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Remote sensing application for investigating groundwater recharge at Lake Chad Basin

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Understanding groundwater hydrology processes for groundwater management requires from accurate information on the hydrologic cycle. Of special importance is the water balance parameters identification and groundwater recharge quantification. Assessment of groundwater recharge requires of detailed understanding of natural recharge dynamics in a catchment in response to rainfall events spatially and temporally distributed. Precipitation (P) and temperature (T) data series are critically important in studies quantifying the groundwater balance. Arid and semiarid water balance dynamics is usually influenced by hazards of drought and desiccation and both temperature and rainfall play key roles in hydrological processes. However, lack, inaccuracy or low spatial and temporal resolution of rainfall data sets are commonly found in arid zones. The use of remote sensing has been identifying as a step forward addressing the paucity of high resolution rainfall time series at daily scale. Moreover, data from geostationary satellites are generally available in near real-time and cover large areas.
At the Lake Chad conventional Basin (2.3×106 km2), 45 meteorological stations covering variable historical period data length (ranging between 4 and 90 yrs) are available. Precipitation and temperature daily data series may present important data gaps. The study area extends over three climatic zones that range from the tropical to the desert climatic regime: humid-tropical (South more than 1500mm/yr), the Sahel semi-arid area and the arid Sahara (North, less than 100mm/yr).
To address the scarcity and the availability at catchment scale data sets of current meteorological data (P&T) at the Lake Chad basin for further recharge estimation, input data for water balance were obtained from satellite products. Rainfall and temperature data were obtained from: African Flood and Drought monitor platform (http://stream.princeton.edu/AWCM/WEBPAGE) additionally from rain gauges (ReSeau project and LCBC). The remote sensing data were compared and validated with the observed data, and then bias corrections were performed.