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Surface-vegetation-atmosphere interaction on the upper Ouémé basin. Synthesis of the experimental results

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Despite the fact that soil vegetation atmosphere interface is known to control retroaction of continents on West African Monsoon (WAM) dynamic through energy, aerosol and water transfer, very few energy budget measurements and fewer carbon budget data have been collected over West African land covers. The consequence is that surface processes are poorly known in this region, and surface characteristics used in SVAT Model are often spoiled with large uncertainties. To document the energy budget, flux stations have been set up during the AMMA experiment to better understand the role of energy surface transfer on WAM and on its climate variability on a latitudinal transect from 9°N to 17°N. These stations are supported by the AMMA-CATCH Observatory. This paper aims to synthetize recent advances in the evapotranspiration flux measurement analysis and modeling within the upper Ouémé Basin, including water and CO2 flux, transpiration, sensible and ground heat flux, radiative budget and soil moisture. The experimental setup of the fluxes on the upper Ouémé basin includes : 1 scintillometer (2006), 2 eddy correlation flux stations (2007) and sap flow (2008). These data are completed with meteorological classical stations including radiation (2002) and profile of soil moisture and temperature (2004). In Benin the Sudanian climate shows four periods : (1) the dry season, with low but not null evapotranspiration, (2) the onset with highly variable atmospheric conditions and isolated rainy events, (3) the rainy season where actual evapotranspiration reaches the reference evapotranspiration for all vegetation types, because soil water supply is not limiting and (4) the drying period where the difference between the different vegetation types are highlighted. During the drying period the trees find their water supply from the water table. This suggests that trees have no water shortage in this region. The tree activity stops only for one month in January when they shed their leaves. The impact of this water transfer from the watertable to the atmosphere plays a major role in river stream control and water table dynamics.

Keywords: Sudanian climate, eddy correlation, sap flow, energy balance

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