Iron formations at Lake Tyrrell, Victoria, Australia: microbially-mediated redox chemistry

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Lake Tyrrell is a hypersaline lake (35-250 ppt) covering approximately 160 km^2 in northwestern Victoria, Australia. Microbial biofilms dominated by *Salinisphaera* spp. and *Haloarcula* spp. accumulate against elevated ferricretions associated with mineralized mudcracks in the vicinity of spring discharge sites on the lake's south shore. This leads to the formation of a black organic-rich layer of sediment of varying thickness adjacent to the ferricretions.

Some of the organic material is respired by sulfate reducers (*Desulfobacter* spp.), producing sulfides that combine with biologically or inorganically reduced Fe (II) to generate iron sulfide accumulations in proximity to the seeps [1]. The metal sulfides oxidize as the lake dries seasonally, causing lateral growth of ferricrete laminations.

During the dry summer months, water discharge along mineralized mudcracks localizes growth of photosynthetic microbial communities, resulting in further accumulation of organic matter. Thus, microbial metabolism, in concert with seasonal changes in water availability, directly affects the cycling of iron and sulfur in the lake.

We present analyses of water, ferrihydroxides, and biofilm communities, including data from 16S rRNA libraries, collected from acidic (pH 4.7-5.5) seeps on the southern shore of the lake. These data support biologically-mediated formation of the ferricretes, and illustrate the integral role of microorganisms in determining meter-scale redox chemistry within the lake's sediments.

References

[1] Welch, S., Beavis, S., & Somerville, P. (2004). *Regolith 2004* **CRC LEME**, 391-393.