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Micromorphology of soil surface seals developed on a clay soil from a field site in Essex, southeast England

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There is a body of literature relating to the development of soil seals in sandy and loamy soils, including clay loam, but there is little research describing the development of seals in clay soils. This poster describes the micromorphology of sedimentary soil seals developed in a clay soil (50 – 60% clay) from southeast England. The field site is about 150m^2 and is divided into three plots in a sloping field. The seals were sampled over the course of a winter season (early December 2002 to late February 2003).

Prior to soil saturation there was no development of a sedimentary surface seal. Heavy rains in December and early January caused a perched water table to rise and saturate the soil at which time sedimentary seals began to rapidly develop. The extent of surface seal coverage varied with position over the slope. The surface seal was most extensive at the top of the slope, with up to 90% by the end of January. The surface seal developed more gradually in the lower plot due to an underlying tile drain keeping this area relatively well drained and only 63% cover was reported by the end of February 2003.

Sedimentary soil seal formation began with material being transported from areas of high micro-relief to areas of low micro-relief to form poorly bedded skeleton grain bands in-filling microscopic hollows on the soil surface, which have the affect of beginning to smooth out the profile of the soil surface. Fine-grained material was observed to have been deposited in vughs at greater than 1cm below the surface to form clay skins. After the initial phase of micro-depressions being in-filled, several different types of seals developed at the field site. Some are composed of successive laminae of

sorted sediments that sometimes form fining-up sequences and, combined, are up to 1.5cm thick. These include some deltaic facies. Other seals that formed at the site are composed of fine rounded soil aggregates and/or sorted quartz grain bands.

In this poster we describe how the banding in some of the sedimentary seals can be correlated with individual rainfall events at the site, and how porosity and structure of the different types of seals, and the underlying soil, varies temporally and spatially. The porosity of the samples is measured using image analysis of the thin sections. Porosity was found to be greatly affected by diurnal freeze/thaw action, both within the seals and the underlying soil (in the form of large planar voids, which may penetrate the full depth of the soil seen in thin section). Also, previously stable material at the soil surface becomes remobilised following frost action and deposited as further bands in sedimentary soil seals.