Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2017-180-RC1, 2017

Biogeosciences
Discussions

Interactive comment on "Anatomical structure overrides temperature controls on magnesium uptake – calcification in the Arctic/subarctic coralline algae *Leptophytum laeve* and *Kvaleya epilaeve* (Rhodophyta; Corallinales)" *by* Merinda C. Nash and Walter Adey

J. Fietzke (Referee)

jfietzke@geomar.de

Received and published: 19 June 2017

The submitted manuscript of Nash and Adey addresses important aspects of coralline algal skeletal features and their respective impact on using chemical proxies like Mg content for the reconstruction of environmental parameters i.e. ambient temperature.

This is significant, competently researched material. Obviously, I will not ridicule myself trying to lecture the authors on algal ecology and physiology or description of algal

skeletal features. In particular to my understanding the senior author is well-recognized as one of the world-experts in this field and a person I would ask for advice in such matters.

I do strongly belief the authors' approach is a very important one and we need more such studies to better understand the underlying processes controlling the formation of calcified hard-tissue of all kinds of biogenic samples on the μm and nm scale. This has the potential to greatly improve our conceptual understanding for the use of chemical proxies.

I've got no doubt this manuscript fits into the scope of BG and will become a valuable contribution. In its current form the manuscript strongly focusses on the investigation of skeletal ultrastructure and related Mg variability. That's in my opinion the real strength of this work. The consequences for the proxy application are discussed in the latest parts relatively briefly. I guess this study is supposed to be followed by more in the coming years and the mentioned discussion could be dealt with in a future manuscript in more detail. Nevertheless, I would underline the fact, that existing temperature-Mg calibrations used to be based on "bulk" methods, at least when compared to the ultrastructure studied in here. Applying a calibration derived from empirical correlation of temperature to mean concentrations (averaging tens or hundreds of μm) to sub-μm chemical variations may be critical, simply because it is an extrapolation beyond the factual base used to establish the former. Don't get me wrong, I consider this a valid point, just, please, be careful not to blame the existing calibrations not to work for the fine-scale variations. They never have been developed on that base and to my knowledge did not claim to work for anything beyond their spatial resolution. Thus, please, reconsider the point you make e.g. in figure 5 (how do the different skeletal parts contribute to the particular mix at a given time?).

I would love to see a more detailed quantitative evaluation of to what degree the seasonal variation in Mg content (for lower resolution studies) can be explained by changing skeletal structure, thus, just being an indirect response to temperature or even just

a co-variation with temperature due to seasonal changes in algal physiology. Or how much of the Mg-variation is truly coming from a changed chemical composition of the calcite crystals formed and how much is reflecting changing skeletal structure? But again, this may be the focus of future work and too early to address in this work.

As you cite Ragazzola et al. (2016) in the text, please, add this citation to the reference list.

Check wording in line 180 “show identify”.

Finally, please, reconsider the very short conclusion. Is this all, you want to state?

Cheers,

jf

Interactive comment on Biogeosciences Discuss., https://doi.org/10.5194/bg-2017-180, 2017.