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Abstract

A detailed analysis is presented for the days in March, 2015 surrounding St. Patrick's Day 2015 geomagnetic storm, based on the existing real-time and near real-time ionospheric models (global or regional) within the group, which are mainly based on Global Navigation Satellite Systems (GNSS) and ionosonde data. For this purpose, a variety of ionospheric parameters is considered, including Total Electron Content (TEC), F2 layer critical frequency (foF2), F2 layer peak (hmF2), bottomside half-thickness (B0) and ionospheric disturbance W-index. Also, ionospheric high-frequency perturbations such as Travelling Ionospheric Disturbances (TIDs), scintillations and the impact of solar flares facing the Earth will be presented to derive a clear picture of the ionospheric dynamics.

IAG's RTIM-WG

The **Real Time Ionosphere Monitoring** is a new Working Group (RTIM-WG) within the International Association of Geodesy (IAG) Sub-Commission 4.3 "Atmosphere Remote Sensing". The WG will run for the period 2016 – 2019, including experts in the field from multiple countries worldwide. The complementary expertise of the participating research groups allows to analyse the ionospheric behaviour from a broad perspective, taking benefit of comparing multiple independent real-time and near real-time ionospheric approaches. The models are based on **GNSS** and **ionosonde** data (based on IGS Iono-WG Global Ionospheric Maps, **GIMs**, or the International Reference Ionosphere, **IRI**).

The main objectives of the WG have evolved in the last year and now cover the following ones:

- Assessment of the current status of RT Ionosphere Monitoring
- Comparison of existing RT Ionosphere Monitoring approaches from different perspectives for a specific period. Find out ways to combine different regional/global products.
- A procedure to automatically compare on a daily basis real time ionosphere products providing the results in a common compatible IONEX-like format. Potential validation with external data sources, such as dual-frequency altimeters.
- The improvement in the dissemination and format of GIMs in order to properly support real time usage.
- Support on quality control and validation of existing products/services (including the possibility to assess the performance by means of standard and precise point positioning techniques)
- Open discussion towards new concepts on RT Ionosphere Monitoring. Drawing recommendations and arranging training and dissemination activities for the community.

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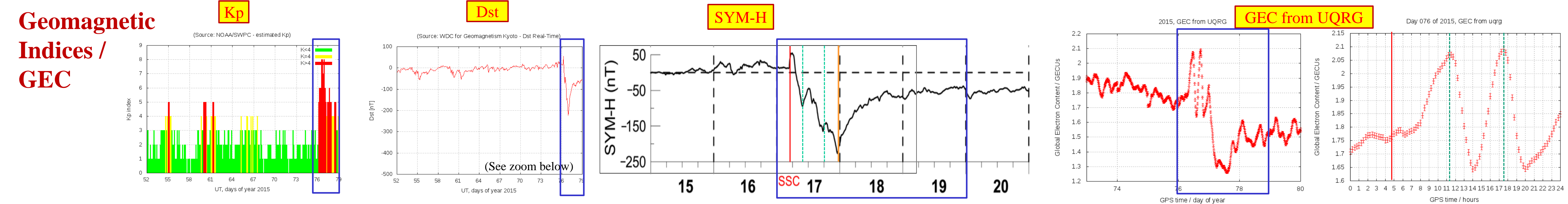
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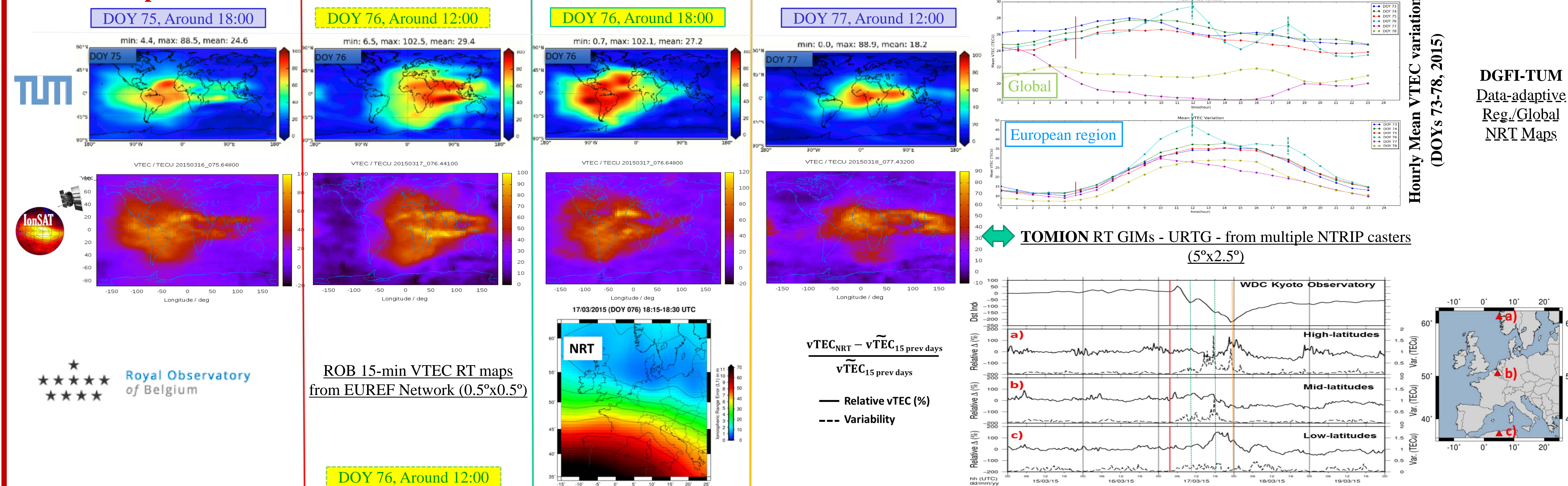
The work has been done in the frame of the International Association of Geodesy (IAG) WG 4.3.1 Real Time Ionosphere Monitoring (RTIM-WG). Part of the results have been obtained within MONITOR contract of the European Space Agency (C4000100988). Data/products are mainly available through <http://monitor.estec.esa.int/>, www.gnss.be, <ftp://gnss.oma.be>, <http://giro.uml.edu/IRTAM>, <http://www.izmiran.ru>. The authors are also grateful to IGS, EUREF, BKG/CNES, NASA/CNES, GIRO, WDC Kyoto and INPE for data/products provision.

Results

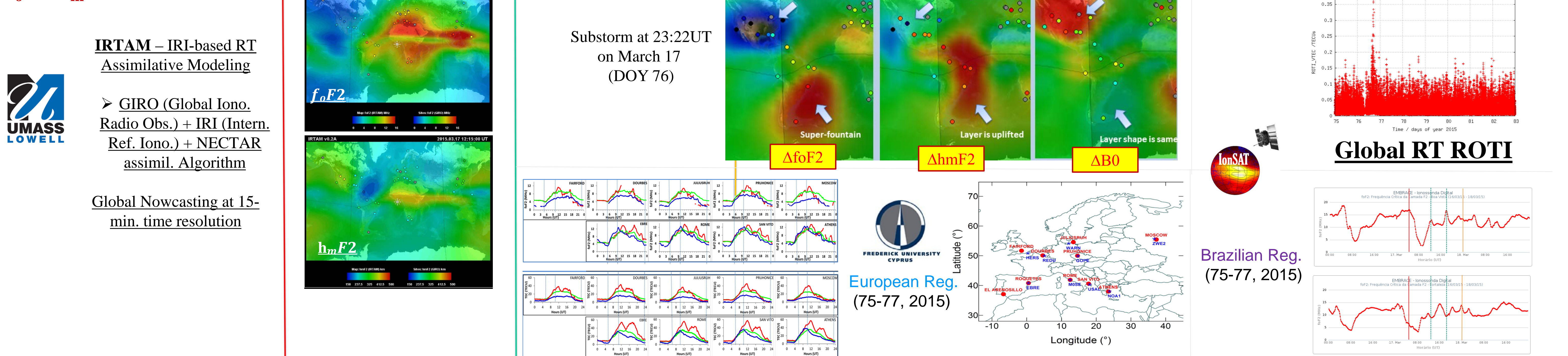
Results on the **RT/NRT** products for the days surrounding St. Patrick storm (doy 76, 2015) have been merged considering different approaches within the RTIM-WG to have a global overview of the impact on ionosphere. Additional data (also in postprocessing) are also added for further analysis.



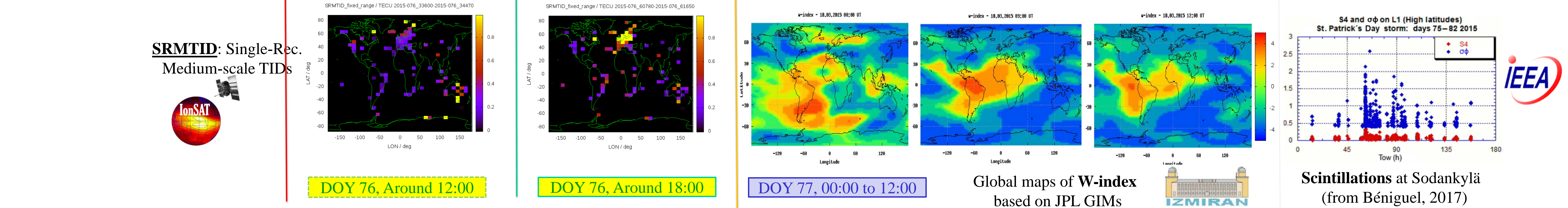
VTEC Maps



f_oF₂/h_mF₂/B0



SRMTID



Conclusions

Existing RT and NRT ionospheric approaches complement very well to each other, allowing a detailed study of events like the St. Patrick's day ionospheric storm. Next steps on RTIM-WG will cover comparisons between different products with external references, as well as its automatization, discussion and dissemination/combination of RT ionosphere data (particularly, VTEC maps), among others.