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On the observed EEP signal attributed to the Kythira *M* 6.9 earthquake in January 2006

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Abstract

This research work investigates the nature of the electric earthquake precursor (EEP) accompanying the M 6.9 Kythira earthquake on the 8^{th} of January, 2006, with the epicentre located at 36.31˚N, 23.25˚E in the vicinity of the Southern Hellenic arc. The study of characteristic features of the recorded EEP transient signal supports the authors' thesis [1,2,3,4] regarding the nature of EEP signals and their generation mechanism, which can be explained on the basis of the propagating cracks theory [5,6]. It is suggested that EEP signals are preseismic and/or co-seismic transient electrical potential anomalies superimposed to the Earth's electromagnetic field of ionospheric origin, observed upon surface measurements of the Earth's electric field. A significant indication towards that direction is the fact that the EEP signal accompanying the Kythira earthquake was solely and clearly observed upon the surface recordings of the measured electric field whilst there was no detected corresponding variation upon the simultaneous recordings of the magnetic field. This observation seems to be in contradiction with several of the existing models aiming to describe preseismic electromagnetic phenomena [7,8,9]. To strengthen the argument that EEP signals are extrinsic to the natural electric field of the Earth due to ionospheric disturbances, we implemented a pattern recognition application with the incorporation of neuro-fuzzy technology to the time-series of the measured electric field. A neuro-fuzzy model has been trained to predict [3,4] the recorded electric field signal during time-periods of minimal regional seismic activity. Following successful training, the activation of the neuro-fuzzy model upon the electric field recordings around the time of the Kythira earthquake resulted

in the rejection of the observed EEP signal from the surface electric field recordings. The neuro-fuzzy model has 'decided' that the observed variation is not part of the Earth's electric field fluctuations due to ionospheric variability, thereby considerably suppressing the variation at its output. The behaviour of the neuro-fuzzy model, and the fact that the EEP does not appear upon the corresponding magnetic field recordings, lead the authors to present a scientific hypothesis regarding the nature of this particular EEP signal discussing a possible physical generation mechanism producing such a signal and its relation to the propagating cracks theory.

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