



Global empirical model of TEC response to geomagnetic activity: Short-term (24 hours ahead) prediction model

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A global empirical model of the $r\text{TEC} = (\text{TEC}_{\text{obs}} - \text{TEC}_{\text{med}}) / \text{TEC}_{\text{med}}$ depending on the geomagnetic activity (described by the Kp-index) and at a given moment is built by using global TEC data for full 13 years between 1999 and 2011. The data are downloaded from the CODE (Center for Orbit Determination in Europe) database in the Astronomical Institute, University of Bern. By using a 2D cross-correlation analysis it is found that the ionospheric response to the geomagnetic activity revealed both positive and negative phases of the response. The both phases of the ionospheric response have different duration and time delay with respect to the geomagnetic storm. It was found that these two parameters of the ionospheric response depend on the season, geographical/geomagnetic coordinates and local time. The $r\text{TEC}$ response is represented by 2D (longitude-time) sine waves with different zonal wavenumbers and periods being harmonics of the diurnal period. The input data for the current and predicted geomagnetic activity are obtained from the MAK model developed in NIGGG-BAS, which uses the solar wind measurements from the ACE satellite. The background condition is defined by the recent CODE TEC maps. For each current hour the model provides predicted global TEC maps in geographic frame for the next 24 hours.