Geophysical Research Abstracts, Vol. 7, 02335, 2005
SRef-ID: 1607-7962/gra/EGU05-A-02335

Evolution of the Antarctic Opal Belt during the Late Neogene

G. Cortese (1), R. Gersonde (1), C.-D. Hillenbrand (2), G. Kuhn (1)

(1) Alfred Wegener Institute for Polar and Marine Research (AWI), Bremerhaven, Germany

(2) British Antarctic Survey, Cambridge, United Kingdom

(gcortese@awi-bremerhaven.de / Phone: +49 471 4831 1207

In the World Ocean today, the so-called „Antarctic Opal Belt“ of the Southern Ocean represents the main site for the accumulation of biogenic silica (opal) in the sediments. The burial of opal in the sediments accumulated in this area acts as a major sink for the dissolved silica (DSi) present in the water column. Upwelling systems and continental margins are the other oceanic areas reputed to play an important role in the cycling of DSi, its burial, and the impact of these processes on the global budget of silica.

Through time, however, both the main DSi sink in the ocean, and the links between Southern Ocean and upwelling systems have changed, in response to large-scale oceanic conditions quite different from those prevailing today.

Over last 15 Myr, oceanic reorganizations interacted with several events having the potential to affect, in one way or another, the cycling of silica and its sedimentary record. These events include the Cenozoic global cooling trend, intensified glaciation in Antarctica, Late Miocene-Early Pliocene biogenic bloom, development of Northern Hemisphere glaciation, closing of the Panama Seaway, transition of the climate system from a monopolar- to a bipolar-glaciated world, Mid-Pleistocene Revolution, changes in global/local nutrient availability, evolution of diatoms and C4 plants, changes in continental weathering rates.

We used opal accumulation records to trace mechanisms and geographic pattern of shifts in the main locus of opal deposition of the World Ocean, in an attempt to disentangle the complex interplay between opal deposition and the mentioned series of climatic, tectonic, oceanographic and biologic events. While the observed shifts

in the principal opal burial sites are mostly traceable to oceanic reorganizations and global climatic evolution, conditions favorable to opal deposition involve the above-mentioned complex mix of processes.

It is this complex evolution that led to the establishment of the Southern Ocean as the main DSi sink, as over the last 2-3 million years, the main opal sink seems to have moved from the „coastal“ North Pacific and Southern Ocean, to the eastern boundary current upwelling systems (California, Namibia, Peru), and finally to the Southern Ocean.