THE FLUVIAL ARCHITECTURE OF BURIED FLOODPLAIN SEDIMENTS OF THE WEIßE ELSTER RIVER (GERMANY) REVEALED BY A COMBINATION OF CORE DRILLINGS WITH 2D AND 3D GEOPHYSICAL MEASUREMENTS

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The fluvial dynamics of a river are generally complex and non-linear, showing repeated periods of sediment erosion and re-deposition in different parts of the floodplain. Therefore, understanding the fluvial architecture of a floodplain, i.e. the three-dimensional spatial arrangement and genetic interconnectedness of different types of fluvial sediments, is fundamental to obtain well-based information about natural or human factors controlling the fluvial dynamics from fluvial sediment archives. Whereas the fluvial architecture can relatively easily be studied in recently incised river systems with large natural outcrops, this is challenging in currently buried floodplain deposits. Within the frame of a multi-disciplinary geoarchaeological project, we investigated the fluvial architecture of the middle and upper Weiße Elster floodplain in Central Germany that offers an extraordinary long-standing archive of Holocene flooding patterns and landscape changes in sensitive loess-covered Central European landscapes. At three sites we did a combined interpretation of 2D transects of Electrical Resistivity Measurements (ERT) and closely spaced core drillings with 3D measurements of Electromagnetic Induction (EMI) of larger floodplain areas. The aim was to decipher the fluvial architecture for larger areas at these sites with high resolution and to reconstruct the main steps of their former fluvial dynamics. Our novel systematic approach allows for time and cost-efficient core drilling based on the preceding ERT measurements, and enables a spatial up-scaling of the main elements of the fluvial architecture from the 2D floodplain transects to their surroundings. Doing so, it was possible to (i) extrapolate the distribution of thick fine-grained silt-clay overbank deposits to larger floodplain areas, and (ii) follow currently buried palaeochannel structures in these areas what allowed to reconstruct former channel patterns. It turned out that fine -grained sandy and silty-clayey overbank deposits overlying basal gravels in the middle and upper Weiße Elster floodplain were deposited during several periods that were separated from each other by geomorphologically stable periods with soil formation. These deposits were affected by strong lateral erosion

during two main periods probably linked with strong meandering or possibly even braiding. Brick and pottery fragments in the corresponding sediments indicate that the last phase of lateral erosion and fine-grained sedimentation must have occurred during the Little Ice Age. This study demonstrates that our novel systematic method combination is a promising and cost-effective approach for future studies of buried floodplain sediments.