



## **Glacier reaction to large-scale climatic change during Termination 1 in the European Alps - age and climatic significance**

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Alpine ice recession during Termination 1 was interrupted several times by phases of glacier growth, which formed a multitude of morainic systems in the Alpine valleys. An increasing number of sites has been dated with the terrestrial cosmogenic nuclides  $^{10}\text{Be}$ ,  $^{26}\text{Al}$  and  $^{36}\text{Cl}$ . The results show that the major morainic systems were formed as a reaction of Alpine glaciers to the Heinrich 1 ice rafting event during Greenland Stadial 2a, the Younger Dryas event (Greenland Stadial 1) and the Preboreal Oscillation. As far as dating accuracy permits, it seems that glacier reaction to climatic shifts was immediate with no discernible time lag. The palaeoclimatic interpretation of the former glacier topographies is physically straightforward and shows that climate in central Europe was still of the subarctic type (cold and dry) during GS 2a, whereas during GS 1 an initial wet phase was followed by increasingly drier conditions. Summer temperatures during GS 1 were only moderately colder than during the Holocene on a century time scale. During the PBO, climate was already rather similar to the climate of colder phases during the late Holocene. Results for the Younger Dryas (GS 1) are well in line with those from biological proxies and  $\delta^{18}\text{O}$ . During earlier phases of Termination 1 (e.g. GS 2a), glacier data are the only reliable quantitative climate data source so far.