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# Can Geomagnetic Storms Affect Stratospheric O<sub>3</sub> and NO<sub>x</sub> in the South Atlantic Anomaly Zone?

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## Abstract

The low magnetic field in the South Atlantic Anomaly (SAA) zone facilitates the entrance of high-energy particles from the magnetosphere. When particles that are drifting in closed orbits around the Earth reach the SAA zone, they can be quasi-trapped instead of being trapped in a stable way or precipitating. The effects over the total column ozone (TCO), NO<sub>x</sub> (=NO + NO<sub>2</sub>) and ozone profiles in the SAA zone during and after two intense geomagnetic storms that occurred during solar cycle 23 are analyzed in this work. The two periods occurred on November 20, 2003, and on November 08, 2004, during spring in the South American sector. Data of the Total Column Ozone Mapping Spectrometer (TOMS), Solar Backscatter Ultraviolet (SBUV) Merged Ozone Data and Upper Atmosphere Research Satellite (UARS-HALOE) are used. Three stations located in the SAA zone are chosen for the analysis with TOMS and SBUV data. During both storms, a statistically significant TOC decrease is observed. In the 2003 storm, the decrease reached values between -4.4 % and -6.0% one week after the day of the minimum value of the disturbance storm time (Dst) index, and in the 2004 storm the decrease is observed on November 17, with a value of the order of -4.0% over the three stations. In the case of ozone profiles from SBUV data, between 0.639 hPa and 101.3 hPa, a significant increase at middle stratospheric heights during both storms is detected. The following days also show significant decreases in the middle and lower stratosphere for the 2003 storm. On the other hand, from UARS-HALOE data, we observe that for both storms, the profiles of the relative difference of NO<sub>x</sub> show significant increases between 25 and 40 km, but ozone profiles do not present significant changes for the analyzed storms

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