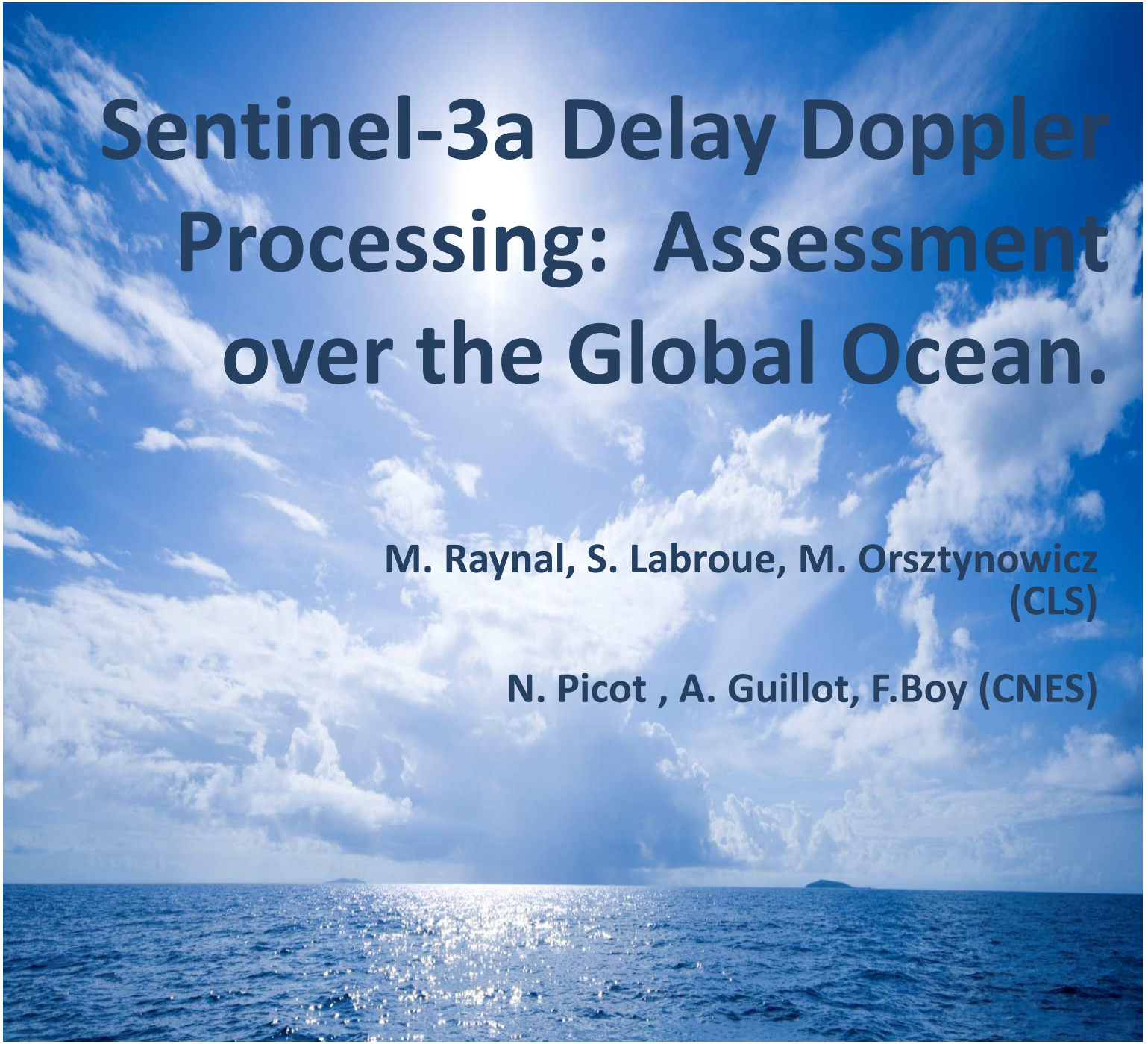

Sentinel-3a Delay Doppler Processing: Assessment over the Global Ocean.

M. Raynal, S. Labroue, M. Orsztynowicz (CLS)

N. Picot , A. Guillot, F.Boy (CNES)

CLS
COLLECTE LOCALISATION SATELLITES

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Introduction

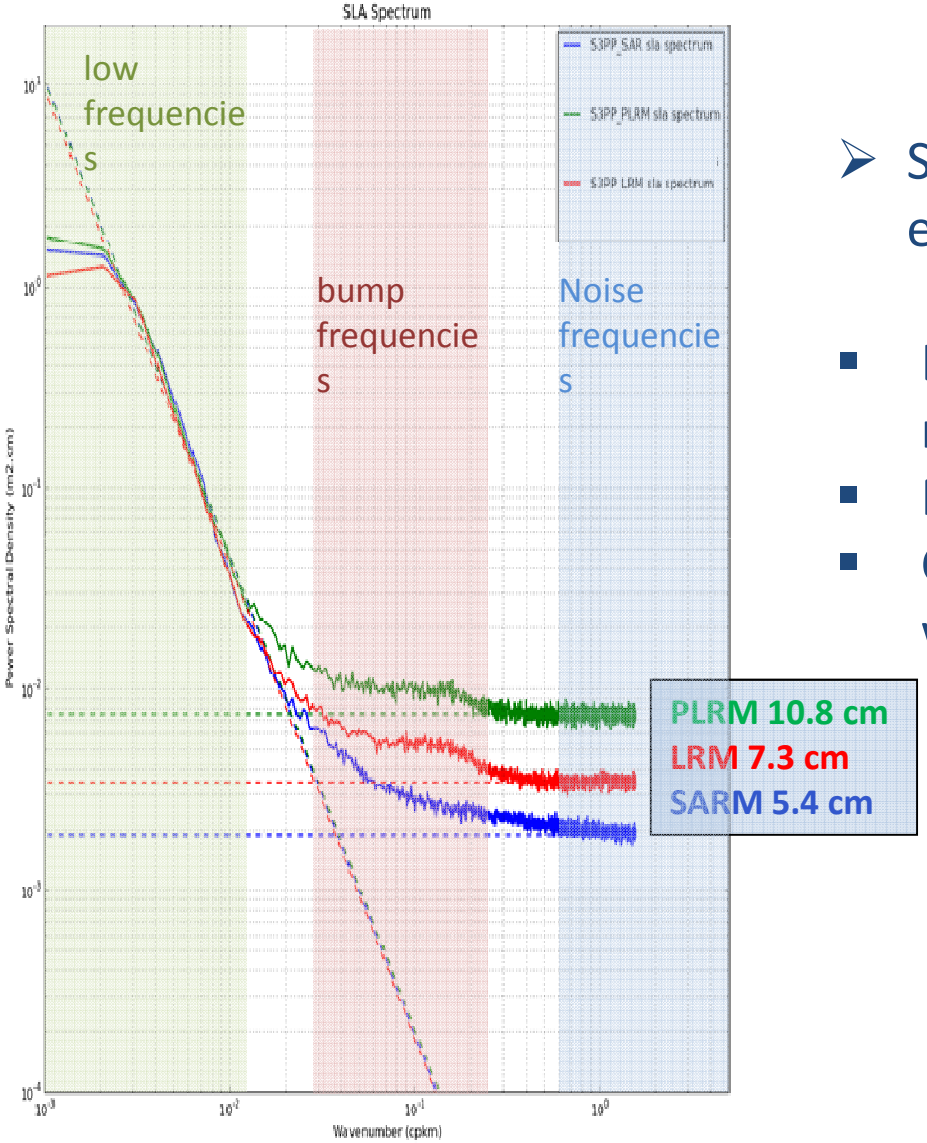
- Assessment performed over ~7 months of Sentinel-3A full SARM dataset (12th April – October) using S3PP L2 products (used for S3A commissioning phase).

- Overview of the SARM data quality over ocean using comparisons with respect to the collocated P-LRM measurements.

- Overview of the SARM performances through mono-mission and multi-mission metrics.


RANGE AND SLA

Range high frequency content



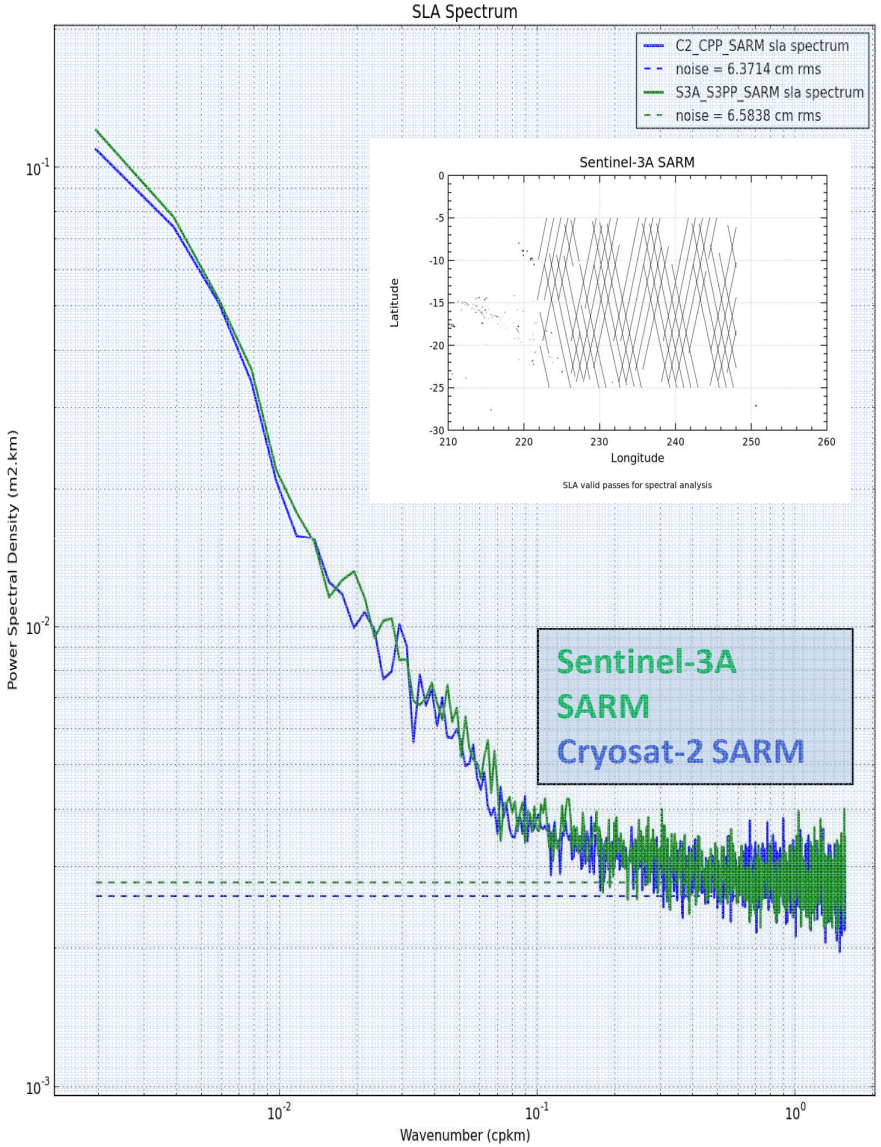
- SARM range highlights the SARM benefits expected:

  - Lower 20Hz instrumental (+processing) white noise
  - No spectral bump for small scales wavelength.
  - Continuity with conventional altimetry for long wavelength

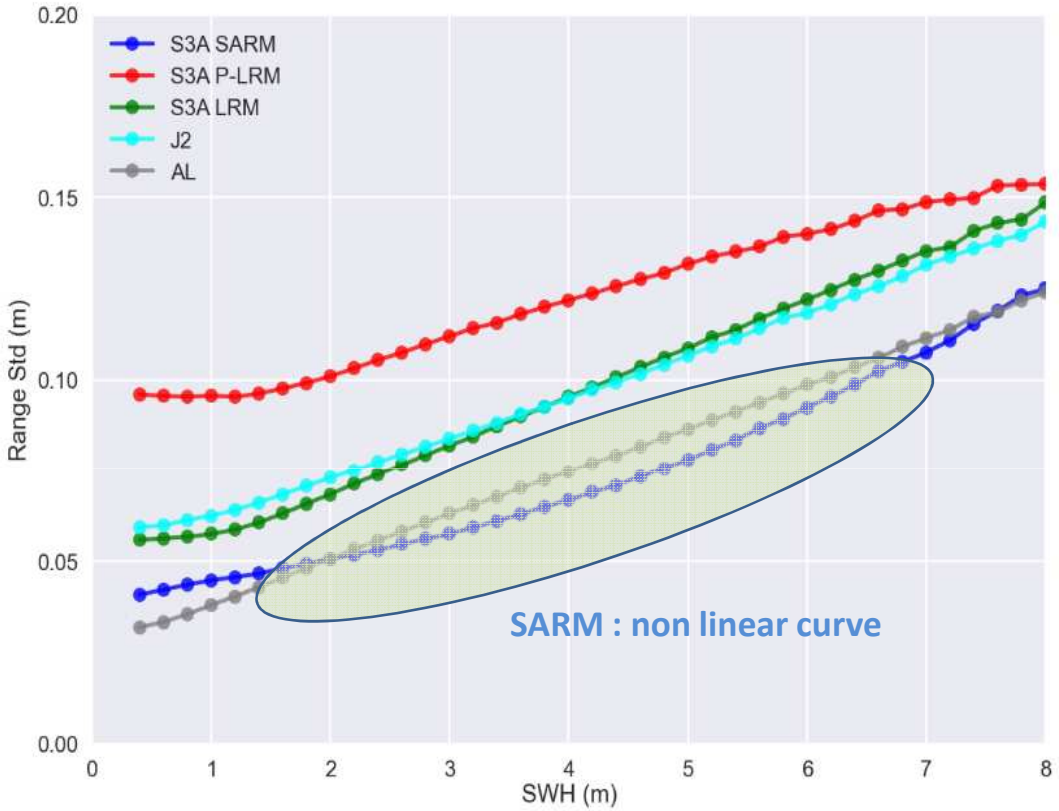
Range high frequency content

- Comparison with Cryosat-2 SARM over the Equatorial Pacific SARM box:

- "Perfect" matching between the two SARM altimeter with same noise level and same long wavelength behaviour.

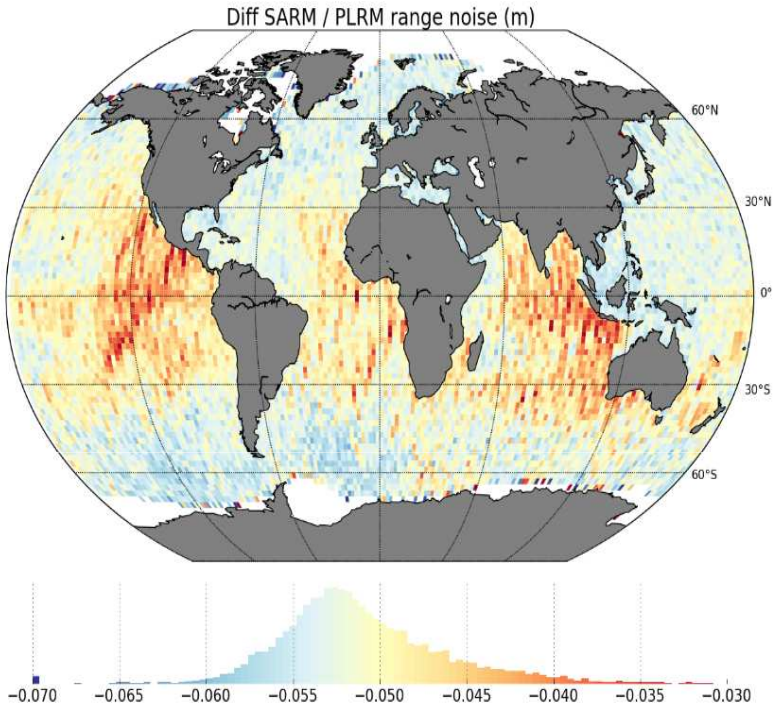


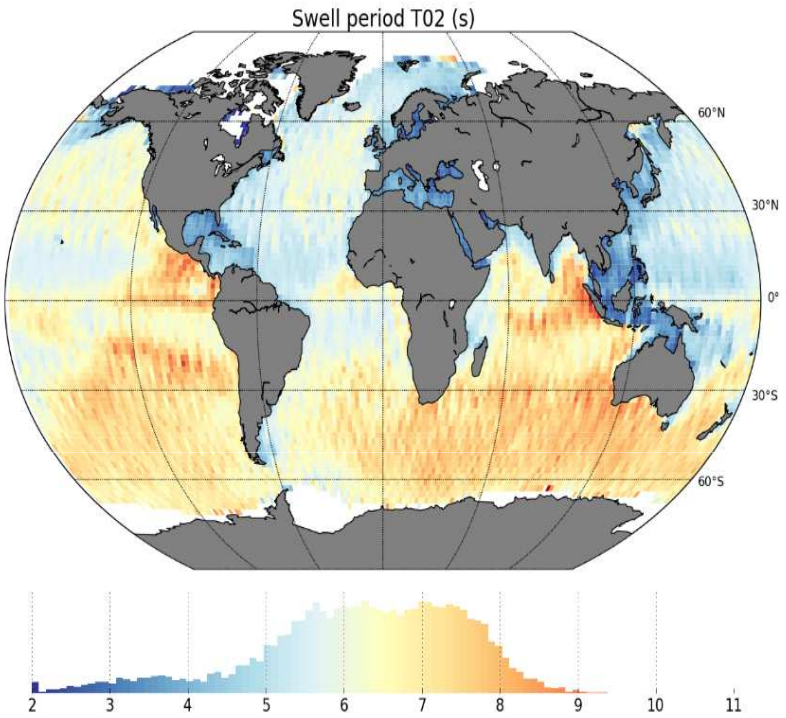
Range high frequency content



- Range standard deviation over 7km integrated records:
  - Jason-2, AltiKa and Sentinel-3a conventional modes highlight a linear dependency as function of SWH, whereas this is not the case for SARM.

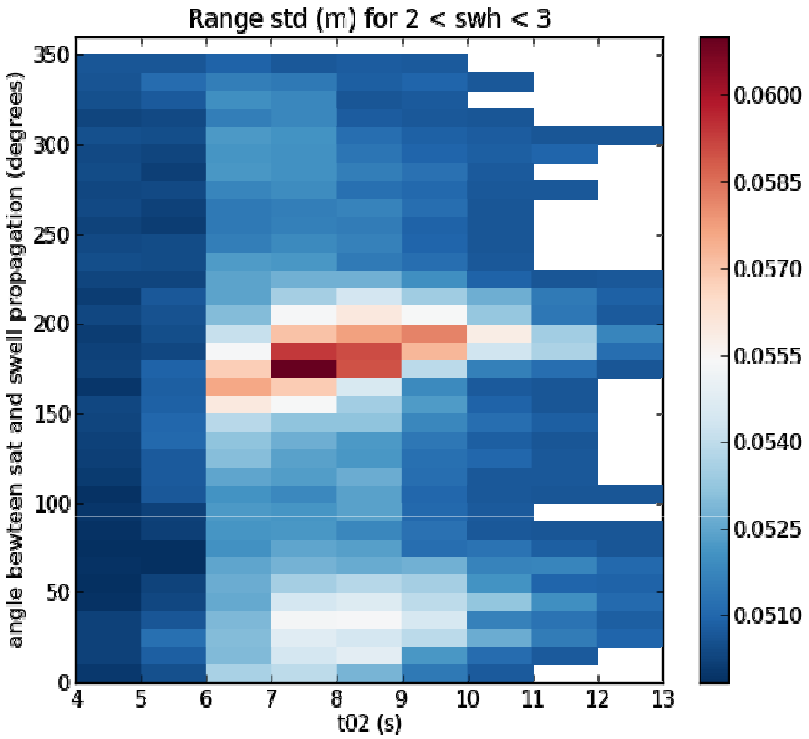
Range high frequency content : Swell impact



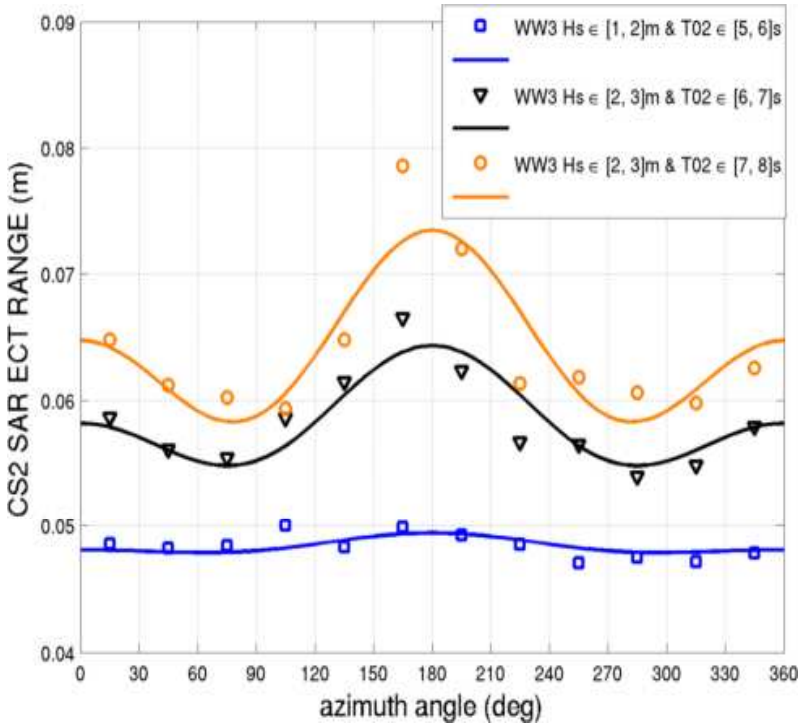


- Noise differences between SARM and conventional altimetry is not homogenous over Ocean:
  - It highlights regional patterns that seem correlated with swell period, but not only …

Range high frequency content : Swell impact



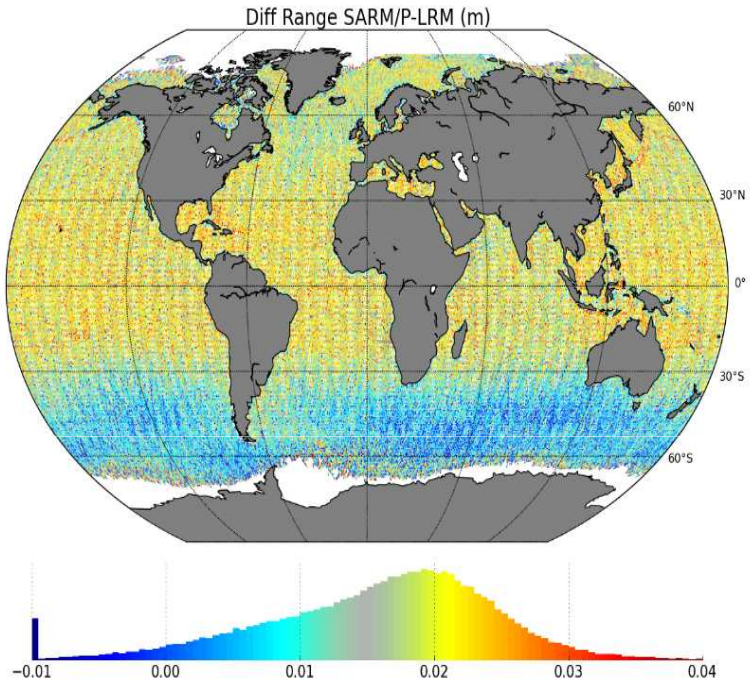
Sentinel-3A SARM

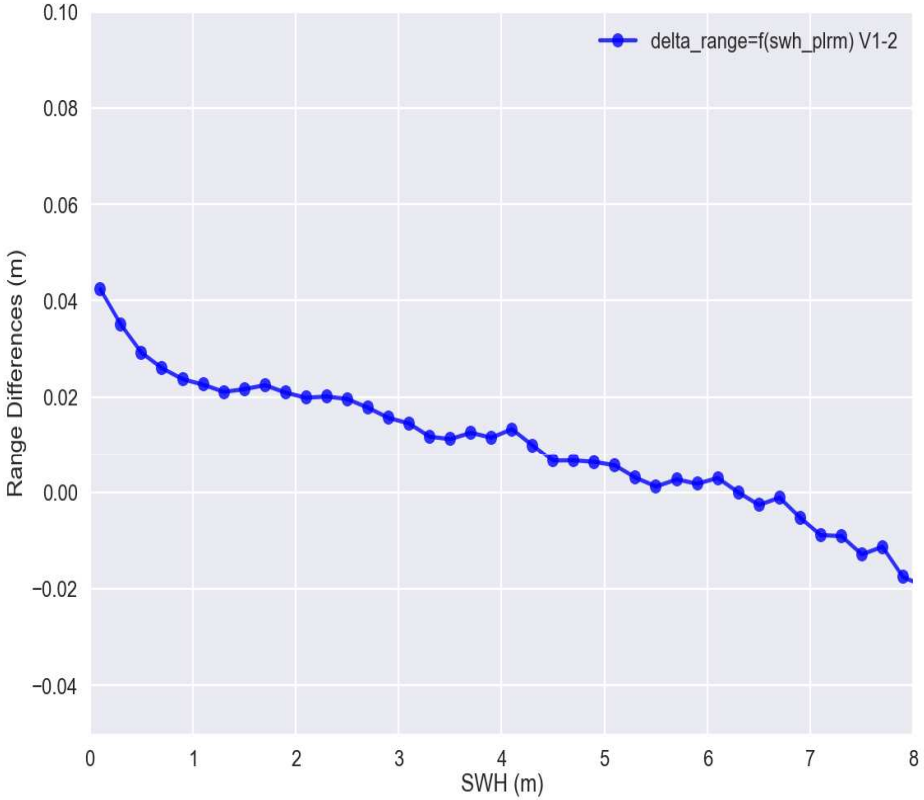


Cryosat-2 SARM
(Moreau and Tran)

- The SARM noise variation also depends on the swell propagation (with respect to the satellite direction)
- For more details, see Moreau et al. talk, OSTST error session.

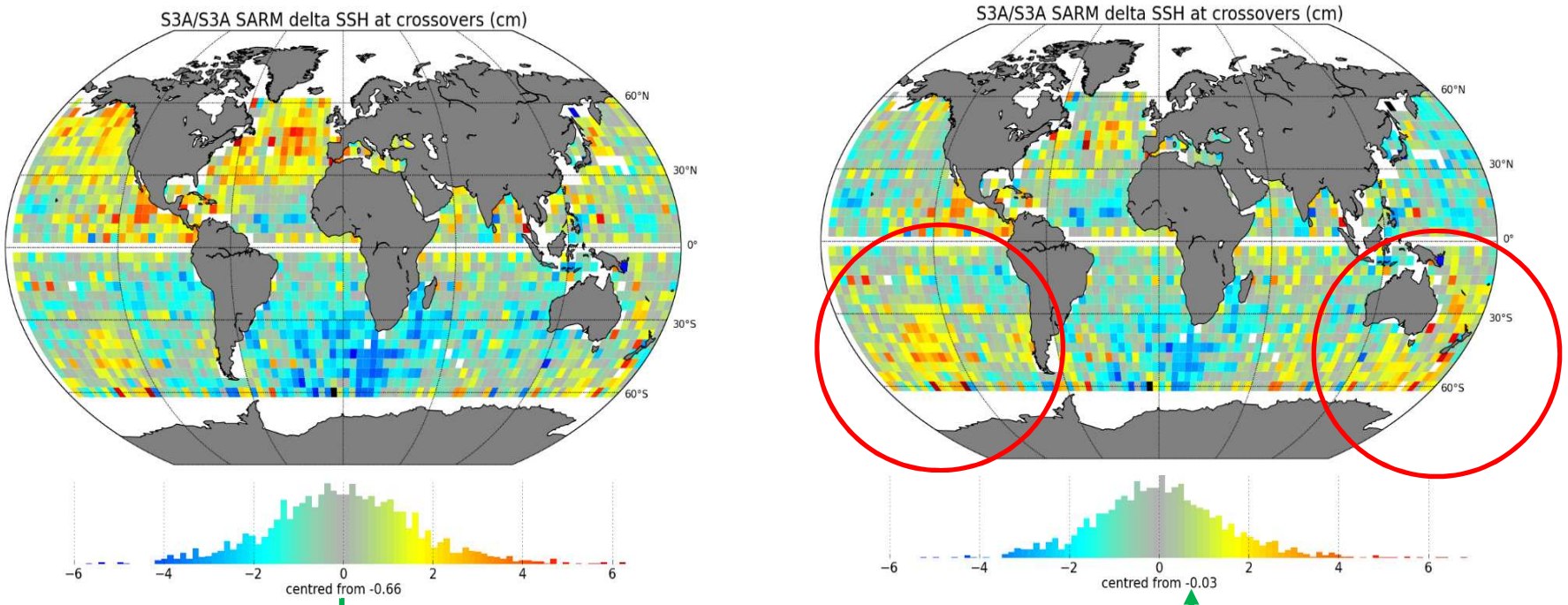
Range





- As we have seen with spectral analysis, SARM range long wavelength is consistent with conventional altimetry. However a small 0.5 %SWH signal remains ➔ ongoing investigations to reduce it.

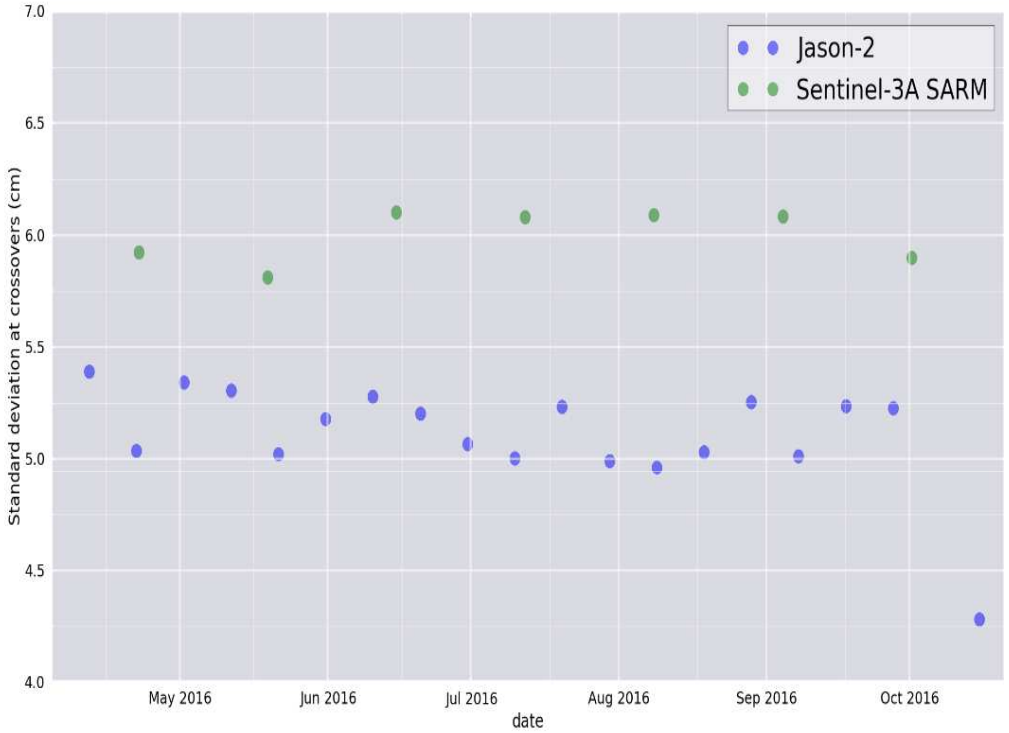
SSH Crossovers S3A/S3A

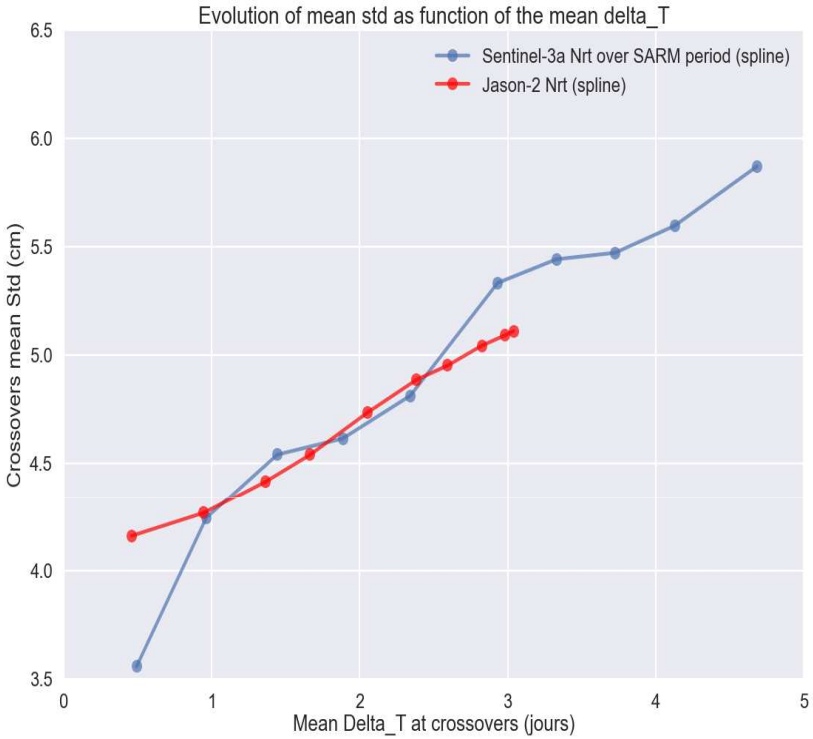


-300 us time tag bias corrected

- Mono mission crossovers allows to assess the consistency between ASC and DSC tracks.
- It highlights a -300 micro sec time tag bias (consistent with F. Boy estimations done with transponder). Accounting for it, the metrics are excellent.
- Small geographical patterns, could be explained by the IGDR orbit quality, among others (see A. Ollivier poster)

SSH Crossovers S3A/S3A

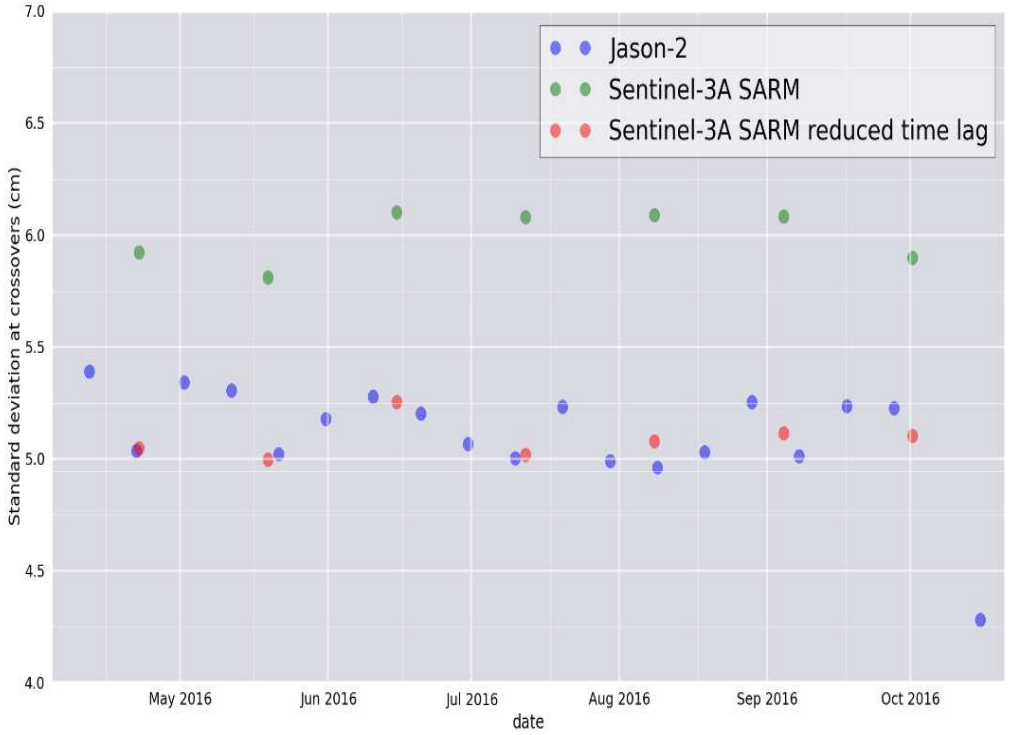


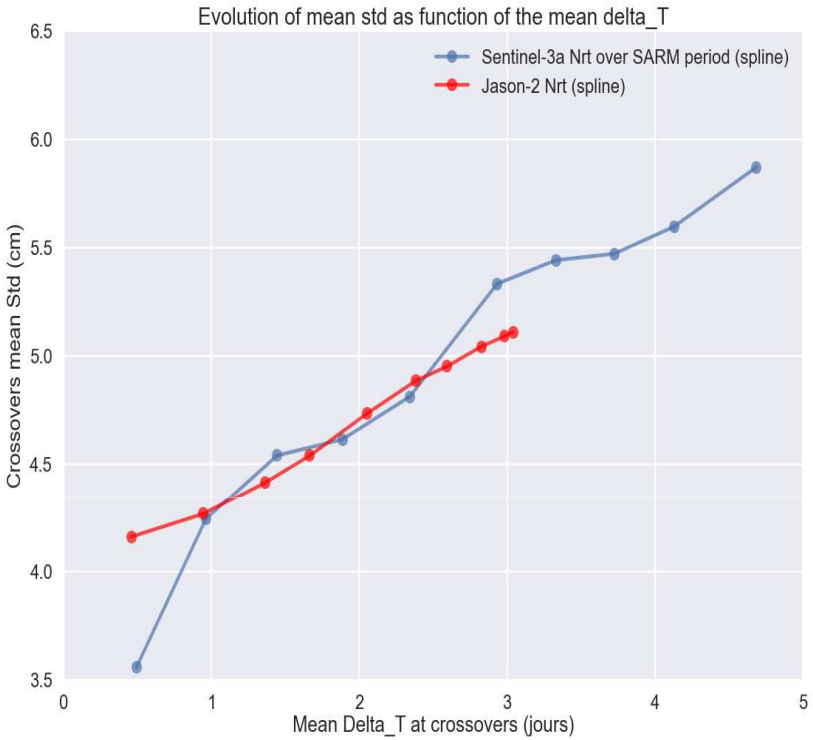


- Mono-mission cyclic standard deviation gives an estimation of SSH error (time scales < 10 days)

- At first glance the Sentinel-3A SSH estimation errors are higher than the Jason-2 ones. With consistent time lag for both mission, crossover metrics are consistent.

SSH Crossovers S3A/S3A





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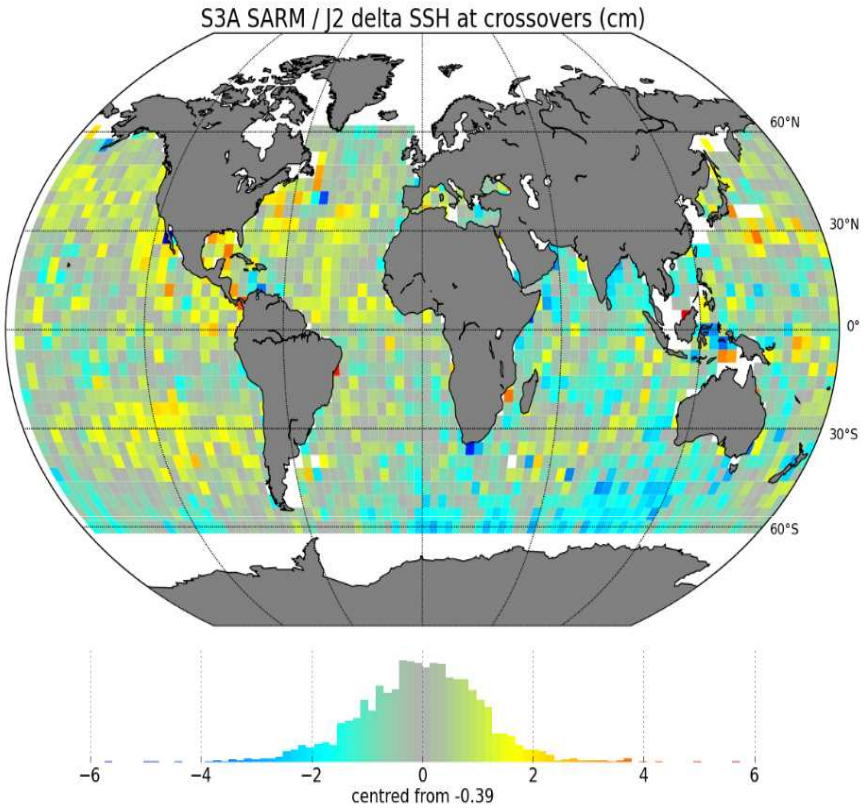
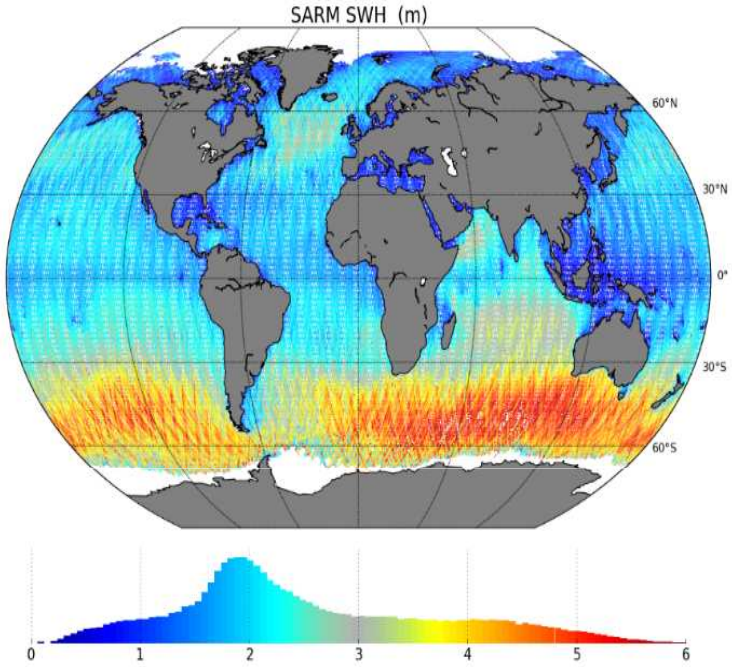
SSH Crossovers S3A/J2

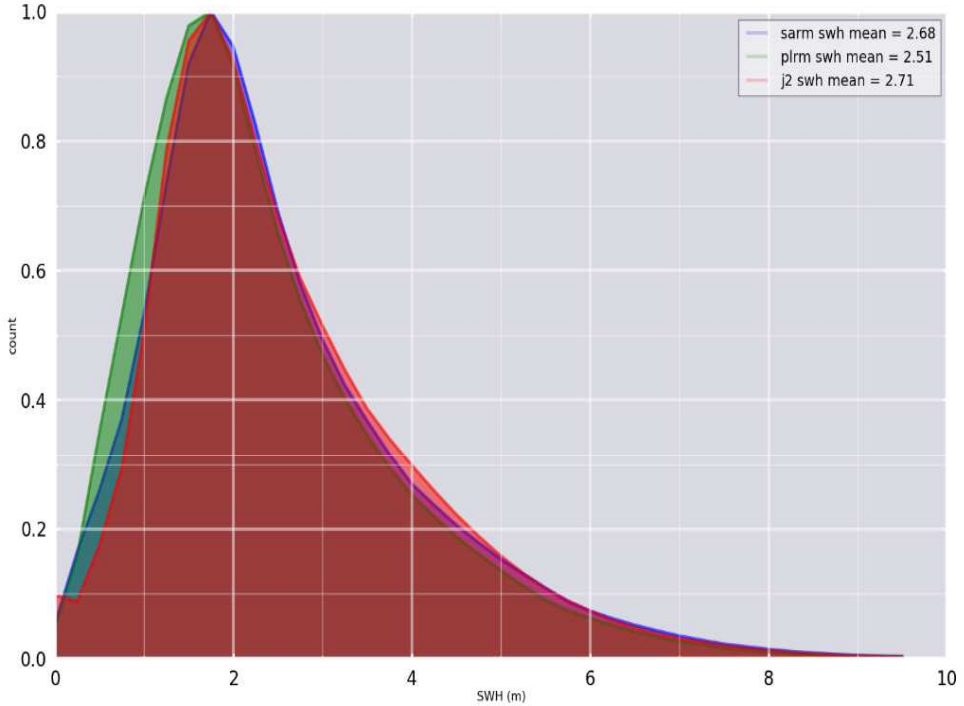


➢Excellent agreement between Sentinel-3a SARM and Jason-2 measurements at Xovers.


SWH

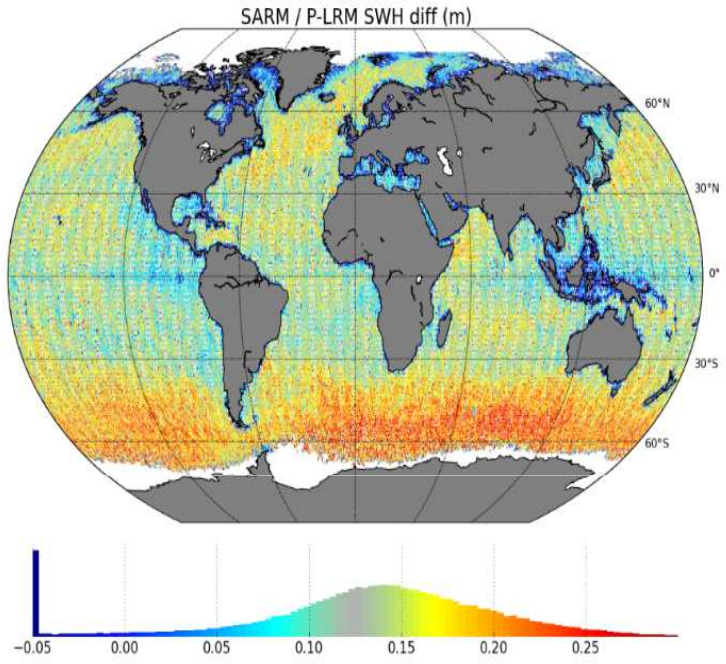
SWH

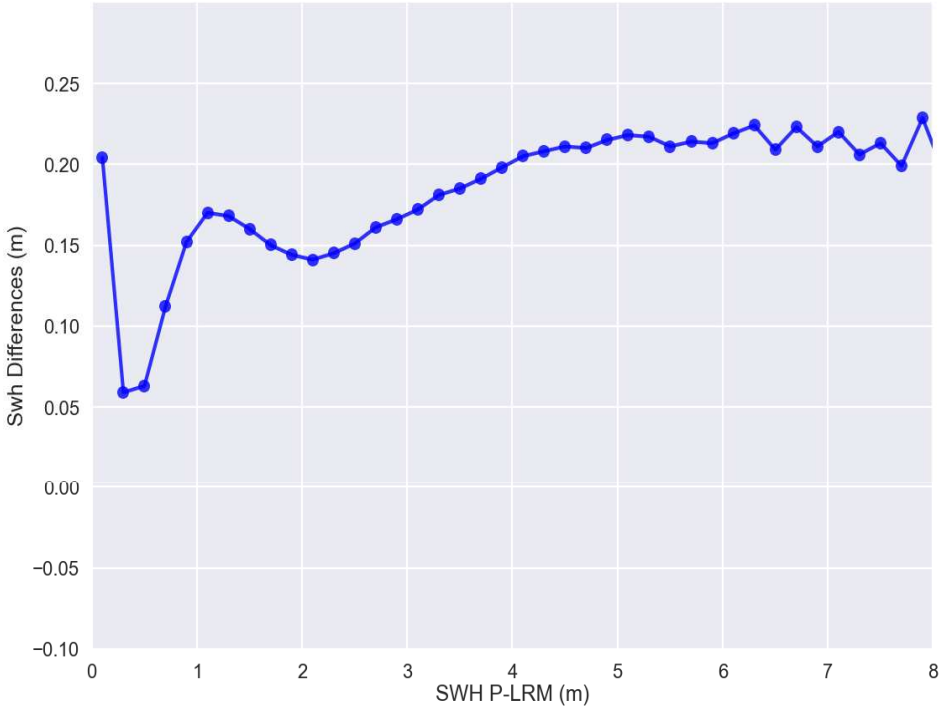




- Expected geographical patterns and good consistency with P-LRM and Jason-2

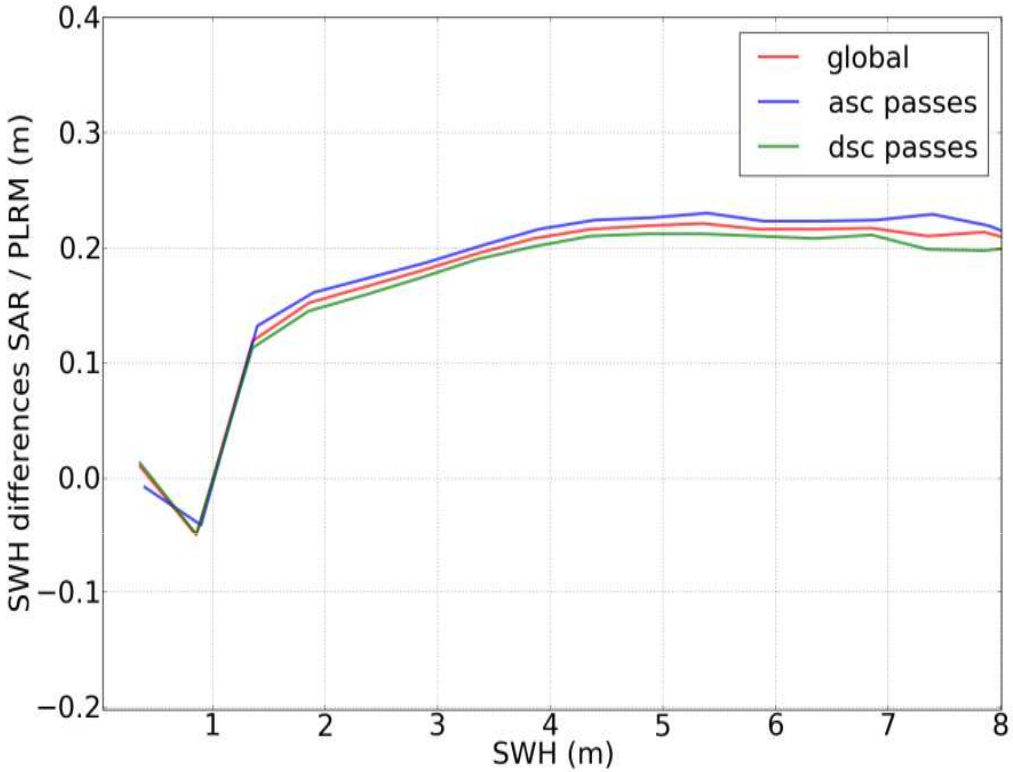
SWH

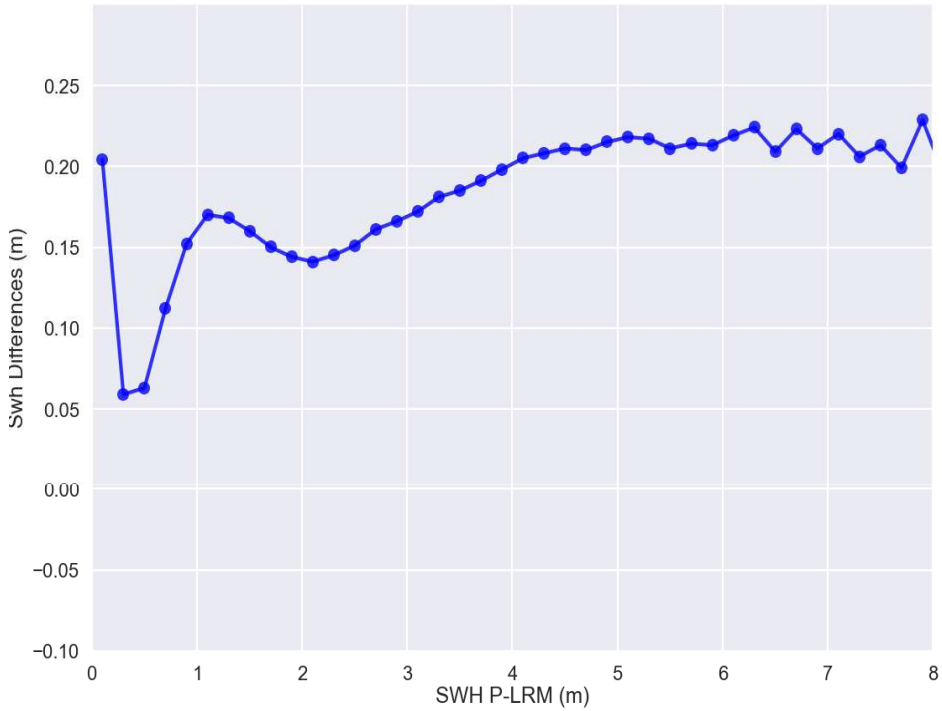




- Expected geographical patterns
- ~20 cm differences between SARM and P-LRM SWH. This result is in line with observations done within CP4O project based on Cryosat-2 SARM dataset.

SWH





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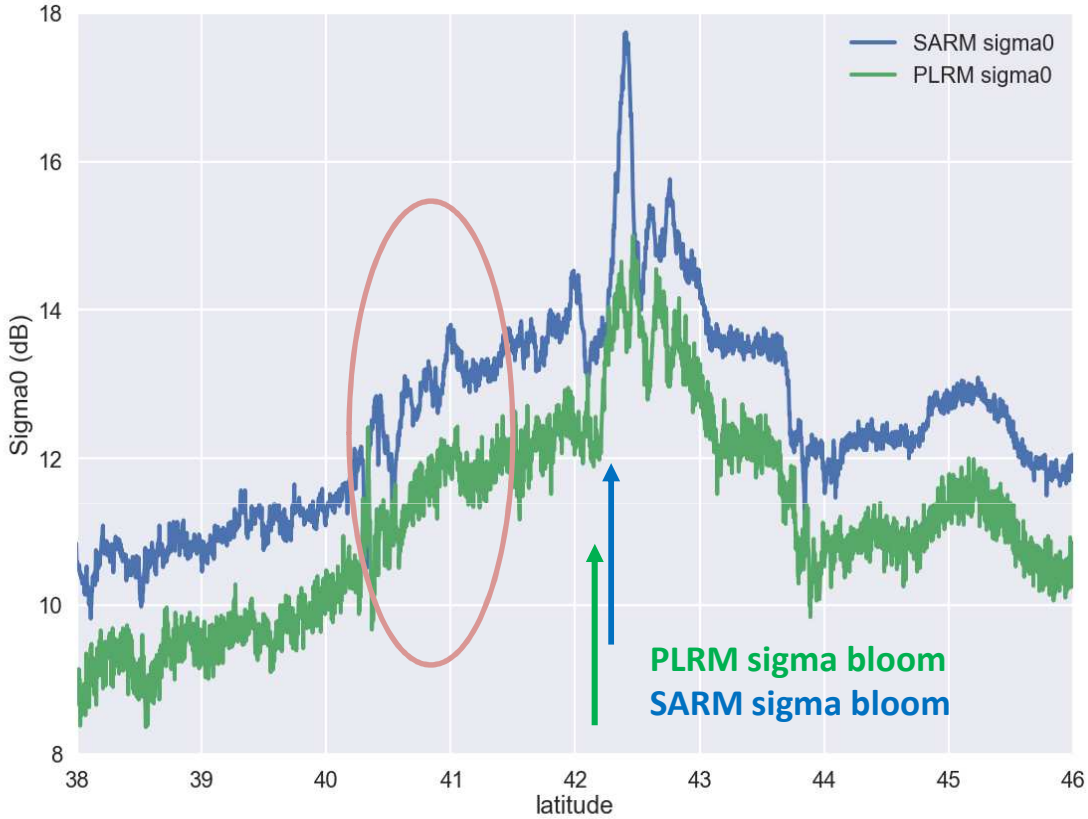
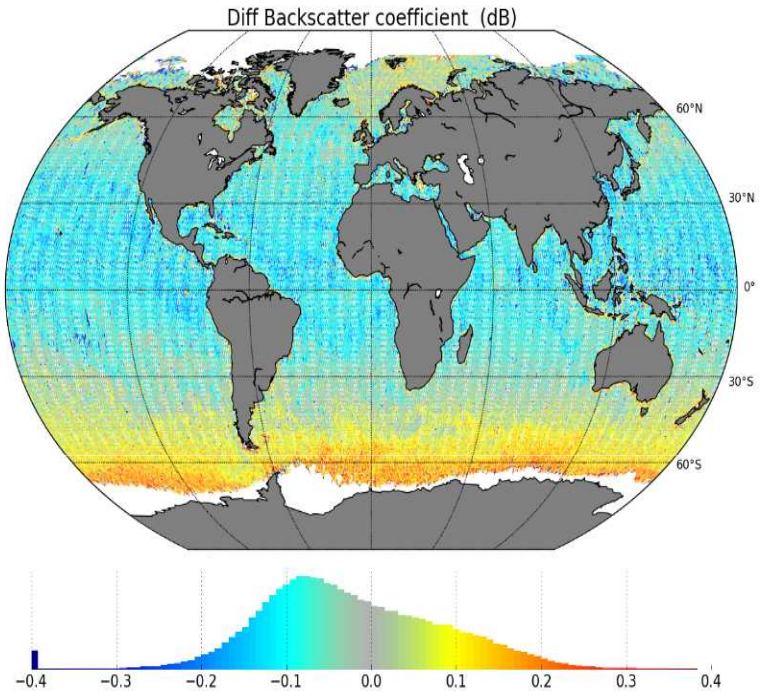
SIGMA0 AND WIND SPEED

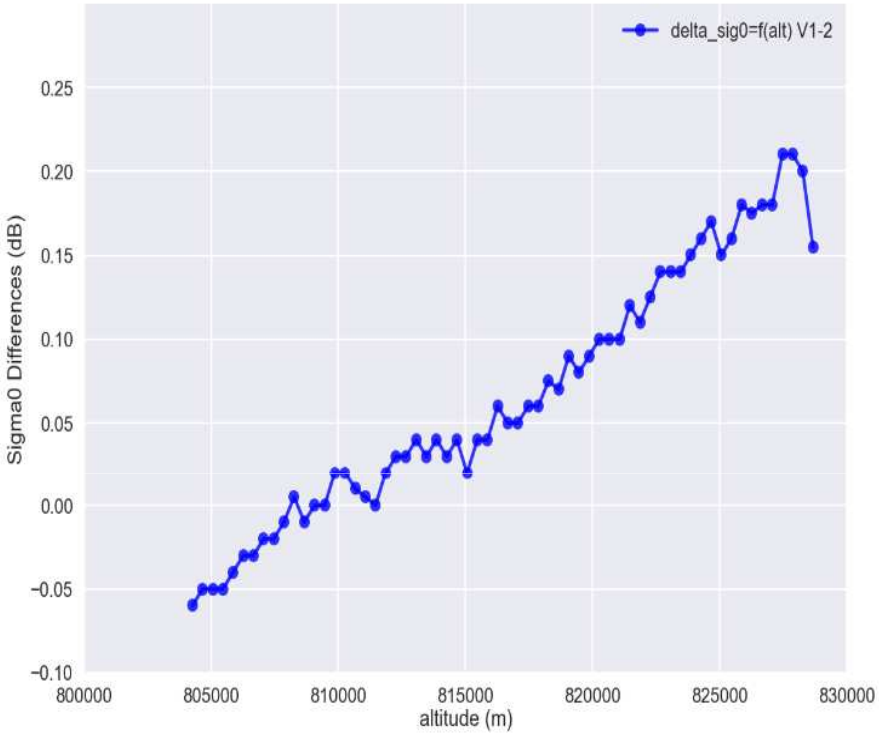
Backscatter coefficient and wind speed



- 20Hz Sigma0 variations reveals as expected :
  - finest structures details explained by the SARM smaller footprint

Backscatter coefficient and wind speed





- At global scales, a bias of 0.2 dB is observed between SARM and P-LRM sigma0 in the 40-60°S latitude band. ➔ correlated with satellite altitude.
- 0.2 dB ➔ 0.7 m/s on wind speed ➔ small impact

Conclusion

- Excellent SARM performances observed for the first time at global scales.
  - Excellent consistency with Jason-2 at global scales after only 7 months of full SARM
  - No mean bias on Sea level
  - reduced noise
  - No spectral bump

- Next steps :
- Future S3PP version under preparation by F. Boy (SARM Time tag bias correction, …)
- Further progress on sigma0 error, SWH bias, range dependency
- Understand and characterise swell effects on SARM observations.


THANK YOU FOR YOUR
ATTENTION