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Estimating the landslide volume of past and future events using high resolution DEM and the Sloping Local Base Level (SLBL) approach

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A common limitation in landslide hazard assessments is that the potential volume of future landslides is unknown. Therefore, landslide volume is often not considered in landslide hazard assessments. Thus, the estimation of potential landslide volumes is essential to improve local and regional landslide hazard assessments.

With the availability of data from high resolution DEM and the analytical SLBL approach, it is now possible to derive potential landslide volumes at local and regional scales. The SLBL approach is based on an algorithm which geometrically calculates a sliding surface on a DEM within an area defined by surrounding fixed points. Whereas at local scale it is possible to use potential landslide boundaries of various extents as fixed points to calculate the volume within these boundaries, some other criteria are necessary to define the fixed points at a regional scale.

In a first step just streams and a slope threshold value are used to calculate potential landslide volumes in a case study of the Jurassic escarpment of the Swabian Alb (Germany). In this scenario rather large volumes are resulting since the areas between the fixed points are quite large. Since not only large or extreme events should be considered in landslide hazard assessments, the method must be improved. Thus, in a second step more criteria were applied to narrow the mesh of fixed points. Different curvature derivates improve the SLBL approach at a regional scale significantly. Back analyses of past events show also the applicability of the SLBL approach to determine the volume of landslides which occurred many years ago.