

December 2009 Astronomy Calendar by Dave Mitsky
Some information supplied and/or added by Tony Donnangelo

All times are Eastern Standard Time (-5 hrs. U.T.).

Events listed are based on a location of 40°N in the Eastern US and may not be visible in all areas.

Concerning moderate and minor meteor shower activity:

Do not have any high expectations. This general information is to account for why you might be seeing a few more than normal meteors during your observing session.

Lunar light rays may occur prior to or after the predicted time. Initial observations might have occurred after the ray's inception or continued after the observer's session. Rays may last a very short time or for many hours. Obtain further information; send reports (including non-occurrences and miss-calculations), photos, and observations of new rays to:

The Robinson Lunar Observatory: <http://www.lunar-occultations.com/rlo/rlondx.htm>.

- 12/1 The Moon is 0.03° south of the bright open cluster M45 (the Pleiades) in Taurus at 10:00 a.m.
- 12/2 Uranus is stationary at 1:00 a.m.
- 12/2 Full Moon (known as the Before Yule, Cold, Long Nights, and Oak Moon) occurs at 3:30 a.m.
- 12/2 Alpha Puppids meteor shower (minor activity) peaks from 2nd through 5th. Duration is from 11/17 through 12/9. Observing and history: http://meteorshowersonline.com/showers/alpha_puppids.html
- 12/3 Mars exceeds 10" in apparent size today.
- 12/3 Kuiper Belt Object (19521) Chaos is at closest approach to Earth at 40.745 A.U.
- 12/3 The Moon is 0.8° north of the bright open cluster M35 in Gemini at 4:00 p.m.
- 12/3 Lame (sunset) lunar light ray predicted to occur at 7:09 p.m. Moonrise at 6:03 p.m.
- 12/4 The earliest end of evening twilight at 40° north latitude occurs today.
- 12/4 Endymion (sunset) lunar light ray predicted to occur at 4:37 a.m.
- 12/4 The Moon is at perigee, subtending 32'55" from a distance of 363,749 kilometers (225,856 miles), at 10:18 a.m.
- 12/5 Phoenicids meteor shower (minor activity) peaks 5/6. Duration is from 11/29 to 12/9. Observing and history: <http://meteorshowersonline.com/showers/phoenicids.html>
- 12/6 Maskelyne P (sunset) lunar light ray predicted to occur at 2:32 a.m.
- 12/6 Maskelyne F (sunset) lunar light ray predicted to occur at 3:14 p.m.
- 12/6 Stiborius (sunset) lunar light ray predicted to occur at 5:02 a.m.
- 12/7 The earliest sunset of 2009 at 40° north latitude occurs today.
- 12/7 Mercury is at its greatest heliocentric latitude south today.
- 12/7 Catherina (sunset) lunar light ray predicted to occur at 2:40 a.m.
- 12/8 Tempel (sunset) lunar light ray predicted to occur at 2:37 a.m.
- 12/8 Walter (sunset) lunar light ray predicted to occur at 3:31 a.m.
- 12/8 Lilius lunar light ray predicted to occur at 4:49 a.m.
- 12/8 Lecture on "Kepler, Galileo, and the Birth of Modern Astronomy" held in Schenectady, N.Y.
- 12/8 Delta Arietids meteor shower (minor activity) peaks 8/9. Duration is from 8th to 1/2. Observing and history: http://meteorshowersonline.com/showers/delta_arietids.html
- 12/8 Last Quarter Moon occurs at 8:13 p.m.
- 12/9 Asteroid (2309) Mr. Spock makes its closest approach to the Earth at 1.80 A.U.
- 12/9 Asteroid (19) Fortuna (magnitude 9.3) is at opposition at 12:00 p.m.
- 12/10 Asteroid (334) Chicago is at closest approach to Earth at 2.987 A.U.
- 12/10 Lecture on "Six Years on Mars" held in Cambridge, Massachusetts.
- 12/10 Saturn is 8° north of the Moon at 7:00 a.m.
- 12/10 The Curtiss Cross, an X-shaped illumination effect located between the craters Parry and Gambart, is predicted to occur at 9:47 a.m.
- 12/10 Canis Minorids meteor shower (minor activity) peaks 10/11. Duration is 4th to 15th. Observing and history: http://meteorshowersonline.com/showers/canis_minorids.html
- 12/10 Northern Chi Orionids meteor shower (minor activity) peaks 10/11. Duration is 11/16 through 12/16. Observing and history:

http://meteorshowersonline.com/showers/chi_orionids.html

12/10 Southern Chi Orionids meteor shower (minor activity) peaks 10/11. Duration is from the 2nd through 18th. Observing and history:
http://meteorshowersonline.com/showers/chi_orionids.html

12/11 Sigma Hydrids meteor shower (minor activity) peaks 11/12. Duration is from 4th to 15th. Observing and history: http://meteorshowersonline.com/showers/sigma_hydrids.html

12/11 December Monocerotids meteor shower (minor activity) peaks 11/12. Duration is from 11/9 through 12/18. Observing and history:
http://meteorshowersonline.com/showers/december_monocerotids.html

12/13 Geminids meteor shower (major activity - 50/80 per hour) peaks 13/14 at 5:00 a.m. on the 14th. Duration is from 6th to 19th. The Geminids are dust from asteroid (3200) Phaethon. Observing and history: <http://meteorshowersonline.com/geminids.html>

12/16 New Moon (lunation 1076) occurs at 8:02 a.m.

12/18 Asteroid (52) Europa (magnitude 10.1) is at opposition.

12/18 Asteriod (128) Nemesis (magnitude 10.7) is at opposition.

12/18 Mercury is 1.4° south of the Moon at 4:00 a.m.

12/18 Mercury is at greatest eastern elongation (20°) at 1:00 p.m.

12/18 Coma Berenicids meteor shower (minor activity) peaks from 12/18 to 1/6. Duration is from 12/8 to 1/23. Observing and history:
http://meteorshowersonline.com/showers/coma_berenicids.html

12/18 Cleomedes (sunrise) lunar light ray predicted to occur at 6:05 p.m. Moonset at 6:46 p.m.

12/19 Griffith Observatory Public Star Party held in Los Angeles, California.

12/20 Mt. Wilson Observatory's 105th Birthday.

12/20 Asteriod (111) Ate (magnitude 10.8) is at opposition.

12/20 Venus is at the descending node today.

12/20 The Moon is at apogee, subtending 29'28" from a distance of 405,731 kilometers (252,109 miles), at 12:53 a.m.

12/20 Jupiter is 0.6° south of Neptune at 1:00 a.m.

12/21 Winter Solstice at 12:47 p.m.

12/21 Ursids meteor shower (moderate activity - 10 per hour) peaks on 21/22 at 10:00 a.m. on 22nd Duration is 17th to 25th. Observing and history:
<http://meteorshowersonline.com/showers/ursids.html>

12/20 Double Galilean satellite shadow transit (Callisto's shadow follows Io's) begins at 9:34 p.m.

12/21 Mars exceeds -0.5 magnitude today.

12/21 Jupiter is 4° south of the Moon at 11:00 a.m.

12/21 Neptune is 4° south of the Moon at 11:00 a.m.

12/21 Mars is stationary, with retrograde (westward) motion to follow, at 12:00 p.m.

12/21 The northern hemisphere winter solstice occurs at 1:47 p.m.

12/22 Gemma Frisius (sunrise) lunar light ray predicted to occur at 6:53 p.m.

12/22 Sacrobosco (sunrise) lunar light ray predicted to occur at 8:11 p.m.

12/23 The Lunar X (the Purbach or Werner Cross), an X-shaped illumination effect involving various rims and ridges between the craters La Caille, Blanchinus, and Purbach, is predicted to occur at 8:22 p.m.

12/23 Parrot (sunrise) lunar light ray predicted to occur at 9:01 p.m.

12/23 Alpine Valley/Mt Blanc (sunrise) lunar light ray predicted to occur at 9:09 p.m.

12/23 Uranus is 6° south of the Moon at 10:00 p.m.

12/24 First Quarter Moon occurs at 1:36 p.m.

12/24 Pluto is in conjunction with the Sun at 2:00 p.m.

12/24 Parry (sunrise) lunar light ray predicted to occur at 8:28 p.m.

12/24 Plato (sunrise) lunar light ray predicted to occur at 11:05 p.m.

12/25 Asteroid (11) Parthenope (magnitude 9.9) is at opposition.

12/25 Cichus A (sunrise) lunar light ray predicted to occur at 6:41 p.m.

12/25 Reinhold (sunrise) lunar light ray predicted to occur at 7:14 p.m.

12/25 Kies (sunrise) lunar light ray predicted to occur at 8:33 p.m.

12/25 Copernicus (sunrise) lunar light ray predicted to occur at 9:24 p.m.

12/25 Lagalla (sunrise) lunar light ray predicted to occur at 9:12 p.m.

12/25 Palus Epidemiarum (sunrise) lunar light ray predicted to occur at 11:29 p.m.

12/26 Mercury is at the ascending node today.

12/26 Mercury is stationary at 5:00 a.m.

12/26 Philolaus (sunrise) lunar light ray predicted to occur at 11:50 p.m.
 12/27 Clausius (sunrise) lunar light ray predicted to occur at 10:42 p.m.
 12/28 Asteroid (324) Bamberga (magnitude 9.8) is at opposition.
 12/28 Mersenius P (sunrise) lunar light ray predicted to occur at 12:10 a.m.
 12/28 The Moon is 0.03° north of M45 at 9:00 p.m.
 12/28 Vieta (sunrise) lunar light ray predicted to occur at 10:33 p.m.
 12/29 Lacroix G (sunrise) lunar light ray predicted to occur at 12:59 a.m.
 12/29 Babbage (sunrise) lunar light ray predicted to occur at 1:26 a.m.
 12/31 Mercury is at perihelion today.
 12/31 The Moon is 0.8° north of M35 at 2:00 a.m.
 12/31 Second Full Moon for the month, a so-called Blue Moon, occurs at 3:13 p.m.
 12/31 Partial lunar eclipse occurs primarily in the Eastern Hemisphere from 18:52 to 19:54, reaching maximum eclipse at 3:23 p.m.
 12/31 Zeta Aurigids meteor shower (minor activity) peaks Dec. 31/Jan. 1. Duration is from 12/11 through 1/21. Observing and history:
http://meteorshowersonline.com/showers/zeta_aurigids.html

The peak of the Geminid meteor shower, which is associated with the asteroid (or possible cometary nucleus) 3200 Phaethon, takes place after midnight on the morning of December 14. Geminids appear to originate from a radiant that is a bit northwest of Alpha Geminorum (Castor). The Ursids, a normally minor meteor shower, peak late in the morning of December 22. The radiant is located close to Beta Ursa Minoris (Kochab), some 15 degrees from the north celestial pole. For more on these meteor showers, click on <http://www.imo.net/calendar/2009#gem>

The Moon occults M45 (the Pleiades) on December 1 and December 29. See <http://www.lunar-occultations.com/iota/pleiades/pleiades.htm> for further information on these events. The first-magnitude star Spica is less than five degrees southeast of the Moon on the morning of December 11. A partial lunar eclipse that is best seen from Australia, Asia, Africa, and Europe takes place from on December 31. Observers in the far northwest portion of North America can see the start of the eclipse. The end of the eclipse is visible from far northeastern North America. There's additional information on this minor lunar eclipse at <http://eclipse.gsfc.nasa.gov/OH/OH2009.html#LE2009Dec31P>

The Moon is 14.2 days old and is located in Aries on December 1 at 0:00 UT. It attains its greatest northern declination (+25.8 degrees) for the month on December 2 and December 30 and its greatest southern declination (-25.8 degrees) for the month on December 16. Latitudinal libration is at a maximum of +6.8 degrees on December 11 and a minimum of -6.8 degrees on December 26. Longitudinal libration is at a maximum of +6.0 degrees on December 12 and a minimum of -7.3 degrees on December 26. Visit <http://www.astronomyblogs.com/member/saberscorp/?xjMsgID=50821> for tips on spotting extreme crescent Moons.

The Sun is located in Ophiuchus on December 1. When the winter solstice for the northern hemisphere occurs on December 21, there will be 9 hours and 20 minutes of daylight at latitude 40 degrees north.

Brightness, apparent size, illumination, distance from the Earth in astronomical units, and location data for the planets and Pluto on December 1: Mercury (-0.5 magnitude, 5.1", 92% illuminated, 1.33 a.u., Ophiuchus), Venus (-3.9 magnitude, 10.0", 99% illuminated, 1.67 a.u., Libra), Mars (-0.1 magnitude, 9.9", 91% illuminated, 0.95 a.u., Leo), Jupiter (-2.3 magnitude, 37.7", 99% illuminated, 5.23 a.u., Capricornus), Saturn (1.0 magnitude, 16.9", 100% illuminated, 9.83 a.u., Virgo), Uranus (5.8 magnitude, 3.5", 100% illuminated, 20.10 a.u., Aquarius), Neptune (7.9 magnitude, 2.2", 100% illuminated, 30.51 a.u., Capricornus), and Pluto (14.1 magnitude, 0.1", 100% illuminated, 32.72 a.u., Sagittarius).

Mercury and Jupiter lie in the southwest and Uranus in the south in the evening sky. At midnight, Mars can be found in the east. In the morning, Mars is in the southwest and Saturn is in the south. At midmonth from 40 degrees north latitude, Mars rises at approximately 9:00 p.m. EST and transits the meridian at 4:00 a.m. EST, Jupiter sets at 9:00 p.m. EST, Saturn rises at 1:00 a.m. EST and transits at 7:00 a.m. EST.

Mercury shines at magnitude -0.5 for the first three weeks of the month. It's positioned five degrees above the horizon thirty minutes after the Sun sets on December 9. When it reaches greatest eastern elongation on December 18, the speediest of planets spans 6.7 arc seconds and is 61% illuminated. Mercury reaches an altitude of eight degrees a half hour after sunset that evening and is accompanied by a thin crescent Moon located six degrees to its upper left. Mercury becomes a thin crescent, illuminated just 10% and subtending 9.4 arc seconds, and fades from sight by the end of 2009.

As it heads for superior conjunction in January, Venus is lost in the glare of the Sun and is not visible this month.

Mars rises five hours after sunset in early December. By the end of the month, it rises three hours after the Sun sets. As the Earth catches up to Mars during December, the Red Planet doubles in brightness. Mars approaches to within eleven degrees of Regulus before beginning its retrograde loop back towards Cancer on December 21. Mars subtends 12.7 arc seconds in apparent size and shines at -0.7 magnitude on December 31. Since the northern hemisphere of Mars is inclined towards the Earth, the north polar cap is readily visible. Syrtis Major, a triangular surface feature, is well-placed at midnight during the first week of the month; the Amazonis Basin and the Tharsis Ridge during the second; and Solis Lacus, also known as the Eye of Mars, during the third. An article on observing Mars during the current apparition appears on pages 57 to 61 of the December issue of *Sky & Telescope*.

Jupiter's 2009 apparition is nearing an end. At the end of December, the giant planet sets before the end of twilight. Jupiter is just 34 arc seconds due south of Neptune on December 19 and is less than 0.6 degrees away from Neptune through December 22. This will be the last conjunction of Jupiter and Neptune to take place for some 13 years. Jupiter is less than two degrees due north of the third-magnitude star Delta Capricorni (Deneb Algedi) on the evening of December 20. Mutual events involving the Galilean satellites take place on December 2 at 9:08 p.m. EST when Io occults Europa and December 14 at 7:26 p.m. EST when Europa occults Io. A double Galilean satellite shadow transit begins at 8:34 p.m. EST on the evening of December 20. Browse http://skyandtelescope.com/observing/objects/planets/article_107_1.asp to determine transits of the central meridian by the Great Red Spot. Data on the Galilean satellites is available at <http://skytonight.com/observing/objects/javascript/3307071.html#>

Saturn is near the celestial equator this month. As December begins, Saturn rises at approximately 1:30 a.m. EST. By mid-December, the Ringed Planet rises about 40 minutes after midnight and transits the meridian six hours later. On December 31, it clears the horizon around 1:30 a.m. EST. Saturn reaches western quadrature on December 25. Its rings are inclined by 4.3 degrees on December 1 and reach a maximum inclination of 4.9 degrees by the end of the year. The Moon is 8 degrees from Saturn on December 10. Eighth-magnitude Titan, Saturn's largest and brightest satellite, is close to the planet on December 1, 9, 17, and 25. Iapetus is due north of Saturn on December 21. For further information on the five brightest satellites of Saturn, browse <http://skytonight.com/observing/objects/javascript/3308506.html>

This month Uranus lies six degrees due west of the fifth-magnitude star 27 Piscium. It sets shortly before midnight.

For the first three weeks of the month, Neptune can be found north of the third-magnitude star Delta Capricorni (Deneb Algedi) and the fourth-magnitude star Gamma Capricorni. From December 15 to December 25, Neptune, which is tiny at 2.2 arc seconds in apparent size, is located within one degree of Jupiter, which decreases in apparent size from 36.3 to 35.4 arc seconds during that period.

The dwarf planet Pluto is in conjunction with the Sun on December 24 and is not visible this month.

The tenth-magnitude comet C/2007 Q3 (Siding Spring) travels northeastward through Coma Berenices during December. It passes north of the globular clusters M53 and NGC 5053 on the mornings of December 12 and December 13. Some other comets to look for this month include the periodic comets

217P/LINEAR, 211P/Hill, and 81P/Wild. Visit <http://cometchasing.skyhound.com/> for additional information on comets that are visible this month.

The ninth-magnitude asteroid 18 Melpomene heads northeastward through Cetus this month, passing within one degree of the stars Theta Ceti (magnitude 4.0) and 44 Ceti (magnitude 6.2) from December 6 to December 13. On December 9, asteroid 2309 Mr. Spock makes its closest approach to the Earth (1.80 a.u.). Asteroid 19 Fortuna (magnitude 9.3) is at opposition on December 9. Other asteroids reaching opposition this month include 11 Parthenope (magnitude 9.9), 52 Europa (magnitude 10.1), 111 Ate (magnitude 10.8), 128 Nemesis (magnitude 10.7), and 324 Bamberga (magnitude 9.8).

A free star map for December can be downloaded at <http://www.skymaps.com/downloads.html>

For location (40°16'N 76°45'W) Hummelstown, PA, USA:

December 1:

Astronomical twilight starts: 5:34 a.m.

Nautical twilight starts: 6:06 a.m.

Civil twilight starts: 6:40 a.m.

Sunrise: 7:10 a.m.

Sunset: 4:41 p.m.

Civil twilight ends: 5:12 p.m.

Nautical twilight ends: 5:45 p.m.

Astronomical twilight ends: 6:18 p.m.

January 1:

Astronomical twilight starts: 5:52 a.m.

Nautical twilight starts: 5:56 p.m.

Civil twilight starts: 6:59 a.m.

Sunrise: 7:30 a.m.

Sunset: 4:52 p.m.

Civil twilight ends: 5:22 p.m.

Nautical twilight ends: 5:56 p.m.

Astronomical twilight ends: 6:29 p.m.

For location (40°16'N 76°45'W) Hummelstown, PA, USA:

December 1 planet information (24 hr. clock):

	R.A.	DEC.	DIA."	MAG.	%ILL.	RISE	TRANSIT	SET
Mercury	17:30	-25°25'	5.0	-0.5	91.7	08:18	12:50	17:16
Venus	15:48	-19°12'	10.0	-3.9	98.6	06:11	11:08	16:01
Mars	09:23	+17°58'	9.9	-0.1	91.0	21:37	04:41	11:51
Jupiter	21:35	-15°26'	37.7	-2.3	99.1	11:42	16:51	22:01
Saturn	12:14	+00°46'	17.0	+1.0	99.8	01:46	07:32	13:57
Uranus	23:34	-03°35'	3.5	+5.8	99.9	13:07	18:50	00:48
Neptune	21:45	-13°57'	2.2	+7.9	100.0	11:46	17:01	22:15
Pluto	18:09	-18°12'	0.1	+14.1	100.0	08:32	13:25	18:29

January 1 planet information (24 hr. clock):

	R.A.	DEC.	DIA."	MAG.	%ILL.	RISE	TRANSIT	SET
Mercury	19:20	-20°26'	9.5	+2.8	5.6	07:43	12:32	17:23
Venus	18:35	-23°38'	9.8	-3.9	99.9	07:18	11:53	16:31
Mars	09:30	+18°46'	12.7	-0.8	96.4	19:37	02:46	09:57
Jupiter	21:56	-13°35'	34.9	-2.1	99.5	09:31	15:10	20:03
Saturn	12:20	+00°18'	17.9	+0.8	99.7	23:31	05:36	11:39
Uranus	23:36	-03°25'	3.4	+5.9	99.9	11:06	16:50	22:48
Neptune	21:48	-13°43'	2.2	+8.0	100.0	09:42	15:02	20:12

Pluto 18:13 -18°14' 0.1 +14.1 100.0 06:34 11:28 16:31

Comet information for: December 16, 2009 (New Moon)

	Constellation	Rises	Transits	Sets
C/2006 W3 (Christensen)	Sagittarius	8:49 a.m.	6:54 p.m.	6:59 p.m.
29P/Schwassmann-Wachmann 1	Leo	9:38 p.m.	4:20 a.m.	11:02 p.m.
88P/Howell	Capricorn	10:35 a.m.	3:25 p.m.	8:14 p.m.
118P/Shoemaker-Levy	Orion	5:56 p.m.	12:26 a.m.	6:56 a.m.
81P/Wild 2	Virgo	11:55 p.m.	6:06 a.m.	12:17 p.m.
217P/2009 F3 (LINEAR)	Orion	6:06 p.m.	12:20 a.m.	6:37 a.m.
C/2007 Q3 (Siding Springs)	Coma Berenices	12:26 a.m.	7:44 a.m.	3:02 p.m.
C/2008 Q3 (Garradd)	Boötes	12:49 a.m.	8:08 a.m.	3:27 p.m.

The objects listed above are located between 2:00 and 4:00 hours of right ascension.

One hundred and five binary and multiple stars for December: Gamma Andromedae, 59 Andromedae, Struve 245 (Andromeda); Struve 362, Struve 374, Struve 384, Struve 390, Struve 396, Struve 400, Struve 419, Otto Struve 67 (Camelopardalis); Struve 191, Struve Iota Cassiopeiae, Struve 263, Otto Struve 50, Struve 283, Struve 284 (Cassiopeia); 61 Ceti, Struve 218, Omicron Ceti, Struve 274, Nu Ceti, h3511, 84 Ceti, h3524, Lambda Ceti, Struve 330 (Cetus); h3527, h3533, Theta Eridani, Rho Eridani, Struve 341, h3548, h3565, Tau-4 Eridani, Struve 408, Struve 411, h3589, h3601, 30 Eridani, 32 Eridani (Eridanus); h3478, h3504, Omega Fornacis, Eta-2 Fornacis, Alpha Fornacis, See 25, Xi-3 Fornacis, h3596 (Fornax); Struve 268, Struve 270, h1123, Otto Struve 44, h2155, Nu Persei, Struve 297, Struve 301, Struve 304, Eta Persei, Struve 314, Otto Struve 48, Tau Persei, Struve 331, Struve 336, Es588, Struve 352, Struve 360, Struve 369, Struve 382, Struve 388, Struve 392, Struve 410, Struve 413, Struve 425, Otto Struve 59, Struve 426, 40 Persei, Struve 434, Struve 448, Es277, Zeta Persei, Struve 469, Epsilon Persei, Es878 (Perseus); Struve 399, Struve 406, Struve 401, Struve 422, Struve 430, Struve 427, Struve 435, 30 Tauri (Taurus); Epsilon Trianguli, Struve 219, Iota Trianguli, Struve 232, Struve 239, Struve 246, 10 Trianguli, Struve 269, h653, 15 Trianguli, Struve 285, Struve 286, Struve 310 (Triangulum)

Challenge binary star for December: 48 Cassiopeiae (Cassiopeia)

One hundred deep-sky objects for December: NGC 891 (Andromeda); IC 342, K6, St23, Tom 5 (Camelopardalis); Be65, IC 1848, K4, Mel15, NGC 896, NGC 1027, St2, Tr3 (Cassiopeia); M77, NGC 788, NGC 835, NGC 864, NGC 908, NGC 936, NGC 955, NGC 958, NGC 1015, NGC 1016, NGC 1022, NGC 1042, NGC 1052, NGC 1055, NGC 1087, NGC 1094 (Cetus); IC 2006, NGC 1084, NGC 1140, NGC 1187, NGC 1199, NGC 1209, NGC 1232, NGC 1291, NGC 1300, NGC 1309, NGC 1332, NGC 1337, NGC 1353, NGC 1357, NGC 1395, NGC 1400, NGC 1407, NGC 1421, NGC 1426, NGC 1440, NGC 1452, NGC 1453, NGC 1461 (Eridanus); NGC 1079, NGC 1097, NGC 1201, NGC 1292, NGC 1316 (Fornax I Galaxy Cluster), NGC 1317, NGC 1326, NGC 1344, NGC 1350, NGC 1360, NGC 1365, NGC 1371, NGC 1374, NGC 1379, NGC 1380, NGC 1381, NGC 1387, NGC 1398, NGC 1404, NGC 1406, NGC 1425 (Fornax); Bas10, Cz8, IC 351, IC 2003, K5, Mel 20, M34, NGC 869, NGC 884, NGC 957, NGC 1023, NGC 1058, NGC 1161, NGC 1245, NGC 1275 (Perseus I Galaxy Cluster), NGC 1333, NGC 1342, NGC 1444, Tr2 (Perseus); M45 (Taurus); NGC 777, NGC 784, NGC 890, NGC 925, NGC 949, NGC 959, NGC 978A/B (Triangulum)

Top ten binocular deep-sky objects for December: M34, M45, Mel15, Mel20, NGC 869, NGC 884, NGC 1027, NGC 1232, St2, St23

Top ten deep-sky objects for December: M34, M45, M77, NGC 869, NGC 884, NGC 891, NGC 1023, NGC 1232, NGC 1332, NGC 1360

Challenge deep-sky object for December: vdB14 (Camelopardalis)

December, 2009 Jupiter Events

Table created using The Planets 2.02. A FREE program available from <http://www.cpac.org.uk>

Jupiter events are calculated for an observer in Hummelstown, PA, USA.

40°16'N 76°45'W

Times are Eastern Standard Time (-5 hrs. U.T.).

Times may differ by a minute or two to those quoted in the Astronomical Almanac.

It's suggested that you start observing a few minutes before the event is scheduled. There may also be a slight deviation from my observing site.

Tue	1	Dec	2009	16:35	Viewing Resumed - Sun Sets
Tue	1	Dec	2009	19:32	Gan: Reappears from Eclipse
Tue	1	Dec	2009	22:02	Viewing Suspended - Jupiter Sets
Wed	2	Dec	2009	16:35	Viewing Resumed - Sun Sets
Wed	2	Dec	2009	18:29	Eur: Reappears from Eclipse
Wed	2	Dec	2009	20:25	GRS: Crosses Central Meridian
Wed	2	Dec	2009	21:59	Viewing Suspended - Jupiter Sets
Thu	3	Dec	2009	16:34	Viewing Resumed - Sun Sets
Thu	3	Dec	2009	18:52	Cal: Transit Ends
Thu	3	Dec	2009	21:55	Viewing Suspended - Jupiter Sets
Fri	4	Dec	2009	16:34	Viewing Resumed - Sun Sets
Fri	4	Dec	2009	20:16	Io : Transit Begins T
Fri	4	Dec	2009	21:31	Io : Shadow Transit Begins ST
Fri	4	Dec	2009	21:52	Viewing Suspended - Jupiter Sets
Sat	5	Dec	2009	16:34	Viewing Resumed - Sun Sets
Sat	5	Dec	2009	17:25	Io : Disappears into Occultation
Sat	5	Dec	2009	17:56	GRS: Crosses Central Meridian
Sat	5	Dec	2009	20:57	Io : Reappears from Eclipse
Sat	5	Dec	2009	21:49	Viewing Suspended - Jupiter Sets
Sun	6	Dec	2009	16:34	Viewing Resumed - Sun Sets
Sun	6	Dec	2009	17:04	Io : Transit Ends S
Sun	6	Dec	2009	18:18	Io : Shadow Transit Ends
Sun	6	Dec	2009	21:46	Viewing Suspended - Jupiter Sets
Mon	7	Dec	2009	16:34	Viewing Resumed - Sun Sets
Mon	7	Dec	2009	19:35	GRS: Crosses Central Meridian
Mon	7	Dec	2009	20:37	Eur: Transit Begins T
Mon	7	Dec	2009	21:43	Viewing Suspended - Jupiter Sets
Tue	8	Dec	2009	16:34	Viewing Resumed - Sun Sets
Tue	8	Dec	2009	18:43	Gan: Reappears from Occultation
Tue	8	Dec	2009	19:59	Gan: Disappears into Eclipse
Tue	8	Dec	2009	21:40	Viewing Suspended - Jupiter Sets
Wed	9	Dec	2009	16:34	Viewing Resumed - Sun Sets
Wed	9	Dec	2009	21:06	Eur: Reappears from Eclipse
Wed	9	Dec	2009	21:14	GRS: Crosses Central Meridian
Wed	9	Dec	2009	21:37	Viewing Suspended - Jupiter Sets
Thu	10	Dec	2009	16:34	Viewing Resumed - Sun Sets
Thu	10	Dec	2009	17:06	GRS: Crosses Central Meridian
Thu	10	Dec	2009	21:34	Viewing Suspended - Jupiter Sets
Fri	11	Dec	2009	16:34	Viewing Resumed - Sun Sets
Fri	11	Dec	2009	21:31	Viewing Suspended - Jupiter Sets
Sat	12	Dec	2009	16:34	Viewing Resumed - Sun Sets
Sat	12	Dec	2009	16:38	Cal: Reappears from Eclipse
Sat	12	Dec	2009	18:45	GRS: Crosses Central Meridian
Sat	12	Dec	2009	19:24	Io : Disappears into Occultation
Sat	12	Dec	2009	21:28	Viewing Suspended - Jupiter Sets
Sun	13	Dec	2009	16:35	Viewing Resumed - Sun Sets
Sun	13	Dec	2009	16:46	Io : Transit Begins T
Sun	13	Dec	2009	17:56	Io : Shadow Transit Begins ST
Sun	13	Dec	2009	19:04	Io : Transit Ends S
Sun	13	Dec	2009	20:13	Io : Shadow Transit Ends
Sun	13	Dec	2009	21:24	Viewing Suspended - Jupiter Sets
Mon	14	Dec	2009	16:35	Viewing Resumed - Sun Sets
Mon	14	Dec	2009	17:21	Io : Reappears from Eclipse

Mon 14 Dec 2009 20:24	GRS: Crosses Central Meridian
Mon 14 Dec 2009 21:21	Viewing Suspended - Jupiter Sets
Tue 15 Dec 2009 16:35	Viewing Resumed - Sun Sets
Tue 15 Dec 2009 19:22	Gan: Disappears into Occultation
Tue 15 Dec 2009 21:18	Viewing Suspended - Jupiter Sets
Wed 16 Dec 2009 16:35	Viewing Resumed - Sun Sets
Wed 16 Dec 2009 18:33	Eur: Disappears into Occultation
Wed 16 Dec 2009 21:15	Viewing Suspended - Jupiter Sets
Thu 17 Dec 2009 16:36	Viewing Resumed - Sun Sets
Thu 17 Dec 2009 17:55	GRS: Crosses Central Meridian
Thu 17 Dec 2009 21:12	Viewing Suspended - Jupiter Sets
Fri 18 Dec 2009 16:36	Viewing Resumed - Sun Sets
Fri 18 Dec 2009 17:53	Eur: Shadow Transit Ends
Fri 18 Dec 2009 21:09	Viewing Suspended - Jupiter Sets
Sat 19 Dec 2009 16:37	Viewing Resumed - Sun Sets
Sat 19 Dec 2009 17:46	Gan: Shadow Transit Ends
Sat 19 Dec 2009 19:34	GRS: Crosses Central Meridian
Sat 19 Dec 2009 21:06	Viewing Suspended - Jupiter Sets
Sun 20 Dec 2009 16:37	Viewing Resumed - Sun Sets
Sun 20 Dec 2009 18:46	Io : Transit Begins T
Sun 20 Dec 2009 19:51	Io : Shadow Transit Begins ST
Sun 20 Dec 2009 20:32	Cal: Shadow Transit Begins SST
Sun 20 Dec 2009 21:03	Viewing Suspended - Jupiter Sets
Mon 21 Dec 2009 16:38	Viewing Resumed - Sun Sets
Mon 21 Dec 2009 19:17	Io : Reappears from Eclipse
Mon 21 Dec 2009 21:00	Viewing Suspended - Jupiter Sets
Tue 22 Dec 2009 16:38	Viewing Resumed - Sun Sets
Tue 22 Dec 2009 17:05	GRS: Crosses Central Meridian
Tue 22 Dec 2009 20:57	Viewing Suspended - Jupiter Sets
Wed 23 Dec 2009 16:39	Viewing Resumed - Sun Sets
Wed 23 Dec 2009 20:54	Viewing Suspended - Jupiter Sets
Thu 24 Dec 2009 16:39	Viewing Resumed - Sun Sets
Thu 24 Dec 2009 18:44	GRS: Crosses Central Meridian
Thu 24 Dec 2009 20:51	Viewing Suspended - Jupiter Sets
Fri 25 Dec 2009 16:40	Viewing Resumed - Sun Sets
Fri 25 Dec 2009 17:36	Eur: Shadow Transit Begins ST
Fri 25 Dec 2009 18:25	Eur: Transit Ends S
Fri 25 Dec 2009 20:30	Eur: Shadow Transit Ends
Fri 25 Dec 2009 20:49	Viewing Suspended - Jupiter Sets
Sat 26 Dec 2009 16:40	Viewing Resumed - Sun Sets
Sat 26 Dec 2009 17:41	Gan: Transit Ends
Sat 26 Dec 2009 18:12	Gan: Shadow Transit Begins S
Sat 26 Dec 2009 20:24	GRS: Crosses Central Meridian
Sat 26 Dec 2009 20:46	Viewing Suspended - Jupiter Sets
Sun 27 Dec 2009 16:41	Viewing Resumed - Sun Sets
Sun 27 Dec 2009 20:43	Viewing Suspended - Jupiter Sets
Mon 28 Dec 2009 16:42	Viewing Resumed - Sun Sets
Mon 28 Dec 2009 17:55	Io : Disappears into Occultation
Mon 28 Dec 2009 20:40	Viewing Suspended - Jupiter Sets
Tue 29 Dec 2009 16:43	Viewing Resumed - Sun Sets
Tue 29 Dec 2009 17:34	Io : Transit Ends S
Tue 29 Dec 2009 17:55	GRS: Crosses Central Meridian
Tue 29 Dec 2009 18:33	Io : Shadow Transit Ends
Tue 29 Dec 2009 20:37	Viewing Suspended - Jupiter Sets
Wed 30 Dec 2009 16:43	Viewing Resumed - Sun Sets
Wed 30 Dec 2009 20:34	Viewing Suspended - Jupiter Sets
Thu 31 Dec 2009 16:44	Viewing Resumed - Sun Sets
Thu 31 Dec 2009 19:34	GRS: Crosses Central Meridian
Thu 31 Dec 2009 20:31	Viewing Suspended - Jupiter Sets

DECEMBER 2009 COMETS

C/2006 W3 (Christensen)

Date	TT	R. A. (2000)	Decl.	Delta	r	Elong.	Phase	m1	m2
2009 12 01	19	20.56	-14 21.3	4.110	3.434	41.5	11.0	13.4	
2009 12 02	19	21.04	-14 30.0	4.127	3.438	40.6	10.7	13.4	
2009 12 03	19	21.53	-14 38.6	4.143	3.442	39.6	10.5	13.5	
2009 12 04	19	22.03	-14 47.0	4.160	3.446	38.7	10.3	13.5	
2009 12 05	19	22.54	-14 55.3	4.176	3.450	37.8	10.1	13.5	
2009 12 06	19	23.05	-15 03.6	4.191	3.454	36.9	9.9	13.5	
2009 12 07	19	23.57	-15 11.7	4.207	3.458	36.0	9.6	13.5	
2009 12 08	19	24.09	-15 19.7	4.222	3.462	35.1	9.4	13.5	
2009 12 09	19	24.62	-15 27.6	4.237	3.466	34.1	9.2	13.5	
2009 12 10	19	25.16	-15 35.4	4.252	3.471	33.2	8.9	13.5	
2009 12 11	19	25.70	-15 43.1	4.267	3.475	32.3	8.7	13.6	
2009 12 12	19	26.25	-15 50.7	4.281	3.479	31.4	8.5	13.6	
2009 12 13	19	26.80	-15 58.2	4.295	3.483	30.5	8.2	13.6	
2009 12 14	19	27.36	-16 05.6	4.309	3.487	29.6	8.0	13.6	
2009 12 15	19	27.93	-16 12.9	4.323	3.491	28.7	7.8	13.6	
2009 12 16	19	28.49	-16 20.2	4.336	3.496	27.8	7.5	13.6	
2009 12 17	19	29.07	-16 27.3	4.349	3.500	26.9	7.3	13.6	
2009 12 18	19	29.64	-16 34.4	4.362	3.504	26.0	7.1	13.6	
2009 12 19	19	30.22	-16 41.4	4.375	3.508	25.1	6.8	13.7	
2009 12 20	19	30.81	-16 48.3	4.387	3.513	24.2	6.6	13.7	
2009 12 21	19	31.40	-16 55.1	4.399	3.517	23.3	6.3	13.7	
2009 12 22	19	31.99	-17 01.8	4.411	3.521	22.4	6.1	13.7	
2009 12 23	19	32.58	-17 08.5	4.423	3.526	21.5	5.9	13.7	
2009 12 24	19	33.18	-17 15.1	4.434	3.530	20.6	5.6	13.7	
2009 12 25	19	33.78	-17 21.7	4.445	3.534	19.7	5.4	13.7	
2009 12 26	19	34.39	-17 28.1	4.456	3.539	18.8	5.1	13.7	
2009 12 27	19	35.00	-17 34.5	4.466	3.543	17.9	4.9	13.7	
2009 12 28	19	35.60	-17 40.9	4.477	3.548	17.0	4.6	13.8	
2009 12 29	19	36.22	-17 47.2	4.487	3.552	16.1	4.4	13.8	
2009 12 30	19	36.83	-17 53.4	4.496	3.557	15.2	4.2	13.8	
2009 12 31	19	37.44	-17 59.6	4.506	3.561	14.3	3.9	13.8	

118P/Shoemaker-Levy

Date	TT	R. A. (2000)	Decl.	Delta	r	Elong.	Phase	m1	m2
2009 12 01	06	07.17	+08 16.1	1.073	2.001	152.6	13.1	15.2	17.9
2009 12 02	06	06.78	+08 14.8	1.068	2.000	153.5	12.7	15.2	17.9
2009 12 03	06	06.37	+08 13.8	1.064	1.999	154.4	12.3	15.1	17.9
2009 12 04	06	05.92	+08 12.9	1.059	1.998	155.3	11.9	15.1	17.8
2009 12 05	06	05.46	+08 12.3	1.055	1.997	156.2	11.5	15.1	17.8
2009 12 06	06	04.97	+08 11.8	1.051	1.996	157.0	11.1	15.1	17.8
2009 12 07	06	04.47	+08 11.6	1.048	1.995	157.8	10.7	15.1	17.8
2009 12 08	06	03.94	+08 11.6	1.044	1.994	158.7	10.4	15.1	17.8
2009 12 09	06	03.39	+08 11.8	1.041	1.993	159.4	10.0	15.1	17.7
2009 12 10	06	02.83	+08 12.3	1.038	1.993	160.2	9.6	15.1	17.7
2009 12 11	06	02.25	+08 13.0	1.035	1.992	160.9	9.3	15.1	17.7
2009 12 12	06	01.65	+08 13.9	1.032	1.991	161.6	9.0	15.1	17.7
2009 12 13	06	01.04	+08 15.0	1.030	1.991	162.2	8.7	15.1	17.7
2009 12 14	06	00.41	+08 16.4	1.028	1.990	162.8	8.4	15.0	17.6
2009 12 15	05	59.78	+08 18.0	1.026	1.989	163.4	8.1	15.0	17.6
2009 12 16	05	59.13	+08 19.9	1.024	1.989	163.9	7.9	15.0	17.6
2009 12 17	05	58.48	+08 21.9	1.023	1.988	164.3	7.7	15.0	17.6
2009 12 18	05	57.82	+08 24.3	1.022	1.988	164.6	7.6	15.0	17.6
2009 12 19	05	57.15	+08 26.8	1.021	1.987	164.9	7.4	15.0	17.6
2009 12 20	05	56.48	+08 29.6	1.020	1.987	165.0	7.4	15.0	17.6
2009 12 21	05	55.81	+08 32.7	1.019	1.986	165.1	7.3	15.0	17.6
2009 12 22	05	55.14	+08 35.9	1.019	1.986	165.1	7.3	15.0	17.6
2009 12 23	05	54.47	+08 39.4	1.019	1.986	165.0	7.4	15.0	17.6
2009 12 24	05	53.80	+08 43.1	1.019	1.985	164.8	7.4	15.0	17.6
2009 12 25	05	53.14	+08 47.1	1.020	1.985	164.6	7.6	15.0	17.6
2009 12 26	05	52.48	+08 51.2	1.020	1.985	164.2	7.7	15.0	17.6
2009 12 27	05	51.83	+08 55.6	1.021	1.985	163.8	7.9	15.0	17.6

2009 12 28	05 51.19	+09 00.2	1.022	1.984	163.3	8.2	15.0	17.6
2009 12 29	05 50.56	+09 05.0	1.023	1.984	162.8	8.4	15.0	17.6
2009 12 30	05 49.94	+09 10.0	1.025	1.984	162.2	8.7	15.0	17.6
2009 12 31	05 49.33	+09 15.2	1.027	1.984	161.5	9.0	15.0	17.7

88P/Howell

Date	TT	R. A. (2000)	Decl.	Delta	r	Elong.	Phase	m1	m2
2009 12 01		20 04.69	-23 48.4	1.899	1.467	49.6	30.8	14.9	19.0
2009 12 02		20 08.31	-23 37.4	1.906	1.471	49.5	30.6	14.9	19.1
2009 12 03		20 11.91	-23 26.1	1.914	1.475	49.3	30.4	14.9	19.1
2009 12 04		20 15.48	-23 14.5	1.922	1.479	49.1	30.3	15.0	19.1
2009 12 05		20 19.04	-23 02.7	1.930	1.483	49.0	30.1	15.0	19.1
2009 12 06		20 22.58	-22 50.7	1.939	1.487	48.8	29.9	15.0	19.1
2009 12 07		20 26.10	-22 38.4	1.947	1.491	48.6	29.7	15.1	19.1
2009 12 08		20 29.60	-22 25.9	1.955	1.496	48.4	29.5	15.1	19.1
2009 12 09		20 33.08	-22 13.1	1.964	1.500	48.2	29.3	15.1	19.1
2009 12 10		20 36.54	-22 00.1	1.973	1.505	48.1	29.1	15.1	19.1
2009 12 11		20 39.98	-21 46.9	1.981	1.509	47.9	28.9	15.2	19.1
2009 12 12		20 43.40	-21 33.5	1.990	1.514	47.7	28.7	15.2	19.2
2009 12 13		20 46.79	-21 19.9	1.999	1.518	47.5	28.6	15.2	19.2
2009 12 14		20 50.17	-21 06.2	2.008	1.523	47.3	28.4	15.3	19.2
2009 12 15		20 53.52	-20 52.2	2.017	1.528	47.1	28.2	15.3	19.2
2009 12 16		20 56.86	-20 38.0	2.026	1.532	46.9	28.0	15.3	19.2
2009 12 17		21 00.17	-20 23.7	2.035	1.537	46.7	27.8	15.3	19.2
2009 12 18		21 03.46	-20 09.2	2.045	1.542	46.5	27.6	15.4	19.2
2009 12 19		21 06.73	-19 54.6	2.054	1.547	46.3	27.4	15.4	19.2
2009 12 20		21 09.98	-19 39.7	2.064	1.552	46.0	27.2	15.4	19.2
2009 12 21		21 13.21	-19 24.8	2.073	1.557	45.8	27.0	15.5	19.3
2009 12 22		21 16.41	-19 09.7	2.083	1.562	45.6	26.8	15.5	19.3
2009 12 23		21 19.60	-18 54.5	2.093	1.567	45.4	26.5	15.5	19.3
2009 12 24		21 22.76	-18 39.1	2.102	1.572	45.2	26.3	15.6	19.3
2009 12 25		21 25.91	-18 23.7	2.112	1.577	44.9	26.1	15.6	19.3
2009 12 26		21 29.03	-18 08.1	2.122	1.582	44.7	25.9	15.6	19.3
2009 12 27		21 32.13	-17 52.4	2.132	1.588	44.5	25.7	15.7	19.3
2009 12 28		21 35.21	-17 36.6	2.142	1.593	44.2	25.5	15.7	19.3
2009 12 29		21 38.27	-17 20.7	2.152	1.598	44.0	25.3	15.7	19.3
2009 12 30		21 41.31	-17 04.7	2.163	1.604	43.7	25.1	15.8	19.4
2009 12 31		21 44.33	-16 48.6	2.173	1.609	43.5	24.9	15.8	19.4

217P/2009 F3 (LINEAR)

Date	TT	R. A. (2000)	Decl.	Delta	r	Elong.	Phase	m1	m2
2009 12 01		06 09.98	+00 20.1	0.680	1.600	147.2	19.5	13.2	
2009 12 02		06 08.91	+00 34.3	0.683	1.608	148.3	18.8	13.2	
2009 12 03		06 07.82	+00 48.7	0.687	1.615	149.3	18.1	13.3	
2009 12 04		06 06.73	+01 03.3	0.692	1.623	150.3	17.5	13.3	
2009 12 05		06 05.61	+01 18.2	0.696	1.631	151.4	16.8	13.3	
2009 12 06		06 04.49	+01 33.3	0.700	1.638	152.3	16.2	13.4	
2009 12 07		06 03.36	+01 48.7	0.705	1.646	153.3	15.6	13.4	
2009 12 08		06 02.22	+02 04.2	0.710	1.654	154.3	15.0	13.4	
2009 12 09		06 01.08	+02 19.9	0.715	1.661	155.2	14.4	13.5	
2009 12 10		05 59.93	+02 35.8	0.720	1.669	156.1	13.9	13.5	
2009 12 11		05 58.79	+02 51.9	0.726	1.677	156.9	13.3	13.5	
2009 12 12		05 57.64	+03 08.1	0.732	1.684	157.7	12.8	13.6	
2009 12 13		05 56.50	+03 24.4	0.737	1.692	158.5	12.3	13.6	
2009 12 14		05 55.37	+03 40.9	0.744	1.700	159.2	11.9	13.7	
2009 12 15		05 54.25	+03 57.4	0.750	1.708	159.8	11.5	13.7	
2009 12 16		05 53.14	+04 14.0	0.757	1.716	160.4	11.1	13.7	
2009 12 17		05 52.04	+04 30.7	0.763	1.724	160.9	10.8	13.8	
2009 12 18		05 50.95	+04 47.5	0.770	1.732	161.3	10.5	13.8	
2009 12 19		05 49.88	+05 04.3	0.778	1.740	161.7	10.3	13.9	
2009 12 20		05 48.84	+05 21.1	0.785	1.747	161.9	10.1	13.9	
2009 12 21		05 47.81	+05 37.9	0.793	1.755	162.1	9.9	13.9	
2009 12 22		05 46.80	+05 54.7	0.801	1.763	162.2	9.8	14.0	
2009 12 23		05 45.82	+06 11.5	0.809	1.771	162.2	9.8	14.0	

2009 12 24	05 44.86	+06 28.3	0.818	1.779	162.1	9.8	14.1
2009 12 25	05 43.93	+06 45.0	0.826	1.787	161.9	9.9	14.1
2009 12 26	05 43.02	+07 01.7	0.835	1.795	161.6	10.0	14.2
2009 12 27	05 42.15	+07 18.3	0.844	1.804	161.2	10.1	14.2
2009 12 28	05 41.30	+07 34.8	0.854	1.812	160.8	10.3	14.2
2009 12 29	05 40.48	+07 51.2	0.863	1.820	160.3	10.5	14.3
2009 12 30	05 39.70	+08 07.5	0.873	1.828	159.8	10.7	14.3
2009 12 31	05 38.94	+08 23.8	0.883	1.836	159.2	11.0	14.4

81P/Wild

Date	TT	R. A. (2000)	Decl.	Delta	r	Elong.	Phase	m1	m2
2009 12 01	11 01.61	+05 53.8	1.598	1.796	84.5	33.1	11.8	20.7	
2009 12 02	11 03.84	+05 41.8	1.585	1.791	84.9	33.2	11.8	20.7	
2009 12 03	11 06.07	+05 29.7	1.573	1.787	85.3	33.4	11.8	20.6	
2009 12 04	11 08.30	+05 17.7	1.560	1.783	85.8	33.5	11.7	20.6	
2009 12 05	11 10.52	+05 05.6	1.548	1.779	86.2	33.6	11.7	20.6	
2009 12 06	11 12.75	+04 53.6	1.535	1.775	86.6	33.7	11.7	20.6	
2009 12 07	11 14.98	+04 41.5	1.523	1.771	87.0	33.8	11.6	20.6	
2009 12 08	11 17.21	+04 29.4	1.510	1.766	87.5	33.9	11.6	20.5	
2009 12 09	11 19.44	+04 17.4	1.498	1.762	87.9	34.0	11.6	20.5	
2009 12 10	11 21.67	+04 05.3	1.486	1.758	88.3	34.0	11.5	20.5	
2009 12 11	11 23.90	+03 53.3	1.474	1.754	88.8	34.1	11.5	20.5	
2009 12 12	11 26.13	+03 41.2	1.462	1.751	89.2	34.2	11.5	20.5	
2009 12 13	11 28.36	+03 29.2	1.450	1.747	89.6	34.3	11.4	20.4	
2009 12 14	11 30.59	+03 17.2	1.438	1.743	90.0	34.4	11.4	20.4	
2009 12 15	11 32.81	+03 05.2	1.426	1.739	90.5	34.5	11.4	20.4	
2009 12 16	11 35.04	+02 53.2	1.414	1.735	90.9	34.5	11.3	20.4	
2009 12 17	11 37.26	+02 41.3	1.402	1.732	91.3	34.6	11.3	20.4	
2009 12 18	11 39.48	+02 29.4	1.391	1.728	91.7	34.7	11.3	20.3	
2009 12 19	11 41.70	+02 17.5	1.379	1.724	92.2	34.8	11.2	20.3	
2009 12 20	11 43.92	+02 05.6	1.368	1.721	92.6	34.8	11.2	20.3	
2009 12 21	11 46.14	+01 53.8	1.356	1.717	93.0	34.9	11.2	20.3	
2009 12 22	11 48.36	+01 42.1	1.345	1.714	93.5	35.0	11.2	20.3	
2009 12 23	11 50.57	+01 30.3	1.334	1.710	93.9	35.0	11.1	20.2	
2009 12 24	11 52.78	+01 18.7	1.322	1.707	94.3	35.1	11.1	20.2	
2009 12 25	11 54.99	+01 07.1	1.311	1.703	94.8	35.1	11.1	20.2	
2009 12 26	11 57.20	+00 55.5	1.300	1.700	95.2	35.2	11.0	20.2	
2009 12 27	11 59.40	+00 44.0	1.289	1.697	95.6	35.2	11.0	20.1	
2009 12 28	12 01.60	+00 32.5	1.278	1.694	96.1	35.3	11.0	20.1	
2009 12 29	12 03.80	+00 21.1	1.268	1.690	96.5	35.3	10.9	20.1	
2009 12 30	12 06.00	+00 09.8	1.257	1.687	97.0	35.3	10.9	20.1	
2009 12 31	12 08.19	-00 01.4	1.246	1.684	97.4	35.4	10.9	20.1	

C/2007 Q3 (Siding Springs)

Date	TT	R. A. (2000)	Decl.	Delta	r	Elong.	Phase	m1	m2
2009 12 01	12 47.60	+16 36.0	2.552	2.337	66.3	22.7	10.2		
2009 12 02	12 49.56	+16 50.6	2.543	2.340	67.0	22.8	10.2		
2009 12 03	12 51.52	+17 05.4	2.534	2.343	67.6	22.9	10.2		
2009 12 04	12 53.48	+17 20.4	2.524	2.346	68.3	23.0	10.2		
2009 12 05	12 55.44	+17 35.7	2.515	2.349	69.0	23.1	10.2		
2009 12 06	12 57.40	+17 51.2	2.506	2.353	69.7	23.1	10.2		
2009 12 07	12 59.36	+18 06.9	2.497	2.356	70.4	23.2	10.2		
2009 12 08	13 01.31	+18 22.9	2.488	2.359	71.0	23.3	10.2		
2009 12 09	13 03.27	+18 39.2	2.479	2.363	71.7	23.3	10.2		
2009 12 10	13 05.22	+18 55.6	2.470	2.366	72.4	23.4	10.2		
2009 12 11	13 07.18	+19 12.4	2.461	2.370	73.1	23.4	10.2		
2009 12 12	13 09.13	+19 29.3	2.452	2.373	73.8	23.5	10.2		
2009 12 13	13 11.07	+19 46.5	2.443	2.377	74.5	23.5	10.2		
2009 12 14	13 13.02	+20 04.0	2.435	2.381	75.1	23.6	10.2		
2009 12 15	13 14.96	+20 21.7	2.426	2.384	75.8	23.6	10.2		
2009 12 16	13 16.90	+20 39.7	2.418	2.388	76.5	23.6	10.2		
2009 12 17	13 18.84	+20 57.9	2.409	2.392	77.2	23.7	10.2		
2009 12 18	13 20.78	+21 16.4	2.401	2.396	77.8	23.7	10.2		
2009 12 19	13 22.71	+21 35.1	2.393	2.399	78.5	23.7	10.2		

2009 12 20	13 24.64	+21 54.1	2.385	2.403	79.2	23.7	10.2
2009 12 21	13 26.56	+22 13.3	2.377	2.407	79.9	23.7	10.2
2009 12 22	13 28.48	+22 32.8	2.370	2.411	80.5	23.7	10.2
2009 12 23	13 30.40	+22 52.5	2.362	2.415	81.2	23.7	10.2
2009 12 24	13 32.31	+23 12.5	2.354	2.420	81.8	23.7	10.2
2009 12 25	13 34.22	+23 32.7	2.347	2.424	82.5	23.7	10.2
2009 12 26	13 36.13	+23 53.2	2.340	2.428	83.2	23.7	10.2
2009 12 27	13 38.03	+24 13.9	2.333	2.432	83.8	23.7	10.2
2009 12 28	13 39.92	+24 34.8	2.326	2.436	84.5	23.7	10.2
2009 12 29	13 41.81	+24 56.0	2.319	2.441	85.1	23.7	10.2
2009 12 30	13 43.69	+25 17.4	2.312	2.445	85.8	23.6	10.2
2009 12 31	13 45.57	+25 39.0	2.306	2.449	86.4	23.6	10.2

29P/Schwassmann-Wachmann

Date	TT	R. A. (2000)	Decl.	Delta	r	Elong.	Phase	m1	m2
2009 12 01	09 53.78	+11 52.8	5.893	6.178	102.3	9.0	15.8	19.4	
2009 12 02	09 53.86	+11 51.6	5.877	6.178	103.3	8.9	15.8	19.4	
2009 12 03	09 53.93	+11 50.4	5.862	6.179	104.3	8.9	15.7	19.4	
2009 12 04	09 53.99	+11 49.2	5.846	6.179	105.2	8.9	15.7	19.4	
2009 12 05	09 54.03	+11 48.1	5.831	6.179	106.2	8.8	15.7	19.4	
2009 12 06	09 54.07	+11 47.1	5.815	6.179	107.2	8.8	15.7	19.4	
2009 12 07	09 54.10	+11 46.1	5.800	6.179	108.2	8.7	15.7	19.4	
2009 12 08	09 54.11	+11 45.2	5.785	6.180	109.3	8.7	15.7	19.4	
2009 12 09	09 54.12	+11 44.3	5.769	6.180	110.3	8.6	15.7	19.3	
2009 12 10	09 54.11	+11 43.5	5.754	6.180	111.3	8.5	15.7	19.3	
2009 12 11	09 54.09	+11 42.7	5.739	6.180	112.3	8.5	15.7	19.3	
2009 12 12	09 54.06	+11 42.0	5.724	6.181	113.3	8.4	15.7	19.3	
2009 12 13	09 54.02	+11 41.3	5.710	6.181	114.3	8.3	15.7	19.3	
2009 12 14	09 53.97	+11 40.7	5.695	6.181	115.4	8.3	15.7	19.3	
2009 12 15	09 53.91	+11 40.2	5.681	6.181	116.4	8.2	15.7	19.3	
2009 12 16	09 53.84	+11 39.7	5.666	6.181	117.4	8.1	15.7	19.3	
2009 12 17	09 53.75	+11 39.2	5.652	6.182	118.4	8.0	15.7	19.3	
2009 12 18	09 53.66	+11 38.8	5.638	6.182	119.5	8.0	15.7	19.3	
2009 12 19	09 53.55	+11 38.5	5.624	6.182	120.5	7.9	15.7	19.3	
2009 12 20	09 53.44	+11 38.2	5.610	6.182	121.6	7.8	15.7	19.3	
2009 12 21	09 53.31	+11 38.0	5.596	6.182	122.6	7.7	15.7	19.2	
2009 12 22	09 53.17	+11 37.8	5.583	6.183	123.7	7.6	15.6	19.2	
2009 12 23	09 53.03	+11 37.7	5.570	6.183	124.7	7.5	15.6	19.2	
2009 12 24	09 52.87	+11 37.6	5.556	6.183	125.8	7.4	15.6	19.2	
2009 12 25	09 52.70	+11 37.6	5.543	6.183	126.8	7.3	15.6	19.2	
2009 12 26	09 52.52	+11 37.7	5.531	6.184	127.9	7.2	15.6	19.2	
2009 12 27	09 52.33	+11 37.8	5.518	6.184	128.9	7.1	15.6	19.2	
2009 12 28	09 52.13	+11 37.9	5.506	6.184	130.0	7.0	15.6	19.2	
2009 12 29	09 51.92	+11 38.1	5.493	6.184	131.1	6.9	15.6	19.2	
2009 12 30	09 51.70	+11 38.4	5.481	6.184	132.2	6.8	15.6	19.2	
2009 12 31	09 51.47	+11 38.7	5.470	6.185	133.2	6.7	15.6	19.1	

C/2008 Q3 (Garradd)

Date	TT	R. A. (2000)	Decl.	Delta	r	Elong.	Phase	m1	m2
2009 12 01	13 38.37	+16 53.4	3.084	2.674	56.8	18.0	16.7		
2009 12 02	13 38.70	+17 08.3	3.076	2.683	57.8	18.1	16.7		
2009 12 03	13 39.02	+17 23.4	3.068	2.691	58.7	18.2	16.7		
2009 12 04	13 39.32	+17 38.8	3.059	2.700	59.7	18.4	16.7		
2009 12 05	13 39.61	+17 54.4	3.051	2.709	60.7	18.5	16.7		
2009 12 06	13 39.89	+18 10.3	3.042	2.717	61.7	18.6	16.8		
2009 12 07	13 40.15	+18 26.5	3.033	2.726	62.7	18.7	16.8		
2009 12 08	13 40.40	+18 43.0	3.024	2.734	63.7	18.8	16.8		
2009 12 09	13 40.64	+18 59.7	3.015	2.743	64.7	18.9	16.8		
2009 12 10	13 40.87	+19 16.7	3.006	2.752	65.7	19.0	16.8		
2009 12 11	13 41.07	+19 34.1	2.997	2.760	66.7	19.1	16.8		
2009 12 12	13 41.27	+19 51.7	2.988	2.769	67.7	19.2	16.8		
2009 12 13	13 41.44	+20 09.6	2.978	2.778	68.8	19.3	16.8		
2009 12 14	13 41.60	+20 27.8	2.969	2.786	69.8	19.4	16.8		
2009 12 15	13 41.75	+20 46.3	2.959	2.795	70.8	19.4	16.8		

2009 12 16	13 41.88	+21 05.1	2.950	2.804	71.8	19.5	16.8
2009 12 17	13 41.98	+21 24.2	2.940	2.812	72.9	19.5	16.8
2009 12 18	13 42.07	+21 43.7	2.931	2.821	73.9	19.6	16.8
2009 12 19	13 42.15	+22 03.4	2.921	2.830	74.9	19.6	16.8
2009 12 20	13 42.20	+22 23.5	2.911	2.838	76.0	19.7	16.9
2009 12 21	13 42.23	+22 43.9	2.902	2.847	77.0	19.7	16.9
2009 12 22	13 42.24	+23 04.6	2.892	2.856	78.1	19.7	16.9
2009 12 23	13 42.24	+23 25.6	2.882	2.865	79.1	19.7	16.9
2009 12 24	13 42.20	+23 46.9	2.873	2.874	80.2	19.7	16.9
2009 12 25	13 42.15	+24 08.6	2.863	2.882	81.2	19.7	16.9
2009 12 26	13 42.08	+24 30.6	2.854	2.891	82.3	19.7	16.9
2009 12 27	13 41.98	+24 52.9	2.844	2.900	83.4	19.7	16.9
2009 12 28	13 41.86	+25 15.5	2.835	2.909	84.4	19.7	16.9
2009 12 29	13 41.71	+25 38.5	2.825	2.918	85.5	19.6	16.9
2009 12 30	13 41.54	+26 01.8	2.816	2.926	86.6	19.6	16.9
2009 12 31	13 41.34	+26 25.4	2.807	2.935	87.6	19.6	16.9

DECEMBER 2009 BRIGHT ASTEROIDS AT OPPOSITION

(52) Europa

Date	TT	R. A. (2000)	Decl.	Delta	r	Elong.	Phase	V
2009 12 01		05 59.88	+15 18.5	1.868	2.804	157.4	7.8	10.4
2009 12 02		05 59.15	+15 19.0	1.863	2.804	158.5	7.4	10.4
2009 12 03		05 58.40	+15 19.6	1.858	2.803	159.6	7.0	10.4
2009 12 04		05 57.64	+15 20.2	1.853	2.803	160.7	6.7	10.4
2009 12 05		05 56.87	+15 21.0	1.849	2.802	161.8	6.3	10.4
2009 12 06		05 56.08	+15 21.7	1.845	2.801	162.8	6.0	10.3
2009 12 07		05 55.27	+15 22.6	1.841	2.801	163.9	5.6	10.3
2009 12 08		05 54.46	+15 23.5	1.837	2.800	164.9	5.2	10.3
2009 12 09		05 53.63	+15 24.5	1.834	2.800	166.0	4.9	10.3
2009 12 10		05 52.79	+15 25.5	1.831	2.799	167.0	4.6	10.2
2009 12 11		05 51.94	+15 26.6	1.828	2.799	167.9	4.2	10.2
2009 12 12		05 51.08	+15 27.8	1.826	2.798	168.8	3.9	10.2
2009 12 13		05 50.22	+15 29.0	1.824	2.798	169.7	3.6	10.2
2009 12 14		05 49.34	+15 30.3	1.822	2.798	170.4	3.4	10.2
2009 12 15		05 48.47	+15 31.7	1.820	2.797	171.1	3.1	10.1
2009 12 16		05 47.58	+15 33.1	1.819	2.797	171.6	2.9	10.1
2009 12 17		05 46.70	+15 34.6	1.818	2.796	172.0	2.8	10.1
2009 12 18		05 45.81	+15 36.2	1.818	2.796	172.2	2.7	10.1
2009 12 19		05 44.92	+15 37.8	1.817	2.795	172.2	2.7	10.1
2009 12 20		05 44.03	+15 39.5	1.817	2.795	172.0	2.8	10.1
2009 12 21		05 43.14	+15 41.2	1.817	2.794	171.7	2.9	10.1
2009 12 22		05 42.25	+15 43.0	1.818	2.794	171.2	3.1	10.1
2009 12 23		05 41.37	+15 44.9	1.818	2.793	170.5	3.3	10.2
2009 12 24		05 40.49	+15 46.8	1.819	2.793	169.8	3.6	10.2
2009 12 25		05 39.62	+15 48.8	1.821	2.792	168.9	3.9	10.2
2009 12 26		05 38.75	+15 50.8	1.822	2.792	168.0	4.2	10.2
2009 12 27		05 37.89	+15 52.9	1.824	2.792	167.1	4.5	10.2

(111) Ate

Date	TT	R. A. (2000)	Decl.	Delta	r	Elong.	Phase	V
2009 12 01		06 13.78	+28 56.6	1.426	2.357	155.2	10.1	11.3
2009 12 02		06 12.96	+28 56.3	1.420	2.357	156.3	9.7	11.3
2009 12 03		06 12.12	+28 55.9	1.415	2.356	157.5	9.2	11.2
2009 12 04		06 11.25	+28 55.4	1.410	2.355	158.7	8.8	11.2
2009 12 05		06 10.35	+28 54.8	1.405	2.355	159.8	8.3	11.2
2009 12 06		06 09.43	+28 54.1	1.401	2.354	161.0	7.8	11.2
2009 12 07		06 08.49	+28 53.3	1.397	2.354	162.2	7.4	11.1
2009 12 08		06 07.53	+28 52.5	1.393	2.353	163.3	6.9	11.1
2009 12 09		06 06.54	+28 51.5	1.389	2.353	164.5	6.4	11.1
2009 12 10		06 05.54	+28 50.5	1.386	2.352	165.7	6.0	11.1

2009 12 11	06 04.52	+28 49.4	1.382	2.352	166.8	5.5	11.0
2009 12 12	06 03.49	+28 48.2	1.379	2.351	167.9	5.0	11.0
2009 12 13	06 02.44	+28 46.8	1.377	2.351	169.0	4.6	11.0
2009 12 14	06 01.38	+28 45.4	1.374	2.350	170.1	4.1	10.9
2009 12 15	06 00.31	+28 43.9	1.372	2.350	171.2	3.7	10.9
2009 12 16	05 59.23	+28 42.2	1.371	2.349	172.2	3.3	10.9
2009 12 17	05 58.14	+28 40.5	1.369	2.349	173.1	2.9	10.9
2009 12 18	05 57.05	+28 38.7	1.368	2.348	173.8	2.6	10.8
2009 12 19	05 55.95	+28 36.7	1.367	2.348	174.4	2.3	10.8
2009 12 20	05 54.85	+28 34.7	1.366	2.348	174.8	2.2	10.8
2009 12 21	05 53.75	+28 32.6	1.366	2.347	174.9	2.2	10.8
2009 12 22	05 52.65	+28 30.3	1.365	2.347	174.6	2.2	10.8
2009 12 23	05 51.55	+28 28.0	1.366	2.346	174.1	2.5	10.8
2009 12 24	05 50.45	+28 25.6	1.366	2.346	173.4	2.8	10.8
2009 12 25	05 49.37	+28 23.1	1.367	2.345	172.6	3.1	10.9
2009 12 26	05 48.29	+28 20.5	1.368	2.345	171.6	3.5	10.9
2009 12 27	05 47.22	+28 17.8	1.369	2.345	170.6	3.9	10.9

(128) Nemesis

Date	TT	R. A. (2000)	Decl.	Delta	r	Elong.	Phase	V
2009 12 01	06 02.84	+24 28.3	1.622	2.564	158.1	8.2	11.2	
2009 12 02	06 01.97	+24 31.1	1.619	2.565	159.3	7.8	11.1	
2009 12 03	06 01.08	+24 33.8	1.616	2.566	160.5	7.4	11.1	
2009 12 04	06 00.17	+24 36.5	1.613	2.568	161.7	6.9	11.1	
2009 12 05	05 59.24	+24 39.2	1.610	2.569	163.0	6.5	11.1	
2009 12 06	05 58.30	+24 41.8	1.608	2.570	164.2	6.0	11.0	
2009 12 07	05 57.34	+24 44.5	1.606	2.571	165.4	5.5	11.0	
2009 12 08	05 56.36	+24 47.1	1.604	2.572	166.6	5.1	11.0	
2009 12 09	05 55.38	+24 49.6	1.602	2.573	167.9	4.6	11.0	
2009 12 10	05 54.38	+24 52.2	1.601	2.575	169.1	4.1	10.9	
2009 12 11	05 53.36	+24 54.7	1.600	2.576	170.3	3.7	10.9	
2009 12 12	05 52.34	+24 57.1	1.599	2.577	171.5	3.2	10.9	
2009 12 13	05 51.32	+24 59.5	1.599	2.578	172.8	2.8	10.9	
2009 12 14	05 50.28	+25 01.9	1.598	2.579	174.0	2.3	10.8	
2009 12 15	05 49.24	+25 04.2	1.598	2.581	175.1	1.8	10.8	
2009 12 16	05 48.19	+25 06.5	1.599	2.582	176.3	1.4	10.8	
2009 12 17	05 47.15	+25 08.7	1.599	2.583	177.3	1.0	10.7	
2009 12 18	05 46.10	+25 10.9	1.600	2.584	178.0	0.7	10.7	
2009 12 19	05 45.05	+25 13.0	1.602	2.585	178.1	0.7	10.7	
2009 12 20	05 44.00	+25 15.1	1.603	2.587	177.5	1.0	10.7	
2009 12 21	05 42.96	+25 17.2	1.605	2.588	176.5	1.3	10.8	
2009 12 22	05 41.92	+25 19.1	1.607	2.589	175.4	1.8	10.8	
2009 12 23	05 40.89	+25 21.0	1.610	2.590	174.2	2.2	10.8	
2009 12 24	05 39.86	+25 22.9	1.612	2.591	173.0	2.7	10.9	
2009 12 25	05 38.85	+25 24.7	1.615	2.593	171.8	3.1	10.9	
2009 12 26	05 37.84	+25 26.5	1.619	2.594	170.6	3.6	10.9	
2009 12 27	05 36.84	+25 28.2	1.622	2.595	169.3	4.0	11.0	

(324) Bamberga

Date	TT	R. A. (2000)	Decl.	Delta	r	Elong.	Phase	V
2009 12 01	07 00.07	+39 02.5	1.319	2.191	143.4	15.6	10.0	
2009 12 02	06 59.18	+39 04.2	1.317	2.195	144.4	15.2	10.0	
2009 12 03	06 58.25	+39 05.8	1.314	2.198	145.5	14.7	10.0	
2009 12 04	06 57.29	+39 07.2	1.312	2.202	146.5	14.3	10.0	
2009 12 05	06 56.29	+39 08.5	1.310	2.206	147.5	13.9	10.0	
2009 12 06	06 55.25	+39 09.6	1.308	2.209	148.6	13.4	10.0	
2009 12 07	06 54.18	+39 10.5	1.306	2.213	149.6	13.0	9.9	
2009 12 08	06 53.08	+39 11.2	1.305	2.217	150.6	12.6	9.9	
2009 12 09	06 51.95	+39 11.7	1.304	2.220	151.7	12.2	9.9	
2009 12 10	06 50.79	+39 12.0	1.303	2.224	152.7	11.7	9.9	
2009 12 11	06 49.60	+39 12.1	1.302	2.228	153.7	11.3	9.9	
2009 12 12	06 48.39	+39 12.1	1.301	2.231	154.7	10.9	9.9	
2009 12 13	06 47.15	+39 11.7	1.301	2.235	155.6	10.5	9.9	
2009 12 14	06 45.89	+39 11.2	1.301	2.239	156.6	10.1	9.8	

2009	12	15	06	44.61	+39	10.4	1.301	2.243	157.5	9.7	9.8
2009	12	16	06	43.31	+39	09.4	1.302	2.246	158.4	9.3	9.8
2009	12	17	06	42.00	+39	08.2	1.303	2.250	159.2	8.9	9.8
2009	12	18	06	40.67	+39	06.7	1.304	2.254	160.0	8.6	9.8
2009	12	19	06	39.34	+39	05.0	1.305	2.257	160.8	8.2	9.8
2009	12	20	06	37.99	+39	03.0	1.306	2.261	161.5	7.9	9.8
2009	12	21	06	36.64	+39	00.8	1.308	2.265	162.2	7.6	9.8
2009	12	22	06	35.28	+38	58.4	1.310	2.269	162.8	7.4	9.8
2009	12	23	06	33.92	+38	55.7	1.312	2.272	163.3	7.1	9.8
2009	12	24	06	32.56	+38	52.8	1.315	2.276	163.8	6.9	9.8
2009	12	25	06	31.20	+38	49.6	1.318	2.280	164.1	6.8	9.8
2009	12	26	06	29.84	+38	46.2	1.321	2.283	164.4	6.6	9.8
2009	12	27	06	28.49	+38	42.5	1.324	2.287	164.6	6.6	9.8

(11) Parthenope

Date	TT	R. A.	(2000)	Decl.	Delta	r	Elong.	Phase	V		
2009	12	01	06	42.10	+18	48.8	1.694	2.587	148.5	11.5	10.5
2009	12	02	06	41.37	+18	49.9	1.688	2.588	149.7	11.1	10.4
2009	12	03	06	40.62	+18	51.1	1.682	2.588	150.9	10.7	10.4
2009	12	04	06	39.84	+18	52.4	1.677	2.589	152.1	10.3	10.4
2009	12	05	06	39.04	+18	53.7	1.672	2.590	153.3	9.9	10.4
2009	12	06	06	38.21	+18	55.0	1.667	2.591	154.5	9.4	10.4
2009	12	07	06	37.36	+18	56.4	1.662	2.592	155.7	9.0	10.3
2009	12	08	06	36.49	+18	57.8	1.658	2.593	156.9	8.6	10.3
2009	12	09	06	35.59	+18	59.3	1.654	2.594	158.1	8.2	10.3
2009	12	10	06	34.68	+19	00.9	1.650	2.594	159.3	7.7	10.3
2009	12	11	06	33.75	+19	02.5	1.646	2.595	160.5	7.3	10.2
2009	12	12	06	32.80	+19	04.1	1.643	2.596	161.7	6.8	10.2
2009	12	13	06	31.83	+19	05.7	1.640	2.597	162.9	6.4	10.2
2009	12	14	06	30.85	+19	07.5	1.637	2.598	164.1	5.9	10.2
2009	12	15	06	29.85	+19	09.2	1.634	2.599	165.4	5.5	10.1
2009	12	16	06	28.83	+19	11.0	1.632	2.599	166.6	5.0	10.1
2009	12	17	06	27.81	+19	12.8	1.630	2.600	167.8	4.6	10.1
2009	12	18	06	26.77	+19	14.6	1.628	2.601	169.0	4.2	10.1
2009	12	19	06	25.73	+19	16.5	1.627	2.602	170.1	3.7	10.0
2009	12	20	06	24.67	+19	18.4	1.626	2.603	171.3	3.3	10.0
2009	12	21	06	23.61	+19	20.3	1.625	2.603	172.4	2.9	10.0
2009	12	22	06	22.54	+19	22.2	1.625	2.604	173.5	2.5	10.0
2009	12	23	06	21.47	+19	24.2	1.624	2.605	174.4	2.1	9.9
2009	12	24	06	20.40	+19	26.2	1.624	2.606	175.3	1.8	9.9
2009	12	25	06	19.32	+19	28.2	1.625	2.607	175.9	1.6	9.9
2009	12	26	06	18.24	+19	30.2	1.625	2.607	176.1	1.5	9.9
2009	12	27	06	17.16	+19	32.2	1.626	2.608	176.0	1.5	9.9

(19) Fortuna

Date	TT	R. A.	(2000)	Decl.	Delta	r	Elong.	Phase	V		
2009	12	01	05	15.94	+21	03.1	1.154	2.130	168.9	5.1	9.5
2009	12	02	05	14.92	+21	01.1	1.153	2.131	170.1	4.6	9.5
2009	12	03	05	13.88	+20	59.1	1.152	2.132	171.3	4.0	9.5
2009	12	04	05	12.83	+20	57.1	1.152	2.133	172.6	3.4	9.4
2009	12	05	05	11.78	+20	55.1	1.152	2.134	173.8	2.9	9.4
2009	12	06	05	10.72	+20	53.1	1.152	2.136	174.9	2.3	9.4
2009	12	07	05	09.65	+20	51.1	1.153	2.137	176.0	1.8	9.3
2009	12	08	05	08.59	+20	49.0	1.154	2.138	177.0	1.4	9.3
2009	12	09	05	07.52	+20	47.0	1.155	2.139	177.7	1.0	9.3
2009	12	10	05	06.46	+20	45.0	1.156	2.140	177.8	1.0	9.3
2009	12	11	05	05.39	+20	43.0	1.157	2.142	177.3	1.2	9.3
2009	12	12	05	04.34	+20	41.1	1.159	2.143	176.4	1.7	9.3
2009	12	13	05	03.28	+20	39.1	1.161	2.144	175.3	2.2	9.4
2009	12	14	05	02.24	+20	37.1	1.164	2.145	174.1	2.7	9.4
2009	12	15	05	01.21	+20	35.2	1.166	2.147	172.9	3.2	9.5
2009	12	16	05	00.19	+20	33.3	1.169	2.148	171.7	3.8	9.5
2009	12	17	04	59.18	+20	31.5	1.172	2.149	170.5	4.3	9.5

2009	12	18	04	58.19	+20	29.6	1.176	2.150	169.3	4.9	9.6
2009	12	19	04	57.21	+20	27.9	1.179	2.152	168.0	5.4	9.6
2009	12	20	04	56.25	+20	26.1	1.183	2.153	166.8	6.0	9.7
2009	12	21	04	55.32	+20	24.4	1.188	2.154	165.6	6.5	9.7
2009	12	22	04	54.40	+20	22.7	1.192	2.156	164.4	7.1	9.7
2009	12	23	04	53.50	+20	21.1	1.197	2.157	163.1	7.6	9.8
2009	12	24	04	52.63	+20	19.5	1.202	2.158	161.9	8.1	9.8
2009	12	25	04	51.79	+20	18.0	1.207	2.160	160.7	8.6	9.8
2009	12	26	04	50.97	+20	16.6	1.212	2.161	159.5	9.2	9.9
2009	12	27	04	50.17	+20	15.2	1.218	2.162	158.3	9.7	9.9