The Influence of the Interplanetary Magnetic Field (IMF)-Dependent Ionospheric Convection on the Thermospheric Dynamics

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To better understand how high-latitude electric fields influence thermospheric dynamics, we study winds in the high-latitude lower thermosphere using the Thermosphere-Ionosphere-Electrodynamics General Circulation Model of the National Center for Atmospheric Research (NCAR/TIEGCM). In order to compare with Wind Imaging Interferometer (WINDII) observations the model is run for the conditions of 1992-1993 southern summer. The association of the model results with the interplanetary magnetic field (IMF) is also examined to determine the influences of the IMF-dependent ionospheric convection on the winds. The wind patterns show good agreement with the WINDII observations, although the model wind speeds are generally weaker than the observations. It is confirmed that the influences of high-latitude ionospheric convection on summertime thermospheric winds are seen down to 105 km. For negative and positive IMF By the difference winds, with respect to the wind during null IMF conditions, show significantly strong anticyclonic and cyclonic vortices, respectively, down to 105 km. For positive IMF Bz the difference winds are largely confined to the polar cap, while for negative IMF Bz they extend to subauroral latitudes. The IMF Bz-dependent diurnal wind component is strongly correlated with the corresponding component of ionospheric convection velocity down to 108 km and is largely rotational. The influence of IMF By on the lower thermospheric summertime zonal-mean zonal wind is substantial at high latitudes, with maximum wind speeds being 60 m/s at 130 km around 77 magnetic latitude.