EGU21-7592
https://doi.org/10.5194/egusphere-egu21-7592
EGU General Assembly 2021

A novel combination of core drillings with 2D and 3D geophysical measurements helps to decipher the fluvial architecture of buried floodplain sediments of the Weiße Elster River (Central Germany)

Hans von Suchodoletz[1], Christoph Zielhofer[1], Mathias Ulrich[1], Azra Khosravichenar[2], Jan Miera[3], Pierre Fütterer[4], Ulrich Veit[3], Peter Ettel[5], Lukas Werther[6], Helen Ballasus[1], and Ulrike Werban[7]

[1]University of Leipzig, Institute of Geography, Leipzig, Germany (hans.von.suchodoletz@uni-leipzig.de)
[2]Max Planck Institute for Evolutionary Anthropology, Department of Human Evolution, Leipzig, Germany
[3]University of Leipzig, Historical Seminar, Leipzig, Germany
[4]Otto von Guericke University Magdeburg, Chair of Medieval History, Magdeburg, Germany
[5]University of Jena, Chair of Prehistory and Protohistory, Jena, Germany
[6]Eberhard Karls Universität Tübingen, Department of Archeology of the Middle Ages, Tübingen, Germany
[7]Helmholtz Centre for Environmental Research - UFZ, Monitoring and Exploration Technologies, Leipzig, Germany

Fluvial sediments are valuable archives of late Quaternary landscape evolution, paleoenvironmental changes and human-environmental interactions. However, given their complex and non-linear character their correct interpretation requires a good understanding of the fluvial architecture. The fluvial architecture describes the spatial arrangement and genetic interconnectedness of different types of fluvial sediments in a floodplain such as channel and overbank deposits. To properly map the different fluvial forms, their variations in composition and geometry must be understood in three dimensions. However, whereas investigations of the fluvial architecture are relatively easy in cohesive floodplain types with incised channel beds and large natural exposures, these are challenging in floodplains with buried stratigraphies where artificial exposures or corings are required.

We studied three cross sections through the floodplain of the middle and upper course of the Weiße Elster River in Central Germany by means of geophysical Electrical Resistivity Measurements (ERT) and closely spaced drillings. These 2D investigations were complemented by spatial geophysical 3D measurements of Electromagnetic Induction (EMI) in the surrounding areas of the cross sections. The latter technique allows fast mapping of larger areas, and was only rarely applied to fluvial systems so far. Our novel and cost-effective combination of core drillings with multidimensional geophysical measurements allowed to systematically reconstruct the fluvial architecture of larger areas of the Weiße Elster floodplain with high resolution, and thereby demonstrates its high value for fluvial geomorphology. Furthermore, in combination with ongoing numerical datings of the fluvial sediments these investigations form the base for precise conclusions about possible climatic and human drivers of the Holocene fluvial dynamics of the Weiße Elster River.