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Earth System Science Data Discussions

Interactive comment on "Overview of the Nordic Seas CARINA data and salinity measurements" *by* A. Olsen et al.

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I would first of all like to thank the reviewer for taking time to carefully read the manuscript and for providing comments. This furnishes me with an excellent opportunity to improve the manuscript.

In the following I will go through the reviewer comments one – by –one. The comments are given in italics and our response in regular font. Since some of the comments of reviewer 1 and 2 raised the same issues, I have added numbers to each comment to enable cross-references

2.1 *Page 3 line 14: Should be 'The Arctic Mediterranean Seas include: : :'*

Will be corrected in revision.

2.2 *Page 3 line 20: According to Fig. 4 and Section 4 the QC salinity data are consistent to 0.005*

Will be corrected in revision.

2.3 *Page 6 lines 8-9: ': : :because they are more or less separate: : :' In which sense more or less separate? Locations, water masses properties ? Please precise this statement.*

By separate we actually mean that not one of the cruises of CARINA covered both the Arctic Ocean and the Nordic Seas to the extent that it could be included in the secondary quality control in both regions. In addition, the differences in data density in the two regions enforced the use of very different QC methods for the data collected in them (for details on the approaches used in the Arctic Ocean, see Jutterström et al., 2009). This will be specified in the revised version.

2.4 *Page 7 line 16: The data of OMEX1NS and Iceland Seas entries were collected during different cruises, using various instrumentation and processed by different analysts. Does it not imply different adjustments rather then the same ones for the whole entry?*

The OMEX1NS data could not be QC'd as they were collected at too shallow depths, and these are labeled NC. The QC of the Iceland Sea data was carried out by comparing these to cruises that were passing by, this took place in 1994, 1997, 2002 and 2003. To follow the suggestion we would have to label these data OK, and the data from the other years as "NC", To further follow up, the data from the different years, or ideally different occupations of this time series would have to be separate entries in the data base. This would complicate files and tables and as wee see it, not be beneficial.

2.5 *Page 7 line 25: 'The latitudinal distribution of the data: : : ' I suggest to add 'binned into5_ bands' for clarity, here or in the Fig. 2 capture.*

Will add this in the Figure 2 capture

2.6 *Page 8 from line 9 on: Table summarizes the results of the secondary quality control. Four different recommendations are provided in this paragraph, labeled by numbers 1 to 4: using data as they are, using data after adjustment, not using data due to poor quality and no specific recommendation. However in the table, there is a mixture of flags (Flag 3 or NC) and numerical values of the recommended adjustments. Since in most cases the adjustments are 0 (when additive) or 1 (when multiplicative), they can be easily mistaken for a sort of flag. I would suggest a clear statement in the table capture that apart from flags NC and Flag3, the given numbers are values of individual adjustments, recommended for each cruise. And I would rather avoid using numbers 1-4 in the text when listing different cases, but instead put clearly in brackets that for the first case the constant (or factor) is 0 (or 1) and for the second case they are other than that.*

In the revised version we will state in the table capture that the numbers are multiplicative adjustments for nutrients, oxygen and CFC, and additive adjustments for TCO2, TA, pH, and salinity. And, that ND signifies No Data, NC: Not Considered and Flag 3 that the data appeared to be of too poor quality to be of any use and were not included in the final CARINA data product. We will also clearly state in the text that summarizes the table what the different numbers mean and avoid using the numbers 1-4.

2.7 *Page 8 line 9: A consistency of the CARINA-AMS data product with GLODAP is underlined here as well as in the abstract. However, not all readers are entirely familiar with GLODAP and its quality standards. Thus it would be welcome to provide a sentence or two explaining what is covered by the GLODAP database.*

We will include a description of GLODAP in the revision

2.8 *Page 9 lines 8-9: Would be useful to provide a more detailed statement how the 1st level QC was performed, were outliers and obvious error identified just by visual control or any automatic screening has been applied?*

The 1st level QC has been described by Tanhua et al (2009). In the revision we will

include a summary, i.e. that it was carried out by examination of property-property plots, and that measurements that were outliers, generally in more than on type of plot, were flagged.

2.9 *Page 9 lines 20-22: The reference to Johnson et al. (2001) in the context of evaluating cruise-to-cruise differences in density space in not correct. In fact Johnson et al. recommended neither density nor depth but potential temperature space for crossover analysis, arguing that it is the most accurately measured hydrographic quantity and is the natural coordinate for evaluating salinity due to the temperature-salinity relationship in the equation of state. The argument against using density in the Nordic Seas arises rather from keeping evaluation independent of errors in salinity which could result in density errors, not from the small density gradients in the area.*

This comment adress the same issues as comment no: 1.2 of reviewer No. 1, and I refer to the reply to this one.

2.10 *Page 9 lines 23-25: As mentioned by the authors, the convection depth in the Greenland Sea did not reach lower than 1500 m in 1990s (based on Ronski and Budeus, 2005 or ICES Report on Ocean Climate, 2008). Then I cannot see the point in taking into account only samples deeper than 1900 m, especially when a fraction of stations included in the Nordic Seas database is located outside the central Greenland Sea, in less deep areas. This criterion has a consequence in limiting a number of samples for crossover analysis. Perhaps the maximum depth criterion could be adjusted, depending on spatial distribution of crossover points. The same refers to the observed positive trend in salinity and other hydrographic parameters in the deep Greenland Sea over the last decade. The similar trend was not found in the other regions in the Nordic Seas and North Atlantic where the deep water mass composition is less affected by the deep outflow from the Arctic Ocean (see ICES Report on Ocean Climate, 2008) and projecting this positive trend onto the whole region seems not justified.*

This comment addresses the same issues as comment no: 1.3 reviewer No. 1, and I

refer to the reply to this one.

2.11 *Section 4.1: Crossover and inversion analysis described here is the backbone of recommendation given for the salinity data from all Nordic Seas cruises. While I assume that a detailed description of the crossover procedures will be given in Tanhua et al. (2009) paper, it would be useful to provide at least basic parameters of the performed analysis in this paper. How were the crossover points defined? Which stations have been included in the crossover groups (in what distance from crossover points)? Were they the same as in Johnson et al. (2001), where the constant value of 200 km was used to designate crossover points and 350 km was used as a radius from a crossover point to define station clusters? The paper refers to the cnaX scripts used for evaluation of the salinity data. After exploring the CARINA website, I have not found any reference to cnaX scripts but instead the nice Matlab Crossover Toolbox which seems to have been used for the crossover analysis. From the Matlab scripts it is possible to find (among others) the interpolation method, definition of crossover points and crossover stations groups but these parameters should be described explicitly in the paper. The other question is how the matrix of weights was constructed for the evaluation of the salinity data. Does it reflect the larger influence of the Greenland Sea cruises on the salinity evaluation or another, region dependent weighting was applied? I strongly suggest to include more exhaustive description of the crossover and inversion analysis into this section, even if this might result in a certain overlap with the Tanhua et al. paper.*

I will include a description of the crossover and inversion method in section 4.1 of the revision, and will make sure that the information that the reviewer asks for here, is present.

2.12 *Page 13 line 4: There is no Fig. 3a in the paper, the sentence should refer to Fig. 3.*

This will be corrected in the revision.

2.13 *Fig. 3: The inlays with maps showing location of stations for each cruise are illegible in the present shape. As spatial distribution of stations is the crucial information for the salinity database, my suggestion is to move these maps to the side of the plots with salinity profiles and to increase size of these maps at least to equal the height of salinity plots.*

For the revision I will prepare a set of new figures, with the maps moved to the side of the profile plots, with height equal to the salinity plots. This will make them legible.

2.14 *Fig. 5: Similar technical remark as above. The colored bathymetry contours are not relevant for a comparison shown by these plots while positions of the 58JH19940525 cruise stations and those of other data used for crossover are. The marker size can be scaled in the M_Map Toolbox and I suggest to use this feature.*

For the revised version I will plot the 134-58 JH19940525 data as open diamonds, this makes all of the station positions clear.

2.15 *Suggestion for the merged data set: Including time as a variable would help to distinguish multiple casts repeated at the same station. It would also not hurt to include the EXPOCODE cruise name as a variable in the merged data sets or at least to provide a separate file, matching cruise numbers with their EXPOCODE names for the cruises used in each merged data set. This information is required when using provided Matlab routines for reading the data and crossover analysis. Copying the text from the manuscript table is not the most convenient (but currently the only) way to get a subset of cruises used in the CARINA Nordic Seas merged data set in digital form.*

For time, please see reply to comment 1.6 of reviewer 1.

For EXPOCODE. We have prepared machine readable files containing cruiseno and EXPOCODE that can be used for translating the cruiseno in the datafile to EXPOCODE. This file is avaliable along with the dataproduct at CDIAC (http://cdiac.ornl.gov/ftp/oceans/CARINA/CARINA_Database/CARINA.AMS.V1.2/, file

AMScruises.csv)

References:

Johnson et al.: Systematic adjustments of hydrographic sections for internal consistecy, J. Atmos Ocean Tech., 18, 1234-1244, 2001.

Jutterström, S. et al.: Arctic Ocean data in CARINA, Eart. Sys. Sci. Data. Discuss, 2, 281-308, 2009.

Ronski, S. and Budéus, G.: Time series of winter convection in the Greenland Sea, J. Geophys. Res., 110, C04015, doi: 10.1029/2004JC002318, 2005.

Tanhua, T, van Heuven, S., Key, R. M., Velo, A., Olsen, A., and Schirnick, C.: Quality controll proceures and methods of the CARINA database, Eart. Sys. Sci. Data. Discuss, 2, 205-240, 2009.

Interactive comment on Earth Syst. Sci. Data Discuss., 2, 1, 2009.