



## **Impact of coronal mass ejections on the Earth's thermosphere and geoeffectiveness observed by ACE and GRACE: Statistical results**

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For the period July 2003 to August 2010, the interplanetary coronal mass ejection (ICME) catalogue maintained by Richardson and Cane lists 106 Earth-directed events, which have been measured in situ by plasma and field instruments on board the ACE satellite. We present a statistical investigation of the Earth's thermospheric neutral density response by means of accelerometer measurements collected by the Gravity Recovery And Climate Experiment (GRACE) satellites, which are available for 104 ICMEs in the data set. We relate the thermospheric density increase to various geomagnetic indices (e.g. Dst, AE, Kp, a-indices, ...) and characteristic ICME parameters (impact speed, southward magnetic field strength Bz).

We find high correlations between the ICME Bz and thermospheric density enhancements as well as with most of the geomagnetic indices. Separating the response for the shock-sheath region and the magnetic structure of the ICME, we find for instance that the Dst and SYM-H indices reveal a tighter relation to the Bz minimum in the magnetic structure of the ICME, whereas the polar cap indices show higher correlations with the Bz minimum in the shock-sheath region.

These results are expected to further stimulate progress in space weather understanding and applications regarding satellite operations.