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B2 thickness parameter response to Equinoctial geomagnetic storms

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ABSTRACT

Most of the ionospheric empirical models make use of thickness parameters to characterize the shape of an electron density profile. These thickness parameters are generally defined by empirical relations related to ionogram characteristics. For instance, Mosert de Gonzalez and Radicella (1990) related their empirical formulation to the inflection point, called by them "base point" that is found in both the experimental and the theoretical profile of the electron density. The "base point" (bp) corresponds to the maximum gradient of the electron density below the peak of the F2 layer. NeQuick model (Radicella and Leitinger, 2001; Nava et al, 2008) uses this "bp" as an anchor point to define a thickness parameter of the F2 bottomside of the electron density profile, which is named B2.

In the present paper we selected three ionospheric storms occurring during the same season (Equinox), all of them developed after a magnetic quiet period and with an onset time between 02 and 06 UT. The three events are those of March 17th, 2013; October 2nd, 2013 and March 17th, 2015. After an analysis of the total electron density (TEC) data from global ionospheric maps (GIM) we have found that the ionospheric effects of these storms have exhibited similar patterns. We analyzed the B2 behavior before, during and after the aforementioned events,

together with vertical TEC (VTEC) and NmF2 variations over about 20 stations at middle and low latitudes of different longitude sectors.

The results show in general two distinct types of responses after the onset of the geomagnetic events: a peak of B2 prior to the increase of VTEC and NmF2 (in 60% of the cases); and a fluctuating B2 associated to decrease of VTEC and NmF2 (25% of cases). A number of observations correspond to stations where the ionosphere does not appear to be affected by the storms and other complex cases.

The behavior observed in view of the dominant factor acting after the CME shocks, namely during positive and negative storms effects is discussed. To investigate the time of response of the different measurements according to location, data series were subsequently analyzed and correlated.

Key words: ionospheric empirical models, geomagnetic storms, thickness parameter, TEC

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