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Interactive comment on "The short-term combined effects of temperature and organic matter enrichment on permeable coral reef carbonat sediment metabolism and dissolution" *by* Coulson A. Lantz et al.

A. Hannides (Referee)

ahannides@coastal.edu

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The manuscript describes a study that falls into a now well-established tradition of permeable sediment experimental studies at Heron Reef. I think that it complements previous findings very well, by extending our fundamental knowledge of how these sands work and are expected to respond in view of future change. Surprisingly, despite their preponderance, sands do not receive more attention and remain understudied. In view of the above, I find this manuscript worthy of publication in this journal.

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The study is justified by a substantial review, the experiments are well designed and sufficient to support the scope of the study and to reach the stated conclusions. However, there are some aspects of the manuscript that need improvement before it is published.

One important correction to be made involves the recipes for organic matter addition, described in section 2.5, "Organic matter manipulations." The math doesn't add up. On p. 7, line 178, the phytodetritus concentrate is characterized by concentrations of 8.5 umol C/L and 0.9 umol N/L, and we are then told that when 10 mL are added to ~4 L and diluted, the concentrations of C and N almost triple! Could the mentioned units be actually mmol instead of umol? On p. 8, line 191, we are told that 94 mL of mucus were added to corresponding treatments. At concentrations of 12.1 mmol C/L and 0.8 mmol N/L (line 194), dilution by 4 L of overlying water would yield 280 umol C/L or roughly 10 times higher than those in Table 1. Please re-examine these recipes and correct accordingly.

Another important aspect of the study that needs improvement is the description of statistical analyses to test the proposed hypotheses and their outcomes. Currently, statistical aspects of the study are spread far and wide in the text, tables and figures, and are occasionally redundant. Below are some suggestions for improvement.

A statement like the following is repeated in the legend of several tables and figures: "Values correspond to the mean ± SE. Control (C) (n = 9) and temperature (T) (n = 7) treatments were pooled together from all four incubations. Organic matter (OM) (phytodetritus (PD) and coral mucus (CM)) and combination treatments (T + PD, T + CM) are pooled together from the two incubations for that specific OM treatment (n = 4)." Mention this pooling strategy once in Methods, and that should be sufficient. This should unclutter a lot of the legends. If you so wish, include values of n in the treatment column of Tables 1 and 3 in parentheses.

The abstract states that "The combined effect of warming and OM enhanced R and

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GPP, but the net effect on GPP/R and Gnet was not significantly different from control incubations." A simple and important statement like this cannot be verified easily. Sure, the bar charts showing means and standard errors can be visually inspected and the statement (kind of) verified, but the statistical proof is buried in the text. One way to resolve this is to use symbols on bar charts (Figures 4, 5 and 6) to indicate statistically insignificantly different treatments, i.e., same symbol indicates indistinguishable values.

The Results section is festooned with statistic and probability values in parentheses. Consider displaying all results of your ANOVA tests in a table to precede or follow Table 3 and focus your Results section on highlighting the main outcomes. In my opinion, the readability problem in this section is exacerbated by a tendency to repeat values for T, GPP, R, GPP/R etc. already shown in Table 3 and the figures. There's no need to repeat these values; just refer to Table 3 and the relevant figure.

A final comment on the statistics front concerns the use of a Model I regression "to fit a linear relationship for the purpose of predicting inorganic metabolism (Gnet) from organic metabolism (NPP, GPP, R, GPP/R)." Since the latter are not true independent variables, a Model II regression may be the appropriate approach towards this goal.

Beyond the two major topics I mentioned above (organic enrichment recipes and statistics), I'd like to make a few more minor suggestions to improve this manuscript.

The excellent overview of past experiments (starting on p. 4) distinguishes between "short" and "long" experiments. It would be useful if the actual time-scales are mentioned explicitly (instead of "hours to days") so that those studies and the one described in the manuscript can be placed in perspective.

The "Sediment grain size: 12.1%. 2 mm . . ." statement (p. 5, lines 120-122) is awkward, not even a complete sentence. Is this information important? I think so. Please place it in a table on characteristics of the sand used, and include some basic sediment grain-size statistics (mean and median size, sorting) as well as permeability and porosity.

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The “best of three” approach (p. 8, line 209) is too generic a term. Please define it and/or provide a reference.

A semantic point regarding the definition of Respiration, R. I definitely understand why it is elegant to present the magnitude of R as a negative for the purposes of Figure 4. However, R values can be listed as positive values in Table 3, so that the positive GPP/R values make sense. Alternatively, modify the definition of R on p. 9, line 235, as flux across the sediment-water interface, where a negative value indicates flux into the sediment.

Finally, please consider adding two columns in Table 3 after Gnet, to show Gnet night and day values.

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