Sentinel-3A STM Mission Performance after 1 year in orbit

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Context and Overview

SARM was recommended to be activated for the first time at global scale by the scientific community and the Copernicus Services

➢This presentation aims at giving an overview of the Sentinel-3A performances in SARM

➢We will address:

- Performances of sea level at large scales
- Assessment of the small scale content for the sea level
- Performances of Wind&Wave parameters
- Overview of the quality over other surfaces (inland waters and land ice)

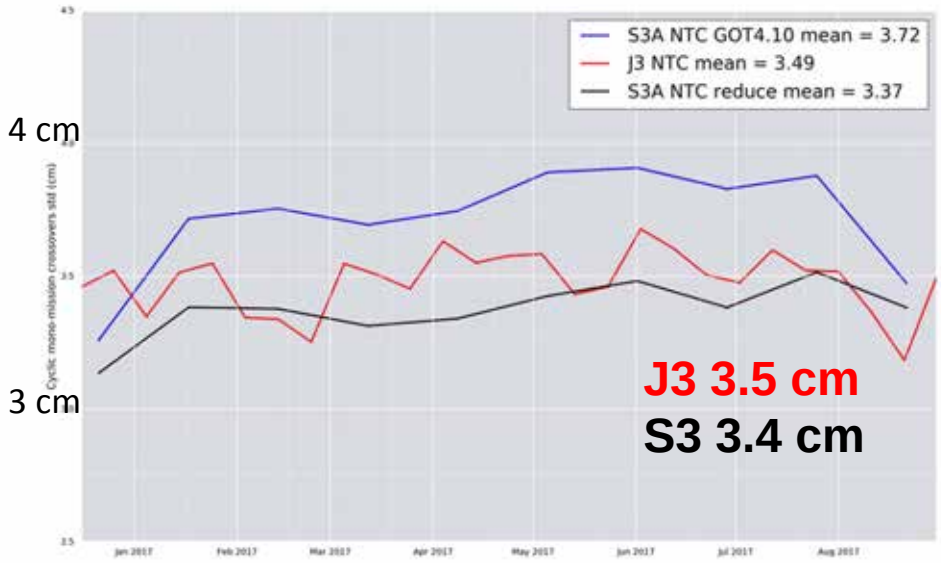
➢Analyses of the on the fly L2 NTC products (= GDR) January 2017- Sept 2017

➢When needed, reference to the next version of the products not yet in operations

S3A Mission Performance for the sea level

- Performances at the same level than the one measured on Jason-3 altimeter
- Room for improvement when future MSS models will reduce the errors due to new S3A ground track

Crossover SSH Error



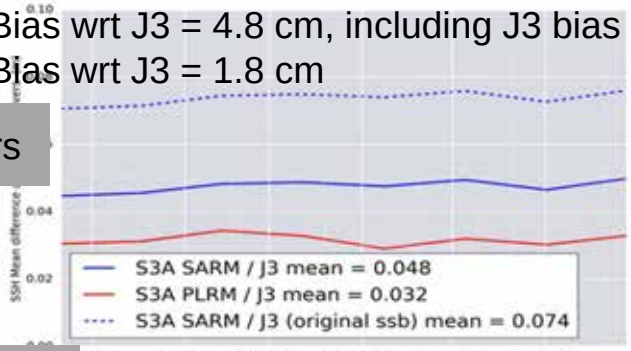
Along track SLA std
With CNES-CLS15 MSS

S3A Mission Performance for the sea level

➢ Negligible bias both for SARM (and PLRM) observed with 4 different metrics: SARM bias below 2 cm

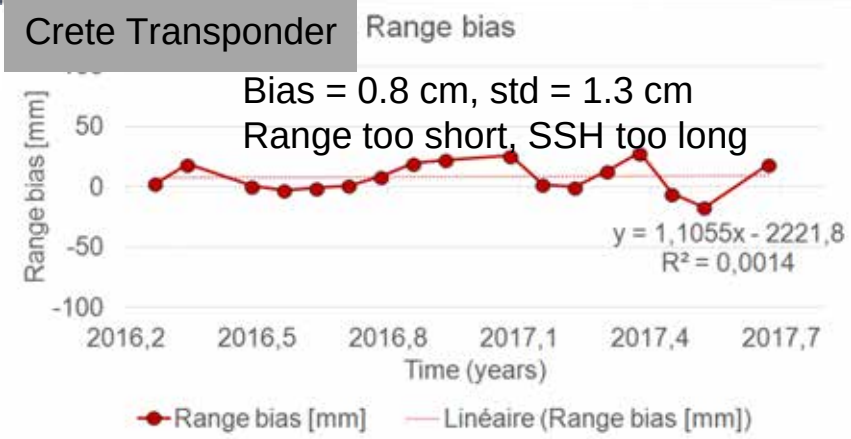
S3-J3 Crossovers

Bias wrt J3 = 4.8 cm, including J3 bias
Bias wrt J3 = 1.8 cm



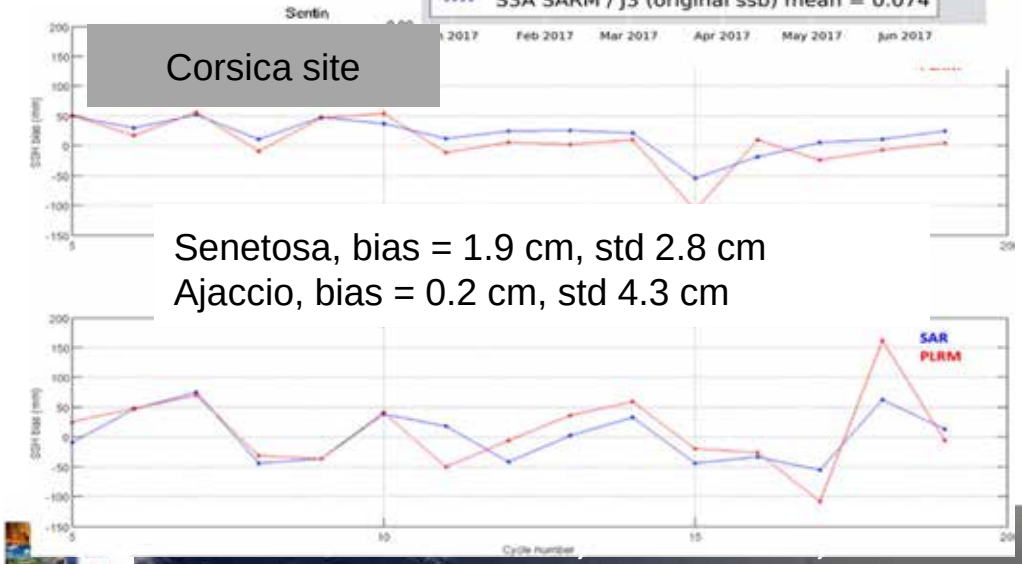
Crete Transponder

Bias = 0.8 cm, std = 1.3 cm
Range too short, SSH too long

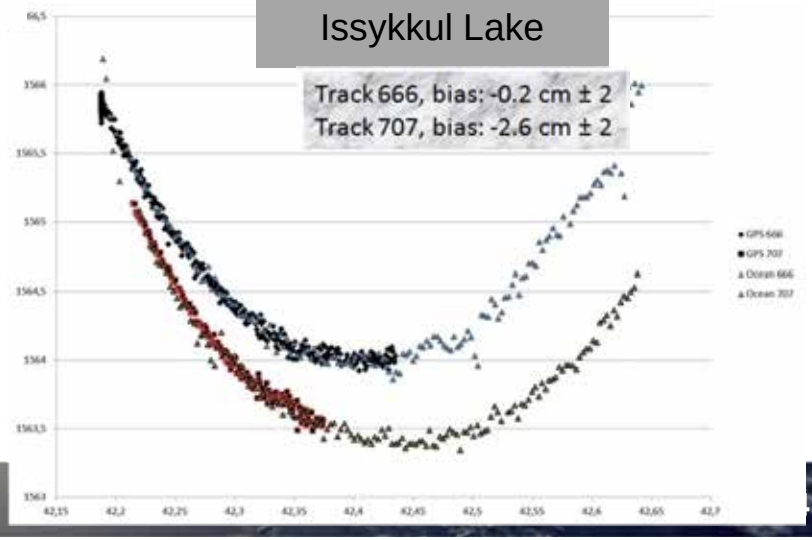


Corsica site

Senetosa, bias = 1.9 cm, std 2.8 cm
Ajaccio, bias = 0.2 cm, std 4.3 cm

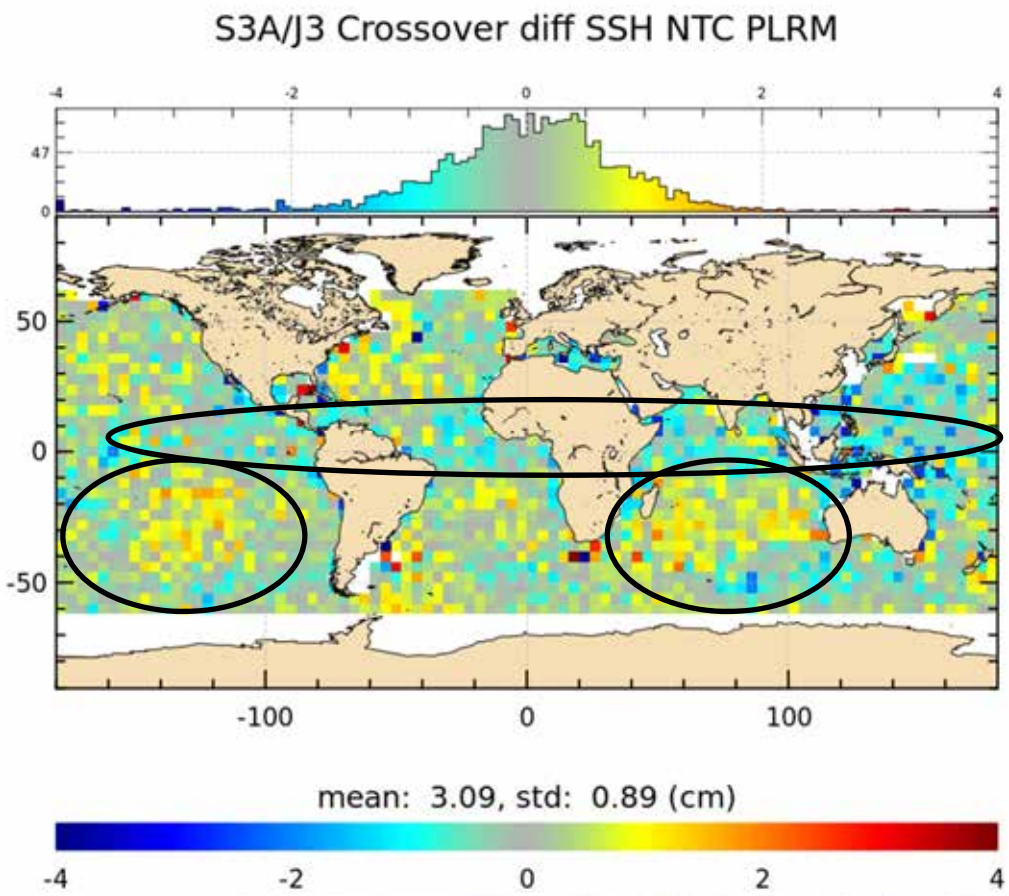


Issykkul Lake



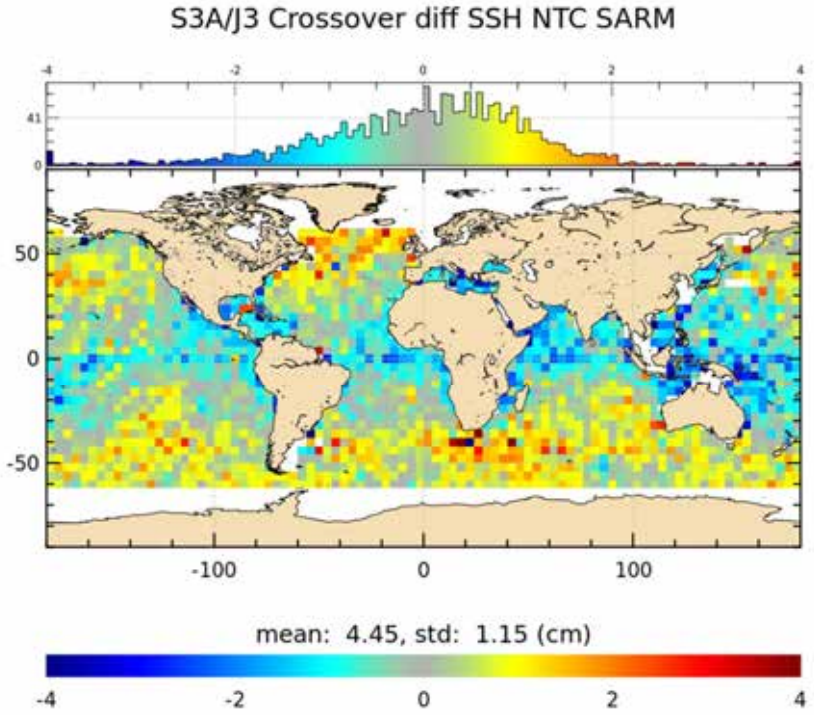
S3A Mission Performance for the sea level

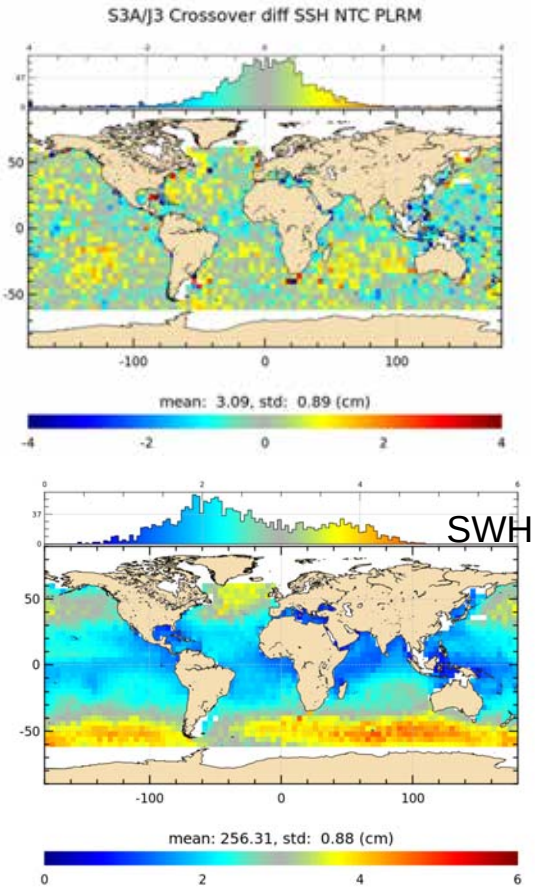
➢ Use of PLRM mode (classical mode used for altimeters)
➢ When comparing sea level between S3A and Jason-3 mission, excellent agreement between both missions (below 2 cm)
➢No clear signature of orbit error patterns
➢Part of residual signal could be due to geophysical corrections (wet tropo and/or SSB signal) which need further fine tuning



S3A Mission Performance for the sea level

➢ Some geographical patterns present for SARM correlated with SWH will be very much decreased with the next version of the products





SWH mean

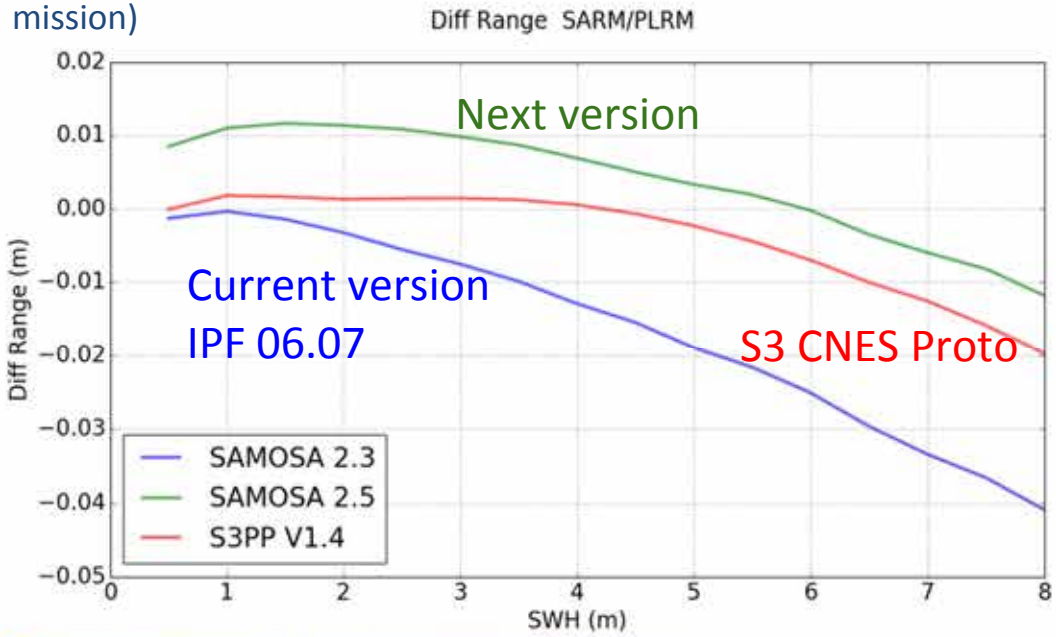
S3A Mission Performance for the sea level

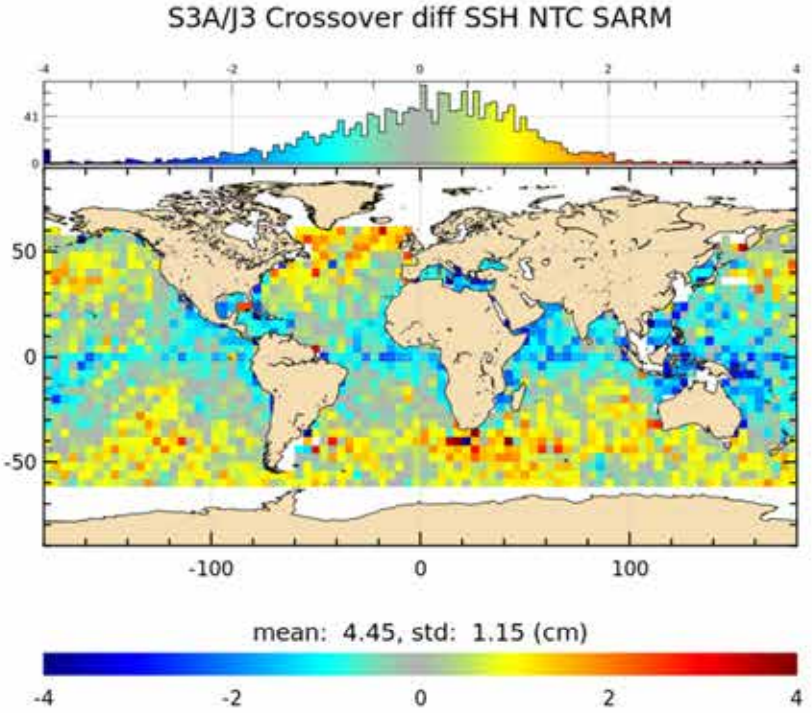
➢ Weakness of SAMOSA 2.3 retracker in the current products => 0.5% SWH error wrt PLRM

➢Error reduced with the SAMOSA 2.5 retracker (next version of S3 products)

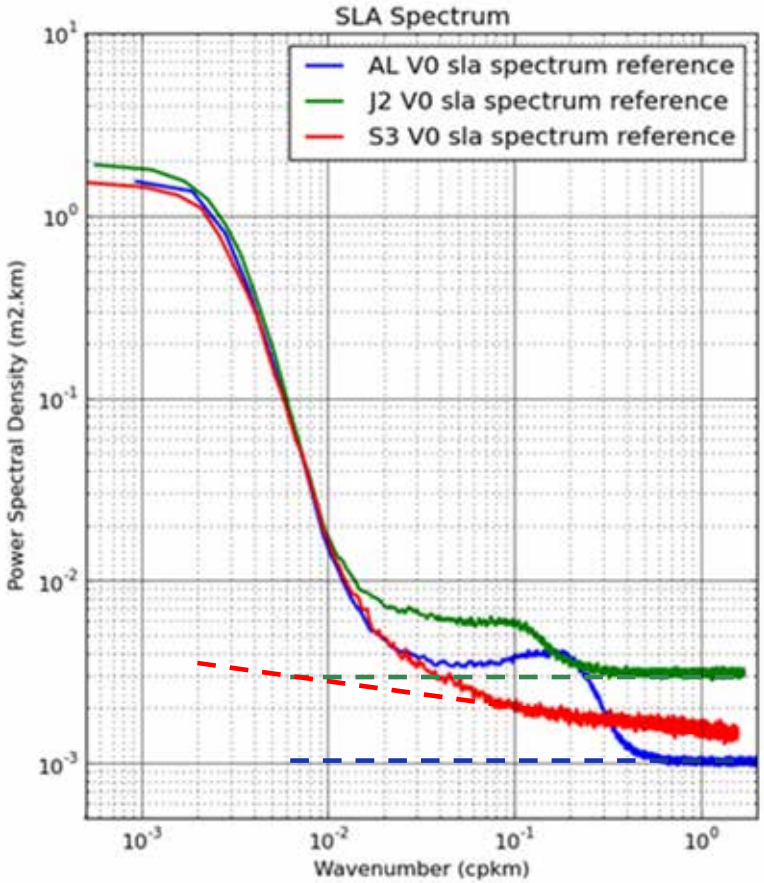
➢Very close agreement with S3PP CNES results

➢Further work on L1 processing is needed to understand the residual difference for SWH > 4m (not observed with Cryosat-2 mission)



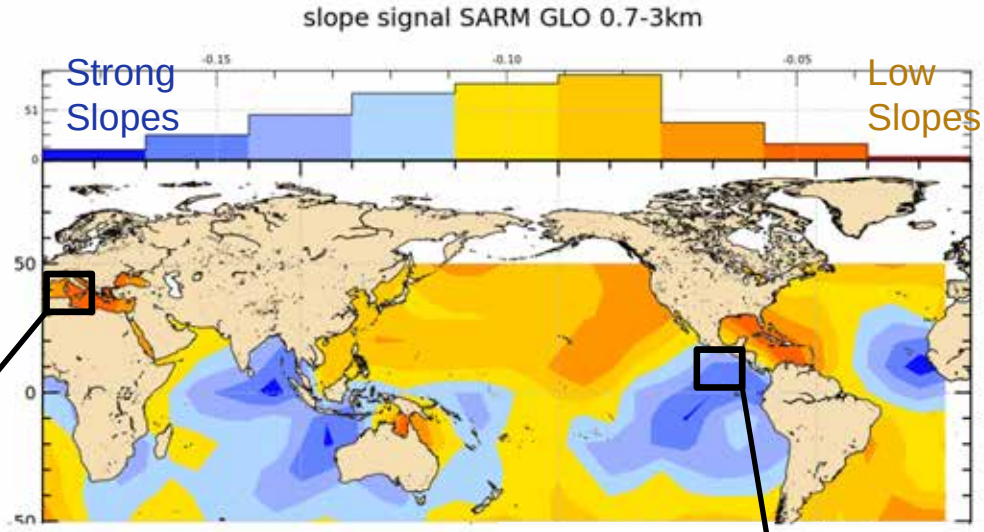


S3A Mission Performance for the sea level

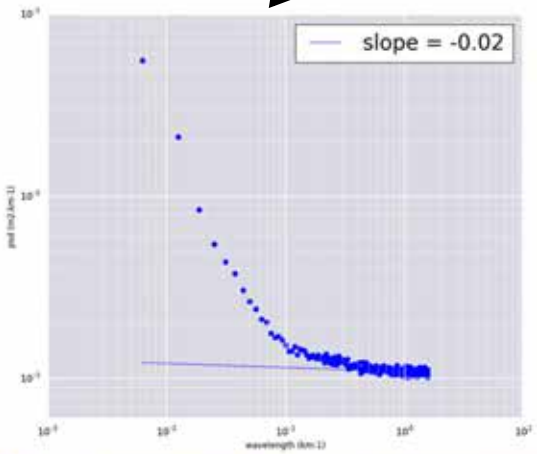


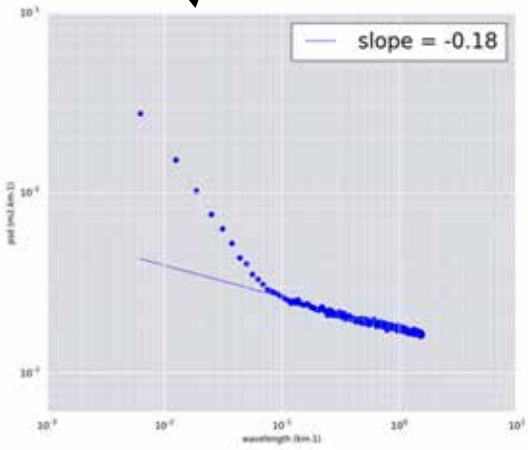
➢While LRM altimeters present a white noise at 20 Hz, SARM data exhibit a red noise, when analysing a global PSD of sea level.

Mean map of red noise slope (1 year)

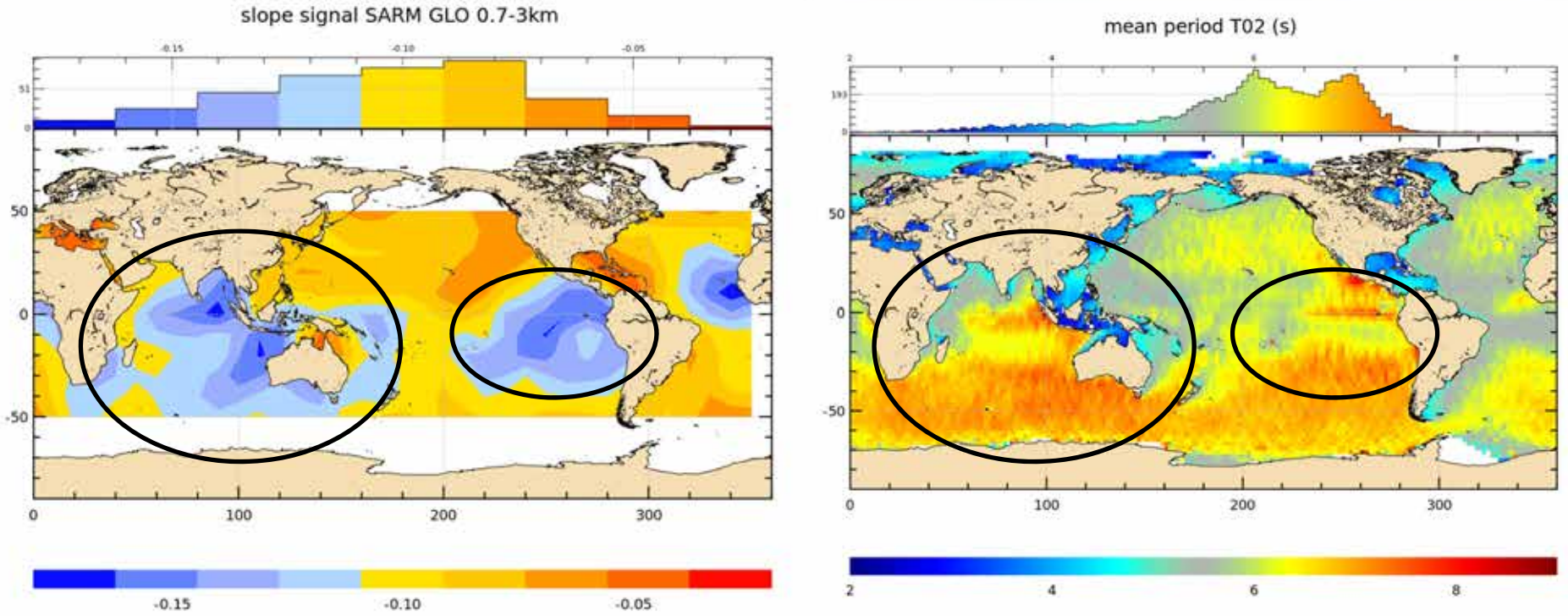


Slope x9 between both locations





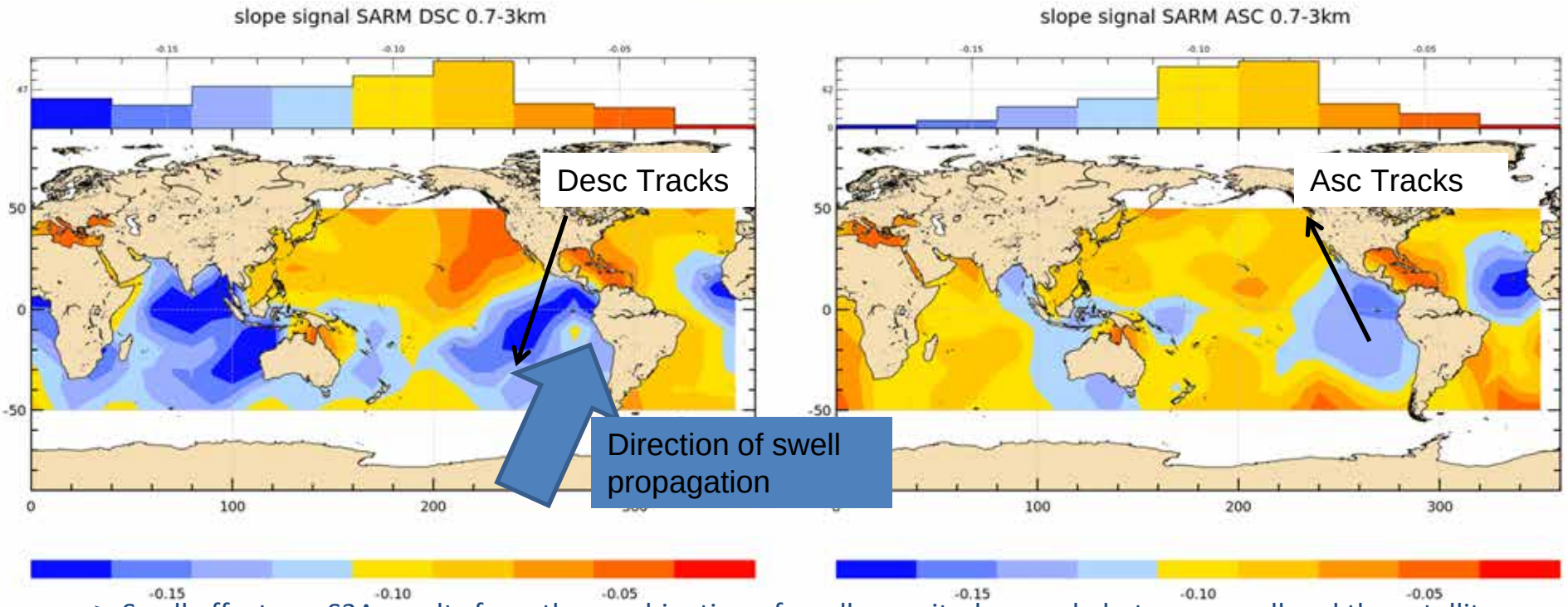
S3A Mission Performance for the sea level



➢Stronger red noise slope (0.7- 3 km) are correlated with areas of swell dominated areas (better correlation in South hemisphere)

➢Red noise on SARM observations of sea level are due to swell effects on SARM range

S3A Mission Performance for the sea level



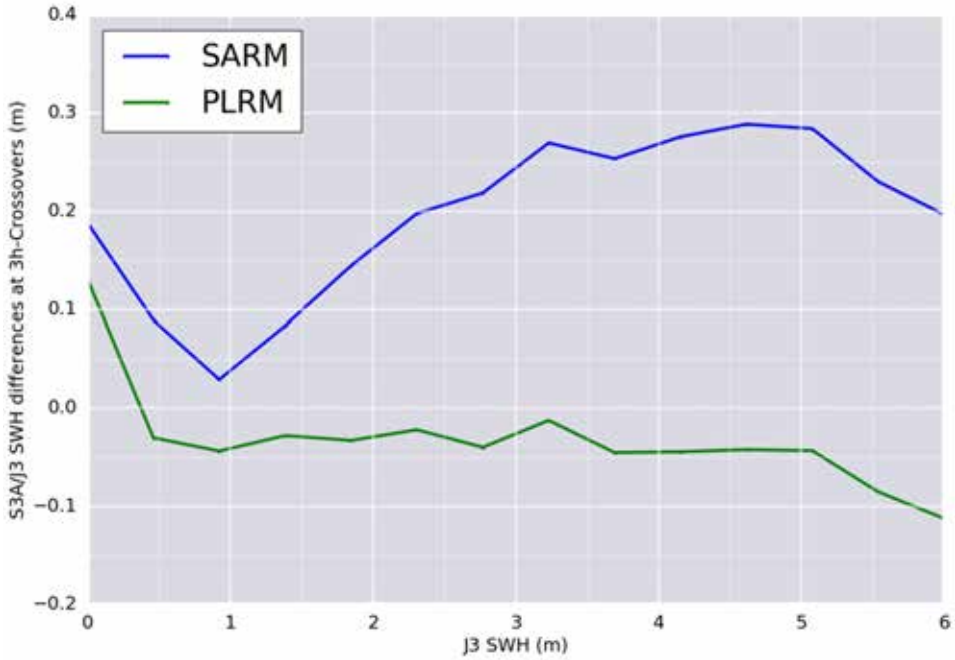
➢Swell effects on S3A results from the combination of swell magnitude + angle between swell and the satellite
=> they are larger when swell propagates along the satellite tracks

➢ Effect is larger on the descending tracks in Pacific and Indian ocean

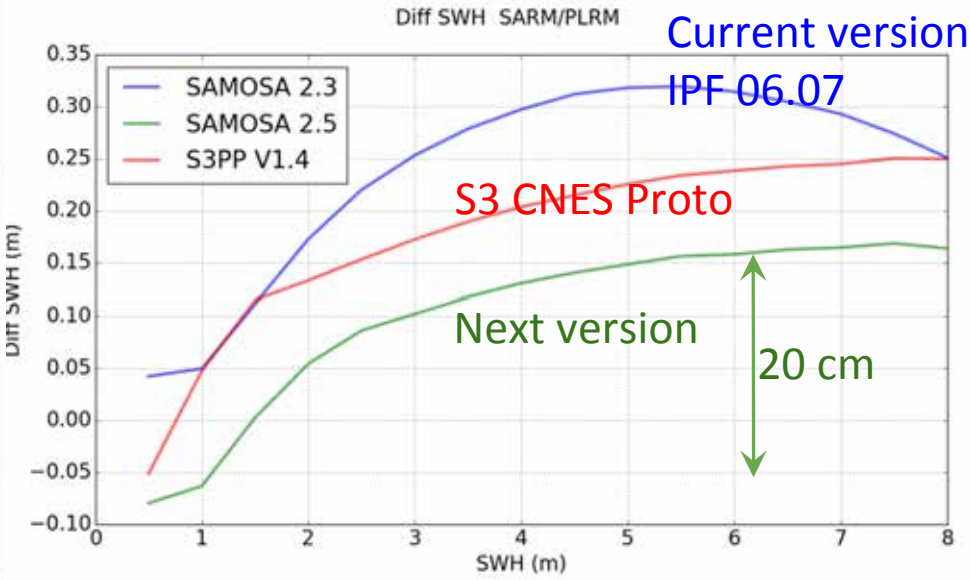
➢Results obtained with CNES prototype. Analysis will be carried out based on the L2 operational products.

SRAL SWH assessment

SWH bias wrt Jason-3



SWH bias wrt S3A PLRM



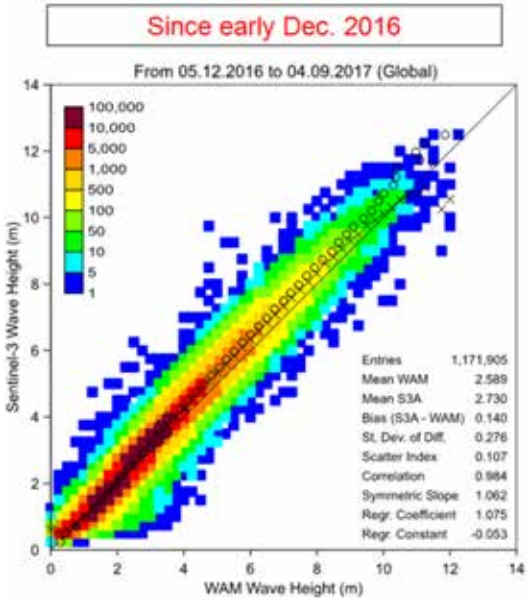
➢ Negligible bias for PLRM compared to Jason-3 measurements

➢ Presence of some biases on SARM SWH that will be reduced with the next version of the products (inclusion of SAMOSA 2.5 retracker)

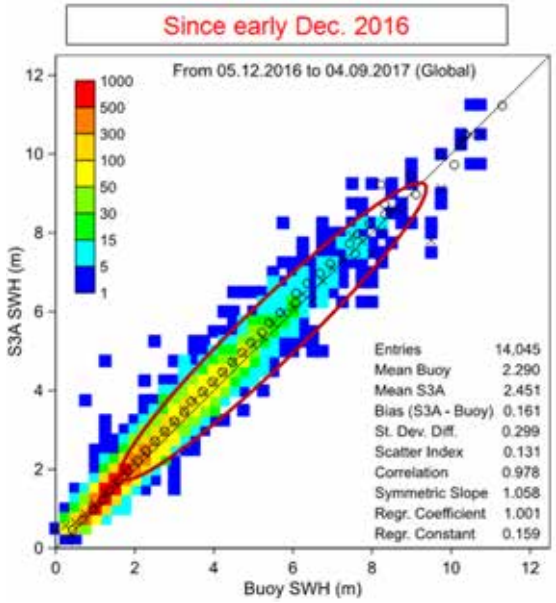
➢ Even if improved, SARM SWH still exhibit residual errors compared to LRM altimeters

SRAL SWH assessment

SWH bias wrt WAM model



SWH bias wrt buoys



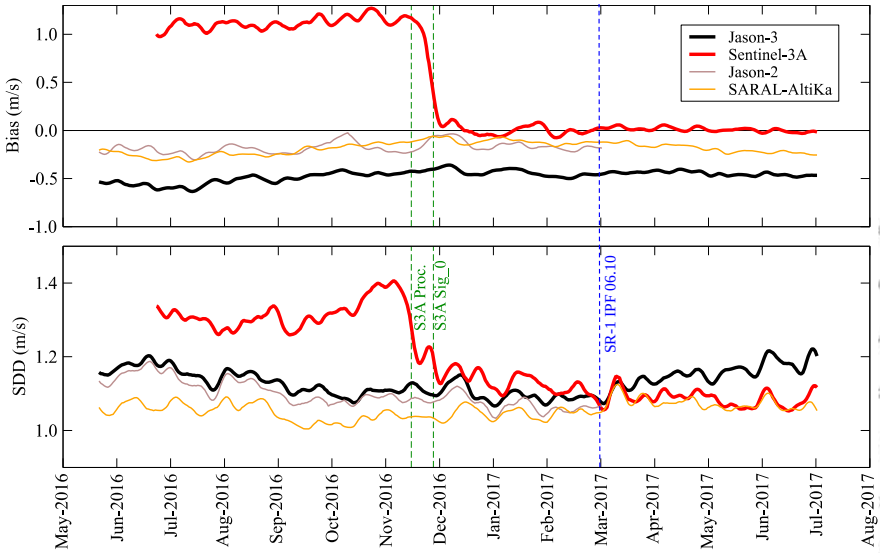
Courtesy of S. Abdalla (ECMWF)

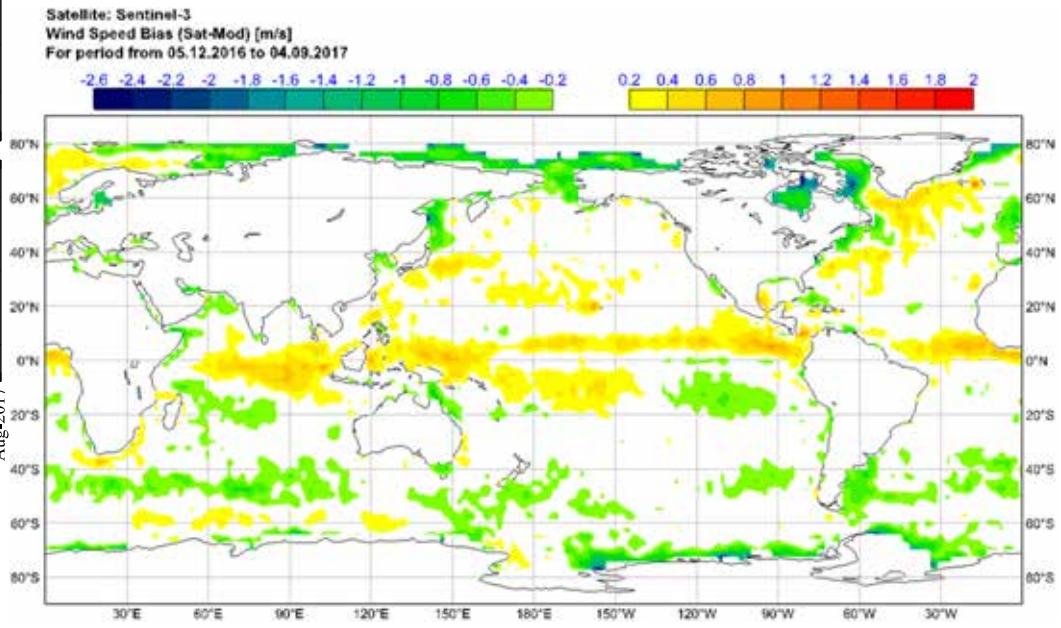
- Even if improved, SARM SWH still exhibit residual biases compared to LRM altimeters
- Error confirmed when comparing with ECMWF model

SRAL Wind Speed Assessment

➢ Excellent performances at large scales when comparing to model data

Since early Dec. 2016



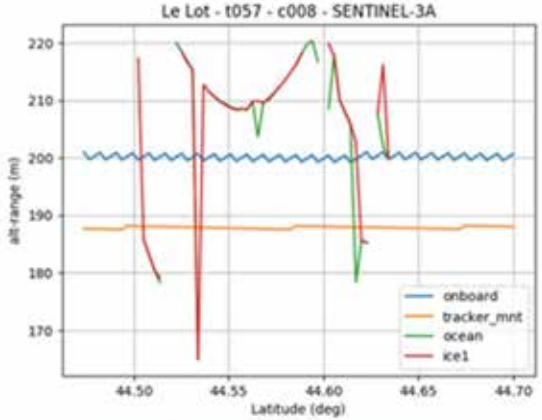


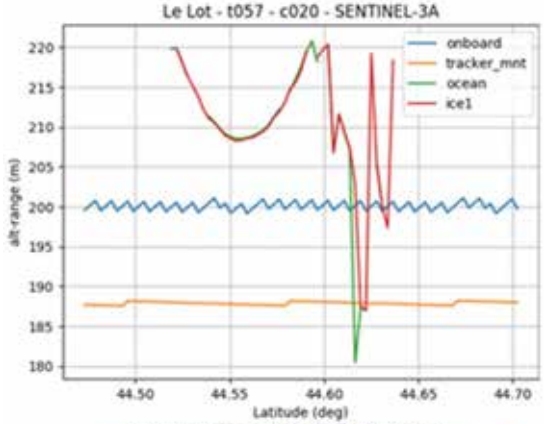
Courtesy of S. Abdalla (ECMWF)

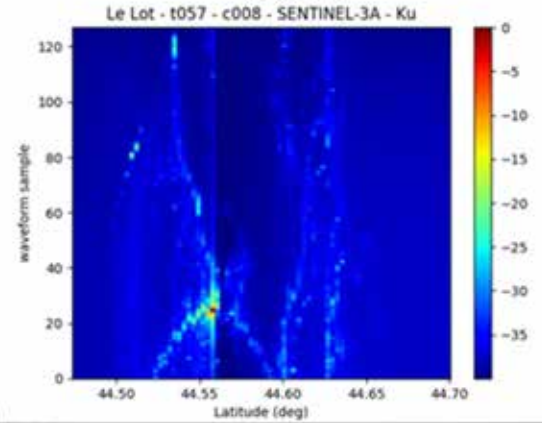
S3A Mission Performance over inland waters

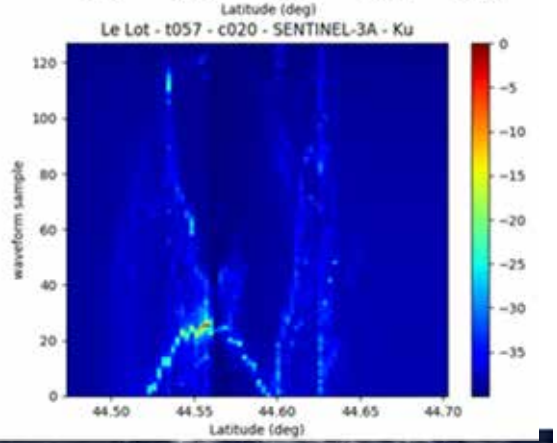
➢ Capability to measure small rivers thanks to OLTC on board Sentinel-3A

Lot : narrow river of 150 m width







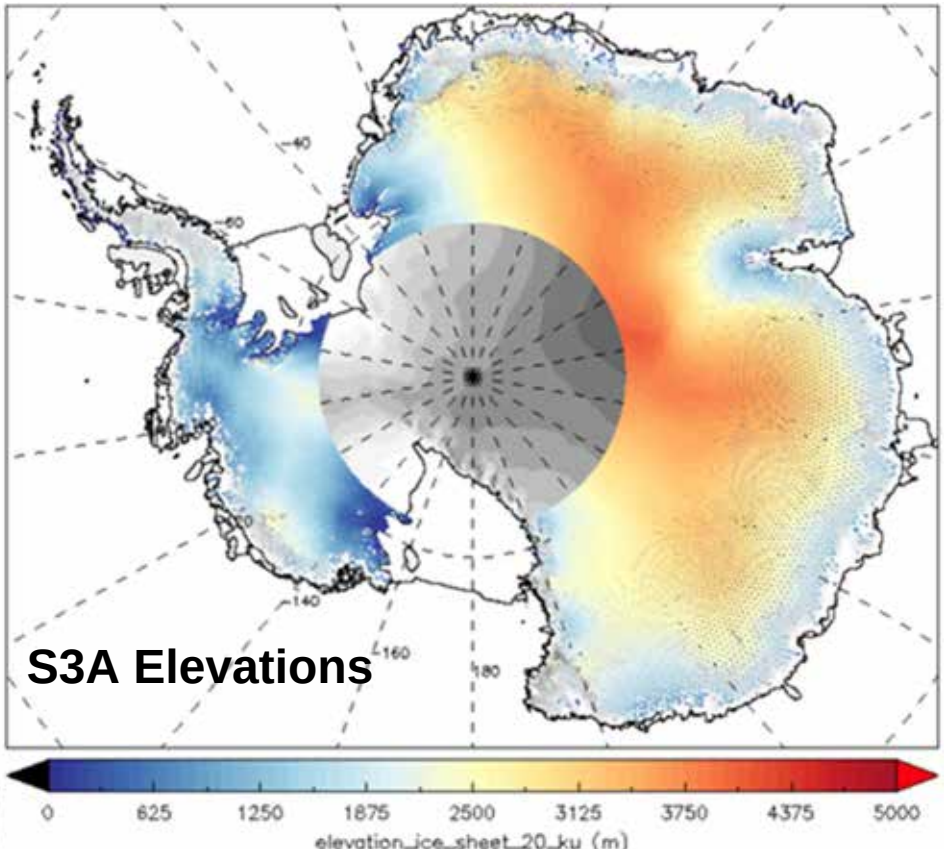


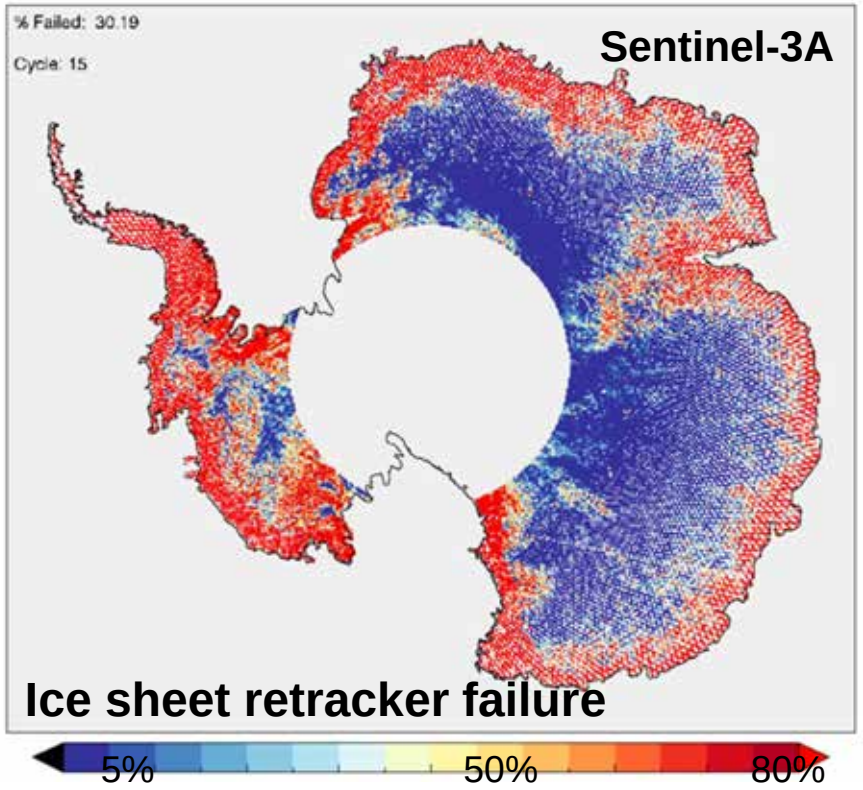
Courtesy of D. Blumstein (LEGOS)

S3A Mission Performance over land ice

➢ First time with acquisition in SAR mode over land ice

➢Data coverage to be improved over the ice margins (thanks to ground processor evolutions)





Courtesy of A. Muir

Conclusion and p

➢**Conclusion :**

➢Excellent data quality of the altimetry observations both for PLRM and SARM

➢ Sentinel-3A is the first SARM mission at global scales. We had great expectations for this new altimeter, and these requirements are met

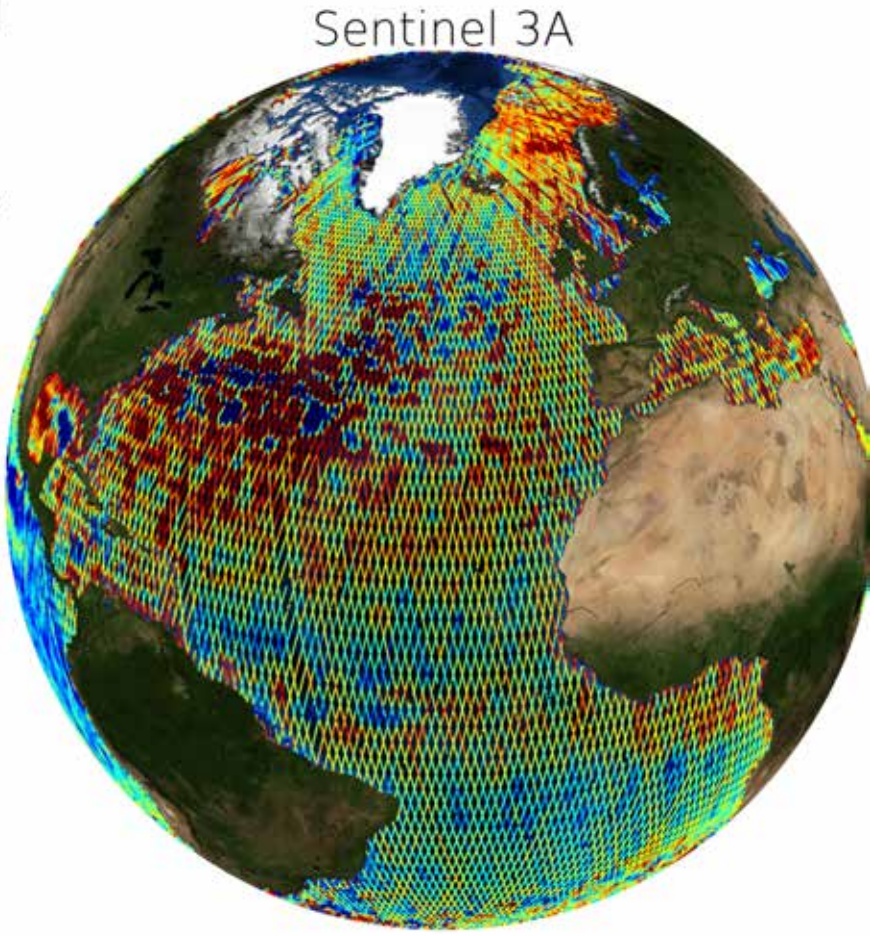
➢ In the coming weeks the Marine products will be upgraded : Improved sea level and wave height

➢All data quality reports are available: https://sentinel.esa.int/web/sentinel/technical-guides/sentinel-3-altimetry/data-quality-reports

➢ **Perspectives for the ocean observations:**

➢ Further progress can be achieved to exploit small scale content over ocean that is impacted by swell signal

➢ Dedicated SARM processing are being studied to reduce swell impact (see F. Boy talk)



Sea Level Anomalies

Thank you for your attention