Velocity distribution of sodium atoms ejected from Jovian satellite Io: High dispersion spectroscopic observation

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Jovian satellite Io is known to have very active volcanic activities. A large amount of volcanic gas supplys neutral particles to the Jovian magnetosphere through the interaction between Io plasma torus and Io. It is estimated that Iogenic plasma source amounts more than 90% of the Jovian magnetospheric plasma. Therefore, it is very crucial to understand the ejection processes of neutral particles from Io in order to investigate the electromagnetic environment of the Jovian magnetosphere.

To obtain velocity distribution of neutral particles around Io orbit, observations of the sodium emission were made using the high dispersion echelle spectrograph (HIDES) with a spectral resolution of 100,000, and a 188cm telescope at the Okayama Astrophysical Observatory (OAO) in February 2004. As a result, three velocity components along the line-of-sight were detected. They were one slow component (3km/s) and two fast components (15km/s, 30km/s). On the other hand, computer simulations were made to discuss physical processes of sodium atom ejection from Io. Comparison between observation and simulation suggests that the slow component is produced by atmospheric sputtering by torus ions and the two fast components are due to charge exchange reaction. In order to confirm this suggestion, simultaneous observation of HIDES and a small FOV imaging observation at the OAO is planned in February 2005.

In the presentation, observation and simulation results in 2004 and a preliminary result of observation in 2005 will be presented, along with discussion on distribution of the line-of-sight velocity component of the ejected sodium atoms in a region close to Io (1RJ) that explains physical processes of sodium atom ejection from Io.