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Climate of the Past Discussions

Interactive comment on "Two-signed feedback of cross-isthmus moisture transport on glacial overturning controlled by the Atlantic warm pool" *by* H. J. de Boer et al.

H. J. de Boer et al.

h.deboer@geo.uu.nl

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We kindly thank Ref #3 for reading the discussion paper. Although Ref #3 does not specifically motivate why he/she didn't like our discussion paper, we guess that the proxy evidence presented in section 2 of the discussion paper did not convincingly show that an Atlantic Warm Pool (AWP) existed during the last glacial. As discussed in more detail in our response to the key concerns of Ref #2, reconstructions of Sea Surface Temperatures (SSTs) from the Caribbean Sea (Schmidt et al., 2004) and the Gulf of Mexico (Ziegler et al., 2008) show that these waters remained relatively warm throughout the glacial and show no consistent response to extratropical North Atlantic

cold events. This led Ziegler et al. (2008) to propose that the AWP continued to expand into the Gulf of Mexico during summer throughout most of the last glacial. We acknowledge that the offset between summer SSTs defining the extent of the AWP and the more annual average signal reflected in Mg/Ca derived SSTs (Anand et al., 2003) may have confused. To prevent confusion, we propose to revise section 2 by emphasizing that paleo-SSTs in the range of modern annual average SSTs are indicative for the presence of an AWP during glacial summers.

Further, Ref #3 noted concerns regarding our model simulations. We like to make clear that the goal of our work was to investigate the atmospheric sensitivity to variations in AWP area during the last glacial. We thereby followed an approach comparable to Wang et al. (2008b). Although this approach may appear artificial to Ref #3, our sensitivity experiments were motivated by proxy evidence suggesting that the AWP existed during last glacial (Schmidt et al., 2004; Ziegler et al., 2008). In contrast, coupled ocean-atmosphere models do not realistically simulate the AWP in the modern climate related to a cold SST bias in the (sub)tropical Northwest Atlantic (Breugem et al., 2008; Misra et al., 2009). As Wang et al. (2008b) reveal an inverse relation between the size of the AWP and easterly moisture transport by the Caribbean Low Level Jet (CLLJ), we were inspired to investigate this process in the context of rapid glacial climate change. We therefore argue that our approach using relatively simple models in combination with hypothesized AWP dynamics is a valid starting point to foster further research towards understanding the role of the AWP in the glacial climate. However, we may not have stated clear enough that we present a sensitivity study. We therefore propose to make this more clear throughout the manuscript and adjust the title of the paper to: "The role of the Atlantic Warm Pool in controlling atmospheric moisture transport across the Central American Isthmus during the last glacial: a climate model sensitivity study".

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