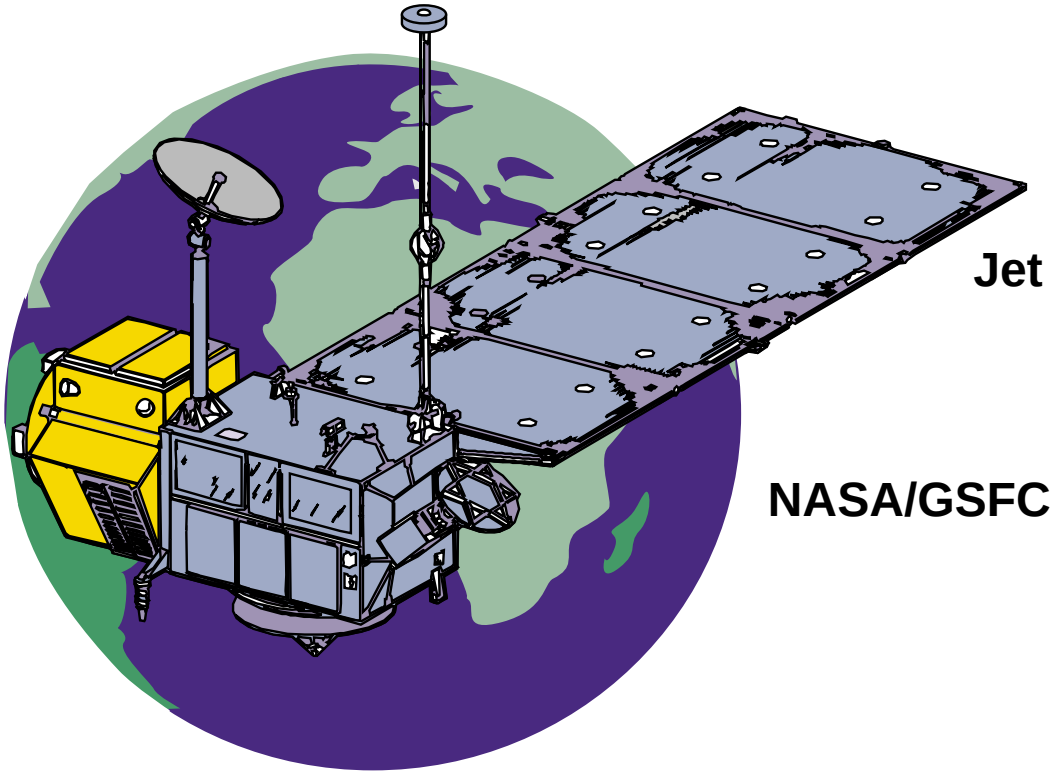
TOPEX/Poseidon

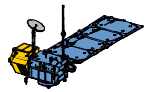
Satellite/Sensors Performance Characteristics Workshop #9



Presented By:
John Hultberg
Jet Propulsion Laboratory

Prepared By:
David Hancock
NASA/GSFC Wallops Flight Facility

Presented At:
JPL
August 8, 2000



TOPEX Side A

Turned On: August 21, 1992
Turned Off: February 9, 1999

Total Hours from Turn On to Turn Off:

OFF	394
IDLE	6,100
TRACK	50,200

TOPEX Side B

Turned On: February 10, 1999

Total Hours from Turn On through August 8, 2000:

OFF	24
IDLE	1,180
TRACK	11,880

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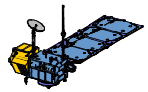
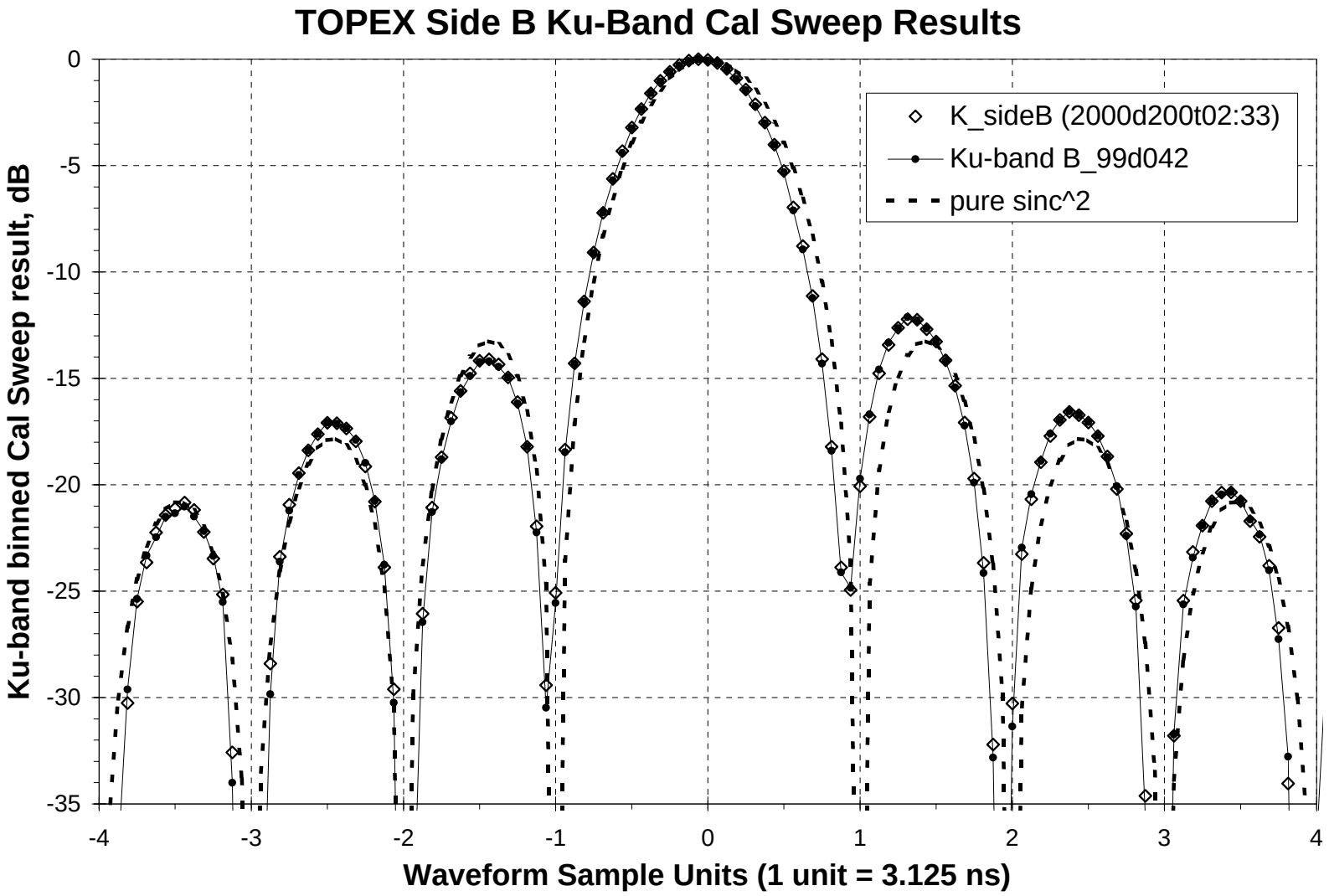
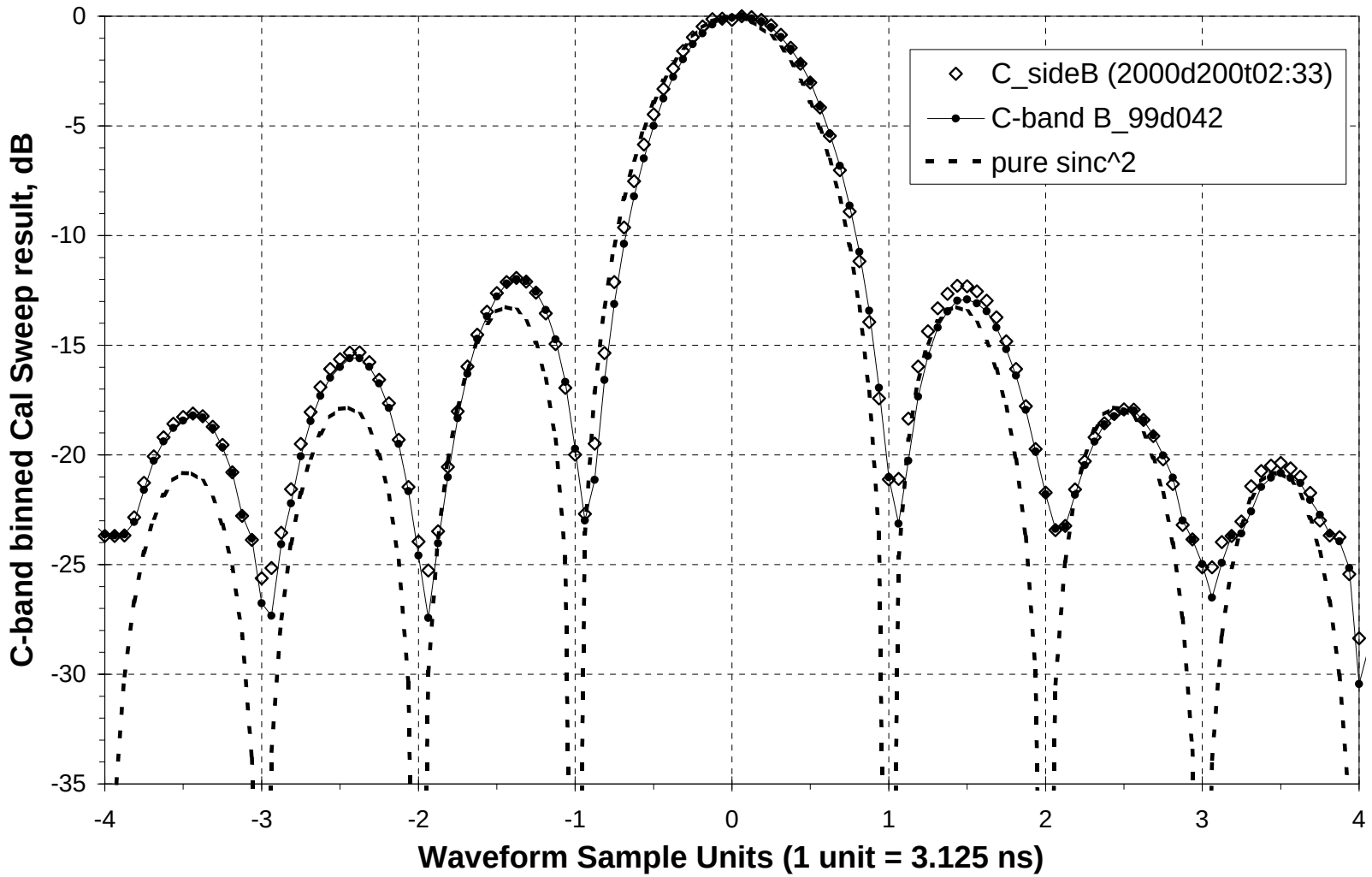
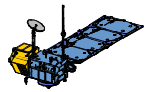


Side B Status

- **Side B continues to operate well.**
- **Cal Sweep Tests are performed monthly, to discern any Side B PTR changes. None detected.**
- **No significant concerns.**


TOPEX Side B Ku-Band Cal Sweep Results
Ku-band binned Cal Sweep result, dB
0
-5
-10
-15
-20
-25
-30
-35
-4
-3
-2
-1
0
1
2
3
4
Waveform Sample Units (1 unit = 3.125 ns)
K_sideB (2000d200t02:33)
Ku-band B_99d042
pure sinc^2


TOPEX Side B C-Band Cal Sweep Results
C-band binned Cal Sweep result, dB
Waveform Sample Units (1 unit = 3.125 ns)
C_sideB (2000d200t02:33)
C-band B_99d042
pure sinc^2
0
-5
-10
-15
-20
-25
-30
-35
-4
-3
-2
-1
0
1
2
3
4



NASA ALTIMETER SIDE B – KEY EVENTS	
Day	**Event**
1999/041	Commanded Side B to IDLE Mode and Uploaded Memory Patches
1999/042	Commanded Side B to STANDBY and then to TRACK Mode
1999/042	Side B Testing, including: Mode Checks, Cal-Sweep, and Waveform Leakage Tests
1999/043	Additional Testing, including: Cal-Sweep, Waveform Leakage Tests, and Gate-Shift Tests
1999/048	Gate Shift Tests (lost 3.1 hours of data)
1999/049	Cal-Sweep Test (lost 0.4 hours of overland data)
1999/049-050	Off-Nadir Tests
1999/050	Began First Side B Operational Cycle [Cycle 237]
1999/071	Improper SEU Recovery (lost 0.7 hours of data)
1999/089	Cal-Sweep Test (lost 0.4 hours of overland data)
1999/109	Cal-Sweep Test (lost 0.4 hours of overland data)
1999/109	Changed to IDLE Mode for SSALT
1999/119	Returned to TRACK Mode
1999/119	Cal-Sweep Test (lost 0.4 hours of overland data)
1999/149	Cal-Sweep Test (lost 0.4 hours of overland data)
1999/179	Cal-Sweep Test (lost 0.4 hours of overland data)
1999/198-199	C-Band Autonomously Switched to Side A Transmit (lost 5.6 hours of data)
1999/209	Cal-Sweep Test (lost 0.4 hours of overland data)
1999/223	**C-Band CAMPIN Autonomously Disabled (lost 1.6 hours of data). Some corruption of Non-Protected Memory**
1999/226	**Unsuccessful Restoration of Non-Protected Memory, due to Command Table Error (lost 0.6 hours of overland data)**
1999/231	**Successful Restoration of Non-Protected Memory (lost 1.1 hours of mostly overland data)**
1999/236	**Commanding for New Parameter File, to Increase AGC Minimum from 13 to 15 dB (lost 0.1 hours of overland data).**

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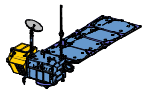

NASA ALTIMETER SIDE B – KEY EVENTS (continued)	
Day	**Event**
1999/237	Cal-Sweep Test (lost 0.4 hours of overland data)
1999/238	Changed to IDLE Mode for SSALT
1999/243	Spacecraft Safehold, after a reset of central data processing unit. ALT was automatically turned OFF.
1999/243	Commanded ALT back to IDLE Mode. Total OFF time was 15.7 hours.
1999/244	Uploaded full memory dump command. ALT remains in IDLE.
1999/245	ALT turned OFF during Attitude Control Electronics switchover
1999/246	Commanded ALT back to IDLE Mode and Uploaded full memory dump command. ALT remains in IDLE. OFF time was 7.9 hours.
1999/248	Returned to TRACK Mode
1999/252	Digital Filter Bank Calibration (lost 0.3 hours of overland data)
1999/265	Sent Commands in Attempt to Improve Acquisition . Lost 1.1 hours of land and ocean data. Commanding was Unsuccessful.
1999/268	Cal-Sweep Test (lost 0.4 hours of overland data)
1999/276	Ku-Band Autonomously Switched to Side A Transmit (lost 3.1 hours of data)
1999/298	Cal-Sweep Test (lost 0.4 hours of overland data)
1999/327	Cal-Sweep Test (lost 0.4 hours of overland data)
1999/337	Changed to IDLE Mode for SSALT
1999/347	Returned to TRACK Mode
1999/357	Cal-Sweep Test (lost 0.4 hours of overland data)
1999/360	SEU resulted in corruption of the engineering Pass Count value. No apparent effect on ALT science data.
2000/012	Orbital Maneuver #13 (affected 1.2 hours of data)
2000/022	Cal-Sweep Test (lost 0.4 hours of overland data)
2000/036	Digital Filter Bank Calibration (lost 0.3 hours of overland data)
2000/052	Cal-Sweep Test (lost 0.4 hours of overland data)

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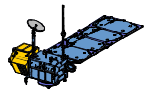
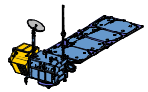
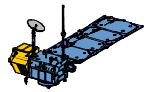


NASA ALTIMETER SIDE B – KEY EVENTS (continued)	
Day	**Event**
2000/061	Reloaded memory to rectify engineering memory corruption which began on day 056. Lost 0.9 hours of mostly overland data. This memory reload also restored the engineering Pass Count value which had been corrupted by an earlier SEU on 1999/360.
2000/067	Improper SEU recovery (lost 5.8 hours of data)
2000/081	Cal-Sweep Test (lost 0.4 hours of overland data)
2000/091	Changed to IDLE Mode for SSALT
2000/101	Returned to TRACK Mode
2000/111	Cal-Sweep Test (lost 0.4 hours of overland data)
2000/141	Cal-Sweep Test (lost 0.4 hours of overland data)
2000/157	Improper SEU recovery (lost 1.9 hours of data)
2000/171	Cal-Sweep Test (lost 0.4 hours of overland data)
2000/200	Cal-Sweep Test (lost 0.4 hours of overland data)
2000/200	Changed to IDLE Mode for SSALT
2000/210	Returned to TRACK Mode



Significant Events Since Last Workshop

- 1999/223 C-Band Campin
  - Similar events have occurred in the past (Side B MTU A/B switch problem, SEU 99/198)
  - Assumed SEU related
  - Reset by commanding
  - No concern, has not recurred
- 1999/236 New Parameter File
  - Increase AGC minimum from 13 to 15 dB to reduce acquisition problems
  - Did not significantly change occurrence
  - Established as current parameter set
  - No change induced in science data
- 1999/243 Safehold
  - Small step change in Ku-band signal level
  - Change land to water acquisition performance
  - No concern



Land-to-Water Acquisitions

- **Some Side B land-to-water acquisitions, prior to the 99/243 spacecraft Safehold, were slow. Resulted in small loss of ocean data (<0.02%)**
- **Land-to-water acquisition times have been nominal since safehold 99/243.**
- **Performance change is related to the small step change that occurred in Ku-band signal level after the safehold.**
- **WFF has not determined reason but does not consider it to be any significant issue.**
- **WFF regularly monitors.**

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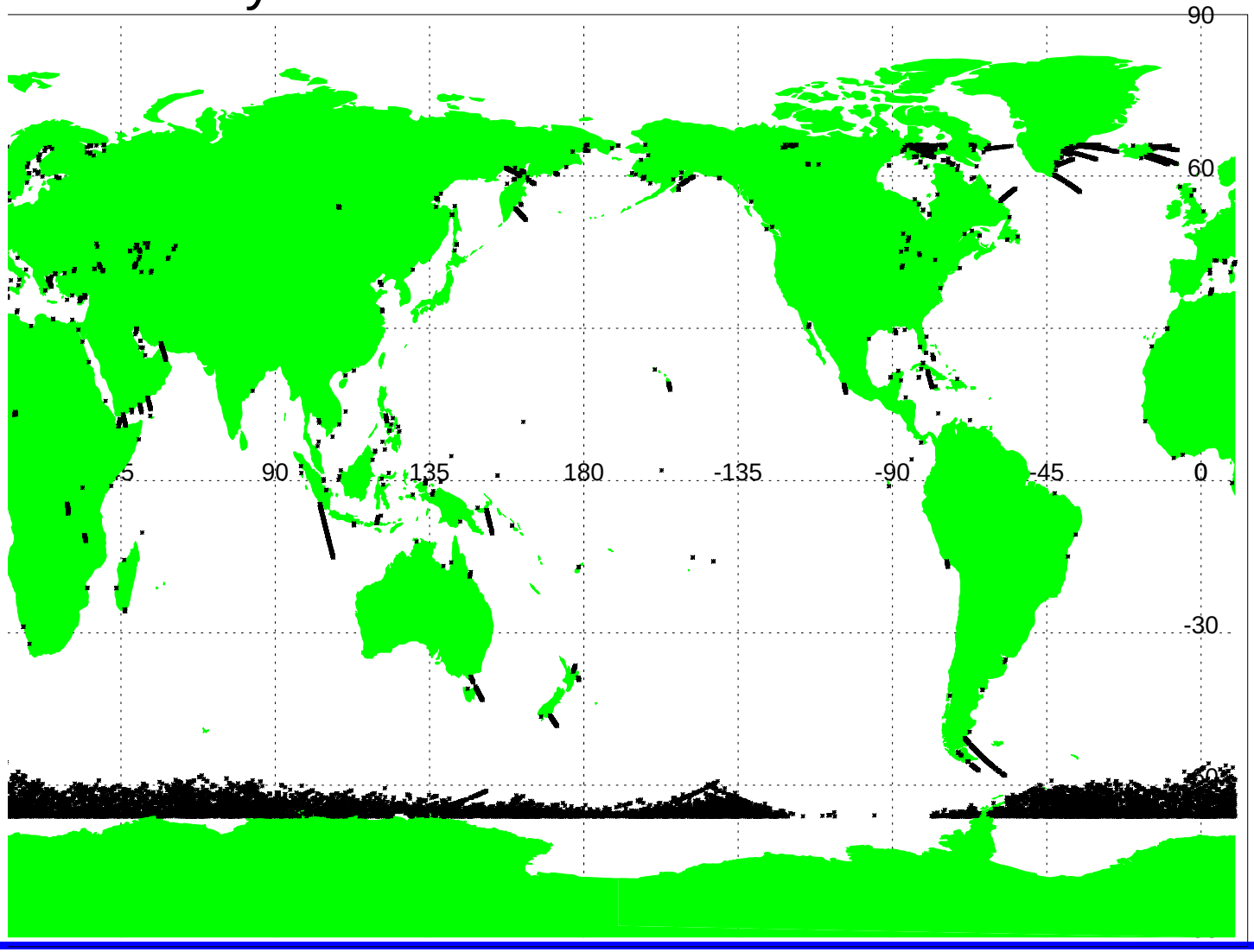
Cycle 255 - Before Safehold 99/243



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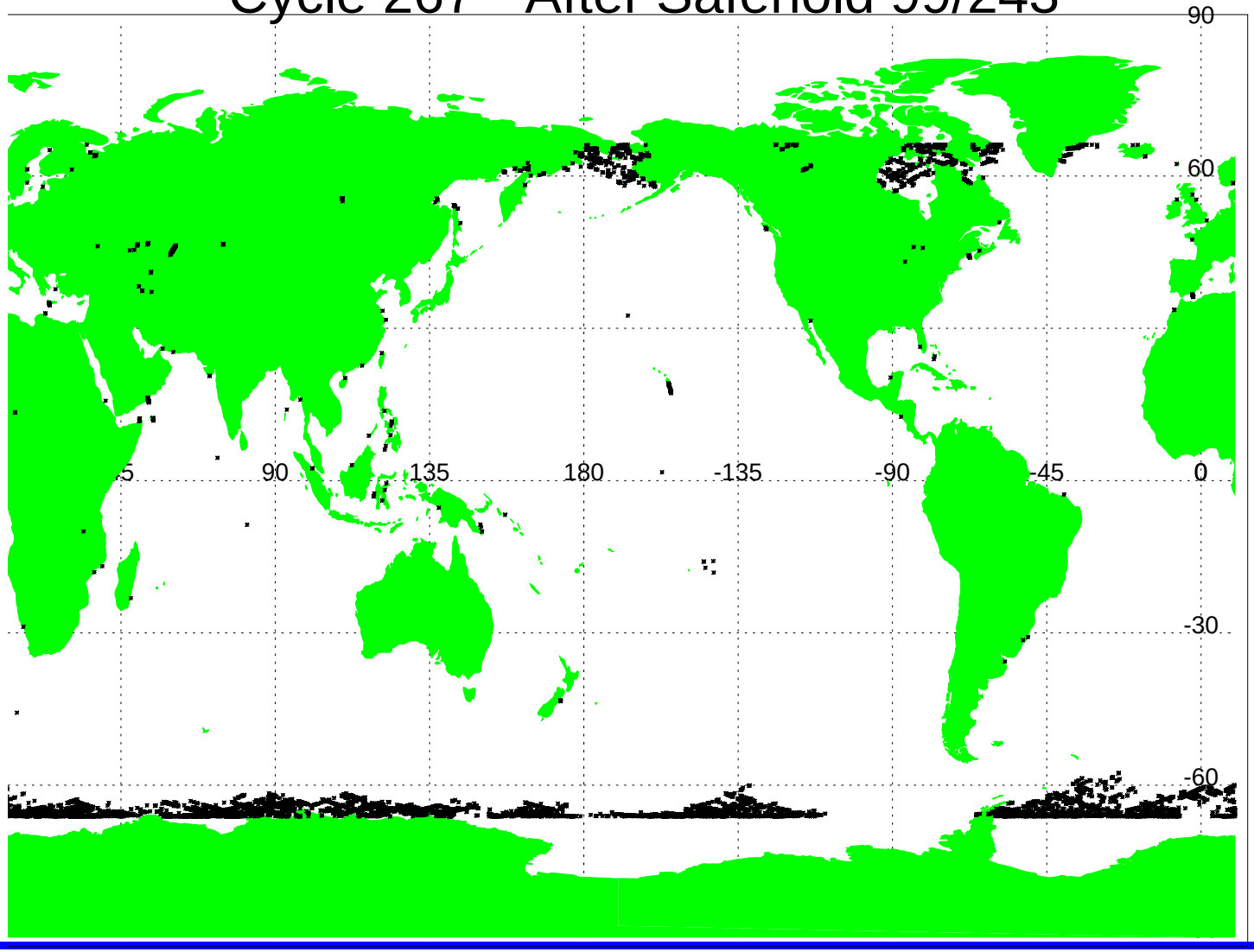
Cycle 267 - After Safehold 99/243



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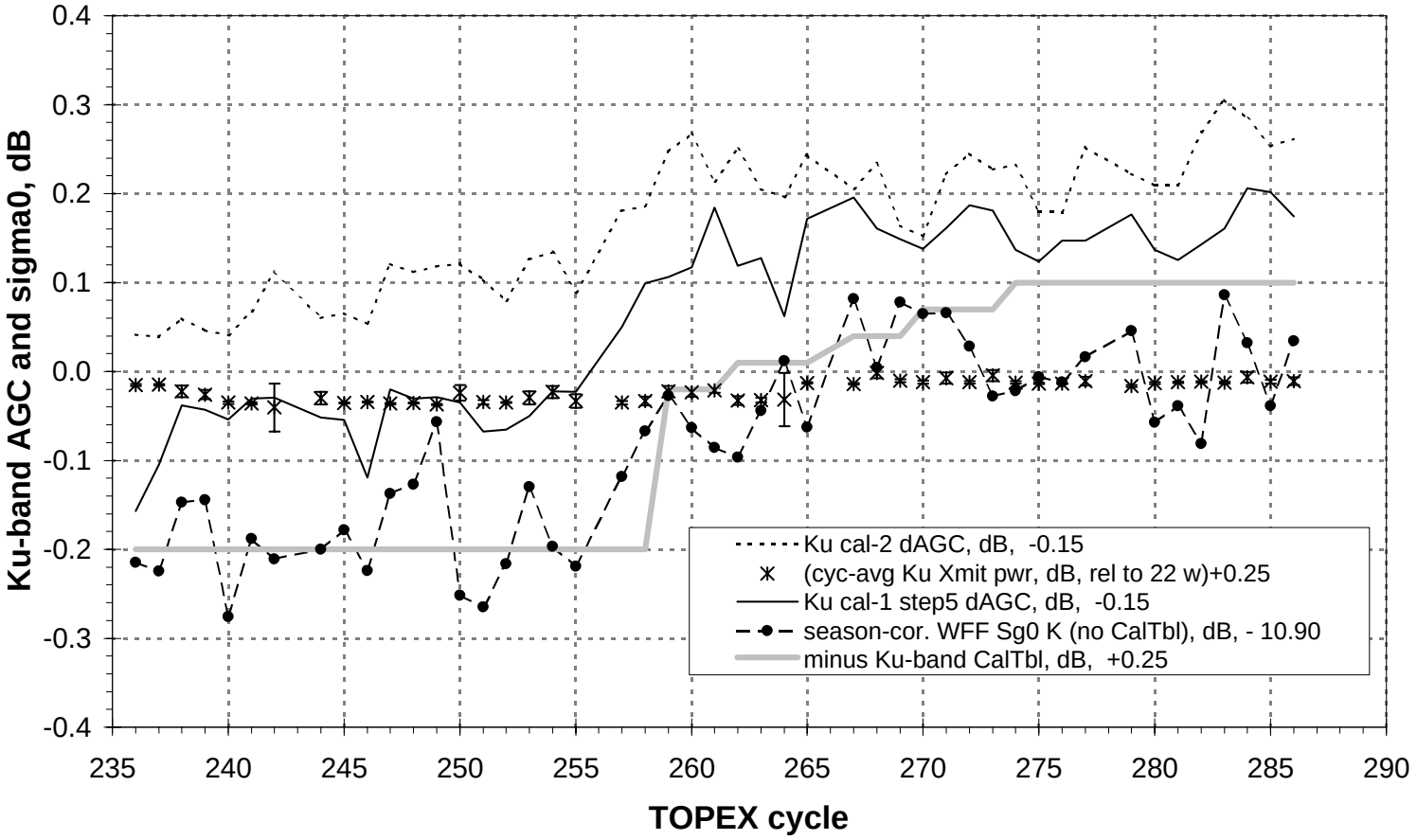
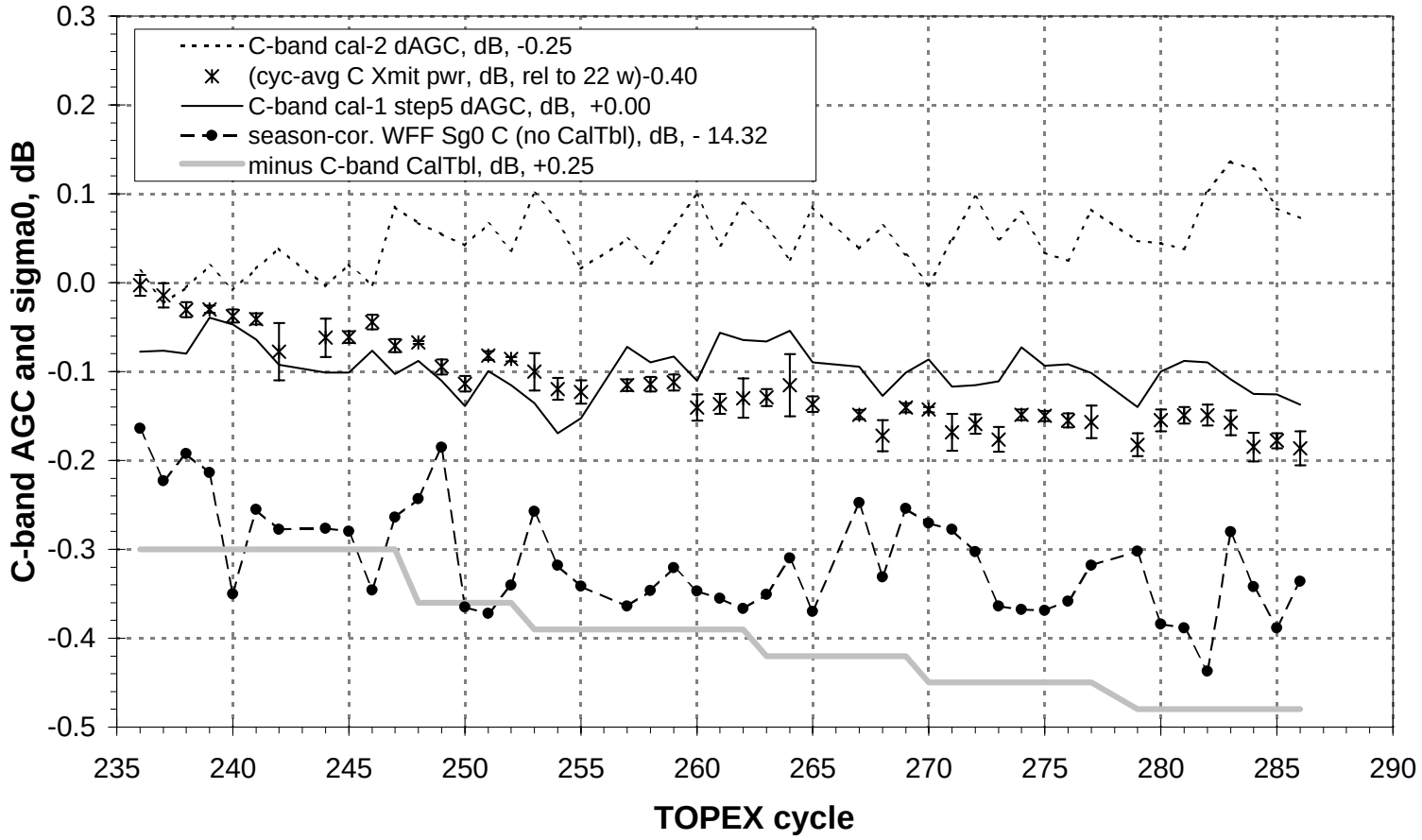
Ku Side B Cycle-Avg Cal-1 & Cal-2 Delta AGC, Sigma0

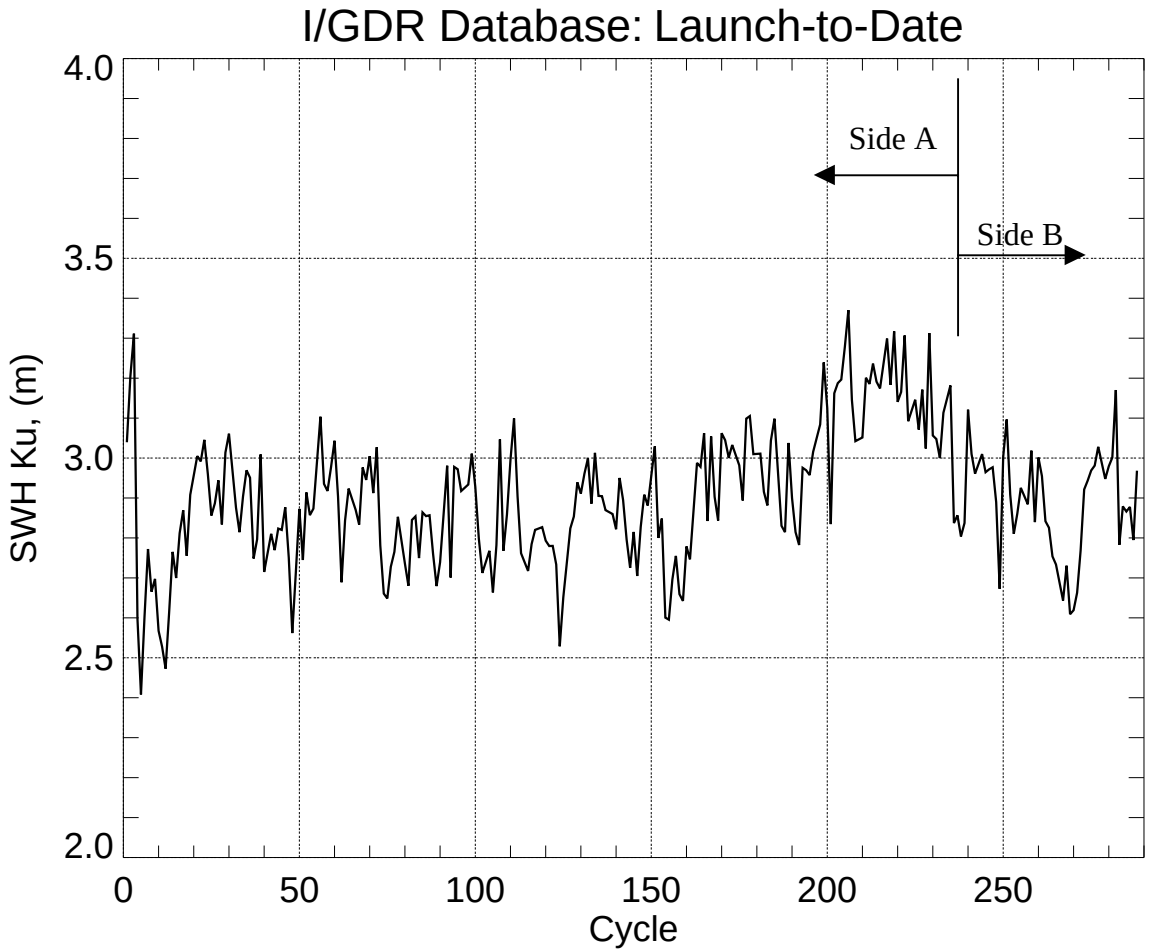
Cal Table Corrections Removed; Cycle 277 onward will be recomputed with revised Cal values, but this figure shows results before recomputation

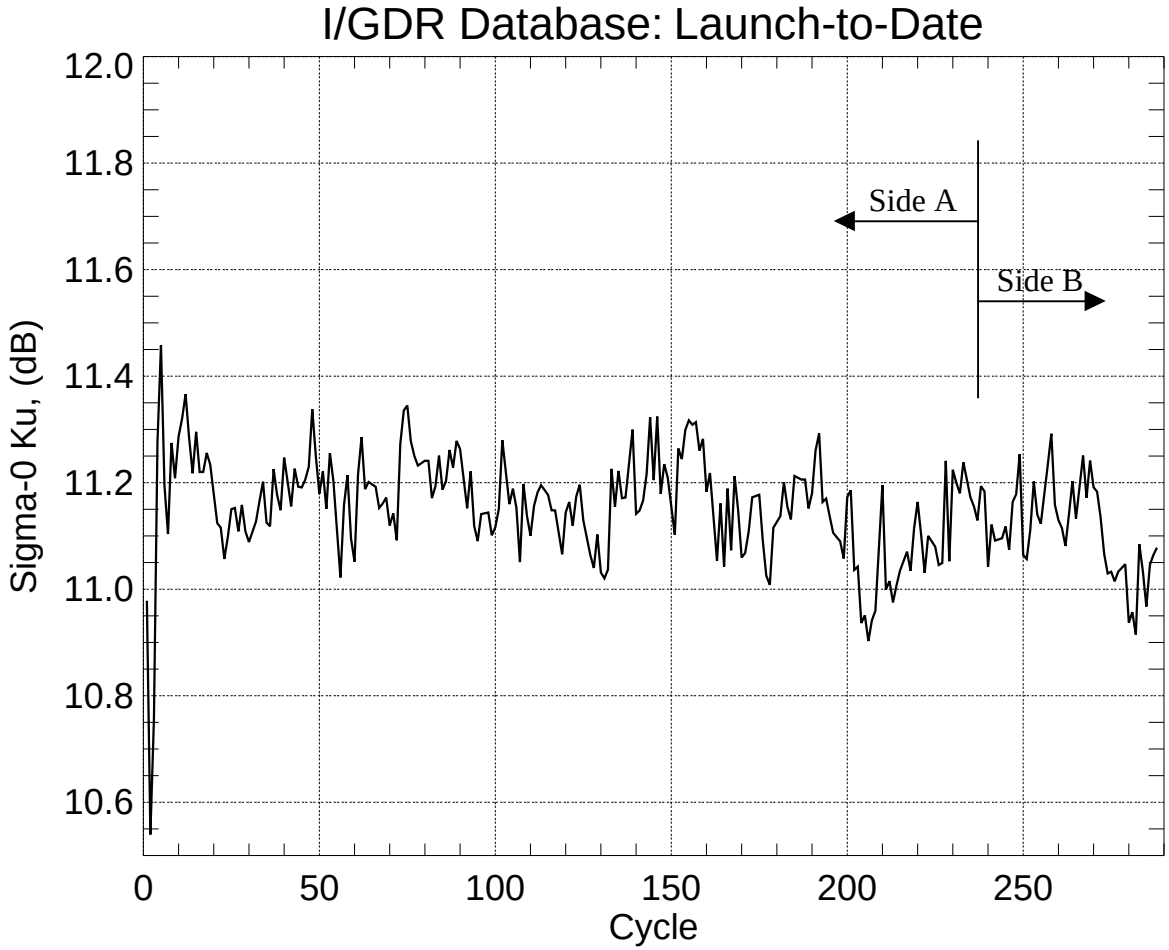


C-Band Side B Cycle-Avg Cal-1 & Cal-2 Delta AGC, Sigma0

Cal Table Corrections Removed; Cycle 277 onward will be recomputed with revised Cal values, but this figure shows results before recomputation




I/GDR Database: Launch-to-Date
SWH Ku, (m)
Cycle
Side A
Side B
4.0
3.5
3.0
2.5
2.0
0
50
100
150
200
250



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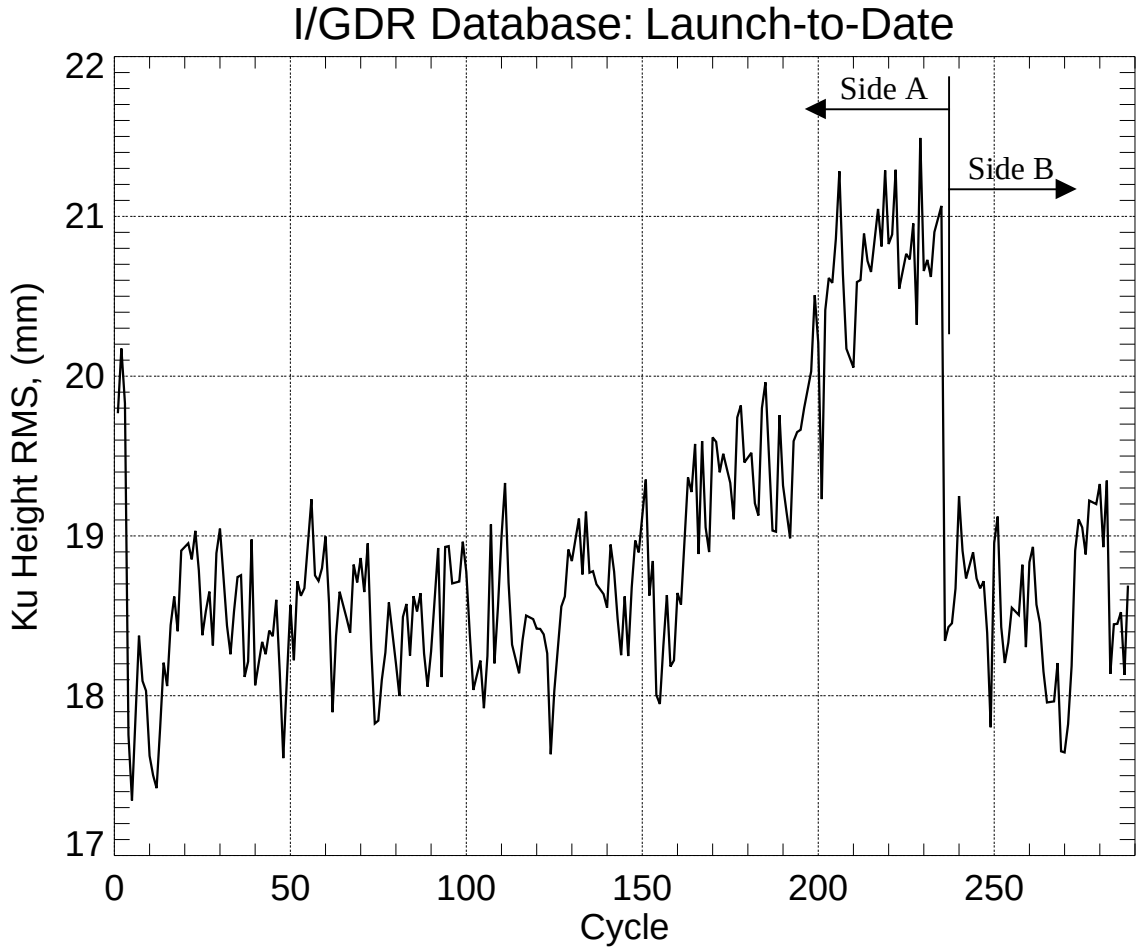

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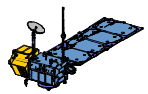
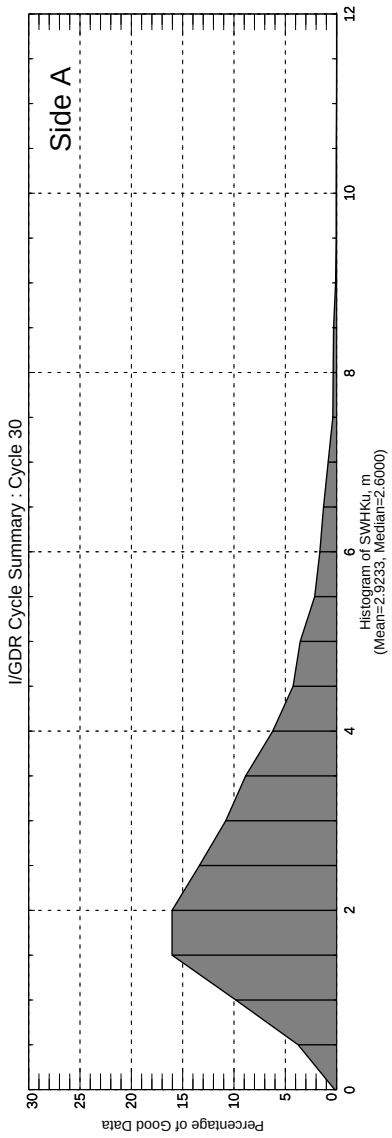
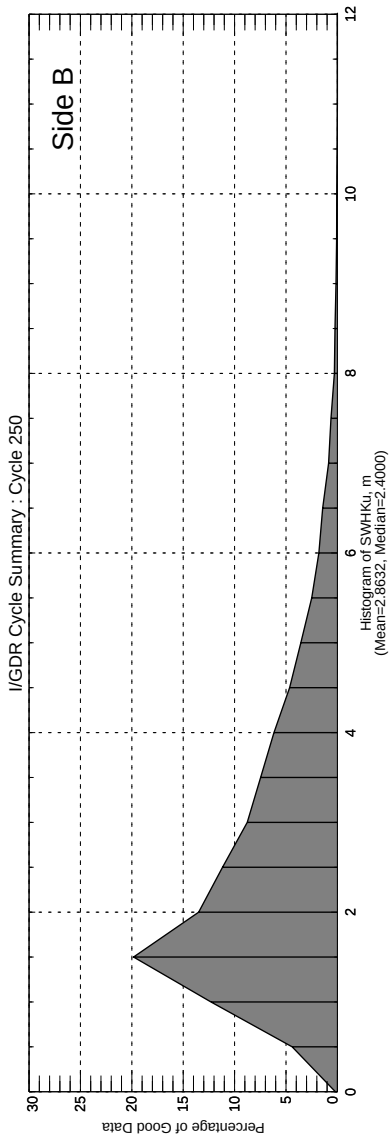
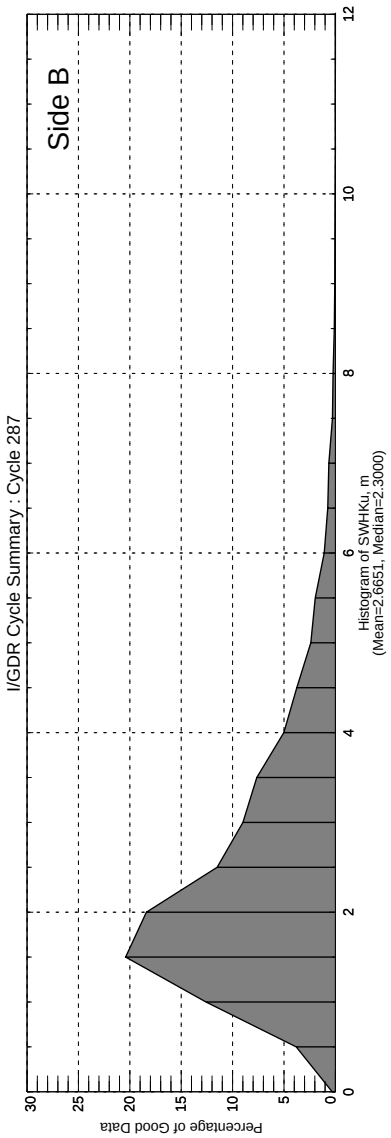


TOPEX ALT







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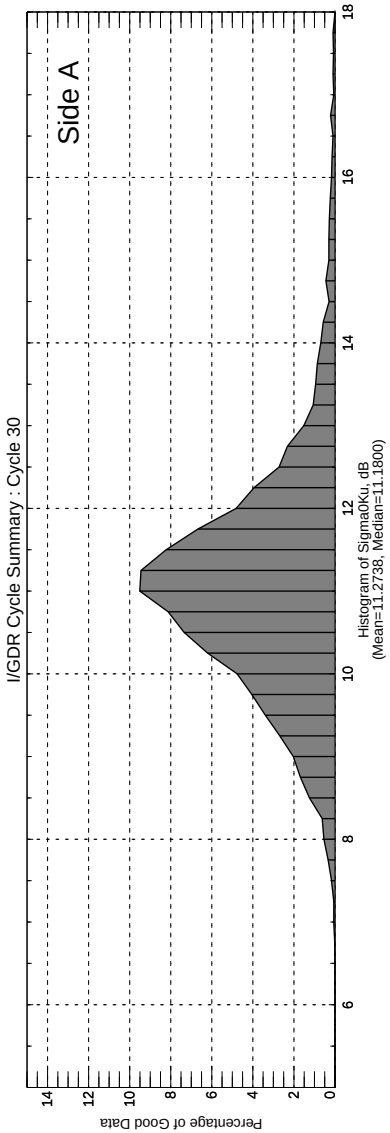

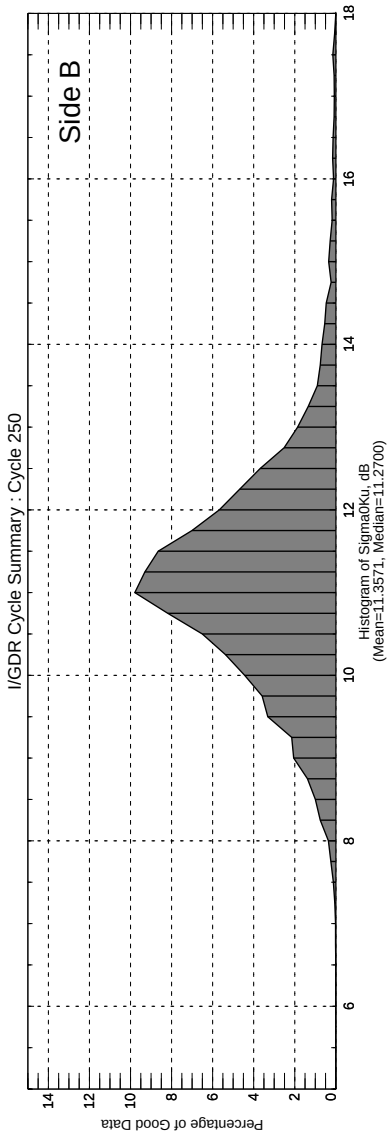

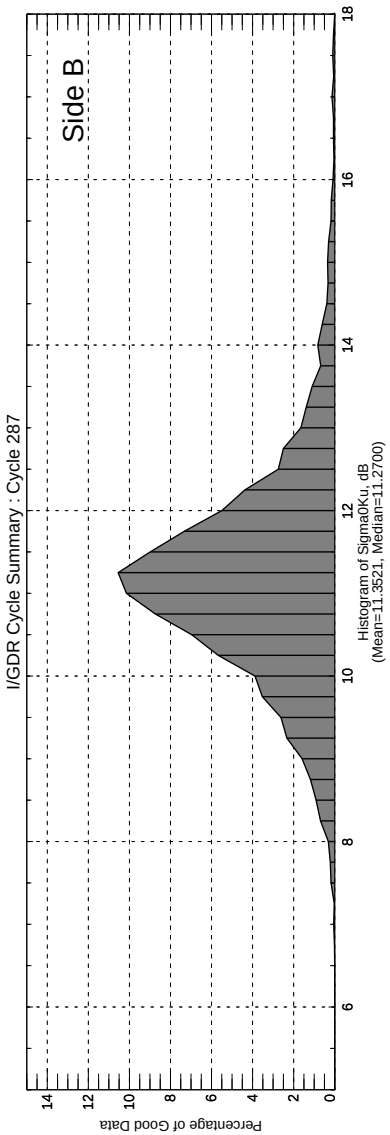

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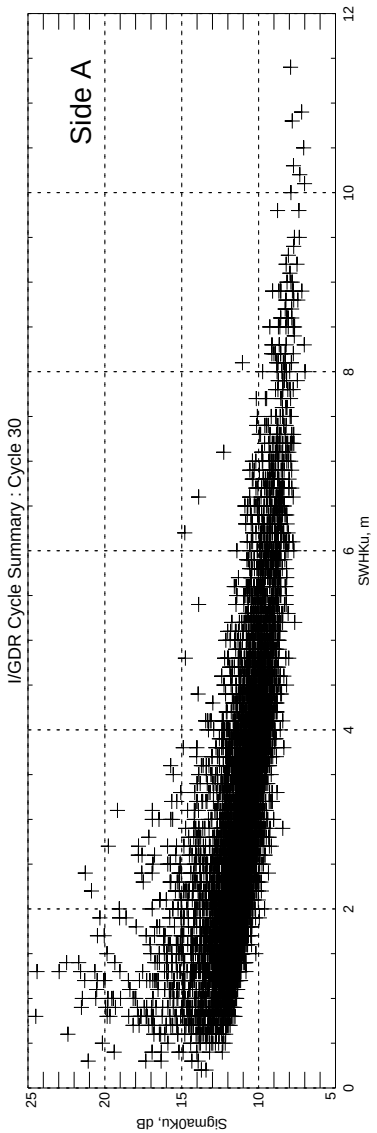

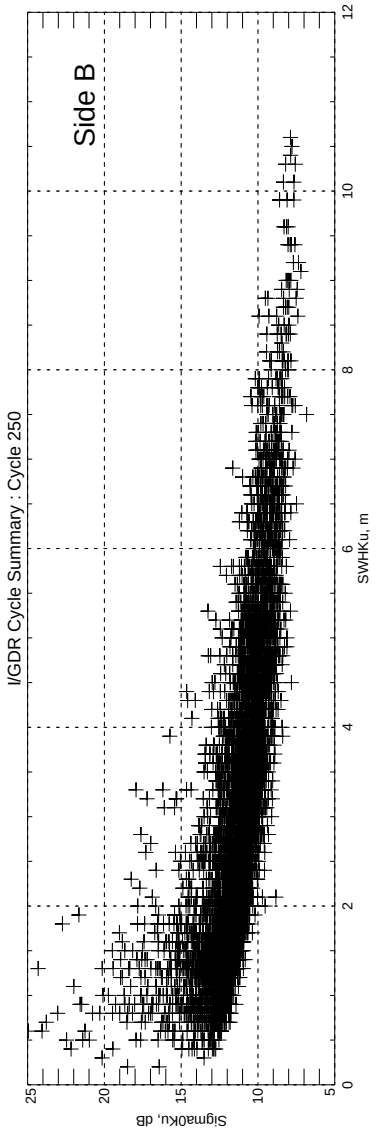

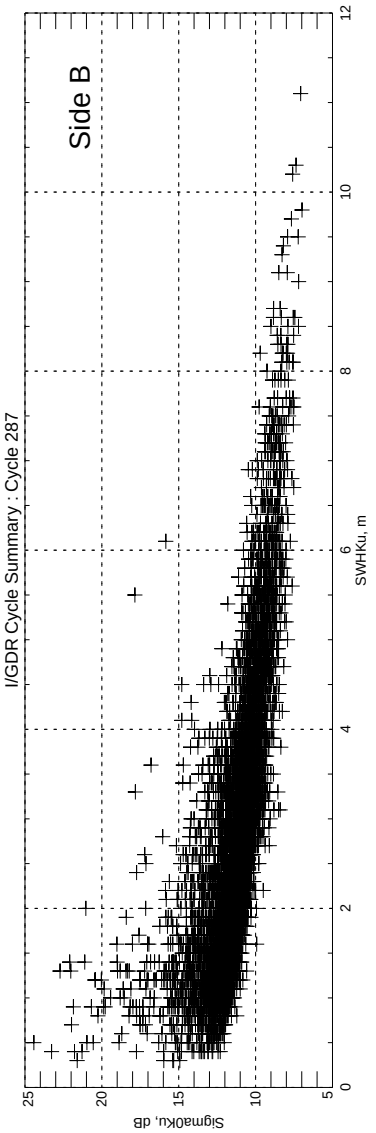

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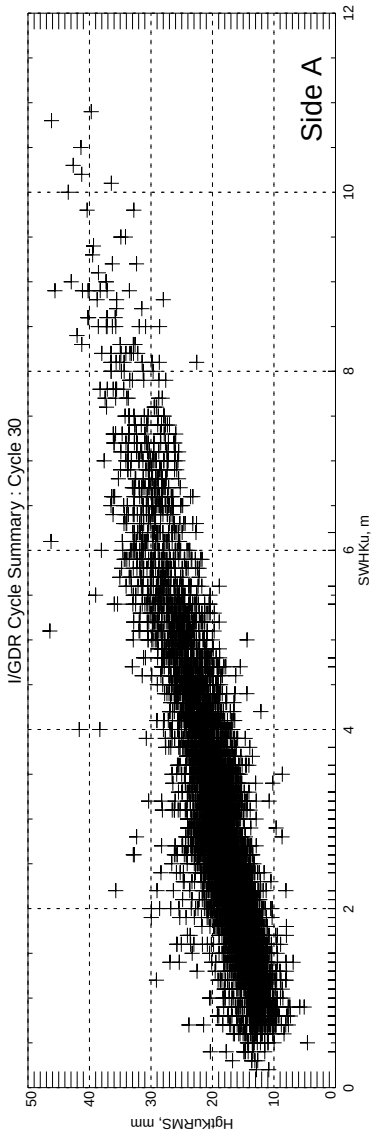

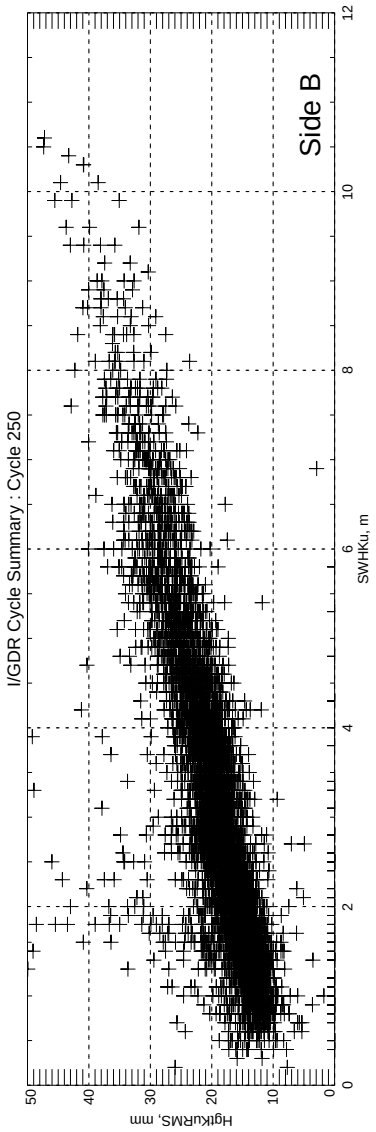

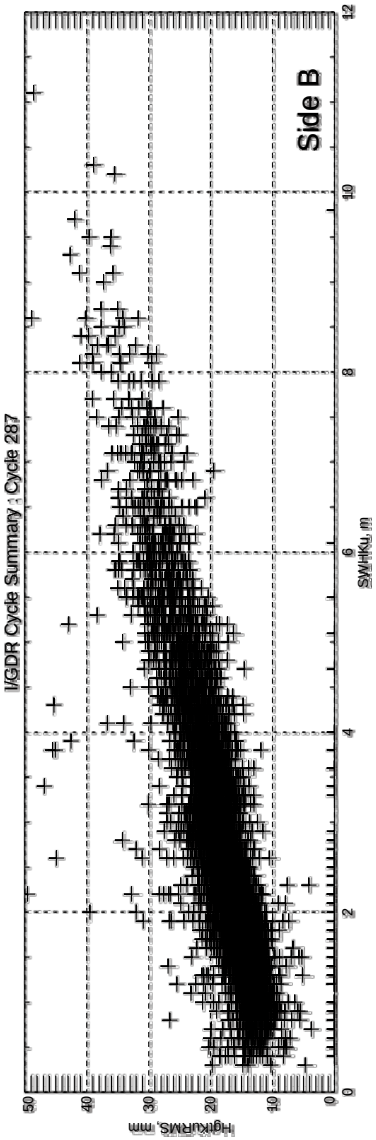

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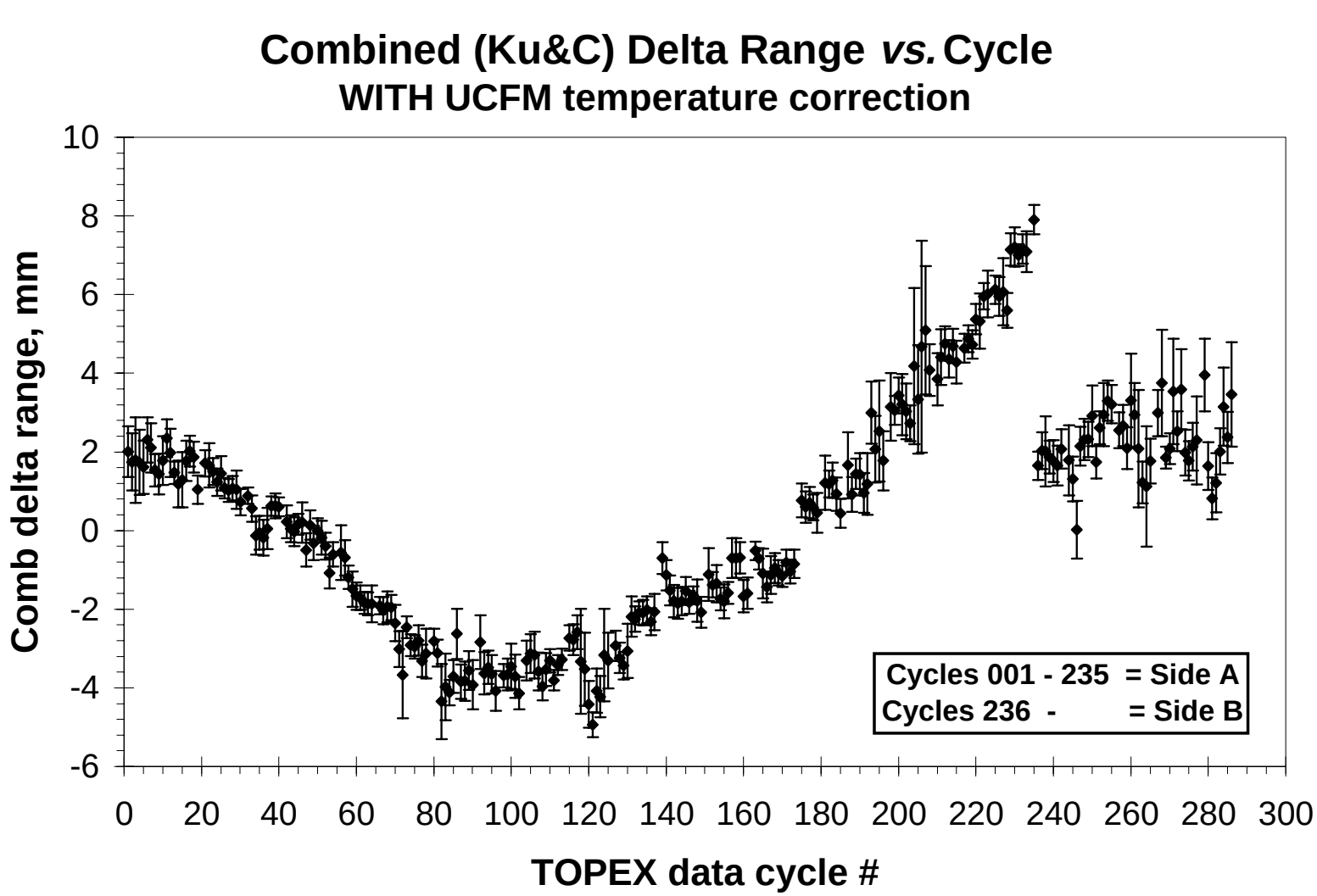
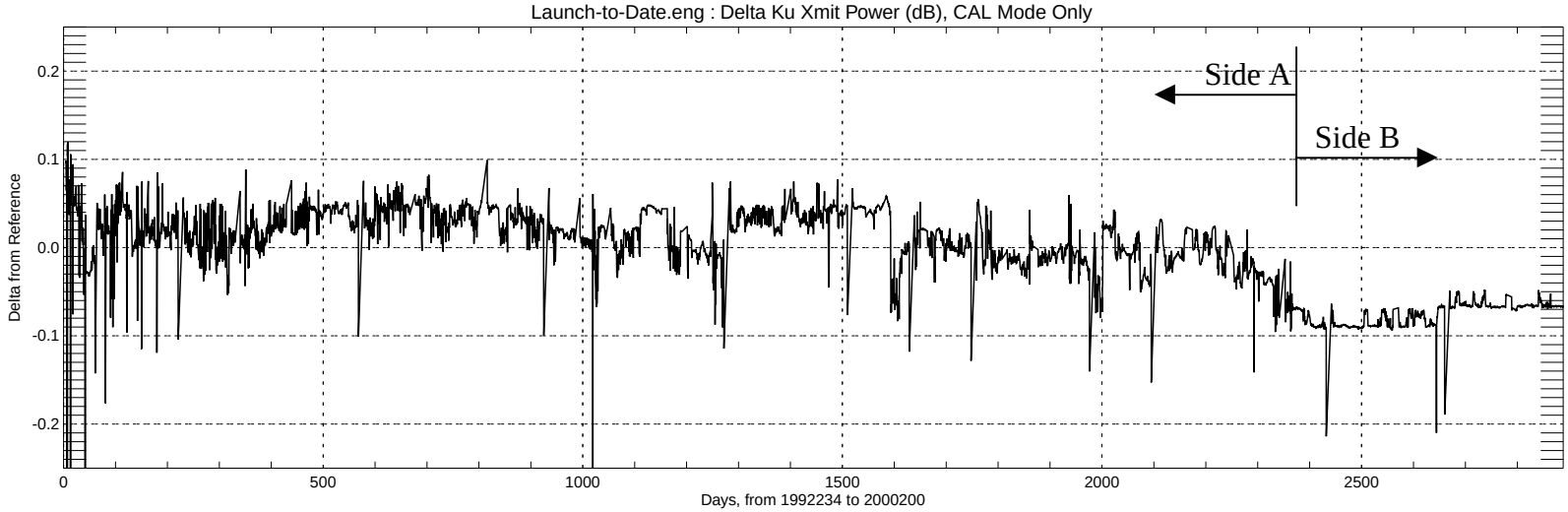
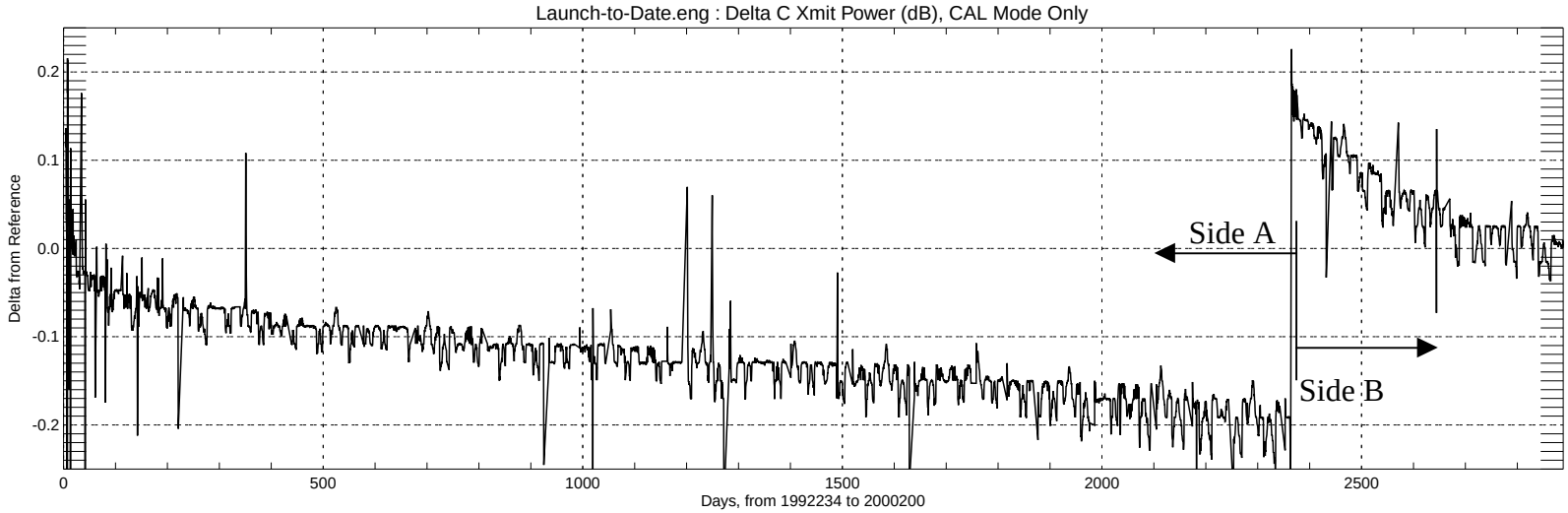

Combined (Ku&C) Delta Range vs. Cycle
WITH UCFM temperature correction
Comb delta range, mm
10
8
6
4
2
0
-2
-4
-6
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
TOPEX data cycle #
Cycles 001 - 235 = Side A
Cycles 236 - = Side B





(24-Hour Averages)

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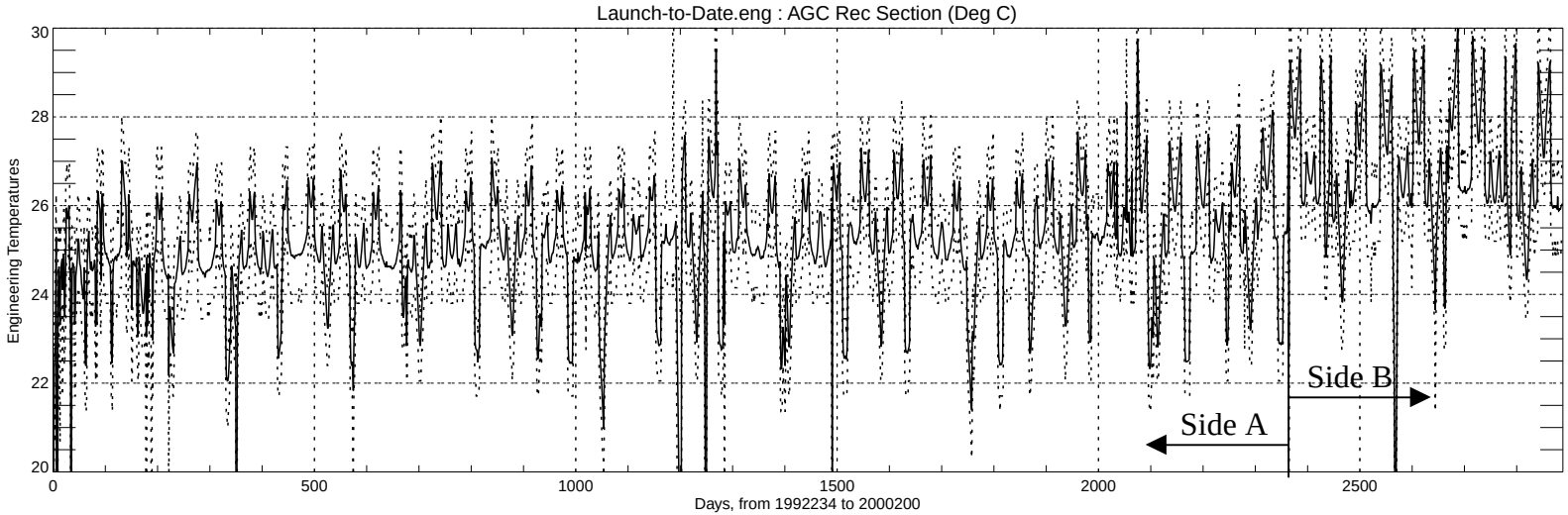

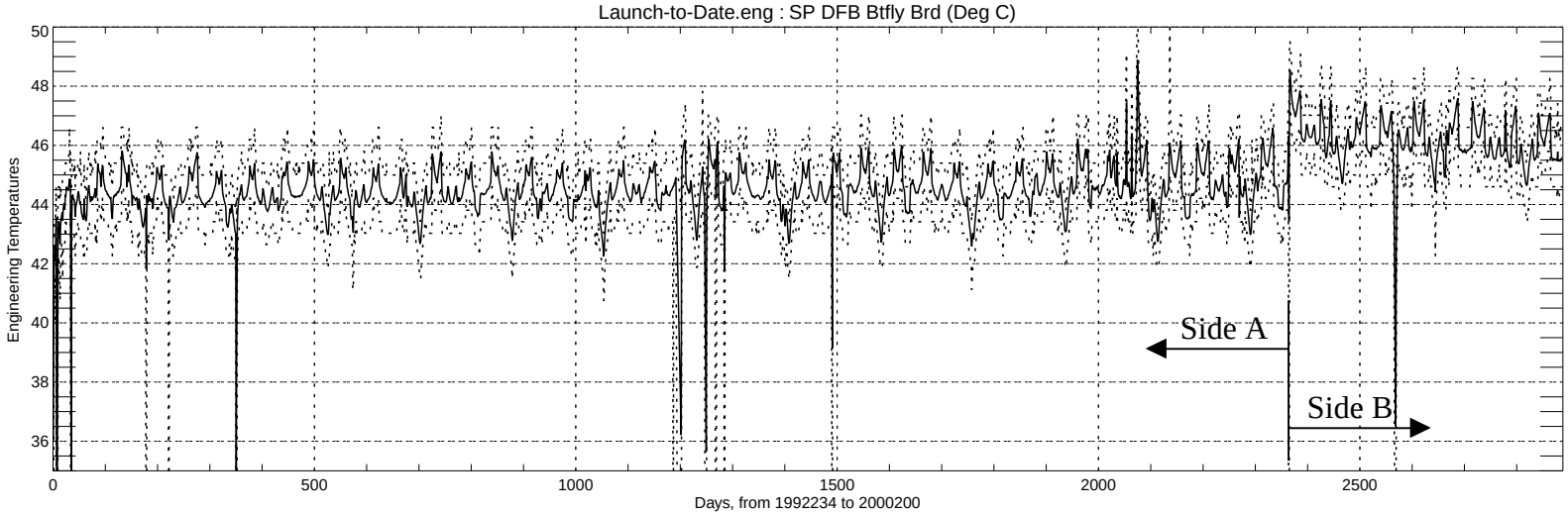

(24-Hour Averages)

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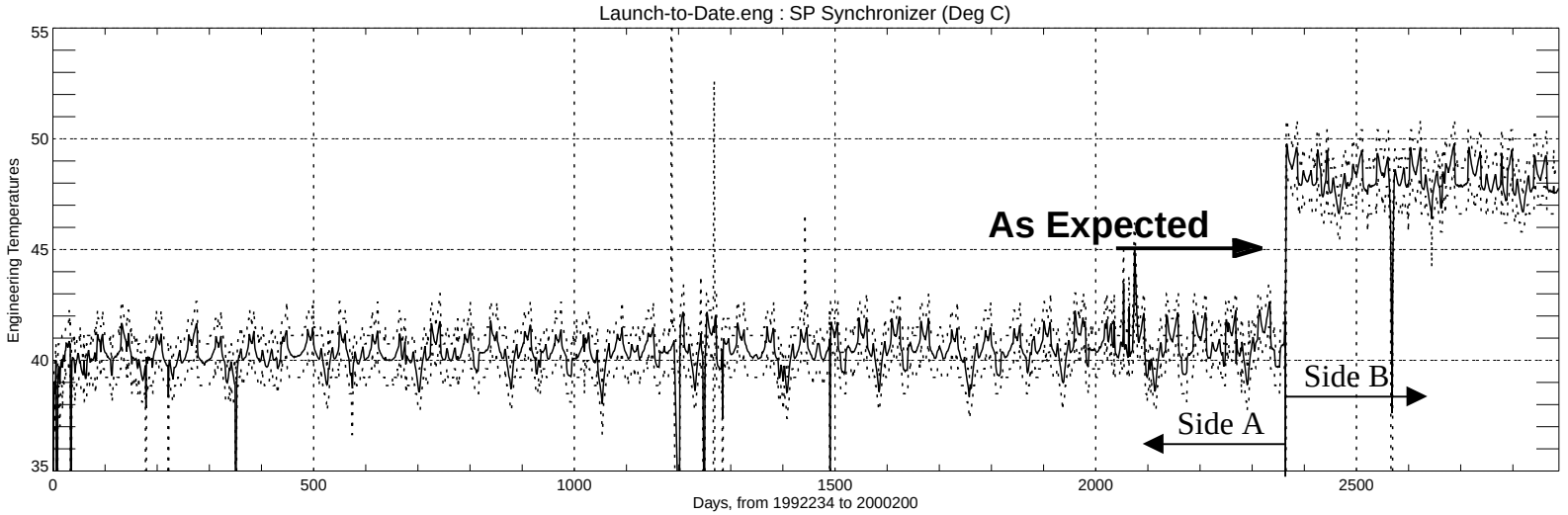

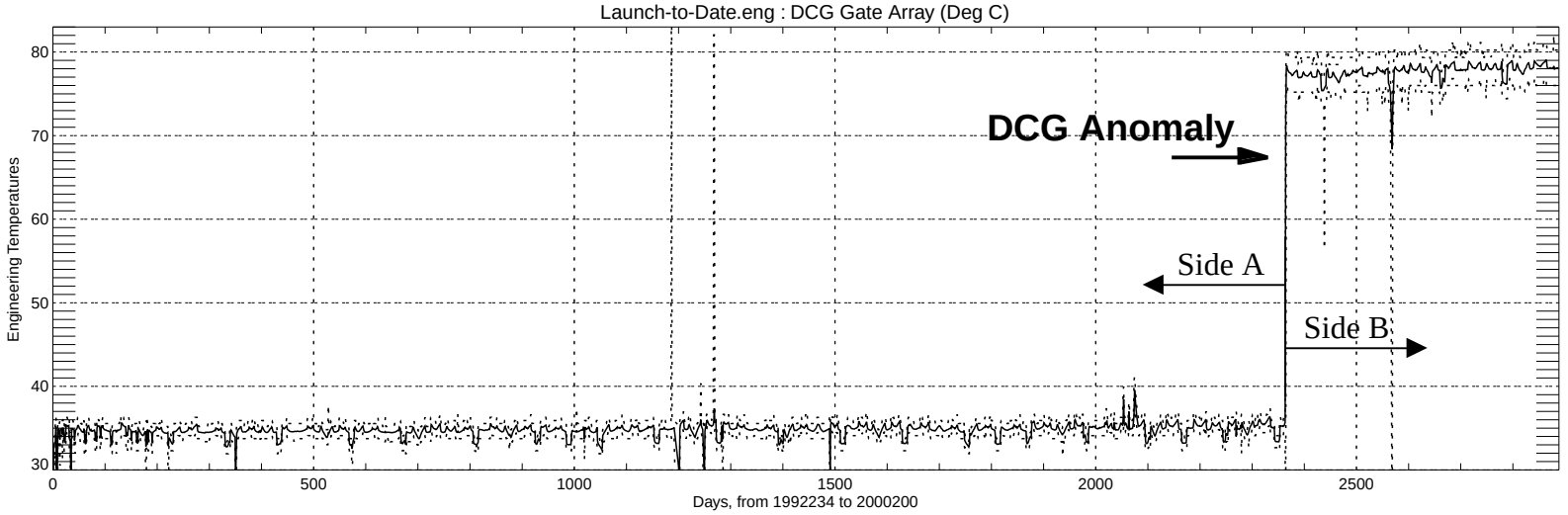

(24-Hour Averages)

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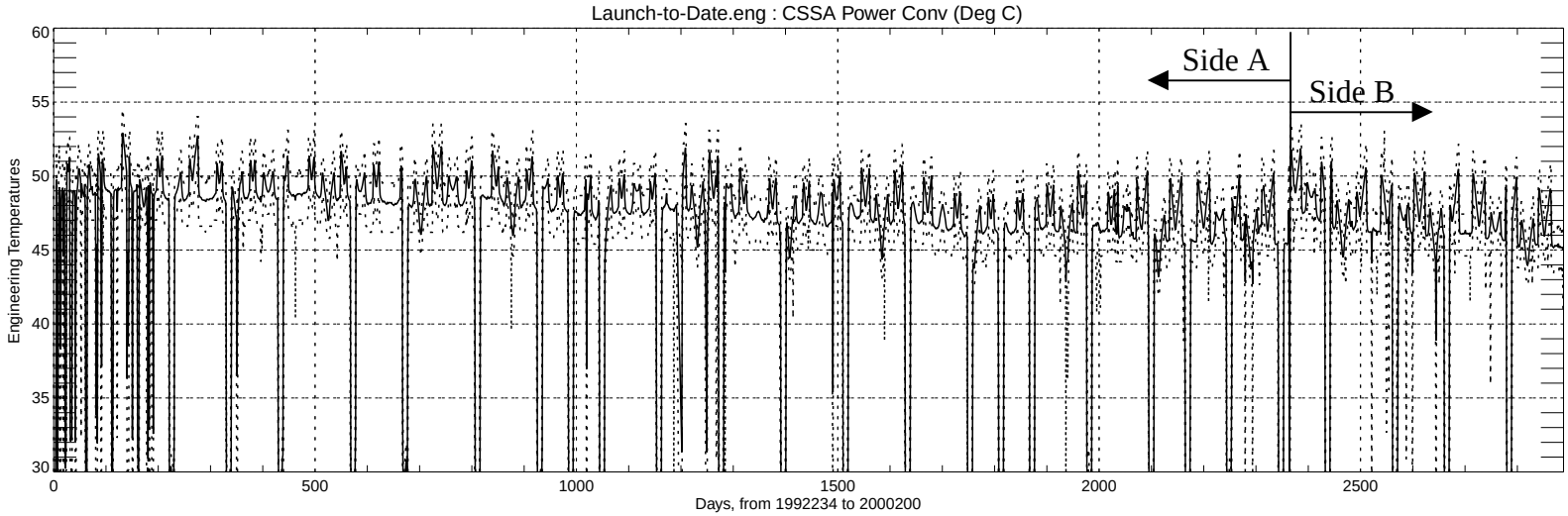
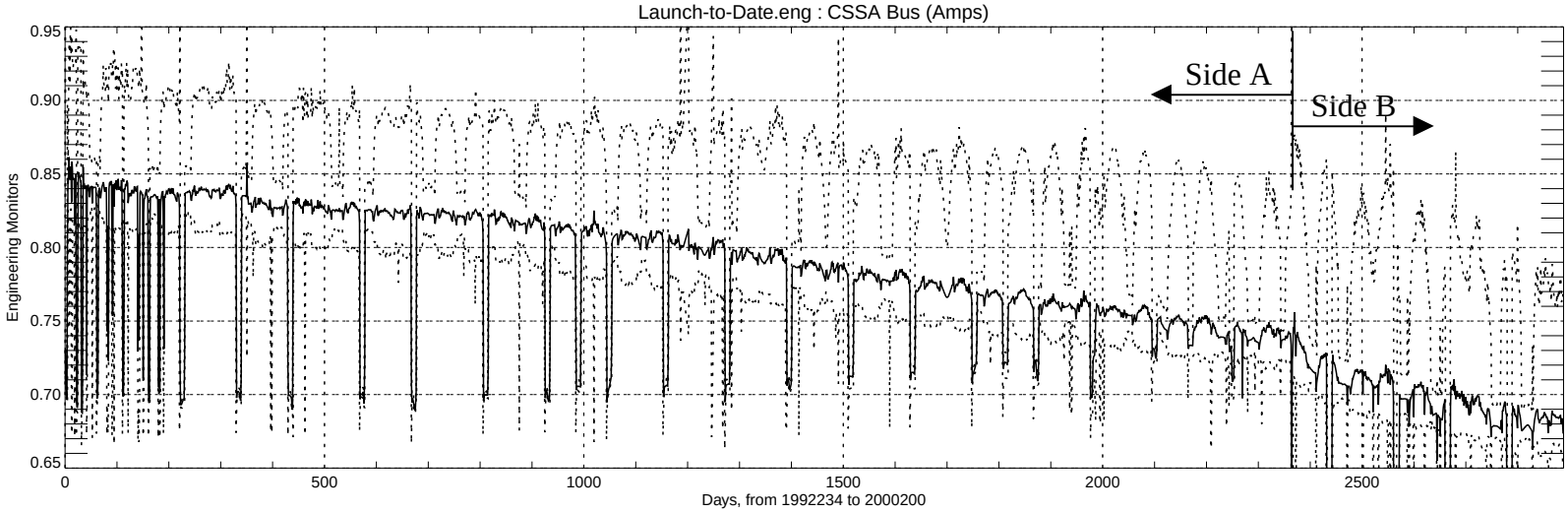
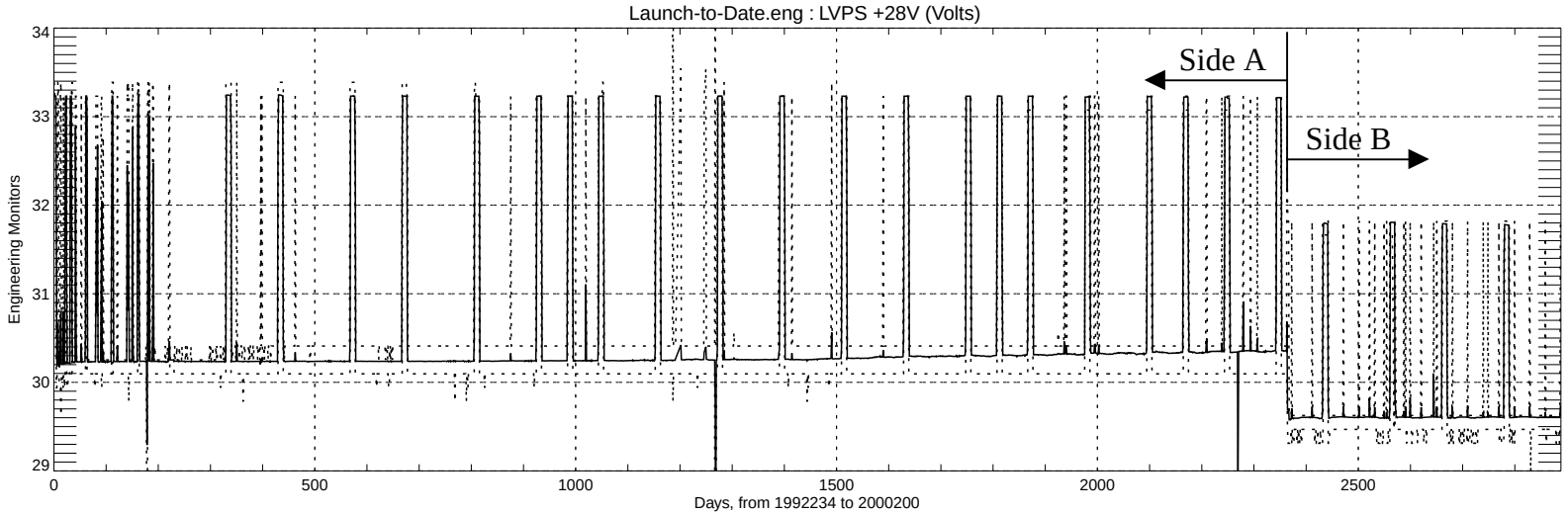




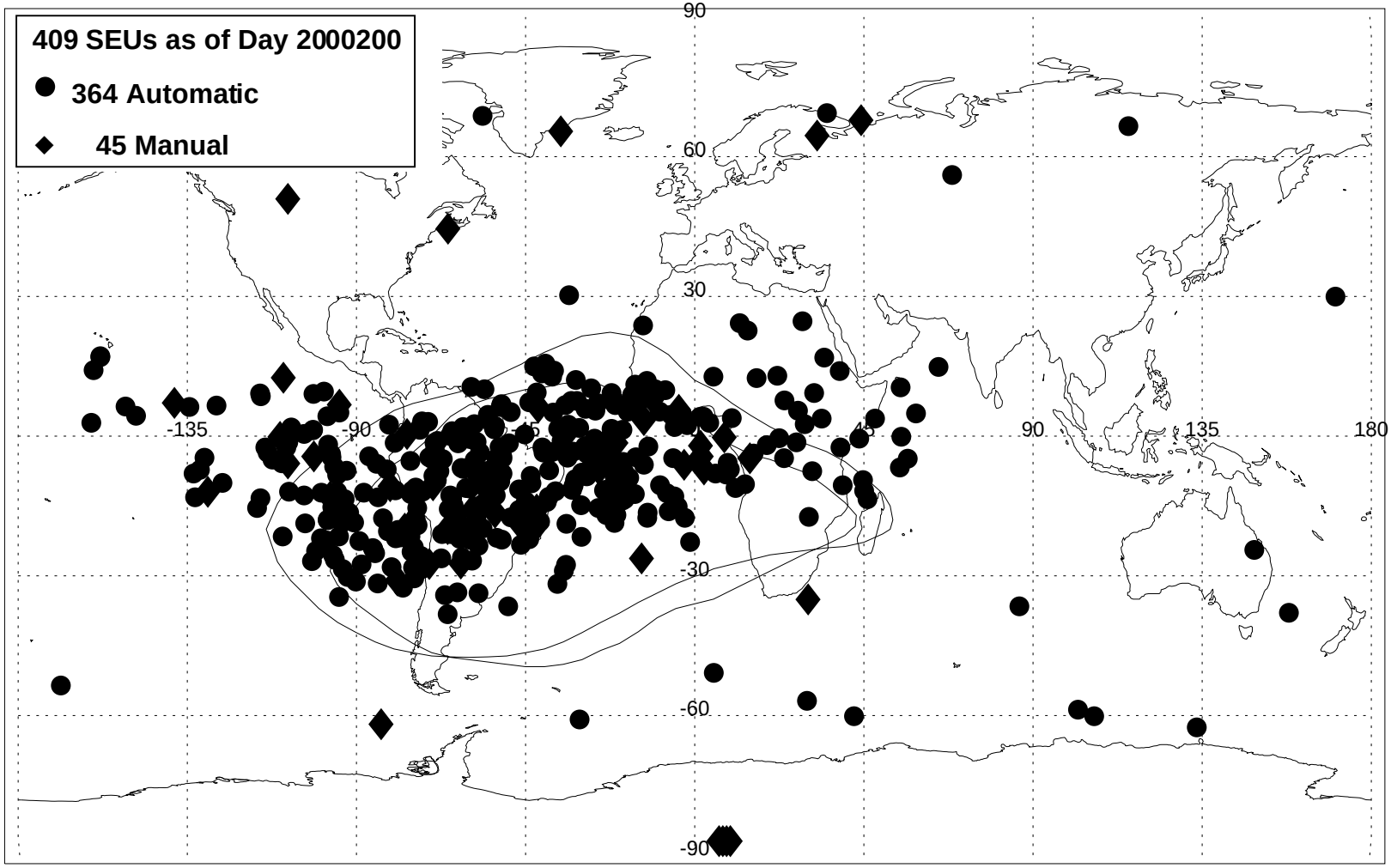
(24-Hour Averages)

NASA Goddard Space Flight Center
Laboratory for Hydrospheric Processes
Observational Science Branch, Code 972
Wallops Island, VA 23337 USA

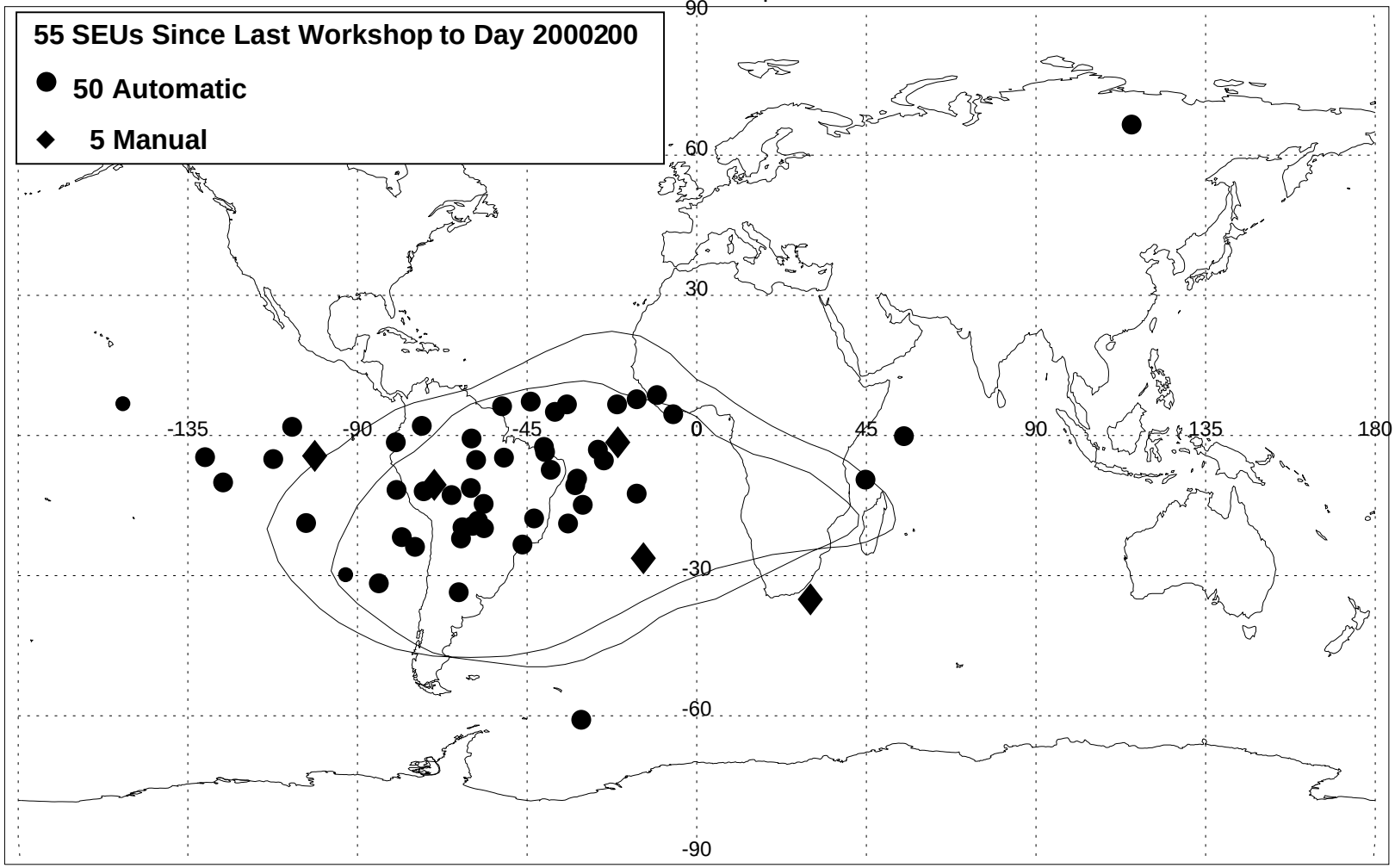


(24-Hour Averages)

Launch-to-Date SEUs



Since Last Workshop SEUs



Concerns

Prior Concerns [from Workshop #8]

- **Side B MTU A/B Switch Problem (SEU 99/198)**
  - **Similar problem occurred only once before (1995), on Side A.**
  - **Has not recurred.**
- **Side B DCG Gate Array Temperature**
  - **Lifetime thermal analysis of similar unit indicates no concern.**
  - **Temperature remains stable.**

New Concerns

- **Land-to-Water Acquisitions (Side B)**
  - **Considered to be only a minor issue**
  - **Improved after Safehold 99/243**
  - **WFF regularly monitors the land-to-water acquisition times.**

Issues

- **None at this time.**