Abstract

Deep-sea benthic foraminifera from Recent sediments of the Indian Ocean show a good correlation with surface productivity, organic carbon flux to the sea floor, deep-sea oxygenation and, to a lesser extent, with bottom temperature, and weak or no correlation with the water depths. The benthic foraminiferal population can be divided into two faunal provinces – Province A and B, based on their relation with the water mass properties. Province A is dominated by benthic foraminifera characteristic of low oxygen and high organic food flux including *Uvigerina peregrina, Robulus nicobarensis, Bolivina pseudopunctata, Bolivinita* sp., *Bulimina aculeata, B. alazanensis, Ehrenbergina carinata* and *Cassidulina carinata*. Province B covers southern, southeastern and eastern parts of the Indian Ocean and is dominated by *Nuttallides umbonifera, Epistominella exigua, Globocassidulina subglobosa, Uvigerina proboscidea, Cibicides wuellerstorfi, Cassidulina laevigata, Pullenia bulloides, P. osloensis, Pyrgo murrhina, Oridorsalis umbonatus, Gyroidinoides soldanii and G. cf. gemma suggesting well-oxygenated, cold deep water with low (oligotrophic) and pulsed food supply.*

The diversity parameters in benthic foraminifera at Hole 716A including Information Function [H(S)], Equitability (E), Number of species (S) and Sanders' rarefied values show nearly similar trends with large variations but do not strictly follow the glacial-interglacial switches, although there is some parallelism. In general, benthic species diversity is low during intervals of sustained flux of organic carbon with low oxygen levels (during intervals of intense SW monsoon) and high during variable flux of organic matter with relatively higher oxygen levels (during intervals of weaker SW monsoon). The Hole 716A is marked by low to intermediate flux of organic matter during ~151 to 118 Kyr B.P. (benthic biofacies Gn-Ps, Hb-Cp and Sb-Cd), ~65 to 62 Kyr B.P. (benthic biofacies Sb-Cd and Cc-Gs), ~38 to 30 Kyr B.P. (benthic biofacies Cc-Gs) and ~22 to 18 Kyr B.P. (benthic biofacies Cb-Bsp), ~60 to 38 Kyr B.P. (benthic biofacies Ts-Rc), ~30 Kyr to 22 Kyr B.P. and the Holocene (benthic biofacies Ci-Upo), high primary productivity and high food supply conditions prevailed linked to intense summer monsoon winds. Higher populations of

planktic foraminifer *Globigerina bulloides* (a well known SW monsoon proxy) are observed during intervals of intense SW monsoon. *Globigerinoides ruber* (white) and *Gs. sacculifer* show higher abundances during glacial stages, suggesting deepening of the mixed layer probably driven by winter monsoon winds. Increases in *Neogloboquadrina dutertrei* percentages indicate a thinner mixed layer and/or a shallower thermocline during ~143 to 136, ~111 to 108, ~66 to 75, ~55 to 43 and 22 to 9 Kyr. The surface and deep water conditions at Hole 716A (as reflected by planktic and benthic foraminiferal population changes) are coupled probably due to the shallow water depth (533 m) of this hole.

Spectral analysis of *Globigerina bulloides* and *Neogloboquadrina dutertrei*, pteropods, and benthic foraminifera including *Bolivinita* sp., *Hyalinea balthica*, *Textularia sagittula*, *Uvigerina porrecta* and *U. proboscidea* show prominent peaks around 40, 30, 24, 20, 6, 1, 0.8 and 0.7 Kyr, thus signifying suborbital and orbital (precession-linked) forcing of the summer monsoon.

Keywords: benthic and planktic foraminifera, pteropods, *Globigerina bulloides*, Indian Ocean, Arabian Sea, Holocene, Late Pleistocene, Maldives, ODP Hole 716A, summer monsoon, diversity, biofacies, productivity, organic flux, oxygenation, spectral analysis, precession.