Timing of UHPM in metasediments from the Rhodope Massif, N Greece

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The Rhodope Massif in N Greece is part of the internal Hellenides that was subjected to severe alpine deformation and metamorphism. Since the discovery of UHPM rocks in N Greece (Kostopoulos et al., 2000), the relation between this UHPM event and the observable alpine orogenic processes is an open question. Such HP and UHPM rocks belong to the Upper Tectonic Unit and comprise gneisses and migmatites associated with marbles, amphibolites and variably retrogressed eclogites. In this study we concentrated on felsic metasediments near Xanthi that record UHPM in excess of 7 MPa. These metasediments are composed of garnet, white mica, kyanite, quartz, feldspar, and biotite as major constituents, and some rare accessory minerals such as zircon and monazite. The garnet porphyroblasts contain inclusions of diamonds, and exsolutions of rutile and silica forming after majoritic garnet as further witnesses of the UHP.

We analysed monazite by microprobe and calculated U-Th-Pb ages, which are grouped into two major populations at 185 Ma and 165 Ma, and two minor at 200 Ma and 146 Ma. The spatial age distribution within the individual grains form regular pattern with ages younging towards the rim. We also determined a Sm-Nd garnet - whole rock age of 140±4 Ma. The mica were dated with Rb-Sr yielding mineral whole-rock ages of 37 Ma for the white mica and 34 Ma for the biotite. We also analysed single zircons of a granitic gneiss from the same region by Pb-Pb evaporation yielding 140±3 Ma. It is noteworthy that the 140 Ma age coincides with the age of metamorphic rims of zircons from the same area (Liathi and Gebauer, 2001).

We suggest the following interpretation. The monazite age of 186 Ma is the closest approximation to the UHPM peak, since monazite has the highest closure temperature of the minerals analysed from the metasediment. The other Jurassic ages reflect later metamorphic overprint during uplift, especially the ca. 140 Ma age appears to be of regional importance and indicates a major upper Jurassic event. The Rb-Sr mica ages document the passage of these minerals through the relevant closure temperatures in response to the exhumation during the Eocene.

References

Kostopoulos, D.K., Ioannidis, N.M., and Sklavounos, S.A. (2000), Int.Geol.Rev. 42, 545-554.

Liathi, A. and Gebauer, D. (2001), J.Conf. Abs. 6, 315.

Direct versus indirect determination of biogenic barium as a proxy for productivity

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The reliability of the determination of biogenic barium by an indirect/normative calculation was assessed by a comparison with directly/sequential extraction determined biogenic barium results. The comparison showed that the terrigenous Ba/Al ratio is the critical factor in the normative approach that may introduce significant errors. In general, the postulated crustal average Ba/Al ratio of 0.005 to 0.01 (Rösler and Lange, 1972) seems to be too high for all analysed samples, which would result in an underestimation of the biogenic barium and thus an underestimation of the primary productivity recalculated from the normatively calculated Ba record. A terrigenous Ba/Al factor of ~0.0037 would lead to calculated biogenic barium contents that are in good agreement with the biogenic barium contents measured by sequential extraction for most investigated samples of the Atlantic, Pacific (Fig. 1) and Indian ocean.

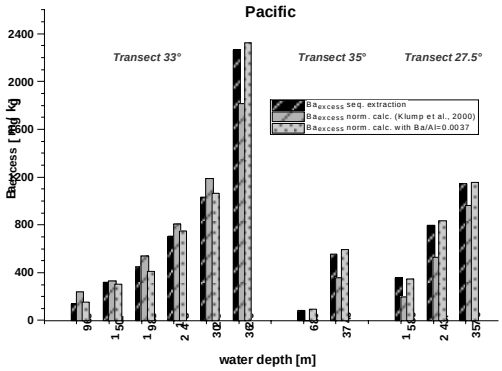

Fig. 1: Excess/biogenic barium in surface sediments of the Pacific Ocean.

However, the results from the Pacific Ocean (Fig. 1) show that the sequential extraction technique is required in sedimentary environments with a terrigenous fraction of >40%. Comparing samples from different deep-sea regions suggest that using an average crustal Ba/Al ratio in many cases will lead to erroneous results.

Klump J., Hebbeln D. and Wefer G. (2000) The impact of sediment provenance on barium-based productivity estimates. *Mar. Geol.* **169** (3-4), 259-271.