

Comet at dawn

November 12 2013, by Helmut Hornung



Rendezvous in space: this picture depicts comet ISON closely passing the yellowish planet Mars on October 19, 2013. Credit: Sebastian Voltmer / www.weltraum.com

(Phys.org) —Soon after its discovery in late summer of last year, the media hyped ISON to be the comet of the millennium. At the time when it is expected to come closest to the Sun, on 28 November 2013, it is supposed to shine as bright as the full moon. And even though the

predictions have now been revised, ISON could still conjure up a quite passable light show at the beginning of December.

At first, the two amateur astronomers Vitaly Nevsky from Belorussia and Artyom Novichonok from Russia saw only a weak spot of light. It was imaged on a picture they had taken with a 40-centimetre telescope of the International Scientific Optical Network on 21 September 2012. This combined network, which goes by the name of ISON, is operated by the Russian Academy of Sciences, comprises observatories in ten countries, and its task is to detect new celestial objects. The spot of light on 21 September turned out to be not an asteroid, as was initially assumed, but a comet. It was eventually given the official designation C/2012 S1 (ISON).

When ISON was tracked down, it was around one billion kilometres from the Sun, i.e. beyond the orbit of the planet Jupiter. The astronomers computed the trajectory of the comet from several of its positions. It was thereby revealed that ISON orbits on a hyperbola; thus it must have been catapulted out of the depths of space into the interior of the planetary system, and is possibly even orbiting the Sun for the first time.

The fact that ISON could be a "novice" should ultimately affect both its form and its brightness, as its nucleus should contain a large quantity of unused material which then outgases when it is close to the Sun, reflecting a correspondingly large amount of light. In any event, a special feature of this comet is its closeness to the Sun.

This closeness is evident from the fact that, on 28 November, ISON will hurtle past the centre of our daystar at a distance of a mere 1.8 million kilometres. Since the Sun has a radius of just under 700,000 kilometres, this means that the comet will pass the seething surface of the star at a distance of around one million kilometres. Its nucleus of ice and rock -

the researchers estimate the diameter to be between two and five kilometres - will be subjected to gigantic tidal forces and brutal heat.

Comet ISON should react to this "stress test" by becoming very active, the surface of its nucleus should heat up and should sublime icy material (convert it directly from the solid to the gaseous state), ejecting huge plumes into space and sweeping along a large quantity of dust. As mentioned above, this would affect its brightness. The astronomers are currently speculating about this, as well as about whether ISON will survive its fiery rendezvous with the Sun at all.

A year ago, optimistic predictions had assumed its brightness would be comparable to that of the full Moon on the day of the perihelion, i.e. the closest approach to the Sun. The experts now think it is more likely to be as bright as Venus, which is currently visible as the evening star in the heavens to the southwest. However, on 28 November, ISON will be very close to the Sun in the daytime sky - it will therefore not be easy to see its apparent brightness, no matter how great it may be. But laypersons won't be able to observe the comet then anyhow.

In mid-August, it was skilled amateur astronomers who took the first photo of ISON as the new day dawned. Around 20 October or so it passed close to the planet Mars, whose journey it had accompanied for a while, in the constellation Leo. It is currently, with a clearly pronounced tail meanwhile, in the constellation Virgo. The comet can already be seen with powerful binoculars, and should become visible to the naked eye from the middle of this month. It is now rapidly approaching the Sun. In the early morning of 24 and 25 November, ISON will encounter the 2P/Encke comet, the separation between the two will be a mere three full Moon diameters.

The observation will be difficult, as the sky will be bathed in the light of the dawn. A further problem will be caused by the [full moon](#), which will

light up the stage. On the days around the perihelion, the observations will be the prerogative of experts and satellite observatories, such as STEREO.

If ISON survives the perihelion passage on 28 November, it will move steeply northwards and be visible before sunrise in the morning sky just above the eastern horizon. Its distance from the Sun will then increase as every day passes, its tail should reach its maximum size and appear on the horizon even before the head of the comet appears. From 1 to 6 December it will be possible to observe ISON at around 7 o'clock in the morning.

From the mid-December, the comet will also appear in the evening sky low in the west after sunset. Its tail will now be greatly flattened, almost parallel to the horizon, and its brightness will also decrease more and more at this time. It is unlikely that there will be an impressive star of Bethlehem, however, and around Christmas Eve ISON will again become an object for binoculars - even though on 27 December the [comet](#) will reach its point of [closest approach](#) to the Earth, hurtling past it at a distance of 64 million kilometres. Right on cue at the end of the year, the stellar performance of the tailed vagabond from outer space will be more or less history.

Provided by Max Planck Society

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