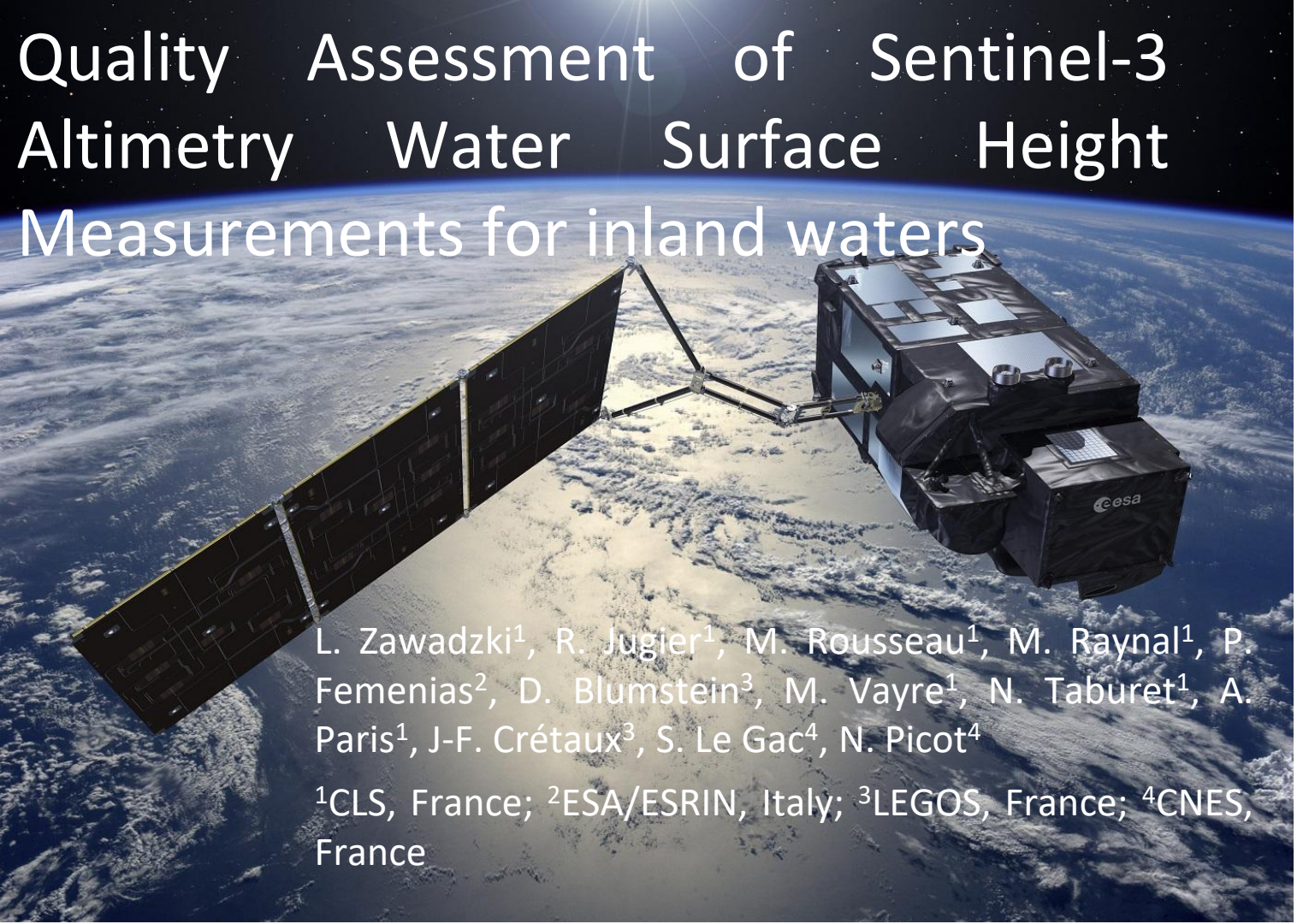
Quality Assessment of Sentinel-3 Altimetry Water Surface Height Measurements for inland waters



L. Zawadzki[1], R. Jugier[1], M. Rousseau[1], M. Raynal[1], P. Femenias[2], D. Blumstein[3], M. Vayre[1], N. Taburet[1], A. Paris[1], J-F. Crétaux[3], S. Le Gac[4], N. Picot[4]

[1]CLS, France; [2]ESA/ESRIN, Italy; [3]LEGOS, France; [4]CNES, France

SENTINEL 3 Mission Performance Centre

CLS COLLECTE LOCALISATION SATELLITES

LEGOS

esa European Space Agency

cnes

Ensure a continuous quality monitoring of Sentinel-3 PDGS Level-2 Short-Time-Critical **Land** products for core services

Ensure a quality assessment of Sentinel-3 PDGS Level-2 Non-Time-Critical **Land** Products in case of reprocessing

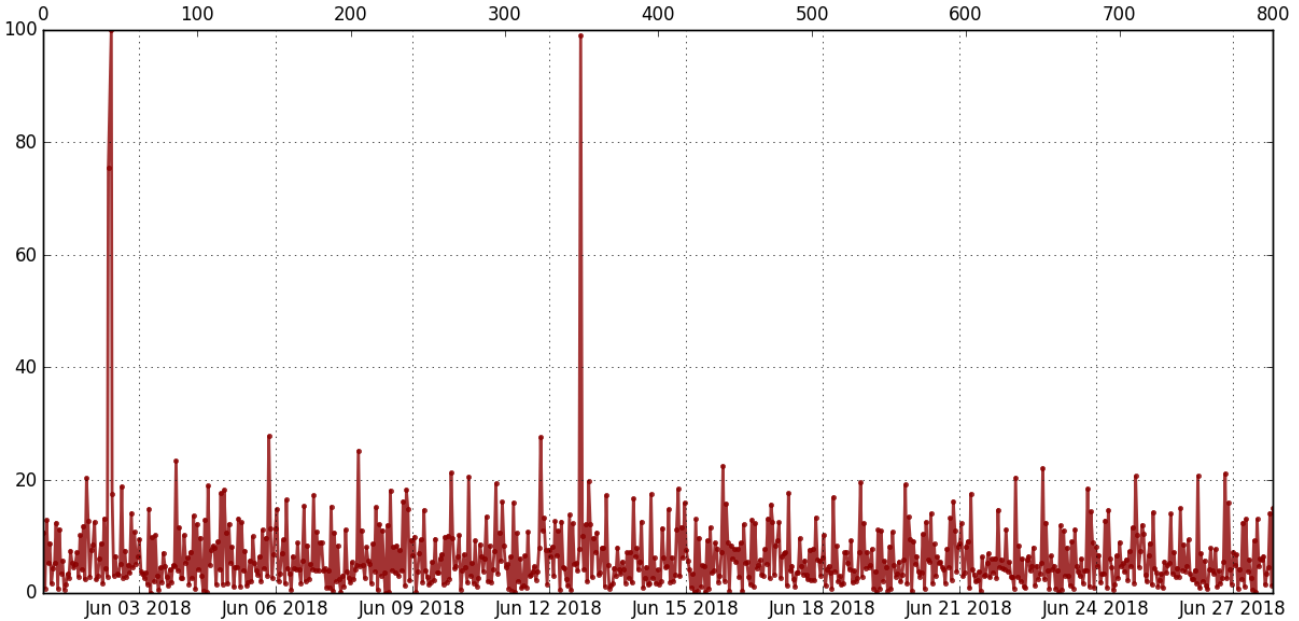
1. Quality Assessment of Sentinel-3a on inland waters
2. Verification of Sentinel-3a and Sentinel-3b consistency (Tandem Phase)

1. Quality Assessment of Sentinel-3a on inland waters
2. Verification of Sentinel-3a and Sentinel-3b consistency (Tandem Phase)

Quality Assessment of Sentinel-3a on inland waters

Sentinel-3a PDGS Land L2

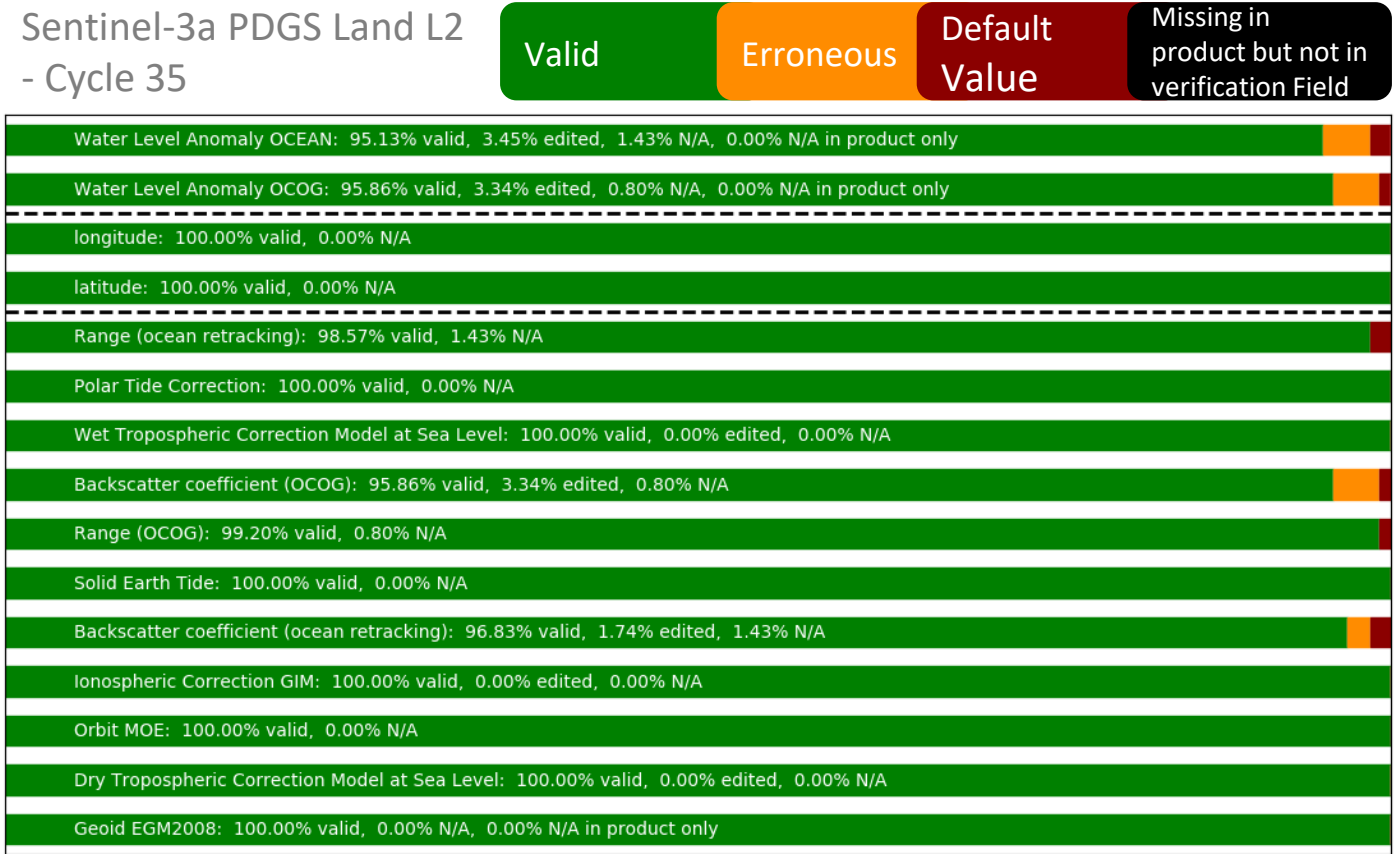
% of Missing Data – Cycle 32 track by track



Quality Assessment of Sentinel-3a on inland waters

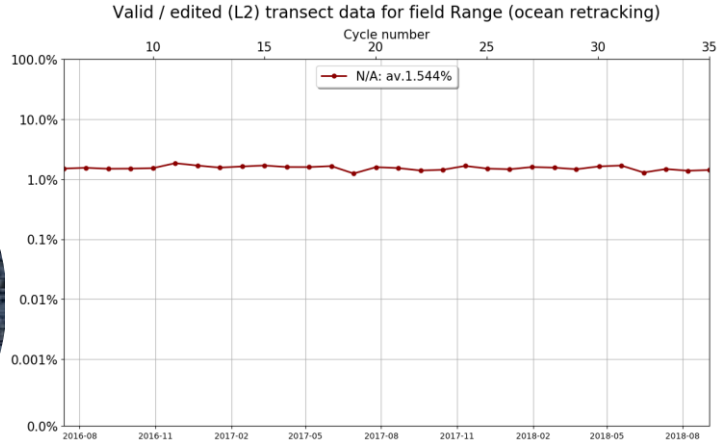
DV and erroneous data over land water

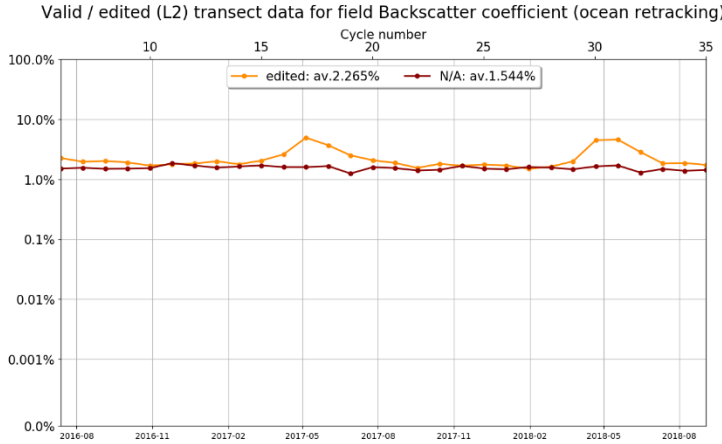
Sentinel-3a PDGS Land L2 - Cycle 35



Quality Assessment of Sentinel-3a on inland waters

DV and erroneous data over land water





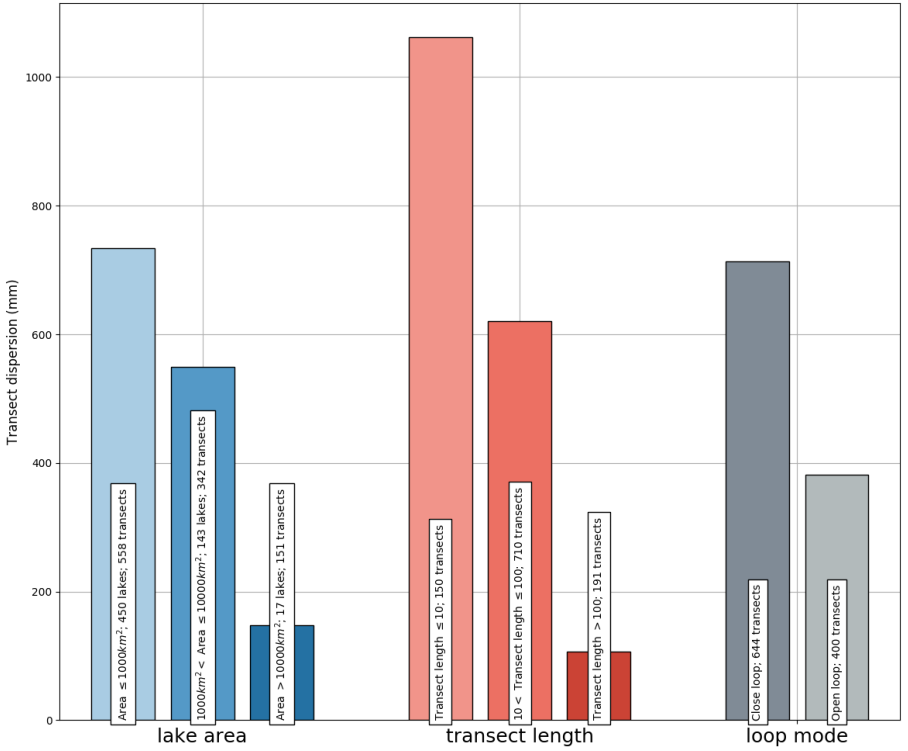
- Stable percentage of DV range measurements → **nominal**
- Stable percentage of DV and erroneous (threshold editing) backscatter measurements → **nominal**

Quality Assessment of Sentinel-3a on inland waters

Along-Track high-frequency signal

- There is no editing and dispersion contains geophysical signal (geoid errors for small wavelengths)
- Smaller dispersion with the Open loop tracking mode

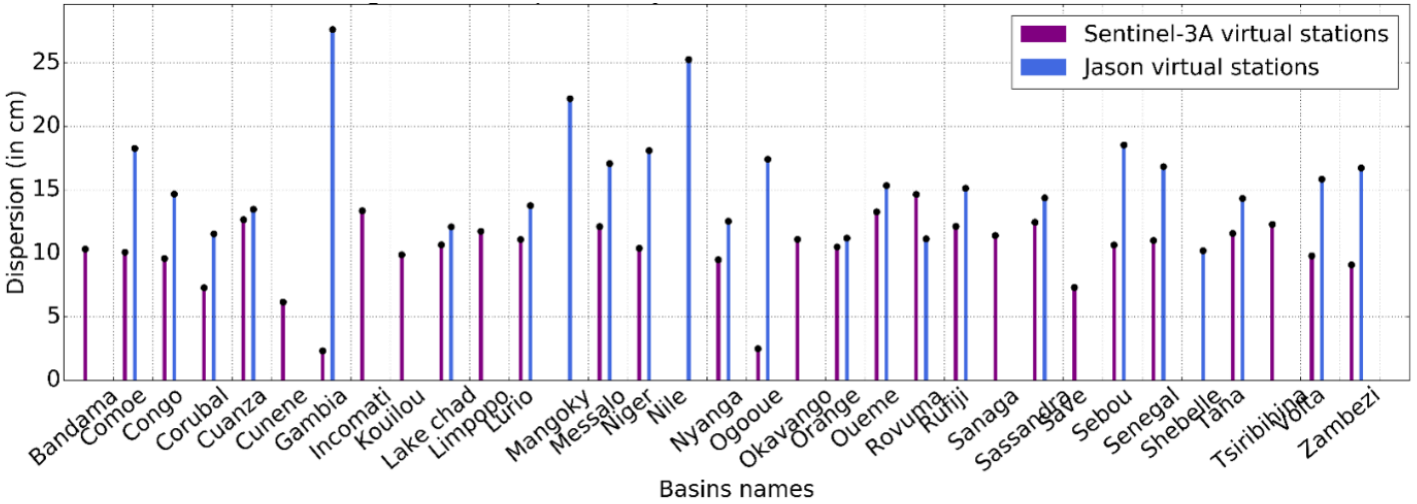
Along-track Dispersion of WSH (m) – Cycle 35



Quality Assessment of Sentinel-3a on inland waters

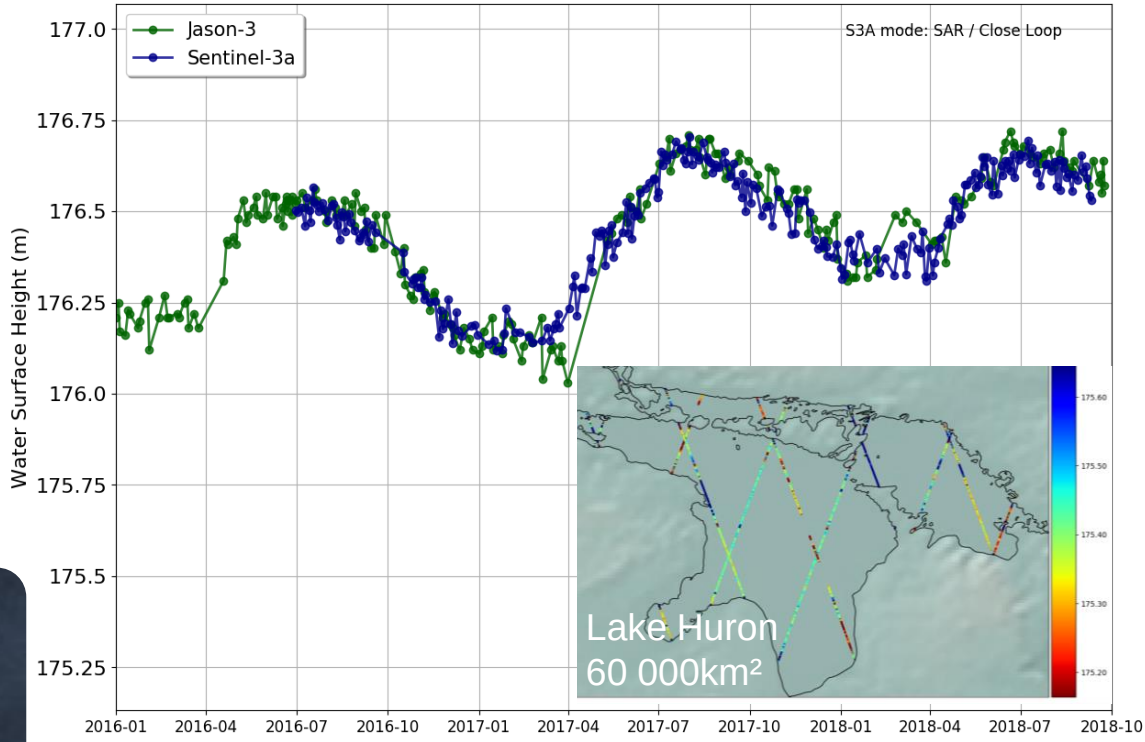
Along-Track high-frequency signal

The Specific Case of Rivers: Virtual Stations (VS)
→10 cm dispersion of WSH on 500 VS in Africa for Sentinel-3a
→ Nb: 15cm dispersion of WSH on 200 VS in Africa for Jason-2/3



Quality Assessment of Sentinel-3a on inland waters

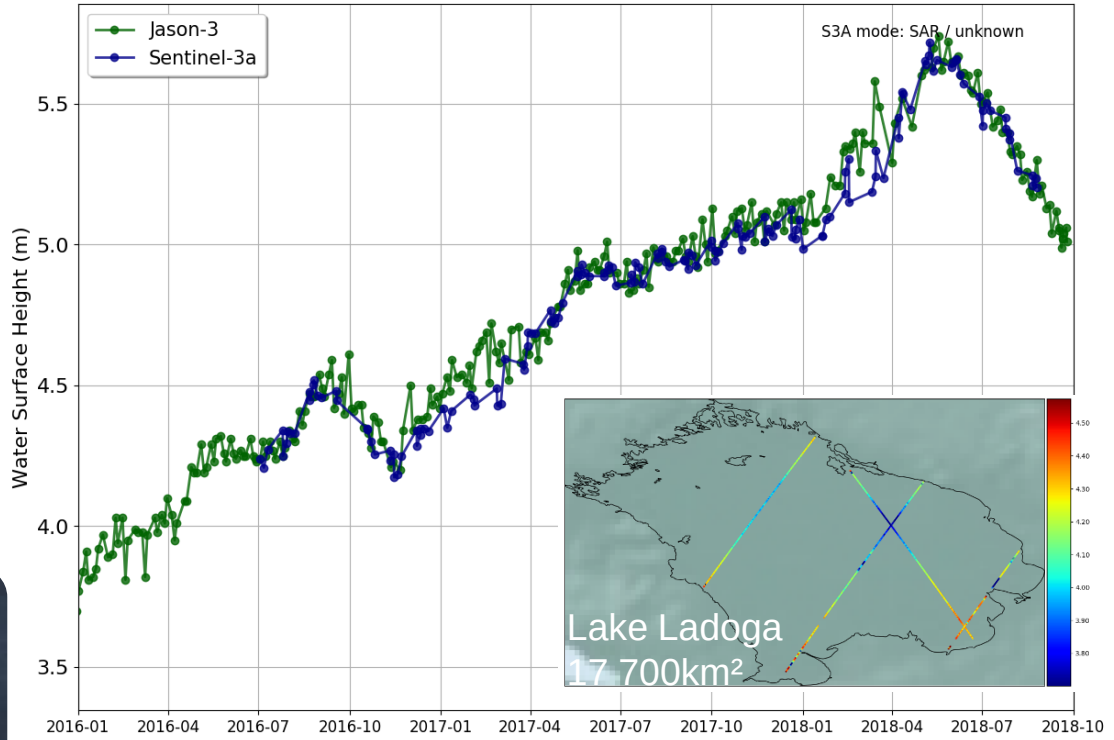
Long-term Evolution



- Stable Long-Term Evolution of Water Surface Height
- Consistent with Jason-3

Quality Assessment of Sentinel-3a on inland waters

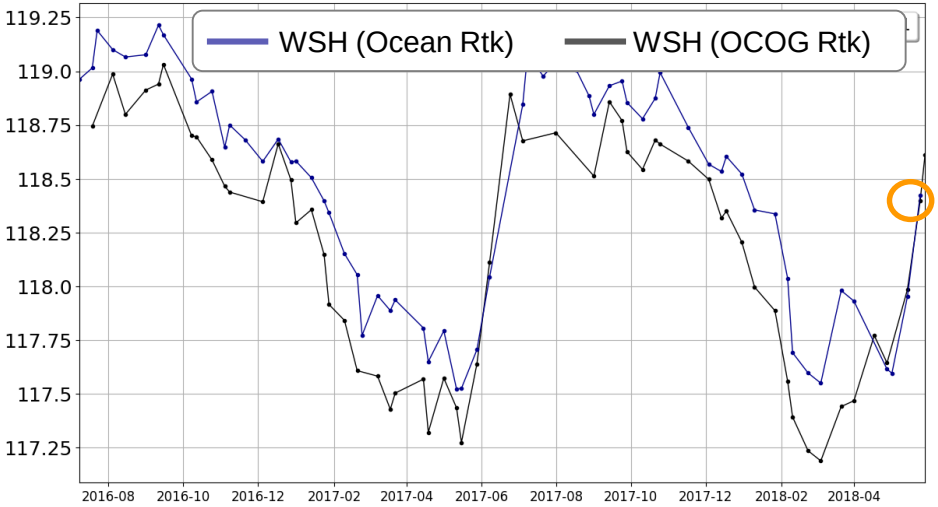
Long-term Evolution



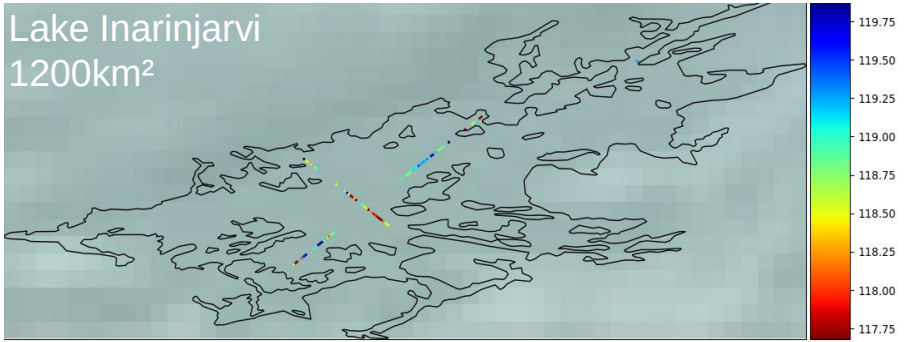
- Stable Long-Term Evolution of Water Surface Height
- Consistent with Jason-3

Quality Assessment of Sentinel-3a on inland waters

Long-term Evolution



- Stable Long-Term Evolution of Water Surface Height
- ~30cm bias between Ocean and OCOG retrackers

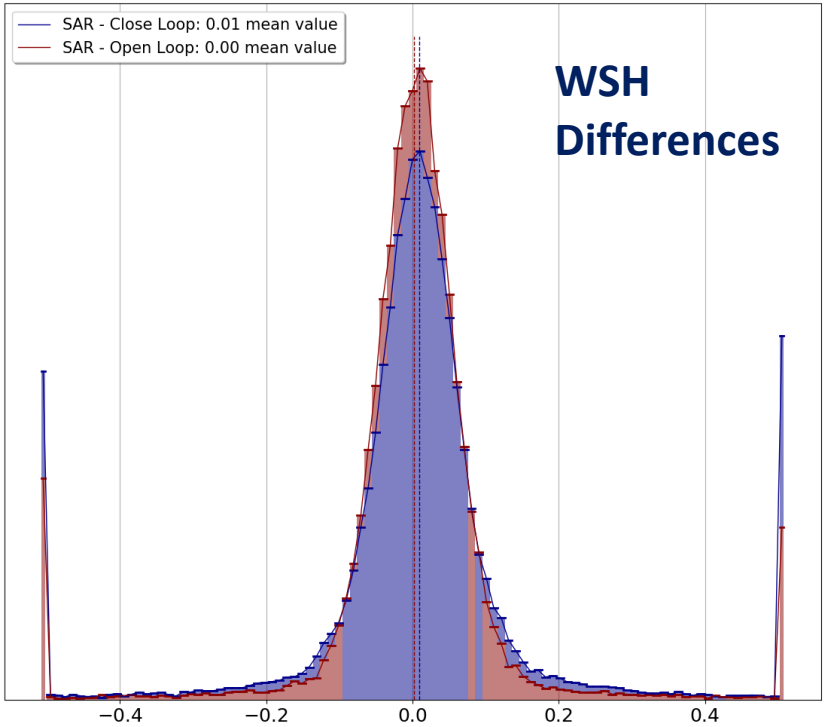


1. Quality Assessment of Sentinel-3a on inland waters
2. Verification of Sentinel-3b consistency (Tandem Phase)


S3B
S3A
(m)
1650
1647.5
1645

Verification of Sentinel-3a and Sentinel-3b consistency

- Comparison of **WSH** for Sentinel-3a and 3b in SAR Mode (ocean retracker)
  - Very Good agreement in SAR Mode, for close loop and open loop: no bias, differences<14 cm at 68% confidence level
  - Results suggest a better agreement in Open Loop
  - Differences may be partly explained by the geoid errors at small scale via the ground-track distance between S3A/B → to be confirmed



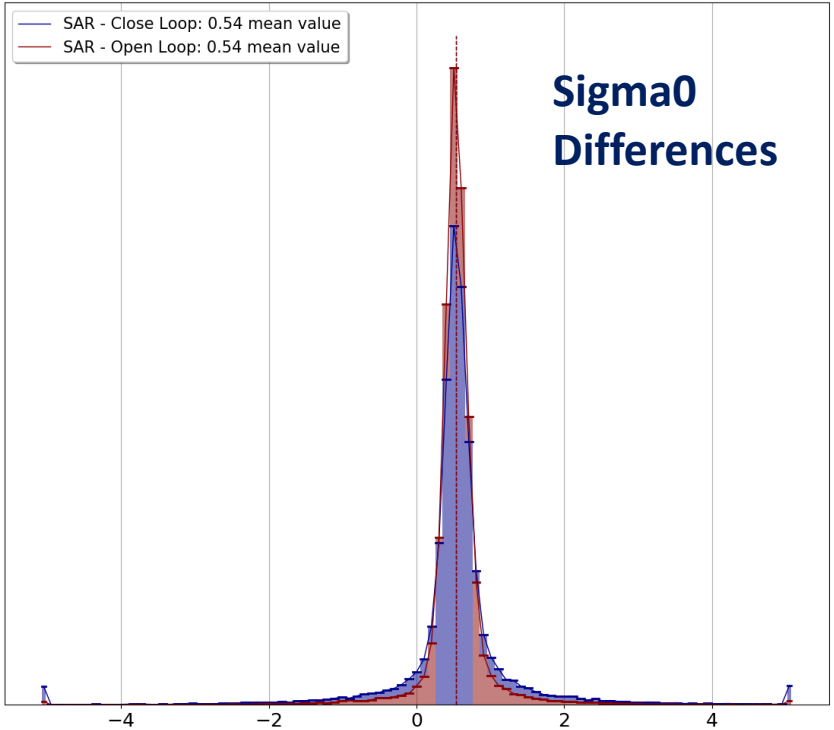
Difference of Water Surface Height between Sentinel-3b and Sentinel-3a (m). Only SARM measurements are compared, for Open Loop and Close Loop Tracking Modes separately. Analysis period: S3B cycles 9-12

Verification of Sentinel-3a and Sentinel-3b consistency

- Comparison of **Backscatter** (Sigma0) for Sentinel-3a and 3b in SAR Mode

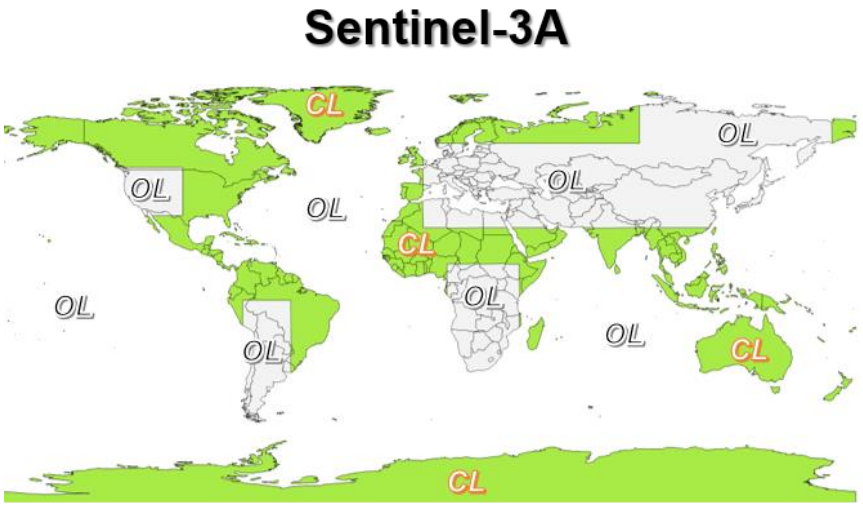
  - Very Good agreement in SAR Mode, for close loop and open loop: ~0.5dB bias (known), differences<0.6 dB at 68% CL

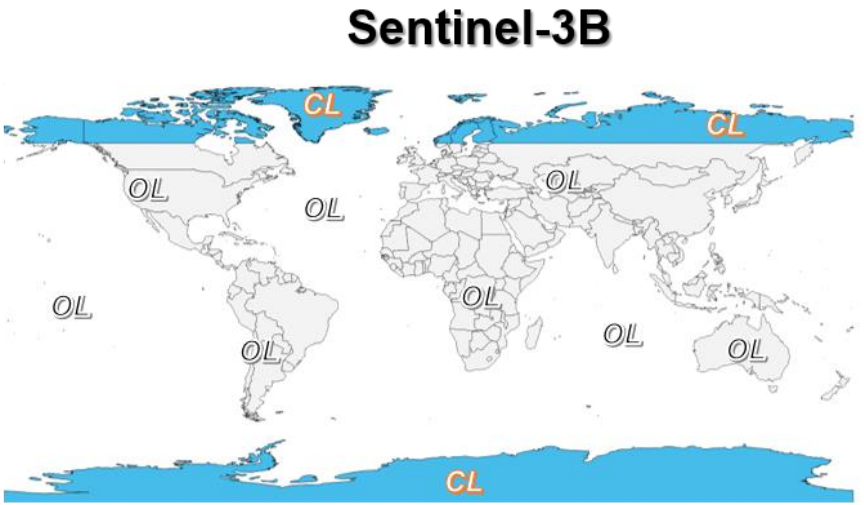
  - Results suggest a better agreement in Open Loop
  - Differences may be partly explained by the ground-track distance between S3A/B → to be confirmed



Difference of Sigma0 between Sentinel-3b and Sentinel-3a (dB). Only SARM measurements are compared, for Open Loop and Close Loop Tracking Modes separately. Analysis period: S3B cycles 9-12

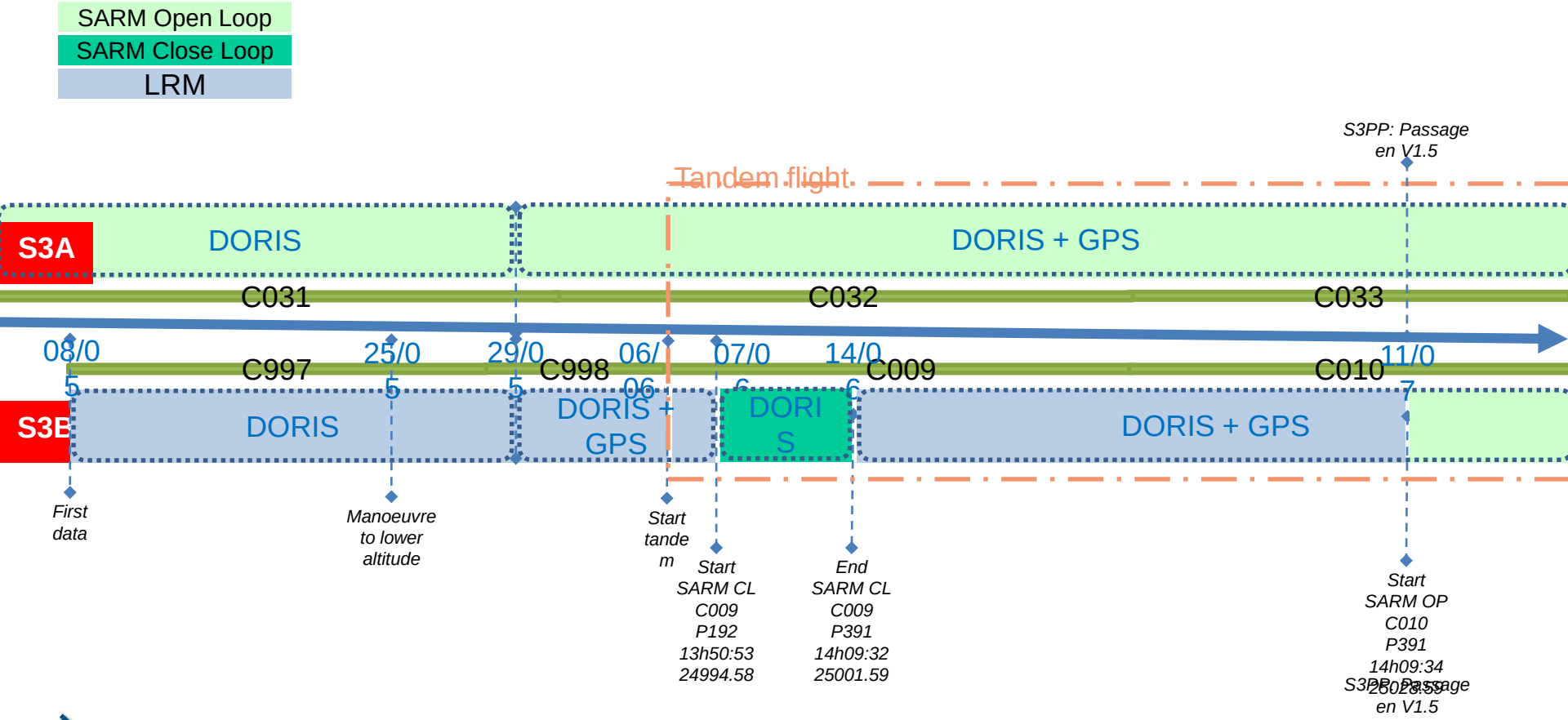
Reminder on the acquisition modes





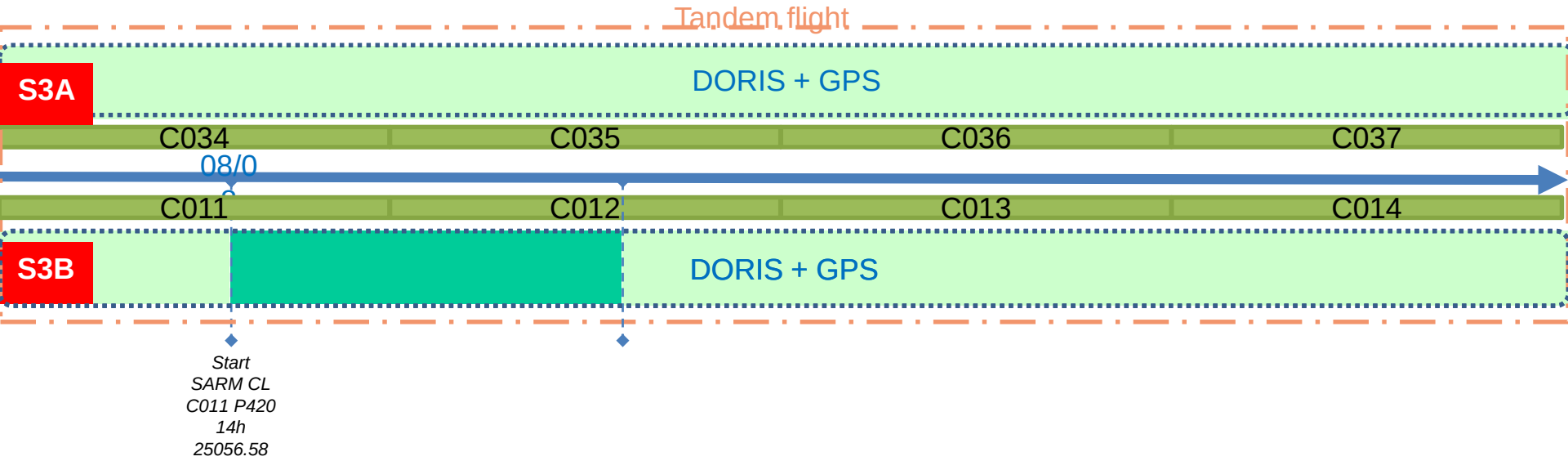
Courtesy S. Le Gac (CNES)

Reminder on the acquisition modes

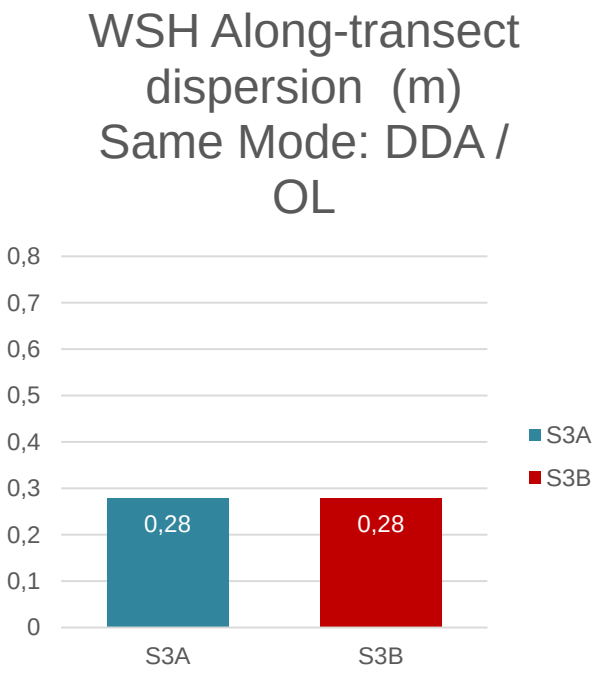


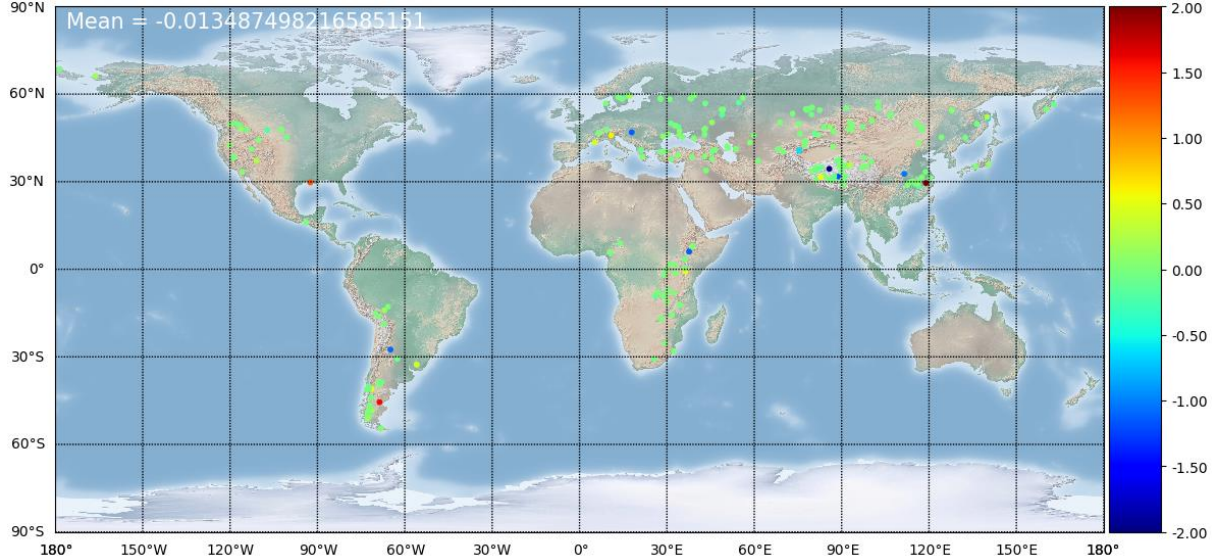
Reminder on the acquisition modes

SARM Open Loop
SARM Close Loop
LRM



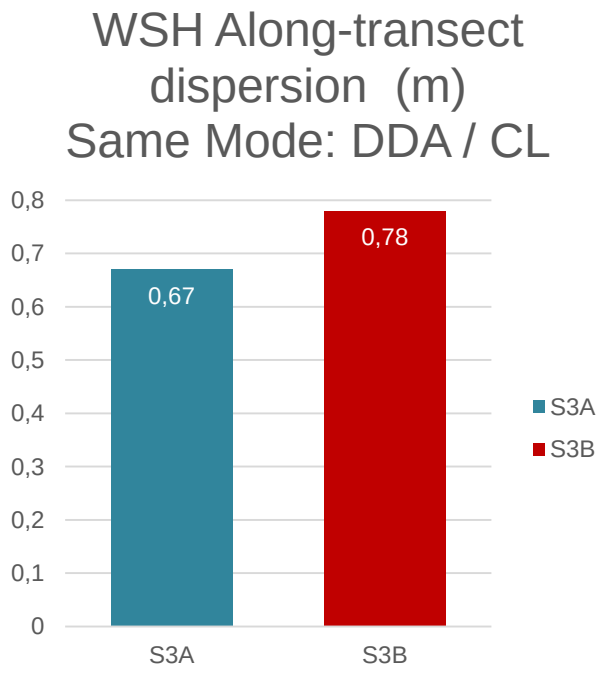
Verification of Sentinel-3a and Sentinel-3b consistency

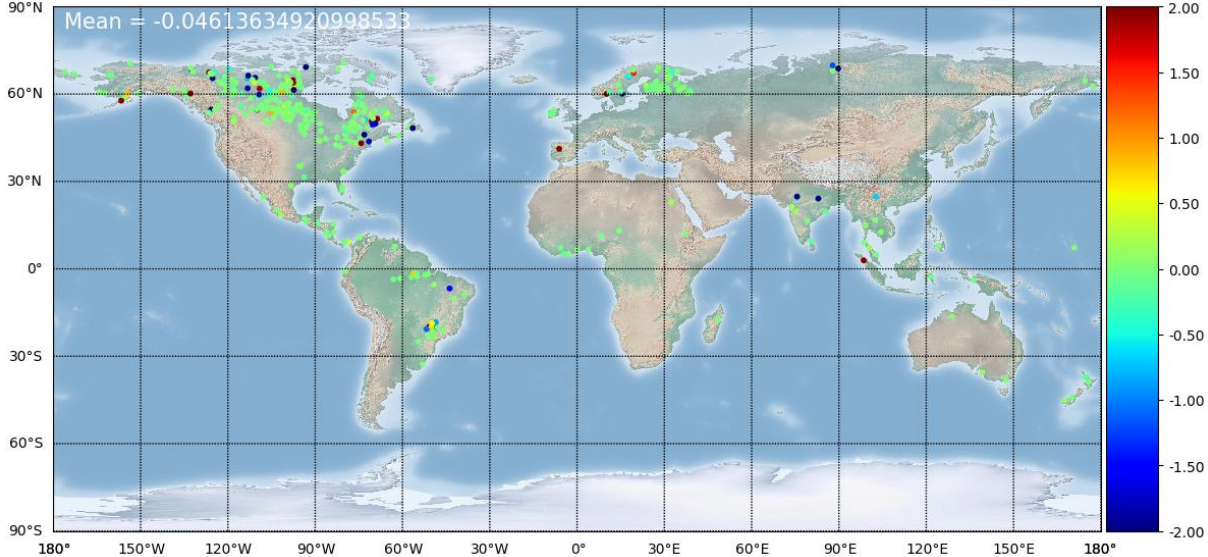




Differences of average dispersions between Sentinel-3a and Sentinel-3b for each lake and DDA/OL measurements

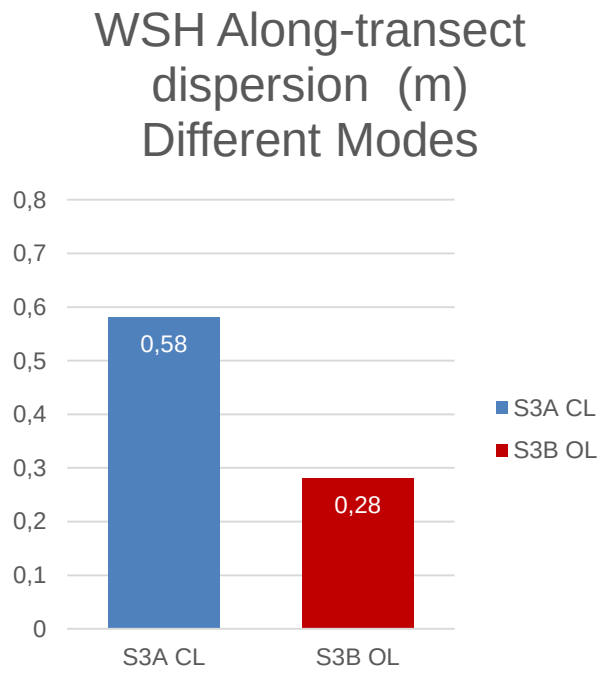
Verification of Sentinel-3a and Sentinel-3b consistency

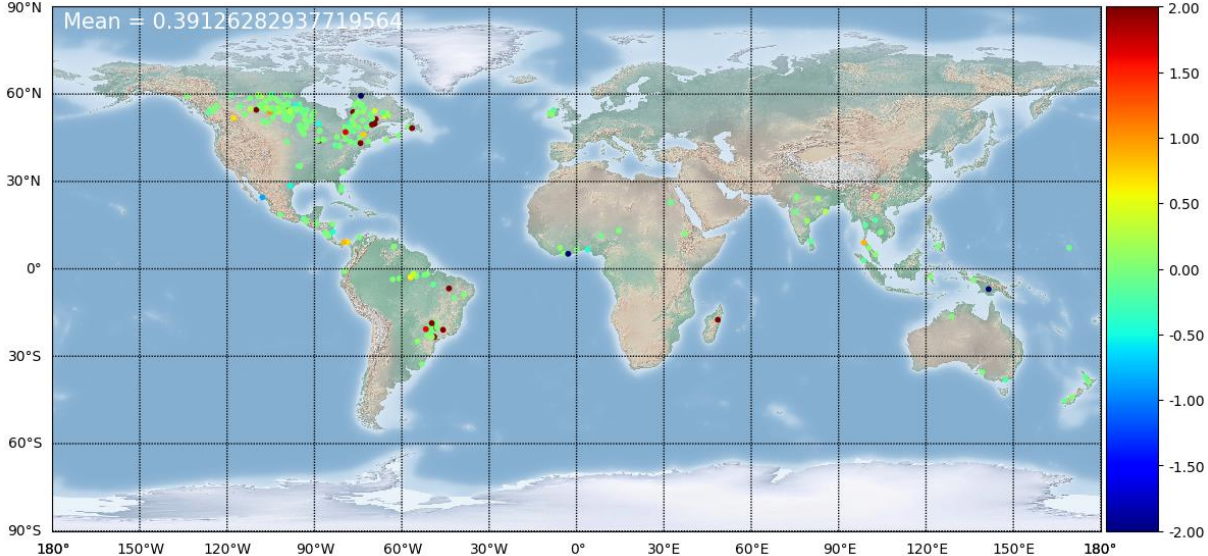




Differences of average dispersions between Sentinel-3a and Sentinel-3b for each lake and DDA/CL measurements

Verification of Sentinel-3a and Sentinel-3b consistency





Differences of average dispersions between Sentinel-3a and Sentinel-3b for each lake and respectively DDA/CL and DDA/OL measurements

Outlook

- A routine monitoring of the quality of Sentinel-3 PDGS Land products will be implemented for the users and core services

- Nominal precision of Sentinel-3a and Sentinel-3b over inland waters. Consistent accuracy with Jason-3. However, Cal/Val analyses based on in situ measurements are essential to further assess the accuracy (see J-F. Crétaux's talk on Issyk-kul)

- Open loop mode improves significantly the quality of the data. This will be further improved with ongoing CNES/LEGOS work on DEM (see S. Le Gac's talk and D. Blumstein's poster).

- Further analyses will be performed on the benefit of SAR vs LRM during tandem phase


S3B
S3A
(m)
1650
1647.5
1645