Pre-perihelion Observations of Comet C/2012 S1 (ISON) by the Subaru Telescope

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Comet C/2012 S1 (ISON) was discovered at 6.3 AU from the Sun and expected to be very bright at the perihelion passage (q = 0.01247 AU) on Nov. 28, 2013. Thanks to its brightness many observations by the Subaru telescope with different instruments were performed in pre-perihelion (from Oct. to Nov. 2013). Here we summarize the preliminary results of the observations performed by the Subaru Telescope and discuss about the nature of the comet that disintegrated near the perihelion passage.

Comet ISON & Observations with the Subaru Telescope

- Comets are frozen reservoirs of the materials in the solar nebula. As a cometary nucleus approaches the sun, coma and tails appear.
- Comet ISON was a sungrazing comet from the Oort cloud and disintegrated at its perihelion passage.
- The Subaru Telescope observed comet ISON with several instruments (methods & wavelengths).

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<th>UT Date on 2013</th>
<th>P.I.</th>
<th>Instrument</th>
<th>Method</th>
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<td>Oct. 19, 21</td>
<td>T. Ootsubo</td>
<td>COMICS</td>
<td>Imaging Spectroscopy</td>
<td>N8.8 &amp; N12.4 filter 8–13 μm (R=250)</td>
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<td>Oct. 31</td>
<td>M. Yagi</td>
<td>FOCAS</td>
<td>Imaging Spectroscopy</td>
<td>V band (550 nm) 380–760 nm (R=1000)</td>
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<td>Nov. 5</td>
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<td>Nov. 15</td>
<td>Y. Shinnaka</td>
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In order to understand how comets has the materials which formed under high and cold temperature environments, the Mid-IR spectroscopic observation is important.

**COMICS**

- Spectroscopic obs. (Right)
  - N band low-res. (R–250) spectrum (exp. = 400 sec).
  - Strong continuum and weak overlapped silicate feature excess at around 9–11 microns.
  - This silicate feature could be attributed to the small sized grains of amorphous silicate.
  - No clear features for crystalline silicate were detected.

**FOCAS**

- Imaging obs. (Left)
  - Images with N8.8 and N12.4 filters (exp. = 200 sec for each) with a FoV of 40” x 30”. The left images are for 10” x 10”.
  - Dust coma was slightly elongated along the antisolar direction.

Dust mineralogy of comet ISON revealed by COMICS might indicate its peculiar origin. How about mixing ratios of radicals and dust properties in optical?

**HDS**

- HDS observed comet ISON immediately after the beginning of the outburst on Nov 14 UT. Many gas emission lines were detected with high-S/N ratios.

**Highlights**

- 15NH3, (Left)
  - The first report of 15NH3 detection in a single comet (red: observed, black: unidentified features, blue: 15NH3).
  - 14NH3/15NH3 in comet ISON is similar to 12C/14N/12C/15N in other comets (~150).


More detailed information can be found in Shinnaka’s poster.

HSC Project Website: http://www.naoj.org/Projects/HSC/