Correlation of the Upper Cretaceous magmatism and the related Cu-Au mineralization in Bulgaria and Serbia: the status quo

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The Apuseni–Banat–Timok–Srednogorie (ABTS) belt, Europe's most extensive belt of calc-alkaline magmatism and Cu–Au mineralization, is related to the subduction of the Tethys ocean beneath the European continental margin during the Late Cretaceous phase. Economic deposits are restricted to certain segments along the belt, and all major porphyry-style and high-sulphidation ore deposits in Bulgaria are aligned on the Panagyurishte corridor, a narrow zone obliquely crossing the ABTS belt and in Serbia on the Timok unit.

This paper reviews the geology, geochemistry and geochronology of igneous events in three profiles extending from the European continental basement through the Srednogorie zone in Bulgaria (Central and Eastern part) and Timok unit in Serbia. U–Pb dating of single zircon grains from subvolcanic intrusions and major plutons, supplemented by published age data for magmatic rocks and hydrothermal ore deposits obtained by other methods, reveals a general younging of the magmatism from 92.1 Ma in the north (Elatsite) to 78.5 Ma in the south (Capitan Dimitrievo), in the Timok unit (east to west) from 86.29 Ma (first phase) to 78.6 Ma (third phase) and in Eastern Srednogorie from 86.6 Ma to 77.9 Ma with no magmatic time trend. Cu–Au deposits are restricted in Bulgaria in time from ~92 to ~86 Ma and in Serbia from 86 to 82 Ma, while the southernmost (Bulgaria)/westernmost (Serbia) part exposes more deeply eroded mid-crustal plutons devoid of economic mineralization. The time for epithermal deposits in Eastern Srednogorie can be estimated from Rb/Sr mineral isochrones between 81 and 79 Ma.

The age progression correlates in both profiles with the geochemical trend of decreasing crustal input into mantle-derived magmas. Magmatism and ore formation in individual magmatic–hydrothermal complexes along the profile is much shorter with life times between 0.6 and 0.9 Ma. The life time of the ore formation for the Timok, Central Srednogorie and Eastern Srednogorie is ranging between 3 and 6 Ma.

The age progression of calc-alkaline magmatism within the Srednogorie zone and Timok unit is explained as a consequence of slab retreat during oblique subduction. This led to transtensional block faulting and subsidence, and thus to the preservation of near-surface magmatic–hydrothermal products, including economic Cu–Au deposits.

The Cretaceous magmatism continued into the Rhodopian Massif (see Peytcheva et al., this volume) as well as further to West in Serbia into the Ridanj-Krepoljin belt. The magmatism outside the Timok unit and Srednogorie zone show a dramatic change in the geochemical and isotopic evolution, e.g. increasing of crustal assimilation. Theses observation lead to the question: what is the tectonic scenario of the Cretaceous magmatism on the Balkan Peninsula.