Analysis of the EGNOS ionospheric model and its impact on the integrity level in Central Eastern Europe

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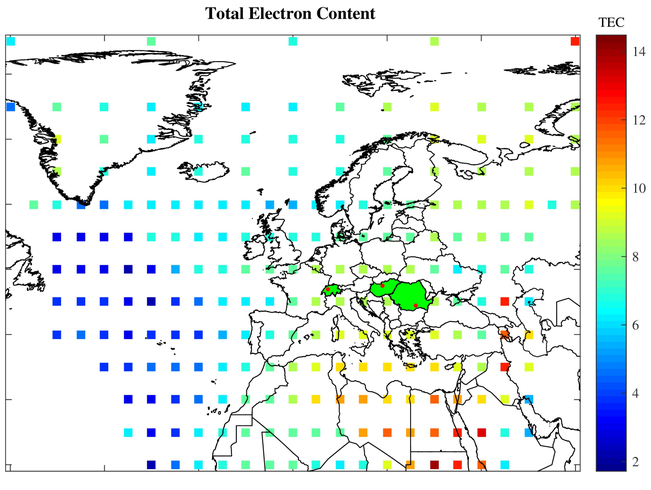
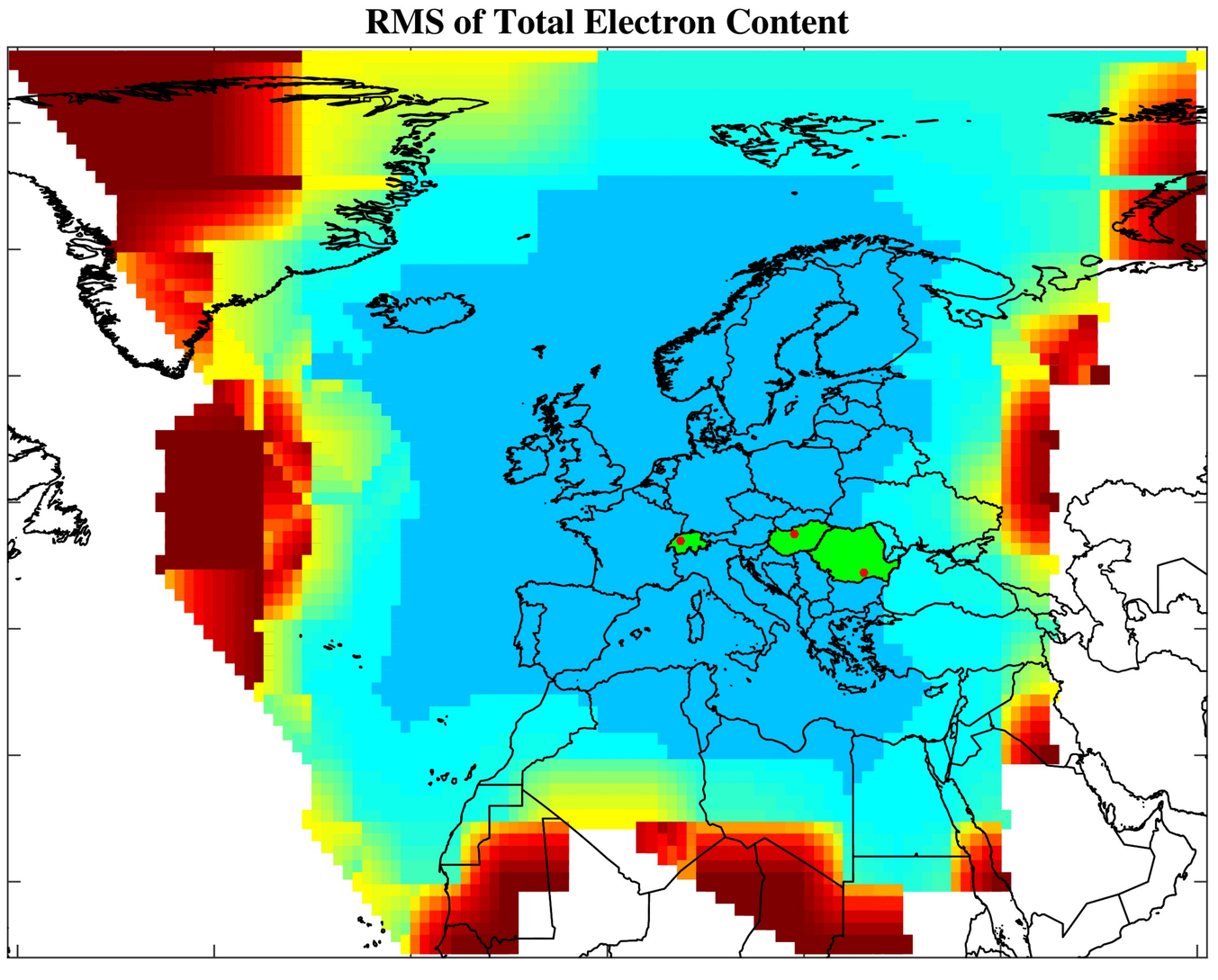
INTRODUCTION

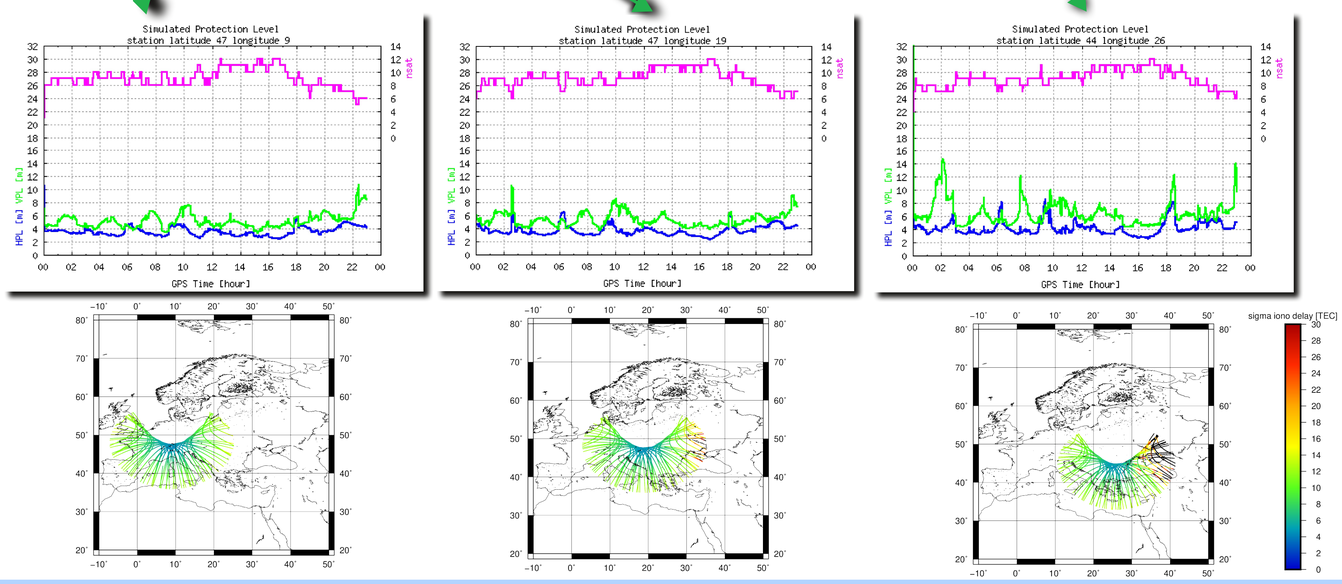
One of the major error factors of a single frequency receiver is the ionospheric delay, which is proportional to the total electron content (TEC) along the path from the satellite to a receiver. The focus of the current paper is on the EGNOS (European Geostationary Navigation Overlay Service) ionospheric model. EGNOS is the regional satellite-based augmentation system (SBAS) of Europe that is used to improve the performance and integrity of the global navigation satellite systems (GNSSs).



EGNOS broadcasts Ionospheric Delay Corrections (GIVD) for a set of predefined points defined on a grid 350 km above the WGS-84 ellipsoid Earth approximation (IGPs), and their accuracy (σ_{GIVE}) in



Edge of the ionospheric model significantly increases the Protection Level in Central Eastern Europe. Deployment of a monitoring station in this region would eliminate this effect.



Ionospheric model impact on Protection Level

The effect of the EGNOS ionospheric model on the Protection Level was demonstrated. Closing to the edge of the broadcasted VTEC map, the increased variances of the grid points have a grand impact on the Protection Level. The Protection Level variations tend to get higher towards the Eastern regions. While in Switzerland the ionospheric horizontal Protection Level remains below 6 meters, in Bucharest the peaks could exceed the 8 meter limit on the same day. The ionospheric vertical Protection Level values show even greater distortion. The reason for this phenomenon is that increased variances of grid points have a notable impact on the Protection Level. More Ranging and Integrity Monitoring Stations at the Eastern regions could mitigate this effect.