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Field scale spatio-temporal soil moisture variability for trafficability and crop water availability

Coleen Carranza, Martine van der Ploeg, and Coen Ritsema
Soil Physics and Land Management Group,Wageningen University, Netherlands (coleen.carranza@wur.nl)

Spatio-temporal patterns of soil moisture have been studied mostly for inputs in land surface models for weather and climate predictions. Remote sensing techniques for estimation of soil moisture have been explored because of the good spatial coverage at different scales. Current available satellite data provide surface soil moisture as microwave systems only measure soil moisture content up to 5cm soil depth. The OWAS1S project will focus on estimation of soil moisture from freely available Sentinel-1 datasets for operational water management in agricultural areas. As part of the project, it is essential to develop spatio-temporal methods to estimate root zone soil moisture from surface soil moisture. This will be used for crop water availability and trafficability in selected agricultural fields in the Netherlands. A network of single capacitance sensors installed per field will provide continuous measurements of soil moisture in the study area. Ground penetrating radar will be used to measure soil moisture variability within a single field for different time periods. During wetter months, optimal conditions for traffic will be assessed using simultaneous soil strength and soil moisture measurements. Towards water deficit periods, focus is on the relation (or the lack thereof) between surface soil moisture and root zone soil moisture to determine the amount of water for crops. Spatio-temporal distribution will determine important physical controls for surface and root zone soil moisture and provide insights for root-zone soil moisture. Existing models for field scale soil-water balance and data assimilation methods (e.g. Kalman filter) will be combined to estimate root zone soil moisture. Furthermore, effects of root development on soil structure and soil hydraulic properties and subsequent effects on trafficability and crop water availability will be investigated. This research project has recently started, therefore we want to present methods and framework of activities.