ひさき衛星によるオーロラとプラズマ供給率の連続監視で明らかにする木星サブストームライクイベントの動力学

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Dynamics of Jupiter’s substorm-like event explored by monitoring of aurora and plasma mass loading with the Hisaki satellite

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Plasma production and transfer processes in the planetary and stellar magnetospheres are essential for understanding the space environments around these bodies. It is hypothesized that the mass of plasma loaded from Io’s volcano to Jupiter’s rotating magnetosphere is recurrently ejected as blobs from the distant tail region of the magnetosphere. The plasma ejections are likely triggered by the magnetic reconnections, which are followed by the particle energization, bursty planetward plasma flow, and resultant auroral emissions. They are referred to as the ’substorm-like events’. However, there has not been no evidence that the plasma mass loading actually causes the substorm-like events because of lack of the simultaneous observation for them. This study presents that the recurrent transient auroras, which are representative for the substorm-like events, are caused by the mass loading. Continuous monitoring of the aurora and Io plasma torus indicates onset of the recurrent auroras when accumulation of the loaded plasma mass reaches the canonical total mass of the magnetosphere. This onset condition implies that the plasma mass overflows from the fully filled magnetosphere accompanying the substorm-like events.