IKONOS Performance and Technical Update

March 22, 2007

Martin Taylor
Gene Dial

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Accuracy

- IKONOS Historic Accuracy
  - ~ 7 m CE90
- Accuracy issue in 2006
  - ~ 15 m CE90
- Corrective Actions
  - IC9 Instrument Calibration
  - Interlock Angle Adjustment
  - NC0 New Calibration Zero
- Accuracy after correction
  - ~ 6 m CE90

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2006 Accuracy Issue

Source ID	dX (m)	dY (m)	CE (m)
20060113173515100000011608735	2.2	-5.0	5.4
20060130175402200000011600427	11.1	-16.6	20.1
20060204173636200000011607875	5.7	-6.2	8.4
20060207174558900000011612248	1.7	-5.4	5.7
20060414174950900000011610404	11.4	-9.8	15.0
20060503174114000000011603810	3.0	0.9	3.2
20060602173443700000011611822	7.2	-7.1	10.1
20060705173722100000011625729	2.9	-3.4	4.5
20060821174919900000010100579	10.4	-8.9	13.7

- 2006 (January – August)
  - 7 tests with Good accuracy
  - 2 tests with Poor accuracy
    - 1 at 15m CE90 specification
    - 1 outside specification
- Corrective Action
  - Planned after February test
  - Initiated after May test
  - IC9 installed 2006.08.23
  - Monitoring continued
  - Additional actions followed

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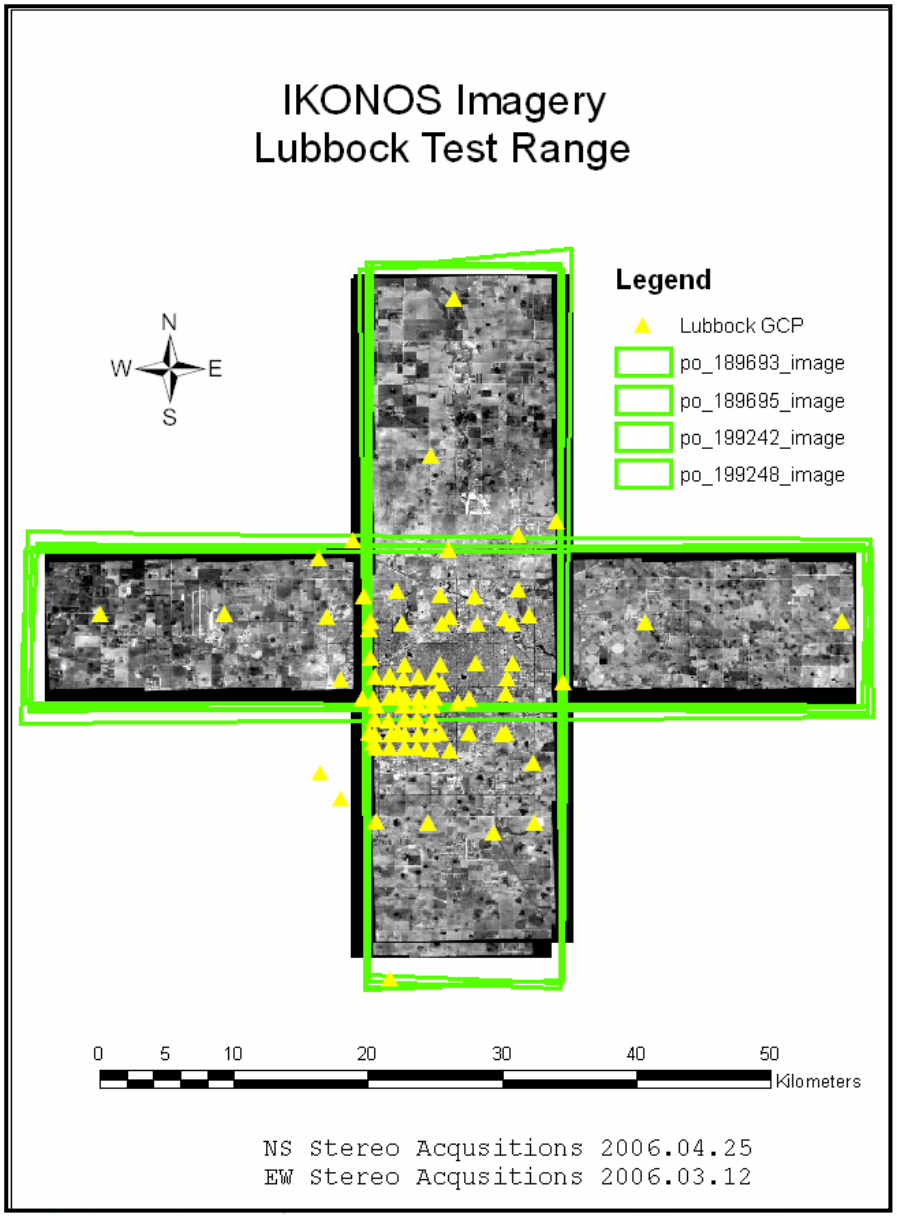
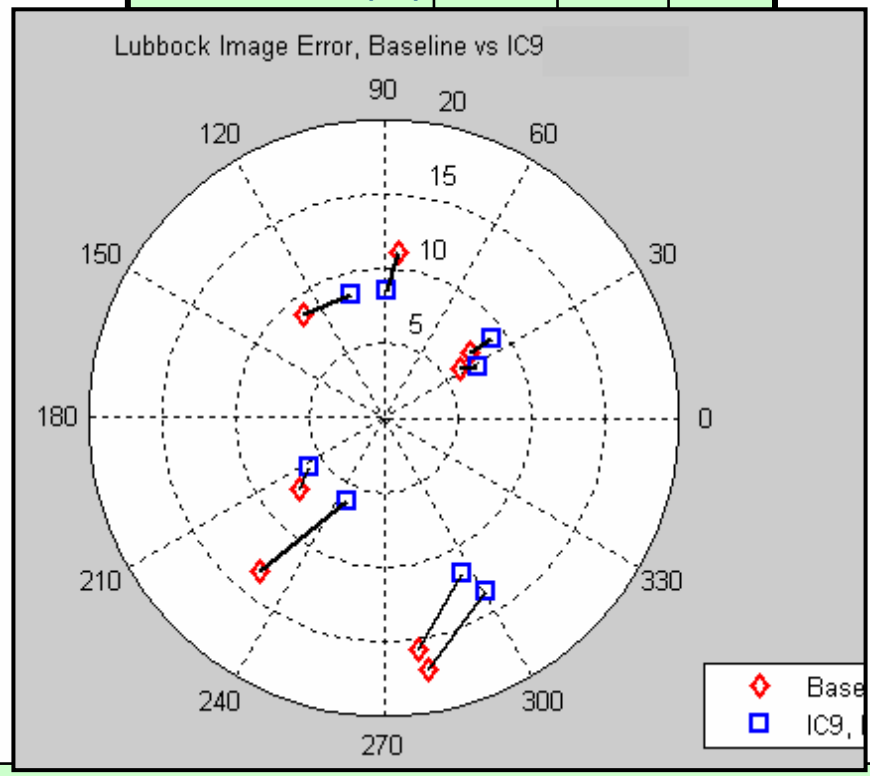
Lubbock Tests of IC9 Accuracy



Accuracy	Base	IC9	Delta
Average CE (m)	11.0	9.0	-18%
Worst Case (m)	17.3	13.7	-21%



- 4 stereo pairs on 2 passes
  - (1) East-West forward scan stereo pair and EW reverse scan stereo pair on 2006.03.12
  - (2) North-South forward scan stereo pair and NS reverse scan stereo pair on 2006.04.25
- Illustrates IKONOS agility and collection capacity.

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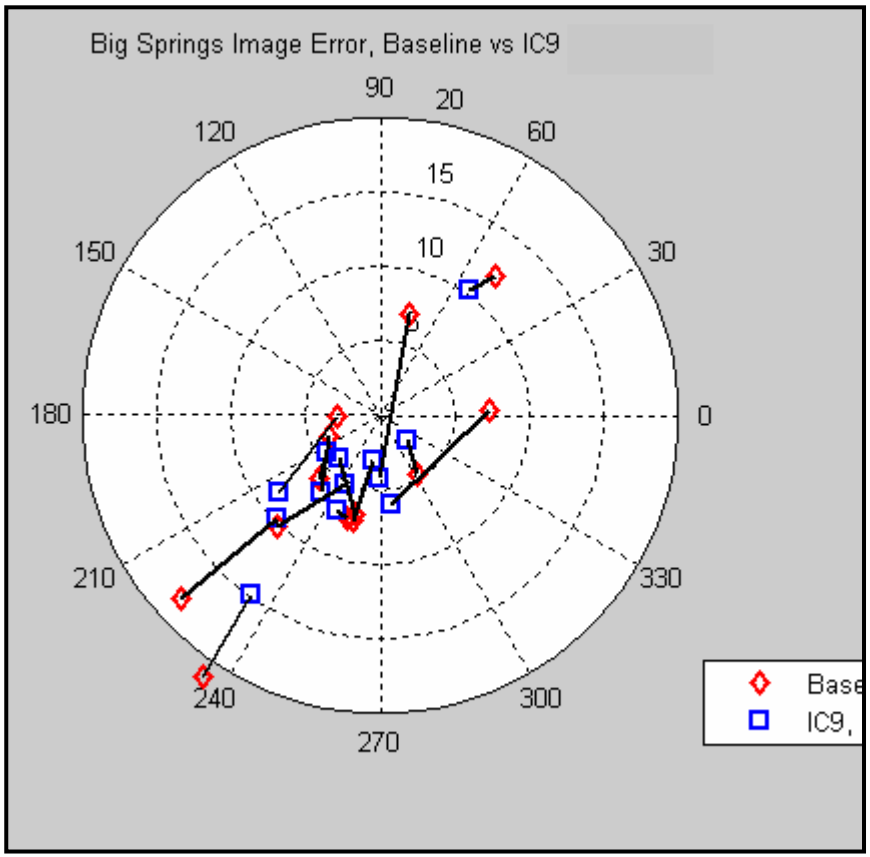
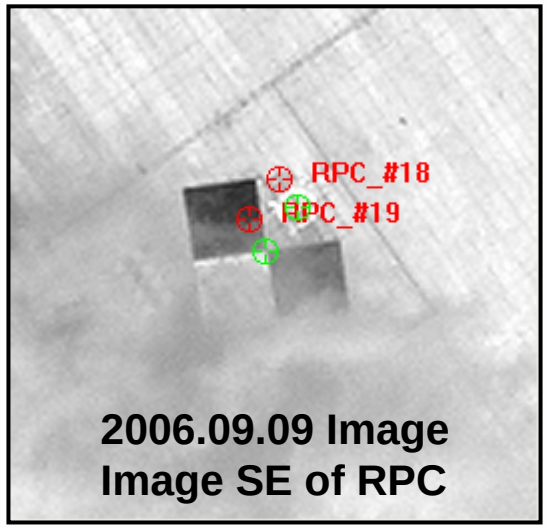
Big Spring Tests of IC9 Accuracy



Accuracy	Base	IC9	Delta
Average CE (m)	8.8	6.6	-25%
Worst Case (m)	21.2	14.8	-30%



2006.09.09 Image
Image SE of RPC

- 13 images before August 2006.
- IC9 improved average CE 25%
- Worst case improved 30%, dropping below 15 m CE90 specification.
- IC9 installed 2006.08.23

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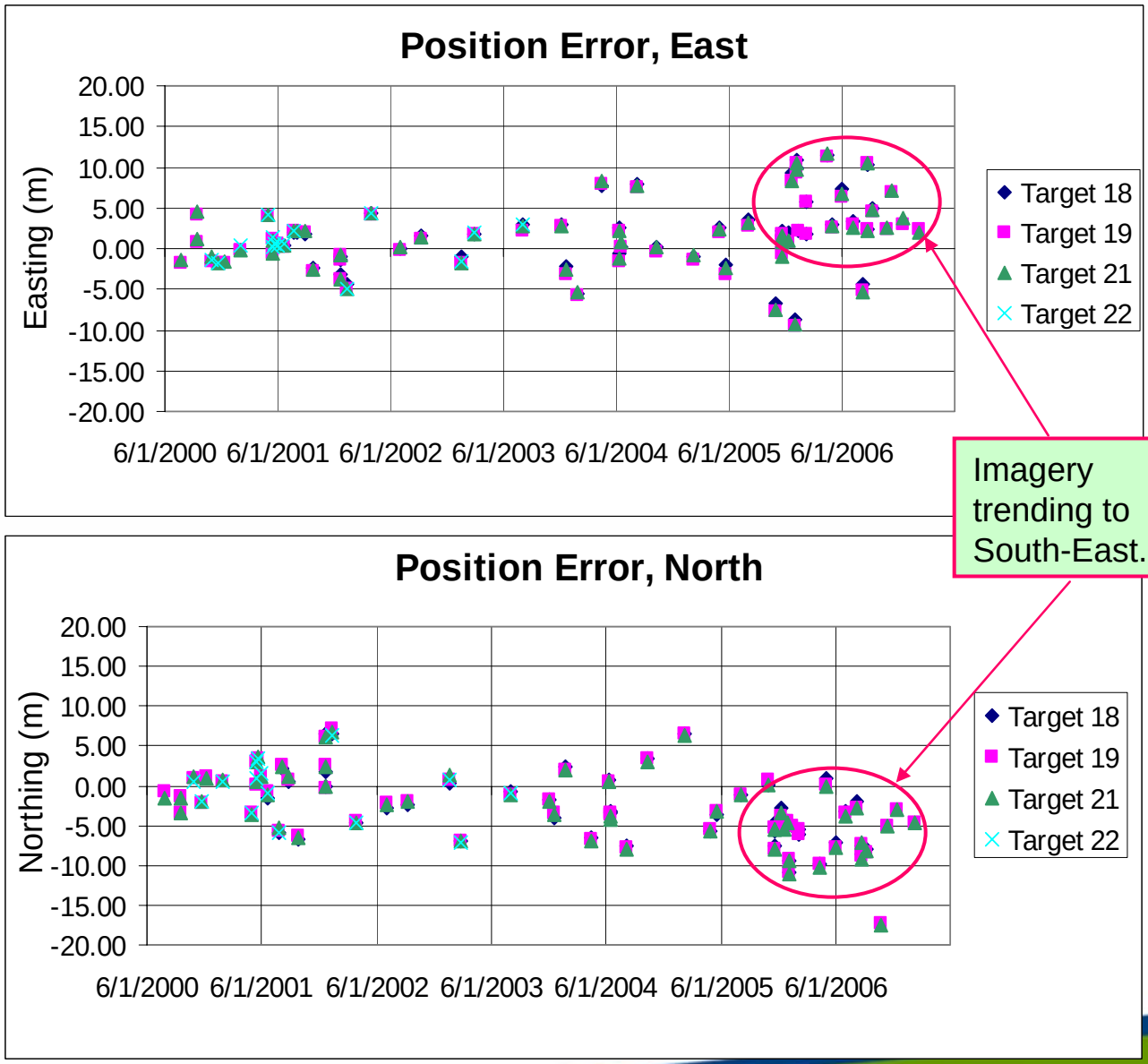
Interlock Angle Adjustment

Tests show imagery trending towards the South-East.

Corrective action:

- Adjust interlock angles
- Pitch +6.3 uR
- Roll -5.9 uR
- Apply to imagery collected after 2005.11.22
- Starting production date 2007.04.09

uR = micro-radian



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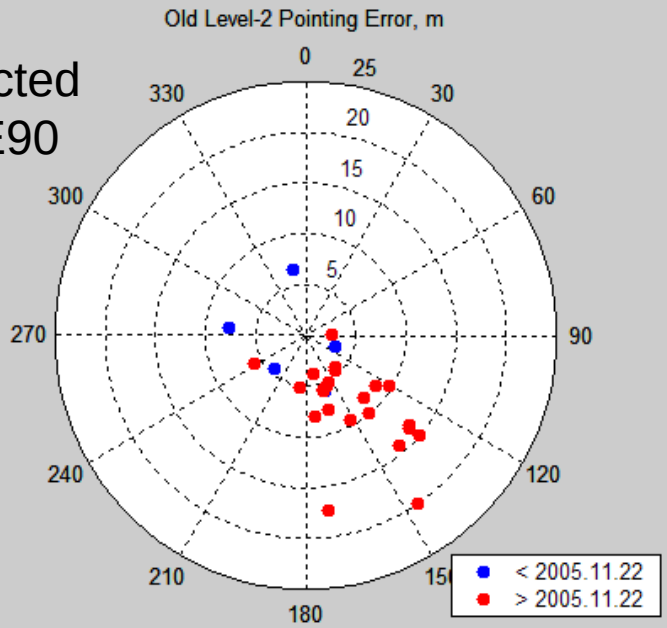
Uncorrected
14 m CE90



28 Images
2005-2006

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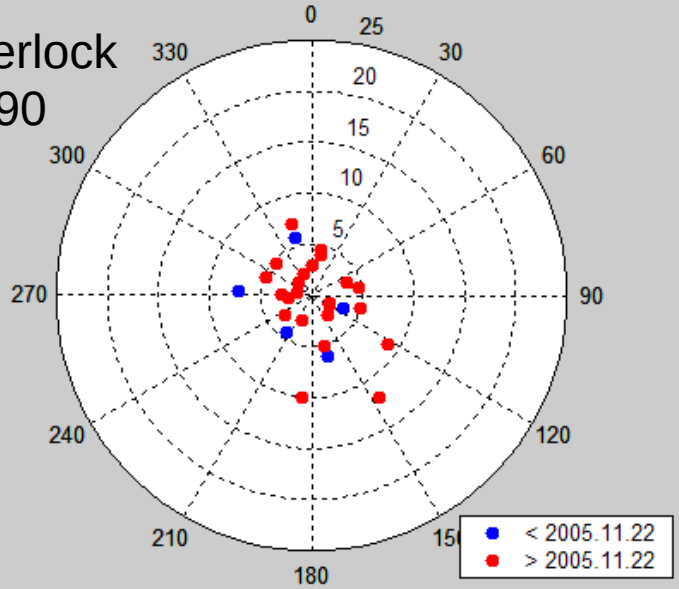
IC9+Interlock
8 m CE90



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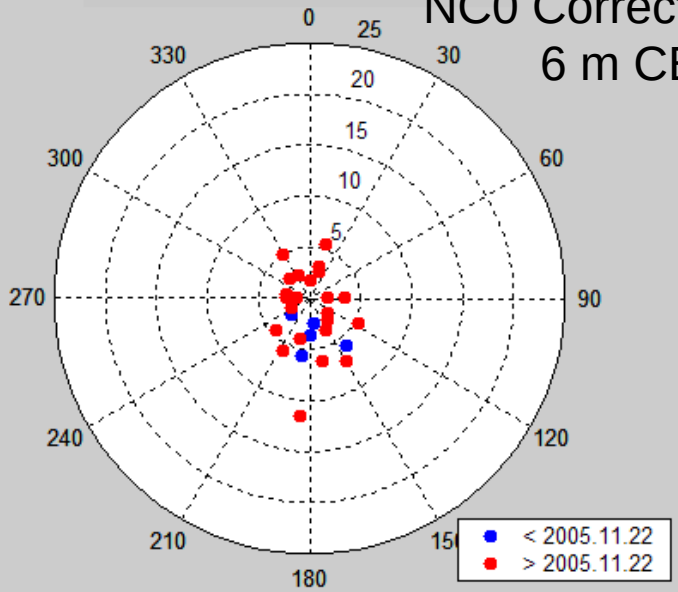
NC0 Correction
6 m CE90



Metric Calibration Summary

Effectivity		Description
Collection Date	Production Date	
1999.09.24	2001.11.19	Interior Orientation (IO) ~ 150 ppm Scale
1999.09.24	2002.01.31	Exterior Orientation (XO) ~ 5 m Offset
1999.09.24	2005.01.17	IO & XO ~ 1 Pixel between arrays
2006.08.23	2006.08.23	Instrument Calibration 9 (IC9)
2005.11.22	2007.04.13	Interlock Adjustment
2007.05.01	2007.05.01	New Case-0 Calibration (NC0)

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Image Quality

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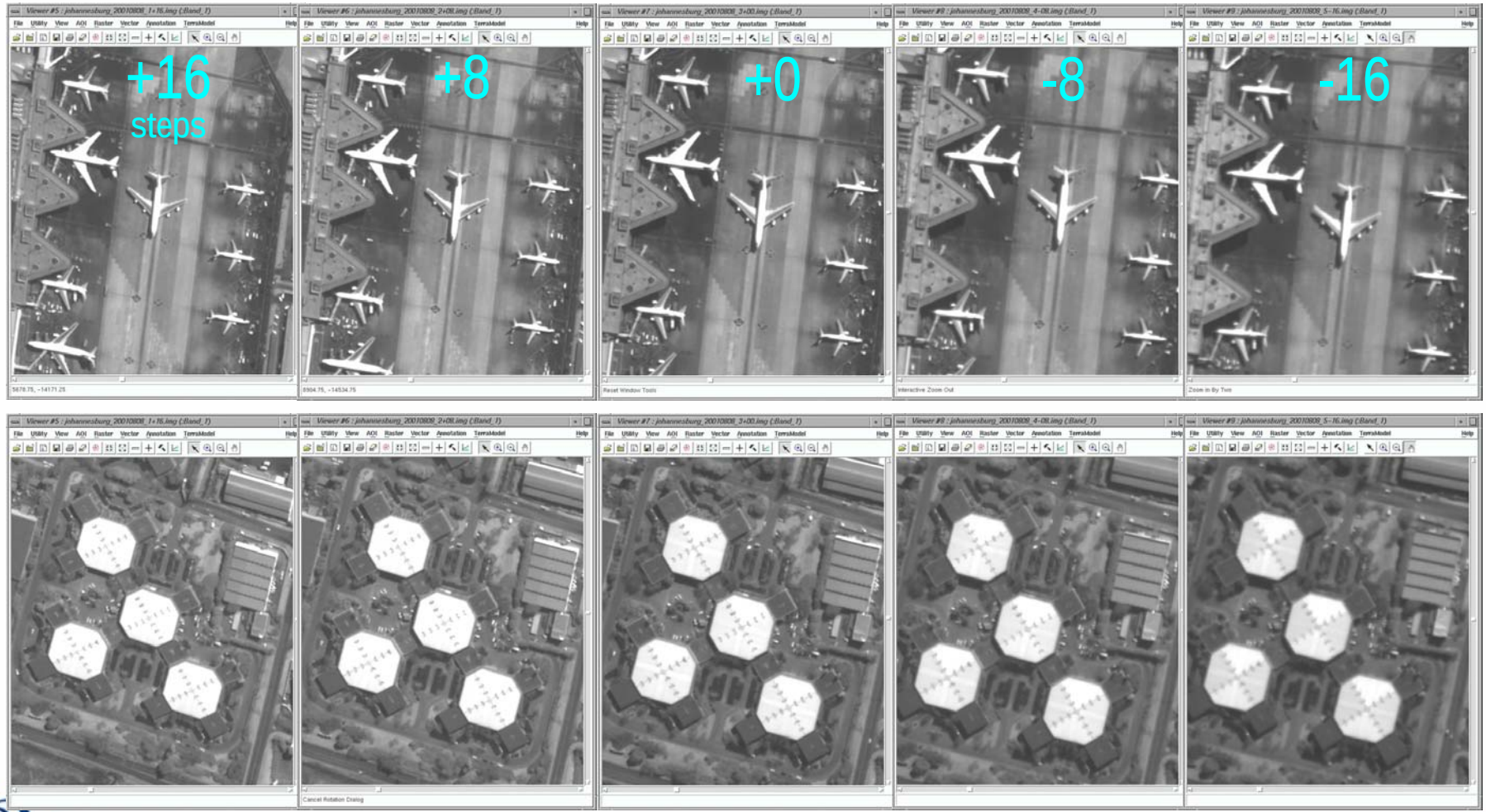
Quarterly Through-Focus Test

- Technique: Step through 32 steps of secondary mirror to determine ideal location
- Most recent adjustment: 4 steps (100 um = 1/3 depth of field) on 2006.10.16.



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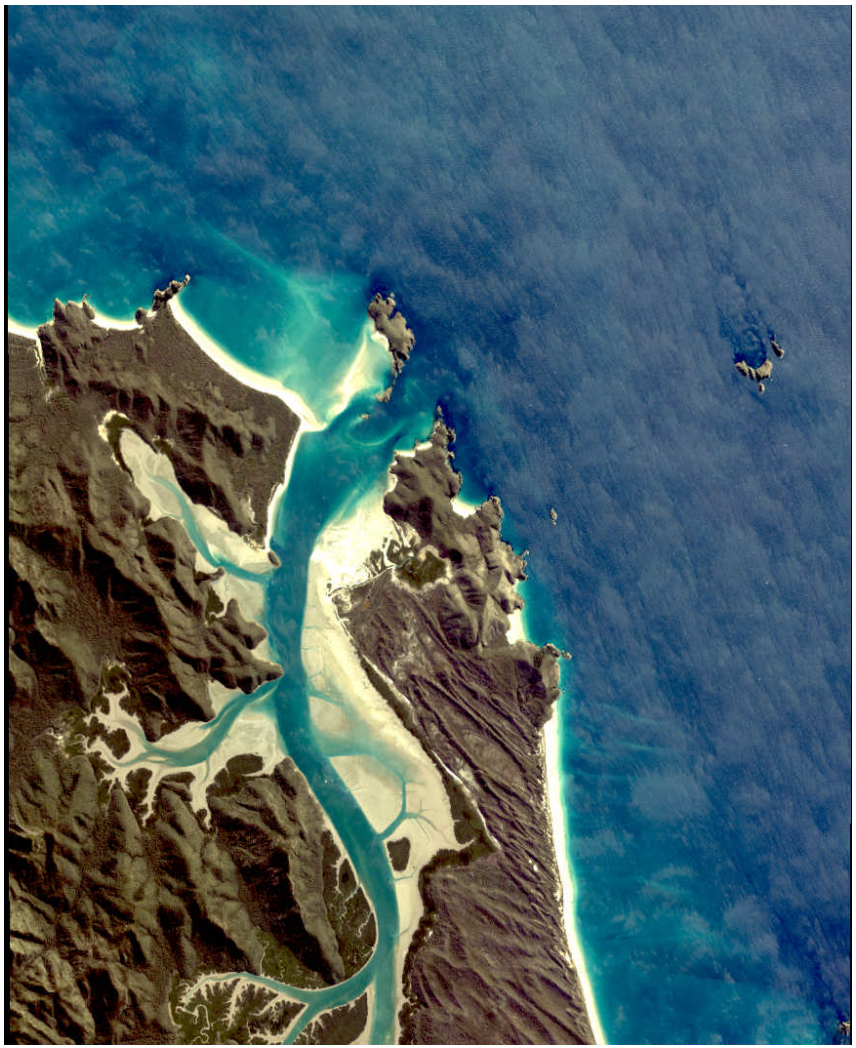
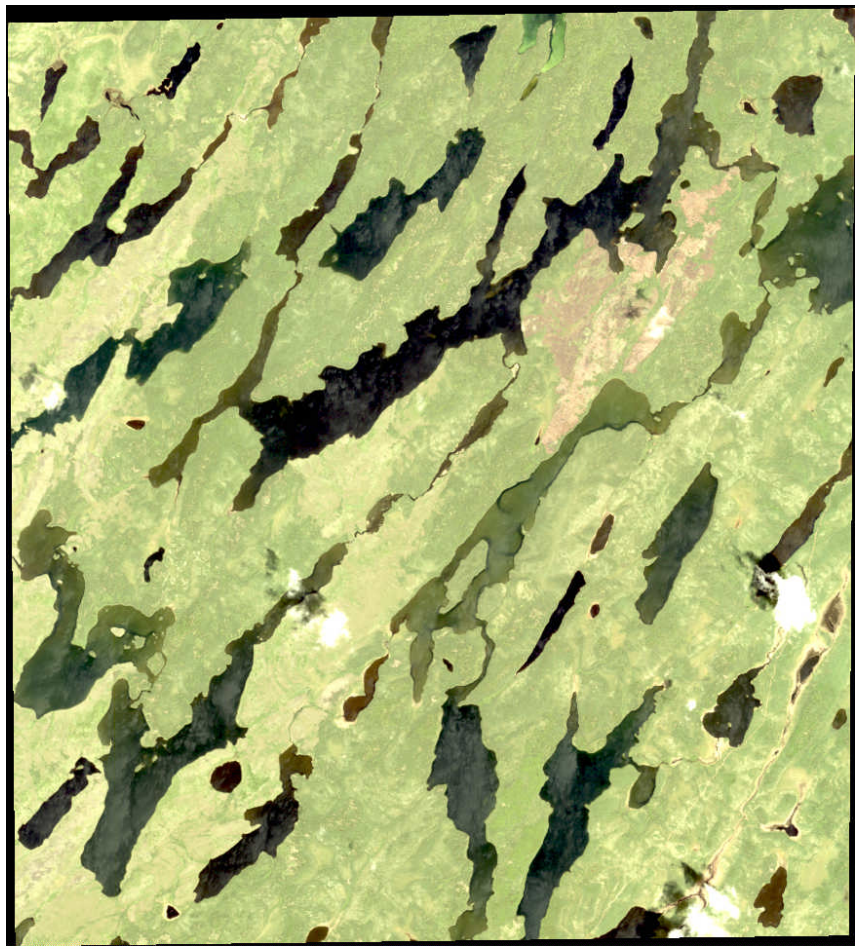
Radiometry





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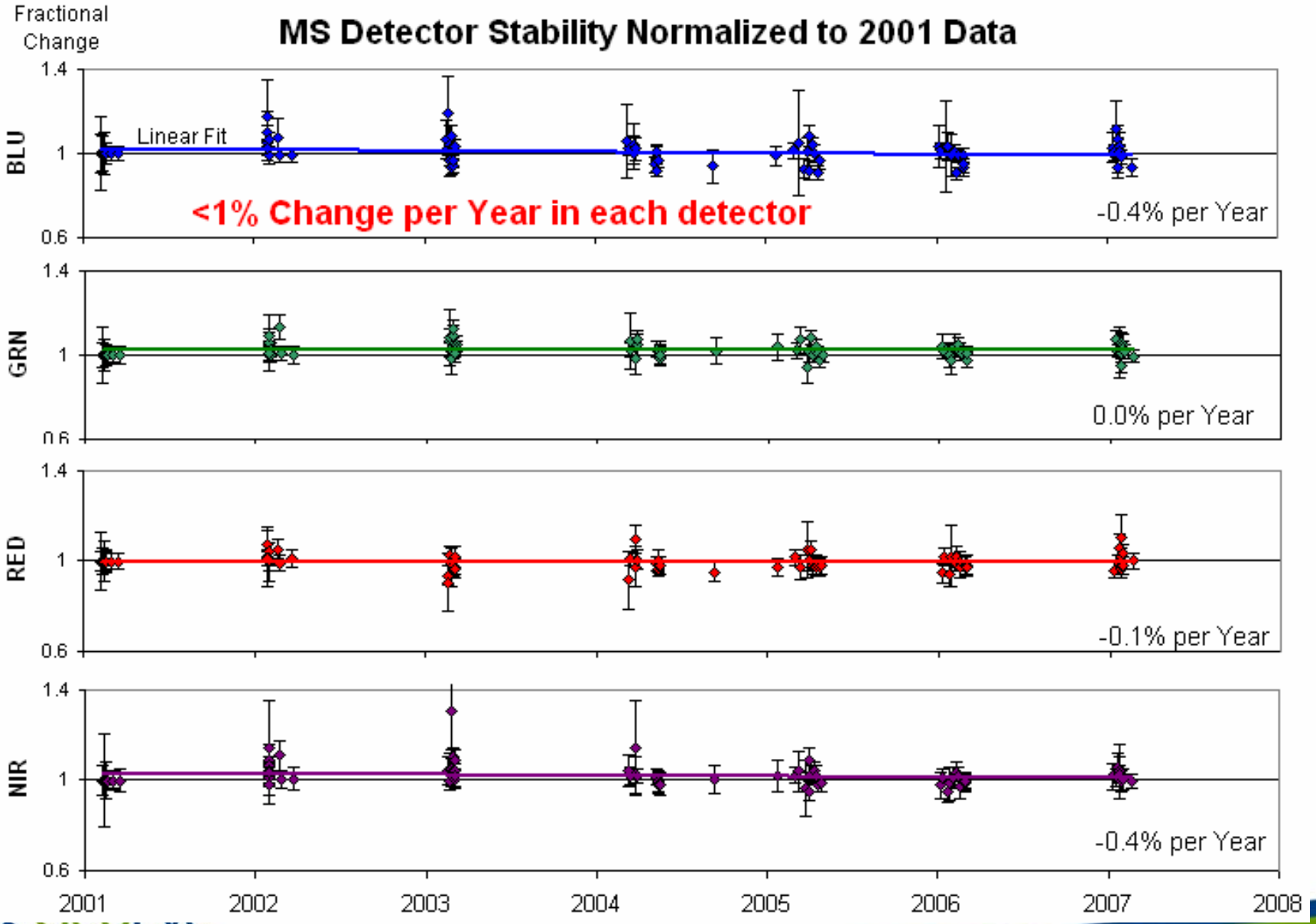
Detector Stability – Stellar Data



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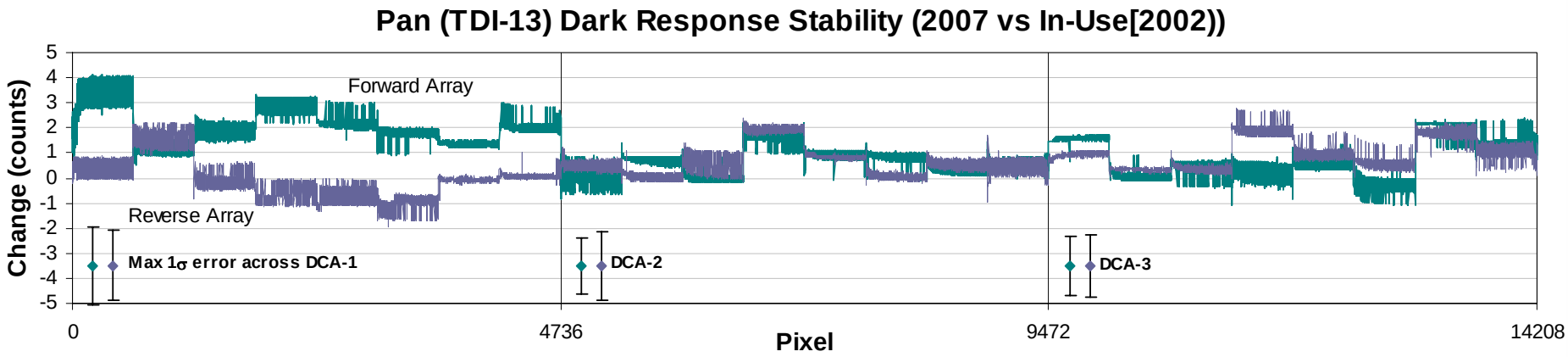
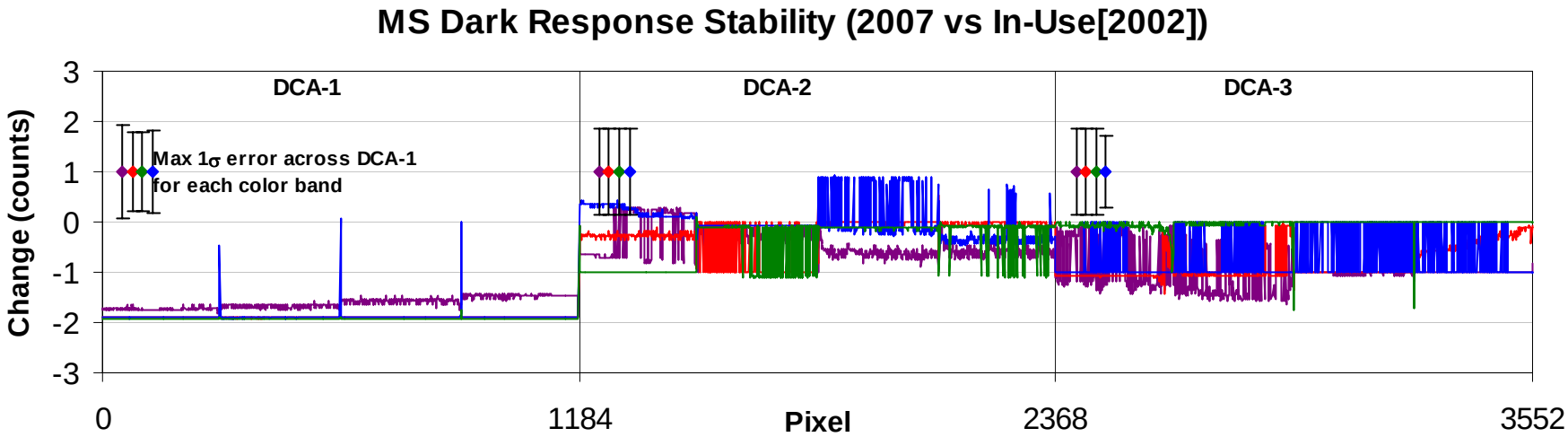
Dark Response Calibration
(Images Taken with Door Closed)





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Lunar Side Slither Technique

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Lunar Side Slither Technique

- Desert and Arctic regions work well for relative calibration in mid to bright portions of dynamic range
- Dark, uniform, cloud-free terrestrial targets for dark portion of dynamic range increasingly difficult to find
- Dark, Mare regions of the Moon provide alternative for High-Res instruments
  - Pointing accuracy allows for precise array location over uniform Mare
- Technique has been shown to be a viable alternative for IKONOS

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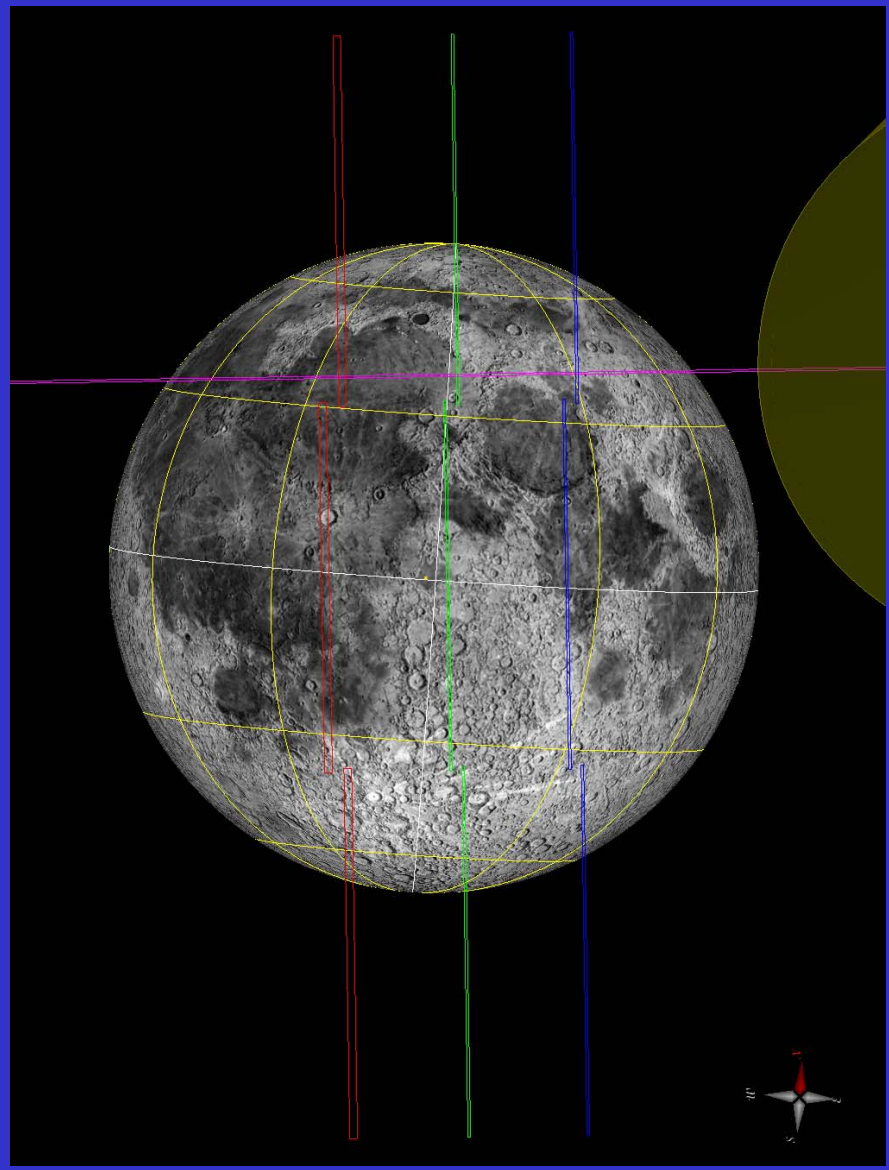
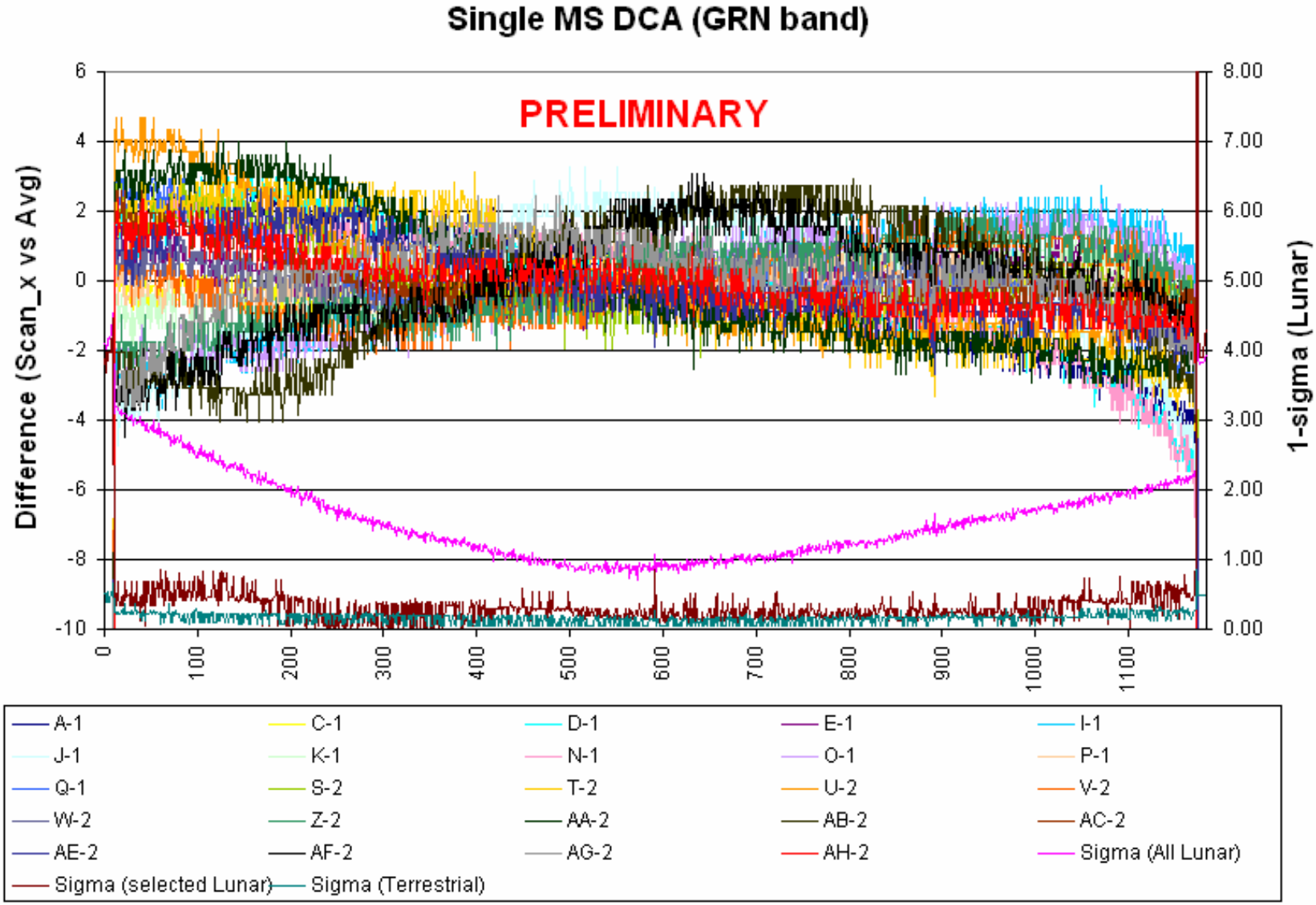
Lunar Side Slither – Array Location

Side Slither
7 Sept 2006

Red –MS
Green – Pan Fwd
Blue – Pan Rev



Lunar Side Slither Results



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Questions?

- Customer Service
  info@geoeye.com
- Online: geoeye.com
- Martin Taylor
  Payload Vehicle Specialist
  303.254.2178
- Gene Dial
  Director, Product Engineering
  303.254.2058

Shuttle Discovery, 2005.04.08

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