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Transport of cold-dense ions from magnetospheric flank to inner magnetosphere by fast flows in the magnetotail

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We have investigated plasma transport from magnetospheric flank to inner magnetosphere associated with a passage of large-scale solar wind structures including variations of the interplanetary magnetic field (IMF) and the solar wind dynamic pressure (Pdyn).
Based on the THEMIS, Geotail and LANL simultaneous observations for a co-rotating interaction region (CIR) event, we propose the following scenario; cold-dense ions on dawnside drift duskward and are pushed into geosynchronous orbit (GEO) by fast flows after the IMF southward turning preceded by an extended northward IMF. Density increase at GEO was observed on the time-scale of fast flows ($\sim$ 20 min). Statistical analysis of simultaneous Geotail and LANL observations is also conducted to support our considerations. It is found that density increase and temperature decrease at GEO are seen associated with fast flows in the magnetotail in most events. The duration of the density increase at GEO are comparable to the time-scale of fast flows, even for a case where fast flows last for several hours under continuous southward IMF during a coronal mass ejection (CME). This fact may indicate a significance of fast flows for the plasma transportation to GEO.
Pdyn enhancement is known to cause density increase at GEO extensively. We will discuss the differences of the transport process and geoeffectiveness by fast flows and Pdyn enhancement based on simultaneous multipoint observations.