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Using Metop-A ASCAT vegetation parameters to study canopy water dynamics in the North American Grasslands

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In this study, we investigate the vegetation parameters of the TU Wien Soil Moisture Retrieval (TUW SMR) approach as a potential source of information about vegetation. A recent development in the TUW SMR approach allows for the dynamic estimation of the slope and curvature of the 2nd order Taylor polynomial used to represent the incidence angle dependence of backscatter. This allows us to characterize the seasonal cycle of these parameters and their inter-annual variability. With some modifications, this approach can also be used to estimate these parameters separately for the descending (∼9:30 AM) and ascending (∼9:30 PM) overpasses, allowing us to examine diurnal variations in the slope and curvature. The goal of this study is to explore the potential value of the dynamic vegetation parameters to monitor vegetation phenology and canopy water dynamics. Results will be presented from an analysis of the first ten years of ASCAT observations from Metop-A over the grasslands of North America. Grasslands are of particular interest due to their hydrological and ecological value, but also because the vegetation parameters are highly dynamic in this cover type.

Spatial patterns in the seasonal cycle, inter-annual variations and diurnal differences of the vegetation parameters, normalized backscatter and soil moisture were found to vary across the different grassland ecosystems. Spatially contiguous anomalies in the vegetation parameters were observed in areas where the duration and intensity of drought was severe enough to impact vegetation. Diurnal differences in the slope and curvature suggest changes in the relative dominance of different scattering mechanism as a result of the daily water dynamics within the vegetation. In short, the vegetation parameters provide promising new insights into canopy water dynamics at daily, seasonal and inter-annual scales.