EGU22-11542
https://doi.org/10.5194/egusphere-egu22-11542
EGU General Assembly 2022

A perspective on the current and future use of satellite radar observations for monitoring vegetation water dynamics

Susan Steele-Dunne
Delft University of Technology, Delft, Netherlands (s.c.steele-dunne@tudelft.nl)

Many studies have demonstrated the value of microwave remote sensing for soil and vegetation applications in agricultural and natural systems. The sensitivity of microwave observables to internal water content makes them suitable for monitoring changes in above ground biomass associated with growth, seasonality and land cover change. In recent years, microwave observations have increasingly been used to monitor changes in vegetation water content associated with water status. Here, novel experimental data from field campaigns and analyses of satellite data records will be synthesized to provide a perspective on the current and future use of radar for monitoring vegetation water dynamics.

Ground-based radar and in-situ data will be used to illustrate the sensitivity of sub-daily radar data to detect the subtle response of the vegetation to variations in moisture supply and demand. These data will also be used to highlight the sensitivity of radar observables to surface canopy water (dew and/or interception). On the one hand, it will be shown that surface canopy water can have a confounding effect on vegetation parameter retrieval. On the other hand, microwaves can provide valuable information on this quantity of considerable interest in hydrology and land-atmosphere interactions.

Analyses of existing satellite data records (ASCAT, Sentinel-1) will be used to show that the opportunities and challenges identifiable at field scale translate to the footprint scale. Furthermore, they will be used to outline a way forward. Future microwave missions offer unprecedented diversity in terms of sensors (in terms of frequency, polarization, viewing geometry, observation technique), as well as finer spatial and temporal resolution. To make optimal use of these new capabilities, we need to be willing to revisit our fundamental understanding of the factors affecting microwave interactions with vegetation. Finally, it will be argued that the use of machine learning can facilitate extracting the full information content of microwave observations by providing a means to reconcile microwave observables with land surface model states and parameters.