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The impact of ancient mining on the environment of Schwaz (Tirol) evidenced by a multi-proxy analysis

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Changes in ancient cultural landscapes are seen as a product of predominantly agricultural activities, but there is another type of human impact which has left significant effects on past environments: Ore mining caused a huge demand on raw materials (water, timber) and the metallurgic process polluted the environment with heavy metals. Recent advances in pollen analysis enable a detailed reconstruction of past vegetation and its agricultural utilization, but the palaeoecology of mining is still poorly known, although its impact shaped the Alpine landscape for thousands of years. However, the difficulty of palynology in mining areas is that mining acitivities produce a similar pollen signal as agricultural activities do. Therefore, here we use a multi-proxy approach to evaluate the effects of historical mining on the vegetation by the combination of pollen, micro-charcoal and geochemical analyses validated by historical and archaeological data.

The subject matter is a small fen “Kogelmoos” located within the prominent historical mining area of Schwaz in Tyrol, Austria. Detailed pollen, micro-charcoal and geochemical analyses of its deposits reflect significant changes in the vegetation, intensive fire activities and heavy metal pollution since the late mediaeval times. This palaeoecological record of land use is corroborated by historical data concerning settlement foundation with livestock farming and tillage as well as ore exploitation and smelting activities within the hydrological catchment of the fen. Finally this historical palaeoecological record of the impact of mining is used as a calibration set to evaluate ancient mining activities in this area. A synchronous increase of lead and micro-charcoal values, followed by an increase of pioneer tree species (Pinus, Larix) displays the beginning of ore exploitation in the area at the Neolithic/Bronze Age transition and persists until the beginning of the Iron Age. Archaeological investigations of the “Heidenzechen” by Schwaz revealed galleries of underground mining dated at least to 932 -762 BC. The potential of this multi-proxy approach, combining palynology, charcoal, geochemical analyses as well as historical and archaeological data to evaluate past anthropogenic changes of the environment by the impact of mining is discussed.