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Sources and transport of freshwater and their influence on carbon dynamics in the Hudson Bay

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Global climate models predict enhanced warming in Polar regions, thereby suggesting that early signs of global climate change may be detected by observations made in the Arctic regions. Hudson Bay is a shallow (mean depth of 150m) and large scale estuarine system connected to the Canadian Arctic Archipelago to the north and the Labrador Sea to the east. Their water mass characteristics and circulation are strongly influenced by freshwater dynamics, namely, fluvial input from the large drainage basin, sea ice formation and melt, and less saline Pacific water inflows in the northern part of the Bay. Low salinity water flowing out of Hudson Bay through Hudson Strait will affect the Labrador Current system, and further may affect the deep convection regimes of the Labrador Sea through influencing the density of the surface waters where the convection occurs. Deep convection in the Labrador Sea, together with that in the Nordic Seas, supply intermediate and deep water to much of the North Atlantic Ocean. Identifying the freshwater distributions and their variability in Hudson Bay will contribute to the understanding of not only the Arctic climate processes but also of the influence of the Arctic water outflow can have on the global climate change through its effect on the Labrador Sea. Freshwater also influences carbon dynamics in Hudson Bay. River water carries terrestrial carbon including both in organic and inorganic forms into Hudson Bay. Ice coverage hinders the air-sea flux of CO_2 much of the year, while ice formation enhances the vertical mixing, and therefore the transport of surface organic carbon to the depth and deep inorganic carbon to the surface. Polynya formation contributes to active biological production (i.e. biological pump). Observation of carbon and freshwater distributions and their variability in the Hudson Bay will contribute to understanding of not only the Arctic climate processes, but also of the influence of the Arctic water outflow can have on the global climate change through its

effects on the Labrador Sea. Dissolved inorganic carbon and total alkalinity as well as oxygen isotope composition were measured annually since 2003 in Hudson Bay and adjacent area to investigate carbon dynamics and influence of freshwater sources and transport. Following questions including - (1) Is Hudson Bay a sink for atmospheric CO_2? (2) What is the size and variability of the carbon flux between the air-sea interface and from Hudson Bay to the Labrador Sea? and (3) What are possible changes of the carbon cycle in the Hudson Bay under the climate warming scenario? will be discussed.