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11. Data Report: Relative Abundance and Ranges of Selected Diatoms from Pliocene–Pleistocene Sections of ODP Leg 177, Sites 1089–1094[1]

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INTRODUCTION

During Ocean Drilling Program (ODP) Leg 177, seven sites were drilled aligned on a transect across the Antarctic Circumpolar Current in the Atlantic sector of the Southern Ocean. The primary scientific objective of Leg 177 was the study of the Cenozoic paleoceanographic and paleoclimatic history of the southern high latitudes and its relationship with the Antarctic cryosphere development. Of special emphasis was the recovery of Pliocene–Pleistocene sections, allowing paleoceanographic studies at millennial or higher time resolution, and the establishment of refined biostratigraphic zonations tied to the geomagnetic polarity record and stable isotope records. At most sites, multiple holes were drilled to ensure complete recovery of the section. A description of the recovered sections and the construction of a multihole splice for the establishment of a continuous composite is presented in the Leg 177 *Initial Reports* volume for each of the sites (Gersonde, Hodell, Blum, et al., 1999). Here we present the relative abundance pattern and the stratigraphic ranges of diatom taxa encountered from shore-based light microscope studies completed on the Pliocene–Pleistocene sequences from six of the drilled sites (Sites 1089–1094) (Tables T1, T2, T3, T4, T5, and T6). No shore-based diatom studies have been conducted on the Pliocene–Pleistocene sediments obtained at Site 1088, located on the northern crest of the Agulhas Ridge, because of the scattered occurrence and poor preservation of diatoms in these sections (Shipboard Scientific Party, 1999b). The data included in our report present the baseline of a

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diatom biostratigraphic study of Zielinski and Gersonde (2002), which (1) includes a refinement of the southern high-latitude Pliocene–Pleistocene diatom zonation, in particular for the middle and late Pleistocene, and (2) presents a biostratigraphic framework for the establishment of age models of the recovered sediment sections. Zielinski and Gersonde (2002) correlated the diatom ranges with the geomagnetic polarity record established shipboard (Sites 1090 and 1092) (Shipboard Scientific Party, 1999c, 1999d) and on shore (Sites 1089, 1091, 1093, and 1094) by Channell and Stoner (2002).

The Pliocene–Pleistocene diatom zonation proposed by Zielinski and Gersonde (2002) relies on a diatom zonation from Gersonde and Bárcena (1998) for the northern belt of the Southern Ocean. Because of latitudinal differentiation of sea-surface temperature, nutrients, and salinity between Antarctic and Subantarctic/subtropical water masses, the Pliocene–Pleistocene stratigraphic marker diatoms are not uniformly distributed in the Southern Ocean (Fenner, 1991; Gersonde and Bárcena, 1998). As a consequence, Zielinski and Gersonde (2002) propose two diatom zonations for application in the Antarctic Zone south of the Polar Front (Southern Zonation, Sites 1094 and 1093) and the area encompassing the Polar Front Zone (PFZ) and the Subantarctic Zone (Northern Zonation, Sites 1089–1092). This accounts especially for the Pleistocene zonation where *Hemidiscus karstenii,* whose first abundant occurrence datum and last occurrence datum defines the subzonation of the northern *Thalassiosira lentiginosa* Zone, occurs only sporadically in the cold-water realm south of the PFZ and thus is not applicable in sections from this area. However, newly established marker species assigned to the genus *Rouxia* (*Rouxia leventerae* and *Rouxia constricta*) are more related to cold-water environments and allow a refinement of the Pleistocene stratigraphic zonation for the southern cold areas. A study relying on quantitative counts of both *Rouxia* species confirms the utility of these stratigraphic markers for the identification of sequences attributed to marine isotope Stages 6 and 8 in the southern Southern Ocean (Zielinski et al., 2002).

MATERIAL AND METHODS

Samples were taken aboard the *JOIDES Resolution* and in the ODP core repository at Bremen, Germany. In general, average sample spacing was 1.5 m for high-resolution sediments and 45 or 90 cm for sediments deposited at lower sedimentation rates. Additional samples were studied when needed. Raw samples were prepared as smear slides when calcium carbonate contents were below ~50 wt% (Sites 1091, 1093, and 1094). The other sediment samples containing carbonate above this value (Sites 1089, 1090, and 1092) were chemically treated after the method described by (Gersonde and Zielinski, 2000) in order to remove calcareous components. After the washing process, strewn slides were prepared for diatom analysis. Light microscopic studies were achieved using a Zeiss Axioskop with a magnification of 1000× (oil-immersion objective). At least three transects per slide were studied in sediments consisting of pure diatom ooze; double that number or more was necessary in samples with lower diatom content. The preservation of diatom valves was estimated qualitatively as good (no signs of dissolution, lightly silicified species present), moderate (lightly silicified species present but with alterations, diatom valves are slightly affected by dissolution) or poor (no fine silicified forms present, fragmented valves, dominance of robust silicified species). Estimation of species relative abundance follows the ODP style (Shipboard Scientific Party, 1999a) as follows:

D = dominant (>60% of assemblage).
A = abundant (>30%–60% of assemblage).
C = common (>15%–30% of assemblage).
F = few (3%–15% of assemblage).
R = rare (<3% of assemblage).
T = trace (sporadic occurrence).
X = present (species observed, but not included to species abundance estimate, e.g., fragments of *Ethmodiscus rex*).

The determination of a biostratigraphic datum was defined by the midpoint between two adjacent samples. Trace occurrences of species were not considered in defining datums. For all depth information of the studied samples the meters composite depth (mcd) scale was used (see individual site chapters in Gersonde, Hodell, Blum, et al., 1999).

The presented range charts were also archived in the PANGAEA information system at the Alfred Wegener Institute for Polar and Marine Research, Bremerhaven (AWI) (**www.pangaea.de**).

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Table T1. Stratigraphic occurrence and relative abundance of diatom taxa from the Pliocene and Pleistocene, Site 1089. (This table is available in an **oversized format.**)

Table T2. Stratigraphic occurrence and relative abundance of diatom taxa from the Pliocene and Pleistocene of Site 1090. (This table is available in an **oversized format.**)

Table T3. Stratigraphic occurrence and relative abundance of diatom taxa from the Pliocene and Pleistocene, Site 1091. (This table is available in an **oversized format.**)

Table T4. Stratigraphic occurrence and relative abundance of diatom taxa from the Pliocene and Pleistocene, Site 1092. (This table is available in an **oversized format.**)

Table T5. Stratigraphic occurrence and relative abundance of diatom taxa from the Pliocene and Pleistocene, Site 1093. (This table is available in an **oversized format.**)

Table T6. Stratigraphic occurrence and relative abundance of diatom taxa from the Pliocene and Pleistocene, Site 1094. (This table is available in an **oversized format.**)