

Variation in SII and SIII brightness distribution of Io plasma torus based on Hisaki/EXCEED and ground based observation data

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We report the time and spatial variation of sulfur ion emission line from the Io plasma torus ([SII]76.5nm and[SIII]68nm) to understand the dynamical process in the torus associated with Io's volcanic event during the period from December 2014 to March 2015, using the data obtained by Hisaki/EXCEED. The large quantities of gas were ejected by Io's volcanoes, principally oxygen and sulfur atoms and their compounds. Once they are ionized through electron impact and charge exchange, the ions are accelerated to the nearly corotational flow of the ambient plasma to form a torus of ions (the Io plasma torus, about $6R_J$ from the center of Jupiter) surrounding Jupiter. The fresh ions lose their pickup energy to the ambient electrons through Coulomb collisions. Ultimately, the torus electrons lose energy by moving electrons bound to ions into excited states, leading to the prodigious extreme ultraviolet (EUV), ultraviolet, and visible emissions from the torus. Hisaki/EXCEED is an EUV spectrograph launched in September 2013. During the period from December 2014 to March 2015, Io's outburst was observed by EXCEED, and the increase in the pickup ions were anticipated along with the increase in the neutral gas. During this period, we identified the time variation of sulfur ion temperature associated with enhanced volcanic activities from images of sulfur ion emission at 76.5nm(SII) and 68nm(SIII) (an integration time for each image is about 50 min) to find increase in ion temperature through the ion-pickup process and cooling by transferring energy to electrons. In addition, we carried out the measurement of SII 673 nm emission with visible spectrograph on T60 telescope at Haleakala, Hawaii, which has high spatial resolution. In this talk we give the results on the scale height and ion temperature of sulfur torus derived from spatial distribution of Io torus with EXCEED associated with the Io's volcanic event, and the comparison with ground-based visible data obtained with T60.