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

ABSTRACTS VOLUME

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Vegetation, climate and fire: new insight from palaeoecological records from the Romania

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Palaeoecological datasets (pollen, plant macrofossils, stomata, charred remains, charcoal, testate amoebae) are a surrogate for measurement of past biotic responses to environmental and disturbance scenarios occurring at different temporal scales (10 to 103 years). Here, I provide an overview of the results from the latest methodological approach in fossil records from the Romanian Carpathians spanning the last glacial to the present. This paper is structured around three main research subjects: I) Past vegetation dynamics with focus on the vegetation sensitivity to the climate and human impact in the lowlands of Transylvania (Lake Stiucii). Particularly emphasis is on the application of Regional Estimates of Vegetation Abundance at Large Sites (REVEALS model) to correct for biases in taxon-specific pollen productivities and dispersal for an accurate quantification of vegetation cover changes and human induced land cover changes; II) Patterns and drivers of biomass burning in Carpathian region; and III) Hydro-climatic shifts during the last 1000 yeast as revealed in peat bogs from the Northern Carpathians.

I) Results from pollen based land cover reconstruction at Lake Stiucii show that temperate deciduous broadleaf woodlands prevailed during the early and mid Holocene in the lowlands of Transylvania. These forests were intensively cleared and burnt after 3700 cal yr BP (Bronze Age). Following the extensive and sustained land use, also supported by rich archeological records, the woodlands were too vulnerable to ever fully recover (Feurdean et a., in review). Our new findings of intensive human land use challenge the previous view and modeling results of a more recent landscape transformation in the region i.e., the past 1000 years. This therefore adds new insights on the timing and intensity of the anthropogenic transformation and their profound ecological changes in this region.

II) The usefulness of sedimentary charcoal records to document centennial to millennial scale trends in aspects of fire regimes is widely acknowledged, yet the long-term variability in these regimes is poorly understood. Lake level reconstructions at Lake Stiucii alongside climate simulations indicate that early summer temperature and precipitation were significantly associated to changes in the fire frequency and severity until about 3300 cal. yr. BP (Feurdean et al., 2013). Humans enhanced fire regimes between 3500 and 700 cal. yr. BP, while subsequently, with the development of more densely populated area, humans have efficiently suppressed fires. Results from the analysis of trends in biomass burning on an elevation transect in the Carpathians suggest a broad-scale homogenous pattern in biomass burning during the Late glacial and increase heterogeneities during the Holocene. It also shows a strongly contrasting pattern in fire activity across elevations.

III) Results from testate amoebae, plant macrofossils, and δ13C in Sphagnum provide a quantitative reconstruction of water depth fluctuations and wet /dry shifts in the Northern Carpathians. Our multi-proxy reconstructions suggest several wet/dry shifts over the past millennium. Most importantly, climate conditions during the Medieval Warm Period (800-1150 AD) were considerable wetter than today, whereas conditions during the Little Ice Age (1300-1850 AD), were dry, with the driest phase evidenced from 1550 to 1750 AD (Feurdean et al., in prep).

These results provide significant advances of the methodology in the field and increases and consolidate the geographical coverage of proxy records of past climate variability in a poorly studied region.

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