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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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### **Point by point response referring to the revised manuscript**

Dear Mr. Homburg,

Thank you for handling our manuscript as topical editor within the SOIL review process. Please find below our point by point response referring to the revised manuscript. If something remained unclear, please feel free to contact me for further discussion.

Sincerely,

Sascha Scherer and co-authors

**Line 35 (Abstract)**

For more clarity, we have added “, 1600 – 1250 BCE”

**Lines 36-37, 73, 117, 118, 131-132, 593, 705, 915 (whole manuscript)**

For a higher precision, we have added: “and buried topsoils”

**Line 40 (Abstract)**

“stimulated” was missing

**Lines 74-83 (Introduction)**

For more clarity of the general definition of colluvial deposits and how we refer to it, we have changed these lines to:

*“With respect to the diverse definitions of colluvial deposits as hillslope sediments transported by either mass-gravity transport or slopewash type processes (Miller and Juilleret, 2020), we refer to the German term ‘Kolluvium’, which defines colluvial deposits as the correlate sediments of human-induced soil erosion (e.g. Kadereit et al., 2010). In Central Europe, human impact on the terrestrial ecosystem has distinctly increased since the Late Holocene (Winiwarter and Bork, 2019) and land use practices such as deforestation and soil tillage have left land use traces (e.g. charcoal, archaeobotanical and biogeochemical proxies) that are archived in colluvial deposits by impeding degradation processes through continuous sedimentation (Kühn et al., 2017). Therefore, colluvial deposits can be considered one of the key archives for human-land interactions (Pietsch and Kühn, 2017; Zádorová, and Penížek, 2018) as they store not only the history of climate and sedimentation, but also proxies for past land use change and associated practices (Dreibrodt et al., 2010a;b; Scherer et al., 2021).”*

**Line 141 (Material and Methods)**

Spelling error. We have changed to “Younger”

**Lines 342ff. (Results)**

We have added the information on the U.S. Soil Taxonomy in the header of table 1.

**Lines 351ff. (Results)**

To better understand the dating results derived from optically luminescence analysis, we provide the dose rate ( $D_e$ )-distribution curves in the supplementary (see Fig. S1)

**Lines 424ff. (Results, Table 2)**

For a better understanding, we have changed the header of table 2 to:

*“Phytolith concentrations, relative abundances of phytoliths (monocotyledonous, dicotyledonous) and anatomical origin of phytoliths (grasses, dicotyledonous) of selected profiles. Percentages are calculated over the total number of morphotypes identified in each soil sample; at least 200 morphotypes were identified in each sample (n.i. = not identified); \*: Leaves only.”*

#### **Line 428 (Table 2)**

We have changed the following table column names:

“Morphotypes → Rel. abundances”; “Grasses → Monocot. grasses”; “Inflorescence → Inflorescences”; “Grass short cells → Short cells”

#### **Line 433 (Results)**

To better integrate the results from the micromorphological analyses into the storyline of the manuscript, we have added the following transition.

*“Two thin sections from the 2Apb horizon at the ABR SA2 profile were analyzed to further support MBA ploughing activity.”*

#### **Lines 594 (Discussion)**

The manuscript has been published in March 2021.

#### **Lines 724ff. (Discussion)**

To better integrate the results from the micromorphological analyses into the storyline of the manuscript, we have added the following transition.

*“So far, MBA plow marks and soil-structural features indicating tillage have not been published for the north-western Alpine foreland at inland sites. Therefore, the micromorphological analysis of thin section from a buried plough horizon offers an unique opportunity of identifying prehistoric tillage practices. Evidence of arable farming derived from phytolith analysis is further supported by micromorphological analysis of two thin sections at the 2Apb horizon (ABR SA2), which indicates the use of ards that were widely spread since the Late Neolithic (see Tegtmeier, 1987).”*

#### **Lines 842ff (Discussion)**

We have changed the last paragraph of 4.2.3 *Livestock husbandry* according to a comment from referee #1.

#### **Lines 897ff (Discussion)**

We have changed the last paragraph of 4.3 *Offsite vegetation signals in relation to land use practices at the ABR site* according to a comment from referee #1. We have additionally added: *“Even the use of cereals is distinct from onsite archaeobotanical data, ‘closed’ forested landscapes may have hindered the distribution of the offsite pollen of cultivated cereals by the*

*filtering effect. Due to their size (ca. 40-55 µm), the spread of the Cerealia-type pollen is hindered if they are not in the immediate surrounding of the depositional environment. Moreover the pollination of several cereal crops (Triticum, Hordeum) is cleistogamic - this means the flower is closed – which also contributes to a limited pollen spread if no threshing or further crop processing took place near the peat bog. The anthracological data indicate local vegetation and deforestation patterns (colluvial deposits) and human decision-making (fuel procurement).”*

#### **Lines 919ff (Conclusion)**

For more clarity, we have divided the sentence into two.

#### **Lines 1164f. (References)**

We have added the reference: „*Kühn P., Lehdorff E., Fuchs M.: Late Pleniglacial to Holocene Pedogenesis and Formation of Colluvial Deposits in Central Europe (Gambach, Germany). Catena 154, 118-135. doi: 10.1016/j.catena.2017.02.01, 2017*“

#### **Lines 1204f. (References)**

We have added the reference: “*Miller, B. A. and Juilleret, J.: The colluvium and alluvium problem: Historical review and current state of definitions. Earth Sci Reviews, <https://doi.org/10.1016/j.earscirev.2020.103316>, 2020.*”

#### **Lines 1271f. (References)**

The manuscript has been published in March 2021.

#### **Lines 1318f. (References)**

We have added the reference: “*Tegtmeier, U.: Neolithische und bronzezeitliche Pflugspuren in Norddeutschland und in den Niederlanden. Archäologische Informationen, 10(1), 1987.*”

#### **Lines 1355f. (References)**

We have added the reference: “*Winiwarter, V. and Bork, H.-R.: Geschichte unserer Umwelt: 66 Reisen durch die Zeit, Jubiläumsausgabe, 3., erweiterte und aktualisierte Auflage ed. wbg Theiss, Darmstadt, 208 pp, 2019.*”