

Interactive comment on “Coral Cd/Ca and Mn/Ca records of El Niño variability in the Gulf of California” by J. D. Carriquiry and J. A. Villaescusa

Anonymous Referee #1

Received and published: 22 March 2010

Carriquiry and Villaescusa present new trace metal data from a short coral record collected from Cabo Pulmo reef, Southern Gulf of California, Mexico. Located in a sensitive region to oceanographic variability associated with the ENSO phenomenon, there is potential for coral trace metal concentrations to record ENSO variability. The authors examine Mn/Ca and Cd/Ca ratios from three different coral species from their study site and employ rigorous analytical techniques. According to previously published work, this present study concludes that during the mature El Niño phase, when vertical mixing is strongly reduced, there is a decrease in surface Cd enrichment and a covarying enrichment in Mn due to increased photo-reduction of particulate Mn. While limited in scope due to the brevity of the coral record, the authors present new trace metal data from a climate sensitive region and is of interest to the climate and paleoclimate communities.

C34

There are several questions in this study that I believe need to be addressed prior to publication. I have listed these questions/comments below:

1. What is the original source of Mn to this site? I don't believe this is ever really stated in the manuscript.
2. Given the relatively weak Cd/Ca signal, particularly in 2 of the 3 coral species, have the authors thought about analyzing Ba since it shows nutrient-like water depth profiles? Is there any water column data that can be used to infer strength of upwelling at the study site?
3. Is there any coral $\delta^{18}\text{O}$ data that would help strengthen the proxy record of ENSO variability given that in the area of study during El Niño episodes, there are SST anomalies of 4°C ?
4. I feel there should be a greater discussion of why the different coral species yield different trace metal patterns. Are the distribution coefficients different? These values should be clearly stated on page 65.

It is not clear how the authors conclude that differences in heterotrophic feeding could help explain the 4 to 4.5 time fold for the Mn/Ca and Cd/Ca ratios. There needs to be a reference regarding this interpretation.

5. The text on sample collection should be expanded to include information on the following: depth, distance to shore, proximity to the other coral sites, any other site specific information.
6. What is the sample resolution for the geochemical measurements? This is never stated on page 68. Were the corals sub-sampled via drilling? Cutting? Since the different coral species exhibit different growth rates, the sample resolution should inherently be different—if not then the sampling could bias the geochemistry (see work by Goodkin et al.)

What are the statistics behind the authors' conclusion that the growth rate and geo-

C35

chemistry do not show a clear relationship?

The sample resolution and the assigned temporal resolution should be stated in Tables 1 and 2.

7. Why are some El Nino years recorded in the coral trace element data while during other years the signal is weaker?

8. How long is the coral core? Is there a hope of extending the trace metal record farther back in time, especially beyond instrumental/historical records?

9. What are the grey bars and the arrows in Figures 2, 3, 4, and 6? There is no information in the figure captions.

10. What are the error bars for the Cd/Ca and Mn/Ca measurements? This should be included in the relevant figures as well as in the text.

11. I highly suggest the authors plot Cd/Ca and Mn/Ca in Figure 6 on the same plot so that the reader can clearly see when the trace metals behave inversely.

12. Suggestion—list the length of the record (i.e., 1967-1989?) in the abstract.

Typos: 1. Line 16, page 73 comma after 2008) should be a period. 2. Species names should be italicized in reference list 3. correct reference abbreviation for *Geochimica et Cosmochimica Acta* is *Geochim. Cosmochim. Acta* 4. Trenberth is spelled incorrectly in Figure 2 caption. 5. Capitalize Cadmium in Delgadill-Hinojosa et al., 2001 ref.

Interactive comment on *Clim. Past Discuss.*, 6, 63, 2010.