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Performance analysis of different radiative transfer models for soil moisture estimation

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A good knowledge about soil moisture over agricultural fields especially with a high spatial and temporal resolution is very important for different applications from the hydrology sector to agricultural purposes. Therefore, different approaches from empirical (Water Cloud Model) over semi-empirical (Oh et al., Dubois et al.) to more physical based (Integral Equation Method) radiative transfer (RT) models for the active microwave domain have been proposed in the literature. Nevertheless, a clear validation tool for the comparison of the different models among themselves and in different model combination for the different backscatter contribution of soil and vegetation is missing. Due to the Sentinel satellite program with the satellites Sentinel-1A and 1B and therefore the availability of SAR data in a high temporal and spatial resolution, new opportunities for analyzing soil moisture and therefore also a validation of different RT-models are given.

In this study, we present a performance analysis of different RT-model combinations for soil moisture calculation over agricultural fields. The used RT-models consists of two parts a vegetation and a soil one. Therefore, in their complexity different RT-models for the estimation of the soil contribution (Oh et al., Dubois et al., Integral Equation Method) are coupled with models (Water Cloud Model, Single Scattering Radiative Transfer) which are calculating the vegetation contribution of the total radar backscatter. The different models are driven with in-situ measurements on field basis from a test site in south Germany. The retrieved backscatter is further compared to available Sentinel-1 time series.