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Improving ASCAT slope estimation methods for representing vegetation water dynamics

Paco Frantzen[1], Susan Steele-Dunne[1], Mariette Vreugdenhil[2], Sebastian Hahn[2], Raphael Quast[2], and Wolfgang Wagner[2]

[1]Department of Geoscience and Remote Sensing, Delft University of Technology, Delft, The Netherlands
[2]Department of Geodesy and Geoinformation, Vienna University of Technology , Vienna, Austria

Vegetation is a key part of the water and carbon cycle and the interaction between Earth's surface and atmosphere. Understanding water dynamics within vegetation is crucial for improving models that represent vegetation processes. Previous studies have investigated exploiting ASCAT scatterometer data from the METOP satellites to evaluate dynamics in vegetation water content. ASCAT has been operational since 2007 and captures microwave backscatter from multiple angles, revealing the relation between backscatter and the incidence angle. This relation reflects the relative contributions of volume and surface scattering—the former affected by water on and within vegetation, and the latter influenced by water in the top soil layer. Currently, a weighted regression using ASCAT observations from 42 days is used to estimate the parameters representing this relation: the slope and curvature, or the first and second order derivative of a second order Taylor approximation, respectively. This estimation method is implemented in the Soil Water Retrieval Retrieval Package developed by TU Wien. Adverse artefacts of this estimation method are the aggregation of observations corresponding to varying states of the earth surface, e.g. before and after a forest fire. Here, we present results from a study to improve the estimation method for ASCAT's slope and curvature parameters, tailored to quantification of vegetation processes. Goals include: representing parameters at briefer temporal scales, reducing the impact of interception, and restricting temporal aggregation around instantaneous events of change such as storms. In addition to analysing real ASCAT observations, synthetic ASCAT observations are simulated using a radiative transfer model, enabling a thorough comparison of estimated slope against simulated ground truth values. Preliminary results show that simulated ASCAT slope time series represent the dynamics of real ASCAT slope, indicating that synthetic observations can be used to quantify improvement of the slope estimation method.