ETH zürich

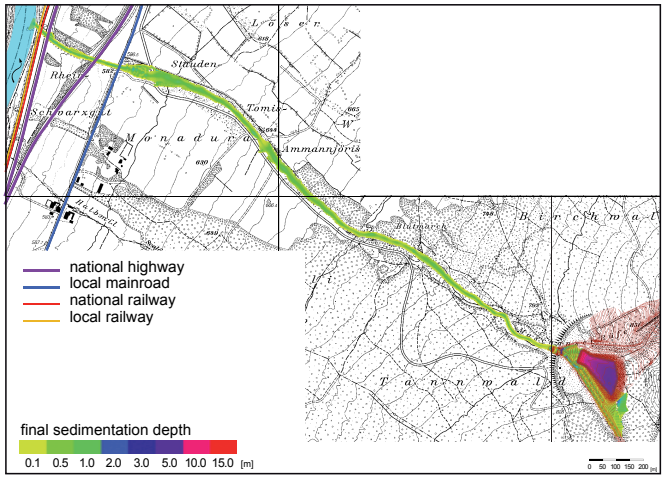
Maschänserrüfe (GR): Debris flow regulation in a sediment basin

Development of transport channel system with confined capacity in the sediment basin upstream the endangered infrastructure using a physical model.

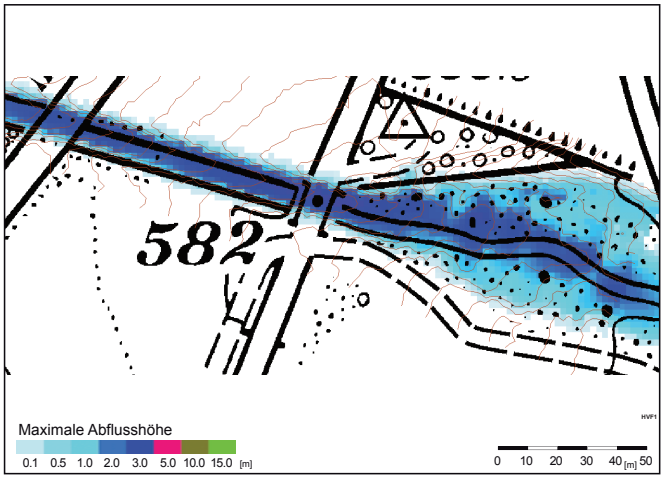
In the catchment area of the Maschänserrüfe near Trimmis debris flows occur regularly and endanger infrastructure such as the National Highway, local main road, National Railway, and private railway. To protect infrastructure a sediment basin of 400'000 m^3 capacity 2 km upstream was constructed 30 years ago. Due to recurrent debris flows the capacity of the sediment basin has been dramatically reduced during this period. Today material must be excavated at high costs to guarantee security of infrastructure downstream.

In order to maintain security of infrastructure but to reduce excavation costs, a solution is required which enables the dosing of the arriving debris flows. The solution was found in the sediment basin and consists in a system of transport channels of reduced capacity. The capacity of this channels is smaller than the local channel capacity at the downstream infrastructures. This solution enables to reduce the maximum discharge and the volume of the debris flows to values which do not endanger the downstream infrastructure. On the other hand deposition of debris flow material in the sediment basin and thus corresponding excavation is reduced.

The solution has been developed and optimized in the physical model of the sediment basin. An overall test was then made in the numerical model using the code flo-2D. Here the simulation area covered the area from upstream of the sediment basin to downstream of the endangered transport infrastructure and the entrance in the river rhein.



Final sedimentation depth after a large debris flow event of 150'000 m^3 in the area from the sediment basin (down right) to the entrance in the river rhein (up left) calculated with the code flo-2D.



Local maximum flow depths for a large debris flow of 150'000 m^3 in the upper area of the endangered bridges (local main road and north lane of National Highway) calculated with the code flo-2D.

Keywords: Debris flows, Debris flow dosing, Debris flow hazard mitigation, sediment retention basin
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