Geophysical Research Abstracts
Vol. 19, EGU2017-17430, 2017
EGU General Assembly 2017

Rainfall events as landslide triggers – implications for the evolution of the SW-German cuesta landscape

Jan Henrik Blöthe (1), Joachim Götz (2), Hannah Berger (3), and Daniel Jäger (4)

(1) University of Bonn, Department of Geography, Bonn, Germany (jan.bloethe@uni-bonn.de), (2) University of Salzburg, Department of Geography and Geology, Salzburg, Austria, (3) Bayerisches Landesamt für Umwelt, Augsburg, Germany, (4) University of Würzburg, Department of Geography and Geology, Würzburg, Germany

The cuesta landscape of southwestern Germany (Swabian Alb) is characterized by layered sedimentary rocks (Jurassic) of variable strength. Due to this geologic preconditioning, where porous limestone (Malm) is underlain by impermeable claystone (Dogger), and the deeply incised valleys of the Rhine river system, landslides play an important role in the landscape evolution of the region, continually eroding the slopes of the Swabian Alb and displacing the escarpment further backwards. One of the largest (well documented) landslides happened in April 1983, when an estimated volume of 6 x 10^6 m^3 ($\sim$0.5 x 10^6 m^2) was mobilized at the Hirschkopf close to Mössingen, after 1/3 of the mean annual precipitation was delivered in only a few days. The historic record holds further evidence of at least four landslides of similar size ($>$0.25 x 10^6 m^2) in the past 250 years, most of which have been attributed to high-intensity and/or long-duration precipitation events.

During summer 2013, at least eight landslides have been initiated in the vicinity ($<$10 km distance) of the Hirschkopf, all on June 2^{nd} and 3^{rd}. Again, the period before these events was very wet, suggesting that high-intensity and/or long-duration precipitation plays a key role in the evolution of the SW German cuesta landscape. We take this opportunity to a) quantify the volume of material mobilized during the events and b) to estimate the sediment output from the affected catchments.

By comparing post-event digital elevation models (DEMs) obtained from UAV/SfM and TLS surveys with a pre-event DEM (ALS), we estimate that at least 2.5 x 10^6 m^3have been mobilized by these landslides, with the largest of them accounting for $>$1 x 10^6 m^3 of material. Assessing data from more than 20 rainfall stations in the region ($<$40 km distance) reveals the June 2013 precipitation to exceed the 95^{th} percentile of the past decade by far, in six locations constituting the maximum of the ten-year record. Preliminary results of suspended sediment export that we estimate from sediment-discharge rating curves indicate that high-intensity long-duration rainfall events govern the total sediment delivery from the region.