Geophysical Research Abstracts
Vol. 12, EGU2010-9167, 2010
EGU General Assembly 2010

ELF signals and EQLs in Central Italy in 2009

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Instrumental studies of earthquake electromagnetic phenomena began in the 1800's in Italy. These studies were inspired by several observations reported on in the XVIII century collections of earthquake phenomena and the inventions of the first electric and magnetic instruments. From about fifteen years ago in Italy a VLF electromagnetic monitoring which concerns sub ionospheric channel of propagation has been active. It has produced interesting results in connection with seismic activity. Recently, a continuous monitoring of LF, ELF and SLF electromagnetic signals was started in Central Italy. This was done to verify the usefulness of this research field so to understand earthquake processes and forecasting. The first station started operating near the city of Fermo, in the Marche region in 2006; while a second station started operating in Perugia, in the Umbria region in 2008. The Fermo station was initially set up with only a low frequency amplifier but from mid 2007 it has also been equipped with a long wave radio receiver tuned at 150 KHz. The electrode and the antenna are oriented along a north-south direction. Signals are recorded in wave and spectral image files through a maximal sample frequency of 2-5.5 KHz, so that a maximum signal frequency of 1-2.75 KHz can be analysed, while minimum frequency is limited by amplifier band equal to 4 Hz. The Perugia station was set up with a couple of low frequency amplifiers which work on two orthogonal electrodes, oriented along north-south and east-west directions. At this station the maximum sample frequency is 2-22 KHz so a maximum signal frequency of 1-11 KHz can be analysed, while minimum frequency is limited to 4 Hz. Several signals were recorded before and after the Aquila earthquake and on the occasions of other central Italy seismic swarms in 2009. Here the search for a physical link between seismic events and electromagnetic signals is being carried out. At the opposite end of the electromagnetic spectrum several luminous phenomena were observed near Aquila before and after the main shock of April 6, 2009. A seven month collection of earthquake experiences on the the Aquila region, which was mainly obtained by interviews, allowed for a collection of 280 candidate EQLs. Testimonies reported seeing exceptional sightings of light glows, flashes, lightning, flames and fireballs. Witnesses often shared the same phenomena experiences at different locations. The geographical distribution of the sightings covered a large area around the city of Aquila, with a major extension in the northern region of Abruzzo, up to about 50 km. From this collection, two particular forms of lights were selected, electric discharges and flames, which were compared with the regional morphology. Seeing that major strong earthquakes in Italy have been preceded by weak seismic activity, which have not always culminated in strong shocks, both a continuous monitoring of electromagnetic signals and a temporary video network could be useful to have a possible idea if a strong seismic event is looming.