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The Flimser Bergsturz - A new perspective on failure mechanisms and kinematics

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The Flimser Bergsturz, which happened about 9000 years ago and involved a volume of 8-9 km3, is the largest rockslide event in the European Alpine belt and one of the largest in the world. The landslide deposit covers an area of around 52 km2 in the Vorderrhein valley. According to its characteristics, the Flimser Bergsturz can be termed a rockslide which transformed into a very rapid rock avalanche (Sturzstrom). Although a sliding plane is clearly visible close to the head scarp, there is no published work addressing the release mechanisms and the kinematics of the rockslide in detail. In the current work, extensive field and photogrammetric discontinuity surveys in the head scarp area and the first-time creation of 2D and 3D models of the release area give new insights on release mechanisms and kinematic processes. Detailed discontinuity surveys and mapping at the scarp provide information on persistent structures and consequently potential release mechanisms. In addition, existing descriptions of the landslide deposits, including locations and dimensions of intact rock slabs, suggest possible kinematic processes such as translational sliding. Distinct features such as the undulating sliding plane, which shows a mean dip of about 25° to the south, or the large step-forming features oblique to sliding direction, indicate the rupture surface geometry. The importance of persistent fracture sets can be seen in the morphology of the Flimserstein, which is controlled by these sets. A conceptual model of the evolution of the landscape in the failure area is developed using geomorphological maps and reconstructions of pre-event topography. With the aid of modeling programs, such as Phase2 and RS3 (RocScience 2014), 2D as well as 3D slope stability models are generated, and constrained by field observations and geomorphological mapping.