Geophysical Research Abstracts
Vol. 18, EGU2016-8139, 2016
EGU General Assembly 2016

Rangelands: a closing carbon sink?

Nikolaus J. Kuhn
University of Basel, Institute for Urban and Landscape Studies, Basel, Switzerland (nikolaus.kuhn@unibas.ch)

Two thirds of the world's agricultural land is suitable for grazing only. Much of this land has experienced severe erosion due to mismanagement, massive redistribution of soil and sediment, and significant degradation of vegetation. As a consequence, geochemical cycles have changed. Unlike croplands, the impact of degradation on nutrient fluxes is hardly compensated on rangelands, potentially disturbing the carbon cycle because of the declining biomass production and the subsequent conversion of litter into soil organic matter. Over time, the degradation leads to a decline in soil C stocks and, if associated with soil erosion, also to a decline in carbon transfer from soil into sediment sinks. A priory reasoning suggests that during the degradation process, with soil productivity not yet massively affected, the Carbon transfer initially increases because soil erosion rates are also greater than in the non-disturbed system. With most soil degradation in rangelands occurring during the past 200 years, this mechanism on a large part of the global land area could have generated an unintentional terrestrial carbon sink during a time period with increasing industrial CO_2 emissions.
Using global data on soil degradation, soil erosion, soil carbon stocks and dynamics to simulate their interaction and potential role for rangeland carbon cycles supports the assumption that rangelands may have functioned as a carbon sink, but reveals major uncertainties with regards to the size. This highlights the need to improve our knowledge and understanding of rangeland erosion, landscape change and soil formation, both with regards to the recent past, but also the impacts of their future use and climate.