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Downscaling precipitation in the Sahara-Sahelian region during the Holocene in order to decipher the paleo-variations of Lake Chad

Camille Contoux (1), Alberte Bondeau (2), Nicolas Barrier (3), and Florence Sylvestre (1)

(1) CEREGE, Aix-Marseille Université, CNRS, IRD, Aix-en-Provence, France (contoux@cerege.fr), (2) IMBE, Aix-Marseille Université, CNRS, IRD, Aix-en-Provence, France, (3) Labex OT-Med, Aix-Marseille Université, Aix-en-Provence, France

In order to understand the paleo-variability of Saharo-Sahelian paleoprecipitation, which is recorded in the sediments of Lake Chad situated in central Sahel, we use a modelling chain going from global climate to basin-scale hydrological model. Namely, climate model outputs for the Holocene, starting with the mid-Holocene (6ka) available from the IPSL-CM5 global climate model are statistically downscaled with the General Additive Model approach (Levavasseur et al., 2011), then used to feed the LPJmL model (Bondeau et al., 2007) which calculates the equilibrium vegetation and runoff. Climate and runoff are then given to the dynamic routing scheme HYDRA (Coe et al., 2000) in order to calculate the paleo river network and paleo extent of Lake Chad. The results at each step are compared with reconstructions derived from continental proxies on the regional scale in order to assess the robustness of the results. For the mid-Holocene, the downscaled precipitation matches very well precipitation estimations derived from lacustrine pollen data. For the historical period, the LPJmL simulated runoff averaged over the Chad basin depicts the same trend than observations of Lake Chad water level, but the absolute water level is overestimated in HYDRA, which can be attributed to humid biases both in LPJmL and HYDRA. Finally, we will investigate the relative changes in river network and Lake Chad extent between the present and the mid-Holocene.