

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.

Anonymous Referee #1

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The paper by de Boer et al. investigates the cross-isthmus moisture transport sensitivity to the size of the Atlantic warm pool. They use a model of intermediate complexity simulating the effect of freshwater forcing applied to the North Atlantic under glacial boundary conditions to monitor changes in the size of the Atlantic warm pool. They use these ocean model outputs together with other sensitivity experiments as forcings for studying the atmospheric sensitivity to North Atlantic cold spells, with a special emphasis of freshwater (moisture) fluxes through Central America isthmus. As changes in cross-isthmus moisture fluxes were previously proposed to have acted as feedbacks on abrupt climate changes without any clear consensus on the sign of these feedbacks, the authors try to clarify the sign of those feedbacks using the available paleo-proxy

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evidences for regional hydrological changes during the last glacial period.

I have no expertise on climate models, and cannot comment on the reliability of the model experiments. I however like how the study was framed, and how the authors have built their working hypothesis based on marine sediment records. The article provides evidences for both positive and negative feedbacks of cross-isthmus moisture transport as revealed by their model experiments, which may help reconciling conflicting interpretations of paleohydrological data from that region. I support publication in *Climate of the Past* with minor revisions, and suggest to clarify few minor points as detailed below.

Introduction:

I found the first paragraph difficult to follow. In particular, the sentence from Line 11 to 15 (page 3861) should be simplified. I also suggest the introduction sentence of the CCLJ (line 15-20) to be brought before the sentence from lines 11-15.

Model framework:

You may try to turn the sentence page 3865, lines 11-14 more positive, e.g. by pointing out that you look at the atmospheric response to oceanic changes during the AMOC collapse. As it stands this sentence suggests to the reader not expert in models that your analysis is meaningless.

Results / Figures:

The meaning of Figure 5c is not clear to me, nor the sentence from page 3871, lines 20-23. Please clarify these issues.

General comment on the positive/negative feedbacks terminology:

I also recommend the authors to clarify the use of the feedback terminology. Perhaps it would be more appropriate to use the terms "amplifying feedbacks" and "attenuating/dampening feedbacks" instead of positive / negative feedbacks, as e.g. a nega-

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tive feedback on abrupt climate change is a feedback that does not operate efficiently since abrupt climate changes do occur. Then when it is stated, as in the abstract, that the "feedback turns negative as enhanced cross-isthmus moisture transport may help AMOC recovery", my understanding of such sentence is that a positive feedback may be at play to trigger an abrupt AMOC recovery.

In other words, I think using the terminology of "positive feedback" should be restricted to describe retroactions occurring during abrupt transitions, while "negative feedbacks" should be used to describe processes acting to keep climate into a stable warm (interstadial) or cold (stadial) state.

As such positive / negative feedback terminology was often misleadingly used in the literature for describing amplifying and/or attenuating effects of moisture transport across central america, perhaps the authors should use the opportunity to clearly define what mechanism they interpret as being positive and/or negative retroaction loops in light of the atmospheric processes they look at, and propose several recommendations on appropriate terminology to be used for future studies on that topic.

Interactive comment on Clim. Past Discuss., 7, 3859, 2011.