Cyanobacterial 'whiting' origin of Devonian-Mississippian carbonate mud mounds?

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Carbonate mud mounds are unusually abundant in the Late Devonian-Early Mississippian. A sediment baffling origin has been suggested, but a suitable source of off-mound carbonate mud has been difficult to identify. Late Devonian changes in atmospheric composition, particularly pCO_2 reduction and pO_2 increase, may have been sufficiently large to induce CO_2 concentrating mechanisms (CCM) in phytoplankton. CCM act to maintain photosynthesis, and include active transport of HCO^{3-} into the cells that can lead to extracellular pH rise and precipitation of fine-grained carbonate ('whitings') in the water column when carbonate saturation state is sufficiently elevated. It is proposed that Late Devonian-Early Mississippian whitings promoted mound development by generating mud off-mound whose import substantially augmented any on-mound carbonate production. Coeval increase in benthic calcified cyanobacteria supports elevated carbonate saturation state and CCM induction, and potential increase in primary productivity stimulated by CCM induction is consistent with organic carbon rich anoxic sediments and large positive δ^{13}CPDB excursions at this time.

A number of the sedimentary features commonly associated with Late Devonian-Early Mississippian mud mounds are consistent with current-driven accumulation of fine-grained carbonate. These include: (i) formation in a wide range of water depths; (ii) orientation, asymmetry, lateral progradation and amalgamation, (iii) grainstone haloes; (iv) presence of current-reliant filter feeders (bryozoans, crinoids, sponges); (v) layered structure; (vi) collapse structures (stromatactis and slumps). Carbonate mud derived from phytoplanktic whitings can be rich in organic matter. This could have promoted microbial lithification (e.g., by bacterial sulfate reduction) that contributed to the formation of clotted-peloidal microfabric. Thus, whiting processes could have been the primary mud source and also have created conditions favoring syndepositional on-mound early lithification. In this view, on- and off-mound microbial processes were mutually related, with off-mound mud production being mediated by cyanobacterial oxygenic photosynthesis and on-mound lithification mediated by heterotrophic mineralization of whiting organic matter.

Peritidal cyclical sequences of Kimmeridgian-Berriasian-?Valanginian limestones from Piatra Craiului Massif (Romania); the role of microbialites and rivulariacean-type cyanobacteria

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The Kimmeridgian-Berriasian-?Valanginian limestones from Piatra Craiului Massif are part of the sedimentary cover of the Getic Nappe from Southern Carpathians. Within the Piatra Craiului carbonate succession, three major types of depositional systems have been separated which can be followed from base to the top: (1) slope and shelf margin system; (2) open shelf system (offshore) and (3) coastal and shoreline system.

The carbonate deposits belonging to the slope and shelf margin system are represented by reef breccias and bioconstructions. The bioconstuctions associated with gravity flows indicate a shelf slope environment related to the external flanks of the carbonate platform. Within the bioconstructions microbialites and encrusting organisms played an important role.