Geophysical Research Abstracts
Vol. 15, EGU2013-6776, 2013
EGU General Assembly 2013
© Author(s) 2013. CC Attribution 3.0 License.

Linking soil and sediment properties for research on biogeochemical cycles

Nikolaus J. Kuhn
University of Basel, Physical Geography, Environmental Sciences, Basel, Switzerland (nikolaus.kuhn@unibas.ch)

Conventional perspectives on soil erosion include the on-site damage to soil and reductions in crop yield, as well as the resulting off-site effects on water quality, runoff and sediment loads in rivers. Our evolving understanding of the Earth System has added a new dimension to the role of soil erosion within the global geochemical cycles. First, the relevance of soil as a nutrient and Carbon (C) pool was recognized. Initially, the role of soils in the global C cycle was largely considered to be limited to a vertical exchange of greenhouse house gases (GHG) between vegetation, soil and atmosphere and thus mostly studied by soil scientists, plant ecologists and climatologists. Even Critical Zone research focused mostly on weathering and regolith properties and ignored lateral fluxes of dissolved or particulate organic matter. Since the late 1990s, a wider role of soils in biogeochemical cycles has emerged. Recent estimates place the lateral movement of C between soil and sediment pools in terrestrial ecosystems (including rivers and lakes) at approximately 0.6 to 1.5 Gt per year. Some of the eroded C is replaced by photosynthesis from the atmosphere, but at a cost of additional emissions, for example due to fertilizer production. The long-term fate of the eroded and deposited soil organic matter is subject to an open debate and suffers from a lack of reliable spatial information on lateral C fluxes and its subsequent fate in terrestrial ecosystems.
The connection between soil C pool, GHG emissions and erosion illustrates the relevance of surface processes for the C fluxes between Earth's spheres. Accordingly, soil is now considered as mobile system to make accurate predictions about the consequences of global change for terrestrial biogeochemical cycles and climate feedbacks. This expanded perspective on soils as dynamic pool of weathering regolith, sediment, nutrients and C at the interface between the geospheres requires the analysis of relevant soil properties, i.e. nutrient or C content, with regards to their mobility within local, regional and global biogeochemical cycles, including past, current and future rates of transfer. In this presentation, an initial framework illustrating a concept for linking soil properties and the mobility (lateral and vertical) of nutrients and organic matter critical for environmental conditions and services is developed.