Time-series investigations of settling particle flux and composition in the deep Canada Basin, Arctic Ocean

TIMOTHY I. EGLINTON[1,2]*, STEVE J. MANGANINI[2], JERZY S. BLUSZTAJN[2], MINKYOUNG KIM[3], JEOMSHIK HWANG[3], DANIEL MONTLUCON[1], RICHARD A. KRISHFIELD[2] AND CAMERON MCINTYRE[1,4]

[1]ETH-Zürich, Geological Inst., Switzerland
[2]Woods Hole Oceanographic Institution, Geology & Geophysics, USA
[3]Pohang University of Science & Technology, South Korea
[4]ETH-Zürich, Laboratory for Ion Beam Physics, Switzerland
* Correspondence: timothy.eglinton@erdw.ethz.ch

The central Arctic Ocean is undergoing dramatic change in recent years in relation to regional and global warming. Marked decreases in sea ice cover are accompanied by changes in freshwater and nutrient flux from surrounding continents. In an effort to further our understanding of biological productivity and associated biogeochemical processes in the cryopelagic Arctic Ocean, as well future pertubations to this system, we are undertaking time-series investigations in particle fluxes to seasonally and permanently ice-covered regions of the deep Canada Basin. The majority of observations stem from a bottom-tethered trap deployed at 3000 m (800 mab) in the southwest Canada Basin (75°N, 150°W), however time-series traps have also been deployed at different depths and in different quadrants of the basin.

Particle flux observations, which began in 2004, have yielded several insights into the flux and origin of particulate matter settling to the deep Canada Basin: (i) Particle fluxes are very low relative to other oceans and indicative of a weak biological pump; (ii) Mass fluxes, which consist predominantly (80%) of lithogenic material and carry pre-aged organic carbon (^{14}C age, ~1-4 kyr), are highest during maximum ice coverage at all locations, and decrease towards the interior of the Basin. These observations suggest that the dominant mode of particle supply is via lateral transport from surrounding margins; (iii) Neodymium isotopic analysis (detrital fraction) is used to constrain the origin of lithogenic particles, and indicates time-varying inputs of resuspended sediments from the Mackenzie shelf and Beaufort/Chukchi shelf; (iv) Time-series sediment trap observations spanning the past decade, including periods encompassing recent intervals of record minimum sea ice cover, reveal no significant change in particle flux or composition to the deep Canada Basin. Key questions regarding if, how, and when biogeochemical fluxes in deepwaters of the cryopelagic central western Arctic Ocean will change in response to changing surface conditions therefore remain uncertain.