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Do deglaciated mountainslopes contribute significantly to paraglacial sediment fluxes?

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Current models of paraglacial sediment generation and transport (Ballantyne, 2002 & 2003) are general in nature; they are probably inaccurate for many specific locations because of the wide range in local or regional geomorphic conditions encountered around the globe. One of the conditions that varies from place to place is the pattern of paraglacial landsliding; it varies in both the magnitude, scale, and timing, and therefore has variable influence on sediment generation. Another condition that varies is the sediment connectivity between slopes and the fluvial system; this can vary due to differences in topography, hydrologic regimes, or transient sediment buffers such as landslide dams. In this paper, we examine the extent to which variability in paraglacial landslide patterns and sediment connectivity may affect the applicability of the general paraglacial model. To achieve this we draw on both existing literature and our field experience from the European Alps and Iceland.
Sediment generation and pathways, as influenced by post-glacial collapse of mountain slopes in particular, are studied in three steps. First, the processes involved in rock failure are identified and their possible influence on mass-movement locations at different spatial scales in various places is discussed. This comparison reveals a variable pattern of paraglacial landslide distribution, and allows the local/regional controlling parameters to be identified. Second, the rate of triggering of mass-movement over time is roughly assessed in various settings based on a review of recently published data. This comparison aims to identify typical temporal-models for slope evolution through the time elapsed since deglaciation. Third, an attempt is made to assess the contribution of landsliding to the whole paraglacial cascading system by evaluating the somewhat contradictory findings and assertions from previous authors: Some authors have argued for a high sediment yield at catchment sinks in relation to paraglacial landsliding (Church & Ryder, 1972; Ritter & Ten Brink, 1986), whereas others have identified that some long-lived sediment dams can occur after the deposition of a landslide mass, so that no or little sediment exportation occurs (Korup, 2009; Cossart & Fort, 2008). We add to this debate by developing a typology of geomorphic couples, between paraglacial landslides and other geomorphic processes, and present simulations of sediment yield evolution since glacier disappearance.

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