Geophysical Research Abstracts
Vol. 16, EGU2014-774, 2014
EGU General Assembly 2014

Benthic foraminifera from the Arabian Sea oxygen minimum zone: towards a paleo-oxygenation proxy.

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The thermohaline circulation oxygenates the deep ocean sediment and therefore enables aerobic life on the sea-floor. In the past, interruption of this deep water formation occurred several times causing hypoxic to anoxic conditions on the sea-floor leading to major ecological turnover. A better understanding of the interaction between climate and bottom water oxygenation is therefore essential in order to predict future oceanic responses. Presently, permanent (stable over decadal timescale) low-oxygen conditions occur naturally at mid-water depths in the northern Indian Ocean (Arabian Sea). Oxygen Minimum Zones (OMZ) are key areas to understand the hypoxic-anoxic events and their impact on the benthic ecosystem. In this context, a good knowledge of the ecology and life cycle adaptations of the benthic foraminiferal assemblages living in these low oxygen areas is essential.
A series of multicores were recovered from three transects showing an oxygen gradient across the OMZ: the Murray Ridge, the Oman margin and the Indian margin. The stations located at the same depths showed slightly different oxygen concentrations and large differences in organic matter content. These differences are mainly related to the geographic location in the Arabian Sea. We investigated at these stations live and dead benthic foraminiferal faunas. At each location, faunal diversity seems to be controlled by bottom-water oxygen content; limited diversity corresponding to low oxygen content. Foraminiferal abundances reflect organic matter quantity and quality; higher organic matter quality and quantity are related to higher foraminiferal abundances. When comparing the three study areas, similar foraminiferal species (live and dead) are observed suggesting that benthic foraminifera from the Arabian Sea predominantly respond to bottom-water oxygenation. Based on these observations, we aim to develop a paleo-oxygenation proxy based on live, dead and fossil faunas resulting from both our study and previous studies in the Arabian Sea.