Seafloor records of sediment dispersal patterns in the Nelson River, Hudson Bay

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Patterns of sediment deposition in the Nelson River Estuary, southwestern Hudson Bay, have been examined using radioisotope-geochronological analysis of sediment cores and seabed sonar data, in order to gain a better understanding of sedimentary processes and sediment transport from fluvial to marine systems at high latitudes. This is important because the majority of previous sediment-dispersal studies on estuaries and deltas have focused on low to mid latitudes. The Nelson River was chosen because: it is the largest source of freshwater input to the Hudson Bay, the mouth is a classic example of a macrotidal estuary, and it is ice-bound for much of the year, producing an interesting contrast between the dampening effects of ice, and the dynamic effects of tides.

Two gravity cores were collected from the Nelson River Estuary in 2009, and have been sub-sampled for granulometry and radiochemical analysis during July 2010. Analysis of the particle-bound radioisotopes Pb^{210} (half-life = 22.3y) and Cs^{137} (half-life = 31y), using a low energy gamma spectrometer, are used to determine sediment flux over ~decadal timescales. Previously processed analysis of box-cores from the same area is used to supplement findings. Multibeam bathymetry and sub-bottom seismic profiles are being analyzed to evaluate seafloor morphology and depositional patterns. The physical data, radiochemical data, and structural images are being integrated to elucidate sediment dispersal patterns. The preliminary results show a region of sediment bypass in the inner estuary, with sediment accumulation rates increasing from 0.4

Atlantic Geology, 2010, Volume 46, Number 1

cm/y to >0.9 cm/y in the middle and outer estuary. The results are consistent with high sediment supply from the river and decreasing tidal current energy in a seaward direction. These observations will be compared with ice-coverage and river-flow data, to explore relationships among spatial deposition patterns, ice extent, and river forcing.