Geophysical Research Abstracts
Vol. 21, EGU2019-14575, 2019
EGU General Assembly 2019

A novel combined stratigraphic-geophysical approach to investigate the alluvial architecture of buried floodplain sediments

Hans von Suchodoletz (1,2), Marco Pohle (3), Christoph Zielhofer (1), and Ulrike Werban (3)

(1) Leipzig University, Institute of Geography, Leipzig, Germany (hans.von.suchodoletz@uni-leipzig.de), (2) University of Technology Dresden, Institute of Geography, Dresden, Germany, (3) Helmholtz-Centre for Environmental Research (UFZ), Department of Monitoring and Exploration Technologies, Leipzig, Germany

The concept of „alluvial architecture“ has long been used in alluvial geomorphology. It includes the three-dimensional arrangement of channel-belt and overbank deposits in a fluvial succession. When alluvial sediments are used to derive paleoenvironmental information, it is mandatory to reconstruct the alluvial architecture since its structure is determined by fluvial style, the rate of aggradation and the intensity of avulsion that are governed by different geomorphic and paleoenvironmental factors.
Due to often found natural outcrops in alluvial terraces giving access to Quaternary fluvial sediments, a reconstruction of the alluvial architecture is generally much easier feasable in incised river systems. However, in the case of missing exposures invasive stratigraphical (drillings and trenches) and non-invasive geophysical methods are necessary to investigate the buried alluvial architecture in three spatial dimensions. During the last years, geophysical methods such as Electrical Resistivity Tomography (ERT) and Ground Penetrating Radar (GPR) were regularly used to investigate buried alluvial sediments. However, ERT for 3D reconstruction of alluvial sediments is time-consuming, and GPR often fails to penetrate fine-grained overbank deposits due to the high clay content. In contrast, Electromagnetic Induction Measurements (EMI) that allows a quite fast mapping of all kinds of buried sediment structures of larger areas was only rarely used in alluvial geomorphology so far.
In the course of a running research project, Holocene sediments of the Weiße Elster River in Central Germany are investigated to serve as an archive for changes of the former fluvial dynamics. The middle and lower courses of this river are not significantly incised so that the alluvial stratigraphy is not naturally outcropped. This poster presents the combined application of vibracore drillings together with geophysical ERT and EMI measurements in selected areas of the floodplain. This allows a three-dimensional reconstruction of the Holocene alluvial architecture in these areas and forms the base for further paleoenvironmental reconstructions. The presented innovative combination of vibracore drillings, ERT and EMI measurements offers a promising approach for relatively fast three-dimensional reconstructions of the alluvial architecture as a base for paleoenvironmental reconstructions also in non-incising river systems.