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Bringing together monitoring of soil erosion and rainfall simulations

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Soil erosion is a non linear process depending on soil conditions and the rainfall characteristics. As a consequence, the monitoring and quantification of soil erosion and sediment yield faces great difficulties related to the occurrence of erosional events and the variability of soil charcateristics. Numerous research groups have been using rainfall simulators to quantify soil erosion under reproducible conditions, especially facing the comparision of different land use and soil management systems. But there is only little evidence of the comparability of the results of rainfall simulations with the real soil erosion.
As a consequene, the following questions arise: reflect both methods the same or similar process complexes? Which orders of magnitude or overland flow and erosion do they reflect? Resuming: are the results comparable?
For adressing this questions, we compared two adyacent parcels on a SSW exposed slope (steepness 35 %) on slate vineyard soils. One of the parcels was stubbed right before the installation of the sediment traps, the other one remained unchanged. 4 rainfall collectors were installed on soil surface, and daily rainfall amount was recorded in 3 meteorological stations only few kilometers away. The traps and the collectors were cleaned out after every large rainfall event.
15 rainfall simulations (4 on the unchanged area, 11 on the stubbed surface) were performed with a portable, pressure driven nozzle rinfall simulator, generating rainfall with an intensity of 40 mm h-1 during 30 min on a plot with 60 cm diameter. Surface runoff and sediment yield was collected in 5 min intervals during the experiment's duration.
The runoff collected in traps on the stubbed parcel was 10 to 15 times higher than in the unchanged vineyard. Soil loss was up to 6 times higher. Contrasting with this, the results from rainfall simulations showed a very much lower difference between both sites.
The portable rainfall simulator used in this study is able to reflect qualitative differences between different soil management types, but seems to understimate runoff generation and sediment yield. This is considered to be the effect of the limited porcess variability inside the rainfall simulator plot, this is detachment and incipient runoff. Additionally, we assume a considerably lower energy of the rainfall generated than the one of natural rain. Another consraint on comparability is the different temporal resolution of both systems.