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## Reconstruction of LGM ice extents in Europe indicates a cold and dry climate with precipitation patterns similar to present day

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During the pinnacle of the last glacial period 21 kyr ago, the Alps and the Pyrenees were largely covered by ice. Climate was colder and most likely drier, but the magnitudes of temperature and precipitation changes remain poorly constrained. This is in part because climate proxies are not sufficiently accurate, and because there are unknowns on the past position of the Westerly winds and, consequently, the intensity of the moisture flow towards Europe. A new inverse method combined with an ice flow model enables us to infer past climate from mapped ice extents. In the case of the Alps, all of the presented scenarios recover an increase in the position of the ELA across the mountain range from west to east, and a decrease from north to south, pointing to a dominantly zonal circulation with Westerlies bringing moisture from the Atlantic. This is supported by the Pyrenees reconstruction, where the method recovers a clear N-S gradient for all scenarios, indicating that the moisture source from the direction of the Atlantic. While the precipitation pattern was probably not much different from today, mean temperatures were  $\sim 9.3 \pm 2.97^\circ\text{C}$  lower in the Alps and  $\sim 6.6 \pm 1.6^\circ\text{C}$  lower in the Pyrenees. Our results match pollen-based reconstructions if the climate was 60% dryer than today.