

## ***Interactive comment on* “Evidence for benthic-pelagic food web coupling and carbon export from California margin bamboo coral archives” by T. M. Hill et al.**

### **Anonymous Referee #1**

Received and published: 30 March 2014

Hill et al. present a new study developing the proxy of  $\delta^{15}\text{N}$  and  $\delta^{13}\text{C}$  in the organic node material of bamboo corals from varying depths along the California margin. The  $^{14}\text{C}$  bomb spike is used to date the material and develop relevant age models while  $^{15}\text{N}$  and  $^{13}\text{C}$  are used as indicators of relative production in the surface ocean. Overall this is a well conceived, well presented study suitable for publication in Biogeosciences Discussion, and I would recommend publishing it with moderate revisions.

I have three substantive suggestions regarding the manuscript as follows:

1) Coral Species: The description of the coral species and materials needs to be improved including a photo, x-ray or diagram of the coral itself and the portions being

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sampled. For those of us who are unfamiliar with this species, the methods and techniques are not clear based on the descriptions alone, and I don't think readers should have to rely on another published manuscript to reference an image of the coral. In the first paragraph on page 2597 and the beginning of the methods a figure and an image would make the description more useful.

2) Organization: The results section of the manuscript is very short and the discussion seems to combine additional results and discussions into one. In addition on page 2602 lines 14-22 you discuss additional issues with the dating that likely should have been mentioned earlier in section 4.1. Then again beginning on line 5 on page 2604, the authors mention another source of error with the 14C. I would recommend combining the results and discussion into one section. I would also recommend spending considerably more time on age and growth rate model errors that could help to bring this scattered discussion into a more focused section (see 3).

3) Age Model and Growth Error: There are obvious sources of error in both the age model and growth rate reconstructions. These are not prohibitive to the study nor to the use of the proxy in the future, but they are likely limiting. The authors clearly mention most if not all of these sources of error but the details are a bit scattered and hard to understand as they are not addressed quantitatively. A more open, focused discussion of the realities would be helpful. For instance, do individual Bamboo colonies grow at a consistent rate throughout their lifetimes? I don't think so, but the manuscript is unclear. On page 2601, line 26, the authors state that one coral can grow from 38-89 micrometers per year. But the age model tie points do not extend beyond the bomb spike, so what are the possible magnitudes of errors pre-bomb spike? This will have significant impact on the comparison and time series analysis of the long records. Yet, the long record plots (Figures 4 and 5) and relevant discussion do not address age model error in a quantitative fashion. I think that by addressing items 1 and 2 in this review and trying to calculate a relevant age model error through time much of the confusion can be addressed. But, as it stands, it is hard to conclude or believe any

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conclusions from the long records without an age model error placed on the plots. I think this is an incredibly interesting new way to use corals to study historical changes in surface productivity and addressing the caveats of the age models more concretely will only serve to improve the interpretation.

More specifically there appear to be the following uncertainties regarding age model: a) the assumption that growth rates are constant through time in one colony beyond the two tie-points from the bomb spikes b) predation of organic matter of dead corals c) consumption of more degraded POM by the corals could lead to an offset between surface age and coral age

It seems that a and c should be able to be quantified in some manner and included in the longer record figures. For item b, does this mean that all dead corals are at risk of not being useful and do starfish possibly eat old node material in living corals possibly leading to diagenesis in living corals?

Other more minor issues:

1) Page 2597, line 5 '400 yr' should be '400 yrs' 2) Page 2600, line 5 D14C the 14 should be superscript 3) Page 2601, line 27 the authors reference Table 3 for 38-89 micrometers per year but these numbers do not correspond to any numbers in Table 3. This part of the discussion/results are very confusing but should be cleaned up in the process of addressing the more significant comments of the paper.

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Interactive comment on Biogeosciences Discuss., 11, 2595, 2014.

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