カッシーニ探査機の磁気圏その場観測と電波から予測する土星オーロラ加速域の制御因子

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Control factors of Saturn’s auroral acceleration region deduced from auroral radio and in-situ measurements by Cassini

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Multi-instrumental surveys of Saturn’s magnetosphere by Cassini have indicated that auroral radio emissions (Saturnian Kilometric Radiation, SKR), aurorae at UV and IR wavelengths and Energetic Neutral Atoms (ENA) from the inner magnetosphere exhibit periodic behavior at around Saturn’s rotational period with the north-south asymmetry and seasonal variations [e.g., Gurnett et al., 2010; Mitchell et al., 2009; Nichols et al., 2010]. These rotationally periodic phenomena are suggestive of distinct magnetosphere-ionosphere coupling current systems, rotating at different periods in the northern and southern hemispheres [e.g., Andrews et al., 2010]. These phenomena suggest that the magnetosphere-ionosphere coupling process and associated energy dissipation process (aurora & SKR) are dynamically dependent on both magnetospheric rotations and long-term conditions of the magnetosphere/ionosphere. Auroral acceleration region is the interface of the M-I couple region between the polar ionosphere and magnetosphere. To reveal the global view of this M-I coupling process, this study investigated seasonal variations of Saturn’s auroral acceleration region based SKR spectra measured by the wave experiments onboard Cassini. Boundary conditions of the auroral acceleration region at the magnetosphere, ionosphere, and solar wind are also compared with the deduced SKR spectra. This comparison indicates that the compressions of magnetosphere are positively correlated with the auroral acceleration region. In addition, the response of auroral acceleration region differs between the northern and southern hemisphere depending on seasons (i.e., differs between sunlit and dark hemisphere).