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Interactive comment on "Southern Hemisphere imprint for Indo–Asian summer monsoons during the last glacial period as revealed by Arabian Sea productivity records" *by* T. Caley et al.

Anonymous Referee #3

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The manuscript by Caley et al. presents a composite Bromine record from Indian Ocean, which stacks nine marine sediment cores located across the whole Arabian Sea. Following the previous study, the authors use the Bromine as the proxy of regional surface marine productivity, reflecting the intensity of Indian summer monsoon winds. Comparing the composite record to the polar ice core records from both Hemispheres, the authors suggest that during the last glacial period, the imprint of suborbital southern Hemisphere temperature change is clear, while the northern Hemisphere play a more significant role during the last deglaciation. It's good to incorporate multiple records from different locations together to investigate the common features of these records. However, the interpretation is not sound and the discussion on the orbital forcing for

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Indo-Asian summer monsoons is weak because of lack of reliable evidence.

Comments and suggestions

It is reasonable to use the Bromine counts as the proxy index of total organic carbon in the sediment, as the bromine counts correlates well with the total organic carbon. However, the total organic carbon is not only affected by the surface productivity in Indian Ocean, but also altered by the preservation of the organic materials which is related to the dynamic of OMZ in Indian Ocean. The significant differences among different cores indicate that the dynamic of OMZ may play an important role in changing the total organic carbon, i.e. bromine counts. For example, the bromine counts show much weak oscillation in drilling cores KS-04, KS-07 and KS-09 than in cores KS-05, KS-11 and KS-12. Also, the differences among the stacked Bromine records and TOC record from core SO90-111KL are significant, although the authors try to link the peaks and troughs with the dashed lines, which may change the original chronology out of the range of the dating errors. So the interpretation of the Bromine counts needs to be further proved.

Page 9323, Line 15-19. The authors mentioned: "Results from this study support the idea that the atmospheric d18O signal is exported by the Indian summer monsoon winds towards the Asian monsoon system, as recently showed by numerical modelling (Pausata et al., 2011; Lee et al., 2012), explaining the synchronicity between the Indian and Asian monsoon millennial events (Fig. 7)." How can this study support this idea? My understanding is that this study only reveals that the monsoon wind over the Indian Ocean varied in a pattern similar to the Antarctic temperature changes during the last glacial and aligned with the Greenland temperature during the deglaciation. How can the variation in monsoon wind link with the precipitation δ18O over the northern Indian (as mentioned in Pausata et al., 2011) and then the precipitation δ18O over the East Asia? Actually, if the authors compare the Bromine record with the Hulu cave δ18O record, can we find the significant similarity between these two records?

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Page 9323, line 26. This study argues that the Indo–Asian monsoon can be considered as an amplifier of inter-hemispheric energy transfer at sub-orbital scale during the last glacial period. What is the original inter-hemispheric energy transfer signal, or what is forcing of the inter-hemispheric energy transfer? Can we find this amplified inter-hemispheric energy transfer signal in other records, such as the Greenland ice core temperature record (as amplified energy transfer will affect the temperature in Greenland, i.e., figure 8)? I think the Indo-Asian monsoon only transfer energy from southern Hemisphere to northern Hemisphere, so the word inter-hemisphere is not appropriate here.

Why the monsoon interstadial events aligned with GIS 12, 13 and 14 are much stronger than other events and also even stronger than the Holocene? These events are not so prominent in the core NIOP 463. Also the dominant increasing trend from 16 ka to present in this study contradicts with the previously reported Holocene monsoon records from Arabian Sea, e.g., Gupta et al., 2003 and 2005, which show a decreased trend of Indian summer monsoon during the Holocene. This discrepancy may weaken the arguments on the precessional phase difference between ISM and AIM and the discussion on this issue need to be revised accordingly.

Interactive comment on Biogeosciences Discuss., 10, 9315, 2013.