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Discussions

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

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1. General comments

Creation of a quality controlled (QC) and publicly available dataset presented in the article is of the first priority. Absorption of the atmospheric CO2 by the ocean is one of the key processes for understanding the Earth climate system, especially under increased anthropogenic pressure. How much CO2 could be absorbed by the ocean under present and future climatic conditions? To answer the question reliable historical and modern data should be analyzed. Salinity is a most important parameter for the chemistry and tracer variables validation. It is looks natural that the paper devoted to salinity QC was published first among the series of related studies including methodology description. Although, it establish difficulties in reviewing process since some important details of the method unknown yet. Nevertheless, the main result of the

analysis is very promising since it states very high quality of the salinity data. According to the Table 1 salinity from the most cruises (28) except erroneous (1) and 'not considered' (6) does not require any biases correction within the CARINA threshold for salinity +/- 0.005 and can be used as 'it is'.

2. Specific comments

The article describes processing of the salinity observations in order to construct consistent dataset without systematic biases for the Nordic Seas (NS) region. First level QC (outliers and obvious errors) will be described in another article (Key et al., 2009, in preparation). Secondary QC on salinity was applied for 35 cruises from the total 188 non-publicly available cruises collected in the CARINA database. To identify cruise-to-cruise salinity biases a weighed least squares (WLSQ) model was selected recommended in Johnson et al., 2001. Since there is no complete description of the method in the article (details in Tanhua et al., 2009 submitted) it may be useful to provide some additional information about the secondary QC. For instance about a criterion was chosen for the crossovers definition and an explanation why it is optimal. Obviously, it should be linked to water mass properties of different origin and their geostatistical characteristics.

There are some deviations from methodology described in Johnson et al., 2001.

Page 9, line 21-22: 'the analysis in most regions evaluates cruise-to-cruise differences in density space (Johnson et al., 2001), depth was used as the ordinate in the Nordic Seas due to the small density gradients in this region.'

Page 9, line 23-24: '. . .only samples deeper than 1900m were compared to avoid effects of ventilation'

Actually, potential temperature surfaces were used in Johnson et al., 2001. And it is not clear why density gradients in the Nordic Seas are smaller than in the WOCE dataset. It may be because the only deep samples were used. In Johnson et al., 2001 full depth

profiles were incorporated into the analysis. It is need to specify that such simplification does not effects the final conclusions about salinity quality in the upper layers.

The WLSQ method was selected as optimal for WOCE (high quality standard!)repeated standard sections with rather uniform crossovers spatial distributions between cruise legs. The CARINA data collection represents more scattered data with one exception – repeated section along 75o in the Greenland Sea. It is questionable how temporal variations of the deep convection activity in the central Greenland Sea can be expanded to the whole NS and North Atlantic. Observations in the Atlantic domain of the Nordic Seas do not show salinity increase in the intermediate and deep layers during the 1990s, most probably due to reduction in light to dense water transformation (see Isachsen et al., 2007 for mechanism). It was mentioned also that ventilation was not penetrated deeper than 1500 m, so why 1900 m was selected as limiting depth? It potentially limits a number of samples for crossovers. Reference: Isachsen P. E., C. Mauritzen, H. Svendsen (2007). Dense water formation in the Nordic Seas diagnosed from sea surface buoyancy fluxes. Deep-Sea Research I 54, 22–41.

Page 11, line 15-17: 'There is an overall trend towards higher salinity values, i.e. increasingly negative corrections. This is consistent with the aforementioned increasing fraction of deep waters from the Arctic Ocean in this region (Blindheim and Rey, 2004) and should not be corrected for.'

As was mention AODW (EBDW,CBDW) spreading is not only the process that affects properties of the deep water masses in the Nordic Seas. Therefore it is look strange that all salinity corrections are negative (Fig.4) particularly for cruises where the most stations located outside the central Greenland Sea (Fig.3).

Three cruises (58JH19920712, 34AR19970805, 58JH19940723) which according to the WLSQ analysis potentially require adjustment (Fig.4) were marked as 'not considered'. Main reason is that salinity samples located in overflow area with limited number of crossovers and different variability. Obviously the number of crossovers will be low

due to samples selection criterion (>1900 m) and additional information is required. It can be recommended to involve data from much more comprehensive datasets (ICES, NODC World Ocean Databases) to check consistency of the regional subsets of the CARINA database.

One problem potentially arises when merging CARINA data with existing databases. In common oceanographic databases station time is a necessary field while in CARINA collection time is missed. Disadvantage is that duplicate control especially in the case of multi-days stations is very complicated.

3.Typing Errors

Abstract, line 20. It should be 0.005 instead 0.05.

Page 12, line 18. EXPOCODE 34AK19970414 does not exist, it should be 34AR19970805

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