Three rockslides shaped the valleys around Sterzing/Vipiteno, Northern Italy

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The post-Glacial development of mountain valleys near the city of Sterzing/Vipiteno (Italy) was profoundly influenced by instantaneous local base-level rise caused by rockslides. Each of the mass-wasting events had blocked the valley it descended into, resulting in rockslide-dammed lakes that became filled, or largely so, by lacustrine and fluvial deposits.

Three rockslides have been investigated. (1) The Pfitsch-valley rockslide, situated in the tributary Pfitsch valley east of Sterzing, has an estimated volume of 0.38 km$^3$ and covers an area of about 0.92 km$^2$. This rockslide consists of calcareous phyllites and, locally, is lithified into a rockslide breccia (Sanders et al., 2010). The backwater lake of the rockslide mass shows well-developed shoreline terraces. Uranium/Thorium age-dating of post-rockslide calcite cements, found within the rockslide deposit, yielded a minimum age of 2686 ± 50 a respectively 11290 a ± 500. Additionally, the shoreline terraces and lack of glacial overprint of the rockslide indicate that the valley bottom was free of ice when the Pfitsch rockslide occurred.

(2) The Ridnaun-valley rockslide descended into a tributary valley west of Sterzing. The Ridnaun rockslide is of an estimated volume of 0.6 km$^3$, and covers an area of about 2.4 km$^2$. The corresponding rockslide-dammed lake has been breached and run out an unknown interval of time ago; again, however, well-developed shoreline terraces are present that can be traced laterally over a few kilometres. The rockslide mass of Ridnaun is composed of paragneiss, phyllithic mica schist and, subordinately, of amphibolite and marble. Radiocarbon dating of organic remnants from a sandy deltaic succession shed into the former rockslide lake yielded an age of 8865 ± 50 a BP; this implies that the rockslide event is older. Again, however, there is no evidence for glacial overprint of the rockslide mass and its associated backwater deposits. Samples for optically-stimulated luminescence dating of post-rockslide deltaic sands are in process at present.

(3) The Stilfes rockslide, in turn, descended into the trunk valley a few kilometres to the south (=downstream) of Sterzing. This rockslide mass has an estimated preserved volume of about 0.32 km$^3$, and covers an area of about 2.1 km$^2$. The rockslide mass consists mainly of calcareous phyllites, phyllites, and marble. The rockslide had dammed up a lake some 15.5 km$^2$ in area that became completely filled, and turned into a swampy area. Pollen analysis of lacustrine sediments by Sarnthein (1946) suggested that lake sedimentation started during the 'first beech-fir-time' (corresponding to the Subboreal 5000-2700 BP, in present terminology). Radiocarbon samples of a layer rich in organic debris intercalated into the lacustrine sediments yield an age of 4405 ± 45 a BP.

The longitudinal profiles of the streams draining the tributary Pfitsch and Ridnaun valleys, respectively, are knicked at the rockslide masses. Conversely, the trunk valley with the Stilfes rockslide does not show a knick in longitudinal profile, despite significant aggradation within the former rockslide-dammed lake. At present, the reasons for this are not fully clear to us. Perhaps, in re-grading its profile, the rate of incision by the trunk river (and its capacity for sediment redistribution downstream) were so high that the disturbance of profile exerted by the rockslide mass is already eliminated. In summary, in the investigated area, aside of glacial erosion, the rockslides and their associated geomorphic effects were most significant in shaping the valleys since the last glaciation.
