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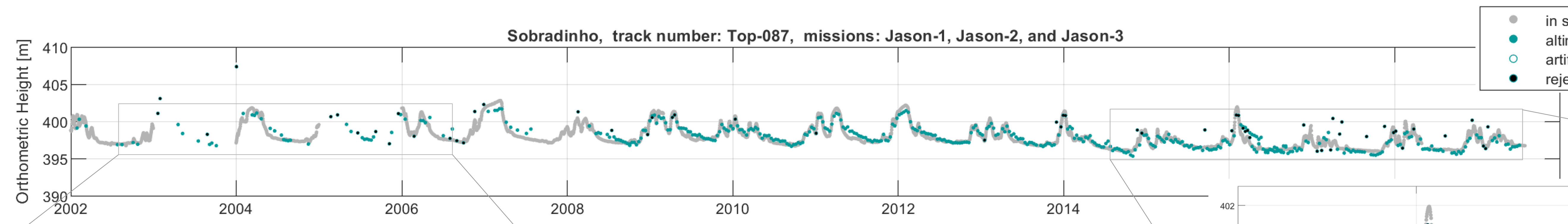
GIS

SOUTH AMERICA WATER from SPACE II Conference

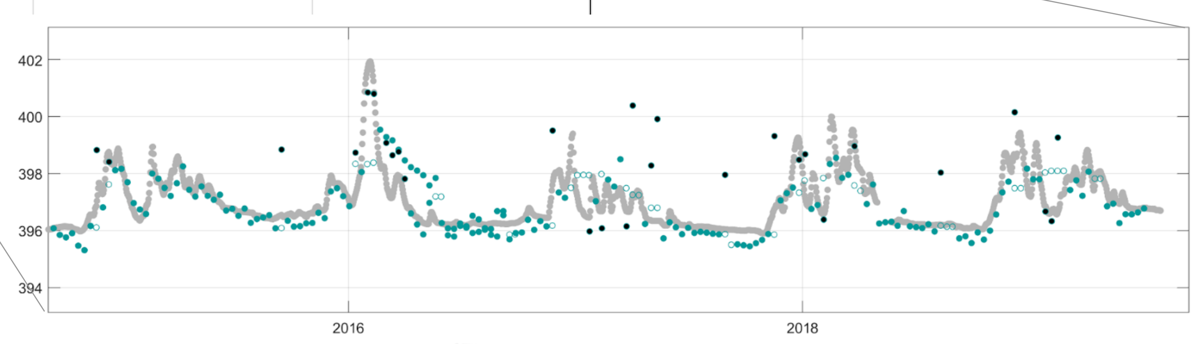
This study is conducted as part of research project SaWaM (Seasonal Water Resource Management: Regionalized Global Data and Transfer to Practice) whose main objective is the performance analysis of global hydro-meteorological data as decision support for the regional water management in semi-arid regions.

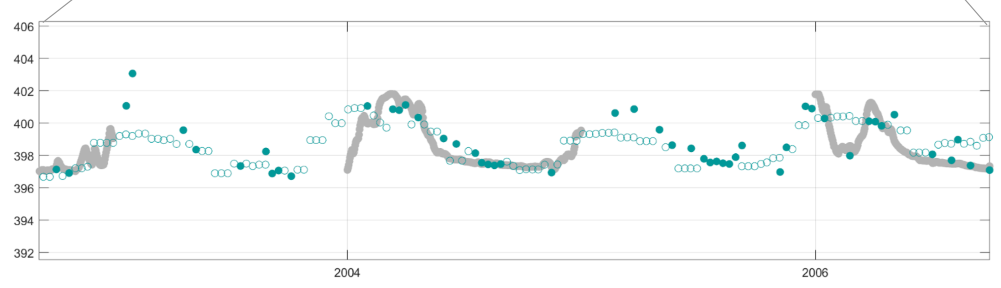
São Francisco as monitored by Radar Altimetry Satellites

Automatic Processing and the Challenge of Outlier Rejection



main challenges
- low sample size
- high noise level
- many outliers
- periods of no data

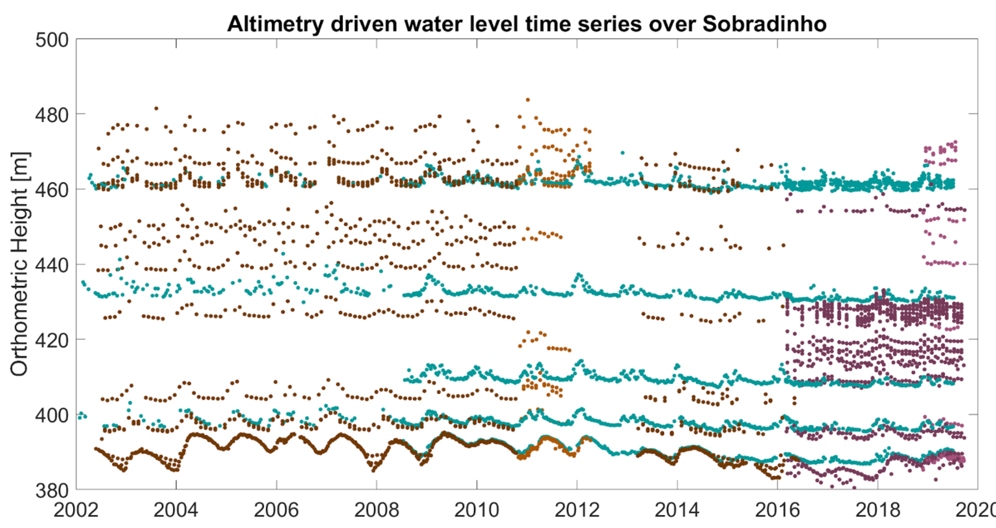




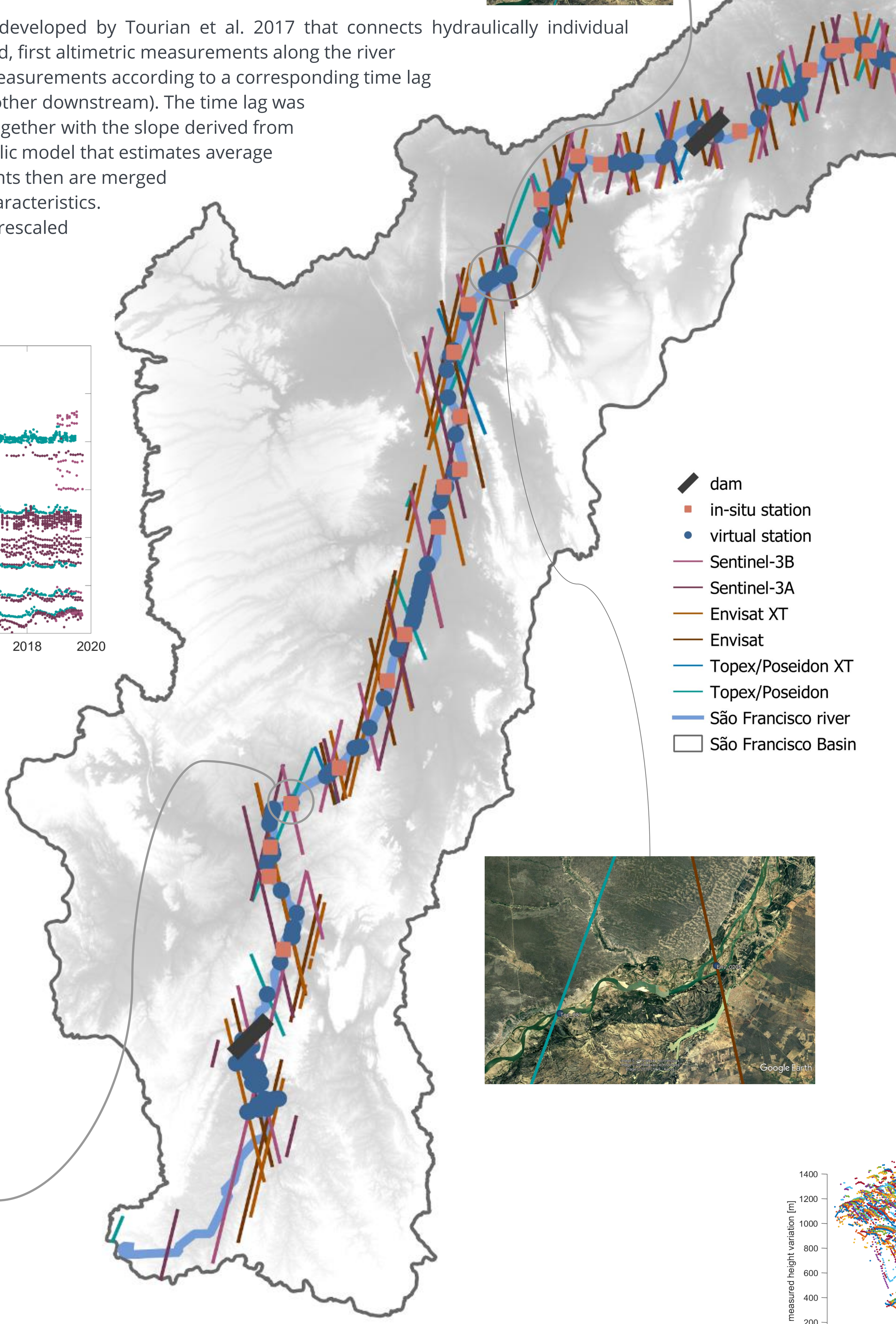
proposed methodology
1. Monthly median of all measurements is calculated
2. Within the window size of a year, a local shift between the retrieved pattern and the actual measurements is calculated and the deviation is compensated for
3. Moving average kernel of size 5 is run over actual and artificial samples
1. Outlier candidates are identified and iteratively rejected

Densification

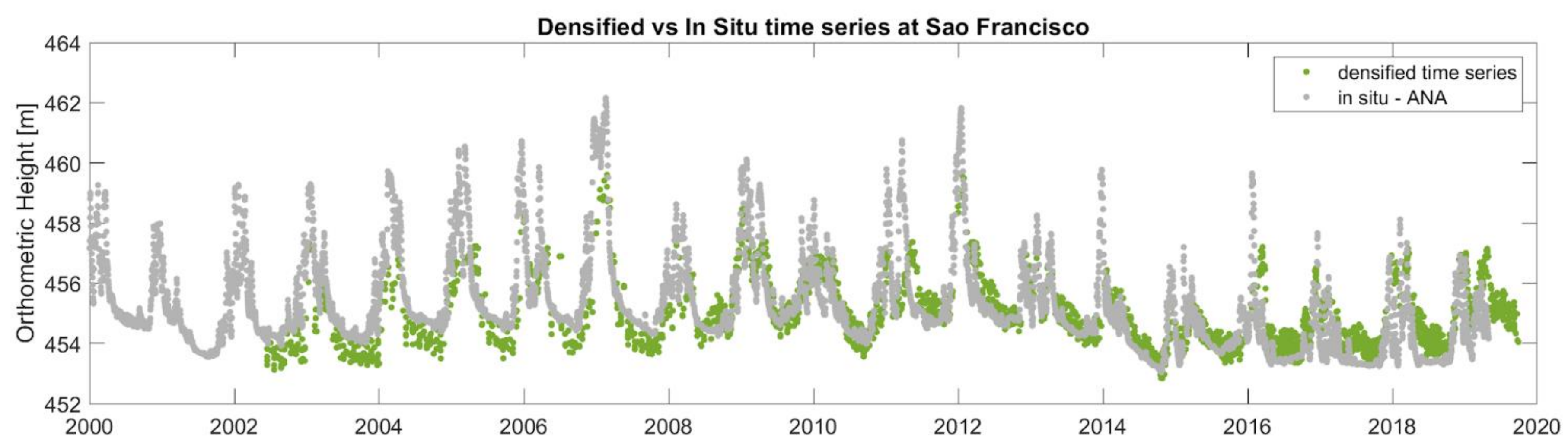
Water levels are densified using a multimission approach developed by Tourian et al. 2017 that connects hydraulically individual altimetric time series along the Sao Francisco River. To this end, first altimetric measurements along the river are stacked after shifting the water level hydrographs of all measurements according to a corresponding time lag (i.e., the time that stream flows from one virtual station to another downstream). The time lag was estimated using average river width obtained from imagery together with the slope derived from satellite altimetry. These measurements are input to a hydraulic model that estimates average flow velocity from width and slope of a river. The measurements then are merged by normalizing the time series according to their statistical characteristics. After an outlier identification process, the measurements are rescaled back to their true water level values.



missions and datasets				
	version	retracker	sampling rate (Hz)	time period
Envisat	GDR-V3	ICE-1	20	2002-2012
Saral/AltiKa	GDR-t	ICE-1	40	2013-2016
Jason-1	GDR-e	ICE	20	2002-2009
Jason-2	GDR-d	ICE	20	2008-2016
Jason-3	GDR-d	ICE	20	2016-2019
Sentinel-3A		OCOG	20	2016-2019
Sentinel-3B		OCOG	20	2018-2019



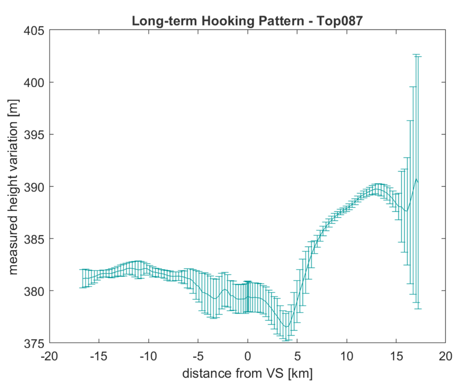
- The densified time series at São Romeo gauging station correlates with in situ time series with a correlation coefficient 0.71
- Majority of water level peaks is not captured by studied altimetry missions
- The densified time series generally represents a bias within the time period 2003–2008. Possible reasons for the bias:
  - Inter-satellite bias between Envisat and Jason 1 with missions launched after 2008
  - Water management effect; within the densification method, it is considered that water level follows the same distribution pattern up- and downstream. In case of a change in water management regime after 2008, this would influence our densification results
- Within 2016–2019 the densified time series (from Sentinel-3, Sentinel-3B, and Jason 3) deviates from in situ data with an RMSE 0.65 m

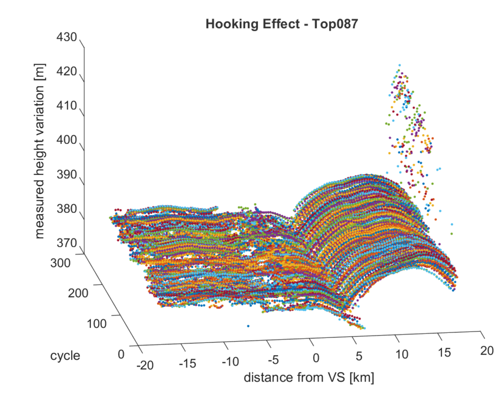


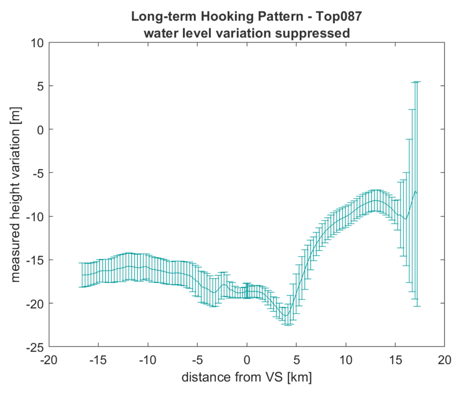
Hooking Effect: Challenge or Advantage?

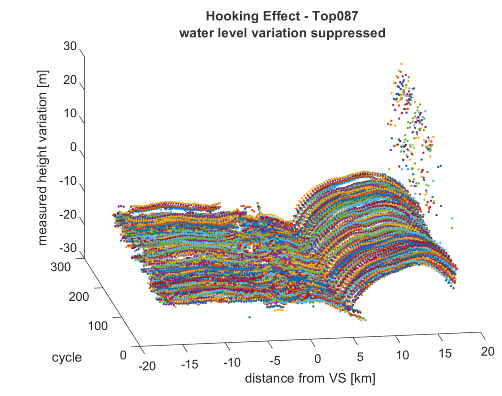
How accurately can we characterize the hooking effect?
What are the contributing parameter?

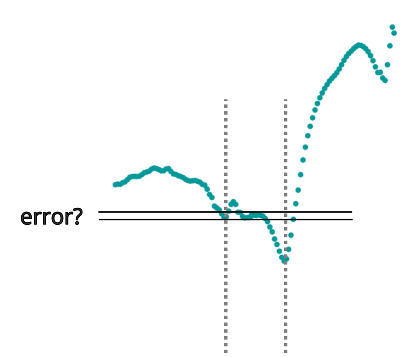
- altimetry footprint size
- angle of intersection
- river width
- neighbor water bodies
- …

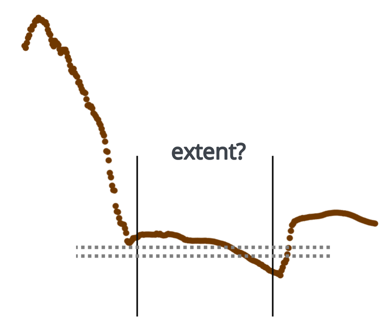


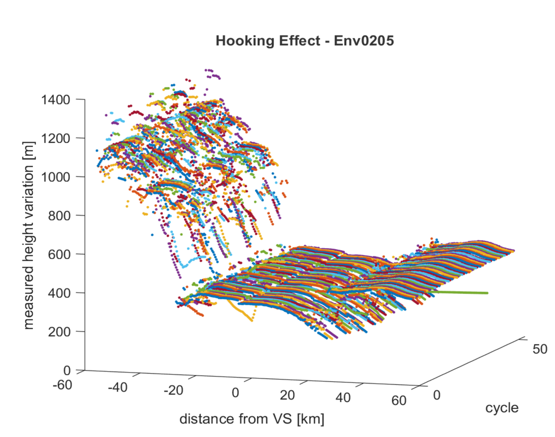


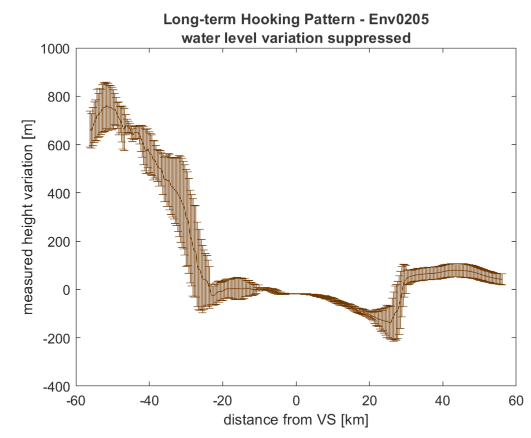


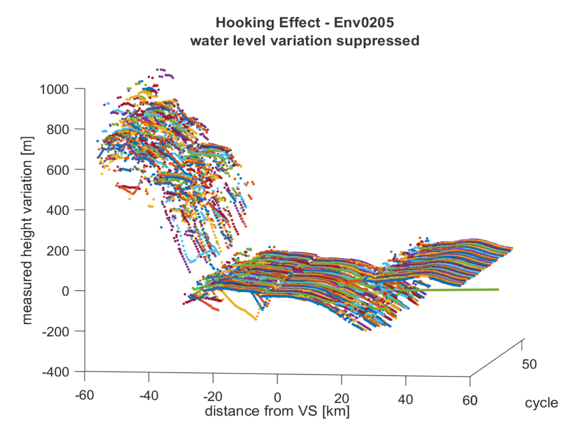


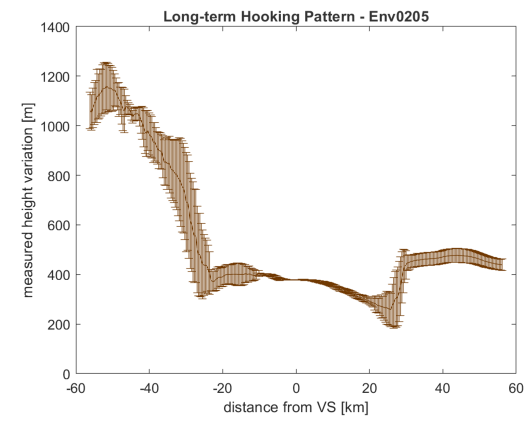












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