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Biogeosciences Discussions

Interactive comment on "Early diagenetic overprint in Caribbean sediment cores and its effect on the geochemical composition of planktonic foraminifera" *by* M. Regenberg et al.

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This paper presents isotopic and trace element composition of foraminifera as well as bulk sediment data from two sediment cores taken in the Windward Passage of the Caribbean Sea. The main thrust of the ms. is to try to explain anomalous foraminiferal data that differs from other sites in the region. The authors conclude, based on a number of lines of evidence, that the foraminifera from these cores have been altered by recrystallization, with a resultant shift to more positive O18, higher Mg/Ca and lower Sr/Ca. This rapid recrystallization is a result of the predominance in these sites of reactive carbonate phases such as high-Mg calcite and aragonite.

I think the ms. is excellent and found very little to criticize. I think it makes a very strong case that the observed trends are due to recrystallization ? in fact, I cannot really think of a credible alternative hypothesis. I think it is a valuable contribution because it demonstrates that we cannot just interpret foram geochemical records climatologically without considering the secondary processes that have altered the primary signatures.

My suggestions for improvement mainly relate to the broader implications of these findings. First, it would be useful to add some discussion about why some Caribbean sites display this phenomenon and others do not. Or is it possible that in other sites there is a very slight level of recrystallization that could significantly affect the climatological interpretations? In this respect, it would be very valuable if the authors could list criteria researchers could use to evaluate if forams from a particular core have experienced recrystallization, both major as observed here or perhaps more subtly. This would be particularly valuable in the form of a preliminary test that could be made prior to major investment in research on a particular core.

With respect to this issue, it would appear that the Sr/Ca data is the most unambiguous indicator of recrystallization. The authors might add some further discussion what controls Sr in forams (Lea et al., 1999, GCA, Russell et al 2004, GCA) and about how the observed altered Sr/Ca values compare to published downcore records of Sr/Ca in the literature. Sources might include Martin et al 1999 Gˆ3 and Elderfield et al 2000 Gˆ3. The quantification of how an observed Sr/Ca depletion is related to %recrystallization could be quite valuable, for example, in assessing how much a particular O18 record has been shifted by recrytallization. In this context it might be useful to discuss the range of published Sr/Ca values for each species and how definitively a particular degree of recrystallization can be picked up by an observed Sr/Ca depletion (see the above cited ref?s and others for what factors control Sr/Ca in downcore records). It would be valuable to present a minimum Sr/Ca value for a particular species in this setting below which one could confidently state that some degree of recrystallization had taken place.

BGD

4, S1194–S1196, 2007

Interactive Comment

Other points: 2180-2181: I would say that overprinting of the forams by coatings is another important diagenetic process that affects foram composition. See discussion going back to Boyle (1983) through Pena et al (2005) Gˆ3.

2183: the stated analytical errors are probably too optimistic to represent long-term reproducibility of metal ratios

2193: the discussion of how the recrystallization takes places seems somewhat vague and unspecific

Fig. 2: the tie lines between the SO164-07-4 O18 record and the Martinson stack should not be in red - it makes it hard to differentiate between the data and the tie lines.

Fig.4: Move the Sr/Ca scale and records up so that they do not overlap with the O18 records below - it will make the plot clearer.

Interactive comment on Biogeosciences Discuss., 4, 2179, 2007.