



Unusual enhancement in the perturbation component of GPS-TEC during a cyclonic storm KYANT observed from more than 100 GNSS station over the Asian Region

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Abstract

An investigation of a cyclonic storm KYANT (21-26 October 2016) is performed using observation from 110 GPS stations located in the vast Asian region covering Indian sector to understand the effect of the cyclones on the ionospheric TEC (total electron content). The GPS-TEC variations are detrended using a band pass filter at different bands to obtain the dVTEC and 2-D ionospheric maps are generated using the ionospheric pierce points at every 30-sec interval. A temporal sequence of the 2-D images of the ionospheric TEC perturbations is then generated to obtain a movie for a duration of more than 4-7 days considering the severity of the cyclonic storm. Some very interesting features of travelling ionospheric disturbance (TID) are observed which will be shown through a movie of the variations of dVTEC. The ionospheric features are further investigated using several other observations from SWARM and TIMED-GUVI satellite to find a possible ionospheric source of the TIDs. The GPS stations, which are mostly located in the west side of the eye of the cyclone, recorded a west-poleward propagating TID structure in the VTEC, which however was suddenly stagnated at around the crest of the anomaly region in the west Indian sector.

It is interesting to note that a minor Geomagnetic storm also occurred which caused an equatorward propagating unusual enhancement on 26 October 2016 at around 02:00 UT in a region enclosed by 20°-40° N and along 70° E longitude in the Asian latitude sector. Majorly, 4 different PRNs have shown the perturbation stagnation which are possibly sourced from the cyclone generated gravity waves, which later turned into geomagnetic storm generated MSTIDs. The interesting geophysical phenomena will be discussed using multiple data sets.

Keywords: Cyclon, Low latitude Ionosphere, GPS-TEC, Geomagnetic Storm, minor storm