Empirical ionospheric modelling and short-term forecasting

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Short-term ionospheric forecasting characterizes the ionospheric state for up to 3 days ahead. The most representative ionospheric parameter, the critical plasma frequency (foF2) is widely considered as the main subject of forecasting. The foF2 variations are decoupled into two parts: mean daily variations and relative deviations from the mean. The former contains the regular (climatological) variations while the latter includes irregular, short-term changes of foF2, induced mostly by geomagnetic activity. In essence, the regular variations are the smoothed long-term changes of foF2, while the irregular relative deviations have a time scale of a few hours to several days. In our approach, the irregular variations are modeled and then superimposed on the regular variations.

This presentation will briefly describe the different forecasting techniques: weighted extrapolation, empirical modeling, theoretical, and hybrid. Most attention will be given to the empirical forecasting models driven by the geomagnetic index Kp. One particularly important feature of these models is the consideration of the time-delayed reaction of foF2 to geomagnetic forcing. Models describing the foF2 behavior at different scales – local, regional, and global -- will also be presented.