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The reliability of the seismo-magnetic method derived from ULF/ELF observations by the South European Geomagnetic Array (SEGMA)

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In the frame of the South European GeoMagnetic Array (SEGMA) project magnetic field variations are studied in the frequency range from several milli-Hz to several Hz.
The fluxgate and induction coil magnetometers are located in Italy, Bulgaria and Hungary.
The scientific objectives comprises field-line resonances, space weather phenomena and seismo-magnetic (SM) studies.
In our present study on the reliability of the seismo-magnetic method we emphasize on the influence of external non-seismic sources on the quality of seismo-magnetic studies.
External magnetic sources include lightning, power lines, railway and traffic as well as geomagnetic variations of magnetospheric origin.

We observe anomalies of the ratio of the vertical to horizontal magnetic field component in the ultra/extreme-low-frequency (ULF/ELF) frequency range up to several Hz [2]. These signals can be produced in the lithosphere near a seismic active region and are interpreted as earthquake precursors. In order to differentiate geomagnetic from seismo-magnetic fluctuations, we use mainly observations around midnight because the night time geomagnetic fluctuations are much smaller than during day time. The SEGMA network provides the unique opportunity to use multipoint observations, which are also useful to distinguish local from global phenomena.
In order to get undisturbed magnetic field observations, the stations are located outside populated areas [2].
The electrical conductivity of the soil in the vicinity of magnetometers on the terrestrial surface is a further source for interferences. This type of disturbances caused by induced electrical currents can be minimized either by a careful selection of the magnetometer site ans/or by the measurement of the conductivity profile in the vicinity of the instrument site.
In the frame of the investigation of the April 6, 2009 L'Aquila earthquake magneto-telluric methods have been used to measure the conductivity profile near the epicenter of the earthquake and thus correct the observed magnetic field fluctuations [1].
A further interference source which can reduce the sensitivity of the seismo-magnetic methods (SM) is the mechanical vibration of the magnetometer sensors.
We present a SM reliability number taking into account all above mentioned interference sources.
The SM number can be used to improve the sensitivity of the seismo-magnetic method.

References

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