Geophysical Research Abstracts
Vol. 20, EGU2018-2091, 2018
EGU General Assembly 2018

Geomorphological re-interpretation of selected Holocene glacier chronologies for the Southern Alps/New Zealand

Stefan Winkler
University of Würzburg, Department of Geography and Geology, Würzburg, Germany (stefan.winkler@uni-wuerzburg.de)

Numerical age dating techniques are indispensable for providing reliable age constraints with the reconstruction and interpretation of more recent mountain glaciations. Supplementing the well-established radiocarbon dating, terrestrial cosmogenic nuclide dating (TCND) has achieved impressive progress in during the past few decades.

The Southern Alps of New Zealand among the few suitable study sites for the investigation of Holocene glacier chronologies in the mid-latitudinal Southern Hemisphere. Despite abovementioned methodological progress and an increasing number of studies, there still remains considerable discrepancy if these studies are analysed in detail. Although records of Holocene glacier variations in the Southern Alps of New Zealand are included in most recent global compilations of Holocene glacier and climate history, the corresponding paragraphs are biased towards certain selected chronologies and an ostensible ‘supremacy’ of age information obtained by TCND.

Recommendations about necessary precautions and interpretative steps with the reconstruction of Holocene glacier chronologies have often not been followed because a comparably high number of individual boulders precisely dated by TCND may apparently ensuring robustness. One example is the identification of ‘moraines’ as evidence of former glacier advances based on clusters of individual boulder ages rather than on detailed geomorphological mapping and genetic interpretation of moraine ridges. The arithmetic mean for all individual TCND-samples of these clusters is still regarded as ’representative’ age estimate whereas several studies confirm that inheritance constitutes an insignificant source of uncertainty with the application of TCND for (Late) Holocene moraines. By contrast, factors potentially yielding too young age estimates like postdepositional disturbance are often very common. Critical geomorphological re-interpretation of such existing data at Mueller Glacier indicates an overestimation of the true number of local and potentially regional glacier advances during the Late Holocene in the Southern Alps of New Zealand. More conservative error margins and application of the ’Little Ice Age’-type event concept would create a more reliable (albeit less precise) correspondence and reduce the discrepancy between different existing studies.

Recently re-calibrated older radiocarbon-based data sets have also shown not to be immune to such geomorphological uncertainties. Their common practise to relate the position of fossil organic matter within lateral moraine profiles to former glacier surfaces and relative overall expansion does not take any changes of the altitudinal level of the valley floor into account. Tasman Glacier is a good example where the crest of the outermost latero-frontal moraine is more than 100 m lower than the proximal one build during the ’Little Ice Age’ where the glacier did not expand as far down the valley. Reconstructing that older glacier surface would see it within the lower slopes of the lateral moraine up-valley because the valley floor has significantly risen during the past 6,500 years. The strongest neoglacial advance may, therefore, be represented by a fossil soil or organic remnants in the lower profile previously interpreted as moderate or minor glacial expansion period only.

Summarising, detailed geomorphological examination cannot be replaced by any progress in numerical dating technique.