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Holocene climate variability in Northwest Africa: evidence from marine sediment cores

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The analysis of grain-size distributions of the terrigenous fraction found in marine sediments has been demonstrated to be a powerful tool to reconstruct the climate and hydrological changes on the African continent. Based on their specific grain size, dust and fluvial matter can be distinguished in marine sediments. But although grain-size distributions can reflect a given origin and can point out different transport mechanisms, they are unlikely to be more revealing of the precise source area of the associated material.
In order to characterize the precise provenance of the terrigenous fraction offshore the North-West African coast, sediment samples were fractionated into size fractions typical for fluvial and aeolian material and analysed for their 143Nd/144Nd and 87Sr/86Sr isotope ratios.
Changes in the isotopic ratio between 87Sr/86Sr can be used to identify changes in the intensity of chemical weathering processes. Furthermore, the isotopic ratio between 143Nd/144Nd provides information about the source area of the sediment. The combined analysis shows a return to glacial conditions during the Younger Dryas ($\sim$ 12.900 to 11.500 years BP) and a transition from a wet early to a dry late Holocene.
The nearly stable Nd isotope record points to a constant source region of terrigenous matter over the last 12.000 years. The distinct changes in Sr isotope ratios are interpreted to reflect major changes in the evaporation/precipitation balance over the study area. We suggest that the combination of 87Sr/86Sr and 143Nd/144Nd isotopic records mirror a latitudal shift of the ITCZ and the associated wind belts causing changes in the evaporation/precipitation balance over northwestern Africa. While hyperarid conditions are prevailing during the Younger Drays, more humid conditions and intensified monsoonal rainfall can be observed during the early- and mid- Holocene. In late Holocene times the monsoonal circulation diminished again and a return to arid conditions can be observed.