

MINOR PLANETS AT UNUSUALLY FAVORABLE ELONGATIONS IN 2012

Frederick Pilcher
4438 Organ Mesa Loop
Las Cruces, NM 88011 USA
pilcher@ic.edu

(Received: 31 July)

A list is presented of minor planets that are much brighter than usual at their 2012 apparitions.

The minor planets in the lists which follow will be much brighter at their 2012 apparitions than at their average distances at maximum elongation. Many years may pass before these planets will be again as bright as in 2012. Observers are encouraged to give special attention to those which lie near the limit of their equipment.

These lists have been prepared by an examination of the maximum elongation circumstances of minor planets computed by the author for all years through 2060 with a full perturbation program written by Dr. John Reed, and to whom he expresses his thanks. Elements are from *Ephemerides of Minor Planets* (1992), except that for all planets for which new or improved elements have been published subsequently in the *Minor Planet Circulars* or in electronic form, the newer elements have been used. Planetary positions are from the JPL DE-200 ephemeris, courtesy of Dr. E. Myles Standish.

Any planets whose brightest magnitudes near the time of maximum elongation vary by at least 2.0 in this interval and in 2012 will be within 0.3 of the brightest occurring, or vary by at least 3.0 and in 2012 will be within 0.5 of the brightest occurring; and which are visual magnitude 14.5 or brighter, are included. For planets brighter than visual magnitude 13.5, which are within the range of a large number of observers, these standards have been relaxed somewhat to include a larger number of planets. Magnitudes have been computed from the updated magnitude parameters published in MPC28104-28116, on 1996 Nov. 25, or more recently in the *Minor Planet Circulars*.

Oppositions may be in right ascension or in celestial longitude. Here we use still a third representation, maximum elongation from the Sun, instead of opposition. Though unconventional, it has the advantage that many close approaches do not involve actual opposition to the Sun near the time of minimum distance and greatest brightness and are missed by an opposition-based program. Other data are also provided according to the following tabular listings: minor planet number, date of maximum elongation from the Sun in format yyyy/mm/dd, maximum elongation in degrees, right ascension on date of maximum elongation, declination on date of maximum elongation, both in J2000 coordinates, date of brightest magnitude in format yyyy/mm/dd, brightest magnitude, date of minimum distance in format yyyy/mm/dd, and minimum distance in AU.

Users should note that when the maximum elongation is about 177° or greater, the brightest magnitude is sharply peaked due to enhanced brightening near zero phase angle. Even as near as 10 days before or after minimum magnitude the magnitude is generally about 0.4 greater. This effect takes place in greater time interval for smaller maximum elongations. There is some interest in very small minimum phase angles. For maximum elongations E

near 180° at Earth distance Δ , an approximate formula for the minimum phase angle ϕ is $\phi = (180^\circ - E)/(\Delta + 1)$.

Six numbered Earth approachers will be making approaches within 0.122 AU to Earth or closer. Their numbers and names, dates of brightest magnitude in the year 2012, and brightest magnitude are: 4179 Toutatis 12/16 10.5; 4183 Cuno 05/31 12.2; (136993) 1998 ST49 10/15 13.6; (153958) 2002 AM31 07/18 13.7; (162421) 2000 ET70 02/20 13.3; and (214869) 2007 PA8 11/02 11.5. For 4179 Toutatis this is the last of a series of close approaches beginning with discovery in 1989. The next will not occur until 2069 Nov. 6 at 0.020 AU.

Table I. Numerical Sequence of Favorable Elongations

Planet	Max	Elon	D	Max	E	RA	Dec	Br	Mag	D	Br	Mag	Min	Dist	D	Min	Dist
1	2012/12/18	178.1°		5h45m	+25°			2012/12/18	6.7		2012/12/20	1.684					
5	2012/03/11	174.9°		11h37m	+7°			2012/03/11	9.0		2012/03/08	1.141					
11	2012/09/03	175.1°		22h57m	-11°			2012/09/03	8.9		2012/08/31	1.215					
17	2012/08/05	178.5°		21h 6m	-18°			2012/08/05	10.1		2012/07/31	1.225					
59	2012/09/30	175.4°		0h36m	-0°			2012/09/30	10.8		2012/09/30	1.402					
67	2012/07/21	167.8°		19h53m	-8°			2012/07/21	10.2		2012/07/22	0.976					
85	2012/10/11	178.1°		1h 4m	+8°			2012/10/11	10.1		2012/10/04	1.284					
95	2012/10/29	170.1°		1h57m	+22°			2012/10/29	11.3		2012/10/28	1.620					
96	2012/02/10	179.4°		9h32m	+15°			2012/02/10	11.0		2012/02/13	1.684					
116	2012/04/08	175.7°		13h15m	-3°			2012/04/08	10.8		2012/04/05	1.447					
138	2012/06/13	177.2°		17h26m	-26°			2012/06/13	10.9		2012/06/19	1.150					
141	2012/08/17	177.7°		21h44m	-11°			2012/08/17	10.6		2012/08/23	1.234					
162	2012/02/12	170.4°		9h54m	+22°			2012/02/12	12.1		2012/02/14	1.506					
183	2012/12/19	134.6°		5h16m	-21°			2012/12/08	12.2		2012/12/04	1.050					
234	2012/08/12	176.9°		21h22m	-12°			2012/08/12	10.1		2012/08/15	0.807					
236	2012/09/20	178.0°		23h49m	+0°			2012/09/20	10.7		2012/09/20	1.272					
295	2012/10/23	175.7°		1h47m	+15°			2012/10/23	13.0		2012/10/26	1.379					
347	2012/02/27	159.5°		11h13m	+26°			2012/02/28	11.7		2012/02/29	1.229					
352	2012/12/02	179.5°		4h37m	+21°			2012/12/02	11.4		2012/11/27	0.933					
359	2012/10/03	179.1°		0h36m	+4°			2012/10/03	11.4		2012/09/29	1.339					
360	2012/01/12	173.0°		7h25m	+14°			2012/01/11	11.9		2012/01/07	1.624					
368	2012/08/30	167.6°		22h15m	+2°			2012/08/29	13.2		2012/08/26	1.478					
430	2012/11/25	177.1°		4h 3m	+23°			2012/11/25	12.4		2012/11/26	1.131					
431	2012/07/13	179.6°		19h30m	-21°			2012/07/13	12.0		2012/07/17	1.671					
433	2012/02/10	148.3°		10h19m	-15°			2012/02/03	8.5		2012/01/31	0.179					
492	2012/10/01	178.3°		0h35m	+2°			2012/10/01	13.1		2012/09/27	1.626					
499	2012/11/05	178.3°		2h39m	+17°			2012/11/05	13.8		2012/11/07	2.245					
518	2012/10/20	179.0°		1h44m	+10°			2012/10/20	13.2		2012/10/11	1.199					
521	2012/12/15	177.9°		5h33m	+21°			2012/12/15	10.2		2012/12/08	1.068					
544	2012/08/02	176.6°		20h50m	-14°			2012/08/02	12.3		2012/07/29	1.217					
555	2012/01/09	178.4°		7h18m	+20°			2012/01/09	14.1		2012/01/11	1.743					
585	2012/02/15	172.0°		9h41m	+5°			2012/02/15	12.7		2012/02/16	1.137					
596	2012/05/31	179.5°		16h32m	-21°			2012/05/31	11.7		2012/05/31	1.432					
597	2012/10/09	172.0°		1h10m	-1°			2012/10/09	12.2		2012/10/05	1.339					
601	2012/09/09	178.8°		23h10m	-3°			2012/09/09	13.3		2012/09/07	1.824					
602	2012/08/30	177.2°		22h33m	-6°			2012/08/30	11.2		2012/09/04	1.431					
612	2012/09/18	161.9°		23h 6m	+13°			2012/09/16	14.4		2012/09/12	1.422					
620	2012/08/24	172.8°		22h23m	-17°			2012/08/24	13.5		2012/08/24	1.105					
625	2012/08/31	167.6°		23h 4m	-19°			2012/08/30	12.2		2012/08/28	1.062					
629	2012/01/21	171.6°		8h22m	+28°			2012/01/21	13.5		2012/01/22	1.677					
704	2012/11/15	159.6°		2h54m	+37°			2012/11/14	9.9		2012/11/11	1.709					
711	2012/06/26	166.5°		18h22m	-36°			2012/06/27	13.3		2012/06/30	0.817					
748	2012/11/11	178.0°		3h 7m	+19°			2012/11/12	13.5		2012/11/14	2.316					
756	2012/05/12	166.2°		15h36m	-5°			2012/05/11	13.4		2012/05/11	1.755					
760	2012/03/28	167.2°		12h11m	-15°			2012/03/27	11.2		2012/03/26	1.459					
767	2012/08/31	176.1°		22h47m	-11°			2012/08/31	13.2		2012/08/31	1.574					
787	2012/09/17	175.6°		23h33m	+1°			2012/09/17	12.5		2012/09/13	1.283					
882	2012/11/22	177.0°		3h47m	+22°			2012/11/21	13.3		2012/11/15	1.405					
889	2012/10/26	163.9°		2h28m	-2°			2012/10/27	13.1		2012/10/28	0.987					
923	2012/09/24	172.1°		23h49m	+7°			2012/09/24	13.9		2012/09/28	1.179					
930	2012/08/25	175.1°		22h20m	-15°			2012/08/25	13.5		2012/08/22	1.093					
960	2012/10/08	175.0°		0h49m	+10°			2012/10/08	14.5		2012/10/02	0.935					
999	2012/10/23	178.2°		1h48m	+12°			2012/10/22	13.3		2012/10/15	1.171					
1013	2012/01/20	158.2°		8h28m	+41°			2012/01/20	12.8		2012/01/21	1.184					
1052	2012/12/07	176.2°		5h 0m	+18°			2012/12/07	13.6		2012/12/03	0.983					
1060	2012/08/10	166.6°		21h 3m	-2°			2012/08/09	14.0		2012/08/06	0.792					
1083	2012/12/02	178.2°		4h36m	+20°			2012/12/02	14.2		2012/12/07	0.996					
1088	2012/11/27	177.0°		4h11m	+24°			2012/11/26	12.7		2012/11/18	0.892					
1096	2012/08/05	165.7°		21h23m	-30°			2012/08/05	12.7		2012/08/06	1.117					
1116	2012/12/29	152.0°		6h41m	+51°			2012/12/28	12.8		2012/12/26	1.351					
1130	2012/07/21	175.2°		20h 1m	-15°			2012/07/22	13.3		2012/07/26	0.815					
1131	2012/07/18	177.5°		19h52m	-22°			2012/07/18	13.7		2012/07/31	0.713					
1180	2012/07/22	174.5°		20h14m	-25°			2012/07/22	13.8		2012/07/22	2.343					
1198	2012/08/12	173.0°		21h21m	-8°			2012/08/13	14.5		2012/08/21	0.514					
1240	2012/08/25	177.2°		22h15m	-7°			2012/08/25	12.5		2012/08/26	1.381					
1267	2012/08/31	173.4°		22h50m	-14°			2012/08/31	14.3		2012/08/24	1.116					
1299	2012/09/15	178.2°		23h38m	-4°			2012/09/16	14.5		2012/09/21	1.550					
1301	2012/02/19	162.1°		9h26m	-3°			2012/02/17	13.4		2012/02/13	1.167					
1310	2012/09/26	174.9°		0h 6m	+6°			2012/09/27	13.2		2012/10/10	0.959					
1319	2012/06/18	179.1°		17h48m	-22°			2012/06/18	14.2		2012/06/12	1.532					
1346	2012/09/06	178.9°		22h58m	-5°			2012/09/06	14.0		2012/09/12	1.404					
1360	2012/08/12	170.5°		21h35m	-24°			2012/08/11	13.6		2012/08/04	1.243					
1369	2012/10/03	176.1°		0h46m	+0°			2012/10/03	14.3		2012/09/25	1.725					
1456	2012/09/14	163.9°		23h 3m	+11°			2012/09/13	14.4		2012/09/12	1.551					
1473	2012/08/21	154.7°		21h24m	+11°			2012/08/23	14.1		2012/08/24	1.026					

Planet	Max	Elon	D	Max	E	RA	Dec	Br	Mag	D	Br	Mag	Min	Dist	D	Min	Dist	Planet	Max	Elon	D	Max	E	RA	Dec	Br	Mag	D	Br	Mag	Min	Dist	D	Min	Dist																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
1474	2012/09/02	147.2°	23h	8m	+24°			2012/09/16	13.8	2012/09/25	0.646	3554	2012/03/27	151.1°	12h47m	-31°		2012/03/29	14.4	2012/04/01	0.258	760	2012/03/28	167.2°	12h11m	-15°		2012/03/27	11.2	2012/03/26	1.459	116	2012/04/08	175.7°	13h15m	-3°		2012/04/08	10.8	2012/04/05	1.447	1545	2012/03/10	175.2°	11h31m	+8°		2012/03/10	14.1	2012/03/06	1.169	1650	2012/04/24	178.5°	14h13m	-11°		2012/04/25	13.5	2012/05/01	1.100	1554	2012/09/12	162.5°	22h47m	+11°		2012/09/11	14.3	2012/09/11	1.114	19774	2012/04/28	160.7°	13h49m	-31°		2012/04/28	14.5	2012/04/29	1.049	4201	2012/05/07	177.1°	14h54m	-19°		2012/05/07	14.1	2012/05/12	1.469	756	2012/05/12	166.2°	15h36m	-5°		2012/05/11	13.4	2012/05/11	1.755	2093	2012/05/26	167.2°	16h22m	-8°		2012/05/27	14.3	2012/05/31	0.913	8278	2012/05/29	177.3°	16h25m	-24°		2012/05/29	14.3	2012/05/28	1.273	596	2012/05/31	179.5°	16h32m	-21°		2012/05/31	11.7	2012/05/31	1.432	1817	2012/06/07	165.5°	16h50m	-8°		2012/06/06	13.7	2012/06/04	0.941	4724	2012/06/07	173.9°	17h 0m	-16°		2012/06/07	14.4	2012/06/13	0.823	5559	2012/06/07	172.7°	16h59m	-15°		2012/06/07	13.9	2012/06/10	0.832	138	2012/06/13	177.2°	17h26m	-26°		2012/06/13	10.9	2012/06/19	1.150	153958	2012/06/14	156.6°	18h10m	-1°		2012/07/18	13.7	2012/07/22	0.035	1319	2012/06/18	179.1°	17h48m	-22°		2012/06/18	14.2	2012/06/12	1.532	6193	2012/06/23	169.3°	18h 8m	-34°		2012/06/23	14.1	2012/06/20	0.889	4183	2012/06/24	168.7°	17h55m	-33°		2012/05/31	12.3	2012/05/20	0.122	711	2012/06/26	166.5°	18h22m	-36°		2012/06/27	13.3	2012/06/30	0.817	5391	2012/06/30	175.2°	18h41m	-27°		2012/07/01	14.3	2012/07/10	0.781	431	2012/07/13	179.6°	19h30m	-21°		2012/07/13	12.0	2012/07/17	1.671	1131	2012/07/18	177.9°	19h52m	-22°		2012/07/18	13.7	2012/07/31	0.713	67	2012/07/21	167.8°	19h53m	-8°		2012/07/21	10.2	2012/07/22	0.976	1130	2012/07/21	175.2°	20h 1m	-15°		2012/07/22	13.3	2012/07/26	0.815	1180	2012/07/22	174.5°	20h14m	-25°		2012/07/22	13.8	2012/07/22	2.343	4842	2012/07/28	174.8°	20h25m	-13°		2012/07/28	14.5	2012/07/27	0.886	544	2012/08/02	176.6°	20h50m	-14°		2012/08/02	12.3	2012/07/29	1.217	6113	2012/08/04	179.6°	21h 0m	-17°		2012/08/04	14.5	2012/08/03	1.115	17	2012/08/05	178.5°	21h 6m	-18°		2012/08/05	10.1	2012/07/31	1.225	1096	2012/08/05	165.7°	21h23m	-30°		2012/08/05	12.7	2012/08/06	1.117	4769	2012/08/07	169.5°	21h17m	-26°		2012/08/16	14.1	2012/08/28	0.114	4460	2012/08/09	170.9°	21h21m	-24°		2012/08/09	14.2	2012/08/12	1.491	1060	2012/08/10	166.6°	21h 3m	-2°		2012/08/09	14.0	2012/08/06	0.792	2467	2012/08/10	178.0°	21h17m	-13°		2012/08/10	14.2	2012/08/10	0.850	234	2012/08/12	176.9°	21h22m	-12°		2012/08/12	10.1	2012/08/15	0.807	1198	2012/08/12	173.0°	21h21m	-8°		2012/08/13	14.5	2012/08/21	0.514	1360	2012/08/12	170.5°	21h35m	-24°		2012/08/11	13.6	2012/08/04	1.243	1789	2012/08/13	177.2°	21h37m	-17°		2012/08/13	14.0	2012/08/11	0.786	141	2012/08/17	177.7°	21h44m	-11°		2012/08/17	10.6	2012/08/23	1.234	1928	2012/08/20	174.9°	21h50m	-7°		2012/08/20	14.4	2012/08/21	0.976	1473	2012/08/21	154.7°	21h24m	+11°		2012/08/23	14.1	2012/08/24	1.026	7534	2012/08/21	169.6°	22h22m	-21°		2012/08/20	14.5	2012/08/14	0.754	5133	2012/08/22	160.3°	22h42m	-29°		2012/08/24	14.2	2012/08/27	1.207	3813	2012/08/23	178.2°	22h 6m	-9°		2012/08/22	14.3	2012/08/18	0.812	620	2012/08/24	172.8°	22h23m	-17°		2012/08/24	13.5	2012/08/24	1.105	2393	2012/08/24	164.1°	21h51m	+3°		2012/08/24	14.1	2012/08/24	1.628	930	2012/08/25	175.1°	22h20m	-15°		2012/08/25	13.5	2012/08/22	1.093	1240	2012/08/25	177.2°	22h15m	-7°		2012/08/25	12.5	2012/08/26	1.381	368	2012/08/30	167.6°	22h15m	+2°		2012/08/29	13.2	2012/08/26	1.478	602	2012/08/30	177.2°	22h33m	-6°		2012/08/30	11.2	2012/09/04	1.431	625	2012/08/31	167.6°	23h 4m	-19°		2012/08/30	12.2	2012/08/28	1.062	767	2012/08/31	176.1°	22h47m	-11°		2012/08/31	13.2	2012/08/31	1.574	1267	2012/08/31	173.4°	22h50m	-14°		2012/08/31	14.3	2012/08/24	1.116	4332	2012/09/01	174.2°	22h30m	-3°		2012/09/02	13.1	2012/09/07	0.809	1474	2012/09/02	147.2°	23h 8m	+24°		2012/09/16	13.8	2012/09/25	0.646	3920	2012/09/02	163.7°	23h21m	-21°		2012/09/03	14.0	2012/09/05	0.658	11	2012/09/03	175.1°	22h57m	-11°		2012/09/03	8.9	2012/08/31	1.215	1346	2012/09/06	178.9°	22h58m	-5°		2012/09/06	14.0	2012/09/12	1.404	2374	2012/09/07	178.7°	23h 5m	-7°		2012/09/07	14.4	2012/09/08	1.465	601	2012/09/09	178.8°	23h10m	-3°		2012/09/09	13.3	2012/09/07	1.824	5619	2012/09/09	170.5°	22h49m	+2°		2012/09/08	14.4	2012/09/04	1.101	1560	2012/09/11	169.9°	23h 3m	+4°		2012/09/12	14.0	2012/09/15	1.183	1554	2012/09/12	162.5°	22h47m	+11°		2012/09/11	14.3	2012/09/11	1.114	1456	2012/09/14	163.9°	23h 3m	+11°		2012/09/13	14.4	2012/09/12	1.551	1299	2012/09/15	178.2°	23h38m	-4°		2012/09/16	14.5	2012/09/21	1.550	787	2012/09/17	175.6°	23h33m	+1°		2012/09/17	12.5	2012/09/13	1.283	612	2012/09/18	161.9°	23h 6m	+13°		2012/09/16	14.4	2012/09/12	1.422	3879	2012/09/19	168.3°	23h32m	+9°		2012/09/18	14.4	2012/09/16	0.754	236	2012/09/20	178.0°	23h49m	+0°		2012/09/20	10.7	2012/09/20	1.272	6000	2012/09/23	158.4°	0h30m	-20°		2012/09/23	14.1	2012/09/23	1.161	923	2012/09/24	172.1°	0h 6m	+6°		2012/09/27	13.2	2012/10/10	0.959	1527	2012/09/27	177.6°	0h18m	-0°		2012/09/26	13.4	2012/09/18	0.863	5275	2012/09/28	168.2°	23h58m	+12°		2012/09/27	14.3	2012/09/21	0.664	4608	2012/09/29	175.5°	0h15m	+6°		2012/09/29	14.4	2012/10/05	0.921	59	2012/09/30	175.4°	0h36m	-0°		2012/09/30	10.8	2012/09/30	1.402	492	2012/10/01	178.3°	0h35m	+2°		2012/10/01	13.1	2012/09/27	1.626	1945	2012/10/02	174.3°	0h42m	-1°		2012/10/01	14.4	2012/09/26	1.146	214869	2012/10/02	172.1°	0h55m	-2°		2012/11/02	11.5	2012/11/05	0.043	359	2012/10/03	179.1°	0h36m	+4°		2012/10/03	11.4	2012/09/29	1.339	1369	2012/10/03	176.1°	0h46m	+0°		2012/10/03	14.3	2012/09/25	1.725	16403	2012/10/05	170.9°	0h54m	-3°		2012/10/05	14.1	2012/10/06	0.861	2820	2012/10/06	177.5°	0h45m	+7°		2012/10/06	14.1	2012/10/05	0.870	960	2012/10/08	175.0°	0h49m	+10°		2012/10/08	14.5	2012/10/02	0.935	2763	2012/10/08	173.3°	0h44m	+12°		2012/10/07	14.2	2012/10/01	0.934	597	2012/10/09	172.0°	1h10m	-1°		2012/10/09	12.2	2012/10/05	1.339	136993	2012/10/10	151.6°	23h59m	-16°		2012/10/10	13.6	2012/10/18	0.074	85	2012/10/11	178.1°	1h 4m	+8°		2012/10/11	10.1	2012/10/04	1.284	1606	2012/10/14	177.2°	1h22m	+6°		2012/10/13	13.9	2012/10/02	0.992	2006	2012/10/14	176.2°	1h15m	+11°		2012/10/14	13.9	2012/10/14	0.880	2890	2012/10/16	173.7°	1h19m	+15°		2012/10/16	14.5	2012/10/18	0.926	518	2012/10/20	179.0°	1h44m	+10°		2012/10/20	13.2	2012/10/11	1.199

Table II. Temporal Sequence of Favorable Elongations

Planet	Max	Elon	D	Max	E	RA	Dec	Br	Mag	D	Br	Mag	Min	Dist	D	Min	Dist
3712	2012/01/03	171.8°		6h46m	+30°			2012/01/03	13.8			2012/01/07	1.112				
555	2012/01/09	178.4°		7h18m	+20°			2012/01/09	14.1			2012/01/11	1.743				
360	2012/01/12	173.0°		7h25m	+14°			2012/01/11	11.9			2012/01/07	1.624				
2950	2012/01/12	179.6°		7h34m	+21°			2012/01/12	14.4			2012/01/03	1.322				
1013	2012/01/20	158.2°		8h28m	+41°			2012/01/20	12.8			2012/01/21	1.184				
629	2012/01/21	171.6°		8h22m	+28°			2012/01/21	13.5			2012/01/22	1.677				
1660	2012/01/29	134.9°		7h52m	-25°			2012/01/30	13.7			2012/01/31	0.827				
27174	2012/02/03	171.5°		9h14m	+24°			2012/02/02	14.5			2012/01/27	1.068				
28913	2012/02/03	179.5°		9h 3m	+16°			2012/02/03	14.2			2012/02/05	0.949				
3178	2012/02/06	164.6°		8h59m	+0°			2012/02/04	13.0			2012/02/02	0.733				
96	2012/02/10	179.4°		9h32m	+15°			2012/02/10	11.0			2012/02/13	1.684				
433	2012/02/10	148.3°		10h19m	-15°			2012/02/03	8.5			2012/01/31	0.179				
162	2012/02/12	170.4°		9h54m	+22°			2012/02/12	12.1			2012/02/14	1.506				
585	2012/02/15	172.0°		9h41m	+5°			2012/02/15	12.7			2012/02/16	1.137				
47035	2012/02/15	128.3°		9h42m	+64°			2012/01/31	14.5			2012/01/29	0.852				
1301	2012/02/19	162.1°		9h26m	- 3°			2012/02/17	13.4			2012/02/13	1.167				
162421	2012/02/21	137.5°		11h57m	-23°			2012/02/20	13.3			2012/02/19	0.046				
347	2012/02/27	159.9°		11h13m	+26°			2012/02/28	11.7			2012/02/29	1.229				
1545	2012/03/10	175.2°		11h31m	+ 6°			2012/03/10	14.1			2012/03/06	1.169				
5	2012/03/11	174.9°		11h37m	+ 7°			2012/03/11	9.0			2012/03/08	1.141				

Planet	Max	Elon	D	Max	E	RA	Dec	Br	Mag	D	Br	Mag	Min	Dist	D	Min	Dist
6455	2012/10/23	127.4°	23h36m	-29°				2012/10/07	14.2				2012/10/02	0.437			
1694	2012/10/24	172.1°	1h49m	+19°				2012/10/23	12.7				2012/10/18	0.810			
889	2012/10/26	163.9°	2h28m	-2°				2012/10/27	13.1				2012/10/28	0.987			
95	2012/10/29	170.1°	1h57m	+22°				2012/10/29	11.3				2012/10/28	1.620			
2341	2012/10/31	176.6°	2h27m	+10°				2012/10/31	13.8				2012/10/31	0.889			
4222	2012/10/31	178.2°	2h26m	+12°				2012/10/31	13.0				2012/11/06	0.711			
5234	2012/11/01	173.9°	2h14m	+19°				2012/11/01	14.1				2012/11/01	1.318			
1508	2012/11/03	143.8°	2h42m	+51°				2012/11/15	14.2				2012/11/21	0.926			
499	2012/11/05	178.3°	2h39m	+17°				2012/11/05	13.8				2012/11/07	2.245			
748	2012/11/11	178.0°	3h 7m	+19°				2012/11/12	13.5				2012/11/14	2.316			
4613	2012/11/11	165.9°	3h24m	+4°				2012/11/11	13.4				2012/11/08	0.881			
704	2012/11/15	159.6°	2h54m	+37°				2012/11/14	9.9				2012/11/11	1.709			
4352	2012/11/21	176.7°	3h51m	+16°				2012/11/21	14.1				2012/11/20	1.224			
882	2012/11/22	177.0°	3h47m	+22°				2012/11/21	13.3				2012/11/15	1.405			
2397	2012/11/23	163.4°	4h 9m	+4°				2012/11/24	14.4				2012/11/25	1.595			

5646	2012/11/23	163.7°	3h40m	+36°				2012/11/09	14.4				2012/10/07	0.444			
430	2012/11/25	177.1°	4h 3m	+23°				2012/11/25	12.4				2012/11/26	1.131			
1088	2012/11/27	177.0°	4h11m	+24°				2012/11/26	12.7				2012/11/18	0.892			
3322	2012/12/01	178.4°	4h27m	+23°				2012/12/01	14.0				2012/12/06	0.990			
352	2012/12/02	179.5°	4h37m	+21°				2012/12/02	11.4				2012/11/27	0.933			
1083	2012/12/02	178.2°	4h36m	+20°				2012/12/02	14.2				2012/12/07	0.996			
3998	2012/12/02	167.4°	4h26m	+34°				2012/12/02	14.4				2012/12/03	0.864			
1052	2012/12/07	176.2°	5h 0m	+18°				2012/12/07	13.6				2012/12/03	0.983			
20789	2012/12/14	174.1°	5h31m	+29°				2012/12/14	14.5				2012/12/13	0.954			
521	2012/12/15	177.9°	5h33m	+21°				2012/12/15	10.2				2012/12/08	1.068			
1	2012/12/18	178.1°	5h45m	+25°				2012/12/18	6.7				2012/12/20	1.684			
183	2012/12/19	134.6°	5h16m	-21°				2012/12/08	12.2				2012/12/04	1.050			
1116	2012/12/29	152.0°	6h41m	+51°				2012/12/28	12.8				2012/12/26	1.351			
4179	2012/12/30	171.3°	6h 1m	+21°				2012/12/16	10.5				2012/12/12	0.046			

ROTATION PERIOD DETERMINATION FOR 668 DORA

Frederick Pilcher
4438 Organ Mesa Loop
Las Cruces, NM 88011 USA
Pilcher@ic.edu

Russell I. Durkee
Shed of Science Observatory
Minneapolis, MN 55410 USA

Luis Martinez
515 E. Barrus Place
Casa Grande, AZ 85122 USA

(Received: 9 September)

For previously unstudied 668 Dora a rotation period of 22.914 ± 0.001 hours and amplitude 0.19 ± 0.02 magnitude have been found.

Minor planet 668 Dora was selected for observation because Harris et al. (2011) show no previous photometric observations and because at its 2011 August opposition it was considerably brighter than at any time for the next several years. Authors Pilcher and Durkee began observations independently. Author Martinez kindly offered to collaborate with Pilcher beginning in late August after Pilcher had lost many nights due to clouds and was having difficulty finding the period. Martinez offered helpful advice to find a definitive period and contributed several additional lightcurves to provide full phase coverage. When Pilcher and Durkee learned of each other's work, they agreed to share data and publish jointly.

Observations by Pilcher were made at the Organ Mesa Observatory with a Meade 35 cm LX200 GPS S-C, SBIG STL-1001E CCD, unguided exposures. Those by Durkee at the Shed of Science Observatory used a 0.35 m Schmidt-Cassegrain, SBIG ST-10XE CCD working at a scale of 0.94 arcsec/pixel, Celestron UHC LPR filter. Martinez used a Celestron CPC 1100 28 cm Schmidt Cassegrain, SBIG ST8XME CCD, clear filter. All observers used differential photometry only.

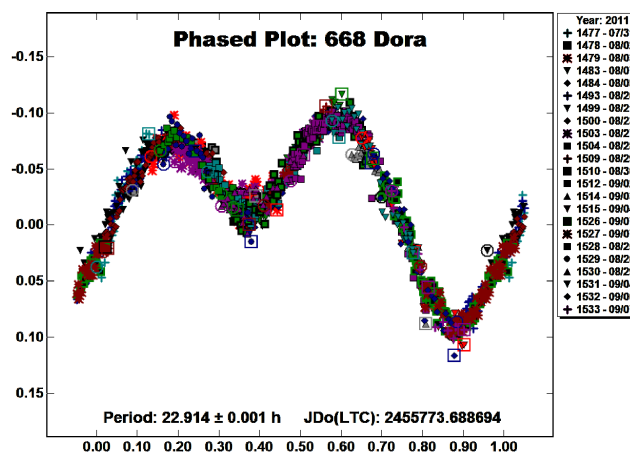
MPO Canopus software was used by all observers to measure the images photometrically, share data, adjust instrumental magnitudes up or down to produce the best fit, and prepare the lightcurve. Due to the large number of data points acquired the lightcurve has been binned in sets of three data points with a maximum of five minutes between points.

Five sessions were obtained 2011 July 31 – Aug. 8 by Pilcher, with 18 additional sessions by all three authors 2011 Aug. 20 – Sept. 7.

When all data for all 23 sessions were combined they produced a very well defined asymmetric bimodal lightcurve with period 22.914 ± 0.001 hours, amplitude 0.19 ± 0.02 magnitudes.

References

Harris, A. W., Pravec, P., and Warner, B. D. (2011). "Asteroid Lightcurve Data File, Aug. 4, 2011."
<http://www.minorplanet.net/info/lightcurvedatabase.html>



ASTEROIDS OBSERVED FROM GMARS AND SANTANA OBSERVATORIES: 2011 JULY - SEPTEMBER

Robert D. Stephens
Center for Solar System Studies / MoreData! Inc.
11355 Mount Johnson Court, Rancho Cucamonga, CA 91737
RStephens@foxandstephens.com

(Received: 29 September)

Lightcurves of three asteroids were obtained from Santana Observatory and Goat Mountain Astronomical Research Station (GMARS) from 2011 July to September: 688 Melanie, 1077 Campanula, and (42265) 2001 QL69.

Observations at Santana Observatory (MPC Code 646) were made with a 0.30-m Schmidt-Cassegrain (SCT) with a SBIG STL-1001E. All images were unguided and unbinned with no filter. Observations at GMARS (MPC Code G79) were made with a 0.4-m Schmidt-Cassegrain (SCT) with a SBIG STL-1001E. Measurements were made using *MPO Canopus*, which employs