Introducing the GeoEye Sensor Performance Lab

Preston Mattox

JACIE 2011

Boulder, CO

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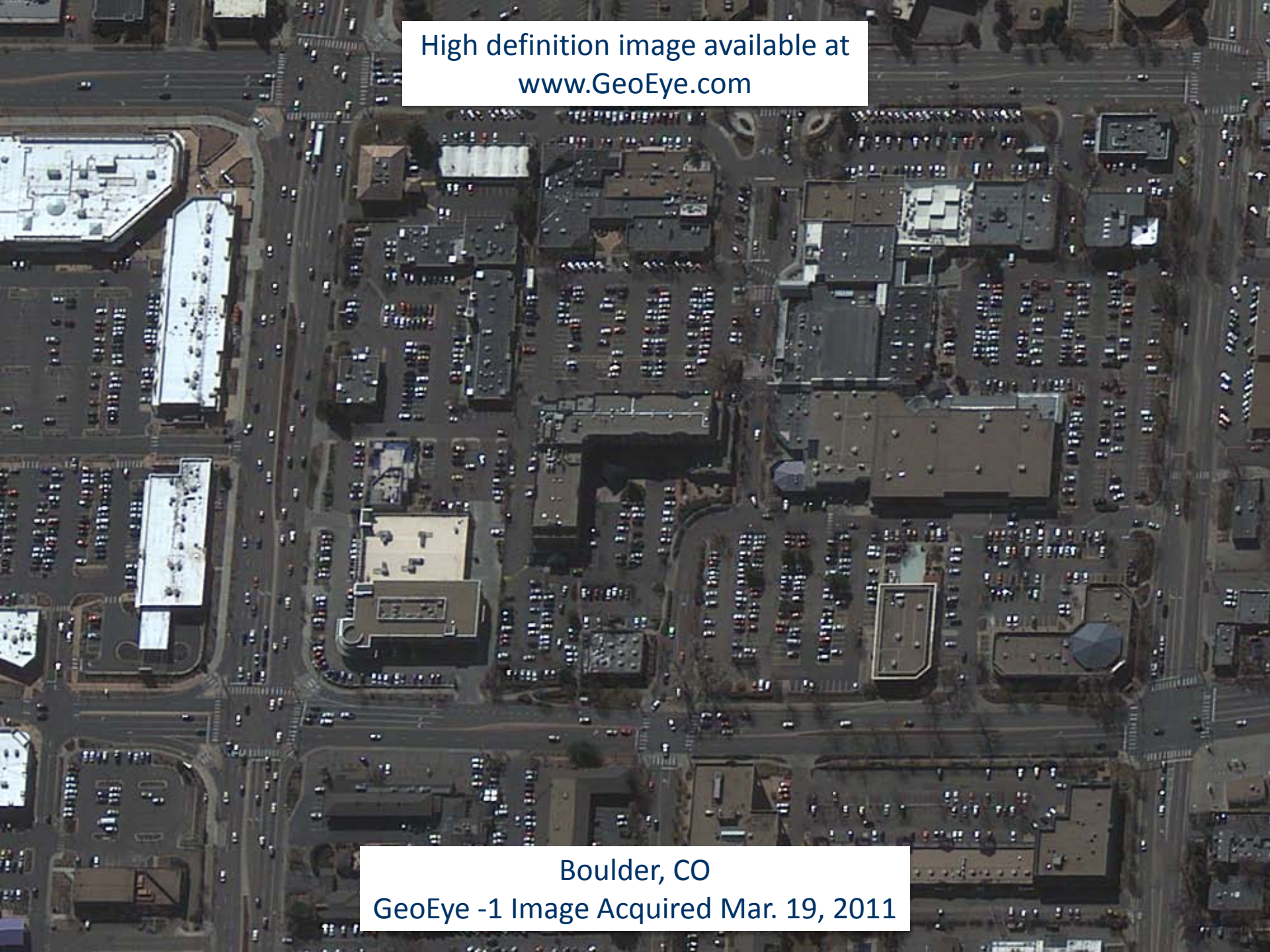

High definition image available at
www.GeoEye.com
Boulder, CO
GeoEye -1 Image Acquired Mar. 19, 2011

GeoEye Overview

Imagery Collection satellite and aerial platforms

- GeoEye-1
- IKONOS
- Aerial (MJ Harden)

Production Services

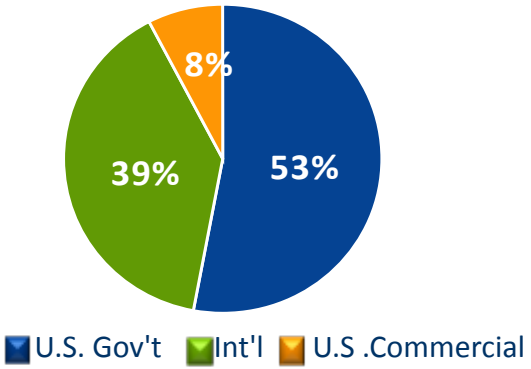
- Digital Airport Maps
- Adv. Imagery Products
- Multi-Source Production
- US Government Certified

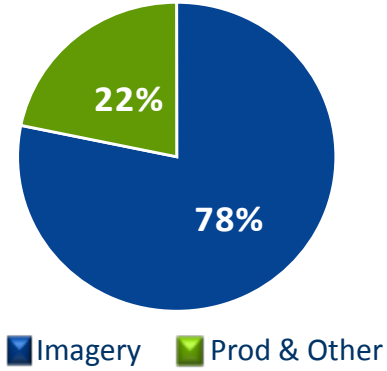
Information Services

- EyeQ Web Services
- Predictive Analytics
- SeaStar
- Signature Analyst

- Employees: 770+
- Publicly traded: NASDAQ: GEOY
- HQ: Dulles, VA

2010 Est. Revenue $310 - 320M





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GeoEye Constellation

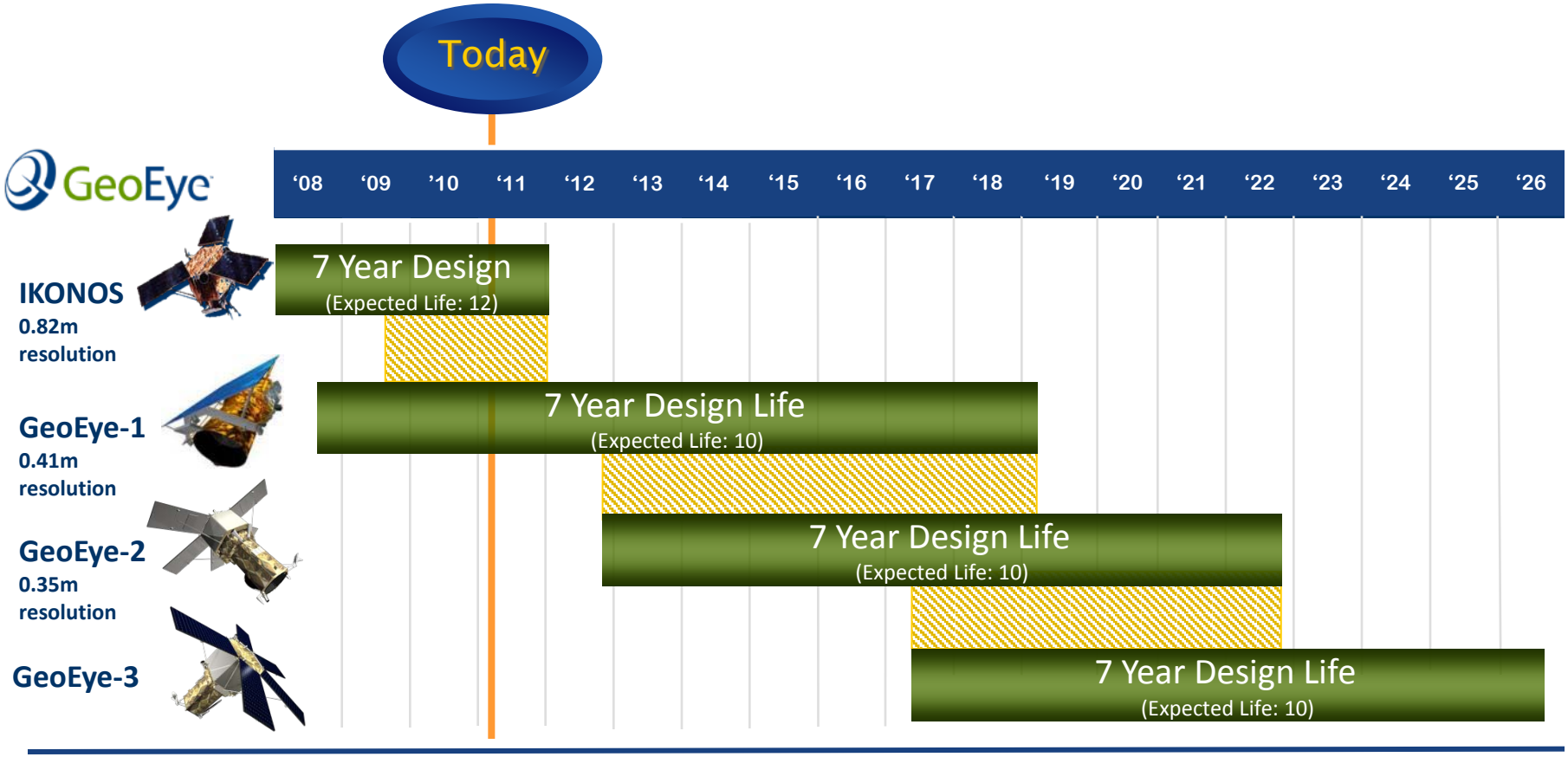
IKONOS
September 1999
.82m

GeoEye-1
September 6, 2008
.41 m

GeoEye-2
2013
.35 m

MJ Harden Digital Mapping
Camera & LiDAR sensors
March 2007

Continuity of Imagery



Assured access to uninterrupted high resolution imagery

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Sensor Performance Lab

- Located in GeoEye's St. Louis, MO offices
- Diverse disciplines
  - Orbit mechanics, image chain analysis, ground processing, radiometry, photogrammetry
- Core team: 6 members

Total combined experience: 64 staff-years

- Support from 13 additional experts & analysts

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Core Competencies

- Image Quality
  - MTF
  - SNR
  - Streaking & banding
  - Spectral anomalies
  - Artifact identification & characterization
  - Aggregation mode tuning / TDI adjustment
- Geometric Accuracy
  - Mono imagery metrics
    - CE90
  - Stereo imagery metrics
    - CE90 & LE90
  - Characterization of position, attitude, & timing
  - Calibration
    - Modeling
    - Truth referencing
    - GeoEye-developed software
    - Staffing

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Value Added Consulting Services

- Radiometric characterization & calibration
- Geometric characterization & calibration
  - Three GeoEye-maintained calibration ranges and over 40 test & evaluation sites
- Noise filtering/reduction
- Artifact identification
- Aggregation tuning
- Sharpening/MTFC
- Contrast enhancement
- Gamma correction
- Colorization

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Multi-Source Ingest and Processing

- Sensor agnostic

GeoEye	IKONOS, OV-3, GE-1, GE-2
DigitalGlobe	Quickbird, WV-1, WV-2
Israel	EROS B
Korea	KOMPSAT-2
Aerial	Zeiss/Intergraph DMC

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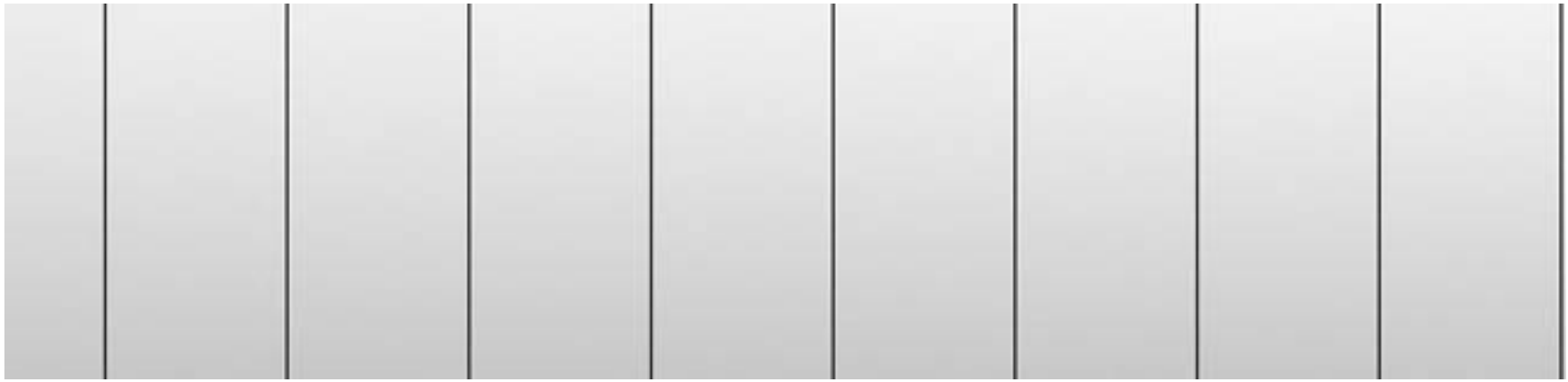
Relative Radiometric Calibration – GeoEye-1

GE-1 Flat-Field Imagery Pre-Correction



GE-1 Flat-Field Imagery Post-Correction

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Sharpening/MTFC – 3rd Party Imagery

Pan image prior to kernel application

Pan image after kernel application

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Artifact Identification/Characterization – 3rd Party Imagery

Excessively smooth (blurry) in low entropy areas.

This is potentially set as part of the on-board compression so that structured noise is minimized in these areas.

Vertical band of increased noise

Imagery with Artifacts

(2x Magnification with Sharpening Applied)

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Aggregation Mode Tuning / TDI Adjustment – 3rd Party Imagery

Image Displaying TDI Smear
Potentially Correctable via TDI Optimization

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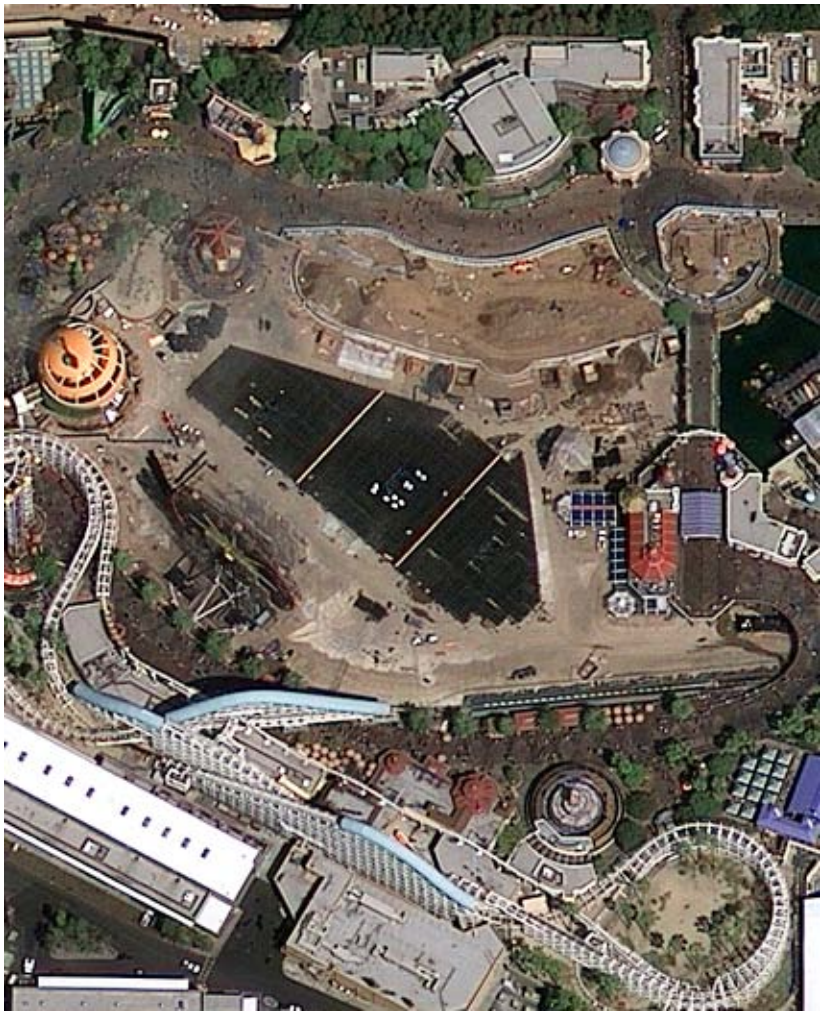
Colorization (Pan Sharpening) – GeoEye-1

GE-1 Pan Only Image



GE-1 Image After Pan Sharpening Weights Applied

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Summary

- Great imagery comes from the pairing of:
  - Pre-launch design, quality build
  - Post-launch performance, optimization

GeoEye's Sensor Performance Lab

Assessment	**Characterization**
Calibration	**Enhancement**

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