Plasma pressure distribution of ions and electrons in the inner magnetosphere during CIR driven storms observed during Arase satellite era

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Geomagnetic storms are the main component of space weather. Enhancement of the ring current is a typical feature of the geomagnetic storm and a global decrease in the H component of the geomagnetic field is observed during the main phase of the geomagnetic storm. The ring current represents a diamagnetic current driven by the plasma pressure in the inner magnetosphere. The plasma pressure is mainly dominated by protons in an energy range of a few to a few hundred keVs during quiet times. The O⁺ contribution is also important, and sometimes dominates more than H⁺ during intense geomagnetic storms. However, electron contribution to the ring current is not studied well. Recently, we showed that the electron pressure also contributes to the depression of ground magnetic field during the November 2017 CIR-driven storm by comparing Ring current Atmosphere interactions Model with Self Consistent magnetic field (RAM-SCB) simulation, Arase in-situ plasma/particle data, and ground-based magnetometer data [Kumar et al., 2021]. Arase satellite observed 26 geomagnetic storms driven by Corotating Interaction Regions (CIR) during 2017-2021. In this study, we examine statistically the spatial and temporal distribution of ions (H⁺, He⁺, O⁺) and electrons pressure as a function of magnetic local time, L shell and wide range of energies during prestorm, main phase, early recovery and late recovery phase for 26 CIR storms using in situ plasma/particle data obtained by Arase. The results indicate that the electrons (20-50 keV) contribution to the ring current pressure is non-negligible.