

Alberto García-Rigo¹, David Roma-Dollase^{1,2}, Manuel Hernández-Pajares¹, Zishen Li³, Michael Terkildsen⁴, Reza Ghoddousi-Fard⁵, Denise Dettmering⁶, Eren Erdogan⁶, Haris Haralambous⁷, Yannick Bénéguet⁸, Jens Berdermann⁹, Martin Kriegel⁹, Anna Krypiak-Gregorczyk¹⁰, Tamara Gulyaeva¹¹, Attila Komjathy¹², Panagiotis Vergados¹², Joachim Feltens^{13,19}, René Zandbergen¹³, German Olivares⁴, Tim Fuller-Rowell¹⁴, David Altadill¹⁵, E. Blanch¹⁵, Nicolas Bergeot¹⁶, Andrzej Krankowski¹⁷, Loukis Agrotis¹⁸, Ivan Galkin²⁰, Raul Orus-Perez²¹ and Fabricio S. Prol^{1,22}

¹UPC-IonSAT research group, Technical University of Catalonia, Spain, ²Department of Engineering: Electronics, University of Barcelona (UB), Spain, ³Academy of Opto-Electronics, Chinese Academy of Sciences (CAS), China, ⁴Bureau of Meteorology, Space Weather Services, Australia, ⁵Canadian Geodetic Survey, Natural Resources Canada / Government of Canada (NRCan), Canada, ⁶Deutsches Geodätisches Forschungsinstitut der Technischen Universität München (DGFI-TUM), Germany, ⁷Frederick University Cyprus, Cyprus, ⁸IEEA, France, ⁹Institute of Communications and Navigation, DLR, Germany, ¹⁰Institute of Geodesy, UWM, Poland, ¹¹Institute of Terrestrial Magnetism, ionosphere and Radio Wave Propagation, Russian Academy of Sciences, Russia, ¹²NASA - Jet Propulsion Laboratory (JPL), California Institute of Technology, USA, ¹³Navigation Support Office, ESA-ESOC, Germany, ¹⁴NOAA affiliate, USA, ¹⁵Observatori de l'Ebre (OE), CSIC - Universitat Ramon Llull, 43520 Roquetes, Spain, ¹⁶Planetology and Reference Systems, Royal Observatory of Belgium (ROB), Belgium, ¹⁷Space Radio-Diagnostics Research Centre, UWM (SRRC/UWM), Poland, ¹⁸SYMBAN Limited, ESA-ESOC, Germany, ¹⁹Telespazio VEGA Deutschland GmbH c/o ESA-ESOC, Germany, ²⁰University of Massachusetts Lowell, Space Science Lab, USA, ²¹Wave Interaction and Propagation Section (TEC-EEP), ESA-ESTEC, The Netherlands, ²²São Paulo State University, Presidente Prudente - SP, Brazil

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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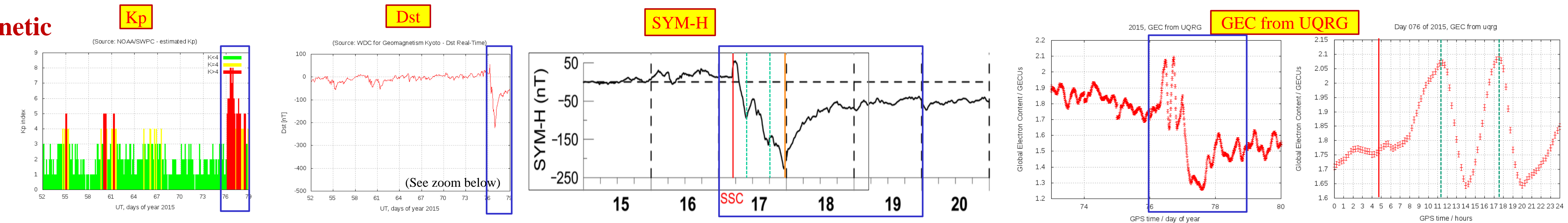
Acknowledgements

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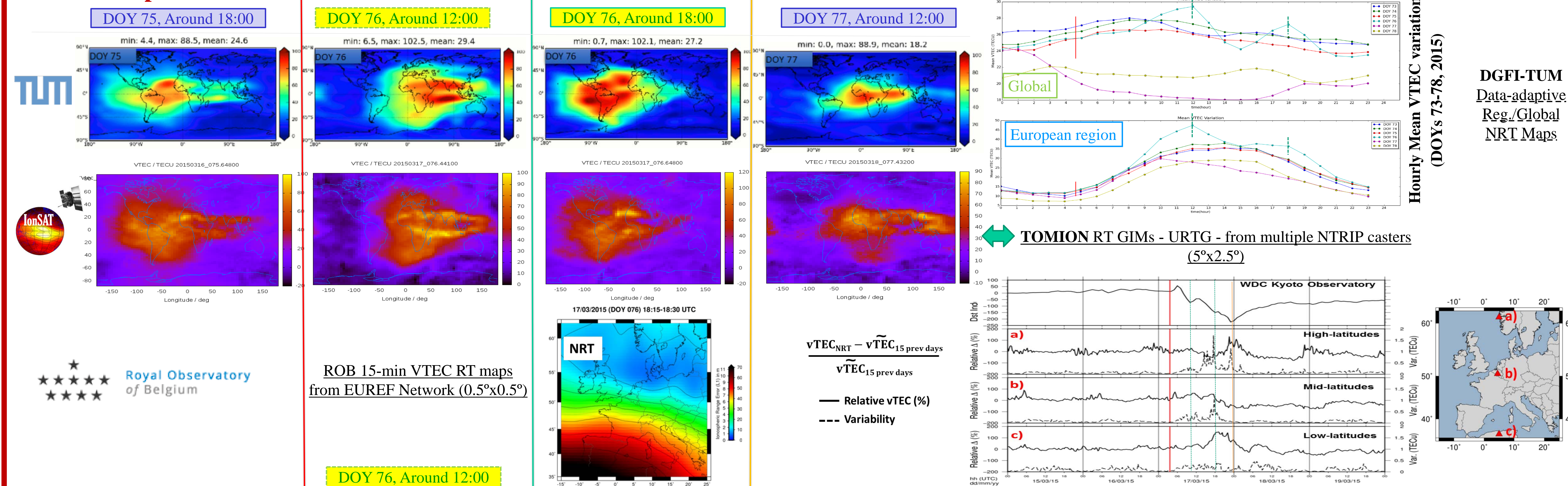
Results

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.

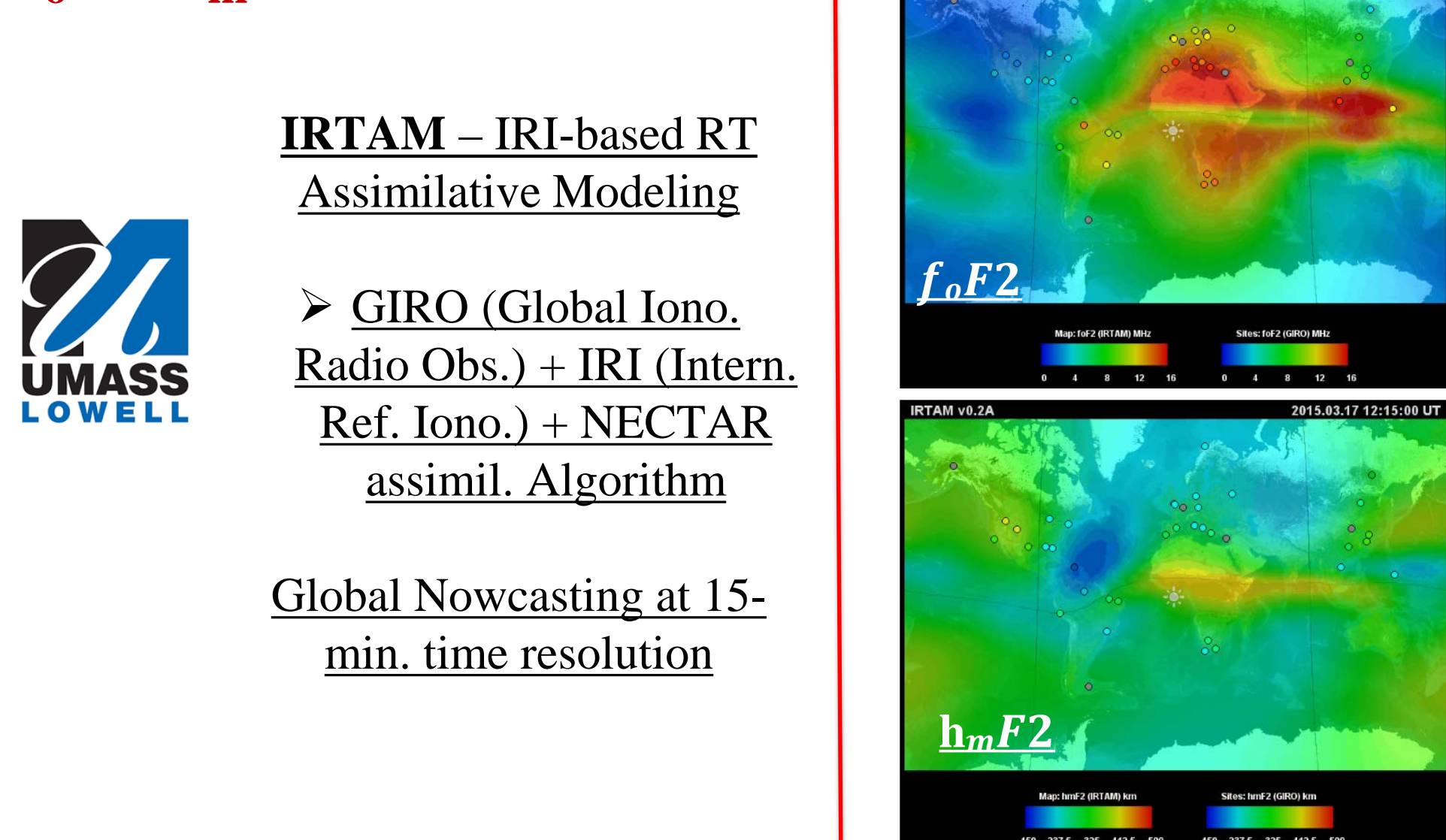
Geomagnetic Indices / GEC



VTEC Maps



f_oF₂/h_mF₂/B₀



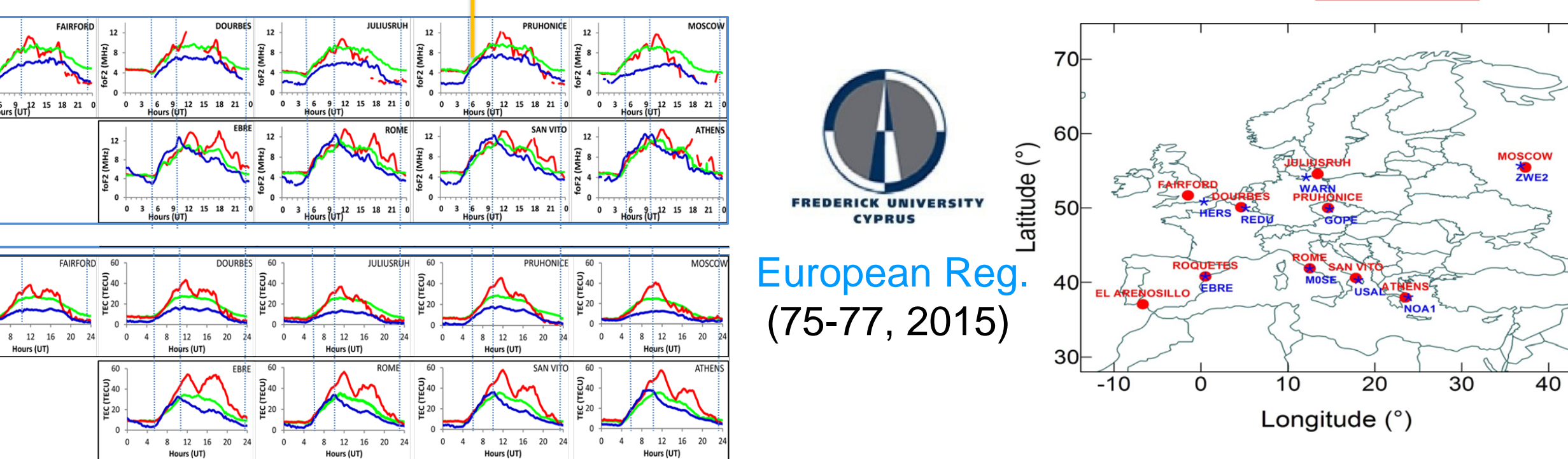
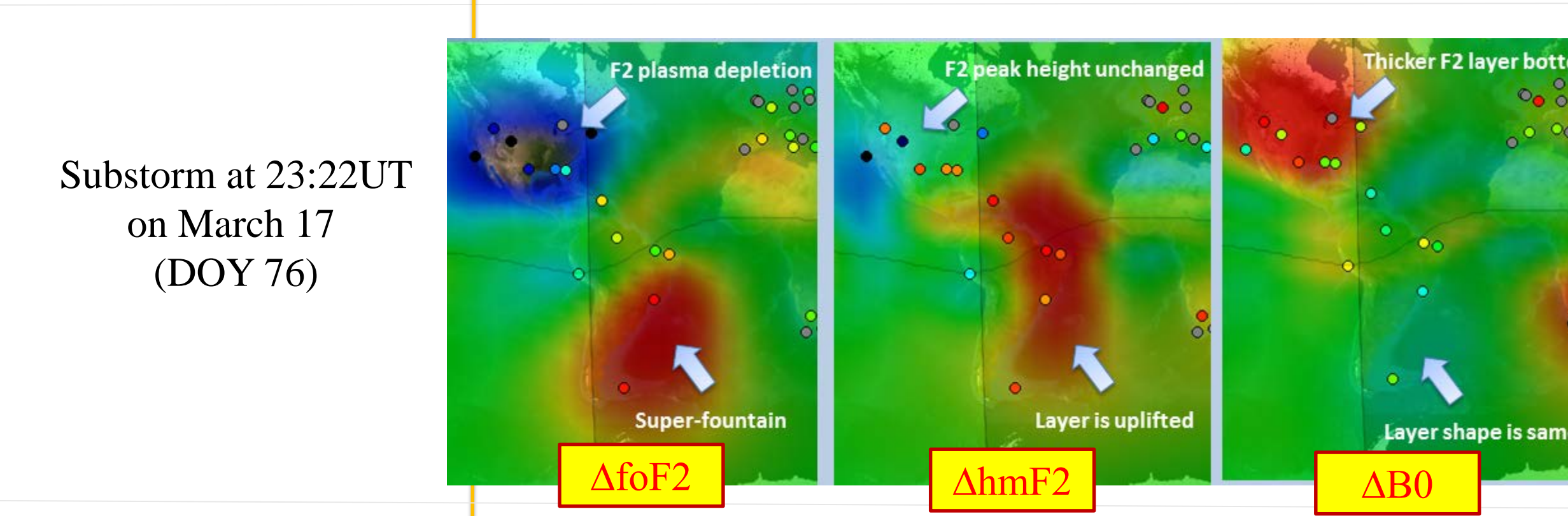
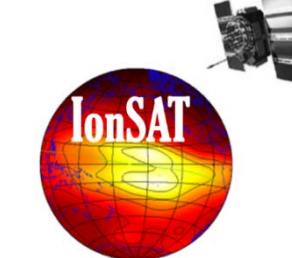
IRTAM – IRI-based RT Assimilative Modeling

GIRO (Global Iono. Radio Obs.) + IRI (Intern. Ref. Iono.) + NECTAR assimil. Algorithm

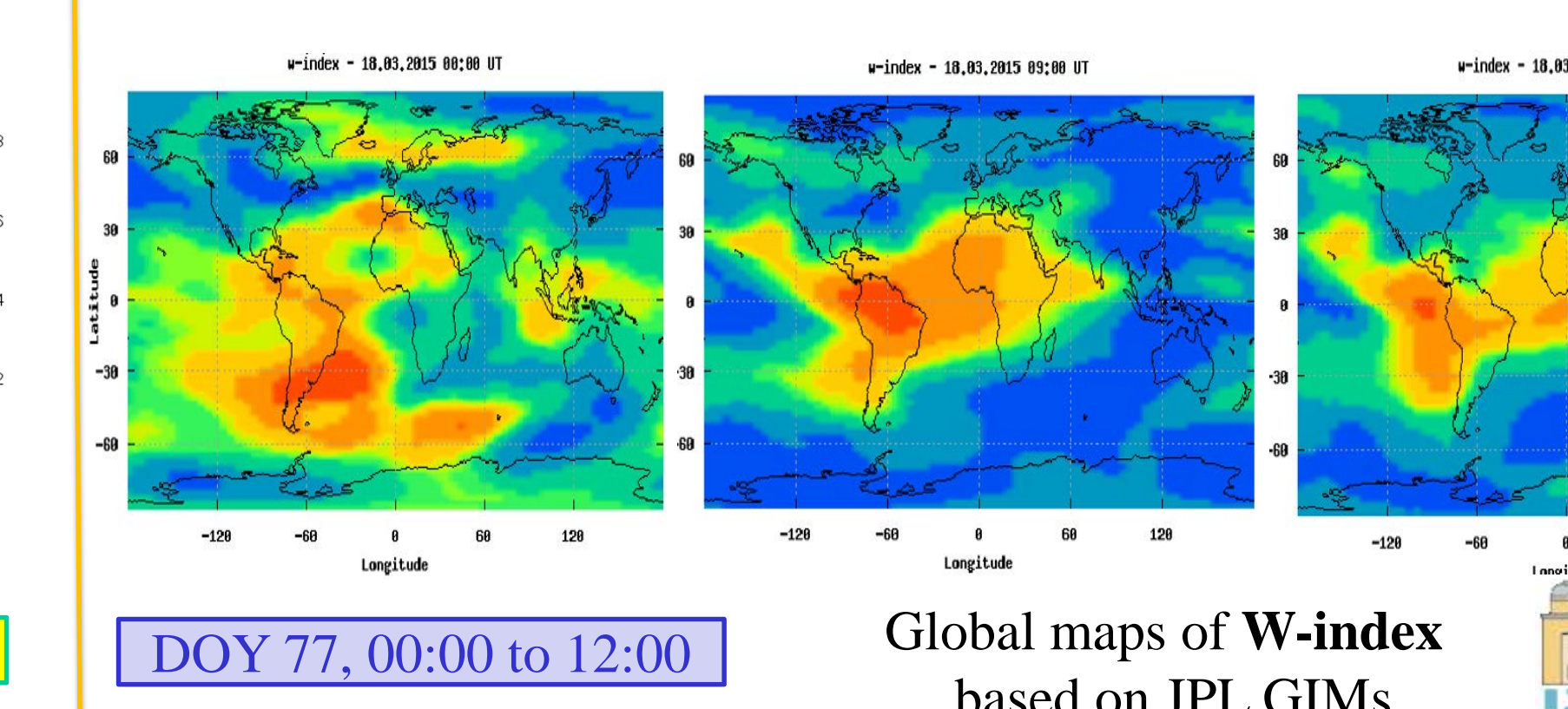
Global Nowcasting at 15-min. time resolution

SRMTID

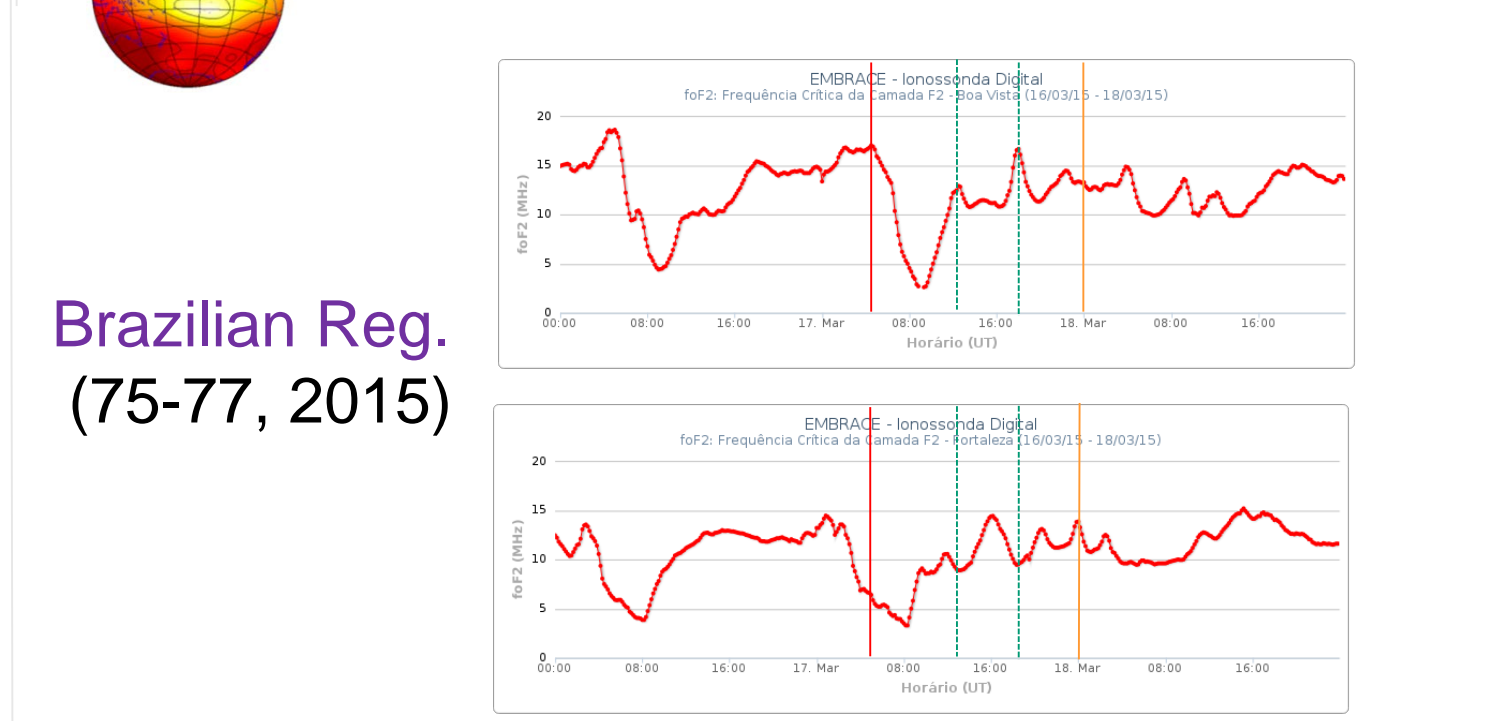
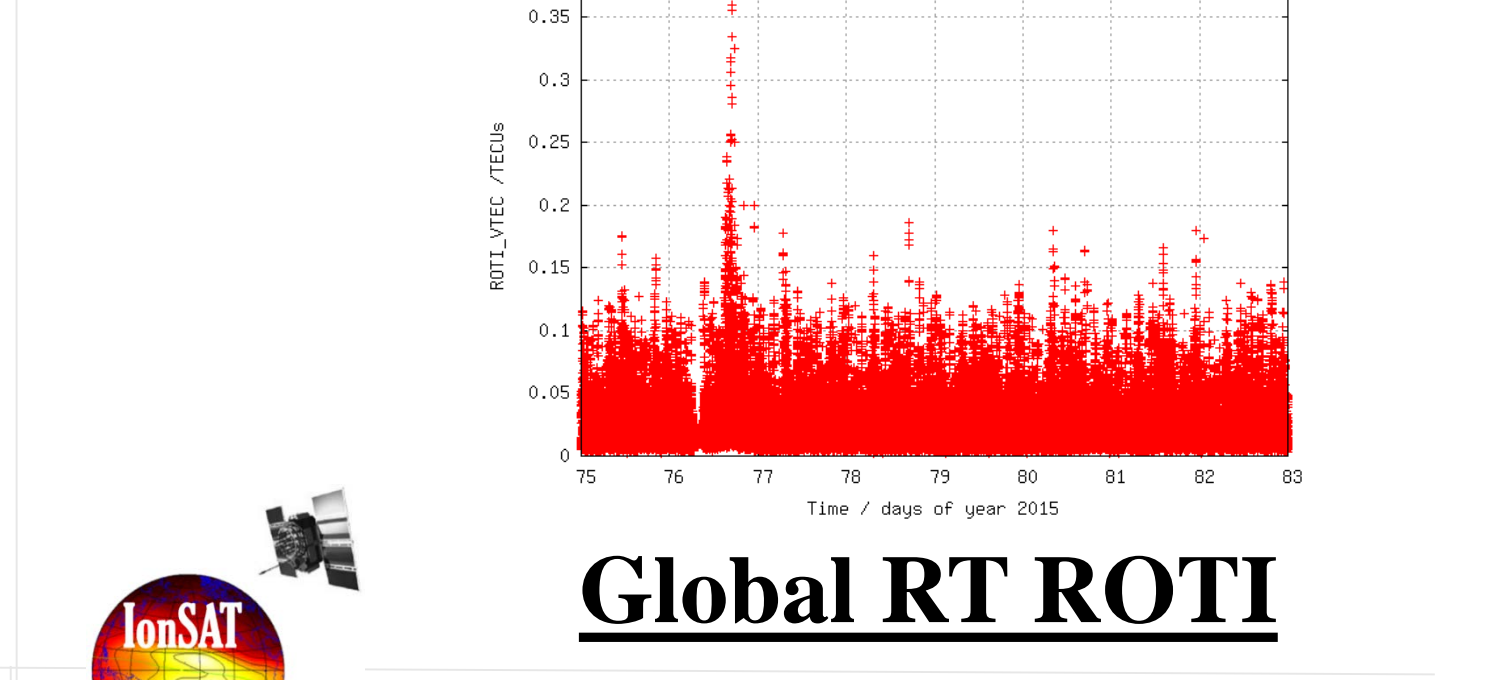
SRMTID: Single-Rec. Medium-scale TIDs



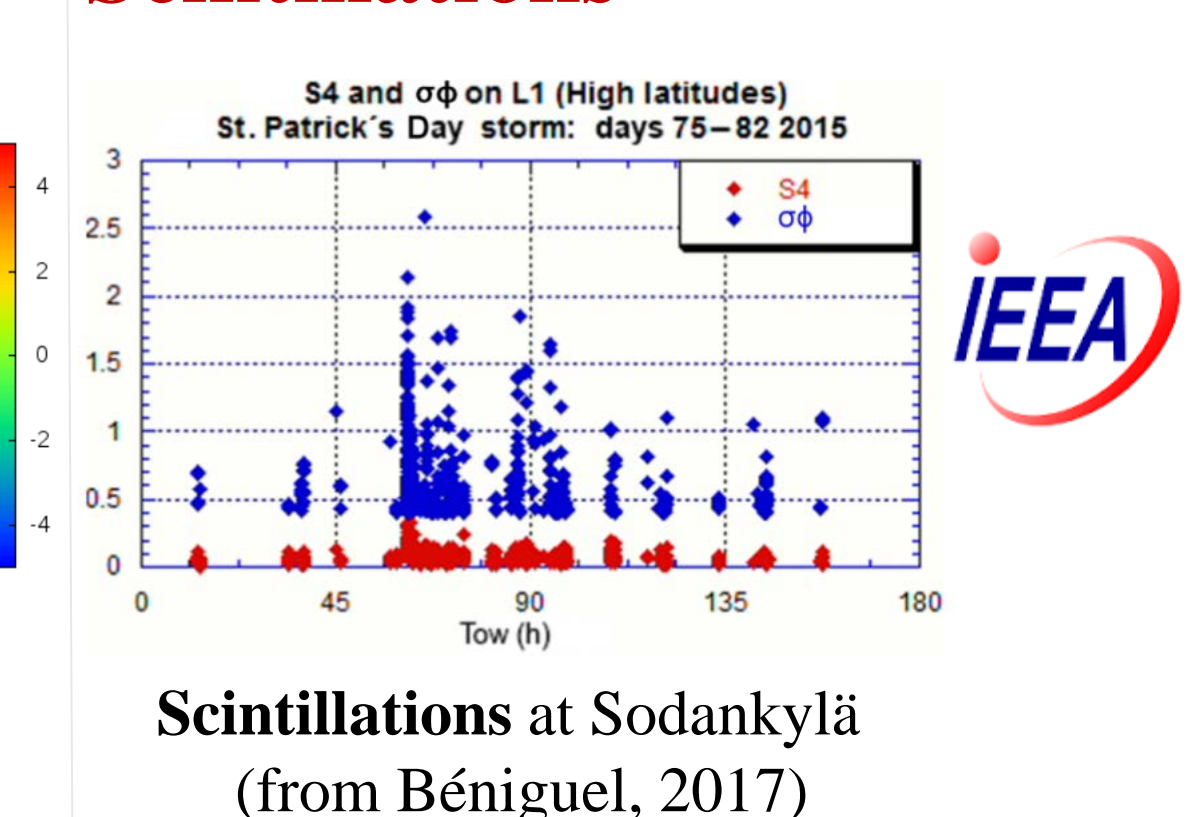
W-index



ROTI



Scintillations



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.