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A Late Pleistocene radiolarian-based environmental reconstruction from the eastern Pacific sector of the Southern Ocean

B. Kotrys(1), Andrea Abelmann(2)

(1) University of Stettin, Poland, (2) Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany

The Southern Ocean represents a crucial area to understand global climatic and environmental changes through past glacial and interglacial cycles. Prominent proxy used for deciphering the paleoceanographic evolution of the Southern Ocean is the quantitative composition of siliceous microfossil assemblages (radiolarians, diatoms) that are widespread and well preserved in the Pleistocene sediment record below the Antarctic Circumpolar Current. Whereas most of the paleoclimatic information are available from the Atlantic and Indian sectors, only limited data are available from the Pacific sector.

Here we present a radiolarian environmental study, carried out on a 24 m long piston core that documents the past 140 kyrs. Core PS58/271 is located at the Polar Front in the eastern Pacific Sector (61°14,6' S; 116°02,8' W) of the Southern Ocean. We investigated the radiolarian composition and identified radiolarian key species in order to reconstruct changes in the hydrographic system during glacial and interglacial periods. In addition, we run a factor analysis resulting in three assemblage factors representing the influence of Antarctic, Subantarctic and Subtropical water masses, respectively.

In the absence of foraminifers we developed an age model based on the abundance pattern of the radiolarian *Cycladophara davisiana* that was calibrated with the oxygen isotope record of Martinson et al. (1987). The age model results in relatively low glacial sedimentation rates ranging between ca. 8 cm/1000 years during marine isotope stage (MIS) 2 and ca. 14 cm/1000 years during MIS 3 and 4. Distinctly higher sedimentation rates (around 25 cm/1000 years) have been encountered for MIS 5,

allowing for the establishment of a high-resolution paleoceanographic record. The radiolarian species composition points to little surface water temperature differentiation between MIS 1 and MIS 2, at the studied location. This is agreement with results from diatom-based studies in the eastern sector of the Pacific Southern Ocean and in contrast to findings from the Atlantic and Indian Ocean sectors (Gersonde et al. 2005). Distinctly colder than MIS 2 conditions occurred during the glacial MIS 6. This pattern suggests a non-uniform surface water development in the last glacial Southern Ocean, while during MIS 6 this development may have been more uniform. Warmest surface water conditions occurred during MIS 5.5, when subantarctic and subtropical radiolarian species entered the studied area.

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Gersonde R, Crosta X, Abelmann A, Armand L, 2005. Sea surface temperature and sea ice distribution of the Southern Ocean at the EPILOG Last Glacial Maximum – A circum-Antarctic view based on siliceous microfossil records. Quaternary Science Reviews (in press).