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GEOPHYSICAL IMPRINTS OF THE GEODYNAMIC EVOLUTION OF MOESIA FOLLOWING THE BLACK SEA OPENING

Lucian Besutiu

Institute of Geodynamics of the Romanian Academy, Solid Earth Dynamics, Bucharest, Romania (besutiu@geodin.ro, 00 4021 317.2120)

Genesis of the two types of the Moesia basement (the so called Walachian, and Dobrogean sectors) along with the complex fault system affecting its cover and basement are still debated issues. Besides, there are two other intriguing aspects raised by the seismicity map of Romania: the sub-crustal events in the bending zone of East Carpathians, and the crust seismicity of the eastern Moesian Plate (MoP). Both the intermediate-depth earthquakes within full intra-continental environment and the intense craton seismicity are unusual aspects, and their apparent association difficult to explain.

The paper proposes an integrated geodynamic model of MoP able to justify its current tectonics and both the crustal events in front of Carpathians, and the intermediate-depth earthquakes in the Vrancea zone within the frame of a unique geodynamic process. It starts from the idea that tectonic and geodynamic evolution of the E MoP and the bending zone of East Carpathians has been strongly affected by the opening of the W Black Sea basin, and is currently maintained by active rifting in SW Arabian Plate. The model is supported by geophysical and geodetic evidence.

Unlike some previous geology-based models assuming that Black Sea opened during a singular geodynamic event (northward subduction of the Neo-Tethys Ocean floor), the pattern of the gravity and geomagnetic field, along with off-shore seismics bring convincing evidence on the distinct timing of the W and E Black Sea basins opening.

Fingerprints of the lithosphere expelled by the W Black Sea rifting in the NW inland may be seen in the distribution of compression (P) wave velocity. In-depth development of NW striking major faults (splitting MoP into numerous vertical compartments) is also well revealed by seismic tomography (e.g. Peceneaga-Camena Fault, as the limit between MoP and East European Plate (EEP), still separates two distinct P wave velocity domains at 150 km depth). A second major fault system was created by the downward bending of MoP pushed towards vertical edge of Intra-Alpine Plate.

It seems that W Black Sea opening also created the necessary environment for a FFT unstable triple junction within the bending zone of East Carpathians (VTJ), to which intermediate-depth earthquakes should be associated through thermo-baric accommodation phenomena occurring within the lithosphere sunken into the upper mantle. The triangle-shape and in-depth increase of the lateral extension of the VTJ high velocity seismic body are revealed by the high accuracy P wave tomography performed within Vrancea zone.

Current geodetic and geophysical monitoring in the area has suggested a close link between crust and intermediate-depth seismic events. The intensification in tectonic forces may firstly led to the intensification of crust seismicity in the Carpathians foreland (by provoking slips between the MoP vertical compartments), followed, after a time-span depending on the force intensity and upper mantle viscosity, by VTJ sinking and consequent intermediate-depth seismic events in the Vrancea zone.