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# NAO impact in high mountain lacustrine ecosystems in the Iberian Peninsula

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The North Atlantic Oscillation (NAO) is one of the main climate modes ruling winter rainfall and temperatures in the Western Europe. In recent years a large number of works has described in detail the relevance of the NAO pattern in shaping the climate variability of the Iberian Peninsula (IP) since the mid 19th century. However on longer time scales a less clear picture emerges and, despite recent reconstructions of the NAO index for the last millennium, there is no consensual reconstruction of the NAO role during the last 1,000 years, neither at longer time scales (Holocene and Late Glacial periods). Additionally, within the current state-of-the-art it is virtually impossible to formulate a clear understanding of the relationships between this climate phenomenon and past abrupt climate changes in the IP.

High mountain lake ecosystems in the IP could provide the required reconstructions because they should be very sensitive to NAO variability owing to their physical, chemical and biological characteristics (small lake and catchment, ice-covered periods, oligotrophic and quite simple food-web chain). Two mountain lakes, with a glacial origin and located in the Spanish Central Range, have been selected to provide a long-term and high-resolution paleoclimatic reconstructions of NAO using their sedimentary infill: Cimera Lake (dimictic at 2140 m a.s.l., 384 m long, 177 m wide and 9.4 m deep) and Peñalara Lake (monomictic at 2017 m a.s.l., 115 m long, 71.5 m wide and 4.8 m deep). We have been able to characterize the influence of the NAO in both lakes because of their location in a region highly influenced by NAO variability and the availability of limnological data set available from 2001 onwards for both lakes.

In 2012, twenty-one cores (ten and eleven from Cimera and Peñalara Lakes, respectively) were recovered using the 60 mm and the 90 mm UWITEC corers. Four cores from Cimera and five from Peñalara were analysed every 2 mm by X-Ray Fluorescence core scanner. The preliminary chronological framework was constructed with AMS 14C dates on pollen extract. Principal Component Analyses were used to identify and isolate the environmental forcings that have triggered the input, composition and distribution of sediments in the lake. In addition, smear slides every 5 cm were used to characterize the main particle content of the sediments.

Preliminary results suggest that during the negative phase of the NAO (NAO-) when rainfall increases in the south of Europe, a major amount of snow is accumulated in these high mountain lakes, and their ice-covered period is longer. Moreover, the geochemical data show that coarse grain-size terrigenous input in both lakes decreases during the NAO- and water column stratification is more intense, as shown by changes in the diatom assemblages.