Long term changes in groundwater storage in the Lake Chad Basin, central Africa, as a function of drought periods and lake fluctuations.

Benjamin Ngounou Ngatcha, Guillaume Favreau, Mathieu Le Coz, Yahaya Nazoumou, Marie Boucher, Ibrahim Goni.

Email : ngatchangou@yahoo.fr

ABSTRACT

The tropical Lake Chad, central Africa, is often seen as an example of the impact of climate variability on water resources, with large fluctuations in its surface recorded through the 20th century. These changes were shown by hydrological modeling to be mostly due to relatively small climate shifts, having huge impact on the lake surface area (25,000 to 3,000 – 14,000 km^2 over the past few decades). Lake Chad is a fresh water lake, connected by seepage to the underlying quaternary aquifer (500,000 km^2). Groundwater recharge occurs by direct infiltration of rainfall through the vadose zone but also locally by seepage from surface water (Lake, main rivers). Long-term groundwater surveys (1960s-1980s; 1990s-2015) indicate (1) drops (few cm / years) in the water table at short distance from the Lake, followed by (2) stabilization or even recovery in the water table for recent years. At distance, where the water table is mostly fed by rainfall infiltration through sand dunes, more important drops were recorded during the drought periods of the 1970s-80s. In the northern part of the lake, groundwater modeling taking into account rapid changes in lake surface area indicate that measured trends in groundwater storage through the past decades (1990-2015) can be explained by changes in recharge rates from the Lake, using calibrated subsurface magnetic resonance soundings data for estimating aquifer hydraulic parameters (T, Sy).