

In-filled reservoirs serving as sediment archives to analyse soil organic carbon erosion – Taking a closer look at the Karoo rangelands

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The semi-arid rangelands of the Great Karoo region in South Africa, which are nowadays characterized by badlands on the foot slopes of upland areas and complex gully systems in valley bottoms, have experienced a number of environmental changes. With the settlement of European farmers in the late 18th century agricultural activities increased, leading to overgrazing which probably acted as a trigger to land degradation. As a consequence of higher water demands and shifting rainfall patterns, many dams and small reservoirs have been constructed to provide drinking water for cattle or to facilitate irrigation during dry periods. Most of these dams are now filled with sediment and many have become breached, revealing sediment archives that can be used to analyse land use changes as well as carbon erosion and deposition during the last ca. 100 years.

In this ongoing project, a combination of analytical methods that include drone imagery, landscape mapping, erosion modelling and sediment analysis have been employed to trace back the sediment origin and redistribution within the catchment, setting a special focus on the carbon history.

Sediment deposits from a silted-up reservoir were analysed for varying physicochemical parameters, in order to analyse erosional and depositional patterns. A sharp decrease in total carbon content with decreasing depth suggests that land degradation during and after the post-European settlement most likely triggered erosion of the relatively fertile surface soils which presumably in-filled the reservoirs. It is assumed that the carbon-rich bottom layers of the dam deposits originate from these eroded surface soils. A combination of erosion modelling and sediment analysis will be used to determine the source areas of the depositional material and might clarify the question if land degradation in the Karoo has resulted in its return from being a net sink of carbon into a net source of carbon.