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Geomorphological and sedimentological evidences in the Western Massif of Picos de Europa since the Last Glaciation

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The Western Massif of Picos de Europa includes some of the highest peaks of the Cantabrian Mountains. However, the environmental evolution in this massif since the Last Glaciation is still poorly understood. This research provides a new geochronological approach to the sequence of environmental events occurred here since the maximum expansion of glaciers during the last Pleistocene glaciation. The distribution of the glacial landforms suggests four main stages regarding the environmental evolution in the massif: maximum glacial advance, phase of second maximum glacial expansion, Late Glacial and Little Ice Age. A 5.4-m long sedimentological section retrieved from the kame terrace of Belbín, in a mid-height area of the massif, complements the geomorphological interpretation and provides a continuous paleoenvironmental sequence from this area since the Last Glaciation until nowadays. This section suggests that the maximum glacial expansion occurred at a minimum age of 37.2 ka cal BP, significantly prior to the global Last Glacial Maximum. Subsequently, a new glacial expansion occurred around 18.7-22.5 ka cal BP. The melting of the glaciers after this phase generated a shallow lake in the Belbín depression. Lake sediments do not reveal the occurrence of a cold stage during the Late Glacial, whilst, at higher locations, moraine complexes were formed suggesting a glacier readvance. The terrestrification of this lake started at 8 ka cal BP, when Belbín changed to a peaty environment. At 5 ka cal BP human occupation started at the high lands of the massif according to the existence of charcoal particles in the section. The presence of moraines in the highest northern cirques evidences the last phase with formation of small glaciers in the Western Massif of Picos de Europa, corresponding to the Little Ice Age cold event. Since then, the warming climate has led to the melting of these glaciers.