Influence of Uncertainties of the Empirical Models for Inferring the E-Region Electric Fields at the Dip Equator

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Daytime E-region electric fields play a crucial role in the ionospheric dynamics at the geomagnetic dip latitudes. Due to their importance, there is an interest in accurately measuring and modelling the electric fields for both climatological and near real-time studies. In this work, we present the daytime vertical (*Ez*) and eastward (*Ey*) electric fields for a reference quiet day (February 7, 2001) at the São Luís Space Observatory, Brazil (SLZ, 2.31°S, 44.16°W). The component *Ez* is inferred from Doppler shifts of type II echoes (gradient drift instability) and the anisotropic factor, which is computed from ion and electron gyro frequencies as well as ion and electron collision frequencies with neutral molecules. The component *Ey* depends on the ratio of Hall and Pedersen conductivities and Ez. A magnetic field-line-integrated conductivity model is used to obtain the anisotropic factor for calculating *Ez* and the ionospheric conductivities for calculating *Ey*. This model uses the NRLMSISE-00, IRI-2007, and IGRF-11 empirical models as input parameters for neutral atmosphere, ionosphere, and geomagnetic field, respectively. Consequently, it is worth determining the uncertainties (or errors) in *Ey* and *Ez* associated with these empirical model outputs in order to precisely define the confidence limit for the estimated electric field components. For this purpose, errors of ±10 % were artificially introduced in the magnitude of each empirical model output before estimating *Ey* and *Ez*. The corresponding uncertainties in the ionospheric conductivity and electric field are evaluated considering the individual and cumulative contribution of the artificial errors. The results show that the neutral densities and temperature may be responsible for the largest changes in *Ey* and *Ez*, followed by changes in the geomagnetic field intensity and electron and ions compositions.