Geomorphological reconstructions of the late-Roman and early-medieval landscape in the Rhine-Meuse delta

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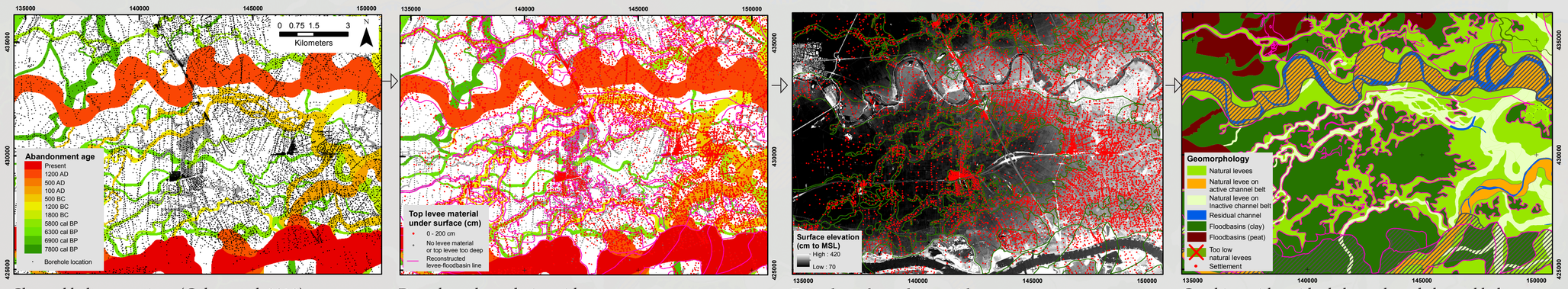
Natural levees are important elements in delta plain geomorphology for understanding delta architecture, landscape evolution and settlement patterns. The data-rich Rhine-Meuse delta, The Netherlands, has a long tradition of integrated digital reconstruction maps and databases.
For this delta we present a new generation of digital map products with natural levees mapped at delta scale. In this contribution, we present the integrative map showing the patterns of levee distribution at AD 100, 500 and 900 and a palaeo-topography reconstruction of the levees. We outline the method of compiling these maps and analyse the levee patterns of different channel belts and delta segments. At delta scale, tectonic setting and delta plain configuration are important in determining the width and orientation of natural levees. At smaller scale, time of evolution, orientation of the channel belt relative to the delta plain gradient overprint these delta scale trends. The resulting palaeogeographical maps are integrative products created for a very data-rich research area that will yield new insights on delta evolution and past delta hydrology. They provide new opportunities for palaeoenvironmental and archaeological maps to study changes in the Late Holocene landscape and the interaction with past habitation.

Geomorphological reconstructions

Method



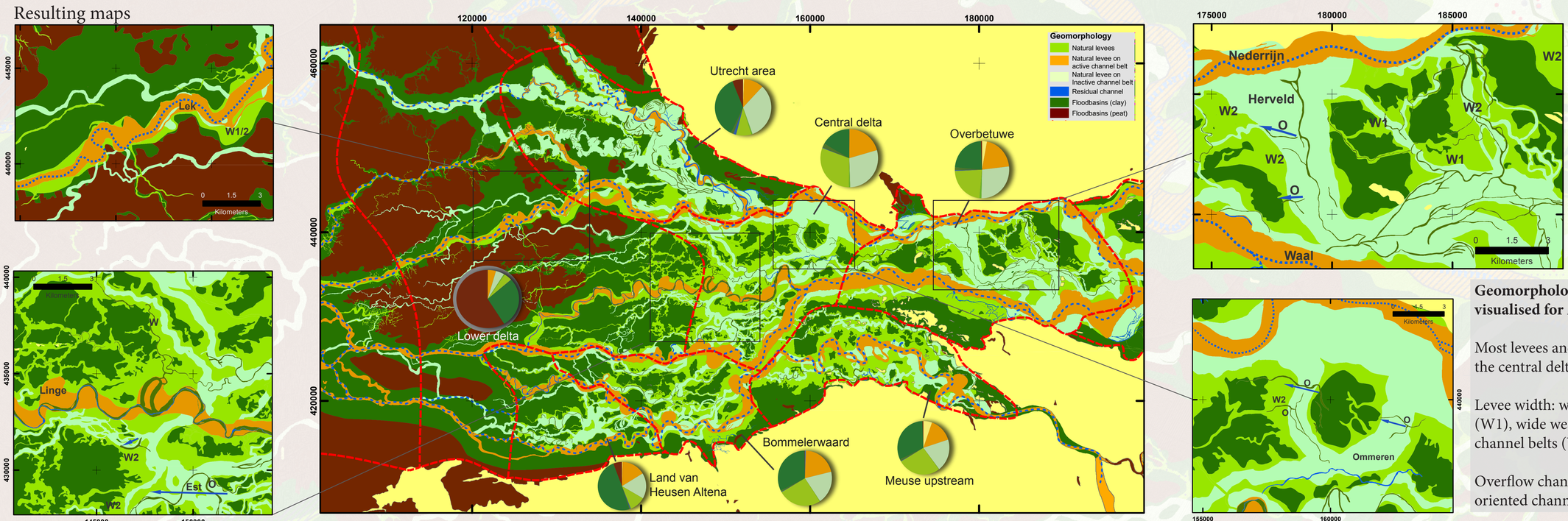
Channel belt generations (Cohen et al. 2012) and borehole locations

Draw levee boundaries with queries from >100,000 boreholes

Draw levee boundaries with AHN LIDAR geomorphology

Combine with residual channels and channel belts into integrated geomorphological reconstruction

Resulting maps



Geomorphological reconstructions visualised for AD 900

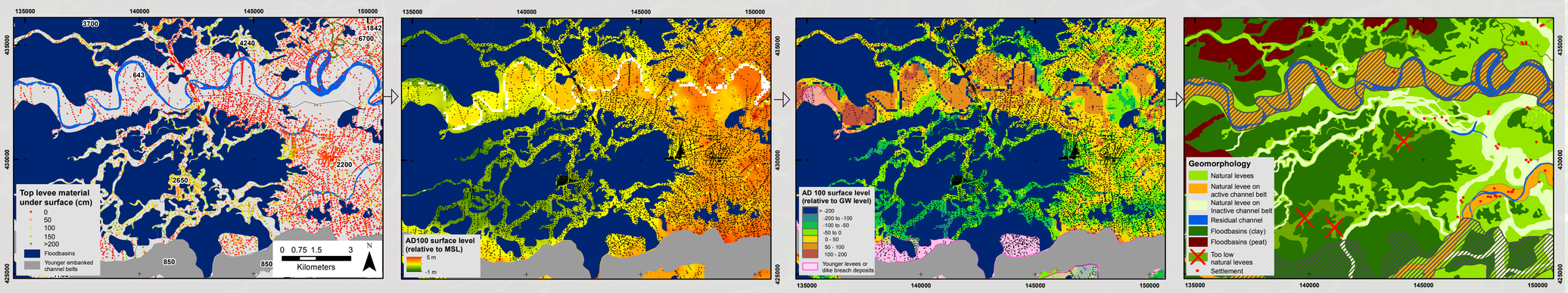
Most levees and crevasse splays in the central delta

Levee width: wide close to avulsion point (W1), wide western side of N-S oriented channel belts (W2)

Overflow channels (O) dissecting N-S oriented channel belts

Palaeo elevation reconstruction AD 100

Method



Mapped levee extent
top levee queries from borehole data

Top levees relative to MSL

Top levees corrected for younger sedimentation and for delta plain gradient reconstructed groundwater level (Cohen 2005; Koster et al. in prep)

Mask out lowest levees

Resulting map

Conclusions and outlook

New detailed geomorphological reconstructions of the Rhine-Meuse delta for the late-Roman and early-medieval landscape provide the following insights:

1) Holocene tectonic activity caused the large abundance of natural levees and crevasse splays in the central part of the delta.
2) Generally, the elevation of levees increases for youngest levees. In the most confined part of the delta plain, natural levees are especially elevated due to flood-water level amplification in the most narrow part of the delta plain.
3) On a smaller scale, wide levees and crevasse splays form where channel belt directions divert from the regional delta plain gradient and directly downstream from the avulsion point.
4) Settlements are found in the higher elevated natural levees of the delta

The presented geomorphological reconstructions facilitate new vegetation reconstrutions, studies on flooding hydrology and settlement dynamics in the landscape.

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