

supports the idea for the presence of shallow magmatic chamber after which emptying the main caldera-forming eruption is realized. The pressure of the Chatalalmdere Volcanic Subcomplex is comparatively higher (2.2–2.6 kbar) which is in accordance with the later eruption of deeper levels of the same chamber.

## **The Moho's structure in West Bulgaria obtained from receiver function**

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In September 2005 Geophysical Institute of Bulgarian Academy of Sciences after procurement procedure selected the Refraction Technology, Inc. to upgrade the existing National Operative System for Seismological Information (NOTSSI) to a modern digital seismological network. At the beginning of December 2005 all the equipment supplied were installed on seismological stations and acquisition and processing software was operating in the data center. The network became operational on 08.12.2005. The Bulgarian Seismological Network was equipped with broad-band sensors and digital acquisition systems. It enabled application of modern techniques of analysis of the velocity structure in Bulgaria. This study presents one of the first results from application of the receiver function technique. The Receiver functions were computed using scripts written on Seismic Handler program by Sodoudi F. The Western part of Bulgaria is characterized by mountains, river valleys and small fields between the mountains. Two stations of the network Musomishte (MMB) and Krupnik (KKB) were chosen in south-west of Bulgaria and also station Vitosha (VTS) which is close to Sofia and known as the station with lowest noise. These sites are located in areas of complex tectonic structures manifesting high seismic activity during recent years. As starting models we used shear wave velocity models for the territory of Bulgaria, obtained in Raykova R, 2004. For the study were used earthquakes in epicentral range 35 - 90o and with a magnitude more than 5,5 – 6 also with clear P-onset. All earthquakes from the end of 2005 to the summer of 2009 were used and a good azimuthal covering was reached. From the seismic survey and gravimetric measurements is determined a Moho depth between 30 km and 50 km. The crust is shallower in the north-eastern part of the country and thicker in the south-western part. The obtained results show thicker crust than expected Earth crust. This can be an effect of reflections/refractions on the object close to the station. They show only the main trends of the Moho depth for the whole country but not local effects in some part, beneath the mountains for example. Further detailization of the structure of the Moho boundary could be done after estimation of receiver functions for other stations of the network. The results show also very good the faults close to stations KKB and VTS.

## **Metabasic rocks from the Chepelare variegated complex, Central Rhodope massif, Bulgaria – preliminary studies**

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Metabasic rocks in the Chepelare area occur in two different tectonic settings. Lenses of garnet amphibolites are part of Chepelare mélange embedded in migmatic gneisses of Arda 1 tectonic unit. They reach length up to 15 m and in the variegated complex closely associate whit garnet-kyanite schists, impure marbles and granitoid migmatic gneisses. Whereas numerous small bodies of retrogressed eclogites trace out the ductile shear zone between Arda 1 and Arda 2 tectonic units.

Garnet, amphibole, plagioclase, ± diopside, ± quartz constitute the main minerals in garnet amphibolites from the Chepelare mélange. Accessory minerals are rutile, titanite, ilmenite ± apatite. Garnet occurs as lobate and resorbed porphyroblasts, up to 5 mm in

diameter, containing inclusions of amphibole, plagioclase, epidote, quartz, titanite and abundant rutile. Many porphyroblasts have overcrowded by undistinguishable small inclusions core, often surrounded by inclusion-free rim. In finegrained samples garnets rarely include amphibole or quartz. It is almandine-rich (Alm 41-58, Grs 23-34, Pyr 18-30, Sps 1-3 mol%) with weak prograde zonation and almost lacking retrograde alternation to the rim. Porphyroblastic garnet is commonly surrounded by corona-like symplectites of sodic plagioclase (An<sub>27-30</sub>) and paragonitic amphibole, indicating retrograde metamorphic reactions at expense of garnet and omphacitic clinopyroxene. Amphibole inclusions in garnet have higher Al and Ti content and are mainly tschermakites. In some samples pseudomorph replacement of amphibole by K-feldspar, chlorite and andesitic plagioclase close to garnet porphyroblasts suggests further decompression reactions at active fluid regime. Pale green diopsidic clinopyroxene (Na<sub>2</sub>O = 0.7-2 wt%) in the matrix associates with oligoclase and is partly resorbed and enveloped by amphibole. In samples where abundant leucocratic material is present and close to almost completely resorbed garnet it includes unoriented small idiomorphic amphiboles. Incomplete replacement of rutile by ilmenite and titanite in matrix reflects the decompression path. The assemblage without the presence of Opx should reflect metamorphism in the HP granulite facies.

P-T estimates using Fe-Mg exchange equilibrium between garnet and clinopyroxene or amphibole and Al-in-amphibole and Grt-Hbl-Pl barometers indicate that the amphibolites reached at least pressures of 12-14 kbars and temperatures of 700-750°C for garnet inclusions and 750-800°C for the matrix assemblage. These new P-T data are consistent with previously reported for the garnet-kyanite gneisses from the Chepelare mélange.

Preliminary major and trace elements geochemistry plotted on discrimination diagrams suggests MORB affinity for the studied garnet amphibolites. Enrichment in Zr, Y, Nb, Ta, TiO<sub>2</sub>, LREE and more pronounced Eu anomaly of two samples from the southernmost outcrops do not precludes the possibility of incorporation in Chepelare mélange of metabasics with different protoliths or stronger interaction with the host migmatitic gneisses of granite composition. The later is supported also by high variability in LREE patterns. Additional geochemical studies are planned to reveal the possible connection with retrogressed eclogites from the ductile shear zone to the north, which according to the previous publications also show MORB-type geochemistry.

Petrological observations and P-T data support the metamorphism at least in HP granulite facies for the rock of variegated complex. We do not refer these new estimations as peak metamorphic conditions, as the HP/UHP metamorphic records could be completely erased by observed late high-temperature metamorphic overprint involving hydration reactions during the exhumation.

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## **Late Eocene synmetamorphic thrusting and syn-orogenic extension across the metamorphic pile of the Bulgarian Central Rhodope**

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In the last few years, a consensus has emerged according to which the Rhodope Metamorphic Complex (RMC) has started undergoing post-orogenic extension in the early Late Eocene or before. Hence, no significant compressional structure younger than the Middle Eocene should be observed in it. In the Bulgarian Central Rhodope, the lower part of the metamorphic pile is mostly made of migmatitic orthogneisses from which several zircon and monazite U-Pb ages around 36-37 Ma have been reported. This may suggest that the structures formed during migmatization and subsequent cooling of this part of the