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Exploiting the information in soil moisture and vegetation optical depth retrievals from passive microwave radiometry.

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Historically, microwave radiometry has usually been used for retrieving estimates of soil moisture. As these measurements are also sensitive to vegetation, the attenuation of the microwave signal from vegetation, described by the vegetation optical depth (VOD) parameter can be used an analog of above-ground canopy biomass. This study explores the relative and joint utility of assimilating soil moisture and VOD retrievals from passive microwave radiometry within the NoahMP land surface model. The impact of assimilation on key water and carbon budget terms are quantified through comparisons against reference datasets. The results indicate that the assimilation of soil moisture retrievals has a positive impact on the simulation of surface soil moisture and little impact on evaporative fluxes. In contrast, VOD assimilation has significant impacts on the simulation of vegetation conditions, root zone soil moisture, and evapotranspiration (ET). Over water limited domains with sparse vegetation where soil moisture is the primary control on ET, the assimilation of surface soil moisture is more beneficial than VOD DA. In contrast, over regions with dense vegetation and where water availability is not limiting, transpiration has a significant influence on evapotranspiration. The assimilation of VOD is more beneficial in developing improvements in ET over such areas. The results of this study confirm that soil moisture and VOD retrievals provide independent information that can be jointly exploited through their simultaneous assimilation.