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Microclimatological conditions along a land use gradient in the tropical Andes of South Ecuador

Katja Trachte[1], **Franz Pucha Cofrep**[1,3], Volker Raffelsbauer[1], Oliver Limberger[2], Andreas Fries[3], Galo Carillo-Rojas[4], and Jörg Bendix[2]

[1]Department of Atmospheric processes, Brandenburg University of Technology Cottbus-Senftenberg, Germany
[2]Laboratory for Climatology and Remote Sensing, Philipps University of Marburg, Germany
[3]Universidad Técnica Particular de Loja, Ecuador
[4]University of Cuenca, Ecuador

Knowledge about microclimatological conditions strongly contributes to our understanding of land surface – atmosphere interactions as drivers of the Earth's surface energy budget. Particularly the radiative fluxes are major determinants providing energy for vital climate processes and are crucial for climate warming, water availability, primary productivity and ecosystem services. The partitioning into sensible and latent heat fluxes are highly dependent on the land coverage and represent feedback effects affecting the cycling of heat and water in the vegetation-atmosphere continuum. In the Reserva Biologica San Francisco (RBSF) on the eastern escarpment of the South Ecuadorian Andes on 2000m elevation above sea level (a.s.l.) two eddy-covariance measurement stations have been installed over natural rain forest and pasture ecosystem to observe atmospheric water and carbon fluxes. The aim is to assess net-ecosystem exchange (NEE) and evapotranspiration (ET) in order to estimate the impact of deforestation on the carbon sink function and the water availability. Additionally, microclimatological conditions in terms of e.g. radiative fluxes and soil conditions are supposed to further disentangle effects of the respective land surface properties on the environmental conditions. Over the last three years generally higher water fluxes could be observed during daytime over the forest ecosystem compared to pasture. Concerning NEE a clear carbon sink was revealed for both ecosystems indicated by a mean gross primary productivity (GPP) of 12.7 gC/m²day (forest) and 6.5 gC/m²day (pasture), while a mean ecosystem respiration (Reco) of 10.6 gC/m²day (forest) and 5.9 gC/m²day (pasture) was obtained. However, a mean NEE of 2.1 gC/m²day (forest) and 0.6 gC/m²day (pasture) clearly shows the stronger productivity of the forest ecosystem and thus, a higher carbon sink as a contribution to climate change mitigation.