USE OF A DISTRIBUTED SENSOR NETWORK TO PARAMETERIZE A MODEL OF FLOWS BETWEEN THE SOIL, VEGETATION, AND ATMOSPHERE IN A MIXED SAVANNA-AGRICULTURAL CATCHMENT IN SOUTH EASTERN BURKINA FASO

Natalie Ceperley, EPFL ENAC EFLUM, 41212632711, natalie.ceperley@epfl.ch

1. Natalie Ceperley, EPFL ENAC EFLUM
2. Theophile Mande, EPFL ENAC EFLUM
3. Christopher A. Williams, Clark University
4. Alexandre Repetti, CODEV, EPFL
5. Marc B. Parlange, EPFL ENAC EFLUM

The hydrologic processes underlying a natural savanna in a semi-arid environment is altered when savanna is converted to agriculture. Infiltration is often observed to decrease while rapid runoff increases to the detriment of crop productivity, downstream populations and local water sources. Planting a mix of vegetation in cultivated fields, mimicking the dispersal of trees in a savanna has been proposed as a solution to help buffer these consequences. However the hydrologic behavior of savanna, agricultural, and agroforestry land cover is not fully understood for the Sudanian vegetation zone of West Africa and the consequences of land use changes are debatable.

We use a distributed sensor network of seventeen wireless meteorological stations including soil moisture sensors in addition to two eddy covariance stations and sap flow probes dispersed across cultivated rice and millet fields, natural savanna, fallow fields, and around agroforestry trees, specifically Sclerocarya birrea, to understand land cover controls on variations in evapotranspiration and infiltration over a semi arid watershed in Southeastern Burkina Faso. Normalized difference vegetation indexes taken from weekly MODIS images as well as personal field observations were used to inform seasonal and spatial variations in albedo, rate of transfer to ground heat flux, and roughness length.

Measurements are used parameterize a distributed model of energy and hydrologic fluxes between the soil and atmosphere controlled by the vegetated surface and presence of agroforestry trees. We use this model to further understanding of the effect of Sudanian land cover on the water and energy balances by exploring the effects of modifications in the arrangement and dispersion of vegetation types. Outreach work in the community is on-going and our hope is that the results of our modeling will inform local farming practices.