

## Space Weather effects on regional short term TEC and scintillation forecasting

Juliana G. Damaceno<sup>(1), (2)</sup>, Claudio Cesaroni<sup>(1)</sup>, Luca Spogli<sup>(1), (3)</sup>, Marcin Grzesiak<sup>(4)</sup>, Giorgiana De Franceschi<sup>(1)</sup> and Massimo Cafaro<sup>(2)</sup>.

(1) Istituto Nazionale di Geofisica e Vulcanologia (INGV), Via di Vigna Murata 605, 00143 Rome, Italy.

(2) University of Salento (UNISALENTO), Via per Monteroni, 73100 Lecce, Italy.

(3) SpacEarth Technology (SET), Via di Vigna Murata 605, 00143 Rome, Italy.

(4) Space Research Center of Polish Academy of Sciences (CBK-SRC), Bartycka 18A 00-716 Warsaw, Poland.

Ionospheric irregularities can cause sudden, rapid and irregular fluctuations of the amplitude and phase of the radio waves crossing them, termed “ionospheric scintillation”. Given the morphology of the Earth’s magnetic field, the regions in which scintillations are more likely to occur are the polar and the equatorial/low latitudes regions. At high latitudes, scintillation is mainly associated to magnetospheric phenomena under storm events whereas at low latitudes, the so-called “fountain effect”, due to the interplay between ExB drift, gravity and pressure gradients, leads to an enhancement of ionization in the regions close to  $\pm 15^\circ$  magnetic latitude. Such enhancements are commonly referred to as the northern and southern crest of the Equatorial Ionization Anomaly (EIA), respectively, where scintillation are more likely to occur during post-sunset hours. Scintillation causes GNSS signal degradation reducing the accuracy of PPP and RTK. The ionosphere modelling and forecasting is then of great importance, contributing with TEC and scintillation prediction to the necessary input for improving/developing errors mitigation algorithms. A regional short-term forecasting model to predict ionospheric scintillation and TEC at low latitudes has been implemented and tested for the Brazilian region [1] and is now under improvements [2]. This work presents the comparisons between the first formulation of the model and the improved version by correction of the mesh structure and tested with real data under quiet and perturbed geospatial conditions.

[1] Grzesiak, M., Cesaroni, C., Spogli, L., De Franceschi, G., & Romano, V. (2018). Regional Short-Term Forecasting of Ionospheric TEC and Scintillation. *Radio Science*, 53(10), 1254-1268, <https://doi.org/10.1029/2017RS006310>.

[2] Damaceno, J.G. , C. Cesaroni, L. Spogli, M. Grzesiak, G. De Franceschi and M. Cafaro, (2019), ”Regional short-term forecasting model to predict ionospheric scintillation and TEC at low latitudes”, poster presentation at URSI AP-RASC 2019, New Delhi, India, 09 - 15 March 2019.