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Real scale debris flow experiments at Schesatobel/Austria

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In Austria's biggest erosion area (Schesatobel) west of Bludenz (Vorarlberg) artificial debris flows have been triggered in a test channel with a total length of approximately 200 meters. The experiments were conducted in order to better understand the transport process itself and to increase the knowledge about the fluid-structure interaction. The experimental channel can be divided into an erosion and a transit reach with a length of circa 100 meters, respectively. At the upper end of the channel a water reservoir of about 2000 m^3 is located. By opening this reservoir with the help of an excavator a water discharge of 1.5 m^3/s was produced, that initiated a debris flow within several meters, creating an erosion channel. Downstream the average inclination of the transport channel is about 20%. In the transit reach of the channel different parameters, like velocity, discharge depth, fluid pressure, and seismic and infrasound emission of the triggered debris flows have been measured and documented with the help of modern measuring techniques (video cameras, ultrasonic detector, load cells, geophones and measuring microphones). The used load cells are pressure sensors with a measuring range from 0.3 to 6 kN placed into a steelbox. These load cells were screwed up on a massive construction, which was installed directly into the transit reach of the test channel. Because of the signal of this pressure measurement it was possible to distinguish impact loads, produced from the forces of single boulders and fluid dynamic pressure parts. The signal parts of the impact forces reaches their maximum at about 8 kN with a typical time duration of only 1/100 second, which could be confirmed in a laboratory test. The fluid dynamic pressure was up to 40 kN/m^2, which was nearly the maximum of the used load cells. Further it was possible to improve and calibrate all the measuring systems, which have been used in this experiment.