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Application of a combined and automated monitoring and early warning system for debris flows at the Dawinbach

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After a heavy rainfall event on August 31st, 2019, a debris flow at the Dawinbach in the municipality of Strengen (Tyrol, Austria) caused a blockage of the culvert below the provincial road B-316 and deposition in the residential area. The debris deposition raised up to 2 to 3 meters on the road and led to property damage to real estate. The total volume of the debris flow was approximately 15 000 cubic meters.

In order to control a further debris flow of this magnitude, the Austrian Service of Torrent and Avalanche Control started to construct mitigation measures. They include a channel relocation in order to significantly increase the channel crosssection. Hence the construction company STRABAG is also relocating the provincial road bridge.

Since the risk for this road section and for the workers on site is particularly high during the construction period, a combined monitoring and early warning concept was developed and implemented by the BOKU, Vienna and the company IBTP Koschuch.

The monitoring site consisting of a pulse compression radar and a pull rope system was installed 800m upstream from the fan. The combination of the two sensors now results in three major advantages.

- At sensor level, the system operates redundantly.
- A more reliable differentiation between increased discharge or debris flow is given.
- In the event of a false alarm, the system provides easier diagnosis and assignment of the fault.

Two events of increased runoff occurred during the deployment period. Both were successfully detected by the pulse compression radar. Here, the first event was used for threshold validation of the radar unit. Thus, an alarm could already be sent out automatically for the second one. The road is controlled by an integrated light signal system consisting of three traffic lights. A siren near the construction site can warn workers of an impending event by means of an acoustic signal. The reaction time after the alarm has been triggered is between 75 and 150 seconds, depending on the speed of the debris flow. The responsible authorities are informed by sending an SMS chain, which includes details about the type of process and the type of the activated triggering system.

