Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.34004

A multi-scale characterization of thrombolites from the late-Ediacaran Nama Group, Namibia: towards systematic identification in the sedimentary record

AVA WHITEHEAD[1], AJANI BISSICK[1], CHARLOTTE SPRUZEN[1], BIANCA SPIERING[2], CLAIRE MUSAJO[1], PETER LIBERTY[3], JOSHUA H.F.L. DAVIES[4] AND GALEN P. HALVERSON[1]

[1]McGill University
[2]Utrecht University
[3]University of Toronto
[4]Université du Québec à Montréal

Microbialites are organosedimentary carbonate structures formed by the trapping, binding, and precipitation of minerals by microbial communities. They are critical tracers of life in Earth's history, representing some of the oldest evidence for life (~3.45 Ga) and persisting today in the sedimentary record as indicators of environmental conditions and biological activity. Despite their significance, some classes of microbialites remain poorly understood. Thrombolites, characterized by mm- to cm-scale clotted textures, are an enigmatic class of microbialites for which the formative processes, environmental controls, and diagnostic criteria remain inadequately constrained. Consequently, thrombolites are commonly misidentified as texturally similar facies, such as grainstones, or overlooked altogether. Therefore, further thrombolite characterization studies are imperative to develop a systematic identification system and to ensure their reliable identification in the rock record. In southern Namibia, the late-Ediacaran middle Nama Group features abundant thrombolite-dominated patch reefs deposited in a restricted foreland basin. These thrombolites often occur in association with fossils of the earliest carbonate biomineralizing metazoans, such as *Cloudina*, leading to their relevance in recent literature. Within the Nama Group, the Huns Member of the Witputs sub-basin hosts abundant thrombolite facies distinguishable on the outcrop-scale by clot size. We aim to provide a detailed, multi-scale (i.e. micro- to outcrop-scale) characterization of the diverse thrombolitic textures in the Huns Member. This project integrates high-resolution sequence stratigraphy alongside laboratory techniques such as optical microscopy, scanning electron microscopy (SEM), and trace element analysis by laser-ablation inductively-coupled plasma mass spectrometry (LA-ICPMS) to characterize the textures, associated inorganic features, and geochemical signatures of these thrombolites. These data will be used to infer paleoenvironmental parameters such as sea level, temperature, redox conditions during thrombolite growth, and potentially their microbial metabolisms. Here we present optical microscopy and SEM analyses of thrombolitic textures from the Huns Member within a sequence stratigraphic context. Preliminary results suggest that thrombolite morphology is controlled by three factors: microbial influence, sedimentation rate, and cementation. We hope to quantify the influence of these controls and assign facies accordingly. Ultimately, this work will establish a consistent, process-based framework for defining thrombolites and interpreting their paleoenvironmental significance.