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An attempt to monitor tectonic forces in the Vrancea active geodynamic zone: The Baspunar experiment

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An alternative model attempting to explain the unusual sub-crustal seismicity occurring in the bending zone of East Carpathians within full intra-continental environment (the so-called Vrancea zone) has assumed the presence of a FFT unstable triple junction between the three lithospheric compartments joining the area: East European Plate (EEP), Intra-Alpine Microplate (IaP) and the Moesian Microplate (MoP). Geophysical imprints (e.g. EM data, potential fields, seismic tomography), and indirect geological evidence (e.g. absence of the volcanism associated to subduction zones, the unusual high Neogene tectonic subsidence, symmetry and normal faulting within compressional environment of Focsani basin) support the hypothesis. The above-mentioned model considers the intermediate-depth seismicity as the result of the thermo-baric-accommodation phenomena generated within the colder lithosphere collapsed into the hotter upper mantle. Therefore, the amount of seismic energy thus released should be related to the volume of the lithosphere brought into thermo-baric disequilibrium by sinking into the upper mantle.
Vertical dynamics of the Vrancea unstable triple junction (VTJ) seems to be controlled by the both tangential tectonic forces driving the neighbouring plates and the gravitational pull created by the eclogitization of VTJ lower crust. But, while eclogitization provides a relatively constant force, acceleration of sinking is expected to be provided by changes in the tectonic forces acting on VTJ. As changes in tectonic forces should reflect in changes of the dynamics of lithospheric compartments, geodetic means were considered for helping in their monitoring.
The Peceneaga-Camena Fault (PCF) is a major lithospheric contact separating MoP and EEP, starting from the W Black Sea basin to the Vrancea zone. Geological evidence advocate for its variable geodynamic behaviour during the time, both as left-lateral or right-lateral fault. Unfortunately, GPS campaigns, so far (sparsely) run in the area, have provided inconsistent results on the PCF current dynamics.
The Baspunar Geodynamic Observatory (BGO) has been designed and implemented by the Solid Earth Dynamics Department in the Institute of Geodynamics of the Romanian Academy in order to reveal and monitor eventual motions along PCF in the attempt to correlate variations in the slip rate with changes in the seismicity released within Vrancea zone. The first BGO records were strongly affected by changes in the atmospheric parameters. Consequently, technical measures and special corrections for the removal or at least mitigation of the effects created by changes in temperature, air pressure and humidity have been applied to the observations. In order to improve the signal to noise ratio, some mathematical filters have been applied too.
The paper is aimed at revealing results of the geodetic observations along with preliminary geodynamic considerations. On the overall, after about two years of monitoring, PCF appears as an active tectonic contact. It mainly behaves as a left-lateral fault, but some short episodes with a reverse slip (dextral) were also pointed out. Correlations with crustal and intermediate-depth earthquakes occurring in both cases within the bending zone of East Carpathians are illustrated and discussed.