Geophysical Research Abstracts
Vol. 18, EGU2016-8119, 2016
EGU General Assembly 2016

Effect of aggregation on SOC transport: linking soil properties to sediment organic matter

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Soils are an interface between the Earth's spheres and shaped by the nature of the interaction between them. The relevance of soil properties for the nature of the interaction between atmosphere, hydrosphere and biosphere is well-studied and accepted, on point- or ecotone-scale. However, this understanding of the largely vertical connections between spheres is not matched by a similar recognition of soil properties affecting processes acting largely in a lateral way across the land surface, such as erosion, transport and deposition of soil and the associated organic matter. Understanding the redistribution of eroded soil organic matter falls into several disciplines, most notably soil science, agronomy, hydrology and geomorphology, and recently into biogeochemistry. Accordingly, the way soil and sediment are described differs: in soil science, aggregation and structure are essential properties, while most process-based soil erosion models treat soil as a mixture of individual mineral grains, based on concepts derived in fluvial geomorphology or civil engineering. The actual behavior of aggregated sediment and the associated organic matter is not reflected by either approach and difficult to capture due to the dynamic nature of aggregation, especially in an environment such as running water. Still, a proxy to assess the uncertainties introduced by aggregation on the behavior of soil/sediment organic while moving in water across landscapes and into the aquatic system would represent a major step forward. To develop such a proxy, a database collating relevant soil, organic matter and sediment properties could serve as an initial step to identify which soil types and erosion scenarios are prone to generate a high uncertainty compared to the use of soil texture in erosion models. Furthermore, it could serve to develop standardized analytical procedures for appropriate description of soil and organic matter as sediment.