



## **The smelting of metals in the Romanian Carpathians throughout the Holocene**

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In Europe the characteristics, distribution and effects of recent pollution are well known, with monitoring observations existing at a continental scale. However, estimates of long-term pollution are restricted to central-western Europe, the British Isles and Scandinavia. In Eastern Europe in particular, the lack of such estimates has led to incomplete understanding of regional differences. When coupled to the insufficient knowledge of past emission sources and isotopic signatures of various ores, it is clear there are gaps in our knowledge of the history of pollution in this area. As a result, the causal relationship between humans and the environment are insufficiently explored, particularly within the Carpathian region- one with mineral wealth and a long history of human presence.

Peat bogs have long been used as an archive for environmental and climatic imprints, with research using climate indicators from bogs burgeoning in recent decades, and a range of proxies for past hydrological change have been developed. The potential for utilising the geochemistry of archives such as peat bogs to resolve the input of metals from the atmosphere has long been known, and has been used to distinguish the background levels from the anthropogenic imprint.

Here we present initial results from a multi-proxy study into the geochemical history of a collection of ombrotrophic peat bogs located in the Romanian section of the study region. We present elemental concentrations for a number of the base metals associated with metal mining, smelting and subsequent pollution. These data (base metal concentrations) display the first such study in the region and indicate a pollution history hitherto unseen in the records from Western Europe, with peaks in metal production over time periods during which production was thought to be low. This includes a large, likely medieval Pb peak, and extended periods of metal production in the region after the Roman occupation. These early peaks are followed by recent (1850-present) enrichment in all elements. Alongside the geochemical results, an initial pollen record is presented, indicating timing and extent of deforestation in the region.