



Interpretation of radar scatterometer observations over land: a case study over southwestern France

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This paper investigates the impact of leaf area index (LAI) and surface soil moisture (SSM) on satellite-derived radar backscatter (σ_0) observations over southwestern France. Observations from the Advanced Scatterometer (ASCAT) are compared to simulated σ_0 values produced by the Water Cloud Model (WCM) coupled to the Interactions between Soil, Biosphere, and Atmosphere (ISBA) land surface model (LSM). The LAI and SSM variables used by the WCM are derived from satellite observations and from ISBA simulations, respectively. Values of four parameters of the WCM are calibrated. The ability of the WCM to simulate ASCAT σ_0 observations in contrasting land cover conditions is explored. The response of observed and simulated σ_0 to LAI and SSM is analyzed across seasons. Two ways of representing vegetation in the WCM are compared. The impact of the Klaus storm on the ASCAT observations over the Les Landes forest in January 2009 is examined. The difference in σ_0 between the forest zone affected by the storm and the bordering agricultural areas presents a marked seasonality before the storm and hardly any seasonality during four years after the storm. From 2013 onward, a regeneration phase is visible, with the return of seasonality in the forest vs. non-forest σ_0 difference. The ability of the WCM to represent this phenomenon is investigated. It is shown that the WCM can be used as an observation operator for the assimilation of ASCAT σ_0 observations into the ISBA LSM.