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

EO1 Level-0 Data → EXTRACT → REDUCE → VERIFY → ARCHIVE → DELIVER → Permanent Database → Temporary Storage → Level-1 Products
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)

\[ I_{i,j,t} \Rightarrow I_{x,y,v} \]
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)
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
Spectral Calibration (Pixel)
Spectral Calibration (Global)
Dark Current Evolution

![Histograms showing dark current evolution over different periods]

- Dark Subtraction: 2001058-2001198
  - Mean = -0.97
  - Stdv = 2.99
  - N = 196608, Bins = 512

- Dark Subtraction: 2001120-2001198
  - Mean = -0.94
  - Stdv = 2.39
  - N = 196608, Bins = 512

- Dark Subtraction: 2001198-2001198
  - Mean = -0.52
  - Stdv = .88
  - N = 196608, Bins = 512
Mt. Etna 07/29

- Red 1.275 μm
- Blue 0.988 μm
- Green 1.083 μm
Mt. Etna 07/29

- 0.988 μm
Mt. Etna 07/29

- **Black 1.005 µm**
- **Purple 1.080 µm**
- **Blue 1.097 µm**
Mt. Etna 07/29

LAC

- **Red 1.523 µm**
- **Green 0.988 µm**
- **Blue 1.005 µm**

Landsat-7
Browse