Ocean Science
Discussions

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Interactive comment on "Tidally-induced lateral dispersion of the Storfjorden overflow plume" *by* F. Wobus et al.

Anonymous Referee #1

Overview

This paper described a series of model sensitivity simulations of the outflow of dense water from the Storfjorden in Svalbard with focus on how tidal dispersion acts to modify the spreading of the plume. It is a very well written contribution, with some important conclusions. Considering the importance of deep water in the Arctic, and the lack of observations from the area, the present sensitivity approach is sound and of interest to the readers of Ocean Science. It also highlights the importance of including tides in regional ocean models – a process which has been neglected for too long. There are a few issues, however, which must be addressed before this paper can be published (see below). I therefore recommend a medium-major revision of the manuscript.

Major issues

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There are two main problems which must be addressed. The first, and less serious, is that the model deviates quite significantly from the observation in Fig 3-4. Since the work is largely a sensitivity study, I can accept this (after all there are similarities), but this must be discussed better, and the sensitivity nature of the investigation mentioned and made cleared. It is also somewhat surprising that there is only a very weak surface mixed layer in the simulation shown. Was there no wind in this run? Please comment on this, and discuss it in the paper, e.g., could this affect the outflow dynamics of dense water?

The more serious issue is a complete lack of tidal validation of the model results. TPXO7.2 data is used as boundary forcing but does the model actually get the tides right around the plume? Since there is no tidal potential included over the domain it is quite possible the amplitudes are underestimated. This must be addressed, preferably by comparing modelled elevations at tidal frequencies to both the TPXO field and to tide gauge/pressure data. There is tides gauge data available from the area (there is data from Ny-Alesund and Bear island: see http://ilikai.soest.hawaii.edu/uhslc/htmld/d0823A.html), and including a comparison to those stations is crucial, along with a error analysis compared to TPXO. After all, showing that the model can reproduce tides is quite crucial since the paper deals with tidally driven dispersion.

Minor comments

The figures/figure captions need to be improved:

Fig 3.: Which wind scenario? The x-axis have different scales – please amend. I assume we sea potential temperature, salinity and potential density in the different rows?

Fig 4.: Which wind scenario?

Fig 5 and 6.: Which runs are shown?

Fig 7.: Mention that isobars have been superimposed, but from which run?

Fig 10.: The colourbar related to the tracer concentration is missing

p.14 l. 23 - which differences in k_{hor} are significant ? Please test if they are statistically different and shade differently in Fig 8c

p 15 l. 7 - Is the spring-neap cycle significant? M2-N2 modulation?

p.15 l. 8 - 'does not significantly affect' - has this been statistically tested? If not, please rephrase.

Interactive comment on Ocean Sci. Discuss., 10, 691, 2013.