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# Seasonal Variability of the Inorganic Carbon System in the Amundsen Gulf Region of the Southeastern Beaufort Sea

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High latitude oceans are ecologically sensitive areas where the early detection of climactic changes will most likely be possible. Polar oceans are also chemically sensitive due to the relatively high Revelle factor and correspondingly weaker buffer capacity of these waters. Dissolved inorganic carbon (DIC), total alkalinity (TA) and partial pressure of $CO_2$ ($pCO_2$) measurements covering a full annual cycle were collected in the Amundsen Gulf region of the Southeastern Beaufort Sea as part of the Canadian International Polar Year initiatives, between October 2007 and September 2008. The annual cycles of inorganic carbon system parameters (DIC, TA, $pCO_2$, pH, and aragonite saturation ($\Omega_{ar}$)) are presented, and seasonal variations examined. The physical and biological processes responsible for the seasonal variations in water column DIC are identified. We establish a two-box model for the surface and subsurface layers in order to compute monthly changes in DIC due to: horizontal and vertical advection between the boxes, air-sea exchange of $CO_2$, freshwater input from river runoff and sea-ice melt, and biological processes. The assessment of these governing processes allows an estimate of net community production and respiration for Amundsen Gulf to be made on the basis of the inorganic carbon data collected in the region.