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Radio-anomalies and acoustic emissions for the teaching of Seismology

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Since 2009 in Italy, experimental research [1] has focused on establishing potential relationships between the emission of electromagnetic and acoustic signals and earthquakes or geophysical events of significance on a global scale.

The devices used in the monitoring stations of Rome and Rovigo can be recreated and scaled preserving their efficiency in a school laboratory by the students—costs are reduced when having a computer and an Internet connection at your disposal.

Without any direct observation of crustal efforts, geophysics rests on "abstract" elements and indirect measures to interpret the underground stress.

It is necessary, therefore, to find diagnostic tools for the evolution of the Earth's crust even in absence of earthquakes—diagnostics on the state of the crust is essential, as well as on the way its efforts propagate on a global scale [2].

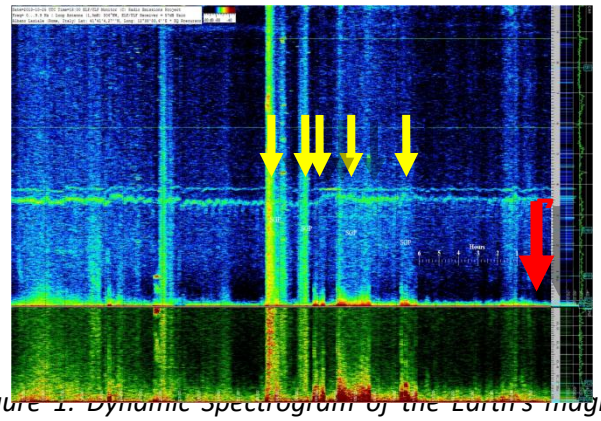

Figure 1: Dynamic spectrogram of the Earth's magnetic field. The picture shows the variation of the geomagnetic field at a frequency between 0 and 9,9Hz (SELF-ELF Band) in the hours leading up to the M7.1 Japanese earthquake in 2011 (vertical red arrow). The vertical yellow arrows indicate very intense radio anomalies a few hours before the earthquake.

This original and innovative instrument can real time monitor the evolution of crust efforts on a global scale with the use of low-cost acoustic probes and the detection of magnetic variations through the analysis of specific radio-anomalies, the latter linked also to pre-seismic tensions [3]. The use of a seismometer, which can be produced in a laboratory at low costs as well, allows to check the occurrence of an earthquake on a global scale, also verifiable on the website. Laboratory experiments proposed in this study have proved intriguing, arousing curiosity and interest in the students, which are the basic requirements for scientific investigation. Workshops and lab experience, in addition to opening a new challenge for the teaching of geophysics in secondary school, can be suitable for interdisciplinary projects.

References:

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