

Updating century old Congo River navigation maps and revealing their geomorphological secrets

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Introduction

- River transport relies on > 17,000 km of navigable channels
- A crucial part of the economy for river basin countries
- Development of the region held back as river transport has declined since the Congo basin countries became independent in the 1960s

Navigation Maps

- River navigation maps are a specialist map for safe navigation
- Captains use them for the advised navigation routes and avoid rocks and shallow channels
- Navigation maps between Kinshasa and Kisangani (1,700 km) are issued by RVF (Régie de Voie Fluvial), the state river authority
- There are 60+ maps each showing a 30km long reach
- These maps originate from the early 1900s and have not been updated since the early 1900s (Note, there is a PANAV project to update them)
- For the CRuHM project we are using remote sensing to study the river
- This provides us with a unique opportunity to compare snapshots of the river system geomorphology separated by nearly 100 years.

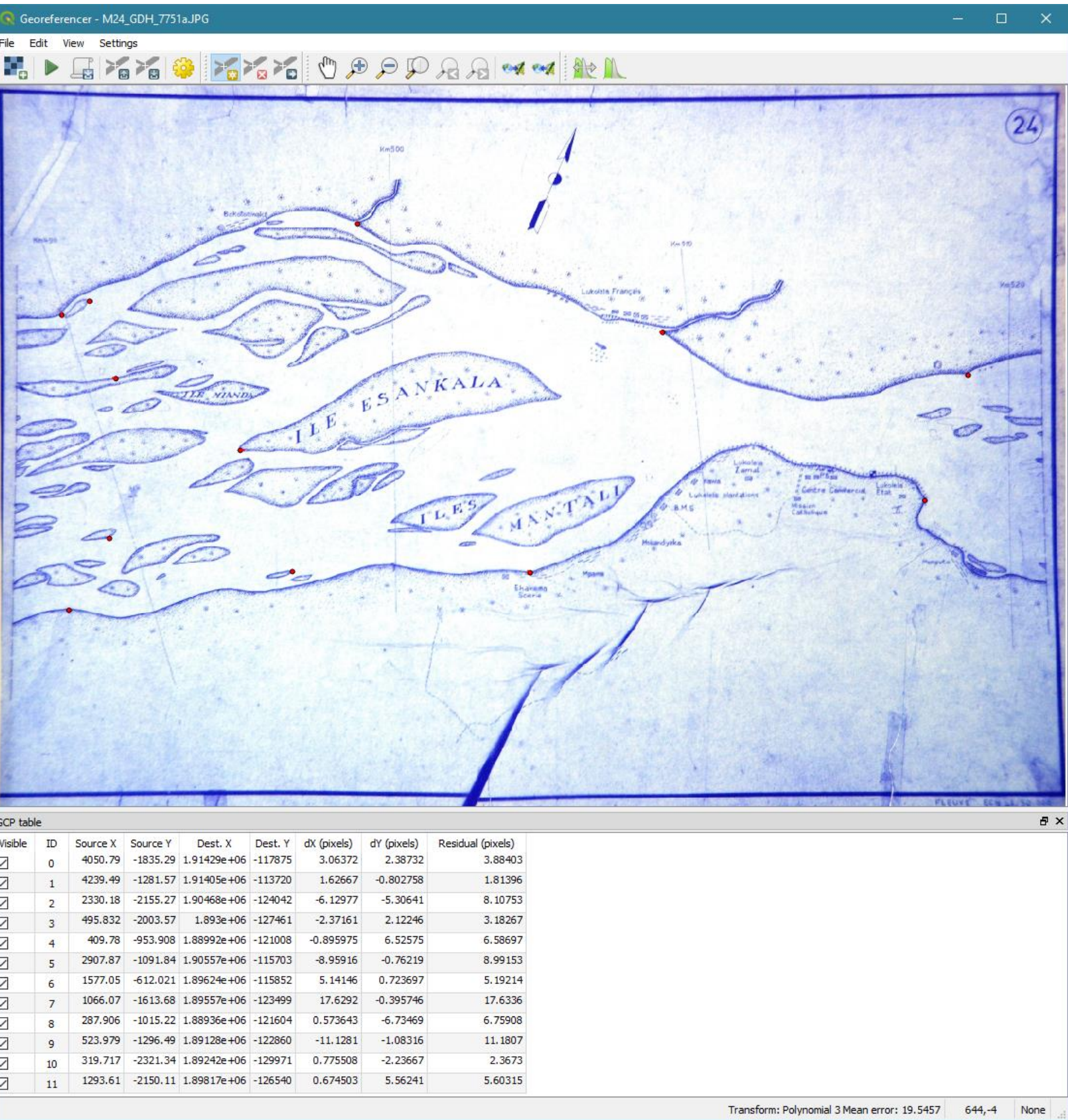


Figure 2: Geolocating maps with stable geographical locations

Funding

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Methodology

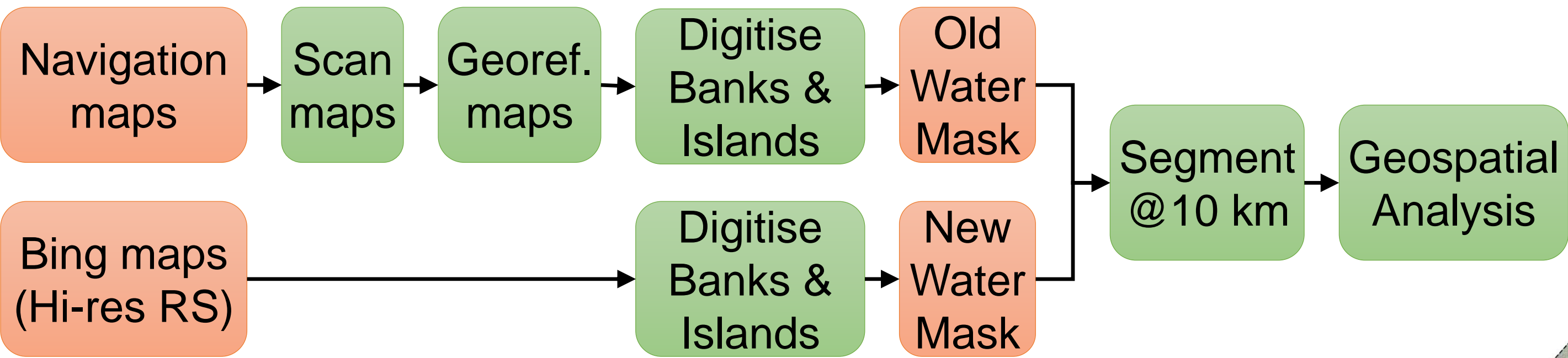


Figure 3: Schematic of methodology

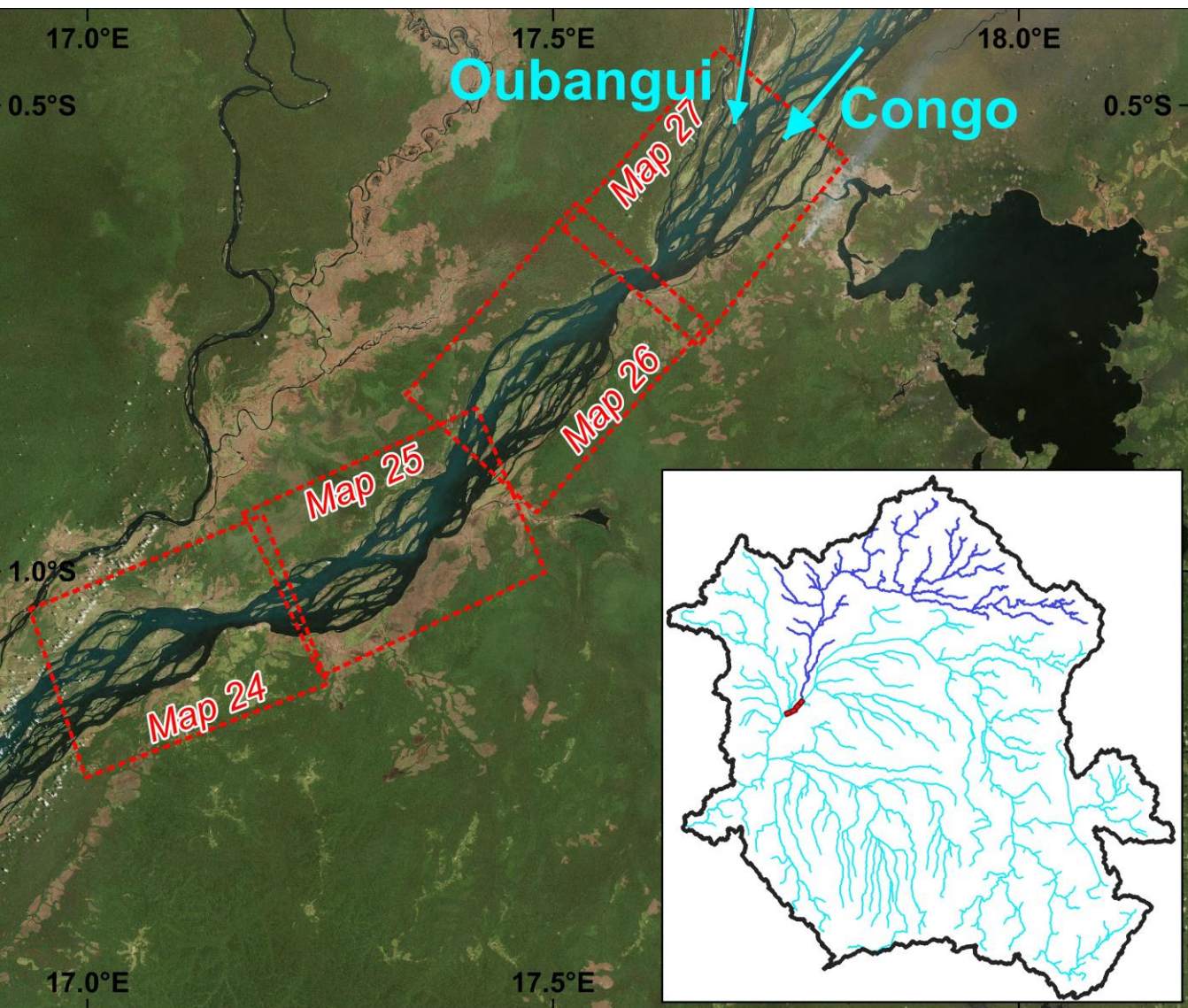
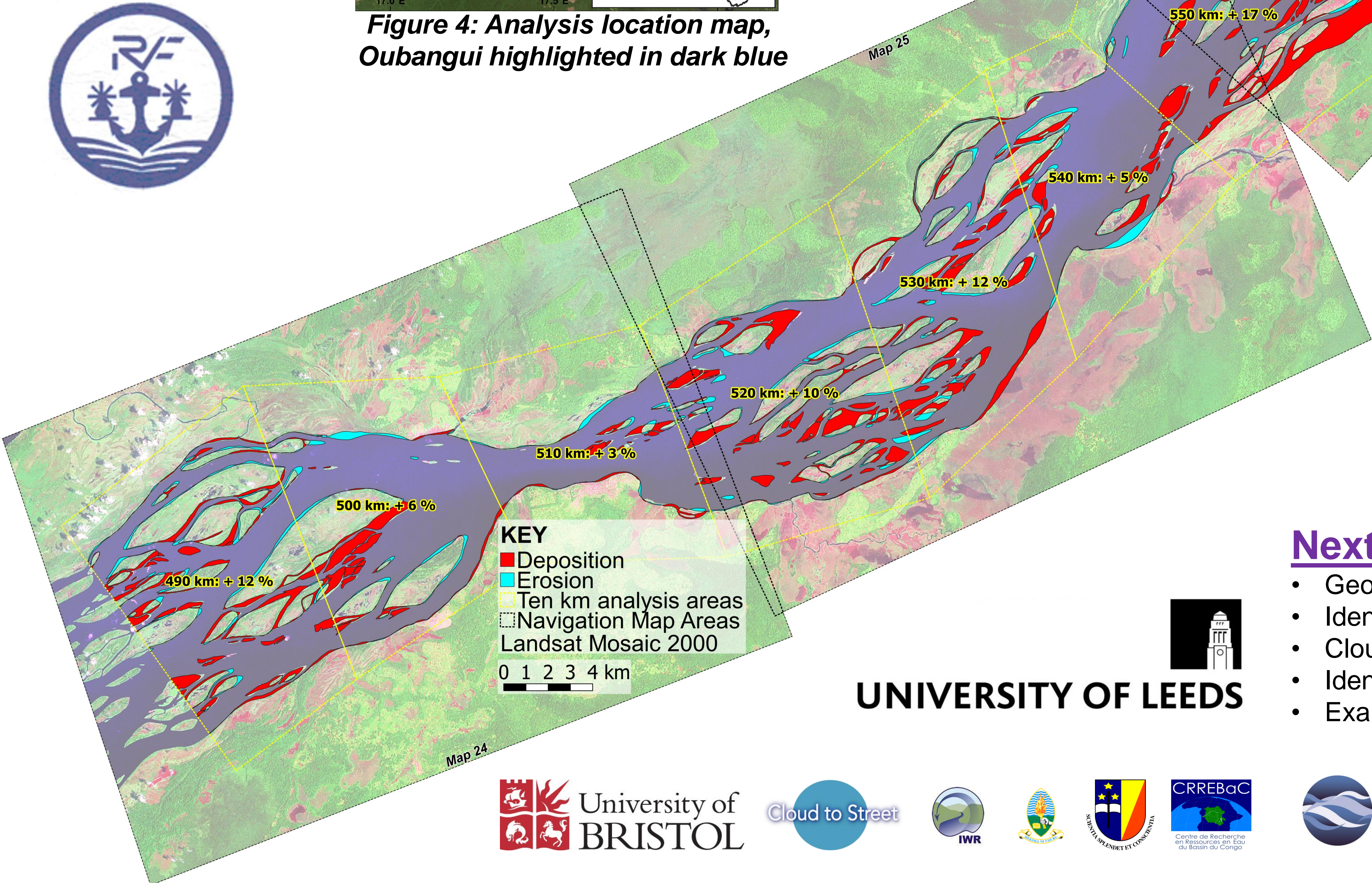


Figure 4: Analysis location map, Oubangui highlighted in dark blue



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Figure 1: Example of Transport on the Congo River

Figure 5: Deposition & Erosion with net deposition as % of water area per 10 km navigation reach

Results

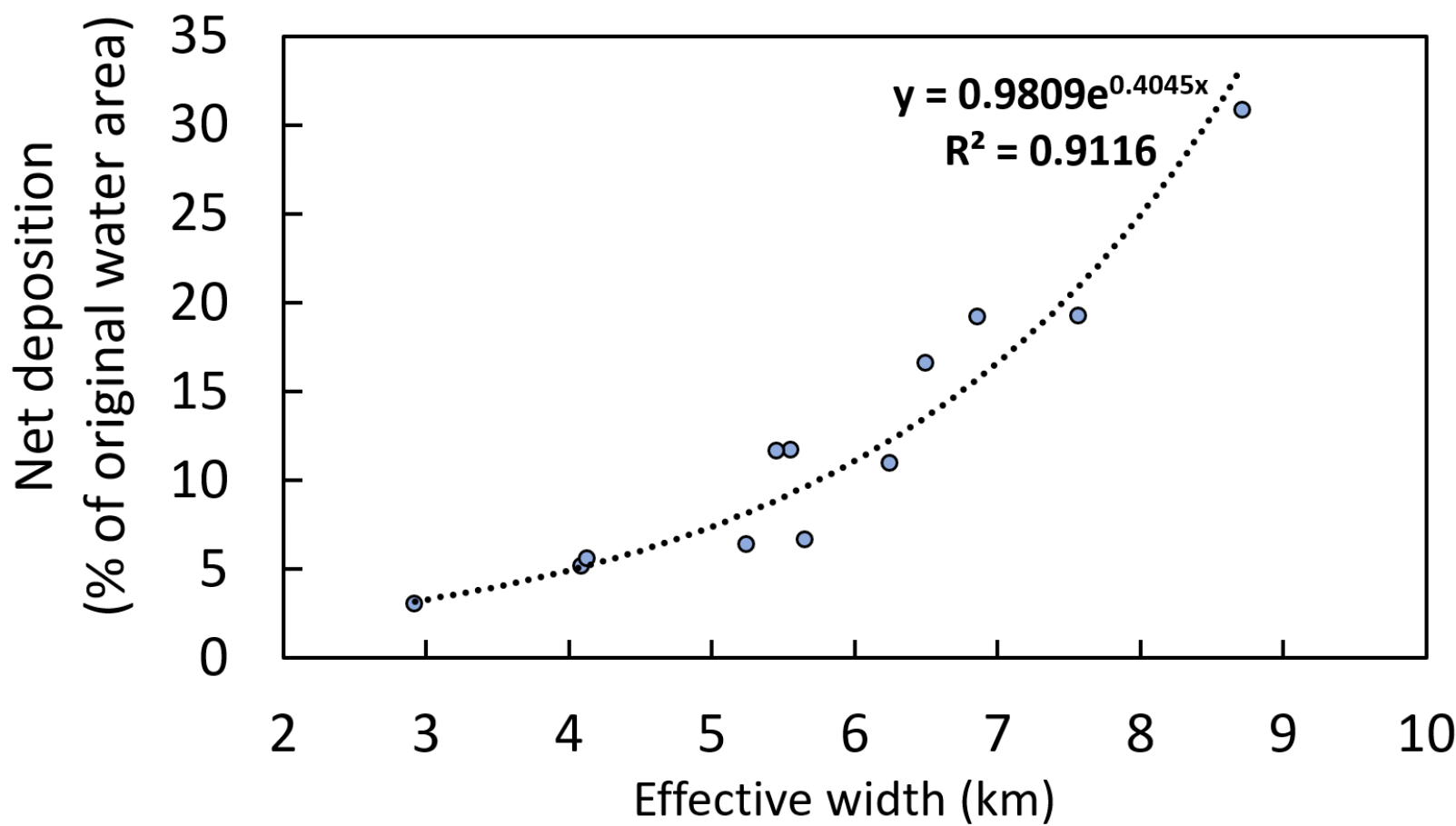


Figure 6: Net deposition is a function of effective width

Conclusions

- Old maps are impressively accurate given tools available
- Net deposition in all reaches since the original maps made
- More deposition in wider-shallower reaches (exponentially related) – velocity lower.
- Indicates a reduction in the flow or an increase in sediment
- Wide reaches most difficult to navigate - many sand bars
- **Future changes in upstream inputs of flow or sediment from the Oubangui will likely cause further changes – possibly exacerbating navigation problems here**
- This work is a useful baseline to monitor future change

Next Steps

- Georeference & digitise all maps with CRREBaC support
- Identify other geomorphological change indices to analyse
- Cloud-to-Street, GEE support for seasonality and vegetation types
- Identify other historical navigation maps for other reaches and repeat
- Examine RVF outputs from PANAV project including bathymetry

