

LOW LATITUDE IONOSPHERIC ELECTRODYNAMICS

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Abstract

The low latitude ionosphere exhibits a large range of complex electrodynamic processes with a very broad range of temporal and spatial scales. These processes play important roles in the distribution of ionization over a large area of the Earth and also on the generation of plasma density structures and waves, which can significantly affect communication and navigation systems. Low latitude ionospheric electrodynamics have been studied initially using mostly ground-based observations in the American and Indian sectors. These experiments and complementary modeling studies have determined the general climatology of low latitude ionospheric currents, electric fields and plasma drifts, but have also revealed the large temporal and spatial variability of these parameters during both geomagnetically quiet and disturbed conditions. Satellite observations have been extensively used over the last decade to examine the longitudinal dependence of quiet-time low-latitude electrodynamics on lower atmospheric processes, including fixed sources of tropospheric heat and high latitude stratospheric warming events, and the transport of low latitude plasma to higher latitudes during geomagnetic storms. In this review we initially describe the main characteristics of ionospheric electric fields and plasma drifts and then discuss their complex response to lower atmospheric mechanisms and to the solar wind-magnetospheric dynamo.