Ionic composition in the Io plasma torus measured using Hisaki/EXCEED and gourd-based telescope

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Volcanic gases (mainly composed of SO_2, SO and S) originated from jovian satellite Io are ionized by interaction with magnetosphere plasma and then form a donut-shaped region called the plasma torus. Ion composition in the plasma torus is a key issue to investigate a source region and production mechanisms of magnetospheric plasma. A coordinated observation of EUV spectroscopy by Hisaki/EXCEED with a ground-based spectroscopy by Kitt Peak 4-m telescope enables to measure composition of most of ions (S^+, S^{++}, S^{+++}, O^+ and O^{++}) in the plasma torus.
At the begging of January 2014, intense campaign observations of Jovian aurora and Io plasma torus were made using Hisaki/EXCEED, Hubble Space Telescope and other ground-based telescopes covering wavelength range from EUV through IR. The 4-meter R.C. Spectrograph was set up covering 550nm through 800nm which could successfully detect NaD (589nm), [S III] 631.2nm, [S II] 671.6/673.1nm, and [O II] 731.9/733.0nm as well. A field-of-view was 98 arc-seconds along the slit and the slit center was pointed at the dawn or dusk edge of the centrifugal equator. We could get 54 spectra from the observation during January 4th through 10th, 2014.
Based on analysis of visible spectrum from Kitt-Peak 4-meter, typical emission intensity of [S II] 671.6+673.1nm, [S III] 631.2nm and [O II] 731.9+733.0nm were 700R, 100R and 60R, respectively. Combining the visible spectrum with EUV spectrum measured by EXCEED/Hisaki, plasma diagnostics can be made on the plasma torus. According to the atomic database, CHIANTI version 8.0, the best fit ion composition was S^+:S^{++}:S^{+++}:O^+:O^{++} = 4:27:11:13:40. The result shows that the average ionization state was higher than that at Cassini era in 2004. More accurate analysis including errors and uncertainty is ongoing, the recent result will be presented at the meeting.

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