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Case studies: Soil mapping using multiple methods

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Soil is a non-renewable resource with fundamental functions like filtering (e.g. water), storing (e.g. carbon), transforming (e.g. nutrients) and buffering (e.g. contamination). Degradation of soils is meanwhile not only to scientists a well known fact, also decision makers in politics have accepted this as a serious problem for several environmental aspects. National and international authorities have already worked out preservation and restoration strategies for soil degradation, though it is still work of active research how to put these strategies into real practice. But common to all strategies the description of soil state and dynamics is required as a base step. This includes collecting information from soils with methods ranging from direct soil sampling to remote applications. In an intermediate scale mobile geophysical methods are applied with the advantage of fast working progress but disadvantage of site specific calibration and interpretation issues.

In the framework of the iSOIL project we present here some case studies for soil mapping performed using multiple geophysical methods. We will present examples of combined field measurements with EMI-, GPR-, magnetic and gammaspectrometric techniques carried out with the mobile multi-sensor-system of Kiel University (GER). Depending on soil type and actual environmental conditions, different methods show a different quality of information. With application of diverse methods we want to figure out, which methods or combination of methods will give the most reliable information concerning soil state and properties. To investigate the influence of varying material we performed mapping campaigns on field sites with sandy, loamy and loessy soils. Classification of measured or derived attributes show not only the lateral variability but also gives hints to a variation in the vertical distribution of soil material. For all soils of course soil water content can be a critical factor concerning a succesful application of geophysical methods, e.g. GPR on wet loessy soils will result in a high attenuation of signals.
Furthermore, with this knowledge we support the development of geophysical pedo-transfer-functions, i.e. the link between geophysical to soil parameters, which is active researched in another work package of the iSOIL project.

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