Geophysical Research Abstracts
Vol. 16, EGU2014-10821, 2014
EGU General Assembly 2014

Greenhouse gas exchange in tropical mountain ecosystems in Tanzania

Friederike Gerschlauer (1), Imani Kikoti (2), and Ralf Kiese (1)

(1) Karlsruhe Institute of Technology, IMK - IFU, Germany (friederike.gerschlauer@kit.edu), (2) Tanzania National Parks, Tanzania

Tropical mountain ecosystems with their mostly immense biodiversity are important regions for natural resources but also for agricultural production. Their supportive ecosystem processes are particularly vulnerable to the combined impacts of global warming and the conversion of natural to human-modified landscapes. Data of impacts of climate and land use change on soil-atmosphere interactions due to GHG (CO_2, CH_4, and N_2O) exchange from these ecosystems are still scarce, in particular for Africa. Tropical forest soils are underestimated as sinks for atmospheric CH_4 with regard to worldwide GHG budgets (Werner et al. 2007, J GEOPHYS RES Vol. 112). Even though these soils are an important source for the atmospheric N_2O budget, N_2O emissions from tropical forest ecosystems are still poorly characterized (Castaldi et al. 2013, Biogeosciences 10).

To obtain an insight of GHG balances of selected ecosystems soil-atmosphere exchange of N_2O, CH_4 and CO_2 was investigated along the southern slope of Mt. Kilimanjaro, Tanzania. We will present results for tropical forests in three different altitudes (lower montane, *Ocotea*, and *Podocarpus* forest), home garden (extensive agro-forestry), and coffee plantation (intensive agro-forestry). Therefore we used a combined approach consisting of a laboratory parameterization experiment (3 temperature and 2 moisture levels) and in situ static chamber measurements for GHG exchange. Field measurements were conducted during different hygric seasons throughout two years.

Seasonal variation of temperature and especially of soil moisture across the different ecosystems resulted in distinct differences in GHG exchange. In addition environmental parameters like soil bulk density and substrate availability varying in space strongly influenced the GHG fluxes within sites. The results from parameterization experiments and in situ measurements show that natural forest ecosystems and extensive land use had higher uptakes of CH_4. For the investigated forest ecosystems we found considerable differences in soil sink strength for CH_4. N_2O emissions were highest in natural forest ecosystems even though N input in the intensively managed system was considerably higher. Highest N_2O efflux rates were identified in the region of highest mean annual precipitation. CO_2 emissions reduced from managed to natural ecosystems. In general an increase in temperature as well as in soil moisture caused higher GHG fluxes throughout all investigated natural and managed ecosystems. With increasing altitude of the investigated forests GHG emissions reduced overall.