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Ground-based monitoring technique used to emphasize the precursory electromagnetic marks associated to the Vrancea's intermediate depth earthquakes (Romania)

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Despite the significant advances obtained in the earthquakes prediction theory, the basic physics underlying this natural hazard is still unknown enough and many critical questions, concerning the geodynamic processes governing the nucleation phase, the time and space dynamics of the seismic sequences, and whether their geophysical marks are possibly detectable, remain unanswered. However, up to day, a lot of innovative and emerging ground-based and satellite electromagnetic techniques are available and can play an important role in emphasizing the precursory phenomena/ parameters related to seismic events. The aim of this paper is to provide a specific approach centered on an electromagnetic methodology used for the natural hazard assessment due to the intermediate depth seismic events occurred in Vrancea zone, Romania. Thus, the specific EM methodology focused on both the pattern recognition and anomalous behaviour of the Bzn parameter linked to seismic events has been taken into consideration. It is well known that at the Earth surface the vertical geomagnetic component Bz is entirely secondary field and its presence is an immediate indicator of lateral inhomogeneity. For two-dimensional structure, Bz is produced essentially by Bperp. (horizontal geomagnetic component perpendicular to the strike) and, consequently, a normalized function Bz defined as: Bzn=Bz/Bperp should be time invariant for a given 2D structure. Furthermore, in terms of resistivity, we may compute: Bzn= (ñparal/ñz)1/2, where: ñz is the vertical resistivity and ñparal is the resistivity parallel to the strike. This relation demonstrates that Bzn could be linked to variation of the electric conductivity into the Earth. For the beginning, it is important to point

out the EM pattern (skewness, strike and specific distribution of the Bzn parameter in non-seismic condition) for the monitoring sites, and then to extract the anomalous behaviour of the Bzn parameter, the most probable due to the resistivity changes as a direct consequence of the fluid migration through the fault systems generated by the thermo-mechanical processes. To have a comprehensive view on the applied methodology and to emphasize the Bzn's precursory character, a correlation between its daily mean distribution and earthquakes occurred in the last three years is accomplished.