H31Z-1861

Global identification of levees and their heights for flood inundation mapping

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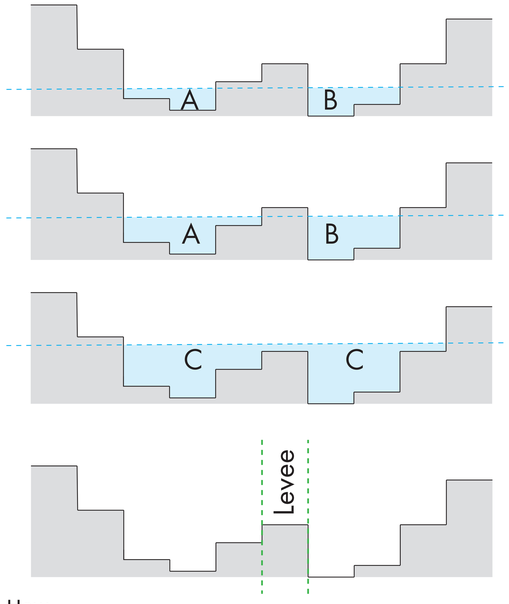
Why

While levees are important assets in natural hazard risk assessments, accurate information in the public domain about the location and height of these embankments is often missing. Whereas Nienhuis et al (2022). made an inventory of levees based on public information, van Nieuwenhuizen et al (2021)., Knox et al. (2022), and Wing et al. (2019) find levees based on a per pixel basis. We aim to improve upon inventories based on public information that are inherently incomplete and per pixel methods that are prone to result in line segments with gaps.



How

We build upon Wood et al. (2018), who used radar-based flood maps, together with gauge information to detect embankments. Here we we create artificial extents by flooding a DEM for a range of elevations and take the outline of the flooded areas each time. When the outlines of two flooded areas meet, we save the line. By taking the volume and perimeter, we can find actual levees, filtering out the edges smaller ponds or larger valleys.

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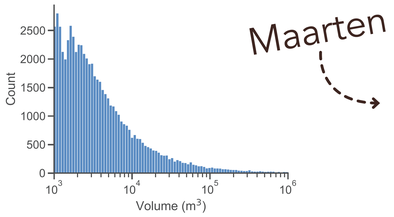
One can detect and **delineate levees** in **global DEMs** by connected components analyses of flood simulations

Scan me for a digital version!

Levees colored by volume as detected by our method for the Dutch polder landscape using CopernicusDEM.

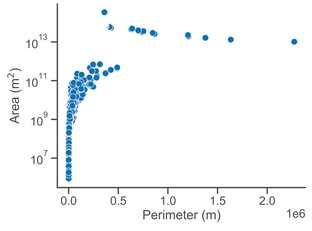


Histogram of the volume of all levees on the left.

Discussion

While this method scales globally, as it only requires an elevation model, and produces closed (watertight) line segments, it also produces a large number of false positives.

- These include the edges of smaller features, such as ponds and dune slacks.
- Similarly, the edges of larger depressions, such as valleys and canyons are also included.
- Lastly, in digital surface models, such as global elevation models, further work is needed to remove false positives from forest edges.



Scatterplot of perimeter versus the area of the levees on the left.

References

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