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Climate of the Past Discussions

Interactive comment on "Inter-annual tropical Pacific climate variability in an isotope-enabled CGCM: implications for interpreting coral stable oxygen isotope records of ENSO" *by* T. Russon et al.

Anonymous Referee #1

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Russun et al present an analysis of model corals from the Hadley model to evaluate the relative influence of precipitation and SST on coral del18O. This work will have a significant impact on how coral geochemical records across this region are used. The manuscript is clear and thorough raising many interesting concerns regarding coral isotope records. The logic and methods are easy to follow, clear and sound. Overall, this is a strong paper that could be published with minimal changes.

The paper does an excellent job of isolating the three key climatic zones of the equatorial Pacific and evaluating the error introduced by simultaneous changes to SST and

the del18O of sea water. The model isolates the limitations of each region in using coral records solely for SST or del18O of sea water including assessing uncertainty.

The paper is however missing two key elements, which should be easy to address and greatly improve the utility of the results. The first issue is the concern of the models reliability within the cold tongue. The cold tongue results indicate that this is the most complex region for using coral del 18O as the relationship between del18O of the coral, SST and precipitation are the least linear and have the greatest uncertainty. The results shown in Figures 3-5 are compelling. However, the manuscript is careful to identify this region as the least climatically accurate region in the model, but the implications of this are not discussed in detail. Would it not improve the manuscript to include this discussion in more detail? At a minimum, the authors could add figures to demonstrate exactly what climate mismatches occur in the model, and more informatively they could analyze how this mismatch could possible be impacting the results. A simple sensitivity analysis would be informative as to whether the non-linearity is impacted by the climate model skill. I am skeptical that this is the case, but I am still interested to know.

The second issue is less critical, but could be of interest. Given the potential uncertainties in coral del18O reconstructions of SST and del18O of sea water within these three regions, do we need to re-evaluate the coral records already published? Addressing this question is of significant interest and importance for the coral paleo-climate community. Likely this could be a manuscript on its own, but perhaps a short paragraph in conclusions on how to apply these results to coral calibrations could be significant.

In general, I found this manuscript very well written. However, there are periods where it suffers from too many clauses and too many adjectives. The sentences become a bit clumsy. I note some specific locations below, but a close edit would help.

Minor Issues: Page 743-lines 24 and 25 – ‘also’ is repeated

Page 744-line 4- the clause in this sentence beginning with ‘such as might’ is awkward and muddles the sentence

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Page 744-line 9 – ‘be’ should be ‘by’

Page 744-line 36 – delete well

Page 745-line 28 – the use of the word ‘such’ twice is awkward

Page 751-lines 19-24 – this may be a good place to include a figure of the magnitude of error in the cold tongue and the potential implications on the model coral. A figure would help a lot to visually see the potential impact.

Page 753-line 8 – should be ‘positively’ correlated not ‘positive’

Page 754-line 2 – should be “transverse’ rather than ‘traverse’

Page 755-line 7 – should be ‘substantial’ not ‘substantially’

Page 758-lines 5-11 – another place where the magnitude of this uncertaintity could be addressed.

Page 761-line 14 – too many words

Figure 5 caption ‘isotoppe’ should have one ‘p’

Interactive comment on Clim. Past Discuss., 9, 741, 2013.