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## Ground-based electrical and dielectrical methods to determine the spatial and temporal variability of soil moisture - the project MESMERISE

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The project MESMERISE (Meteorological Soil Moisture Experiment Series) combines meteorological, geophysical, geotechnical, geodetic and soil physical methods to determine the spatial and temporal variability of soil moisture. The spatial and temporal variability of soil moisture is important for localised meteorological processes such as the initialisation of convection.

By comparing electrical (electrical resistivity tomography (ERT)) and dielectrical methods (e.g. time-domain reflectometry (TDR), ground-penetrating radar (GPR)) with data from soil samples as well as atmospheric energy and moisture balance measurements, the accuracy of the different approaches with respect to the spatial variability shall be assessed. In addition, new soil moisture monitoring methods are developed and validated such as the application of reflected GPS signals and signals along free transmission lines.

In the first project phase in summer 2004 the various methods were compared before and during a precipitation event at a test site in southwest Germany. First results indicate that the spatial variability of soil moisture at the test site before the precipitation event (on the order of 5 Vol.-%) could be detected by all methods. The increase in soil moisture during the precipitation event (up to 10 Vol.-%) was similarly detected, but with significant differences in the calculated absolute values.

In a next step the results will be used as input for sensitivity studies with coupled soil-atmosphere models to determine the impact of spatial and temporal variability of soil moisture for relevant small-scale meteorological processes. In the second project phase the measurements will be extended on a regional scale.