On the TEC short-term forecast with corrections based on the average ionospheric response to background and storm-time geomagnetic conditions

S. M. Stankov [(1) *], R. Warnant [(1)], R. Kozarev [(2)]

[(1)] Royal Meteorological Institute (RMI), Brussels, Belgium
[(2)] University of South Carolina (USC), Columbia SC, United States of America

[*] *Corresponding author*. *Tel*.: +32 60 395 472; *Fax*: +32 60 395 423; *E-mail*: S.Stankov@oma.be

A practical procedure for TEC (Total Electron Content) forecast will be presented with the purpose of assisting in the implementation of an adequate ionospheric monitoring system for the European region. In this procedure, the TEC temporal behaviour is considered as composed of a periodic component and a random component. The periodic component represents the average (annual, diurnal) non-disturbed variation, whereas the random component represents variations inflicted by strong changes in the solar/geomagnetic activity. At first, the TEC median behaviour is predicted by using the latest value obtained from real-time GNSS (Global Navigation Satellite System) measurements and by estimating the forward gradient from an ionospheric climatological model, such as the International Reference Ionosphere (IRI). Immediately after that, the median prediction is corrected for the influence of the 'background' level of geomagnetic activity (Kp<4), an influence that is known to cause notable excursions of the TEC value from its monthly median, sometimes exceeding 10% at higher latitudes. To better account for such variability, a synthetic index has been developed via approximation of the local TEC's normalised average response to changing geomagnetic activity (as represented by the planetary geomagnetic index Kp, alternatively by Ap). Thus, the synthetic index allows for a quick correction of the TEC median prediction with respect to season and latitude. During geomagnetic storms however, the TEC relative deviation from its average/median value is much stronger dependent on the storm time elapsed (i.e. the time passed from the geomagnetic storm onset) and this dependence is proved to be also varying substantially with season and latitude. Therefore, in the final step of the forecast, the TEC median prediction is corrected for these storm-time changes. The described forecast procedure, with a lead time of 1 hour, will be demonstrated on actual measurements performed during various ionospheric and geomagnetic conditions.

Preprint. Published in *Geophysical Research Abstracts* (2009), Vol.11, Abs.No.EGU2009-13283