



A Comparative study of VLF and LF disturbances prior earthquake events by the use of Hilbert-Huang Transformation

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It is well known that the lower ionospheric layer acts as a waveguide for the VLF and LF radiowaves. In the frame of the International Network for Frontier Research on Earthquake Precursors (INFREP) an Elettronica radio receiver was set in operation in Thessaloniki-Greece, in order to collect the VLF-LF signals transmitted by ten stations across Europe. The sampling rate was one-minute. The collected signal samples were analysed using the Hilbert-Huang transformation (HHT).

More specifically the VLF and LF variations during three earthquakes were analysed; (1) the earthquake at Peshkopia-Albania (6 September 2009, Long. 41.62, Lat. 20.41, 5.4 R, 10 km depth) at a distance of 242.45 km from Thessaloniki; (2) the earthquakes at Libolesh-Albania (12 September 2009, Lat. 41.49, Long 20.44, 4.2 R, depth 13 m) 228 km away from Thessaloniki and (3) the Durres-Albania (15 September 2009, Lat. 41.42, Long 19.16, 4.0 Richter, depth 33 km) 329 km away from Thessaloniki. The results of our analysis indicate that: a) The VLF signal variations seem to be stronger compared to the LF ones when the earthquakes are stronger, whereas the opposite seems to hold for weaker earthquakes. b) The HHT analysis used to denoise the signals indicated that the first 4 or 5 IMFs represent noise in these three case studies. In concluding we may say that it is possible to distinguish ionospheric precursor phenomena from natural noise using HHT analysis.