Geophysical Research Abstracts
Vol. 19, EGU2017-9408, 2017
EGU General Assembly 2017

Global relation between microwave satellite vegetation products and vegetation productivity

Irene E. Teubner (1), Matthias Forkel (1), Martin Jung (2), Diego G. Miralles (3), and Wouter A. Dorigo (1)

(1) Department of Geodesy and Geoinformation, Vienna University of Technology, Vienna, Austria (irene.teubner@geo.tuwien.ac.at), (2) Department for Biogeochemical Integration, Max Planck Institute for Biogeochemistry, Jena, Germany, (3) Laboratory of Hydrology and Water Management, Ghent University, Ghent, Belgium

The occurrence of unfavourable environmental conditions like droughts commonly reduces the photosynthetic activity of ecosystems and, hence, their potential to take up carbon from the atmosphere. Ecosystem photosynthetic activity is commonly determined using remote sensing observations in the optical domain, which however have limitations particularly in regions of frequent cloud cover, e.g. the tropics. In this study, we explore the potential of vegetation optical depth (VOD) from microwave satellite observations as an alternative source for assessing vegetation productivity. VOD serves as an estimate for vegetation density and water content, which has an impact on plant physiological processes and hence should potentially provide a link to gross primary production (GPP). However, to date, it is unclear how microwave-retrieved VOD data and GPP data are related.

We compare seasonal dynamics and anomalies of VOD retrievals from different satellite sensors and microwave frequencies with site level and global GPP estimates. We use VOD observations from active (ASCAT) and passive microwave sensors (AMSR-E, SMOS). We include eddy covariance measurements from the FLUXNET2015 dataset to assess the VOD products at site level. For a global scale analysis, we use the solar-induced chlorophyll fluorescence (SIF) observations from GOME-2 as a proxy for GPP and the FLUXCOM GPP product, which presents an upscaling of site measurements based on remote sensing data.

Our results demonstrate that in general a good agreement between VOD and GPP or SIF exists. However, the strength of these relations depends on the microwave frequency, land cover type, and the time within the growing season. Correlations between anomalies of VOD and GPP or SIF support the assumption that microwave-derived VOD can be used to monitor vegetation productivity dynamics.

The study is performed as part of the EOWAVE project funded by the Vienna University of Technology (http://eowave.geo.tuwien.ac.at/) and the STR3S project funded by the Belgian Science Policy Office (BELSPO) as part of the STEREO III programme.