



## **Study of VLF/LF wave propagations above seismic areas**

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We report on radio transmitter signals recorded in Europe by INFREP network which is mainly devoted to search for earthquakes electromagnetic precursors (Biagi et al., 2011). We consider in this analysis the detection of transmitter signals recorded by INFREP receivers located in different regions of Europe, i.e. Romania, Italy, Greece and Austria. The aim is the investigation of the electromagnetic environment above earthquakes regions. We selected seismic events which occurred in the year 2016 and characterized by a moment magnitude ( $M_w$ ) above 5.0 and a depth of less than 50 km. A common method is applied to all events and which involves the analysis of the VLF/LF signal detection taking into consideration the following parameters: (a) the distance transmitters-receivers, (b) the signal to noise ratio during the diurnal and night observations, (c) the daily and night averaged amplitude and (d) the sunset and sunrise termination times. This leads us to specify the key factors which can be considered as criteria to distinguish and to identify earthquakes precursors. We discuss in this contribution the radio wave propagation in the D- and E-layers and their impacts on the VLF/LF amplitude signal. We show that the 'seismic anomaly' requests a more precise analysis of the 'quiet' and 'disturbed' ionospheric conditions and their corresponding spectral traces on the VLF/LF transmitter signals.

Biagi, B.F., T. Maggipinto, F. Righetti, D. Loiacono, L. Schiavulli, T. Ligonzo, A. Ermini, I. A. Moldovan, A. S. Moldovan, A. Buyuksarac, H. G. Silva, M. Bezzeghoud, and M. E. Contadakis, The European VLF/LF radio network to search for earthquake precursors: setting up and natural/man-made disturbances, *Nat. Hazards Earth Syst. Sci.*, 11, 333–341, 2011.