

Ionospheric F-region Drift Measurements Derived from DPS-4D at Zhongshan Station, Antarctic

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By means of high-frequency radio sounding, the ionospheric plasma drift can be measured by the Doppler frequency shift of signal. In this paper we analyze the ionospheric F-region plasma motion performed by Digisonde Portable Sounder (DPS-4D) at cusp latitude over Zhongshan Station in Antarctic. By restricting the echo arrival angle, and selecting the reflection height range at 175 –475 km, we present the variation of the F-region plasma drift measurements by setting limits on the Doppler frequency shift. Base on the 7.5 min interval Digisonde drift data from November 2011 to February 2012, we considered the variations of the plasma drift in F-region under the different geomagnetic activity (K_p) and magnetic local time, as well as its correlation with interplanetary magnetic field (IMF). The results indicate that properly restricting the Doppler frequency shift of the echo has a strong effect that contributes to the accurate and robust measurements of the ionospheric plasma drift. The mean value of horizontal drift mostly leveled off to about 600 m/s at altitude around of 230 km, while the field-aligned component of drift showed mean values of -25 m/s near pre-noon and +40 m/s during the night. These strong diurnal variations have dependence on the sign and strength of the IMF B_y and B_z components. It implies that the contraction and expansion of the polar cap with K_p and the convection in the proximity of the throat with different IMF conditions have a profound influence on the observed drift velocities.

Keywords: Digisonde DPS 4, Doppler frequency shift, remote sensing, polar ionosphere, plasma drift