EO-1/HYPERION: UPDATE FOR ISIS

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IGARSS 2014
Québec City
Québec, Canada
HYPERION IMAGES FROM JULY 2014

July 1, 2014
Hyperion False-Color Image
Nitmiluk National Park, Australia

July 5, 2014
Hyperion False-Color Image
Mato Grosso, Brazil

July 8, 2014
Hyperion False-Color Image
Port-au-Prince, Haiti
RECENT MAJOR EVENTS FOR EO-1

• **February 2011:** EO-1 ran out of fuel and began precession from 10:00am overpass toward earlier times.

• **June 2012:** started new lunar calibration scans that use Hyperion.

• **April 6, 2012:** EO-1 “Safe Hold” incident. This was our first major "safe hold" and there was no guarantee that the satellite would come back up. But the restart procedures worked properly and 2 weeks later EO-1 was working fine.

• **March 2013:** Senior Review proposal delivered to NASA HQ, resulting in 2 more years of funding.

• **May 2013:** IEEE JSTARS EO-1 Special Issue published, containing 20 papers.

• **December 18, 2013:** EO-1 “Safe Hold” incident, caused by a "low power" reading. EO-1 was restarted and the "low power" level was set higher.

• **May 9, 2014:** a piece of Chinese space debris had a chance of impacting the EO-1 satellite, so a 10-second thruster burn was attempted (without knowing if it would work). The thrusters fired correctly, shifting EO-1 into a slightly higher orbit, avoiding the collision.

• **October 2015:** EO-1 is scheduled to be shut down.
AVIRIS supported Hyperion cal/val during the EO-1 post-launch Argentina Field Campaign in Jan-Feb 2001. Currently, Hyperion and AVIRIS are being jointly used in support of the 2013-2014 HyspIRI Airborne Campaign in California.

**Argentine/AVIRIS (Jan-Feb 2001)**

**The HyspIRI Airborne Campaign**

*AVIRIS and Hyperion Overflights, April 2013, CA*

Hyperion (colored bars) is currently being used along with AVIRIS (red lines are AVIRIS flightlines) in support of the HyspIRI Airborne Campaign.
**Objectives**

Conduct ER-2 Remote Sensing Missions with AVIRIS and MASTER over 6 regions for two years with measurements during Spring, Summer, and Fall.

**CY2013 Operations**

- All CY2013 planned data was collected
- Station and Rim fire data added to the plan
- 121.8 total HyspIRI flight hours
- Obtained Landsat 8 underpass, Monterrey Bay, and Yosemite/Neon box data through other funded flight requests
- Provided piggyback opportunity for AirMSPI, RSP, NAST-I, NAST-M, S-HIS, and DCS

**CY2014 Flight Dates:**

- Mar 31 – May 2
- May 27 – June 20
- Aug 18 – 29
- Sept 15 – Oct 31

**CY2014 Plans**

<table>
<thead>
<tr>
<th>Flight Request</th>
<th>Study Name</th>
<th>Flight Hours</th>
<th>Principal Investigator</th>
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<td>142020</td>
<td>Landsat 8</td>
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<tr>
<td>Total ALI Scenes</td>
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<td>Total Hyperion Scenes</td>
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<td>Total Scenes Available</td>
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**As of June 2014**
EO-1 observations in 13 years (2001 through 2014) total over 75,000 for each instrument. Locations of collections made in 2011-2012 (1300+ per instrument) are shown with yellow dots, whereas those collected during the first 10 years are shown with red dots. In addition, locations of 4 repetitively observed sites are highlighted: CEOS calibration sites (blue circles), MSO (dark green circles), NEON (cyan circles) and Volcanoes (purple diamonds). Locations having >10 collects are outlined with black circles.
The lunar irradiances are dependent on parameters that include: the lunar librations, nutation, phase angles, viewing locations, solar distances. These factors are incorporated in the ROLO model.

The EO-1 mission uses the ROLO model only as a basis to normalize the Hyperion data for long-term stability trending, not for absolute calibration comparison purposes.

The Hyperion values are within the uncertainty of the ROLO comparisons with other instruments (e.g. MODIS, ASTER, MISR, LDCM) as shown by Kieffer and Stone (2005, *Astronomical Journal*) describing the ROLO model in detail. There have been on-going discussions with the model authors regarding these differences.
• As EO-1 continues to drift, the equatorial overpass time gets earlier and earlier,

• Equatorial image data are always usable, even in 2016. And even then, higher-latitude image data could still be acquired in the summer months.

• The seasonal change in SZA is much larger than the change due to EO-1’s orbital decay.

Landsat-8
Landsat-7
EO-1
QuikSCAT
Jason
OSTM/Jason 2
Landsat-7
EO-1
TRMM
ACESat
CALIPSO
CloudSat
Aqua
ACRIMSAT
SORCE
GRACE
Terra
Aura

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Today's satellites assumed still operable in 2015