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Identifying the impacts of land use on water and nutrient cycling in the South-West Mau, Kenya

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The Mau Forest is the largest closed canopy forest system and indigenous montane forest in Kenya, covering approximately 400,000 ha. It is the source of twelve major rivers in the Rift Valley and Western Kenya and one of Kenya's five 'water towers' that provide around 10 million people with fresh water. Significant areas have been affected by deforestation and land use changes in the past decades, resulting in a loss of approx. 25% of the forest area. Recent changes in downstream water supply are discussed to be attributed to land use change, though compelling scientific evidence is still lacking.
The study area is located in the South-West Mau as a part of the Sondu River basin that drains into Lake Victoria. This area has suffered a forest loss of 25% through conversion of natural forest to smallholder agriculture and tea/tree plantations. A nested catchment approach has been applied, whereby automatic measurement equipment for monitoring discharge, turbidity, nitrate, total and dissolved organic carbon, electrical conductivity and water temperature at a 10 minute interval has been set up at the outlets of three sub-catchments of 27 – 36 km^2 and the outlet of the 1023 km^2 major catchment. The dominant land use in the sub-catchments is either natural forest, tea/tree plantation or smallholder agriculture. The river data is complemented by six precipitation gauging stations and three climate stations, that all measure at the same interval. Installed during October 2014, the systems have collected high resolution data for one and a half year now.
The high resolution dataset is being analysed for patterns in stream flow and water quality during dry and wet seasons as well as diurnal cycling of nitrate. The results of the different sub-catchments are compared to identify the role of land use in water and nutrient cycling. First results of the high temporal resolution data already indicate that the different types of land use affect the stream nitrate concentration. In addition to that the high resolution allows to investigate diurnal patterns, showing a shift in nitrate concentrations between wet and dry seasons.
Additional spatial stream water snapshot sampling campaigns within the major catchment, as well as sampling for End Member Mixing Analysis (EMMA) and analysis of stable isotopes of precipitation, throughfall, stream water and soil and ground water is ongoing and will provide further information to increase our understanding of hydrological and biogeochemical processes and how these are affected by land use in the Mau Forest. We will report results from six snapshot sampling campaigns that depict the impact of tea/tree plantations on nitrate concentrations and an influence of land use on catchment specific discharge.