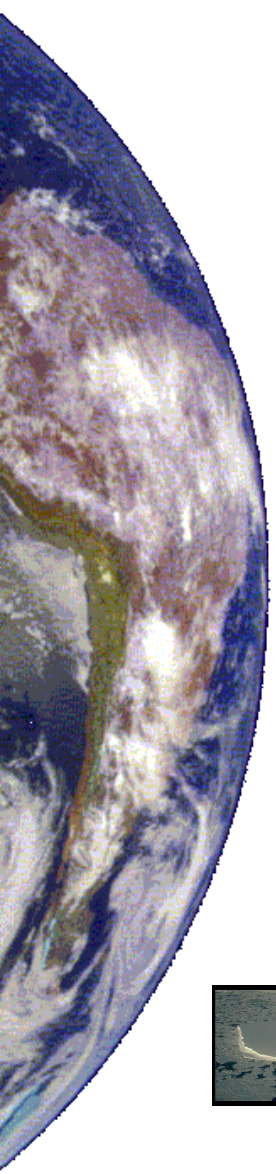
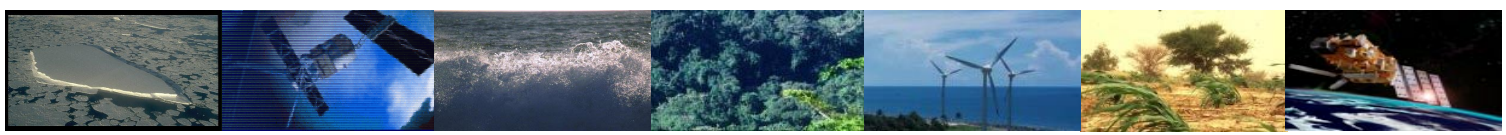


ERS-2 Scatterometer work at ESRIN

R. Crapolicchio° & P. Lecomte °°

°Serco S.P.A.
°° ESA-ESRIN



Content

- Satellite / Ground segment events since last 23rd Ascat SAG
- Long-loop Instrument monitoring
- Yaw angle monitoring
- Esaca Calibration performances
- Instrument calibration monitoring
- Question time

WSP Upgrades

- April 5th 2003 WSP V6.1 operational in Kiruna
  - Yaw flag associated to the node
  - Land/Sea precise map
  - Hey product upgrade
  - WSP identification number in the products
- August 14th WSP V7.2 operational in Kiruna
  - Improvements in the calibration (flat gamma nought profile across track)
  - Improvements in the wind retrieval scheme (ESA winds match ECMWF C-MOD4 winds)

ESACA Story

- July 1st 2003 ESACA 9002 + WSP V6.1 oSAT at ESRIN
- July 14th 2003 ESACA 9002 + WSP V6.1 oSAT at Maspalomas
- July 21st 2003 ESACA 9002 + WSP V6.1 oSAT at Gatineau
- End July , mid August 2003 WSP 7.2 Installation and testing at Kiruna, Maspalomas and Gatineau
- August 14th 2003 ESACA 9002 + WSP V7.2 operational at Kiruna
- August 19th 2003 ESACA 9002 + WSP V7.2 operational at Maspalomas and Gatineau
- August 26th 2003 Re-dissemination of Scatterometer data through the GTS

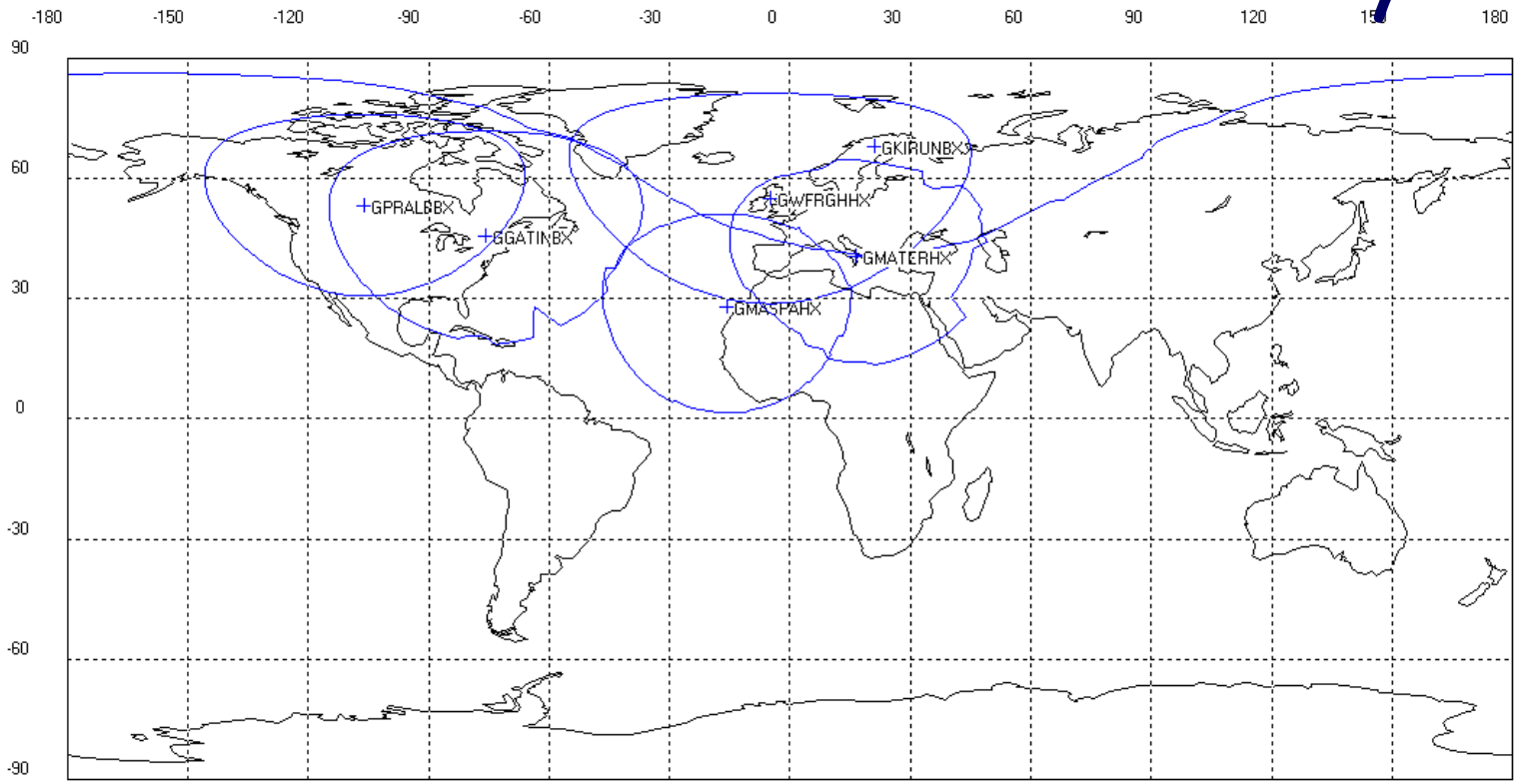
ESACA on the web

- Documentation on:
  - http://earth.esa.int/pcs/ers/scatt/articles/
- ESA web portal: New tool for whether forecasters
  - http://www.esa.int/export/esaCP/SEMB58ZO4HD_index_0.html
- ESA web portal: ERS-2 peers into hurricane Isabel's heart
  - http://www.esa.int/export/esaCP/SEM4Y70P4HD_index_0.html

Instrument & Satellite events

- Since 4th September 2002 new up-convert gain setting (+3 dBm):
  - Wind/Wind Cal mode 26 dBm (2 dBm reserve)
- Since 28th February 2003 new receiver attenuator gain setting (- 3dBm)
  - Wind/Wind Cal mode 15 dBm (0 dBm min)
- June 22nd 2003 HDDT Failure
  - Low rate mission only over ESA ground station visibility

Ground Station visibility



ERS-2 - Relative Orbit Reference

35-day repeat cycle (501 orbits); Reference: 0.133500 deg, orbit 1; First orbit 1, Last orbit 1

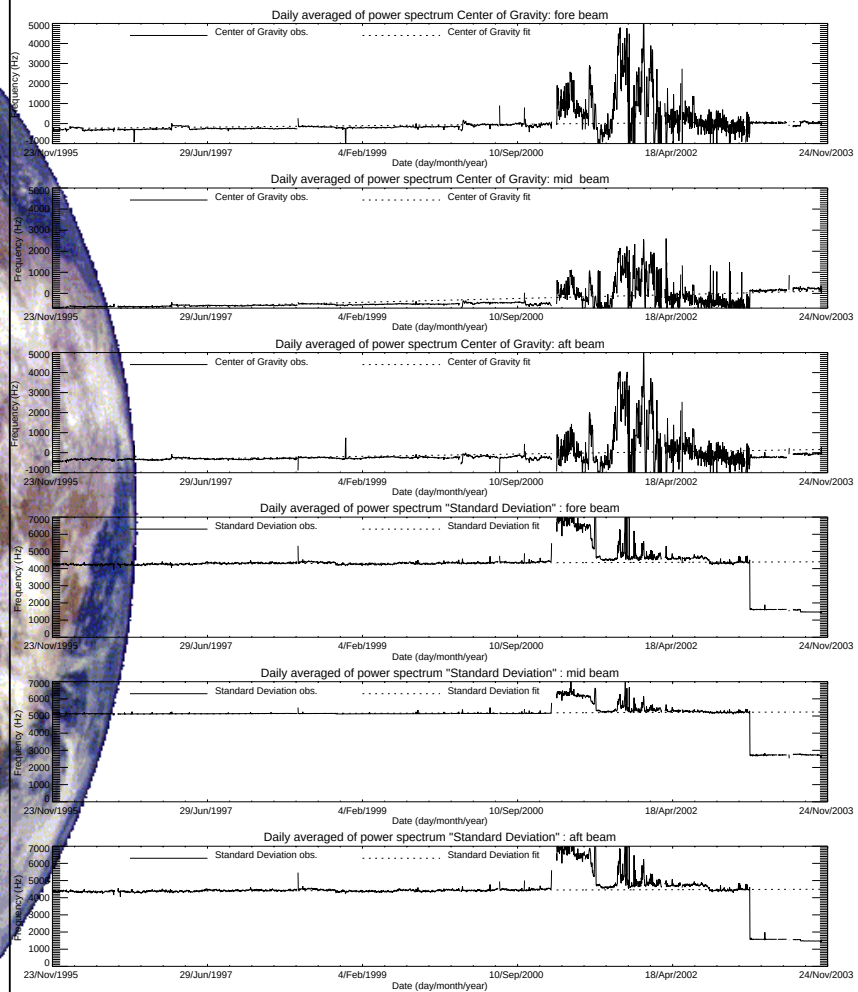
esa ESRIN
serco

Long-loop instrument monitoring

- Doppler compensation evolution
- Internal calibration evolution
- Noise Power evolution
- Instrument working modes

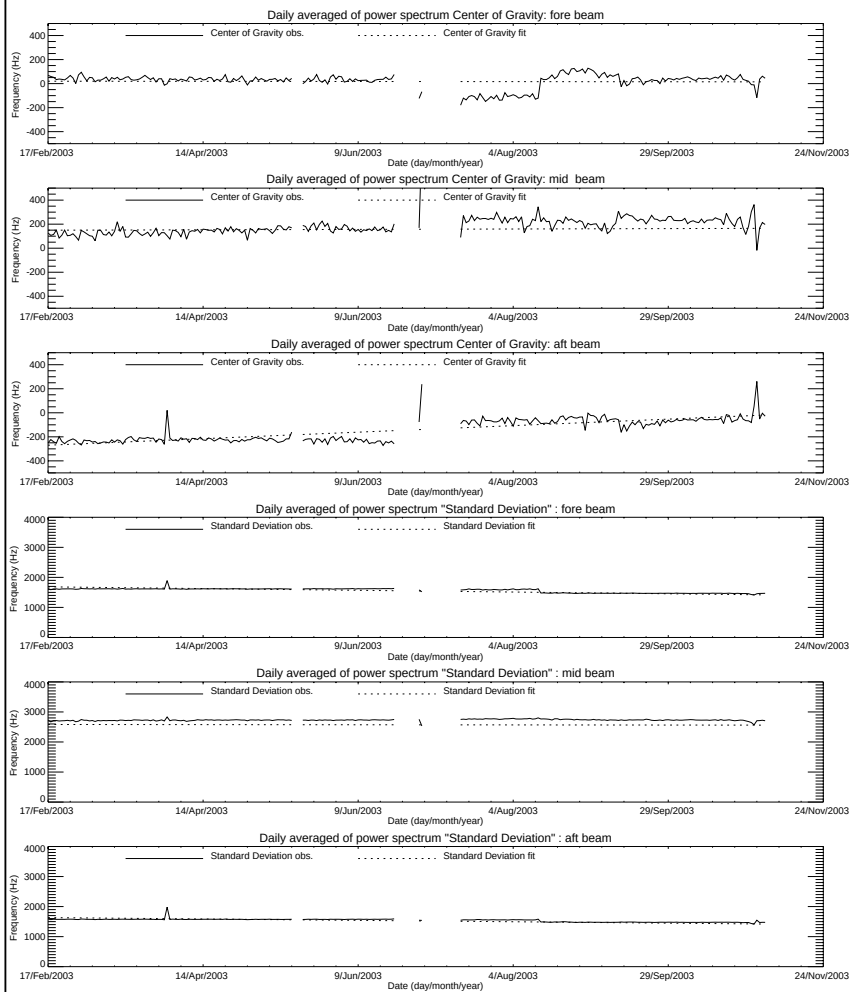
ERS-2 WindScatterometer: DOPPLER COMPENSATION Evolution (UWI)

Least-square poly. fit fore beam	Center of gravity = -248.5 +(0.1230)*day	Standard Deviation = 4247.5 +(0.0509)*day
Least-square poly. fit mid beam	Center of gravity = -780.2 +(0.3069)*day	Standard Deviation = 5102.8 +(0.0448)*day
Least-square poly. fit aft beam	Center of gravity = -411.9 +(0.1964)*day	Standard Deviation = 4368.3 +(0.0424)*day



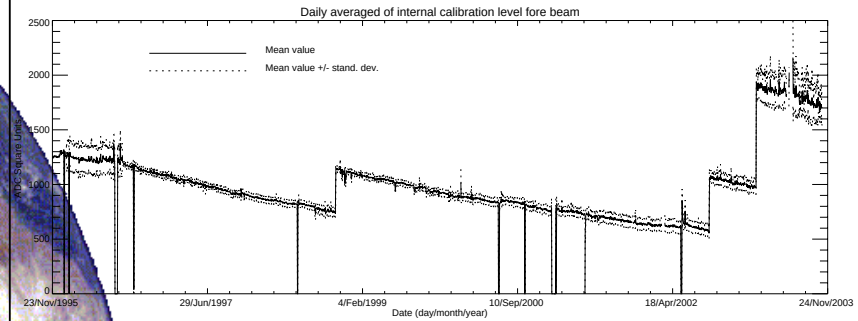
ERS-2 WindScatterometer: DOPPLER COMPENSATION Evolution (UWI)

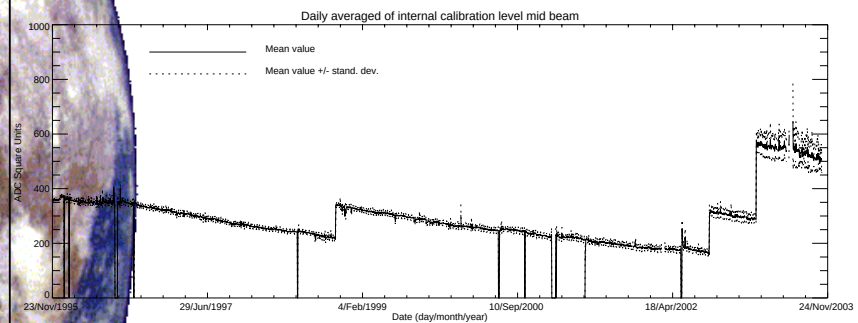
Least-square poly. fit fore beam	Center of gravity = 19.791 +(-0.020)*day	Standard Deviation = 1685.0 +(-1.027)*day
Least-square poly. fit mid beam	Center of gravity = 149.63 +(0.0600)*day	Standard Deviation = 2582.6 +(-0.083)*day
Least-square poly. fit aft beam	Center of gravity = -269.7 +(0.9686)*day	Standard Deviation = 1633.8 +(-0.826)*day

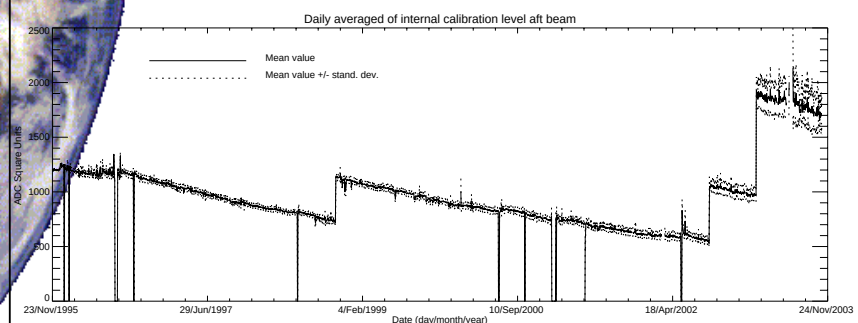


ERS-2 WindScatterometer: Internal CALIBRATION Level Evolution (UWI)

Least-square polynomial fit fore beam	gain (dB) per day 0.0001	940.387 +(0.0145612)*day
Least-square polynomial fit mid beam	gain (dB) per day 0.0001	276.028 +(0.00464254)*day
Least-square polynomial fit aft beam	gain (dB) per day 0.0001	919.533 +(0.0166872)*day



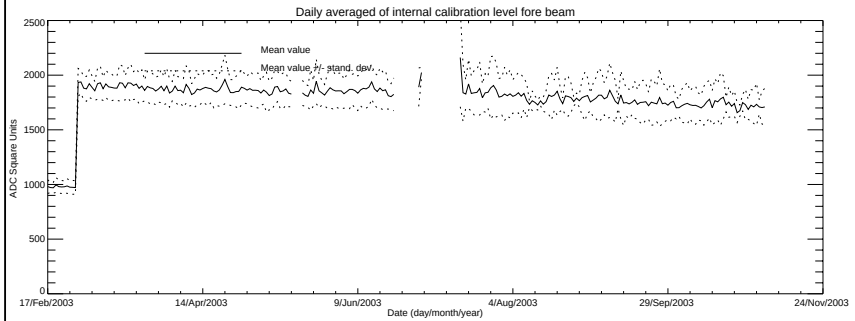


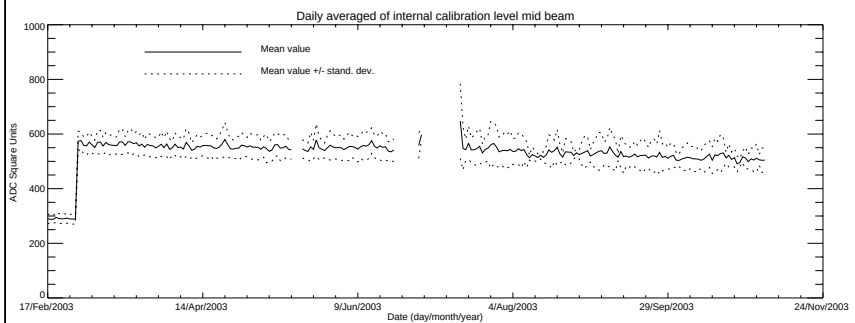


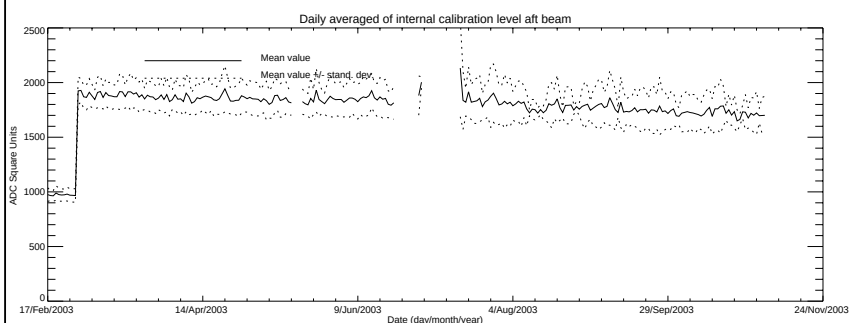
ESRIN/PCS

ERS-2 WindScatterometer: Internal CALIBRATION Level Evolution (UWI)

Least-square polynomial fit fore beam	gain (dB) per day -0.0068	1832.57 +(-2.33214)*day
Least-square polynomial fit mid beam	gain (dB) per day -0.0069	543.322 +(-0.692289)*day
Least-square polynomial fit aft beam	gain (dB) per day -0.0068	1820.56 +(-2.30474)*day



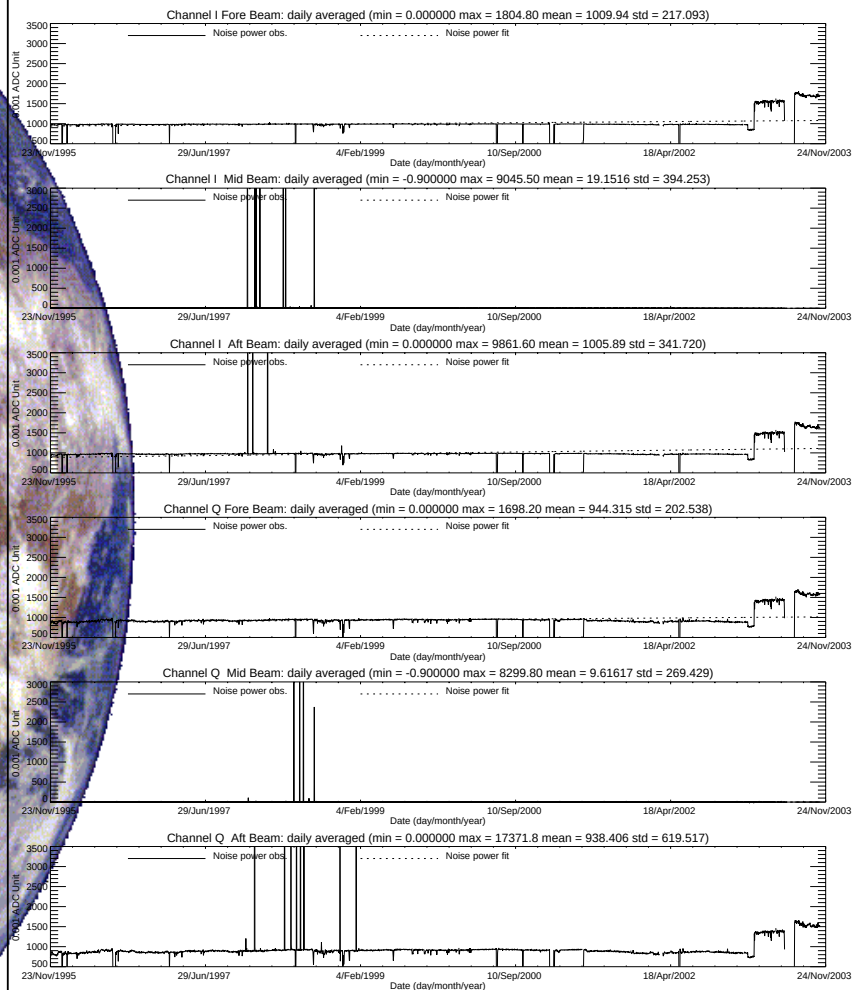




ESRIN/PCS

ERS-2 WindScatterometer: NOISE Level Evolution (UWI)

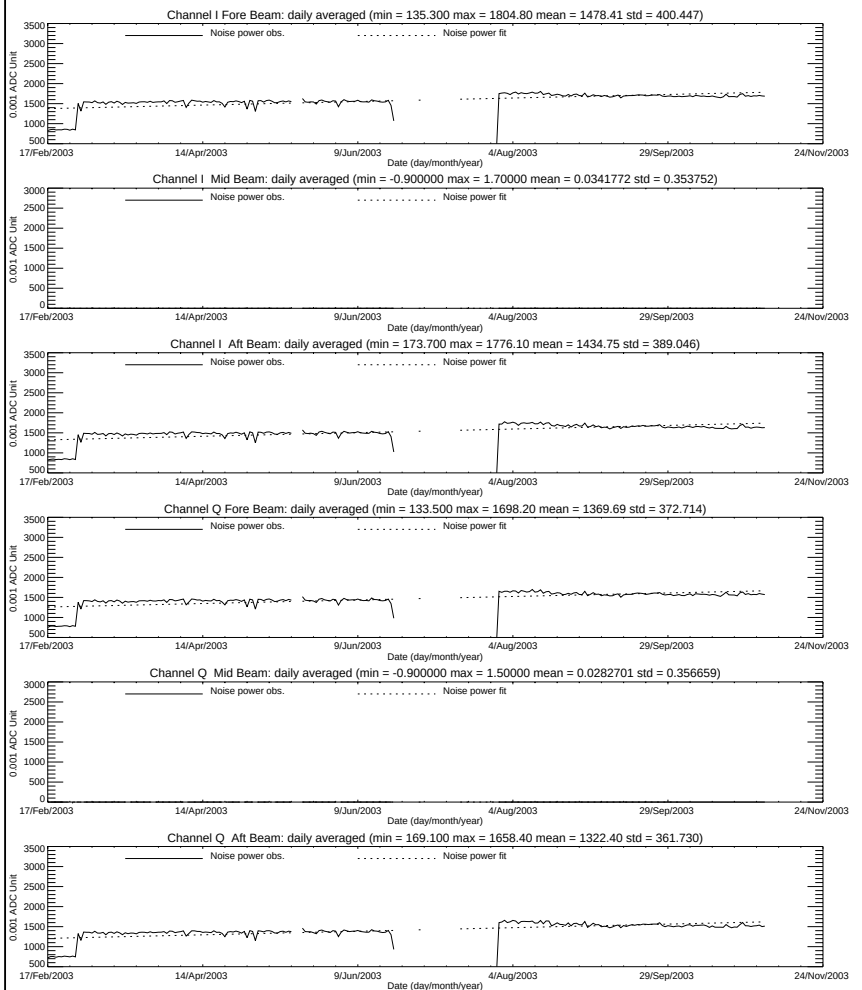
Least-square line fit fore beam: I = 939.66 +(0.0480)*day Q = 877.43 +(0.0471)*day
I channel: No line fit standard deviation too hight Q channel: No line fit standard deviation too hight
Least-square line fit aft beam: I = 886.49 +(0.0770)*day Q channel: No line fit standard deviation too hight



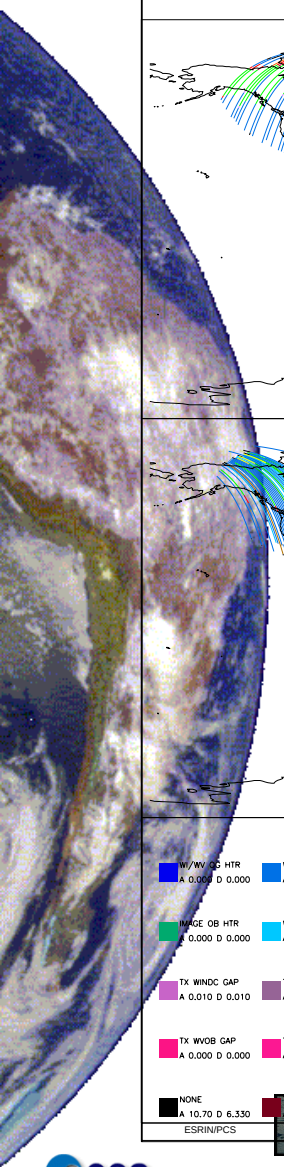
ESRIN/PCS

ERS-2 WindScatterometer: NOISE Level Evolution (UWI)

Least-square line fit fore beam: I = 1375.2 +(1.5778)*day Q = 1260.4 +(1.5664)*day
Least-square line fit mid beam: I = 0.0824 +(-0.000)*day Q = 0.0773 +(-0.000)*day
Least-square line fit aft beam: I = 1323.7 +(1.6137)*day Q = 1206.1 +(1.5935)*day



ESRIN/PCS



ERS-2 Active Microwave Instrument: Working modes

First product : 11/Aug/2003 0:52:14.113 — Last product : 14/Sep/2003 23:14:22.104
Products found: 26420 — Created : 4-NOV-2003 13:25:39.000

Cylindrical projection: Descending passes

Cycle 87

Cylindrical projection: Ascending passes

AMI MODE Decoding Key and percentage of occurences per mode & passage

WI/WV OG HTR A 0.000 D 0.000 | WI/WV OB GAP A 76.02 D 69.02 | WI/WV OB HTR A 2.570 D 0.000 | WIND CAL GAP A 0.110 D 0.000 | WIND CAL HTR A 0.110 D 0.000 | HEATER A 0.410 D 0.380 | GAP A 1.480 D 2.900
IMAGE OB HTR A 0.000 D 0.000 | WAVE OG GAP A 0.000 D 0.000 | WAVE OG HTR A 0.000 D 0.000 | WAVE OB GAP A 0.000 D 0.000 | WAVE OB HTR A 0.000 D 0.000 | WIND GAP A 1.210 D 0.000 | WIND HTR A 0.490 D 0.000 | WI/WV OG GAP A 0.000 D 0.000
TX WINDC GAP A 0.010 D 0.010 | TX WINDC HTR A 0.010 D 0.000 | TX TO HEATER A 0.020 D 0.010 | TX TO GAP A 0.440 D 0.590 | STANDBY A 0.000 D 0.000 | IMAGE OG GAP A 5.130 D 18.52 | IMAGE OG HTR A 1.080 D 1.410 | IMAGE OB GAP A 0.000 D 0.000
TX WVOB GAP A 0.000 D 0.000 | TX WVOB HTR A 0.000 D 0.000 | TX WIND GAP A 0.010 D 0.000 | TX WIND HTR A 0.000 D 0.000 | TX WWOG GAP A 0.000 D 0.000 | TX WWOG HTR A 0.000 D 0.000 | TX WWOB GAP A 0.130 D 0.590 | TX WWOB HTR A 0.010 D 0.000
NONE A 10.70 D 6.330 | TX TO STBY A 0.000 D 0.000 | TX IMOG GAP A 0.050 D 0.230 | TX IMOG HTR A 0.000 D 0.020 | TX IMOB GAP A 0.000 D 0.000 | TX IMOB HTR A 0.000 D 0.000 | TX WVOG GAP A 0.000 D 0.000 | TX WVOG HTR A 0.000 D 0.000

ESRIN/PCS — Page 1

ERS-2 Active Microwave Instrument: Working modes

First product : 15/Sep/2003 0:42:22.182 — Last product : 19/Oct/2003 23:14:06.544
Products found: 35507 — Created : 3-NOV-2003 09:54:12.000

Cylindrical projection: Descending passes

Cycle 88

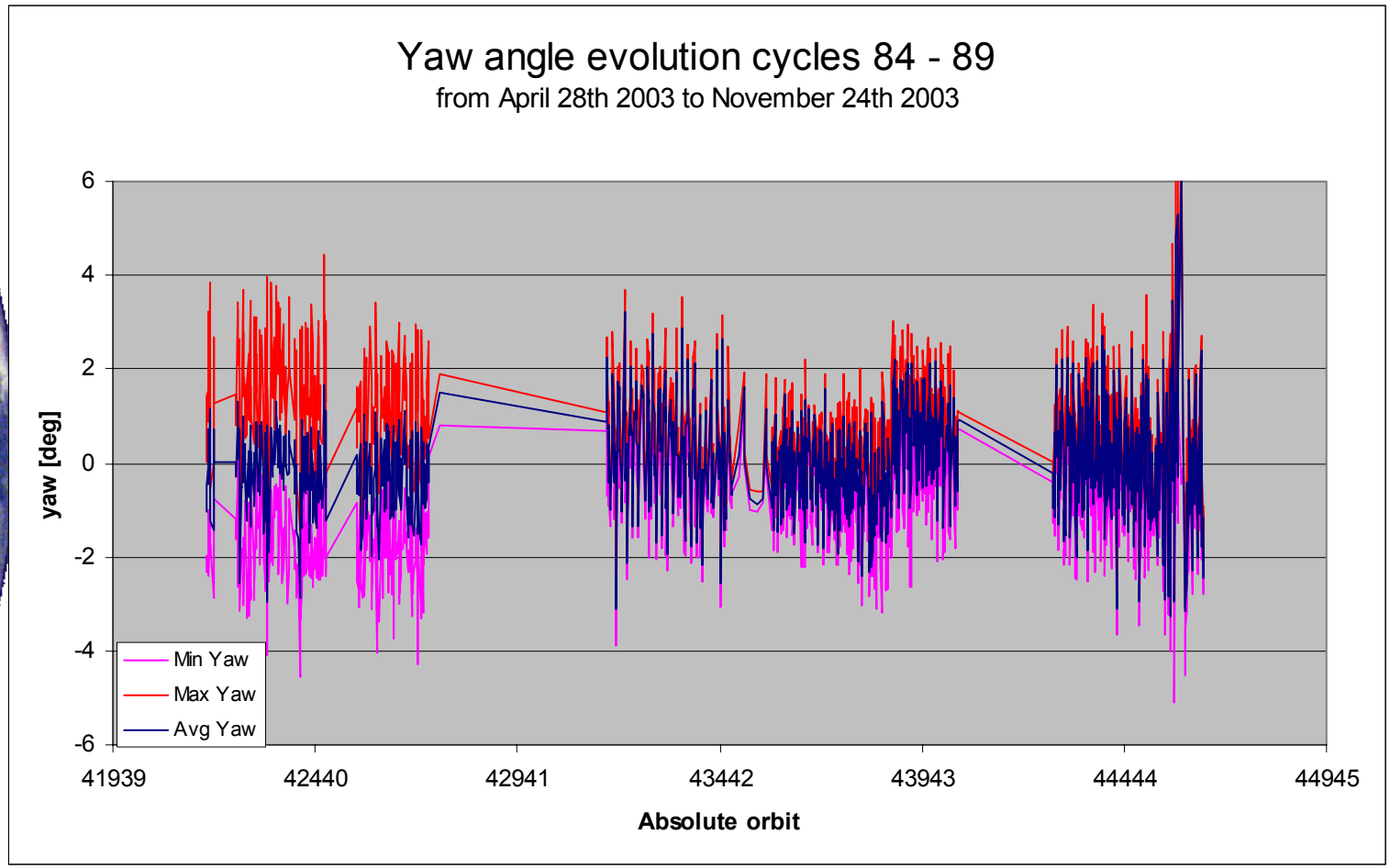
Cylindrical projection: Ascending passes

AMI MODE Decoding Key and percentage of occurences per mode & passage

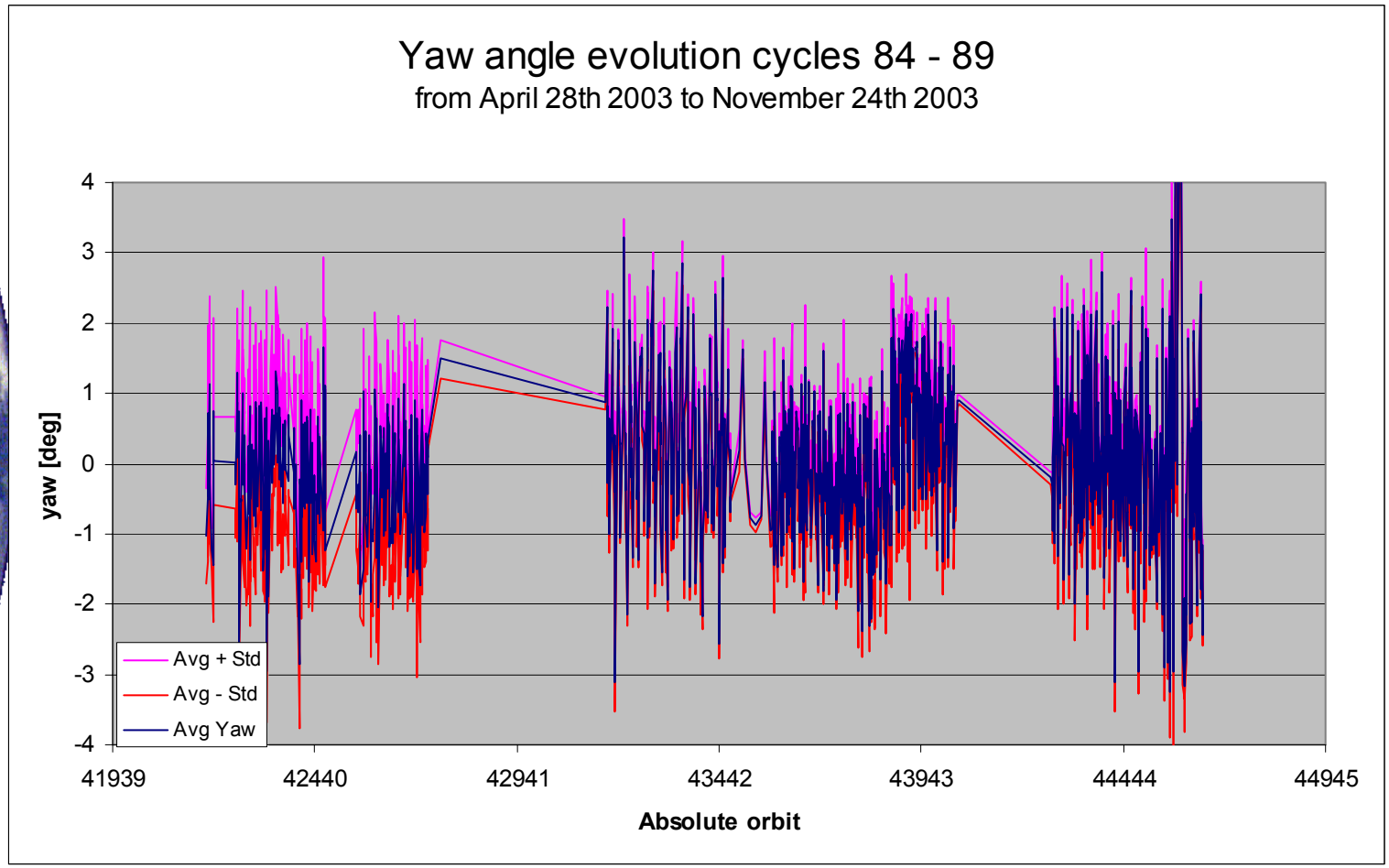
WI/WV OG HTR A 0.000 D 0.000 | WI/WV OB GAP A 70.56 D 72.26 | WI/WV OB HTR A 0.000 D 0.140 | WIND CAL GAP A 0.000 D 0.190 | WIND CAL HTR A 0.210 D 0.000 | HEATER A 0.900 D 0.510 | GAP A 1.390 D 2.270
IMAGE OB HTR A 0.000 D 0.000 | WAVE OG GAP A 0.000 D 0.000 | WAVE OG HTR A 0.000 D 0.000 | WAVE OB GAP A 0.000 D 0.000 | WAVE OB HTR A 0.000 D 0.000 | WIND GAP A 10.88 D 0.000 | WIND HTR A 1.130 D 0.000 | WI/WV OG GAP A 0.000 D 0.000
TX WINDC GAP A 0.000 D 0.000 | TX WINDC HTR A 0.010 D 0.000 | TX TO HEATER A 0.010 D 0.000 | TX TO GAP A 0.210 D 1.150 | STANDBY A 0.000 D 0.000 | IMAGE OG GAP A 3.870 D 17.27 | IMAGE OG HTR A 0.600 D 1.130 | IMAGE OB GAP A 0.000 D 0.000
TX WVOB GAP A 0.000 D 0.000 | TX WVOB HTR A 0.000 D 0.000 | TX WIND GAP A 0.030 D 0.000 | TX WIND HTR A 0.000 D 0.000 | TX WWOG GAP A 0.000 D 0.000 | TX WWOG HTR A 0.000 D 0.000 | TX WWOB GAP A 0.130 D 0.500 | TX WWOB HTR A 0.000 D 0.010
NONE A 10.01 D 6.110 | TX TO STBY A 0.000 D 0.000 | TX IMOG GAP A 0.030 D 0.110 | TX IMOG HTR A 0.000 D 0.000 | TX IMOB GAP A 0.000 D 0.000 | TX IMOB HTR A 0.000 D 0.000 | TX WVOG GAP A 0.000 D 0.000 | TX WVOG HTR A 0.000 D 0.000

ESRIN/PCS — Page 1

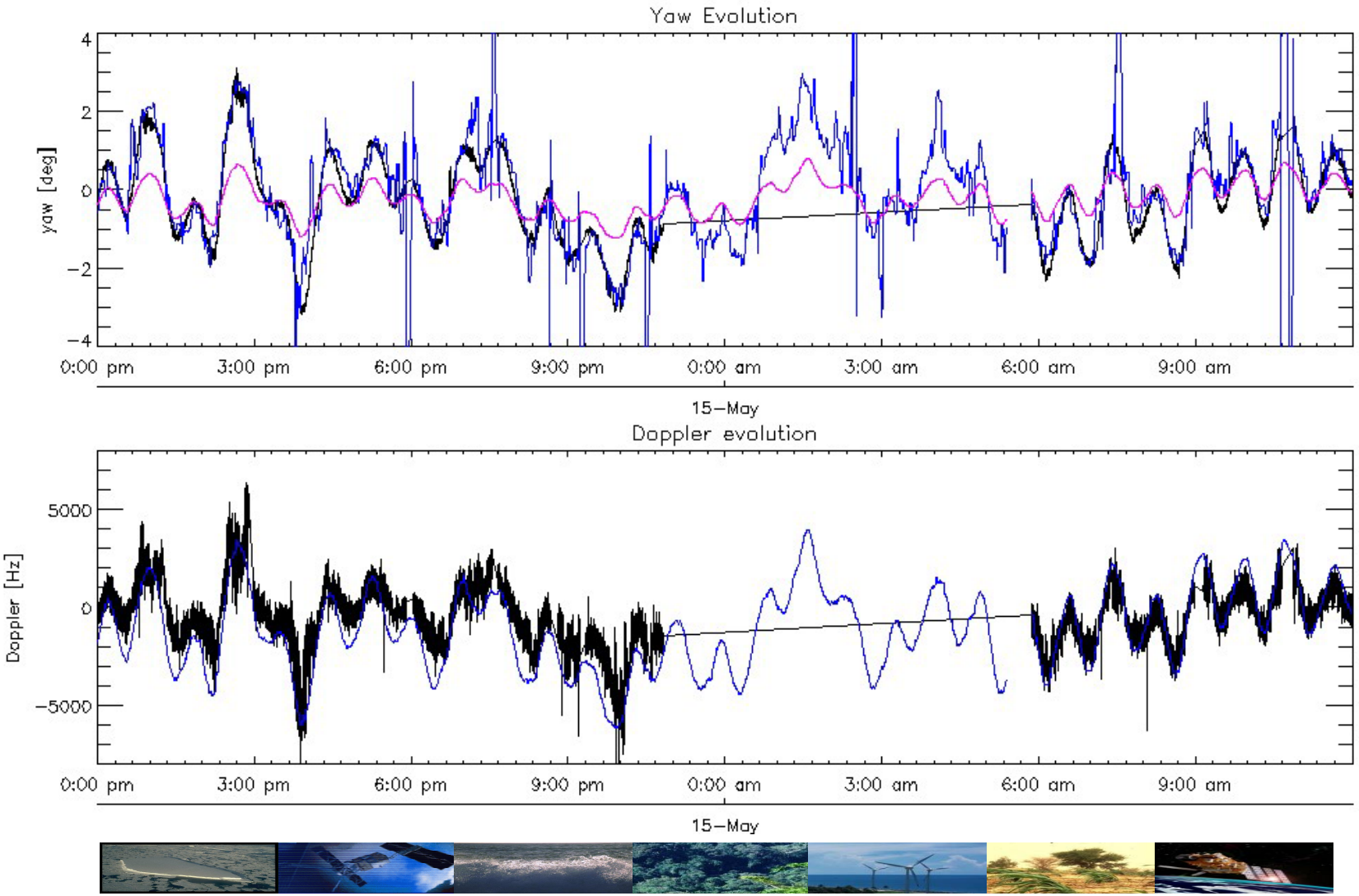
Yaw angle Monitoring



Yaw angle Monitoring

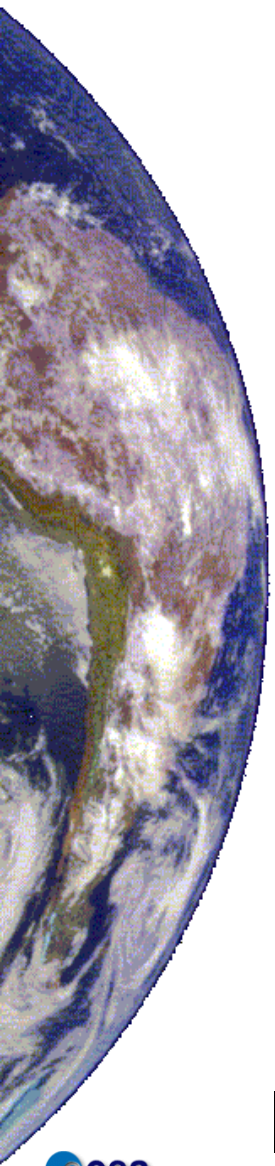


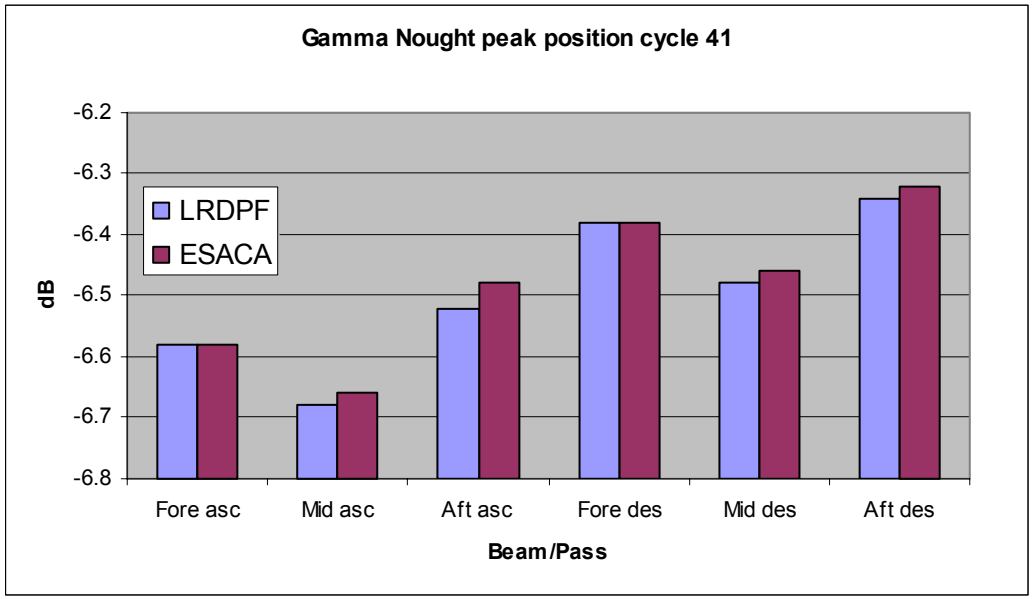
Yaw angle validation

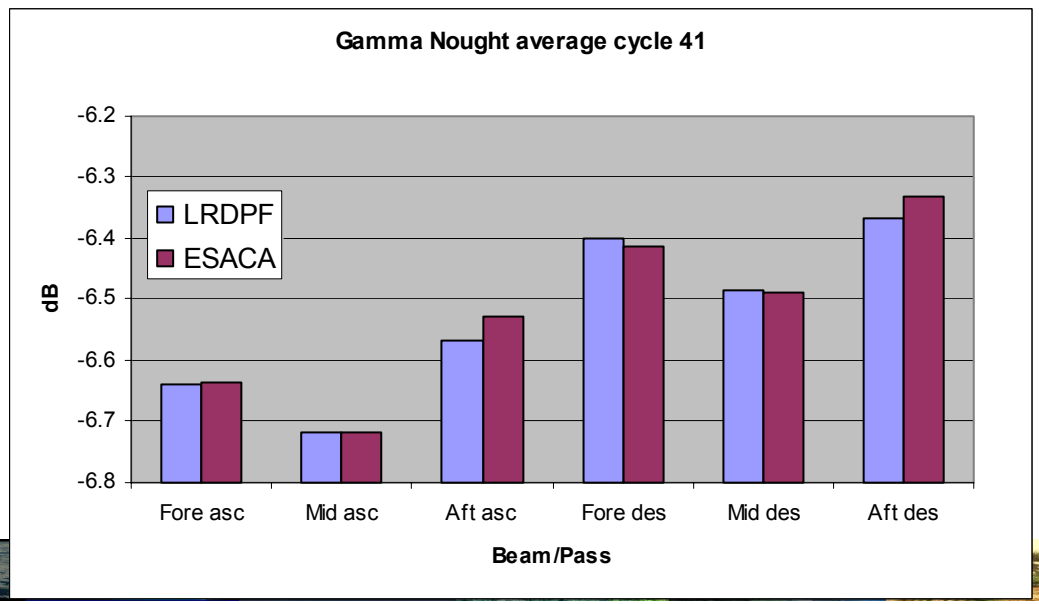


Esaca calibration performances

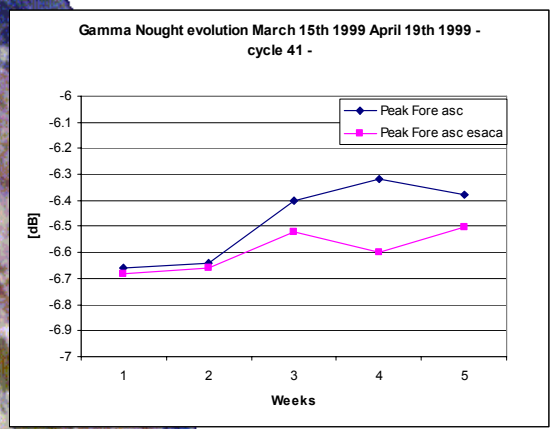
- Re-processed one cycle of data acquired in nominal YSM (cycle 41)
- Comparisons over the Amazon rain forest:
  - Gamma nought Statistics peak/average
  - Gamma nought peak evolution
  - Gamma noughtHistograms
  - Antenna pattern
  - Incidence angle

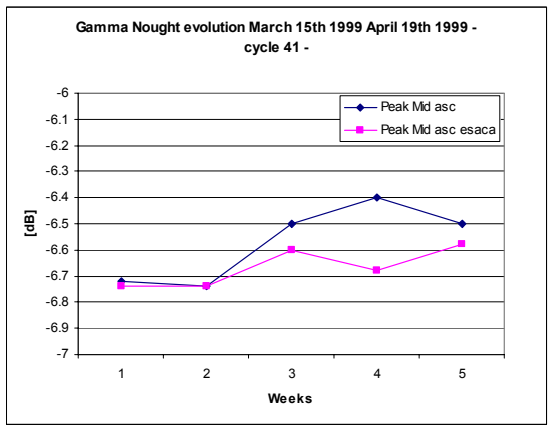


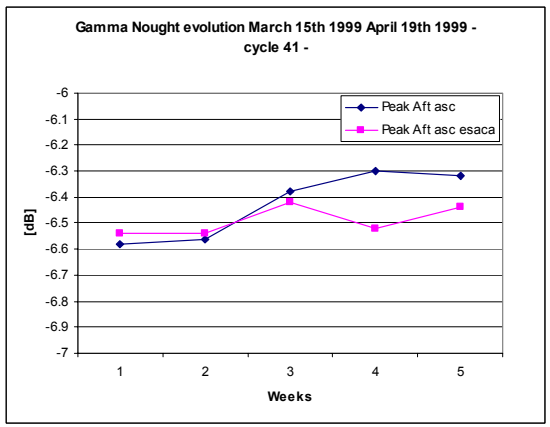

Gamma Nought peak position cycle 41
-6.2
-6.3
-6.4
-6.5
-6.6
-6.7
-6.8
dB
LRDPF
ESACA
Fore asc
Mid asc
Aft asc
Fore des
Mid des
Aft des
Beam/Pass

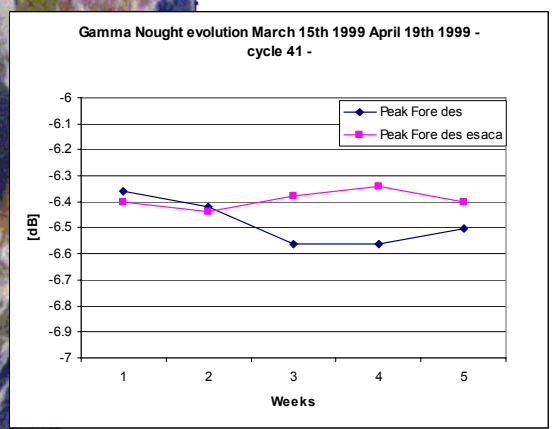

Gamma Nought average cycle 41
-6.2
-6.3
-6.4
-6.5
-6.6
-6.7
-6.8
dB
LRDPF
ESACA
Fore asc
Mid asc
Aft asc
Fore des
Mid des
Aft des
Beam/Pass

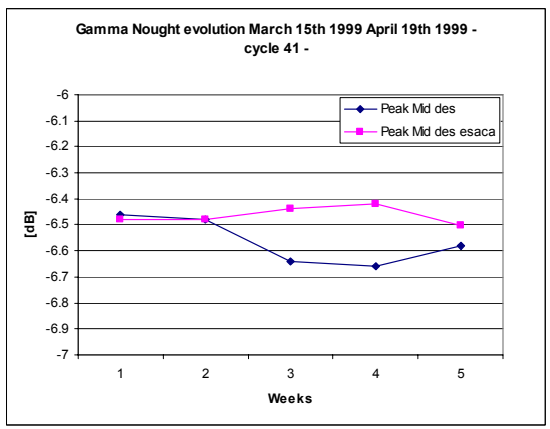
ESACA vs. LRDPF Gamma Nought

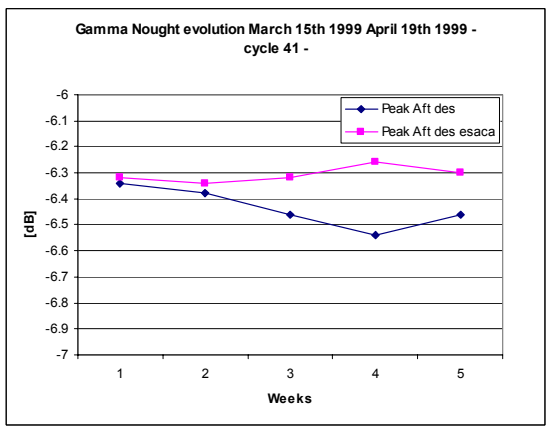




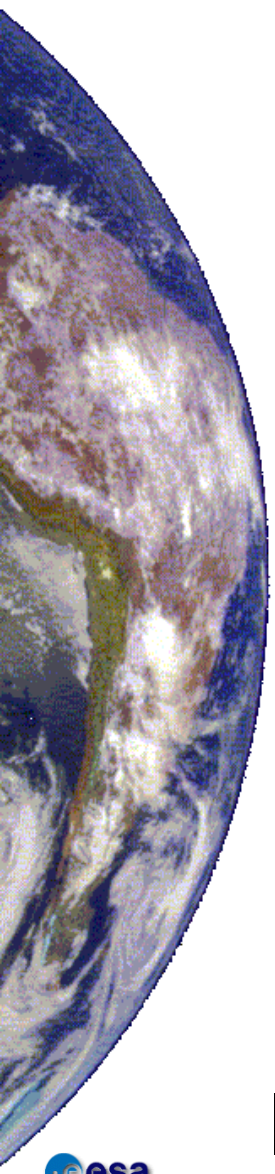








Note: Small amount of LRDPF data for week-3 and week-4 Small amount of ESACA data for week 5



GAMMA_HISTOGRAM_990315_990418.EPS - GSview

File Edit Options View Orientation Media Help

Fore Antenna Ascending Passage — Max = −6.58000, Avg = −6.63775, Std = 0.322296, N = 8658

Mid Antenna Ascending Passage — Max = −6.68000, Avg = −6.71694, Std = 0.321855, N = 8658

Aft Antenna Ascending Passage — Max = −6.52000, Avg = −6.56872, Std = 0.320232, N = 8658

Fore Antenna Descending Passage — Max = −6.38000, Avg = −6.39945, Std = 0.264588, N = 9075

Mid Antenna Descending Passage — Max = −6.46000, Avg = −6.48643, Std = 0.270282, N = 9075

Aft Antenna Descending Passage — Max = −6.34000, Avg = −6.36782, Std = 0.269972, N = 9075

Number of measurements / N

Gamma Nought value (dB)

LRDPF

...MMA_HISTOGRAM_990315_990418.EP: Page: "0" 1 of 1

Fore Antenna Ascending Passage — Max = −6.58000, Avg = −6.63604, Std = 0.311520, N = 9639

Mid Antenna Ascending Passage — Max = −6.66000, Avg = −6.71642, Std = 0.317730, N = 9639

Aft Antenna Ascending Passage — Max = −6.48000, Avg = −6.52914, Std = 0.300266, N = 9639

Fore Antenna Descending Passage — Max = −6.38000, Avg = −6.41273, Std = 0.262314, N = 9564

Mid Antenna Descending Passage — Max = −6.46000, Avg = −6.48838, Std = 0.272049, N = 9564

Aft Antenna Descending Passage — Max = −6.32000, Avg = −6.33261, Std = 0.272365, N = 9564

Number of measurements / N

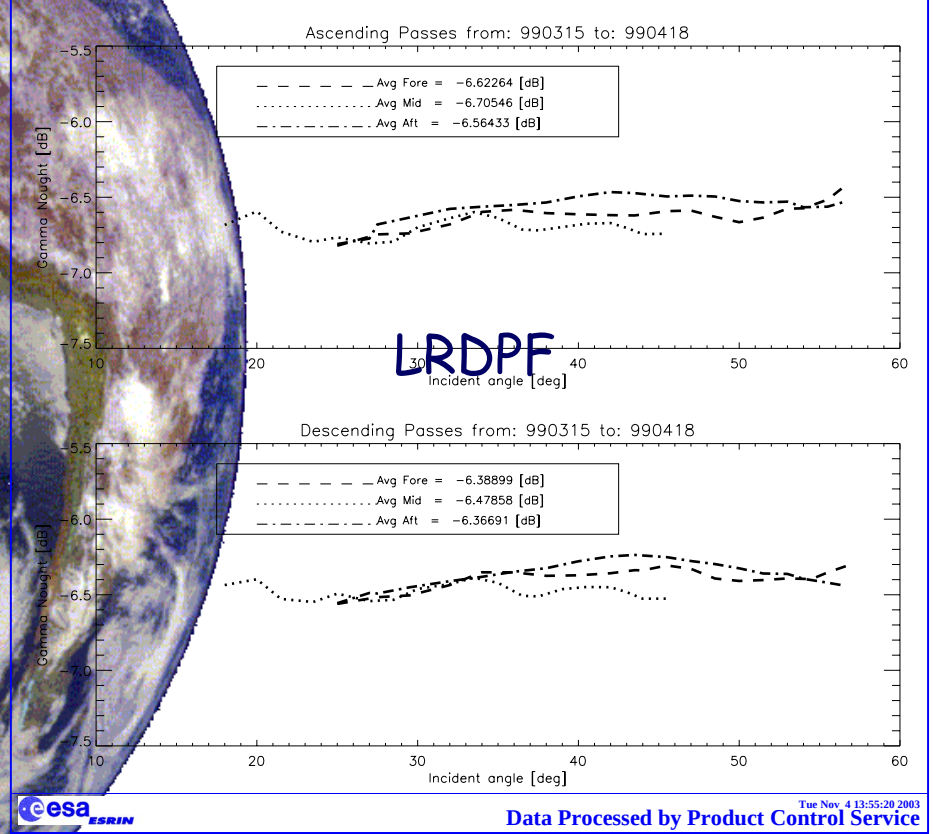
Gamma Nought value (dB)

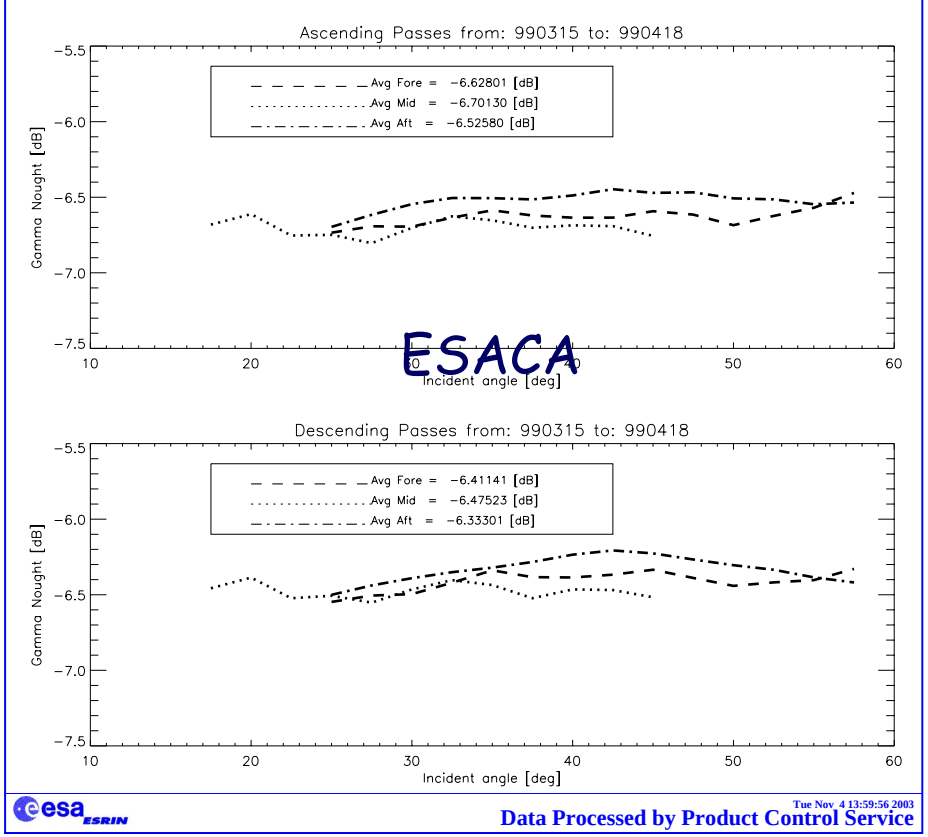
ESACA

...stogram_esaca_990315_990418.eps Page: "0" 1 of 1

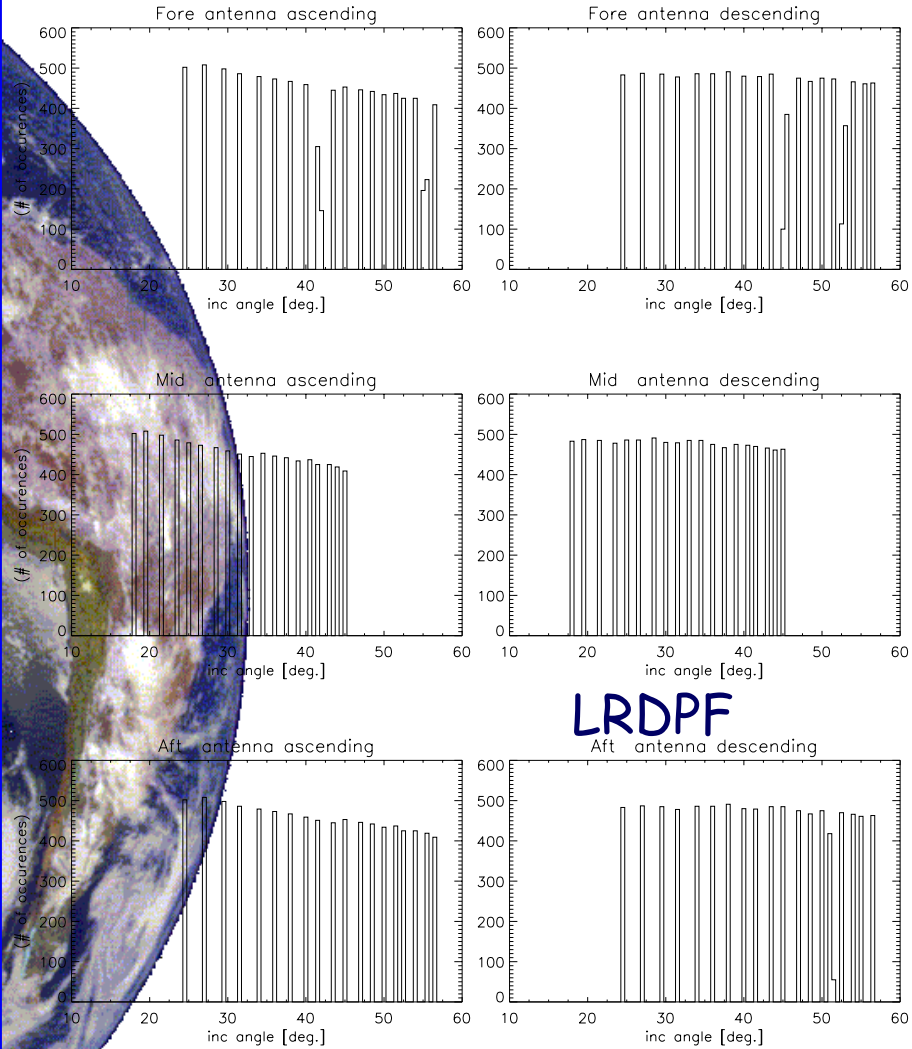
esa ESRIN serco

Antenna Pattern





ERS-2 Scatt: incidence angles histograms cycle 41



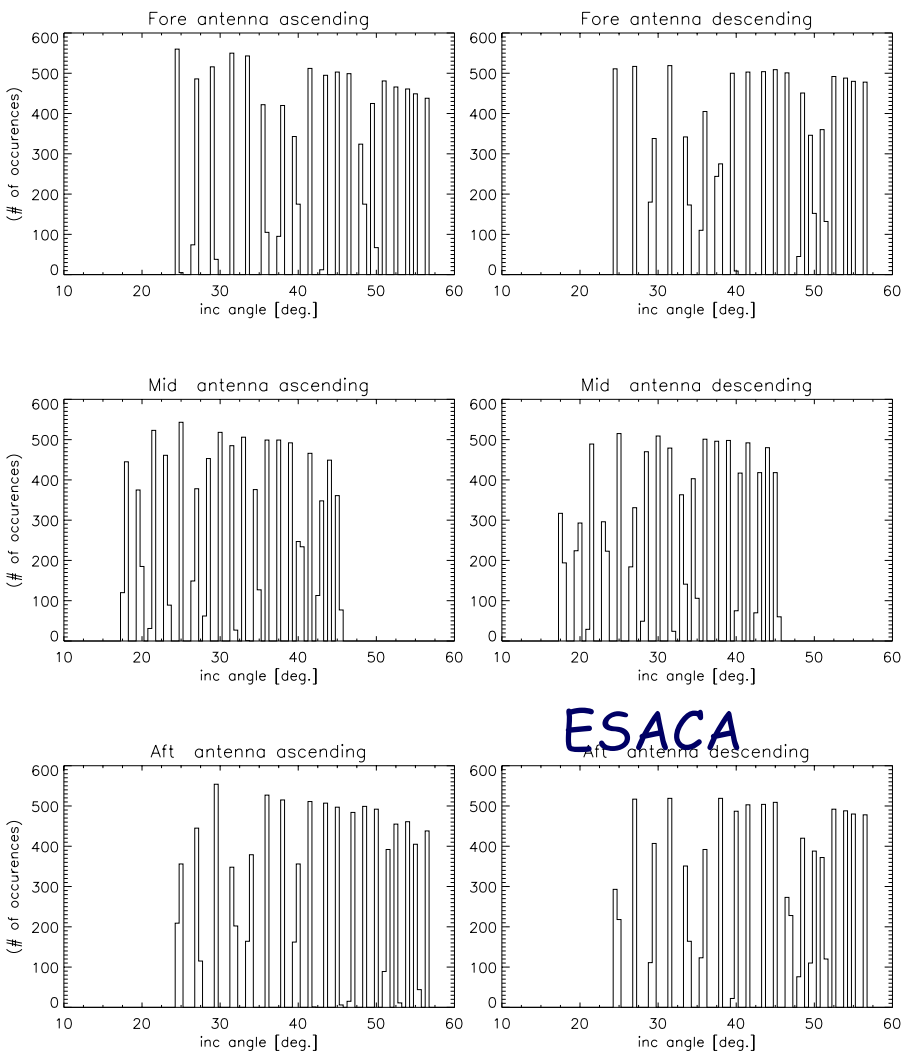
LRDPF

esa ESRIN

Wed Oct 29 08:42:07 2003

Data Processed by Product Control Service

ERS-2 Scatt: incidence angles histograms cycle 41



ESACA

esa ESRIN

Wed Oct 29 09:02:35 2003

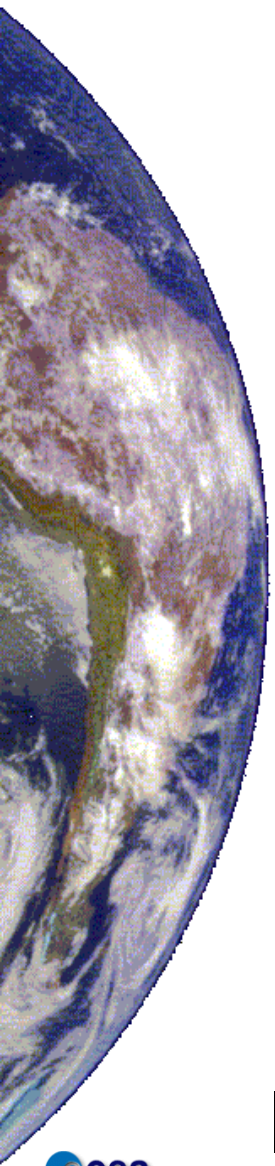
Data Processed by Product Control Service

Esaca calibration performances

- ESACA gamma nought are within 0.04 dB LRDPF sigma nought
- ESACA gamma nought across track flat profile as LRDPF gamma nought
- ESACA gamma nought peak evolution seems more stable (t.b.c.)
- ESACA nodes do not have the same incidence angle for nominal YSM at near – mid range (t.b.e.)

Instrument calibration Monitoring

- North Atlantic regional mission
  - No data available for the rain forest test area
  - Transponder available (one)
- TOSCA (**TO**ol for **S**catterometer **CA**libration)
  - re-processing of Transponder data with derived attitude information
  - New approach in calibration monitoring (Rainforest and ice)



Question Time