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The Geospatial Way!

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An Overview of the WorldView-3 Sensor

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Puntiagudo Cordon Cenizos volcanic chain, Chile | April 2, 2012 | WorldView-2
We Are the Innovators of Our Industry

- **1993**: First commercial license granted by U.S. Dept. of Commerce
- **1999**: Ikonos
- **2001**: QuickBird
- **2003**: ClearView & NextView NGA contracts (~$600M)
- **2005**: Google GeoEye-1
- **2008**: First archive to exceed 1B km²
- **2009**: WorldView-2
- **2010**: EnhancedView NGA contract (~$3.6B)
- **2011**: Global EGD/Global Basemap products launched
- **2013**: >20 patents in hand
- **2013**: First archive to exceed 4B km²
WorldView-3 Advantages

1. Advantages:
   a. Atmospheric Sensor (CAVIS)
   b. Improved resolution
   c. Material identification (SWIR)
2. Short Wave Infrared (SWIR) reveals materials
3. Chemistry-based absorption features not present in VNIR
4. Superspectral versus hyperspectral and multispectral
5. Applications
A Sensor Perspective

**WorldView 3**
- Multispectral: 16 bands VNIR-SWIR.
- Pixels: 0.31, 1.2, 3.7 m.
- CAVIS instrument for atmospheric retrievals.

**AVIRIS (aerial sensor):**
- Imaging Spectrometer: 224 bands VNIR-SWIR.
- Pixels vary: 2 to 20 m.
- Used to generate WV3 simulated spectra.

**ASTER**
- Multispectral: 10 bands VNIR - SWIR.
- Pixels: 15, 30 m.
- SWIR failed.

**Landsat (8)**
- Multispectral: 8 bands VNIR - SWIR.
- Pixels: 30 m.

**Expected launch:**
2014
WorldView-3 will be the first high-resolution “super spectral” satellite in the industry.

Pan: 0.31m GSD (0.5m releasable)

1.24m GSD (2.0m releasable)

3.72m GSD (7.5m releasable)

Solar Radiation

Wavelength (NanoMeters)

WORLDVIEW-3 CAVIS BANDS

30m GSD

Atmospheric Compensation

WORLDVIEW-3 SWIR BANDS
CAVIS will improve measurement and removal of atmospheric effects
Does resolution make a difference?  
**WV-3 vs ASTER**

WV-3 simulation 3.5 m  
SWIR Composite

ASTER actual 30 m  
SWIR Composite
Examples of what WV-3’s bands can see

<table>
<thead>
<tr>
<th>Visible (V)</th>
<th>Near Infrared (NIR)</th>
<th>Short Wave Infrared (SWIR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Picture</td>
<td>Veg</td>
<td>Iron</td>
</tr>
<tr>
<td>Man made</td>
<td>Rocks</td>
<td></td>
</tr>
</tbody>
</table>

Landsat 8  
(30 m)

ASTER  
(15/30 m)

WV 2 - 3  
(1.2)

WV 3 only  
(3.7)
Differentiating Snow from Clouds
Differentiating Snow from Clouds

Red Band 660nm

SWIR Band 1.63nm
Compare Spectra:

- WV-3 (simulated)
- AVIRIS
- ASTER
- Landsat TM
Zonation aids in predicting location of precious metals.

Hydrothermal Ore Deposit Model

- Clay Zones
  - Kaolinite
  - Alunite

Graphic Source: Taranik, et al., 2010.

Geospatial World Forum 2014
Application to Mineral Exploration
Panchromatic “WV-1”
Application to Mineral Exploration
True Color “GE-1, WV-2”
Application to Mineral Exploration
Mineral Indices “WV-3”

Clay
Mica
Carbonates
8-band WV-3 SWIR enables accurate geological classification, ± 2–5% of hyperspectral AVIRIS!
Hydrocarbon Alteration Model
Lisbon Valley, Utah USA

Red un-altered surface rock

Bleached surface rock, higher Calcite, Hematite, Kaolinite

oxidized

reduced

unconformity

hydrocarbon leakage via micro & macro fractures in overlying clastic rocks

faulted anticlinal trap oil & dissolved gas

Sources: Kruse and Perry, 2012; and Petrovic et al., 2012.
Hydrocarbon Alteration Mapping
Canyon Lands, Utah USA

Mixture: Calcite + Kaolinite
Simulated SWIR rooftop classification
Smoke Penetration in SWIR

Station Fire, Los Angeles National Forest, CA
Advanced Land Imager (ALI) 03 SEP 2009
Smoke Penetration in SWIR

Station Fire, Los Angeles National Forest, CA
Advanced Land Imager (ALI) 03 SEP 2009

False color composite:

- Active fire in bright red
- Healthy vegetation in green
- Burned vegetation dark red
- Smoke in blue-gray
- Clouds in white

ALI bands: 7, 4, 1
[WV3 equivalent: SWIR-6, NIR-1, Blue]
Environmental Monitoring:
Mapping marsh oil using simulated WV-3 SWIR data (Louisiana Oil Spill 2010)

Marsh oil mapped by spectral matching of simulated WV3 data.
Maritime SWIR applications:
Wake and ‘Splash’ Detection
Conclusion

- DigitalGlobe is the leader in the Global Earth Observation market. DigitalGlobe’s sensors have unmatched spatial, spectral resolution and accuracy. We have the largest and highest resolution collection capacity in the world.

- WorldView-3 will be the first high resolution super-spectral satellite in the industry, dramatically improving the resolving power of many image exploitation applications.

- WorldView-3 will provide improved spatial and spectral resolution with 8 additional bands in the SWIR and an atmospheric sensor for accurate rendering of super-spectral signatures.

- The SWIR bands will detect chemistry-based absorption features and dramatically improve our ability to identify man-materials, soils and minerals with applications to mineral, gas and oil exploration, environmental monitoring, urban inventorying and intelligence.