

Integrated behavior of ionospheric indexes in South America during the Saint Patricks geomagnetic storm

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Abstract

In Latin America, interest in space weather studies has increased, particularly in three countries, Brazil, Mexico and Argentina (Denardini et al., 2016a, Mendoza et al., 2019a). MAGGIA (UNLP + CIC, Argentina) has developed ad hoc computational software, AGEO 19.12; which freely provides the entire scientific community with real-time and post remote sensing products of the atmosphere. MAGGIA is the only provider of these products for Latin America making full use of all satellite constellations (i.e., GPS, GLONASS, Galileo and BeiDou) and all available observation bands (five frequencies). We employed the software developed at MAGGIA making use of GNSS observations to study the behavior of ionospheric indexes: ROTI (Rate of TEC Index), W (Weather Index) and DIX (Disturbance Ionosphere Index) during the St. Patrick's Day geomagnetic storm on March 17 and 18, 2015 over South America.

We make a new implementation of the DIX presented by Jakowski et al. 2012 to study the ionospheric region of South America, with a great number of GNSS stations and using multiple frequencies. The highlight point is the generation of carrier-phase ionospheric observables using AGEO 19.12 to calculate the ROTI and DIX indexes free of systematic errors. The W-index was generated from maps of VTEC over South America produced by MAGGIA.

We conclude that the degree of ionospheric disturbance due to the geomagnetic storm shows regional differences when we compare the ionospheric indexes results at low, mid, and high geomagnetic latitudes.

We can affirm that the three indexes are quality tools to provide temporal and spatial ionospheric information over South America during study event.