B-Be-^{10}Be-εNd systematics of the Kurile arc

J.D. MORRIS[1] AND B.M. DREYER[2]

[1]National Science Foundation, Arlington VA (*correspondence: jdmorris@nsf.gov)
[2]Monterey Bay Aquarium Research Institute, Moss Landing, CA

B-Be-^{10}Be-εNd systematics of the incoming crust and across the wide Kurile arc constrain prograde metamorphism in the subducting slab and therefore have implications for the thermal and mineralogical structure of subduction zones. ^{10}Be enrichments in all lavas across the width of the arc clearly identify a subducted sediment component, and drastic reductions in across-arc fluid-sensitive B/Be [1,2] suggest protracted stability of the primary B and Be host in subducted lithologies (i.e., phengite [3]).

Three of the four samples in the Kurile volcanic front (VF) with the highest B/Be also have highest ^{10}Be/^{9}Be but mantle-like εNd. Rear-arc (RA) lavas exhibit mantle-like B/Be but have ^{10}Be enrichments and εNd offset from mantle values towards sediment compositions. ^{10}Be concentrations in RA lavas are often comparable to those in the VF, despite additional subduction time of approximately one ^{10}Be half-life. Together, these observations argue that 1) B and Be are preferentially extracted relative to Nd from the sediment column ± basaltic basement via subsolidus fluids and into melt regions beneath the VF, 2) significant uppermost sediment survives the subduction journey to reach melt regions tapped by RA volcanoes, and 3) sedimentary Be and Nd are extracted from the slab and delivered to melt regions with increasing efficiency as the slab deepens.

Models incorporating published sediment-fluid-melt partition coefficients show that the sole addition of a sediment-fluid, partial sediment melt, or bulk sediment to the mantle cannot reproduce tends in frontal and rear-arc data. The simplest interpretation of the combined B/Be-^{10}Be/^{9}Be-εNd data is that the dominant agent of slab-mantle element transfer beneath the VF is an aqueous fluid (with ^{10}Be, B/Be >> sediment, negligible sediment Nd) and a supercritical or melt-like fluid (with ^{10}Be, increasing proportion of sediment Nd, B/Be approaching mantle values) beneath the RA. Relatively smooth VF to RA data trends suggest that changes in the transfer agent and the subduction component composition are transitional and depth-dependent.

[1] Ryan *et al.* (1995) *Science* **270**, 625-7. [2] Ishikawa and Tera (1997) *EPSL* **152**, 123-38. [3] Domanik *et al.* (1993) *GCA* **57**, 4997-5010.

Assessing the role of the Bothnian Sea phosphorus burial sink

HAYDON P. MORT[1]*, CAROLINE P. SLOMP[1], AND BO G. GUSTAFSSON[2]

[1]Department of Earth Sciences – Geochemistry, Faculty of Geosciences, Utrecht University, The Netherlands (*correspondence: h.mort@geo.uu.nl)
[2]Baltic Nest Institute, Stockholm University, Sweden

Anthropogenic inputs of phosphorus (P) to the Baltic Sea have led to enhanced primary production and an increase in the spatial extent and intensity of hypoxia over the past century. This particularly holds for the Baltic Proper, which is the highly stratified central sub-basin of the Baltic. Mass-balance models of P dynamics in the Baltic Sea suggest that the Bothnian Sea, which is located north of the Baltic Proper and is as yet unaffected by hypoxia, is a major sink for P mobilized from sediments in the Baltic Proper.[1,2].

In this study, we assess and compare the role of sediments from both the Baltic Proper and Bothnian Sea as a temporary and permanent burial sink for P. We find that organic P is a major long-term burial sink for P in both basins. Authigenic Ca-P is nearly absent in most recent sediments in the Baltic Proper and Bothnian Sea. Fe-oxide bound P is an important phase in the surface sediment in both areas. In the Baltic Proper, this Fe-bound P is mobilized from the sediment seasonally [3] whereas in the Bothnian Sea, the Fe-bound P is likely currently acting as a net sink for P. Preliminary P burial rate calculations confirm that the Bothnian Sea acts as a significant net sink for P in the Baltic Sea. Current work focusses on refining these estimates and predicting the effects of continued loading of P on this Bothnian Sea burial sink.

[1] Savchuk, O. (2005). Resolving the Baltic Sea in to seven sub-basins: N and P budgets for 1991- 1999. *Journal of Marine Systems*, **56**: 1-15. [2] Wulff, F. *et al*., 2001. A Systems Analysis of the Baltic Sea. Ecological Studies 148. Springer. 455p. [3] Conley, D.J., Humborg, C., Rahm, L., Savchuk, O.P., and Wulff, F., (2002), Hypoxia in the Baltic Sea and Basin-Scale Changes in Phosphorus Biogeochemistry: *Environmental Science Technology*, v. **36**, p. 5315-5320.