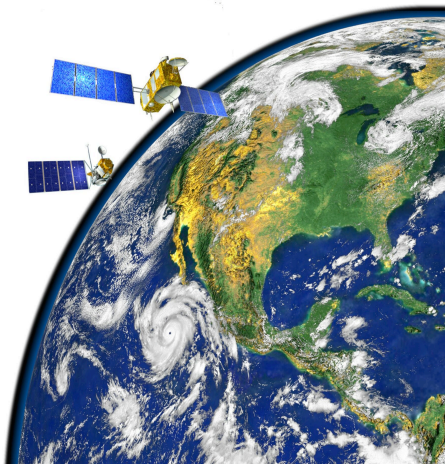
# Assessment of Jason-1 and OSTM Global Verification Phase Sea Surface Height Collinear Residuals

B.D. Beckley, N.P. Zelensky, S. Holmes
*SGT Inc., NASA/GSFC Greenbelt, MD, USA*

F.G. Lemoine, R.D. Ray
*NASA Goddard Space Flight Center, Greenbelt, MD, USA*

S. D. Desai, S. T. Brown
*Jet Propulsion Laboratory, Pasadena, CA, USA*

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



**OSTM Science Working Team Meeting, Seattle, Washington June 22-24, 2009**

# Preview

- Data : OSTM Project GDR cycles 1 -20
- Jason-1 GDR_C cycles 240 -259 with GDR_C JMR replacement product

- Determine Ku and C band range bias from global collinear SSH residuals.

- Isolate and quantify contribution of instrument dependent corrections to SSH bias.

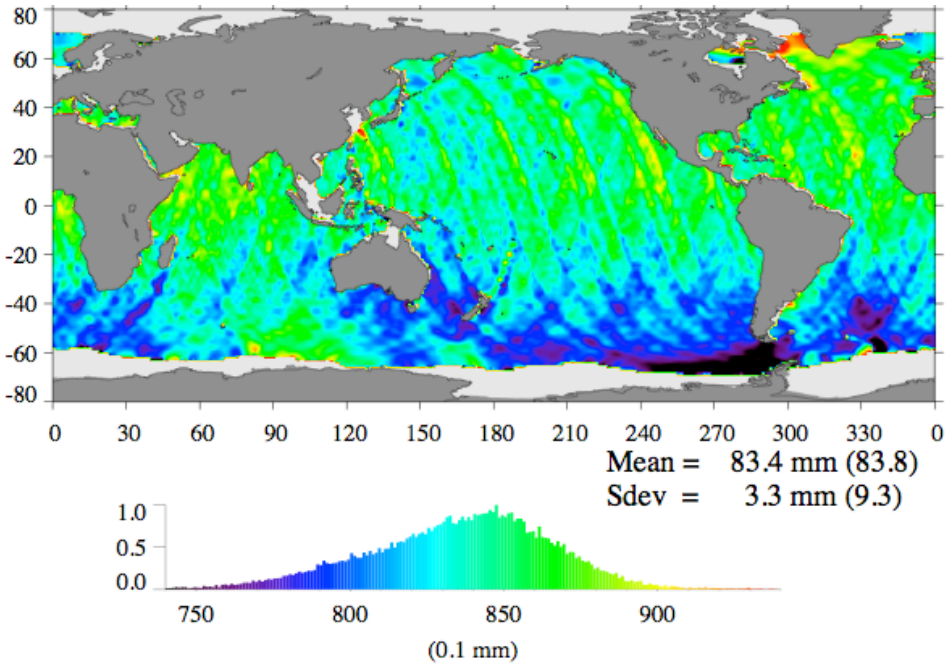
- Impact of GSFC std0905 replacement orbits on bias estimation.

- Inter-mission bias and drift estimates from comparisons with tide gauge network.

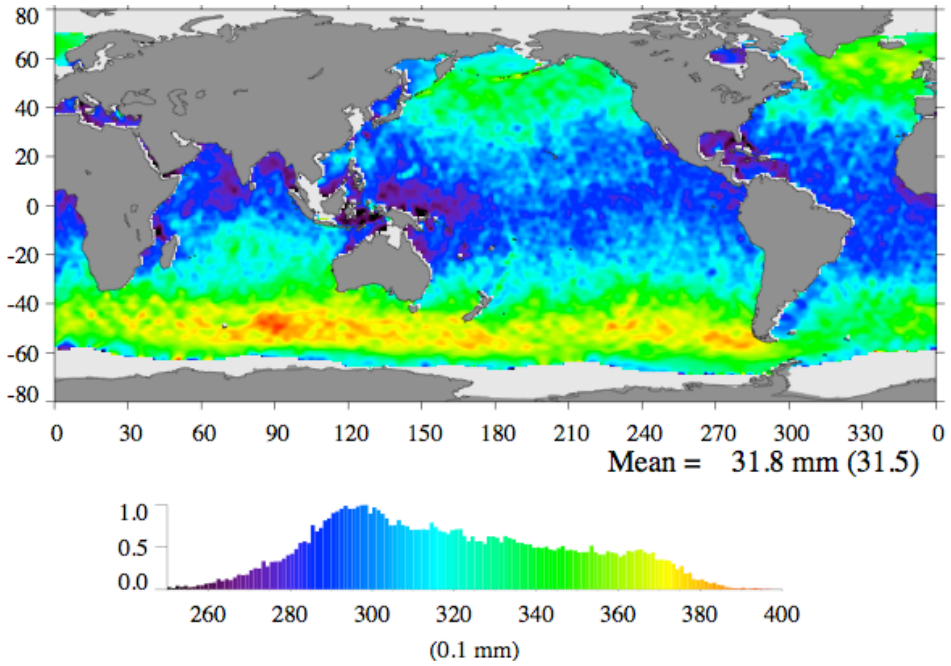
# *Ku Band Sea Surface Height Differences*

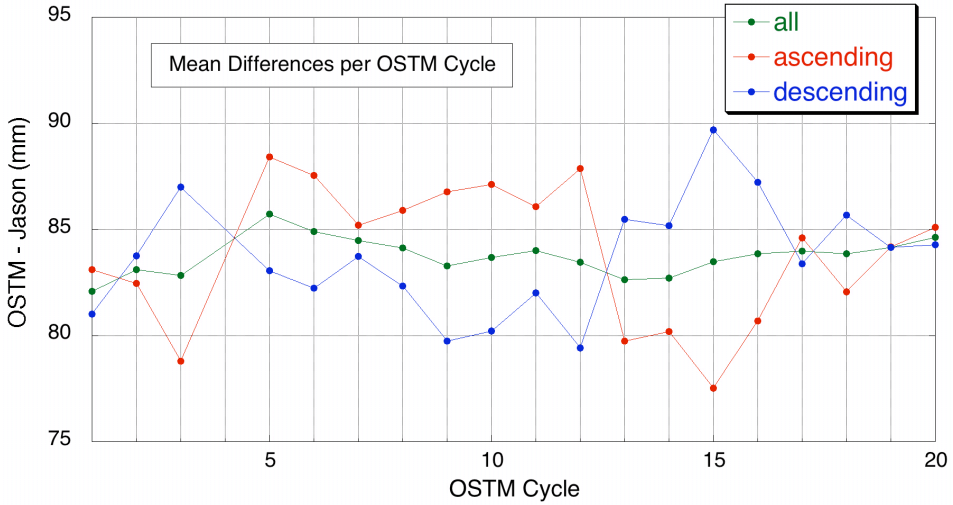
OSTM – Jason-1 Ku Band SSH (cross-track gradient correction only)

Mean




Standard Deviation



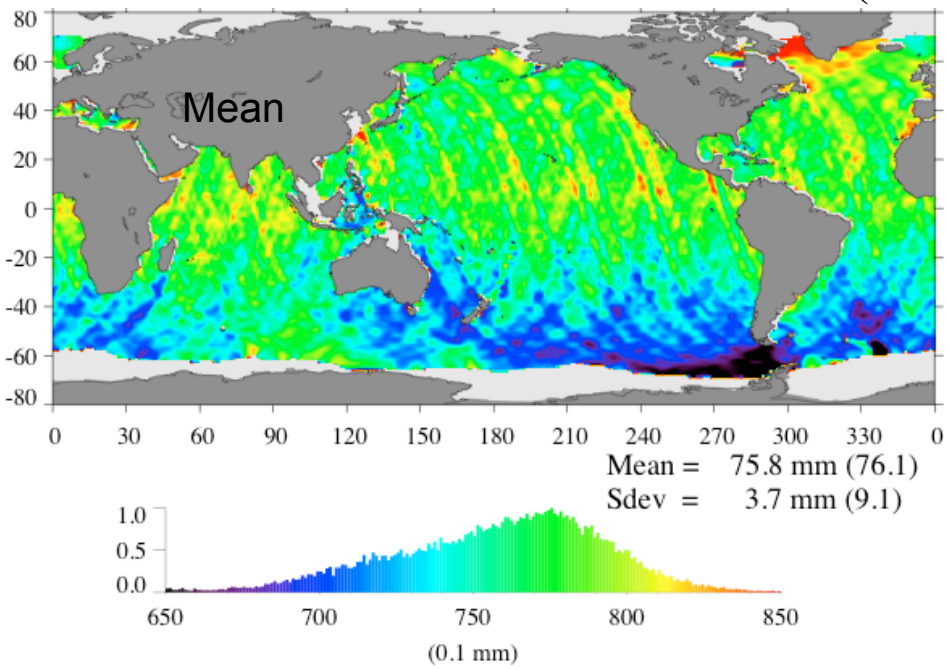



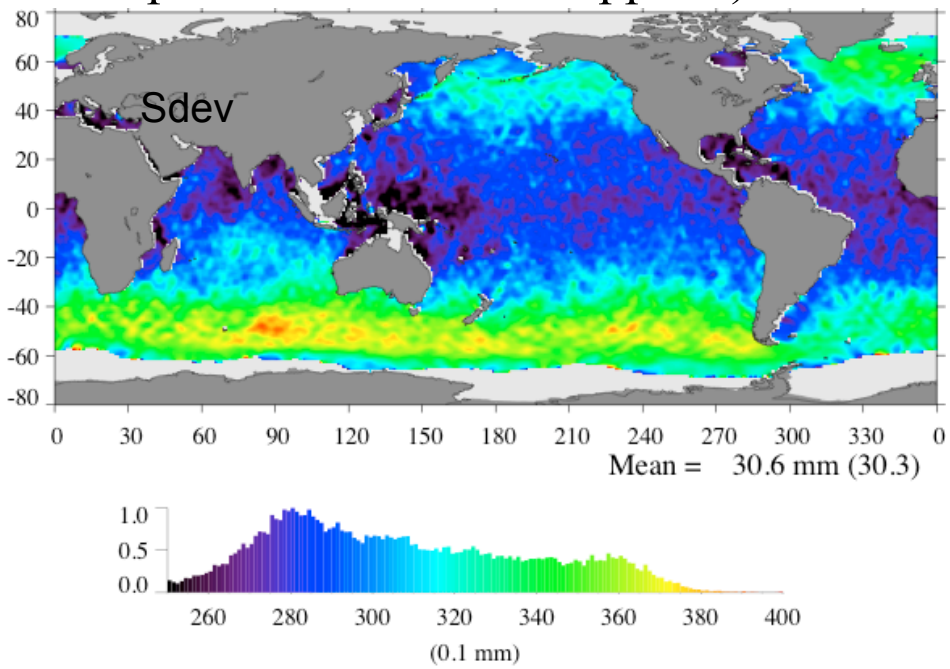

Ku band range bias = 84 ± 9 mm

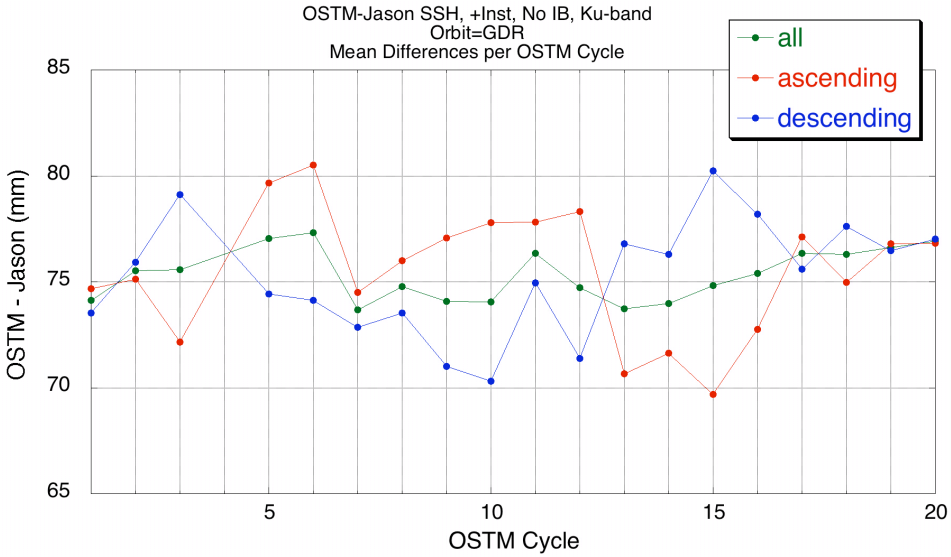
OSTM range measuring short with respect to Jason-1.

# *Contribution of instrument dependent corrections to bias*

OSTM – Jason-1 Ku Band SSH (instrument dependent corrections applied)



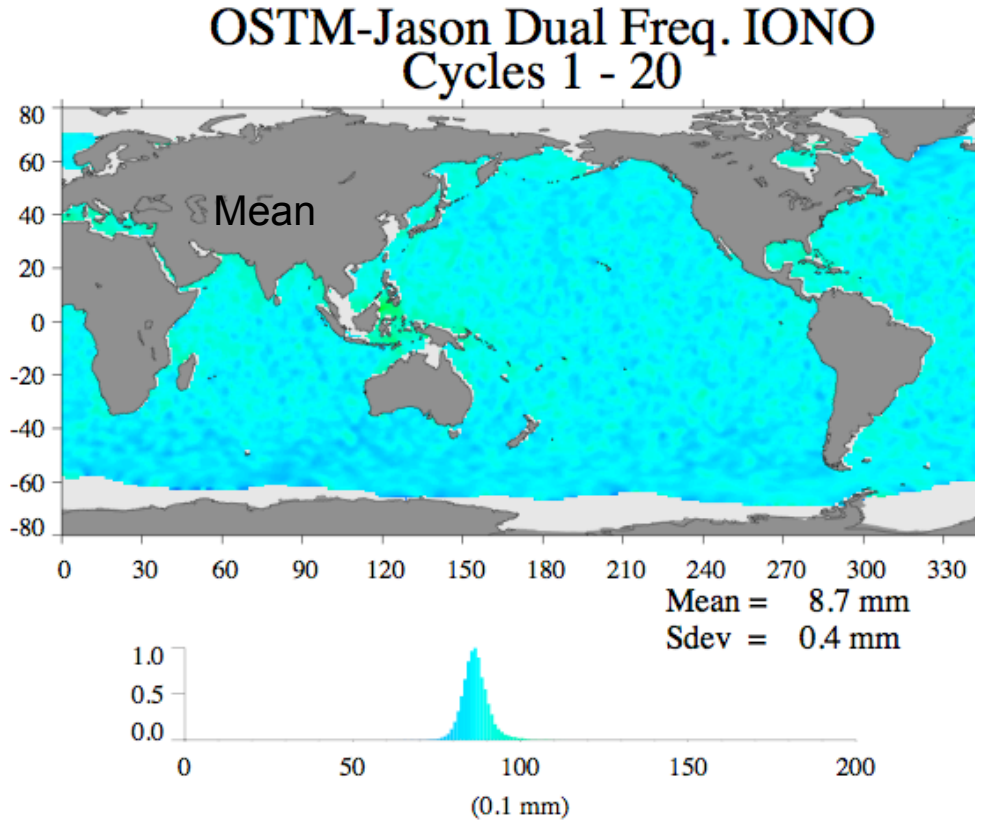



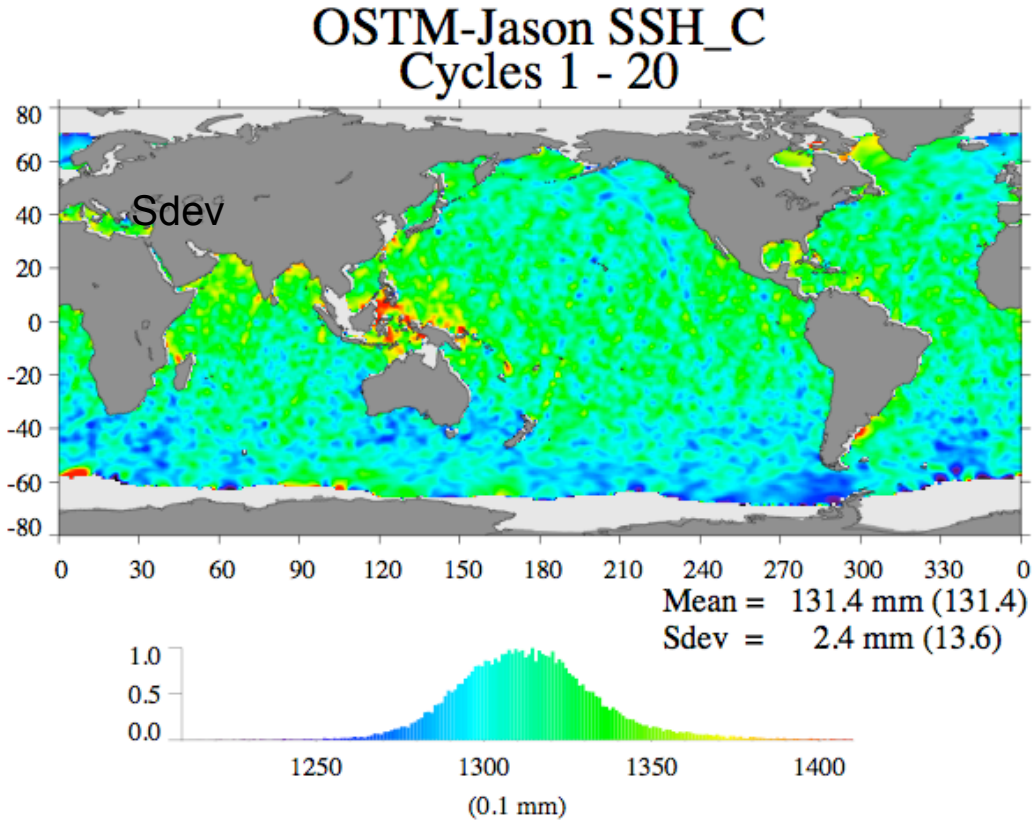



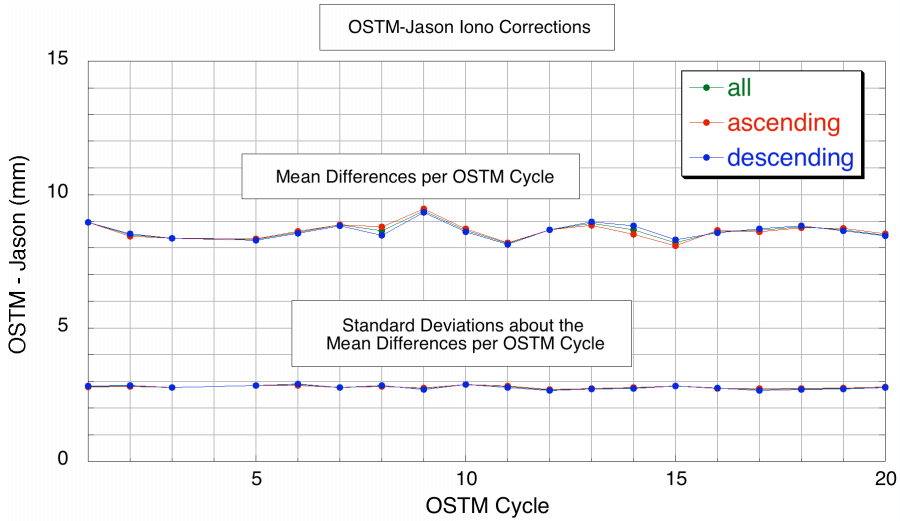

*Instrument dependent corrections contributes < 1 cm. to total OSTM-Jason-1 mean SSH difference.*

# Ku / C Band Range Bias

*Impact on Dual Frequency Ionosphere Correction Bias*



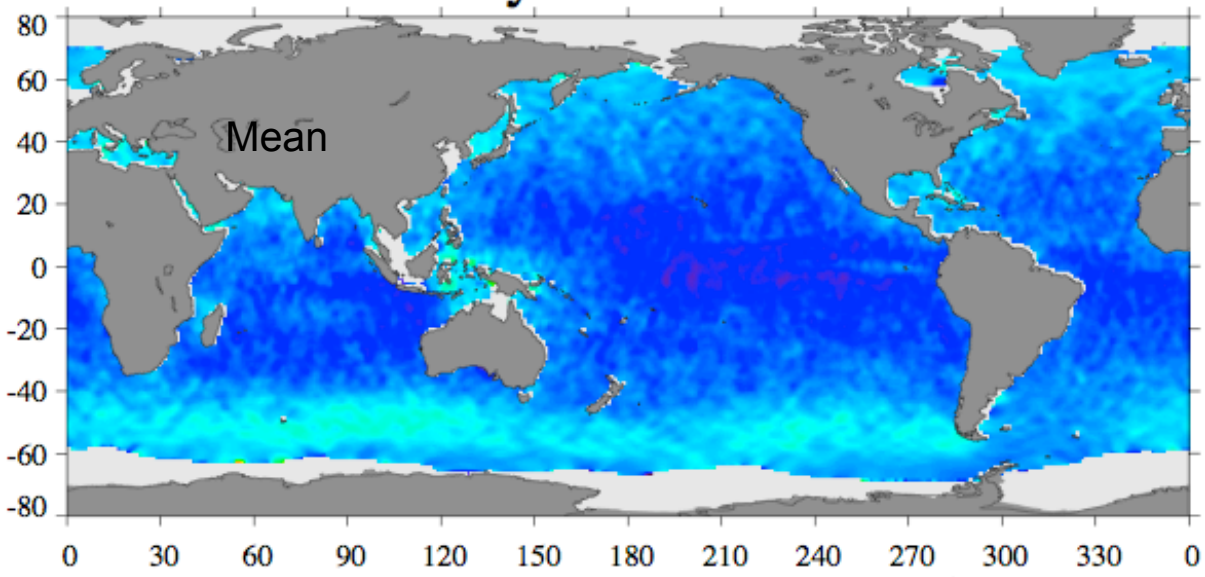



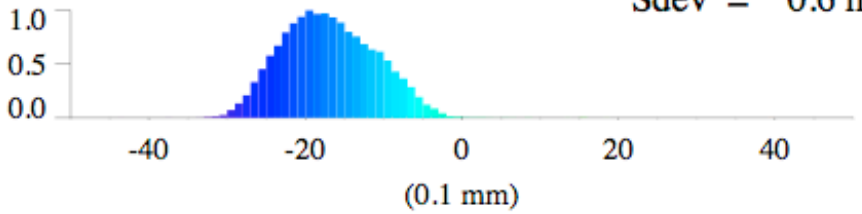

C band range bias = 131 ± 14 mm

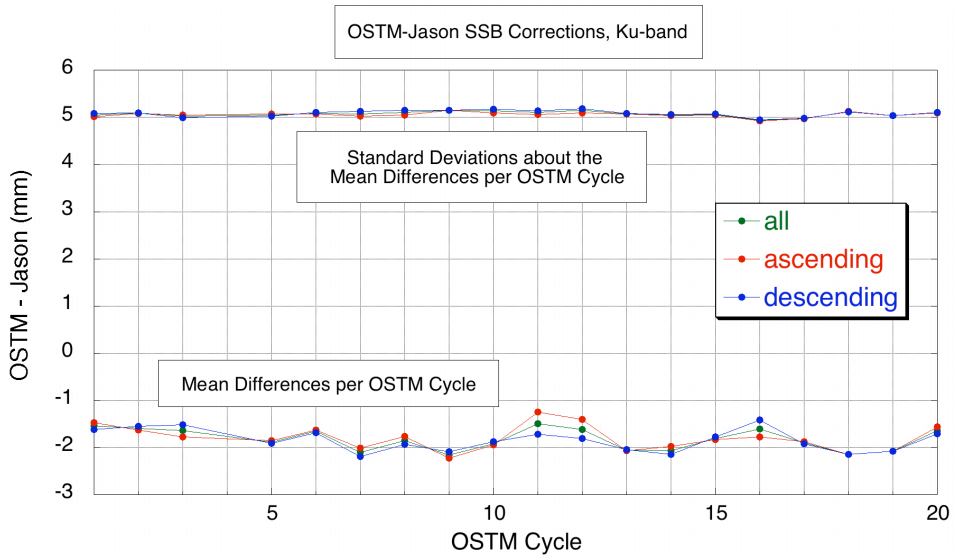
Ionosphere SSH correction bias =
0.1798 * ($R_{Ku}$ bias) - ($R_C$ bias) =
0.1798 * ((-83.4mm) – (-131.4mm)) = 8.6 mm
OSTM Iono = J1 Iono + 8.6 mm

# OSTM-Jason IEMBK
# Cycles 1 - 20



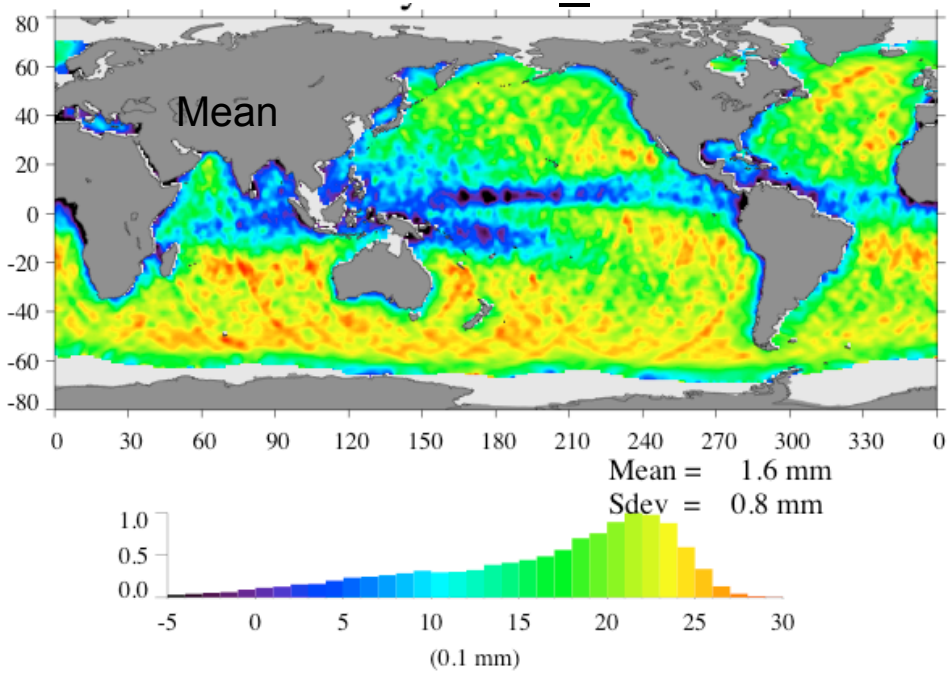

Mean = -1.7 mm
Sdev = 0.6 mm



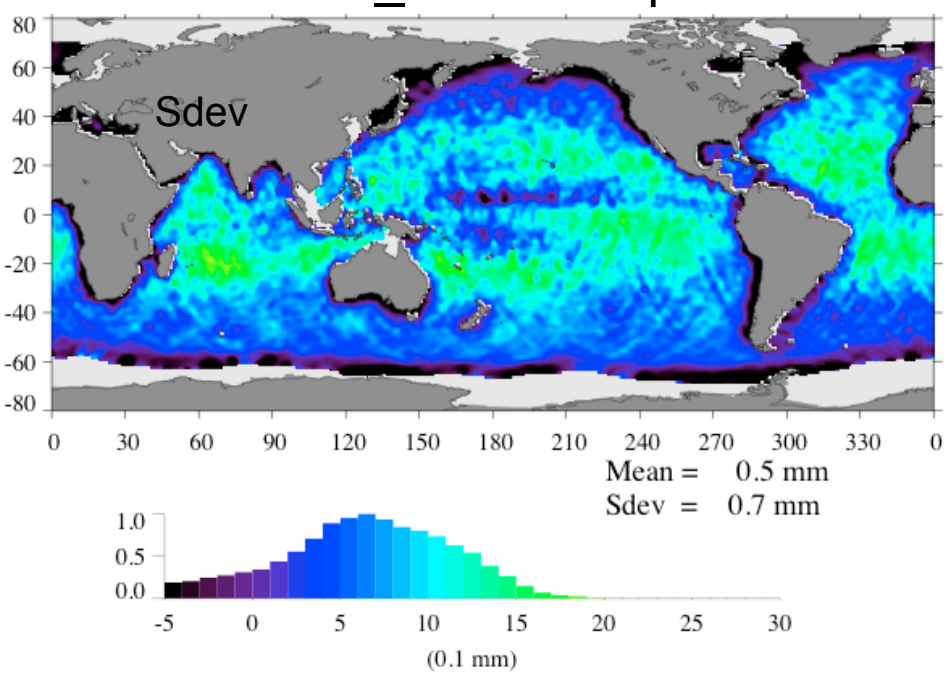



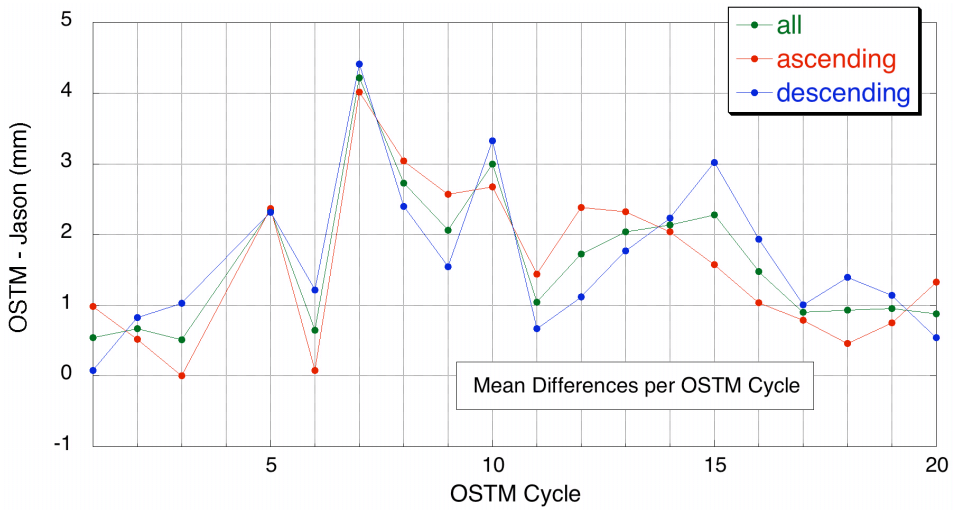
# *Jason-1 GDR_C JMR Replacement Product*

## AMR – GDR_C JMR

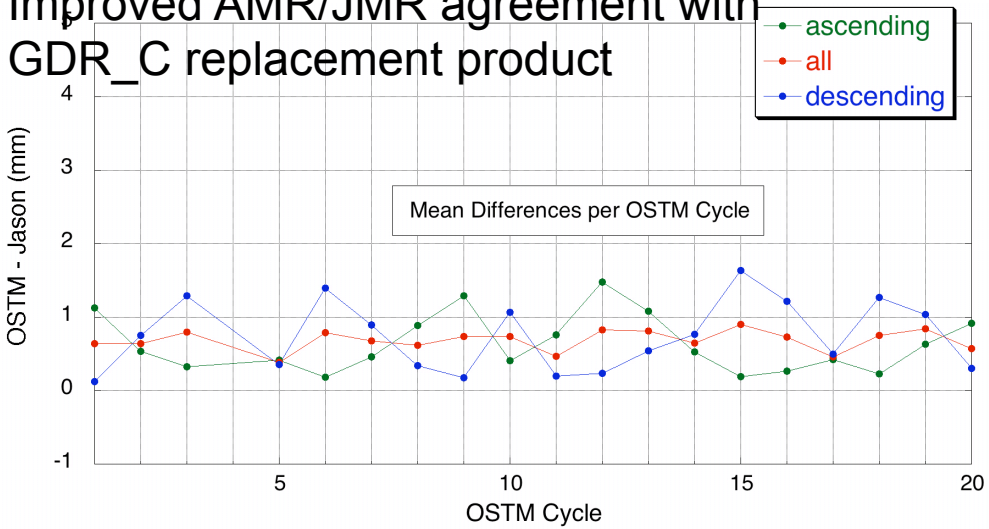



## AMR – GDR_C JMR Replacement



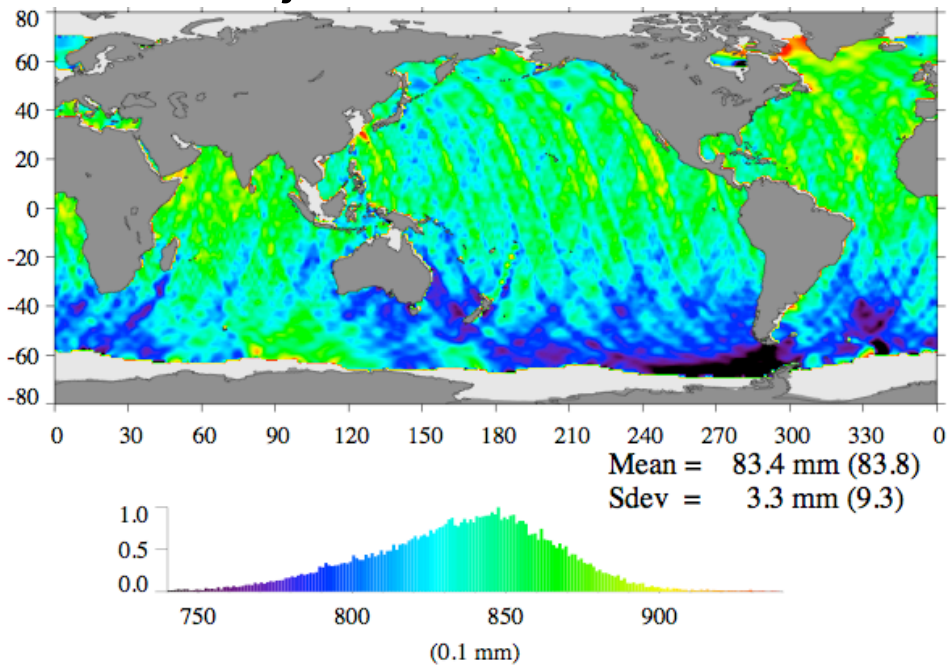

Improved AMR/JMR agreement with GDR_C replacement product



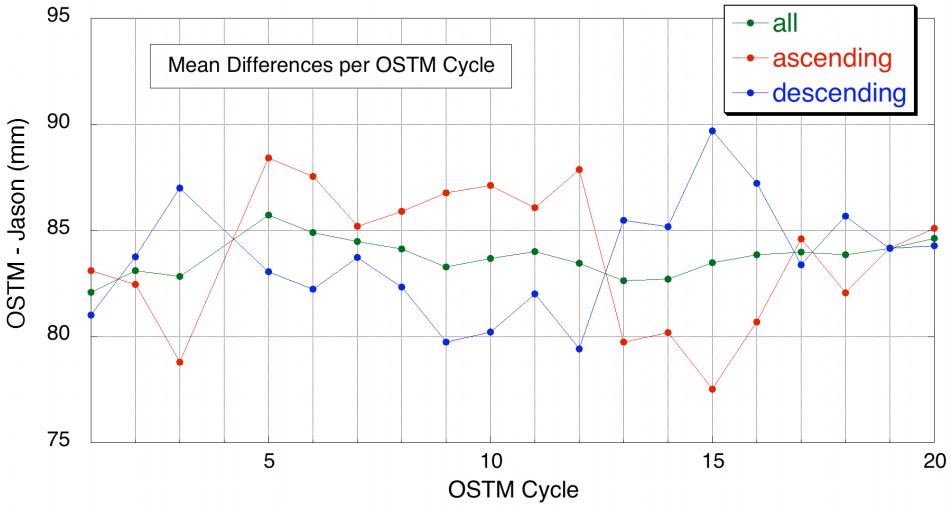
# *Inter-Mission Orbit Consistency*

*Impact of GSFC SLR/Doris Replacement Orbits*

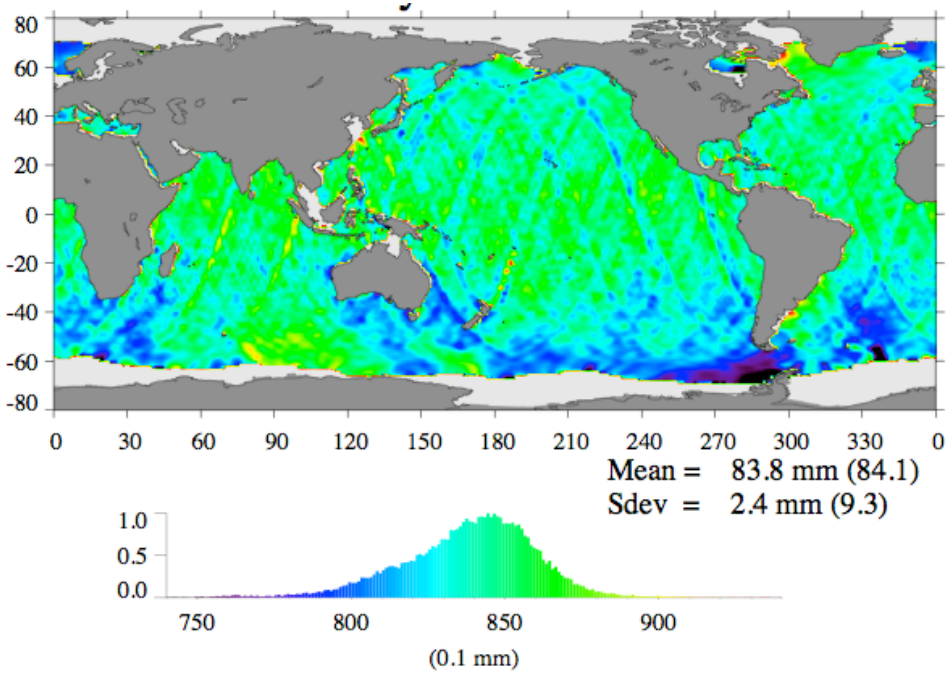
## Project GDR Orbit



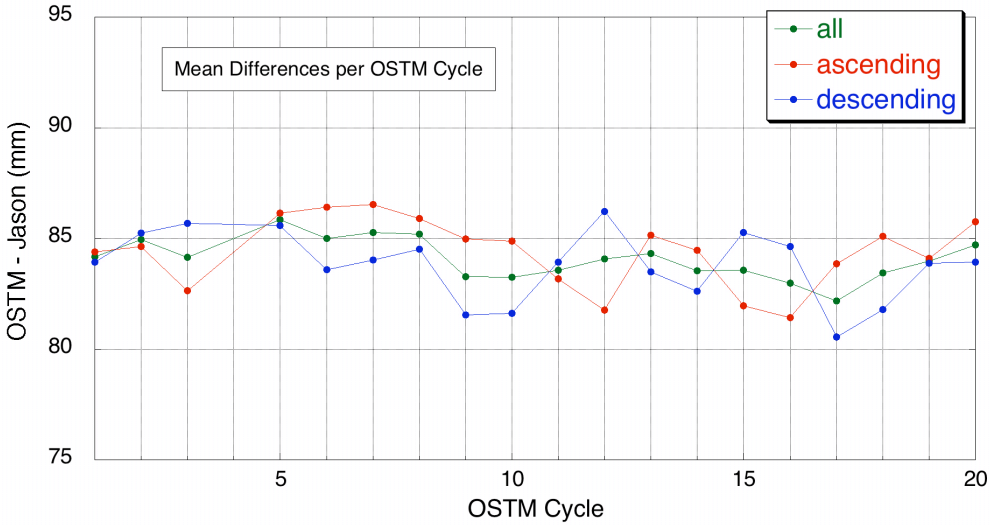

RMS: OSTM=8.04 cm, Jason=7.92 cm




## GSFC Std0905 Orbit

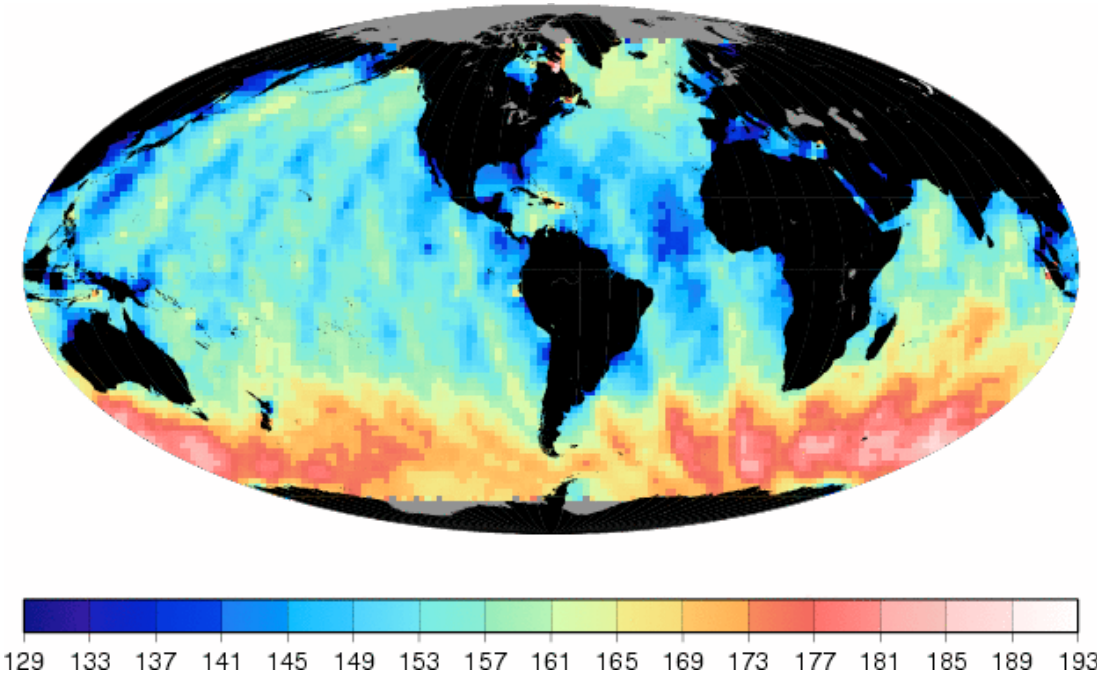



RMS: OSTM=8.05 cm, Jason=7.94



## Jason-1 – TOPEX Mean Sea Surface Height

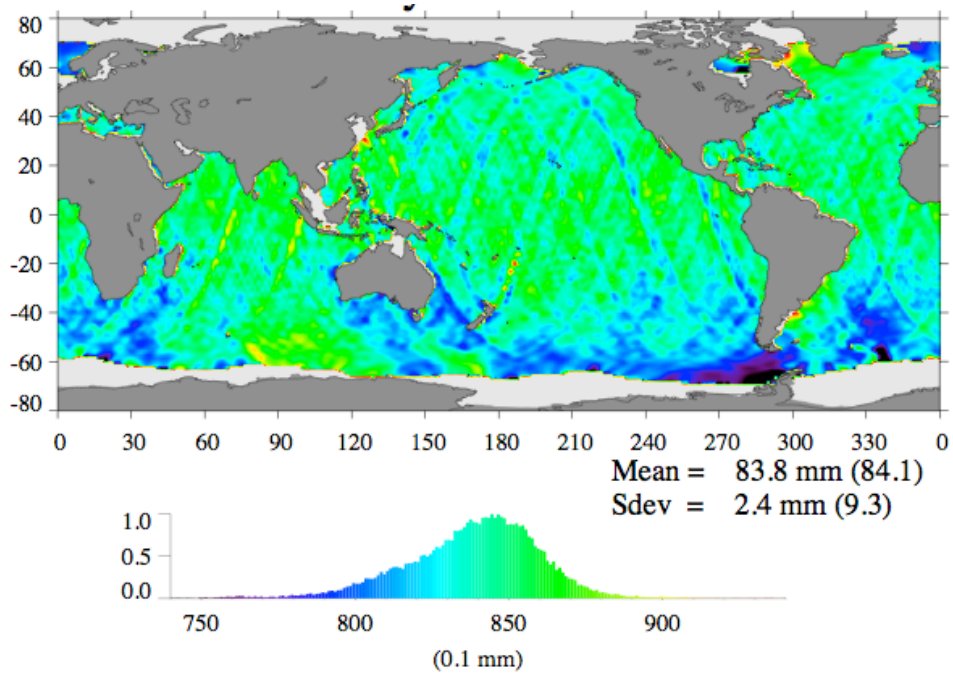
Haines, et. al, SWT 2003, Arles, France




± 3 cm

## OSTM – Jason-1 Mean Sea Surface Height

SWT 2009, Seattle, Washington

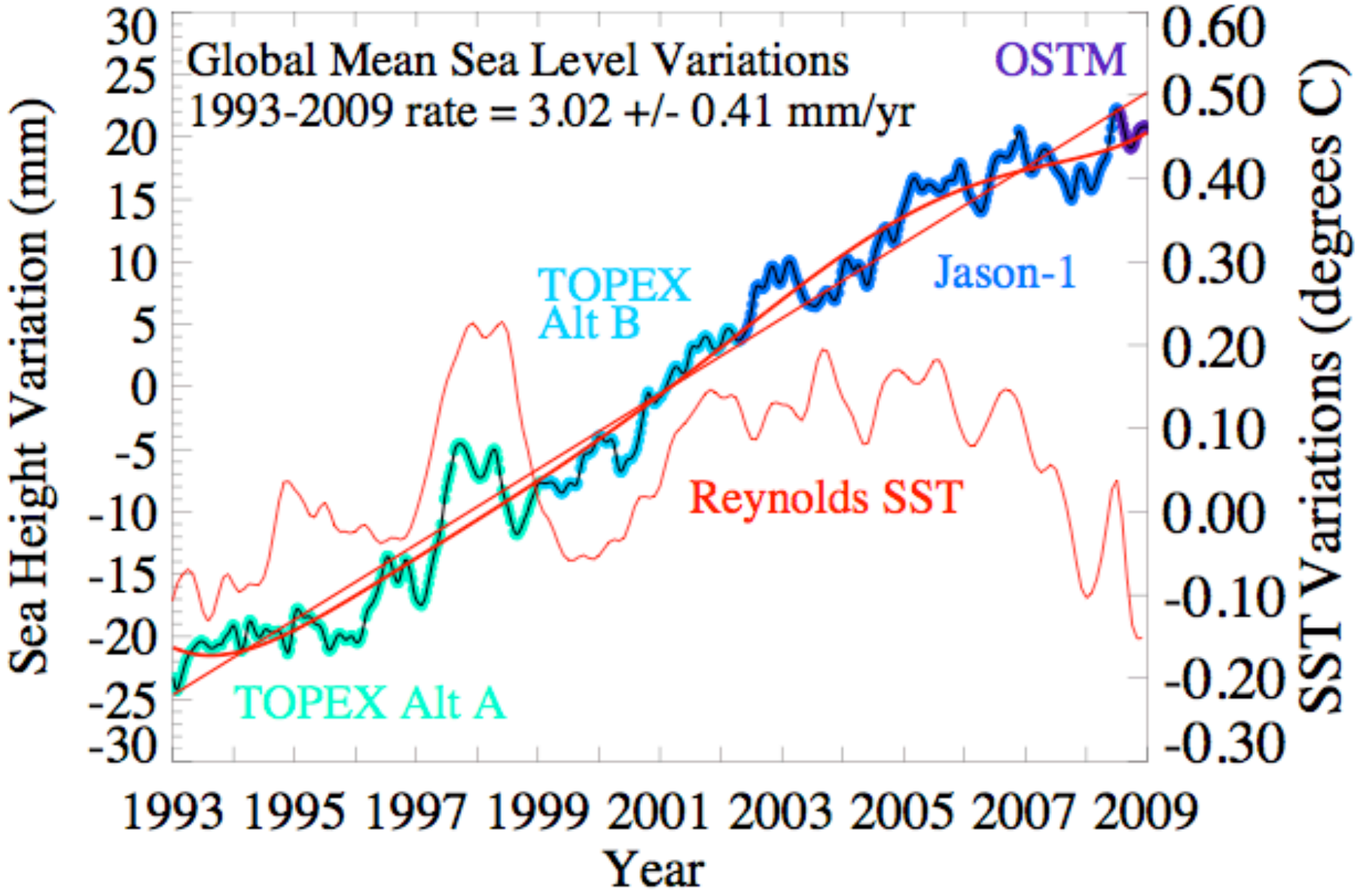


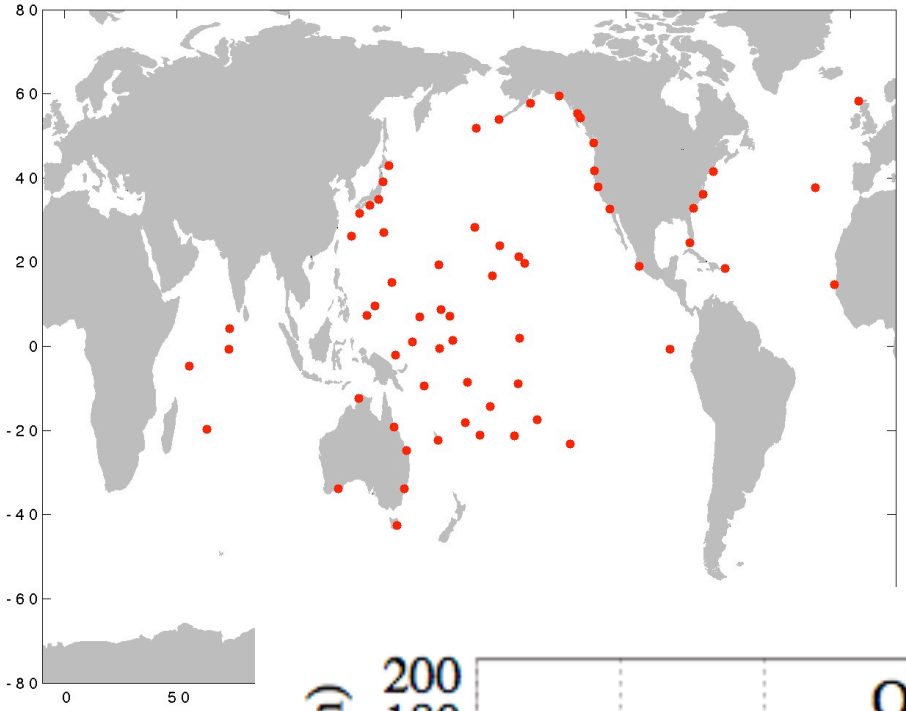

± 1 cm

**Formation Flying Phase**
**Jason-1 GDR: Cycles 1–21**
**T/P MDGR + TMR Drift Correction: Cycles 344–364**

**GLOBAL**
**Mean = 159.5 mm**
**σ = 13.0 mm**

# *Extending the SSH Climate Data Record with OSTM Altimetry*

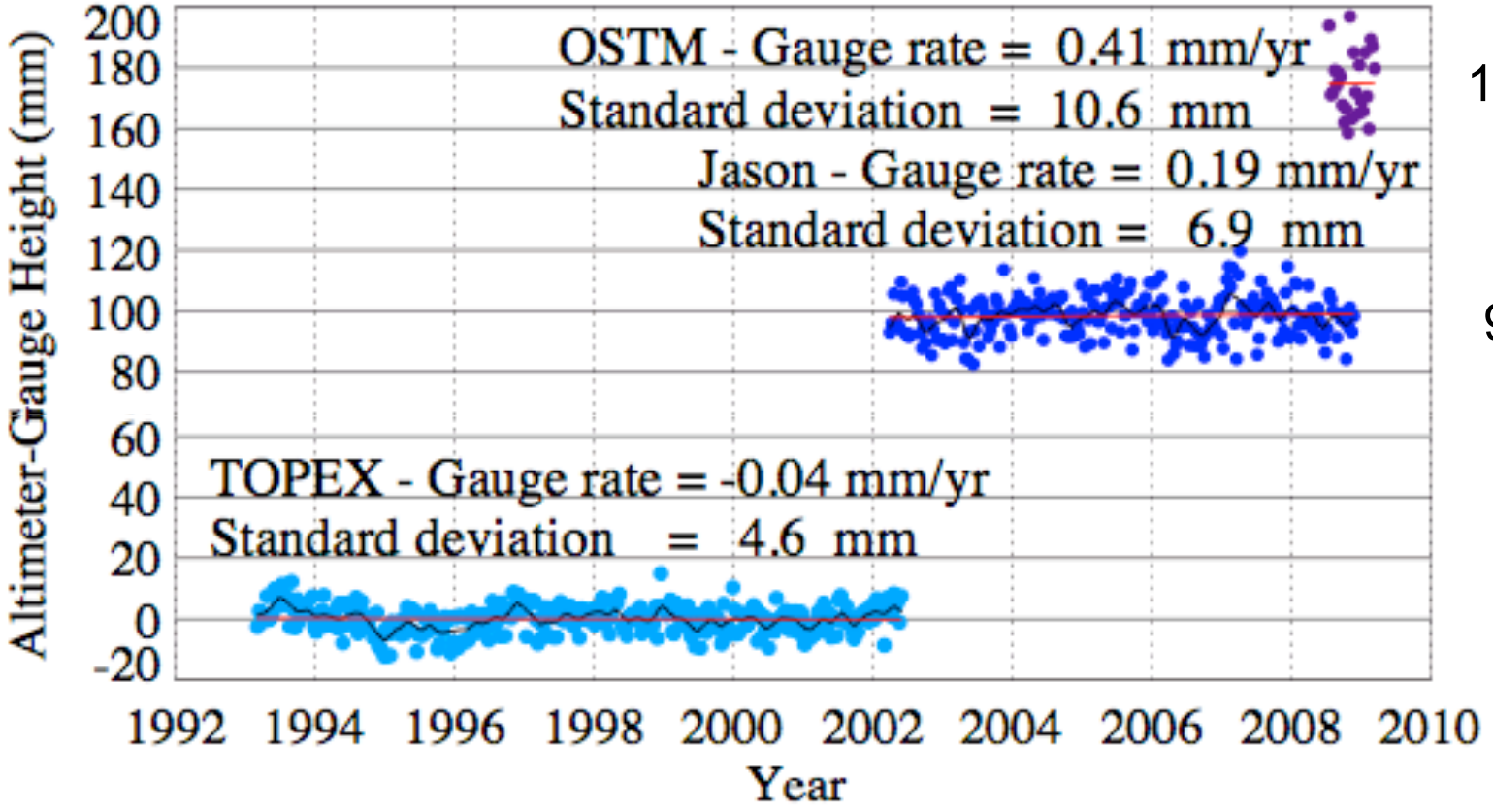




# *Tide Gauge Verification*

Gary Mitchum – U. South Florida

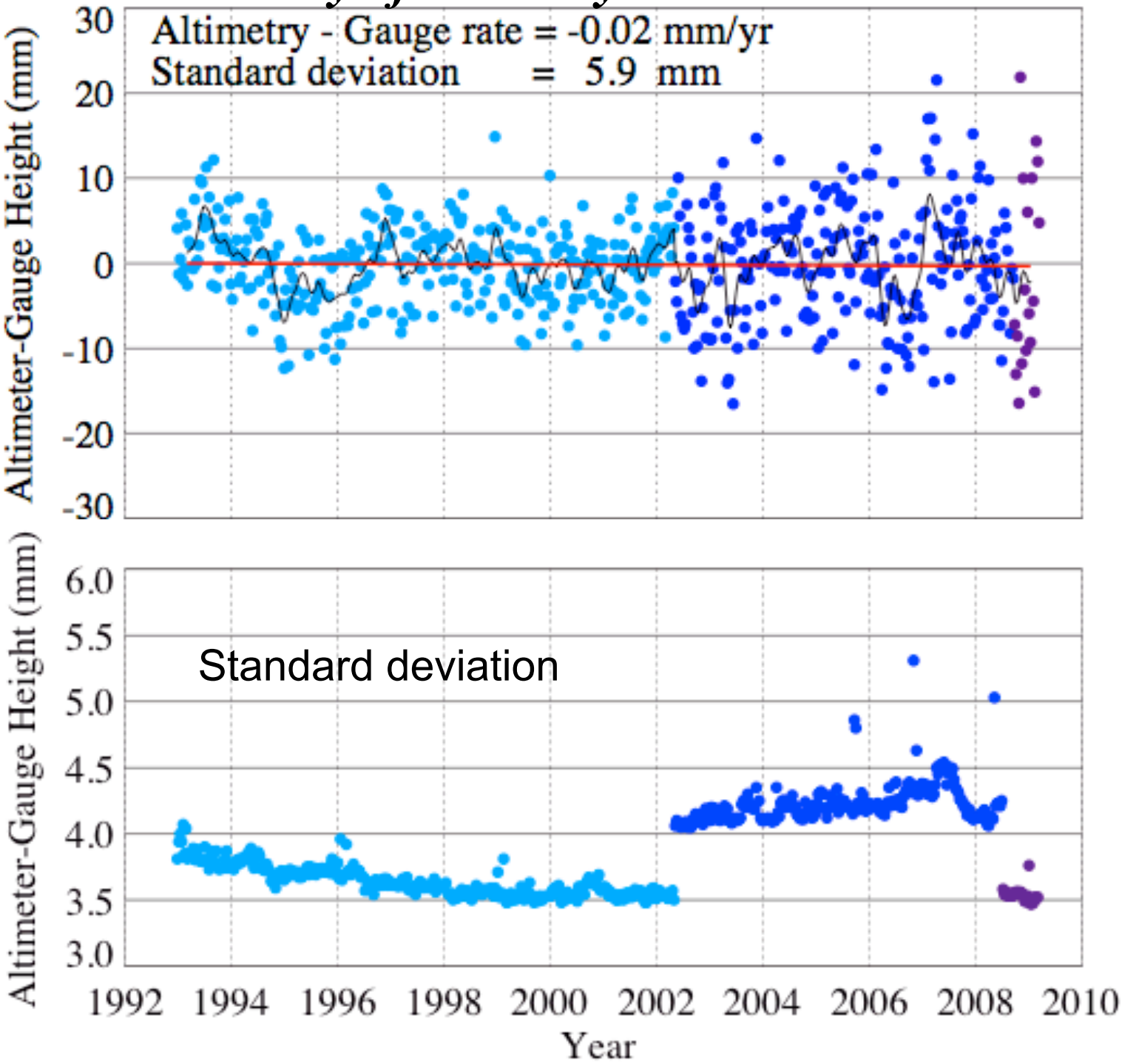
TOPEX MGDR_B (11 – 364), GSFC Std0809
Jason-1 GDR_C (1 – 259) , GSFC Std0905
OSTM GDR ( 1 – 26), GSFC Std0905




175 mm

99 mm

# *Stability of the 16+ year time series*



# Summary

- Excellent OSTM/Jason-1 agreement, std < 1 cm for both project GDR and GSFC orbit revealing low tracker bias. SLR/Doris more than adequate for Jason-1 extended tandem mission.

- OSTM SSH bias of 76 ± 9 mm with respect to Jason-1.

- OSTM range bias in both Ku (84 mm) and C band (131 mm) results in ~ 1 cm ionosphere correction bias.

- GDR_C JMR replacement product more consistent with OSTM AMR wet troposphere correction.

- Jason-1 drift rate with respect to tide gauge network reduced with revised GDR_C, though variance still higher than TOPEX benchmark. Bias estimates from tide gauge comparisons agree well with bias estimates derived from verification phase collinear SSH residuals.