Improving Ionospheric determinations at UPC: Kriging and Wide Area RTK techniques

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The purpose of this talk is to summarize the last results obtained at UPC in two fronts, which suppose a significant improvement of the corresponding ionospheric determinations:

- The application of a Kriging interpolation technique adapted to the global Total Electron Content mapping, especially useful in the context of the IGS reprocessing campaign.
- The improvement of the Wide Area Real Time Kinematics (WARTK) technique (originally based on an optimal combination of a real-time precise ionospheric and geodetic modelling) with a simple Medium Scale Travelling Ionospheric Disturbance (MSTID) modelling.

Indeed, the Kriging technique has shown its potential in order to significantly improve the performance of the ionospheric interpolation, being an important point in global TEC mapping, due to the lack of receivers in large areas over the Seas and South Hemisphere (see for example Orus et al. 2005). The reason behind such improvement is that Kriging takes optimally into account the spatial error decorrelation.

In this context we will show the first systematic results of UPC Ionospheric VTEC maps reprocessing, applied during the first three months of 2000, in which Kriging provides an additional 10% of improvement, regarding to the other improvements developed in the last 6 years.

An other ionospheric front in which significant improvements has been achieved recently corresponds to high accuracy ionospheric corrections, supporting cm-error-level GNSS navigation at continental scales (based for example on the Satellite Based Augmentation reference receivers, SBAS systems, such as the EGNOS RIMS).

Indeed, in order to achieve cm-error-level navigation, is important to correctly estimate the carrier phase ambiguities. In this context, the WARTK technique allows such fixing in baselines up to hundreds of km, due to an optimal combination of a high precision real-time tomographic ionospheric model, with the geometric model (see for example Hernandez-Pajares et al. 2000). We will show that a new and simple real-time modelling of MSTIDs doubles the WARTK service area over Europe. WARTK can be applied for both GPS and the new Galileo and GPS modernized systems, and it is being demonstrated in recent and ongoing European projects, which will be also briefly summarized.

References:

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