# [271] Following the footsteps of the Ésera glacier (Central Pyrenees) during the last glacial cycle

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The Ésera valley (Central Pyrenees) is one of the few in the Pyrenees with still receding glaciers and active periglacial processes in the headwaters, both affected by global warming. In this work, we investigate the Ésera glacier response to climate fluctuations during the last glacial cycle to provide a comparison with a current rapid decrease in glacier ice in the mountains.

We have analyzed the sedimentary record from Pllan d'Están, a paleolake located at 1,840 m asl in the Ésera valley in an over excavated basin that collected the water and sediments from the melting glaciers since it was formed 40 ka ago. We have obtained two parallel 6 m long cores using a vibracorer, and built a master sequence. Pllan d'Están depth-age model is based on 30 AMS dates with a basal date around 40 ka cal BP. We have analyzed several proxies to reconstruct past depositional, hydrological and climatic variations: sedimentary facies analyses to identify the main depositional environments; x-ray fluorescence to geochemically characterise the sediments, diatom composition to understand lake level fluctuations and pollen to reconstruct the plant community variations.

The preliminary interpretations of these proxies indicate that the Ésera glacier had already retreated from the Plan d'Están areas at 40 ka BP. The basal sediments are carbonate-rich, suggesting a dominant local source from the nearby limestone outcrops. The further retreat of the Ésera glacier allowed the development of a proglacial lake characterized by deposition of millimetric-thick laminae, alternating darker grey, carbonate-rich laminas with lighter grey, carbonate-poor ones. At 35 ka cal yr BP, sedimentation became dominantly siliciclastic and banded, suggesting that the glacier had retreated higher up in the Ésera valley, only composed by granitic rocks. Up to 12 ka cal yr BP, changes in sedimentation rate, grain-size variability and some geochemical proxies (Rb/Zr) reflect the response of the glacier to climate with higher grain size and sediment fluxes during warmer phases associated to stronger meltwater flows and/or more intense precipitation. The sedimentation rate decreased between 35 and 25 ka cal yr BP and increased afterwards, pointing to changes in the intensity of erosion and transport processes, likely associated to the transition from very cold and dry conditions to a more humid climate.

The onset of the Holocene is characterized by a rapid transition to a lacustrine environment dominated by more organic deposition, with great variability of diatom assemblages, as pollen contents indicates a less harsh climate. At around 7000 years ago the shallow and permanent Pllan d'Están lake became an ephemeral lake/wetland, likely as a result of infilling of the accommodation space in the basin, and also paleohydrological and/or geomorphological changes.

The environmental evolution of Pllan d'Están Lake underlines the highly sensitive response of geomorphological features of the Ésera valley and associated hydrological and depositional features to climate changes during the last deglaciation. Our results are critical to produce and test robust models of future hydrological changes, essential to manage natural resources in the one of the southernmost mountain ranges in Europe.