Biogeosciences Discuss., 6, S649–S651, 2009
www.biogeosciences-discuss.net/6/S649/2009/

Biogeosciences Discussions

Interactive comment on "Carbon cycling in the Arctic Archipelago: the export of Pacific carbon to the North Atlantic" *by* E. H. Shadwick et al.

Anonymous Referee #1

Received and published: 31 March 2009

This is a puzzling paper with unique and sometimes seemingly inconsistent nomenclature. Even though the authors refer to several relevant articles, they have chosen to describe water masses that differ from what most researchers use. This makes for difficult reading and, together with other points noted below, mean that I cannot recommend the article for publication in its present form.

P975, line 3. Atlantic water is a significant contributor to water in Nares Strait, but not at the surface. The surface water is mostly Pacific water with river water contributing to the total fresh water.

P975, line 6. Eurasian rivers are the source of most of the river water in the Arctic Ocean. Models show these waters are present in the Beaufort Gyre and thus con-

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

tribute, perhaps significantly, to the flow through Lancaster and Jones sounds and almost certainly to the flow through Nares Strait.

P975, lines 13 and19. The authors have two definitions of river water, the first having S<29 and the second having S=0. This causes problems for the reader.

P975, lines 14 and 29. The designation of an Arctic water with 28<S<32 is new to me. Waters in this salinity range (and with lower salinity) more appropriately might be called the Polar Mixed Layer. Pacific water is usually defined by its salinity as it enters through Bering Strait. The most recent determination is S=32 (Aagaard, K., T. J. Weingartner, S. L. Danielson, R. A. Woodgate, G. C. Johnson, and T. E. Whitledge (2006), Some controls on flow and salinity in Bering Strait, Geophys. Res. Lett., 33, L19602, doi:10.1029/2006GL026612).

P975, line 16. Water with S=33.1 is formed mostly on the Chukchi Sea shelf and was first designated as upper halocline water (Jones, E.P., and L.G. Anderson. 1986. On the origin of the chemical properties of the Arctic Ocean halocline. Journal of Geophysical Research, 91, 10759-10767). This was followed with refinements in many subsequent papers.

P975, line 29. What region and/or water masses are included in the region?

P976, line7 and equations 2-4. Four water masses are listed but only three fractions are calculated. This is part of the confusion resulting from the definition of river water.

P976, lines 19-21. It's hard to understand what is involved in this sentence, particularly the part regarding a negative runoff fraction. Above (P 975, line14) the definition of Arctic water includes water with S=28 and above. Completely neglected is sea ice. Meltwater can contribute significantly to the fresh water components in the Beaufort Sea and hence in the CAA. Freezing surface water (negative meltwater) produces brine that ultimately adds salinity to Pacific water to form upper halocline water (Macdonald et al., 2002, Ekwurzel et al., 2001 and several other papers).

BGD

6, S649–S651, 2009

Interactive Comment

P977, lines 18-21and P988, lines 10-11. A reference is needed for the source of Atlantic water coming from the WGC. An alternative source would be Atlantic water flowing through Nares Strait (e.g., Jones, E. P., and A. J. Eert. 2006. Waters of Nares Strait in 2001, Polarforschung 74:185-189; Jones, E. P., and L. G. Anderson (2008), Is the Global Conveyor Belt Threatened by Arctic Ocean Fresh Water Outflow?, in Arctic-Subarctic Ocean Fluxes. Defining the Role of Northern Seas in Climate, edited by R. Dickson et al., pp. 385-404, Springer, New York).

P978, line 12. Confusion to the discussion related to definitions of water masses is the newly labeled "diluted Pacific water". This needs a clarifying discussion.

P979, line 2. The Atlantic water could be coming through the CAA via Nares Strait.

P980, line 27. The Beaufort Sea also communicates with the Atlantic Ocean via Fram Strait.

P981, line10. Jones et al. (2003) do not calculate volume transport.

P982, line10. A clearer statement saying what is meant by "deeper Pacific water." Is it Pacific water mixed with Atlantic water?

P982, lines 22-23. While it could be true that "this investigation sheds some light on the water mass properties", the unusual designations of water masses will more likely confuse the reader.

Interactive comment on Biogeosciences Discuss., 6, 971, 2009.