Multi-method dating (^{1}Be, ^{3}Cl, and ^{1}C) of the Ossau Valley moraine complex (Pyrenees, France). A new stronghold of asynchronous glacier maximum advance relative to the global LGM falls.

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Résumé

The Last Glacial Maximum (LGM) refers to the most recent time interval during which the global volume of continental ice reached its maximum extent, resulting in the lowest global sea level. This event occurred between 19 and 24–26 ka cal BP, as evidenced from U-Th and radiocarbon dating of coral reefs associated with the last major sea-level lowstand. In the Pyrenees, the LLGM (i.e. Local Last Glacial Maximum of the Late Pleistocene glaciation) occurred during MIS 4, i.e. earlier than the LGM interval, whereas glacier positions during the LGM interval are unequally documented. Based on Pyrenees-wide available data, LGM glaciers seem to have extended as far as their earlier LLGM positions in the eastern valleys but were substantially shorter farther west. These differences along the strike of the mountain range have been interpreted (i) as a possible indicator of an increasing precipitation gradient from the Atlantic Ocean towards the Mediterranean Sea, or alternatively, (ii) as an artifact of the dating methods applied so far.

Here we test these two hypotheses in the poorly documented northwesternmost part of the

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Pyrenees by providing a new series of 33 10Be and 36Cl surface exposure ages from the terminal LLGM moraines of the Gave d'Ossau. These combined exposure-age results are discussed in light of previously acquired ^{1}C ages from the ice-marginal Estarrès glaciolacustrine sequence, and from Late Pleistocene archaeological sites. The evidence allows the reconstruction of a four-step scenario detailing glacier fluctuations during the Late Pleistocene: (i) a first glacial advance occurred during MIS 4 / MIS 3; (ii) between 34–30 ka and 31–27 ka, the Ossau glacier receded by at least 2 to 3 km but the precise extent of this recession remains uncertain; (iii) during the LGM interval, the Ossau glacier readvanced, leading to the formation of LLGM moraines around 27–24 ka, followed by post-LLGM recessional moraines 2 km upstream around 22–19 ka; (iv) from 20 to 19 ka, the Ossau glacier retreated extremely rapidly more than 30 km from its LLGM terminal morainic complex.

Mots-Clés: Ice fluctuation, surface exposure age, LGM, Pleistocene, Pyrenees