Geophysical Research Abstracts
Vol. 19, EGU2017-16702, 2017
EGU General Assembly 2017

St. Patrick's Day 2015 geomagnetic storm analysis based on Real Time Ionosphere Monitoring

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IAG's Real Time Ionosphere Monitoring (RTIM) is a new Working Group within the International Association of Geodesy (IAG) Sub-Commission 4.3 "Atmosphere Remote Sensing". 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.

In this context, a detailed analysis will be presented for the days in March, 2015 surrounding St. Patrick's Day 2015 geomagnetic storm, based on the existing 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 will be 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.

Among other sources of information to take part in the comparisons, there will be (1) scintillation results

-from MONITOR ESA/ESTEC-funded project- derived by means of S4 index and Sigma Phi (IEEA), specially significant in the African sector and European high latitudes, (2) dynamics of the global maps of W-index with 1h resolution derived from JPL Global Ionospheric Maps (GIMs; IZMIRAN), (3) deviations from expected quiet-time behavior analysed in terms of foF2, hmF2, B0 and B1 based on IRTAM and GIRO network of digisondes (Lowell), showing F2 layer peculiar changes due to the storm, (4) statistics based on the median of the VTEC for the 15 previous days considering VTEC european regional maps (ROB), (5) time series of VTEC data that are derived by running the NRT ionosphere model of DGFI-TUM in offline mode, which show clear variations for both global and European scales associated to the event, (6) global maps of inter-frequency phase rate variations as proxy phase scintillation index from 1Hz real-time IGS network (NRCan), (7) manually scaled ionospheric peak parameters from European ionosondes (FUC), (8) NOAA US-Total Electron Content Product (NOAA-USTEC) operational product, which shows the passage of the storm-enhanced density, (9) as well as other products -also from MONITOR ESA/ESTEC-funded project-, such as the Rate of TEC index (ROTI), Single Receiver Medium Scale TIDs index (SRMTID), GNSS Solar Flare Detector (GSFLAD), which is a EUV rate proxy, the Sunlit Ionosphere Sudden TEC Enhancement Detector (SISTED) and the Global Electron Content (GEC) generated from UQRG GIMs (UPC-IonSAT).