URSI GASS 2020, Rome, Italy, 29 August - 5 September 2020

A correlational study between the Rate of Total Electron Index and the Travelling Ionospheric Disturbance in low latitude region during the 24th solar cycle magnetic storms (2013 – 2017)

Osei-Poku Louis *(1), Long Tang (1, 3), Wu Chen(1) and Mingli Chen(2)
(1) Department of Land Surveying and Geo-Informatics, The Hong Kong Polytechnic University, Kowloon, Hong Kong, e-mail: louis.oseipoku@connect.polyu.hk; wu.chen@polyu.edu.hk
(2) Department of Building and Services Engineering, The Hong Kong Polytechnic University, Kowloon, Hong Kong; e-mail: mingli.chen@polyu.edu.hk
(3) School of Civil and Transportation Engineering, Guangdong University of Technology, Guangzhou, China; email: ltang@whu.edu.cn

Ionospheric responses to weather events always are of interest to researchers because of the negative effects they pose to the radio, navigation and communication links. In the instance of Global Navigation Satellite Systems (GNSS), the change in carrier phase can result in cycle slips or loss of lock between the satellite and receiver. This can lead to large positional errors. GNSS on the other hand has become useful tools in studying the behaviour of the ionosphere. The double difference technique of the L1 and L2 frequencies has generated the integration of the electron density along the signal path. The result obtained is the Total Electron Content (TEC). By knowing the TEC and any changes to it, the spatial and temporal pattern of the ionosphere can be detected.

The weather events generate atmospheric gravity waves (AGWs) that cause Travelling Ionospheric Disturbance (TID) and change the Rate of Total Electron Content (ROTI). TID and ROTI are two indices in detecting ionosphere behavioral changes. In this study, the correlation between the TID and ROTI value in low latitude region during magnetic storms in the 24th solar cycle (2013 – 2017) has been investigated. The results indicate that an eastward polarized Prompt Penetration Electric Field (PPEF) from a geomagnetic storm contributes to a higher value of ROTI > 0.5 TECU (1 TECU = 10^{16} el m^{-2}), while a westward polarized PPEF inhibits the ROTI disturbance. The TID always links to a higher magnetic index representing the presence of a geomagnetic storm, indicating that the TID is directly related to the geomagnetic storm.