Holocene palaeoDEMs for the Rhine valley and delta plain, the Netherlands and Germany

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PalaeoDEMs are important tools for integrating diverse types of data and improving understanding of landscape evolution, flood dynamics and past habitation patterns. Unlike 2D series of landscape maps, palaeoDEMs provide the possibility to reconstruct settlement elevation and flood dynamics. This works especially well in densely populated Holocene landscapes, such as the Rhine delta and its adjacent valley. In this area, large quantities of raw data have been produced by geotechnical, archaeological, soil science and hydrological communities as well as in academic research.

In this contribution, we present surface-level reconstructions of the natural levees as a new generation of digital map products for the late Holocene Rhine-Meuse delta. We created time-sliced reconstructions for the late Holocene, peeling of the younger elements, such as dike-breach fans and recent flood-basin clays. The palaeoDEMs have been based on hundred thousands of borehole descriptions, over a thousand 14C dates collected by multiple institutes, and further integrates LiDAR data, soil maps, and archaeological data. We discuss the limitations and show three interlinked applications of these new delta-wide landscape reconstructions: (1) analysis of the natural levee shape and its evolution; (2) understanding settlement distribution and changes in settlement elevation through time, specifically during Roman and early-medieval periods; (3) assessing the magnitude and impact of extreme floods before river embankment.