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Rock-physics properties of the upper crust within Vrancea active seismic region

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The INDEGEN (Research on the intracontinental INtermediate Depth Earthquakes GENesis within Vrancea Zone) project was aimed at studying mechanisms of the intra-continental intermediate depth seismicity within Vrancea active zone, located in the bending area of East Carpathians, Romania.

Among the major targets of the project is the construction of an appropriate model of the lithosphere structure and dynamics within the seismically active area. First step in accomplishing that very intricate task would be to establish rock properties in the region, from the upper crust to its bottom.

The area is very complicated from the geological point of view. The Carpathians Alpine Orogene, Transylvanian Depression, Bârlad Depression and Focsani Depression, the Moldavian Platform (as the westernmost part of the Russian Platform) and eastern Moesian Platform (whose origin is still debated), the northwestward extension of North Dobrogea (Northern Dobrogea Promontory), are present in the area where three major lithospheric compartments met each other: the Intra-Alpine Microplate, the Moesian Microplate and the East European Plate.

5523 oil wells were explored and 37800 rock density lab determinations were performed and analyzed. Some data provided by rock samples collected in more than 300 outcrops, within the areas where drillings are missing, were also added to the computer database, taking into account their lower exhibited density due to the alteration phenomena, as compared to their equivalents collected in deep boreholes.

In addition, acoustic well logging in 75 boreholes was available for interpreting in connection with rock-density.

After comparing in depth velocity variation with density change for individual boreholes, data were distinctly treated on the overall for each of the above-mentioned structural units. Graphs of the in depth variation of density for the main geological formations were constructed and thoroughly examined according to their main lithology. Maps with lateral variation of the density were also plotted for each structural unit and compared with similar maps of the lateral variation of seismic velocity at the corresponding depths

Such maps will considerably help in improving seismic tomography, providing accurate distribution of the velocity in the upper part of the crust and related rock density.

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