Contextual mapping for acid sulfate soils in Denmark

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Digital Soil Mapping techniques traditionally relate soil observations with point information extracted from different environmental covariates at corresponding locations. This representation of data as vectors at point location only partially describe a soil property. Taking into account spatial contextual information around soil observations thus represents a crucial step forward for Digital Soil Mapping. Considering acid sulfate soils, the use of contextual information would considerably benefit both the mapping of their occurrence and of key soil properties in strategic areas. Accounting for the spatial variability of soil properties, such as incubation pH and titratable acidity, enables an improved management of environmental risks related to acid sulfate soils. Among the various contextual mapping approaches, two are particularly compelling for acid sulfate soil mapping. First, the combination of a mixed-scaling technique with a deep learning algorithm will be assessed for the occurrence mapping. Then, a specific deep learning algorithm called Convolutional Neural Networks, which enables the prediction of a soil property at different depths while preserving the interrelation between depths, will be evaluated for the mapping of soil properties in hot spot acid sulfate soil areas.

The present study will focus on acid sulfate soils located in the wetland areas of Jutland, Denmark (c. 6,500 km2). More than 8,000 soil observations and 18 environmental covariates, including geology, landscape type, land use and several terrain parameters, are available as input data.