



MARS (Managing Agricultural Resources and Security)

14th Annual Conference, 2008

Geomatics in support of the CAP

Ljubljana, Slovenia 3rd - 5th December, 2008



REPUBLIC OF SLOVENIA

MINISTRY OF AGRICULTURE,  
FORESTRY AND FOOD

# GeoEye-1

## a next generation satellite for the CwRS campaign



# Telespazio and GeoEye

- **Telespazio is the first GeoEye appointed Commercial Regional Affiliate (CRA)**
  - Exclusive right to distribute GeoEye-1 and IKONOS Satellite imagery products to customers located in the Exclusive Sales Territory
  - Non exclusive right to plan GeoEye-1 and IKONOS within the Imaging Territory, and to process the imagery into Products
  - Non exclusive right to distribute GeoEye-1 and IKONOS Satellite imagery products to customers located outside the Reserved Territories





# GeoEye-1

- **Launched: 6 September 2008**
- **Launch Mass: 2050 kg – Boeing Delta II launch vehicle**
- **Orbit:**
  - 684 Km
  - Sunsynchronous
  - 10:20 equatorial crossing
- **Designed for 7+ years of operations (fuel for 10 years)**
- **Next generation technology with proven IKONOS architecture**





## First image: 7 October 2008





# Ljubljana on November 23, 2008





**47° off-nadir, GSD 69 cm**





## Marzling, Germany, 30 Nov 2008, 1.7 m MS



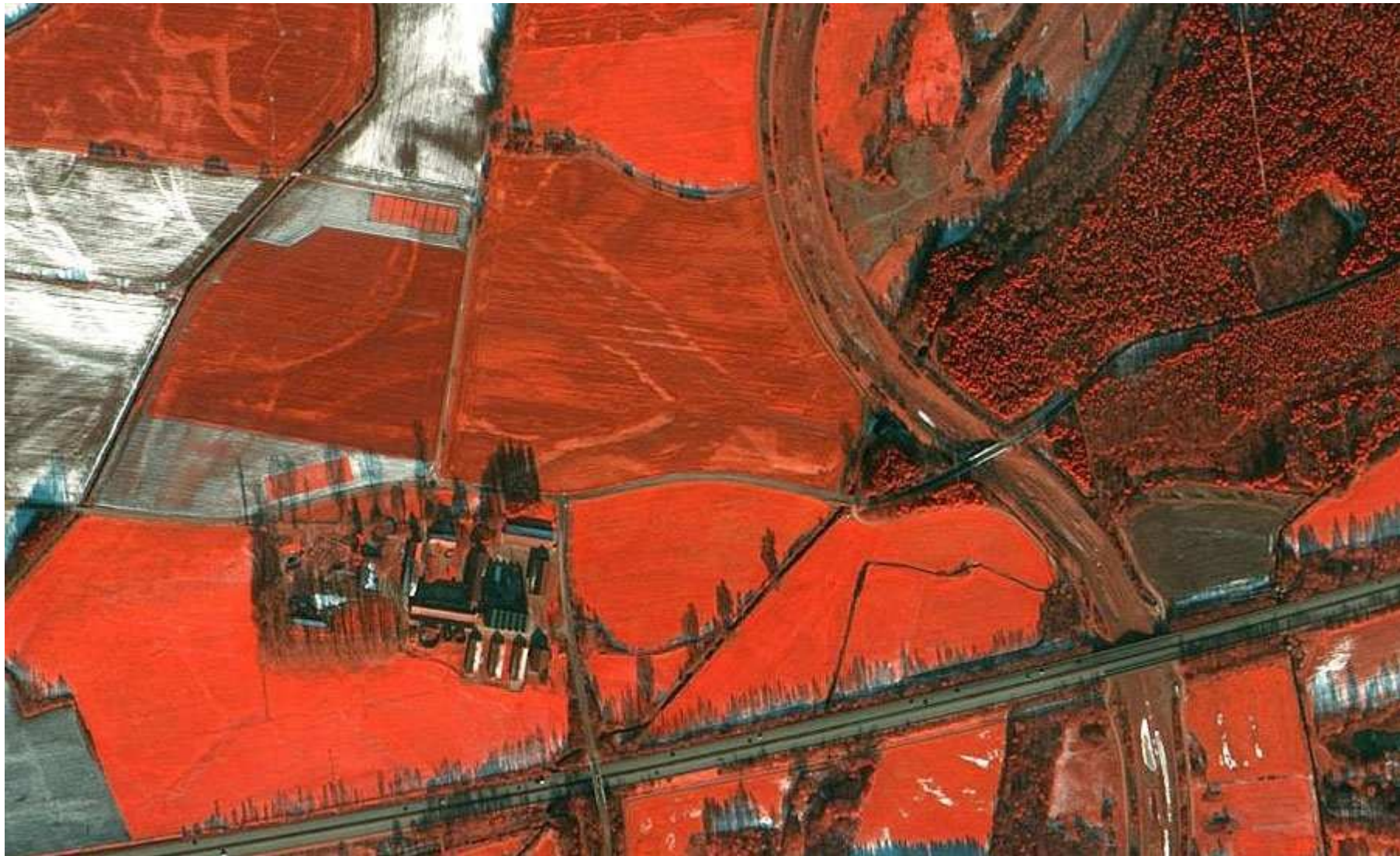


## Marzling, Germany, 30 Nov 2008, 1.7 m MS





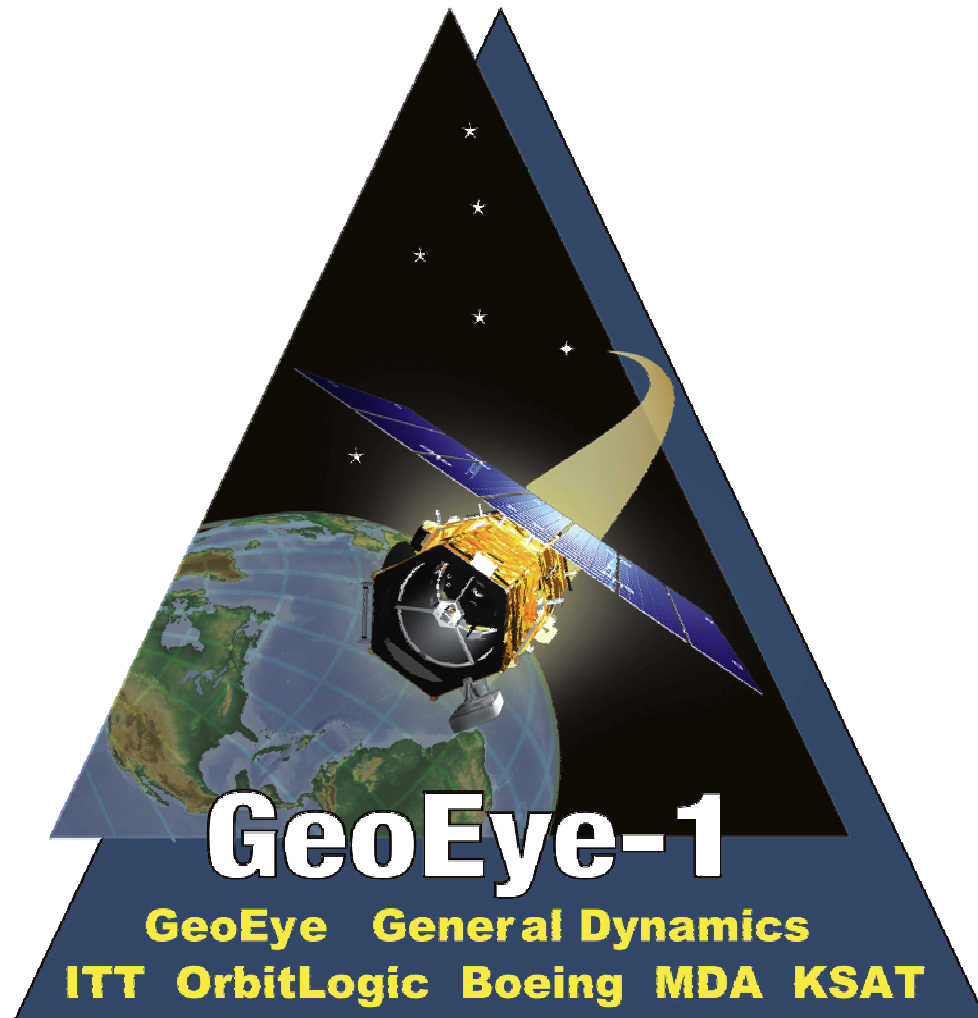
## Marzling, Germany, 30 Nov 2008, 1.7 m MS





# GeoEye-1 current status

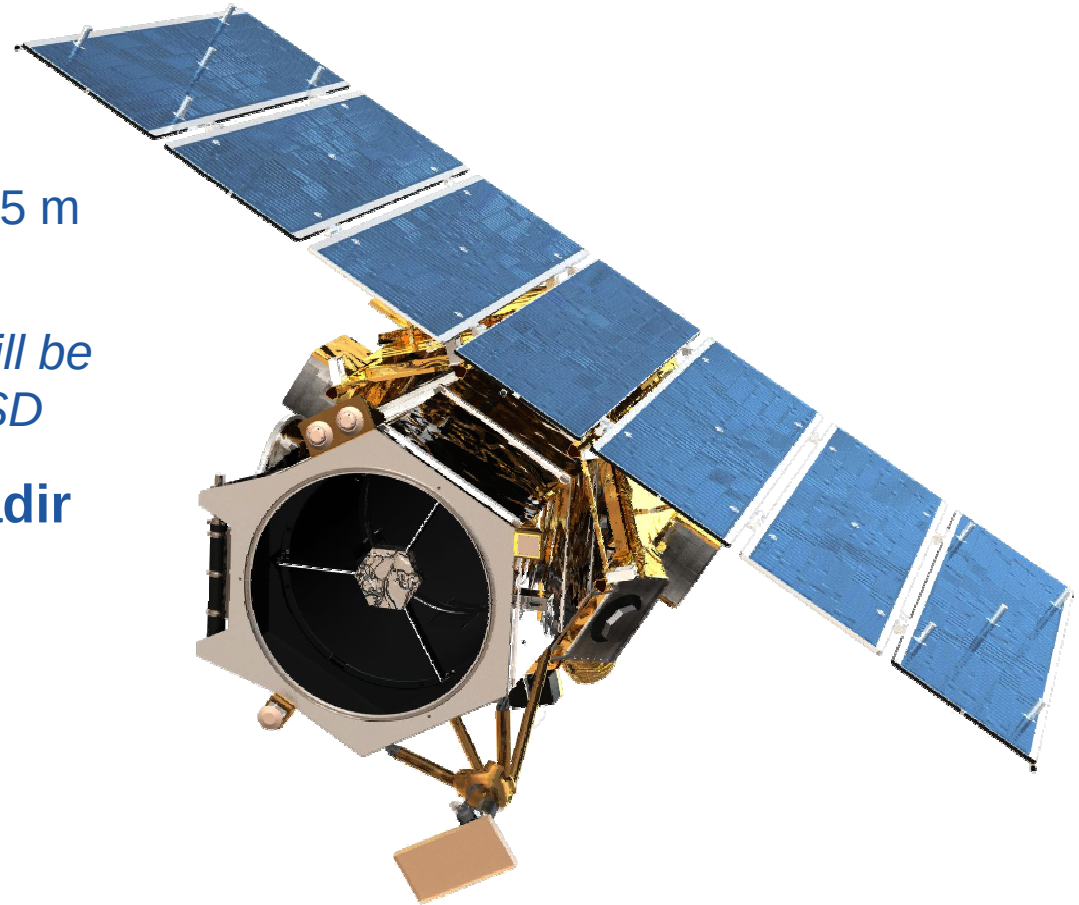
- GeoEye-1 system still under commissioning phase
- Probable SCO (Start of Commercial Operations): end December 2008



# GeoEye-1

- **Imaging sensor (11 bit)**
  - Pan: 41 cm GSD @ nadir
  - MS: 4 bands (B,G,R,NIR) 1,65 m GSD @ nadir

*NB: Commercial products will be resampled at 50 cm/ 2 m GSD*
- **Swath width: 15.2 Km @ nadir**
- **On-Board 1.0 Terabit Solid Stage Recorder**
- **Daily capacity**
  - Pan: 700,000 Km<sup>2</sup>
  - Pan+MS: 350,000 Km<sup>2</sup>

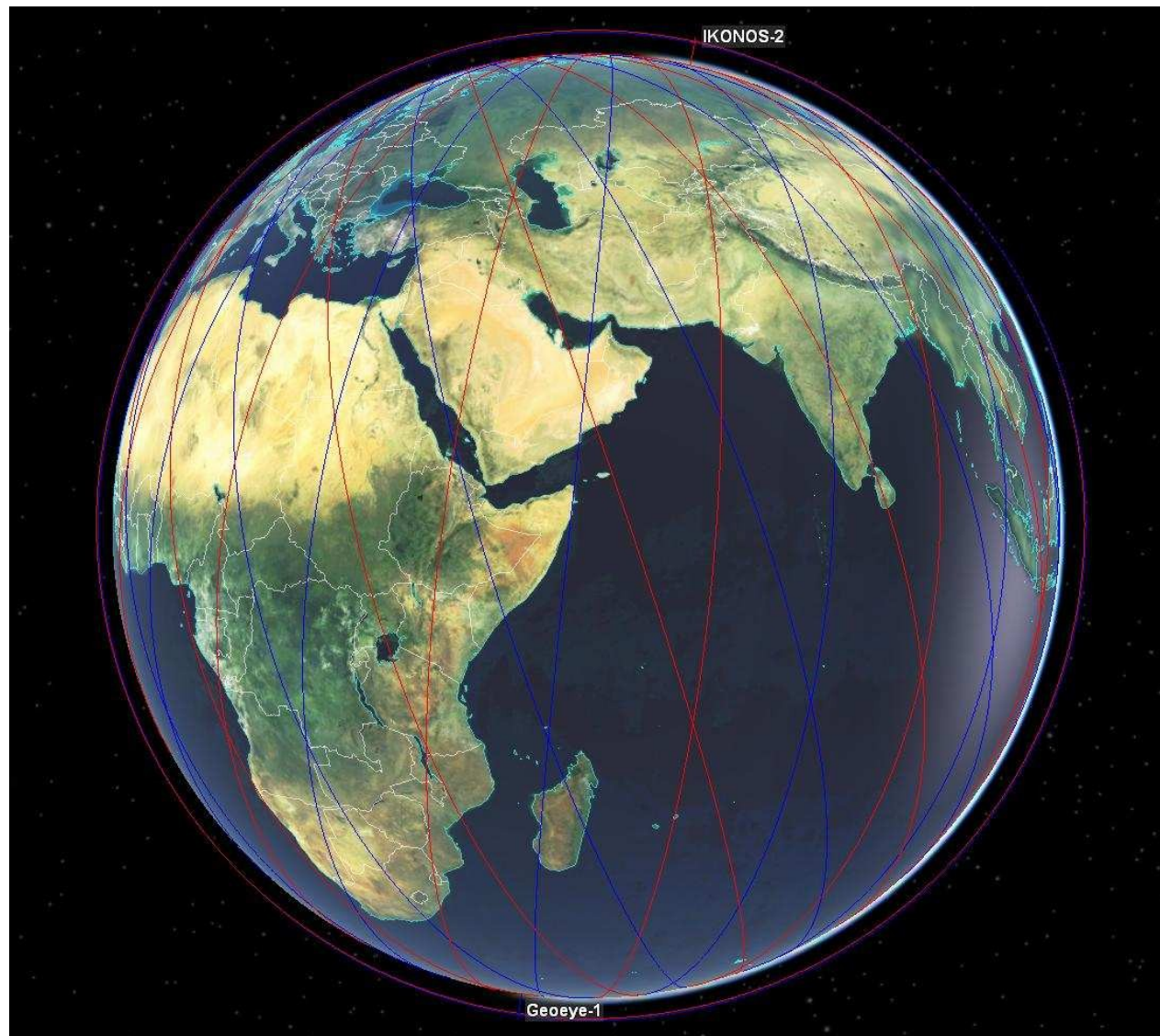




# GeoEye-1 and IKONOS sensors

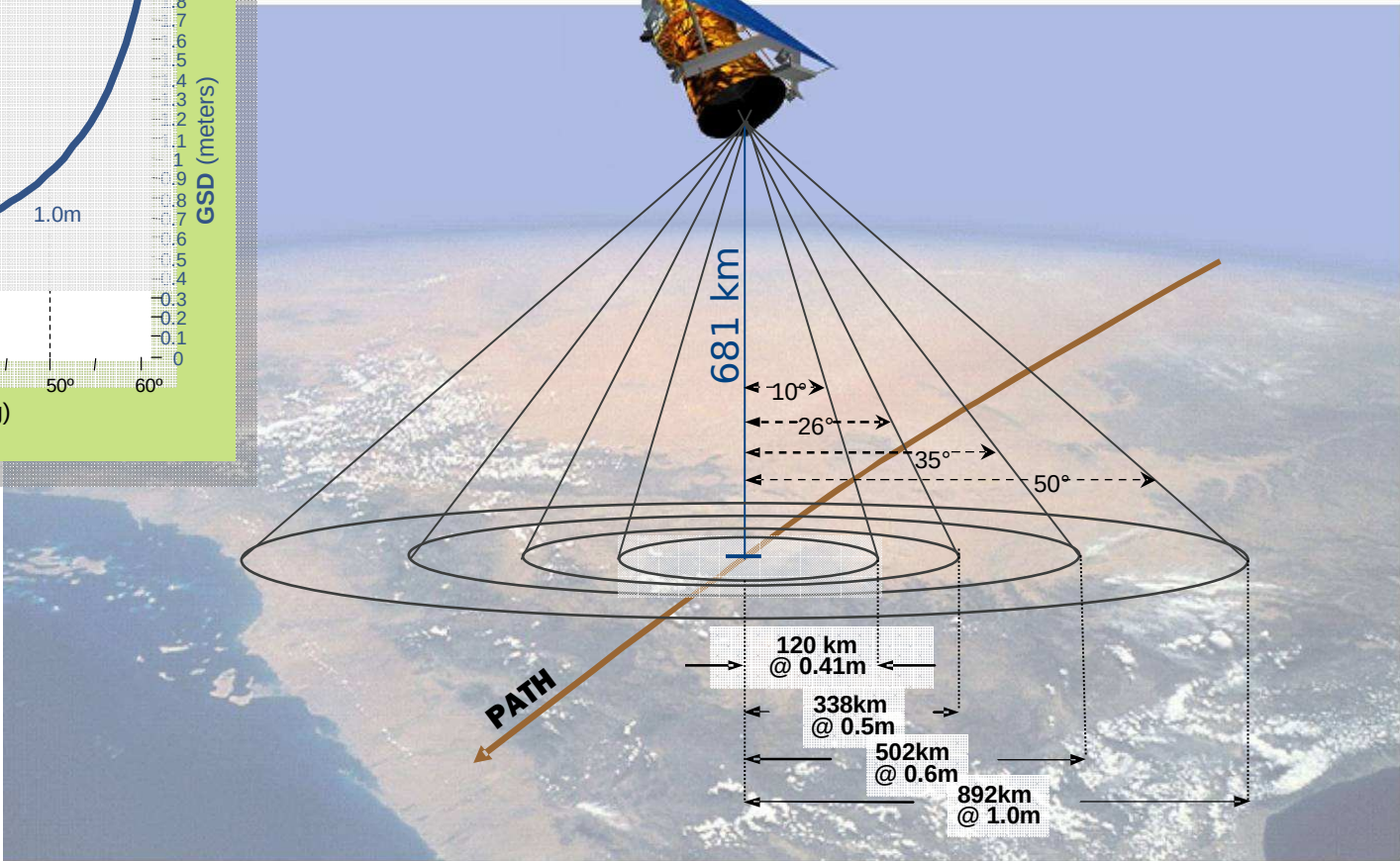
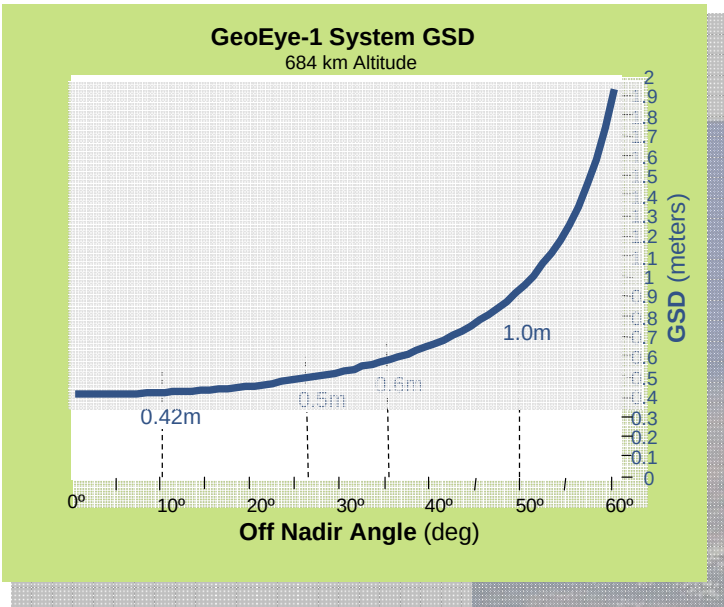
Sensor	GeoEye-1	IKONOS
Pan	450 – 800 nm	526 – 929 nm
Blue	450 – 510 nm	445 – 516 nm
Green	510 – 580 nm	505 – 595 nm
Red	655 – 690 nm	632 – 698 nm
Near InfraRed	780 – 920 nm	757 – 853 nm

# GeoEye-1 and IKONOS phased orbits

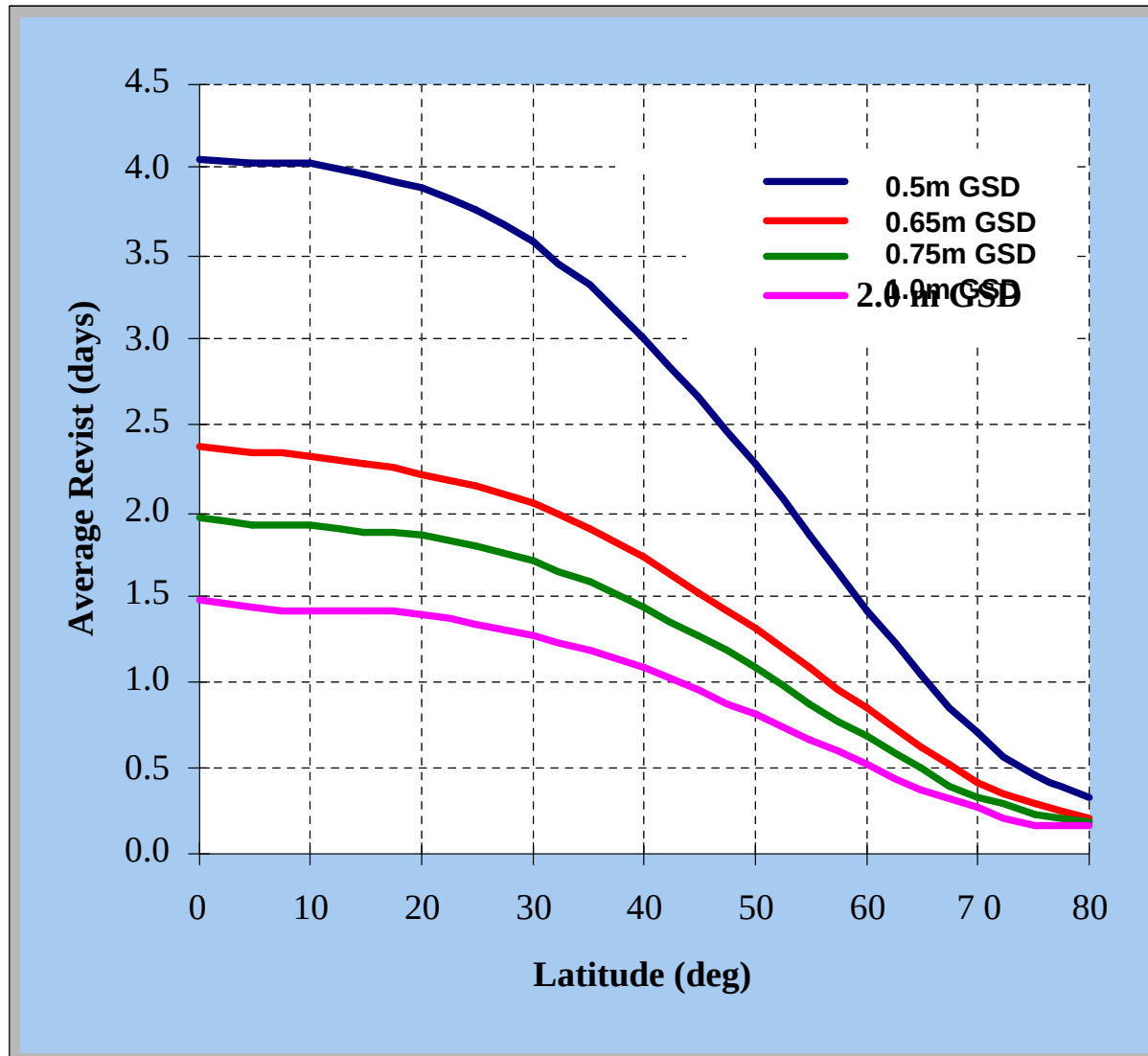




## Resolution and angles



# GeoEye-1 Revisit



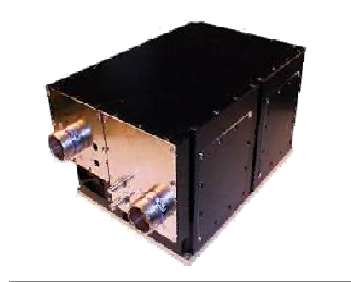


# Geolocation accuracy

Satellites	Geolocation accuracy specifications (CE90%)
IKONOS	15 m
QuickBird	23 m
EROS-B	34.6 m
Kompsat-2	80 m
WorldView-1	6.5 m
GeoEye-1	5 m

*Of course these numbers are referring to lev. 2 products, acquired at sea level with nadiral viewing angle, without GCPs*

# GeoEye-1 geolocation accuracy



- **High accuracy star trackers from Ball Aerospace**
  - Used on US Government satellite systems
  - Only commercial satellite to use this technology
- **Monarch GPS receiver**
  - Best available on market with 1M accuracy
  - More accurate than older technology Viceroy receiver
- **Litton Scaleable Inertial Reference Unit (SIRU) Gyros**
  - High precision, low drift rates

State-of-the-art technologies previously flown only on  
USG intelligence satellites



# GeoEye-1 Ground Stations Network

- **Operations centralized in the USA:**
  - Dulles, VA: operations center for mission planning & production
  - Thornton, CO: operations back-up center
  - Barrow, AK and Dulles, VA: ground terminals
  - Tromsø, Norway and Troll, Antarctica: terminal services



# GeoEye-1 Operations in Europe

- Telespazio's GeoEye-1 IPF (Imaging & Processing Facility) will probably be located in Germany, with the support of DLR's experience and local Telespazio group companies
- Tasking capacity like an old IKONOS ROC, but without uplink
- Full processing capability, using compressed raw data received from US
- Commercial operations done in Italy

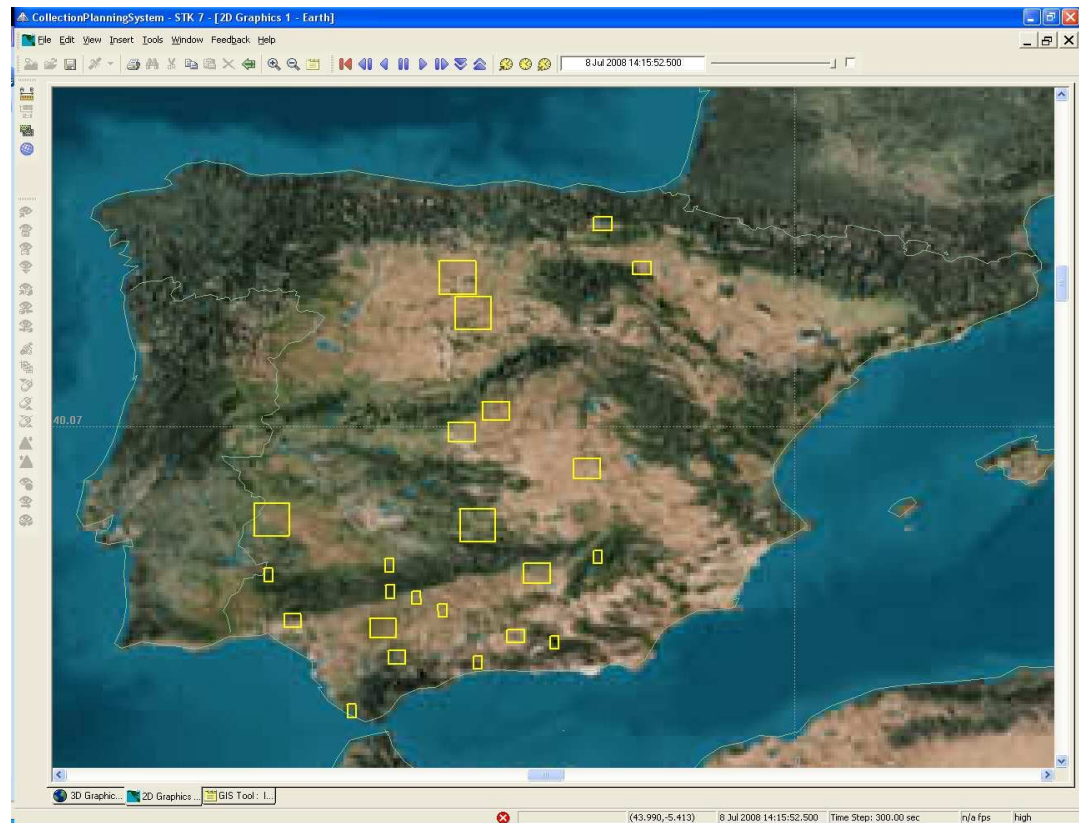




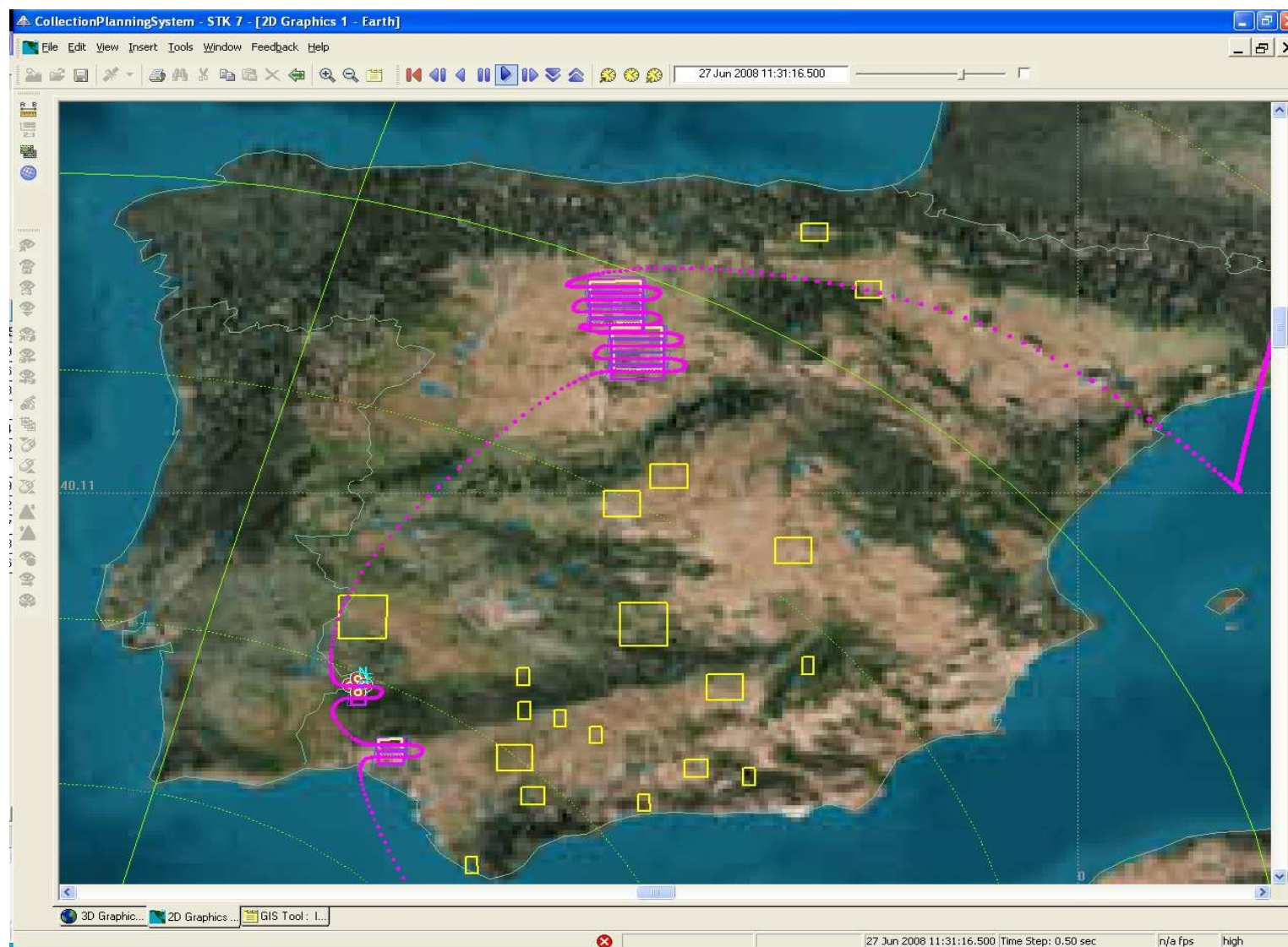
# Expected GeoEye-1 agility

- **GeoEye-1 simulation over 23 Spanish sites of 2008 campaign:**
  - 4 sites of 2,000 km<sup>2</sup> each
  - 5 sites of 900 Km<sup>2</sup> each
  - 5 sites of 400 Km<sup>2</sup> each
  - 9 sites of 200 Km<sup>2</sup> each

**Total: 16,300 Km<sup>2</sup>**

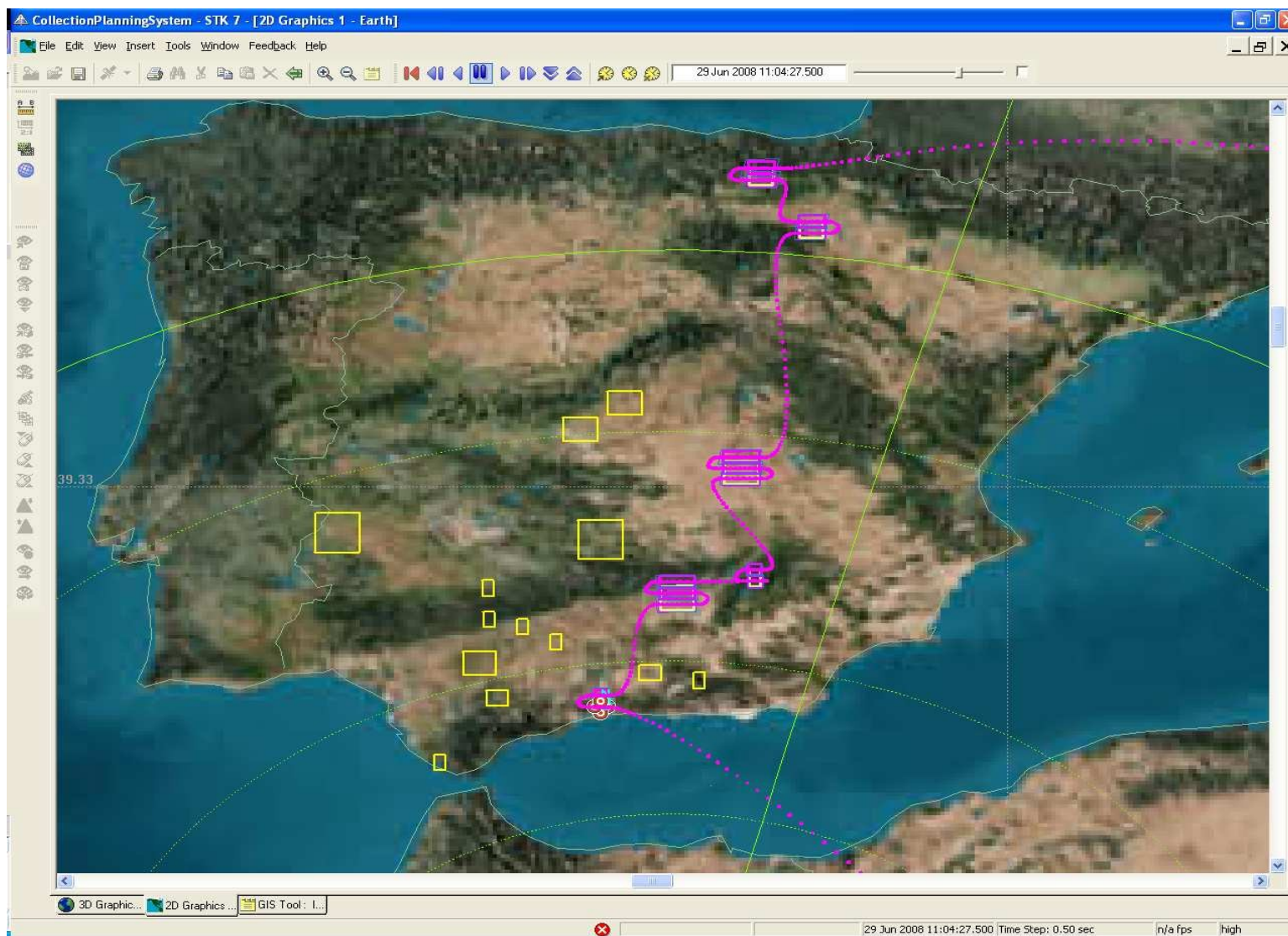


# Pass 1: 27 June 2008

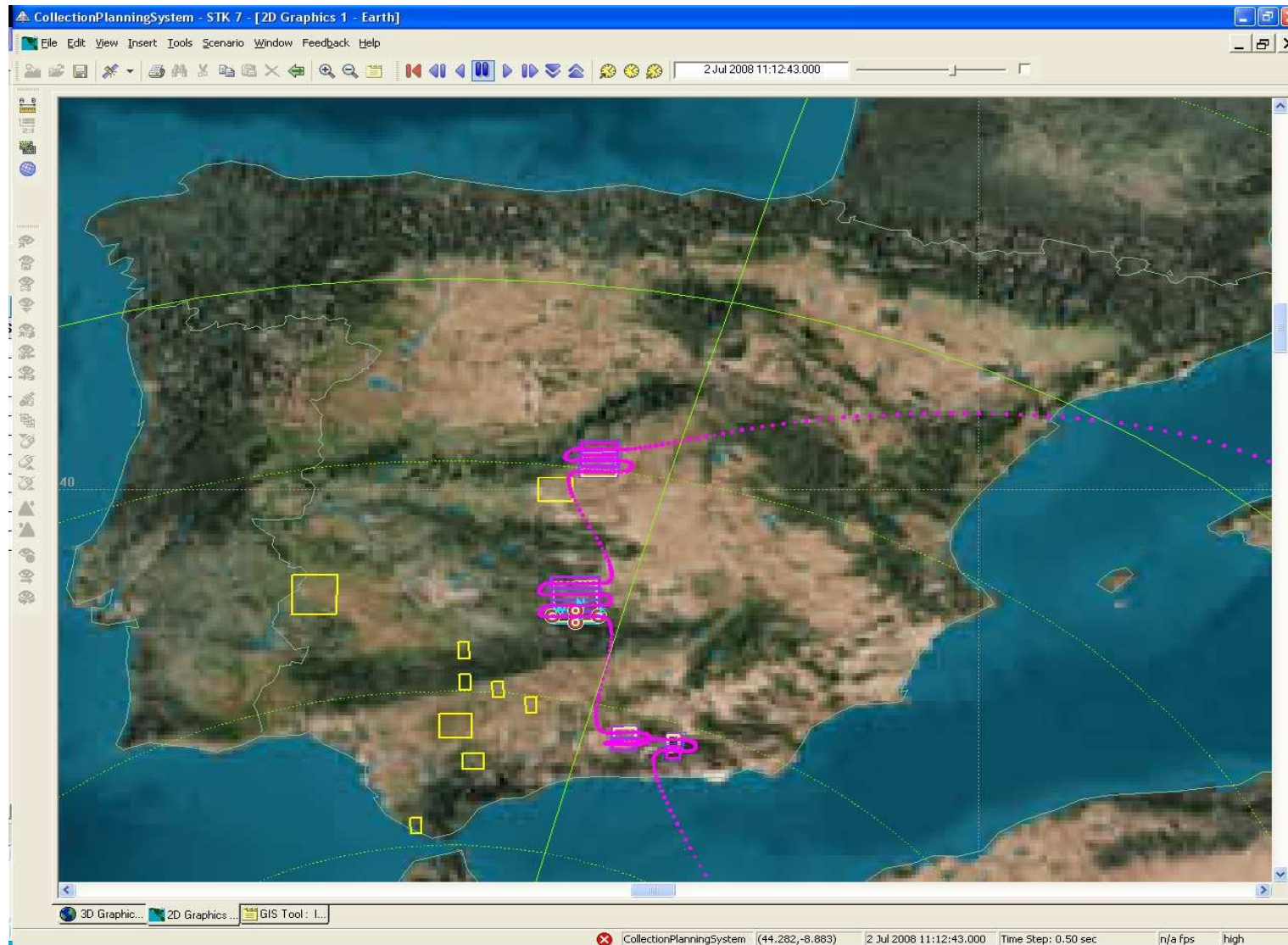




## Pass 2: 29 June 2008

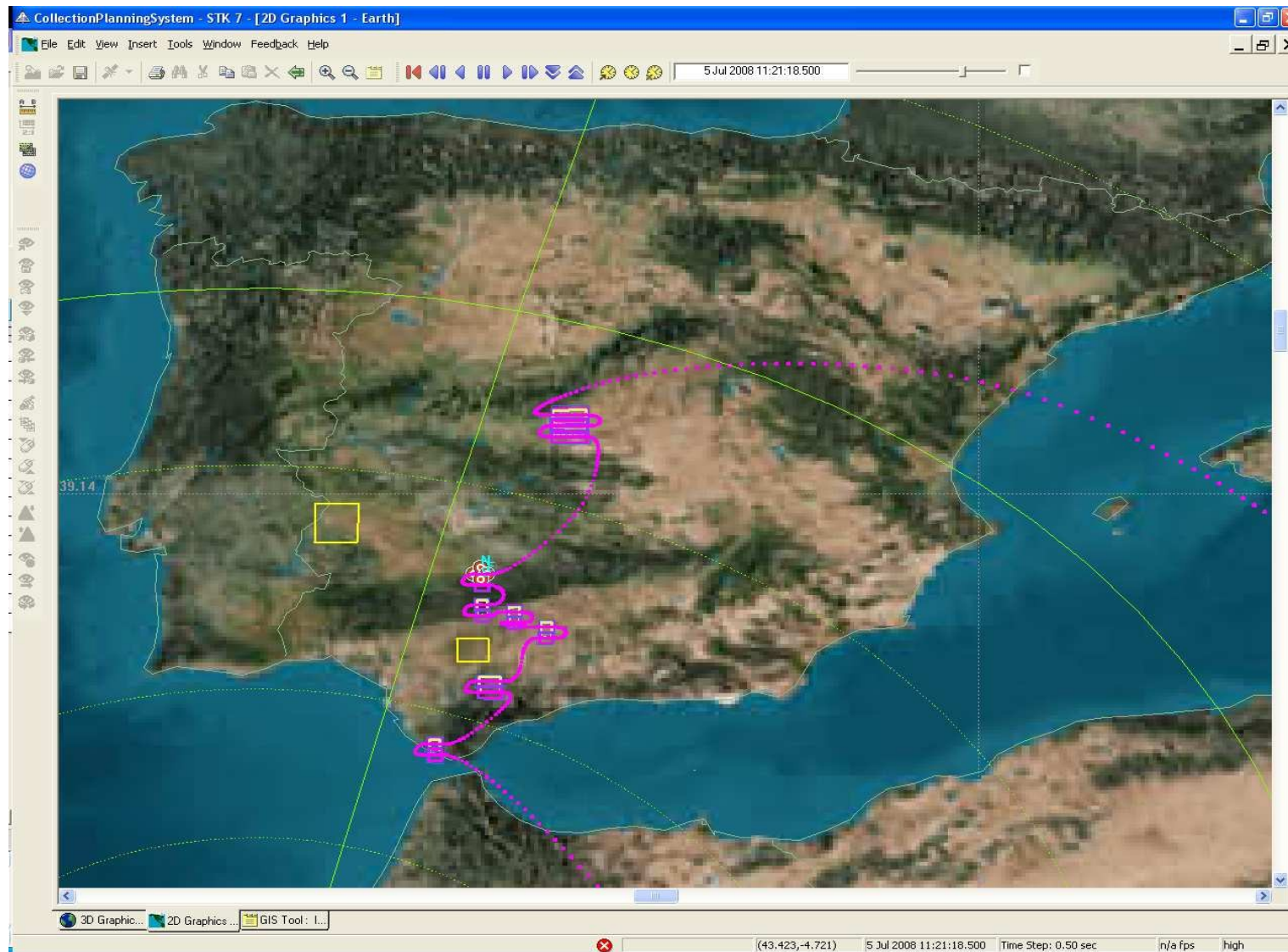


## Pass 3: 2 July 2008

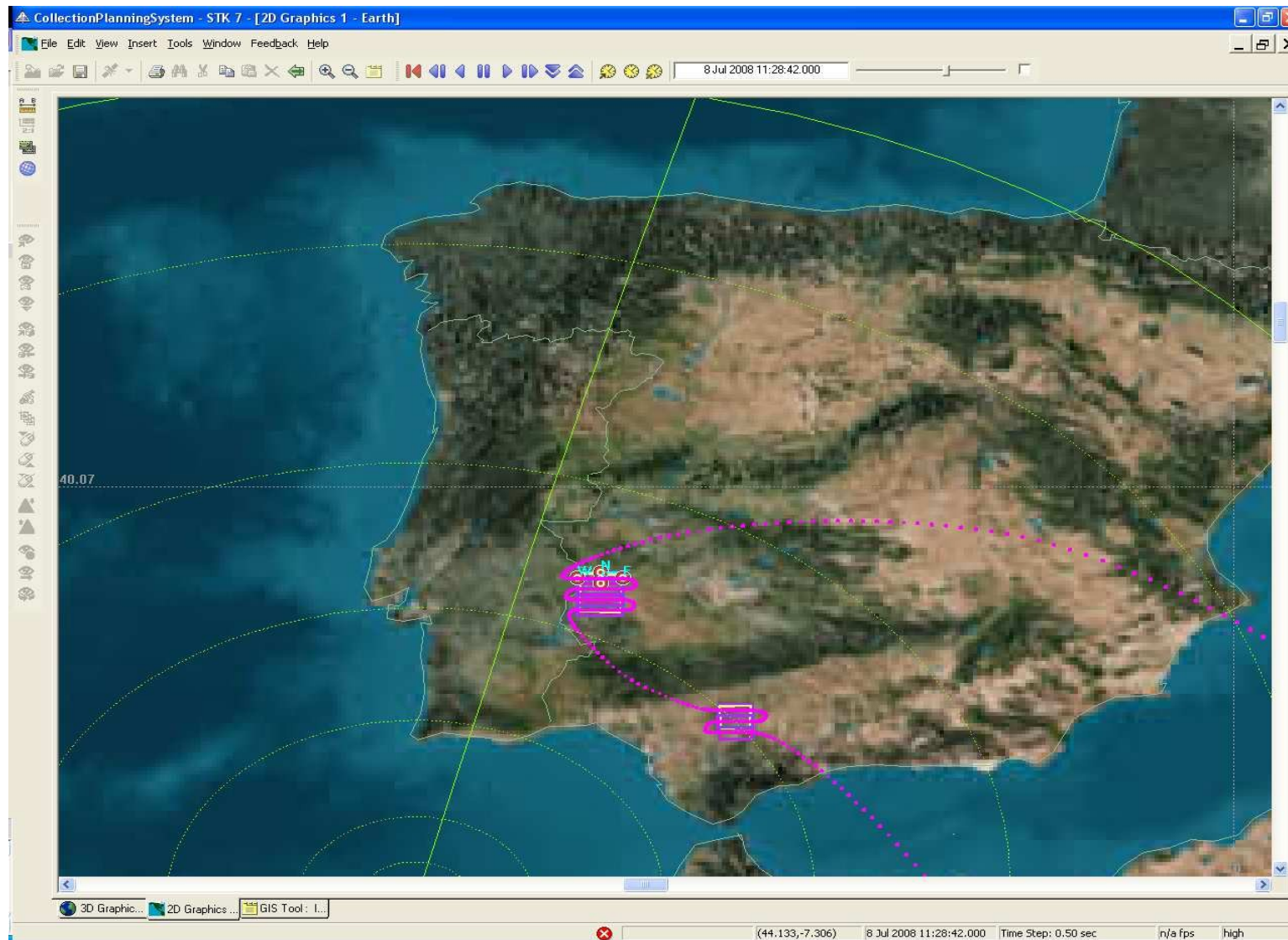




## Pass 4: 5 July 2008



## Pass 5: 8 July 2008





## Expected GeoEye-1 agility

Day of Pass	Areas acquired
27 June 2008	6,536 Km <sup>2</sup>
29 June 2008	5,090 Km <sup>2</sup>
2 July 2008	5,060 Km <sup>2</sup>
5 July 2008	4,017 Km <sup>2</sup>
8 July 2008	4,124 Km <sup>2</sup>
<b>TOTAL:</b>	<b>24,827 Km<sup>2</sup></b>

- **5 passes to complete all 23 sites**
  - 12 days
  - No cloud cover impact considered
- **Elevation angle**
  - Requested 50°-90°
  - All images acquired 57°-90° (GSD between 50-58 cm)
- **Acquired 52% of Km<sup>2</sup> more**
  - Overlap between strips
  - Unordered area versus swath size

# New product approach

- **One overall concept: simplify**
- **Two product classes:**
  - 50 cm
  - 1 m
- **New Product Names**
  - Geo <sup>TM</sup> : cost-effective geometrically corrected images
  - GeoProfessional <sup>TM</sup> : imagery orthorectified to specified map accuracy
  - GeoStereo <sup>TM</sup> : stereo imagery
- **All products are available as panchromatic, multispectral, bundle and pan-sharpened color imagery**

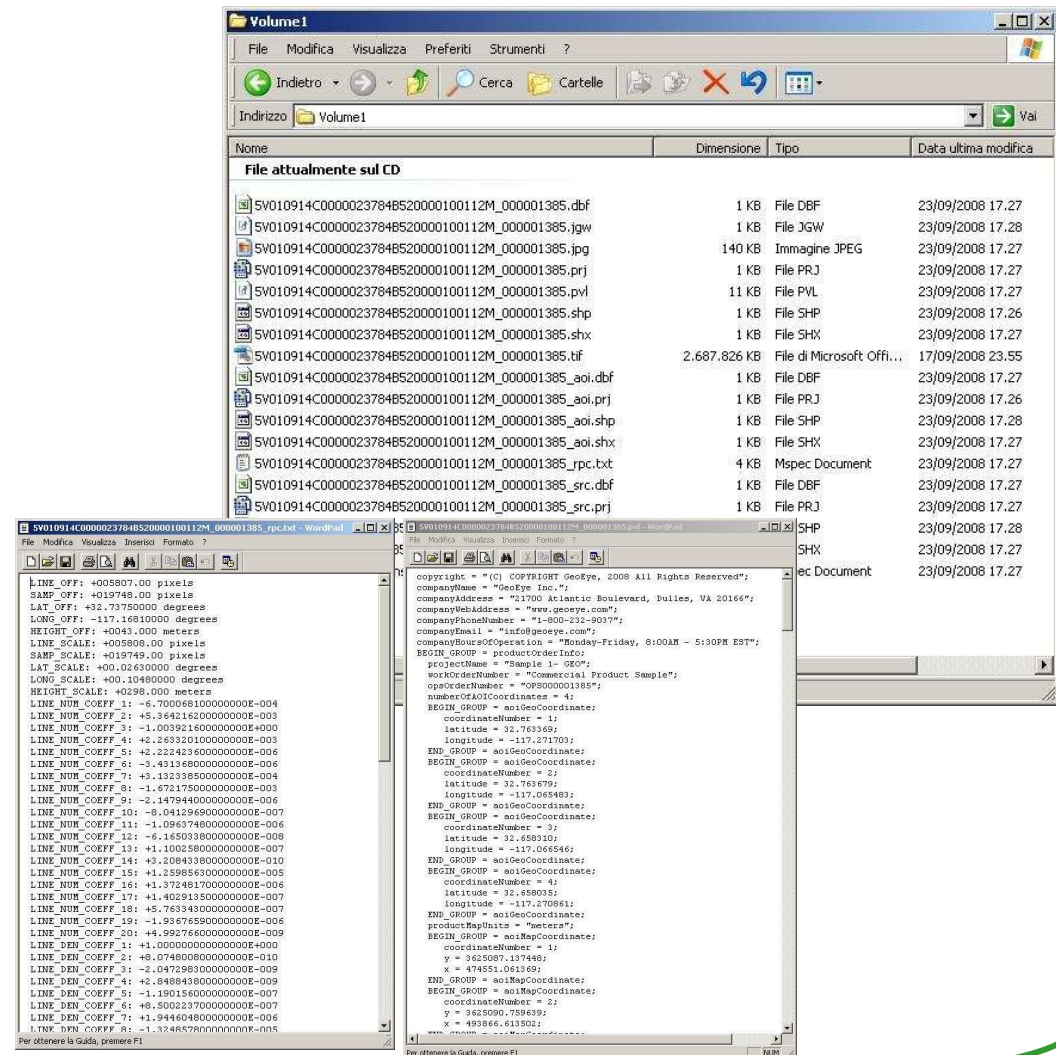


# Products

Processing level	Notes	Product line	CE90%	Orthorectified	Target elevation angle	Mosaics available
Geo	Including RPCs	50 cm / 2 m	5 m	No	> 60°	No
		1 m / 4 m	15 m			
Geo Professional		50 cm / 2 m	10 m	Yes	> 66°	Yes
		1 m / 4 m				
	Precision (GCPs required)	50 cm / 2 m	4 m		> 72°	
		1 m / 4 m				
Geo Stereo		50 cm / 2 m	4 m	No	> 60°	No
		1 m / 4 m	15 m			
	Precision (GCPs required)	50 cm / 2 m	2 m			
		1 m / 4 m	4 m			

# IP software COTS

- All packages (PCI, Erdas, SocetSet, ENVI, Intergraph, Remote View, Silver Eye, ...) that currently process IKONOS RPC data in text format will be able to process GeoEye-1 imagery with the IKONOS-format text RPC file
- GeoEye is working also on a new metadata format
- Working with major IP vendors to ensure full compatibility





# Thank you!

