Post-Last Glacial Maximum glacier variations in the southern Écrins massif (westernmost Alps): Insights from geomorphological mapping, 10Be exposure dating and palaeoglacier reconstruction

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Résumé

Only few chronological constraints on Late Glacial and early Holocene glacier fluctuations in the westernmost Alps have been published. Pre-Little Ice Age (LIA) moraines of two palaeoglaciers in the Écrins massif were mapped and then assigned to ice-marginal positions to establish a morphostratigraphy. Thirty-nine 10Be cosmic ray exposure (CRE) ages from boulders on selected moraines were obtained. The equilibrium line altitude (ELA) depressions relative to the LIA during moraine deposition were reconstructed. Ten pre-LIA positions of the first palaeoglacier were identified. Its third outermost pre-LIA moraine may have been shaped by three confluent glaciers at 16.4±1.7 ka. The ELA of the first palaeoglacier was then depressed by 218±10 m with respect to the LIA, whereas the ELA of two tributary glaciers must have been lowered by 493±10 to 591±10 m. The moraine was likely shaped or re-occupied by the first palaeoglacier at 12.5±0.6 ka when the ELA was about 226±10 m lower than during the LIA. At least six periods of stable glaciers associated with ELA depressions between 222±10 and 164±10 m occurred thereafter. The moraines of the innermost pre-LIA position of the first palaeoglacier stabilised at 11.2±0.6 ka. The formation of eight pre-LIA moraines of the second palaeoglacier required ELA depressions between 127±10 and 202±10 m with respect to the LIA. Hence, the moraines can be linked to the same period of glacier variability as the moraines of the first palaeoglacier. This is

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supported by three 10Be CRE ages from one moraine of the second palaeoglacier indicating moraine stabilisation at 11.3±0.6 ka. The 10Be CRE ages are in agreement with recalculated CRE ages from other moraines in the Alps that stabilised during the regional Egesen stadial. This suggests a common climatic forcing of the glacier variations. Local factors, such as topography, likely explain the CRE age variability.