

Hemispheric Asymmetry of the Vertical Ion Drifts at Dawn Observed by DMSP

*Mohan Liu¹, Xiao-Xin Zhang¹, Fei He², Wenbin Wang³

1. National Satellite Meteorological Center, 2. Institute of Geology and Geophysics, Chinese Academy of Sciences, 3. High Altitude Observatory, National Center for Atmospheric Research

Based on the measurements from Defense Meteorological Satellite Program (DMSP) F12, F13, and F15 satellites in 1995–2014, we report significant hemispheric asymmetries in vertical ion drift velocity (V_z) at dawn (0500–0700 solar local time) in geomagnetic and geographic coordinates. V_z is distributed in 0300–0900 magnetic local time sector in both the northern (NH) and southern (SH) hemispheres. The north-south asymmetries are persistent no matter under what kind of seasonal, solar activity, and IMF conditions. In the polar cap, downward V_z is stronger in the SH. Such difference shows clear IMF BY dependence and is more significant in the local winter and/or under low solar activity conditions. In the geomagnetic coordinates, the auroral zone is dominated by upward V_z in the NH but by downward V_z in the SH statistically. In the geographic coordinates, the geographic longitudinal variation of V_z is more pronounced in the SH. The seasonal variations of high-latitude V_z are different in the NH and SH. The average asymmetric feature of V_z largely depends on the occurrence and magnitude of ion upflow/outflow, which are modulated by the combined effects of the asymmetric magnetic field configuration between the two hemispheres, and the dynamic processes in the tightly coupled ionosphere-thermosphere system, and their (probably nonlinear) interactions with each other.

Keywords: the topside ionosphere, vertical ion velocity, hemispheric asymmetry