A CONTROVERSIAL METAMORPHIC RECORD AT THE MOLDANUBICUM/ BOHEMICUM CONTACT— A POSSIBLE EXAMPLE OF THE RELAXATION OF ISOTHERMS AFTER RAPID TECTONIC MOVEMENT

J. BABŮREK

Czech Geological Survey, Klárov 3, 118 21 Prague 1, Czech Republic

The Bohemian Massif forms probably the easternmost part of the European Variscan Belt. In its western part, the Massif is subdivided into large tectonometamorphic superunits —Moldanubicum and Bohemicum (or the Teplá–Barrandian Zone). The former is largely influenced by periplutonic (high-temperature/low-pressure) metamorphism with advanced anatexis of metapelitic (and partly also metabasic) lithologies. Bohemicum is situated to the NW of Moldanubicum. This unit is formed by unmetamorphozed (or just very slightly metamorphosed) sediments of Upper Proterozoic to Middle Devonian age and crystalline rocks at its western margin. The aim of this study was to characterize the contact between Moldanubicum and Bohemicum from the petrological point of view.

The 7 km distance between Nýrsko and the Czech/German boundary comprises an exceptional possibility to study the Moldanubicum/Bohemicum contact. Both intrusive rocks of the Central Bohemian Pluton and its contact aureole are absent i this area. Thus the original metamorphic mineral assemblages of both superunits are well preserved.

Bohemicum in this area comprises amphibolites (with or without garnet) and diorites with some intercalations of K-feldspar–sillimanite gneisses. The neighbouring Moldanubian Zone is built up by garnet–chlorite phyllites and garnet–biotite–muscovite gneisses. In addition, there are some intercalations of albite-epidote amphibolites.

Both garnet amphibolites, the typical rock of Bohemicum, and kyanite–staurolite–garnet mica schists which are typical of Moldanubicum, penetrate each other at the direct contact of the two superunits. Hence, these rock types are situated here roughly in the same structural level.

Mineral assemblages of both units underwent the same pressure–temperature evolution at the contact with each other. Thermobarometrical calculations of garnet–amphibole and orthopyroxene–clinopyroxene pairs yield values of 660–680°C/8–10 kb in garnet amphibolites of Bohemicum. Furthermore, garnet–biotite and garnet–plagioclase pairs in associated Moldanubian kyanite–staurolite–garnet mica schist yield comparable values. Into the interior of Bohemicum, garnet amphibolites conserve progressively granulite-facies conditions of metamorphism (750 °C/8–10 kb), while the garnet phyllites in the neighbouring Moldanubian Zone show greenschist facies temperatures and the same pressure conditions (450 °C/8–10 kb).

Thus, from the contact into Bohemicum, isobaric heating was observed, while in the opposite direction from the contact to Moldanubicum, isobaric cooling was distinguished.

Moldanubicum and Bohemicum are separated by a first order tectonic zone along their entire boundary — the Central Bohemian Shear Zone (CBSZ). It was probably active through the whole Phanerozoic era. Thus, the tectonic history of CBSZ was very complex and there are kinematic markers of both sinistral and dextral shear sense along it. Still, the rock sequences of both Moldanubicum and Bohemicum record the same metamorphic P–T conditions in the structural level of their contact in the area under study. These superunits were not detached from each other in a lateral way after the peak of regional metamorphism. The only tectonic movement along CBSZ after the metamorphic peak was vertical and it should have been faster than heat transfer through the rock sequences and so the isotherms were moved without having time for thermal relaxation. The Moldanubian Zone is relatively uplifted. The uplift was followed by successive isobaric cooling. By contrast, the Bohemian Zone sank, which was followed by isobaric heating. This process is in accord with preservation of unmetamorphozed sedimentary sequences in the interior of Bohemicum.

It appears that normal faulting (as well as folding and thrusting of other authors), could have been responsible for contrasting isobaric cooling/heating on the opposite sites of the shear zone, as a result of rapid rate of movement of blocks (uplift/sinking), causing curving of isotherms and their successive relaxation.