



Particle dynamics in the wake of Kerguelen Island traced by thorium isotopes

(Southern Ocean, KEOPS program)

C. Venchiarutti (1), C. Jeandel (1), M. Roy-Barman (2)

(1) LEGOS, CNRS/UMR 5566, Observatoire Midi-Pyrénées, av. Edouard Belin, 31400
Toulouse, France, (venc@legos.obs-mip.fr / Phone : +33 0 561 333 003),
Jeandel@legos.obs-mip.fr

(2) LSCE, Laboratoire des Sciences du Climat et de l'Environnement / Institut Pierre Simon
Laplace, Domaine du CNRS, Bât 12 - avenue de la Terrasse. F - 91198 Gif-sur-Yvette, Cedex
France, (Matthieu.Roy-Barman@lsce.cnrs-gif.fr)

In the context of the Kerguelen Ocean and Plateau compared Study (KEOPS, 19 January-13 February 2005), particle dynamic was investigated using thorium isotope measurements over and off the Kerguelen Plateau. Dissolved and particulate ^{230}Th and ^{232}Th samples were collected at 9 stations (5 over and 4 off the Plateau). Dissolved excess ^{230}Th concentrations, [$^{230}\text{Th}_{x,s}$], range from 0.5 to 22 fg/kg and particulate [$^{230}\text{Th}_{x,s}$] from 0.1 to 7 fg/kg. Dissolved and particulate [^{232}Th] ranges are 0.6-450 pg/kg and 9-503 pg/kg, respectively. $^{230}\text{Th}_{x,s}$ distributions are increasing linearly with depth until 700 m at most of the stations. Moreover, this linear trend is observed down to the bottom (1550 m) at Kerfix, the open-ocean "upstream" station, west of the Kerguelen Plateau. These linear distributions allowed us to apply a simple reversible scavenging model: we estimated scavenging rates ($k_1 \approx 0.3-0.9 \text{ y}^{-1}$), re-mineralization rates ($k_{-1} \approx 1-5 \text{ y}^{-1}$) and partition coefficients (average $K_d = 0.16 \pm 0.04$). Calculated particle settling velocities S are of ca. 500 m.y^{-1} at most of the stations and 800 m.y^{-1} at Kerfix. Surprisingly, the Plateau settling velocities are relatively low for such a productive site, compared to the surrounding HNLC areas (Coppola & al., 2006). Tidal effect, possible mixing with fine lithogenic suspended particles, intensified re-mineralization and diatom domination of the bloom are the possible reasons that could explain these differences.

The deep layers of the 3 stations located east of the Plateau display $^{230}\text{Th}_{xs}$ maxima and minima that could reflect Kerguelen shelf effect, with a local intensification of shelf inputs followed by strong scavenging due to the occurrence of bottom sediment re-suspension and nepheloid layers (about 50% of the Th stock is lost in 510 km).