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Swedish Meteorological and Hydrological Institute

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COMBINING SATELLITE ALTIMETRY, IN-SITU OBSERVATIONS, AND MODELS TO IMPROVE HYDROLOGICAL FORECASTING IN WEST AFRICA AND YAKUTIA

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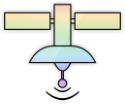
Water level in-situ gauges



Water level from satellite (virtual stations)

Discharge from in-situ gauges

HYPE model

Simulated discharge

Rating curves:

in-situ w in-situ q

in-situ w simulated q

satellite w in-situ q

satellite w simulated q

Discharge forecast

Water level forecast at gauged and virtual stations

Assimilation of gauge, satellite, and simulated data

Improved initial state before forecast → improved accuracy

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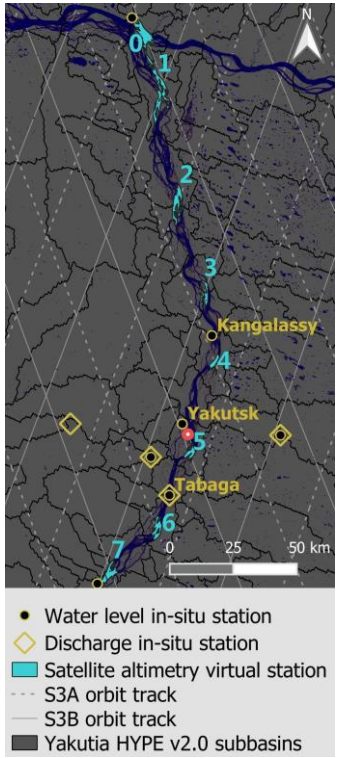
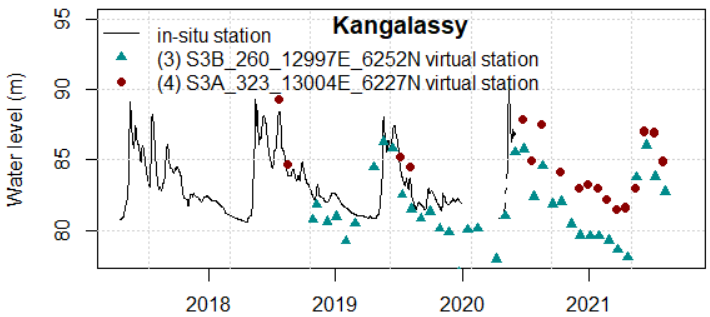
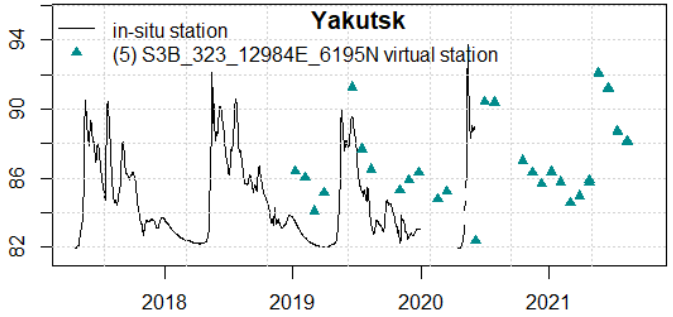
SATELLITE DATA IN YAKUTIA CASE STUDY

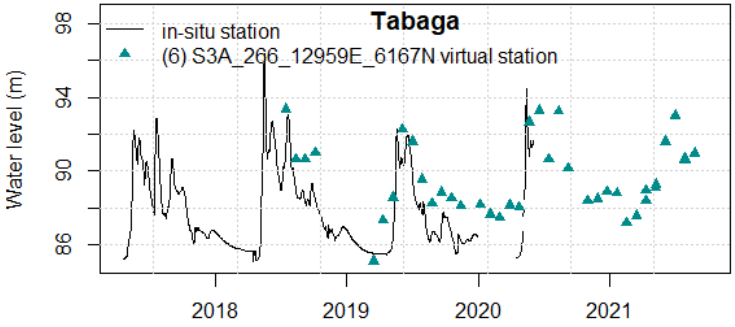
Lena River in Yakutia



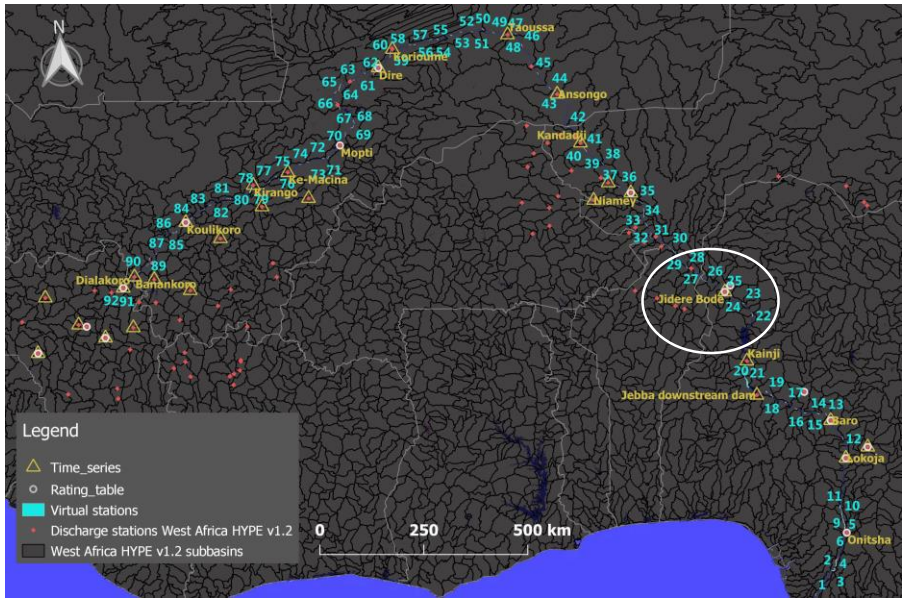
Water level observations (meters) from satellite altimetry and its corresponding in situ stations geometries.

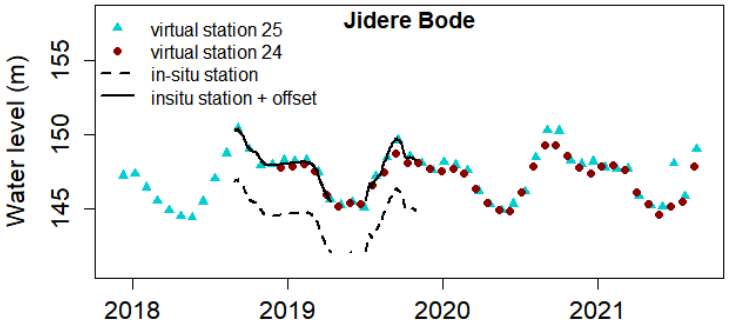


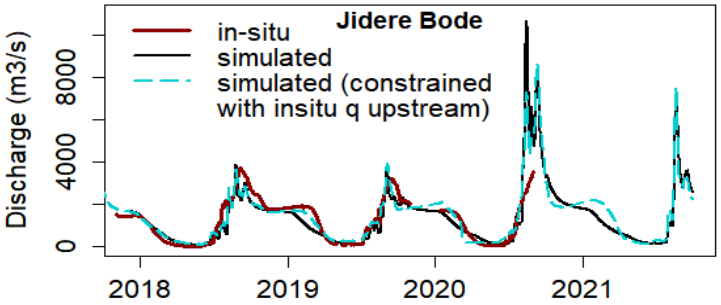




Niger River Basin







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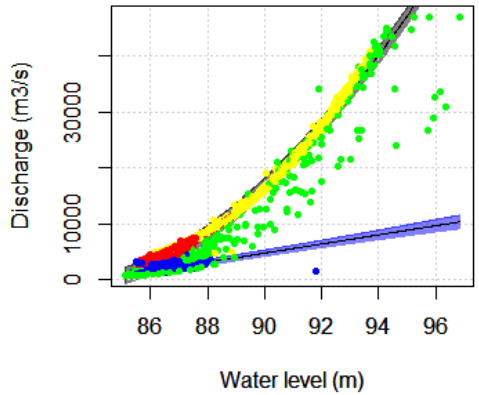
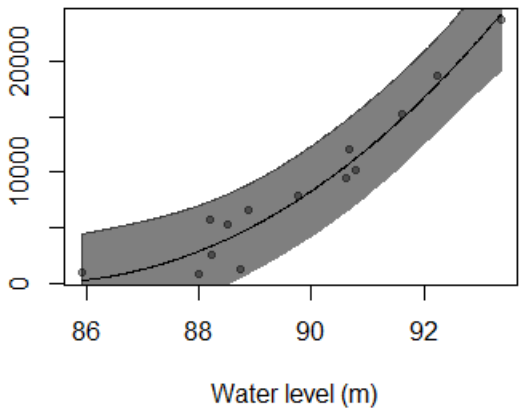
in-situ w and in situ q

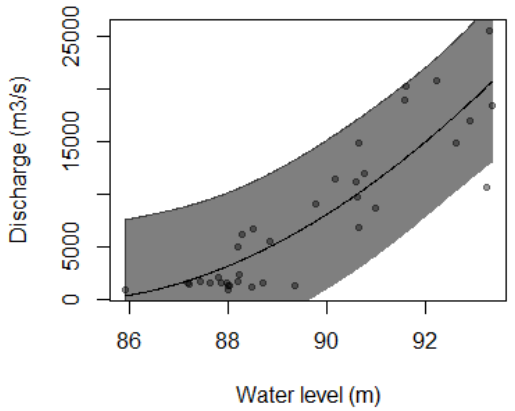
satellite w and in situ q

satellite w simulated q

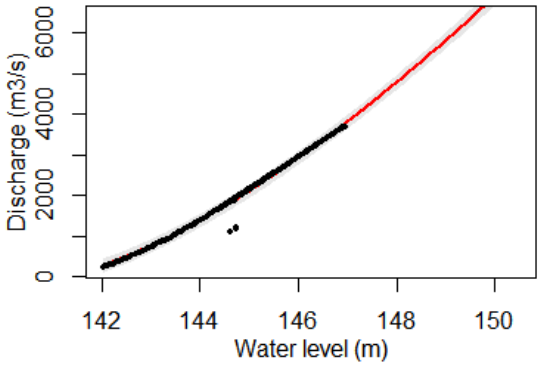
Lena River at Tabaga

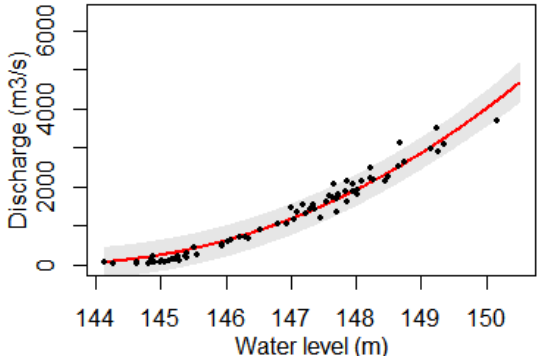


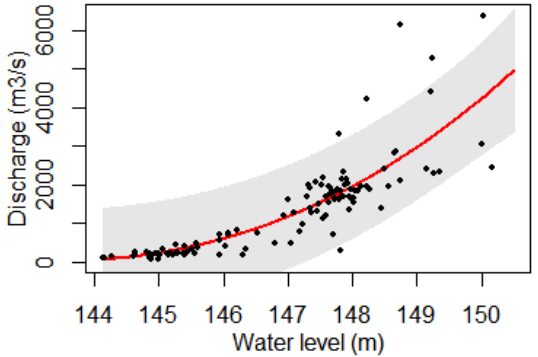




Niger River at Jidere Bode







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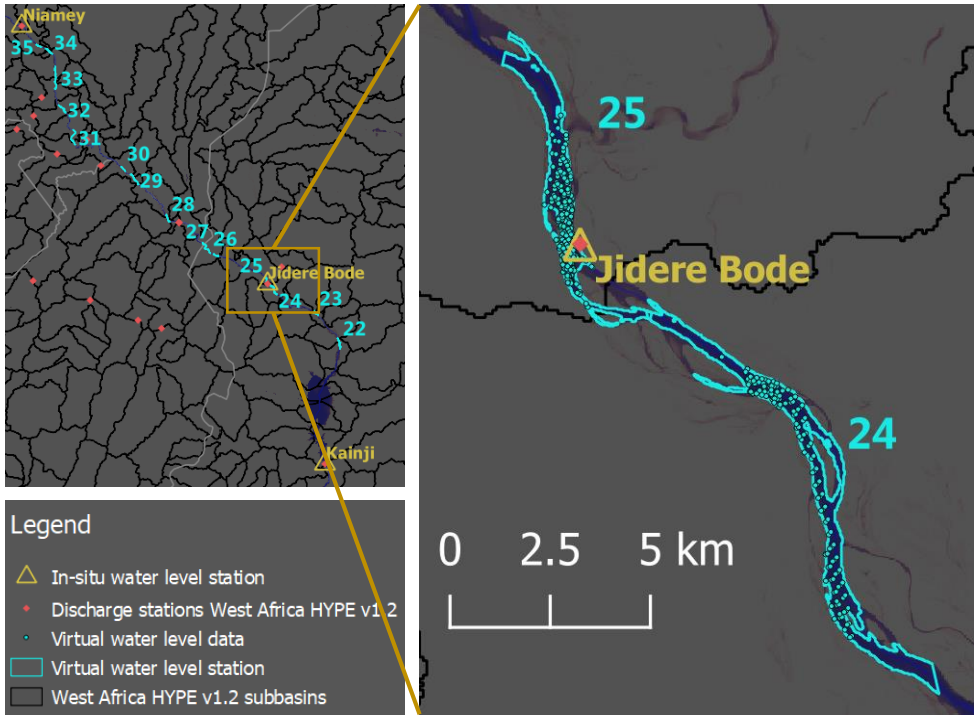
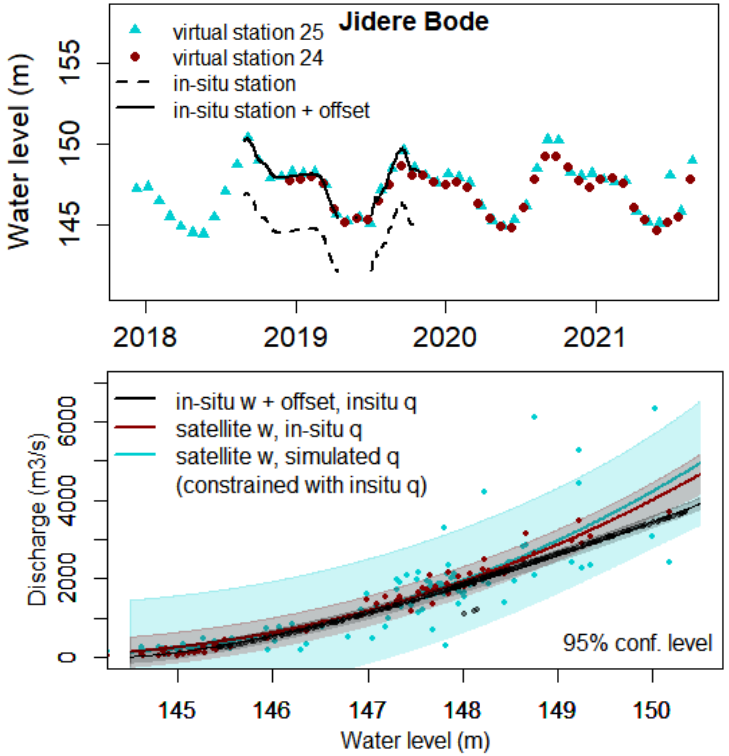
Niger River at Jidere Bode





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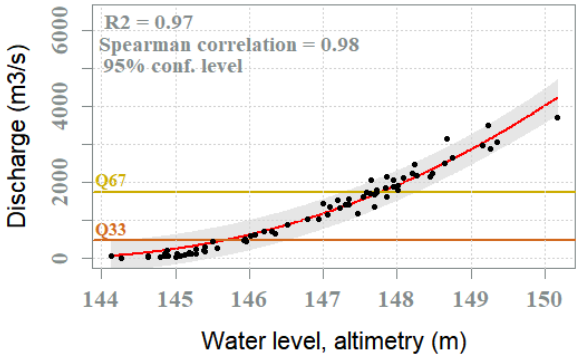
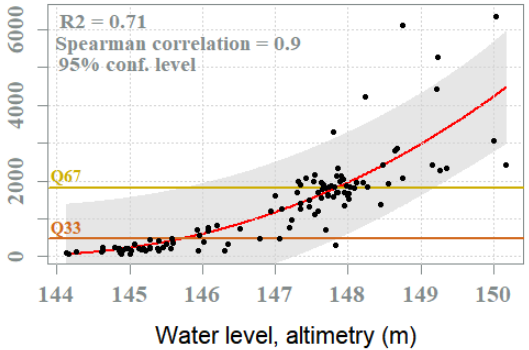
Residuals: relative bias (%) = $\frac{\sum_{i=1}^{n}(discharge_i^{fitted} - discharge_i^{ref})}{\left|\sum_{i=1}^{n} discharge_i^{ref}\right|} \times 100$

satellite w and in-situ q



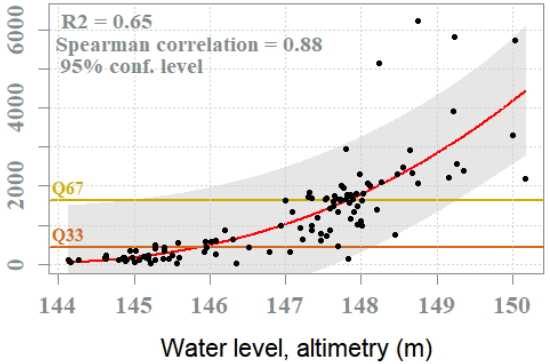
Q0-33	Q33-67	Q67-100
85%	1%	-2%

satellite w and simulated q (constrained with in-situ q upstream)



Q0-33	Q33-67	Q67-100
56%	14%	-10%

satellite w and simulated q



Q0-33	Q33-67	Q67-100
63%	24%	-14%

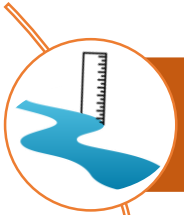
River rating curve $q = k \times (w - w0ref)^p$

k	w0ref	p
64.9	143.1	2.1

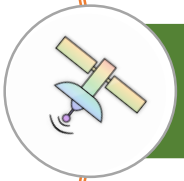
k	w0ref	p
56.6	143.1	2.2

k	w0ref	p
36.7	143.1	2.5

Following steps



Combination of satellite, in-situ data and hydrological modelling for generating water level data.



Rating curve using satellite data at several ungauged locations.

Hydrological research applications at large scale and collaboration with other projects partners.

Hydrologic Research Unit
Swedish Meteorological and Hydrological Institute
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THANK YOU

This work was conducted in HYPE-ERAS and FANFAR projects:

https://hype-eras.org/ **https://fanfar.eu/**

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