



## **GNSS monitoring of the ionosphere for Space Weather services**

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The International GNSS Service (IGS) Ionosphere Working Group routinely provides the users global ionosphere maps (GIMs) of vertical total electron content (vTEC). The IGS GIMs are provided with spatial resolution of 5.0 degrees x 2.5 degrees in longitude and latitude, respectively. The current temporal resolution is 2 hours, however, 1-hour maps are delivered as a pilot project. There are three types IGS GIMs: the final, rapid and predicted. The latencies of the IGS ionospheric final and rapid products are 10 days and 1 day, respectively. The predicted GIMs are generated for 1 and 2 days in advance. There are four IGS Associate Analysis Centres (IAACs) that provide ionosphere maps computed with independent methodologies using GNSS data. These maps are uploaded to the IGS Ionosphere Combination and Validation Center at the GRL/UWM (Geodynamics Research Laboratory of the University of Warmia and Mazury in Olsztyn, Poland) that produces the IGS official ionospheric products, which are published online via ftp and www.

On the other hand, the increasing number of permanently tracking GNSS stations near the North Geomagnetic Pole allow for using satellite observations to detect the ionospheric disturbances at high latitudes with even higher spatial resolution. In the space weather service developed at GRL/UWM, the data from the Arctic stations belonging to IGS/EPN/POLENET networks were used to study TEC fluctuations and scintillations. Since the beginning of 2011, a near real-time service presenting the conditions in the ionosphere have been operational at GRL/UWM www site. The rate of TEC index (ROTI) expressed in TECU/min is used as a measure of TEC fluctuations. The service provides 2-hour maps of the TEC variability. In addition, for each day the daily map of the ionospheric fluctuations as a function geomagnetic local time is also created.

This presentation shows the architecture, algorithms, performance and future developments of the IGS GIMs and this new space weather service at GRL/UWM.