



The influence of IMF on the main ionospheric trough

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The main ionospheric trough is a large-scale, persistent feature of the auroral and sub-auroral ionosphere, extending longitudinally from the post-noon region, through the nightside and into the morning sector. The location of the trough minimum, and to a lesser extent the gradients of the trough walls, have been characterized in terms of local time and the global Kp geomagnetic index. The physics of the formation of the trough is, however, less well determined. Its structure has been associated with soft-particle precipitation and the high-latitude convection pattern, but the balance of these processes remains an open question. In order to understand their relative importance, the trough location and structure need to be considered in terms of high-latitude plasma processes that are driven largely by the coupling of the interplanetary magnetic field (IMF) to the geomagnetic field. In this study, extended databases of tomographic images of the mid- and high-latitude ionosphere are used to categorize trough characteristics in terms of the IMF. Comparisons with the Coupled Thermosphere-Ionosphere-Plasmasphere (CTIP) model and with complementary observations of plasma flow, optical emissions and satellite particle measurements are used to investigate the roles of plasma convection and soft-particle precipitation in the formation of the trough.