



Behavior of the ionosphere over Europe during two geomagnetic storms which caused tongues of ionization over North America.

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This work presents the effect of two geomagnetic storms on the ionospheric total electron content (TEC) over Europe. Those geomagnetic storms occurred on July 14th, 2013 and February 19th, 2014 and originated a tongue of ionization over North America.

Following the criteria of Gonzalez et al.(1994), the July storm can be classified as a moderate one because the Dst index reached a value of -72nT , whereas the February storm as an intense event considering that Dst index dropped to -112nT .

For this study we have used RINEX files obtained from GNSS stations belonging to International GPS Service, IGS, EUREF Permanent Network, and University Navstar Consortium, UNAVCO, networks. The data has been divided into two groups in function of the region: Europe or North America. For each group we have used all the available stations. The RINEX files have been processed using a technique developed by Ciraolo (2012) which assumes the ionospheric thin shell model to obtain the vertical total electron content (vTEC) from the slant total electron content (sTEC) at the Ionospheric Pierce Point, IPP, the point where the line-of-sight between the satellite and the ground receiver intersects the ionosphere. The data were obtained at 1 minute sampling in periods of geomagnetic storms and quiet days close to them.

In both storms a tongue of ionization, ToI, appeared over North America from afternoon to dusk (between 19:00 and 3:00 GMT). The behavior of the ionosphere over Europe was very different in eachcase. In July, the TEC decreased respect the quiet days during the ToI time. In the February storm the behavior of the ionosphere over Europe was similar to that of a quiet day but the following day appeared a phenomenom similar to the ToI.

Ciraolo, L. (2012). Ionospheric Total Electron Content (TEC) from Global Positioning System. Personal Communication.

González, W.D., Joselyn, J. A., Kamide, Y., Kroehl, H. W., Rostoker, G., Tsurutani, B. T., Vasyliunas, V. M. (1994). What is a Geomagnetic Storm?. *J. Geophys. Res.*, 99, 5771–5792, doi:10.1029/93JA02867.