



Barium and Carbon fluxes in the Canadian Arctic Archipelago

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The seasonal and spatial variability of dissolved Barium (Ba) in the Amundsen Gulf, southeastern Beaufort Sea, was monitored over a full year from September 2007 to September 2008. Barium displays a nutrient-type behavior with the highest concentrations observed at river mouths. The water column maximum is located at the base of the surface layer with lower concentrations above and below. The lowest concentrations are found in water masses of Atlantic origin, and Ba concentrations decrease eastward through the Canadian Arctic Archipelago. A three end-member mixing model comprising fresh water from sea-ice melt and rivers, as well as upper halocline water, was used to establish their relative contributions to the surface waters of the Amundsen Gulf. Based on water column and riverine Ba contributions, we assess the Ba depletion by particle sinking and subsequently estimate the carbon export production. In the upper 50 m of the water column of Amundsen Gulf, riverine Ba accounts for up to 15% of the dissolved Ba inventory, whereas up to 20% of the dissolved Ba inventory is depleted by barite (BaSO_4) formation and export. Since riverine inputs and Ba export occur concurrently, the seasonal variability of dissolved Ba is moderate. Assuming a fixed organic carbon to barite flux ratio, carbon export out of the surface layer is estimated at 2 mol C per (m^2 yr). Finally, we propose a climatological carbon budget for the Amundsen Gulf based on recent literature data and our findings, the latter bridging the surface and subsurface water carbon cycles.