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Analyses of rainfall- triggered shallow landslides in Switzerland

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In August 2005 heavy rainfall (up to 300 mm in three days) triggered off more than 5000 shallow landslides in Switzerland and caused vast damage. Usually such slides comprise only little volume. But their threat is substantial, as they occur suddenly and both spatial and temporal forecasting are extremely difficult. The events provide an opportunity to improve knowledge on the causes of shallow landslides and on their run out action.

Three study areas with surface areas from 2 to 5 km^2 each were defined in different regions affected by heavy rainfall. Within these study areas, all landslide processes with a volume of more than 30 m^3 (i.e. a total of 132 slides) were analysed in the field. Following a standardised protocol, geomorphological, geological and geotechnical parameters were assessed for every landslide as well as aspects of soil physics, vegetation and run out action.

This contribution contains selected results of the three case studies of the 2005 events and points to similarities and differences. Furthermore, the findings are compared to the results of similar investigations in Switzerland in connection with the hazard events of 2002 (regions of Napf and Appenzell, 133 slides investigated) and of 1997 (region of Sachseln, 280 slides investigated). For instance, slope inclination was an important parameter in all regions, but range and mean values of the observed inclinations varied markedly from region to region. Concerning the dimensions of the landslide scars, only little differences between slides in forest and slides in open land exist. But mostly, slides in forest occur on steeper slopes. Other results show, that geomorphology seemed to be relevant in some of the regions, whereas at the study site of Sachseln, the importance of the shape of terrain was marginal. Nevertheless in all studies

very few landslides were observed in areas with concave longitudinal profiles. Despite some differences between the studies concerning the mean volume of the slides, most shallow landslides are small, i.e. mostly with volumes of less than 300 m^3. Yet, their hazard potential is high, as they usually end as debris flows. The observed shadow angles of the run out trajectories range from 17 to 40˚.

Nowadays, assessment, modelling and mapping of shallow landslides are still very difficult. Case studies as the described can help to improve knowledge on shallow landslides. The collected data enable more detailed analyses in the near future.