CalVal Analysis of Latest Release of TOPEX Retracked Data

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Objectives

- CalVal analysis already performed in 2006 (Venice OSTST) and 2007 (Hobart OSTST)

  => Main result= Topex retracking changed Range/SWH correlation and thus the SSB. New Topex SSB was closest to Jason-1 SSB and they agreed at the mm level.

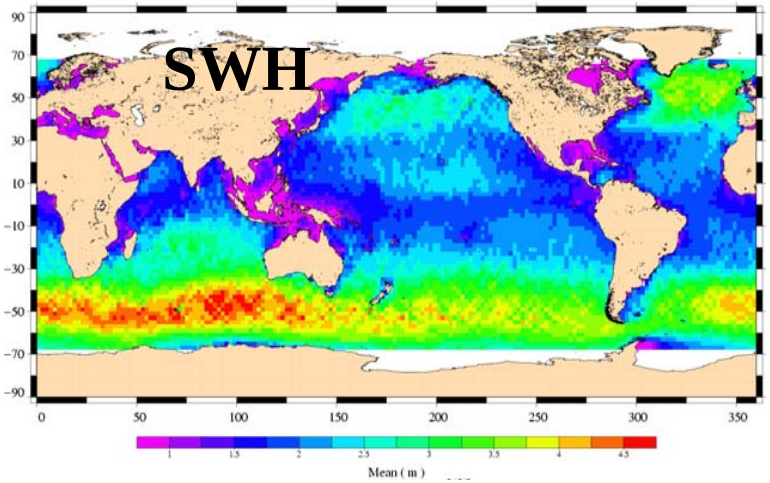
- 2 objectives with 2009 release:

  1 - Non regression with data sets previously analyzed in 2006 and 2007
  - Comparison with Jason-1 during the J1 verification phase (cycles 344-364)
  - Comparison with MGDR data

  2 - CalVal analysis of the whole time series of Topex A and B
  - One aim of Topex retracking is to better take into account the PTR drift that occurs at the end of side A altimeter.
  - Retracking should provide corrected SWH and Range measurements (Sigma0 is not reprocessed although it is also affected by the PTR degradation)

1- Non regression

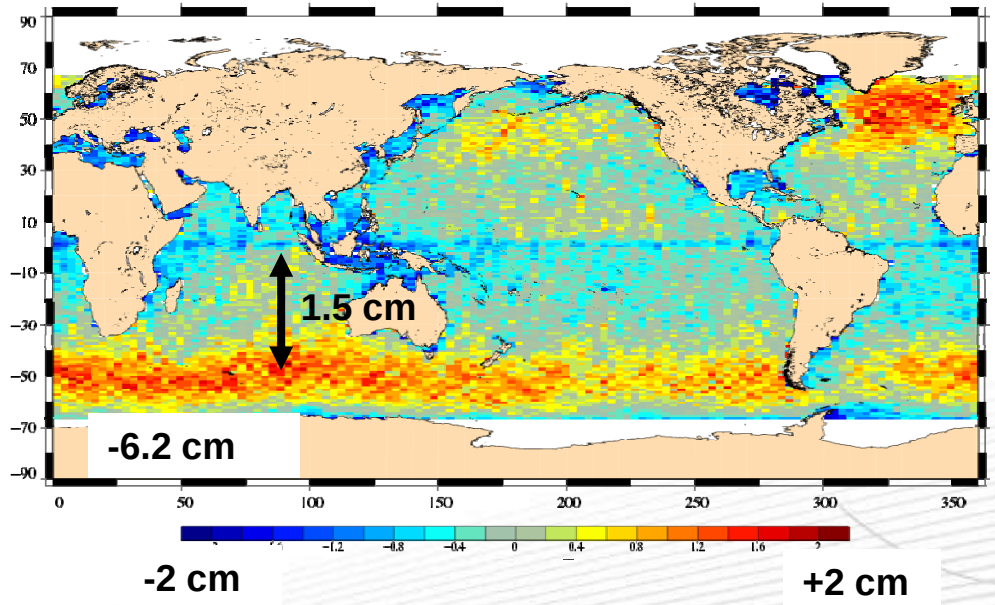
TOPEX and Jason-1 cross-calibration



TP-J1 analysis
Orbit-Range-MSS (No SSB)
Jason-1 verification phase (Cycles 1 – 21)

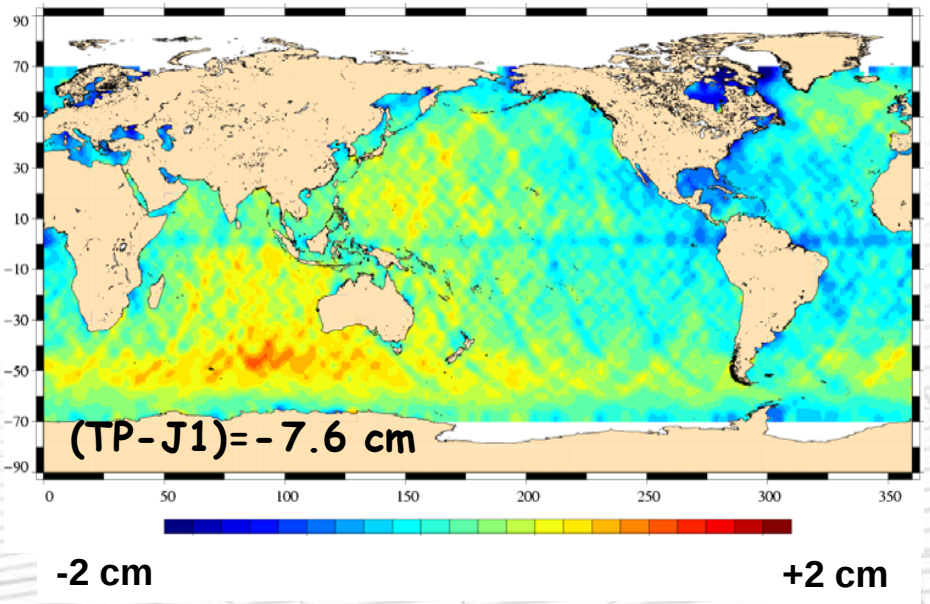
2007 results = J1 and TP were in very good agreement without correcting for SSB (east-west bias due to orbit error). Both missions need the same SSB model.

2009 results = J1 and TP show differences correlated with sea state. Both missions need different SSB models.



TP-J1 2009

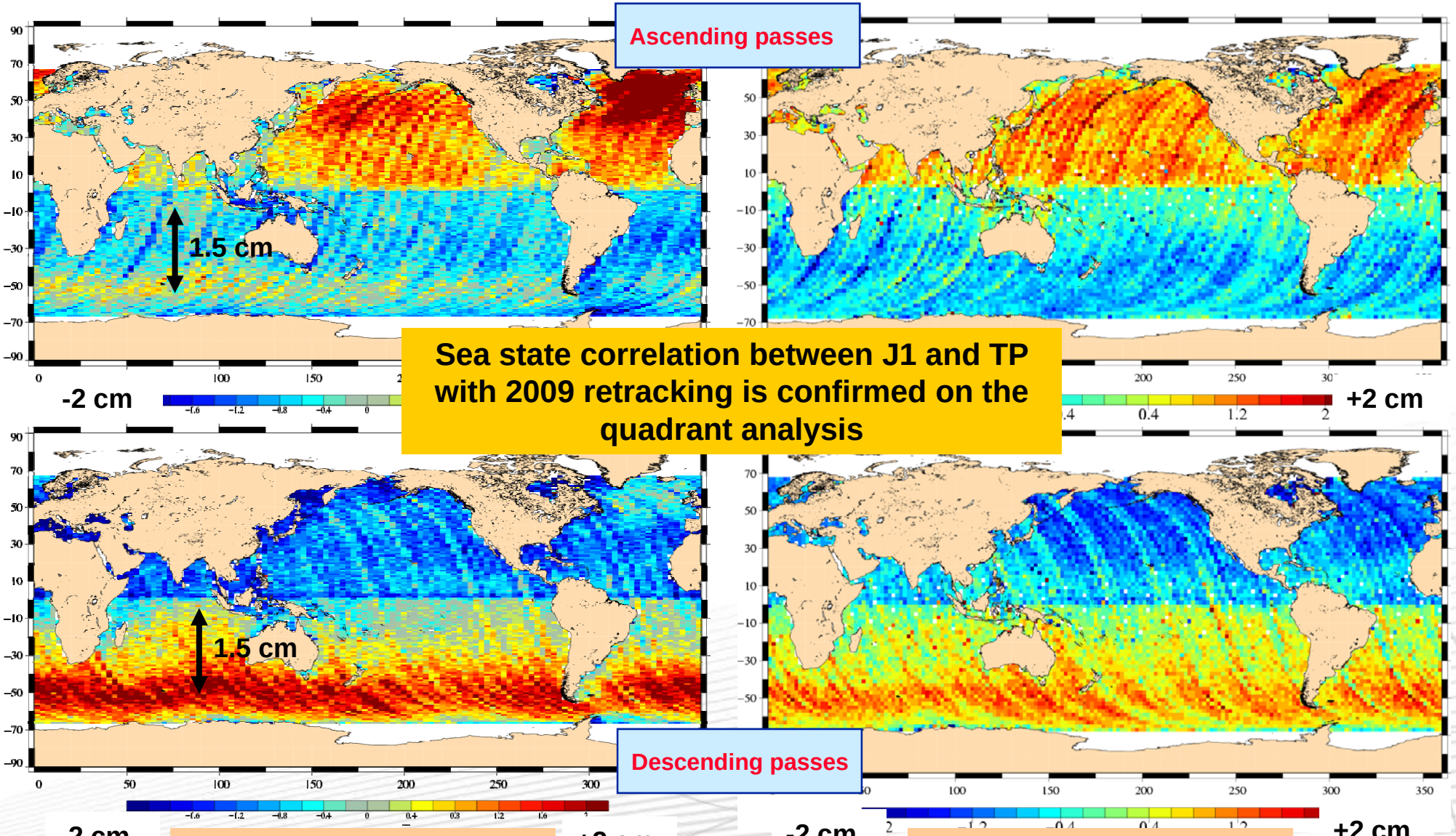
Orbits : GSFC 2008 (TP) / GDR-C (J1)



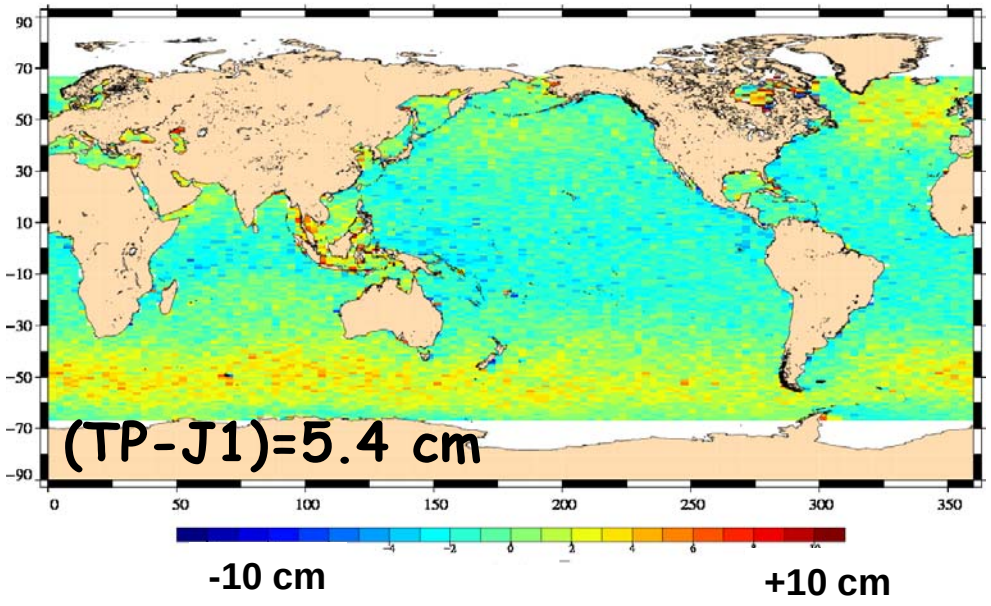
TP-J1 2007

Orbits : GSFC 2006 (TP) / GDR-B (J1)

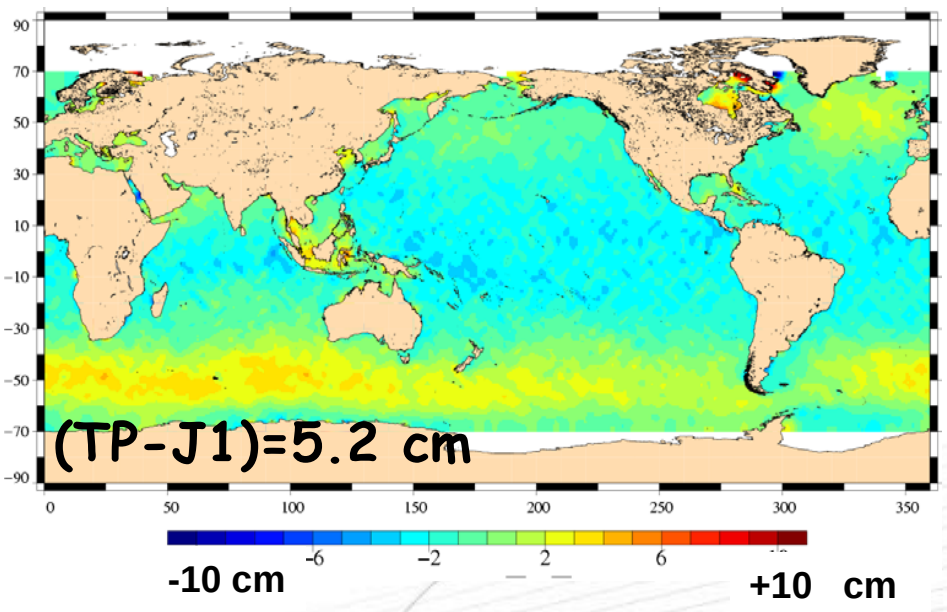
Orbit-Range-MSS (quadrants), Cycles 1 – 21



TP-J1 SWH, Cycles 1 – 21



TP RGDR 2009/J1 GDR-C

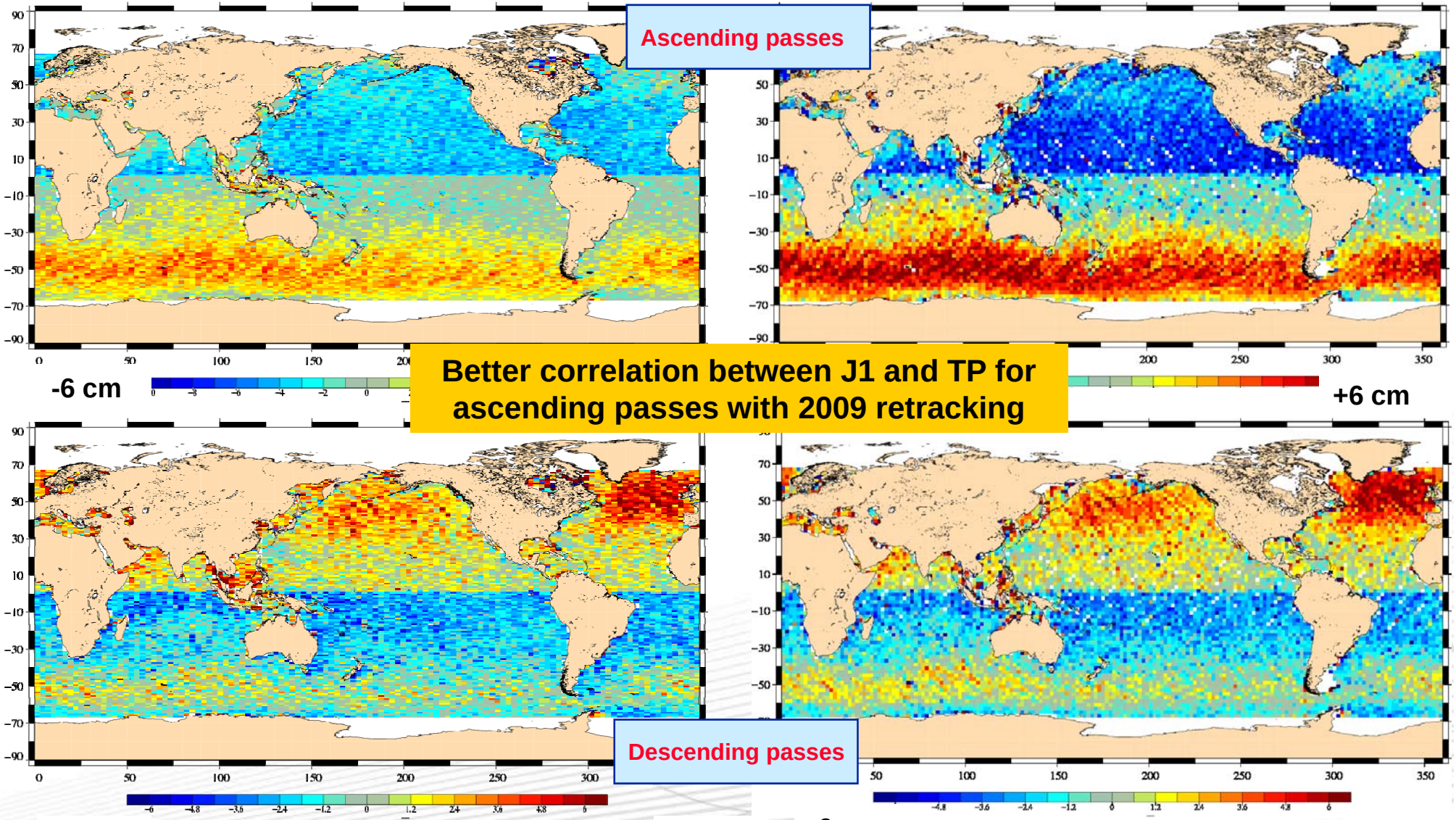


TP RGDR 2007/J1 GDR-B

Same behavior between 2007 and 2009 results

J1 and TP show a very good agreement for SWH

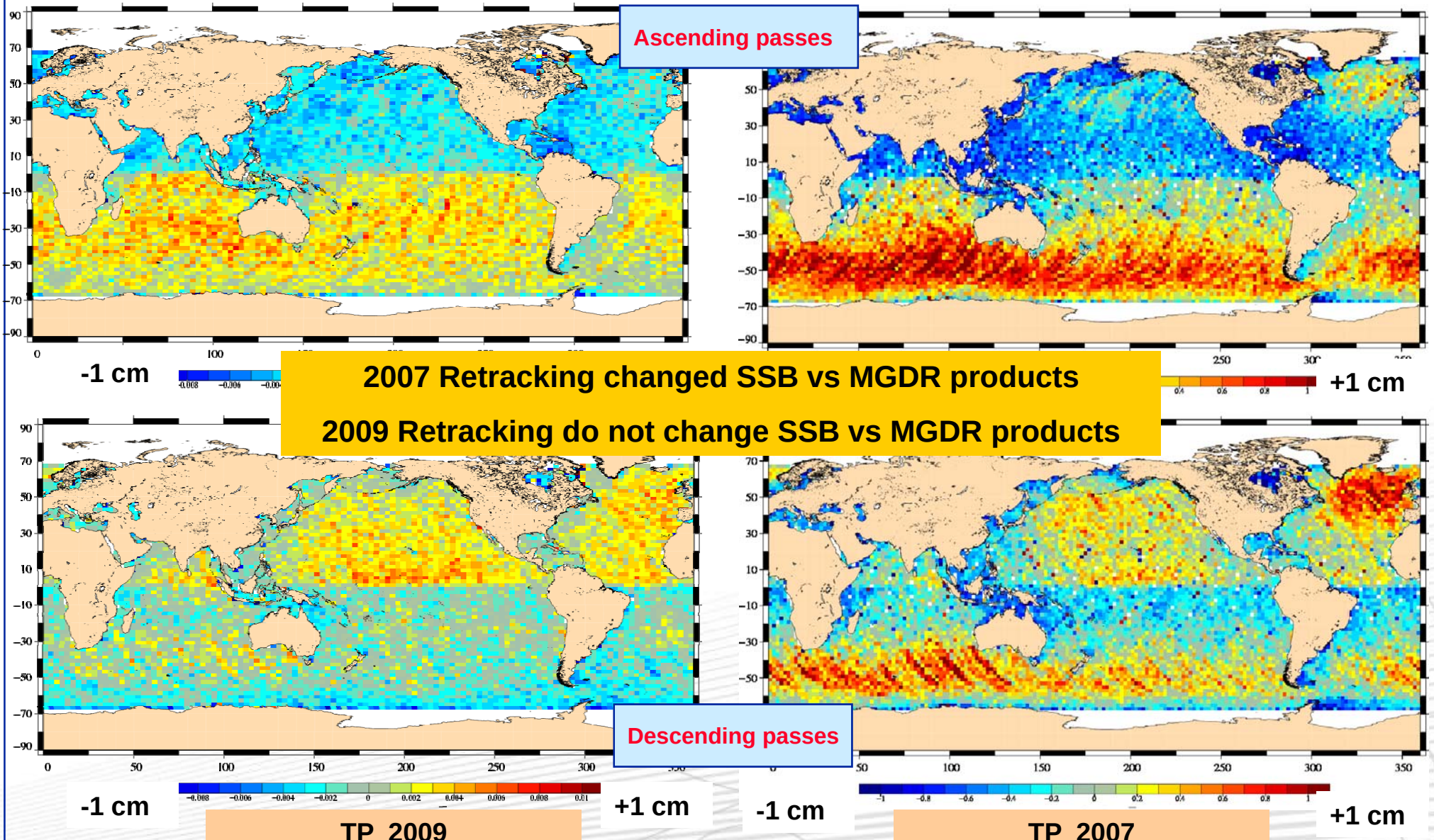
TP-J1 SWH, Cycles 1 – 21



1- Non Regression

RGDR and MGDR comparison

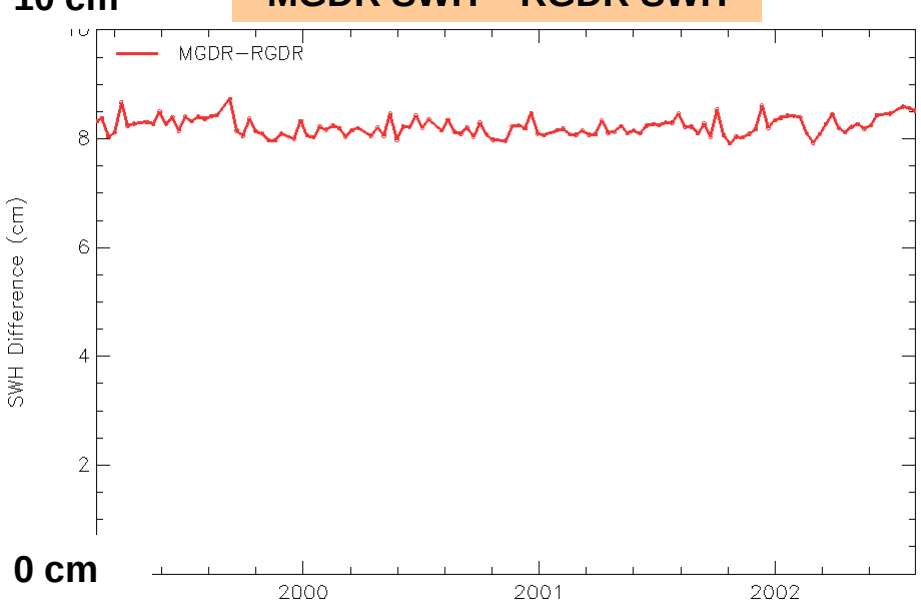
TP RGDR Range – TP MGDR Range (Ku Band) Cycles 344-364



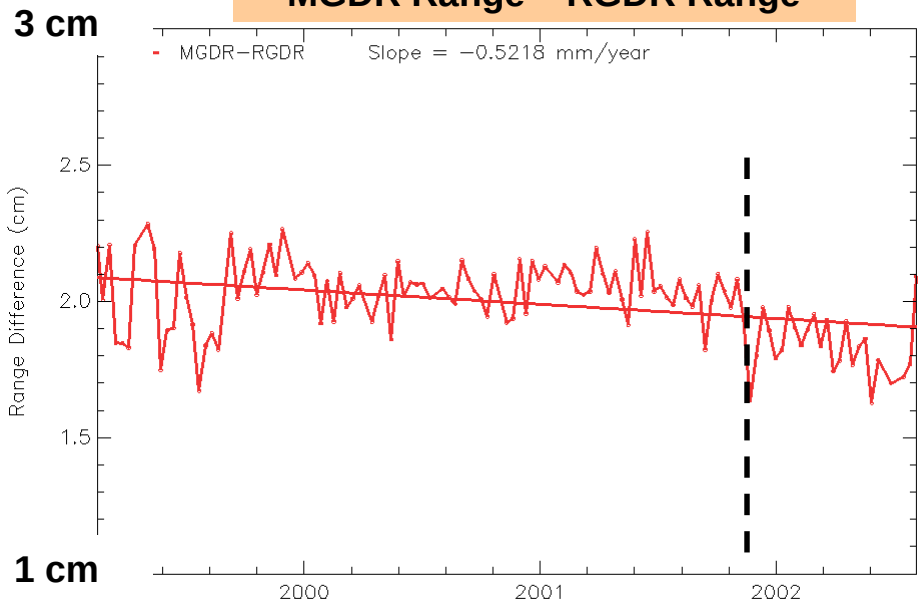
2 - Time series analysis

Side B time series

MGDR SWH – RGDR SWH



MGDR Range – RGDR Range

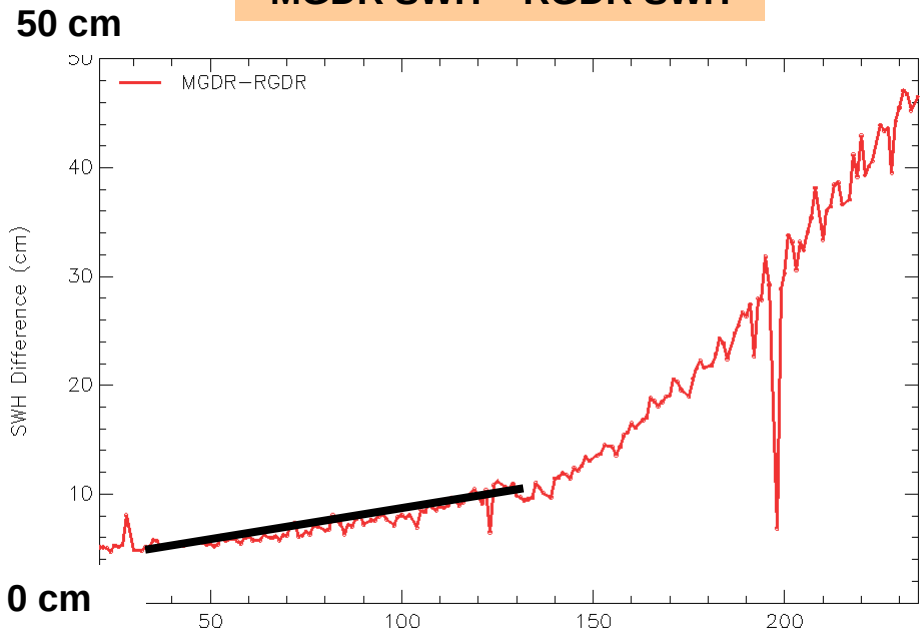


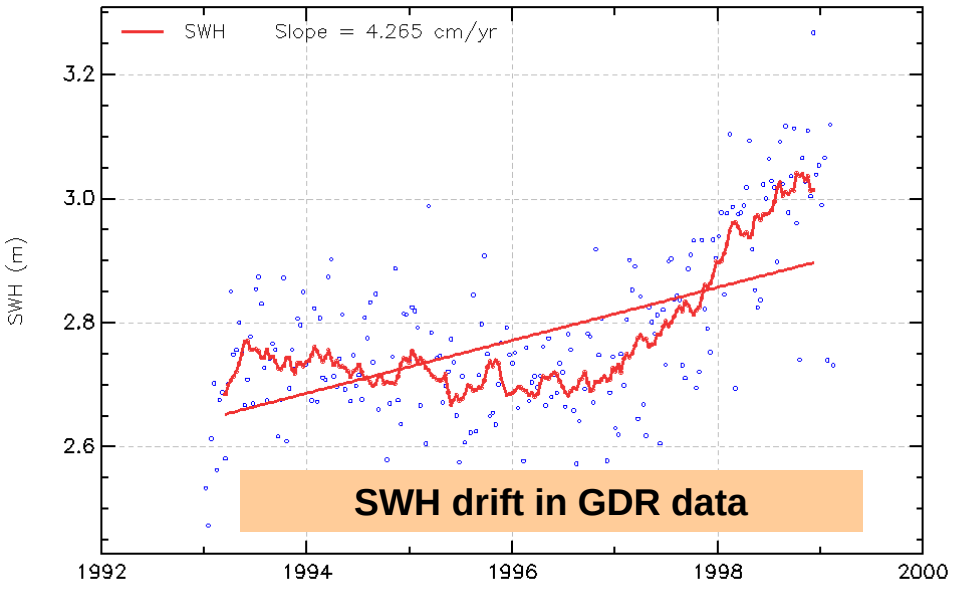
Side B altimeter is known to be very stable. 2009 retracking should not change the range and SWH stability. Results show:

- a constant bias of 8 cm on SWH => OK
- a constant bias of 2 cm on the range + linear trend during 2002 => 2002 trend is dubious. It makes a global trend of -0.5 mm/year

Side A time series

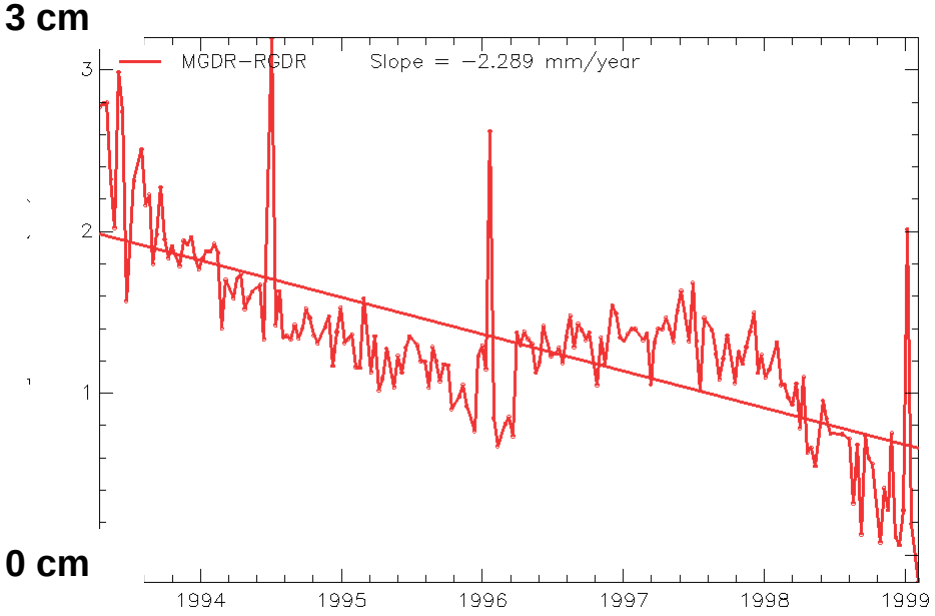
MGDR SWH – RGDR SWH





SWH drift in GDR data

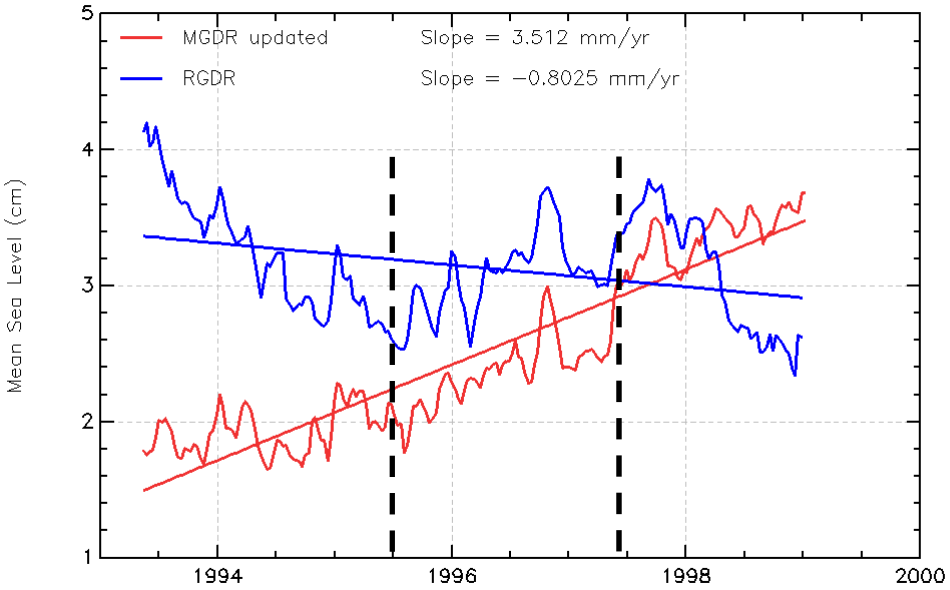
MGDR Range – RGDR Range



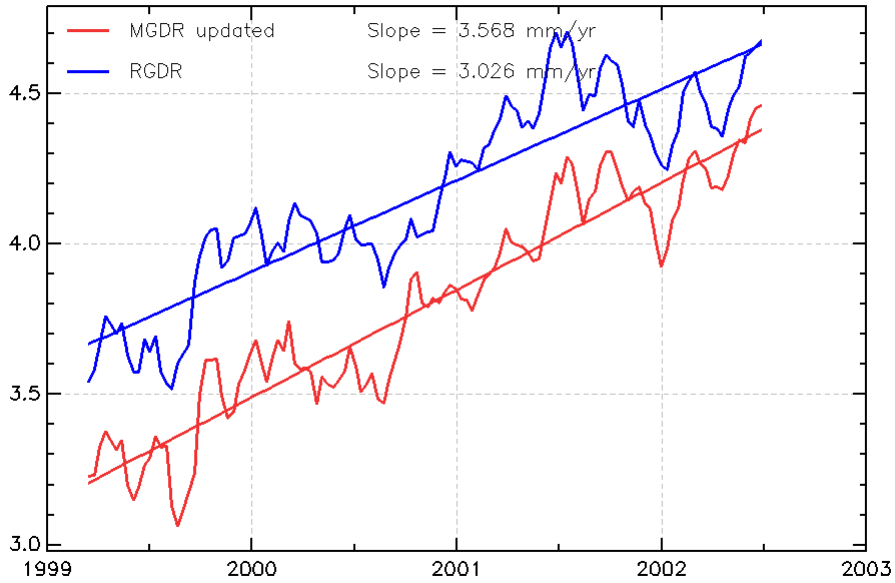
- Retracking has well captured PTR drift at the end of side A altimeter for SWH. The positive trend present between 1993 and 1997 has to be confirmed
- The range analysis suggest a bad handling of the PTR at the beginning of side A. The global trend is of -2.3 mm/year.

Mean Sea Level Analysis

Side A MSL



Side B MSL



Careful assessment of the PTR correction needs to be performed on the SSH (including PTR corrections on range and SWH (through SSB)). A SSB has been estimated on RGDR products for each altimeter.

• Side B MSL with RGDR data presents a trend lowered by 0.55 mm/year which is significant for MSL studies. We are more confident in MGDR MSL since side B is very stable (validated against in situ data and Jason-1 data)

• Side A MSL with RDGR shows strong discrepancy with respect to MGDR MSL. RGDR exhibits a false curve and trend (-0.8 mm/year!!!!). The main differences appear at the beginning and the end of the time series.

Conclusions

- Non regression results

  Comparisons with MGDR and Jason-1 data show that 2009 RGDR products are different from 2006 and 2007 releases
  - 2009 retracking do not change Range/SWH correlation. The 2009 SSB is the same than the SSB correction derived from MGDR data. The 2009 SSB is no more in agreement with Jason-1 SSB.
  - This change in SSB behavior clearly evidences that the Topex retracking changes the Topex tracker bias

- Analysis of the side A time series
  - The PTR drift appears to be well corrected for SWH but not for the range measurement.
  - The MSL trend obtained with 2009 RGDR is false with a negative trend of -0.8 mm/year.

- Analysis of the side B time series
  - SWH OK
  - Strange trend on the range on the year 2002
  - The MSL trend obtained with 2009 RGDR is of 3 mm/year, which makes a difference of 0.6 mm/year compared to MSL obtained with MGDR data. This discrepancy is significant since side B altimeter is known to be very stable (calibration with tide gauges, comparison with Jason-1)

Recommendations

- From the presented results, 2009 RGDR release is not recommended for MSL studies, especially the side A time series
  - These results should be confirmed by other teams (global CalVal and calibration with in situ data)
  - The only way to validate the PTR correction is to recompute the whole time series on side A

- Further work is needed on Topex retracking
  - Change in the SSB behavior is of minor impact (leaving aside our understanding about tracker bias issue…) since it can be corrected by a suitable SSB correction
  - Correcting for PTR drift is a critical issue since MSL studies are very sensitive to the PTR variations included in the retracking processing
  - PTR drift also impacts the sigma0 and thus the MSL trend (by way of wind speed and SSB correction). The sigma0 is not corrected in the RGDR data. Even this error is of second order compared to range error and SWH error (0.2 dB drift = 1 mm/year error on MSL), efforts should be done in the view of a final Topex reprocessing.