How predictable is the behaviour of torrential processes: two case studies of the summer 2012

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Debris flow hazards play an important role in the Austrian Alps since many villages are located on alluvial fans. Most of the mitigation Measures as well as Hazard Zone Maps are designed by engineers of previous generations, who know quite a lot about the torrential behaviour from their experience. But speaking in terms of recurrence intervals of 100 years or even more, human memory is restricted.

On the other hand numerical modelling is a fast growing task in dealing with natural hazards. Scenarios of torrential hazards can be defined and accordant deposition pattern, flow depths and velocities are calculated. But of course, errors in the input data must lead to fatal errors in the results, consequently threaten human life in possible affected areas.

Thus the need for data collection of exceptional events can help to reproduce the reality in a quite high grade, indeed, but unexpected events are still an issue and pose a challenge to engineers.

In summer 2012 two debris flow events occurred in Austria with quite different behaviours, from triggering mechanism and flow behaviour through to deposition: Thunderstorms or long lasting rainfall, slope failures with subsequent channel blockage and dike breaching or linear erosion, one or more debris flows, one huge debris flow surge or a series of debris flow surges, sediments without clay or cohesive material, near channel deposition or outspread deposits.

Both debris flows have been unexpected in their dimension, although mitigation measures and hazard maps exist. Both events were documented accurately, first to try to understand the torrential process occurred, second to identify the most fitting mitigation measures, ranging from permanent structures to temporary warning systems.