Sentinel-3A Marine Center data calibration and validation in a multi-mission setting

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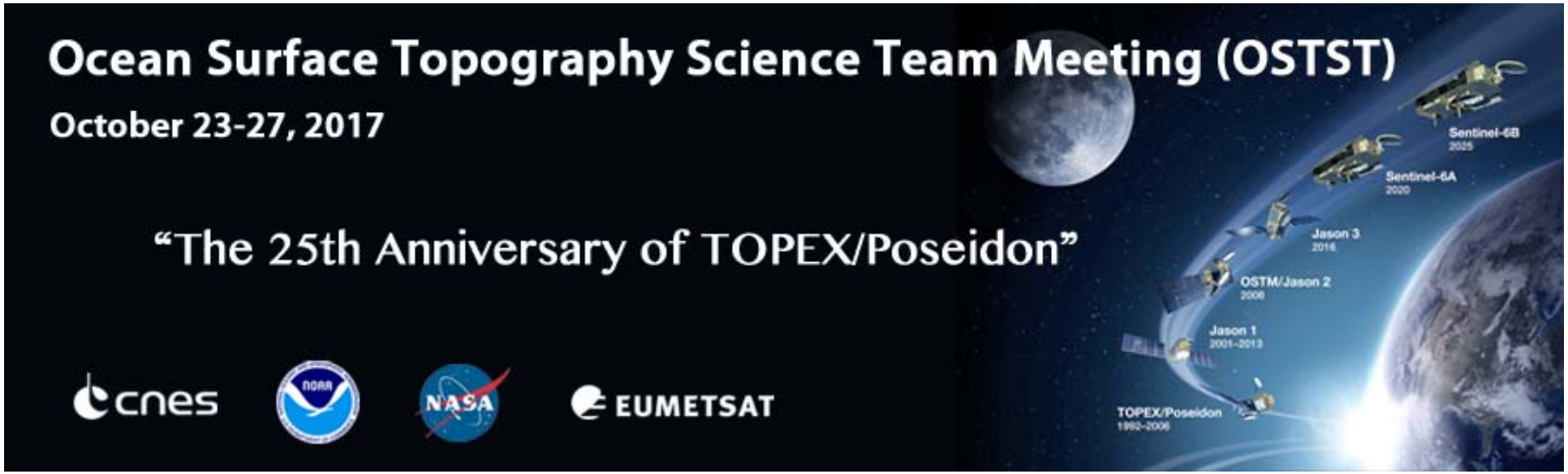

Processing Baseline PB 2.15

Reprocessed [CODAREP]

- 16 October 2017 release of NTC reprocessed
  - From cycles 5 (2016-06-15) to cycle 16 (2017-04-15)
  - Before 2016-06-15 data could not be properly calibrated due to an issue of the Payload Data Ground Segment (PDGS) → this datasets will be processed on a future reprocessing (Q1 2018)

Operational [CODA]

- Since 2017-04-15 operational data has been produced with the same processing baseline as used for the reprocessing

REP + OPE = a consistent NTC dataset from 2016-06 to 2017-08

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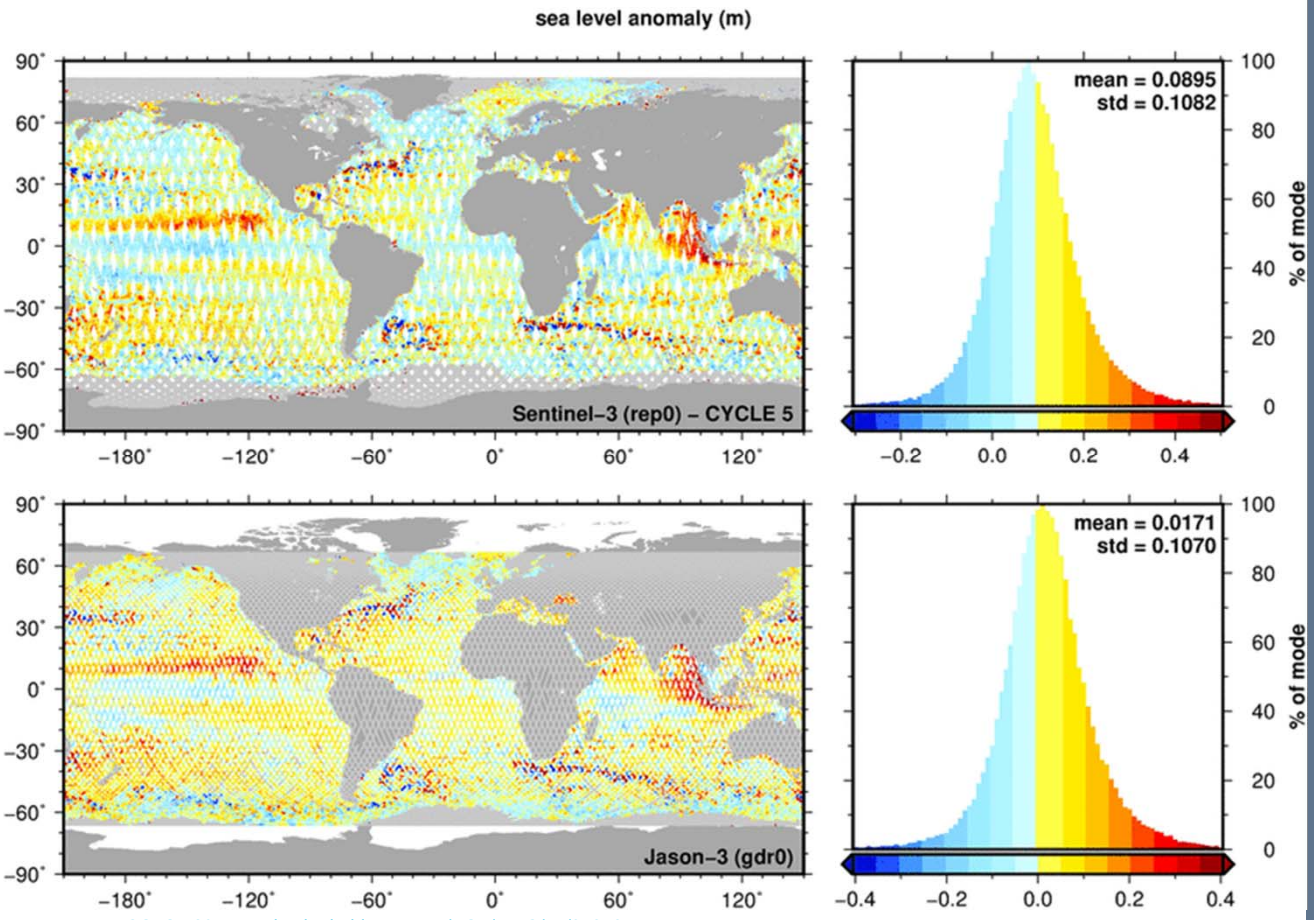
OUT_008 Access to Sentinel-3 Marine Centre data

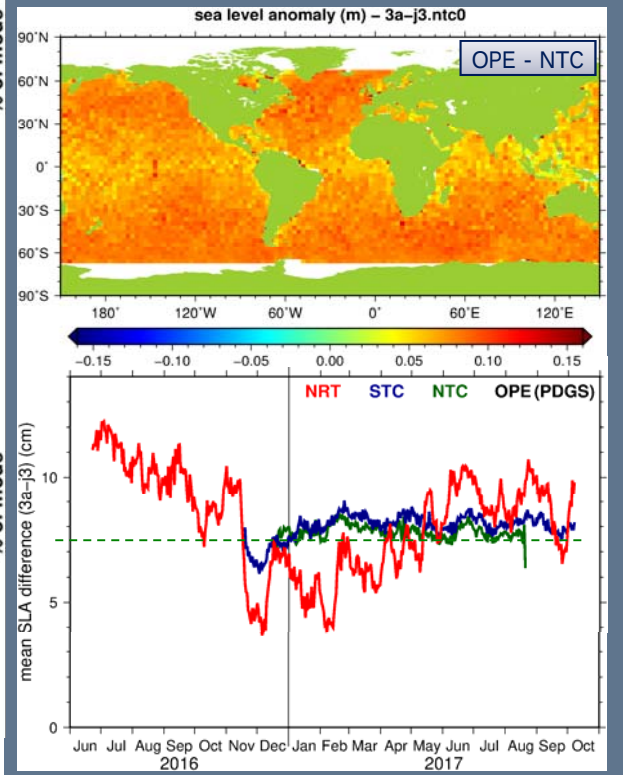
Bruno Lucas, Remko Scharroo, Carolina Nogueira-Loddo, Cristina Martin-Puig, Salvatore Dinardo

REP + OPE = a consistent NTC dataset from 2016-06 to 2017-08

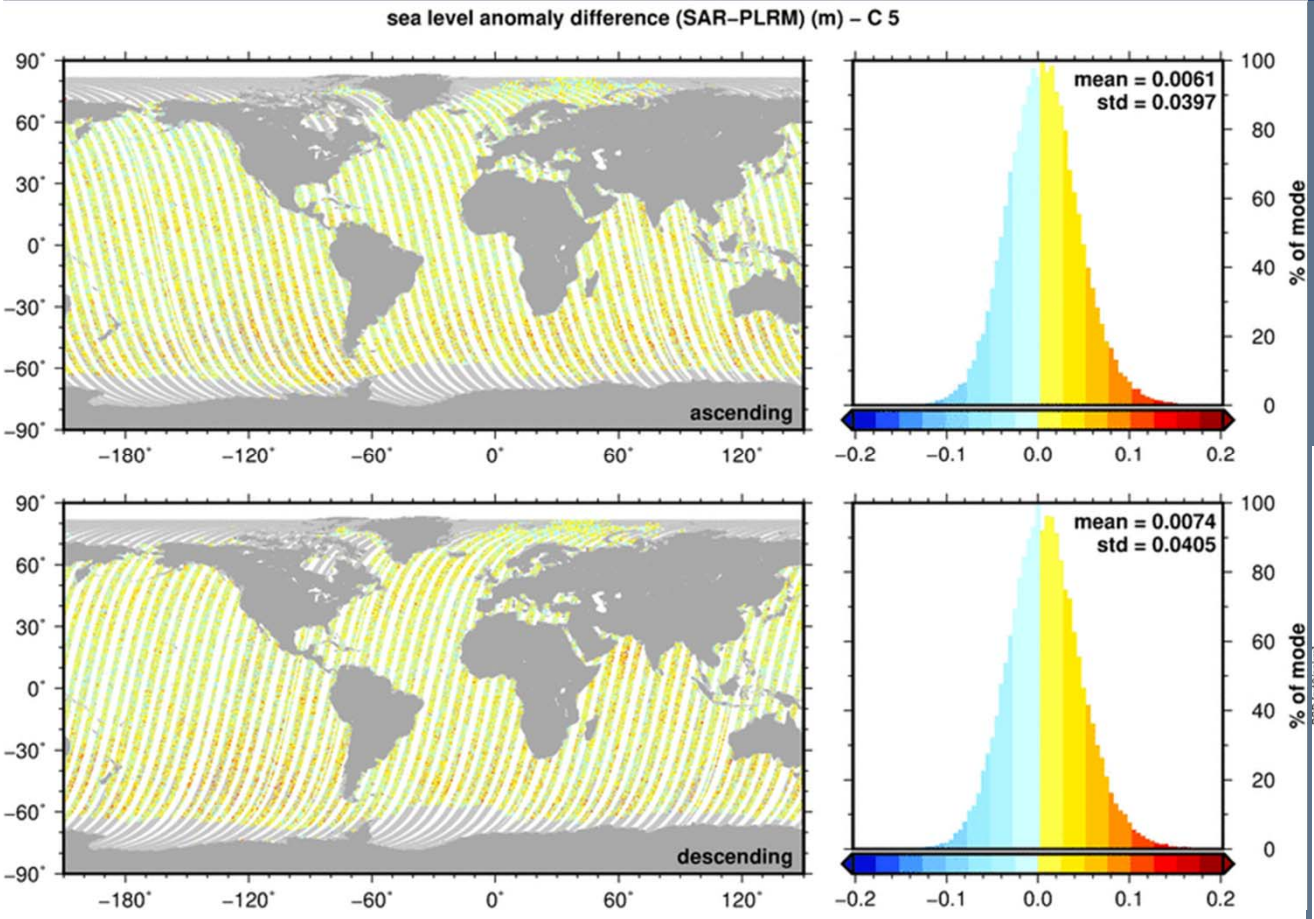
Sea Level Anomaly – S3 HR vs J3



SLA bias S3 HR - J3
~ 7.5 cm
X-over S3 – J3

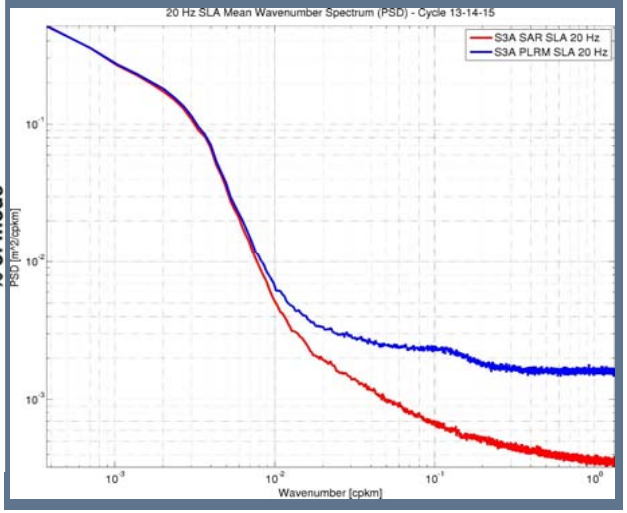


SLA – HR vs LR and Noise Level

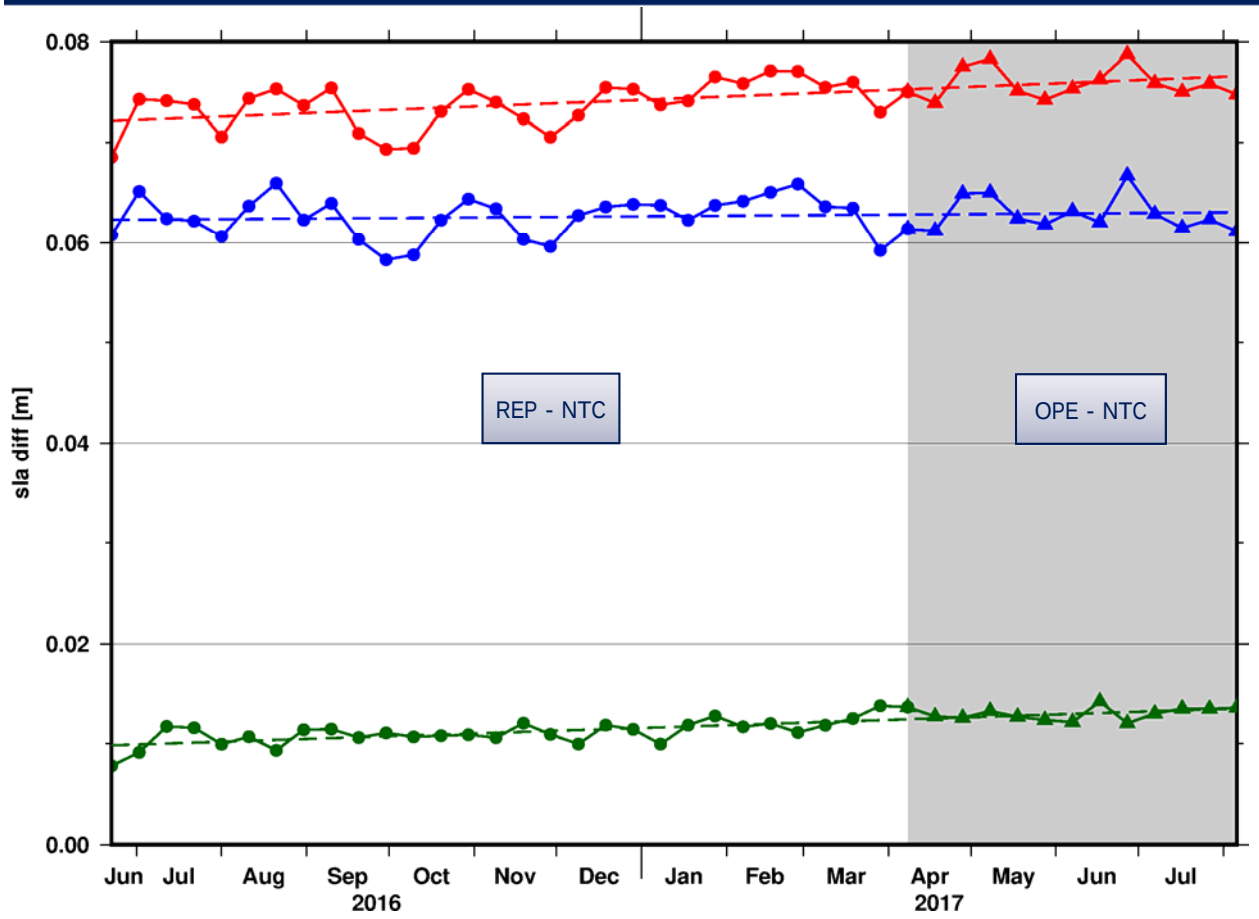


S3 SLA bias LR vs HR ~ 1mm

LR - PLRM	HR - SAR
Noise plateaus at 20 cm^2/cpkm	Noise drops below 4 cm^2/cpkm
Equivalent to 1.7 cm 1-Hz noise at 2 m SWH	Equivalent to 1.0 cm 1-Hz noise at 2 m SWH

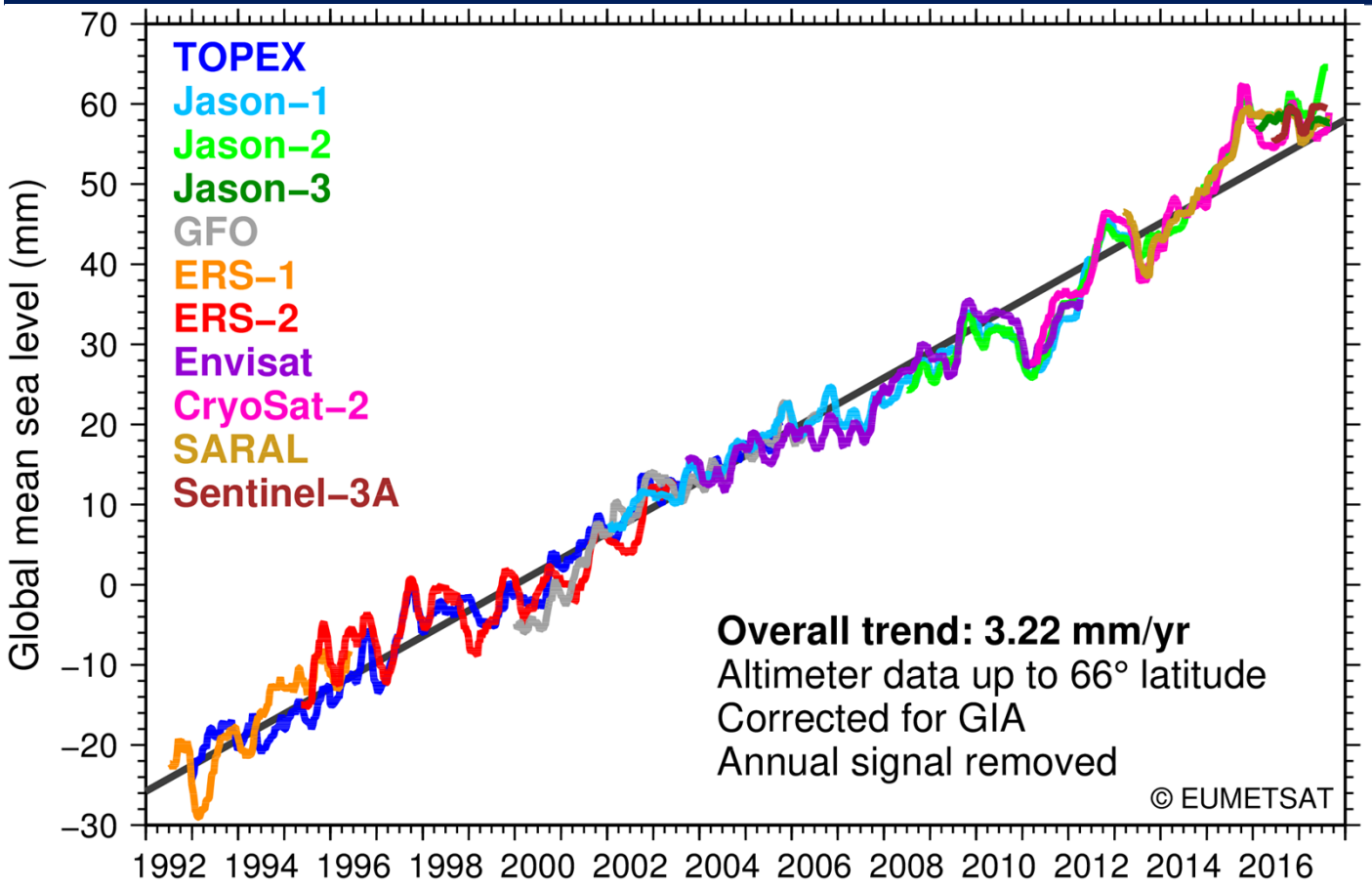


SLA trend – S3 one year of data



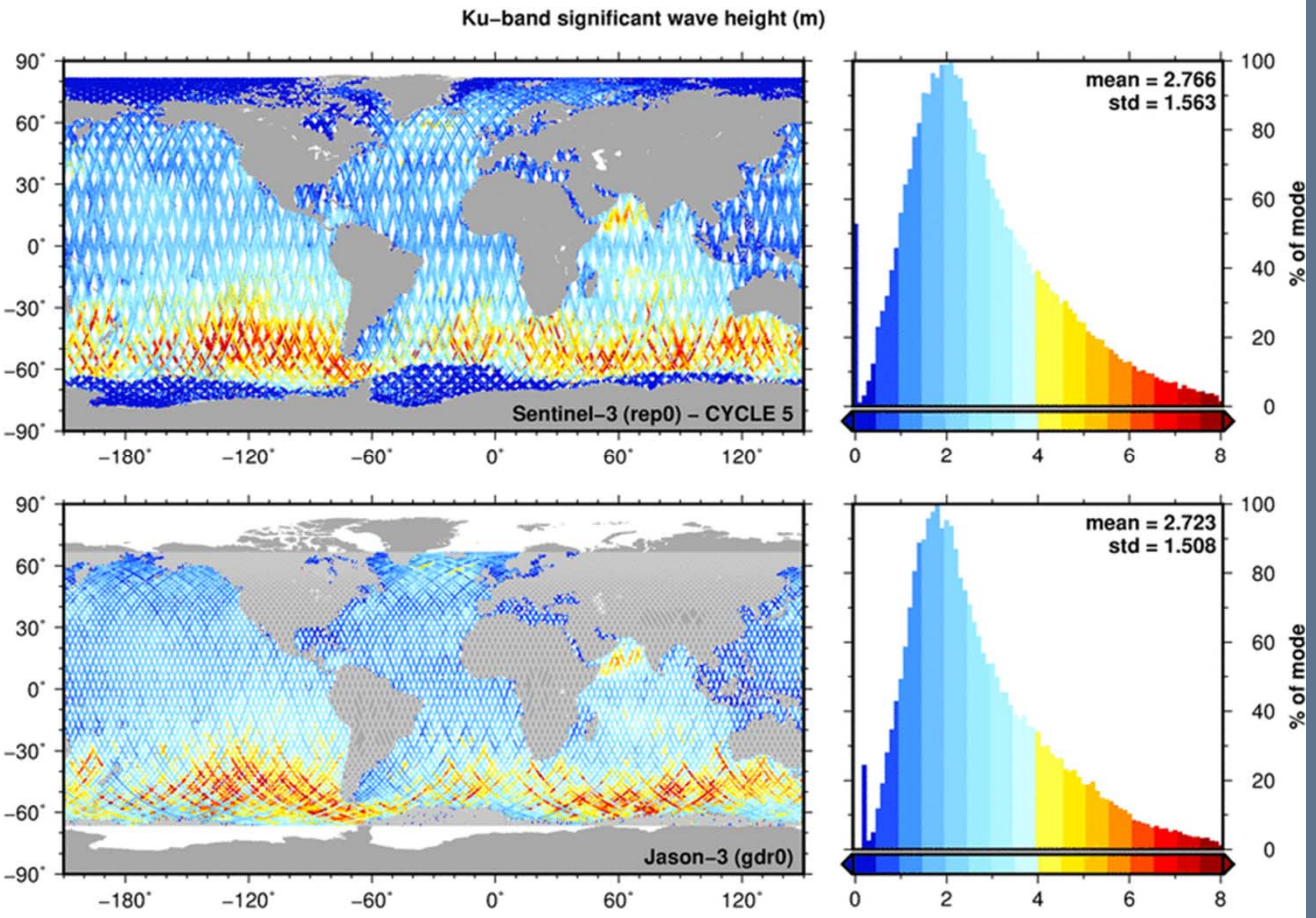
	SLA slope [mm/y]
S3 HR - J3	3.94
S3 LR - J3	0.67
S3 HR - LR	3.27

Sea Level Trend (S3 HR)



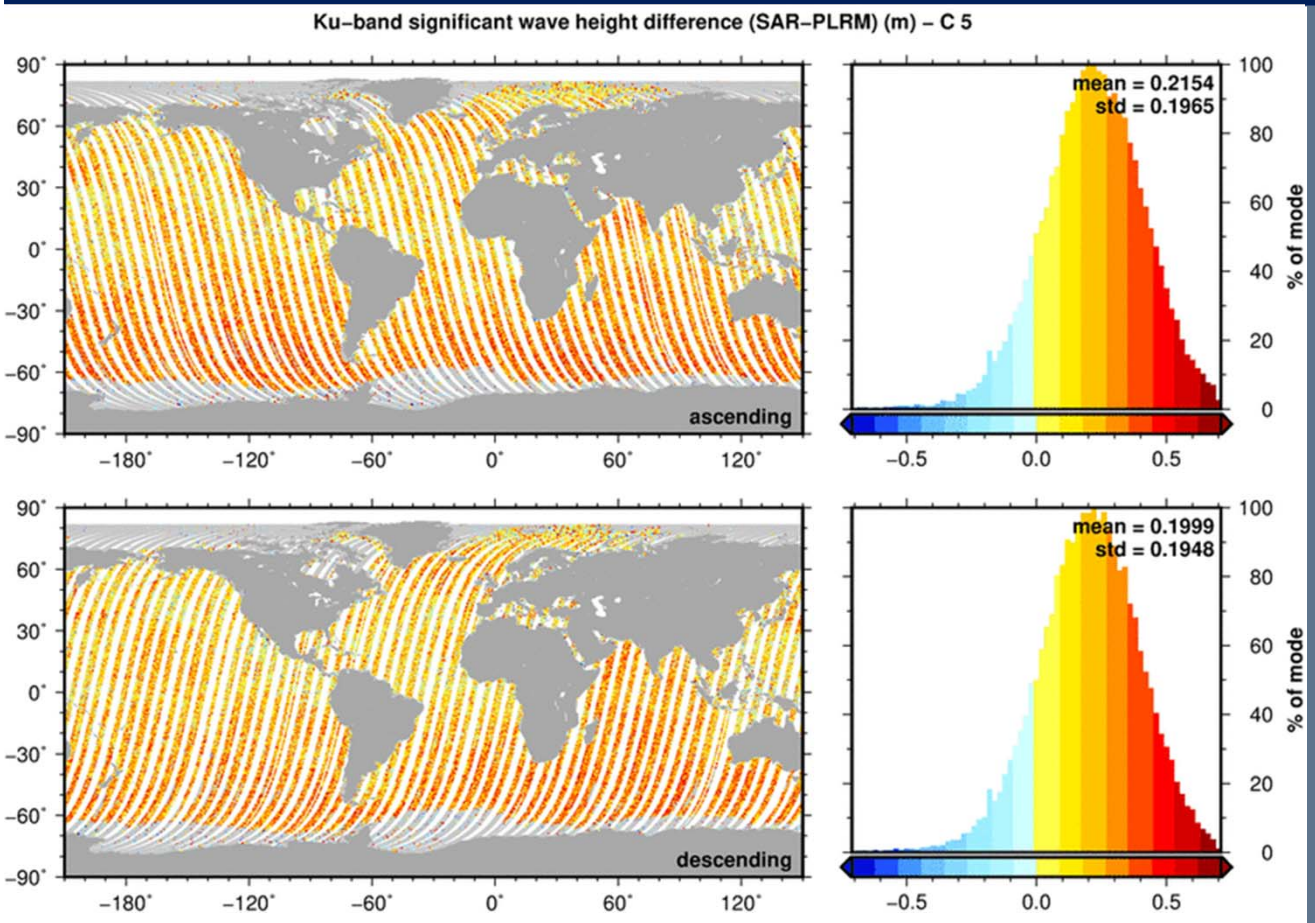
- Sentinel-3 and CryoSat-2 consistent
- But not with Jason-2, Jason-3, and SARAL

Significant Wave Height – S3 HR vs J3

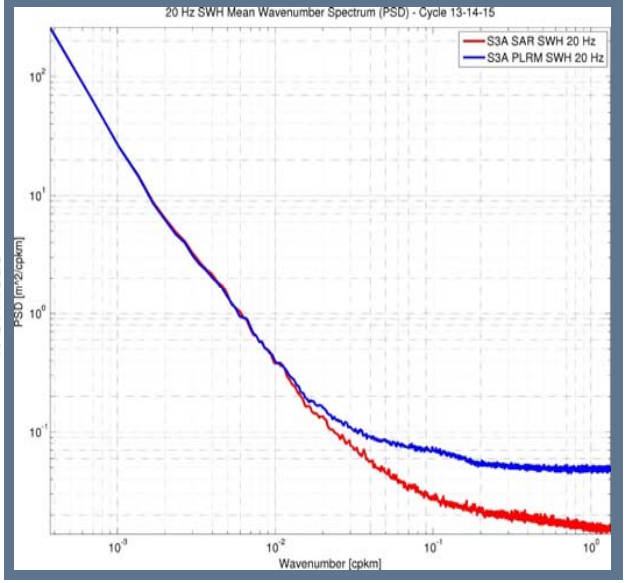


SWH bias S3 HR - J3
~ 14 cm

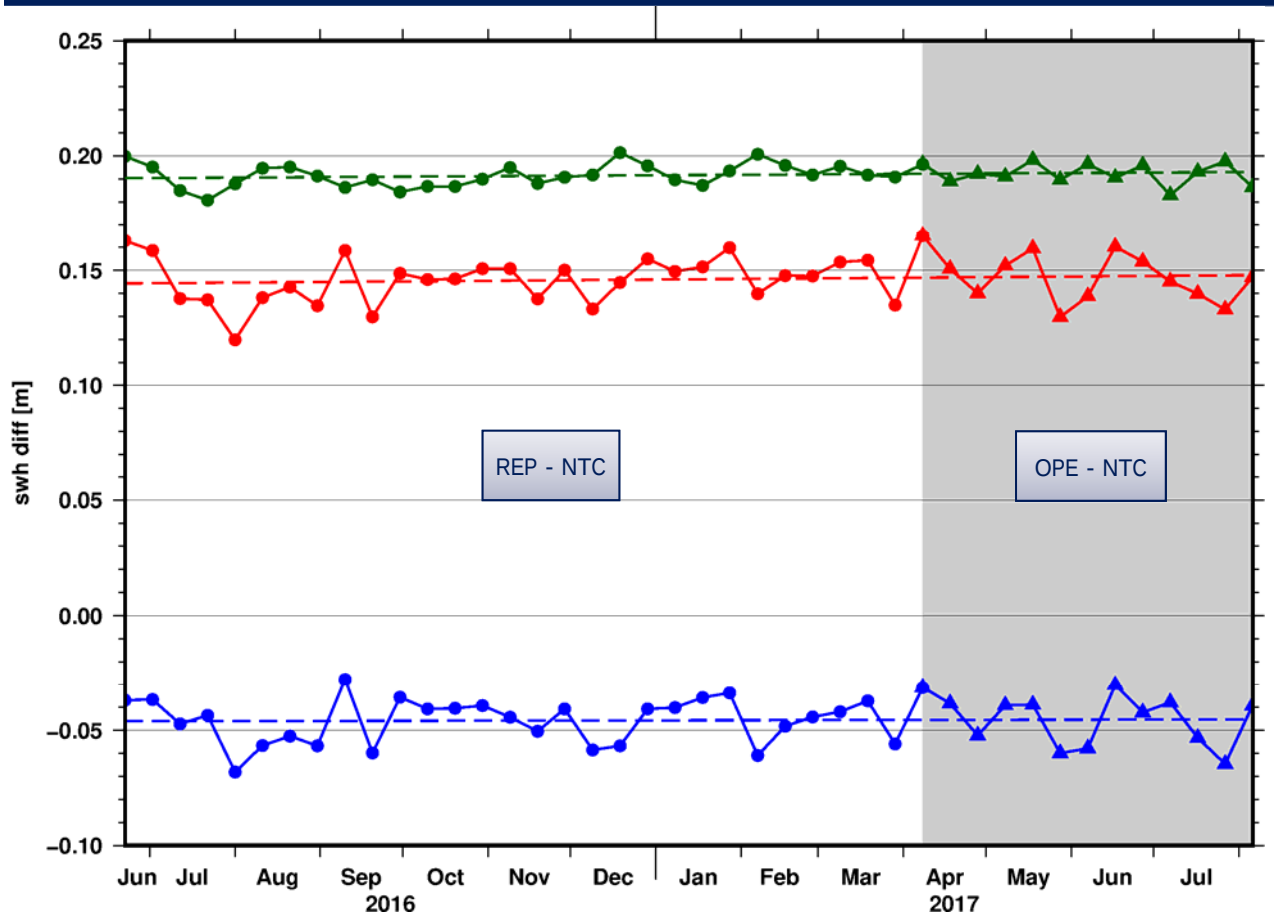
SWH S3 HR vs LR consistency



LR - PLRM	HR - SAR
Noise plateaus at 0.5 m^2/cpkm	Noise drops below 0.2 m^2/cpkm
Equivalent to 12 cm noise at 2m SWH	Equivalent to 8 cm 1-Hz noise at 2 m SWH

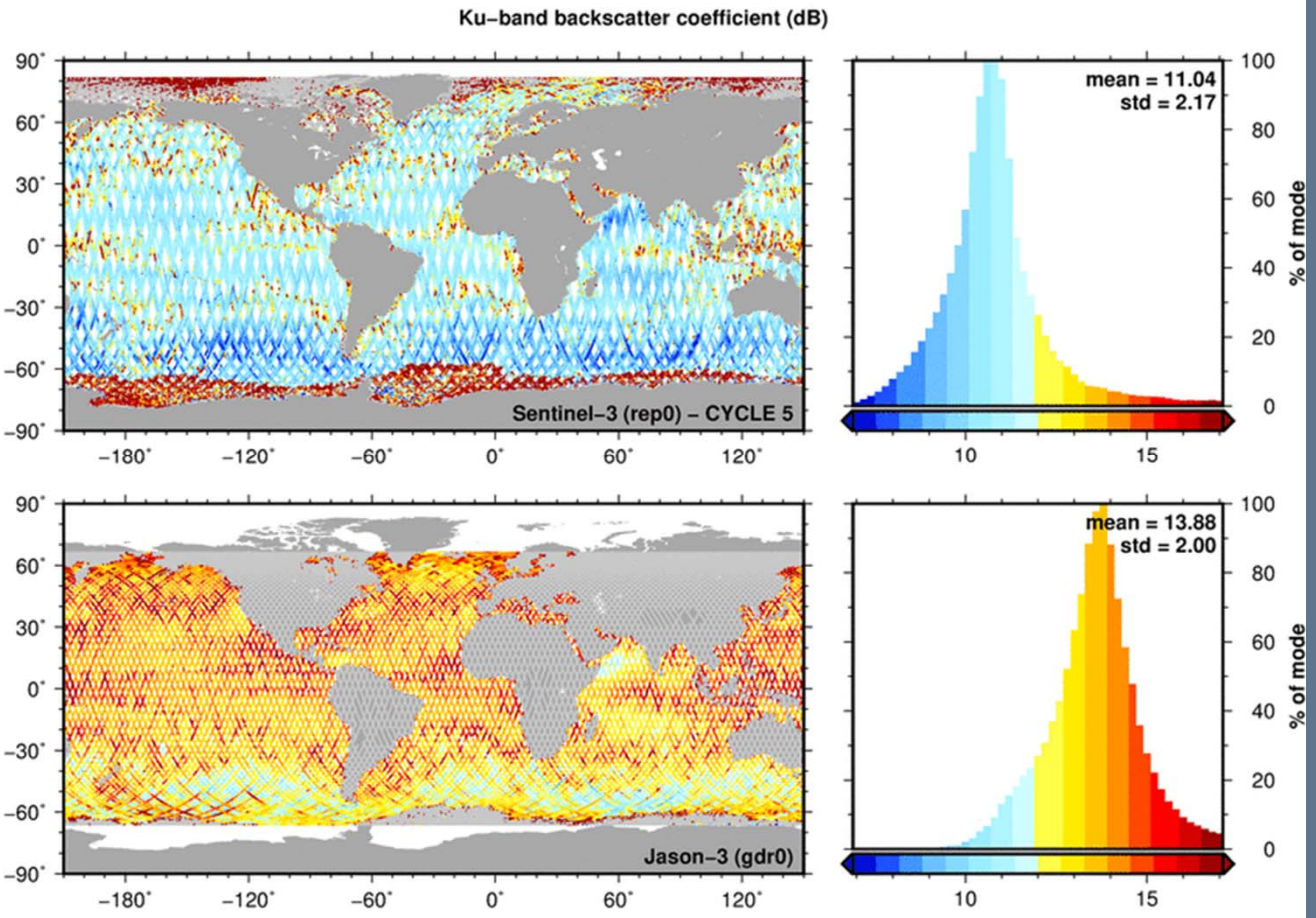


SWH trend – S3 one year of data



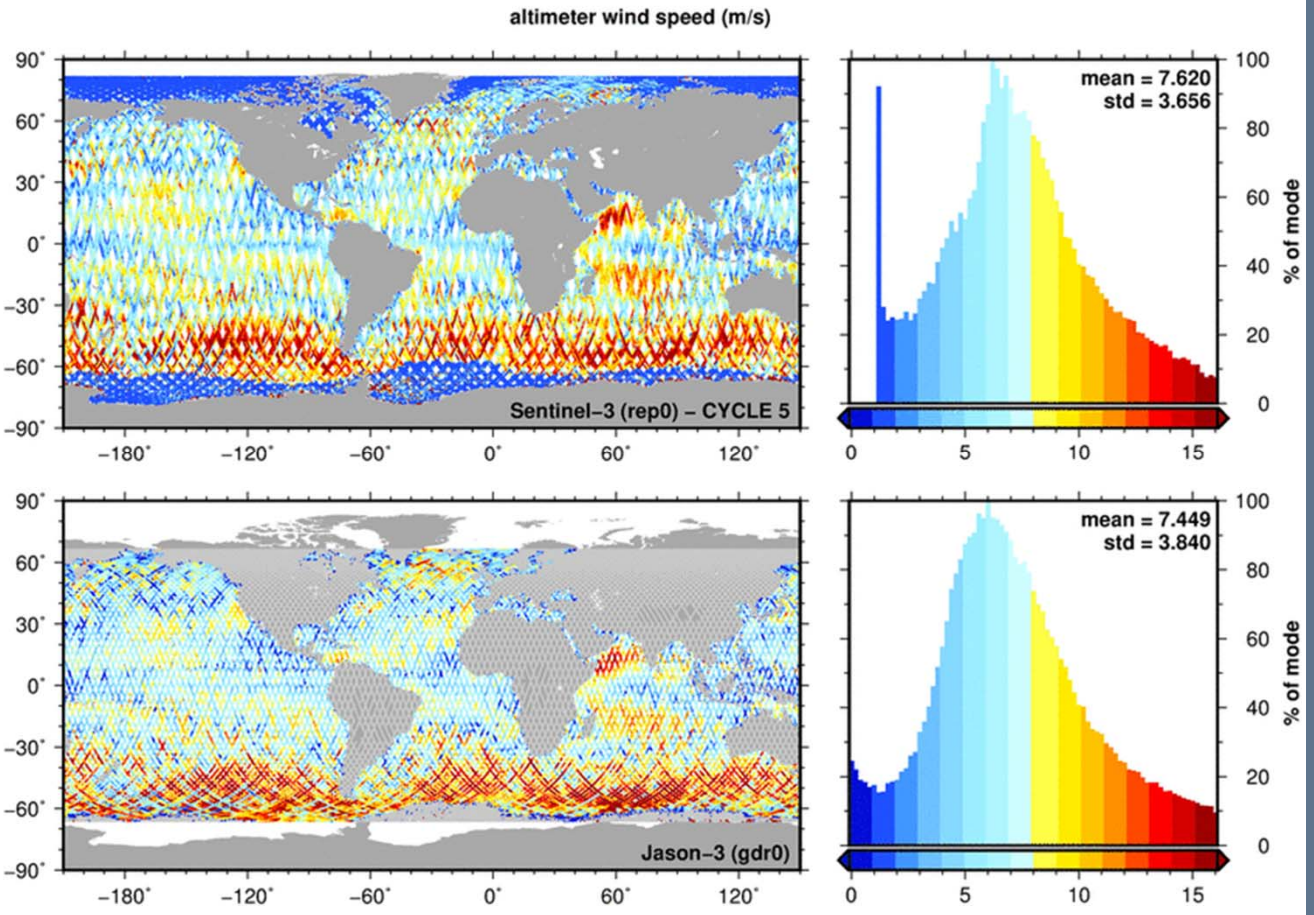
	SWH slope [mm/y]
S3 HR - J3	3.19
S3 LR - J3	0.73
S3 HR - LR	2.46

Backscatter coefficient (sig0) – S3 vs J3



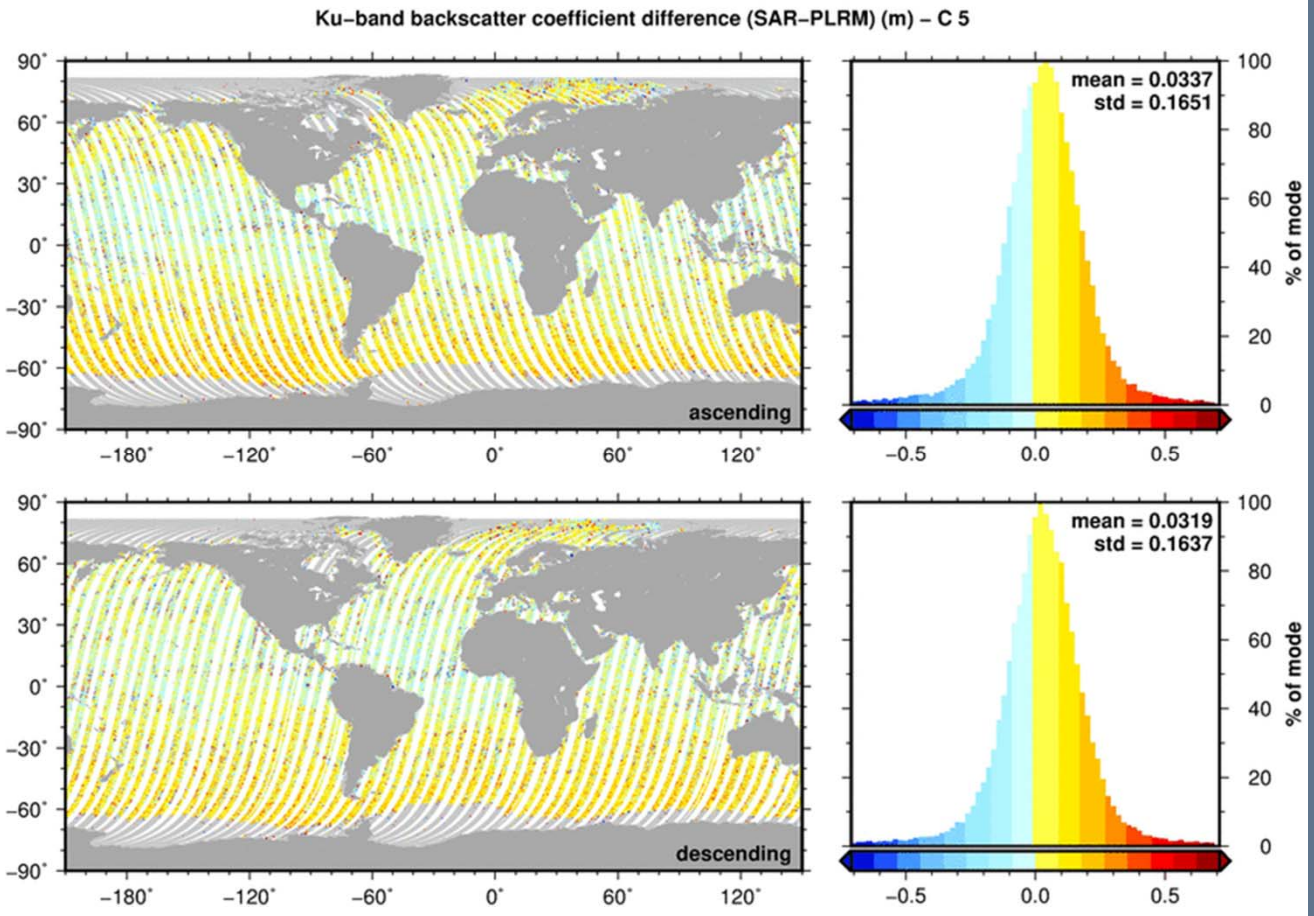
Sig0 bias S3 HR - J3
~ 3.1dB

Wind Speed – S3 vs J3

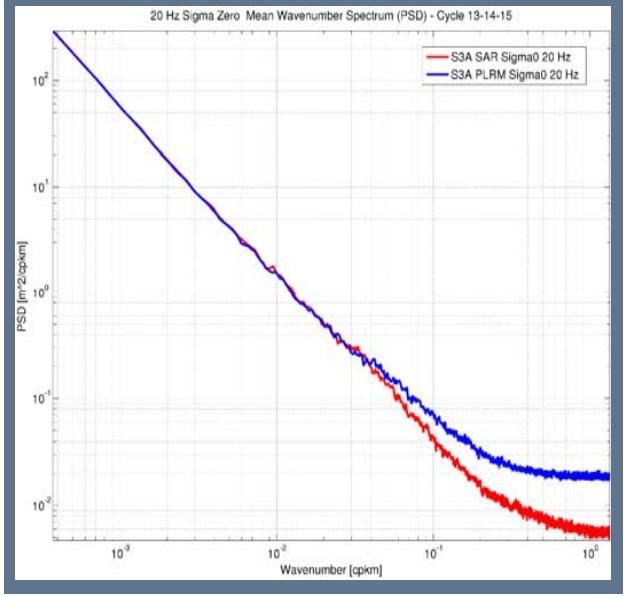


- **Note lower wind speed values saturated below 1.18 [m/s] → this is a known limitation of the model implementation**

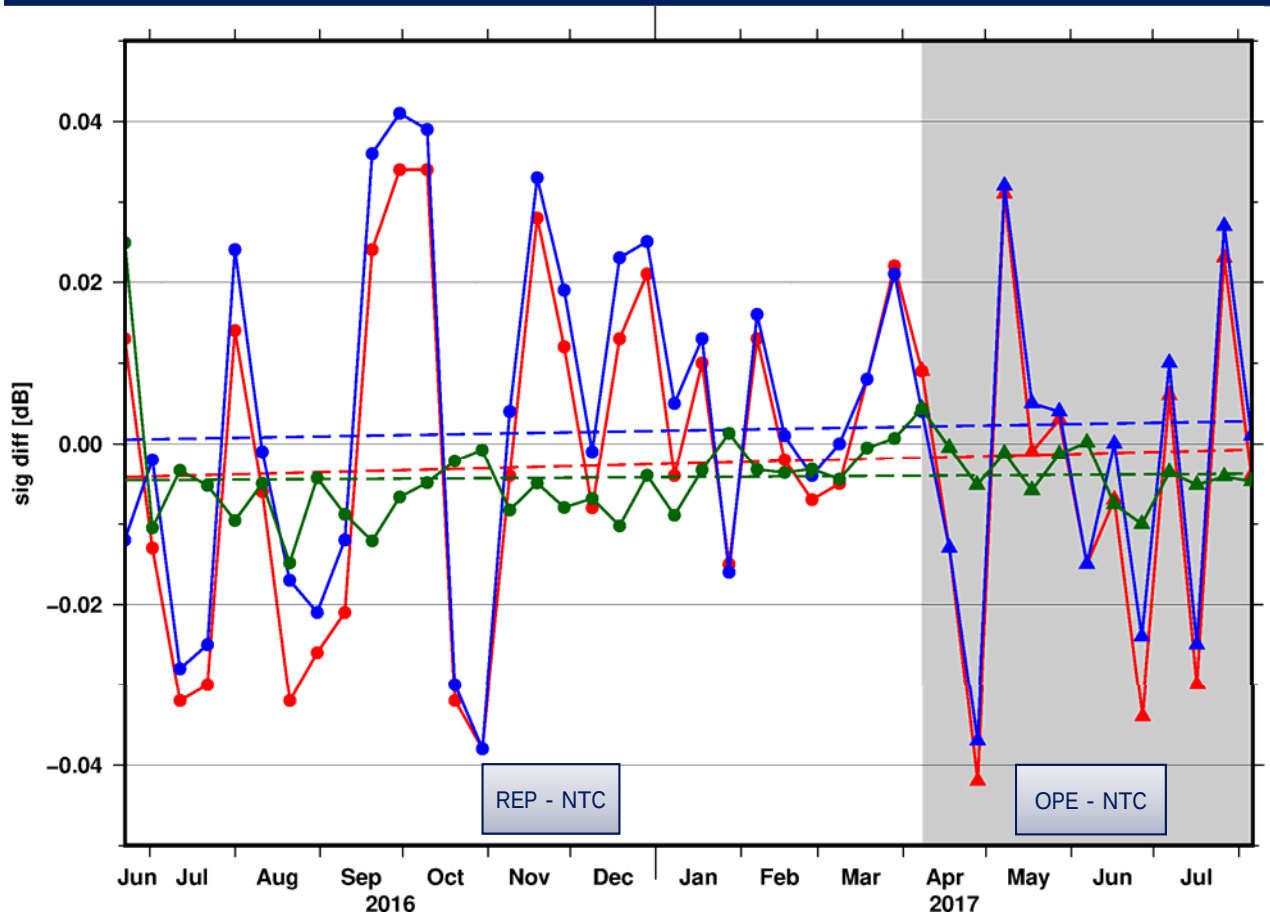
sig0 – HR vs LR and noise level



LR - PLRM	HR - SAR
Noise plateaus at 0.02dB^2/cpkm	Noise drops to 0.006 dB^2/cpkm
Equivalent to 0.03 dB 1-Hz noise at 2 m SWH	Equivalent to 0.02 dB 1-Hz noise at 2 m SWH



sig0 trend – S3 one year of data



	SIG0 slope [dB/y]
S3 HR - J3	0.003
S3 LR - J3	0.002
S3 HR - LR	0.001

Conclusions

- **SRAL NTC data quality**
  - Sea level, wave height and wind speed are all within requirements
  - For all variables S3-HR shows a noise reduction in the measurements
  - **SLA**
    - SLA mean bias of ~ 7.5 cm between S3-HR and J3
    - Good consistency between S3- HR and –LR, with few geographical pattern
    - SLA trend of ~ 4mm/y between S3-HR and J3, and also btw S3HR-LR; almost negligible trend comparing S3-LR and J3, and thus good consistency between missions for LR
  - **SWH**
    - Geographical pattern observed between S3- HR and –LR; Higher differences @ higher latitudes
    - Negligible trend observed for SWH, but clear biases between missions and operating modes within S3:
      - S3 HR vs J3 → ~ 14 cm mean bias
      - S3 HR vs LR → ~ 19 cm mean bias
  - **SIG0 and wind speed**
    - SIG0 mean bias of 3 dB between S3-HR/S3-LR and J-3
    - Saturation of lower wind speed values due to model implementation limitation
    - Geographical pattern in sig0 S3- HR and –LR differences; in mean these differences reach 0.002dB
    - No clear trend between missions nor between operating modes

SWH improvements in next PB

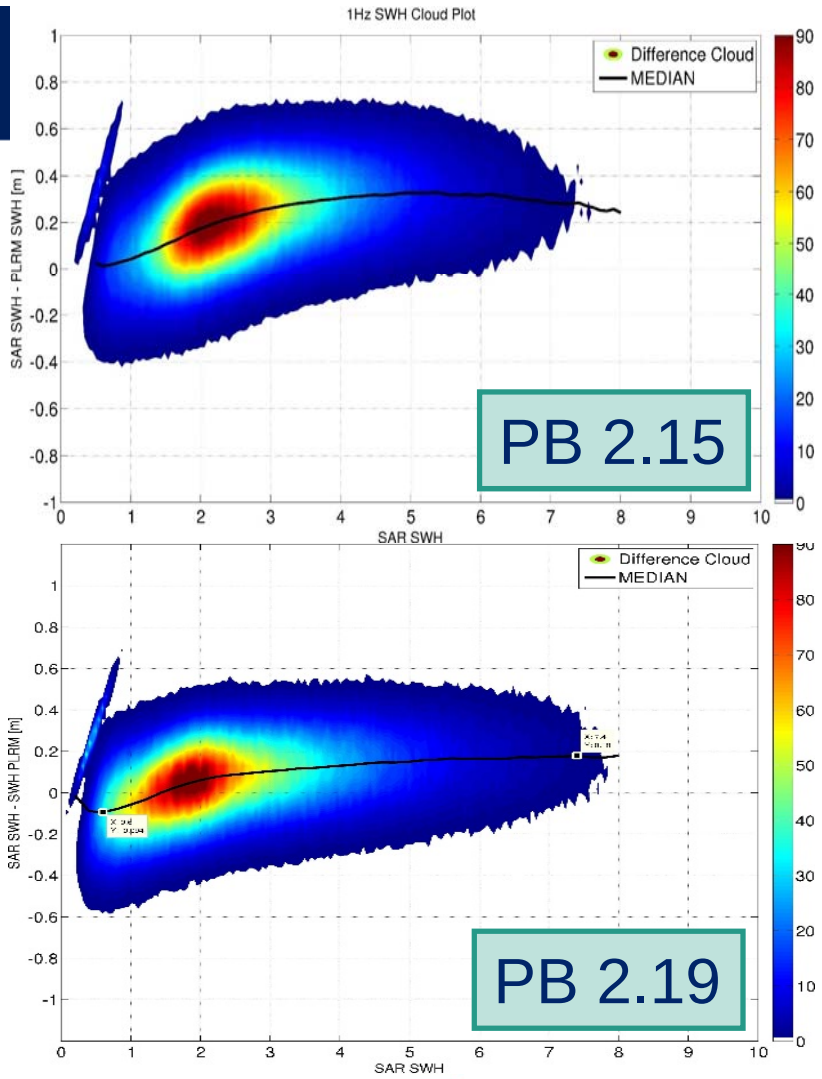
Difference between SAR and PLRM

PB 2.15: dependency on SWH

- 0 cm difference at 0 m
- Approx 30 cm difference at 5 m SWH and above
- Trend as function of SWH

PB 2.19

- This improves a bit in PB 2.19 (20 cm above 5 m SWH)
- However, mostly just reduction of bias



sig0 improvements in next PB

Difference between SAR and PLRM

Dependency on SWH

- 0 dB difference at 0 m
- Approx +0.1 dB difference at 5 m SWH and above

Dependency on altitude

- Increased to approx 0.15 dB at highest altitude
- Missing altitude or spherical earth correction?
- Somewhat reduced in PB 2.19