



Comparison of hydrographic climatologies in the Nordic seas using the metric of water mass census

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We have compared and evaluated the watermass census of eight climatologies: the 1982,1998,2001 and 2005 versions of the World Ocean Atlas (Levitus82,WOA98,WOA01,WOA05), the US Navy's GDEM climatologies (GDEM93,GDEM09 versions) and its MODAS01 climatology, and the Arctic/Nordic climatology PHC2 of the University of Washington. The study was restricted to the Arctic and its marginal seas, with particular focus on the Greenland and Norwegian seas. Validation computations using watermass census as a metric included 'climatological' comparisons with all available casts from the World Ocean databases (WOD98, WOD01, WOD05)and some more local casts in the GIN Sea. Both the climatologies and the observations exhibited the presence of deep watermasses with T-S characteristics that do not fall into the 'named' deep water varieties (e.g. Norwegian Sea deep water).

The seasonal volumetric changes for the Atlantic and deep waters in the GIN Sea are in reasonably good agreement between the climatologies, and with the results of hydrographic census surveys. Typical seasonal changes involve about 33.103 km³ of AW increase, and about 39.103 km³ of DW decrease, between spring and autumn in the GIN Sea.

Some explanations for the differences include: (a) the availability of much larger data bases in recent years; (b) sampling biases of the observations in space and time (near surface, near shelves, spring and summer, etc.), (c) in the fall, even depth levels of the computations; (d) errors in earlier years of the salinity measurements, where a small change of .005 psu can easily shift a watermass between classes, especially in the deep water regime; (e) horizontal level averaging of neighboring hydro-casts.