Ocean Sci. Discuss., 6, C703–C704, 2009
www.ocean-sci-discuss.net/6/C703/2009/

Ocean Science
Discussions

Interactive comment on "Density and Absolute Salinity of the Baltic Sea 2006–2009" *by* R. Feistel et al.

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Received and published: 27 October 2009

All substances dissolved or suspended in sea water contribute to the density of water. If the relative composition of matter always were the same, it would be sufficient to measure one component to get the total concentration of matter in the water. This was the idea behind measuring the chlorinity of sea water from which one then could obtain its Salinity and density using Knudsens Tables published in 1901. Analogous thoughts were behind the conductivity method to estimate salinity by measurements of conductivity and Practical Salinity was defined by the conductivity of sea water. In future, density measurements will be used to estimate Absolute Salinity although the practical methods are still not fully developed. Feistel et al. (2009) describes the development of methods to determine salinity and density. They focus on the problem to determine salinity and density of seawater in the Baltic Sea where the composition of water differs from that of ocean water due to supply of riverine freshwater of anomalous

composition and due to biological and geochemical processes causing sinks of matter in the Baltic Sea. Based on sampling in different parts of the Baltic Sea during the period 2006-2009 the authors determined the density anomaly of the samples and derived an empirical formula which estimates Absolute from Practical Salinity of Baltic Sea water.

If seawater is mixed with freshwater, the composition of the mixture may differ from that of sea water depending on the composition of the freshwater. This effect may be particularly great if freshwater is the largest component as it is in the Baltic Sea. However, composition differences may not only arise due to different composition of freshwater and seawater. Biologically/geochemically active minor constituents of sea water, like e.g. plant nutrients, may have much shorter residence times than major components of sea water. To understand the concentration of such constituents one has to account for sources and sinks. However, Feistel et al. (2009) neglected sinks when explaining the measured anomalous sulphate concentration in the Baltic as a result of anomalous riverine supply only. The applied model, equation (15), does not account for sulphur sinks in the Baltic, e.g. due to burial of iron and other metal sulphides in sediments and net loss of sulphur, e.g. as dimethylsulphide (DMS) and other sulphur-containing matter, through the sea surface. Accounting for the sinks would probably lead to a significantly higher estimate of the mean concentration of sulphate in riverine water.

Apart from the calculation of the riverine supply of sulphate, I find this paper very useful. It is an important reference providing data on anomalous composition of Baltic Sea water with respect to several elements. It also shows that the concentration of carbonate has changed during the last 30 years which is very interesting. The reasons for this are not known but it is discussed that the changes may be related to increased weathering due to increased CO2 in the atmosphere and that the result may be that acidification of the Baltic Sea may be counteracted.

Interactive comment on Ocean Sci. Discuss., 6, 1757, 2009.