

**Correlation between ~3.22 Ga old microbial mat morphotypes and distinct paleoenvironments (Moodies Group, Barberton Greenstone Belt, South Africa)**

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The Middle Archean Moodies Group represents Earth's oldest known siliciclastic sequence with common microbial mats, thriving in the former photic zone of a tidally influenced shoreline. We here present the association of specific mat morphotypes with distinct paleoenvironments.

The fossil mats are preserved as kerogenous laminae and are interbedded with medium- to coarse-grained sandstones and sporadic gravel beds. The interwoven laminae have a thickness of ~1mm and SEM analyses reveal the presence of silicified microbial filaments (1 - 3  $\mu\text{m}$  in diameter), that presumably have been fossilized in life position. Detailed stratigraphic sections logged over 15 km along strike demonstrate, that the microbial communities once had developed in three major habitats: coastal floodplain, inter- and supratidal environments. In the coastal floodplain zone the mats are typically flat and occasionally have overgrown gravel beds, whereas wavy-crinkly morphotypes are generally restricted to the intertidal zone. Tufted microbial mats are exclusively present in the supratidal facies and frequently associated with gas escape structures. These 1 - 2 cm tall tufts are internally calcified although most of it has been replaced by chert. Modern tufted mats are built by filamentous cyanobacteria, suggesting that their ancient counterparts also were constructed by filamentous bacteria and required early mineralization for structural support.

Follow-up work will investigate whether light, nutrients, sedimentation rate, or the prevailing hydraulic regime were the governing factors in the development of the different morphotypes.