Prospects for Viewing Comet ISON

Plus Extra for the Stellar Sentinel – November 2013

By Bob Moler

Comet C/2012 S1 (ISON) was discovered by and named for an organization, the International Scientific Optical Network. It was discovered on September 21, 2012. Vitali Nevski of Belarus and Artyom Novichonok of Russia used a 16" ISON telescope near Kislovodsk, Russia to make the discovery.

It is a sungrazing comet, and appears to be a first timer. While there's no official definition for a sungrazing comet, ISON will pass only 0.0124 Astronomical Units (AU) from the sun's center. That's a bit more than 700,000 miles above the sun's photosphere. From the earth's point of view the comet will not pass behind the sun at its closest, called perihelion, at a few minutes past 1:30 p.m. EST November 28th.

Those checking the comet's progress on our Planet Page, may have noticed that ISON is coming in close to the plane of the earth's orbit. It came close to Mars October 1st, and will cross the earth's orbit about November 1st. The earth won't reach that point until mid January. After passing perihelion the comet's orbit will take it far above the earth's orbital plane, and on out of the solar system. As of now the comet has a very slightly hyperbolic orbit, which means it won't be back, Ahnold's Terminator to the contrary.

I spent three mornings in early October in a quest for the comet, which was expected to be barely visible in binoculars. Not really. I finally had to out flank Traverse City and went to Ron and Jan Uthe's house, off Youker Road with my 11" Dob to spot it. It was, even then, very faint. I had to use averted vision to spot it at all. It was a very faint smudge. A complication factor was, since it hung near the ecliptic, near Mars actually, It was in the midst of zodiacal light which is best seen on autumn mornings and spring evenings. I didn't know which I had when viewing from home, but at Ron's there was a definite differentiation between the glow of Traverse City and the zodiacal light.

That aside, Comet ISON has been under performing in the brightness department. For the first 5 months of this year it stayed around magnitude +15. As of about mid October it's was supposedly +10.5. There is a problem estimating the brightness of a comet. While a star is a point source, a comet's coma or head is spread out. So a comet with the same magnitude as a star appears fainter than a star of the same brightness because it's surface brightness per square arc second is so much less. Take a star out of focus in a telescope and see how big you can get a faint star before it disappears. That's what we're up against with comet magnitudes, and why magnitude estimates are wildly scattered by different observers.

The brightness of the comet at mid October was about 1.5 times dimmer that the current pessimistic predictions, which has the comet at magnitude -3 when closest to the sun. It doesn't seem at the present time that the comet will have daytime visibility. However don't despair prematurely. There is one absolute thing we know for sure about comets: They are unpredictable in terms of brightness and survivability. The photograph of ISON by the Hubble Space Telescope taken on October 9th, shows that ISON's nucleus appears to be intact. Of course it will get much, much closer to the sun by the end of this month! The Hubble Space Telescope will be most likely observing Comet ISON until November 9th. After that it will be less than 45º elongation from the sun, too close to the sun to be safely observed by it.

For most of November Comet ISON will be visible in the morning sky. It will be visible before the

start of astronomical twilight (sun below 18º of the horizon) until about the 19th when according to the adjustment mentioned earlier it should be about magnitude 5.5. And be visible before the start of nautical twilight (sun below 10º of the horizon) 3 days later when it's brightest should be around 4.2. ISON won't reach first magnitude until the 26th, two days before perihelion.

What happens to Comet ISON between now and perihelion will determine what we will see of it. At perihelion the sun's heat and gravitational forces may destroy the comet, or can activate it to be even brighter as it leaves the sun. This happened to Comet Lovejoy two years ago. Unfortunately for us Lovejoy was only visible to southern hemisphere observers, as was Comet McNaught some years earlier. We're due.

After perihelion the comet will be heading about straight north in the morning sky from our perspective and will pass within 3 degrees of the north pole of the sky and Polaris on January 7th. It will be first visible again before nautical twilight on December 5th. Sunrise that day will be at 8:03 a.m. for those in the Grand Traverse region. While nautical twilight starts about 7:15. The comet appears before astronomical twilight two days later. Something to note: the tail of the comet will precede the head of the comet in rising, so get out extra early.

Charts and graphs for this article will be available at http://www.gtastro.org before this month's (November) meeting in which I will cover all this in detail with charts and animations.

Extra

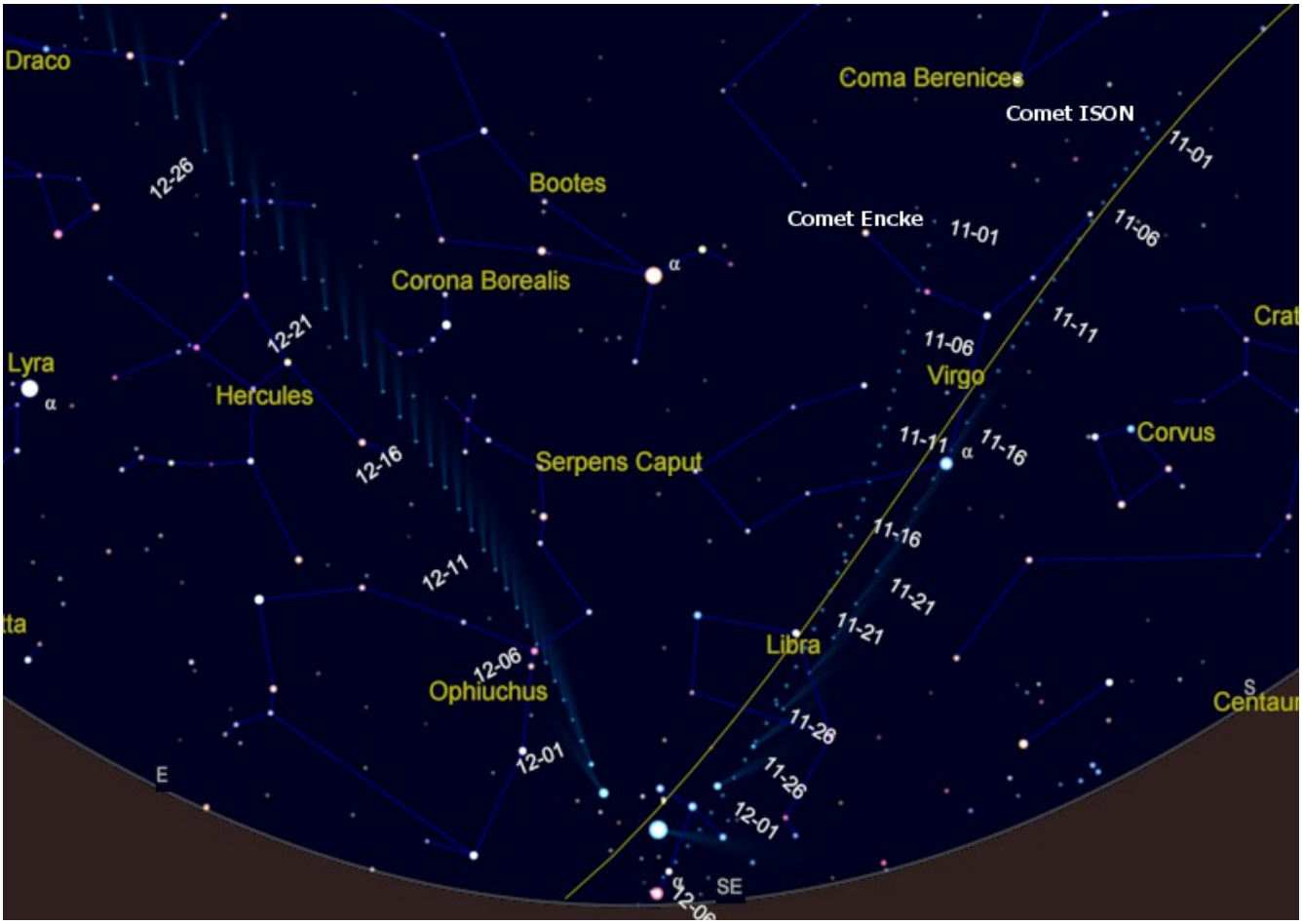

Illustration 1: Path of Comet ISON for every morning in November and December 2013. Created using Cartes du Ciel

In illustration 1 we see Comet ISON and Encke's Comet approaching the sun. For the first days of the plot Encke's Comet will be actually be brighter than Comet ISON. The really bright comet head display at the bottom is Comet ISON on November 28th, Perihelion day. Note that I have removed the Sun, Moon and all the planets from the plot. In the real sky, there's quite the traffic jam of planets in late November by the sun.

In illustration 2 below we see the positions of Comet ISON and the Sun at hour intervals starting at 7:30 EST at the lower right. This is taken from the animation created for November's program, as are most illustrations in this article.

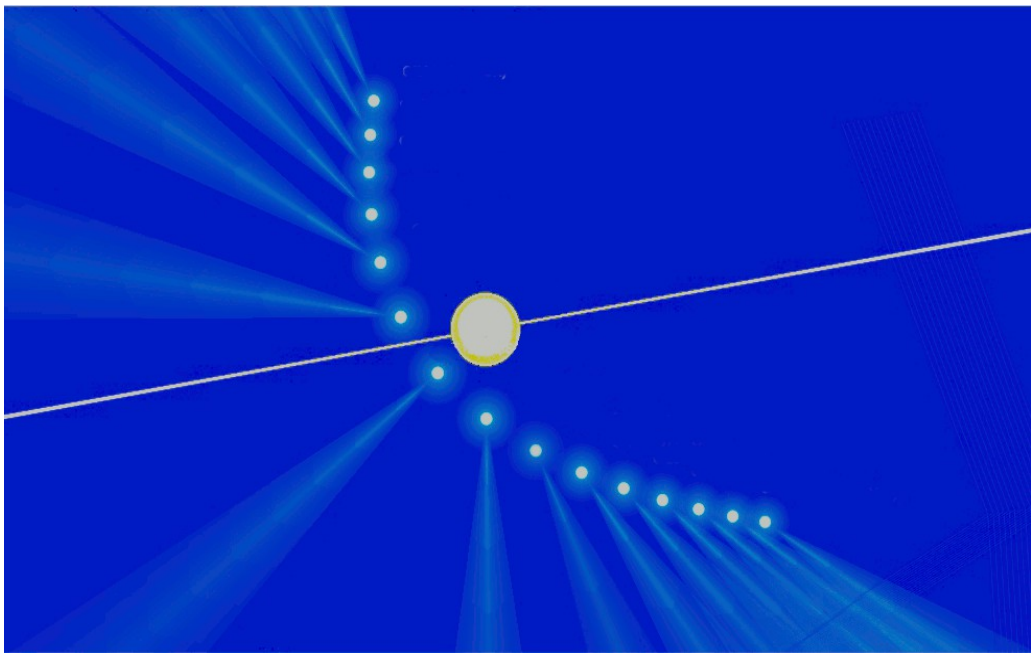

Illustration 2: The positions of Comet ISON as it passes around the sun on November 28th at hourly intervals from 5:30 a.m. to 7:30 p.m. EST. Created using Cartes du Ciel.

DO NOT LOOK AT THE SUN! Yes, I am shouting in Internet parlance. The best way to see Comet ISON near the sun is to get on the Internet at this address: http://sohowww.nascom.nasa.gov/data/realtime-images.html. The comet will be visible there on the L:ASCO C3 and C2 images. They are updated throughout the day.

See below.

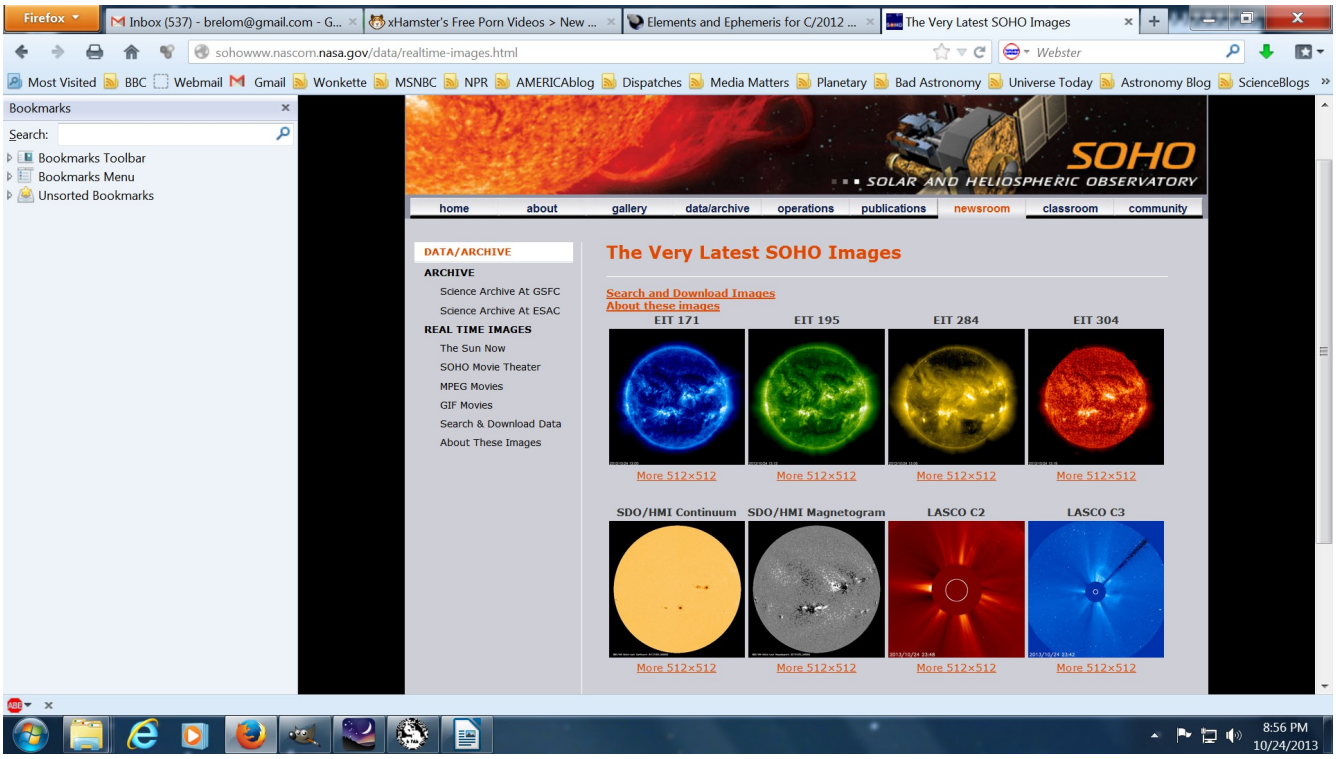

Illustration 3: The latest images page from the SOHO web site.

The images to click on to view Comet ISON on November 28th are LASCO C3 and LASCO C2. Below is the expected path of Comet ISON through these fields. Note that the face of the sun in the LASCO images are blocked out by an occulting disk since these images are not highly filtered. The little witre circle is the size of the photosphere of the sun.

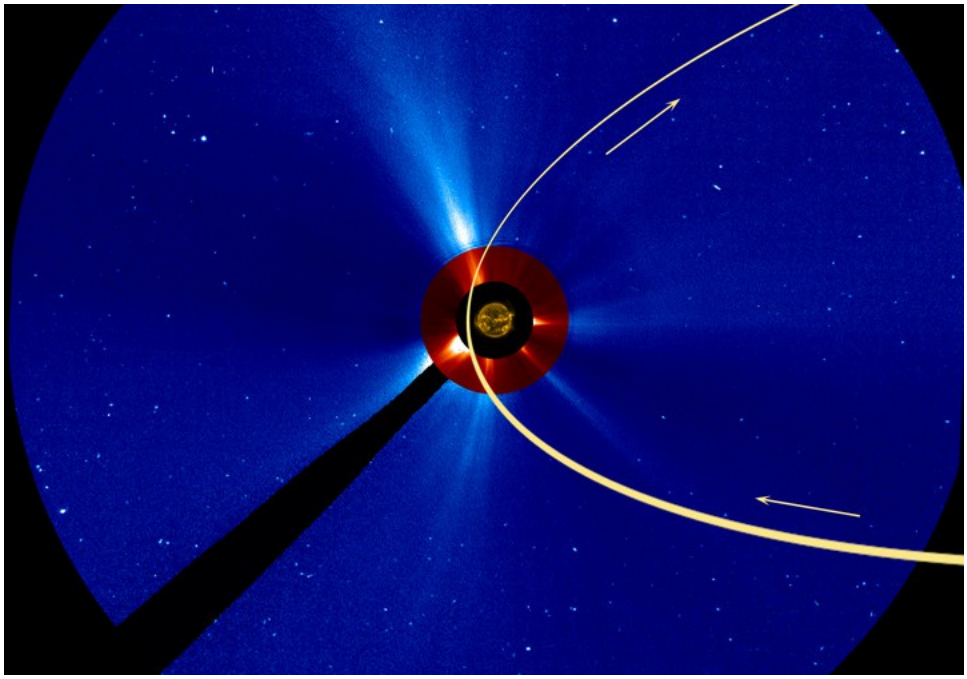

Illustration 4: LASCO C3 field showing the size of the occulting disks for C3 and C2 with the predicted path of Comet ISON.

Other web sites to check for the latest Comet ISON images are www.spaceweather.com, www.space.com, sdo.gsfc.nasa.gov, and stereo.gsfc.nasa.gov/. There may be more.

Table 1: Comet ISON Ephemeris for November 2013. Credit: Internatioonal Astronomical Union (IAU) Minor Planet Center

Date TT	R. A. (2000) Decl.	Delta	r	Elong.	Phase	m1
2013 11 01	11 12 23.8 +06 21 41	1.2300	0.9969	52.0	51.7	7.9
2013 11 02	11 17 32.7 +05 41 31	1.2024	0.9725	51.5	53.0	7.8
2013 11 03	11 22 55.3 +04 59 16	1.1751	0.9479	51.0	54.5	7.7
2013 11 04	11 28 32.8 +04 14 48	1.1484	0.9229	50.4	56.0	7.5
2013 11 05	11 34 26.1 +03 28 01	1.1221	0.8975	49.8	57.5	7.4
2013 11 06	11 40 36.4 +02 38 47	1.0965	0.8719	49.0	59.2	7.2
2013 11 07	11 47 04.9 +01 46 57	1.0716	0.8458	48.2	60.9	7.1
2013 11 08	11 53 52.8 +00 52 25	1.0474	0.8193	47.3	62.7	6.9
2013 11 09	12 01 01.6 -00 04 55	1.0240	0.7924	46.3	64.6	6.7
2013 11 10	12 08 32.6 -01 05 10	1.0016	0.7651	45.2	66.6	6.6
2013 11 11	12 16 27.4 -02 08 22	0.9802	0.7372	43.9	68.7	6.4
2013 11 12	12 24 47.3 -03 14 33	0.9600	0.7089	42.6	70.9	6.2
2013 11 13	12 33 34.0 -04 23 43	0.9411	0.6799	41.1	73.3	6.0
2013 11 14	12 42 48.9 -05 35 47	0.9236	0.6504	39.6	75.7	5.8
2013 11 15	12 52 33.5 -06 50 36	0.9077	0.6202	37.9	78.2	5.6
2013 11 16	13 02 49.3 -08 07 57	0.8936	0.5892	36.0	80.8	5.4
2013 11 17	13 13 37.6 -09 27 29	0.8813	0.5574	34.1	83.6	5.2
2013 11 18	13 24 59.4 -10 48 47	0.8713	0.5247	32.0	86.4	5.0
2013 11 19	13 36 55.8 -12 11 18	0.8635	0.4910	29.8	89.3	4.7
2013 11 20	13 49 27.5 -13 34 20	0.8584	0.4561	27.5	92.3	4.4
2013 11 21	14 02 35.3 -14 57 06	0.8561	0.4199	25.0	95.3	4.1
2013 11 22	14 16 19.7 -16 18 40	0.8569	0.3820	22.5	98.4	3.8
2013 11 23	14 30 41.6 -17 38 00	0.8612	0.3423	19.9	101.4	3.5
2013 11 24	14 45 42.9 -18 53 57	0.8693	0.3002	17.1	104.3	3.0
2013 11 25	15 01 27.5 -20 05 11	0.8819	0.2551	14.3	107.0	2.5
2013 11 26	15 18 04.8 -21 09 58	0.8998	0.2058	11.4	109.3	1.8
2013 11 27	15 35 58.6 -22 05 31	0.9244	0.1501	8.2	110.4	0.7
2013 11 28	15 56 28.6 -22 43 29	0.9595	0.0826	4.6	106.9	-1.3
2013 11 29	16 23 17.5 -19 52 50	0.9762	0.0322	1.8	107.7	-4.5
2013 11 30	16 21 22.3 -16 20 29	0.9125	0.1145	5.3	127.4	-0.2

Columns:

Date TT = Date YYYY MM DD at 0 hours UT

R.A. = Right Ascension as mapped to 2000.0 star charts

Decl. = Declination

Delta = Distance of the comet to the Earth in astronomical units (AU)

r = Distance of the comet to the Sun (AU)

Elong = Angular distance of the comet to the Sun.

Phase = Phase angle of the Sun to the Earth from the comet's point of view.

m1 = Predicted magnitude of the coma (head) of the comet.

Table 2: Comet ISON Ephemeris for December 2013. Credit: Internatioonal Astronomical Union (IAU) Minor Planet Center

Date	TT	R. A. (2000)	Decl.	Delta	r	Elong.	Phase	m1
2013 12 01		16 19 11.7	-13 59 04	0.8680	0.1757	8.1	128.1	1.2
2013 12 02		16 17 23.7	-11 56 00	0.8309	0.2282	10.6	127.3	2.0
2013 12 03		16 15 54.2	-10 00 52	0.7980	0.2755	13.0	126.1	2.5
2013 12 04		16 14 39.4	-08 09 20	0.7681	0.3191	15.4	124.8	3.0
2013 12 05		16 13 36.9	-06 19 01	0.7404	0.3601	17.8	123.4	3.3
2013 12 06		16 12 45.0	-04 28 24	0.7144	0.3990	20.1	121.9	3.6
2013 12 07		16 12 02.3	-02 36 20	0.6899	0.4361	22.4	120.4	3.8
2013 12 08		16 11 27.9	-00 41 55	0.6666	0.4717	24.8	118.9	4.0
2013 12 09		16 11 01.0	+01 15 35	0.6445	0.5060	27.2	117.3	4.2
2013 12 10		16 10 41.1	+03 16 51	0.6234	0.5393	29.6	115.6	4.3
2013 12 11		16 10 27.8	+05 22 31	0.6033	0.5716	32.1	113.9	4.5
2013 12 12		16 10 20.7	+07 33 07	0.5841	0.6030	34.6	112.1	4.6
2013 12 13		16 10 19.6	+09 49 13	0.5659	0.6336	37.2	110.2	4.7
2013 12 14		16 10 24.4	+12 11 18	0.5486	0.6635	39.8	108.2	4.8
2013 12 15		16 10 35.0	+14 39 48	0.5322	0.6928	42.5	106.2	4.9
2013 12 16		16 10 51.5	+17 15 07	0.5169	0.7215	45.3	104.0	4.9
2013 12 17		16 11 13.9	+19 57 34	0.5026	0.7496	48.2	101.8	5.0
2013 12 18		16 11 42.4	+22 47 21	0.4893	0.7772	51.2	99.4	5.1
2013 12 19		16 12 17.4	+25 44 34	0.4772	0.8044	54.2	97.0	5.1
2013 12 20		16 12 59.2	+28 49 09	0.4663	0.8311	57.4	94.4	5.2
2013 12 21		16 13 48.3	+32 00 52	0.4567	0.8574	60.6	91.8	5.3
2013 12 22		16 14 45.6	+35 19 18	0.4484	0.8833	63.9	89.0	5.3
2013 12 23		16 15 52.0	+38 43 46	0.4416	0.9088	67.2	86.2	5.4
2013 12 24		16 17 08.7	+42 13 26	0.4362	0.9340	70.6	83.3	5.5
2013 12 25		16 18 37.5	+45 47 13	0.4323	0.9588	74.0	80.4	5.5
2013 12 26		16 20 20.6	+49 23 49	0.4299	0.9833	77.4	77.4	5.6
2013 12 27		16 22 21.0	+53 01 52	0.4292	1.0076	80.7	74.4	5.7
2013 12 28		16 24 43.1	+56 39 49	0.4301	1.0315	84.0	71.5	5.8
2013 12 29		16 27 32.9	+60 16 09	0.4326	1.0552	87.2	68.6	5.9
2013 12 30		16 30 59.3	+63 49 21	0.4367	1.0786	90.4	65.7	6.0
2013 12 31		16 35 15.9	+67 17 58	0.4424	1.1018	93.4	63.0	6.1