

## ***Interactive comment on “Barents Sea heat – transport, storage and surface fluxes” by L. H. Smedsrud et al.***

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Review # 3 of the manuscript entitled “Barents Sea Heat – Transport, Storage and Surface Fluxes” by L. H. Smedsrud, R. Ingvaldsen, J. E. Ø. Nilsen, and Ø. Skagseth.

This manuscript presents interesting results synthesizing heat and freshwater budgets for the Barents Sea, in particular providing a new estimate of heat transport by the Norwegian Coastal Current (NCC), and employing a 1-D column model to estimate the Barents Sea heat budgets. Relevant model sensitivity experiments examined impacts of ocean heat transport and sub-basin areas on ocean temperature profiles and their annual cycle, suggesting an interesting transition from current state to a new Arctic state when ocean heat transport/sub-basin area changes over a threshold. The manuscript is generally well organized and written. I would recommend that this paper

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is acceptable in the Ocean Science after a minor revision as suggested below.

Answer;

We would like to thank the reviewer for the positive feedback. It is a most motivating confirmation that our efforts are clearly appreciated as they were intended. We have improved the paper further through addressing the two other reviews, and followed all the minor improvements suggested by this reviewer. There is only one question that needed an answer, included below. All the other suggestions have been implemented as is.

Specific minor comments # 20;

In Section 3.4 and Figure 5, a large difference of the seasonal variation of temperature profile occurred in the Northern Barents Sea. The simulated temperature is too low compared to the observations. This would have a large impact on heat budget estimate. It would be useful to have some discussions on this.

Answer;

There is a difference in the North box temperature. This difference is significant, if not "large". Winter observations tend to be taken quite late in the winter (March - April), when the sun has returned, and the sea ice starts to melt and open up. We do not state that the model is "perfect" but since the observations are biased towards "spring", the model winter mean (December - April) is realistic. After all - the north box area is covered by sea ice with over 90 % concentration in March (Budgell 2005). This is now included in the paper as:

“The summer surface warming is close to observations, about 2oC. The model winter mixed layer temperature is at the freezingpoint (-1.8oC), and the observations are around -1.0oC. Winter observations tend to be taken quite late in the winter (March - April), when the sun has returned, and the sea ice starts to melt and open up. Until March most of the northern box is 90% covered by sea ice Budgell (2005). It is therefore

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quite likely that the model winter mean (December - April) better reflects the real mean temperature than the observations taken mostly in late winter."

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Interactive comment on Ocean Sci. Discuss., 6, 1437, 2009.