

## ***Interactive comment on “The effects of environment on *Arctica islandica* shell formation and architecture” by Stefania Milano et al.***

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Received and published: 20 January 2017

Dear Referee #2,

We appreciate your positive review and the constructive comments.

In regards to the first remark: to our knowledge a detailed description of the orientation of the microstructural units in the different shell layers of *Arctica islandica* currently not available. We are only aware of one single paper that has been published on a similar subject (Karney et al., 2012). However, in that case, the EBSD analyses were exclusively conducted in the hinge plate and not in the ventral margin. The study characterized the microstructural orientation in the growth increments and in the growth lines, respectively. However, no data was shown on the three shell layers mentioned in the current manuscript. Given the frequent use of *A. islandica* in sclerochronological

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studies, the community will benefit from a map of crystal orientation in the whole shell, not just in very small shell portions.

As suggested, a more detailed description of the microstructures will be added to a revised version of the manuscript (paragraph 2.4: *A. islandica* shell organization) and a sketch (new Fig. 2) will be provided to better locate each type of microstructure described in the article. However, a superimposition of SEM images and CRM spectral maps would be imprecise since the two analyses were conducted on different machines without common coordinates as reference. We therefore prefer to show the two outputs separately.

The paragraph 4.2 will be edited as suggested. The main difference between the two techniques is the output of absolute (EBSD) and relative (CRM) data. This can be considered the main advantage of EBSD over the CRM. The information has been added to the paragraph. However, it should be realized that the “absolute orientation” is determined for the actual cross section. Therefore we regard a relative change in orientation as sufficient to for the questions asked in this study.

As for the third point highlighted by the referee, we agree that an experimental setup in which more parameters had been varied would be very interesting. However, this was outside the scope of the present study, which focused on the general feasibility of the applied methods. The positive results obtained by this first study set the basis for further studies in which now a more complex matrix of parameters can be investigated.

### REFERENCES:

Karney, G.B., Butler, P.G., Speller, S., Scourse, J.D., Richardson, C.A., Schröder, M., Hughes, G.M., Czernuszka, J.T., Grovenor, C.R.M., 2012. Characterizing the microstructure of *Arctica islandica* shells using NanoSIMS and EBSD. *Geochemistry, Geophys. Geosystems* 13, doi:10.1029/2011GC003961