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Preface to the special issue "Quaternary research in times of change – inspired by INQUA Roma 2023"

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1 The XXI INQUA Congress – time for change

The 21st Congress of the International Union for Quaternary Research (INQUA 2023) took place from 13 to 20 July 2023 in Rome. It was co-organised under the auspices of the Consiglio Nazionale delle Ricerche (CNR) and the Italian Association for Quaternary Studies (AIQUA). Under the headline "time for change", the congress attracted more than 2700 participants from over 90 countries, gathering at the prestigious Roma Sapienza University (participant numbers vary slightly by source: Firoze Quamar, 2024; Monegato, 2024). Notably, nearly half of the attendees were early career scientists (ERCs), possibly marking the highest ERC participation in INQUA Congress history.

The programme featured 143 scientific sessions organised around seven key themes: (i) from natural processes to geohazards; (ii) landforms, facies architecture, and sequence stratigraphy; (iii) Quaternary environments and human evolution: fossil record, phylogeny, palaeobiology, palaeoecology, and cultural models; (iv) ecosystems and biogeography from the Latest Pliocene to the "Anthropocene"; (v) climate records, processes, and models; (vi) the Quaternary time machine; and (vii) time for change in Quaternary sciences (Monegato, 2024). Five plenary sessions enriched the scientific exchange. In keeping with tradition, various pre- and post-congress field trips were organised, primarily in Italy but also in neighbouring Mediterranean countries. Overall, the congress highlighted the vast scope of Quaternary sciences and underscored the knowledge still needed to address pressing environmental and societal challenges.

2 The contributions to this volume

The broad thematic scope of the XXI INQUA Congress is reflected in the nine contributions published in this special issue, aptly titled "Quaternary research in times of change – inspired by INQUA Roma 2023". These contributions consist of six research articles, two express reports, and one thesis abstract, all of which present case studies. The original research is based on presenting new data, drawing from a diverse range of scientific disciplines including archaeology (Losaberidze et al., 2024), geochronology (Appel et al., 2024; Bartz et al., 2024), geophysics (Reiß et al., 2025), palaeobotany/palynology (Tinapp et al., 2025), photogram-

metry/remote sensing (Losaberidze et al., 2024), and sedimentology (Garbe et al., 2024; Gegg et al., 2024; Reitner and Menzies, 2024). Additionally, the thesis abstract summarises extensive geomorphological and geochronological research (Hofmann, 2023).

These contributions can be broadly divided into two categories based on their focus. The first category comprises five research articles that explore geoarchaeology (in its broadest sense) and Holocene human–environment interactions, covering a time span from the Neolithic to the medieval period (Appel et al., 2024; Garbe et al., 2024; Losaberidze et al., 2024; Reiß et al., 2025; Tinapp et al., 2025). The second category includes four studies that examine landscape evolution, focusing on fluvial, glacial, and glaciofluvial processes and archives. Two of these contributions cover the Late Pleistocene (Hofmann, 2024; Reitner and Menzies, 2024), while the others address broader Quaternary timescales (Bartz et al., 2024; Gegg et al., 2024). Geographically, the majority of these studies are set in Germany, covering a range of environments from the Wadden Sea to the Upper Rhine Graben (URG) and the Black Forest (Appel et al., 2024; Bartz et al., 2024; Gegg et al., 2024; Hofmann, 2023; Reiß et al., 2025; Tinapp et al., 2025). Additional study areas include the Austrian Alps (Reitner and Menzies, 2024), the Nile Delta in Egypt (Garbe et al., 2024), and the southern Caucasus in Georgia (Losaberidze et al., 2024).

The following section presents the short summaries of the nine contributions to this special issue. It is structured by the main foci of the studies, namely (i) geoarchaeology and human–environment interactions and (ii) landscape evolution.

2.1 Geoarchaeology and human–environment interactions

Appel et al. (2024) reconstruct the historical watercourse systems of the Hessische Ried (URG, Germany), focusing on Roman-era river regulation and water management. Using high-resolution digital elevation models, geophysical surveys, sediment analyses, and radiocarbon dating, they identify abandoned fluvial channels and reconstruct the region's hydrological evolution. The findings challenge previous assumptions, showing that the Weschnitz and Winkelbach/Lauter rivers did not contribute to the Roman Landgraben waterway, which instead relied on smaller tributaries for navigation.

Garbe et al. (2024) investigate the ancient city of Bubastis in the southeastern Nile Delta, where geoarchaeological research has primarily focused on the western and central areas. While the "temple of Hermes" was estimated to be roughly located in the east during 19th-century explorations, its exact position remains unknown. Geomorphological surveys in 2023 identified an elevated sandy area as a potential temple site, offering new insights into the city's landscape and settlement history.

Losaberidze et al. (2024) present a multi-stage landscape archaeological survey of the Shiraki Plain (southeast Georgia) to investigate late Bronze Age–early Iron Age fortified settlements. Using remote sensing, photogrammetry, and archaeological surveys, the research reveals a dense network of massive fortifications, suggesting a well-organised defensive system. These findings contribute to a broader regional understanding of social complexity and settlement patterns in the South Caucasus.

Reiß et al. (2025) investigate the drowned medieval Trendermarsch outside the modern sea dike of Nordstrand in the north Frisian Wadden Sea. Combining geophysical prospection, sediment analyses, and historical sources, they reconstruct landscape evolution and human impact since the Middle Ages. The findings reveal settlement sites, dike remnants, and evidence of salt peat processing after the 1634 CE storm surge, highlighting how past societies adapted to coastal changes and extreme events.

Tinapp et al. (2025) investigate a multi-cultural site near Kieritzsch with archaeological remains spanning the early Neolithic to the early Bronze Age. Geoarchaeological and archaeobotanical analyses, including pollen and macro-remain studies, enabled the reconstruction of Neolithic vegetation and land use history, revealing early forest clearance for agriculture during the Linear Pottery culture and subsequent landscape changes. A hiatus of over 3000 years follows the Neolithic, with sedimentation resuming in the early medieval period, marked by substantial deforestation and intensified human impact.

2.2 Landscape evolution

Bartz et al. (2024) provide the first numerical age estimates of the Rhine's main-terrace deposits in the emblematic Kärlich profile along the Middle Rhine Valley via electron spin resonance (ESR) dating of optically bleached quartz. Consistent depositional ages around 1.5 Ma (i.e. older than previously expected) (i) give valuable new insights into the aggradation time of this key geomorphologic marker in this valley section and (ii) call for further numerical dating of the main terrace complex and other terrace subsets of the Rhine.

Gegg et al. (2024) propose a quantitative lithostratigraphic analysis of glaciofluvial sediments deposited in the URG's southeastern part (Germany). They use material collected from three boreholes and apply an approach combining sedimentary facies with gravel morphometrics and petrography. Based on endmember modelling and principal component analysis, they highlight (i) a shift in sediment provenance over consecutive glaciations of the Middle and Late Pleistocene (i.e. enrichment of alpine lithologies during more recent times) and (ii) the usefulness of quantitative analyses for petrographic studies.

Hofmann's (2024) PhD thesis provides new key information on the glacial history of the southern part of the Black Forest in Germany. This study proposes a consistent chrono-

logical framework for deglaciation during the Late Pleistocene maximum in the Feldberg area based on ^{10}Be exposure ages obtained from moraine boulders and erratics. It also underlines the need for further chronological data in the Black Forest, which has high potential for future climate reconstructions.

Reitner and Menzies (2024) study till formation and subglacial deformation processes in a complex sequence (i.e. alluvial, glaciolacustrine, and subglacial deposits) from the Austrian Alps. Based on a combination of micro- and macrosedimentological analysis of both diamictons and deformation structures, evidence of rapid changes in both till rheology and stress field dynamics in the subglacial environment is highlighted. The authors interestingly question the notion of "till" with respect to sedimentology and emphasise the need to reinvestigate complex sedimentary sequences located in the vicinity of former active ice interfaces in alpine environments.

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References

Appel, E., Becker, T., Wilken, D., Fischer, P., Willershäuser, T., Obrocki, L., Schäfer, H., Scholz, M., Bubenzer, O., Mächtle, B., and Vött, A.: The Holocene evolution of the fluvial system of the southern Hessische Ried (Upper Rhine Graben, Germany) and its role for the use of the river Landgraben as a waterway during Roman times, E&G Quaternary Sci. J., 73, 179–202, https://doi.org/10.5194/egqsj-73-179-2024, 2024.

Bartz, M., Duval, M., Alonso Escarza, M. J., and Rixhon, G.: Older than expected: fluvial aggradation of the Rhine's main terrace at Kärlich dated around 1.5 Ma by electron spin resonance, E&G Quaternary Sci. J., 73, 139–144, https://doi.org/10.5194/egqsj-73-139-2024, 2024.

Firoze Quamar, M.: XXIst INQUA Congress 2023: Time for change, J. Geol. Soc. India, 100, 1067, https://doi.org/10.17491/jgsi/2024/173950, 2024.

Garbe, P., El-Raouf, A. A., Es-Senussi, A., Lange-Athinodorou, E., and Meister, J.: Lost and potentially found: the location of the "Temple of Hermes" at ancient Bubastis in the Nile Delta, E&G Quaternary Sci. J., 73, 95–99, https://doi.org/10.5194/egqsj-73-95-2024, 2024.

Gegg, L., Griebling, F. A., Jentz, N., and Wielandt-Schuster, U.: Towards a quantitative lithostratigraphy of Pleistocene glaciofluvial deposits in the southern Upper Rhine Graben, E&G Quaternary Sci. J., 73, 239–249, https://doi.org/10.5194/egqsj-73-239-2024, 2024.

Hofmann, F. M.: Geometry, chronology and dynamics of the last Pleistocene glaciation of the Black Forest, E&G Quaternary Sci. J., 72, 235–237, https://doi.org/10.5194/egqsj-72-235-2023, 2023.

Losaberidze, L., Kirkitadze, G., Akhalaia, M., Lobjanidze, M., Zimmerman, M., and Elashvili, M.: New insights into complex social organization in the southern Caucasus – Late Bronze Age–Early Iron Age settlement patterns in the Shiraki Plain (southeast Georgia), E&G Quaternary Sci. J., 73, 145–158, https://doi.org/10.5194/egqsj-73-145-2024, 2024.

Monegato, G.: INQUA – International Union for Quaternary, Activities' Report – Year 2023, 2024.

Reiß, A., Hadler, H., Wilken, D., Majchczack, B. S., Blankenfeldt, R., Bäumler, S., Ickerodt, U., Klooß, S., Willershäuser, T., Rabbel, W., and Vött, A.: The Trendermarsch sunken in the Wadden Sea (North Frisia, Germany) – reconstructing a drowned medieval cultural landscape with geoarchaeological and geophysical investigations, E&G Quaternary Sci. J., 74, 37–57, https://doi.org/10.5194/egqsj-74-37-2025, 2025.

Reitner, J. M. and Menzies, J.: Subglacial deformation and till formation in a stratigraphic complex Late Pleistocene sequence (Einödgraben/Aurach, Kitzbühel Alps, Austria), E&G Quaternary Sci. J., 73, 101–116, https://doi.org/10.5194/egqsj-73-101-2024, 2024.

Tinapp, C., Gumnior, M., Heinrich, S., Herbig, C., Kretschmer, S., Schneider, B., Stäuble, H., and Stobbe, A.: Holocene vegetation dynamics and sedimentation processes in a small depression on a Pleistocene plain – a multi-proxy approach for the palaeoenvironmental reconstruction of a Neolithic settlement area near Leipzig, Saxony, E&G Quaternary Sci. J., 74, 79–99, https://doi.org/10.5194/egqsj-74-79-2025, 2025.