

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

E. H. Shadwick et al.

Received and published: 16 April 2009

Response to Comment by Jean-Pierre Gattuso

The authors certainly appreciate that *Biogeosciences* promotes the full availability of data sets corresponding to the papers it publishes. The work presented here is part of the Canadian IPY initiatives, specifically the Circumpolar Flaw Lead System Study (CFL) Project, and is therefore subject to the regulations agreed upon by all project participants. As such, the data has been submitted to the CFL project data center, and will become available according to the applicable Canadian IPY regulations. In the meantime, we would, of course, welcome requests from individual researchers with a particular interest in this work.

Response to Anonymous Referee 2

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



The authors wish to convey our thanks for this helpful comment, which we believe has resulted in a strengthening of the revised manuscript.

Measurements of TA were made in parallel with DIC measurements for all samples collected, allowing the full set of carbonate system parameters to be computed. The TA, pH and Ω_{Ar} data have been included in the revised manuscript, and a new section exploring the connection between pH, Ω_{Ar} , and the amount of Pacific water entering Baffin Bay, has been added.

In response to the concern regarding the calculations described in section 2.3, all three systems of equations used have now been presented, and the description of the methods used to compute the water mass fractions has been clarified and expanded.

Response to Anonymous Referee 1

The authors wish to convey our thanks for this insightful and helpful review. We believe we have addressed all the issues brought forward and have improved our manuscript in so doing. Please see our responses to the individual comments below.

P975, Line 3: We certainly agree with this clarification about the contribution of Atlantic water in Nares Strait, and the correction has been made.

P975, Line 6: While we agree that rivers are an important source of freshwater to the Arctic Ocean as a whole, our dataset provided evidence of only North American river runoff, (namely from the Mackenzie and the Horton) at the stations we occupied. This signal is no longer present as the North American landmass becomes more distant, or as we move eastward. Furthermore the outflow of freshwater from Lancaster Sound is both seasonally and inter-annually variable, and our sampling took place in the autumn, when runoff is at a minimum.

P975, Lines 13 and 19: We have clarified the definition of our freshwater end member.

P975, Lines 14 and 29: We have accepted the suggestion that our 'Arctic' water mass would more appropriately be called the 'Polar Mixed Layer', and made the correspond-

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



ing changes throughout the manuscript.

P975, Line 16: Salinity may be considered a necessary but not sufficient condition for the characterization of a water mass. We here rely on salinity and DIC to identify our Pacific origin water mass using a salinity of 33.1. While we acknowledge the reviewer's comment that more recent characterizations using $S = 32$ have been proposed, we feel that there is adequate support in the literature to justify our choice of salinity 33.1 for our Pacific-origin water in this study (see for example: Wheeler et al., 1997; Miller et al., 2002; Hansell et al., 2004; and Mathis et al., 2005).

P975, Line 29: The regional mean salinity of 32.5 results from all samples collected at stations indicated in Fig. 1. This has now been explained in the text.

P976, Line 7 and Eq. (2-4): The equations have been expanded to include all three versions used to compute water mass fractions. In the absence of a third water mass, a 2-end member mixing equation was considered. This has been clarified in the text.

P76, Lines 19-21: The description of the application of the equations has been clarified. We have included melt-water in as a contributor to our freshwater signal. Samples deemed to result from a contribution from sea-ice melt are indicated and described in the captions of Figures 2 and 3.

P977, Lines 18-21: We have responded to the suggestion that a reference is needed for the source of Atlantic water coming from the WGC, and have added the appropriate citations in section 3.1.

P978, Line 12: The term 'diluted Pacific water' has been removed in response to the reviewer comment.

P980, Line 27: The Beaufort Sea indeed communicates with the Atlantic through Fram Strait, and this has been added to the text.

P981, Line 10: The Jones et al., (2003) citation has been removed from the references for water mass transport.

BGD

6, S824–S827, 2009

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



P982, Line 10: The term 'deeper' has been removed. The authors were referring to the fact that Pacific and Atlantic water are found in the lower water column, beneath the PML.

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

BGD

6, S824–S827, 2009

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

S827

