Geophysical Research Abstracts
Vol. 17, EGU2015-7641, 2015
EGU General Assembly 2015

Evapotranspiration components determined by eddy covariance and sap flux measurements in oil palm plantations in Sumatra, Indonesia

Ana Meijide (1), Alexander Röll (2), Furong Niu (2), Tania June (3), Dirk Hölscher (2), and Alexander Knohl (1)

(1) Bioclimatology, Georg-August-Universität Göttingen, Germany (ameijid@gwdg.de), (2) Tropical Silviculture and Forest Ecology, Georg-August-Universität Göttingen, Germany, (3) Department of Geophysics and Meteorology, Bogor Agricultural University (IPB), Indonesia

The expansion of oil palm cultivation fueled by the increasing global demand for palm oil is leading to massive land transformations in tropical areas, particularly in South-East Asia. Conversions of forest land to oil palm plantations likely affect ecosystem water fluxes. However, there is a lack of information on water fluxes from oil palm plantations as well as on the partitioning of these fluxes into its different components such as transpiration and evaporation. It is expected that water fluxes from oil palm plantations vary temporally, both long-term, i.e. between different age-classes of plantations, and short-term, i.e. from day to day within a certain plantation (e.g. during or after periods of rainfall). A proper evaluation of water fluxes from oil palm plantations thus requires an experimental design encompassing these types of variability.

To assess evapotranspiration (*ET*) rates, an eddy covariance tower was installed in a 2-year-old oil palm plantation in the lowlands of Jambi, Sumatra; it was subsequently moved to a 12-year-old oil palm plantation located in the same region. In parallel to the *ET*, sap flux density was measured on 16 leaf petioles on four oil palms; stand transpiration rates were derived from these measurements with stand inventory data. The parallel measurements ran for several weeks in both plantations.

Preliminary results for our period of study show that the average *ET* rate of the 2-year-old oil palm plantation was 5.2 mm day^{-1}; values up to 7.0 mm day^{-1} were observed on dry, sunny days with non-limiting soil moisture. Stand transpiration (T) by the young oil palms was very low, 0.3 mm day^{-1}on average, and only showed a small variation between days. Under optimal environmental conditions, the ratio of T to total *ET* was up to 0.08 in the young plantation, while in the mature, 12-year-old plantation, it was significantly higher and reached 0.5. Transpiration rates in the mature oil palm plantation were about six- to seven-fold higher than in the young plantation and again showed very small fluctuations between days (1.8-2.2 mm day^{-1}). Regardless of the age class, evapotranspiration followed changes in environmental conditions more closely than transpiration. This uncoupling of the oil palm transpiration response from environmental drivers may have severe effects on both the magnitude and the spatial and temporal variability of ecosystem water fluxes and needs to be investigated further.