



Impact of solar and geomagnetic activity on thermospheric density during ESA's mission GOCE

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The impact of solar activity on thermospheric density during ESA's gravity mission GOCE has been investigated using different solar and geomagnetic indices. The analysed period (17 March, 2009 - 11 November, 2013) corresponds to the rising phase of solar cycle 24.

Thermospheric density at a mean altitude of 254 km, derived from the high-precision accelerometers on board the GOCE satellite, represents a unique low-altitude dataset.

The temporal behavior of Ap geomagnetic index and solar activity indices, i.e. the F10.7 flux and the Mg II core-to-wing ratio, have been examined and their correlations with GOCE thermospheric density studied. Then, solar indices have been decomposed into a set of modes, i.e. the intrinsic mode functions (IMFs), through the Empirical Mode Decomposition (EMD), a technique best suited in analysing non-stationary and non-periodic time signals.

After the decomposition, certain subsets of of IMFs from the solar and geomagnetic indices and thermospheric density have been reconstructed and compared with the original GOCE dataset. The results suggest the relevance of using the Mg II index and EMD IMFs in describing the solar-thermospheric connection and reconstruct thermospheric density.