Dawn-dusk Asymmetry of Corotation Deviation in Io Plasma Torus

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Timescale of change of emission intensity and structure of Io plasma torus is important to understand the supply, transport and loss mechanism of plasma in the Jovian magnetosphere. In order to monitor the variation of heavy ion density, temperature and mass-loading rate in the Io plasma torus (IPT), we made campaign observation of singly charged sulfur ion emissions of IPT ([SII] 673.1nm and 671.6nm) and Iogenic neutral sodium cloud from May 25th through June 21st, 2007. Observation of [SII] emission was made at Haleakala observatory, Maui using a high-dispersion Echelle spectrograph coupled to a 40-cm Schmidt-Cassegrain telescope.

Based on the observation that produced 97 spectral dataset, average [SII] emission intensity around the Io's orbit decreased from 500 Rayleighs before June 1st to 200 Rayleighs after June 10th. Though decreasing change is correlated with the emission intensity of Iogenic sodium cloud, the decay timescale of [SII] emissions is much shorter than that predicted by radial diffusion. The result implies that S^+ around Io's orbit was not only reduced by radial transport but also by enhanced loss process of sulfur ions and/or increased ionization that made S^+ to higher ionization sates.

As for deviation from corotation derived from the Doppler-shift of sulfur emission lines, obvious dawn-dusk asymmetry were seen as well as System III longitude dependence. Amplitude of variation of corotation deviation in dawn ansa is three times larger than that in the opposite ansa. The deviation in both ansae seems to be dependent on System III longitude of sub-solar point. This variation is reproduced by model calculation based on the GCM calculated ionospheric density and VIP4 magnetic field model. The result implies that the ionospheric conductivity plays an important role for corotation deviation in the magnetosphere.