Division of Environmental Chemistry
- Hydrospheric Environment Analytical Chemistry -

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Visitor

Dr BOWIE, A. R Antarctic Climate & Ecosystems CRC, University of Tasmania, Australia, 30 March 2009

Scope of Research

(i) Biogeochemistry of trace elements in the hydrosphere: Novel analytical methods are developed for trace metals and isotopes. Distribution of trace elements in the hydrosphere and its effects on ecosystem are investigated. The study also covers hydrothermal activity, deep biosphere and paleocene.

(ii) Ion recognition: Novel ligands and ion recognition systems are designed, synthesized and characterized.

Research Activities (Year 2009)

Publications

Mukai H, Sohrin Y: 4,5-Bis(diphenylphosphinoyl)-1,2,3-triazole Ligand: Studies on Metal Complex Formations in Liquid-liquid Distribution Systems, *Inorganica Chimica Acta*, **362**, 4526-4533 (2009).

Hojo M, Ueda T, Hamada H, Chen Z, Umetani S: Condutometric Studies on Higher Ion-aggregation from Lithium Fluoroalkanoates in Propylene Carbonate and N,N-dimethylformamide, *J. Mol. Liquids*, **145**, 24-32 (2009).

Nakatsuka S, Okamura K, Takeda S, Nishioka J, Fildaus ML, Norisuye K, Sohrin Y: Behaviors of Dissolved and Particulate Co, Ni, Cu, Zn, Cd and Pb during a Mesoscale Fe-enrichment Experiment (SEEDS II) in the Western North Pacific, *Deep-Sea Res. II*, **56**, 2822-2838 (2009).

Presentations

Molecularly Imprinted Sol-gel Materials for the Separation of Metal Ions, Umetani S, Taguchi Y, Okabe T, Sohrin Y, 1st International Conference on Multifunctional, Hybrid and Nanomaterials (Hybrid Materials 2009), 15 March 2009.

Tale of Oxygen in the Hydrosphere, Sohrin Y, Research Meeting of Geo Biotechnology Development Organization, 22 May 2009 (invited).

Do Phyotoplanktons Dream of Iron?, Sohrin Y, Autumn Meeting of the Iron and Steel Institute of Japan, 9 September 2009 (invited).

Organic-inorganic Hybrid Adsorbents for Metal Ions Prepared by Ion Imprinting Synthesis, Umetani S, Meeting of the Union of Materials Engineering, Science Council of Japan, 19 October 2009 (keynote).

Grants

Sohrin Y, Development of Redox Proxy Using Molybdenum and Tungsten and Reconstruction of Environmental Changes in the Japan Sea, Challenging Exploratory Research, 1 April 2008–31 March 2010.

Sohrin Y, Development of Precise Isotopic Analysis for Founding Heavy Stable Isotope-Marine Chemistry, Grant-in-Aid for Scientific Research (B), 1 April 1 2009–

Ocean Section of Dissolved Zr, Hf, Nb, Ta, Mo and W in the Southern and South Pacific Ocean

Ocean sections of trace elements and isotopes (TEIs) are important for understanding their geochemical cycles, anthropogenic contamination, and effect on ecology and global climate. Zr, Hf, Nb, Ta, Mo and W are adjacent metals in the periodic table. Their marine geochemistry is still poorly known[1]. We are now studying the full-depth ocean sections of dissolved Zr, Hf, Nb, Ta, Mo and W along 170°W in the Southern and South Pacific Ocean. Seawater samples were collected during the KH-04-5 cruise of R/V Hakuho Maru (November 29, 2004 to March 22, 2005). By analyzing a large number of seawater samples (more than 250 samples from 12 stations[2]), we are discovering the first meridional section of TEIs throughout ocean basins.

In general, Zr and Hf increase with depth (Figure 1). Nb and Ta show depletion in surface water (0–300 m depths) and enrichment in bottom water. The concentrations of Zr, Hf, Nb and Ta in surface water are higher at stations in the Southern Ocean than at the northern stations in the South Pacific Ocean. In deep water (2000–4000 m depths), Zr, Hf, Nb and Ta show gradual increase toward northern stations, coincident with the flow of seawater by global thermohaline circulation. Mo and W show uniform concentrations, regardless different water masses and ocean basins. Based on these findings, we are going to develop a new model of trace metal cycling in the ocean.

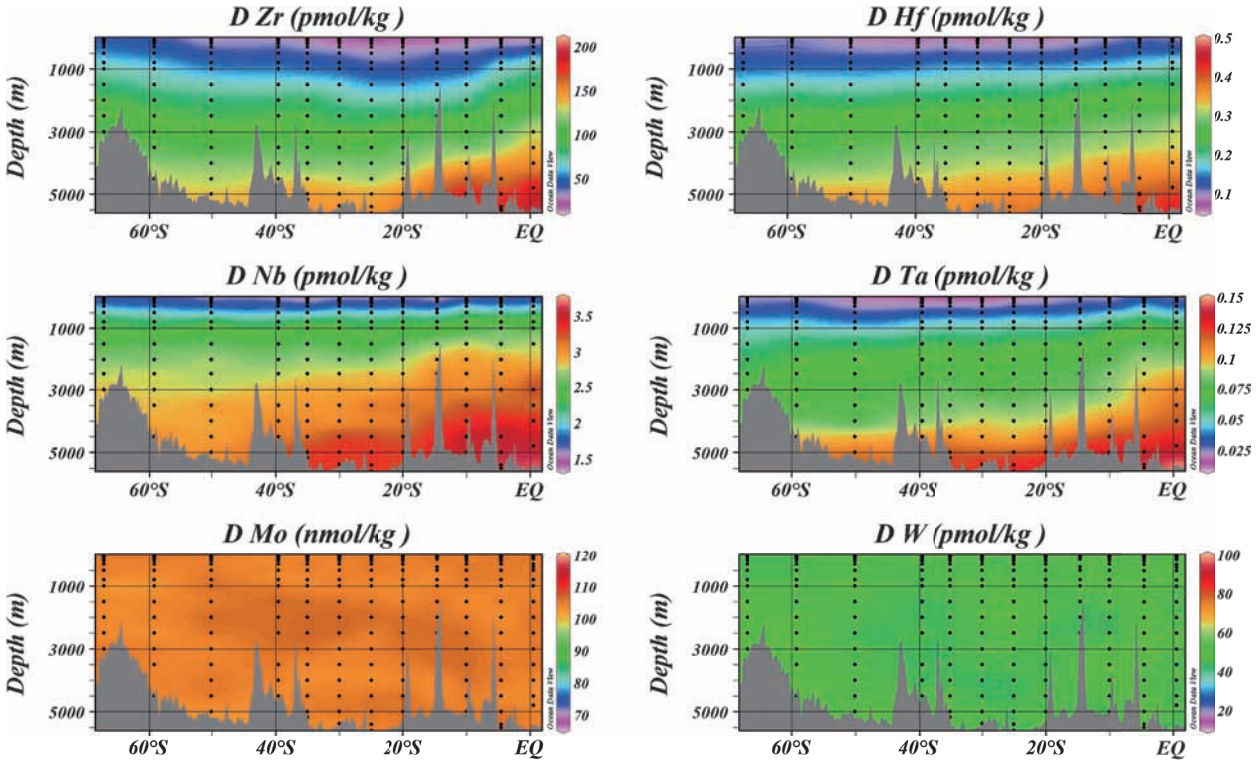

Figure 1. Full-depth ocean section of dissolved Zr, Hf, Nb, Ta, Mo and W in the Southern and South Pacific Ocean.

References:

1. M. Lutfi Firdaus *et al*.: *J. Oceanogr*., **64**, 247-257 (2008).
2. M. Lutfi Firdaus *et al*.: *Anal. Chim. Acta*, **583**, 296-302 (2007).

31 March 2012.

Nakagawa Y, Stable Isotope Marine Geochemistry Using Molybdenum and Tungsten, Grant-in-Aid for JSPS Fellows, 1 April 2009–31 March 2010.

Norisuye K, Development of a Method for Determination of Divalent Iron and Elucidation of the Behavior in the Ocean, Steel Industry Foundation for the Advancement of Environmental Protection Technology, 1 November 2007–31 October 2009.

Firdaus ML, Marine Geochemistry of High Field Strength Elements (Zirconium, Hafnium, Niobium, Tantalum, Molybdenum and Tungsten), Sasakawa Scientific Research Grant–The Japan Science Society, 1 April 2009–31 March 2010.