Mn(IV) reduction: A driving mechanism for Mg^{2+}-enrichment in shallow marine carbonates?

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A wide variety of bacterial metabolisms have been suggested to facilitate the precipitation of penecontemporaneous dolomite (e.g. aerobic respiration, sulfide oxidation, sulfate reduction, and methanogenesis), highlighting a strong need for additional insights from modern near-surface dolomite-forming locales. In the transition from intertidal to supratidal settings in a Ca-dolomite-forming lagoon, Archipelago Los Roques, Venezuela, early diagenesis is strongly influenced by a complex microbial mat system. The overlying evaporated seawater is characterized by temperatures in excess of 30°C; elevated alkalinity, ~245 meq/L (as total $CaCO_3$) and pH, ~9.3. Sedimentation in the lagoonal system is dominated by allochemical aragonite, authigenic calcite and gypsum. In the sediment, there is a slightly cemented zone, 8-12 cm below the surface, consisting of aragonite, calcite and Ca-dolomite. EPMA show that within this layer, gypsum is actually being calcified. Such evidence would suggest that the enrichment of Mg in carbonate cements might have been mediated by the terminal stages of degradation of organic matter [1], however, the Mg-enriched zone also corresponds with a local increase in the total organic carbon. Sediment major and trace element data yield a more complex picture of diagenetic processes leading to dolomitization. The trends in sediment trace element concentrations reveal marked changes in redox conditions with increasing depth. Carbonates in the cemented zone have maximum [Mn^{2+}] and minimum [Fe^{2+}], and as compared with underlying sediments, they also record highest Ni and Co concentrations. The incorporation of these elements in authigenic carbonates is though dependent on their solubilisation by Mn (IV) reduction [2], and the trends described here strongly suggest that at this depth, manganese reduction outcompetes sulfate reduction for labile organic carbon. Our results suggest that the trace element composition of carbonate minerals may track the biogeochemical processes that take place during low-temperature diagenesis, and importantly, offers new insight into the formation of penecontemporaneous dolomite.

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LP-HT signature from the Adria-Europe plate boundary realm: The role of mantle/crust interaction in granite generation

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The final geodynamic position of the Moslavačka Gora (MG) on the SW margin of the Pannonian Basin (PB) is related to Mesozoic and Cenozoic evolution of the Dinaric segment of the Alpine-Himalayan orogenic belt formed along the Adria-Europe active continental margin. Overall lithology of the MG crystalline can be broadly divided into three main groups: S-type granites which make the core of the MG complex and high- to medium-grade metamorphic rocks (migmatites, gneisses, amphibolites, metapelites) which are present in form of foreign enclaves i.e. xenoliths inside the MG granite pluton.

Dm- to m-sized xenoliths bear signature of the polyphase metamorphic evolution of the MG complex with at least two phases being identifiable through specific mineral assemblages. First phase (recorded in amphibolites), which preceded granite intrusion, reached maximum conditions of amphibolite facies metamorphism. The second, Late Cretaceous LP-HT phase, can be separated into two closely related metamorphic events (recorded in the metapelite xenoliths) that took place under low-P amphibolite facies conditions. Pseudosection modelling gave temperature range 585-600 °C and pressure range 390-460 MPa for assemblage Bt + Cd + Pl + Grt + Sil + Qtz while younger assemblage Bt + Chl + Pl + And + Qtz gave temperature 540°C and pressure <250 MPa).

Major and trace element chemical data (including REE) favor anatexis of a crustal (meta)pelitic source as a dominant process in the genesis of two dominant types of the Late Cretaceous MG peraluminous granites: two-mica granite (Tmg), and leucogranites (Lg). Occurrence of different types of cognate enclaves, e.g. tourmaline nodules, together with presence of miaroles and magmatic andalusite in the assemblage points to upper crust emplacement level of the intrusion (avg. 5-6 km). Rare MME field occurrences imply genetic link of the MG granite intrusion with Late Cretacoeus LP-HT event and the upper mantle/lower crust mafic intrusion that might be the same that was responsible for Cretaceous gabbro occurences of the MG crystalline complex.