Multiple Night Observations

Figure 8 (row 2, column 3). For each of the 10 asteroids, we averaged the distances from all 15 observations, and find the residuals by comparison with NASA JPL Horizons Data

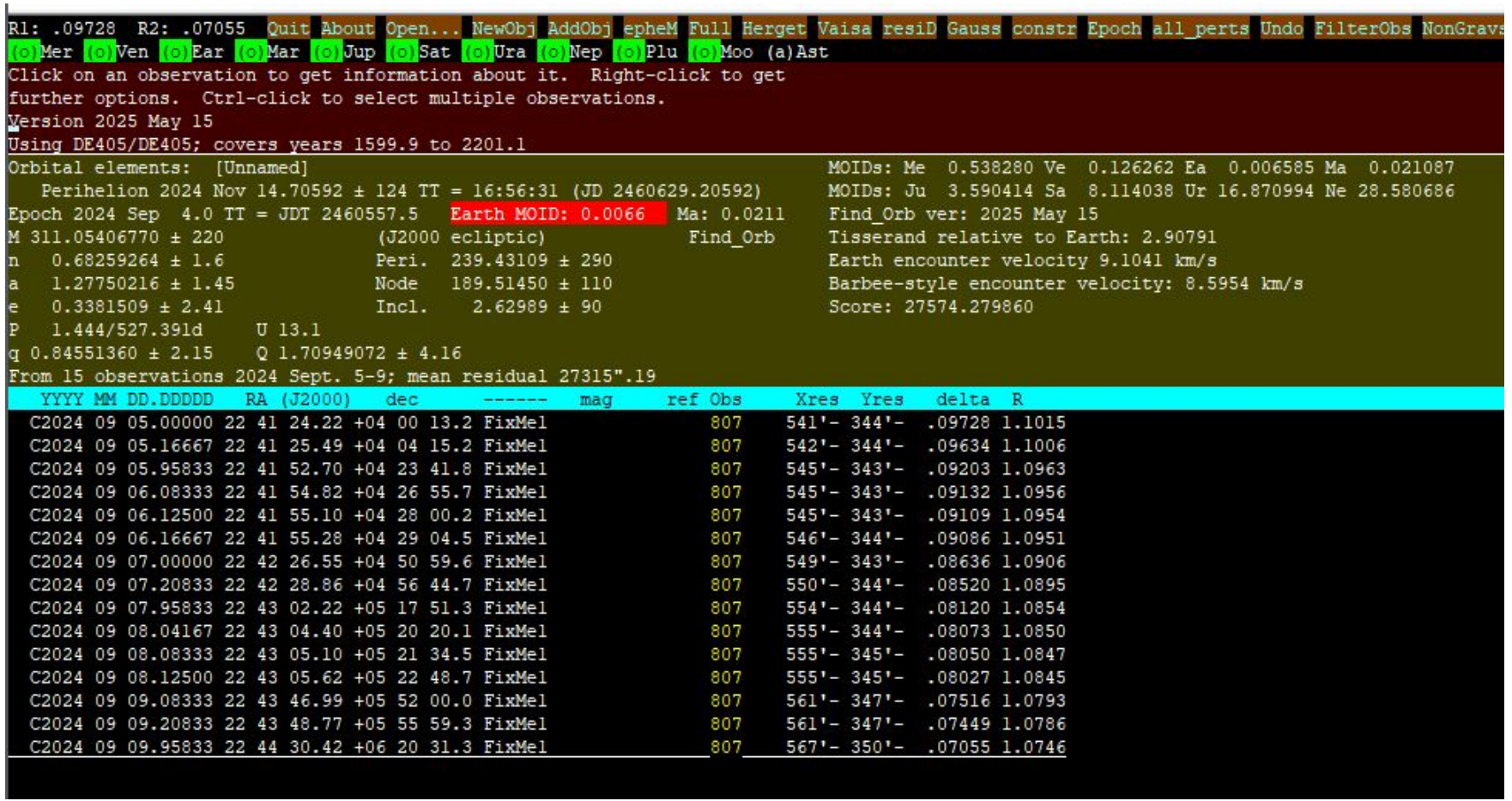
2024 ON

```
R1: .06326  R2: .03857  Quit About Open... NewObj AddObj epheM Full Herget Vaisa resiD Gauss constr Epoch all_perts Undo FilterObs NonGravs
(o)Mer (o)Ven (o)Ear (o)Mar (o)Jup (o)Sat (o)Ura (o)Nep (o)Plu (o)Moo (a)Ast
Click on an observation to get information about it.  Right-click to get
further options.  Ctrl-click to select multiple observations.
Version 2025 May 15
Using DE405/DE405; covers years 1599.9 to 2201.1
Orbital elements:  [Unnamed]                                  MOIDs: Me  0.641602 Ve  0.282747 Ea  0.002932 Ma  0.219444
   Perihelion 2024 Sep 20.05642 ± 0.00352 TT =  1:21:15 (JD 2460573.55642)   MOIDs: Ju  1.708188 Sa  5.692452 Ur 14.552397 Ne 26.502534
Epoch 2024 Sep  4.0 TT = JDT 2460557.5   Earth MOID: 0.0029     Find_Orb    Find_Orb ver: 2025 May 15
M 355.66368499 ± 0.017          (J2000 ecliptic)                Tisserand relative to Earth: 2.91779
n   0.27006728 ± 0.00101        Peri.  185.37586 ± 0.0022       Tisserand relative to Jupiter: 3.28930
a   2.37039868 ± 0.00593        Node   172.33743 ± 0.0013       Earth encounter velocity 8.6015 km/s
e   0.5751792 ± 0.00106         Incl.    7.74239 ± 0.009        Barbee-style encounter velocity: 8.8347 km/s
P   3.64949           U  8.1                                    Score: 0.320885
q 1.00699457 ± 4.48e-6    Q 3.73380279 ± 0.0119
From 15 observations 2024 Sept. 5-9; mean residual 0".03
   YYYY MM DD.DDDDD   RA (J2000)   dec       ------   mag     ref Obs     Xres  Yres   delta  R
  C2024 09 05.00000 17 56 23.36 +05 34 10.7 FixMel              807     .03+  .00   .06326 1.0257
  C2024 09 05.16667 17 56 21.27 +05 29 26.7 FixMel              807     .02-  .01+  .06245 1.0253
  C2024 09 05.95833 17 56 55.41 +05 05 44.3 FixMel              807     .01-  .02+  .05850 1.0235
  C2024 09 06.08333 17 56 53.34 +05 01 38.9 FixMel              807     .01+  .00   .05788 1.0232
  C2024 09 06.12500 17 56 53.16 +05 00 14.5 FixMel              807     .01+  .00   .05768 1.0231
  C2024 09 06.16667 17 56 53.45 +04 58 49.0 FixMel              807     .01-  .02+  .05748 1.0230
  C2024 09 07.00000 17 57 35.22 +04 28 57.5 FixMel              807     .07+  .06-  .05331 1.0211
  C2024 09 07.20833 17 57 36.49 +04 20 34.0 FixMel              807     .06-  .04-  .05231 1.0207
  C2024 09 07.95833 17 58 27.86 +03 48 05.9 FixMel              807     .01+  .00   .04854 1.0192
  C2024 09 08.04167 17 58 27.39 +03 44 09.1 FixMel              807     .06-  .02-  .04812 1.0190
  C2024 09 08.08333 17 58 27.48 +03 42 08.2 FixMel              807     .01-  .00   .04792 1.0189
  C2024 09 08.12500 17 58 28.01 +03 40 05.7 FixMel              807     .01-  .05+  .04772 1.0188
  C2024 09 09.08333 17 59 36.09 +02 48 26.6 FixMel              807     .03-  .04+  .04294 1.0170
  C2024 09 09.20833 17 59 41.45 +02 40 44.9 FixMel              807     .08+  .01-  .04234 1.0168
  C2024 09 09.95833 18 01 02.92 +01 50 04.1 FixMel              807     .01-  .01-  .03857 1.0155
```

2024 SJ

```
R1: .05684  R2: .09099  Quit About Open... NewObj AddObj epheM Full Herget Vaisa resiD Gauss constr Epoch all_perts Undo FilterObs NonGrav
(o)Mer (o)Ven (o)Ear (o)Mar (o)Jup (o)Sat (o)Ura (o)Nep (o)Plu (o)Moo (a)Ast
Click on an observation to get information about it.  Right-click to get
further options.  Ctrl-click to select multiple observations.
Version 2025 May 15
Using DE405/DE405; covers years 1599.9 to 2201.1
Orbital elements:  [Unnamed]                                    MOIDs: Me  0.226892 Ve  0.090843 Ea  0.021752 Ma  0.335070
   Perihelion 2024 May 26.26405 ± 5913 TT =  6:20:14 (JD 2460456.76405)     MOIDs: Ju  3.882326 Sa  8.208103 Ur 17.683526 Ne 28.781506
Epoch 2024 Sep  4.0 TT = JDT 2460557.5   Earth MOID: 0.0218   Ve: 0.0908    Find_Orb ver: 2025 May 15
M 128.13606987 ± 5800            (J2000 ecliptic)            Find_Orb     Tisserand relative to Earth: 2.80396
n   1.27199946 ±                 Peri.  211.24495 ± 2200                  Earth encounter velocity 13.2829 km/s
a   0.84361591 ±                 Node   338.39474 ± 140                   Barbee-style encounter velocity: 12.8682 km/s
e   0.3045687 ± 30               Incl.   22.32162 ± 1500                  Score: 122542.181105
P   0.775/283.014d     U 15.1
q 0.58667683 ± 29.4    Q 1.10055498 ± 7.69
From 15 observations 2024 Sept. 5-9; mean residual 130657".62
   YYYY MM DD.DDDDD   RA (J2000)   dec      ------   mag     ref Obs     Xres  Yres   delta  R
  C2024 09 05.00000 20 14 17.28 +45 51 32.5 FixMel              807     636'+  55d+  .05684 1.0419
  C2024 09 05.16667 20 15 13.92 +45 50 50.8 FixMel              807     646'+  54d+  .05792 1.0424
  C2024 09 05.95833 20 20 35.50 +45 46 26.6 FixMel              807     696'+  51d+  .06310 1.0447
  C2024 09 06.08333 20 21 20.78 +45 45 54.9 FixMel              807     704'+  51d+  .06393 1.0450
  C2024 09 06.12500 20 21 35.76 +45 45 36.3 FixMel              807     707'+  51d+  .06421 1.0452
  C2024 09 06.16667 20 21 50.89 +45 45 13.7 FixMel              807     709'+  50d+  .06450 1.0453
  C2024 09 07.00000 20 27 46.22 +45 38 29.3 FixMel              807     766'+  48d+  .07014 1.0476
  C2024 09 07.20833 20 29 06.17 +45 36 22.7 FixMel              807     780'+  47d+  .07159 1.0482
  C2024 09 07.95833 20 34 46.86 +45 28 03.6 FixMel              807     835'+  45d+  .07678 1.0503
  C2024 09 08.04167 20 35 20.82 +45 27 18.3 FixMel              807     841'+  45d+  .07736 1.0505
  C2024 09 08.08333 20 35 37.56 +45 26 49.6 FixMel              807     845'+  45d+  .07766 1.0506
  C2024 09 08.12500 20 35 54.31 +45 26 16.5 FixMel              807     848'+  45d+  .07795 1.0507
  C2024 09 09.08333 20 43 19.62 +45 12 30.0 FixMel              807     923'+  43d+  .08472 1.0533
  C2024 09 09.20833 20 44 13.13 +45 10 12.5 FixMel              807     933'+  42d+  .08563 1.0536
  C2024 09 09.95833 20 50 27.91 +44 56 37.0 FixMel              807     997'+  41d+  .09099 1.0556
```

2024 RN15


R1: .09728 R2: .07055 Quit About Open... NewObj AddObj epheM Full Herget Vaisa resiD Gauss constr Epoch all_perts Undo FilterObs NonGravs
(o)Mer (o)Ven (o)Ear (o)Mar (o)Jup (o)Sat (o)Ura (o)Nep (o)Plu (o)Moo (a)Ast
Click on an observation to get information about it. Right-click to get
further options. Ctrl-click to select multiple observations.
Version 2025 May 15
Using DE405/DE405; covers years 1599.9 to 2201.1
Orbital elements: [Unnamed]
Perihelion 2024 Nov 14.70592 ± 124 TT = 16:56:31 (JD 2460629.20592)
Epoch 2024 Sep 4.0 TT = JDT 2460557.5
Earth MOID: 0.0066
Ma: 0.0211
M 311.05406770 ± 220 (J2000 ecliptic) Find_Orb
n 0.68259264 ± 1.6 Peri. 239.43109 ± 290
a 1.27750216 ± 1.45 Node 189.51450 ± 110
e 0.3381509 ± 2.41 Incl. 2.62989 ± 90
P 1.444/527.391d U 13.1
q 0.84551360 ± 2.15 Q 1.70949072 ± 4.16
From 15 observations 2024 Sept. 5-9; mean residual 27315".19
MOIDs: Me 0.538280 Ve 0.126262 Ea 0.006585 Ma 0.021087
MOIDs: Ju 3.590414 Sa 8.114038 Ur 16.870994 Ne 28.580686
Find_Orb ver: 2025 May 15
Tisserand relative to Earth: 2.90791
Earth encounter velocity 9.1041 km/s
Barbee-style encounter velocity: 8.5954 km/s
Score: 27574.279860
YYYY MM DD.DDDDD RA (J2000) dec ------ mag ref Obs Xres Yres delta R
C2024 09 05.00000 22 41 24.22 +04 00 13.2 FixMel 807 541'- 344'- .09728 1.1015
C2024 09 05.16667 22 41 25.49 +04 04 15.2 FixMel 807 542'- 344'- .09634 1.1006
C2024 09 05.95833 22 41 52.70 +04 23 41.8 FixMel 807 545'- 343'- .09203 1.0963
C2024 09 06.08333 22 41 54.82 +04 26 55.7 FixMel 807 545'- 343'- .09132 1.0956
C2024 09 06.12500 22 41 55.10 +04 28 00.2 FixMel 807 545'- 343'- .09109 1.0954
C2024 09 06.16667 22 41 55.28 +04 29 04.5 FixMel 807 546'- 344'- .09086 1.0951
C2024 09 07.00000 22 42 26.55 +04 50 59.6 FixMel 807 549'- 343'- .08636 1.0906
C2024 09 07.20833 22 42 28.86 +04 56 44.7 FixMel 807 550'- 344'- .08520 1.0895
C2024 09 07.95833 22 43 02.22 +05 17 51.3 FixMel 807 554'- 344'- .08120 1.0854
C2024 09 08.04167 22 43 04.40 +05 20 20.1 FixMel 807 555'- 344'- .08073 1.0850
C2024 09 08.08333 22 43 05.10 +05 21 34.5 FixMel 807 555'- 345'- .08050 1.0847
C2024 09 08.12500 22 43 05.62 +05 22 48.7 FixMel 807 555'- 345'- .08027 1.0845
C2024 09 09.08333 22 43 46.99 +05 52 00.0 FixMel 807 561'- 347'- .07516 1.0793
C2024 09 09.20833 22 43 48.77 +05 55 59.3 FixMel 807 561'- 347'- .07449 1.0786
C2024 09 09.95833 22 44 30.42 +06 20 31.3 FixMel 807 567'- 350'- .07055 1.0746

2024 RJ16

```
R1: .10134  R2: .07555  Quit About Open... NewObj AddObj epheM Full Herget Vaisa resiD Gauss constr Epoch all_perts Undo FilterObs NonGravs
(o)Mer (o)Ven (o)Ear (o)Mar (o)Jup (o)Sat (o)Ura (o)Nep (o)Plu (o)Moo (a)Ast
Click on an observation to get information about it.  Right-click to get
further options.  Ctrl-click to select multiple observations.
Version 2025 May 15
Using DE405/DE405; covers years 1599.9 to 2201.1
Orbital elements:  [Unnamed]                                    MOIDs: Me  0.428646 Ve  0.115361 Ea  0.001117 Ma  0.321793
   Perihelion 2024 Dec 16.05968 ± 835 TT =  1:25:56 (JD 2460660.55968)      MOIDs: Ju  3.898502 Sa  8.291431 Ur 17.439356 Ne 28.854083
Epoch 2024 Sep  4.0 TT = JDT 2460557.5   Earth MOID: 0.0011     Find_Orb    Find_Orb ver: 2025 May 15
M 252.77474736 ± 1000            (J2000 ecliptic)                        Tisserand relative to Earth: 2.88626
n   1.04041906 ± 2.48            Peri.  292.70308 ± 200                   Earth encounter velocity 10.1175 km/s
a   0.96456281 ± 1.08            Node   180.30918 ± 800                   Barbee-style encounter velocity: 9.6725 km/s
e   0.2389520 ± 2.14             Incl.   14.14350 ± 380                   Score: 121747.251327
P   0.947/346.008d     U 13.4
q 0.73407859 ± 2.51    Q 1.19504703 ± 0.988
From 15 observations 2024 Sept. 5-9; mean residual 121679".88
   YYYY MM DD.DDDDD   RA (J2000)   dec       ------   mag     ref Obs     Xres  Yres   delta  R
  C2024 09 05.00000 22 02 08.88 -04 00 07.6 FixMel               807    329'-  49d-  .10134 1.0736
  C2024 09 05.16667 22 02 27.07 -03 59 18.2 FixMel               807    314'-  49d-  .10045 1.0731
  C2024 09 05.95833 22 04 18.36 -03 55 06.7 FixMel               807    243'-  48d-  .09631 1.0704
  C2024 09 06.08333 22 04 33.98 -03 54 28.6 FixMel               807    231'-  48d-  .09564 1.0700
  C2024 09 06.12500 22 04 38.90 -03 54 15.4 FixMel               807    227'-  48d-  .09541 1.0699
  C2024 09 06.16667 22 04 43.79 -03 54 01.9 FixMel               807    223'-  48d-  .09520 1.0697
  C2024 09 07.00000 22 06 50.99 -03 49 22.3 FixMel               807    8436-  48d-  .09085 1.0669
  C2024 09 07.20833 22 07 18.48 -03 48 12.0 FixMel               807    7072-  48d-  .08975 1.0662
  C2024 09 07.95833 22 09 25.31 -03 43 43.1 FixMel               807    2235-  47d-  .08587 1.0637
  C2024 09 08.04167 22 09 38.06 -03 43 14.4 FixMel               807    1652-  47d-  .08542 1.0634
  C2024 09 08.08333 22 09 44.15 -03 42 59.7 FixMel               807    1354-  47d-  .08520 1.0632
  C2024 09 08.12500 22 09 50.14 -03 42 44.7 FixMel               807    1054-  47d-  .08498 1.0631
  C2024 09 09.08333 22 12 41.14 -03 36 39.1 FixMel               807    5843+  47d-  .08003 1.0598
  C2024 09 09.20833 22 13 00.93 -03 35 49.7 FixMel               807    6841+  47d-  .07938 1.0594
  C2024 09 09.95833 22 15 31.93 -03 30 40.2 FixMel               807    212'+  46d-  .07555 1.0567
```

2024 RO2

```
R1: .20662  R2: .04967  Quit About Open... NewObj AddObj epheM Full Herget Vaisa resiD Gauss constr Epoch all_perts Undo FilterObs NonGrav
(o)Mer (o)Ven (o)Ear (o)Mar (o)Jup (o)Sat (o)Ura (o)Nep (o)Plu (o)Moo (a)Ast
Click on an observation to get information about it.  Right-click to get
further options.  Ctrl-click to select multiple observations.
Version 2025 May 15
Using DE405/DE405; covers years 1599.9 to 2201.1
Orbital elements:  [Unnamed]                                    MOIDs: Me  0.080565 Ve  0.031968 Ea  0.032721 Ma  0.129629
   Perihelion 2024 Sep 27.91504 ± 12.7 TT = 21:57:39 (JD 2460581.41504)    MOIDs: Ju  0.160847 Sa  0.337067 Ur  0.104210 Ne  0.318154
Epoch 2024 Sep  4.0 TT = JDT 2460557.5   Earth MOID: 0.0327   Ju: 0.1608    Find_Orb ver: 2025 May 15
q   0.34162908 ± 3.06            Ve: 0.0320   Me: 0.0806   Sa: 0.3371      Earth encounter velocity 80.7100 km/s
                                   Peri.  255.13413 ± 240     Find_Orb     Barbee-style encounter velocity: 102.8058 km/s
z  -6.5590166774 ± 17            Node   171.93414 ± 9                       Score: 44809.274805
e   3.2407508 ± 0                 Incl.   15.37656 ± 210
From 15 observations 2024 Sept. 5-9; mean residual 97991".97
   YYYY MM DD.DDDDD   RA (J2000)   dec       ------   mag     ref Obs     Xres  Yres   delta  R
 C2024 09 05.00000 22 10 12.93 +17 22 04.7 FixMel              807    217'+ 677'+  .20662 1.2046
 C2024 09 05.16667 22 10 10.87 +17 24 14.4 FixMel              807    241'+ 667'+  .19916 1.1969
 C2024 09 05.95833 22 10 20.23 +17 33 47.1 FixMel              807    387'+ 606'+  .16407 1.1603
 C2024 09 06.08333 22 10 19.52 +17 35 29.2 FixMel              807    415'+ 594'+  .15855 1.1546
 C2024 09 06.12500 22 10 18.98 +17 36 01.6 FixMel              807    425'+ 590'+  .15672 1.1526
 C2024 09 06.16667 22 10 18.39 +17 36 33.0 FixMel              807    436'+ 585'+  .15489 1.1507
 C2024 09 07.00000 22 10 30.14 +17 46 48.2 FixMel              807    709'+ 467'+  .11888 1.1123
 C2024 09 07.20833 22 10 28.16 +17 49 32.1 FixMel              807    805'+ 426'+  .11009 1.1027
 C2024 09 07.95833 22 10 43.08 +17 58 51.1 FixMel              807     22d+ 209'+  .07984 1.0681
 C2024 09 08.04167 22 10 43.16 +18 00 02.7 FixMel              807     24d+ 176'+  .07667 1.0643
 C2024 09 08.08333 22 10 42.92 +18 00 37.3 FixMel              807     24d+ 9524+  .07511 1.0623
 C2024 09 08.12500 22 10 42.55 +18 01 10.8 FixMel              807     25d+ 8452+  .07357 1.0604
 C2024 09 09.08333 22 10 59.89 +18 13 34.6 FixMel              807     58d+ 382'-  .04620 1.0164
 C2024 09 09.20833 22 10 59.07 +18 15 13.9 FixMel              807     66d+ 430'-  .04461 1.0106
 C2024 09 09.95833 22 11 20.52 +18 25 01.0 FixMel              807    109d+ 217'-  .04967 .97623
```

2024 SR4

```
R1: .10984  R2: .01520  Quit  About  Open...  NewObj  AddObj  epheM  Full  Herget  Vaisa  resiD  Gauss  constr  Epoch  all_perts  Undo  FilterObs  NonGravs  Caler
(o)Mer (o)Ven (o)Ear (o)Mar (o)Jup (o)Sat (o)Ura (o)Nep (o)Plu (o)Moo (a)Ast
Click on an observation to get information about it.  Right-click to get
further options.  Ctrl-click to select multiple observations.
Version 2025 May 15
Using DE405/DE405; covers years 1599.9 to 2201.1
Orbital elements:  [Unnamed]                                        MOIDs: Me  0.128441 Ve  0.003659 Ea  0.010669 Ma  0.128287
   Perihelion 2024 Oct 13.54490 ± 13.3 TT = 13:04:39 (JD 2460597.04490)     MOIDs: Ju  0.930802 Sa  1.970656 Ur  4.236518 Ne  6.125405
Epoch 2024 Sep  4.0 TT = JDT 2460557.5   Earth MOID: 0.0107   Ju: 0.9308    Find_Orb ver: 2025 May 15
q   0.36735812 ± 0.774           Ve: 0.0037                    Find_Orb     Earth encounter velocity 40.4959 km/s
                                   Peri.  277.29377 ± 80                   Barbee-style encounter velocity: 68.3296 km/s
z  -0.5455767782 ± 0.538         Node   168.69090 ± 3.8                     Score: 27537.036571
e   1.2004220 ± 0               Incl.   16.57459 ± 52
From 15 observations 2024 Sept. 5-9; mean residual 72154".33
   YYYY MM DD.DDDDD   RA (J2000)   dec       ------   mag     ref Obs     Xres   Yres   delta  R
 C2024 09 05.00000 22 38 32.70 +14 31 35.2 FixMel              807     6778- 217'+  .10984 1.1133
 C2024 09 05.16667 22 38 31.79 +14 31 11.2 FixMel              807     5841- 210'+  .10604 1.1096
 C2024 09 05.95833 22 38 40.20 +14 28 19.9 FixMel              807      483- 168'+  .08817 1.0919
 C2024 09 06.08333 22 38 40.14 +14 27 57.0 FixMel              807      594+ 9599+  .08533 1.0891
 C2024 09 06.12500 22 38 39.86 +14 27 48.3 FixMel              807      974+ 9430+  .08439 1.0881
 C2024 09 06.16667 22 38 39.53 +14 27 38.8 FixMel              807     1364+ 9259+  .08345 1.0872
 C2024 09 07.00000 22 38 49.43 +14 23 48.3 FixMel              807     186'+ 4923+  .06482 1.0685
 C2024 09 07.20833 22 38 48.47 +14 22 50.6 FixMel              807     244'+ 3455+  .06018 1.0638
 C2024 09 07.95833 22 39 00.05 +14 18 29.3 FixMel              807     548'+ 3969-  .04381 1.0469
 C2024 09 08.04167 22 39 00.36 +14 18 03.6 FixMel              807     598'+ 5116-  .04201 1.0450
 C2024 09 08.08333 22 39 00.28 +14 17 49.9 FixMel              807     625'+ 5718-  .04112 1.0441
 C2024 09 08.12500 22 39 00.09 +14 17 35.5 FixMel              807     653'+ 6340-  .04023 1.0431
 C2024 09 09.08333 22 39 13.38 +14 10 58.8 FixMel              807      32d+ 491'-  .02141 1.0215
 C2024 09 09.20833 22 39 12.88 +14 10 03.3 FixMel              807      38d+ 562'-  .01944 1.0187
 C2024 09 09.95833 22 39 28.33 +14 03 45.9 FixMel              807      99d+ 411'-  .01520 1.0017
```

2022 QV1

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R1: .08437  R2: .04894  Quit About Open... NewObj AddObj epheM Full Herget Vaisa resiD Gauss constr Epoch all_perts Undo FilterObs NonGrav
(o)Mer (o)Ven (o)Ear (o)Mar (o)Jup (o)Sat (o)Ura (o)Nep (o)Plu (o)Moo (a)Ast
Click on an observation to get information about it.  Right-click to get
further options.  Ctrl-click to select multiple observations.
Version 2025 May 15
Using DE405/DE405; covers years 1599.9 to 2201.1
Orbital elements:  [Unnamed]                                  MOIDs: Me  0.632420 Ve  0.275788 Ea  0.000411 Ma  0.071835
   Perihelion 2024 Sep 18.10789 ± 16.1 TT =  2:35:21 (JD 2460571.60789)   MOIDs: Ju  0.084775 Sa  0.135729 Ur  0.249642 Ne  0.224582
Epoch 2024 Sep  4.0 TT = JDT 2460557.5   Earth MOID: 0.0004   Ju: 0.0848   Find_Orb ver: 2025 May 15
q   0.99916145 ± 0.0165          Ma: 0.0718   Sa: 0.1357   Ur: 0.2496     Earth encounter velocity 12.6051 km/s
                                   Peri.  191.08060 ± 33      Find_Orb    Barbee-style encounter velocity: 71.5179 km/s
z  -0.0057943776 ± 0.00028       Node   164.85740 ± 16                     Score: 10424.050165
e   1.0057895 ± 0               Incl.    2.19536 ± 3.8
From 15 observations 2024 Sept. 5-9; mean residual 10353".22
   YYYY MM DD.DDDDD   RA (J2000)   dec       ------   mag     ref Obs     Xres  Yres   delta  R
  C2024 09 05.00000 17 23 16.58 -17 35 13.1 FixMel                807     502+ 8471+  .08437 1.0243
  C2024 09 05.16667 17 23 37.04 -17 38 03.6 FixMel                807    1096+ 8481+  .08320 1.0237
  C2024 09 05.95833 17 25 20.29 -17 51 50.6 FixMel                807    3668+ 8718+  .07753 1.0208
  C2024 09 06.08333 17 25 35.87 -17 53 59.2 FixMel                807    4164+ 8757+  .07665 1.0204
  C2024 09 06.12500 17 25 41.15 -17 54 41.5 FixMel                807    4324+ 8768+  .07636 1.0203
  C2024 09 06.16667 17 25 46.50 -17 55 23.6 FixMel                807    4480+ 8778+  .07607 1.0201
  C2024 09 07.00000 17 27 37.78 -18 09 50.4 FixMel                807    7483+ 9260+  .07010 1.0173
  C2024 09 07.20833 17 28 04.96 -18 13 21.3 FixMel                807    8361+ 9376+  .06864 1.0167
  C2024 09 07.95833 17 29 48.08 -18 26 19.8 FixMel                807    189'+ 168'+  .06325 1.0144
  C2024 09 08.04167 17 29 59.00 -18 27 45.0 FixMel                807    196'+ 170'+  .06266 1.0141
  C2024 09 08.08333 17 30 04.51 -18 28 27.1 FixMel                807    199'+ 170'+  .06236 1.0140
  C2024 09 08.12500 17 30 10.08 -18 29 09.0 FixMel                807    203'+ 171'+  .06207 1.0139
  C2024 09 09.08333 17 32 23.96 -18 45 33.5 FixMel                807    278'+ 194'+  .05521 1.0112
  C2024 09 09.20833 17 32 41.32 -18 47 38.0 FixMel                807    289'+ 197'+  .05434 1.0109
  C2024 09 09.95833 17 34 29.53 -19 00 28.4 FixMel                807    357'+ 224'+  .04894 1.0090
```

2024 YR4

```
R1: .22972  R2: .21670  Quit About Open... NewObj AddObj epheM Full Herget Vaisa resiD Gauss constr Epoch all_perts Undo FilterObs NonGravs
(o)Mer (o)Ven (o)Ear (o)Mar (o)Jup (o)Sat (o)Ura (o)Nep (o)Plu (o)Moo (a)Ast
Click on an observation to get information about it.  Right-click to get
further options.  Ctrl-click to select multiple observations.
Version 2025 May 15
Using DE405/DE405; covers years 1599.9 to 2201.1
Orbital elements:  [Unnamed]                                    MOIDs: Me  0.598745 Ve  0.208577 Ea  0.022513 Ma  0.048902
   Perihelion 2024 Oct 28.59943 ± 1099 TT = 14:23:10 (JD 2460612.09943)     MOIDs: Ju  2.800489 Sa  7.077093 Ur 15.793688 Ne 27.688997
Epoch 2024 Sep  4.0 TT = JDT 2460557.5   Earth MOID: 0.0225   Ma: 0.0489    Find_Orb ver: 2025 May 15
M 337.38477142 ± 1300            (J2000 ecliptic)            Find_Orb     Tisserand relative to Earth: 2.89991
n   0.41420267 ±                 Peri.  100.04534 ± 1100                  Earth encounter velocity 9.4911 km/s
a   1.78235463 ±                 Node   294.98432 ± 60                    Barbee-style encounter velocity: 9.1584 km/s
e   0.4815419 ± 2.95             Incl.    1.89569 ± 30                    Score: 2375.804356
P   2.380/869.123d     U 14.0
q 0.92407602 ± 1.87    Q 2.64063324 ± 11.3
From 15 observations 2024 Sept. 5-9; mean residual 2379".56
    YYYY MM DD.DDDDD   RA (J2000)   dec       ------   mag     ref Obs     Xres  Yres   delta  R
  C2024 09 05.00000 18 25 33.61 -17 48 56.9 FixMel                807    4715-  584-  .22972 1.1239
  C2024 09 05.16667 18 25 25.33 -17 48 43.2 FixMel                807    4546-  651-  .22930 1.1228
  C2024 09 05.95833 18 24 51.89 -17 47 47.3 FixMel                807    3851-  962-  .22722 1.1179
  C2024 09 06.08333 18 24 46.02 -17 47 37.8 FixMel                807    3720- 1013-  .22689 1.1171
  C2024 09 06.12500 18 24 44.11 -17 47 34.2 FixMel                807    3677- 1031-  .22679 1.1168
  C2024 09 06.16667 18 24 42.25 -17 47 30.4 FixMel                807    3635- 1049-  .22669 1.1166
  C2024 09 07.00000 18 24 09.86 -17 46 30.7 FixMel                807    2880- 1387-  .22449 1.1114
  C2024 09 07.20833 18 24 01.15 -17 46 12.5 FixMel                807    2663- 1479-  .22397 1.1101
  C2024 09 07.95833 18 23 35.08 -17 45 19.0 FixMel                807    1978- 1793-  .22198 1.1055
  C2024 09 08.04167 18 23 31.76 -17 45 12.7 FixMel                807    1887- 1829-  .22176 1.1049
  C2024 09 08.08333 18 23 30.12 -17 45 09.3 FixMel                807    1842- 1847-  .22166 1.1047
  C2024 09 08.12500 18 23 28.52 -17 45 05.5 FixMel                807    1797- 1866-  .22155 1.1044
  C2024 09 09.08333 18 22 57.61 -17 43 53.4 FixMel                807     871- 2286-  .21902 1.0986
  C2024 09 09.20833 18 22 53.42 -17 43 41.6 FixMel                807     738- 2347-  .21871 1.0978
  C2024 09 09.95833 18 22 32.75 -17 42 46.7 FixMel                807    19.5- 2682-  .21670 1.0933
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2014 GL1

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R1: .55645  R2: .39231  Quit About Open... NewObj AddObj epheM Full Herget Vaisa residD Gauss constr Epoch all_perts Undo FilterObs NonGravs Cale
(o)Mer (o)Ven (o)Ear (o)Mar (o)Jup (o)Sat (o)Ura (o)Nep (o)Plu (o)Moo (a)Ast
Click on an observation to get information about it.  Right-click to get
further options.  Ctrl-click to select multiple observations.
Version 2025 May 15
Using DE405/DE405; covers years 1599.9 to 2201.1
Orbital elements:  [Unnamed]                                    MOIDs: Me  0.623956 Ve  0.276867 Ea  0.004084 Ma  0.008886
   Perihelion 2024 Sep 17.50036 ± 130 TT = 12:00:31 (JD 2460571.00036)   MOIDs: Ju  0.261480 Sa  0.609804 Ur  0.776622 Ne  1.964794
Epoch 2024 Sep  4.0 TT = JDT 2460557.5   Earth MOID: 0.0041   Ju: 0.2615   Find_Orb ver: 2025 May 15
q   1.00084760 ± 0.161          Ma: 0.0089   Sa: 0.6098   Ur: 0.7766      Earth encounter velocity 58.4675 km/s
                                 Peri.  348.26481 ± 80      Find_Orb      Barbee-style encounter velocity: 117.2104 km/s
z  -6.6947089094 ± 94.2          Node   358.55775 ± 100                    Score: 14661.703978
e   7.7003833 ± 95.5             Incl.    2.43858 ± 8
From 15 observations 2024 Sept. 5-9; mean residual 8020".58
   YYYY MM DD.DDDDD   RA (J2000)   dec       ------   mag     ref Obs     Xres  Yres   delta  R
  C2024 09 05.00000 16 41 46.03 -28 53 25.5 FixMel              807    5893- 171'-  .55645 1.1646
  C2024 09 05.16667 16 41 49.57 -28 52 43.3 FixMel              807    5876- 170'-  .55100 1.1606
  C2024 09 05.95833 16 42 09.56 -28 49 42.3 FixMel              807    5831- 9980-  .52492 1.1420
  C2024 09 06.08333 16 42 12.42 -28 49 12.1 FixMel              807    5820- 9947-  .52082 1.1392
  C2024 09 06.12500 16 42 13.43 -28 49 01.8 FixMel              807    5817- 9937-  .51945 1.1382
  C2024 09 06.16667 16 42 14.49 -28 48 51.3 FixMel              807    5815- 9927-  .51809 1.1373
  C2024 09 07.00000 16 42 37.66 -28 45 45.6 FixMel              807    5797- 9701-  .49055 1.1190
  C2024 09 07.20833 16 42 43.33 -28 44 55.2 FixMel              807    5791- 9648-  .48369 1.1146
  C2024 09 07.95833 16 43 06.34 -28 42 14.3 FixMel              807    5813- 9441-  .45882 1.0994
  C2024 09 08.04167 16 43 08.67 -28 41 55.3 FixMel              807    5812- 9418-  .45606 1.0977
  C2024 09 08.08333 16 43 09.87 -28 41 45.5 FixMel              807    5813- 9408-  .45469 1.0969
  C2024 09 08.12500 16 43 11.12 -28 41 35.6 FixMel              807    5813- 9397-  .45331 1.0961
  C2024 09 09.08333 16 43 42.53 -28 38 11.0 FixMel              807    5894- 9130-  .42147 1.0783
  C2024 09 09.20833 16 43 46.71 -28 37 41.9 FixMel              807    5908- 9098-  .41733 1.0761
  C2024 09 09.95833 16 44 13.56 -28 35 09.5 FixMel              807    6040- 8879-  .39231 1.0635
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Ceres

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R1: .25773  R2: .23965  Quit About Open... NewObj AddObj epheM Full Herget Vaisa resiD Gauss constr Epoch all_perts Undo FilterObs NonGra
(o)Mer (o)Ven (o)Ear (o)Mar (o)Jup (o)Sat (o)Ura (o)Nep (o)Plu (o)Moo (a)Ast
Click on an observation to get information about it.  Right-click to get
further options.  Ctrl-click to select multiple observations.
Version 2025 May 15
Using DE405/DE405; covers years 1599.9 to 2201.1
Orbital elements:  [Unnamed]                                    MOIDs: Me  0.694387 Ve  0.328794 Ea  0.049092 Ma  0.058277
   Perihelion 2024 Oct 7.44252 ± 229 TT = 10:37:13 (JD 2460590.94252)    MOIDs: Ju  0.411640 Sa  4.432263 Ur 13.202779 Ne 25.166286
Epoch 2024 Sep  4.0 TT = JDT 2460557.5   Earth MOID: 0.0491   Ju: 0.4116   Find_Orb ver: 2025 May 15
M 353.89871070 ± 320            Ma: 0.0583                  Find_Orb    Tisserand relative to Earth: 2.95215
n   0.18244106 ±                Peri.   14.65216 ± 180                  Tisserand relative to Jupiter: 2.84182
a   3.07884374 ±                Node   352.34438 ± 54                   Barbee-style encounter velocity: 8.3143 km/s
e   0.6595829 ± 5.72            Incl.    5.08301 ± 26                   Score: 2194.058343
P   5.40233          U 14.0
q 1.04809095 ± 0.395    Q 5.10959653 ± 46.8          (J2000 ecliptic)
From 15 observations 2024 Sept. 5-9; mean residual 2190".06
   YYYY MM DD.DDDDD   RA (J2000)   dec       ------   mag     ref Obs     Xres  Yres   delta  R
 C2024 09 05.00000 18 34 17.67 -30 53 41.3 FixMel               807    3672+ 2460+  .25773 1.1359
 C2024 09 05.16667 18 34 20.03 -30 53 35.1 FixMel               807    3623+ 2279+  .25714 1.1351
 C2024 09 05.95833 18 34 33.20 -30 53 08.9 FixMel               807    3225+ 1443+  .25426 1.1311
 C2024 09 06.08333 18 34 35.13 -30 53 04.5 FixMel               807    3185+ 1307+  .25380 1.1305
 C2024 09 06.12500 18 34 35.79 -30 53 02.7 FixMel               807    3170+ 1259+  .25366 1.1303
 C2024 09 06.16667 18 34 36.46 -30 53 01.0 FixMel               807    3153+ 1211+  .25351 1.1301
 C2024 09 07.00000 18 34 51.55 -30 52 31.4 FixMel               807    2691+  298+  .25047 1.1260
 C2024 09 07.20833 18 34 55.18 -30 52 22.4 FixMel               807    2602+ 54.4+  .24973 1.1250
 C2024 09 07.95833 18 35 10.00 -30 51 54.5 FixMel               807    2127+  794-  .24697 1.1214
 C2024 09 08.04167 18 35 11.54 -30 51 51.2 FixMel               807    2090+  890-  .24667 1.1210
 C2024 09 08.08333 18 35 12.32 -30 51 49.4 FixMel               807    2071+  940-  .24652 1.1208
 C2024 09 08.12500 18 35 13.10 -30 51 47.5 FixMel               807    2051+  991-  .24637 1.1206
 C2024 09 09.08333 18 35 33.16 -30 51 08.4 FixMel               807    1420+ 2126-  .24286 1.1162
 C2024 09 09.20833 18 35 35.76 -30 51 02.1 FixMel               807    1348+ 2286-  .24242 1.1156
 C2024 09 09.95833 18 35 52.80 -30 50 30.7 FixMel               807     776+ 3198-  .23965 1.1122
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