Geophysical Research Abstracts, Vol. 7, 06312, 2005
SRef-ID: 1607-7962/gra/EGU05-A-06312

Comparison of dissolved Barium with Nutrients and Physico-chemical Conditions along 30˚E and 145˚E across the Southern Ocean

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Two spatially well resolved WOCE transects across the Southern Ocean (30˚E, CIVA 1, Jan. 1993 and 145˚E, CLIVAR-SR3, Jan.-Mar. 1998 and Nov.-Dec. 2001) are compared in terms of dissolved barium distribution (Ba conc. ranging from 35 to 100 nM). Contrary to the nutrients, which decrease to near depletion in the Subantarctic - Subtropical waters, upper mixed layer dissolved Ba concentrations do not drop below 35 nM. Zonally varying water column Ba profiles are discussed and shown against those of physico-chemical conditions and nutrients. At both meridians the occurrence of major frontal structures (Polar Front; Subantarctic Front) and associated mesoscale eddies (particularly at 30˚E) is well reproduced by the Ba distribution, even at great depth.

Stepwise regression reveals silicate to be the best predictor of Ba, followed by alkalinity, temperature, salinity, nitrate, oxygen. Ba – silicate correlations are strong and persist throughout the major zonal systems with regression slopes (Ba as a function of Si) consistently decreasing southward. The slope of these regressions appear mainly driven by conditions in the intermediate and sub-surface waters (σ <27.55), while throughout the deep basin where Lower Circumpolar Deep Water and Antarctic Bottom Water are the dominant water masses the Ba and silicate correlative behaviour is much more homogenous. In contrast, the zonal gradient of Ba in the surface mixed layer is similar to the ones of nitrate and phosphate, with the Polar Front setting the

mark for rapid northward concentration decreases.

These features, as well as differences in Ba contents over the growth season (145˚E) and characteristic subsurface Ba minima associated with mesoscale eddies in the PFZ (30˚E), prompted us to assess the degree of non-conservativeness of the Ba distribution. Therefore, we applied an optimum multi-parameter approach focussing on the upper 1000m of the PFZ and the SAZ, with careful selection of proximate waters as end-members. First results will be discussed and situations at 30˚ and 145˚E compared. More detailed information about the technique used, will be given in another presentation (de Brauwere et al.)

de Brauwere et al., Refinement of Optimum Multi-Parameter approach for water mass analysis; submitted to OS3.