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When did the Lyon ice lobe (French Alps) reached its Late Pleistocene maximum extent? A new contribution to a long lasting debate.

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Last Glacial Maximum reconstructions of former glacier in the European Alps shows large ice expansion on the northern side of the Alps, with wide piedmont lobes spreading over lowlands (synthese in Ehlers et al., 2011). The general chronological outline of the LGM in the Alps suggests a fairly synchronous glacial maximum around 26-20 ka (marine isotope stage 2; Wirsig et al., 2016), in line with global data from the Northern Hemisphere. However, a long lasting debate persists in French Alps regarding the timing of the Late Pleistocene maximum ice lobe extent in the Lyon area, varying from MIS 2 to MIS 4 based on indirect and contradictory radiocarbon ages (Mandier et al., 2003) and field constraints (Monjuvent and Nicoud, 1988). This debate was further rekindled by recent alpine ice modelling studies (Becker et al., 2016; Seguinot et al., 2018).
A clear and robust chronological constrain of the Lyon glacial lobe extent is now critical as it would have major implication in terms of our understanding of past atmospheric circulation patterns. Traditional dating techniques such as radiocarbon and cosmogenic nuclides exposure are challenging in this area due to the scarcity of organic material incorporated within glacial deposits and the huge scarcity of in-place moraine boulders. In these circumstances, Optically Stimulated Luminescence (OSL) techniques, which allow the dating of buried sedimentary material, offer a promising alternative. In this study, we propose a new chronological reconstruction of the Lyon Lobe maximum extent during the Late Pleistocene. This chronology is based on new OSL data measured from fluvio-glacial deposits located in presently dry valleys only active during the Late Pleistocene maximum extent of the Lyon Lobe. Our preliminary results suggest that in fact, two major phases of glacial advance of similar extent occurred during the Last Glacial cycle, around the MIS 2 and around the MIS 4. These results not only bring a fresh contribution to the debate of the local paleoglacial history in the French Western Alps but may also have significant implications in terms of Late Pleistocene glaciations pattern and paleoclimate evolution in the Alps.