



## The contribution of the Ionosphere Prediction Service Project in supporting the mitigation of the ionospheric effects on radio signals

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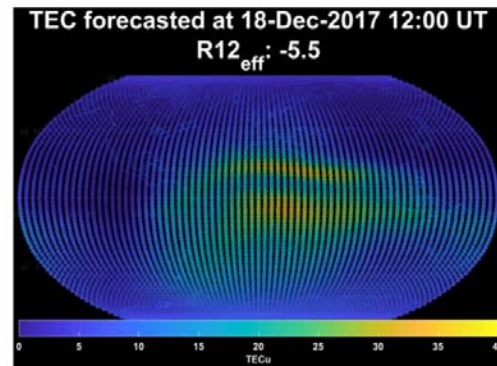
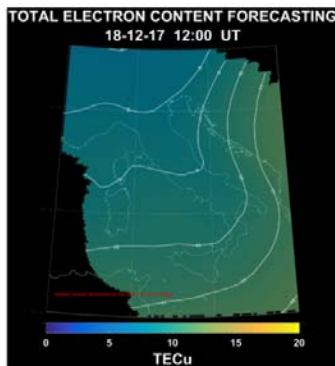
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The Ionosphere Prediction Service (IPS) is an on-going project funded by the EC (project 434/PP/GRO/RCH/15/8381; 2016-2018). IPS is led by TELESPAZIO (IT) in collaboration with the Istituto Nazionale di Geofisica e Vulcanologia (INGV-IT), the University of Nottingham (UNOTT-UK), the University of Tor Vergata (UTOV-IT), the Nottingham Scientific Ltd (NSL, UK) and TELESPAZIO VEGA (DE). The scope of this project is to design and develop a service prototype capable of providing different products to GNSS users and service providers that can assist with early warnings and predictions on the state of the ionosphere. Such products are fine-tuned to match the needs of the different communities (aviation, mass market, critical infrastructures monitoring etc.) to which the service is targeted. The core scientific contribution of the project is represented by the research activities carried out by the project's research collaborators (i.e. INGV, UNOTT and UTOV) with the aim to go beyond the state of the art in understanding the impact of significant ionospheric-related geophysical events on today's technology-based society. The outputs of the research activities are nowcasting and forecasting tools, dealing with different topics that can be divided into three blocks: Solar and Space-Weather Monitoring (UTOV), Ionosphere weather monitoring and forecasting (INGV) and Receiver and user positioning performance (UNOTT). TELESPAZIO is in charge of integrating all the products into a Central Processing and Storage Facility (CPSF) as a chain of processors capable of describing the Space-Weather phenomena from the sun to the ionosphere affecting the GNSS service provider and user community. This paper presents the nowcasting and forecasting algorithms developed in the frame of the INGV research activity to produce TEC and scintillations maps at a global, European and Mediterranean level including the results of the validation process. Figure 1 shows an example of output of the short term forecasting (30 minutes in advance) algorithm for TEC over Mediterranean region while Figure 2 reports an example of the long term forecasting (24 hours in advance) of TEC at global level. In addition, the paper gives some demonstrations on the usage of the IPS web portal showing the possibilities for different users to customize the alert and warning related to the products available. The outcomes of the IPS project could be a valuable contribution for different scientific users that need an operational tool to mitigate the disruptive effects of the ionosphere on the propagation of the radio signals.



**Figure 1 (left).** Example of Total Electron Content map over Mediterranean area forecasted 30 minutes in advance.

**Figure 2 (right).** Example of Global Total Electron Content map forecasted 24 hours in advance.