INVESTIGATING THE PRESENCE OF TWO DISTINCT MICROBIAL COMMUNITIES FROM ARCHEAN FENESTRATE MICROBIALITES M. Juarez Rivera[1] and D. Y. Sumner[2], [1,2]Department of Earth and Planetary Sciences, University of Califronia, Davis, 1 Shields Avenue, CA 95616. mjuarezrivera@ucdavis.edu.

Introduction: Neoarchean microbialites from the 2521±3 Ma Gamohaan Formation, South Africa capture clues to understanding ancient ecosystems. These fenestrate microbialites consist of organic inclusions with complex organization that represent at least two microbial communities. We interpret vertical and horizontal changes in microbialite morphology as evidence of microbial community change through time and space, possibly in response to changing environmental chemistry. Previous work documented six microbialite morphologies in the Gamohaan Formation [1]. Our work focused on the presence and distribution of two end-member morphologies: cuspate and plumose [1-2] near Kuruman Kopp and Danielskuil, South Africa.

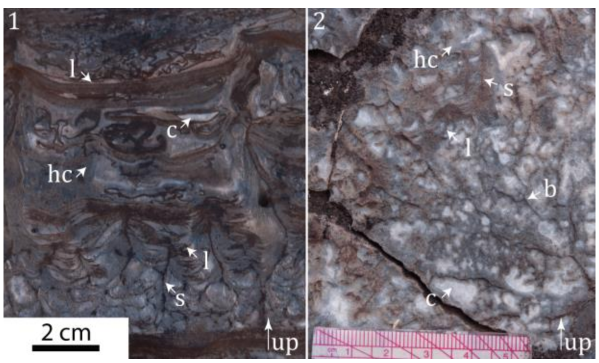

Figure 1. Microbialite components (hc) herringbone calcite, (c) calcite, (s) support, (l) draping lamina, (b) branching elements. 1) Sample displaying vertical transitions of cuspate microbialites, where the spacing between supports increases while vertical spacing between lamina decreases. 2) Sample shows vertical transition from plumose to cuspate microbialite.

Observations: The bulk of fenestrate microbialites are made of herringbone calcite, with traces of kerogen preserved as sub-millimeter inclusions. These inclusions delineate the preserved microbial mat and outline various morphologies as seen in outcrops (Fig.1). Individual microbialite beds are separated by multi-centimeter lenses of marine sediment and rolled up mat. Fenestrate microbialites create 0.5 to 1 meter-thick packages that were traced laterally across 85 km. Microbialite textures change both gradually and abruptly on the centimeter to decimeter scale. The basal two packages display an upward gradational change of cuspate morphology, definen by vertically oriented linear features (supports) and attached concave up elements (draping lamina) (Fig.1.1) [1-2]. The number of supports and the vertical spacing between lamina decrease upwards with in each micrcrobialite producing areas with more draping lamina per cm^2 at the top. The third package displays an upward transition from branching (plumose [1-2]) microbialites into cuspate microbialites (Fig.1.2). As the branching decreased toward the top of the beds, draping lamina appear. Sharp lateral changes from plumose to cusptate microbialites are also present in the third and fourth package. Specifically, some of the microbialite elements such as draping lamiae and supports can be traced from plumose into cuspate microbialites (Fig. 2).

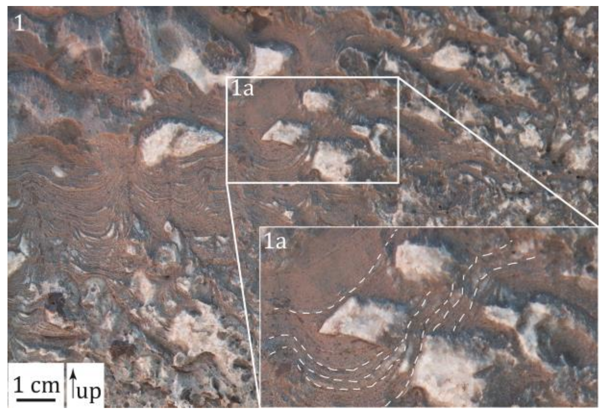

Figure 2. Lateral transition from cuspate to plumose microbialite. Draping lamina can be traced across both morphologies.

Implications: The microbial mat arrangements of these morphologies are complex yet vary systematically throughout the outcrops. Microbial components can be traced across both lateral and vertical transitions indicating simultaneous growth and the gradual appearance of new microbial components. The vertical transitions may represent changes in the environment where new growth forms could be supported. The horizontal transitions may represent an environment that supported the presence of both growth forms. We interpret these complex morphological changes to represent an ecosystem that had a regional control, as suggested by the continuity of first order morphology across sections spanning 85 km, but with fairly dynamic characteristics in the decimeter scales that allowed the simultaneous growth of at least two different microbial communities.

References: [1] Sumner D. Y. (1997) Palaios, 12, 302-318 [2] Sumner D. Y. (1997b) American J. of Science, 297, 4-487.