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Late Pleistocene and Holocene Climatic Variability in the Carpathian-Balkan Region

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Vegetation response to climate forcing during the last glacial maximum and deglaciation in the East Carpathians: attenuated response to maximum cooling and increased biomass burning

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The Carpathian Mountains were one of the main mountain reserves of the boreal and cool temperate flora during the Last Glacial Maximum (LGM) in East-Central Europe. Previous studies demonstrated late glacial vegetation dynamics in this area; however, our knowledge on the LGM vegetation composition is limited due to the scarcity of suitable sedimentary archives. Here we present a new record of vegetation, fire and lacustrine sedimentation from the youngest volcanic crater of the Carpathians (Lake St Anne, Lacul Sfânta Ana, Szent-Anna-tó) to examine environmental change in this region during the LGM and the subsequent deglaciation. Our record indicates the persistence of boreal forest steppe vegetation (*Pinus sylvestris*, *Pinus mugo*, *Pinus cembra*, *Betula*, *Salix*, *Populus*, *Picea abies*) in the foreland and low mountain zone of the East Carpathians and *Juniperus* shrubland at higher elevation. We demonstrate attenuated response of the regional vegetation to maximum global cooling. Between ~22,870 and 19,150 cal yr BP we find increased regional biomass burning that is antagonistic with the global trend. Increased regional fire activity suggests extreme continentality likely with relatively warm and dry summers. We also demonstrate xerophytic steppe expansion directly after the LGM, from ~19,150 cal yr BP, and regional increase in boreal woodland cover with *Pinus* and *Betula* from 16,300 cal yr BP. Plant macrofossils indicate local (950 m a.s.l.) establishment of *Betula nana* and *B. pubescens* at 15,150 cal yr BP, *Pinus sylvestris* at 14,700 cal yr BP and *Larix decidua* at 12,870 cal yr BP. Pollen data furthermore hints at the regional presence of some temperate deciduous trees during the LGM (*Fagus sylvatica*, *Carpinus betulus*, *Corylus avellana*, *Fraxinus excelsior*, *Ulmus*). We also present pollen based quantitative climate reconstruction from this site and discuss its connection with other climate reconstructions and climate modeling results.