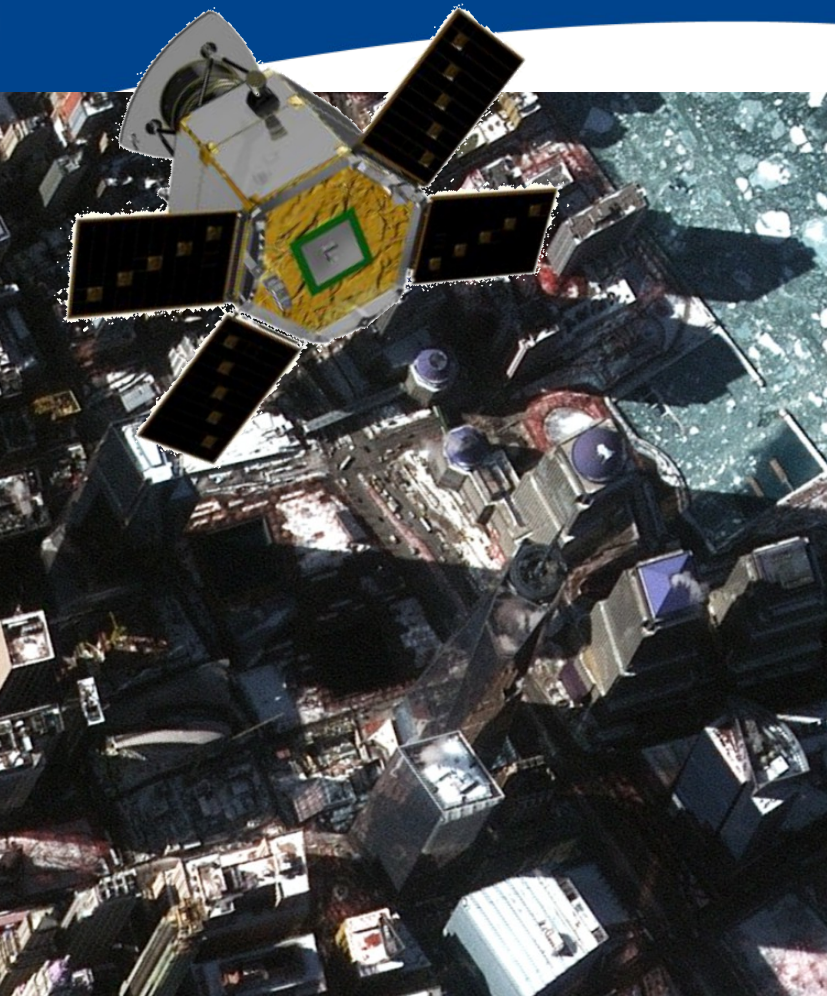

DEIMOS-2
Becomes Operational: Very High Resolution with a Premium Service

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CEO

DEIMOS Imaging (Spain)

INSPIRE Geospatial World Forum

Lisbon, 28/05/2015

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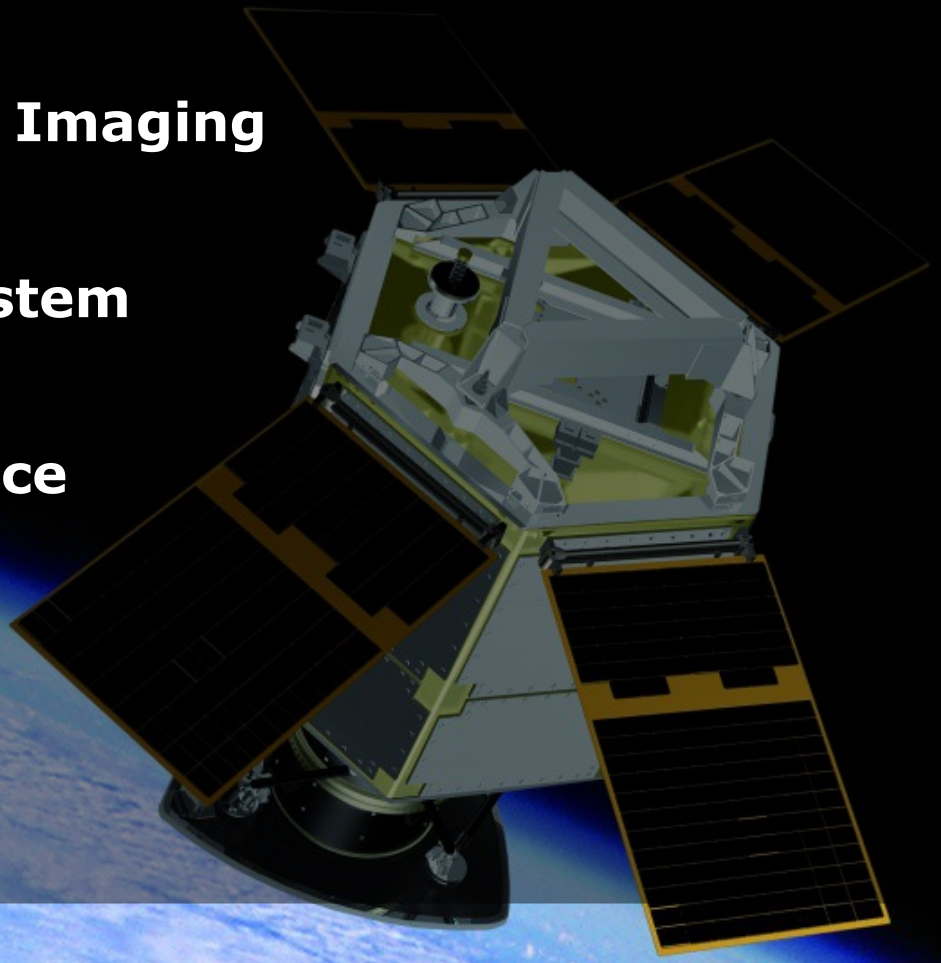
- ELECNOR DEIMOS Imaging
- The DEIMOS-2 System
- The PanGeo Alliance
- Conclusions

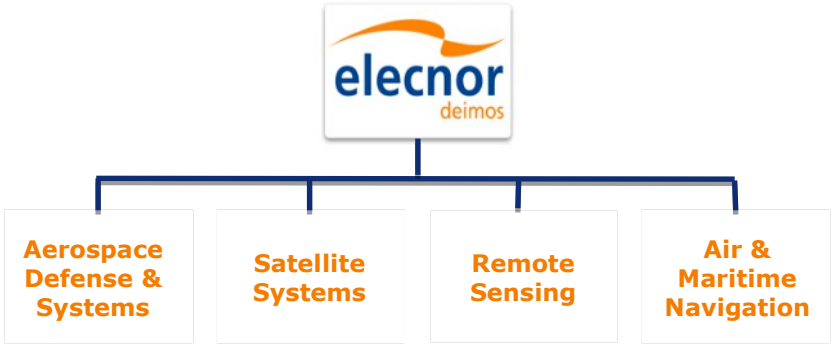


The Four Towers of Madrid, the tallest buildings in Spain
DEIMOS-2, August 2014
75cm Pan-Sharpened

1 ELECNOR DEIMOS Imaging

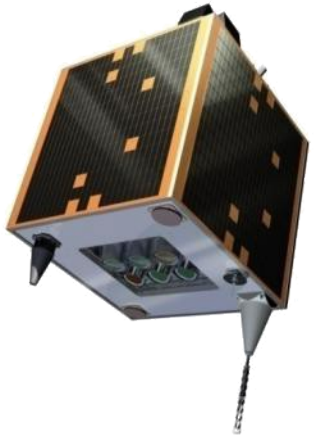
ELECNOR DEIMOS

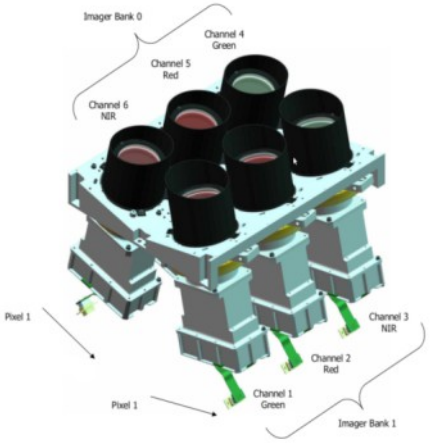
- **ELECNOR DEIMOS is the technology company of the ELECNOR Group** (one of the largest industrial groups in Spain, with 12,000 employees) operating in Aerospace & Defence, IT Systems, Telecommunication Networks, Security and Technological Infrastructures
- 6 companies in 4 countries, a staff of 400 engineers and 50 M€ of turnover in A&D in 2014
- **Relevant Involvement in the Majority of ESA Programs and Missions:** EO (Earth Explorers, Sentinels, MTG, Copernicus), GNSS (Galileo, EGNOS), Launchers (IXV), Exploration (Rosetta, BepiColombo, Exomars), SSA
- Involvement in **all phases of space missions** (design to operations)
- **DEIMOS-1**, owned by ELECNOR DEIMOS, is the first Spanish EO satellite
- Awarded "**Best Newcomer Earth Observation Operator**" at the Euroconsult's Earth Observation Business Week in Paris, in September 2013

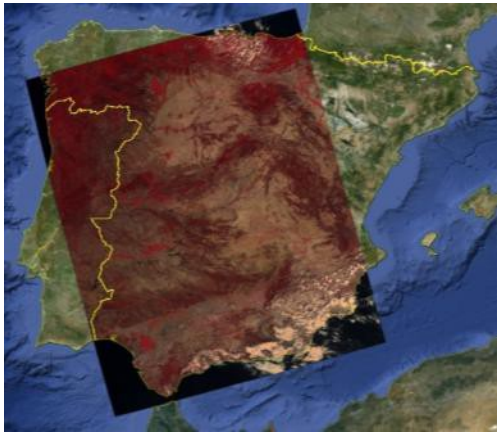


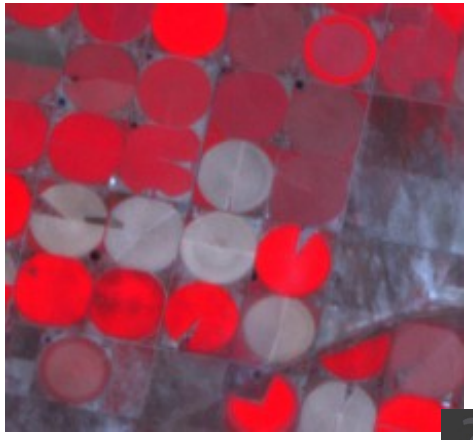
The DEIMOS-1 Earth Observation System

- **First Spanish Earth Observation satellite**
- **Owned and operated by DEIMOS Imaging (Spain), with 24/7/365 service**
- Member of the Disaster Monitoring Constellation **(DMC)**
- **Launched in 2009** on a 650-km ascending SSO, with lifetime > 10 years
- **Very wide swath (650km) coupled with high resolution (22m GSD @ 10 bits)**
- **Three spectral bands (R,G,NIR)** similar to Landsat to assure continuity with existing tools and harmonization with historical data
- **Synthetic blue band** can be generated for natural-color imagery
- System capacity > 5,000,000 km²/day, with **3-day average revisit time worldwide**
- Two ground stations (Spain+Norway) assure **one contact with up/download per orbit**

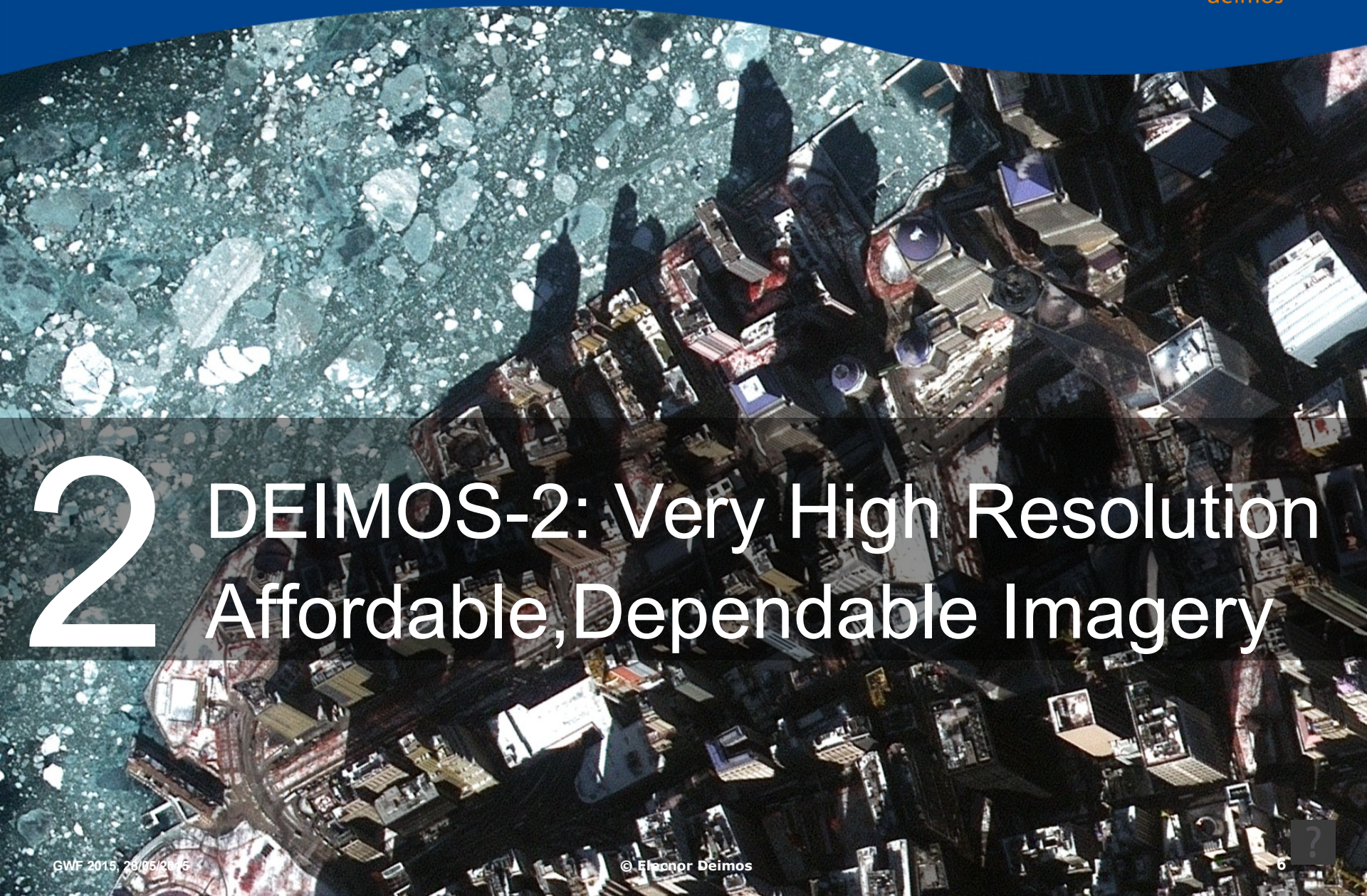








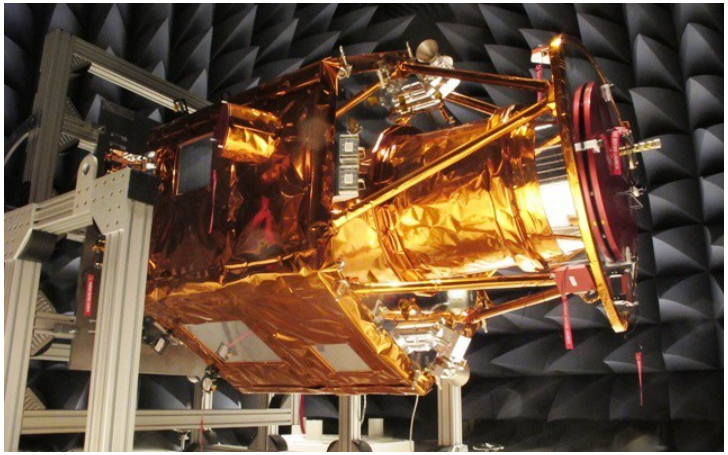
Lower Manhattan, New York (US)
DEIMOS-2, February 2015
75cm Pan-Sharpened

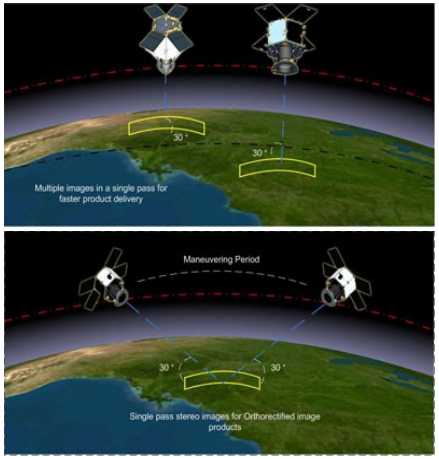


2 DEIMOS-2: Very High Resolution Affordable,Dependable Imagery

The DEIMOS-2 Earth Observation System

- **Very-high resolution (1m GSD Pan, 4m MS) multispectral optical satellite**
- Main product: **75-cm pan-sharpened**
- Developed by ELECNOR DEIMOS (Spain) with SATREC-i (South Korea)
- End-to-end system designed for a **cost-effective and highly responsive service**
- Push-broom camera with 5 spectral channels (1 pan, 4 MS bands: R, G, B, NIR) @ 10 bits
- **12/24 km swath**, stereo-par capability, **system capacity >150,000 km²/day**
- Agile platform with ±45º off-nadir tilting capacity
- 2-day average revisit time worldwide
- **Multiple ground stations** (2 in Spain+Sweden+Canada) assure **at least one contact per orbit**, with each satellite, with telecommand upload and telemetry & data download





DEIMOS-2 Business Concept

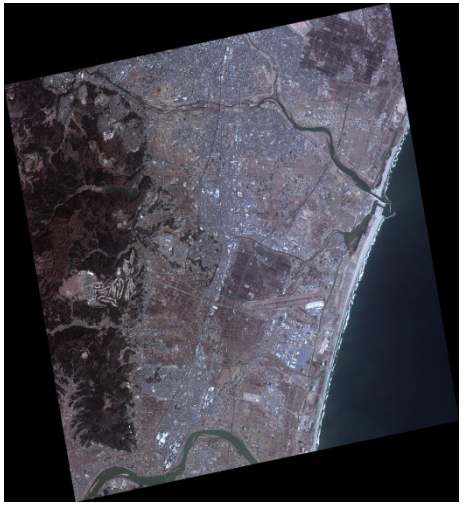
"Cost-effective, dependable and submetric imagery, coupled with highest-quality end-to-end service to customers"

- 75 cm/pixel - the highest-resolution, fully-private satellite in Europe
- **Dependable** - no outside stakeholders: we can assure acquisitions & confidentiality
- Highest quality service to the customers:
  - **24/7 service** for ordering, tasking, downloading, processing, delivery
  - **Tasking** up to few minutes before acquisition
  - **Download** within minutes from acquisition
  - Fast **processing and delivery**
- Total control over the Ground Segment:
  - Possibility of delivering **fully-customised Direct or Virtual Receiving Stations**
- Very **cost-effective** service

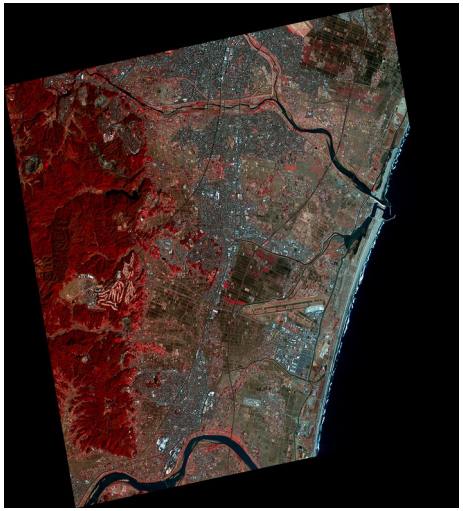
DEIMOS-2- Standard Products

Product Type	Name	Description
Pan-sharpened	PSH	Pan-sharpened 4 bands
	PS3	Pan-sharpened 321 Natural Colors
	PS4	Pan-sharpened 432 False Colors
Panchromatic	PAN	Panchromatic only
Multispectral	MS4	4 Multispectral files only
Bundle	PM4	Bundle (Pan +Multispectral)

DEIMOS-2 L1B (non-ortho) PAN



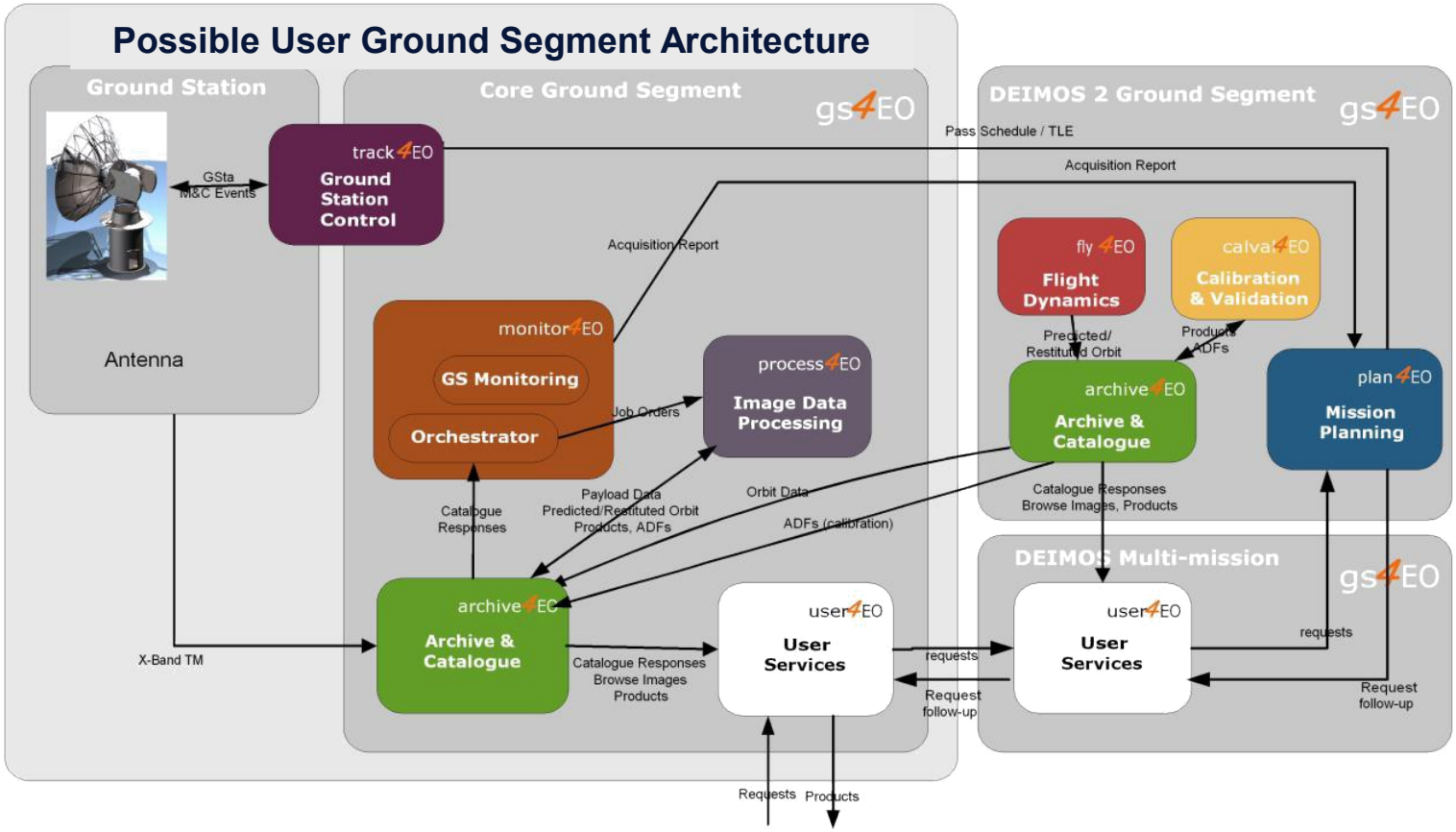
DEIMOS-2 L1C (ortho) PS3



DEIMOS-2 L1C (ortho) PS4

Direct Receiving Station

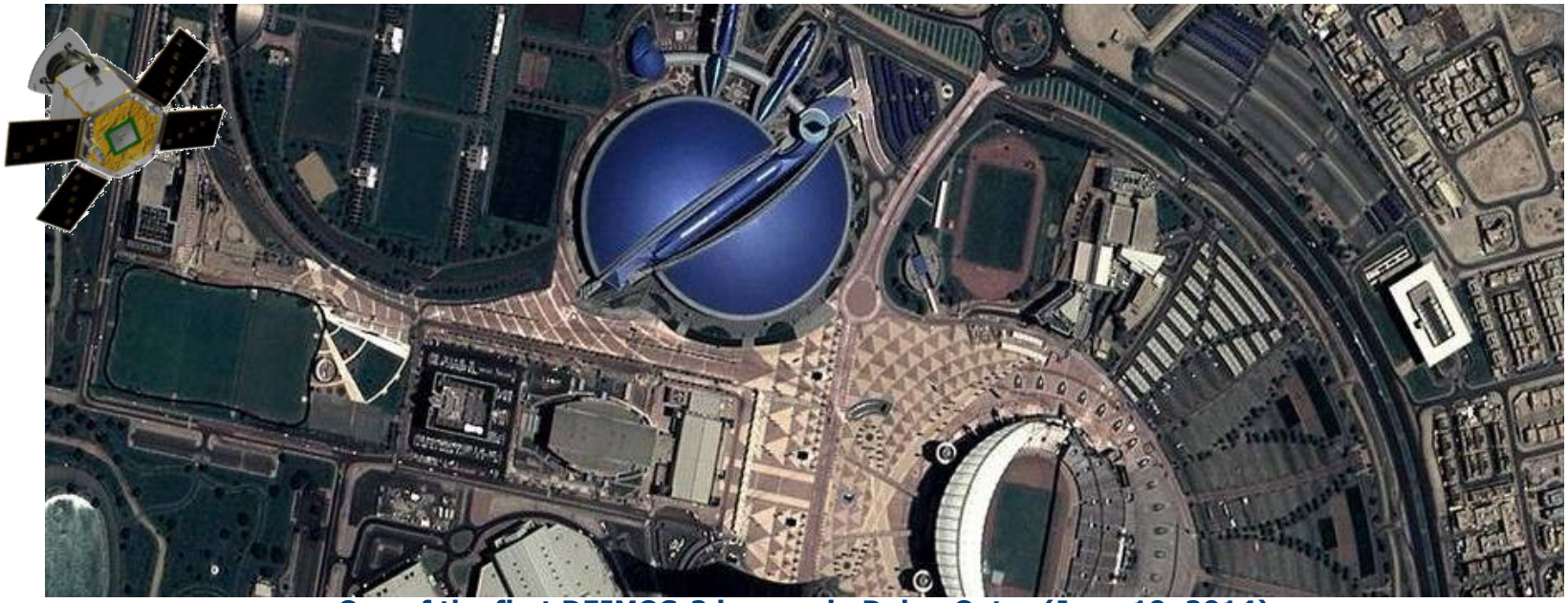
- **Direct Receiving Station terminal based on gs4EO® allows the reception and processing of DEIMOS-2 data in Customer's premises**



DEIMOS-2 Operational Status

DEIMOS-2

- **Launch:** June 19, 2014 from Yasni (Russia)
- **Orbit**: 620-km ascending sun-synch with 10:30 local time at node
- **First Image:** 12 hours after launch
- **IOC**: Start of pre-operational commercial activities: November 1st, 2014
- **FOC**: Start of full-fledged operational commercial operations: May 2015



One of the first DEIMOS-2 images in Doha, Qatar (June 19, 2014)

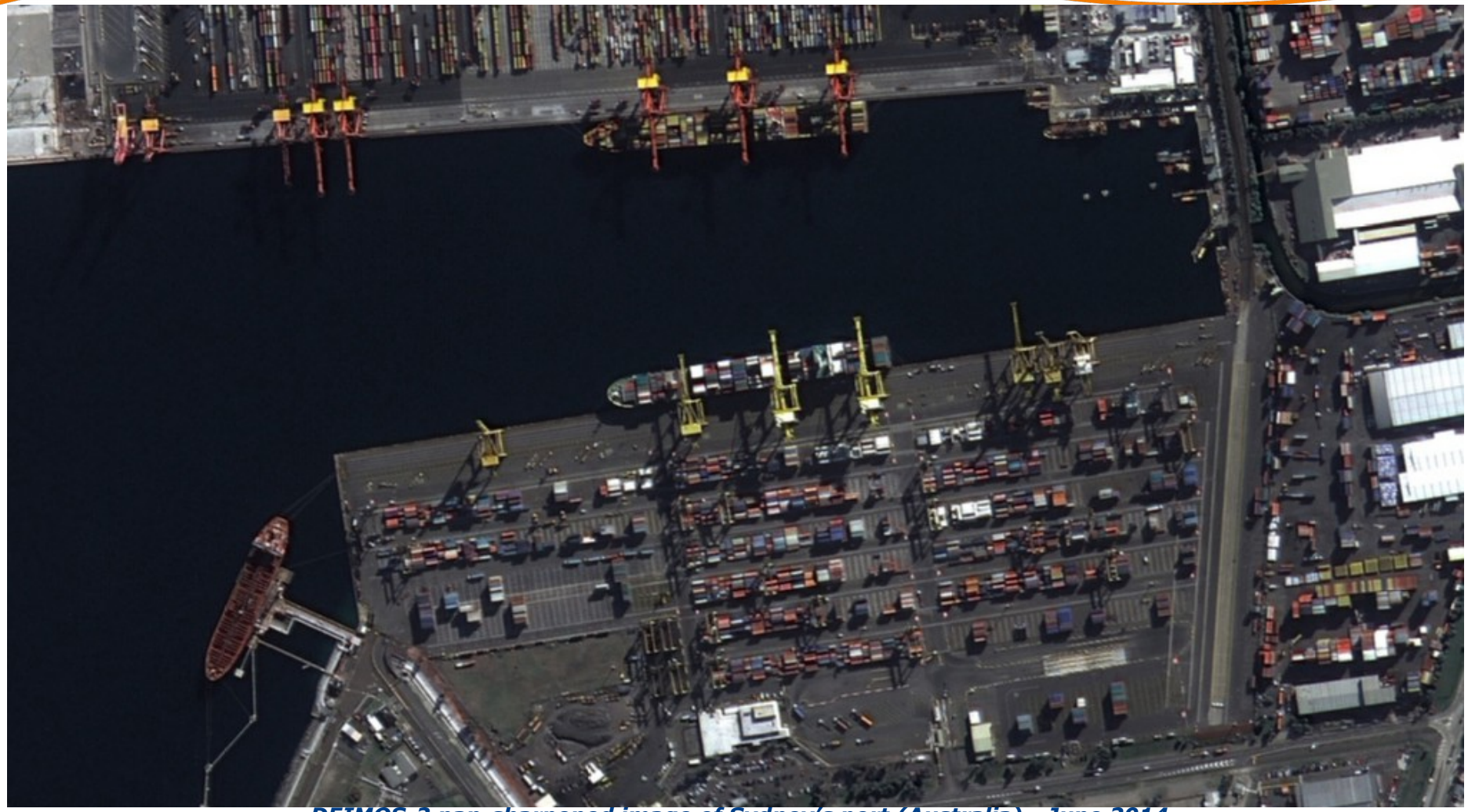
Examples of DEIMOS-2 Imagery
Civil Constructions in Madrid, Spain

DEIMOS-2 pan-sharpened 20x10 km mosaic of Madrid (Spain) with four main football stadiums- August 2014

Examples of DEIMOS-2 Imagery
Industrial Activity in Baotou, China

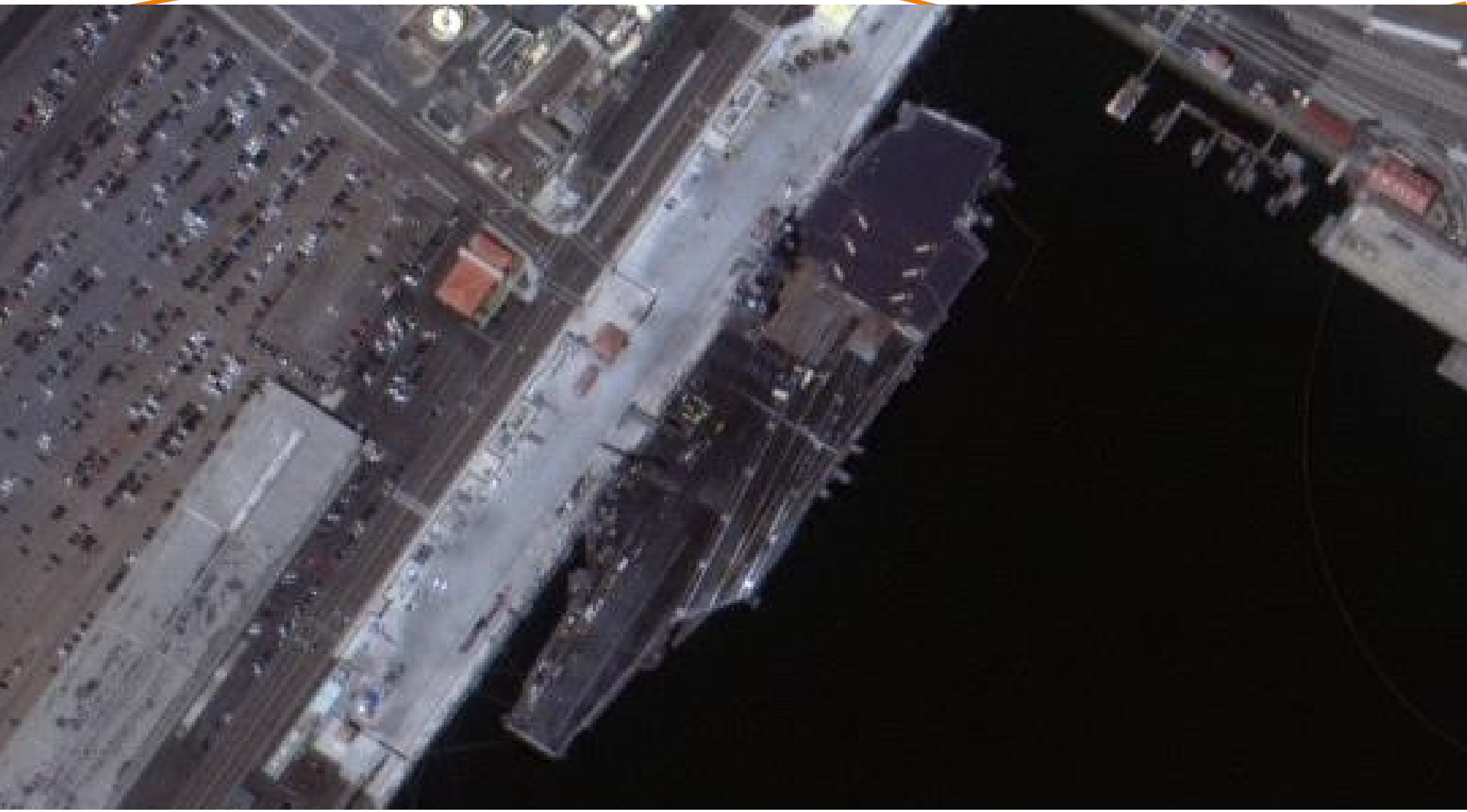
DEIMOS-2 pan-sharpened image of the Baotou industrial complex (China) - July 2014

Examples of DEIMOS-2 Imagery
Harbor Activity in Sydney, Australia



DEIMOS-2 pan-sharpened image of Sydney's port (Australia) - June 2014

Examples of DEIMOS-2 Imagery
US Aircraft Carrier Carl Vinson, San Diego, US

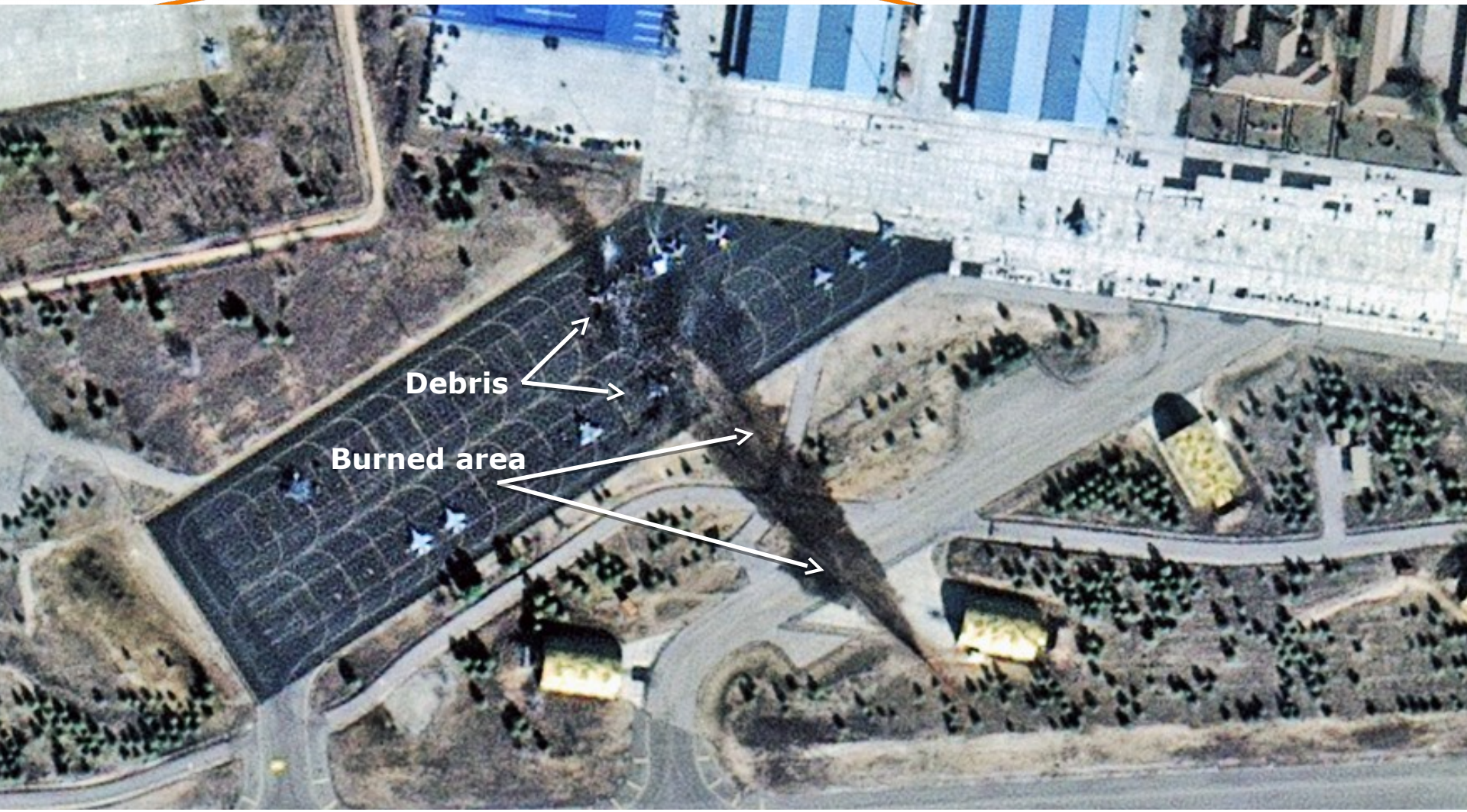


DEIMOS-2 pan-sharpened image of CVN-70 USS Carl Vinson, San Diego (CA) - July 2014

Examples of DEIMOS-2 Imagery
Launch prep for Orion first mission, Cape Canaveral

DEIMOS-2 pan-sharpened images of Launch Complex 37, Cape Canaveral (FL) - December 2014

Examples of DEIMOS-2 Imagery
F-16 crash in Los Llanos Air Force Base, Spain



DEIMOS-2 pan-sharpened images of Los Llanos Air Force Base (Spain) – January 27, 2015

Examples of DEIMOS-2 Imagery
Ebro river floodings in Spain

BEFORE: Google Earth – September 4, 2011

Examples of DEIMOS-2 Imagery
Ebro river floodings in Spain

AFTER: DEIMOS-2 pan-sharpened images of Ebro river floodings near Zaragoza (Spain) – February 25, 2015

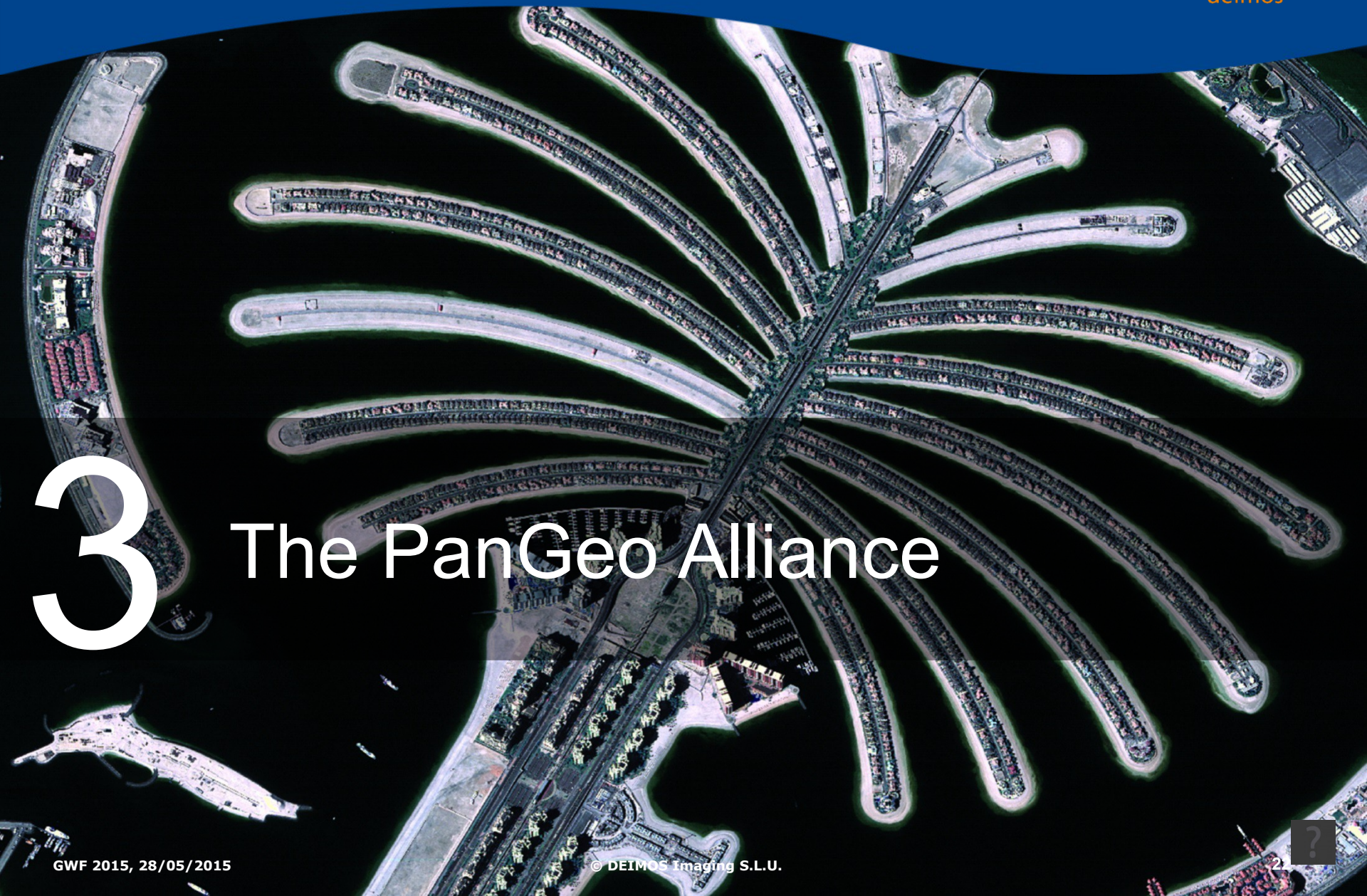
Examples of Change Detection with DEIMOS-2
Limani – Area 4

***BEFORE*: Google Earth – October 30, 2013**

Examples of Change Detection with DEIMOS-2
Limani – Area 4

***AFTER*: DEIMOS-2 pan-sharpened image (75cm/pixel) of Limani (Cameroon) – January 31, 2015**

The Jumeirah Palm Island, Dubai, UAE
DubaiSat-2, March 2014
1m Pan-Sharpened



3 The PanGeo Alliance

The PanGeo Alliance

PanGeo Alliance:
A Unique Earth Observation Constellation

The PanGeo Alliance is the first global alliance of Earth Observation satellite operators. With four members, it provides access to a unique fleet of 9 Earth Observation satellites, which will greatly expand in the next couple of years.

The PanGeo Alliance satellite fleet provides multispectral imagery in a wide range of resolutions (from 20m to 75cm per pixel), and a daily global imaging capability.

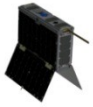
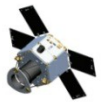
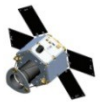
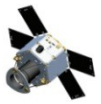
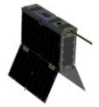
All PanGeo Alliance members can provide access to the full products portfolio of the whole satellite fleet.

PanGeo multisatellite mission planning allows to assess imaging opportunities for all satellites in the alliance, and to directly request imaging tasking to the satellite operator.

PanGeo coordinates access to the archives of all members, so that each member can see what is available and directly request images from the entire Alliance archive.

Customers can benefit of a global network of resellers and of a unified access point to new tasking and archive imagery of the complete fleet.

The PanGeo Alliance

9 satellites now >20 to be launched	Medium Resolution 1 satellite in orbit >8 to be launched		High Resolution 3 satellites in orbit >10 to be launched			Very High Resolution 2 satellites in orbit 1 to be launched			AIS 3 satellites in orbit	
PanGeo ALLIANCE										
Deimos 1 Elecnor Deimos	**Perseus 0** Dauria	**Auriga** Dauria	**DubaiSat 1** EIAST	**TH-1-01/02** Beijing Space Eye Innovation	**Deimos 2** Elecnor Deimos	**DubaiSat 2** EIAST	**KhalifaSat** EIAST	**Dauria DX** Dauria	**Perseus M 1-2** Dauria	
Country	Spain	US/Russia	US/Russia	UAE	China	Spain	UAE	UAE	US/Russia	US/Russia
Type	Optical MR	Optical MR	Optical HR	Optical HR	Optical HR	Optical VHR	Optical VHR	Optical VHR	AIS	AIS
Launch	2009	2015	2017	2009	2010, 2012	2014	2013	2017	2014	2014
Local Time AN	10:30	10:30	10:30	10:30	10:30	10:30	22:00	22:00	10:30	10:30
Lifetime	10 years	>5 years	>5 years	>5 years	7 years	7 years	7 years	7 years	>5 years	>5 years
Agility	-	±25°	±25°	±45°	±30°	±45°	±45°	±45°	-	-
Spatial Resolution	20 m	20 m	2.5 m	2.5 m	2.0 m	0.75 m	0.75 m	0.5 m	-	-
Spectral Bands	3	3	5	Pan + 4	Pan + 4	Pan + 4	Pan + 4	Pan + 4	-	-
Swath	650 km	220 km	25 km	20 km	60 km	12 / 24 km	12 / 24 km	16 km	-	-

4 Conclusions

VHR Constellation service already available

- DEIMOS-1 operational since 2009
- DubaiSat-2 launched in November 2013, already operational
- DEIMOS-2 launched in June 2014, commercially available since November 2014
- **Start of operational VHR Constellation commercial operations: January 2015**
- **Daily revisit time worldwide, with 75-cm cost-effective, dependable imagery**
- Available through Deimos Imaging and all **PanGeo Alliance** members

DUBAISAT-2 First Official Image, the Burj Khalifa building (Dubai, UAE) © EIAST, All rights reserved

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