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A Late Holocene deep-seated landslide in the northern French Pyrenees

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A very large deep-seated landslide (DSL) in the northern Pyrenees with over 1200 million cubic meters was examined, mapped, and dated by lake sediment rates and 10Be terrestrial cosmogenic radionuclide surface exposure (CRE) dating. Our analysis reveals the role of inherited structures in the landslide process, and we highlight typical gravitational morpho-structures and a small lake trapped at the toe of the landslide headscarp. The study of the lake helps provide us with the approximate age of the landslide, through calculations based on sedimentation rates (0.859 mm yr-1). Using these, we find the earliest formation of the lake following the landslide to be 1106 $\pm$ 510 yr. To better constrain the timing of the landslide, we applied 10Be CRE dating and they highlight two main destabilization phases. Finally, we discuss the different triggering factors responsible for the main failure. Information, arguments, and evidence relating to historic markers, and especially to the absence of particular climate markers, point to a single event at 1380 yr. This argument is supported by the absence of major climate change during the Dark Ages. The hypothesis of a single event scenario is supported by a major seismic event that occurred around 1380 yr (Lavedan earthquake).