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Remote observation of Jupiter's magnetosphere by EXCEED on Hisaki spacecraft

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Abstract

Hisaki is the space-telescope dedicated for planetary science. It was launched in September 2013 and orbiting around the Earth with its altitude of around 1000 km (orbital period is 106 minutes) [1]. Since December 2013, the spacecraft is observing for various planets such as Mercury, Venus, Jupiter, and Saturn. This presentation will show the results of Hisaki's observation especially about Jupiter's magnetosphere.

1. Introduction

Jupiter's magnetosphere contains ultra-relativistic electrons in its radiation belt. These high energy particles are thought to be partly accelerated through the resonance effect with whistler-mode waves which is excited by anisotropic hot electrons injected from the outer magnetosphere [2]. However, radial electron transportation in the inner magnetosphere around the Io plasma torus is not well understood. The detailed observation was needed.

2. The Hisaki/EXCEED data

The only instrument on board the Hisaki is "EXCEED" which is the extreme ultraviolet (EUV) spectrometer with its spectral coverage of 52-148 nm [3, 4]. The data consists of 1-dimentional spatial information and the spectral dispersion, respectively. Figure 1 shows the EUV spectrum taken by EXCEED with its high-resolution mode. The total integration period is 550 minutes. We can see many lines from sulfur and oxygen ions in the torus. The foreground emission from geocoronal hydrogen, helium and oxygen are also shown. The spectrum fitting analysis are used to deduce the radial profile of plasma parameters such as the electron density, temperature, and ion compositions. According to the analysis, we show evidence for global inward transport of flux tubes containing hot plasma [5]. Other than high-resolution mode, the observation with full latitudinal coverage of Io plasma torus was continued for more than 3 months. The emissions from the Io plasma torus and Jupiter's northern aurora were monitored continuously (every ~50 minutes per orbit) [6].

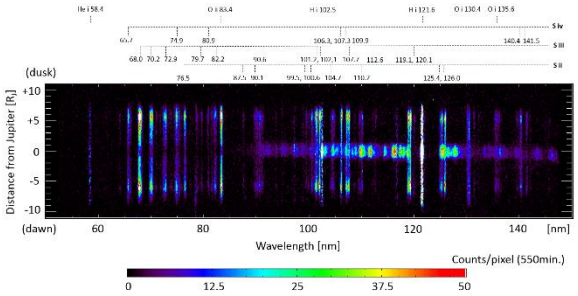

Figure 1: EUV spectrum from Io plasma torus taken by EXCEED on Hisaki (from reference 5). The horizontal axis means spectral dispersion and the vertical axis shows spatial distribution.

3. Conclusion

The EUV spectrum from Io plasma torus and Jupiter's aurora taken by Hisaki were analyzed. The radial variations of plasma parameters and temporal modulations of Io plasma torus and Jupiter's aurora were deduced.

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References

[1] Yoshikawa, I. et al.: Extreme ultraviolet radiation measurement for planetary atmospheres/magnetospheres from the earth-orbiting spacecraft (EXCEED), Space Sci. Rev., 184, 237–258, DOI: 10.1007/s11214-014-0077-z, 2014.

[2] Horne, R. et al.: Gyro-resonant electron acceleration at Jupiter, Nature Phys., 4, 301–304, DOI: 10.1038/nphys897, 2008.

[3] Yamazaki, A. et al.: Field-of-View Guiding Camera on the HISAKI (SPRINT-A) Satellite, Space Sci. Rev., 184, 259–274, DOI: 10.1007/s11214-014-0106-y, 2014.

[3] Yoshioka, K.: The extreme ultraviolet spectroscope for planetary science, EXCEED, Planet. Spa. Sci., 85, 250-260, DOI: 10.1016/j.pss.2013.06.021, 2013.

[5] Yoshioka, K. et al.: Evidence for global electron transportation into the jovian inner magnetosphere, Science, 345, 1581–1584, DOI: 10.1126/science.1256259, 2014.

[6] Kimura, T. et al.: Transient internally driven aurora at Jupiter discovered by Hisaki and the Hubble Space Telescope, Geophys. Res. Let., 42, DOI: 10.1002/2015GL063272, 2015.