

Interactive comment on “Polar coralline algal CaCO₃-production rates correspond to intensity and duration of the solar radiation” by S. Teichert and A. Freiwald

Anonymous Referee #1

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General Comments

This paper measures CaCO₃ production rates by rhodolith-forming coralline red algal communities at higher latitudes. The authors report annual CaCO₃ production of 100.9 to 200.3 g (CaCO₃) m⁻² yr⁻¹ across a latitudinal gradient in Svalbard. Comparisons of CaCO₃ production with physical parameters indicates that geographical latitude, duration of the polar night, and duration of sea ice cover correlate with CaCO₃ production. The authors conclude that light is the primary driver of coralline algal growth.

I think the paper should be published however I have a few serious concerns about the statistical analyses describe below, in addition to a few other minor comments.

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Specific comments

1. The authors should include literature on CRA growth rates by the Kamenos group and the Halfar group.
2. If any of the studies listed in table 1 used methods similar to those in the current study, then comparisons among results should be made. To permit comparisons going forward, the authors could consider recommendations for a unified method of measuring annual CaCO₃ production.
3. The authors should consider fresh river discharge when examining environmental parameters that may influence CaCO₃ production.
4. For the multiple linear regression, the authors need to adjust for the multiple comparisons and overfitting otherwise they are reporting inflated R² values and potentially falsely rejecting the null hypothesis of no significance. If the adjustments have been made, they need to be reported in the methods. Also, Table 4 says that multiple linear regression was used while Figure 5 says one-way ANOVA was used to test for correlations between CaCO₃ production rates and environmental variables.
5. Were the calculated CaCO₃ production rates averaged over the same period of time for each specimen and the environmental data? Otherwise, the authors are aliasing their results.
6. The authors should consider including the source of environmental parameters in the methods, not just in Table 3. They should also include errors on the environmental parameters. The errors should also be included when presenting any of the algal data as well (e.g., Figure 5).
7. I appreciate that the authors did not include data from the shallower site 714 in the statistical analyzes, however they may want to include it in Figure 5 for reference.

Technical corrections

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1. Table 2, Table 4, and Figure 5: exact p-values should be listed, unless $p < 0.0001$.
2. Text in Figure 5 is nearly illegible in the pdf produced online.

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