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Climate of the Past Discussions
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Interactive comment on "Long-term variations in Iceland–Scotland overflow strength during the Holocene" *by* D. J. R. Thornalley et al.

Anonymous Referee #2

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General comments

The manuscript presents estimates of the strength of the Iceland Scotland Overflow (I-S) by analysing the grain size of "sortable silt" (SS) in 13 sediment cores located South of Iceland, which are grouped into four depth intervals, and a "stack" of all intervals. The SS stack suggests increasing I-S overflow during early Holocene with a maximum at ~7 ka and a gradually declining overflow strength thereafter. Simulated deep convection from a set of transient Holocene climate model experiments is found to be in general agreement with the reconstructed trends. In the simulations a late Holocene shoaling trend of deep convection is related to an increase in sea-ice in the Nordic Seas. This relationship is also discussed in context with the projected future decline in Arctic sea-ice.

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Interactive Discussion
Discussion Paper

I enjoyed reading this manuscript. The meridional overturning strength exhibits a huge spread in climate simulations of the past and future and the I-S overflow is an important component of this complex. The presented data are valuable to constrain the millenial scale variability of the I-S overflow throughout the Holocene. Both, text and figures are mostly clear and understandable and the method seems to be generally suitable. I recommend the paper to be accepted for publications in "Climate of the Past" with minor revisions outlined below.

Title:

OK

Abstract

The result that the axis of I-S overflow seems to be shallower in the early Holocene should be incorporated.

1. Introduction:

p. 1629, ll. 16-20:

Here a refence to the detailed review in "previous studies" sections would be helpful, otherwise this citation seems too unspecific.

p. 1629 ll. 27/28

I would recommend to distinguish here between data and modelling studies

2. Previous studies

Maybe some more literature on how I-S overflow relates to wind forcing and density on the sill would be helpful.

3. Proxy reconstruction of I-S overflow strength

p. 1632, l.20

CPD

9, C1020–C1023, 2013

Fig. 1 should be referenced here. It is nicely illustrating the different stacking strategies which were considered- otherwise the subsection about the sensitivity tests is the only place where it is made clear that the "stack" is not only an unweighted average of all cores.

p. 1633, l. 22

this is misleading as it suggests that an unweighted average of all cores was taken.

p. 1634 l. 5

what is the difference of sortable silt and silt?

4. Results and discussion

p. 1636 l. 22: unnescessarily ambiguous: is velocity reducing from ∼8cm/s to ∼6.5cm/s or is the reduction ∼8cm/s to ∼6.5cm/s ?

p. 1638

It would be disirable to provide some information on the meridional overturning in LOVECLIM: How is meridional overturning strength changing during Holocen? Is convection depth tightly related to meridional overturning strength?

p. 1639/1640

The LOVECLIM simulation should be discussed with reference to other, state-of-the-art IPCC models. In particular the strongly diverging sensitivities of meridional overturning to IPCC scenarios should be mentioned.

p. 1641

The main axis of flow changes strongly in the early Holocene but not so much after 7 ka. Can this indicate that Early Holocene I-S overflow change was thermohaline driven while after 7 ka it was (also) wind driven?

p. 1640 l. 10

CPD
9, C1020–C1023, 2013

remove bracket

References:

OK

Figures: p. 1650 correct to "map of core sites"

Interactive comment on Clim. Past Discuss., 9, 1627, 2013.