Evaluation of disturbances detected on a VLF/LF receiver of earthquakes with similar characteristics in different points in time.

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This work investigates disturbances received prior to the occurrence of 2 earthquakes that took place during November 2016 (10-11-2016, mb=4.8, 18-11-2016, mb=4.9, with depths 8km) and compares them with 2 similar earthquakes that took place in December 2017 and January 2018 (31-12-2017, mb=5, 02-01-2018, mb=5.1 with depths 5km) and epicenters around 20km from each other, in Thessaloniki, Greece.

The occurrence of two distinct and separate seismic events that both took place 30km to 50km from a VLF/LF receiver, well inside the preparation zone, according to Dobrovolsky's equation, has provided a valuable opportunity to firstly be able to evaluate and demonstrate the repeatable and thus objective nature of the precursors, in two different earthquakes, with similar characteristics and secondly to evaluate the method that has been developed, to process and analyze the precursors as they are recorded on a VLF and LF receiver network. Lastly, the repetition of two similar events in different times allows us to evaluate the capabilities of the installed network of receivers and of the methodology of the analysis and assessment of the results and clearly assess the potential detection of further phenomena in the future.

For the purpose of this paper, data acquired in Thessaloniki, Greece (40.59N, 22,78E) from ten VLF and LF transmitters around Europe are processed.

The receivers have been developed by Elettronika Srl and are part of the International Network for Frontier Research on Earthquake Precursors (INFREP).

The signals undergo transformation using a noise assisted version of the Hilbert Huang Transform (HHT) using the Complete Ensemble Empirical Mode Decomposition with Adaptive Noise (CEEMDAN), and on the product of this transformation, a developed method of Differential Analysis is applied, and the results presented.

Based upon the results, which are characterized by a repeatable and robust method of analyzing earthquake precursors, the merits of a dense receiver network is evaluated.