Geophysical Research Abstracts
Vol. 16, EGU2014-10676, 2014
EGU General Assembly 2014
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21,000 years of Ethiopian African monsoon variability recorded in sediments of the western Nile deep-sea fan: impact of the Nile freshwater inflow for the Mediterranean thermo-haline circulation

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The Nile delta sedimentation constitutes a continuous high resolution (1.6 mm/year) record of Ethiopian African monsoon regime intensity. Multiproxy analyses performed on core MS27PT recovered in hemipelagic Nile sediment margin (<90 km outward of the Rosetta mouth of the Nile) allow the quantification of the Saharan aeolian dust and the Blue/White Nile River suspended matter frequency fluctuations during the last 21 cal. ka BP. The radiogenic Sr and Nd isotopes, clay mineralogy, bulk elemental composition and palynological analyses reveal large changes in source components, oscillating between a dominant aeolian Saharan contribution during the LGM and the Late Holocene (∼4 to 2 cal. ka BP), a dominant Blue/Atbara Nile River contribution during the early Holocene (15 to 8.4 cal. ka BP) and a probable White Nile River contribution during the Middle Holocene (8.4 to 4 cal. ka BP).
The following main features are highlighted:
1. The rapid shift from the LGM arid conditions to the African Humid Period (AHP) started at about 15 cal. ka BP. AHP extends until 8.4 cal. ka BP, and we suggest that the Ethiopian African Monsoon maximum between 12 and 8 cal. ka BP is responsible for a larger Blue/Atbara Nile sediment load and freshwater input into the Eastern Mediterranean Sea.
2. The transition between the AHP and the arid Late Holocene is gradual and occurs in two main phases between 8.4 and 6.5 cal. ka BP and 6.5 to 3.2 cal. ka BP. We suggest that the main rain belt shifted southward from 8.4 to ∼4 cal. ka BP and was responsible for progressively reduced sediment load and freshwater input into the eastern Mediterranean Sea.
3. The aridification along the Nile catchments occurred from ∼4 to 2 cal. ka BP. A dry period, which culminates at 3.2 cal. ka BP, and seems to coincide with a re-establishment of increased oceanic primary productivity in the western Mediterranean Sea.
We postulate that the decrease in thermo-haline water Mediterranean circulation could be part of a response to huge volumes of fresh-water delivered principally by the Nile River from 12 to 8.4 cal. ka BP in the eastern Mediterranean. We propose that the large hydrological change in Ethiopian latitude could be a trigger for the 8.2 ka cooling event recorded in high latitude.

Revel R., Colin C., Bernasconi S., Combourieu-Nebout N., Ducassou E., Grousset F.E., Rolland Y., Migeon S., Brunet P., Zhaa Y., Bosch D., Mascle J.,. "21,000 years of Ethiopian African moonsoon variability recorded in sediments of the western Nile deep sea fan", Regional Environmental Change, in press.