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Integrated analyses of satellite and seafloor magnetic observations for searching possible seismogenic signatures

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Large seismic events can shake the Earth so much that they can cause many other phenomena such as abrupt changes in regional topography, free oscillations or even modifications in some of the Earth's geophysical properties.
Among the most energetic seismic events occurred in the last forty years there are those located in the Sumatra region from December, 2004 to March, 2005 causing relevant free oscillations whose effects were felt up to hundreds kilometers of height in ionosphere probably through propagation of acoustic gravity waves, affecting, for instance, the Total Electron Content (TEC) along the pathway of GPS signals.
The aim of this study is the identification of anomalous magnetic signals in seafloor and satellite data in correspondence with a strong earthquake, possibly caused by Earth's free oscillations within an almost static geomagnetic field due to Sumatra earthquakes. The search of these anomalies is performed by means of careful comparisons between spectral analyses of both daily seafloor and satellite magnetic data coming from ORION-GEOSTAR3 2003-2005 deep seafloor mission in Southern Tyrrenian Sea and CHAMP satellite (2000- present), respectively. These analyses are challenging because of the expected small amplitude but large lateral scale signatures that must be extracted from the numerous natural background signals, and the influences on magnetic field data exerted by so different environments must be taken into the due account.