**Interactive comment on “Can Mg isotopes be used to trace cyanobacteria-mediated magnesium carbonate precipitation in alkaline lakes?” by L. S. Shirokova et al.**

Anonymous Referee #1

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The paper “Can Mg isotopes be used to trace cyanobacteria-mediated magnesium carbonate precipitation in alkaline lakes?” is worthy of publication in Biogeosciences with minor revisions. This paper is interesting in that it uses a mixture of field and laboratory methods to test a hypothesis at the border of geology and biology. As such is it both timely and of interest to a broad audience.

The paper is well structured. I only found myself lacking appropriate references once (mentioned below).

My major concern with this paper is that it takes the results from experiments with one genus of bacteria (Synechococcus sp.) and makes an overly broad statement that Mg isotopes do not track biologically mediated precipitation of hydrous Mg-carbonates. __Could these results be unique to this particular genus or to cyanobacteria in general?__ Discussion of the answer to this question is required before this paper should be published. The paper’s title should be checked so that it reflects the proper scope of the study’s findings.

My second concern is that the abstract does not adequately portray all that is useful in this paper. If the authors were to rewrite the abstract to include more of the information from the last three pages of the text, it would provide a much more useful synopsis of the article to the would-be reader. I would also suggest that the message in the final two sentences of the current abstract be incorporated at the beginning of the abstract so the most important finding of the article gets to the reader as soon as possible.

General technical comments: 1. The authors use both “magnesium carbonates” and “Mg-carbonates.” They should pick one and use it throughout. I would suggest the latter. 2. $\delta^{36}$Mgsolid-solution is confusing. This makes me think of solid solutions. I would suggest $\delta^{36}$Mgmineral-solution. 3. The terms “stromatolite” and “microbialite” are used interchangeably both before and after stromatolites are defined as a subset of microbialites. Perhaps the authors could use “stromatolite” only and then define it in terms of microbialites in the site description (6477-17). 4. If this paper is a digital document, why is there an electronic supplement? Can the electronic supplementary material be integrated into the body of the paper? Also if the publication format is landscape, can the portrait figures be rendered in landscape format? 5. I would ask the authors to look at the number they report and take care to keep track of significant figures. In some cases $\delta^{36}$Mg has 3 decimal places (e.g. in tables), other times 1. 6. To reduce confusion, I would strongly suggest that the terms “heavier” and “lighter” when used in the context of isotopic values, should be preplaced with “more positive” and “more negative,” respectively. 7. Why do figures 9 & 10 use color when none of the other line drawings do? I would make 9 & 10 black & white too.

Specific technical comments: 6474-2: change “precipitation in both” to “both in” -3,
be separately reported. It would be preferable to have the reported like the previous sentence with the range of values and not with a "±". -18, include a chemical formula for brucite; reverse structure of sentence so beginning products are described before final products. -21, "main" to "most abundant" -24, "needle-like" to "acicular" 6486-19, "evidenced" to "showed" -22, "whole cell surfaces (see Fig. 3c) or cell sheaths (see Fig. 3b)" to "cell sheaths (see Fig. 3b) or whole cell surfaces (see Fig. 3c)" -28; define "representative" 6487-15, "0.93-0.84" to "0.84 to 0.90" -17, italicize "Synechococcus" 6488-6, It would be useful for the authors to speculate on dypingite saturation state even if they can’t calculate it because it is a major phase precipitated in their experiments. 6489-6, "The isotopic" to "The Mg isotopic" -8, "solution" to "the solution’s" -10, "Mg" to "Mg concentration" -18, "as the main mineral of" to "among the minerals precipitating in" -19, delete "void-like," -21, delete "lake" 6490-3, "fluid" to "solution" -7, "weeks")" to "weeks)," -8, Can the authors list the temperatures each study used so the reader can decide if they are "elevated?" -11, "is in agreement to "agrees" 6491-1, "honeycomb-like" to "honeycomb-like" -4, "exopolysaccharide" to "exopolysaccharide" -21, delete "(not shown)" 6485-3, "2010" to "2010," -5, I do not understand why δ²⁶Mg from stromatolite parts and littoral sands are summarized with one value and a "±". These should
are formatted differently than tables in the main body of the paper.

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