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OBSERVATIONAL DATA AND ORBITS OF THE ASTEROIDS DISCOVERED AT THE MOLĖTAI OBSERVATORY IN 2008–2009

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Abstract. We present the statistics of the asteroids observed and discovered at the Molėtai Observatory, Lithuania, in 2008–2009 within the project for astrometric observations of the near-Earth objects (NEOs), the main belt asteroids and comets. CCD observations of the asteroids were obtained with the 35/51-cm Maksutov-type meniscus telescope. In the Minor Planet Circulars and the Minor Planet Electronic Circulars (2008–2009), 11 900 astrometric positions of 2522 asteroids were published. Among them 95 were new asteroids, including four belonging to the Trojan group: (352655) 2008QX28, 2008 SE8, (353194) 2009 SM100 and (264068) 2009 SQ148. For the asteroids discovered at Molėtai their precise orbits are calculated. Because of short observational arc, a few asteroids have low-precision orbits and some asteroids are considered lost. For the three Main Belt asteroids with low-precision orbital elements, 2008 QP32, 2008 SD8 and 2008 SG150, we present their ephemerides for 2017. They can be brighter than 20 mag.

Key words: minor planets, asteroids: search, astrometry, orbits

1. ASTROMETRIC OBSERVATIONS OF MINOR PLANETS

In 2014 we began a series of papers in *Baltic Astronomy* that review our contribution to discovery and follow-up observations of newly and previously discovered asteroids. The first paper (Černis et al. 2014) was devoted to the asteroids discovered at the Molėtai Observatory, Lithuania, in 2000–2004. In the second paper (Černis et al. 2015) we summarized the asteroid discoveries made at the Baldone Observatory, Latvia, during the period from 2008 to 2013. The third paper (Černis et al. 2016) presented a review of asteroid discoveries with the equipment of the Molėtai Observatory in 2005–2008. In this fourth paper we shall overview the asteroids discovered at Molėtai in 2008–2009.

The aim of our project is the determination of more precise orbits of asteroids and comets and predictions of their Earth-impact threat. In this undertaking, one of the main sites of observations is the Molėtai Astronomical Observatory (MAO) of Vilnius University, located at the longitude 25.5633 E, latitude 55.3166 N and altitude 210 m. Its IAU code is 152. At MAO, the Maksutov-type 35/51-cm meniscus telescope and occasionally the 1.65-m Ritghey-Chretien reflector are

Table 1. Statistics of asteroid discoveries and astrometric observations of the asteroids (both new and known) at the Molėtai Observatory in 2008–2009.

Year	Number of asteroid discoveries	Number of asteroid observations	Number of asteroids observed	References (MPC No.)
2008	34	3595	852	62 865 63124, 63364, 63808, 64095, 64483
2009	61	8305	1670	65274, 65921, 66189, 66906, 67131, 67396
Total	95	11 900	2522	

used for surveying, recovery and astrometry of asteroids.

Most of the asteroid discoveries were made with the Maksutov telescope in the morning sky about 10–30 days before their opposition time at elongations 140–170°. The sky was surveyed close to the ecliptic (mostly not more than 15° from the ecliptic line), taking three CCD images on the same field, with 15–20 min time spans between the exposures. Follow-up astrometric measurements were carried out using the Astrometrica software (Raab 2003). The reference stars were selected from the catalogs USNO-A2.0, USNO-B1.0 and UCAC-2.

During 2008–2009, about 2500 CCD images for astrometry of asteroids were obtained by the team of four observers: K. Černis, J. Zdanavičius, K. Zdanavičius and E. Černis. We measured the positions of all asteroids that appeared in the CCD frames. A total of 11 900 astrometric positions of 2522 asteroids, including ten NEOs, were published in the Minor Planet Circulars (MPC) and Electronic Minor Planet Circulars (MPEC) (Černis & Zdanavičius 2008, 2009, 2010). During our sky survey in the ecliptic regions and during follow-up observations of the NEOs, 95 new asteroids were discovered in the years 2008–2009.

Our contribution accounts for about 0.08% of the total number of asteroid observations (15 703 284) done worldwide in 2008–2009. Our new discoveries (95 asteroids) compose a similar part, 0.12%, of all 81 705 asteroids discovered in the world during this two-year period. Most of the asteroid discoveries worldwide were made by the specialized projects such as LINEAR, NEAT, Spacewatch, LONEOS and Catalina.

Table 1 presents the numbers of asteroid discoveries, astrometric observations, and all asteroids (known and new) observed at the Molėtai Observatory for the years 2008 and 2009. The list of the 95 asteroids discovered at MAO is given in Table 2.

As of 2016 December 1, the credits for discovery of 41 asteroids listed in Table 2 have been already received from the Minor Planet Center, three of them have been named.

In the near future we expect to get numbers and credits for another 11 asteroids discovered at the Molėtai Observatory: 2008 QG35, 2008 QH35, 2008 SD8, 2009 CP2, 2009 CN3, 2009 CQ3, 2009 SK17, 2009 SL17, 2009 SR17, 2009 SV77, 2009 SL100. The asteroids 2009 ST369 and 2011 FN129 got their designation only in 2016 and 2011, respectively, although these objects were first spotted at the Molėtai Observatory in 2008–2009.

Table 2. List of asteroids discovered at the Molėtai Observatory in 2008–2009.

No.	Date of discovery	Designation	Number	Name	Discoverers	Status
1	2008 Apr 24	2008 HG66	319917			Id
2	2008 May 2	2008 JC6	424613		KC, JZ	*
3	2008 May 2	2008 JN8	336109		KC, JZ	*
4	2008 May 4	2008 JQ8	320977		KC, JZ	*
5	2008 May 4	2008 JS8	325322			Id
6	2008 May 5	2008 JB6	189396	Sielewicz	KC, JZ	*
7	2008 Aug 31	2008 QX28	352655		KC, EC	*
8	2008 Aug 31	2008 QY28	279927			Id
9	2008 Aug 31	2008 QZ28	334266			Id
10	2008 Aug 31	2008 QO32	375338			Id
11	2008 Aug 31	2008 QP32				Lost
12	2008 Aug 31	2008 QX32	346318		KC, EC	*
13	2008 Aug 31	2008 QY32	321045		KC, EC	*
14	2008 Aug 31	2008 QZ32	233661	Alytus	KC, EC	*
15	2008 Aug 31	2008 QE35	447334			Id
16	2008 Aug 31	2008 QG35			KC, EC	+
17	2008 Aug 31	2008 QH35			KC, EC	+
18	2008 Aug 31	2008 QK35	269253		KC, EC	*
19	2008 Aug 31	2008 QK40	278626		KC, EC	*
20	2008 Aug 31	2008 QL40	431803		KC, EC	*
21	2008 Aug 31	2008 RA6				Id
22	2008 Aug 31	2008 RJ98	375322		KC, EC	*
23	2008 Aug 31	2008 SE8				Id
24	2008 Aug 31	2011 FN129	336860		KC, EC	*
25	2008 Sep 2	2008 RZ5	278640		KC, JZ	*
26	2008 Sep 2	2008 RU98				Lost
27	2008 Sep 23	2008 SB8	266918			Id
28	2008 Sep 23	2008 SC8	457303		KC, JZ	*
29	2008 Sep 23	2008 SD8			KC, JZ	+
30	2008 Sep 23	2008 SP139	453256		KC, JZ	*
31	2008 Sep 23	2008 SG150				Lost
32	2008 Sep 23	2008 SH150	322264			Id
33	2008 Sep 23	2008 SQ185	349568			Id
34	2008 Sep 23	2008 SQ250	331316			Id
35	2009 Feb 2	2009 CG2	441752		KC, JZ	*
36	2009 Feb 2	2009 CH2	346805		KC, JZ	*
37	2009 Feb 2	2009 CJ2	395017			Id
38	2009 Feb 2	2009 CK2	309836			Id
39	2009 Feb 2	2009 CL2	284863		KC, JZ	*
40	2009 Feb 2	2009 CM2	453387			Id
41	2009 Feb 2	2009 CN2	405088			Id
42	2009 Feb 2	2009 CO2	296207		KC, JZ	*
43	2009 Feb 2	2009 CP2			KC, JZ	+
44	2009 Feb 2	2009 CM3	294178			Id
45	2009 Feb 2	2009 CN3			KC, JZ	+
46	2009 Feb 2	2009 CO3	338959			Id

Table 2. Continued.

No.	Date of discovery	Designation	Number	Name	Discoverers	Status
47	2009 Feb 2	2009 CP3	435938		KC, JZ	*
48	2009 Feb 2	2009 CQ3			KC, JZ	+
49	2009 Feb 2	2009 CR3	395019		KC, JZ	*
50	2009 Feb 2	2009 CS3	389191			Id
51	2009 Feb 2	2009 CT3	212977		KC, JZ	*
52	2009 Feb 2	2009 CW3	445190		KC, JZ	*
53	2009 Feb 2	2009 CX3	359169			Id
54	2009 Feb 2	2009 CY3	441753			Id
55	2009 Feb 2	2009 CZ3	241496		KC, JZ	*
56	2009 Feb 2	2009 CS13	398010		KC, JZ	*
57	2009 Feb 2	2009 CX39				Id
58	2009 Feb 2	2009 CY39				Lost
59	2009 Apr 28	2009 HK81	398067		KC, JZ	*
60	2009 Apr 28	2009 HL81	262312			Id
61	2009 Apr 28	2009 HO82	306561			Id
62	2009 Apr 28	2009 HA94	296472		KC, JZ	*
63	2009 Apr 26	2009 HE94	257320		KC, JZ	*
64	2009 Apr 27	2009 HJ94	263951		KC, JZ	*
65	2009 Sep 9	2009 RQ	467736			Id
66	2009 Sep 10	2009 RM7	367534		KC, JZ	*
67	2009 Sep 17	2009 SK17			KC, JZ	+
68	2009 Sep 17	2009 SL17			KC, JZ	+
69	2009 Sep 17	2009 SM17				Lost
70	2009 Sep 17	2009 SN17	324313			Id
71	2009 Sep 17	2009 SO17	403409		KC, JZ	*
72	2009 Sep 17	2009 SP17	383137			Id
73	2009 Sep 17	2009 SQ17				Lost
74	2009 Sep 17	2009 SR17			KC, JZ	+
75	2009 Sep 17	2009 SS17	330894			Id
76	2009 Sep 17	2009 ST17	425696			Id
77	2009 Sep 17	2009 SS77	320999			Id
78	2009 Sep 17	2009 ST77				Lost
79	2009 Sep 17	2009 SV77			KC, JZ	+
80	2009 Sep 17	2009 SW77				Lost
81	2009 Sep 17	2009 SX77				Id
82	2009 Sep 17	2009 SL98	346896		KC, JZ	*
83	2009 Sep 17	2009 SL100			KC, JZ	+
84	2009 Sep 17	2009 SM100	353194		KC, JZ	*
85	2009 Sep 20	2009 SU100	375759		KC, JZ	*
86	2009 Sep 17	2009 SR101	281189			Id
87	2009 Sep 17	2009 SS101				Lost
88	2009 Sep 19	2009 SQ148	264068		KC, JZ	*
89	2009 Sep 19	2009 SR148	333720		KC, JZ	*
90	2009 Sep 19	2009 SS148	325588	Bridžius	KC, JZ	*
91	2009 Sep 17	2009 SH229				Lost
92	2009 Sep 19	2009 SH335	402524			Id

Table 2. Continued.

No.	Date of discovery	Designation	Number	Name	Discoverers	Status
93	2009 Sep 19	2009 SX358	400736		KC, JZ	*
94	2009 Sep 17	2009 ST369	483266			Id
95	2009 Sep 20	2009 TC14	375801		KC, JZ	*

Notes:

KC, JZ, EC	Kazimieras Černis, Justas Zdanavičius , Edvardas Černis
*	Credited for discoverers from MAO
Lost	The lost asteroid
Id	An independent discovery
+	Waiting for crediting MAO

2. ORBITS

The orbits and ephemerides of the asteroids were computed using the freely available OrbFit software v.5.0[1]. In our computations we also used the JPL DE431 planetary and lunar ephemerides, the biased error model based on Chesley et al. (2010), the debiasing scheme described in Farnocchia et al. (2015), and 25 perturbing asteroids. For weighting and selecting the observations, we applied the method described in the NEODyS site (see Wlodarczyk et al. 2014).

The masses of 25 perturbing asteroids were taken from Farnocchia et al. (2013). The starting positions of these asteroids and their perturbations were computed using the ASTDyS base of the initial orbital elements of asteroids[2] and the OrbFit software. The precision that can be attained in computation of orbits using the OrbFit software is described in the paper by Wlodarczyk (2009).

Table 3 contains the high-precision orbital elements and their uncertainties for the asteroids discovered at the Molėtai Observatory in 2008–2009. The asteroids are listed in the order of the discovery date. For each asteroid, the columns of the first line give, in succession, the following orbital elements: semimajor axis, a, eccentricity, e, inclination, i, longitude of the ascending node, Ω, argument of perihelion, ω, and mean anomaly, M. The second line gives the rms errors of the orbital elements given in the first line. The third line gives for each asteroid its absolute magnitude H, the rms error of the fit of the orbital elements to the observational data (i.e., rms of residuals), the number of observations used and their time coverage. The orbital elements and their ephemerides are computed without taking into account non-gravitational effects, that is, only the gravitational model of the Solar System was used in computations.

The absolute magnitudes H given in Table 3 were calculated from the observed magnitudes R taking into account the computed orbit. Almost all of the asteroids listed have absolute magnitudes in the range H = 13–18 mag. The asteroids (352655) 2008 QX28, 2008 SE8, (353194) 2009 SM100 and (264068) 2009 SQ148 belong to the Trojan group with H = 13.23–13.50. According to the JPL NASA, Jupiter Trojans are trapped in Jupiter's L4/L5 Lagrange points (4.6 au $< a <$ 5.5 au; $e < 0.3$). All Trojans discovered at the Molėtai Observatory are near the

[1] http://adams.dm.unipi.it/∼orbmaint/orbfit/

[2] http://hamilton.dm.unipi.it/astdy s/

L4 point which lies 60°ahead Jupiter in its orbit around the Sun. As of 2016 December 1, the MPC lists 6456 Jupiter Trojans.

In our sample of asteroids presented in Table 3 the absolutely brightest is the asteroid (352655) with $H = 13.226$ mag which corresponds to the diameter from 6.73 km (for S-class with albedo 0.20) to 15.04 km (for C-class with albedo 0.04). The faintest asteroid is (266918) with $H = 18.372$ mag and the diameter from 0.63 km to 1.41 km if it belongs to S- or C-class.

It was impossible to compute the orbits of only two asteroids: 2008 RU98 with two observations available, and 2009 SS101 having too large rms error (about 2000″). We note that the orbits for about a dozen of asteroids listed in Table 3 are of lower accuracy because of their short observational arcs. From them we selected three Main Belt asteroids with different values of errors in their position on the sky that can be visible in the nearest future. The ephemerides of these asteroids for 2017 are given in the next section.

Table 3. High precision orbital elements of the asteroids discovered at the Molėtai Observatory in 2008–2009. The epoch JD2457600 = 2016 July 31.

a (au)	e	i (deg)	Ω (deg)	ω (deg)	M (deg)
(319917)					
2.6844483202042	0.129345338483	7.1606635616	213.124870246	337.539165675	329.3890881160
9.66297E-08	1.44749E-07	1.46108E-05	1.22624E-04	1.39660E-04	6.66198E-05
$H = 16.250$	rms=.7214″	66 obs.	arc: 2005 11 01.17146 – 2014 10 01.21759		
(189396)					
2.7176364163978	0.0719781419586	6.9236316661	183.6596927799	62.2667815907	286.8836600297
4.35586E-08	7.48553E-08	1.04279E-05	6.35074E-05	9.76870E-05	7.69450E-05
$H = 15.995$	rms=.6560″	198 obs.	arc: 1960 10 25.30348 – 2016 01 13.28778		
(424613)					
2.769602495524	0.307571465042	10.2644262656	71.5613198282	201.200402669	259.9773478235
1.75428E-07	3.09855E-07	3.43556E-05	8.39889E-05	1.00368E-04	9.24495E-05
$H = 16.537$	rms=.6664″	61 obs.	arc: 2005 11 26.41250 – 2014 11 27.50121		
(336109)					
2.3455693052494	0.118003194154	7.9703714906	118.0993987319	95.6733073749	115.1435499613
3.03118E-08	1.08472E-07	7.67141E-06	7.29948E-05	8.83378E-05	4.12818E-05
$H = 17.130$	rms=.7289″	168 obs.	arc: 2002 10 10.403530 – 2015 05 07.25777		
(320977)					
2.8371602717197	0.209727349341	16.6693971528	91.9047856344	171.8973021466	243.6020922632
7.22175E-08	1.88593E-07	1.49595E-05	4.03492E-05	5.12740E-05	3.70116E-05
$H = 16.392$	rms=.5436″	81 obs.	arc: 2002 01 09.362950 – 2014 11 25.30437		
(325322)					
2.7617466430416	0.183350200066	14.6760800733	96.2019348688	154.8992359995	277.2871900613
6.96566E-08	1.30128E-07	1.13792E-05	3.80974E-05	5.92787E-05	5.51651E-05
$H = 16.237$	rms=.6019″	125 obs.	arc: 2003 03 24.35412 – 2016 02 06.22585		
(352655)					
5.255058605545	0.039264497682	12.4656442928	323.3106135555	86.479580131	179.867450169
7.87126E-07	1.76285E-07	1.84114E-05	5.93753E-05	3.40748E-04	3.59647E-04
$H = 13.226$	rms=.6497″	102 obs.	arc: 2003 03 30.28522 – 2015 03 21.45410		
(279927)					
2.3133948515196	0.132591081086	6.4664968217	315.4684825353	3.306144343	109.4633323116
1.79163E-08	1.85432E-07	1.55653E-05	8.74710E-05	1.00959E-04	4.61930E-05
$H = 16.571$	rms=.5413″	297 obs.	arc: 2001 08 17.35435 – 2015 11 02.25286		
(334266)					
2.3527453497633	0.115129189833	6.4500165440	314.9380472923	31.9918524024	67.9017614760
3.93801E-08	1.88604E-07	1.33386E-05	6.10231E-05	7.78023E-05	5.08107E-05
$H = 16.848$	rms=.5189″	176 obs.	arc: 2001 09 25.32868 – 2015 10 02.23498		
(375338)					
2.7804056458649	0.145710544642	8.1236224916	328.2073214447	98.9906150783	188.4056852242
7.86883E-08	1.05780E-07	1.43395E-05	6.45597E-05	9.80407E-05	6.45399E-05
$H = 16.269$	rms=.7034″	187 obs.	arc: 2003 08 24.01276 – 2015 03 15.39060		

Table 3. Continued.

a (au)	e	i (deg)	Ω (deg)	ω (deg)	M (deg)
		(2008QP32)			
2.7307733	0.28975147	7.687248	322.4914233	18.11753	271.6561
7.62502E-02	5.88276E-03	3.80542E-01	7.71604E-01	4.40591E+00	2.67675E+01
H = 18.113	rms=0.6837″	9 obs.	arc: 2008 08 31.90493 – 2008 09 05.22901		
		(346318)			
2.4023769762135	0.115090541626	4.6707922365	315.536782828	358.960918712	68.919039151
5.88121E-08	2.33881E-07	1.67221E-05	2.42735E-04	2.65627E-04	1.20279E-04
H = 17.517	rms=.6818″	67 obs.	arc: 1993 08 17.33396 – 2014 02 27.35292		
		(321045)			
2.4262179775772	0.196370396482	3.6692860292	203.274178122	165.119397656	17.7094576512
3.37533E-08	1.42518E-07	1.55666E-05	1.39453E-04	1.42945E-04	2.51571E-05
H = 17.442	rms=.6444″	105 obs.	arc: 1993 10 10.11979 – 2012 11 12.36207		
		(233661)			
2.3523677033652	0.055819510745	3.80633059332	269.177313052	150.829662158	1.286538838
3.46017E-08	1.11445E-07	9.74026E-06	1.68661E-04	2.08969E-04	1.23462E-04
H = 17.079	rms=.6310″	121 obs.	arc: 1998 11 15.43179 – 2015 08 14.29626		
		(447334)			
2.2752419637435	0.277522395473	5.45829806588	307.799413502	76.466938289	87.7257975492
4.00139E-08	2.68742E-07	7.89597E-06	1.24818E-04	1.72979E-04	5.26117E-05
H = 18.201	rms=.6535″	139 obs.	arc: 2005 12 25.46736 – 2016 01 08.33444		
		(2008QG35)			
2.2126227999806	0.120150937410	4.2877084424	276.0770167376	350.194725548	210.9790145896
6.54428E-08	1.70853E-07	1.19012E-05	1.74382E-04	1.87610E-04	7.50787E-05
H = 17.650	rms=.6284″	79 obs.	arc: 2005 11 06.19008 – 2015 11 14.22038		
		(2008QH35)			
2.2805724408031	0.272094419031	4.2780518725	225.5989251751	176.6080813805	73.2926624961
1.65063E-08	1.23000E-07	1.15289E-05	8.57673E-05	8.94402E-05	1.65767E-05
H = 17.959	rms=.5784″	224 obs.	arc: 1991 11 11.49475 – 2016 01 21.15545		
		(269253)			
2.8484410156854	0.097159217286	5.12614174759	245.164241291	118.672071497	218.0425171401
5.15612E-08	1.28502E-07	8.66710E-06	1.32261E-04	1.37724E-04	4.29379E-05
H = 16.102	rms=.6545″	196 obs.	arc: 1999 11 12.35874 – 2016 04 02.35969		
		(278626)			
2.7428989128556	0.047211252365	4.17867561344	300.212461912	108.619097756	208.383632759
5.55996E-08	1.24326E-07	9.28078E-06	1.60882E-04	2.13116E-04	1.36590E-04
H = 16.427	rms=.6323″	160 obs.	arc: 2000 12 29.43260 – 2015 03 19.41913		
		(431803)			
2.634955372277	0.138939819666	3.3972491121	278.179868861	98.029212362	282.175702467
1.10846E-07	1.92559E-07	1.70644E-05	2.97706E-04	3.14892E-04	1.07224E-04
H = 17.151	rms=.5774″	44 obs.	arc: 2004 10 04.34049 – 2014 02 24.32054		
		(278640)			
3.1384102757107	0.085454411863	10.3089253821	330.3287429740	35.0448213781	136.8619963185
7.28169E-08	1.19437E-07	1.27031E-05	5.13917E-05	9.03373E-05	7.04426E-05
H = 16.017	rms=.5967″	128 obs.	arc: 2002 07 15.37500 – 2016 01 17.39536		
		(2008RA6)			
2.613038702342	0.098267200302	14.3347186780	334.4454788566	306.3683990	9.7389876338
1.15682E-07	2.54973E-07	2.15426E-05	5.00233E-05	1.13313E-04	9.27936E-05
H = 16.535	rms=.6567″	62 obs.	arc: 2008 08 25.02969 – 2015 02 10.38529		
		(375322)			
3.0053737739388	0.078169038162	9.2762775251	312.9794015697	42.362523346	180.811202568
8.86394E-08	1.75529E-07	1.75078E-05	7.18505E-05	1.48502E-04	1.23835E-04
H = 16.186	rms=.7568″	74 obs.	arc: 2003 09 19.38140 – 2016 02 27.21124		
		(266918)			
3.416627968259	0.157078908788	6.8004523531	279.183617679	115.448088469	55.6999168052
1.09038E-07	2.01645E-07	1.26752E-05	1.15095E-04	1.24867E-04	4.01348E-05
H = 15.936	rms=.6814″	132 obs.	arc: 2002 10 06.40535 – 2015 12 03.27671		
		(457303)			
2.2355856465658	0.229251192415	2.9732524005	257.993161557	100.094234697	124.25420003886
3.93863E-08	1.37278E-07	1.47231E-05	2.25134E-04	2.28629E-04	4.63269E-05
H = 18.372	rms=.5266″	54 obs.	arc: 2005 12 04.25122 – 2016 01 02.24924		

Table 3. Continued.

a (au)	e	i (deg)	Ω (deg)	ω (deg)	M (deg)
			(2008SD8)		
2.686399181	0.2499325798	9.170317025	198.84333868	173.3325213	270.2153833
2.33781E-04	6.85139E-05	4.98346E-04	1.15245E-03	2.14011E-02	9.25437E-02
H = 17.712	rms=0.5355″	21 obs.	arc: 2008 09 23.82090 – 2008 11 24.13197		
			(2008SE8)		
5.259325451073	0.115316929788	28.0566563521	181.9507364548	260.1240920908	156.0002958645
2.95217E-07	1.69615E-07	1.77383E-05	2.46311E-05	8.78387E-05	9.48109E-05
H = 13.366	rms=.5380″	108 obs.	arc: 2001 04 17.177850 – 2016 04 10.58172		
			(453256)		
2.2032347070083	0.147623335553	4.9106684753	316.847145751	358.386719117	172.8205581317
5.94135E-08	1.29278E-07	1.27983E-05	1.68932E-04	1.82716E-04	8.79025E-05
H = 17.529	rms=.5669″	54 obs.	arc: 2008 07 29.42857 – 2015 12 10.33105		
			(2008SG150)		
2.82263164	0.06789759	5.2057697	231.618219	85.0068	267.2153
5.56086E-03	6.47640E-03	6.43887E-02	5.78625E-01	2.59814E+01	2.38107E+01
H = 15.997	rms=0.7000″	15 obs.	arc: 2008 09 23.82090 – 2008 10 01.20107		
			(322264)		
3.0942927440581	0.0380046912962	10.5088559771	195.9546972987	227.730911749	89.919212259
7.05792E-08	9.82074E-08	1.07070E-05	4.56033E-05	1.80727E-04	1.64795E-04
H = 15.490	rms=.4574″	207 obs.	arc: 1992 10 03.33410 – 2016 01 10.57713		
			(349568)		
2.3157548903286	0.134450753615	7.39673159561	209.1777849552	128.6080854593	94.0501635645
2.76673E-08	1.00735E-07	9.98923E-06	6.37569E-05	7.23052E-05	3.01884E-05
H = 17.547	rms=.6250″	157 obs.	arc: 2001 11 12.148740 – 2015 11 03.25306		
			(331316)		
3.0541642709557	0.0049705363727	9.34143001279	202.9385326501	160.983958479	158.615627265
7.40550E-08	9.16397E-08	7.70340E-06	4.78785E-05	8.09184E-04	8.06720E-04
H = 15.575	rms=.4668″	231 obs.	arc: 2003 10 18.18761 – 2016 02 09.42192		
			(441752)		
2.636925333243	0.0503694847689	6.4928046820	111.1573235350	332.382146628	316.849845721
1.26773E-07	9.74321E-08	1.20945E-05	9.33787E-05	3.37495E-04	3.48515E-04
H = 17.085	rms=.4904″	85 obs.	arc: 2003 10 29.34630 – 2015 09 05.35329		
			(346805)		
3.010548898375	0.301667221157	9.0935164680	334.3464731349	56.969555106	223.952811575
1.76710E-07	2.14545E-07	3.35167E-05	8.75098E-05	1.56654E-04	1.35416E-04
H = 16.678	rms=.8453″	57 obs.	arc: 2002 11 01.21825 – 2012 07 28.44177		
			(395017)		
2.6996313635418	0.109534892366	14.7715268078	123.6563430174	16.1792464481	244.4021732364
8.61902E-08	1.26706E-07	1.55996E-05	3.76752E-05	7.74748E-05	7.80608E-05
H = 16.439	rms=.6005″	97 obs.	arc: 2003 11 21.30243 – 2015 08 11.36233		
			(309836)		
2.2661530518894	0.1321098941106	2.6898920437	32.769813267	120.266250489	56.1419381719
2.78537E-08	1.41738E-07	1.29652E-05	2.07481E-04	2.14977E-04	5.06024E-05
H = 18.104	rms=.5877″	93 obs.	arc: 1999 04 17.20485 – 2016 03 15.38068		
			(284863)		
3.0661736267564	0.0253363017405	10.7635263795	114.8071380238	90.442474297	75.510272044
9.81542E-08	1.19508E-07	1.07002E-05	7.07719E-05	2.49812E-04	2.32824E-04
H = 15.795	rms=.5849″	126 obs.	arc: 2005 07 11.24808 – 2015 04 19.20951		
			(453387)		
2.3217417957308	0.164454928482	3.35313219381	65.908022364	59.580283705	48.5823908787
3.04311E-08	1.12596E-07	9.20796E-06	1.70207E-04	1.74193E-04	3.31429E-05
H = 18.126	rms=.5007″	112 obs.	arc: 2009 01 01.45744 – 2016 02 03.19901		
			(405088)		
2.2236994258505	0.137981920769	5.3611443777	78.552187398	338.315188458	155.3248679338
3.20896E-08	1.16048E-07	1.03645E-05	1.06930E-04	1.21370E-04	5.09209E-05
H = 17.806	rms=.6682″	99 obs.	arc: 2001 11 17.30364 – 2016 03 28.42509		
			(296207)		
2.4163670492726	0.1665161601638	5.4507227862	15.6484962523	16.8816174629	80.5568707800
4.63744E-08	1.46938E-07	1.17505E-05	7.64680E-05	9.44796E-05	3.77771E-05
H = 17.461	rms=.5644″	182 obs.	arc: 2000 11 29.22824 – 2015 11 30.41761		

Table 3. Continued.

a (au)	e	i (deg)	Ω (deg)	ω (deg)	M (deg)
		(2009CP2)			
2.3658660538038	0.116836845759	5.3932419682	10.100573593	195.816545694	321.5099152627
5.93684E-08	2.26467E-07	2.16869E-05	1.14676E-04	1.28150E-04	5.52265E-05
H = 17.681	rms=.6056″	70 obs.	arc: 2002 04 20.19974 – 2014 09 02.32877		
		(294178)			
2.8129783774710	0.0600712024054	4.7202798438	39.724641907	69.923799257	234.084805629
6.17881E-08	9.21898E-08	1.15796E-05	1.29045E-04	1.70057E-04	1.11008E-04
H = 16.974	rms=.6228″	122 obs.	arc: 2003 12 18.38250 – 2014 04 01.16672		
		(2009CN3)			
2.562926014910	0.191897310898	5.2924822286	76.597586955	357.785927599	339.6947080559
1.58293E-07	2.80014E-07	2.54081E-05	2.34780E-04	2.43065E-04	6.89463E-05
H = 17.537	rms=.5418″	51 obs.	arc: 2009 02 02.04039 – 2014 05 27.36548		
		(338959)			
2.988220977442	0.085644224099	6.7696585970	8.478631736	192.642811435	104.5659710204
1.08287E-07	1.80752E-07	1.30853E-05	1.00371E-04	1.28123E-04	7.09593E-05
H = 16.560	rms=.5753″	79 obs.	arc: 2004 02 16.36774 – 2016 08 08.45791		
		(435938)			
3.039272392372	0.235345244374	4.8866027438	44.720645126	28.941524190	188.0518466072
1.74928E-07	2.12136E-07	2.65625E-05	2.40539E-04	2.43684E-04	9.47210E-05
H = 16.488	rms=.9006″	47 obs.	arc: 2002 11 22.20598 – 2010 05 08.24576		
		(2009CQ3)			
3.246622167922	0.036615693493	5.0571751659	72.395907191	48.881849944	113.492607822
1.52161E-07	1.34081E-07	1.38353E-05	1.49845E-04	3.15183E-04	2.71189E-04
H = 16.198	rms=.6130″	86 obs.	arc: 2007 11 19.18166 – 2016 04 30.45430		
		(395019)			
2.7459897388297	0.127786166101	4.0888641970	47.545325847	117.293216107	209.4861013909
7.38343E-08	1.50299E-07	1.80427E-05	1.99440E-04	2.13919E-04	7.99970E-05
H = 17.115	rms=.6539″	55 obs.	arc: 2005 03 14.44302 – 2014 05 18.21575		
		(389191)			
3.007236740590	0.066499422737	9.883153330	106.5756789503	74.2276794877	117.1550252207
1.08156E-07	1.19270E-07	1.05200E-05	7.39018E-05	1.30056E-04	1.02557E-04
H = 16.337	rms=.5687″	117 obs.	arc: 2007 11 14.22274 – 2015 07 02.30804		
		(212977)			
2.2673125918137	0.1425034059530	5.9815802264	0.3857706773	259.1625854425	318.2957132318
2.59942E-08	9.34981E-08	1.11244E-05	7.16830E-05	8.12950E-05	4.31689E-05
H = 16.862	rms=.7010″	206 obs.	arc: 2000 09 24.28932 – 2016 03 02.35623		
		(445190)			
2.727317314118	0.129843465847	13.9080745768	328.50230525135	232.203535660	185.9091472511
1.58628E-07	3.04833E-07	2.52695E-05	5.12228E-05	1.09955E-04	8.28194E-05
H = 16.963	rms=.6328″	55 obs.	arc: 2006 09 26.17147 – 2015 07 28.50091		
		(359169)			
2.3704679747088	0.119743955685	3.8685945331	77.722504770	115.185639084	331.4877646185
5.52603E-08	1.34775E-07	1.12353E-05	1.72348E-04	1.80476E-04	4.75743E-05
H = 17.598	rms=.6959″	80 obs.	arc: 2004 12 20.21977 – 2015 12 14.41226		
		(441753)			
2.5537060386974	0.164050511862	5.0871080467	93.901320850	8.782501491	324.0253364083
8.94464E-08	1.95670E-07	1.80486E-05	1.91455E-04	1.98685E-04	6.22880E-05
H = 17.766	rms=.6652″	56 obs.	arc: 2007 09 13.30537 – 2015 08 12.46223		
		(241496)			
2.6390557795527	0.126205225402	9.3871988545	118.0947066826	224.3691111220	54.7732256121
6.33926E-08	1.29188E-07	1.06642E-05	4.37595E-05	5.92575E-05	3.42905E-05
H = 16.477	rms=.6314″	175 obs.	arc: 2003 11 24.28301 – 2015 10 15.21953		
		(398010)			
2.6668943117669	0.193341216839	15.8922214541	115.9188422705	93.022694834	204.8831848460
9.42148E-08	2.16127E-07	1.93610E-05	6.24777E-05	1.24274E-04	8.54402E-05
H = 16.702	rms=.6127″	84 obs.	arc: 2005 03 15.41646 – 2014 07 28.30959		
		(2009CX39)			
3.056700207048	0.242092123563	10.5411485230	107.8278412501	31.322559877	142.231773527
8.12045E-07	7.25690E-07	2.57379E-05	9.94364E-05	8.64451E-04	6.89678E-04
H = 16.751	rms=.7029″	48 obs.	arc: 2008 10 31.49292 – 2014 02 24.33023		

Table 3. Continued.

a (au)	e	i (deg)	Ω (deg)	ω (deg)	M (deg)
		(2009CY39)			
2.47135	0.28336	12.2259	331.7402	208.173	307.552
2.20045E+00	1.01688E+00	1.21645E+01	1.62881E+01	2.14702E+02	9.86409E+02
H = 18.020	rms=0.7589″	7 obs.	arc: 2009 02 02.04039 – 2009 02 03.09098		
		(398067)			
3.094545737901	0.241832750555	15.7971694670	204.9506398631	88.651111397	68.487142671
2.84697E-07	1.71901E-07	4.44433E-05	6.10794E-05	1.51153E-04	1.54180E-04
H = 15.670	rms=.7032″	61 obs.	arc: 2005 11 03.19667 – 2010 09 14.43833		
		(262312)			
2.4183387324715	0.214902190784	3.4821582276	116.066416753	165.062294701	291.6842756081
4.28769E-08	1.07624E-07	1.06483E-05	1.75664E-04	1.77987E-04	3.68206E-05
H = 17.061	rms=.6130″	101 obs.	arc: 1995 10 25.32772 – 2016 02 16.43471		
		(306561)			
2.6101109495057	0.116580862728	3.30343481854	138.260743777	41.642851237	291.2043968595
3.84932E-08	1.00169E-07	8.70595E-06	1.68585E-04	1.72132E-04	3.71564E-05
H = 16.494	rms=.5924″	174 obs.	arc: 1999 12 09.46787 – 2016 01 04.32060		
		(296472)			
2.4273532928159	0.182421670129	5.07962431497	81.574341596	183.126814495	299.9583779563
5.29466E-08	1.29203E-07	9.65066E-06	1.09486E-04	1.24150E-04	7.35188E-05
H = 17.227	rms=.7301″	126 obs.	arc: 1994 06 03.10312 – 2016 03 03.28751		
		(257320)			
2.3175687933398	0.1241905704659	7.33795450351	136.3617448934	176.317078767	303.4761840052
2.65494E-08	8.05506E-08	7.36178E-06	9.88802E-05	1.13989E-04	6.10386E-05
H = 17.021	rms=.5704″	172 obs.	arc: 1995 06 25.20966 – 2016 05 10.26339		
		(263951)			
2.7908820023657	0.1762491595492	8.82427316181	147.1016440862	124.4286019027	163.8830824904
5.11509E-08	9.02772E-08	9.65076E-06	6.97530E-05	7.70282E-05	3.84433E-05
H = 16.391	rms=.5419″	115 obs.	arc: 2004 04 16.13641 – 2016 01 01.26273		
		(467736)			
2.4143499760648	0.2238681630075	4.8804285941	186.2371406505	134.563858878	318.9081517873
5.65996E-08	9.08063E-08	1.83237E-05	1.08462E-04	1.24453E-04	6.15089E-05
H = 17.611	rms=.5981″	114 obs.	arc: 2009 08 18.30641 – 2016 04 16.57772		
		(367534)			
2.633213662611	0.188571312541	8.3040582617	337.5756684403	21.1769965524	214.9234163208
1.44252E-07	3.16868E-07	1.82679E-05	7.35675E-05	9.80694E-05	9.30798E-05
H = 17.141	rms=.6265″	69 obs.	arc: 2005 10 10.35550 – 2016 03 10.40668		
		(2009SK17)			
3.079187921044	0.22630662020	10.6142727790	349.544109760	51.923786526	74.143753730
9.10362E-07	1.07216E-06	2.15132E-05	1.11271E-04	8.93881E-04	7.64060E-04
H = 16.805	rms=.4474″	41 obs.	arc: 2009 09 17.91259 – 2015 12 10.46383		
		(2009SM17)			
2.78837276	0.248599409	11.8545664	350.1672671	33.803016	159.33766
9.46534E-03	5.54255E-04	9.03095E-02	9.61533E-02	8.99277E-01	2.97587E+00
H = 17.416	rms=0.4847″	19 obs.	arc: 2009 09 17.91748 – 2009 09 25.21359		
		(2009SQ17)			
2.27895042	0.13951484	5.4272368	328.718564	66.90588	334.29854
7.27299E-03	1.29522E-03	5.19682E-02	2.29043E-01	2.61053E+00	5.22015E+00
H = 18.123	rms=0.7447″	12 obs.	arc: 2009 09 17.92214 – 2009 09 25.21359		
		(324313)			
3.1160058204126	0.1352072528287	4.3675630349	324.364001633	75.664806202	62.8493220220
9.42460E-08	9.60887E-08	1.49701E-05	1.23482E-04	1.36648E-04	5.51416E-05
H = 16.762	rms=.6418″	98 obs.	arc: 2004 11 11.33915 – 2015 12 03.28250		
		(403409)			
3.118440641269	0.060068640228	9.0127227835	338.7175317745	334.659848663	136.444454188
1.07188E-07	1.87284E-07	2.16118E-05	5.71427E-05	1.23382E-04	1.04836E-04
H = 15.547	rms=.6259″	119 obs.	arc: 2003 07 08.40110 – 2015 11 01.31281		
		(383137)			
2.586724044083	0.263217541073	2.9291770371	261.001816588	123.174584012	221.3532914447
1.48475E-07	5.82930E-07	1.28312E-05	3.60814E-04	4.08123E-04	9.75748E-05
H = 17.821	rms=.6398″	87 obs.	arc: 1 2004 07 16.09908 – 2013 08 18.47788		

Table 3. Continued.

a (au)	e	i (deg)	Ω (deg)	ω (deg)	M (deg)
		(2014RL20)			
3.0439432161209	0.092728676549	10.1774878954	343.8462319845	132.840079035	5.1089263855
9.93233E-08	1.17862E-07	1.79068E-05	6.00312E-05	1.12603E-04	9.65630E-05
H = 15.916	rms=.5249″	101 obs.	arc: 1998 09 26.22578 – 2015 12 16.26577		
		(330894)			
2.7934833565183	0.0675837496881	4.33250278731	297.452979028	110.287607441	132.4199307068
6.40816E-08	8.08804E-08	8.44997E-06	1.06907E-04	1.28061E-04	6.94876E-05
H = 16.195	rms=.5925″	192 obs.	arc: 2005 12 10.29056 – 2016 02 27.32686		
		(425696)			
2.7348771903194	0.080312287073	8.9577260549	342.1603631434	166.063394500	50.1780496231
3.40494E-08	1.24179E-07	1.11693E-05	6.01720E-05	1.04407E-04	7.90659E-05
H = 16.561	rms=.5728″	149 obs.	arc: 1993 01 25.31950 – 2016 04 03.14693		
		(320999)			
2.3411597103072	0.069813328670	4.3245714070	209.415292611	197.956065379	291.6478492588
2.88624E-08	1.45439E-07	1.64151E-05	1.10042E-04	1.30383E-04	7.49615E-05
H = 17.696	rms=.6204″	99 obs.	arc: 1991 09 15.23186 – 2015 05 25.23128		
		(2009ST77)			
2.7554761	0.1523540	3.896379	210.29833	191.1324	152.7061
9.57364E-02	3.19575E-02	8.60665E-01	3.69264E+00	6.61951E+01	7.40922E+01
H = 17.127	rms=0.5251″	10 obs.	arc: 2009 09 17.84765 – 2009 09 23.21957		
		(2009SV77)			
2.898452803668	0.194436380056	12.3696632377	350.6424378734	66.187205513	105.403149051
1.14431E-07	5.36717E-07	2.91302E-05	5.26232E-05	3.69841E-04	2.80086E-04
H = 17.090	rms=.5706″	80 obs.	arc: 2004 09 11.40539 – 2016 02 11.41883		
		(2009SW77)			
3.2145763	0.2135687	3.411951	248.50870	90.8952	85.46285
4.25122E-02	4.61135E-02	1.34957E-01	2.11397E+00	1.17313E+01	3.90414E+00
H = 16.933	rms= 0.5563″	11 obs.	arc: 2009 09 17.91748 – 2009 09 23.21203		
		(346896)			
2.2465702317373	0.097885769211	6.5712502613	196.8805648577	206.536334042	340.3220648926
4.64736E-08	1.11254E-07	1.01107E-05	9.84346E-05	1.21688E-04	8.24319E-05
H = 17.768	rms=.5166″	79 obs.	arc: 2004 02 17.31477 – 2015 06 23.44282		
		(2009SL100)			
3.045708228463	0.070851224903	9.4438613374	346.1823082627	90.072518368	41.727665724
1.26197E-07	1.28348E-07	1.85375E-05	6.38568E-05	1.64205E-04	1.45200E-04
H = 15.941	rms=.6073″	83 obs.	arc: 2006 02 07.17172 – 2016 03 01.27608		
		(353194)			
5.148631571052	0.087255180032	16.2237970496	358.1302976202	123.980931893	107.505258191
3.83902E-07	1.20030E-07	1.62044E-05	3.72733E-05	1.27189E-04	1.13942E-04
H = 13.499	rms=.5408″	151 obs.	arc: 1997 10 04.17639 – 2015 05 19.32032		
		(375759)			
2.600919083461	0.299977673032	32.0710491229	22.2249947299	308.3353480531	258.8603235514
1.24569E-07	3.03335E-07	5.97898E-05	2.45880E-05	6.84260E-05	4.24334E-05
H = 16.435	rms=.8081″	94 obs.	arc: 2008 03 29.27010 – 2016 04 04.23413		
		(281189)			
2.7601341596000	0.1241744241402	8.2718616157	208.9080813236	243.1591849819	105.9428769921
5.43159E-08	7.73303E-08	1.16622E-05	4.91494E-05	7.55464E-05	4.95747E-05
H = 16.587	rms=.5807″	213 obs.	arc: 2002 02 15.33771 – 2016 04 02.38578		
		(264068)			
5.190529794428	0.116656738948	8.1542366780	242.3258950452	149.773390947	196.7478802063
5.28086E-07	1.82800E-07	1.23321E-05	8.07807E-05	1.06158E-04	8.74173E-05
H = 13.351	rms=.5190″	152 obs.	arc: 1998 12 17.16344 – 9 2015 06 03.03234		
		(333720)			
2.2146770516135	0.190960614786	4.1149397450	274.669623981	92.944145005	29.8228983775
3.42525E-08	1.23860E-07	1.11704E-05	1.84259E-04	1.86282E-04	3.99311E-05
H = 17.810	rms=.5192″	72 obs.	arc: 1999 09 05.29264 – 2014 02 28.33143		
		(325588)			
3.1559436286602	0.1421456002595	5.9184731864	289.5848275848	107.3893701206	62.8266141642
7.63539E-08	7.56203E-08	1.07188E-05	8.30264E-05	9.66601E-05	4.26306E-05
H = 15.672	rms=.4777″	174 obs.	arc: 2003 08 20.94269 – 2016 02 06.32546		

Table 3. Continued.

a (au)	e	i (deg)	Ω (deg)	ω (deg)	M (deg)
		(2009SH229)			
2.4043898	0.21140552	2.242032	193.611708	189.91582	283.1121
5.51157E-02	7.63209E-03	1.62548E-01	9.19786E-01	2.47664E+00	2.35978E+01
H = 18.431	rms=1.0485″	18 obs.	arc: 2009 09 17.36848 – 2009 09 21.94308		
		(402524)			
3.216539902641	0.086135659992	12.3577959854	351.1682345629	85.790157629	14.39405119252
1.54546E-07	1.68399E-07	1.38928E-05	5.24285E-05	1.10832E-04	8.78274E-05
H = 15.733	rms=.4863″	121 obs.	arc: 2006 02 20.41970 – 2015 12 06.23665		
		(400736)			
3.0735045515158	0.298386907096	7.9966779659	237.269374205	104.648434325	114.1856142463
6.16663E-08	1.52395E-07	1.60193E-05	1.12525E-04	1.28141E-04	4.07074E-05
H = 16.516	rms=.6320″	64 obs.	arc: 1993 10 13.41832 – 2014 07 27.85792		
		(2015TZ170)			
3.1133346728136	0.075993627571	10.1841353789	178.4332529084	220.116817262	50.2281467019
1.43449E-07	1.70413E-07	1.70820E-05	7.24709E-05	1.23451E-04	9.02998E-05
H = 16.522	rms=.6998″	62 obs.	arc: 2003 07 08.39094 – 2016 01 04.28200		
		(336860)			
2.5859595705288	0.169619235780	4.1959103143	277.332017102	358.475317565	17.7029978508
6.08751E-08	1.40237E-07	1.34294E-05	1.87658E-04	1.95282E-04	4.77673E-05
H = 17.757	rms=0.6731″	109 obs.	arc: 2007 03 13.32531 – 2016 08 07.38289		
		(375801)			
2.5786879371214	0.251457817446	12.0876394652	21.9330450856	19.1158777154	225.6261105913
8.91735E-08	2.89758E-07	2.41350E-05	4.63008E-05	8.26733E-05	6.52614E-05
H = 16.758	rms= 0.7260″	138 obs.	arc: 2007 04 20.24167 – 2015 03 25.53108		
		(2016QT23)			
2.3301836551573	0.1826907131586	5.2812236917	212.5936816094	93.083294434	16.1988556025
2.55216E-08	8.59645E-08	1.04159E-05	9.95604E-05	1.07407E-04	3.27007E-05
H = 17.813	rms= 0.6052″	103 obs.	arc: 2002 10 10.23500 – 2016 10 30.27842		
		(2016NT46)			
2.331946298964	0.10175153528	6.6509426859	344.412084864	63.67581604	297.20361679
2.78225E-07	4.10541E-06	3.67008E-05	1.18923E-04	1.56617E-03	1.34794E-03
H = 17.729	rms= 0.7097″	59 obs.	arc: 2002 09 21.43160 – 2016 10 06.27244		

3. EPHEMERIDES FOR THE ASTEROIDS WITH ORBITS OF LOW ACCURACY

The ephemerides for 2017 (geocentric observer) were computed for three asteroids with poor orbits, when they will be the brightest: 2008 QP32, 2008 SD8, and 2008 SG150. These three Main Belt asteroids have different values of errors in their ephemeridial position on the sky. We used the OrbFit software version 5.0 and JPL DE431 planetary and lunar ephemerides with 25 additional perturbing asteroids according to Farnocchia et al. (2013). The ephemerides are computed for the value of the non-gravitational parameter $A2 = 0$.

The ephemerides are given in Table 4. The columns list, in succession, right ascensions (h, m, s) and declinations (deg, arcmin, arcsec), expected magnitudes, solar and lunar elongations (deg), the sky plane errors in both axes (Err1 and Err2) in (deg, arcmin, arcsec), and the position angle (PA, deg). The errors in magnitudes are of the order of 0.5 mag. We need additional astrometric observations to extend their observational arcs and to improve the orbital elements.

4. SUMMARY

During the years 2008–2009, we obtained at the Molėtai Observatory a total of 11 900 astrometric positions of 2522 asteroids. Of these asteroids, 95 are new discoveries that account for 0.12% of all 81 705 asteroids discovered worldwide

Table 4. Ephemerides for 2017 (geocentric observer) of the asteroids of low accuracy discovered at the Molėtai Observatory .

Date	RA	DEC	Mag	Solar elongations	Lunar	Sky plane error Err1	Err2	PA
			2008 QP32 – Main Belt					
16 Jul 2017	22 49 30.520	– 08 31 54.77	20.9	132.9	32.8	91.289°	0.051°	59.3
26 Jul 2017	22 49 27.791	– 07 31 35.93	20.7	142.1	176.5	99.664°	0.034°	59.8
5 Aug 2017	22 46 09.978	– 06 42 43.00	20.4	152.1	–59.0	107.587°	0.014°	60.2
15 Aug 2017	22 40 00.184	– 06 05 14.79	20.1	162.8	72.5	113.945°	0.006°	60.6
25 Aug 2017	22 31 49.697	– 05 38 01.89	19.7	173.3	–144.5	117.495°	0.022°	60.9
4 Sep 2017	22 23 03.589	– 05 18 02.38	19.8	–172.7	–21.7	117.383°	0.029°	61.0
14 Sep 2017	22 15 15.629	– 05 01 13.43	20.1	–161.9	117.2	113.662°	0.027°	60.8
24 Sep 2017	22 09 45.042	– 04 43 29.21	20.4	–151.2	–106.4	107.202°	0.016°	60.6
4 Oct 2017	22 07 24.867	– 04 20 55.52	20.7	–141.1	18.1	99.273°	0.001°	60.2
14 Oct 2017	22 08 30.536	– 03 50 52.39	20.9	–131.7	156.3	91.009°	0.019°	59.7
			2008 SD8 – Main Belt					
4 Sep 2017	02 11 48.640	+15 11 18.98	20.8	125.5	–81.7	14.478′	0.025′	81.2
14 Sep 2017	02 15 11.436	+14 29 35.18	20.6	134.7	54.6	15.672′	0.028′	80.9
24 Sep 2017	02 15 20.759	+13 23 06.38	20.4	144.8	–169.4	16.858′	0.031′	80.3
4 Oct 2017	02 12 26.851	+11 54 13.64	20.1	155.8	–46.8	17.881′	0.030′	79.6
14 Oct 2017	02 07 07.783	+10 09 17.02	19.8	167.2	96.6	18.546′	0.028′	79.0
24 Oct 2017	02 00 27.163	+08 18 27.57	19.6	176.3	–133.3	18.681′	0.023′	78.6
3 Nov 2017	01 53 49.752	+06 34 38.21	19.9	–167.3	–4.9	18.231′	0.018′	78.5
13 Nov 2017	01 48 33.462	+05 09 17.42	20.2	–155.9	140.0	17.292′	0.014′	78.6
23 Nov 2017	01 45 34.958	+04 09 46.02	20.5	–144.9	–96.4	16.050′	0.011′	78.9
3 Dec 2017	01 45 25.598	+03 38 40.15	20.8	–134.6	35.5	14.698′	0.010′	79.3
			2008 SG150 – Main Belt					
17 May 2017	20 01 43.569	–15 22 25.79	20.7	116.6	4.5	2.178°	0.099°	77.8
27 May 2017	20 03 20.113	–14 48 15.50	20.5	125.6	142.8	2.358°	0.119°	77.5
6 Jun 2017	20 02 22.867	–14 21 17.92	20.3	135.2	–82.9	2.539°	0.139°	77.4
16 Jun 2017	19 58 53.820	–14 02 47.03	20.1	145.3	38.7	2.708°	0.158°	77.5
26 Jun 2017	19 53 05.787	–13 53 24.63	19.9	155.8	–174.2	2.848°	0.174°	77.7
6 Jul 2017	19 45 30.774	–13 53 01.70	19.6	166.1	–46.5	2.942°	0.185°	77.9
16 Jul 2017	19 36 58.045	–14 00 32.73	19.5	172.5	80.1	2.975°	0.189°	78.2
26 Jul 2017	19 28 25.943	–14 14 14.48	19.6	–166.4	–133.3	2.946°	0.187°	78.6
5 Aug 2017	19 20 56.553	–14 31 57.90	19.8	–156.0	–9.2	2.863°	0.179°	78.9
15 Aug 2017	19 15 19.497	–14 51 32.73	20.0	–145.5	123.4	2.743°	0.166°	79.1
25 Aug 2017	19 12 06.933	–15 11 03.95	20.3	–135.3	–94.7	2.607°	0.150°	79.2
4 Sep 2017	19 11 35.208	–15 28 48.27	20.4	–125.6	27.4	2.471°	0.133°	79.2
14 Sep 2017	19 13 43.289	–15 43 18.22	20.6	–116.5	162.9	2.347°	0.117°	79.1

during this two-year period. Four of the new asteroids belong to the Trojan group. For most of the 95 new asteroids we present the orbits of high accuracy. The orbital elements of the remaining new asteroids are of low accuracy, thus they need additional astrometric observations. For three Main Belt asteroids with poor orbits, that can be brighter than 20 mag and can be visible in the nearest future, the ephemerides for 2017 are given.

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