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Discrimination between preseismic electromagnetic anomalies and solar activity effects

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Abstract.

Laboratory studies suggest that electromagnetic emissions in a wide frequency spectrum ranging from kHz to very high MHz frequencies are produced by the opening of microcracks, with the MHz radiation appearing earlier than the kHz radiation. Earthquakes are large-scale fracture phenomena in the Earth's heterogeneous crust. Thus, the radiated kHz-MHz electromagnetic emissions are detectable not only at laboratory but also at geological scale. Clear MHz-to-kHz electromagnetic anomalies have been systematically detected over periods ranging from a few days to a few hours prior to recent destructive earthquakes in Greece. We bear in mind that whether electromagnetic precursors to earthquakes exist is an important question not only for earthquake prediction but mainly for understanding the physical processes of earthquake generation. An open question in this field of research is the classification of a detected electromagnetic anomaly as a pre-seismic signal associated to earthquake occurrence. Indeed, electromagnetic fluctuations in the frequency range of MHz are known to related to a few sources, i.e., they might be atmospheric noise (due to lightning), man-made composite noise, solar-terrestrial noise (resulting from the Sun-solar wind-magnetosphere-ionosphere-Earth's surface chain) or cosmic noise, and finally, lithospheric effect, namely pre-seismic activity. We focus on this point. We suggest that if a combination of detected kHz and MHz electromagnetic anomalies satisfies the herein presented set of criteria these anomalies could be considered as candidate precursory phenomena of an impending earthquake.