

Comparison of observation with and without diversity using Find_Orb

Figure 9, Table 4. For each of the 9 asteroids, we compute the ratio of the semi-major-axis uncertainties for observations with diversity and without diversity. This ratio is plotted on the y-axis. On the x-axis, we show the average of the recovered distances. For each case—diverse and non-diverse—we first average the distances within that case, and then compare the averages between the two cases.

Observations
with no
diversity

Orbital elements: [Unnamed]										MOIDs: Me 0.641474 Ve 0.282703 Ea 0.002858 Ma 0.216662									
Perihelion 2024 Sep 20.10970 ± 0.363 TT = 2:37:58 (JD 2460573.60970)										MOIDs: Ju 1.887364 Sa 5.867671 Ur 14.731670 Ne 26.681222									
Epoch 2024 Sep 5.0 TT = JDT 2460558.5 Earth MOID: 0.0029 Find_Orb										Find_Orb ver: 2025 May 15									
M 355.67631834 ± 1.7 (J2000 ecliptic)										Tisserand relative to Earth: 2.92195									
n 0.28615270 ± 0.107 Peri. 185.41178 ± 0.24										Earth encounter velocity 8.3811 km/s									
a 2.28071392 ± 0.57 Node 172.35355 ± 0.10										Barbee-style encounter velocity: 8.6130 km/s									
e 0.5585048 ± 0.11 Incl. 7.58762 ± 1.0										Score: 0.305073									
P 3.44434 U 11.2																			
q 1.00692417 ± 0.000467 Q 3.55450367 ± 1.14																			
From 6 observations 2024 Aug. 31-Sept. 5; mean residual 0".03																			
YYYY	MM	DD.DDDDD	RA (J2000)	dec	-----	mag	ref	Obs	Xres	Yres	delta	R							
C2024	08	31.00000	17 55	21.29	+07 11	06.4	FixMel	807	.03-	.02-	.08574	1.0391							
C2024	09	01.00000	17 55	23.93	+06 56	39.6	FixMel	807	.04+	.03+	.08096	1.0360							
C2024	09	02.00000	17 55	30.83	+06 40	11.1	FixMel	807	.01-	.01-	.07616	1.0331							
C2024	09	03.00000	17 55	42.54	+06 21	18.2	FixMel	807	.03+	.01+	.07134	1.0303							
C2024	09	04.00000	17 55	59.74	+05 59	31.1	FixMel	807	.04-	.03-	.06652	1.0277							
C2024	09	05.00000	17 56	23.36	+05 34	10.7	FixMel	807	.01+	.01+	.06168	1.0253							

Observations
with diversity

Orbital elements: [Unnamed]										MOIDs: Me 0.641604 Ve 0.282748 Ea 0.002934 Ma 0.219505									
Perihelion 2024 Sep 20.05457 ± 0.0214 TT = 1:18:35 (JD 2460573.55457)										MOIDs: Ju 1.703799 Sa 5.688150 Ur 14.548005 Ne 26.498155									
Epoch 2024 Sep 4.0 TT = JDT 2460557.5 Earth MOID: 0.0029 Find_Orb										Find_Orb ver: 2025 May 15									
M 355.67020387 ± 0.06 (J2000 ecliptic)										Tisserand relative to Earth: 2.91769									
n 0.26969237 ± 0.00379 Peri. 185.37544 ± 0.009										Tisserand relative to Jupiter: 3.28740									
a 2.37259497 ± 0.0223 Node 172.33623 ± 0.020										Earth encounter velocity 8.6067 km/s									
e 0.5755719 ± 0.00397 Incl. 7.74591 ± 0.036										Barbee-style encounter velocity: 8.8398 km/s									
P 3.65456 U 9.0										Score: 0.316486									
q 1.00699584 ± 1.55e-5 Q 3.73819409 ± 0.0445																			
From 6 observations 2024 Aug. 31-Sept. 4; mean residual 0".03																			
YYYY	MM	DD.DDDDD	RA (J2000)	dec	-----	mag	ref	Obs	Xres	Yres	delta	R							
C2024	08	31.00000	17 55	21.29	+07 11	06.4	FixMel	807	.01-	.01-	.08799	1.0399							
C2024	09	01.00000	17 55	23.93	+06 56	39.6	FixMel	807	.04+	.03+	.08308	1.0368							
C2024	09	02.00000	17 55	30.83	+06 40	11.1	FixMel	807	.04-	.02-	.07815	1.0338							
C2024	09	03.95833	17 56	00.85	+06 00	29.3	FixMel	807	.02+	.03+	.06846	1.0284							
C2024	09	04.08333	17 55	57.76	+05 57	31.4	FixMel	807	.05-	.02-	.06785	1.0281							
C2024	09	04.20833	17 55	57.15	+05 54	24.4	FixMel	807	.03+	.00	.06725	1.0277							

Observations
with no
diversity

Using DE405/DE405, covers years 1999.5 to 2201.1												
Orbital elements: [Unnamed]												
Perihelion 2024 Sep 9.90740 ± 0.0615 TT = 21:46:39 (JD 2460563.40740)												
Epoch 2024 Sep 5.0 TT = JDT 2460558.5 Earth MOID: 0.0686 Ma: 0.0672												
M 357.17277714 ± 0.15 (J2000 ecliptic) Find_Orb												
n 0.57611435 ± 0.0249 Peri. 152.11154 ± 0.13												
a 1.43042003 ± 0.0412 Node 194.54268 ± 0.026												
e 0.2627655 ± 0.0191 Incl. 8.77298 ± 0.49												
P 1.711/624.864d U 10.3												
q 1.05455486 ± 0.00303 Q 1.80628519 ± 0.0794												
From 6 observations 2024 Aug. 31-Sept. 5; mean residual 0".03												
YYYY	MM	DD.DDDDD	RA (J2000)	dec	-----	mag	ref	Obs	Xres	Yres	delta	R
C2024	08	31.00000	19 46 36.55	+45 47 05.8	FixMel			807	.01-	.01-	.10970	1.0580
C2024	09	01.00000	19 51 30.33	+45 51 20.1	FixMel			807	.02+	.04+	.10739	1.0573
C2024	09	02.00000	19 56 42.47	+45 54 05.3	FixMel			807	.00	.04-	.10510	1.0567
C2024	09	03.00000	20 02 13.82	+45 55 10.9	FixMel			807	.02+	.04+	.10282	1.0562
C2024	09	04.00000	20 08 05.17	+45 54 24.4	FixMel			807	.04-	.05-	.10056	1.0558
C2024	09	05.00000	20 14 17.28	+45 51 32.5	FixMel			807	.02+	.02+	.09833	1.0554

Observations
with diversity

Using DE405/DE405, covers years 1999.5 to 2201.1												
Orbital elements: [Unnamed]												
Perihelion 2024 Sep 9.90552 ± 0.029 TT = 21:43:57 (JD 2460563.40552)												
Epoch 2024 Sep 4.0 TT = JDT 2460557.5 Earth MOID: 0.0686 Ma: 0.0671												
M 356.59776475 ± 0.029 (J2000 ecliptic) Find_Orb												
n 0.57611059 ± 0.00294 Peri. 152.10671 ± 0.07												
a 1.43042625 ± 0.00487 Node 194.54556 ± 0.041												
e 0.2627668 ± 0.00225 Incl. 8.77266 ± 0.056												
P 1.711/624.868d U 8.8												
q 1.05455771 ± 0.000372 Q 1.80629479 ± 0.00937												
From 6 observations 2024 Aug. 31-Sept. 4; mean residual 0".02												
YYYY	MM	DD.DDDDD	RA (J2000)	dec	-----	mag	ref	Obs	Xres	Yres	delta	R
C2024	08	31.00000	19 46 36.55	+45 47 05.8	FixMel			807	.01-	.01-	.10970	1.0580
C2024	09	01.00000	19 51 30.33	+45 51 20.1	FixMel			807	.02+	.04+	.10739	1.0573
C2024	09	02.00000	19 56 42.47	+45 54 05.3	FixMel			807	.01-	.04-	.10510	1.0567
C2024	09	03.95833	20 07 51.63	+45 54 20.2	FixMel			807	.02-	.03-	.10066	1.0558
C2024	09	04.08333	20 08 31.74	+45 54 22.3	FixMel			807	.03+	.02+	.10038	1.0557
C2024	09	04.20833	20 09 12.17	+45 53 50.5	FixMel			807	.01-	.02+	.10010	1.0557

Observations
with no
diversity

Orbital elements: [Unnamed]										MOIDs: Me 0.635446 Ve 0.232463 Ea 0.010917 Ma 0.076618									
Perihelion 2024 Nov 1.30837 ± 0.446 TT = 7:24:03 (JD 2460615.80837)										MOIDs: Ju 3.275247 Sa 7.615730 Ur 16.344447 Ne 28.203992									
Epoch 2024 Sep 5.0 TT = JDT 2460558.5 Earth MOID: 0.0109 Ma: 0.0766										Find_Orb ver: 2025 May 15									
M 330.44041829 ± 2.1 (J2000 ecliptic) Find_Orb										Tisserand relative to Earth: 2.94400									
n 0.51579867 ± 0.033 Peri. 180.78774 ± 1.2										Earth encounter velocity 7.0993 km/s									
a 1.53986470 ± 0.0657 Node 225.28614 ± 1.1										Barbee-style encounter velocity: 6.5849 km/s									
e 0.3804172 ± 0.0274 Incl. 1.35000 ± 0.07										Score: 0.216020									
P 1.911/697.934d U 10.4																			
q 0.95407357 ± 0.00157 Q 2.12565584 ± 0.133																			
From 6 observations 2024 Aug. 31-Sept. 5; mean residual 0".03																			
YYYY	MM	DD.DDDDD	RA (J2000)	dec	-----	mag	ref	Obs		Xres	Yres	delta	R						
C2024	08	31.00000	22 39	32.98	+02 16 45.4	FixMel		807		.02+	.01-	.14412	1.1513						
C2024	09	01.00000	22 39	51.68	+02 35 19.2	FixMel		807		.06-	.01+	.13900	1.1461						
C2024	09	02.00000	22 40	11.83	+02 54 49.9	FixMel		807		.06+	.01+	.13395	1.1408						
C2024	09	03.00000	22 40	33.72	+03 15 24.0	FixMel		807		.02-	.03-	.12896	1.1356						
C2024	09	04.00000	22 40	57.72	+03 37 09.0	FixMel		807		.00	.02+	.12404	1.1305						
C2024	09	05.00000	22 41	24.22	+04 00 13.2	FixMel		807		.00	.00	.11918	1.1254						

Observations
with diversity

Orbital elements: [Unnamed]										MOIDs: Me 0.635314 Ve 0.232329 Ea 0.010926 Ma 0.076832									
Perihelion 2024 Nov 1.26535 ± 0.0723 TT = 6:22:06 (JD 2460615.76535)										MOIDs: Ju 3.262752 Sa 7.605493 Ur 16.332856 Ne 28.191198									
Epoch 2024 Sep 4.0 TT = JDT 2460557.5 Earth MOID: 0.0109 Ma: 0.0768										Find_Orb ver: 2025 May 15									
M 330.13128320 ± 0.34 (J2000 ecliptic) Find_Orb										Tisserand relative to Earth: 2.94335									
n 0.51263255 ± 0.00523 Peri. 180.66617 ± 0.41										Earth encounter velocity 7.1404 km/s									
a 1.54619853 ± 0.0105 Node 225.39693 ± 0.35										Barbee-style encounter velocity: 6.6256 km/s									
e 0.3830451 ± 0.00437 Incl. 1.35670 ± 0.011										Score: 0.217524									
P 1.923/702.244d U 9.2																			
q 0.95393473 ± 0.000631 Q 2.13846234 ± 0.0213																			
From 6 observations 2024 Aug. 31-Sept. 4; mean residual 0".03																			
YYYY	MM	DD.DDDDD	RA (J2000)	dec	-----	mag	ref	Obs		Xres	Yres	delta	R						
C2024	08	31.00000	22 39	32.98	+02 16 45.4	FixMel		807		.05+	.01-	.14507	1.1523						
C2024	09	01.00000	22 39	51.68	+02 35 19.2	FixMel		807		.07-	.01+	.13992	1.1470						
C2024	09	02.00000	22 40	11.83	+02 54 49.9	FixMel		807		.01+	.00	.13483	1.1417						
C2024	09	03.95833	22 40	56.95	+03 36 12.1	FixMel		807		.02+	.01-	.12507	1.1315						
C2024	09	04.08333	22 40	58.55	+03 39 02.9	FixMel		807		.02-	.02+	.12444	1.1309						
C2024	09	04.20833	22 40	58.70	+03 41 53.1	FixMel		807		.01+	.01-	.12381	1.1302						

Observations
with no
diversity

Orbital elements: [Unnamed]										MOIDs: Me 0.696896 Ve 0.310396 Ea 0.039317 Ma 0.092354									
Perihelion 2024 Oct 13.71314 ± 0.0713 TT = 17:06:55 (JD 2460597.21314)										MOIDs: Ju 2.060495 Sa 6.247980 Ur 14.983688 Ne 26.917383									
Epoch 2024 Sep 5.0 TT = JDT 2460558.5 Earth MOID: 0.0393 Ma: 0.0924										Find_Orb ver: 2025 May 15									
M 348.40453095 ± 1.1 (J2000 ecliptic) Find_Orb										Tisserand relative to Earth: 2.96741									
n 0.29952283 ± 0.0286 Peri. 201.67379 ± 0.12										Earth encounter velocity 5.4162 km/s									
a 2.21232752 ± 0.141 Node 181.72879 ± 0.038										Barbee-style encounter velocity: 6.5453 km/s									
e 0.5326005 ± 0.0292 Incl. 2.48134 ± 0.09										Score: 0.283429									
P 3.29059 U 10.4																			
q 1.03404063 ± 0.00117 Q 3.39061441 ± 0.28																			
From 6 observations 2024 Aug. 31-Sept. 5; mean residual 0".02																			
YYYY	MM	DD	DDDD	RA (J2000)	dec	-----	mag	ref	Obs	Xres	Yres	delta	R						
C2024	08	31	00000	21 53	24.11	-04 23	02.7		FixMel	807	.01-	.00	.15486	1.1615					
C2024	09	01	00000	21 54	52.04	-04 18	46.4		FixMel	807	.03+	.01+	.14994	1.1563					
C2024	09	02	00000	21 56	27.68	-04 14	22.6		FixMel	807	.02-	.02-	.14510	1.1511					
C2024	09	03	00000	21 58	11.80	-04 09	49.5		FixMel	807	.01-	.00	.14033	1.1460					
C2024	09	04	00000	22 00	05.23	-04 05	05.2		FixMel	807	.02+	.02+	.13563	1.1410					
C2024	09	05	00000	22 02	08.88	-04 00	07.6		FixMel	807	.01-	.01-	.13100	1.1360					

Observations
with diversity

Using DE405/DE405; covers years 1599.9 to 2201.1																			
Orbital elements: [Unnamed]										MOIDs: Me 0.696972 Ve 0.310465 Ea 0.039391 Ma 0.092385									
Perihelion 2024 Oct 13.70896 ± 0.0333 TT = 17:00:54 (JD 2460597.20896)										MOIDs: Ju 2.049691 Sa 6.237575 Ur 14.973037 Ne 26.906593									
Epoch 2024 Sep 4.0 TT = JDT 2460557.5 Earth MOID: 0.0394 Ma: 0.0924										Find_Orb ver: 2025 May 15									
M 348.14998420 ± 0.26 (J2000 ecliptic) Find_Orb										Tisserand relative to Earth: 2.96729									
n 0.29842172 ± 0.00661 Peri. 201.67231 ± 0.08										Earth encounter velocity 5.4258 km/s									
a 2.21776621 ± 0.0328 Node 181.73032 ± 0.038										Barbee-style encounter velocity: 6.5575 km/s									
e 0.5337151 ± 0.00672 Incl. 2.48506 ± 0.022										Score: 0.280816									
P 3.30273 U 9.4																			
q 1.03411072 ± 0.000545 Q 3.40142170 ± 0.0651																			
From 6 observations 2024 Aug. 31-Sept. 4; mean residual 0".01																			
YYYY	MM	DD	DDDD	RA (J2000)	dec	-----	mag	ref	Obs	Xres	Yres	delta	R						
C2024	08	31	00000	21 53	24.11	-04 23	02.7		FixMel	807	.01-	.00	.15515	1.1618					
C2024	09	01	00000	21 54	52.04	-04 18	46.4		FixMel	807	.03+	.01+	.15022	1.1565					
C2024	09	02	00000	21 56	27.68	-04 14	22.6		FixMel	807	.02-	.02-	.14537	1.1513					
C2024	09	03	95833	22 00	00.71	-04 05	16.4		FixMel	807	.00	.00	.13609	1.1414					
C2024	09	04	08333	22 00	13.69	-04 04	42.3		FixMel	807	.01+	.02-	.13548	1.1408					
C2024	09	04	20833	22 00	25.79	-04 04	05.9		FixMel	807	.01-	.02+	.13490	1.1402					

2024 RO2

Observations
with no
diversity

Orbital elements: [Unnamed]										MOIDs: Me 0.624314 Ve 0.221414 Ea 0.001016 Ma 0.149693									
Perihelion 2024 Nov 1.34027 ± 0.2 TT = 8:09:59 (JD 2460615.84027)										MOIDs: Ju 2.948009 Sa 7.330418 Ur 16.043401 Ne 27.866097									
Epoch 2024 Sep 5.0 TT = JDT 2460558.5 Earth MOID: 0.0010 Find_Orb										Find_Orb ver: 2025 May 15									
M 334.58221697 ± 0.9 (J2000 ecliptic)										Tisserand relative to Earth: 2.90421									
n 0.44327978 ± 0.0157 Peri. 216.26226 ± 0.44										Earth encounter velocity 9.2850 km/s									
a 1.70353384 ± 0.0403 Node 190.77120 ± 0.29										Barbee-style encounter velocity: 8.8817 km/s									
e 0.4469063 ± 0.013 Incl. 7.12049 ± 0.13										Score: 0.259000									
P 2.223/812.113d U 10.0																			
q 0.94221378 ± 0.000716 Q 2.46485391 ± 0.0804																			
From 6 observations 2024 Aug. 31-Sept. 5; mean residual 0".04																			
YYYY	MM	DD	DDDDD	RA (J2000)	dec	-----	mag	ref	Obs	Xres	Yres	delta	R						
C2024	08	31	.00000	22 10	04.53	+16 21 36.5	FixMel		807	.04+	.01-	.18152	1.1754						
C2024	09	01	.00000	22 10	03.50	+16 33 40.6	FixMel		807	.07-	.02+	.17527	1.1693						
C2024	09	02	.00000	22 10	03.56	+16 45 43.9	FixMel		807	.02-	.02-	.16909	1.1632						
C2024	09	03	.00000	22 10	04.96	+16 57 47.9	FixMel		807	.08+	.02+	.16297	1.1571						
C2024	09	04	.00000	22 10	07.97	+17 09 54.1	FixMel		807	.02-	.02-	.15691	1.1511						
C2024	09	05	.00000	22 10	12.93	+17 22 04.6	FixMel		807	.01-	.01+	.15091	1.1451						

Observations
with diversity

Orbital elements: [Unnamed]										MOIDs: Me 0.624311 Ve 0.221414 Ea 0.001020 Ma 0.150051									
Perihelion 2024 Nov 1.33246 ± 0.0838 TT = 7:58:44 (JD 2460615.83246)										MOIDs: Ju 2.944986 Sa 7.327581 Ur 16.040521 Ne 27.863014									
Epoch 2024 Sep 4.0 TT = JDT 2460557.5 Earth MOID: 0.0010 Find_Orb										Find_Orb ver: 2025 May 15									
M 334.17751626 ± 0.42 (J2000 ecliptic)										Tisserand relative to Earth: 2.90405									
n 0.44267776 ± 0.00669 Peri. 216.24951 ± 0.28										Earth encounter velocity 9.2927 km/s									
a 1.70507795 ± 0.0172 Node 190.77955 ± 0.19										Barbee-style encounter velocity: 8.8895 km/s									
e 0.4474086 ± 0.00569 Incl. 7.12580 ± 0.06										Score: 0.258706									
P 2.226/813.217d U 9.4																			
q 0.94221133 ± 0.00107 Q 2.46794458 ± 0.0345																			
From 6 observations 2024 Aug. 31-Sept. 4; mean residual 0".04																			
YYYY	MM	DD	DDDDD	RA (J2000)	dec	-----	mag	ref	Obs	Xres	Yres	delta	R						
C2024	08	31	.00000	22 10	04.53	+16 21 36.5	FixMel		807	.07+	.01-	.18172	1.1756						
C2024	09	01	.00000	22 10	03.50	+16 33 40.6	FixMel		807	.07-	.02+	.17547	1.1695						
C2024	09	02	.00000	22 10	03.56	+16 45 43.9	FixMel		807	.04-	.01-	.16928	1.1634						
C2024	09	03	.95833	22 10	08.15	+17 09 20.3	FixMel		807	.00	.02-	.15736	1.1515						
C2024	09	04	.08333	22 10	07.07	+17 11 00.1	FixMel		807	.02+	.01-	.15658	1.1508						
C2024	09	04	.20833	22 10	05.00	+17 12 32.7	FixMel		807	.01+	.02+	.15582	1.1500						

Observations
with no
diversity

Using DE405/DE405; covers years 1599.9 to 2201.1

Orbital elements: [Unnamed]

Perihelion 2024 Oct 21.68539 ± 7.9 TT = 16:26:57 (JD 2460605.18539)

Epoch 2024 Sep 5.0 TT = JDT 2460558.5 Earth MOID: 0.1331 Find_Orb

M 340.17725961 ± 15 (J2000 ecliptic)

n 0.42460265 ± 0.252 Peri. 203.52960 ± 9

a 1.75313048 ± 0.695 Node 155.21045 ± 8

e 0.3548825 ± 0.192 Incl. 7.70243 ± 2.5

P 2.321/847.835d U 11.8

q 1.13097507 ± 0.112 Q 2.37528589 ± 1.28

From 6 observations 2024 Aug. 31-Sept. 5; mean residual 0".03

MOIDs: Me 0.762133 Ve 0.404322 Ea 0.133106 Ma 0.180486

MOIDs: Ju 3.065103 Sa 6.978390 Ur 15.912092 Ne 27.847059

Find_Orb ver: 2025 May 15

Tisserand relative to Earth: 3.02382

Barbee-style encounter velocity: 5.0741 km/s

Score: 0.132331

YYYY MM DD.DDDDD RA (J2000) dec ----- mag ref Obs Xres Yres delta R

C2024 08 31.00000 17 13 24.06 -16 07 49.2 FixMel 807 .00 .01- .53977 1.2315

C2024 09 01.00000 17 15 15.62 -16 25 21.5 FixMel 807 .02- .04+ .54038 1.2280

C2024 09 02.00000 17 17 10.66 -16 42 52.7 FixMel 807 .02+ .04- .54097 1.2245

C2024 09 03.00000 17 19 09.17 -17 00 22.0 FixMel 807 .03+ .00 .54155 1.2210

C2024 09 04.00000 17 21 11.14 -17 17 49.0 FixMel 807 .05- .00 .54212 1.2176

C2024 09 05.00000 17 23 16.58 -17 35 13.1 FixMel 807 .02+ .00 .54267 1.2143

Observations
with diversity

Orbital elements: [Unnamed]							MOIDs: Me 0.744173 Ve 0.382614 Ea 0.112949 Ma 0.184458				
Perihelion 2024 Oct 23.25692 ± 0.834 TT = 6:09:58 (JD 2460606.75692)							MOIDs: Ju 3.299974 Sa 7.209145 Ur 16.145417 Ne 28.084311				
Epoch 2024 Sep 4.0 TT = JDT 2460557.5 Earth MOID: 0.1129 Find_Orb							Find_Orb ver: 2025 May 15				
M 336.60941670 ± 1.7 (J2000 ecliptic)							Tisserand relative to Earth: 3.01399				
n 0.47486893 ± 0.0273 Peri. 205.41493 ± 1.0							Barbee-style encounter velocity: 4.7641 km/s				
a 1.62712234 ± 0.0624 Node 157.03140 ± 1.0							Score: 0.158525				
e 0.3184044 ± 0.0188 Incl. 7.18419 ± 0.30											
P 2.076/758.090d U 10.3											
q 1.10903933 ± 0.0121 Q 2.14520534 ± 0.113											
From 6 observations 2024 Aug. 31-Sept. 4; mean residual 0".02											
YYYY	MM	DD.DDDDD	RA (J2000)	dec	-----	mag	ref	Obs	Xres	Yres	delta R
C2024	08	31.00000	17 13 24.06	-16 07 49.2	FixMel		807	.00	.02-	.49954	1.2081
C2024	09	01.00000	17 15 15.62	-16 25 21.5	FixMel		807	.01-	.05+	.50011	1.2047
C2024	09	02.00000	17 17 10.66	-16 42 52.7	FixMel		807	.01+	.04-	.50067	1.2014
C2024	09	03.95833	17 21 06.27	-17 17 05.5	FixMel		807	.00	.00	.50171	1.1950
C2024	09	04.08333	17 21 20.98	-17 19 15.0	FixMel		807	.01+	.00	.50178	1.1946
C2024	09	04.20833	17 21 36.16	-17 21 22.5	FixMel		807	.01-	.00	.50187	1.1942

Observations
with no
diversity

Observations with diversity

Orbital elements: [Unnamed]										MOIDs: Me 0.536848 Ve 0.141859 Ea 0.002537 Ma 0.105249									
Perihelion 2024 Nov 22.44731 ± 3.48 TT = 10:44:07 (JD 2460636.94731)										MOIDs: Ju 1.207723 Sa 5.639162 Ur 14.343966 Ne 26.102061									
Epoch 2024 Sep 4.0 TT = JDT 2460557.5 Earth MOID: 0.0025 Find_Orb										Find_Orb ver: 2025 May 15									
M 340.73401209 ± 2.2 (J2000 ecliptic)										Tisserand relative to Earth: 2.77270									
n 0.24250018 ± 0.0178 Peri. 134.58858 ± 0.9										Tisserand relative to Jupiter: 3.08647									
a 2.54679895 ± 0.125 Node 271.30585 ± 1.9										Earth encounter velocity 14.3027 km/s									
e 0.6647825 ± 0.0105 Incl. 3.43932 ± 0.26										Barbee-style encounter velocity: 13.8503 km/s									
P 4.06436 U 10.0										Score: 0.354757									
q 0.85373137 ± 0.0176 Q 4.23986654 ± 0.233																			
From 6 observations 2024 Aug. 31-Sept. 4; mean residual 0".02																			
YYYY MM DD.DDDDD	RA (J2000)	dec	-----	mag	ref	Obs	Xres	Yres	delta	R									
C2024 08 31.00000	18 30 06.02	-17 54 41.9	FixMel		807	.00	.01+	.63964	1.4354										
C2024 09 01.00000	18 29 04.42	-17 53 35.5	FixMel		807	.00	.02+	.63830	1.4258										
C2024 09 02.00000	18 28 06.35	-17 52 27.8	FixMel		807	.00	.05-	.63700	1.4162										
C2024 09 03.95833	18 26 23.19	-17 50 11.1	FixMel		807	.01-	.05+	.63452	1.3974										
C2024 09 04.08333	18 26 16.42	-17 50 02.1	FixMel		807	.02+	.01-	.63437	1.3962										
C2024 09 04.20833	18 26 09.92	-17 49 51.1	FixMel		807	.00	.02-	.63423	1.3950										

YYYY	MM	DD.DDDDD	RA (J2000)	dec	-----	mag	ref	Obs	Xres	Yres	delta	R
C2024	08	31.00000	16 40 26.40	-29 14 30.1	FixMel		807		.01+	.01+	.98475	1.4682
C2024	09	01.00000	16 40 36.45	-29 10 03.5	FixMel		807		.04-	.00	.98820	1.4595
C2024	09	02.00000	16 40 49.50	-29 05 43.9	FixMel		807		.03+	.03-	0.9916	1.4507
C2024	09	03.00000	16 41 05.48	-29 01 31.1	FixMel		807		.01+	.00	0.9949	1.4419
C2024	09	04.00000	16 41 24.34	-28 57 25.0	FixMel		807		.02-	.05+	0.9980	1.4330
C2024	09	05.00000	16 41 46.03	-28 53 25.6	FixMel		807		.01+	.02-	1.0012	1.4240

YYYY	MM	DD.DDDDD	RA (J2000)	dec	-----	mag	ref	Obs	Xres	Yres	delta	R
C2024	08	31.00000	16 40	26.40	-29 14	30.1	FixMel	807	.01+	.00	.98507	1.4685
C2024	09	01.00000	16 40	36.45	-29 10	03.5	FixMel	807	.04-	.01+	.98850	1.4597
C2024	09	02.00000	16 40	49.50	-29 05	43.9	FixMel	807	.03+	.02-	0.9919	1.4509
C2024	09	03.95833	16 41	23.65	-28 57	35.4	FixMel	807	.06+	.01-	0.9982	1.4335
C2024	09	04.08333	16 41	25.80	-28 57	03.7	FixMel	807	.03-	.02+	0.9986	1.4324
C2024	09	04.20833	16 41	28.27	-28 56	30.7	FixMel	807	.04-	.02+	0.9990	1.4313

Observations with diversity

Ceres

Observations
with no
diversity

Using DE403/DE403, covers years 1999.5 to 2201.1

Orbital elements: [Unnamed]

Perihelion 2025 Nov 2.67532 ± 5195 TT = 16:12:27 (JD 2460982.17532)

Epoch 2024 Sep 5.0 TT = JDT 2460558.5

M 277.93720896 ± 1100 (J2000 ecliptic)

n 0.19369264 ± 0.291 Peri. 304.61756 ± 900

a 2.95842547 ± 2.96 Node 78.65427 ± 20

e 0.0449997 ± 1.25 Incl. 10.23114 ± 4.2

P 5.08851 U 11.9

q 2.82529714 ± 0.863 Q 3.09155381 ± 6.78

From 6 observations 2024 Aug. 31-Sept. 5; mean residual 0".03

MOIDs: Me 2.470779 Ve 2.105244 Ea 1.844814 Ma 1.328753

MOIDs: Ju 2.169102 Sa 6.115975 Ur 15.258501 Ne 26.969560

Find_Orb ver: 2025 May 15

Score: -0.379779

YYYY	MM	DD.DDDDD	RA (J2000)	dec	-----	mag	ref	Obs	Xres	Yres	delta	R
C2024	08	31.00000	18 33 20.19	-30 55 52.1	FixMel			807	.01-	.02+	2.3213	2.9482
C2024	09	01.00000	18 33 28.53	-30 55 31.2	FixMel			807	.03+	.03-	2.3329	2.9478
C2024	09	02.00000	18 33 38.45	-30 55 07.6	FixMel			807	.03-	.04-	2.3445	2.9473
C2024	09	03.00000	18 33 49.96	-30 54 41.3	FixMel			807	.03+	.04+	2.3563	2.9469
C2024	09	04.00000	18 34 03.03	-30 54 12.5	FixMel			807	.04-	.05+	2.3681	2.9464
C2024	09	05.00000	18 34 17.67	-30 53 41.3	FixMel			807	.01+	.04-	2.3801	2.9460

Observations
with diversity

Orbital elements: [Unnamed]							MOIDs: Me 1.947695 Ve 1.593210 Ea 1.330195 Ma 0.950268				
Perihelion 2025 Mar 18.58664 ± 368 TT = 14:04:45 (JD 2460753.08664)							MOIDs: Ju 0.028716 Sa 0.434418 Ur 2.921303 Ne 14.025586				
Epoch 2024 Sep 4.0 TT = JDT 2460557.5 Ju: 0.0287 Sa: 0.4344							Find_Orb ver: 2025 May 15				
M 353.31627282 ± 80 (J2000 ecliptic) Find_Orb							Tisserand relative to Jupiter: 2.29979				
n 0.03417271 ± 0.0506 Peri. 285.99850 ± 100							Score: 0.587070				
a 9.40480283 ± 9.28 Node 70.41841 ± 7											
e 0.7537531 ± 0.284 Incl. 8.72908 ± 3.1											
P 28.84194 U 10.8 SR											
q 2.31590349 ± 0.749 Q 16.4937021 ± 8.84											
From 6 observations 2024 Aug. 31-Sept. 4; mean residual 0".21											
YYYY	MM	DD.DDDDD	RA (J2000)	dec	-----	mag	ref	Obs	Xres	Yres	delta R
C2024	08	31.00000	18 33 20.19	-30 55 52.1	FixMel			807	.40-	.06-	2.3672 2.9921
C2024	09	01.00000	18 33 28.53	-30 55 31.2	FixMel			807	.20+	.03+	2.3734 2.9864
C2024	09	02.00000	18 33 38.45	-30 55 07.6	FixMel			807	.48+	.08+	2.3796 2.9808
C2024	09	03.95833	18 34 02.52	-30 54 13.7	FixMel			807	.03+	.01+	2.3921 2.9697
C2024	09	04.08333	18 34 04.07	-30 54 09.9	FixMel			807	.03-	.01-	2.3929 2.9690
C2024	09	04.20833	18 34 05.69	-30 54 05.2	FixMel			807	.28-	.05-	2.3938 2.9683