Between-fields variation explains 39% of the total soil organic carbon variance in the cropland of Luxembourg

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Evidence exists that the spatial variability of soil organic carbon (SOC) in cropland is partially controlled by environmental or human factors acting on a field basis (e.g. agricultural management, landuse history, landscape structure). However, few studies have quantified the relative importance of the fields-related variability at the regional scale. Recent airborne hyperspectral imagery methods provide SOC estimates at high resolution and over large surfaces. They may be used to quantify and explain the spatial variation of SOC. In this study we used a SOC hyperspectral image over Luxembourg to separate SOC variation in three components: the effect of the texture class (as defined by a texture map), the effect of fields (as defined by a cadastral map) and spatially dependent residues. The relative variance of these components and the spatial structure of the residues were rigorously assessed by restricted maximum likelihood (REML). Results indicate that both the effects of texture and management count for almost half of the total variance each. The amplitude of spatially correlated residues after other effects have been removed is smaller. These findings point out the importance of considering fields-related variability in SOC modeling and mapping studies