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Bedrock alteration's role in the formation of (micro-)aggregates and the development of the soil structure: A profile-for-time-research approach.

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The development of soil structure and (micro-)aggregates may be initiated by the alteration of fluid-exposed surfaces of the parent rock during weathering, with the bedrock type and the void/fracture network as essential determinants. Biochemical and physical weathering of primary minerals causes rock disintegration and element release, but also the formation of, e.g., secondary clay minerals, metal (hydro)oxides, and aluminosilicates, and the incorporation of rock and mineral fragments into the soil structure. Periodic drying and flushing by meteoric waters provides alternating hydro- and biogeochemical conditions for fluid-rock interactions and provokes the dissolution, displacement, and relocation of minerals as well as the release or adsorption of colloids. As a result, the seepage suspension is enriched with mobile mineral and organic matter that infiltrates the bedrock-void system, thereby feeding aggregate-forming materials including mobile organic matter to exposed surfaces of the bedrock, initiating aggregate formation.

We aim to elucidate the differences of bedrock surface alteration processes as a function of mineral composition, seepage, and the fracture network during weathering in a humid continental climate. To do so, we investigated by a profile-for-time-approach the bedrock-soil continuum in Central Germany, starting from the pristine bedrock to regolith and subsoil of different bedrock types, including sedimentary, igneous, and metamorphic rocks. We gain information on textural, petrological, mineralogical, and chemical properties with a suite of methods, including stereo and polarization microscopy, scanning electron microscopy with energy-dispersive X-ray spectroscopy (SEM-EDX), FTIR-spectroscopy, X-ray diffraction (XRD) analyses, and inductively coupled plasma mass spectrometry (ICP).

With this contribution, we present the results on carbonate and felsic-silicate bedrock types about aggregate formation and structure development during pedogenesis.