Early historic topography of the Lower Rhine valley and upper delta

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Introduction

Reconstruction of past topography in a palaeo-DEM is useful for a range of geological, geomorphological and archaeological applications. We developed a workflow (Fig. 2) for constructing palaeo-DEMs of large areas at high resolution, and applied this workflow to a region with a long history of human interference in the landscape. The results (Fig. 6) indicate major changes in floodplain connectivity.

Objectives

• Develop a workflow for palaeo-DEM construction.
• Reconstruct the circa 1000 CE topography of the Lower Rhine river valley and the upper part of the Waal-Nederrijn-IJssel delta.

Fig. 1. LiDAR DEM with study area.

Fig. 2. Workflow developed in this study and applied to the study area.

Present-day DEM:
• LiDAR DEM of ground surface.
• Anthropogenic modifications to the terrain include dikes, infrastructure embankments, dump sites, raised grounds for building, pits, quarries, harbours.
• River training.

Palaeo-DEM:
• LiDAR DEM adjusted by alternating automated and manual steps listed in workflow.
• Natural state of floodplain, no compartmentalization.
• Medieval river position.

Results

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• LiDAR DEM adjusted by alternating automated and manual steps listed in workflow.
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Future work

The workflow developed here is widely applicable to lowland areas at different spatial scales. The resulting palaeo-DEM is currently being applied in a hydraulic model study in order to identify late Holocene to historic flooding patterns and quantify the magnitudes of the largest historic floods of the Rhine river.