Biogeosciences Discuss.,
doi:10.5194/bg-2015-647-RC1, 2016

Biogeosciences
Discussions

Interactive comment on "Linking the distribution of microbial deposits from the Great Salt Lake (Utah, USA) to tectonic and climatic processes" *by* A. Bouton et al.

Anonymous Referee #3

Received and published: 2 June 2016

Summary: In the associated manuscript, Bouton et al. develop high-resolution distribution maps of microbialites and lacustrine deposits of the Great Salt Lake (GSL), Utah. These maps demonstrate interesting heterogeneous spatial relationships among microbial and sedimentary features, shorelines and faults. Using these data the authors argue that microbialite distributions indicate ancient shorelines and relate these shorelines to lake level curves generated in prior works.

This manuscript presents an impressive relatively high-resolution set of maps that provide crucial insight into the distribution of apparent microbialite structures. I commend the authors in generating beautiful images in this manuscript. The authors' interpretations are broadly backed by the collected data. However, the potential variability

in microbialite genetic mechanisms may complicate the conclusions, particularly the association of microbialites with shorelines.

General Comments: Whereas the desiccation polygons have a straightforward relationship to the shoreline, microbialite relationships are likely more complicated. Indeed the alignment of microbialite structures with the modern shoreline suggests they may be shoreline structures, however, it appears that this orientation coincides with faults as well (the faults probably directly influence the shoreline). Indeed, the authors mention that deeper microbialites occur in association with faults (lines 27-31, pg 12). The faults likely provide a source of Ca^{2+} to the lake promoting localized carbonate precipitation (as in Mono Lake, CA). This may also explain microbialite distributions along polygon edges as the authors discuss (lines 10-11, pg 8). At any rate, both fault and polygon edge proximal structures can be related to a genetic mechanism for local carbonate precipitation (source of Ca^{2+}). In contrast, a shoreline formation mechanism is not explained. If microbial in nature these structures may be limited to shallow photosynthetic depths, although light can penetrate to significant depths depending on water clarity. In addition, calcium contents are relatively low and photosynthesis does not relieve this burden for carbonate mineral precipitation.

Might is also be possible that microbialites occur at deeper depths that are simply not visible because of water clarity? This would certainly lead to easier identification of shallower (and therefore shoreline) structures.

Specific and Technical Comments:

Pg 1 Lines 19-20: "system" appears twice in same sentence

Line 29: microfabric (singular)

Pg 4 Lines 8-9: AMS undefined. In this context the following "spectrometers" is redundant.

Lines 17-20: "microbially-mediated precipitation" and "trapping and binding" are quite distinct processes. Trapping and binding does not involve mineralization (precipitation) but rather incorporation of detrital grains. Are both processes leading to microbialite formation?

Lines 20-21: It would be informative to identify which of the microbialite structures (domes, cauliflower, etc) host living microbial mats. Same comment for line 3 pg 8.

Pg 5 Line 1: missing a unit after "few".

Line 2: "...with thicknesses between..."

Line 18: need a "the" before "boulders"

Pg 8 Line 29: The microbialites track approximate shorelines, as they must form in submerged (at least predominantly) environments.

Figure 3: The caption describes a pane E that is not shown.

Interactive comment on Biogeosciences Discuss., doi:10.5194/bg-2015-647, 2016.