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RUNON a hitherto little noticed factor - Field experiments comparing RUNOFF/RUNON processes

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When ponded water moves downslope as overland flow, an important process called runon manifests itself, but is often ignored in rainfall-runoff studies (Nahar et al. 2004) linking infiltration exclusively to rainfall. Runon effects on infiltration have not yet or only scarcely been evaluated (e.g. Zheng et al. 2000). Runoff-runon occurs when spatially variable infiltration capacities result in runoff generated in one location potentially infiltrating further downslope in an area with higher infiltration capacity (Jones et al. 2013). Numerous studies report inverse relationships between unit area volumes of overland flow and plot lengths (Jones et al. 2016). This is an indication that the effects of rainfall and runon often become blurred.

We use a coupled hydrological/2D hydrodynamic model to simulate surface runoff and pluvial flooding including the associated infiltration process. In frame of the research project SAFFER-CC (sensitivity assessment of critical condition for local flash floods – evaluating the recurrence under climate change) the influence of land use and soil conservation on pluvial flash flood modeling is assessed. Field experiments are carried out with a portable irrigation spray installation at different locations with a plot size 5m width and 10m length. The test plots were subjected first to a rainfall with constant intensity of 100 mm/h for one hour. Consecutively a super intense, one hour mid accentuated rainfall hydrograph was applied after 30 minutes at the same plots, ranging from 50 mm/h to 200 mm/h for 1hour. Finally, runon was simulated by upstream feeding of the test plots using two different inflow intensities.

The irrigation test showed expected differences of runoff coefficients depending on the various agricultural management. However, these runoff coefficients change with the applied process (rainfall or runon). While a decrease was observed on a plot with a closed litter layer, runoff coefficient from runon increases on poor covered plots. At the same time, a similar variety in the characteristics of the infiltration behavior between rainfall and runoff could be observed.

This extension of artificial rainfall simulations with concurrent and successive runon tests will enhance our process understanding.