Geophysical Research Abstracts
Vol. 19, EGU2017-12118, 2017
EGU General Assembly 2017

Drone based estimation of actual evapotranspiration over different forest types

Philip Marzahn (1), David Gampe (1), Saulo Castro (2), Mauricio Vega-Araya (3), Arturo Sanchez-Azofeifa (2), and Ralf Ludwig (1)

(1) Department of Geography, Ludwig-Maximilians-University, Munich, Germany (p.marzahn@iggf.geo.uni-muenchen.de), (2) Earth and Atmospheric Sciences Department, University ofAlberta, Edmonton, Canada , (3) Instituto de Investigación y Servicios Forestales, Universidad Nacional de Costa Rica, Heredia, Costa Rica

Actual evapotranspiration (Eta) plays an important role in surface-atmosphere interactions. Traditionally, Eta is measured by means of lysimeters, eddy-covariance systems or fiber optics, providing estimates which are spatially restricted to a footprint from a few square meters up to several hectares . In the past, several methods have been developed to derive Eta by means of multi-spectral remote sensing data using thermal and VIS/NIR satellite imagery of the land surface. As such approaches do have their justification on coarser scales, they do not provide Eta information on the fine resolution plant level over large areas which is mandatory for the detection of water stress or tree mortality.
In this study, we present a comparison of a drone based assessment of Eta with eddy-covariance measurements over two different forest types - a deciduous forest in Alberta, Canada and a tropical dry forest in Costa Rica. Drone based estimates of Eta were calculated applying the Triangle-Method proposed by Jiang and Islam (1999). The Triangle-Method estimates actual evapotranspiration (Eta) by means of the Normalized Difference Vegetation Index (NDVI) and land surface temperature (LST) provided by two camera systems (MicaSense RedEdge, FLIR TAU2 640) flown simultaneously on an octocopter. .
Results indicate a high transferability of the original approach from Jiang and Islam (1999) developed for coarse to medium resolution satellite imagery tothe high resolution drone data, leading to a deviation in Eta estimates of 10% compared to the eddy-covariance measurements. In addition, the spatial footprint of the eddy-covariance measurement can be detected with this approach, by showing the spatial heterogeneities of Eta due to the spatial distribution of different trees and understory vegetation.