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Seismo-magnetic multi-point ULF studies before the 2009 L'Aquila earthquake using the South European GeoMagnetic Array

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A strong earthquake (Ml=5.8, Mw=6.3) hit L'Aquila (Central Italy, Abruzzo region, LT=UT+1) on April 6, 2009, 01:32 UT, causing more than 300 deaths. We present a seismo-magnetic analysis of local ULF measurements for the time period one year before the main stroke. As part of the South European GeoMagnetic Array (SEGMA) the evaluated station L'Aquila in closest distance to the epicentre of the main seismic event is $\sim$ 6 km. We consider three further SEGMA stations: Castello Tesino, Ranchio (both Italy) and Nagycenk (Hungary) for comparison and the Kp geomagnetic index to distinguish local- , global- and geomagnetic effects. Further local seismic activities are respected. The instrumentation consists of fluxgate magnetometers with a sampling frequency of 1 Hz. Concerning signal processing the standardized polarization method was applied based on the ratio between the vertical and horizontal power spectral density. A frequency band from 10-100 mHz focused on 10-15 mHz was used during the nighttime period from 22.00 – 02.00 UT. The polarization analysis was introduced and applied for previous seismic events by Hayakawa et al., GRL, 23, 241, 1996.; Molchanov et al., GRL, 19, 1495, 1992.; Prattes et al., NHESS, 2008. A sophisticated method was performed by Ida, et al, NHESS, 2008. With these calculations we expect clearer precursor signatures and they could contribute to EQ forecast. The results are explained using a simple source magnetic dipole model near the EQ focus. The results obtained are explained by the attenuation in the electrical conductive lithosphere.