Empirical Model of the Nighttime Winter Ionospheric Trough in the Northern and Southern Hemispheres

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The empirical median model of the shape and position of the MIT (Main Ionospheric Trough) in the Northern and Southern Hemispheres has been developed for the first time. The model is based on the topside sounding data of the Intercosmos-19 satellite (about 2000 passes in both hemispheres) and in situ electron density N_e measurements onboard the low-orbiting CHAMP satellite (more then 20 000 passes) for high and low solar activity, accordingly.

The model is applicable to the quiet geomagnetic conditions ($K_p = 2$), the night-time (18:00 – 06:00 LT), the winter (November–February in the Northern Hemisphere and May–August in the Southern Hemisphere) season, and different level of solar activity (F10.7=70-250). Model describes the dependence of trough minimum position on the local time (LT) and longitude. The MIT model is practically the model of the subauroral ionosphere since it describes not only the trough minimum position but its shape too, i.e. the *foF*2 distribution in the trough region including its minimum, equatorial and polar walls of the MIT. This model can be included as constituent part into the global empirical model of the ionosphere.

The model input parameters are the longitude, latitude, LT and $F_{10.7}$. The output parameters are the MIT minimum positions, latitudinal and longitudinal *foF*2 profiles and *foF*2 longitude-latitude maps in the trough region (from 38°N to 75°N and from 38°S to 75°S) for different LT and $F_{10.7}$. The accuracy of the model is 2° in latitude, 30° in longitude, and 0.5 MHz in *foF*2. The online version of the MIT model is presented at the IZMIRAN website.

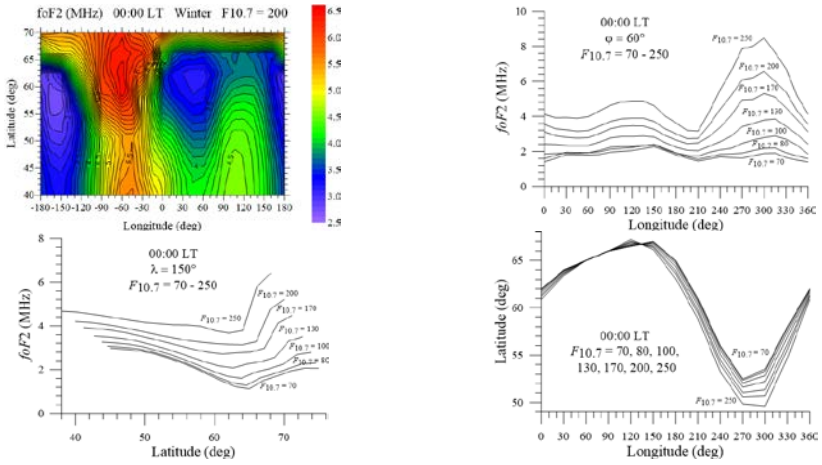

Figure. Examples of the MIT model results: longitude-latitude *foF*2 map (top left), longitudinal *foF*2 profiles (top right), latitudinal *foF*2 profiles (bottom left) and position of the main ionospheric trough minimum in *foF*2 (bottom right).