

5.3.P18

**The subcontinental lithosphere
beneath Central Srednogorie
(Bulgaria): U-Pb and Hf-zircon, Nd
and Sr whole rock constraints**

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The Central part of the Srednogorie zone (Bulgaria) is characterized by high-metamorphic continental (mainly) and low-metamorphic island-arc basement rocks, overlain by Carboniferous to Cretaceous cover sequences. This succession is intruded by Late Cretaceous subduction related calc-alkaline basic to acid (predominantly intermediate) igneous rocks, which host world-class Cu-Au-deposits. The goal of this study is to constrain the age and the nature of these basement rocks and to evaluate the role of both, the crustal protoliths and the subcontinental mantle lithosphere as source for some elements of the deposits.

The following rock types were investigated using ID-TIMS for the precise U-Pb single zircon (zr) and the Rb-Sr and Sm-Nd whole rock samples and MC-ICPMS for the analyses of the Hf isotopes: (1) Zircons from Amf-Bi Gneiss point to Lower Paleozoic age of the protoliths (460-500 Ma) and crustal dominated source (ϵNd (500) of -9.4 and ϵHf (500) of the concordant zr in the range of -1.14 to -2.55); (2) Concordant zircons of the green-schist facies overprinted diabase define an age of 443.0 ± 1.5 Ma. The ϵNd (440) values of +2.5 to +2.8 are in agreement with the idea for island-arc geodynamic environment of formation. (3) Early Paleozoic events are recorded also in inherited zr of the Upper Cretaceous Velichkovo gabbro and the Medet gabbro-diorite. In the first case the age is 442.7 ± 7.3 , the ϵHf (440) ranging between -0.85 and +1.20 and marking a mixed mantle and crustal source for the protolithic magma. Old inherited zr grains and cores of the Medet gabbro-diorite define a discordia line with an upper intercept age of 456.5 ± 5.5 Ma. The ϵHf (460) of the same zircons of +8.04 to +9.88 suggest mantle source of the old protoliths; (4) Upper Cretaceous basic rocks (most primitive magmatic compositions were chosen) reveal slightly positive ϵNd characteristics ($< +1.55$), initial Sr ratios of 0.7042 to 0.7049 and ϵHf of the concordant zircons in the range of +0.78 to +9.94, but mainly $> +8.5$. They argue for an enriched and probably not homogenous mantle source. Geochemical features give evidence for contribution of slab-derived components (Rb, Th, K, Na, P).

The formation of economic deposits was a combination of factors, which lead to the concentration of the ore metals; the world-class Cu-Au-(PGE) deposits in Central Srednogorie are not connected with the most primitive Cretaceous magmas, but are related to processes of mantle-crustal interaction.

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**Crustal processing: The
Finnmarkian orogen reassessed**

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The geological history of the Finnmarkian orogen in the northern Scandinavian Caledonides has traditionally been the subject of many contrasting interpretations. Early geochronological work had provided evidence for a Cambrian orogenic event that predated the Siluro-Devonian nappe emplacement [1]. Subsequent studies [2] showed that there was also a record of Neoproterozoic deformation and plutonism in what had originally been taken to be the Late Neoproterozoic-Cambrian cover of the Baltic margin.

Our new work confirms the evidence for a prolonged evolution but also leads to a more differentiated picture. It is now apparent that the metasedimentary succession is a composite of two distinct assemblages. The lower nappe complex had a multistage Neoproterozoic history and little Scandian overprint. The upper assemblage probably represents a sequence of latest Neoproterozoic or Palaeozoic deposits, which underwent deformation, metamorphism reaching anatexis and granitic magmatism in the Silurian as indicated by preliminary ages between 440 and 420 Ma for zircon, monazite and titanite in various rocks. It appears to correlate with the fossiliferous Palaeozoic units present on the island of Magerøy, that were intruded by gabbro and granite at 440-434 Ma.

The lower nappe complex contains the syntectonic 850 Ma Litlefjord granite [2], the syn-tectonic (?) 706 Ma Sandøra granite on Skjervoy, the 602 Ma Gildetun granite, and the 580-560 (+530) Ma Seiland alkaline igneous complex. Titanite and monazite in various samples show evidence for metamorphic reworking during episodes that correlate with the granitic events, but there is only a very weak signature for the Siluro-Devonian nappe emplacement. This lower nappe complex, originally interpreted to represent the rifted Baltic margin, matches age relationships observed in the Moine succession of northern Scotland, that is considered to have been derived from Laurentia. Their distinct Neoproterozoic history suggests, however, that both represent terranes swept up from the Peri-Gondwanan realm, as Baltica was in the process of approaching Laurentia.

References

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