

***Interactive comment on “Absolute Salinity,
Density Salinity and the Reference-Composition
Salinity Scale: present and future use in the
seawater standard TEOS-10” by D. G. Wright et al.***

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Neither reviewer has proposed any changes, nor have they queried any of the material presented. No comments are needed, and no changes are proposed on that basis.

In preparation for this authors comment, the manuscript was also reexamined. As far as could be determined, no additional information has come to light since the publication of the discussion paper that would contradict the arguments and conclusions presented. Thus no corrections or changes are proposed on that basis either.

However, a small mathematical error was discovered during the reexamination, and

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recent discussions suggest a clarification on one point would be useful.

The mathematical error arises on page 1574 Line 15. It is noted that a recent reevaluation of the concentration of boric acid in seawater would increase the true mass fraction of solute by 0.0002 g/kg. However, the correct value would be about 0.001 g/kg. The mathematical error arises because Lee et al., (2010) measured the ratio of boron mass fraction to chlorinity in a variety of seawaters (although not in SSW), and not the ratio of boric acid mass fraction to chlorinity. Their analyses suggested that the actual ratio is 4% larger than the value used in Millero et al., (2008) to define the Reference Composition. Although the increase in the mass of boron alone in seawater with $S_p=35$ then goes up by 0.0002 g/kg if the same ratio holds true in SSW (and there is no reason to assume it does not), because boron is found as boric acid in the form of $B(OH)_3$ and $B(OH)_4^-$ the implied increase in the mass of solute is much larger, approximately 0.001 g/kg. The apparent increase arises purely from differences in the molar masses of $B(OH)_4^-$ and $B(OH)_3$ relative to B . However, we emphasize that either value is far less than the known uncertainty in the true mass fraction of dissolved matter in SSW (which is 0.05 g/kg, as discussed in the first and last paragraphs of page 1574), and so replacing '0.0002 g/kg' with '0.001 g/kg' can be done without any changes at all in the rest of the text. In particular, there is still no reason to update the Reference Composition.

The clarification arises in the context of coastal waters. Although no changes to the arguments and conclusions are required, in the past month it has become clear that the discussion is slightly incomplete. The discussion is somewhat implicitly concerned mainly with the open ocean for which highest levels of accuracy for the properties of seawater are required, although references are also made to Baltic studies. However, the seamless transition of these ideas into near-coastal and estuarine waters of low salinity presents some additional practical and conceptual questions. The density anomalies in such regions are measurable (e.g., Millero, The conductivity-density-salinity-chlorinity relationships for estuarine waters, *Limnol. Oceanogr.* 29(6), 1317-

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1321, 1984; Feistel et al., Thermophysical property anomalies of Baltic seawater, Ocean Sci. 6, 949-981, 2010). However, the chemical composition anomalies that give rise to these density anomalies, and their possible changes over time, are very poorly known in general. Then again, in these regions the density anomalies themselves are generally unimportant in practical terms relative to the much larger gradients present. A full scientific and operational resolution of this issue is clearly beyond the scope of this paper, and will be addressed in future work. We propose making this point by adding a few sentences to the discussion.

Interactive comment on Ocean Sci. Discuss., 7, 1559, 2010.

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