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Middle Bronze Age land use practices in the north-western Alpine foreland – A multi-proxy study of colluvial deposits, archaeological features and peat bogs

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We present a multi-proxy approach to reconstruct Middle Bronze Age (MBA, 1600-1250 BCE) land use practices in the north-western Alpine foreland (SW Germany, Hegau). We combined biogeochemical proxies from multi-layered colluvial deposits and archaeobotanical and archaeozoological data within and in the surrounding of the archaeologically well-documented settlement site of Anselfingen. Offsite pollen data from two peat bogs were used to place the onsite and near-site vegetation and land use data to a regional context.

Phases of colluvial deposition were reconstructed by optically stimulated luminescence (OSL) and radiocarbon (AMS ¹⁴C) dating. The first phase of major colluviation could be correlated with MBA land use followed by phases of colluvial deposition during the Iron Age, the Medieval period, and modern times. Charcoal spectra from colluvial deposits and archaeological structures indicate MBA forest management favoring *Quercus* in the surrounding area north of the settlement. The analysis of faecal biomarker (5β-stanols up to 40 %) and excavated pig bones (up to 14 %) suggest the presence of a forest pasture mainly used for pig farming. In the surrounding area south of the

settlement, an arable field with a buried MBA plough horizon (2Apb) could be verified by soil micromorphological features such as very dusty clay coatings and a banded microstructure and by high concentrations of grass phytoliths from leaves and stems. Agricultural practices (e.g. ploughing) focused on five staple cereal crops (*Hordeum distichon/vulgare*, *Triticum dicoccum*, *Triticum monococcum*, *Triticum spelta*, *Triticum aestivum/turgidum*) as indicated by the onsite archaeobotanical records. Stilted pantries, reconstructed from MBA post-holes, were interpreted as storage facilities, while excavated heat stones are likely to indicate post-harvest processing of cereal crops and other agrarian products. Higher levels of urease activity compared to microbial biomass carbon (up to $2.1 \mu\text{g N } \mu\text{g Cmic}^{-1}$), and input of herbivorous animal faeces indicate livestock husbandry on fallow land or manuring practices. The suites of polycyclic aromatic hydrocarbons (PAHs) and their spatial distribution indicate the use of fire for various purposes, e.g. for landscape opening and maintenance, for domestic burning and for technical applications. The offsite pollen data support the onsite and near-site vegetation change. During the MBA, fire played a major role in shaping the landscape (peak of micro-charcoal during the MBA in the offsite pollen records) and anthropogenic activities promoted oak dominated forest vegetation at the expense of natural beech forests. This approves a broad regional human influence in the north-western Alpine foreland during the MBA.

Our data allow in-depth insights into the MBA subsistence economy on a local and regional scale, which was not limited to settlements at lakeshore sites. The MBA in the north-western Alpine foreland was a period of establishing settlements with sophisticated land management and land use practices also at low and mid altitude inland sites. We could further show that colluvial deposits are promising archives for the reconstruction of past land use practices.