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Spatio-temporal integration of soil data originating from different sources for the estimation of national carbon stock in Hungary

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Realistic estimation of national carbon stocks should be based on timely reliable and spatially detailed mapping of the distribution of soil organic matter.

The Hungarian Soil Information and Monitoring System (SIMS) is a national monitoring system, with about 1,200 observation sites. These 'representative' sampling sites were selected by regional soil experts on the basis of all available soil information and on their local experiences. The first sampling was carried out in 1992; soil parameters are measured yearly, others every 3 or 6 years, depending on their stability. Thematically very wide range of soil characteristics are covered by SIMS thus providing a unique opportunity for detailed monitoring of the state of Hungarian soils and follow up of major trends in their conditions. Nevertheless SIMS locations were definitely not selected to be spatially representative, the sampling was not designed for spatial extension of spatial information collected at SIMS points. Sampling conception was rather based on thematic and organizational issues. As a consequence SIMS provides vast, suitable information on temporal changes in soil conditions while spatial features of this information are rather unsatisfactory.

To provide reliable spatial inventories on the state of national soil resources (as well as to produce primary, secondary or functional soil maps) SIMS based information should be regionalized by adequate spatial inference of the collected data. As a special application of DSM, this can be also supported by spatially more detailed soil information used as auxiliary environmental information. In this process the existence of an adequate national spatial soil information system with appropriate data structure and spatial resolution is expected as well as a proper methodology for the integration of the different type of datasets.

Digital Kreybig Soil Information System (DKSIS) represents a suitable candidate being the most detailed Hungarian nationwide spatial dataset which covers the whole area of the country. It simultaneously contains two types of geometrical datasets. The approximately 100,000 soil mapping units (SMU) are represented by polygons and are characterized by three attributes. Detailed soil properties are determined and measured in soil profiles. There is representative profile description in the database for about 22,000 sites, which is transferred for further locations, which sums up in approximately 250,000 plots. The fact that soil profile database contains vast soft data in addition to hard data, facilitates the spatial inference of any profile related variable.

In our paper we present how the two dataset were integrated for the spatial inference of recent SOM related data collected in the frame of SIMS which then were used for detailed mapping and calculation of carbon stock in Hungary.