Impact of oil-based drill mud disposal on benthic foraminiferal assemblages on the continental margin off Angola

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Résumé en anglais	In order to assess the possible environmental impact of oily cuttings discharged during oil exploration activities, we studied the benthic foraminiferal faunas in a five-station, 4-km-long sampling transect around a cuttings disposal site at about 670 m depth offshore Angola (W Africa), where drilling activities started 1.5 years before sampling. Living (Rose Bengal stained) and dead foraminiferal faunas were sampled in March 2006. The faunal patterns mirror the spatial distribution of hydrocarbons, which are dispersed into a southeastern direction. Four different areas can be distinguished on the basis of the investigated faunal parameters (density, diversity and species composition of the living fauna, and comparison with subrecent dead faunas). The fauna at station S31, 300 m SE of the oil cuttings disposal site, appears to be clearly impacted: the faunal density and diversity are maximal, but evenness is minimal. Taxa sensitive to organic enrichment, such as Uvigerina peregrina, Cancris auriculus and Cribrostomoides subglobosus, have largely disappeared, whereas the low-oxygen-resistant taxon Chilostomella oolina and opportunistic buliminids and bolivinids attain relatively high densities. At station S32, 500 m SE of the disposal site, environmental impact is still perceptible. The faunal density is slightly increased, and U. peregrina, apparently the most sensitive species, is still almost absent. The faunas found at 1 and 1.8 km SE of the disposal site are apparently no longer impacted by the drill mud disposal. Faunal density and diversity are low, and the faunal composition is typical for a mesotrophic to eutrophic upper slope environment. Finally, Station S35, 2 km NW of the disposal site, contains an intermediate fauna, where both the low-oxygen-resistant C. oolina and the more sensitive taxa (U. peregrina, C. auriculus and C. subglobosus) are present. All taxa live close to the sediment–water interface here, indicating a reduced oxygen penetration into the sediment. Since the hydrocarbon concentration is low at this station, it appears that the faunal characteristics are the consequence of a slightly different environmental setting, and not due to a contamination with drill cuttings. Our data underline the large potential of benthic foraminifera as bio-indicators of anthropogenic enrichment in open marine settings, such as caused by the disposal of oily drill cuttings. The foraminiferal faunas react essentially by a density increase of a number of tolerant and/or opportunistic taxa, and a progressive disappearance of more sensitive taxa in the most impacted area. Rather surprisingly, large-sized taxa appear to be more sensitive than small-sized foraminiferal taxa.
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