Earth Syst. Dynam. Discuss., 3, C399–C400, 2012
www.earth-syst-dynam-discuss.net/3/C399/2012/

Earth System Dynamics Discussions

Interactive comment on "Minor effect of meltwater on the ocean circulation during deglaciation" *by* G. Lohmann et al.

Anonymous Referee #2

Received and published: 13 September 2012

This paper addresses the issue why a large meltwater flux into the North Atlantic, as occurred in MWP1A, does not slow down the AMOC significantly. The authors propose that the meltwater enters into the North Atlantic as hyperpycnal flow due to the mixing with sediments and sinks directly to the bottom North Atlantic, where the large volume and strong boundary current dilute the salinity anomaly signal significantly (relative to the case water injected at the surface), and therefore leads to a minor effect on the AMOC. This provides one hypothesis to reconcile the large 1A and the little changed AMOC around BA. Overall, this is an interesting idea, the study is reasonable and should eventually be published. I have some questions that I would like the authors to address before the paper is accepted for publication.

My major question is that, if this idea of hyperpycnal flow is applied, how can the

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

authors explain H1, when a modest NA melting water about 0.1 Sv. is able to almost shut down the AMOC? In other words, why the meltwater at 1A is hyperpyncal, but not at H1, from the ice sheet melting perspective?

The other major question is that the authors should perform a series of sensitivity experiments with the flow injected at different levels. A single experiment seems not sufficiently robust.

Minor comments:

P11, L17: "30°S" should be "30°N"

P11, L20-21: "The overturning circulation increases slightly faster in the initial phase relative to the background climate simulation. The freshwater perturbation acts therefore on a higher overturning level"

Why the overturning increases slightly faster initially? Physically?

What does it mean acts . . .on a higher overturning level? Please clarify.

P12 L2-3: "The effect of the deglacial meltwater (Fig. 6b) onto salinity is only slightly decreased relative to (Fig. 6a),". This sentence should refer to the hyperpycnal flow case on the right, so better clarify. Also, why the subsurface salinity increase in the bottom relative to the top in (a)? is it because the surface freshening stop convection?

Interactive comment on Earth Syst. Dynam. Discuss., 3, 801, 2012.