



Large scale Travelling Ionospheric Perturbations over Europe and Africa during St. Patrick's Day storm 2015

Claudia Borries (1), Ayman M. Mahrous (2), Nada M. Ellahouny (2), and Ronny Badeke (1)

(1) Institute for Communication and Navigation, DLR, Neustrelitz, Germany (claudia.borries@dlr.de), (2) Space Weather Monitoring Center (SWMC), Helwan University, Ain Helwan, Egypt

During the intense geomagnetic storm on 17th March 2015, many GNSS applications suffered from degradation due to strong ionospheric perturbations. Here, we are focusing perturbations in the European-African Sector observed in the Total Electron Content (TEC). We are analyzing wavelike phenomena considered as Large Scale Ionospheric Disturbances (LSTID). In the European-African Sector, the storm produced three different types of LSTID: (1) a concurrent TEC perturbation at all latitudes at the same time; (2) an equatorwards propagating LSTID having unusually large wave parameters (wavelength: ≈ 3600 km, period: ≈ 120 min, speed: ≈ 500 m/s); (3) several equatorwards propagating LSTIDs with typical wave parameters (wavelength: ≈ 2100 km, period: ≈ 60 min, speed ≈ 600 m/s). The first two phenomena are rather unusual in their appearance. They occurred during the partial recovery phase while geomagnetic perturbations were minor and IMF turned northward. The first perturbation signature, which indicates a sudden TEC depletion, is considered to be excited by a westward prompt penetration electric field. Variations in the Lorentz force due to perturbed electric fields and a minor particle precipitation effect are extracted as possible excitation mechanisms for the second LSTID type. Third type of LSTIDs is considered to be excited as most LSTIDs either due to variations in the Joule heating or variations in the Lorentz force.