RESULTS – STAGE V/ 2010

The multiparametric approach of the electromagnetic methods, synergic with seismologic, geomorphologic, geologic and hydrogeologic information, created conditions to develop efficient techniques and methodologies for the analysis and assessement of the natural hazard due to seismic activity and landslides, by a coherent correlation of the all involved factors

In the **stage V** of the project, the space-temporal relations between electromagnetic parameters and corresponding natural hazard (seismic and landslide) are presented as: distributions of the Bzn and ρn daily mean values correlated with the intermediate depth seismic events (Mw>3) for the interval 2008-2010; 3D tomographic images and 2D models with lithospheric resistivity variation in Vrancea zone; distributions of the electrical anisotropy, skew and strike related to the Provita de Sus landslide; 2D tomographic images of shallow resistivity variation along the profiles; landslide hazard assessment.

With the aim to detect their anomalous behavior in correlation with intermediate depth earthquakes of M≥ 4, all the Bzn and ρn distributions carried out on the whole period of the project, were analyzed. The mean value of 1,842, associated with earthquakes of M< 3.5, has been considered that represents the limit between the normal trend and pre-seismic anomalous distribution (Fig. 1).

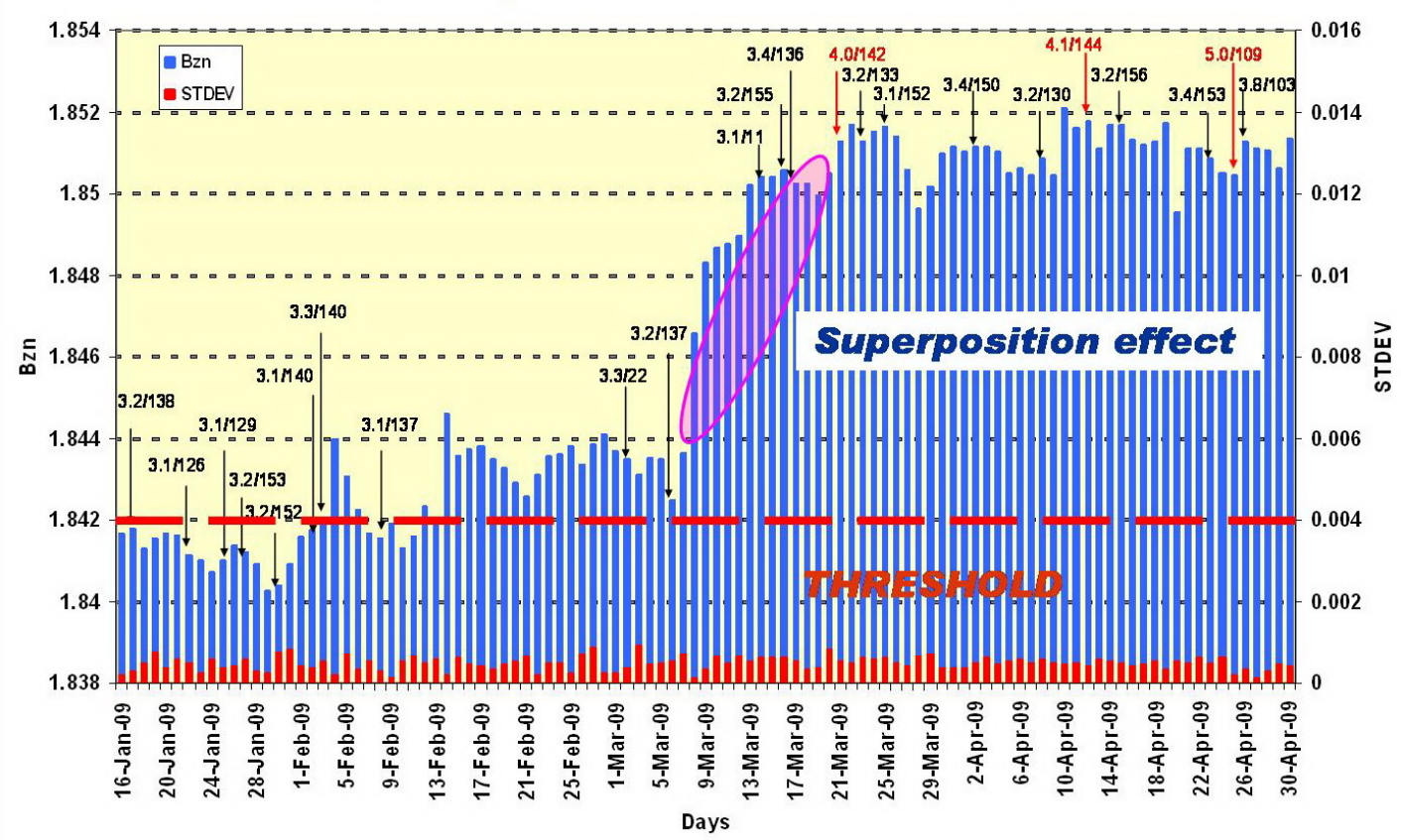

Fig. 1.Distributon of the Bzn correlated with the intermediate depth seismic events (Mw>3) for the interval January- April 2009

Finally, for the seismic hazard assessment of the Vrancea zone, two type of correlations between Bzn and the magnitude of intermediate depth earthquakes were observed: it is most probably that an earthquake of $M \geq 4$ is expected to occur when daily mean value of $Bzn \geq 1.846$, while a anomalous distribution of $Bzn \geq 1.851$ may be used as pre-seismic value for an earthquakes of $M \geq 5$.

The entire volume of the landslides data, and also intermediate and final obtained maps were included in a GIS data base (Fig. 2) which has the property that can always be improved, enriched with new data and analysis, capabilities of fast rendering and efficient query, as well.

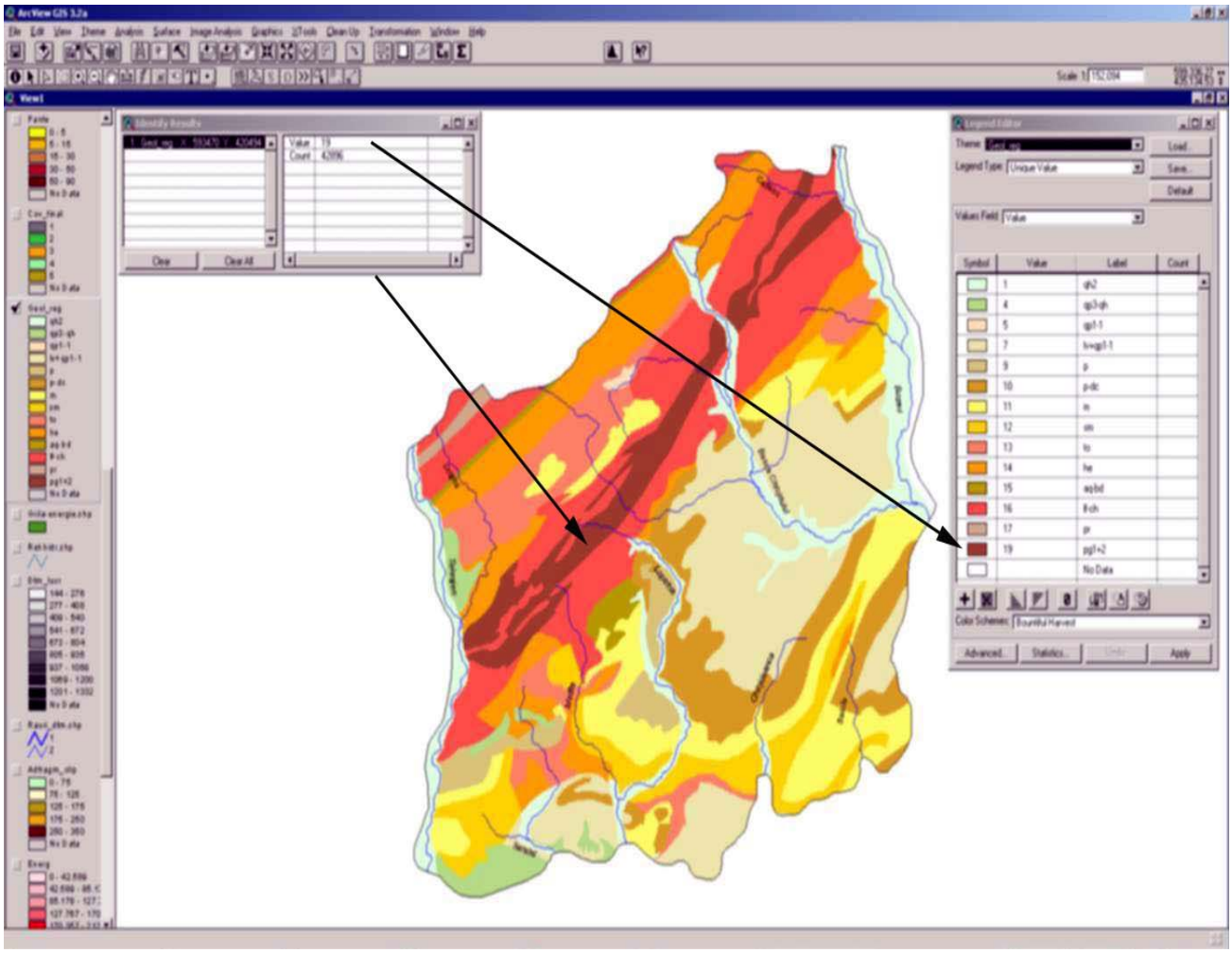

Fig. 2.GIS data base for a geological map

An evaluation of the maximum absolute values of ground acceleration, velocity and displacement, the distribution of the peak ground accelerations on maps or punctual for 18 under crustal Vrancea earthquakes with Mw4.0-5.0 occurred from January 2008 to August 2010 was carried out. An analysis of the maximum accelerations, velocities and displacements showed that their distribution has a weak connection to the attenuation

laws vs distance but rather are a function of local geology which favor the amplification phenomena. Some amplification areas were identified around the Ploiesti city, in the Focsani and Galati areas, but also in the local areas such as near Cernavoda town.

For the highest magnitude earthquake (Mw5.0) occurred in the analyzed period (April 25, 2009) the recorded peak values are the followings: 55 cm/s^2 for acceleration (Fig. 3), 24 mm/s for velocity and 3,6 mm for displacements in the area of the SECR seismic station (NW of Ploiesti). The spectral analysis of displacements points out a maximum interval in between 3 - 25 Hz as a function of local geology. For the data base of this project additional data were provided: earthquake catalog for events with $M_D \geq 3,0$ (January 2008-September 2009), hazard seismic probabilistic map of Romania for 95 years and 475 years recurrence period, as well as maps for acceleration, velocity and displacement for some of the significant earthquakes occurred in the analyzed period.

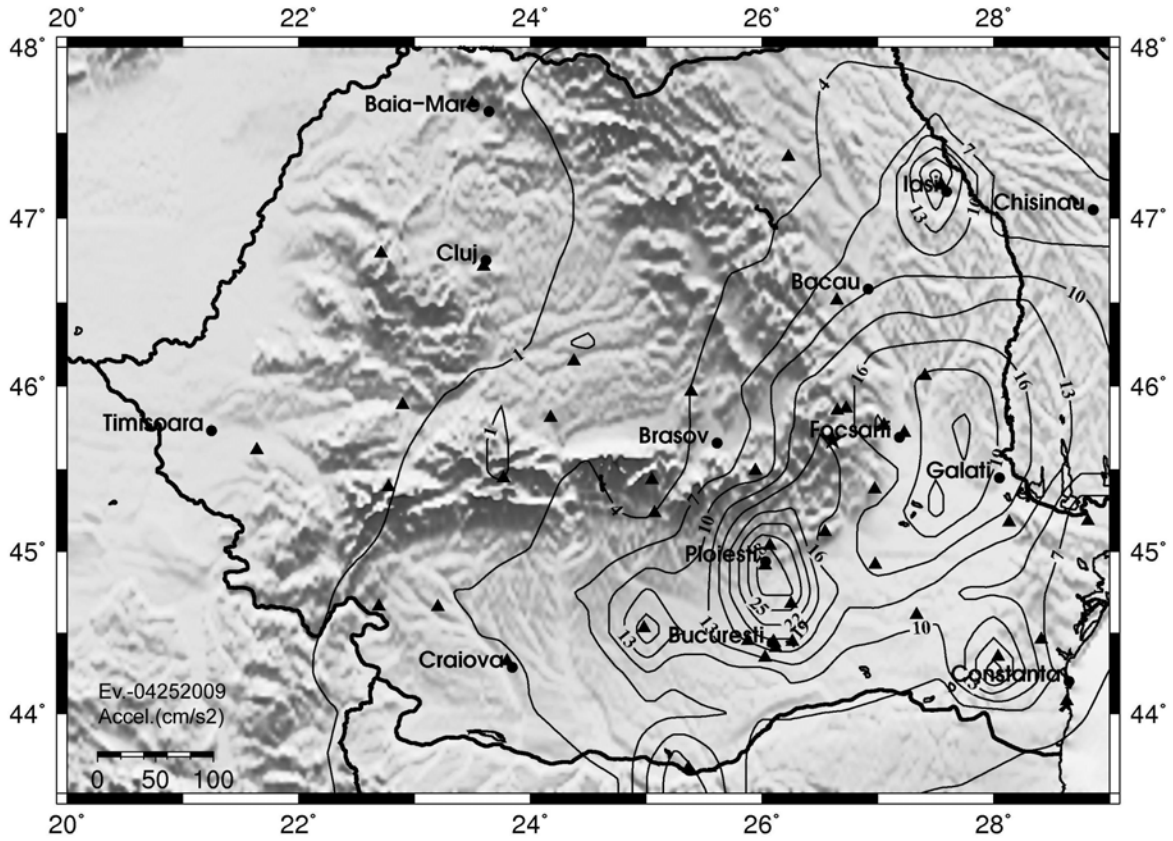

Fig. 3. Ground acceleration for the earthquake of M5.0 occurred on April 25, 2009

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