



## **Pre-seismic electromagnetic anomalies induced by intermediate-depth earthquakes (Vrancea zone-Romania)**

Dumitru STANICA and Armand Dragos STANICA

Institute of Geodynamics, Electromagnetism and Lithosphere Dynamics, Bucharest, Romania (dstanica@geodin.ro, 0040 21 3172120)

Recent studies show that before the earthquake initiation, the high stress level which reached within the seismogenic volume may generate dehydration of rocks and fluids migration along surrounding faulting systems and could be reflected by electrical conductivity changes. In this paper, we investigate these changes of conductivity using ULF electromagnetic data recorded at the Geodynamic Observatory Provita de Sus, located on the Carpathian electrical conductivity anomaly (CECA), at about 100km distance of Vrancea epicentral zone. Using ground-based monitoring system (GMS 06 and MAG03 DAM electromagnetic and geomagnetic equipments, respectively), possible anomalous variations of the electromagnetic normalized functions (ENF) have been analyzed in correlation with earthquakes with  $M_w > 3.7$  triggered in 2013 year at the intermediate depth interval 70-160km, in seismic active Vrancea zone. Thus, the daily mean distributions of the both functions  $B_{zn} = B_z/B_{perp}$  (where:  $B_z$  is vertical component of the geomagnetic field;  $B_{perp}$  is geomagnetic component perpendicular to the strike orientation) and  $R_n = R_{par}/R_z$  (where:  $R_{par}$  is resistivity parallel to strike;  $R_z$  is vertical resistivity), together with their standard deviation (SD) are performed by using the FFT band-pass filter analysis in the frequency range (0.001Hz to 0.016Hz). After analyzing the anomalous intervals of the  $B_{zn}^*$  and  $R_n^*$  values obtained by using a standardized random variable equation, we may conclude that: (i) a pre-seismic anomalous value of maximum related to the both ENF may reflect an impending earthquake; (ii) a superimposed effect of some earthquakes occurred at short time-intervals is also reflected by the anomalous maximum value; (iii) pre-seismic lead time is between 1 to 32 days before the impending earthquake.