Soil mapping at regional scale using Remote Sensing – integrating multiple research methods

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Initiated by renewed interest in soil resources because of their role in supporting food security and climate change adaptation and mitigation, this research aims to provide a coherent methodology for soil and terrain mapping using remote sensing data. The work particularly addresses data acquisition for extensive areas where information about soils is sparse while at the same time resources are limited. The methodology aims to fully exploit data from current missions as well as the Sentinel-2 satellite mission (to be launched in 2014) for delivering soil data. The project aims to establish a coherent methodology where RS is integrated within each part of the soil mapping process on a regional scale; (1) A sampling method (constrained Latin hypercube sampling) that aims to acquire soil sample data representing soil variability in the study area under time and budgetary constraints. (2) Retrieval of composite soil mineralogy from spectroscopic data using linear mixing and non-linear methods. (3) Soil property prediction at regional scale using remote sensing data and a small primary data set. Employing regression trees and related methods along with spatial interpolation, this part integrates the above components and produces soil property maps as well as confidence intervals for these. The methodologies are demonstrated in a 1500 km2 study area in Northern Morocco offering a combination of landscape diversity, sparse vegetation cover and limited availability of existing data. With this research, we demonstrate that remote sensing plays a fundamental role for delivering detailed soil data on global and regional scale which is required for research focussing on food security and climate change adaptation and mitigation.