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Comment

## ***Interactive comment on “Structure and forcing of the overflow at the Storfjorden sill and its connection to the Arctic coastal polynya in Storfjorden” by F. Geyer et al.***

### **Anonymous Referee #2**

Received and published: 4 March 2010

This is an interesting and well written paper. It describes a simulation of dense water overflows at Storfjorden sill in 1999-2000, and how these flows relate to the Storfjorden polynya. The key result of the paper is that, while the polynya is the main source of the brine enriched dense water that fills the deep Storfjorden basin, the overflows themselves are wind driven rather than of thermohaline origin. Indeed, the authors claim that easterly winds cause surface Ekman flows into the Storfjorden basin that are compensated by an outflow of dense water at depth. This result certainly merits publication in Ocean Modelling. However, I have a few problems with the model setup, the duration of the integration and the conclusions drawn from the simulation. The paper could be greatly improved if the authors took in consideration these concerns. The comments

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below are organised by page and line in the paper. Those that I consider particularly important and specially worth addressing are indicated with an asterisk.

Page 18, lines 1-2. High salinity shelf waters formed on Arctic shelves are believed to be the main source, perhaps the sole source, of halocline and deep waters in the Arctic, but there is insufficient for stating this in such a matter-of-fact manner.

Page 19, lines 21-23. State clearly that both the total dense water production and the Storfjorden dense water formation are model estimates.

\* Page 21. lines 21-28. There is no spin-up of the high-resolution Storfjorden region model. The basin is likely to be still responding to the initial conditions by the end of the first, and only, year of simulation. Why to carry out an initial spin up of a few years up to August 1999 before the beginning of the simulation. How does this “cold start” of the model affect the results?

Page 22, line 8. How many passes of the Shapiro filter do you apply?

Page 22, line 10. Sensitive heat?

Page 23. line 9-11. Explain why concentration may not be a good variable for identifying the polynya area.

Page 23, line 19. Please, provide a brief explanation of why tidal forcing of the polynya is negligible based on Ersdal (2009).

Page 24, lines 8-9. What was the vertical range of the ADCP?

Page 24, line 19. Provide a figure comparing your modelled cross-sill component of the velocity with the observations of Geyer et al. (2009). Is the simulated overflow larger than observed because the model is undergoing a transient from its initial state?

\* Page 27, lines 20-22. There is quite a bit of explaining to be done here. How is it that Ekman inflow and bottom outflow seem to be causally linked from January to July but not at other times? Is the winter agreement just a fluke? You would need to integrate

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the model for at least another year to confirm, or otherwise, any strong relation between both flows.

Pages 30-31. Section 4.3. I find this discussion a bit confusing, as it is not clear which transports are model estimates and which ones are from observations. Please, clarify.

Figure 2. All contours are unlabelled. Please, include labels.

Figure 5. Ditto.

Figure 7a. Ditto.

Figures 8a and 9a. Ditto.

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Interactive comment on Ocean Sci. Discuss., 7, 17, 2010.

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