Global assessment of Jason-1 GDR-E Reprocessing

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Service Altimetrie & Localisation Precise

Overview

- Complete reprocessing campaign performed in 2015.

- Reprocessed dataset: **GDR-E** update (L2 products) – previously GDR-C

- Performance assessment:
  - What is new in the product?

  - Altimeter parameters updates
  - Geophysical corrections updates: example of ocean tide

  - Performance at crossovers
  - Impact on Sea Level Anomaly and long term evolution

Updates in GDR-E product – Waht's new?

	GDR-C	GDR-E
Orbit	CNES POE-C until cycle 374, CNES POE-D from cycle 500 onwards	CNES POE-E
Range	GDR-C range	GDR-E range = GDR-C range + bias
Solid Earth Tide	Cartwright and Edden [1973]	Cartwright and Edden [1973]
Pole Tide	Wahr [1985]	Wahr [1985]
Ocean Tide	GOT00V2_S1_S2 & FES 2012	GOT4V10 & FES 2014
Dry Tropo	ECMWF model	ECMWF model
Sea State Bias	GDR-C SSB	TRAN 2015
DAC	MOG2D	MOG2D
Wet Tropo	GDR-C JMR, except between cycles 228 and 259 (replacement product)	GDR-E JMR
Ionospheric correction	filtered dual-frequency GDR-C iono	filtered dual-frequency GDR-E iono
Other	datation bias	Directly applied to time tags

Netcdf fmt.

+ available in the product:

- ERA data (Dry troposphere correction/Wet tropospheric correction/DAC solution)

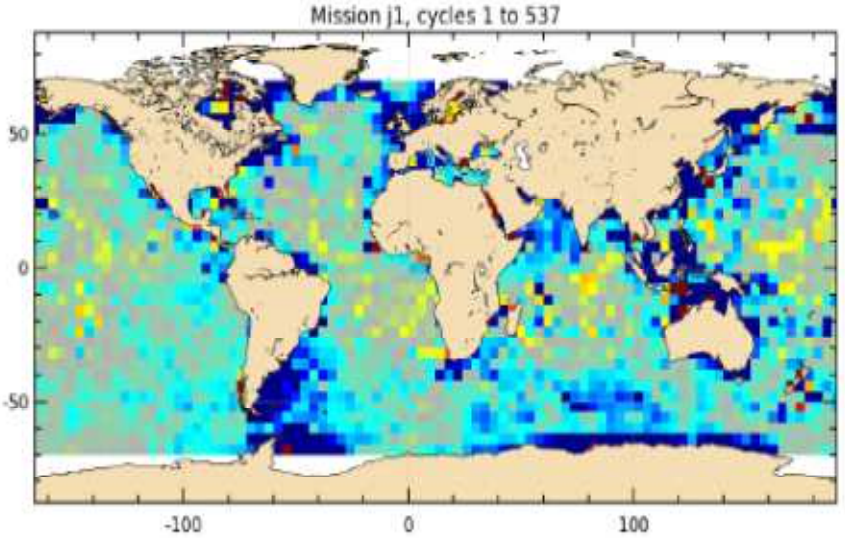
Altimetric parameters

- No new retracking, but:
  - biases applied on range
  - Impact on ionopsheric correction
  - Sea State bias:
    - New method (Tran, OSTST 2012) – Updated for J2 too (J2 GDR-D)
    - Computed for J1 GDR-E using data from cycle 1 to 111

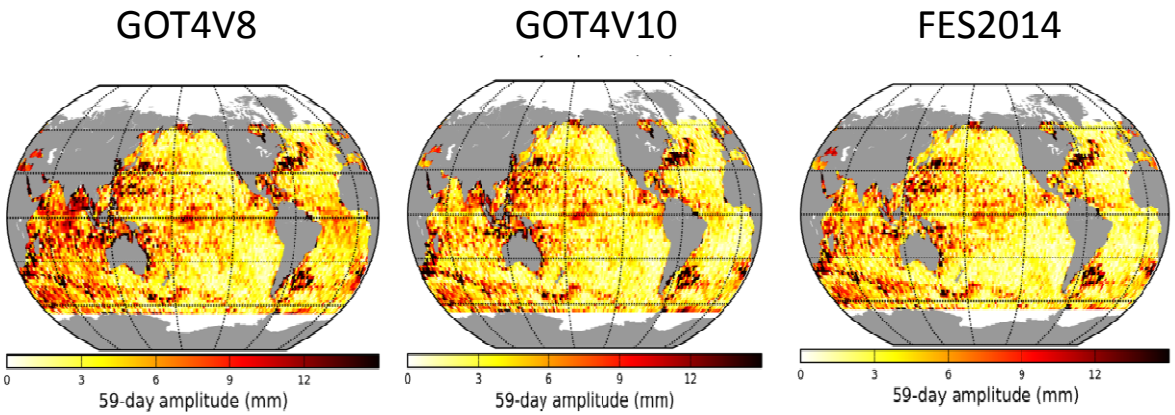
biases (m) on → / due to ↓	Repetitive orbit	Geodetic orbit
Internal path delay	+0.0639	
PRF truncature	-0.0032 (Ku and C)	/
Ionospheric correction	+0.0103	
SSB	+0.0065	

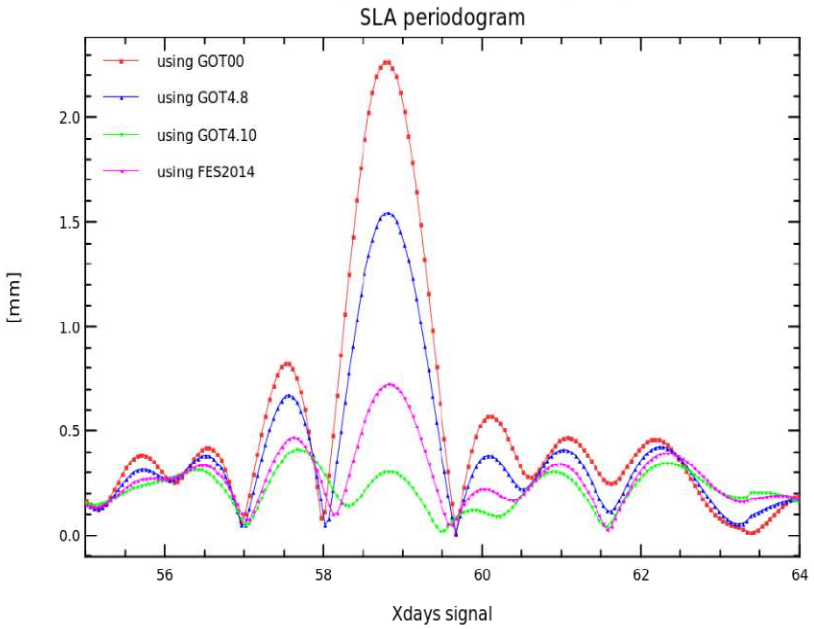
Model updates: example of ocean tide

- Ocean tide GOT 4V10 solution
  (vs GDR-C GOT00 solution)
  - more valid data near coasts and over lakes
  - reduction of variance of SSH at crossovers
  - reduction of 60d signal
    (Zawadzki et al., 2016, in prep.)



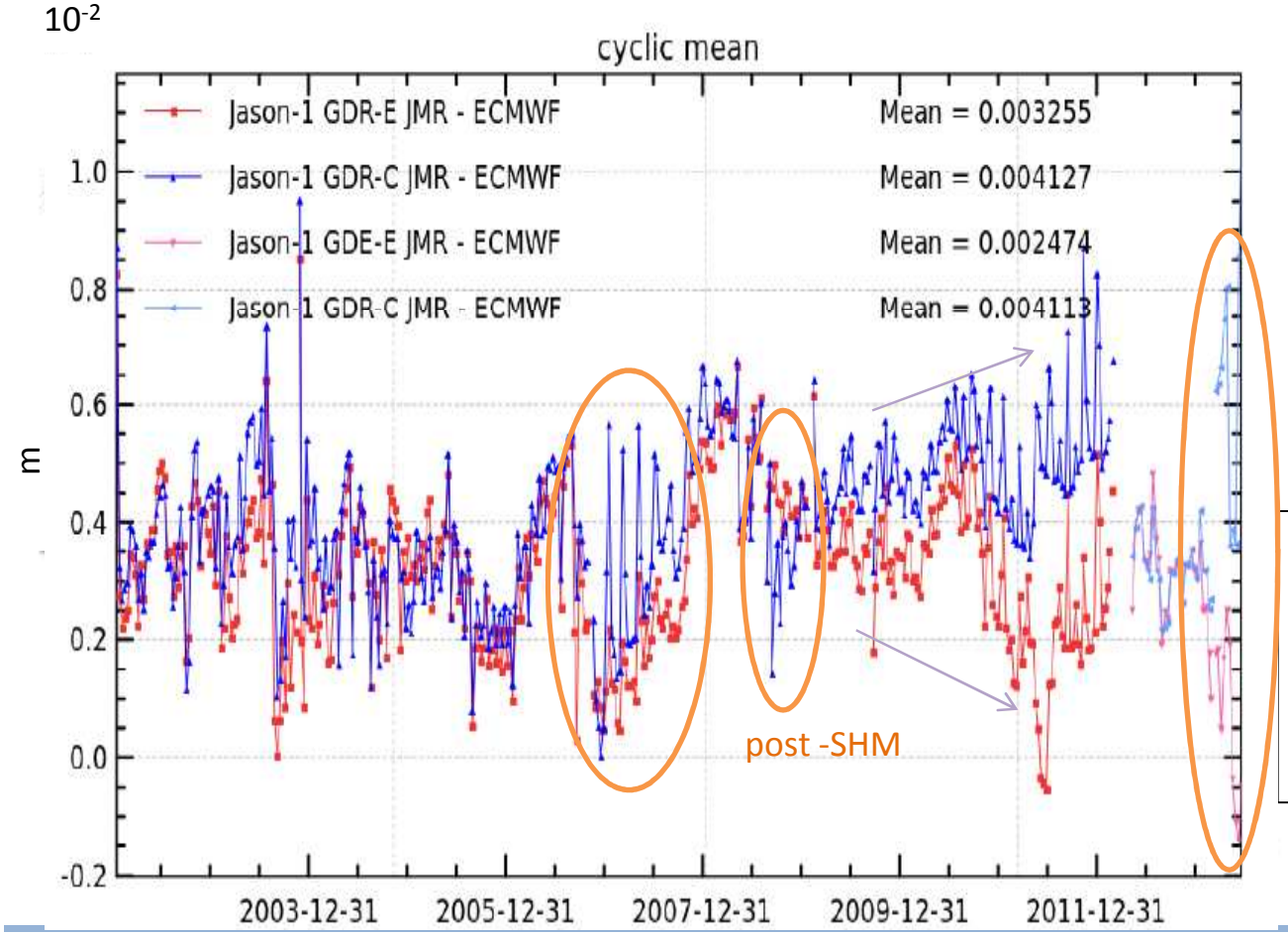
Reduction of mesoscale errors





Radiometer data update

- JMR data reprocessed over the complete J1 period by the JPL
  - New calibration coefficients
  - New algorithm for coastal data consideration

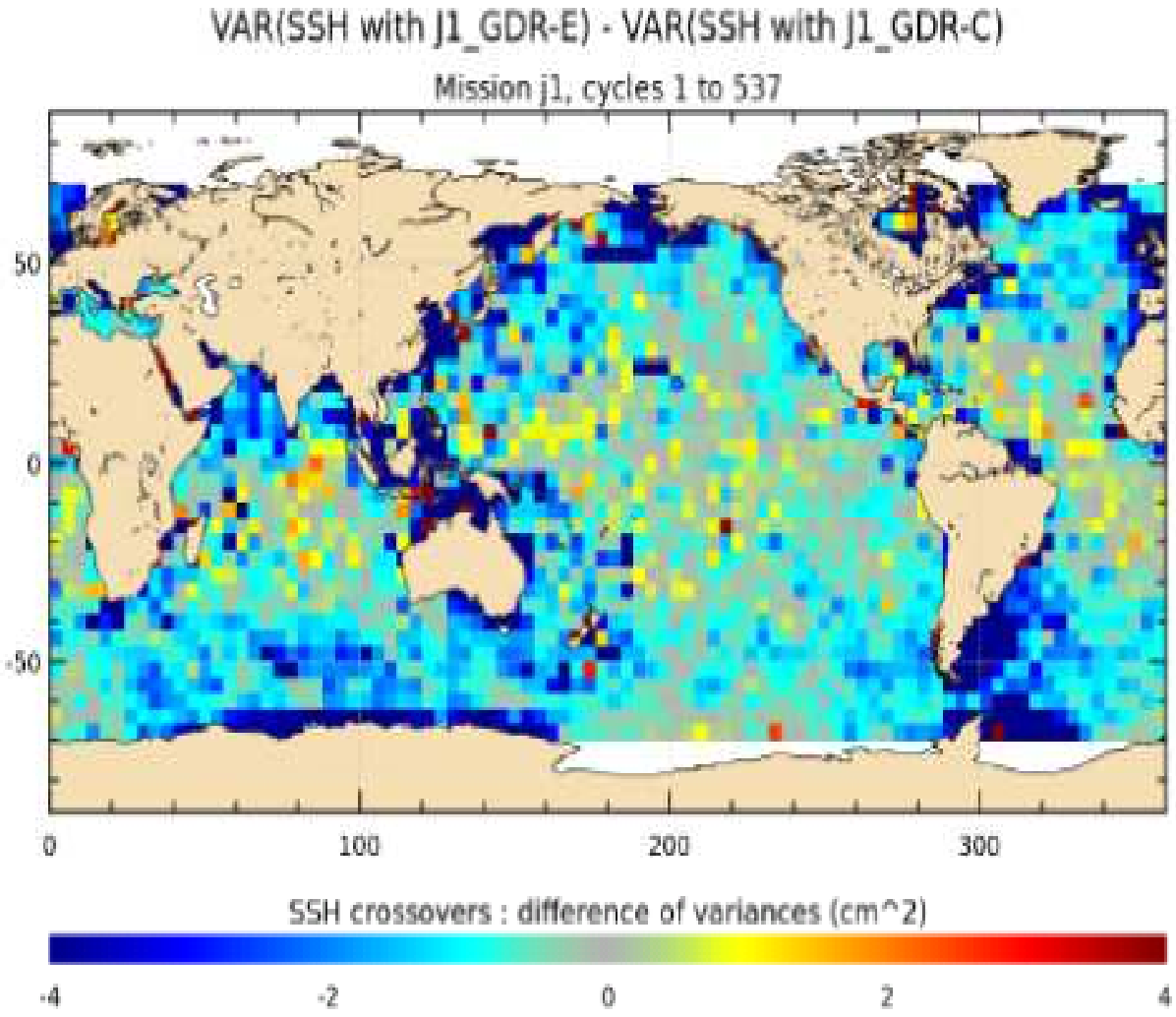


Difference of radiometer - ECMWF model wet troposphere correction (GDR-E – GDR-C)

- Reduction on instabilities
- End of period is notable
- Trends differ after SHM


SEA-LEVEL IMPROVEMENTS
- VARIANCE REDUCTION
- CONSISTENCY
- STABILITY

Sea-level improvement : variance reduction



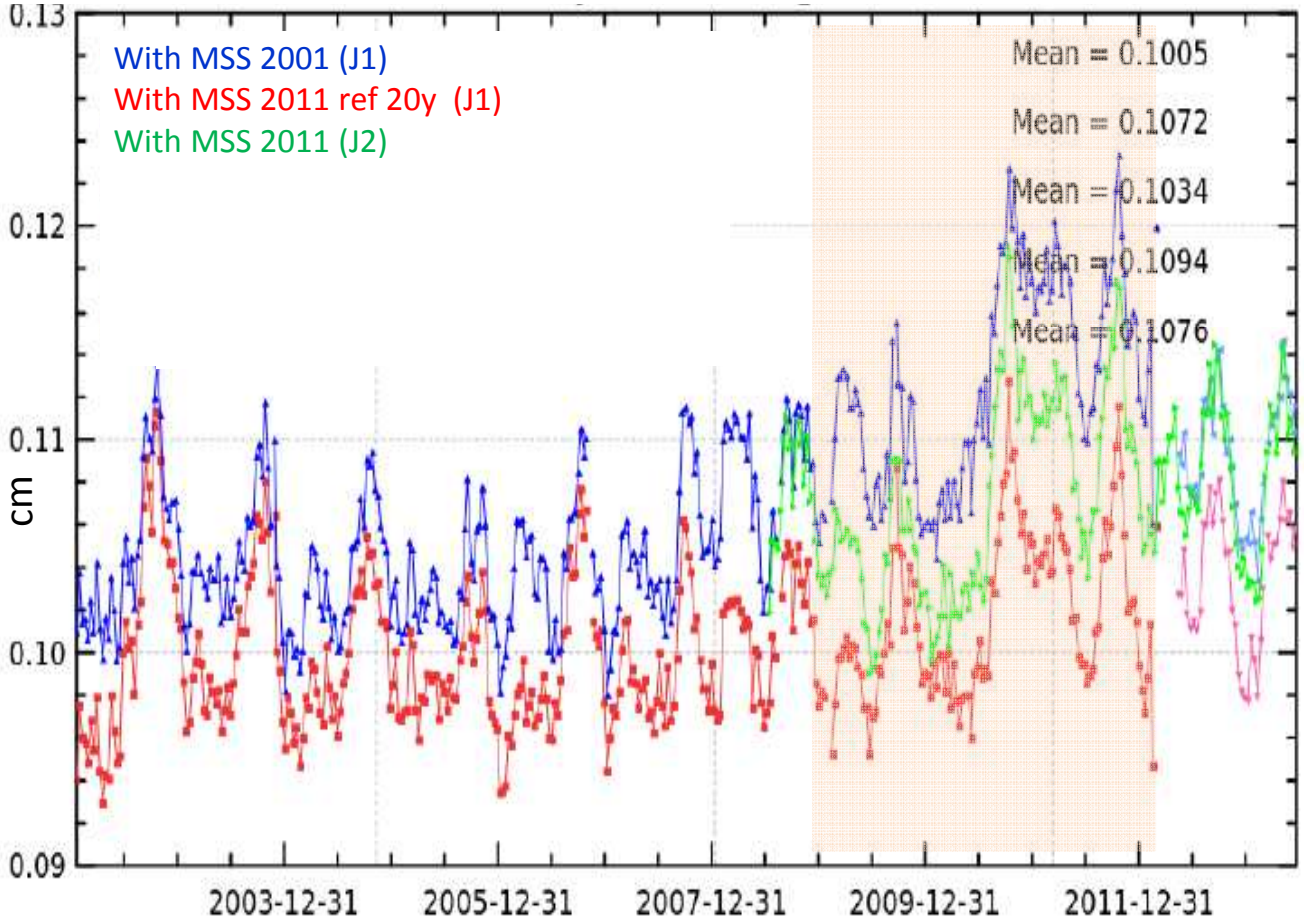
Difference of variance of SSH GDR-E – GDR-C (*crossovers*)

Variance of SSH is reduced -1.3cm²

POE-E: -0.36cm²
Ocean tide: - 0.87 cm²
SSB: -0.08cm²

Sea-level improvement : variance reduction

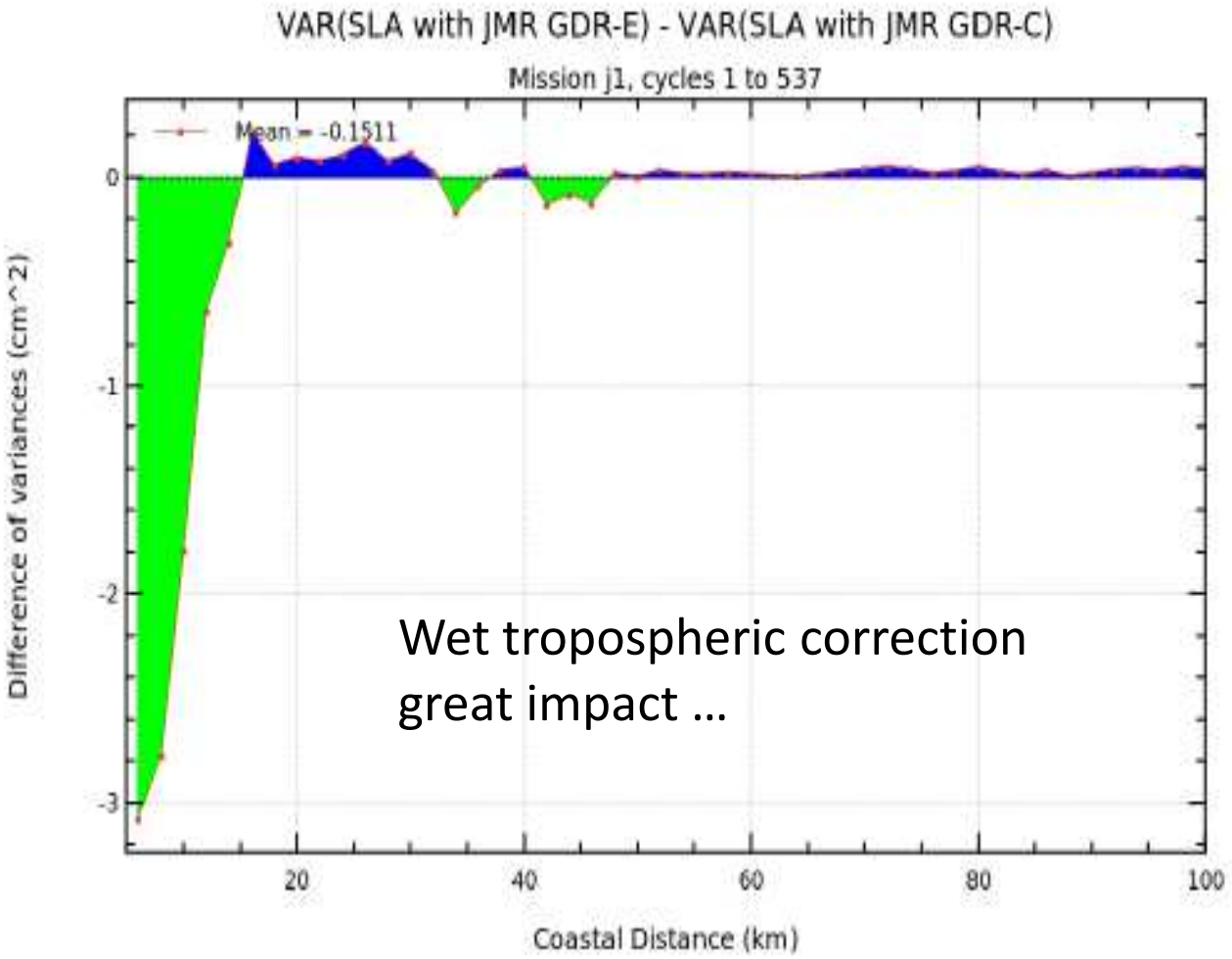
- Global bias observed on Sea Level Anomaly: 'GDR-E – GDR-C' = -10.4cm
- Due to MSS: 2.40cm



Standard deviation of SLA Comparison
J1 GDR-C/J1 GDR-E / J2 GDR-D
(*along track*)

SLA standard deviation is reduced

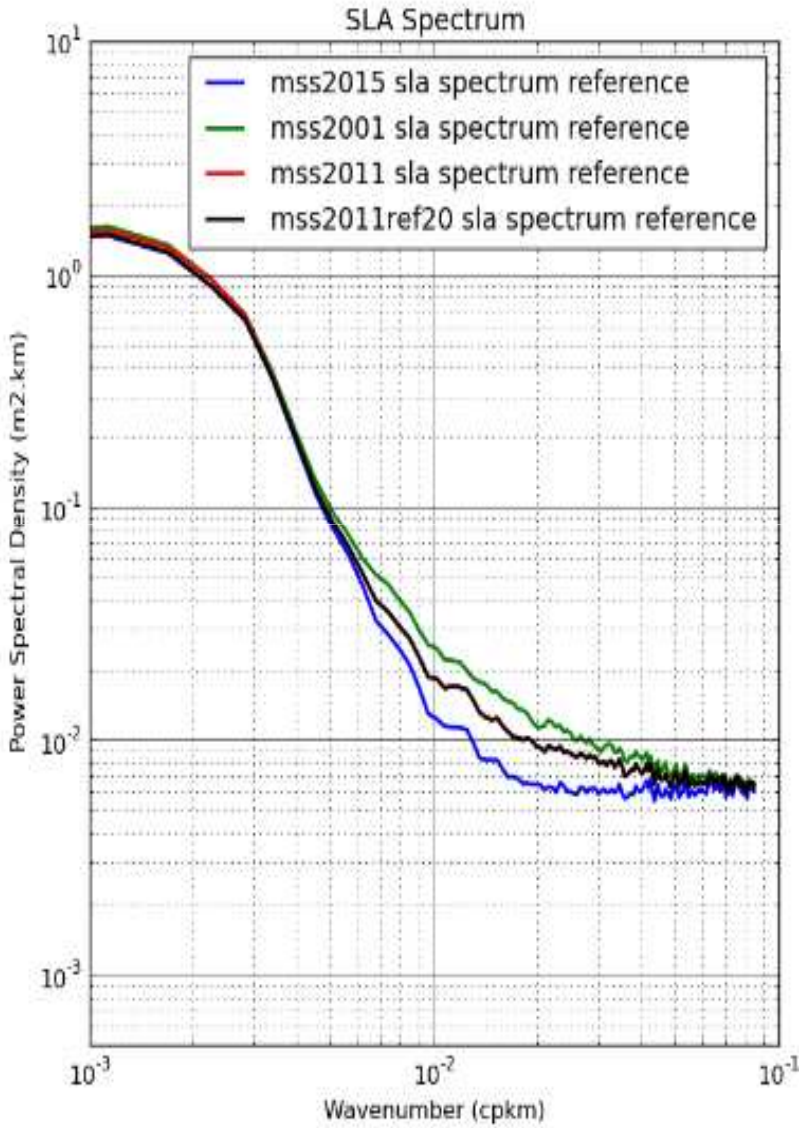
Sea-level improvement : variance reduction



Difference of variance of SLA approaching coasts GDR-E – GDR-C (*along track*)

Variance of SLA approaching coasts is reduced

Sea-level improvement : variance reduction



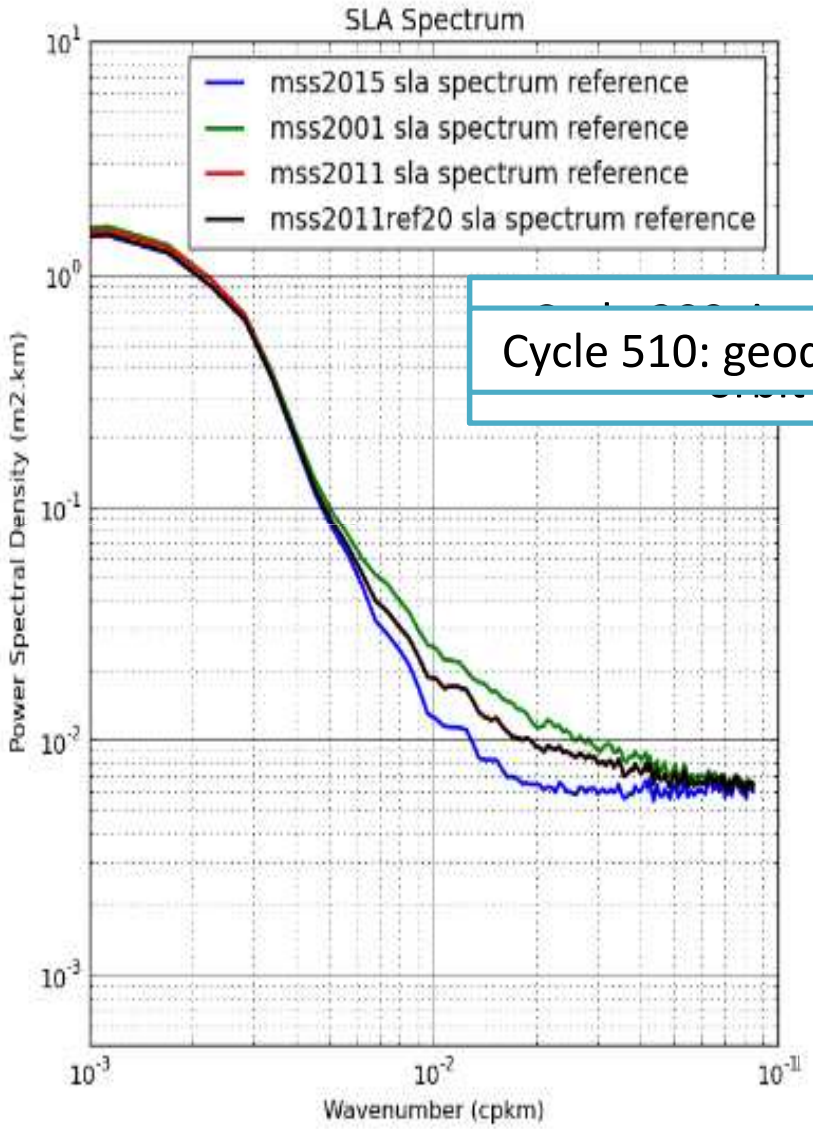
Cycle 510
geodetic orbit

SLA spectrum

⇒ better observation of smaller ocean scales

MSS 2001 integrates only repetitive orbit data
MSS 2011 integrates interleaved data
MSS 2015 integrates the complete period

Sea-level improvement : variance reduction



SLA spectrum

Cycle 510: geodetic orbit

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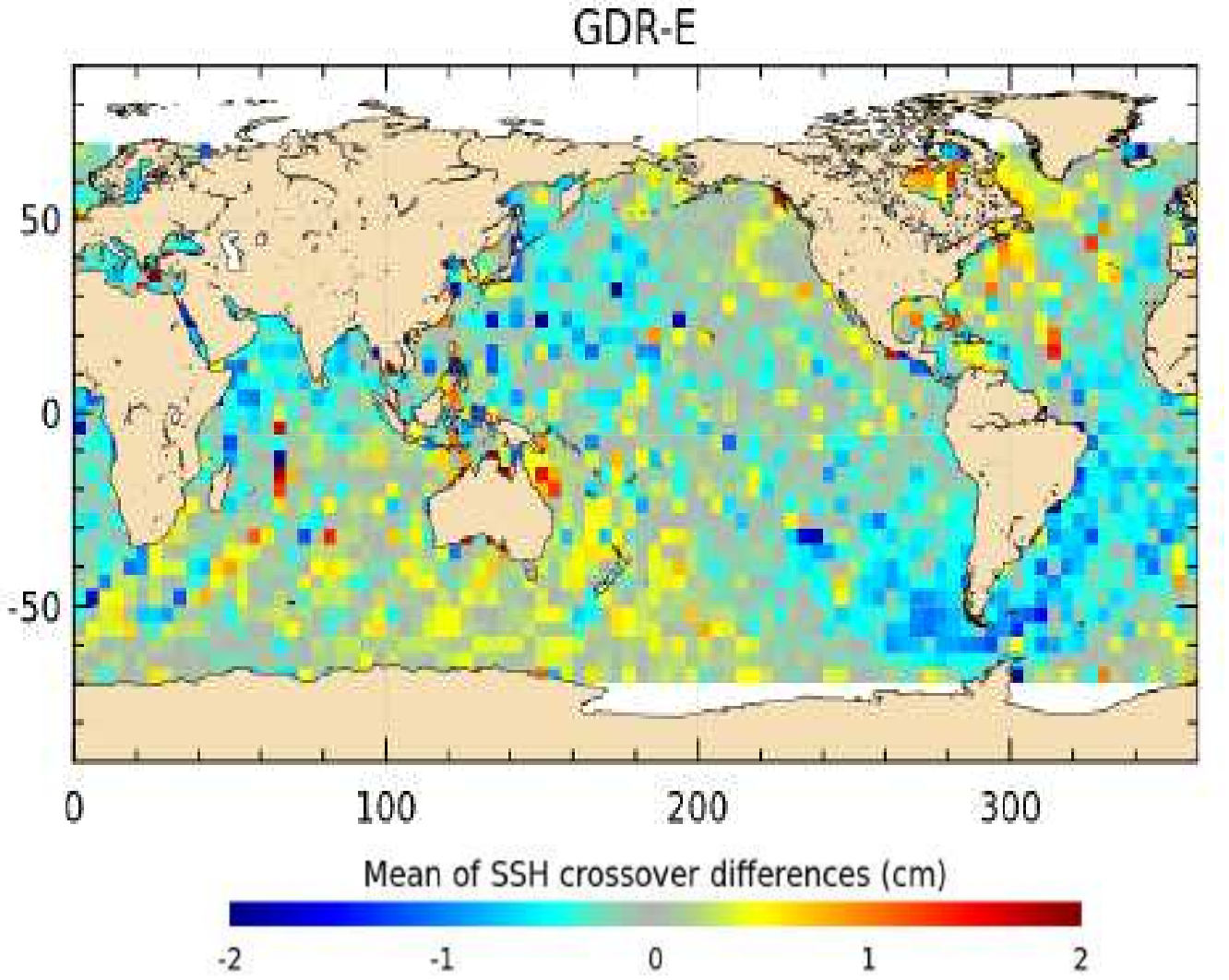
⇒ better observation of smaller ocean scales

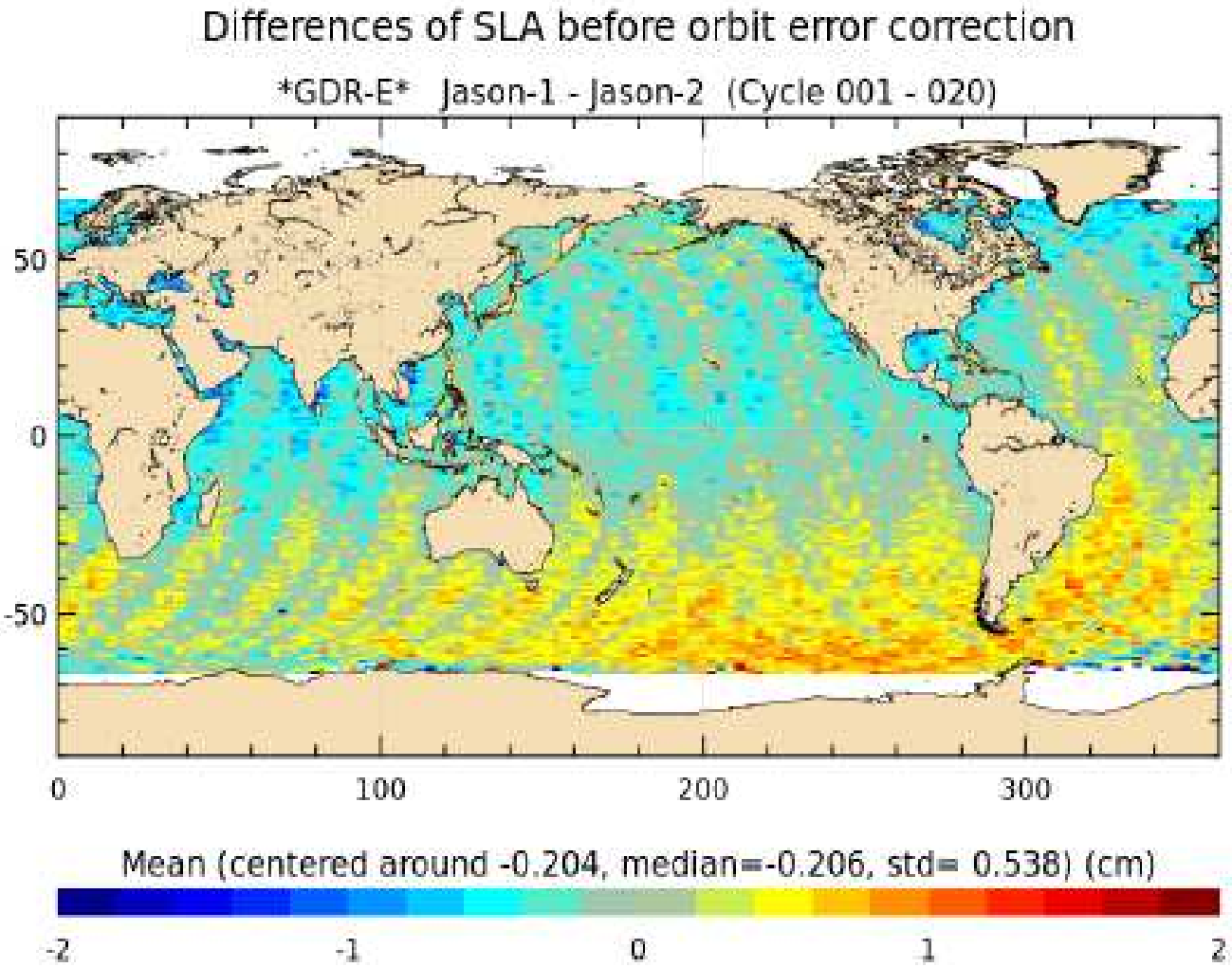
Sea-level improvement : consistency



Mean of SSH difference GDR-E (*crossovers*)

Geographical patterns are reduced

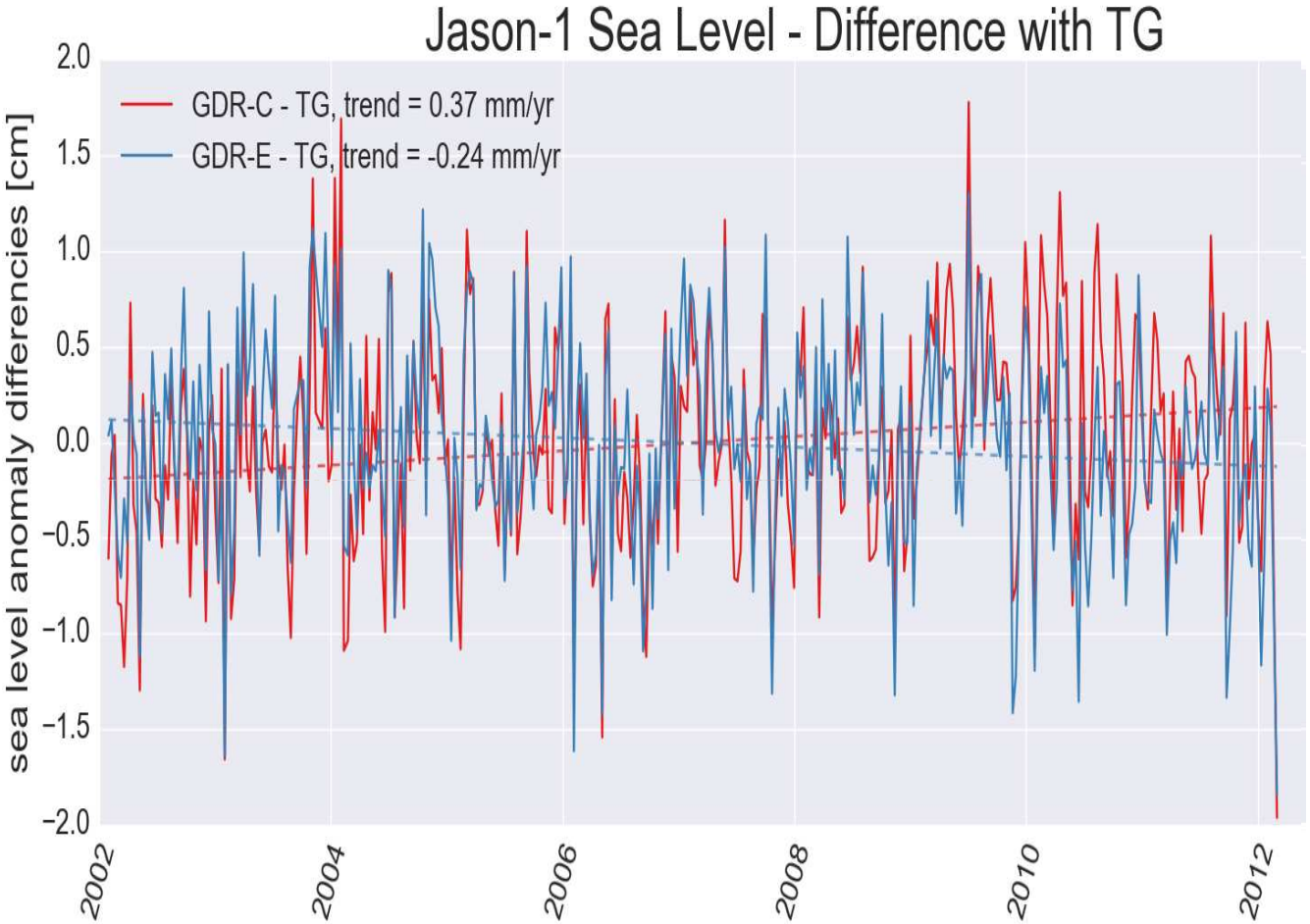
Sea-level improvement : consistency



SLA difference with Jason-2
Cycle 1 to 20
(*along track*)

Geographical
Geographical patterns; due to orbit / ssb
reduced

Sea-level improvement : stability



MSL comparison with GDR-C (repetitive orbit)

Significant impact: 0.2mm/y

Variability clearly reduced (60 days signal)

Comparison with TG: No obvious conclusion

Conclusions

✓ Mesoscale error reduction: variance of sea level is clearly reduced

✓Consistency between asc/dsc tracks is improved.
✓Consistency with J2 too

✓ Long term stability: significant impact on trend and great reduction of variability.

And after…

=> other updated standards: MSS CNES/CLS 2015, ocean tide solution, etc…

=> small ocean scales improvement: 'J3 like' retracking, …

The final report with the exhaustive analysis and results will be soon available on the Aviso web site

Questions ?

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