# TASK 4.5: ASSESSMENT OF CRYOSAT-2 OCEAN PROTOTYPE DATA

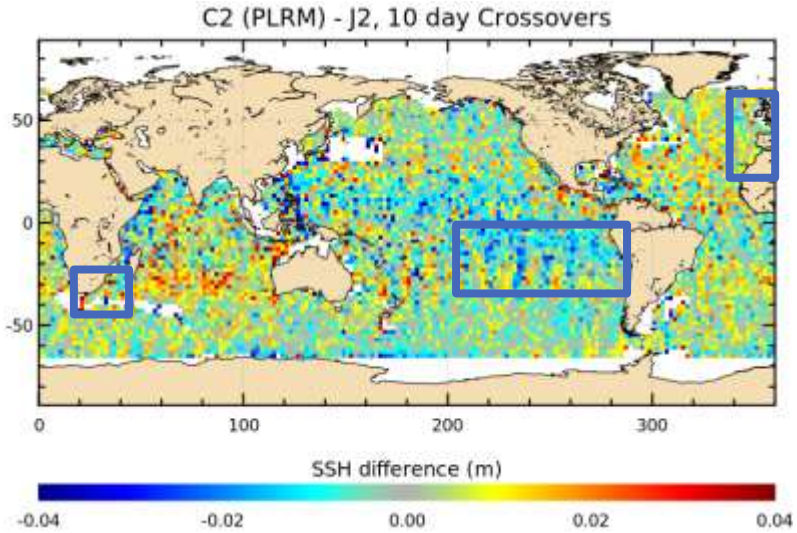
**T. Moreau, P. Thibaut, M. Raynal, S. Labroue (CLS)**

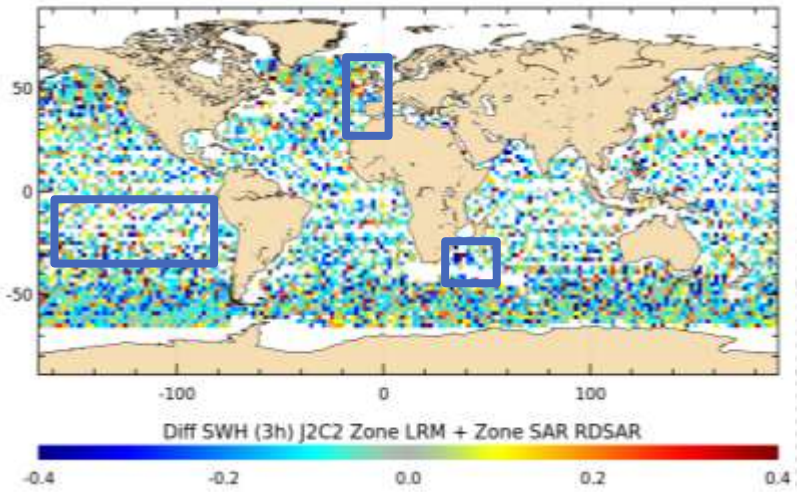
# ASSESSMENT OF OPEN OCEAN PRODUCTS

- Two years of Cryosat-2 data using the Cryosat processing prototype (CPP v14)
  - Full LRM and SARM coverage (No SARin)
  - Period from May, 2012 to April, 2014
- Several metrics are presented here
  - Cross calibration with Jason-2
  - Focus on the LRM / PLRM transition
  - Analysis of the spectral content of the different geophysical retrieved parameters
  - Assessment of long wavelength errors based on comparison with PLRM data colocalised with SARM data
  - Assessment of residual errors linked to key parameters for the SAR processing that would suggest potential error in modelling

# CRYOSAT-2 PLRM VALIDATION

## Cross-calibration with Jason-2

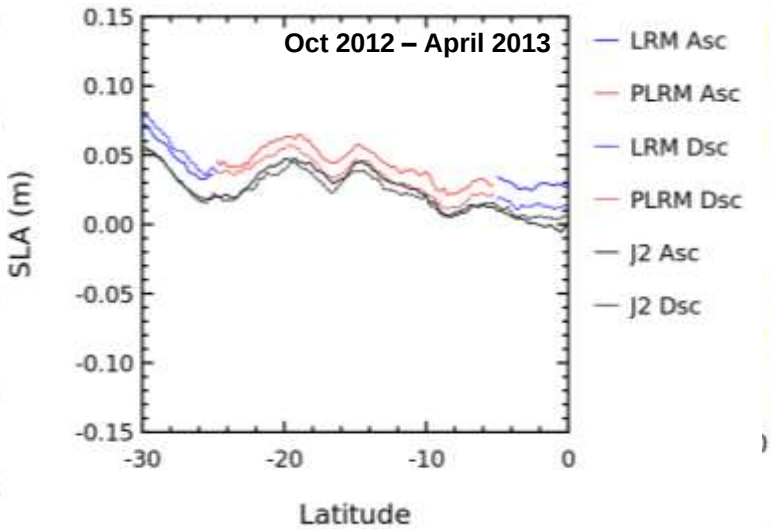


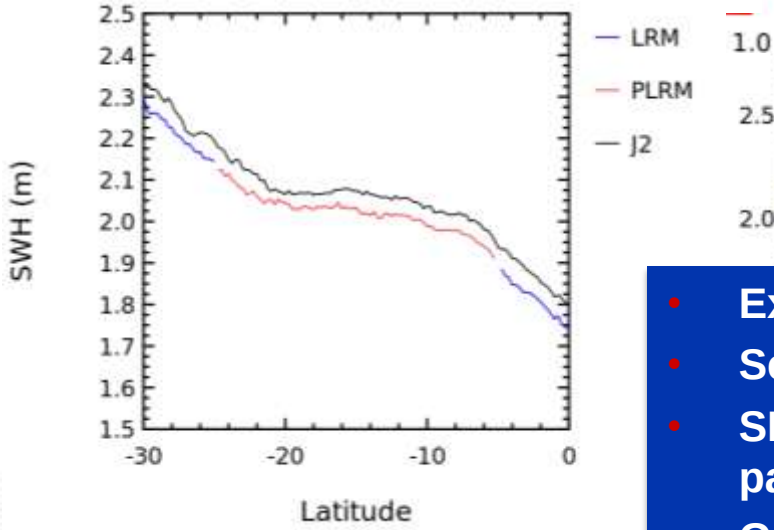



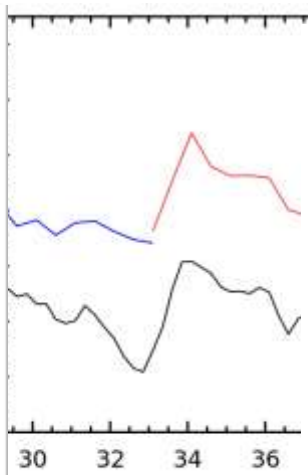

- 2 years crossovers C2/J2 in SSH and SWH (Jason-2 SSH is computed with the same geophysical corrections to cancel ionosphere and troposhere errors)
- **Very good agreement between C2 and J2 SLA**
- PLRM provides a seamless transition with LRM data for SLA over most of the analysed cases
- **Mean bias below 5 cm between C2 and J2 SWH ➔ Very good agreement**

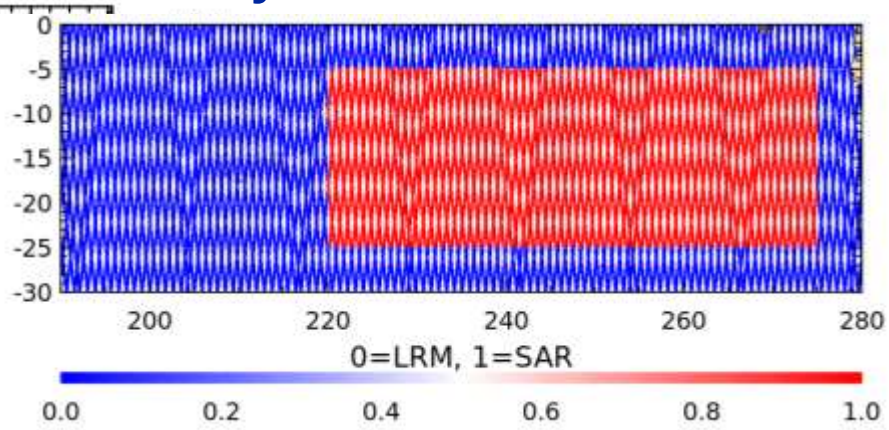
# CRYOSAT-2 PLRM VALIDATION

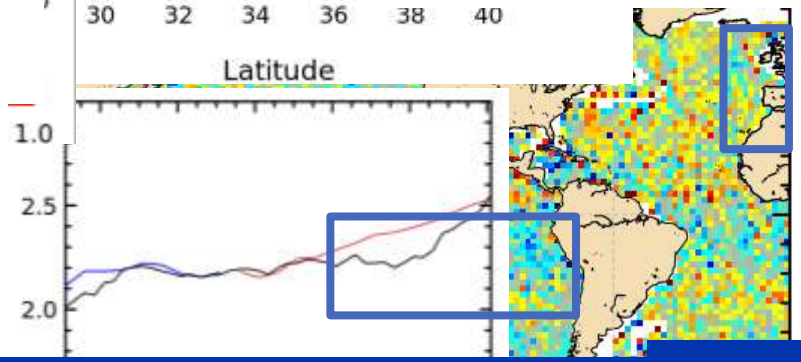
## Continuity between LRM and PLRM



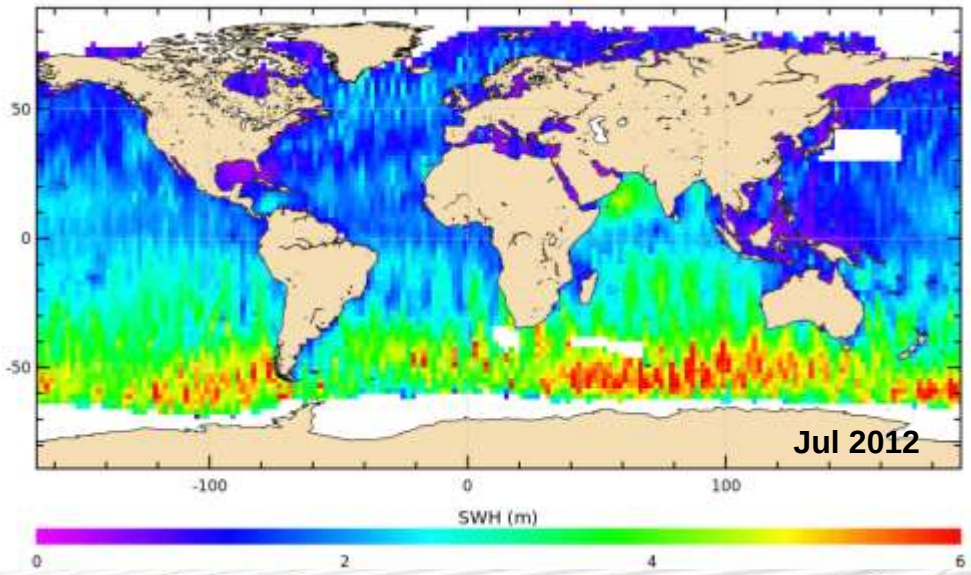



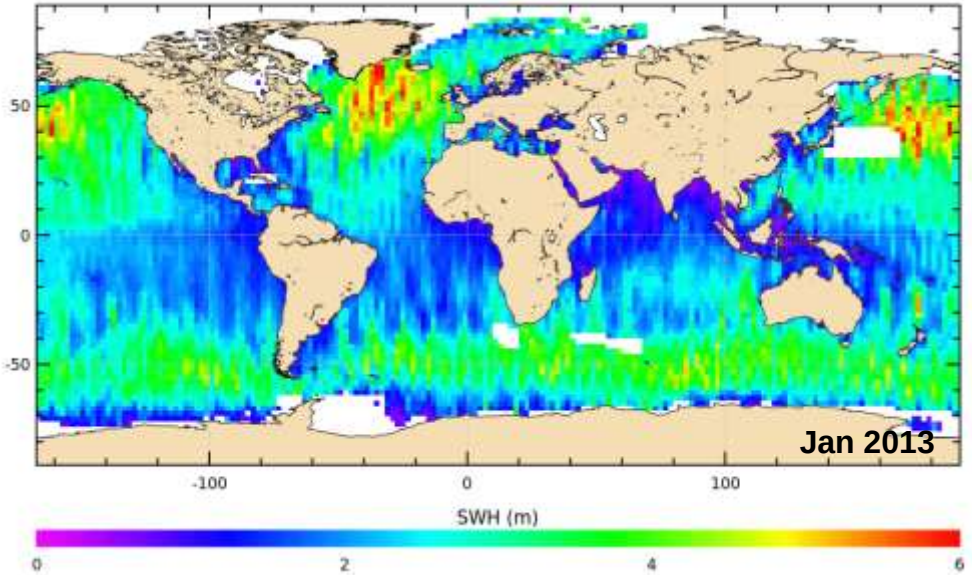



- Excellent agreement with SLA and SWH Jason-2.
- Seamless transition between PLRM and LRM data
- SLA discontinuities between ascending and descending passes lower than 1 cm (better match for descending passes)
- Getting transitions at centimetre level is excellent and it fully validates the PLRM processing compared to the LRM standard that we are used to in altimetry

# CRYOSAT-2 SARM VALIDATION

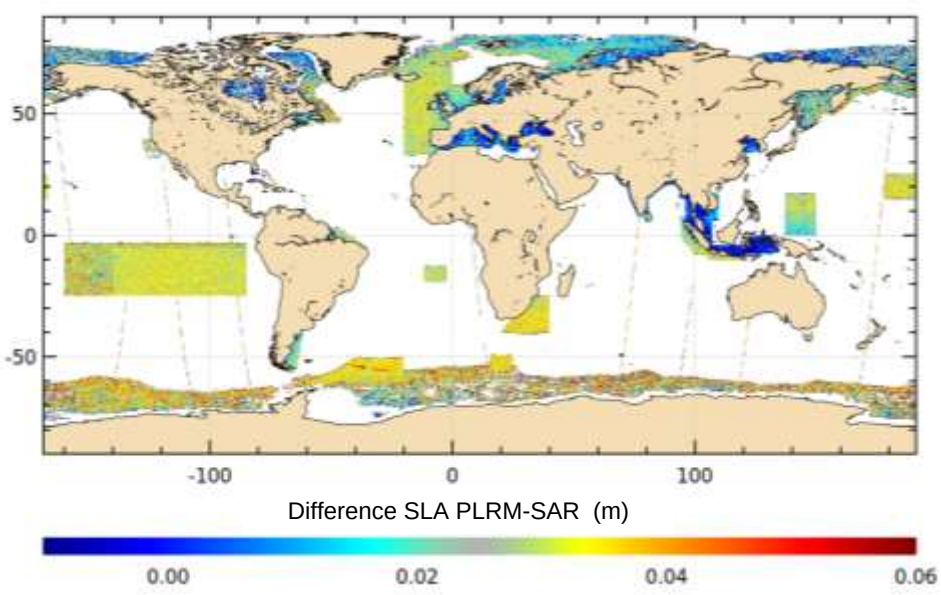
- Validation with Cryosat-2 mission is not that straightforward because of
  - No overlap between LRM and SARM zones
  - SARM sensitivity to several parameters (waves, mispointing angle, radial velocity)
  - The limited geographic coverage which makes difficult to separate the different effects that have spatial coverage varying in space and time
- Two years of data allow to cover large range scale of wave and wind conditions



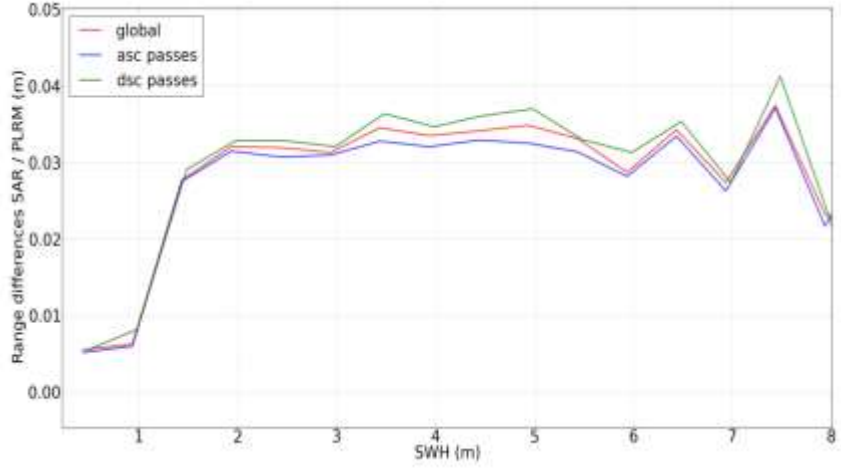



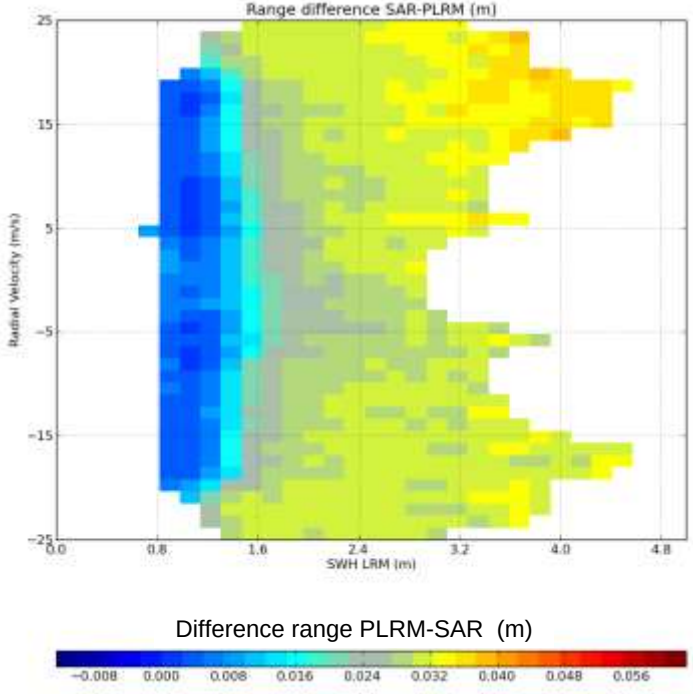
# CRYOSAT-2 SARM VALIDATION

## Long wavelength errors-range



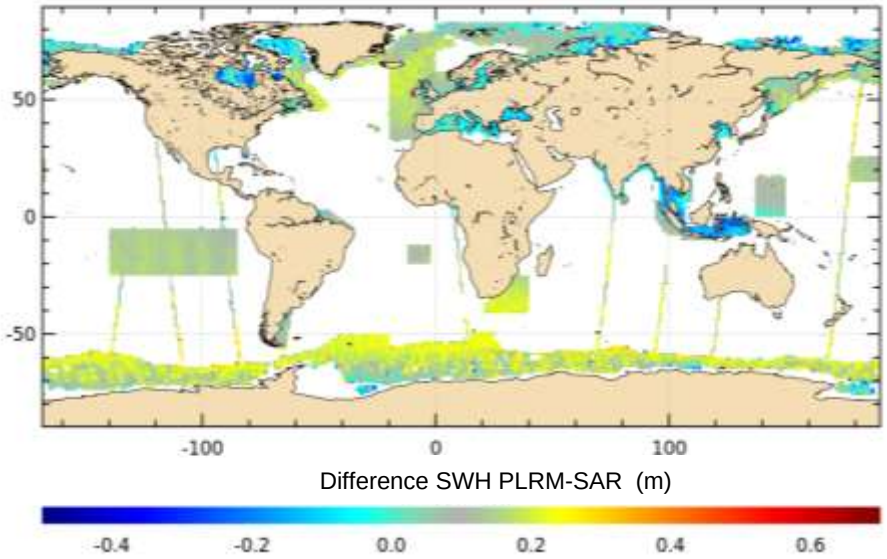

- Very small bias (PLMR-SARM) of 3 cm, given by the value at small SWH
  ➔ **Excellent agreement between PLRM and SAR SLA**
- SLA shows neither residual errors correlated to mispointing, nor to radial velocity
- No dependency for SWH>2m, suggesting similar SSB behaviour between LRM and SAR modes with the proposed processing

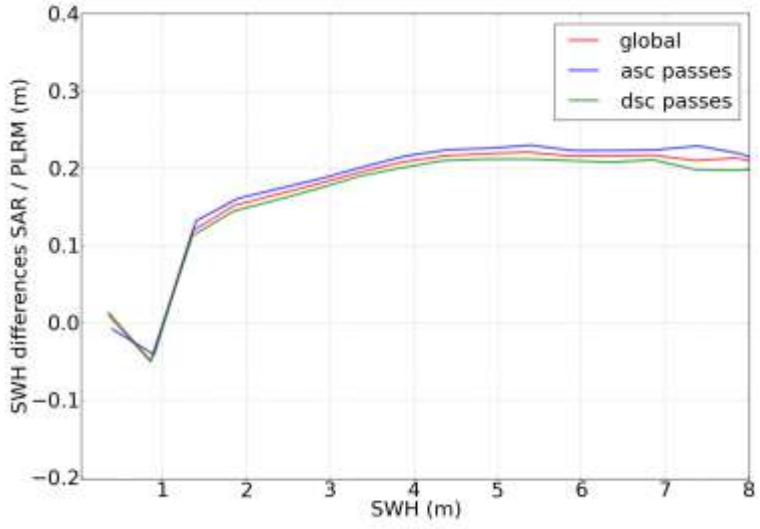


# CRYOSAT-2 SARM VALIDATION

## Long wavelength errors-SWH

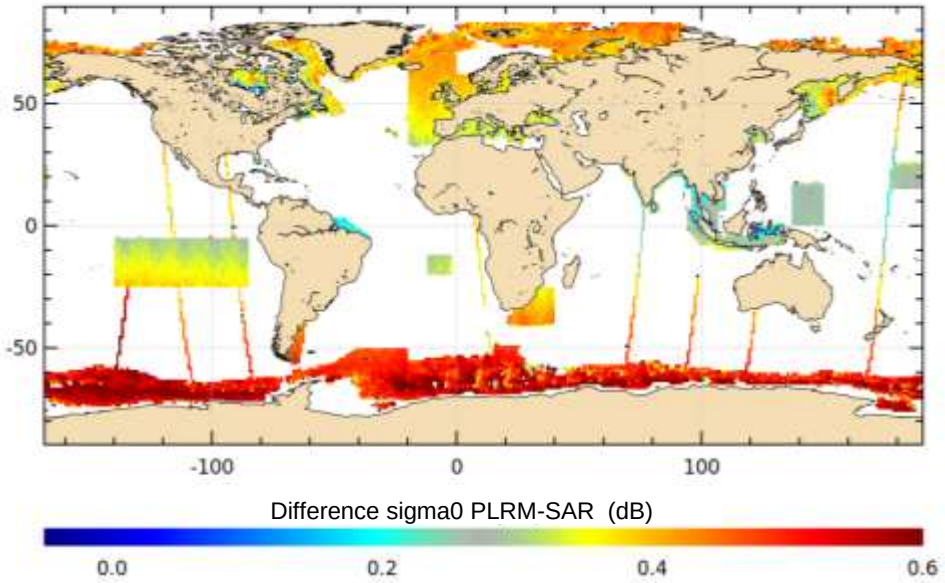


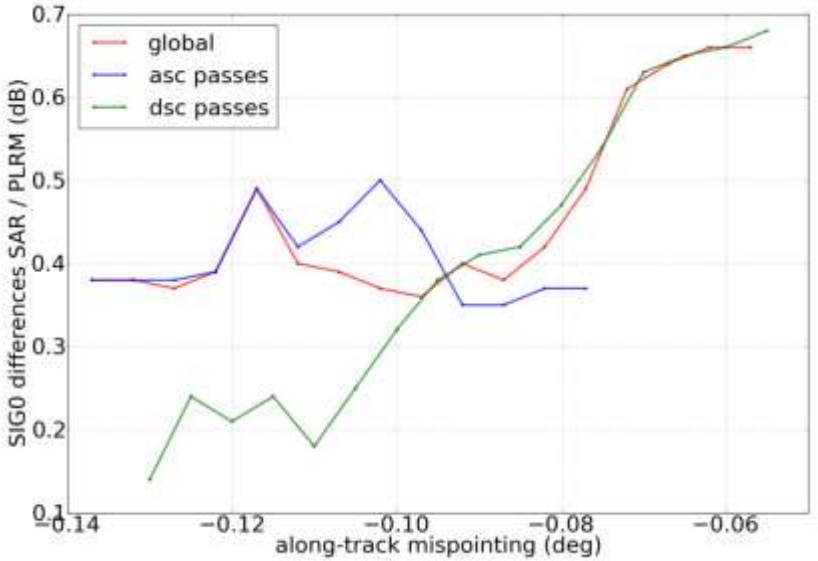




- SWH exhibits residual error correlated with SWH close to 2.5% SWH. Same responses for ascending and descending passes
- Dependency does not vary in time
- The absolute bias on SWH is close to 15 cm at 2m and around 20cm for SWH>4m which is good given the few areas in SAR mode and the complexity of the signals

  **➔ it validates the SARM processing compared to the PLRM (investigation is however on-going to understand this small discrepancy)**

## Long wavelength errors-Sigma0



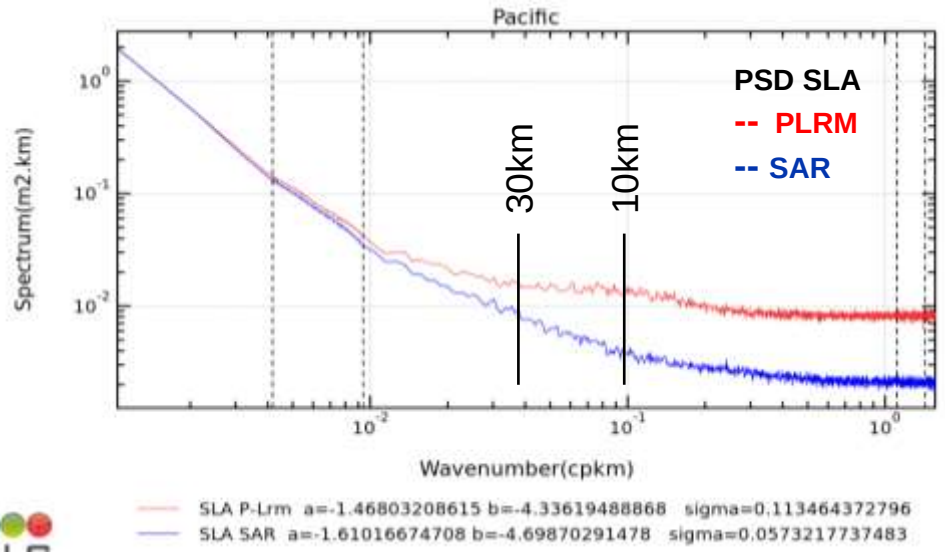



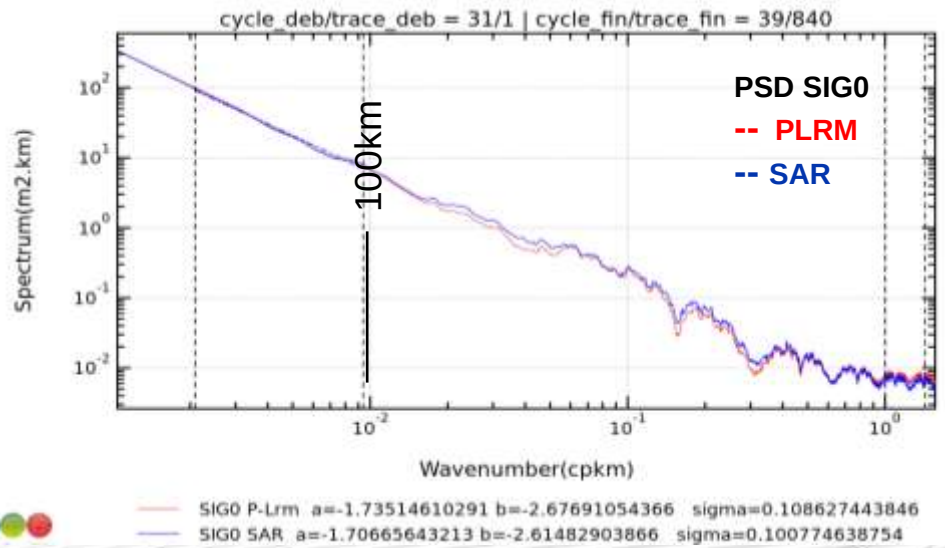

- Sigma0 shows negligible bias

  ➔ **Excellent agreement between PLRM and SAR sig0**

- No dependencies as function of SWH, neither as function of across-track mispointing
- Slight dependencies as function of along-track mispointing (for descending passes) maybe due to inaccuracy in the pitch bias value

# SPECTRAL ANALYSIS




- Spectral hump observed in range 10-30km on PLRM SLA

  but not present in SAR mode

  **➔ should yield better accurate observations to capture oceanic structures below 100 km**

- Improved sig0 content at scales below 100 km due to the 300 m footprint in the along track direction

  **➔ SAR processing better captures the sea surface roughness in the sigma0, thus providing a cleaner SLA observation**

- Excellent data quality both for PLRM and SAR-mode
  - Excellent agreement with Jason-2 mission in SSH and SWH
  - The LRM and PLRM data show a seamless transition below one centimeter
  - PLRM and SARM are in very good agreement (differences of 3cm in range and 20cm in wave height at maximum)