Using radar to measure vegetation water stress

*Tim vanEmmerik[1], Susan Steele-Dunne[1], Nick van de Giesen[1]

1. Water Resources Section, Delft University of Technology, The Netherlands

Vegetation water stress significantly affects agricultural and tropical forest canopies. Water shortages in crops influence plant water dynamics, reduces primary production and might eventually lead to plant death. Tropical forests are essential part of global carbon and water cycle. Continuing drying of e.g. the Amazon rainforest might accelerate climate change through carbon losses and changing land surface energy balances.

In addition to ground measurements, various studies have reported observations of plant water stress using active microwave remote sensing. For example, statistical significant variations in radar backscatter were shown to coincide with the onset of water stress over West Africa [1]. Others were able to link radar backscatter time series over the Amazon to the heavy 2005 drought [2].

Additional in situ measurements in agricultural and tropical forest canopies allow further exploration of the full potential of water stress detection using radar. Novel ground measurements techniques have been used to detect and quantify the effects of water stress in various types of plant canopies [3,4], increasing the understanding of how hydrological and plant physiological signatures of water stress affect radar backscatter. Recent efforts have focused on linking these measurements to radar backscatter time series [5].

This presentation aims to present a journey across scales with respect to vegetation water stress. Measurements of changing plant physiological dynamics on leaf and plant levels are linked to radar backscatter on field and forest scales. We aim to demonstrate new insights obtained using field measurements, and highlight the potential of vegetation water stress detection using radar remote sensing.

References

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