

## ***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 #2**

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Carbon cycling in the Arctic Archipelago: the export of Pacific carbon to the North Atlantic EH Shadwick et al

Shadwick et al measured DIC, oxygen, salinity and temperature in waters of the Canadian high Arctic (<70degN). By characterising the provenance of source waters and DIC concentrations in this region (from where water flows into the high-latitude N Atlantic) they aim to improve our understanding of possible future impacts on N Atlantic ocean acidification (OA). If DIC in this area should change, the N Atlantic in future would be provided with water that is higher or lower in DIC.

This area is particularly inaccessible and so any data are welcomed. It is unfortunate however, that only one carbonate system parameter has been measured on these

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cruises, because derivation of OA parameters (pH, carbonate ion etc) requires measurement of two or more. If measurements of alkalinity, for instance, had also been made, then this would have been much more informative and interesting with regards to OA (this paper is submitted to a special issue on OA). As it stands, without knowing the alkalinity concentrations (the full carbonate chemistry) of the different waters, the usefulness of the work for OA is greatly diminished. It is impossible to tell, from DIC alone, whether any given change in source waters would exacerbate or moderate OA in the N. Atlantic.

I am not convinced by the mathematical calculations in section 2.3. There are 3 equations and 4 variables, and so solution should be impossible. It is stated that "a version of the following equations may be used to compute the relative fractions of river run off (frro) ..."; but this is hard to believe given that frro does not appear in any of the equations. If a different method has been used than that which is shown, then that method must be explicitly shown and justified in any revised version.

The authors are strongly encouraged to collect a greater range of data on future cruises to this interesting area, including more than one carbonate system parameter, nutrients, chlorophyll etc.

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