Geophysical Research Abstracts, Vol. 7, 03001, 2005
SRef-ID: 1607-7962/gra/EGU05-A-03001

RADIOLARIAN OYGEN ISOTOPE RECORDS FROM THE SOUTHERN OCEAN - A NEW PROXY FOR STRATIGRAPHIC AND PALEOENVIRONMENTAL RECONSTRUCTIONS

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During the last decade, stable isotope measurements on biogenic opal preserved in the sedimentary record have been put forward to establish new proxies for the reconstruction of past environment. These isotope measurements were primarily done on the siliceous remains of diatoms (e.g. Shemesh et al. 1992, 1994, 2002). The potential of radiolarians as carrieres of stable isotope signals has so far been overlooked, although these microzooplankton heterotrophs represents the siliceous counterpart of planktic foraminifers. Radiolarians are widely distributed in the World Ocean and their skeletons preserve better in the sedimentary record than diatom valves. Radiolarians dwell in surface waters as well as subsurface and deep-water layers. Thus radiolarians are excellent suited to provide isotopic signals from different water masses.

Here we represent the first radiolarian oxygen isotope records showing the great value of such measurements for paleoceanographic reconstruction and stratigraphic dating. The records come from two cores, PS2498 and PS1768, located in the Subantarctic and in the Antarctic Zone, respectively, of Atlantic Southern Ocean. Both sections document the last glacial – Holocene interval. The extraction of radiolarians was achieved through a differential settling technique in the >63 μm fraction of purified biogenic opal samples. The radiolarian δ^{18}O signals are compared with planktic and benthic δ^{18}O signals of foraminifera and other paleoceanographic parameters. To identify the provenance of the measured radiolarian opal we determined the species composition

of the extracted radiolarians and their depth habitat.

The radiolarian δ^{18}O record obtained at the northern site PS2498 provides an isotope stratigraphic signal which compares well with the δ^{18}O records available from benthic and planktic foraminifers. In contrast, the record obtained at the southern site PS1768, which was seasonally covered by sea ice during the glacial (Gersonde et al. 2003) is broadly governed by local surface water conditions. At the southern site PS1768, which was seasonally covered by sea ice during glacial periods (Gersonde et al. 2003, 2005), the radiolarian δ^{18}O signal is broadly governed by surface water conditions. This is documented by distinct δ^{18}O anomalies reaching strongest depletion during the Last Glacial Maximum (LGM). Such prominent LGM melt water input accompanied by a distinct increase in ice rafted detritus (IRD) is also documented in an oxygen isotope record obtained from diatoms in a core (TNO57-13) recovered nearby the location of PS1768 (Shemesh et al. 2002). The mapping of the magnitude and the spatial extent of melt water input in the Southern Ocean is crucial for the understanding of past water mass structure development and its impact on global thermohaline circulation and biological productivity.

1 References

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