Timing of megalake Chad occurrences in the Pliocene: an insight into early hominid environment

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The occurrence of large lakes episodes in the Chad basin during the Mio-Pliocene has been demonstrated through the analysis of sedimentary deposits located in the presently arid area of the Djurab desert (Schuster, 2002, Schuster et al., 2009). There, the Mission Paléo-Franco Tchadienne (MPFT) identified four main paleontological sites, ranging from 7 to 3 Ma. All of them are extremely rich in vertebrate fauna remains (mammals, reptiles, fishes) and in two of them, remains of early hominids have been collected. *Australopithecus barhelghazali* (Koro-Toro site: 3.6 Ma; Brunet et al., 1995; Lebatard et al., 2010), the first australopithecine ever found out of the classical hominid sites (East African Rift System, South Africa), is associated to fauna assemblages showing the presence of a mosaic landscape typical of a perilacustrine area, and habitats from wooded savanna to open grassland (Brunet et al., 1997, 1998, 2000). This would have been the typical landscape during mega-lake episodes. *Sahelanthropus tchadensis* (Toros-Menalla site: 7Ma; Brunet et al., 2002; Lebatard et al., 2010), the earliest known hominid, was found in comparable perilacustrine environment.

It is worth noticing that each of these four major continental vertebrate sites are always associated to large lake episodes. This suggests that there is a strong link between large lake episodes (megalakes) and fauna dispersal/ presence of early hominids. This link highlights the need for a comprehensive understanding of the rise, culmination and demise of megalakes in the Chad basin during the Neogene.

From 7 to 3 Ma, the climate was globally warmer than present (e.g. Zachos et al., 2001, Haywood et al., 2010), and the Hadley circulation might have been slowed, leading to a poleward shift of the Inter Tropical Convergence Zone during the whole Pliocene interval (e.g. Brierley et al., 2009, Kamae et al., 2011). Insolation changes related to the 23 kyr precession cycles might have also played a role on the monsoon, providing a sufficient amount of water to fill in the vast endorheic region of Chad basin (Braconnot et al., 2008).

In order to better characterize the timing and the forcings of these Mega-lake Chad occurrences during the late Cenozoic, we use a coupled ocean atmosphere climate model forced with four different orbital configurations and mid-Pliocene boundary conditions. The simulated climate is then used to force the river routing model HYDRA (Coe, 2000), which calculates the water balance, river discharge and potential lake areas. Thanks to this study, we will be able to determine the evolving extent of lake Chad during the Pliocene, bringing insights to the possibility for early hominids populations to live in this region throughout the Mio-Pliocene period.