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Thermospheric neutral density variation during extreme solar events from CHAMP accelerometer data

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The CHAMP satellite is a low Earth orbiting mission with the objective of a precise determination of the Earths gravity and magnetic field. Among other instruments it carries a high-precision accelerometer on board which is used in this study to investigate the temporal and spatial variation of the atmospheric density in a height of about 400 km. We analyze CHAMP uncalibrated accelerometer and orbit ephemeris data and correlate the atmospheric drag forces with orbit height, geographic latitude and local time. We further compare the absolute density values derived from in-situ measurements with the Mass Spectrometer Incoherent Scatter 1990 (MSIS90) model. In particular we focus on the variation of the neutral atmospheric density during the extreme solar events occurring at the end of 2003. These Halloween events caused periods with magnetic activities up to Kp values of 9 which induced density enhancements up to about 300% compared to quiet conditions.