Do altimetric water level observations in an ungauged basin agree well with streamflow model discharge? A preliminary analysis on the Nile.

Amin Shakya [1], Roelof Rietbroek [1], Daphne van der Wal [1,2]

[1] ITC Faculty of Geo-Information Science and Earth Observation, University of Twente, the Netherlands

[2] NIOZ Royal Netherlands Institute for Sea Research, Department of Estuarine and Delta systems, the Netherlands

Background

- The "*wet gets wetter and dry gets dryer*" paradigm is yet to be established in a regional scale.
- This is currently being studied under the **NWO Vidi Talent Programme** *"Unravelling watershed fluxes to detect emerging changes of the water balance"*

Research questions

- Does inland altimetry water level observation have an acceptable uncertainty on various virtual stations on the Nile river?
- Is the altimetric water level observation in good agreement with streamflow modelling results (such as GLOFAS) for the Nile river?

GLOFAS model discharge on the Nile basin

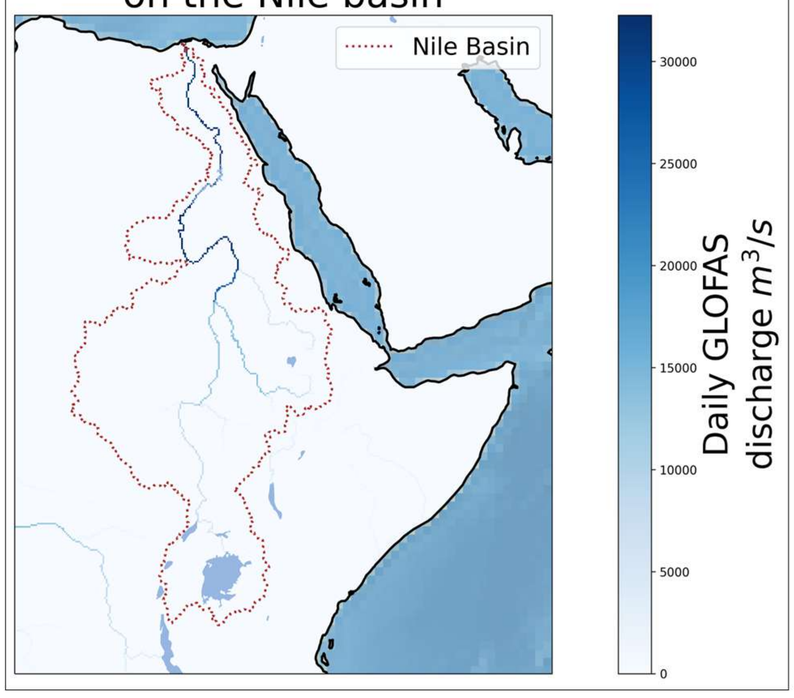


Fig. 1: GLOFAS model discharge available everywhere (including ungauged basins); snap 2023-07-31

Selection of sample Hydroweb VSs on the Nile Basin

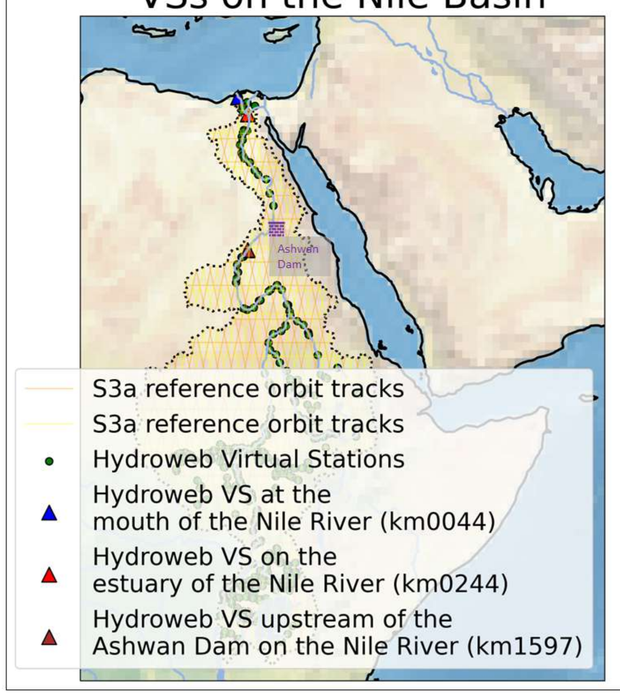
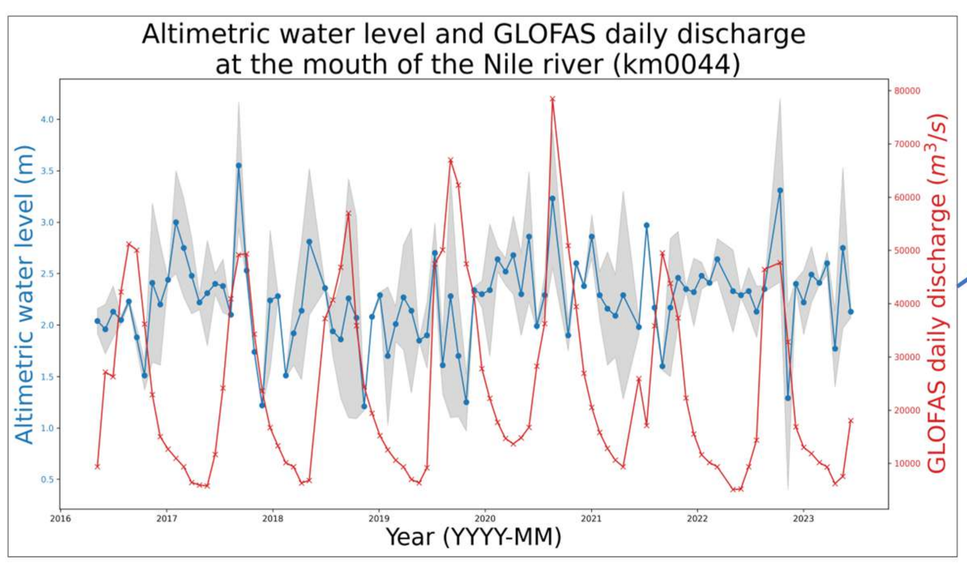
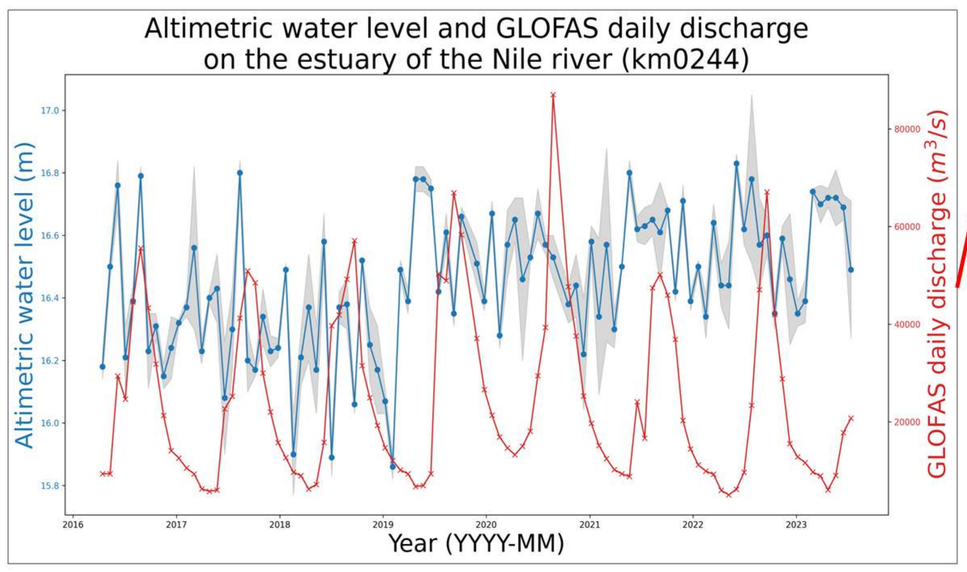
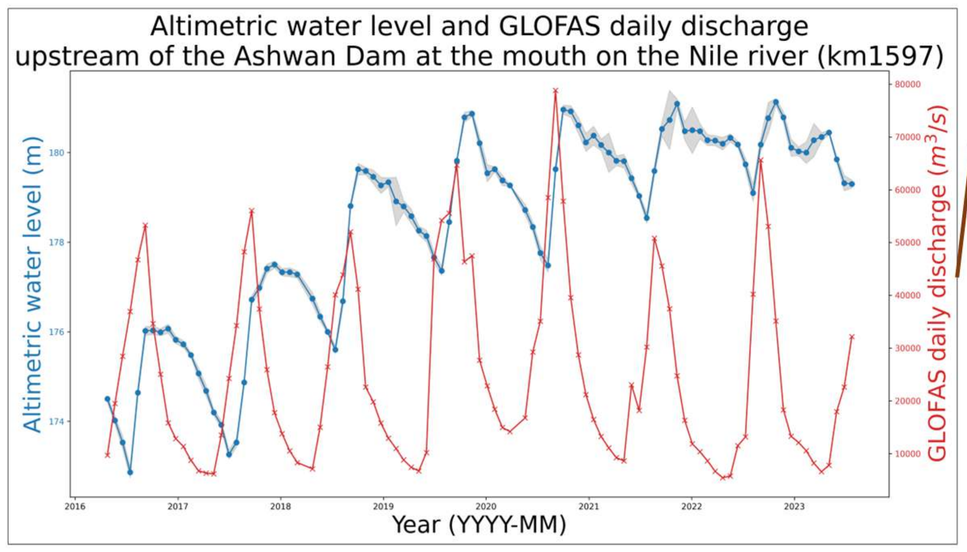


Fig. 2: Selection of three sample Hydroweb virtual stations (VS) on the Nile river







Location	Altimetric Uncertainty	Agreement with GLOFAS	Remark
Mouth of the river	Very high	Very poor	Reach width Oceanic influence
Estuary	High	Very Poor	Reach width Oceanic influence
Upstream of Ashwan Dam	Low	Poor	Influence of dam

Fig. 3: Altimetric water level, associated uncertainties and GLOFAS daily discharge at the selected VSs: are they in good agreement?

Conclusion

- Rivers are complex systems and require a site-specific analysis.
- Estuarian altimetric height estimates could benefit from oceanic process consideration.

Outlook and Recommendations

- Identify opportunities and limitations of altimetric water level height observations for the Nile river Virtual Stations
- Develop an altimetry-based river discharge prediction model for an ungauged river system (Nile), complemented by streamflow models such as GLOFAS.
- Incorporate oceanic process along with altimetry data to estimate estuarian discharge.

HYDROSPACE 2023
27 November – 1 December 2023 | FIL Lisbon, Portugal

a.shakya@utwente.nl

This project is funded by the **NWO Vidi Talent Programme**