Responses of Io Plasma Torus to middle magnetosphere of Jupiter

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The satellite of Jupiter, Io, is volcanically active and ejects ionized gas such as sulfur and oxygen into space. This gas forms a torus encircling Jupiter along the orbit of Io, and called Io Plasma Torus (IPT). Jupiter has by far the most energetic and brightest aurorae in the solar system. During the Cassini spacecraft's flyby of Jupiter (October, 2000-March, 2001), the UV spectrometer witnessed a puzzling phenomenon. Both of IPT and Jupiter's aurorae were sometimes brightened almost simultaneously. The torus emissions reflect the state of the inner magnetosphere while the aurora emissions are an index of activity in the middle magnetosphere. This fact might suggest an energy transport process from the middle to inner magnetosphere, but it has not been understood yet. The dataset of Cassini was insufficient to reveal the process due to its low-temporal resolution. The HISAKI/EXCEED was launched in September 2013 by the Epsilon rocket. Now it is orbiting around the Earth. EXCEED is a space telescope dedicated for planets and has an advantage of long-term and continuous monitoring of the aurorae and IPT at the same time. We find that electron temperature in IPT increases 11 hours after the transient aurora brightening events. It suggests inward flow of hot electrons from the middle magnetosphere to IPT. On middle of January 2015, EXCEED observed gradual increase in EUV brightness of IPT. This observation suggests enhancement of Io's volcanic activity. Characteristics of the transient IPT brightening events also changed during the volcanic event. In this presentation, we will show the energy transport process in the Jovian magnetosphere by analyzing of the EXCEED observation.

Keywords: Jupiter, magnetosphere, aurora, Io plasma torus

