Response of Io Plasma Torus to middle magnetosphere of Jupiter

F. Suzuki [1]; K. Yoshioka [1] ; G. Murakami [2] ; F. Tsuchiya [3] ; T. Kimura [4];
M. Kuwabara [1] ; R. Hikida [1] ; I. Yoshikawa [1]
[1]The University of Tokyo ; [2] ISAS/JAXA ; [3] Tohoku University ; [4] RIKEN

Abstract

The satellite of Jupiter, Io, continuously supplies volcanic gases to the Jovian magnetosphere. These gases form a dense 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.

Cassini's observations of IPT indicated brightenings in the extreme ultraviolet (EUV), which is caused by the hot electron fraction increase in the torus, following the sudden auroral brightenings. This suggests that the hot plasma is transported radially inward, and/or plasma is locally heated by consuming energy transported after sudden auroral brightenings.

However, due to the small number of observed events, it is difficult to make a definitive statement about correlation of these brightenings.

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.

Analyzing dataset of EXCEED, we find that electron temperature in IPT increases 11 hours after the transient auroral brightening events and the duration of the IPT brightenings is over ten hours. The light curve of IPT indicates that this duration is caused by the collisional relaxation time of the hot electrons.

It suggests that the Jovian magnetic disturbance which causes auroral brightenings is a trigger of inward flow of hot electrons from the middle magnetosphere to IPT and the temperature of the hot electrons is more than 100 eV.