Letter of Intent—Arctic Geotraces—Sediment Geochemistry
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I will be proposing to work with sediment cores obtained in the Bering-Chukchi-Beaufort Sea transect. Likely collaborators on this project will be: M. Prokopenko, Pomona; J. Granger, U. Conn.

As a critical boundary to the oceanic water column, the transformations and reactions that occur in near-surface sediments can shape influence and even apply tracer information to the overlying water. Through a vast region where the N. Pacific transitions to the Arctic Ocean, there are sediments in contact with water at depths <100m. The impact of TEI fluxes, quantitatively, and the impact of organic matter diagenesis as it affects TEI cycling both need to be studied in this cruise transect via the best means available and logistically reasonable.

Our approach will include analyses of pore waters at mm and cm scales, as well as determination of fluxes via core incubations and manipulation experiments. Pore water profiles provide insights into the location and rates of diagenetic reactions, which can be modeled to assess benthic fluxes across the sediment-water interface (SWI). Resolving constituent gradients in high resolution, near the SWI, will provide invaluable insight into true source vs. sink terms. High resolution profiling will be undertaken with our Whole Core Squeezer, a device we've used successfully since JGOFS-EQPAC in 1992. Centimeter-scale sampling will occur using rhizon and/or Jahnke-like pore water extraction. Again, our group has vast experience with this strategy and has worked on both shelf (Southern, Central and N. California, Oregon, Gulf of Mexico) and numerous deep-water settings. We are experienced at the onshore-offshore transect as we've done this work specifically off Monterey/Pt. Sur in collaboration with trace metal groups (K. Johnson, K. Coale). We will also obtain flux information using core incubation strategies. Here again, our experience in coastal S. California, C. California and along a transect N. from Baja Mexico give us great insight into how to best achieve meaningful flux information from this methodology.

Our focus will be on reactions that influence and are indicative of organic matter loading and the redox state of near-surface sediments. We plan on measuring pore water profiles and fluxes of: Oxygen, nitrate, nitrite, ammonium, dissolved Si, TCO_2, alkalinity, phosphate, Rn-222. We also plan on measuring ^{13}C of pore waters and fluxing TCO_2, potentially on board ship with a Picarro system (which we have). We will also measure $^{15}N/^{14}N$ and $^{18}O/^{16}O$ isotope ratios of nitrate and $^{15}N/^{14}N$ ratios of ammonium in conjunction with Granger. We will formally and perhaps informally ally with other Geotraces investigators to provide pore water and core flux water for analysis of TEIs. As mentioned, we have experience in this sort of alliance with TEI colleagues and have found excellent partnerships and fruitful collaborations.

Pore water and core incubation work is manpower intensive. There is no way that an inexperienced colleague or crew member can perform the tasks we will be proposing. This will require at least 2 and preferably 3 bunk-spaces for personnel. It will also require the attention of the ship technicians and spare personnel in multi-corer deployments and recoveries. We are sensitive to the TEI mission of Geotraces and hence will be handling cores in a cold room (Healy has 2 Temp controlled rooms) and/or a dedicated van.