

Numerical modeling of the equatorial ionization anomaly (EIA), equatorial temperature and wind anomaly (ETWA) and equatorial electron temperature anomaly (EETA) on the basis of the GSM TIP

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On the basis of Global Self-consistent Model of Thermosphere, Ionosphere and Protonosphere (GSM TIP), developed in WD IZMIRAN, the calculations of the behavior of thermosphere, F-region and upper ionosphere parameters at middle and low geomagnetic latitudes are carried out. The calculations were carried out with use the new block of the calculation of electric fields in the ionosphere, in which the decision of the three-dimensional equation, describing the law of the conservation of the full current density in the ionosphere of the Earth, is realized by adduction it to the two-dimensional by integration on the thickness of the current conductive layer of the ionosphere along equipotential geomagnetic field lines. The calculations of the neutral atmosphere composition and temperature were executed with use of the MSIS model. The quite geomagnetic conditions of the equinox were considered in the minimum of the solar activity.

There are presented the calculated global distributions of the critical frequency of the F2-layer of ionosphere for the different moments UT, the latitudinal course of the N_e and T_e in the F-region and upper ionosphere in the vicinity of geomagnetic equator and unrolling on UT of the calculated velocities of zonal component of the thermospheric wind and ion temperature in the F-region of ionosphere, as well as critical frequency and height of the F2-layer maximum of the ionosphere at three longitude chains of the stations: Brazilian – Fortaleza (4.0°S, 38.0°W), Jicamarca (11.9°S, 76.0°W), Cachoeira Paulista (22.0°S, 45.0°W), Indian – Ujjain (23.2°N, 75.8°E), Waltair (17.7°N, 83.3°E), Kodaikanal (10.5°N, 77.5°E) and Pacific – Okinawa (26.3°N, 127.8°E), Davao (7.0°N, 125.4°E) è Vanimo (2.7°S, 141.3°E).

It is shown that presented calculation results contain the Equatorial Ionization Anomaly (EIA), or the Appleton anomaly, in the longitude-latitude distribution the critical frequency of the F2-layer, foF2, in the daytime, the Equatorial Electron Temperature Anomaly (EETA), which is concluded in the growth of the electron temperature at equator on heights of the F-region of the ionosphere and, accordingly, drop in upper ionosphere, as well as the Equatorial Temperature and Wind Anomaly (ETWA),

which is concluded in smaller (greater) values of the ion temperature (the velocity of zonal component of the thermospheric wind) at geomagnetic equator in the region of the Equatorial Ionization Anomaly (EIA) as compared with the values of these parameters in the crests of the equatorial anomaly.