Geophysical Research Abstracts
Vol. 19, EGU2017-5265, 2017
EGU General Assembly 2017

Alpine relict rock glaciers and periglacial talus slopes: the witnesses of paraperiglacial crisis?

Cristian Scapozza

Institute of Earth Sciences, University of Applied Sciences and Arts of Southern Switzerland (SUPSI), Canobbio, Switzerland (cristian.scapozza@supsi.ch)

The “paraglacial” and “paraperiglacial” concepts were introduced in the second half of 20th Century for describe processes, landforms and deposits directly conditioned by deglaciation (paraglacial), respectively by permafrost degradation (paraperiglacial). They represents theoretical models describing the transition from glacial to periglacial, or more generally non glacial conditions (paraglacial model), and from periglacial to temperate conditions (paraperiglacial model).
Evidences of sediment transfer conditioned by these processes were described in particular in the Arctic and Subarctic domains. These evidences are less generalised in the Alps and they consider rarely both concepts, integrating periglacial landforms and deposits in source to sink sediment transfer in a single catchment. Here we present evidences of para(peri)glacial sedimentary crises by quantifying sediment transfer under cold climates for the upper Ticino River catchment (southern Swiss Alps).
Compilation and revision of chronological data and the assessment of rockwall erosion rates in the periglacial zone, allowed empirical models of sediment transfer to be produced (Scapozza 2016). These models highlights significant rates of rockwall erosion during periods of intense temperature warming and intense permafrost degradation (such as at the beginning of Bølling and during the Preboreal), showing a very good correspondence with paraglacial and paraperiglacial theoretical models. Sediment transfer evolution during the entire Lateglacial and the first half of Holocene in the southern Swiss Alps may then be explained by a combination of a paraglacial erosion phase related to the deglaciation and of two paraperiglacial erosion phases related with significant periods of temperature warming during the Bølling/Allerød and the first part of the Holocene.
The first phase of paraperiglacial erosion taking place during the Bølling/Allerød was driven by significant permafrost degradation in rockwalls conducing to the formation of actually relict rock glaciers, which are larger than intact ones. During the second phase of paraperiglacial erosion, occurred at the beginning of the Holocene and driving an enhanced erosion phase in the periglacial zone (with erosion rates higher than 2.0 meters per millennium) until the end of the mid-Holocene climate optimum, were formed the main part of periglacial talus slopes and were released deposits that will constitute intact rock glaciers in the followings millennia. For the second part of the Holocene, otherwise, the increase in sedimentation rates in the valley floor is probably explained by the general glacial advance characterizing the six cold phases registered in Central Europe since 6.2 cal. ka BP. For the periglacial zone, this period was at the opposite characterized by low rockwall erosion rates related to limited permafrost degradation at least until the end of the Little Ice Age.

REFERENCE

Scapozza C. (2016). Evidence of paraglacial and paraperiglacial crisis in Alpine sediment transfer since the Last Glaciation (Ticino, Switzerland). Quaternaire 27(2): 139-155. DOI: 10.4000/quaternaire.7805