

Ionospheric response to the October 2003 geomagnetic superstorm in the South American-Atlantic sector

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The major geomagnetic storm that started at 0611GMT on 29th October, 2003, in response to the solar event that occurred on the day before, has affected the earth ionosphere at a broad range of latitudes and longitudes. Drastic and peculiar effects were observed at the equatorial and low latitude ionospheric F region a few hours following the storm onset and also in the following days. In this work we analyze ionograms from a chain of Digisonde stations in the South American-Atlantic (280° - 345°E) longitude sector in order to study the ionospheric response to the intense solar event. Less than two hours after the storm onset, an unusual early morning enhancement of the equatorial ionization anomaly was observed at the three ionospheric stations located at or close to the equatorial anomaly crest Tucuman (TU, 26.9° S, 294.6° E, dip: -26.24°), Cachoeira Paulista (CP, 22.5° S, 315° E, dip: -32.9°) and Ascension Island (AI, 7.95° S, 345.6° E, dip: -37.8°). The anomaly intensification was more pronounced at TU and CP, where the F layer peak electron density increased from 1.1×10^5 el.cm⁻³ to 2.8×10^6 el.cm⁻³, than at AI. The most striking fact about this intensification is that it occurred just before sunrise at TU and around sunrise at CP, when the conditions for the fountain effect are not set yet. Another striking effect of the magnetic storm was the spectacular uplift of the F layer around sunset on 30th October, at the equatorial station São Luís (SL, 2.6° S, 315.8° E, dip: -2.6°), where the F layer trace disappeared from the ionogram by ~45 min. because it was above the 1200 km Digisonde upper sounding limit. This effect was more pronounced at SL and CP than at Jicamarca, TU and AI. The observed results will be discussed in terms of disturbance electric fields and winds, and their local time, latitude and longitude dependence.