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A large landslide in volcanic rock: failure processes, geometry and propagation

I Putu Krishna Wijaya (1,2), Christian Zangerl (1), Wolfgang Straka (1), Martin Mergili (1,3), Shiva Prasad Pudasaini (4), and Yukni Arifianti (5)

(1) Institute of Applied Geology, University of Natural Resources and Life Sciences (BOKU), Vienna, Austria, (2) Sepuluh Nopember Institute of Technology, (3) Department of Geography and Regional Research, University of Vienna, Vienna, Austria, (4) Department of Geophysics, University of Bonn, Bonn, Germany, (5) PVMBG, Bandung, Indonesia

The Jemblung landslide in Banjarnegara, Indonesia was one of the most destructive landslides in the country since 2006. This landslide caused at least 90 deaths while more than 1300 people were evacuated to safer areas. Concerning the failure mechanisms and type of material, the event can be characterized as a complex landslide (earth slide to earth flow). It originated in volcaniclastic soil/rock, i.e. andesites and lapilli-tuffs of varying degrees of weathering that lie above tuffaceous sandstones, conglomerates, as well as an alternation of shale and brown coal layers.
Unmanned aerial vehicle (UAV) data from a secondary database are processed by using photogrammetric software to obtain an overview of the landslide geometry before and after the failure event. Stratigraphic field data and geoelectrical measurements are compared and correlated to build a geological-geometrical model and to estimate the volume of the landslide. Petrographical and XRD analysis are conducted to explain the mineral composition of parent rock and its weathering products. Rainfall as well as seismologic data are collected to study potential trigger and failure mechanisms. The geological-geometrical model of the landslide, digital terrain models of the process area and geotechnical soil properties are combined to model the initial sliding process by applying limit-equilibrium software products. Furthermore, the landslide propagation is simulated with the novel, GIS-based, two-phase mass flow modelling tool r.avaflow in order to improve the understanding of the dynamics of the Jemblung landslide.