Burial dating cave sediments in the Jura Mountains: an archive of Middle Pleistocene Alpine glaciation

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Abstract

The Jura Mountains contain a rich karstic archive uniquely suited for burial dating using the cosmogenic nuclides 10Be and 26Al. During the Middle Pleistocene, the Alpine Ice Field expanded repeatedly across the Swiss Plateau and into the Jura Mountains, forming the External Moraine Complex. Due to its age and subsequent glaciations, this moraine complex is highly weathered and discontinuous on the surface, leaving gaps in our understanding of glacial extent and chronology. However, allochthonous cave sediments transported to the Jura through glacial activity contain diagnostic crystalline lithologies that act as key markers of their Alpine origin, making them ideal targets for isochron-burial dating and P-PINI age modelling. Initial work at the Grottes aux Fées demonstrated good agreement between isochron and P-PINI methods, yielding a burial age consistent with deposition during the MIS 12 glacial cycle. This confirms that at ca. 420 ka, the Rhone glacier exceeded its LGM extent, possibly contributing to the formation of the External Moraine Complex. Building on this, new 10Be and 26Al measurements from four additional cave systems across the Swiss and French Jura reveal cave sedimentation during the Early Pleistocene and during MIS 6. Together, these results build towards a multi-stage chronology of Alpine ice advance into the Jura Mountains and demonstrate the potential of cave sediment archives for reconstructing Middle Pleistocene glacial history in the region.

Keywords: Isochron Burial Dating, PPINI, 10Be, 26Al, Caves, Alpine Ice Field

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