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Interactive comment on “Coral records of reef-water pH across the central Great Barrier Reef, Australia: assessing the influence of river runoff on inshore reefs” by J. P. D’Olivo et al.

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We thank S. M. Aciego for her very helpful and constructive comments. All the comments from the referee have been addressed with special emphasis placed in clarifying and improving the methods section. Specific comments from the referee are followed by the response from the authors.

Page 11444, line 25: Even though the title indicates that this study location is the Great Barrier Reef in Australia, it would be useful to indicate the region of European settlement and refer to the 1st figure.

Response: - Added: “. . .to the central Queensland region.” The location of the Queens-

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land state is now highlighted in the 1st figure.

Page 11445, line 2: one of a few times that the authors use “This” without a modifying noun: suggest “This change in discharge” or just “The change in discharge”

Response: - This paragraph now reads: “The increase in discharge of terrestrial material into the GBR has resulted in a decrease in inshore water quality mainly through increased nutrient loadings and decreased water clarity (Brodie et al., 2010b;Fabricius et al., 2014).” We have systematically worked through the text to apply similar changes in the manuscript where “This” was used without a modifying noun.

Page 11445, line 11: Despite implies an argument, suggest a word change to indicate that the sum of the prior work has not yet addressed the issue at hand

Response: - The text now reads: “Despite the mounting evidence on the negative impacts of the changes in the terrestrial discharge into the GBR, the effect of river flood plumes on the carbonate status of reef-waters, a fundamental property controlling calcification, remains largely unknown.”

Page 11445, line 13: “because” instead of “since”

Response: - Changed

Page 11445, line 29: delete “which is”

Response: - Deleted

Page 11447, line 4-5: other important environmental parameters is too vague – indicate the actual environmental parameters that you assessed

Response: - The paragraph now reads: “Collectively these coral records of $\delta^{11}\text{B}$ (this study) and linear extension (D’Olivo et al., 2013) provide a unique dataset giving insight into the long-term variability of pH_{sw} in a natural coastal system, and how these changes inter-relate to other important environmental parameters (temperature, river discharge and nutrient flux) and their overall influence on coral calcification..”

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Page 11449 line 6-9: need to describe the procedures briefly even if published elsewhere – this is important because later (page 11450, line 24) indicate that extraction and purification is for 1 microgram of boron for water. What is the amount of material required to get the required amount for measurement? What is the required amount for measurement?

Response: - As indicated in page 11450 the amount of sample necessary to purify 1 microgram of born was determined from the concentration of B measured in the water samples. The line: “The amount of water subjected to the boron extraction and purification procedure varied from 250 μl (S = 35) to 5000 μl (S = 0.7), while 30,000 μl were processed for the river water sample (S = 0).” was added to the text.

Page 11449 line 14: reporting precisions in 2 sigma, but is this SD or SE?

Response: - Values refer to standard deviation; the nomenclature in the text was changed to SD to avoid possible confusions.

Page 11449 line 22: please compare measured standard values to accepted or published literature values

Response: - Added: “. . .this identical to the 24.33% \pm 0.11% (SE) reported by Foster et al. (2013) and 24.22 \pm 0.28% (2 SD) reported by Wang et al. (2010).”

Page 11450 line 1: it is generally accepted that SW boron is constant, but because labs have different standard measurements (e.g. small offsets), should be using in-house measured seawater compositions. Also, given the possibility of slightly different seawater compositions due to dilution from river water this point should be directly addressed here.

Response: - Although we agree with the reviewer that small variations can exist between labs, given the small number of true seawater samples measured in the present study (2) and to facilitate the comparison between studies, we opted to use the accepted and standardly used value from Foster et al., 2010.

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Page 11450 line 4: need reference for calculation of pKB

Response: - Added reference to the paper by Trotter et al., 2011.

Page 11450 line 19-25: suggest moving all of this to beginning of methods section –so can compare methods for carbonates with water all at once

Response: - The section on the water samples boron isotopes was moved next to the description of the methods for carbonates.

Page 11451 line 17-19: SE on a small number of samples is not appropriate and goes back to earlier comment about indicating at the beginning is 2-sigma is SD or SE throughout the manuscript.

Response: - The value was originally referred to SD it was incorrectly indicated as SE, the text in the manuscripts has been amended.

Page 11452 line 16: does the linear regression take into account the different errors in the measurements? Or are you applying the external reproducibility precision?

Response: - The external reproducibility was applied. The line: “The uncertainty for the slopes is based on the external reproducibility for the standard.” was added at the end of Table 2 description.

Page 11456 line 25-27: this would be a good place to introduce the idea that the increase in pH of seawater is also correlated with lower growth of corals.

Response: - Since this section mainly deals with changes in the seawater carbonate parameters obtained from the model we feel that the idea relating changes in the seawater carbonate parameters and coral growth should be better introduced in the following sections.

Page 11457 line 27: “specific environmental parameters” is not specific suggest adding “such as”

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Response: - Added: “. . .such as SST, nutrients, sediment or pHsw.”

Section 4.2.4: the idea that phytoplankton blooms can inhibit coral growth (and even the evolution of corals) is longstanding and has implications throughout the geologic record and this body of literature needs to be referenced a little (e.g. Hallock, 1986)

Response: - Added: “For example, nutrient-fueled increase in phytoplankton biomass has been a longstanding explanation for the drowning of coral reefs throughout the geological record (Hallock and Schlager., 1986).”

Page 11460 line 16: suggest deleting “However”

Response: - Deleted.

Page 11460 line 19: “This suggests”, this what?

Response: - This paragraph now reads: “The incompatible relationship of higher pHsw and decreased coral growth suggests that the effects of large flood events on the Ω arag and water quality (e.g. increased shading, turbidity, sedimentation, or competition for carbon by up-regulated photosynthetic activity of zooxanthellae) are the dominant cause of reduced coral growth.”

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