Geophysical Research Abstracts
Vol. 18, EGU2016-4749-2, 2016
EGU General Assembly 2016

Soil organic carbon erosion and its subsequent fate in the Karoo rangeland

Juliane Krenz (1), Philip Greenwood (1), Brigitte Kuhn (1), Goswin Heckrath (2), Ian Foster (3), John Boardman (4), Michael Meadows (5), and Nikolaus Kuhn (1)

(1) Department of Environmental Sciences, University of Basel, Switzerland (juliane.krenz@unibas.ch), (2) Department of Agroecology, Aarhus University, Denmark, (3) School of Science and Technology, University of Northampton, UK, (4) Environmental Change Institute, University of Oxford, UK, (5) Department of Environmental and Geographical Science, University of Cape Town, South Africa

The rangelands of the Great Karoo region in South Africa have experienced a number of environmental changes. With the settling of European farmers in the second half of the 18th century, agricultural activities increased, leading to overgrazing and probably representing a trigger to land degradation. Ongoing land-use change and shifting rainfall patterns resulted in the development of badlands on foot slopes of upland areas, and complex gully systems in valley bottoms. Many dams and small reservoirs have been constructed to provide drinking water for cattle or to facilitate irrigation during dry periods, as a consequence of agricultural intensification. Most of the dams soon in-filled with sediment and many were eventually breached. Such a process offers the potential to use these breached dams as an environmental archive to analyse land use changes as well as carbon (C) erosion and deposition during the last ca. 100 years.
In this ongoing project, a combination of analytical methods that include drone imagery, landscape mapping and sediment analysis have been employed to determine whether land degradation in the Karoo has resulted in the reversion from a net sink of C to a net source of C. Firstly, drone imagery will be used to produce a high-resolution digital elevation model for areas especially prone to erosion and for determining the volume calculation of eroded sediment in the catchment area. Secondly, sediment deposits from the same silted-up reservoir were analysed for varying physicochemical parameters, in order to analyse and reconstruct erosional and depositional patterns. Total Carbon (TC) content was recorded and the sharp decrease in total C content with decreasing depth suggests that land degradation during and after post-European settlement probably led to accelerated erosion of the then relatively fertile surface soils. This presumably resulted in the rapid in-filling of reservoirs with carbon-rich surface material which is found at the base of many dam deposits. Low organic Carbon (OC) content in the top layers of the reservoir in-fill, and in the eroded source areas, supports the assumption that the eroded material was transported from the degraded areas down into the reservoir, where it settled. This raises a crucial question of whether the decline of C sinks in degraded rangelands due to exacerbated soil erosion may have had a greater attenuating effect on GHG emissions than modelled scenarios of present emissions suggest.