Biogeochemical Interfaces In Soil Microaggregates: Understanding Processes And Functions At The Mechanistic Level

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Soil hosts a vast variety of organic and inorganic constituents and organisms. The different components are spatially arranged in a dynamic and frequently hierarchically organized system of aggregates. Within this system, the microaggregates <250µm are supposed to be of primary importance because of their stability, persistence and ubiquitous presence. The different organic, inorganic and biological components that build these microaggregates define a complex, hierarchically structured and extremely large biogeochemical interface to the liquid and gaseous phases that capture the void network. The physical, chemical, and biological heterogeneity of these interfaces is the source of a multitude of habitats and supports a vast biological abundance and functional diversity. Although microaggregate and interface research is one of the most rapidly growing and competitive fields of soil science, in particular the interplay and the interdependencies of the multitude of biochemical and biophysical processes in view of the properties, functions and resilience of soils have yet to be unravelled. This requires integration of soil physical, chemical and biological disciplines and demands the application and development of joint advanced characterization and probing techniques including molecular biology within a multi- and inter-disciplinary research approach. Within the framework of the research unit 2179 “Microaggregate development and turnover in soil” and its preceding priority research program 1315 “Biogeochemical Interfaces in Soil”, two structured inter-disciplinary research programs have been launched that aim at the systematic structural characterization and functional exploration of microaggregates and the biogeochemical interfaces hosted therein. The joint and overarching scientific goals are to gain a mechanistic understanding of the complex interplay and interdependencies of the physical, chemical and biological processes that result in the formation and turnover of microaggregates and the associated biogeochemical interfaces and to elucidate their role for the properties, functioning and resilience of soils.