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Climate of the Past Discussions

Interactive comment on "East Asian Monsoon and paleoclimatic data analysis: a vegetation point of view" *by* J. Guiot et al.

Anonymous Referee #2

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General Comments

This manuscript focuses on Holocene climate change in East Asia, based largely on pollen analysis. The manuscript provides a valuable time series reconstruction from Lake Bayanchangan, Inner Mongolia, as well as a time slice reconstruction for 6 KaBP, spanning East Asia. Results from both are set within the context of a summary of previous regional monsoon maximum reconstructions. The strength of this manuscript stems from the quantitative approaches used, including a modern analog analysis based on plant functional types for the time-series reconstruction and an inverse modeling approach utilizing BIOME4 for the 6 KaBP time slice reconstruction. These approaches greatly enhance the amount of useful information derived from pollen data relative to climatic interpretations based on visual interpretation of pollen spectra, as

is sometimes the case. The results presented are both timely and relevant to discussions of Holocene climate change, especially with regard to timing and spatial extent of monsoonal influence in East Asia. I recommend publication in Climates of the Past with revisions, at the authors discretion, as outlined below.

Specific Comments

I. I highly recommend a location map that delineates the dizzying array of regional geographic descriptions used in the manuscript. Those not intimately familiar with East Asian geography will certainly have trouble visualizing the differences discussed. For example, the abstract (15-21) and p215 (15-25) discuss southern China, northwestern China, north China, northeastern China, north-central China, and northern east-central China as well as Mongolia, northern Mongolia, and inner Mongolia. To the extent that this manuscript discusses the heterogeneity of the monsoon response both spatially and through the Holocene, geographic clarity is important.

II. Rationale for this quantitative work is set out in the introduction p215 (10-23) as an attempt to reconcile the heterogeneity (complexity) of the EAM, possibly due to the '...different responses of environmental proxies to climate change.' The manuscript proceeds on to do an excellent job of reconstructing quantitative estimates of temperature and precipitation from Lake Bayanchangan but then does not close the circle by interpreting their results within the context of the heterogeneity in the timing of monsoon maxima across China as discussed in the introduction. I am left wondering if the authors are suggesting that their quantitative reconstruction of temperature and precipitation from Lake Bayanchangan can be interpreted as the 'true' timing of monsoon response across the whole of East Asia or if the differences in timing of their data set relative to other proxy data is further evidence of the regional heterogeneity widely discussed in the literature. In other words, if all other proxy data sets from East Asia could be similarly cast in terms of underlying temperature and precipitation drivers, would the East Asian monsoon look far more homogeneous in terms of the timing of changes in monsoon strength? Such issues are is important with regard to the ultimate goal, which

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is to understand the physics behind changes in monsoon strength. Homogeneous and heterogeneous regional responses imply different underlying physics. This might be addressed in a Discussion section added between current sections 4 and 5.

III. Both calendar years and 14C years are used making comparisons awkward. For example, the introduction uses 14C years in discussing heterogeneity of monsoon timing from the literature whereas results from Lake Bayanchangan (Figure 1) are plotted in calendar years. Calendar years would be preferable, to the extent possible.

IV. Figure 1 comments. A supplemental figure plotting all three components used in PC1 would be useful to the reader in assessing the PC1 time series. Figure 1 would also benefit from plotting the underlying age control points, presumably 14C ages. This would better allow the reader to assess the age ranges of the transitions in the time series plots. Plotting precession (x-1) as a dashed line in figure 1d might be useful. I find it striking that MTCO, MTWA, and MAP all have maxima extremely consistent with the timing of precession minima (June 21 perihelion) whereas Tree scores, PC1, and alpha all reach maxima later. A short discussion of this relationship might be useful.

V. I recommend that the discussion comparing MAP and Dongge/Sanbao caves be accompanied by a figure as I do not follow the similarities presented in the text p220 (7-17). It is certainly the case that both increase strongly at 11.5 ka. However, Lake Bayanchangan MAP decreases sharply at 5 Ka (down to values found at 12 Ka) whereas cave d18O decrease only minimally at 5 Ka (a very small fraction of the amount necessary to reach 12 Ka values). This is a fundamental difference that should not be overlooked. One might interpret this difference in the context of latitude, postulating a rapid northward advance of the northern limit of the summer monsoon at 11.5 ka (beyond 41°N) followed by a slow retreat, falling back south of Lake Bayanchangan by 5 ka, while the caves, being further south, remain under the influence.

VI. Figure 3 comments. The figure 3 caption could benefit from additional text including the statement that the plots are anomaly plots for 6 Ka relative to modern. The color

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scale bars would benefit from definition of the units (°C..).

Technical Corrections

I. The manuscript, although clearly presented, needs some editing for English grammar.

Interactive comment on Clim. Past Discuss., 4, 213, 2008.