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Soil and sediments micromorphology: reconstruction of palaeoenvironments, anthropogenic processes, or more recent human impact on ecosystems

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Soils and sediments registered the environmental changes in time and space, but also display components inherited from human activities, both in archaeological and in modern times.
Micromorphological investigations carried out on undisturbed samples of soil and sediments by microscopic and ultramicroscopic techniques, correlated with mineralogy, geochemistry or biology, allow us to interpret the processes behind the formation of regoliths, sediments and anthropogenic deposits, from which a relative chronology, specific environmental conditions and/or extent of human impact may be deduced.

The traditional optical microscopy observations, carried on the thin section groundmass and pedofeatures, provide clues on the different processes behind soils and sediments genesis (weathering, supergene, low T hydrothermal, anthropogenic) and their impact on ecosystems or on palaeoenvironments. In more recent times, the improvements in electron microscope imaging technology permit to make detailed observations up to the nanoscale, opening a new domain of observations to micromorphologists, both as regard of the micromass and of the thinner pedofeatures. Moreover, the optimisation of the microgeochemical mapping techniques, with spatially resolved chemical, isotopic or mineralogical analyses, is another powerful tool to gain insight in chemical migration fronts: the limit of the original rock fabric disappearance may be bypassed.

In order to illustrate micromorphological researches in natural and man-influenced ecosystems, and to combine researches at different scales, several optical and electronic images of soils and sediments groundmass, associated to their microgeochemical characteristics will be presented, with selected examples taken from the climatic record of paleosols, the impact of hydrothermal alteration on saprolites, the neo-formation of minerals related to weathering process evolution, the protosoil formation in natural and human waste deposits, and the forensic scenarios.