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The Holocene African Humid Period from Tibesti mountains (Chad): Contribution of the fossil assemblage and the oxygen isotopic composition from lacustrine diatoms

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During the Holocene (0-11.7 ka BP), the subtropical regions of Africa were characterized by very significant climatic changes. These changes were evidenced by variations in lake levels which reflect the balance between precipitation and evaporation (P-E) at the watershed scale. These climatic conditions are mainly associated with the dynamics of the African summer monsoon in relation with the location of the Intertropical Convergence Zone (ITCZ), which is modulated by summer insolation induced by the Earth's orbital parameters. This mechanism explains the wetter conditions observed from 11 ka BP to 5.5 ka BP in the Sahelo-Saharan zone. This period, called "Green Sahara" or "African Humid Period", was characterized by a green landscape, covered by grasslands and trees, dotted with numerous lakes, and incised by large river networks.
Despite the numerous studies carried out on the African Humid Period, there is a scarcity of data for quantifying source and origin of precipitation. The Lake Chad Basin (BLT) is a key region for paleoclimatic research because of its position reflecting main tropical atmospheric mechanisms and its endorheic morphology amplifying climatic signals. More particularly, the crater palaeolakes of Trou au Natron (Pic Toussidé) and Era Kohor (Emi Koussi) in the Tibesti mountains offer unique sedimentary archives that may record the climatic history of the Sahara.
This work aims to reconstruct the evolution of these crater palaeolakes, thanks to the oxygen isotopic composition of diatoms (□18Odiatom), from the termination of the last deglaciation until the African Humid Period. The identification of the fossil diatom assemblages combined with the □18Odiatom values should give insights on the evolution of the limnological parameters, the relative depth, the chemistry, and the water isotopic composition of these palaeolakes.
The measurement of □18Odiatom is carried out using the IR-laser fluorination-isotope ratio mass spectrometry technique at the CEREGE stable isotope laboratory, after dehydration under a flow of nitrogen gas. The diatoms are purified at the CEREGE micropaleontology laboratory after

decarbonation and organic matter oxidation. The taxonomic determination of diatoms is carried at CEREGE (France) and at the University of N'Djamena (Chad).
Preliminary results from the two Tibesti mountains records cover the Holocene wet period. They show significant variations in the d18Odiatom values and a distinct evolution of ecosystems as demonstrated by taxonomic assemblage of fossil diatoms. These results are compared with a reconstruction of the d18Odiatom from Lake Chad for the same period. This comparison evidenced substantial data for the reconstruction of the Holocene wet period, in terms of origin of water inflows in the basin, eg Tropical versus Mediterranean and lowland versus mountainous atmospheric processes, and on the reconstruction of the migration and the position of the ITCZ. These two questions are still speculative and will certainly provide data for global climate circulation models which are struggling to reproduce the climate in Saharan latitudes.