

# Ionospheric irregularities over Bahir Dar, Ethiopia during selected geomagnetic storms

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## Abstract

We have analyzed the effect of geomagnetic storms on the occurrence of ionospheric irregularities by considering seven case studies in the period of 2013-2014 over Bahir Dar, Ethiopia ( $11^{\circ}\text{N}$ ,  $38^{\circ}\text{E}$ ). We inferred the irregularity indices from GPS phase fluctuation by computing the median of 1-min rate of change of total electron content ( $f_p$ ) along the ray paths from all satellites observed. The  $F_p$ -index was calculated as an hourly average  $f_p$ -index values along the ray paths from all satellites observed during each hour. Our results revealed that the irregularity level was inhibited during post sunset hours of the main phase of the storms we considered. On average, the irregularity index has dropped from 400 TECU/min (quiet time) to 50 TECU/min (disturbed time) with an amount of 350 TECU/min. However, in some of the cases, immediately after the onset of the storm, we observed the enhancement of irregularities. We found that only the observations on 01 June 2013 and 19 February 2014 exhibited a correspondence of the time of occurrence of the minimum of the Dst-index with inhibition of irregularities noted by other researchers. Our observations of the enhancement of irregularities on 17 March 2013 and 19 February 2014 can partly be explained by the orientation of the IMF BZ. Other measurements such as neutral wind, electric field are required to explain the observations on 29 June 2013, 06 July 2013, 09 November 2013 and 27 February 2014.

**Keywords:** Ionospheric irregularity, Geomagnetic storm, Rate of change of TEC