TOPEX RGDR '09 Analysis

OSTST 09

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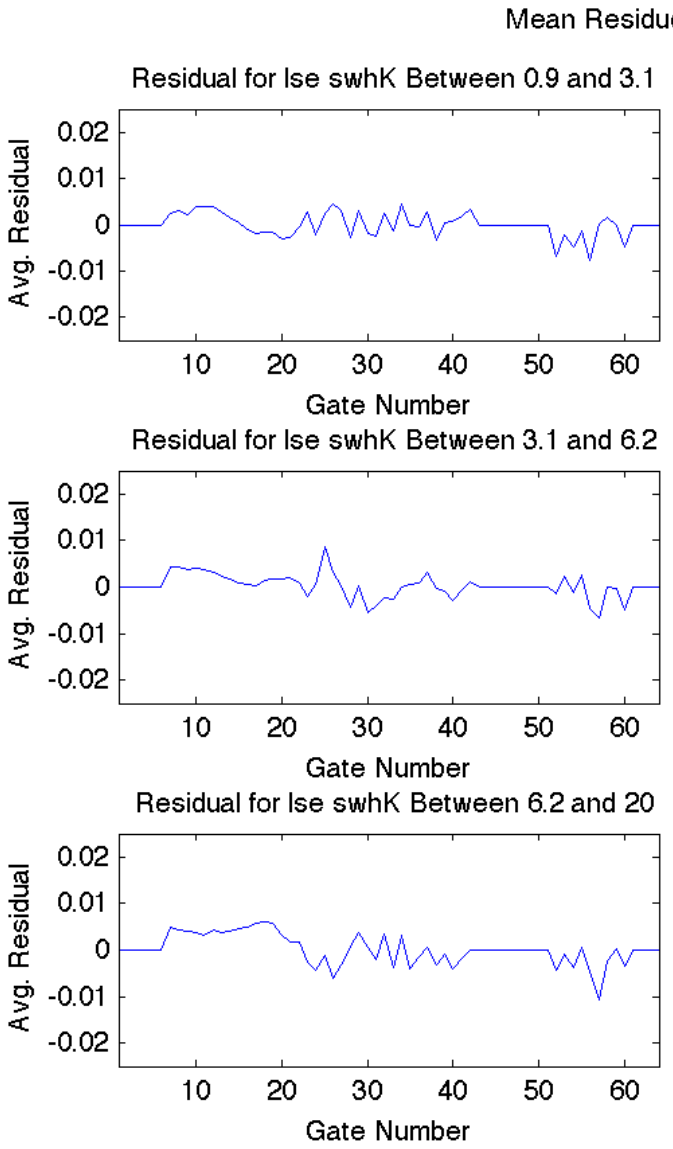
Retracking Overview (1 of 2)

- Same Retracking software used for all altimeters.
  - Basically unchanged since 2004. Ported to newer 32-node SGI machine. A few I/O bugs corrected
  - Notable differences from CNES MLE4:
    - **Uses multiple Gaussians (~30) fit to PTR through first ~10 sidelobes, specifically extended to +/-12 sidelobes, amplitude ~1.E-3 (-30 dB)**
    - **Waveforms treated at 10 Hz, 64 bins. Fits 10 (5 C band) ranges, but only one SWH, attitude, skewness , scale (not converted to sig0)**

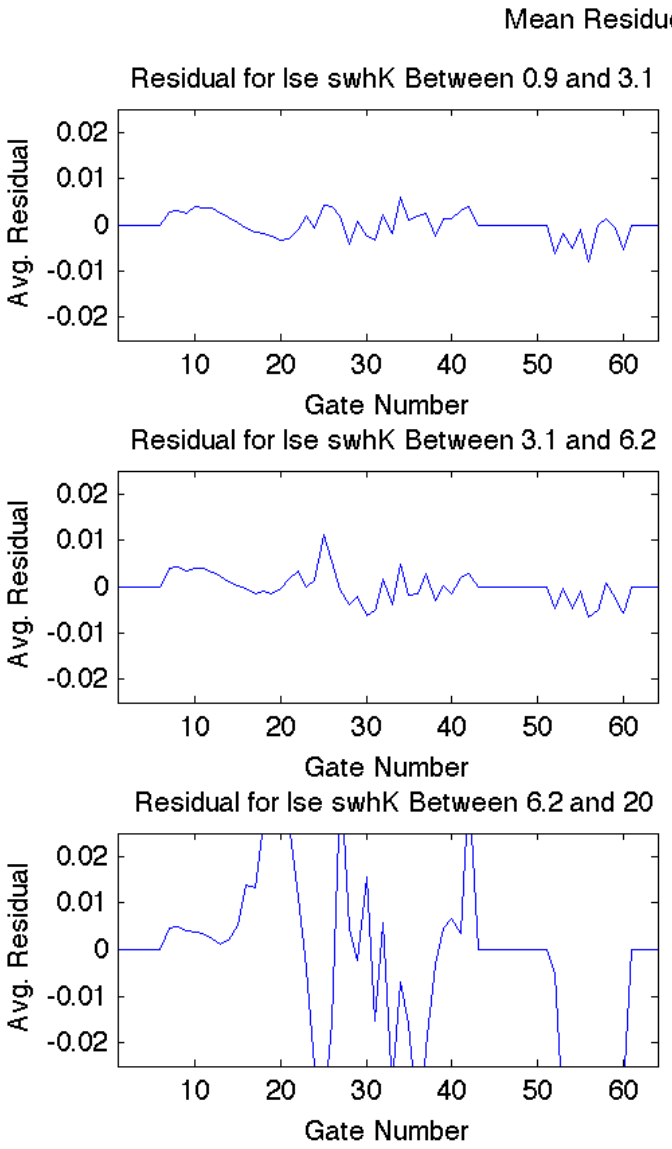
- TOPEX Specifics
  - Waveform leakages
    - Lead to North/South Ascending/Descending – range rate, "toward" / "away" – differences
    - "Weights" on WF bins updated to reduce residuals. Same weights used for both Alt-A and Alt-B
  - Alt-A PTR degradation – fit new PTR for each cycle. Automatic procedure implemented to convert 64 Cal-1 pts (bare Nyquist sampling) to set of Gaussians used in software
    - Same procedure up to cyc 425 where no more Cal-1 data; continued cyc 425 PTR

Effect of Different Weights (Alt-B)

Cyc 251 P 021 Std Processing



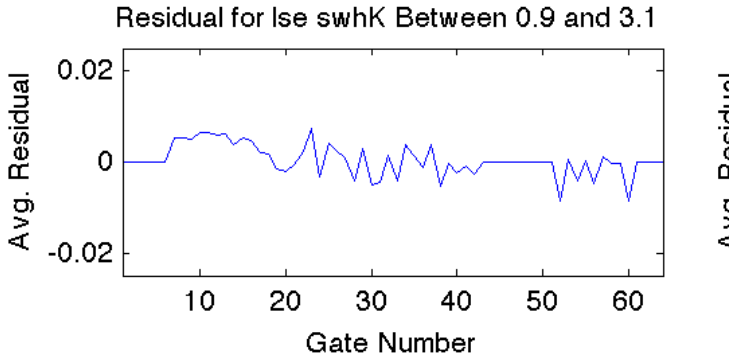
Cyc 364 P 021 Std Processing

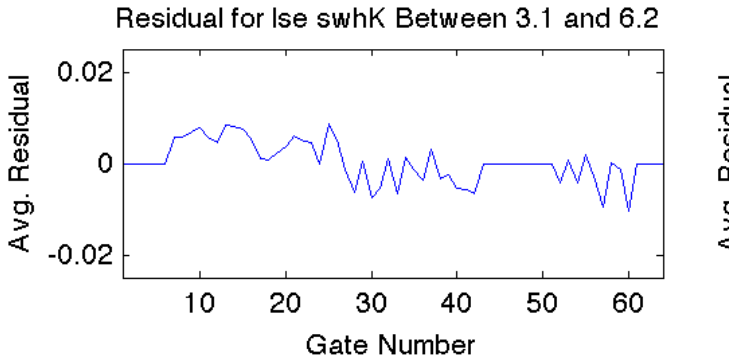


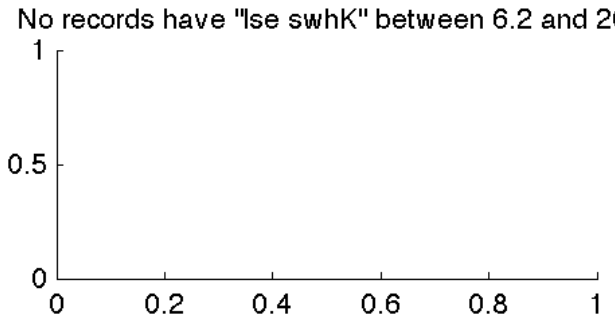
Effect of Different Weights (Alt-A)

Cyc 067 P 021 Std Processing

Mean Residues fo

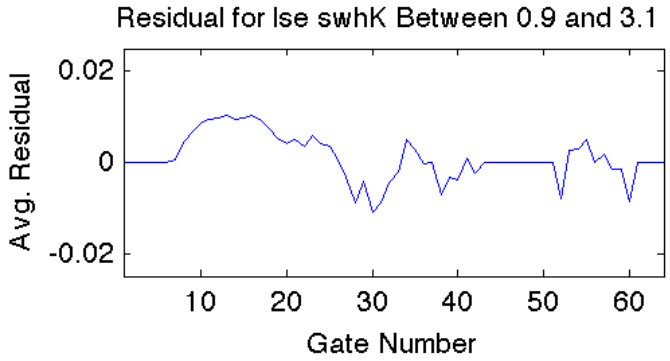


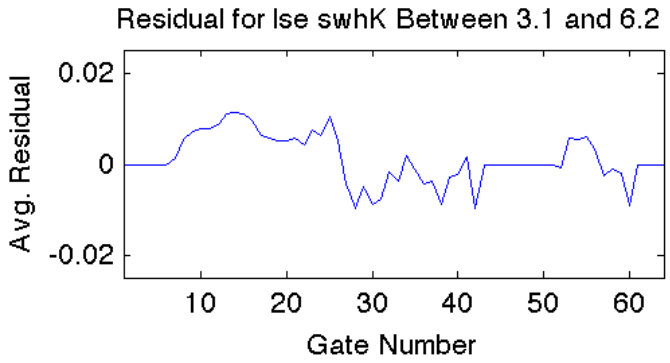


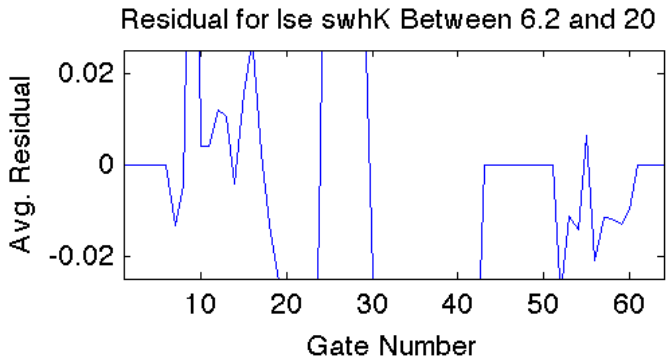


Cyc 213 P 021 Std Processing

Mean Residues fo







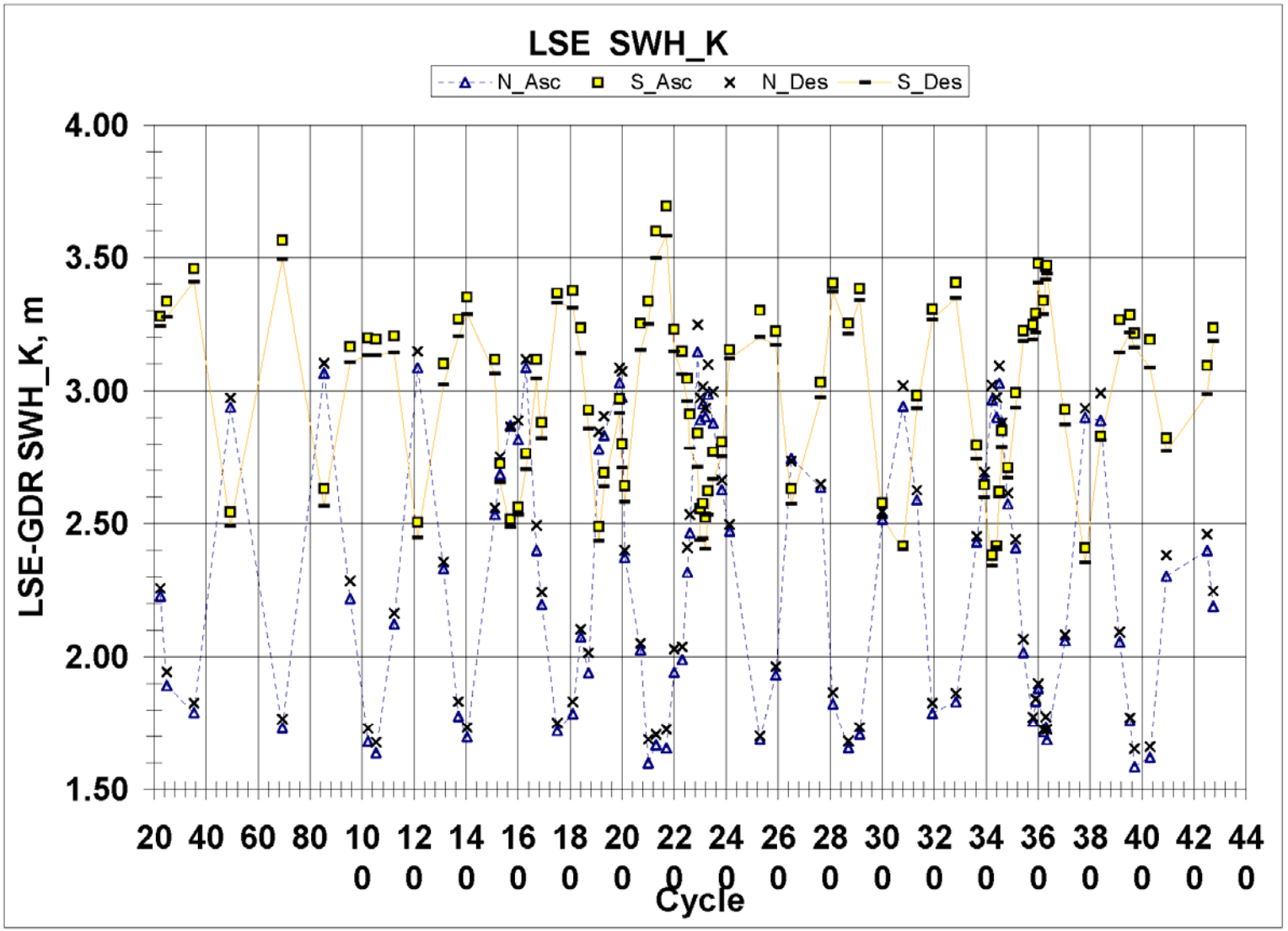
Retracking Overview (2 of 2)

- Data Product Overview
  - Retracked all TOPEX cycles 021 - 480, except for a few for which either GDRs or SDRs could not be obtained from PODAAC
  - RGDRs include new GSFC orbits, GOT4.7 tides, TMR corrections
  - RGDR format same as 2007 (new orbit in different slot)

- Result Highlights
  - Retracking appears to correct SWH change from Alt-A PTR change
  - Results not very sensitive to selection/variation of weights
  - Results fairly sensitive to PTR variations
  - Skewness continues to absorb waveform leakages and shows N/S, Asc/Des (Toward/Away from equator, +/- Range rate) feature
  - 2009 RGDRs different from 2007 RGDRs with a bias of about 1 cm and in variation with SWH, but similar in most other ways
  - New results appear to be more symmetric in variations, errors

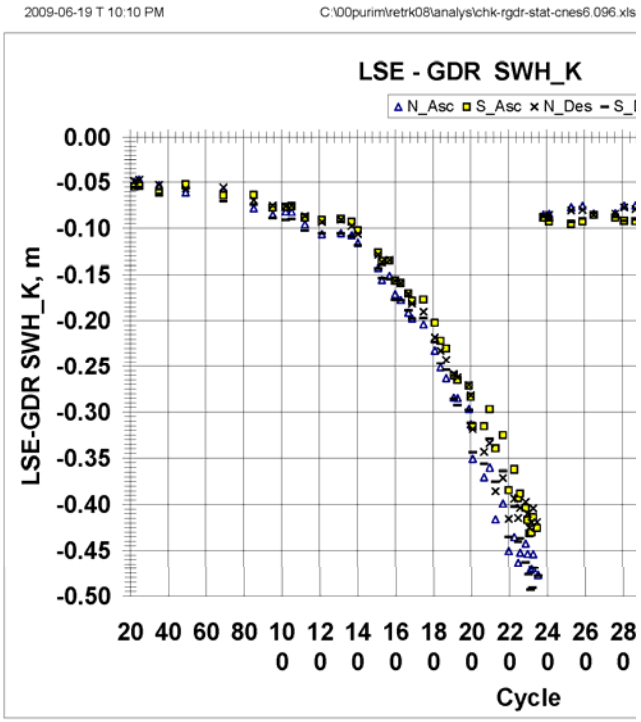
TOPEX RGDR Time Variations (1 of 4)

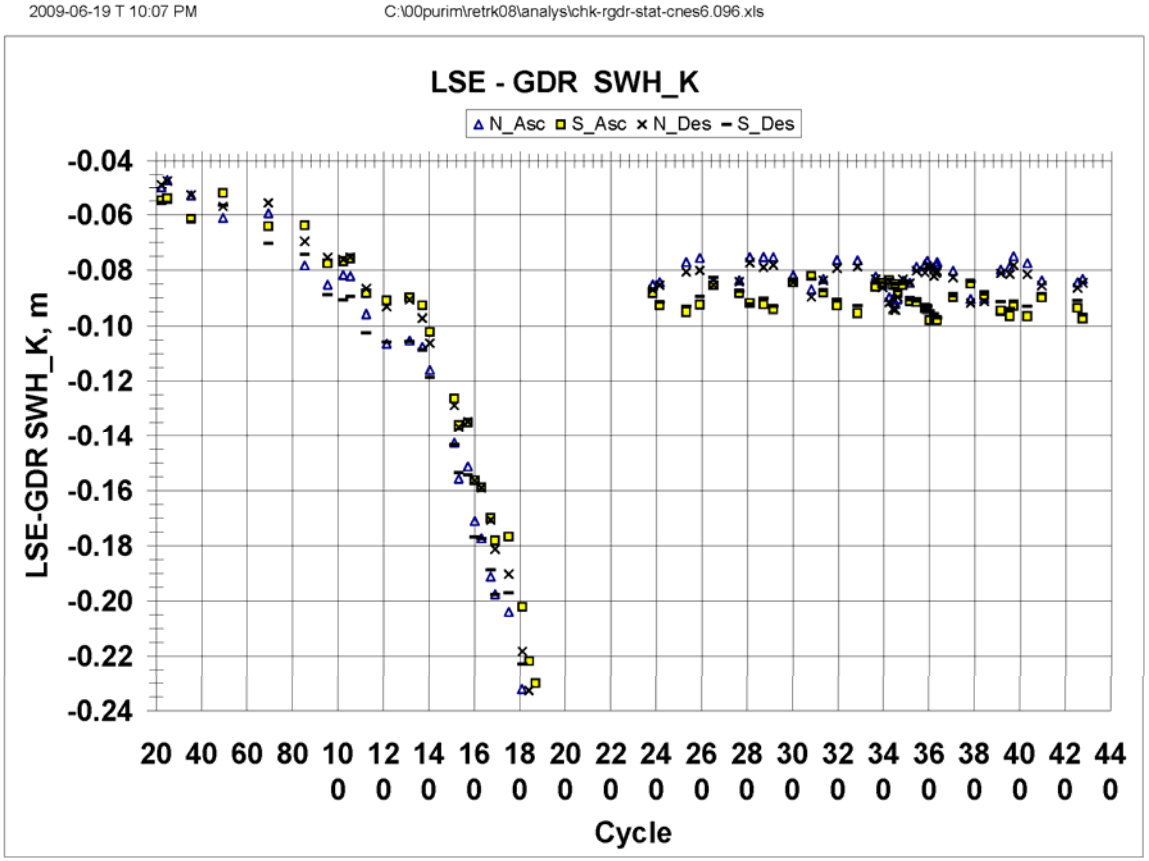
2009-06-19 T 10:13 PM C:\00purim\retrk08\analys\chk-rgdr-stat-cnes6.096.xls



TOPEX RGDR Time Variations (2 of 4)

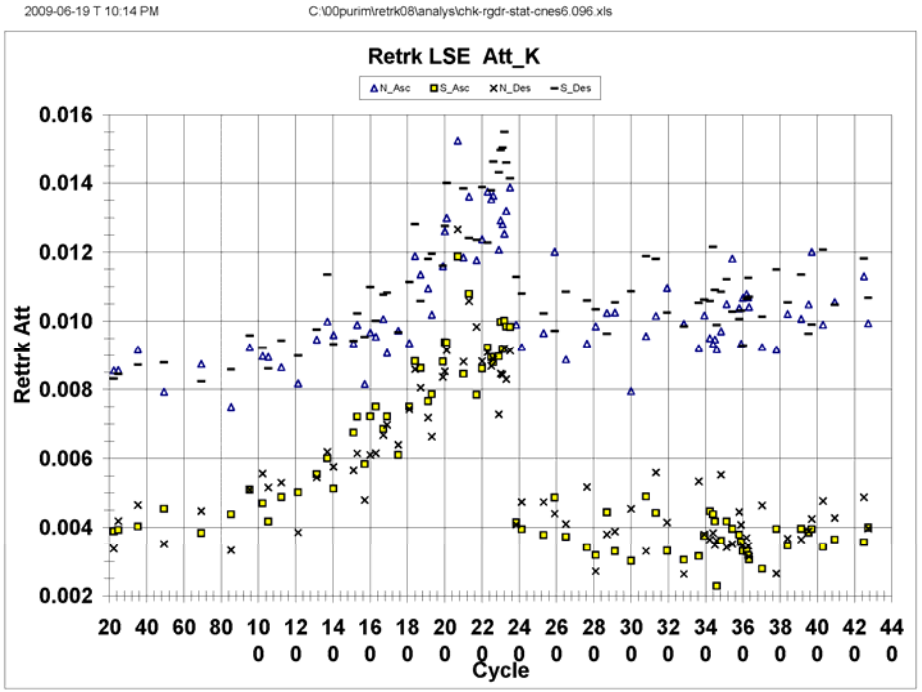
Corrects Alt-A SWH change

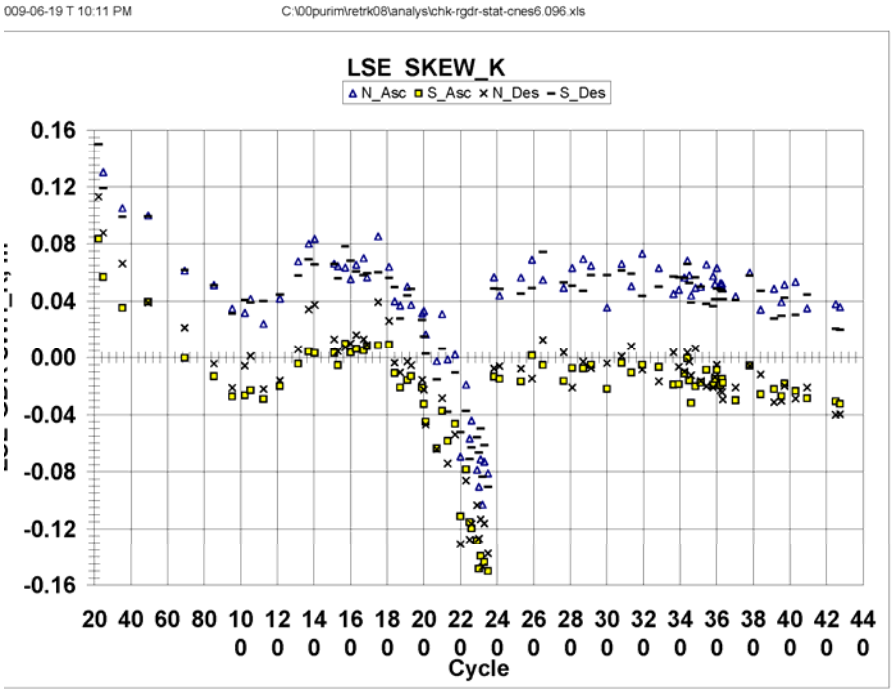




TOPEX RGDR Time Variations (3 of 4)

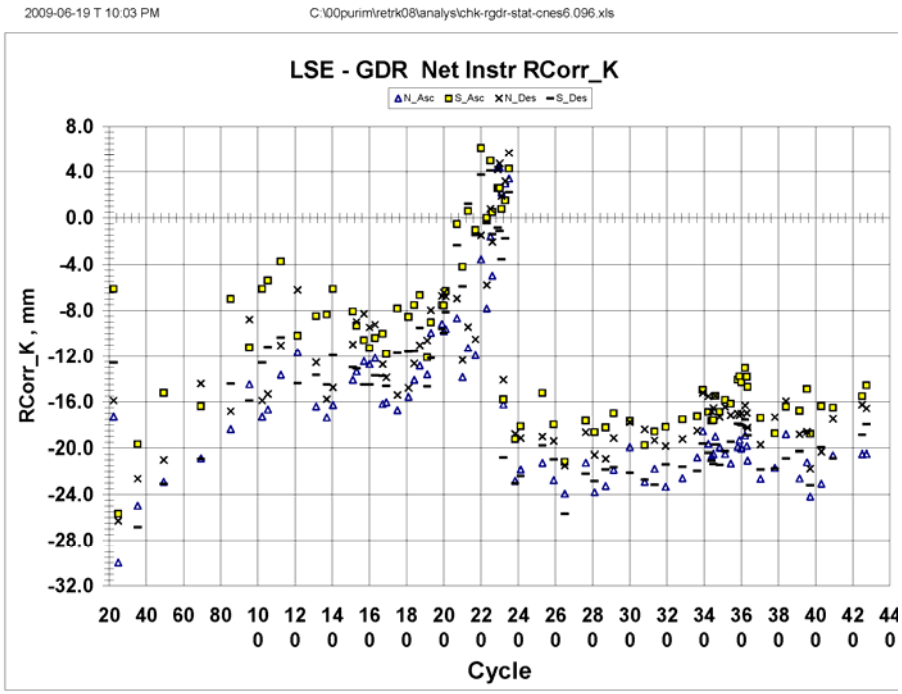
Other Alt-A quantities follow SWH change from PTR

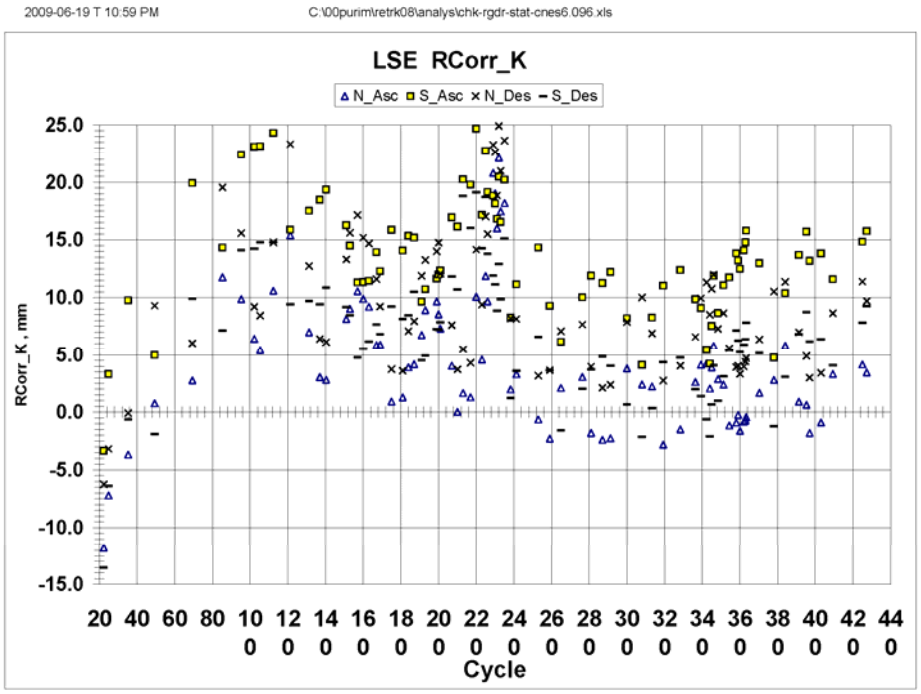




TOPEX RGDR Time Variations (4 of 4)

Other Alt-A quantities follow SWH change from PTR





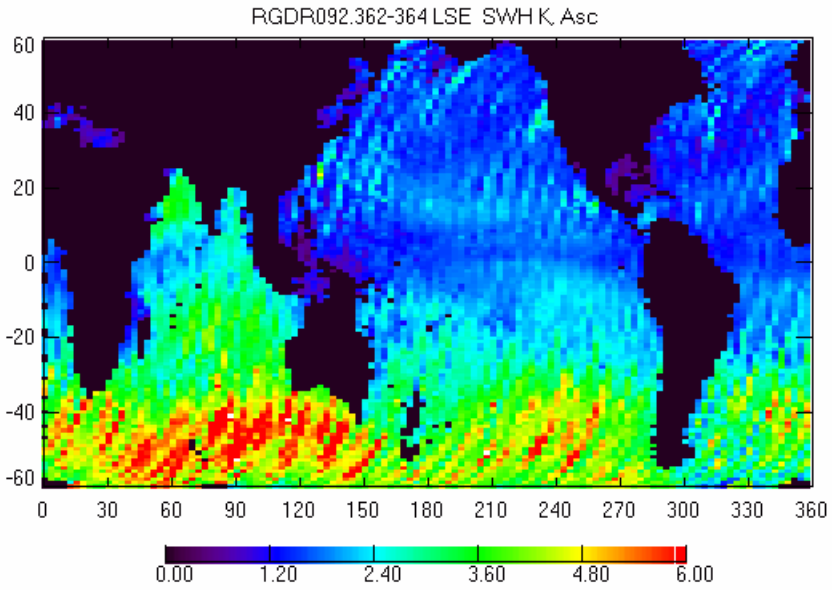
TOPEX RGDR Geographic Distribution (1 of 3)

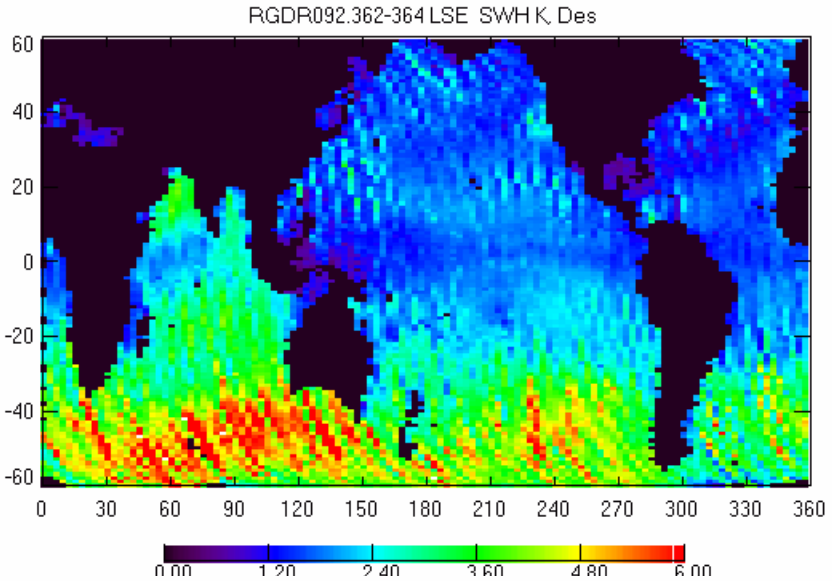
Cycles 362-364 (Aggregate) – 2009 RGDRs

ASC

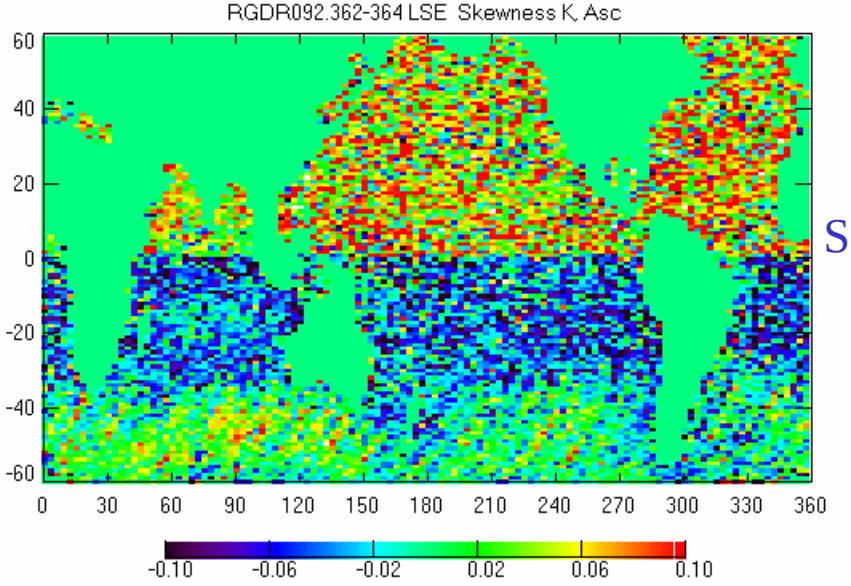
DES

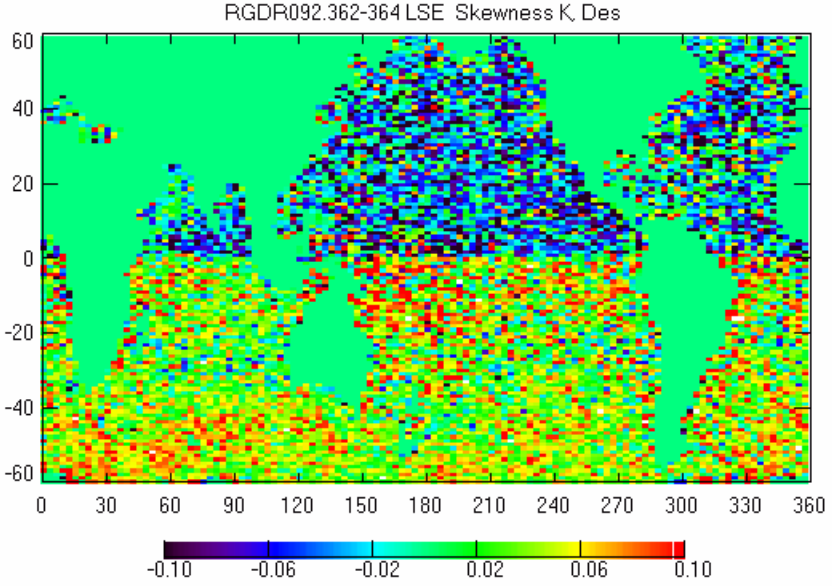
SWH





SKEW





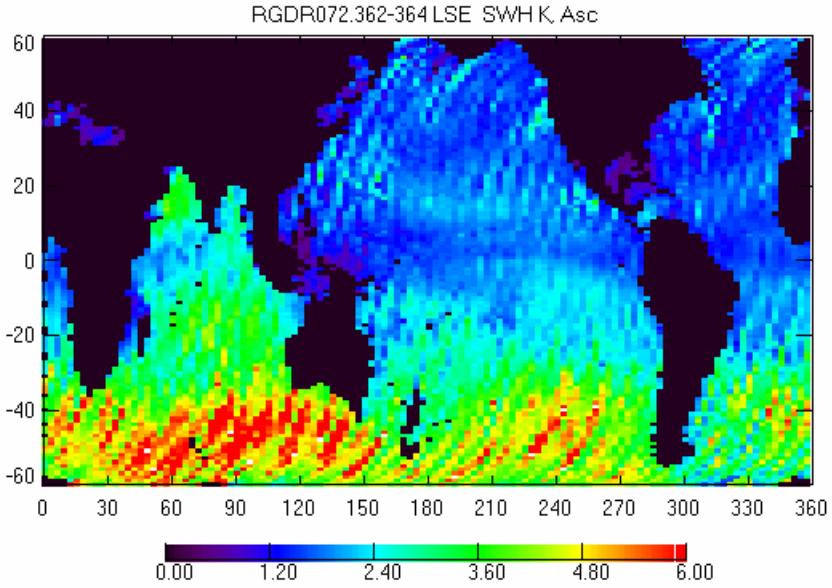
TOPEX RGDR Geographic Distribution (2 of 3)

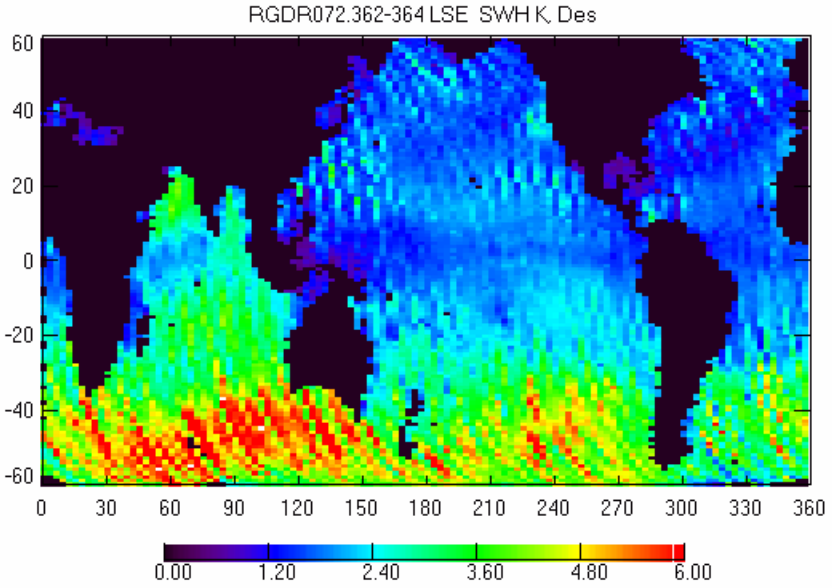
Cycles 362-364 (Aggregate) – 2007 RGDRs

ASC

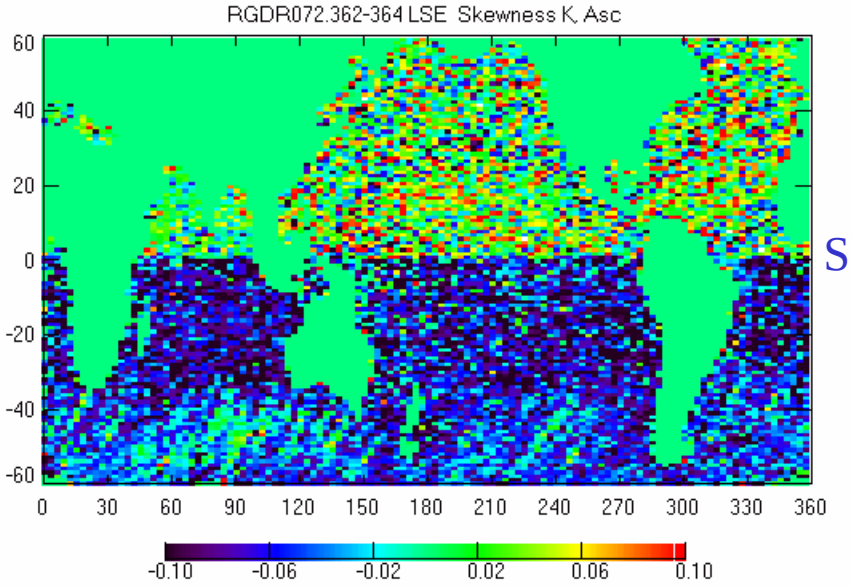
DES

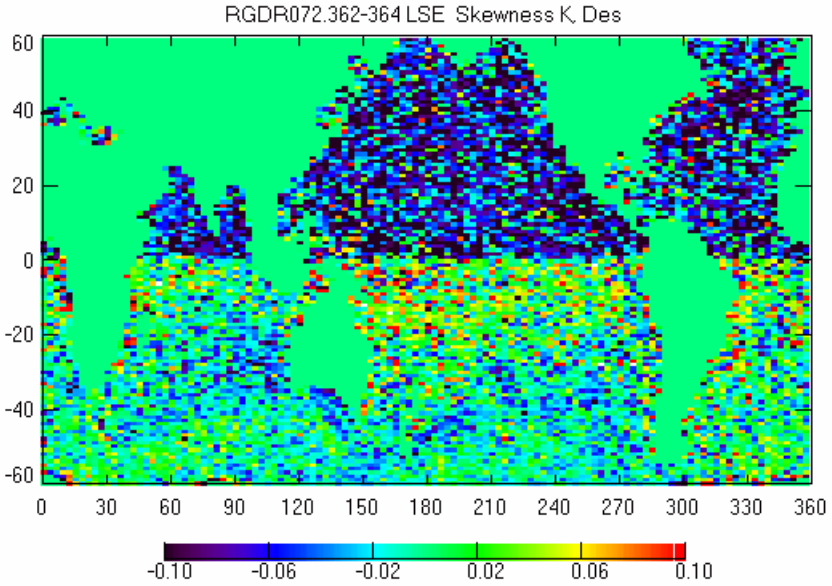
SWH





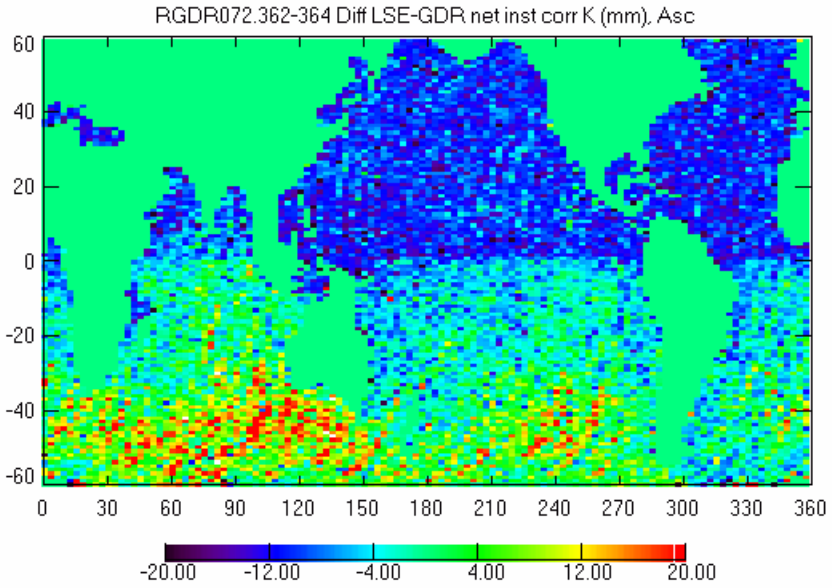
SKEW



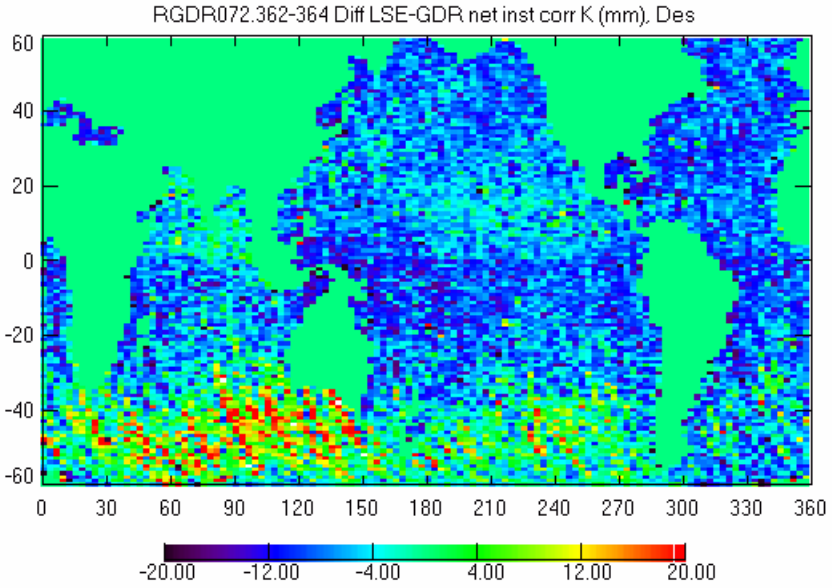


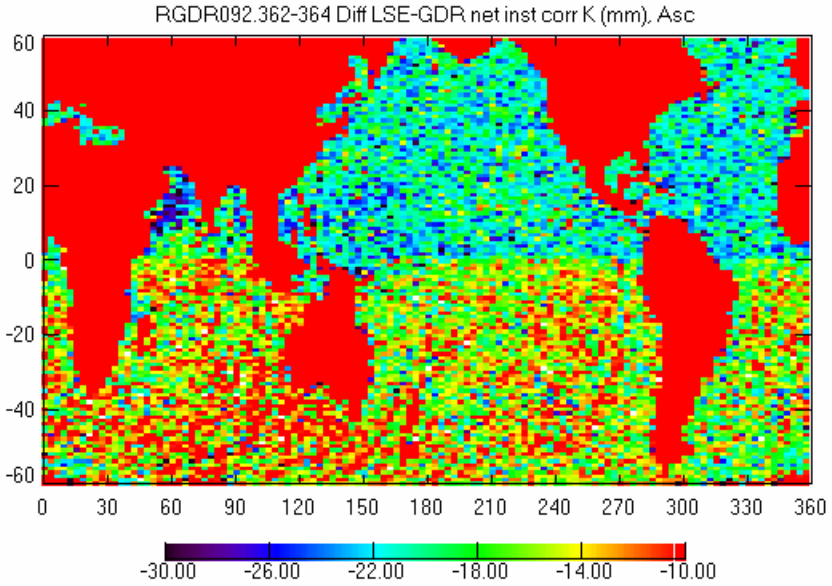
TOPEX RGDR Geographic Distribution (3 of 3)

ASC Cycles 362-364 (Aggregate) – LSE-GDR Net RCorr DES

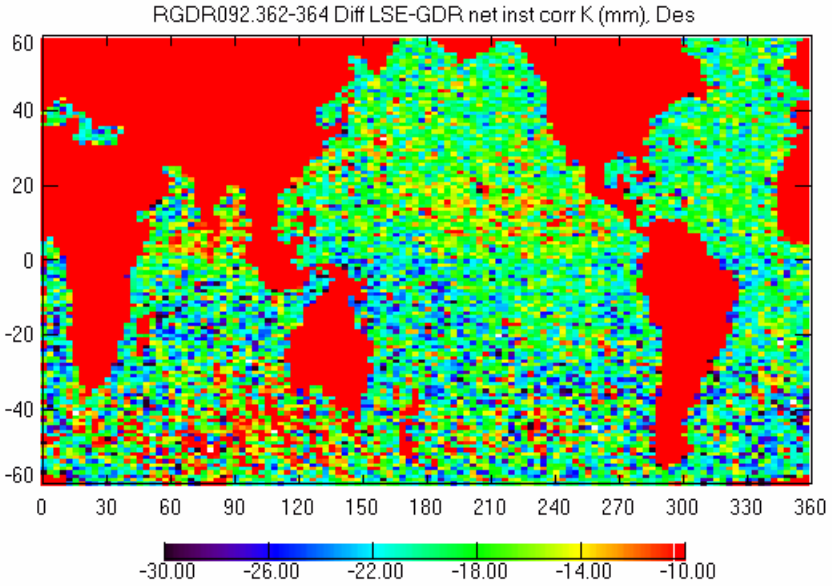


2007



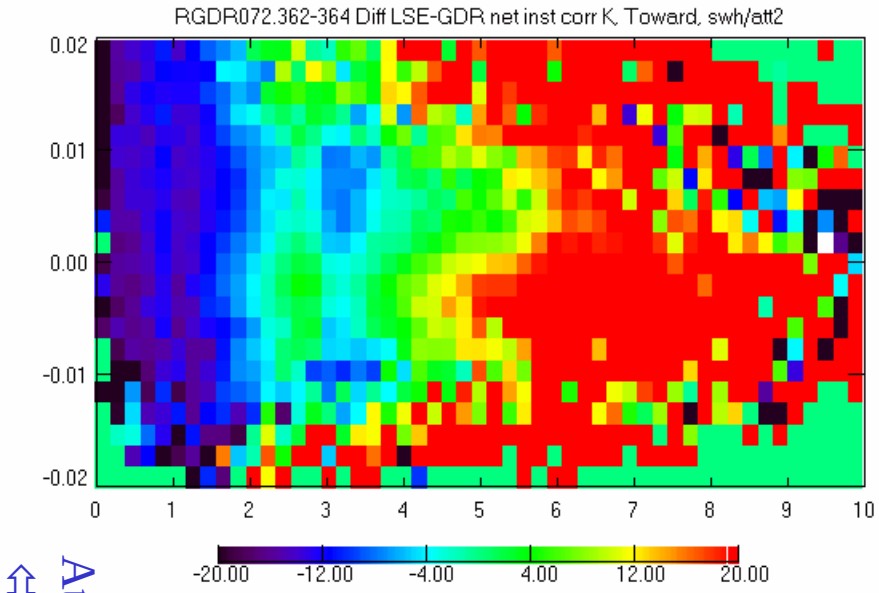


2009

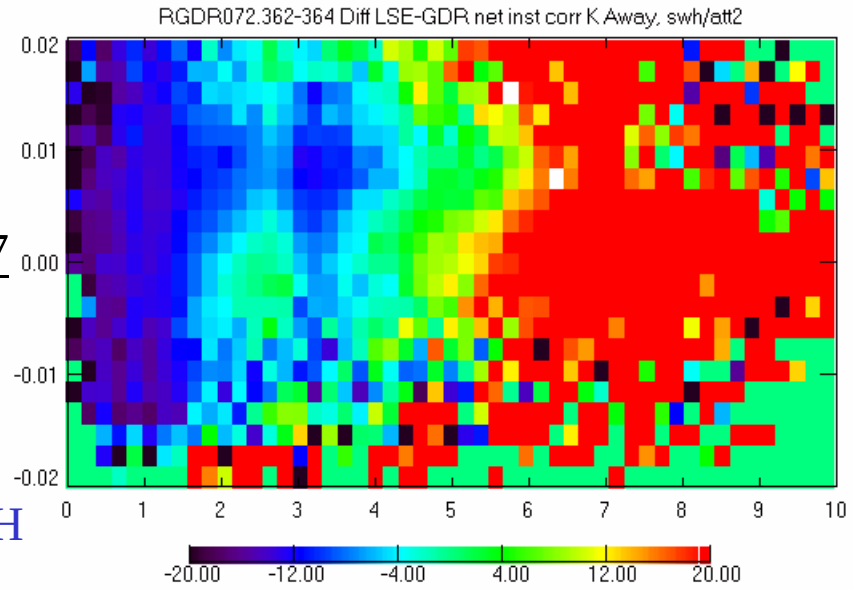


TOPEX RGDR SWH/Att Distribution (1 of 2)

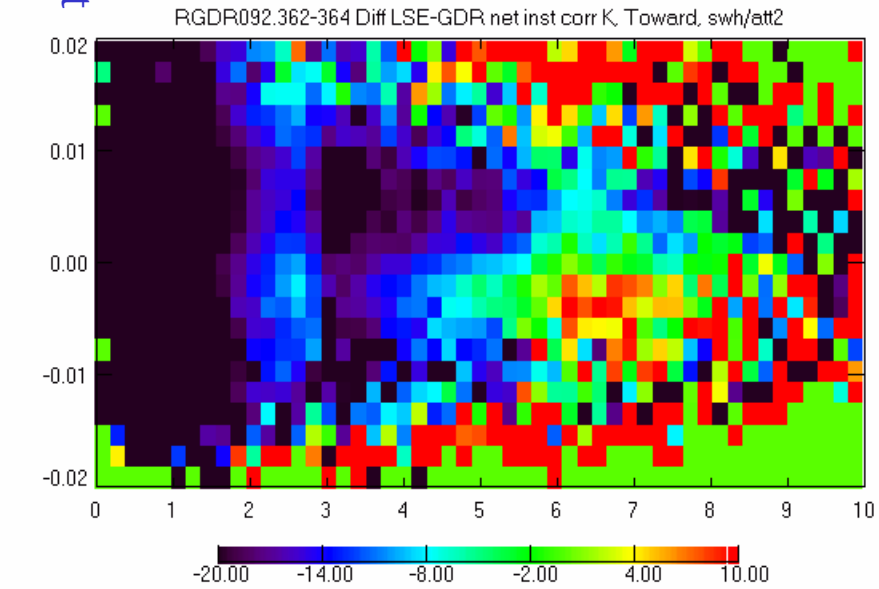
Toward Cycles 362-364 (Aggregate) – LSE-GDR Net RCorr Away



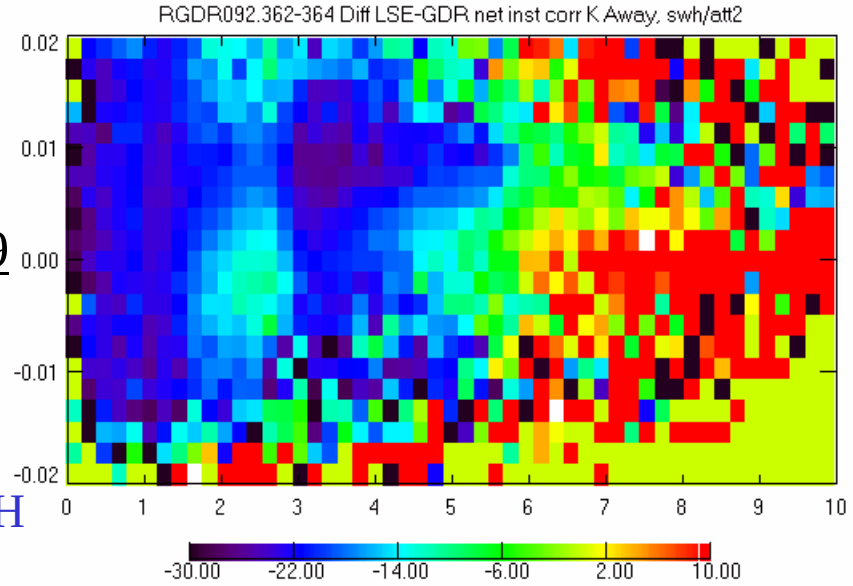
2007



Att ⇕ SWH ⇔



2009



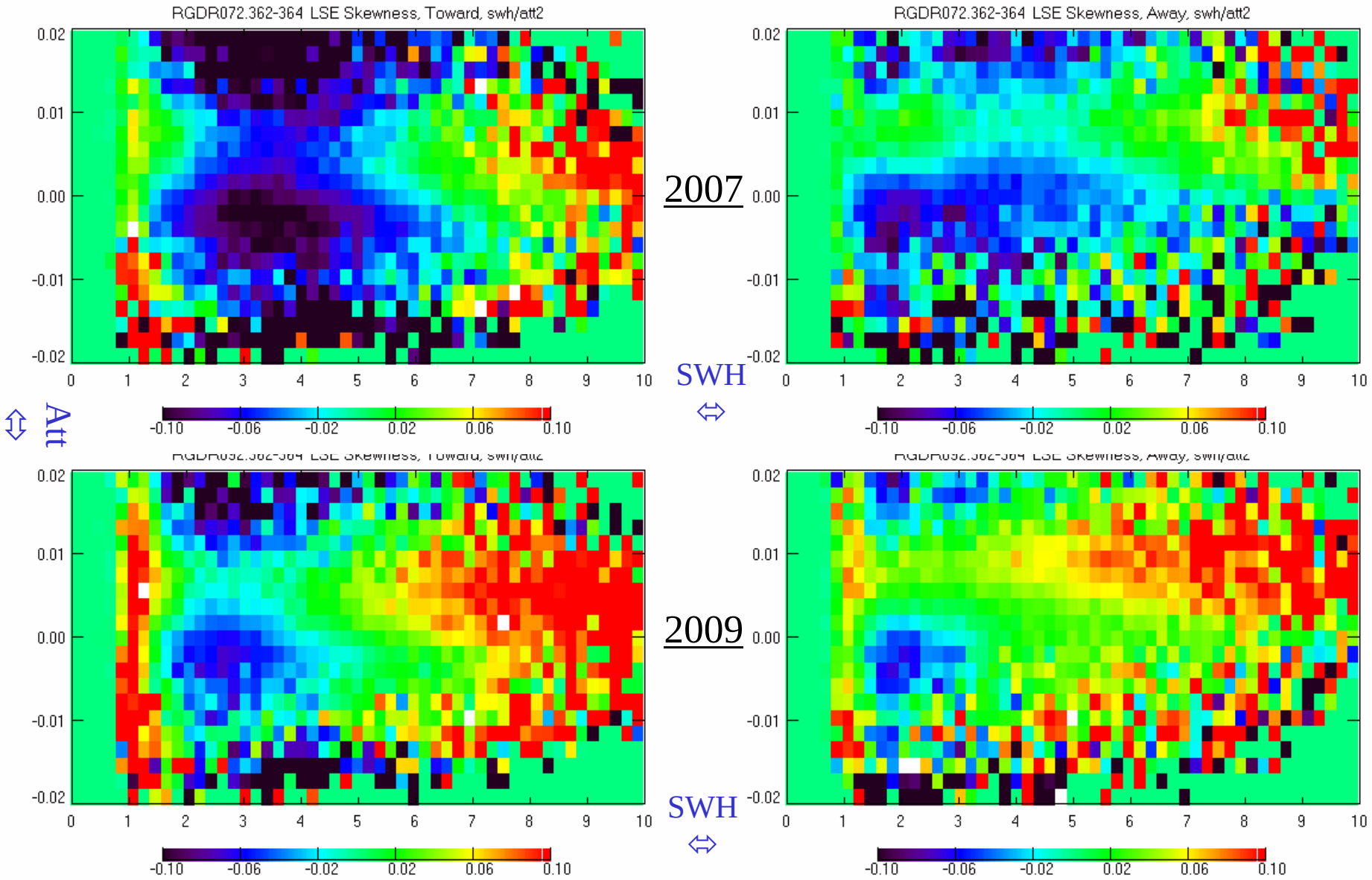
SWH ⇔

TOPEX RGDR SWH/Att Distribution (2 of 2)

Cycles 362-364 (Aggregate) – Skewness

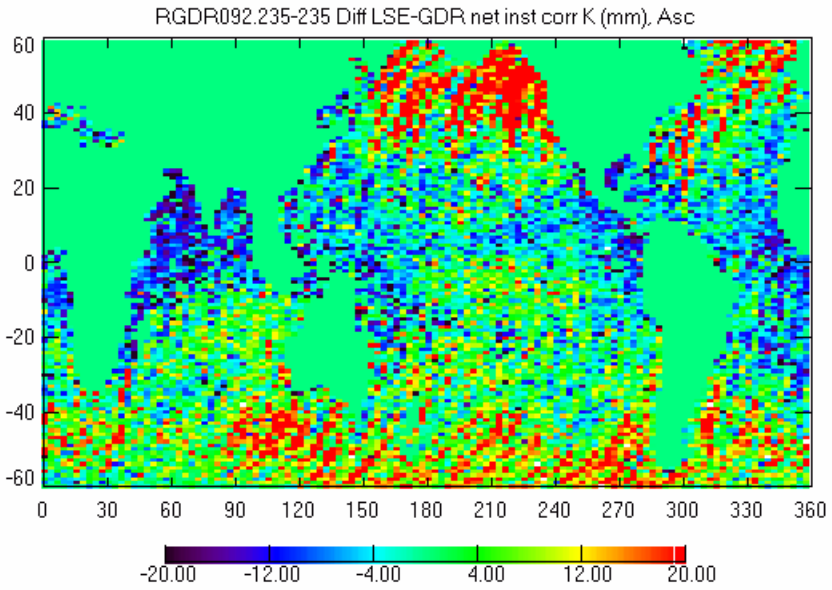
Toward

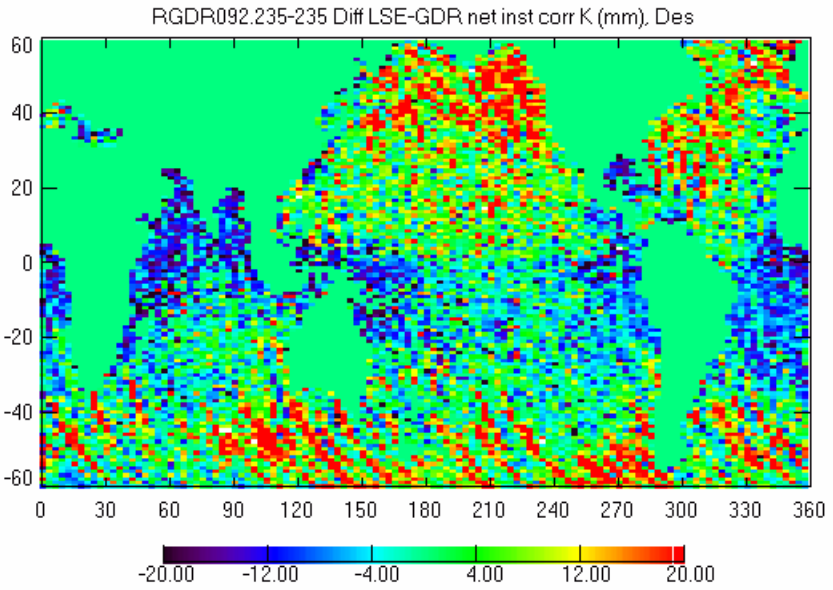
Away

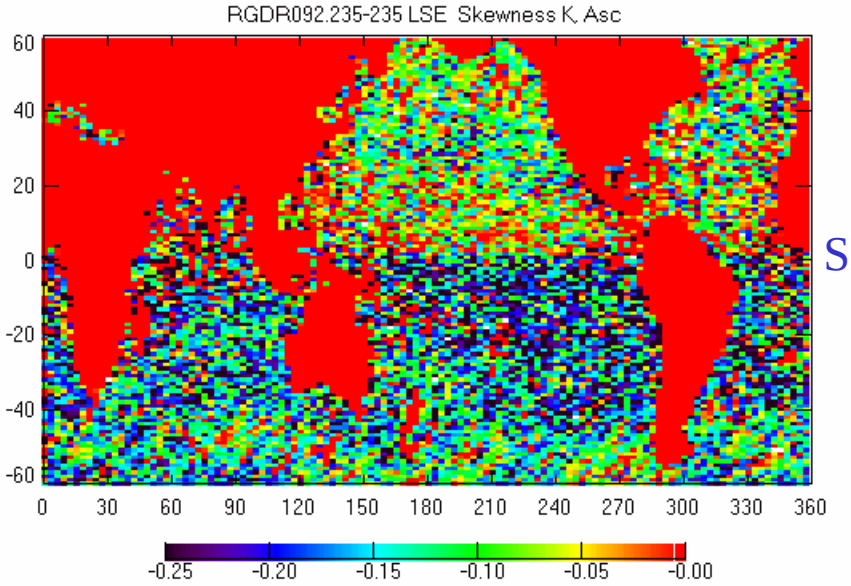


TOPEX RGDR Geographic Distribution (1 of 1)

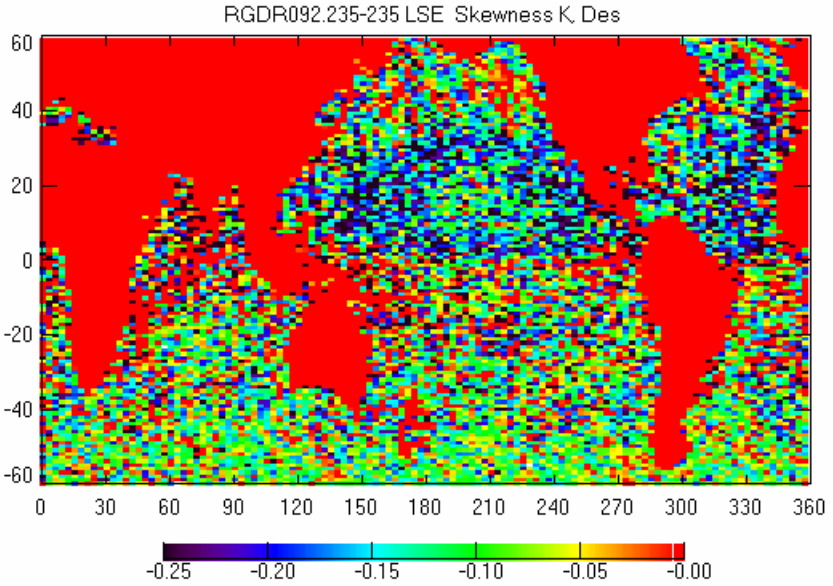
Asc Cycle 235 – LSE-GDR Net RCorr, Skewness Des





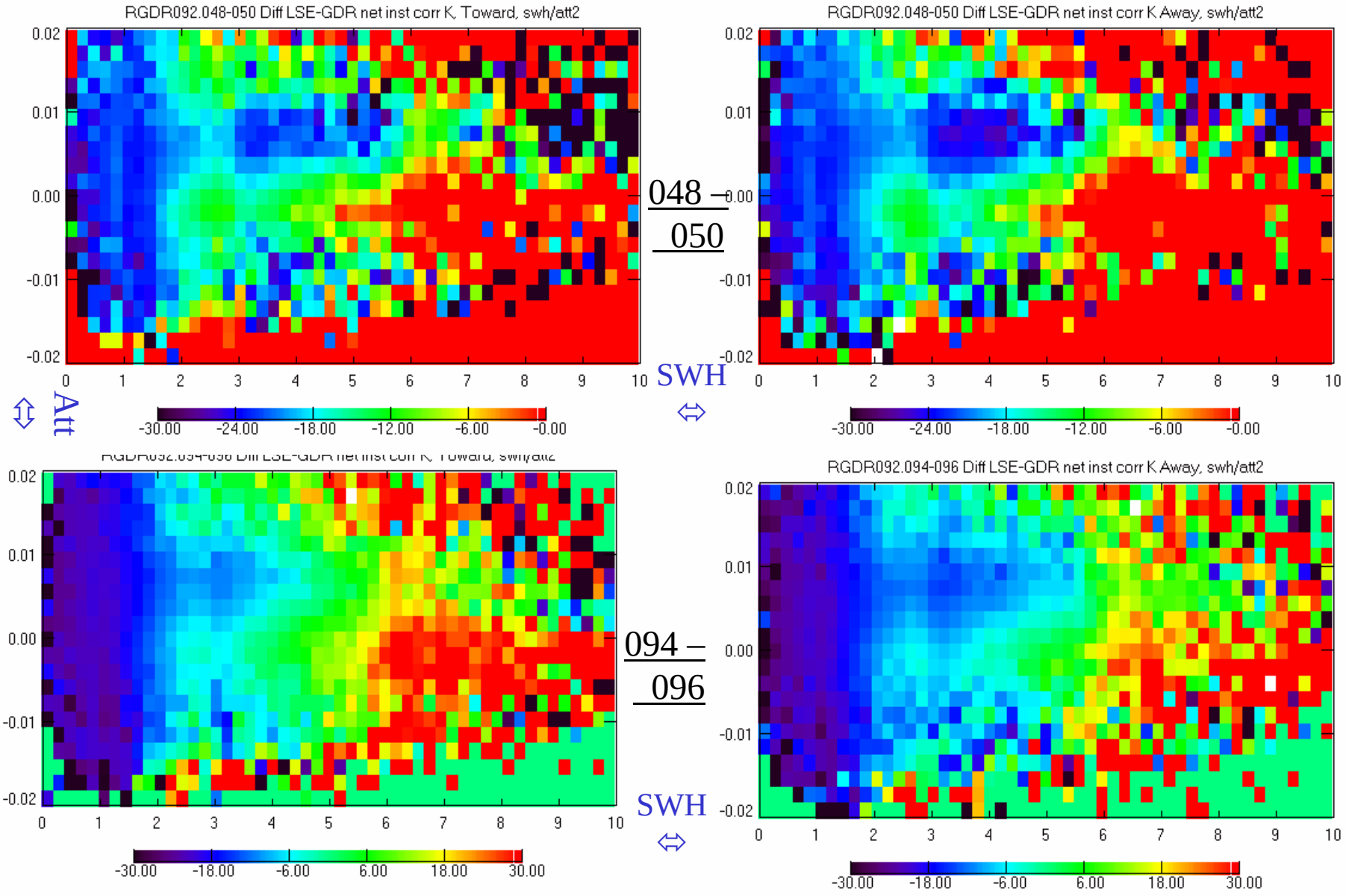


SKEW



TOPEX RGDR SWH/Att Distribution (1 of 4)

Toward Cycles 048-050, 094-096 – LSE-GDR Net RCorr Away

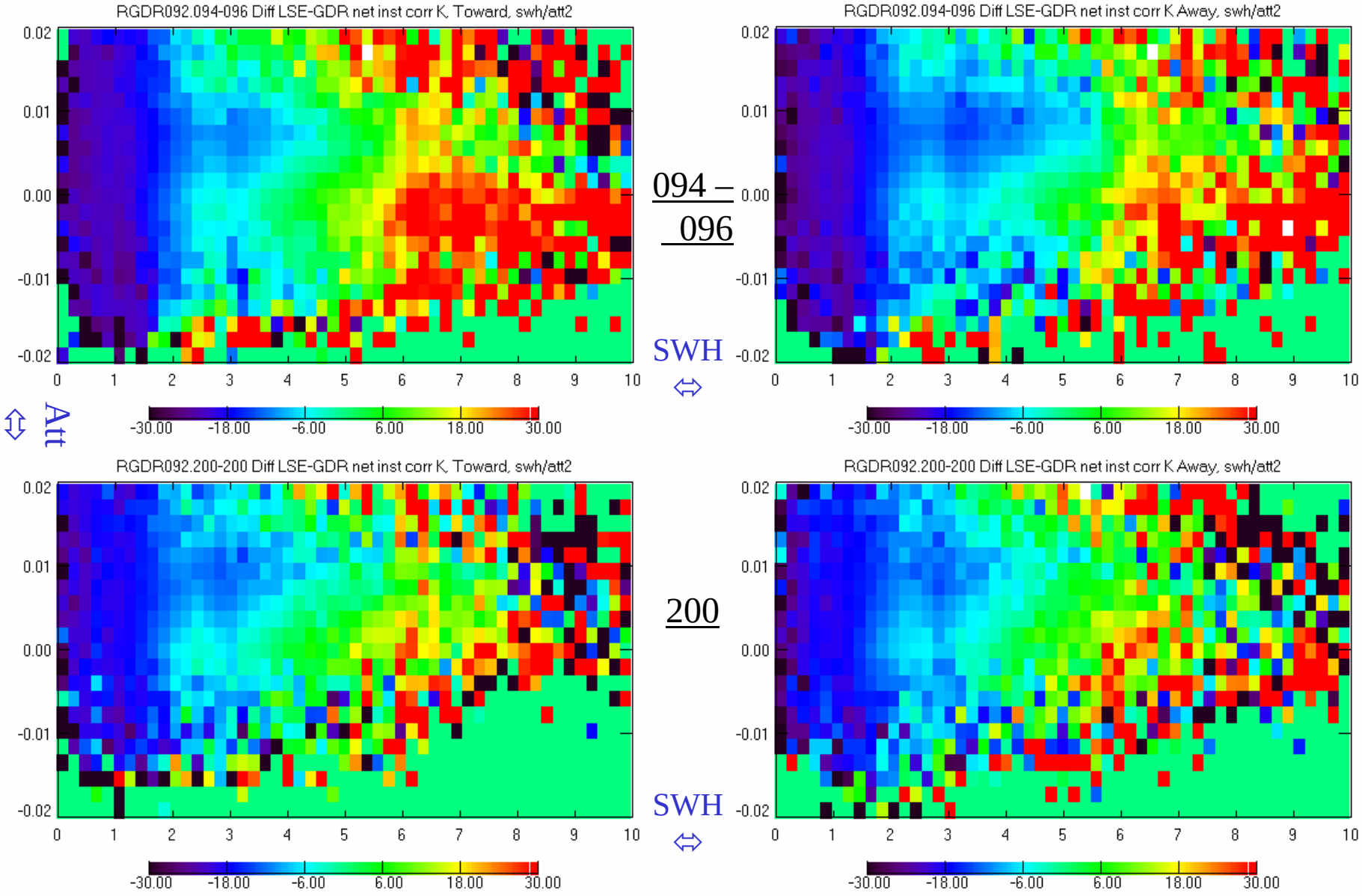


TOPEX RGDR SWH/Att Distribution (2 of 4)

Cycles 094-096, 200 – LSE-GDR Net RCorr

Toward

Away

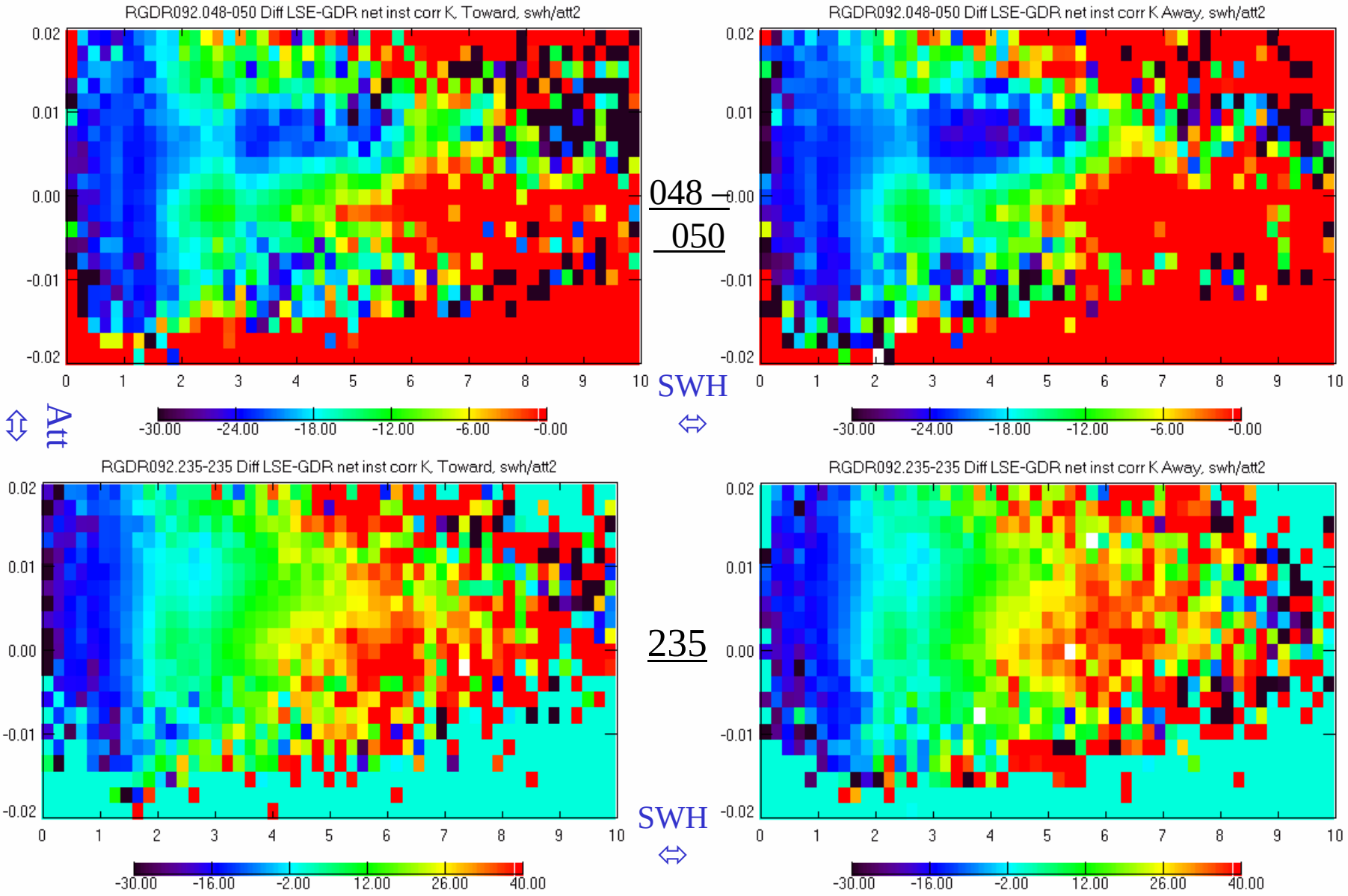


TOPEX RGDR SWH/Att Distribution (3 of 4)

Cycles 048-050, 235 – LSE-GDR Net RCorr

Toward

Away

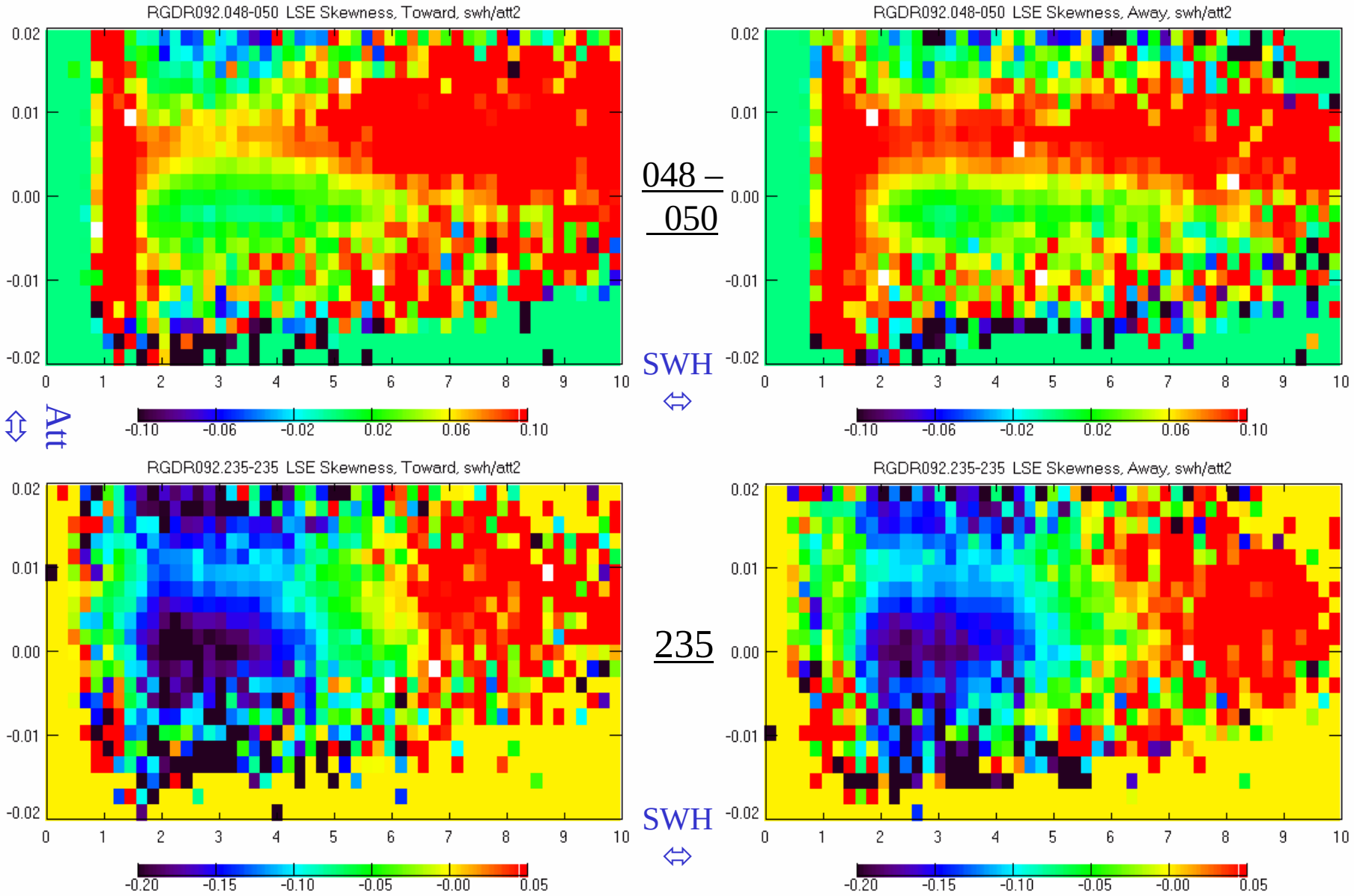


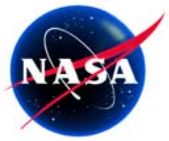
TOPEX RGDR SWH/Att Distribution (4 of 4)

Cycles 048-050, 235 – Skewness

Toward

Away

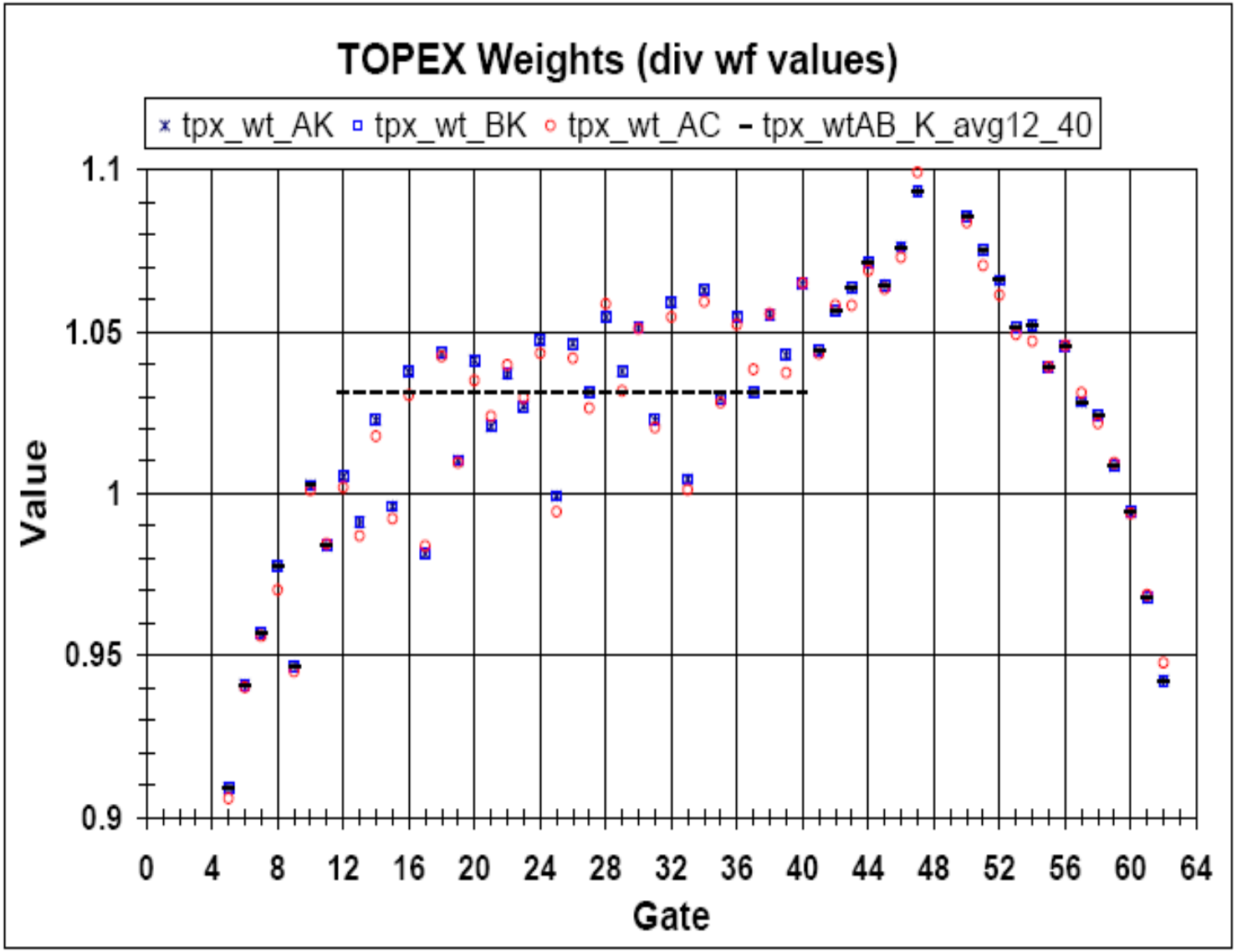




Backup Material

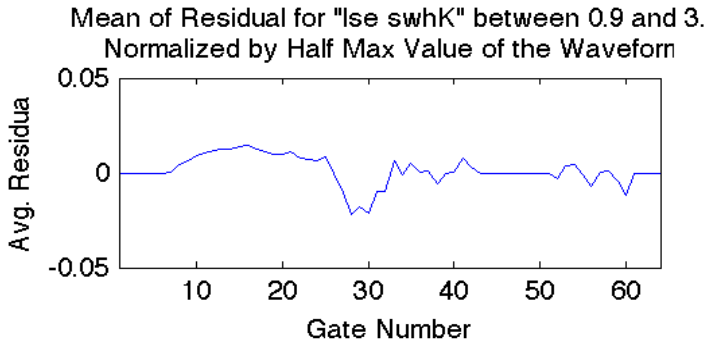
Details

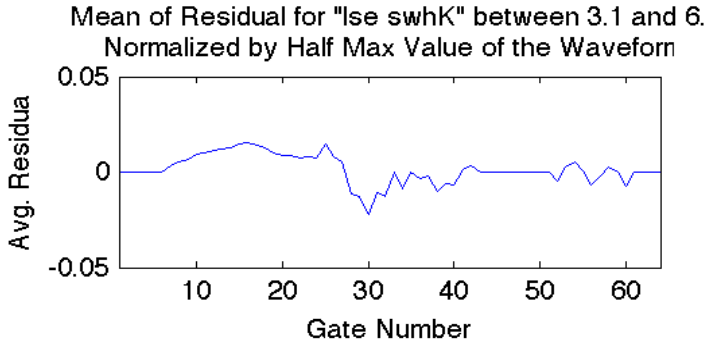
TOPEX Waveform Weights

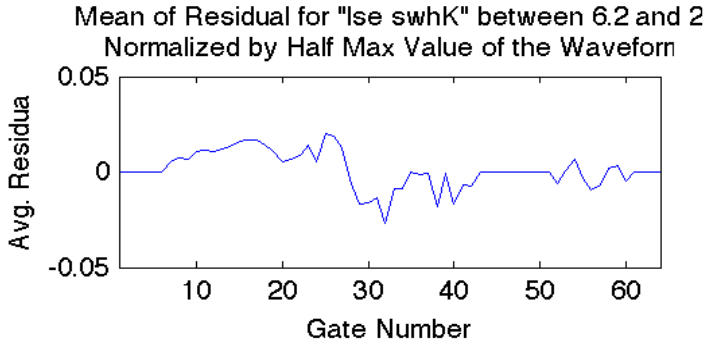


Effect of Different Cycle PTRs (Cyc 049/233)

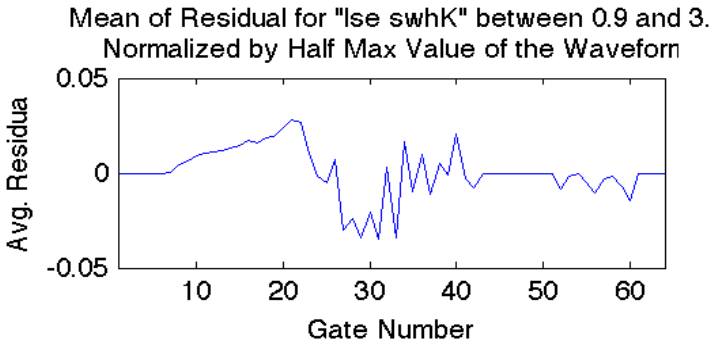
Cyc 233 P 021 PTR v7

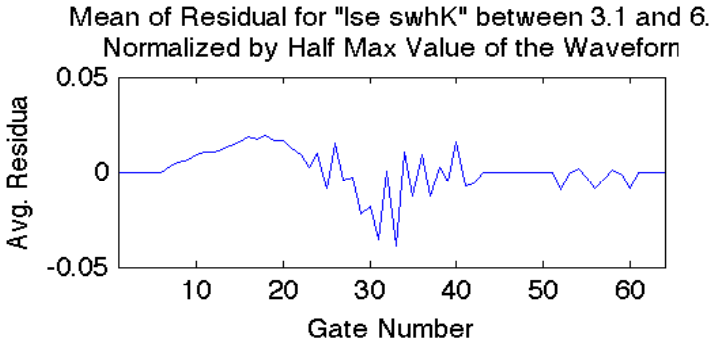


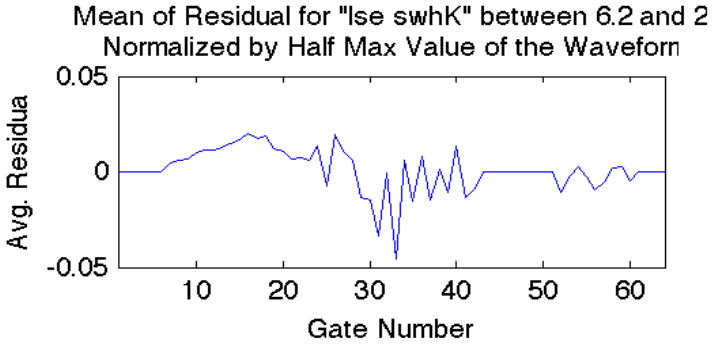




Cyc 049 P 021 PTR v7

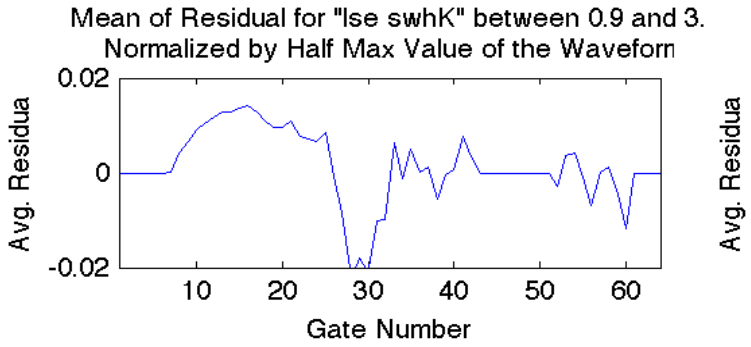


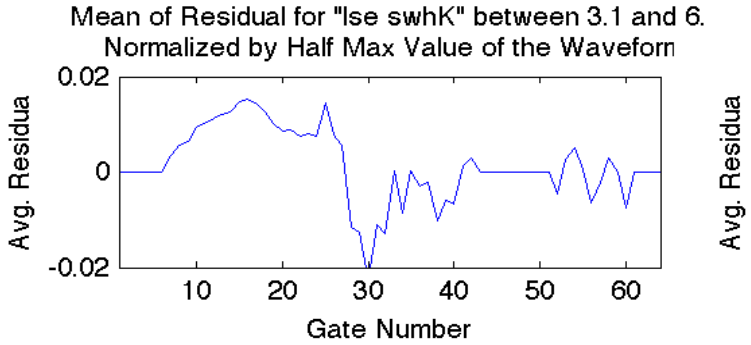


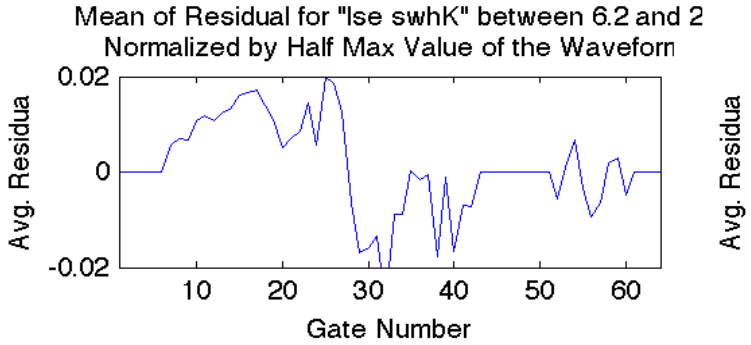


Effect of Different Weights (PTR v7)

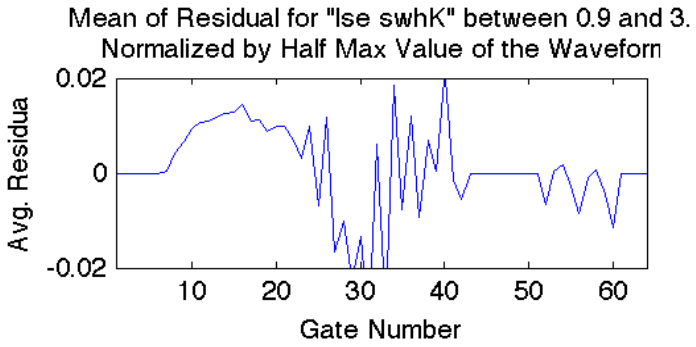
Cyc 233 P 021 Nom Wt

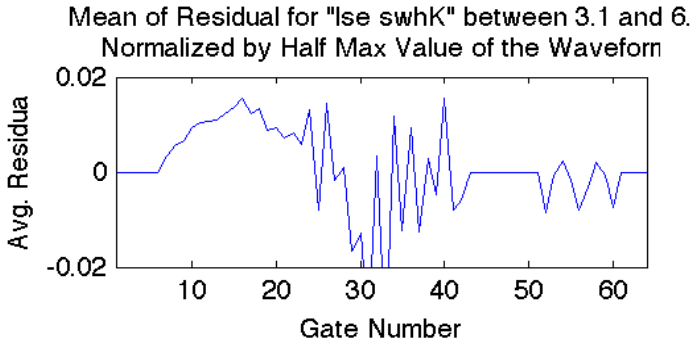


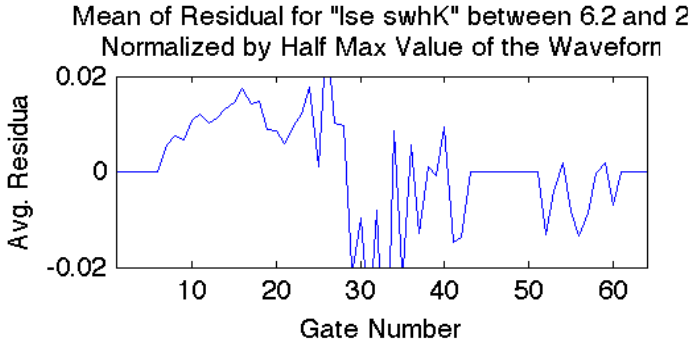




Cyc 233 P 021 Avg Wt

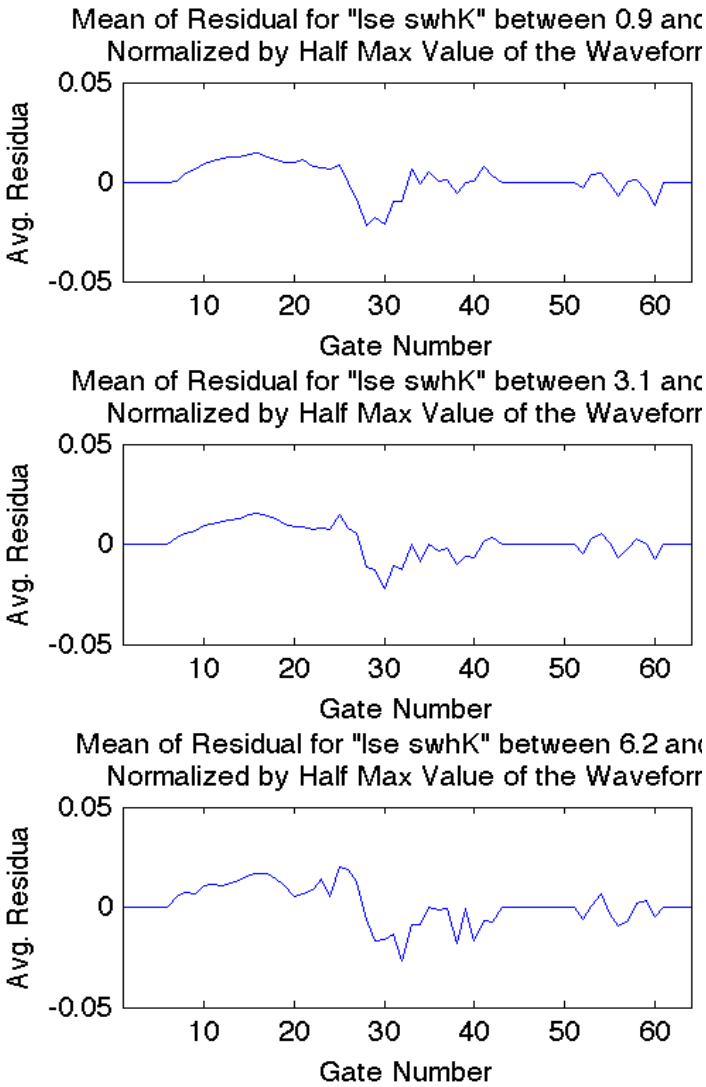




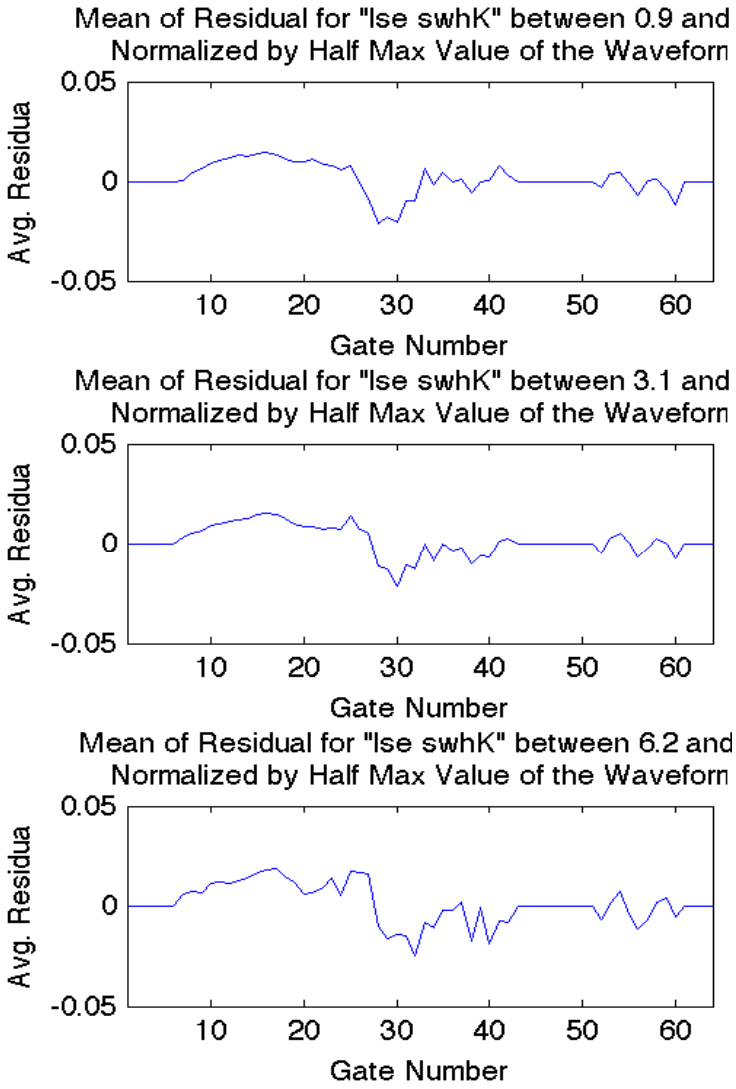


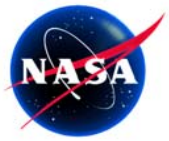
Effect of Different PTR Fits (Cyc 233)

Cyc 233 P 021 PTR v7



Cyc 233 P 021 PTR v5





TOPEX Reprocessing – Jason GDR-C Comparison

Phil Callahan

June 15, 2007

Instrumental parameters and Environmental corrections

Model	TOPEX RGDR (May '09)	Jason Version"b"	Jason Version"C"
Altimeter retracking	**Rodriguez LSE, MAP** (MAP may be dropped from final)	MLE4 &2nd order echo model	MLE4 & 2nd order echo model
Altimeter Instrument Corrections	**Consistent with LSE retracking**	Consistent with MLE4 retracking algorithm.	Consistent with MLE4 retracking algorithm.
Microwave Radiometer Parameters	**Calibration update by Brown & Desai**	Using calibration parameters derived from cycles 1-115.	New JMR characterization file
Dry Troposphere Range Correction	**From CLS (should be compatible with Jason)**	From ECMWF atmospheric pressures and model for S1 and S2 atmospheric tides.	From ECMWF atmospheric pressures (+S1 & S2) corrected for spurious oscillations
Wet Troposphere Range Correction from Model	**From CLS (should be compatible with Jason)**	From ECMWF model.	From ECMWF model.
Dual ionospheric correction	**[Will be Recomputed from retracking with new SSB]**		Updated taking into account new SSB on both bands
Back up model for Ku-band ionospheric range correction.	**Copied from MGDR-B [Will be updated to GIM if provided by CLS]**	Derived from DORIS measurements.	Derived from JPL GIM maps.
Sea State Bias Model	**MGDR-B [Will be updated by CLS based on retracked data]**	Empirical model derived from cycles 11-100 of MLE3 altimeter data with version "b" geophysical models"	Empirical model derived from cycles 11-100 (TBC) of MLE4 altimeter data with version "b" geophysical models".
Altimeter Wind Speed Model	**Jason ver. B, Vandemark et al. model via equations**	Derived from version "a" Jason-1 GDR data.	Derived from version "a" Jason-1 GDR data. ??
Rain Flag	**TPX algorithm with corrected TMR [Will add Jason type]**	Derived from version "a" Jason-1 GDRs (cycles 1-30).	Derived from version "B" Jason-1 GDRs. Using AGC
Ice Flag	**TPX algorithm from MGDR-B**	Climatology table	Climatology table (improve using Y. Faugere proposal)

Other Geophysical Corrections Evolution

Model	TOPEX RGDR (Mar '07)	Jason Version"b"	Jason Version"C"
Mean Sea Surface	**CLS01**	CLS01	CLS01
Along Track Mean Sea Surface	**None (should be added)**	None (set to default)	CLS model
Geoid	**EGM96**	EGM96	EGM96
Bathymetry	**None**	DTM2000.1	DTM2000.1
Inverse Barometer Correction	**Provided by CLS (should be compatible with Jason)**	Computed from ECMWF atmospheric pressures after removing S1 and S2 atmospheric tides.	Computed from ECMWF atmospheric pressures (+S1 & S2) corrected for spurious oscillations
Tide Solution 1	**GOT4.7**	GOT00.2 + S1 ocean tide. S1 load tide ignored.	GOT00.2 + S1 ocean tide. S1 load tide ignored.
Tide Solution 2	**FES2004 + ? (check)**	FES2004 + S1 and M4 ocean tides. S1 and M4 load tides ignored.	FES2004 + S1 and M4 ocean tides. S1 and M4 load tides ignored. K2, S1 and loading tide updated
Equilibrium long-period ocean tide.	**From Cartwright and Taylor tidal potential.**	From Cartwright and Taylor tidal potential.	From Cartwright and Taylor tidal potential.
Non-equilibrium long-period ocean tide.	**Mm, Mf, Mtm, and Msqm from FES2004 (check)**	Mm, Mf, Mtm, and Msqm from FES2004.	Mm, Mf, Mtm, and Msqm from FES2004.
Solid Earth Tide	**From Cartwright and Taylor tidal potential.**	From Cartwright and Taylor tidal potential.	From Cartwright and Taylor tidal potential.
Pole Tide	**Equilibrium model**	Equilibrium model.	Equilibrium model.
Wind Speed from Model	**None (could be added if CLS provides)**	ECMWF model	ECMWF model