

## The Behaviour of $^{10}\text{Be}$ and $^9\text{Be}$ in the Arctic Ocean: Relationship to water mass distribution and particle flux

M. FRANK<sup>1</sup>, D. PORCELLI<sup>1,2</sup>, P. ANDERSSON<sup>3</sup>,  
A.N. HALLIDAY<sup>1</sup>, P.W. KUBIK<sup>4</sup>, B. HATTENDORF<sup>5</sup>, AND  
D. GUENTHER<sup>5</sup>

<sup>1</sup>Institute for Isotope Geology and Mineral Resources, ETH Zürich, Sonneggstrasse 5, CH-8092 Zürich, Switzerland (frank@erdw.ethz.ch, halliday@erdw.ethz.ch)

<sup>2</sup>Department of Earth Sciences, University of Oxford, Parks Road, Oxford OX1 3PR, United Kingdom (donp@earth.ox.ac.uk)

<sup>3</sup>Laboratory for Isotope Geology, Swedish Museum of Natural History, Box 50007, 104 05 Stockholm, Sweden (per.andersson@nrm.se)

<sup>4</sup>Paul Scherrer Institute, c/o Institute for Particle Physics, ETH Hönggerberg, CH-8093 Zürich, Switzerland (kubik@particle.phys.ethz.ch)

<sup>5</sup>Laboratory for Inorganic Chemistry, ETH Hönggerberg, CH-8093 Zürich, Switzerland (bodo@inorg.chem.ethz.ch, guenther@inorg.chem.ethz.ch)

The Arctic Ocean basin is confined by landmasses similar to the Mediterranean. There is only little deep water formed seasonally on the shelves of the Arctic Ocean despite the low temperatures. This is due to a freshwater lid at the surface which originates from the Arctic rivers. The deeper Arctic Ocean water masses can thus only be renewed at comparatively low rates through the only deep connection to the Atlantic Ocean, the Fram Strait. At the same time the biogenic particulate fluxes in the central Arctic Ocean are very low due to perennial sea ice cover and the organic matter produced in the surface waters is remineralised efficiently. Detrital particle fluxes from either eolian or riverine sources are also very low.

The distribution of particle-reactive natural radionuclides, ( $^{230}\text{Th}$ ,  $^{231}\text{Pa}$ ) indicates differences in scavenging behaviour between the Canadian and Eurasian parts of the Arctic Basin, possibly due to different ventilation ages or lateral advection of particulate material from the shelves.

We will present the first combined dissolved  $^{10}\text{Be}$  (cosmogenic) and  $^9\text{Be}$  (continental sources) depth profiles from water samples of the major deep basins of the Arctic Ocean collected during the Swedish Arctic Ocean 2001 expedition. Be is 5-10 times less particle-reactive than Th or Pa and should therefore even at the low Arctic Ocean renewal rates serve as a quasi-conservative tracer for different origins of water masses (Atlantic Ocean/Norwegian Sea, Pacific Ocean, Arctic Shelves).  $^9\text{Be}$  and Nd isotope analyses will provide complementary information on the pathways of dissolved material originating from the Arctic continents.

First results from near Svalbard indicate uniformly low  $^{10}\text{Be}$  concentrations (500 atoms/g) over different water masses in the Eurasian part of the Arctic Basin. This suggests either small differences in initial  $^{10}\text{Be}$  content of the mixed water masses or homogenisation through vertical processes.

## Production and Isolation of Phytosiderophores

SCOTT W. FRAZIER<sup>1,2</sup>, PETRA U. REICHARD<sup>1,3</sup>, RUBEN KRETZSCHMAR<sup>1,4</sup>, AND STEPHAN M. KRAEMER<sup>1,5</sup>

<sup>1</sup>The Institute For Terrestrial Ecology, Swiss Federal Institute Of Technology, Zurich, Switzerland

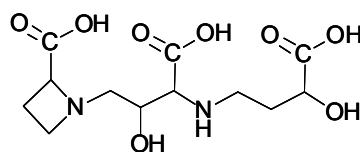
<sup>2</sup>[scott.frazier@ito.umnw.ethz.ch]

<sup>3</sup>[reichard@ito.umnw.ethz.ch]

<sup>4</sup>[kretzschmar@ito.umnw.ethz.ch]

<sup>5</sup>[stephan.kraemer@ito.umnw.ethz.ch]

The solubility of iron, a micronutrient, is far below the concentrations required by plants in well-aerated soils at circum neutral pH. Therefore, plants have developed two mechanisms to increase iron solubility so that it can be taken up by the root system. These mechanisms have been termed strategy I and strategy II. The strategy I mechanism relies on such mechanisms as the reduction of ferric iron to the more soluble ferrous state, excretion of protons from the roots, or the excretion of organic acids from the roots to increase iron solubility. The strategy II mechanism uses phytosiderophore (PS) to dissolve ferric iron in an analogous way to that of microbes who produce siderophores as an iron acquisition strategy--though this mechanism likely evolved independently between plants and microbes. PS are low-molecular weight, organic, hexadentate ligands of the Mugineic acid family (e.g. Fig. 1) that are secreted by the roots of some graminaceous



**Fig.1 Mugineic Acid**

plant species.

Although PS are characterized by their high affinity for Fe, these compounds also have high stability constants for other metal ions. Therefore, the specificity for this efficient iron acquisition strategy is thought to result from transporters that recognize iron-PS complexes and transport them across the plasma membrane, while excluding other metal-PS complexes. However, PS may influence the mobility of other metals in soils despite their irrelevance in plant nutrition.

Presently, studies of plant physiology regarding PS and the environmental significance of PS are hindered by a lack of PS reference material. The synthesis of PS and their isolation from root exudates are both rather involved procedures. In this presentation we will discuss details about the PS isolation procedure and how PS are involved in processes such as the ligand-promoted dissolution of iron hydroxides, the dissolution of precipitated actinides, and the adsorption of actinides to precipitated phases.