

# RASC Toronto Centre

## The Sky This Month – December, 2013 to January, 2014

by Chris Vaughan

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### NEWS

#### Space Exploration – Public and Private

Ref. <http://www.spaceflightnow.com/tracking/index.html>

Dec 14 – China's Chang'e 3 Rover Landing

Dec 17 pm – Launch of Orbital Sciences Antares rocket with Cygnus Cargo Freighter (1<sup>st</sup> time) from Wallops Island, Virginia, payload unmanned ISS re-supply

Dec 19 am – Launch of Arianespace Soyuz rocket from ELS, Sinnamary, French Guiana, payload Gaia observatory mission

Dec 20 pm – Launch of SpaceX Falcon 9 rocket from Cape Canaveral Air Force Station, Florida, payload Thaicom 6 comsat

Dec 20 pm – Launch of Long March 3B rocket from Xichang, China, payload Tupac Katari comsat for Bolivia

Dec 23 – Launch of Soyuz 2-1v rocket (maiden launch) from Plesetsk Cosmodrome, Russia, payload AIST student-built microsat.

Dec 26 am – Launch of Proton rocket from Baikonur Cosmodrome, Kazakhstan, payload Express AM5 civil comsat.

Dec TBD – Launch of Long March 4B rocket from Taiyuan, China, payload Gaofen 2 high-resolution remote sensing satellite

Jan TBD – Launch of GSLV rocket (re-try) from Satish Dhawan Space Center, India, payload GSAT 14 comsat

Jan TBD – Launch of Ariane 5 rocket from Kourou, French Guiana, payload ASTRA 5B and Amazonas 4A comsats

#### This Month in History (a sampling)

Ref. <http://astroplanet.org/next.php>, <http://www2.jpl.nasa.gov/calendar/>

#### Astro-Birthdays

Dec 7, 1905 – Gerard Kuiper, discoverer of moons of Neptune and Uranus, deep solar system scientist

Dec 11, 1863 – Annie Jump Cannon, pioneer in stellar classification at Harvard

Dec 14, 1546 – Tycho Brahe, pioneering naked-eye astronomer

Dec 16, 1917 – Sir Arthur C Clarke, prolific Sci-Fi author, TV host, and conceptualizer of geosynchronous satellites. "Any sufficiently advanced technology is indistinguishable from magic."

Dec 16, 1857 – E.E. Barnard, American astronomer, astrophotographer, pioneer in stellar proper motion

Dec 25, 1642 – Sir Isaac Newton, author, renaissance man, pioneer in calculus, gravitation, optics and light spectra, builder of the Newtonian telescope

Dec 27, 1571 – Johannes Kepler, contemporary of Brahe, applied physics to astronomy, Laws of Planetary Motion

Dec 28, 1882 – Arthur Stanley Eddington, distinguished British astronomer and astrophysicist, developed stellar mass-luminosity relationship

Jan 8, 1942 – Stephen Hawking born

Jan 10, 1946 – Robert Wilson, co-discoverer of cosmic microwave background born

#### Space Exploration

Dec 1, 1973/74 – Pioneer 10 and Pioneer 11 Flybys of Jupiter

Dec 2, 1971 – USSR's Mars 3 makes first soft landing on Mars

Dec 4, 1996 – Launch of Mars Pathfinder

Dec 7-19, 1972 – Apollo 17 mission

Dec 7, 1995 – Galileo probe arrives at Jupiter

Dec 12, 1995 – SOHO Observatory launched

Dec 15, 1970 – Venera 7 becomes first spacecraft to land on another planet and return data

### **Astronomy**

Dec 13, 1920 – The first diameter of a star, Betelgeuse, is measured by Francis Pease with an interferometer at Mt. Wilson

Dec 23, 1672 – Giovanni Cassini discovers Saturn's Rhea

Jan 1, 1801 – Giuseppe Piazzi discovers Ceres

Jan 4-15, 1610 – Galileo uses his spyglass to observe craters and mountains on the Moon, moving spots on the Sun, moons revolving around Jupiter, the phases of Venus, and the almost innumerable stars of the Milky Way!

### **Other**

Dec 20, 1996 – Death of Carl Sagan, aged 62, planetary scientist, teacher, author, pioneer in astronomy and space outreach, co-founder of The Planetary Society

Jan 8, 1642 – Death of Galileo Galilei, and in 1908, Birth of Doctor Who (William Hartnell)

## **Star Parties**

Ref: <http://ontariostargazing.ca/astronomy-star-parties-events-ontario/>

“RASC City Skies Observing”, Bayview Village Park, Toronto – window opens December 9<sup>th</sup>

“RASC City Skies Observing”, Bayview Village Park, Toronto – window opens January 6<sup>th</sup>

“RASC Dark Skies Observing”, Long Sault, ON – window opens January 27<sup>th</sup>

## **OBSERVING**

### **Sunrise/Sunset**

December 1<sup>st</sup> sunrise at 7:38 am, sunset at 4:37 pm

December 31<sup>st</sup> sunrise at 7:58 am, sunset at 4:45 pm

Winter Solstice on December 21 at 12:11 pm

Earth at Perihelion Jan 4<sup>th</sup> at 7 am

### **Moon - Phases**

December 2<sup>nd</sup> at 7:22 pm – New Moon

December 9<sup>th</sup> at 10:12 am – 1<sup>st</sup> Quarter Moon (sets around midnight)

December 17<sup>th</sup> at 4:28 am – Full Moon (near Apogee, smallest Full Moon of 2013)

December 25<sup>th</sup> at 8:48 am – 3<sup>rd</sup> Quarter Moon (rises around midnight)

January 1<sup>st</sup> at 6:14 am – New Moon

January 7<sup>th</sup> at 10:39 pm – 1<sup>st</sup> Quarter Moon (sets around midnight)

January 15<sup>th</sup> at 11:52 pm – Full Moon (coincides with Apogee, “Wimpy” Moon, smallest of 2014)

## Moon - Conjunctions

On the evening of December 14, the Waxing Gibbous Moon will be situated only 7 degrees south of (below) M45, The Pleiades.

On the evening of December 15, the Full Moon will be situated only 2 degrees north of (above) Aldebaran!

On the evening of December 18, the Waning Gibbous Moon sits about 6 degrees south of (to the lower right) of Jupiter.

On the early morning of December 25/26, the Last Quarter Moon passes about 8 degrees south (to the lower right and lower left respectively) of Mars.

On the early morning of December 28, the Waning Crescent Moon sits about 8 degrees west (to the upper right) of Saturn.

On the early morning of December 29, the Old Crescent Moon sits about 8 degrees east (to the upper left) of Saturn.

On the evening of January 2, the New Crescent Moon sits about 6 degrees east (to the upper left) of Venus.

On the evening of January 10, the "First Quarter" Moon will be situated only 9 degrees south of (below) M45 The Pleiades.

On the evening of January 11, the Waxing Gibbous Moon will be situated only 4 degrees west (to the upper right) of Aldebaran.

## Moon - Orbit

Perigee on December 4<sup>th</sup> at 5 am

Apogee on December 19<sup>th</sup> at 7 pm

Perigee on January 1<sup>st</sup> at 4 pm

Apogee on January 15<sup>th</sup> at 9 pm

## Planets and Dwarf Planets

**Mercury**, having completed Greatest Western Elongation, is rapidly descending towards the Sun and superior conjunction on December 29<sup>th</sup>.

**Venus**, in Sagittarius, is completing its summer/autumn elongation and moves quickly into the sunset during December and January, reaching Inferior Conjunction on January 11th. It sets at 7:30 pm on December 1 (30% illum) and 6:16 pm on December 31 (4% illum). On December 16<sup>th</sup>, it passes 1 degree from M75.

**Mars**, in Virgo, is visible in the morning – rising at 1:13 am on December 1 and 12:30 am on December 31. On December 28th and 29th, Mars passes less than 1 degree from Porrima!

**Jupiter** rises at 7:23 pm on December 1<sup>st</sup> and at 5:08 pm on December 31<sup>st</sup>. All month in Gemini, it reaches opposition on January 5<sup>th</sup>. Beautiful lunar conjunctions occur on December 18<sup>th</sup> and January 14<sup>th</sup>.

**Saturn**, in Virgo all month, is a predawn object, but is climbing away from the Sun. It rises at 5:30 am on December 1<sup>st</sup> and at 3:55 am on December 31<sup>st</sup>.

**Uranus**, in Pisces, is best observable in early evenings, setting at 2:20 am on December 1<sup>st</sup> and at 12:22 am on December 31<sup>st</sup>.

**Neptune**, in Aquarius, is an early evening target, setting at 11:13 pm on December 1<sup>st</sup> and at 9:18 pm on December 31<sup>st</sup>.

**Pluto**, above Sagittarius' teapot, is in conjunction, and not visible.

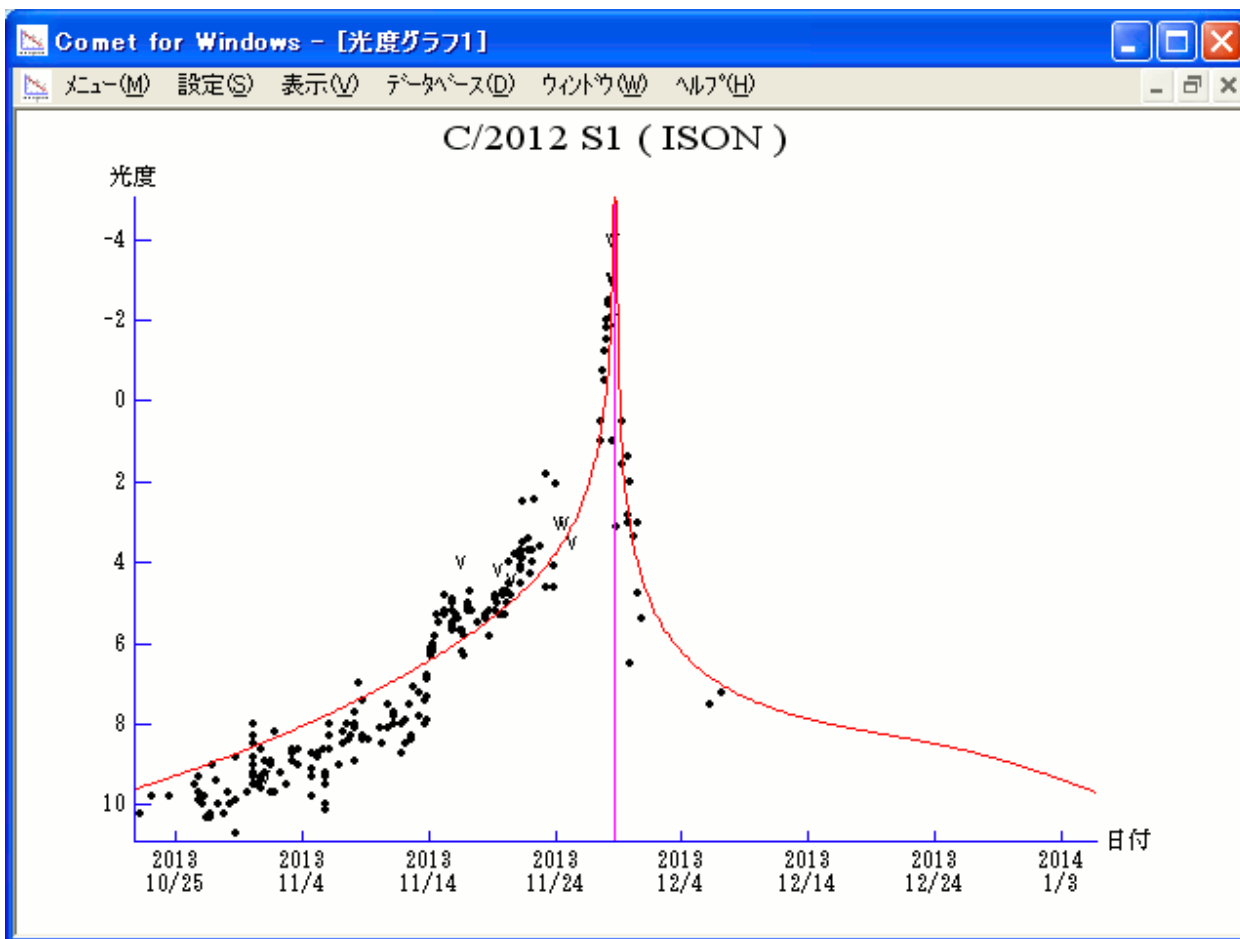
**Ceres** and **Vesta** are near Mars in Virgo, well placed for early morning viewing.

## Comets

Ref. <http://www.aerith.net/comet/catalog/2012S1/2012S1.html>

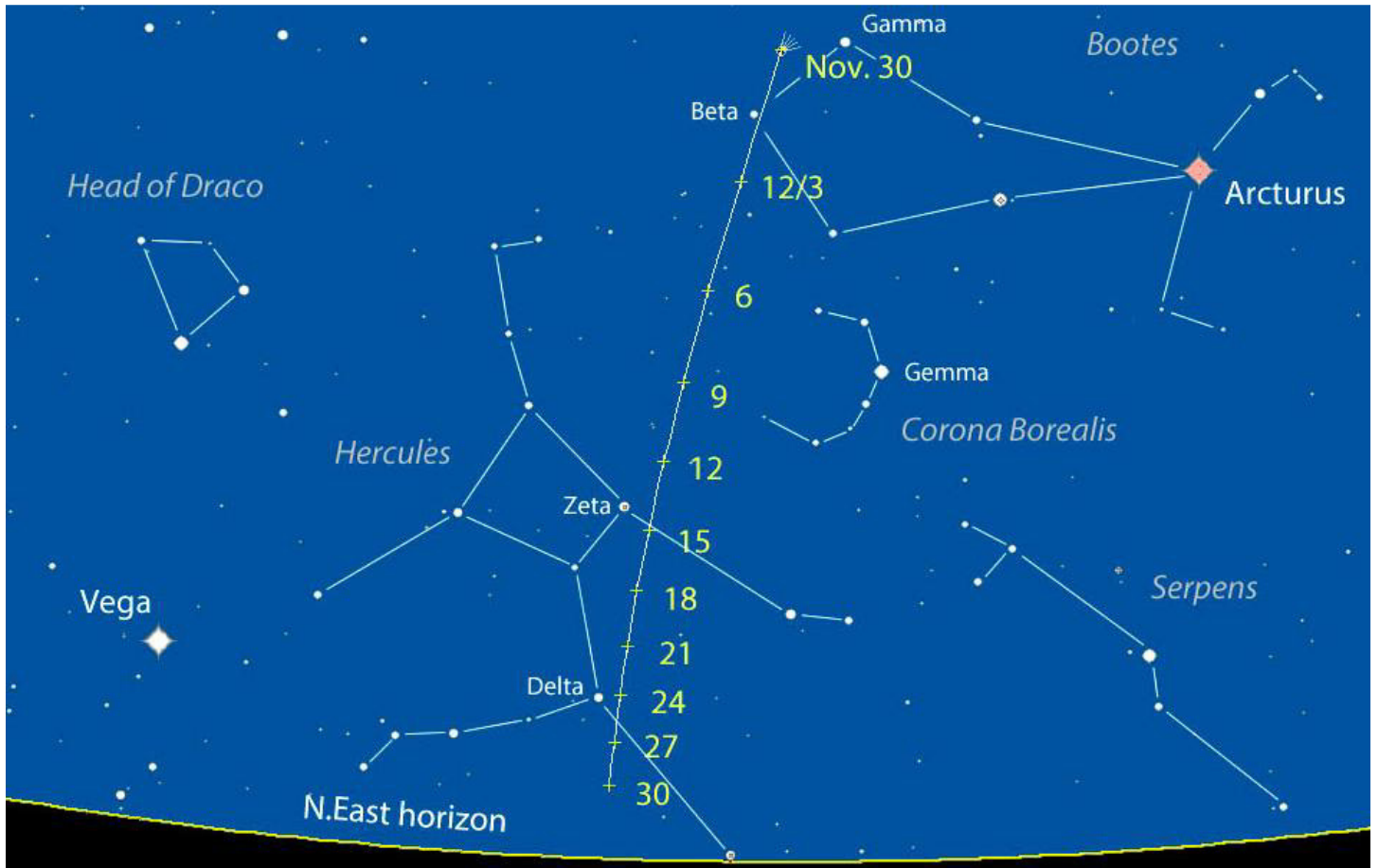
### Comet C/2012 S1 (ISON)

Comet C/2012 S1 ISON did not survive its November 28<sup>th</sup> Solar passage. Born 4.5 Billion BC – Died Nov 28, 2013, (*not at*) *Rest in Pieces*.



## Comet C/2013 R1 Lovejoy

Dropping daily in the eastern pre-dawn sky. Rises at 2:48 am on December 12 (approx 6 degrees to the right of M13). Rises at 3:38 am on December 31 (8 degrees north of Rasalhague and about same elev. as Vega)



## Meteor Shower(s)

### Geminids

Active period Dec 4 – 16, peaking about 2 am on December 14<sup>th</sup>. Moon ~90% illuminated.

Usually the strongest meteor shower of the year. Peaks on Saturday morning December 14<sup>th</sup>. Often bright and intensely coloured, and slower than average. Source material is thought to be asteroid 3200 Phaethon and not a comet. This means that the debris is likely larger and more solid – giving us a better show! Radiant is ~1° Northwest of Castor, in the constellation of Gemini (RA 7h 28m, Decl. +33°)

### Ursids

Active period Dec 17 – 23, peaking about 9 am on December 22<sup>nd</sup>. Moon ~78% illuminated.

Normally see 5-10 Ursids per hour during the late morning hours on the date of maximum activity, occasional outbursts of >25 per hour. Source material is the periodic comet 8P/Tuttle. Radiant is ~1° Northwest of Kochab, in the constellation of Ursa Minor (RA 14h 36m, Decl. +75°)

### Quadrantids

Active period January 1-10, peaking about 3 pm on January 3<sup>rd</sup>. New Moon!

Have an Intense, but short peak (~6 hour) period. Average hourly rate is 25. They usually lack persistent trains but often produce bright fireballs. Source material may be comet C/1490 Y1. Radiant is ~9° Northeast of Nekkar, between constellations of Draco, Her, Boo, and UMa (RA 15h 20m, Decl. +49°)

## Asteroids

Ref. <http://neo.jpl.nasa.gov/ca/>

No news

## Satellites

Current ISS pass series continues until December 29<sup>th</sup>. Most visible passes are between 5:30 and 7:15 pm. Some higher/brighter ones include:

11 Dec	-3.4	18:23:46	10° SW	18:27:04	72° SE	18:27:22	66°	E
14 Dec	-3.2	17:32:26	10° WSW	17:35:45	79° NNW	17:38:28	15°	NE
25 Dec	-3.3	18:09:14	10° NW	18:12:32	60° NNE	18:13:50	32°	E
28 Dec	-3.3	17:16:38	10° WNW	17:19:59	82° NNE	17:23:18	10°	ESE

**Iridium Flares** most frequent evening passes occur between 5:30 and 7 pm. Local occurrences info at [www.heavens-above.com](http://www.heavens-above.com), phone/tablet apps, Chris Vaughan's Skylights (email, [www.astrogeoguy.tumblr.com](http://www.astrogeoguy.tumblr.com))

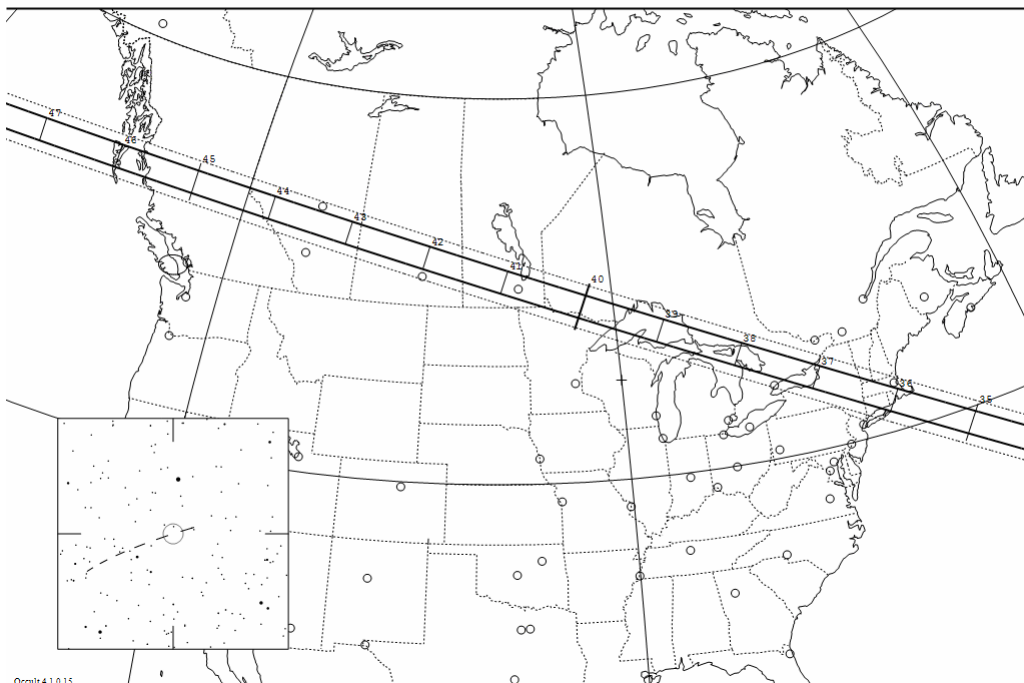
## Occultations/Eclipses

Ref: <http://www.asteroidoccultation.com/> (additional links on the following URLs open track maps)

**11 Dec 2013 at 09:40 UT** Asteroid (602) Marianna (mag 13.0) occults star TYC 2486-01363-1 (mag 12.4) - visible across Georgian Bay and area east of GTA, drops 1.1mags for 17.9sec, alt. 75°

[http://www.asteroidoccultation.com/2013\\_12/1211\\_602\\_30414.htm](http://www.asteroidoccultation.com/2013_12/1211_602_30414.htm)

602 Marianna occults TYC 2486-01363-1 on 2013 Dec 11 from 9h 26m to 9h 54m UT  
 Star: Max Duration = 17.9 secs Asteroid: Mag = 13.0  
 Mr = 12.4 Mp = 13.0 Mr = 12.1 Mag Drop = 1.1 (1.0r) Dia = 130km, 0.086"  
 RA = 8 28 17.8039 (J2000) Sun : Dist = 137 deg Parallax = 4.216"  
 Dec = 34 32 19.054 Moon: Dist = 108 deg Illum = 69 % Hourly dRA = -1.328s  
 [of Date: 8 26 13, 34 29 17] E 0.053"x 0.036" in RA 95 dDec = 5.31"  
 Prediction of 2013 Nov 22.0

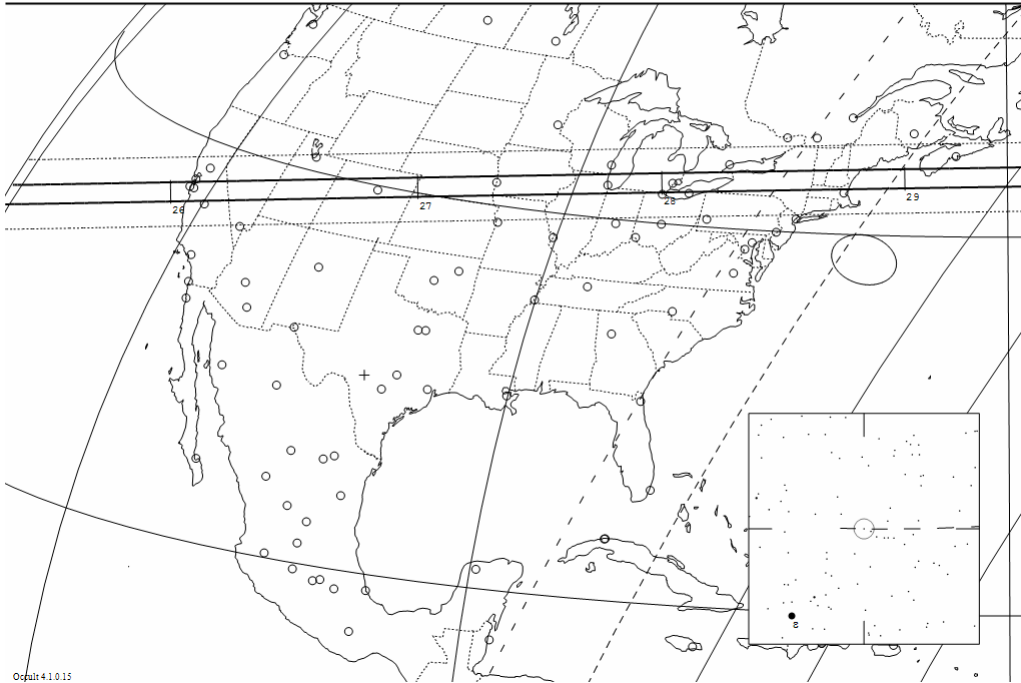


**14 Dec 2013 at 11:28 UT Asteroid (4063) Euforbo (mag 16.6) occults star TYC 0886-00451-1 (mag 11.5) – visible across Windsor-Niagara, drops 5.1mags for 4.7sec, alt. 58°**

[http://www.asteroidoccultation.com/2013\\_12/1214\\_4063\\_33978.htm](http://www.asteroidoccultation.com/2013_12/1214_4063_33978.htm)

4063 Euforbo occults TYC 0886-00451-1 on 2013 Dec 14 from 11h 25m to 11h 33m UT

Star: Mv = 11.5 Mp = 12.0 Mr = 11.2 RA = 12 59 37.4873 (J2000) Dec = 11 42 51.482 [of Date: 13 0 13, 11 38 17] Prediction of 2013 Nov 22.0	Max Duration = 4.7 secs Mag Drop = 5.1 (4.9z) Sun: Dist = 74 deg Moon: Dist = 137 deg illum = 52 % E 0.046"x 0.034" in RA 106	Asteroid: Mag = 16.6 Dia = 106km, 0.027" Parallax = 1.605" Hourly dRA = 1.405z dDec = 0.32"
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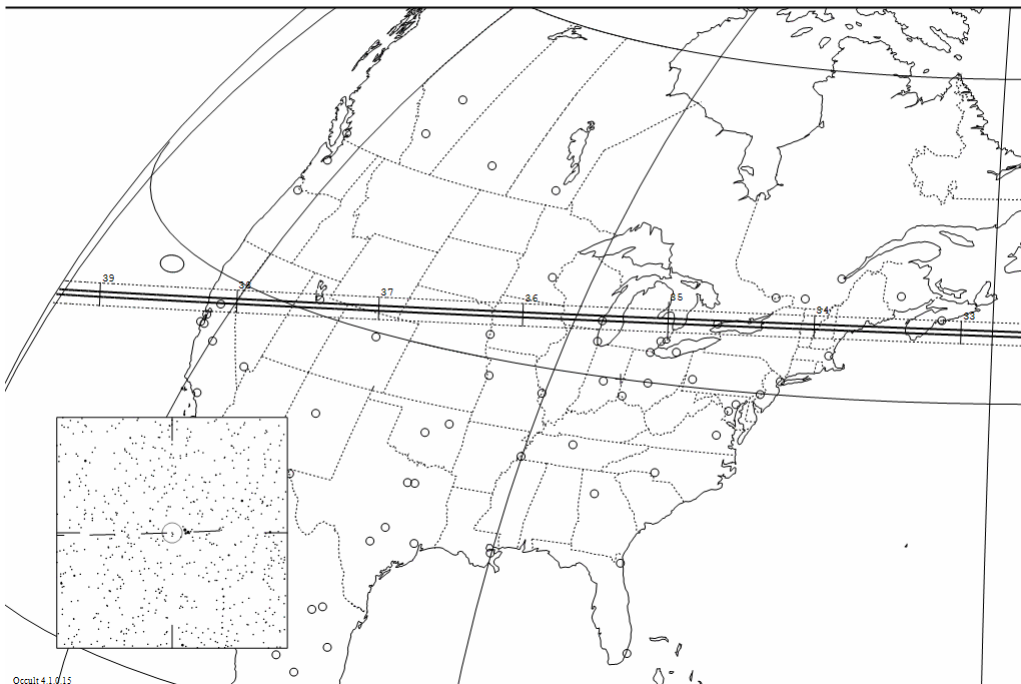


**25 Dec 2013 at 04:32 UT Asteroid (1632) Sieböhme (mag 15.4) occults star TYC 0760-01817-1 (mag 10.4) – visible in Toronto, drops 5.0mags for 2.1sec, alt. 60°**

[http://www.asteroidoccultation.com/2013\\_12/1225\\_1632\\_31432.htm](http://www.asteroidoccultation.com/2013_12/1225_1632_31432.htm)

1632 Sieböhme occults TYC 0760-01817-1 on 2013 Dec 25 from 4h 25m to 4h 39m UT

Star: Mv = 10.4 Mp = 11.6 Mr = 9.8 RA = 6 59 40.9900 (J2000) Dec = 14 43 25.890 [of Date: 6 59 31, 14 12 41] Prediction of 2013 Nov 23.0	Max Duration = 2.1 secs Mag Drop = 5.0 (5.2z) Sun: Dist = 166 deg Moon: Dist = 74 deg illum = 54 % E 0.047"x 0.034" in RA 95	Asteroid: Mag = 15.4 Dia = 28km, 0.020" Parallax = 4.590" Hourly dRA = -2.353z dDec = 1.26"
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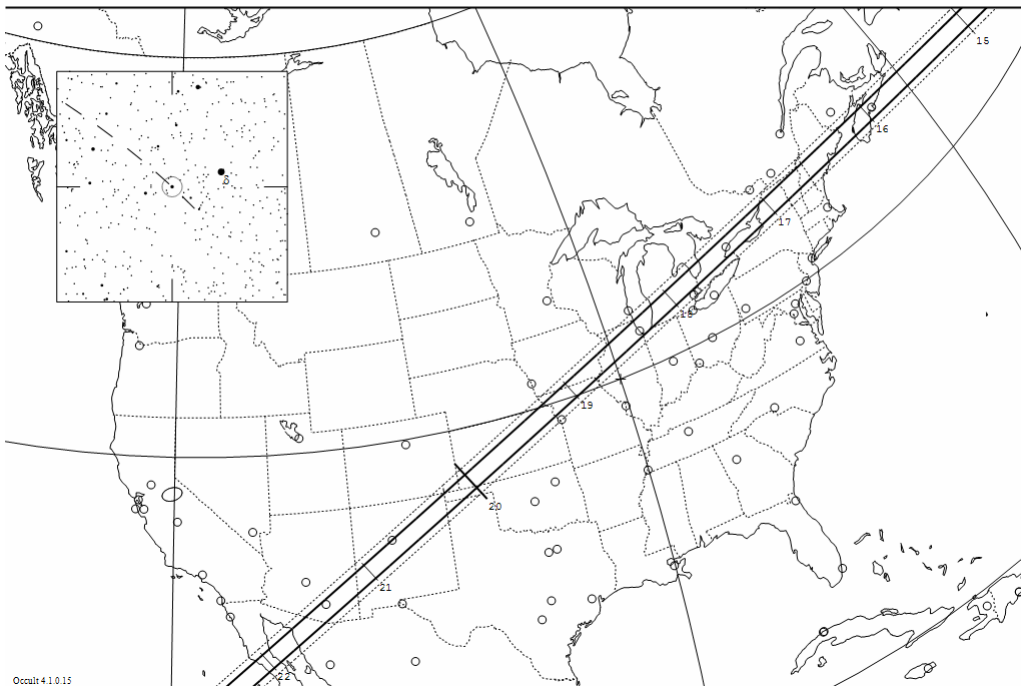


**26 Dec 2013 at 05:20 UT Asteroid (733) Mocia (mag 14.5) occults star HIP 17548 (mag 7.2) – visible in Toronto, drops 7.3mags for 8.0sec, alt. 74° (possible double star)**

[http://www.asteroidoccultation.com/2013\\_12/1226\\_733\\_30470.htm](http://www.asteroidoccultation.com/2013_12/1226_733_30470.htm)

733 Mocia occults HIP 17548 on 2013 Dec 26 from 5h 12m to 5h 29m UT

Star: Mv = 7.2 Mp = 7.2 Mr = 7.2	Max Duration = 8.0 secs	Asteroid: Mag = 14.5
RA = 3 46 27.8882 (J2000)	Mag Drop = 7.3 (6.9r)	Dia = 97km, 0.051"
Dec = 47 39 36.233	Sun : Dist = 141 deg	Parallax = 9.881"
[of Date: 3 46 31, 47 42 16]	Moon: Dist = 123 deg	Hourly dRA = -1.687s
Prediction of 2013 Nov 23.0	illum = 43 %	dDec = -16.78"
	E 0.030"x 0.019" in RA 74	



### Constellations on the Meridian (Annually in mid-December)

7 pm: Sculptor, Cetus, Pisces, Pegasus, and Andromeda

10 pm: Fornax, Eridanus, Taurus, Aries, Triangulum, and Perseus

Midnight: Columba, Lepus, Orion, and Auriga

### Winter Star party Skylights (Annually in December/January)

“Summer” Triangle (image from <http://www.astropixels.com/milkyway/MilkyWayMos12-03.html>) (eye)

Milky Way (eye)

Orion’s Belt, Hyades in Taurus, Square of Pegasus (eye / binoculars)

Christmas Clusters – NGC457 Owl/ET (Cas), NGC884,869 Double Cluster (Per), M45 The Pleiades (Tau), etc. (binoculars, telescope)

Christmas Lights – M42 Orion Nebula and M78 (Ori), Heart & Soul Nebulae (Cas), etc. (telescope)

Ornaments – M31 (And), M81,82 Bode’s (Uma), Blinking Planetary (Cyg), M56 (Tri), Blue Snowball (And) (telescope)

Seeing Double – Albireo (Cyg), Castor (Gem), Almaak (And), etc. (telescope)

Hit Singles - Betelgeuse and Rigel (Ori), Capella (Aur), Aldebaran (Tau) (eye, binoculars, telescope)

**Come out to Long Sault C A, Bayview Village Park, CAO or DDO!**