

P10-6**VRANCEA EARTHQUAKES AREA****GHEORGHE GARDU** and **LUCRETIA MARINESCU**

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Double loop in Romanian Carpathians (a fold thrust belt) has been generated, undoubtedly by more or less rigid plates acting as hanging walls, being subducted or abducted one onto another one. East European Plate moves slower, being a cratonized area and stopped western and southern plates in their advancing movement.

Main geological units in Eastern Carpathians have a North-South direction, pushing and thrusting starting since Cretaceous time. Kinematic analysis stated (P.Zweigel, Tectonophys, 1998) that contraction axes varies from East - West to North West - South East and North West - South East in the northern part and to North West - South East in its southern part.

Subduction coupling generated calco - alkaline magmatism, its character varying from West to East. (D.Radulescu,1977), and has been generated as a consequence of collision process. The estimated rate of collision is about 2.5 cm / year, as has been determined by Roca et al.(1995).

As plate tectonics stated, a spreading ridge will eventually approach a subduction zone (C.Kreemer et al., Tectonophys, 1998), advancing the question if and when the ridge will break-up. Widespread ophiolites in Romanian Carpathians outline the presence of such a ridge, and our model tried to detect its path. In our opinion it migrated from West to East, being now abducted in Eastern Romanian Carpathians, and is today caught up in nappe suites.

Roll-back retreating model (Linzer K., Geology, 1996) reconstructed retreating subduction along the Carpathian Chain, that is an oblique collision of the Eastern Carpathians, with the East European Plate, and also the southern one, between Southern Carpathians and Moesian Plate.

On one hand, subduction ceased since 2 millions years ago, (M.Sandulescu, 1997). And perhaps that's why the most suitable model for the Vrancea earthquakes area is the remnant of an oceanic lithosphere.

To note that in mantle convection process, spinel present a phase change to post- spinel and this happens at 660 km depth, with volume changes (usually raising). At depth where Vrancea earthquakes are generated, i.e. 90-120 Km, minerals phase changes are associated with dehydration, mantle differentiate melting, and so on. This is in our opinion the main triggering of earthquakes in Vrancea area.

Piecewise homogenous models seems to not be in good agreement with geological reality (S.Leonardi, Tectonophys., 1999). Analysis on cores from the German Continental Deep Drilling Project (KTB) outlines and sustain this point of view. So, certain constraints are necessarily to be imposed and we have tried to take them into account in this model.

Geophysical data (gravity, aeromagnetic and electric) outline a structure that is in good agreement with geological observations, palinspastic reconstructions(Sandulescu, Debelmas, Tectonophys, 1995), kinematic analysis (P.Zweigel, Tectonophys, 1998), paleomagnetic data (Patrascu, Tectonophys., 1994) and are fitted with our model.

GPS measurements regarding plate movement in Eastern Mediteranean area (Aegean region) (S.Dimitriadis et al., Tectonophys, 1998; H.G.Kahle et al., Tectonophys, 1998), combined with paleostress direction in the same region, outline general plate movement direction. At continental scale, African plate has a counterclockwise rotation, and it is one of the causes that generated double loop of Romanian Carpathians.

If the earthquakes are intermediate in character, i.e. disposed at 60 Km depth and down to 200 Km, then the subducting plate started this movement of subduction since 70 millions years ago (Wortel, 1995). At that time, axis contraction was West -East directed and then changed to a North West - South East direction. As a particularity, to note the gap between 40-60 Km depth. And all recorded earthquakes are disposed into a vertical prism (Roman, 1971, Nature).

On the other hand, as a whole, oceanic lithosphere does not subduct (or might not do) uniformly (K.Hirosa, 1999, Nature). Consequently, due to differentially advancing of Alpine Plate onto East European one, combined with Moesian one, and all as a result of pushing at continental scale from African and Arabian Plates and being stopped by East European Plate, a 3D rotation should have resulted in horizontal plane combined with a rotation in the two rectangular vertical planes, and all of these in Vrancea earthquakes area.

Knowing loads such as topography and sediments, we employed a finite difference method to obtain the flexural down bending of the East European Plate and the Moesian one, resulting in a 3D model. The model is mainly constructed on geophysical data, and implies a rotation in horizontal plane, as in the roll-back retreating model on one hand, combined with rotations in vertical ones on the other hand.