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Large plot erosion simulations on Alpine area

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We propose an experimental setup to measure soil erosion and related it with sediment transport using rainfall simulator on a large plots experimental area. Experiments were carried out in fulfilment of the HERASE project, aimed at investigating the seasonal variations of soil erosion in the Oglio basin, an Alpine and Pre-alpine watershed with an area of about 1800 km², and maximum elevation of 3.538m a.s.l.

Namely some rainfall simulation experiments were carried out to assess water erosion under three different scenarios, on in situ plots having same soil and slope, but with different soil coverage and initial moisture condition.

In particular, two experiments were carried out on a grassland plot covering an area of 144m², one considering an undisturbed initial soil moisture condition and the other on a wet soil. The third experiment plot, having the same soil and slope of the previous, and covering an area of 72m², was set up in the pine forest underwood area.

The duration of the three experiments were respectively of 18 minutes, 30 minutes and 30minutes and rainfall intensity was set equal to 70mm/h, accordingly to a 200 return period storm. The plots were properly designed to ensure a correct as possible measure of surface runoff, and transported sediments were collected at 1 minute steps. Suspended sediment, and particle size analysis were carried out ex-post.

Our results show a different behaviour of the two analysed plots, in terms of runoff generation and sediment transport. The runoff peak on grassland ranged from 0.018l/s for the undisturbed condition, to 0.09l/s with wet initial condition, while the peak in sediment transport, slowly delayed with respect to the runoff peak, was 1,7 times bigger in wet conditions.

In the third experiment, peak runoff was 0.9l/s (10 times bigger than the peak runoff on wet grassland), and constant until the end of simulated rainfall, and took five minutes to run out (concentration time). The analysis on sediment shows an initial slush, where pine needles composed the majority of sediment. Then, after the sediment reached the peak of 350mg/s after about 9 minutes from the beginning of the experiment, it decreased rapidly to an almost constant value of 50mg/s. Interpretations on experiment results with different formulations and a comparison with similar analyses carried out in the Alpine area of Italy are proposed.