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Conference Abstract

Land use change impacts on H_2O and CO_2 surface/atmosphere fluxes derived from two Eddy-Covariance stations under sudanian climate in West Africa.

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Abstract

Ecosystem capacity studies for carbon sequestration and water extraction are largely conditioned by Eddy Covariance (EC) measurement availability and quality. According to the FluxNet map, West Africa is one the less instrumented continent. This geographical gap leads to large uncertainties in the world carbon Budget. For decades several experiments have been led in Africa but they remain parsimonious with low visibility often because of short time series, associated with time limited project. In this context, several ongoing initiatives aim at structuring the Eddy-Covariance African community that is emerging. Among them, the West African Flux Network (WAF-Net) has been created to structure the West African Flux community together with their “Northern” partners. Among others, one of the WAF-Net partners in Benin has been active for more than 15 years at

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providing Eddy-Covariance fluxes over several ecosystems. This network aims at documenting land use variability and trends in West Africa.

After an introduction of this new context, the presentation will focus on the analysis of the Beninese Eddy Fluxes for H_2O and CO_2 over two major ecosystems in Benin, a mixed crop savannah (Nalohou, lat. 9.74°N, long. 1.60°E) and a clear forest (Bellefoungou, lat. 9.79°N, long. 1.72°E), using data spanning from 2007 to 2024. In terms of methodology, we had to develop specific processing to account for, among others, dust deposit, roughness and displacement height estimations, ground heat flux and Respiration of the Ecosystem (RECO) calculations, as for data qualification. This results in the longest EddyFlux time series in West Africa to document the role of evapotranspiration in the water hydrological cycle, and the CO_2 sink capacity of West African Ecosystems. From this long time series, we explore the inter annual variability and derive averaged annual H_2O and CO_2 budgets and their associated variability. Knowing the land conversion area in the region since the seventies (~20% of the total surface has been converted), this allows us to estimate the losses and changes in sequestration capacity (~8%) and water extraction (~-4%) by sudanian ecosystems in this dry tropical climate environment.

The WAF-Net community, together with other African flux groups, are building the future of Eddy Flux measurements in Africa. They are leading new projects to develop new stations and to produce new Eddy-covariance data to understand better the tropical ecosystems functioning and further on reduce the uncertainties in the African greenhouse gas budget.

Keywords

Eddy-covariance; CO_2 and Water Budgets; tropical ecosystems; Land conversion

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Conflicts of interest

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