

## ***Interactive comment on “Holocene hydrography evolution in the Alboran Sea: a multi-record and multiproxy comparison” by Albert Català et al.***

### **Anonymous Referee #1**

Received and published: 29 December 2018

The paper "Holocene hydrography evolution in the Alboran Sea: a multi-record and multiproxy comparison" by Albert Català, Isabel Cacho, Jaime Frigola, Leopoldo D. Pena, and Fabrizio Lirer, deals with the evolution of deglacial and Holocene SST in the Mediterranean, specifically by presenting new foraminiferal  $\delta^{18}\text{O}$  and Mg/Ca data from two cores, and by comparing these data with existing, primarily Mg/Ca and alkenone, data. The paper documents a high degree of coherence between the different Mg/Ca-reconstructions but also strong discrepancies between Mg/Ca and the alkenone-SST records. The authors evaluate the reasons behind these discrepancies and discusses differences between different SST proxies as well as the deglacial and Holocene ocean circulation in the North Atlantic and the Mediterranean. The overall quality of this paper is good, and although explanation of differences between the proxies in principle is well

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described, the discussion of the reasons behind it needs to be sharpened and clarified better.

Generally, based on the high degree of coherence between the different Mg/Ca reconstructions the authors suggest that this “supports the value of this proxy to reconstruct true regional environmental conditions”. Although the authors let the meaning of the alkenone record “hanging” in this context, as if alkenones would not record the “true” environmental signal, or if so, at least not the regional one. However, the authors advocate, rightly so, throughout the paper that discrepancies between the different SST proxies comes from differences in habitat, i.e. differences in the ecology of the organisms responsibly for the geochemical signal that provide the foundation for the different SST proxies. However, since the primary focus of the paper is the new foram based d18O and Mg/Ca data, and since the paper includes little alkenone into the discussion it is obviously not possible to evaluate the alkenone signal in the Mediterranean or North Atlantic in the same way. Yet, the authors put a lot of effort into discussing the differences between different foram-based records and the alkenone record from MD95-2043. The paper would be improved if the authors presented a little more data on the reproductive season and depth habitat of coccolithophorids in the Mediterranean, since the differences depth habitat and seasonal is the basis for proxy interpretation. The authors suggest that the Mg/Ca SST between represent the spring season whereas the alkenone SST record represents the average annual temperature. The authors also argue that due to the higher number of organisms involved in producing the signal each sample in the alkenone record “favours the integration of several seasons and years “ while the Mg/Ca-SST signal “will be more sensitive to seasonal and inter-annual variability”. Although is likely that the relative few forams needed for a Mg/Ca analyses will introduce more variability (good or bad) to the data, it is not entirely clear that the alkenone record would integrate “several seasons”. It is not clear what several seasons means. Is it the same season from several years or is it actually the integration of a larger portion of the year in the alkenone samples (and from several years in addition)? A little more of an in-depth discussion on the ecology of coccolithophorids in

the Mediterranean could help convince the reader. I assume that the equation used for the alkenone data is calibrated against the average annual SST, however, when does coccolithophorids bloom in the Mediterranean today? Is it really a “well-averaged annual signal”? Could there have been any changes in coccolithophorid ecology between today and the deglaciation? The absence of SST warming in the Mg/Ca record during the second phase of the deglaciation is suggested to be due to a limited capacity of *G. bulloides* to adapt to the large temperature change occurring during the deglaciation.

The authors argue for a “resilient capacity” of *G. bulloides* to change the reproductive season (growth season according to the authors) to compensate for the large SST warming during the LGM and earlier part of the deglaciation by reproducing mostly during the relatively mild upwelling season (autumn) while after the YD *G. bulloides* reproduced primarily during the colder upwelling season (spring), as it does today. This change in behaviour through time could explain the differences seen between foram Mg/Ca SST and alkenone SST. The authors discuss evidence from literature on the habitat and environmental preferences of *G. bulloides* to explain these differences. However, it would be useful if the authors could look at this from a different angle and also address how changes in the water column could have affected coccolithophorids. What do we know about how coccolithophorids handle large changes on hydrography such as those during the deglaciation? Again, I understand that the main focus of the paper is on the new foram data, but the discussion dwells a lot on the differences between foram and alkenone records so any possible changes in the ecology of coccolithophorids needs to be addressed as well.

The hypothesis involving SPG/STG dynamics at the end of the discussions needs a bit more attention considering that this would affect intermediate waters. How would these changes be transferred to the surface layer where the forams are usually reproducing?

The conclusions section is in my opinion is too long as it is now. Parts of it are more discussion type material.

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Although the writing grammar of the appear is generally high, considering that the authors are not native English speakers, there are passages of the text that are quite difficult to understand unless you are a foram paleoceanographer. The title also needs to be given more attention. The authors can easily deal with this by having a native English-speaking scientist help to edit the paper. The technical quality of the figures is generally very good.

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Interactive comment on Clim. Past Discuss., <https://doi.org/10.5194/cp-2018-163>, 2018.

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