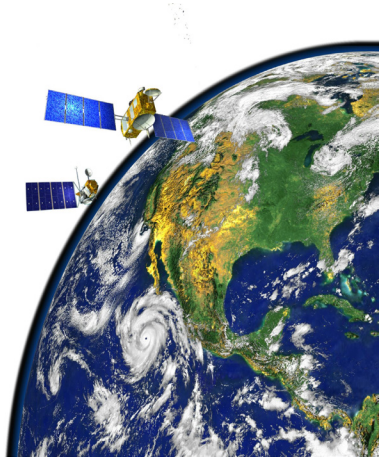
On the “cal mode” correction to TOPEX altimetry and its effect on the global mean sea-level time series

B.D. Beckley
SGT Inc., NASA/GSFC Greenbelt, MD, USA

R.D. Ray
NASA Goddard Space Flight Center, Greenbelt, MD, USA

G. T. Mitchum
University of South Florida, St. Petersburg, FL, USA

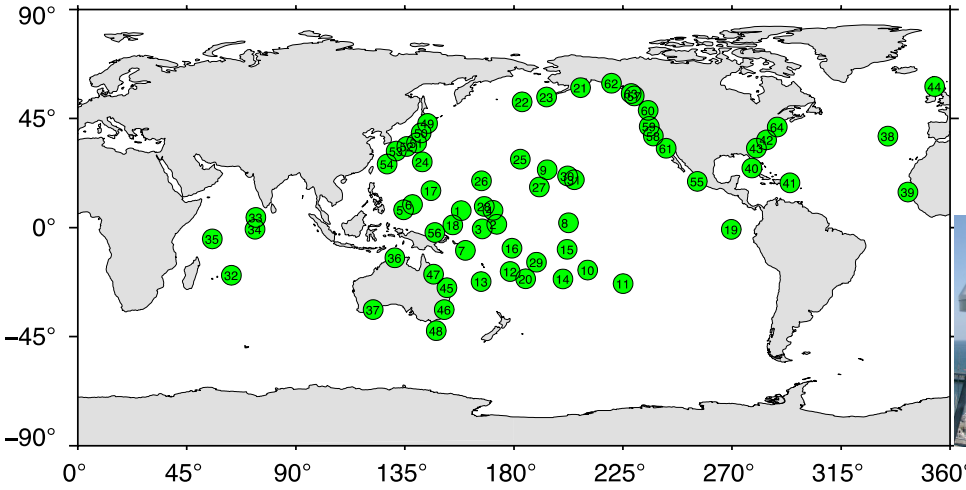
D. Hancock
NASA Wallops Flight Center, Wallops Island, VA, USA



Ocean Surface Topography Science Team Meeting, La Rochelle, France, Nov. 01-04, 2016

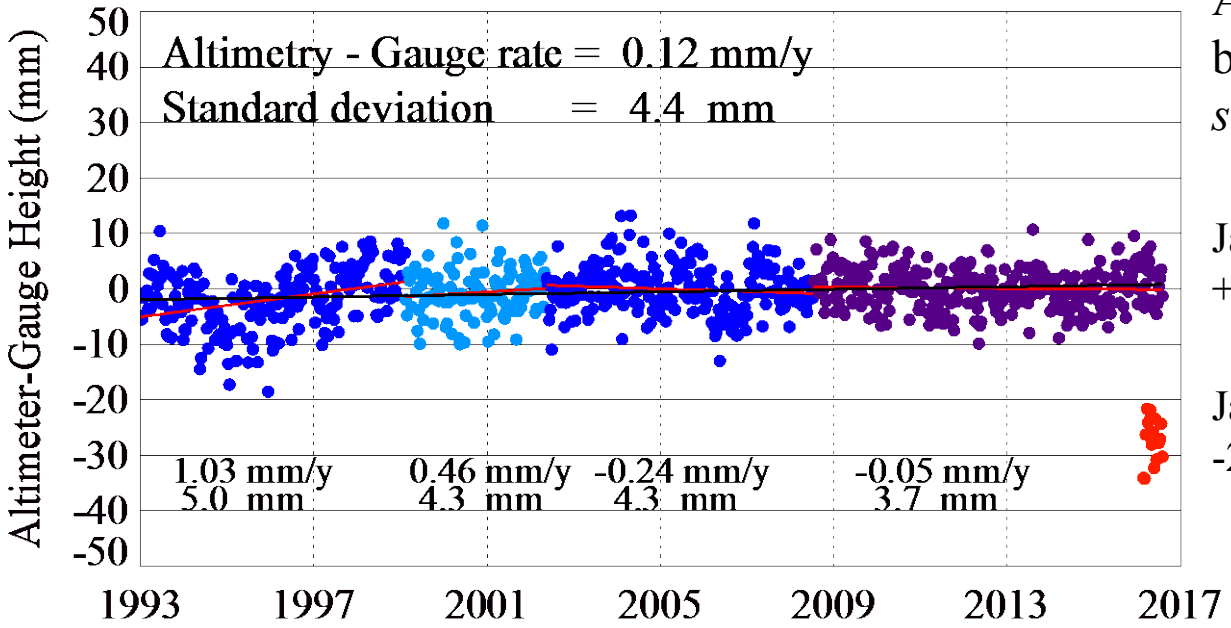
Tide Gauge Verification

Assessing altimeter stability and estimating inter-mission biases



G. Mitchum's 64-station network selection.

Vertical land motion estimates based on ULR5.

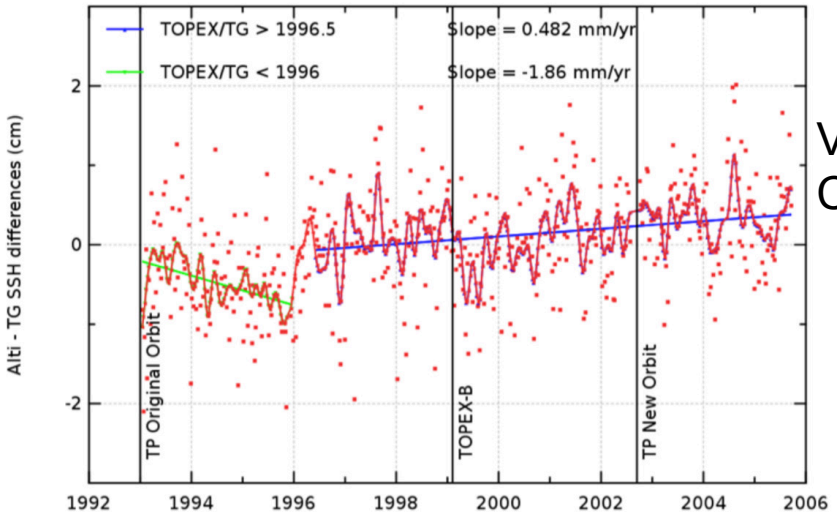


Altimeter sea surface height based on GSFC *std1504_itrf2014* orbit.

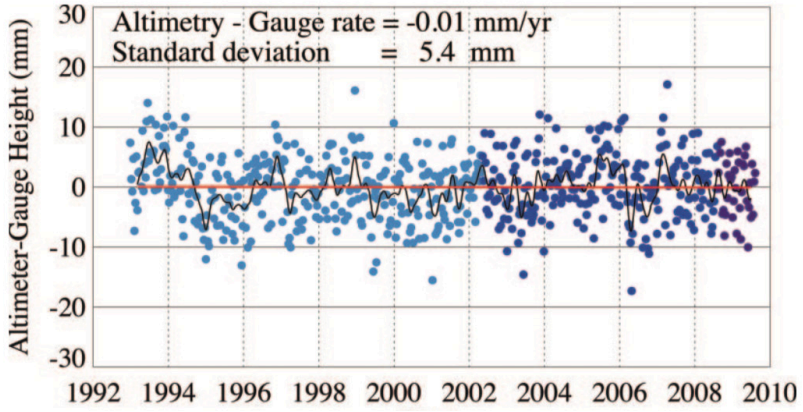
Jason-2 cycles 281-297
+0.9 ± 3.8 mm

Jason-3 cycles 01-17
-27.4 ± 4.0 mm

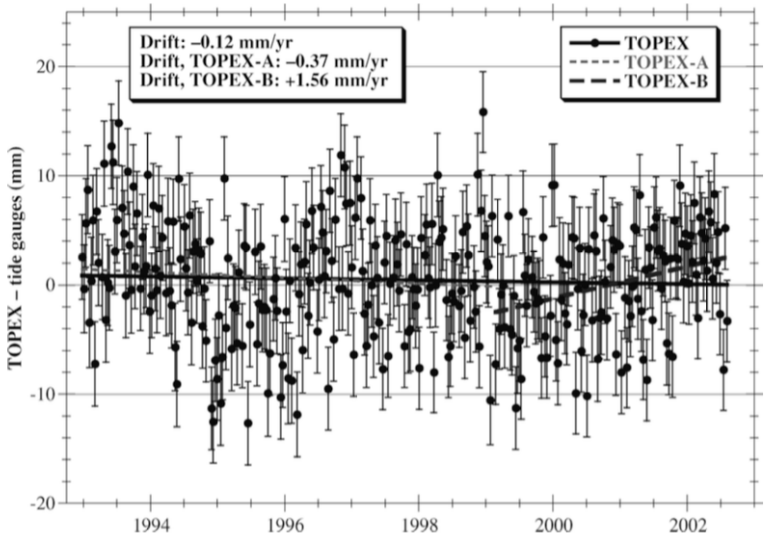
Earlier suggestions of a TOPEX problem



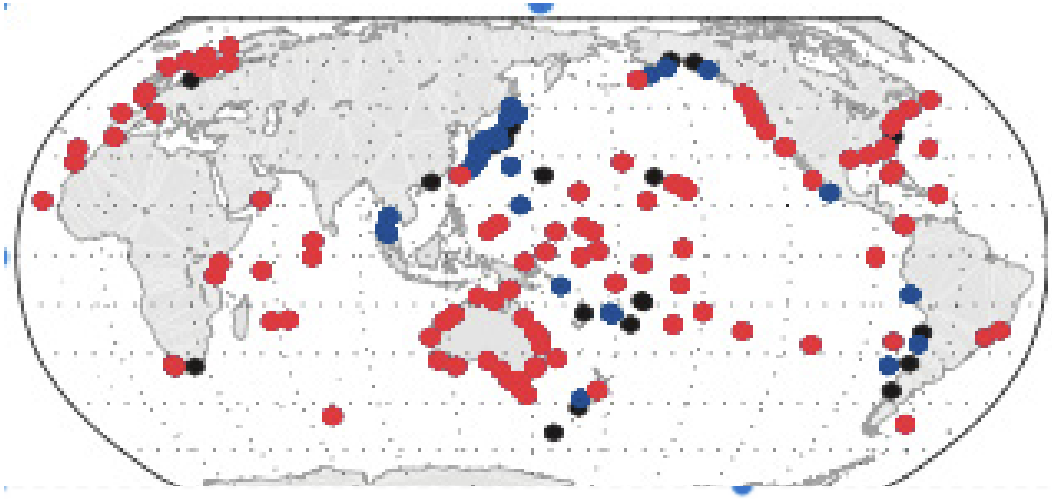
Valladeau & Ablain,
CLS cal/val report, 2010.



Beckley et al., Marine Geodesy, 2010



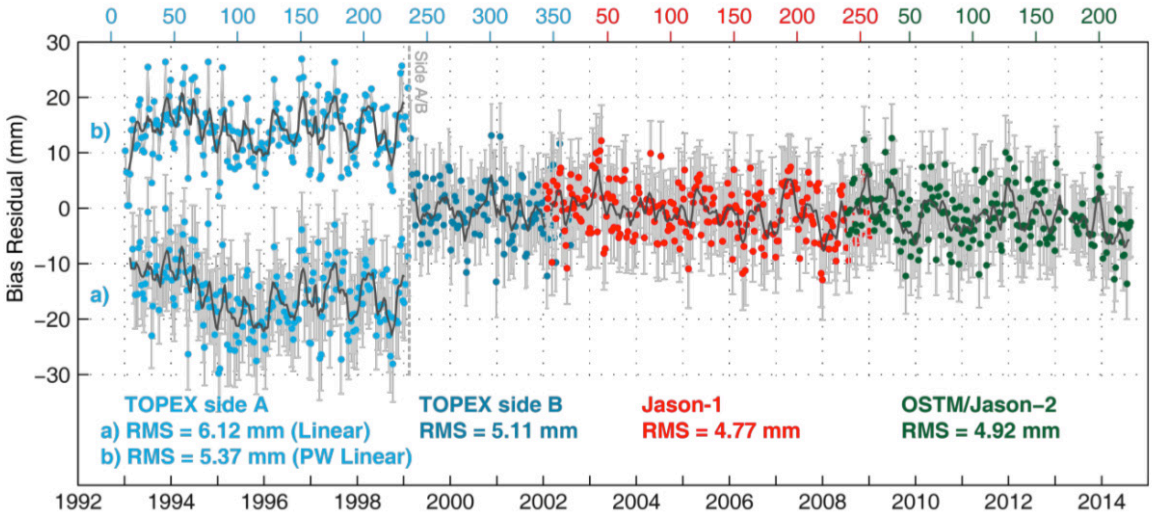
Leuliette et al., Marine Geodesy, 2004



Watson et al, 2015 points out difficulties in aligning TOPEX Sides A/B. Computed drift bias adjustments to altimetry based on tide gauge comparisons.

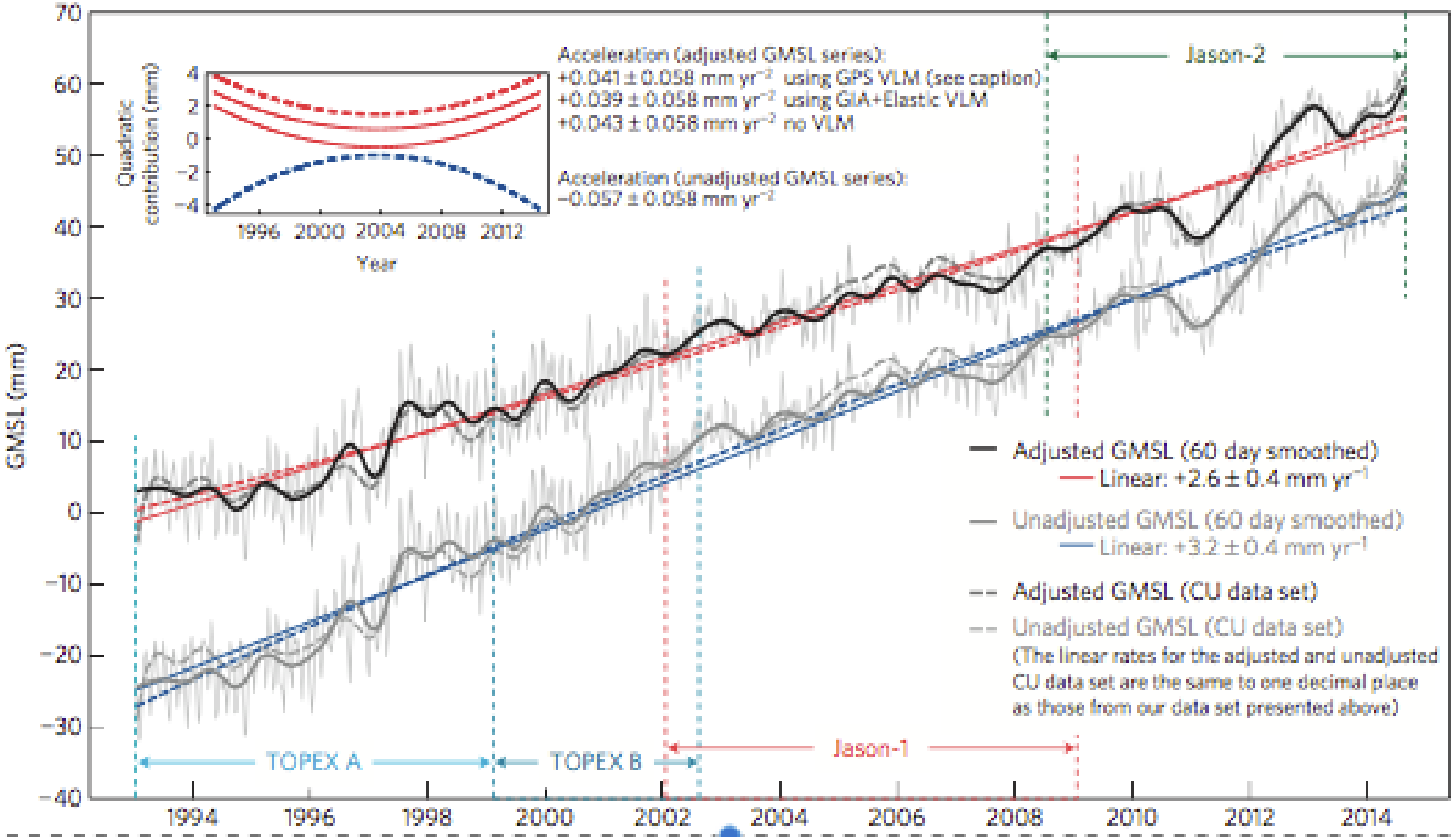
TG Location	Bias Drift (mm/yr)				Adjusted GMSL (mm/yr)
	TOPEX side A	TOPEX side B	Jason-1	OSTM/Jason-2	
Island Only	1.69 ± 0.69 (39)	-0.01 ± 1.20 (40)	0.84 ± 0.65 (41)	+0.00 ± 0.69 (40)	+2.5 ± 0.6
Continental Only	1.07 ± 0.73 (51)	2.90 ± 1.49 (55)	-0.35 ± 0.49 (60)	-0.06 ± 0.58 (50)	+2.5 ± 0.6
All	**1.49 ± 0.49 (90)**	**0.93 ± 0.92 (95)**	**0.42 ± 0.41 (101)**	**-0.02 ± 0.44 (90)**	**+2.6 ± 0.4**

Tide gauge comparison shows TOPEX with V-shaped drift.



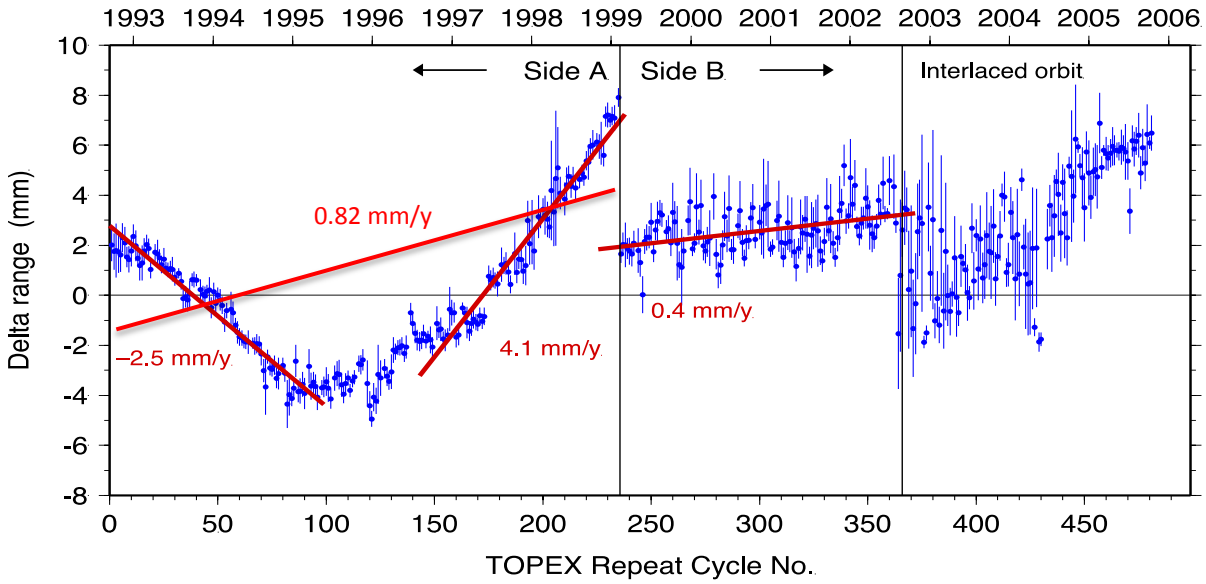
“Adjusted” Global Mean Sea Level estimate 1993 - mid 2014

Is GMSL overestimated by 0.6 mm/y ?



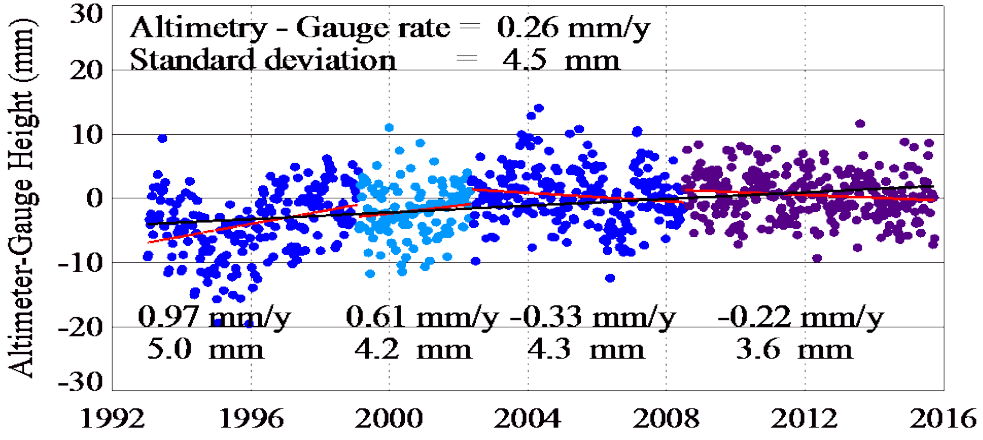
Watson et al.,2015

Cal-1 calibration mode designed to detect internal electronic path delays which would directly translate into errors in range.

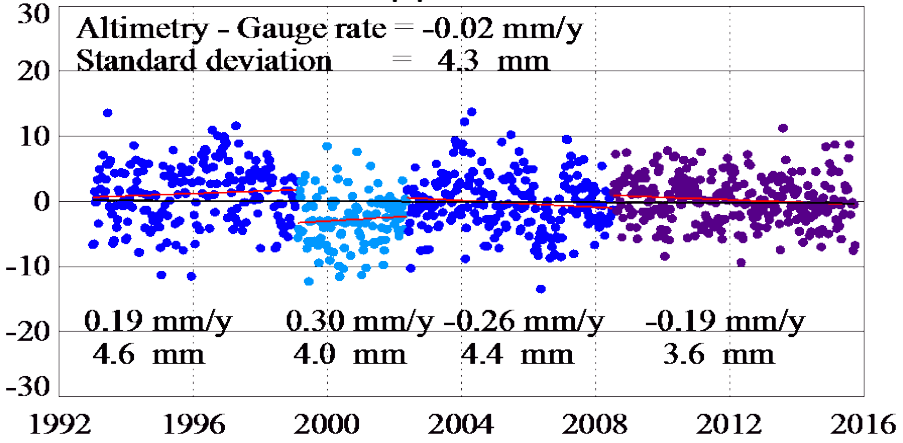


WFF cal1-mode correction applied to MGDR_B TOPEX range via net instrument correction.

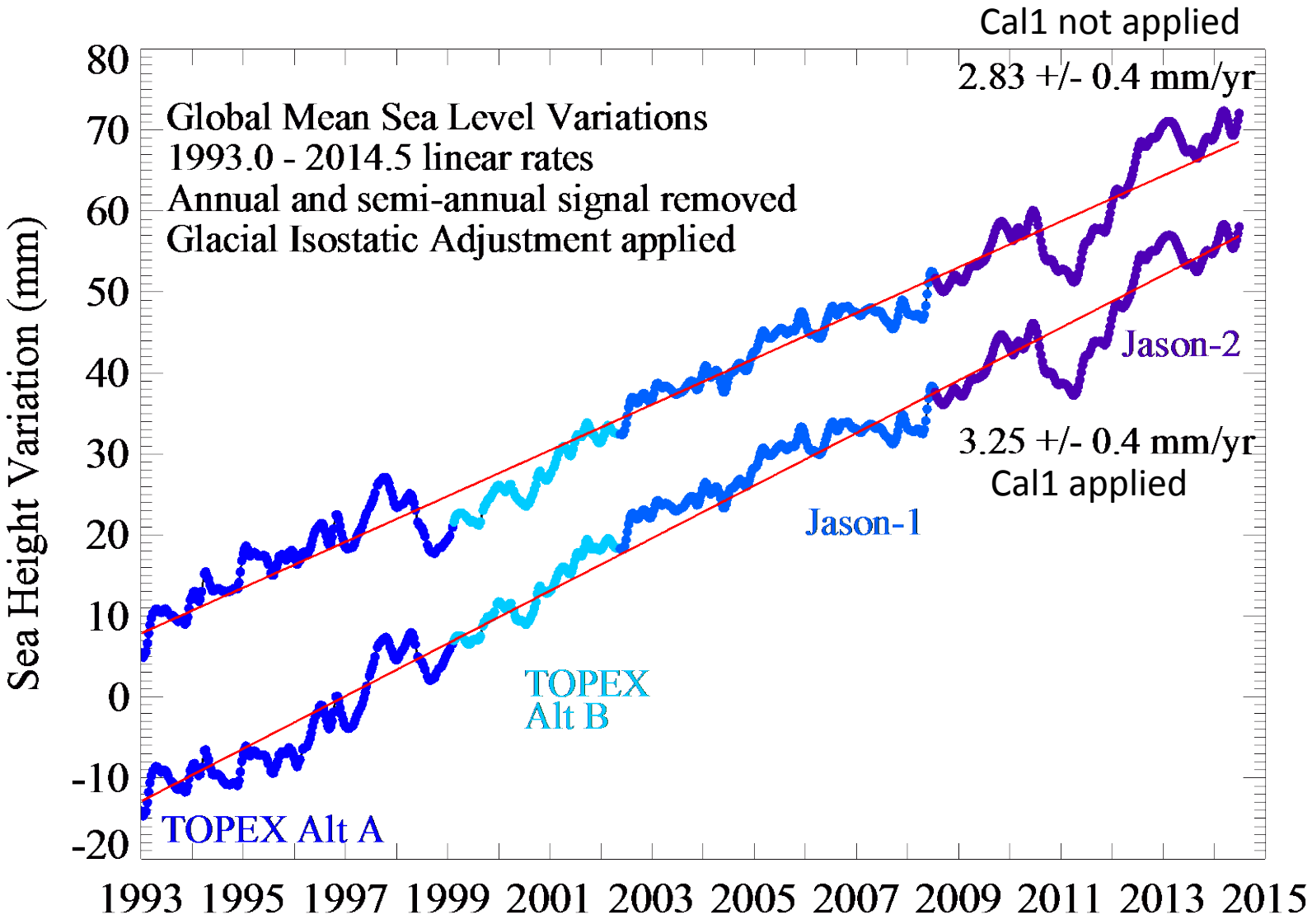
WFF cal1-mode applied to both Side A & B



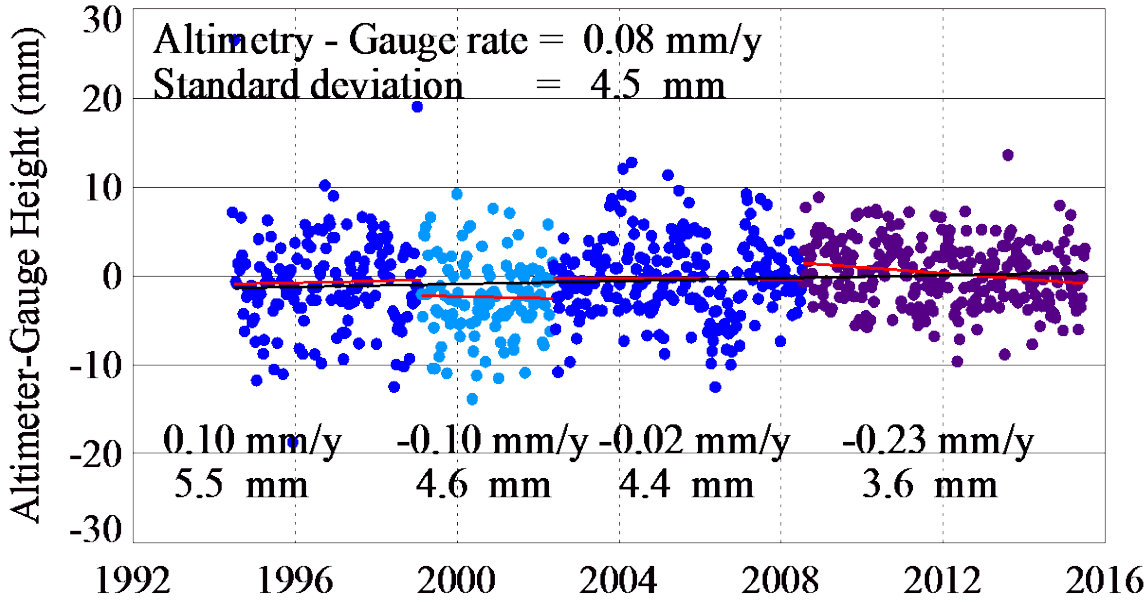
WFF cal1-mode unapplied to both Side A & B



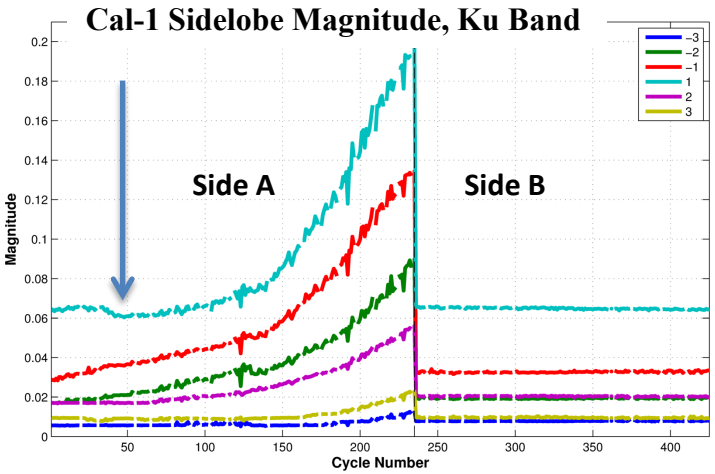
Impact on Global Mean Sea Level time series 1993 – mid 2014



- **How did the degrading Side A PTR (point target response) impact cal-1 mode measurements ?**
- **Can re-tracking mitigate TOPEX Side A/B bias drift issues ?**



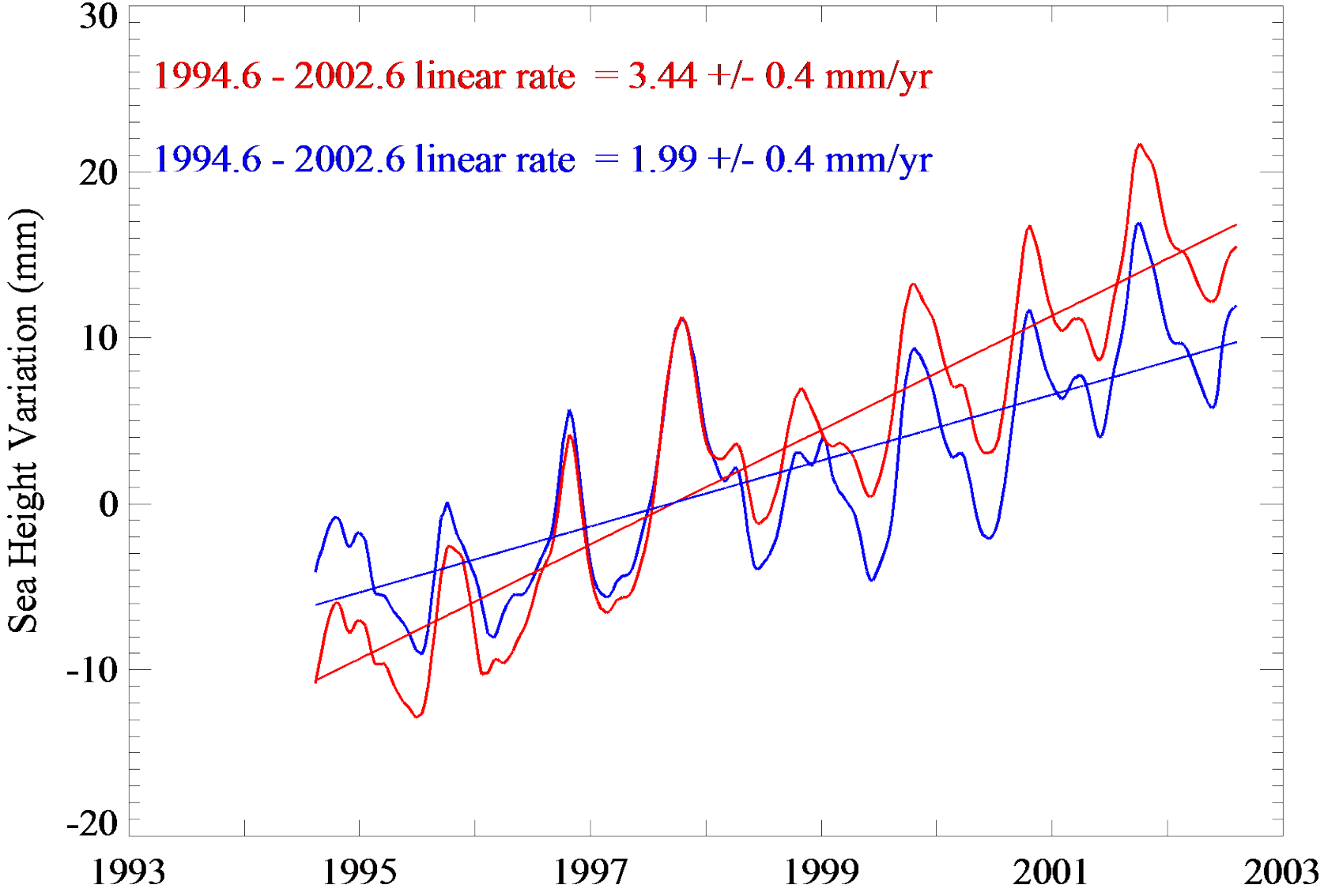
- TOPEX data retracked (version Aug.,2016).
- WFF cal1-mode correction not applied in retracking process
- No external "calibration" A/B bias applied



Changes in sidelobes near cycle 50 (sidelobe +1 drop) seem to produce SSH change in early data.

Anticipating revised TOPEX retracked data with GDR_E standards mid-2017.

Backup


1994.6 - 2002.6 linear rate = 3.44 +/- 0.4 mm/yr
1994.6 - 2002.6 linear rate = 1.99 +/- 0.4 mm/yr
Sea Height Variation (mm)
30
20
10
0
-10
-20
1993
1995
1997
1999
2001
2003