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Editors
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Re: Submission of manuscript bg-2013-605

To the Editors

We have submitted the following paper to *Biogeosciences*, entitled "Sea-ice melt CO_2-carbonate chemistry in the western Arctic Ocean: Meltwater contributions to air-sea CO_2 gas exchange, mixed layer properties and rates of net community production under sea ice" (bg-2013-605), by N.R. Bates, R. Garley, K.E. Frey, K.L. Shake and J.T. Mathis.

The paper reports on recent observations of the sea-ice melt water CO_2-carbonate chemistry of sea-ice melt pond water in the western Arctic Ocean. The melt pond, and co-located mixed layer biogeochemistry data was collected at nineteen sea-ice stations between 2010 and 2011 (northern Chukchi Sea and southern Canada Basin) during the NASA sponsored ICESCAPE project. The paper is primary focused on the CO_2-carbonate chemistry of above-ice melt ponds, meltwater-influenced interface between sea-ice and mixed layer. We report the dissolved inorganic carbon and total alkalinity (and associated pCO_2, pH and saturation states aragonite ($\Omega_{aragonite}$). Meltwater CO_2-carbonate chemistry is highly variable, ranging from acidic (pH of~6) to alkaline (pH of ~10), and pCO_2 ranged from very low to 1500 ppm. As a context for the paper, it should be noted that very few studies have been conducted on sea-ice CO_2-carbonate chemistry, and even fewer on melt pond water.

We also discuss the potential role of meltwater for air-sea CO_2 gas exchange, and how meltwater complicates the determination of the rates of net community production (NCP) in the mixed layer beneath sea-ice. Melt ponds, transient seasonal phenomena as they are, potentially contribute to the complex drivers of air-sea CO_2 gas exchange in the Arctic Ocean and recent changes in CO_2 fluxes (e.g., see relevant papers by Bates et al., 2006; Bates and Mathis, 2009; Cai et al., 2010; Schuster et al., 2013; Manizza et al., 2013). Melt pond chemistry also contributes substantively to determination of NCP, and contributes to enhancement/amelioration of ocean acidification in the Arctic Ocean (e.g., in the western Arctic; see relevant papers by Orr et al., 2005; Steinacher et al., 2010; Bates et al., 2009; 2013).

The paper is not under consideration elsewhere. The first author was primarily responsible for writing of the manuscript and data synthesis and interpretation.

Yours truly

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