



Preface: Quaternary research from and inspired by the first virtual DEUQUA conference

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1 The vDEUQUA2021 online conference

The global Covid-19 pandemic, which began in 2020 and did not abate until 2022, had not only a major impact on the lives of millions of people, but also a noticeable impact on science (Jack and Glover, 2021; Schadeberg et al., 2022). In this context, as with numerous other conferences, the regular meeting of the German Quaternary Association (DEUQUA) had to be postponed from 2020 to 2022, so in early 2021 the following question arose: “do we want to live for 4 years without intensive exchange on Quaternary science issues?” To fill this gap, a team of eight Quaternary scientists at different career stages from different research institutions organized the virtual “vDEUQUA2021” meeting from 29 to 30 September 2021. Supported by DEUQUA and the scientific platform Sciencesconf as well as the University of Würzburg, it was possible to organize this meeting via the online platforms Gather and Zoom. The online format limited classical face-to-face exchange but at the same time enabled an unprecedented international DEUQUA conference with more than 180 participants from 21 countries, with a share of more than 50 % early-career scientists. This led to intensive exchange and networking within a much broader Quaternary community than at previous on-site DEUQUA meetings.

The very interdisciplinary conference program and the high number of contributions impressively demonstrated the

strong interest in Quaternary science and the high demand for scientific exchange despite – or especially because of – the exceptional pandemic situation. This may be explained by (i) the key role that Quaternary science plays in determining the pre-industrial background of the dramatic current climatic, geomorphological and geocological changes due to strongly increased human activity (“the past is the key to the future”; Woodroffe and Murray-Wallace, 2012; McCarroll, 2015) and (ii) the rapid methodical developments within this field that are permanently expanding the possibilities of approaching climate and environmental archives in novel ways, as well as of addressing new research questions, requiring intensive and rapid scientific exchange and feedback (Banerji et al., 2022; Britton et al., 2022). Accordingly, these recent developments are also reflected in the 12 articles of this conference volume, which deal with pre-industrial climatic, geomorphological and geocological changes as well as with methodological developments.

2 The contributions to this volume

Vinnepand et al. (2023) study paleoenvironmental changes at the Schwalbenberg RP1 loess–paleosol sequence in the Middle Rhine Valley in Germany between ~40 and 22 ka using a multi-method approach. Their results confirm the assumption of synsedimentary soil formation during interstadi-

als, show loess provenance changes with overall dominating local to regional dust sources and confirm the close temporal linkages of their proxies to those in other paleoclimate archives in the North Atlantic region.

Tinapp et al. (2023) report on valley development of the Elbe Valley near Dresden during the last ~ 15 kyr. Their study links sedimentation, soil formation and archeology in the area. Sedimentologically, they find that a Preboreal clayey sedimentation phase is followed by two fine sandy sedimentation phases before Holocene clayey sedimentation occurs. Of particular interest is the finding that during a longer period between the Atlantic and Subboreal the Lower Weichsel Terrace was used for settlement by the Linear Pottery culture. Thereafter flooding led to sparser (Bronze Age) or absent settlements on the lower terrace.

Pötter et al. (2023) reconstruct a wetland environment for a late Middle to Upper Pleniglacial (approx. 30–20 ka) loess sequence in western Germany. They find that the investigated section was influenced by periodical flooding, leading to marshy conditions and a stressed ecosystem. Overall, the results show that the landscape of the study area was much more fragmented during this time than previously thought.

Hardt et al. (2023) investigate the geomorphological and geological characteristics of the archeological sites Hawelti–Melazo and their surroundings in northern Ethiopia by performing sedimentological analyses, as well as direct (luminescence) and indirect (radiocarbon) sediment dating. They were able to reconstruct the paleoenvironmental conditions in the late Quaternary, which they integrated into the wider context of Tigray.

Schwahn et al. (2023) investigate the loess sequence of Köndringen in the Upper Rhine Graben using a multi-method approach including the measurement of color, grain size, organic matter and carbonate content. The analyses reveal that the sequence comprises several fossil soils and layers of reworked soil material. According to luminescence dating, it reaches back more than 500 000 years.

Ullmann et al. (2022) highlight the application of a freely available tool for Google Earth Engine. The software allows cloud-free satellite images to be processed. They show processing examples for the Nile Delta (Egypt) and how remote sensing images are used to find indications of buried landforms, such as former river branches of the Nile.

Liu et al. (2022) present an isotope geochemical study on mammoth tooth enamel from the Upper Rhine Graben. Their work is both methodological and applied. While methodological aspects of obtaining ideal samples are discussed, their study also reports high-resolution paleoenvironmental records of likely sub-seasonal resolution.

Engel et al. (2022) investigate the late-glacial Bergstraßen-neckar, a former course of the Neckar River in the Upper Rhine Graben in southwest Germany, by sediment cores and geophysical measurements. They were able to reconstruct the shift from a running river to silting-up meanders that took place about 11 000 to 10 500 years ago.

Abdulkarim et al. (2022) analyze the patterns and provenance of paleochannels in the French Upper Rhine alluvial plain. They find at least five paleochannel groups which can be distinguished. Assessing their timing and sedimentology will shed further light on the paleochannel evolution of the area.

Schulze et al. (2022) study a Late Weichselian loess–paleosol sequence in the southern Upper Rhine Graben in southwestern Germany using a multi-method approach. They found drier conditions in the southern compared with the northern Upper Rhine Graben, and they confirm an earlier start of massive loess accumulation compared with the arrival of glaciers in the foreland of the Alps.

Kirchner et al. (2022) evaluate recent soil agro-potential and search for evidence of prehistoric and historic land use by applying a pedo-geomorphological approach in the surroundings of Munigua, a small Roman city in the ancient province of Hispania Baetica (SW Spain). The available evidence of Roman agricultural use in the Munigua area suggests that the city's economy was by no means solely focused on mining.

Labahn et al. (2022) measure $\delta^{18}\text{O}$ of plant-derived lipids in a loess–paleosol sequence in Serbia over the last glacial–interglacial cycle, a method that was recently proposed as a paleoclimatic/paleohydrologic proxy. They obtained enough bulk lipids for analysis, demonstrating the general applicability of this method to loess–paleosol sequences. Furthermore, systematically higher values in paleosols compared with loess layers were observed. However, short-term climatic fluctuations could not be recognized, which requires further research.

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