100-year record of $^{236}U/^{238}U$ in coral as a step towards establishing ^{236}U as oceanic tracer

S. WINKLER[1]*, P. STEIER[1], J. CARILLI[2]

[1]Faculty of Physics, University of Vienna, 1090 Wien Austria (* correspondence: stephan.winkler@univie.ac.at)
[2]Institute for Environmental Research, Australian Nuclear Science and Technology Organisation

Since uranium is known to behave conservatively in ocean waters, ^{236}U has great potential in application as oceanic tracer. Approximately 600kg of ^{236}U ($t_{1/2}$=23.4Ma) were introduced into the oceans by atmospheric nuclear weapon testing [1]. A resulting initial average $^{236}U/^{238}U$ ratio of $5 \cdot 10^{-9}$ is expected for the oceanic mixed layer. This ratio is significantly higher than the expected natural pre-nuclear background, which is expected to be at 10^{-14} levels [2].

In order to place first experimental constraints the input term from global stratospheric fall-out we established a year-by-year record of $^{236}U/^{238}U$ for a core from the Caribbean Sea. The selected core was taken in 2006. It has shown well-defined annual banding structure under X-ray and stretches back more than 100 years, therefore covering the interesting period of global stratospheric fall-out.

We used the exceptional sensitivity and ultra-low background for ^{236}U of the Vienna Environmental Research Accelerator's Accelerator Mass Spectrometry system for this measurement and find a $^{236}U/^{238}U$ signature of $(1.84 \pm 0.08) \cdot 10^{-9}$ for the fall-out peak. Furthermore we set a first experimental upper limit of $4 \cdot 10^{-12}$ on the pre-anthropogenic $^{236}U/^{238}U$-ratio in ocean surface waters.

[1] Sakaguchi *et al*. (2009) *Science of the Total Environment* **407**(14), 4238-4242. [2] Steier *et al*. (2008) *NIM B* **266**(10), 2246-2250.

Aeolian iron flux in the South-Western Ross Sea, Antarctica

V.H.L. WINTON[1,2]*, M.-A. MILLET[3], N.A.N. BERTLER[1,2] G.B. DUNBAR[1], B. DELMONTE[4] AND P. ANDERSSON[5]

[1]Antarctic Research Centre, Victoria University of Wellington, PO Box 600, Wellington (*correspondence: holly.winton@vuw.ac.nz)
[2]GNS Science Ltd, PO Box 31 321, Lower Hutt
[3]School of Geography, Environment and Earth Sciences, Victoria University of Wellington
[4]Dipartimento di Scienze dell'Ambiente e del Territori Università degli Studi di Milano-Bicocca, Milano, Italy
[5]Laboratory for Isotope Geology, Swedish Museum of Natural History, PO Box 50 007, 104 05 Stockholm

Each summer the waters in the south-western Ross Sea experience vast phytoplankton blooms. This phenomenon is thought to be stimulated by the addition of bio-available Fe in an otherwise Fe-limited environment. Amongst all the potential Fe sources, input from aeolian dust, which has accumulated on sea ice and is released to the ocean in summer as the sea ice melts, is heavily underestimated. The south-western Ross Sea provides an excellent example to study this biogeochemical process.

The amount of bio-available Fe supplied to the ocean depends on a number of factors including, but not limited to; the dust flux into the ocean, particle size distribution and its Fe content. However, none of these parameters are well constrained in the south-western Ross Sea region and, as a result, the significance of this Fe source in the biogeochemical cycle of plankton growth remains to be quantified.

Dust is shown to be sourced locally based on: a) elevated regional dust flux for the region which is higher by orders of magnitude than predicted in global dust distribution models [1] and in the Antarctic Plateau [e.g. 2]; b) Sr and Nd isotopic signature matching local potential source rocks. The regional dust flux for particles <10 μm in size (the potentially bio-available fraction) is ~0.08 g/m^2/yr. Fe-solubility measurements are currently being completed on the 0.4-10 μm size fraction following the leaching protocol of Aguilar-Islas *et al*. [3]. This will allow us to quantify the amount and estimate its importance for aeolian Fe-fertilisation for bio-productivity in this region.

[1] Mahowald *et al*. (2005) *Global Biogeochem. Cycles* **19,** GB4025. [2] Delmonte *et al*. (2004) *Earth Planet. Rev*. **66**, 63-87. [3] Aguilar-Islas *et al*. (2010) *Marine Chem*. **120**, 25-33.