Using detailed elevation data for mapping hidden natural landscape features in the Amstelland region

David Joshua Wagenaar

When looked at the landscape of Amstelland with the bare eye one may think that it is totally flat, so there is very little or no difference in elevation. One may also think that it is impossible to recognize hidden natural landscape features in the current totally flat land. Nothing could be further from the truth, because when using GIS in a correct way it is now possible to use detailed elevation data for recognizing and mapping hidden natural landscape features in Amstelland. This article that is based on a short research project on this topic at the SPINlab of the Vrije Universiteit Amsterdam will show how.

Data

The current generation of the elevation data in the Netherlands (AHN2) is based on detailed LiDAR (Light Detection And Ranging or Laser Imaging Detection And Ranging) data with an initial resolution of several observations per m^2 and a height precision of 5 cm. The data is available for all of the Netherlands at a 0.5 meter x 0.5 meter resolution and a 5 meter x 5 meter resolution.

Research objectives

This detailed elevation data was used in the research project for recognizing and visualizing the old landscape features (like former creeks) in Amstelland. An additional objective was to create a GIS assignment and contribute to the development of the academic education program of the Vrije Universiteit Amsterdam.

Analysis steps

Detailed elevation data was downloaded from a Rijkswaterstaat data portal (http://www.rijkswaterstaat.nl/apps/ geoservices/geodata/dmc) and imported into ArcMap. The whole area of Amstelland is divided into different map sheets that contain many missing data values. So it was needed to use interpolation techniques inside to fill these holes.

As we are only interested in elevation differences that relate to natural landscape features that represent the formation of this area we have discarded the elevation ranges associated with the landscape features. So we have reclassified the detailed elevation data into a handful of classes that distinguish between areas of similar height such as polders, water, peats and cities. The map symbology was changed from a range describing all existing elevation data (like in the interpolated map sheets) towards a range that only highlights the elevation data that represents the different categories of natural landscape features.

Next it was needed to find the natural landscape feature (category) and its range in elevation data that represents the old landscape features. It has turned out to be the category *polders*. So new binary maps were created on which the elevation data, that shows the polders on the map sheets, was reclassified to a certain value. However the elevation data, that shows the other different natural landscape features on the map sheets except for the polders, was

reclassified to another value. In this way it was possible to filter out the category polders and its range in elevation data that represents the old landscape features.

Subsequently these binary maps were multiplied with the interpolated map sheets by using the raster calculator tool to filter out the elevations of areas that were outside the elevation of interest. Thereby the map symbology was changed from a range that only highlights the elevation data that represents the different categories of natural landscape features towards a range that only highlights the elevation data that represents the category polders.

In this way reclassified maps with a very small range of elevation data, that only represents the category polders, but on which the whole map symbology was applied, were created. They were used to map hidden natural landscape features in Amstelland that, in this case, were mainly former creeks. This was done by creating vector data and drawing polygons representing former creeks.

The geological age of this former creeks lies at the border between the Boreal and the Atlantic around 10,000 years ago. At that time the Amstelland region was a wad rich area that was constantly influenced by the tide. So it was a tidal landscape that can be compared to the current West Frisian Islands.

Last but not least a GIS assignment was created, to contribute to the master program Earth Sciences at Vrije Universiteit Amsterdam, based on these analysis and all the map results for these analysis.

Results

When looked at the landscape of Amstelland with the bare eye one may think that it is totally flat (see Figure 1). However, after carrying out the GIS analysis clear elevation differences become visible. It is even possible to recognize and map the former creeks in the area based on these differences (see Figure 2).

Figure 1: Street view of the Amstelland region in Google Maps

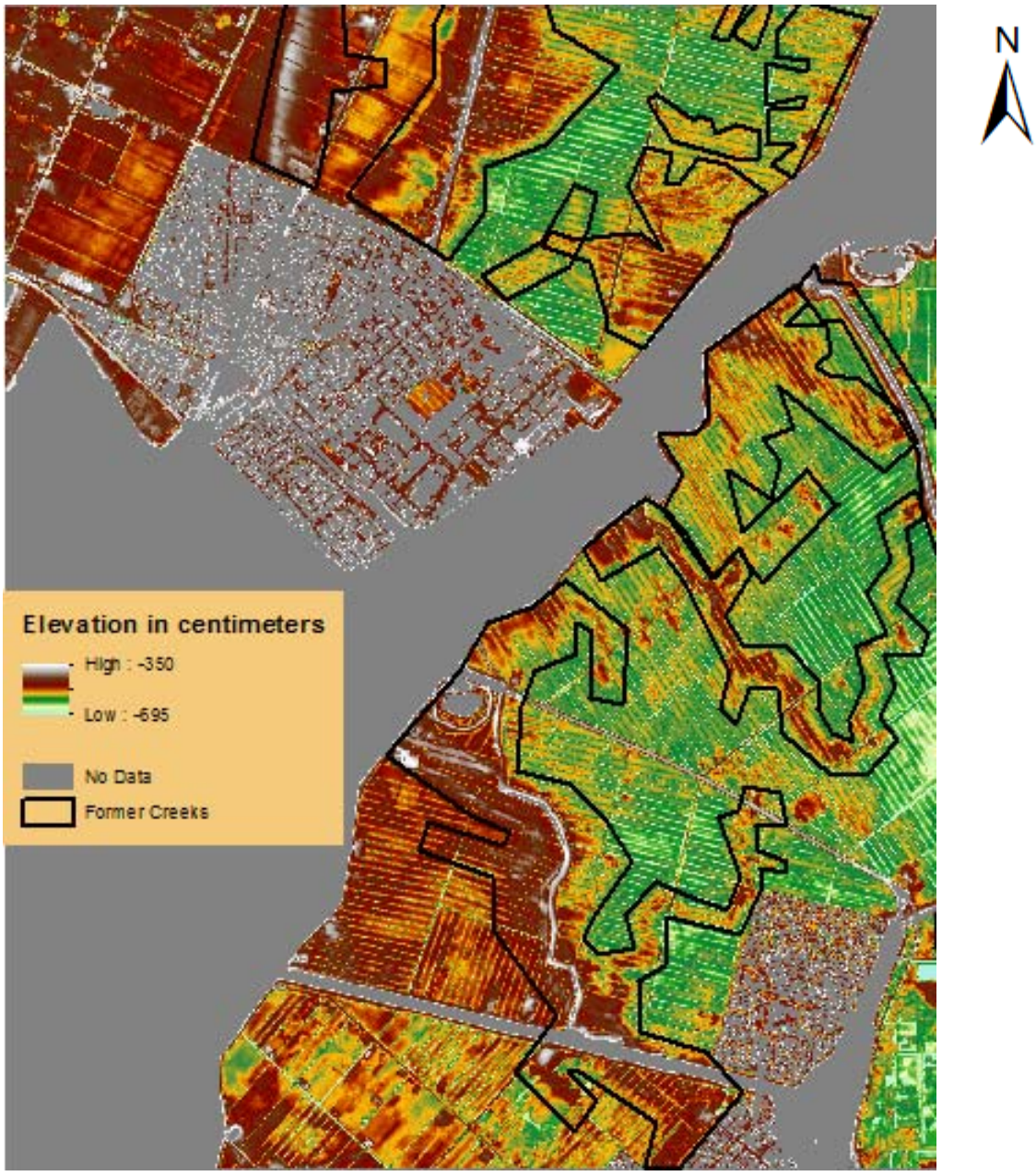

Figure 2: Map sheet within the Amstelland region visualizing elevation differences in the low lying polder areas that represent the former creeks

Conclusion

Using detailed elevation data and GIS allows for the analysis of relatively small elevation differences such as those in the seemingly flat Amstelland area. The analysis helps recognizing and mapping the former creeks in the area that were formed around 10,000 years ago.