Perturbations of Intensity of ELF/VLF Emissions in the Vicinity of Earthquakes: a Statistical Study

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Abstract

We present a statistical study of intensity of ELF/VLF (up to 10 kHz) electromagnetic waves observed by the DEMETER spacecraft (altitude of orbit 700 km) in the vicinity of earthquakes. All the data recorded since the beginning of the mission (June, 2004) up to now have been used and a specially developed two-step data processing method has been applied. In the first step, a map of electromagnetic emissions containing a statistical description of wave intensity at a given point of the orbit under given conditions is constructed. In the second step, the wave intensity observed close to the earthquakes is evaluated by using the expected values of intensity obtained in the first step. This enables us to evaluate changes of wave intensity connected to the seismic activity and their statistical significance. It is shown that during the night there is a statistically significant decrease of wave intensity shortly (0-4 hours) before the time of the main shock. The spatial scale of the affected area is of the order of several hundreds of kilometers. No similar effects have been observed during the day. We have thoroughly checked the individual orbits that are responsible for the observed decrease of wave intensity and we suggest a possible explanation of the observed effects.