Linking the modern to the ancient with morphological and geochemical signatures in microbial mats

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Interpretations of morphological and geochemical signatures in fossilized microbial mats and stromatolites inform our understanding of early life on Earth. Evaluation of such records requires that physical and chemical patterns in ancient microbial mats be interpreted in terms of both biological processes at the time of formation and degradation processes that overprint morphological and geochemical signatures of surface mat communities. Microbial mats from Little Ambergris Cay, Turks and Caicos Islands, British West Indies, provide a model system for examining how these processes influence geobiological signatures. The top ~1cm of Ambergris mats contains three principal cyanobacterial morphotypes, which overlie and are admixed with microbial consortia comprising aerobic and phototrophic Proteobacteria. Below this surface horizon, the mats contain evacuated sheaths of cyanobacteria. Here, we present microbial diversity data of mat surface communities and examine changes microfauna morphology, mat textures, organic biomarkers, and carbon and sulphur isotope values through a depth profile in the Ambergris mats to explore preservable geobiological richness in ancient microbialites and highlight aspects of microbial diversity that are not readily preserved.