A multi-proxy study on decadal to centennial time-scale variations in freshwater discharge recorded in the marine sedimentary record of the Nelson River estuary (Manitoba) and offshore of the Great Whale River mouth (Quebec) in Hudson Bay (poster presentation)

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This study aims to bring recent variations in river water discharge into the Hudson Bay Basin into an appropriate centennial to millennial climatic context by studying the marine sedimentary record. This will help to distinguish between natural variability and possible anthropogenic impacts due to global warming.

The marine sedimentary record of two field localities, the Nelson River estuary (western coast of Hudson Bay) and a sedimentary basin offshore of the Great Whale River mouth (eastern coast of Hudson Bay), will be used to study river water and sediment discharge, marine sediment dispersal and accumulation processes and the history of river runoff variations in Hudson Bay. Recent observations in river discharge from the Canadian Shield to the Canadian sub-Arctic/ Arctic show large variations during the past forty years. These variations have a substantial influence on the marine ecosystem and on sea-surface conditions and deep water formation in the Labrador Sea and thus on the global thermohaline circulation. There is a critical need to increase our understanding of paleo-river-discharge variations to place our current knowledge in a longer climatological context and to prepare for possible future changes. The study applies a multi-proxy approach to

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relate freshwater discharge to sediment discharge and to delineate variations in freshwater discharge within the sedimentary record on decadal to centennial timescales. Hydrographic modeling programs help to estimate river discharge variations under varying climatic conditions. Further, variations in river discharge are used to estimate sediment discharge. High-resolution short-lived radioisotopes (^{7}Be, ^{234}Th, ^{210}Pb, ^{137}Cs) help to elucidate sediment accumulation rates and post-depositional alteration processes to evaluate the potential for preservation and the temporal resolution of the sedimentary record. Because short-lived radioisotopes cannot be applied in the study of the long-term record, granulometry and different imaging techniques (X-radiography, thin-sections) are used to recognize sedimentary structures. Further, stable isotopes (^{18}O, ^{13}C) will be used to delineate variations in terrestrial influence in the sedimentary record, in addition to major element chemistry and the mineralogical composition of the sediment. A multi-sensor core logger will supply additional information on sediment properties, such as grain size, lithology, and color, to study variations in terrestrial input. The geochronological framework will be established by ^{14}C dating.

First results from the Nelson River estuary show that sedimentation occurs due to fluvio-tidal re-suspension on topset beds, and possibly also as gravity-driven fluid muds in the foreset and bottomset region. Offshore of the Great Whale River a large sedimentary basin was discovered, which will provide several thousand years of river runoff history with an estimated temporal resolution of approximately 20 years.

