



Cretaceous evolution of the Adria-Europe plate boundary: succession of events recorded in granites and enclaves of the Moslavačka Gora (Croatia)

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Complex Cretaceous S-type granitoid pluton, geotectonically related to an active continental margin, makes a central part of the Moslavačka Gora (MG) crystalline and hosts two groups of enclaves. Cognate enclaves, genetically related to the granitoid host rocks, comprise different types of microgranular enclaves, tourmaline nodules, K-feldspar megacrysts and other inhomogenities found inside the two-mica granitoids. All of these enclaves provide evidence of the petrogenetic processes that took place inside the MG Cretaceous magmatic system. On the other hand, foreign enclaves, mostly xenoliths of metapelitic and metabasic rocks, hold information about the metamorphic events that preceded or were contemporaneous with the intrusion and solidification of the igneous body.

Based on the age data gathered by earlier researchers of the MG crystalline and P-T data extracted from the study of Cretaceous granitoids and their enclaves, it was possible to characterize multiple episodes of Cretaceous igneous and metamorphic evolution of the MG.

Intrusion of the mantle-related mafic magma at pressures ~ 8 kbar and temperatures ~ 920 °C has been regarded as the oldest Cretaceous magmatic pulse (~ 110 -90 Ma) recorded in the MG crystalline complex, leaving behind local occurrences of gabbroic rocks. Its relation to the medium-pressure metamorphic event recorded in amphibole-bearing xenoliths reaching ~ 8 kbar and max. ~ 800 °C has not been elucidated so far. It was followed by a younger LP-HT event (100-90 Ma), recorded in a sequence of partial melting reactions in the metapelitic rocks reaching granulite facies conditions (2-5 kbar, ~ 720 -790 °C). Such melt-producing reactions documented in the km-sized metapelitic xenoliths point to the nature and extent of processes in the metapelitic source rocks that contributed to the overall production of the granitic magma in this setting. All of the aforementioned events preceded the Late Cretaceous intrusion of the central granitoid body and oscillations of igneous activity recorded in the products of mixing and hybridization between granitoids and more mafic magmas (MME enclaves) and the onset of immiscibility (tourmaline nodules) and the intrusion of leucogranites. According to our data, all of these pulses occurred in a low-pressure crustal setting (< 3 kbar, 660-770 °C). Late Cretaceous peak of igneous activity in the MG system was accompanied by a second LP-HT metamorphic event (< 2 kbar, < 650 °C) that has been recorded in all MG crystalline lithologies and is correlated with the crystallization and cooling of the crystalline complex, following the intrusion of the central granitoid body. Fluids released by its crystallization led to fluid-assisted melting reactions in cm- to m-sized metapelitic enclaves, recording the interaction of granitoid host with the encapsulated fragments of metapelitic rocks and their role in the granite petrogenesis at Moslavačka Gora.

Data gathered by the study of different types of enclaves from the Moslavačka Gora granitoid rocks are mutually consistent and reflect the complexity of Cretaceous evolution of a small and geotectonically still enigmatic crystalline fragment at the Adria-Europe plate boundary. This approach opens new perspectives for future research of the processes that took place in the mobile zone on the southeastern margins of Mesozoic Europe.