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Hazard estimate of rockslides based on a velocity-displacement weakening rotational slider block model

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We consider 5 large saggings or rockslides in the Eastern Alps, which have volumes from 0.1 - 3.8 km^3. The discontinuous displacements along the sliding surfaces are for two of these mass movements a few tens of meters (Hochmais-Atemskopf, Gradenbach), for two others (Lesachriegel, Niedergallmig-Matekopf) a few hundreds of meters, for one >1 km and a transition to catastrophic sliding occurred already at this mass movement (Köfels). Further constraints on the application of slider block models come from structural maps and geodetic observations.

According to velocity-displacement weakening rotational slider block model for rockslides (German and Brückl, 2005) the velocity of displacement v=d(2R$\Delta\alpha$)/dt=E$\Delta\alpha^{\beta}$exp(-$\gamma\Delta\alpha$), where $\Delta\alpha$ is total angle of displacement, t is total time of sliding and R is radius of sliding surface. E, β and γ are parameters: β defines rate of weakening process, increasing with $\Delta\alpha$; γ defines stability factor (due to decreasing of slope angle, receptivity of media for rapid increasing of displacement); E defines the scale of velocity. From E, β and γ we can estimate if the slide will remain quasi-stationary or if a transition to catastrophic sliding have to be expected in the future. In the latter case we can estimate the time t_c when the slide will become unstable. In reality the behavior of function $v(t)$ is complicated, however, it can be explained by variations of the parameters β and γ (for example, γ depends on pore water pressure at the sliding surface and seasonal variations of v can be modeled by this parameter). The past and future developments of the 5 mass movements are modeled by rotational slider block models and fitting the parameters E, β, and γ. The results are compared with results obtained by Brückl and Parotidis (2005).

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