**Reference responses of regional electron content to isolated magnetic storms**

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The paper presents an analysis of reference responses of regional electron content to isolated magnetic storms. The calculation of reference responses of the regional electron content to isolated magnetic storms was implemented in three stages. The first stage was to identify geomagnetic storms using the AE index. An event was considered as a geomagnetic storm if two criteria were met: (1) AE(t0) is the largest AE value in the time interval t0 ± 12 hours, and (2) AE(t0) ≥ 930 nT, where t0 is the time corresponding to the AE maximum. In further analysis, we considered only isolated storms, i.e. storms for which the interval between adjacent events was greater than or equal to 5 days. As an ionospheric characteristic, we used the regional electron content (REC), which is the average total electron content (TEC) for five latitude zones in the corrected geomagnetic coordinate system: the mid-latitude zones in both hemispheres, the high-latitude zones in both hemispheres, and the equatorial zone. The relative (percentage) deviation of observed values from the 27-day running average REC was used to calculate disturbances of REC (dREC). The reference response was calculated by averaging dREC using the superimposed epoch method with key moments corresponding to the AE maximum for the winter, spring, summer and autumn storms. Analysis of reference responses showed that they can be divided into three types: A-type, N-type, and V-type. The A-type responses are predominantly positive disturbances and are observed at the equatorial latitudes for all seasons, at the mid-latitudes for local winters, and at the high latitudes for local winters in the Northern Hemisphere. The N-type responses are disturbances that have a well-defined positive and negative phase, they are observed at the mid-latitudes for spring, autumn and summer, at the high latitudes for spring and autumn, and at the high latitudes for local winter of the Southern Hemisphere. The V-type responses are predominantly negative disturbances and are observed at the high latitudes for local summer.

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