Global MHDシミュレーションを用いた木星オーロラの太陽風応答に関する研究

北 元 [1]; 木村 智樹 [2]; 深沢 圭一郎 [3]; 垰 千尋 [4]; 村上 豪 [5]; 土屋 史紀 [6]
[1] 東北大・理・惑星プラズマ大気; [2] RIKEN; [3] 京大・メディアセンター; [4] 情報通信研究機構; [5] ISAS/JAXA; [6] 東北大・理・惑星プラズマ大気

Investigation of physical mechanisms of the solar wind control of Jovian aurora based on the global MHD simulation

Hajime Kita[1]; Tomoki Kimura[2]; Keiichiro Fukazawa[3]; Chihiro Tao[4]; Go Murakami[5]; Fuminori Tsuchiya[6]
[1] Tohoku Univ.; [2] RIKEN; [3] ACCMS, Kyoto Univ.; [4] NICT; [5] ISAS/JAXA; [6] Planet. Plasma Atmos. Res. Cent., Tohoku Univ.

The solar wind control on Jovian ultraviolet (UV) aurora is one of the unresolved issues in the Jovian system. Previous Hubble Space Telescope and ground based observations showed that the UV aurora and solar wind dynamic pressure had a positive correlation. Hisaki is an Earth-orbiting satellite, which monitoring planetary atmospheres and magnetospheres by the spectrometer EXCEED (Extreme Ultraviolet Spectroscope for Exospheric Dynamics). We have reported the statistical relationship between the total power of the Jovian UV aurora and the solar wind properties found from long-term monitoring by Hisaki EXCEED. Superposed epoch analysis indicates that auroral total power increases when the solar wind dynamic pressure increases. In addition to that, the auroral total power shows a positive correlation with the duration of a quiescent interval of the solar wind that is present before a rise in the dynamic pressure, more than with the amplitude of dynamic pressure increase.

This study investigates the physical mechanisms of the solar wind control on Jovian UV aurora based on the global magnetohydrodynamic simulation. We have calculated different cases of the dynamic pressure and the quiescent interval of the solar wind, which enable us to discuss the possible scenario for the solar wind response of Jovian magnetosphere.

Initial results show that the angular velocity profile becomes steeper when the dynamic pressure increases, which suggests that the magnetosphere-ionosphere coupling current (Hill current) becomes stronger. In addition to that, the field aligned current based on the method proposed by Hasegawa and Sato [1979] increases with a rise of the dynamic pressure. These characteristics are consistent with the observation result of Hisaki EXCEED. We will also discuss the dependence of the angular velocity distribution and the field aligned current with respect to the quiescent interval of the solar wind.