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Worldwide correlation between earthquakes and electromagnetic anomalies from satellites

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A possible coupling between ionosphere and lithosphere has been intensely investigated in the last years. In particular, some studies attempt to use the information about electromagnetic anomalies measured from satellite to increase the performance of the earthquake forecasting models.

Some of these studies are focused on the precursors of few big earthquakes, while other studies try to investigate the problem in a global prospective: in both cases it seems to be a lack of proper statistical testing of the hypothesis of correlation between earthquakes and electromagnetic anomalies.

This study approaches the problem putting the hypothesis of correlation in a testable manner.

We analyze the correlation between earthquakes and electromagnetic (i.e. magnetic and electron density) anomalies from DEMETER and SWARM satellites by counting the number of anomalies that fall inside the Dobrovolsky area (and its fractions) before and/or after the occurrence of M5.5+ earthquakes in the global CMT catalogue.

We do not perform any preselection of earthquakes, and we carefully avoid the problem of double counting of anomalies (e.g. working with a declustered catalogue).

Our final result is that there is a clear statistically significant correlation between earthquakes and electromagnetic anomalies detected from space.