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Slope destabilization induced by river rejuvenation in Shihmen reservoir watershed, northern Taiwan

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Steep incised landscape of Shihmen reservoir watershed was sculpted by rapid uplift and erosion in a tectonically active setting in northern Taiwan, where geomorphic features such as knickpoints, terraces, slope breaks and paleosurfaces are developed. We conduct field investigation and analyses of a 12-m DEM to study the distribution of the geomorphic features and to integrate slope development, gravitational deformation, and landslide occurrence for the purpose of making hazard zonation map of landslides.

The Dahan River has three major tributaries, which have four or five major knickpoints each, and one knickpoint along one major tributary can be correlated to a knickpoint along another major tributary. This is indicative that knickpoints propagated upstream along the major tributaries. The minor tributaries of the major tributaries also have knickpoints, which could be correlated to each other and to the knickpoints along the major tributaries. This again supports an idea that knickpoints propagated upstream along these tributaries. Corresponding to these knickpoints, there are two groups of convex slope breaks, higher and lower slope breaks. The higher slope breaks bound a paleosurface, which is widely developed in higher elevations in the watershed; the formation and retreat of this group of slope breaks accompanied many large landslides, particularly on the outfacing slopes. The lower slope breaks appear to grade to the terraces traced several tens to a few hundred meters above trunk channels and major tributaries associated with the most recent base-level lowering; many shallow landslides have occurred below these lower slope breaks.

Keywords: river rejuvenation, slope destabilization