

## ***Interactive comment on “Controls of Caribbean surface hydrology during the mid- to late Holocene: insights from monthly resolved coral records” by C. Giry et al.***

**Anonymous Referee #1**

Received and published: 1 October 2012

The authors have obviously put much work into this research and have been quite thorough and quantitative in their research. The authors have done an excellent job exploring coral-geochemistry-based climate records for what they can tell us about past climate, while being clear about the boundaries/limits of the data. It would benefit the field if all authors did this as well as the current authors. The work presented gives us a coral-geochemistry-based perspective on the evolution of Holocene paleoclimate from the southern Caribbean. This high-resolution data set is particularly interesting because it can be compared with and used as a check for the oft cited work done previously in the Cariaco Basin and with other work from the northern and western Caribbean. I am somewhat concerned that the paper does not seem to take into ac-

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count the fact that the study site, on the northern coast of South America is prone to seasonal upwelling, though I think it may impact the data interpretation in several instances. As the authors have been working in this region for several years now, I would expect they are well aware of the upwelling issue and I think it would benefit the manuscript greatly if they would explain their thoughts on the topic. The manuscript is generally well written, but I found the amount of detail about the analysis made the text difficult to read. I see a balance between being informative and being readable; this manuscript leans toward informative and away from readable. At the same time, I struggle to find information that should be left out and find it difficult to give specific suggestions to the authors to improve readability, so perhaps it just is going to be one of those papers that is painful to read because of the detailed nature of the work (though interesting stuff!).

Specific issues: 1. The much smaller  $\delta^{18}\text{O}$ -SST regression slope found in this study compared to Hetzinger et al., 2006 is troubling. The authors explain it away as being due to different temperature and hydrologic cycles in the area, but as a reader, I would really like to see some proof of this before believing that this coral is recording the local climate and thus that fossil corals have a good likelihood of representing local climate. Local temperature and salinity data could be brought to bear here, which leads to the second issue. . . 2. The authors indicate that the local salinity cycle is poorly known because the SODA salinity and the World Ocean Atlas salinity don't match. Another potential source of local salinity data is the volunteer observing ship database kept by IRD and the group led by Thierry Delcroix. Alternatively, the Cariaco Basin has been heavily studied and it is worth investigating if any of the studies conducted there might be relevant. 3. My understanding is that directly under the surface layer of the Caribbean is often high salinity 18 degree/subtropical mode water. This water should have a different  $\delta^{18}\text{O}$  value (coming from the subtropics where  $E > P$ ) and a  $\delta^{18}\text{O}$ -SSS relationship that is more indicative of the sub-tropics (steeper slope), reflecting the atmospheric Rayleigh distillation of moisture. If upwelling is important at your site, which I think it is (see work by Frank Muller-Karger and his students), then this is

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a potential complication to your conclusions (especially conclusion#1, and perhaps conclusion #3) that should be explicitly addressed and at a minimum acknowledged. 4. Just a comment: the use of calibration equations by Correge 2006 and Gagan et al., 1998 seems inappropriate since these studies focused on Pacific Ocean Porites spp. It would seem more appropriate to use Hetzinger's Atlantic Diploria strigosa calibration slopes. However, the authors' sensitivity tests demonstrates that the choice of slope does not impact the results, so there is no need to change this. . . just note the problem for future work. 5. Page 3923, lines 17-18. "Control" seems like a poor choice of words here. The ocean and atmosphere tend to be coupled in the tropics such that they feedback on each other. The ocean could be seen as "controlling" the atmosphere too. I think the authors mean that the atmosphere plays an important role in the inter- to multidecadal variability. 6. Really minor typos: a. Page 3925, line 7. "indicate" should be "indicates" b. Page3921, line11 "anomalous" should be "anomalously"

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Interactive comment on Clim. Past Discuss., 8, 3901, 2012.

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