**Biogeosciences
Discussions**

Interactive
Comment

Interactive comment on "Spatial linkages between coral proxies of terrestrial runoff across a large embayment in Madagascar" *by* C. A. Grove et al.
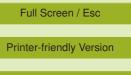
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General comments

This paper presents 15-year-long records of coral luminescence, Ba/Ca, d18O of sea-water (via Sr/Ca and coral d18O) and coral d13C from four coral cores. The authors attempt to compare the different proxies to see how each records a potential runoff signal from adjacent watersheds. They compare the proxy records to one another between cores as well as to modeled runoff (water and sediment) for each watershed. In general the manuscript presents an interesting dataset, which I think is fairly well explored, but the text is confusing in many places and should be edited before publication. In addition, some results are included which I do not think are valid and should be removed.

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Specific comments

Abstract

Don't use the term "coherence" since you haven't used this measure—apparently you have only calculated correlation coefficients (though your statistics are a bit unclear). You might consider exploring the time series in more detail in the frequency domain with measures such as coherence, cross-correlation and phase. However, the records may not be long enough to be very informative from this standpoint.

Methods

Section 2.1: You have a long description of the study area watersheds, but none of this information is included on the map. The map needs to be updated to include this information—i.e. location of towns, forest cover vs. deforested land.

Section 2.3: Did you bleach the coral slabs before or after geochemical sampling? Grottoli et al. (2005, Chemical Geology) found that pretreatment had significant and unpredictable effects on skeletal chemistry.

Section 2.4: Later in the manuscript you make clear that you analyzed MAS1 both via LA-ICP-MS and solution ICP-MS. However, this is not clear in this section. It is also unclear that the lengths of the records (both LA- and solution-ICP-MS) were the same for all 4 cores: 15 years. Similarly, it's unclear that you used the monthly-drilled samples for the solution ICP-MS, this should be explicitly stated.

You should add a section on the statistical measures that you used, and how you treated the data—for instance, explain how you calculated annual anomalies. What statistics software did you use? What kind of correlation tests did you run? Etc.

Results

Section 3.1: You should report your results in the standard fashion as you do later in the manuscript: R and p values. The way it's written now is confusing.

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It's also currently unclear exactly what you are reporting. Presumably the "seasonal" results are the correlation coefficients between 2 monthly-resolution records. This is not valid, because you will have artificially inflated R-values due to both records having a seasonal cycle, even if the records are not otherwise similar. These results need to be removed from the results and from Table 2. (Please remove from all sections of the resultsâĂŤyou refer to seasonal data in other sections in addition to 3.1 as well).

Discussion

How do your absolute Ba/Ca values compare to other studies? Please include a brief summary of other studies' Ba/Ca results.

Page 3121: Another explanation for your results (high HA but low Ba) from the AN-DRA core could be because the nearby river is flowing through a densely forested watershed. Presumably this would mean the runoff might be high in HA (from organic material) but low in sediment and therefore Ba (if the intact vegetation stabilizes the soil).

Page 3122: As above, seems that the watershed characteristics, which you discuss in detail in the methods, are probably important, but you do not really discuss them. I think distance from the watersheds is likely important (this is essentially what we found in the Mesoamerican reef: Prouty et al. 2008 Coral Reefs, Carilli et al. 2009 Marine Pollution Bulletin), but might not be the only explanation.

Technical comments

Introduction

Include text stating that Ba substitutes for Ca in the coral skeleton; also clarify that "Accordingly, sediment discharge is reconstructed using Ba/Ca ratios *in the coral skeleton*"

It doesn't make sense to say that you "propose" to do something in the introduction, since you are reporting on what you actually did

In your introduction to coral d13C, not all of the influences are vital effects, so that term should be removed from the first line

You should reference McConnaughey's work on d13C records in coral skeleton

Methods

What does m.a.s.l. stand for?

The end of section 2.4 finishes with a sentence of results that should be removed. It is premature (before description of geochemical measures) and doesn't belong in the methods.

Does it matter that the cores were collected near Marine Protected Areas? That seems to be a random bit of information to include.

All methods need to be past tense: you are describing what you did. ("used", "followed" etc., not "use", "follow"...)

Results

End of section 3.2: It's more straightforward just to say the d13C records were not statistically significantly correlated

Section 3.2.1-3.2.4: These sections are not all that complex but the way they are written is very confusing. In general the methods sections are presented in a very round-about way that could be streamlined. For instance, in section 3.2.4, you could just say something like this: "The ANDRA core had a mean d13C of -3.33 permil, while MAS1 had a mean of -3 permil and IFAHO -2.8 permil." (replace "permil" with appropriate symbol)

The last sentence on page 3112 belongs in the discussion

You can also remove superfluous words like "moreover"

Discussion

Page 3123: change "combing" to "combining"

Table 2 The table description is confusing, especially the last sentence. Please clarify.

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