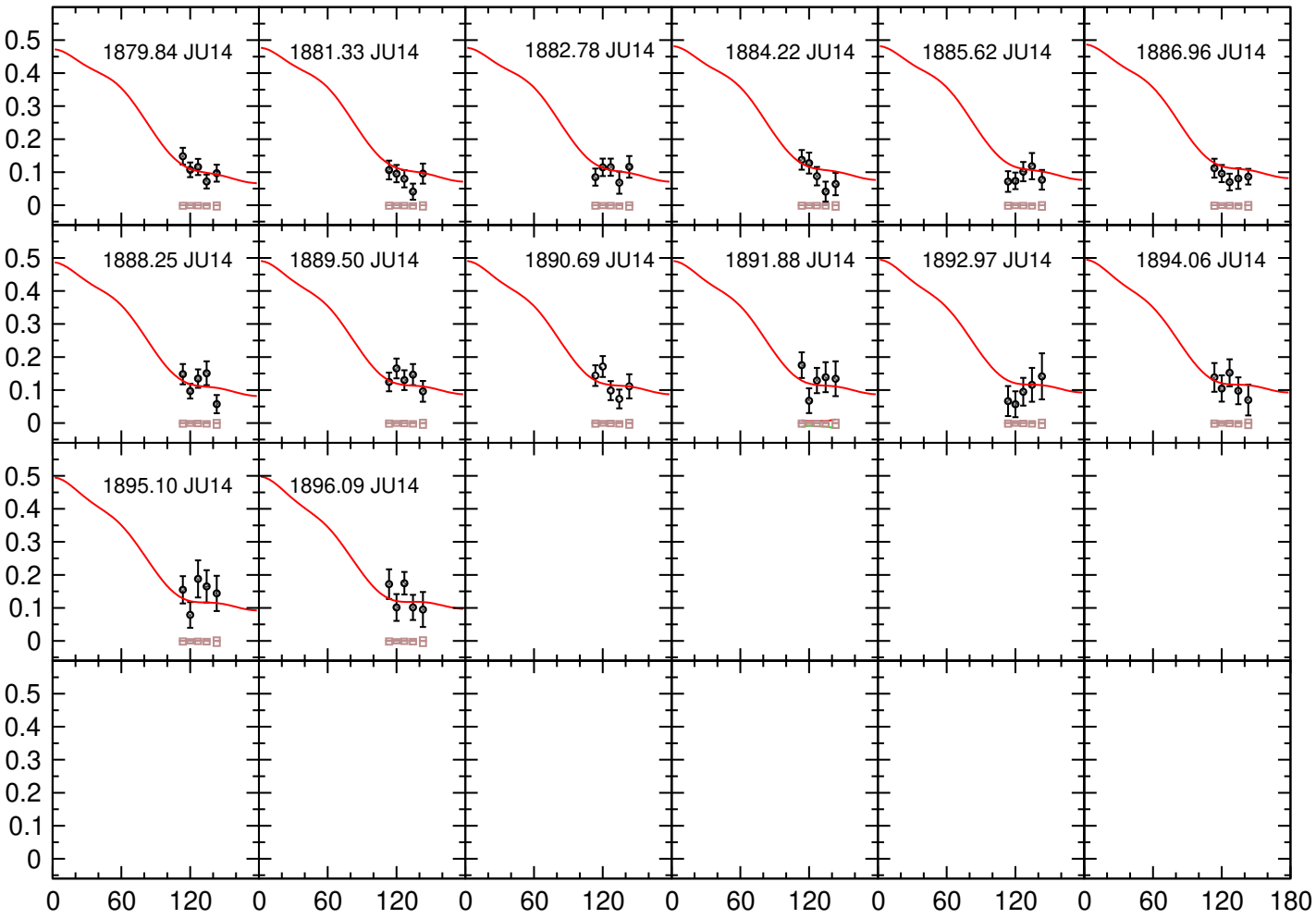

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1814.98 MC10
1816.89 GO71
1818.96 BR06
1819.21 BO94
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1822.05 GR67
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1822.05 BL70
1822.31 MC04
1823.08 DC70
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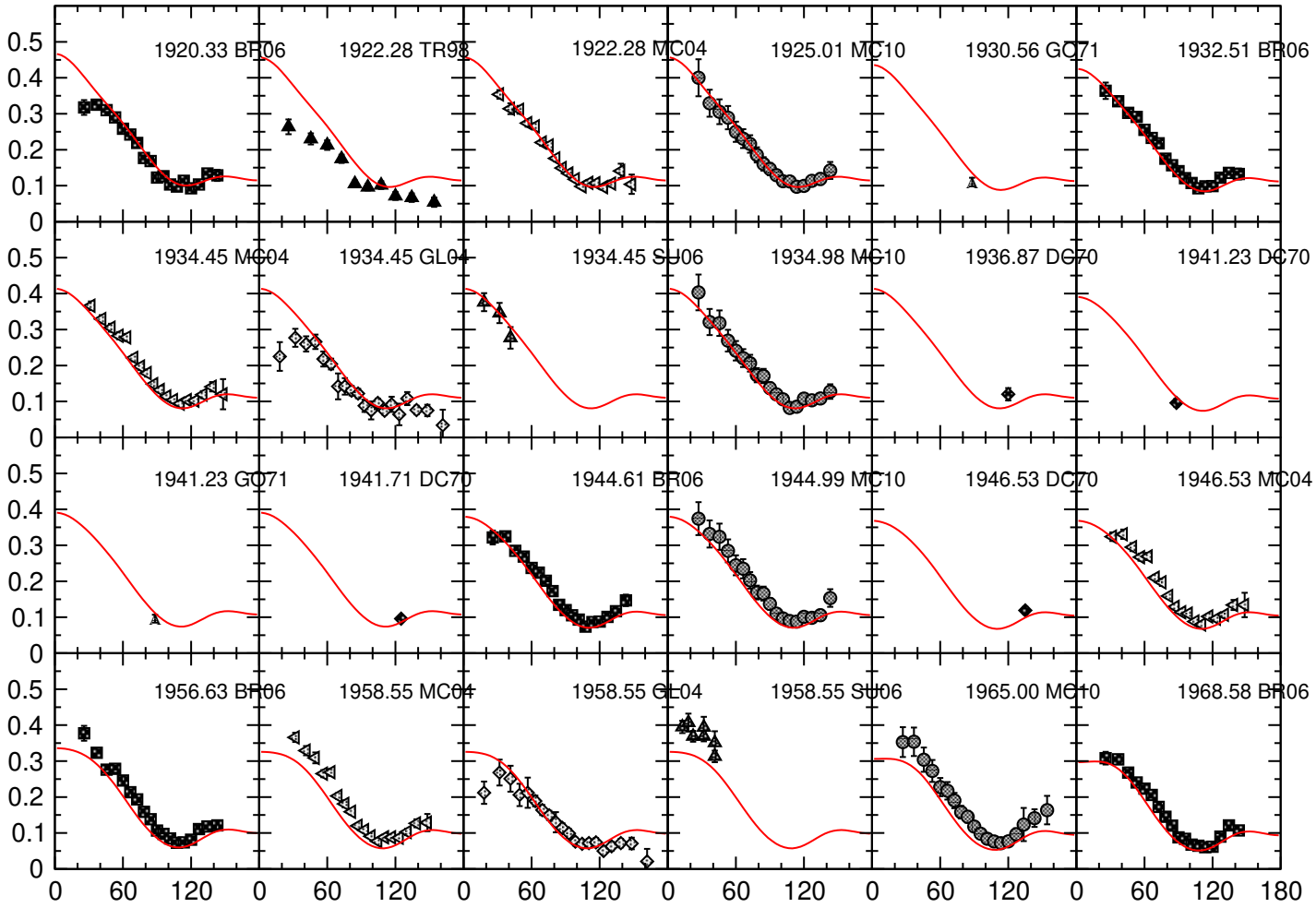

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1828.06 JU14
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1831.09 JU14
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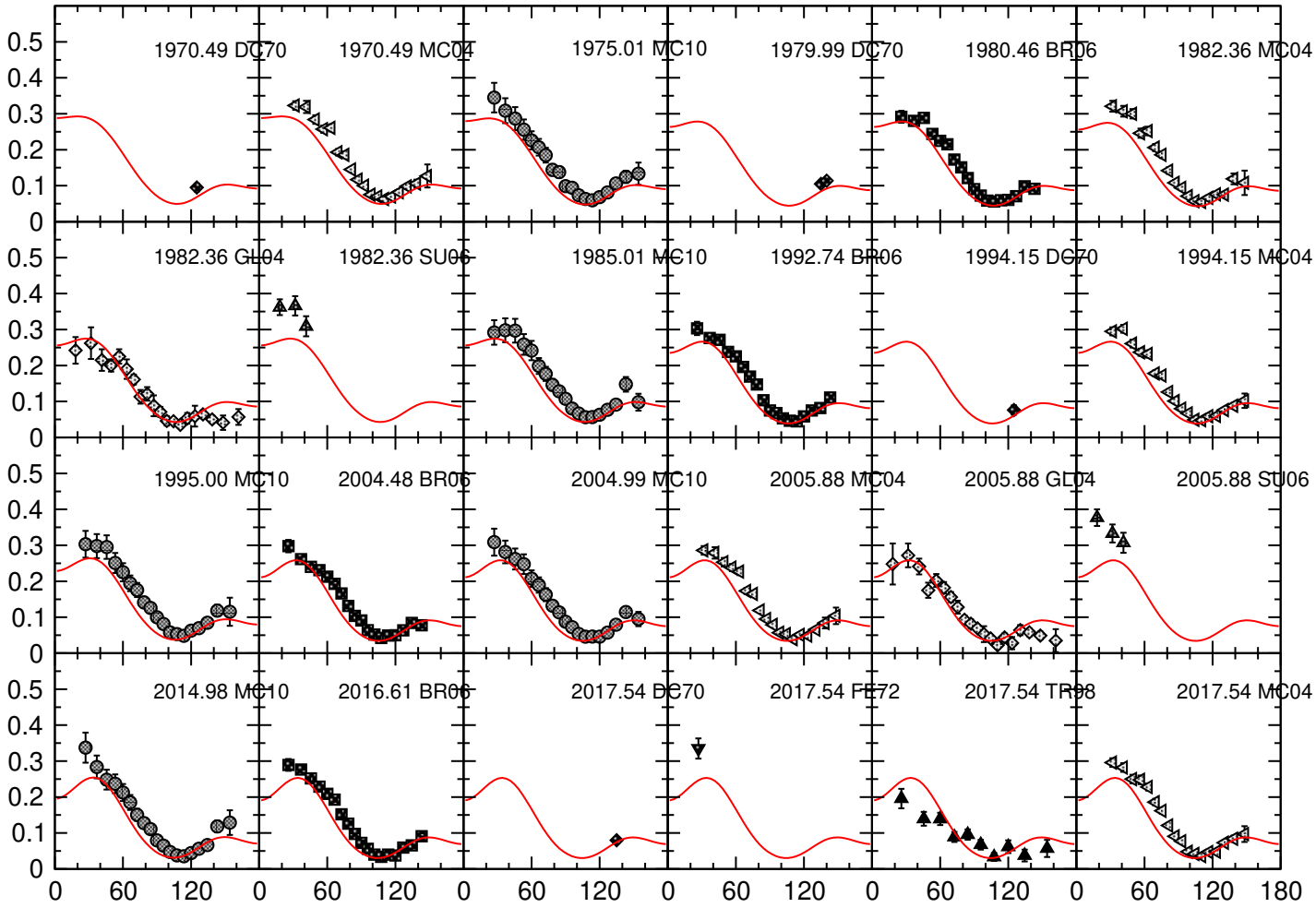

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1845.58 BO94
1847.62 TR98
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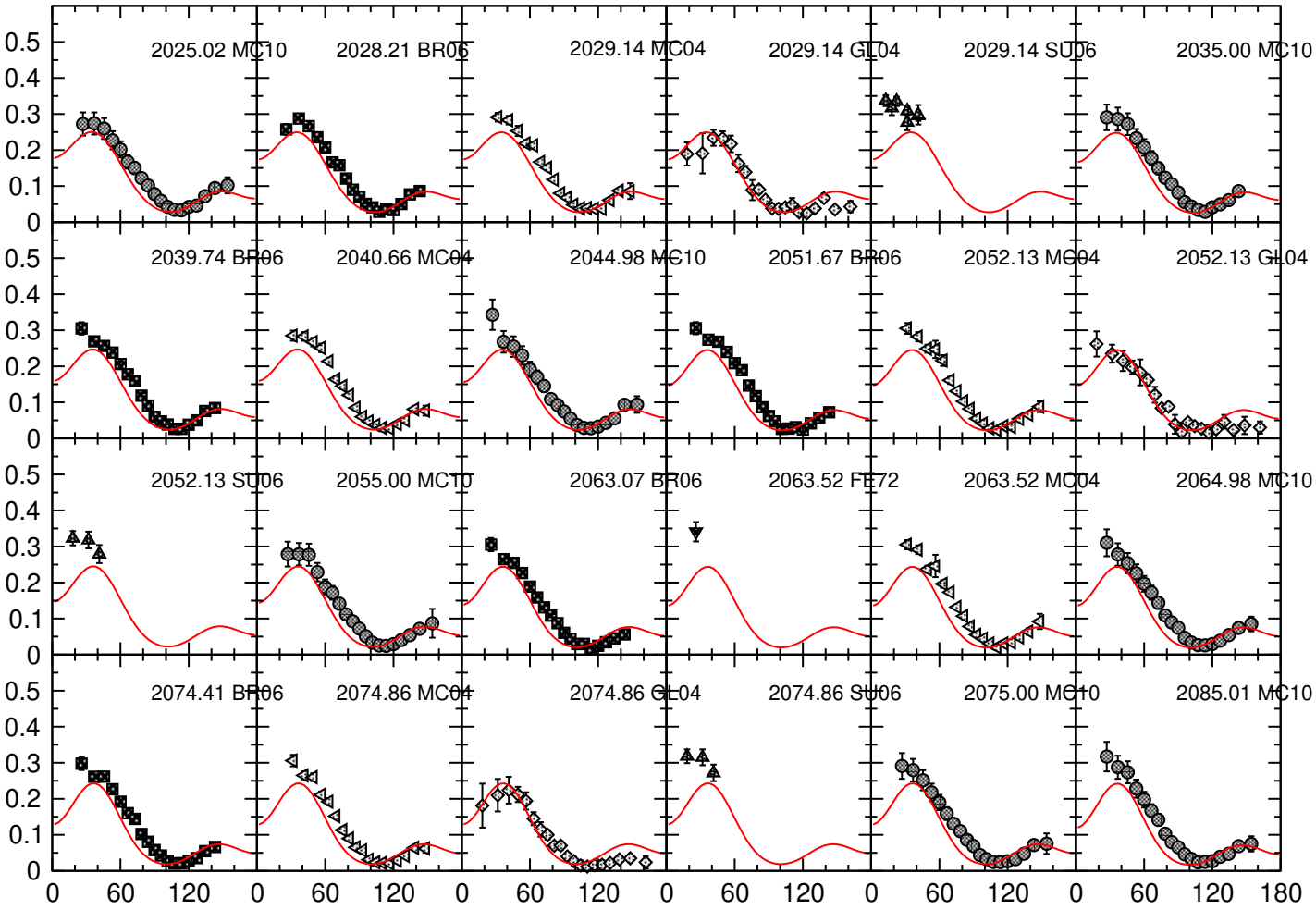

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1862.13 JU14
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1865.41 JU14
1867.02 JU14
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1873.54 JU14
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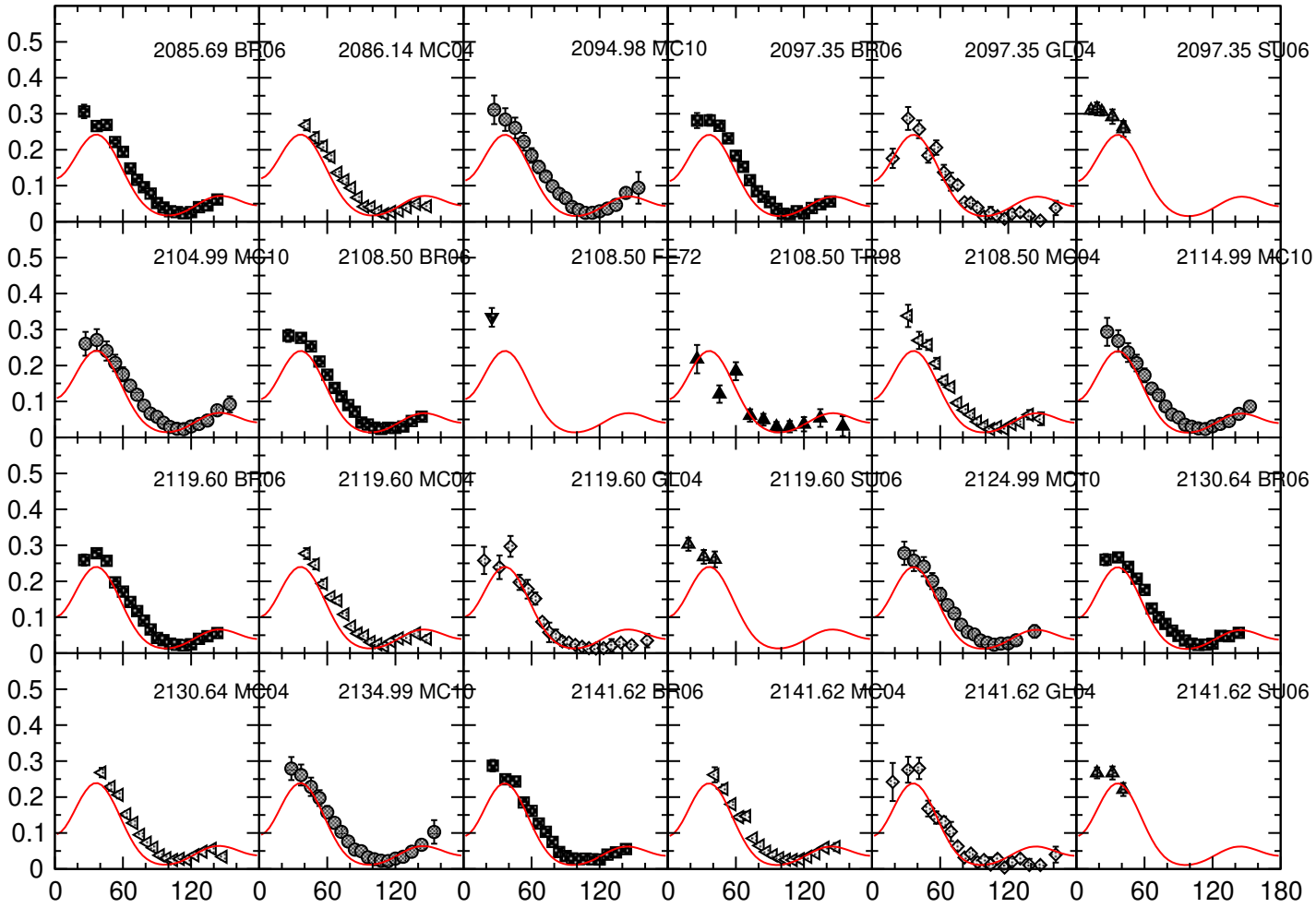

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1885.32 GL04
1893.27 GO71
1895.00 MC10
1895.74 BR06
1897.72 BO94
1897.72 FE72
1897.72 MC04
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1910.04 MC04
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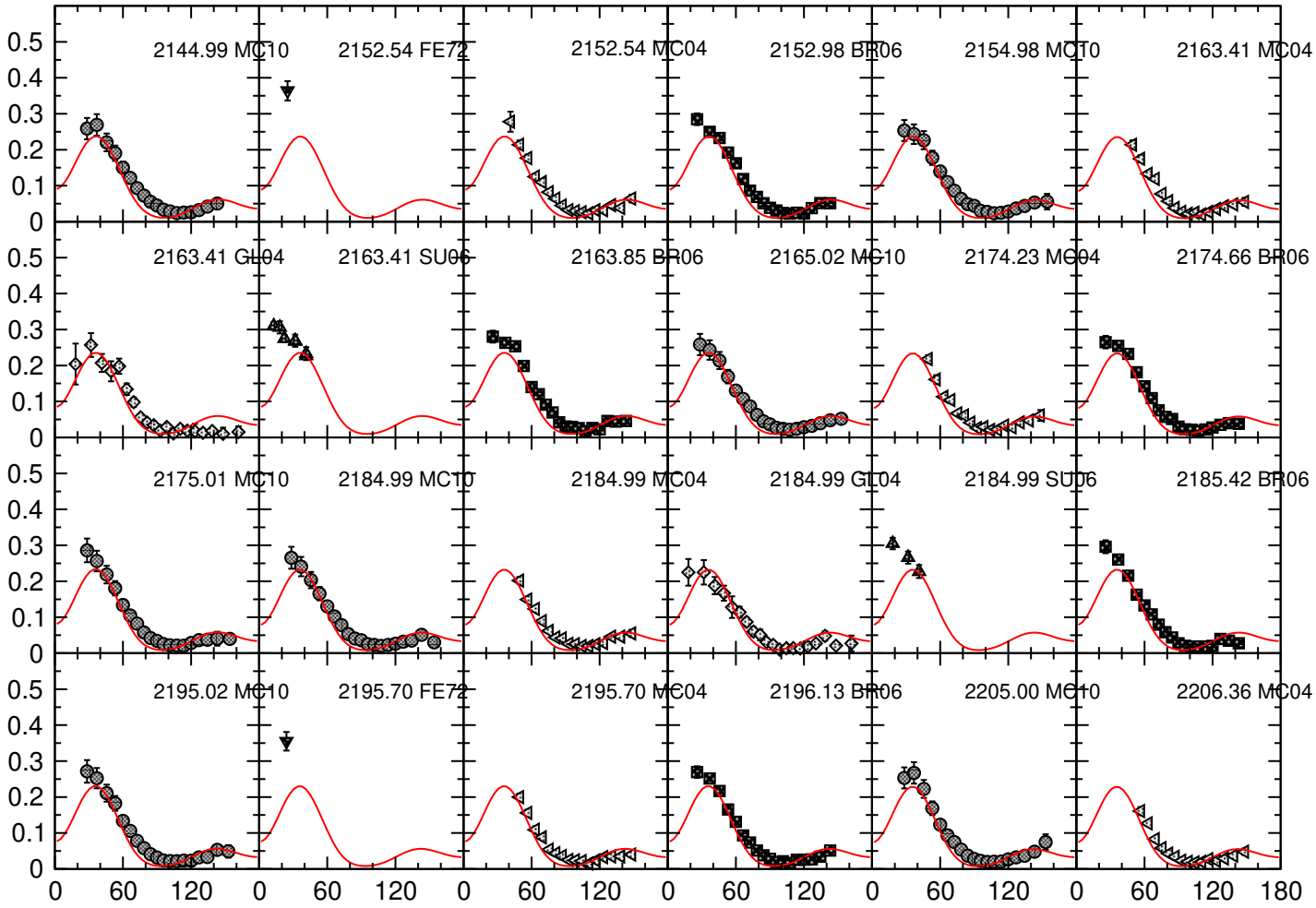

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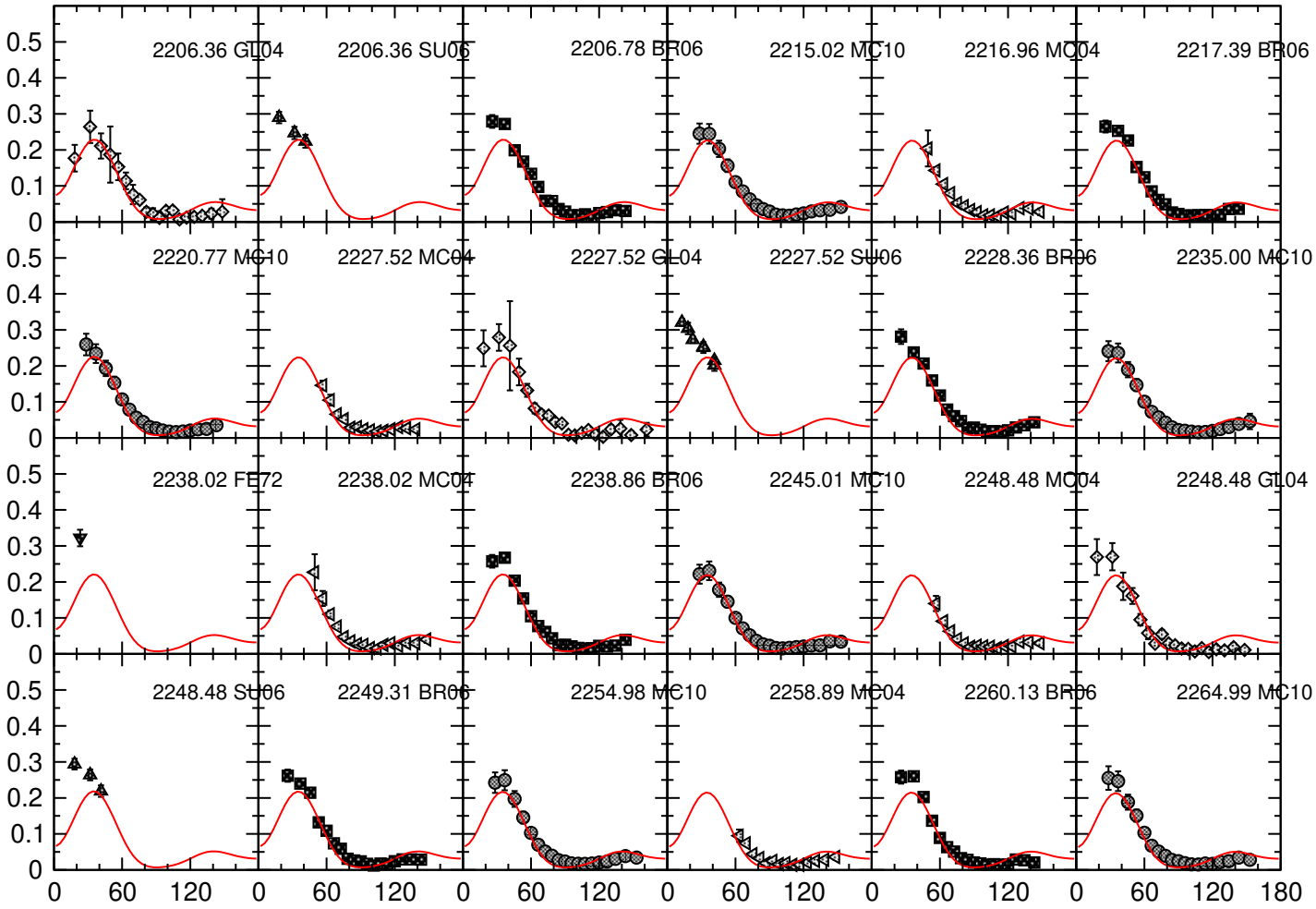

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1934.45 GL04
1934.45 SU06
1934.98 MC10
1936.87 DG70
1941.23 DG70
1941.23 GO71
1941.71 DG70
1944.61 BR06
1944.99 MC10
1946.53 DG70
1946.53 MC04
1956.63 BR06
1958.55 MC04
1958.55 GL04
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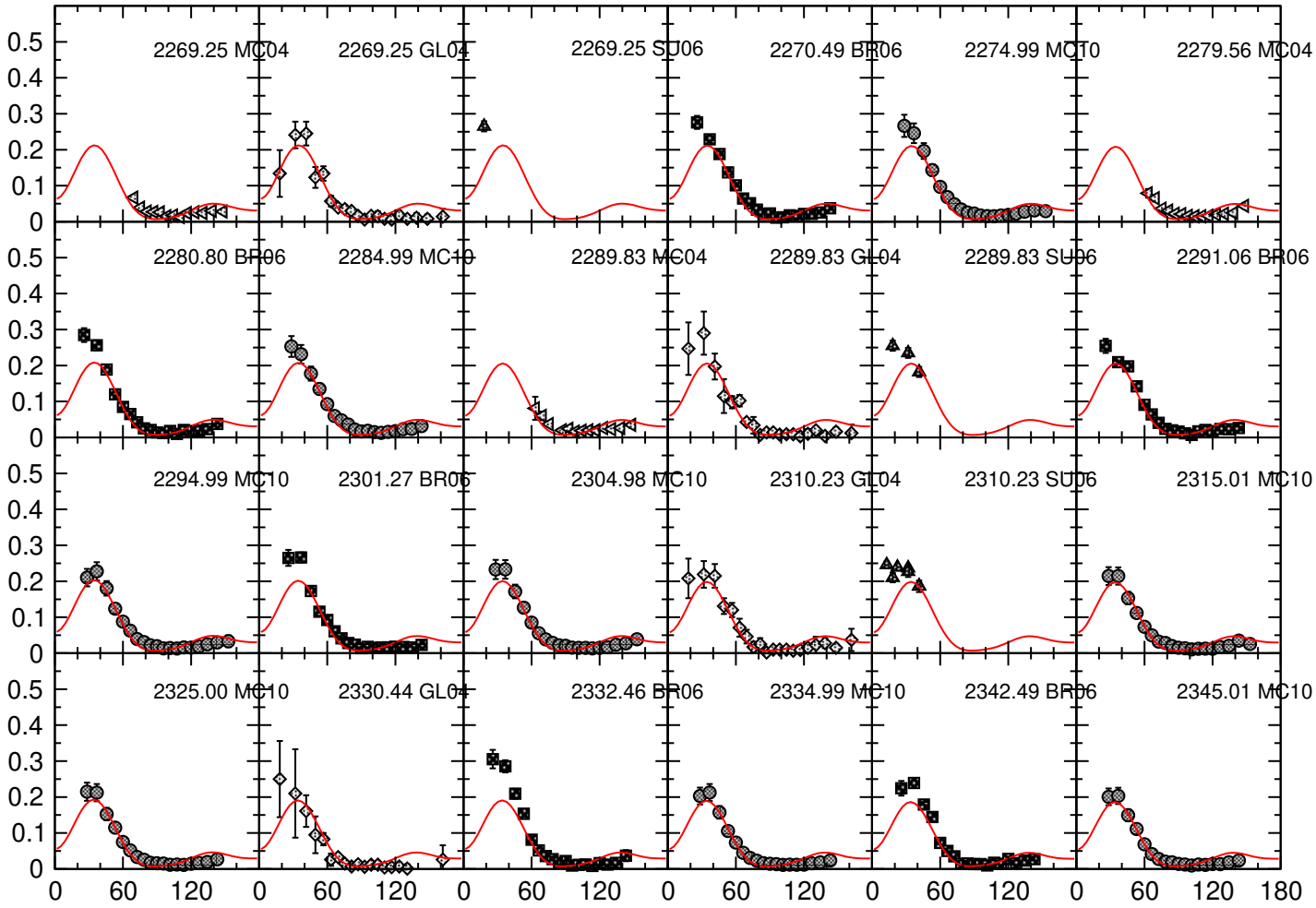

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1985.01 MC10
1992.74 BR06
1994.15 DC70
1994.15 MC04
1995.00 MC10
2004.48 BR06
2004.99 MC10
2005.88 MC04
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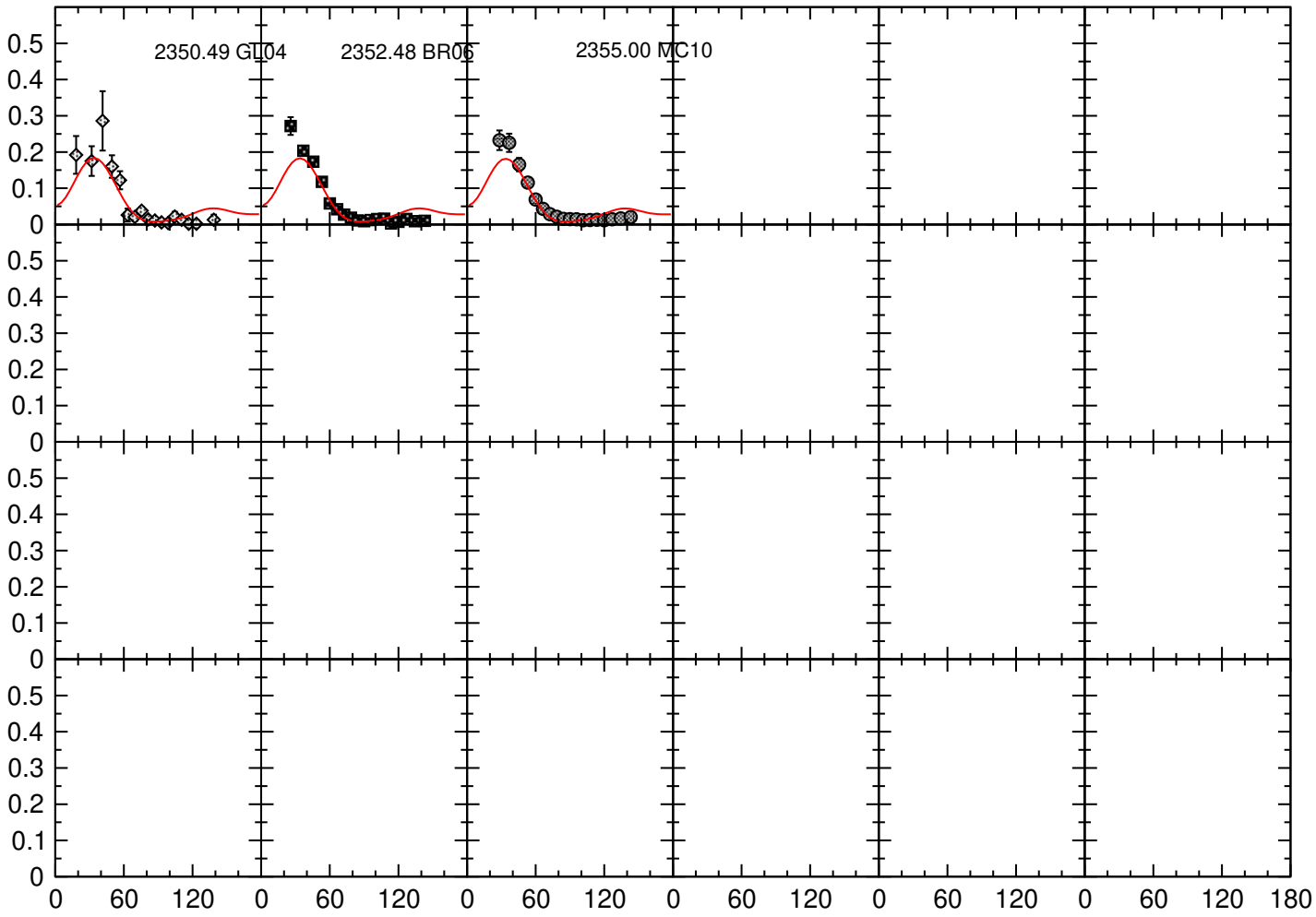

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2051.67 BR06
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2052.13 GL04
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2063.07 BR06
2063.52 FE72
2063.52 MC04
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2074.41 BR06
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2074.86 SU06
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2085.01 MC10
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2085.69 BR06
2086.14 MC04
2094.98 MC10
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2097.35 GL04
2097.35 SU06
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2108.50 FE72
2108.50 TR98
2108.50 MC04
2114.99 MC10
2119.60 BR06
2119.60 MC04
2119.60 GL04
2119.60 SU06
2124.99 MC10
2130.64 BR06
2130.64 MC04
2134.99 MC10
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2141.62 SU06
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120
180


2144.99 MC10
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2154.98 MC10
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2175.01 MC10
2184.99 MC10
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2184.99 SU06
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2206.36 MC04
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2220.77 MC10
2227.52 MC04
2227.52 GL04
2227.52 SU06
2228.36 BR06
2235.00 MC10
2238.02 FE72
2238.02 MC04
2238.86 BR06
2245.01 MC10
2248.48 MC04
2248.48 GL04
2248.48 SU06
2249.31 BR06
2254.98 MC10
2258.89 MC04
2260.13 BR06
2264.99 MC10
0
0.1
0.2
0.3
0.4
0.5
0
60
120
180


2269.25 MC04
2269.25 GL04
2269.25 SU06
2270.49 BR06
2274.99 MC10
2279.56 MC04
2280.80 BR06
2284.99 MC10
2289.83 MC04
2289.83 GL04
2289.83 SU06
2291.06 BR06
2294.99 MC10
2301.27 BR06
2304.98 MC10
2310.23 GL04
2310.23 SU06
2315.01 MC10
2325.00 MC10
2330.44 GL04
2332.46 BR06
2334.99 MC10
2342.49 BR06
2345.01 MC10
0
0.1
0.2
0.3
0.4
0.5
0
60
120
180


2350.49 GL04
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2355.00 MC10
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0.3
0.2
0.1
0
0
60
120
180

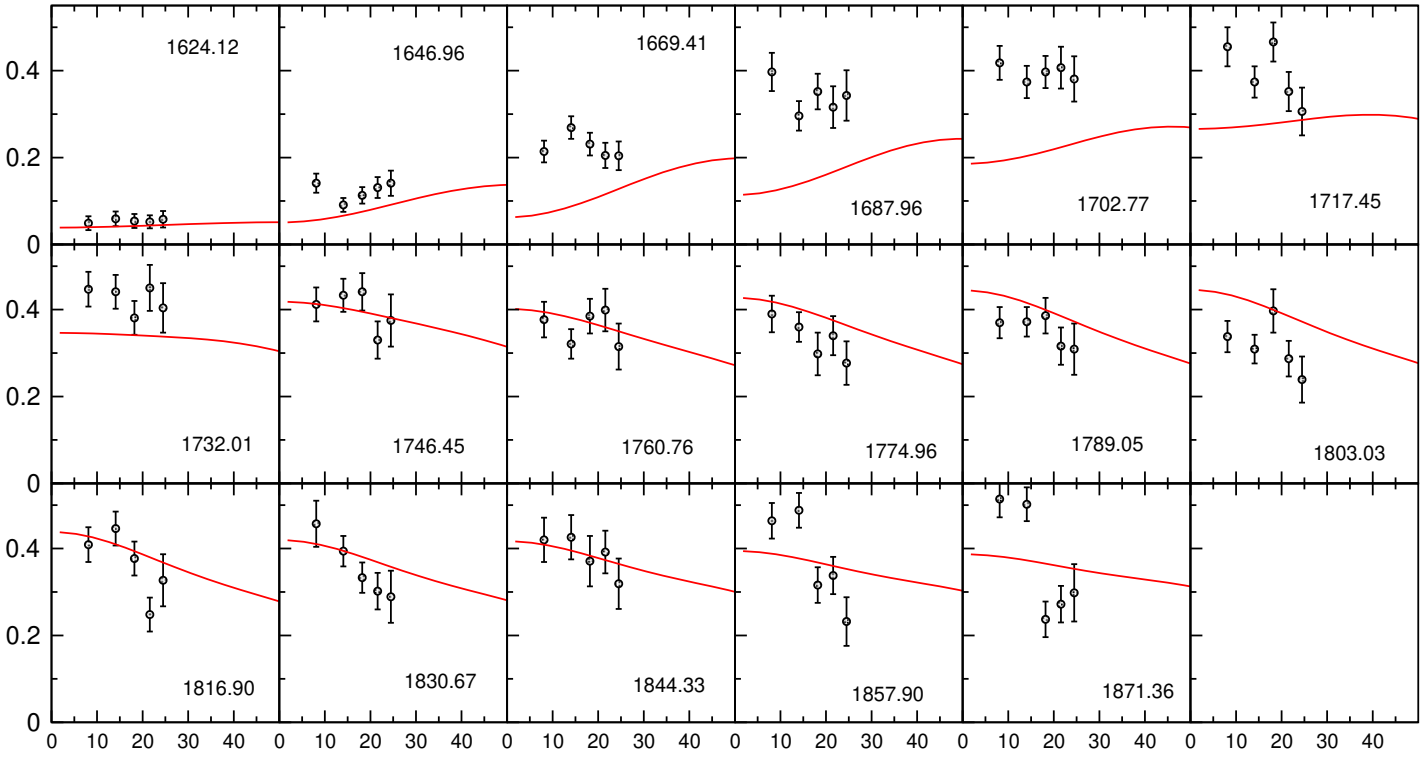
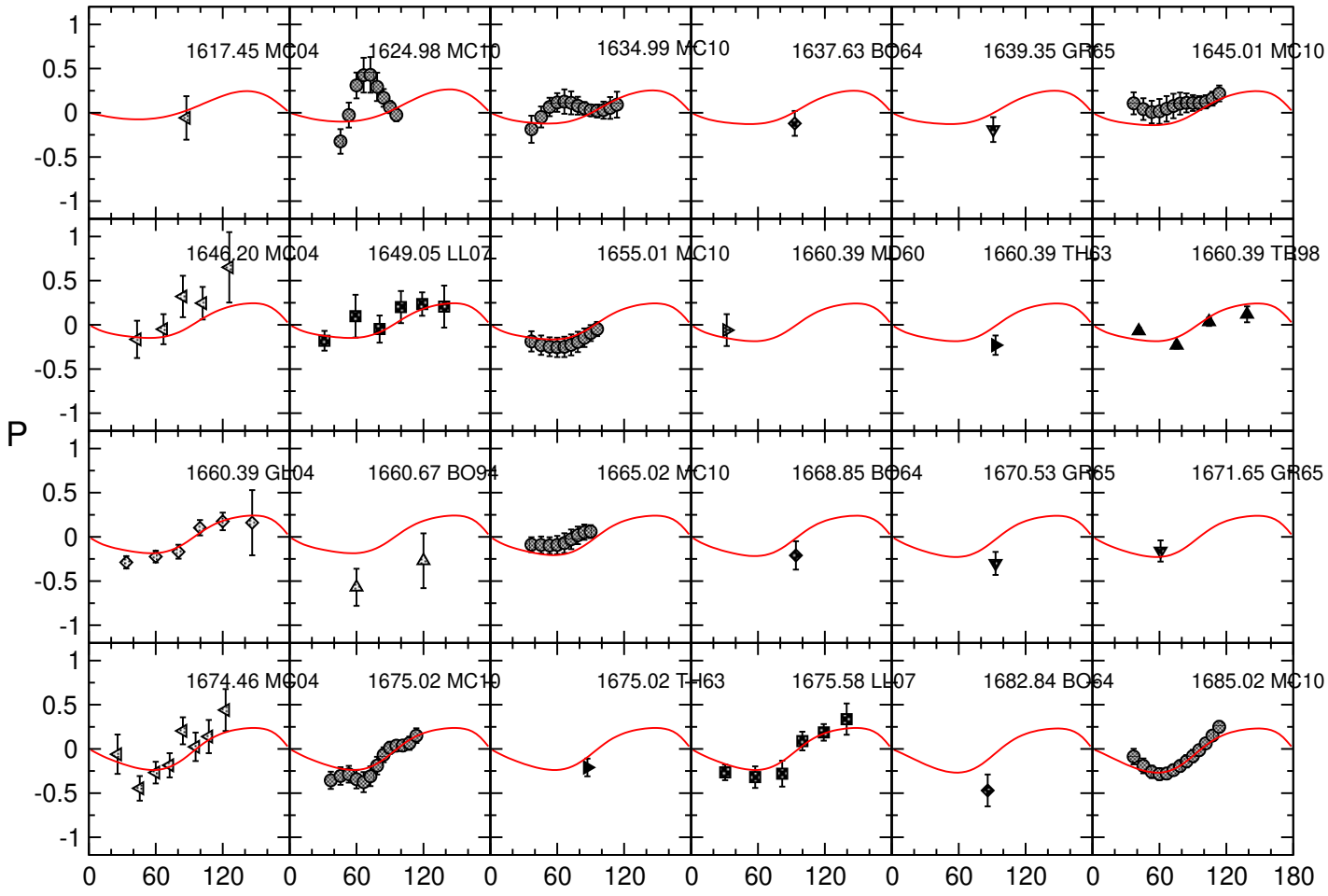
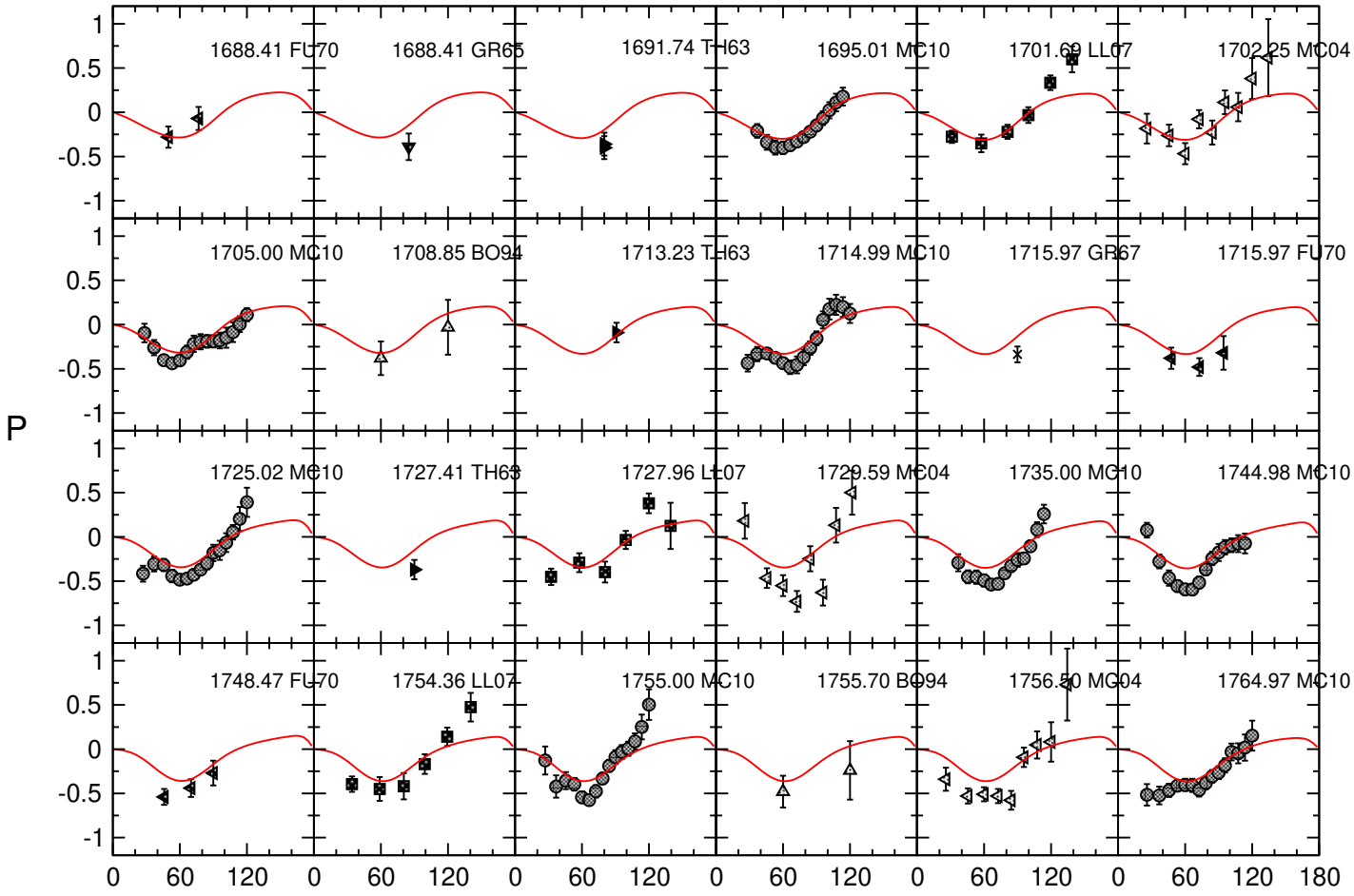
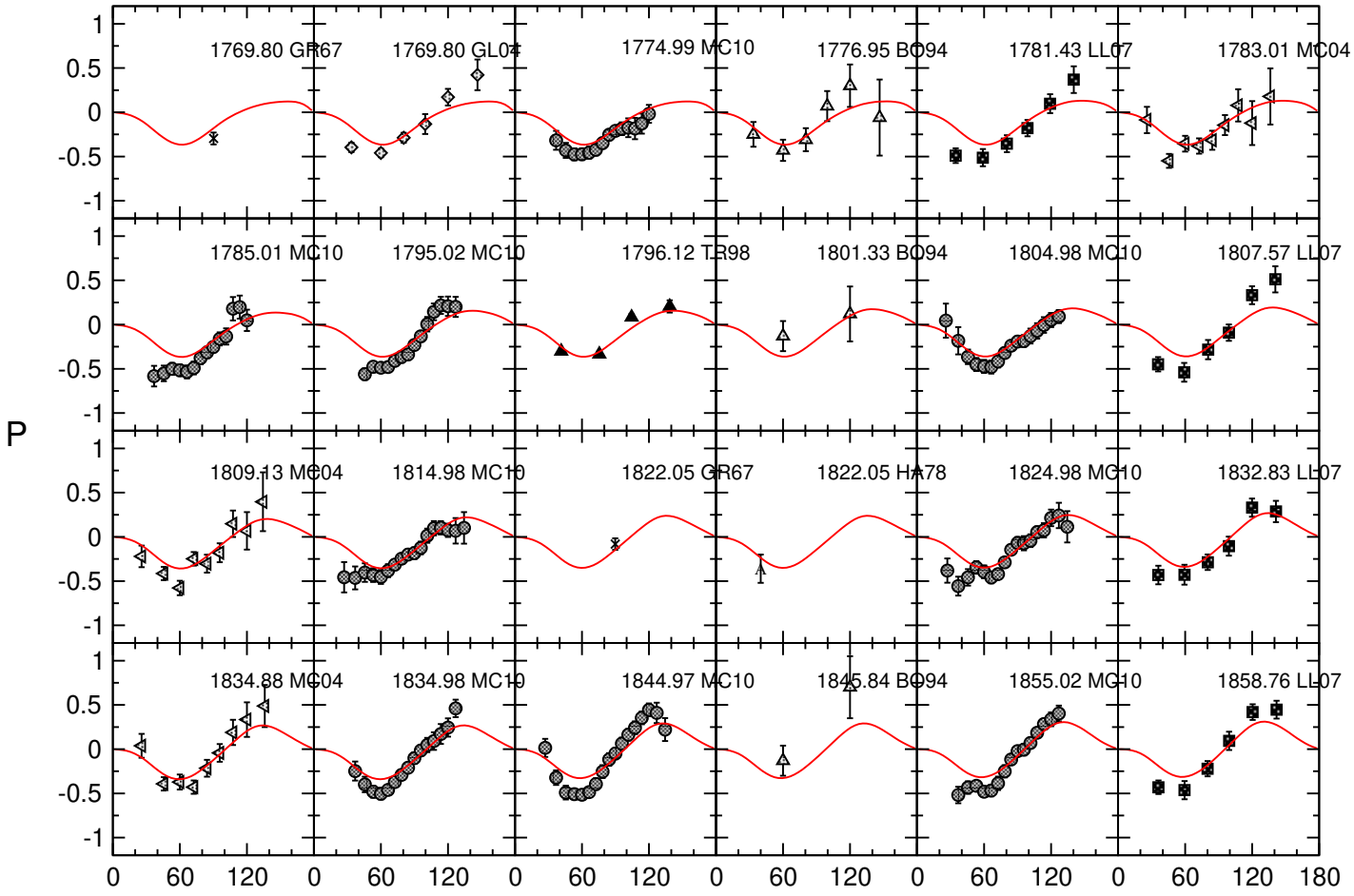
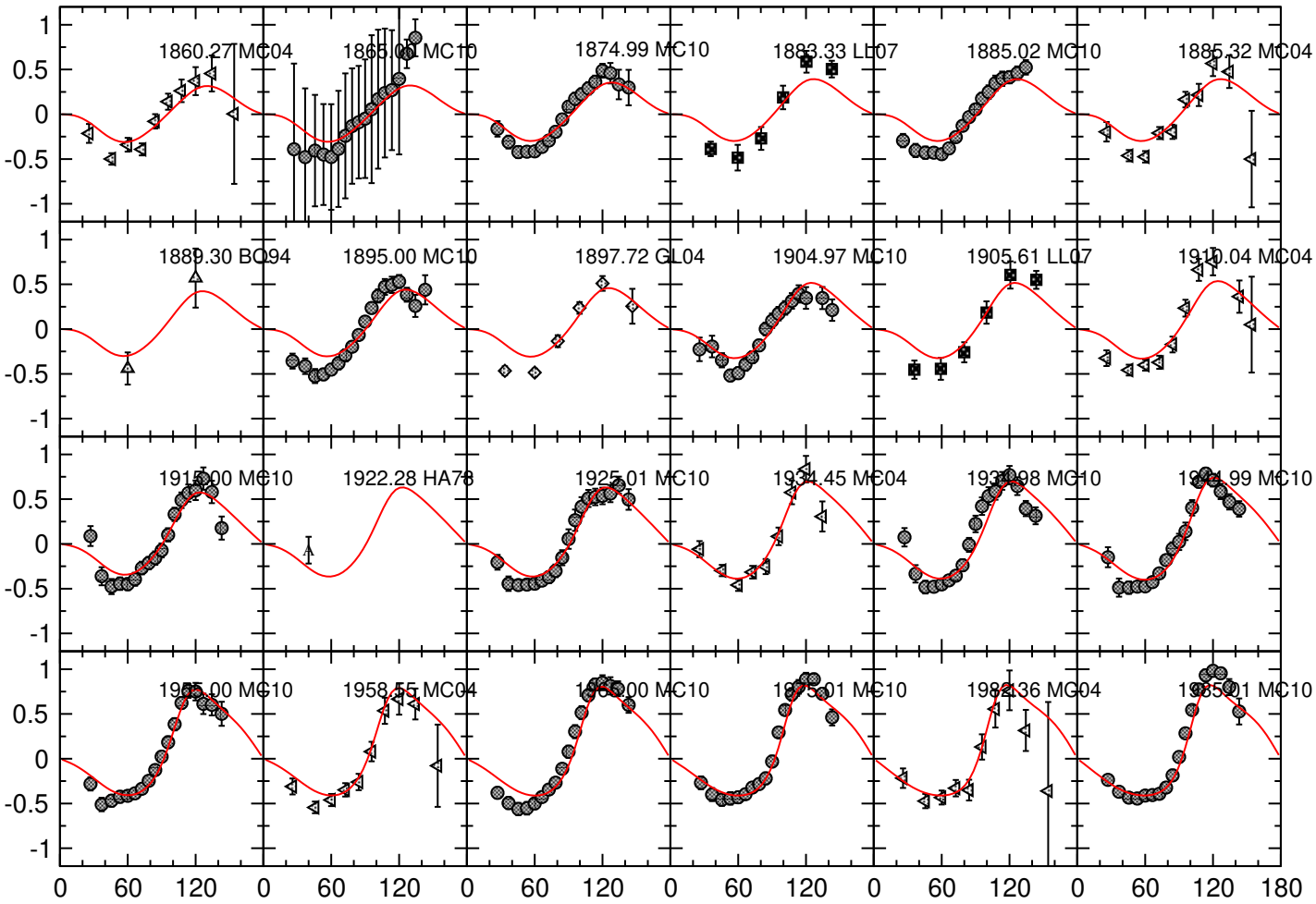


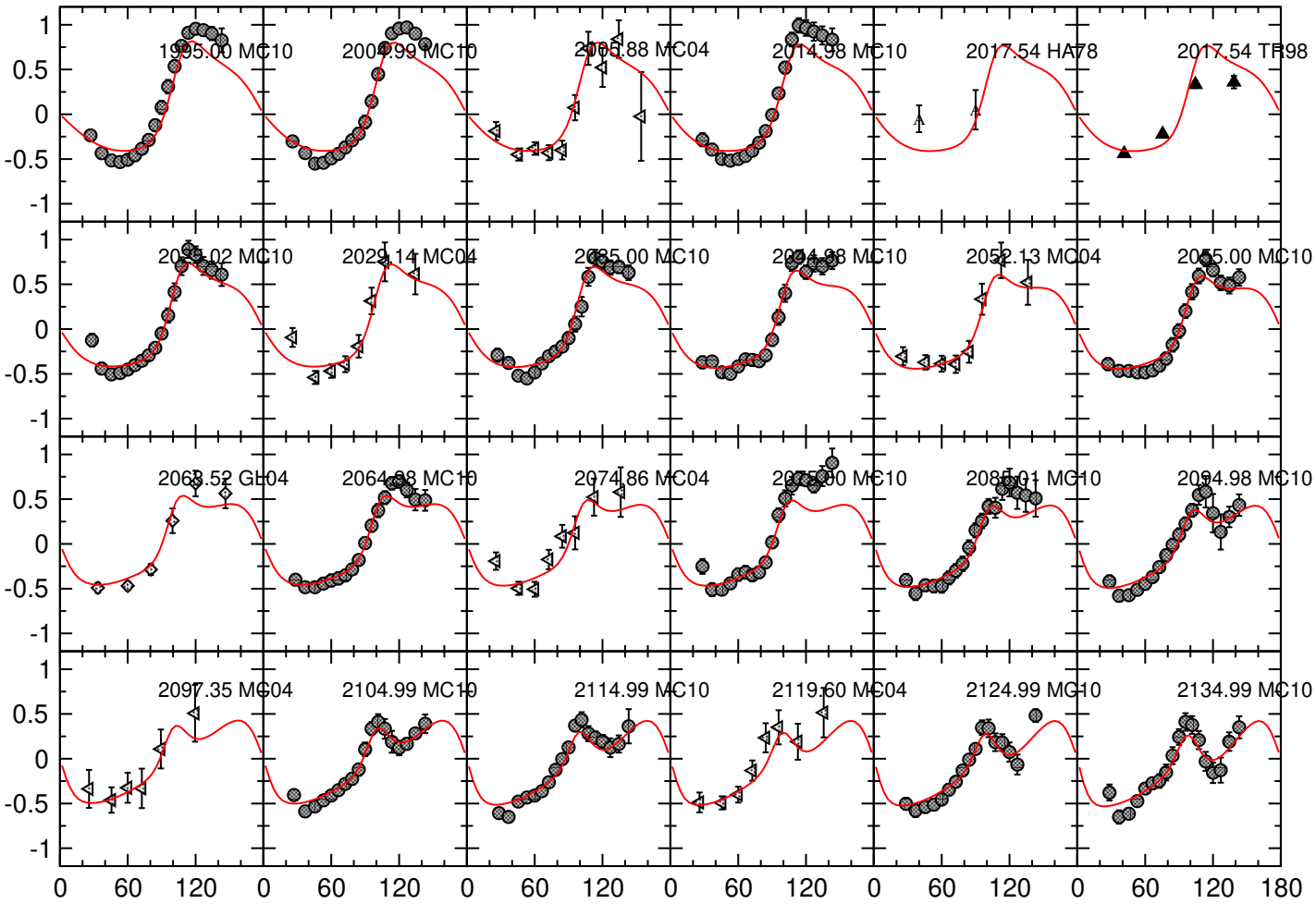
Figure 1: BGOOD (S. Alef et al.) EPJ A 57, 80 (2020)

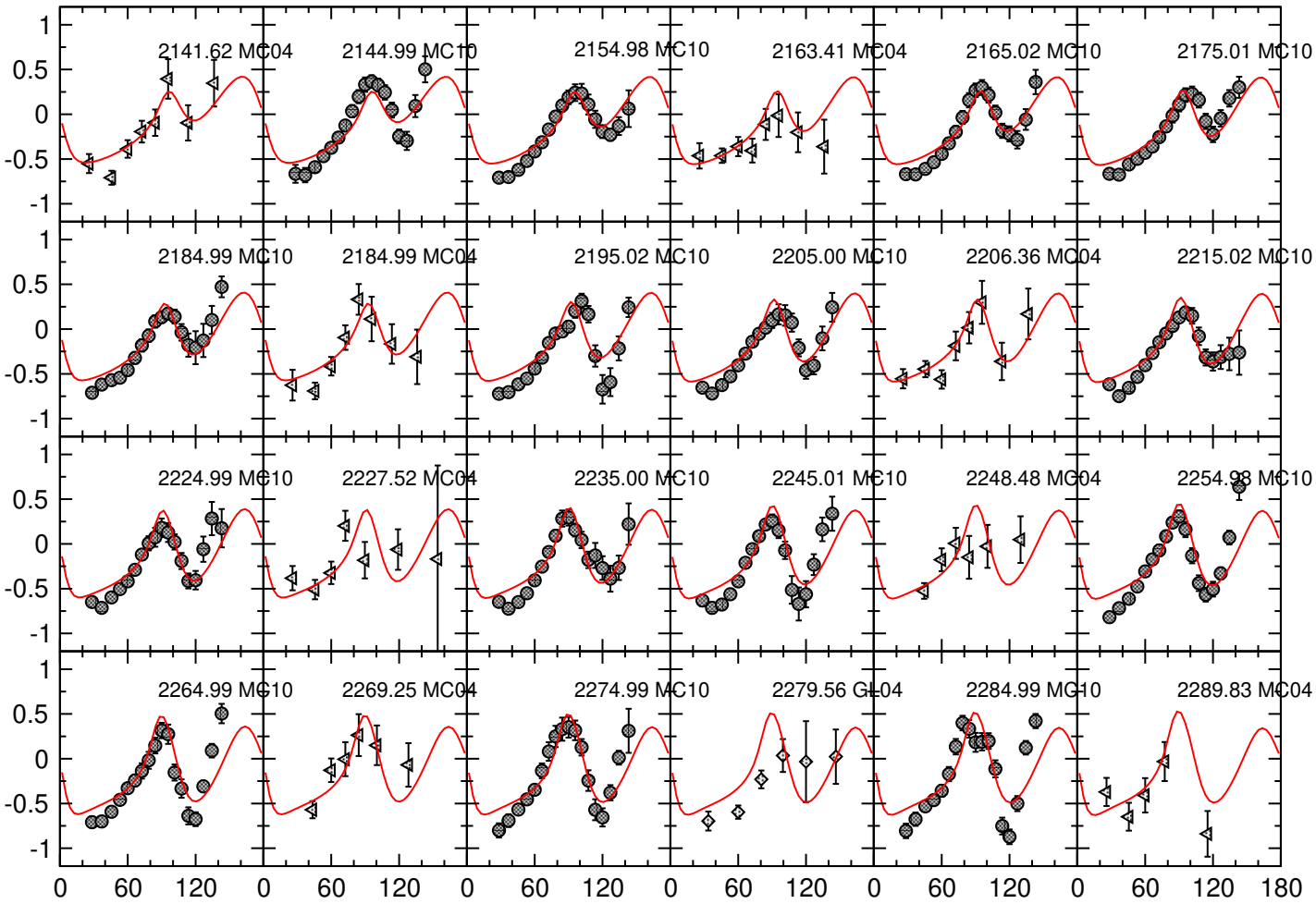

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1634.99 MC10
1637.63 BO64
1639.35 GR65
1645.01 MC10
1646.20 MC04
1649.05 LL07
1655.01 MC10
1660.39 MD60
1660.39 TH63
1660.39 TB98
1660.39 GL04
1660.67 BO94
1665.02 MC10
1668.85 BO64
1670.53 GR65
1671.65 GR65
1674.46 MC04
1675.02 MC10
1675.02 TH63
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0
-0.5
-1
0
60
120
180

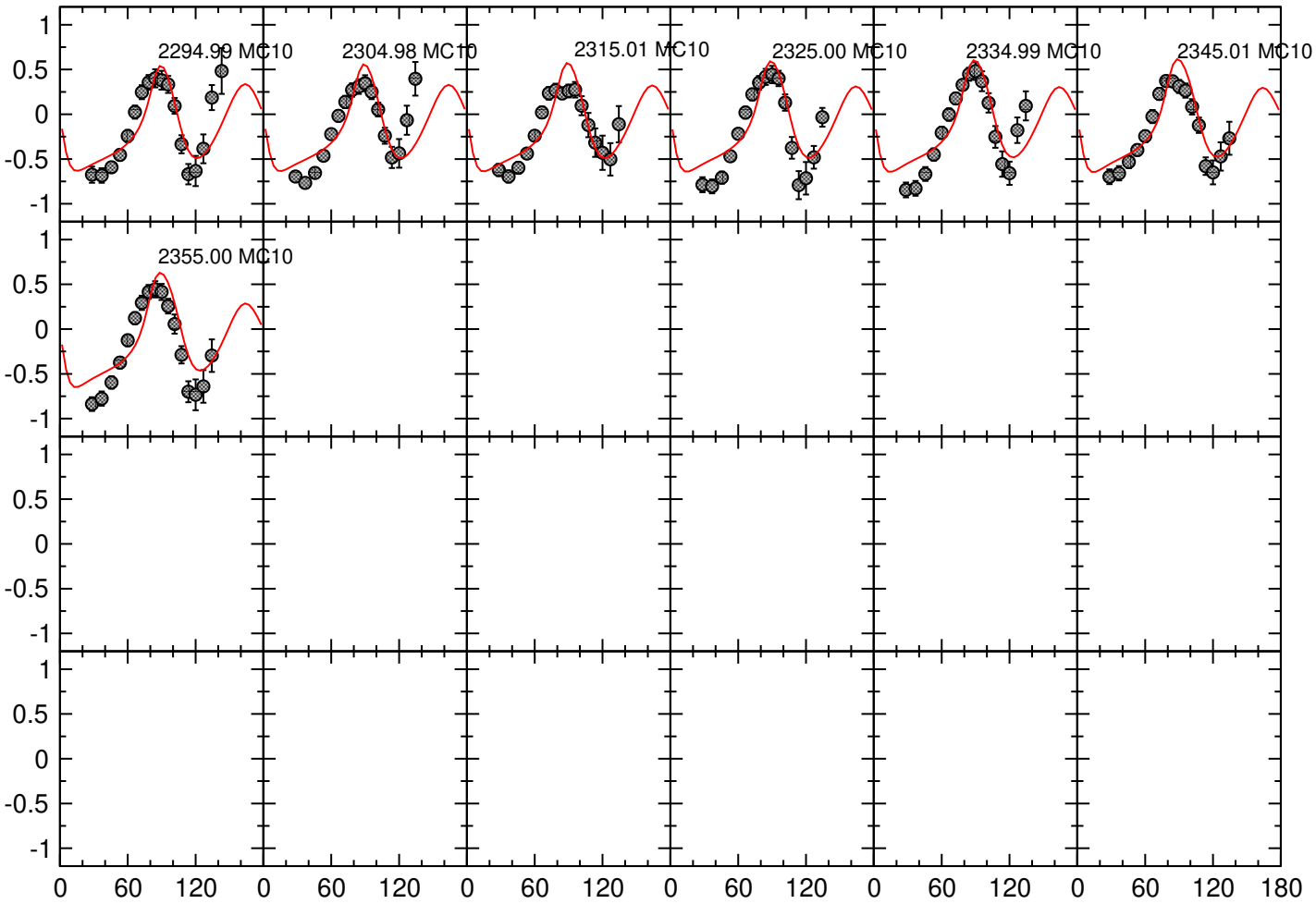

P
1688.41 FU70
1688.41 GR65
1691.74 TH63
1695.01 MC10
1701.69 LL07
1702.25 MC04
1705.00 MC10
1708.85 BO94
1713.23 TH63
1714.99 MC10
1715.97 GR67
1715.97 FU70
1725.02 MC10
1727.41 TH63
1727.96 LL07
1729.59 MC04
1735.00 MC10
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1755.70 BO94
1756.50 MC04
1764.97 MC10

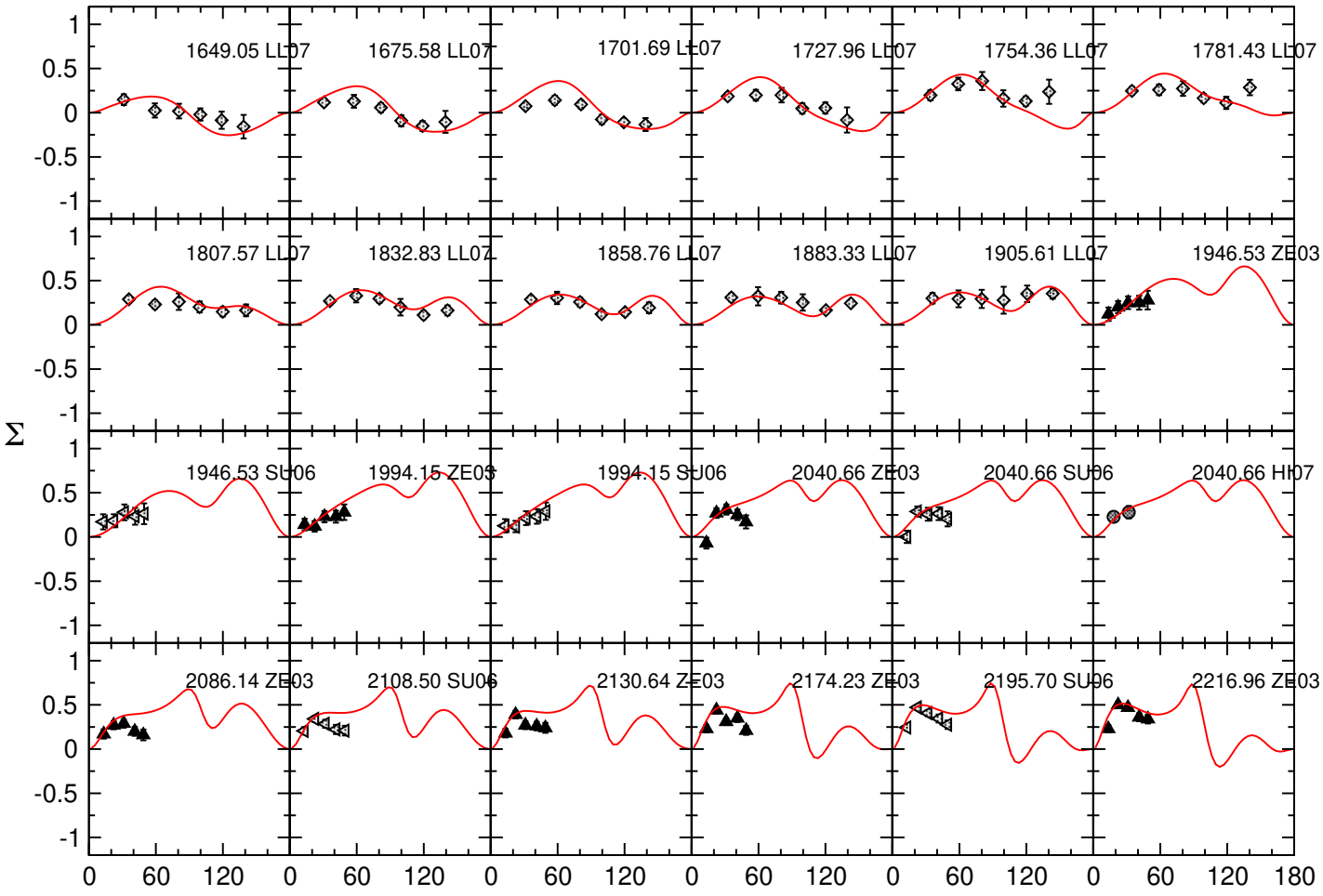

1769.80 GR67
1769.80 GL04
1774.99 MC10
1776.95 BO94
1781.43 LL07
1783.01 MC04
1785.01 MC10
1795.02 MC10
1796.12 TI98
1801.33 BO94
1804.98 MC10
1807.57 LL07
1809.13 MC04
1814.98 MC10
1822.05 GR67
1822.05 HA78
1824.98 MC10
1832.83 LL07
1834.88 MC04
1834.98 MC10
1844.97 MC10
1845.84 BO94
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-0.5
-1
0
60
120
180

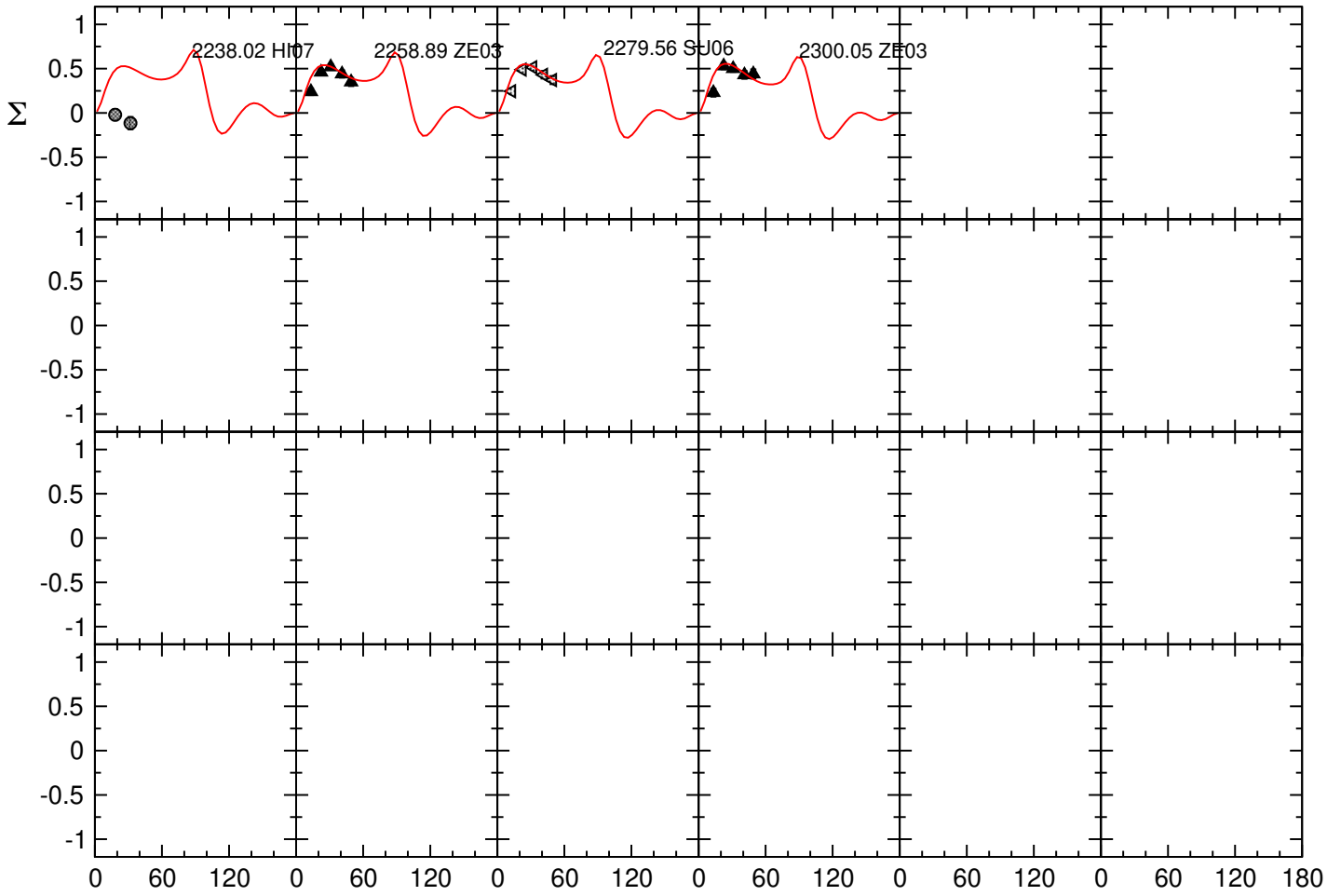

1860.27 MC04
1865.00 MC10
1874.99 MC10
1883.33 LL07
1885.02 MC10
1885.32 MC04
1889.30 BO94
1895.00 MC10
1897.72 GL04
1904.97 MC10
1905.61 LL07
1910.04 MC04
1915.00 MC10
1922.28 HA76
1925.01 MC10
1934.45 MC04
1934.98 MC10
1944.99 MC10
1955.00 MC10
1958.55 MC04
1965.00 MC10
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1982.36 MC04
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-1
0
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120
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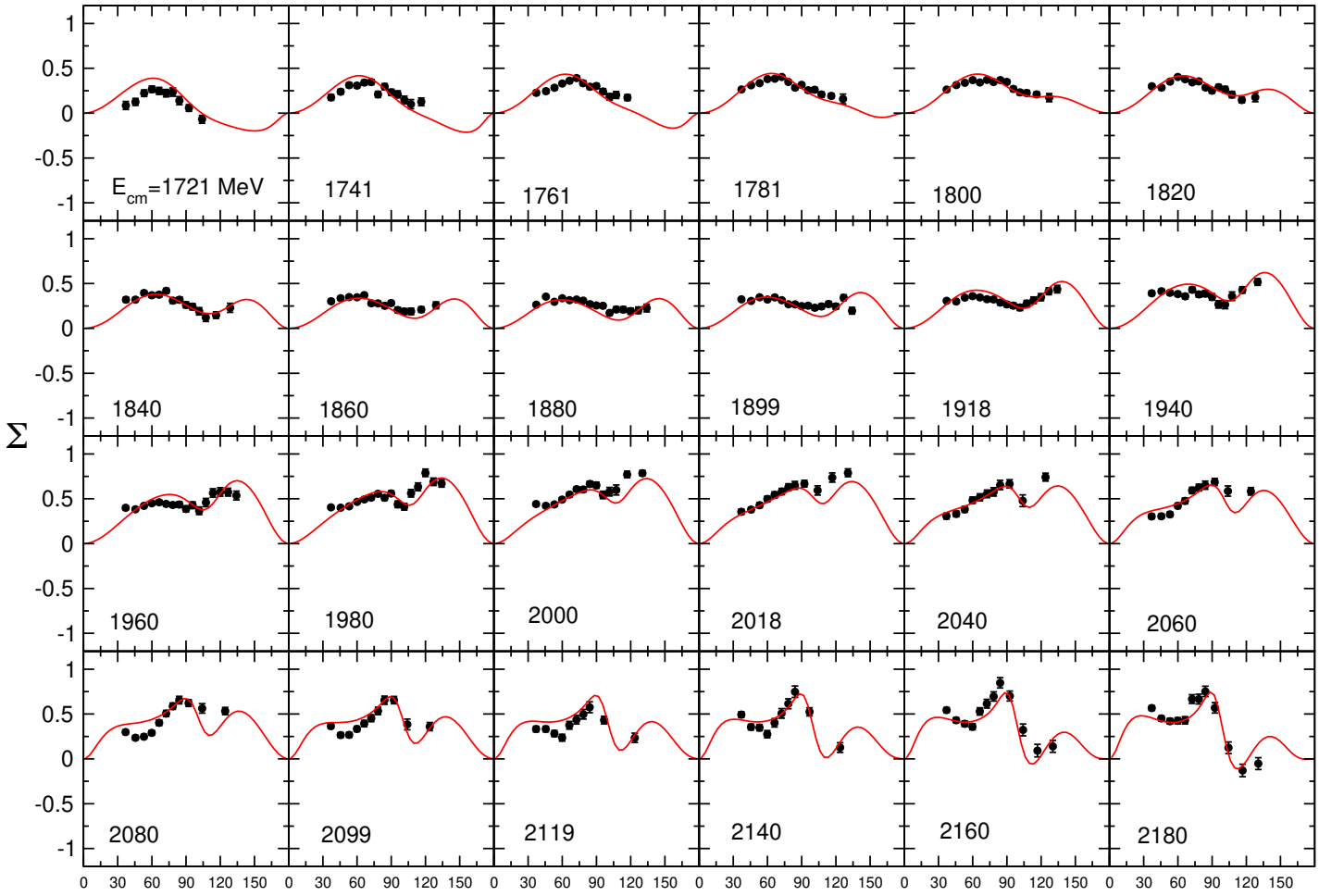

1995.00 MC10
2004.99 MC10
2005.88 MC04
2014.98 MC10
2017.54 HA78
2017.54 TP98
2025.02 MC10
2029.14 MC04
2035.00 MC10
2044.98 MC10
2052.13 MC04
2055.00 MC10
2063.52 GL04
2064.98 MC10
2074.86 MC04
2085.01 MC10
2094.98 MC10
2097.35 MC04
2104.99 MC10
2114.99 MC10
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-1
0
60
120
180

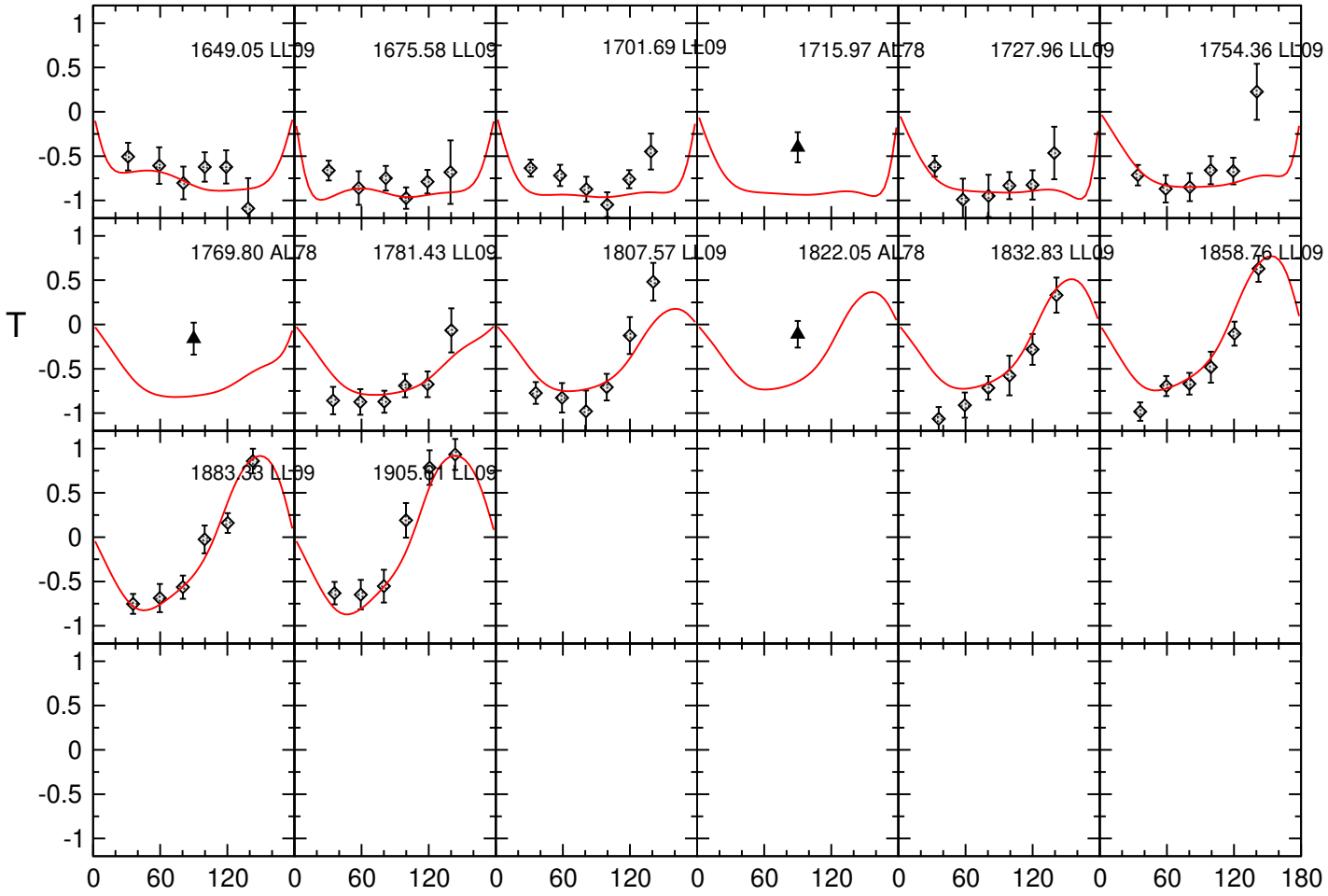

2141.62 MC04
2144.99 MC10
2154.98 MC10
2163.41 MC04
2165.02 MC10
2175.01 MC10
2184.99 MC10
2184.99 MC04
2195.02 MC10
2205.00 MC10
2206.36 MC04
2215.02 MC10
2224.99 MC10
2227.52 MC04
2235.00 MC10
2245.01 MC10
2248.48 MC04
2254.98 MC10
2264.99 MC10
2269.25 MC04
2274.99 MC10
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2284.99 MC10
2289.83 MC04
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120
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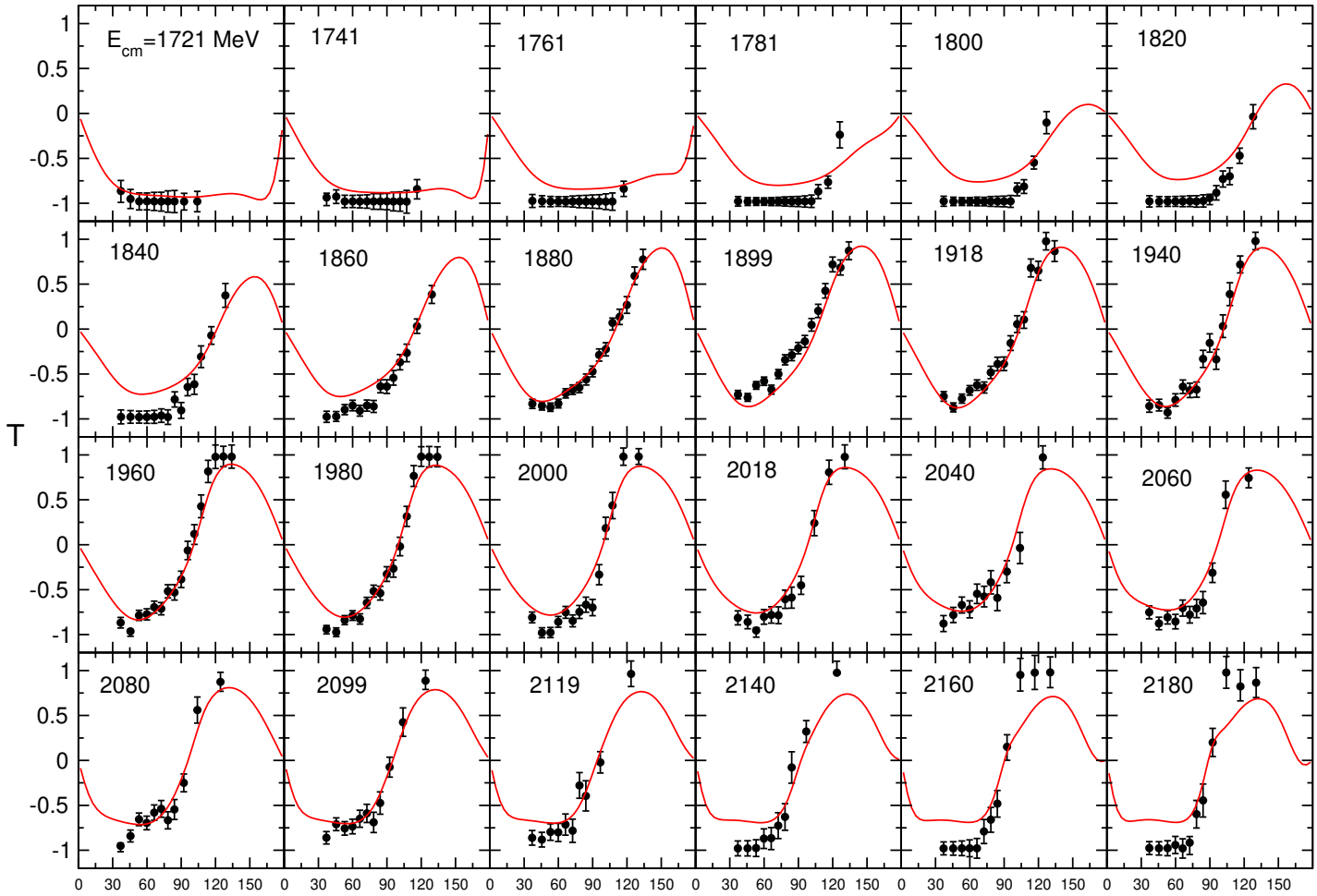

2294.99 MC10
2304.98 MC10
2315.01 MC10
2325.00 MC10
2334.99 MC10
2345.01 MC10
2355.00 MC10
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-0.5
-1
0
60
120
180

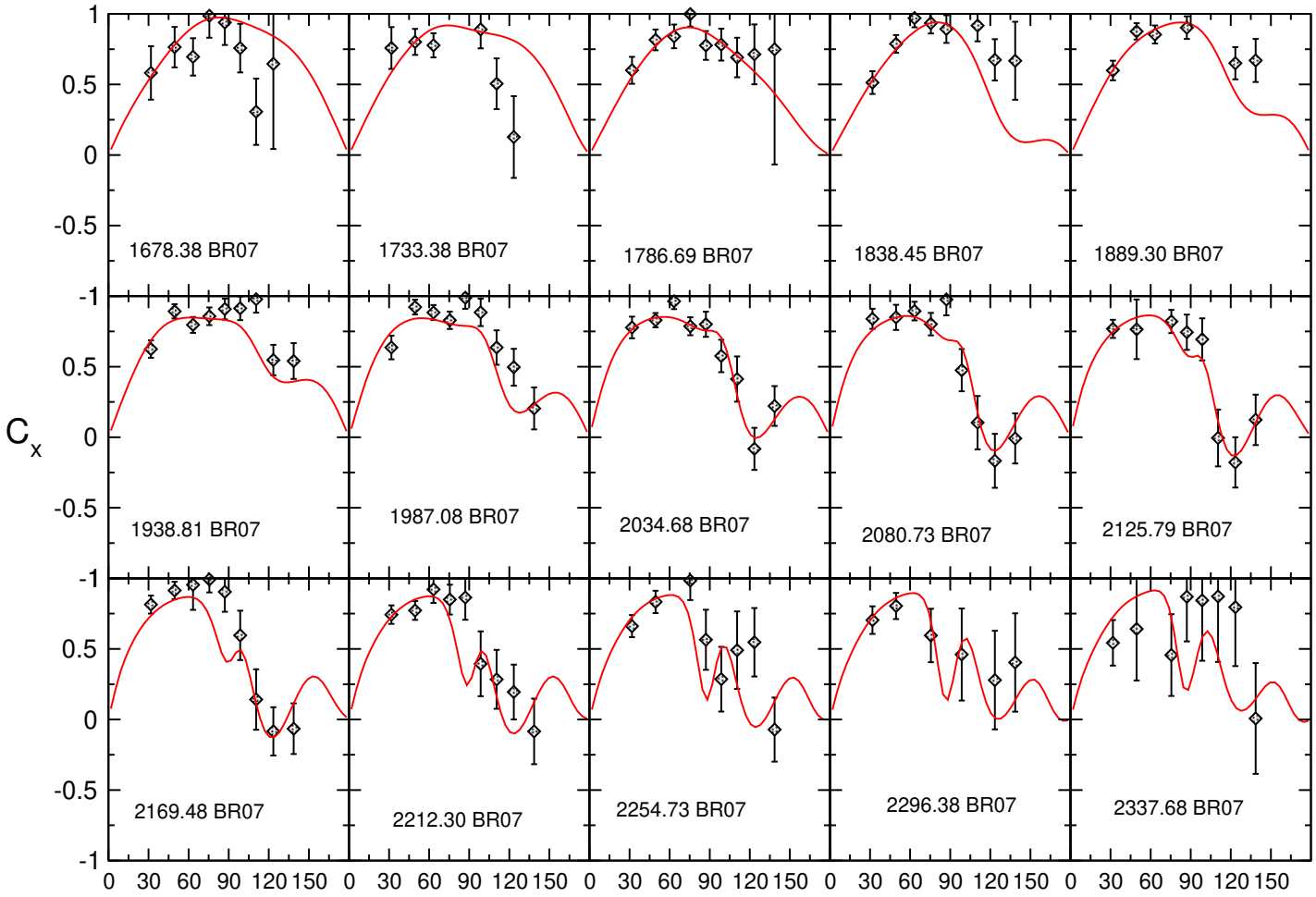

1649.05 LL07
1675.58 LL07
1701.69 LL07
1727.96 LL07
1754.36 LL07
1781.43 LL07
1807.57 LL07
1832.83 LL07
1858.76 LL07
1883.33 LL07
1905.61 LL07
1946.53 ZE03
1946.53 SU06
1994.15 ZE03
1994.15 SU06
2040.66 ZE03
2040.66 SU06
2040.66 HI07
2086.14 ZE03
2108.50 SU06
2130.64 ZE03
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Σ
1
0.5
0
-0.5
-1
0
60
120
180

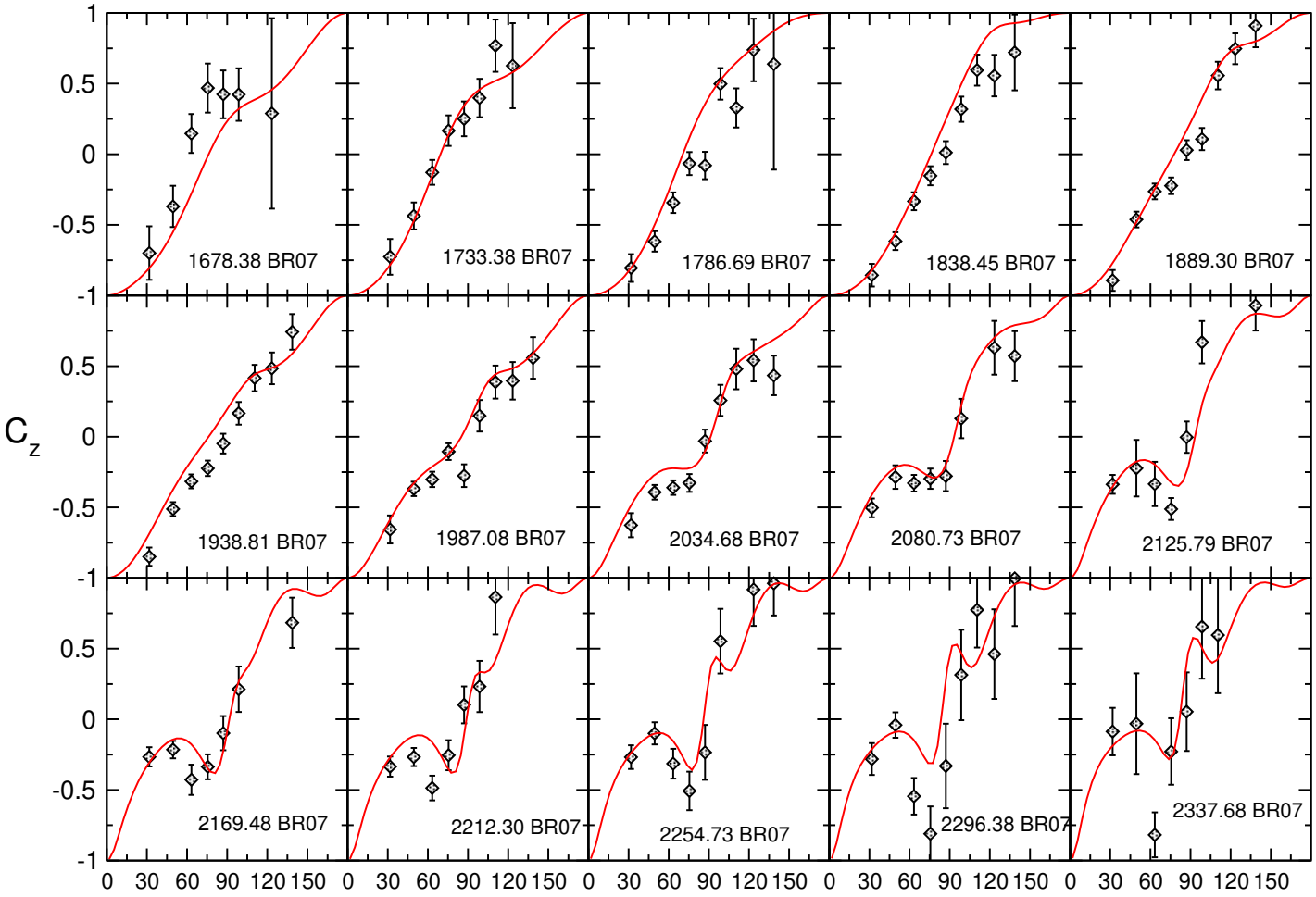

Σ
2238.02 HI07
2258.89 ZE03
2279.56 SU06
2300.05 ZE03
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0
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-1
0
60
120
180

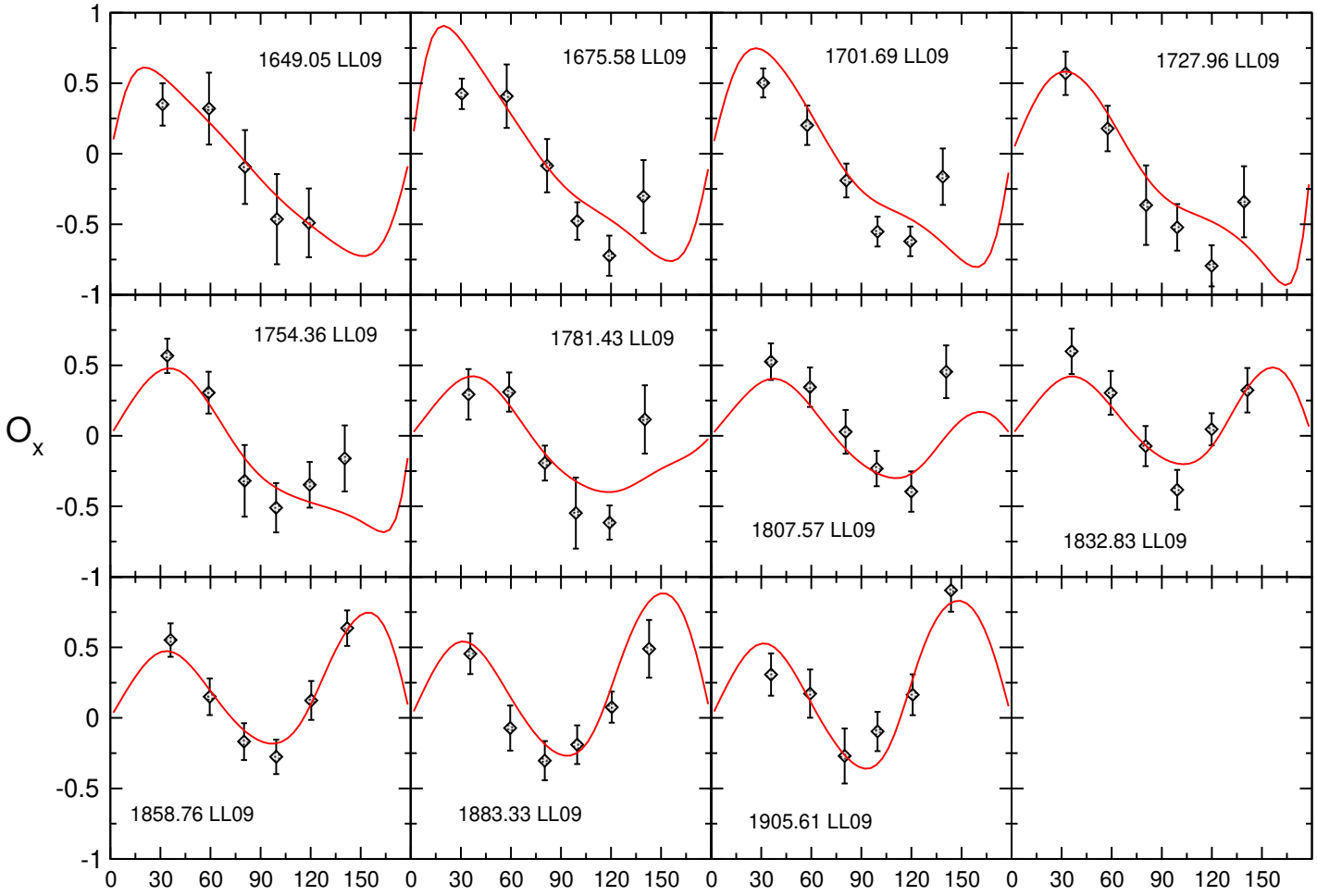

Σ
E_cm=1721 MeV
1741
1761
1781
1800
1820
1840
1860
1880
1899
1918
1940
1960
1980
2000
2018
2040
2060
2080
2099
2119
2140
2160
2180
1
0.5
0
-0.5
-1
0 30 60 90 120 150

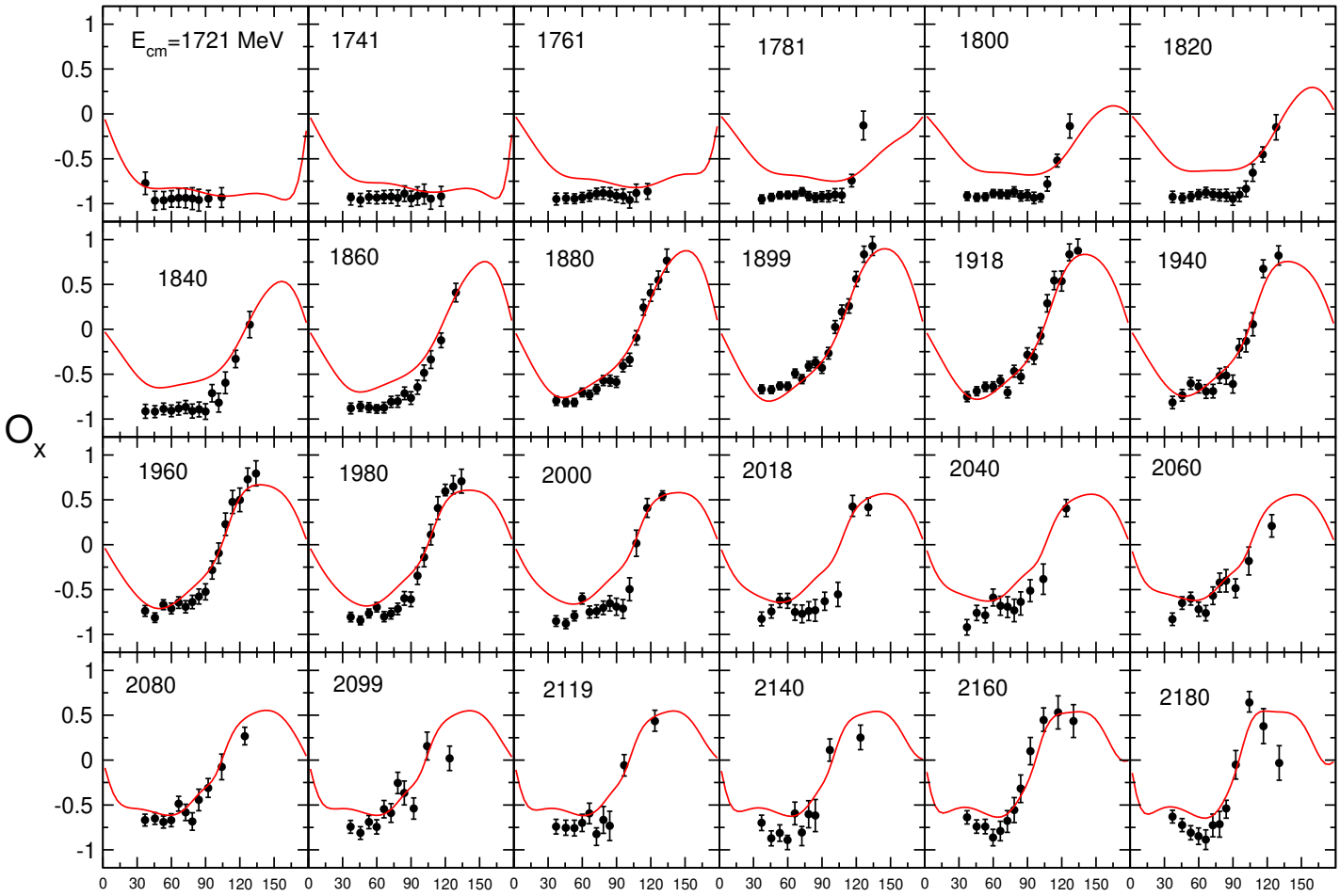

T
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1701.69 LL09
1715.97 AL78
1727.96 LL09
1754.36 LL09
1769.80 AL78
1781.43 LL09
1807.57 LL09
1822.05 AL78
1832.83 LL09
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1883.38 LL09
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0
-0.5
-1
0
60
120
180

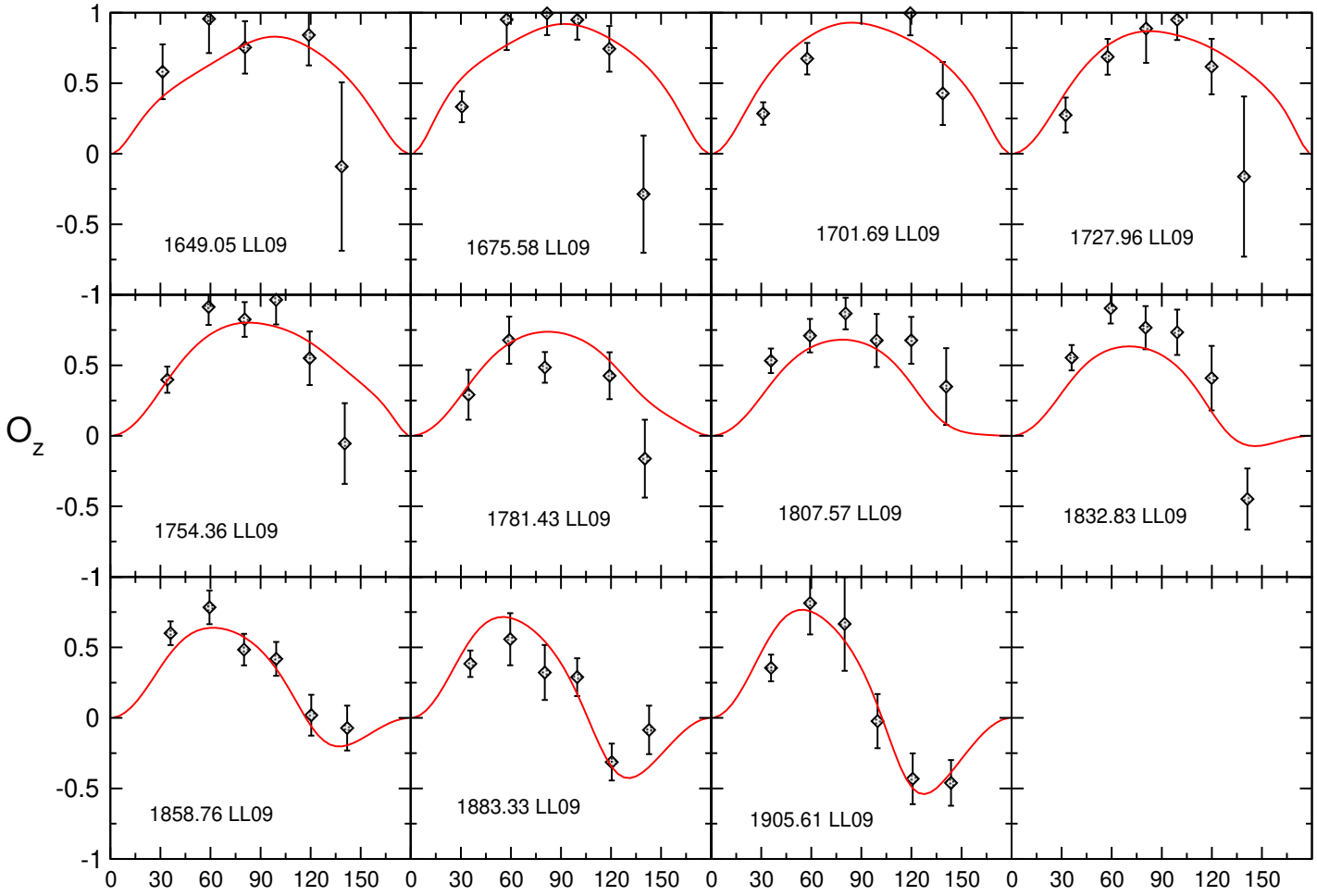

T
E_cm=1721 MeV
1741
1761
1781
1800
1820
1840
1860
1880
1899
1918
1940
1960
1980
2000
2018
2040
2060
2080
2099
2119
2140
2160
2180
1
0.5
0
-0.5
-1
0 30 60 90 120 150

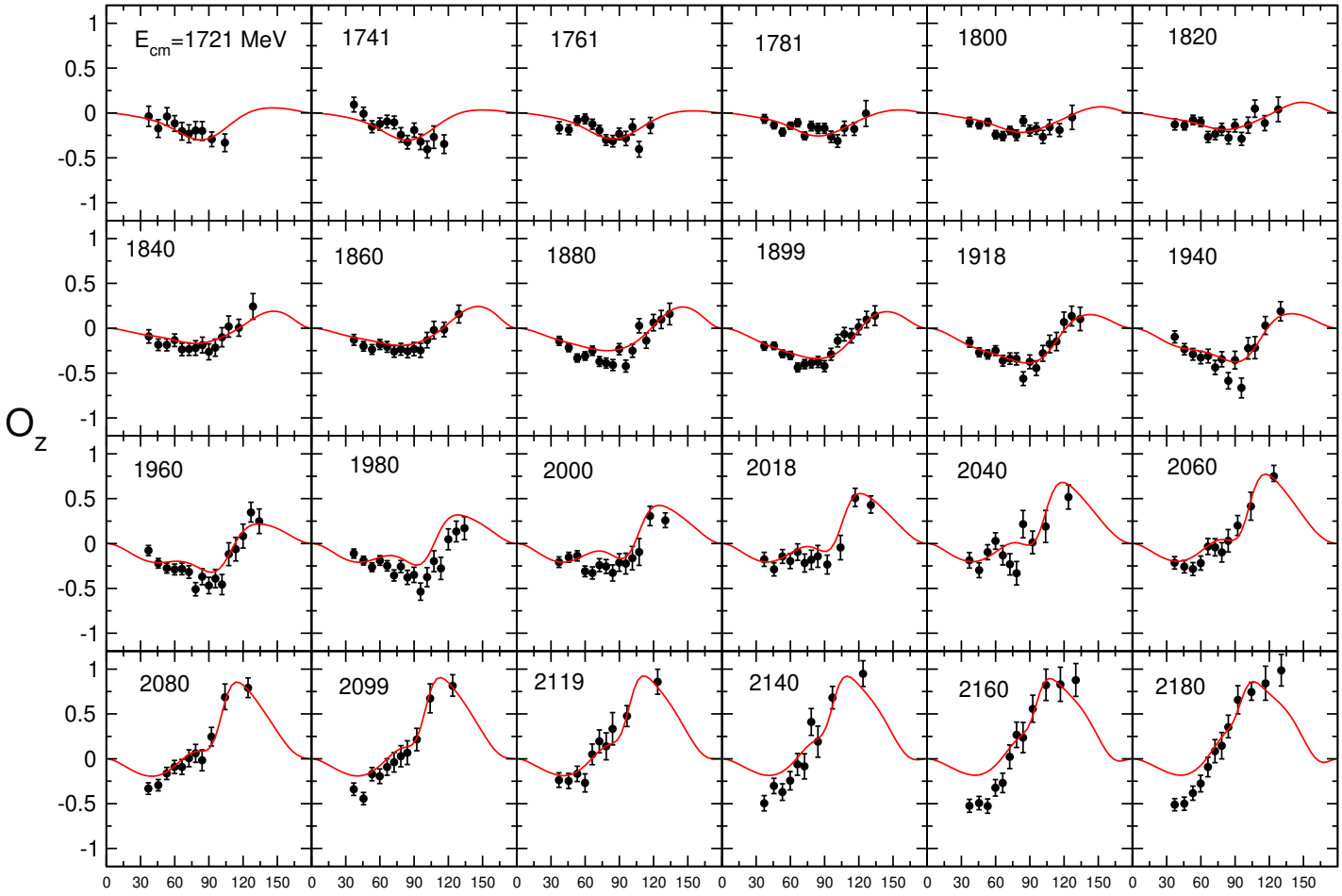

C_x
1678.38 BR07
1733.38 BR07
1786.69 BR07
1838.45 BR07
1889.30 BR07
1938.81 BR07
1987.08 BR07
2034.68 BR07
2080.73 BR07
2125.79 BR07
2169.48 BR07
2212.30 BR07
2254.73 BR07
2296.38 BR07
2337.68 BR07
1
0.5
0
-0.5
-1
0 30 60 90 120 150


C_z
1678.38 BR07
1733.38 BR07
1786.69 BR07
1838.45 BR07
1889.30 BR07
1938.81 BR07
1987.08 BR07
2034.68 BR07
2080.73 BR07
2125.79 BR07
2169.48 BR07
2212.30 BR07
2254.73 BR07
2296.38 BR07
2337.68 BR07
1
0.5
0
-0.5
-1
0 30 60 90 120 150


1649.05 LL09
1675.58 LL09
1701.69 LL09
1727.96 LL09
1754.36 LL09
1781.43 LL09
1807.57 LL09
1832.83 LL09
1858.76 LL09
1883.33 LL09
1905.61 LL09
O-C
1
0.5
0
-0.5
-1
0
30
60
90
120
150


O_x
E_cm=1721 MeV
1741
1761
1781
1800
1820
1840
1860
1880
1899
1918
1940
1960
1980
2000
2018
2040
2060
2080
2099
2119
2140
2160
2180
1
0.5
0
-0.5
-1
0 30 60 90 120 150


O_z
1649.05 LL09
1675.58 LL09
1701.69 LL09
1727.96 LL09
1754.36 LL09
1781.43 LL09
1807.57 LL09
1832.83 LL09
1858.76 LL09
1883.33 LL09
1905.61 LL09
1
0.5
0
-0.5
-1
0
30
60
90
120
150


O_z
E_cm=1721 MeV
1741
1761
1781
1800
1820
1840
1860
1880
1899
1918
1940
1960
1980
2000
2018
2040
2060
2080
2099
2119
2140
2160
2180
1
0.5
0
-0.5
-1
0 30 60 90 120 150

Data references

- Differential cross section $\gamma p \to K^+\Lambda$:
  - GL(04) BONN GLANDER, EPJA19, 251(2004)
  - TR(98) BONN TRAN, PLB445, 20(1998)
  - MC(04) CLAS MCNABB, PRC69, 042201(2004)
  - AN(62) CORN ANDERSON, PRL9, 131(1962)
  - MC(10) JLAB MCCRACKEN, PRC81, 025201(2010)
  - MO(66) CORN MORI, Ph.D. THESIS, CORNELL UNI
  - BR(06) JLAB BRADFORD, PRC73, 035202(2006)
  - BR(60) CALT BRODY, PR119, 1710(1960)
  - DO(58) CALT DONOHO, PR112, 981(1958)
  - DC(70)O RSA DECAMP, LAL-1236, 1970, FOURNER
  - BO(94) BONN BOCKHORST, ZPC63, 37(1994)
  - FU(70) TOKY FUJII, PRD2, 439(1970)
  - FE(72) BONN FELLER, NPB39, 413(1972)
  - PE(64) CALT PECK, PRB135, 830(1964)
  - AN(65) CORN ANDERSON, ISEPIHE, HAMBURG, (19
  - GR(67) CALT GROOM, PR159, 1213(1967)
  - GO(71) DESY GOEING, NPB26, 121(1971)
  - BL(70) BONN BLECKMANN, ZP239, 1(1970)
  - SU(06) LEPS SUMIHAMA, PRC73, 035214(2006)
  - S. Alef et al. [BGOOD] EPJ A 57, 80 (2020)
- Beam asymmetry Σ $\gamma p \to K^+\Lambda$:
  - LL(07) GRAA LLERES, EPJA31, 79(2007)
  - ZE(03) SPRI ZEGERS, PRL (2003), NUCL-EX/030
  - SU(06) LEPS SUMIHAMA, PRC73, 035214(2006)
  - HI(07) LEPS HICKS, PRC76, 042201(2007)
  - Paterson *et al.* [CLAS Collaboration] PRC93, 065201 (2016)
- Recoil Polarization $\gamma p \to K^+\Lambda$:
  - MC(04) CLAS MCNABB, PRC69, 042201(2004)
  - MC(10) JLAB MCCRACKEN, PRC81, 025201(2010),
  - BO(64) BONN BORGIA, NC32, 218(1964)
  - GR(65) BONN GRILLI, NC38, 1467(1965)
  - LL(07) GRAA LLERES, EPJA31, 79(2007)
  - MD(60) CORN MCDANIEL, PRL4, 33(1960)
  - TH(63) CORN THOM, PRL11, 433(1963)
  - TR(98) BONN TRAN, PLB445, 20(1998)
  - GL(04) BONN GLANDER, EPJA19, 251(2004)
  - BO(94) BONN BOCKHORST, ZPC63, 37(1994)
  - FU(70) TOKY FUJII, PRD2, 439(1970)
  - GR(67) CALT GROOM, PR159, 1213(1967)
  - HA(78) BONN HAAS, NPB137, 261(1978)
  - S. Alef et al. [BGOOD] EPJ A 57, 80 (2020)

- Target asymmetry T $\gamma p \to K^+\Lambda$:
  - LL(09) GRAA LLERES, EPJA39, 149(2009)
  - AL(78) BONN ALTHOFF, NPB137, 269(1978)
  - Paterson *et al.* [CLAS Collaboration] PRC93, 065201 (2016)
- C_x $\gamma p \to K^+\Lambda$:
  - BR(07) JLAB BRADFORD, PRC75, 035205(2007)
- C_z $\gamma p \to K^+\Lambda$:
  - BR(07) JLAB BRADFORD, PRC75, 035205(2007)
- O_x $\gamma p \to K^+\Lambda$:
  - LL(09) GRAA LLERES, EPJA39, 149(2009)
  - Paterson *et al.* [CLAS Collaboration] PRC93, 065201 (2016)
- O_z $\gamma p \to K^+\Lambda$:
  - LL(09) GRAA LLERES, EPJA39, 149(2009)
  - Paterson *et al.* [CLAS Collaboration] PRC93, 065201 (2016)

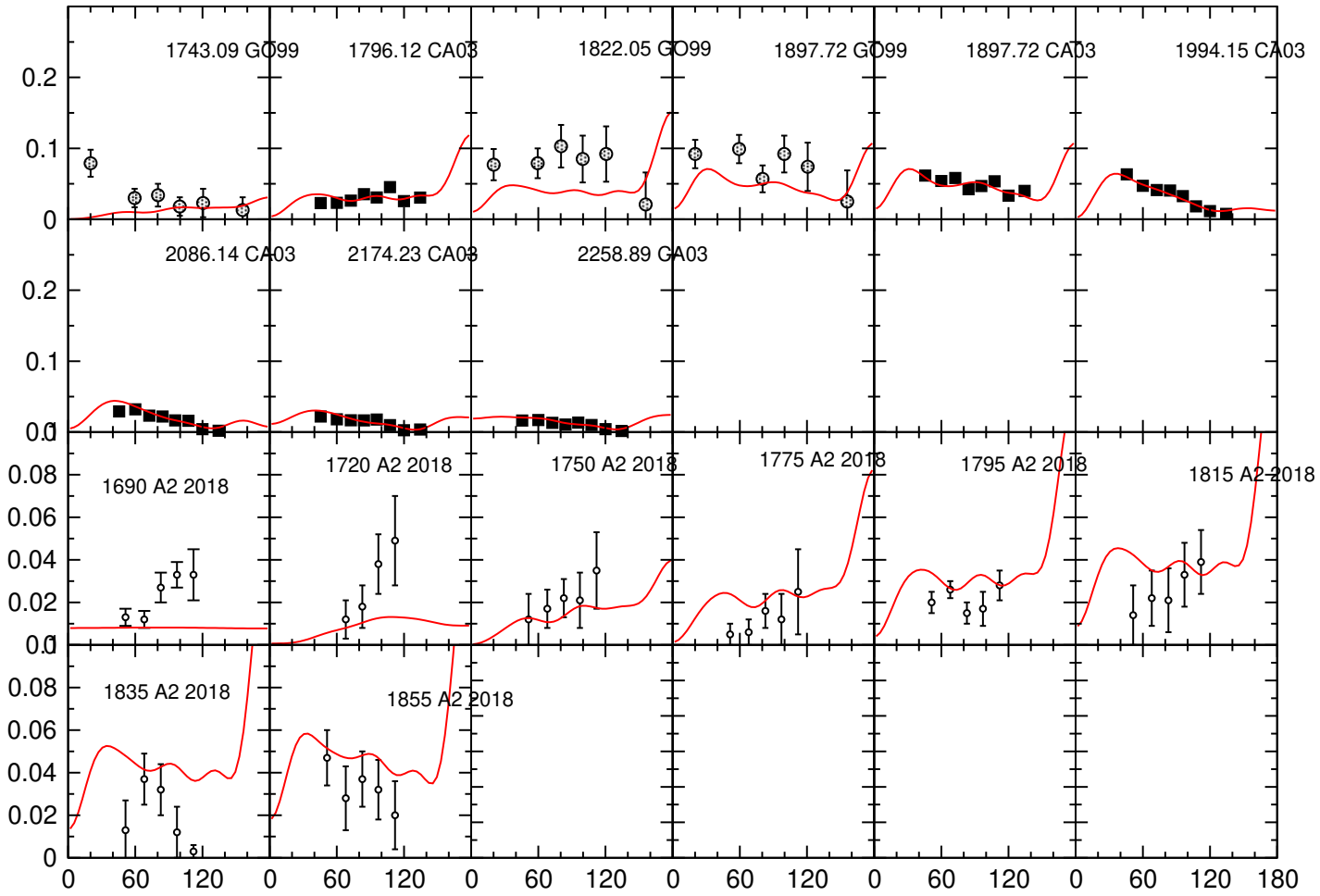
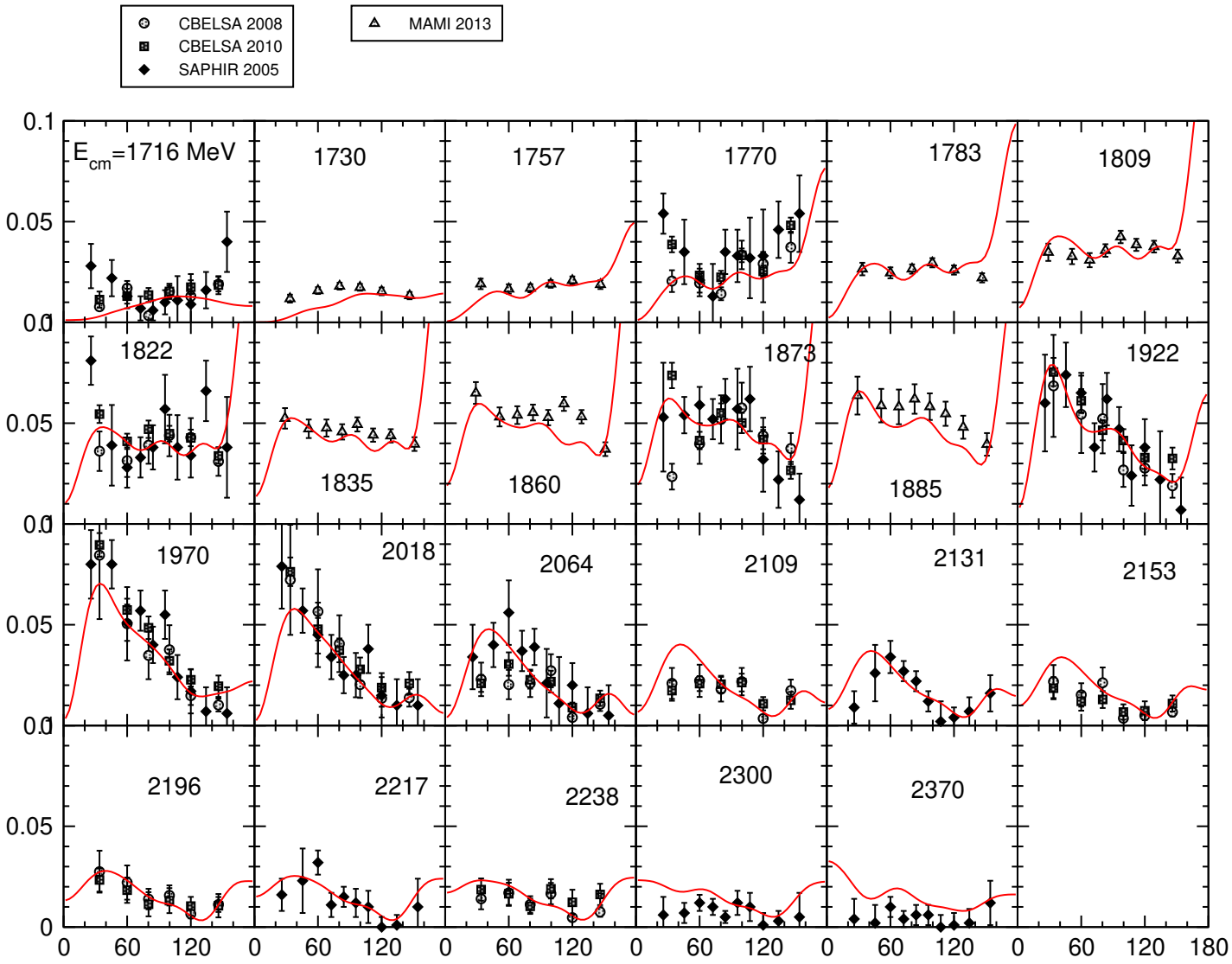
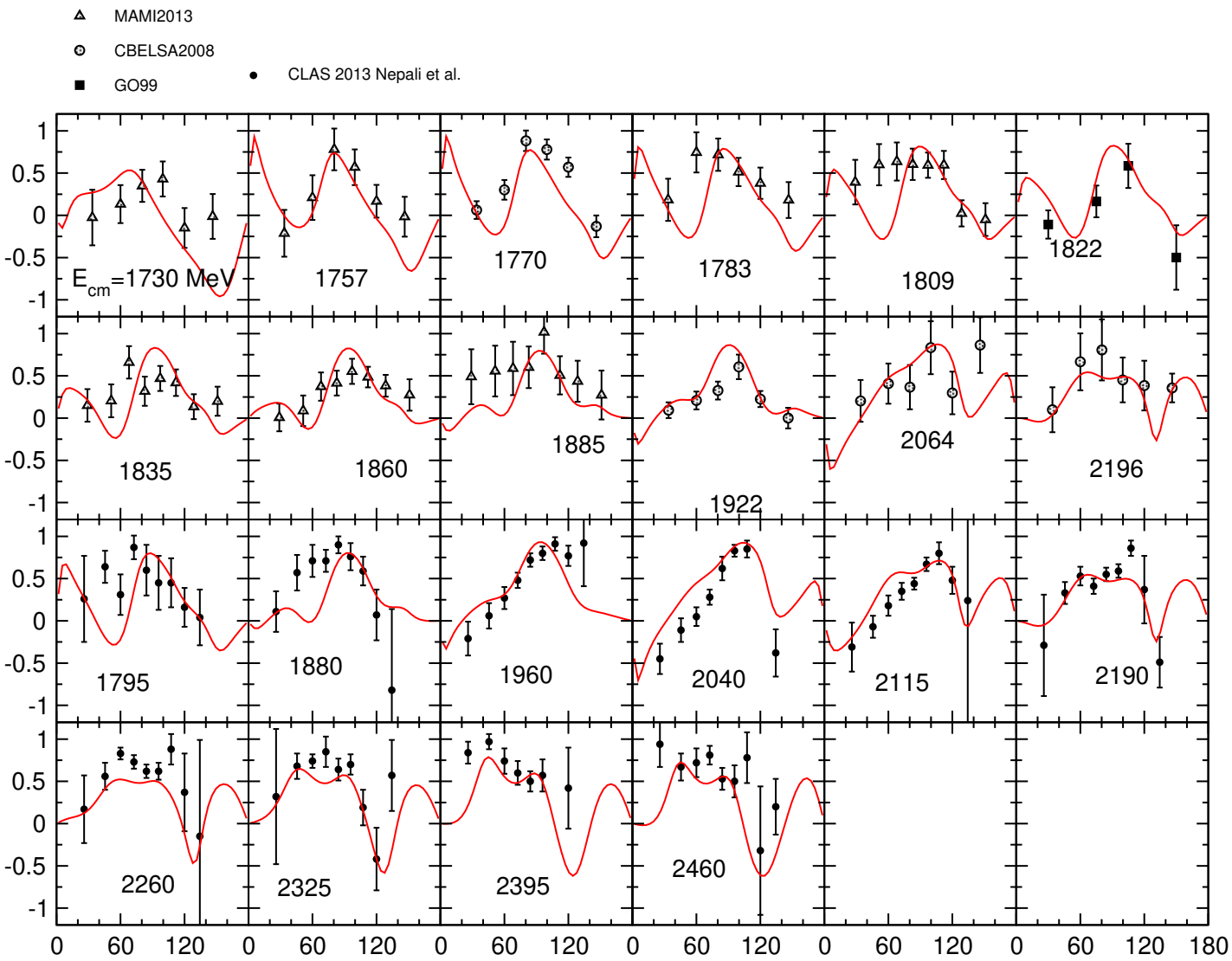


Figure 1: Data: filled (orange) circles: CBELSA/TAPS 2007; filled (black) squares: CBELSA/TAPS 2011; filled (turquoise) diamonds: SAPHIR; open circles: A2 MAMI 2018; open triangles: A2 MAMI 2013; open squares: SAPHIR 1999 (omitted from fit); filled (black) triangles: JLab Hall B 2003


CBELSA 2008
CBELSA 2010
SAPHIR 2005
MAMI 2013
E_cm=1716 MeV
1730
1757
1770
1783
1809
1822
1835
1860
1873
1885
1922
1970
2018
2064
2109
2131
2153
2196
2217
2238
2300
2370
0.1
0.05
0
0
60
120
180


MAMI2013
CBELSA2008
GO99
CLAS 2013 Nepali et al.
E_cm=1730 MeV
1757
1770
1783
1809
1822
1835
1860
1885
1922
2064
2196
1795
1880
1960
2040
2115
2190
2260
2325
2395
2460
1
0.5
0
-0.5
-1
0
60
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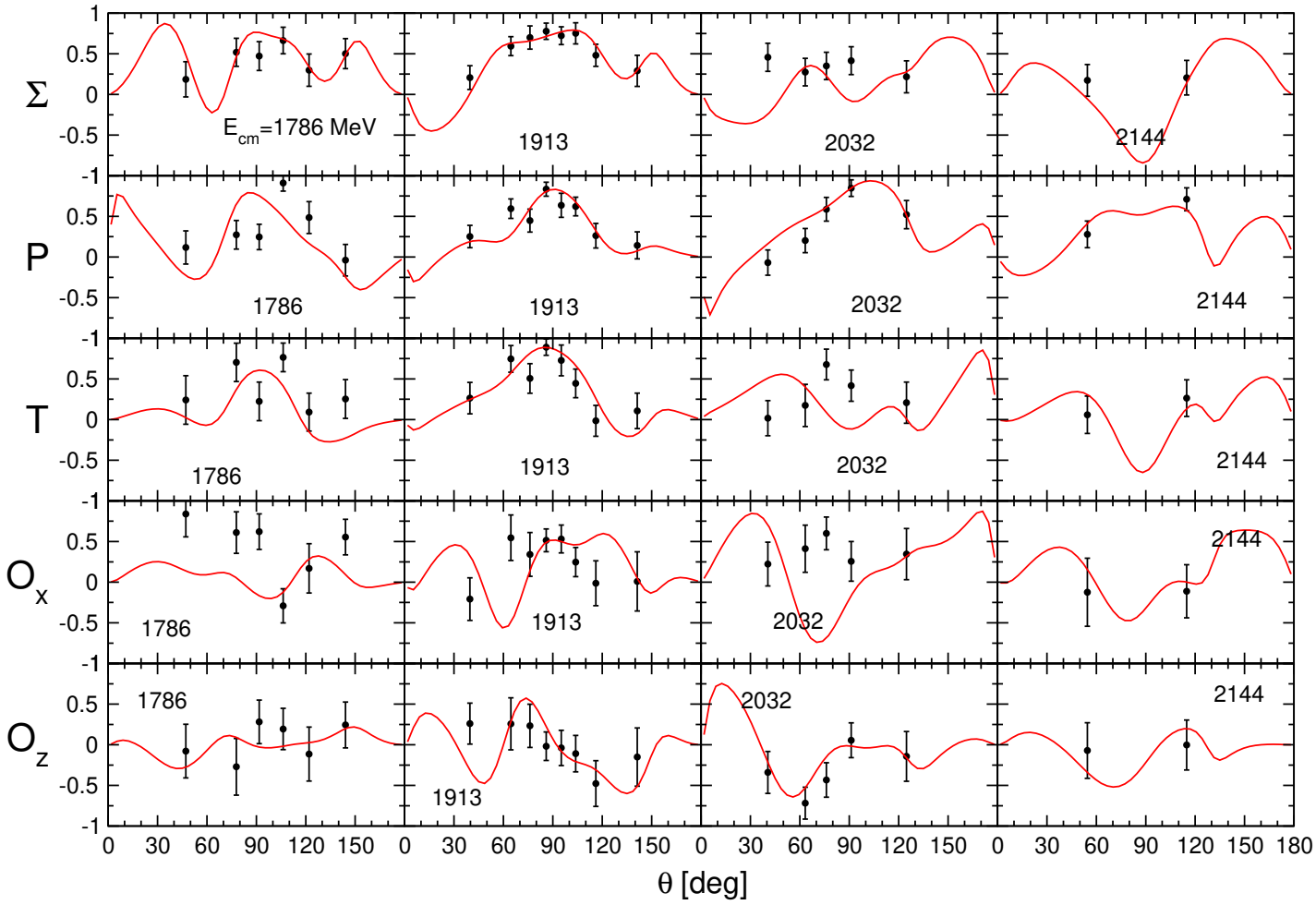
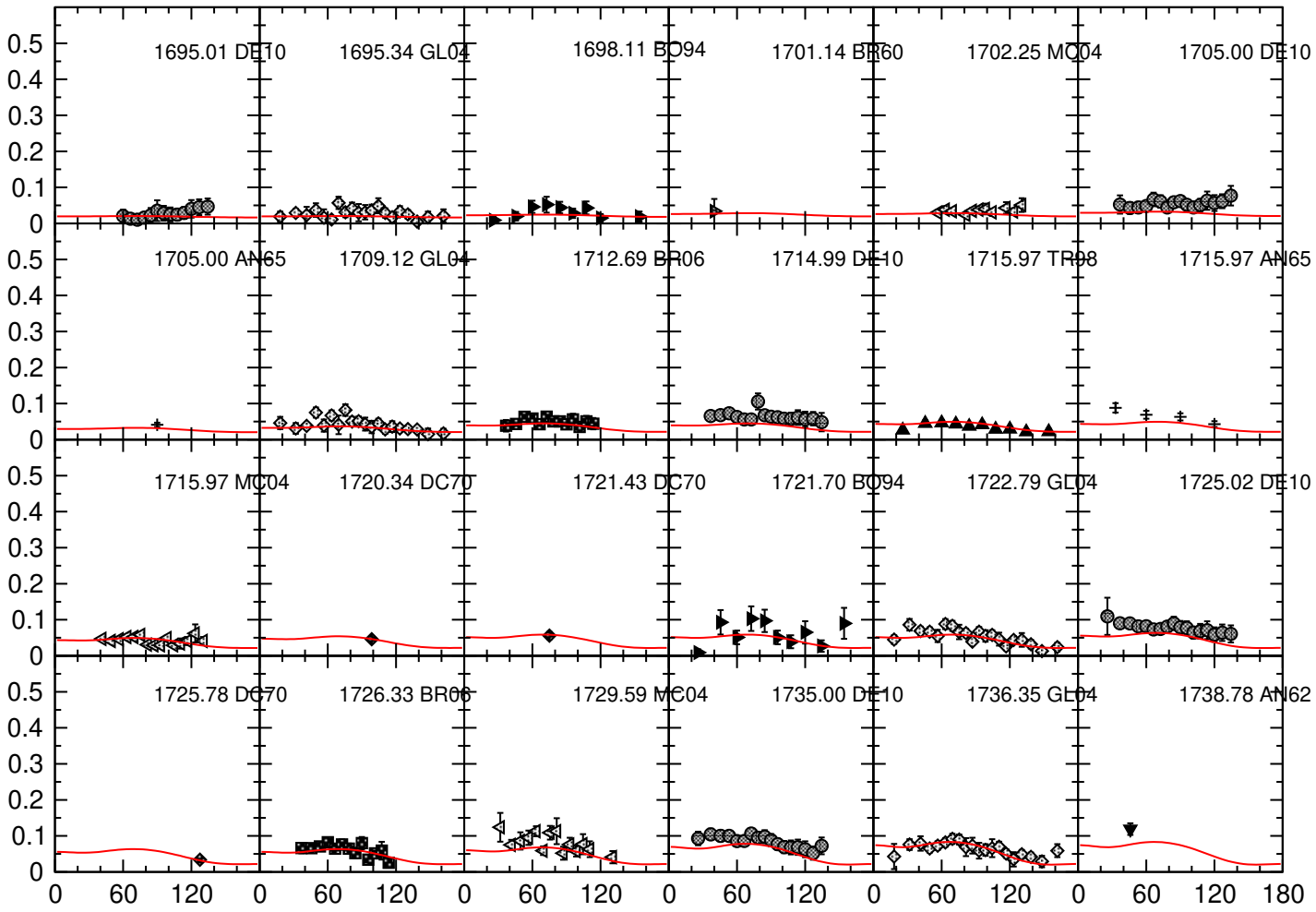
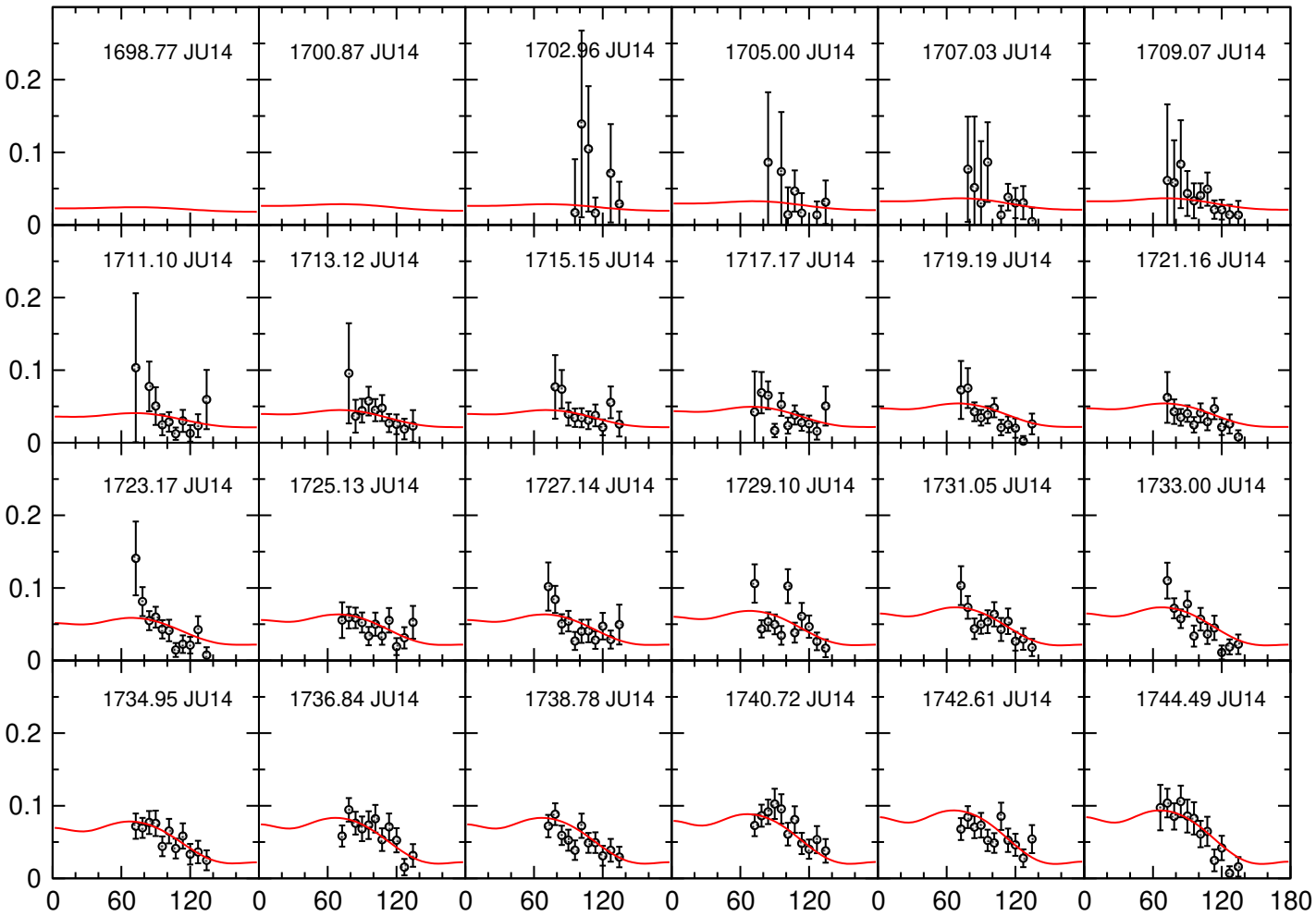


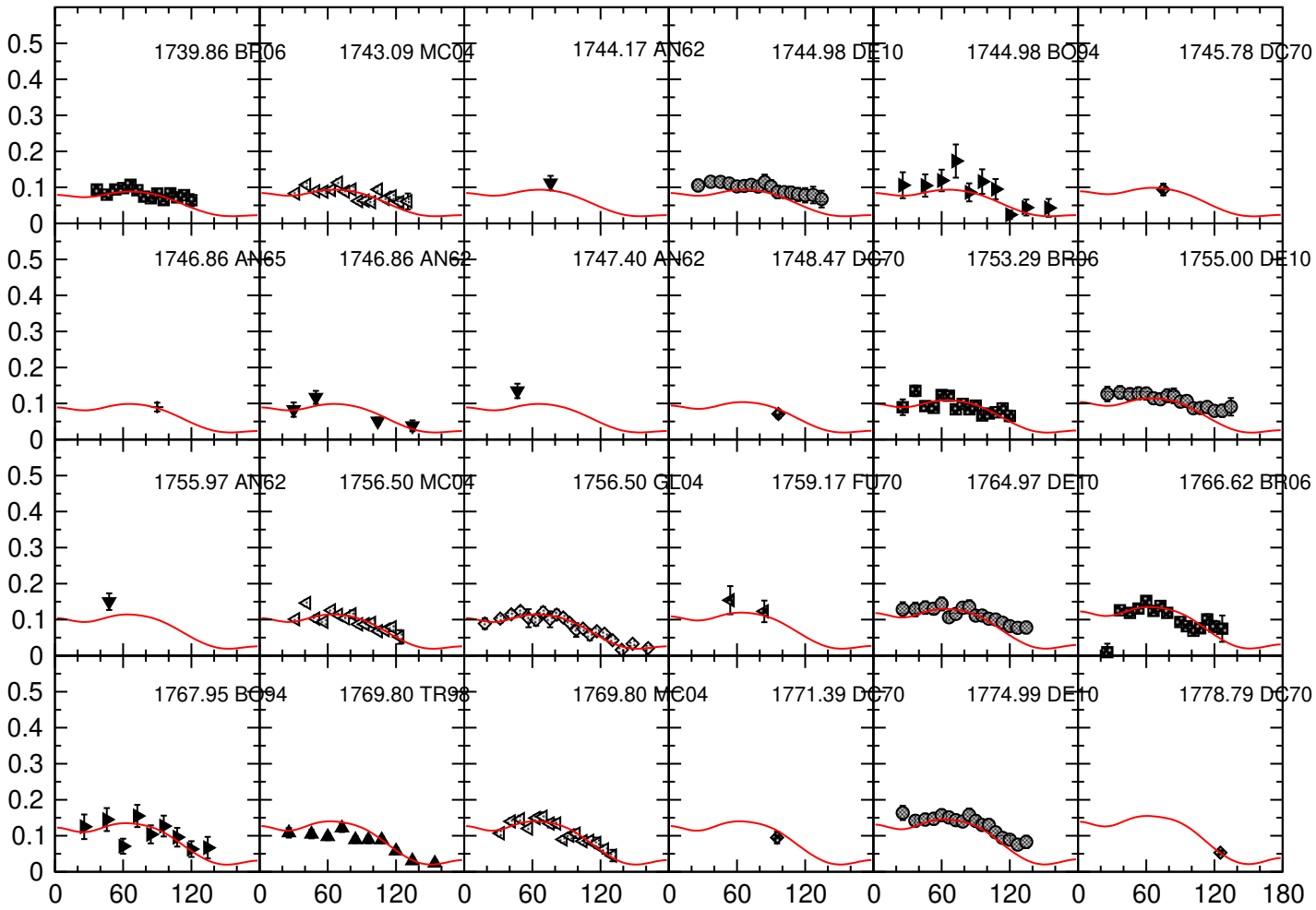
Figure 1: Data for Σ, P, T, O_x and O_z from CLAS2021

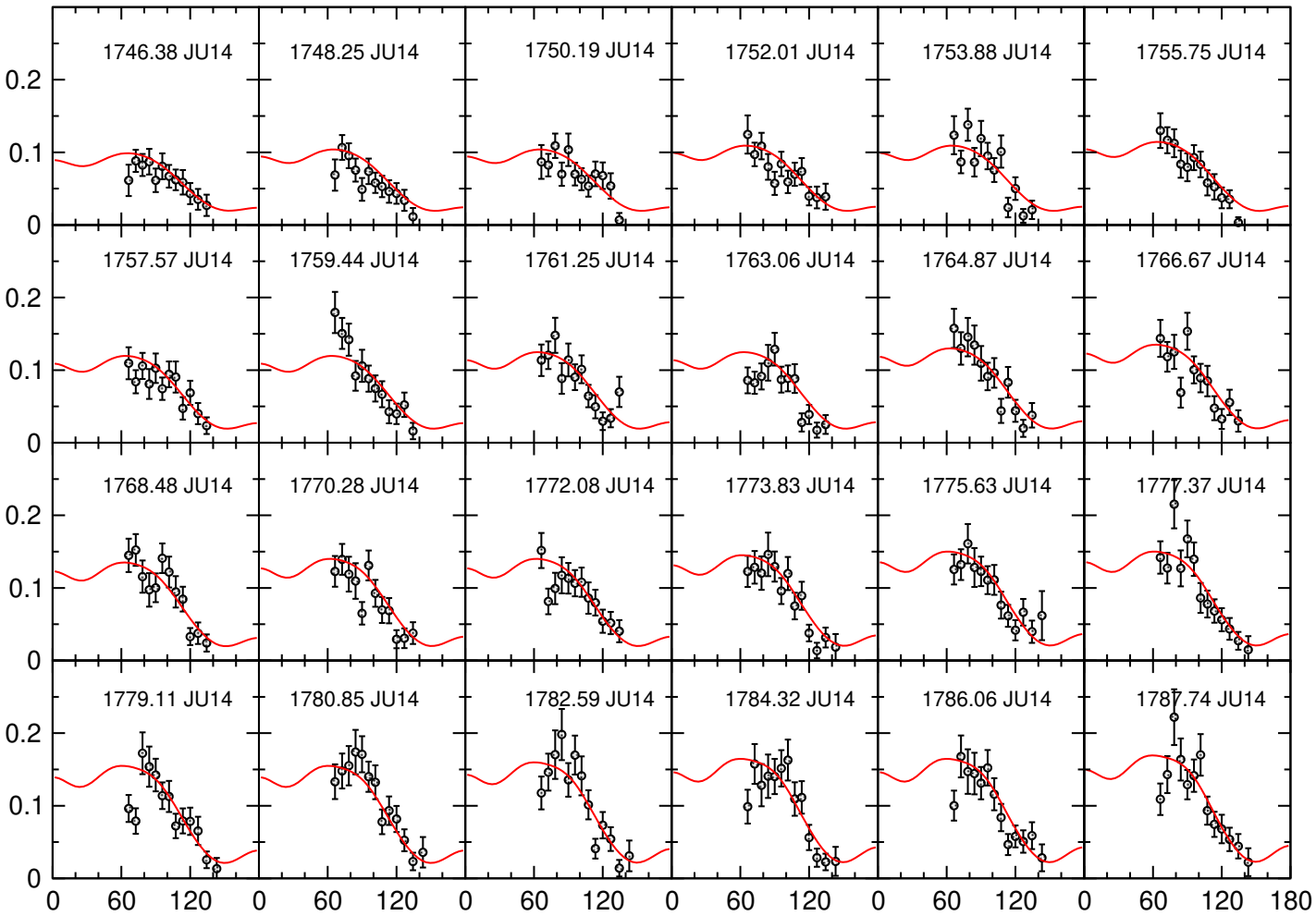
Data references

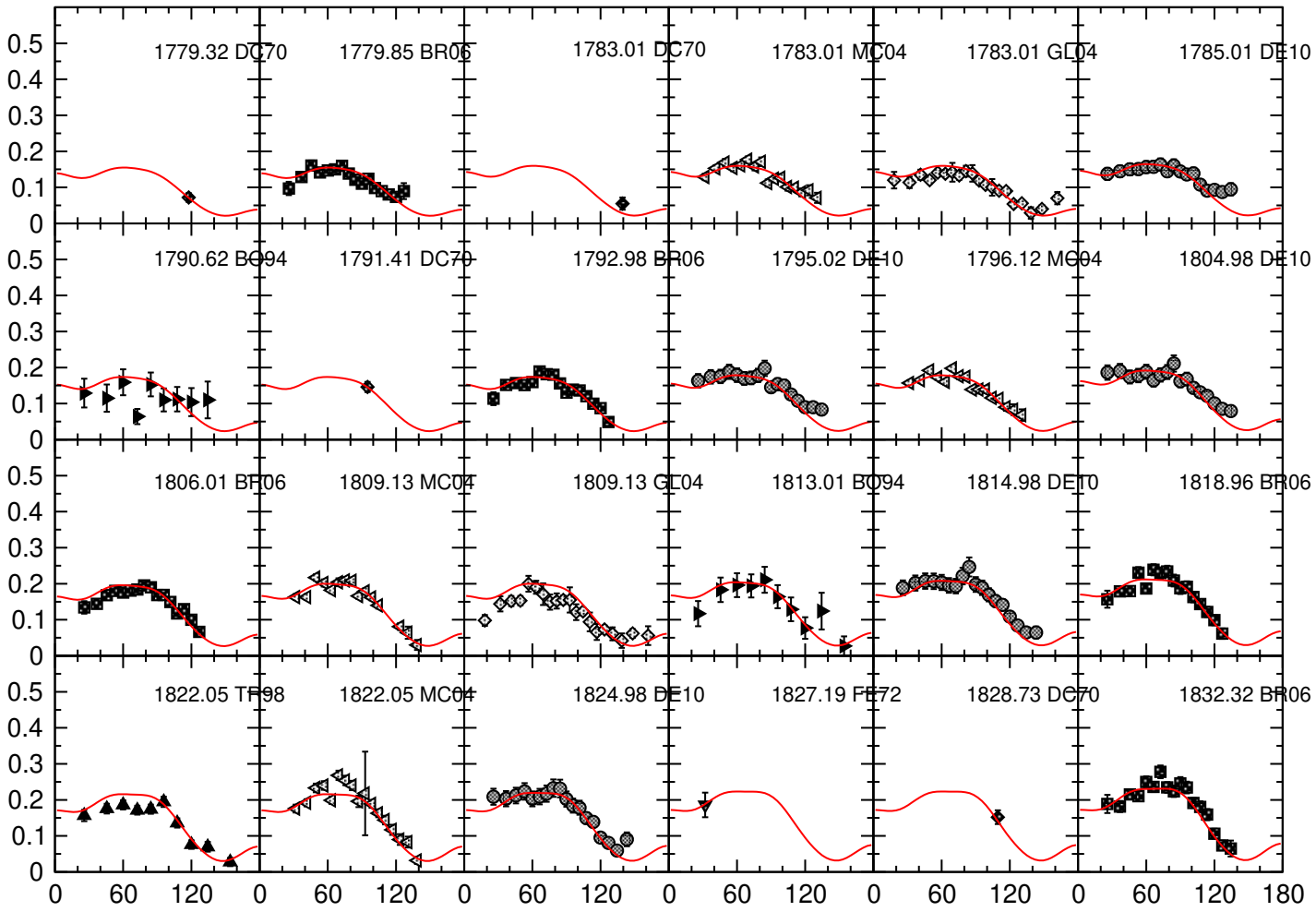
- Differential cross section $\gamma p \to K^0\Sigma^+$:
  - SAPHIR GOERS, PLB464, 331(1999)
  - CA(03)PCLAS CARNAHAN, PHD THESIS, CUA (2003
  - SAPHIR 2005, Lawall EPJA 24, 275
  - CBELSA 2008, Castelijns EPJ A 35, 39
  - CBELSA 2010, Ewald PLB 713, 180 (2012)
  - MAMI 2013, Aguar-Bartolome PRC 88, 044601
  - MAMI A2 2018, Akondi Eur.Phys.J.A 55 (2019)
- Recoil Polarization $\gamma p \to K^0\Sigma^+$:
  - SAPHIR GOERS, PLB464, 331(1999)
  - MAMI 2013, Aguar-Bartolome PRC 88, 044601
  - CBELSA 2008, Castelijns EPJ A 35, 39
  - CLAS 2013, Nepali Phys.Rev.C 87 (2013) 4, 045206
  - CLAS2021, Clark et. al. Phys.Rev.C 111 (2025) 2, 025204
- Beam asymmetry Σ $\gamma p \to K^0\Sigma^+$:
  - CLAS2021, Clark et. al. Phys.Rev.C 111 (2025) 2, 025204
- Target asymmetry T $\gamma p \to K^0\Sigma^+$:
  - CLAS2021, Clark et. al. Phys.Rev.C 111 (2025) 2, 025204
- O_x $\gamma p \to K^0\Sigma^+$:
  - CLAS2021, Clark et. al. Phys.Rev.C 111 (2025) 2, 025204
- O_z $\gamma p \to K^0\Sigma^+$:
  - CLAS2021, Clark et. al. Phys.Rev.C 111 (2025) 2, 025204

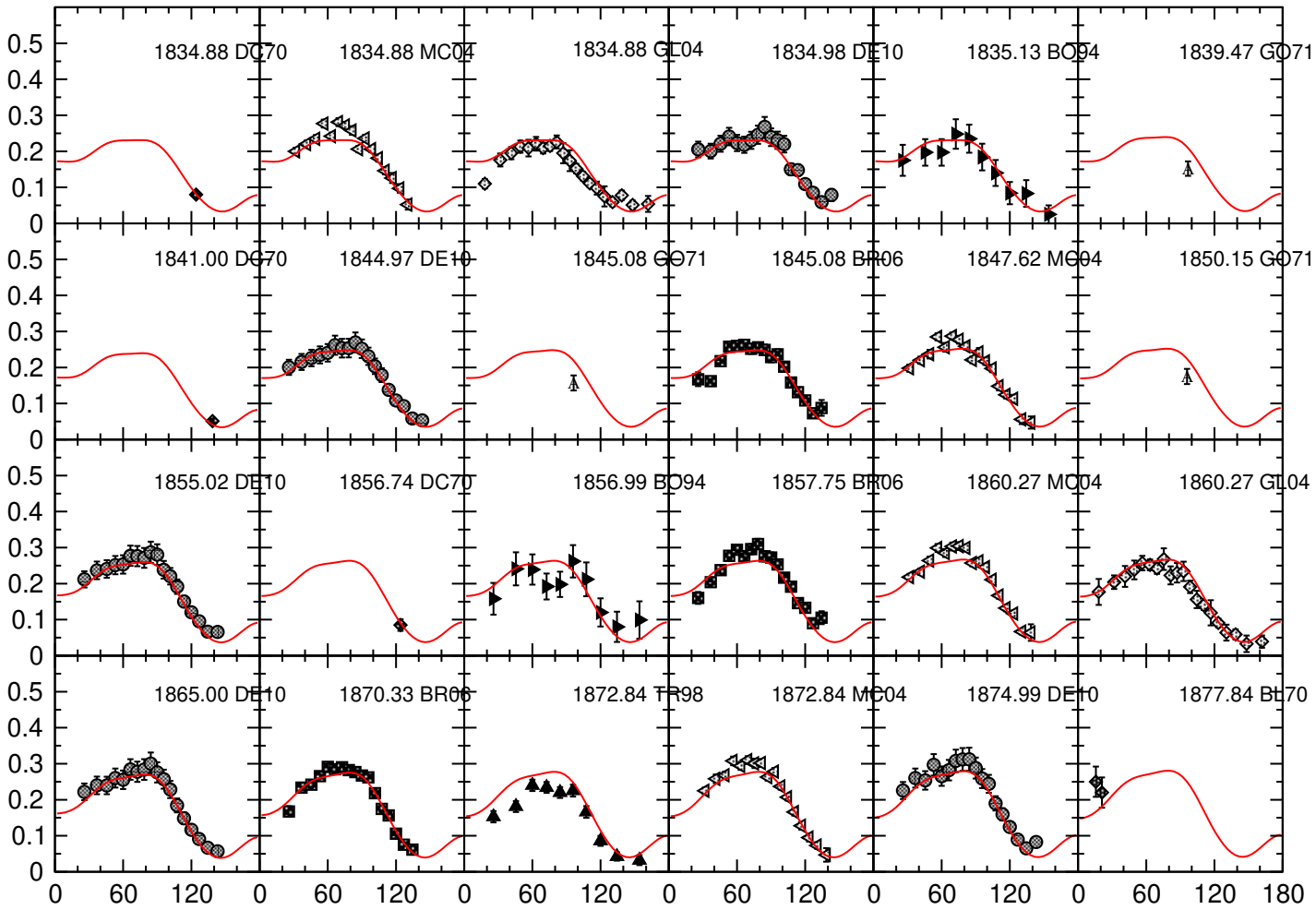

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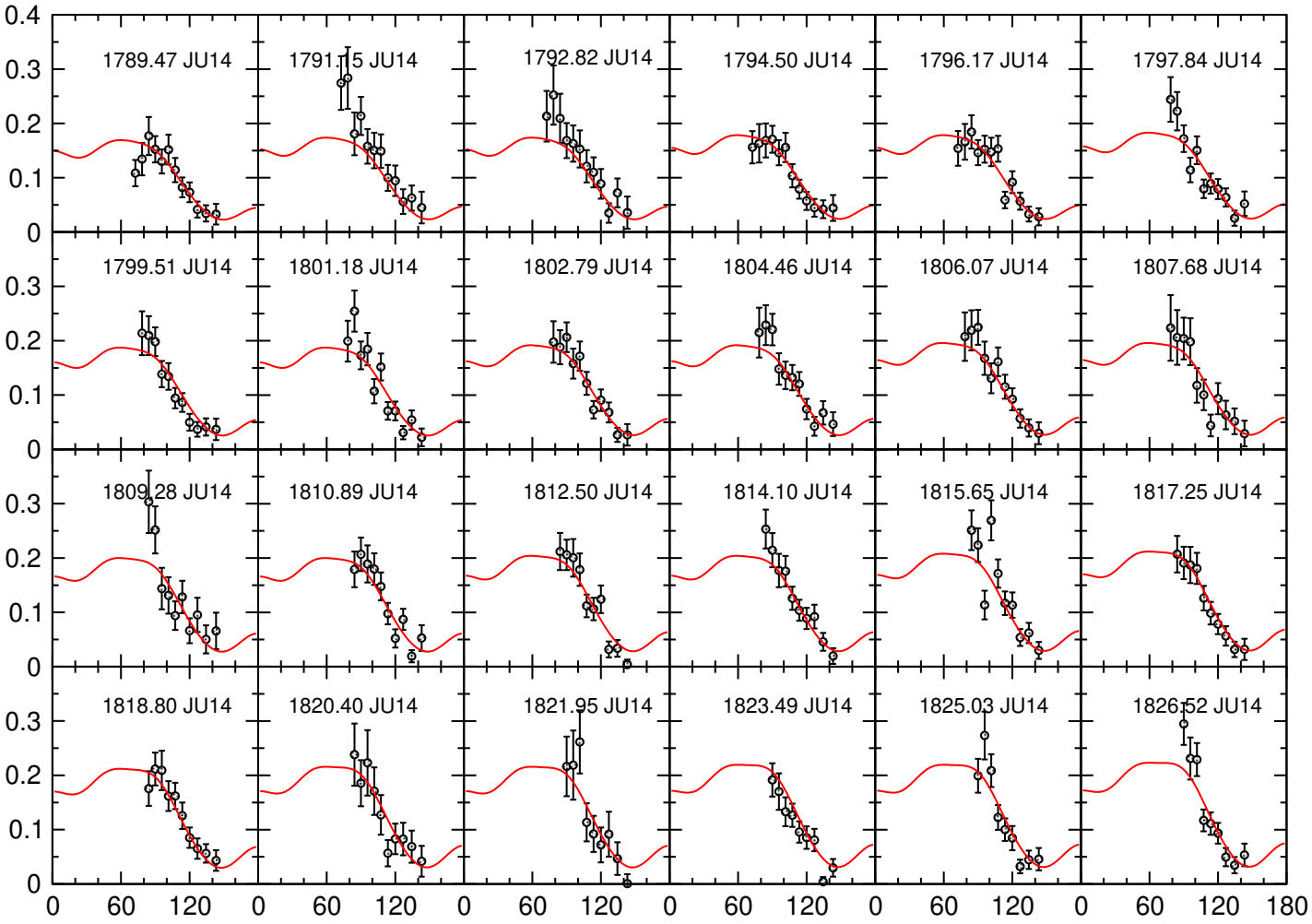

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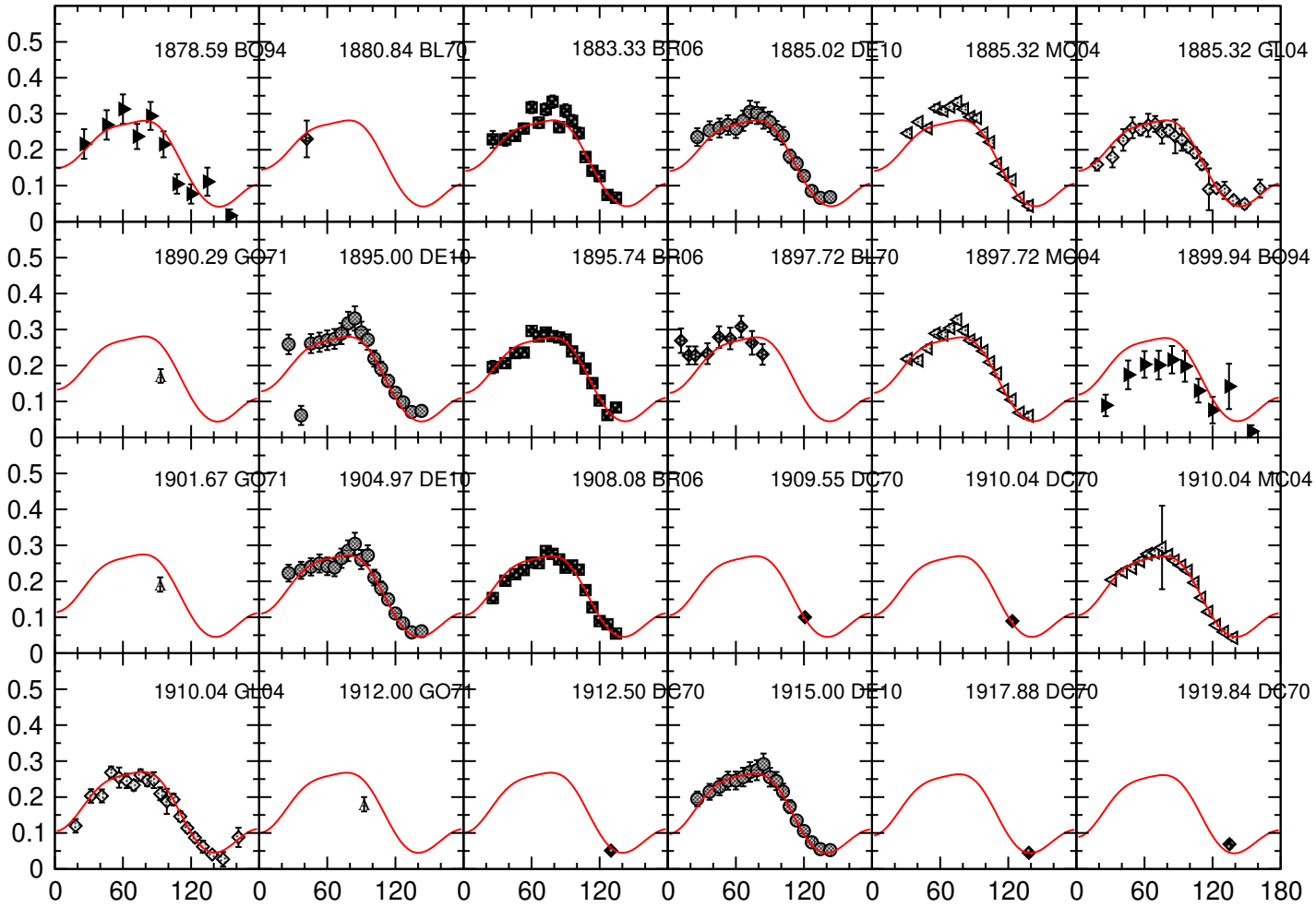

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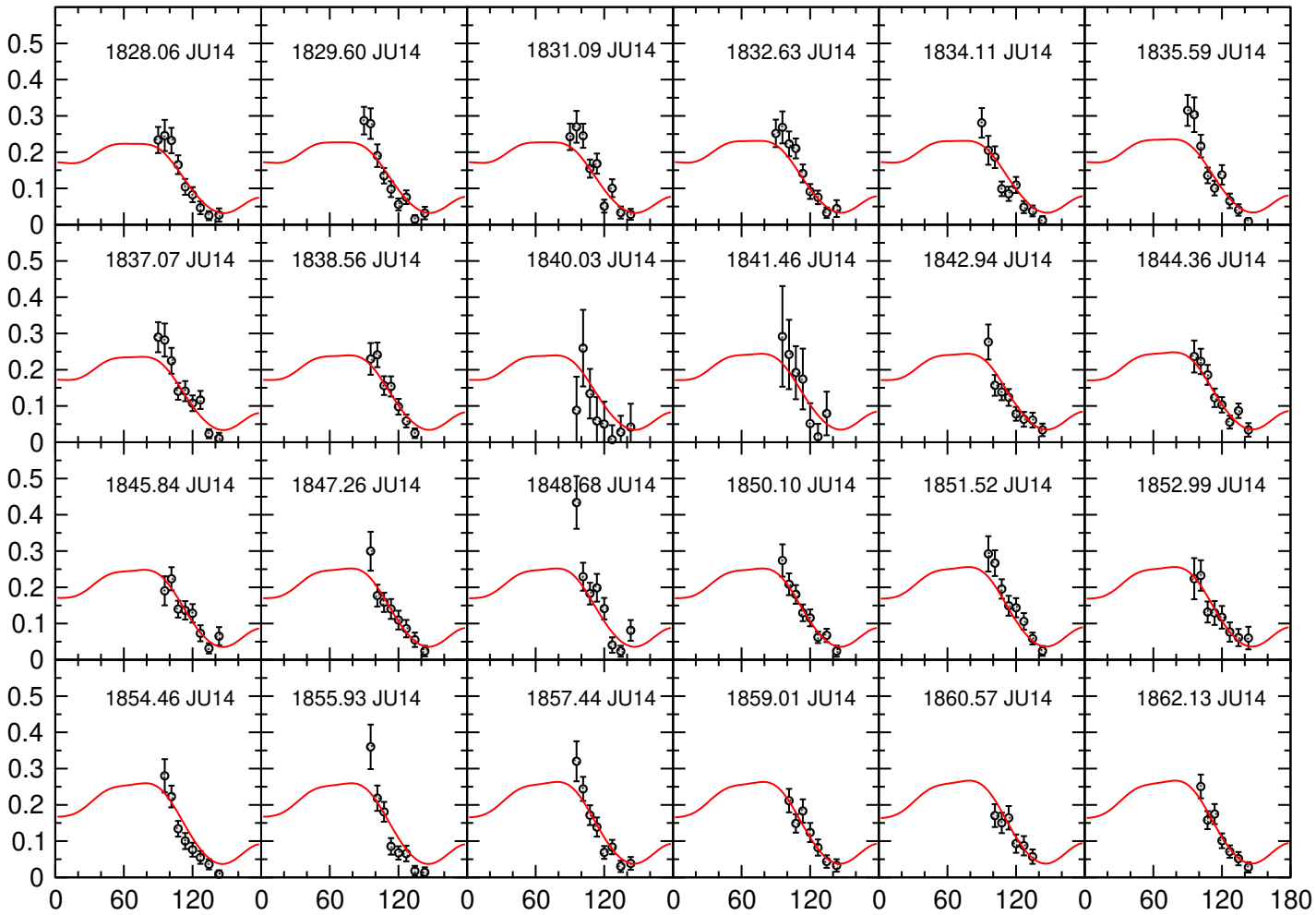

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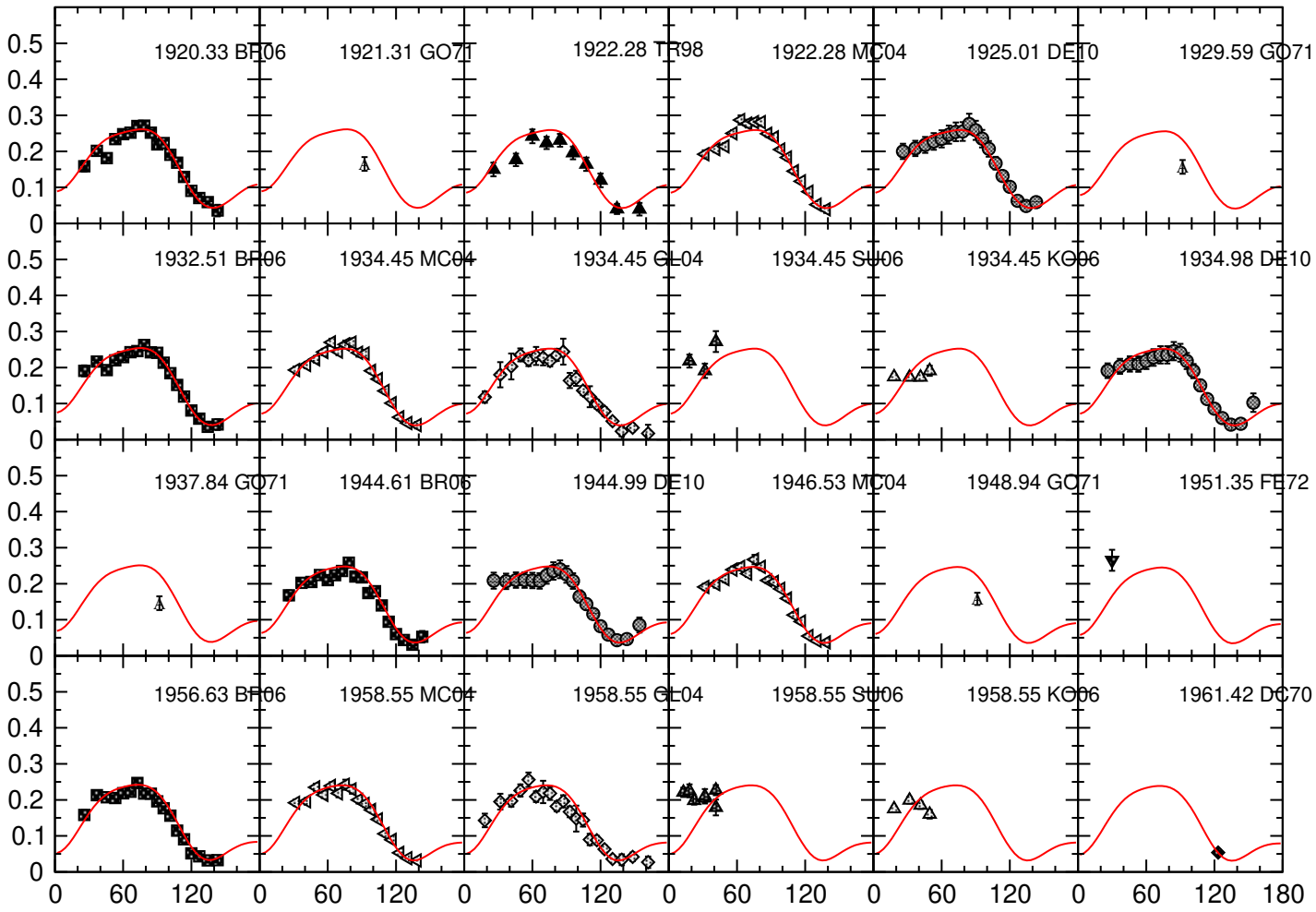

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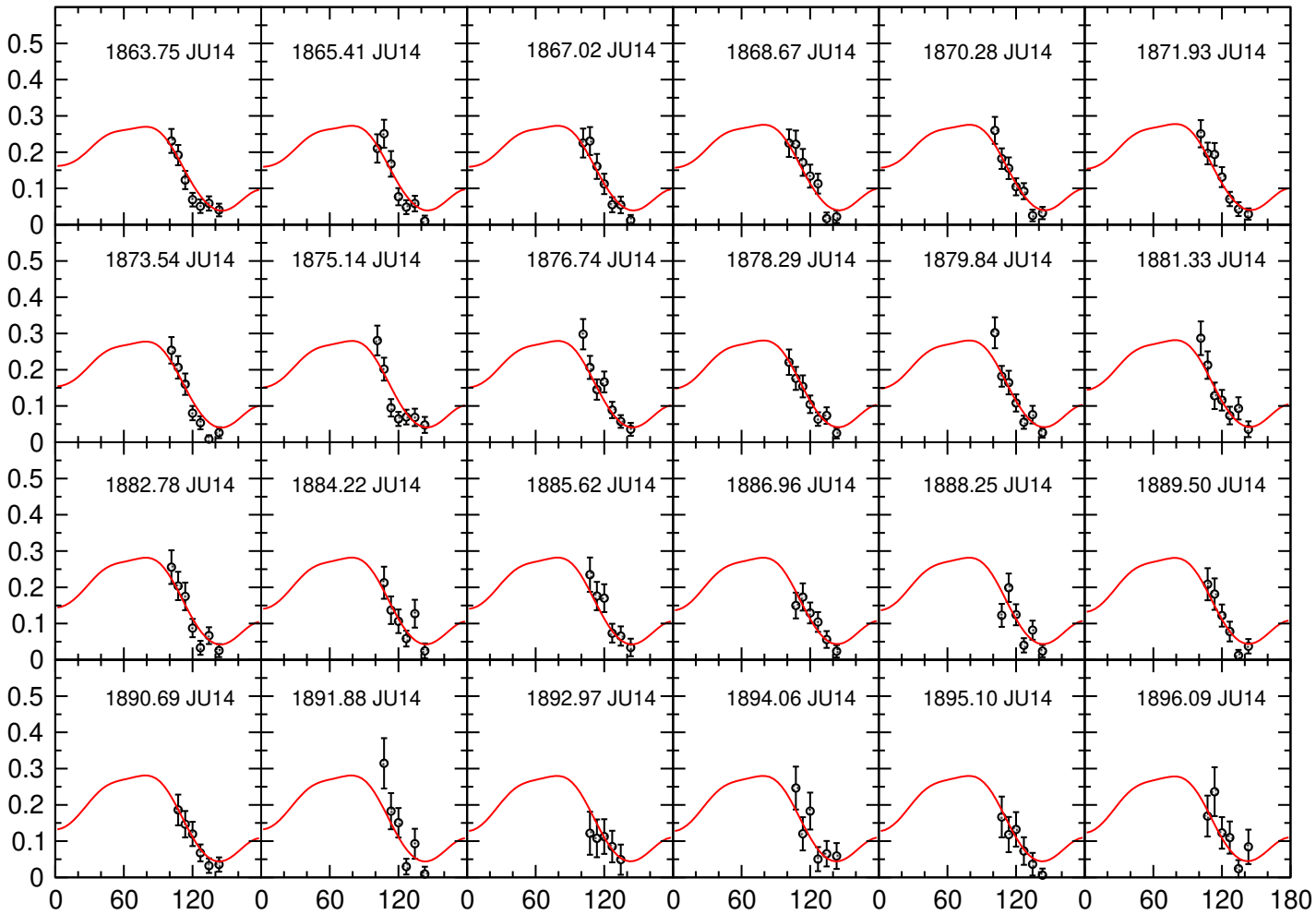

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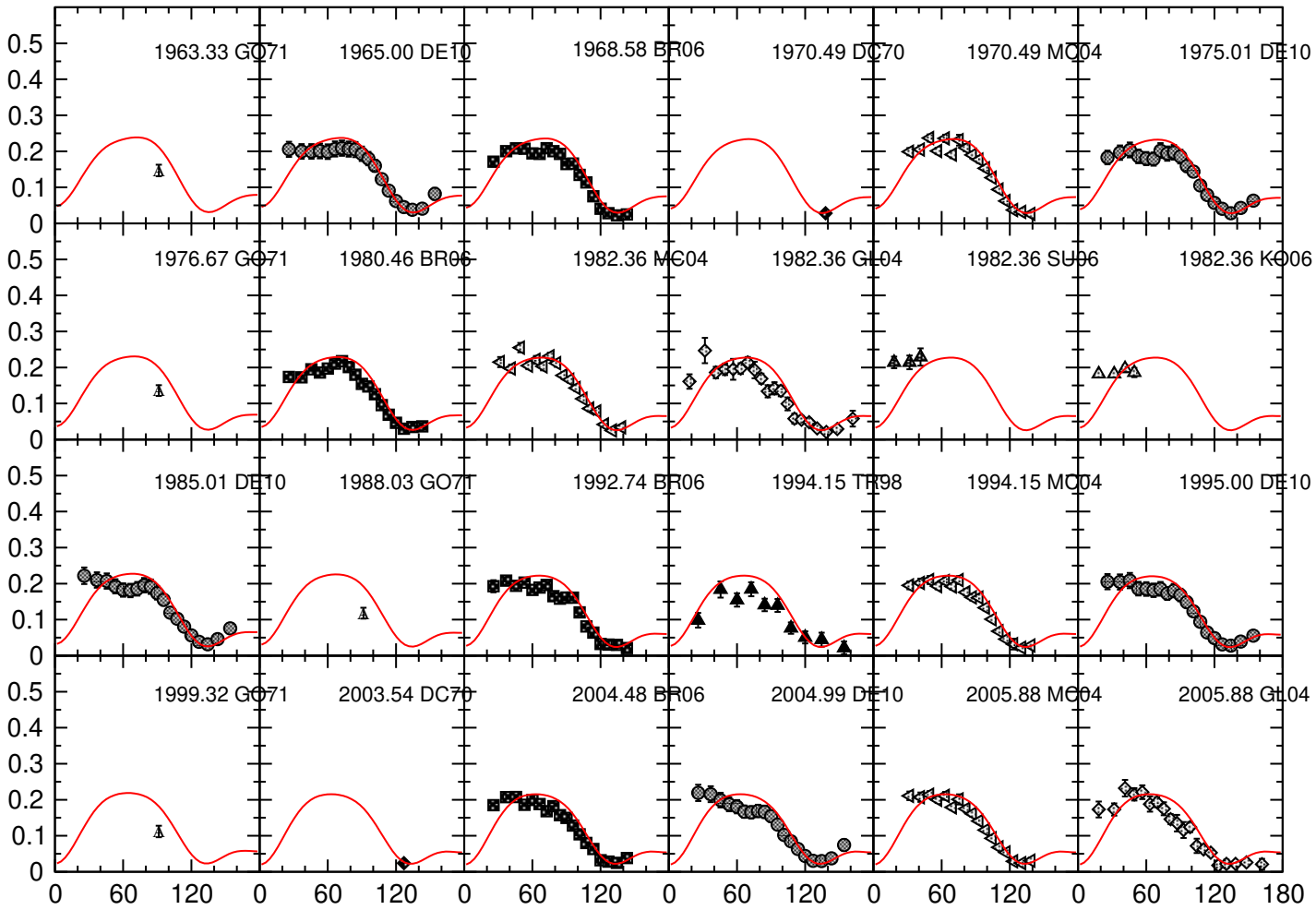

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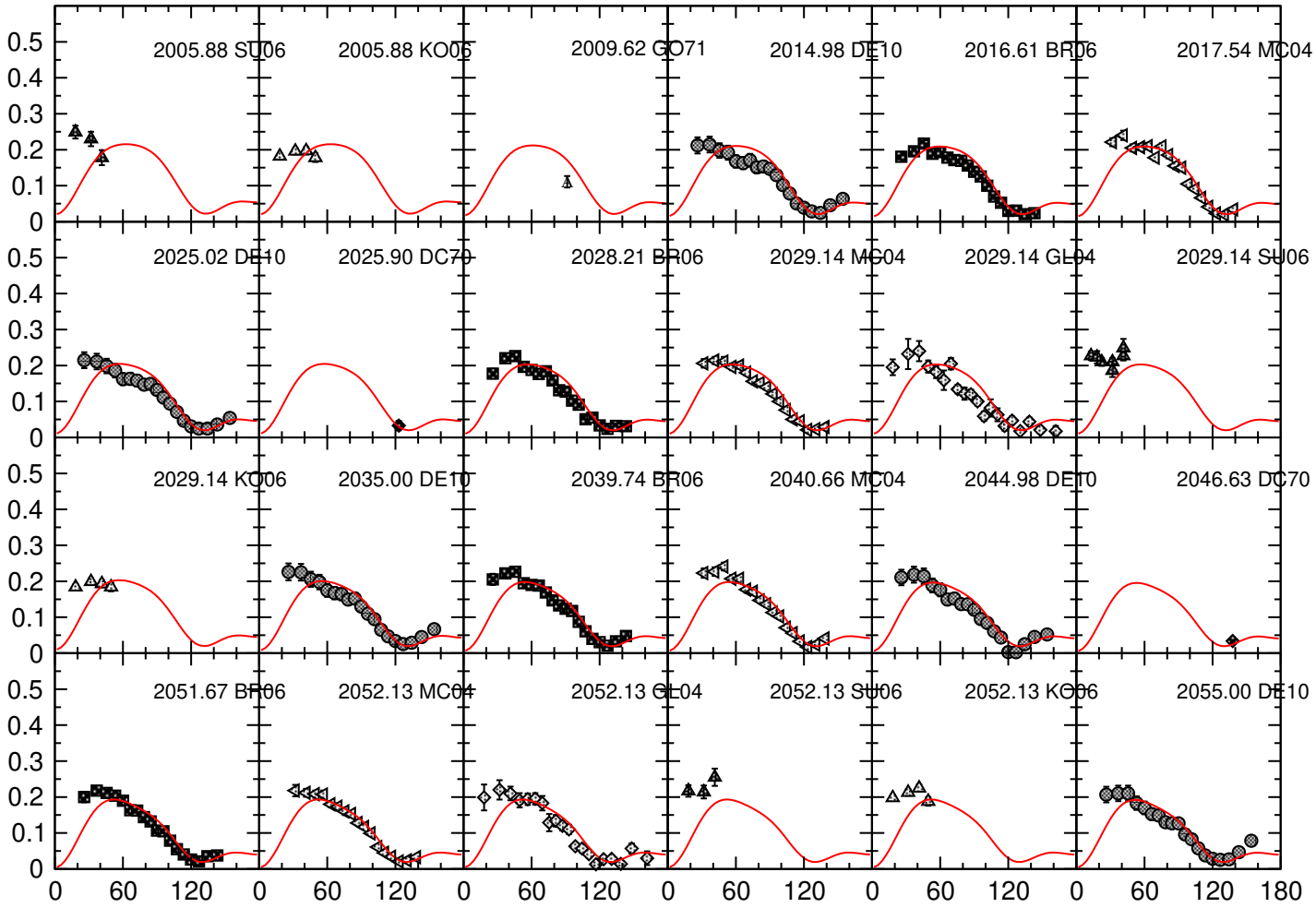

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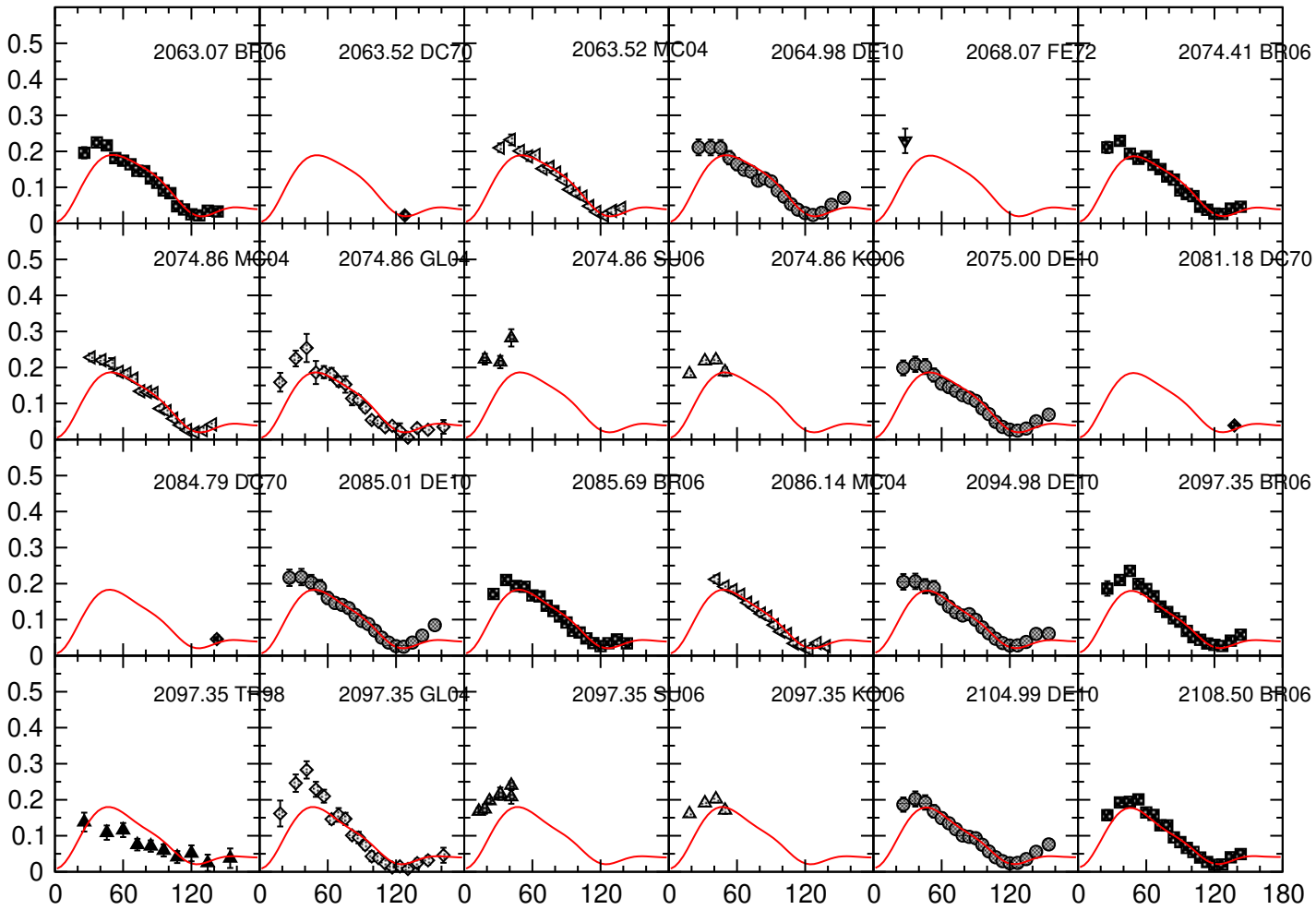

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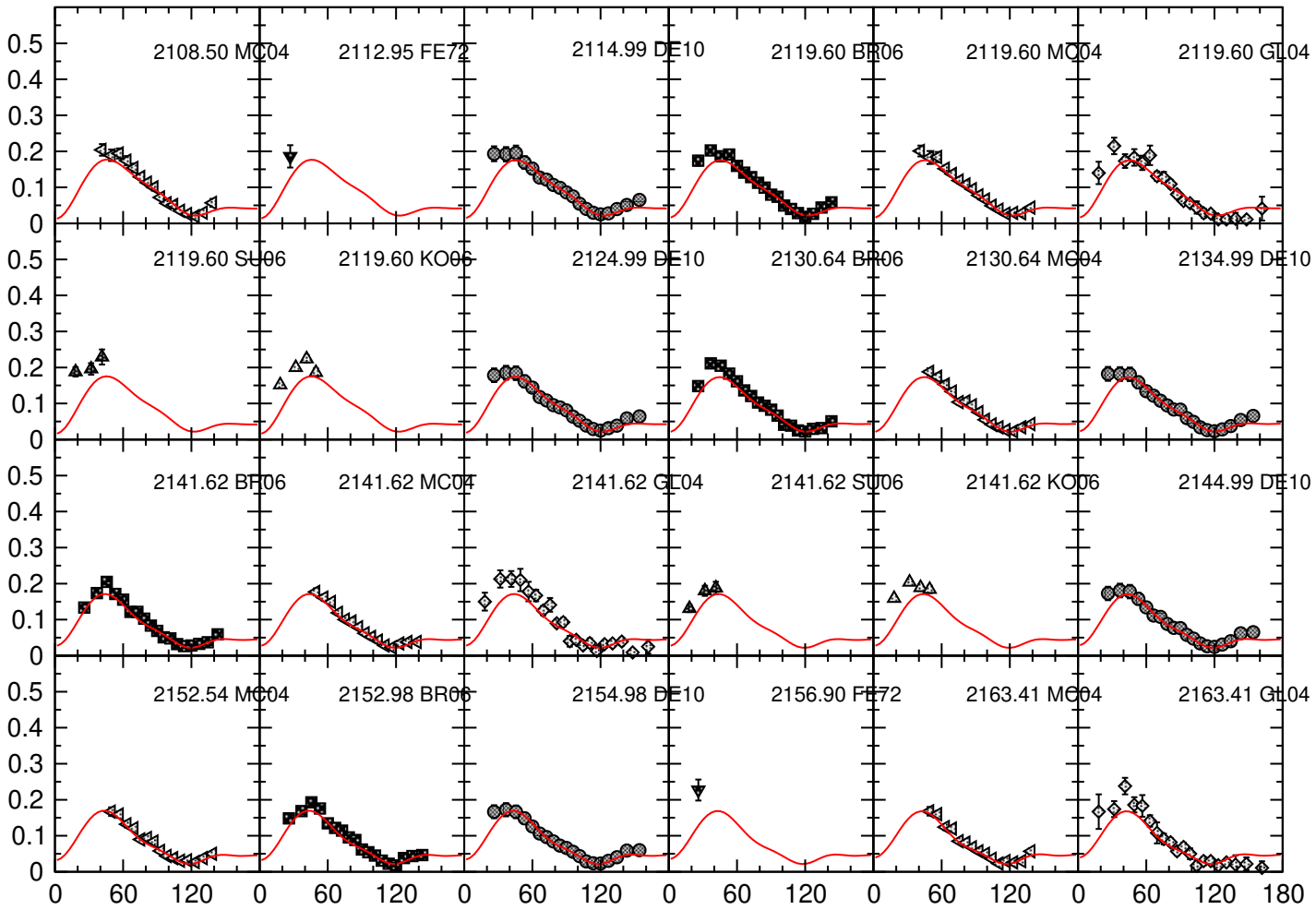

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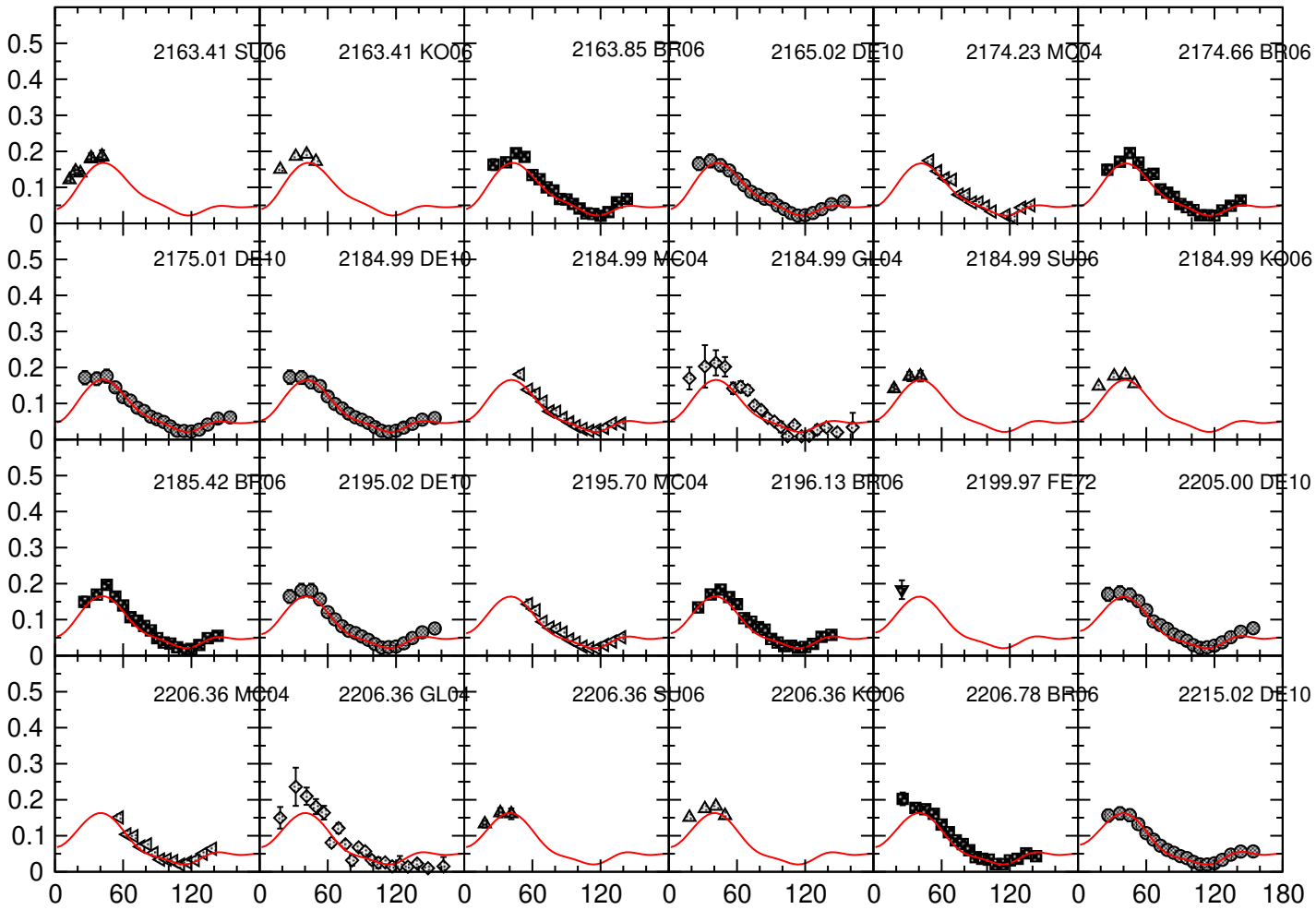

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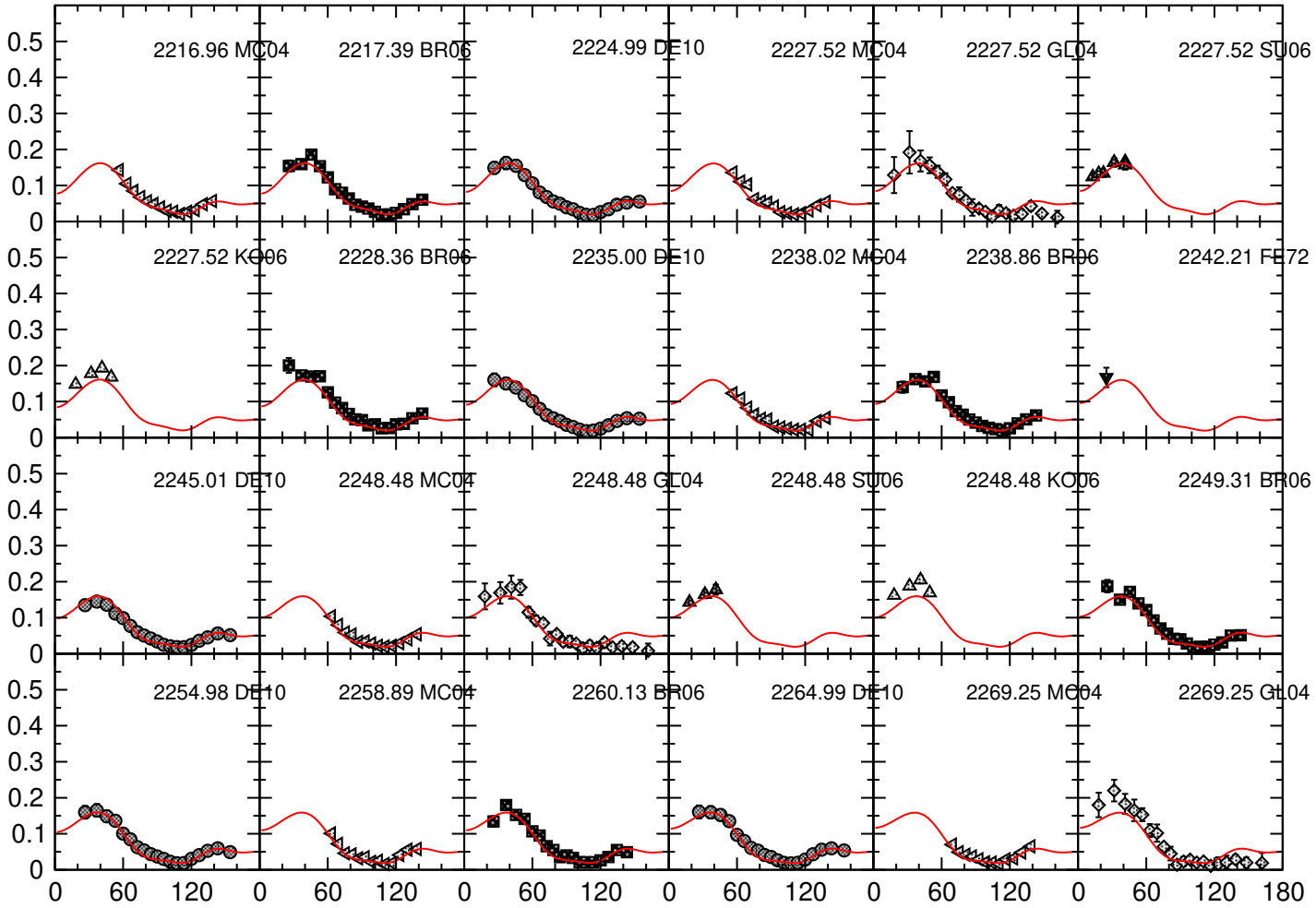

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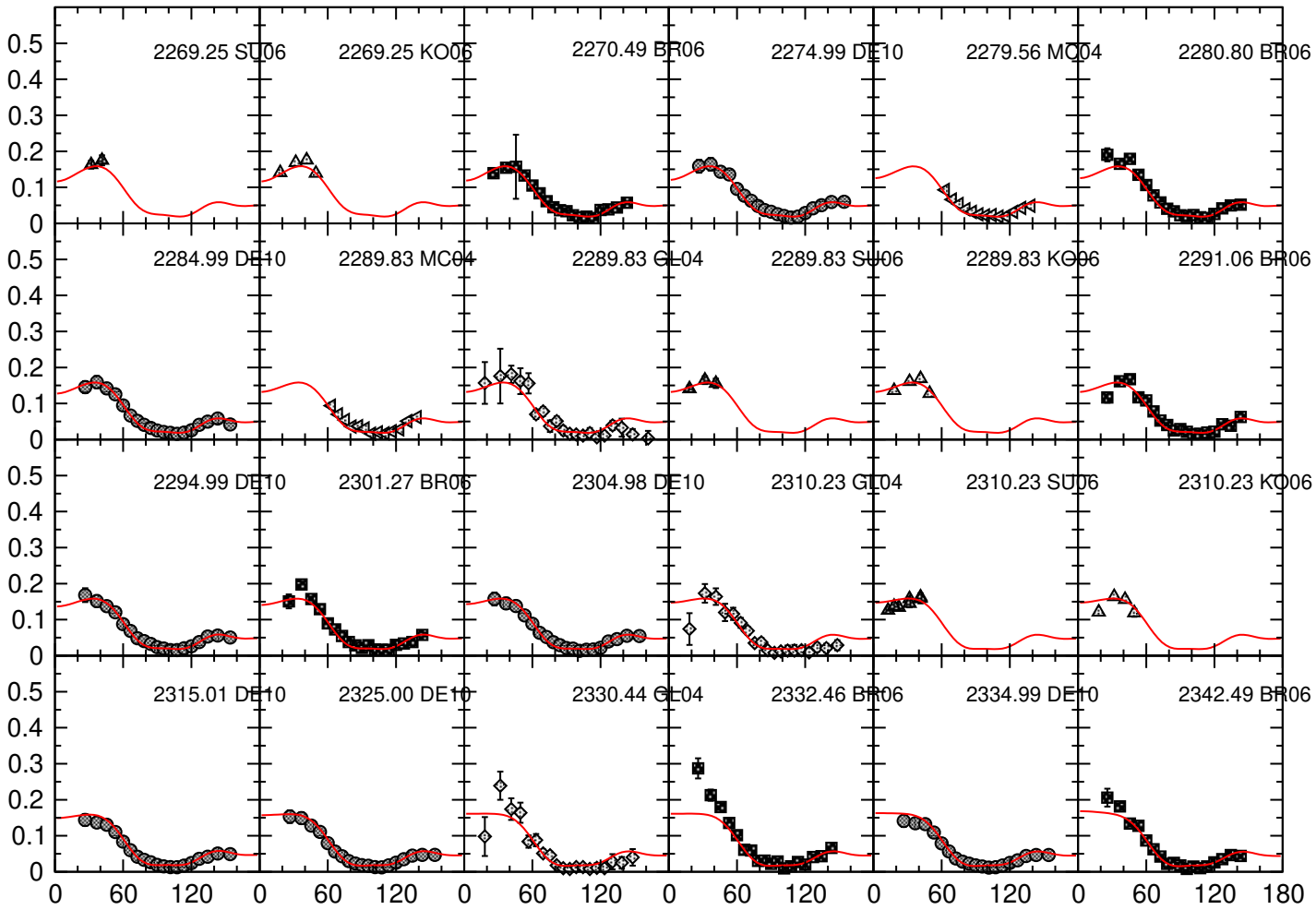

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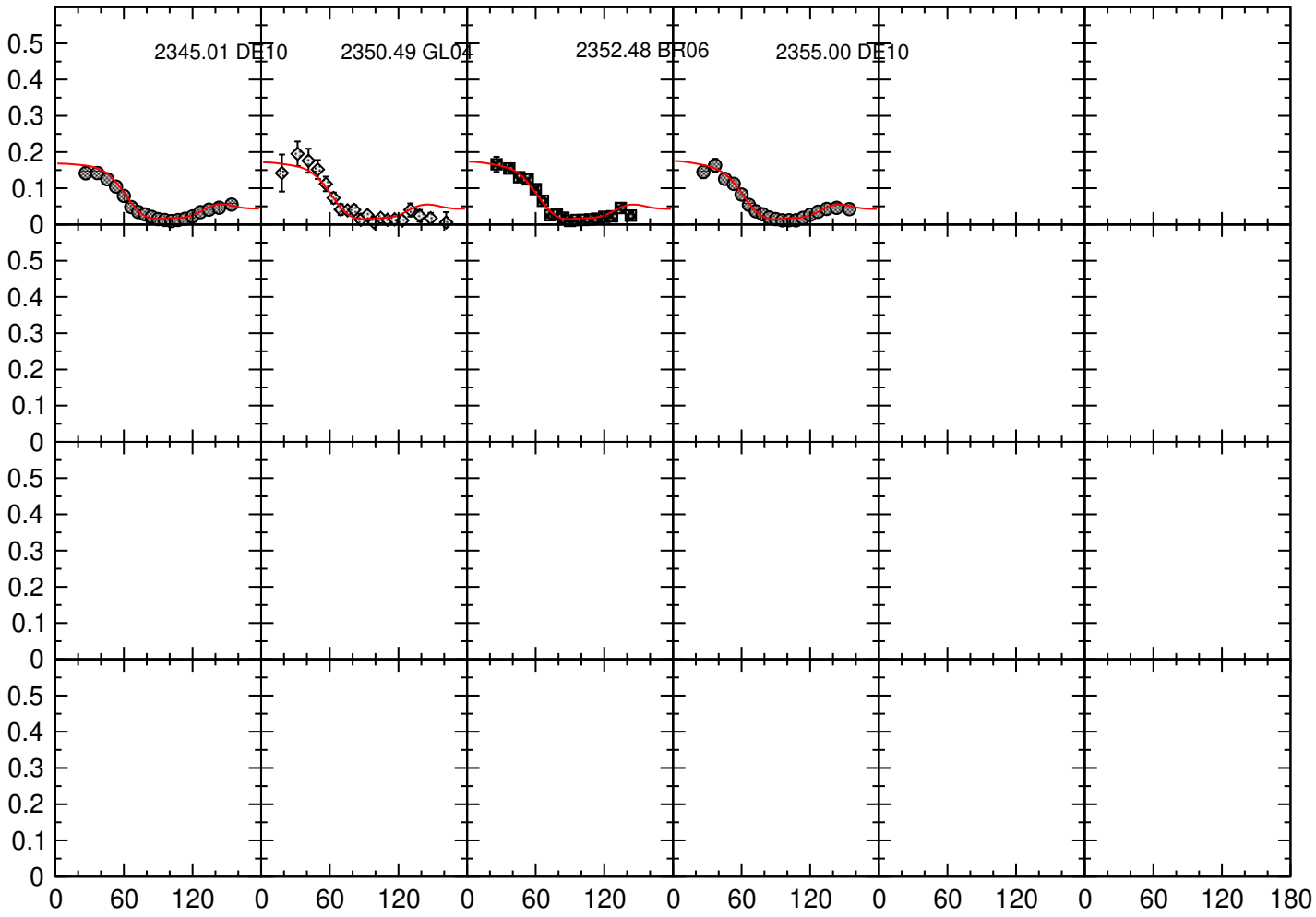

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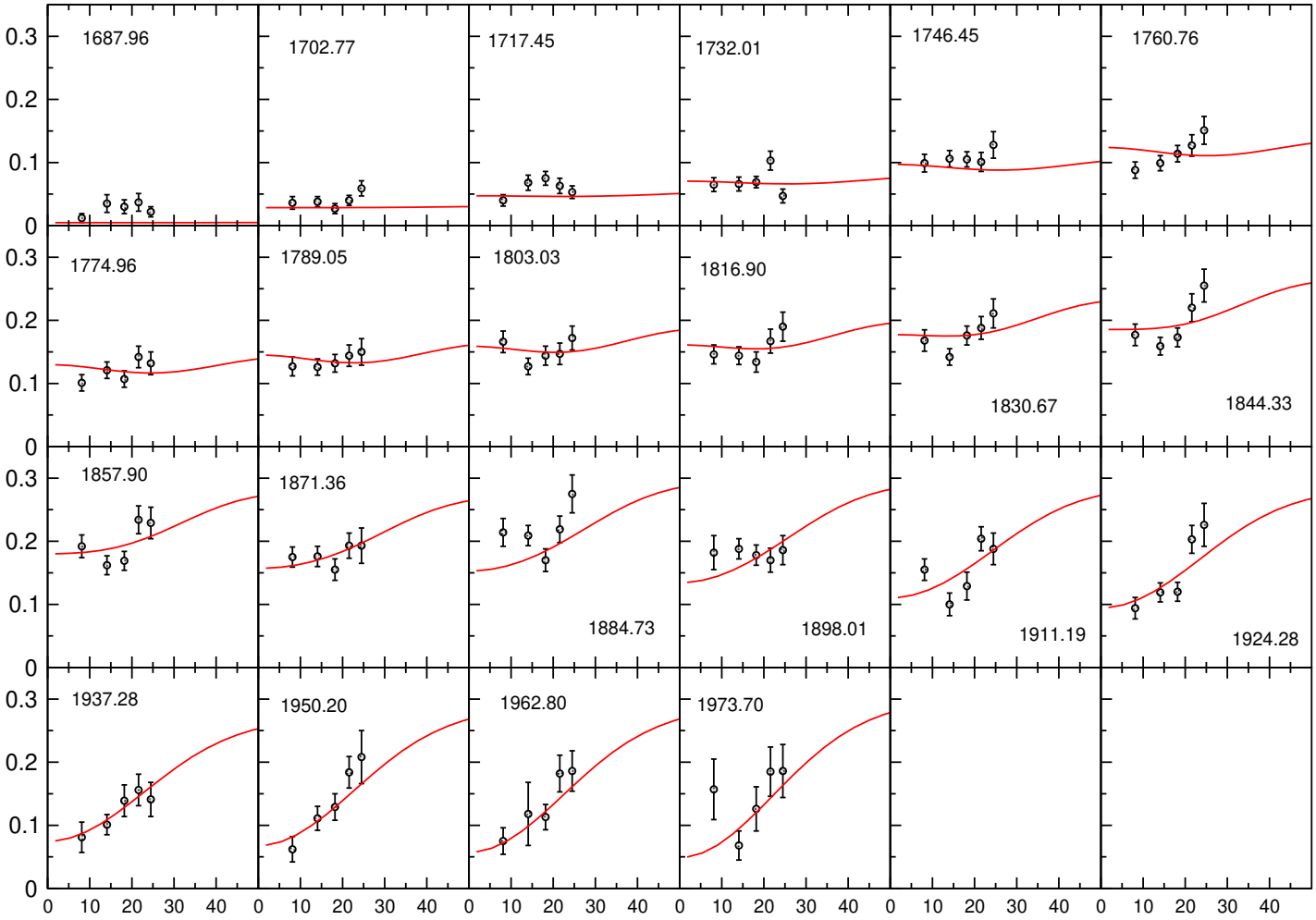
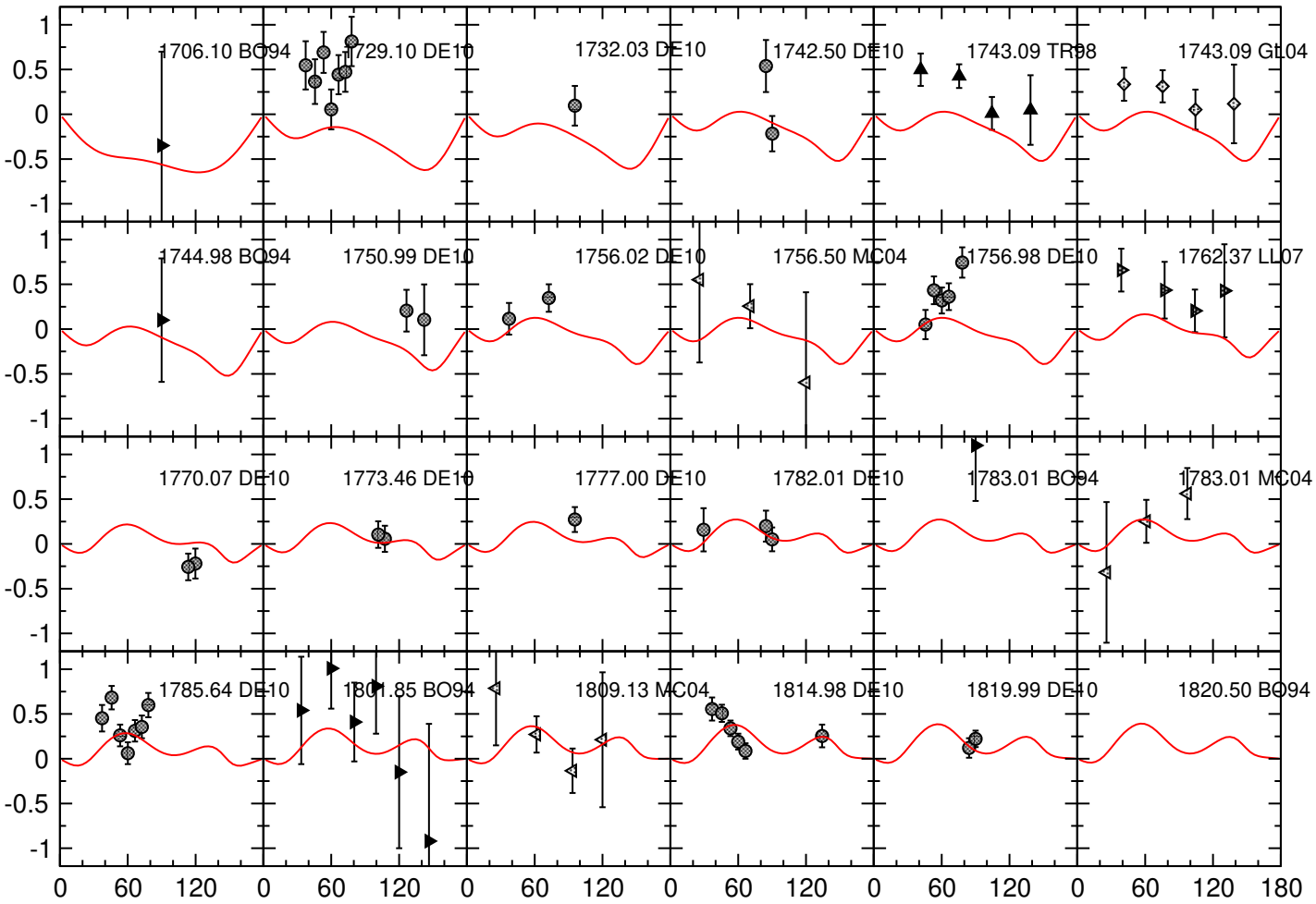
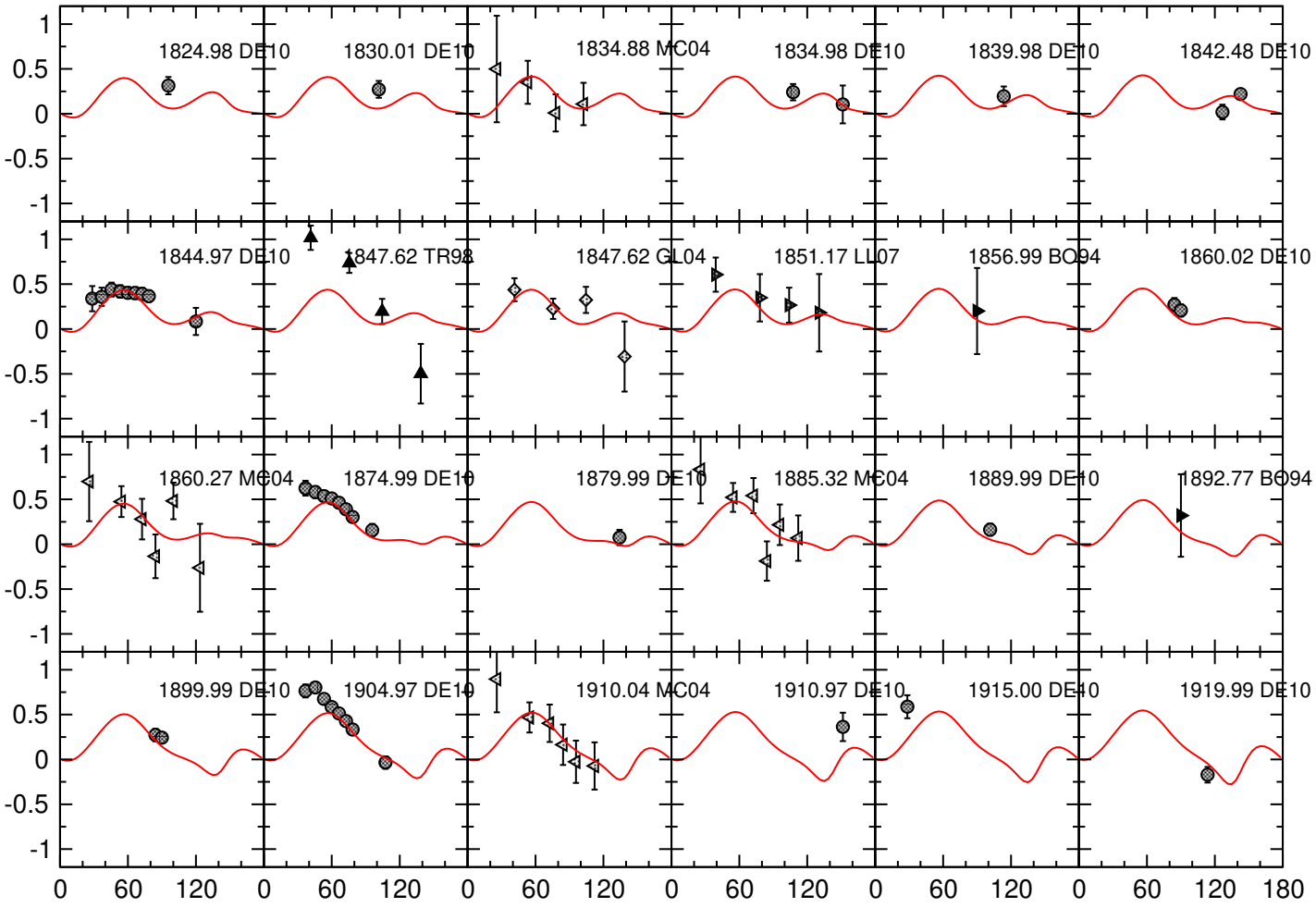
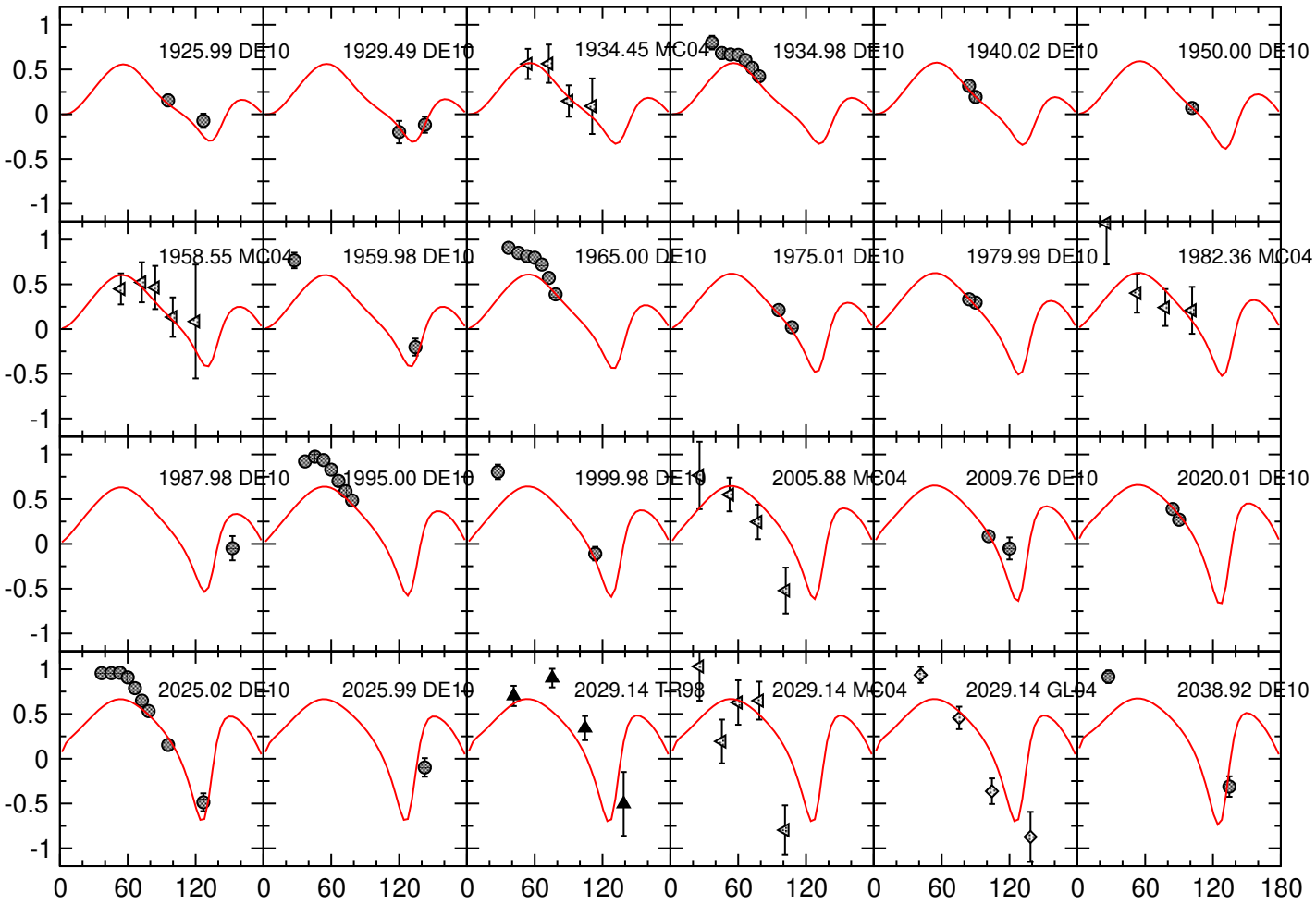
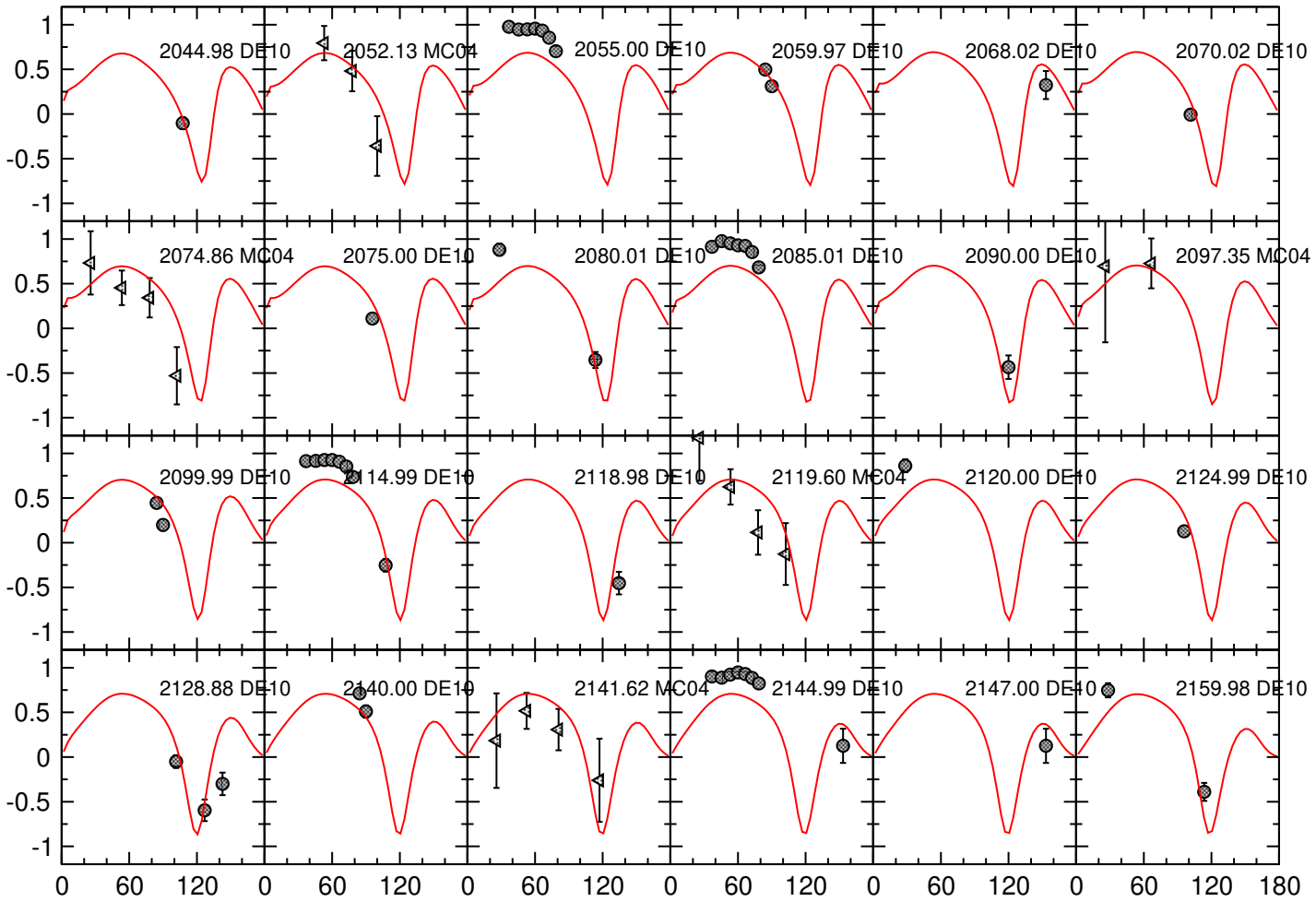


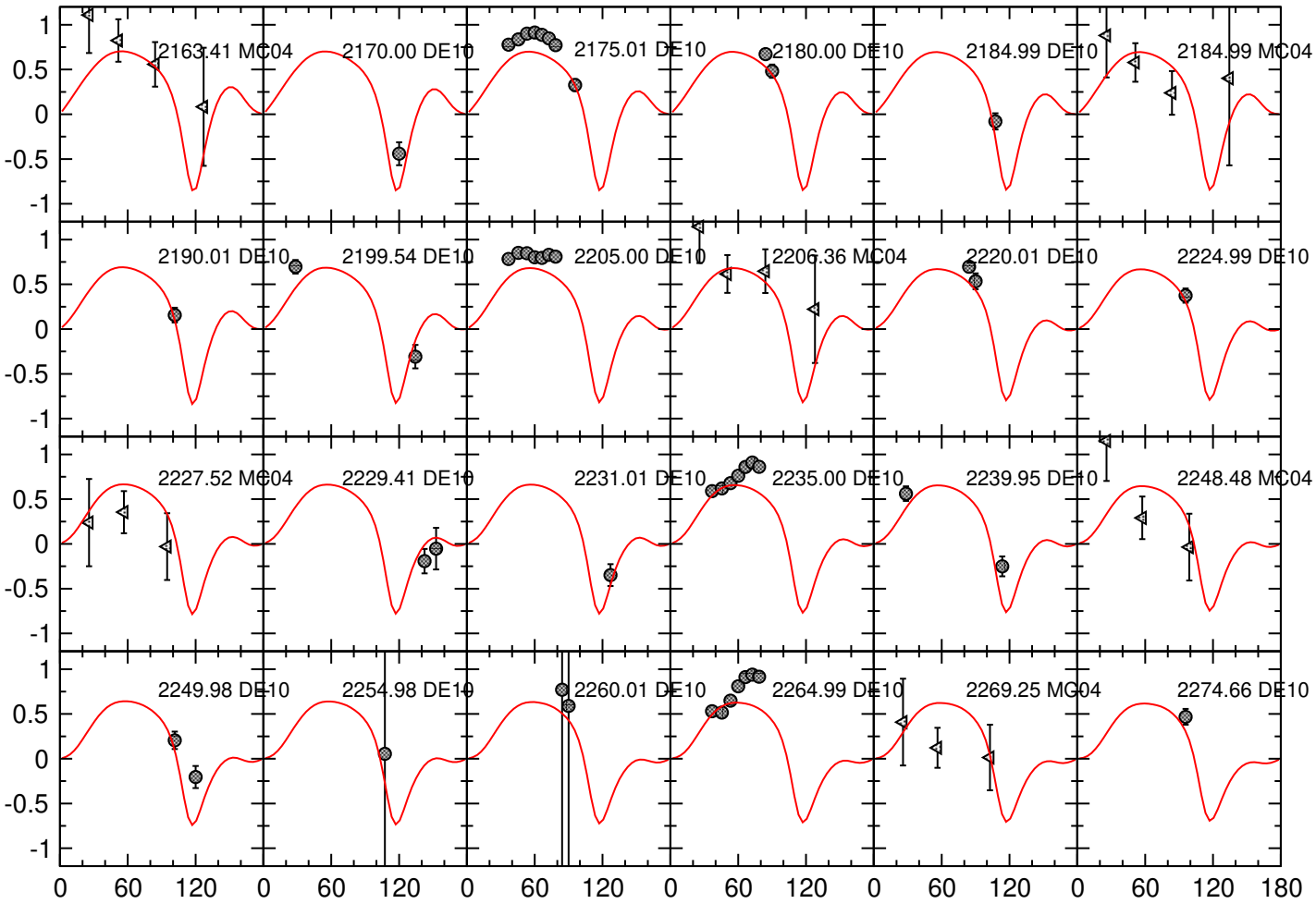
Figure 1: BGOOD 2020

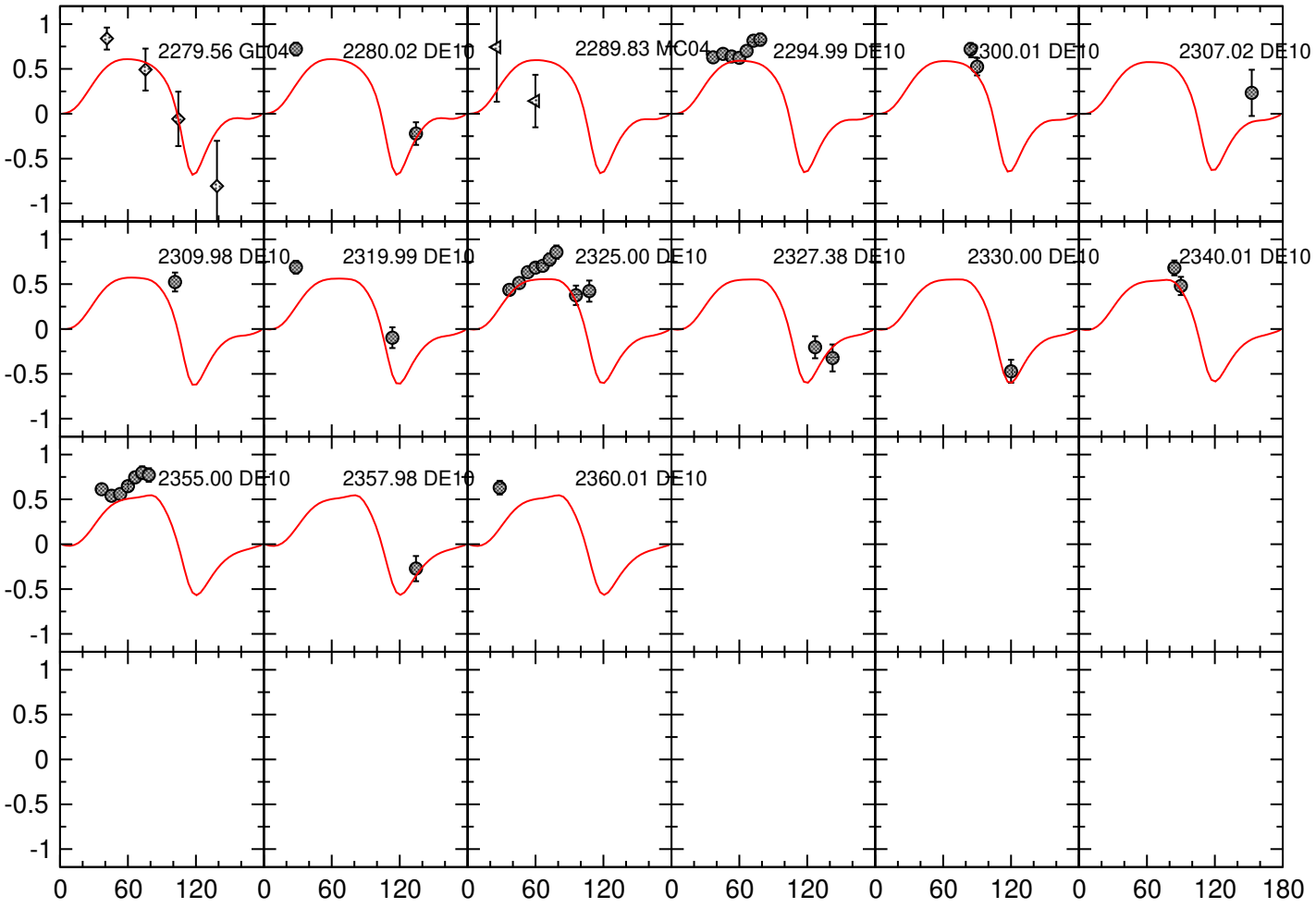

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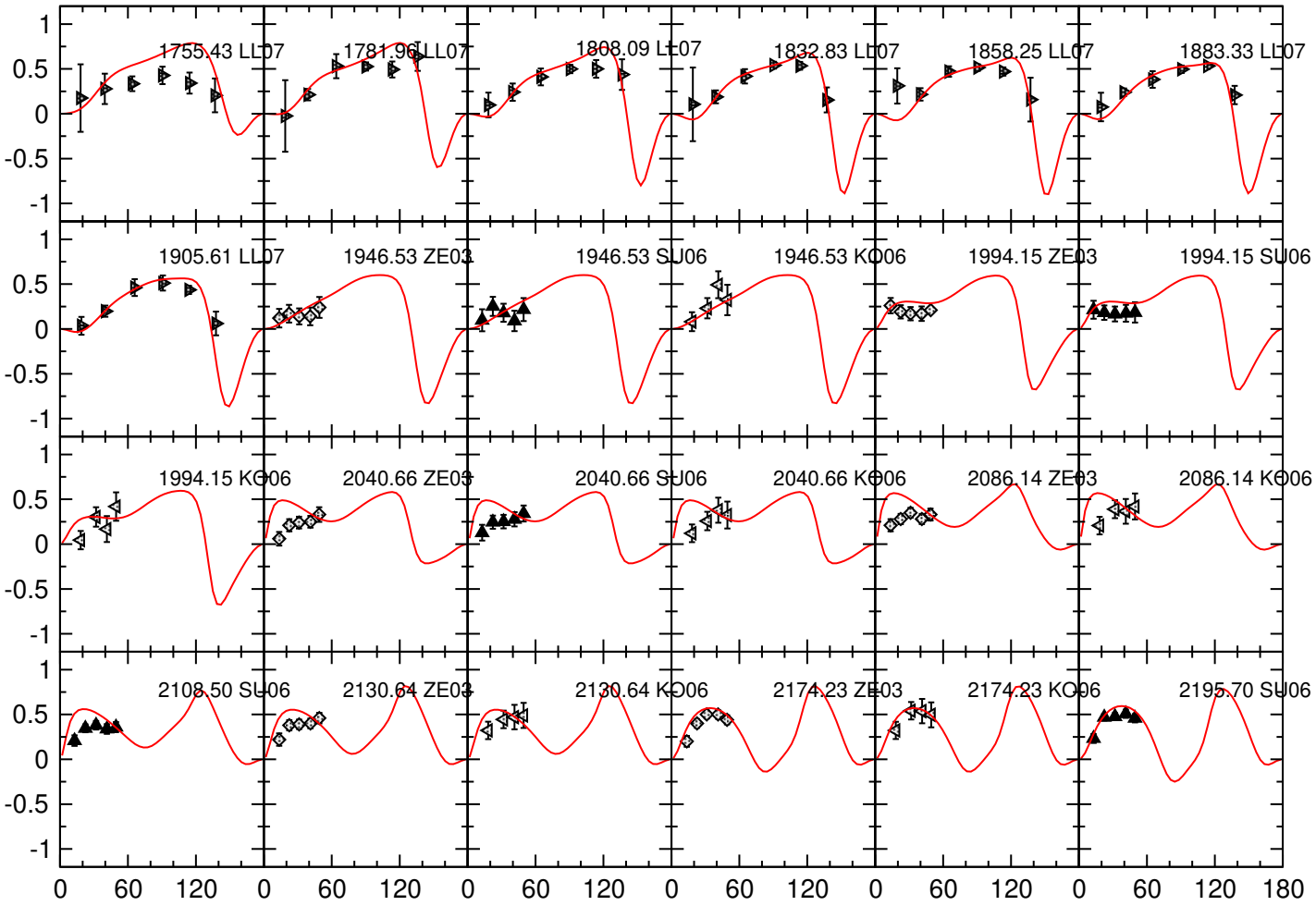

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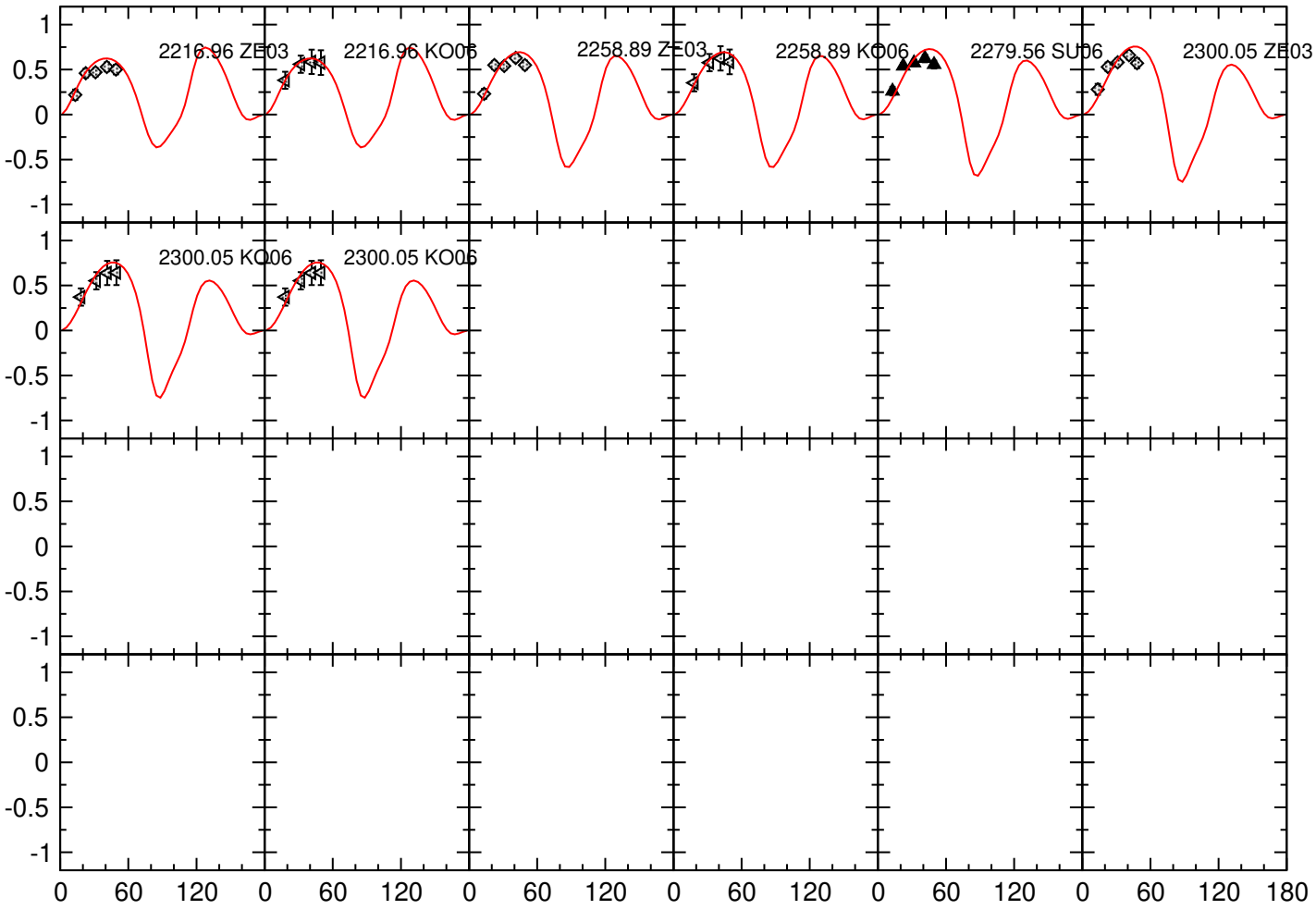

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1982.36 MC04
1987.98 DE10
1995.00 DE10
1999.98 DE10
2005.88 MC04
2009.76 DE10
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0
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120
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0
60
120
180


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1946.53 KO06
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1994.15 SU06
1994.15 KO06
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2040.66 KO06
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0
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120
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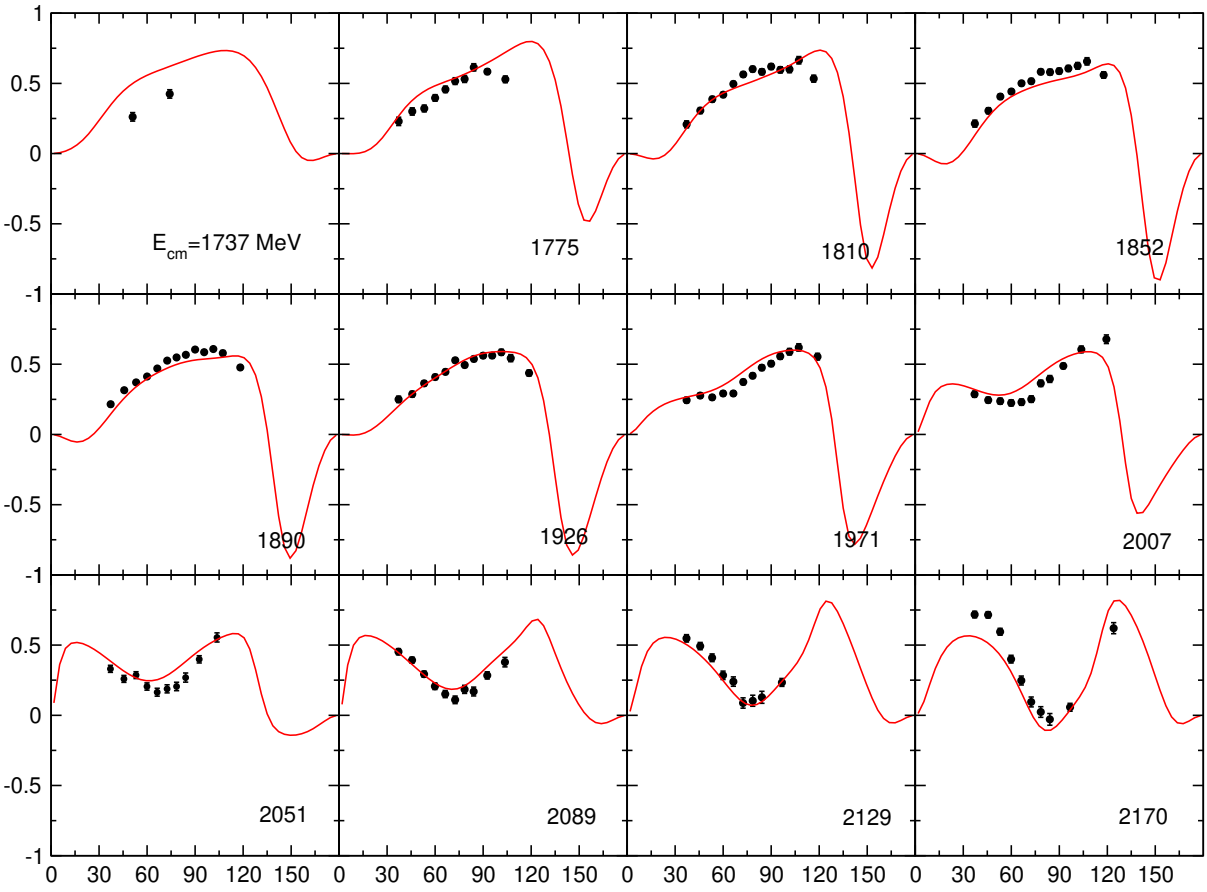
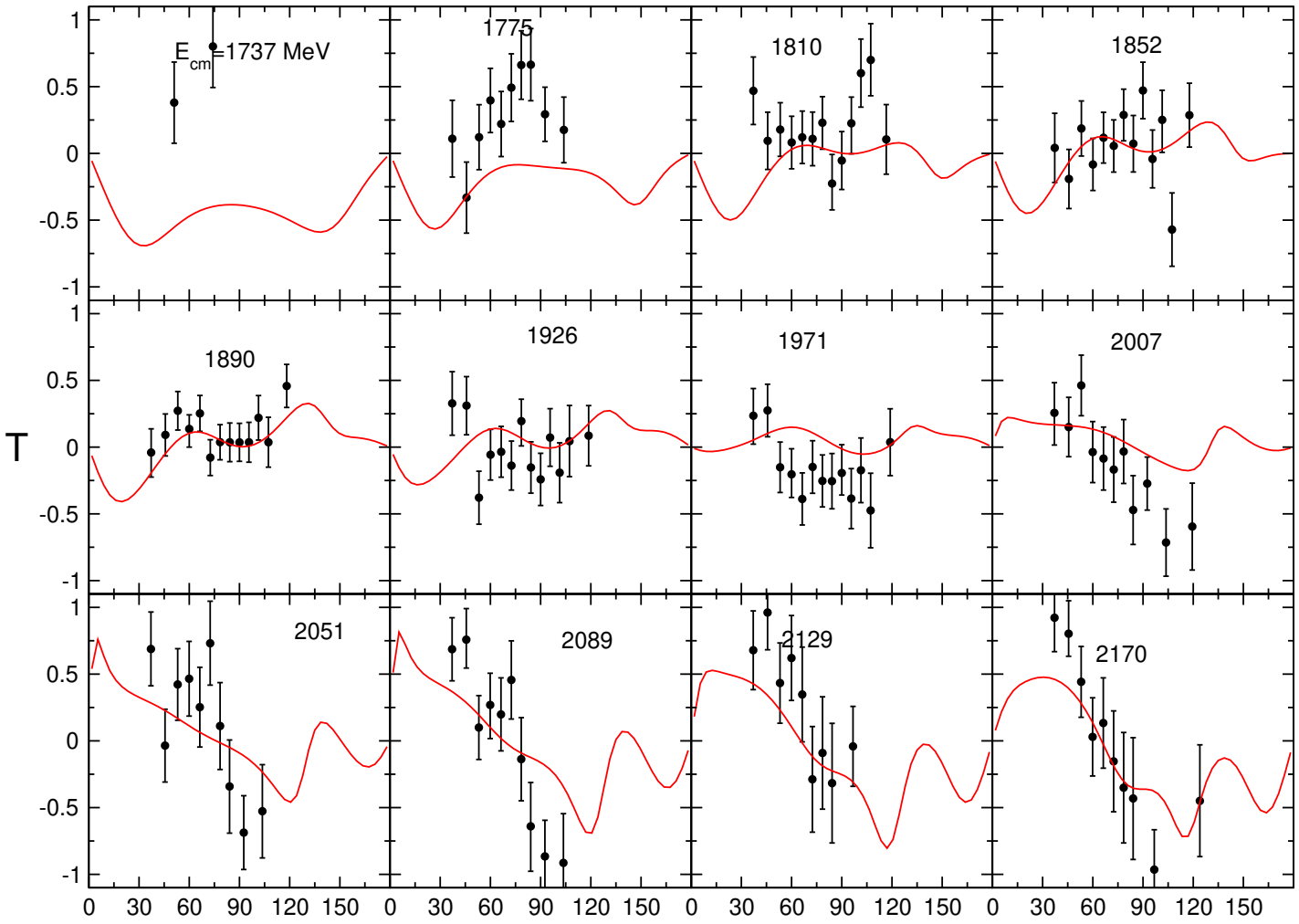
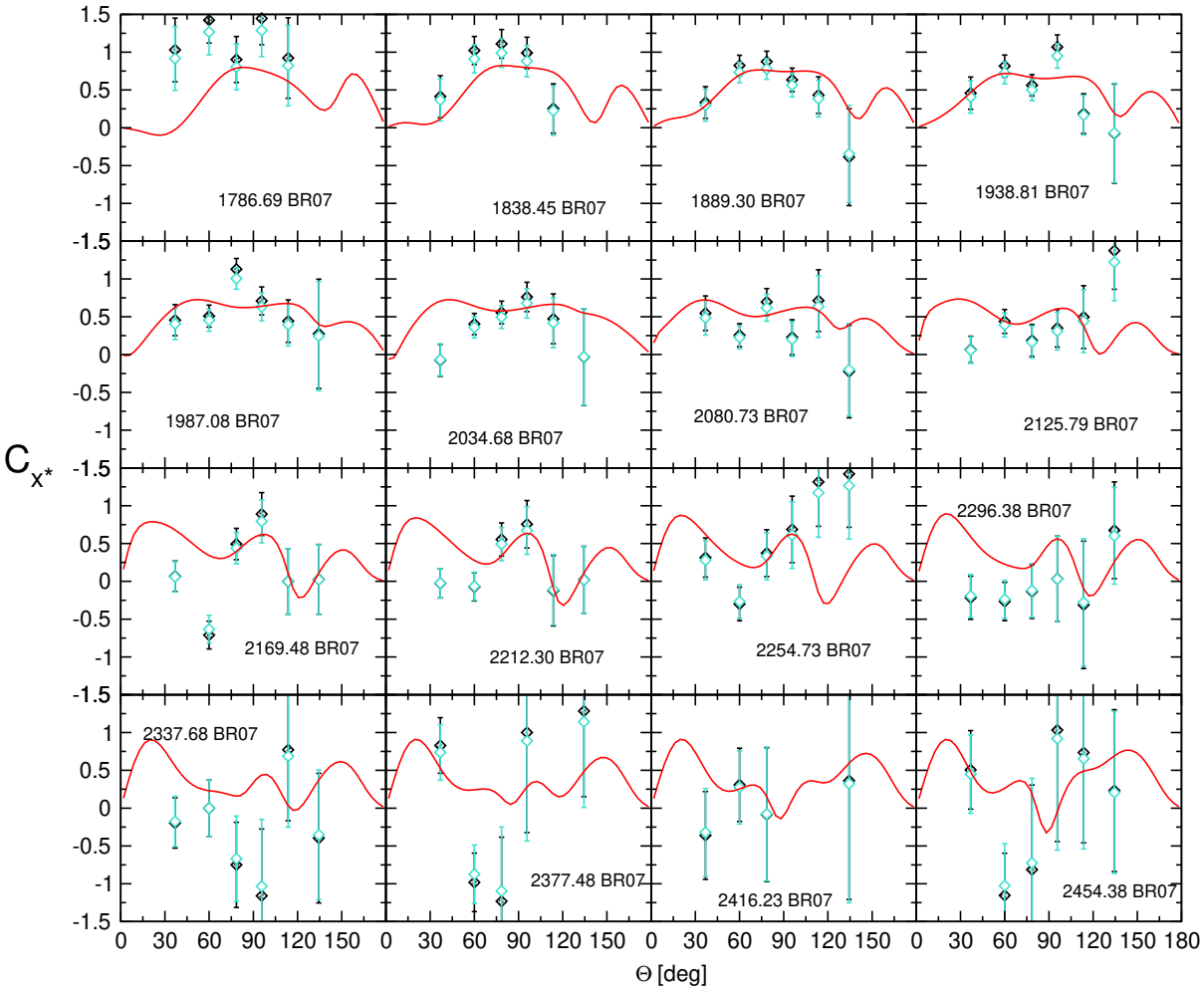
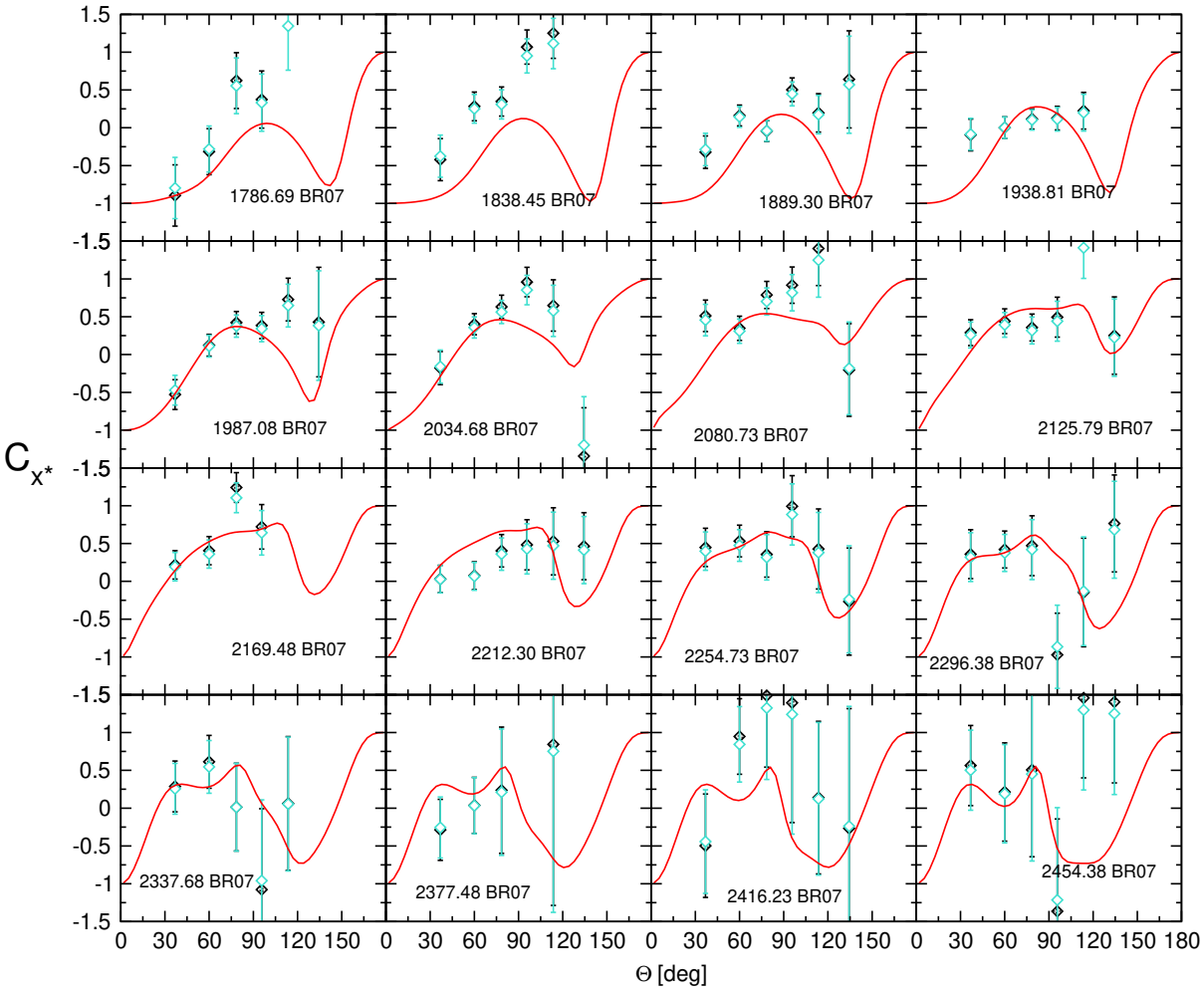
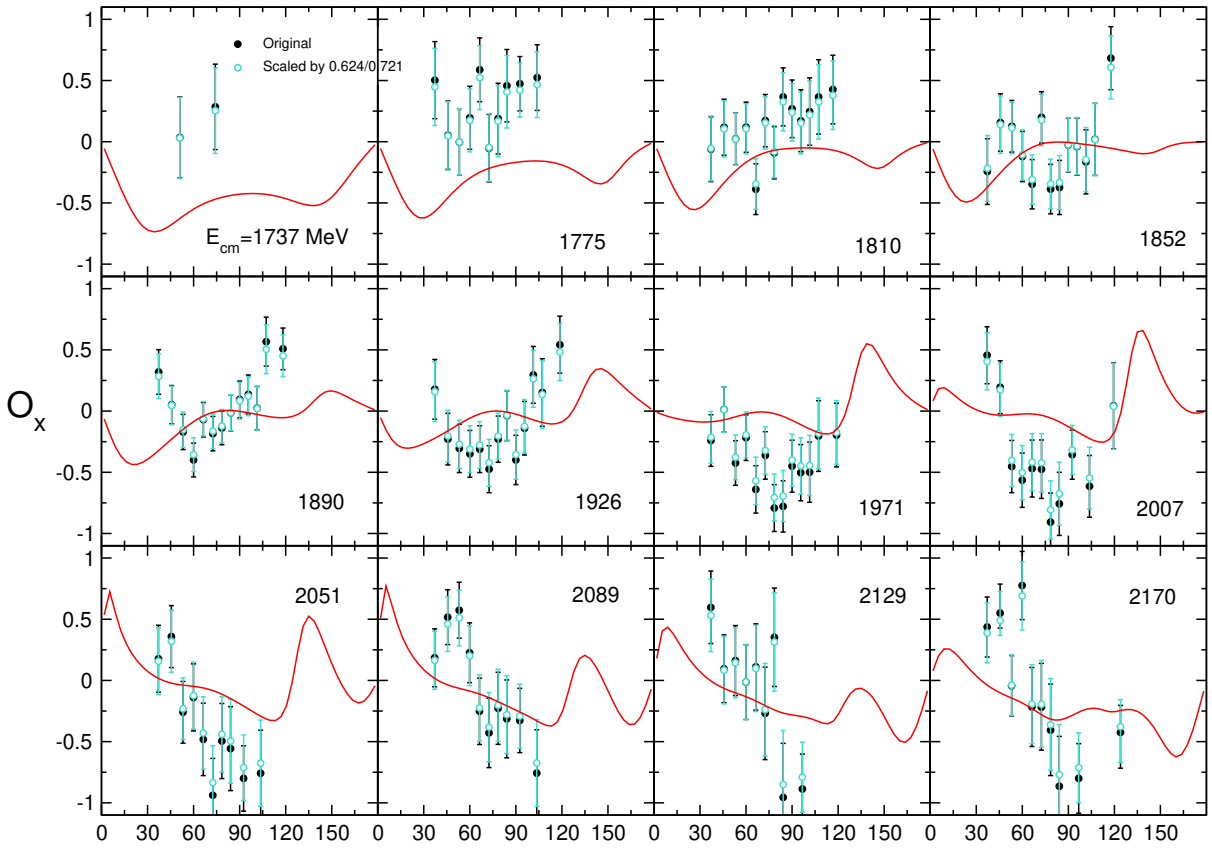


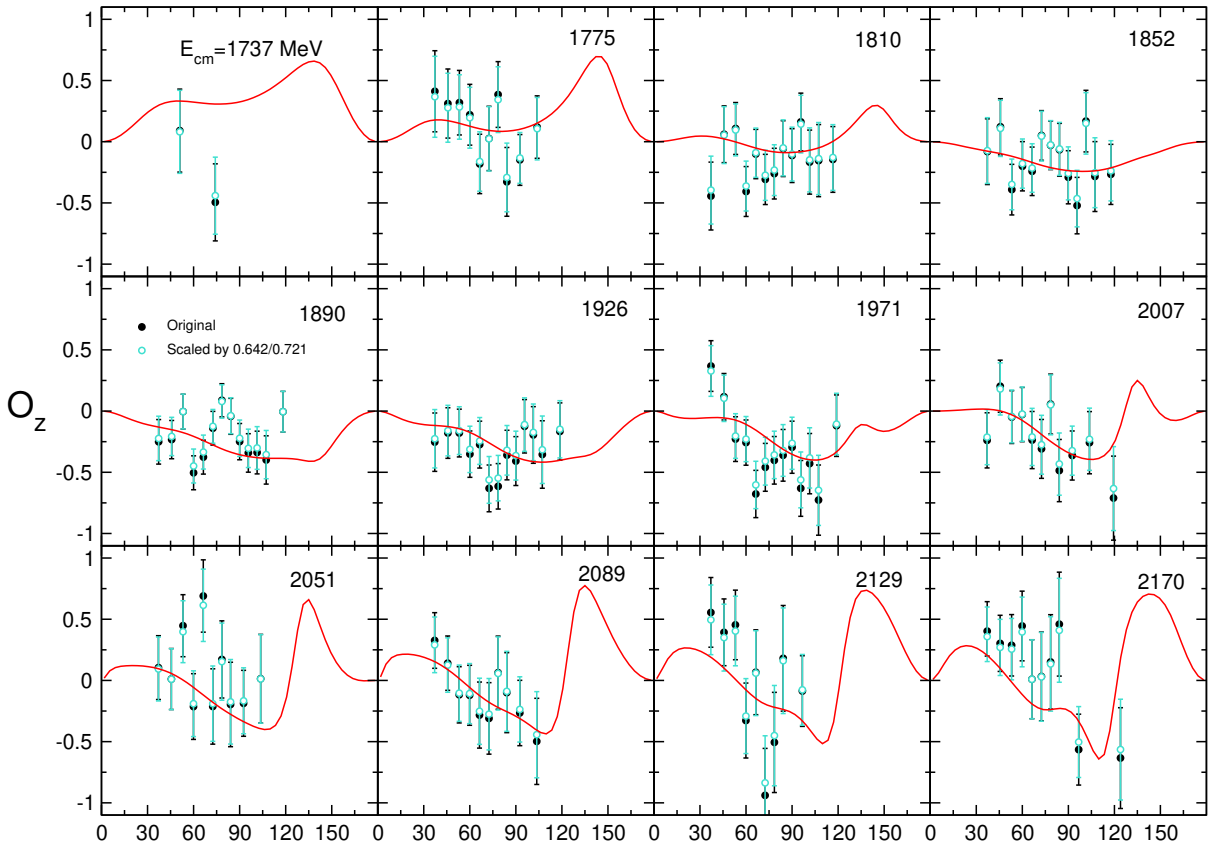
Figure 1: C. A. Paterson et al. (CLAS) PRC 93, 065201 (2016)


T
E_cm=1737 MeV
1775
1810
1852
1890
1926
1971
2007
2051
2089
2129
2170
1
0.5
0
-0.5
-1
0
30
60
90
120
150


1786.69 BR07
1838.45 BR07
1889.30 BR07
1938.81 BR07
1987.08 BR07
2034.68 BR07
2080.73 BR07
2125.79 BR07
2169.48 BR07
2212.30 BR07
2254.73 BR07
2296.38 BR07
2337.68 BR07
2377.48 BR07
2416.23 BR07
2454.38 BR07
C_x*
Θ [deg]


C_x*
1786.69 BR07
1838.45 BR07
1889.30 BR07
1938.81 BR07
1987.08 BR07
2034.68 BR07
2080.73 BR07
2125.79 BR07
2169.48 BR07
2212.30 BR07
2254.73 BR07
2296.38 BR07
2337.68 BR07
2377.48 BR07
2416.23 BR07
2454.38 BR07
Θ [deg]


Original
Scaled by 0.624/0.721
E_cm=1737 MeV
1775
1810
1852
1890
1926
1971
2007
2051
2089
2129
2170
O_x


E_cm=1737 MeV
1775
1810
1852
1890
1926
1971
2007
2051
2089
2129
2170
Original
Scaled by 0.642/0.721
O_z
1
0.5
0
-0.5
-1
0
30
60
90
120
150

Data references

- Differential cross section $\gamma p \to K^+\Sigma^0$:
  - DE(10) JLAB DEY, PRC82, 025201(2010)
  - GL(04) BONN GLANDER, EPJA19, 251(2004)
  - BO(94) BONN BOCKHORST, ZPC63, 37(1994)
  - BR(60) CALT BRODY, PR119, 1710(1960)
  - MC(04) CLAS MCNABB, PRC69, 042201(2004)
  - AN(65)P CORN ANDERSON, ISEPIHE, HAMBURG
  - BR(06) JLAB BRADFORD, PRC73, 035202(2006)
  - TR(98) BONN TRAN, PLB445, 20(1998)
  - AN(65)P CORN ANDERSON, ISEPIHE, HAMBURG
  - DC(70)P ORSA DECAMP, LAL-1236, 1970, FOURNER
  - AN(62) CORN ANDERSON, PRL9, 131(1962)
  - FU(70) TOKY FUJII, PRD2, 439 (1970)
  - BL(70) BONN BLECKMANN, ZP239, 1(1970)
  - GO(71) DESY GOEING, NPB26, 121(1971)
  - FE(72) BONN FELLER, NPB39, 413(1972)
  - SU(06) LEPS SUMIHAMA, PRC73, 035214(2006)
  - KO(06) LEPS KOHRI, PRL97, 082003(2006)
  - JU(14) MAMI PLB 735, 112 (2014)
  - BGOOD (T. C. Jude et al.) PLB 820, 136559 (2021)
- Beam asymmetry Σ $\gamma p \to K^+\Sigma^0$:
  - LL(07) GRAA LLERES, EPJA31, 79(2007)
  - ZE(03) SPRI ZEGERS, PRL (2003)
  - SU(06) LEPS SUMIHAMA, PRC73, 035214(2006)
  - KO(06) LEPS KOHRI, PRL97, 082003(2006)
  - Paterson *et al.* [CLAS Collaboration] PRC93, 065201 (2016)
- Recoil Polarization $\gamma p \to K^+\Sigma^0$:
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  - DE(10) JLAB DEY, PRC82, 025201(2010)
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  - GL(04) BONN GLANDER, EPJA19, 251(2004)
  - MC(04) CLAS MCNABB, PRC69, 042201(2004)
  - LL(07) GRAA LLERES, EPJA31, 79(2007)
- Target asymmetry T $\gamma p \to K^+\Sigma^0$:
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- C_x $\gamma p \to K^+\Sigma^0$:
  - BR(07) JLAB BRADFORD, PRC75, 035205(2007)
- C_z $\gamma p \to K^+\Sigma^0$:
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- O_x $\gamma p \to K^+\Sigma^0$:
  - Paterson *et al.* [CLAS Collaboration] PRC93, 065201 (2016)
- O_z $\gamma p \to K^+\Sigma^0$:
  - Paterson *et al.* [CLAS Collaboration] PRC93, 065201 (2016)

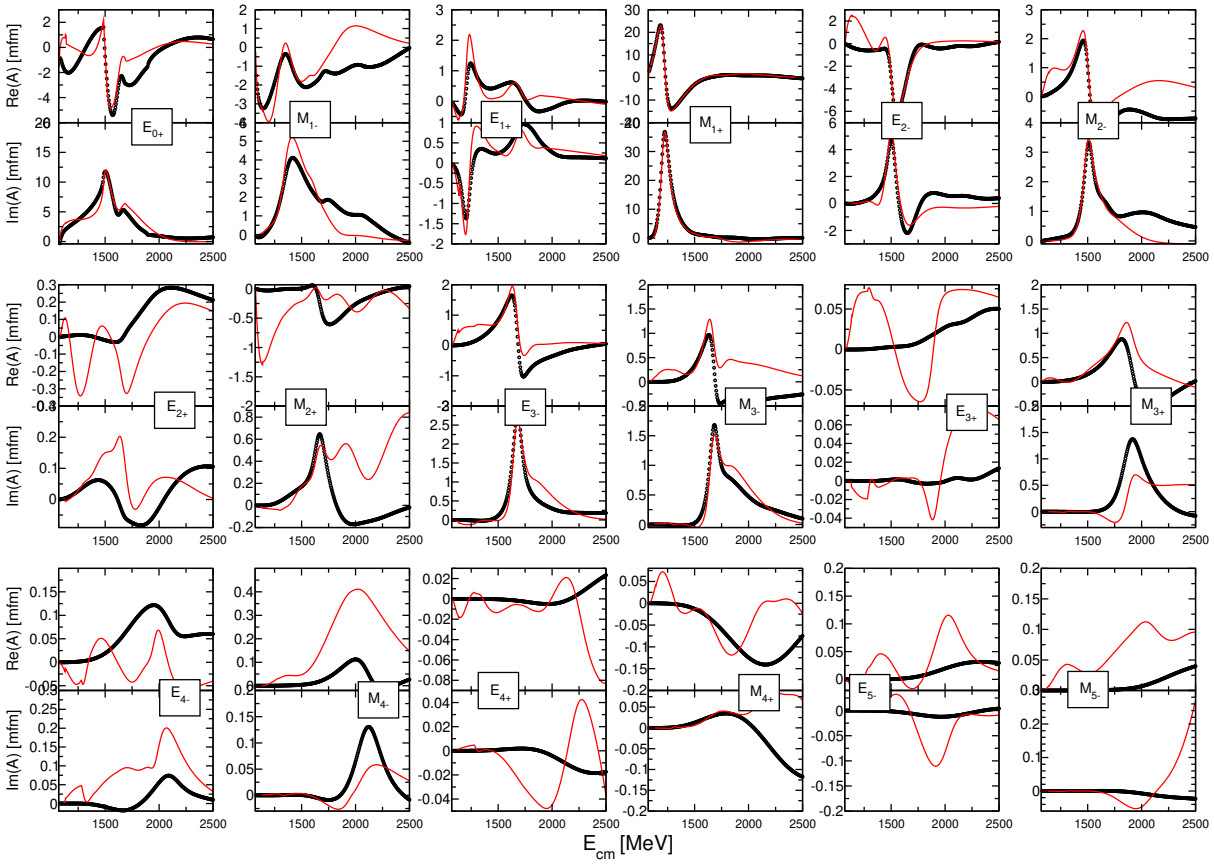


Figure 1: (Solid) red lines: JüBo2025. (Dashed) black lines: Bonn-Gatchina solution BG 2019 (Phys. Lett. B 803, 135323 (2020)) .

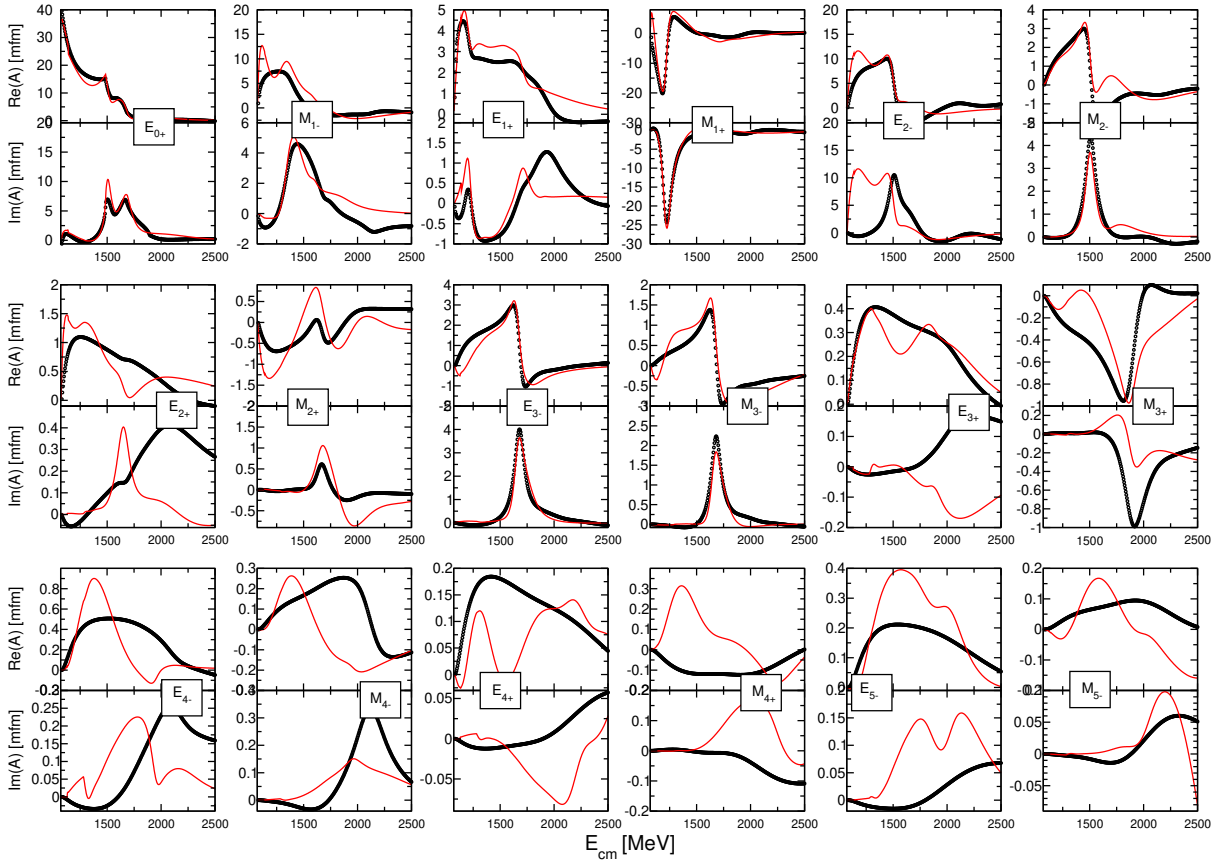


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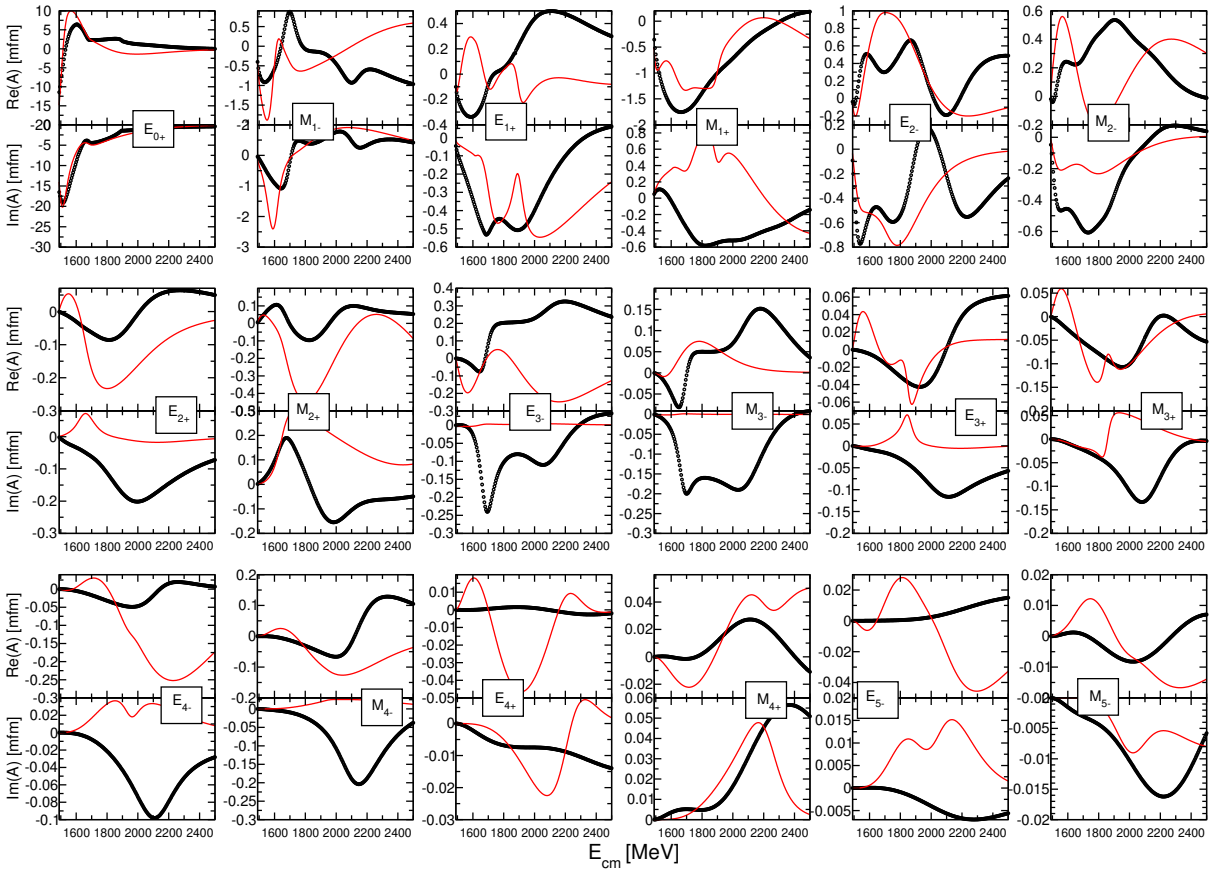


Figure 1: (Solid) red lines: JüBo2025. (Dashed) black lines: Bonn-Gatchina solution BG 2019 (Phys. Lett. B 803, 135323 (2020)) .

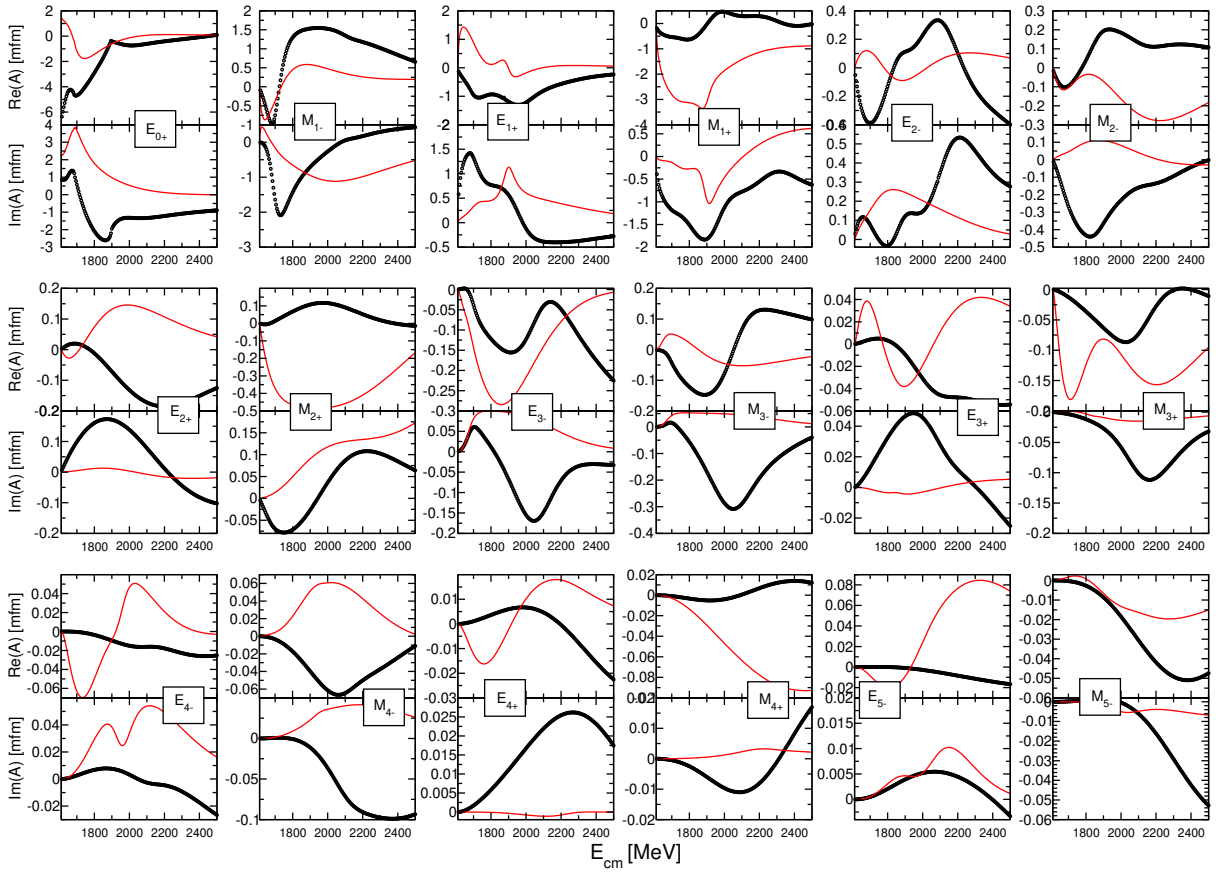


Figure 1: (Solid) red lines: JüBo2025. (Dashed) black lines: Bonn-Gatchina solution BG 2019 (Phys. Lett. B 803, 135323 (2020)) .

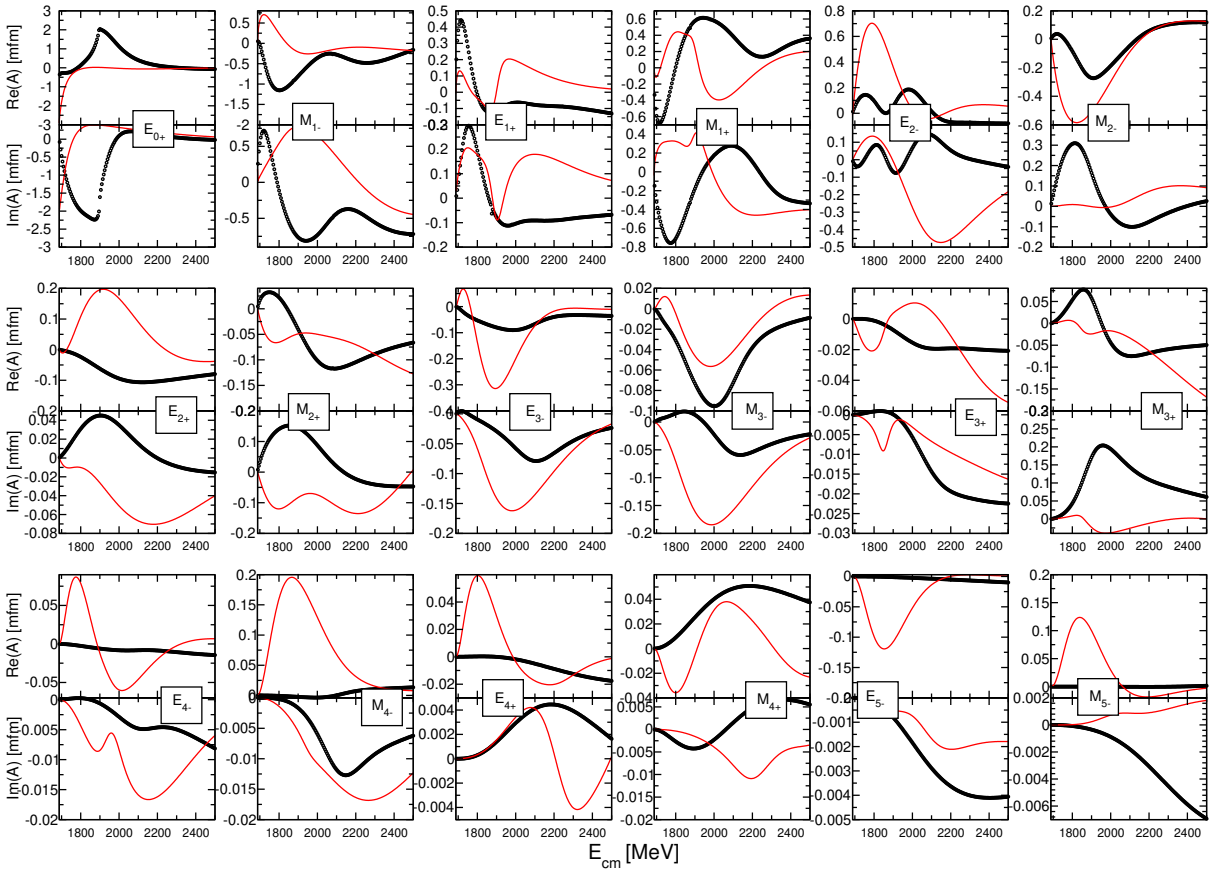


Figure 1: (Solid) red lines: JüBo2025. (Dashed) black lines: Bonn-Gatchina solution BG 2019 (Phys. Lett. B 803, 135323 (2020)) .

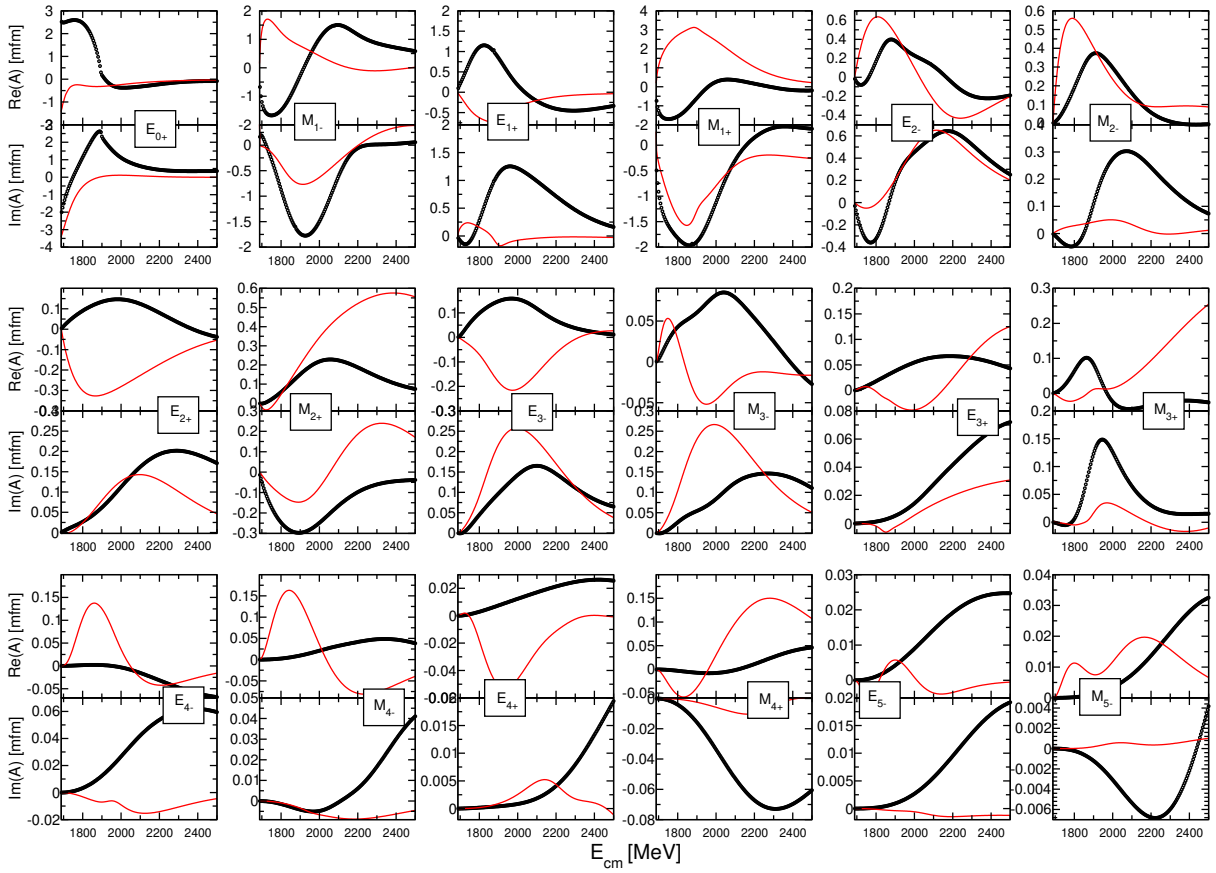


Figure 1: (Solid) red lines: JüBo2025. (Dashed) black lines: Bonn-Gatchina solution BG 2019 (Phys. Lett. B 803, 135323 (2020)) .

2 Supplementary material for the JüBo2026 analysis

In this part of the supplementary material, we list the full fit results of the "JüBo2026" analysis presented in Chapter 5 of the thesis. This includes the pion-induced and photon-induced data not shown within the thesis. The order is the same as in the previous section:

- $\pi N \to \pi N$ partial waves together with the GWU-SAID WI08 solution.
- Scattering data for the inelastic pion-induced processes $\pi N \to \eta N$, $K\Lambda$ and $K\Sigma$.
- Photoproduction data for the processes $\gamma p \to \pi^0 p$, $\pi^+ n$, ηp, $K^+\Lambda^0$, $K^+\Sigma^0$ and $K^+\Sigma^0$.
- Multipole amplitudes for the photoproduction processes $\gamma p \to \pi^0 p$, $\pi^+ n$, ηp, $K^+\Lambda^0$, $K^+\Sigma^0$ and $K^+\Sigma^0$ with a comparison to the Bonn-Gatchina solution BG2019.

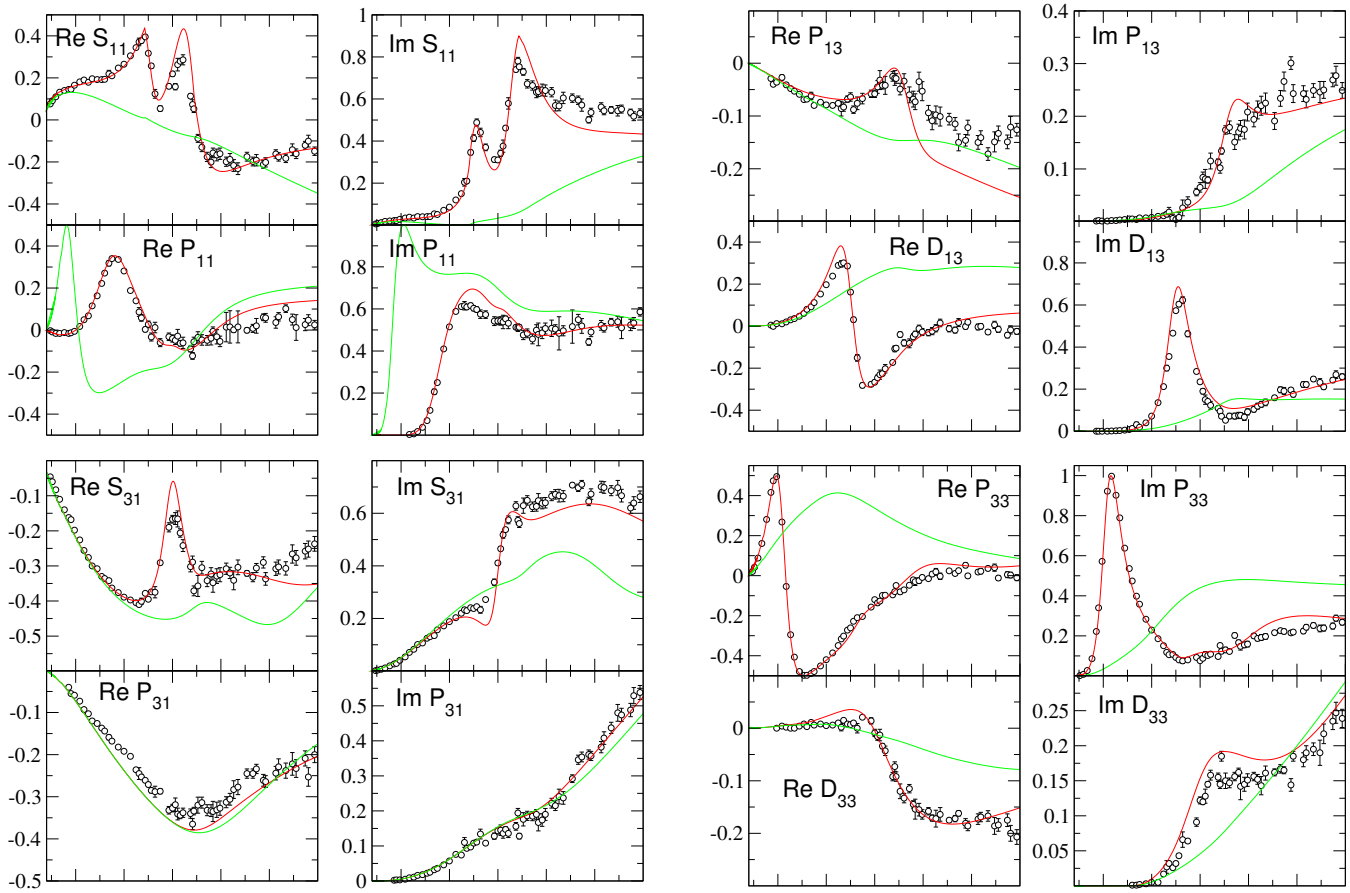


Figure 1: JüBo2026: red (solid) line, $T^{\rm NP}$: green line. Points: GWU-SAID WI08 solution (Phys. Rev. C 86, 035202 (2012)).

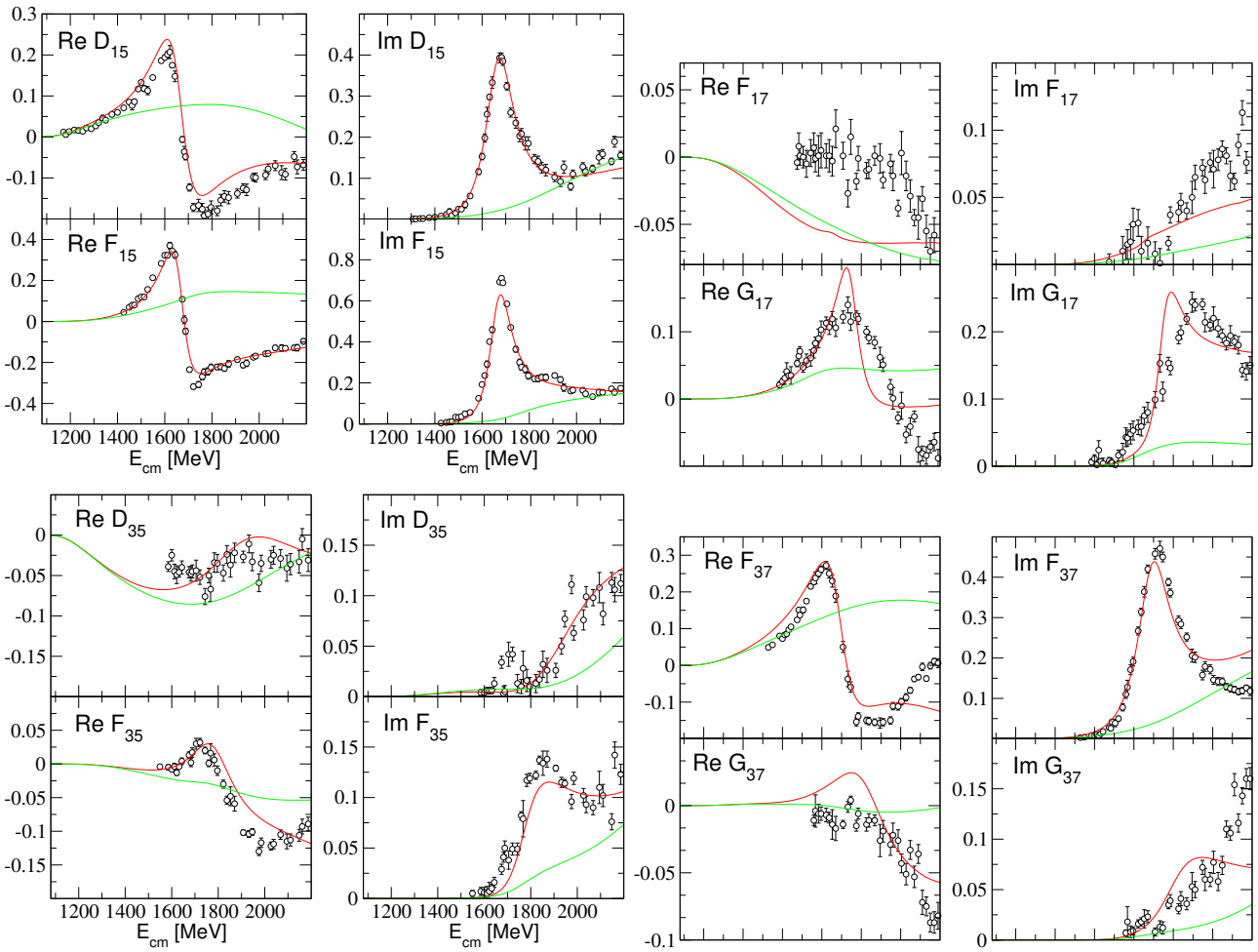


Figure 2: JüBo2026: red (solid) line, $T^{\rm NP}$: green line. Points: GWU-SAID WI08 solution (Phys. Rev. C 86, 035202 (2012)).

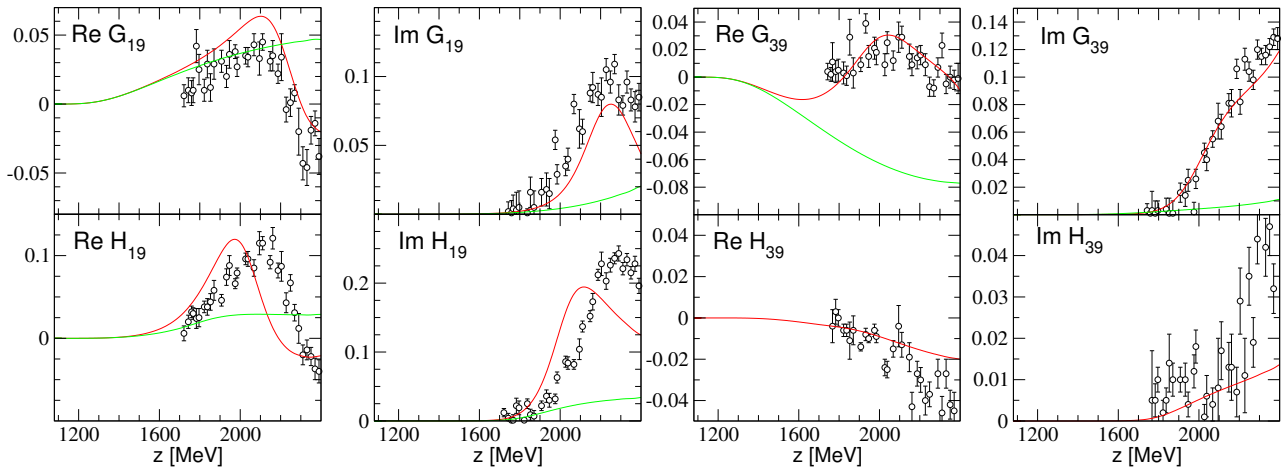


Figure 3: JüBo2026: red (solid) line, T^{NP}: green line. Points: GWU-SAID WI08 solution (Phys. Rev. C 86, 035202 (2012)).

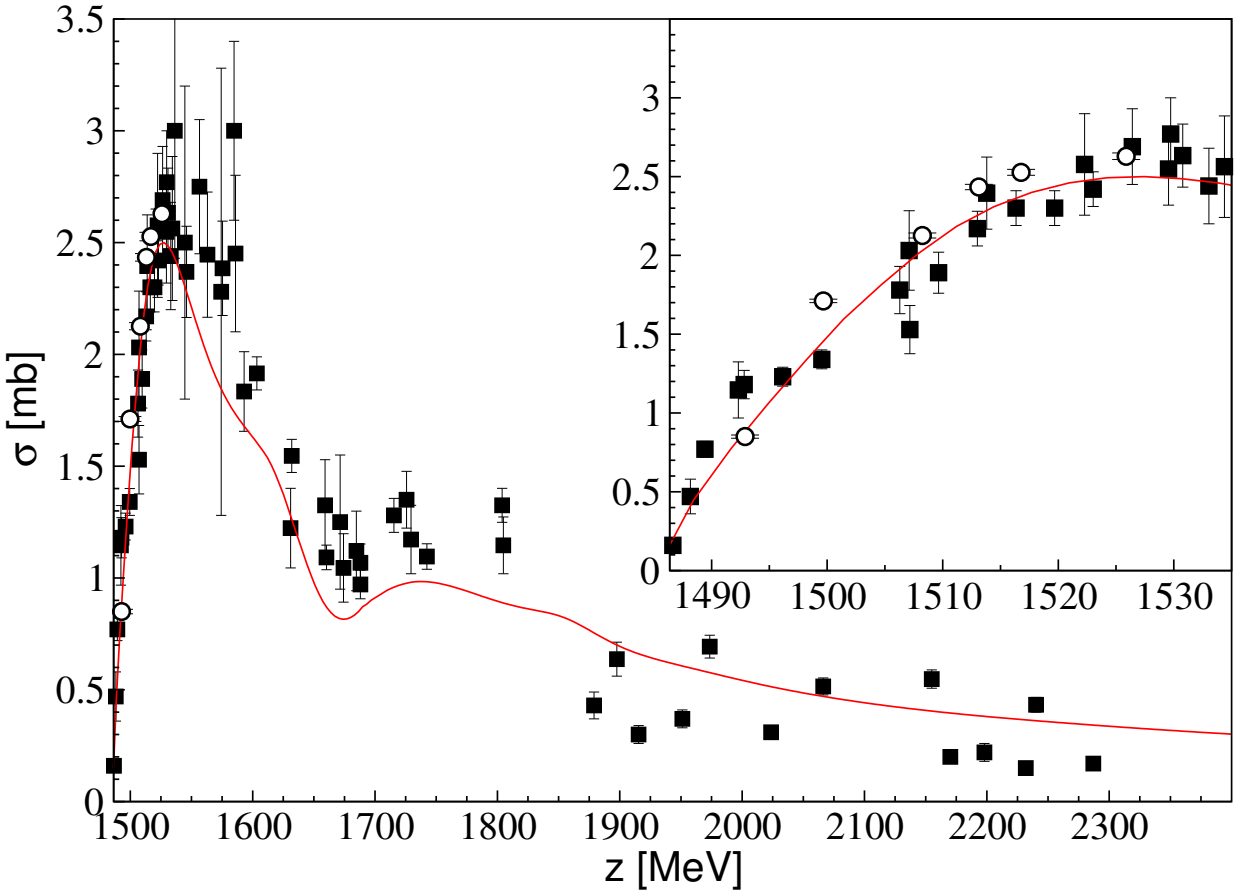


Figure 1: Total cross section of the reaction $\pi^- p \to \eta n$. Data: the filled squares indicate experiments accepted by the GWU/SAID group [1]; open circles fromRef. [2].

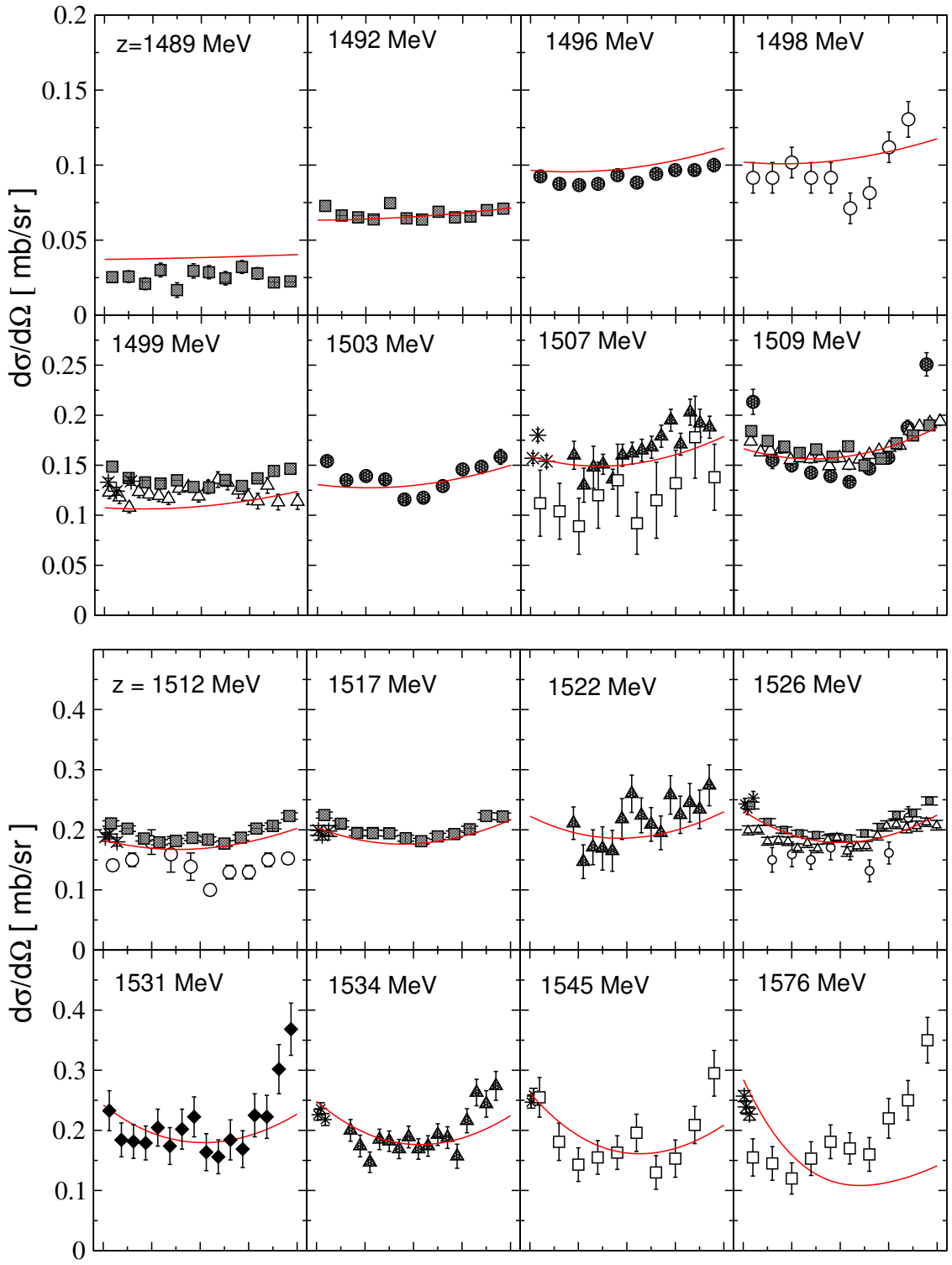


Figure 2: Differential cross section [1/3] of the reaction $\pi^- p \to \eta n$. Data: filled squares from Ref. [2]; filled circles from Ref. [3]; empty circles from Ref. [4]; empty triangles up from Ref. [5]; stars from Ref. [6]; filled triangles up from Ref. [7]; empty squares from Ref. [8]; filled diamonds from Ref. [9].

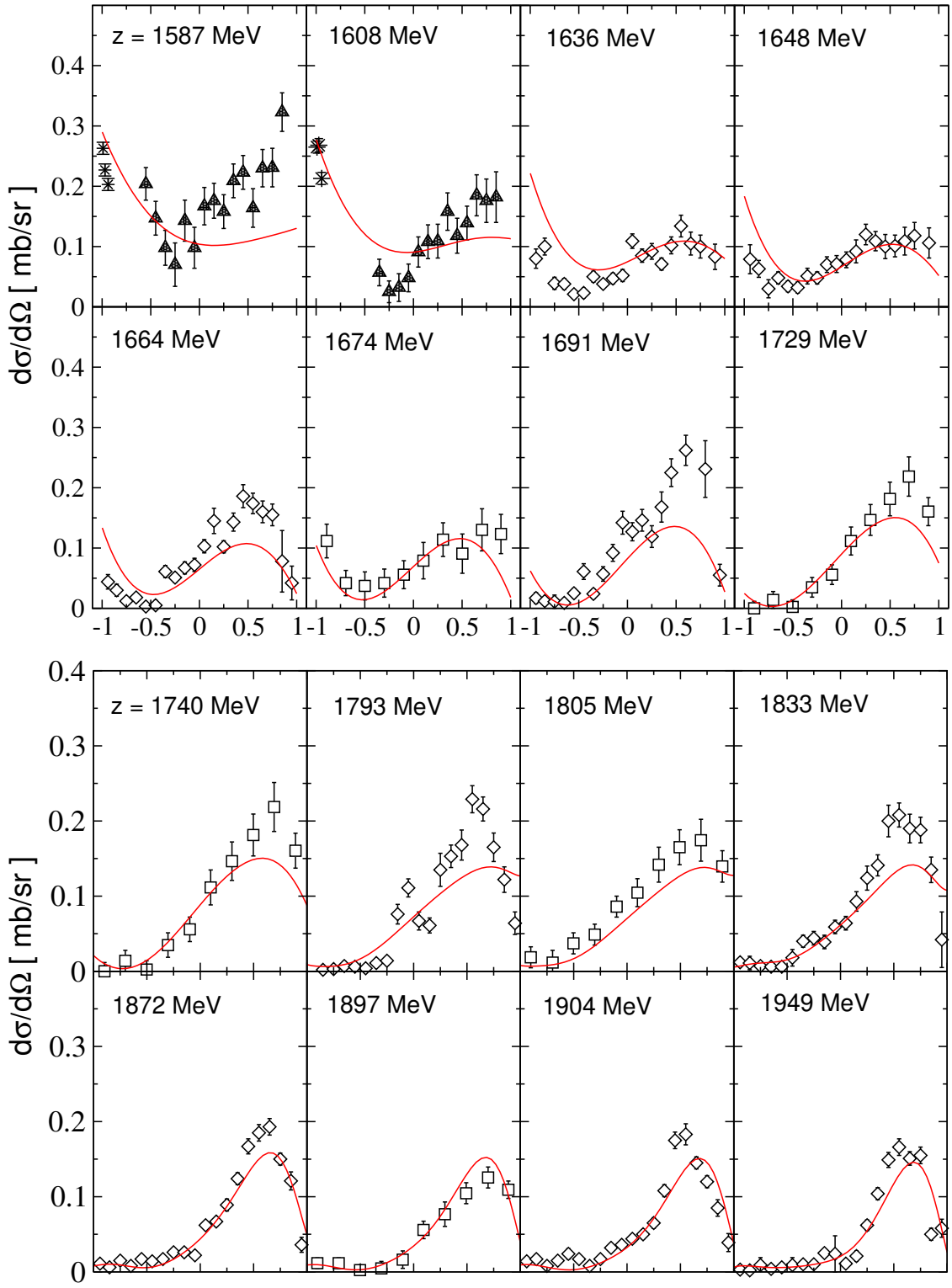


Figure 3: Differential cross section [2/3] of the reaction $\pi^- p \to \eta n$. Data: c.f. Fig. 2 and empty diamonds from Ref. [10].

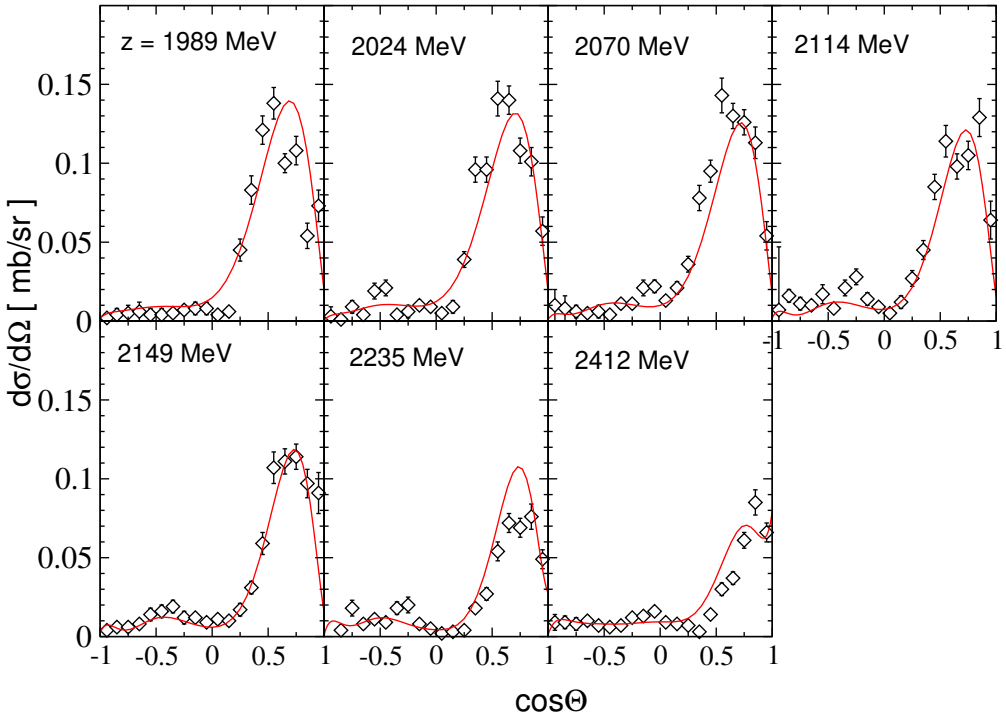


Figure 4: Differential cross section [3/3] of the reaction $\pi^- p \to \eta n$. Data: c.f. Fig. 3.

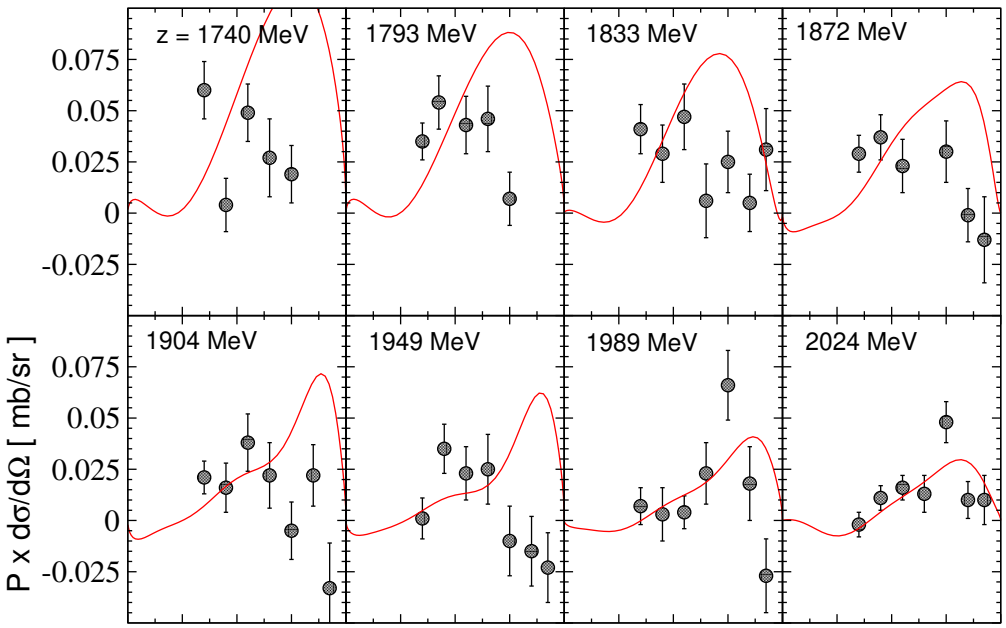


Figure 5: Polarization [1/2] of the reaction $\pi^- p \to \eta n$. Data: Ref. [11].

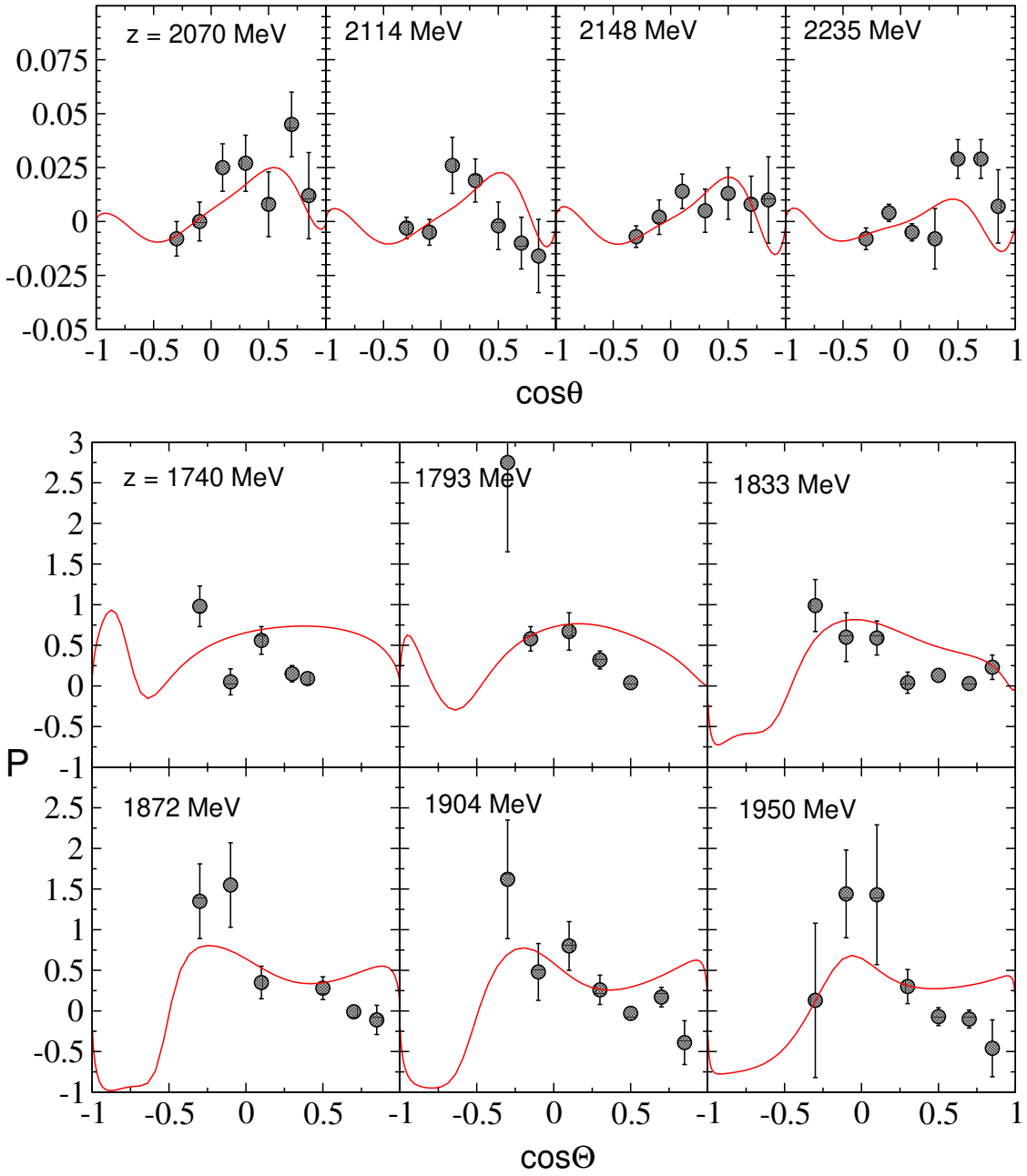


Figure 6: Polarization [2/2] of the reaction $\pi^- p \to \eta n$. Data: Ref. [11].

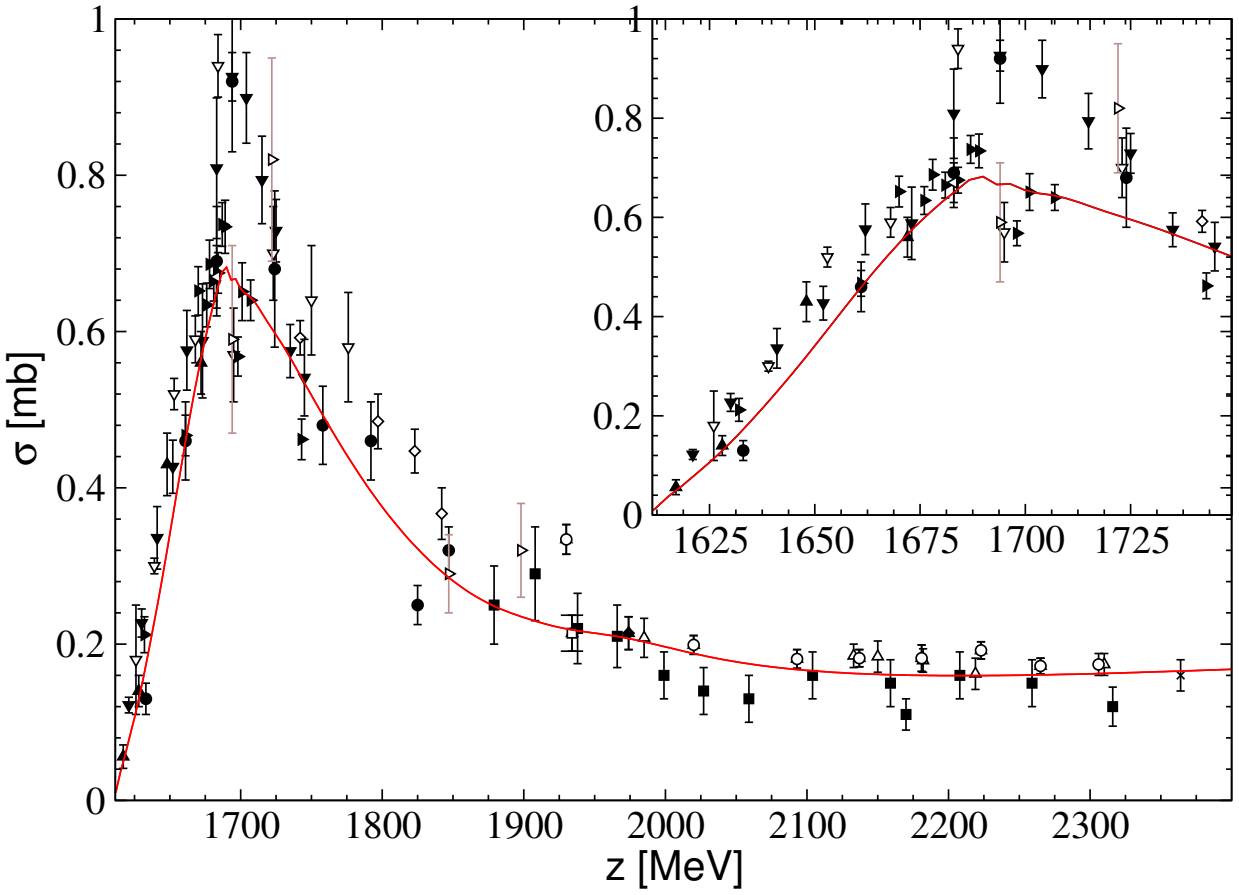


Figure 7: Total cross section of the reaction $\pi^- p \to K^0\Lambda$. Data: filled circles from Ref. [12]; filled squares from Ref. [13]; empty diamonds from Ref. [14]; empty triangles up from Ref. [15]; filled triangles up from Ref. [16]; filled triangles down from Ref. [21]; empty triangles down from Ref. [22]; filled triangles right from Ref. [17]; empty triangles left from Ref. [23]; empty triangles right from Ref. [24]; empty squares from Ref. [18]; filled diamonds from Ref. [19]; stars from Ref. [25]; for empty circles and crosses see Ref. [26].

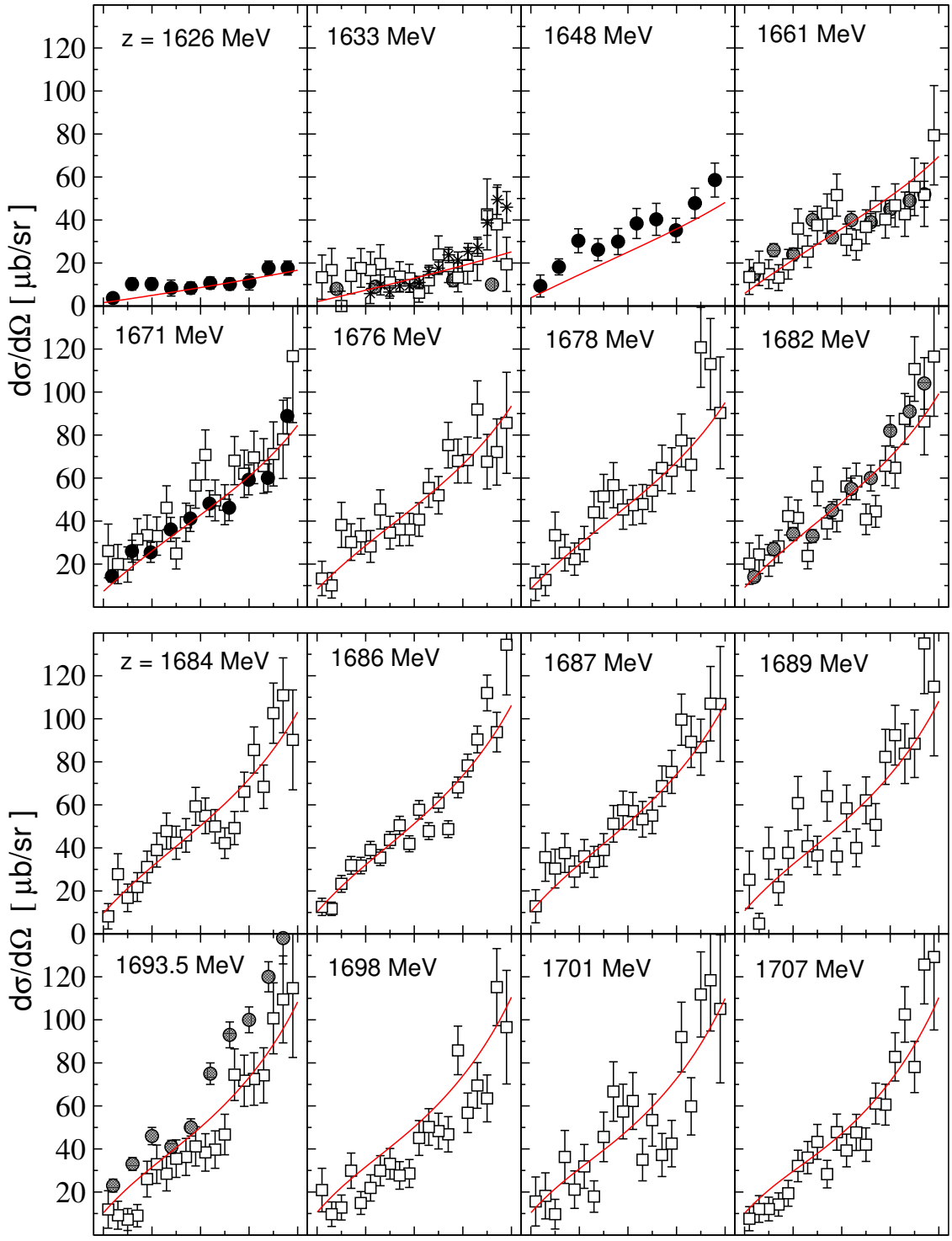


Figure 8: Differential cross section [1/3] of the reaction $\pi^- p \to K^0\Lambda$. Data: filled circles from Ref. [16]; empty squares from Ref. [17]; partially filled circles from Ref. [12]; stars from Ref. [18]; triangles from Ref. [14]; empty diamonds from Ref. [13]; partially filled squares from Ref. [15]; filled diamonds from Ref. [19].

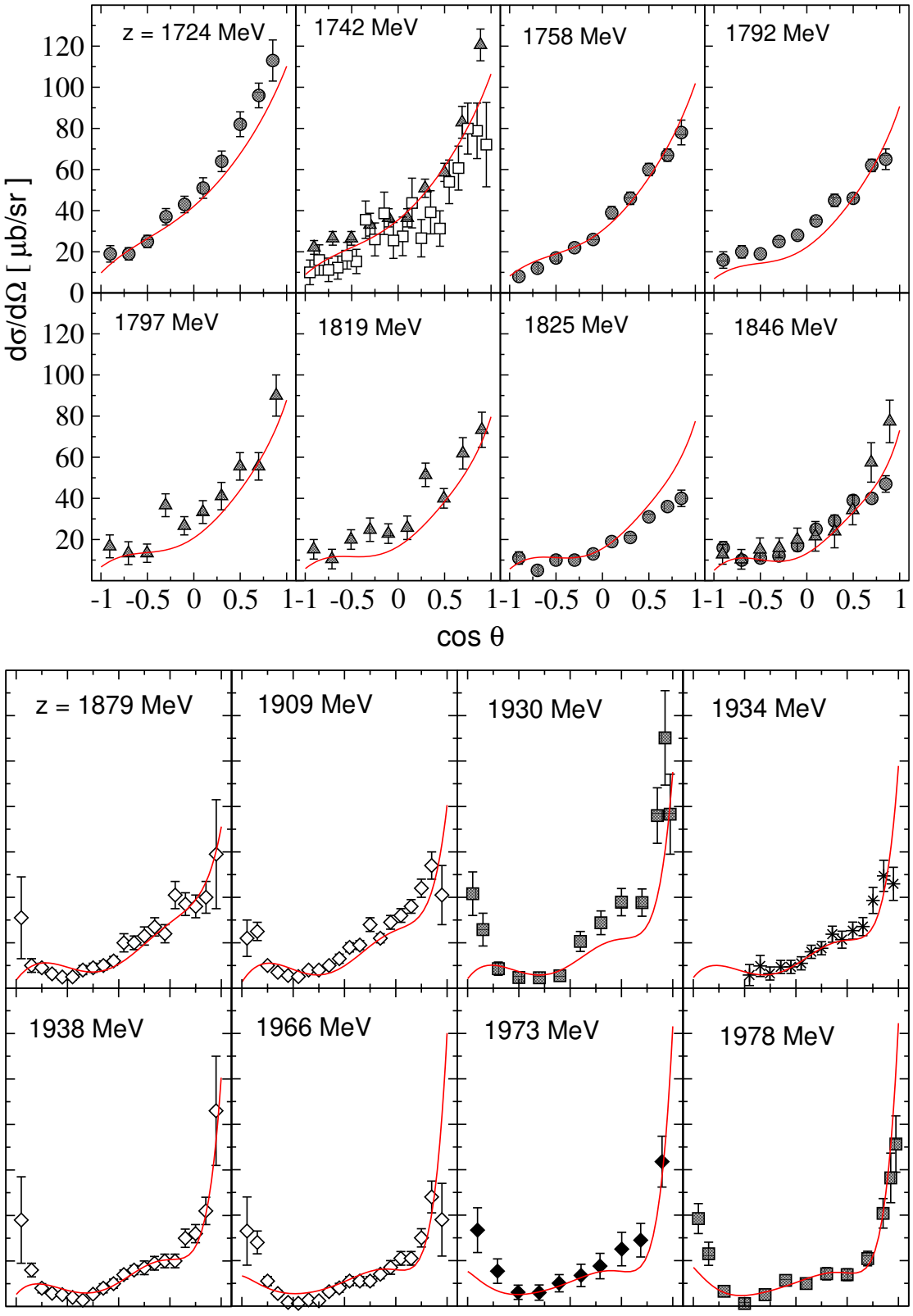


Figure 9: Differential cross section [2/3] of the reaction $\pi^- p \to K^0\Lambda$. Data: c.f. Fig. 8.

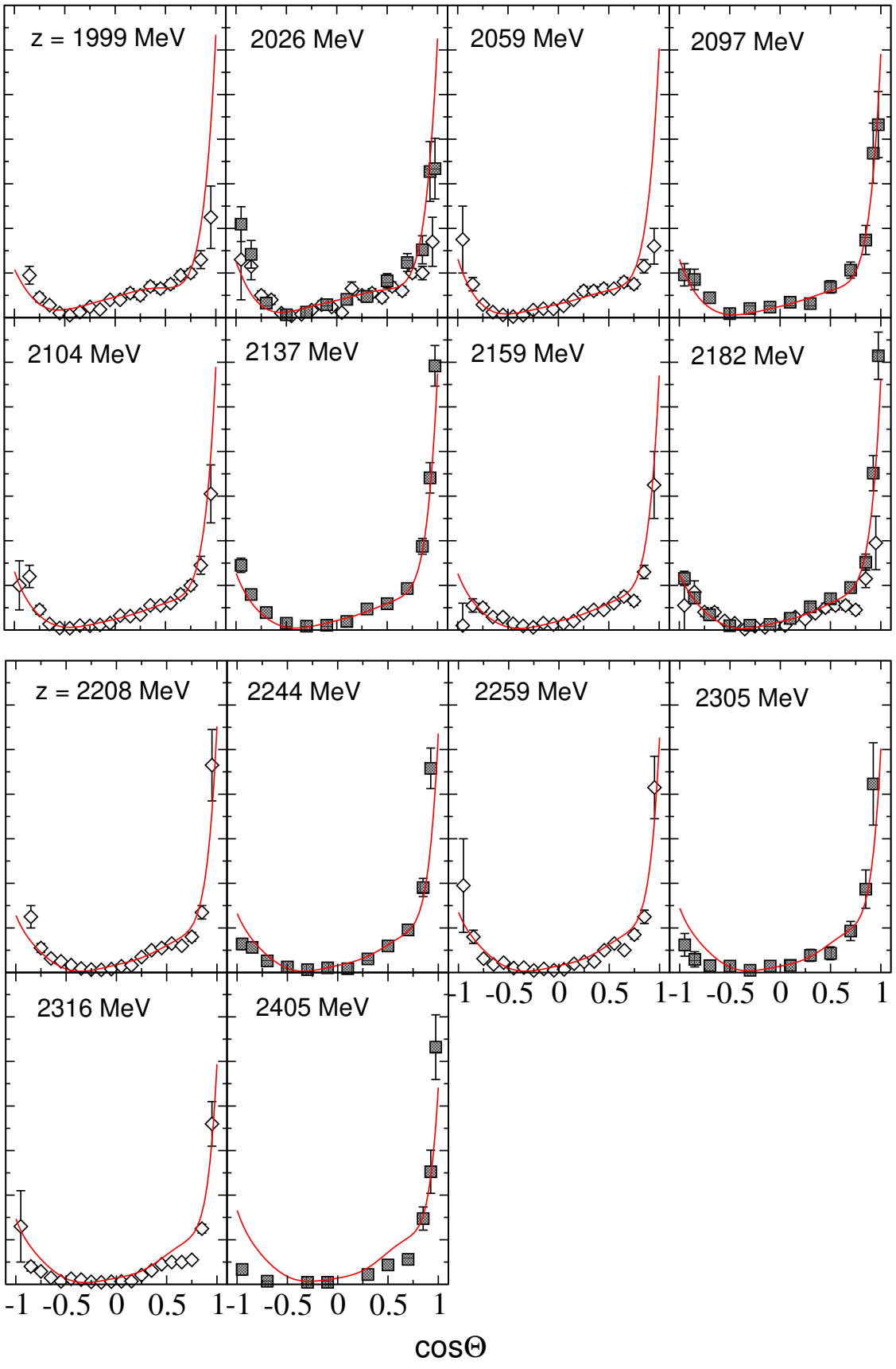


Figure 10: Differential cross section [3/3] of the reaction $\pi^- p \to K^0\Lambda$. Data: c.f. Fig. 8.

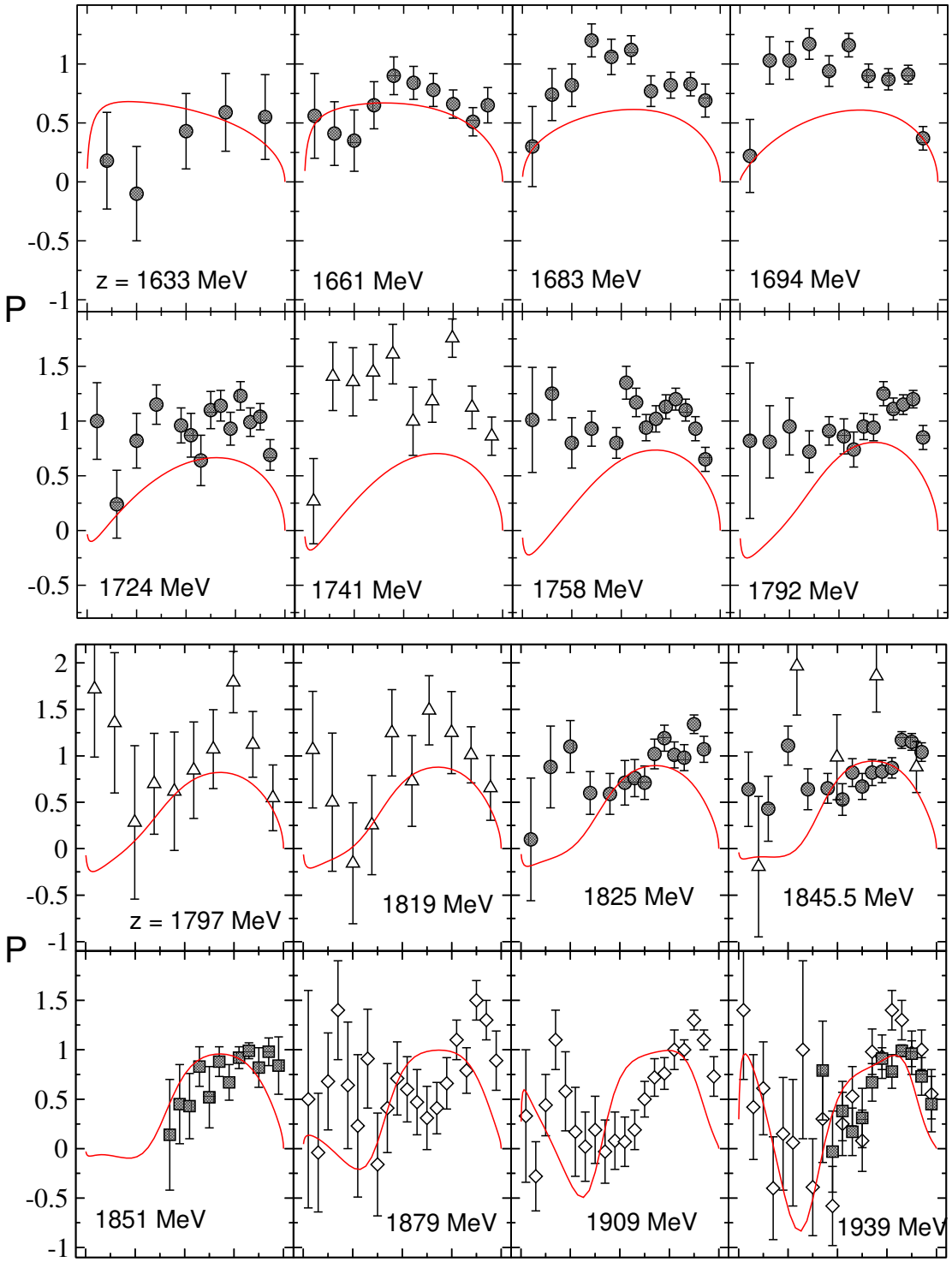


Figure 11: Polarization [1/2] of the reaction $\pi^- p \to K^0\Lambda$. Data: filled circles from Ref. [12]; empty triangles up from Ref. [14]; filled squares from Ref. [20]; empty diamonds from Ref. [13].

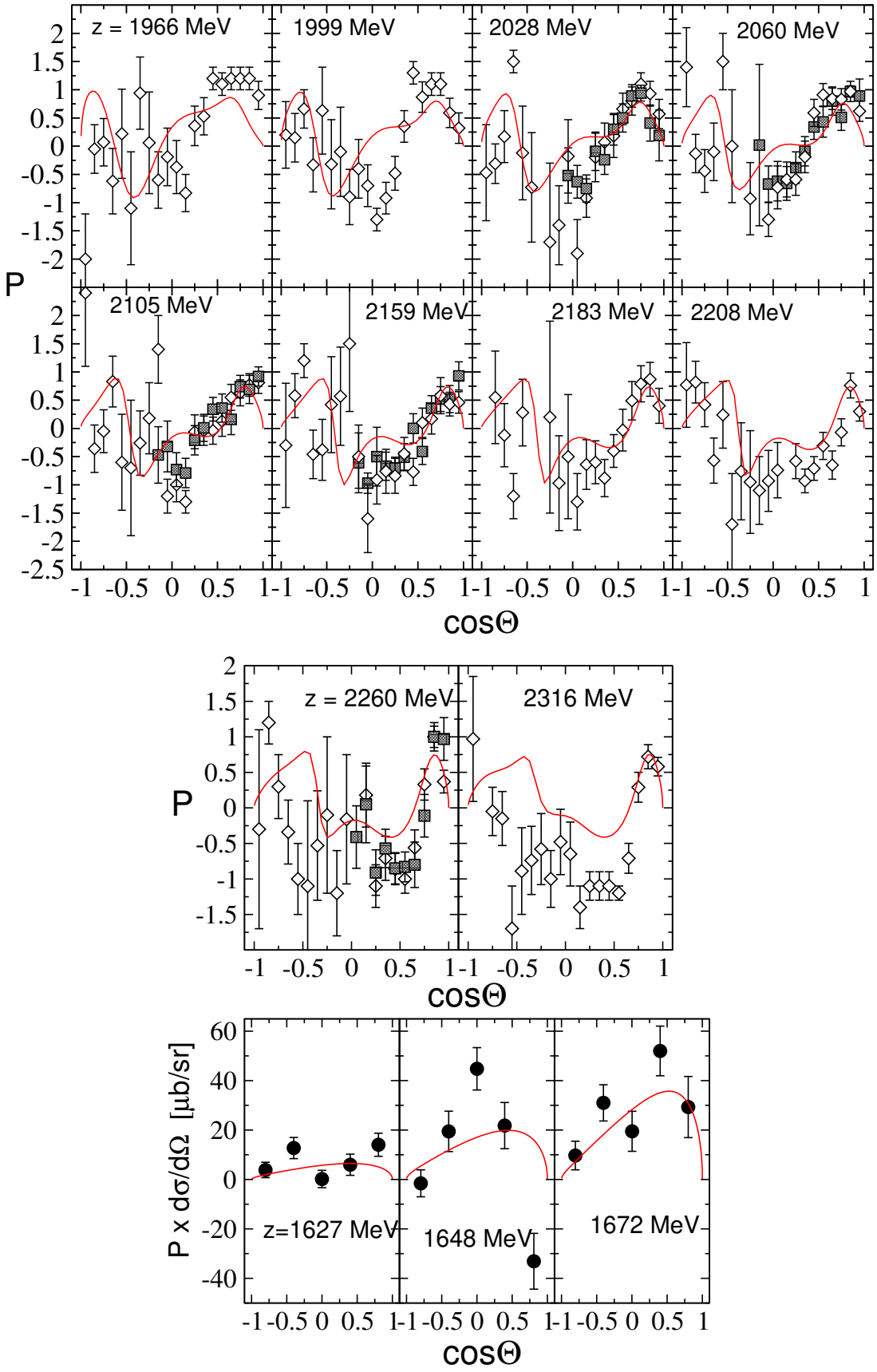


Figure 12: Polarization [2/2] of the reaction $\pi^- p \to K^0\Lambda$. Data: c.f Fig. 11.

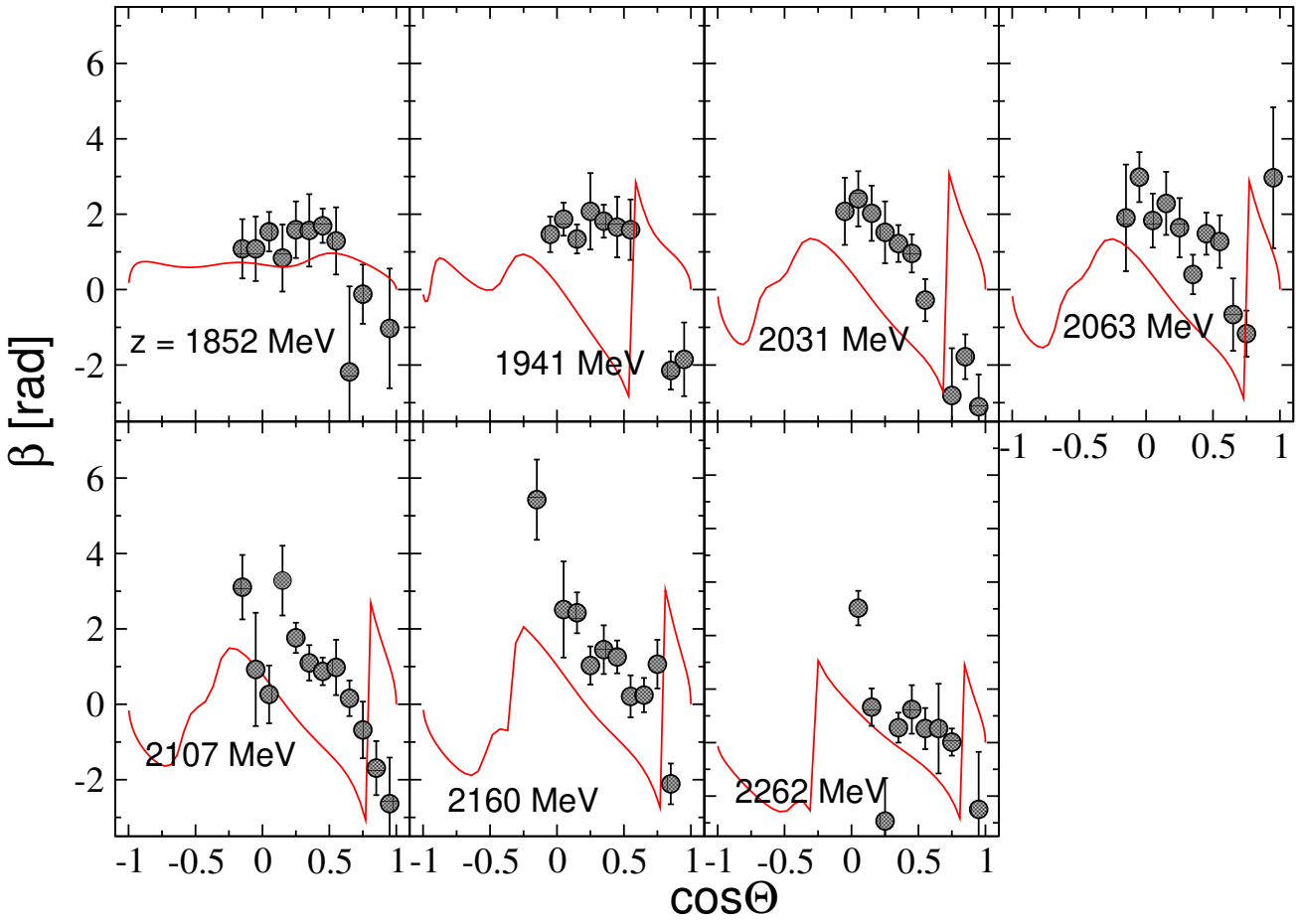


Figure 13: Spin-rotation parameter β of the reaction $\pi^- p \to K^0\Lambda$. Data: Ref. [20].

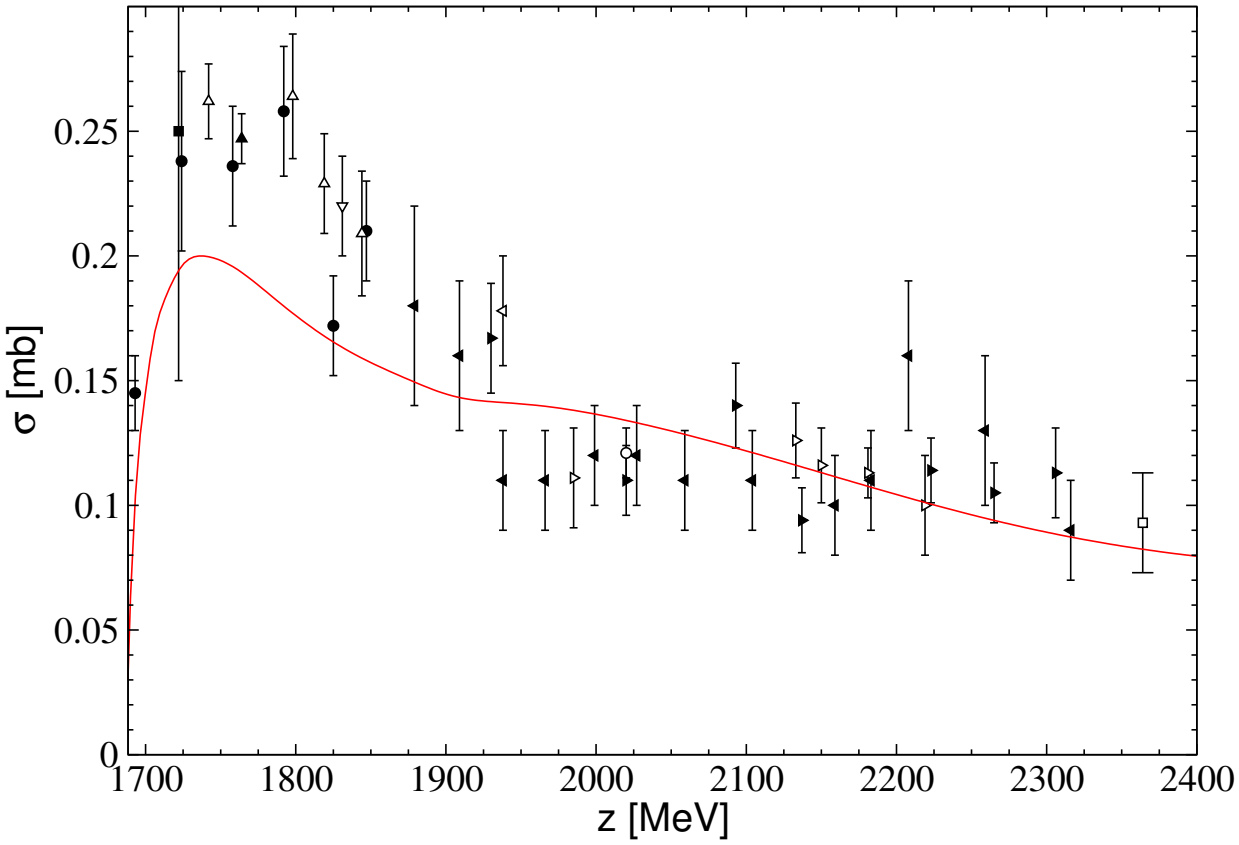


Figure 14: Total cross section of the reaction $\pi^- p \to K^0\Sigma^0$. Data: empty triangles up: Ref. [14]; empty triangles right: Ref. [15]; filled squares: Ref. [24]; empty triangles left: Ref. [19]; filled triangles up: Ref. [29] filled circles: Ref. [27]; empty circles: Ref. [30]; filled triangles left: Ref. [28]. For empty triangles down, filled triangles right, and empty squares see [26].

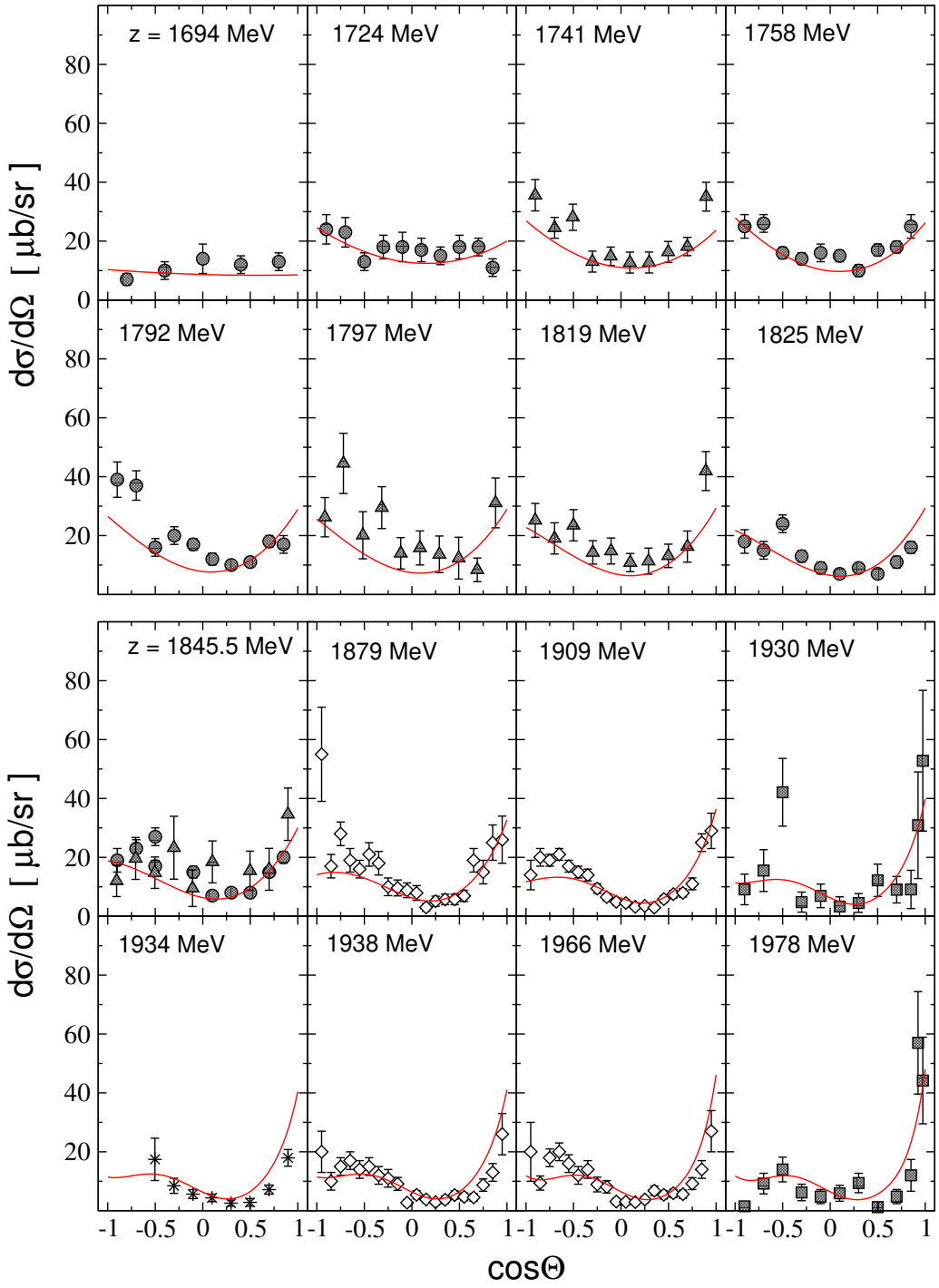


Figure 15: Differential cross section [1/2] of the reaction $\pi^- p \to K^0\Sigma^0$. Data: circles from Ref. [27]; up triangles from Ref. [14]; squares from Ref. [15]; diamonds from Ref. [28]; stars from Ref. [18].

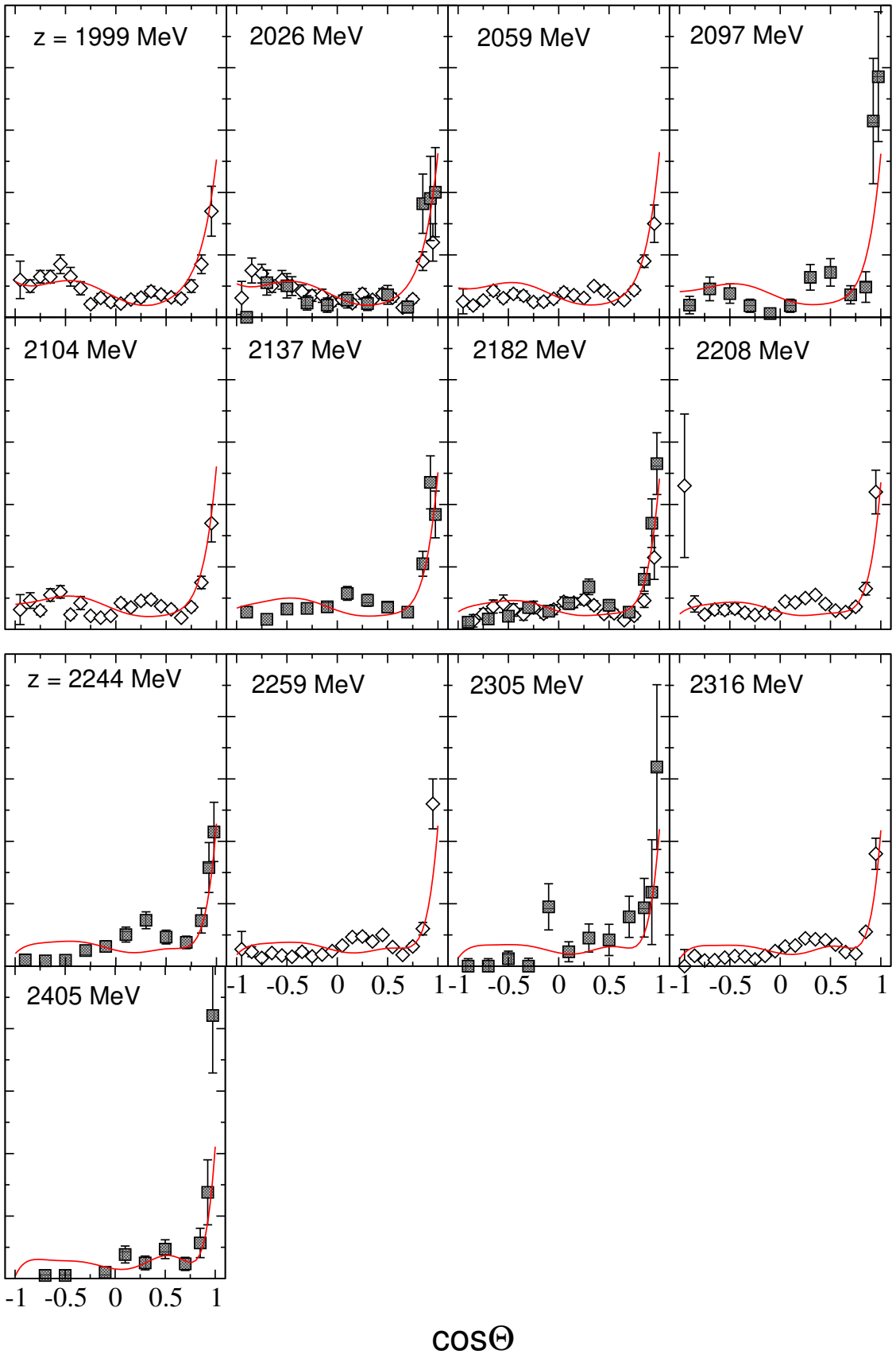


Figure 16: Differential cross section [2/2] of the reaction $\pi^- p \to K^0\Sigma^0$. Data: c.f. Fig. 15.

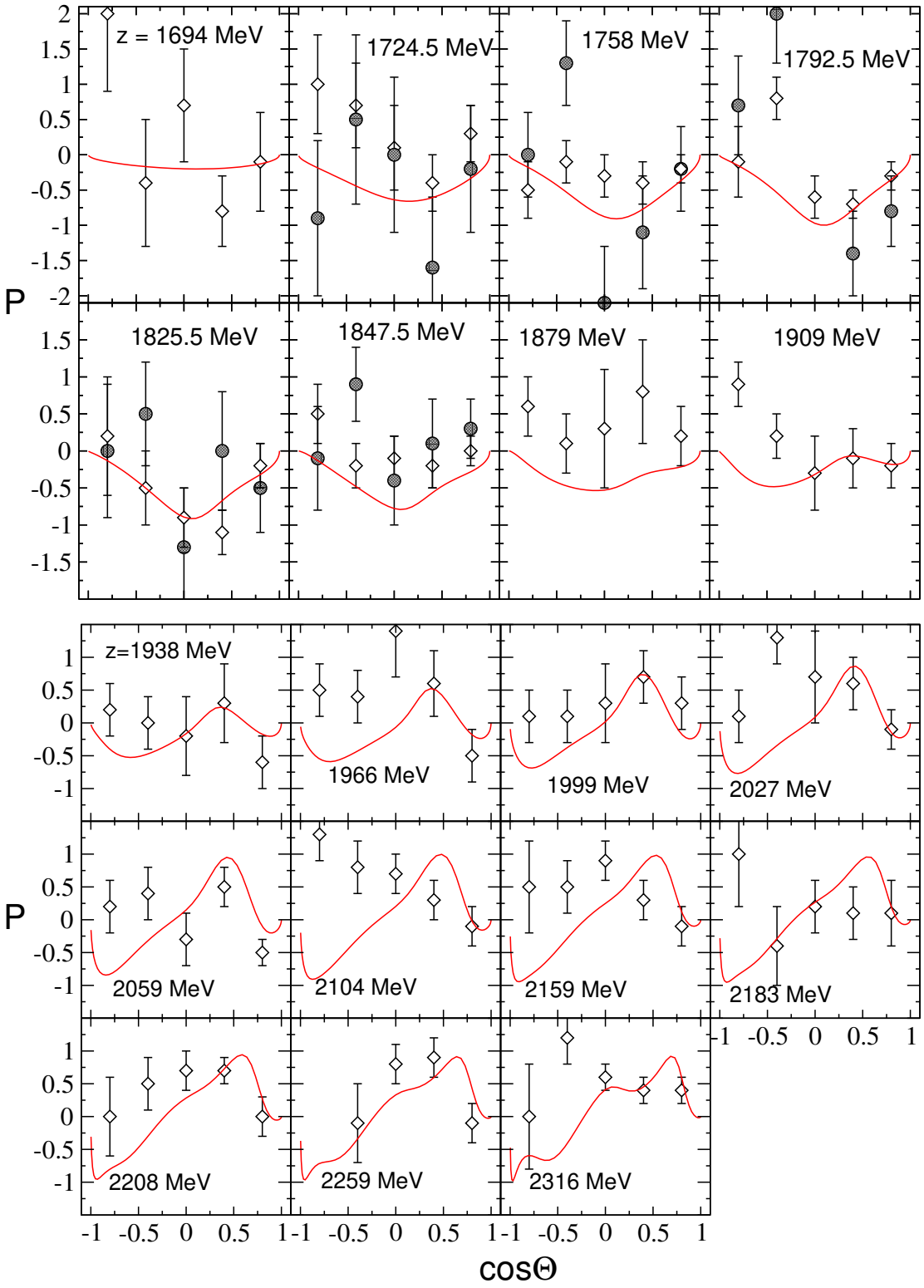


Figure 17: Polarization of the reaction $\pi^- p \to K^0\Sigma^0$. Data: circles from Ref. [27]; diamonds from Ref. [28].

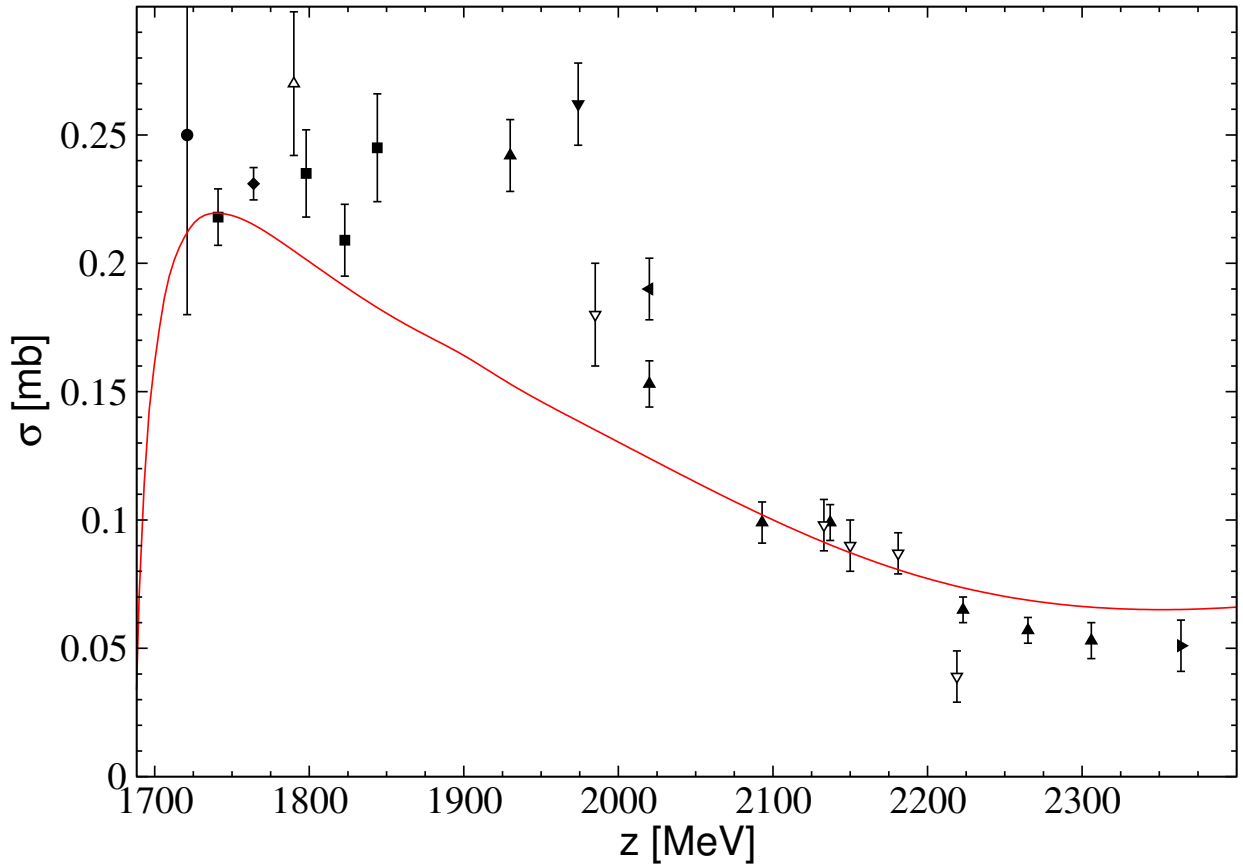


Figure 18: Total cross section of the reaction $\pi^- p \to K^+\Sigma^-$. Data: empty triangles down: Ref. [15]; filled circles: Ref. [24]; filled triangles down: Ref. [19]; filled triangles left: Ref. [30]; empty triangles up: Ref. [34]; filled squares: Ref. [32]; filled diamonds: Ref. [33]. For filled triangles up and filled triangles right see Ref. [26].

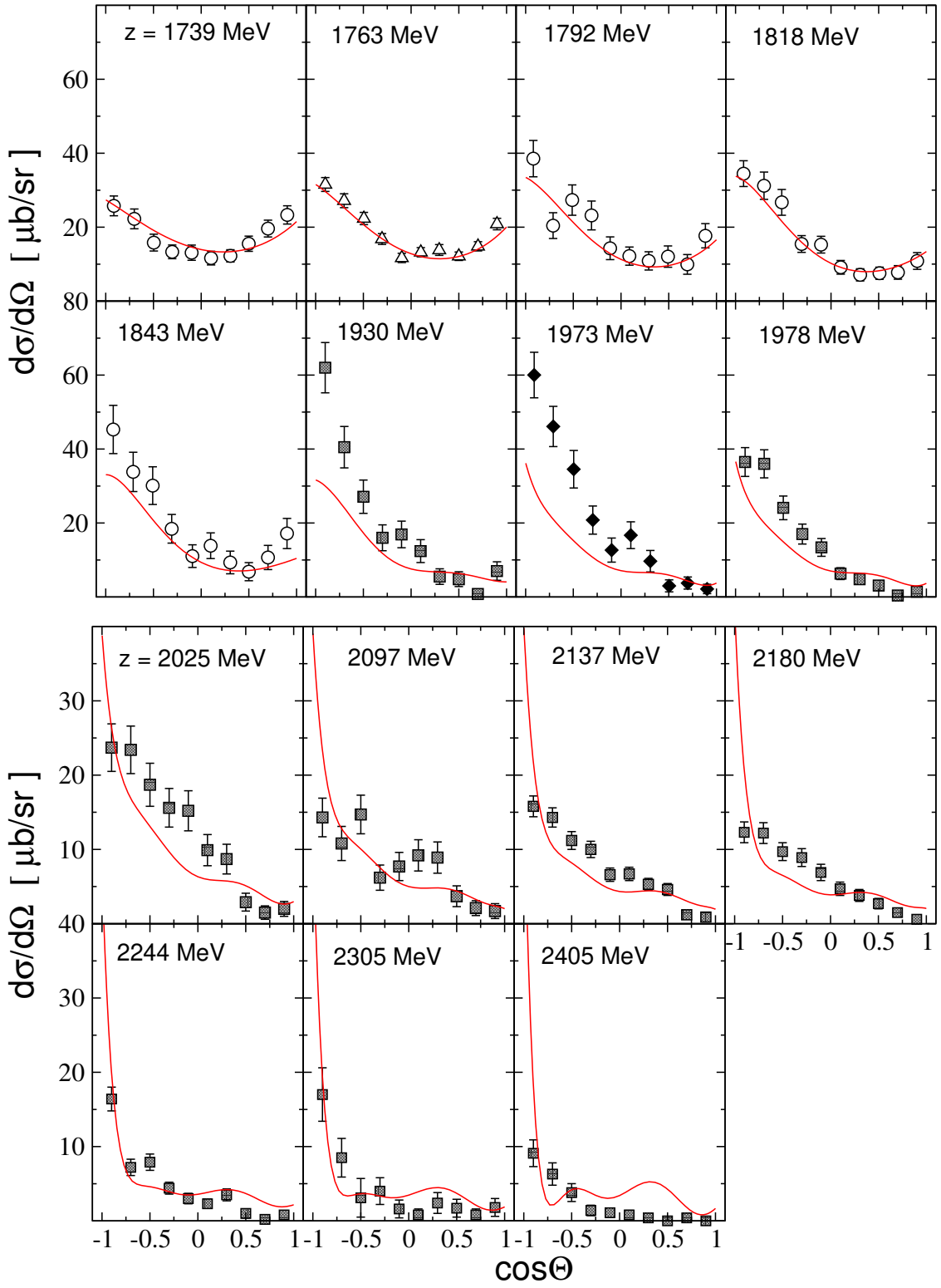


Figure 19: Differential cross section of the reaction $\pi^- p \to K^+\Sigma^-$. Data: circles from Ref. [32]; up triangles from Ref. [33]; squares from Ref. [15]; diamonds from Ref. [19].

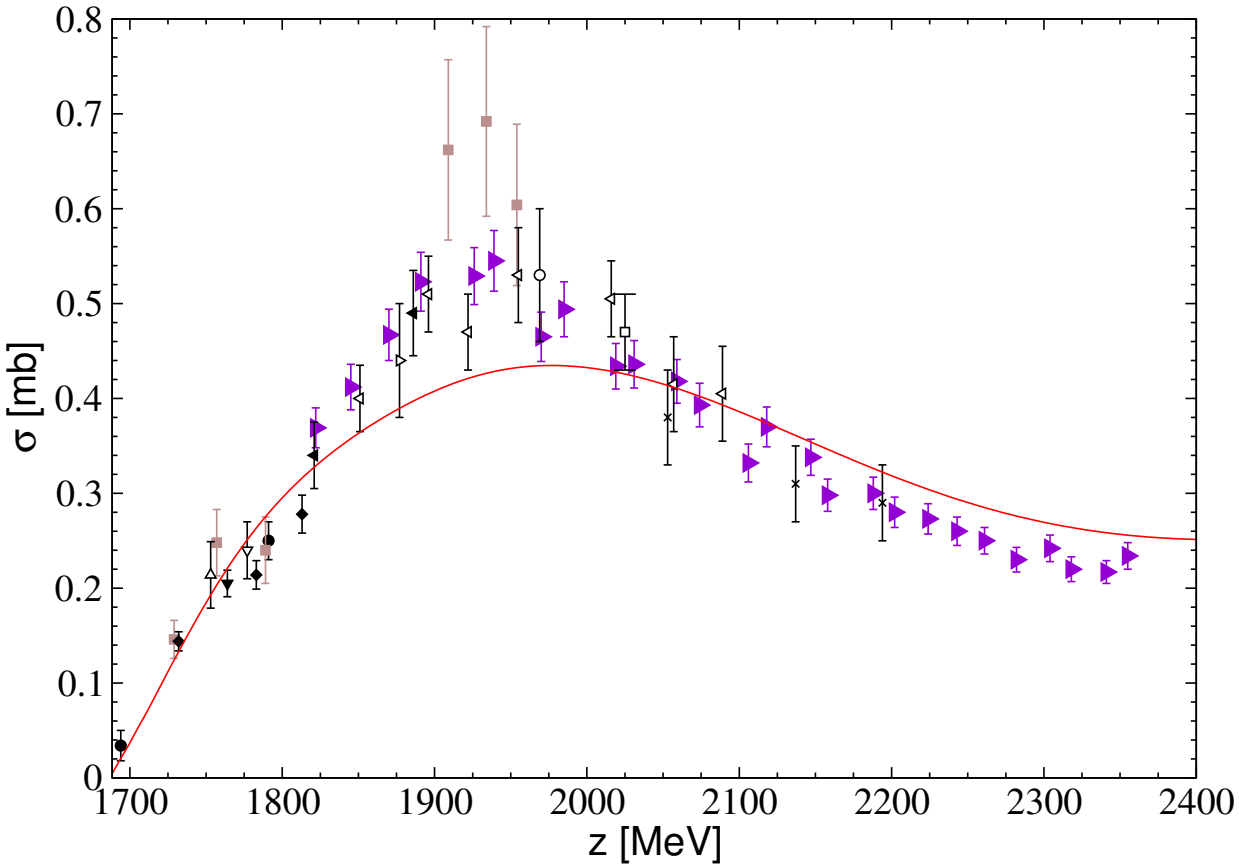


Figure 20: Total cross section of the reaction $\pi^+p \to K^+\Sigma^+$. Data: filled triangles right: Ref. [35]; filled squares: Ref. [40]; filled diamonds: Ref. [41]; empty triangles up: Ref. [47]; filled triangles down: Ref. [43]; empty triangles down: Ref. [48]; empty triangles left: Ref. [49]; empty circles: Ref. [50]; empty squares: Ref. [51]; crosses: Ref. [52]. For filled circles, filled triangles left and empty triangles right see Ref. [26].

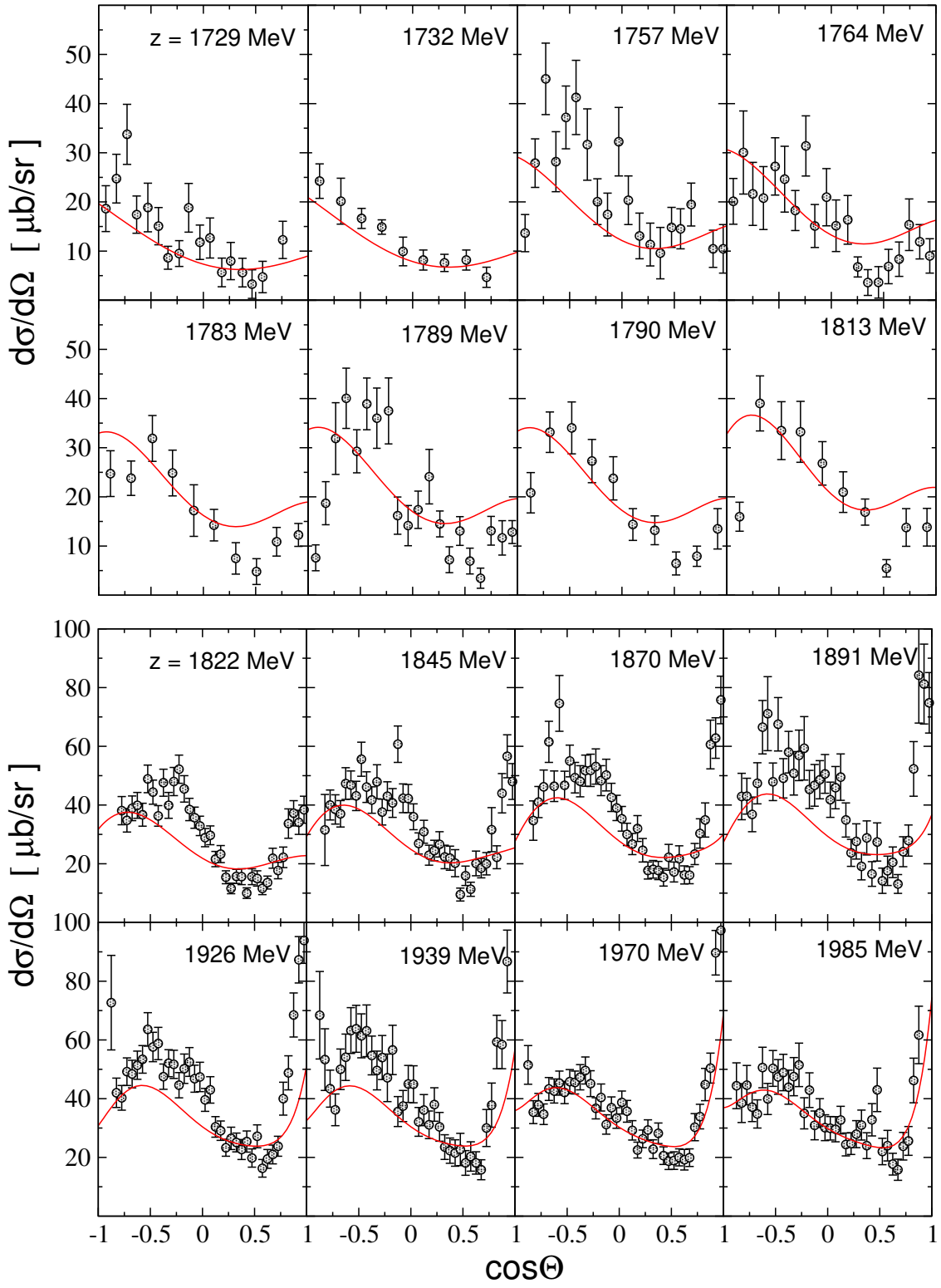


Figure 21: Differential cross section [1/2] of the reaction $\pi^+p \to K^+\Sigma^+$. Data: Ref. [35], except: $z = 1729$, 1757, 1789 MeV from Ref. [40]; $z = 1732$, 1783, 1813 MeV from Ref. [41]; $z = 1764$ MeV from Ref. [43]; $z = 1790$ MeV from Ref. [42].

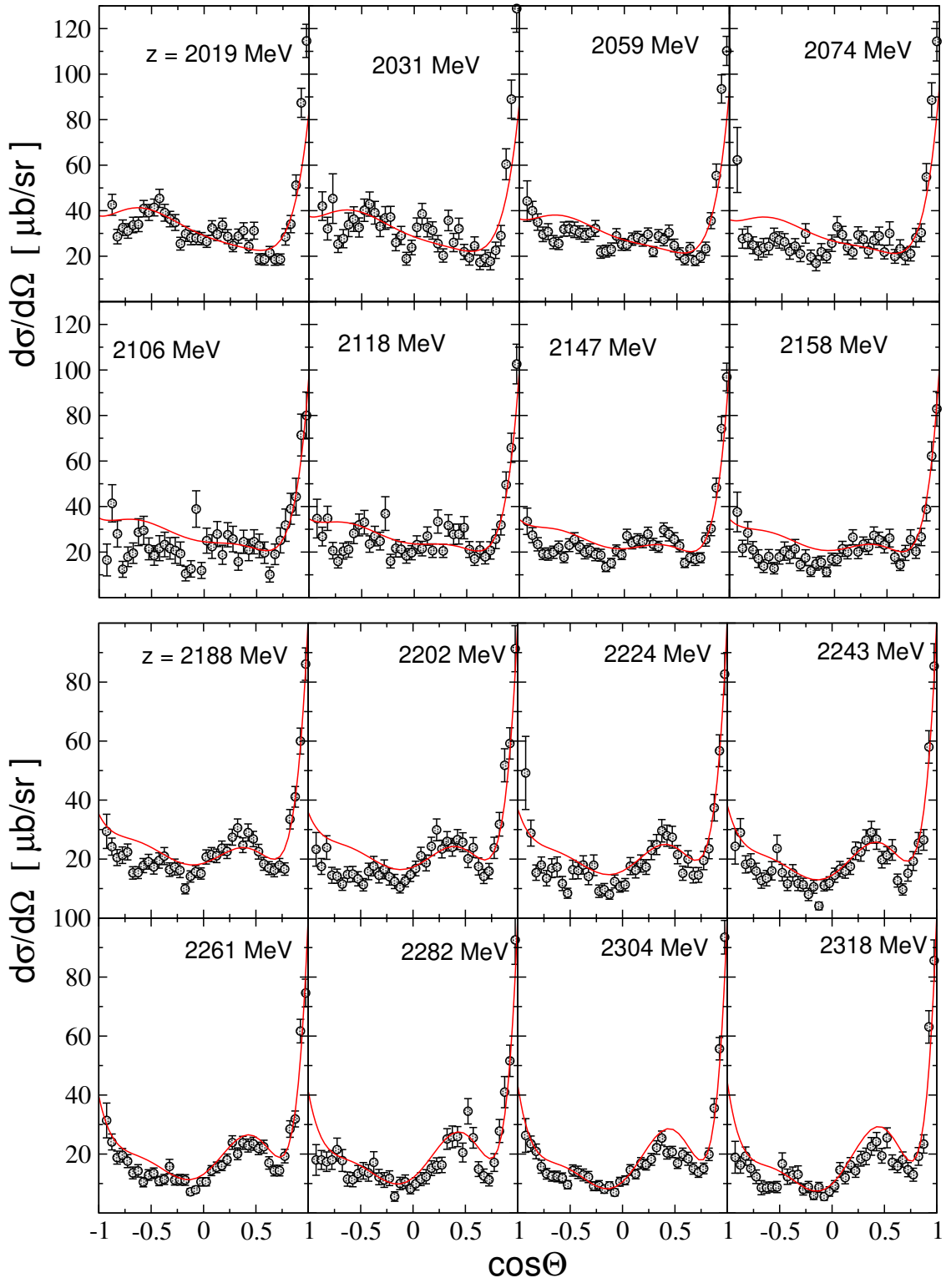


Figure 22: Differential cross section [2/2] of the reaction $\pi^+p \to K^+\Sigma^+$. Data from Ref. [35].

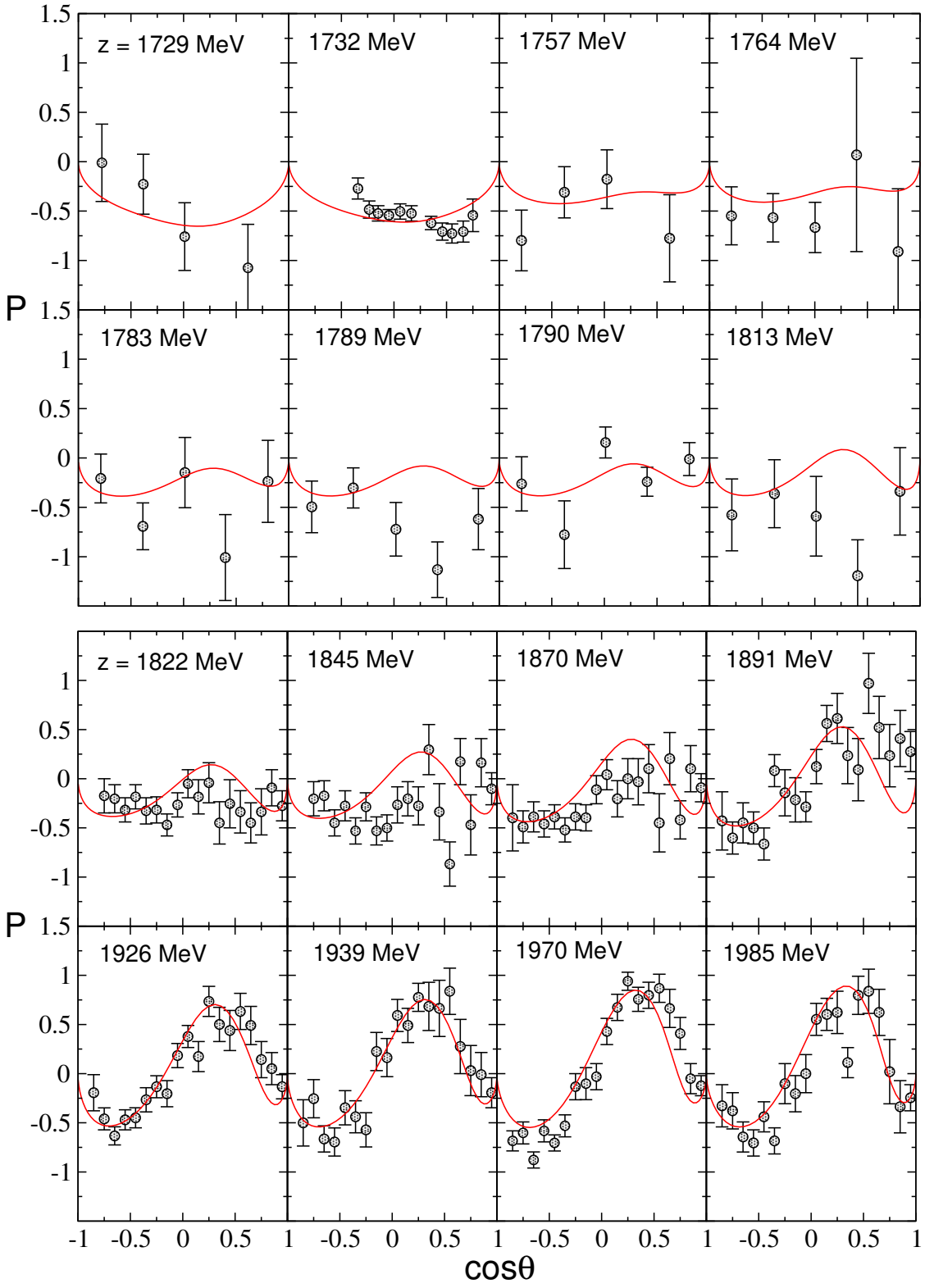


Figure 23: Polarization [1/2] of the reaction $\pi^+p \to K^+\Sigma^+$. Data: Ref. [35], except: z = 1729, 1757, 1789 MeV from Ref. [40]; z = 1783, 1813 MeV from Ref. [41]; z = 1764 MeV from Ref. [43]; z = 1790 MeV from Ref. [42]; z = 1732 MeV from Ref. [44].

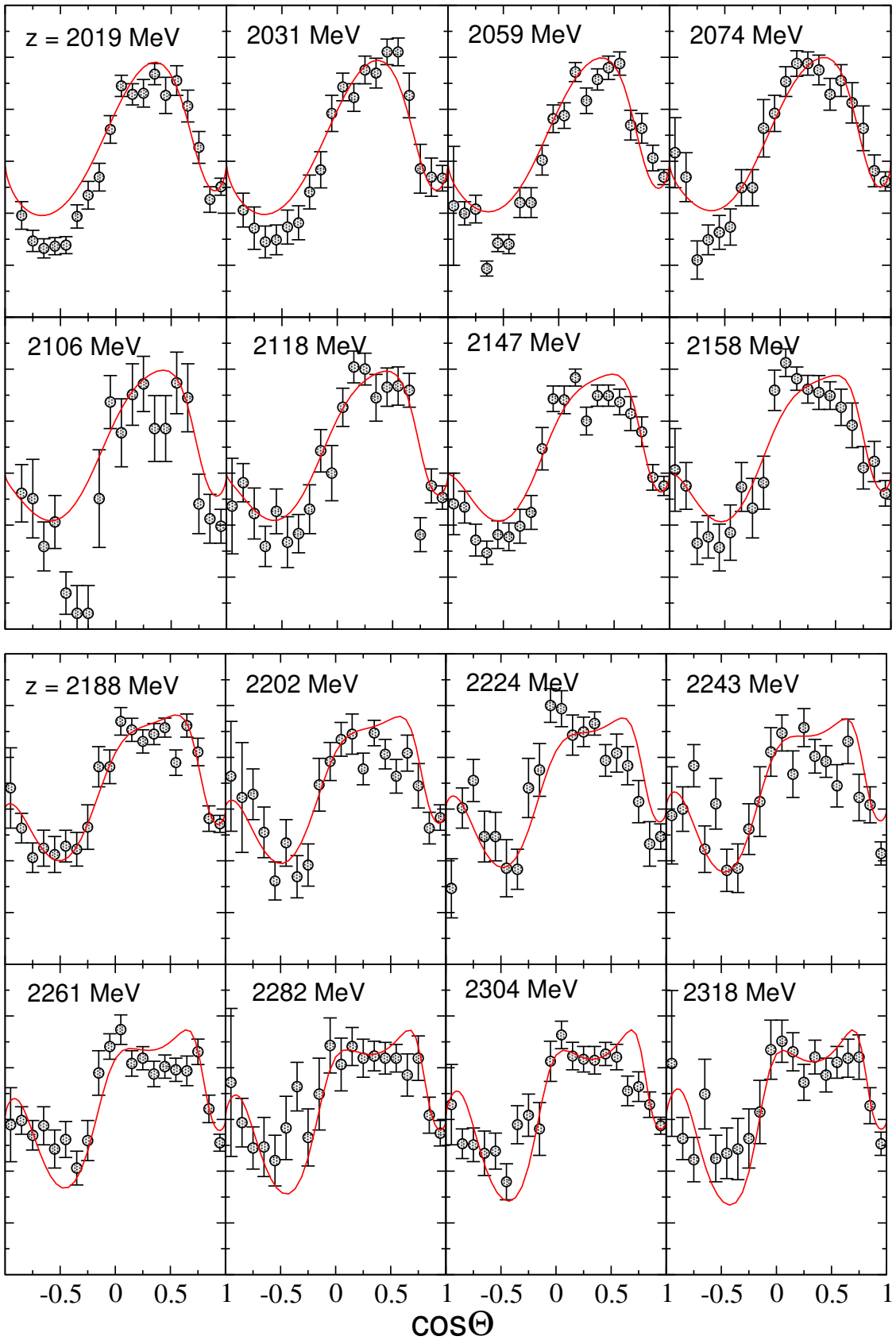


Figure 24: Polarization [2/2] of the reaction $\pi^+p \to K^+\Sigma^+$. Data: Ref. [35].

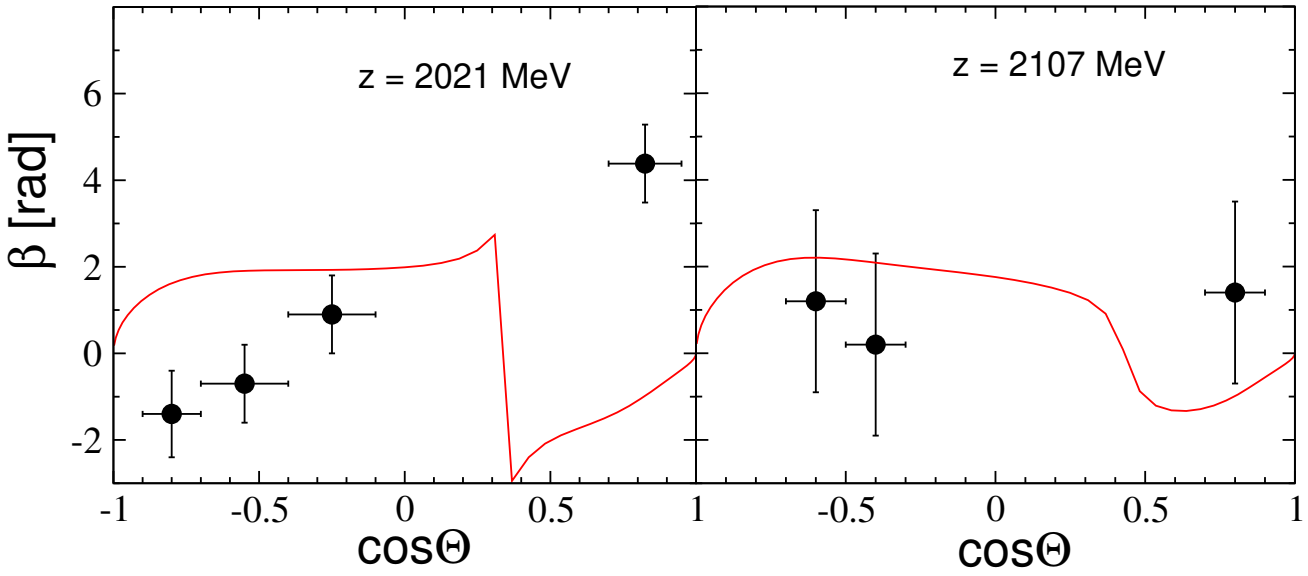


Figure 25: Spin-rotation parameter β of the reaction $\pi^+p \to K^+\Sigma^+$. Data: Ref. [37].

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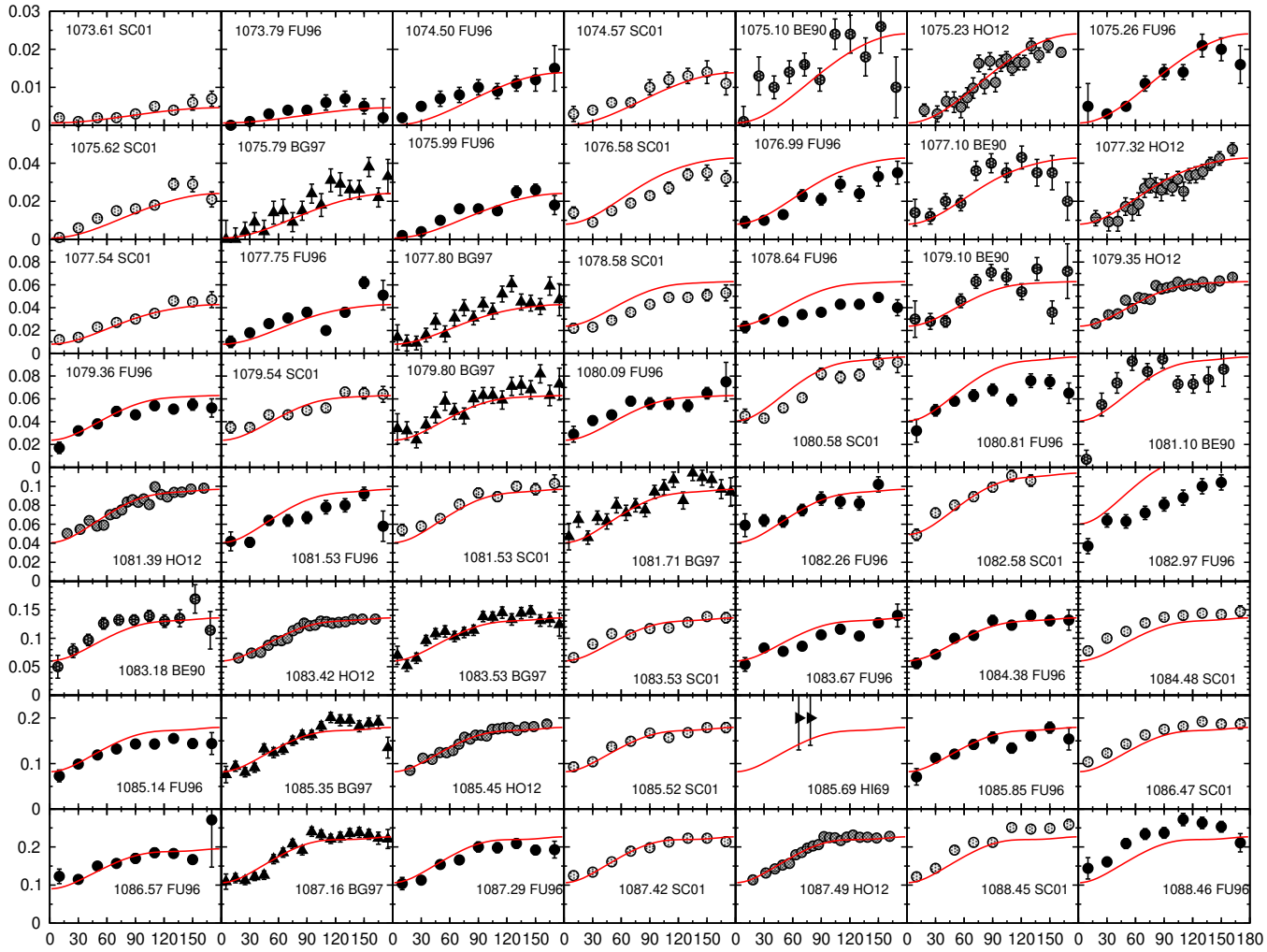
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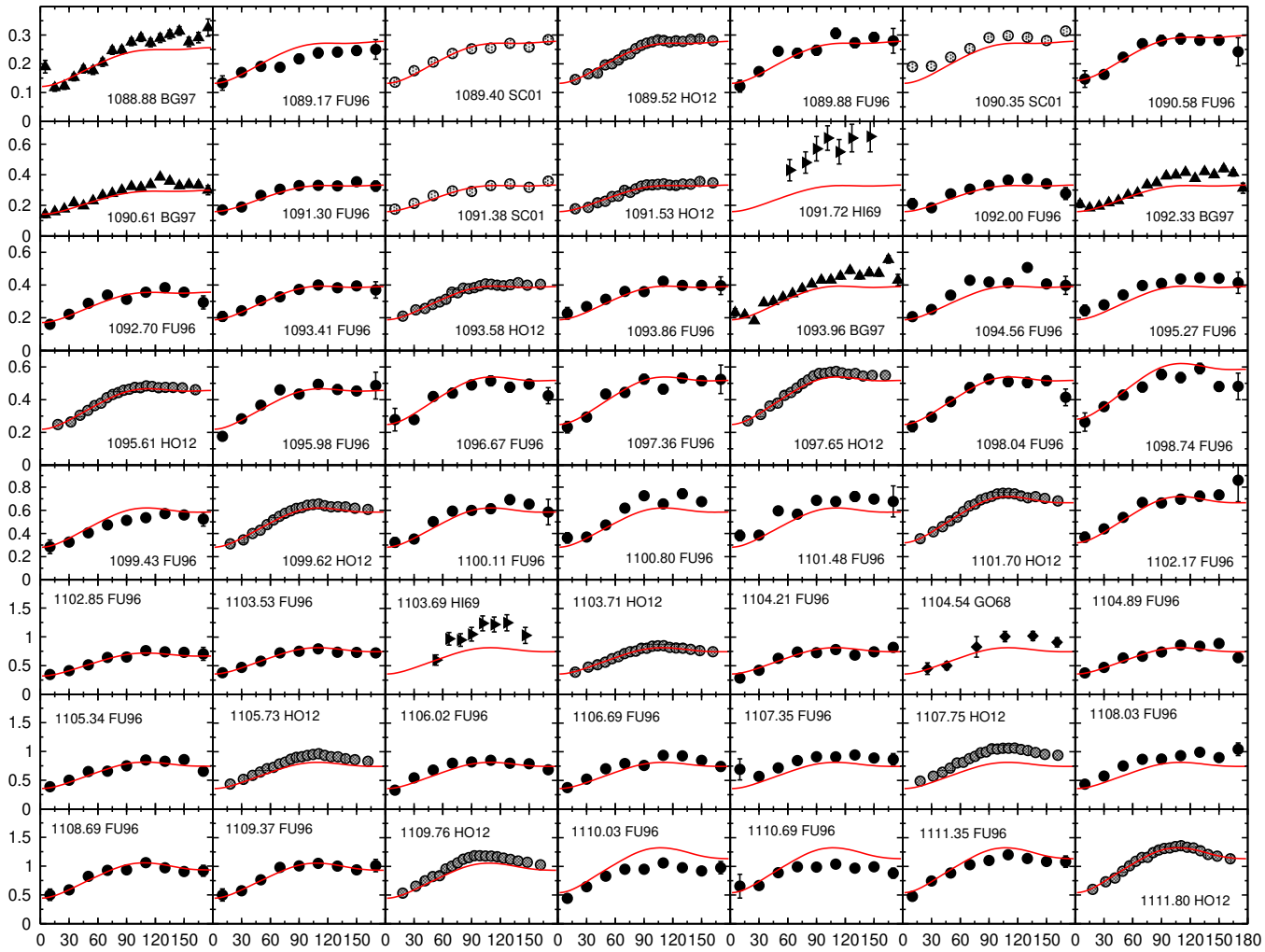
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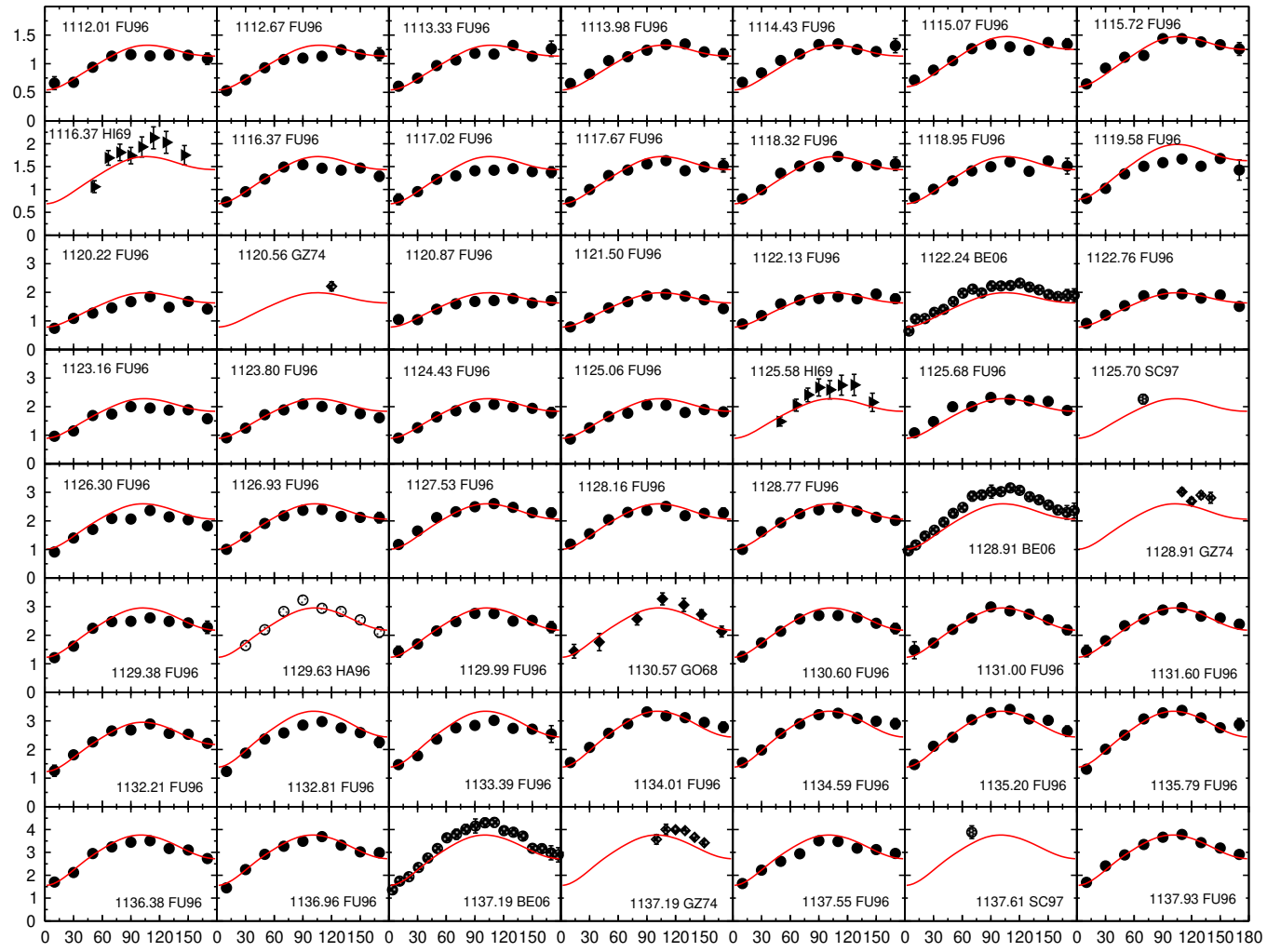
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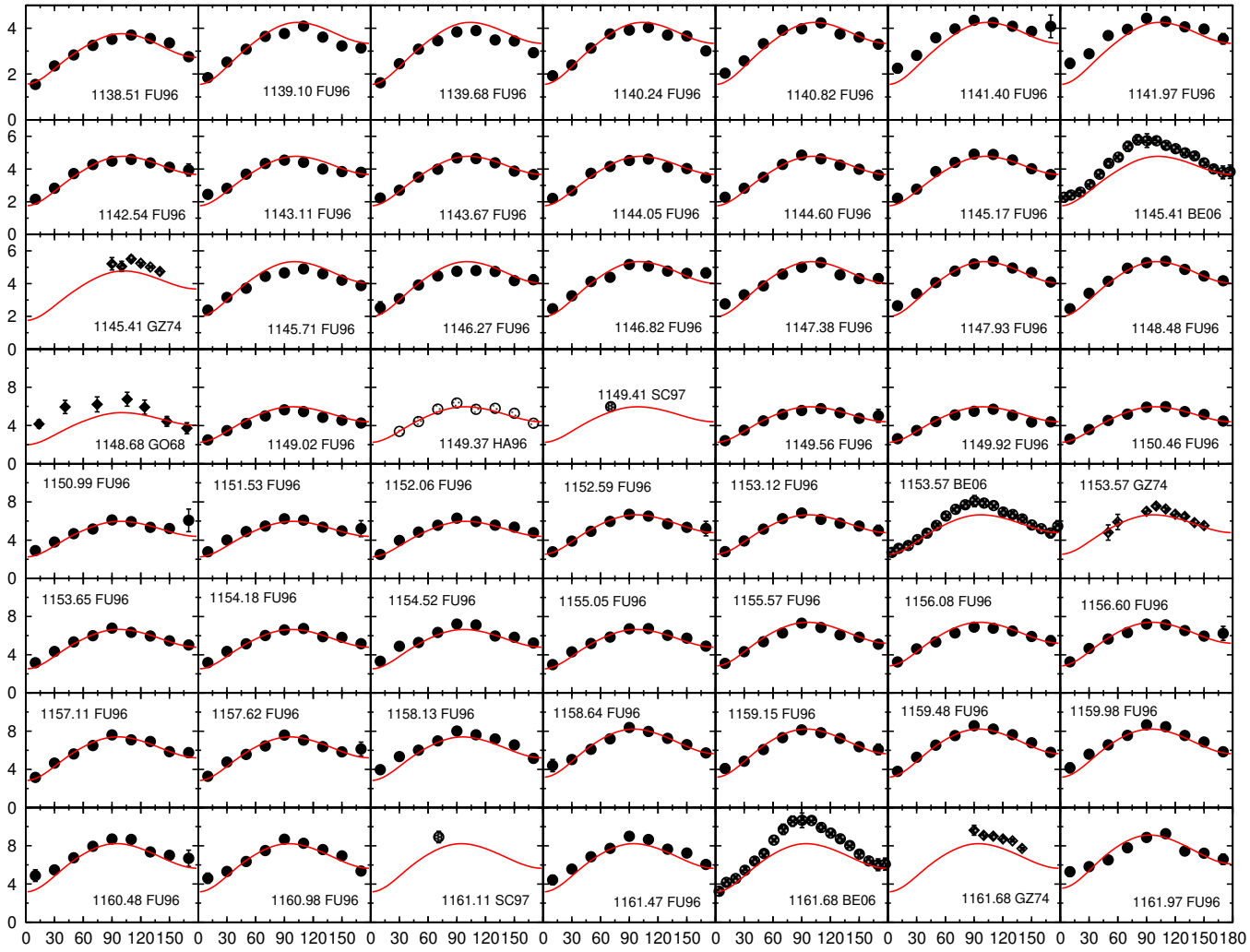
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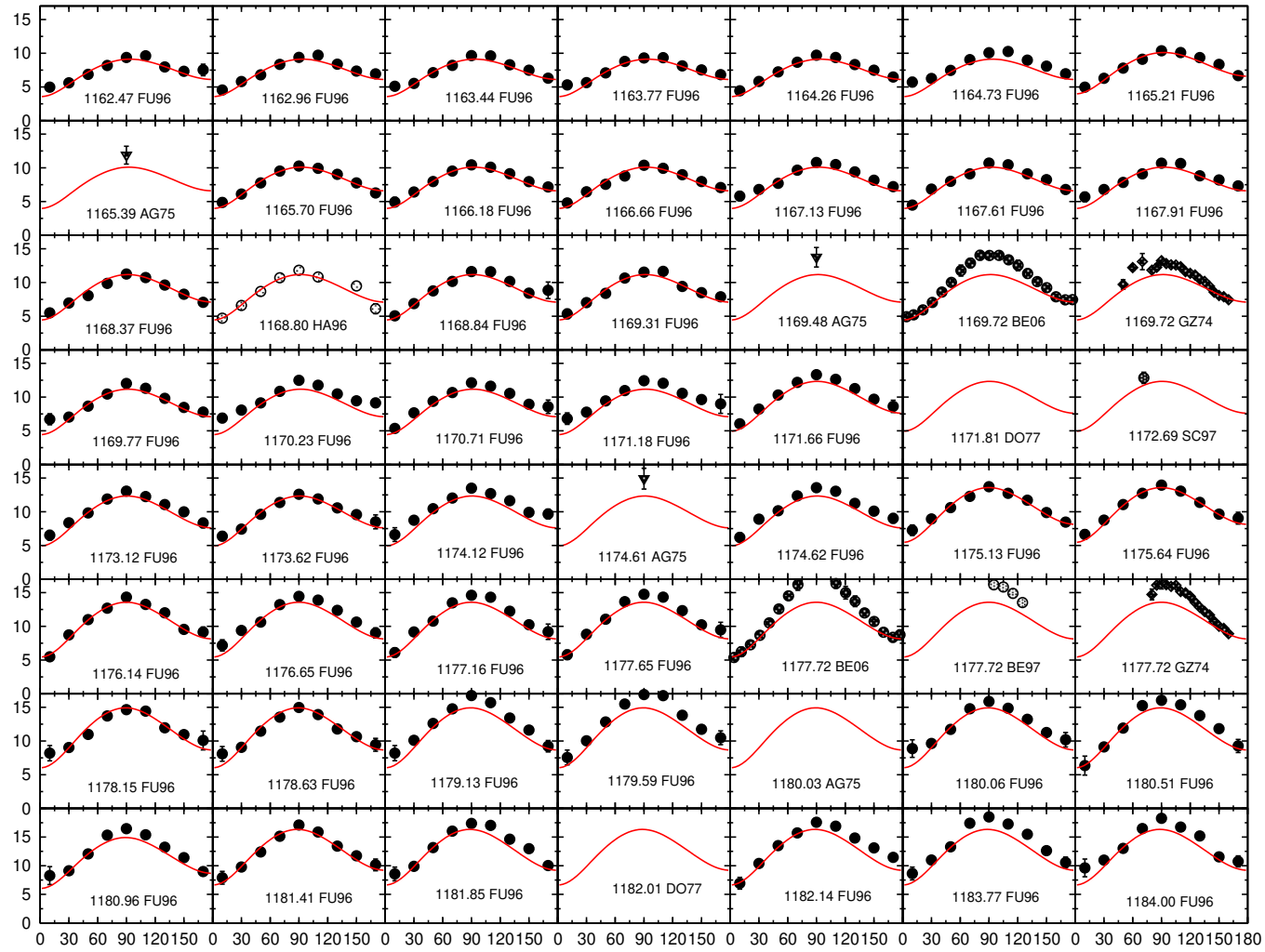
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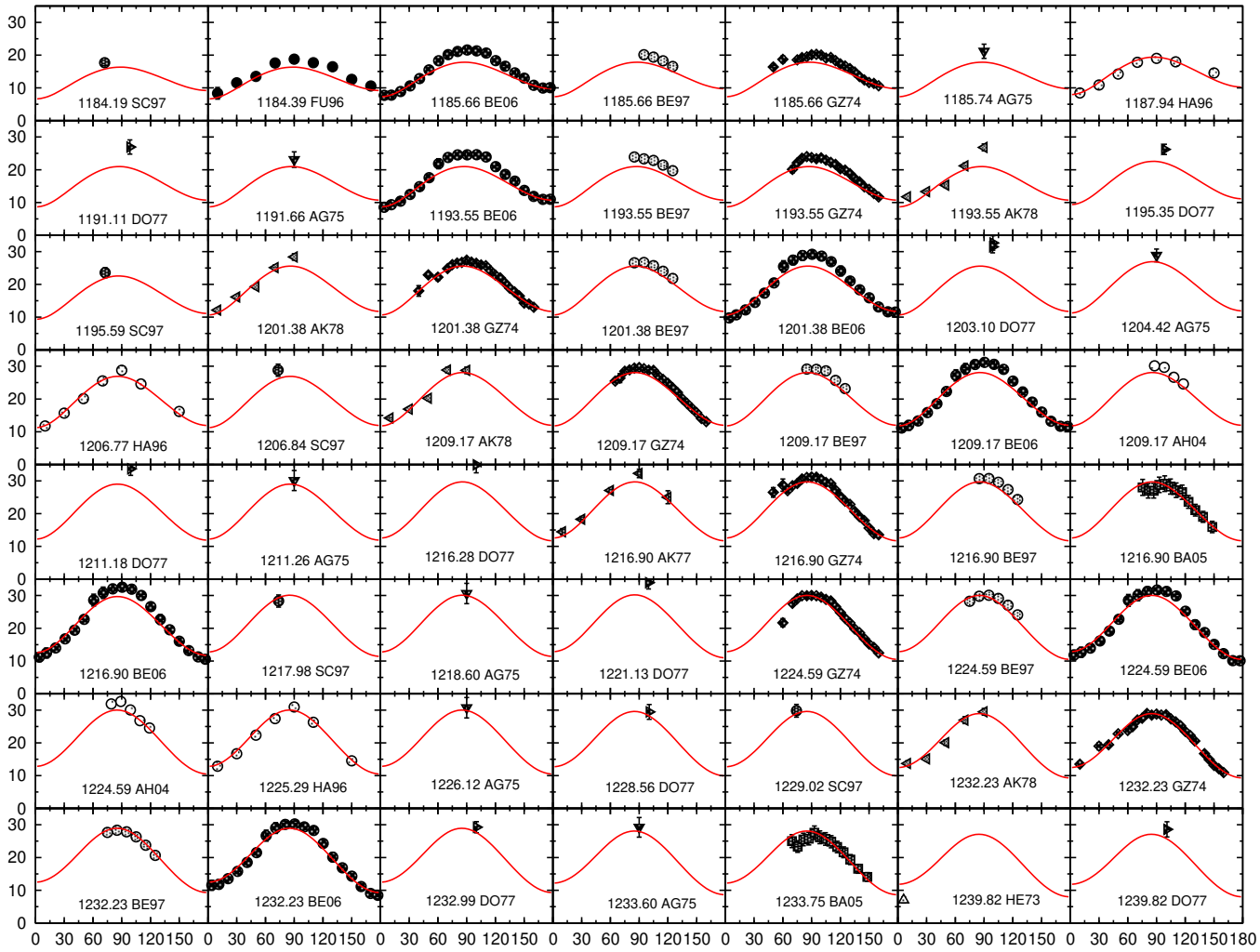

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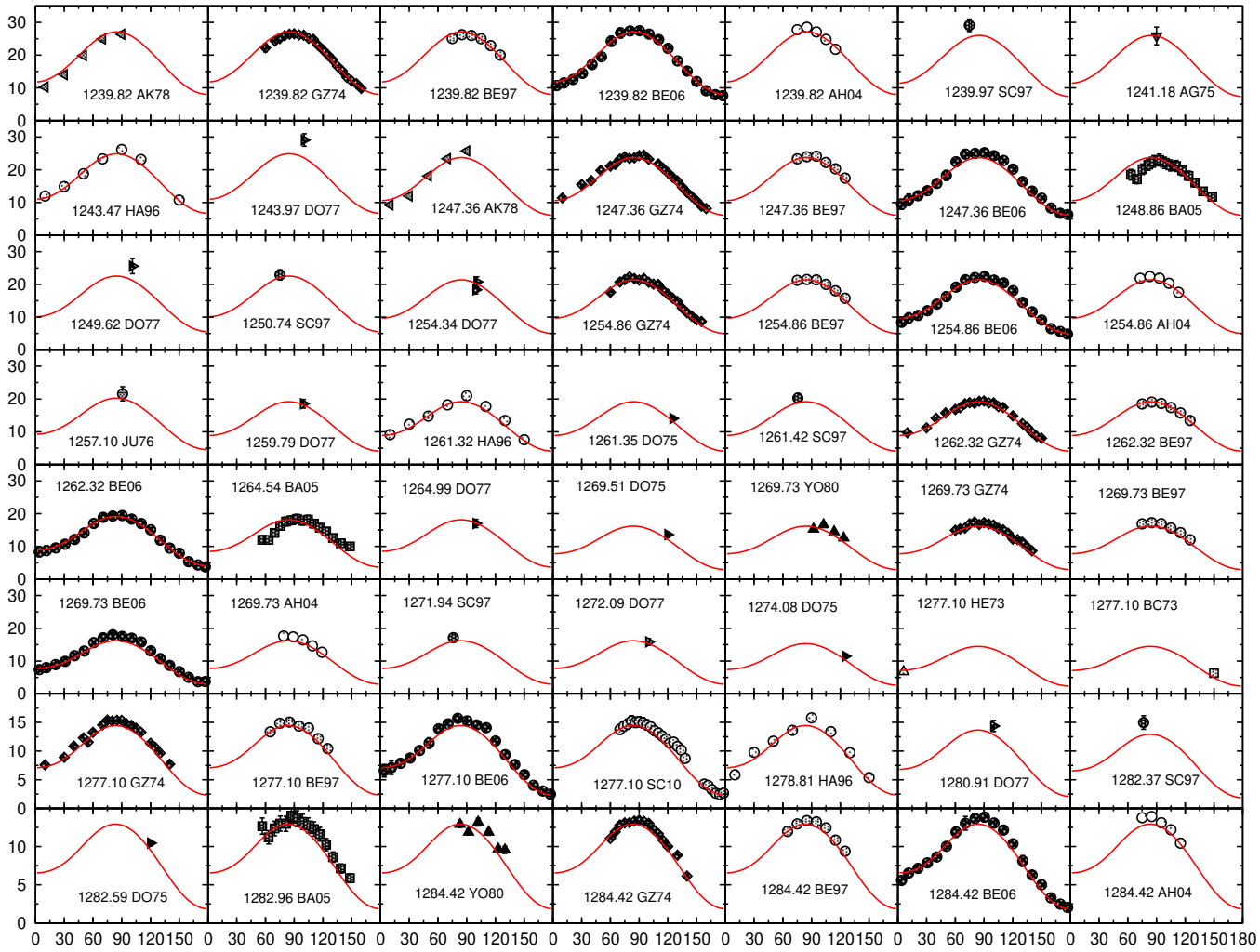

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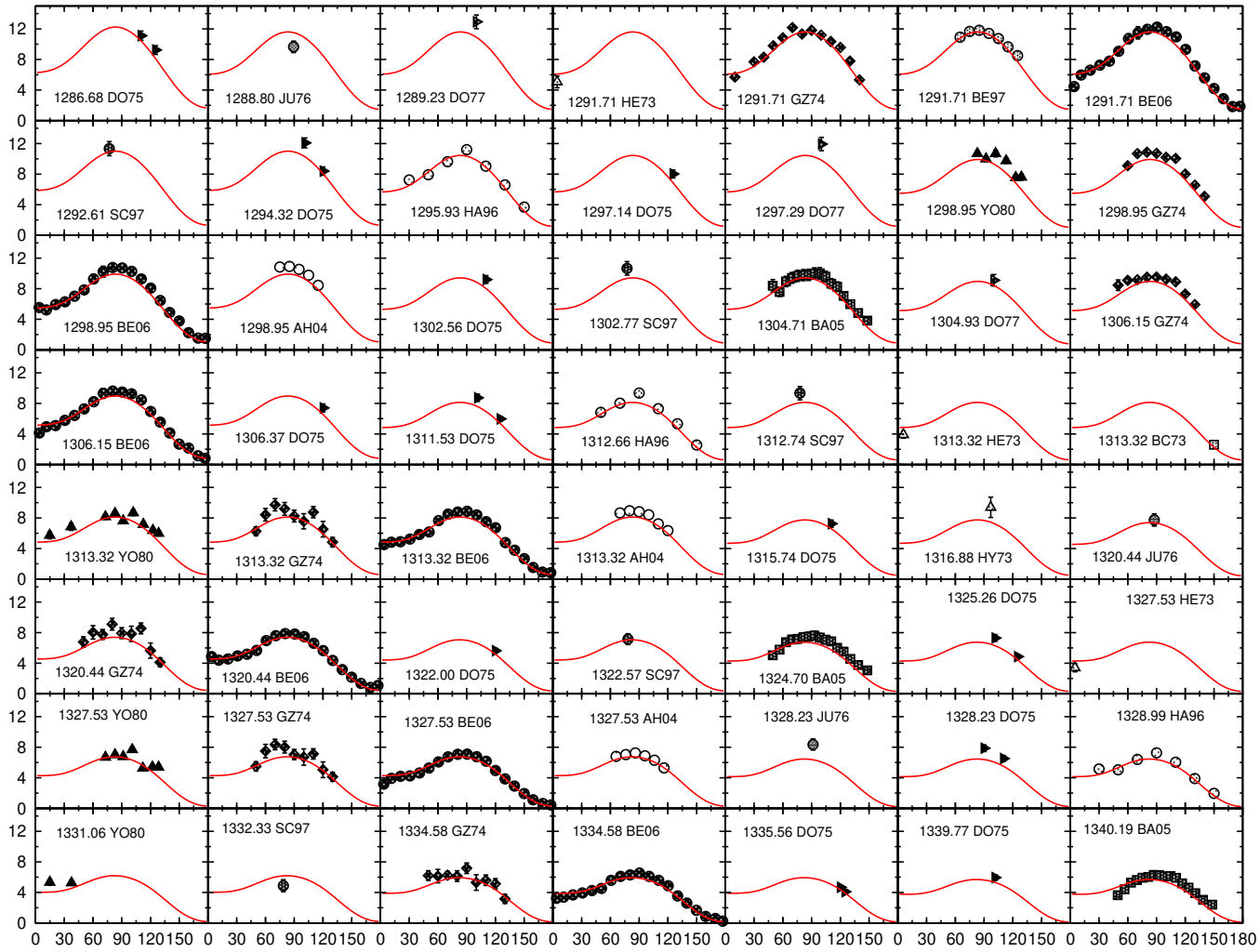

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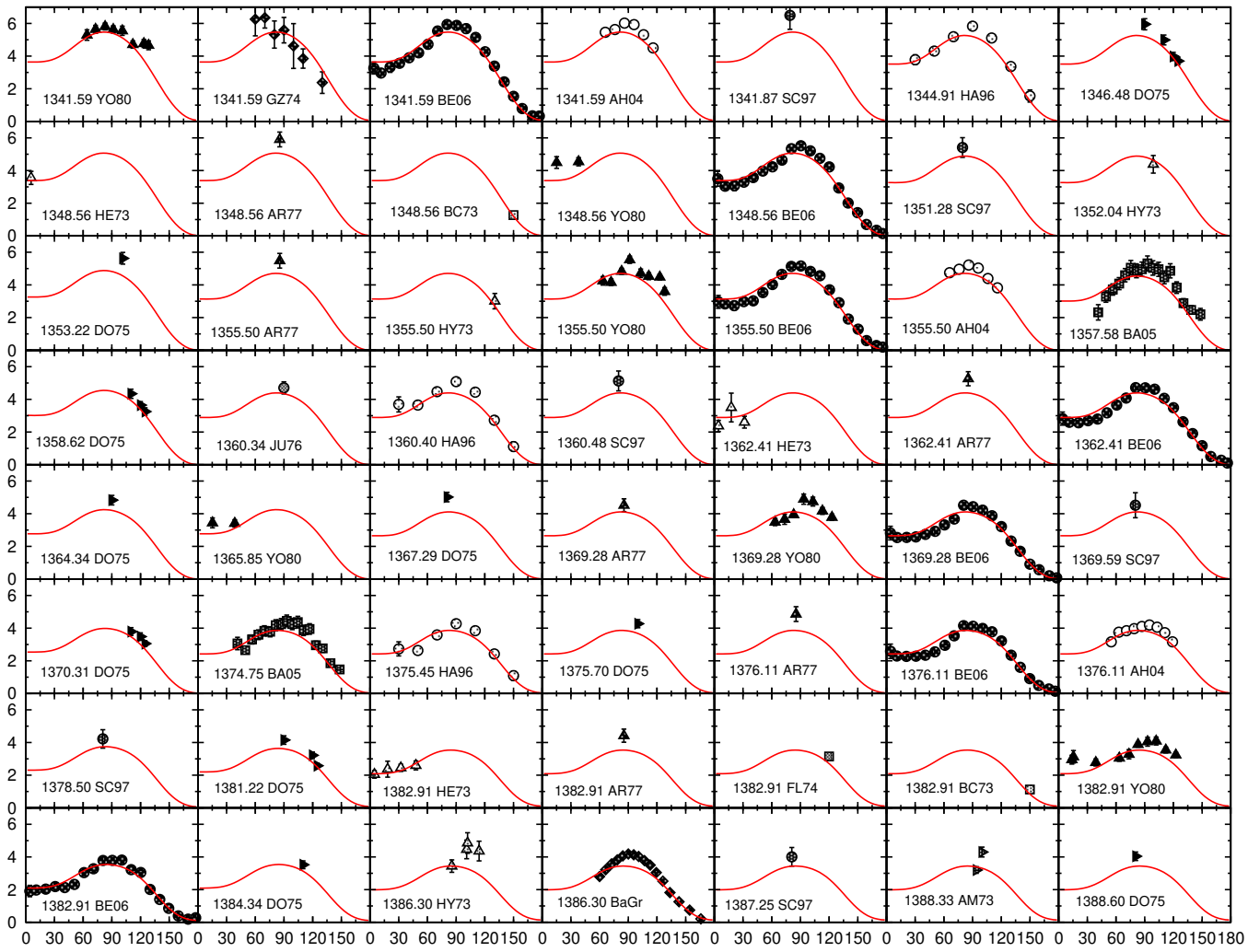

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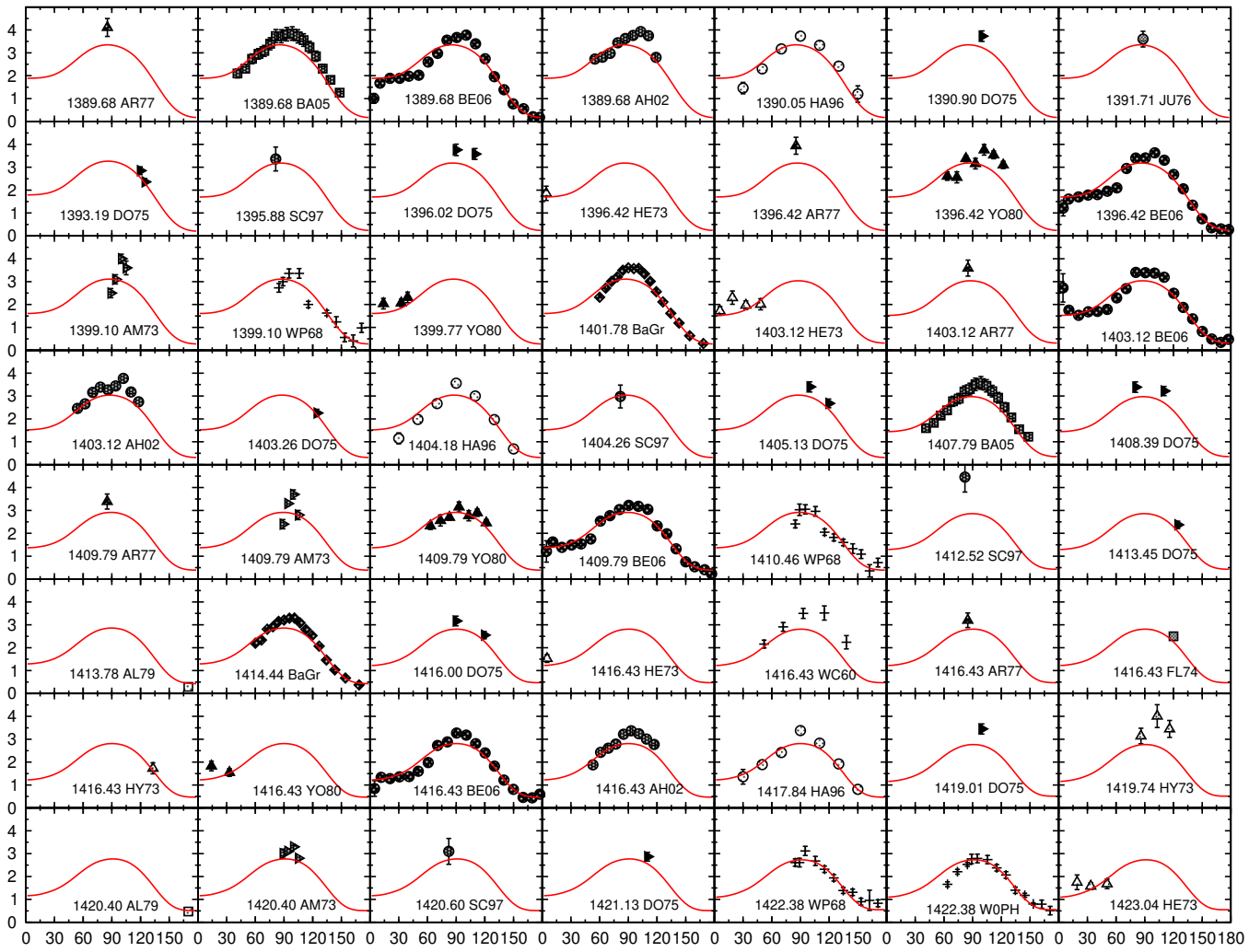

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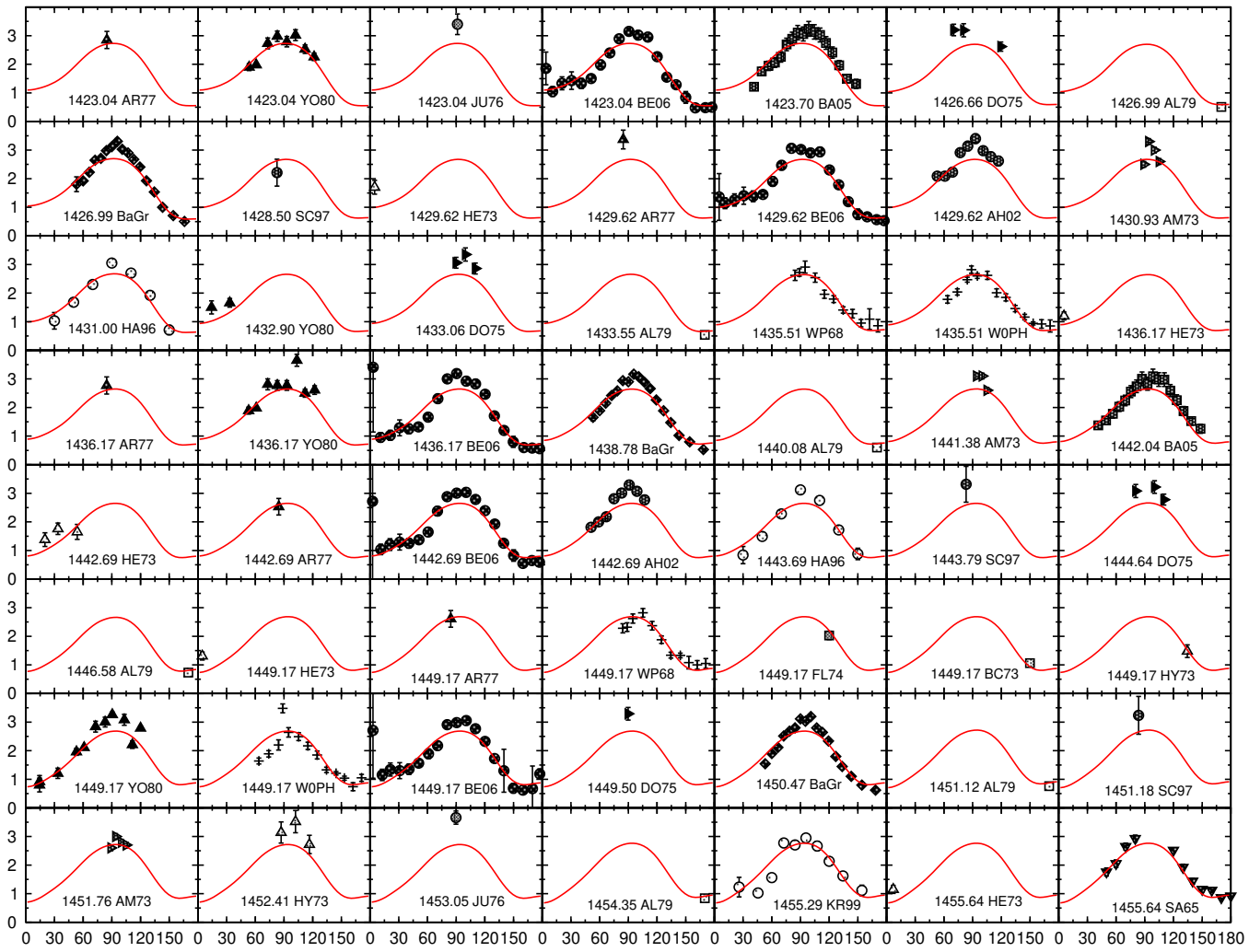

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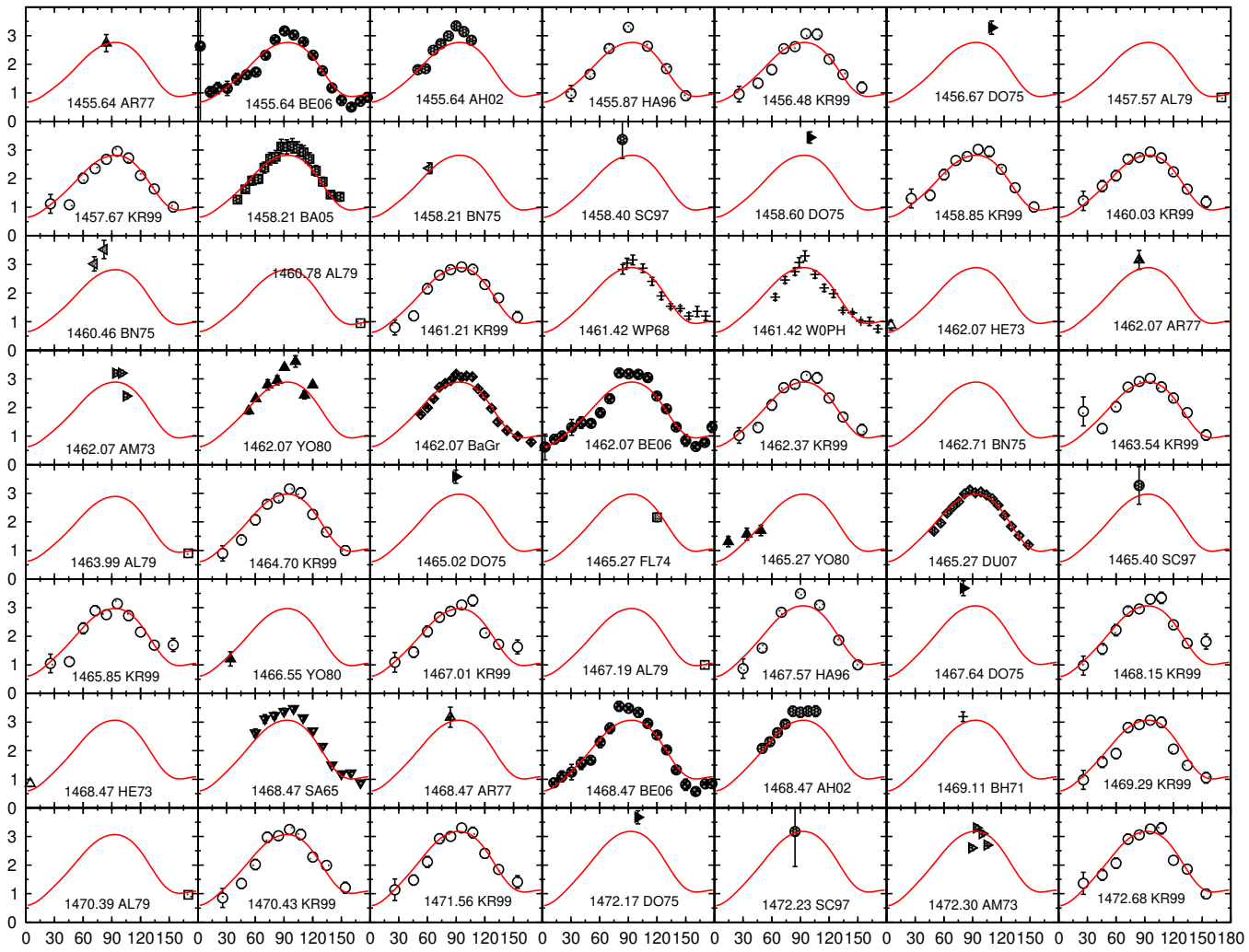

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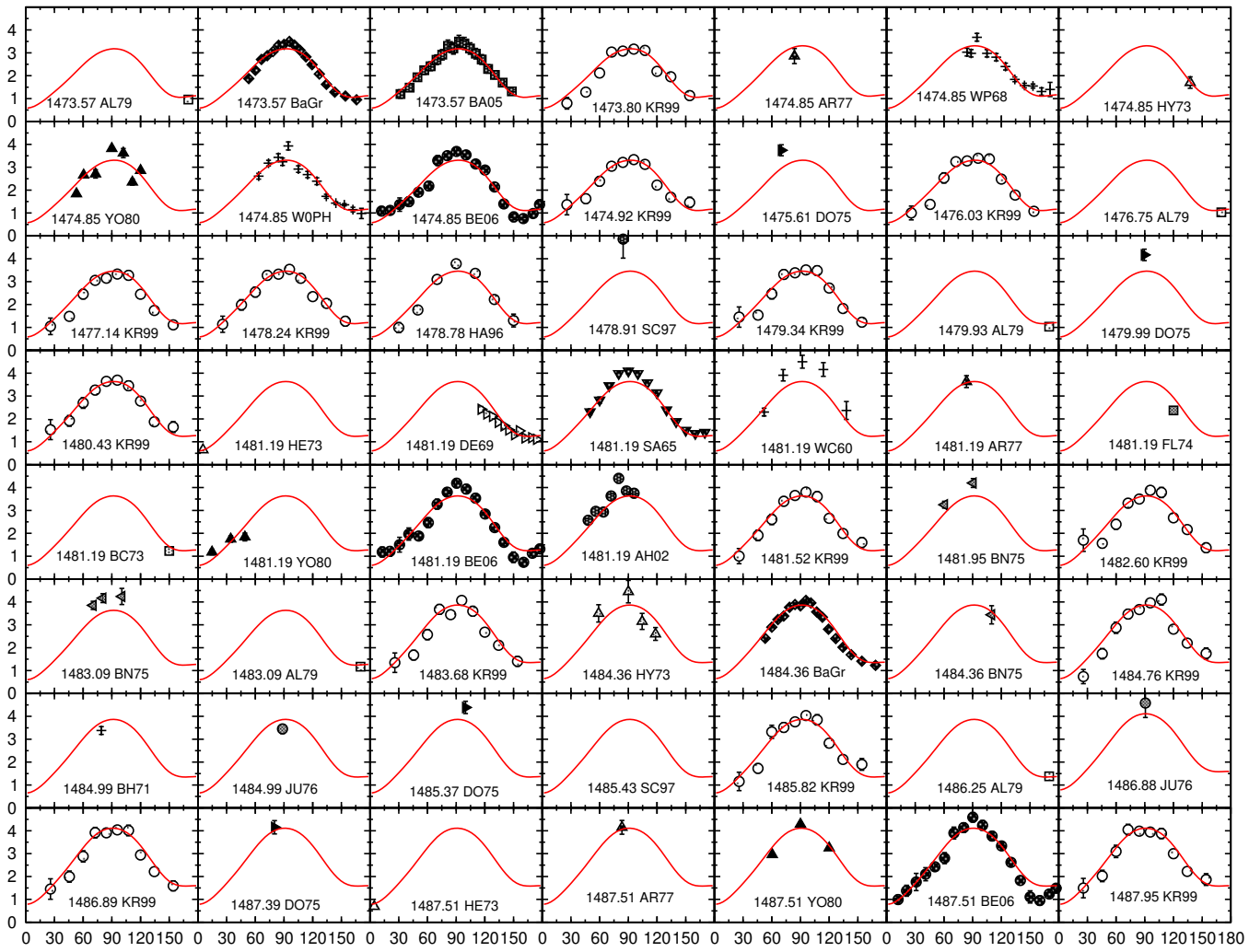

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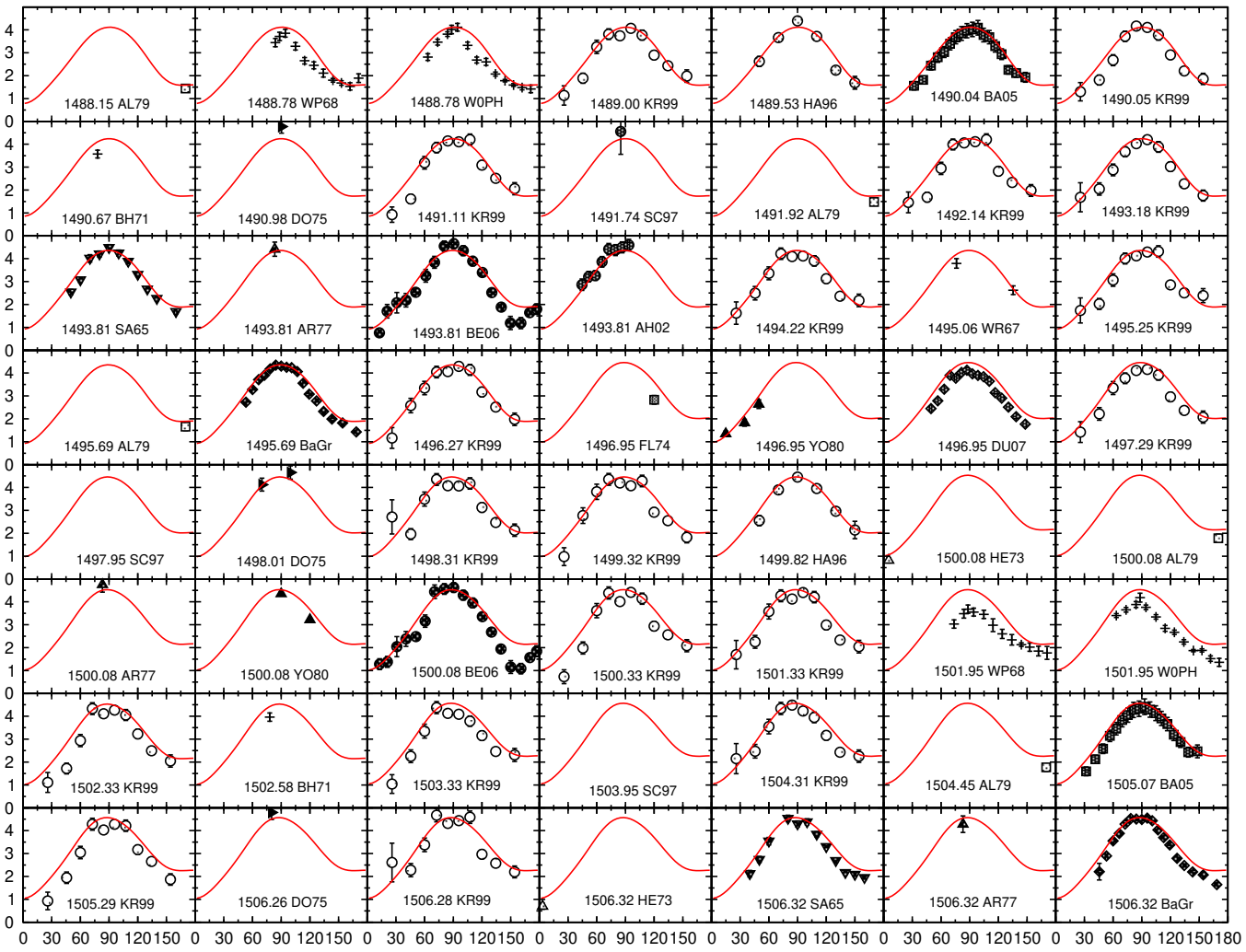

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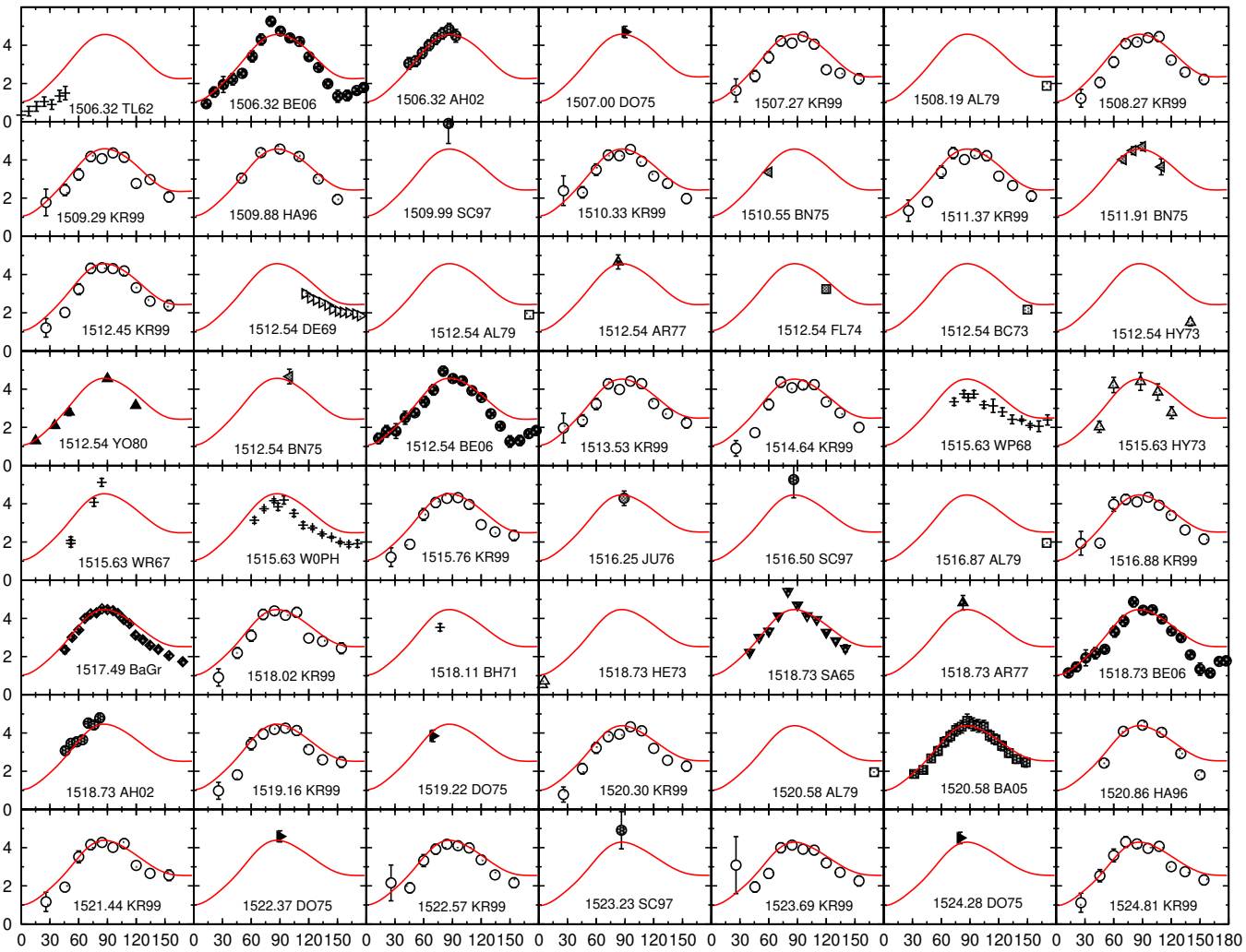

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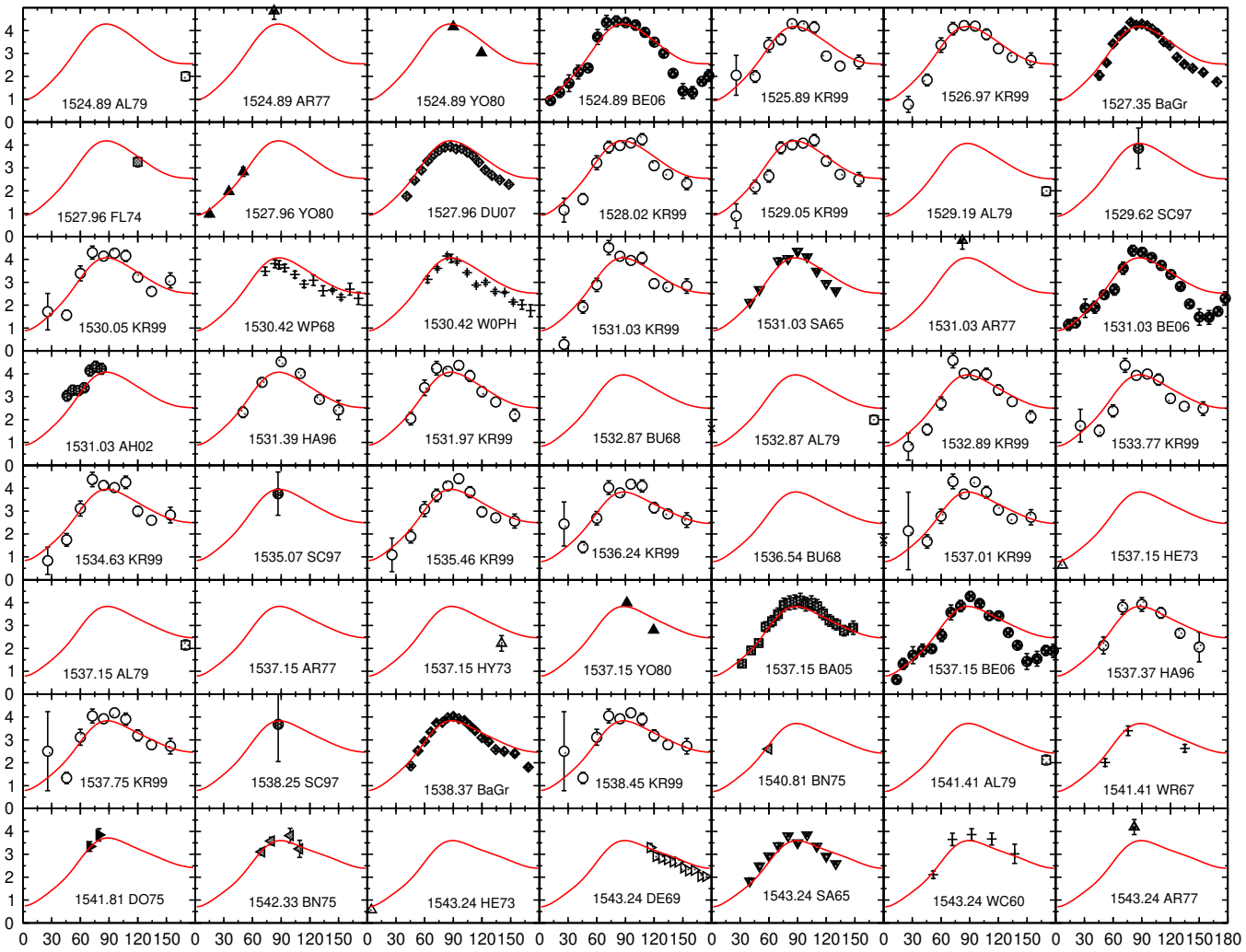

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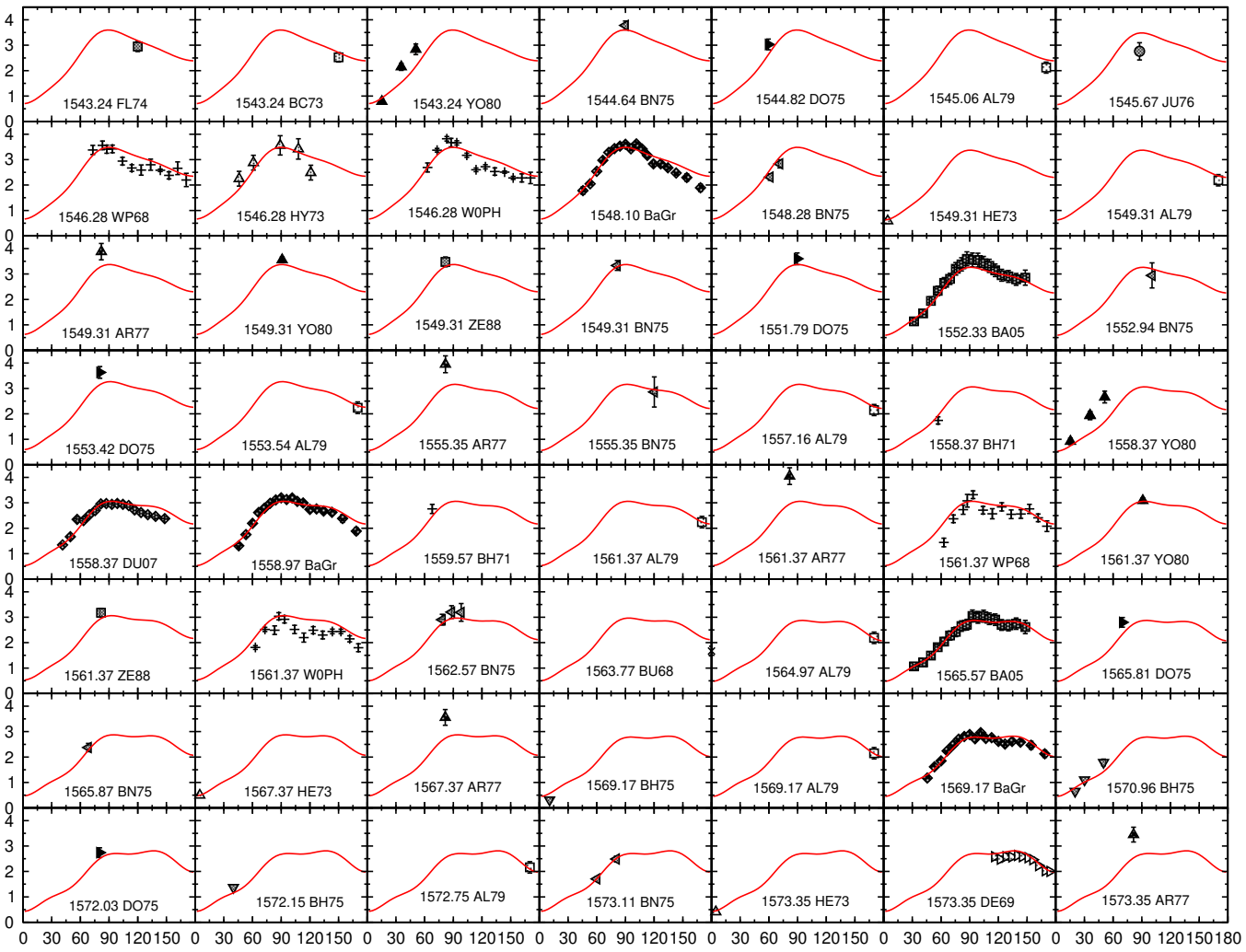

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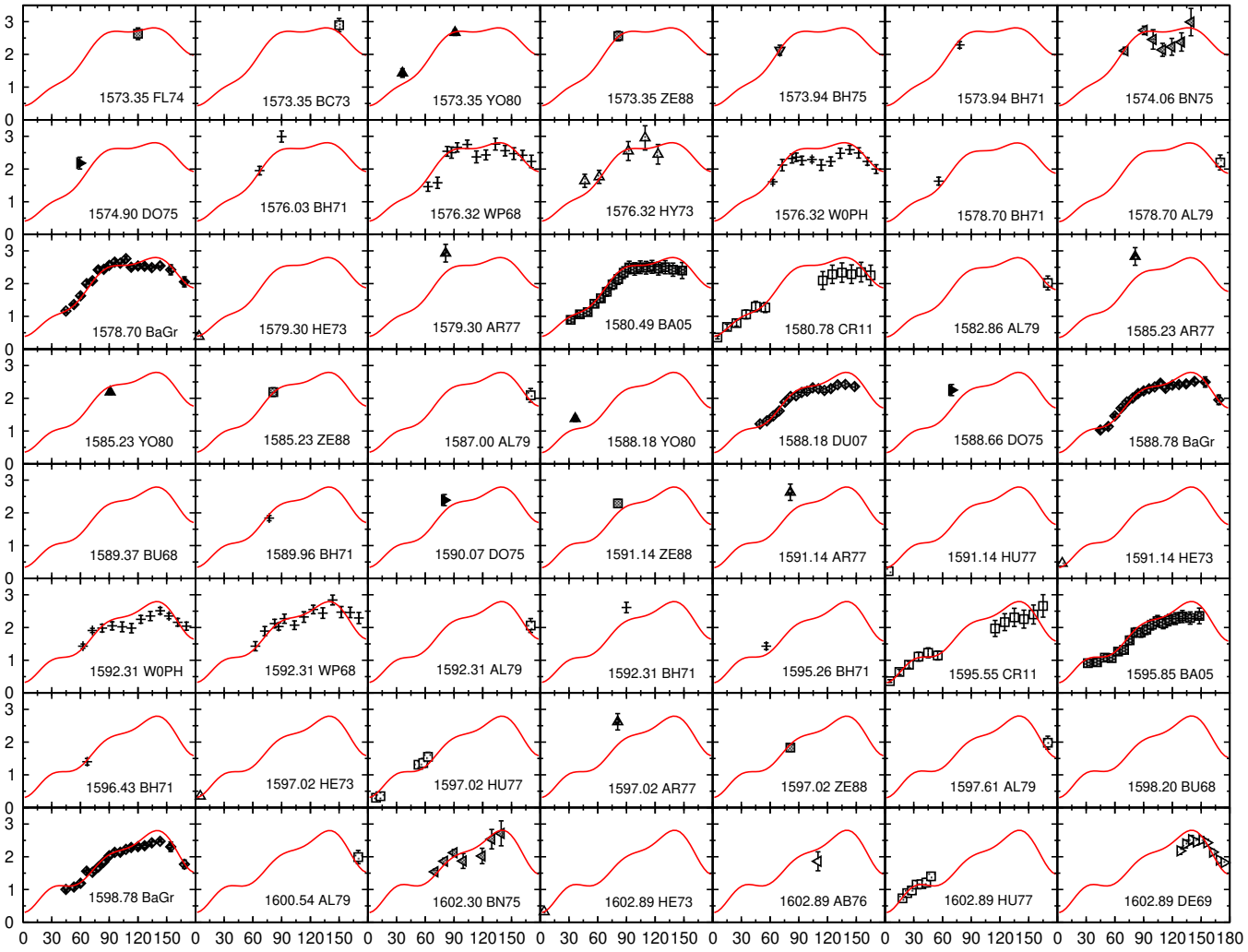

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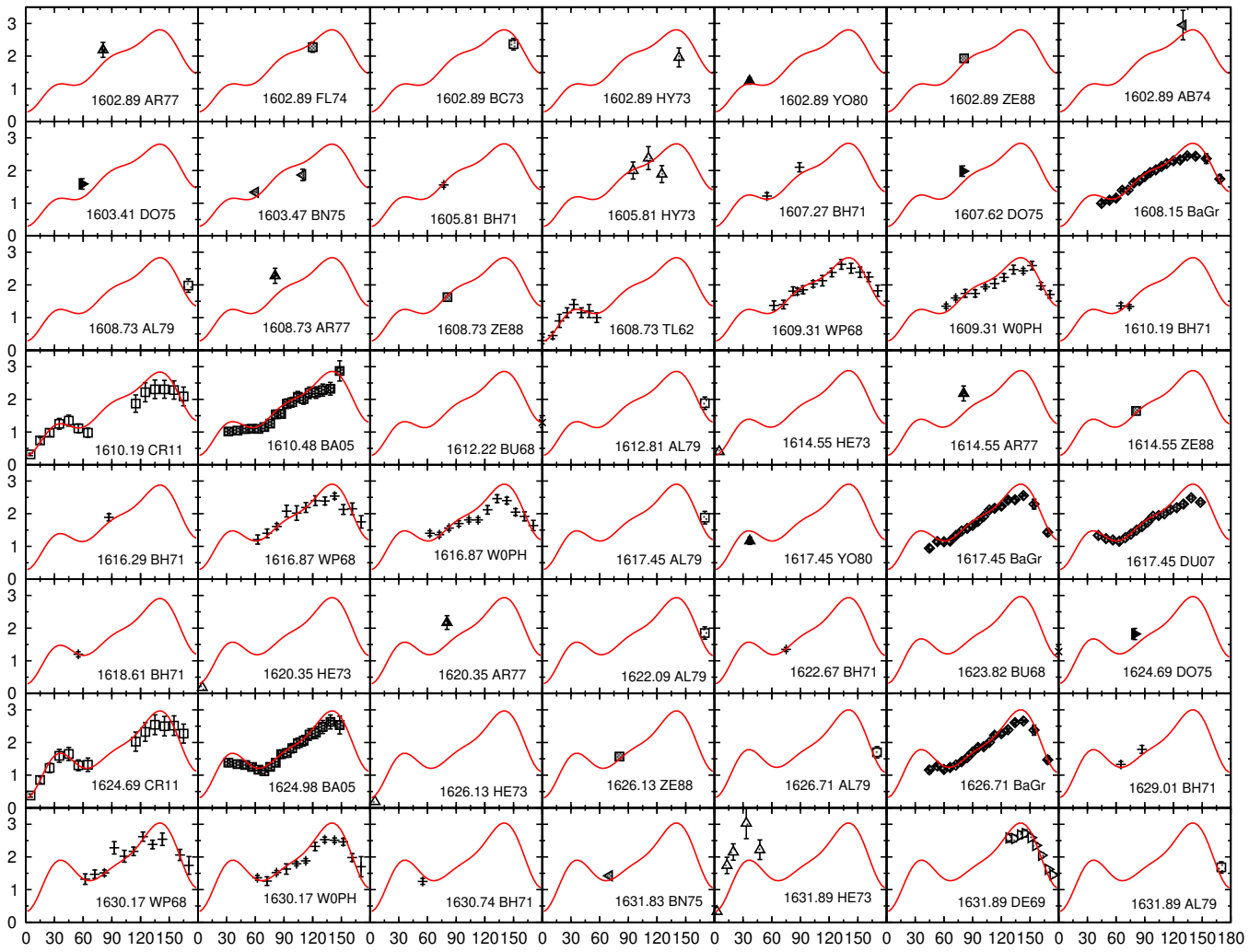

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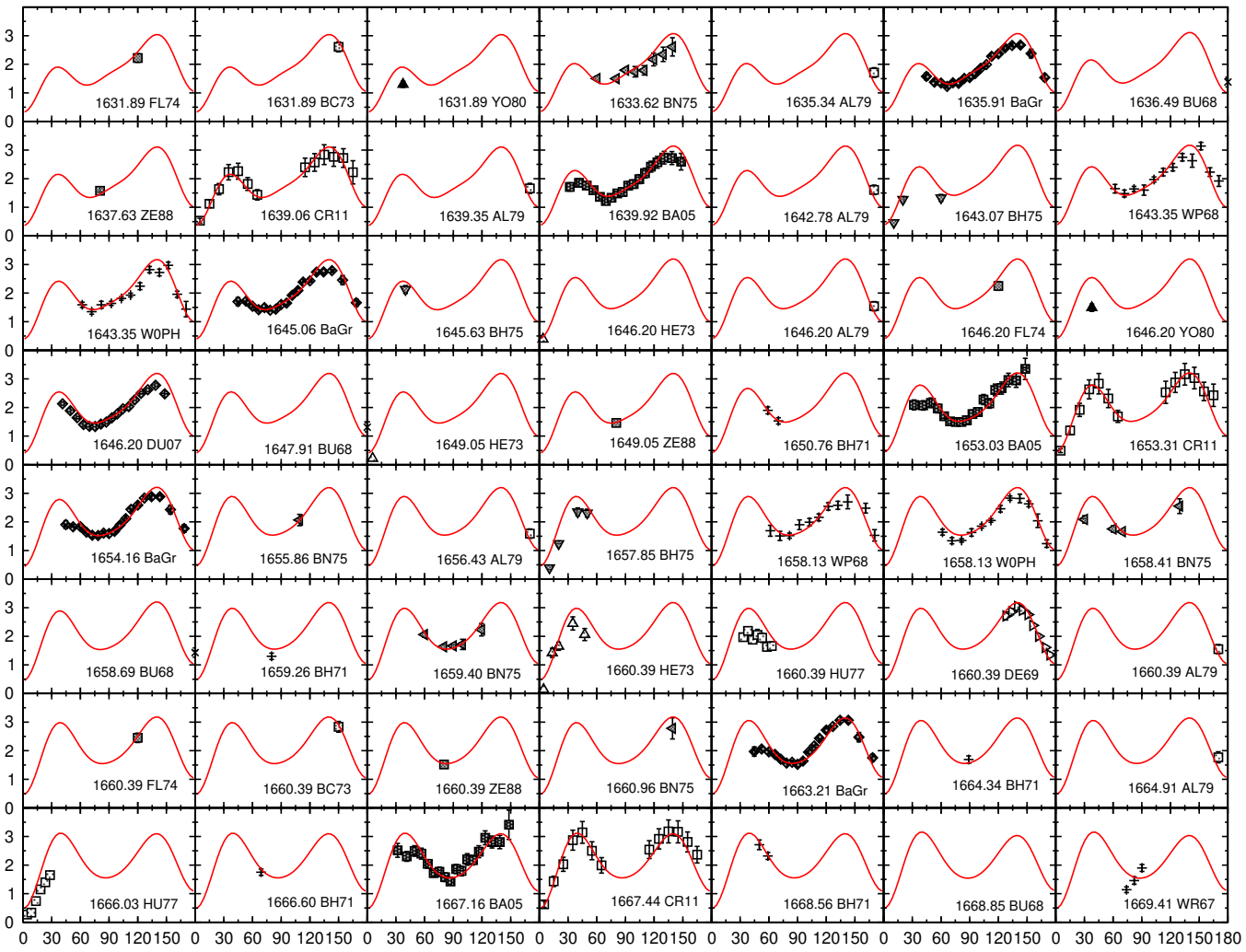

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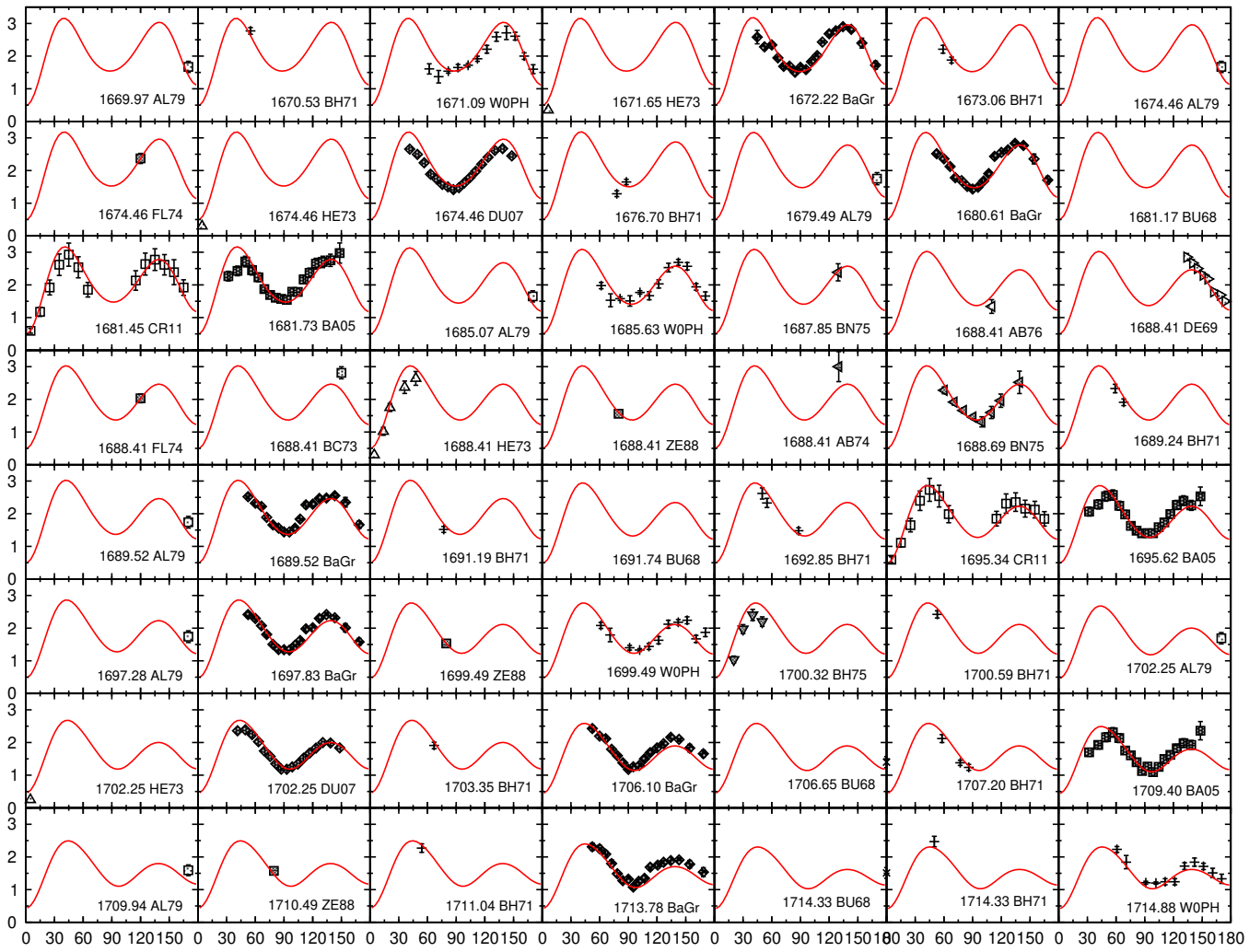

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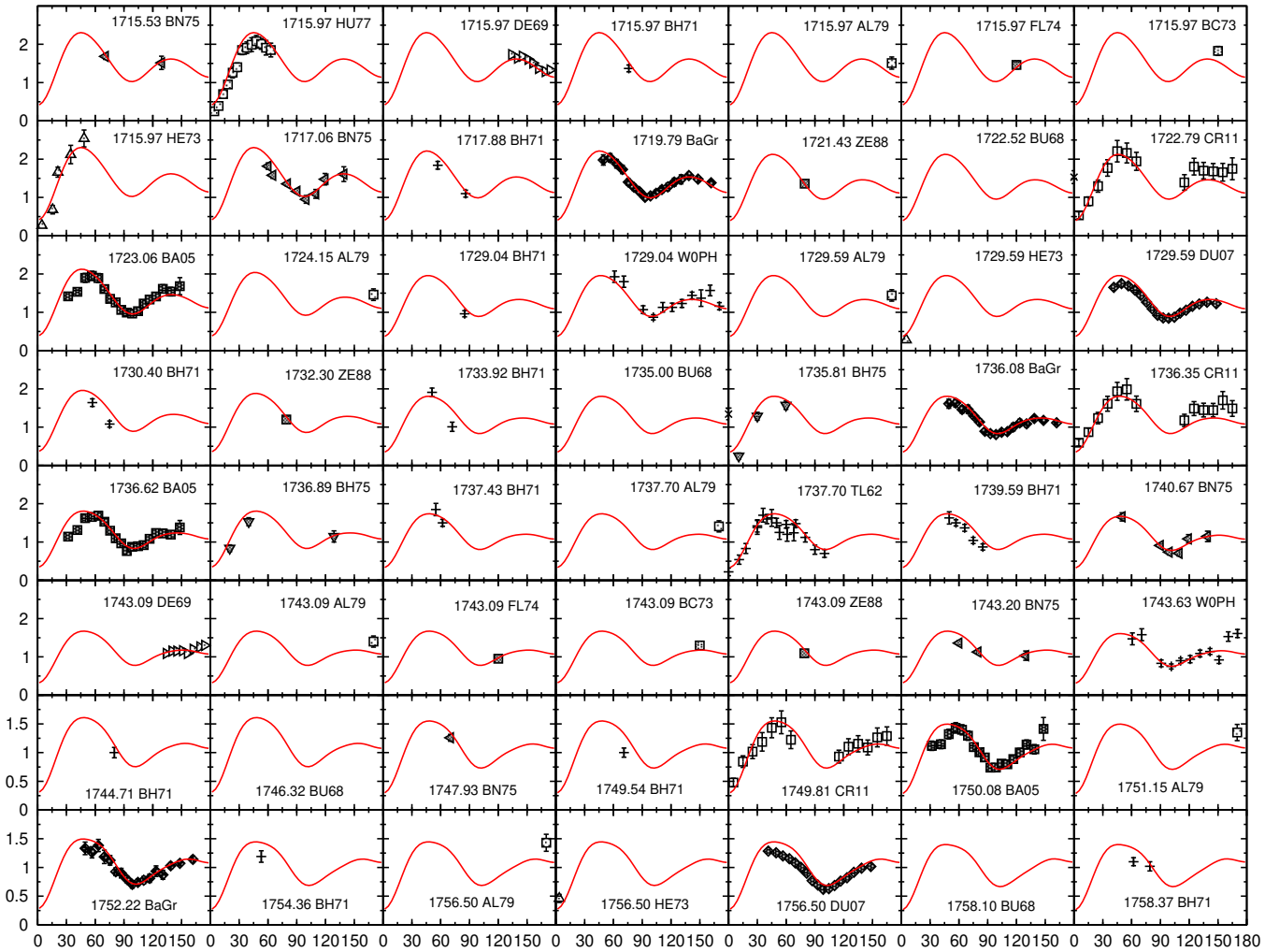

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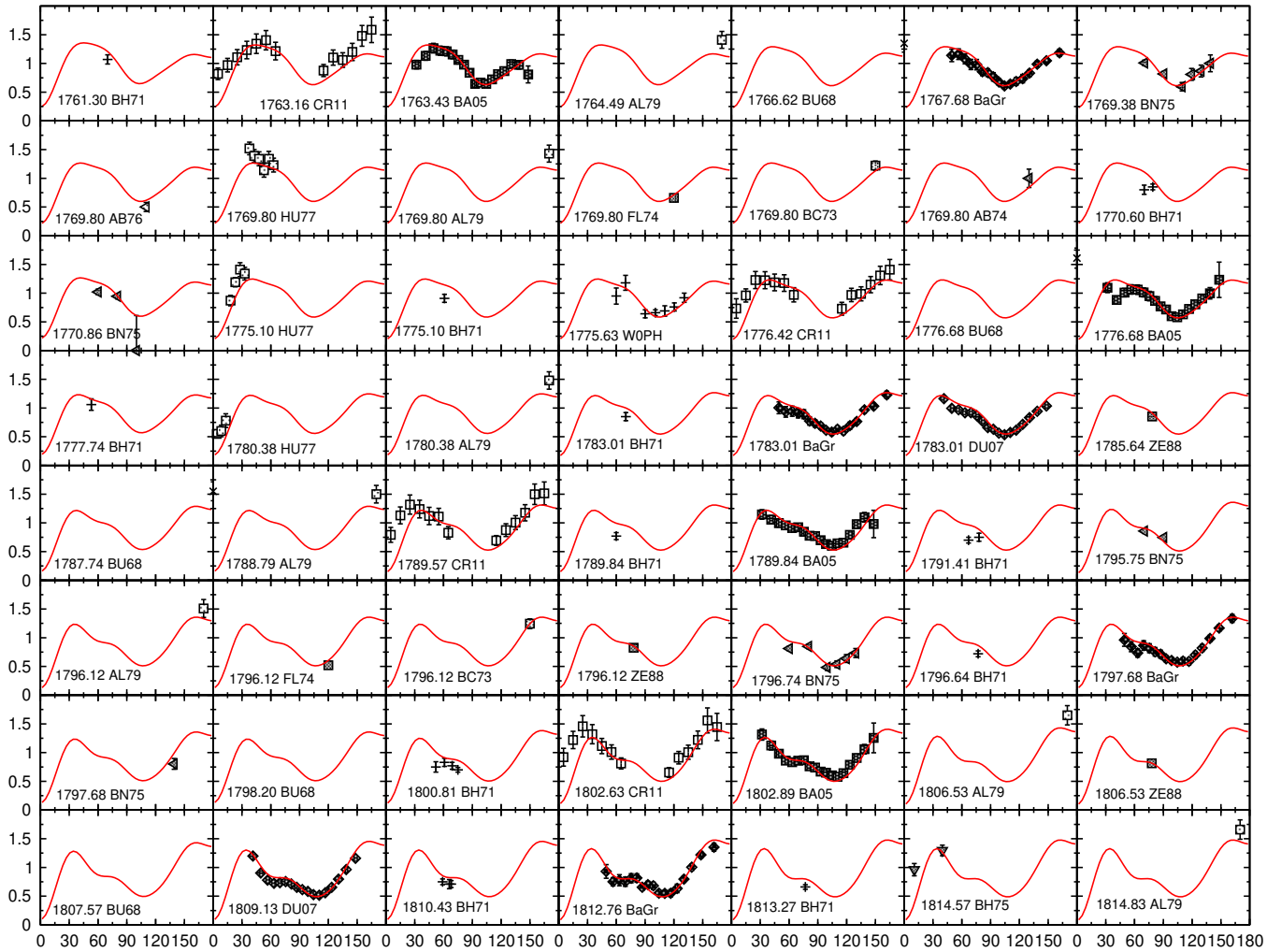

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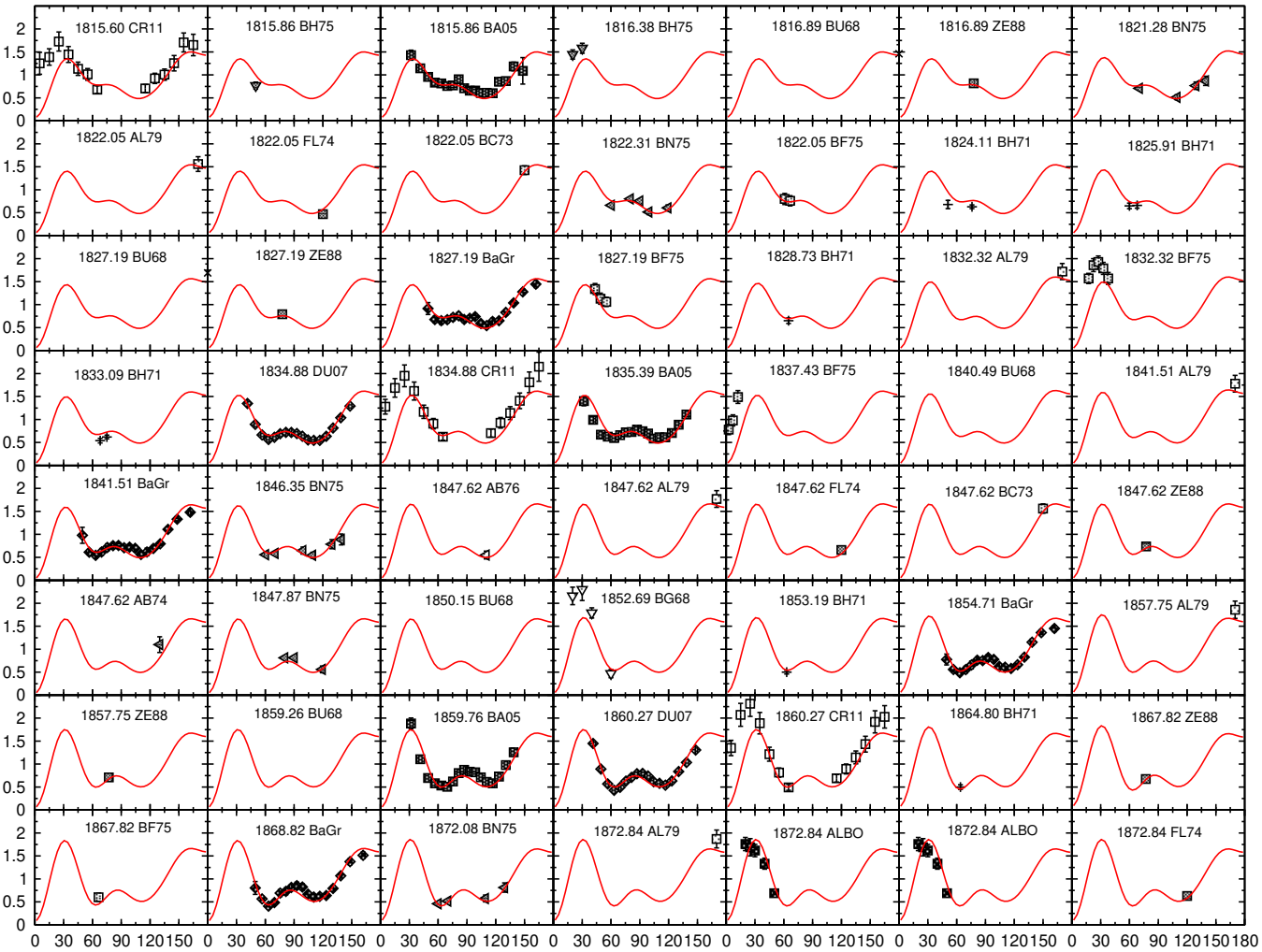

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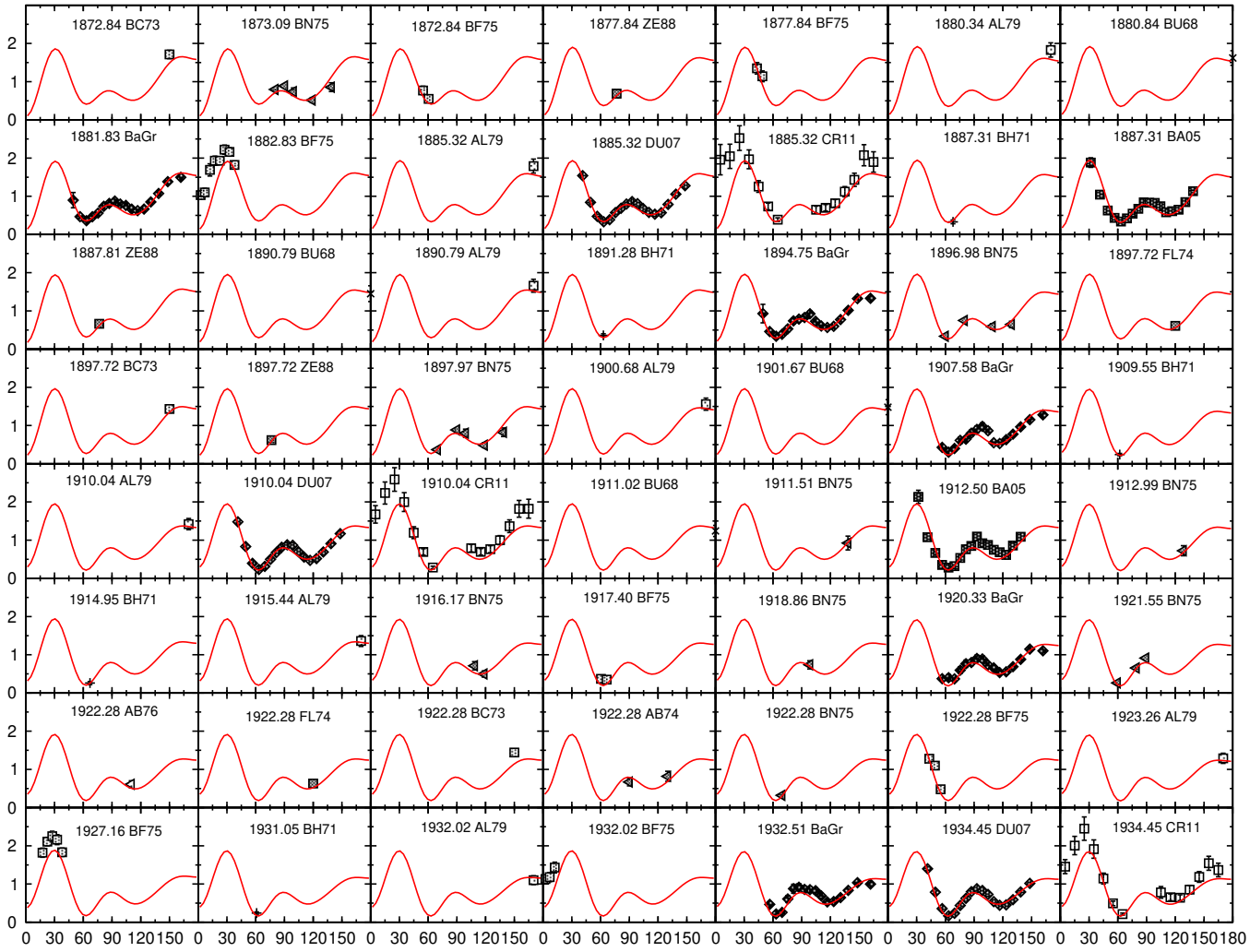

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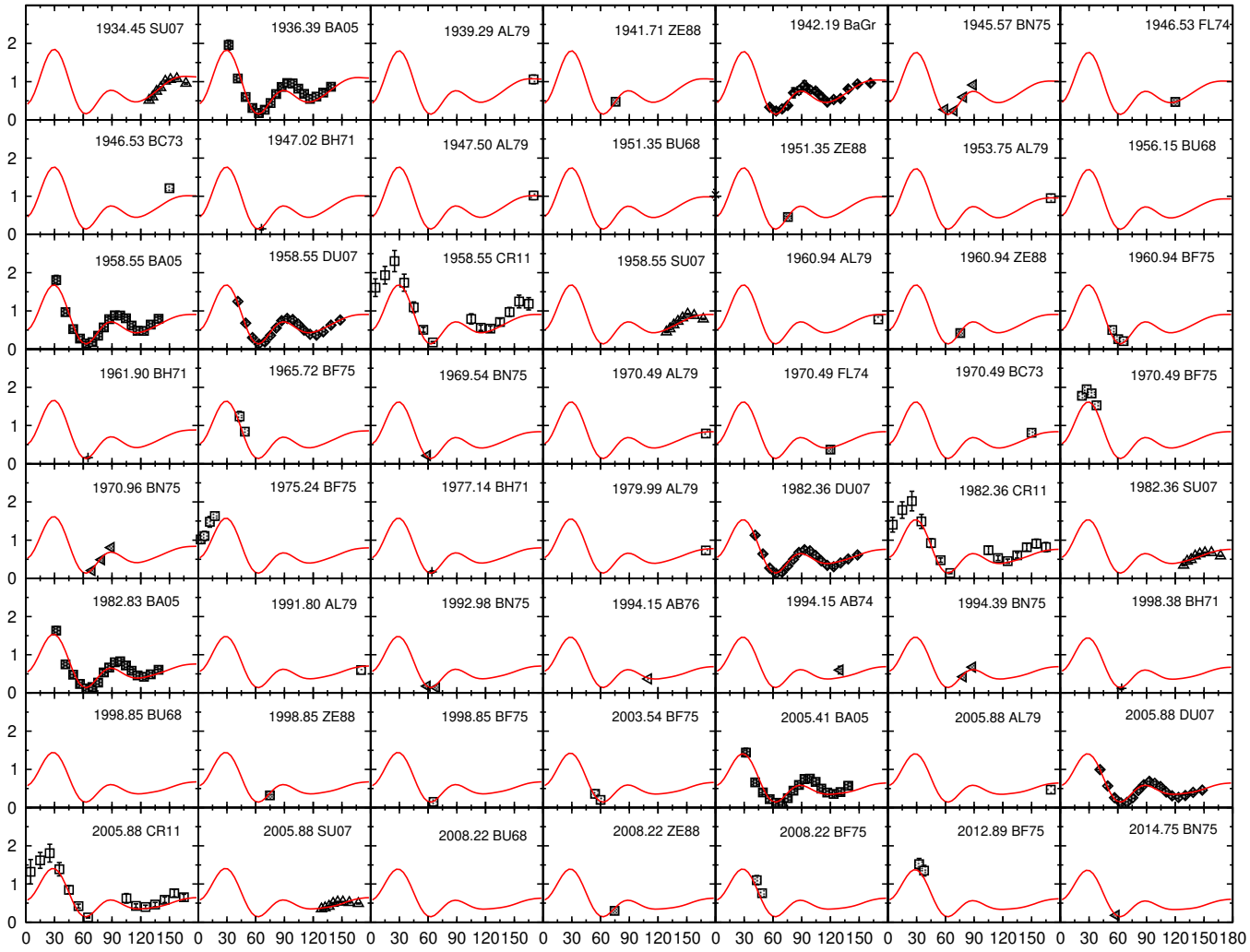

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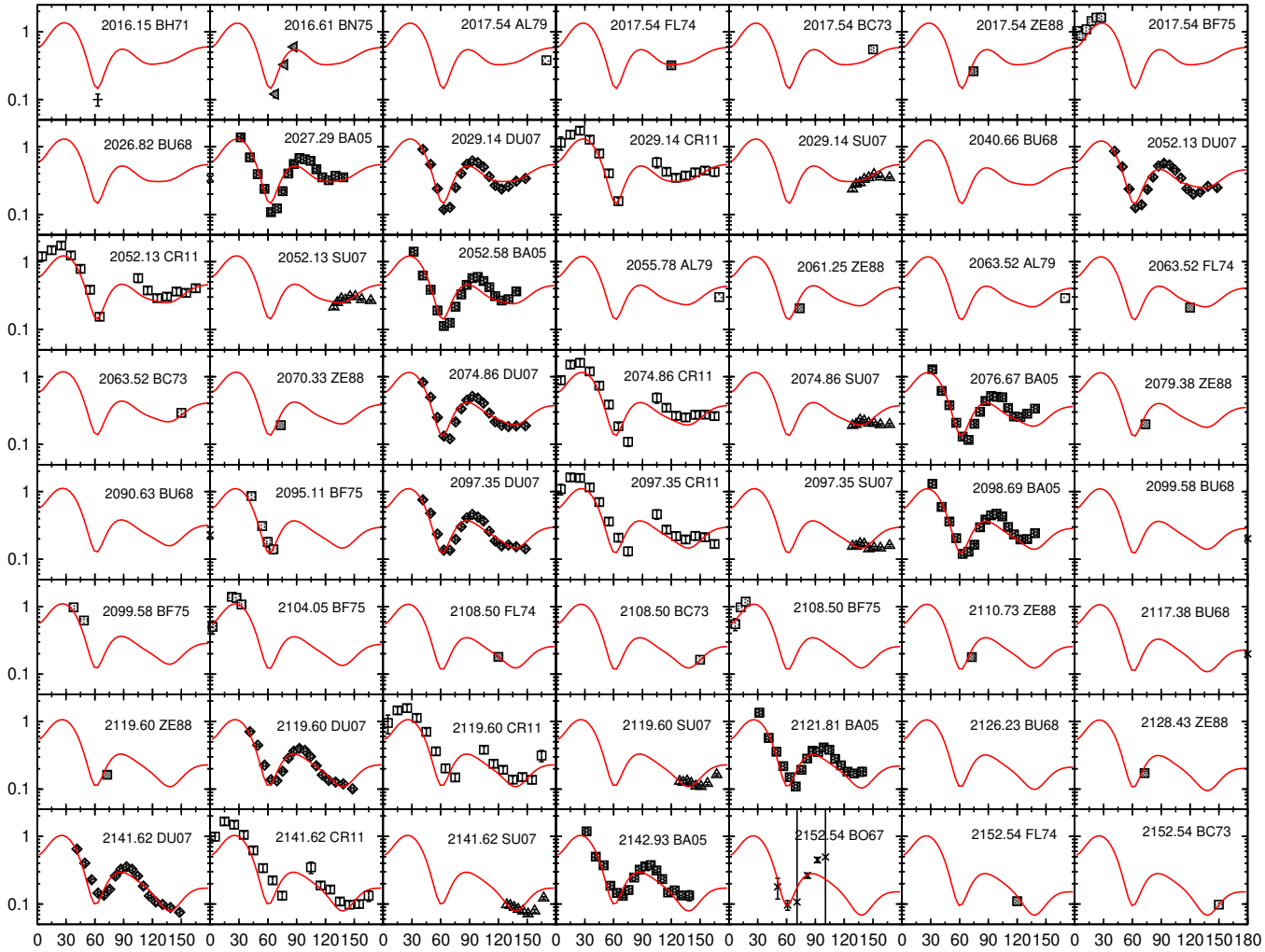

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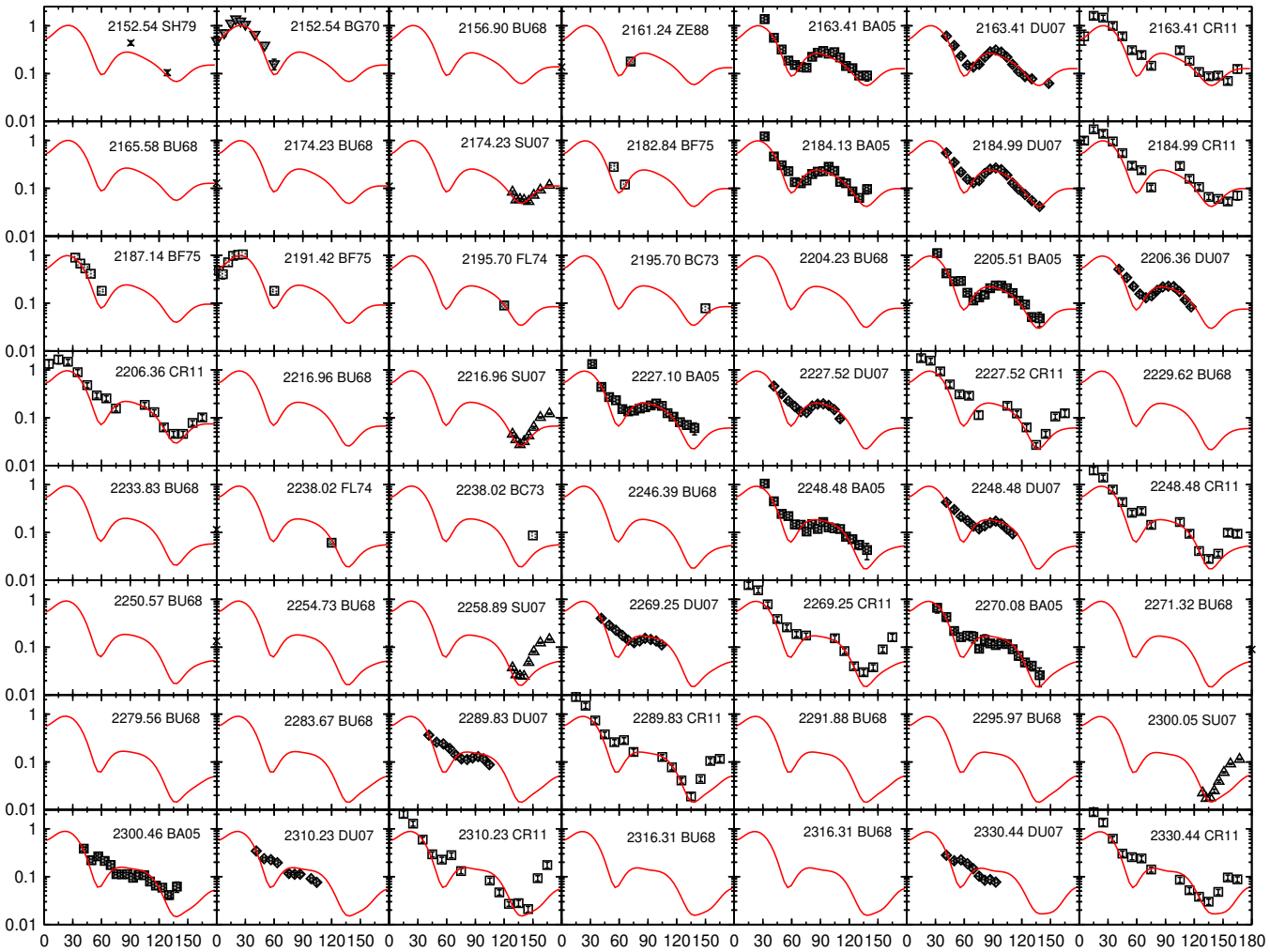

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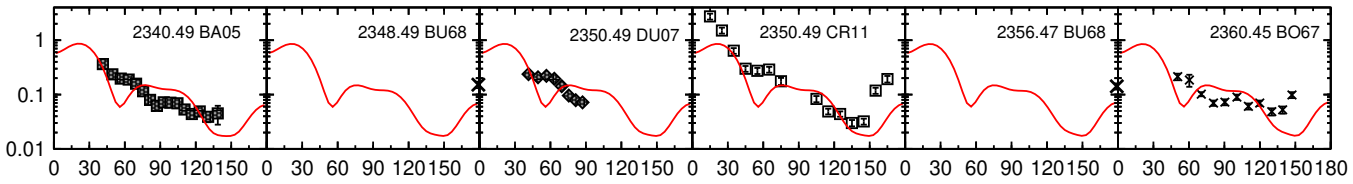

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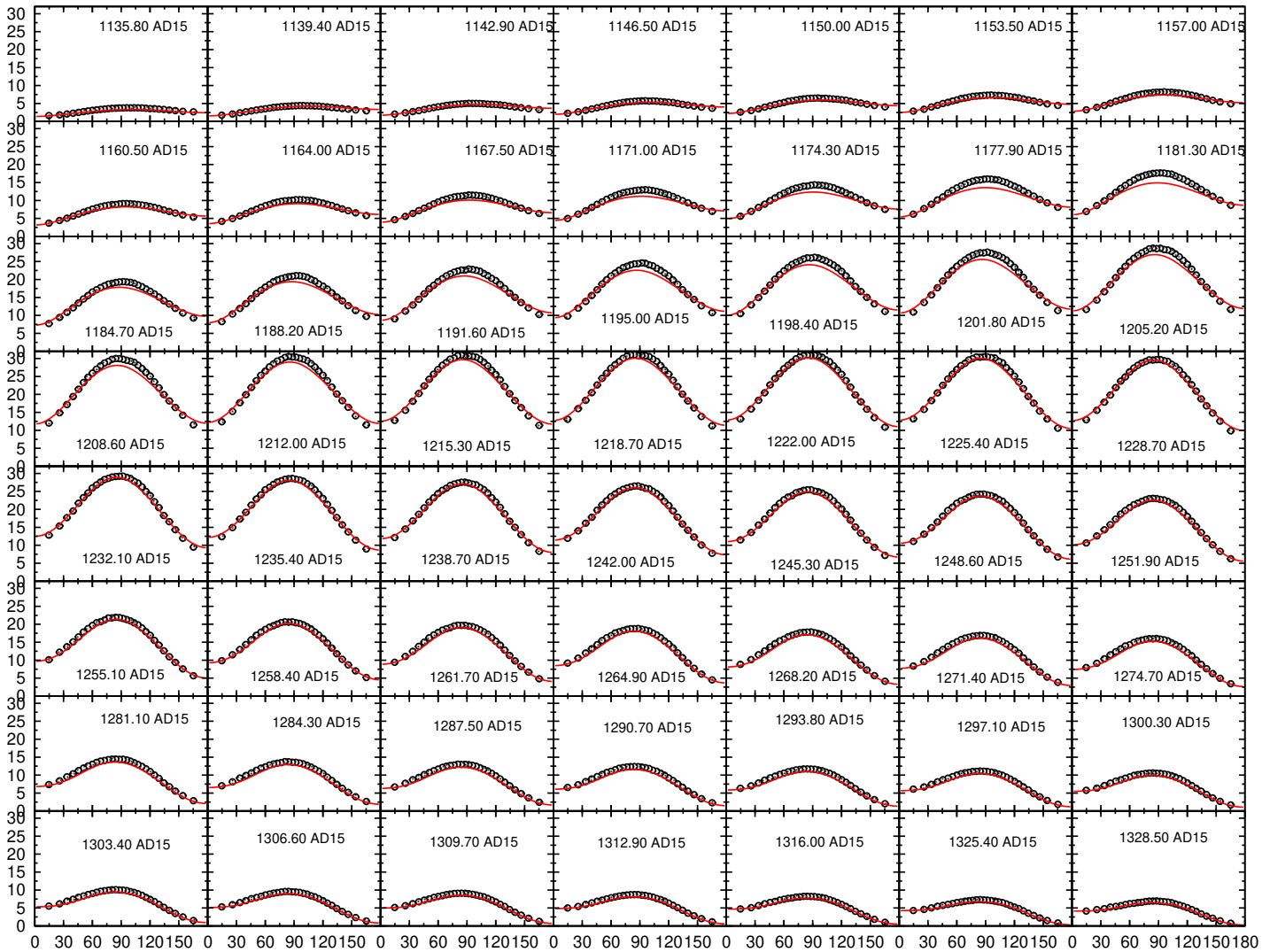

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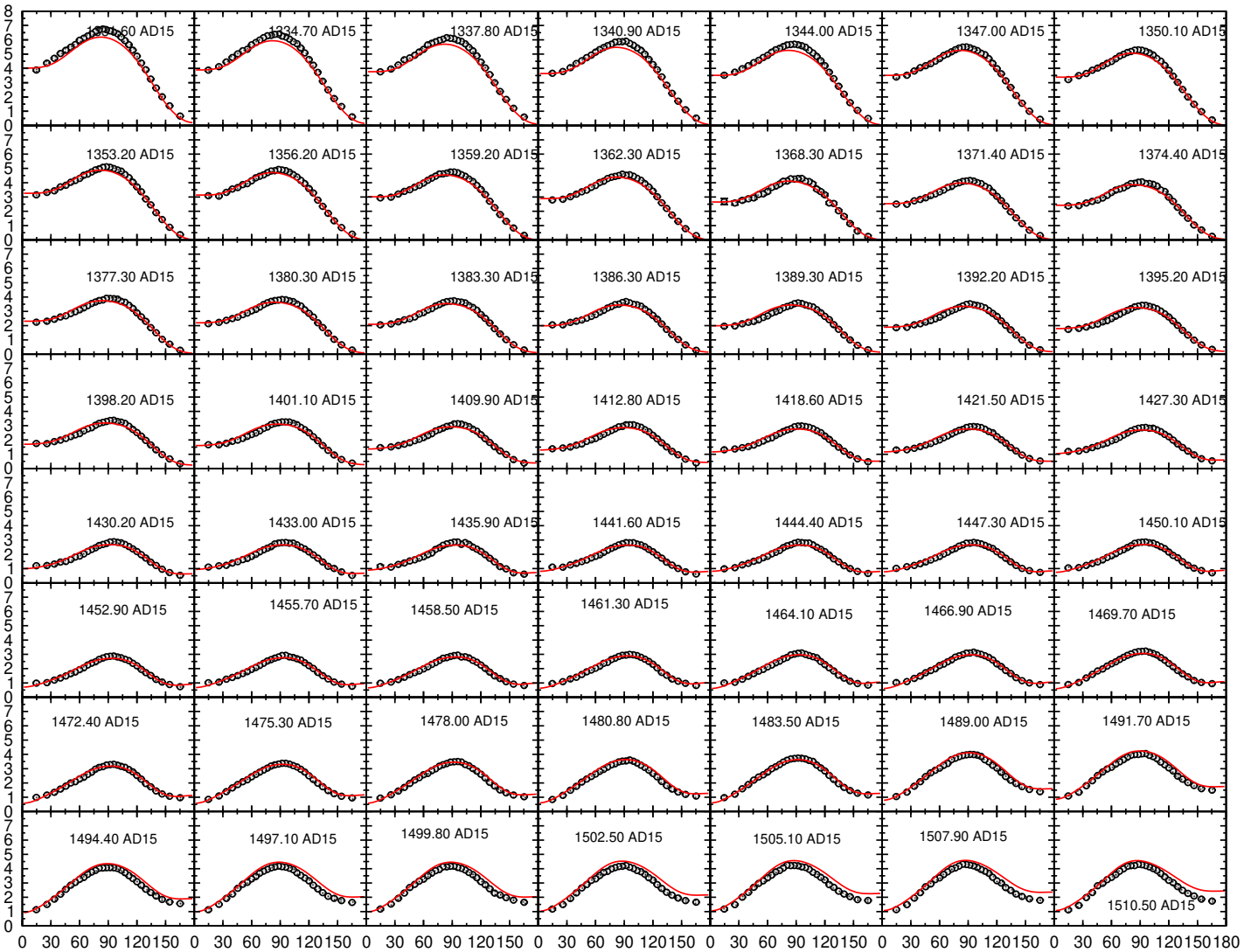

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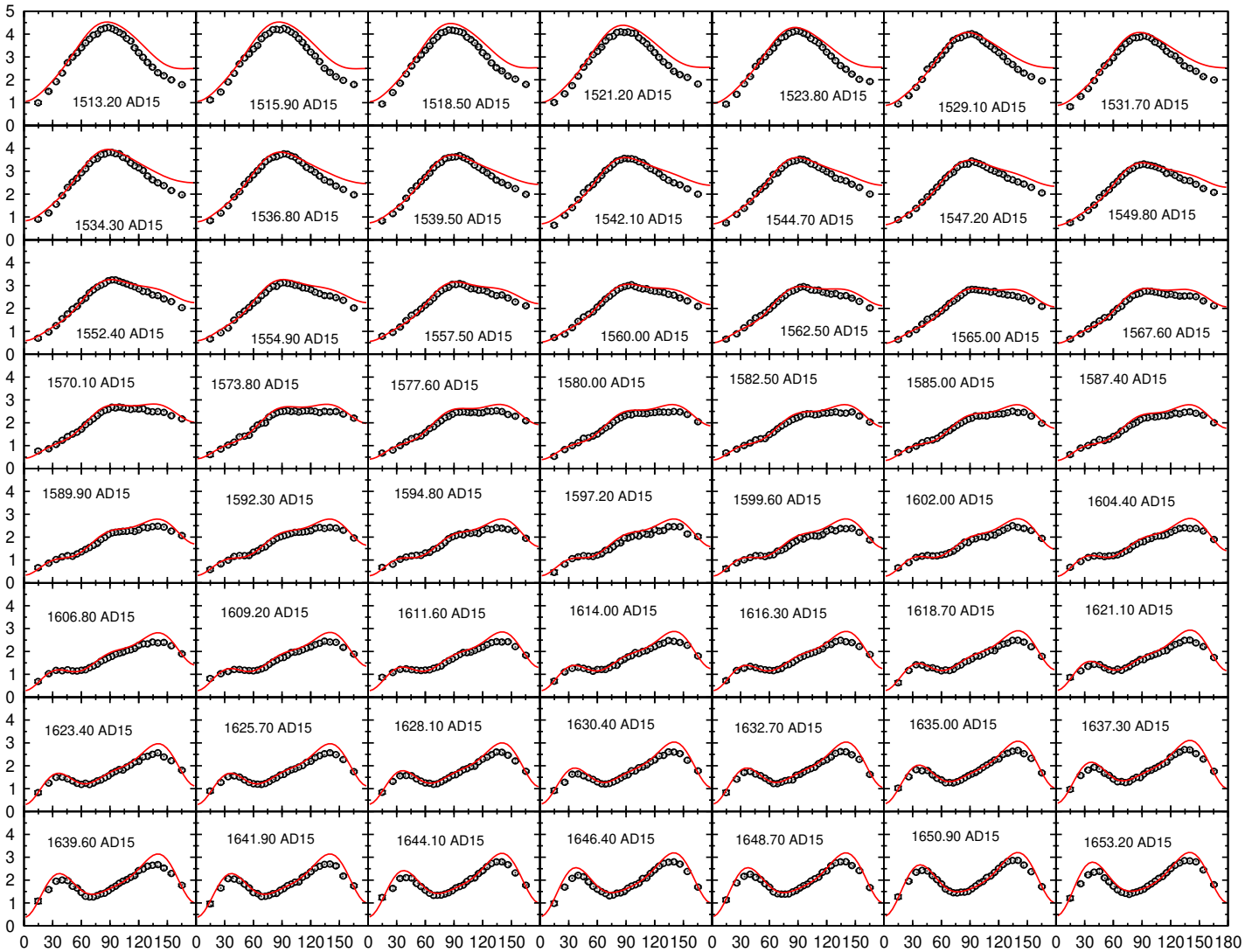

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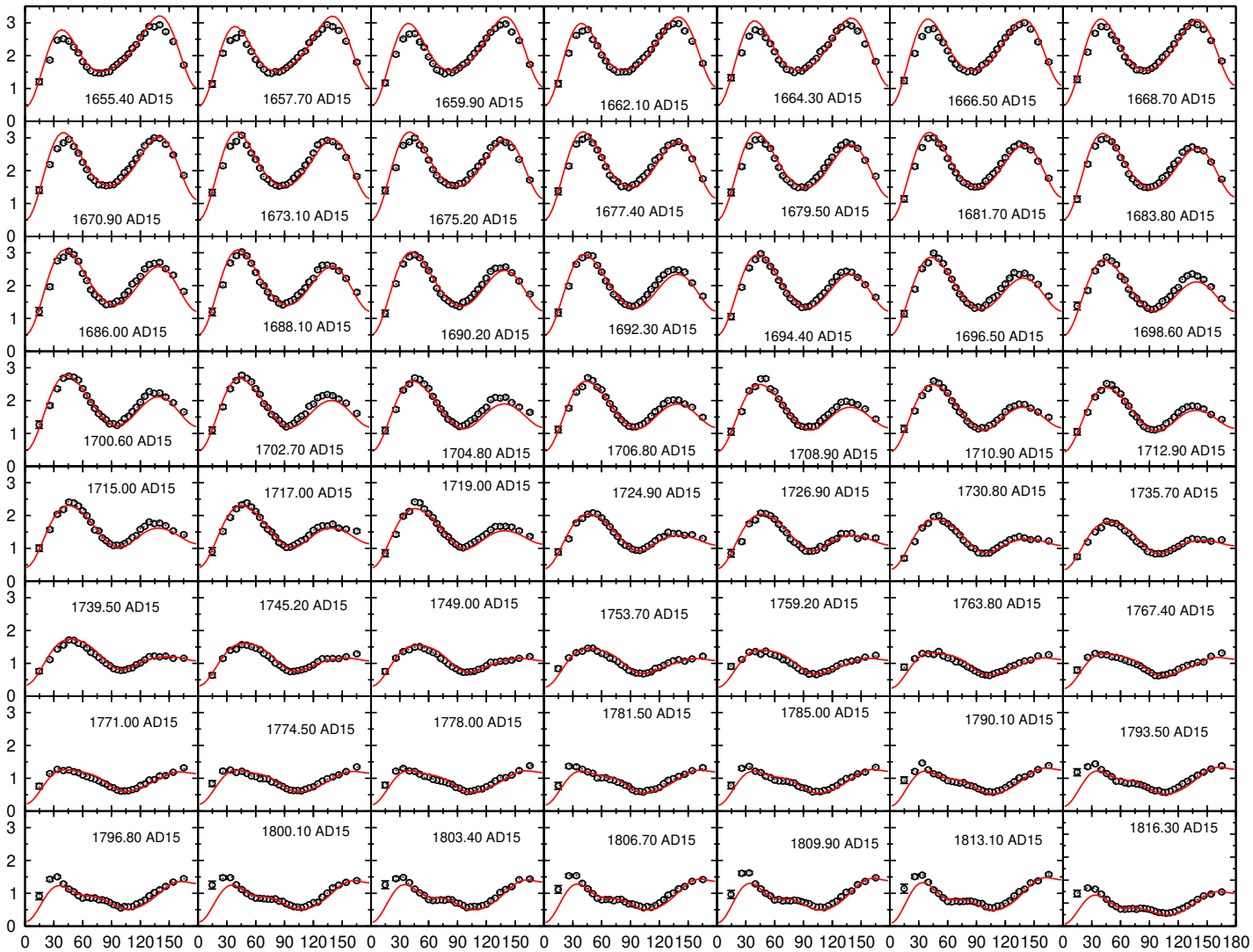

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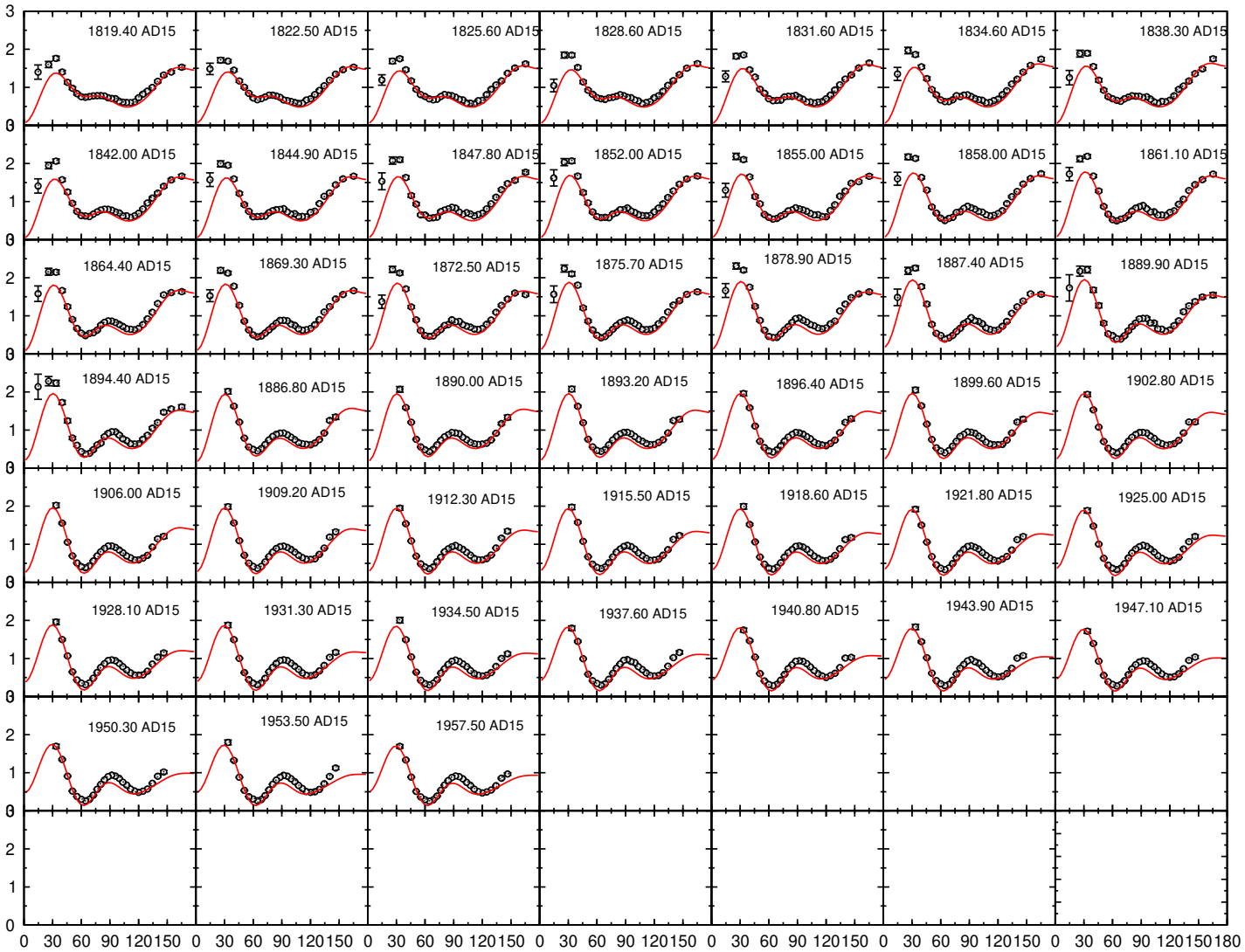

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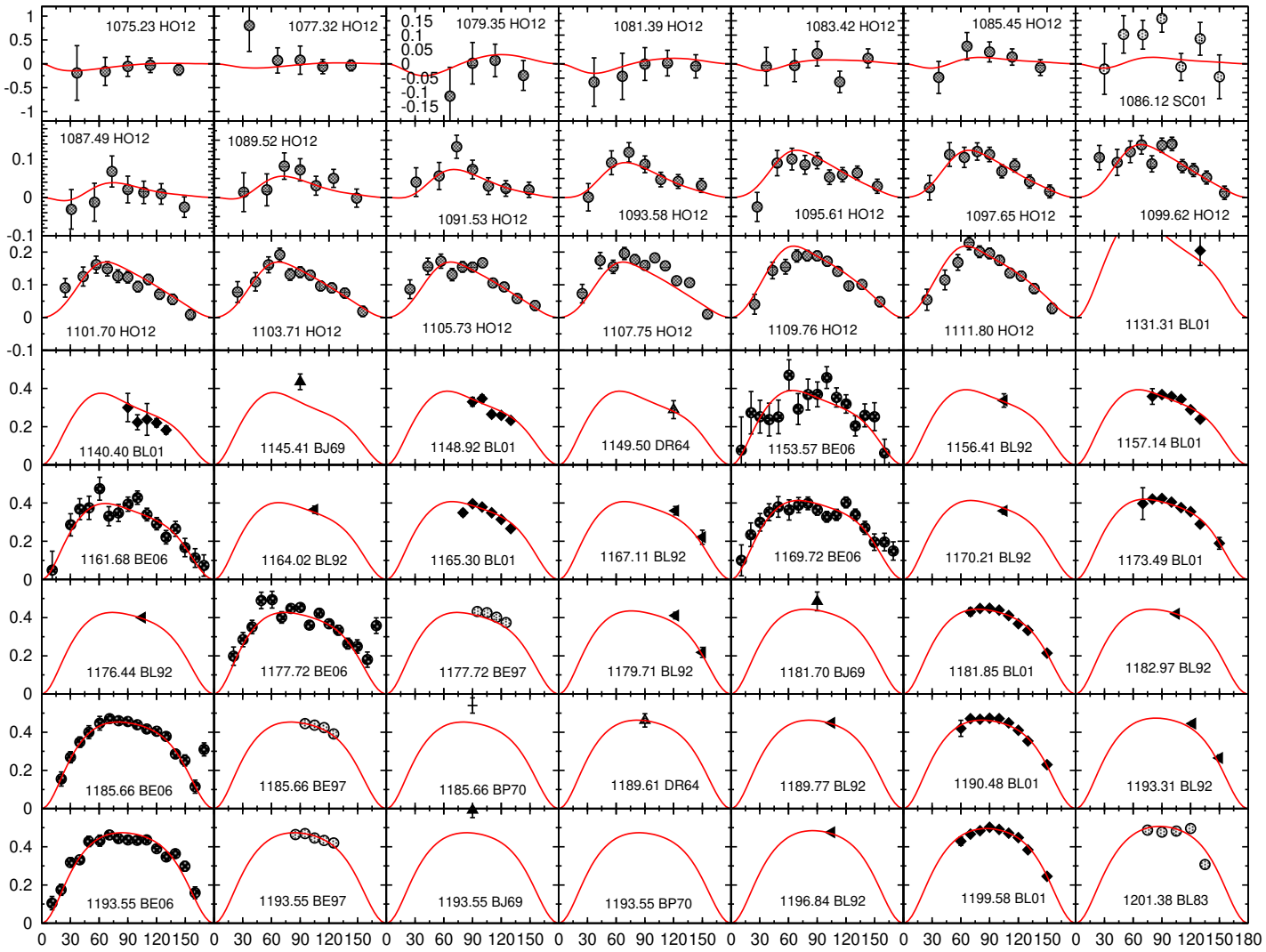

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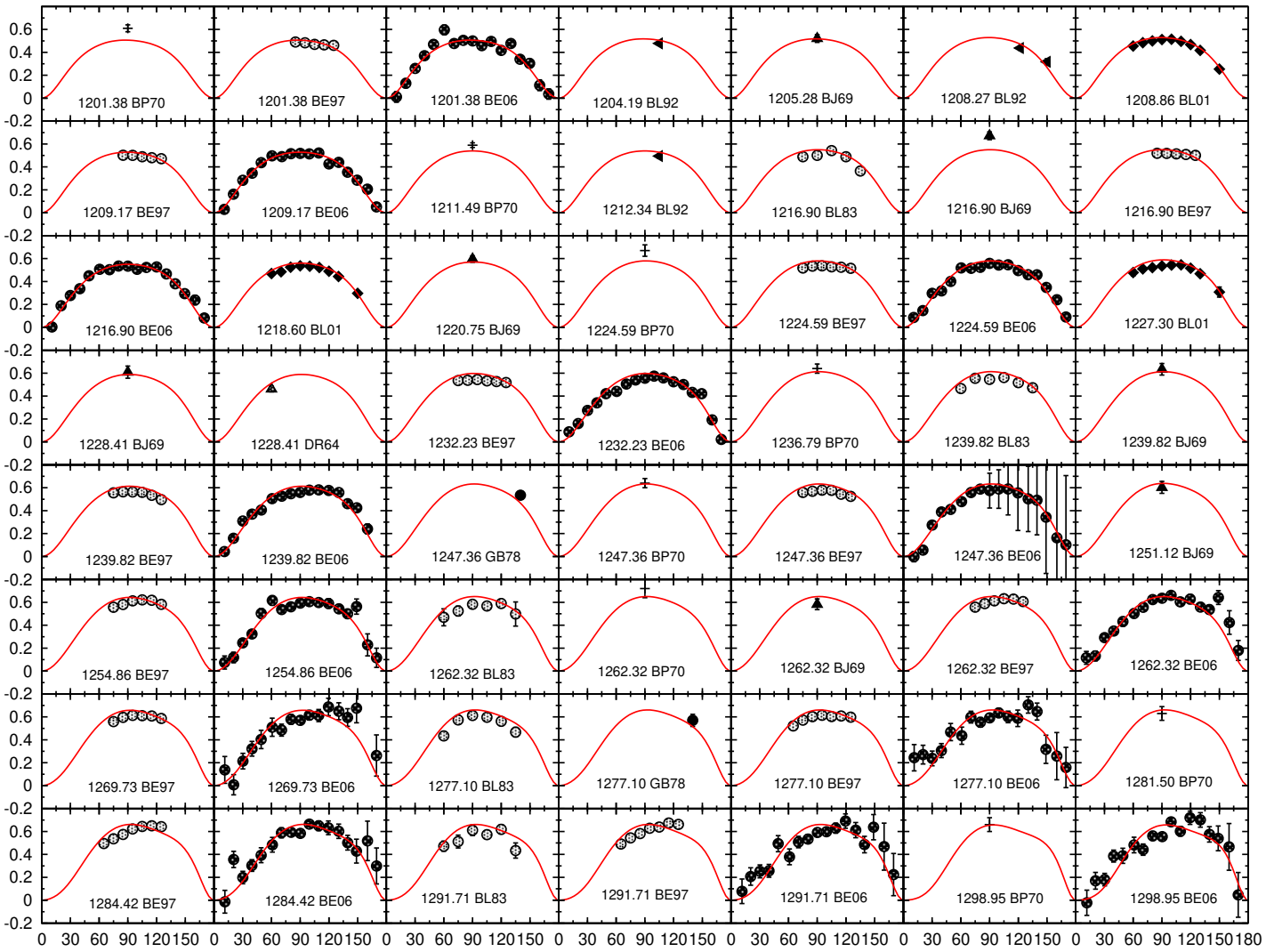

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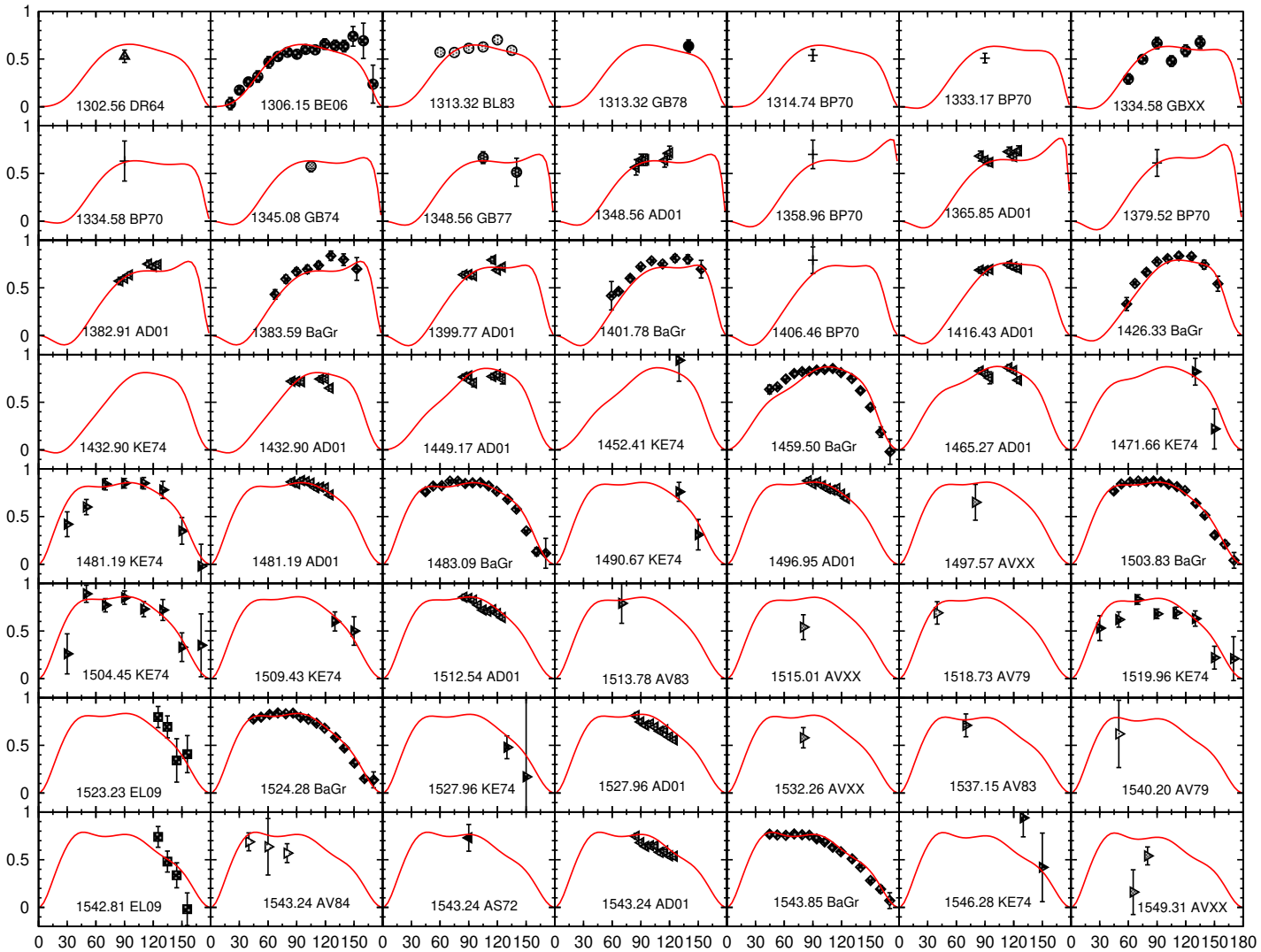

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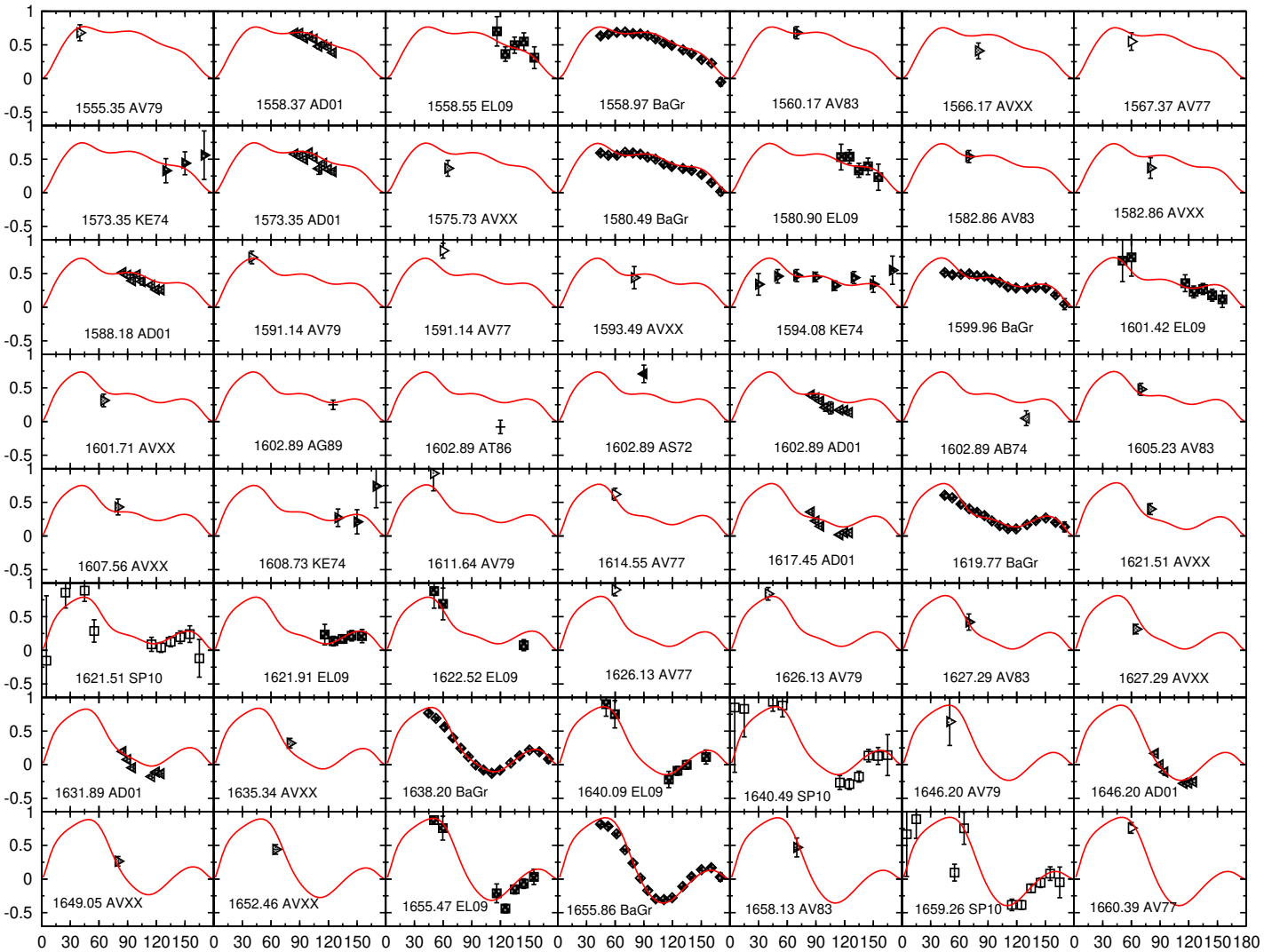

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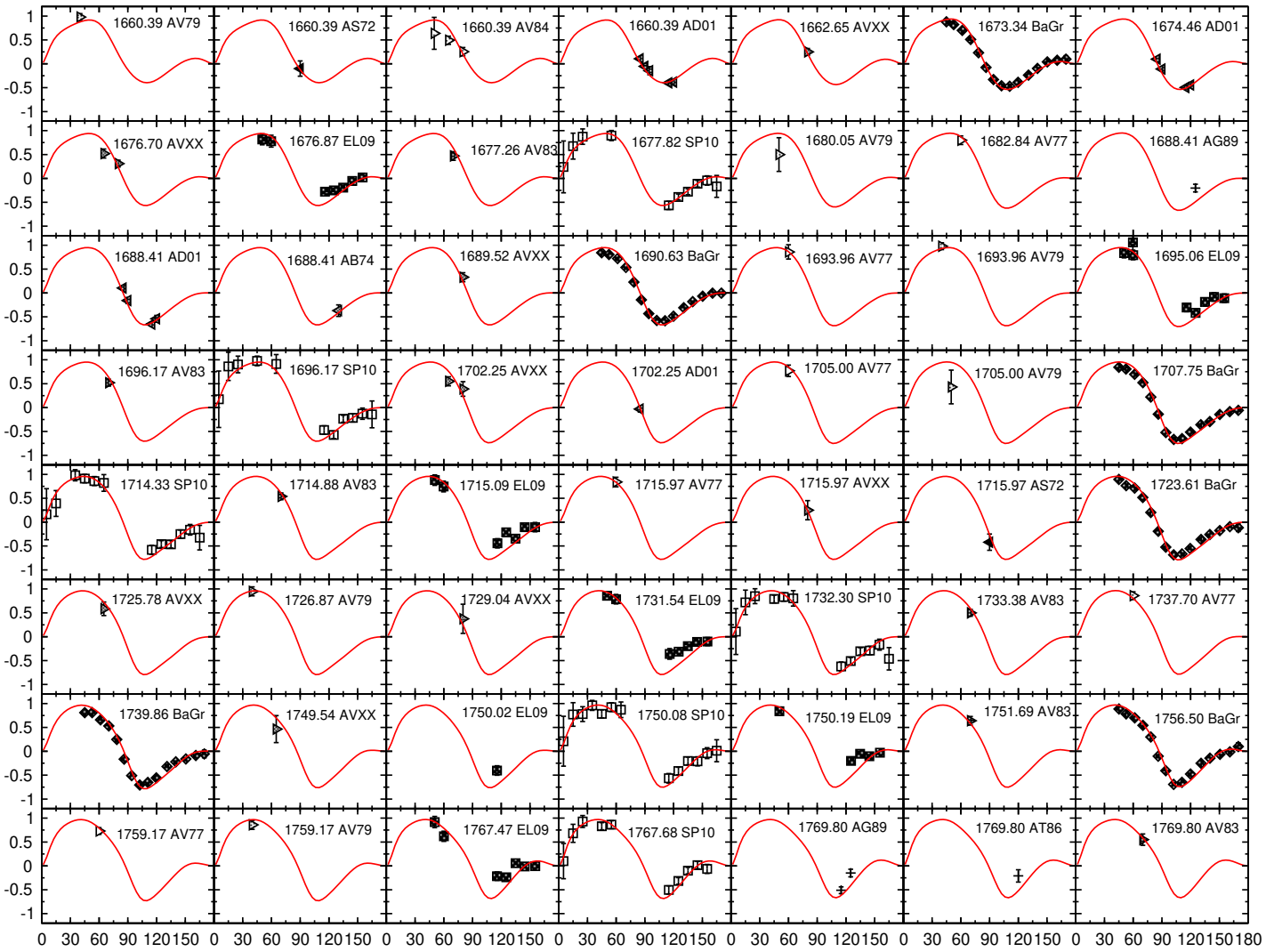

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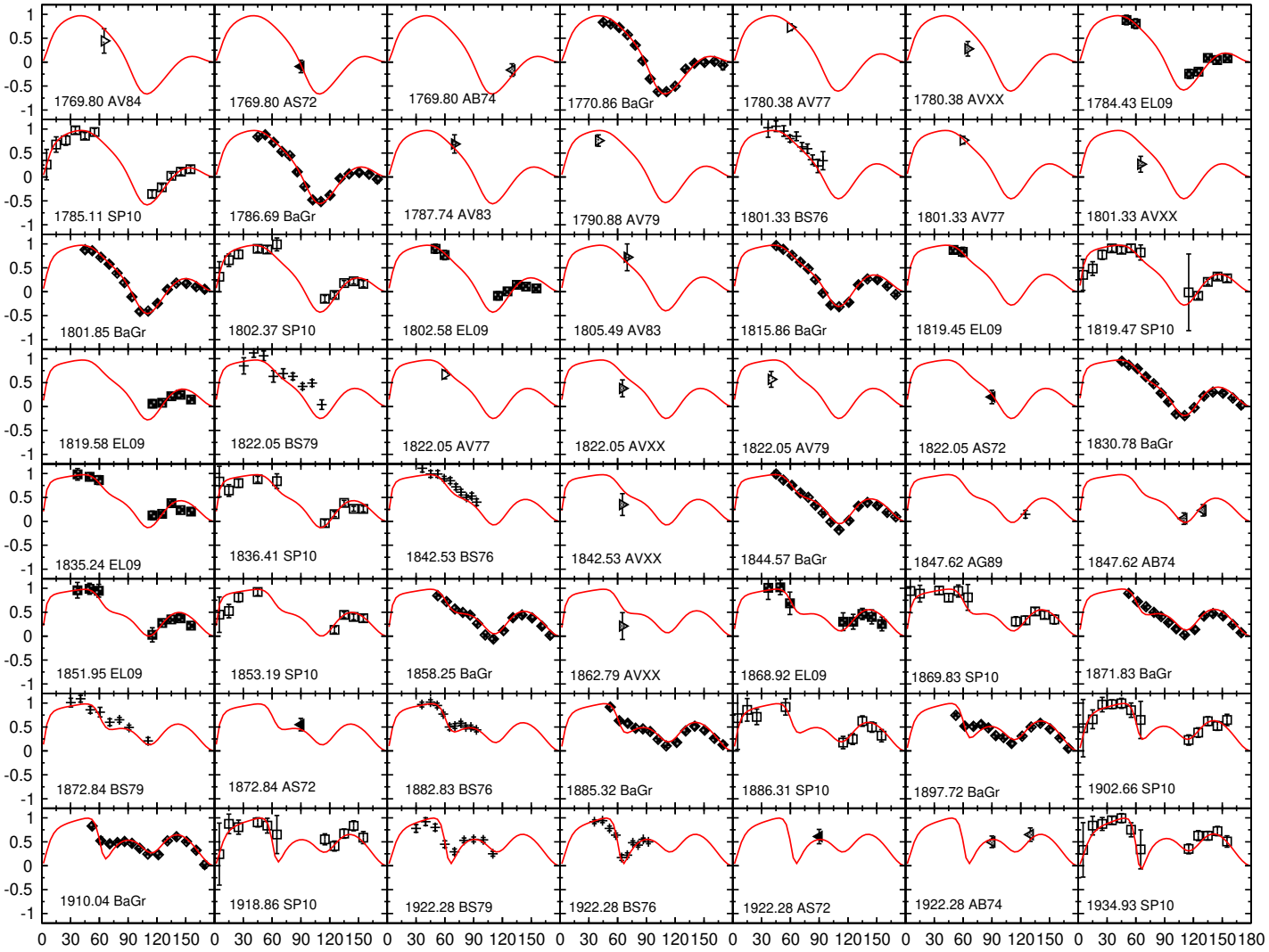

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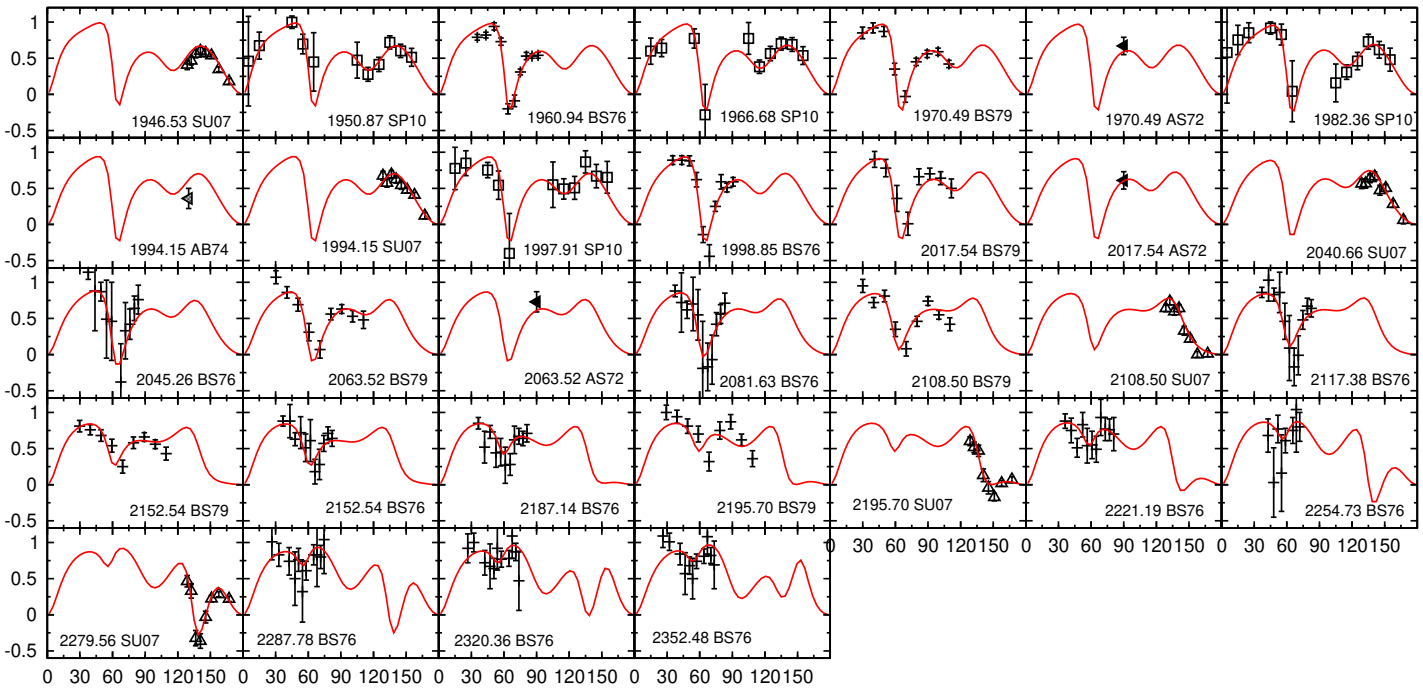

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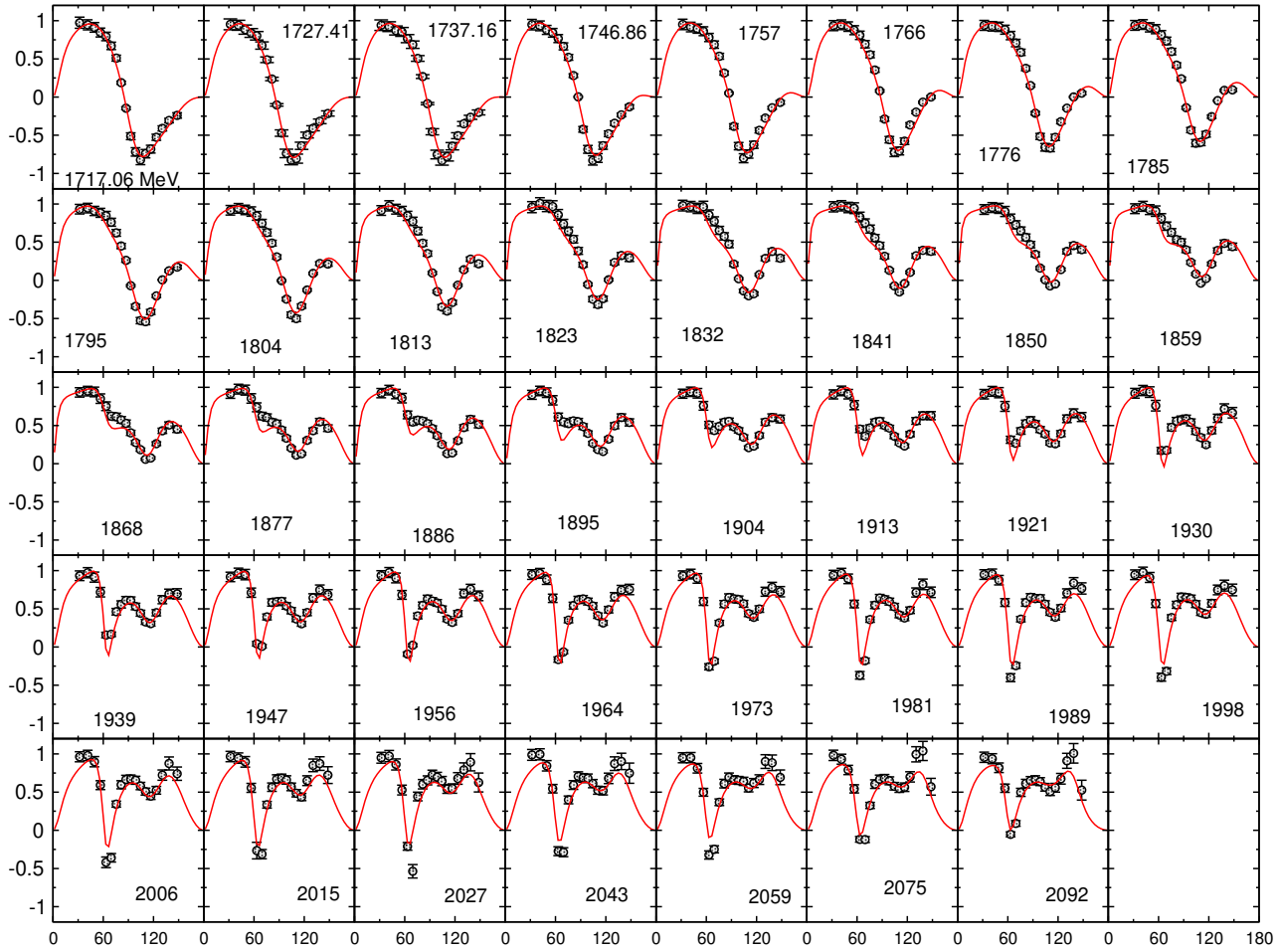
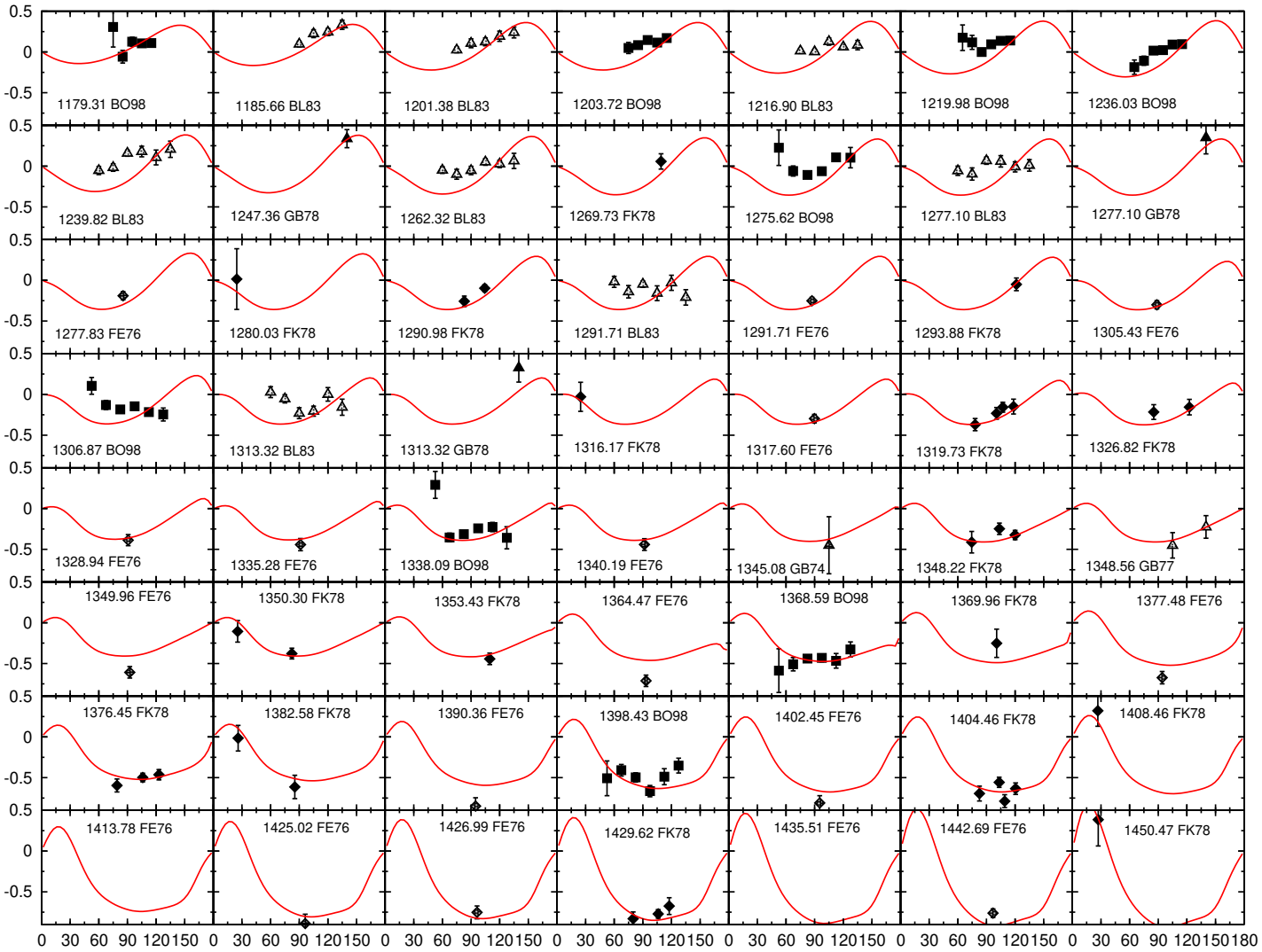
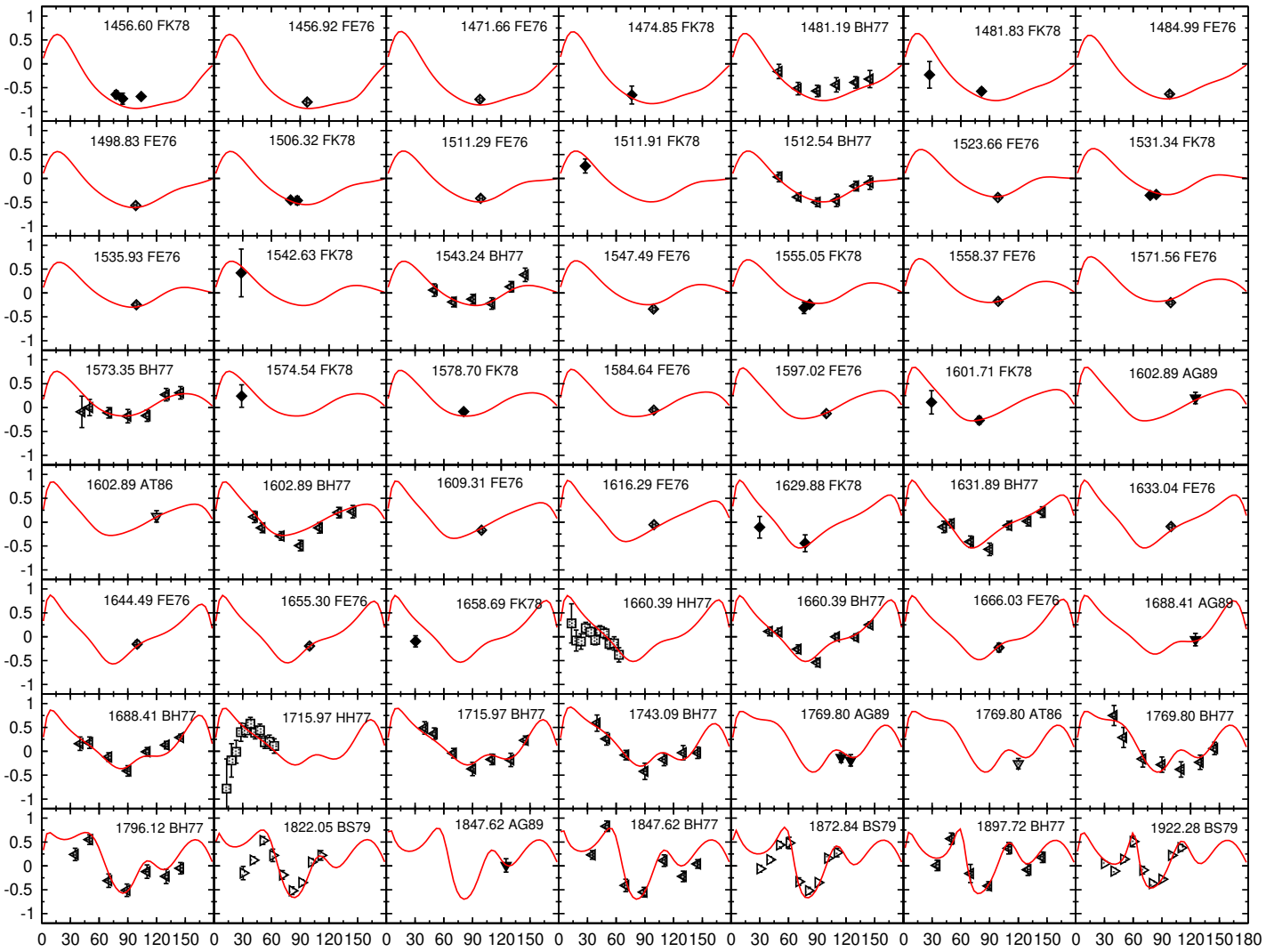
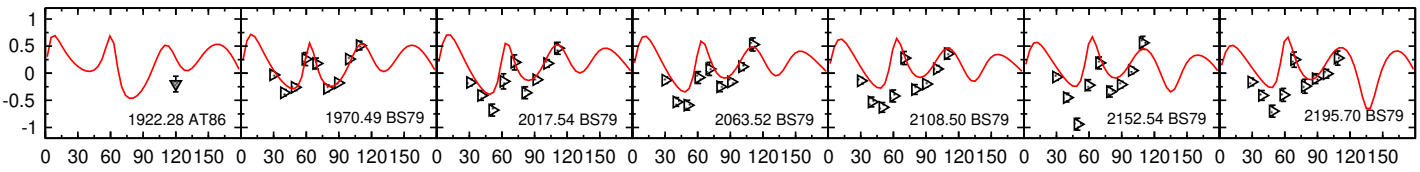
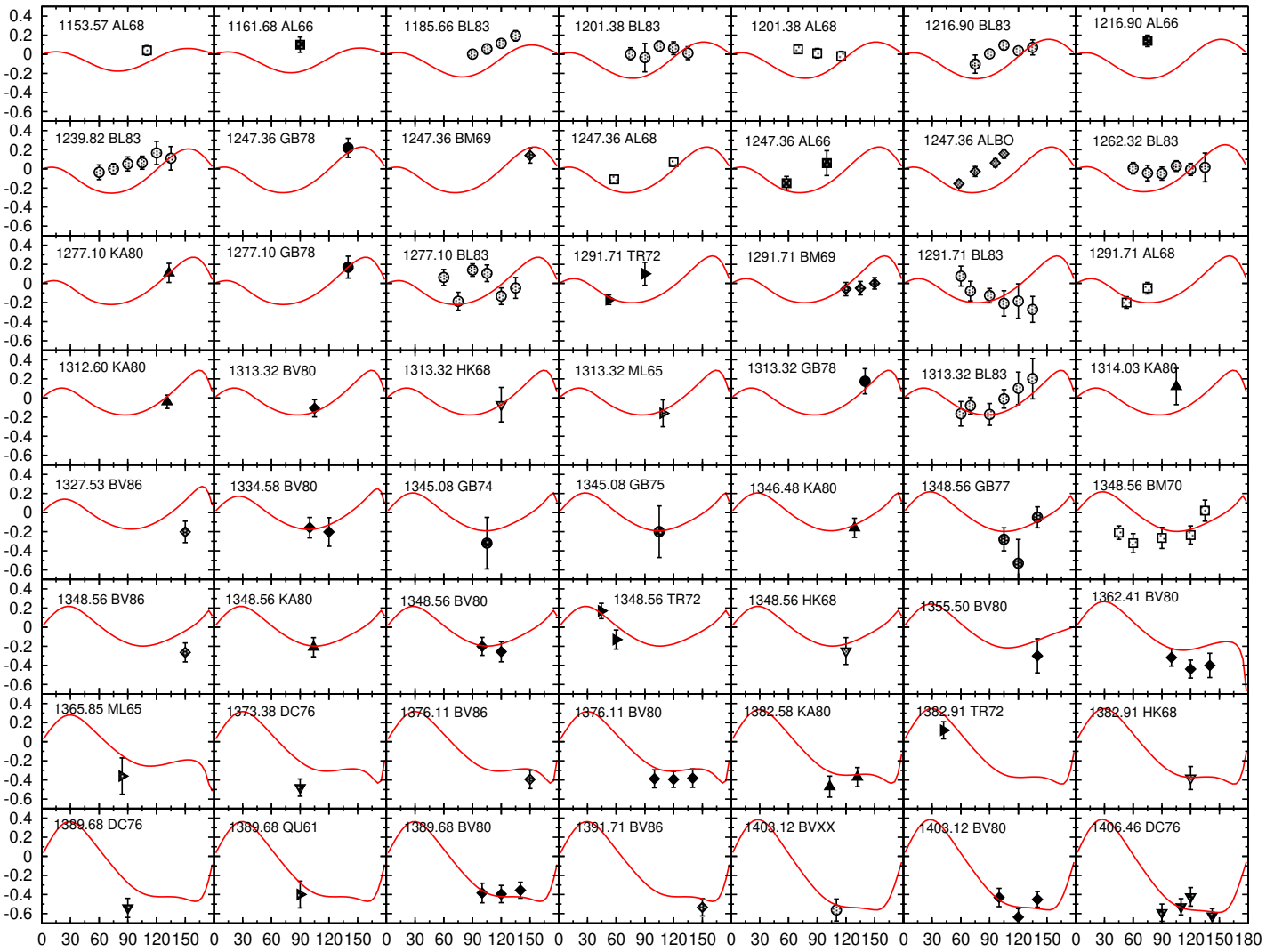


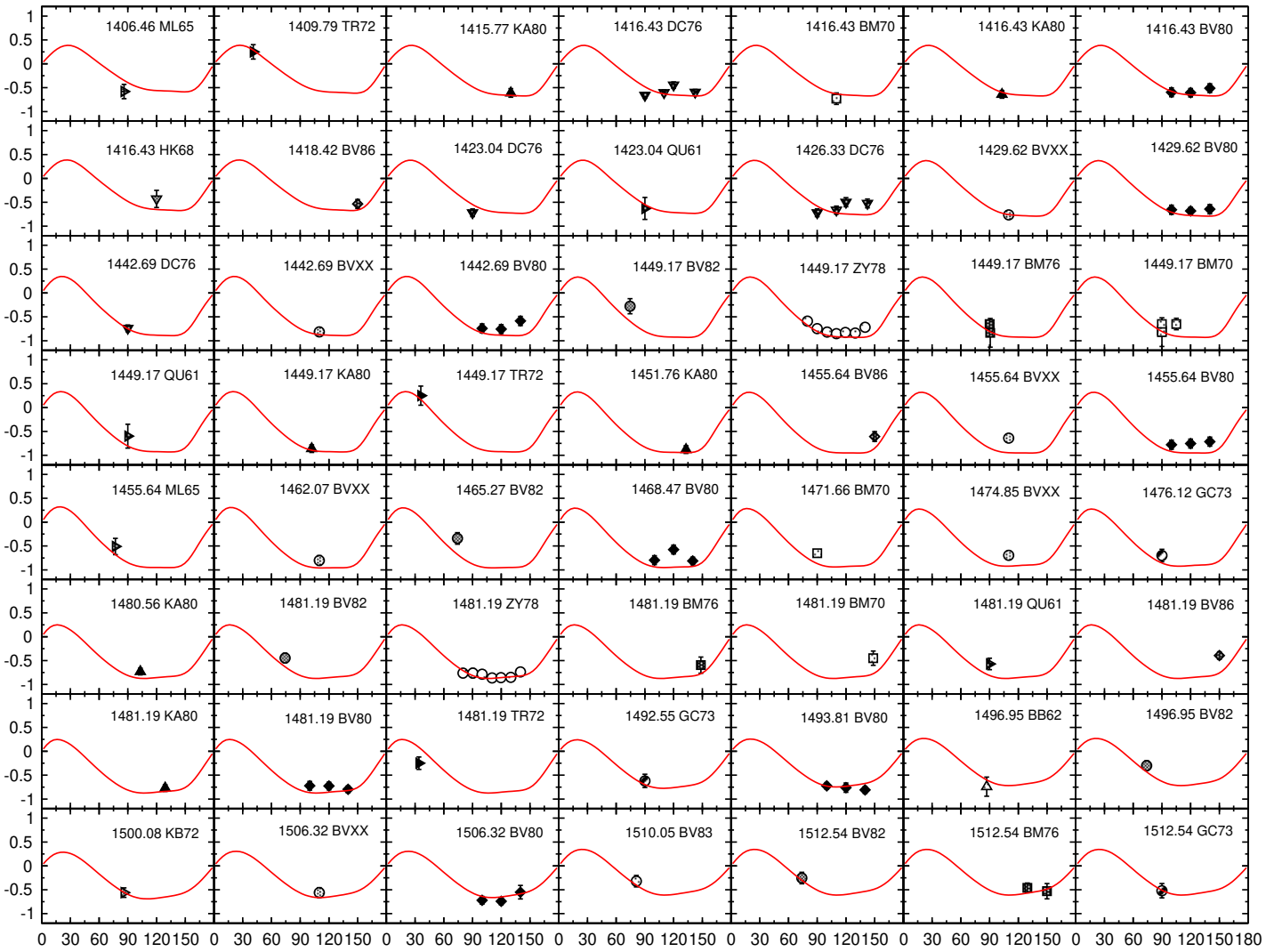
Figure 1: CLAS Dugger et al. (DU(13))

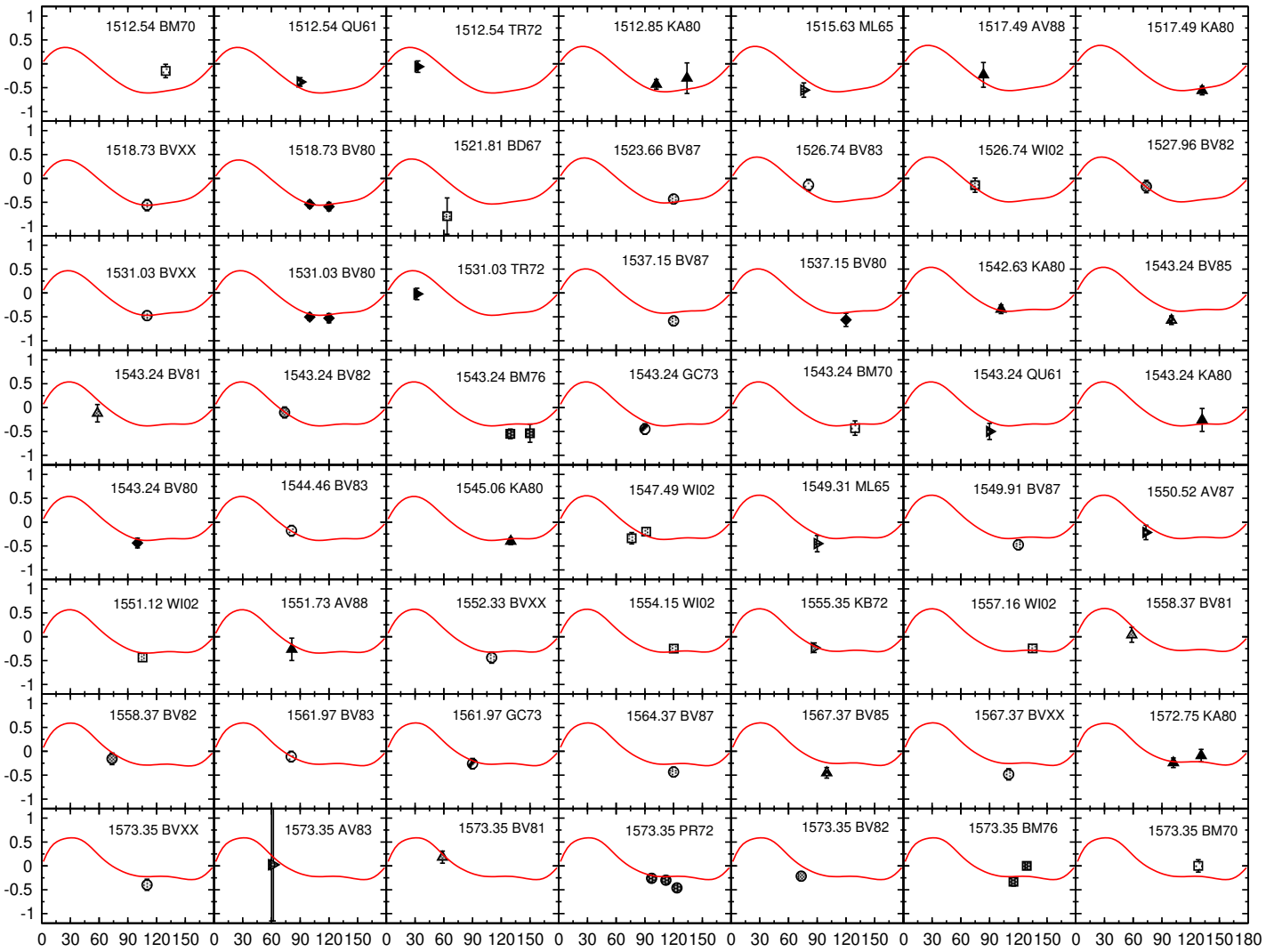

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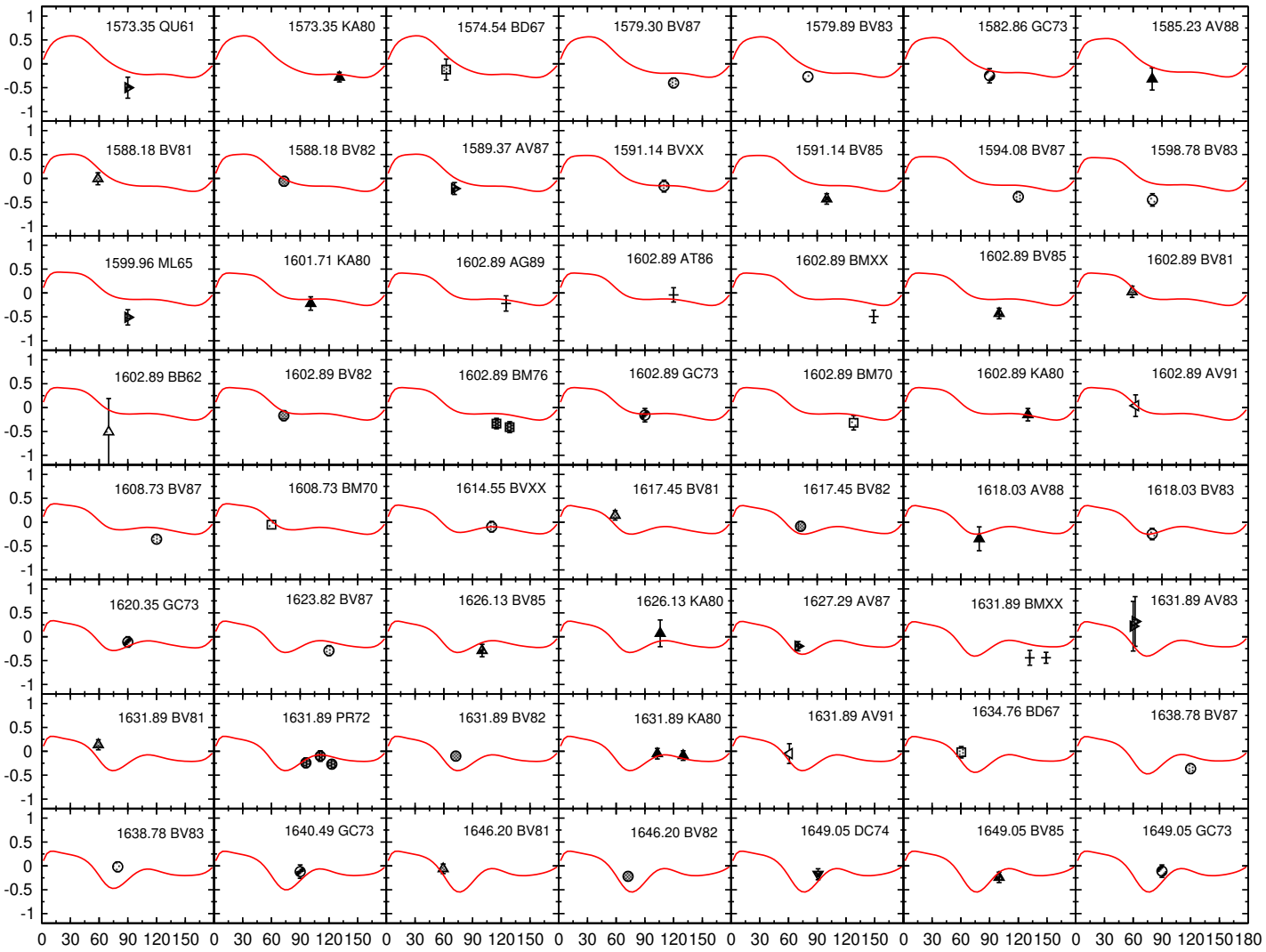

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1715.97 BH77
1743.09 BH77
1769.80 AG89
1769.80 AT86
1769.80 BH77
1796.12 BH77
1822.05 BS79
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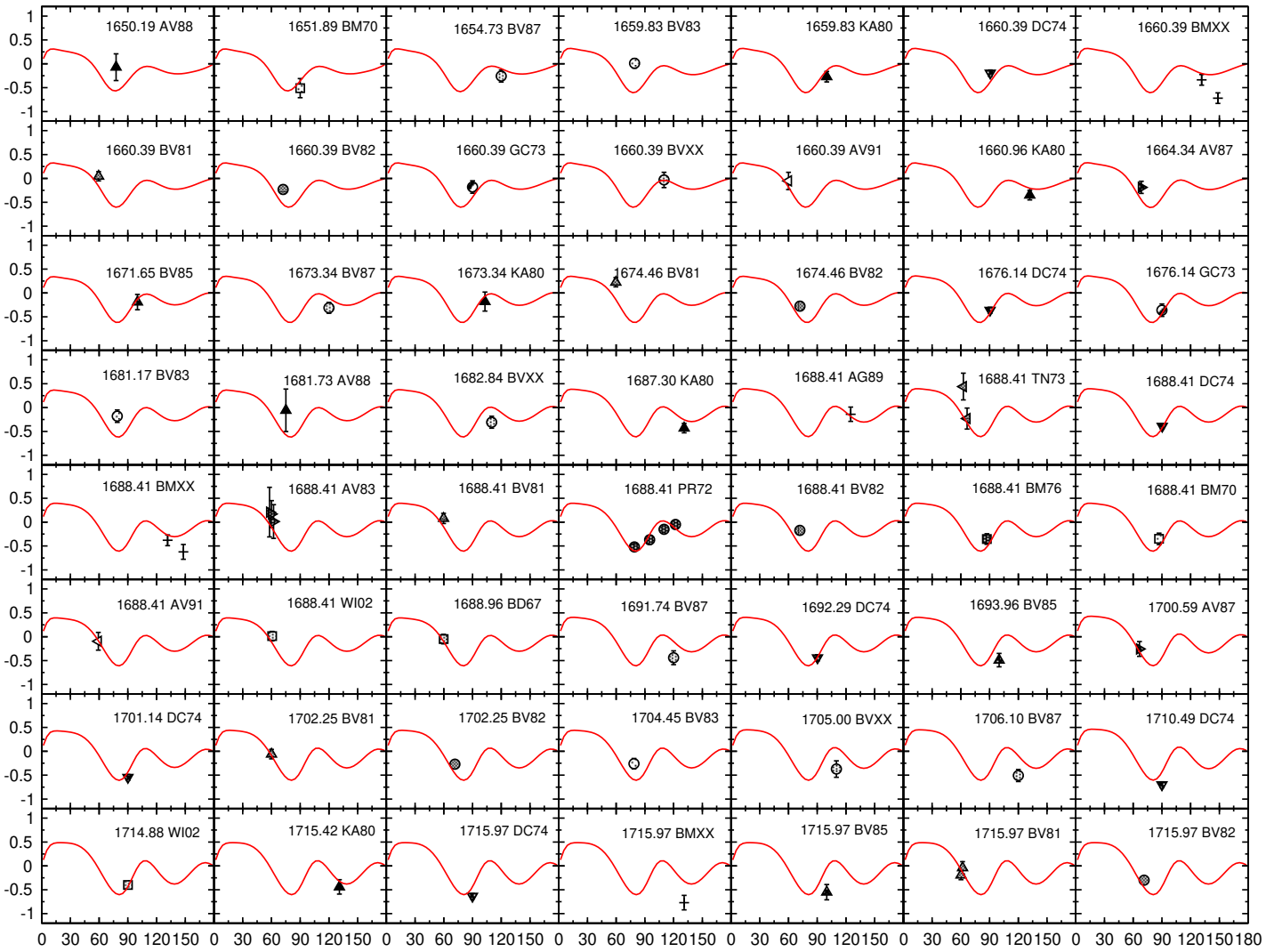

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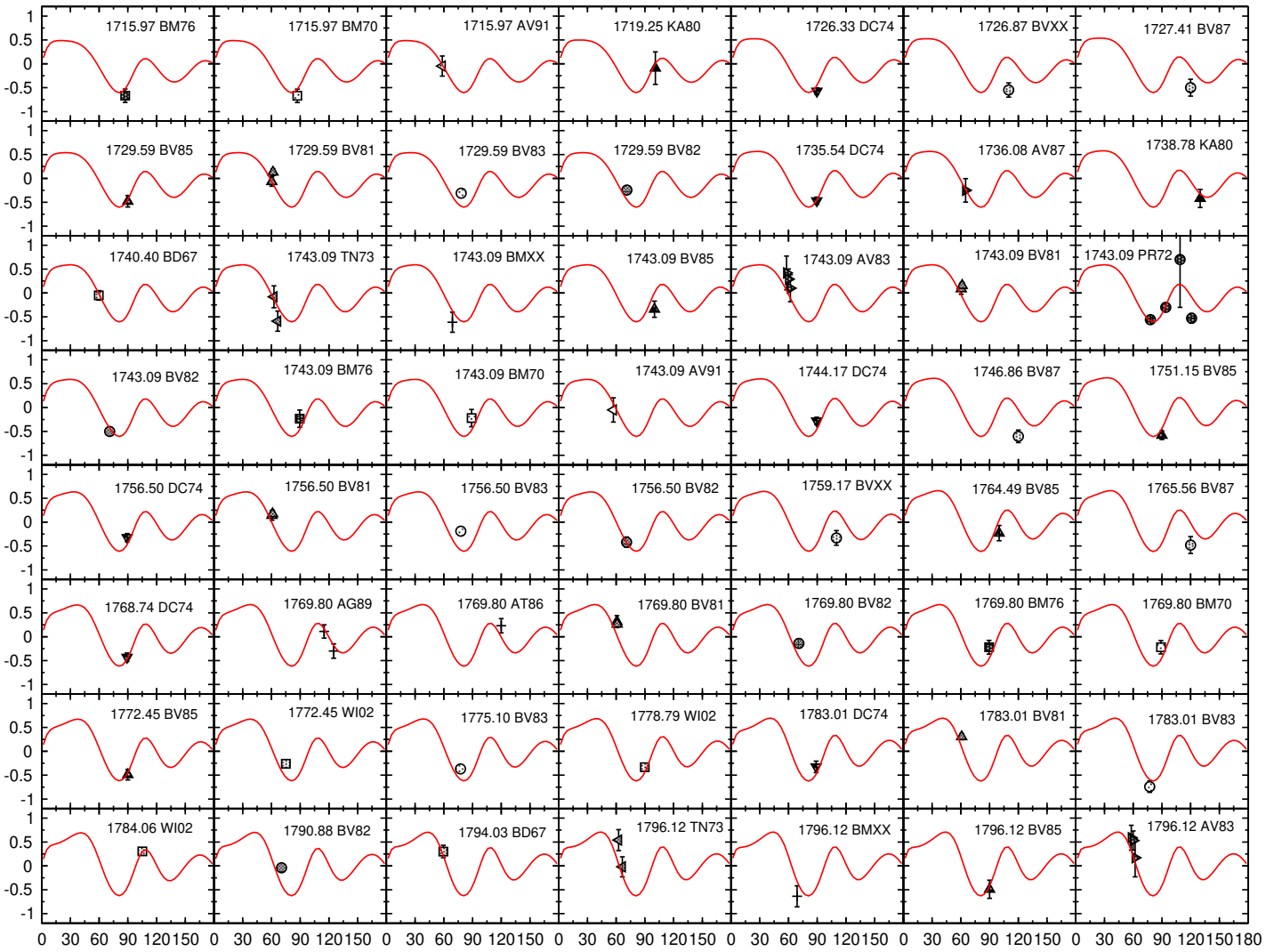

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1247.36 GB78
1247.36 BM69
1247.36 AL68
1247.36 AL66
1247.36 ALBO
1262.32 BL83
1277.10 KA80
1277.10 GB78
1277.10 BL83
1291.71 TR72
1291.71 BM69
1291.71 BL83
1291.71 AL68
1312.60 KA80
1313.32 BV80
1313.32 HK68
1313.32 ML65
1313.32 GB78
1313.32 BL83
1314.03 KA80
1327.53 BV86
1334.58 BV80
1345.08 GB74
1345.08 GB75
1346.48 KA80
1348.56 GB77
1348.56 BM70
1348.56 BV86
1348.56 KA80
1348.56 BV80
1348.56 TR72
1348.56 HK68
1355.50 BV80
1362.41 BV80
1365.85 ML65
1373.38 DC76
1376.11 BV86
1376.11 BV80
1382.58 KA80
1382.91 TR72
1382.91 HK68
1389.68 DC76
1389.68 QU61
1389.68 BV80
1391.71 BV86
1403.12 BVXX
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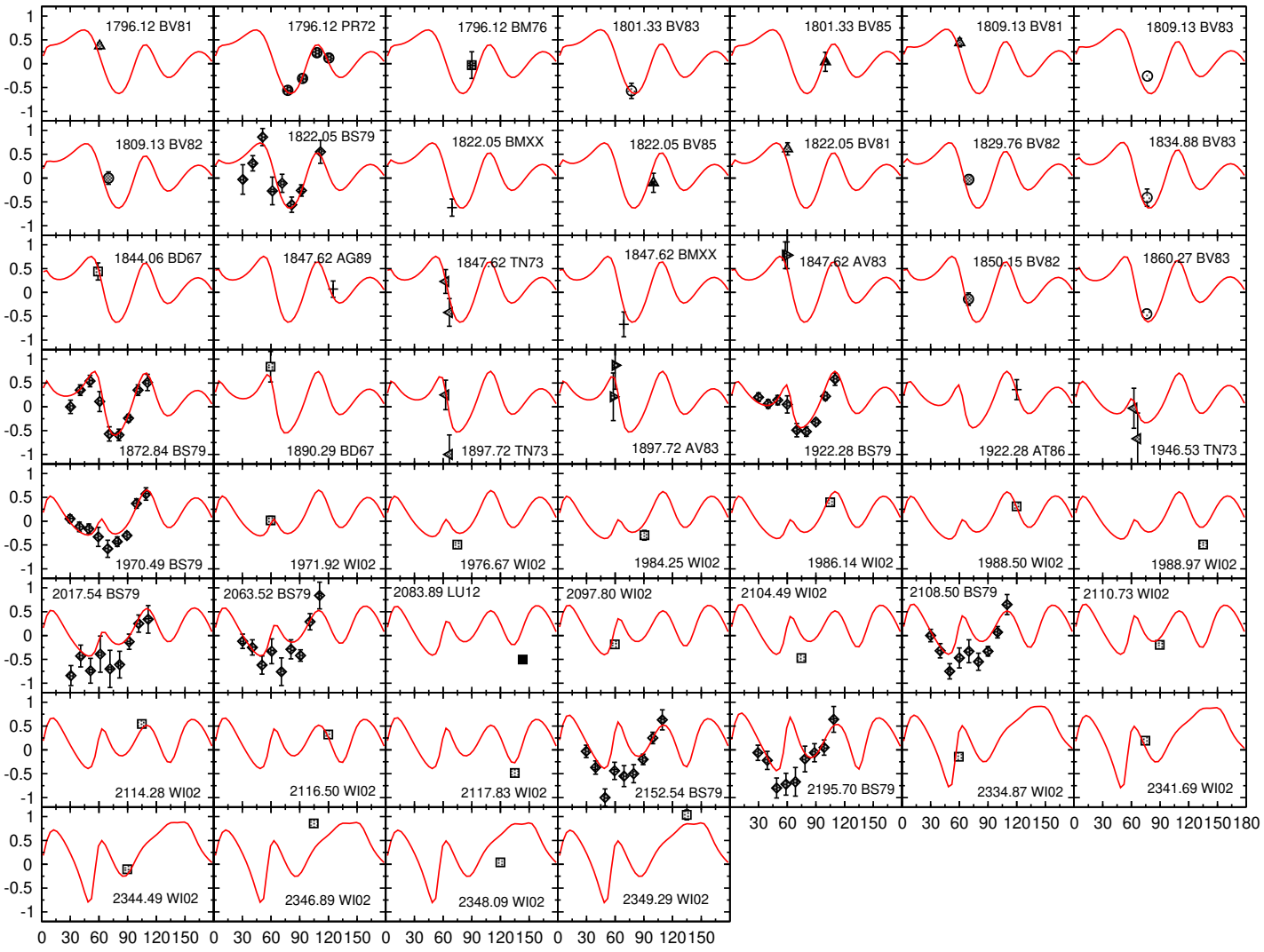

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1416.43 HK68
1418.42 BV86
1423.04 DC76
1423.04 QU61
1426.33 DC76
1429.62 BVXX
1429.62 BV80
1442.69 DC76
1442.69 BVXX
1442.69 BV80
1449.17 BV82
1449.17 ZY78
1449.17 BM76
1449.17 BM70
1449.17 QU61
1449.17 KA80
1449.17 TR72
1451.76 KA80
1455.64 BV86
1455.64 BVXX
1455.64 BV80
1455.64 ML65
1462.07 BVXX
1465.27 BV82
1468.47 BV80
1471.66 BM70
1474.85 BVXX
1476.12 GC73
1480.56 KA80
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1481.19 ZY78
1481.19 BM76
1481.19 BM70
1481.19 QU61
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1481.19 BV80
1481.19 TR72
1492.55 GC73
1493.81 BV80
1496.95 BB62
1496.95 BV82
1500.08 KB72
1506.32 BVXX
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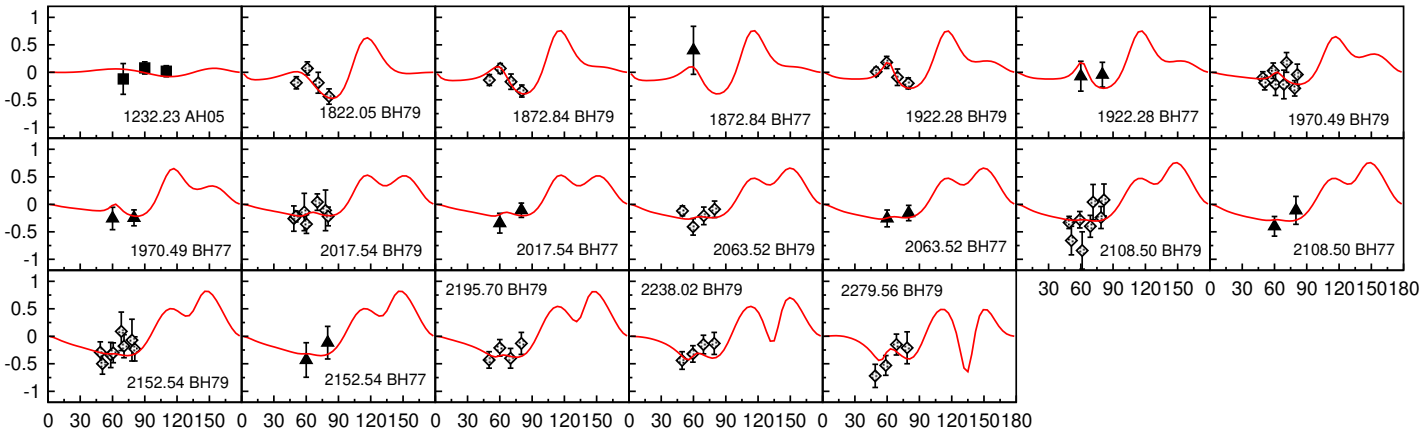

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1518.73 BV80
1521.81 BD67
1523.66 BV87
1526.74 BV83
1526.74 WI02
1527.96 BV82
1531.03 BVXX
1531.03 BV80
1531.03 TR72
1537.15 BV87
1537.15 BV80
1542.63 KA80
1543.24 BV85
1543.24 BV81
1543.24 BV82
1543.24 BM76
1543.24 GC73
1543.24 BM70
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1543.24 KA80
1543.24 BV80
1544.46 BV83
1545.06 KA80
1547.49 WI02
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1551.12 WI02
1551.73 AV88
1552.33 BVXX
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1557.16 WI02
1558.37 BV81
1558.37 BV82
1561.97 BV83
1561.97 GC73
1564.37 BV87
1567.37 BV85
1567.37 BVXX
1572.75 KA80
1573.35 BVXX
1573.35 AV83
1573.35 BV81
1573.35 PR72
1573.35 BV82
1573.35 BM76
1573.35 BM70
1 0.5 0 -0.5 -1
0 30 60 90 120 150 180


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1579.89 BV83
1582.86 GC73
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1588.18 BV81
1588.18 BV82
1589.37 AV87
1591.14 BVXX
1591.14 BV85
1594.08 BV87
1598.78 BV83
1599.96 ML65
1601.71 KA80
1602.89 AG89
1602.89 AT86
1602.89 BMXX
1602.89 BV85
1602.89 BV81
1602.89 BB62
1602.89 BV82
1602.89 BM76
1602.89 GC73
1602.89 BM70
1602.89 KA80
1602.89 AV91
1608.73 BV87
1608.73 BM70
1614.55 BVXX
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1617.45 BV82
1618.03 AV88
1618.03 BV83
1620.35 GC73
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1626.13 BV85
1626.13 KA80
1627.29 AV87
1631.89 BMXX
1631.89 AV83
1631.89 BV81
1631.89 PR72
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1631.89 KA80
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1634.76 BD67
1638.78 BV87
1638.78 BV83
1640.49 GC73
1646.20 BV81
1646.20 BV82
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1649.05 BV85
1649.05 GC73
1 0.5 0 -0.5 -1
0 30 60 90 120 150 180


1650.19 AV88
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1659.83 BV83
1659.83 KA80
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1660.39 BMXX
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1681.73 AV88
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1715.97 BV81
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0 30 60 90 120 150 180


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1743.09 BM76
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1743.09 AV91
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1746.86 BV87
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1756.50 BV81
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0 30 60 90 120 150 180


1796.12 BV81
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1872.84 BS79
1890.29 BD67
1897.72 TN73
1897.72 AV83
1922.28 BS79
1922.28 AT86
1946.53 TN73
1970.49 BS79
1971.92 WI02
1976.67 WI02
1984.25 WI02
1986.14 WI02
1988.50 WI02
1988.97 WI02
2017.54 BS79
2063.52 BS79
2083.89 LU12
2097.80 WI02
2104.49 WI02
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2110.73 WI02
2114.28 WI02
2116.50 WI02
2117.83 WI02
2152.54 BS79
2195.70 BS79
2334.87 WI02
2341.69 WI02
2344.49 WI02
2346.89 WI02
2348.09 WI02
2349.29 WI02
1 0.5 0 -0.5 -1
0 30 60 90 120 150 180


1232.23 AH05
1822.05 BH79
1872.84 BH79
1872.84 BH77
1922.28 BH79
1922.28 BH77
1970.49 BH79
1970.49 BH77
2017.54 BH79
2017.54 BH77
2063.52 BH79
2063.52 BH77
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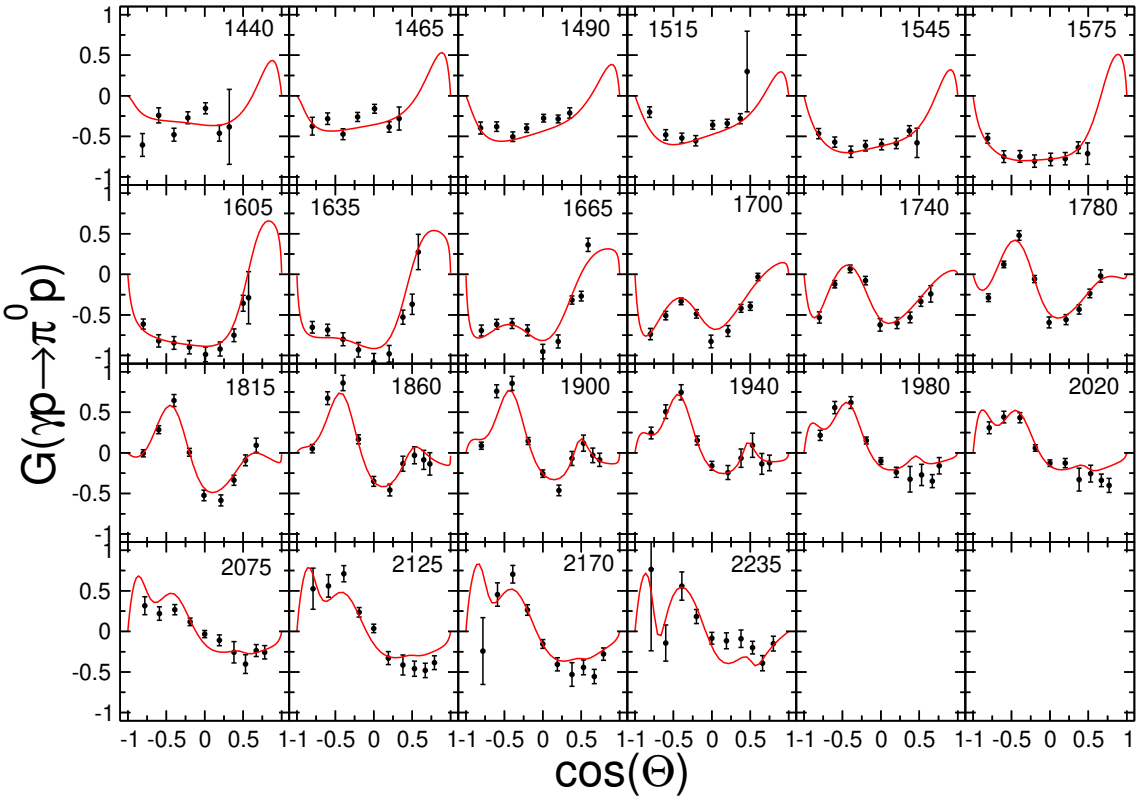
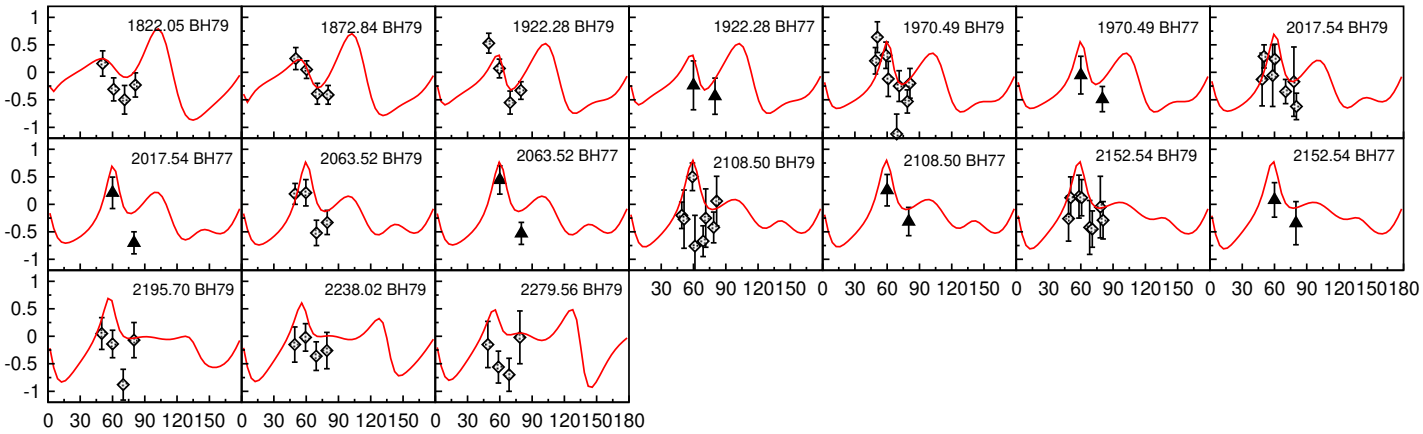
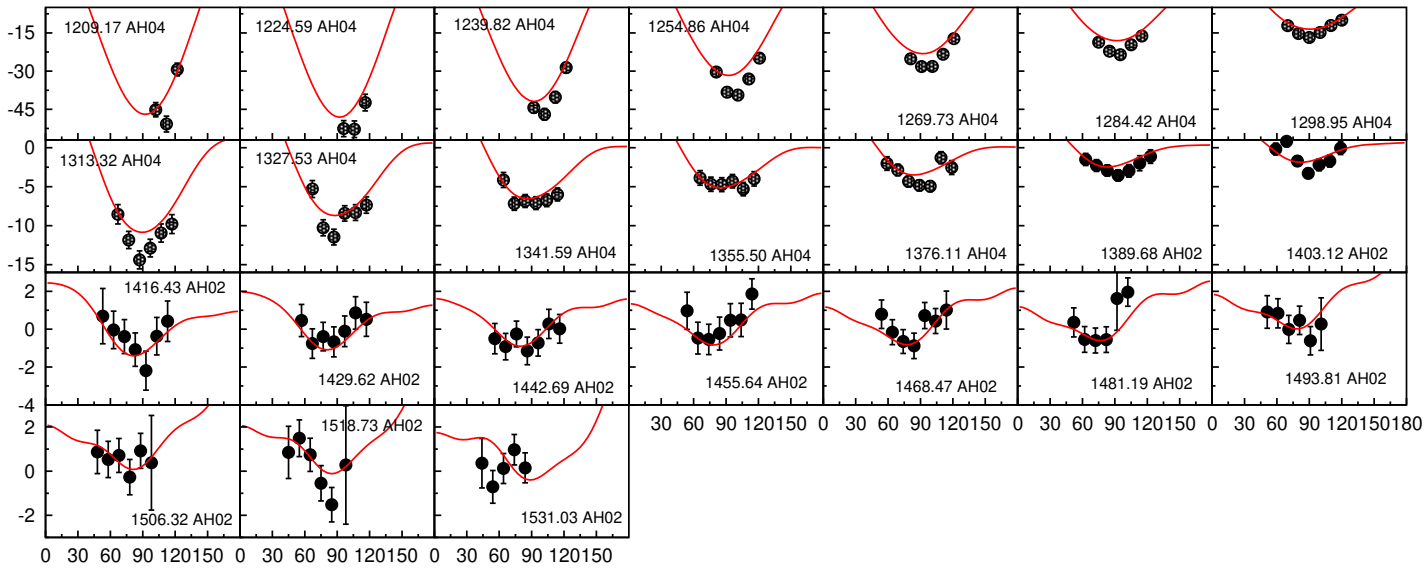


Figure 1: CLAS 2021 (N. Zachariou *et al.* Phys. Lett. B 817, 136304 (2021)


1822.05 BH79
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1922.28 BH79
1922.28 BH77
1970.49 BH79
1970.49 BH77
2017.54 BH79
2017.54 BH77
2063.52 BH79
2063.52 BH77
2108.50 BH79
2108.50 BH77
2152.54 BH79
2152.54 BH77
2195.70 BH79
2238.02 BH79
2279.56 BH79
1 0.5 0 -0.5 -1
0 30 60 90 120150 180


1209.17 AH04
1224.59 AH04
1239.82 AH04
1254.86 AH04
1269.73 AH04
1284.42 AH04
1298.95 AH04
1313.32 AH04
1327.53 AH04
1341.59 AH04
1355.50 AH04
1376.11 AH04
1389.68 AH02
1403.12 AH02
1416.43 AH02
1429.62 AH02
1442.69 AH02
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1493.81 AH02
1506.32 AH02
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1531.03 AH02

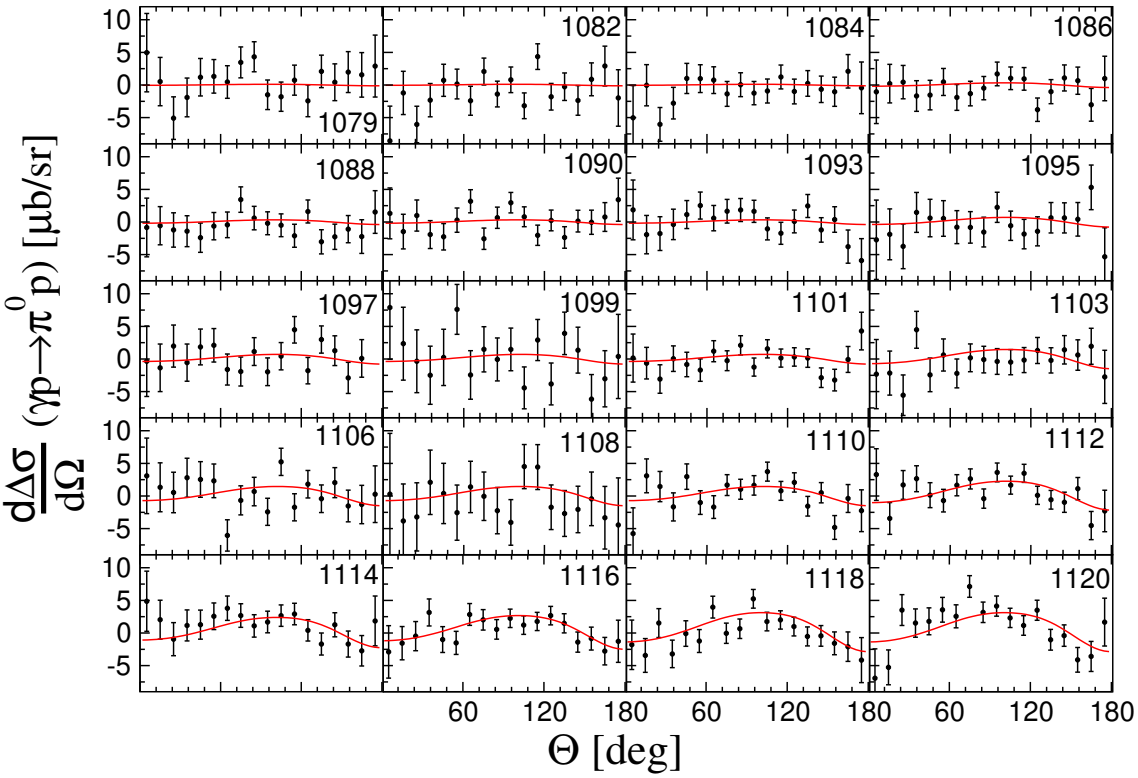


Figure 1: A2MAMI (E. Mornacchi *et al.* Phys. Rev. C 109, 055201 (2024)

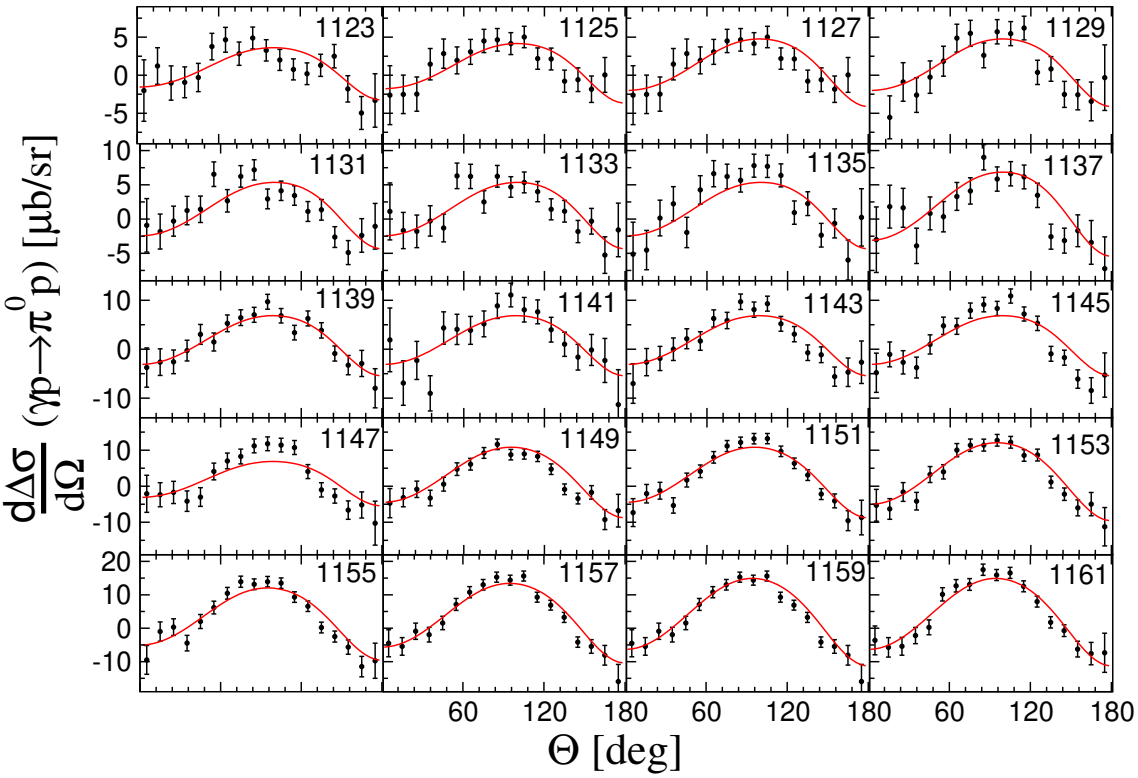


Figure 2: A2MAMI (E. Mornacchi *et al.* Phys. Rev. C 109, 055201 (2024)

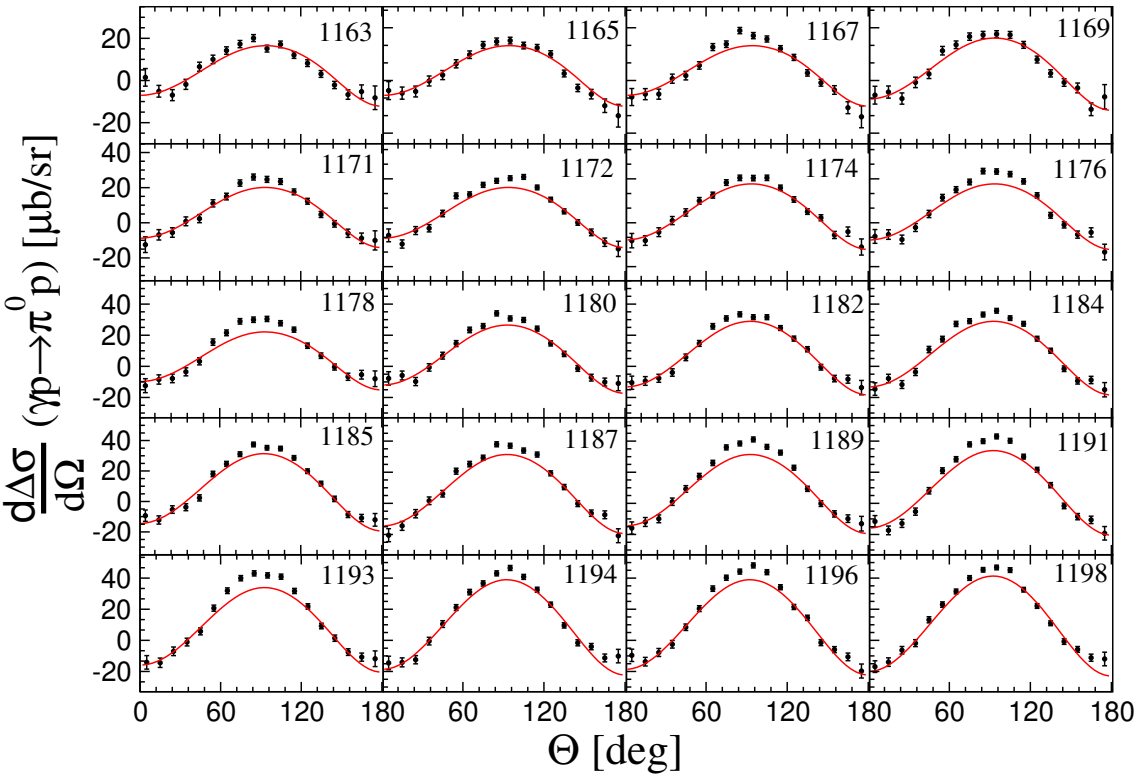


Figure 3: A2MAMI (E. Mornacchi *et al.* Phys. Rev. C 109, 055201 (2024)

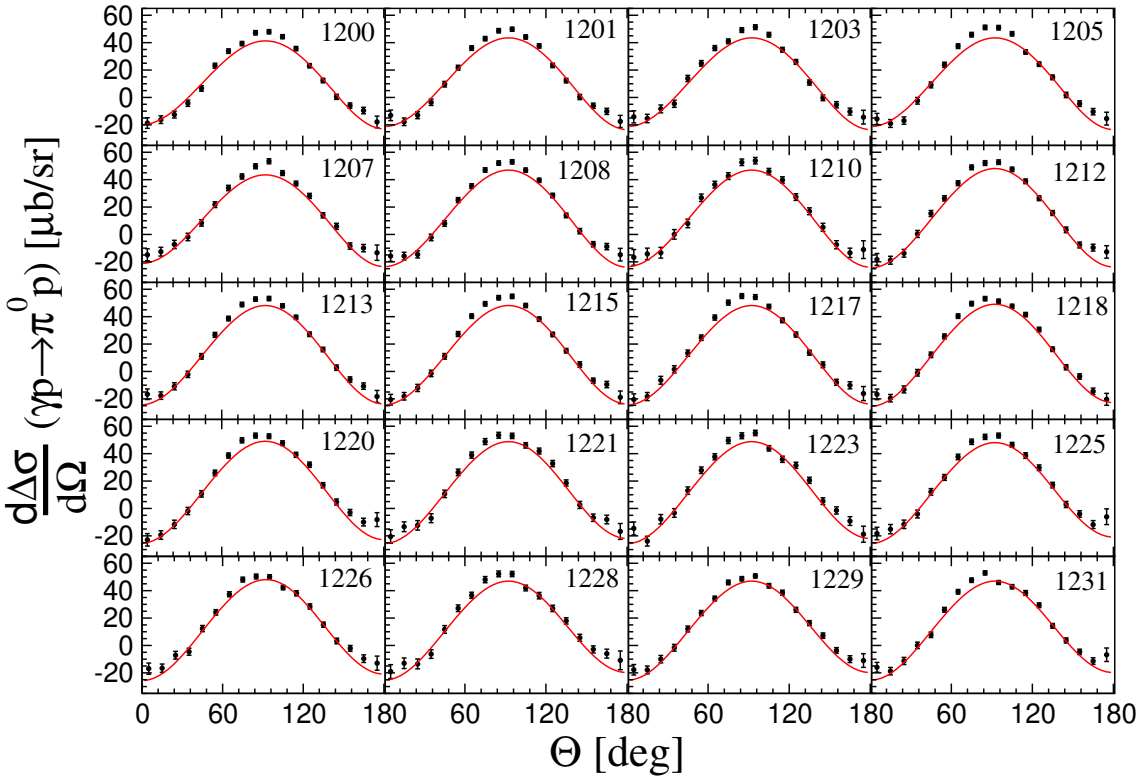


Figure 4: A2MAMI (E. Mornacchi *et al.* Phys. Rev. C 109, 055201 (2024)

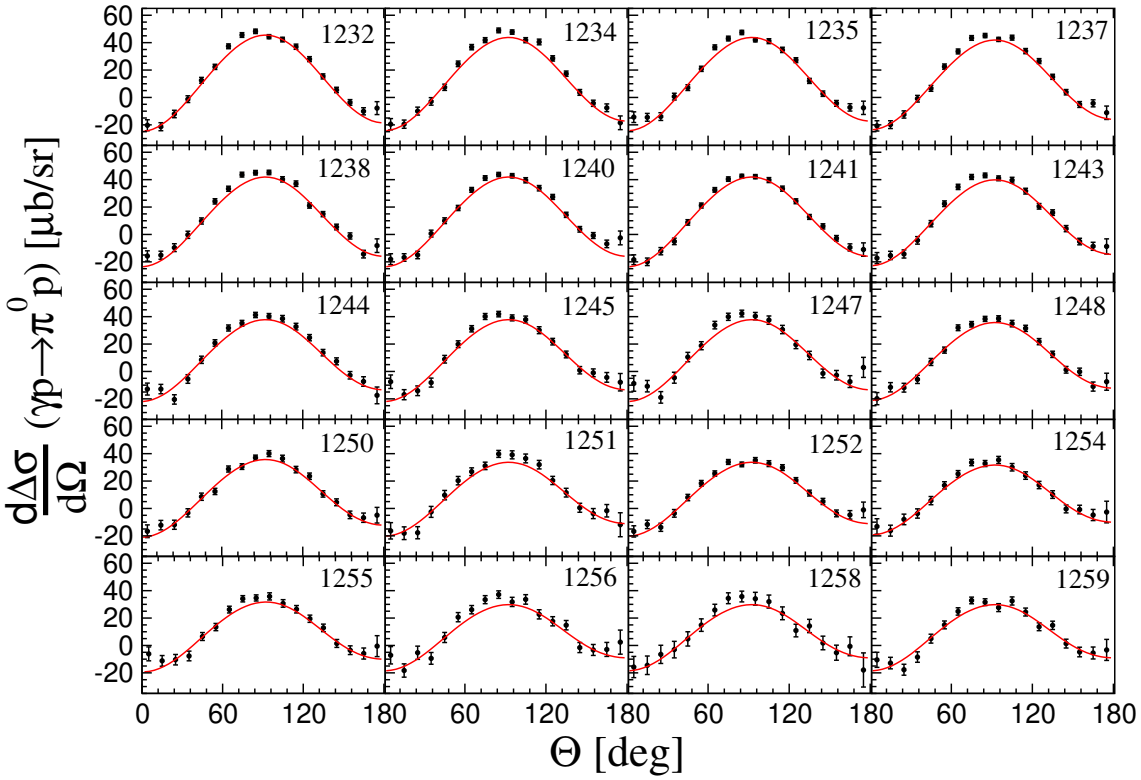


Figure 5: A2MAMI (E. Mornacchi *et al.* Phys. Rev. C 109, 055201 (2024)

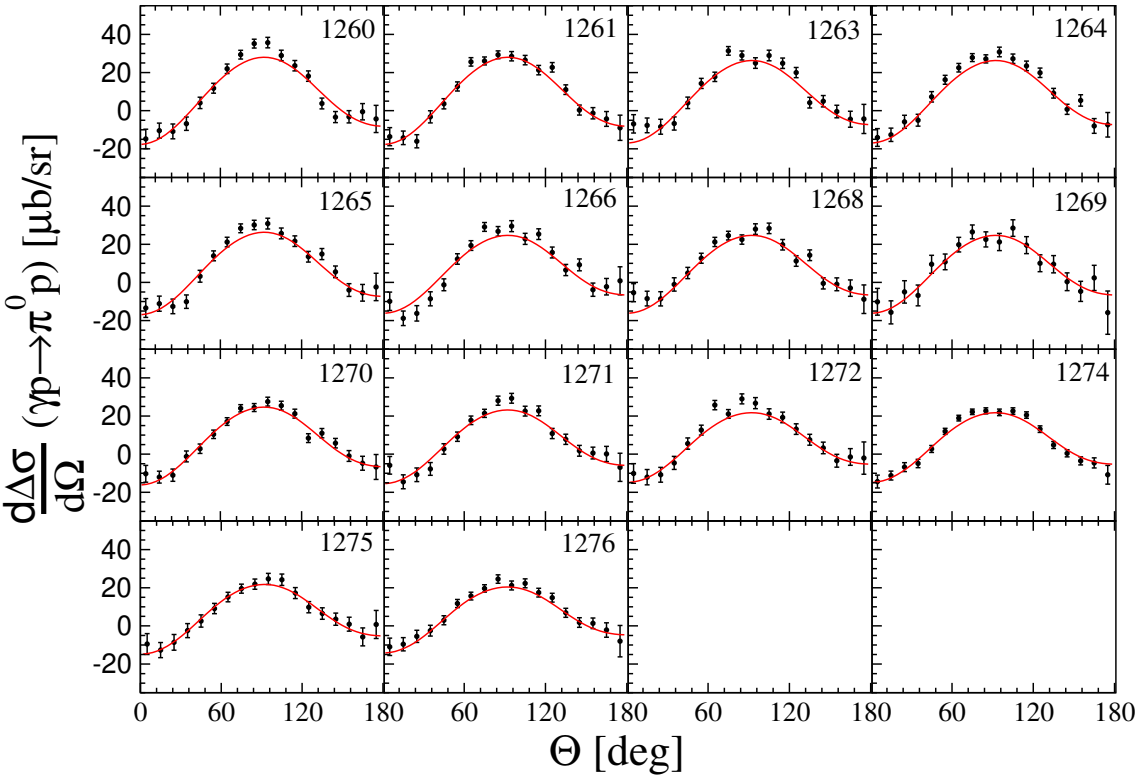
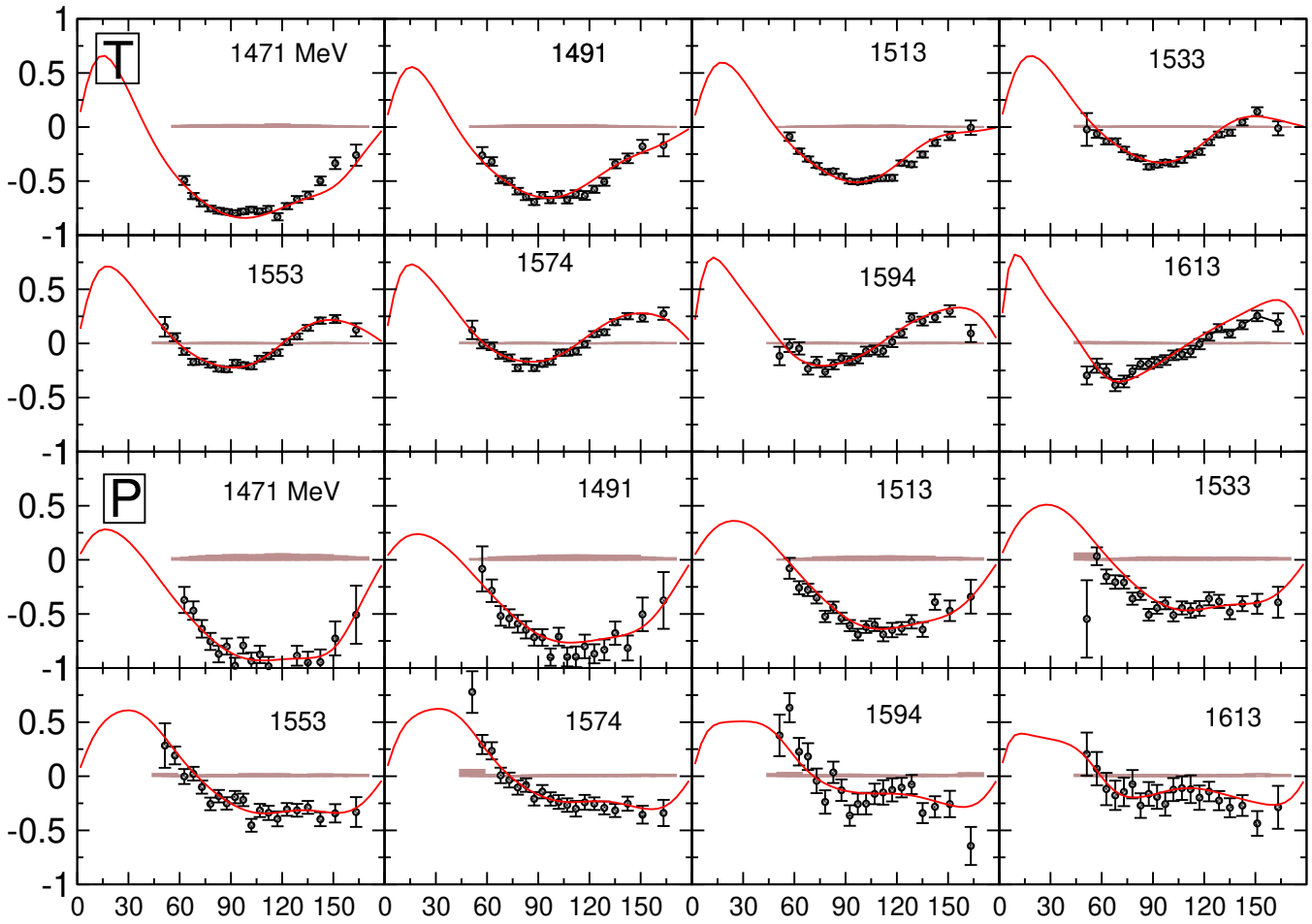
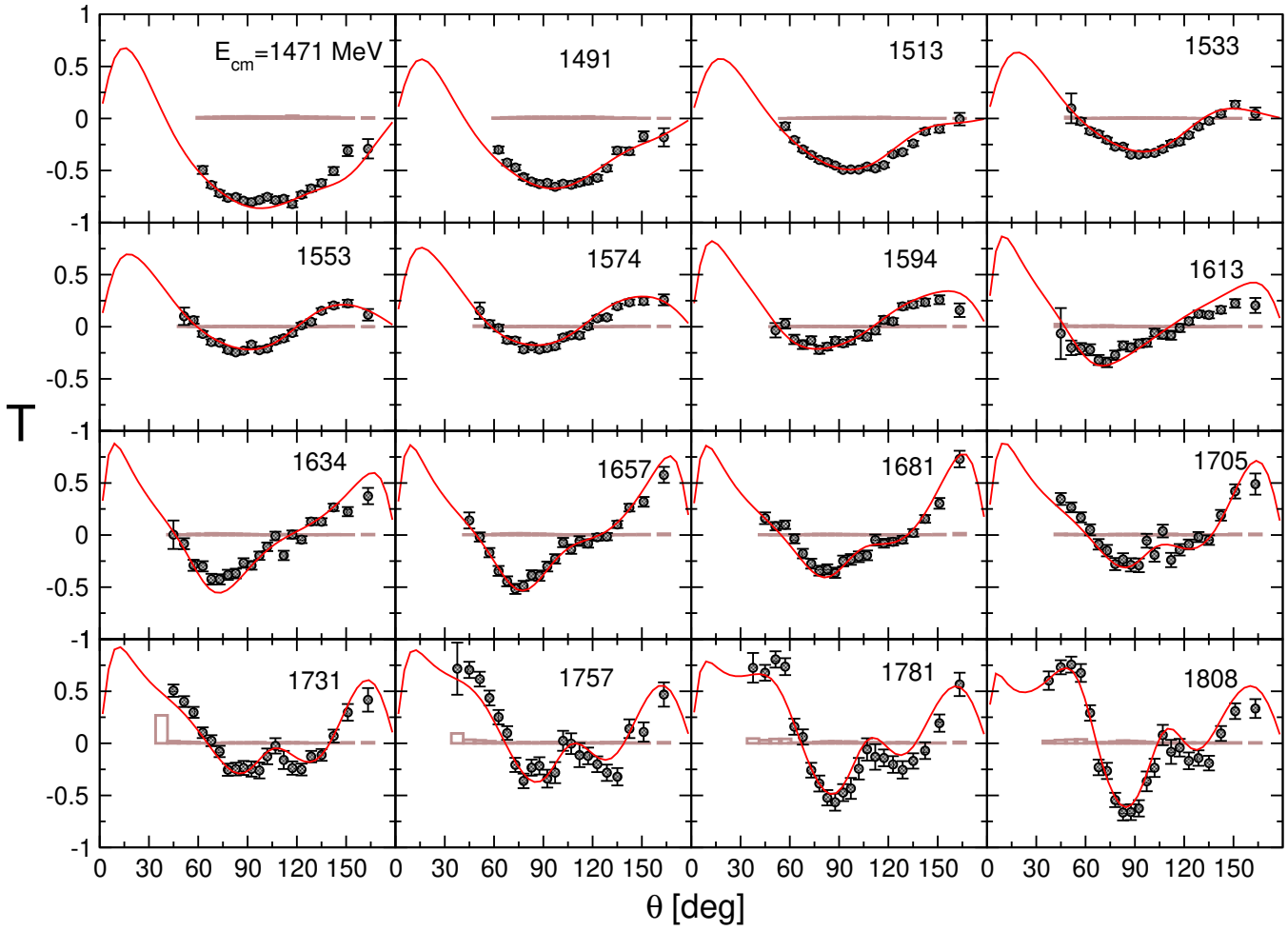
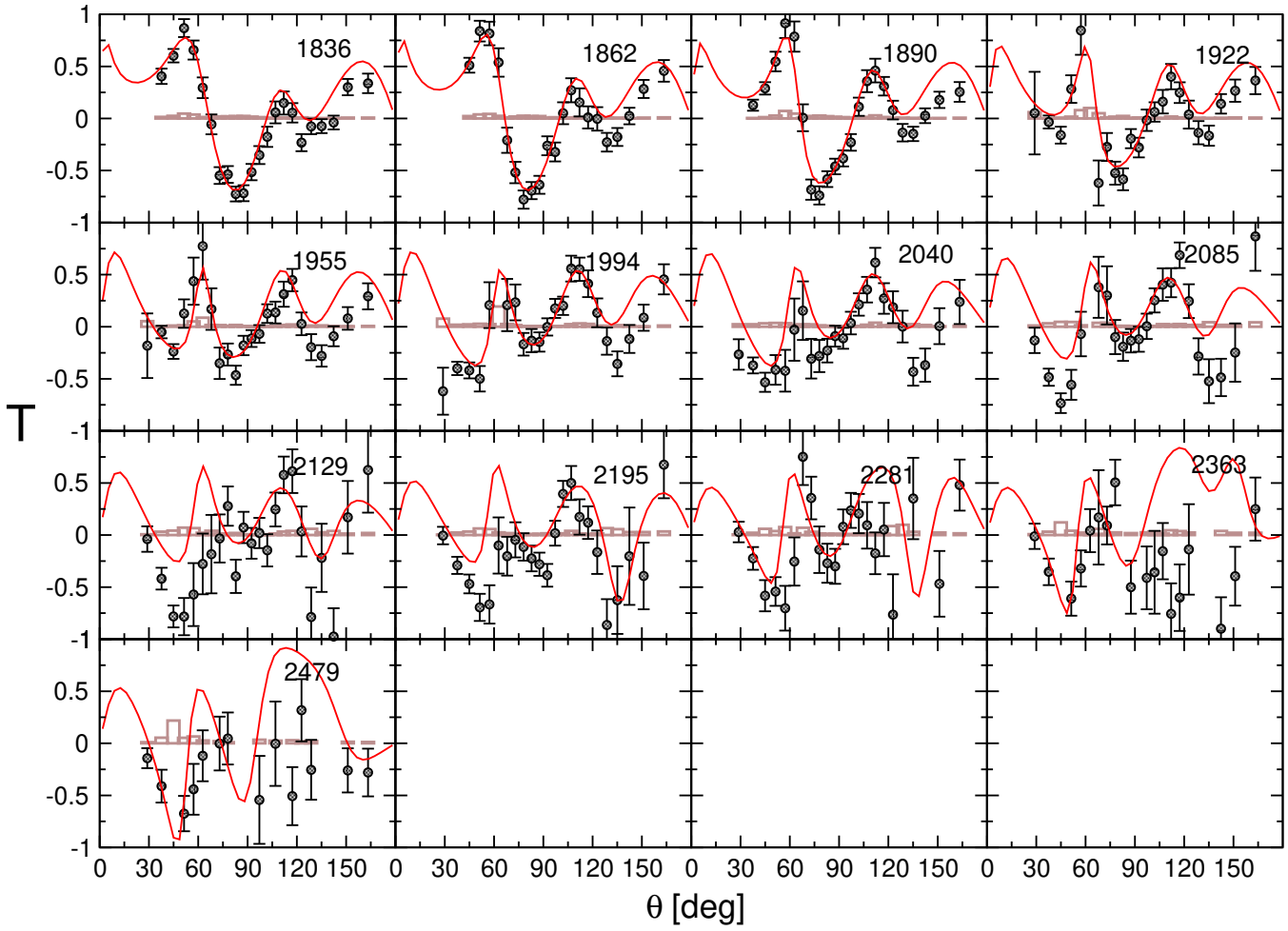
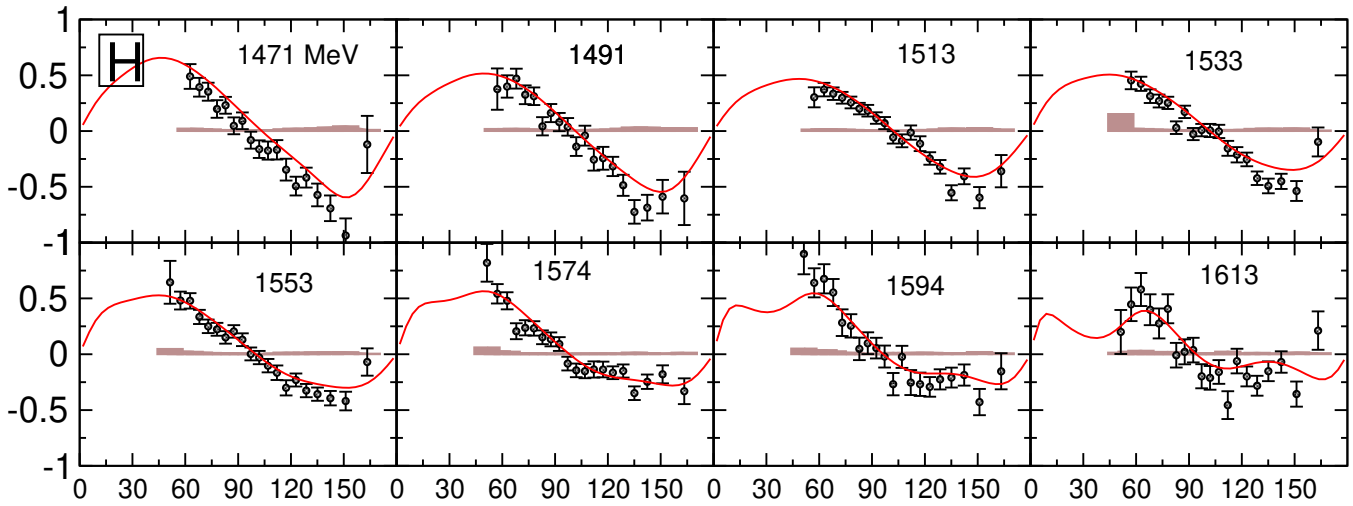


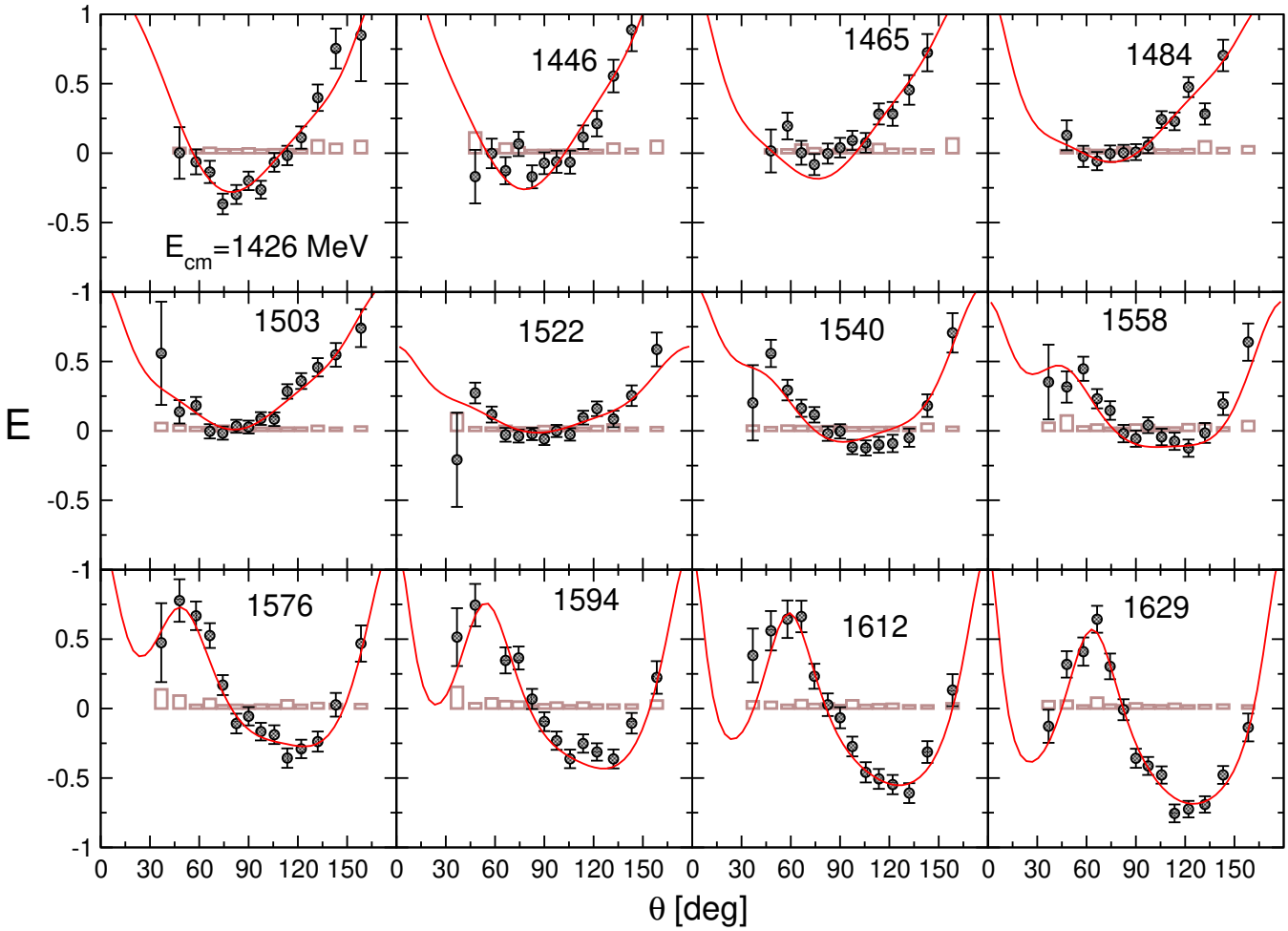
Figure 6: A2MAMI (E. Mornacchi *et al.* Phys. Rev. C 109, 055201 (2024)

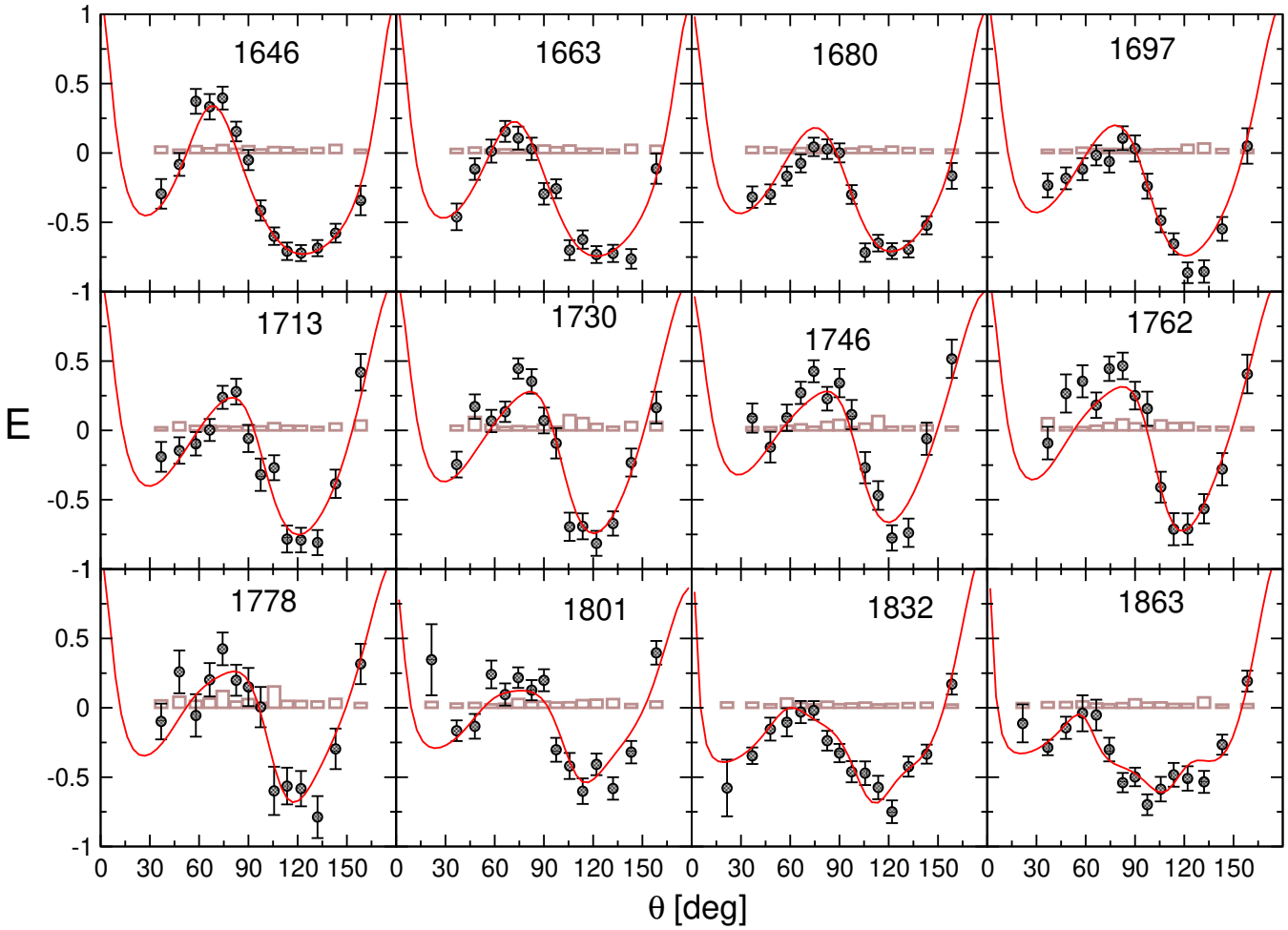

T
1471 MeV
1491
1513
1533
1553
1574
1594
1613
P
1471 MeV
1491
1513
1533
1553
1574
1594
1613
1
0.5
0
-0.5
-1
0 30 60 90 120 150

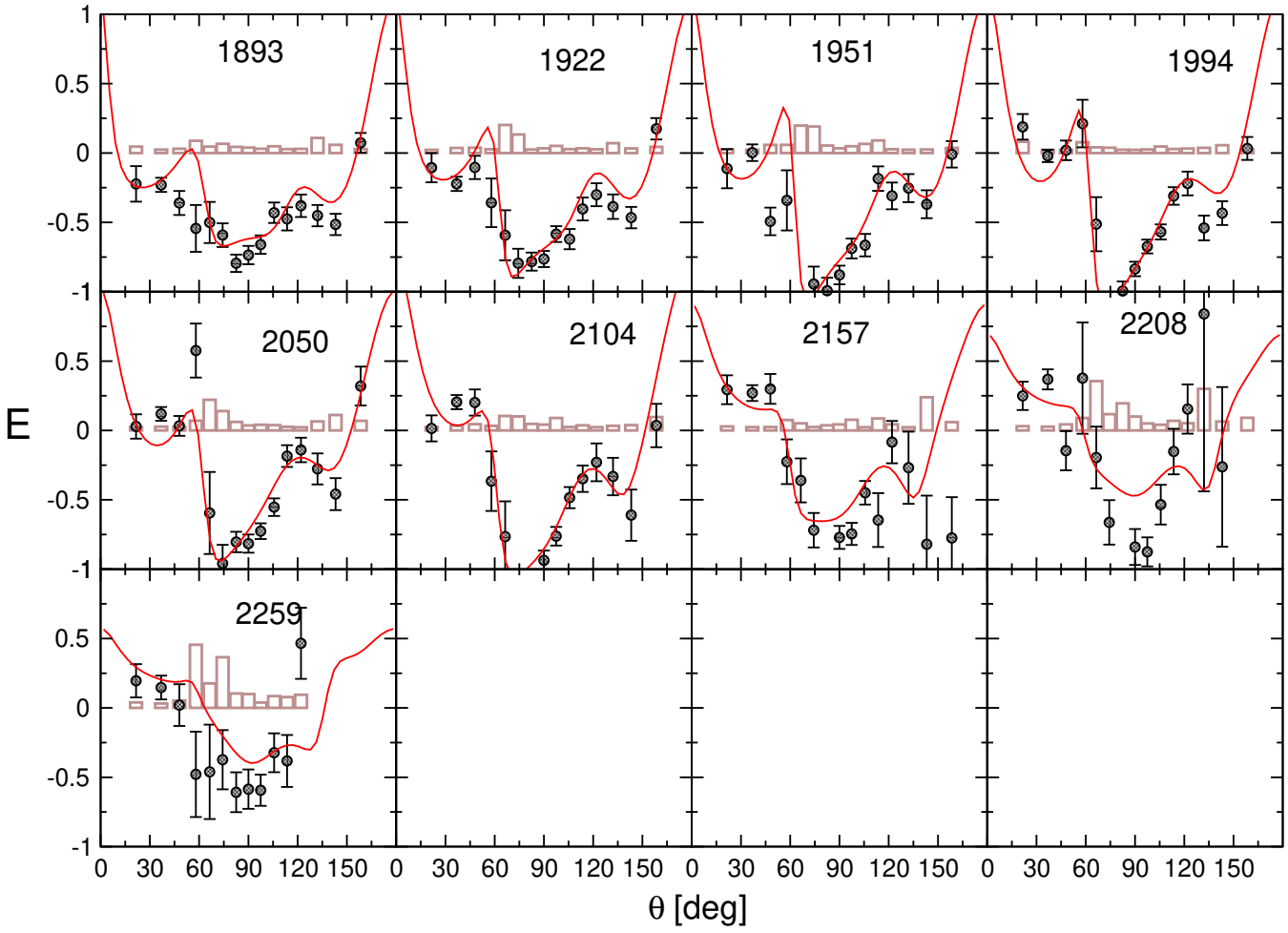

E_cm=1471 MeV
1491
1513
1533
1553
1574
1594
1613
1634
1657
1681
1705
1731
1757
1781
1808
T
θ [deg]


T
θ [deg]
1836
1862
1890
1922
1955
1994
2040
2085
2129
2195
2281
2363
2479

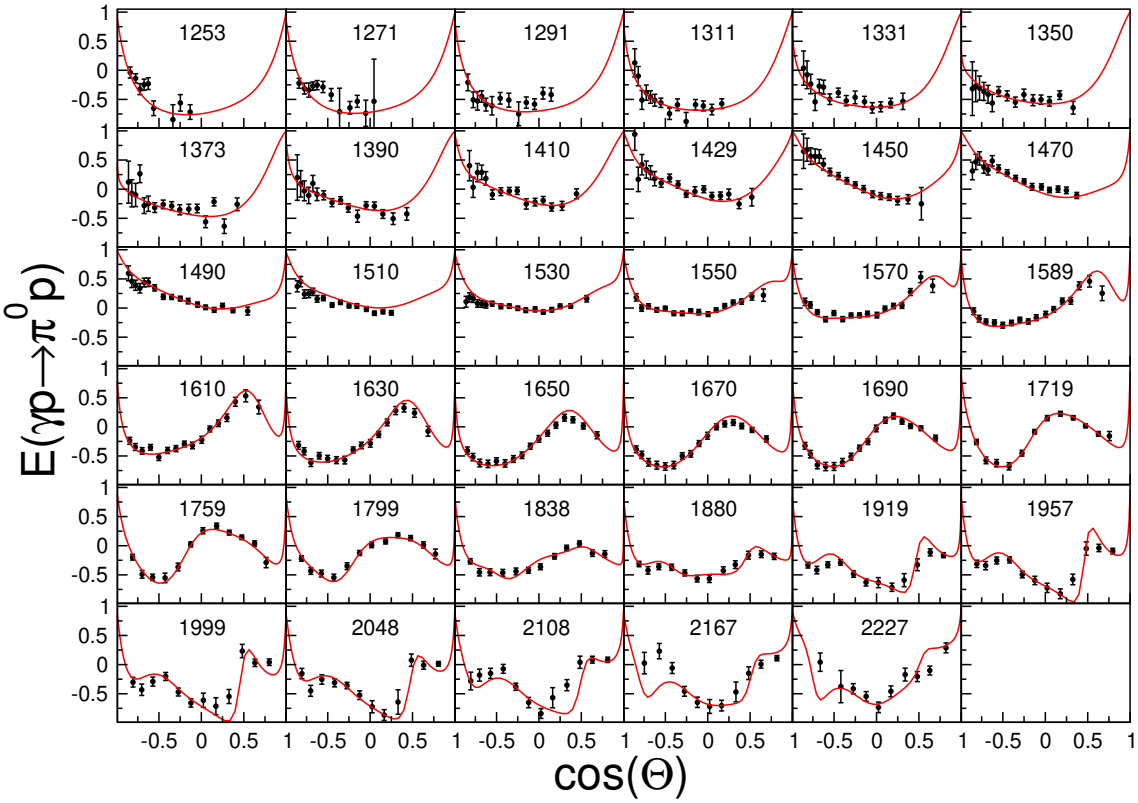

H
1471 MeV
1491
1513
1533
1553
1574
1594
1613
1
0.5
0
-0.5
-1
0 30 60 90 120 150

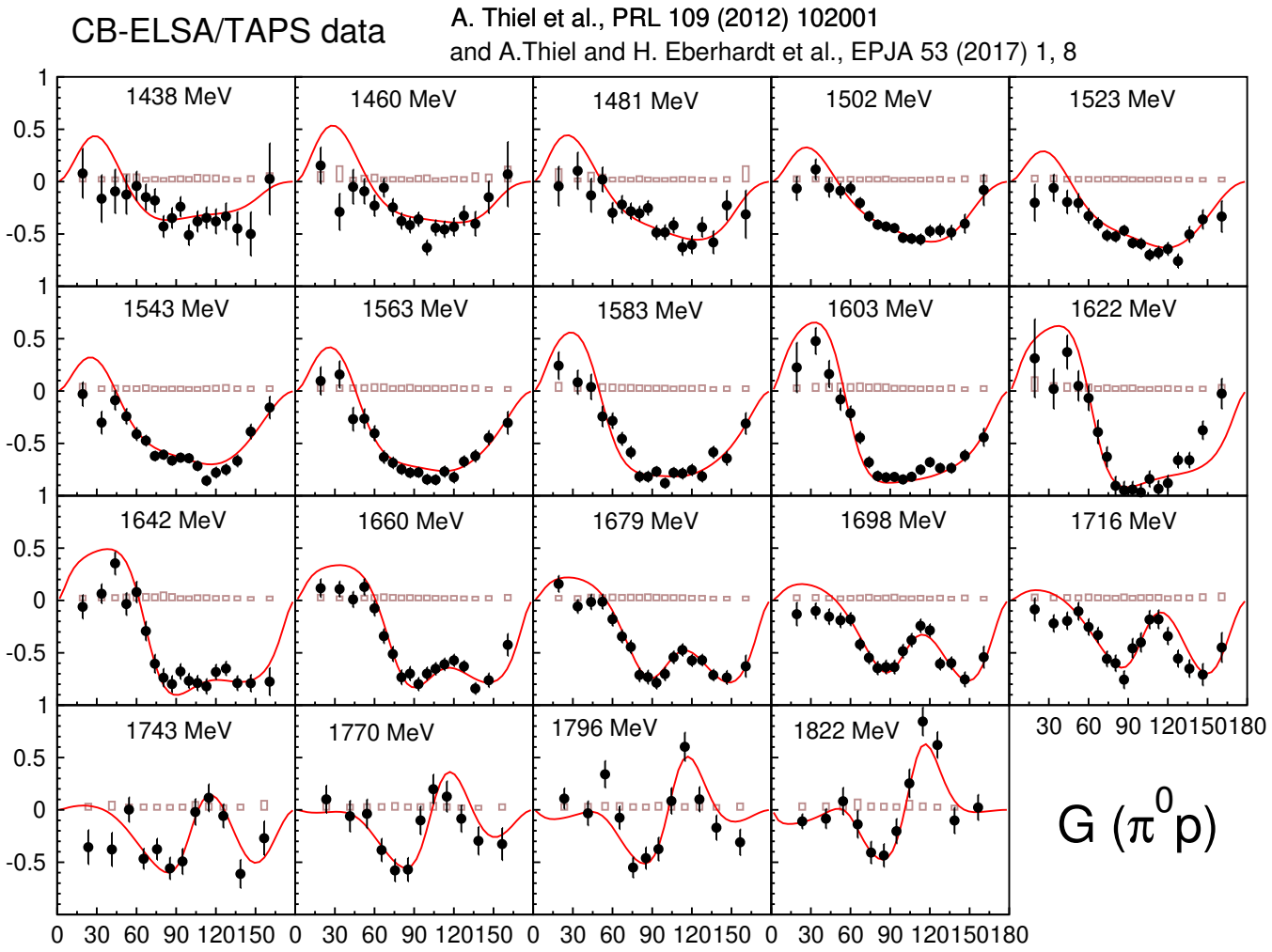

E
θ [deg]
E_cm=1426 MeV
1446
1465
1484
1503
1522
1540
1558
1576
1594
1612
1629
1
0.5
0
-0.5
-1
0
30
60
90
120
150

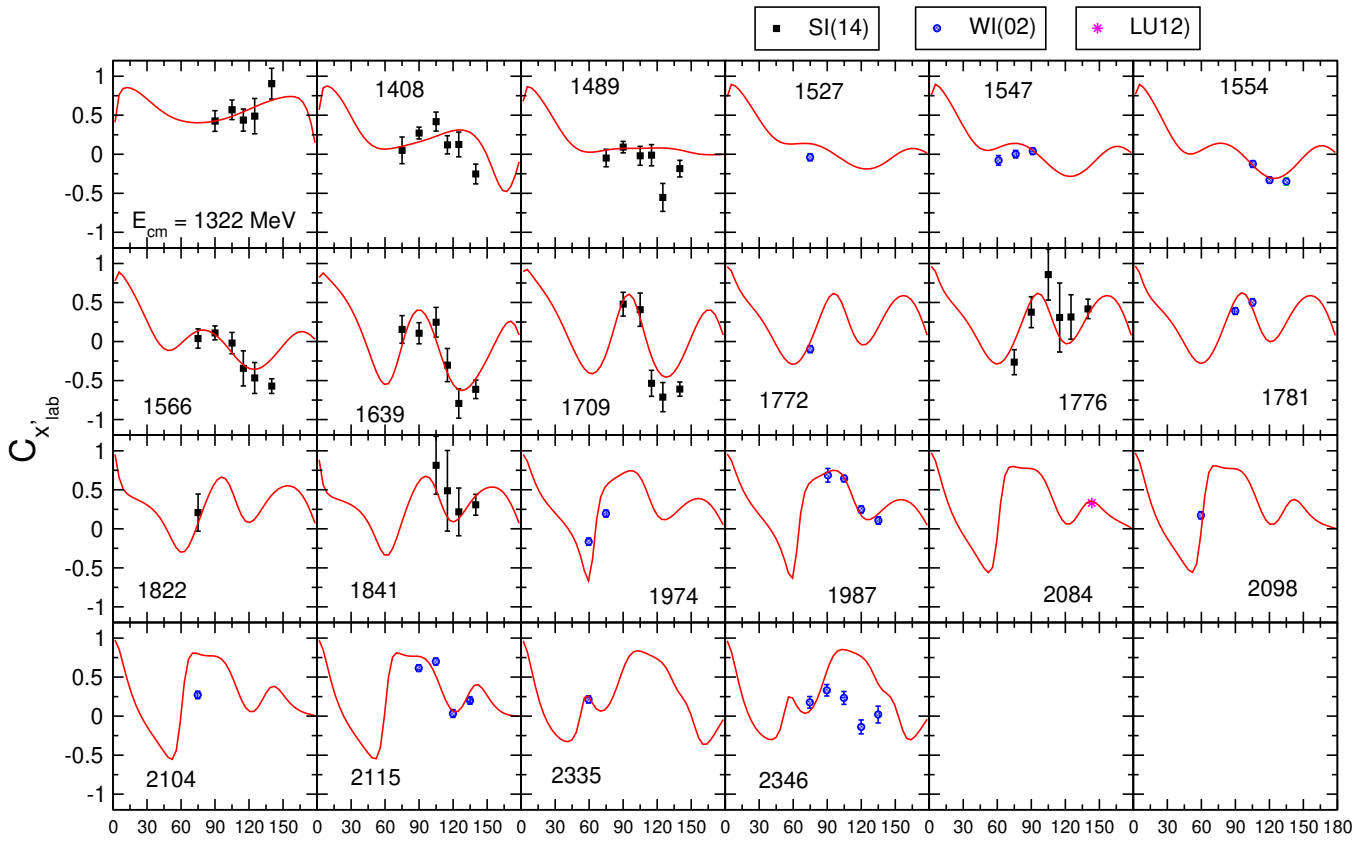

1646
1663
1680
1697
1713
1730
1746
1762
1778
1801
1832
1863
E
θ [deg]
1
0.5
0
-0.5
-1
0
30
60
90
120
150

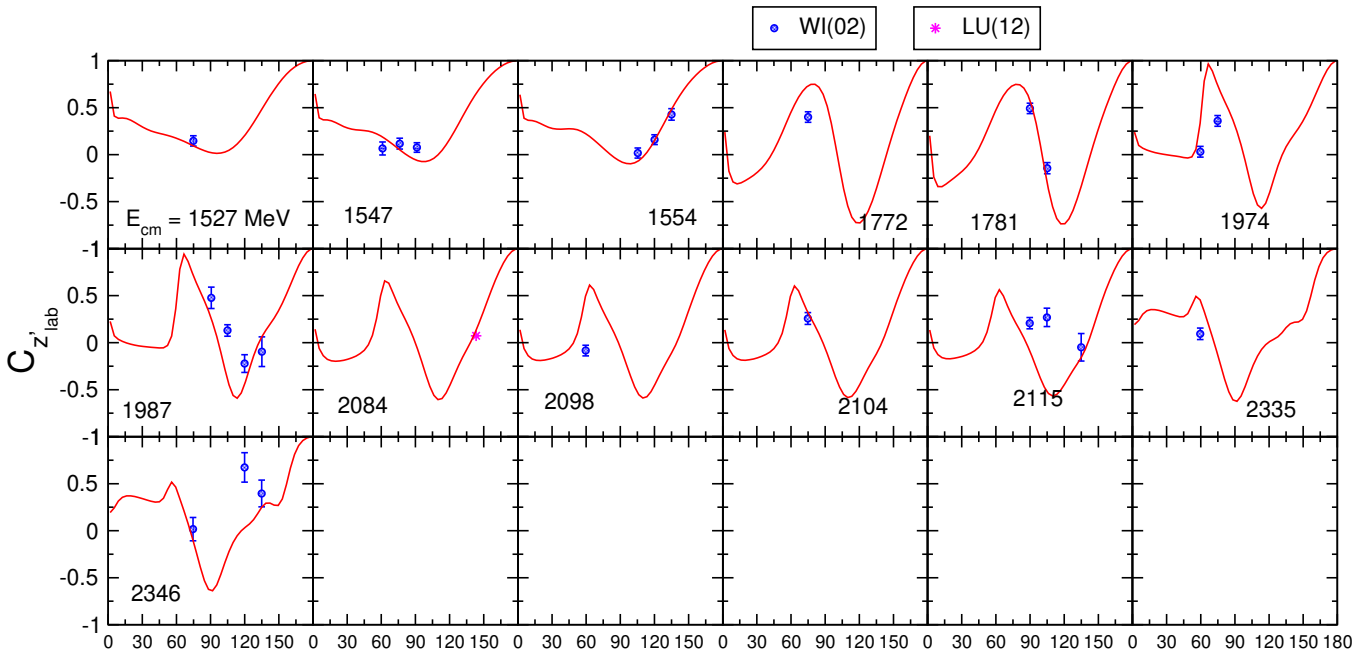

1893
1922
1951
1994
2050
2104
2157
2208
2259
E
θ [deg]
1
0.5
0
-0.5
-1
0
30
60
90
120
150

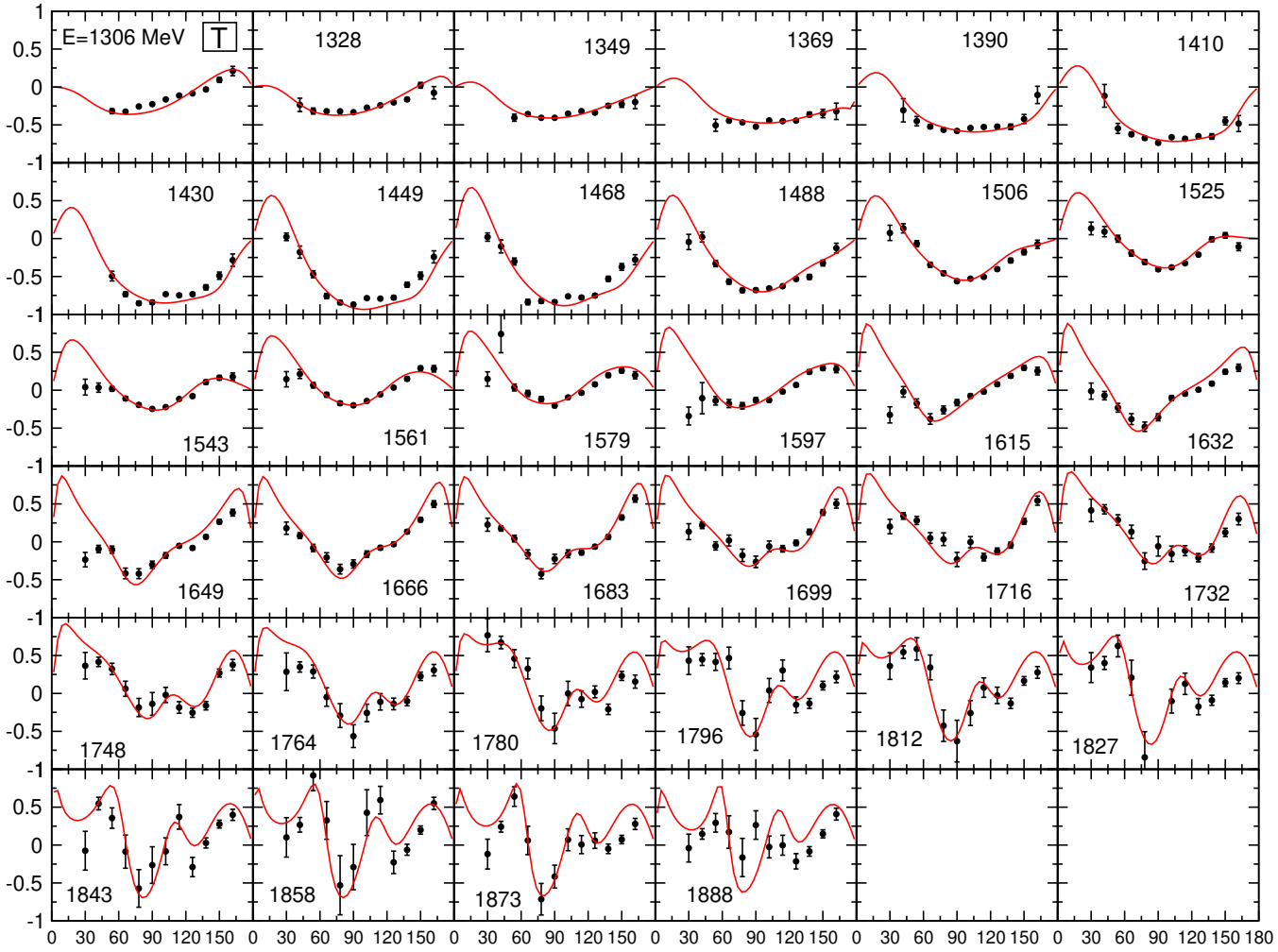
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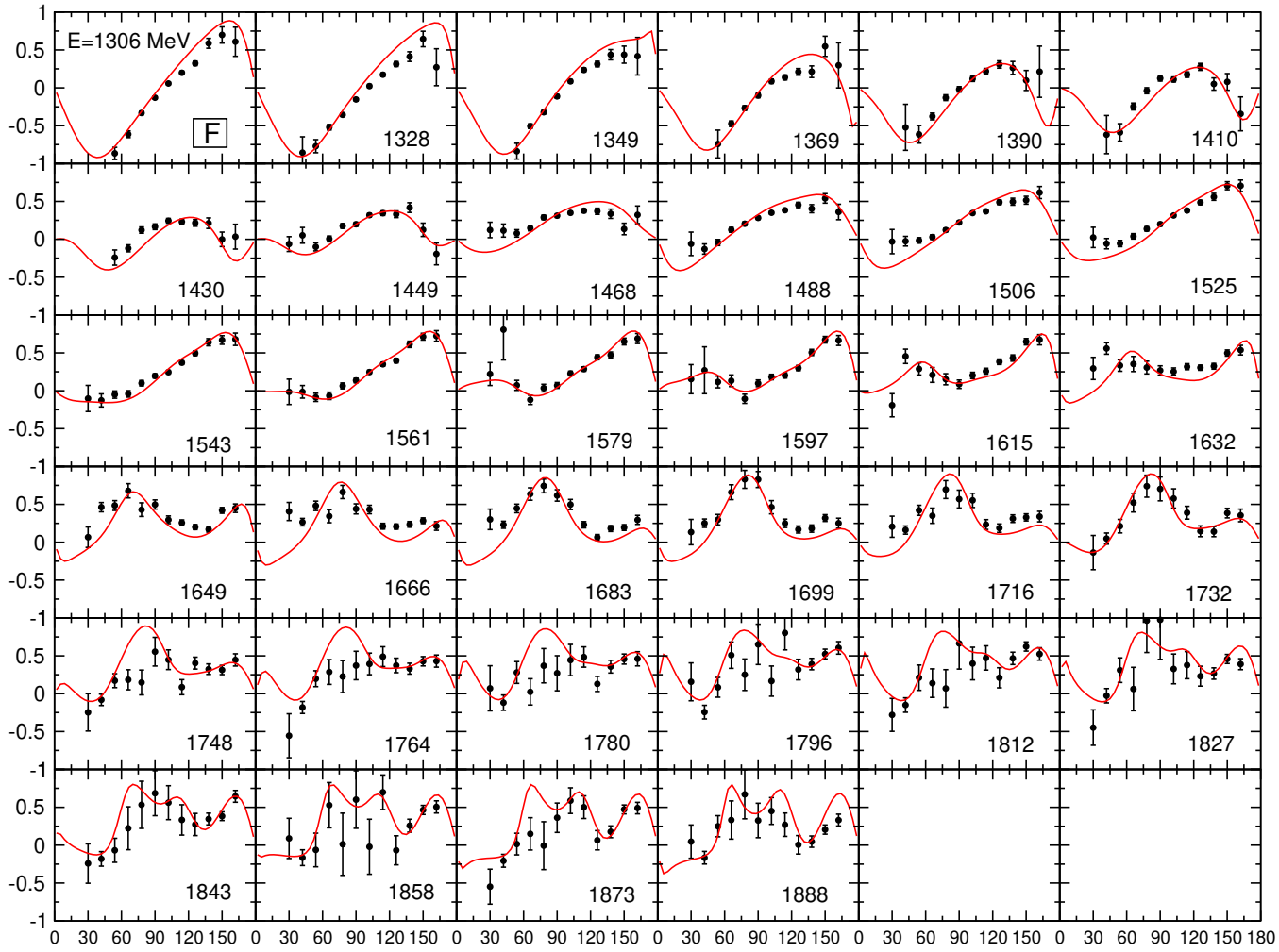



CB-ELSA/TAPS data
A. Thiel et al., PRL 109 (2012) 102001
and A.Thiel and H. Eberhardt et al., EPJA 53 (2017) 1, 8
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1481 MeV
1502 MeV
1523 MeV
1543 MeV
1563 MeV
1583 MeV
1603 MeV
1622 MeV
1642 MeV
1660 MeV
1679 MeV
1698 MeV
1716 MeV
1743 MeV
1770 MeV
1796 MeV
1822 MeV
G (π0p)


SI(14)
WI(02)
LU12)
$C_{x'_{lab}}$
E_{cm} = 1322 MeV
1408
1489
1527
1547
1554
1566
1639
1709
1772
1776
1781
1822
1841
1974
1987
2084
2098
2104
2115
2335
2346


WI(02)
LU(12)
$C_{z'}$ lab
E_{cm} = 1527 MeV
1547
1554
1772
1781
1974
1987
2084
2098
2104
2115
2335
2346


E=1306 MeV
T
1328
1349
1369
1390
1410
1430
1449
1468
1488
1506
1525
1543
1561
1579
1597
1615
1632
1649
1666
1683
1699
1716
1732
1748
1764
1780
1796
1812
1827
1843
1858
1873
1888
1
0.5
0
-0.5
-1
0 30 60 90 120 150 180


E=1306 MeV
F
1328
1349
1369
1390
1410
1430
1449
1468
1488
1506
1525
1543
1561
1579
1597
1615
1632
1649
1666
1683
1699
1716
1732
1748
1764
1780
1796
1812
1827
1843
1858
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1888
1 0.5 0 -0.5 -1
0 30 60 90 120 150 180

Data references

- Differential cross section $\gamma p \to \pi^0 p$:
  - SC(01) MAIN SCHMIT, PRL87, 232501(2001), BE
  - FU(96) MAIN FUCHS, PLB368, 20(96), AHRENS,
  - BE(90) MAIN BECK, PRL65, 1841(90) REVISED 7
  - HO(12)PMAIN HORNIDGE, ARXIV:1211.5495, PRAK
  - BG(97) SAL BERGSTROM, PRC55, 2016(97),
  - HI(69) BONN HITZEROTH, NCA60, 467(69)
  - GO(68) LEBE GOVORKOV, SJNP6, 370(68)
  - GZ(74)1BONN GENZEL, ZP268, 43(74)
  - BE(06) MAIN BECK, EPJA28S1, 173(2006)
  - SC(97)PMAIN SCHNEIDER, PHD THESIS, 1997, AH
  - HA(96)PMAIN HAERTER, PHD THESIS, 1996, AHRE
  - AG(75) SACL ARGAN, NPA237, 447(75)
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  - BE(97) MAIN BECK, PRL78, 606(1997)
  - AK(78) LEBE ALEKSANDROV, SJNP28, 344(78)
  - AH(04) MAIN AHRENS, EPJA21, 323(2004)
  - AK(77) LEBE ALEKSANDROV, SJNP25, 43(77)
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  - HE(73) TOKY HEMMI, PLB43, 79(73)
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  - SC(10) MAIN SCHUMANN, EPJA43, 269(2010)
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  - BA(05)1GRAA BARTALINI, EPJA26, 399(2005)
  - AM(73) LUND S.ALMEHED, CONF BONN 73
  - AH(02) MAIN AHRENS, PRL88, 232002(2002)
  - WO(68) CALT F.WOLVERTON, PH.D THESIS 68
  - AL(79) BONN ALTHOFF, ZPC1, 327(79)
  - WC(60) CALT WORLOCK, PR117, 537(60)
  - WO(68)PCALT F.WOLVERTON, PH.D THESIS 1968
  - KR(99) MAIN KRUSCHE, EPJA6, 309(1999)
  - SA(65) STAN DE.STAEBLER, PRB140, 336(65)
  - BN(75) DNPL BARTON, NPB84, 449(1975)
  - DU(07) JLAB DUGGER, PRC76, 025211(2007)
  - BH(71) DNPL P.S.L.BOOTH, PRP DNPL P95 71
  - DE(69) ORSA DELCOURT, PLB29, 70(69)
  - WR(67) CALT WARD, PR159, 1176(67)

- TL(62) CALT TALMAN, PRL9, 177(1962)
- BU(68) DESY BUSCHHORN, PRL20, 230(1968)
- ZE(88)PBONN ZENZ, THESIS BONN-IR-88-12
- BH(75) DNPL BOOTH, NPB84, 437(75)
- CR(11) BONN CREDE, PRC84, 055203(2011)
- HU(77) BONN HUSMANN, NPB126, 436(77)
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- BF(75) BONN BREFELD, NPB100, 93(1975)
- BG(68) DESY BRAUNSCHWEIG, PLB26, 405(1968)
- AL(79)1BONN ALTHOFF, ZPC1, 257(79)
- LO(70) BONN B.LOHR, PRP PI1-98 70
- SU(07) LEPS SUMIHAMA, PLB657, 32(2007)
- BO(67) CEA BOLON, PRL18, 926(1967)
- SH(79) CORN SHUPE, PRD19, 1921(1979)
- BG(70) DESY BRAUNSCHWEIG, NPB20, 191(1970)
- AD(15) MAMI A2 Phys.Rev.C 92 024617 (2015)

- Beam asymmetry Σ $\gamma p \to \pi^0 p$:
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  - BL(01) LEGS BLANPIED, PRC64, 025203(01)
  - BJ(69) FRAS BARBIELLINI, PR184, 1402(69)
  - DR(64) STAN DRICKEY, PRB136, 543(64)
  - BE(06) MAIN BECK, EPJA28S1, 173(2006)
  - BL(92) LEGS BLANPIED, PRL69, 1880(1992), SA
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  - GB(74) KHAR GORBENKO, JETPL19, 340(74)
  - GB(77) KHAR GORBENKO, SJNP26, 167(77)
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  - AV(83)2YERE R.O.AVAKYAN, PRP EPI-674-6 83
  - AV(83)1YERE AVAKYAN, SJNP38, 721(83)
  - AV(79) YERE AVAKYAN, SJNP29, 625(79)
  - EL(09) BONN ELSNER, EPJA39, 373(2009)
  - AV(84) YERE AVAKYAN, SJNP40, 588(84), GRAPH
  - AS(72) CEA ALSPECTOR, PRL28, 1403(72)
  - AV(77) YERE AVAKYAN, SJNP26, 537(77)
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  - AT(86) YERE ASATURYAN, JETPL44, 341(86)

- AB(74) YERE ABRAHAMIAN, PLB48, 463(1974)
- SP(10) BONN SPARKS, PRC81, 065210(2010)
- BS(76) DNPL BUSSEY, NPB104, 253(76)
- BS(79)1DNPL BUSSEY, NPB154, 492(79)
- SU(07) LEPS SUMIHAMA, PLB657, 32(2007)
- DU(13) Dugger *et al.* (CLAS Collaboration) PRC88, 065203, PRC89, 029901 (2014)

- Recoil Polarization $\gamma p \to \pi^0 p$:
  - AL(68) BONN ALTHOFF, PLB26, 677(68)
  - AL(66) BONN ALTHOFF, ZP194, 135(66)
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  - BM(69) BONN P.BLUEM, CONF DARES 69
  - AL(66)1BONN ALTHOFF, ZP194, 144(66)
  - KA(80) TOKY KATO, NPB168, 1(80)
  - TR(72) BONN D.TRINES, PRP PI1-160 72
  - BV(80) KHAR BRATASHEVSKI, NPB166, 525(80),
  - HK(68) TOKY HAYAKAWA, JPSJ25, 307(68)
  - ML(65) STAN MALOY, PRB139, 733(65)
  - BV(86) KHAR BRATASHEVSKI, UFJ31, 1306(1986)
  - GB(74) KHAR GORBENKO, JETPL19, 340(74)
  - GB(75) KHAR GORBENKO, JETPL22, 186(75)
  - GB(77) KHAR GORBENKO, SJNP26, 167(77)
  - BM(70) BONN P.BLUEM, PRP PI1-105 70
  - DC(76) KHAR DEREBCHINSKI, JETP43, 218(76)
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  - ZY(78) KHAR ZYBALOV, SJNP28, 52(78)
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  - GC(73) KHAR GONCHAROV, JETP37, 205(73)
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  - AV(88) YERE AVAKYAN, SJNP48, 1030(88)
  - BD(67) CALT BLOOM, PRL19, 671(67)
  - BV(87) KHAR BRATASHEVSKI, SJNP46, 635(87)
  - WI(02) JLAB WIJESOORIYA, PRC66, 034614(2002
  - BV(85) KHAR BRATASHEVSKI, SJNP41, 960(85)
  - BV(81) KHAR BRATASHEVSKI, SJNP33, 538(81)
  - AV(87) YERE AVAKYAN, SJNP46, 853(87)
  - AV(83) YERE AVAKYAN, SJNP37, 199(83)
  - PR(72) DNPL PRENTICE, NPB41, 353(72)
  - AG(89) YERE AGABABYAN, SJNP50, 834(89)
  - AT(86) YERE ASATURYAN, JETPL44, 341(86)

- BM(76)1BONN BLUEM, ZPA278, 275(76)
- AV(91) YERE AVAKYAN, SJNP53, 448(91)
- DC(74) KHAR DEREBCHINSKI, JETP39, 30(74)
- TN(73) CEA TANAKA, PRD8, 1(73)
- BS(79)1DNPL BUSSEY, NPB154, 492(79)
- LU(12) JLAB LUO, PRL108, 222004(2012)
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• Target asymmetry T $\gamma p \to \pi^0 p$:

- BO(98) BONN BOCK, PRL81, 534(1998)
- BL(83) KHAR BELYAEV, NPB213, 201(83)
- GB(78) KHAR GORBENKO, SJNP27, 638(78)
- FK(78) TOKY FUKUSHIMA, NPB136, 189(78)
- FE(76)1TOKY FELLER, NPB110, 397(76)
- GB(74) KHAR GORBENKO, JETPL19, 340(74)
- GB(77) KHAR GORBENKO, SJNP26, 167(77)
- BH(77) DNPL BOOTH, NPB121, 45(77)
- AG(89) YERE AGABABYAN, SJNP50, 834(89)
- AT(86) YERE ASATURYAN, JETPL44, 341(86)
- HH(77) BONN HERR, NPB125, 157(77)
- BS(79)1DNPL BUSSEY, NPB154, 492(79)
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• G $\gamma p \to \pi^0 p$:

- AH(05) MAIN AHRENS, EJPA26, 135(2005)
- BH(79) DNPL BUSSEY, NPB159, 383(79)
- BH(77)1DNPL P.S.L.BOOTH, ANNUAL REPORT 77
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• H $\gamma p \to \pi^0 p$:

- BH(79) DNPL BUSSEY, NPB159, 383(79)
- BH(77)1DNPL P.S.L.BOOTH, ANNUAL REPORT 77
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• Δ_{13} $\gamma p \to \pi^0 p$:

- AH(04) MAIN AHRENS, EPJA21, 323(2004), PEDR
- AH(02) MAIN AHRENS, PRL88, 232002(2002), PR
- A2MAMI (E. Mornacchi *et al.* Phys. Rev. C 109, 055201 (2024)

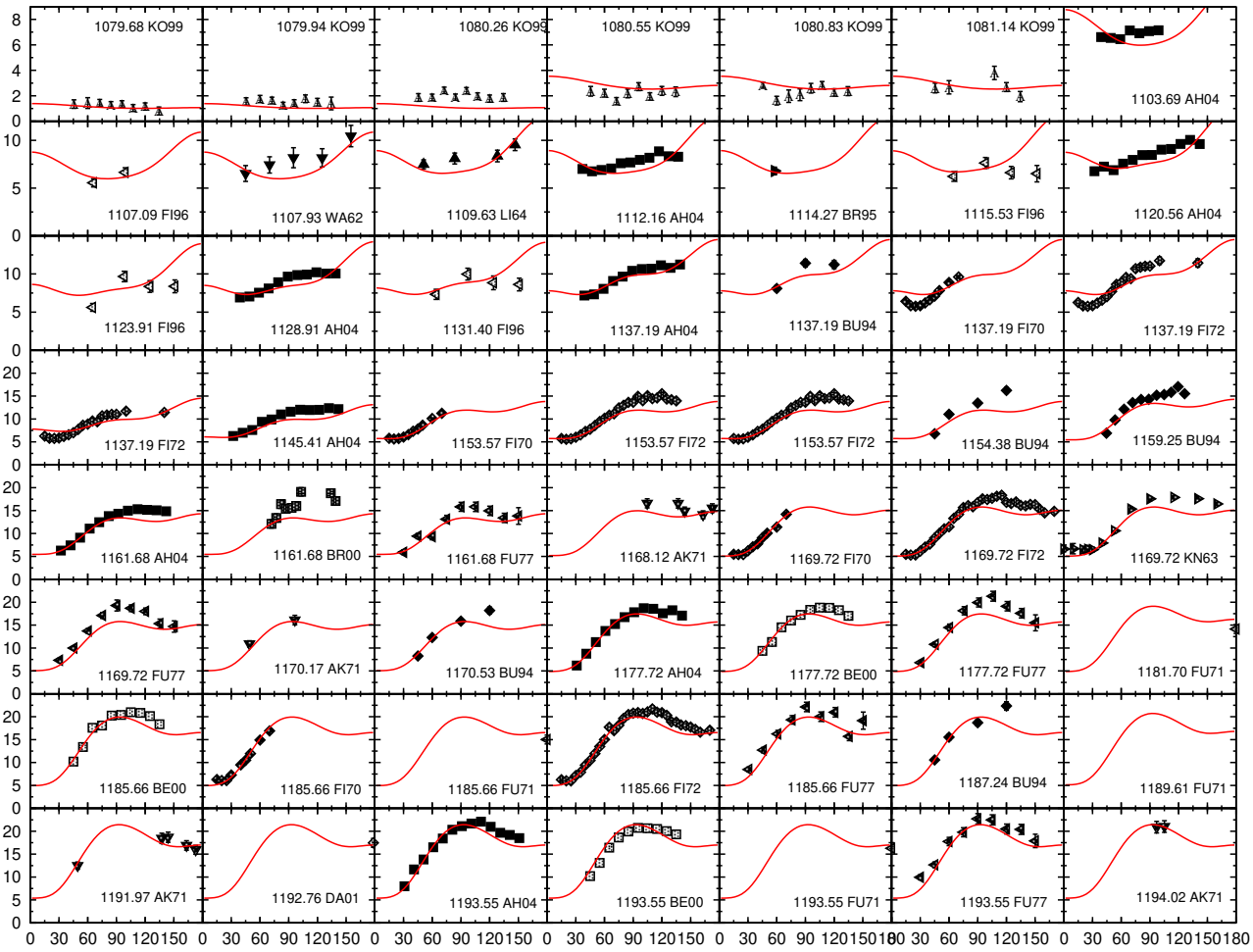
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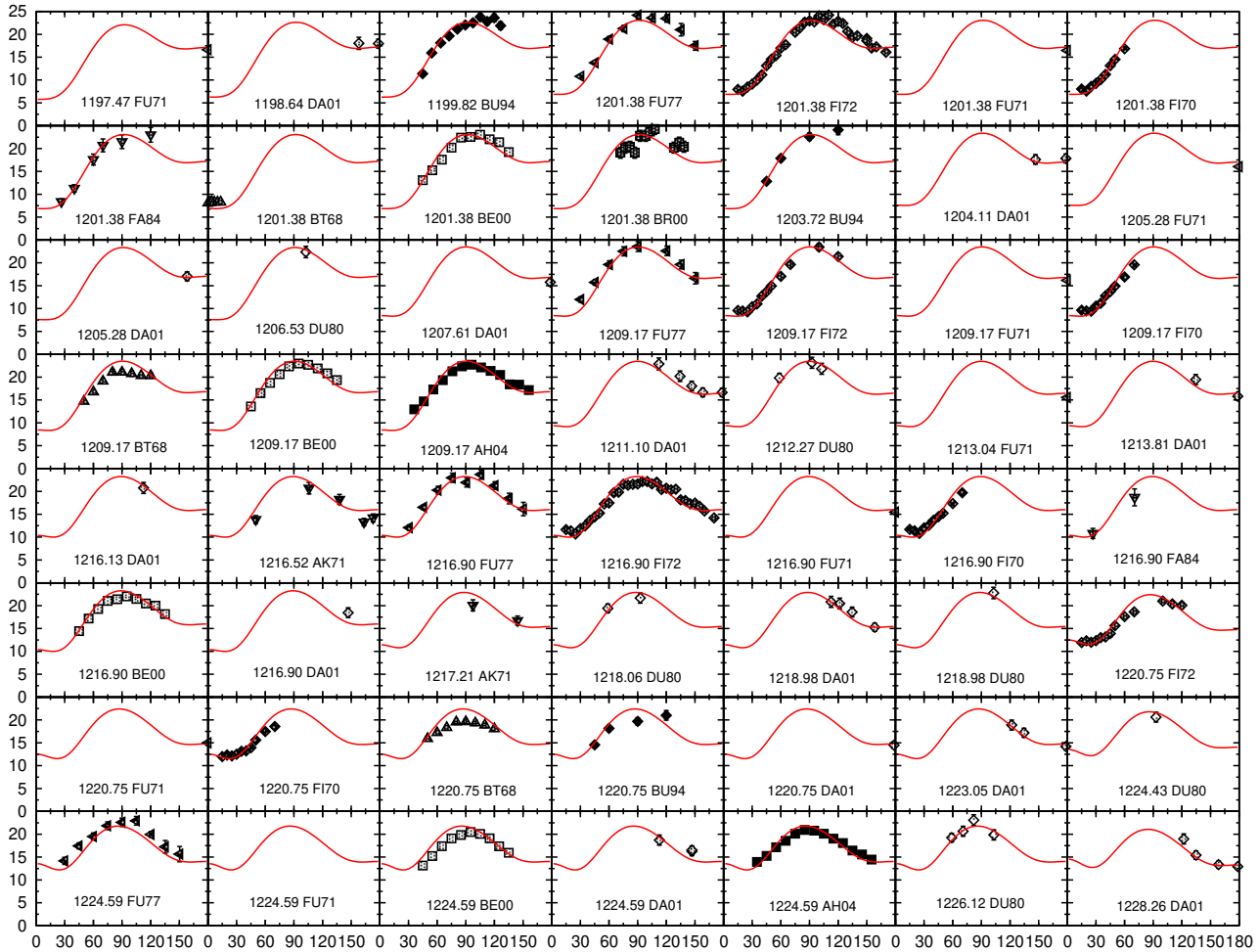
- GO(13): Gottschall *et al.* [CBELSA/TAPS Collaboration] PRL 112, 012003 (2014)
- Gottschall *et al.* [CBELSA/TAPS Collaboration] EPJA 57, 40 (2021)
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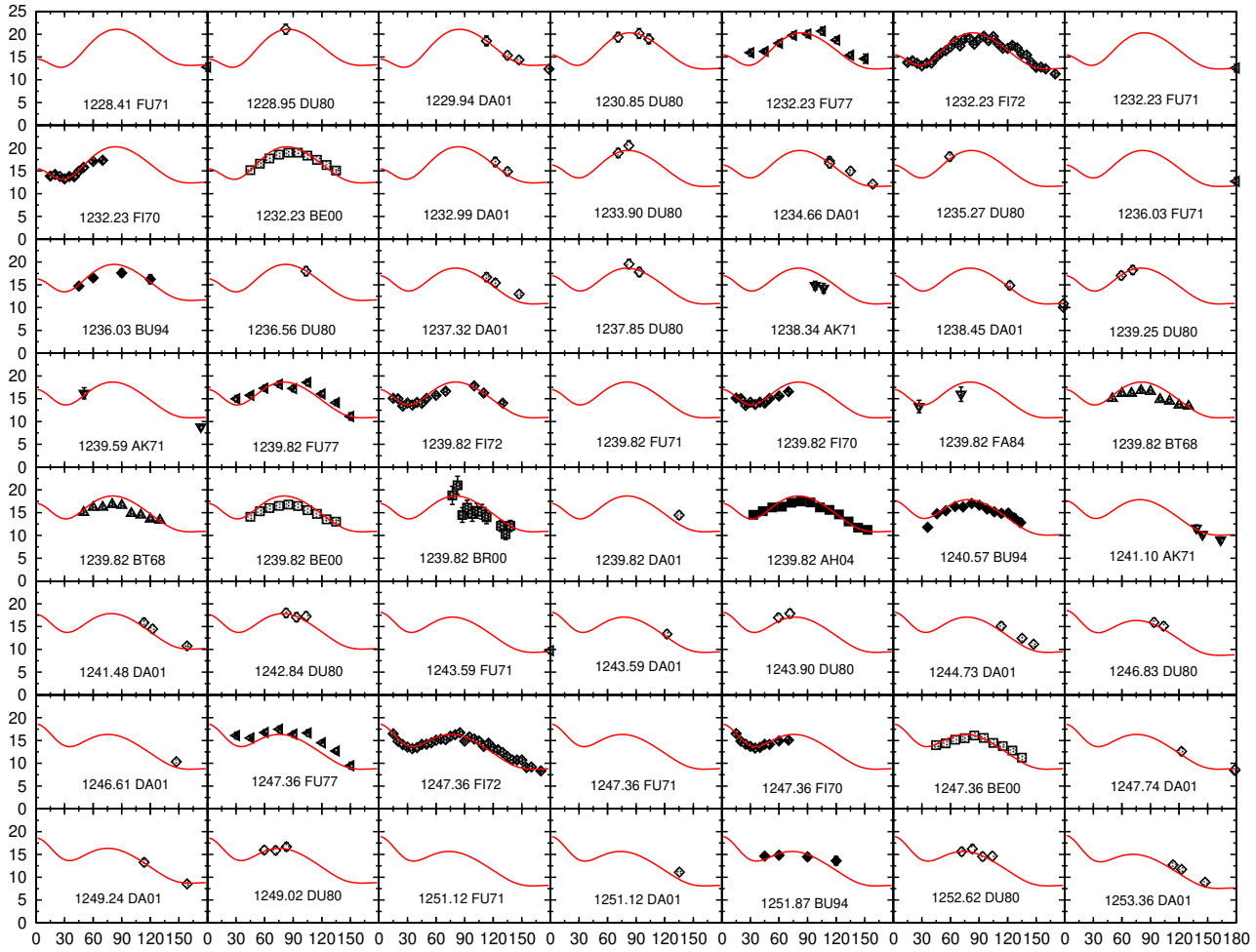
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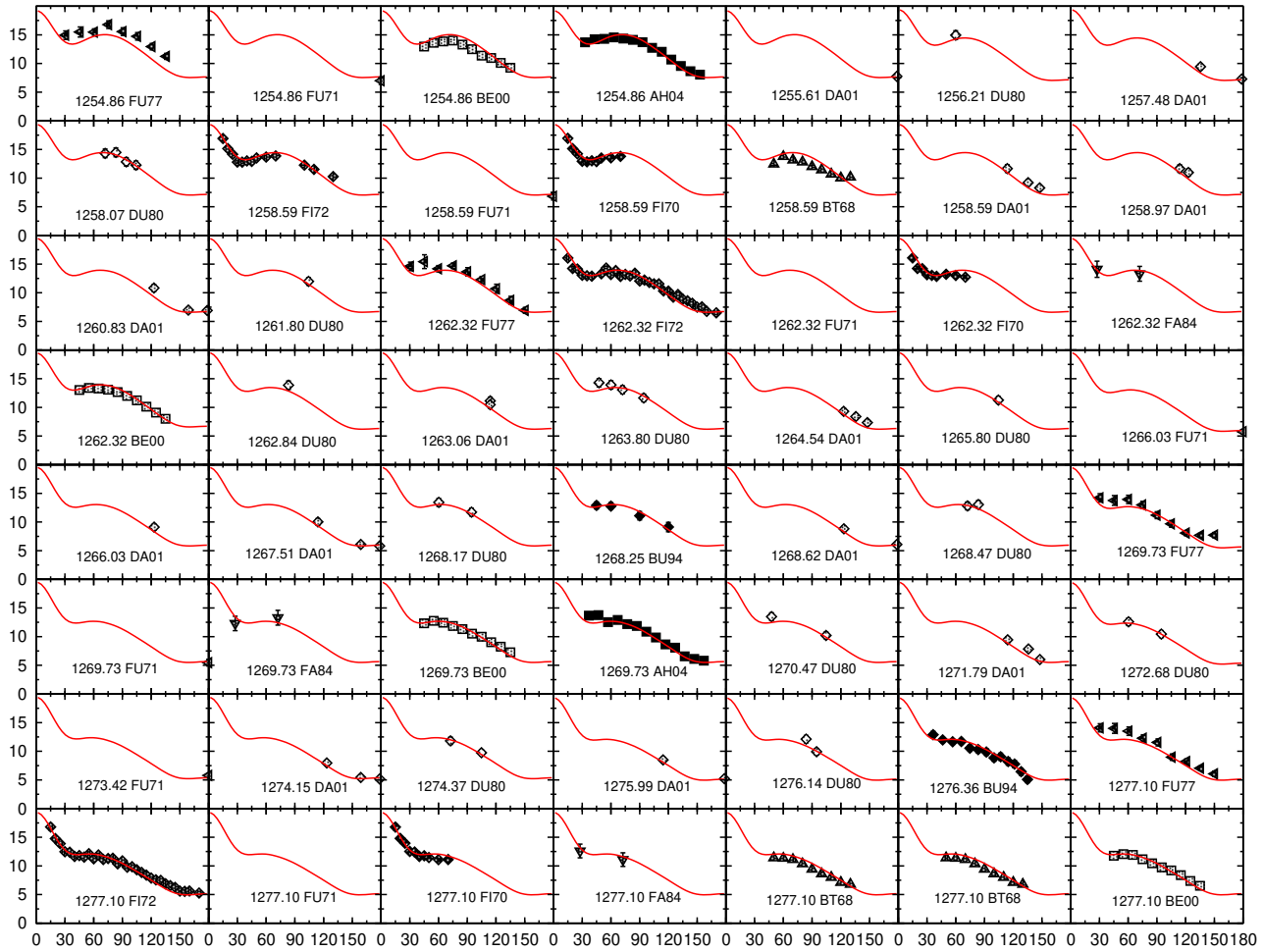
- SI13 Sikora *et al.* [A2 Collaboration at MAMI] PRL 112, 022501 (2013)
- WI02 Wijesooriya *et al.* [JLab Hall A Collaboration] PRC 66, 034614 (2002)
- LU12 *et al.* [GEp-III and GEp2γ Collaborations], Phys. Rev. Lett. 108, 222004 (2012)

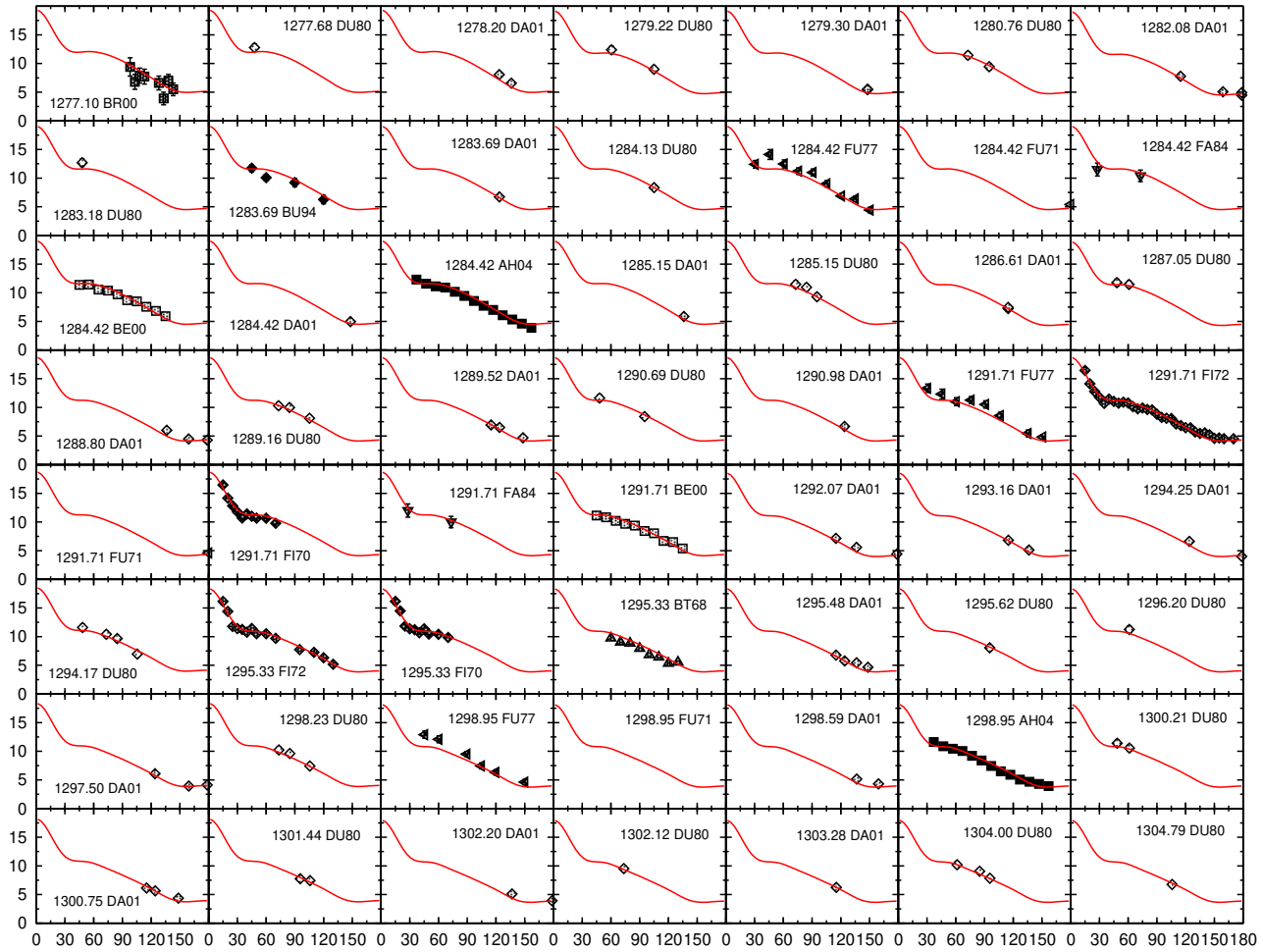
- C_z $\gamma p \to \pi^0 p$:
  - WI02 Wijesooriya *et al.* [JLab Hall A Collaboration] PRC 66, 034614 (2002)
  - LU12 *et al.* [GEp-III and GEp2γ Collaborations], Phys. Rev. Lett. 108, 222004 (2012)
- F $\gamma p \to \pi^0 p$:
  - J. R. M. Annand *et al.* [A2 and MAMI Collaborations] Phys. Rev. C **93**, 055209 (2016)

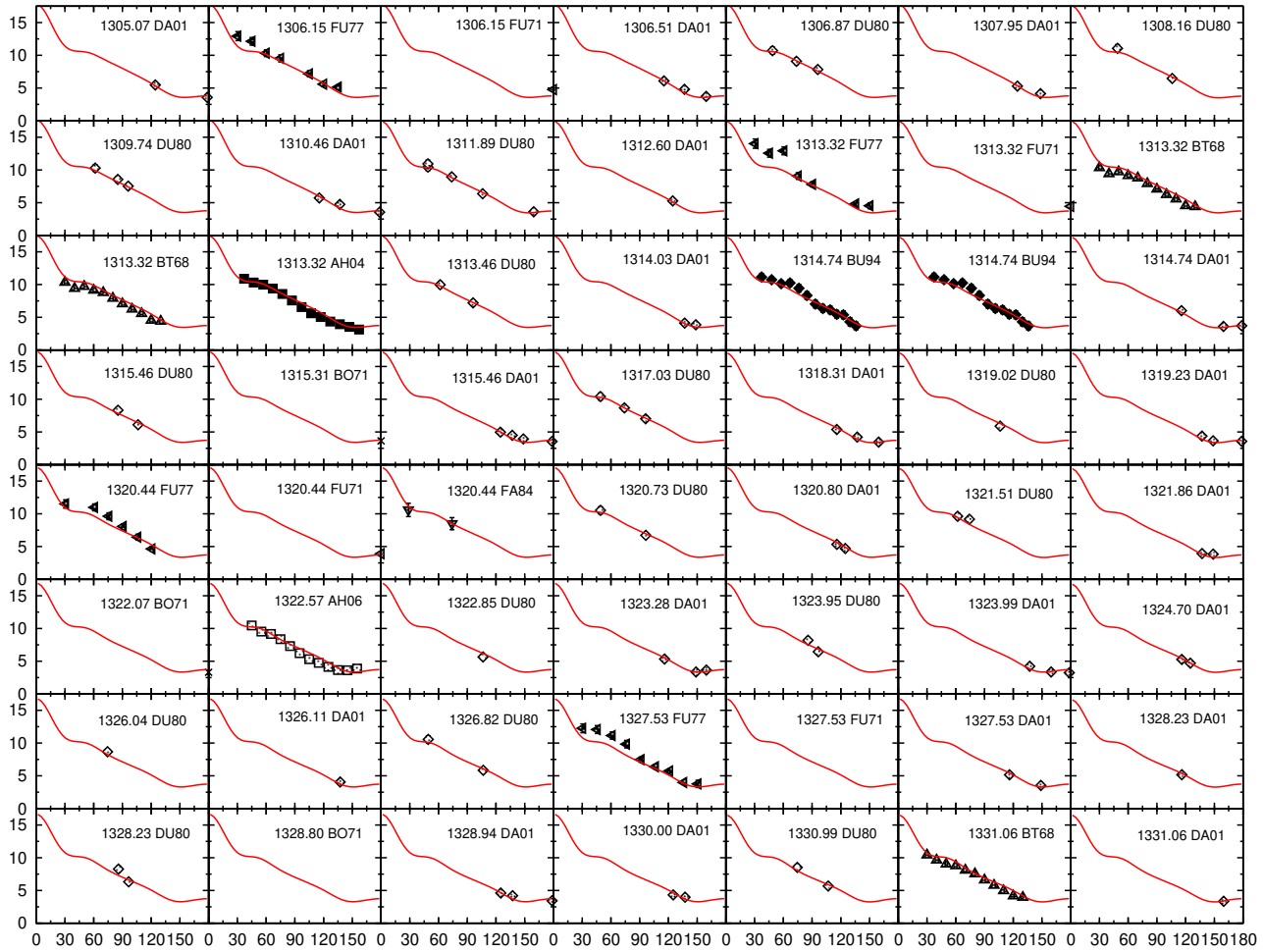

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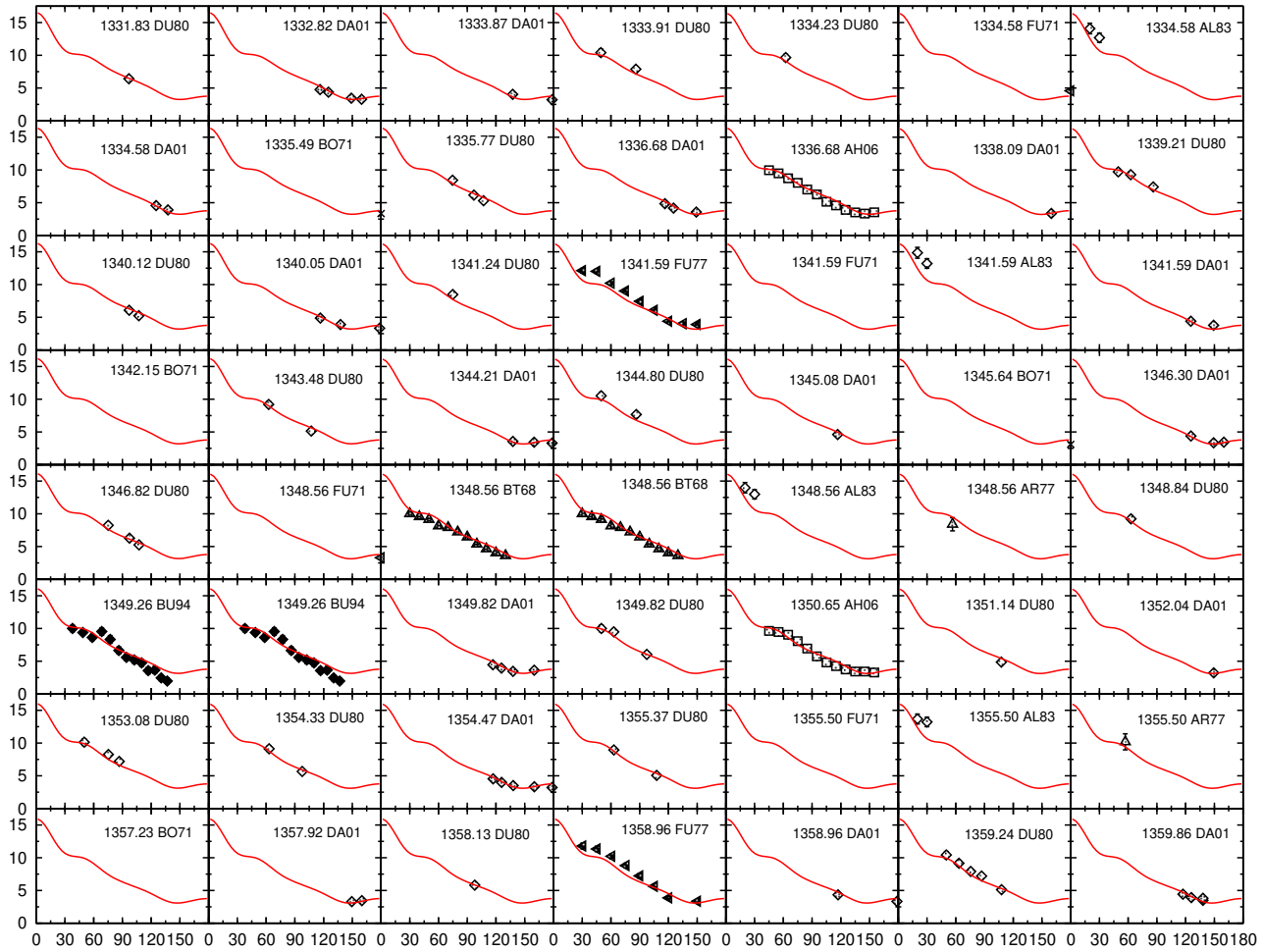

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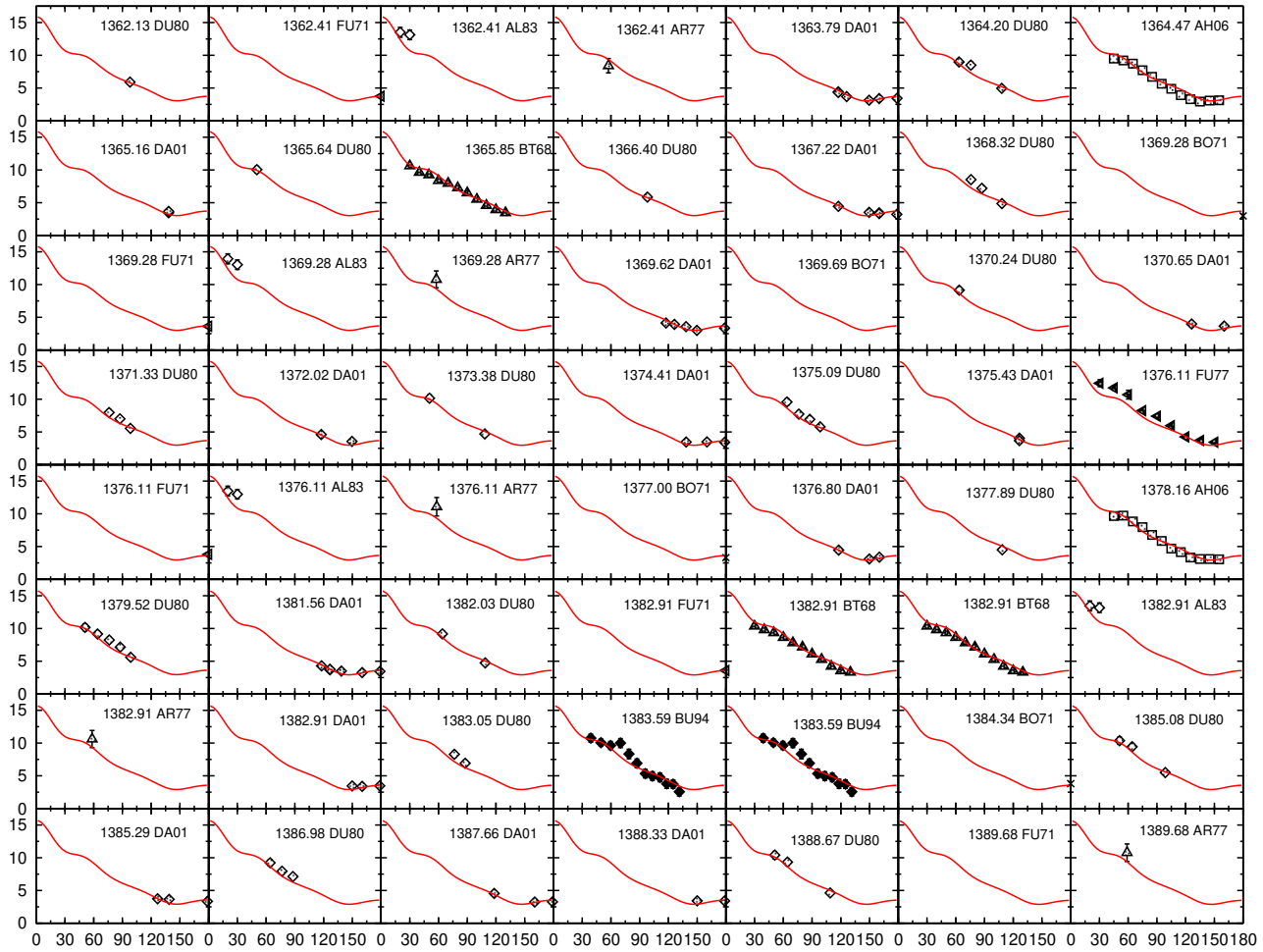

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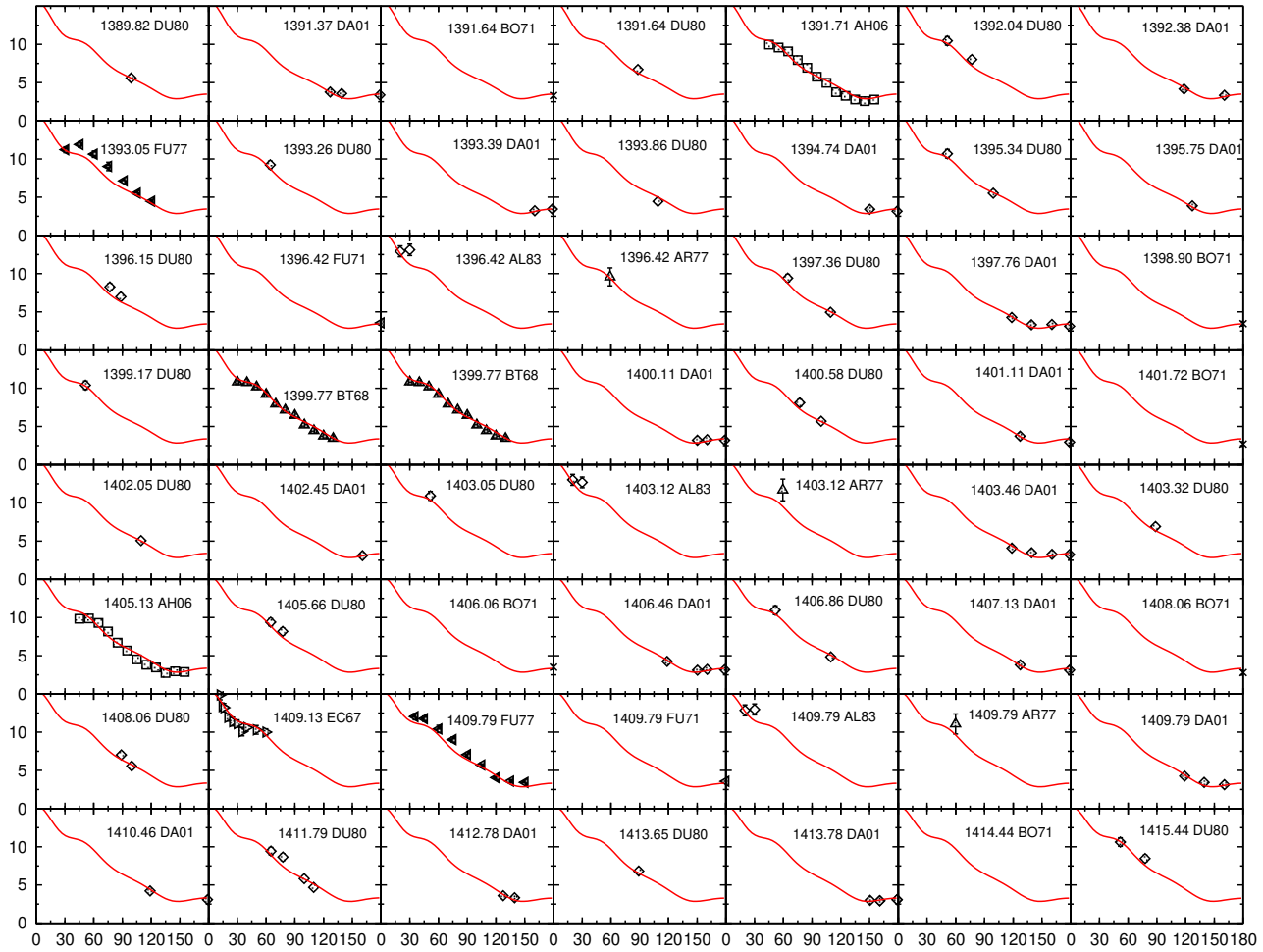

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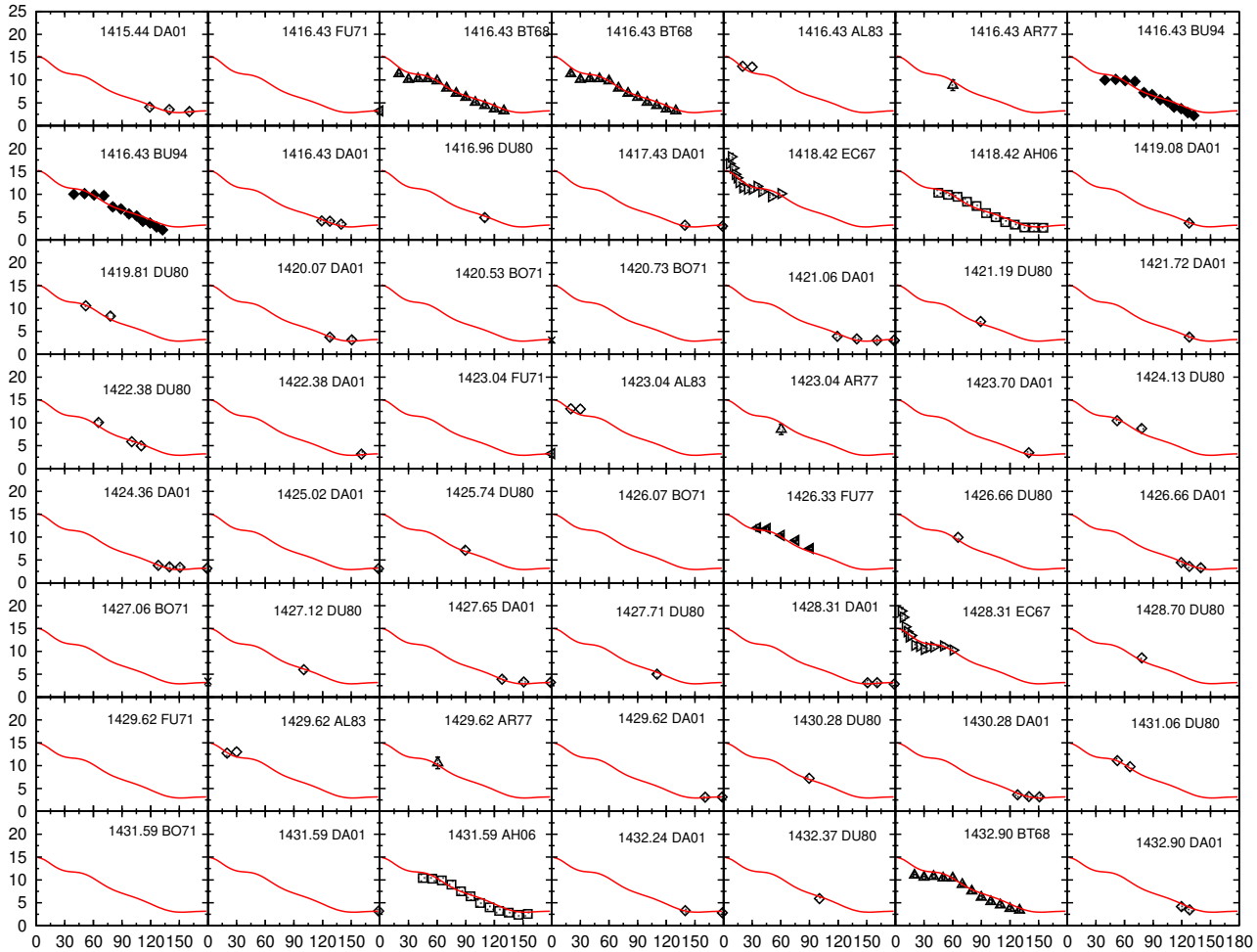

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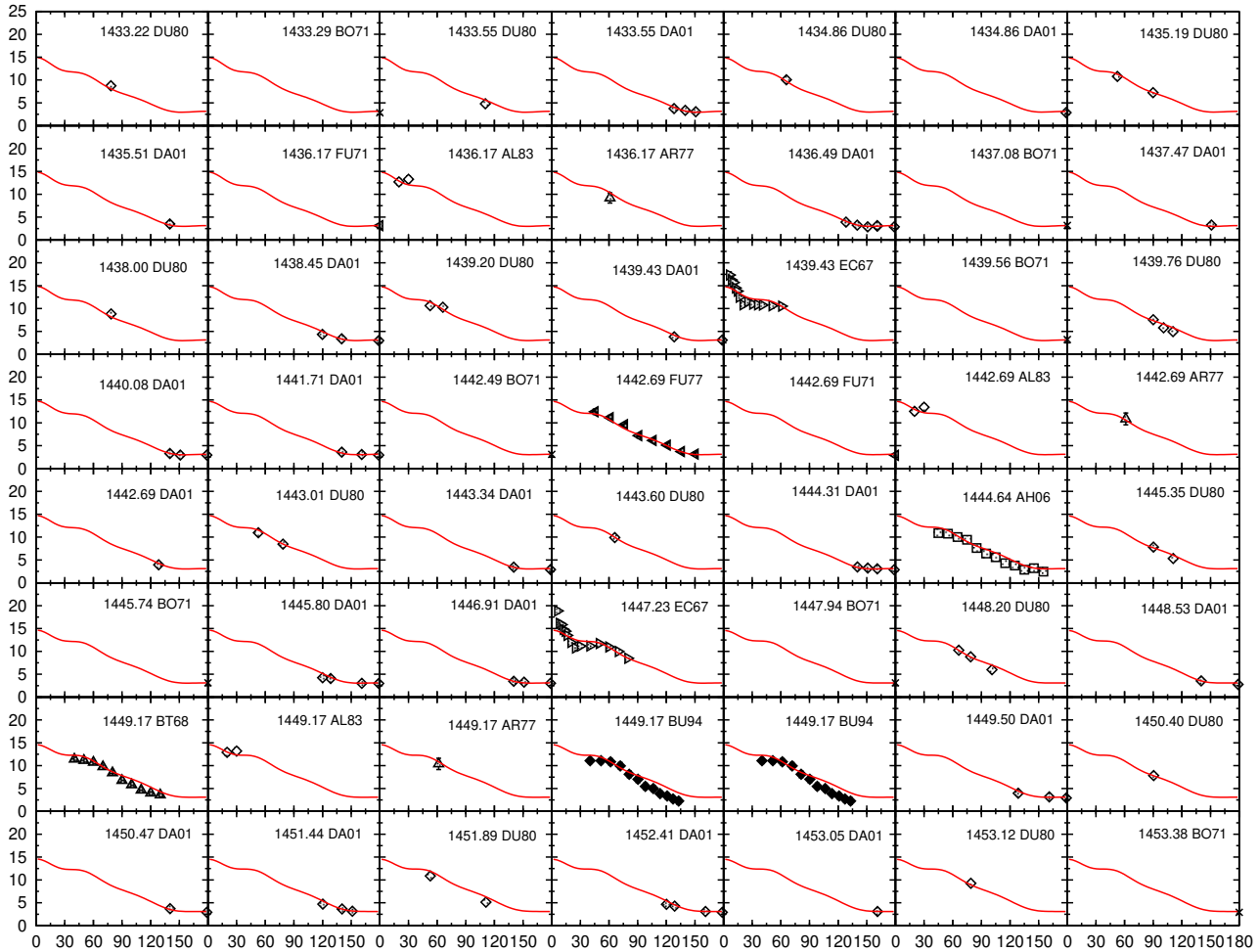

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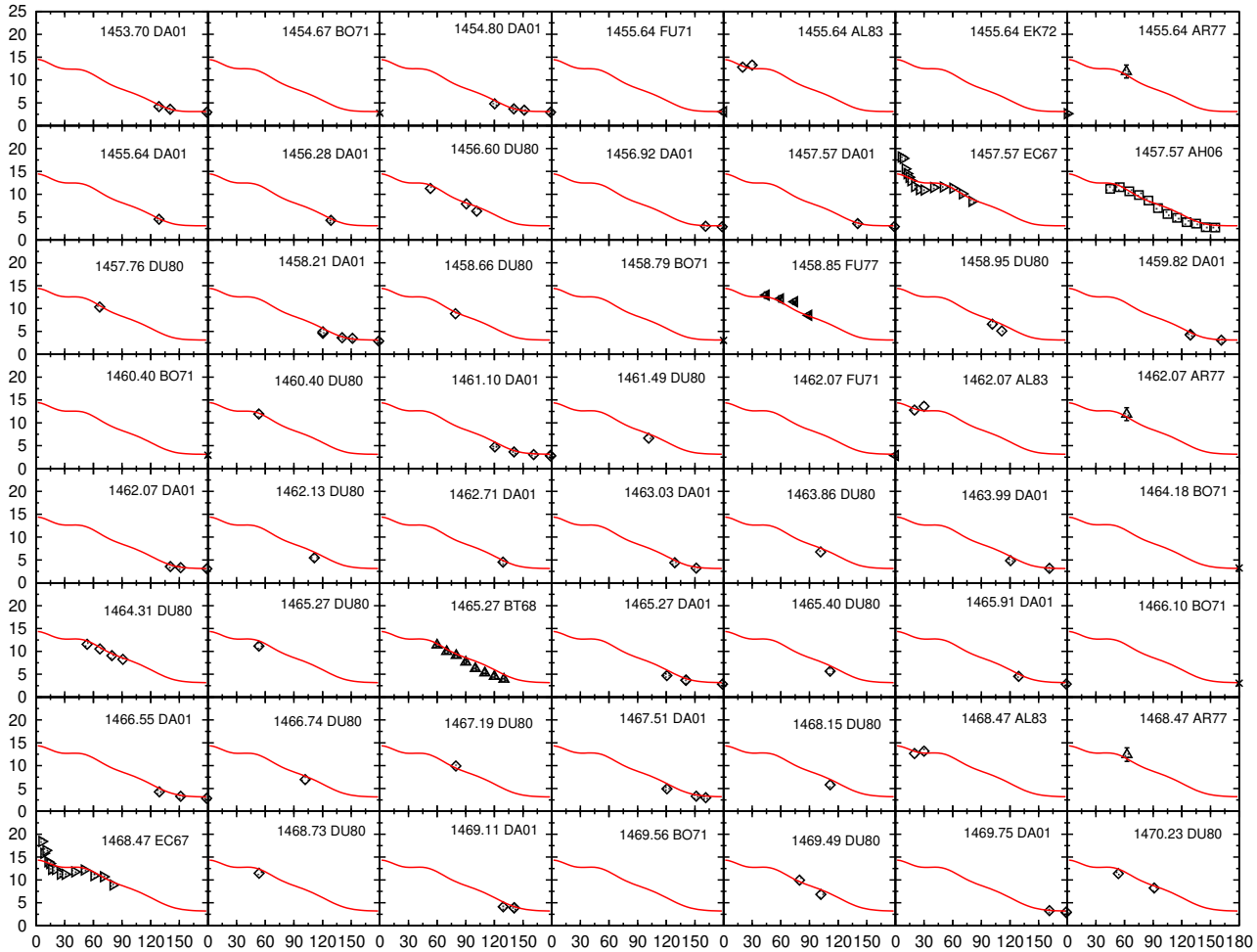

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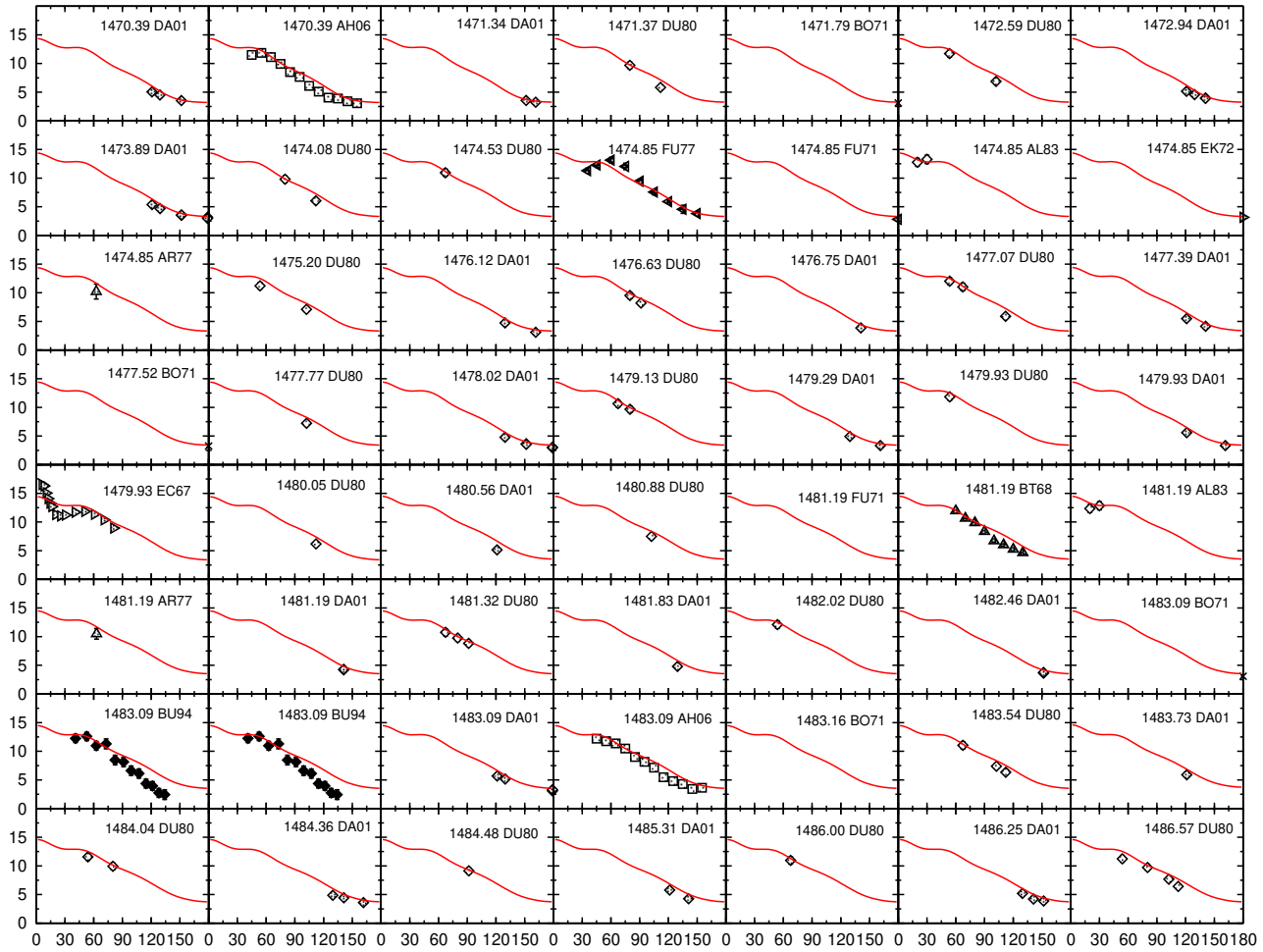

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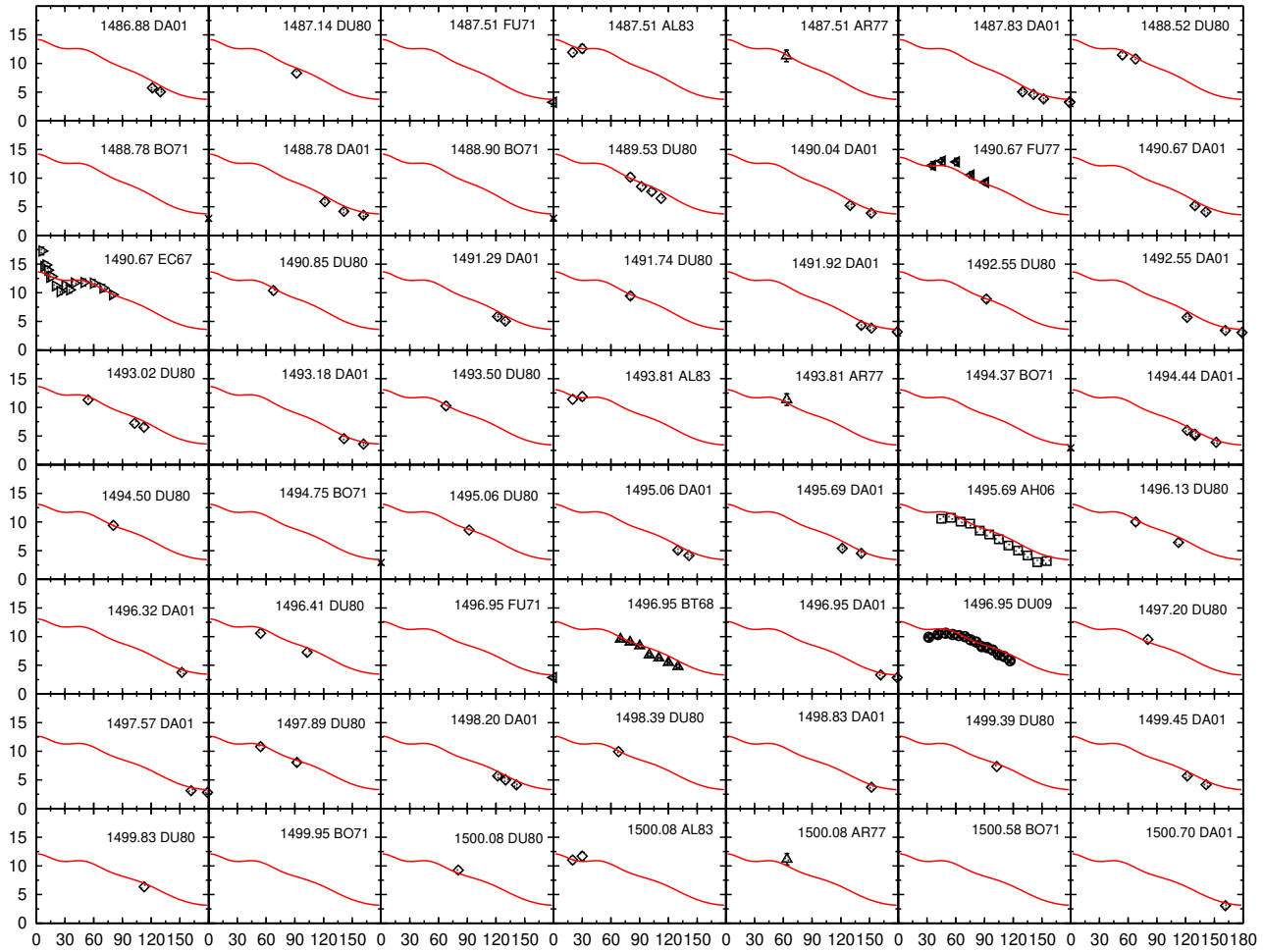

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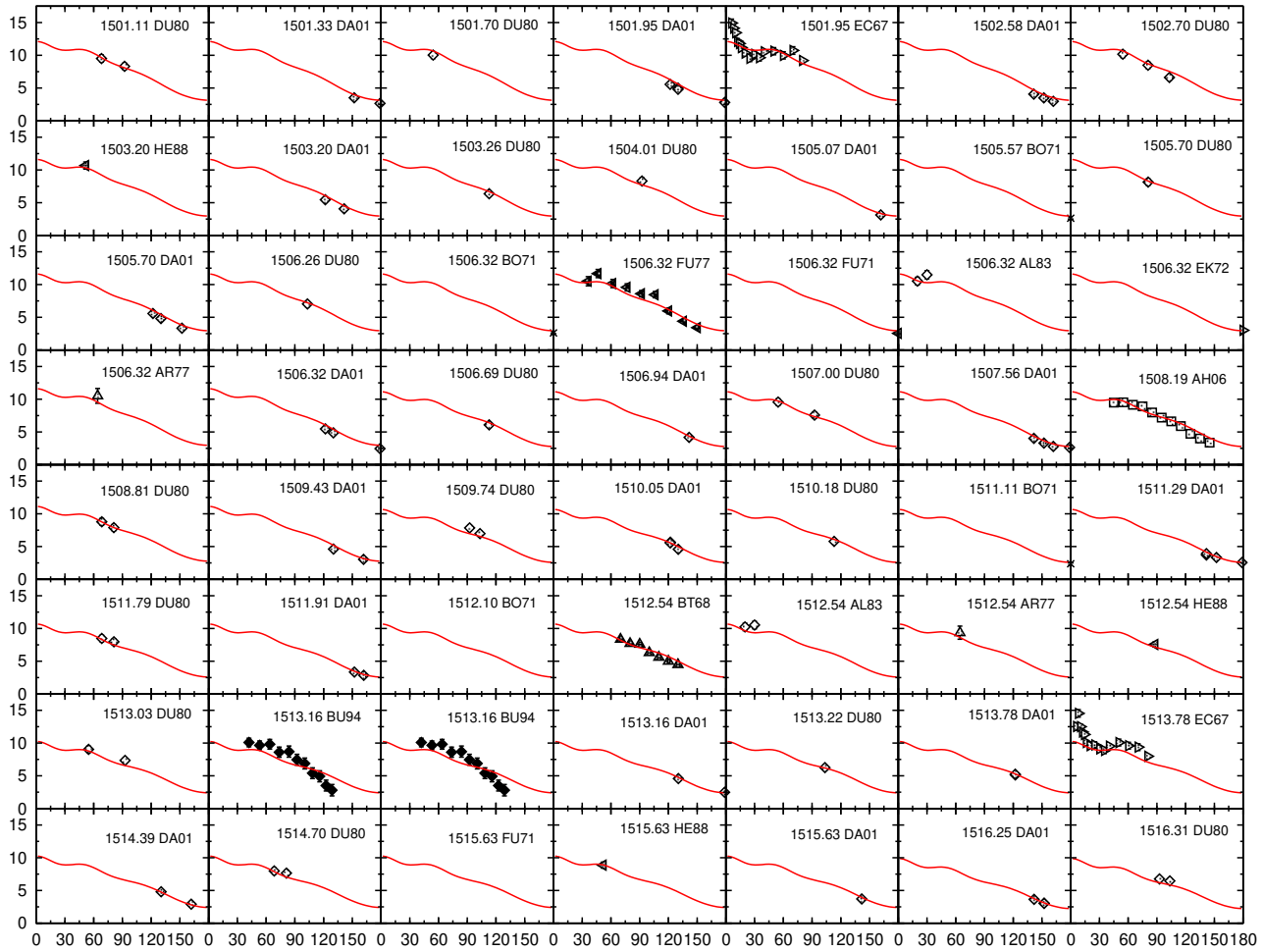

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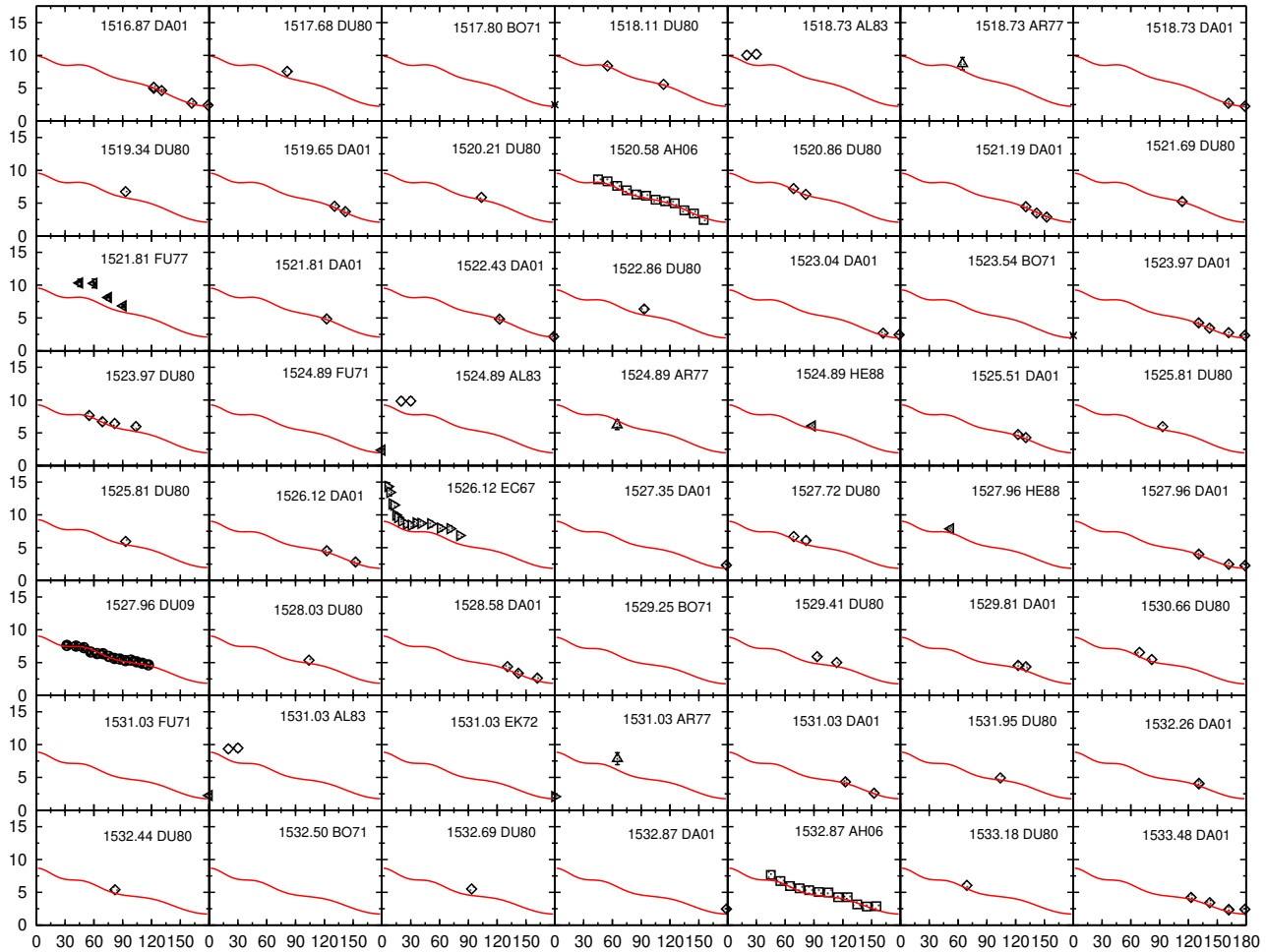

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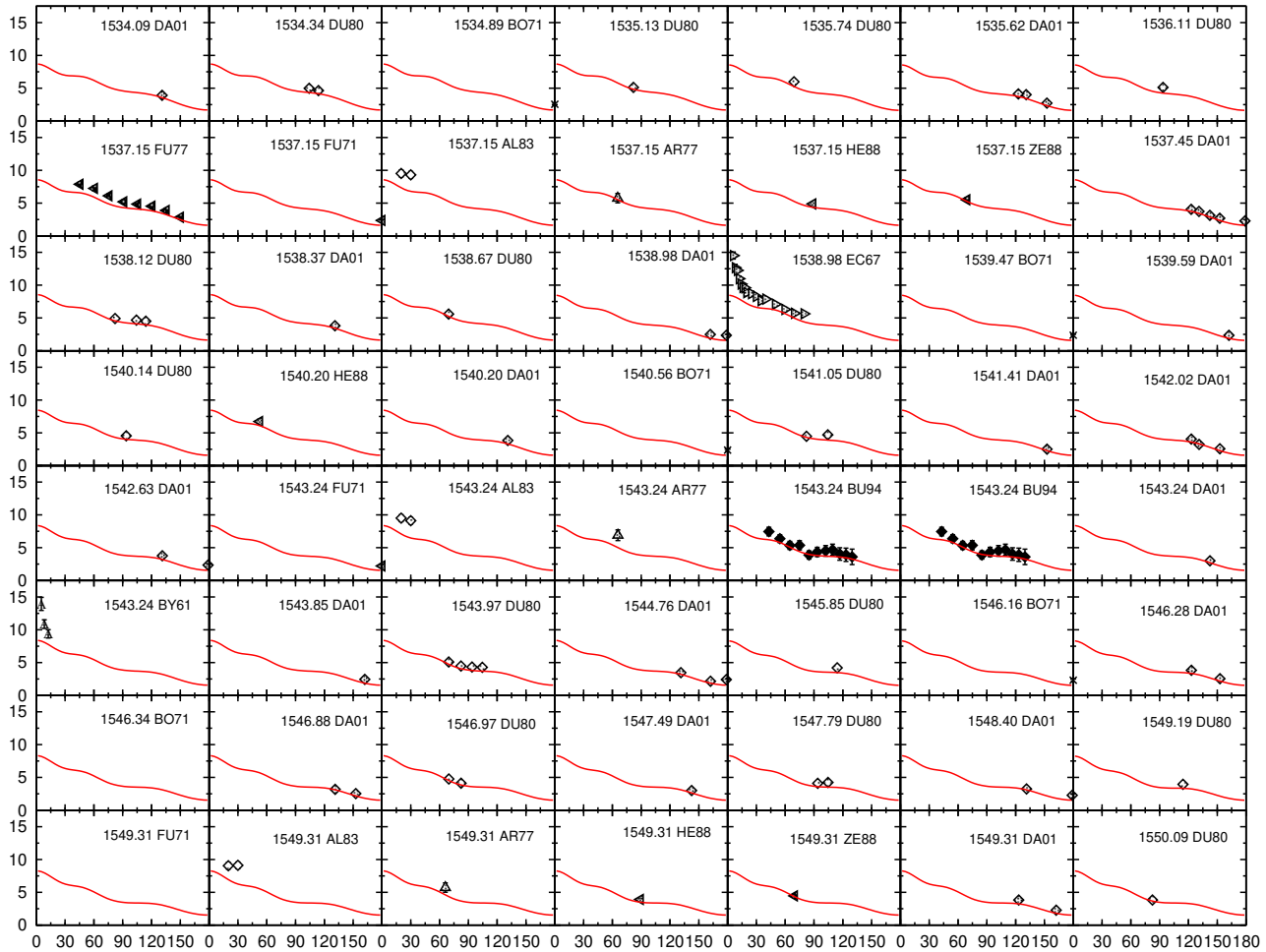

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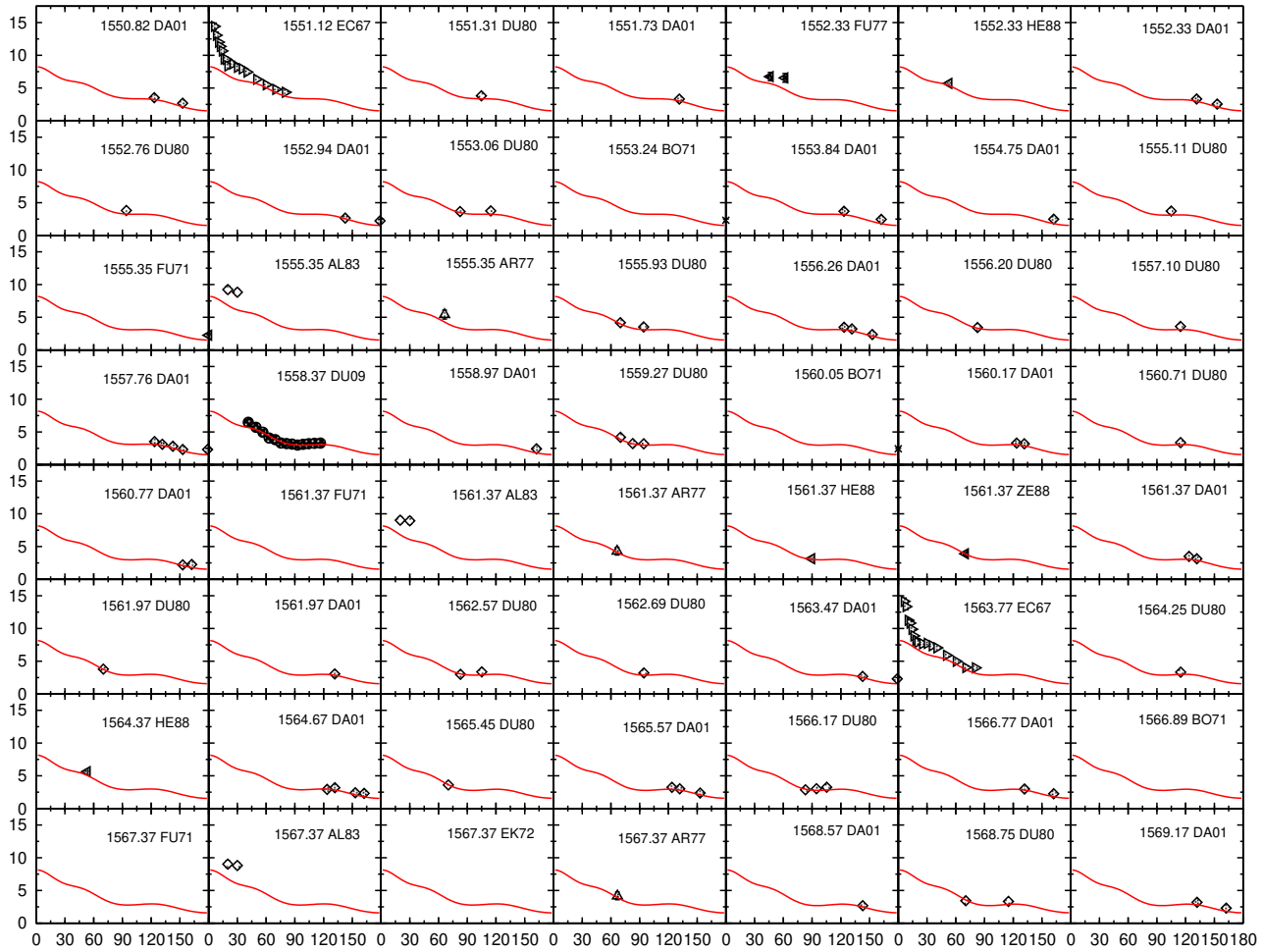

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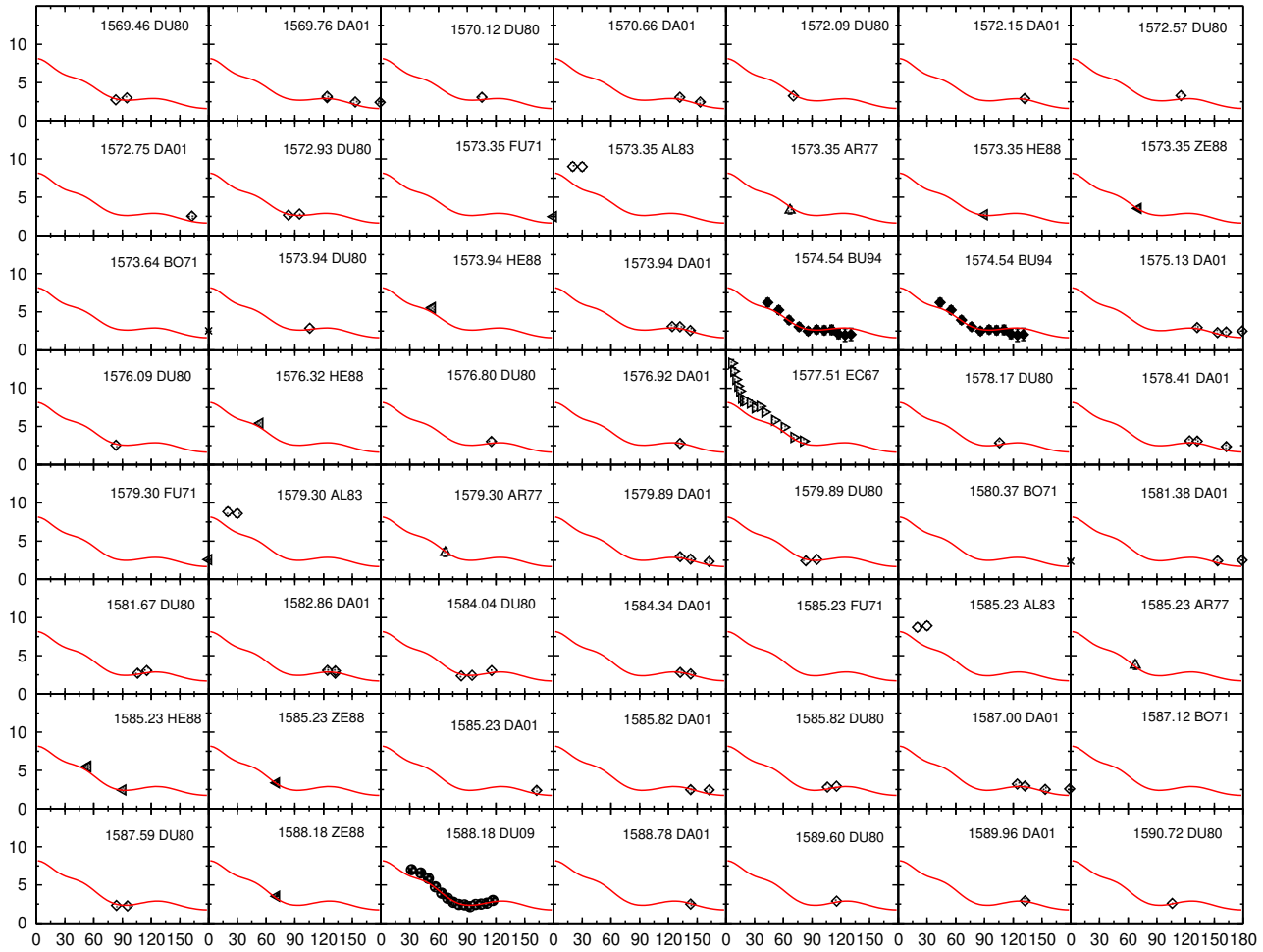

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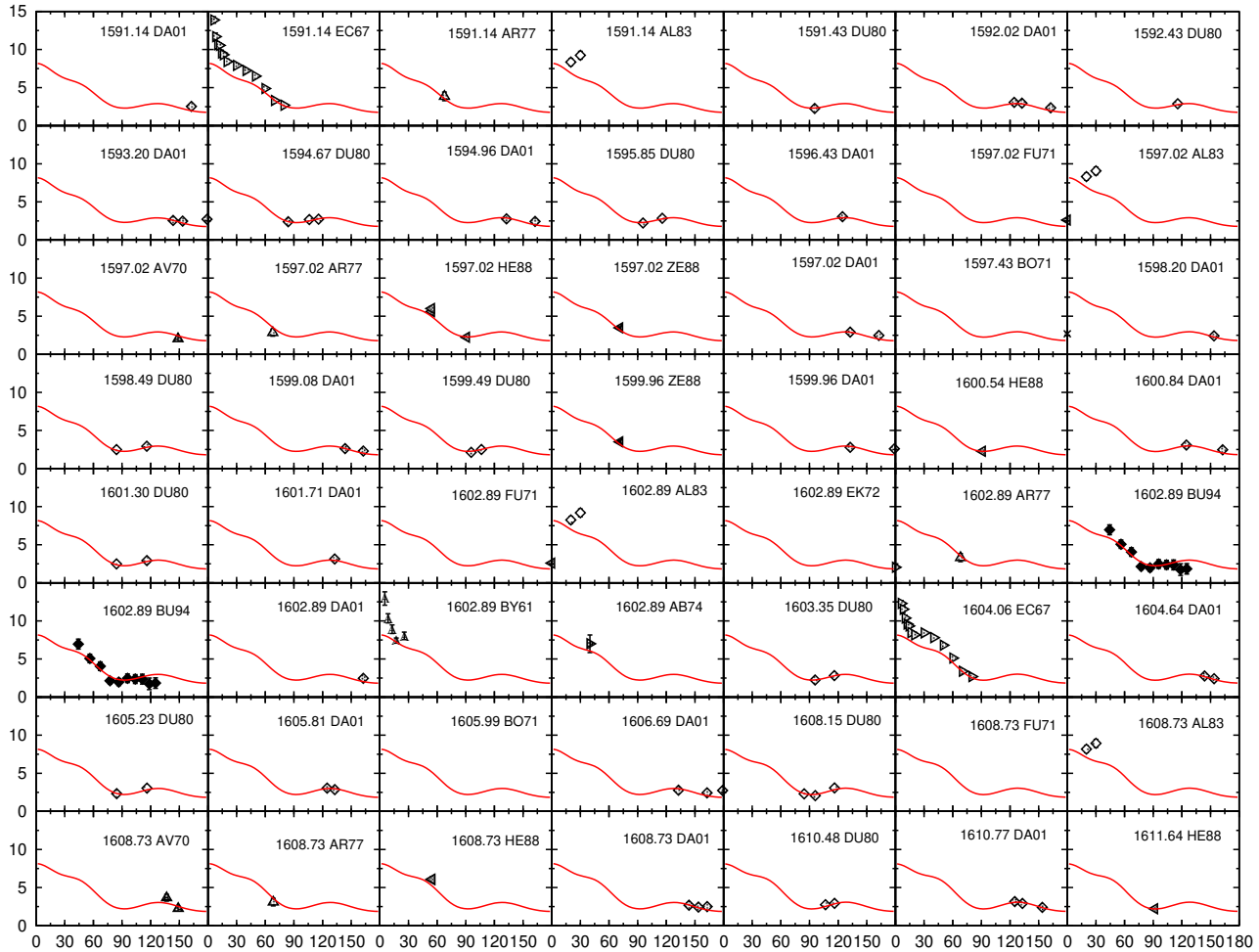

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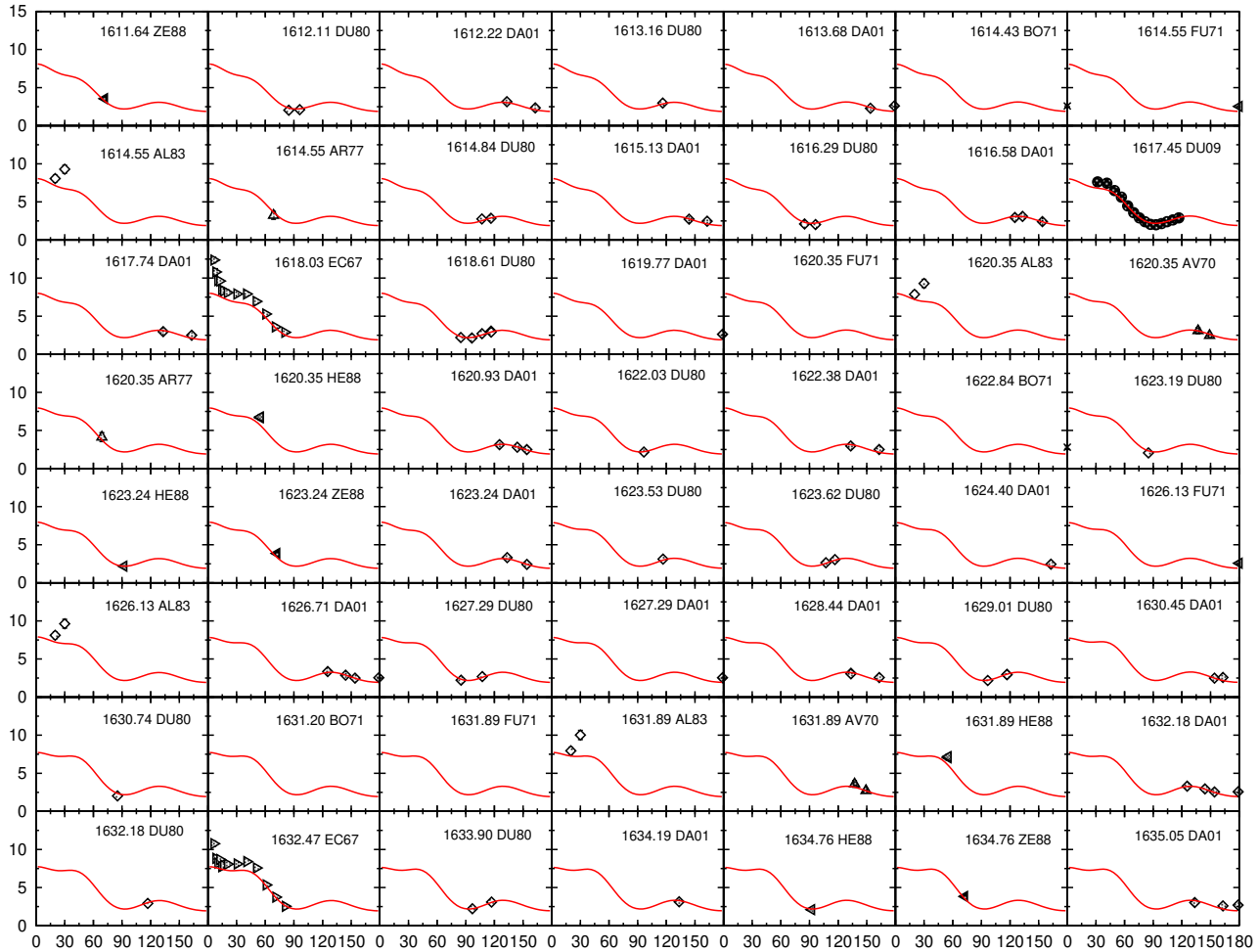

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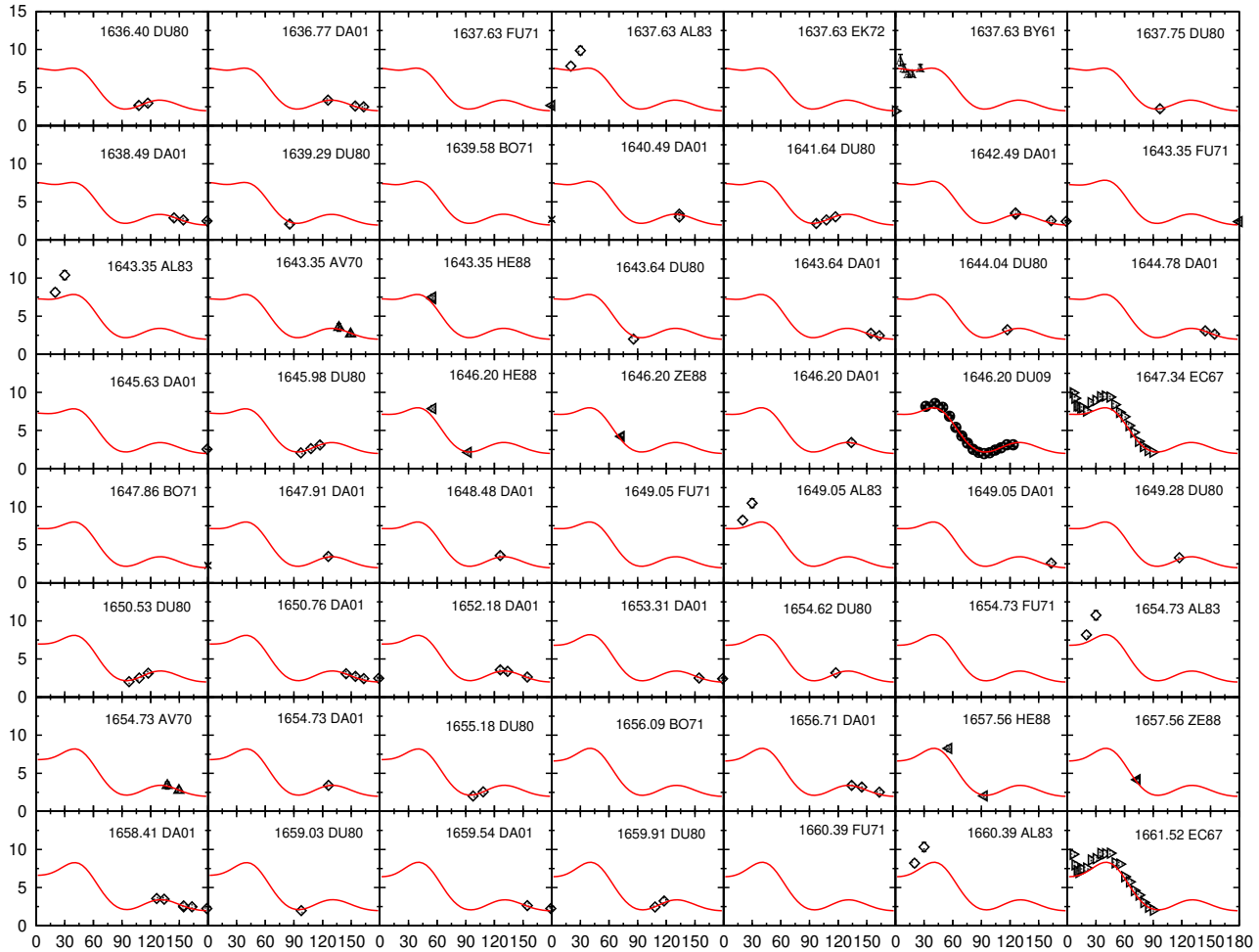

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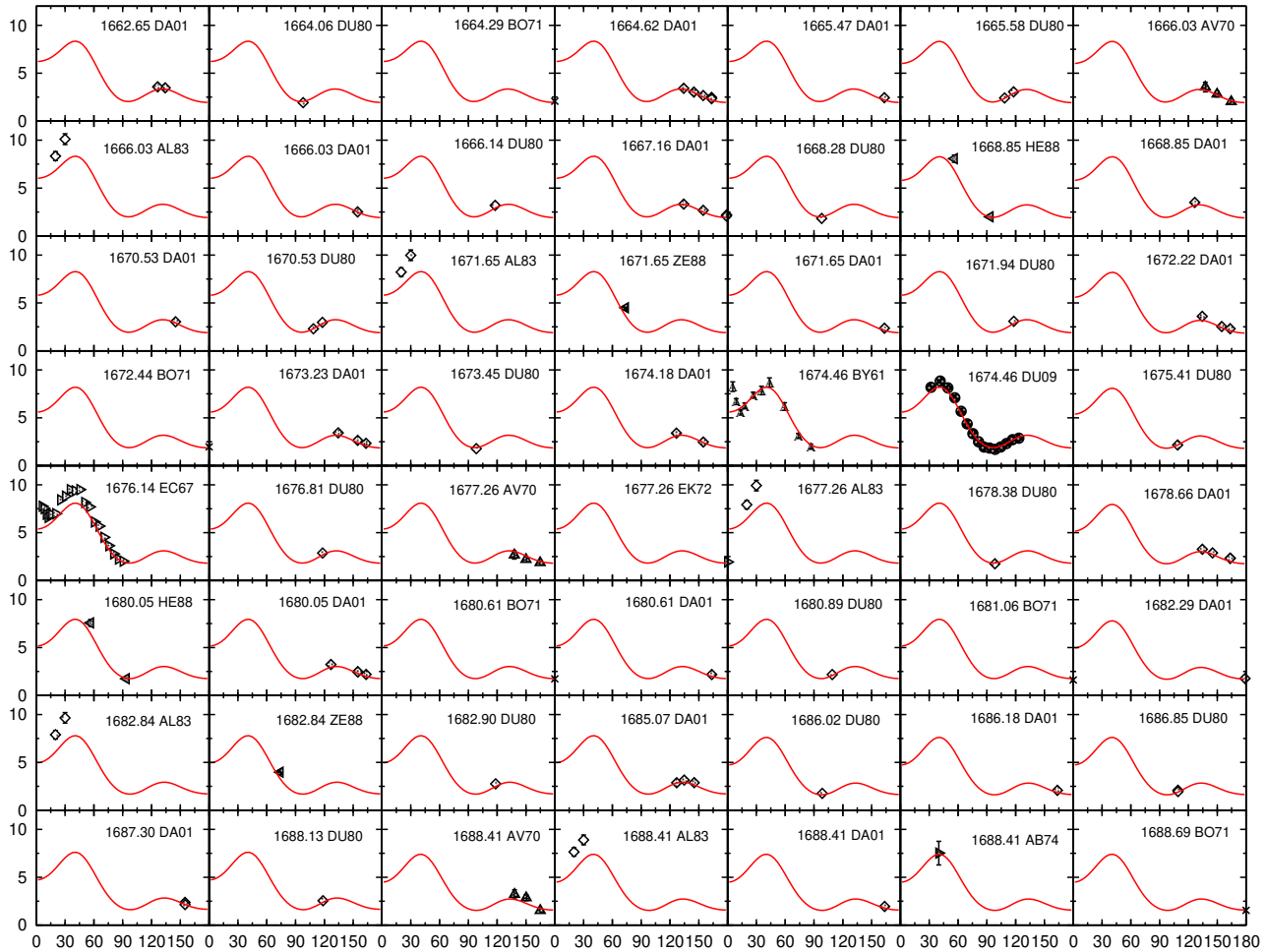

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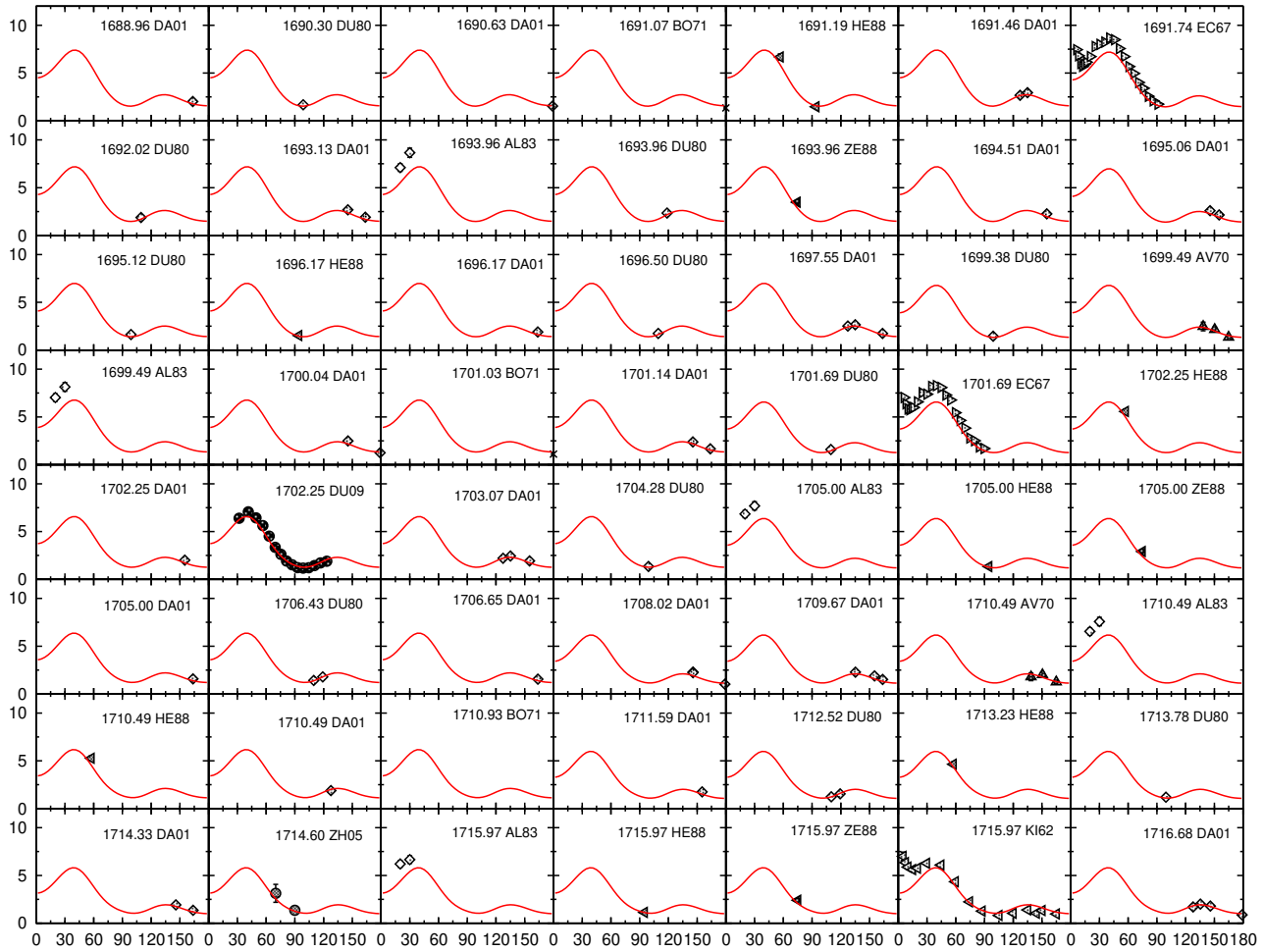

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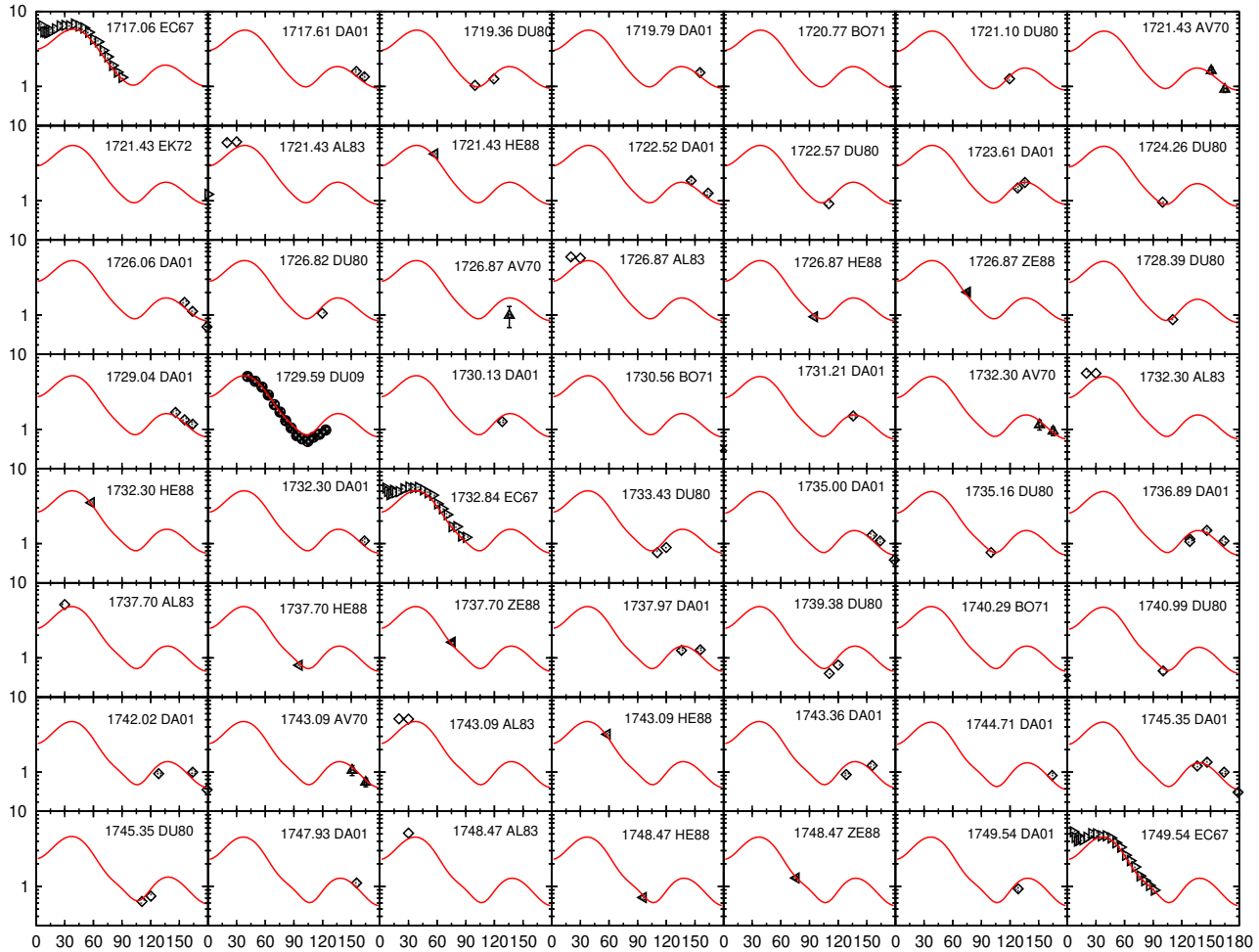

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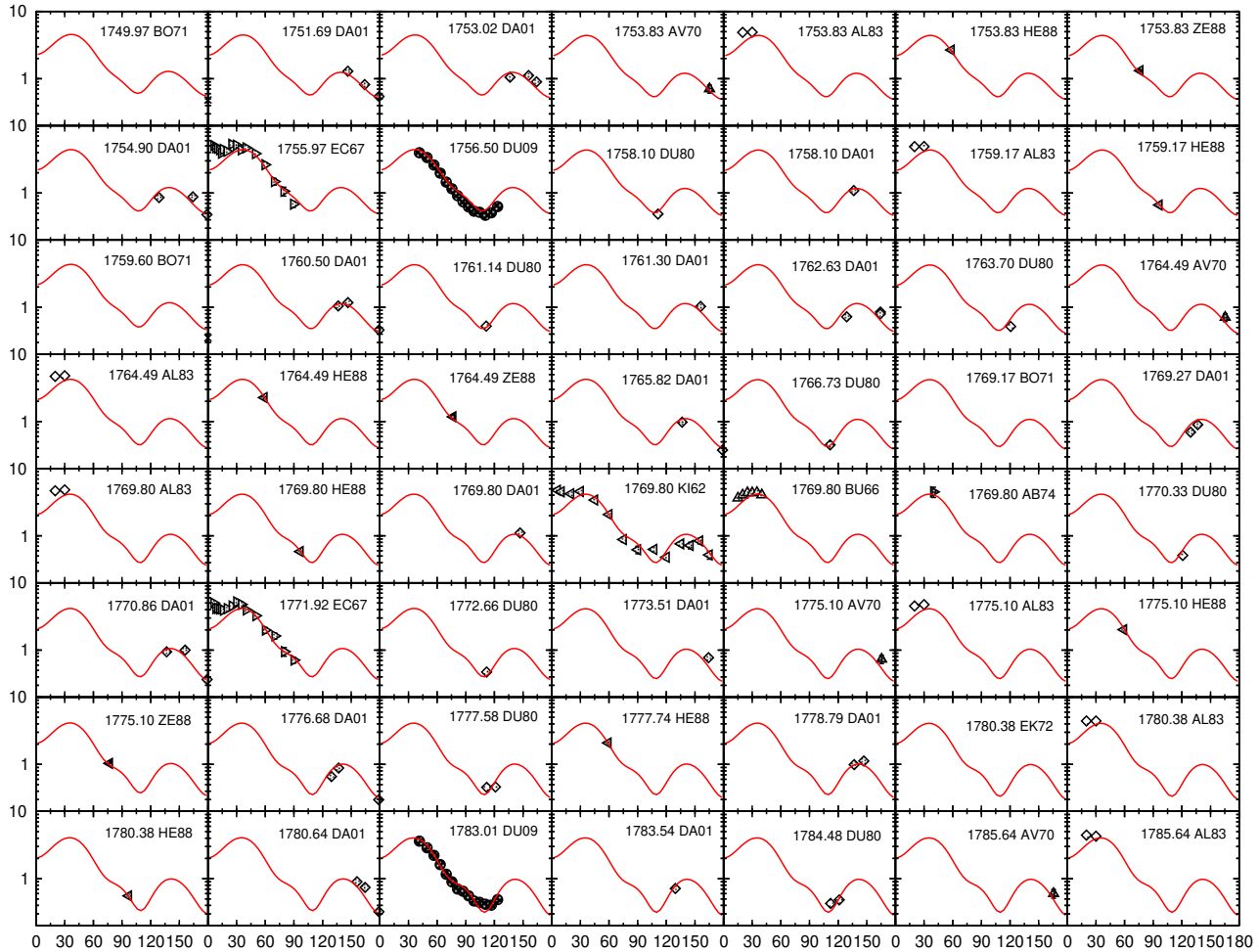

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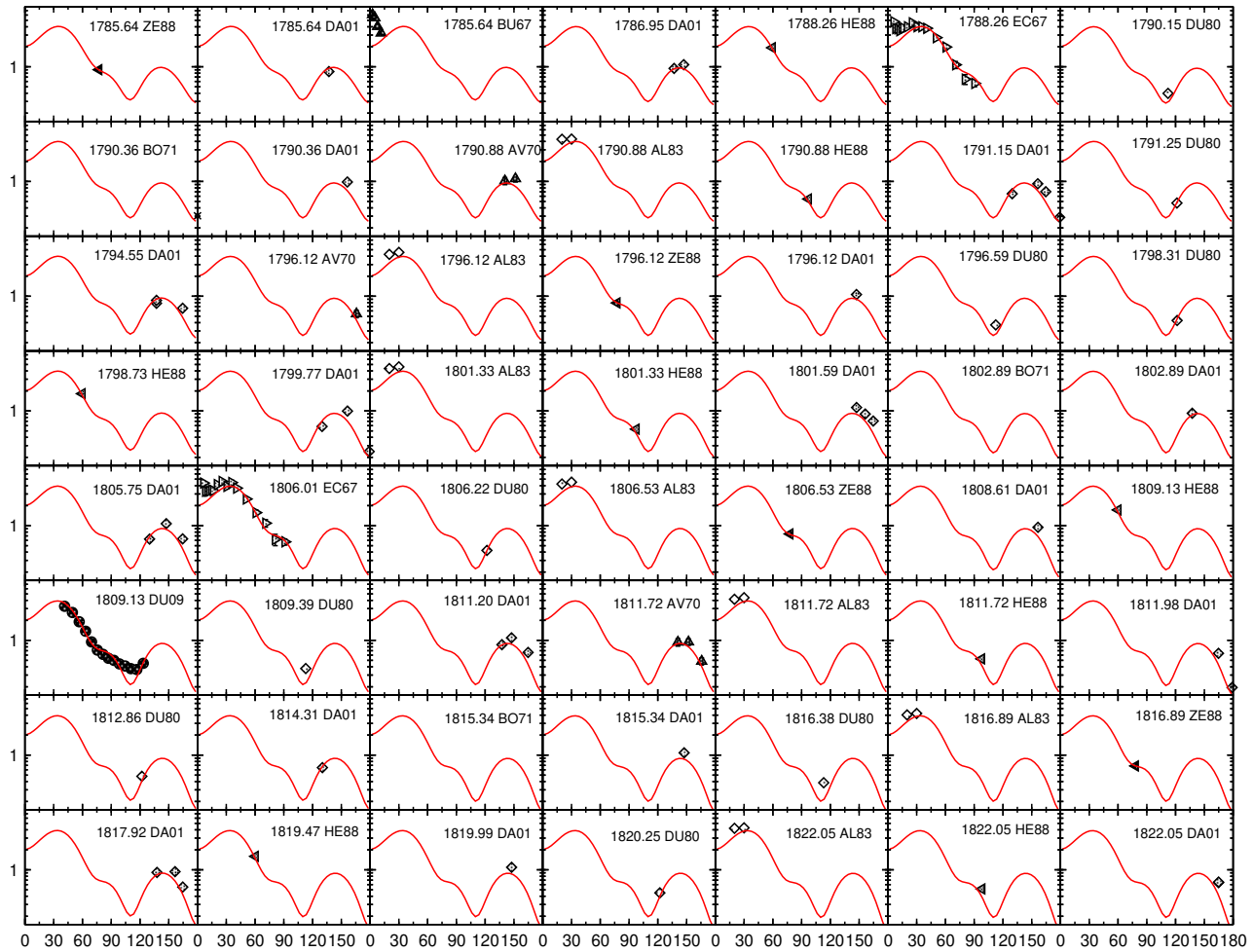

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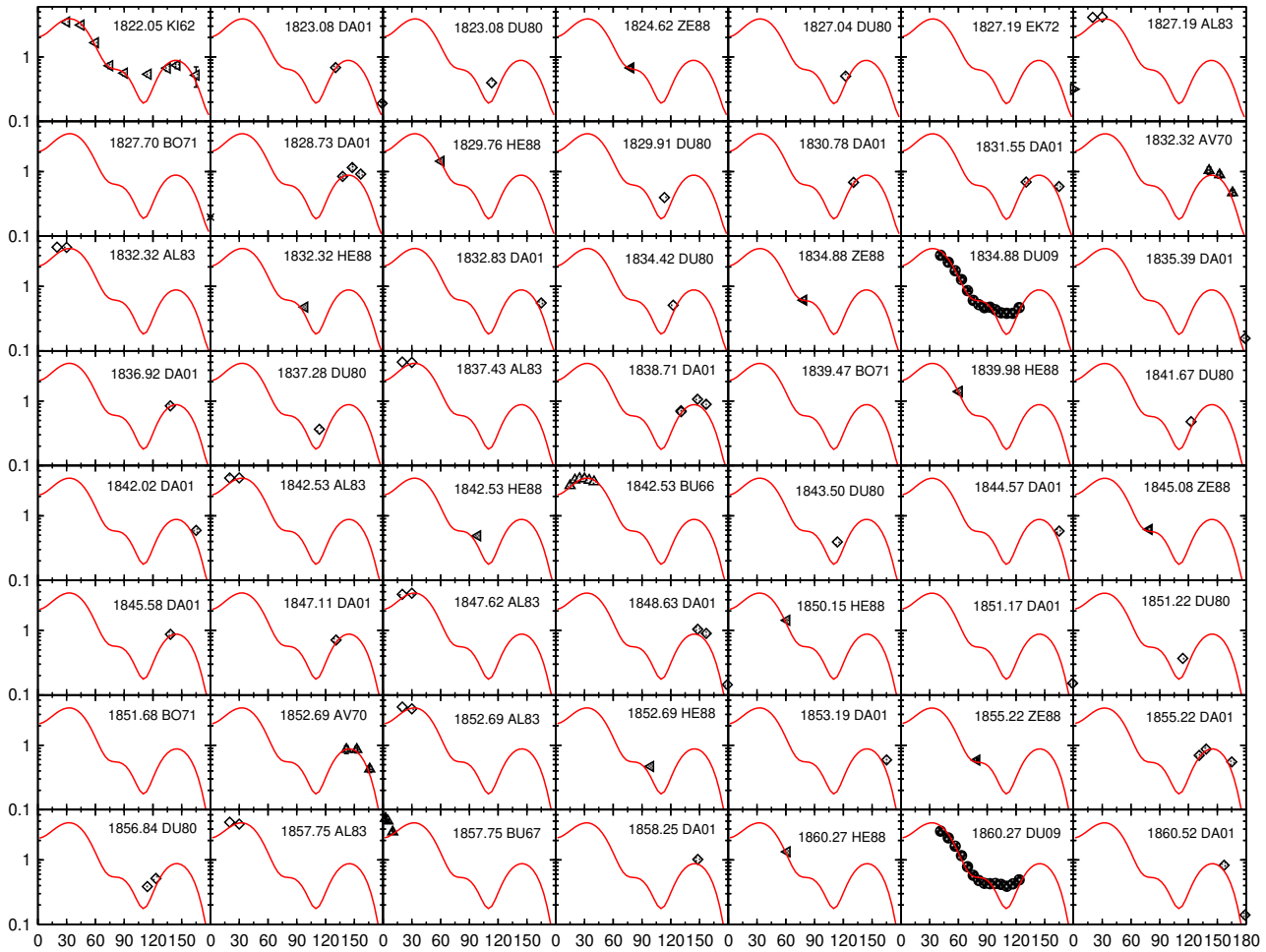

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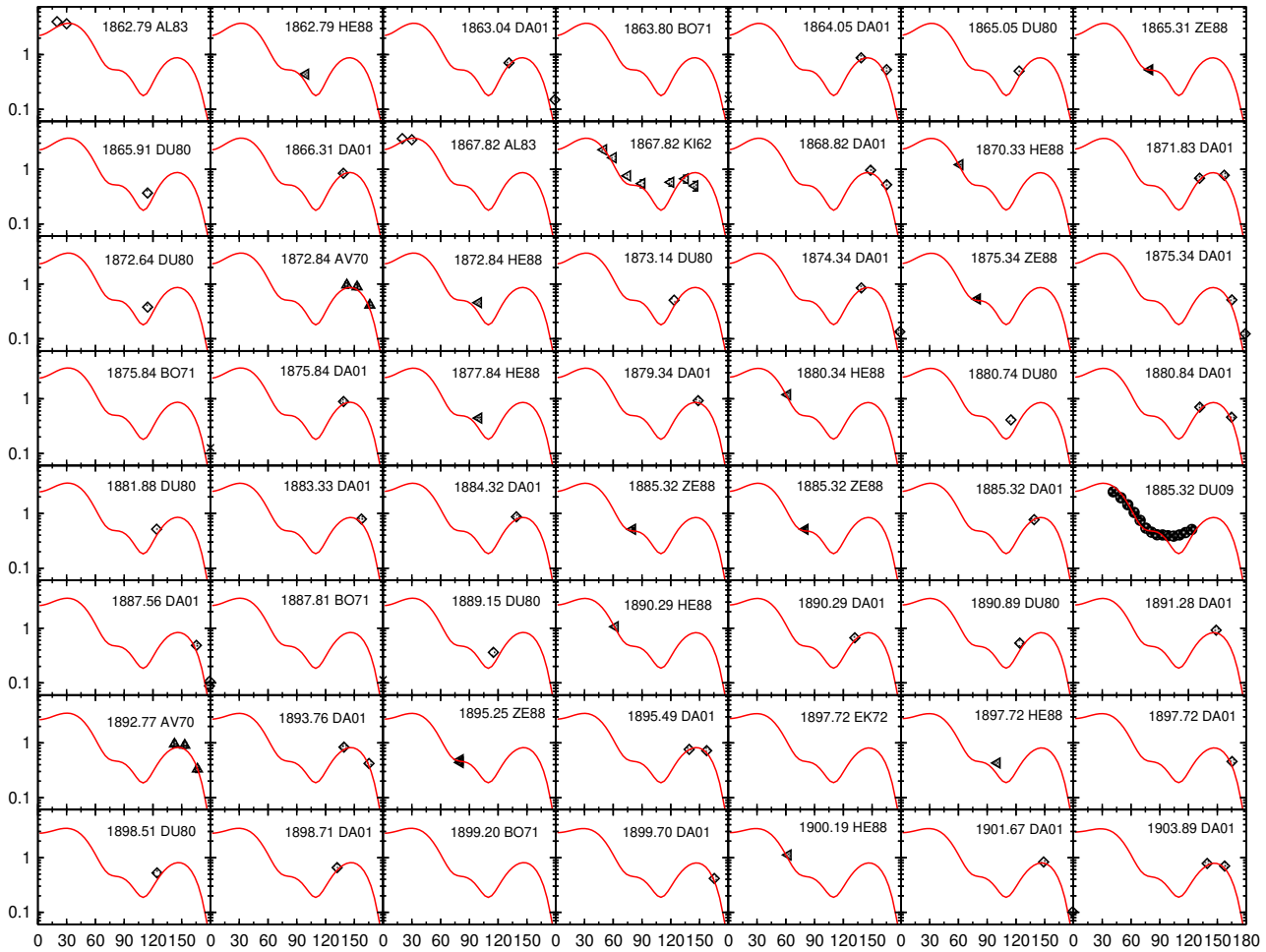

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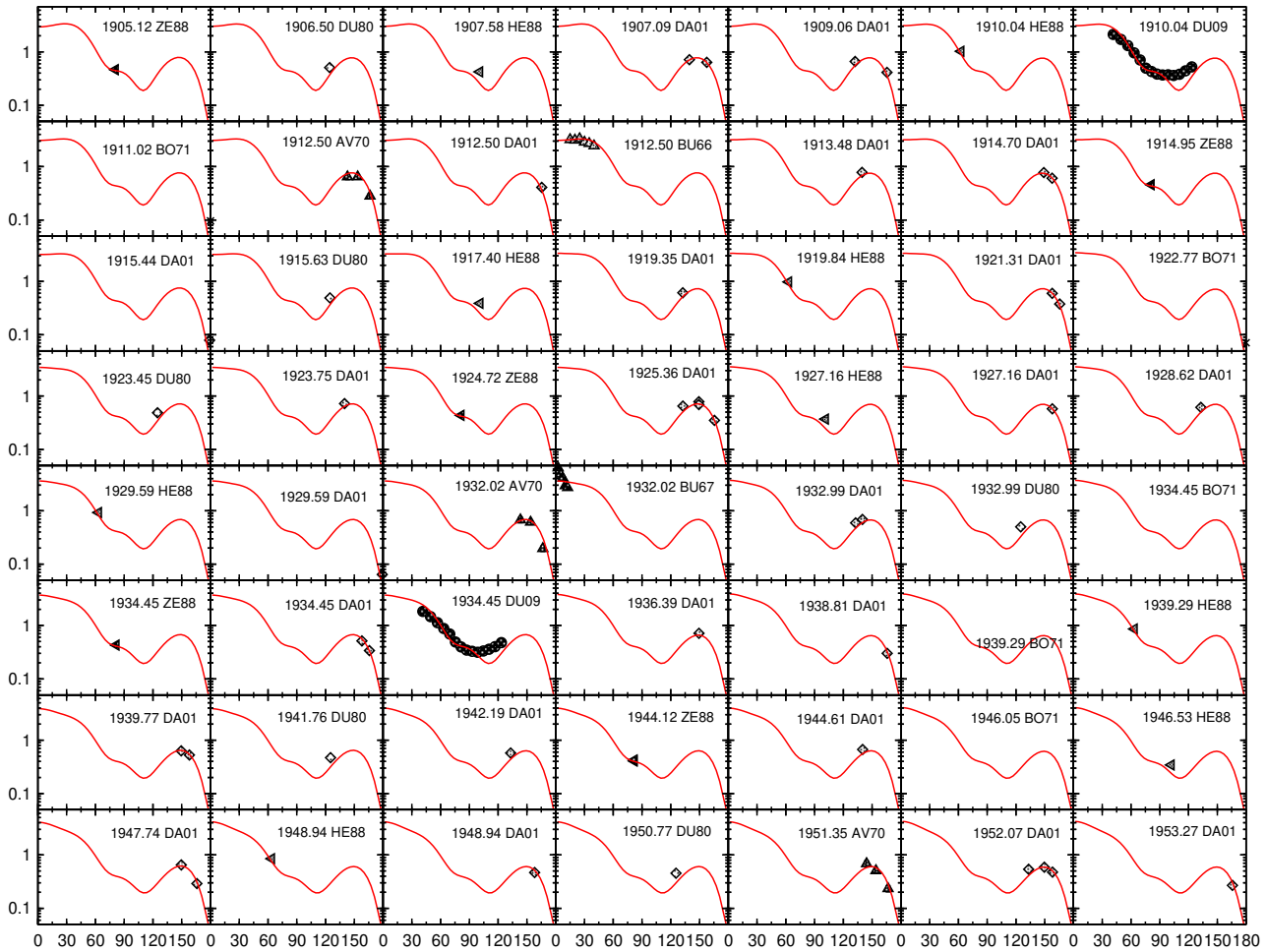

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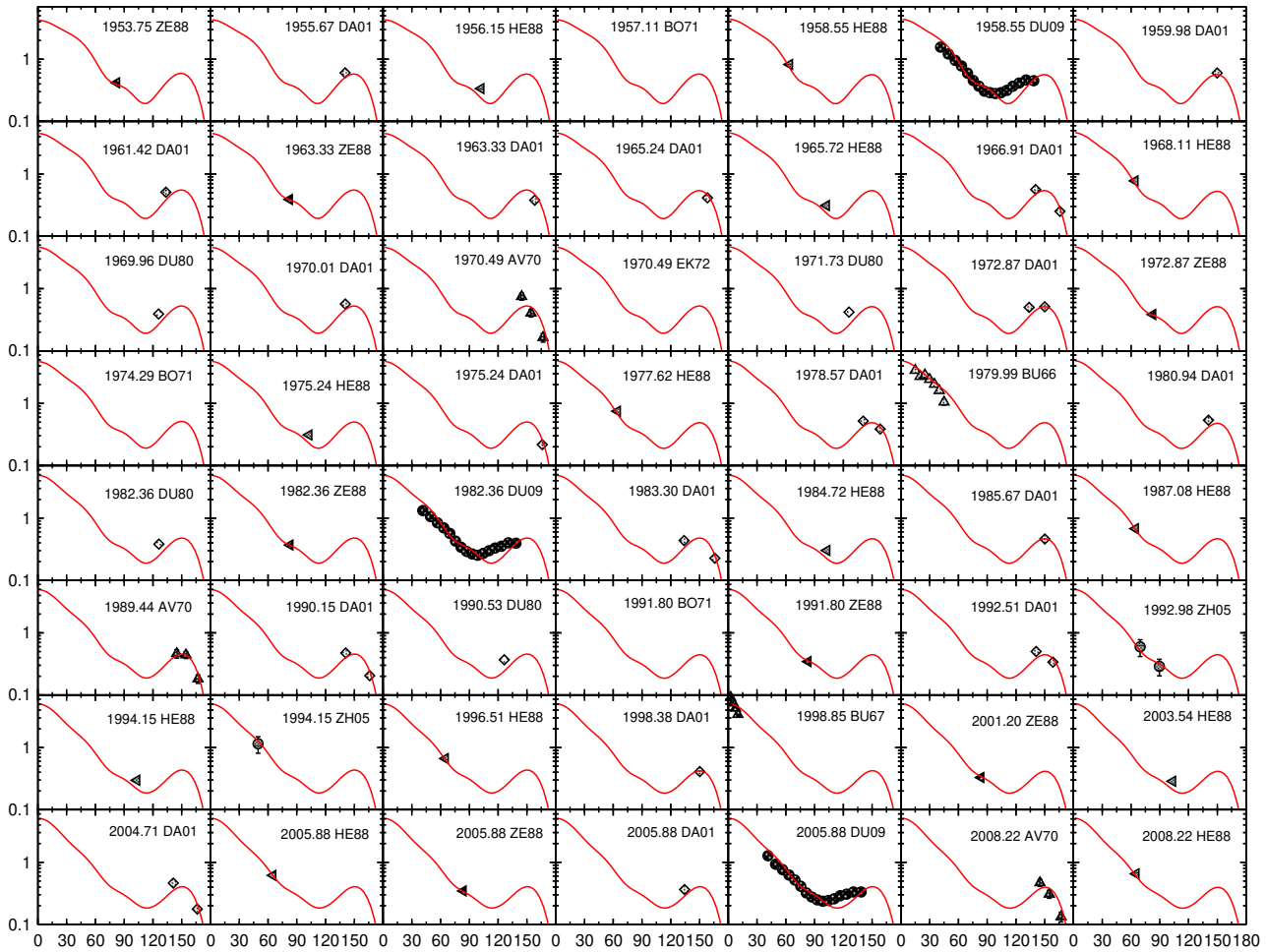

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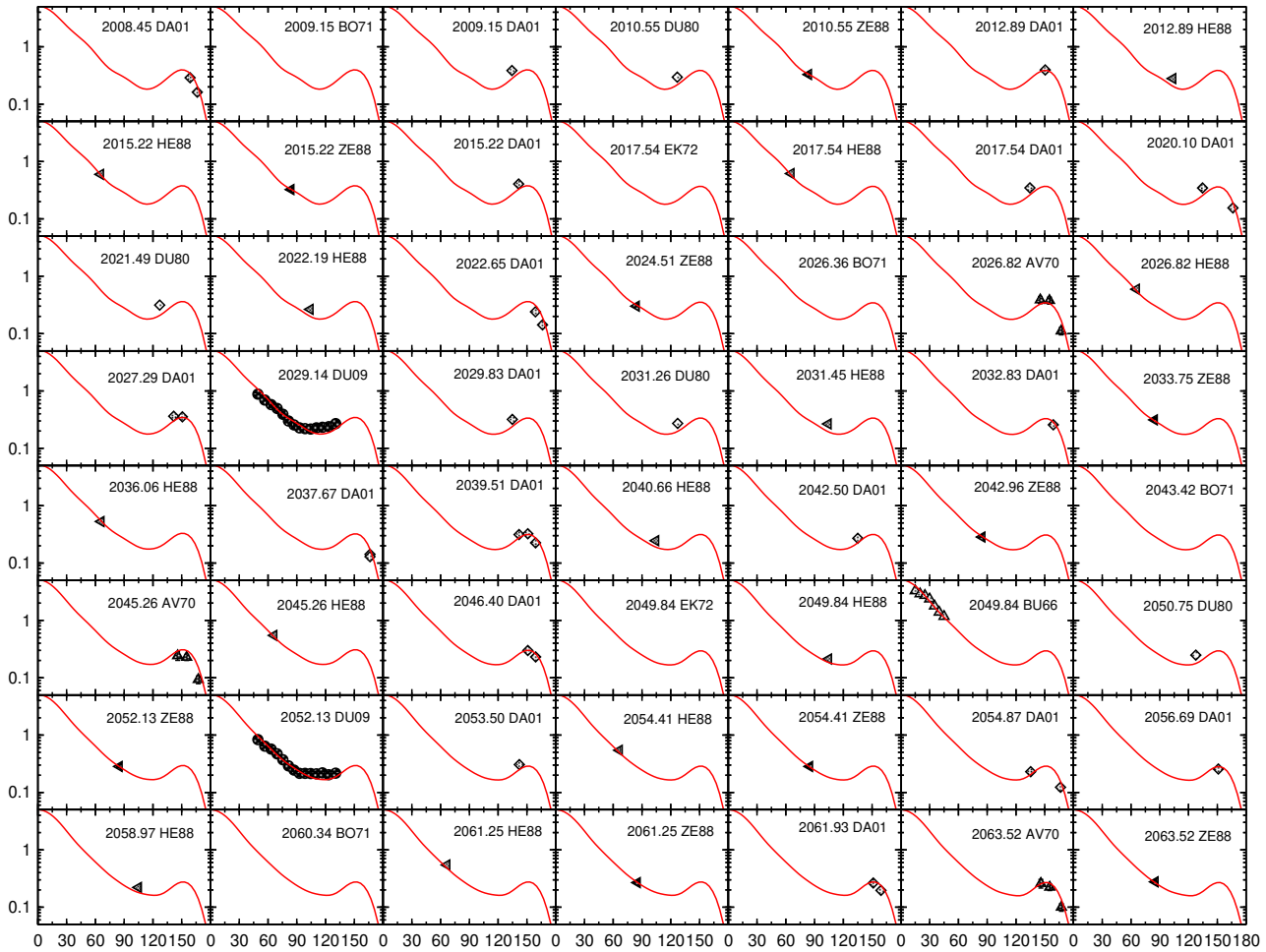

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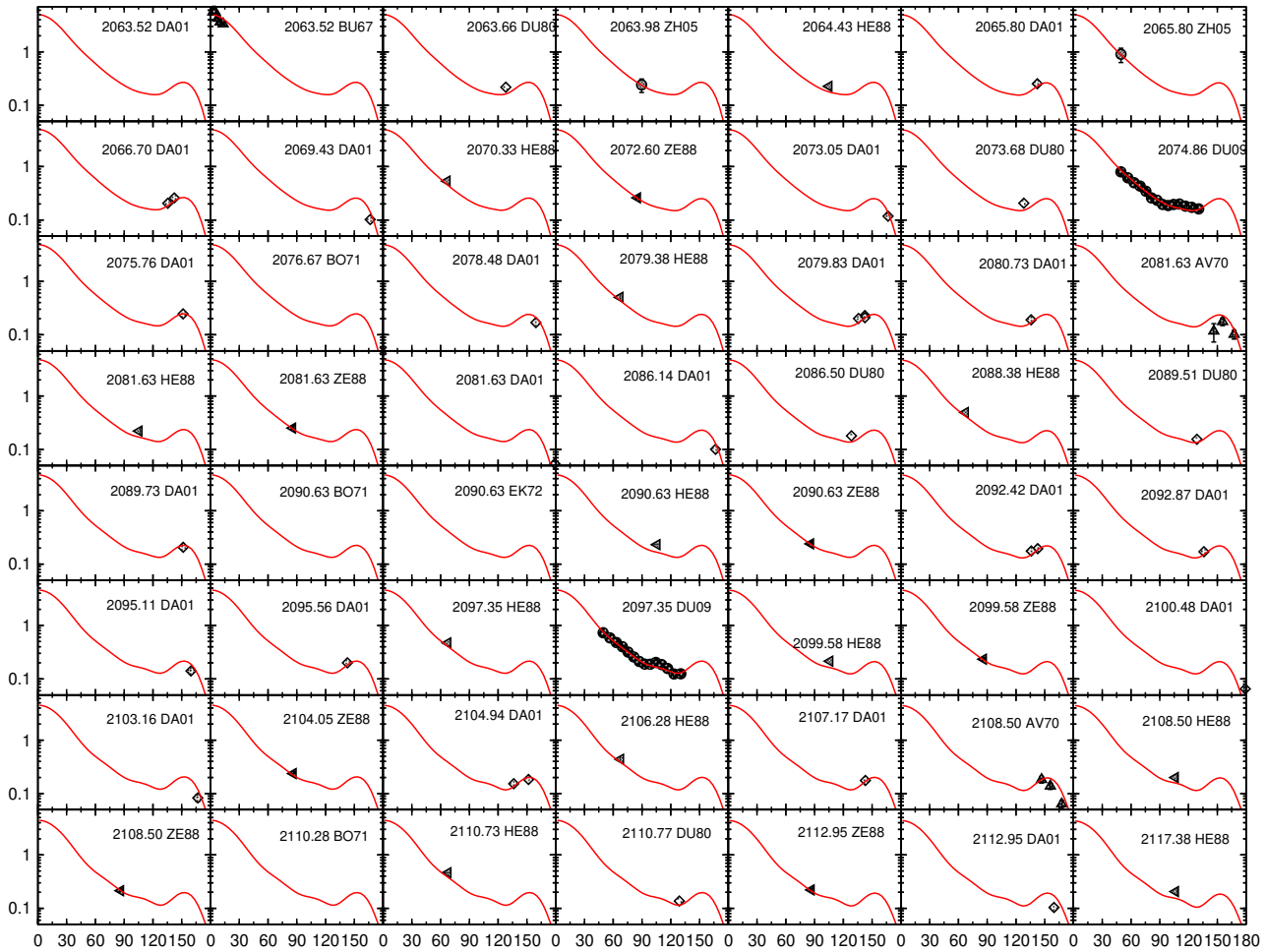

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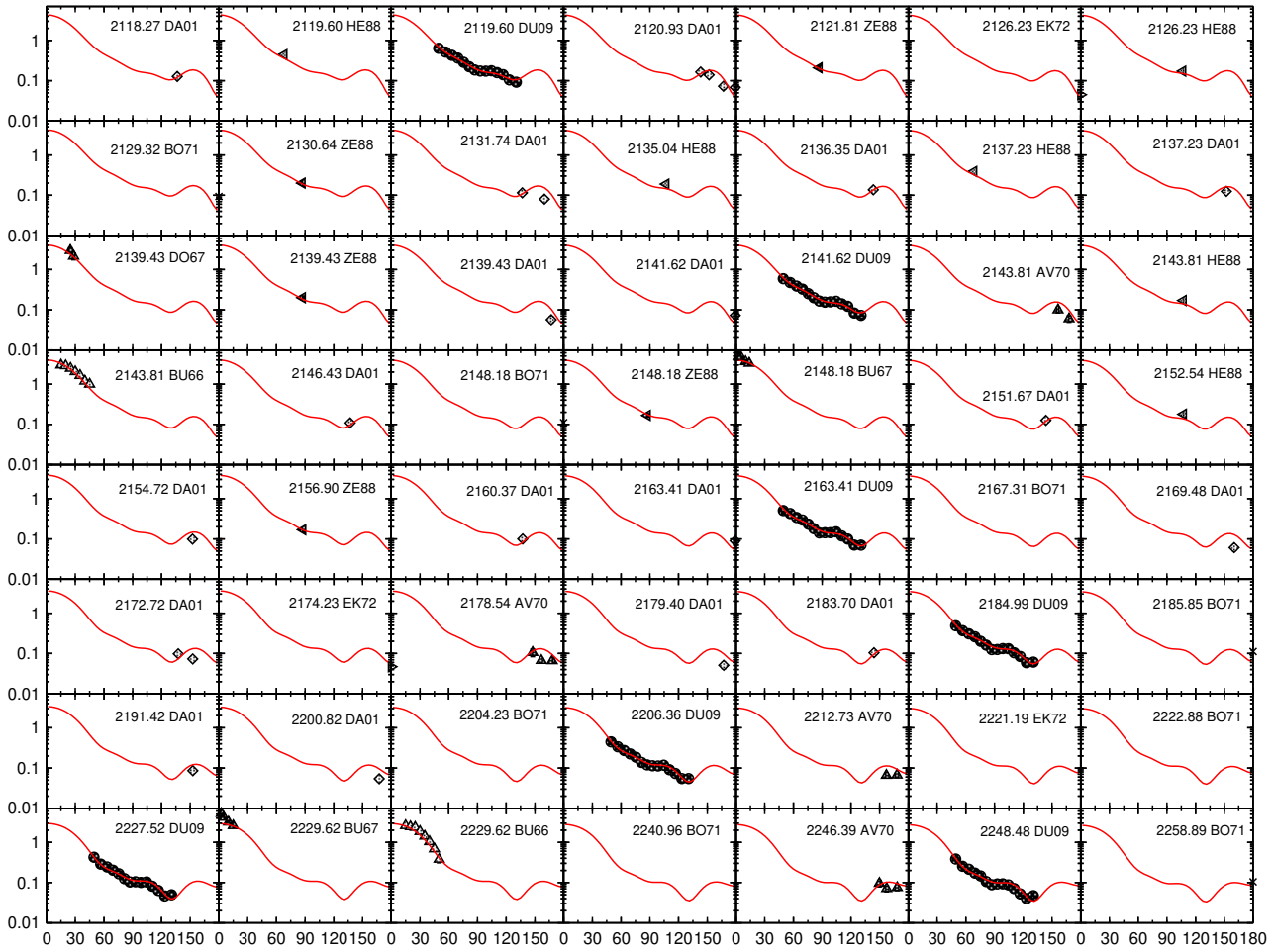

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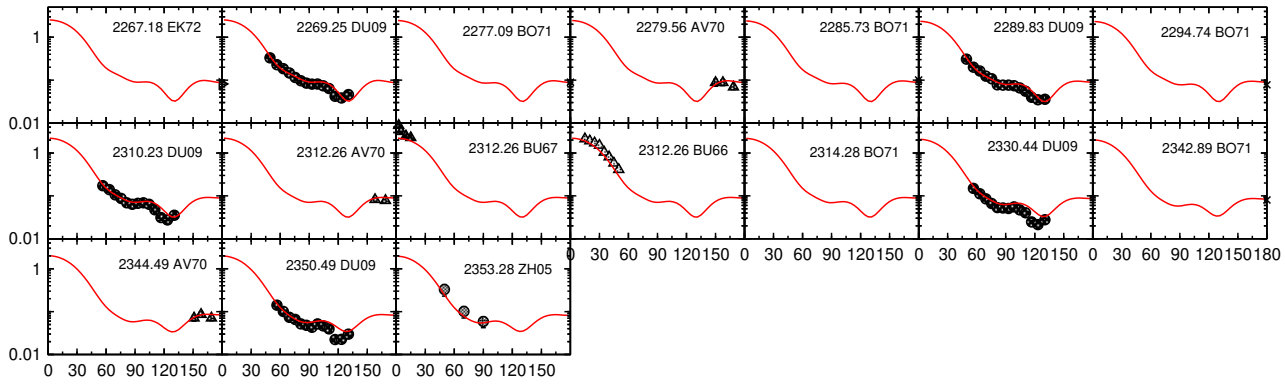

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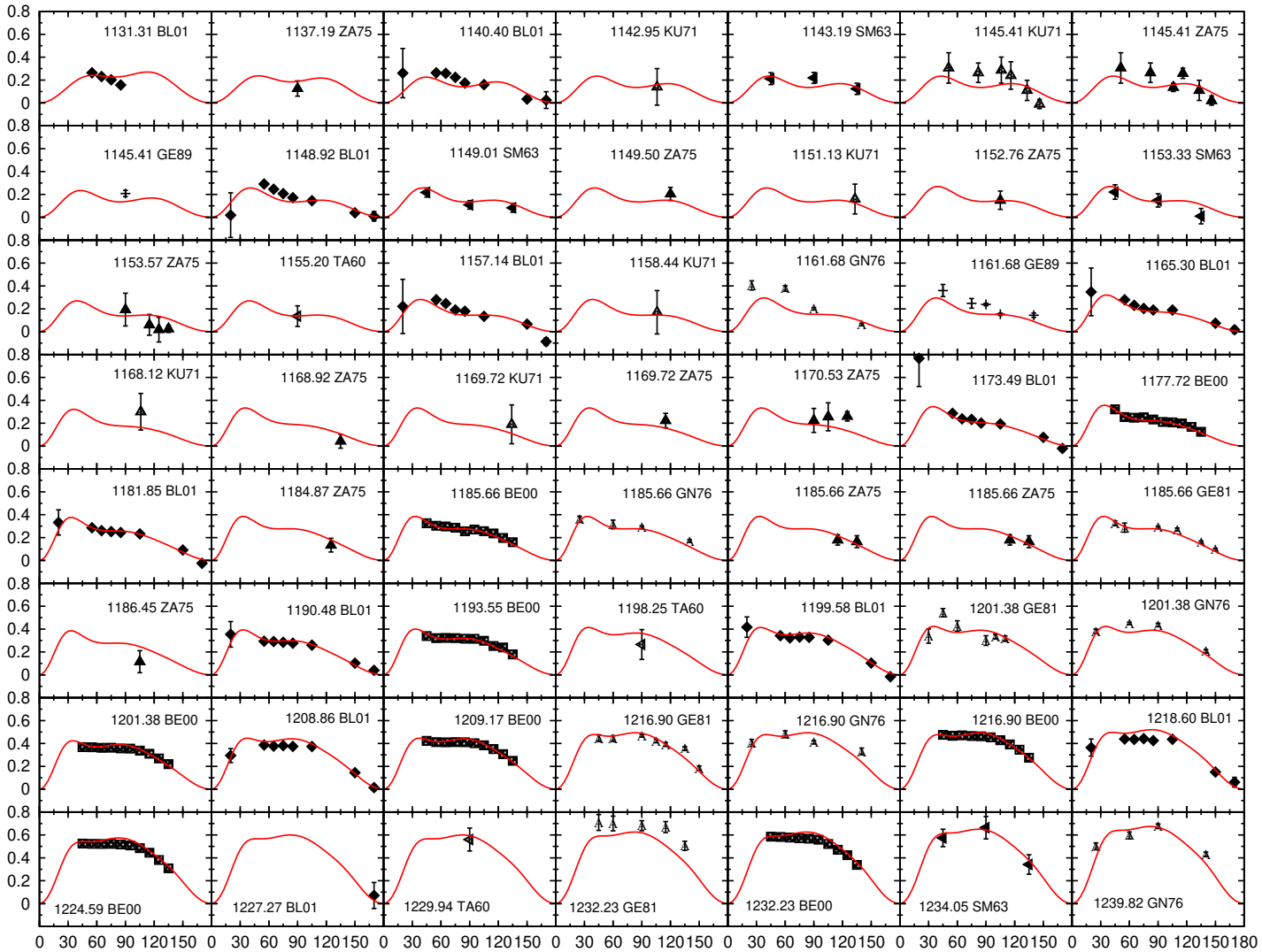

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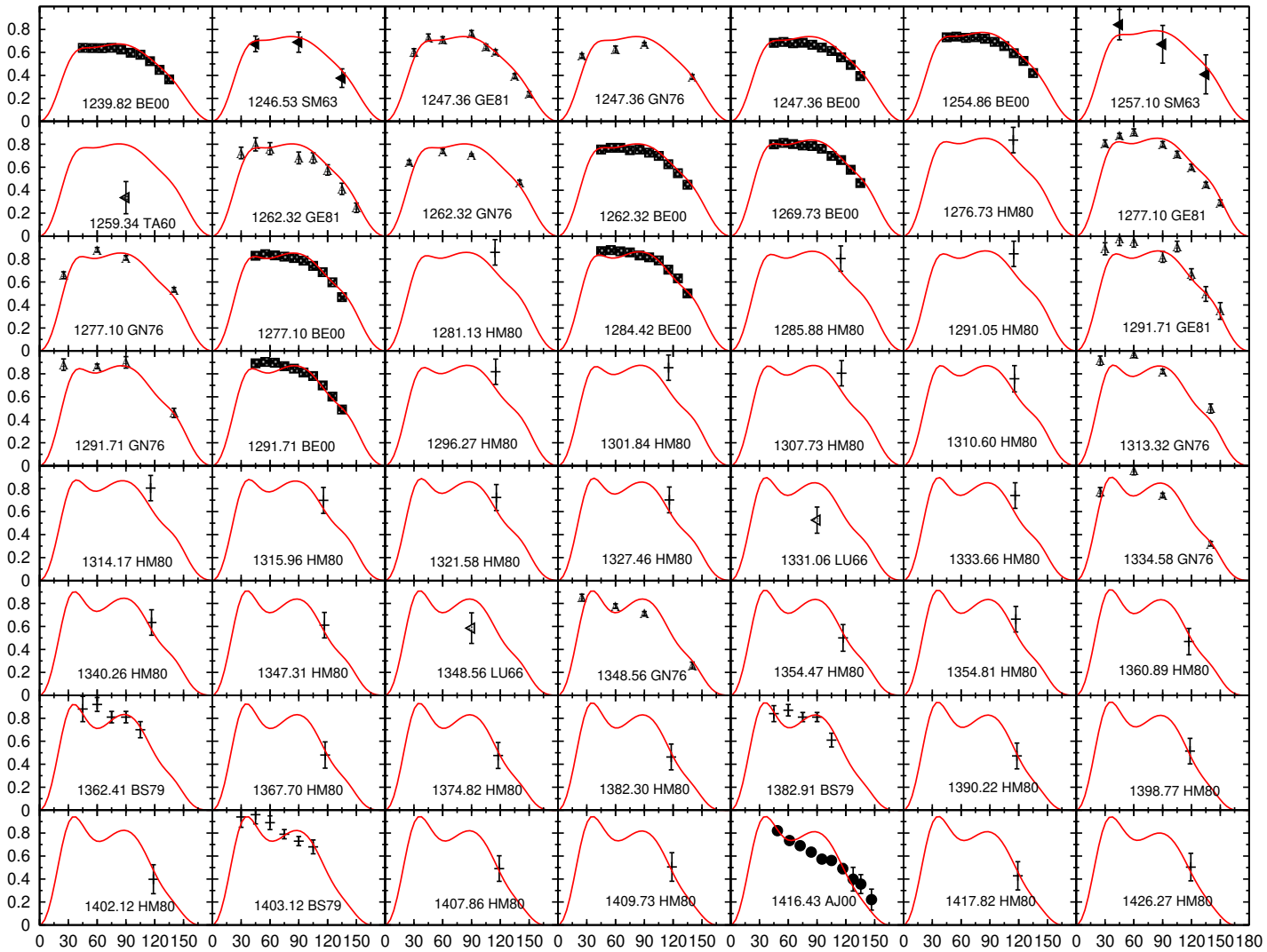

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2029.83 DA01
2031.26 DU80
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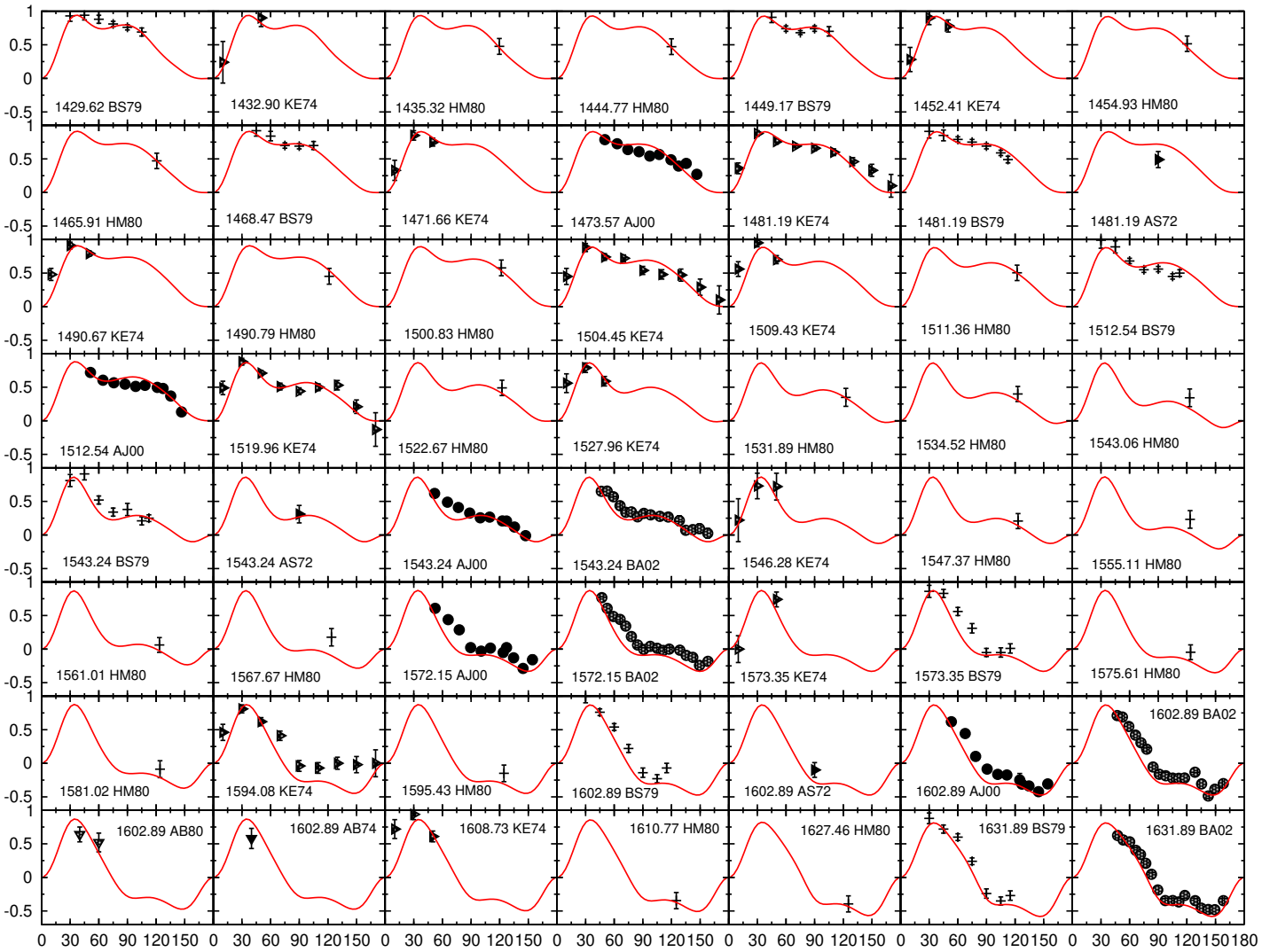

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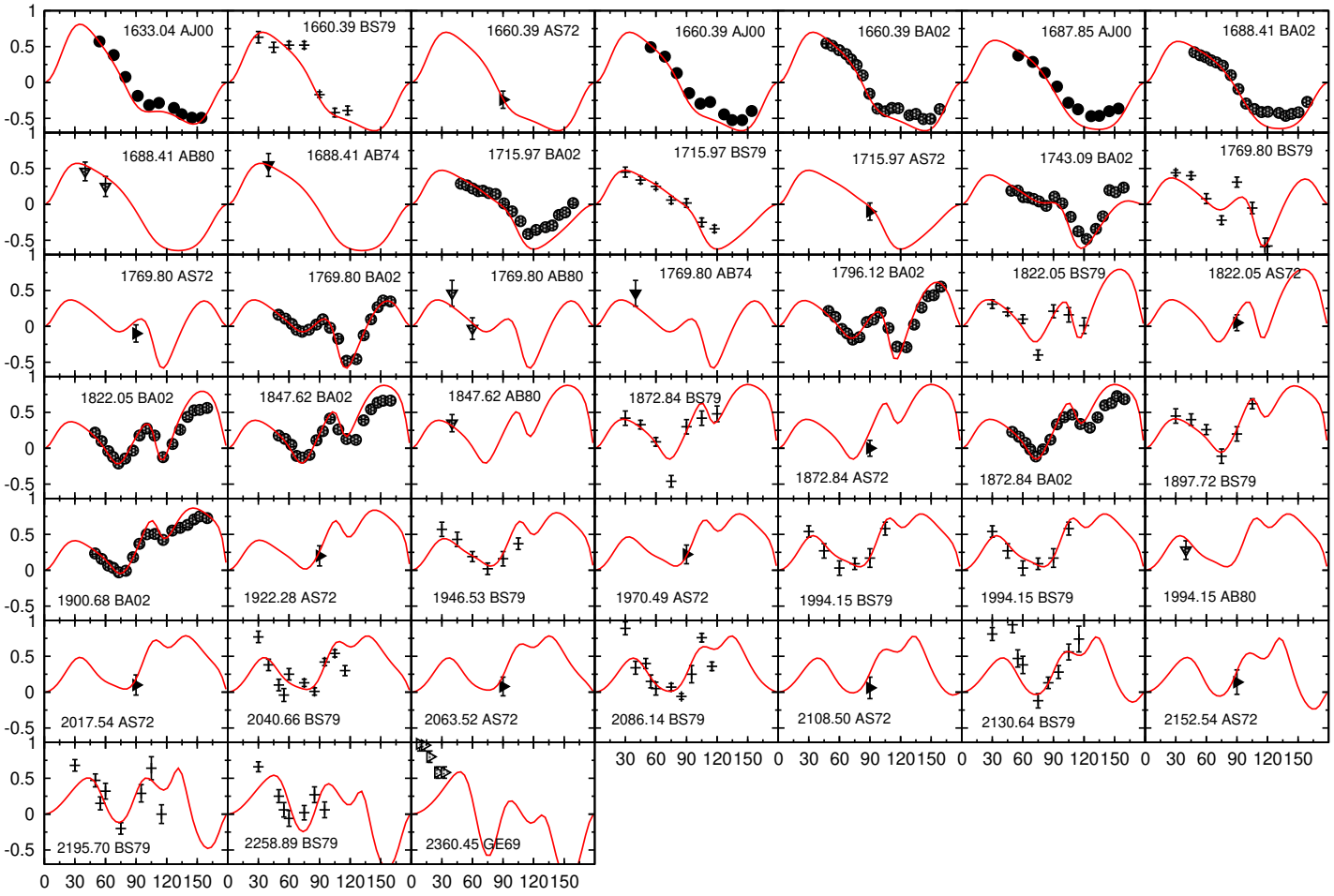

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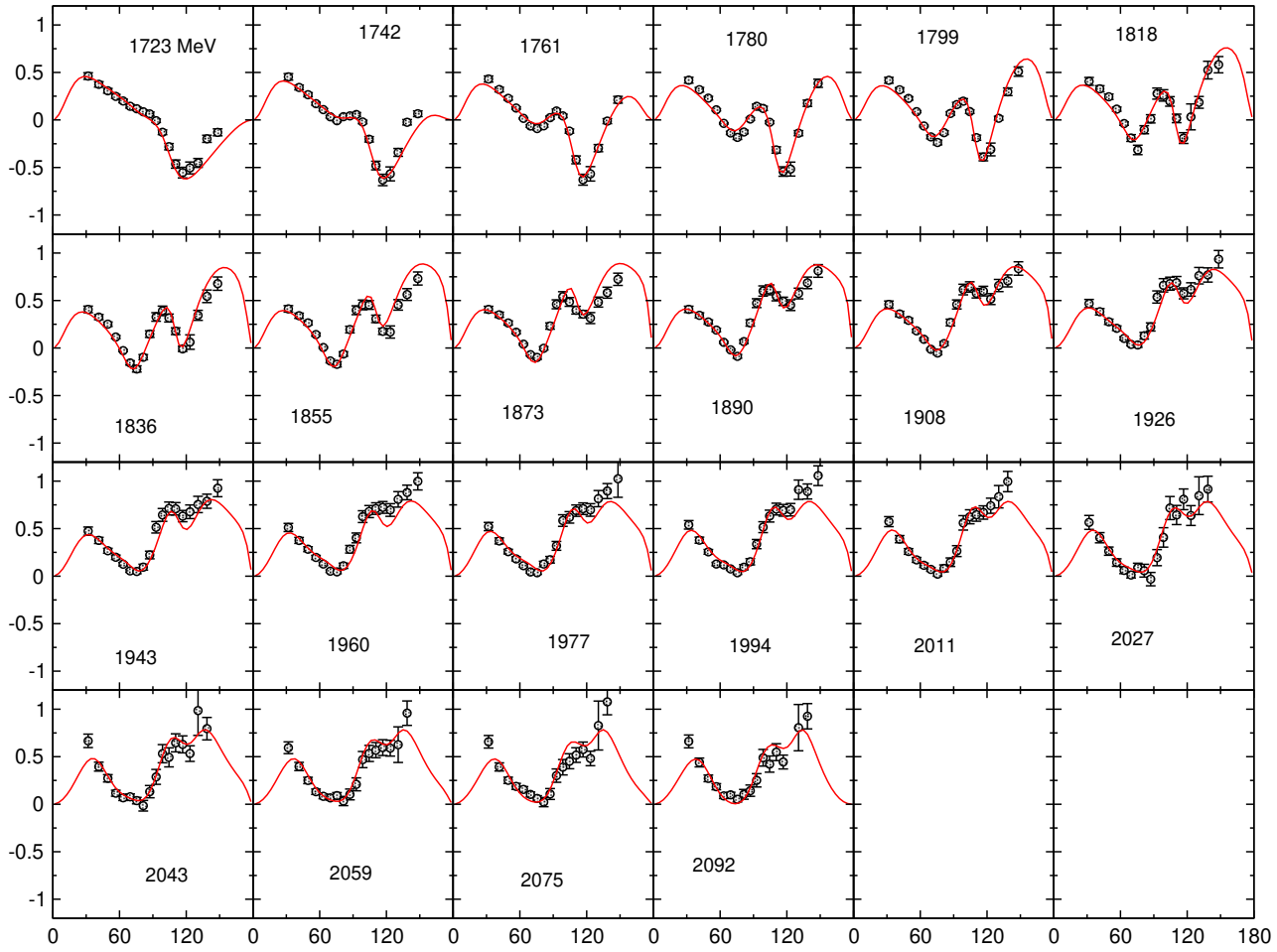
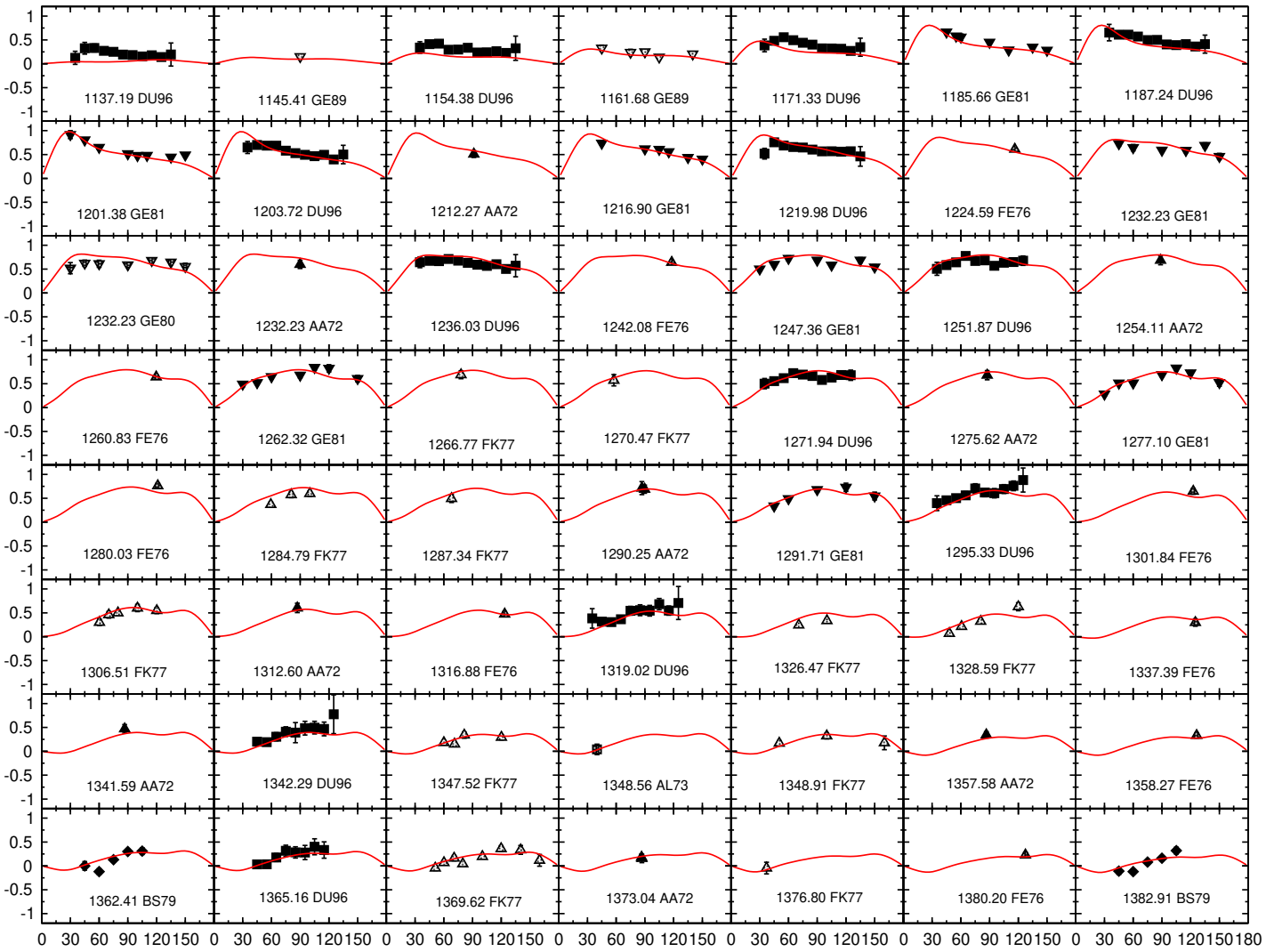
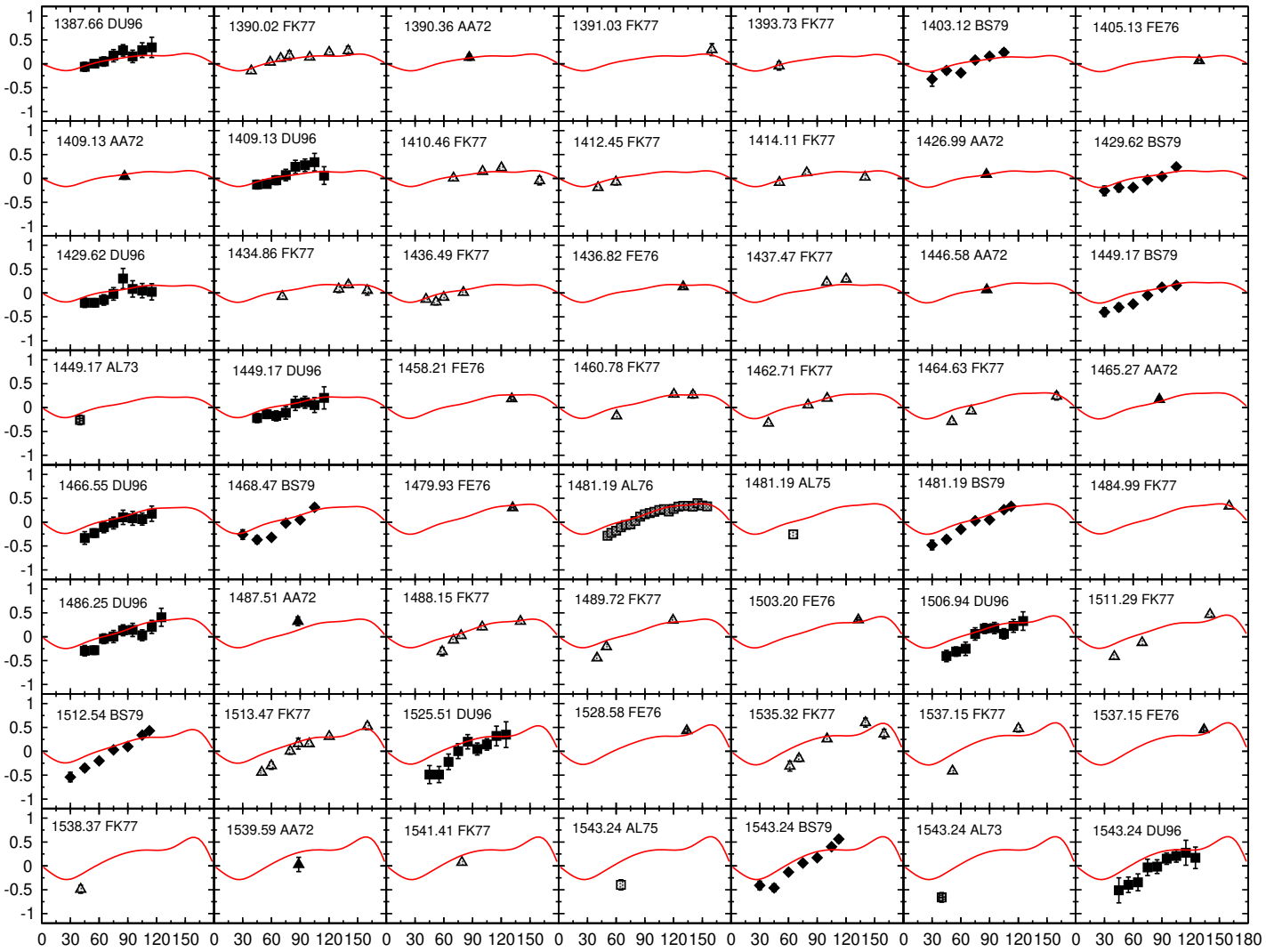
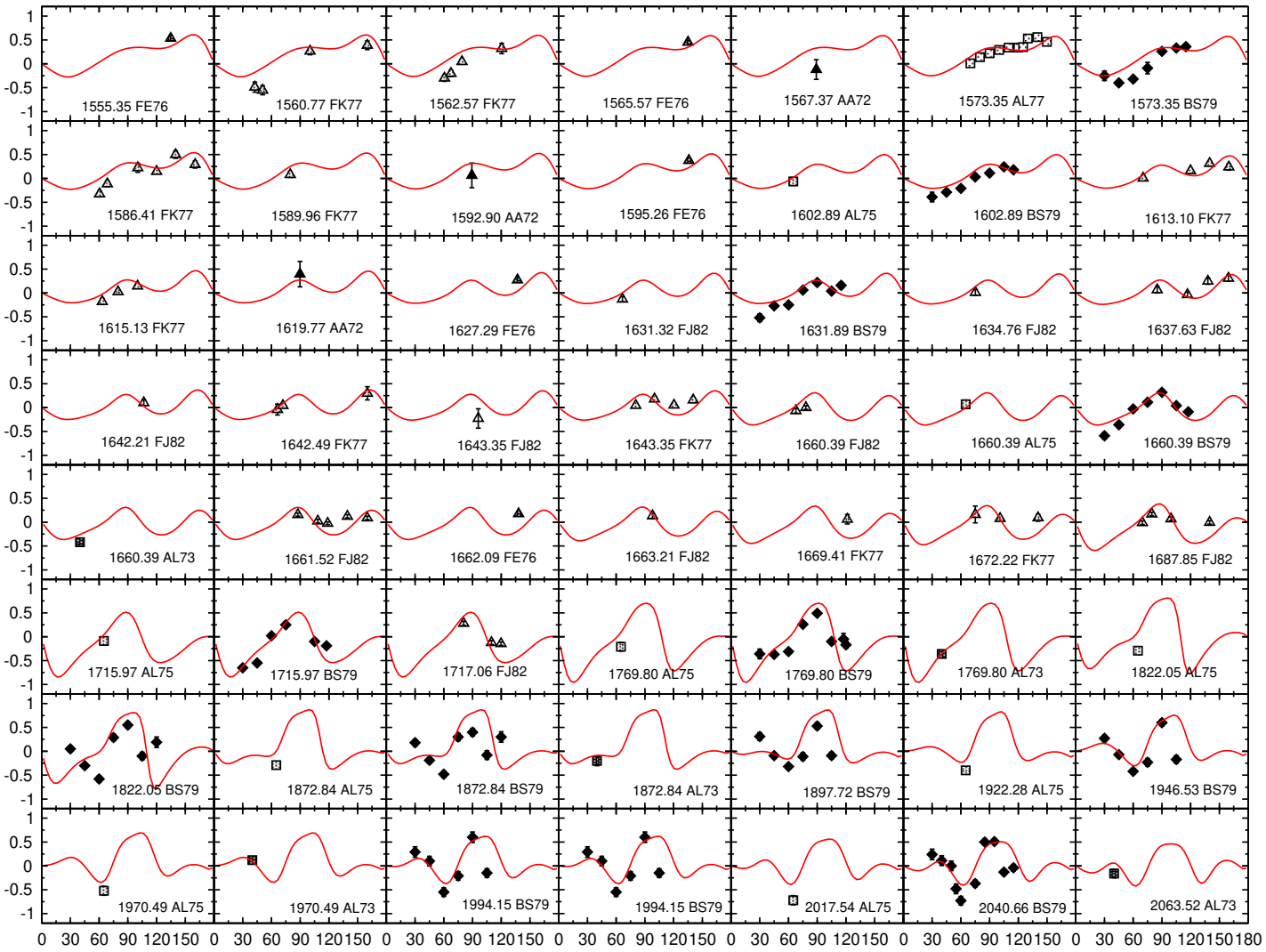
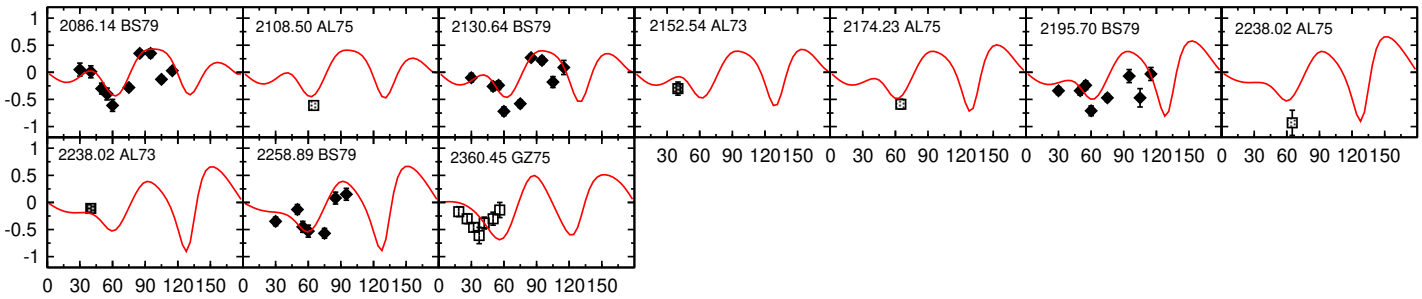


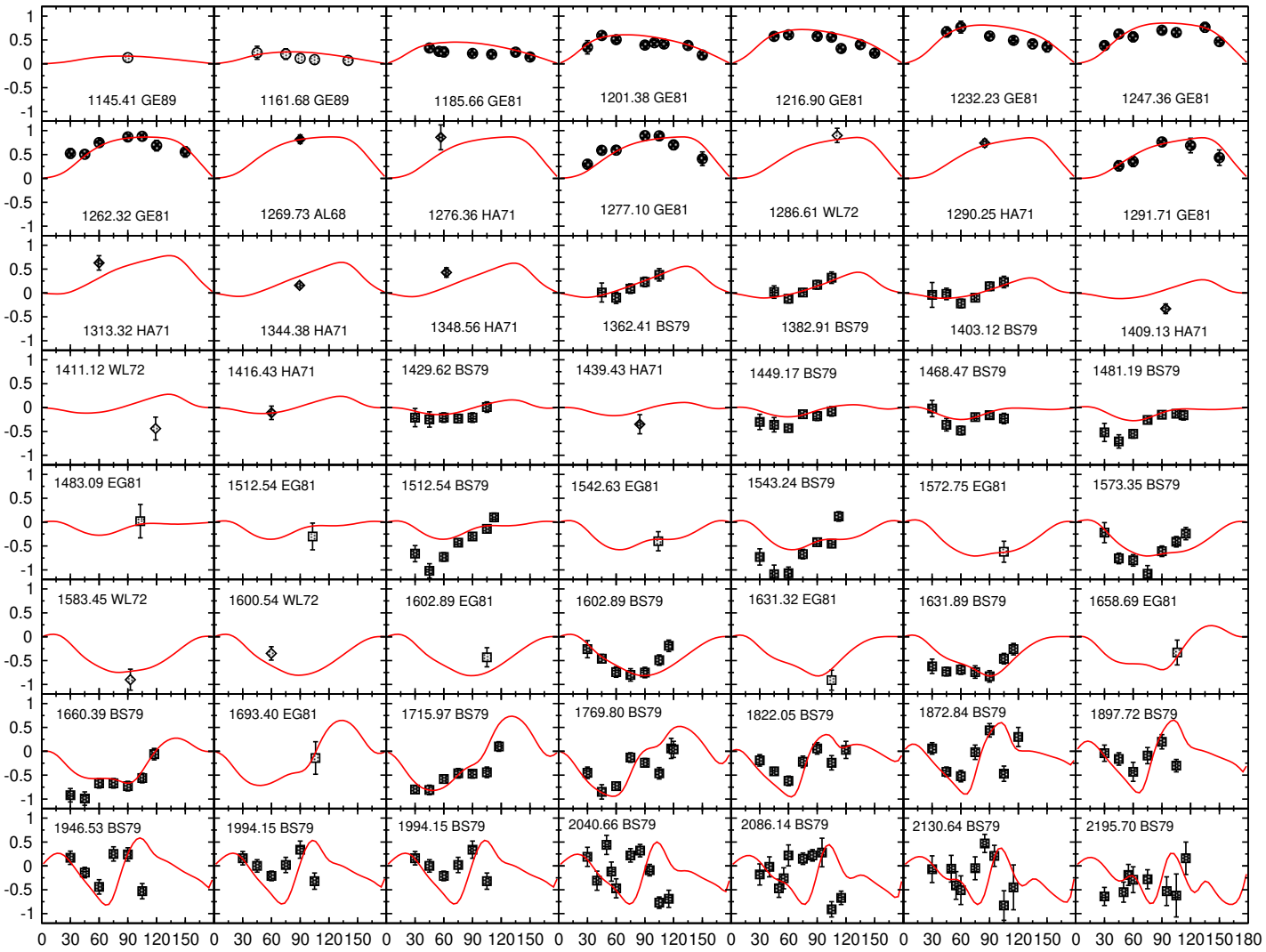
Figure 1: CLAS 2013 (Dugger et al., DU(13))

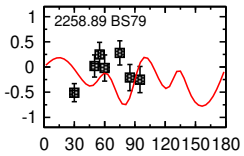

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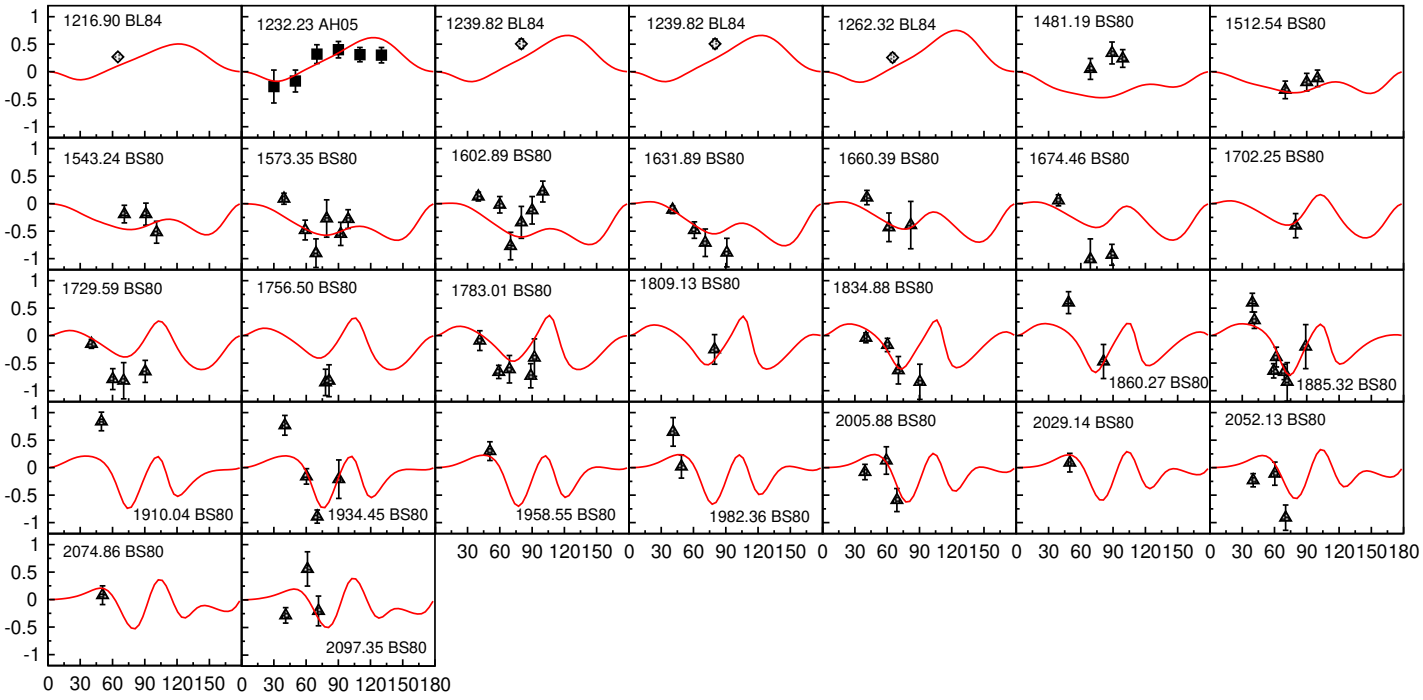

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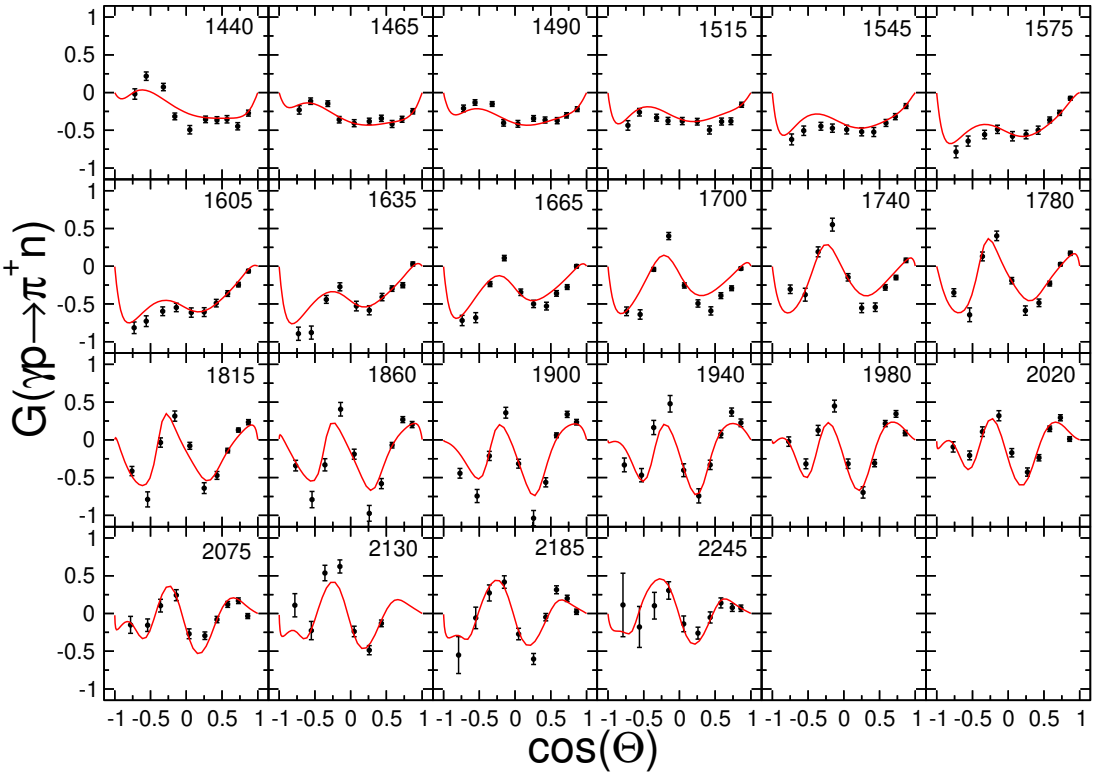
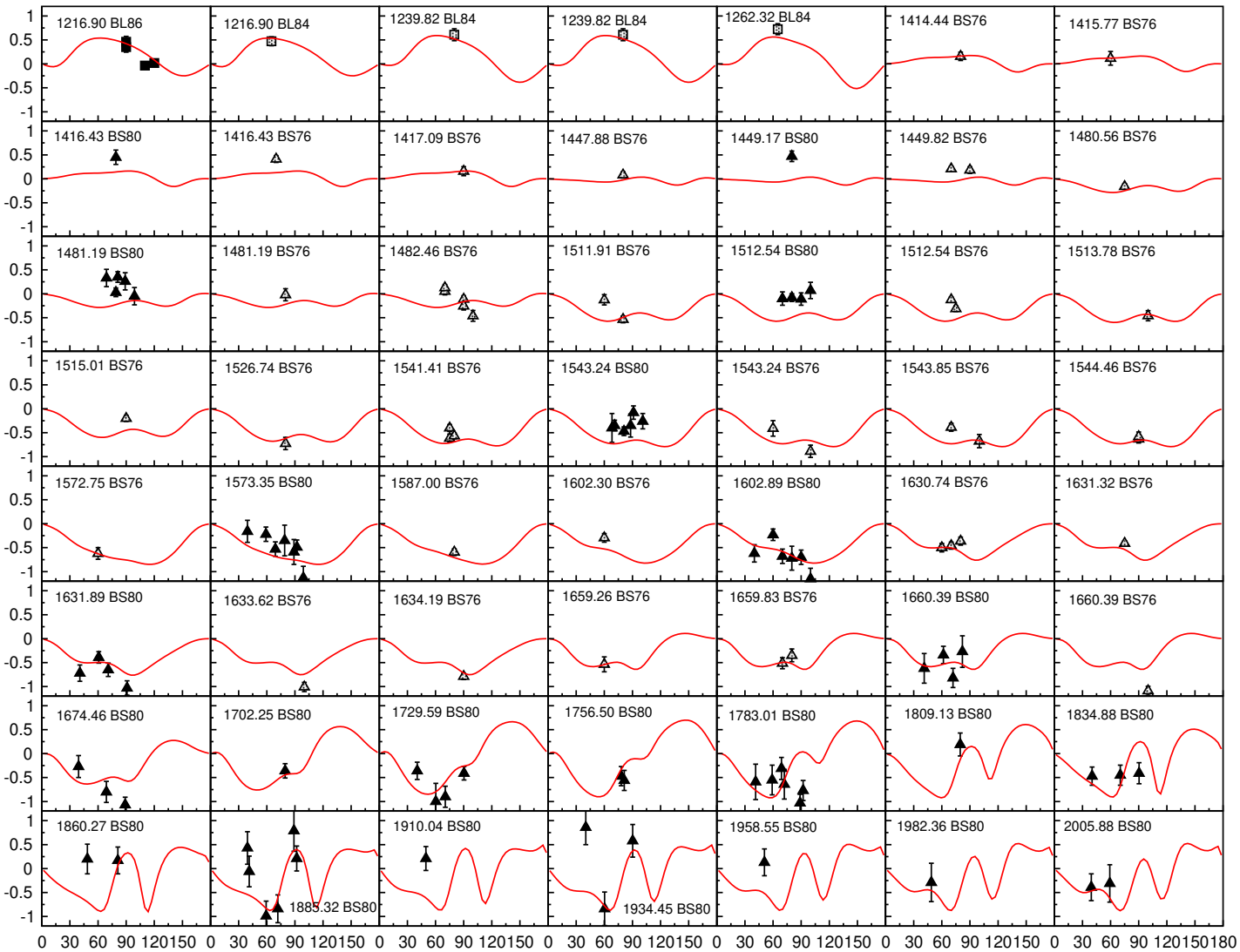
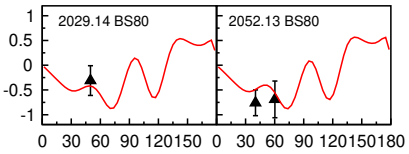
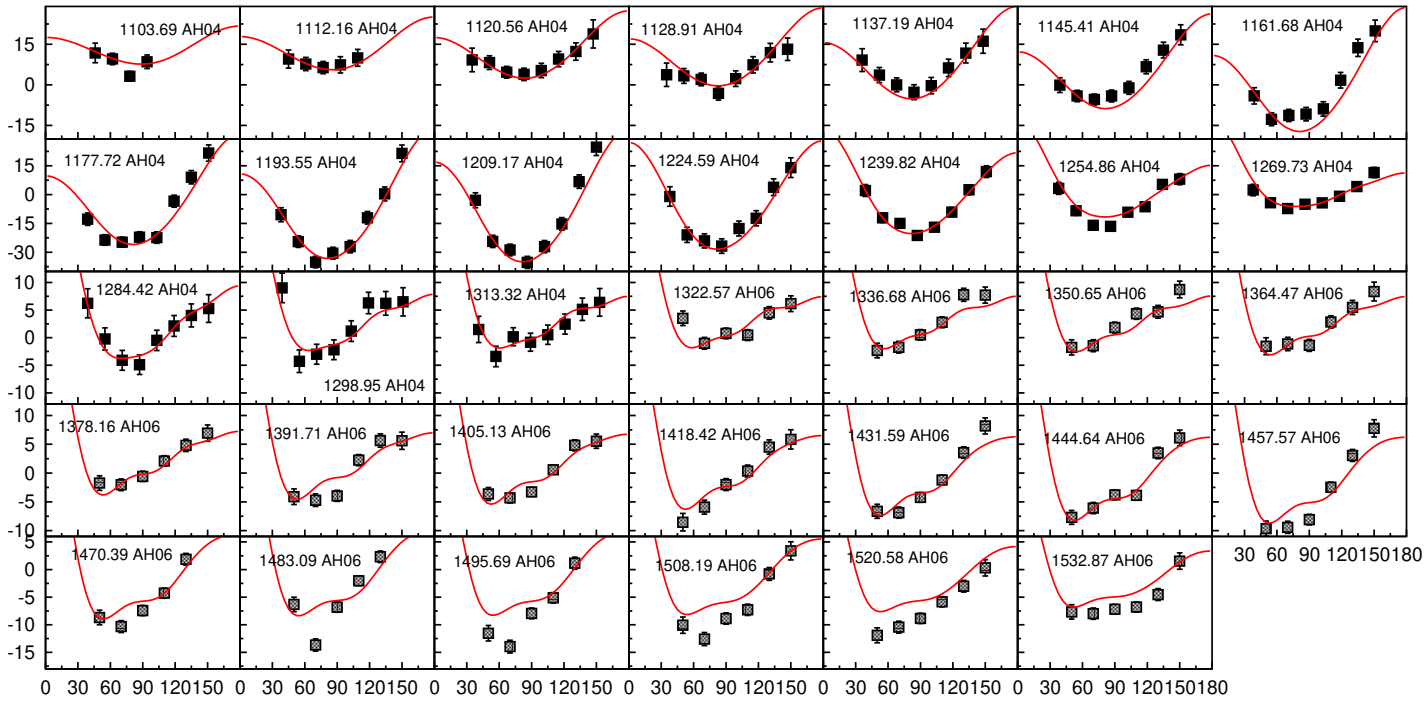
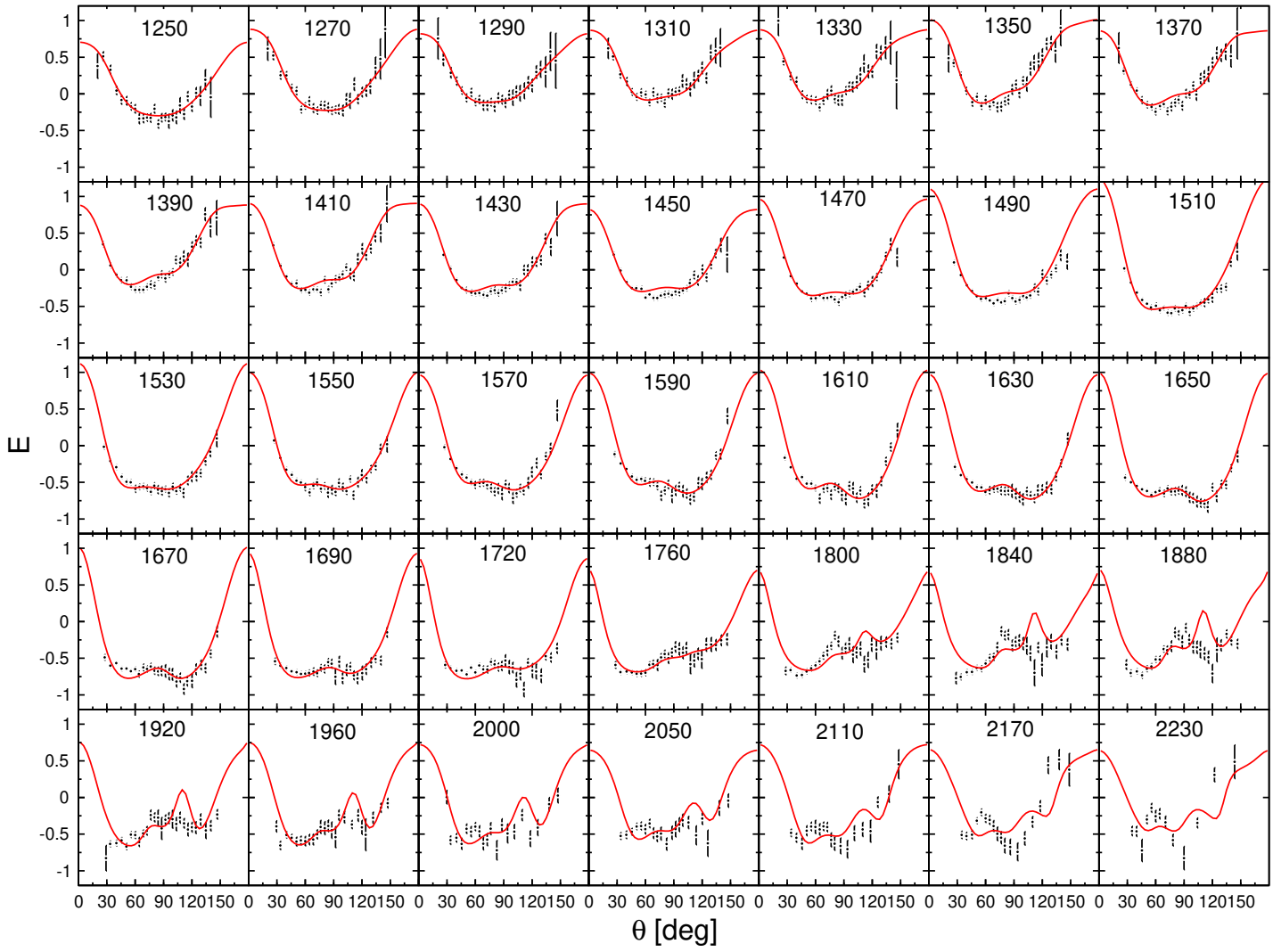


Figure 1: CLAS 2021 (N. Zachariou *et al.* Phys. Lett. B 817, 136304 (2021)


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1602.30 BS76
1602.89 BS80
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1660.39 BS80
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E
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Date references

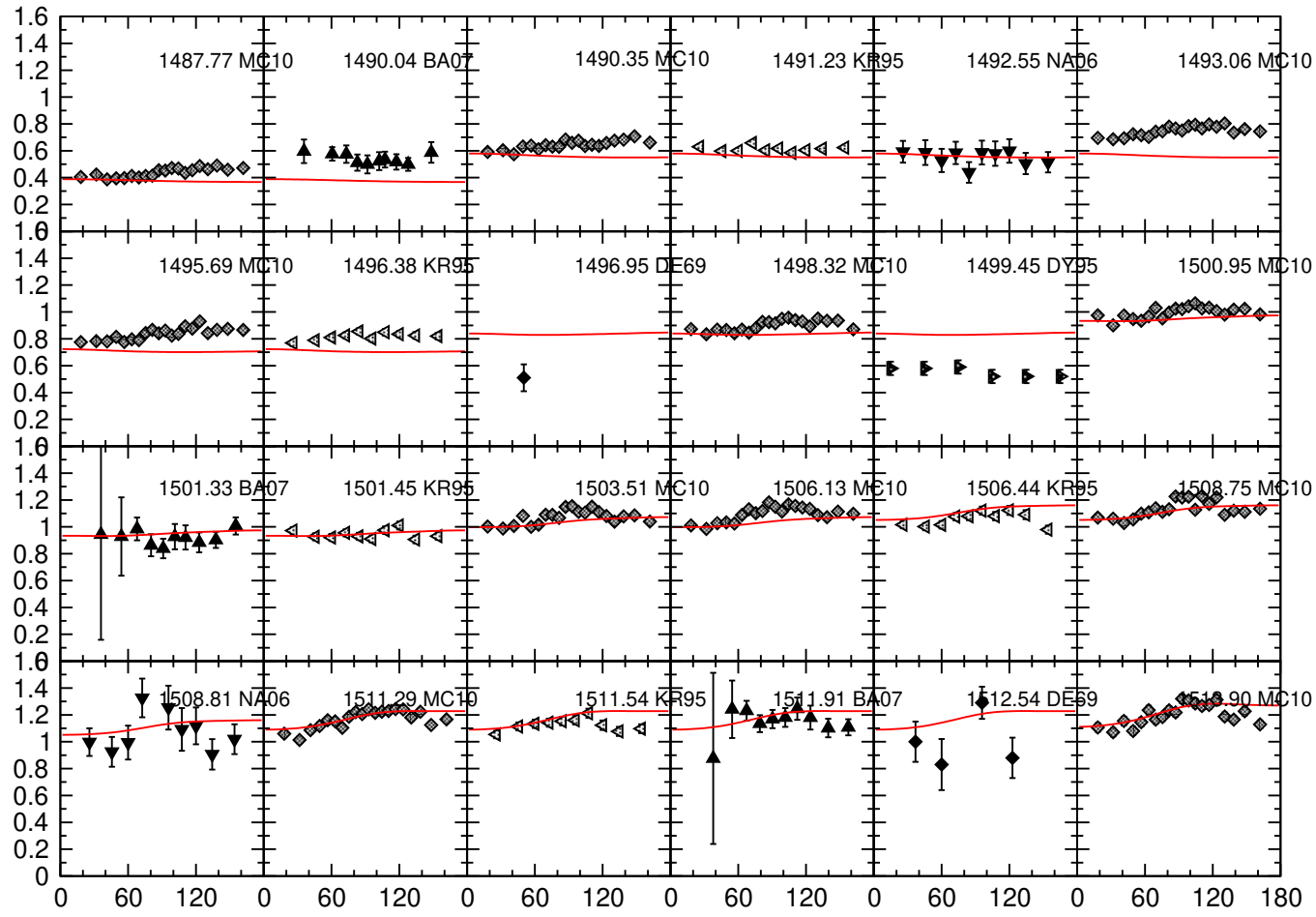
- Differential cross section $\gamma p \to \pi^+ p$:
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  - WA(62) ORSA WALKER, PRL8, 37(62)
  - LI(64) GLAS LEITH, PL8, 355(64)
  - BR(95) SASK BRINK, NPA587, 657(95)
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  - FI(70) BONN FISCHER, NPB16, 119(70)
  - FI(72) BONN FISCHER, ZP253, 38(72)
  - BR(00) MAINZ BRANFORD, PRC61, 014603(2000),
  - FU(77) TOKY FUJII, NPB120, 395(77)
  - AK(71) LEBE ALEKSANDROV, SJNP12, 416(71)
  - KN(63) UCRL KNAPP, PR114, 605(63)
  - BE(00) MAINZ BECK, PRC61, 034604(2000)
  - FU(71) TOKY FUJII, PRL26, 1672(71)
  - DA(01) BONN DANNHAUSEN, EPJA11, 441(2001)
  - FA(84) SACL FAURE, NPA424, 383(84)
  - BT(68) ORSA BETOURNE, PR172, 1343(68)
  - DU(80) BONN E.J.DURWEN, PRP IR-80-7 80
  - BO(71) ORSA BOUQUET, PRL27, 1244(1971)
  - AH(06) MAINT AHRENS, PRC74, 054204 (2006)
  - AL(83) BONN ALTHOFF, ZPC18, 199(83)
  - AR(77) TOKY ARAI, JPSJ43, 363(77)
  - EC(67) CALT ECKLUND, PR159, 1195(1967)
  - EK(72) CORN EKSTRAND, PRD6, 1(1972)
  - DU(09) JLAB DUGGER, PRC79, 065206(2009)
  - HE(88) BONN HEISE, THESIS BONN-IR-88-06
  - ZE(88) BONN ZENZ, THESIS BONN-IR-88-12
  - BY(61) CALT J.H.BOYDEN, PH.D THESIS 1961
  - AV(70) CEA ALVAREZ, PRD1, 1946(70)
  - AB(74) YERE ABRAHAMIAN, PLB48, 463(1974)
  - BY(61) CALT J.H.BOYDEN, PH.D THESIS 1961
  - ZH(05) JLAB ZHU, PRC71, 044603(2005)
  - KI(62) CALT J.R.KILNER, PH.D THESIS 1962
  - BU(66) DESY BUSCHHORN, PRL17, 1027(1966)
  - BU(67) DESY BUSCHORN, PRL18, 571(1967)
  - DO(67) CEA DOWD, PRL18, 414(1967)
- Beam asymmetry Σ $\gamma p \to \pi^+ p$:
  - BL(01) LEGS BLANPIED, PRC64, 025203(01)
  - ZA(75) TOMS ZABAEV, SJNP21, 286(75)
  - KU(71) TOMS KUZNETSOV, NCL1, 233(71)

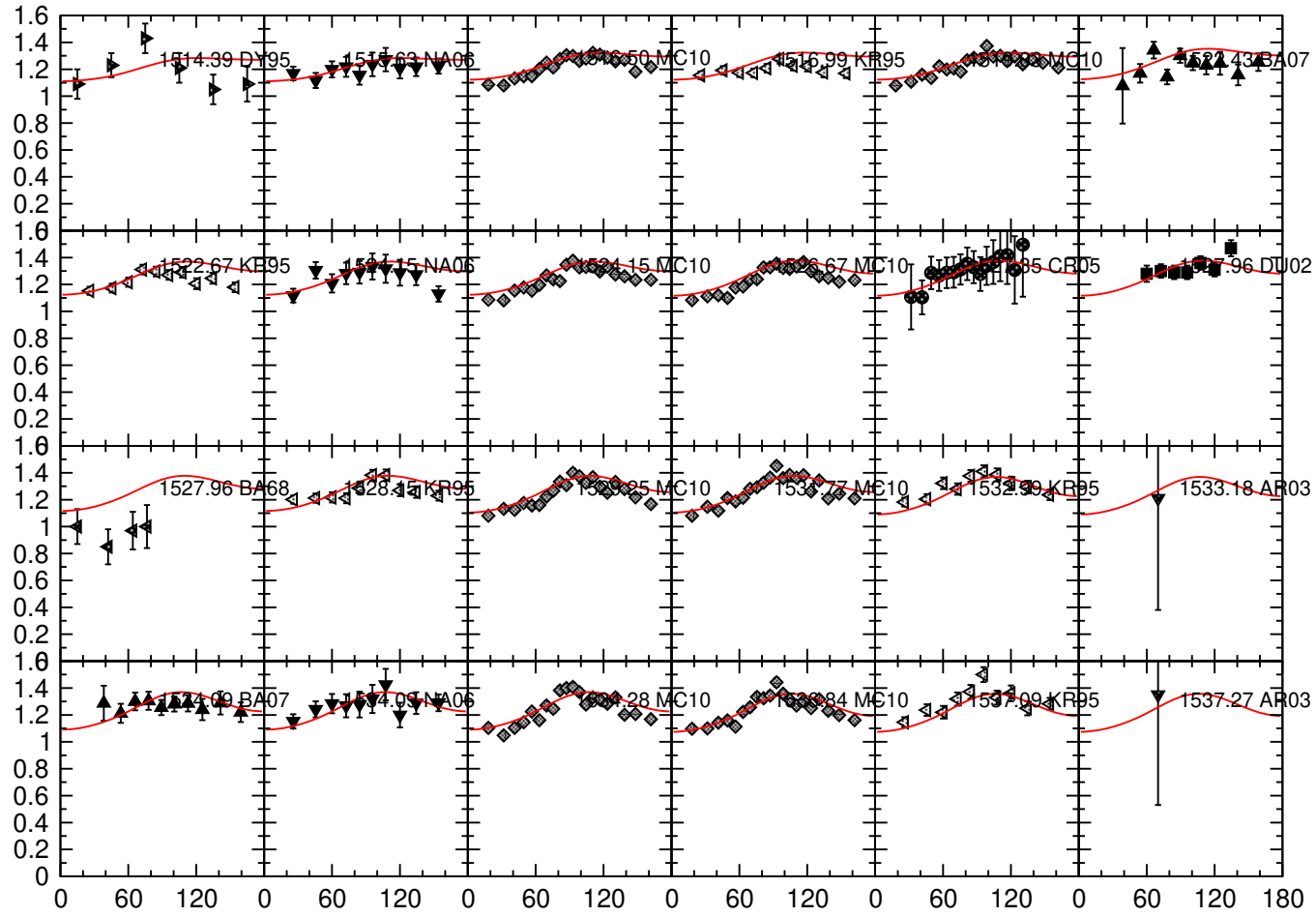
- SM(63) STAN SMITH, PR130, 2429(63)
- GE(89) KHAR GETMAN, VANT8, 3(1989)
- TA(60) STAN TAYLOR, PR117, 835(60)
- GN(76) KHAR GANENKO, SJNP23, 52(76)
- BE(00) MAINZ BECK, PRC61, 034604(2000)
- GE(81) KHAR GETMAN, NPB188, 397(81)
- HM(80)PBONN P.HAMPE, PRP IR-80-1 80
- LU(66) STAN LIU, PR144, 1093(66)
- BS(79) DNPL BUSSEY, NPB154, 205(79)
- AJ(00) GRAA AJAKA, PLB475, 372(2000), KUZNE
- KE(74) SLAC KNIES, PRD10, 2778(74)
- AS(72) CEA ALSPECTOR, PRL28, 1403(72)
- BA(02) GRAA BARTALINI, PLB544, 113(2002)
- AB(80) YERE ABRAHAMIAN, SJNP32, 66(1980)
- AB(74) YERE ABRAHAMIAN, PLB48, 463(1974)
- GE(69) SLAC GEWENIGER, PL29B, 41(1969)
- DU(13) Dugger *et al.* (CLAS Collaboration) PRC88, 065203, PRC89, 029901 (2014)

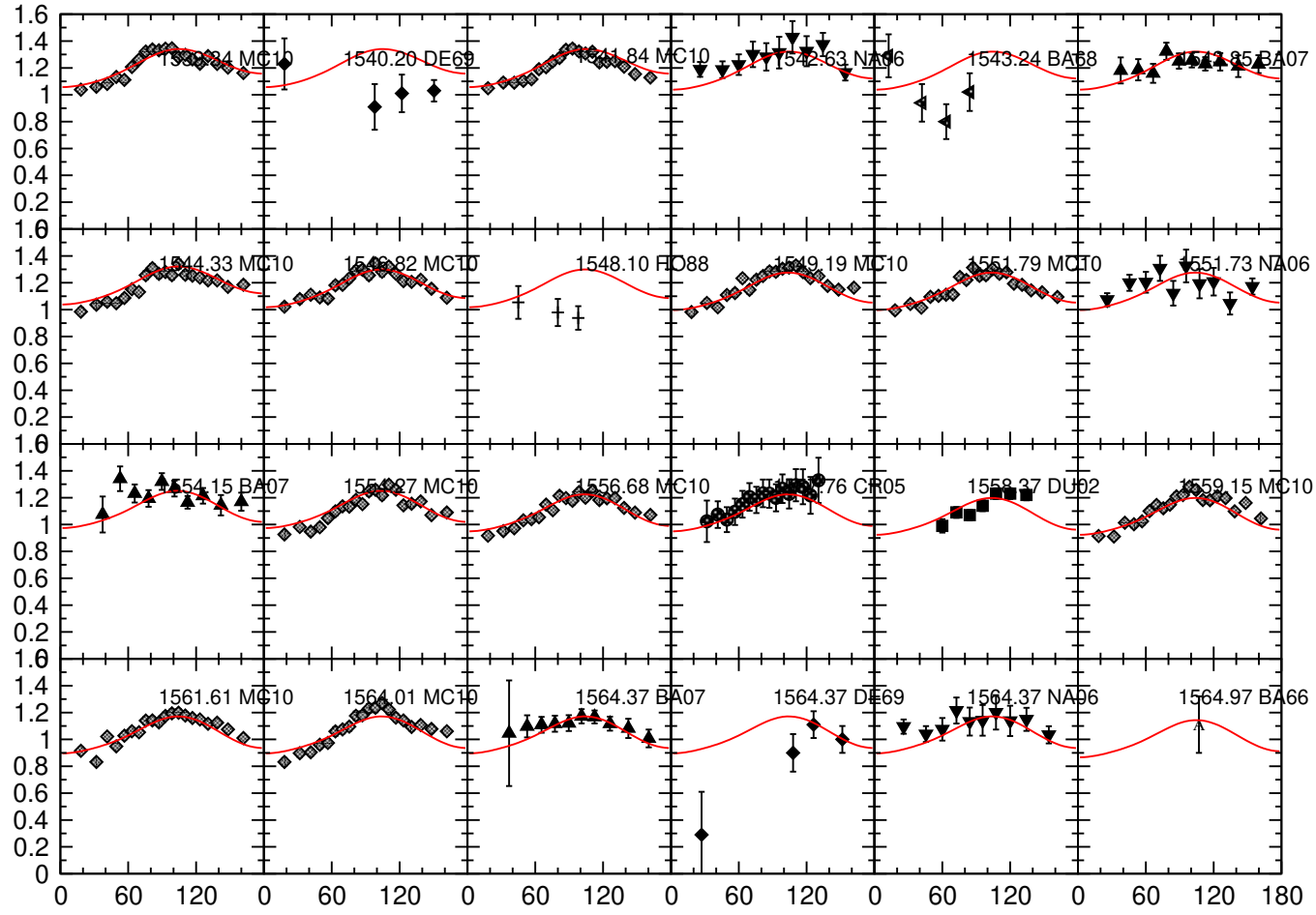
- Recoil Polarization $\gamma p \to \pi^+ p$:
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  - GE(81) KHAR GETMAN, NPB188, 397(81)
  - AL(68) BONN ALTHOFF, PLB26, 640(68)
  - HA(71) BONN U.HAHN, PRP PI1-143 71
  - WL(72) BONN W.WALLRAFF, PRP PIB1-162 72
  - BS(79) DNPL BUSSEY, NPB154, 205(79)
  - EG(81) TOKY EGAWA, NPB188, 11(81)
- Target asymmetry T $\gamma p \to \pi^+ p$:
  - DU(96) BONN DUTZ, NPA601, 319(1996)
  - GE(89) KHAR GETMAN, VANT8, 3(1989)
  - GE(81) KHAR GETMAN, NPB188, 397(81)
  - AA(72) TOKY ARAI, NPB48, 397(72)
  - FE(76) TOKY FELLER, NPB102, 207(76)
  - GE(80) KHAR GETMAN, SJNP31, 480(80)
  - FK(77) TOKY FUKUSHIMA, NPB130, 486(77)
  - AL(73) BONN ALTHOFF, NPB53, 9(73)
  - BS(79) DNPL BUSSEY, NPB154, 205(79)
  - AL(76) BONN ALTHOFF, PLB63, 107(76)
  - AL(75) BONN ALTHOFF, PLB59, 93(75)
  - AL(77) BONN ALTHOFF, NPB131, 1(77)
  - FJ(82) TOKY FUJII, NPB197, 365(82)
  - GZ(75) BONN GENZEL, NPB92, 196(1975)
- G $\gamma p \to \pi^+ p$:
  - BL(84) KHAR BELYAEV, SJNP40, 83(84)
  - AH(05) MAINZ AHRENS, EJPA26, 135(2005)

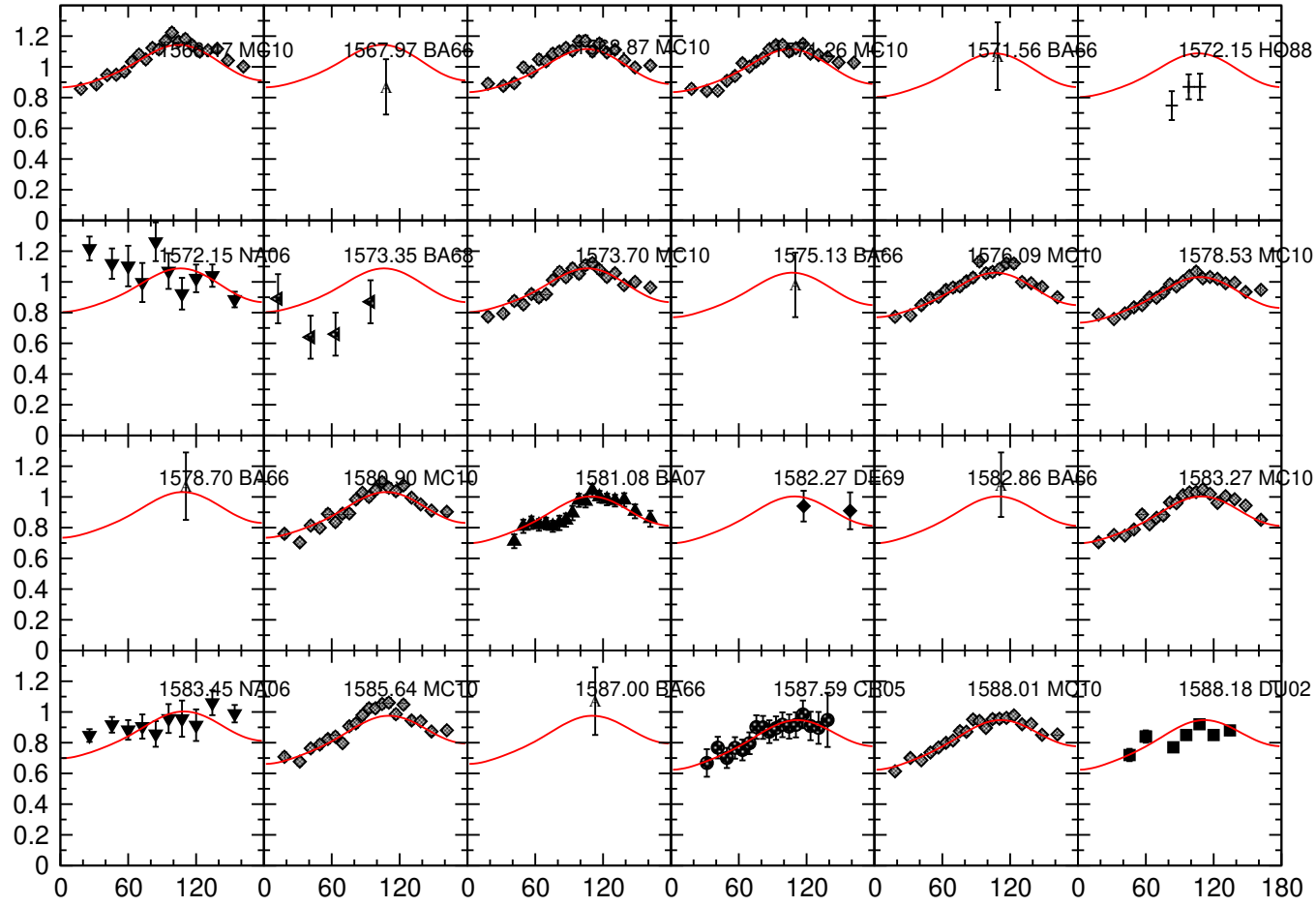
- BS(80) DNPL BUSSEY, NPB169, 403(80)
- CLAS 2021 (N. Zachariou *et al.* Phys. Lett. B 817, 136304 (2021)

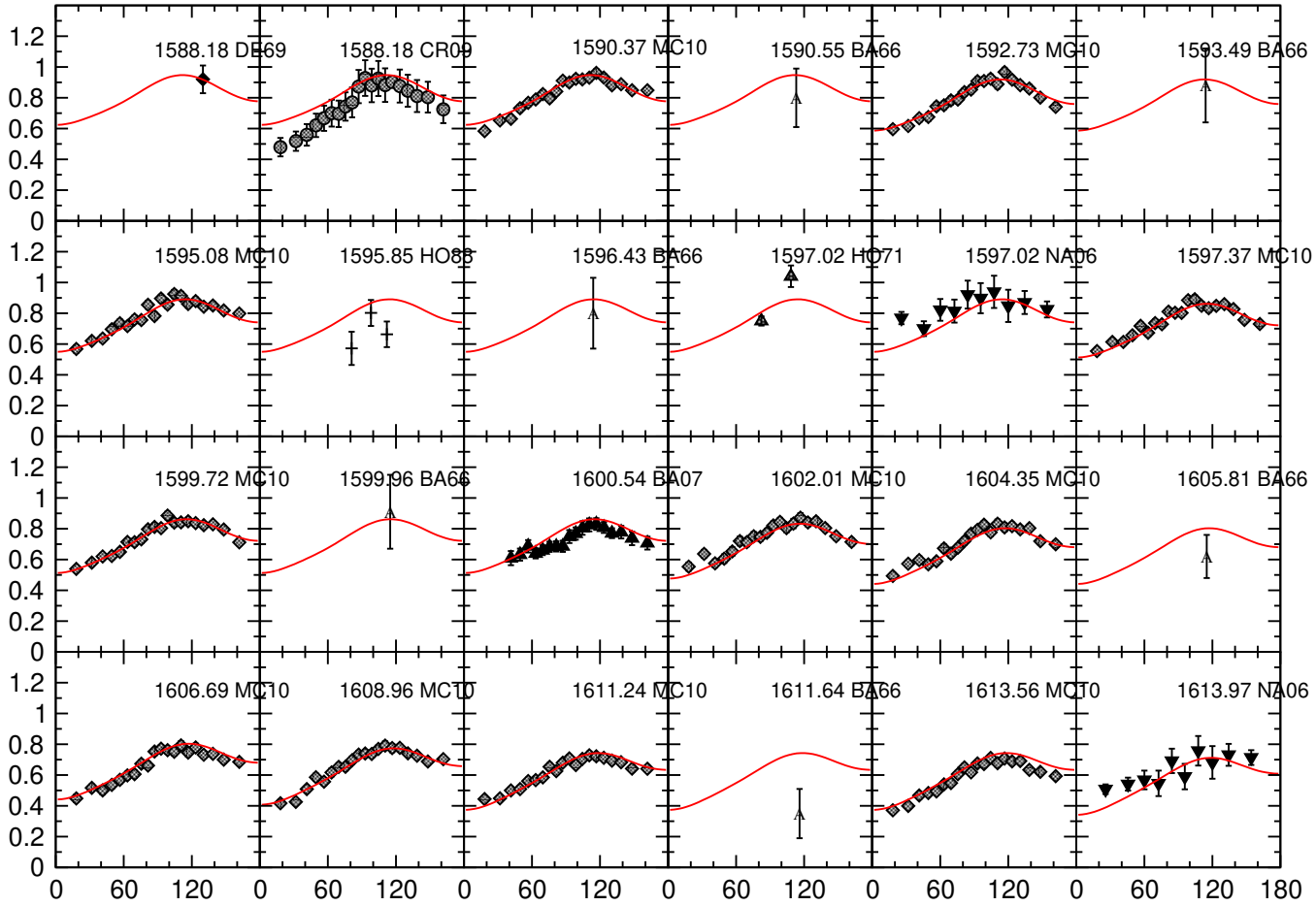
- H $\gamma p \to \pi^+ p$:
  - BL(86) KHAR BELYAEV, SJNP43, 947(86)
  - BL(84) KHAR BELYAEV, SJNP40, 83(84)
  - BS(76) DARE BUSSEY, PHYSIK DATEN 1977
  - BS(80) DNPL BUSSEY, NPB169, 403(80)
- Δ_{13} $\gamma p \to \pi^+ p$:
  - AH(04) MAINZ AHRENS, EPJA21, 323(2004)
  - AH(06) MAINZ AHRENS, PRC74, 054204 (2006)
- E $\gamma p \to \pi^+ p$:
  - Strauch *et al.*, CLAS PLB750, 53 (2015)

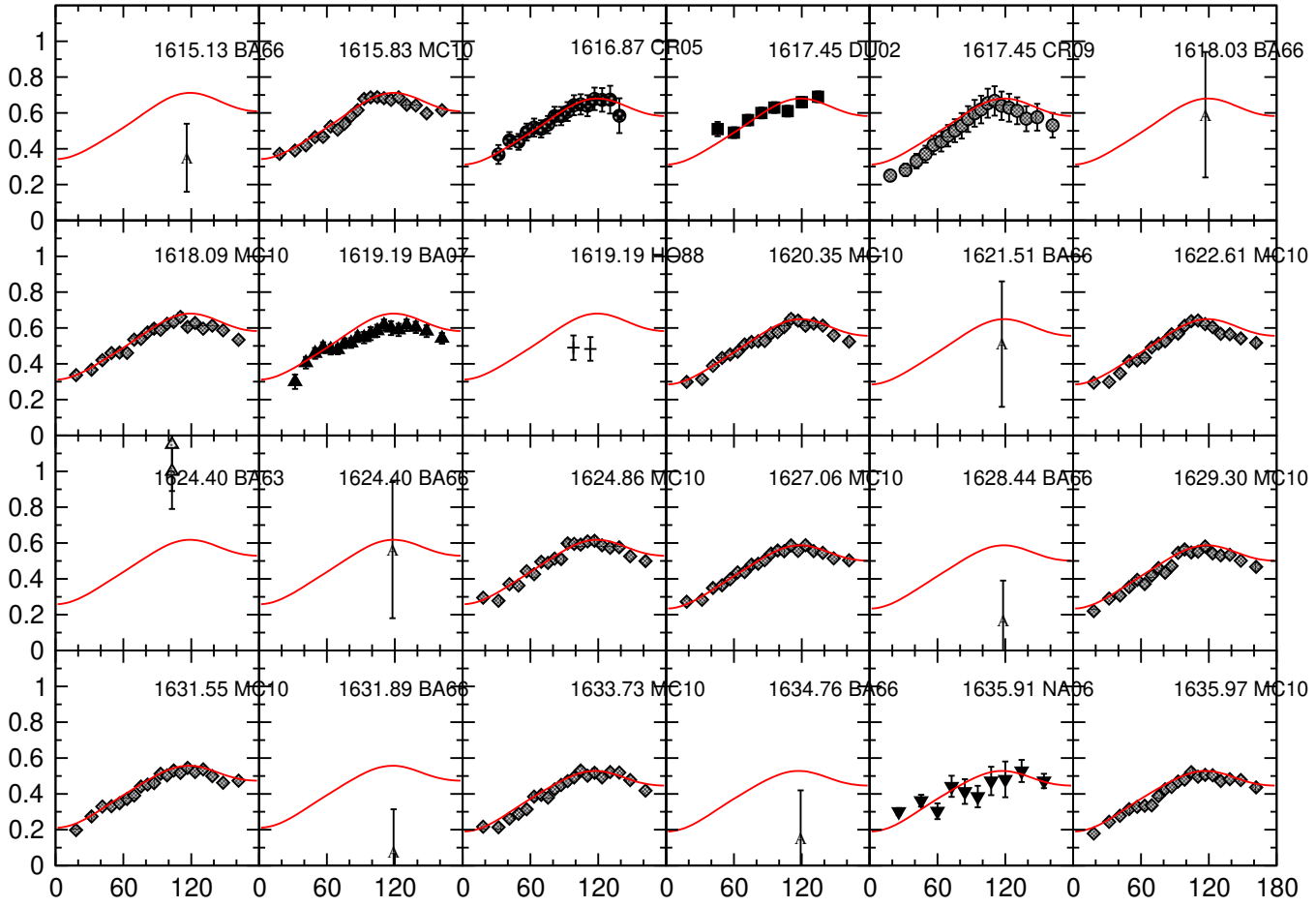

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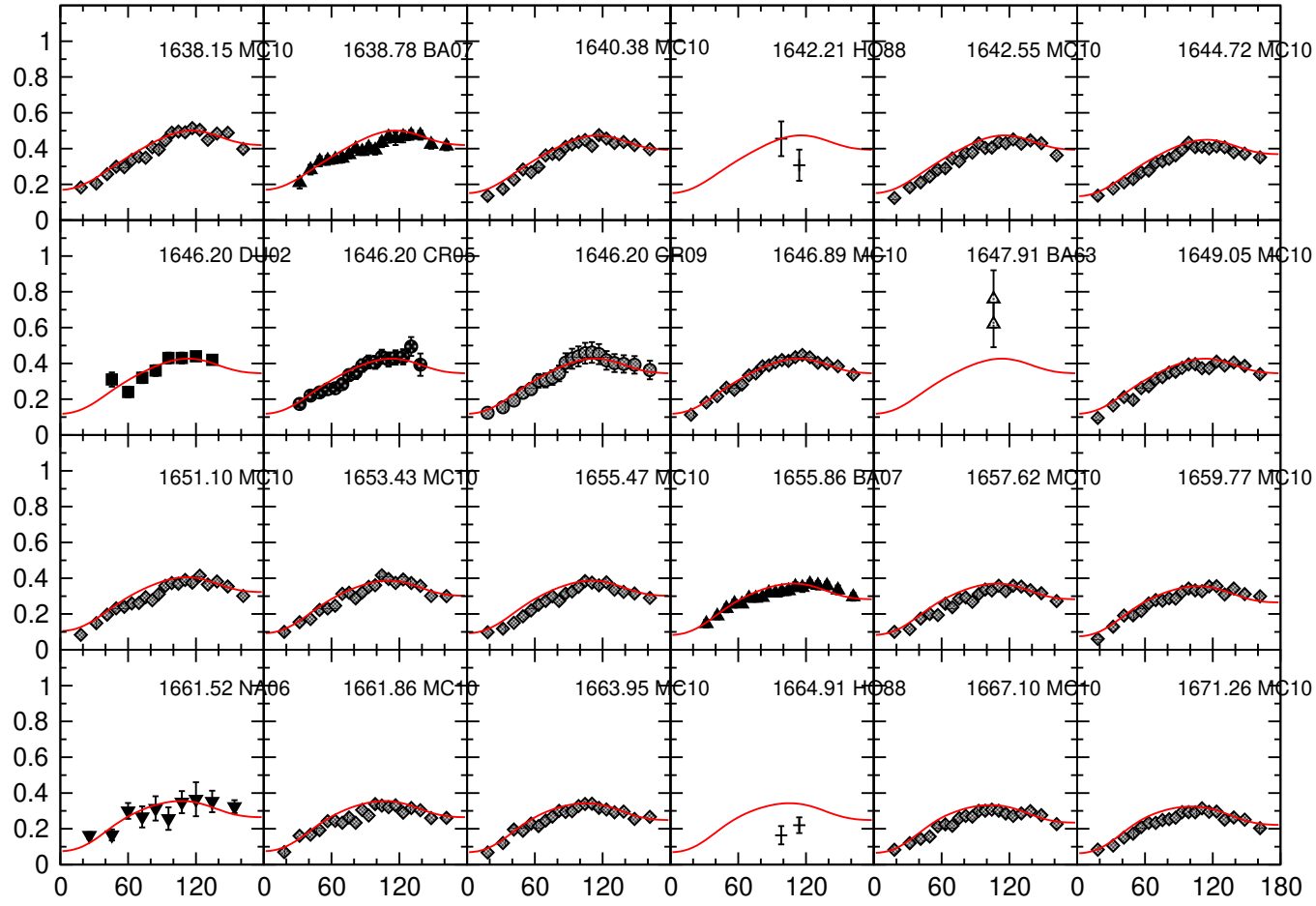

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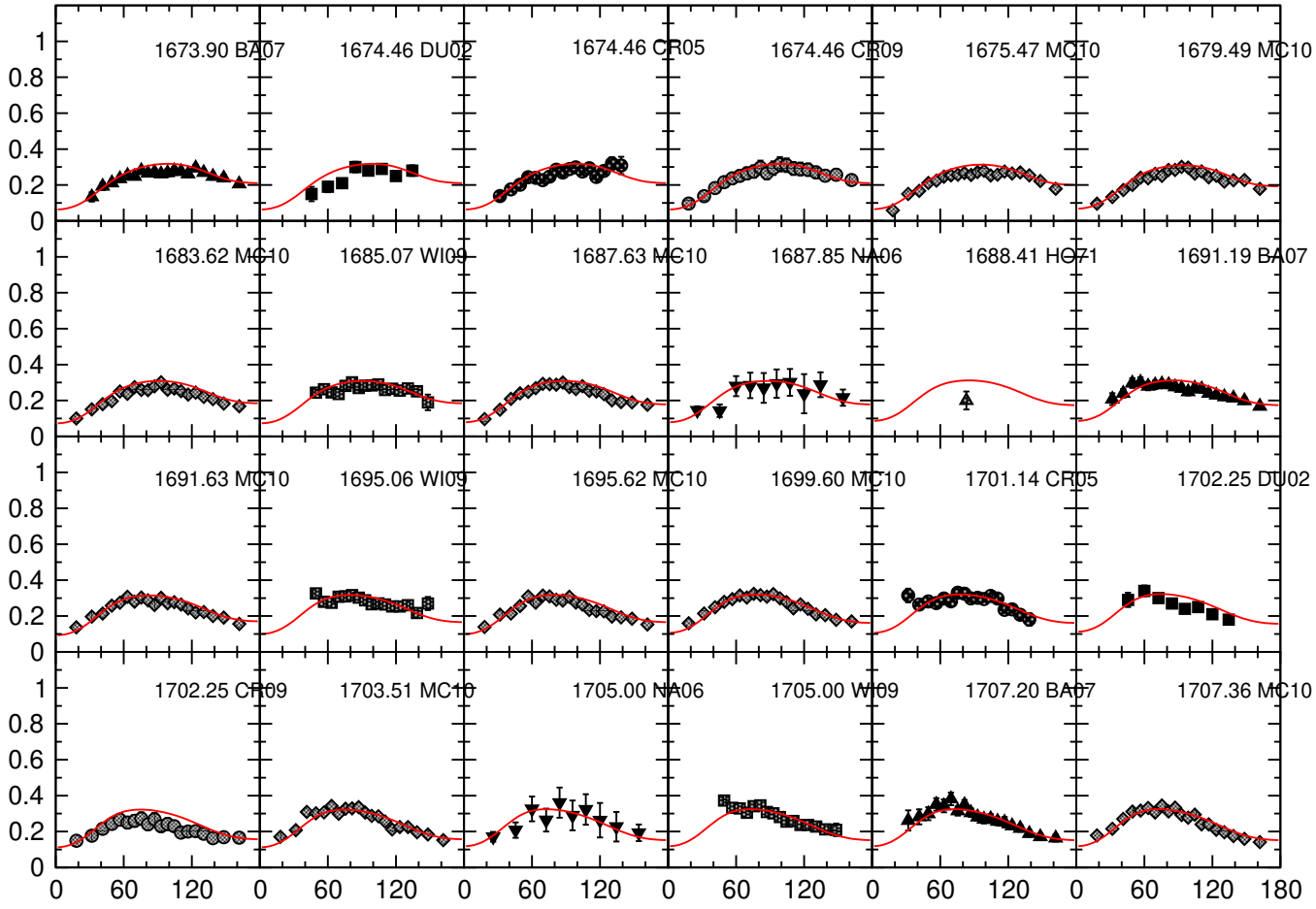

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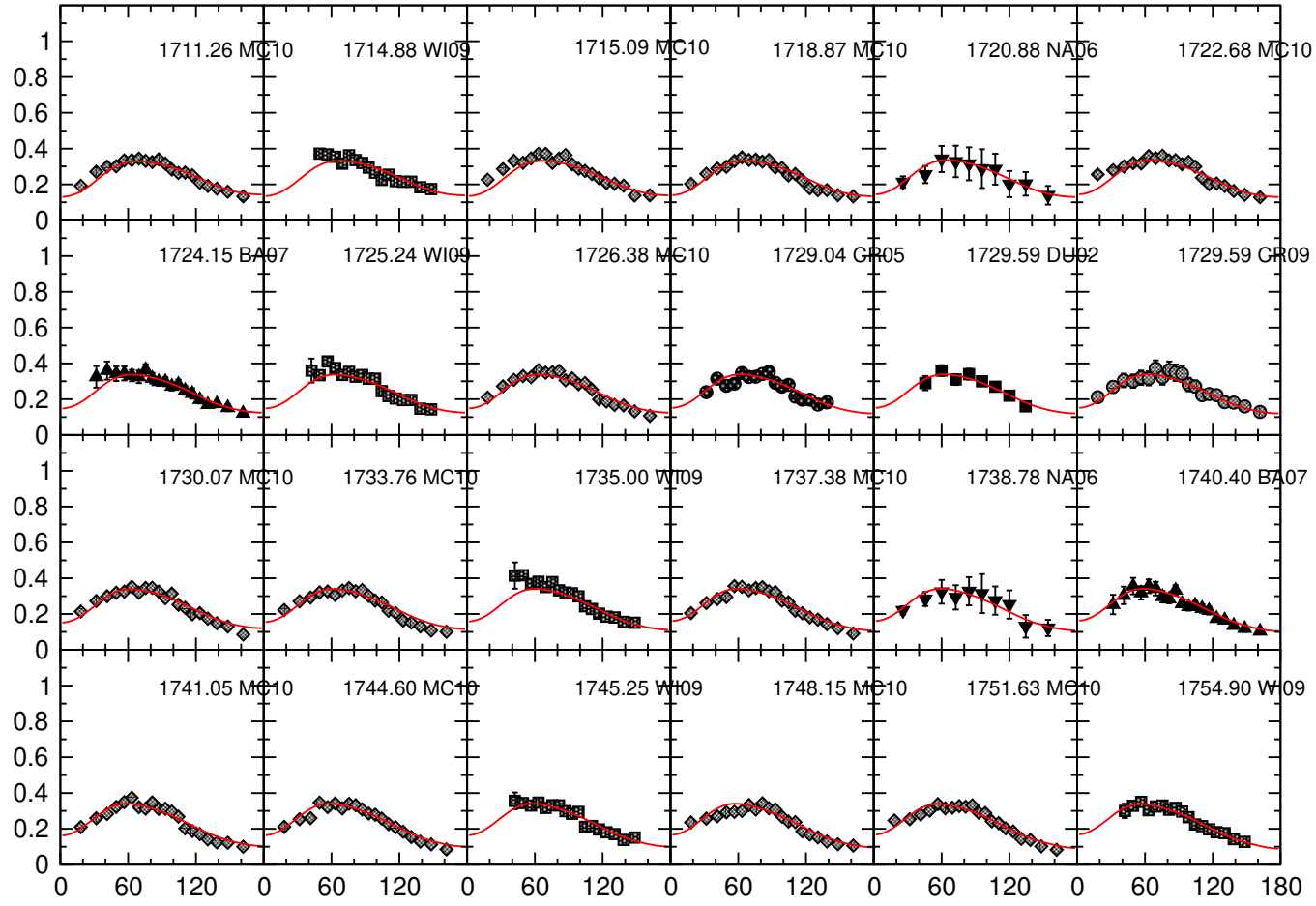

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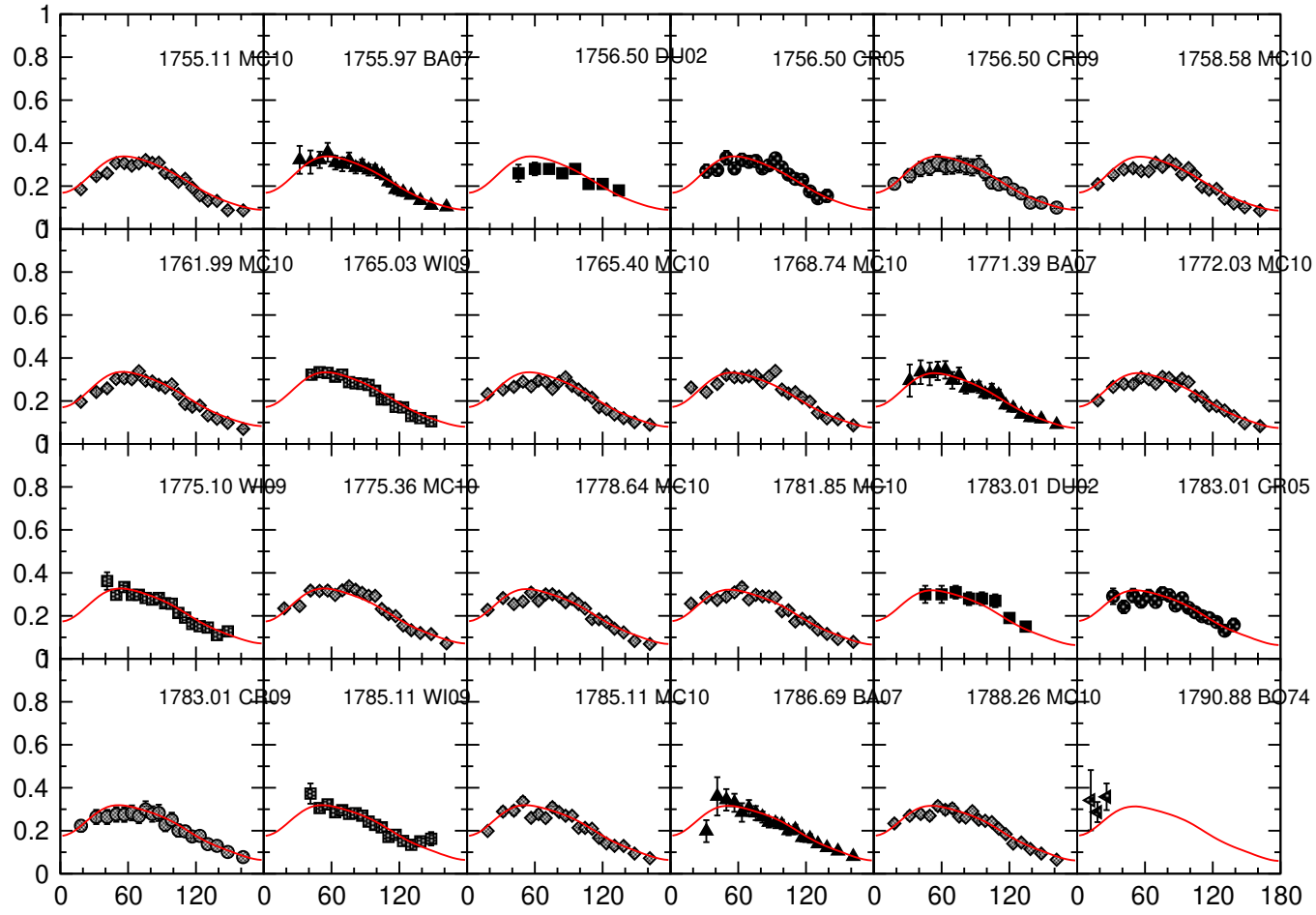

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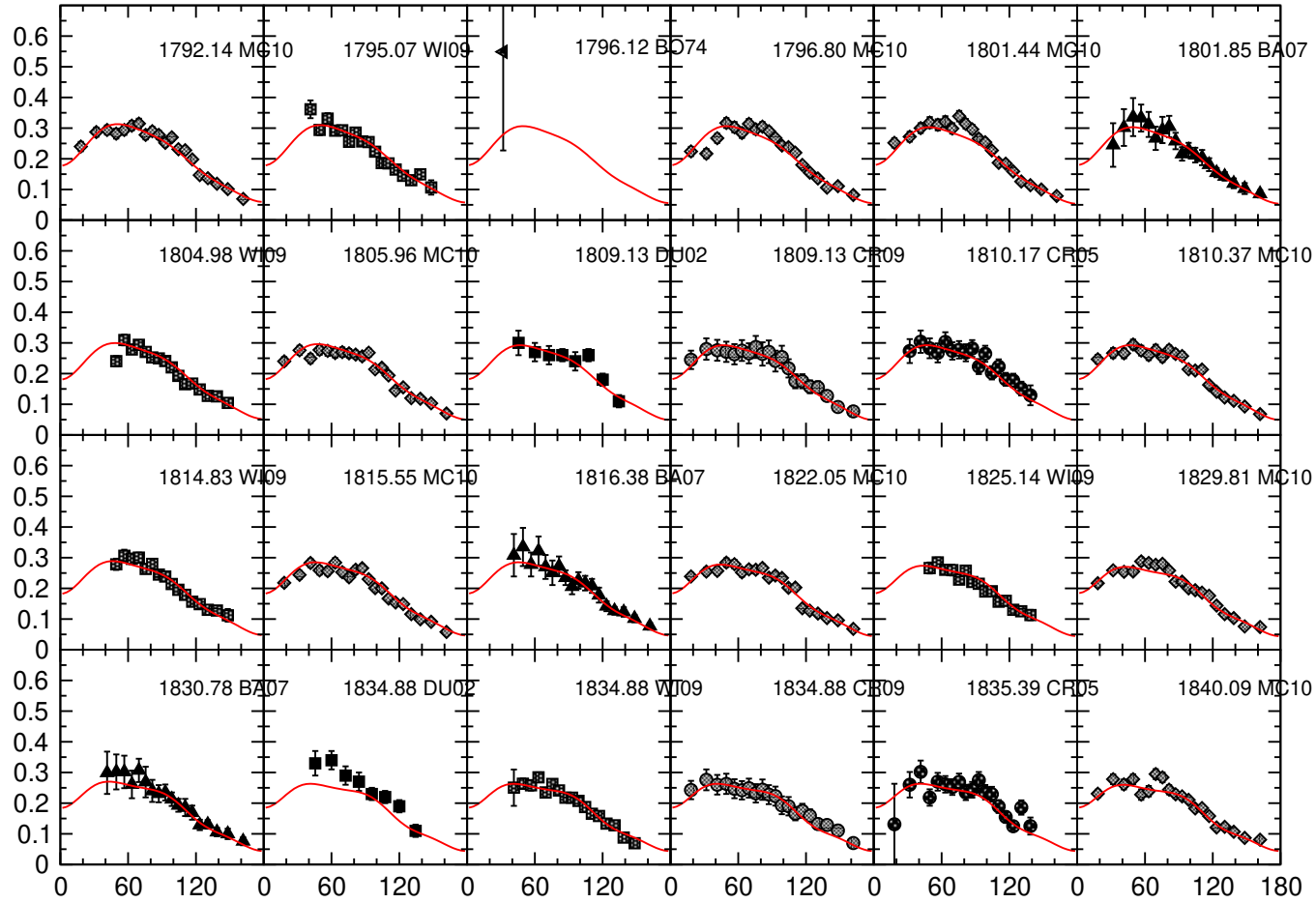

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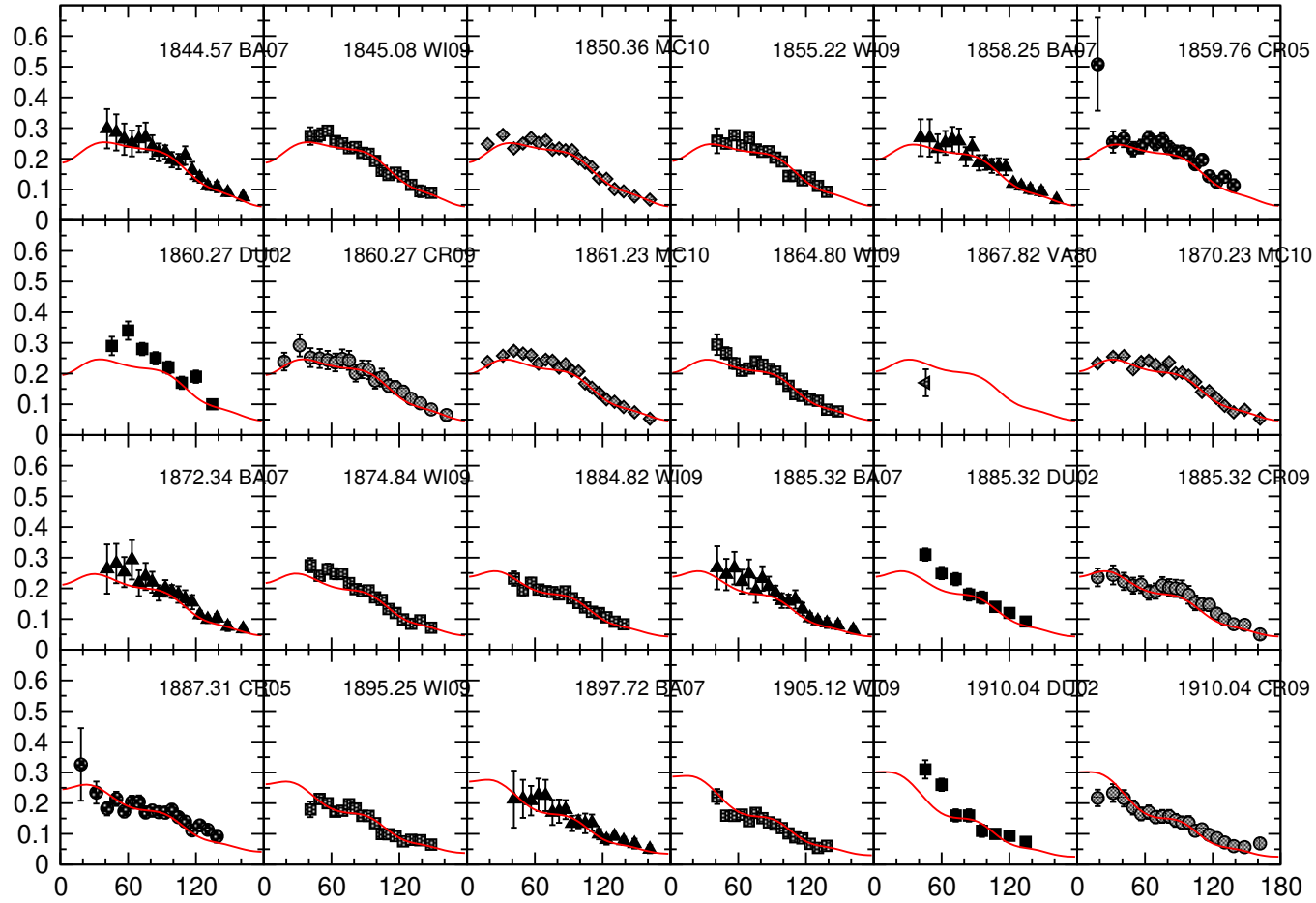

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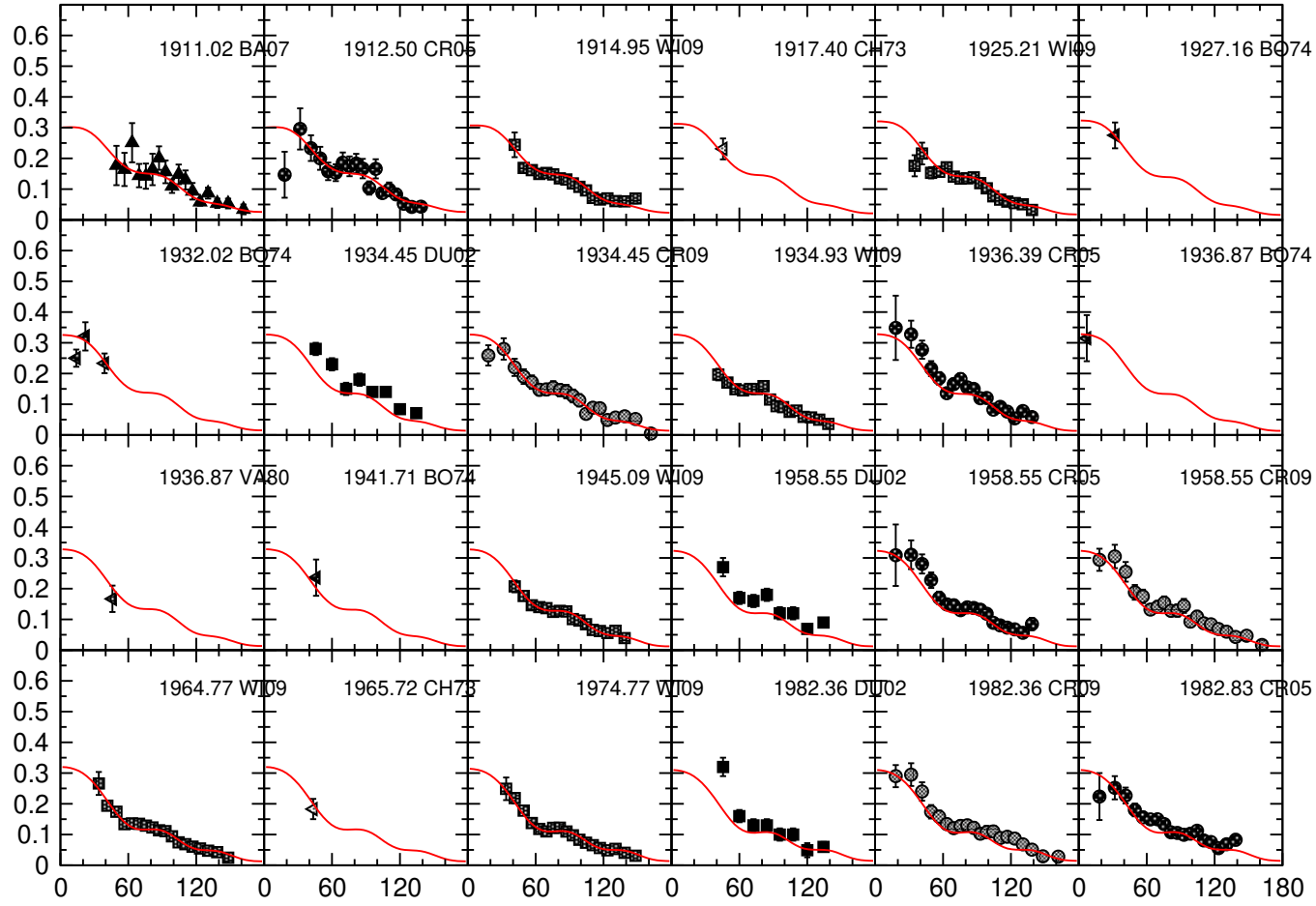

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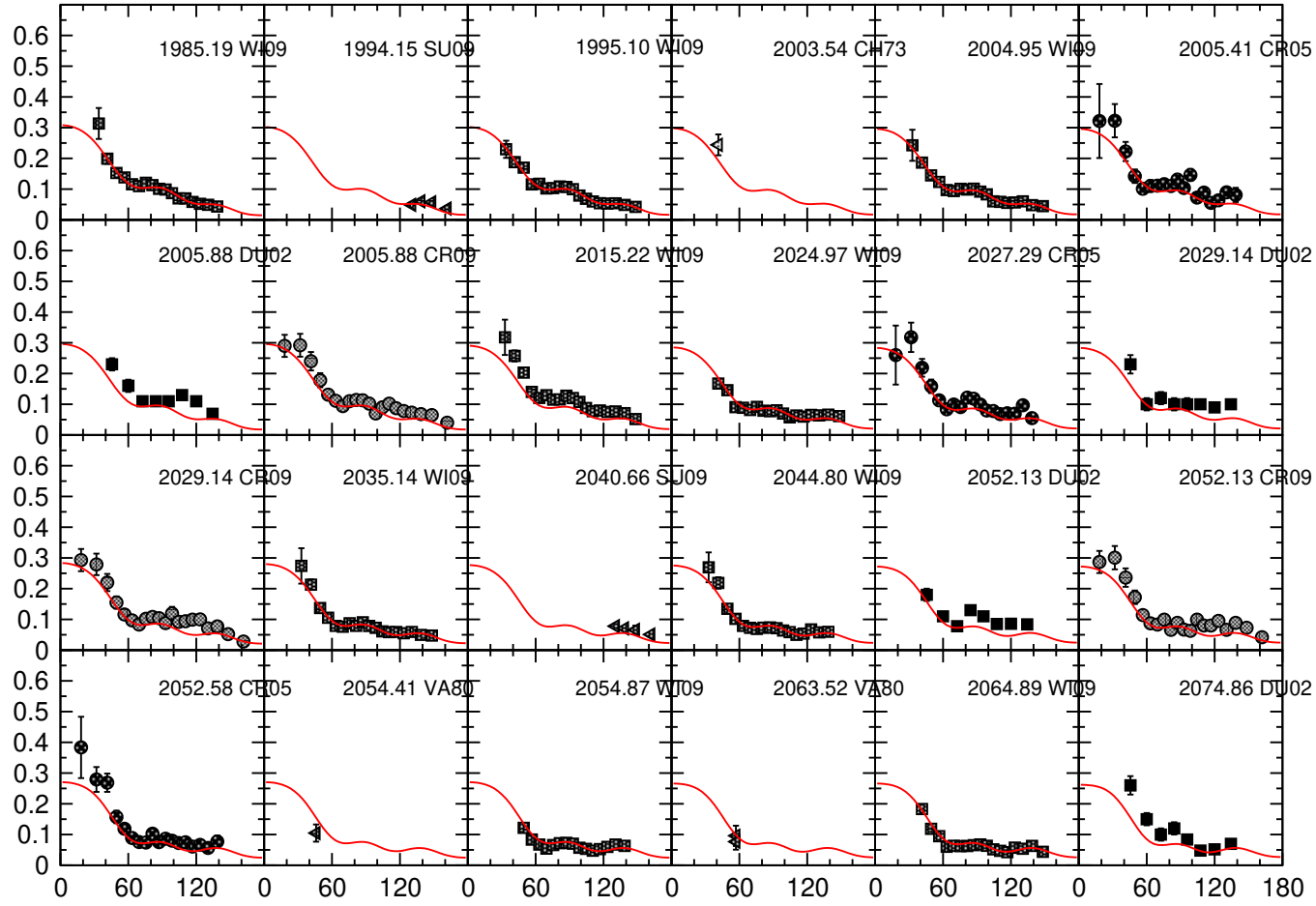

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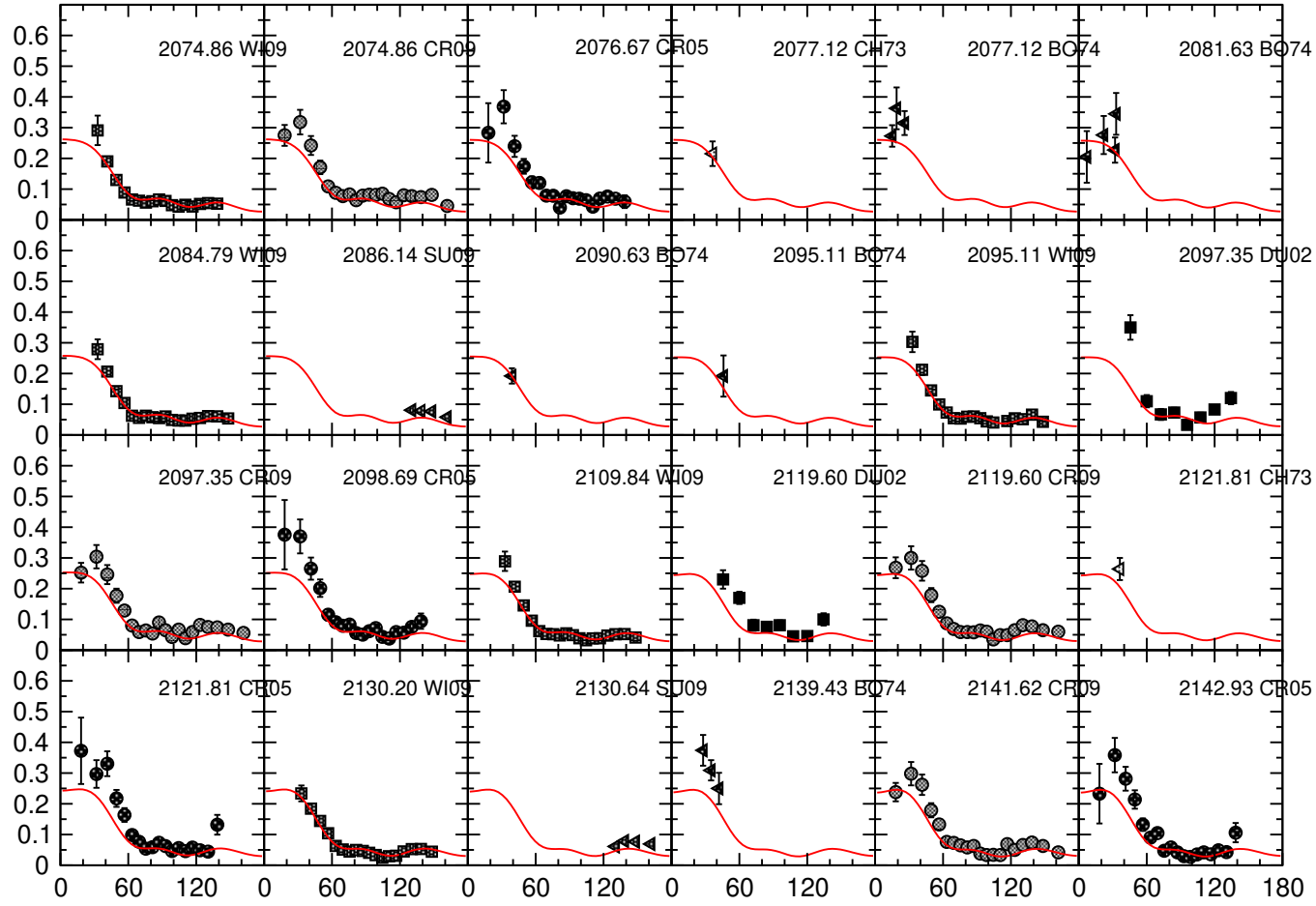

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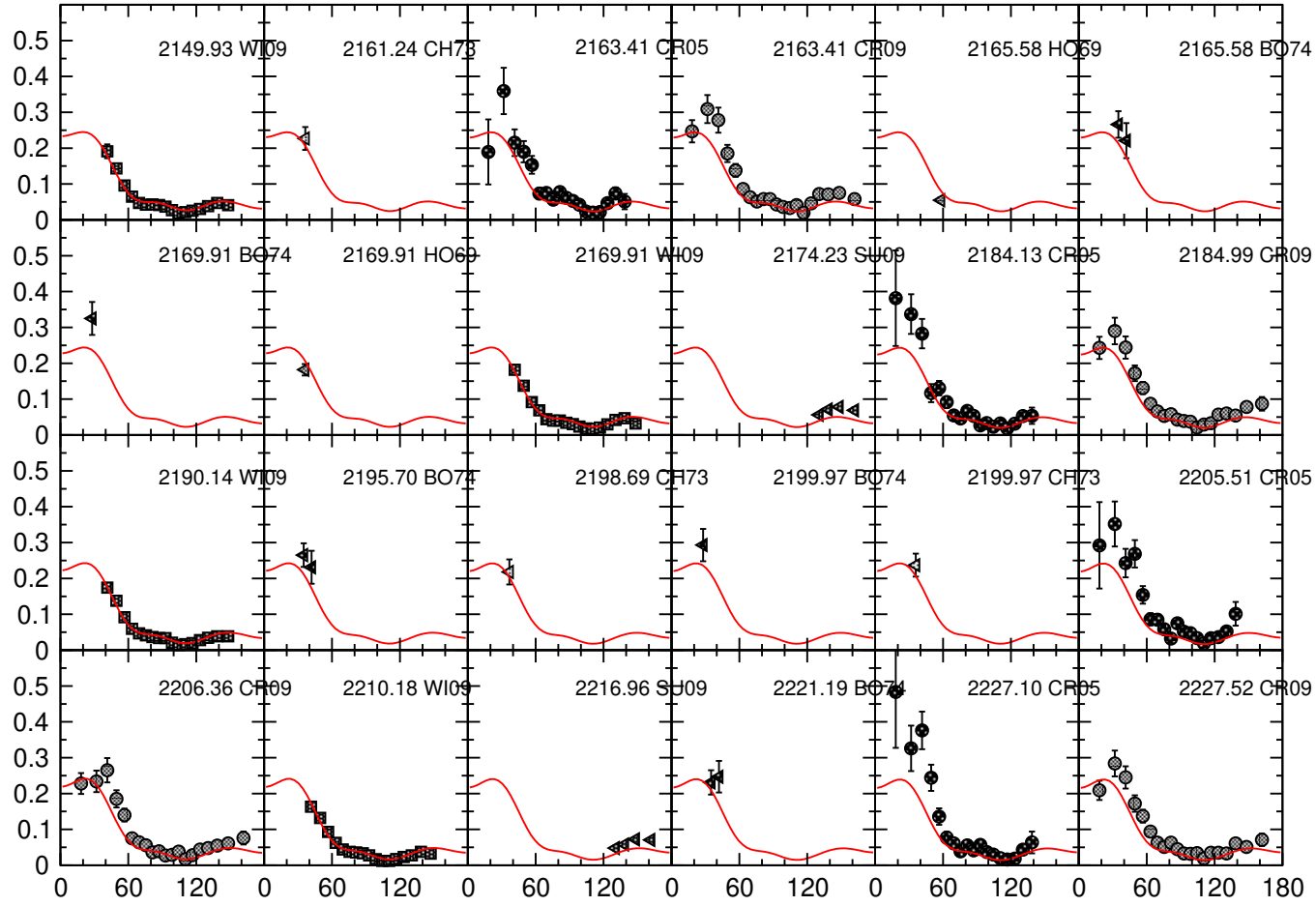

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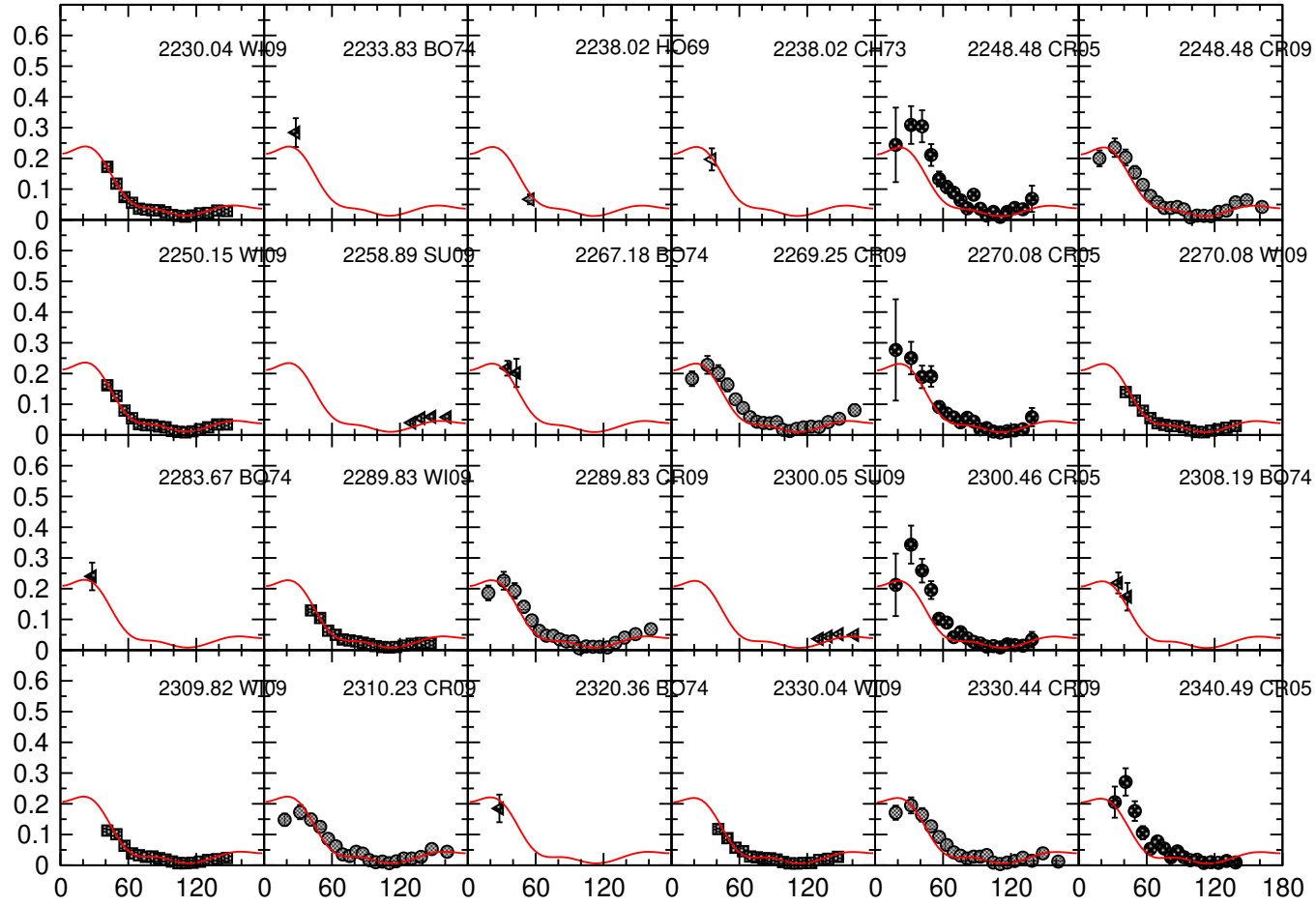

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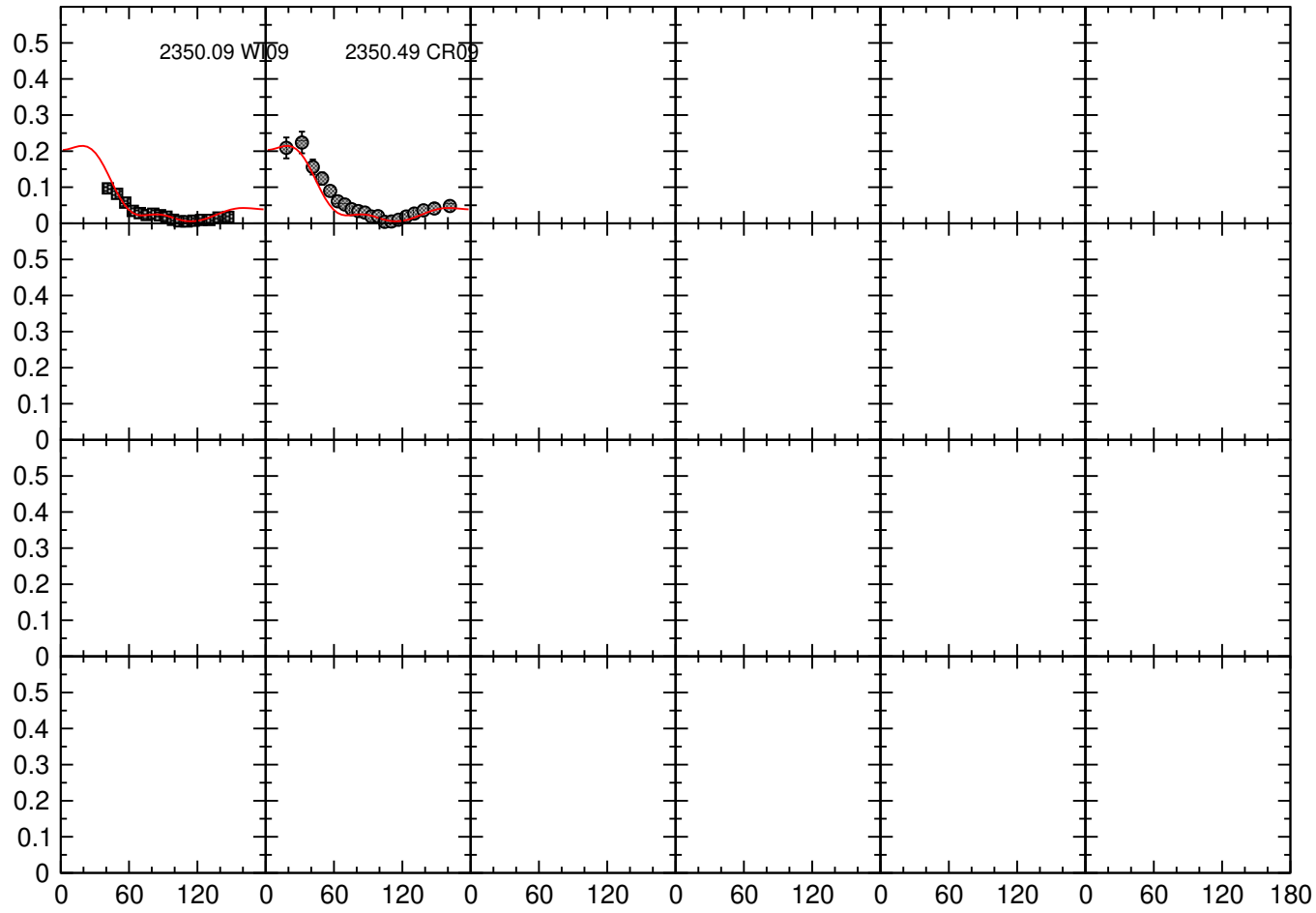

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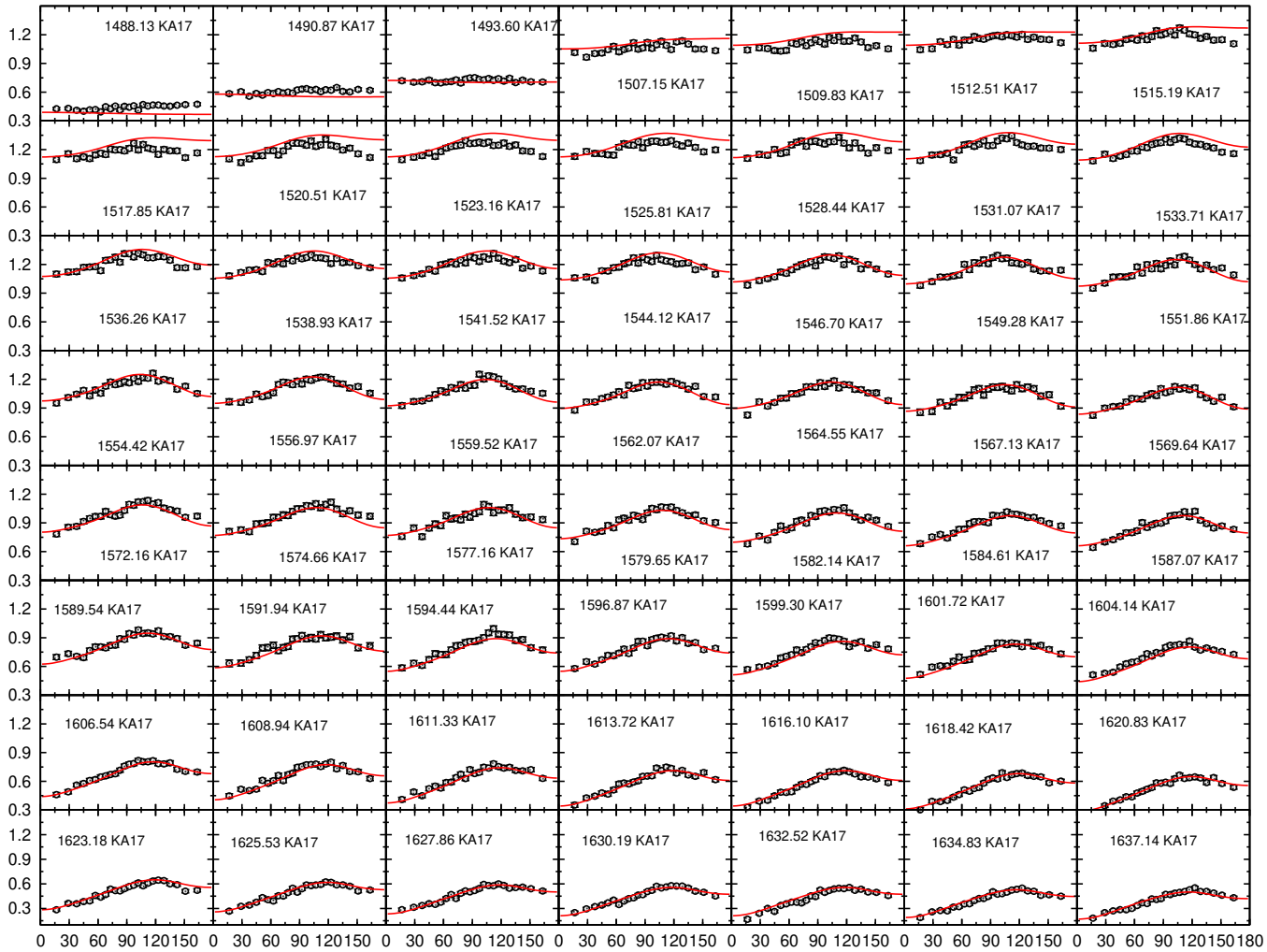

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1995.10 WI09
2003.54 CH73
2004.95 WI09
2005.41 CR05
2005.88 DU02
2005.88 CR09
2015.22 WI09
2024.97 WI09
2027.29 CR05
2029.14 DU02
2029.14 CR09
2035.14 WI09
2040.66 SU09
2044.80 WI09
2052.13 DU02
2052.13 CR09
2052.58 CR05
2054.41 VA80
2054.87 WI09
2063.52 VA80
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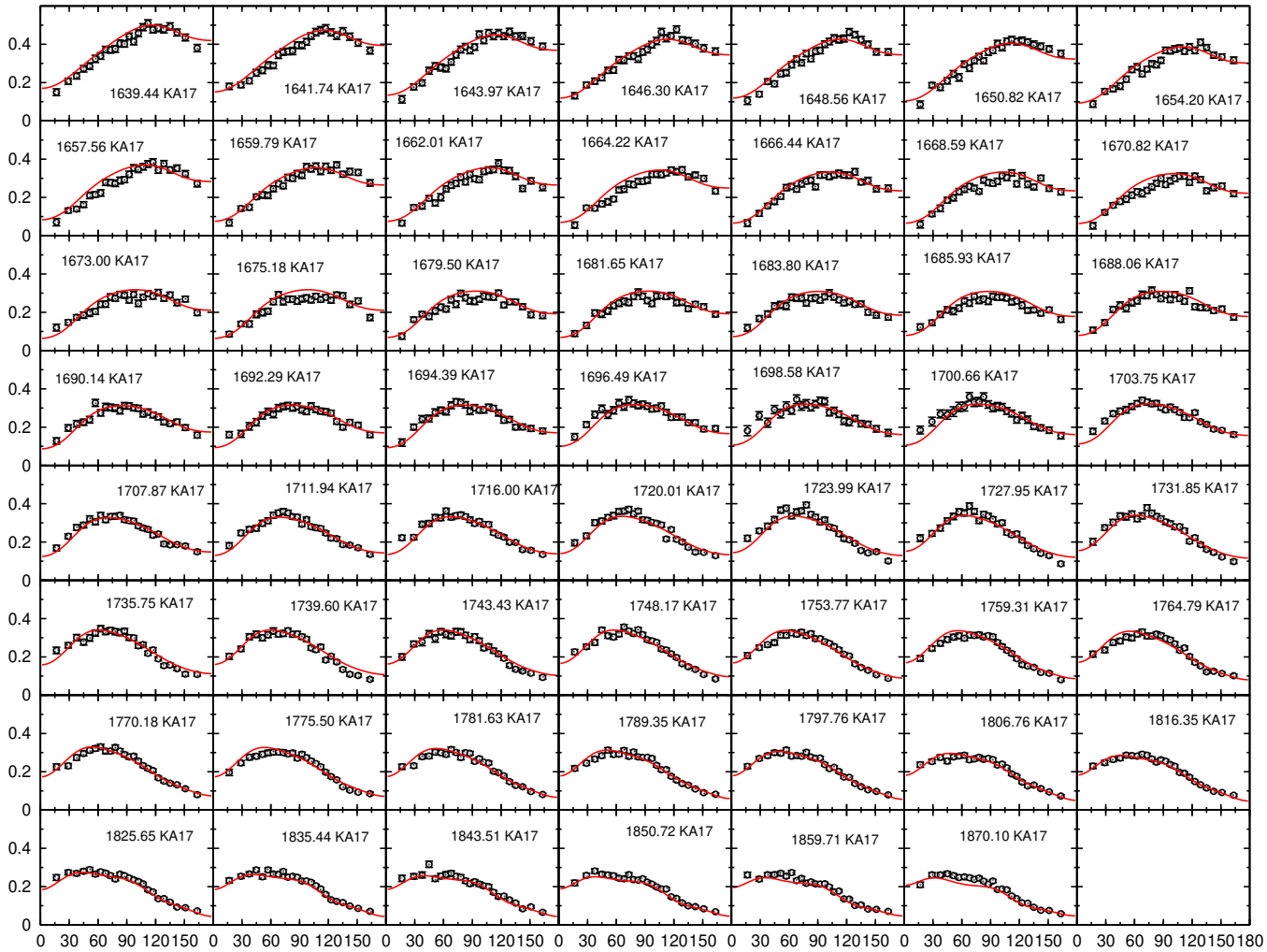

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2077.12 CH73
2077.12 BO74
2081.63 BO74
2084.79 WI09
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2090.63 BO74
2095.11 BO74
2095.11 WI09
2097.35 DU02
2097.35 CR09
2098.69 CR05
2109.84 WI09
2119.60 DU02
2119.60 CR09
2121.81 CH73
2121.81 CR05
2130.20 WI09
2130.64 SU09
2139.43 BO74
2141.62 CR09
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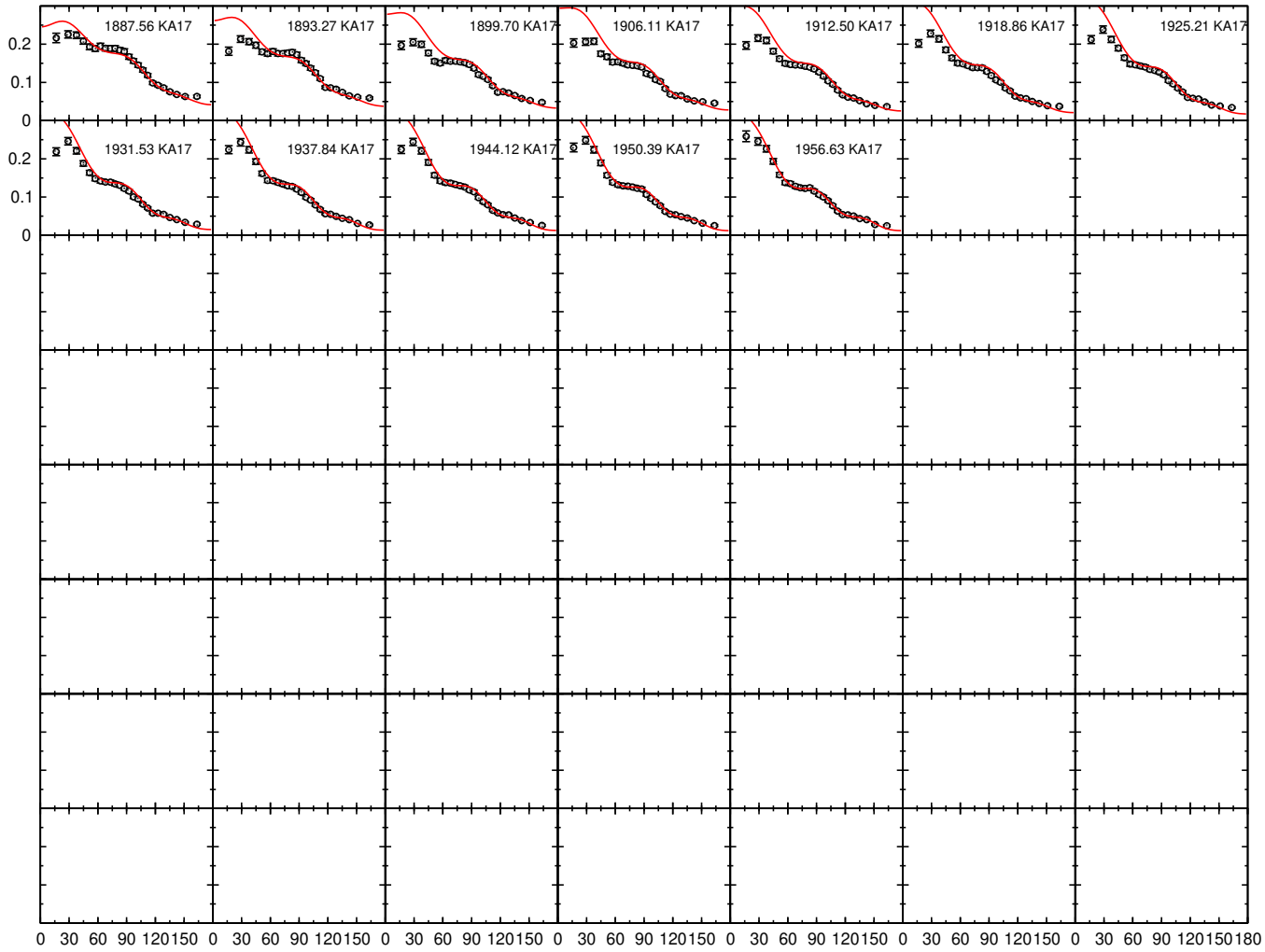

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2161.24 CH73
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2163.41 CR09
2165.58 HO69
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2169.91 BO74
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2169.91 WI09
2174.23 SU09
2184.13 CR05
2184.99 CR09
2190.14 WI09
2195.70 BO74
2198.69 CH73
2199.97 BO74
2199.97 CH73
2205.51 CR05
2206.36 CR09
2210.18 WI09
2216.96 SU09
2221.19 BO74
2227.10 CR05
2227.52 CR09
0 0.1 0.2 0.3 0.4 0.5
0 60 120 180


2230.04 WI09
2233.83 BO74
2238.02 HO69
2238.02 CH73
2248.48 CR05
2248.48 CR09
2250.15 WI09
2258.89 SU09
2267.18 BO74
2269.25 CR09
2270.08 CR05
2270.08 WI09
2283.67 BO74
2289.83 WI09
2289.83 CR09
2300.05 SU09
2300.46 CR05
2308.19 BO74
2309.82 WI09
2310.23 CR09
2320.36 BO74
2330.04 WI09
2330.44 CR09
2340.49 CR05
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0 60 120 180


2350.09 WI09
2350.49 CR09
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0.4
0.3
0.2
0.1
0
0
60
120
180


1488.13 KA17
1490.87 KA17
1493.60 KA17
1507.15 KA17
1509.83 KA17
1512.51 KA17
1515.19 KA17
1517.85 KA17
1520.51 KA17
1523.16 KA17
1525.81 KA17
1528.44 KA17
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1608.94 KA17
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0.9
1.2
0 30 60 90 120 150 180


1639.44 KA17
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1648.56 KA17
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1654.20 KA17
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1703.75 KA17
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1711.94 KA17
1716.00 KA17
1720.01 KA17
1723.99 KA17
1727.95 KA17
1731.85 KA17
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1753.77 KA17
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1775.50 KA17
1781.63 KA17
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1797.76 KA17
1806.76 KA17
1816.35 KA17
1825.65 KA17
1835.44 KA17
1843.51 KA17
1850.72 KA17
1859.71 KA17
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0 0.2 0.4
0 30 60 90 120 150 180


1887.56 KA17
1893.27 KA17
1899.70 KA17
1906.11 KA17
1912.50 KA17
1918.86 KA17
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1931.53 KA17
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0.2
0 30 60 90 120150 180

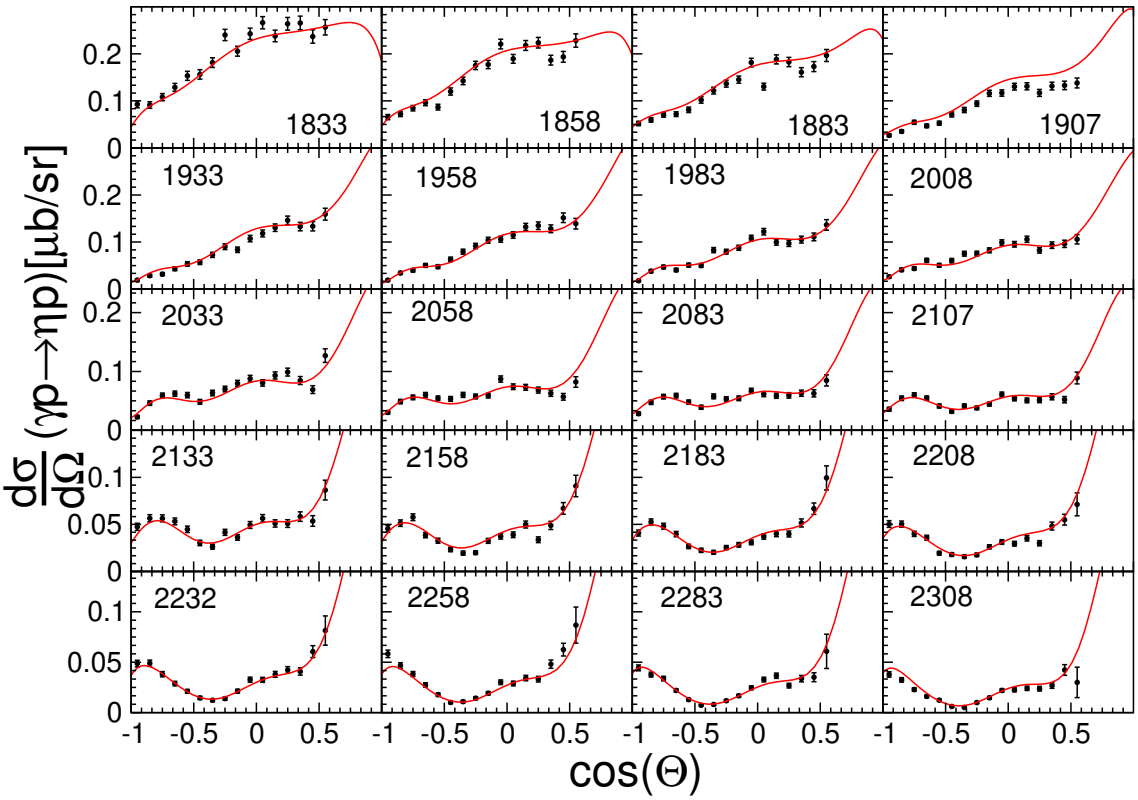
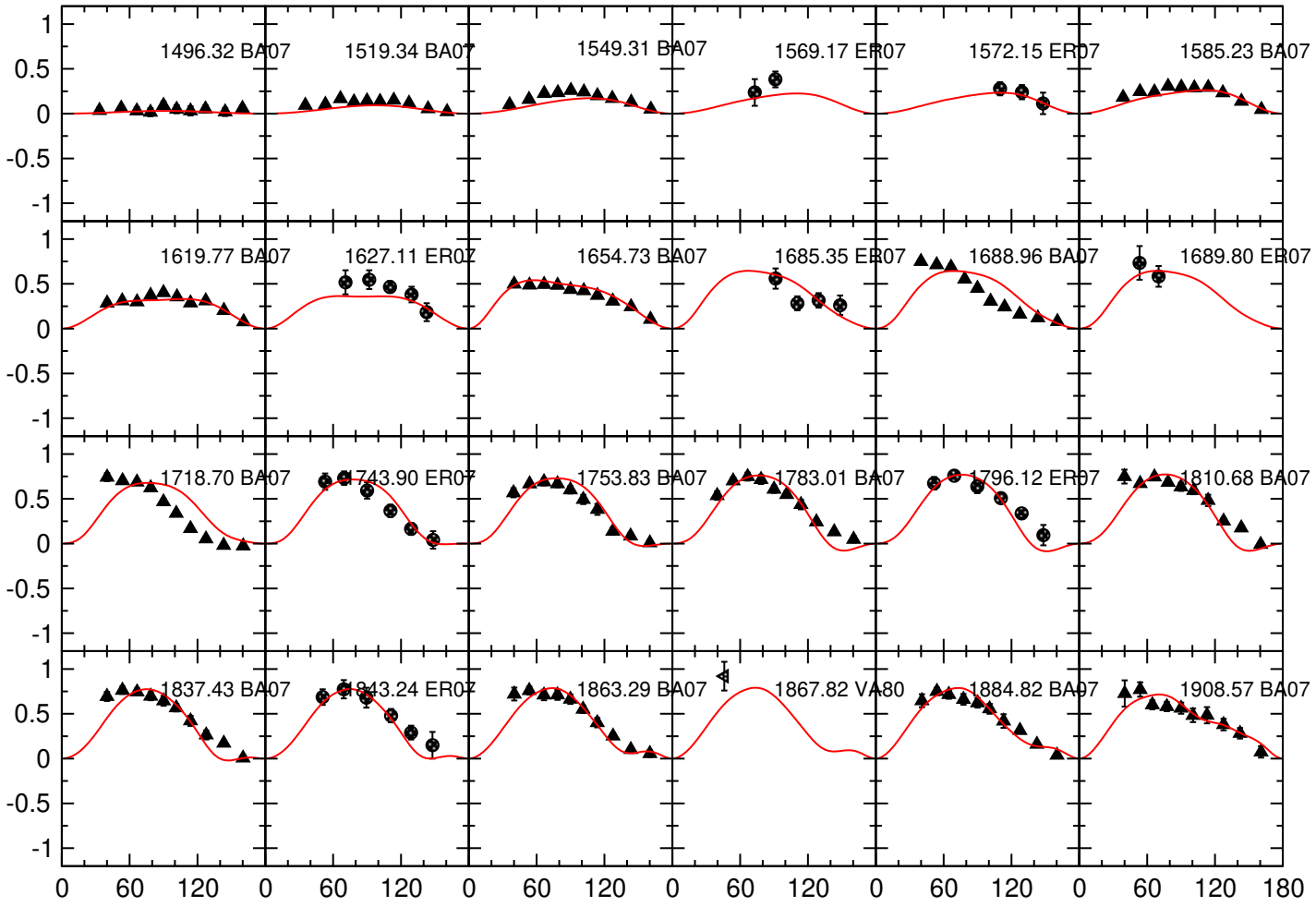
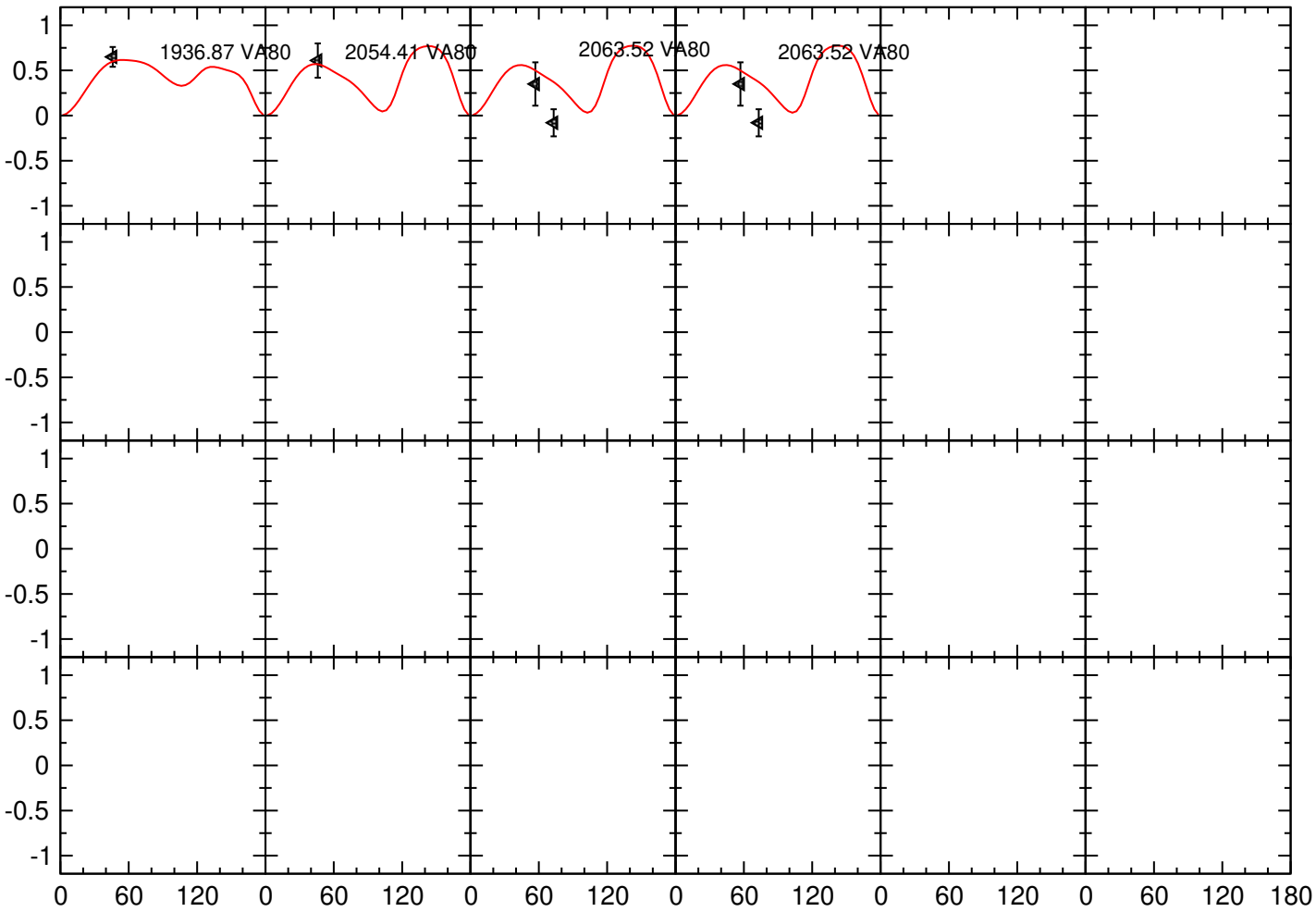


Figure 1: LEPS (Hashimoto *et al.* Phys. Rev. C 106, 035201 (2022))


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1519.34 BA07
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1572.15 ER07
1585.23 BA07
1619.77 BA07
1627.11 ER07
1654.73 BA07
1685.35 ER07
1688.96 BA07
1689.80 ER07
1718.70 BA07
1743.90 ER07
1753.83 BA07
1783.01 BA07
1796.12 ER07
1810.68 BA07
1837.43 BA07
1843.24 ER07
1863.29 BA07
1867.82 VA80
1884.82 BA07
1908.57 BA07
1
0.5
0
-0.5
-1
0
60
120
180


1936.87 VA80
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-1
0
60
120
180

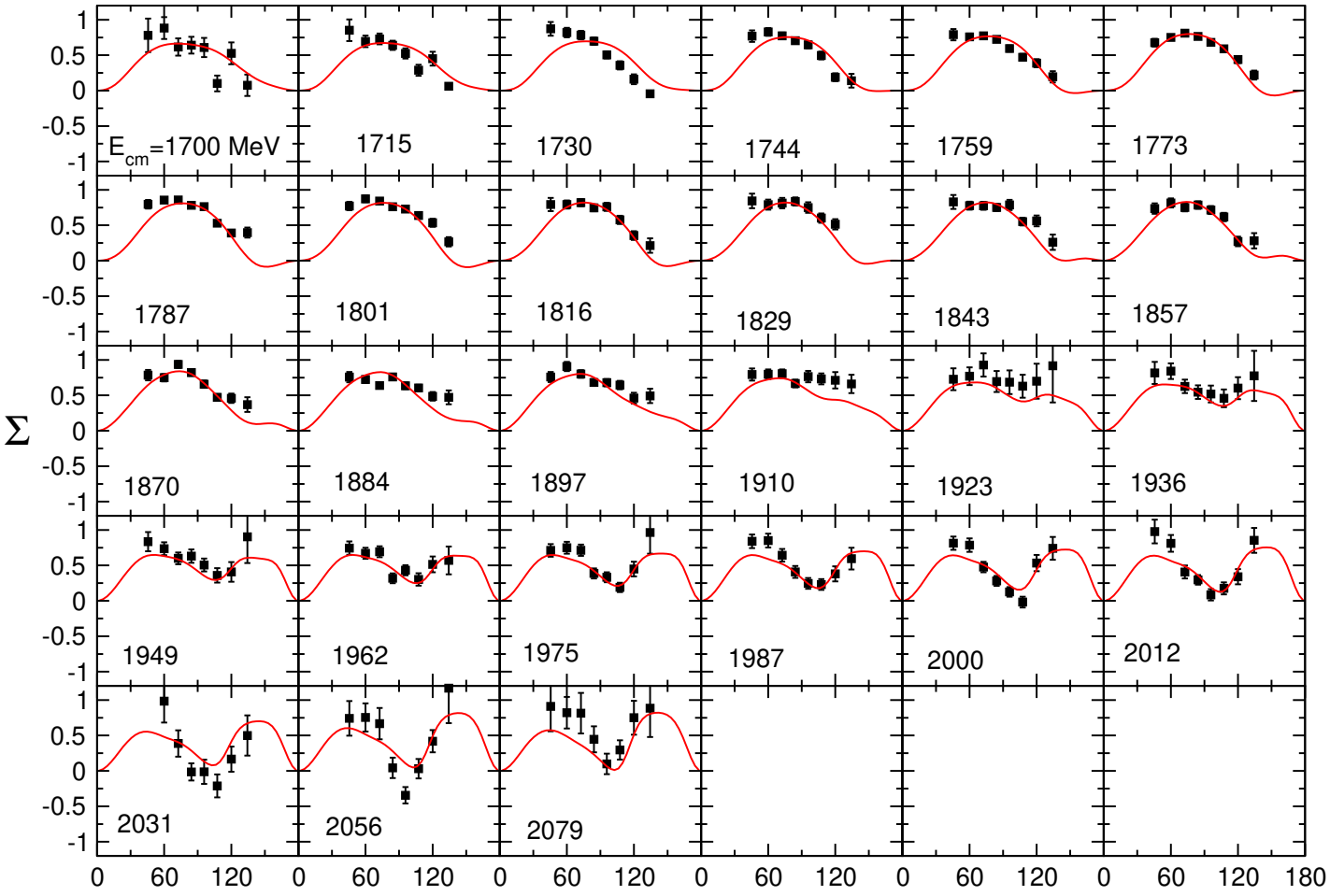


Figure 1: CLAS (Collins et al.) PLB 771, 213 (2017)

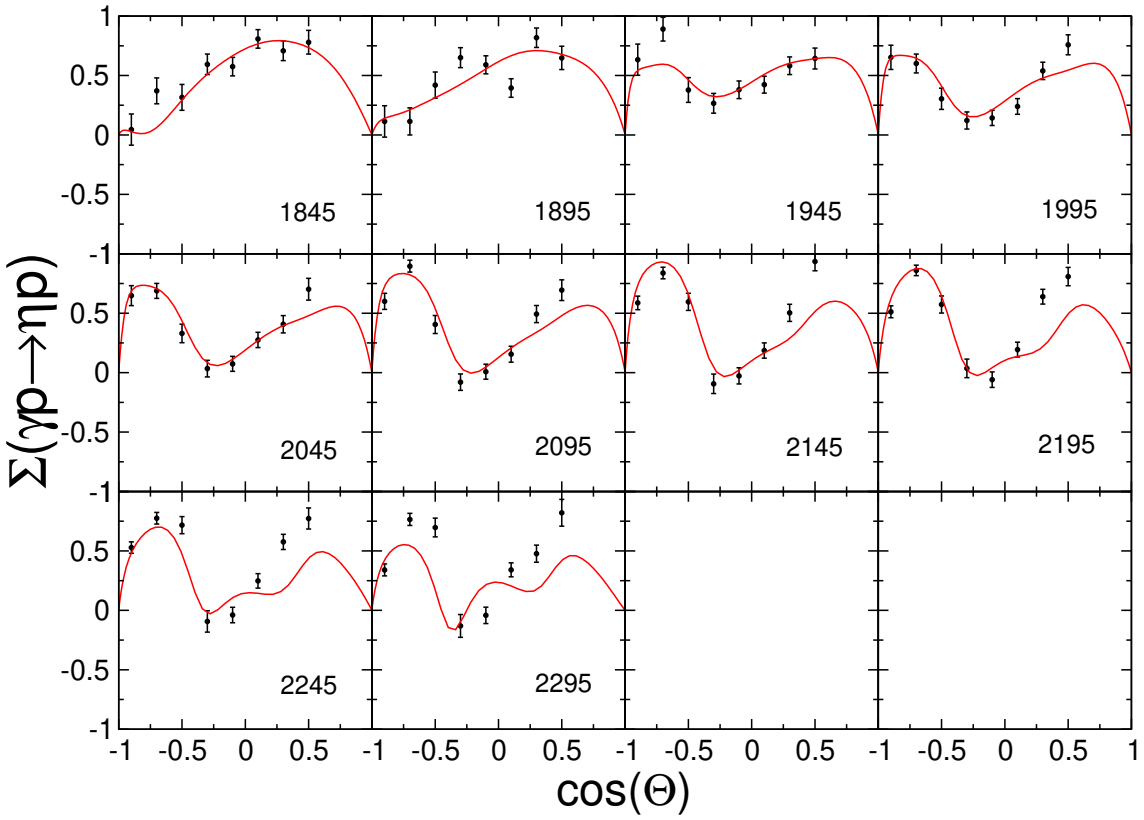
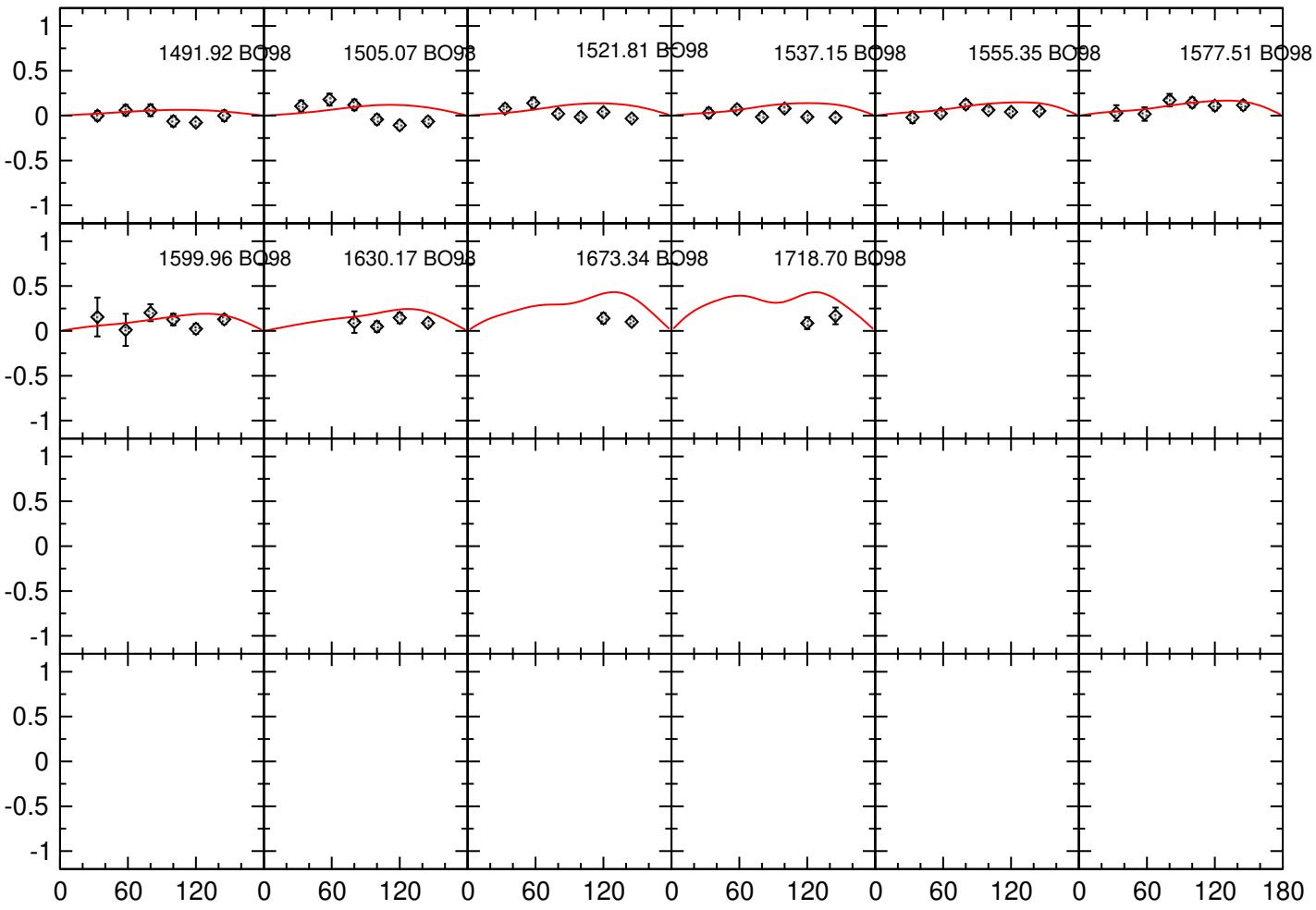
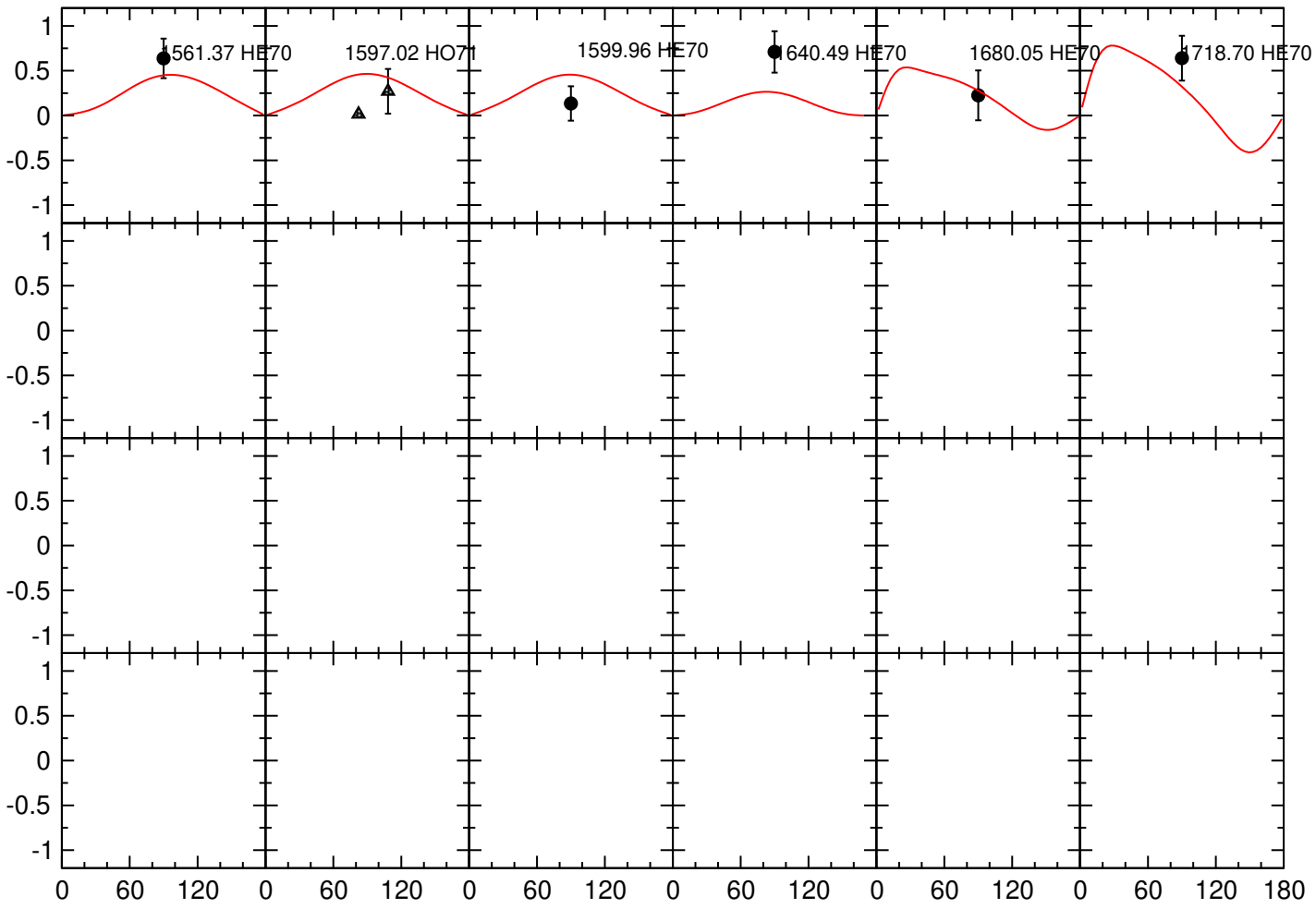
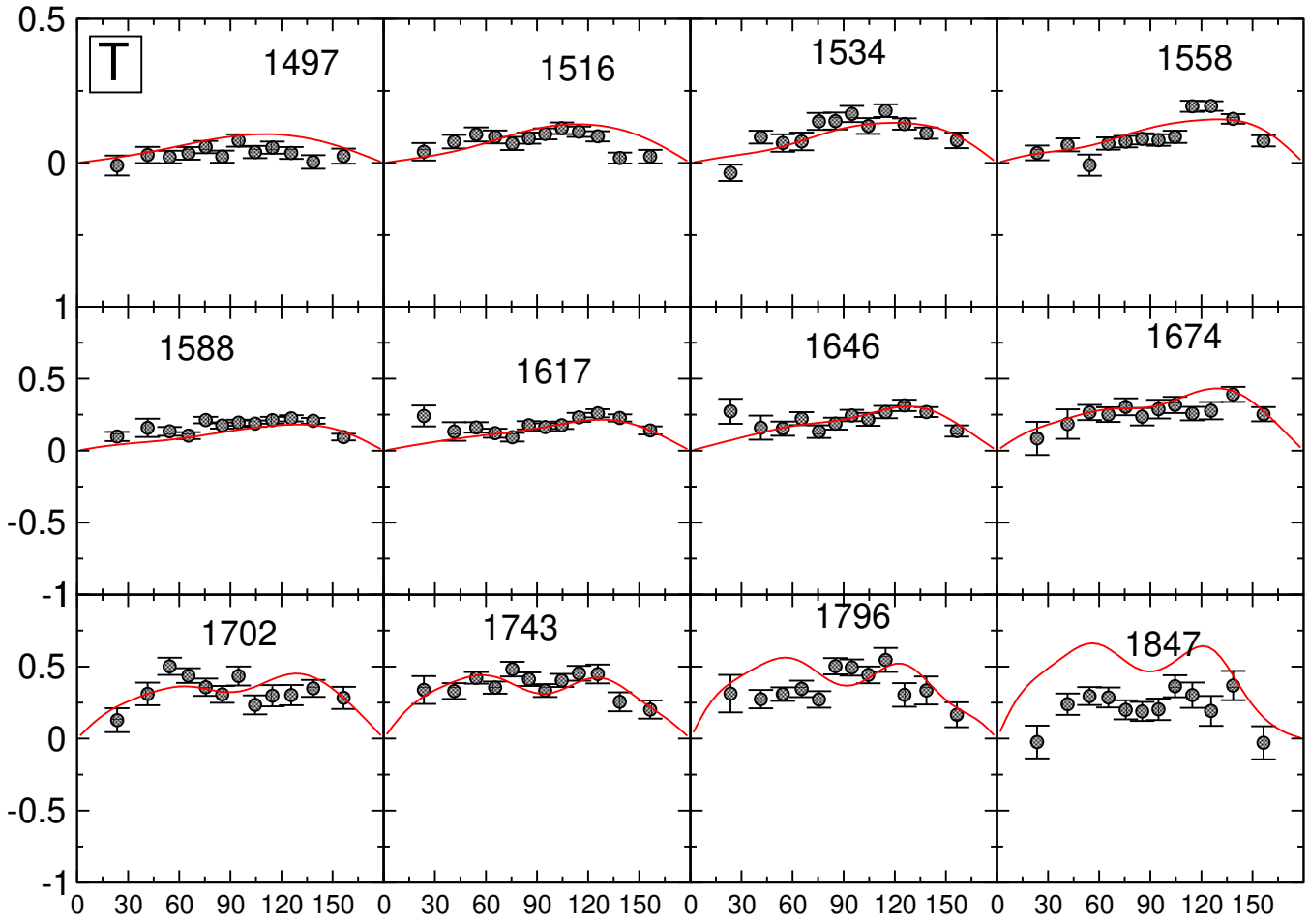
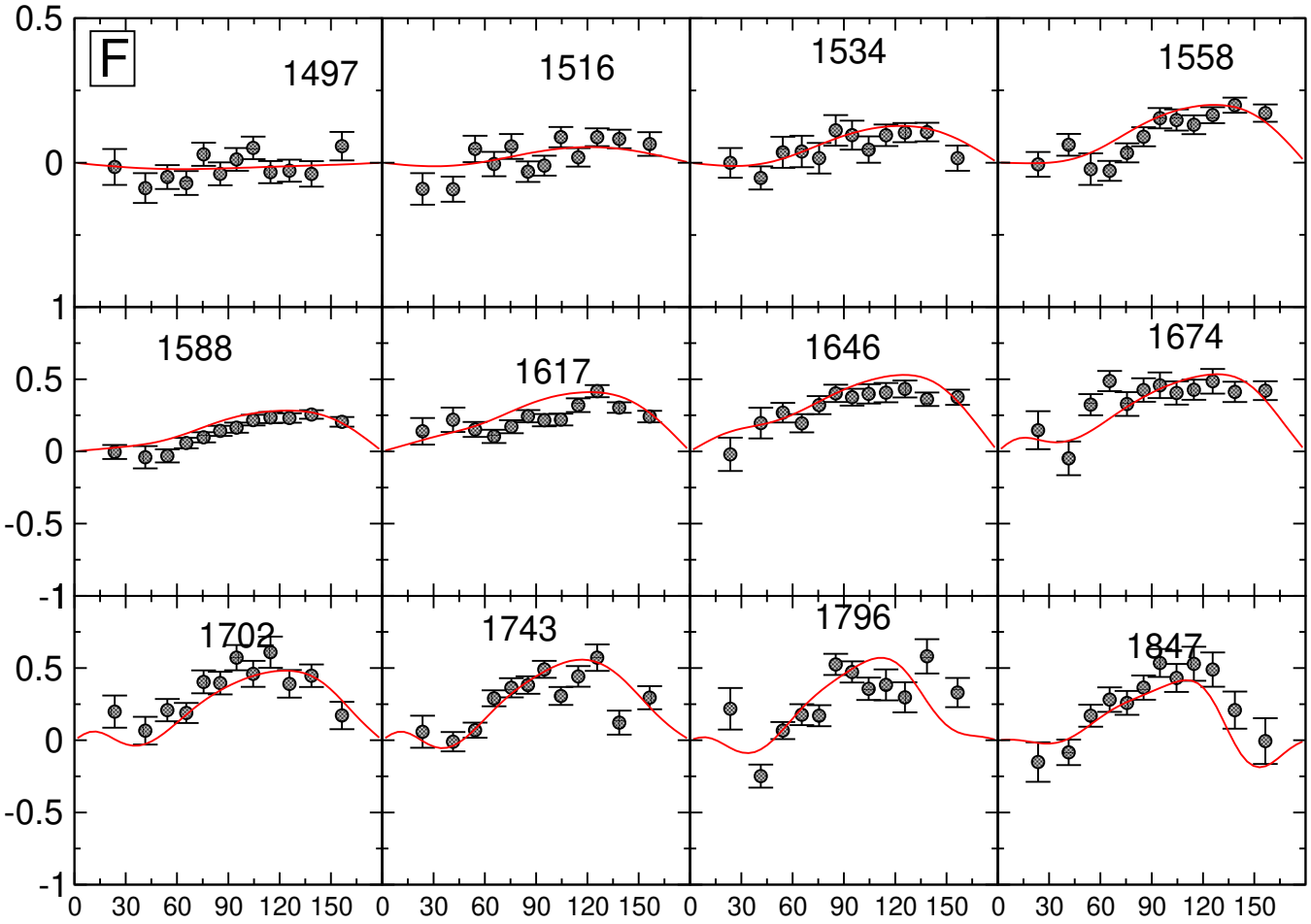


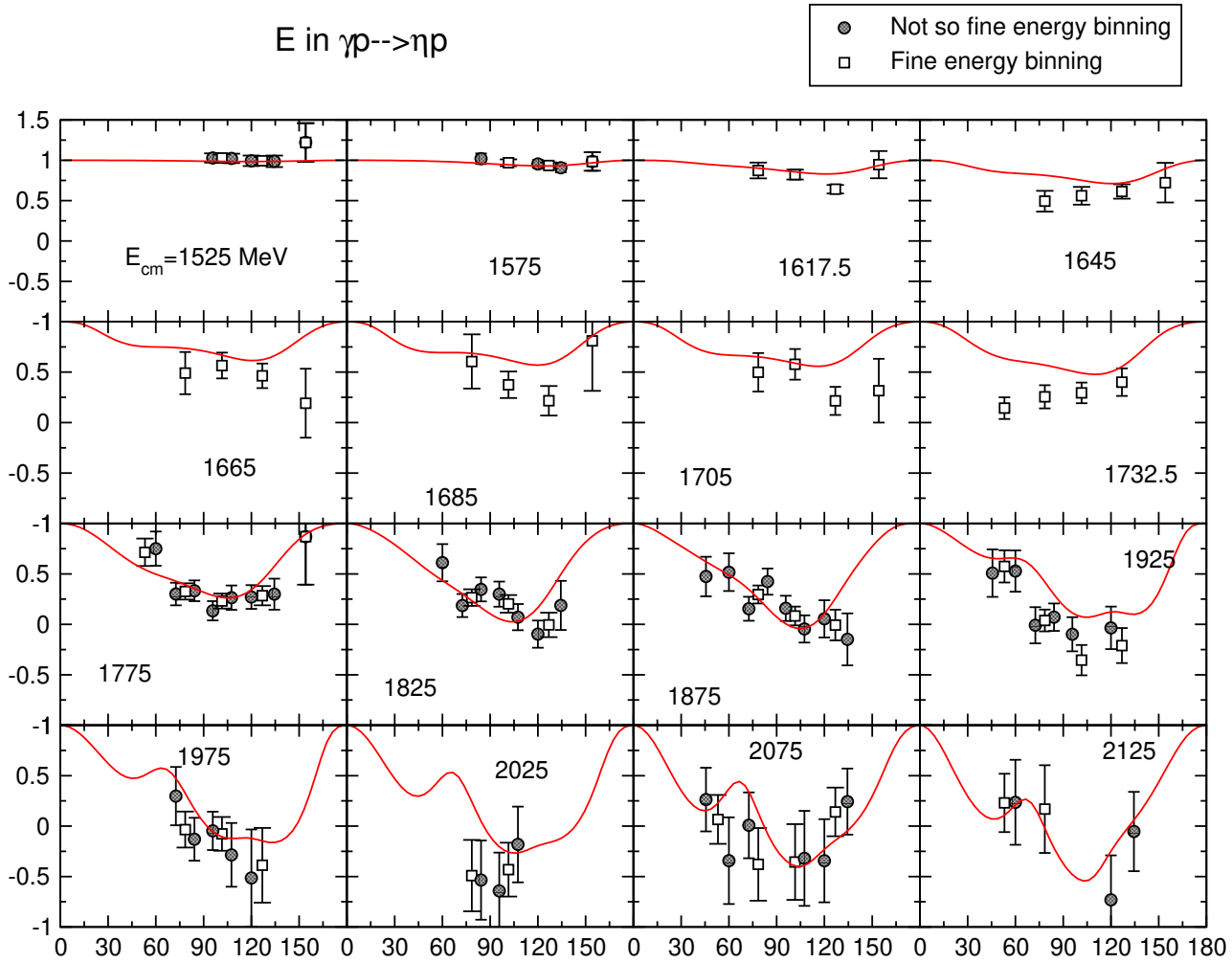
Figure 2: LEPS2022 (Hashimoto *et al.* Phys. Rev. C 106, 035201 (2022)

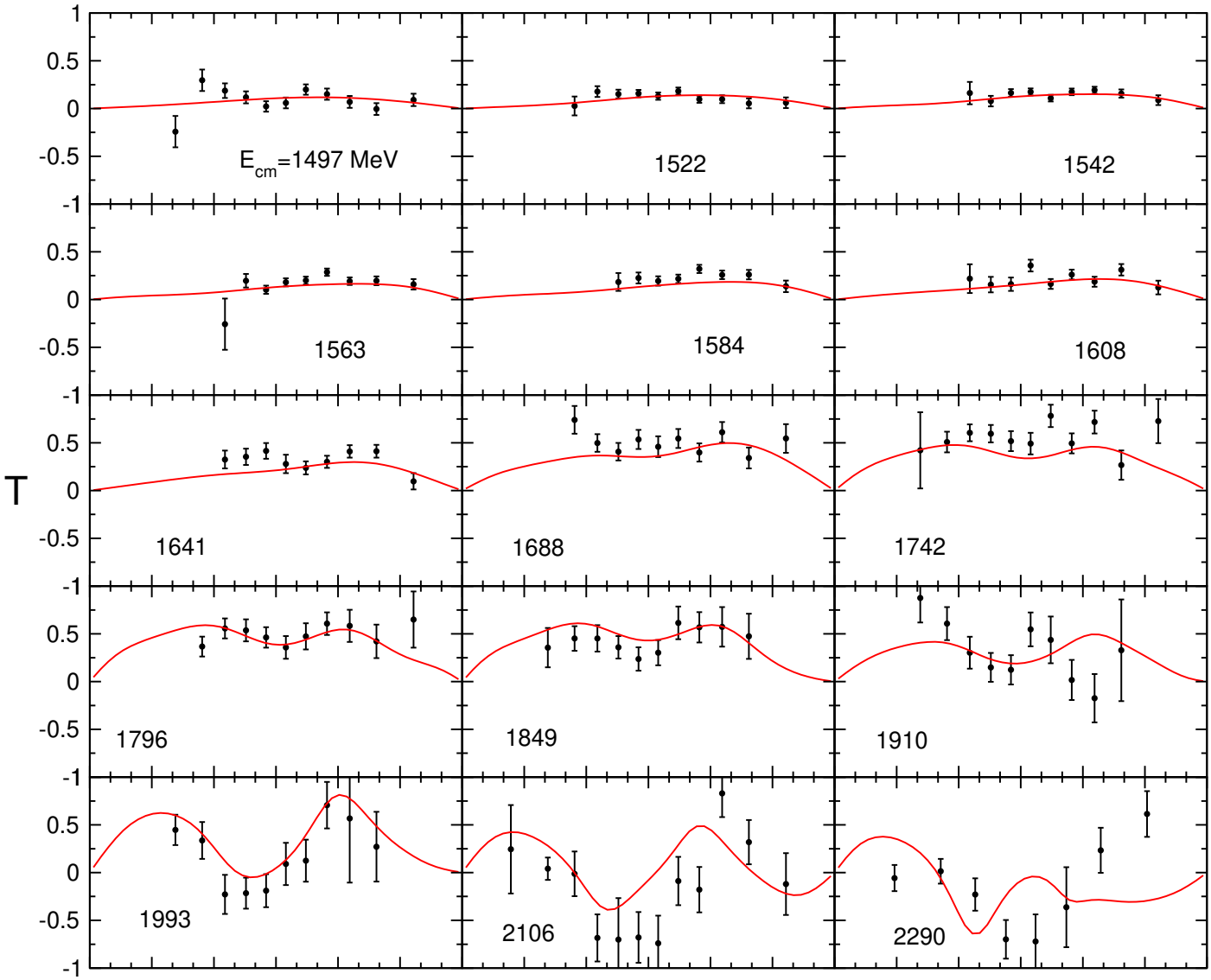

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1537.15 BO98
1555.35 BO98
1577.51 BO98
1599.96 BO98
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1673.34 BO98
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0
-0.5
-1
0
60
120
180

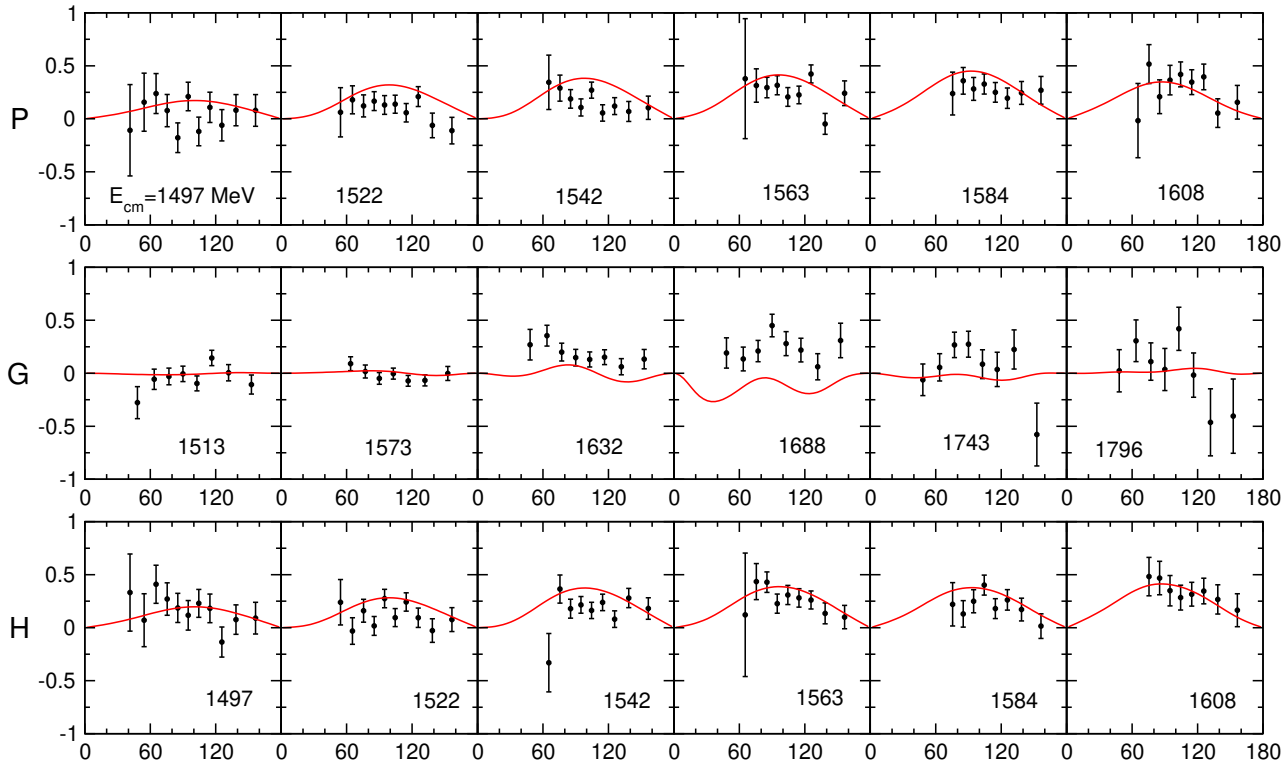

1561.37 HE70
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1599.96 HE70
1640.49 HE70
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0
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0
60
120
180

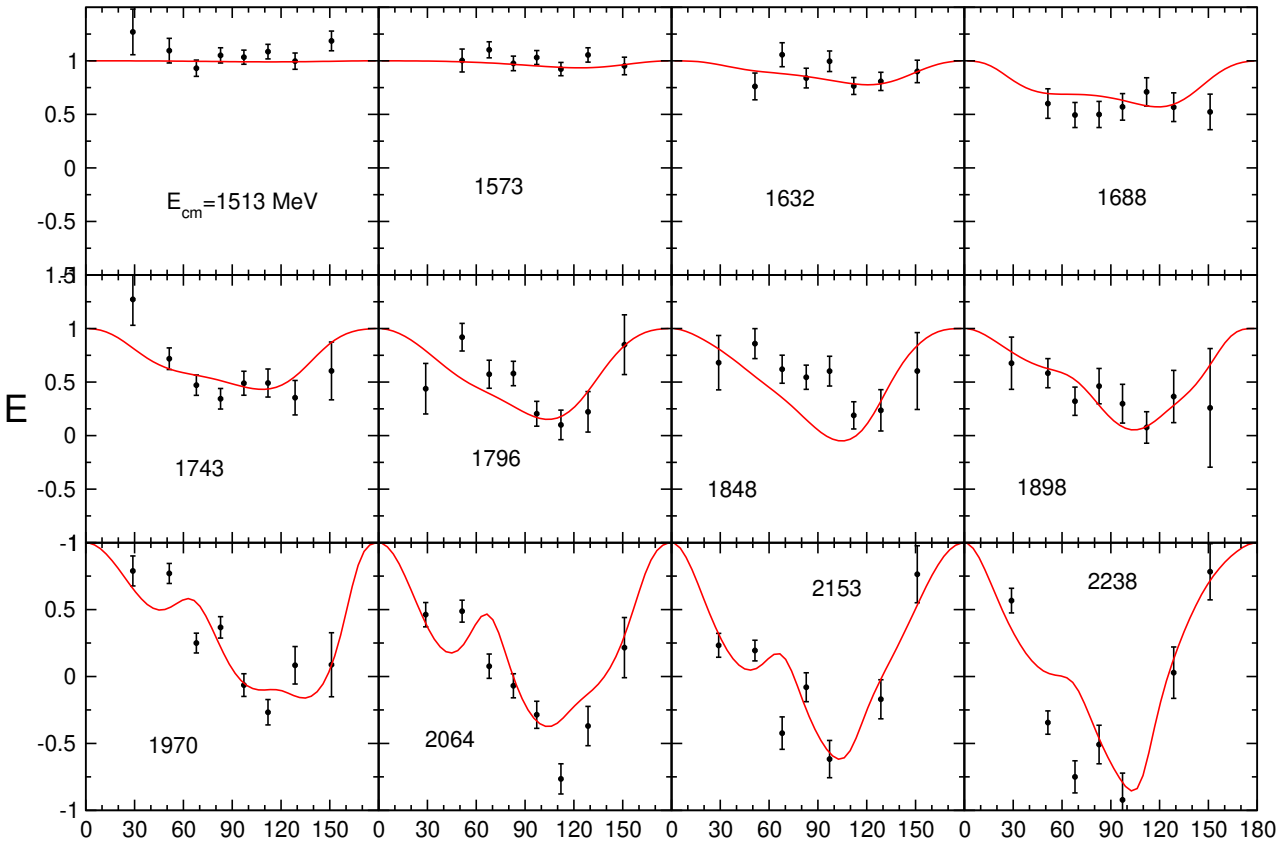

T
1497
1516
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1558
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1617
1646
1674
1702
1743
1796
1847
0.5
0
1
0.5
0
-0.5
-1
0.5
0
-0.5
-1
0 30 60 90 120 150
0 30 60 90 120 150
0 30 60 90 120 150
0 30 60 90 120 150


F
1497
1516
1534
1558
1588
1617
1646
1674
1702
1743
1796
1847
0.5
0
1
0.5
0
-0.5
-1
0.5
0
-0.5
-1
0 30 60 90 120 150
0 30 60 90 120 150
0 30 60 90 120 150
0 30 60 90 120 150


E in γp-->ηp
Not so fine energy binning
Fine energy binning
E_cm=1525 MeV
1575
1617.5
1645
1665
1685
1705
1732.5
1775
1825
1875
1925
1975
2025
2075
2125


T
E_cm=1497 MeV
1522
1542
1563
1584
1608
1641
1688
1742
1796
1849
1910
1993
2106
2290
1
0.5
0
-0.5
-1


P
G
H
E_cm=1497 MeV
1522
1542
1563
1584
1608
1513
1573
1632
1688
1743
1796
1497
1522
1542
1563
1584
1608
1
0.5
0
-0.5
-1
0
60
120
180


E
E_cm=1513 MeV
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1632
1688
1743
1796
1848
1898
1970
2064
2153
2238

Data references

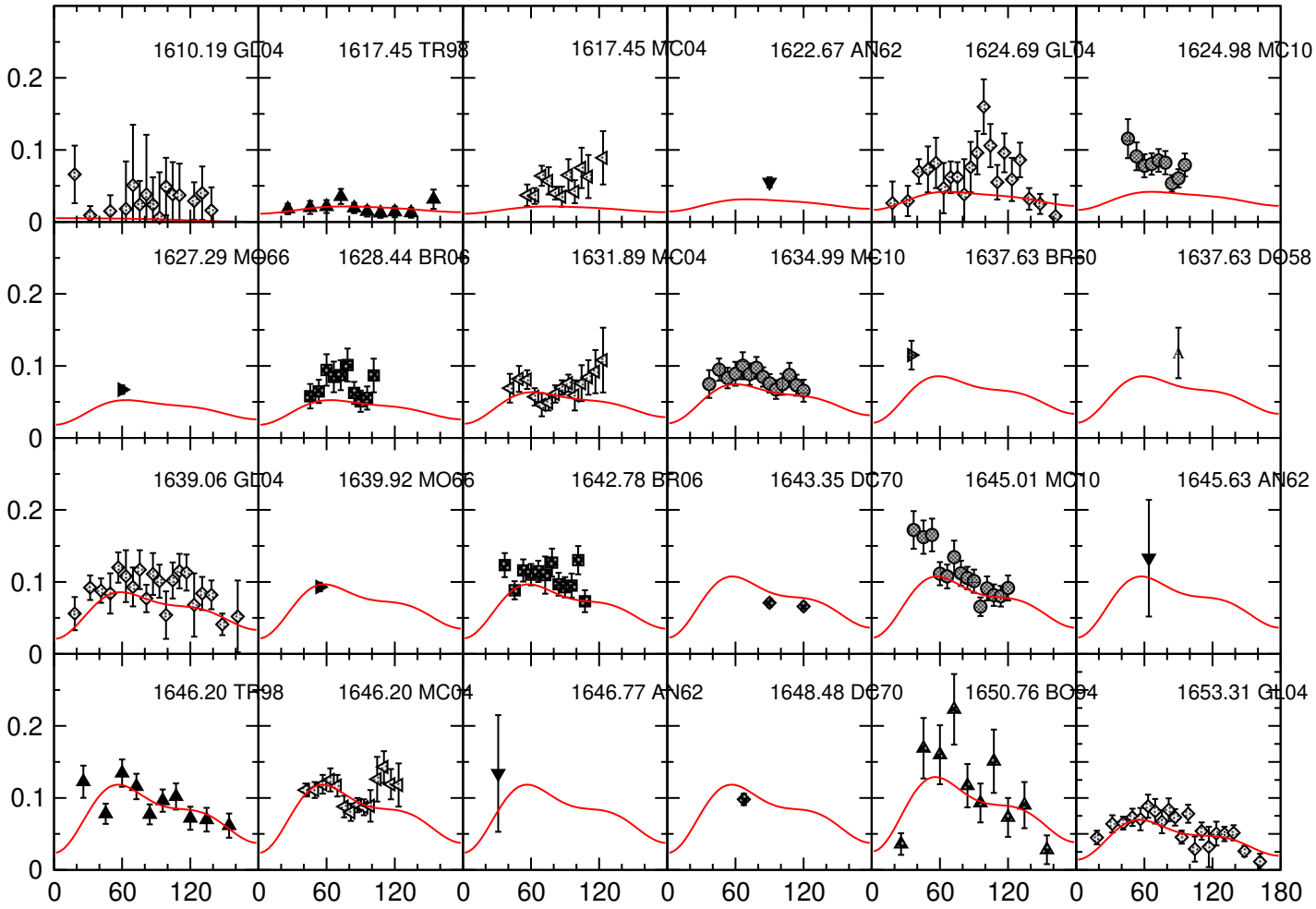
- Differential cross section $\gamma p \to \eta p$:
  - MC(10) MAIN MCNICOLL, PRC82, 035208(2010),
  - BA(07) GRAA BARTALINI, EPJA33, 169(2007)
  - KR(95) MAIN KRUSCHE, PRL74, 3736(1995),
  - NA(06) LNS NAKABAYASHI, PRC74, 035202(2006
  - DE(69)4ORSA DELCOURT, PLB29, 75(1969)
  - DY(95) MIT DYTMAN, PRC51, 2710(1995),
  - CR(05) BONN CREDE, PRL94, 012004(2005)
  - DU(02) JLAB DUGGER, PRL89, 222002(2002),
  - BA(68) FRAS BACCI, PRL20, 571(1968)
  - AR(03) MAIN AHRENS, EPJA17, 241(2003)
  - HO(88) TOKY HOMMA, JPSJ57, 828(1988)
  - BA(66) FRAS BACCI, PRL16, 384(1966)
  - CR(09) BONN CREDE, PRC80, 055202(2009),
  - HO(71) FRAS HONGOH, NCL2, 317(1971)
  - BA(63) FRAS BACCI, PRL11, 37(1963)
  - WI(09) JLAB WILLIAMS, PRC80, 045213(2009),
  - BO(74) DNPL BOOTH, NPB71, 211(1974)
  - VA(80) YERE VARTAPETYAN, SJNP32, 804(1980)
  - CH(73) FRAS CHRIST, NCL8, 1039(1973)
  - SU(09) LEPS SUMIHAMA, PRC80, 052201(2009),
  - HO(69) DNPL HOLT, LNC2, 69(1969)
  - KA(17) MAMI A2 Kashevarov et al. PRL 118, 212001 (2017)
  - Hashimoto *et al.* Phys. Rev. C 106, 035201 (2022)
- Beam asymmetry Σ $\gamma p \to \eta p$:
  - BA(07) GRAA BARTALINI, EPJA33, 169(2007)
  - ER(07) BONN ELSNER, EPJA33, 147(2007)
  - VA(80) YERE VARTAPETYAN, SJNP32, 804(1980)
  - Collins *et al.*, PLB 771, 213 (2017)
  - F. Afzal et al. (CBELSA/TAPS) PRL 125, 152002 (2022)
  - Hashimoto *et al.* Phys. Rev. C 106, 035201 (2022)
- Recoil Polarization $\gamma p \to \eta p$:
  - HE(70) CALT HEUSCH, PRL25, 1381(1970)
  - HO(71) FRAS HONGOH, NCL2, 317(1971)
  - J. Müller et al. (CBELSA/TAPS) PLB 803, 135323 (2020)
- Target asymmetry T $\gamma p \to \eta p$:
  - BO(98) BONN BOCK, PRL81, 534(1998)
  - Akondi *et al.* [A2 at MAMI Collaboration] PRL 113, 102001 (2014)
  - J. Müller et al. (CBELSA/TAPS) PLB 803, 135323 (2020)
- E $\gamma p \to \eta p$:

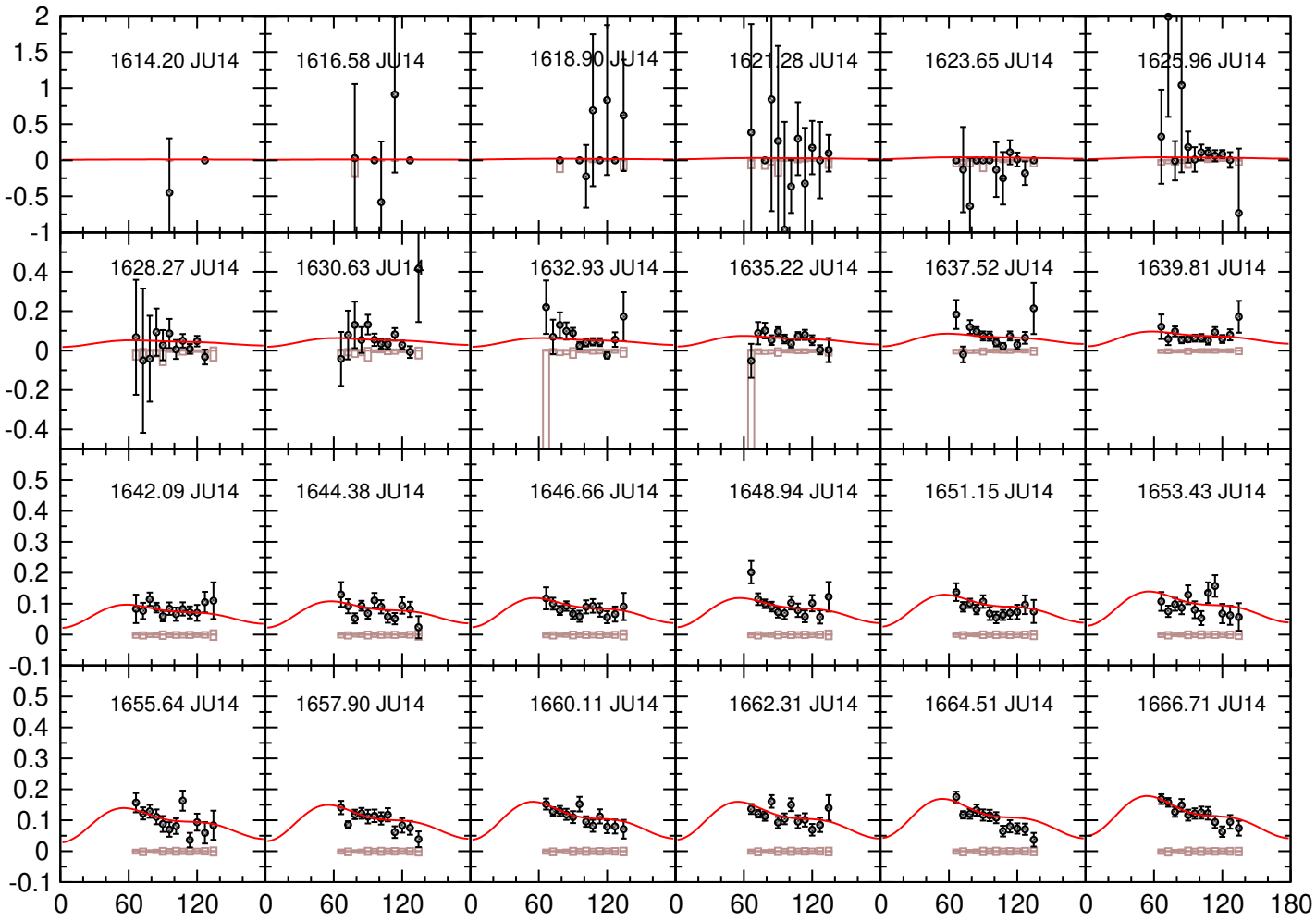
  - Senderovich *et al.* [CLAS Collaboration] PLB 755, 64 (2016)
  - J. Müller et al. (CBELSA/TAPS) PLB 803, 135323 (2020)

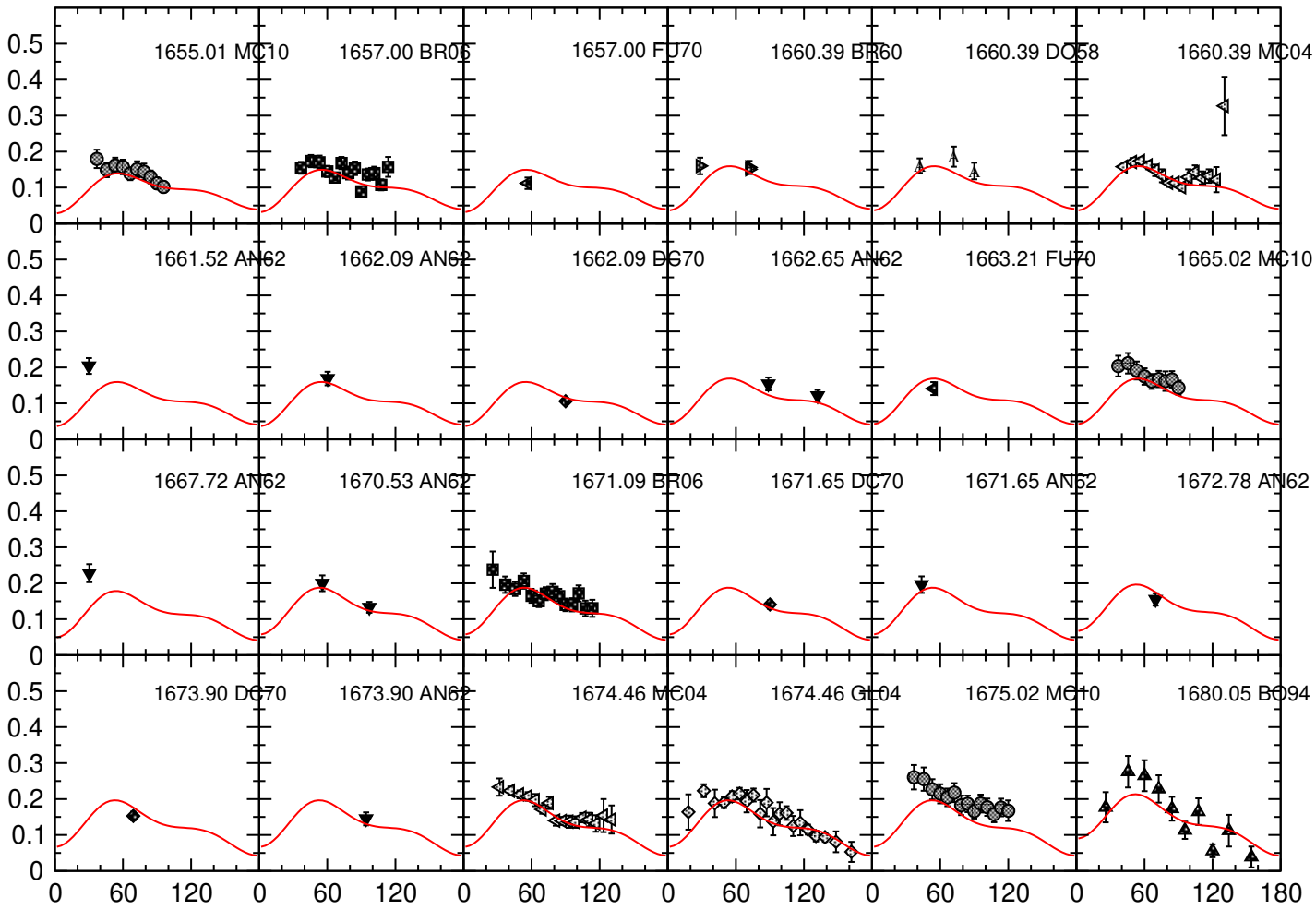
- F $\gamma p \to \eta p$:
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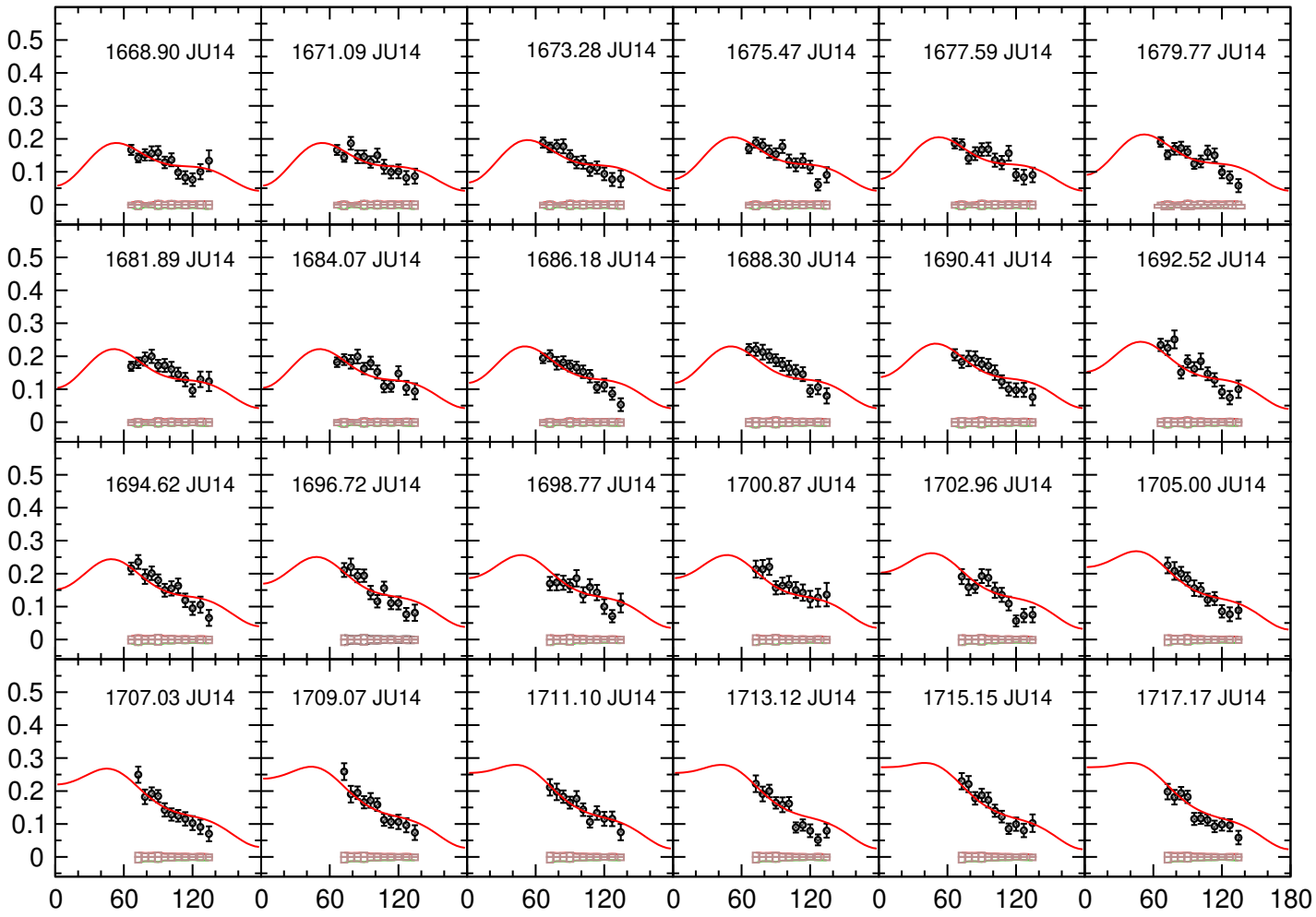
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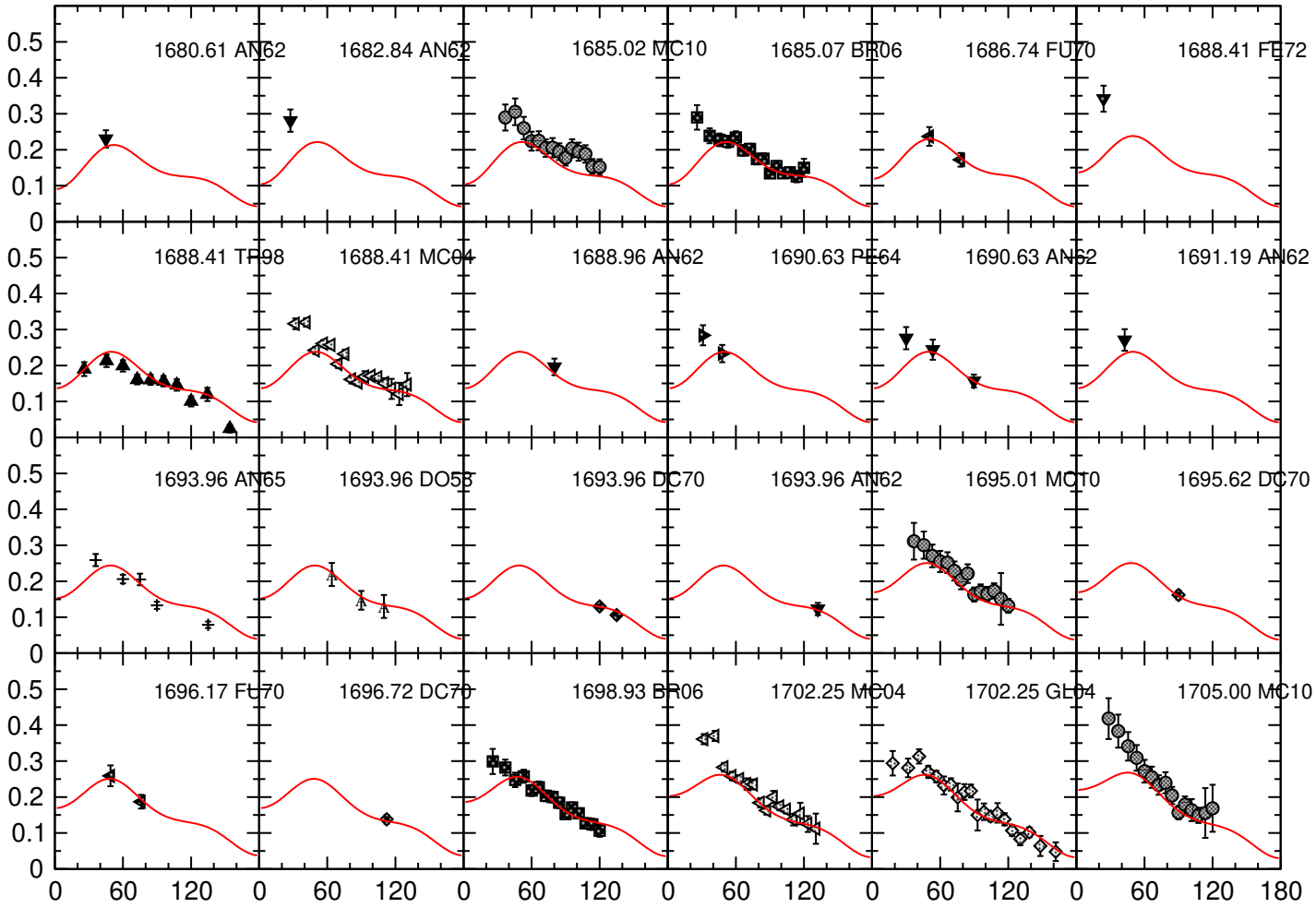
- H $\gamma p \to \eta p$:
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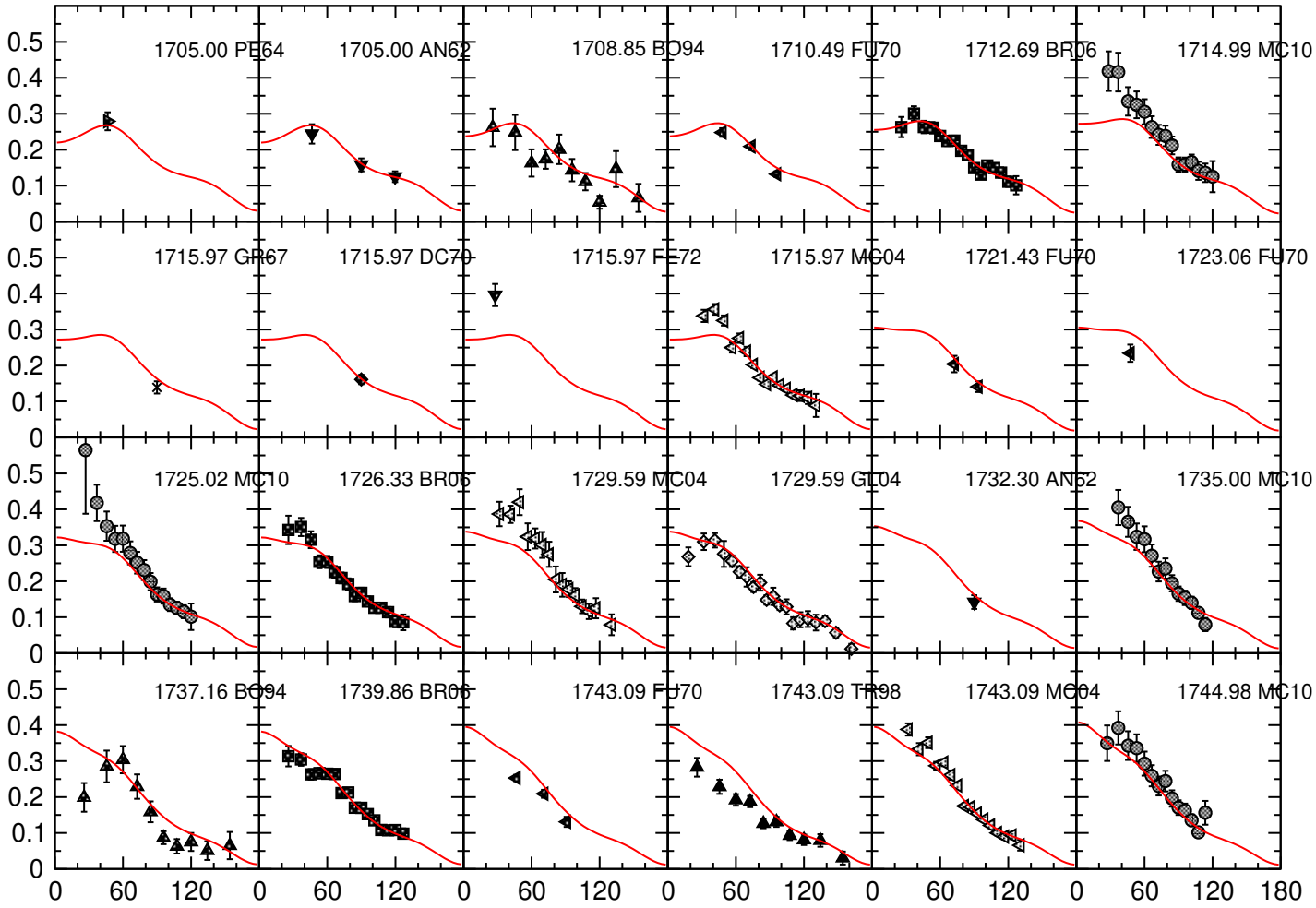

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1631.89 MC04
1634.99 MC10
1637.63 BR60
1637.63 DO58
1639.06 GL04
1639.92 MO66
1642.78 BR06
1643.35 DC70
1645.01 MC10
1645.63 AN62
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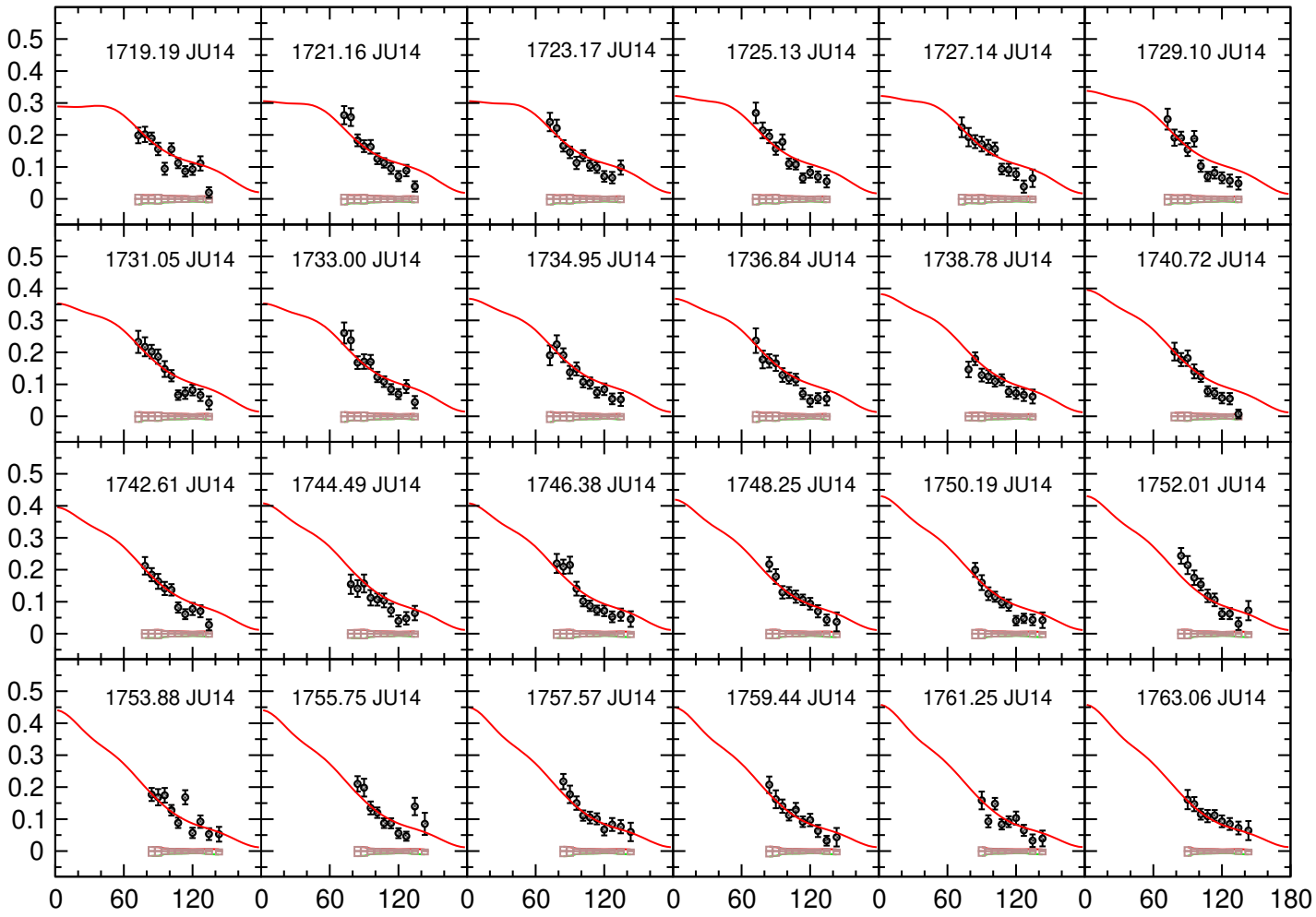

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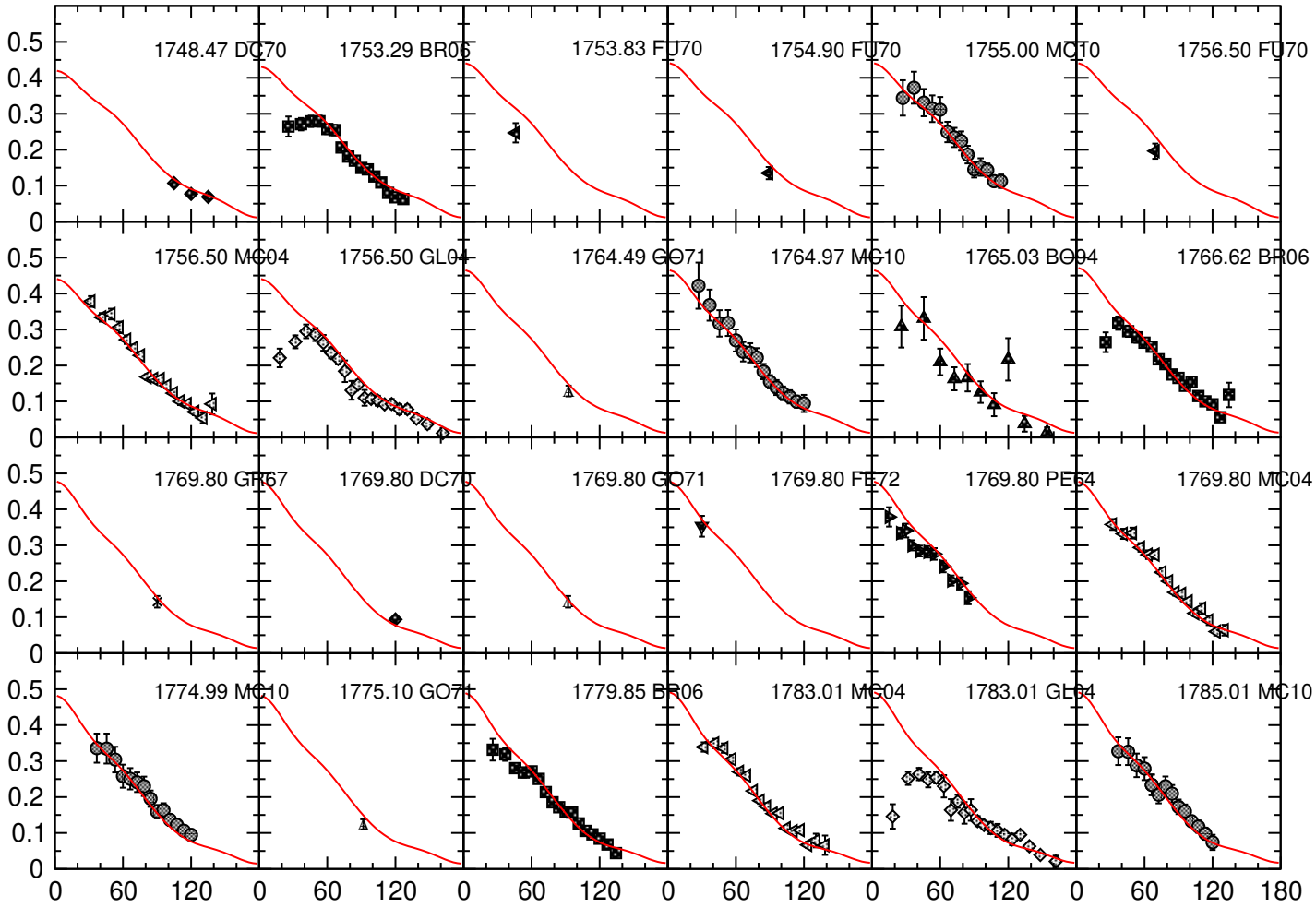

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1657.00 FU70
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1662.09 DG70
1662.65 AN62
1663.21 FU70
1665.02 MC10
1667.72 AN62
1670.53 AN62
1671.09 BR06
1671.65 DG70
1671.65 AN62
1672.78 AN62
1673.90 DG70
1673.90 AN62
1674.46 MC04
1674.46 GL04
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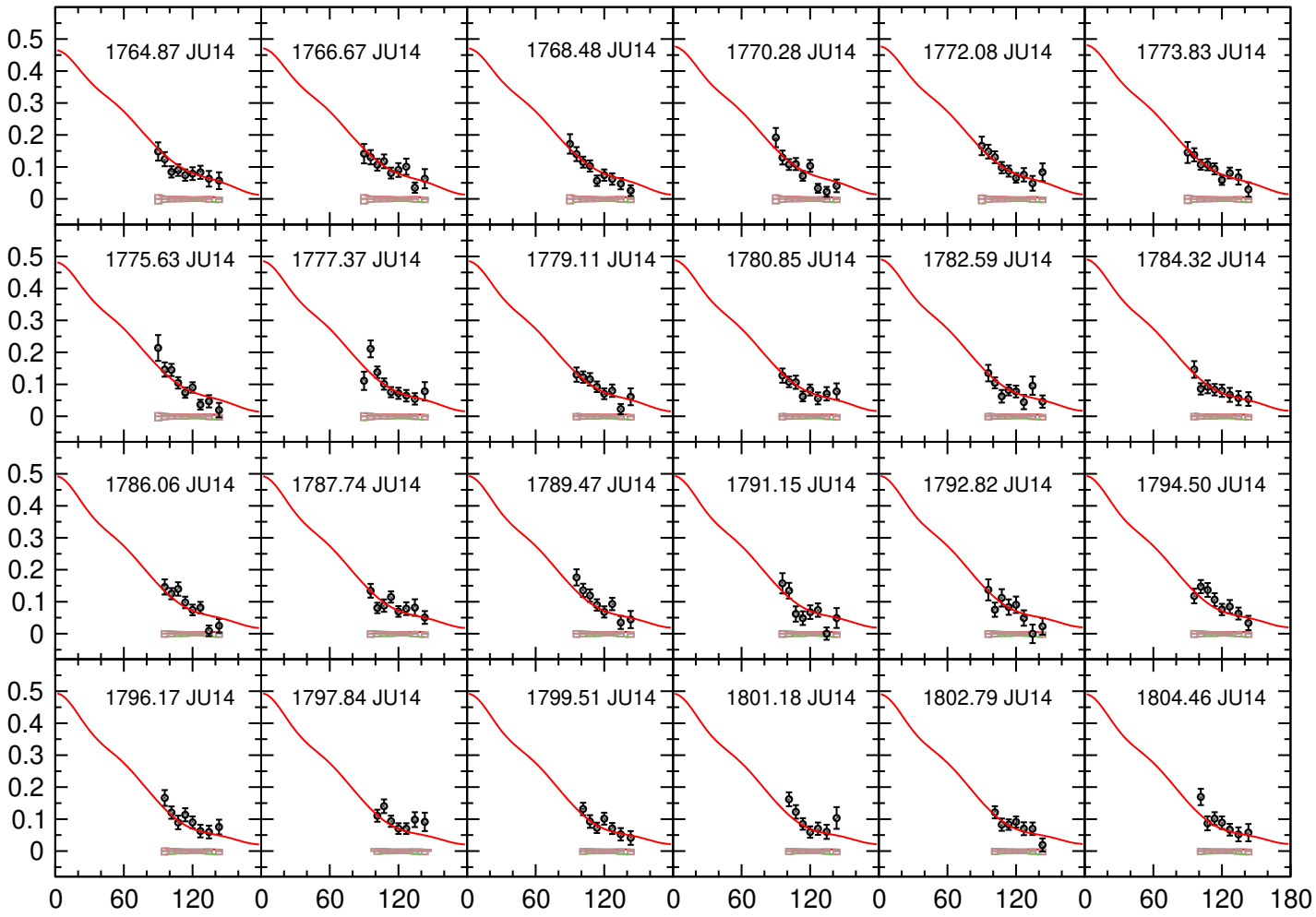

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1686.18 JU14
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1698.77 JU14
1700.87 JU14
1702.96 JU14
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1707.03 JU14
1709.07 JU14
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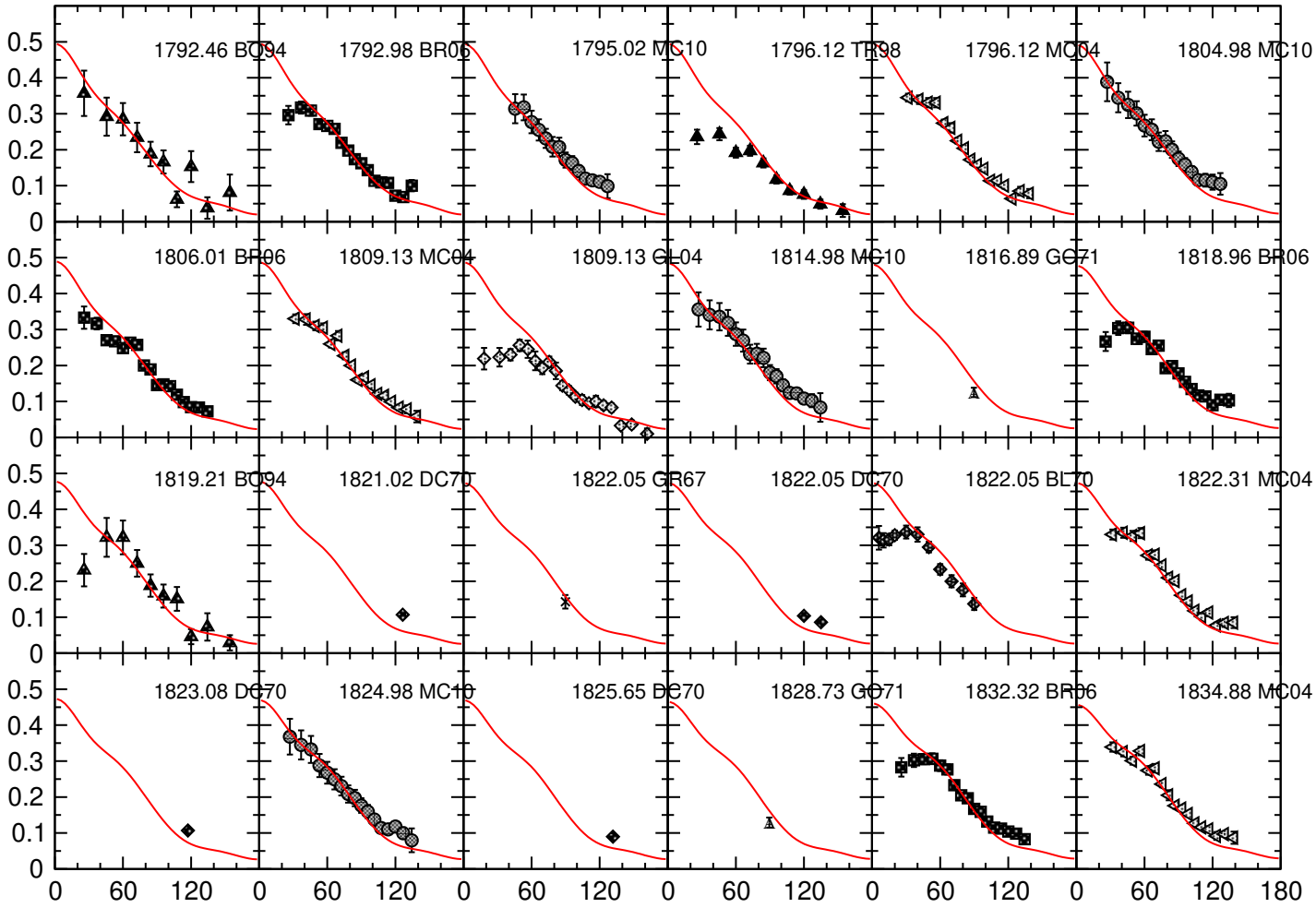

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1690.63 AN62
1691.19 AN62
1693.96 AN65
1693.96 DO53
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1693.96 AN62
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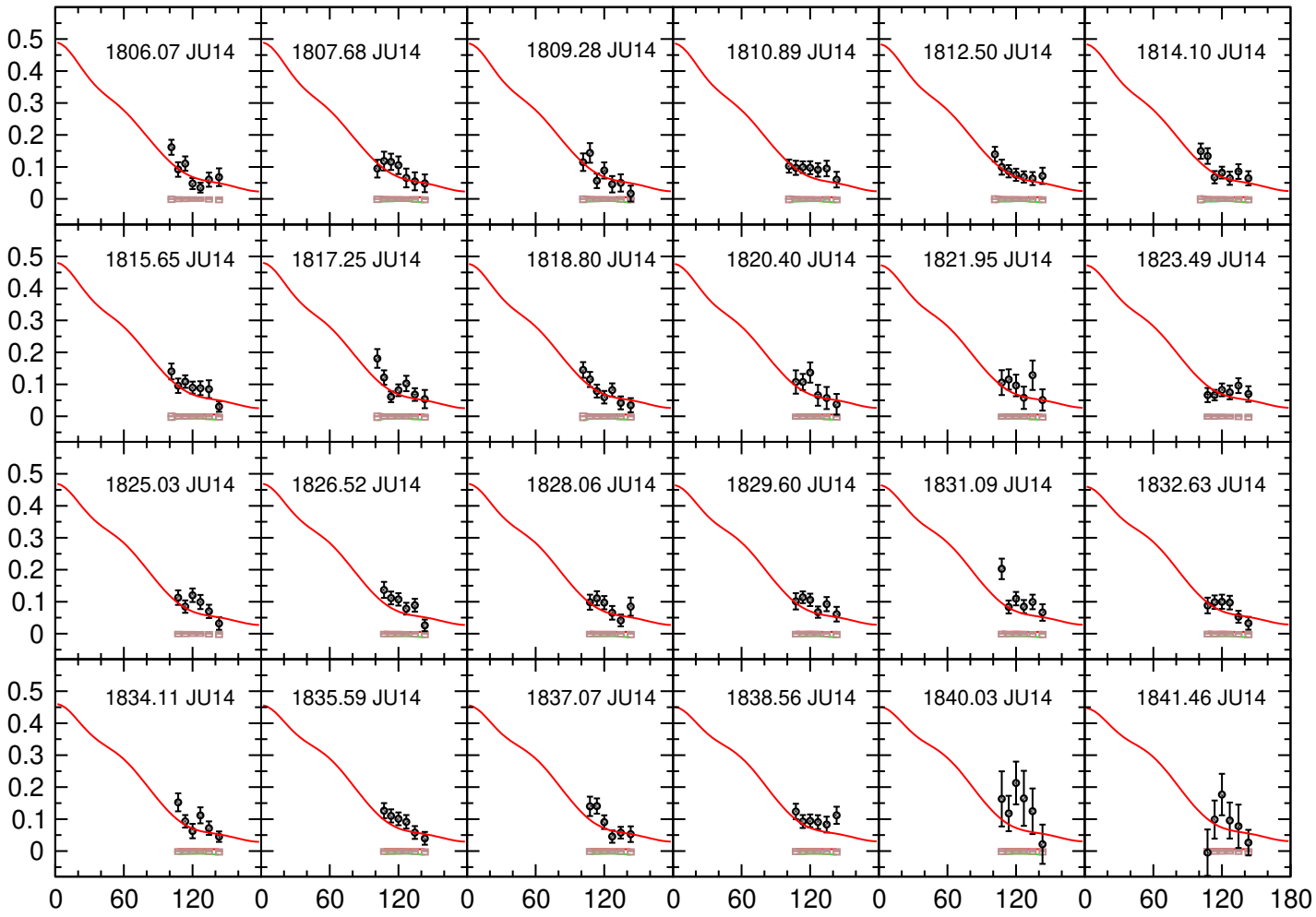

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1715.97 FE72
1715.97 MC04
1721.43 FU70
1723.06 FU70
1725.02 MC10
1726.33 BR06
1729.59 MC04
1729.59 GL04
1732.30 AN62
1735.00 MC10
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1739.86 BR06
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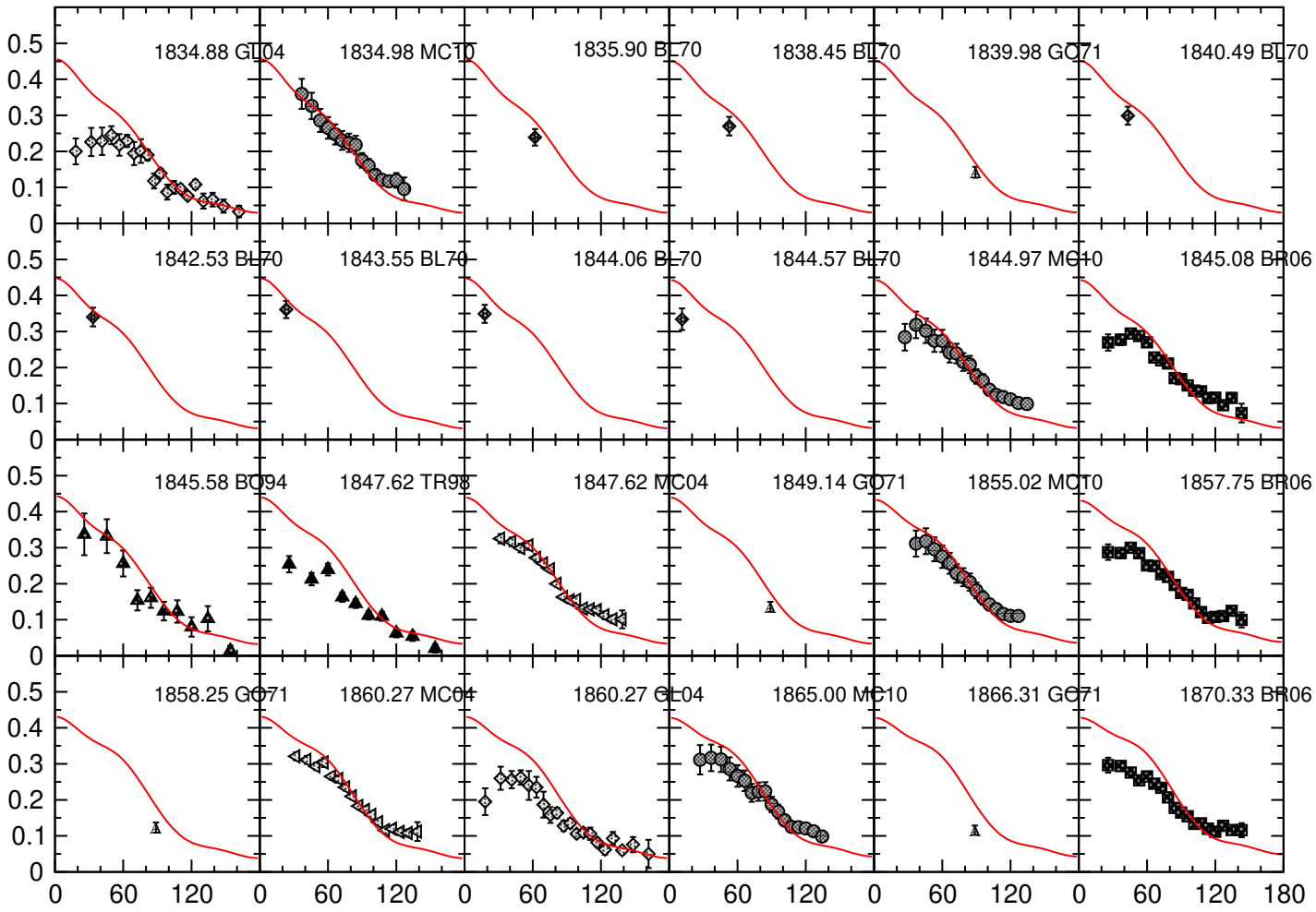

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1734.95 JU14
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1738.78 JU14
1740.72 JU14
1742.61 JU14
1744.49 JU14
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1753.88 JU14
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1757.57 JU14
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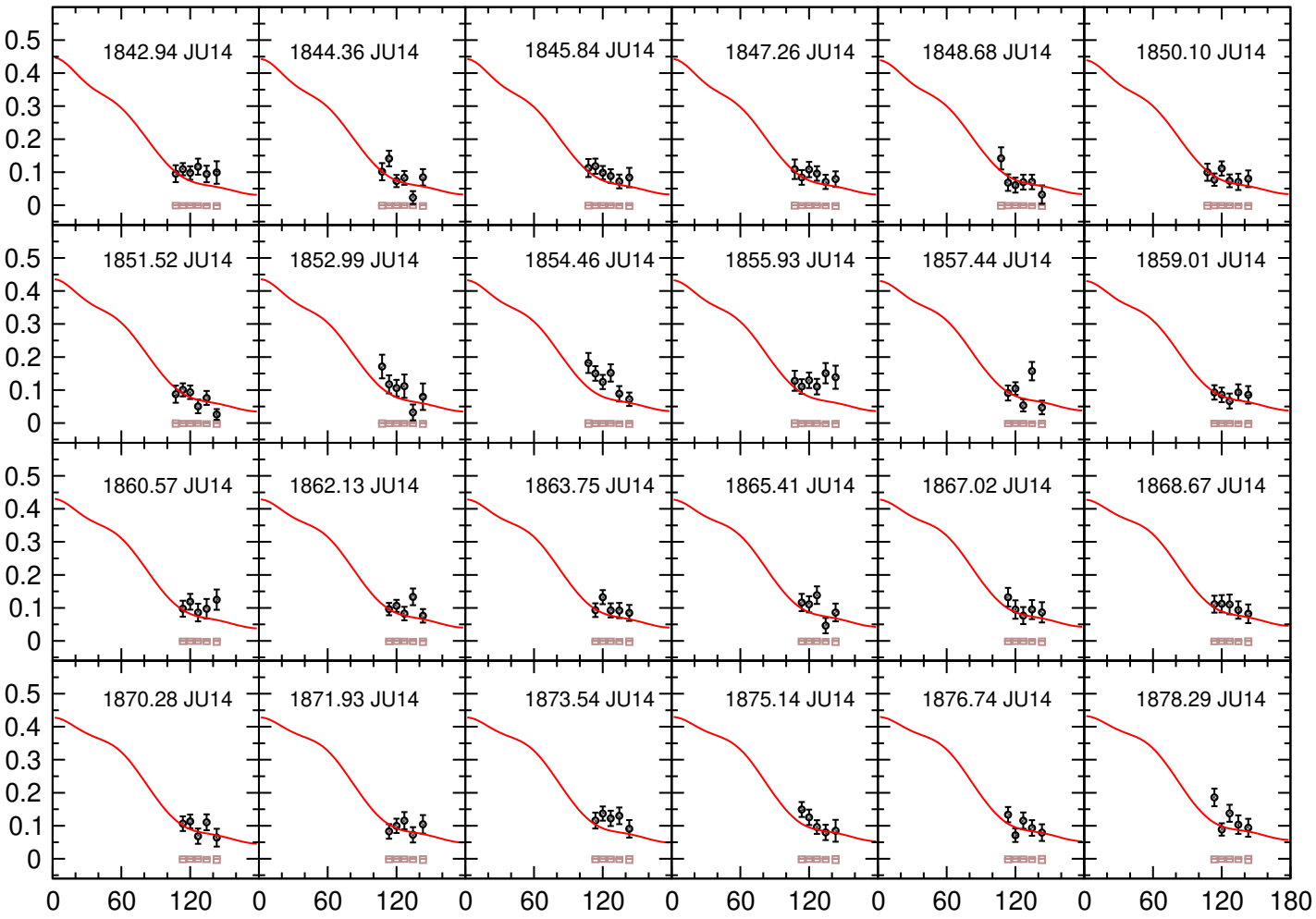

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1764.49 GO71
1764.97 MC10
1765.03 BO04
1766.62 BR06
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1769.80 FE72
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1774.99 MC10
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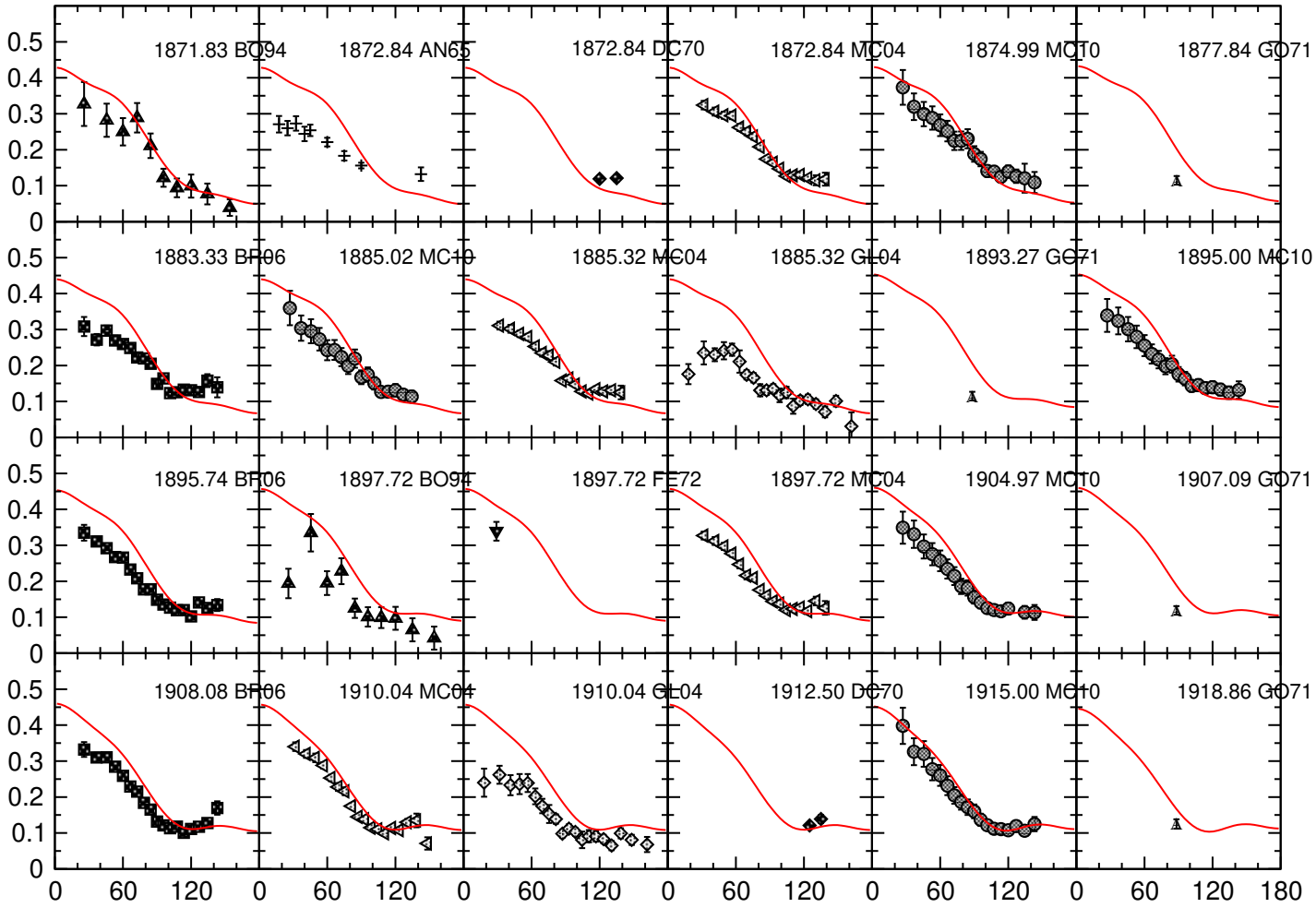

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1777.37 JU14
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1780.85 JU14
1782.59 JU14
1784.32 JU14
1786.06 JU14
1787.74 JU14
1789.47 JU14
1791.15 JU14
1792.82 JU14
1794.50 JU14
1796.17 JU14
1797.84 JU14
1799.51 JU14
1801.18 JU14
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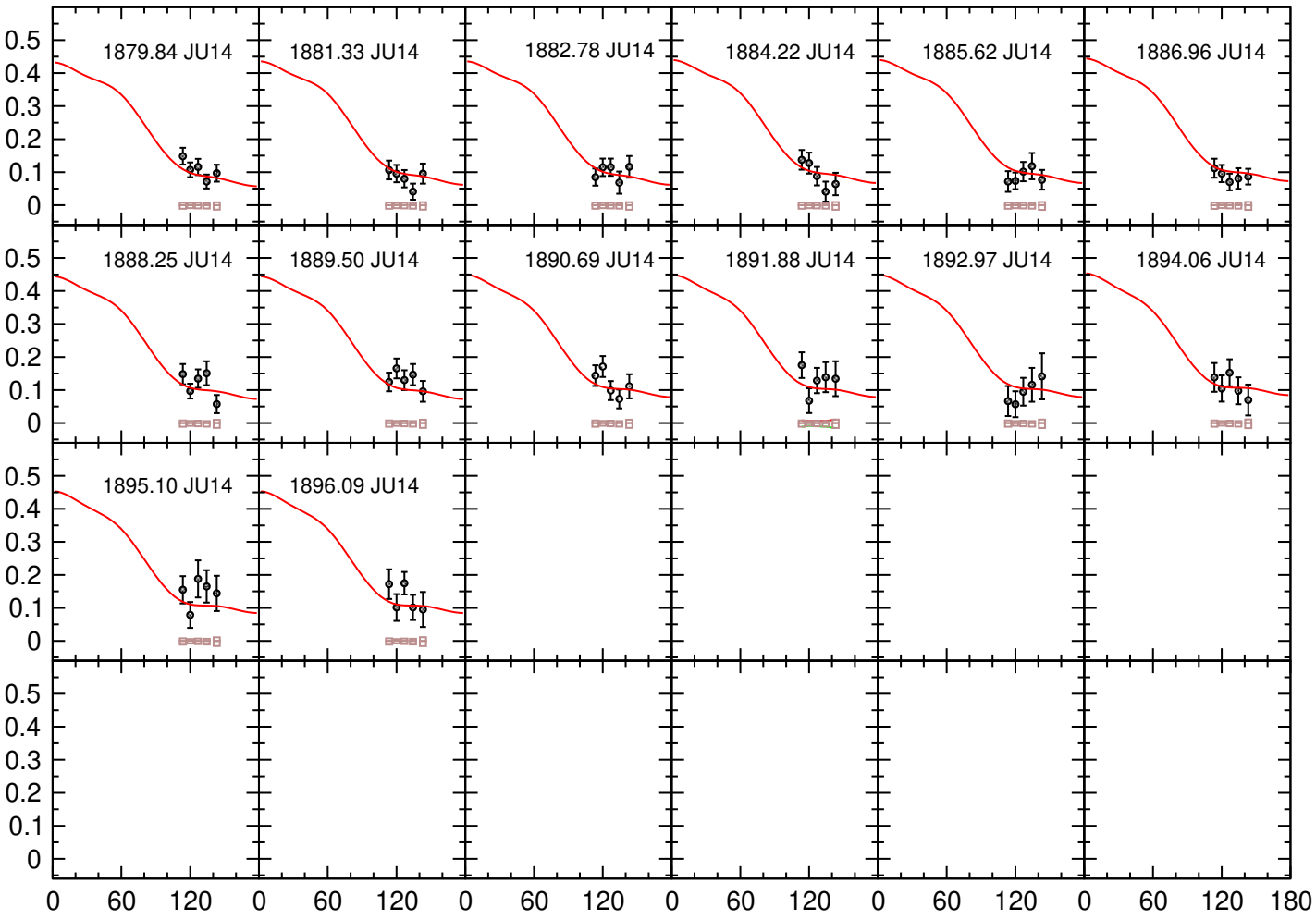

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1819.21 BO94
1821.02 DC70
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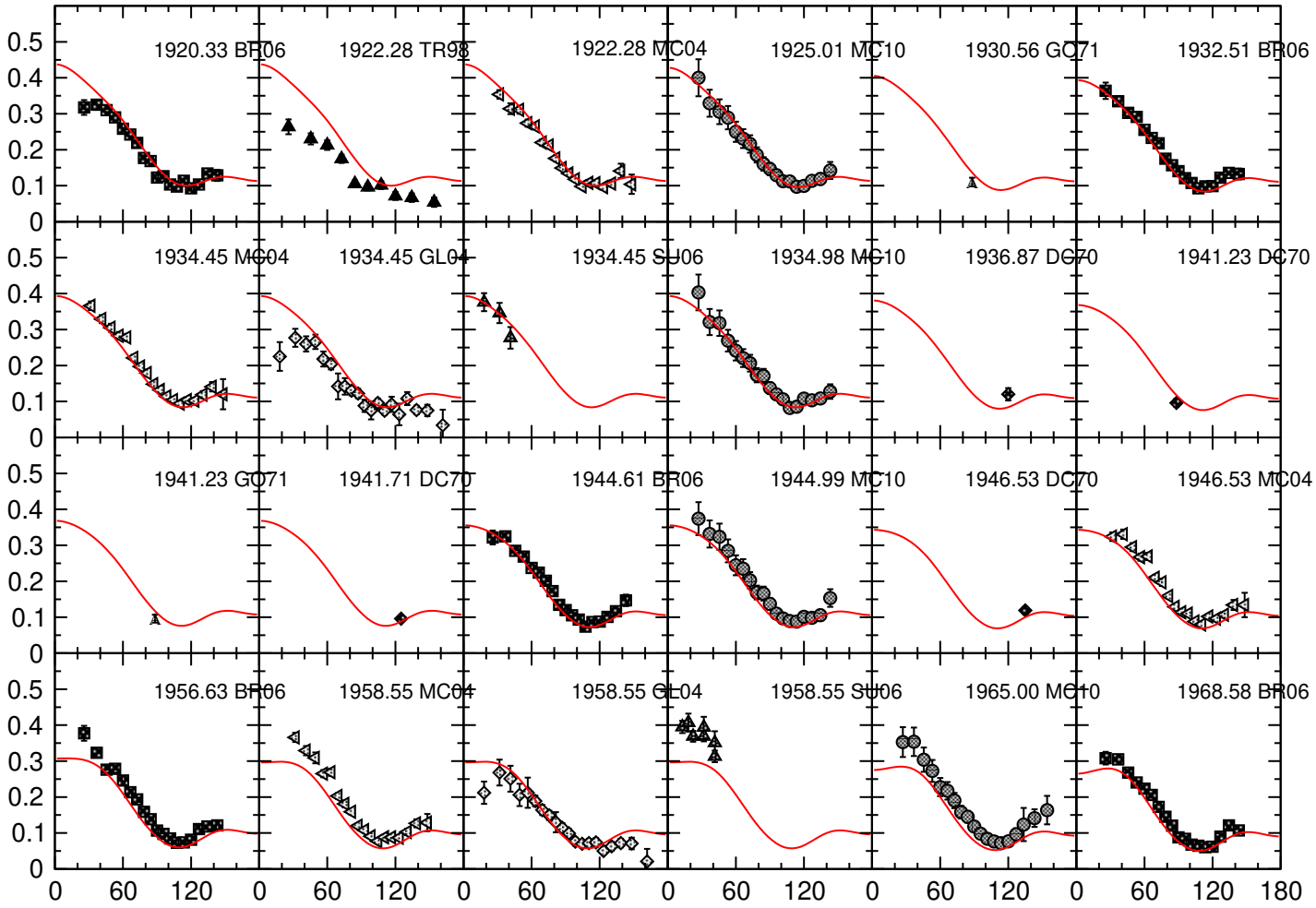

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1826.52 JU14
1828.06 JU14
1829.60 JU14
1831.09 JU14
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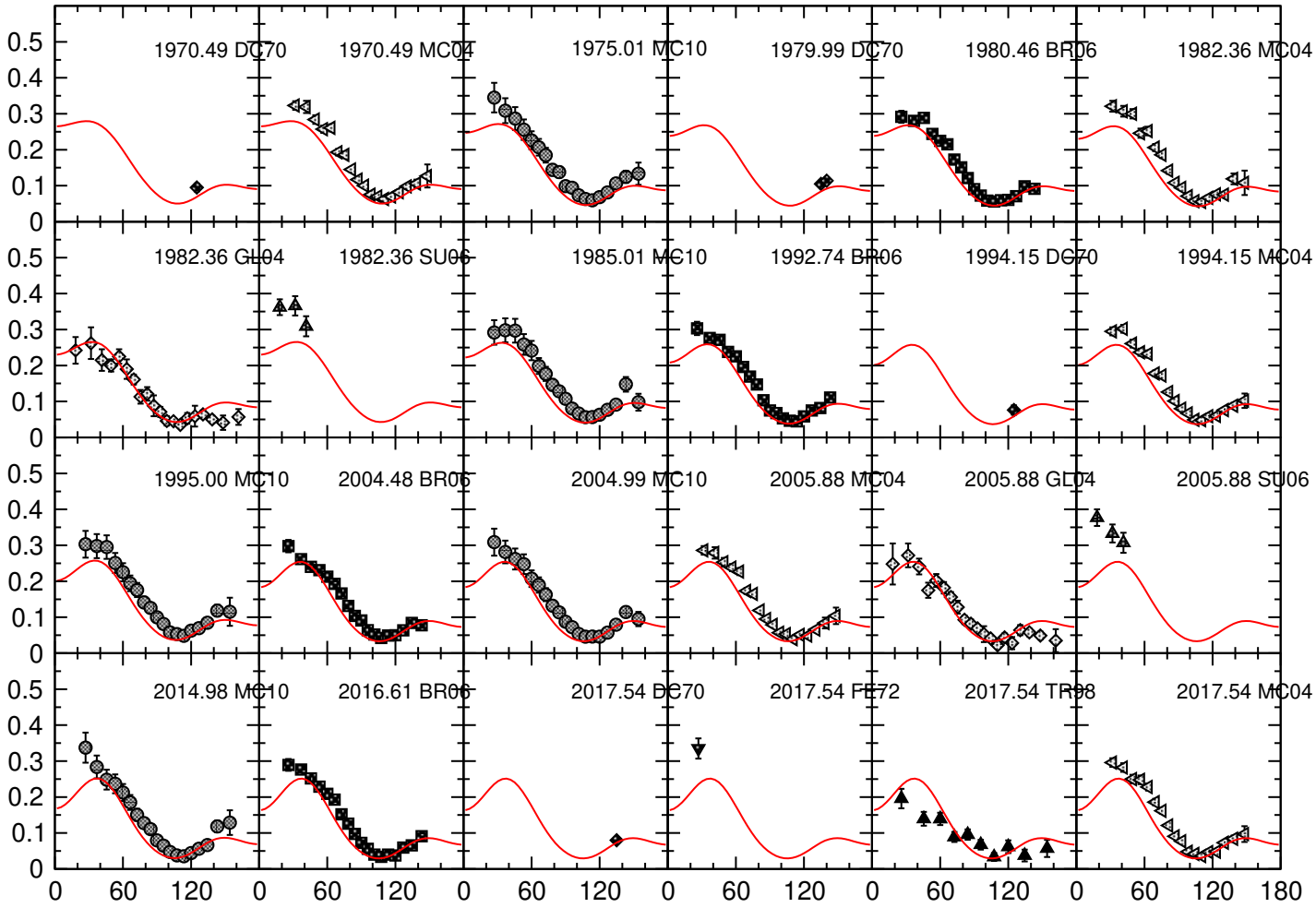

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1845.58 BO94
1847.62 TR98
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1855.02 MC10
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1858.25 GO71
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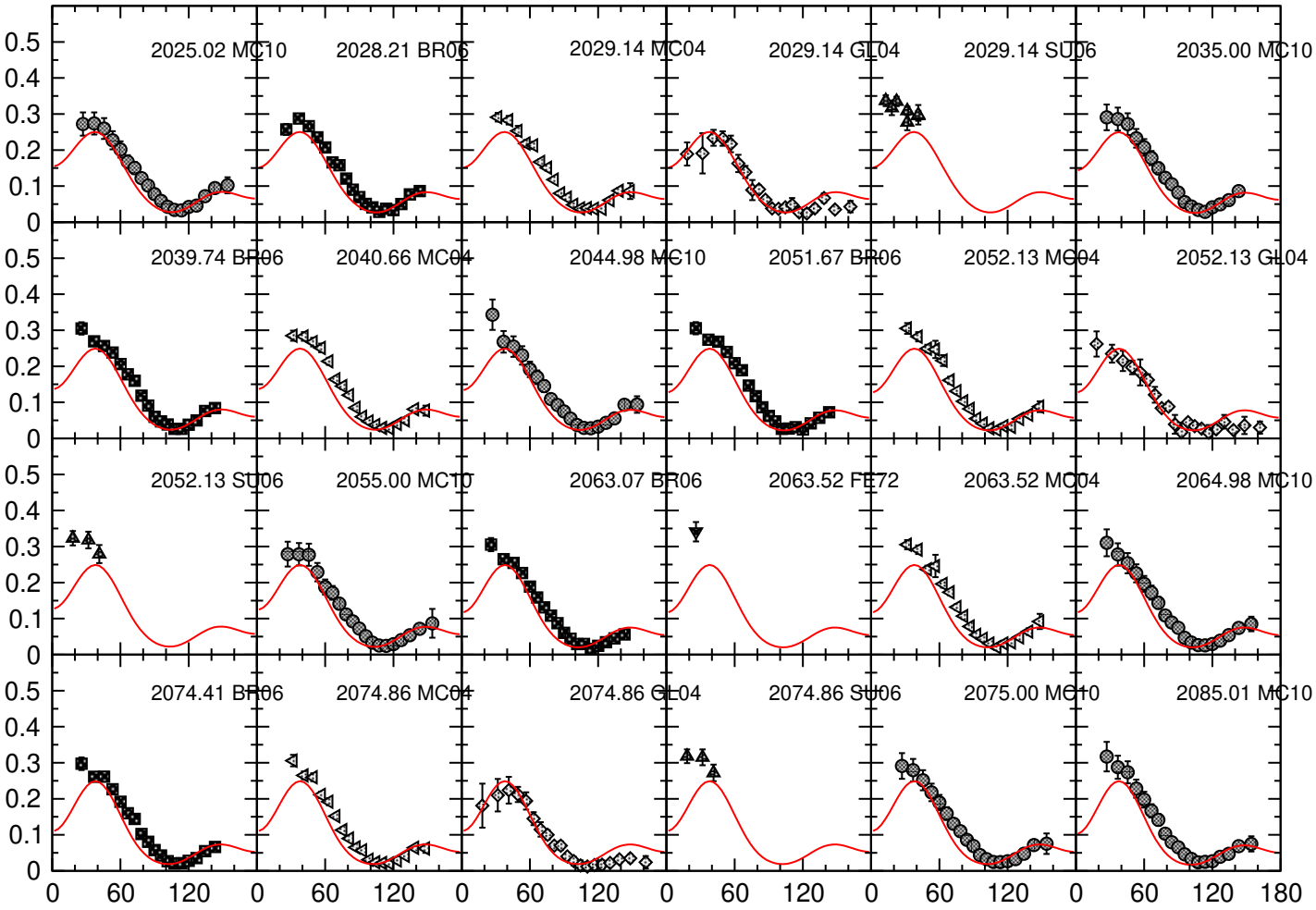

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1875.14 JU14
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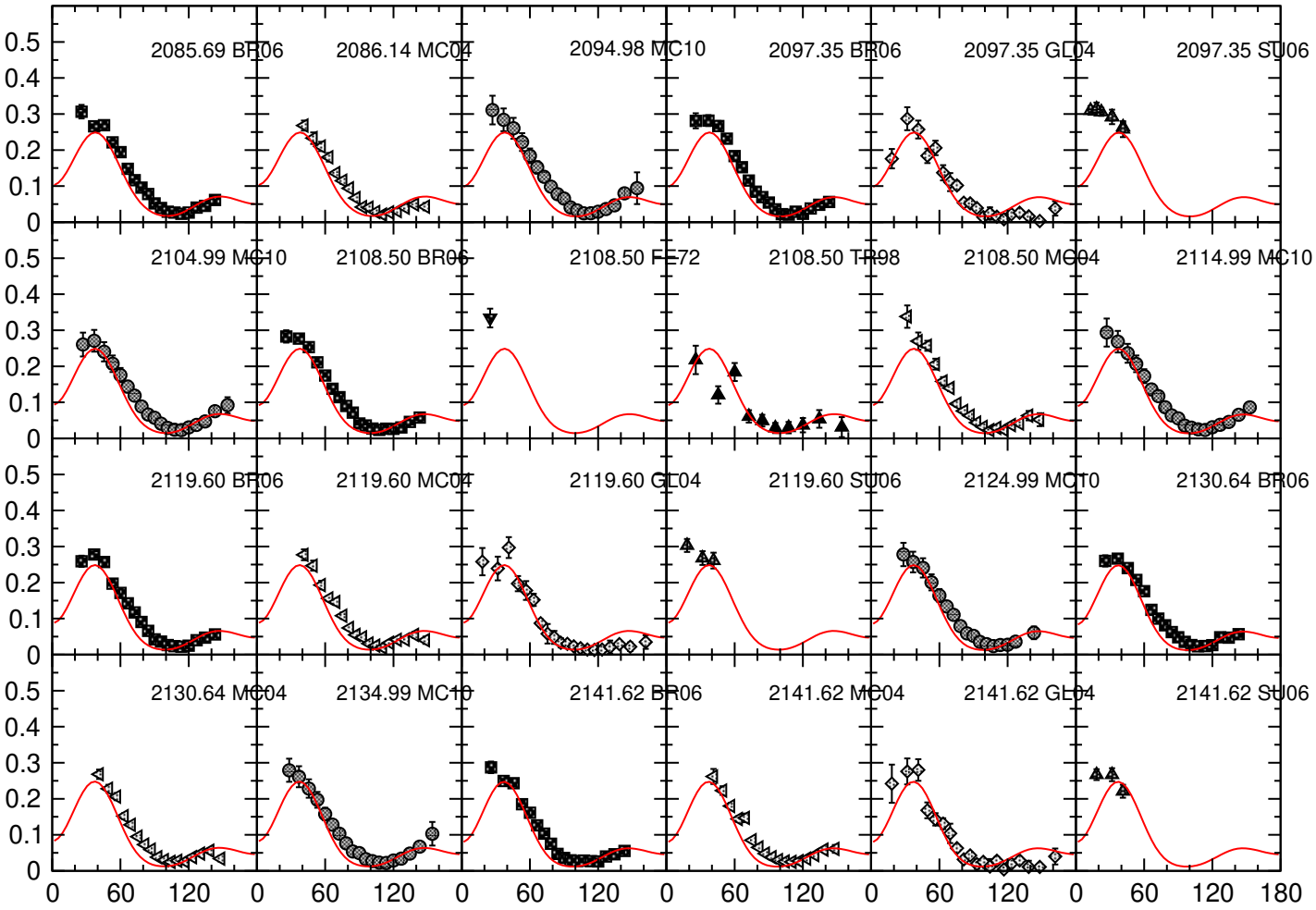

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1895.74 BR06
1897.72 BO94
1897.72 FE72
1897.72 MC04
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1910.04 MC04
1910.04 GL04
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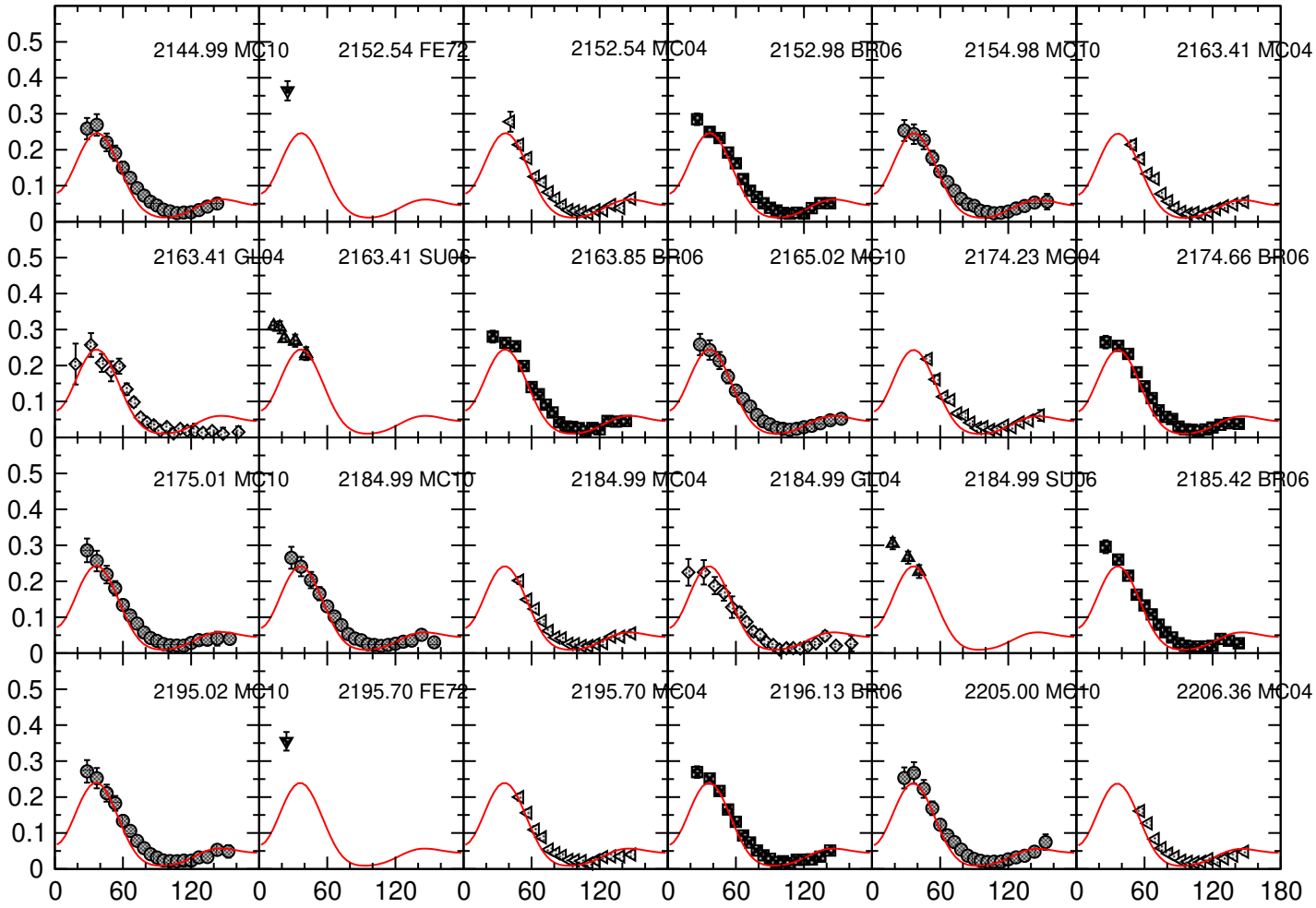

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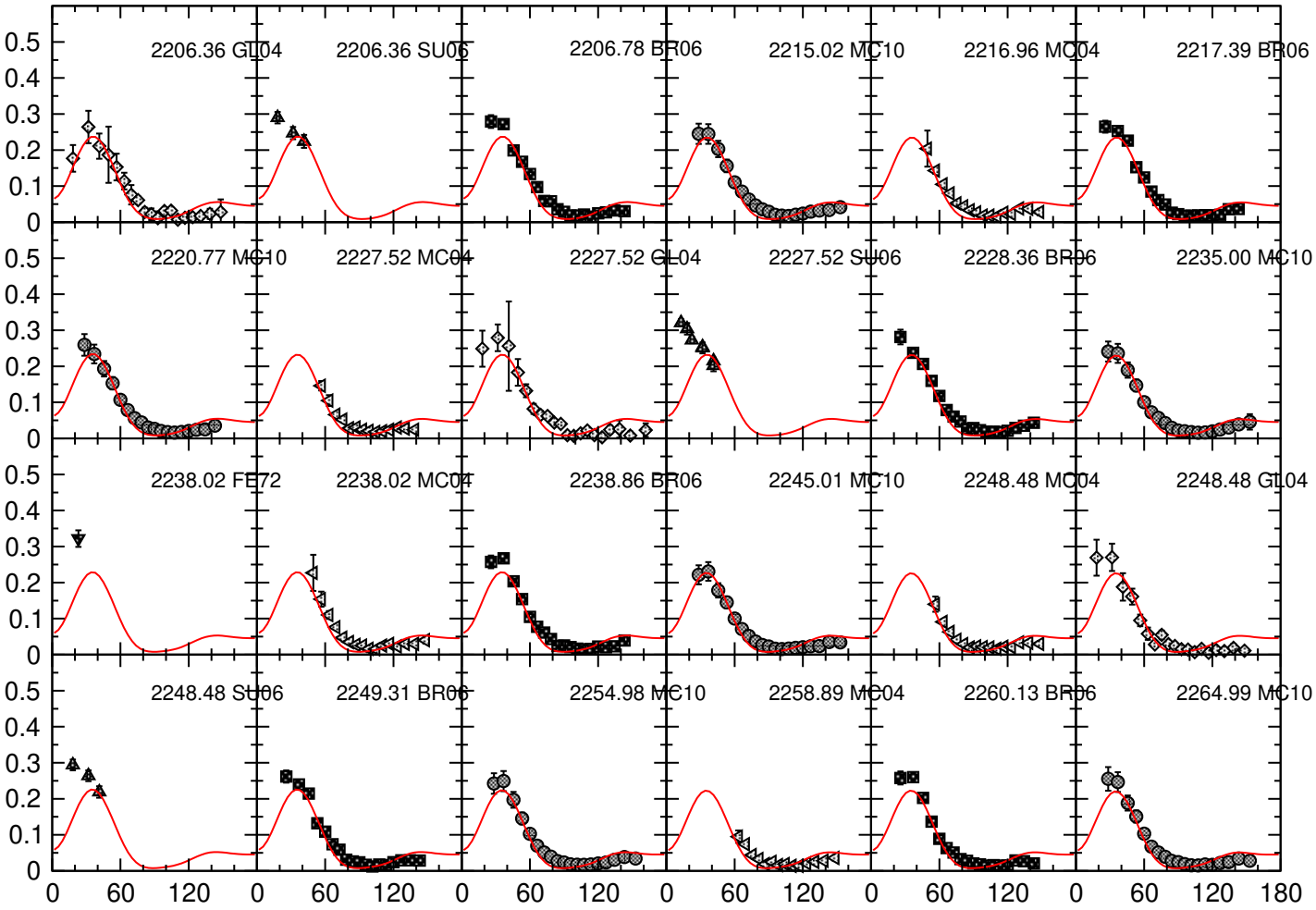

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1936.87 DC70
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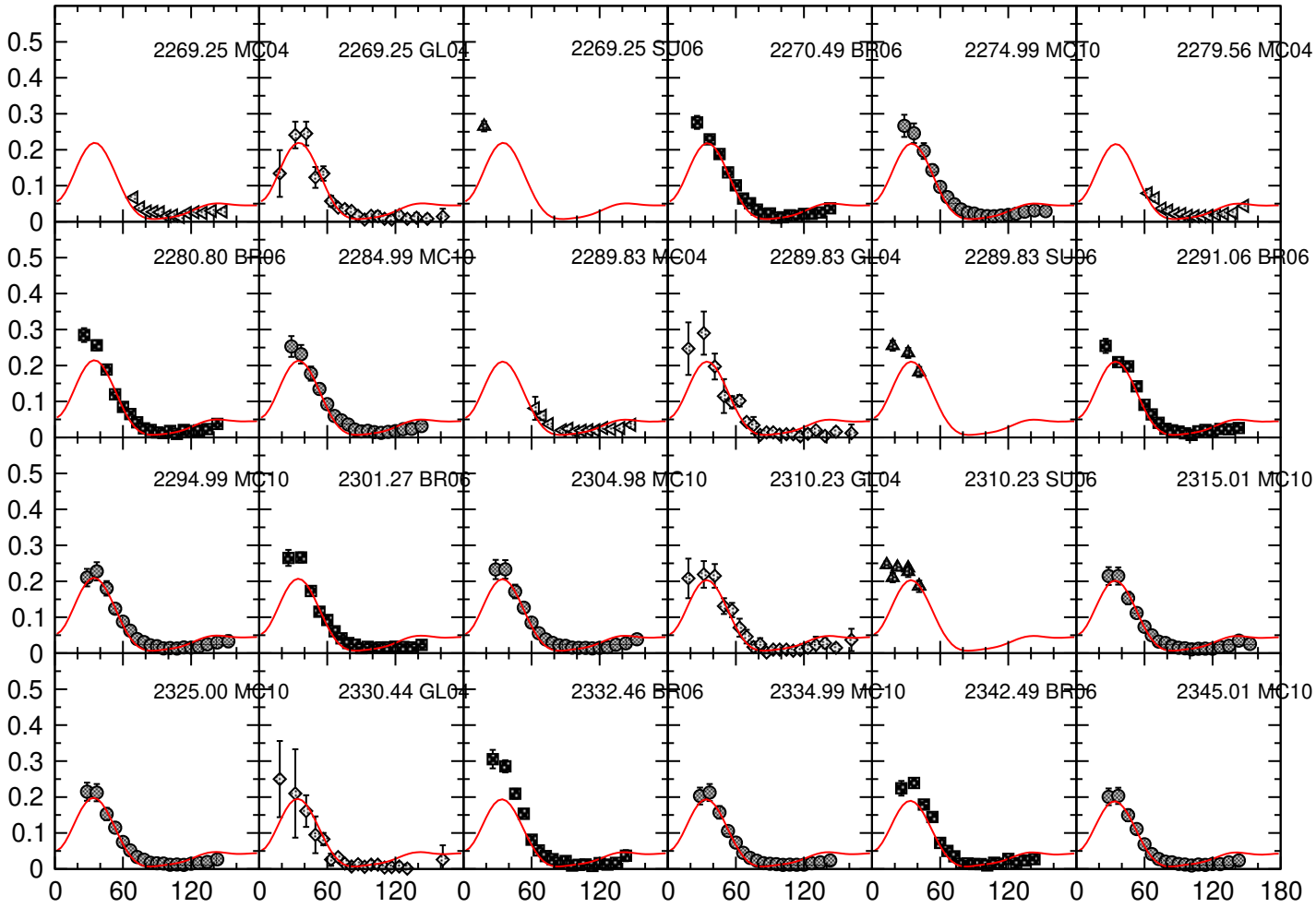

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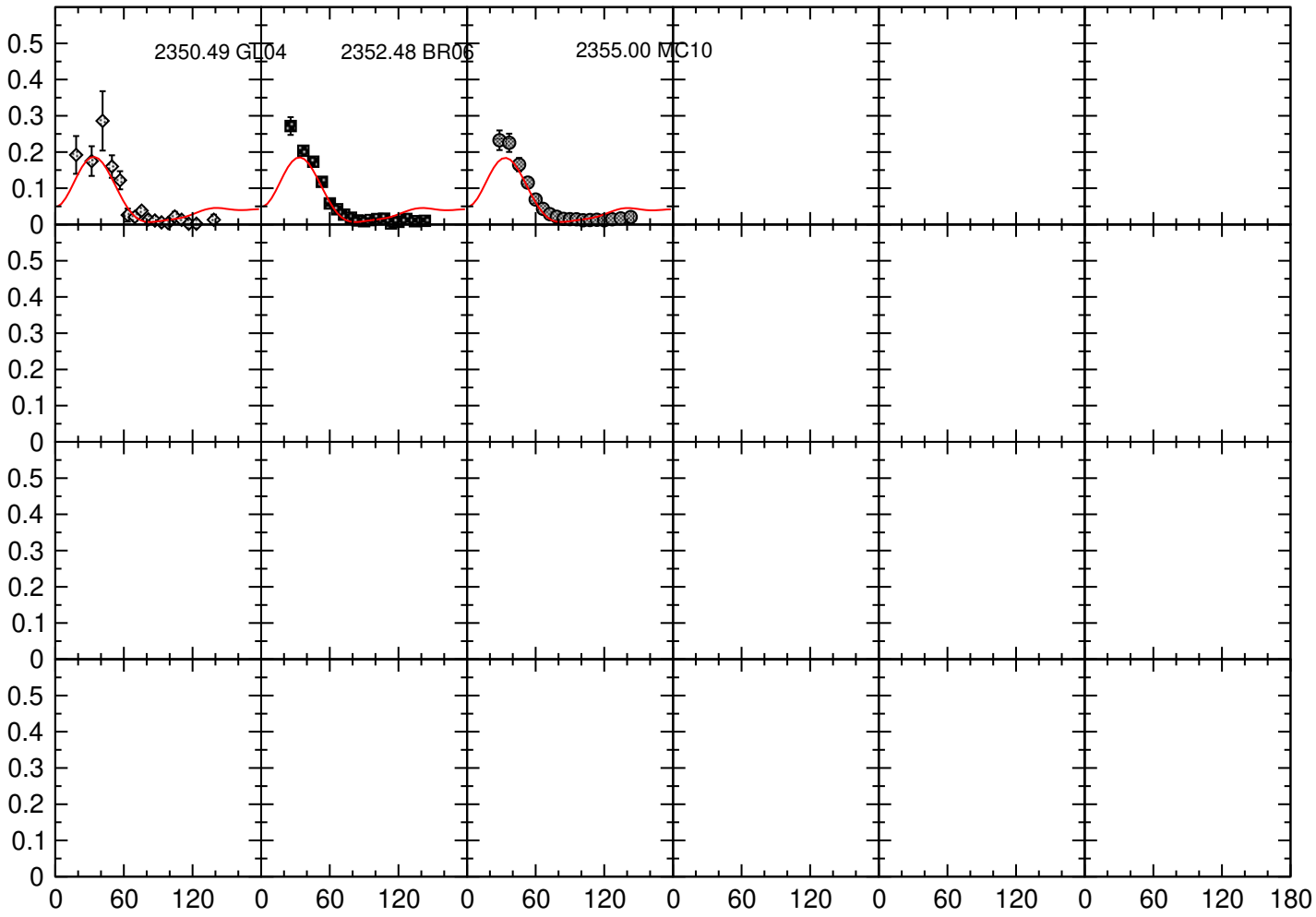

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2175.01 MC10
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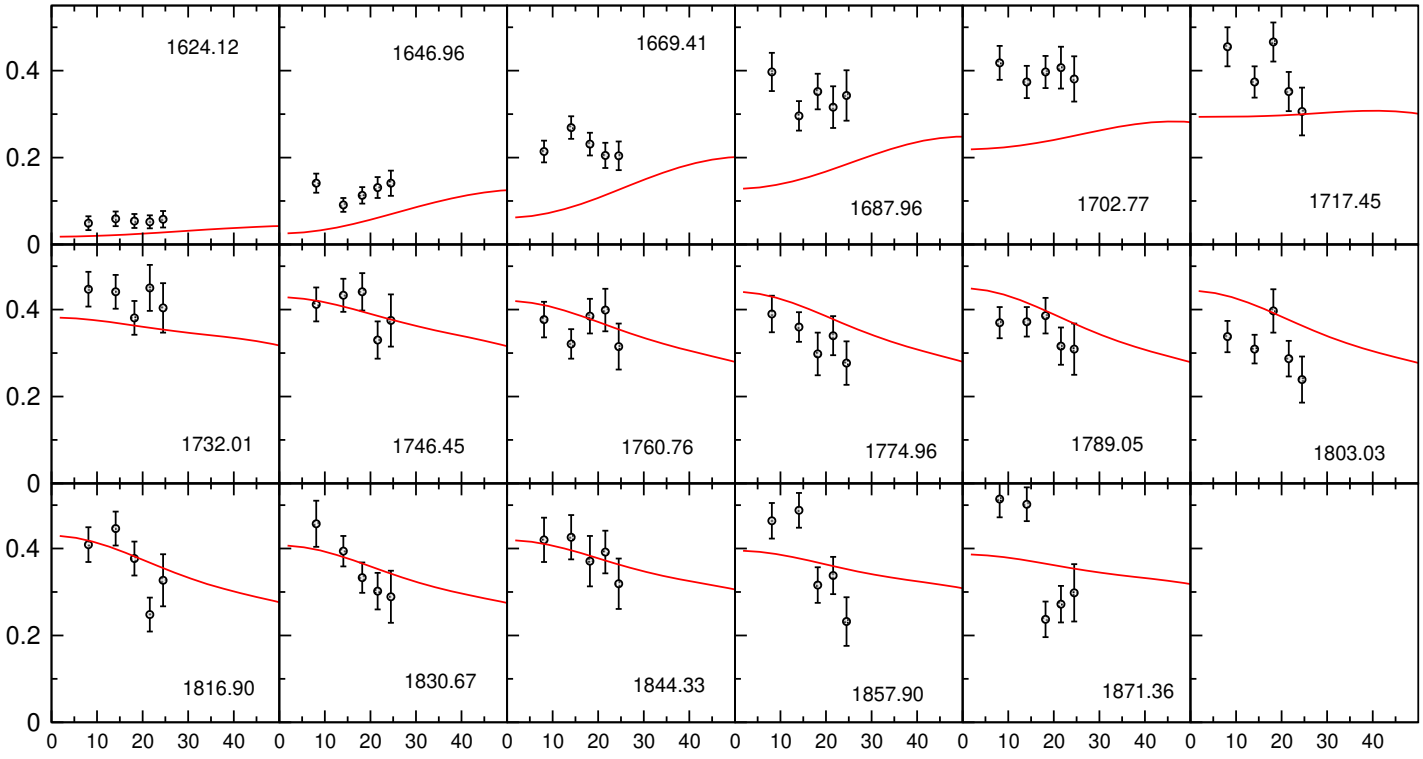
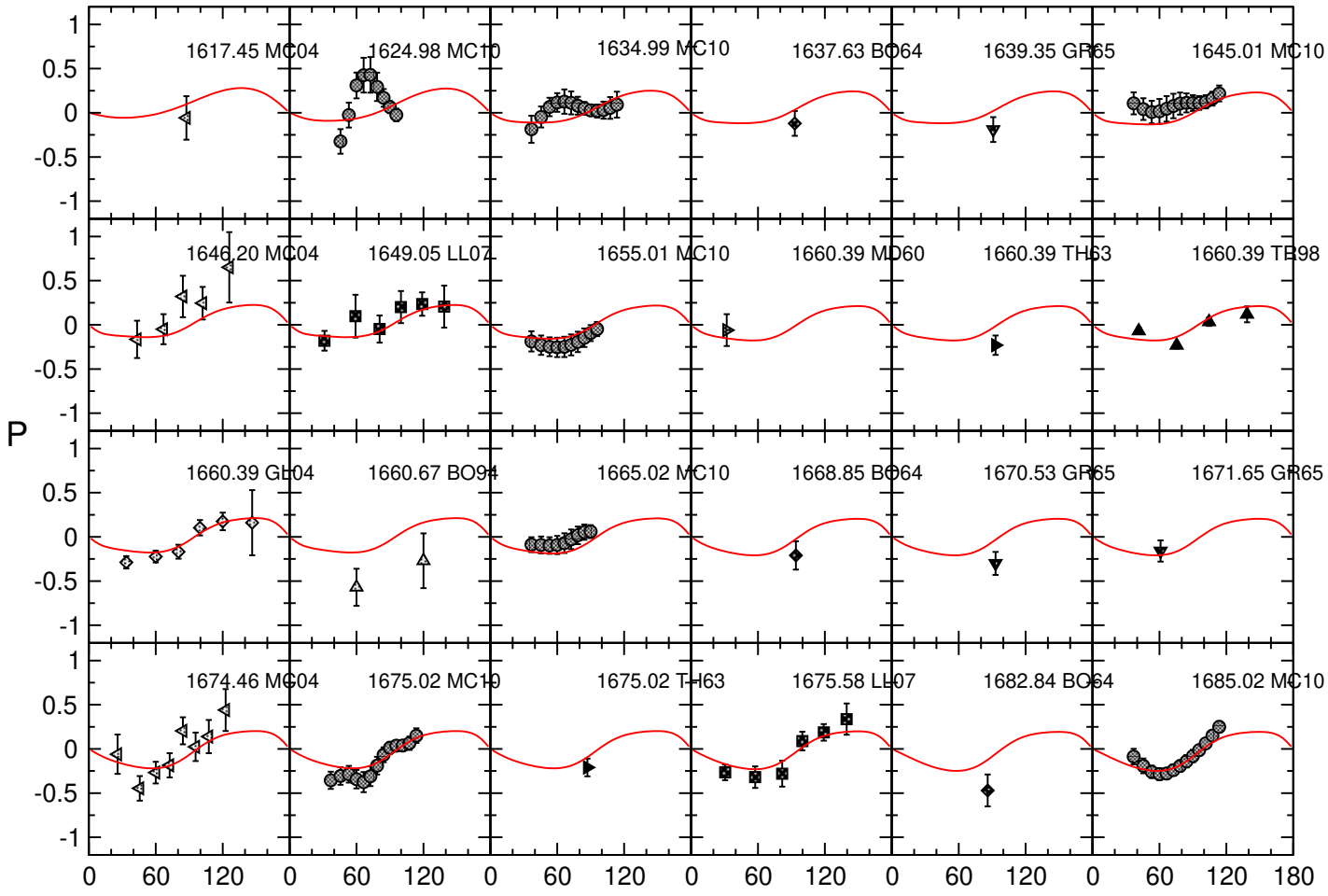
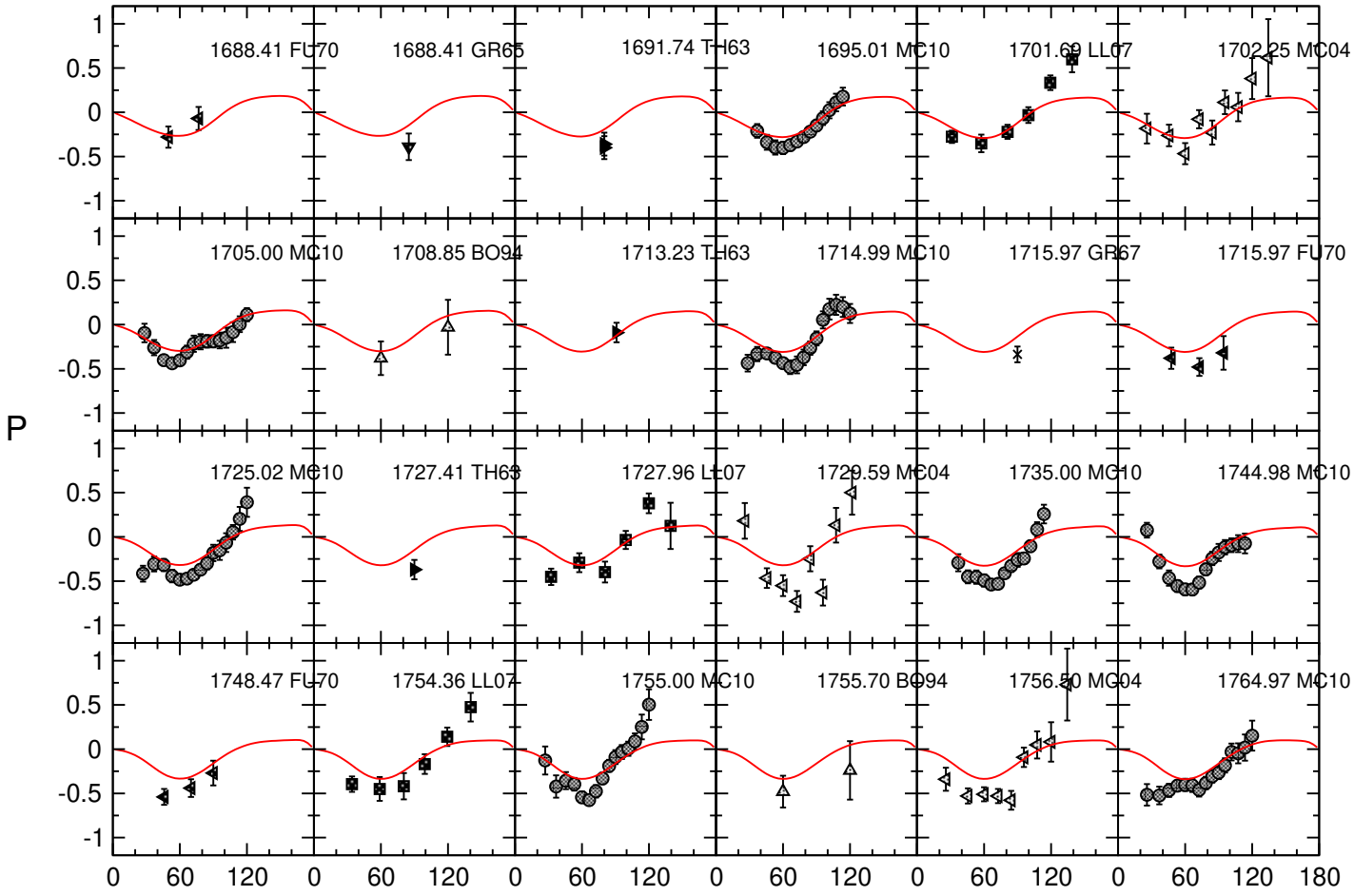
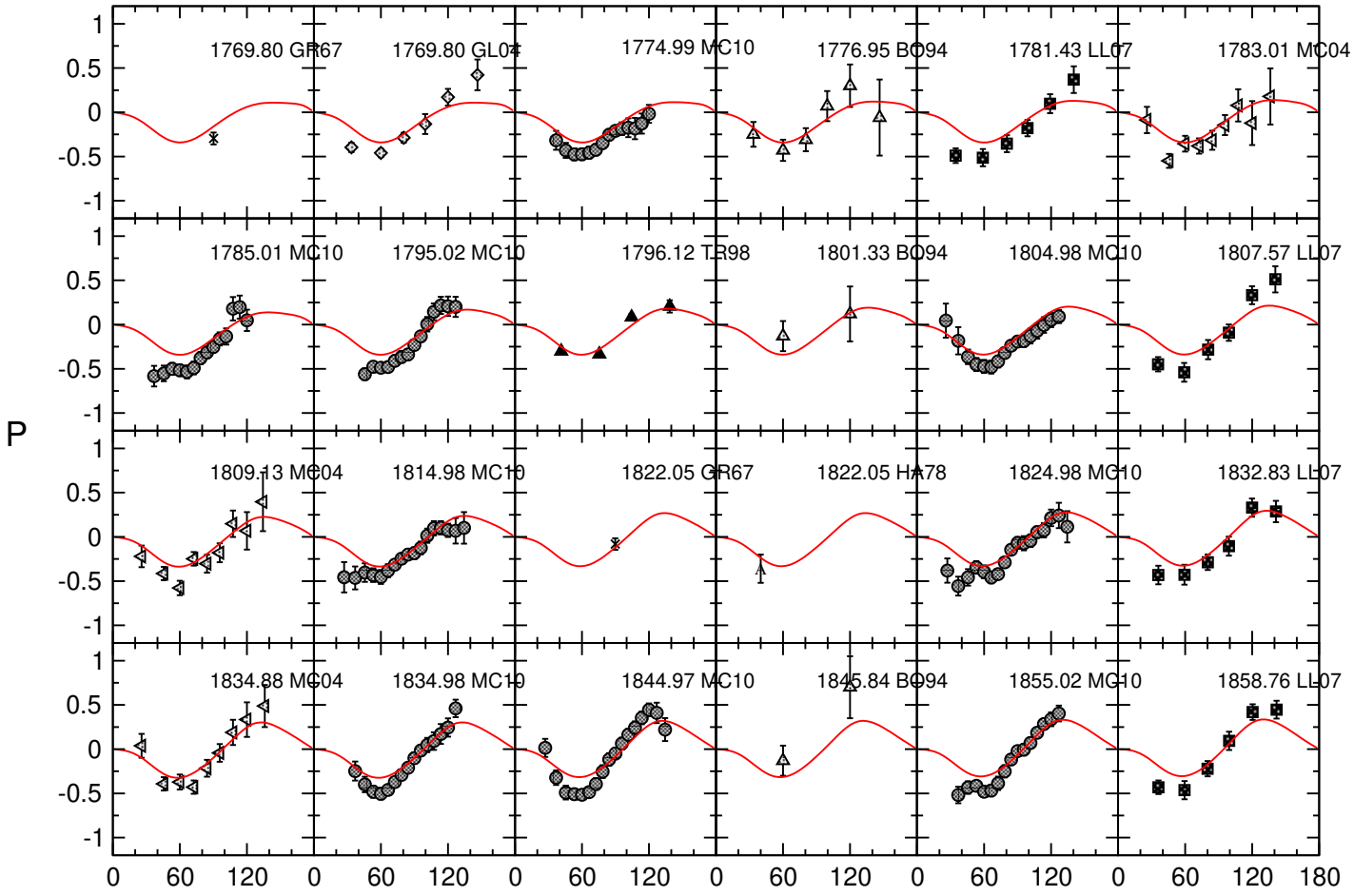
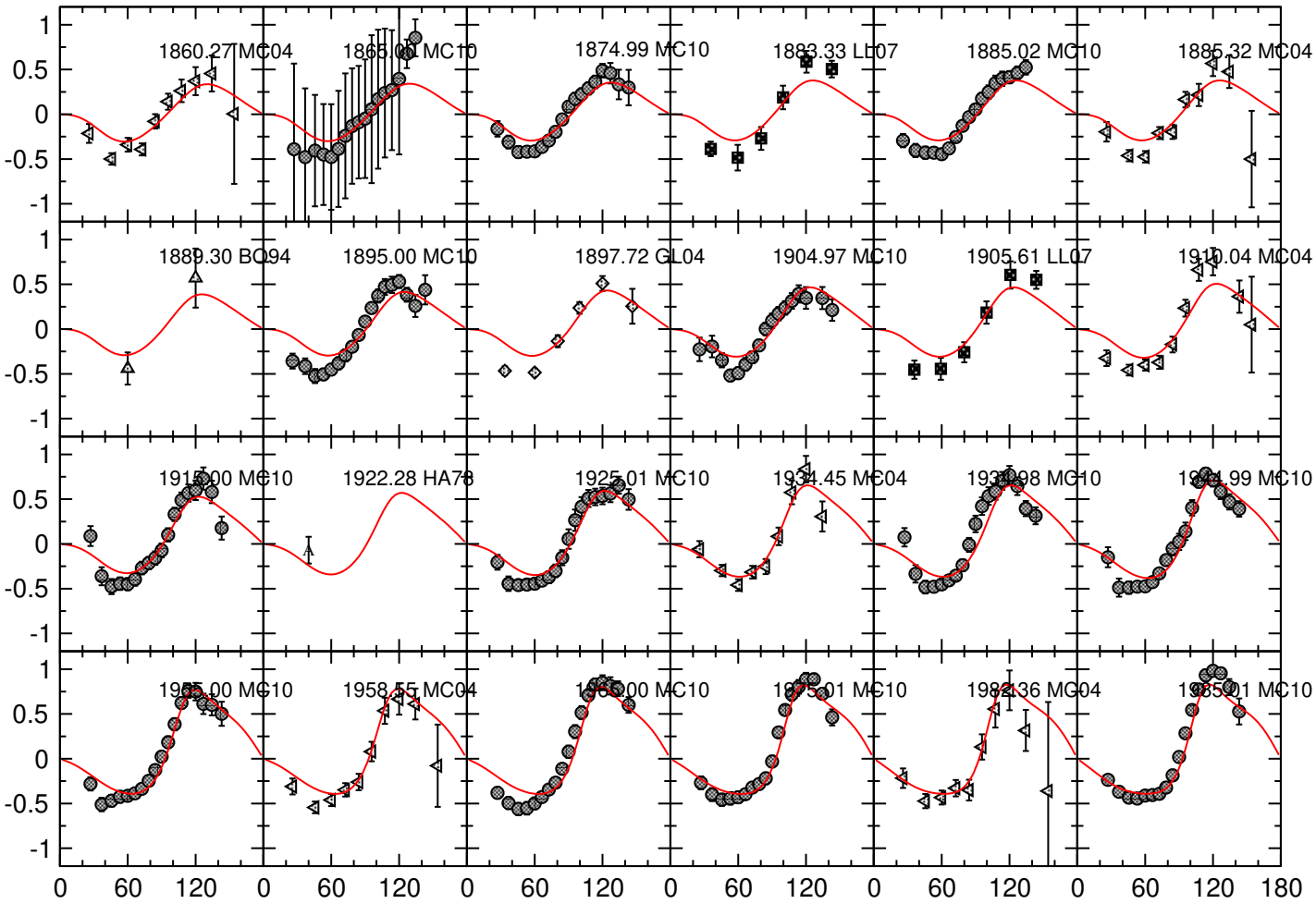


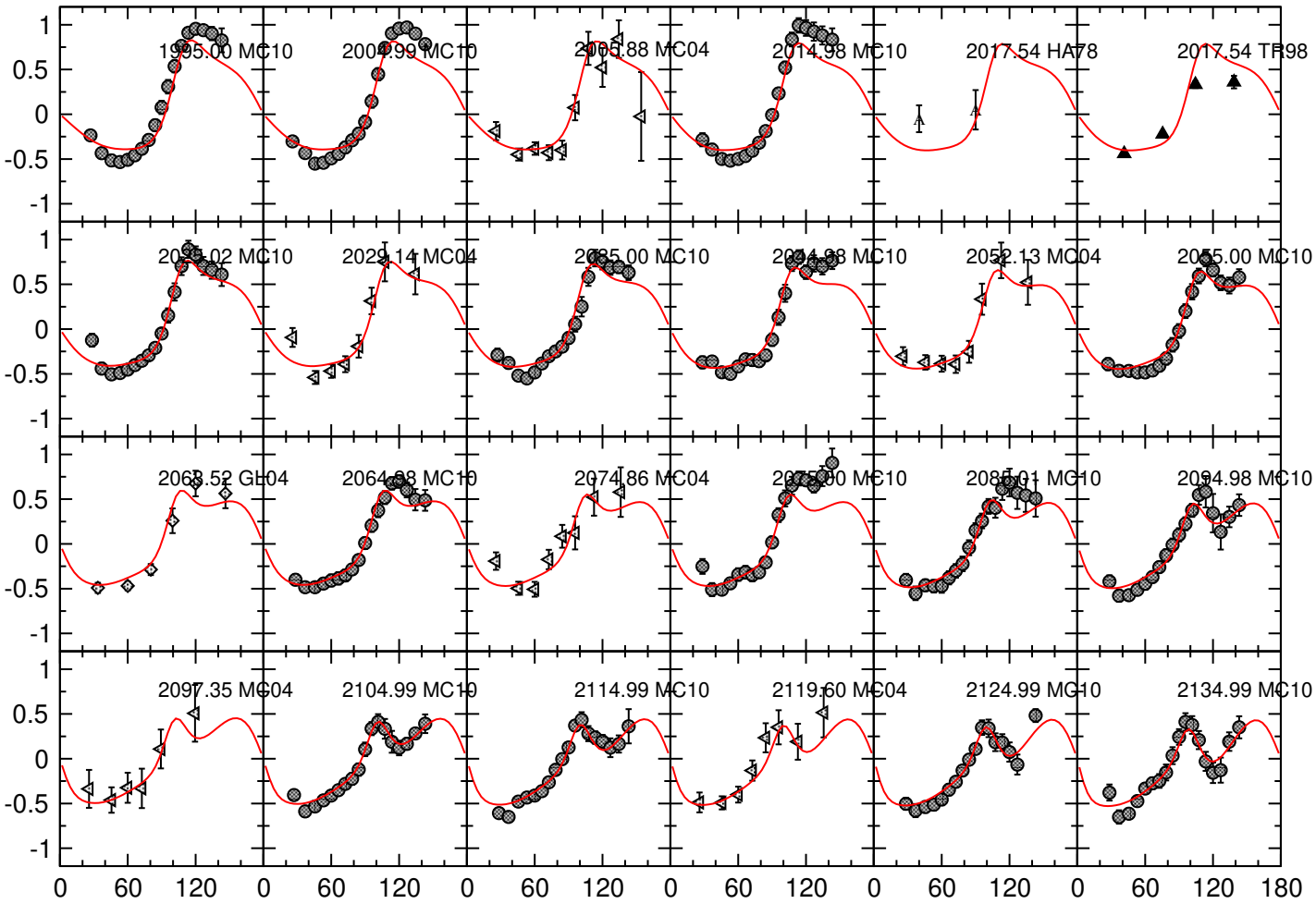
Figure 1: BGOOD (S. Alef et al.) EPJ A 57, 80 (2020)

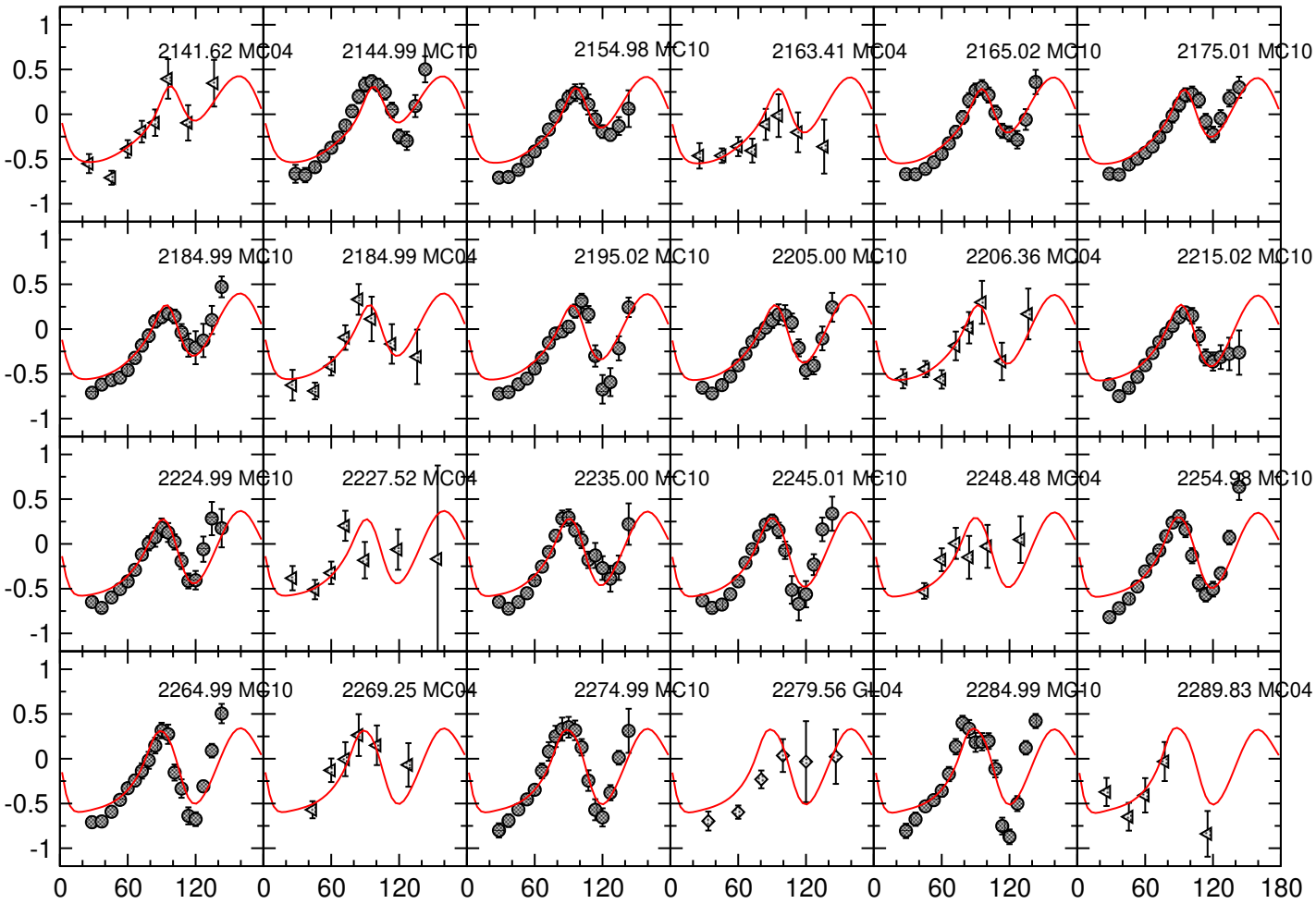

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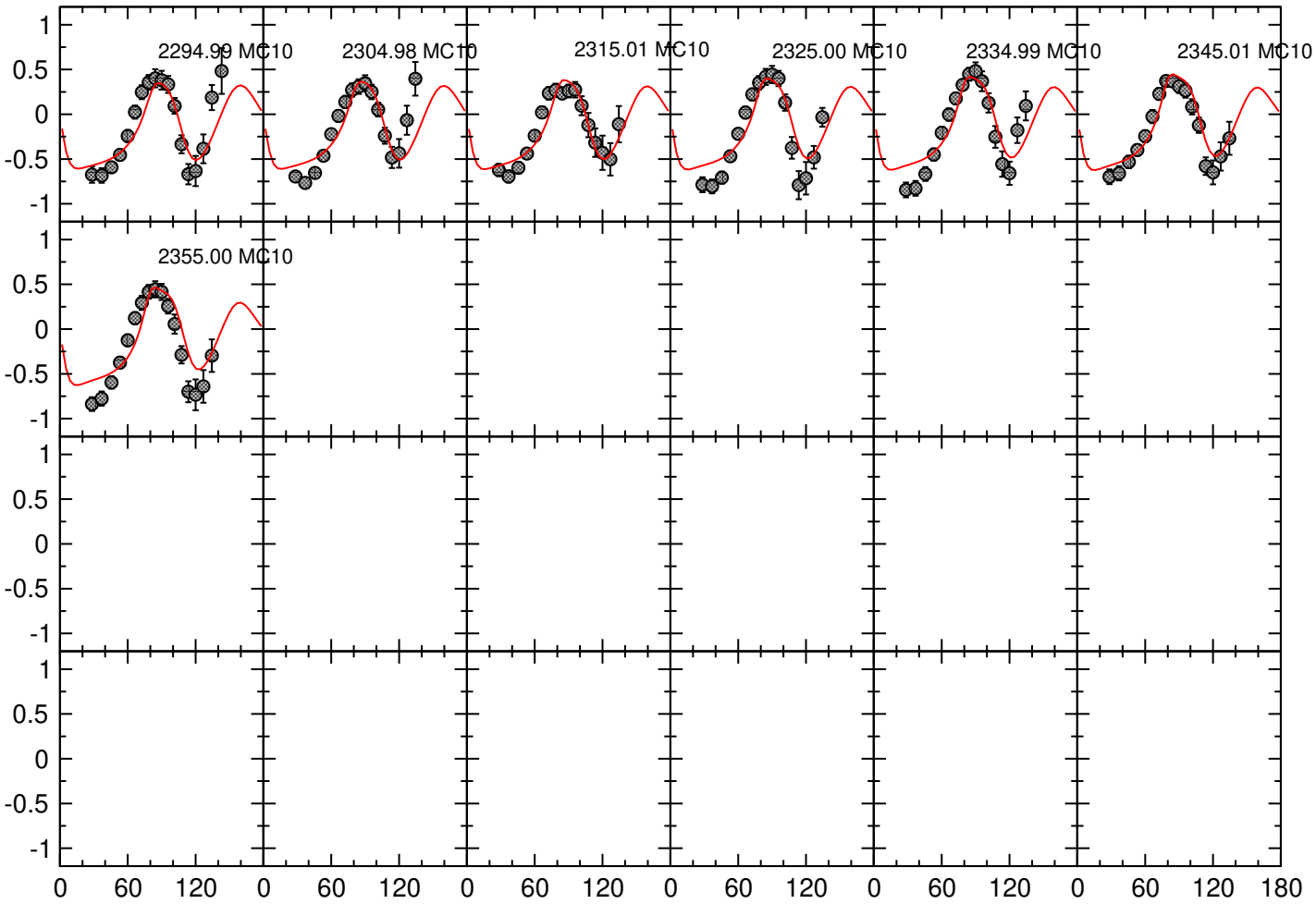

P
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1727.96 LL07
1729.59 MC04
1735.00 MC10
1744.98 MC10
1748.47 FU70
1754.36 LL07
1755.00 MC10
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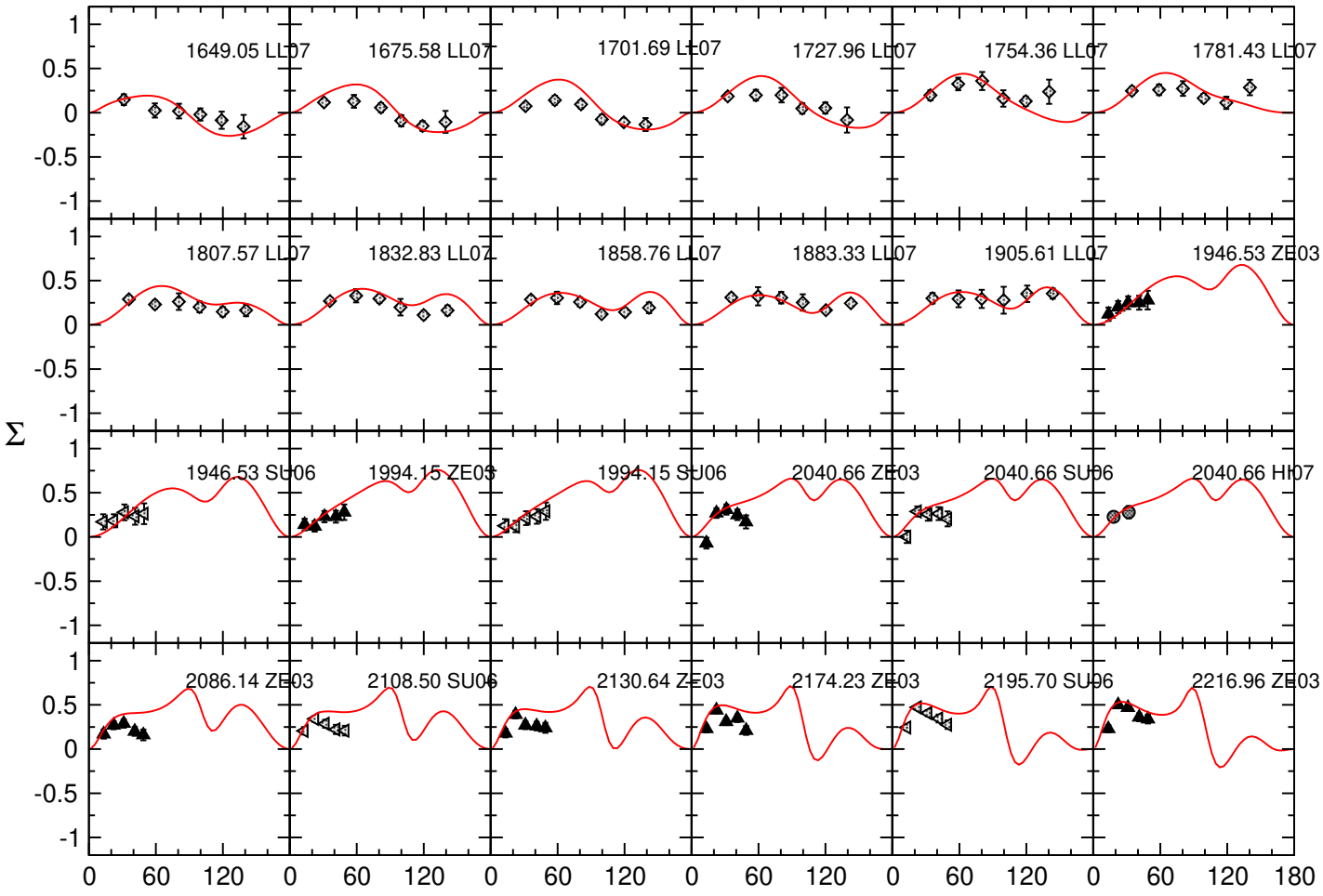

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1807.57 LL07
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1824.98 MC10
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1834.88 MC04
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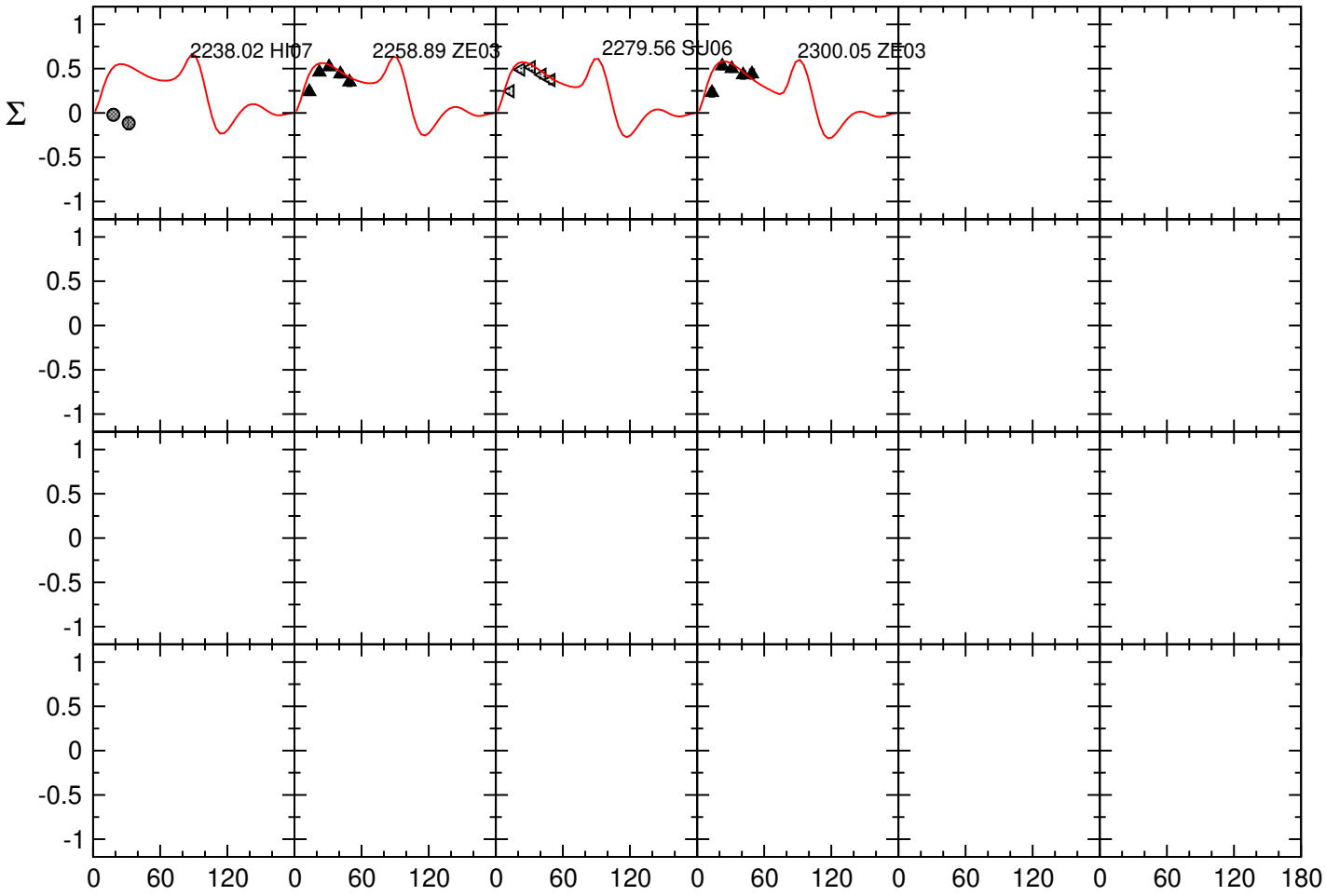

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1905.61 LL07
1910.04 MC04
1915.00 MC10
1922.28 HA76
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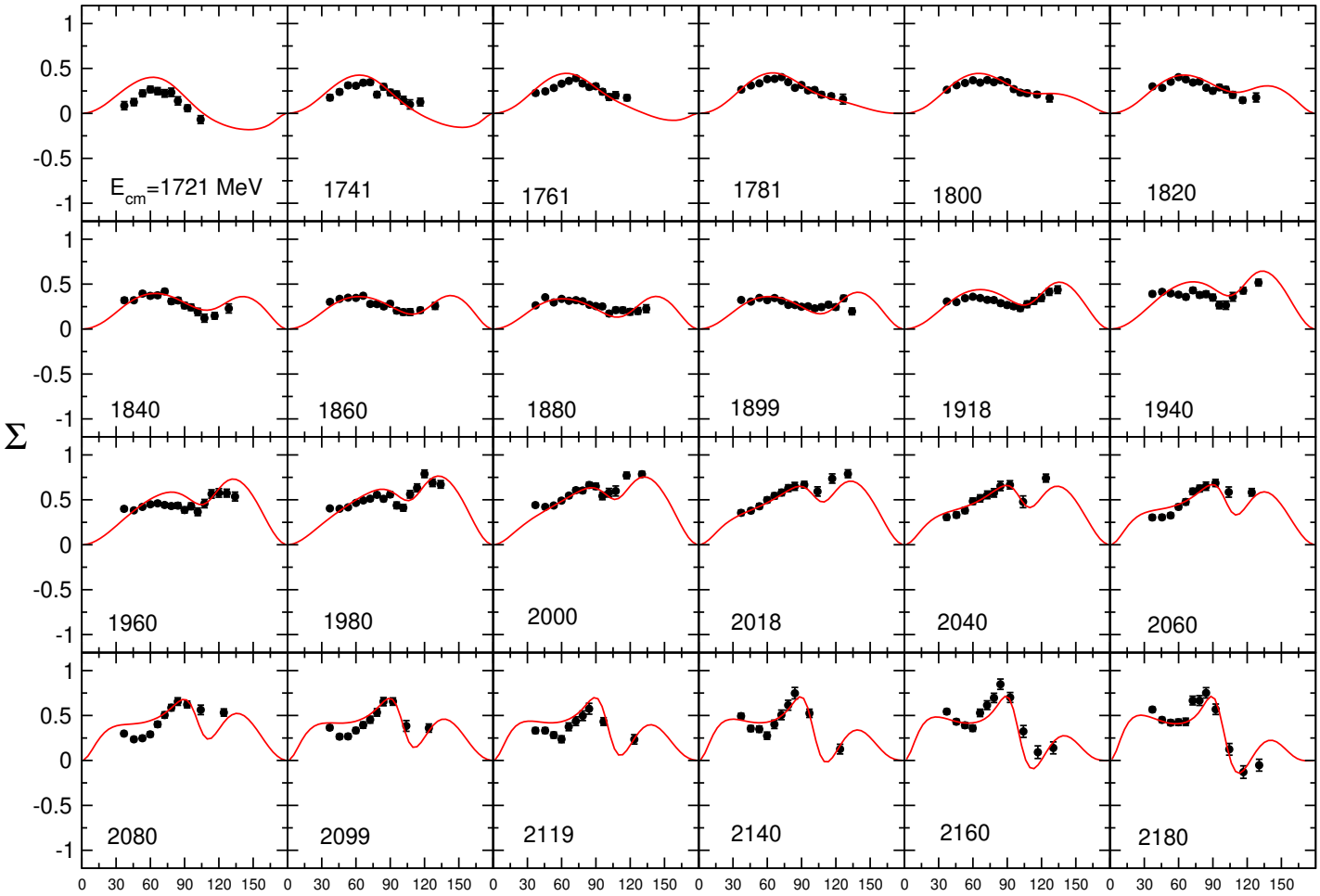

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2055.00 MC10
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2064.98 MC10
2074.86 MC04
2085.00 MC10
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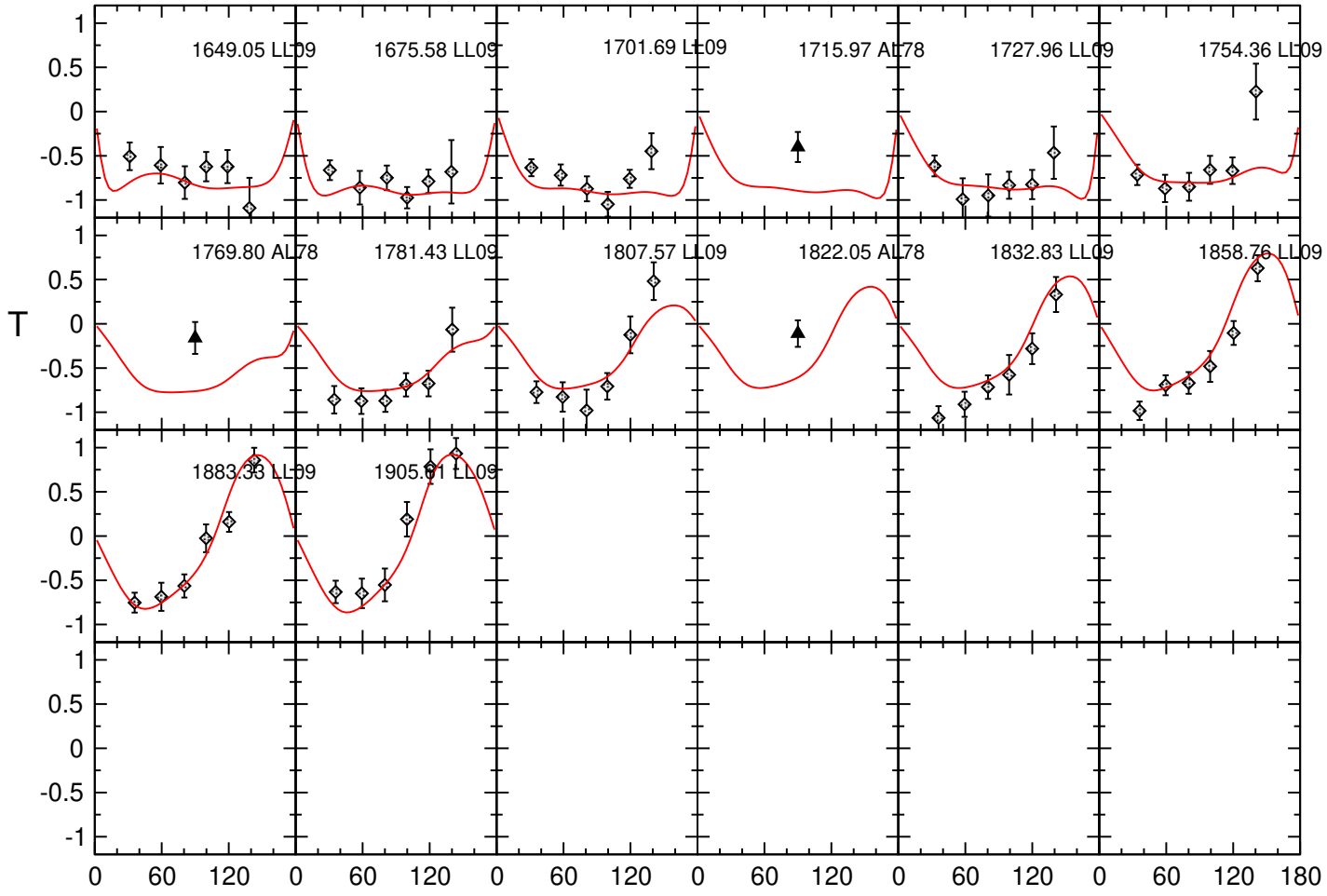

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2195.02 MC10
2205.00 MC10
2206.36 MC04
2215.02 MC10
2224.99 MC10
2227.52 MC04
2235.00 MC10
2245.01 MC10
2248.48 MC04
2254.98 MC10
2264.99 MC10
2269.25 MC04
2274.99 MC10
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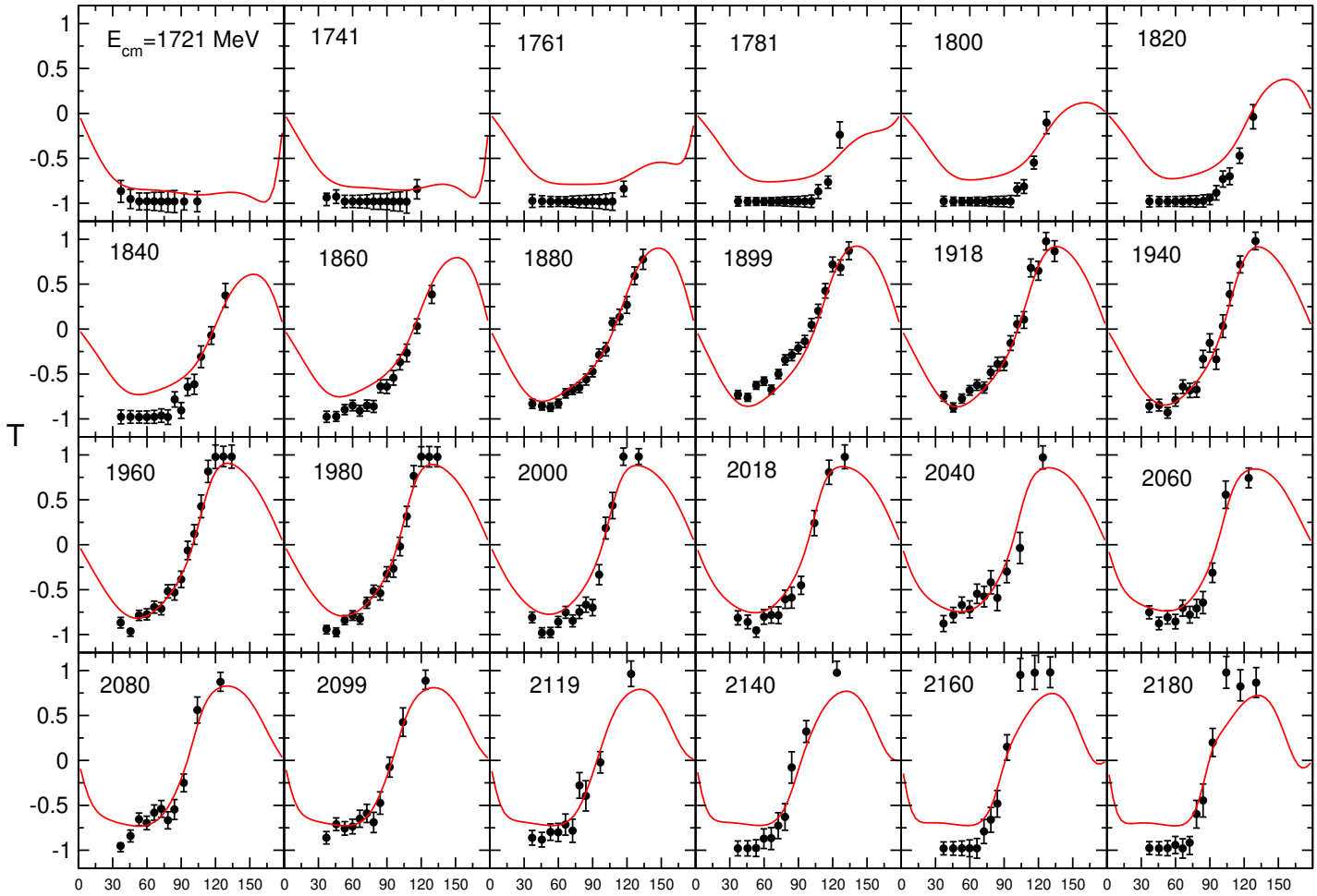

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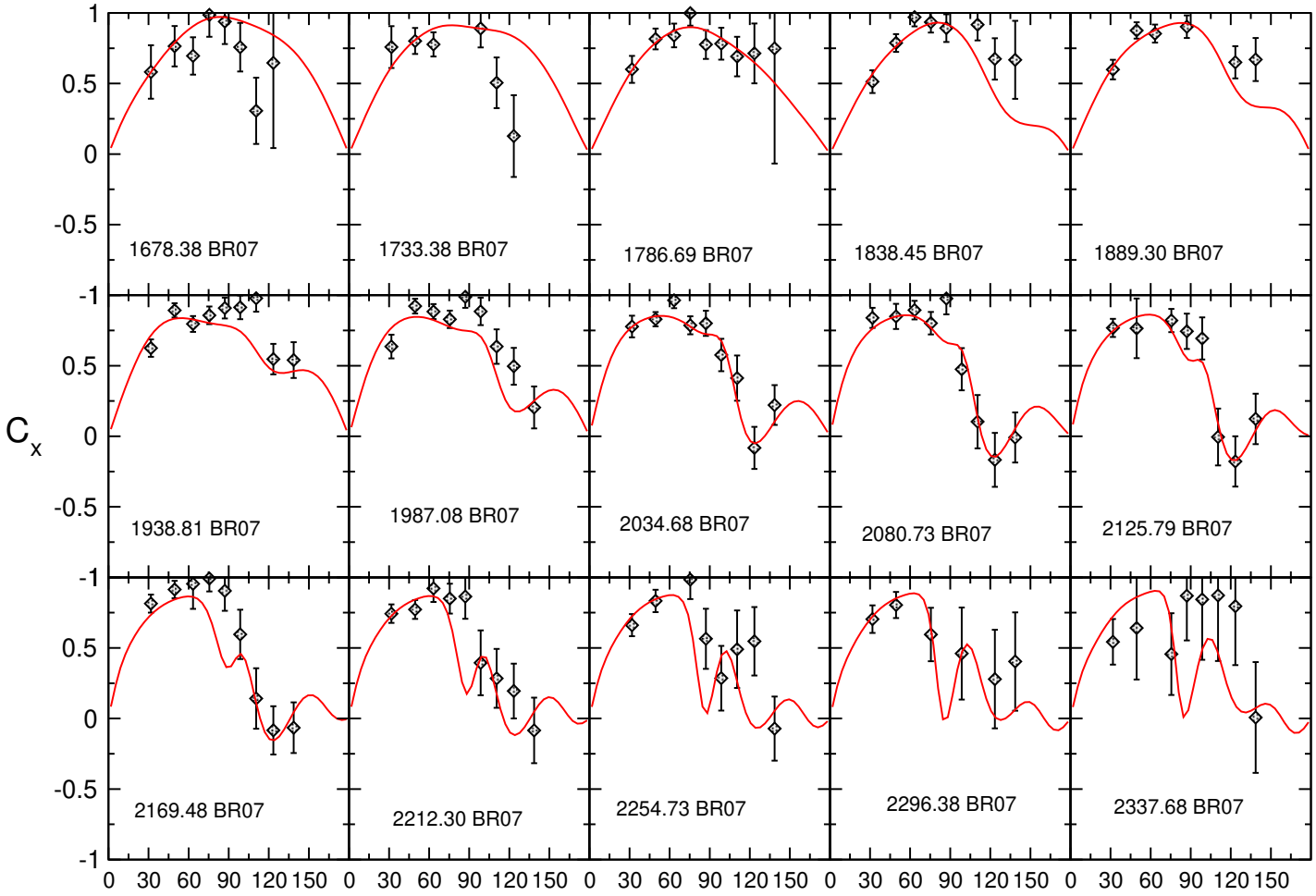

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1858.76 LL07
1883.33 LL07
1905.61 LL07
1946.53 ZE03
1946.53 SU06
1994.15 ZE03
1994.15 SU06
2040.66 ZE03
2040.66 SU06
2040.66 HI07
2086.14 ZE03
2108.50 SU06
2130.64 ZE03
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Σ
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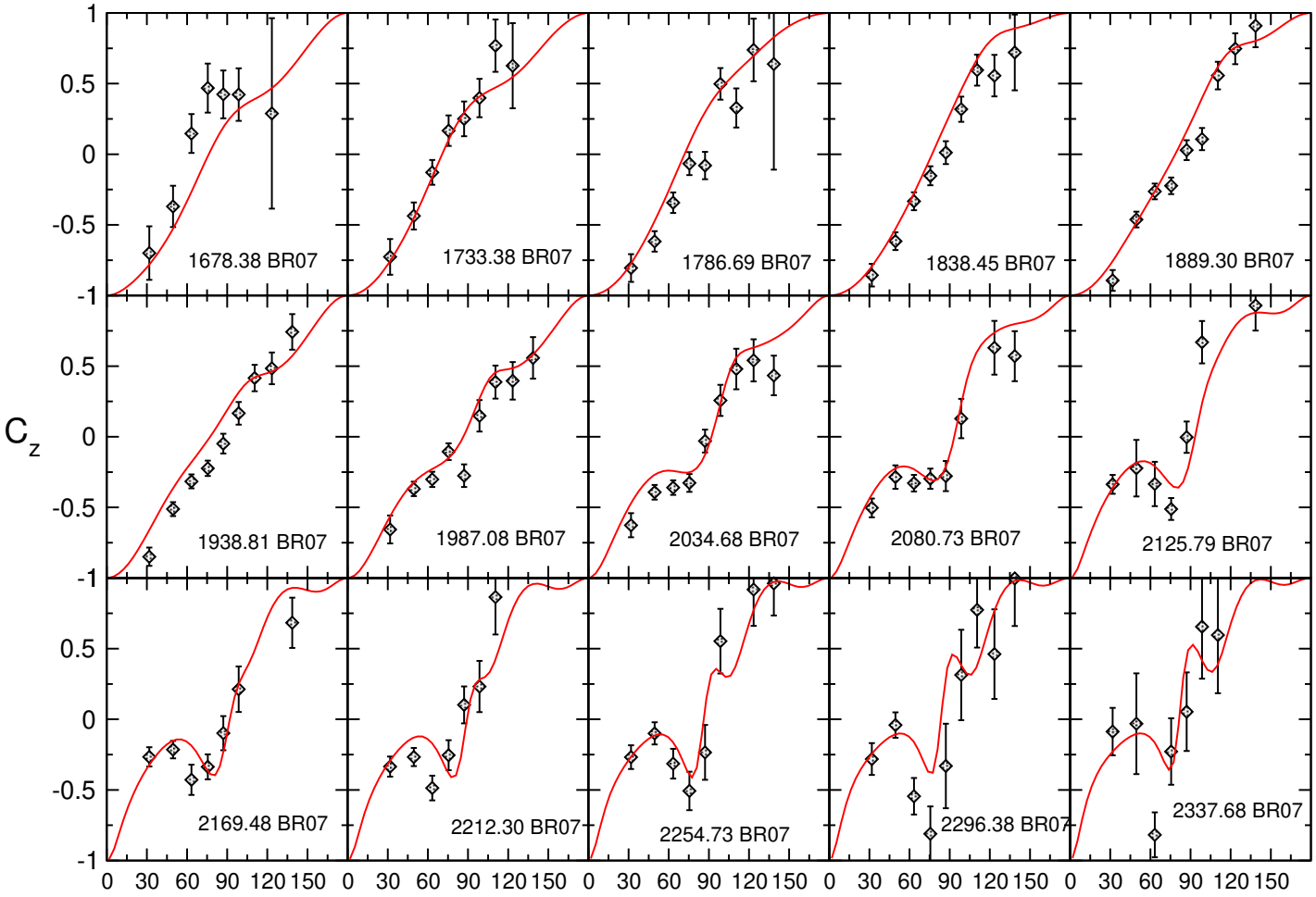

Σ
2238.02 HI07
2258.89 ZE03
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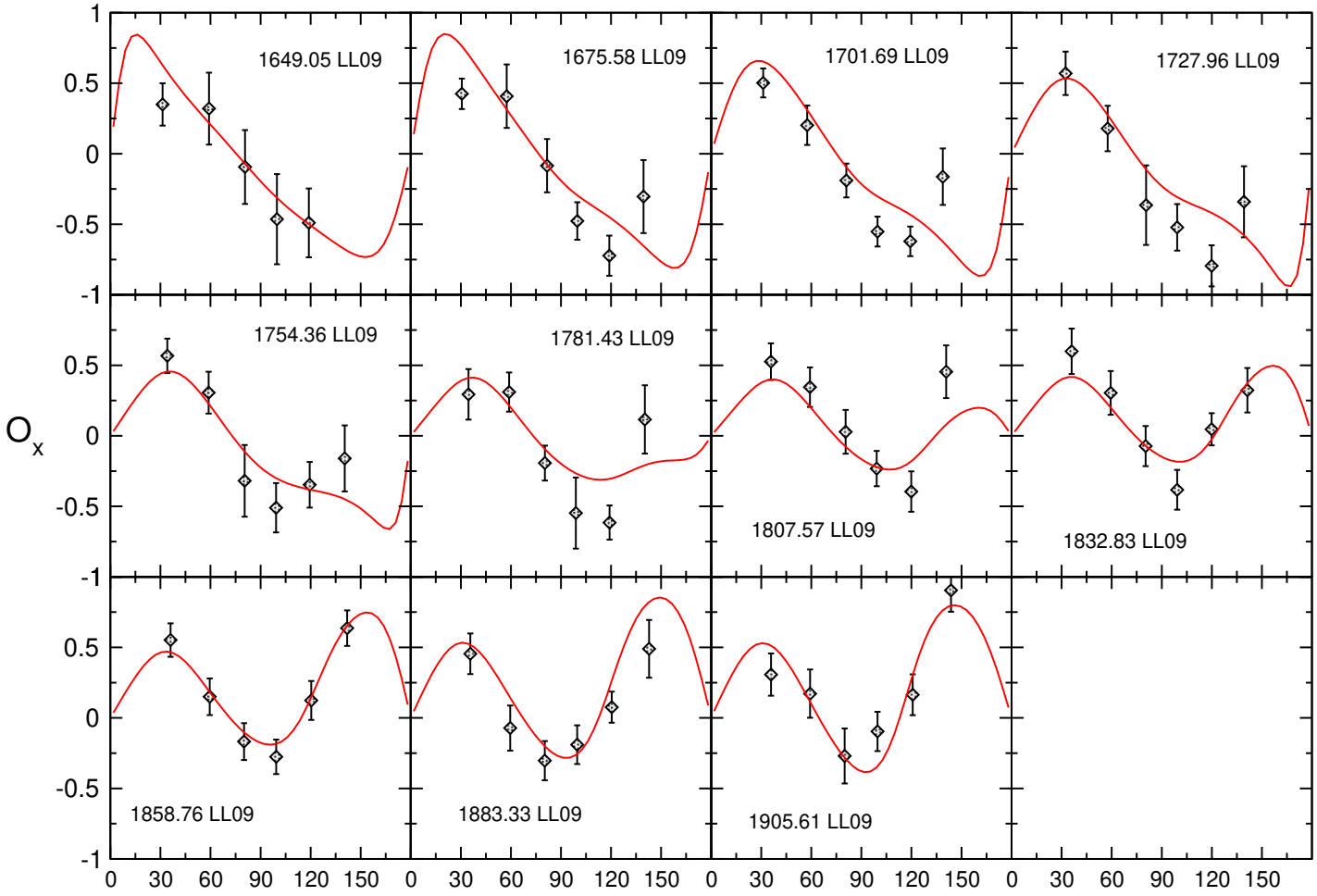

Σ
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1761
1781
1800
1820
1840
1860
1880
1899
1918
1940
1960
1980
2000
2018
2040
2060
2080
2099
2119
2140
2160
2180
1
0.5
0
-0.5
-1
0 30 60 90 120 150

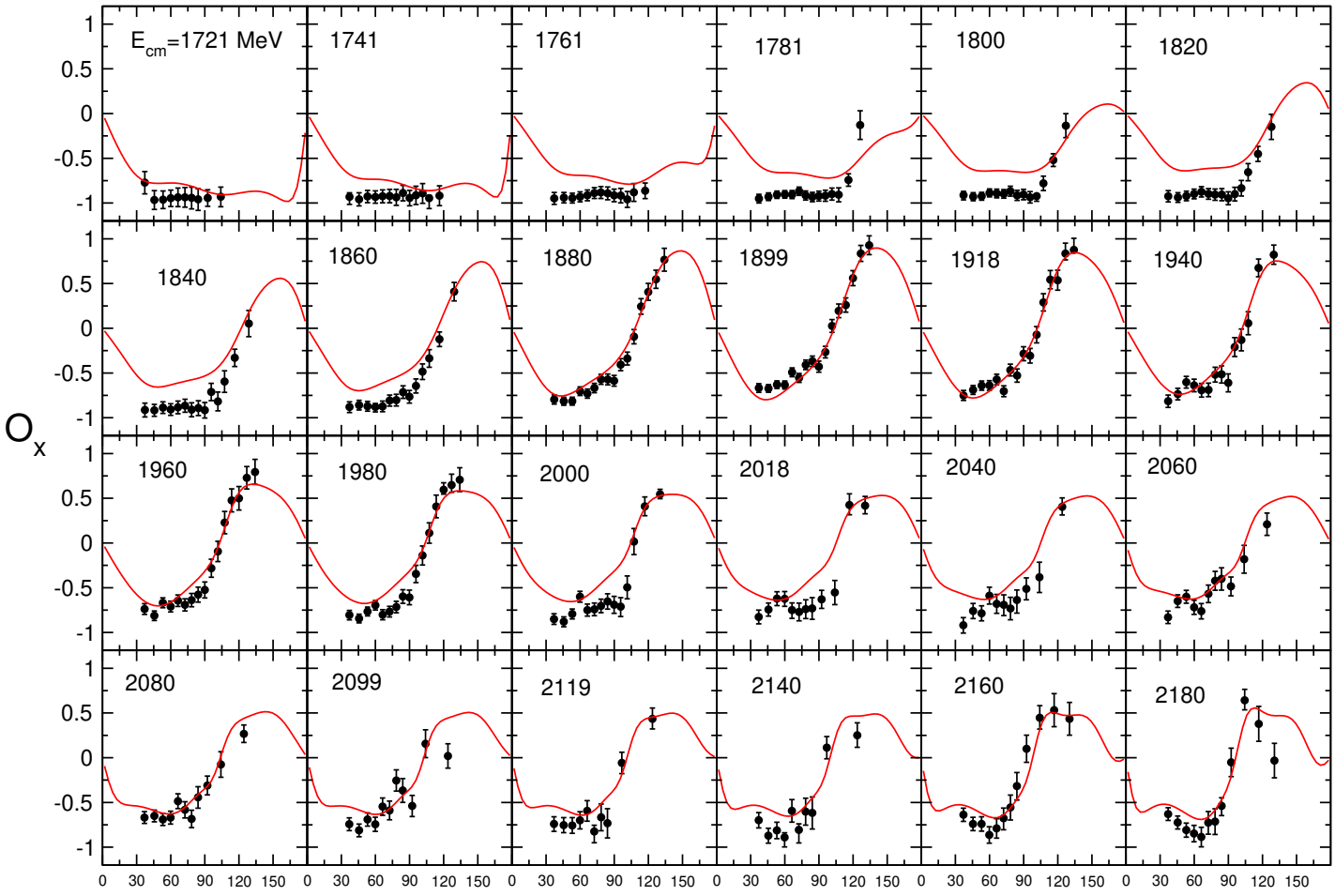

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1715.97 AL78
1727.96 LL09
1754.36 LL09
1769.80 AL78
1781.43 LL09
1807.57 LL09
1822.05 AL78
1832.83 LL09
1858.76 LL09
1883.33 LL09
1905.81 LL09
T
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0
-0.5
-1
0
60
120
180

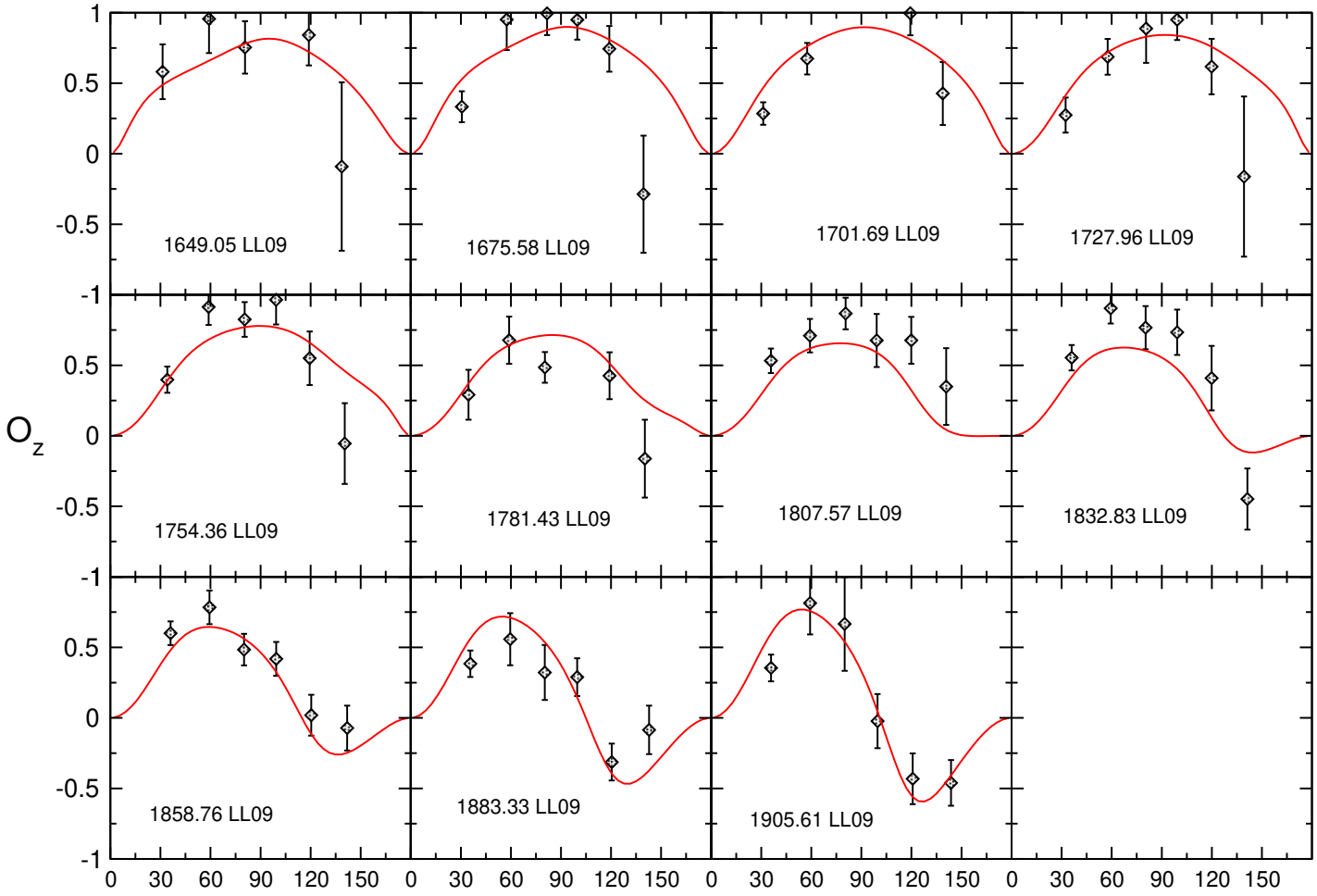

T
E_cm=1721 MeV
1741
1761
1781
1800
1820
1840
1860
1880
1899
1918
1940
1960
1980
2000
2018
2040
2060
2080
2099
2119
2140
2160
2180
1
0.5
0
-0.5
-1
0 30 60 90 120 150

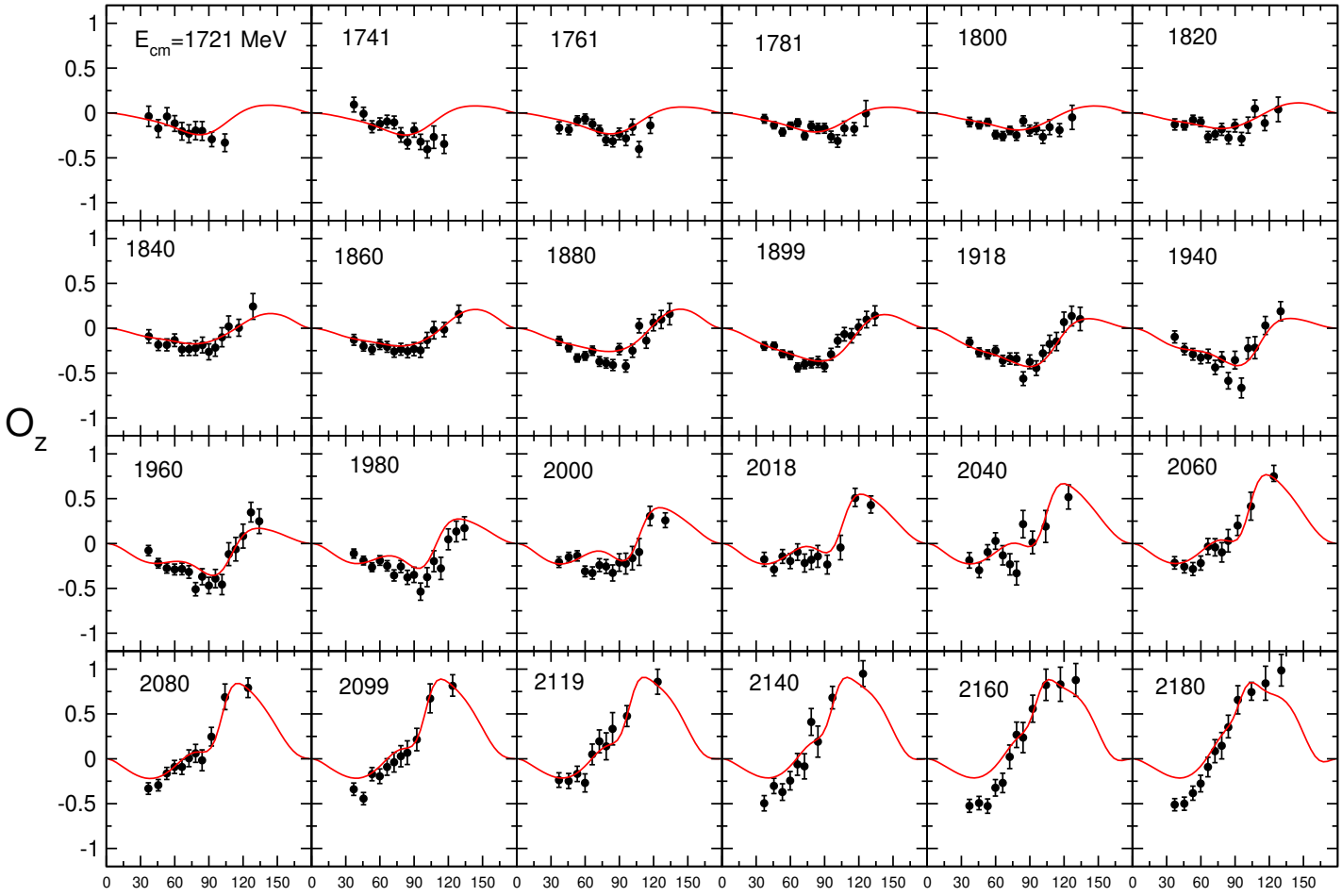

C_x
1678.38 BR07
1733.38 BR07
1786.69 BR07
1838.45 BR07
1889.30 BR07
1938.81 BR07
1987.08 BR07
2034.68 BR07
2080.73 BR07
2125.79 BR07
2169.48 BR07
2212.30 BR07
2254.73 BR07
2296.38 BR07
2337.68 BR07
1
0.5
0
-0.5
-1
0 30 60 90 120 150


C_z
1678.38 BR07
1733.38 BR07
1786.69 BR07
1838.45 BR07
1889.30 BR07
1938.81 BR07
1987.08 BR07
2034.68 BR07
2080.73 BR07
2125.79 BR07
2169.48 BR07
2212.30 BR07
2254.73 BR07
2296.38 BR07
2337.68 BR07
1
0.5
0
-0.5
-1
0 30 60 90 120 150


1649.05 LL09
1675.58 LL09
1701.69 LL09
1727.96 LL09
1754.36 LL09
1781.43 LL09
1807.57 LL09
1832.83 LL09
1858.76 LL09
1883.33 LL09
1905.61 LL09
O_x
1
0.5
0
-0.5
-1
0
30
60
90
120
150


O_x
E_cm=1721 MeV
1741
1761
1781
1800
1820
1840
1860
1880
1899
1918
1940
1960
1980
2000
2018
2040
2060
2080
2099
2119
2140
2160
2180
1
0.5
0
-0.5
-1
0 30 60 90 120 150


O_z
1649.05 LL09
1675.58 LL09
1701.69 LL09
1727.96 LL09
1754.36 LL09
1781.43 LL09
1807.57 LL09
1832.83 LL09
1858.76 LL09
1883.33 LL09
1905.61 LL09
1
0.5
0
-0.5
-1
0
30
60
90
120
150


O_z
E_cm=1721 MeV
1741
1761
1781
1800
1820
1840
1860
1880
1899
1918
1940
1960
1980
2000
2018
2040
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2140
2160
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1
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-0.5
-1
0 30 60 90 120 150

Data references

- Differential cross section $\gamma p \to K^+\Lambda$:
  - GL(04) BONN GLANDER, EPJA19, 251(2004)
  - TR(98) BONN TRAN, PLB445, 20(1998)
  - MC(04) CLAS MCNABB, PRC69, 042201(2004)
  - AN(62) CORN ANDERSON, PRL9, 131(1962)
  - MC(10) JLAB MCCRACKEN, PRC81, 025201(2010)
  - MO(66) CORN MORI, Ph.D. THESIS, CORNELL UNI
  - BR(06) JLAB BRADFORD, PRC73, 035202(2006)
  - BR(60) CALT BRODY, PR119, 1710(1960)
  - DO(58) CALT DONOHO, PR112, 981(1958)
  - DC(70)O RSA DECAMP, LAL-1236, 1970, FOURNER
  - BO(94) BONN BOCKHORST, ZPC63, 37(1994)
  - FU(70) TOKY FUJII, PRD2, 439(1970)
  - FE(72) BONN FELLER, NPB39, 413(1972)
  - PE(64) CALT PECK, PRB135, 830(1964)
  - AN(65) CORN ANDERSON, ISEPIHE, HAMBURG, (19
  - GR(67) CALT GROOM, PR159, 1213(1967)
  - GO(71) DESY GOEING, NPB26, 121(1971)
  - BL(70) BONN BLECKMANN, ZP239, 1(1970)
  - SU(06) LEPS SUMIHAMA, PRC73, 035214(2006)
  - S. Alef et al. [BGOOD] EPJ A 57, 80 (2020)
- Beam asymmetry Σ $\gamma p \to K^+\Lambda$:
  - LL(07) GRAA LLERES, EPJA31, 79(2007)
  - ZE(03) SPRI ZEGERS, PRL (2003), NUCL-EX/030
  - SU(06) LEPS SUMIHAMA, PRC73, 035214(2006)
  - HI(07) LEPS HICKS, PRC76, 042201(2007)
  - Paterson *et al.* [CLAS Collaboration] PRC93, 065201 (2016)
- Recoil Polarization $\gamma p \to K^+\Lambda$:
  - MC(04) CLAS MCNABB, PRC69, 042201(2004)
  - MC(10) JLAB MCCRACKEN, PRC81, 025201(2010),
  - BO(64) BONN BORGIA, NC32, 218(1964)
  - GR(65) BONN GRILLI, NC38, 1467(1965)
  - LL(07) GRAA LLERES, EPJA31, 79(2007)
  - MD(60) CORN MCDANIEL, PRL4, 33(1960)
  - TH(63) CORN THOM, PRL11, 433(1963)
  - TR(98) BONN TRAN, PLB445, 20(1998)
  - GL(04) BONN GLANDER, EPJA19, 251(2004)
  - BO(94) BONN BOCKHORST, ZPC63, 37(1994)
  - FU(70) TOKY FUJII, PRD2, 439(1970)
  - GR(67) CALT GROOM, PR159, 1213(1967)
  - HA(78) BONN HAAS, NPB137, 261(1978)
  - S. Alef et al. [BGOOD] EPJ A 57, 80 (2020)

- Target asymmetry T $\gamma p \to K^+\Lambda$:
  - LL(09) GRAA LLERES, EPJA39, 149(2009)
  - AL(78) BONN ALTHOFF, NPB137, 269(1978)
  - Paterson *et al.* [CLAS Collaboration] PRC93, 065201 (2016)
- C_x $\gamma p \to K^+\Lambda$:
  - BR(07) JLAB BRADFORD, PRC75, 035205(2007)
- C_z $\gamma p \to K^+\Lambda$:
  - BR(07) JLAB BRADFORD, PRC75, 035205(2007)
- O_x $\gamma p \to K^+\Lambda$:
  - LL(09) GRAA LLERES, EPJA39, 149(2009)
  - Paterson *et al.* [CLAS Collaboration] PRC93, 065201 (2016)
- O_z $\gamma p \to K^+\Lambda$:
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  - Paterson *et al.* [CLAS Collaboration] PRC93, 065201 (2016)

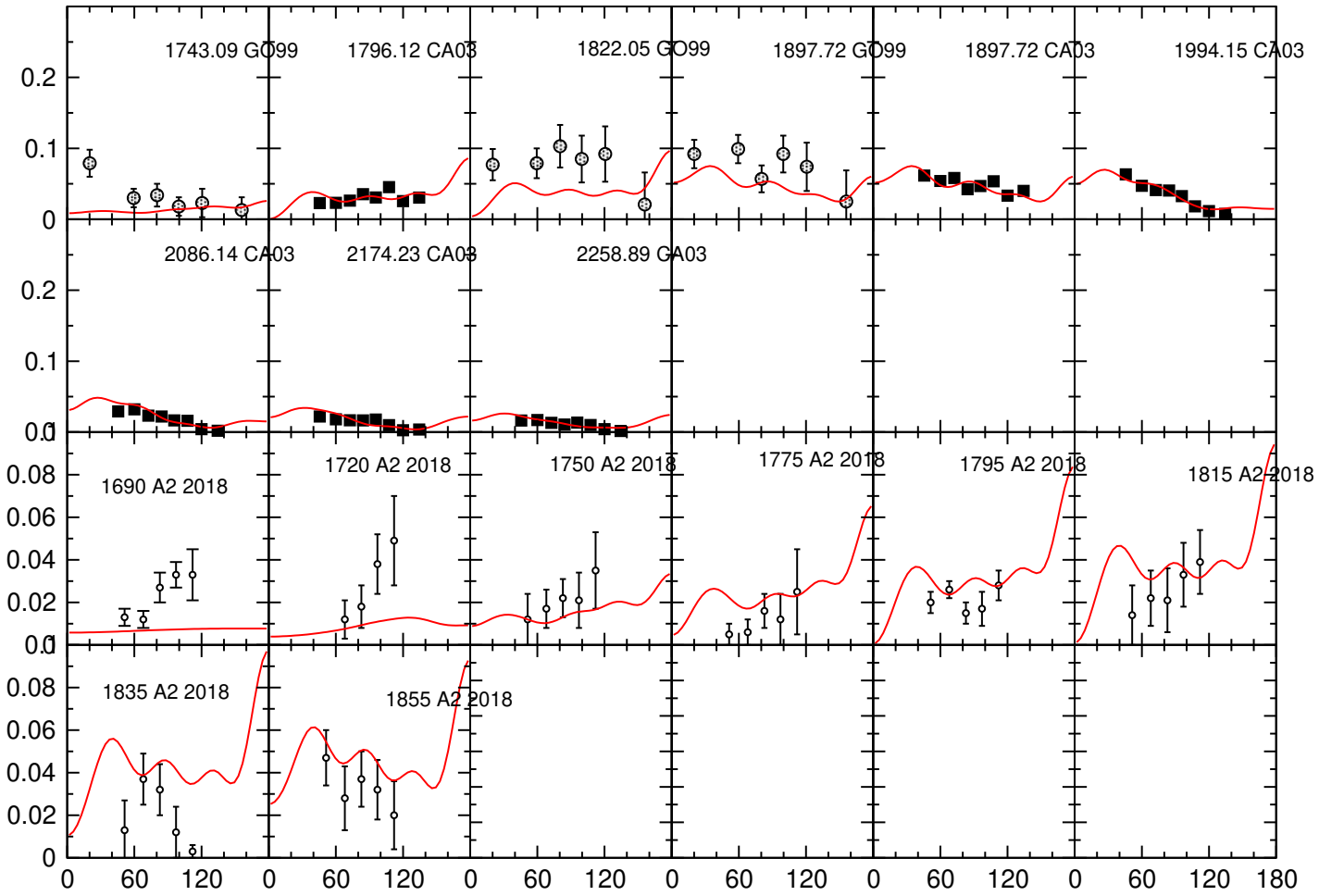
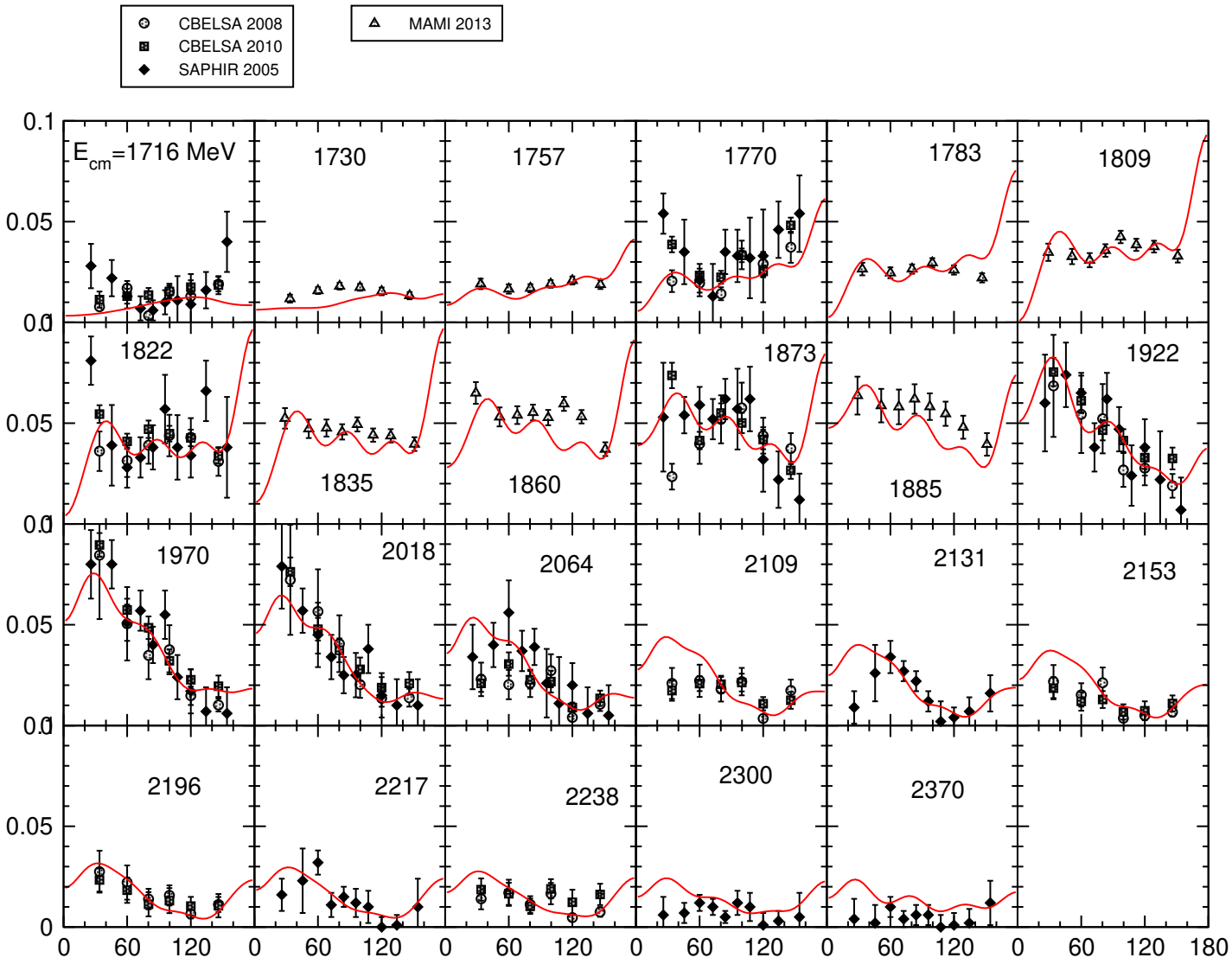
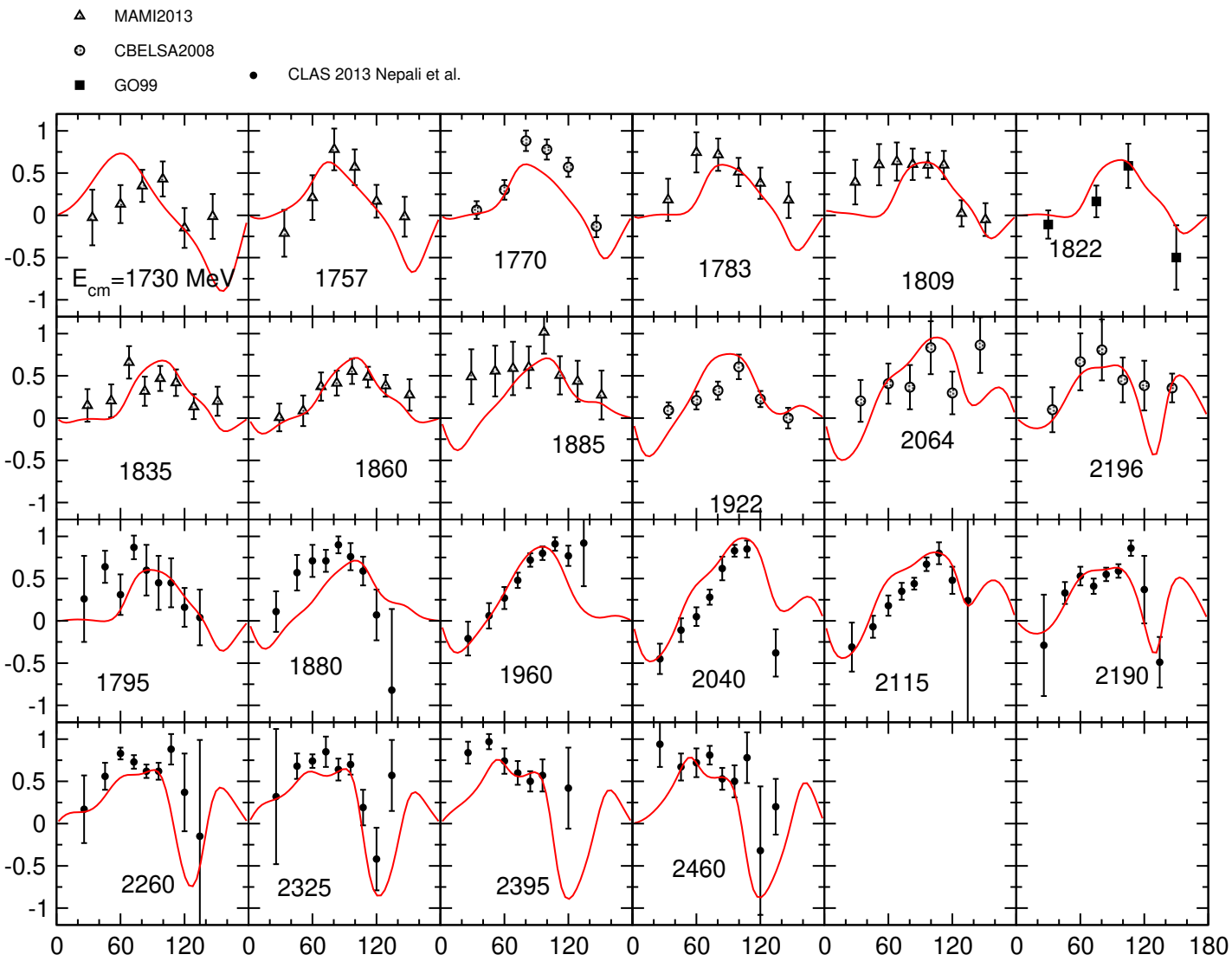


Figure 1: Data: filled (orange) circles: CBELSA/TAPS 2007; filled (black) squares: CBELSA/TAPS 2011; filled (turquoise) diamonds: SAPHIR; open circles: A2 MAMI 2018; open triangles: A2 MAMI 2013; open squares: SAPHIR 1999 (omitted from fit); filled (black) triangles: JLab Hall B 2003


CBELSA 2008
CBELSA 2010
SAPHIR 2005
MAMI 2013
E_cm=1716 MeV
1730
1757
1770
1783
1809
1822
1835
1860
1873
1885
1922
1970
2018
2064
2109
2131
2153
2196
2217
2238
2300
2370
0.1
0.05
0
0
60
120
180


MAMI2013
CBELSA2008
GO99
CLAS 2013 Nepali et al.
E_cm=1730 MeV
1757
1770
1783
1809
1822
1835
1860
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2064
2196
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1960
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2115
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2260
2325
2395
2460

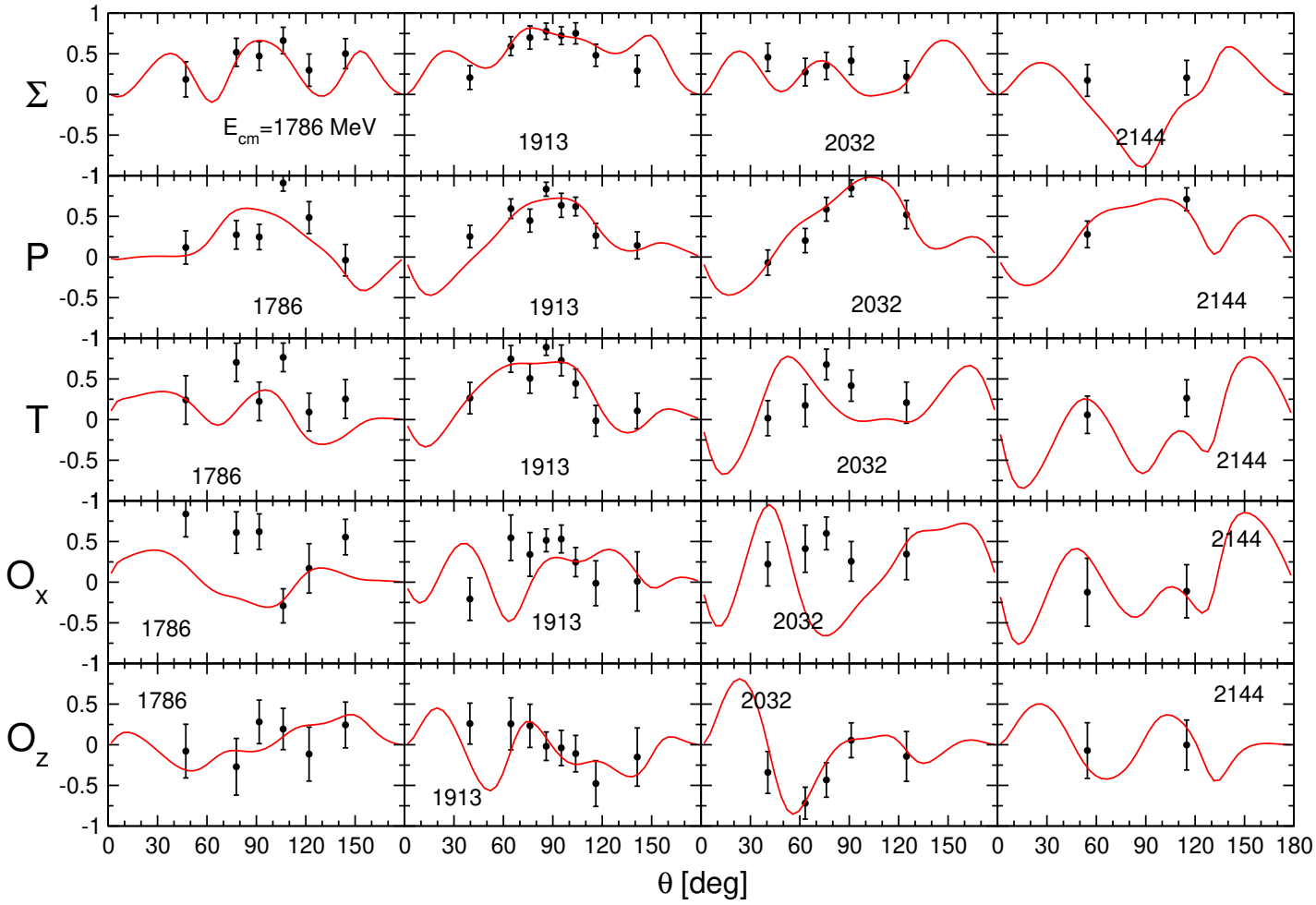
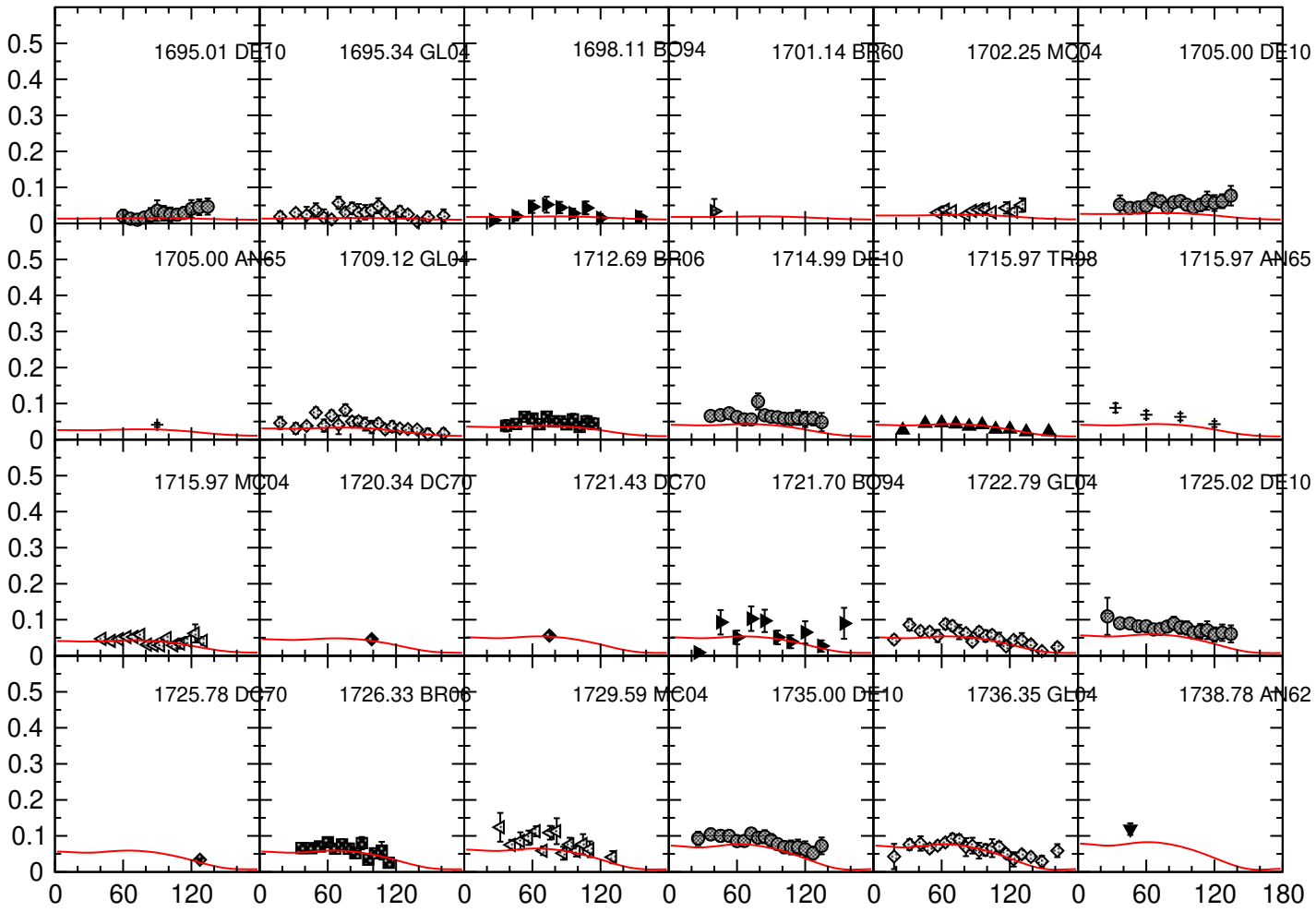
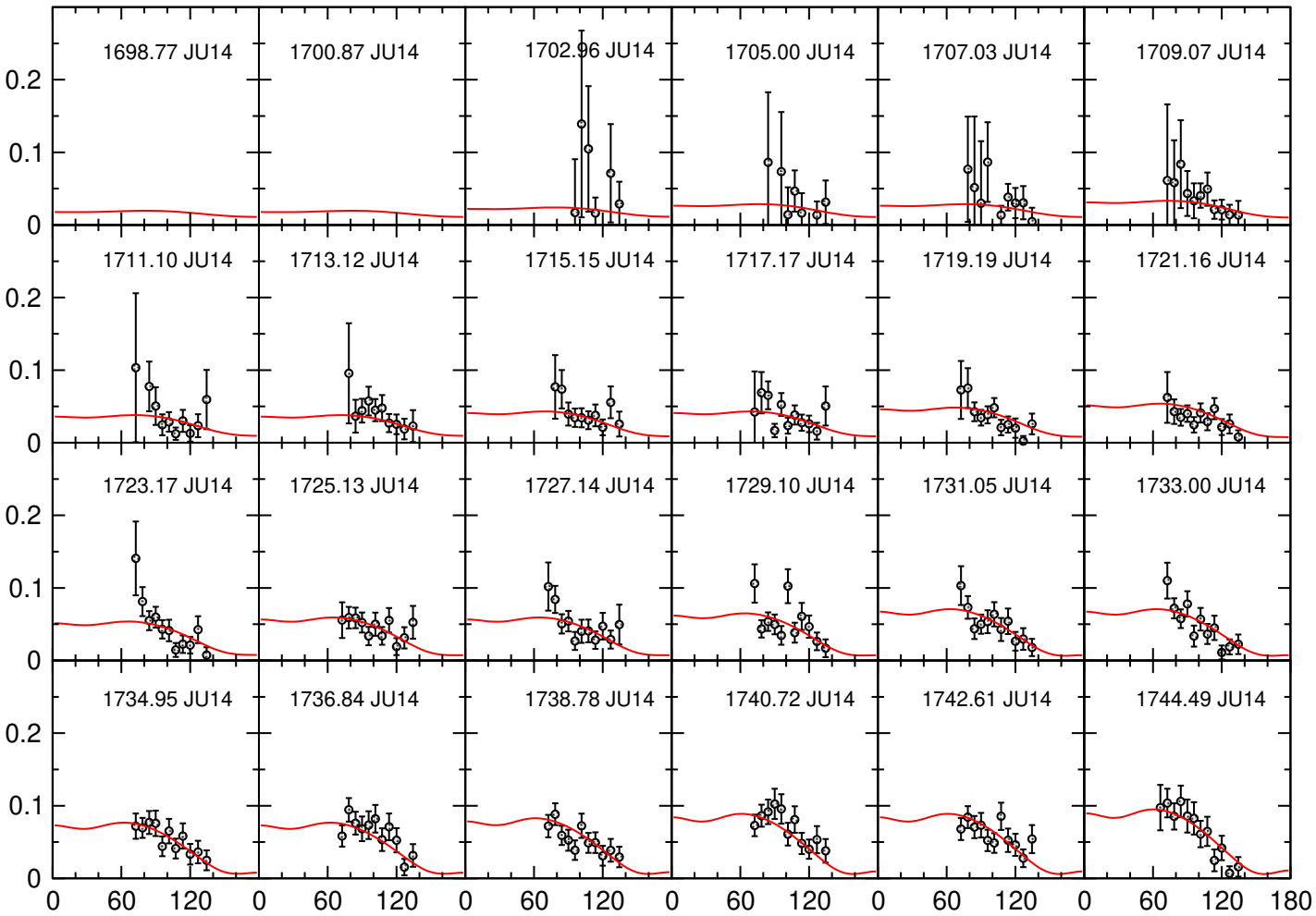


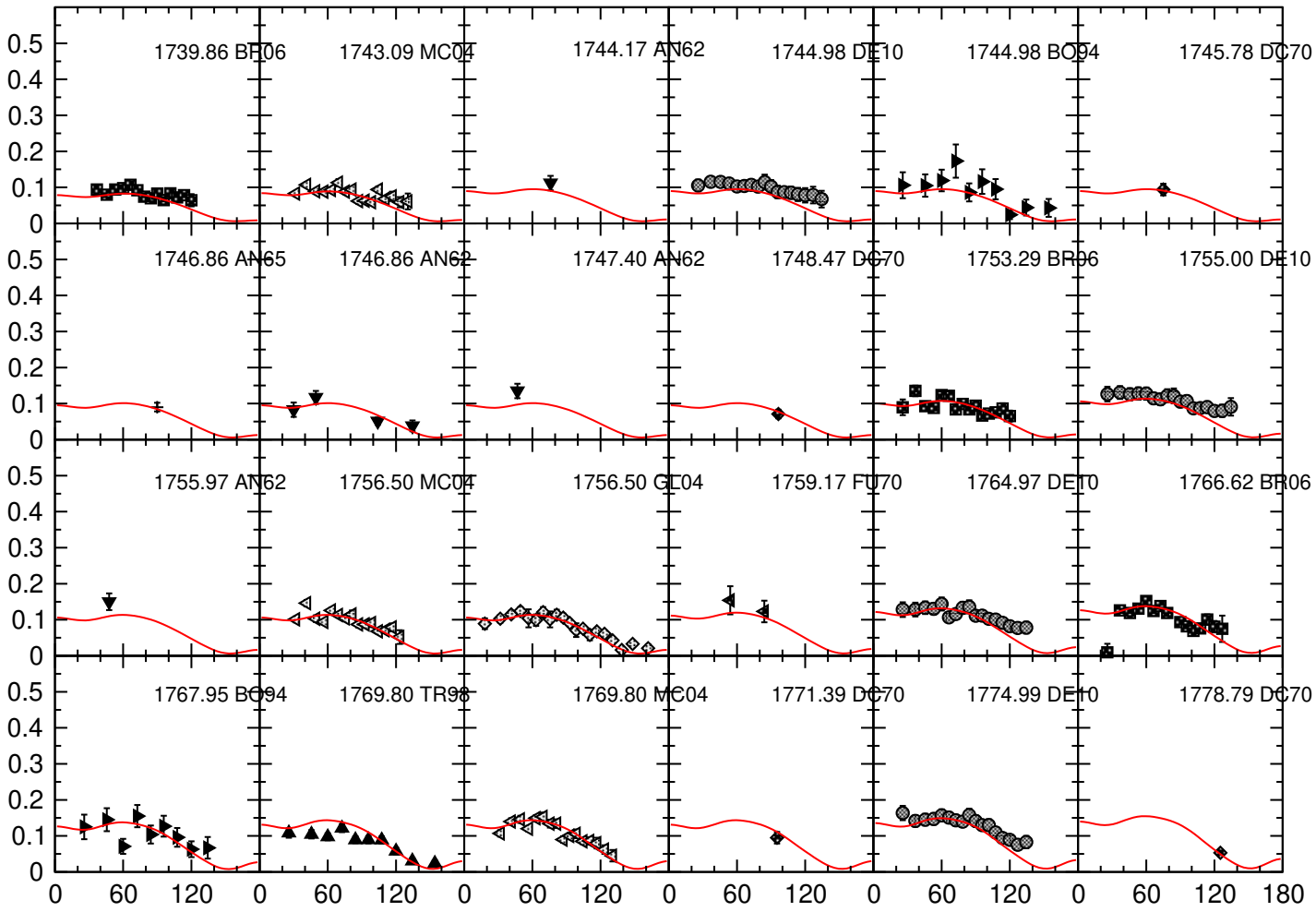
Figure 2: Data for Σ, P, T, O_x and O_z from CLAS2021

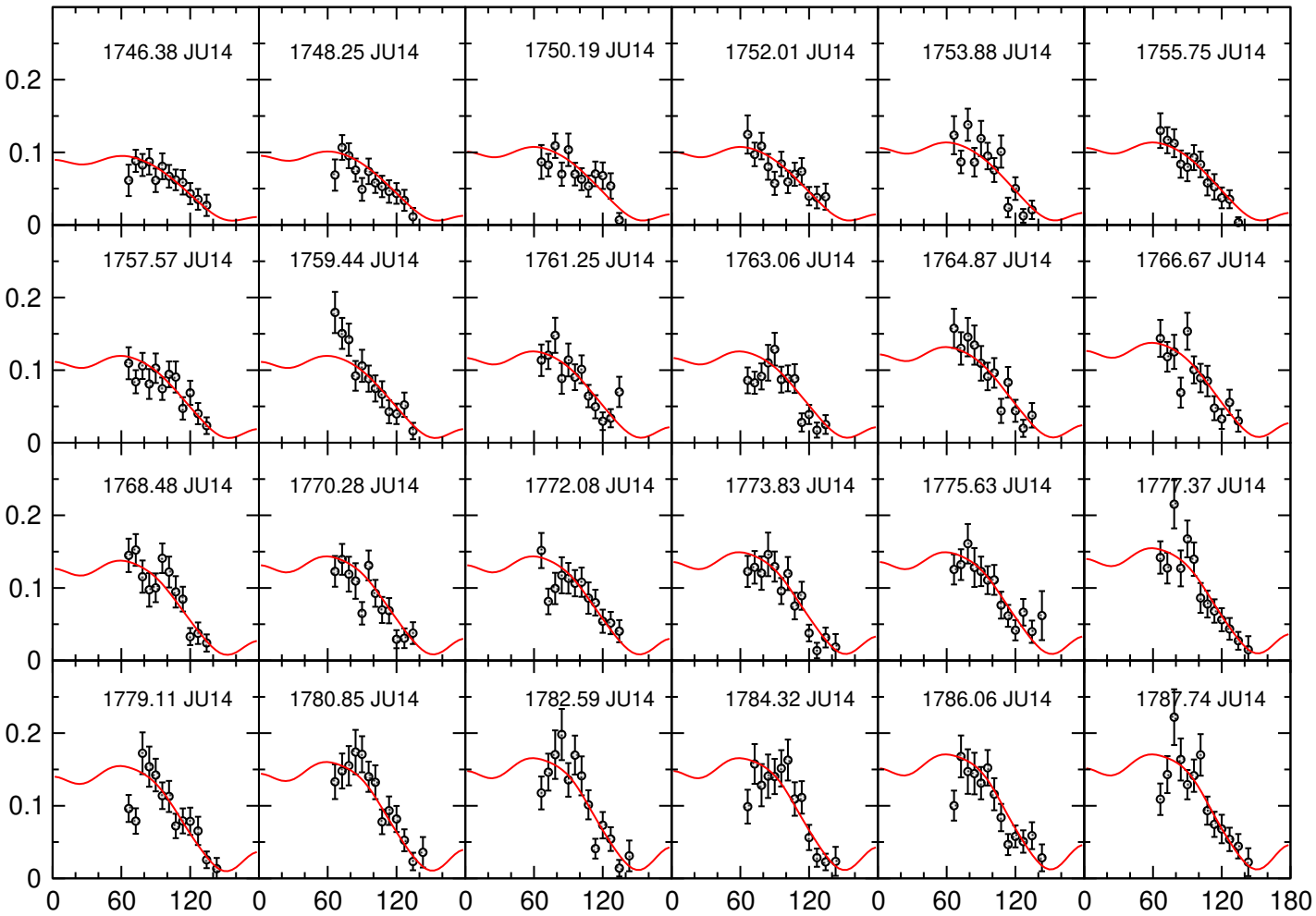
Data references

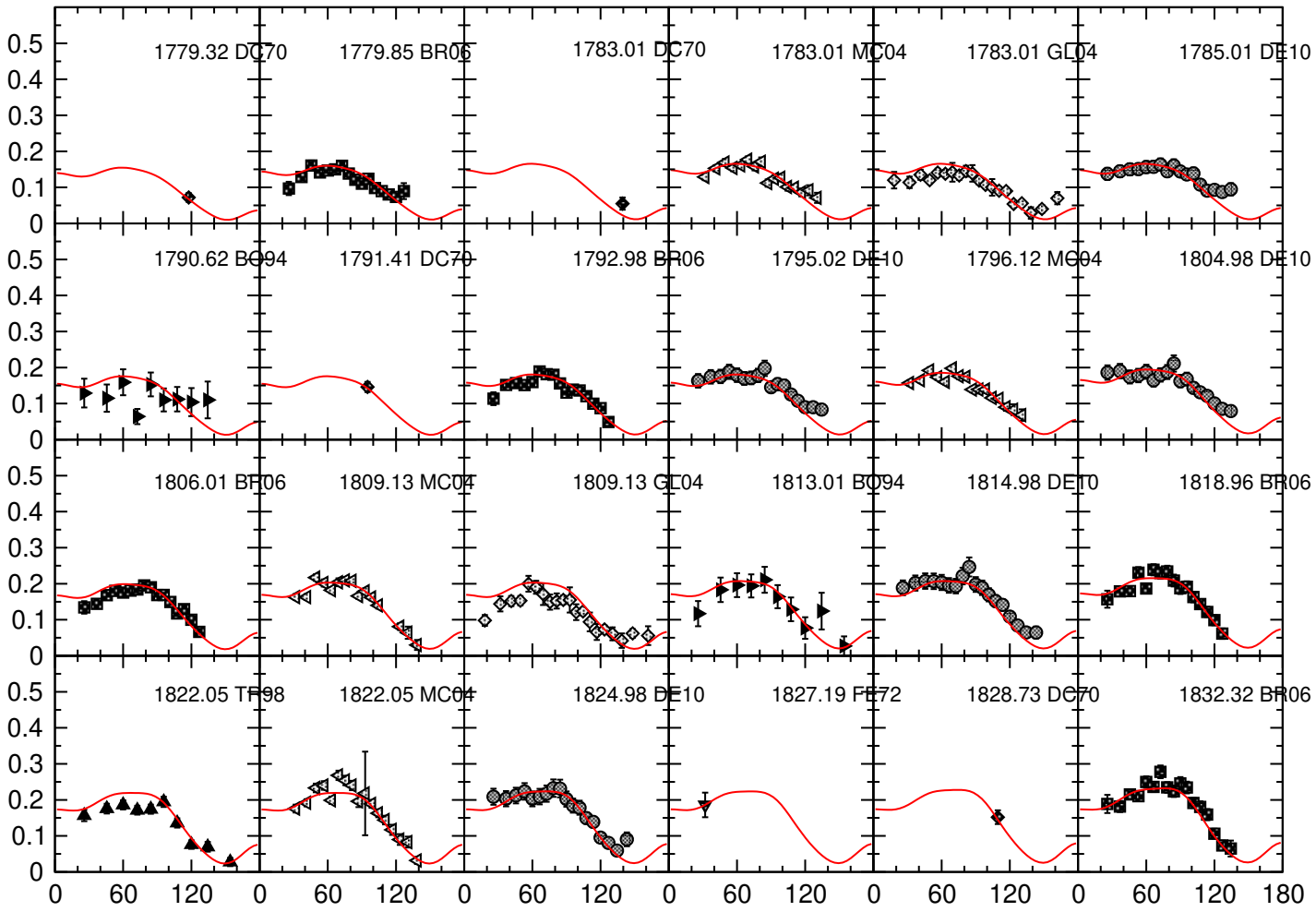
- Differential cross section $\gamma p \to K^0\Sigma^+$:
  - SAPHIR GOERS, PLB464, 331(1999)
  - CA(03)PCLAS CARNAHAN, PHD THESIS, CUA (2003
  - SAPHIR 2005, Lawall EPJA 24, 275
  - CBELSA 2008, Castelijns EPJ A 35, 39
  - CBELSA 2010, Ewald PLB 713, 180 (2012)
  - MAMI 2013, Aguar-Bartolome PRC 88, 044601
  - MAMI A2 2018, Akondi Eur.Phys.J.A 55 (2019)
- Recoil Polarization $\gamma p \to K^0\Sigma^+$:
  - SAPHIR GOERS, PLB464, 331(1999)
  - MAMI 2013, Aguar-Bartolome PRC 88, 044601
  - CBELSA 2008, Castelijns EPJ A 35, 39
  - CLAS 2013, Nepali Phys.Rev.C 87 (2013) 4, 045206
  - CLAS2021, Clark et. al. Phys.Rev.C 111 (2025) 2, 025204
- Beam asymmetry Σ $\gamma p \to K^0\Sigma^+$:
  - CLAS2021, Clark et. al. Phys.Rev.C 111 (2025) 2, 025204
- Target asymmetry T $\gamma p \to K^0\Sigma^+$:
  - CLAS2021, Clark et. al. Phys.Rev.C 111 (2025) 2, 025204
- O_x $\gamma p \to K^0\Sigma^+$:
  - CLAS2021, Clark et. al. Phys.Rev.C 111 (2025) 2, 025204
- O_z $\gamma p \to K^0\Sigma^+$:
  - CLAS2021, Clark et. al. Phys.Rev.C 111 (2025) 2, 025204

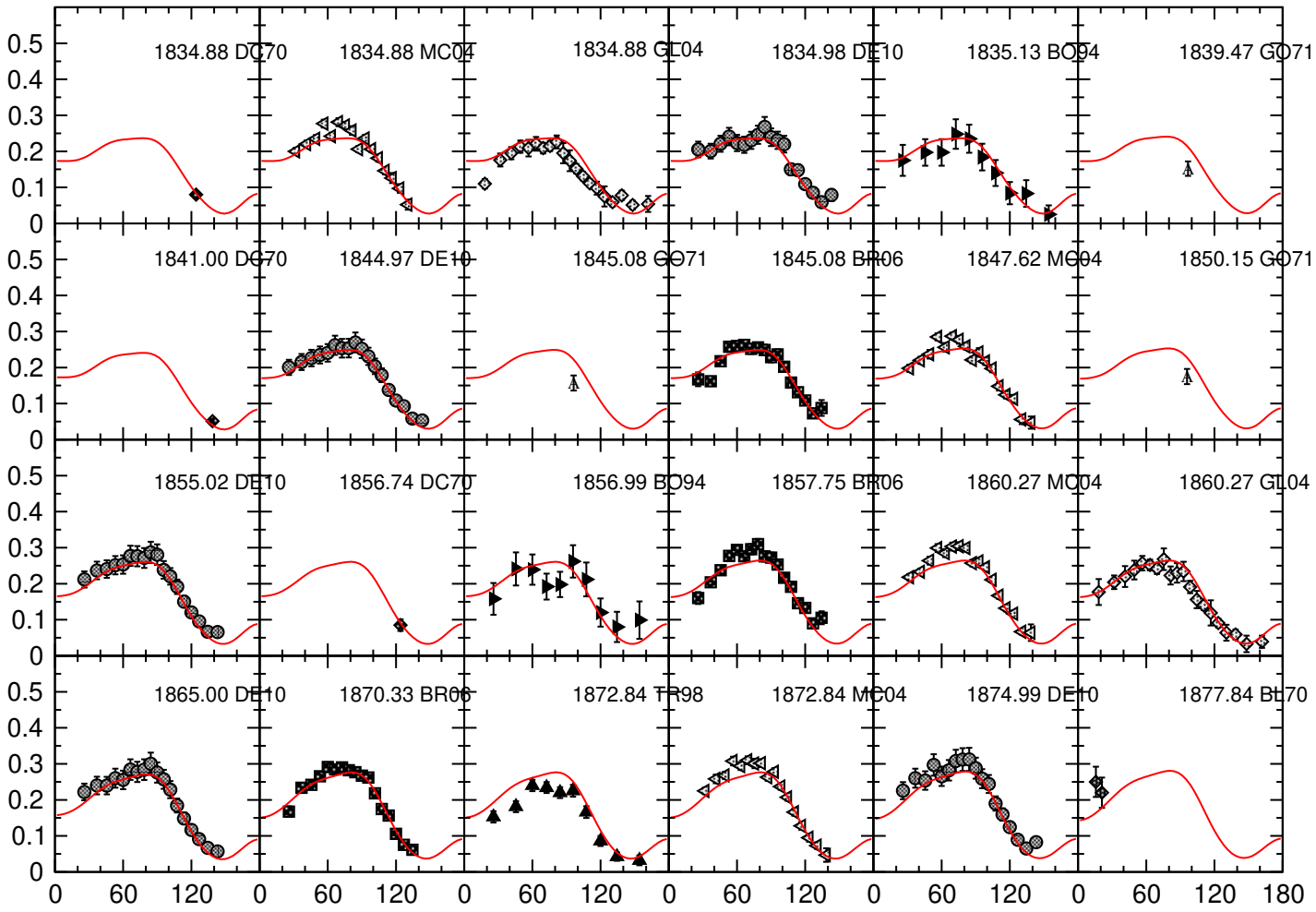

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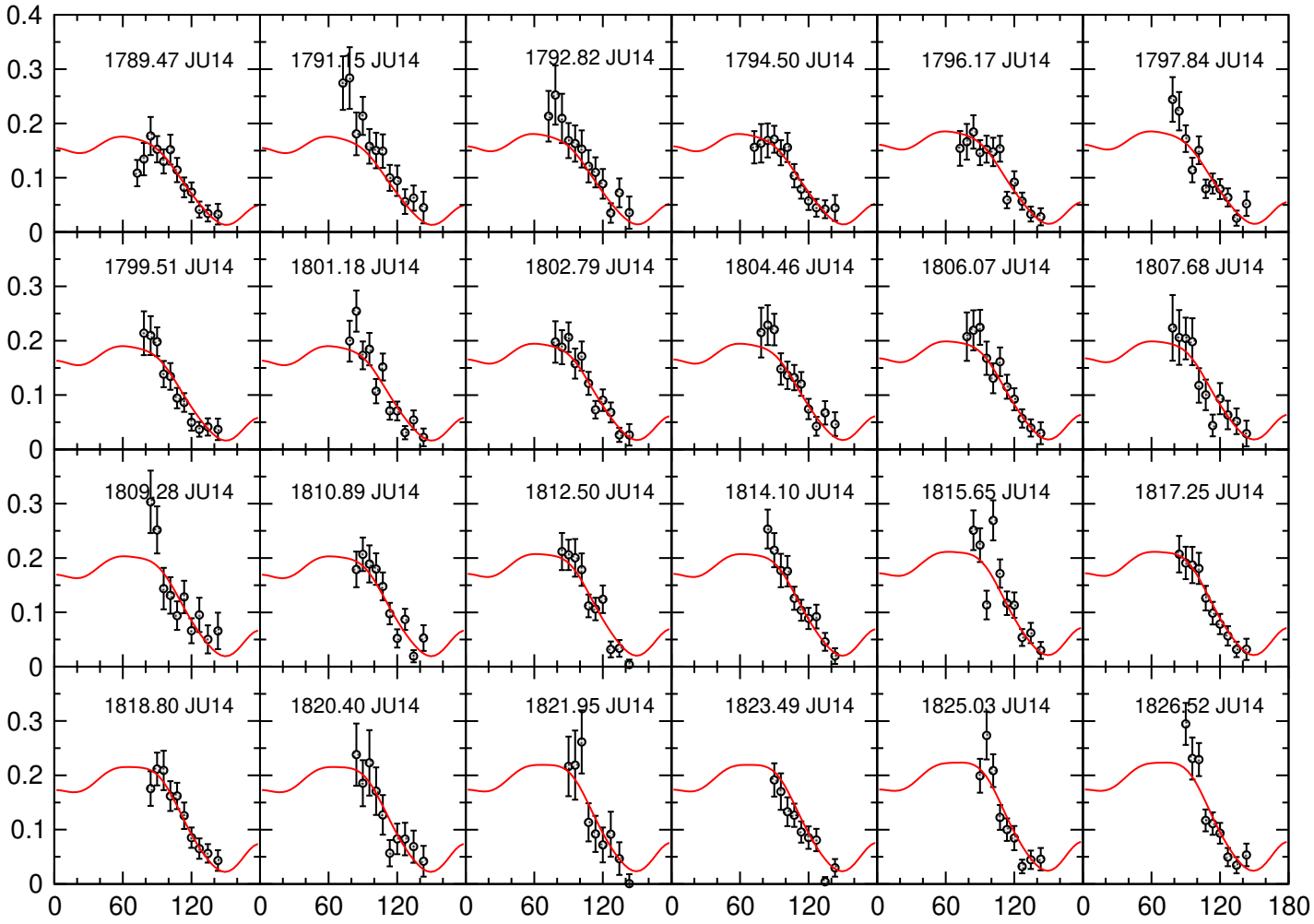

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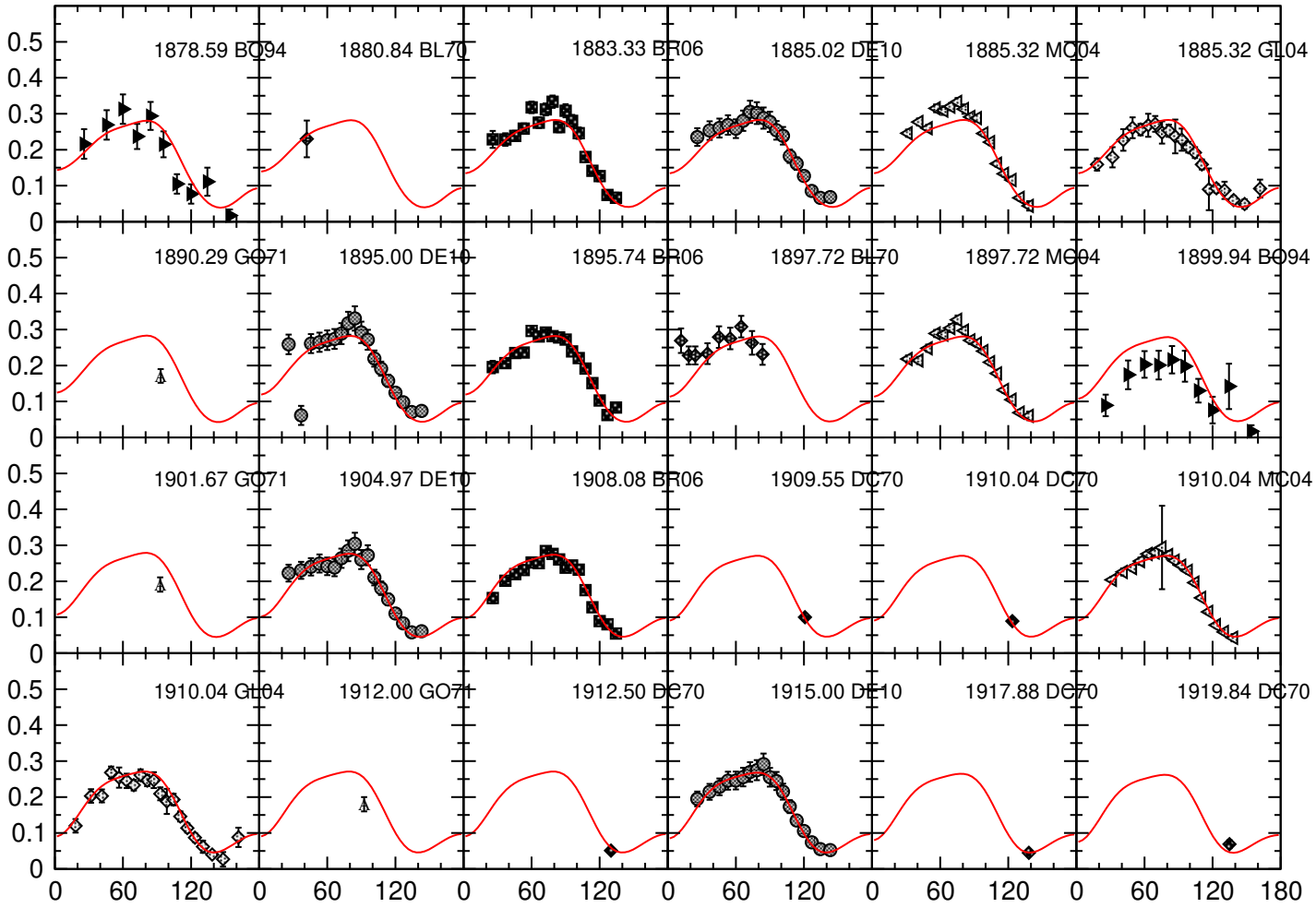

1739.86 BR06
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1746.86 AN65
1746.86 AN62
1747.40 AN62
1748.47 DC70
1753.29 BR06
1755.00 DE10
1755.97 AN62
1756.50 MC04
1756.50 GL04
1759.17 FU70
1764.97 DE10
1766.62 BR06
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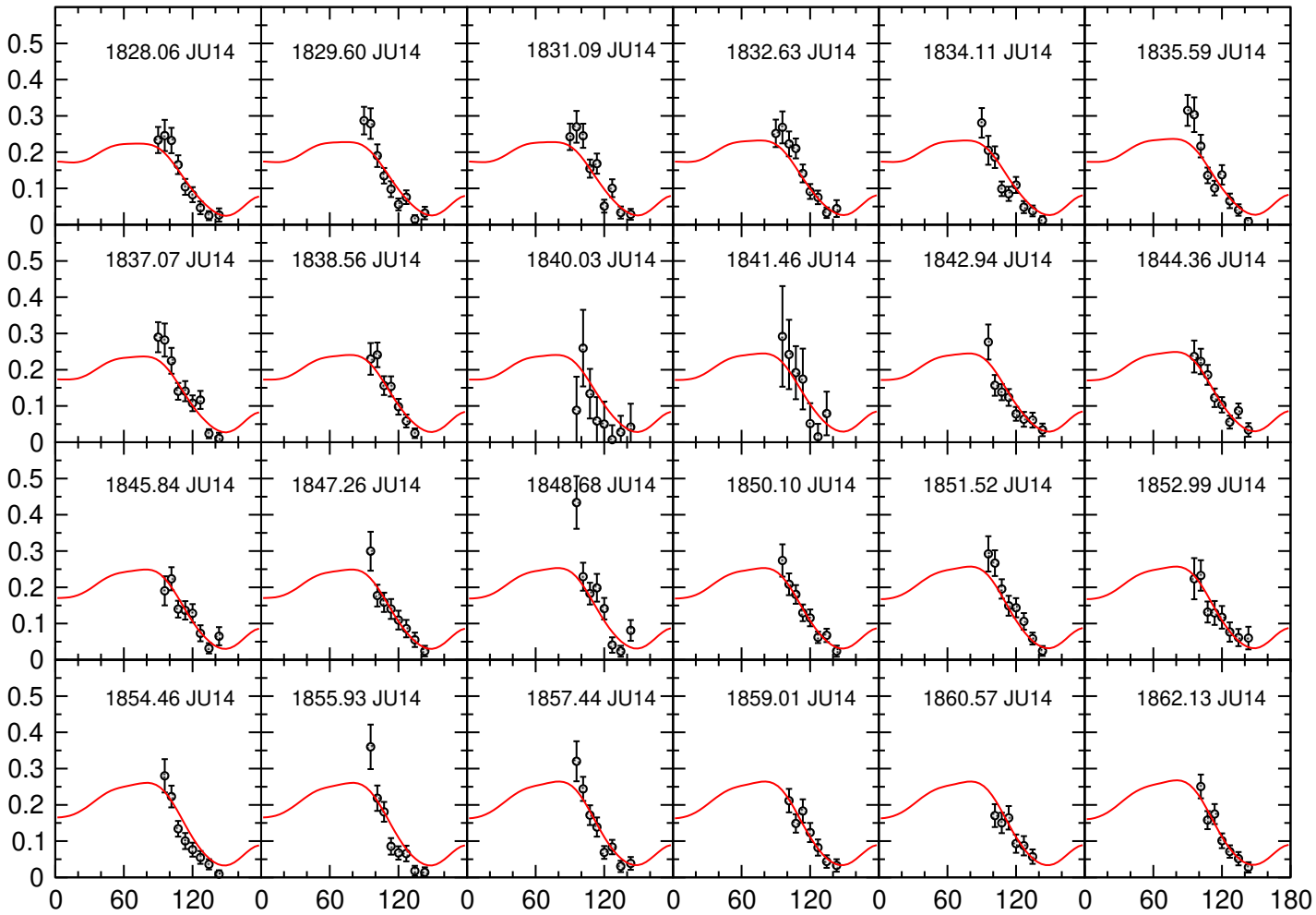

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1753.88 JU14
1755.75 JU14
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1759.44 JU14
1761.25 JU14
1763.06 JU14
1764.87 JU14
1766.67 JU14
1768.48 JU14
1770.28 JU14
1772.08 JU14
1773.83 JU14
1775.63 JU14
1777.37 JU14
1779.11 JU14
1780.85 JU14
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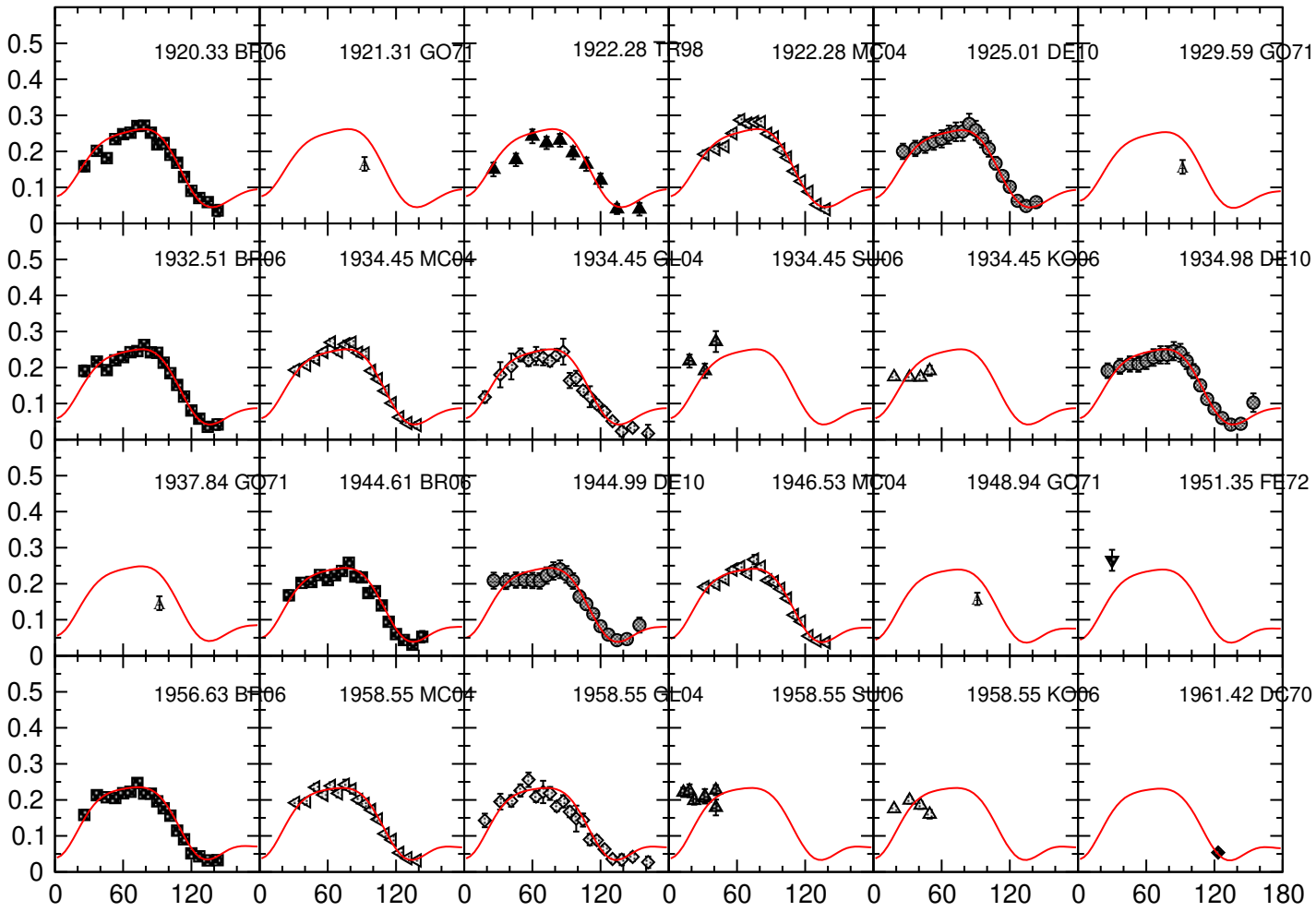

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1792.98 BR06
1795.02 DE10
1796.12 MC04
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1809.13 MC04
1809.13 GL04
1813.01 BO94
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1822.05 TR98
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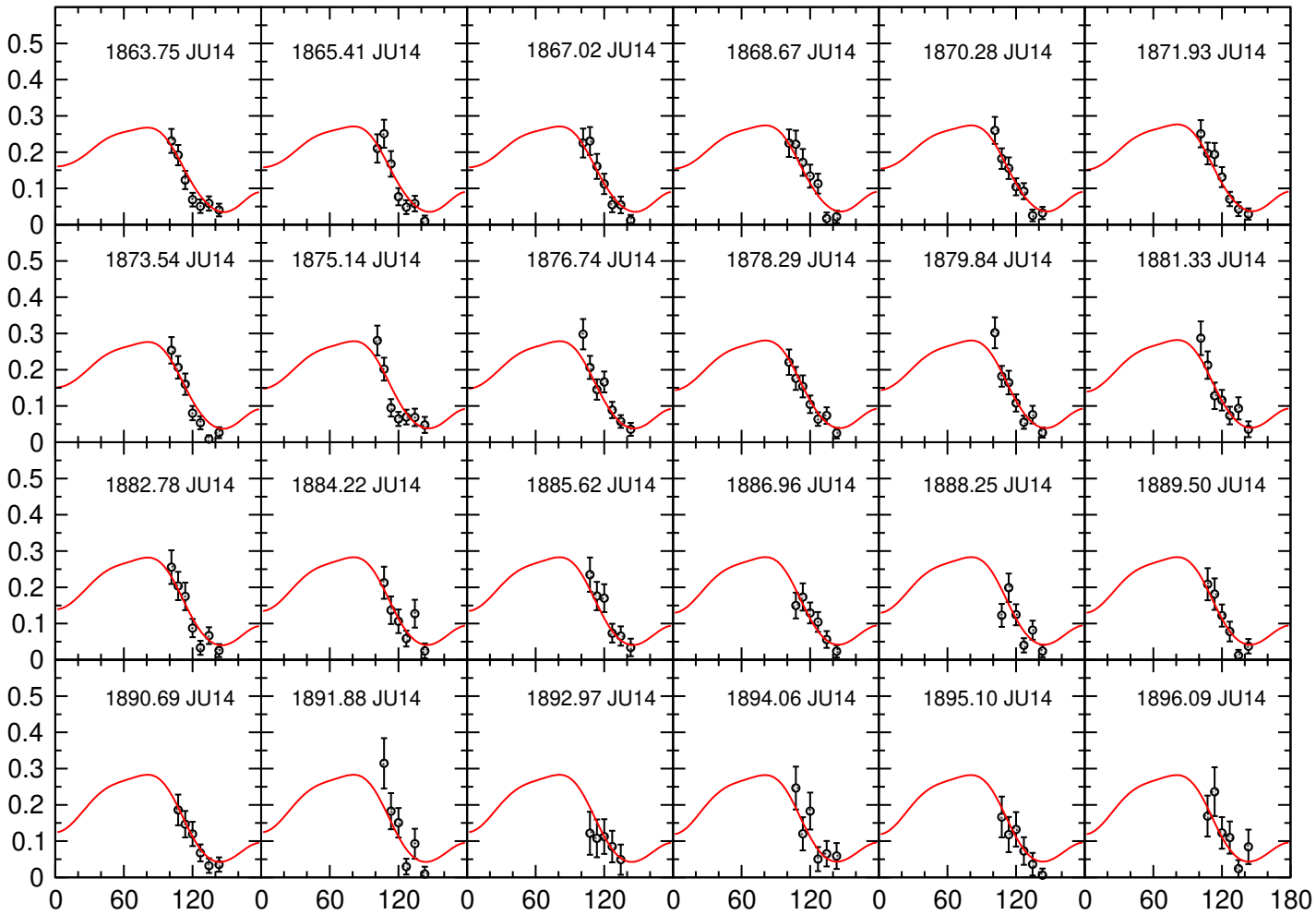

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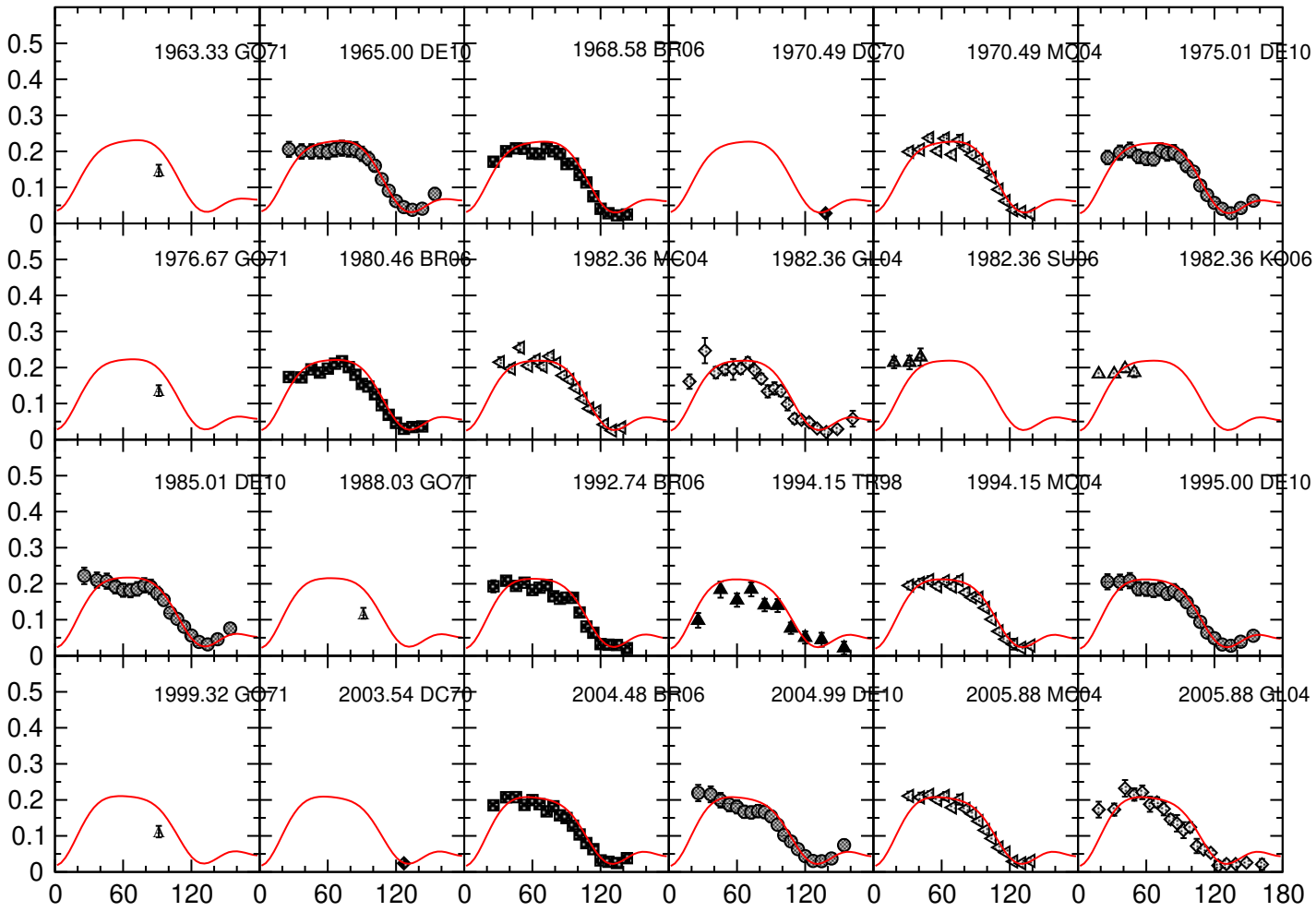

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1804.46 JU14
1806.07 JU14
1807.68 JU14
1809.28 JU14
1810.89 JU14
1812.50 JU14
1814.10 JU14
1815.65 JU14
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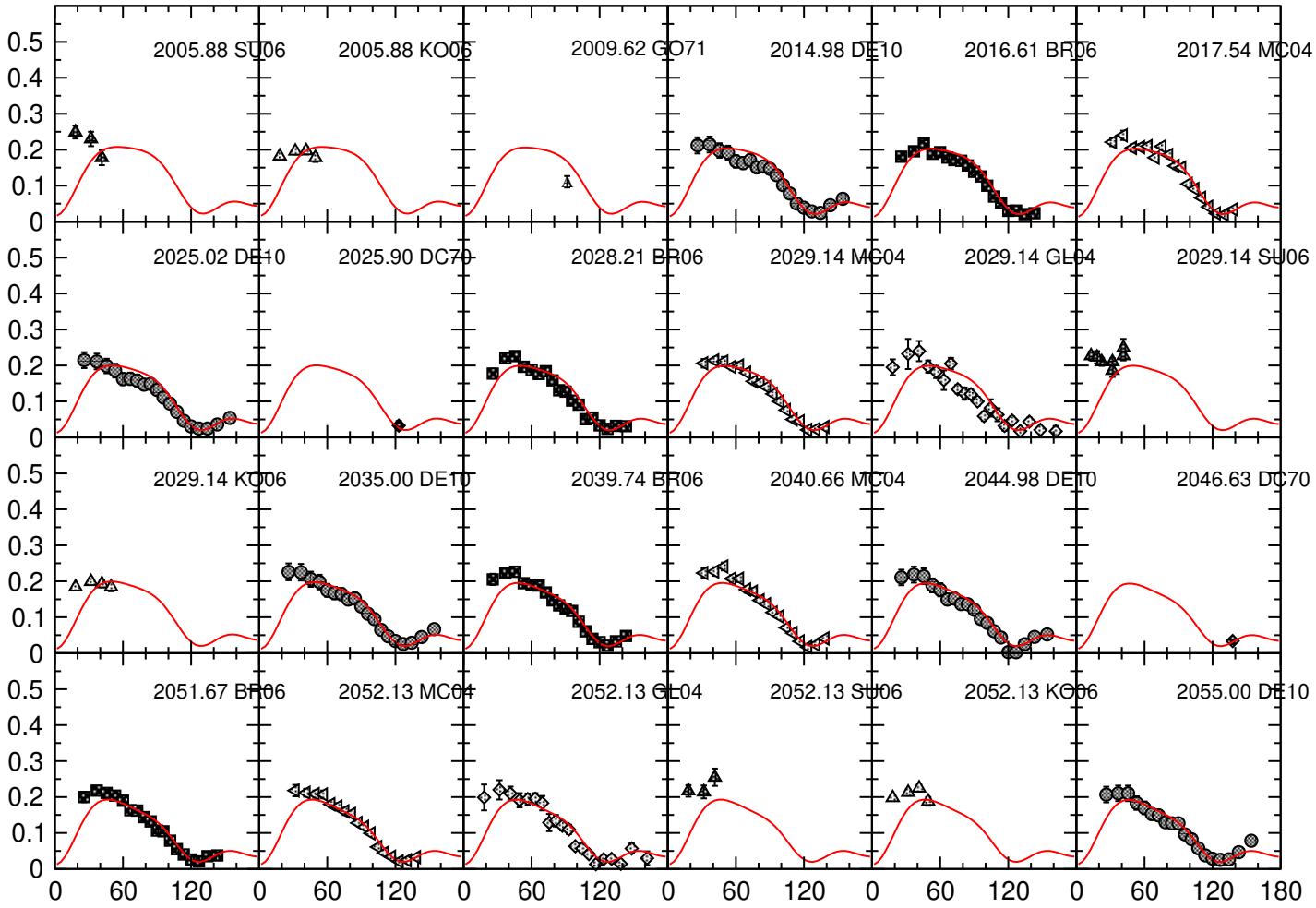

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1897.72 BL70
1897.72 MC04
1899.94 BO94
1901.67 GO71
1904.97 DE10
1908.08 BR06
1909.55 DC70
1910.04 DC70
1910.04 MC04
1910.04 GL04
1912.00 GO71
1912.50 DC70
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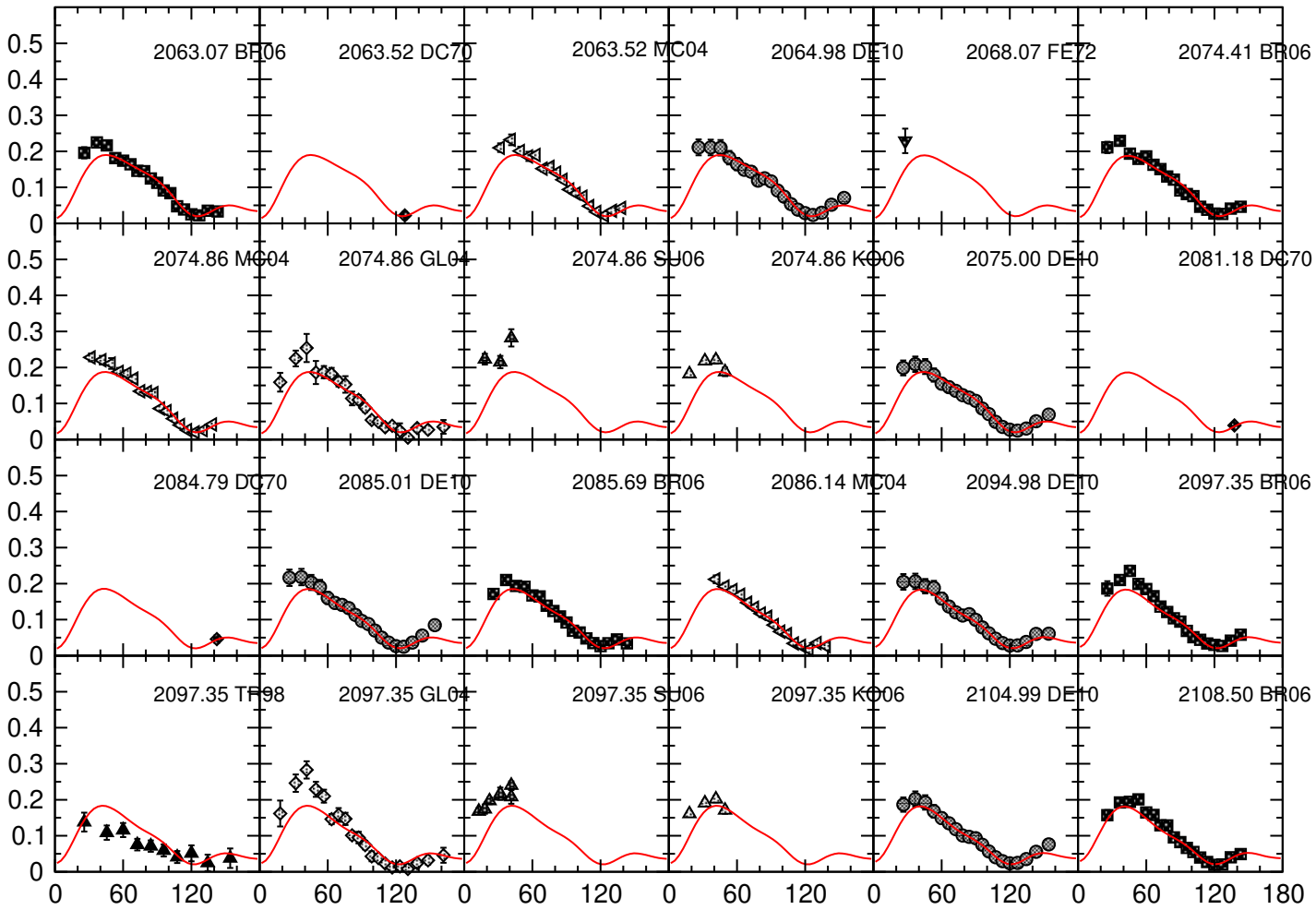

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1835.59 JU14
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1841.46 JU14
1842.94 JU14
1844.36 JU14
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1847.26 JU14
1848.68 JU14
1850.10 JU14
1851.52 JU14
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1857.44 JU14
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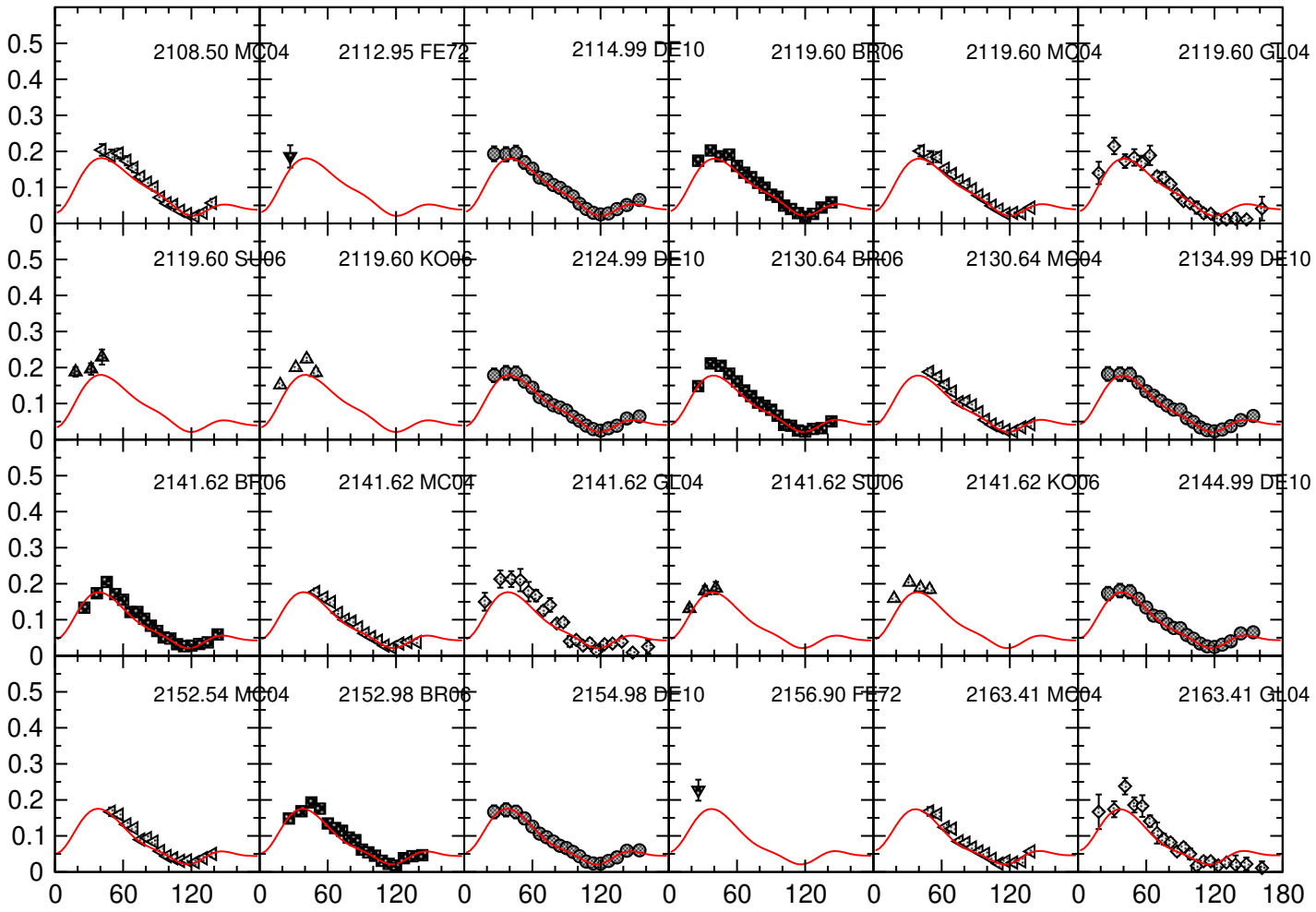

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1922.28 MC04
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1934.45 GL04
1934.45 SU06
1934.45 KO06
1934.98 DE10
1937.84 GO71
1944.61 BR06
1944.99 DE10
1946.53 MC04
1948.94 GO71
1951.35 FE72
1956.63 BR06
1958.55 MC04
1958.55 GL04
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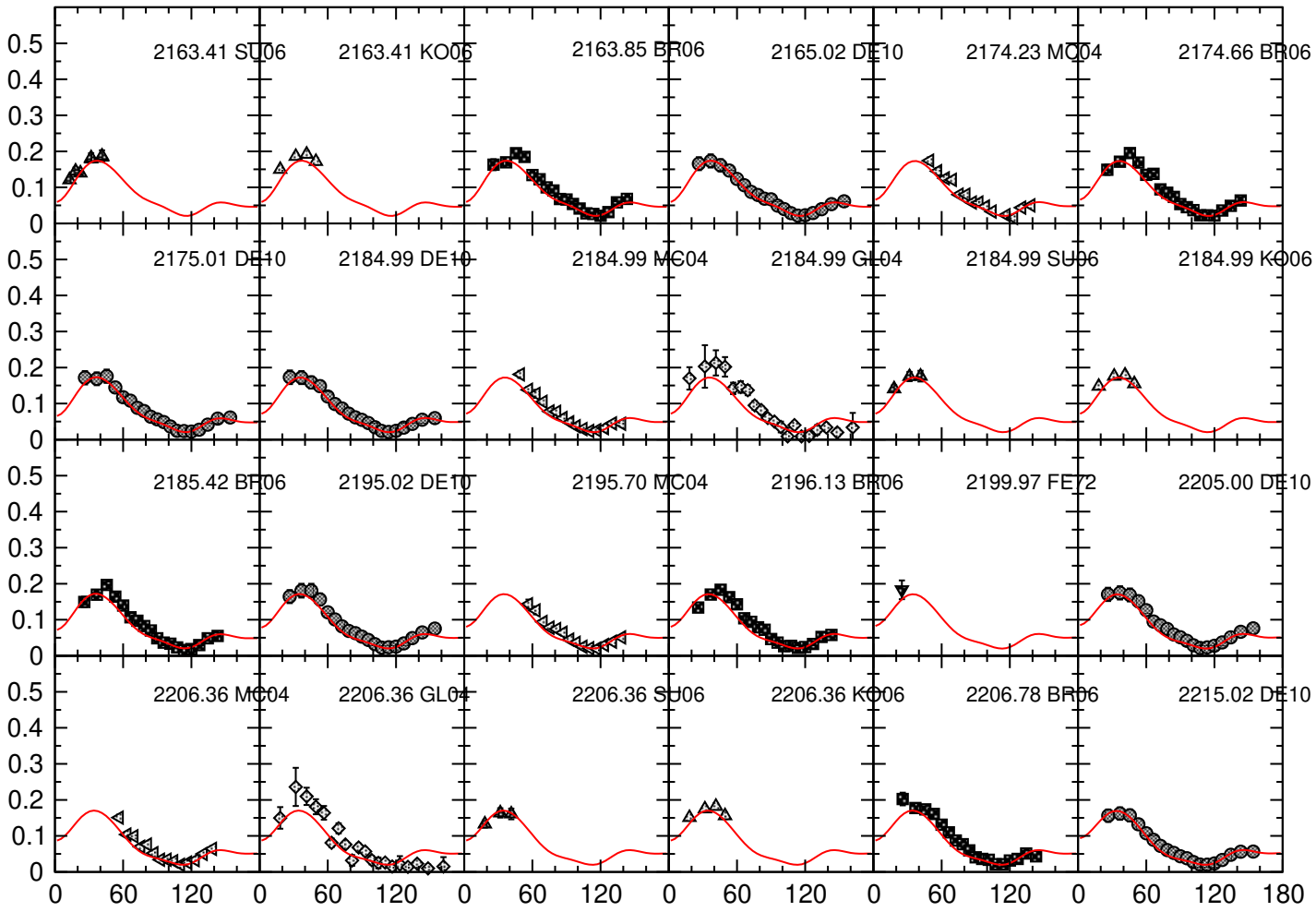

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1867.02 JU14
1868.67 JU14
1870.28 JU14
1871.93 JU14
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1879.84 JU14
1881.33 JU14
1882.78 JU14
1884.22 JU14
1885.62 JU14
1886.96 JU14
1888.25 JU14
1889.50 JU14
1890.69 JU14
1891.88 JU14
1892.97 JU14
1894.06 JU14
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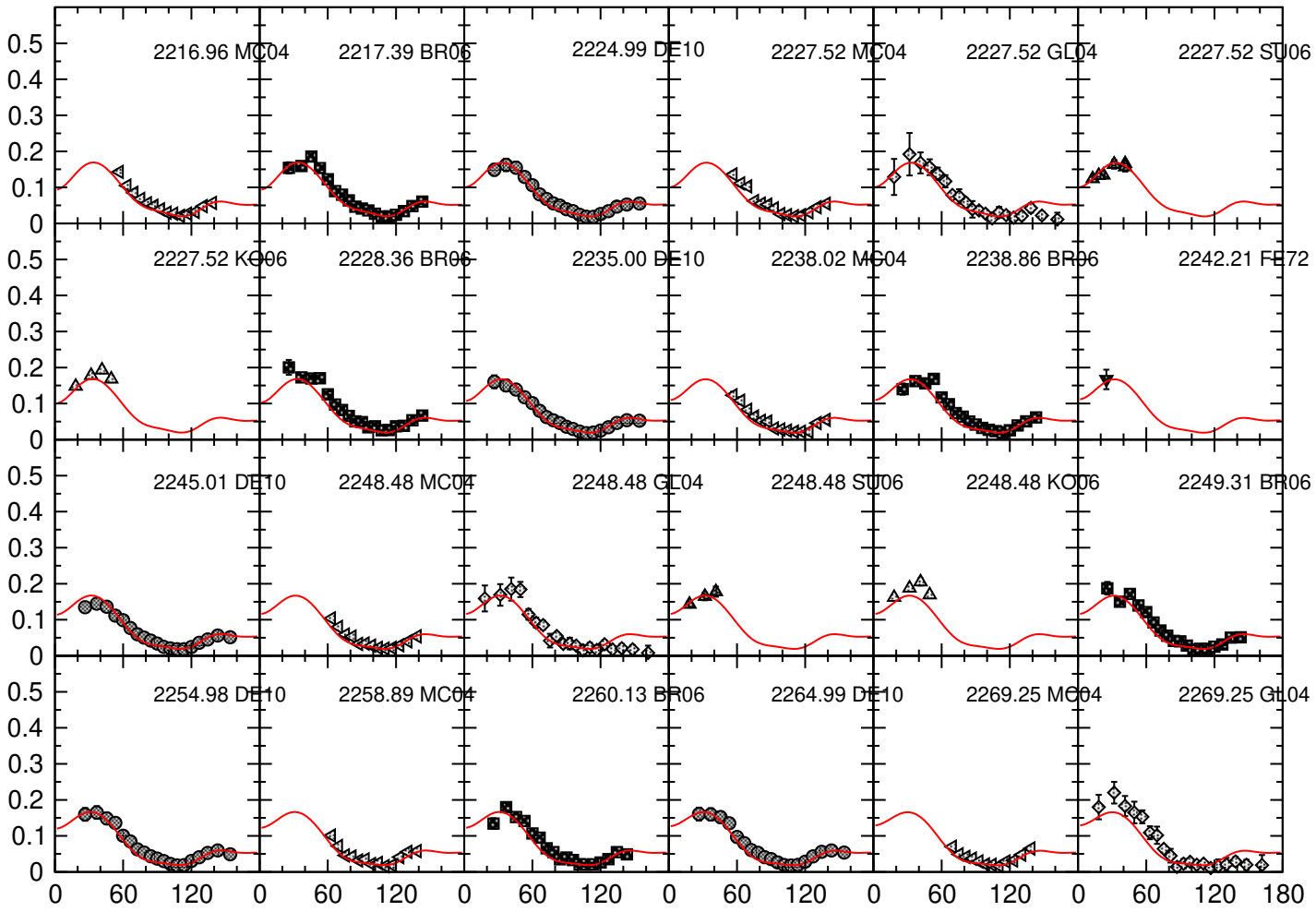

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1982.36 GL04
1982.36 SU06
1982.36 KO06
1985.01 DE10
1988.03 GO71
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1994.15 TR98
1994.15 MC04
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1999.32 GO71
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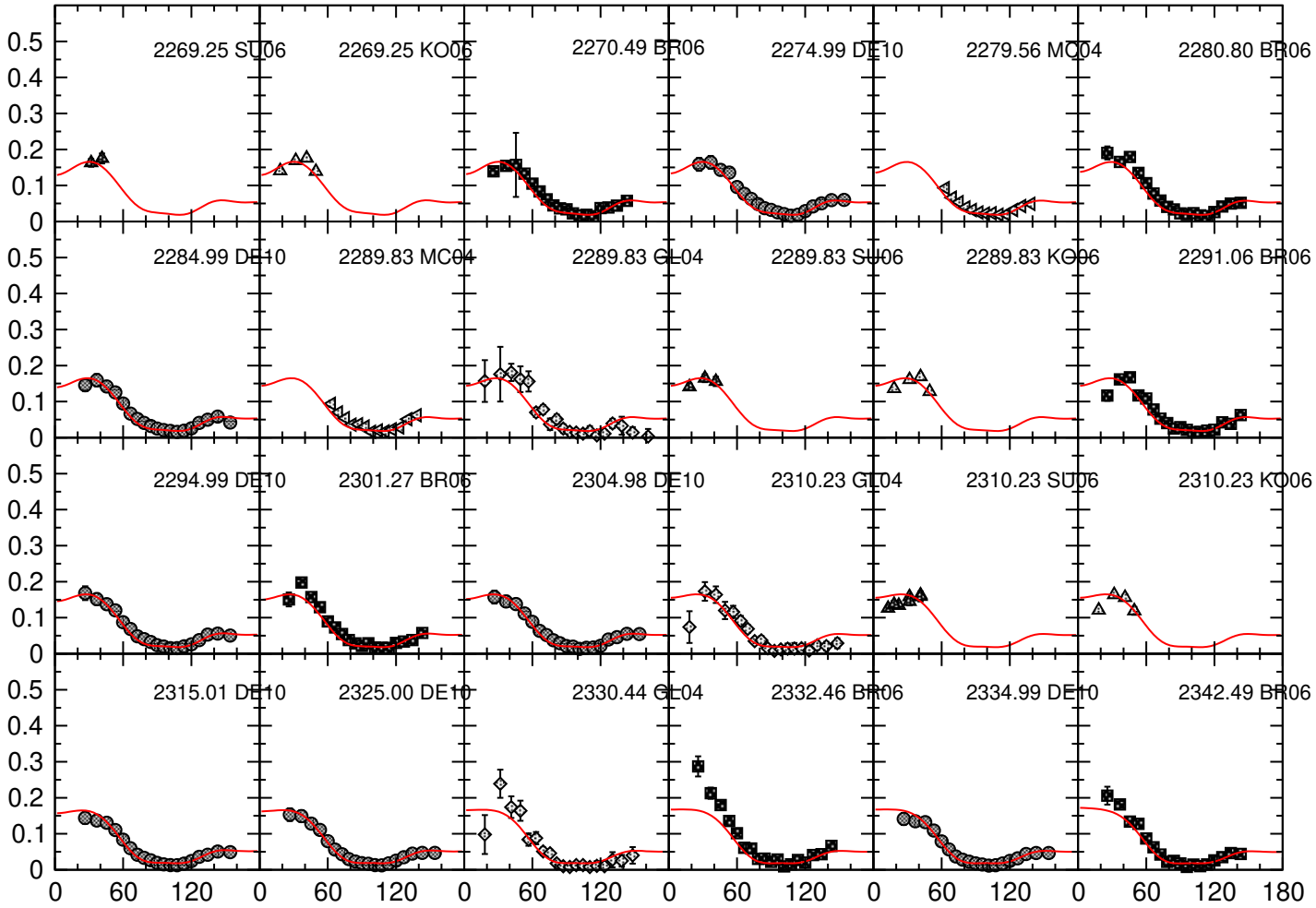

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2035.00 DE10
2039.74 BR06
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2044.98 DE10
2046.63 DC70
2051.67 BR06
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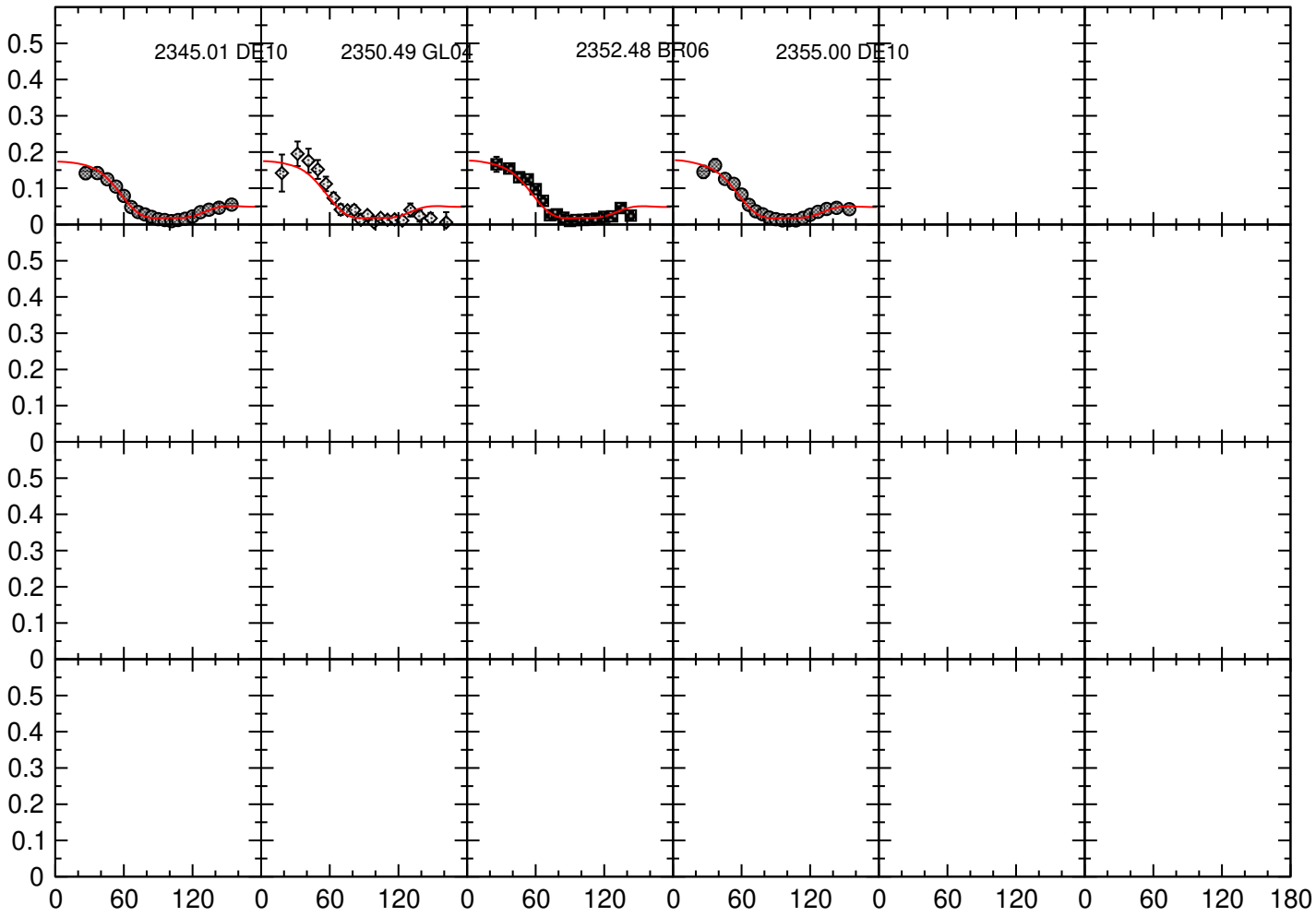

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2068.07 FE72
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2074.86 SU06
2074.86 KO06
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2084.79 DC70
2085.01 DE10
2085.69 BR06
2086.14 MC04
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2097.35 KO06
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60
120
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2141.62 MC04
2141.62 GL04
2141.62 SU06
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2152.54 MC04
2152.98 BR06
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2184.99 DE10
2184.99 MC04
2184.99 GL04
2184.99 SU06
2184.99 KO06
2185.42 BR06
2195.02 DE10
2195.70 MC04
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2199.97 FE72
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2206.36 SU06
2206.36 KO06
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2216.96 MC04
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2224.99 DE10
2227.52 MC04
2227.52 GL04
2227.52 SU06
2227.52 KO06
2228.36 BR06
2235.00 DE10
2238.02 MC04
2238.86 BR06
2242.21 FE72
2245.01 DE10
2248.48 MC04
2248.48 GL04
2248.48 SU06
2248.48 KO06
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2269.25 GL04
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0.4
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2289.83 GL04
2289.83 SU06
2289.83 KO06
2291.06 BR06
2294.99 DE10
2301.27 BR06
2304.98 DE10
2310.23 GL04
2310.23 SU06
2310.23 KO06
2315.01 DE10
2325.00 DE10
2330.44 GL04
2332.46 BR06
2334.99 DE10
2342.49 BR06
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0.4
0.5
0
60
120
180


2345.01 DE10
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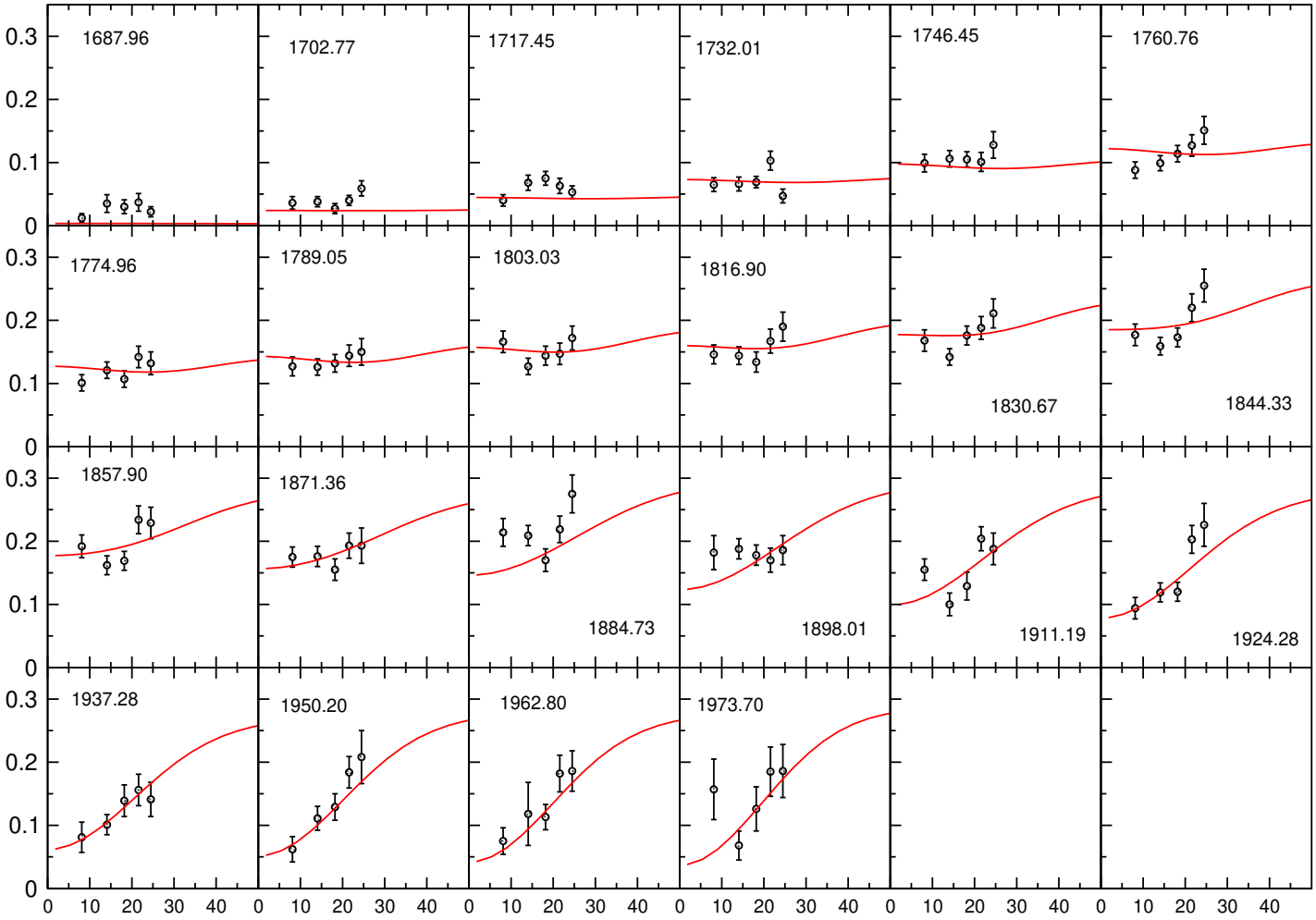
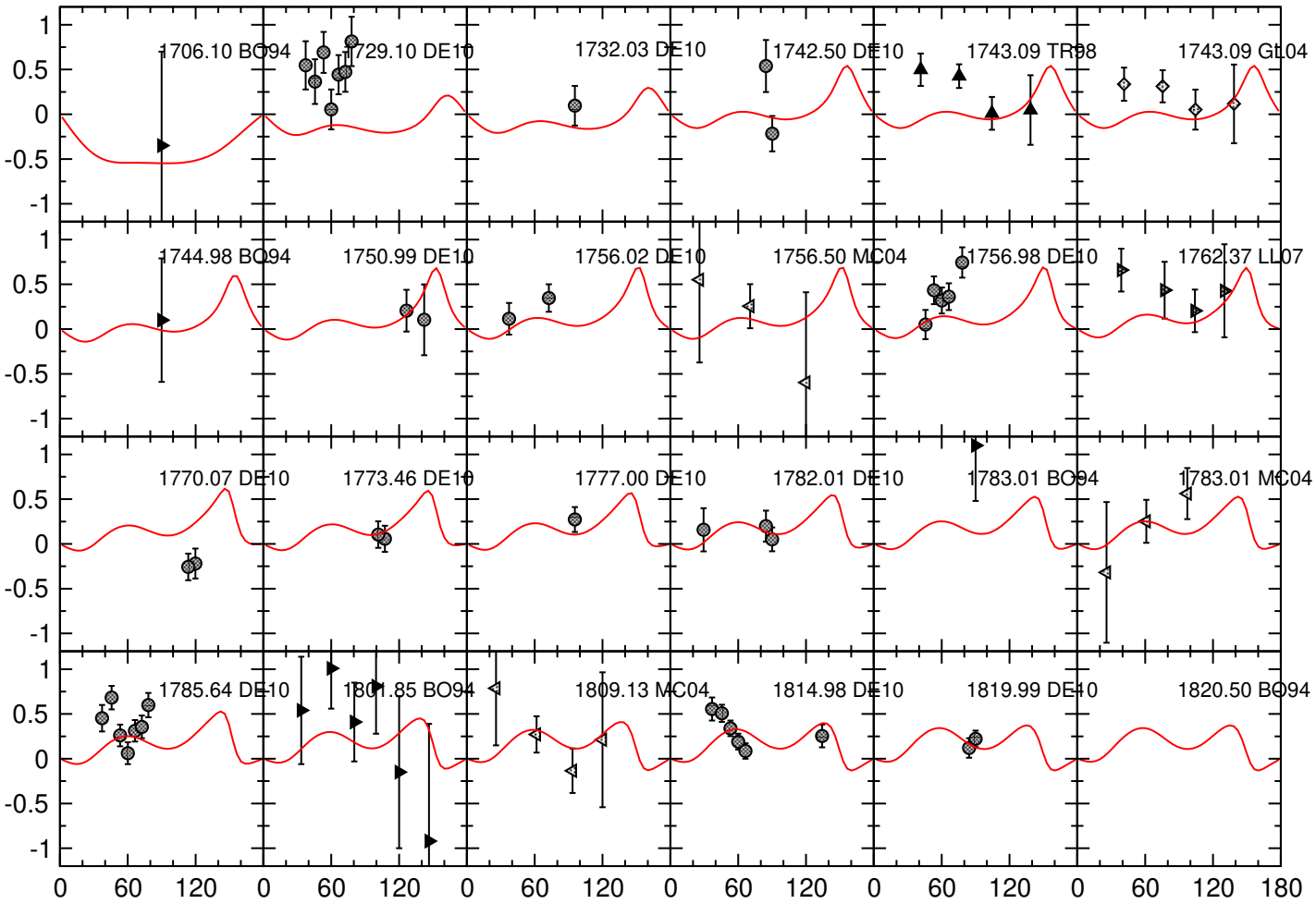
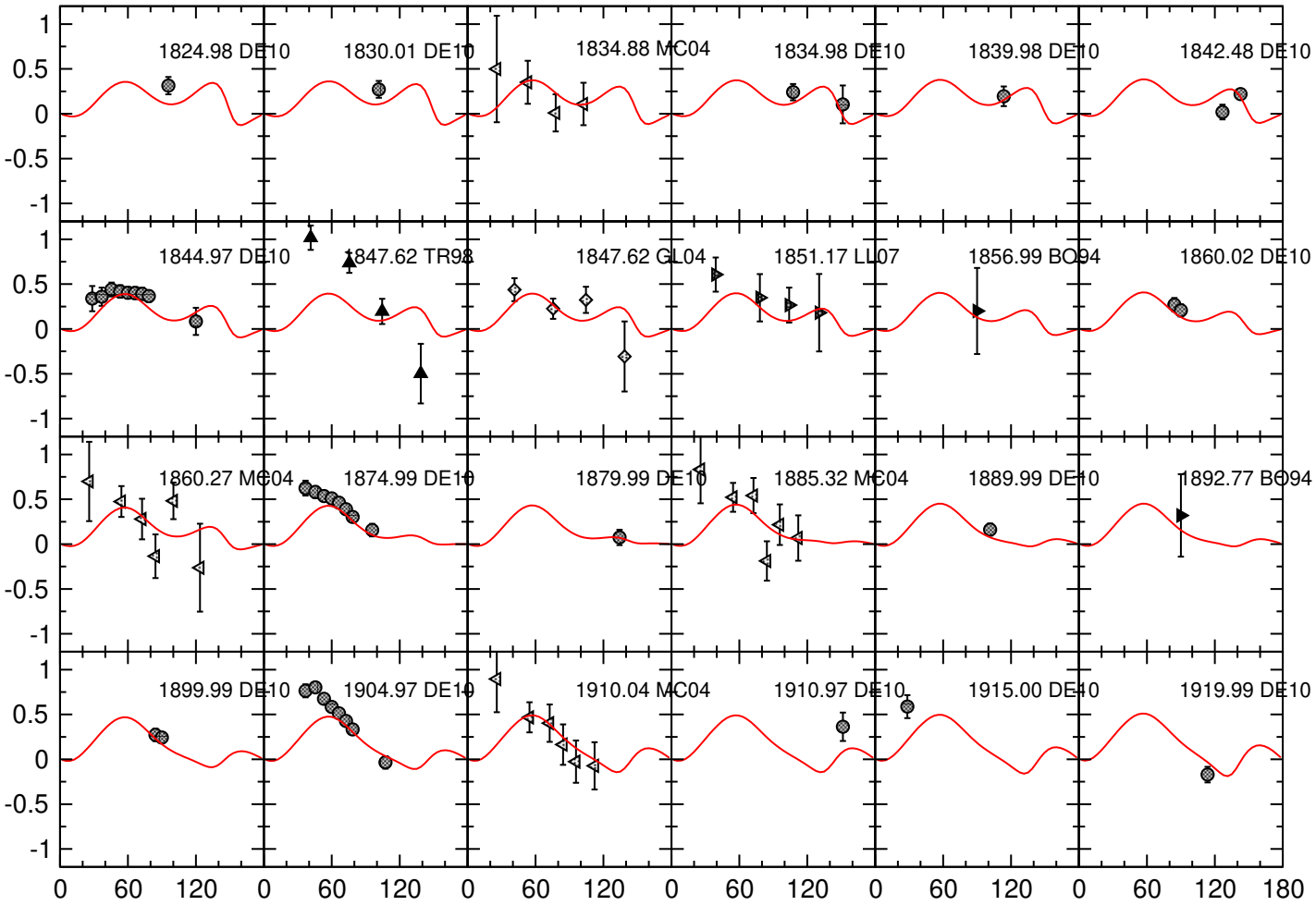
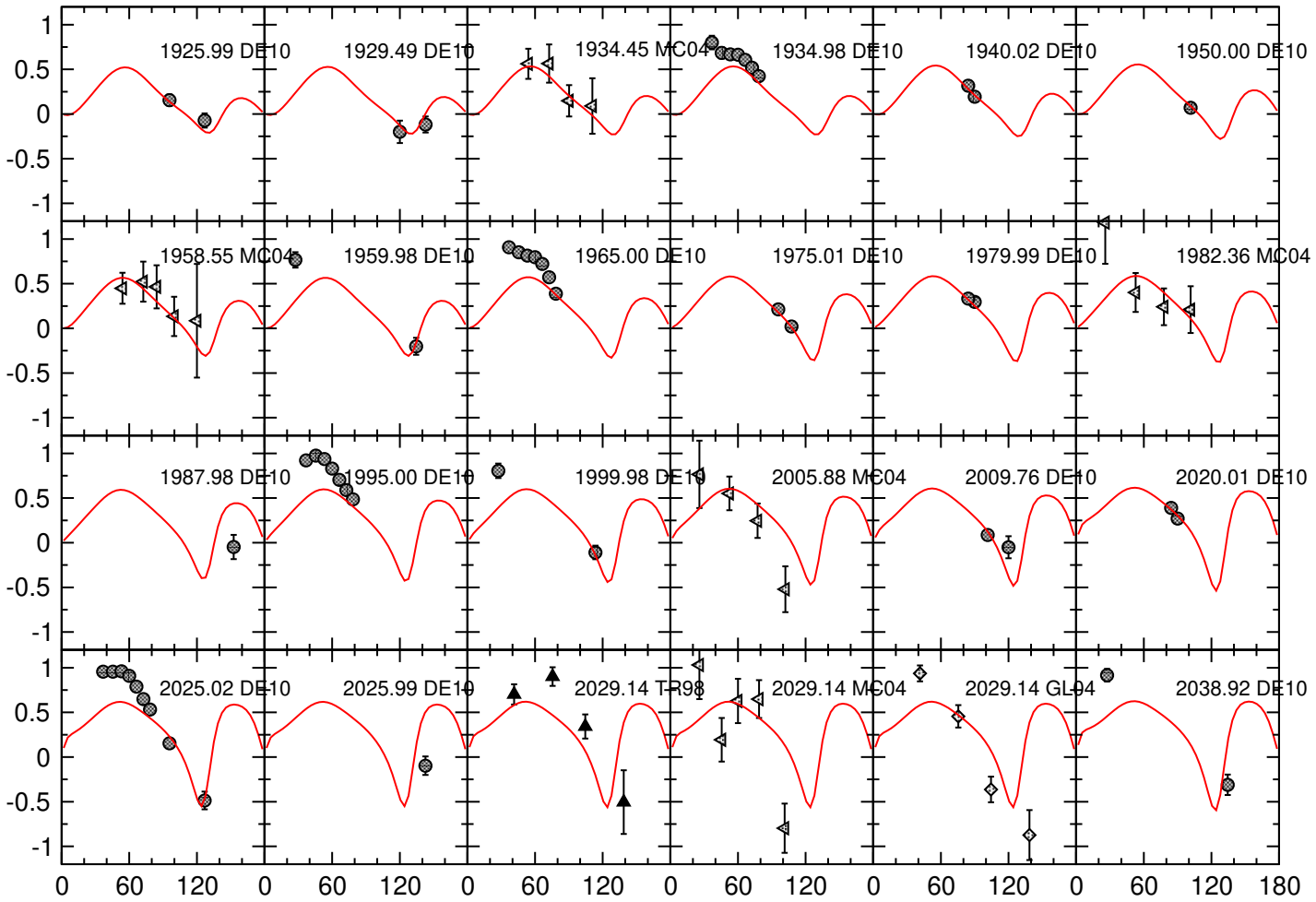
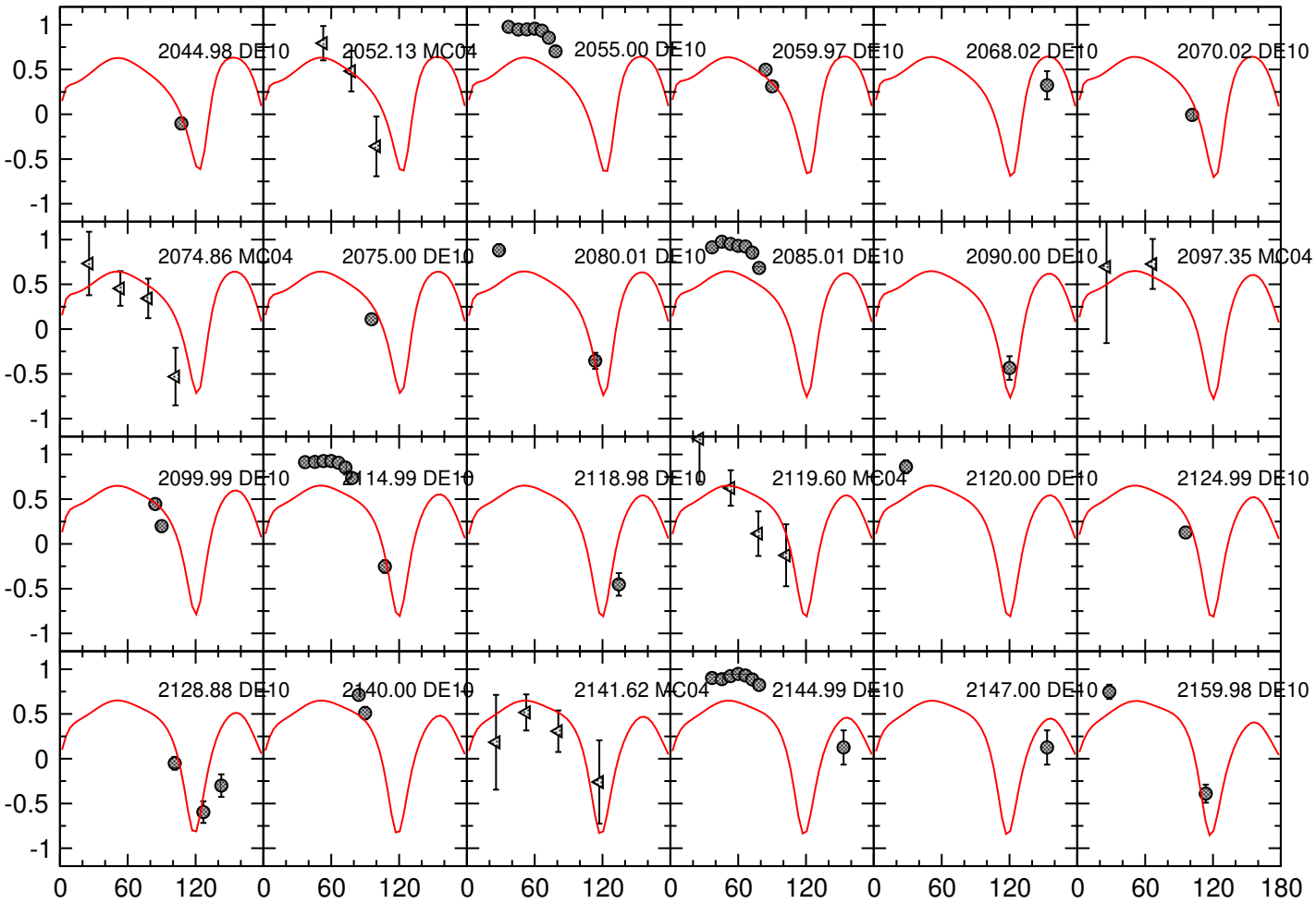


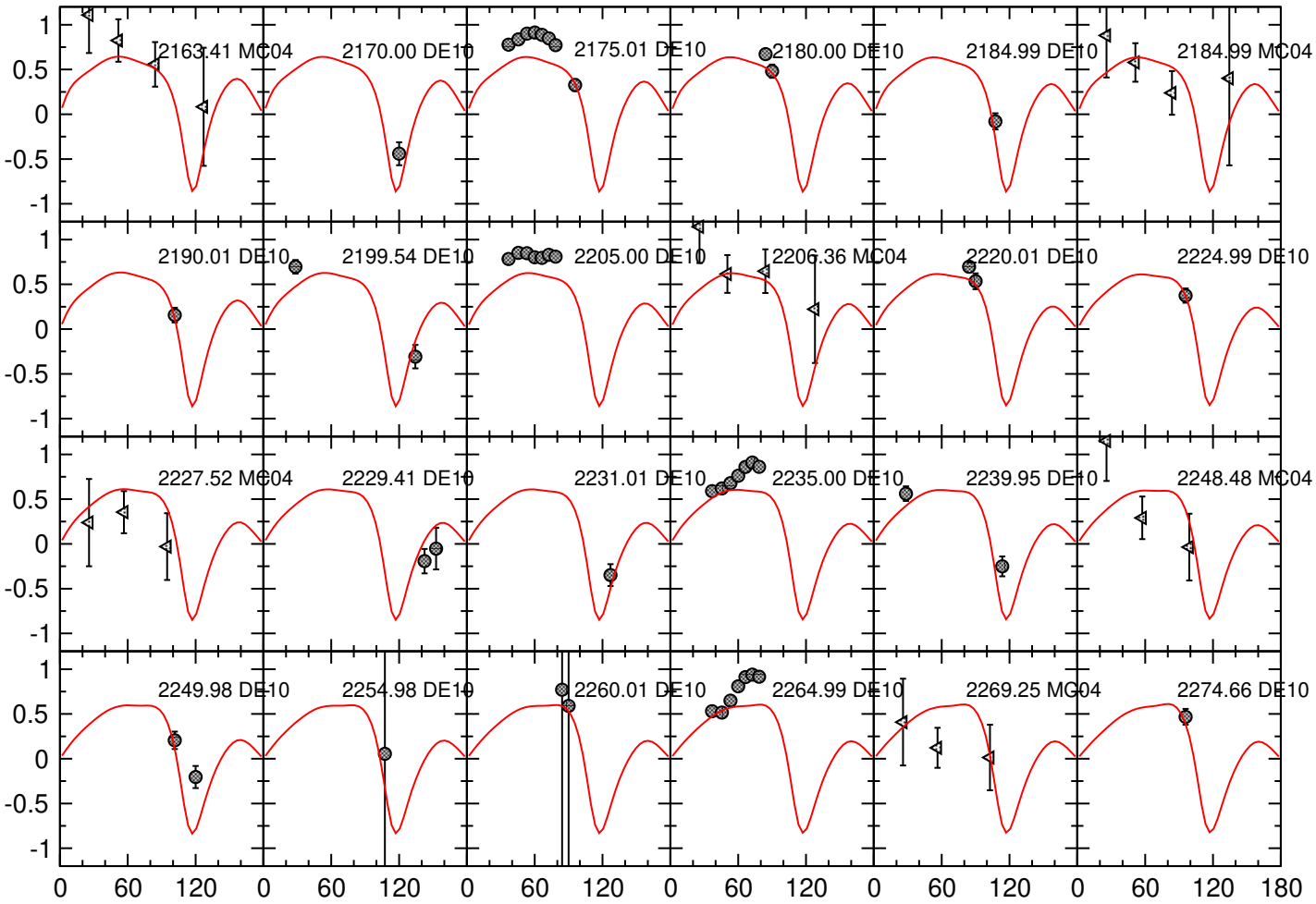
Figure 1: BGOOD 2020

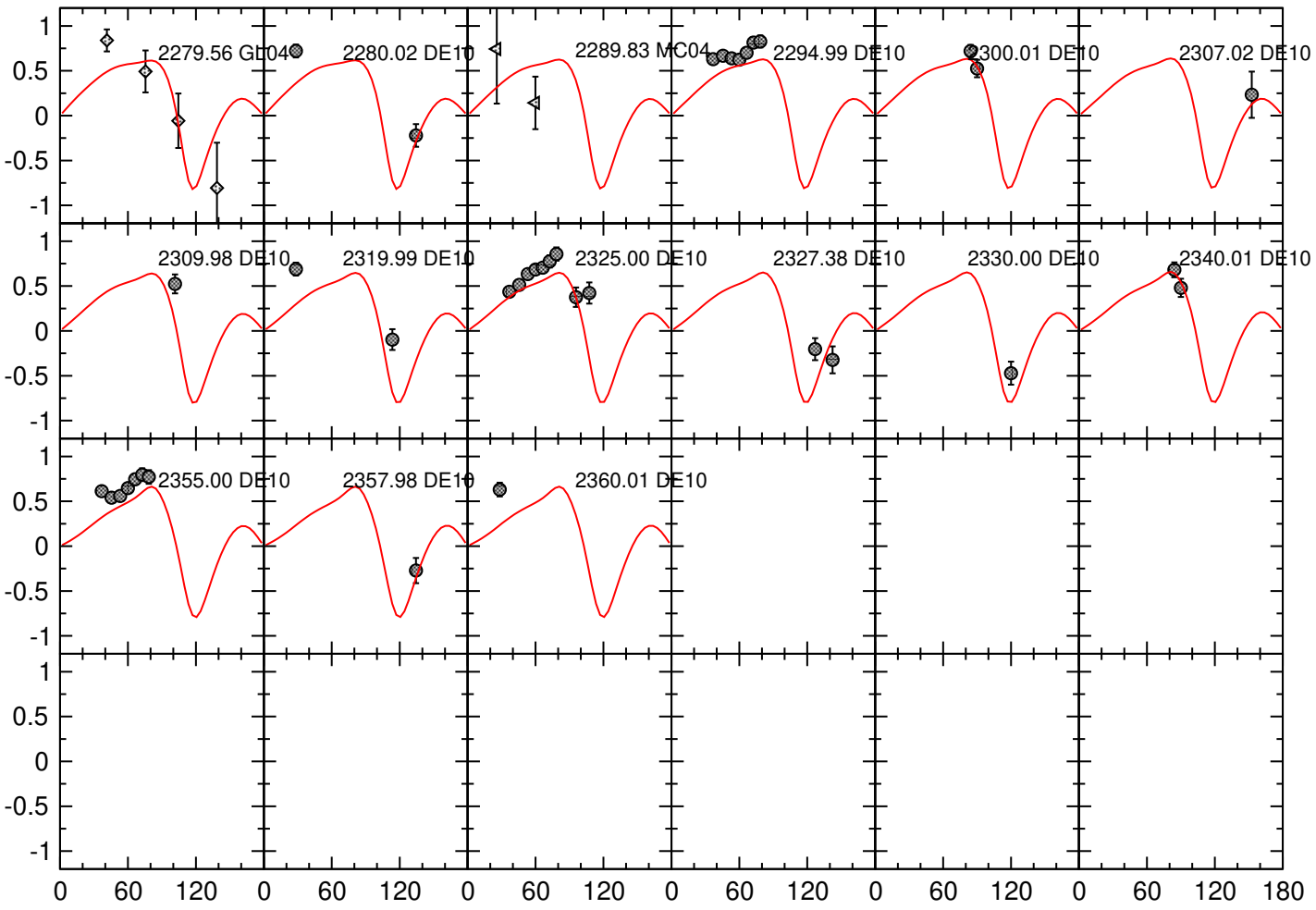

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1756.02 DE10
1756.50 MC04
1756.98 DE10
1762.37 LL07
1770.07 DE10
1773.46 DE10
1777.00 DE10
1782.01 DE10
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1783.01 MC04
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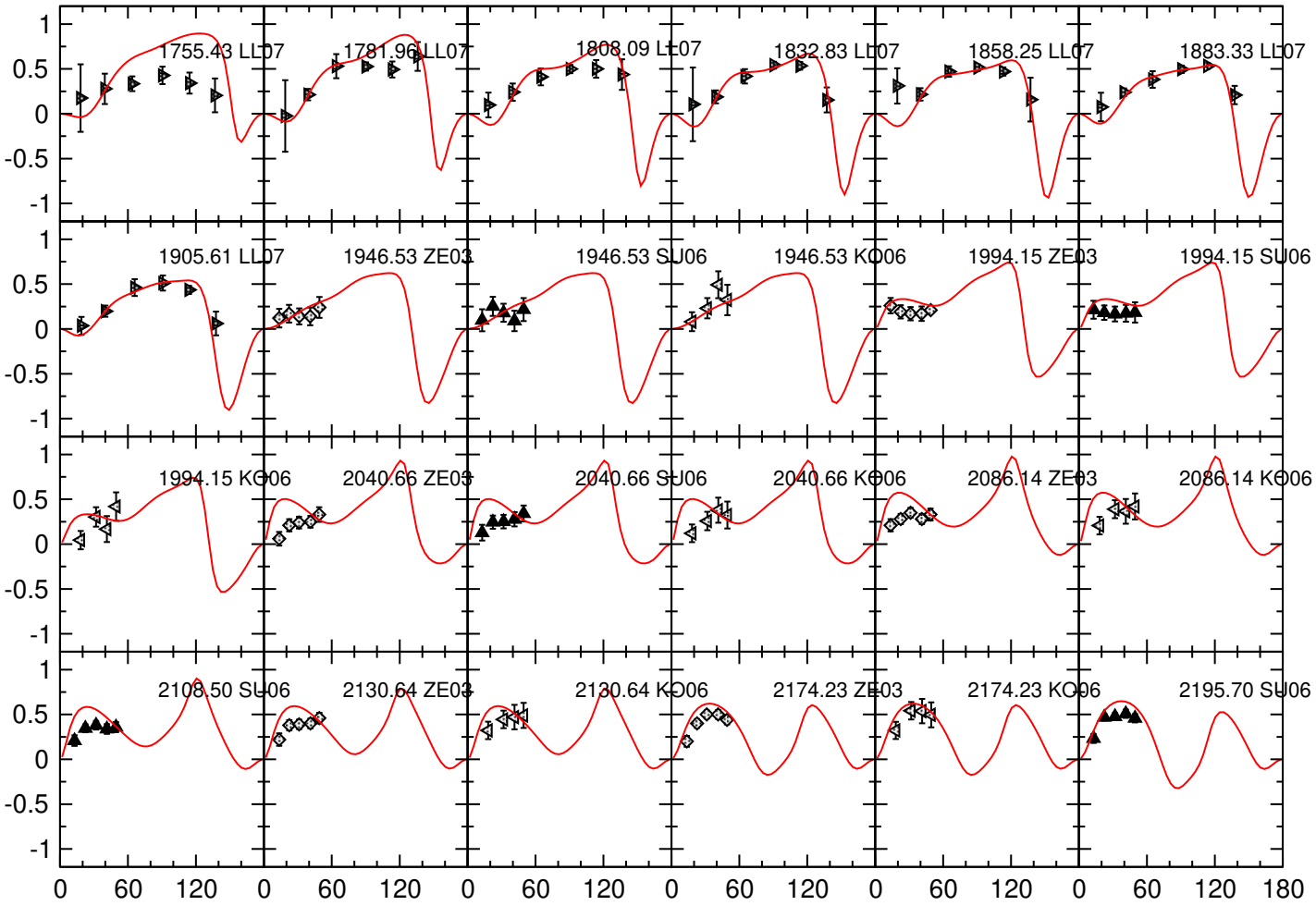

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1889.99 DE10
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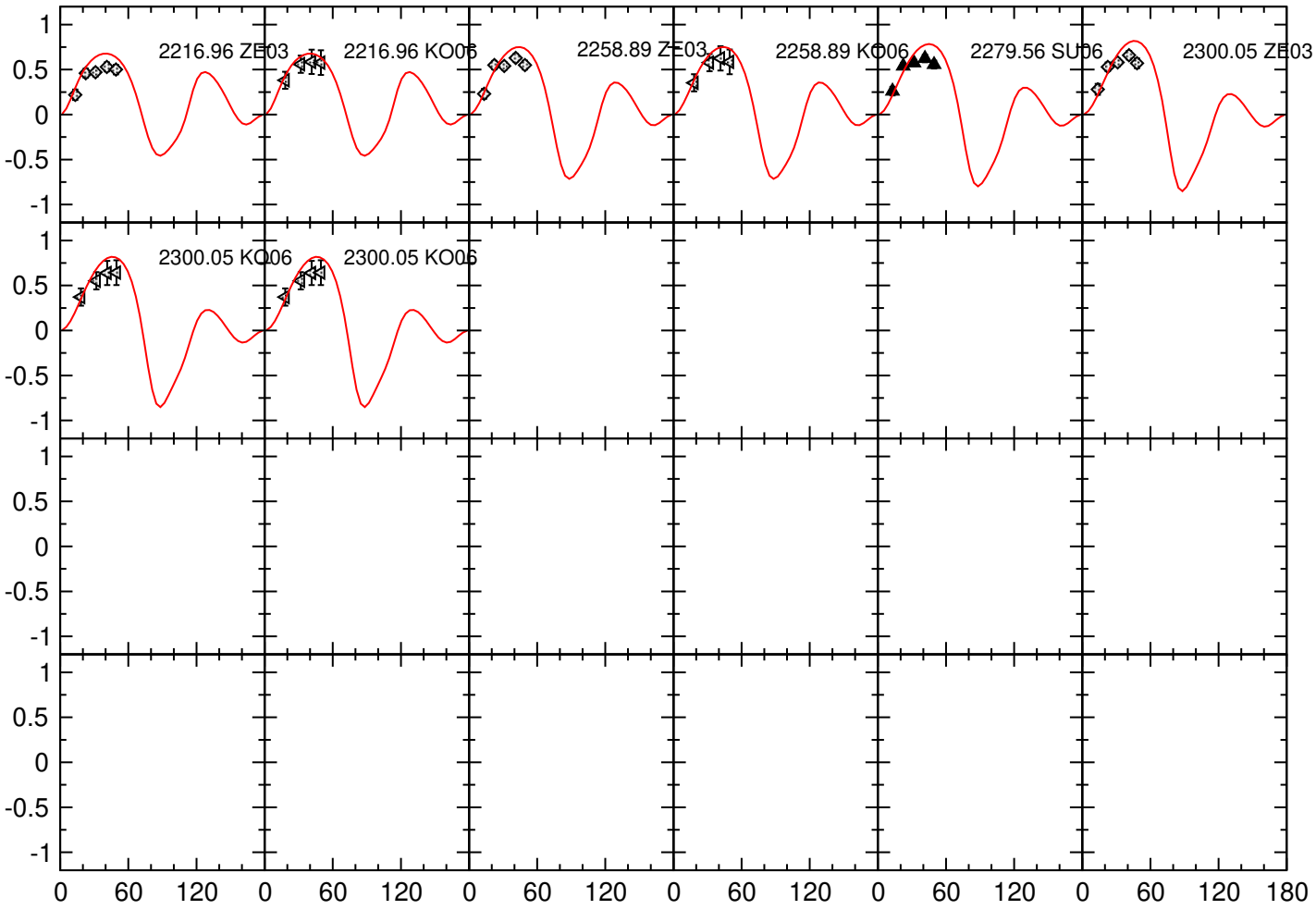

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2005.88 MC04
2009.76 DE10
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2025.02 DE10
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2128.88 DE10
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2190.01 DE10
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2231.01 DE10
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2254.98 DE10
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1946.53 SU06
1946.53 KO06
1994.15 ZE03
1994.15 SU06
1994.15 KO06
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2040.66 SU06
2040.66 KO06
2086.14 ZE03
2086.14 KO06
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2130.64 KO06
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2174.23 KO06
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-1
0
60
120
180


2216.96 ZE03
2216.96 KO06
2258.89 ZE03
2258.89 KO06
2279.56 SU06
2300.05 ZE03
2300.05 KO06
2300.05 KO06
1
0.5
0
-0.5
-1
0
60
120
180

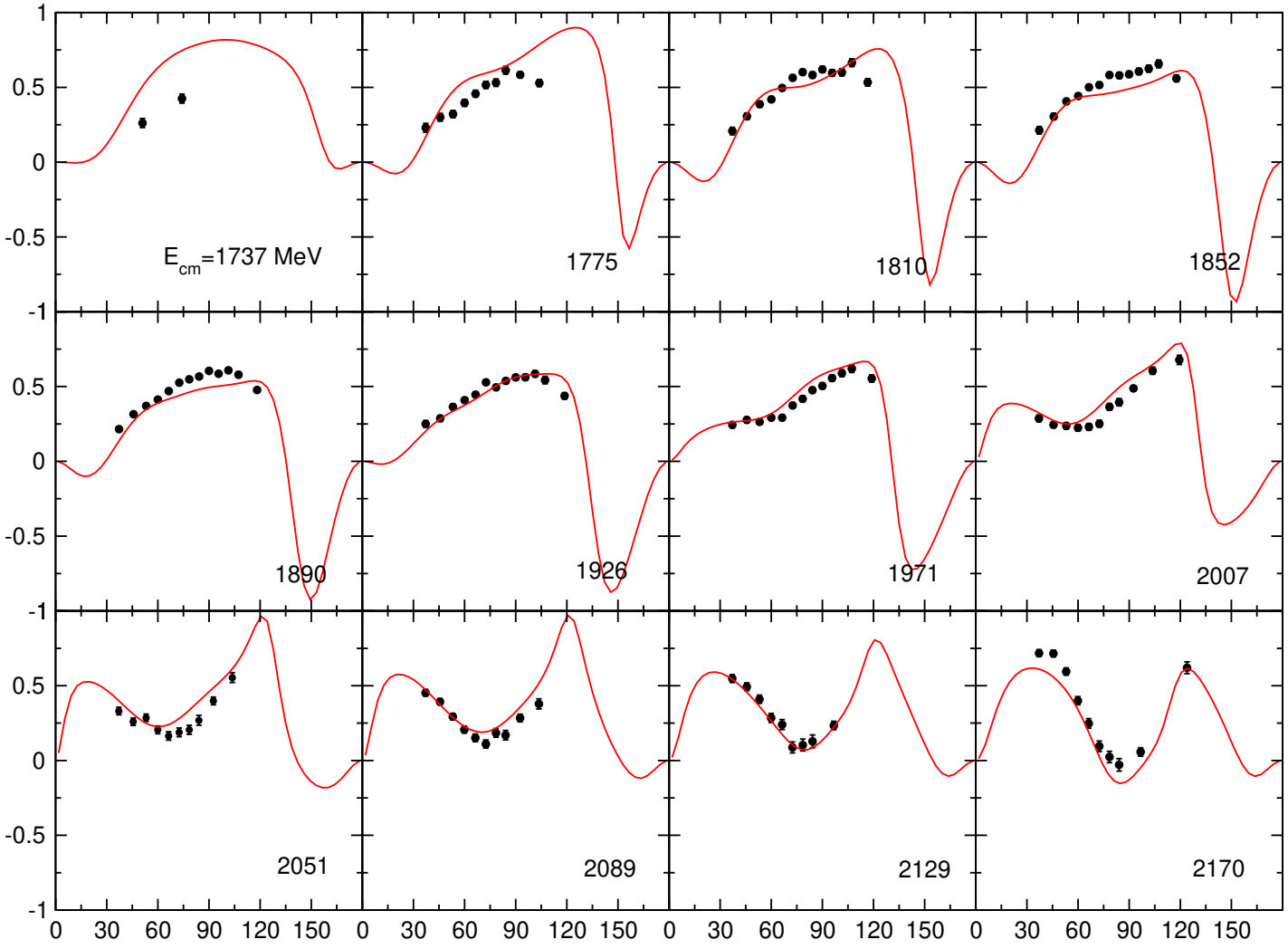
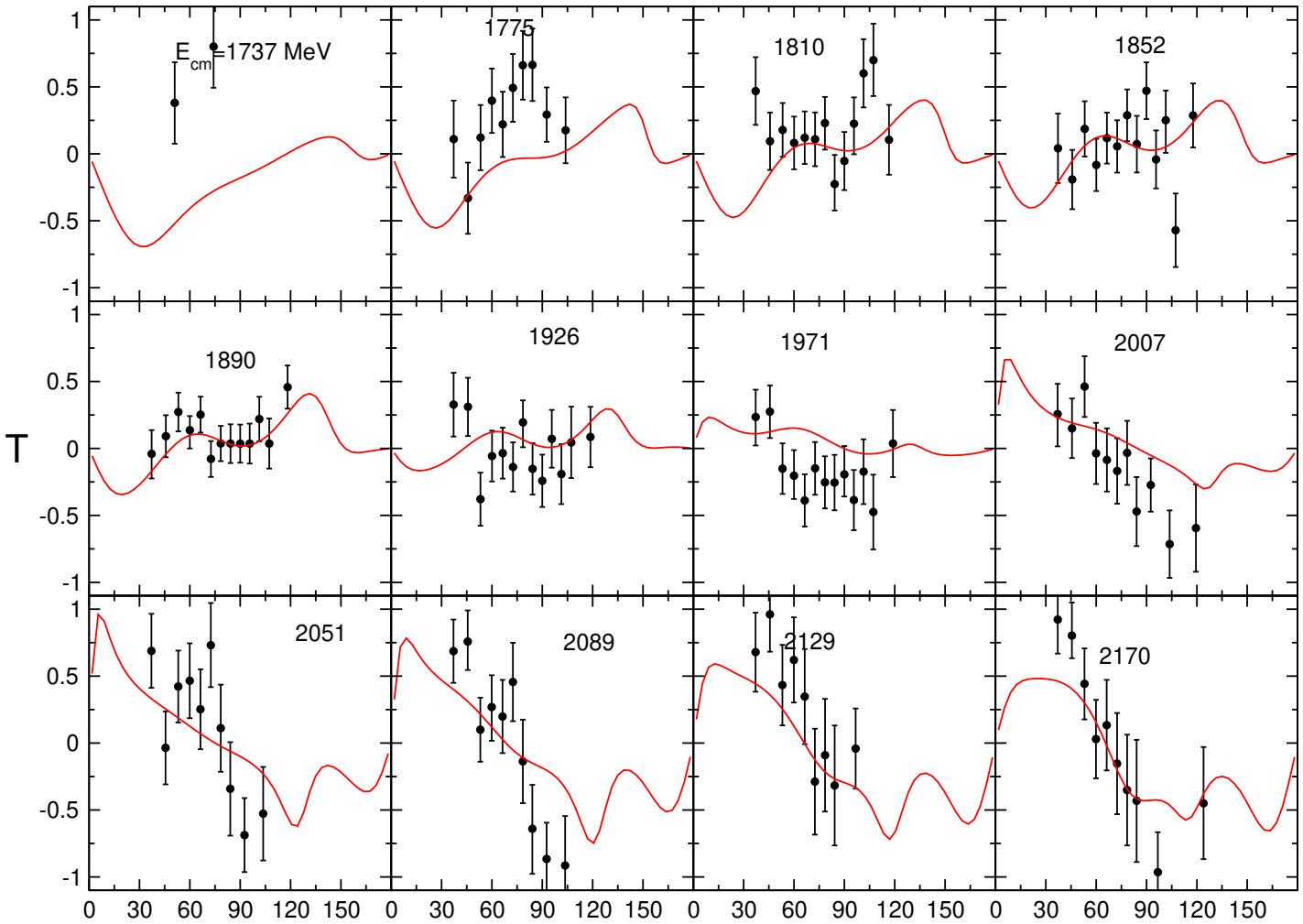
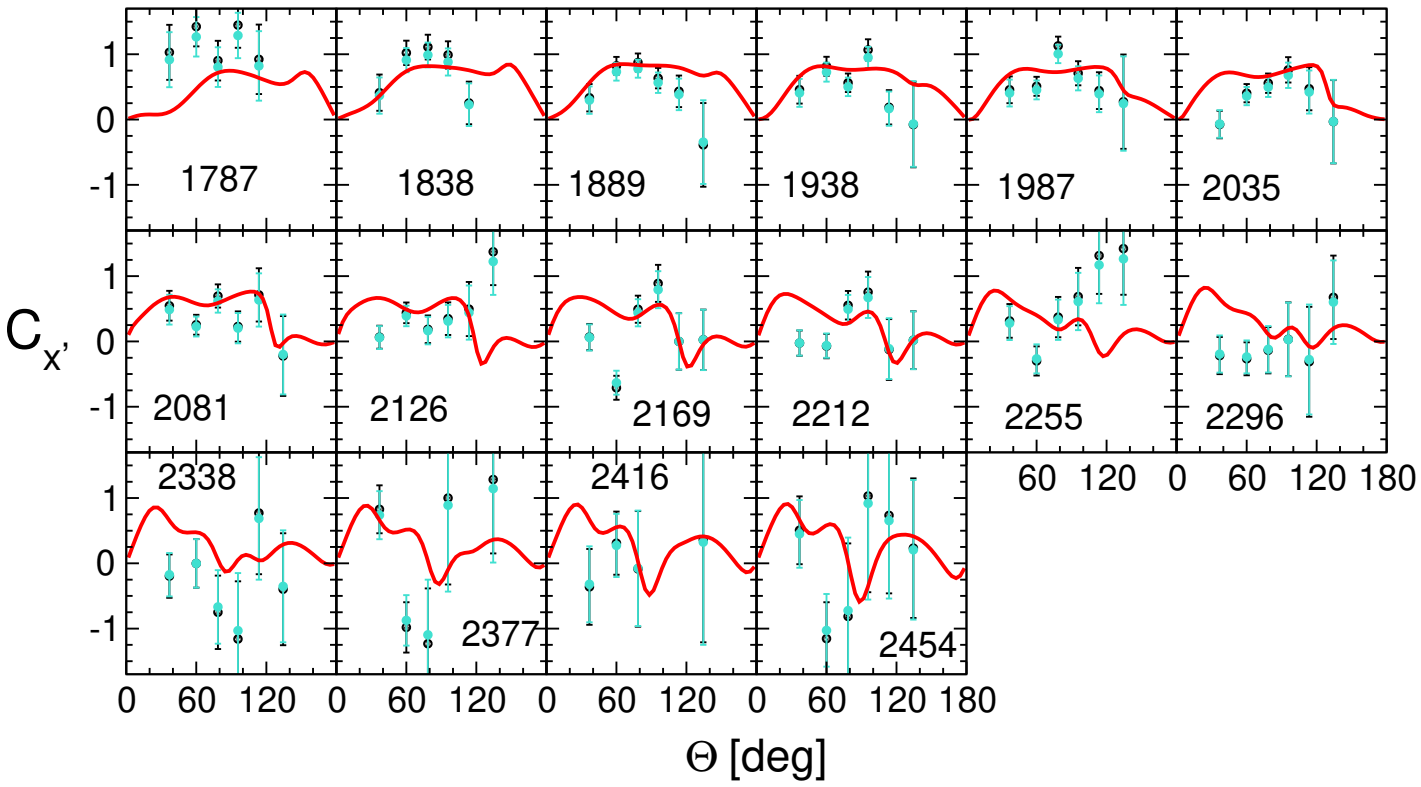
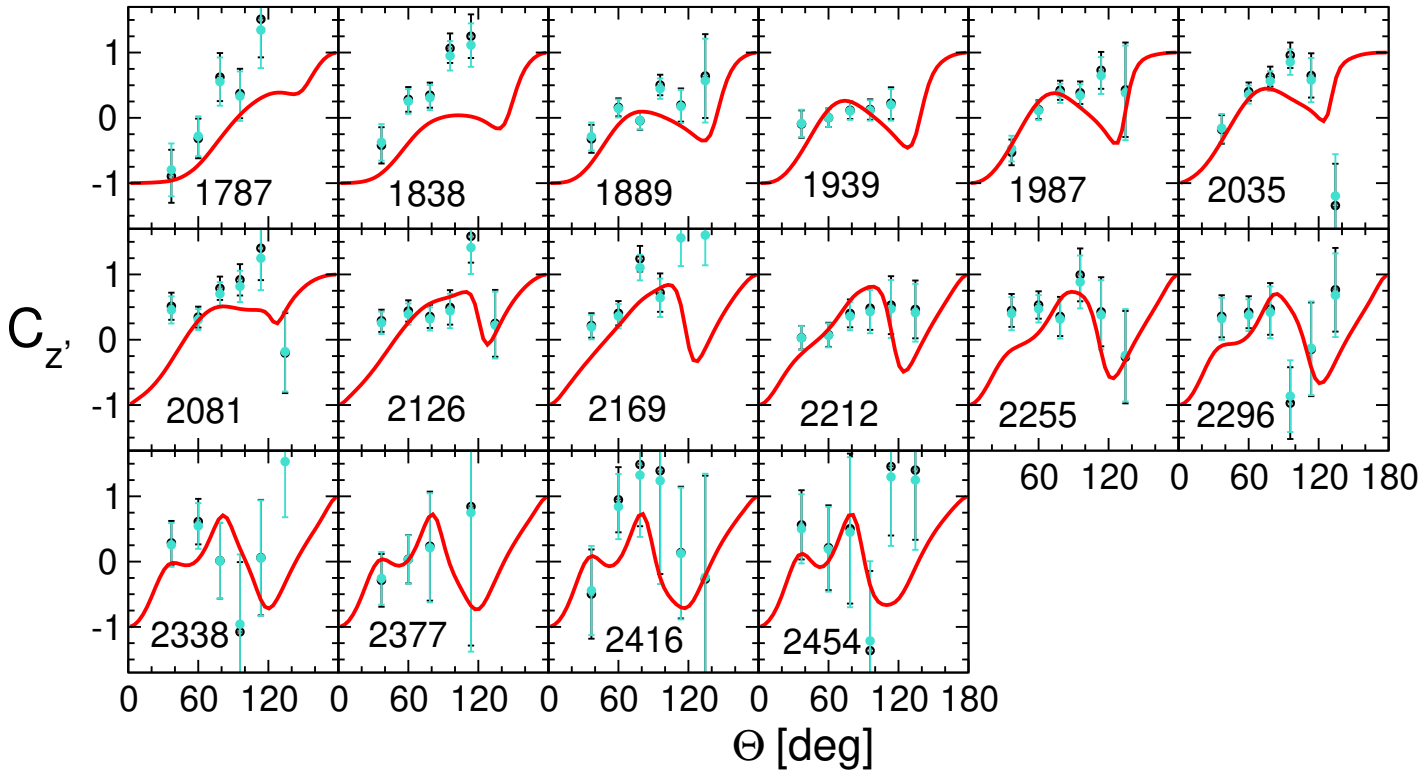
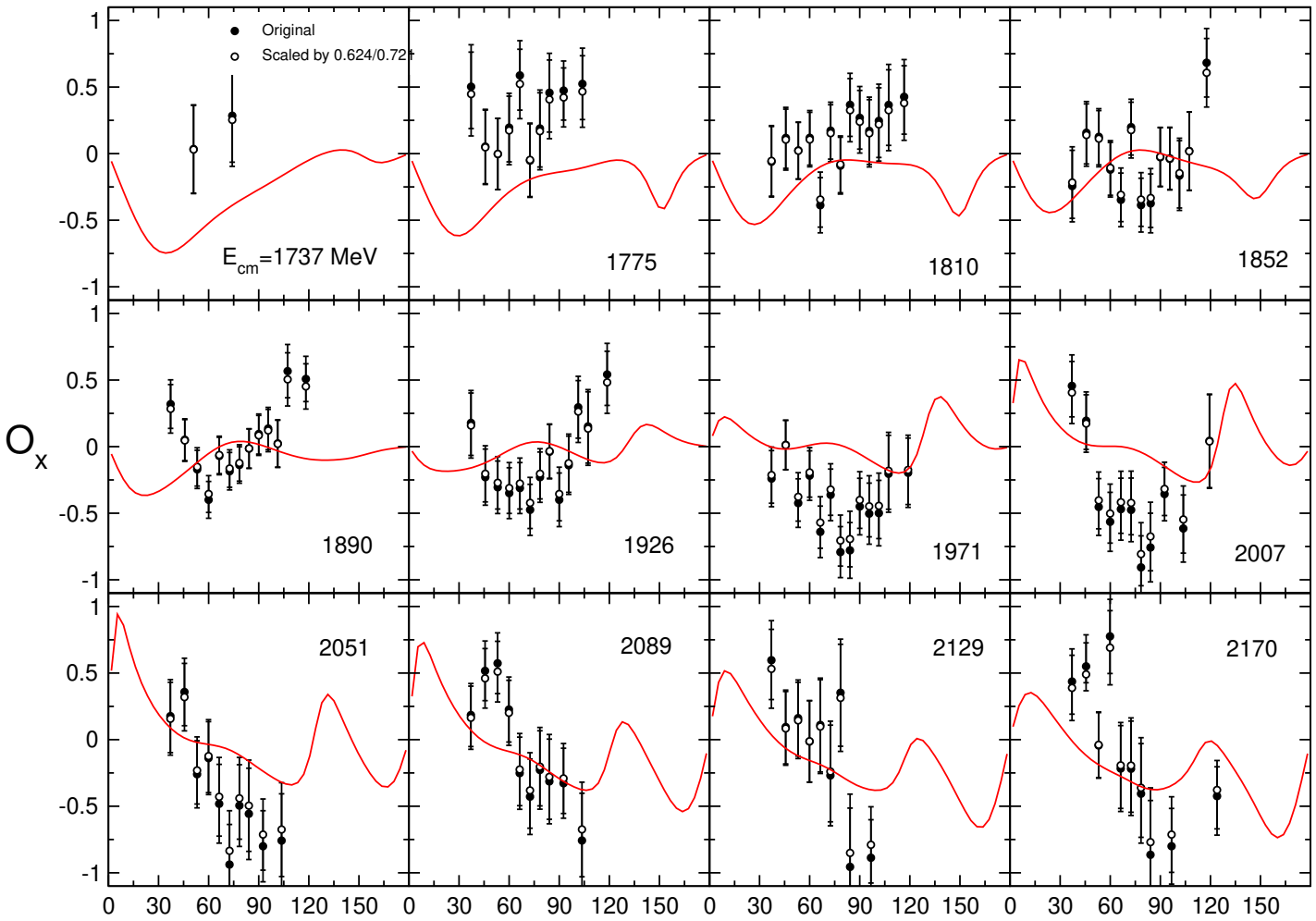


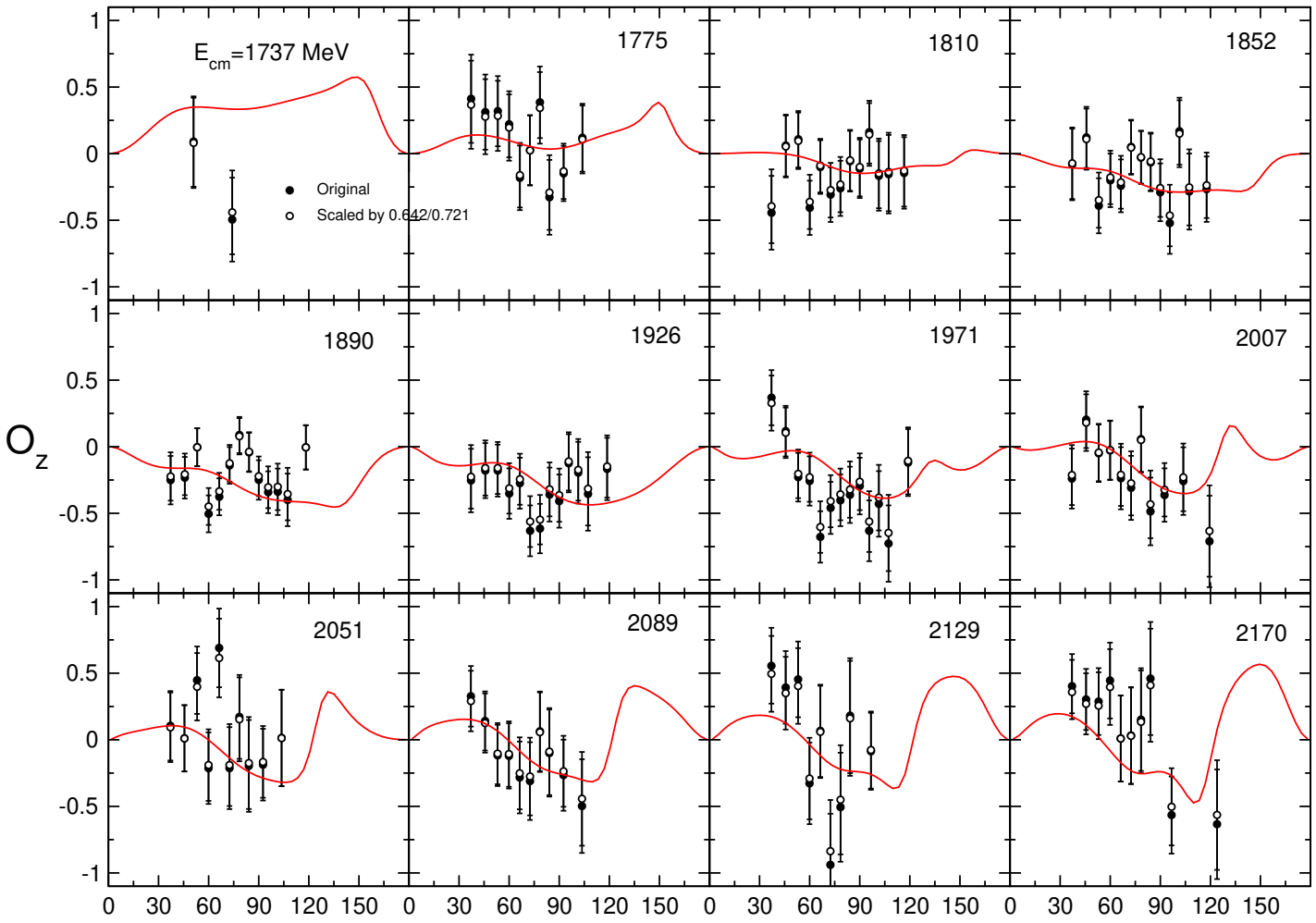
Figure 1: C. A. Paterson et al. (CLAS) PRC 93, 065201 (2016)


T
E_cm=1737 MeV
1775
1810
1852
1890
1926
1971
2007
2051
2089
2129
2170
1
0.5
0
-0.5
-1
0
30
60
90
120
150


1787
1838
1889
1938
1987
2035
2081
2126
2169
2212
2255
2296
2338
2377
2416
2454
C_x'
Θ [deg]


C_z'
1787
1838
1889
1939
1987
2035
2081
2126
2169
2212
2255
2296
2338
2377
2416
2454
Θ [deg]


Original
Scaled by 0.624/0.72
E_cm=1737 MeV
1775
1810
1852
1890
1926
1971
2007
2051
2089
2129
2170
O_x
1
0.5
0
-0.5
-1
0 30 60 90 120 150


E_cm=1737 MeV
1775
1810
1852
1890
1926
1971
2007
2051
2089
2129
2170
Original
Scaled by 0.642/0.721
O_z
1
0.5
0
-0.5
-1
0
30
60
90
120
150

Data references

- Differential cross section $\gamma p \to K^+\Sigma^0$:
  - DE(10) JLAB DEY, PRC82, 025201(2010)
  - GL(04) BONN GLANDER, EPJA19, 251(2004)
  - BO(94) BONN BOCKHORST, ZPC63, 37(1994)
  - BR(60) CALT BRODY, PR119, 1710(1960)
  - MC(04) CLAS MCNABB, PRC69, 042201(2004)
  - AN(65)P CORN ANDERSON, ISEPIHE, HAMBURG
  - BR(06) JLAB BRADFORD, PRC73, 035202(2006)
  - TR(98) BONN TRAN, PLB445, 20(1998)
  - AN(65)P CORN ANDERSON, ISEPIHE, HAMBURG
  - DC(70)P ORSA DECAMP, LAL-1236, 1970, FOURNER
  - AN(62) CORN ANDERSON, PRL9, 131(1962)
  - FU(70) TOKY FUJII, PRD2, 439 (1970)
  - BL(70) BONN BLECKMANN, ZP239, 1(1970)
  - GO(71) DESY GOEING, NPB26, 121(1971)
  - FE(72) BONN FELLER, NPB39, 413(1972)
  - SU(06) LEPS SUMIHAMA, PRC73, 035214(2006)
  - KO(06) LEPS KOHRI, PRL97, 082003(2006)
  - JU(14) MAMI PLB 735, 112 (2014)
  - BGOOD (T. C. Jude et al.) PLB 820, 136559 (2021)
- Beam asymmetry Σ $\gamma p \to K^+\Sigma^0$:
  - LL(07) GRAA LLERES, EPJA31, 79(2007)
  - ZE(03) SPRI ZEGERS, PRL (2003)
  - SU(06) LEPS SUMIHAMA, PRC73, 035214(2006)
  - KO(06) LEPS KOHRI, PRL97, 082003(2006)
  - Paterson *et al.* [CLAS Collaboration] PRC93, 065201 (2016)
- Recoil Polarization $\gamma p \to K^+\Sigma^0$:
  - BO(94) BONN BOCKHORST, ZPC63, 37(1994)
  - DE(10) JLAB DEY, PRC82, 025201(2010)
  - TR(98) BONN TRAN, PLB445, 20(1998)
  - GL(04) BONN GLANDER, EPJA19, 251(2004)
  - MC(04) CLAS MCNABB, PRC69, 042201(2004)
  - LL(07) GRAA LLERES, EPJA31, 79(2007)
- Target asymmetry T $\gamma p \to K^+\Sigma^0$:
  - Paterson *et al.* [CLAS Collaboration] PRC93, 065201 (2016)
- C_x $\gamma p \to K^+\Sigma^0$:
  - BR(07) JLAB BRADFORD, PRC75, 035205(2007)
- C_z $\gamma p \to K^+\Sigma^0$:
  - BR(07) JLAB BRADFORD, PRC75, 035205(2007)
- O_x $\gamma p \to K^+\Sigma^0$:
  - Paterson *et al.* [CLAS Collaboration] PRC93, 065201 (2016)
- O_z $\gamma p \to K^+\Sigma^0$:
  - Paterson *et al.* [CLAS Collaboration] PRC93, 065201 (2016)

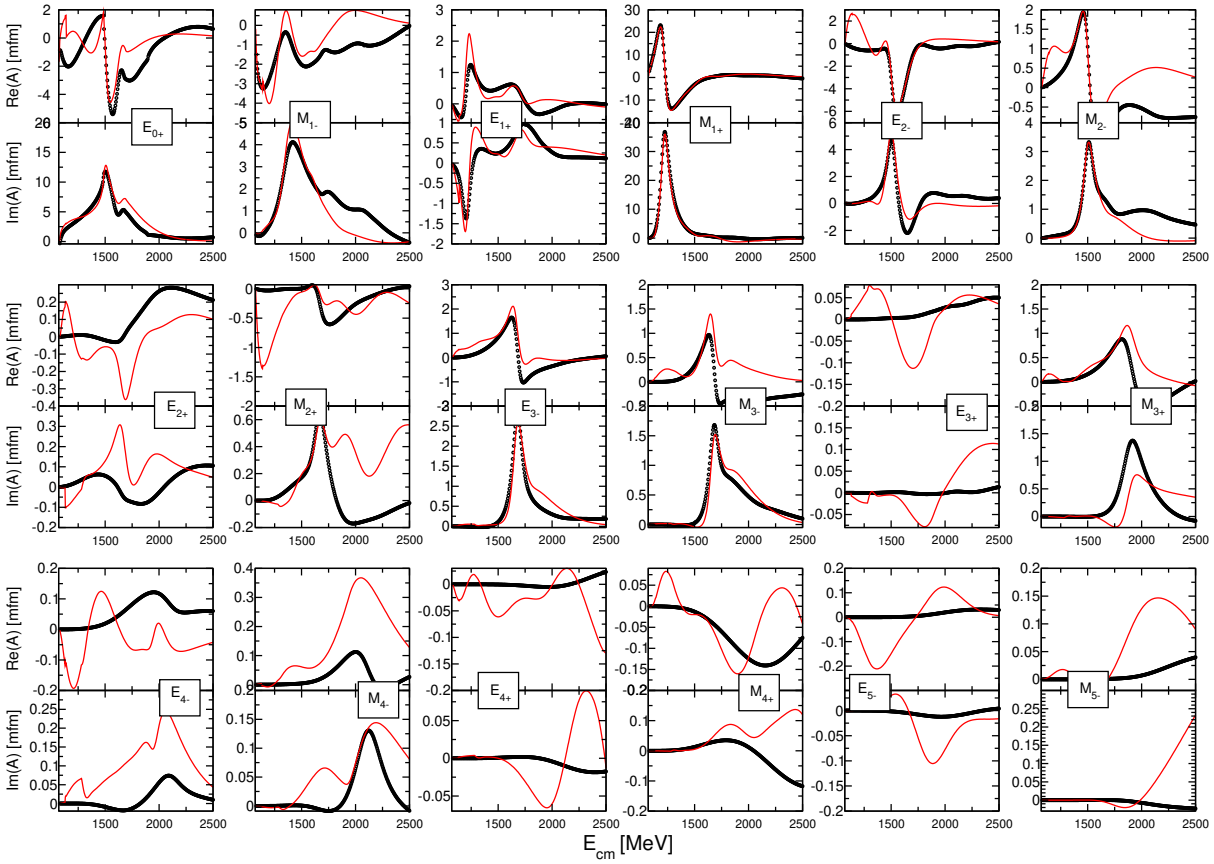


Figure 1: (Solid) red lines: JüBo2026. (Dashed) black lines: Bonn-Gatchina solution BG 2019 (Phys. Lett. B 803, 135323 (2020)) .

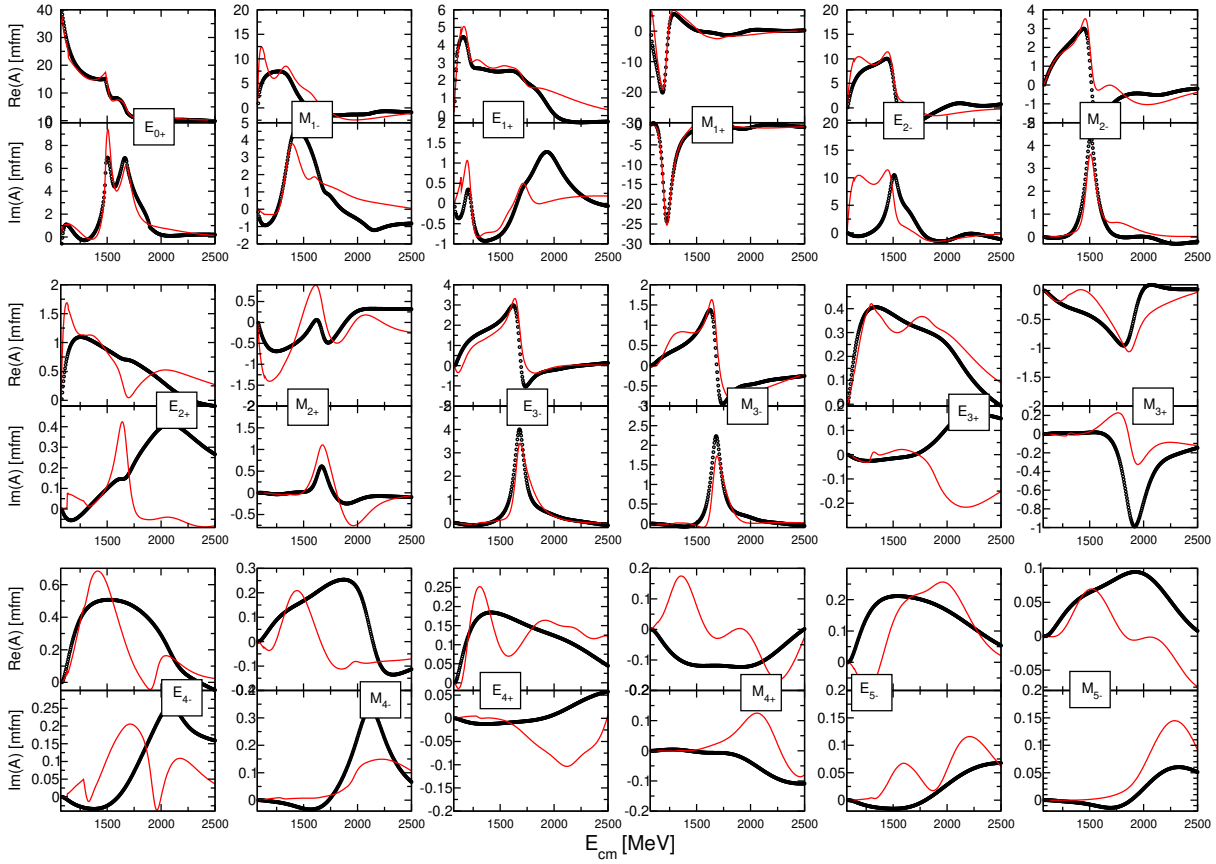


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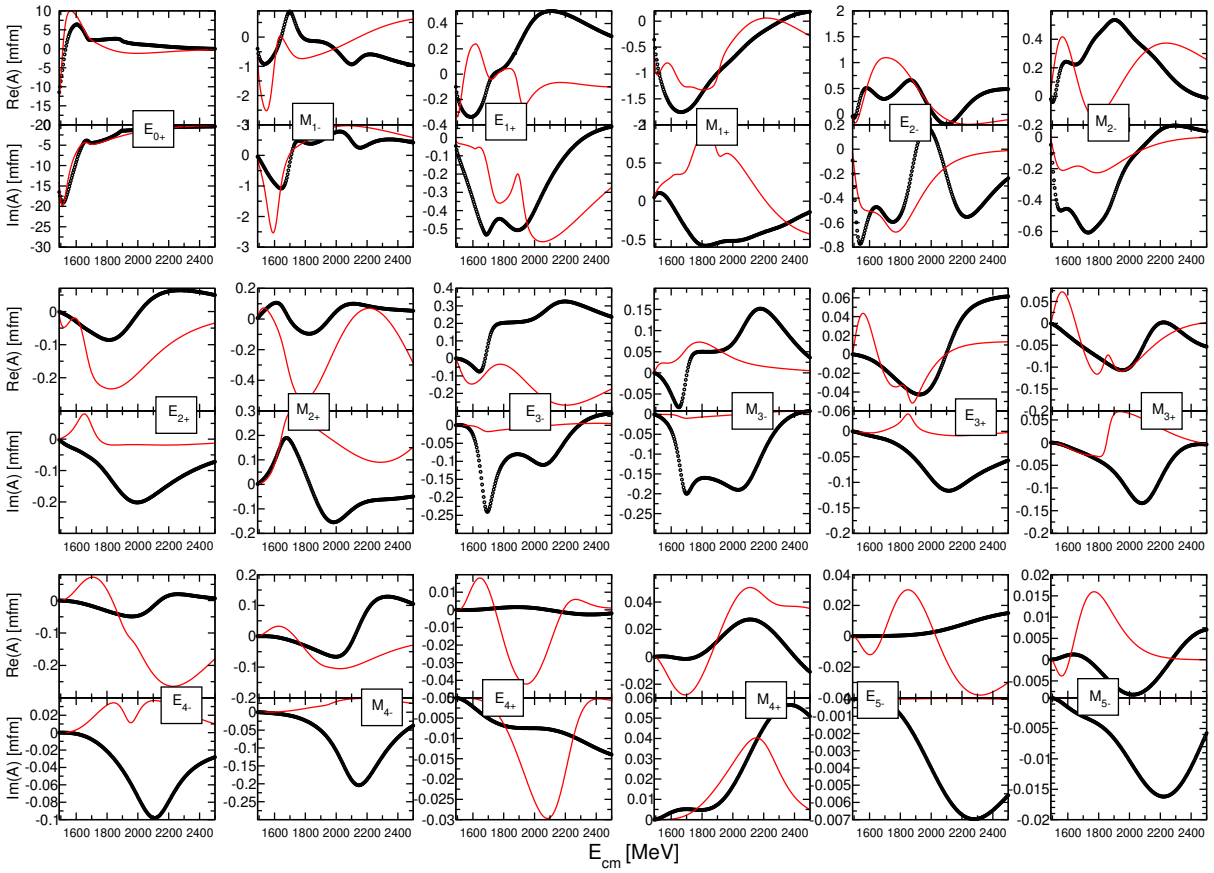


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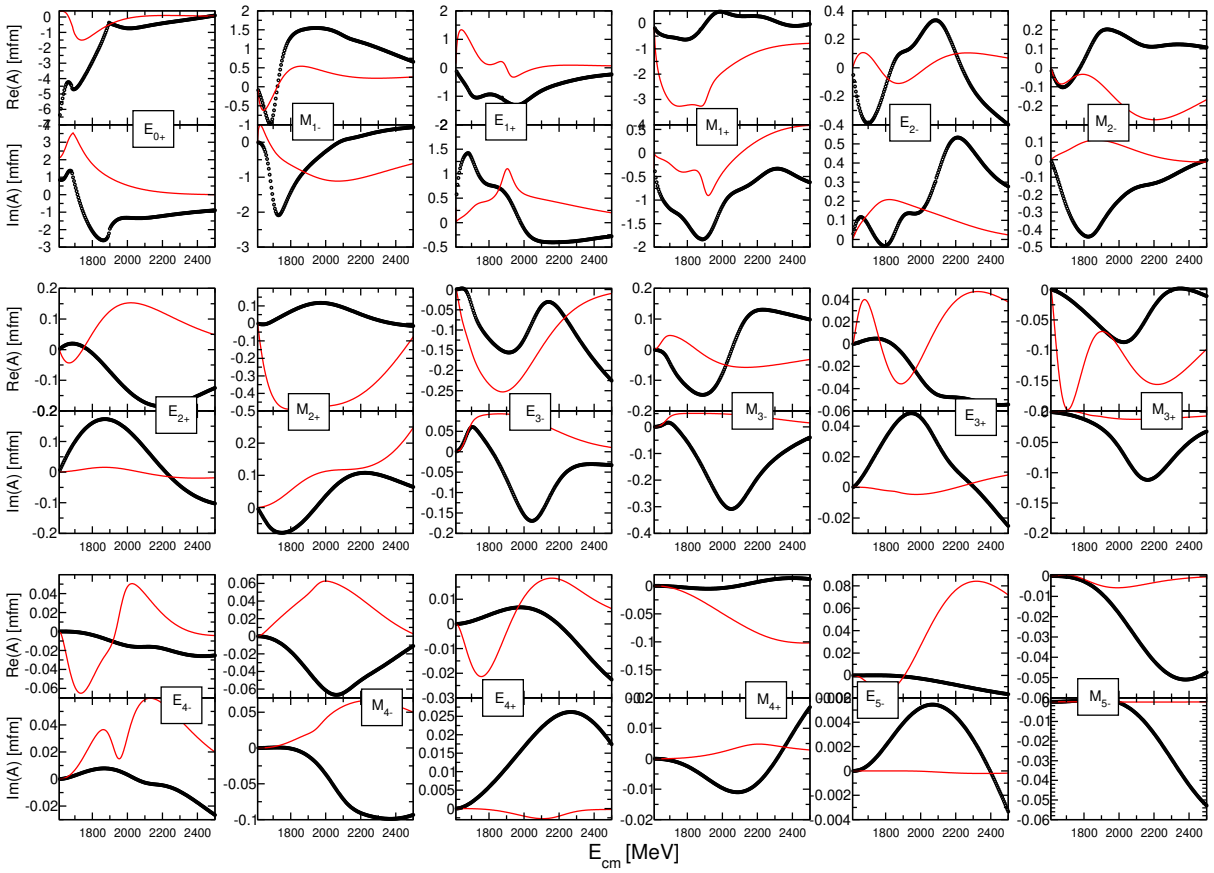


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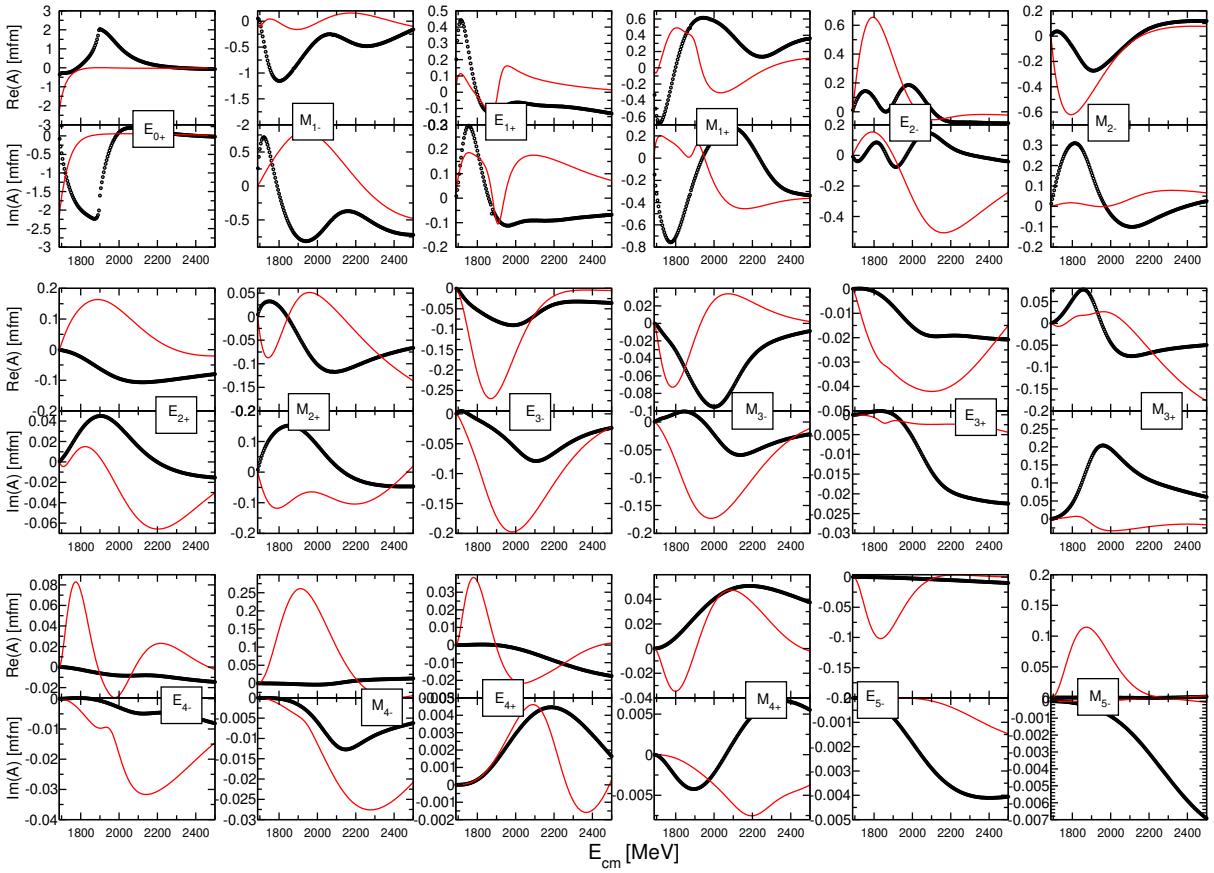


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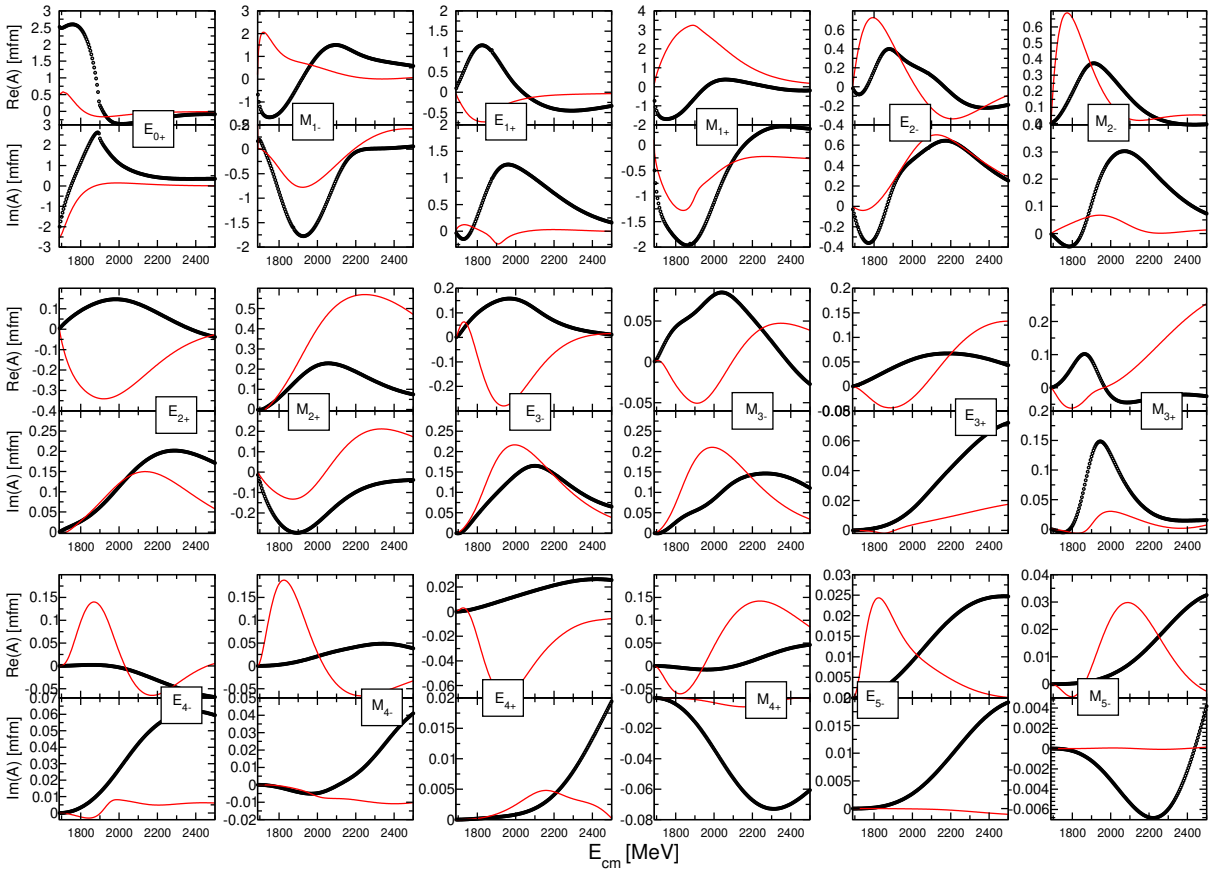


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