Section 13
Requirements for Reprocessing

Crosstalk Study

- PC Bands Crosstalk (B31 - > B32-36)
- SWIR Crosstalk
  - **Thermal Leak (5.3 μm Leak, reviewed in section 10)**
  - Electronic Crosstalk:
    - New Vdet (110) substantially reduced SWIR crosstalk
- MWIR Crosstalk Needs More Work

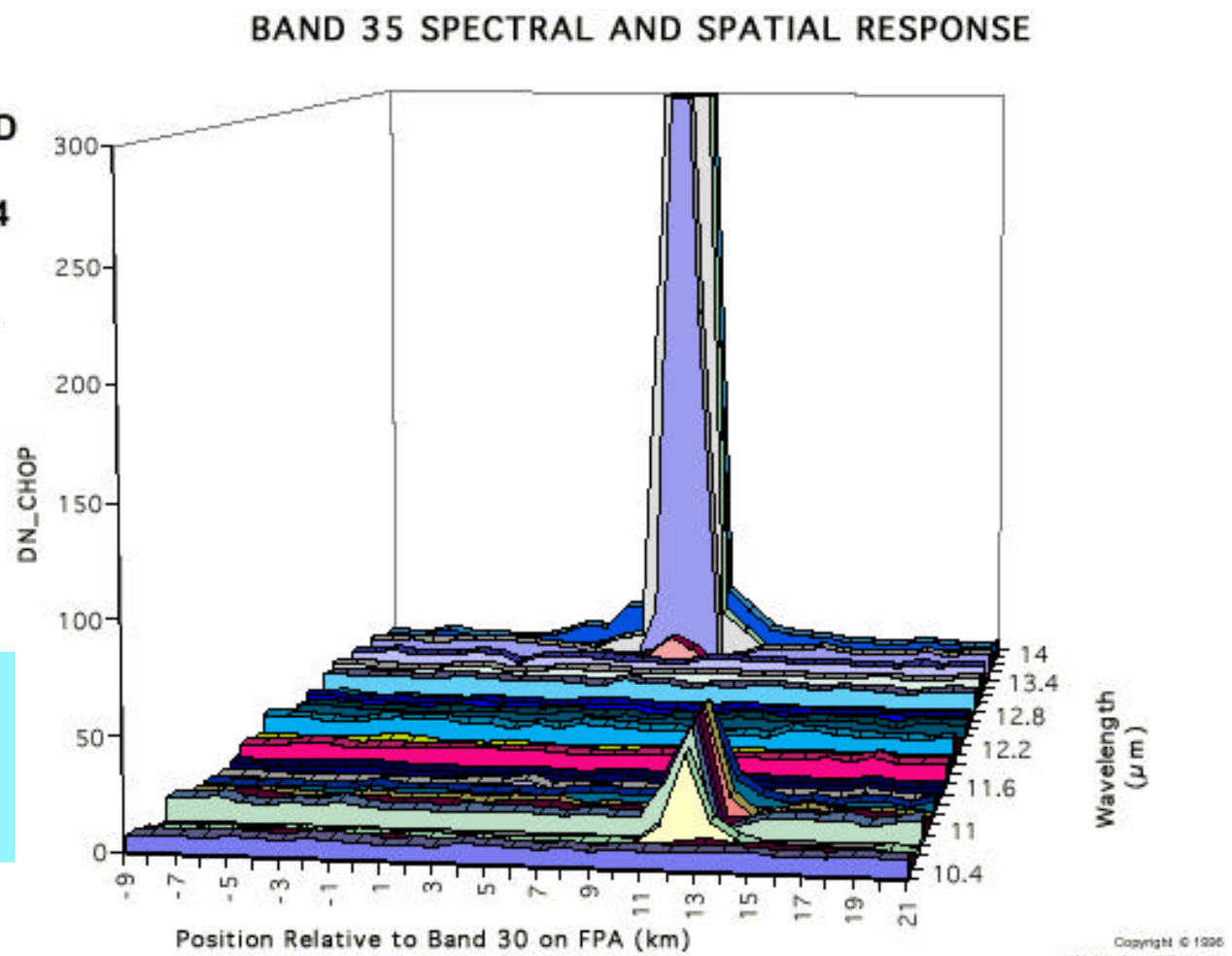
PC Crosstalk

- **Pre-launch**
  - Crosstalk observations & characterization
  - Correction algorithm

- **On-orbit** Analysis Results
  - Moon in Space View Port (SVP)
  - Scene applications

Pre-launch Crosstalk Observation
(Spatial/Spectral OOB Response Testing)

- DATA ACQUIRED DURING OOBD SCAN FROM 10.4 TO 14 µm
- RESPONSE NOT VISIBLE IN BANDS 31-33



Other SBRS plots Show OOB response In B32 and B33

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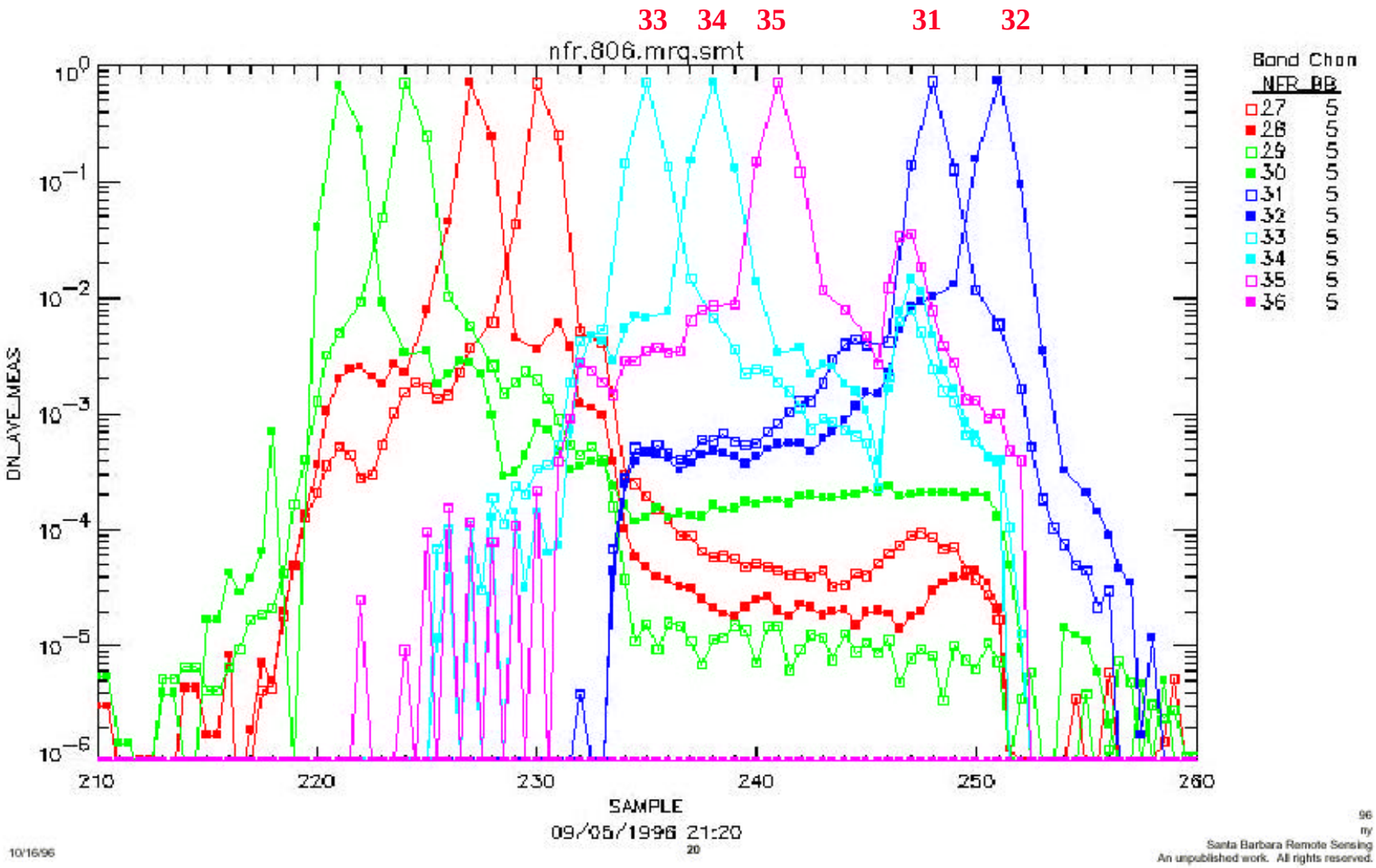
Pre-launch Crosstalk Observation

(Near Field Response Testing)



96
ny
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Correction Algorithm

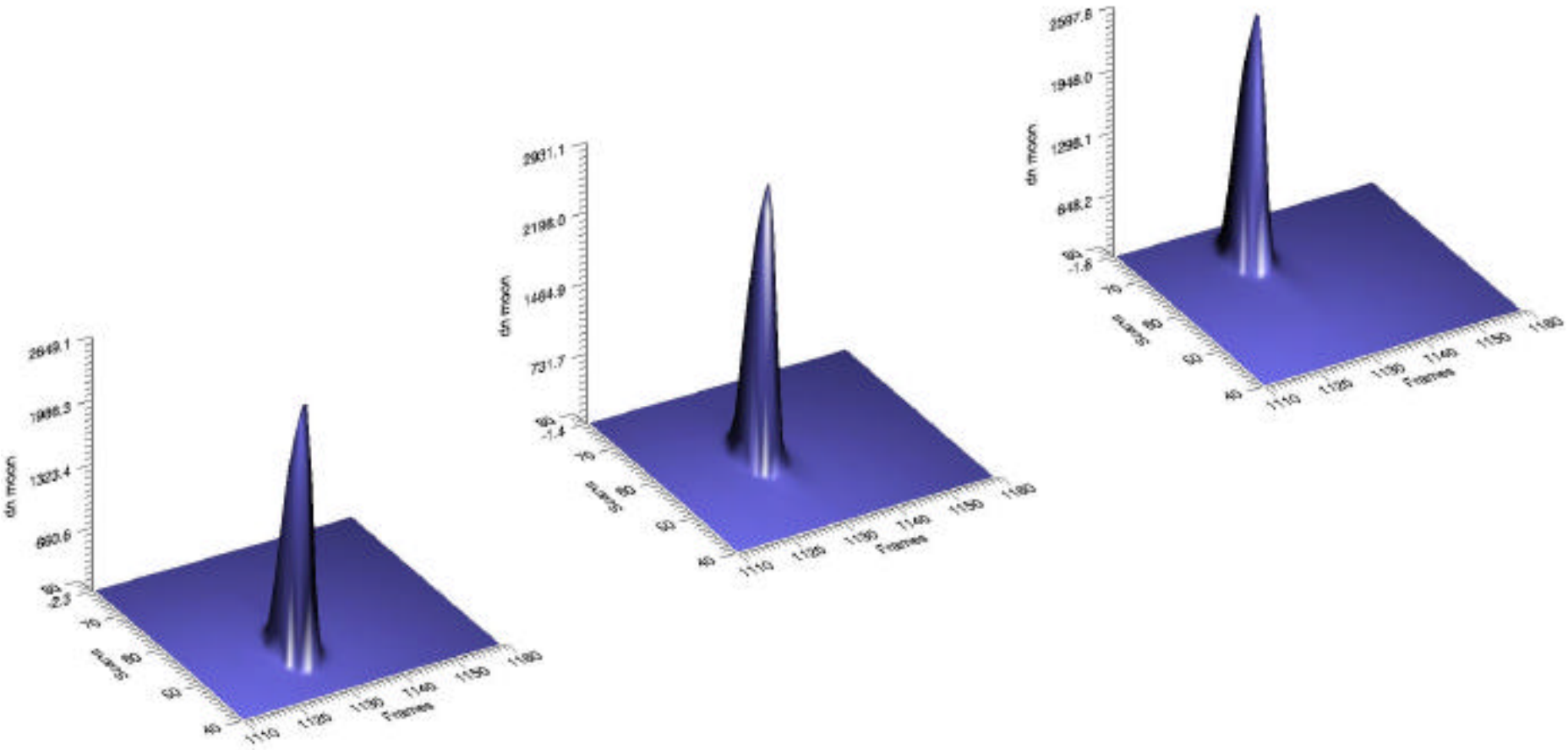
- Only B31 to other PC bands (32 - 36) crosstalk considered
- No along track crosstalk included
- Apply correction to B32-36 dn_{BB} and dn_{EV} for both calibration and retrieval
- Correction derived from TV TEB calibration data sets
- LUT with channel to channel flexibility in L1B code

$$dn_{B(i)}^{True}(F) = dn_{B(i)}^{Cont}(F) - Xtalk_{B31->B(i)} \;\; dn_{B31}(F + FO_{31-B(i)}) \;\; p_{B(i)} + q_{B(i)}$$

(F: Frame; FO: Frame Offset; p and q parameters for use in on-orbit correction)

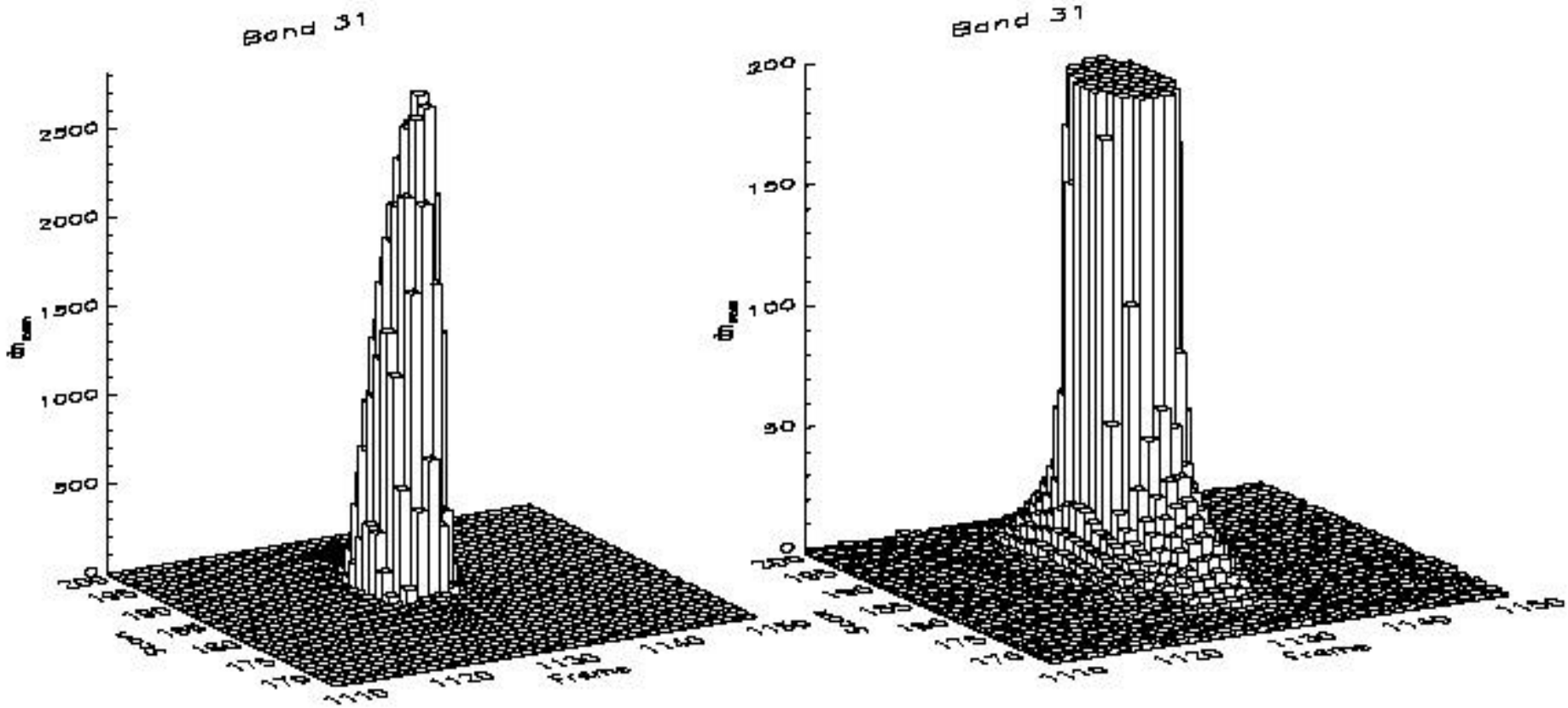
On-orbit Analysis Results
(Moon in SVP)

B31 D1, D5, and D10 Moon View



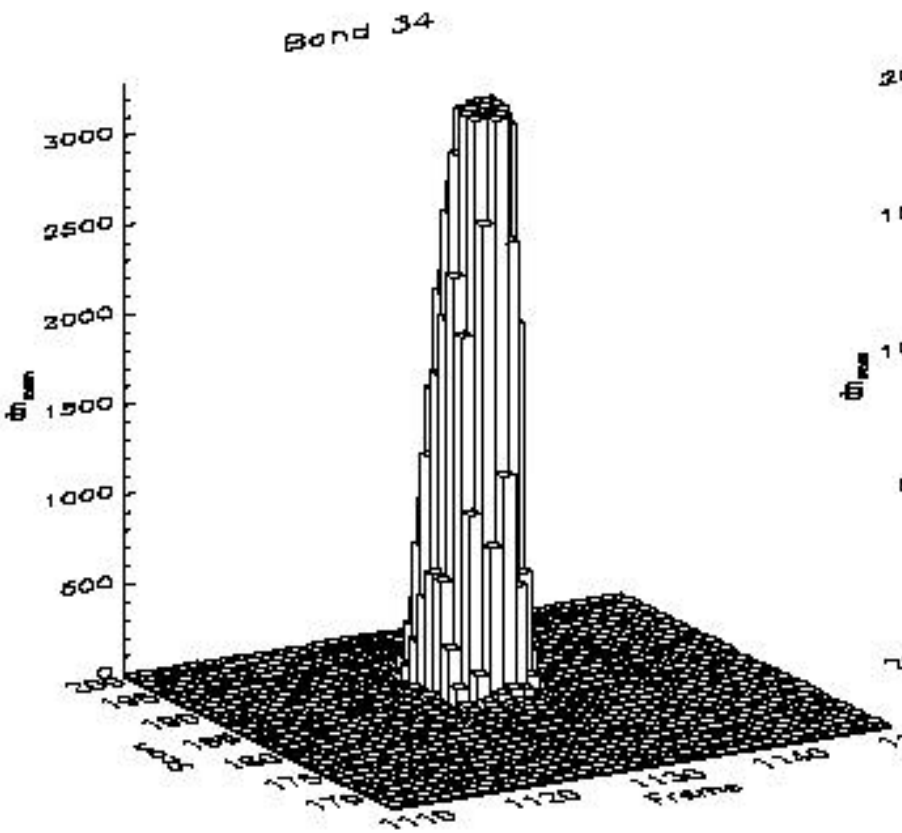
On-orbit Analysis Results
(B31 D6 View of the Moon)

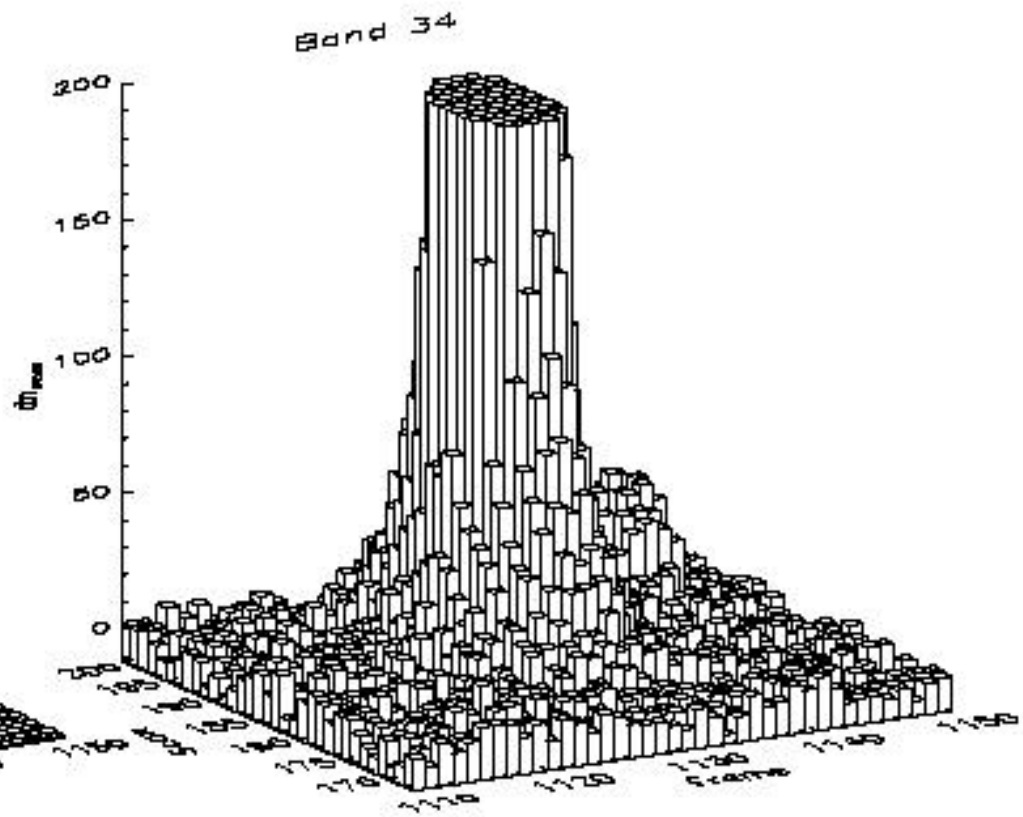
84/17:00 Moon View Event (Vdet = 218)



On-orbit Analysis Results
(B34 D6 View of the Moon)

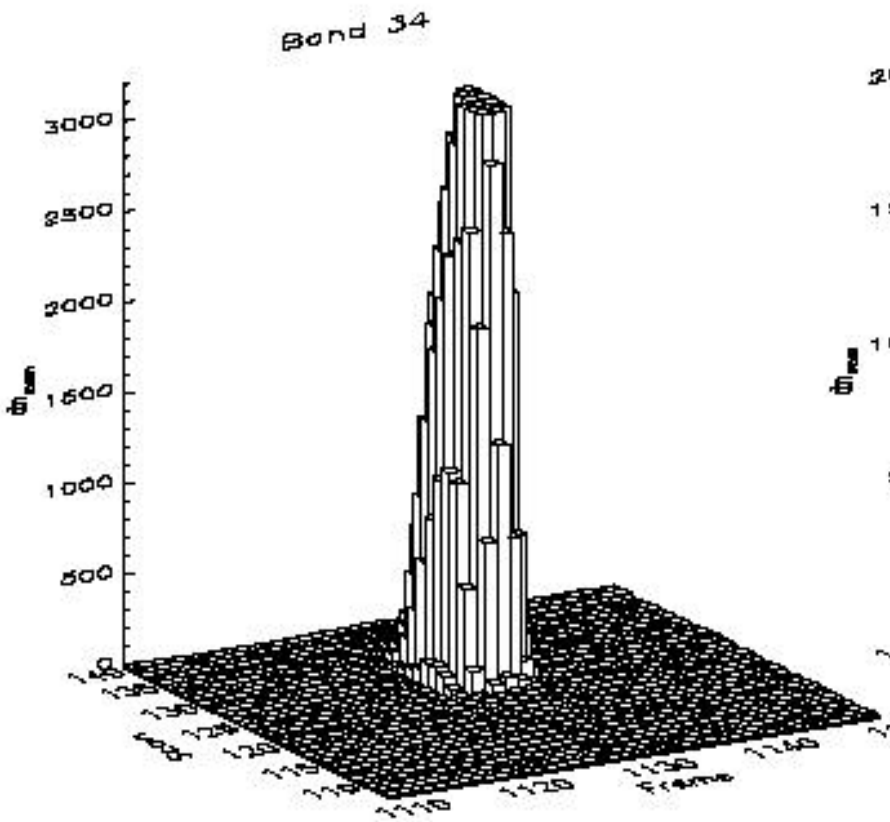
84/17:00 Moon View Event (Vdet = 218)

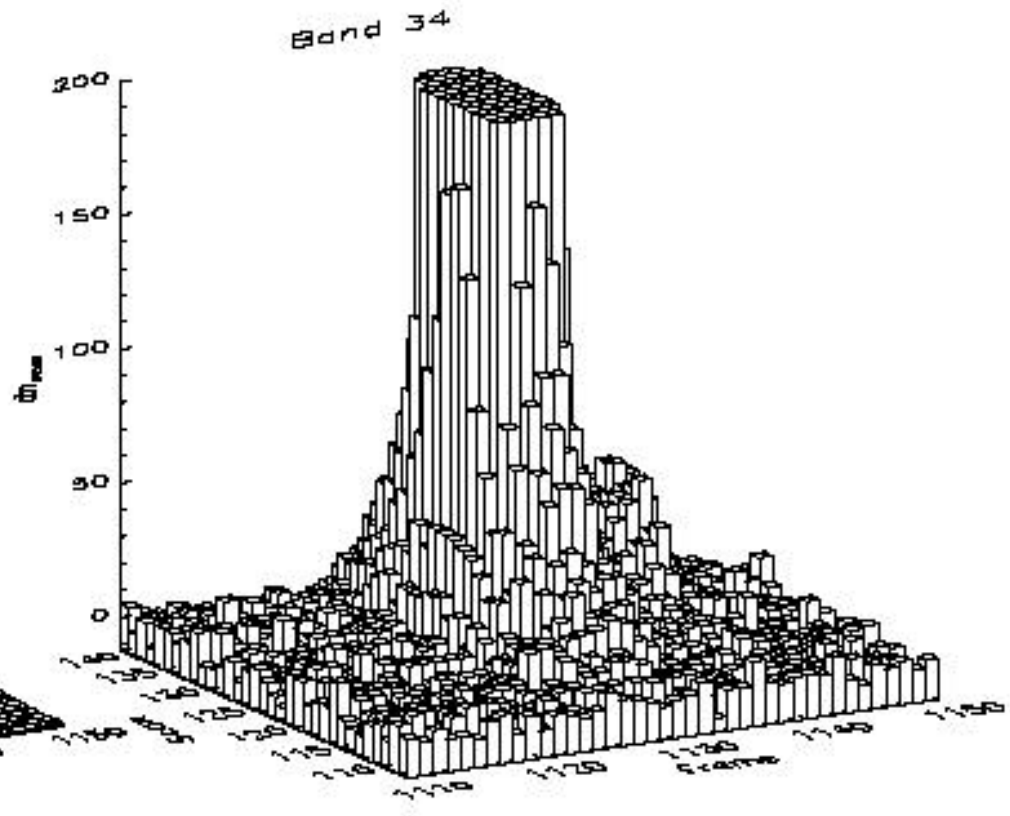




On-orbit Analysis Results
(B34 D6 View of the Moon)

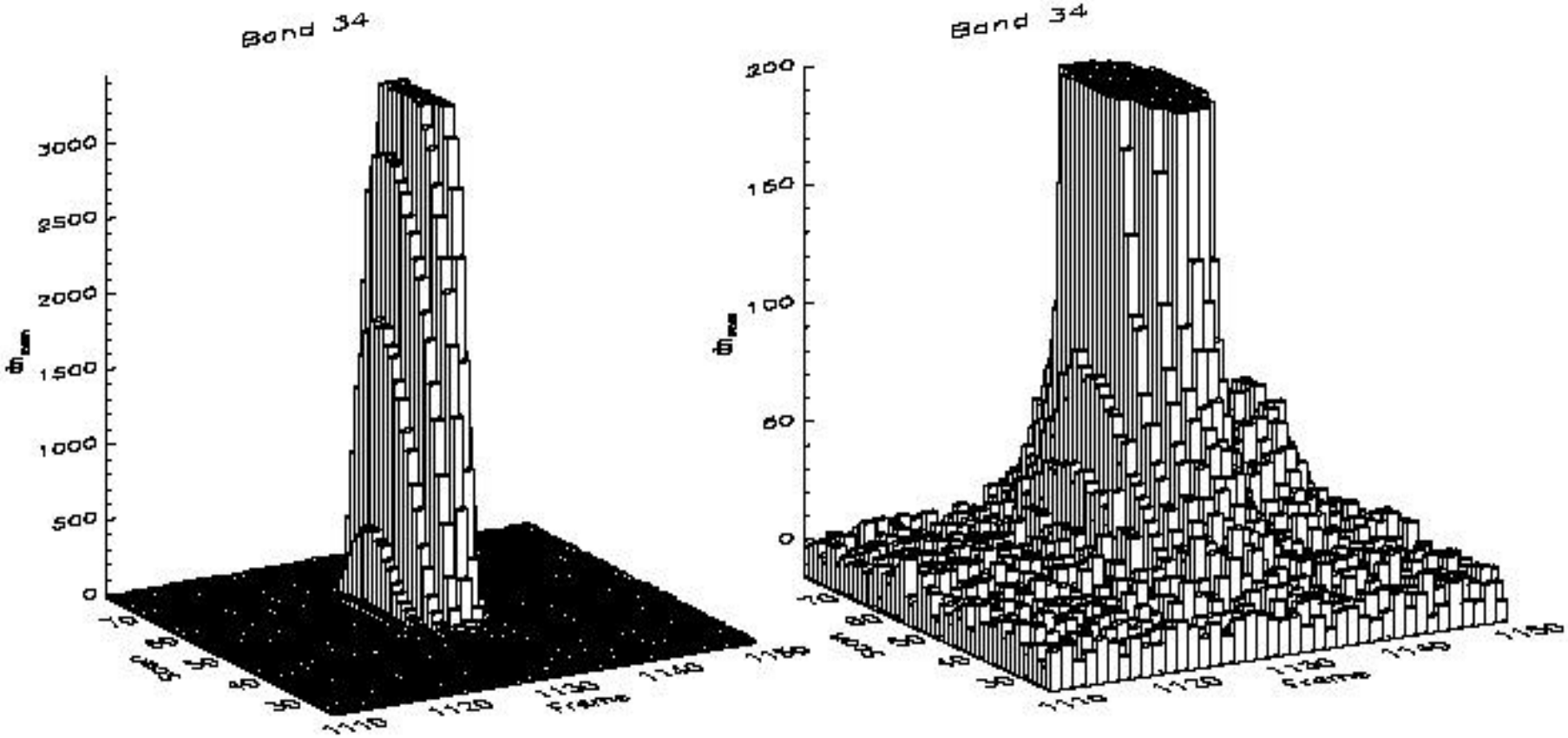
173/21:50 Moon View Event (Vdet = 190)





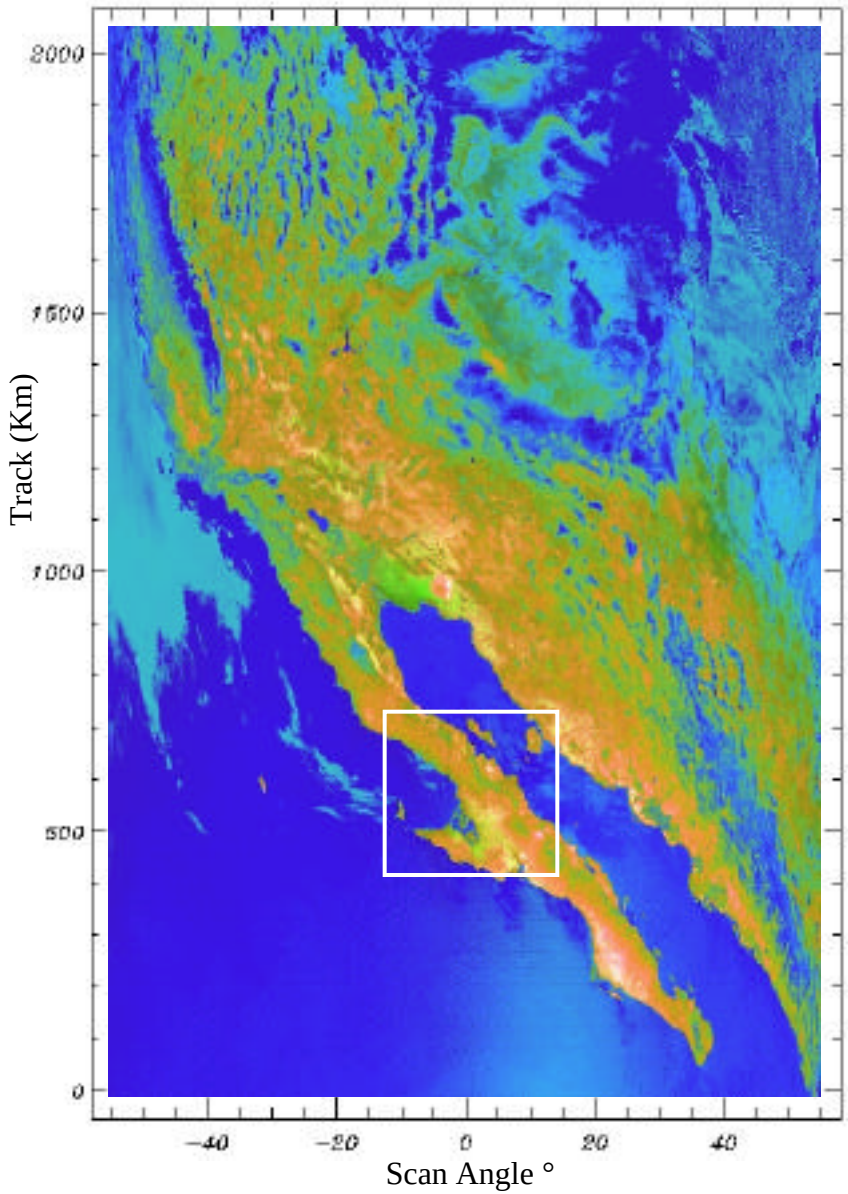
On-orbit Analysis Results
(B34 D6 View of the Moon)

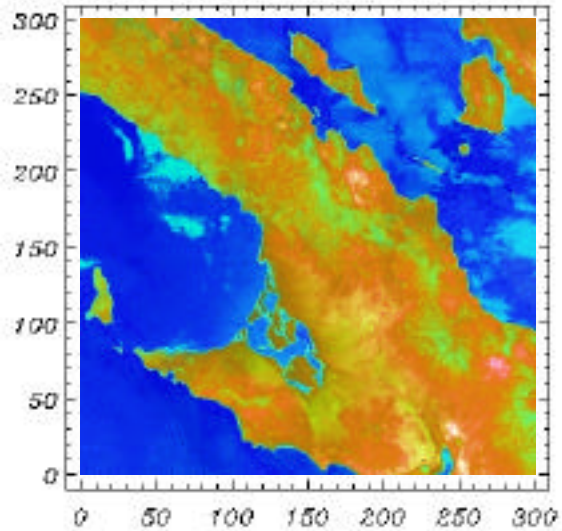
350/08:10 Moon View Event (Vdet = 110)



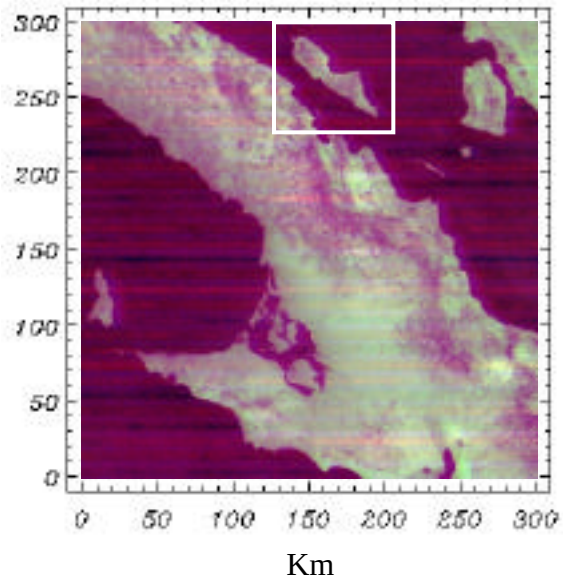
Baja California (094.1835; Day Mode)

Enhanced Radiance Images (*before* PC_XT Correction) in True Color





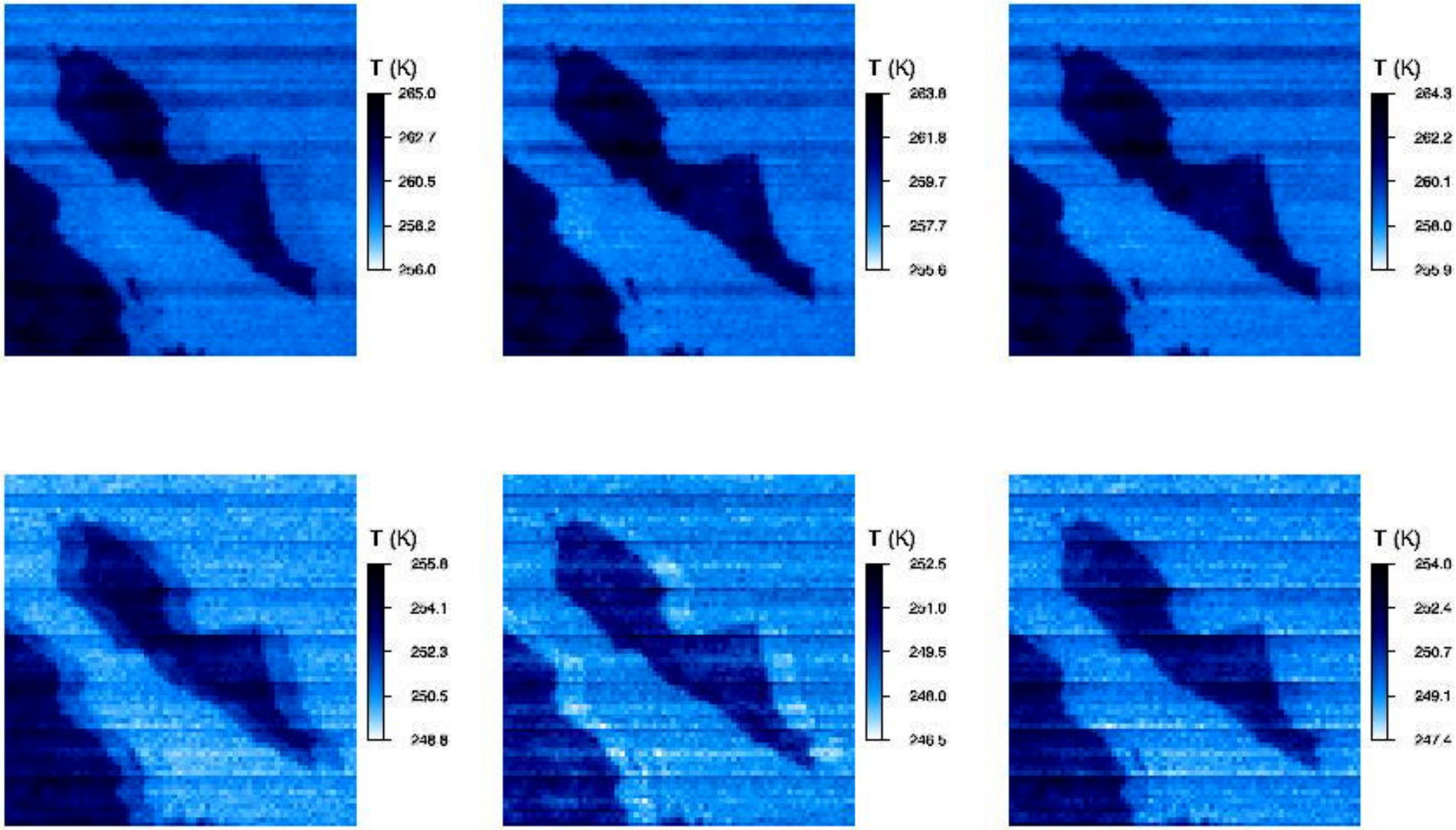
B29 (**R**)
B20 (**G**)
B31 (**B**)



B***34*** (**R**)
B31 (**G**)
B***35*** (**B**)
Cross-Talk Observed

Band 34 (Top) & Band 35 (Bottom) (94/18:35)

No Correction | Pre-launch Correction | New Correction

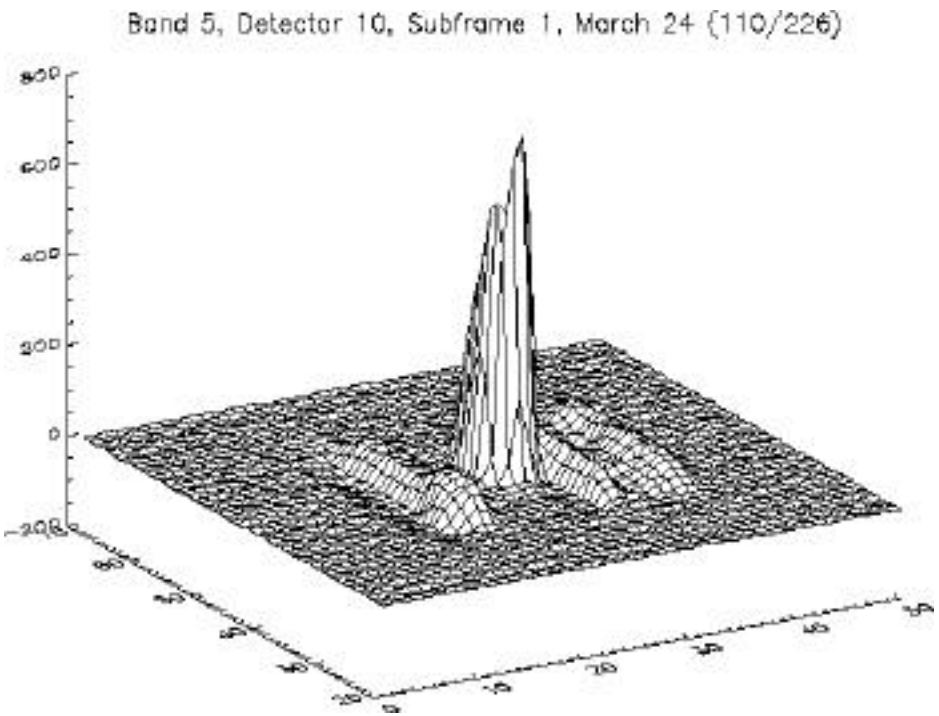


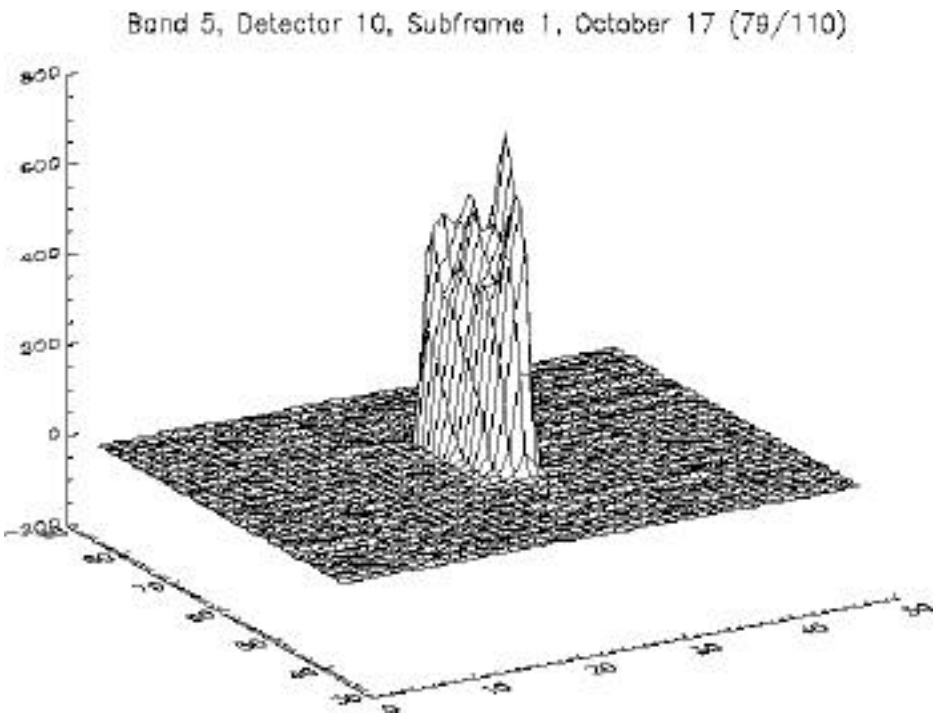
SWIR Crosstalk

- **Pre-launch**
  - Electronic crosstalk observed
  - SAM resistors replaced

- **On-orbit** Analysis Results
  - Moon in Space View Port (SVP)
  - SRCA analysis
  - Vdet change reduced crosstalk
  - **New algorithm and coefficients (see section 10)**

SWIR Crosstalk Reduced with New Vdet at 110



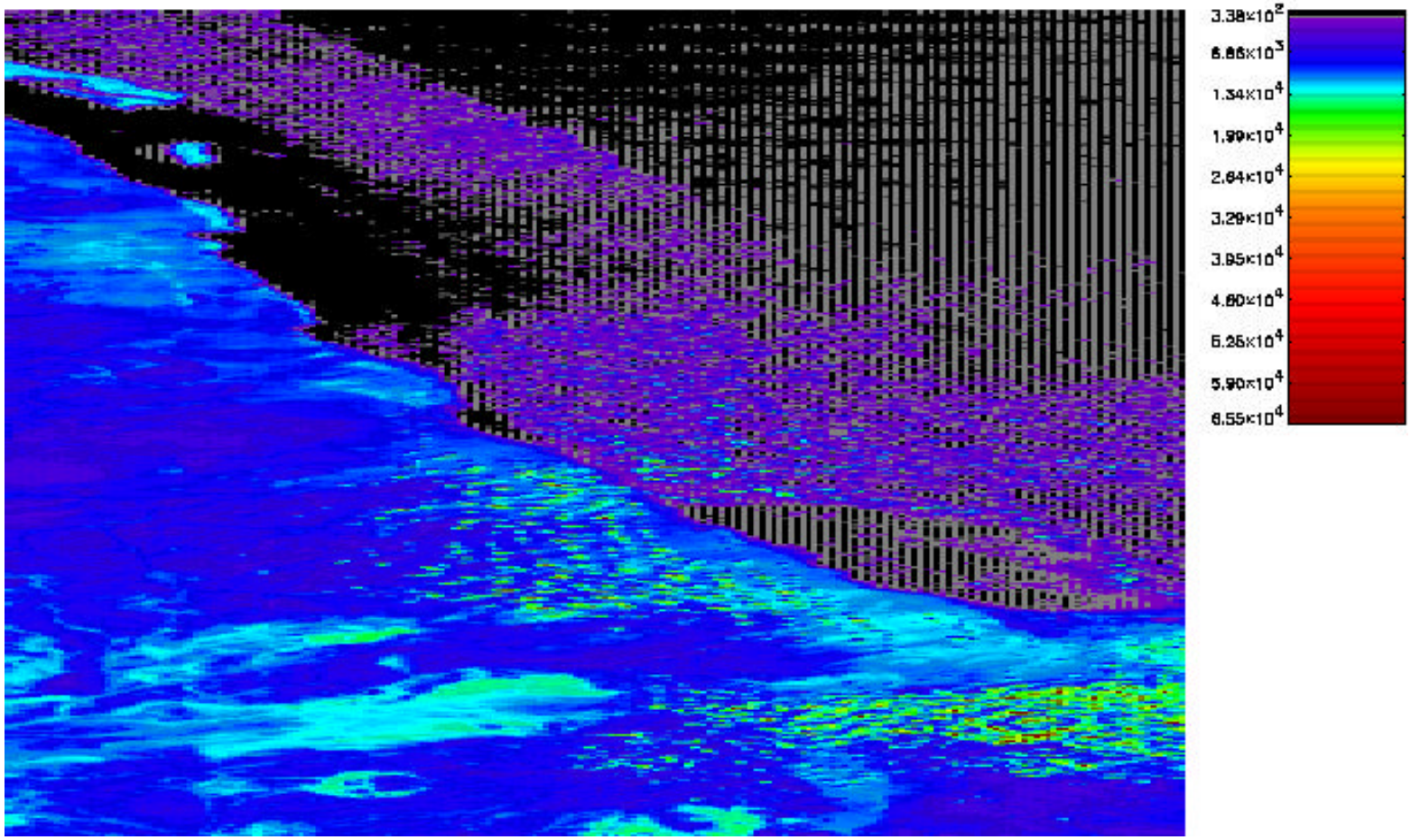


SWIR subframe difference large before applying correction algorithm

L1B V2441_B_SIDE_ONLY A2000306.0820

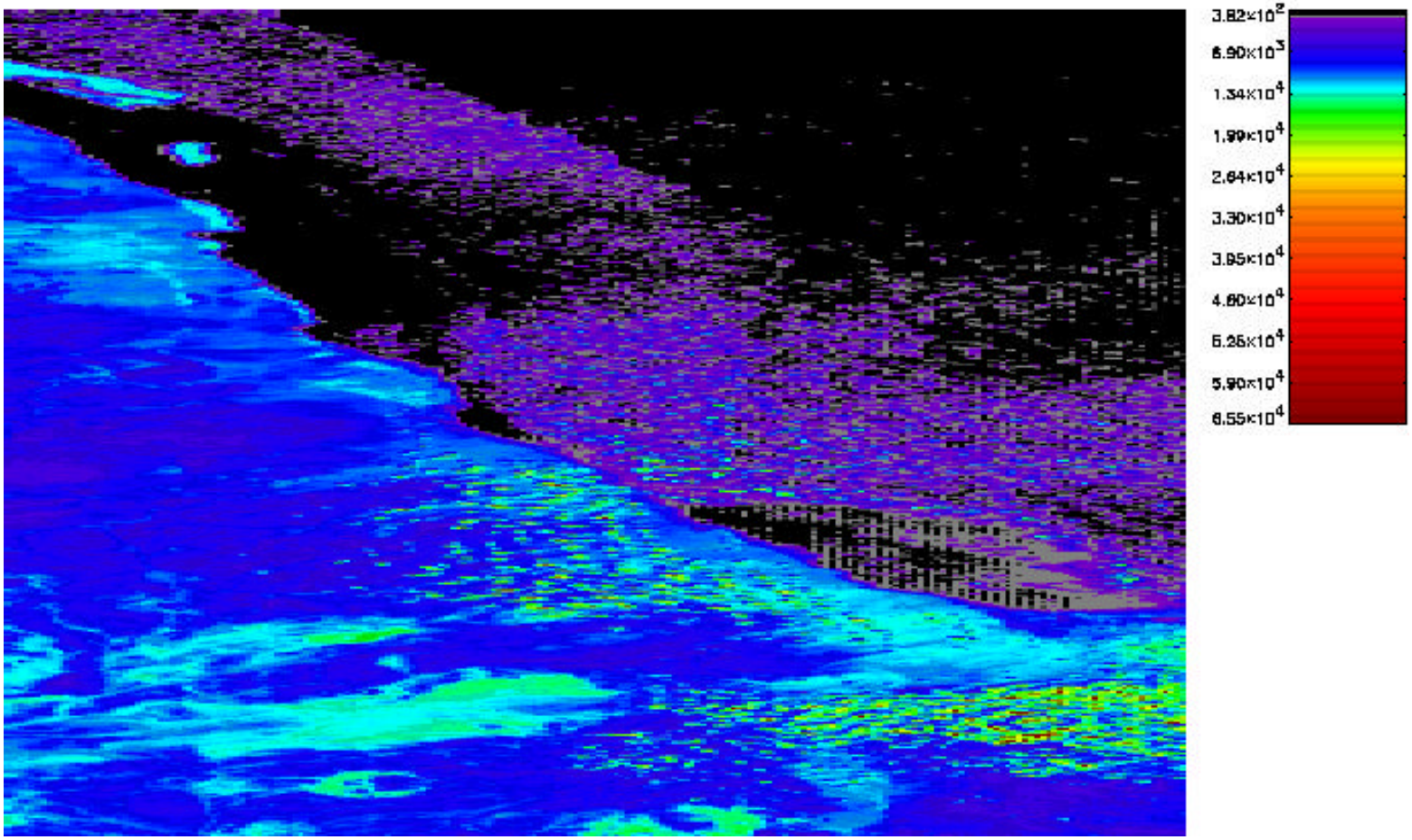
frames: [500,600], scans: [1,40]

Band 5, (detector 4 excluded)

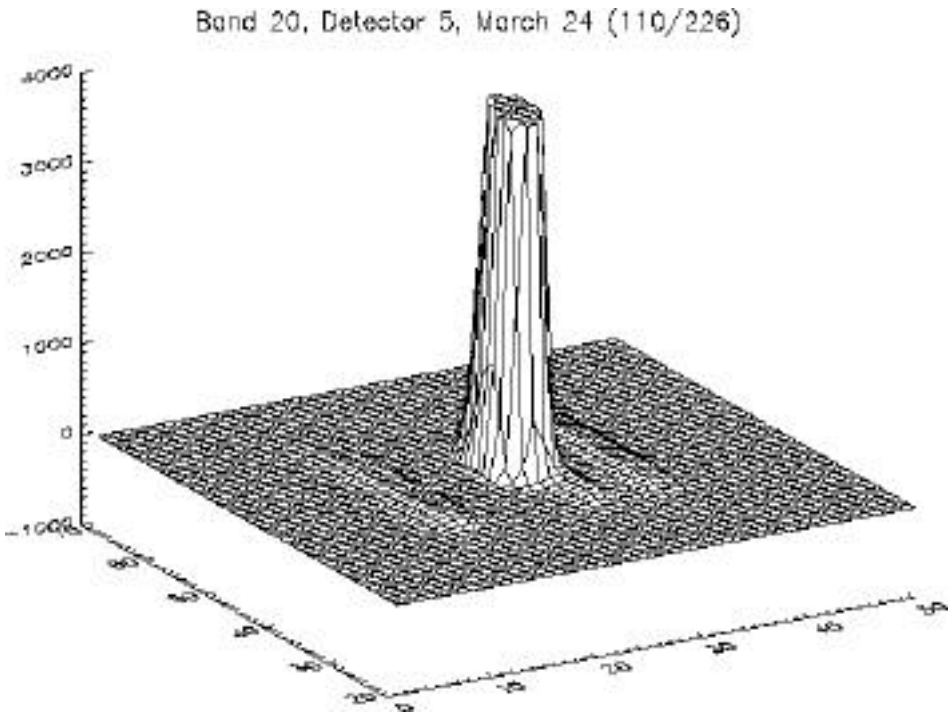


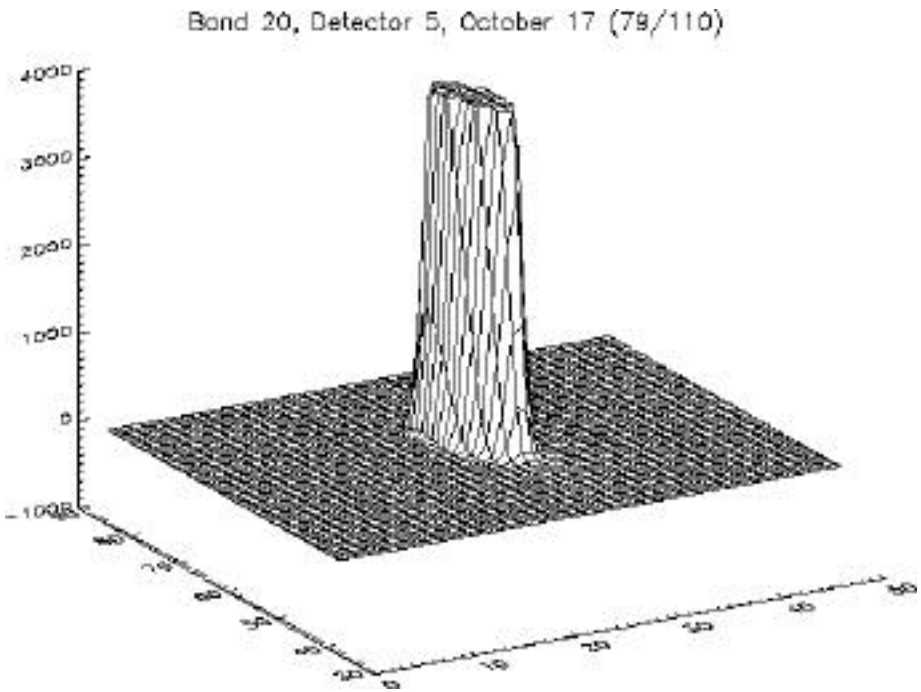
SWIR subframe difference reduced with new algorithm and coefficients

L1B V2540_Terra A2000306.0820
frames: [500,600], scans: [1,40]
Band 5, (detector 4 excluded)



MWIR Crosstalk Reduced with New Vdet at 110





RSB Degradation (Preliminary)

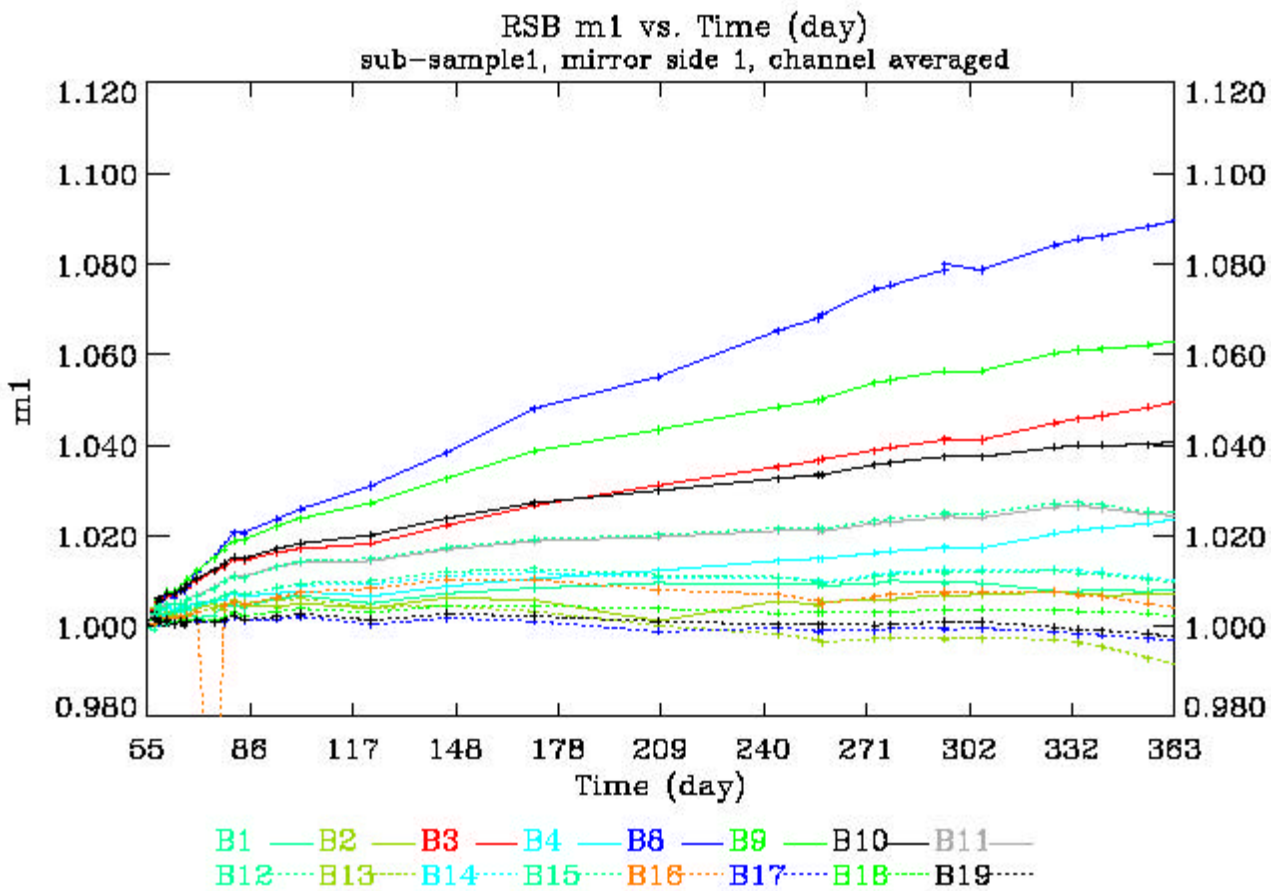
- RSB Degradation & Its Importance
- Results from SDSM Analysis
- Comparison with Lunar View and SRCA Data Analysis
- Impact on the RSB Calibration in the L1B

RSB Degradation (Preliminary)

- RSB Degradation & Its Importance
  - Primarily address the SD degradation factor
    - RSB is calibrated on-orbit with SD that degrades with UV exposure
    - SDSM is designed to monitor the SD degradation
  - Other RSB degradation factors also exist
  - Impact on the RSB calibration uncertainty, RSB related LUT update and its corresponding L1B product

RSB Degradation (Preliminary)

SD determined m_1 - 1st year trending (pay attention to B8, 9, 3, 10)

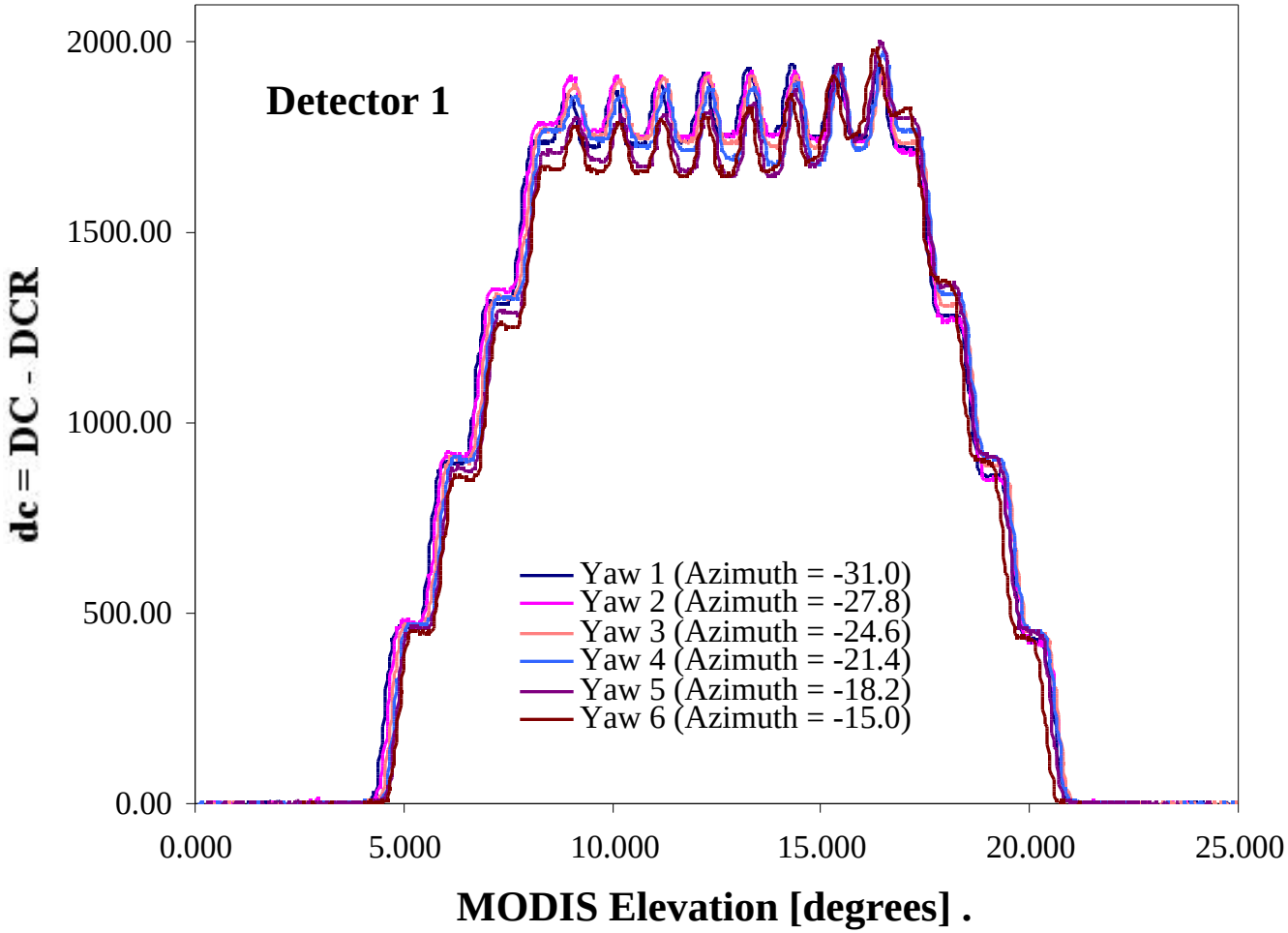


RSB Degradation (Preliminary)

- Results from SDSM Analysis
  - SD degradation is determined by the ratio of SDSM SD view to the SDSM Sun view
  - SDSM Screen - Ripples (10% variation) limit accurate determination of SD degradation factor
  - Alternative approach (9 SDSM detectors)
    - SD has very small degradation at wavelength corresponding to SDSM Detector 9 at 940 nm)
    - D1 - D8 Sun View normalized to D9 Sun View
  - Preliminary results

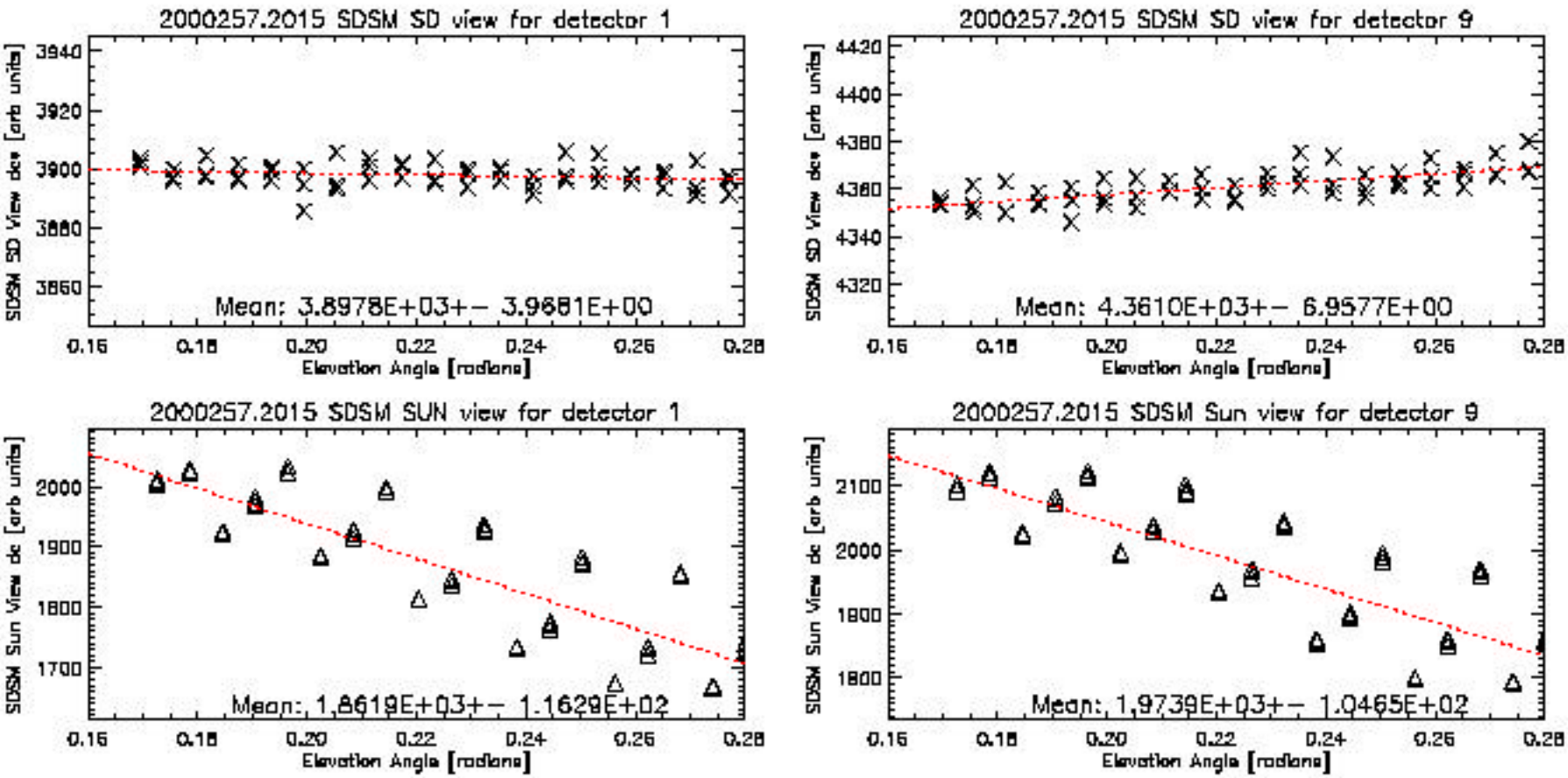
RSB Degradation (Preliminary)

YAW Maneuver - SDSM Sun View



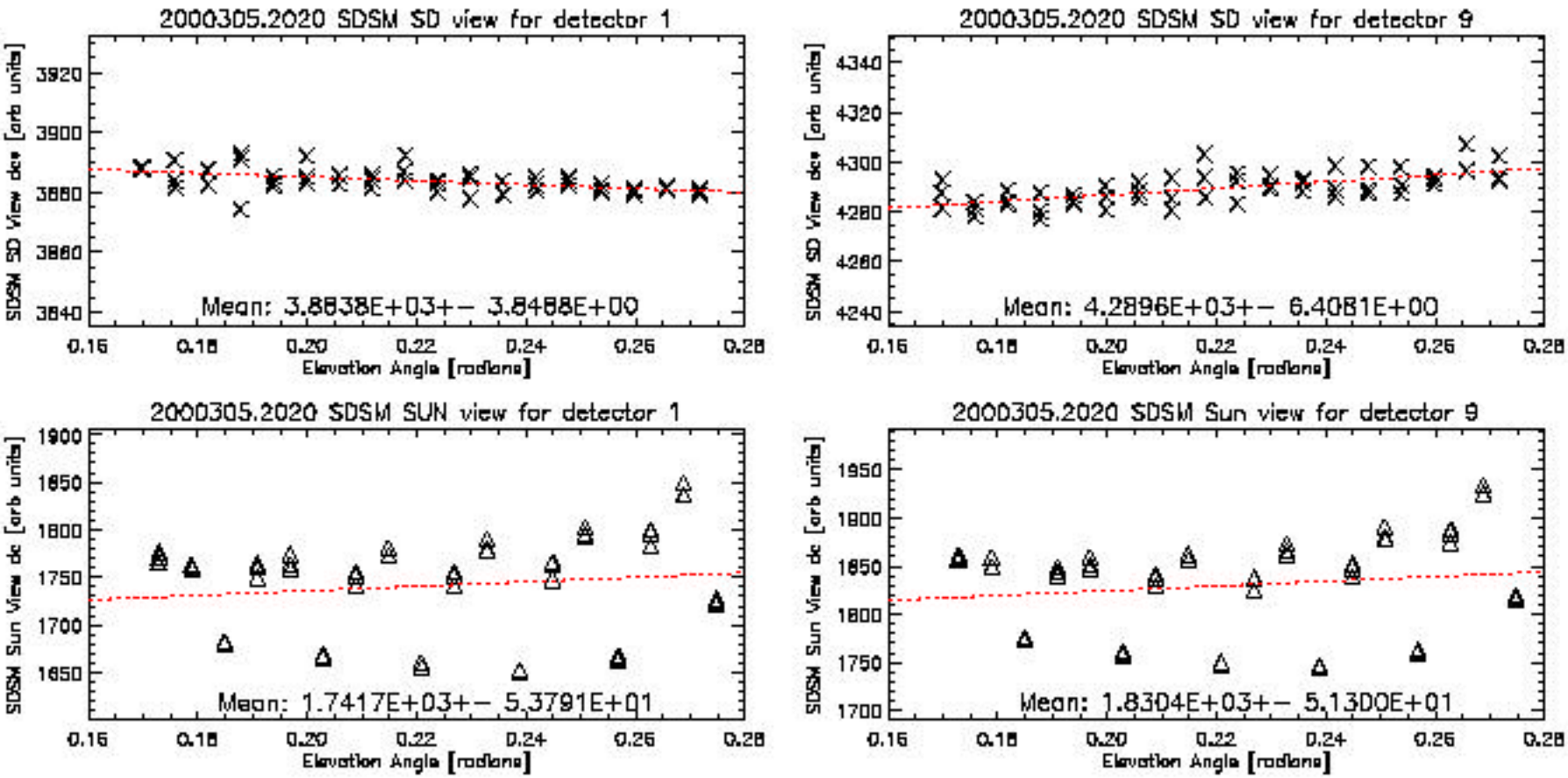
RSB Degradation (Preliminary)

Examples of SDSM SD View and Sun View - 2000257



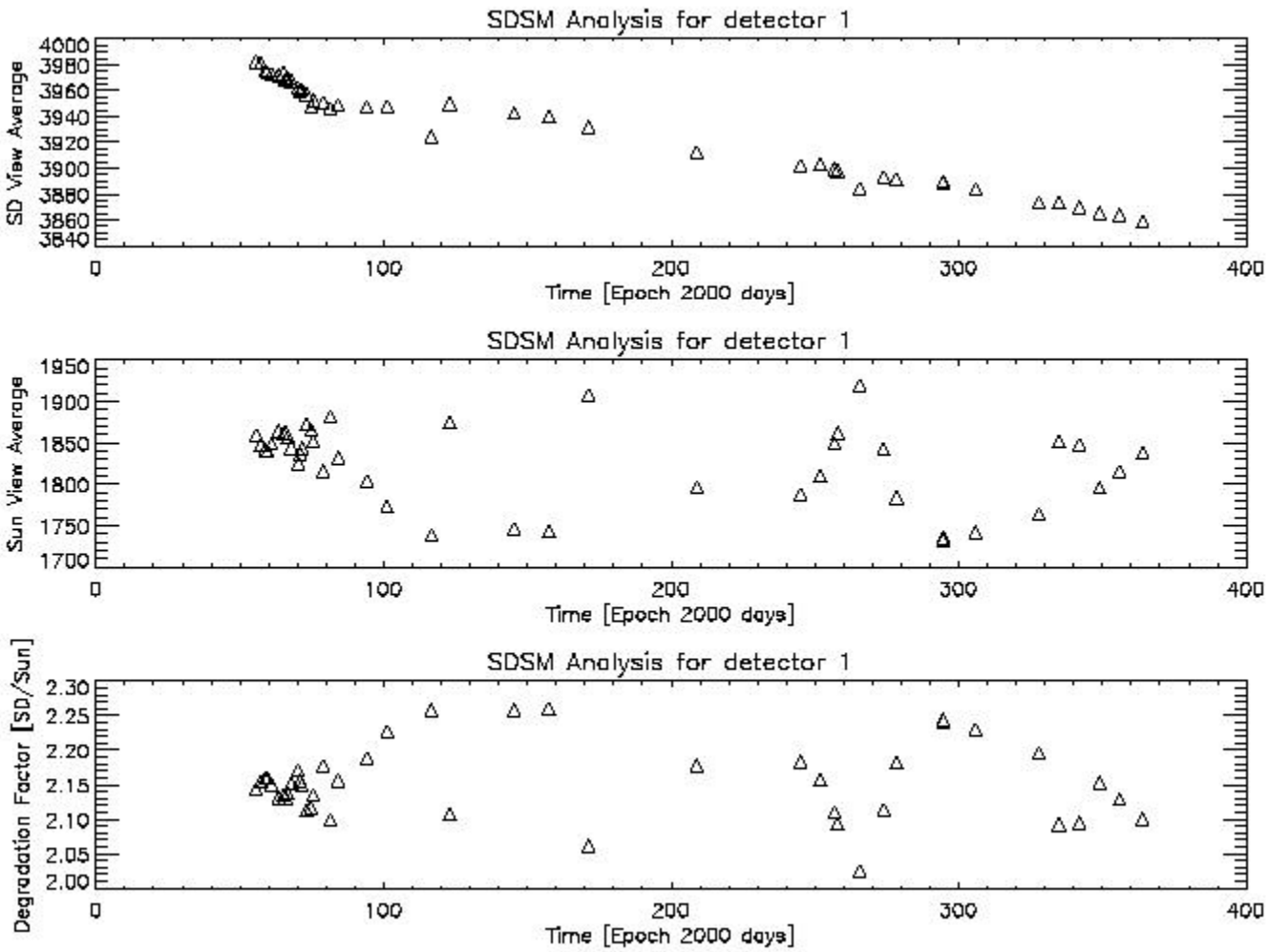
RSB Degradation (Preliminary)

Examples of SDSM SD View and Sun View - 2000305



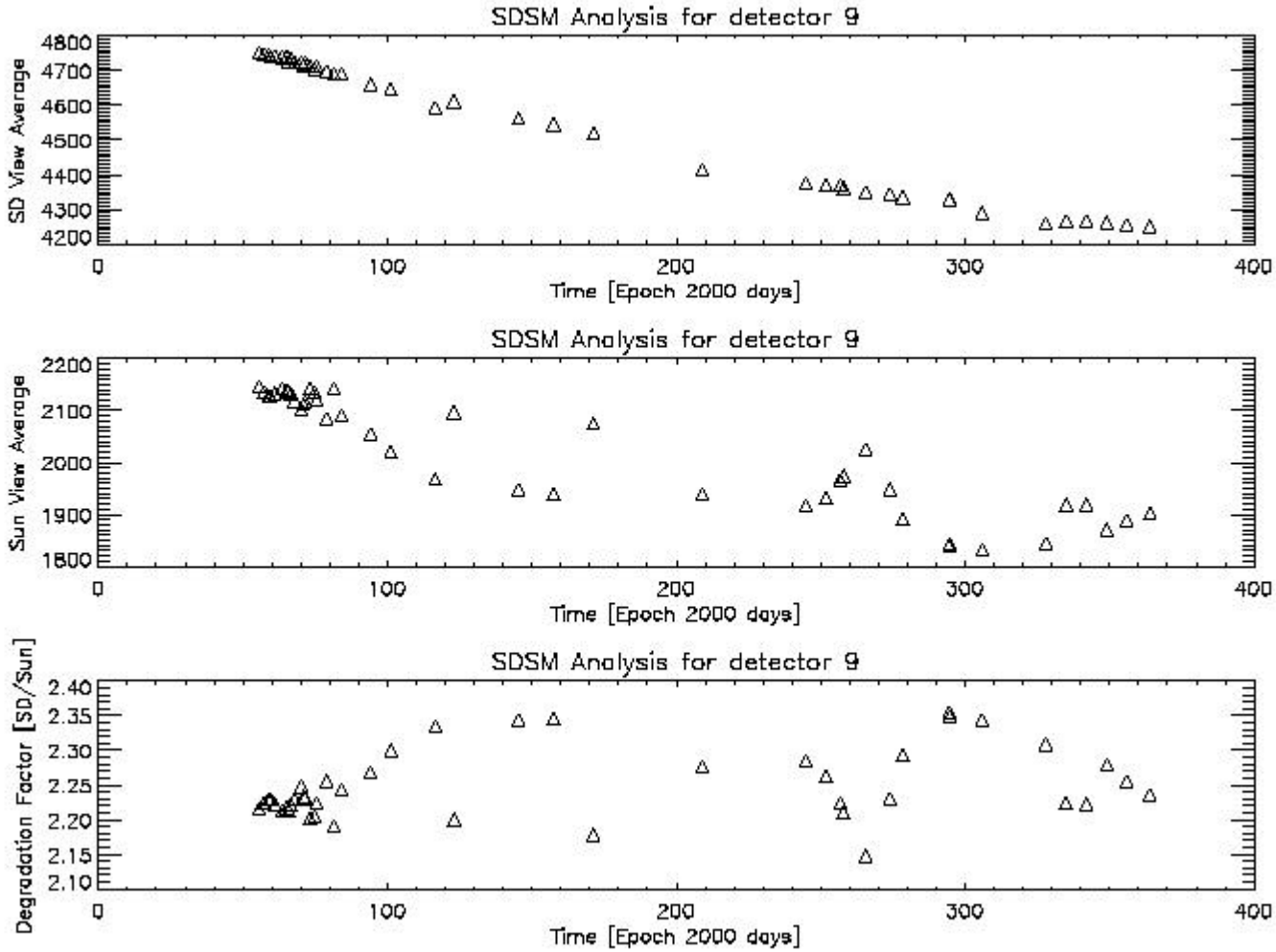
RSB Degradation (Preliminary)

Simple ratio approach - hard to determine the degradation



RSB Degradation (Preliminary)

Simple ratio approach - hard to determine the degradation

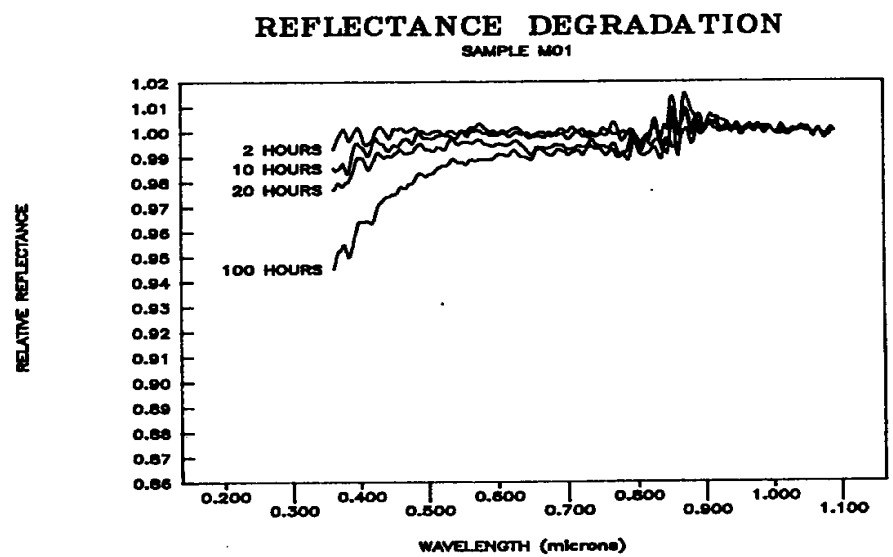


RSB Degradation (Preliminary)

- Alternative Approach
  - D9 centered at about 940 nm
    should have minimum degradation
  - Normalize to D9
    reduce the ripper effect

$$\left[\frac{dc_{SD_view}^{D1} / dc_{Sun_view}^{D1}}{dc_{SD_view}^{D9} / dc_{Sun_view}^{D9}}\right]$$

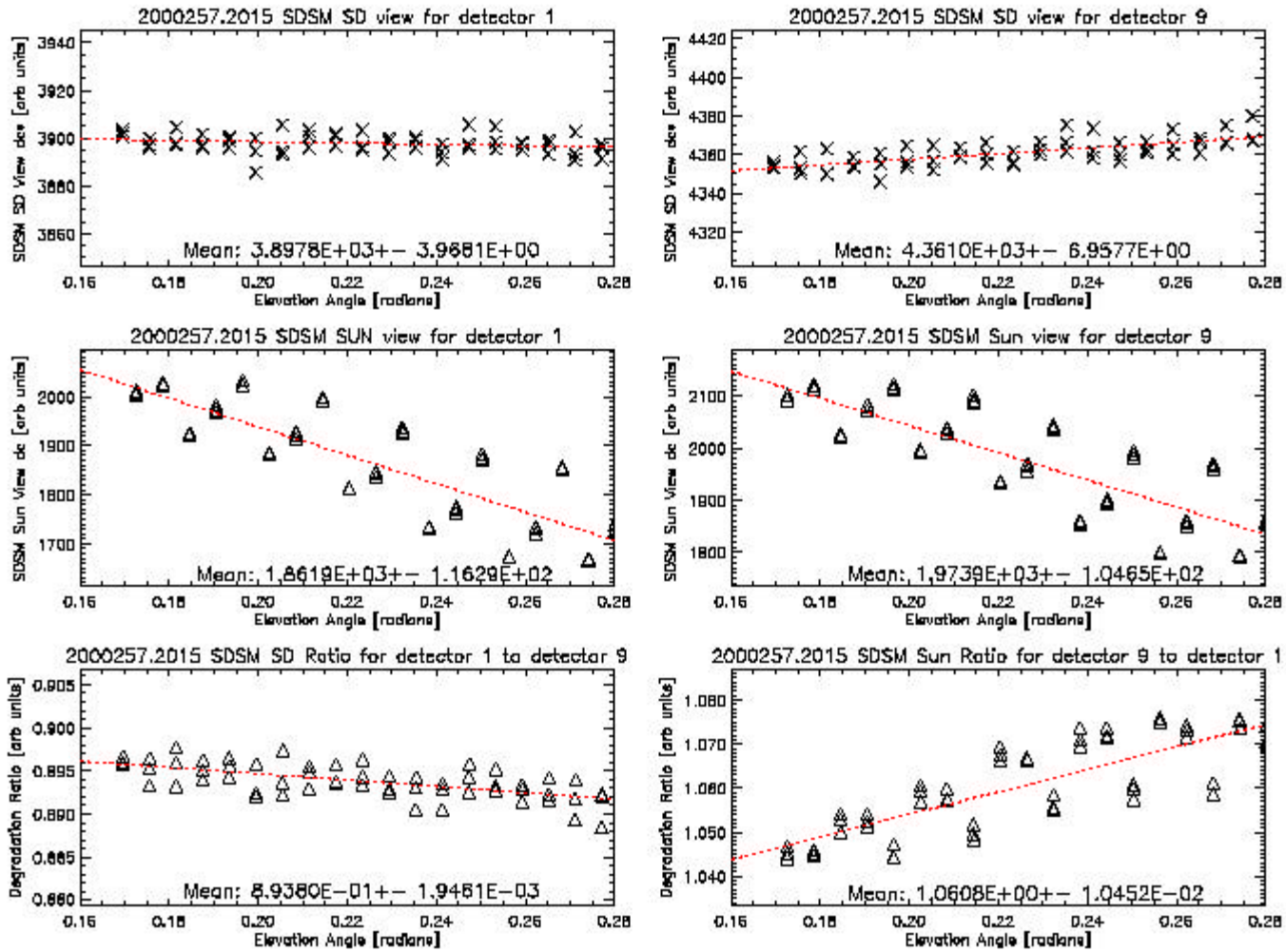
SDSM detectors' center wavelength (nm)	
D1	411.97
D2	465.69
D3	529.74
D4	553.75
D5	646.14
D6	746.62
D7	856.49
D8	904.29
D9	936.23



(Leland and Arecchi, 1995, SPIE, 2475, 384)

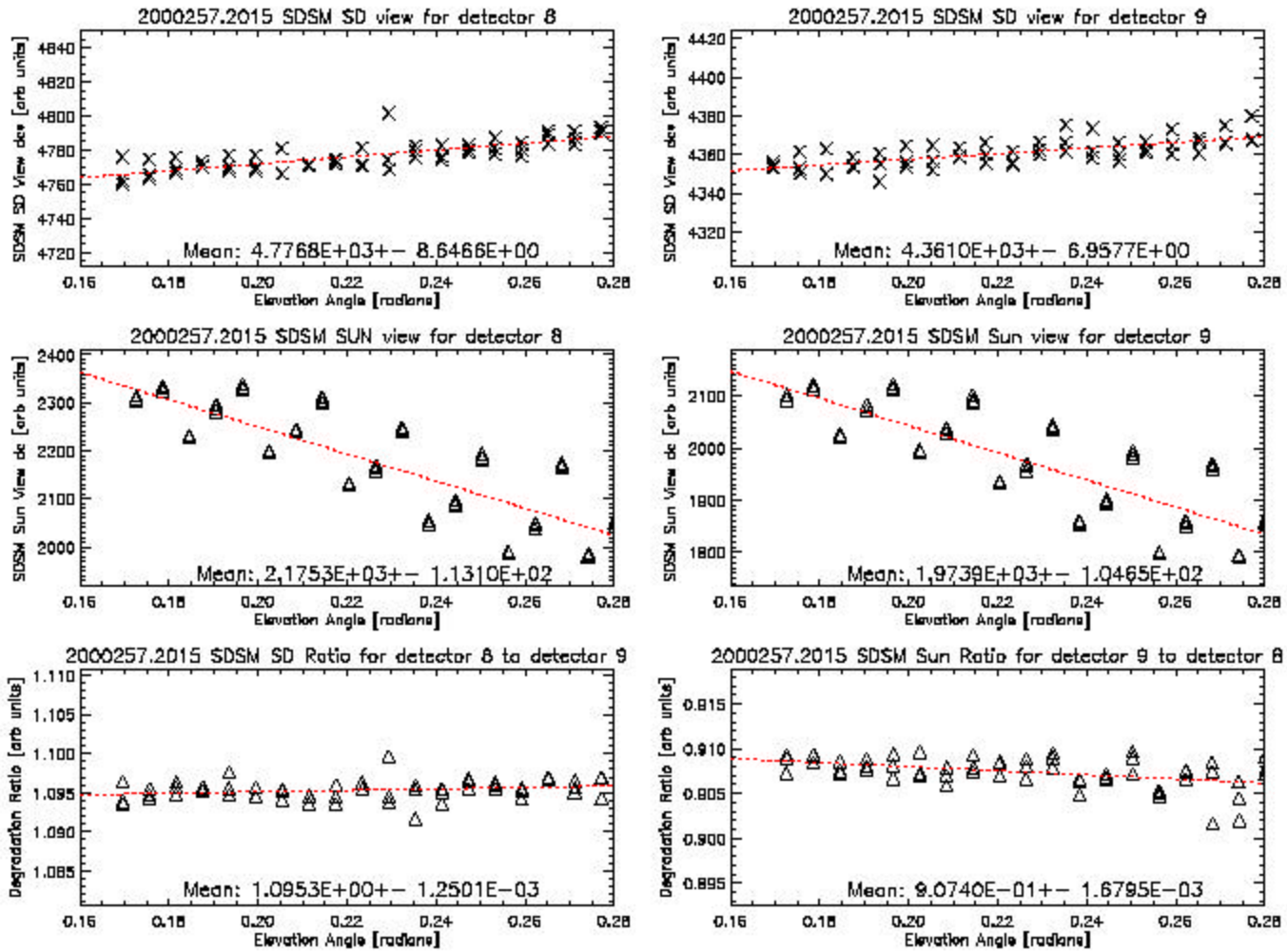
RSB Degradation (Preliminary)

Examples of SDSM SD View and Sun View - 2000257



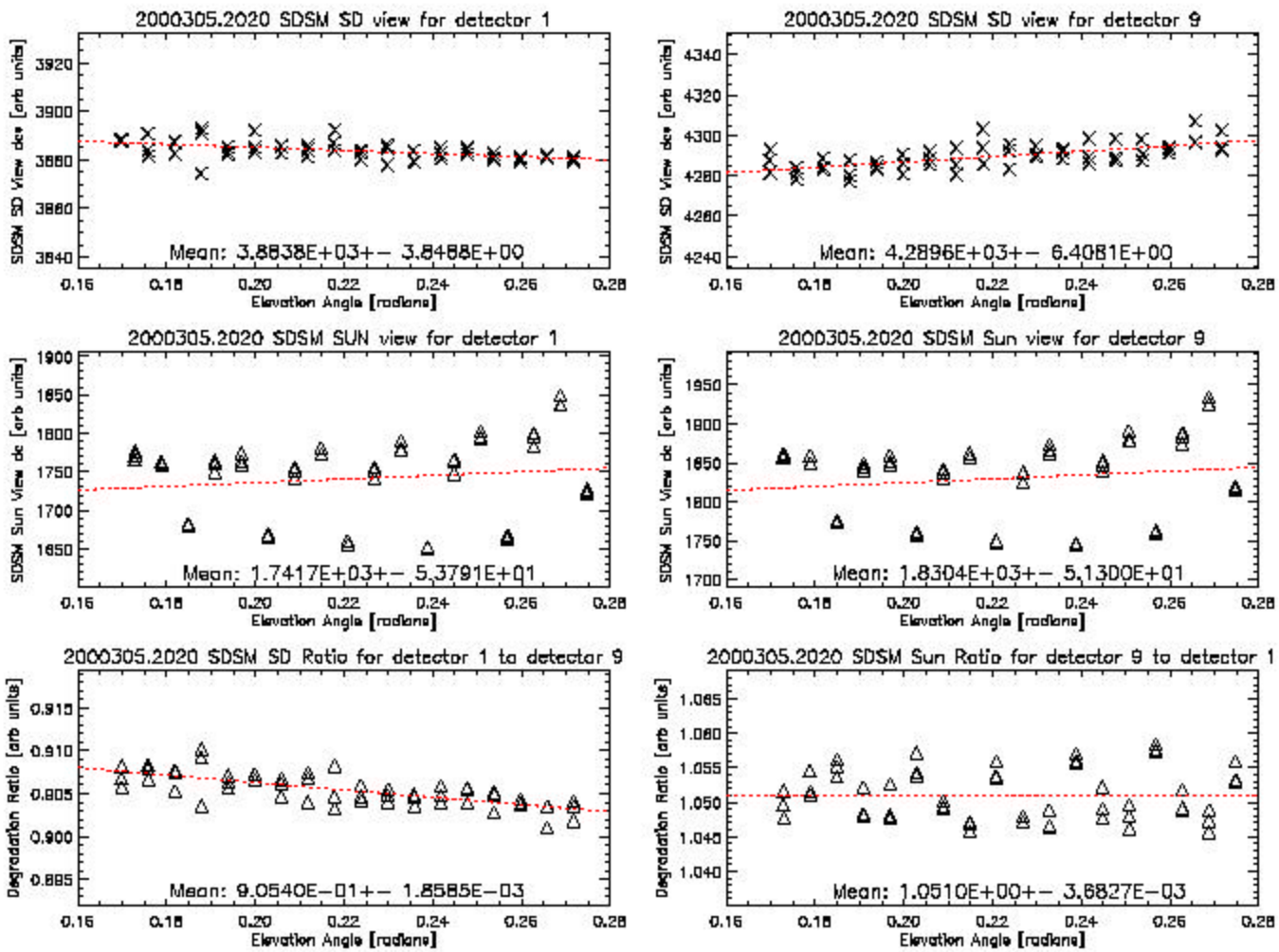
RSB Degradation (Preliminary)

Examples of SDSM SD View and Sun View - 2000257



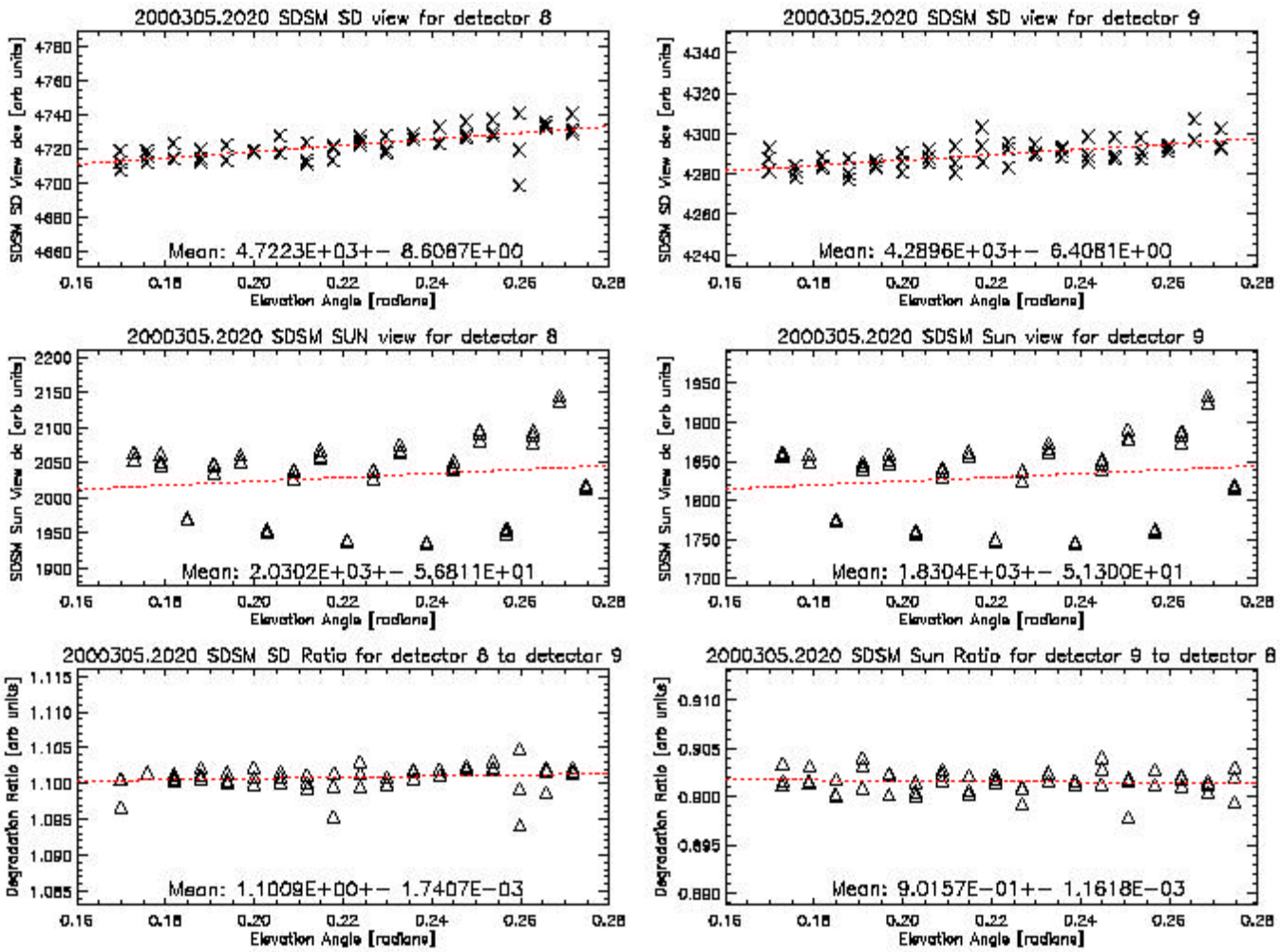
RSB Degradation (Preliminary)

Examples of SDSM SD View and Sun View - 2000305



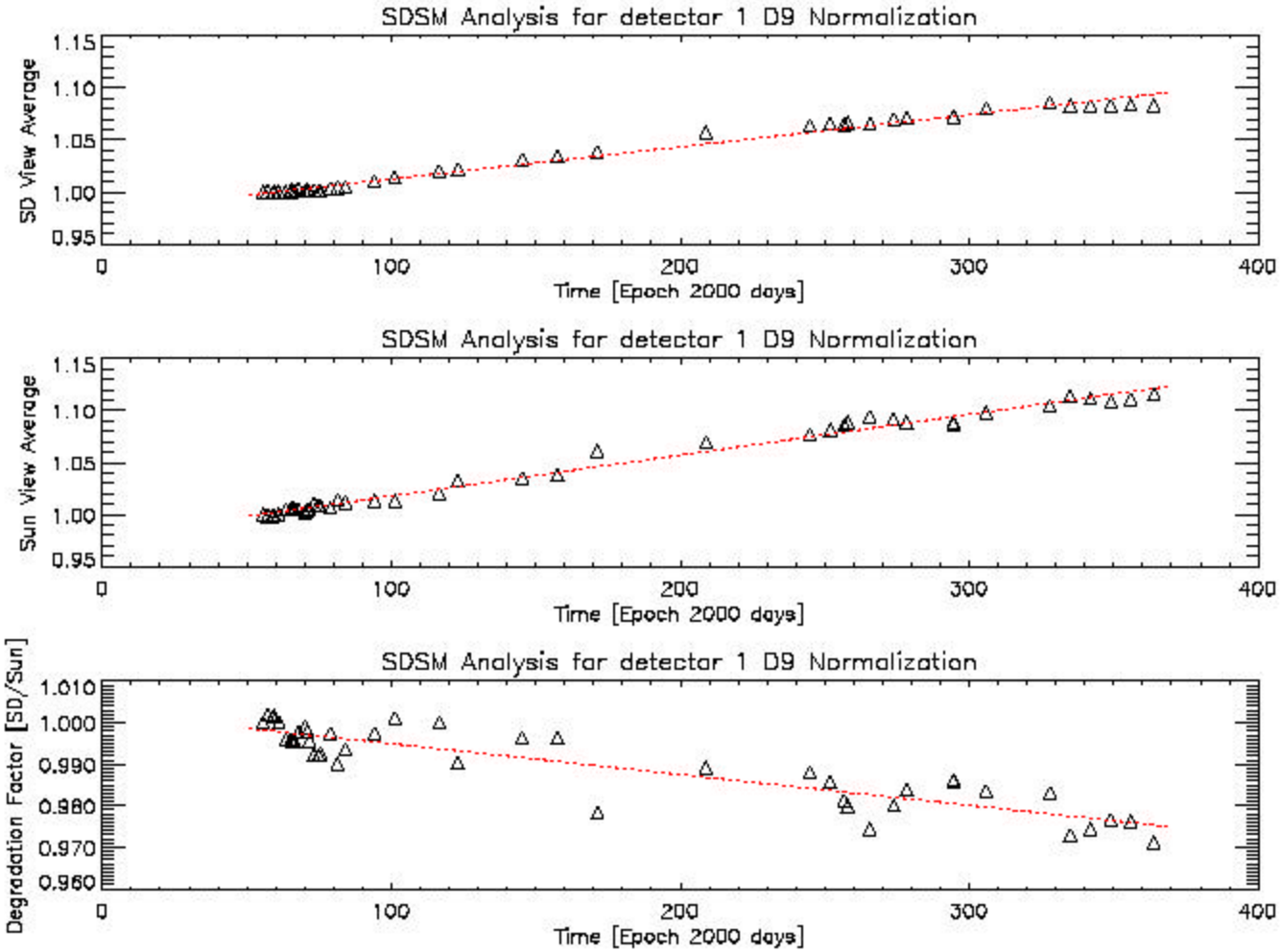
RSB Degradation (Preliminary)

Examples of SDSM SD View and Sun View - 2000305



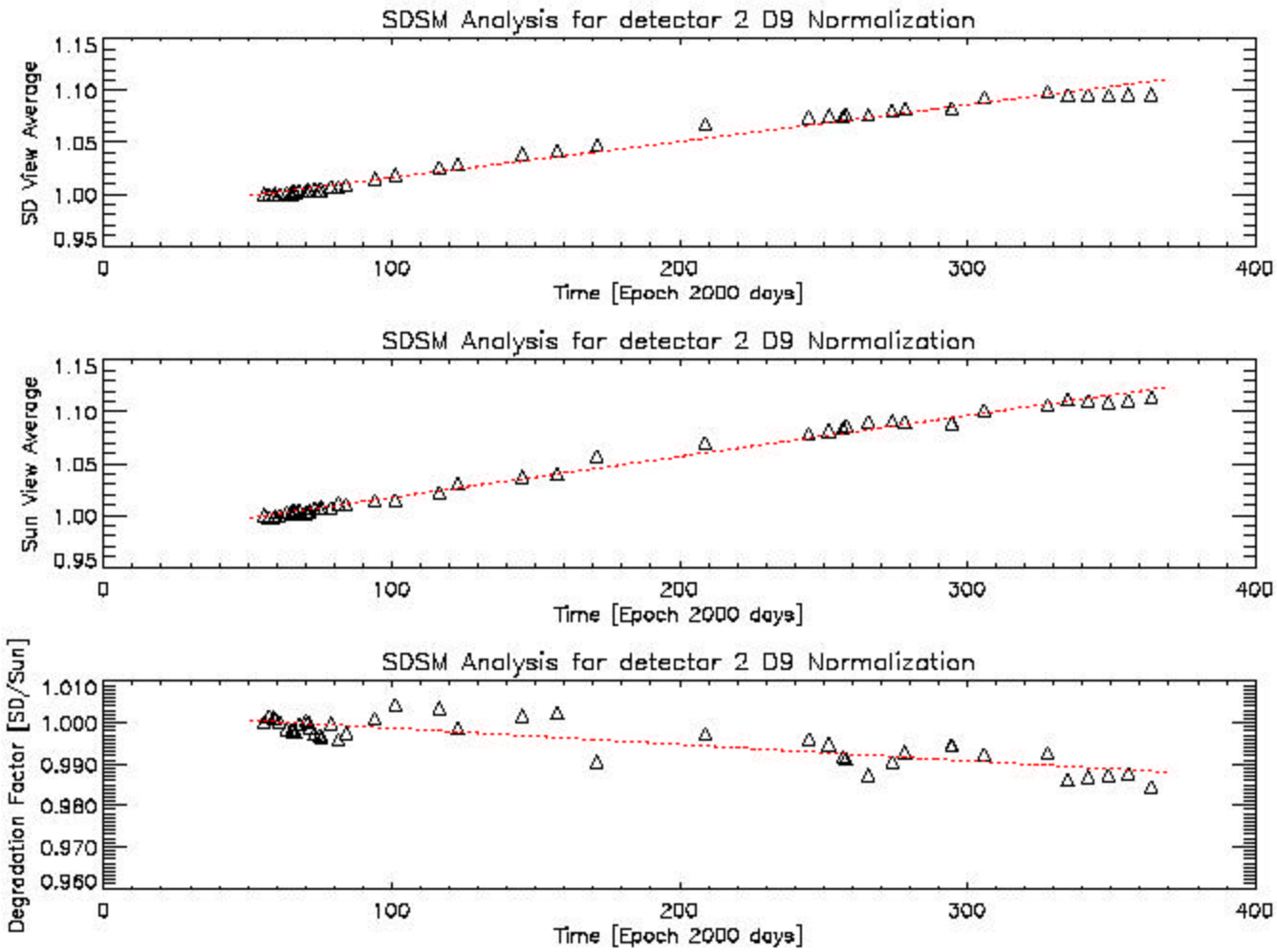
RSB Degradation (Preliminary)

SD Degradation - Alternative Approach



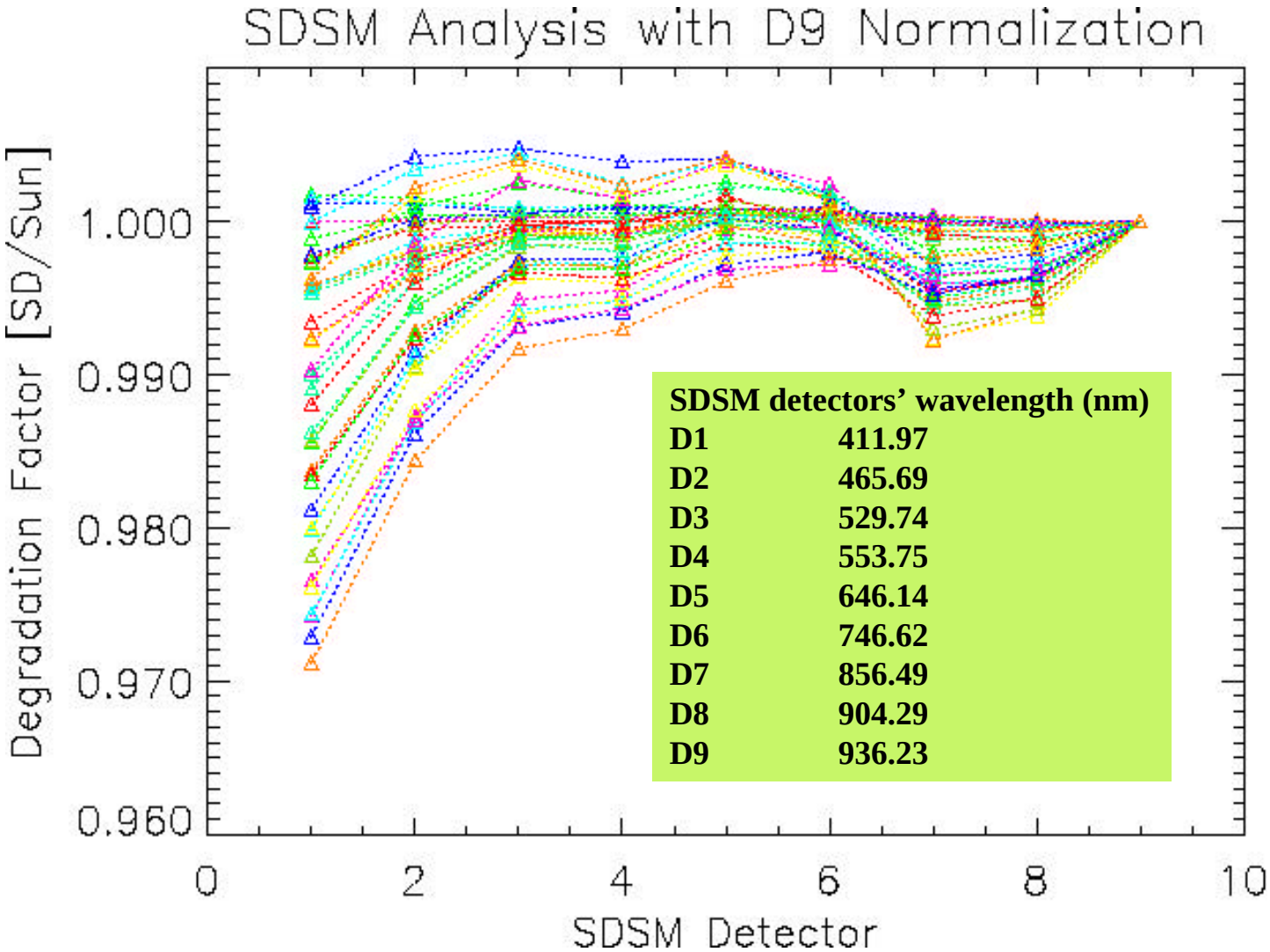
RSB Degradation (Preliminary)

SD Degradation - Alternative Approach



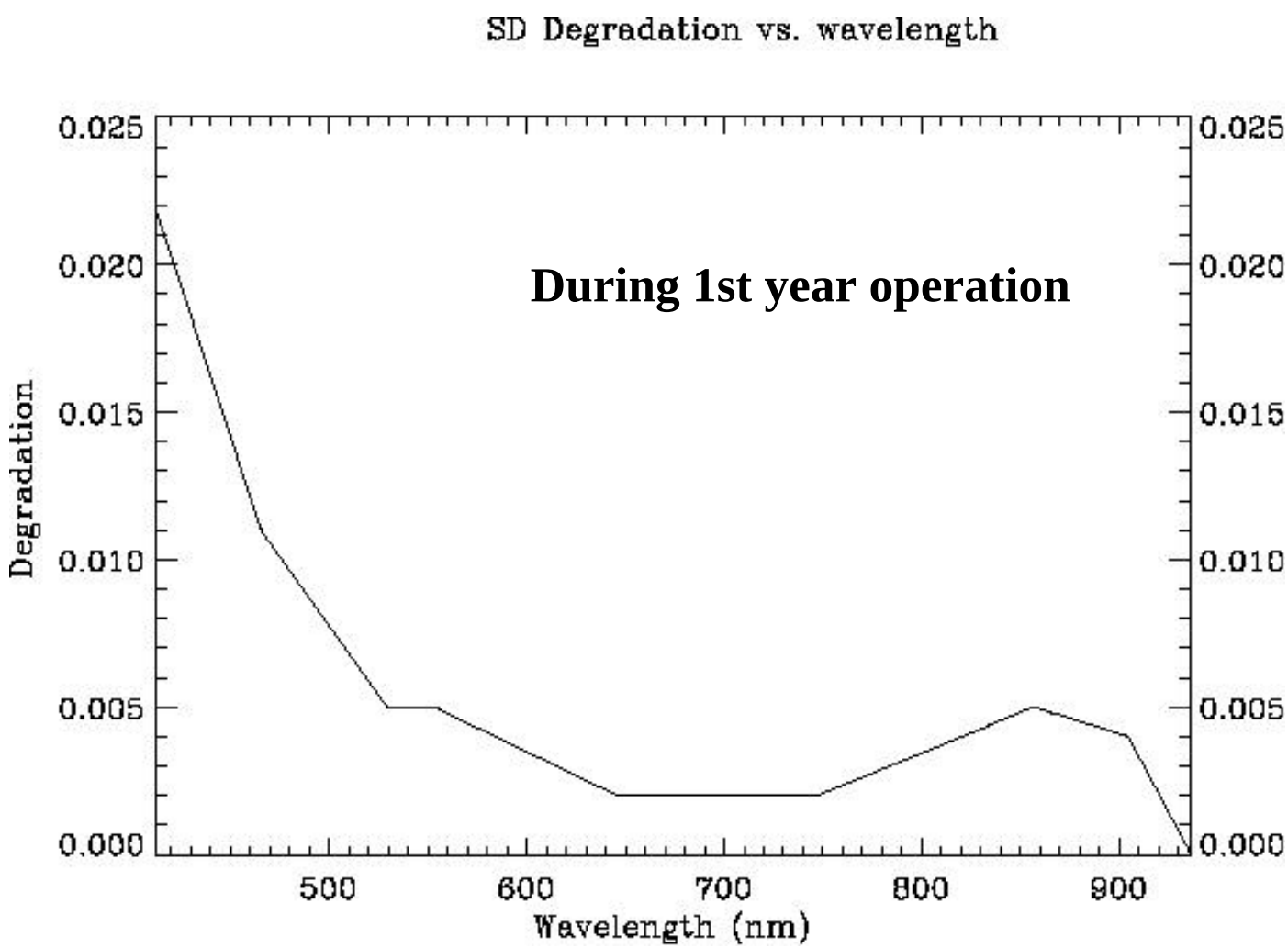
RSB Degradation (Preliminary)

During 1st year operation



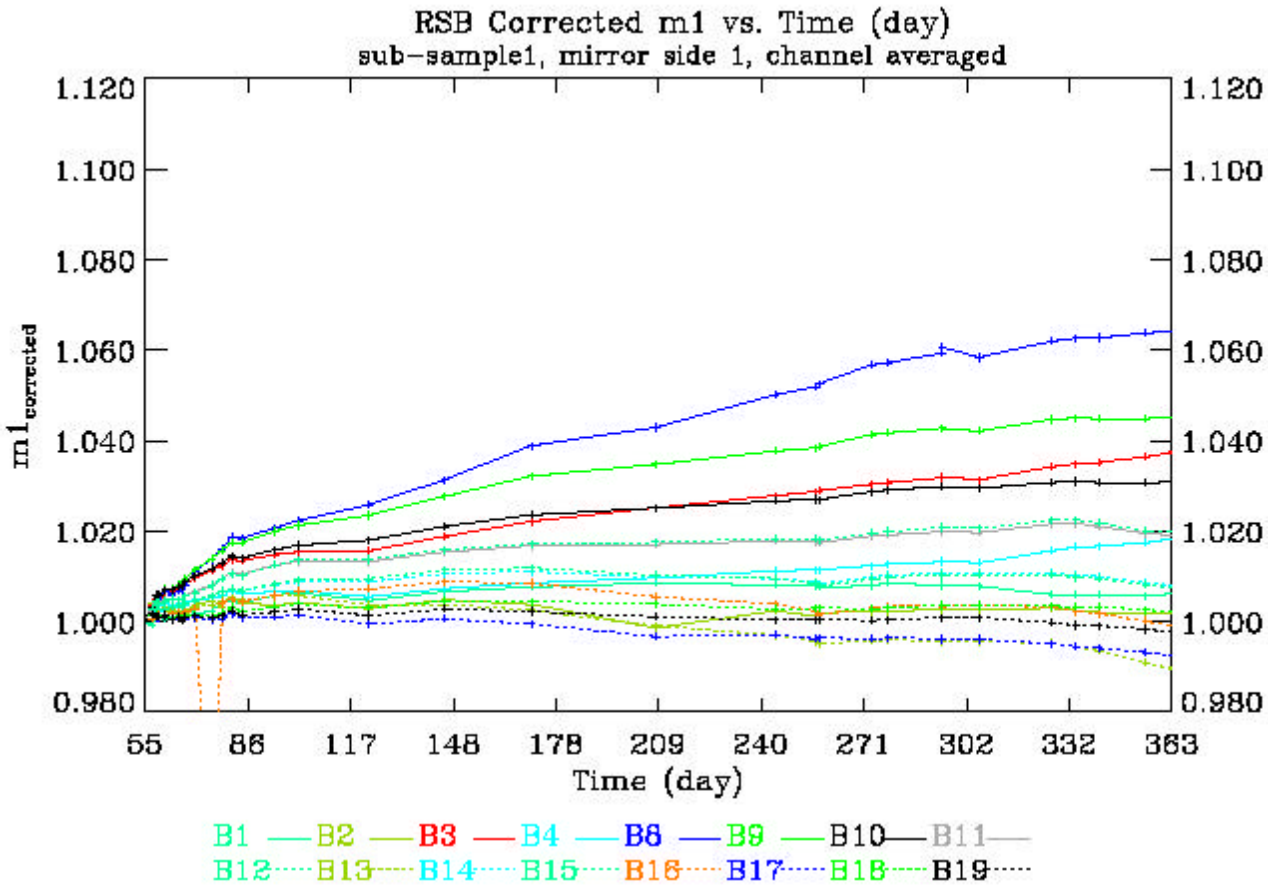
SDSM detectors' wavelength (nm)	
D1	411.97
D2	465.69
D3	529.74
D4	553.75
D5	646.14
D6	746.62
D7	856.49
D8	904.29
D9	936.23

RSB Degradation (Preliminary)



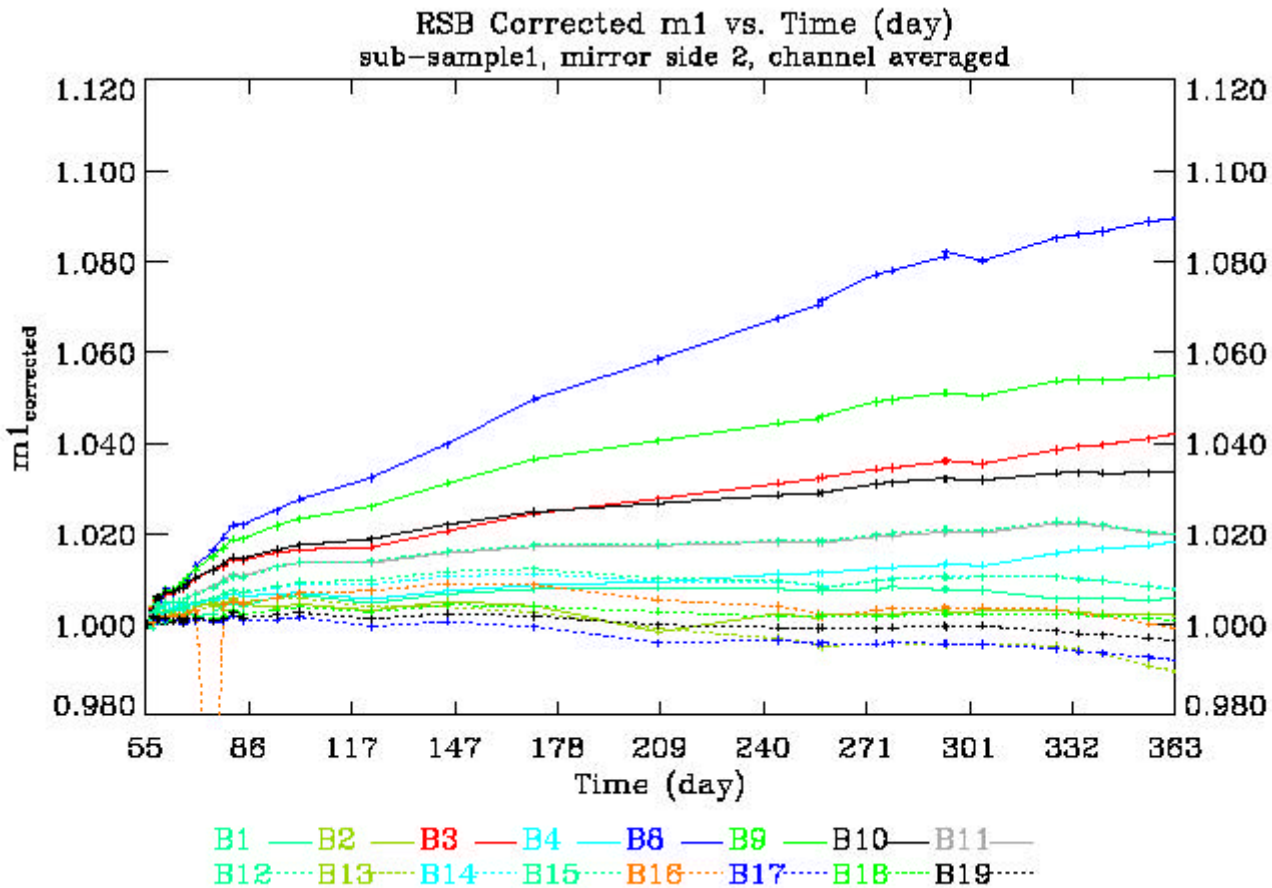
RSB Degradation (Preliminary)

Scan mirror (MS1) and other system degradations



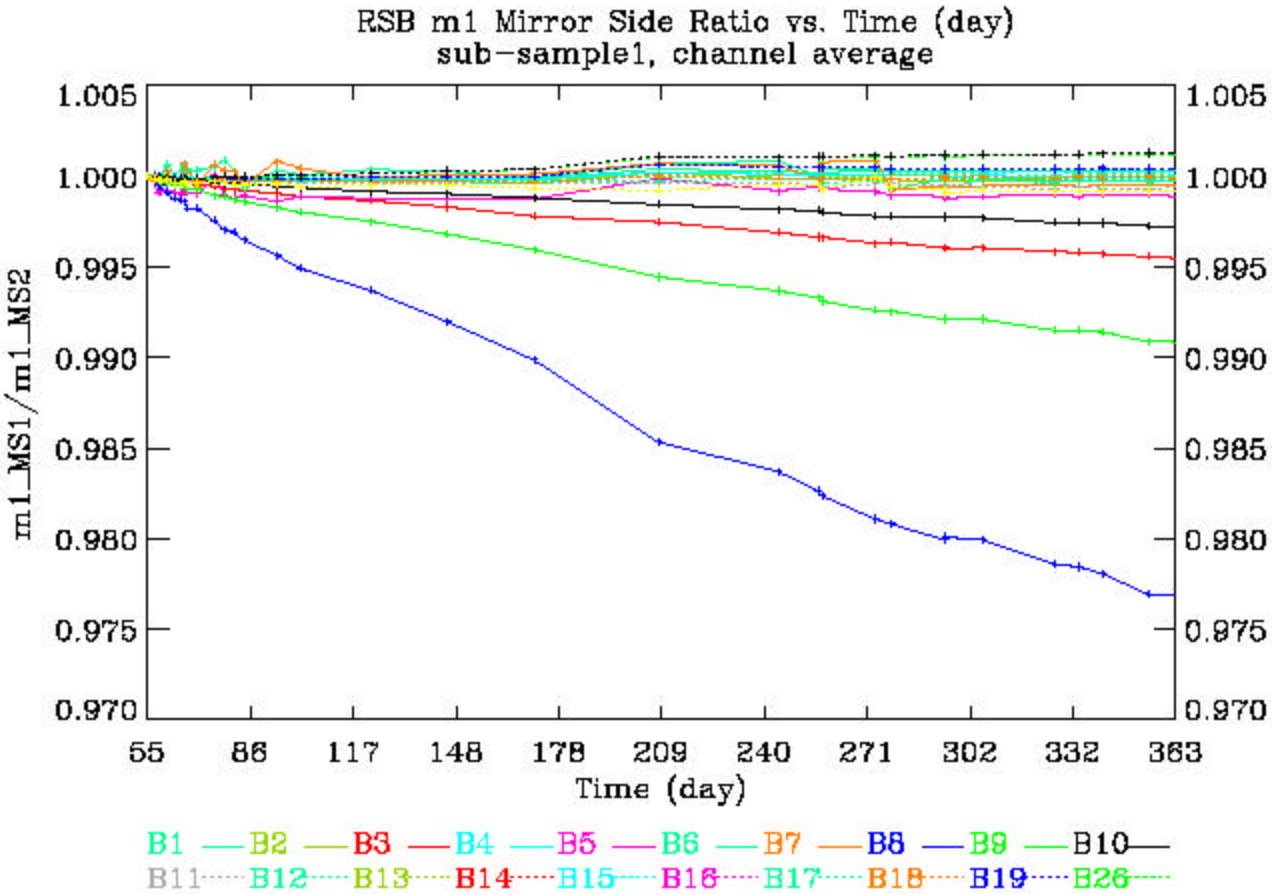
RSB Degradation (Preliminary)

Scan mirror (MS2) and other system degradations



RSB Degradation (Preliminary)

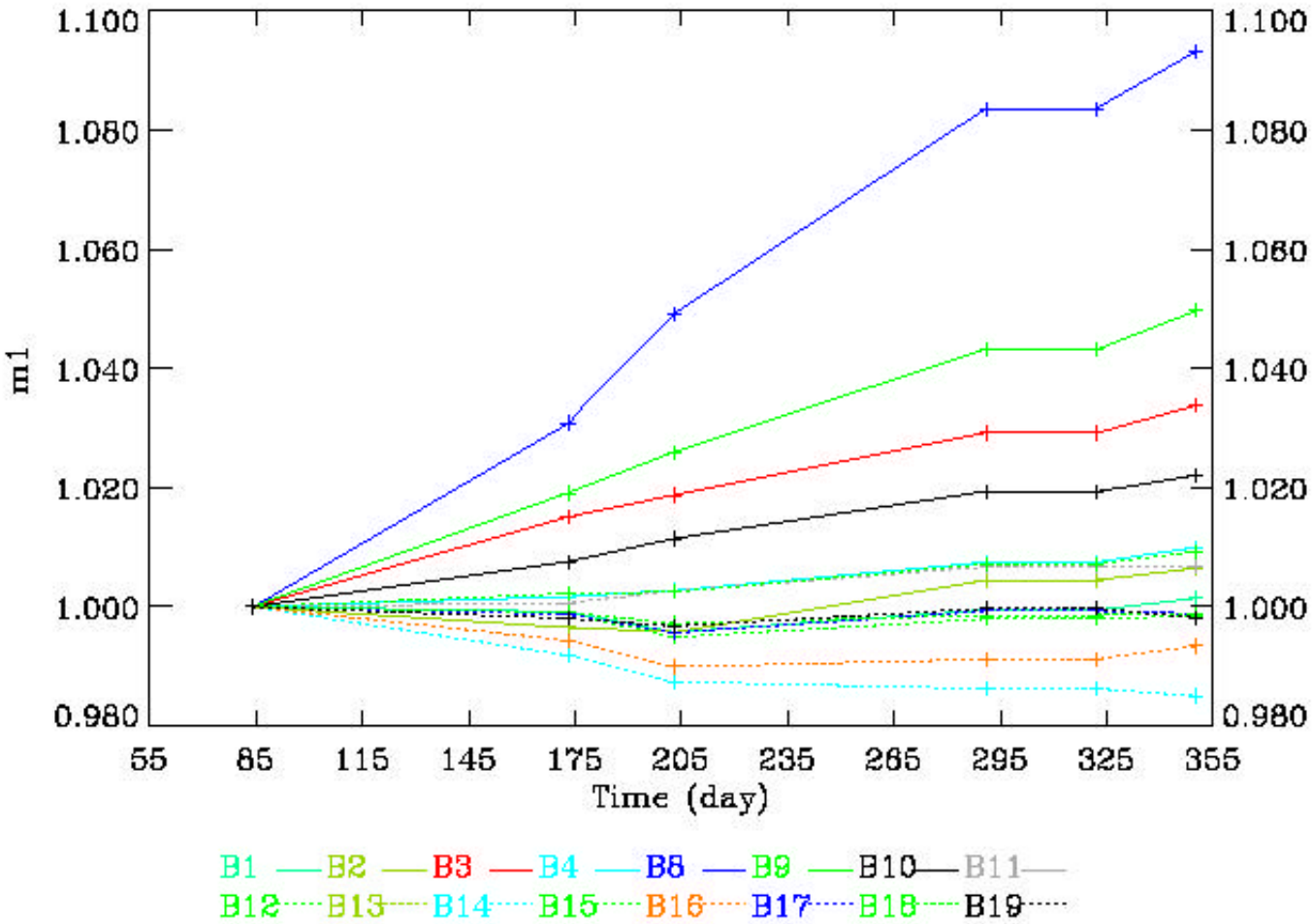
Scan mirror relative degradation



MS2 degrades more for B8, 9, 3, 10

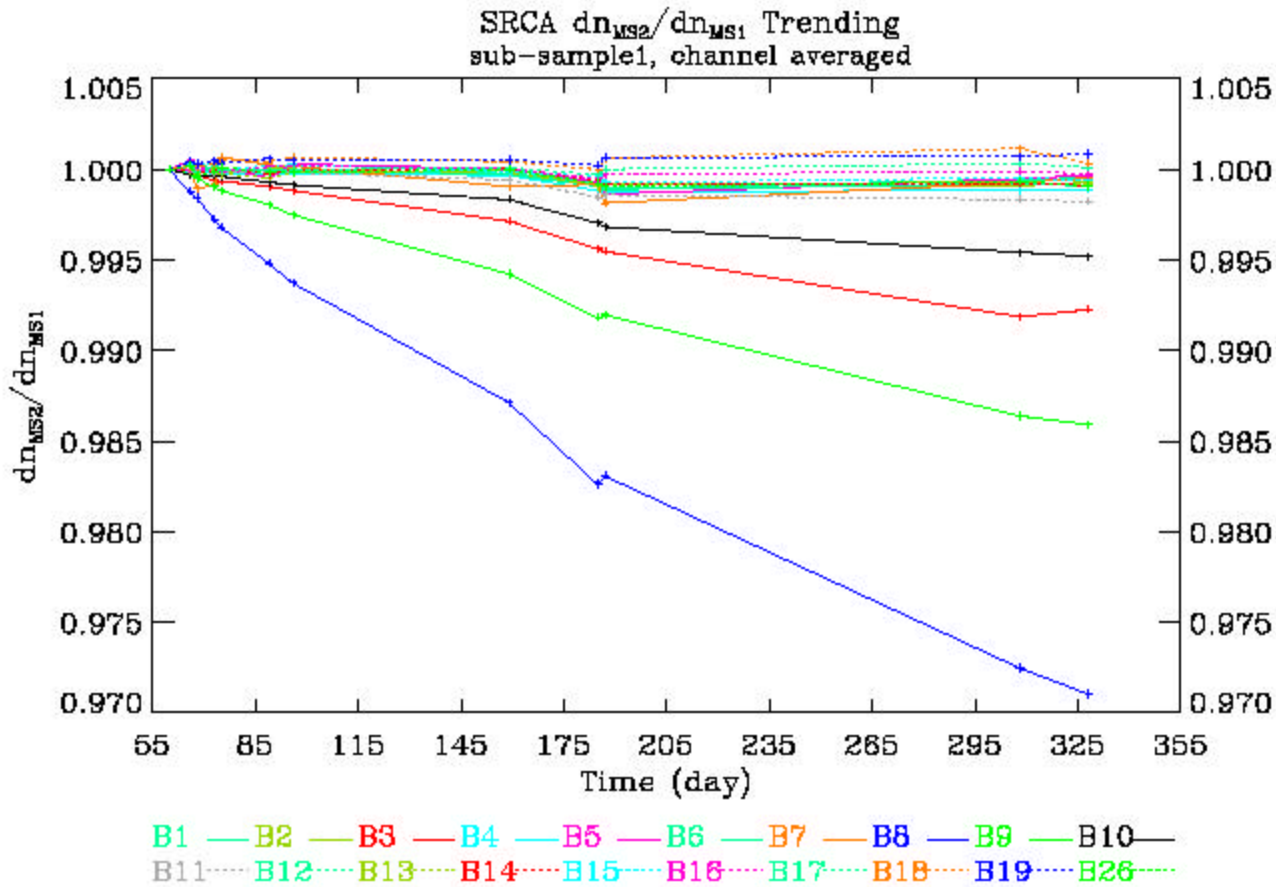
RSB Degradation (Preliminary)

Comparison with Lunar Observation



RSB Degradation (Preliminary)

Comparison with SRCA analysis



RSB Degradation (Preliminary)

- Both SD and scan mirror degrade on-orbit
  - SD degradation is about 2.5% for B8 within the first year of operation
  - Scan mirror degradation (including aft optics) is about 7-8% for B8, 5% for B9, 4% for B3, and 3% for B10 within the first year of operation
  - Small degradation for other RSB bands
- SD degradation can be removed from SD calibration
- Concern - scan mirror degradation's variation with scan angle

Stripes and Mirror Rotation Correlated Noise (in progress)

- Striping Issues
  - See section 12 for stripping reduction algorithm
  - Working with science community (e.g. Miami group) for additional information
  - Strategy: periodically update the reduction coefficients
- Mirror Rotation Correlated Noise
  - Need more work and understanding of the cause(s)
  - Reduction is possible if noise (offset) is stable under certain operation configuration
- Both Issues Impact Data Reprocessing

Section 14
Future Work

Primary Tasks for Coming 6 Months

- Develop next-step validation approaches
- Tune Leak Correction values
- Process Aqua-MODIS data sets
- Initiate polarization related calibration tuning

Develop next-step validation approaches

- Most important task in coming period
  - Requires significantly better interactions between MCST & Science Team members
  - Likely requires weekly telephone conferences at set time, regularly held
  - Exchange of charts before calls when ever possible
  - Working site visits may be needed

Tune Leak Correction values

- Look to Science Team for advice on adequacy of current values
- May need retune things like OBC-BB emissivity within uncertainty of pre-launch characterizations to know what final studies are needed for leak corrections

Process Aqua-MODIS data sets

- Sensor thermal vacuum data
- Spacecraft data may be available too
- Identify new features that may need Science Team attention for L2 algorithms
- Initiate calibration LUT development
  - May not be needed until after July

Initiate polarization related calibration tuning

- What is needed by Science Team from MCST in this area?