IONOSPHERIC CONTROL OF INTERNAL PLASMASPHERIC DENSITY DURING MAGNETIC STORMS

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First discovered by Chung Park in 1973, the plasmasphere within the new plasmaspheric boundary layer during magnetic storms could undergo a noticeable decrease in density, and this depletion could represent a significant fraction of the overall losses from the plasmasphere. Several processes, such as plasma dumping to the ionosphere, have been proposed as the cause of internal plasmaspheric depletion during storm times, but finding the responsible physical mechanism remains an outstanding problem. As an effort to identify the important causes to this complicated phenomenon, this study examines a collection of critical ground and satellite observations, including the mass density inferred from field line resonance sounding, the charge density deduced from whistler traces, ionosonde data, and the RPI observations from the IMAGE satellite. We find that the plasmasphere within the new plasmaspheric boundary layer does not necessarily decrease in all magnetic storms. An enhancement in plasmaspheric density can sometimes be found. The increase or decrease in plasmaspheric density echoes the change in ionospheric content during the storm event. Our results suggest that, during magnetic storms, the related ionospheric storms may play a major role controlling the internal plasmaspheric content.

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