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Post-LGM glacial history of Aosta Valley (western Italian Alps) and implications for Alpine paleo-atmospheric circulations

Elena Serra[1,2], Pierre G. Valla[3,1,2], Natacha Gribenski[1,2], Fabio Magrani[1,2], Julien Carcaillet[3], and Philip Deline[4]

[1]University of Bern, Institute of Geological Sciences, Bern, Switzerland (elena.serra@geo.unibe.ch)
[2]Oeschger Centre for Climate Change Research, University of Bern, Switzerland
[3]Institute of Earth Sciences, CNRS-University Grenoble Alpes, France
[4]EDYTEM Lab, CNRS-University Savoie Mont Blanc, France

Mountain glaciers are useful quantitative paleoclimate proxies because of their mass-balance being sensitive to both temperature and precipitation. Paleoglacial reconstructions in the Alps, together with other paleoclimate proxies[1], suggest a shift in Alpine atmospheric circulation during the Last Glacial Maximum (LGM), with a change from northerly (Atlantic) to south-westerly (Mediterranean) moisture advection[2]. However, the post-LGM reorganization of the atmospheric circulation system in terms of both amplitude and timing remains elusive, as well as the resulting glacier response in the Alps[3,4].

This study focuses on Aosta Valley and its tributaries (SW Alps, Italy). Few chronological constraints are available for the post-LGM glacial history of the region, mainly related to the Ivrea Amphitheatre (terminal extent of Pleistocene glaciations)[5] and the Mont-Blanc massif[6]. We aim to quantify the potential variability in glacier responses for the different massif catchments of Aosta Valley, our working hypothesis being that they have distinct geomorphic (e.g. hypsometry) and climatic conditions (e.g. aspect, moisture sources). Following a detailed geomorphological mapping of glacial landforms and deposits, we sampled moraine boulders and glacially-polished bedrock for *in-situ* ^{10}Be surface exposure dating in 3 main massifs: Mont-Blanc (Courmayeur), Matterhorn (Valpelline) and Gran Paradiso (Val di Cogne and Valsavarenche). In addition, we also investigated the confluence between Aosta Valley and Gran Paradiso valleys (Saint Pierre area). Morphometric analyses were conducted to investigate the possible influence of local factors (e.g. hypsometry and aspect) on glacier fluctuations, before isolating a climatic signal from our paleoglacial reconstructions.

Our ^{10}Be chronology and boulder provenance results testify that glaciers from Mont-Blanc were lastly occupying the Aosta Valley in Saint Pierre at ca. 15 ka, while Gran Paradiso glaciers had already retreated within tributary valleys. In the upper Aosta Valley, Mont-Blanc glaciers retreat is marked by at least[7] two Late-glacial stages nearby Courmayeur at ca. 14 and 11 ka. Bedrock deglaciation profiles in Valpelline (SW of Matterhorn) record an onset of ice-thinning at ca. 14 ka, well after glacier retreat from the Ivrea Amphitheatre (20-24 ka)[5]. This result agrees with other

studies from high Alpine passes[9], supporting the idea that glaciers thinning within the high Alps clearly postdated the rapid post-LGM deglaciation in the foreland. Final deglaciation of Valpelline occurred at ca. 10-11 ka (Younger Dryas), roughly synchronous with the final glacier retreat in Courmayeur. Additional ^{10}Be samples from the Gran Paradiso valleys are under process to further assess potential spatial variability in post-LGM glacier fluctuations between the main northern and southern massifs. Finally, paleoglacial reconstructions and geochronology constraints will be included in ice numerical simulations to test the potential influence of precipitation changes on glacier retreat within the Aosta Valley.

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