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Measuring Water Surface on the Congo River – What Does Field Data Reveal That Satellite Altimetry Cannot?

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Measurements of a river's water surface elevation and slope are a vital input into studies of flood inundation dynamics and environmental flows. Such measurements are used to calibrate hydraulic models, define a river's bathymetry, measure discharge, understand hydrological regimes, and quantify spatial and temporal variations in water surface slope.

Hydrological studies in the Congo Basin are highly dependent on remote sensing data due to the severe lack of gauging infrastructure in the basin. However, flood extent and floodplain terrain data are difficult to obtain or subject to large uncertainties because of the extensive forests that cover the basin. The complex multi-channel bathymetry requires gross simplification, posing another source of uncertainty. This places great reliance on use of satellite altimetry measurements of water surface elevation to understand globally important processes in the basin such as the inundation dynamics of the Cuvette Centrale wetland system.

We review the dominant publically available sources of satellite altimetry data in the Congo basin and compare it with a series of in-situ water surface elevation measurements taken during a field trip in 2017. We find the altimetry does not capture relatively large spatial variations in slope around the outlet of the Cuvette Centrale. The possible causes of these spatial variations are discussed, along with the implications for future use of the altimetry data. The study further demonstrates the importance of the upcoming Surface Water Ocean Topography (SWOT) mission.