

## Developing Age Models to Utilize High Arctic Coastal Sediments for Paleoclimate Research: Results from the Colville Delta and Simpson Lagoon, Alaska

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Sediment cores collected from Simpson Lagoon on the inner Beaufort Sea shelf adjacent to the Colville River delta, AK are being utilized to develop new, high-resolution (sub-decadal scale) archives of the 0-3,000 year Arctic paleoclimate record necessary to assess natural and anthropogenic climate variability. An imperative first step for developing a new paleoclimate archive is to establish methodologies for constraining the age-depth relationship. Naturally occurring and bomb-produced radioisotopes have been utilized in sediments to constrain downcore variability of accumulation rates on  $10^0$ - $10^3$  y timescales, but this methodology is complicated by low activities of many of these tracers at high latitudes. The present study utilizes the combination of a (1) multi-tracer approach and a (2) tailored measurement strategy to overcome this limitation.  $^{210}\text{Pb}$  and  $^{137}\text{Cs}$  analyses were conducted on the fine ( $<32\mu\text{m}$ ) sediment fraction to maximize measurable activity and to minimize radioisotope activity variability resulting from changes in grain size:  $^{137}\text{Cs}$  geochronologies proved more reliable in this setting and revealed mm/y sediment accumulation in the lagoon. To corroborate the  $^{137}\text{Cs}$  results,  $^{239,240}\text{Pu}$  activities were analyzed for selected sites using ICP-MS which has ultra-low detection limits, and yielded accumulation rates that matched the Cs geochronology. Age model development for the remainder of the core lengths ( $>\sim 100$  y in age) were completed using radiocarbon dating of benthic foraminifera tests, which proved the only datable in situ carbon available in this sediment archive. These dates have been used to constrain the ages of acoustic reflectors in CHIRP subbottom seismic records collected from the lagoon. Using this age control, spatial patterns of lagoonal sediment accumulation over the last  $\sim 3$  ky were derived from the CHIRP data. Two depocenters are identified and validate combining age-dated coring with high-resolution seismic profiling to identify areas of the highest temporal resolution for Arctic paleoclimate research in coastal sediments.

**Keywords:** Colville River, Alaska, radioisotope geochronology, radiocarbon, inner continental shelf sedimentation, CHIRP