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Microclimatic conditions in different land-use systems in Sumatra, Indonesia

Ana Meijide (1), Nina Tiralla (1), Clifton Sabajo (1), Oleg Panferov (2), Dodo Gunawan (3), and Alexander Knohl (1)

(1) Georg-August University Göttingen, Bioclimatology, Göttingen, Germany (aknohl@uni-goettingen.de), (2) Climatology and Climate Protection, University of Applied Sciences Bingen am Rhein, Germany, (3) Center for Climate Change and Air Quality, Agency for Meteorology Climatology and Geophysics, Jakarta, Indonesia

Over the last decades, Indonesia has experienced an unprecedented transformation of the land surface through deforestation and conversion from forest to other land-uses such as oil palm and rubber plantations. These transformations are expected to affect not only biodiversity and carbon storage, but also the biophysical conditions of the land surface, i.e. air and surface temperature, surface albedo, air humidity, and soil moisture. There is, however, a lack of quantitative information characterizing these differences with a systematic experimental design.

We report results from micrometeorological measurements in four different land-use types (forest, rubber plantation, jungle rubber, and oil palm plantation, n=4) in two different landscapes in Jambi Province in Sumatra/Indonesia as well as remote sensing data from Landsat. Preliminary results show differences on the average within-canopy air temperature, with lowest values in the forest (24.70°C $\pm$ 0.01°C) and highest in oil palm and rubber plantations (25.45°C $\pm$ 0.02°C and 25.55°C $\pm$ 0.01°C respectively). The temperature ranges also varied between different land uses, from 6.27°C in the forest and up to 9.40 °C in oil palm between the 5 and 95% percentile. Relative air humidity followed an inverse trend to air temperature, with rubber and oil palm plantations being on average 6.29 and 5.37 % drier than the forest. Soil temperature was up to 1°C warmer in oil palm than in forest plots, while soil moisture was more influenced by the soil type in the different landscapes than by the land uses. In conclusion, our data demonstrate that land transformation in Indonesia results in distinctly different microclimatic conditions across land-use types.