15th International Congress of the Geological Society of Greece
Athens, 22-24 May, 2019 | Harokopio University of Athens, Greece
Bulletin of the Geological Society of Greece, Sp. Pub. 7 Ext. Abs. GSG2019-106

Late Glacial and Holocene Vegetation History and Climate Variability in Southwestern Balkans

K. Panagiotopoulos[1], K. Kouli[2], O. Peyron[3], S. Kyrikou[1,2], A. Francke[4], N. Leicher [1], B. Wagner[1]

(1) Institute of Geology and Mineralogy, University of Cologne, Germany, panagiotopoulos.k@uni-koeln.de
(2) Department of Geology and Geoenvironment, National and Kapodistrian University of Athens, Greece
(3) Institut des Sciences de l'Evolution de Montpellier, Université de Montpellier, Montpellier, France
(4) School of Earth and Environmental Sciences, University of Wollongong, Australia

New insights into the floristic composition, vegetation changes and climate variability over the last 17000 years are provided by the two new high-resolution pollen records from lakes Ohrid and Prespa. The Lake Ohrid (DEEP core) pollen record is the first continuous Late Glacial-Holocene sequence from Lake Ohrid, as existing Late Glacial and Holocene records from Lake Ohrid suffer from discontinuities in sedimentation (Sadori *et al.*, 2016). This centennial resolution pollen record along with an increased resolution in the pollen archive of the adjacent Lake Prespa allow to examine the evolution of local and regional vegetation patterns at an unprecedented scale. Subsequently, we employ the modern analogue technique (MAT) on the new pollen data to reconstruct climate variability in the area over the study interval. Moreover, thirty modern surface (moss) samples collected across an altitudinal transect within the catchments of Ohrid and Prespa were analyzed and integrated in the calibration dataset to improve the local vegetation-climate relationship.

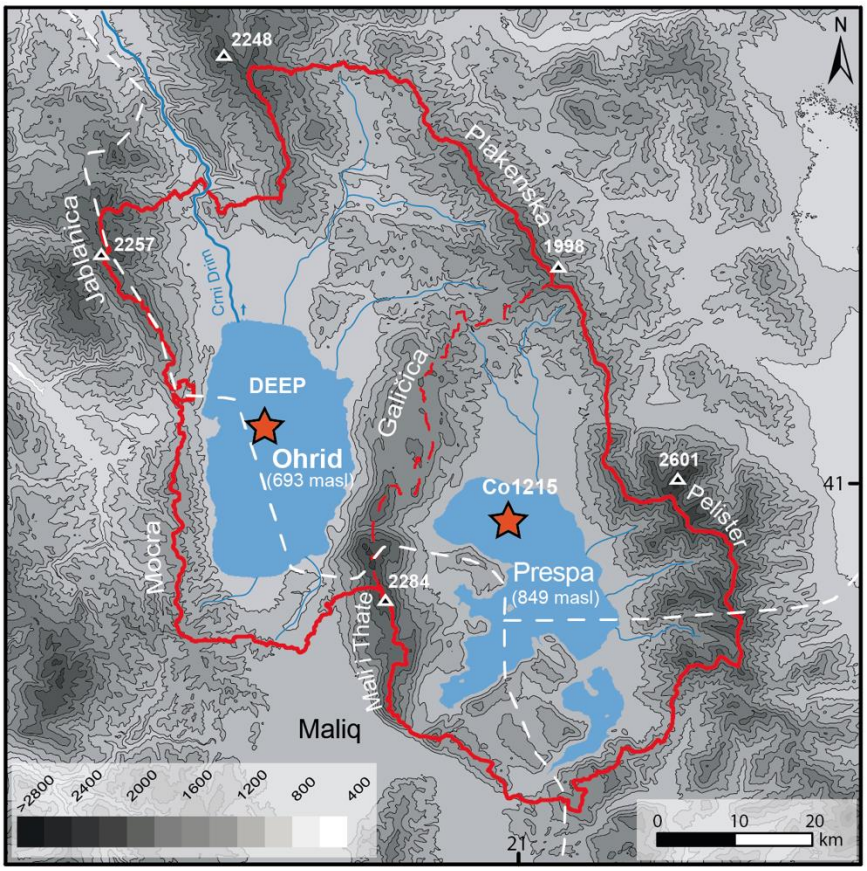

Figure 1: Topographic map of the study region showing the catchment of Lake Ohrid and Lake Prespa and the coring locations of the DEEP (Ohrid) and Co1215 (Prespa) sites (after Panagiotopoulos 2013.

In the Last Glacial period (from 17000 cal BP onwards), pollen spectra from both lakes suggest a rather open landscape dominated by steppe elements (mainly *Artemisia* and Chenopodiaceae) along with grasslands. Pines appear to be the dominant trees in the region during this interval, while relatively high oak percentages suggest their local presence in both catchments. During the Bølling/Allerød deciduous oaks dominate arboreal tree percentages at Ohrid, while at Prespa pines remain dominant throughout this period. During the Bølling/Allerød, deciduous oaks dominate tree percentages at Ohrid, while at Prespa pines remain dominant over this period (Panagiotopoulos *et al.*, 2013). Throughout the Younger Dryas (12900 – 11600 cal BP), the resurgence of steppe elements accompanied by *Betula*, *Ephedra* and *Hippophae* in both pollen records suggest that cold and arid conditions prevailed. Mean annual precipitation values reconstructed applying the MAT method yield values above 400 mm/year during the last 17000 years. These findings imply that moisture availability was most likely not a limiting factor for tree growth and support the refugial character of the region

(Panagiotopoulos *et al.*, 2014).

The Holocene is characterized by an estimated twofold increase of mean annual precipitation compared to the Younger Dryas. The onset of the Holocene is characterized by the gradual expansion of mixed deciduous woodland dominated by oaks indicating the presence of dense deciduous oak forests in the surroundings of Lakes Ohrid and Prespa. A markedly short-term shift highlighted by an abrupt rise of *Artemisia* percentages, corresponding to the centennial 8.2 cooling event is registered in the pollen records of both lakes. During the Middle and Late Holocene, the closed forests diversify and percentages of other deciduous taxa such as *Acer*, *Alnus*, *Carpinus*, *Fagus*, *Ostrya* increase in both records, especially at Prespa. Although Lake Ohrid is situated a 150 m lower than Lake Prespa at 693 m asl, the presence of Mediterranean elements such as *Pistacia* and *Phillyrea* in Ohrid pollen spectra is rather limited compared to Prespa. Intensifying anthropogenic activities during the last two millennia can be inferred in both records from the decline of tree percentages and the coeval increase in pollen of cultivated plants such as walnuts and cereals.

These two pollen records from mid-altitudes in southwestern Balkan suggest that the vegetation response in the region is highly sensitive to sub-millennial climate shifts and improve our understanding on plant diversity dynamics, evolution and resilience over the last 17000 years.

Acknowledgements

This study was funded by a DFG Grant No. PA2664/2-2 (Konstantinos Panagiotopoulos) and by a Grant No. GSGS-2018A-SUH03 of the Graduate School of Geosciences, University of Cologne (Styliani Kyrikou).

References

Panagiotopoulos, K., Aufgebauer, A., Schäbitz, F., Wagner, B., 2013. Vegetation and climate history of the Lake Prespa region since the Lateglacial. Quaternary International 293, 157-169.

Panpagiotopoulos, K., 2013. Late Quaternary ecosystem and climate interactions in SW Balkans inferred from Lake Prespa sediments. PhD thesis, Universität zu Köln, Cologne, Germany,

Panagiotopoulos, K., Böhm, A., Leng, M.J., Wagner, B., Schäbitz, F., 2014. Climate variability over the last 92 ka in SW Balkans from analysis of sediments from Lake Prespa. Climate of the Past 10, 643-660.

Sadori, L., Koutsodendris, A., Masi, A., Bertini, A., Combourieu-Nebout, N., Francke, A., Kouli, K., Joannin, S., Mercuri, A.M., Panagiotopoulos, K., Peyron, O., Torri, P., Wagner, B., Zanchetta, G., Donders, T.H., 2016. Pollen-based paleoenvironmental and paleoclimatic change at Lake Ohrid (SE Europe) during the past 500 ka. Biogeosciences 13, 1423–1437.