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The DIGISOIL multi-sensor system: from geophysical measurements to soil properties.

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The purposes of the multidisciplinary DIGISOIL project are the integration and improvement of in situ and proximal measurement technologies for the assessment of soil properties and soil degradation indicators, going from the sensing technologies to their integration and their application in (digital) soil mapping (DSM). In order to assess and prevent soil degradation and to benefit from the different ecological, economical and historical functions of the soil in a sustainable way, high resolution and quantitative maps of soil properties are needed. The core objective of the project is to explore and exploit new capabilities of advanced geophysical technologies for answering this societal demand. To this aim, DIGISOIL addresses four issues covering technological, soil science and economic aspects: (i) the validation of geophysical (in situ, proximal and airborne) technologies and integrated pedo-geophysical inversion techniques (mechanistic data fusion) (ii) the relation between the geophysical parameters and the soil properties, (iii) the integration of the derived soil properties for mapping soil functions and soil threats, (iv) the pre-evaluation, standardisation and sub-industrialization of the proposed methodologies, including technical and economical studies related to the societal demand. With respect to these issues, the preliminary tasks of the DIGISOIL project were to develop, test and validate the most relevant geophysical technologies for mapping soil properties. The different field tests, realized at this time, allow focusing on technological suitable solutions for each of the identified methods: geoelectric, GPR, EMI, seismics, magnetic and hyperspectral. After data acquisition systems, sensor geometry, and advanced data processing techniques have been developed and validated, we present now the solutions for going from such data to soil properties maps.