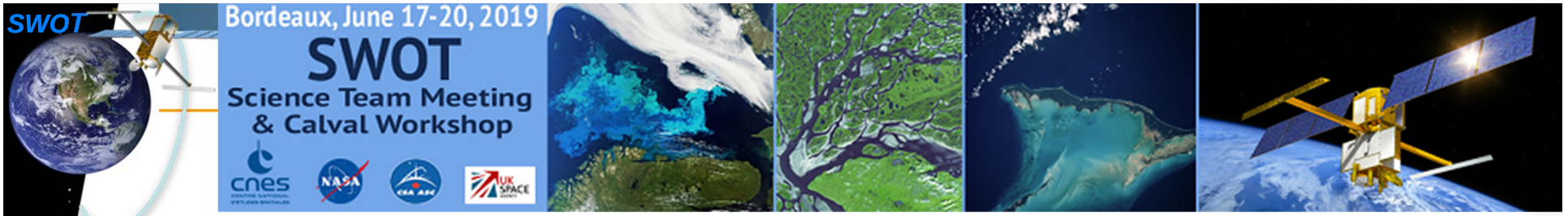


SWOT simulations in the Seine estuary

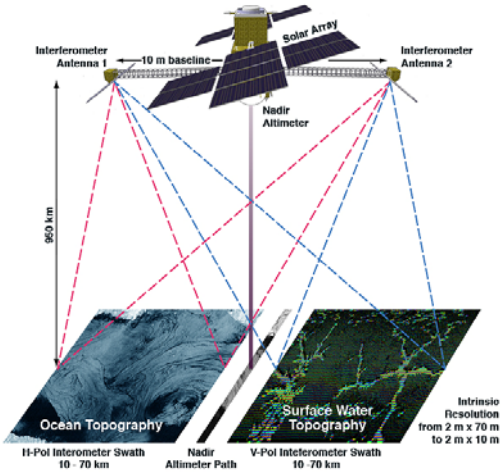
B. Laignel[1], L. Chevalier[1], D. Desroches[2], R. Fjørtoft[2],

Blumstein D[2], I.Turki[1], F. Lyard[3]

[1]M2C Rouen, [2]CNES, [3]LEGOS Toulouse

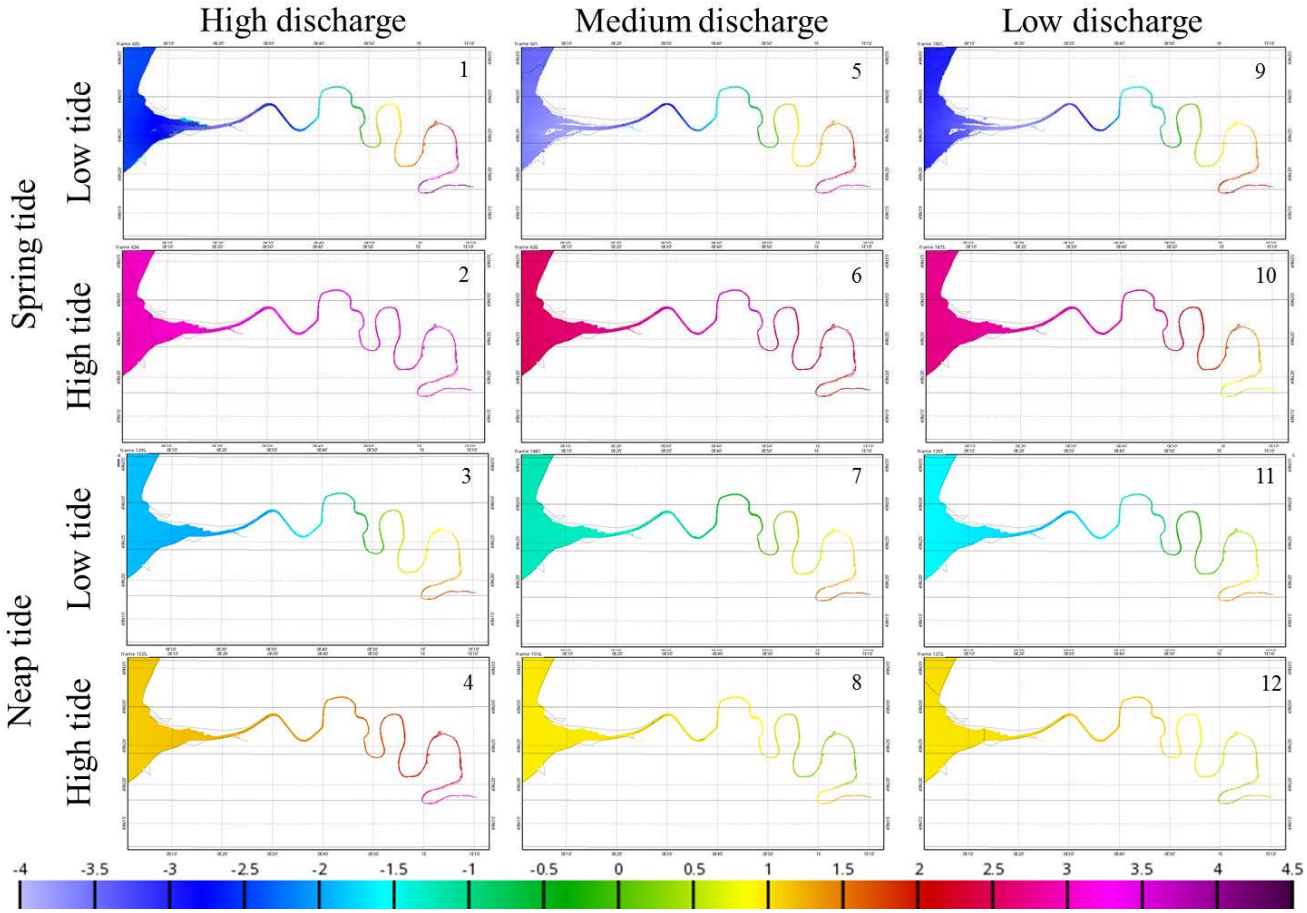
Chevalier et al., 2019

Geoscience and Remote Sensing Letters



Hydrodynamic modelling of the Seine estuary (T-UGOm - 1 year)

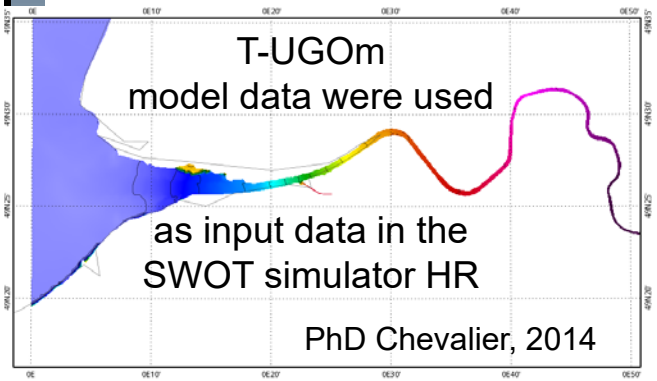
12 different hydrodynamic contexts were calculated by T-UGOm according to tide and discharge (Neap/Spring tide, High/Low tide, High/Medium/Low discharges)



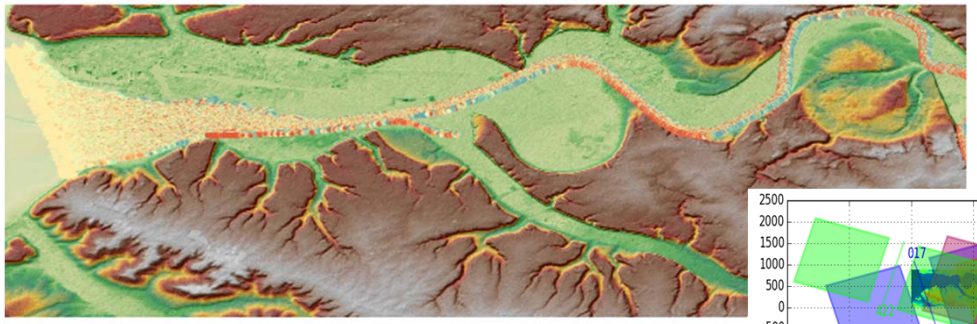
=> T-UGOm outputs were used as input data in the HR simulator (JPL/CNES) for the twelve cases

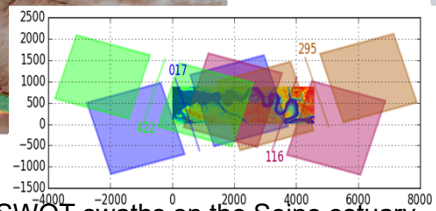
First test of HR Simulator in the Seine estuary

Test spatial restitution of hydrological variability by SWOT
One hydrodynamic context: medium conditions of discharge and tide
for different swaths along the estuary

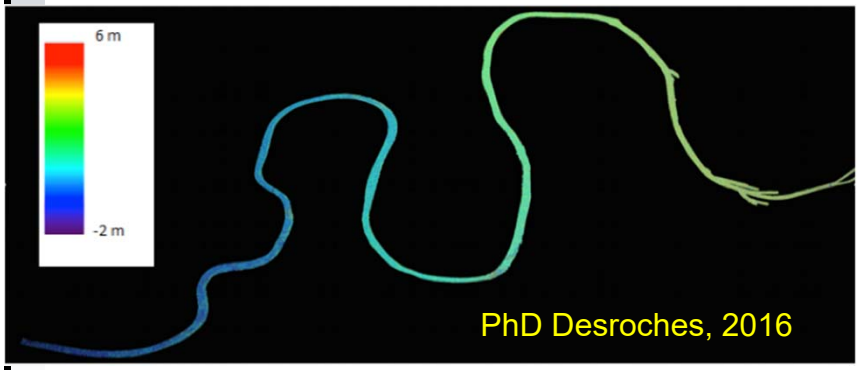


First result of the HR Simulator in the Seine estuary
(swath n° 17 left) - medium conditions of discharge and tide

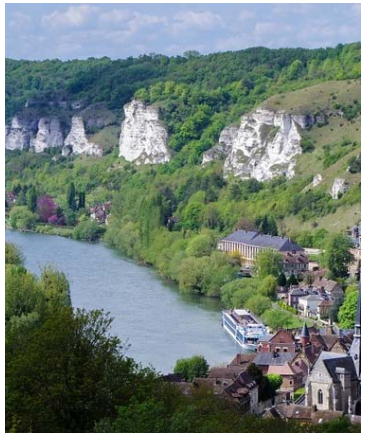




SWOT swaths on the Seine estuary



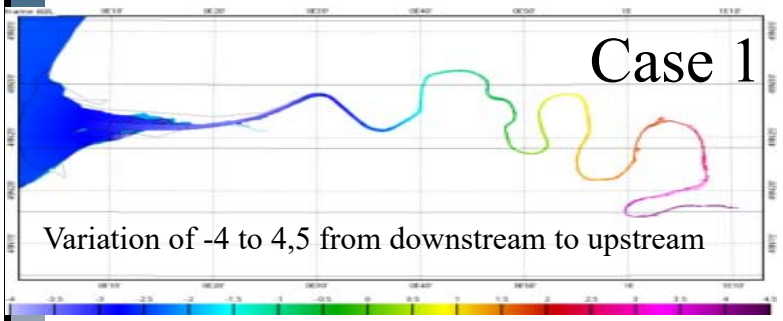
The improved geolocation method of the HR simulator reproduces well the spatial variability of water level along the Seine estuary

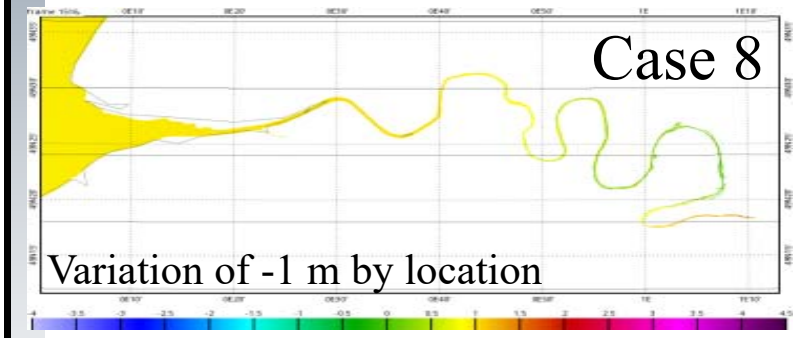


Majority of the SWOT measurement points in the channel, with low water level error (a few centimeters),
but some are outside or on the edge of the channel & error can be several meters
= Thermal noise & Layover in relation with the cliffs along the Seine estuary (height: 50 - 100m)

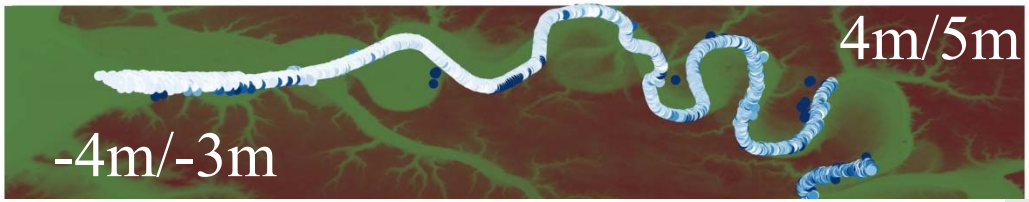
Modeling/SWOT HR simulator in the Seine estuary

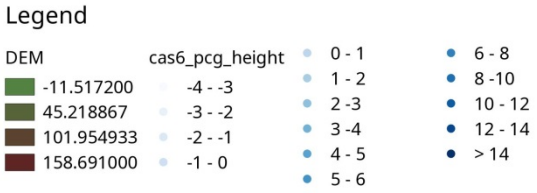
T-UGOm model





SWOT HR simulator

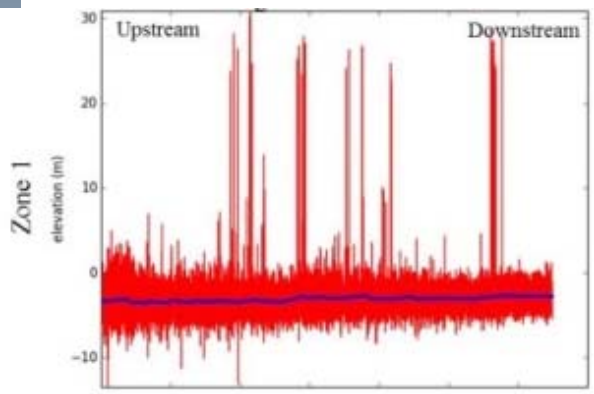


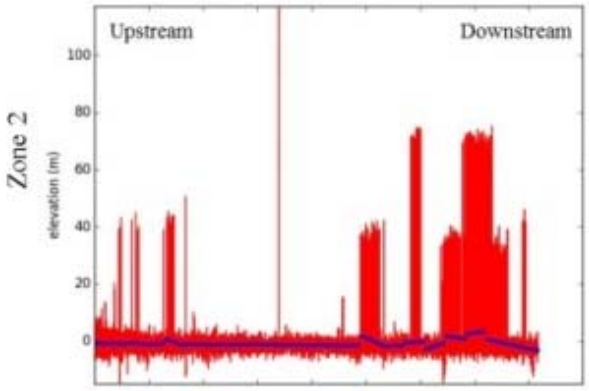


After application of the improved geolocation method (Desroches)
HR simulator shows a good restitution of the spatial variability of the water level along the estuary from downstream to upstream (length: 160 km),
Ex 1 (high variability): simulator reproduces well the 8 m of difference of water level

Some points are still outside of the actual water surface = the phase is degraded by thermal noise and layover contamination

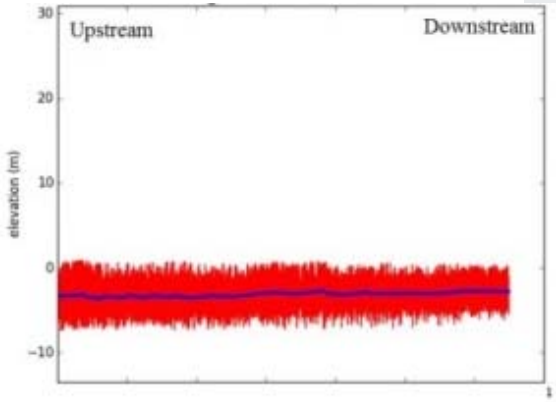
SWOT HR simulator in the Seine estuary: role of layover contamination by cliffs

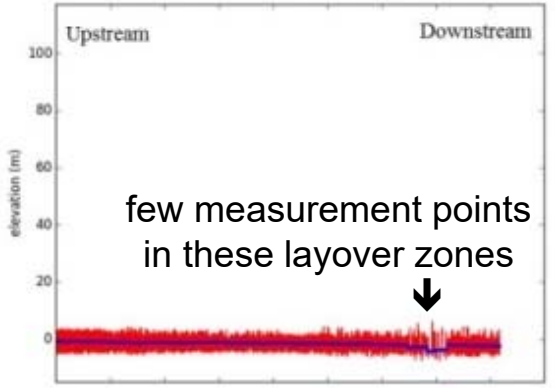




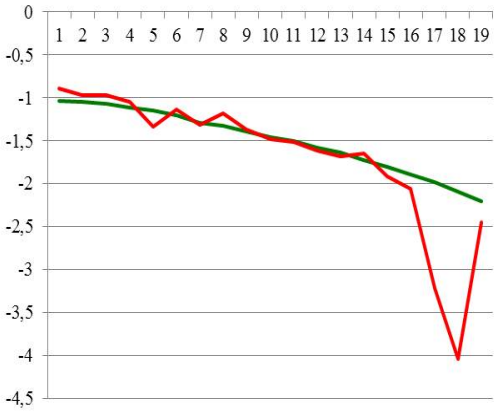
← After height inversion and improved geolocation there are still some high errors mainly in zone 2 with high cliffs = layover

After filtering of low coherence pixels and outlier rejection, the profiles are good → but there are few remaining measurement points in these layover areas



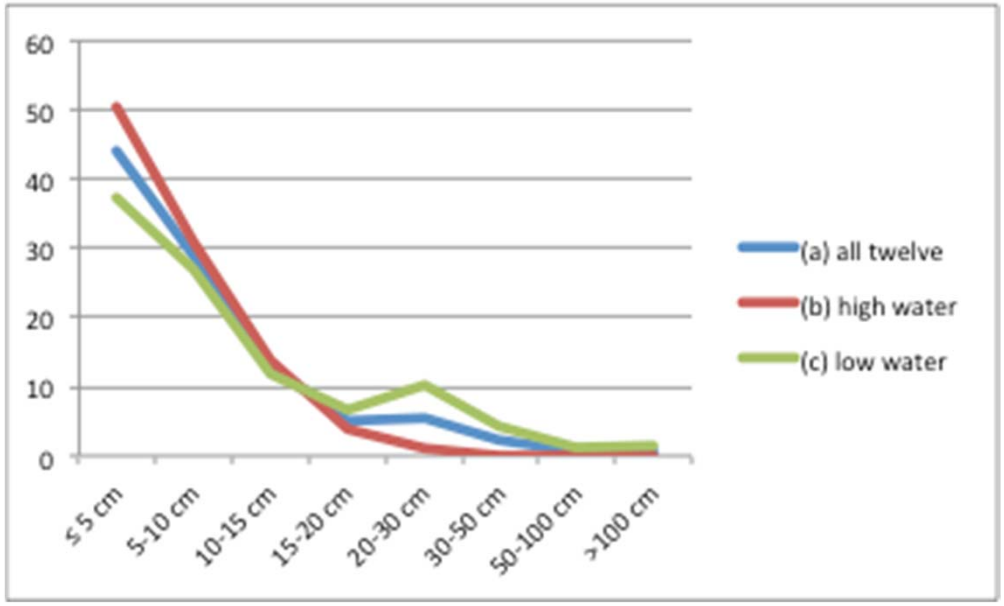


SWOT HR simulator in the Seine estuary



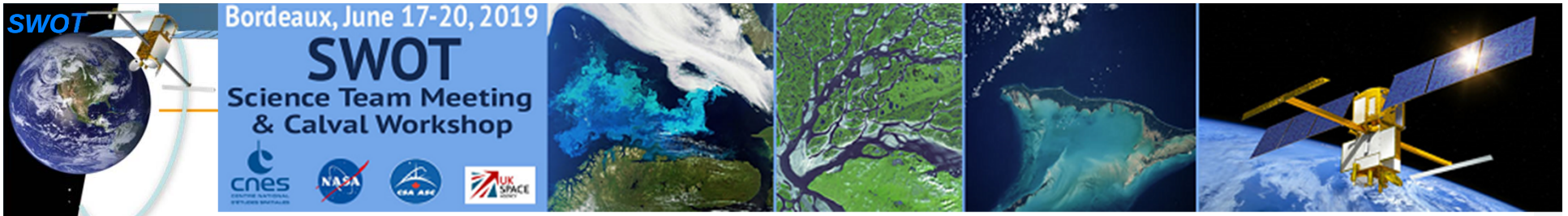
Averaging of SWOT measurements are performed for each section of 1 km and compared with T-UGOm values
Differences between T-UGOm values and SWOT data: 0.3 - 20 cm, except for one case where the difference is of 2m = layover effect near the bank

86% errors < 15cm, 3.5% < 30cm,
less than 1% >1m = layover

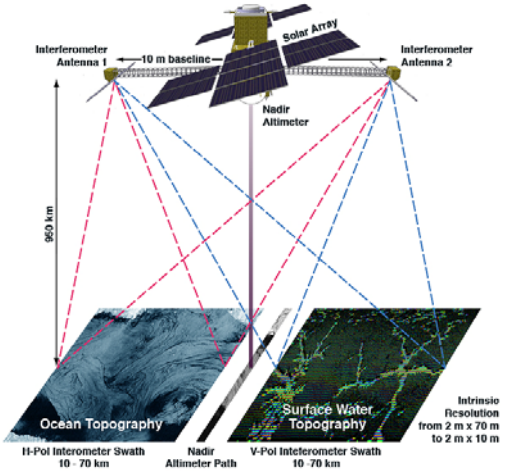


Separation of the 12 hydrodynamic contexts in two classes:
“low” water level situations (below 0 m)
“high” water level situations (above 0 m)

Errors larger than 30 cm
mainly observed for cases where water level is low,
because the impact of layover is stronger near the bank



Thanks



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