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Assessing the effect of biochar on erosion by using a high precision rainfall simulator

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Numerus studies have explored the effect of biochar as a soil amendment and its beneficial effects on different soil properties. Adding biochar to soils might also act as a long-term carbon sink, which would mitigate the anthropogenic climate change. However, there are limitations regarding the current process knowledge on the effects of biochar on soil erosion and its erodibility. First test results point towards lower erosion rates of the substrates, which were enriched with biochar. In contrast, biochar concurrently shows relatively high erosion rates due to its lower bulk density, which makes it more susceptible to erosion. However, the number of conducted experiments does not yet allow quantitative statements. The overall objectives of this study are to gain insight into the process knowledge of erodibility of soils with incorporated biochar, and to develop new techniques for their observation. A drip type rainfall simulator is used on a microscale flume (0.2m2) to be able to control and monitor the thin surface flows and rainfall characteristics precisely. Two different types of biochars (high and low temperature pyrolysis) are used in combination with different substrates ranging from pure sand to naturally developed soils. Depending on the particle size and density of the biochar, different erosion rates can be observed. Particle analysis of the eroded material produces insights into which particle sizes and forms are preferably eroded. Since differentiation between eroded soil organic matter and biochar is very difficult without the use of heavy acids, two new methods are being developed and tested to monitor erosion rates of biochar. Comparing the original substrate with the eroded sediment by means of photogrammetry and isotope analysis, it should be possible to infer how much biochar was discharged and to assess the actual particle movement on the erosion flume. The results of this study could provide guidelines for the types of biochar that should be incorporated into fields as well as to calculate the potential monetary loss due to biochar discharge through rainfall events.