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Watching structural and geodynamic features of a plate boundary: Peceneaga-Camena Fault

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The Peceneaga – Camena Fault represents one of the major lithosphere contacts on the Romanian territory. Its nature and dynamics have been subject to many geological and geophysical researches since the beginning of the 20th century.
Based on geophysical evidence some authors consider PCF as a plate boundary, the strike-slip contact between the Moesian Micro-Plate (MoP) and East European Plate (EEP). Deep seismic soundings along the international line II had revealed its trans-crustal nature, with a 10 km step at both Conrad and Moho discontinuities. It is likely that the geodynamic evolution of this major tectonic accident is tightly connected to the opening of the W Black Sea basin. Seismic tomography studies have outlined strong fingerprints of the W Black Sea opening within its NW inland. In depth extension of PCF may be clearly seen within the tomography images down to more than 150 km.
It seems that lithosphere expelled by the rifting split MoP into several compartments by creating or reactivating a NW trending major fault system to which the PCF belongs. After the W Black Sea rifting ended its evolution, the geodynamic engine in the area seems to be the active rifting in the SW Arabian Plate (red Sea and Aden Bay) pushing northward the Arabian Plate by about 48 mm/yr, and further on, pushing a MoP segment towards the Carpathians. Under this pushing, the above-mentioned MoP compartments move towards the Carpathians, staying together by friction. However, when tectonic forces overcome the friction, the slivers may relatively slip each other, thus generating earthquakes along their wedges. The presence of some scarce seismicity along PCF seems to confirm the idea.
To check up the above mentioned geodynamic scenario, a geodetic experiment has been imagined to monitor PCF flanks displacement.
Two Leica TC 1201 total stations were installed on the southern flank of PCF (belonging to MoP) in order to measure the distance to a laser reflector installed on the northern PCF flank (within the neighbouring EEP). Each instrument measures the distance to the reflector every 6 seconds and records minute averages of the observations. This way time series related to movements of the PCF compartments were acquired and stored in a computer database.
To diminish the record noise, mainly due to the temperature variation and terrestrial tides, some filtering techniques were applied to data in order to better reveal the existent trends.
The analysis made lead to some interesting conclusions: (i) PCF is a geodynamical active contact, which explains earthquakes presence along it; (ii) flanks displacements are irregular in both speed and strike; (iii) according to the records, PCF has behaved both as a right-lateral and / or left-lateral contact. The results are fully consistent with the geodynamic model connected to W Black Sea evolution. When the PCF northern compartment escapes toward Carpathians, PCF appears as a left-lateral fault. On the opposite, if the southern compartment is moving under the action of tectonic forces, then PCF appears as right-lateral fault.
These conclusions may provide important constraints for interpreting GPS data obtained during epoch campaigns.