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Sieveing crusts and water repellency as key soil properties in mica schist soils in semi-arid SE Spain

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Soils from abandoned fields over mica schist colluvia in Almería (SE Spain), have developed layers of sorted particles below a surface stony pavement. The soil micromorphology of the surface 5 cm shows a progressively downward finer washed-out layer (from gravel to coarse sand) underlayered by a very fine sandy washed-in layer, compacted, crusted-like, only crossed by the roots of sparse bushes, shrubs and eventually annual plants. Such layers are interpreted as a sieving crust, though its hydrological behaviour differs to what previous literature reports: under dry conditions, the washed-in layer shows a high to severe water repellency and infiltrability is consequently restricted (< 5 mm h^{-1}), but once wet, infiltrability is quite high (up to 40 mm h^{-1}) because of its sandy nature.

Both the macroporosity (evaluated by image-analysis of polished impregnated blocks) and water repellency of the sieving crust (evaluated by the water drop penetration time, WDPT), provide key elements to explain the hydropedological behaviour of these soils especially in the first stages of a rainfall event. As only the washed-in layer of the sieving crust shows hydrophobicity, some elements of discussion are provided to consider water repellency as a key element in the formation and further evolution of sieving crusts in such environment.

Once the subsurface fine-particle layer of the sieving crust outcrops due to the removal by erosion of the upper layers, the hydrological behaviour changes, with consequences for the further soil evolution.

Moreover, the spatial variability of these layers regarding both morphology, physical and chemical properties, including hydrophobicity, which change along the hillslope,

under bare soil and under perennial plants, and also with the age of land abandonment, provide key elements for the understanding of the hydropedological behaviour at hillslope scale. Knowing how these sieving crusts form and evolve, and their exact relationship with water repellency, are important points for designing adequate soil management and conservation.