



## **Environmental evolution in Picos de Europa (Cantabrian Mountains, Northern Spain) since the last glacial cycle.**

Alexandre Nieuwendam (1), Jesús Ruiz-Fernández (2), Marc Oliva (1), Vera Lopes (3), Anabela Cruces (3), and Maria da Conceição Freitas (3)

(1) Center of Geographical Studies-IGOT, University of Lisbon, Portugal (alexandretn@gmail.com), (2) Department of Geography, University of Oviedo, Spain, (3) IDL, Faculty of Sciences, University of Lisbon, Portugal

The Western Massif of the Picos de Europa includes some of the highest elevations of the Cantabrian Mountains. The maximum ice expansion in this limestone range during the last glacial cycle preceded the global Last Glacial Maximum.

A 5.4 m long sedimentary sequence was collected from Belbín, a depression dammed by a moraine in a mid-altitude environment of this massif. Using a combination of several approaches we have reconstructed the environmental stages and intensity of cryogenic processes since that period until today: (1) geomorphological mapping combining field evidences, aerial photographs and topographic maps; (2) lithostratigraphic description of the cores identifying different sedimentary units; (3) Grain-size analyses of the fine fraction by laser diffraction; and (4) quartz grains using Cailleux (1942) analysis with modifications from Mycielska-Dowgiałło and Woronko (1998).

The studied accumulative kame terrace has preserved a Late Quaternary record with geomorphological and climatic events, variable accumulation rates, and distinct grain properties resulting from frost and chemical weathering. The basal dating of the sediments of this section shows that the maximum glacial extent occurred prior to 37.2 ka cal BP. The lithostratigraphic analysis of the section shows evidence of four major stages regarding the environmental evolution in the area: (1) from 37.2 to 29 ka there was a phase with intense periglacial activity and deposition of slope deposits; (2) from 29 to 22 ka, the depression of Belbín gradually infilled; (3) from 22 to 8 ka, a paleolake was present in the study site; (4) since 8 ka, the lake became infilled. Besides, human-induced fires started at 4.9 ka probably for grazing purposes.

Based on the sediment stratigraphy the data presented, demonstrates that in Belbín area there have been persistent cryogenic conditions since the last glacial cycle until present-day, with different degrees of intensity and type of weathering processes. However, in some cases there are uncertainties between the time of climatic transition and geomorphic adjustment to changing climate conditions. The combination of silt abundance and peculiar quartz grain micromorphology can be an instrument for tracing cryogenic weathering in sedimentary archives. This demonstrates that depending on local conditions these analyses may be very useful indicators of past geomorphological events and interpretation can determine climatic conditions during quartz grains formation.