Supplementary Material 2.

The detailed description of the micromorphological thin sections

* The L1red (HCV/A1, Fig. 1) sample. The fabric of the sample was characterized by well-sorted silt-dominated material. In terms of the degree to which they were spherical at all, the locally moderately-oriented platy-tabular shaped particles were sub-spherical or ovoid. Prominent boundaries were detected between particles. The fine material components were characterized by a yellowish brown colour. Few simple packing voids, vughs, channels, intergrain channels/bridged grain microstructures, enaulic/chitonic C/F distributions and undifferentiated, partly porostriated (around chanels, voids) B fabrics were observed in the groundmass of the sample. Laminated/inverse graded microstructures were detected in the thin section also. A few types of pedofeatures were identified in the thin section: (very little) earthworm biospheroid excrement, and, with their frequency ranging between a few and frequent, broken calcified root cells. Amorphous Fe impregnation and nodules were identified also. The organic components of the sample consisted of very few punctuation and organic pigments.
* The L2red (HCV/A2,Fig. 1, Supplem. Mat. 3a) sample was separated into a coarser-grained dominated part and a fine matrix dominated part. The fabric of the coarser grained part of the sample was characterized by unsorted/poorly sorted, sandy clayey loam material. The boundaries between the tabular-blocky, non-oriented particles were distinct. The coarser-grained part was characterized by yellowish plasma (frequent). The matrix of the fine-grained part of the sample was darker brown and oriented coarser grains and microlamination were identified in the plasma-dominated fabric.

No organic material component was identified in the coarse-grained part of the thin section. Organic fragments and a very little monomorphic organic material were identified on the surface of coarser grains or cracks in the walls of the finer-grained part of the sample.

Simple packing voids, pellicular grain-intergrain channel microstructures, chitonic-eualic C/F related distribution and undifferentiated B-fabric were observed in the groundmass of the coarser-grained part of the sample. In the plasma dominated part of the thin section, vughs, channels (few to frequent), destroyed vughy, spongy and granular microstructures, gefuric-porphyric C/F related distribution and destroyed aggregate ped structures were identified (Supplem. Mat.3a). The B-fabric was predominantly undifferentiated, though partly (grano- and poro-)striated B-fabric was also detected.

Frequently occurring amounts of amorphous organic and Fe hidroxide impregnation, destroyed carbonate coatings, and calcified root cells were identified during the study of the pedofeatures.

* The P2upper (HCV/A3, Fig. 1, Supplem. Mat. 3b) sample. The fabric of the sample was characterized by well to moderately sorted, clay loam – silty clay material. The boundaries between the tabular-blocky, subangular-subrounded, partially oriented particles were distinct. Vertically oriented grains could be identified in some parts of the fabric. The fine material components were characterized by a dark brown (dominant) and yellow brown (to a lesser extent) colour (Supplem. Mat.3b).

The organic fine material consisted of a little or very little monomorphic amorphous organic fine material on coarser grain or on the walls of cracks and voids, and very little organic pigment.

Weakly developed crumb aggregates, and weakly developed pedal structures were described in the groundmass. The intragrain channel/vughy structure of microstructure, porphyric (single and double space)/gefuric C/F related distribution and undifferentiated B-fabrics were observed.

Small to very small amounts of organic impregnation, regular amounts of organic grain coatings (organic coatings around grains), and very few intercalations were described in the thin section.

* The P2(HCV/A4, Fig. 1) sample. The fabric of the sample was characterized by moderately sorted, clay loam – silty loam material. The shape of the smooth/undulating grains was tabular/blocky, and the degree of roundness could be characterised as subangular to subrounded.

The fine material components were characterized by a dark brown colour.

Monomorphic amorphous organic fine material on void walls and organic pigments were detected in the fabric of the sample.

Intergrain microaggregate/vughy structures in microstructures, single-space – close porphyric/gefuric structures of C/F related distribution, and vughs were observed.

Little organic impregnation and few intercalations were described in the thin section.

* The P2trans (HCV/A5, Fig. 1, Supplem. Mat.3c) sample. The fabric of the sample was characterized by a moderately sorted silt loam – silty clay loam material. The edge of the tabular-blocky shape particles was smooth to undulating. Distinct to prominent boundaries were detected between particles and plasma.

The fine material components were characterized by a light brown colour and shades of grey.

The organic components of the sample consisted of amorphous organic fine material and organic pigment (very little in amount).

Few to very few vughs, channels, intergrain channel microstructures, gefuric>porphyric (single space) C/F distributions were observed in the groundmass of the sample.

Different types of pedofeatures were identified in the thin section: clay coatings; amorphous and impregnative organic pedofeatures; organic coatings on grains and on channels and void walls. Spherical, fine-grained opaque material was also identified in the thin section (Supplem. Mat.3c).

* The L3 (HCV/A6, Fig. 1, Supplem. Mat.3d) sample. The fabric of the sample was a moderately sorted, silt loam / sandy silt loam material. The shape of the subangular to subrounded, locally oriented particles was tabular or blocky. The fine material components were brown (dominant), yellow brown and grey coloured.

Few ped fragments were described in the sample (Supplem. Mat.3d). Very few simple packing voids were identified in the gefuric/single spaced porfiric C/F related fabric. The microstructure of the sample had a compact grain structure.

A very small amount of organic impregnation and coatings (organic coatings around grains) was described in the thin section. Limonite impregnations/intercalations were identified around the grains of the fabric.The organic fine material consists of a very small amount of monomorphic amorphous organic fine material and very little organic pigment.

* The L3red (HCV/A7, Fig. 1) sample. The locally and moderately oriented, well-sorted silty material was intercalated by less-sorted sandy silt loam. The tabular/blocky shaped, smooth surfaced particles were subangular to subrounded. Distinct contrasts were detected between the particles and plasma. The fine material components were characterized by yellowish brown (common) and grey and brown (C, Fr) coloured material.

The ‘loess’ groundmass was characterized by simple packing voids. Complex packing voids were also described in the ‘microhorizons’ of the fabric. Complex microstructures were identified in the thin section, such as compact grain (common, dominant), bridged grain and intergrain vesicular pore structures. Enaulic/chitonic C/F distributions were observed in the groundmass of the sample.

A very few pedofeatures, Fe/Mn depletions and Fe impregnations were identified in the thin section.The organic components of the sample consisted of small amounts of amorphous, monomorphic material around grains.

* The P3 (HCV/A8, Fig. 1, Supplem. Mat.3e) sample. The fabric of the sample was characterized by moderately sorted, sandy silt loam material. The boundaries between the tabular-blocky, non-oriented, subangular to subrounded particles were distinct. On the other hand, fine grained, locally oriented material was identified, especially around the channels (voids) and also as a biogallery infill. The grains of the infills were well oriented (Supplem. Mat.3e).

The sample was mainly characterized by yellowish brown fine material. Otherwise, dark brown and black patches were identified around the channels.

The groundmass of the thin section consisted of simple packing voids (common), complex packing voids (common), and vughs. Intergrain vesicular, compact grain microstructure, and eualic-chitonic C/F related distributions were observed in the groundmass.

Organic material pedofeatures such as impregnations were identified around the vughs of the fabric.

* The fabric of the L4red (HCV/B1, Fig. 1, Supplem. Mat.3f, g) sample consists of coarser and finer microlayers. The fabric of the coarser-grained part of the sample was characterized by moderately sorted, (sandy) silt loam material with tabular/blocky shaped, oblate/prolate roundness grains. The boundaries between the subangular to subrounded grains were distinct. Locally oriented grains were detected in biogalleries. The fabric of the fine microlayers was characterized by moderately sorted silty clay loam material. The grains of the fine material were tabular or blocky shaped, the roundness of the subangular or subrounded grains was oblate or prolate. The boundaries between the particles were faint. The coarser-grained part was characterized by yellowish plasma (frequent). The matrix of the fine-grained part of the sample was darker brown.

A pellicular grain microstructure, eualic/chitonic C/F related distribution, and undifferentiated B-fabric were observed in the groundmass of the coarser-grained part of the sample. In the finer-grained part of the thin section, intergrain microstructures andchitonic/(gefuric) C/F related distribution were identified. Laminas of redeposited ped fragments were also identified in the thin section (Supplem. Mat.3f).

Amorphous organic impregnation, limonite (coarser part), carbonate coatings (finer part) and clay coatings (Supplem. Mat.3g) were identified during the study of the pedofeatures.

* The P4upper (HCV/B2, Fig. 1, Supplem. Mat.3h) sample. The fabric of the sample was characterized by well sorted, silt loam material. The shape of the smooth surface grains was tabular/blocky and the degree of roundness could be characterised as subangular to subrounded. The boundaries (contrast) between the unoriented, and the locally vertically-oriented grains were prominent (Supplem. Mat. 3h). The fine material components were characterized by a yellowish brown colour. Intergrain microaggregate microstructures, a chitonic/gefuric structure of C/F related distribution, and voids and channels (common) were observed in the non-aggregated material.

Monomorphic amorphous organic fine material and organic pigment were detected in the fabric of the sample. Few organic coating pedofeatures were described in the thin section.

* The P4 (HCV/B3, Fig. 1) sample. The moderately sorted silty clay loam – clayey silt fabric consisted of tabular-blocky shaped, subangular to subrounded particles with smooth surfaces. Distinct boundaries were detected between the unoriented particles. The fine material was characterized by a brown or dark brown colour. Simple packing voids and vesicles were common in the intergrain vesicular microstructure. A gefuric and single space porphiric C/F distribution were observed in the groundmass of the sample. The grade of pedality was weakly developed.

The organic components of the sample consisted of amorphous and impregnative organic fine materials. Amorphous and impregnative organic pedofeatures were identified around the weakly developed peds.

* The P4trans (HCV/B4, Fig. 1) sample. The fabric of the sample was characterized by well to moderately sorted, silty clay/silty clay loam material. The surface of the tabular-blocky, subangular, non-oriented particles was smooth. The fine material components were greyish brown or brown in colour. Intergrain vesicular structures of microstructure and gefuric C/F related distributions were observed.

The pedofeatures consist of monomorphic amorphous organic fine material on coarser grain or on the walls of cracks and voids, varying between few and frequent. CaCO3 impregnations, coatings and hypocoatings were also identified in the fabric.

* The L5(HCV/C1, Fig. 1) sample. The fabric of the sample was a well to moderately sorted, silty clay – clayey silt material. The shape of the smooth grains was tabular/blocky and the degree of roundness subrounded. The contrast between the grains and the plasma varied between distinct and faint. The fine material components were characterized by a brown colour.

Complex structures of microstructure (intergrain mictrostructure and crumb microstructure), porphyric structures of C/F related distribution, complex packing voids (varying from few to frequent), and simple packing voids (common) were observed in the fabric. The grade of pedality was strongly developed.

Some monomorphic amorphous organic fine material and calcified root cells were detected on the fabric of the sample. Carbonate coatings, hypocoatings and limonite impregnation were also described in the thin section.

* The L5red (HCV/C2, Fig. 1) sample. The fabric of the sample was characterized by a well to moderately sorted silt – silty clay material. The edge of the subangular to subrounded, tabular-blocky shape particles was smooth. Distinct to faint boundaries were detected between particles and plasma. The fine material components were yellowish brown or brown in colour. Common simple packing voids, a few compound- and complex packing voids, intergrain vesicular microstructures, and chitonic C/F distribution were observed in the groundmass of the sample.

The organic components of the sample consisted of amorphous organic fine material and organic pigment (very little). Different types of pedofeatures were identified in the thin section: organic and carbonate coatings on channel and void walls.