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EVALUATION OF THEORETICAL IONOSPHERIC PROFILERS USING TOPSIDE SOUNDING DATA

Stan Stankov, s.stankov@meteo.be
Royal Meteorological Institute (RMI), Brussels, Belgium

Tobias Verhulst, Royal Meteorological Institute (RMI), Brussels, Belgium

Koen Stegen, Royal Observatory of Belgium (ROB), Brussels, Belgium

An operational system for deducing and imaging the vertical distribution of the electron density in the local ionosphere (LIEDR) has been recently developed at the RMI Geophysical Centre in Dourbes (50.1N, 4.6E). At a given location, the vertical electron density profile (EDP) is deduced from local ground-based measurements of the total electron content (TEC), ionospheric vertical incidence soundings, and empirically-obtained values of the upper O+-H+ ion transition level (UTL). The retrieval of the corresponding vertical electron density distribution is performed in two main stages: construction of the bottom-side electron profile (below the F2-layer height, hmF2) and construction of the top-side profiles (above hmF2). The top-side profile is permitted to take one of several forms: Exponential, Chapman, or Epstein. The system acquires and promptly processes the incoming measurements, computes the full-height ionospheric electron density profile, and displays the resulting profilograms (http://ionosphere.meteo.be/). LIEDR is designed to operate in continuous real-time mode for service applications and to provide historical data and plots for research applications and further developments of the system. Evaluation of the abovementioned different forms of top-side profiles is needed in order to find out which of them provides the best representation of the current ionospheric conditions. For this purpose, we use electron density profiles measured by the topside sounders onboard the Alouette and ISIS satellites. Every profile (obtained outside geomagnetic storm conditions) is fitted with each of the theoretical ionospheric profilers and the corresponding approximation errors calculated. The approximation results are analysed with respect to local time, geomagnetic latitude, season, and solar activity. The most suitable ionospheric profiler for different geophysical conditions is then found and representative LIEDR profilograms are presented.