**Impacts of organic matter on structure and hydraulic properties of arable clay soils: combining observations, 3D data and simulations**

Jari Hyväluoma1,2, Riikka Keskinen1, Mika Tähtikarhu1, Jukka Kuva3, Helena Soinne1

1Natural Resource Institute Finland (Luke)

2Häme University of Applied Sciences (HAMK)

3Geological Survey of Finland (GTK)

In addition to its importance in carbon storage in soils, soil organic matter is known to play a crucial role in formation of soil structure. Soil organic matter can thereby affect soil structural and hydraulic properties such as porosity, soil water retention, and hydraulic conductivity. We investigated the influences of organic matter content on the structure-related properties of arable clay soils. The set of studied field sites consisted of 19 private farms located in Uusimaa region in Southern Finland with two sites from each farm. Each soil was analysed for texture and total C, and based on the clay and C contents, 10 sites were selected for soil water retention measurements. The aim was to create a series of soils with approximately constant clay content and varying C content. Management history was taken into account by excluding recently ploughed fields from this set of soils. From these 10 sites further 5 were selected for on-site measurement of near-saturated hydraulic conductivity and 3D imaging of the pore structure with x-ray microtomography (30 µm resolution). The imaged soil pore systems were quantified with image analyses for porosity, specific surface area, pore-size distribution and critical pore diameter. Images were used as simulation geometries in pore-scale image-based flow simulations with the lattice Boltzmann method to investigate connections between soil structure and hydraulic properties. According to our preliminary results, organic matter content affected the structural properties of boreal arable clay soils, but the impact did not dominate flow properties of the soils. Flow simulations indicate that single features of the pore system can be dominant and overshadow the possible effects of organic matter.