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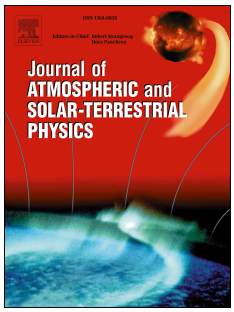

Temporal and spatial variations of the equatorial electrojet during storm times from CHAMP observations

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Temporal and spatial variations of the equatorial electrojet during storm times from CHAMP observations

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Abstract

In this study, we examined the characteristics of temporal and spatial variations of the equatorial electrojet (EEJ) as extracted from the scalar magnetic field data from the CHAMP satellite during magnetic storms on 15 May and 24 August 2005. The main physical mechanisms of EEJ disturbances were analyzed using CHAMP data for the field-aligned currents (FACs), atmospheric mass density, thermospheric zonal winds, and ionospheric electron density. We found that the EEJ had eastward and westward enhancements in the main phase and recovery phase, respectively. The region 1 FACs were significantly strengthened after the storm onset and were much stronger than those in region 2, and they also moved to middle and low latitudes, which indicates that the dawn-to-dusk convection electric field in the auroral zone can penetrate from high latitudes to middle and low latitudes. Therefore, we believed that the prompt penetration electric field was mainly responsible for the eastward enhancement of the EEJ during the main phase. Interestingly, the westward peak of the EEJ coincided in time and space with the propagation of the atmospheric mass density disturbance from high latitudes to middle and low latitudes, whereas the zonal wind weakened and even turned eastward during the recovery phase. In this study, the enhanced equatorward wind at middle and low latitudes can be the main reason for the westward enhancement in the EEJ, whereas previous studies suggested that the enhanced westward zonal wind was responsible for the westward enhancement in the EEJ.

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