Section 16

LAC Performance Validation

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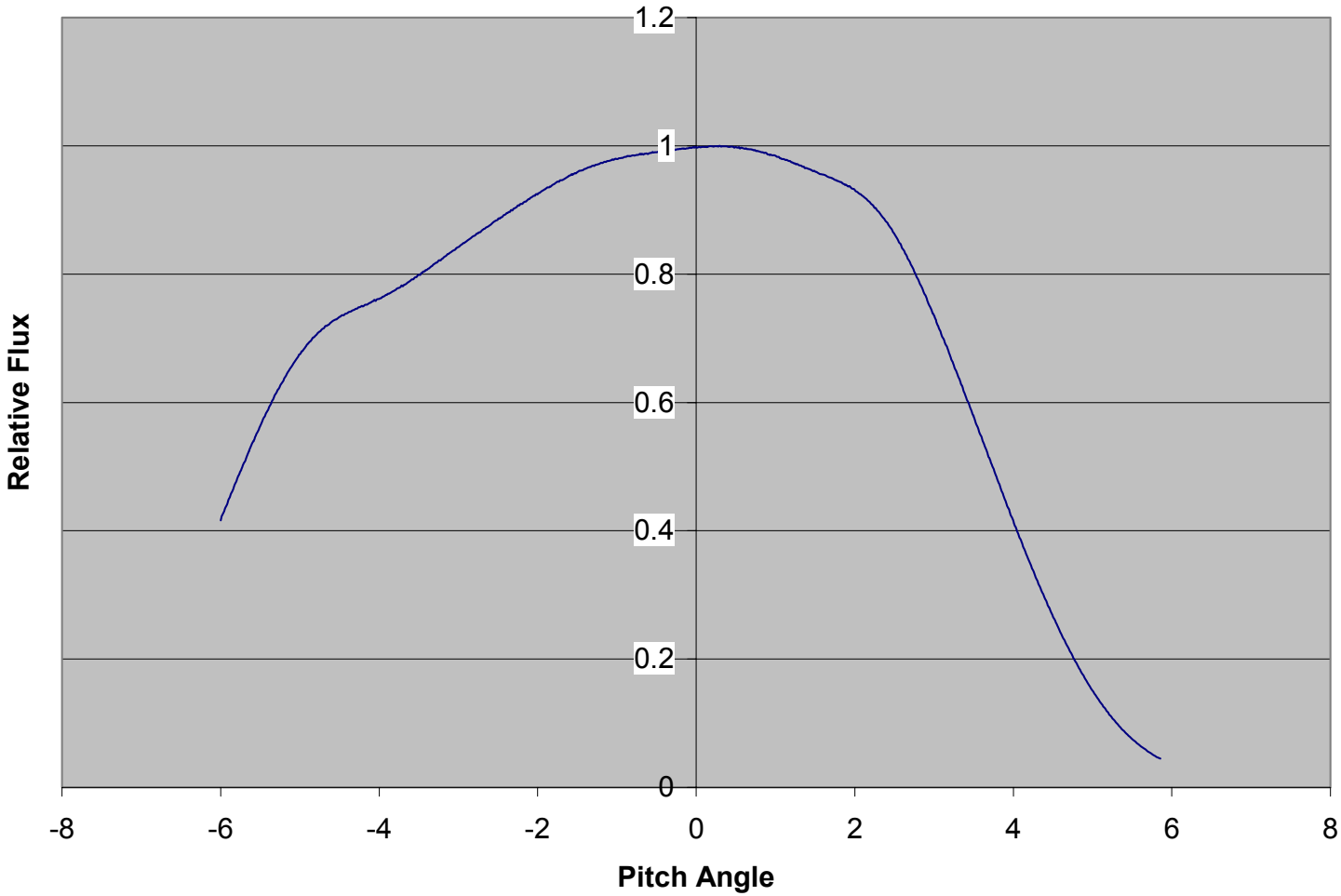
Dark Current Stability

- ***Dark Earth Views: Nominally Obtained Within 1 Orbit of DCE***
  - ***Analyzed ~ 1000 Darks***
  - ***Excluding Non-responsive Pixels, Array Means Typically Agree to < 1 Count***
  - ***Inter-DCE Standard Deviations ~ 2 - 3 Counts***
- ***Lunar Calibration: Effectively Extended DCEs***
  - ***Compare Darks at Beginning and End of Scan***
  - ***Dark Current Statistics Similar to Inter-DCE Statistics***
- ***Additional Non-responsive Pixels Since Launch***
  - ***~400 Pixels at Launch, ~ 1500 Now***
  - ***Two Major Instances (Several Hundred Pixels)***
  - ***Small Mortality Otherwise (1-2 /day)***
  - ***No Major Impact on Task***

In-Flight Calibration

- ***Solar Calibration***
  - ***Radiometric Calibration (Relative and Absolute)***
  - ***Radiometric Stability***
  - ***Variable Light Level Response***
  - ***"Fixed Pattern" Noise Correction***
- ***Lunar Calibration***
  - ***Radiometric Calibration***
  - ***Image Quality***
  - ***Extended Duration Dark Current Stability***
- ***Surface Targets***
  - ***Radiometric/ Spectral Calibration (Ground Campaigns)***
- ***Dark Earth Looks***
  - ***Dark Current Stability***

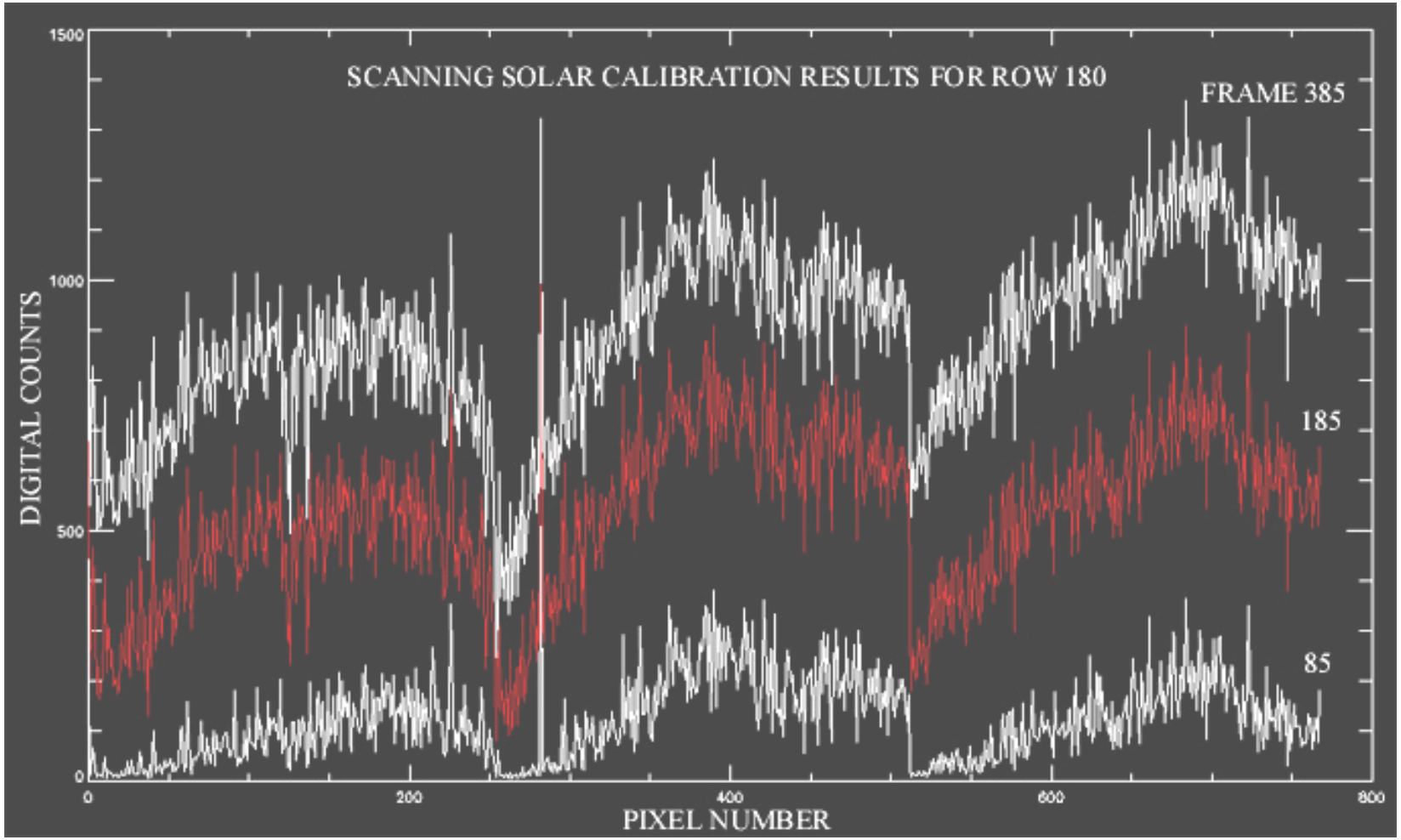
Solar Scan Pitch Angle Dependence



Fixed Pattern Calibration

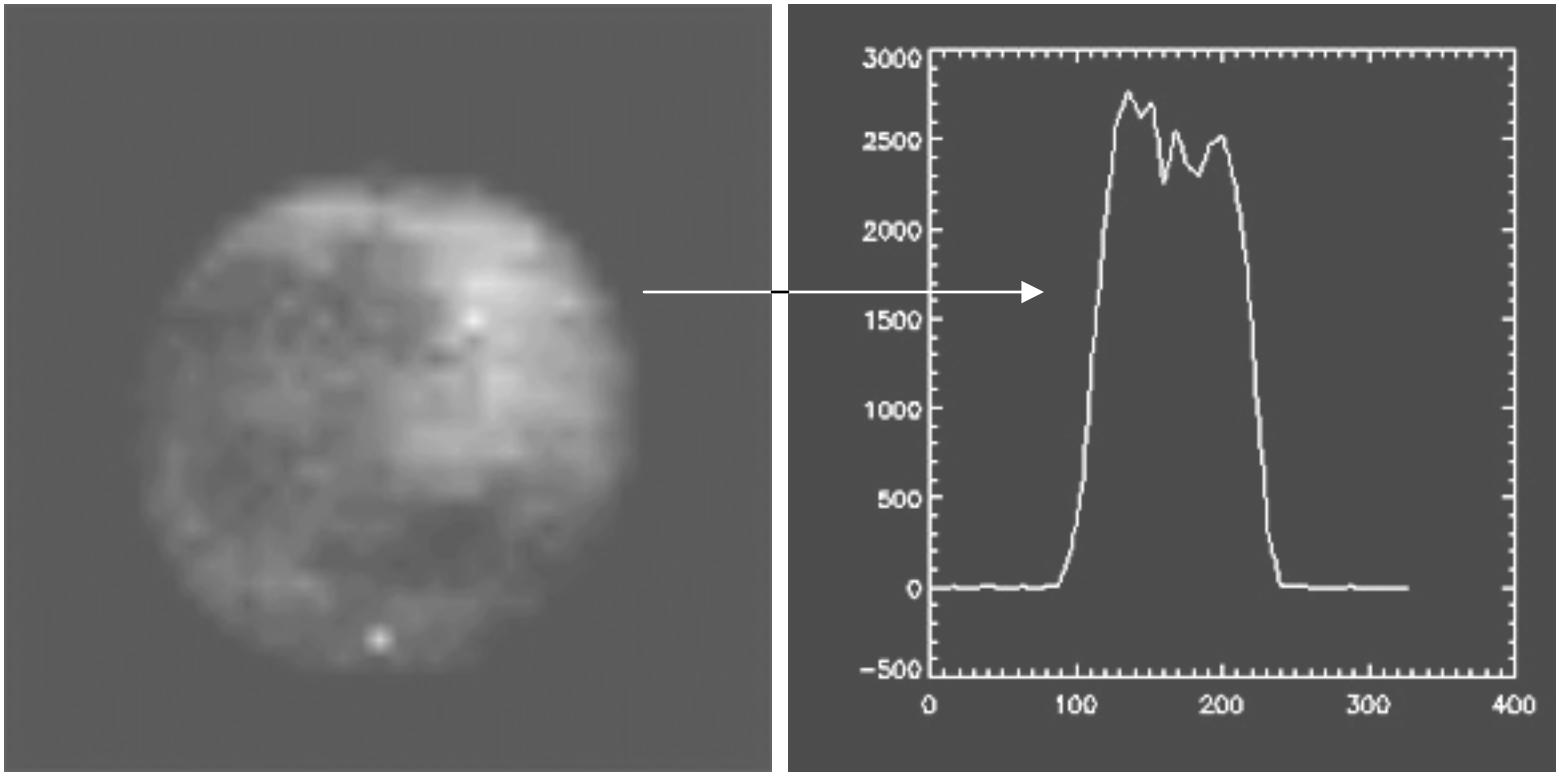
- ***Large nearly additive "fixed pattern" contribution to signal***
- ***Became apparent after launch***
- ***Constant in position***
- ***Constant in time***
- ***Reduces low illumination accuracy for some pixels***
- ***Requires measurements unaffected by atmospheric absorption***
- ***Corrected using scanning solar calibration***

"Fixed Pattern" Signal



SNR (30% albedo, 60 ° Solar Angle)

Image Quality (Edge Sharpness)



Lunar Image Expanded by a Factor of 8

Horizontal Slice Through Expanded Lunar Image
Rise and Fall About 1 Pixel in Normal Image.

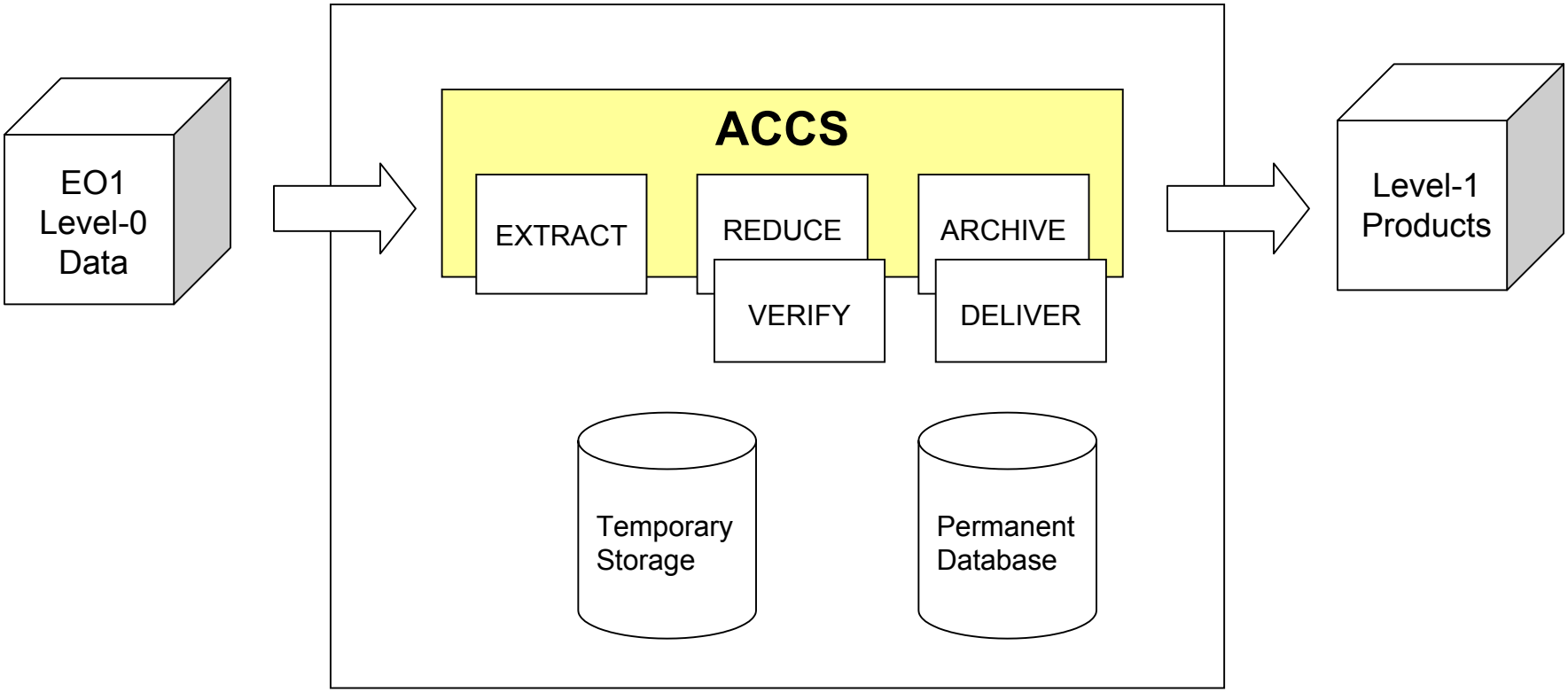
Calibration Summary

- ***Preliminary radiometric calibration based on solar cals***
  - ***Residual non-uniformities typically < 50 counts***
  - ***Larger effect on some pixels***
  - ***Large non-linear effects for some pixels at low illumination levels caused by non-subtracting pattern***
  - ***Secondary non-linearity in pixel response in InGaAS arrays at low illumination***
  - ***Addressed with scanning solar calibration and surface flat fields***
- ***Lunar and Ground Calibration***
  - ***Lunar model***
  - ***Ground calibration collaboration with Hyperion***
  - ***Surface sites***

In-Flight Operation

- ***Data Collection Event (DCE)***
  - ***Instrument activated 10 minutes before DCE***
  - ***Dark Earth view obtained within one orbit***
- ***Selectable Parameters***
  - ***Frame rate (30 & 60 Hz) nominal 30 Hz***
  - ***Array temperatures nominal 275 K (265,280 and 285 options)***
- ***L0 data processed at GSFC DPF***
- ***L1 data processed by AC Calibration Team***
  - ***Will continue for immediate future***
  - ***Includes calibration and Geo-location***

LAC Calibration System

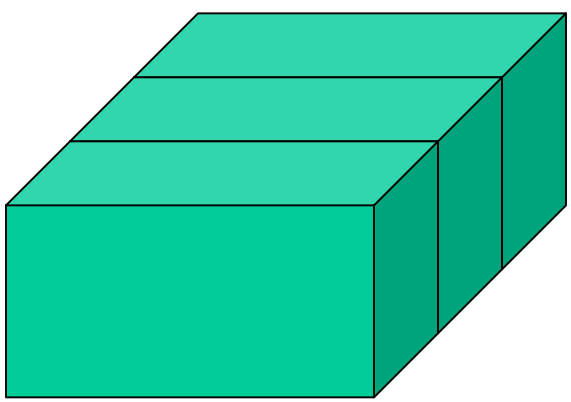


Science Data Formats

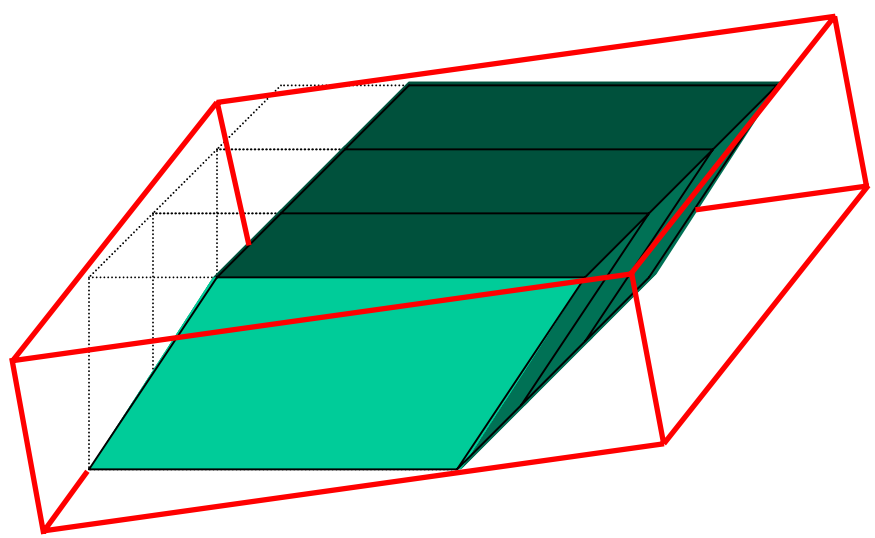
- ***Band Sequential (BSQ)***
  - ***instrument clock, header data***
  - ***pixel pointing map, filter frequency map***
  - ***spacecraft meta data (YYYY_DDD_lac/gps/acs.hdf)***

$$I_{i,j,t} \Rightarrow I_{x,y,\nu}$$

Level-1R

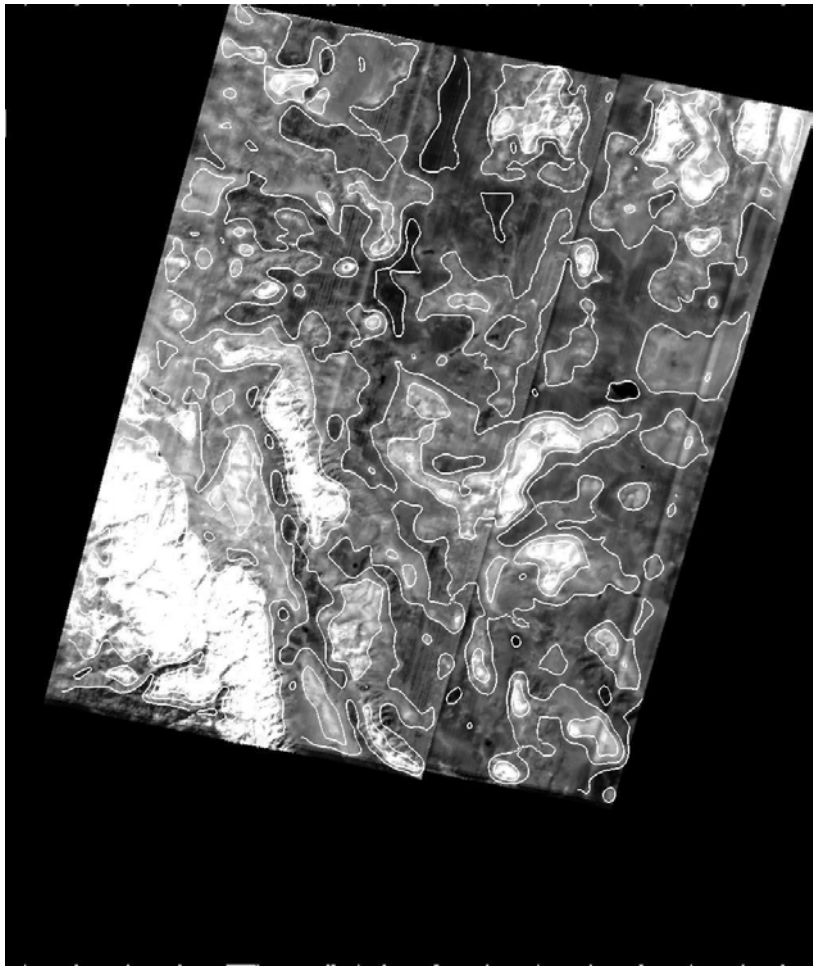


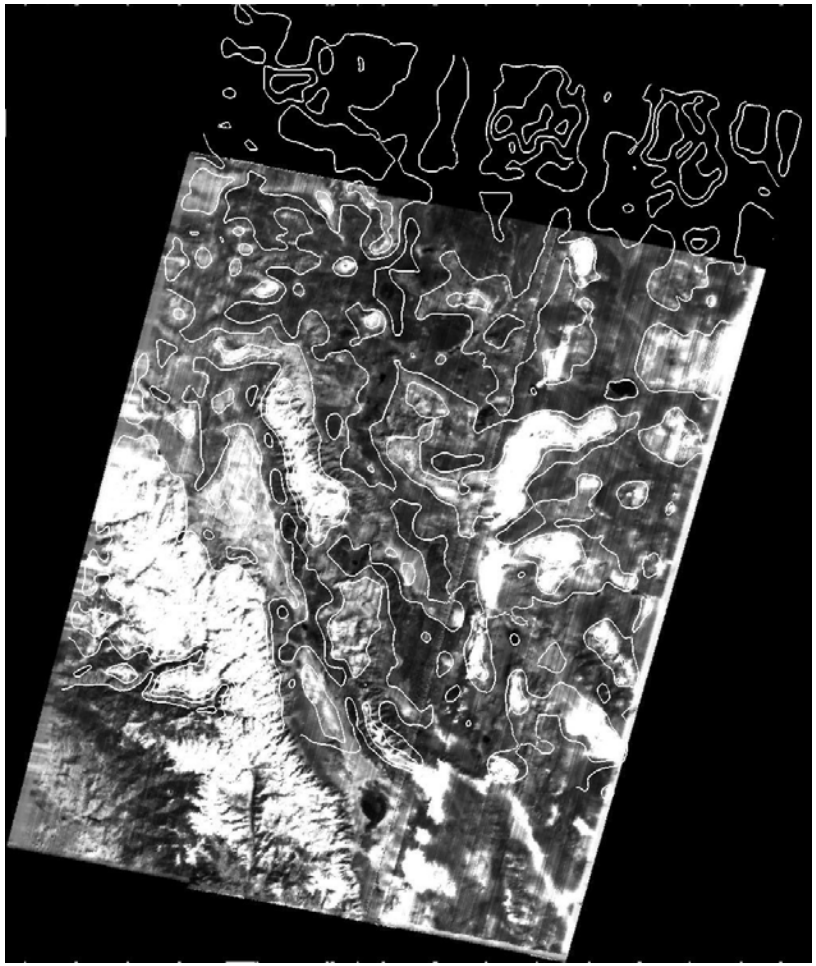
Level-1G



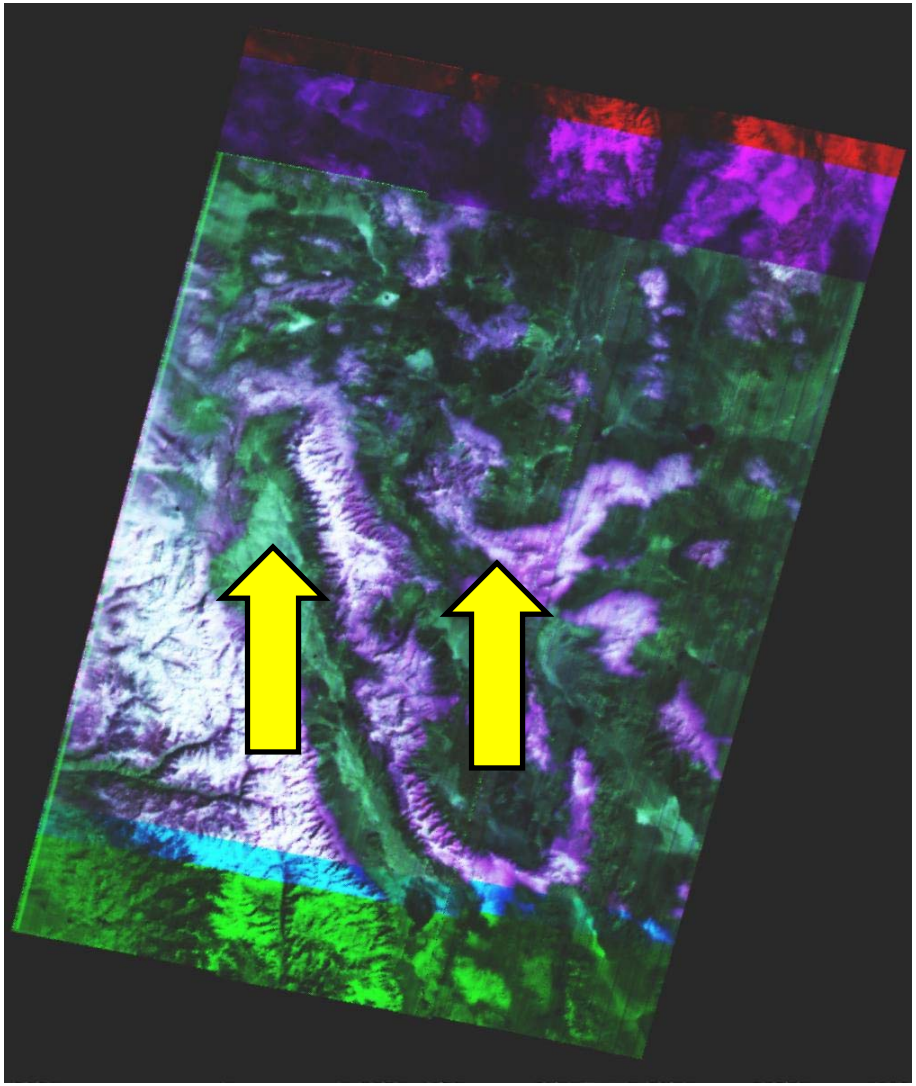
Band Alignment

Scan of Cuprite, NV 1200 frames





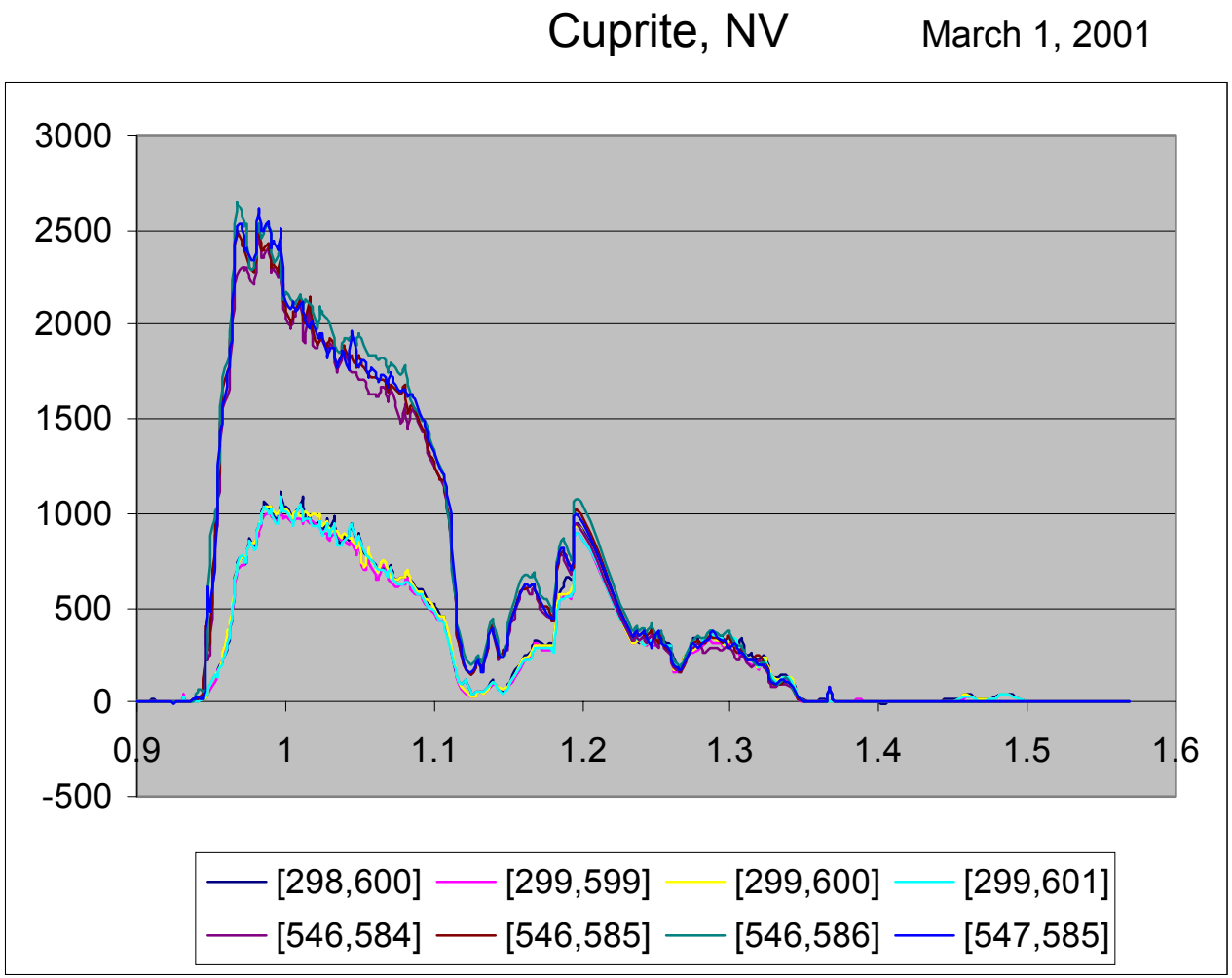
Color Composite Images



Cuprite, NV March 1, 2001

red=1.32, green=1.03, blue=0.98 (μm)

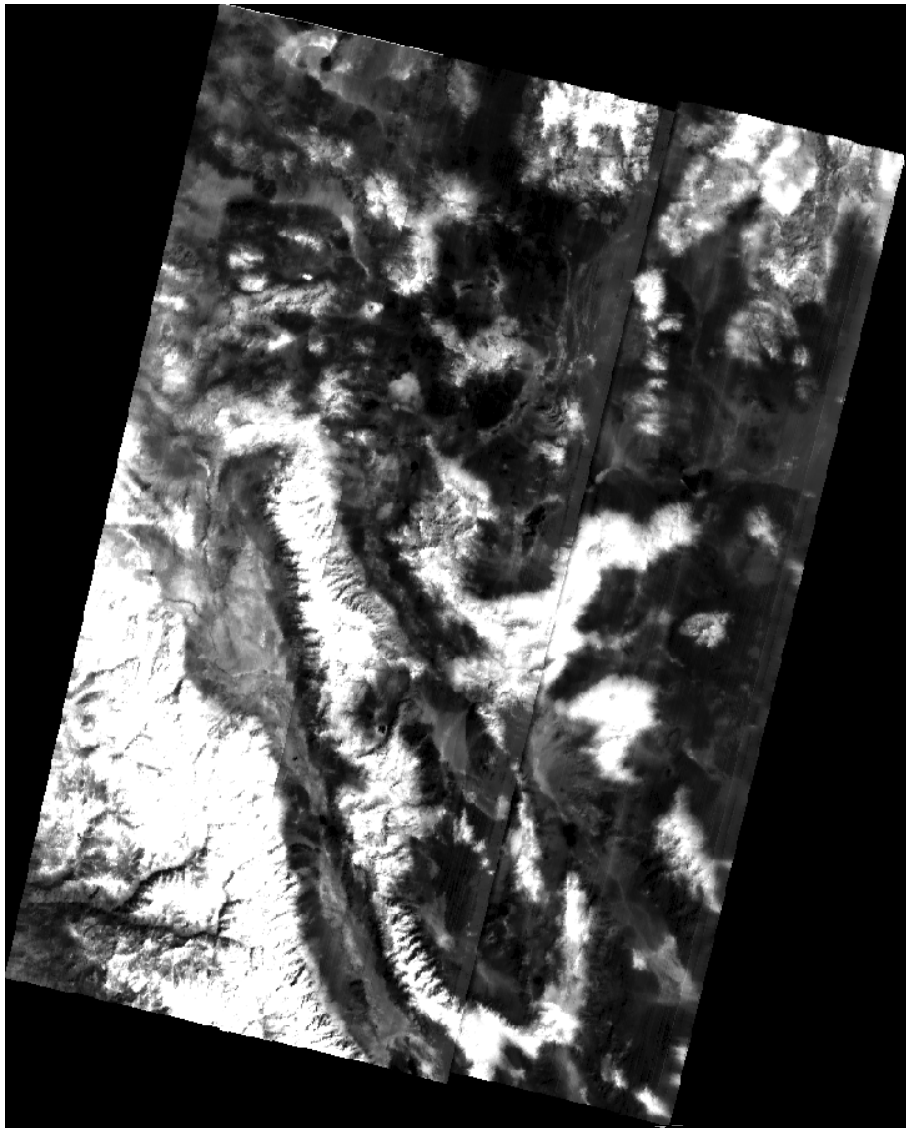
Spectra


Cuprite, NV
March 1, 2001
3000
2500
2000
1500
1000
500
0
-500
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
[298,600]
[299,599]
[299,600]
[299,601]
[546,584]
[546,585]
[546,586]
[547,585]

Status

- ***Purely Operational: Complete***
  - ***Commands perform as expected***
  - ***Single Issue: Red limit temperature reached in long duration events***
- ***L1R Processing Software: 90% Complete***
- ***Radiometric Calibration: 50% Complete***
  - ***Non-linear correction being implemented***
  - ***Mid-August projected completion date***
- ***Geo-rectification Algorithms: 80% Complete***
- ***Collaboration Welcomed***

Scenes



Cuprite, NV

Scene-ID: EO10410342001060111PP

Lake Frome

Scene-ID: EO10970812001021111PP

Rochester, NY

Scene-ID: EO10160302001125111PP

Snake River

Scene-ID: EO10410302001140111PP

Suez Canal

Scene-ID: EO11760392001046111PP

Venice

Scene-ID: EO11920282001158112PP