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Configuration of the upper boundary of the ionosphere

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A b s t r a c t

Variations of the upper boundary of the ionosphere (UBI) are investigated based on three sources of information: (i) ionosonde-derived parameters: critical frequency *foF2*, propagation factor *M3000F2*, and sub-peak thickness of the bottomside electron density profile; (ii) total electron content (TEC) observations from signals of the Global Positioning System (GPS) satellites; (iii) model electron densities of the International Reference Ionosphere (IRI*) extended towards the plasmasphere. The ionospheric slab thickness is calculated as ratio of TEC to the F2 layer peak electron density, *NmF2*, representing a measure of thickness of electron density profile in the bottomside and topside ionosphere eliminating the plasmaspheric slab thickness of GPS-TEC with the IRI* code. The ratio of slab thickness to the real thickness in the topside ionosphere is deduced making use of a similar ratio in the bottomside ionosphere with a weight *Rw*. Model weight *Rw* is represented as a superposition of the base-functions of local time, geomagnetic latitude, solar and magnetic activity. The time-space variations of domain of convergence of the ionosphere and plasmasphere differ from an average value of UBI at ~1000 km over the earth.

Analysis for quiet monthly average conditions and during the storms (September 2002, October–November 2003, November 2004) has shown shrinking UBI altitude at daytime to 400 km. The upper ionosphere height is increased by night with an 'ionospheric tail' which expands from 1000 km to more than 2000 km over the earth under quiet and disturbed space weather. These effects are interposed on a trend of increasing UBI height with solar activity when both the critical frequency *foF2* and the peak height *hmF2* are growing during the solar cycle.

Key words: ionosphere, plasmasphere, total electron content, model electron density, International Reference Ionosphere.