Complex Investigation of Krupnik–Kresna Region in Southwestern Bulgaria by Geodesy, Gravimetry and Seismology

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In the year of 1904, in the region of Krupnik–Kresna occurred one of the strongest earthquakes on the Balkan Peninsula, felt in almost whole Eastern Europe. The magnitude of this event was about 7.5 and intensity X in Medvedev-Sponheuer-Karnik scale in the epicentric zone. The seismologically active structure which caused this destructive event is the Krupnik Fault – a part of the Struma fault zone.

In the framework of "Young scientists" project between several research institutions in Bulgaria, an attempt to compare and complete the data, results and conclusions from different methods of geodesy, gravimetry and seismology was made. The main goal is to form a whole geodynamic picture in the area of investigation. Part of the present work is to determine double couple focal mechanism solutions from P wave first motion polarities of small earthquakes with magnitude about 3 in the region. On the other hand, several GPS campaigns were carried out re-measuring the points from long-existing investigation network in the area. A new set of benchmarks was established for levelling profiles through the visible rupture remaining after the strike from 1904. Also two gravimetric profiles crossing the main tectonic structures were re-measured. All these studies confirm the recent activity of the Krupnik fault.

Geochemical comparison of felsic Eocene granite intrusions in the Rhodope massif, southern Bulgaria and northern Greece

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We compare whole rocks geochemistry of several felsic granite bodies of similar age (53-42 Ma) that are emplaced into the intermediate and upper plate of the Central Rhodope metamorphic core complex (CRMCC), namely: the Smilyan granite in the southernmost part of the Madan unit; the Pripek granite in the Startsevo unit, the Yugovo granites in the Assenitsa unit and the Paranesti granite from the Barutin-Buynovo-Elatia-Skaloti-Paranesti plutonic complex partially hosted by the Madan and Assenitsa units. The time span of granite intrusions overlaps the period of synmetamorphic partial melting in the CRMCC (~50-36 Ma) and clearly predates the anatectic melts crystallization in the core of the complex (38-36 Ma). The temporal and spatial proximity suggests genetic/feedback relations between intrusive granites and migmatites.

The geochemical features of the compared granites show predominantly felsic compositions (SiO_2 > 70 %) and alkaline-calcium to Ca-alkaline and alkaline characteristics. The Smilyan, Pripek and Paranesti granites are meta- to peraluminous (A/CNK 0.80-1.29), and Yugovo granites are only peraluminous (A/CNK 1.06-1.26). High Ba (≥1000 ppm) and Sr (>600 ppm) content is a common feature of granite LILE (Ba, Sr, Rb) geochemistry. Negligible negative to positive Eu-anomaly (Eu/Eu* 0.8-1.2) and high LREE/HREE ratios (up to 54.1) are typical of the chondrite-normalized REE patterns. Increasing Rb/Sr (0.04→1.53) and Rb/Ba (0.03→0.45) ratios towards the most felsic granites mark a trend of feldspar fractional crystallization. The LILE distribution patterns of Pripek and Paranesti granites indicate more evolved differentiation than the Smilyan granite. Decreasing Zr and Hf contents and Zr/Hf