Geophysical Research Abstracts, Vol. 8, 09543, 2006
SRef-ID: 1607-7962/gra/EGU06-A-09543

Forms of rockslide dams: a new suggested classification system

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At the NATO Advanced Research Workshop "Security of natural and artificial rockslide dams" held in Bishkek, Kyrgystan on June 8-13, 2004, 48 scientists from 16 countries reported on rockslide dams from most mountain belts of the world. A number of the examples presented at the workshop clearly showed that the landslide dam classification used over the past 18 years with 6 types of landslide dams (Costa and Schuster, 1988) does not adequately explain the influence of landslide dam and valley morphology on the total volume of water stored in the upstream impoundment and related long term dam stability. Here we propose a new three dimensional classification system considering both rockslide-deposit morphology, and valley morphology. This new classification is a three-step classification considering A) the plan view distribution of the rockslide deposit within the valley and its relation to impounded water bodies, B) the cross valley profile of the rockslide deposit and the underlying valley morphology, and C) the profile of the rockslide debris and the underlying substrate along the thalweg of the valley. In our classification, there are five main types in step A), the plan view distribution of the rockslide within the valley; I) the landslide impounding a water body on top of the landslide mass, II) a single rockslide barrier crossing the valley, III) two or multiple parallel barriers within the valley, IV) a landslide barrier affecting the drainage divide and thus two valleys, and V) a barrier impounding several valleys or tributaries. For each type there are several subtypes which are

related to type and volume of rockslide mass and quantity and confluence of valleys affected. There are three types in step B), the cross valley profile of rockslide deposits and underlying morphology; i) the lowest part of the rockslide debris in the centre and therefore in general above the lowest part of the valley profile, ii) the lowest part of the landslide body close to either the proximal or the distal slope of the breakaway, and iii) the deposit overlying an asymmetric valley. For step C), the vertical profile of the debris and valley thalweg profile along the valley is characterized by the inclination of the valley profile, and the position of the main rockslide body within the valley as well as by the inclination of the up- and downriver slopes of the rockslide dam. In combination, these relations control the capacity of the dam to impound water and the later valley evolution and hence the stability of the rockslide dam. Rockslide dam stability is additionally controlled by grain size distribution of the rockslide mass, the size of the drainage system as well as by climatic parameters, and aspects of overall valley development such as the stability of slopes surrounding the impounded water body.

Costa, J.E., and Schuster, R.L., 1988, The formation and failure of natural dams:Geological Society of America Bulletin, v. 100, p. 1054-1068.