ひさき衛星を用いた木星紫外オーロラの太陽風応答に関する統計解析

Statistical study of the response of Jovian EUV aurora to the solar wind from Hisaki observations

北 元[1]、木村 智樹[2]、垰 千尋[3]、*土屋 史紀[1]、三澤 浩昭[1]、坂野井 健[1]、笠羽 康正[1]、村上 豪[4]、吉岡 和夫[5]、山崎 敦[4]、吉川 一朗[6]
Hajime Kita[1], Tomoki Kimura[2], Chihiro Tao[3], *Fuminori Tsuchiya[1], Hiroaki Misawa[1], Takeshi Sakanoi[1], Yasumasa Kasaba[1], Go Murakami[4], Kazuo Yoshioka[5], Atsushi Yamazaki[4], Ichiro Yoshikawa[6]

1.東北大学大学院理学研究科、2.国立研究開発法人理化学研究所仁科加速器研究センター、3.情報通信研究機構、4.宇宙航空研究開発機構　宇宙科学研究所、5.東京大学大学院理学系研究科地球惑星科学専攻、6.東京大学新領域創成科学研究科複雑理工学専攻
1.Graduate School of Science, Tohoku University, 2.Nishina-Center for Accelerator Based Science, RIKEN, 3.National Institute of Information and Communications Technology, 4.Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, 5.Department of Earth and Planetary Science, Graduate School of Science, University of Tokyo, 6.Department of Complexity Science and Engineering, University of Tokyo

In order to reveal the solar wind response of Jovian extreme ultraviolet (EUV) auroral activity, we made a statistical analysis of Jovian EUV aurora obtained from long term Hisaki observation.
The EUV emission from hydrogen molecule is excited by collision with high energy electron. The main oval is one of the components of Jovian EUV aurora where the auroral particle precipitations are caused by the rotationally driven field-aligned current system. It is theoretically expected that angular velocity of magnetospheric plasma increases when the Jovian magnetosphere is compressed by enhanced solar wind pressure, which decreases the field-aligned current. Regarding this scenario, increase of the solar wind dynamic pressure is expected to be anti-correlated with the intensity of the EUV aurora. A previous observation such as that by International Ultraviolet Explorer (IUE) or Hubble Space Telescope (HST) showed the time variability of the EUV aurora, while their data still limited in continuity over solar wind variation with good time resolution. On the other hand, Hisaki satellite is an earth-orbiting EUV spectroscope launched in 2013 which has been continuously monitoring Jovian EUV auroral activity. Therefore, the Hisaki data sets are effective for investigating the solar wind response of Jovian aurora.
The purpose of this study is to investigate the solar wind response of Jovian EUV aurora observed by Hisaki. We used the EUV data set obtained from Dec. 2013 to Feb. 2014 and from Dec. 2014 to Feb. 2015. We compare the total EUV power over 900-1480 A and solar wind dynamic pressure which is extrapolated at Jupiter using a one-dimensional magnetohydrodynamic (MHD) model.
Superposed epoch analysis indicated that Jovian EUV aurora increases with the enhancement of the solar wind dynamic pressure. We also found a correlation between the total power of EUV aurora and the duration of the rarefaction region of the solar wind before the enhancement of the dynamic pressure. The similar trend could also be found in the thermal current, i.e., incoming electron flux increased with the duration of rarefaction region.
One possible scenario is that mass loading from Io increases the electron density in the Jovian middle magnetosphere and it also increases seed electron of the thermal current whose energy is several keV. The solar wind compression causes adiabatic acceleration of thermal current and then EUV aurora increases. However, it is still unclear how the angular velocity distribution and brightness distribution vary during the solar wind compression.

キーワード：木星、オーロラ、太陽風応答
Keywords: Jupiter, Aurora, Solar wind response

