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Holocene vegetation response to human and climate impacts in the Central Mediterranean at Lake Ledro (Southern Alps, Italy)

Sebastien Joannin (1), Boris Vannière (2), Didier Galop (3), Michel Magny (2), Adrian Gilli (4), Emmanuel Chapron (5), Stefanie Wirth (4), Flavio Anselmetti (6), and Marc Desmet (5)

(1) CNRS USR 3124 MSHE, Besançon, Laboratoire de Chrono-Environnement, Besançon, France (sebastien.joannin@mshe.univ-fcomte.fr), (2) CNRS UMR 6249, Lab. Chrono-Environnement, 16 route de Gray, 25030 Besançon, France, (3) CNRS UMR 5602, GEODE, 5 Allées A. Machado, 31058 Toulouse Cedex 1, France, (4) Geological Institute, ETH Zürich, Universtätstrasse 16, CH-8092 Zürich, Switzerland, (5) CNRS UMR 6113, ISTO, Université d'Orléans, Bâtiment Géosciences, 45067 Orléans, (6) Oberflächengewässer Eawag Überlandstrasse 133, Postfach 611 8600 Dübendorf, Switzerland

In order to link Holocene paleoenvironmental changes with evolving climate state and human impact, a high resolution lake record is studied from the European mountain region. Lake Ledro (652 m a.s.l.; Trentino, north-eastern Italy) is located on the southern slope of the Alps and its catchment area covers 131 km2 with mountains culminating at 1500-2000 m. A multi-proxy approach based on biotic and abiotic indicators (lake-level, palynology, geochemistry and geophysic) was developed from deep and littoral cores, including sediment sequences in Early and Middle Bronze Age lake-shore archaeological sites.

A deep master core was built after extracting twin cores from a non disturbed sediment zone recognised by seismic-reflexion investigations. The age-depth model is based on 13 AMS 14C ages measured on terrestrial plant macrofossils and the mean temporal resolution for analyses is ca 60 years. Palynological study shows the usual vegetation succession for the southern slope of the Alps. During the first part of the Holocene, abrupt changes are observed in pollen assemblages in relation to changes in other proxies (XRF and Magnetic Susceptibility) and correlate with cold events associated to the deglaciation in the North-Atlantic area. Cool episodes corresponding to the PreBoreal Oscillation (ca 11.3 ka cal BP) and 8.2 ka event are respectively characterized by stopping afforestation and a strong development of Abies in the local ecosystem. Human activity is sporadically indicated since 7500 cal. BP. Major change begins from 4200 cal. BP. onwards, three declines of arboreal pollen abundance are observed in relation with occurrences in both cereal and anthropogenic pollen indicators. The three phases are confirmed by increase in soil erosion as indicated by abiotic proxies. Thus, they give evidence of three successive steps for human settlement (Early-Middle Bronze Age, Iron Age and Roman period, recent period) separated by forest development. Palaeohydrological investigation suggests that high lake level associated with more humid climate in the lake surrounding coincided with the Bronze Age human settlements.