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Wind driven rain as a new challenge for in situ rainfall simulation experiments

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With small portable rainfall simulators, around 400 rainfall simulations on different sites and soils in West- and North Africa, South- and Central Europe were carried out in the past 15 years.
Objectives ranged from erodibility of local soils regarding different vegetation and stone covers, runoff generation in gully catchments, process oriented experiments with sealing and crusting, trail erosion by goat-trampling, to recent erosion on geomorphological forms. A huge mass of data was collected yielding a lot of interesting results for some questions. Runoff coefficients range from 0 to 100% and eroded material from 0 to 463 g/m^2.
Natural rain events often occur as rainstorms, adding a driving component to the falling raindrops. Unfortunately, most experimental soil erosion studies either focus on water- or on wind erosion, because among other reasons, especially the comparability between wind and water sediment fluxes and rates cause problems. Nevertheless, the influence of wind on raindrops is undoubtedly strong enough to be taken into account when erosion measurements are performed.
For in situ assessment of this influence on soil erosion rates a portable combined wind and rainfall simulator was constructed. The main objective was to get first results to compare erosion rates with and without the influence of wind on plot scale. Test duration is 30 min (10°min) with intervals of 2.5 min for surface runoff and eroded material and are performed in four variations in the following order: 1) Single wind test run (10 min), 2) single rainfall test run on dry soil conditions, 3) single rainfall test run on moist soil conditions, 4) simultaneous wind and rainfall test run. Comparing test runs in combination with wind to runs without wind on moist surface, first results show no distinctive trend for runoff, but eroded material increases from 1.5% to maximum values of up to 226%. This indicates the influence of wind on the kinetic energy and impact angle of raindrops and consequently on detachment and provision of soil particles. Nevertheless, the sequence of test runs should be discussed, because, compared to single rainfall simulations on dry soil conditions, runoff- and erosion rates are considerably lower.