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Surveying the seismic hazard by using ground based analysis of the Earth's electromagnetic data

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Previous studies have shown that there are some electromagnetic (EM) effects in the crust and upper mantle caused by the major natural hazard activities such as earthquake events. Despite these prolific results of observation, earthquake related EM signals, in particular those at pre-seismic stage, have not yet been completely accepted as real physical quantities. Majority of proposed mechanisms attribute pre-seismic signals/parameters to effects such as piezo-electric, electro-kinetic, charged dislocations, exo-electrons and lithospheric conductivity changes due to the fluid migration through faulting system, being induced by stress changes and fracturing processes in the last stage of EQ preparation, respectively. In this respect, our goal is to develop a multi-parametric approach to assessing the Earth's electromagnetic field related to the intermediate depth seismic activity studies, taking into account that EQs are accompanied by intensified propagation of the electric charges along the specific sensitivity paths, in the lithosphere. These processes lead to generation of internal electric/magnetic field, into and nearby the seismogenic volume (Vrancea zone, Romania), producing the modification of the electrical conductivity in the intermediate depth interval (70-150km.). The methodology is focused on ground based multi-parametric continuous measurements of the geomagnetic field, in the frequency range DC- 1kHz, using the MAG-03 DAM system able to collect the data from the three axis magnetic field sensor MAG-03 MSL and a computer for real time data storage and processing. For a two-dimensional structure, this approach describes the physical coupling between the both vertical geomagnetic component (Bz) and horizontal geomagnetic component perpendicular to the geotectonic strike (Bperp), by using anomalous behavior of the normalized functions Bzn = Bz/Bperp and Ron = Ropar/ Roz as precursory parameters related to the intermediate depth EQs. Our results show that simultaneous analysis of these normalized functions and seismic events occurred in Vrancea zone it could provide monitoring capabilities of the earthquake precursors.