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Deglaciation chronology of the Ecrins-Pelvoux massif (French Western Alps) revealed from new 10Be and 26Al Cosmic Ray Exposure ages.

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We report new Cosmic Ray Exposure ages pertaining to the deglaciation chronology of the Ecrins-Pelvoux massif (French Western Alps). 25 samples have been collected from various glacial morphologic features (e.g., glacially scoured bedrock, erratic boulders, nunataks). Most of the data presented in this study has been collected along 4 altitudinal profiles; the initial goal was to quantify spatial variations in glacial erosion during the last glacial cycle using coupled ^{10}Be and ^{26}Al measurements in order to identify complex surface exposure histories. ^{10}Be exposure ages vary from 4.7 $\pm$ 0.4 ka to 45.5 $\pm$ 3.0 ka, while those inferred from ^{26}Al concentrations vary from 5.2 $\pm$ 0.5 ka to 17.1 $\pm$ 1.2 ka. Generally, samples collected from the highest parts of the relief, above the glacial trimline, present young ages reflecting intense periglacial erosion processes. In addition, although some of the samples could be interpreted as recording glacier retreat shortly after the Last Glacial Maximum, most ages fall within the late-glacial period and appear to record the Younger Dryas glacial advance in this part of the European Alps. ^{10}Be/^{26}Al concentration ratios suggest a simple exposure history for most samples, with similar inferred exposure ages are for both isotopes. These results provide evidence that glacial erosion has reset the cosmogenic signal in most studied areas of the Ecrins-Pelvoux massif (i.e., glacier erosion has been at least $\sim$3 m during the last glaciation). However, 3 samples collected at a single locality have ^{10}Be exposure ages varying from 30.0 $\pm$ 2.0 ka to 45.5 $\pm$ 3.0 ka, while ^{26}Al exposure ages confirm the late-glacial deglaciation chronology obtained elsewhere within the Ecrins-Pelvoux massif. In order to explain this apparent complex exposure history, we used the climatic signal from SPECMAP to test different exposure scenarios that would lead to such different ^{10}Be and ^{26}Al CRE ages. We thus propose that glacial erosion has been limited in this specific area of the massif due to cold-based glacier dynamics.