

Data Quality of Deimos-1 & UK-DMC2 Imagery for the Monitoring of 2011 US Crop Season

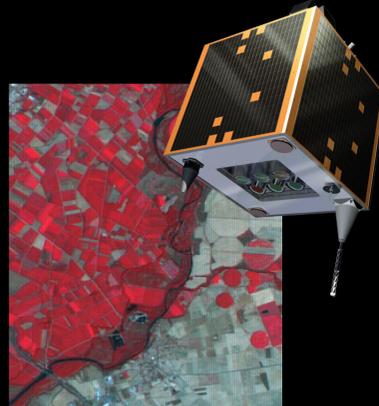
Fabrizio Pirondini, Mónica Díez, Alfredo Romo, Cristina Moclan, Jorge Gil (Elecnor Deimos Imaging)

The DEIMOS-1 Earth Observation System

- Fully owned and operated by Elecnor Deimos Imaging
- Member of the Disaster Monitoring Constellation
- Launched in July 2009, operational since March 2010
- Sun-Synchronous orbit at 650 km
- Lifetime: 5 years nominal, >7 years expected

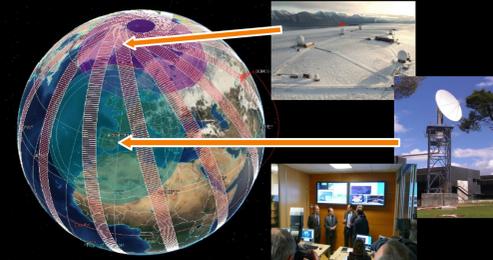
The Satellite

- Built by SSTL (UK)
- Mass: 100 Kg; Nadir-pointing platform
- 8-Gb on-board solid state recorder
- X-, S-band antennas for data transmission, TM/TC



The Payload

- Dual-bank pushbroom CCD, 3 cameras per bank
- 3 bands matching Landsat's NIR, R, G channels
- Swath: >620 km
- Spatial resolution: 22 m GSD at 10 bits
- Capacity: >5 million km² par day



The Ground Segment

- The 2-station ground segment (Norway + Spain) is a key asset of DEIMOS-1, allowing to download data at each orbit
- Elecnor Deimos premises in Boecillo (Spain) include a mission control centre (with a 5-m antenna) integrated with a complete user segment for data processing, archiving and dissemination
- An advanced mission planning system (**PlanEO**), fully developed within Elecnor Deimos, allows the optimisation of large, multi-satellite coverage campaigns

The Campaign for the Monitoring of 2011 US Crop Season

- Elecnor Deimos Imaging has been the data provider for the USDA contract for the provision of satellite imagery for the US 2011 Crop Season, awarded to Astrium GEO-Information Services North America
- Elecnor Deimos Imaging provided DEIMOS-1 data, complemented with data from its twin satellite UK-DMC2, owned by DMCii (around 80% of all delivered data is from DEIMOS-1, with 20% from UK-DMC2)

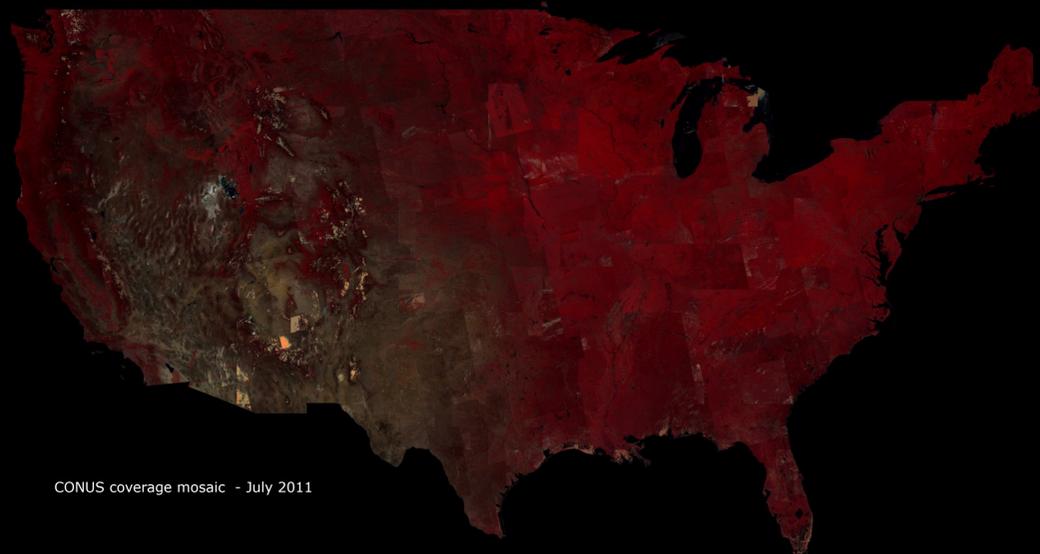
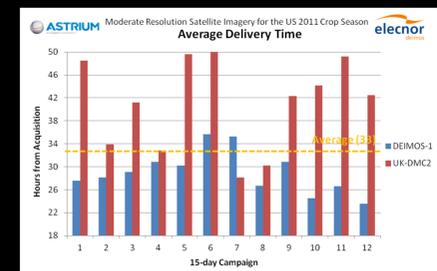
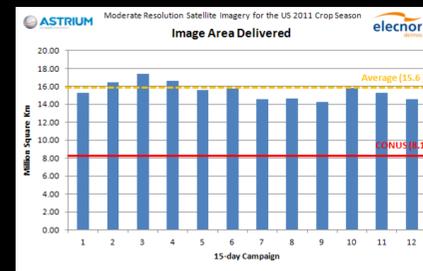
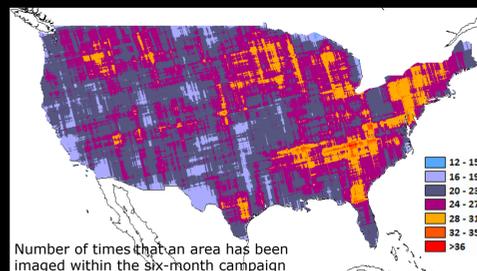
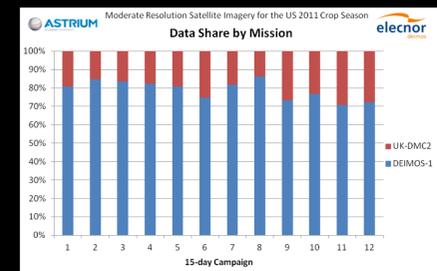
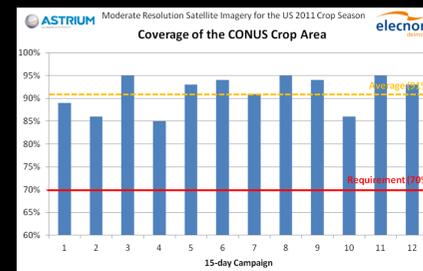
Main contract requirements:

- One complete coverage of CONUS every 15 days from May to October 2011, 70% cloud-free & with daily acquisitions
- All data shall be delivered, orthorectified, within 72 hr from acquisition
- All data shall be orthorectified with <1 pixel GSD accuracy

Campaign result:

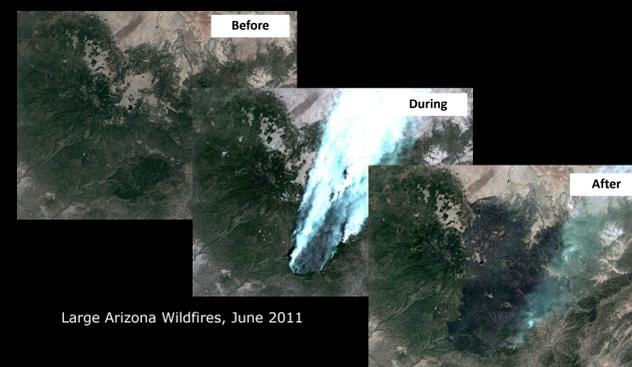
- All requirements have been met (and exceeded)
- More than 186 MKm² have been delivered (equivalent to 23 times the area of the Lower 48), of which 150 MKm² are cloud-free
- Average delivery time of the orthorectified images: 32 hours from acquisition (including weekends and holidays)

	DEIMOS-1	UK-DMC2	Total
Acquired images	1,052	549	1,578
Delivered images	962	500	1,462
Delivered images < 72h	959	494	1,454
Delivered Km2	146,879,759	39,156,063	186,035,822
Cloud-free Km2	117,852,981	32,785,188	150,638,170
Cloud-free Km2 (%)	78.2%	21.8%	100%
Average delivery time (h)	29.0	40.2	32.5



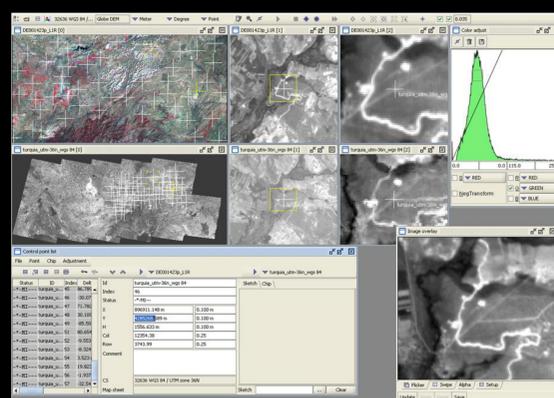
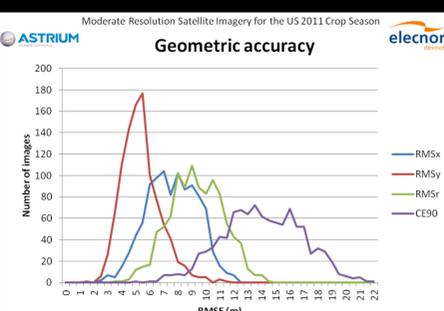
Support to Crisis Management

- Elecnor Deimos Imaging has provided numerous images as support to crisis and disaster management (floodings, fires, tornadoes)
- For this use, natural color images can be quickly generated through the addition of a synthetic blue band



Geometric Quality

- GLS2000 is used as the reference dataset, together with SRTM v3 DEM
- The image orthorectification chain is improved through the generation of mosaics from GLS2000 reference data, in order to streamline GCP collection and processing



- Validation of geometric quality is performed on every image to assure that CE90% is below pixel resolution
- Sub-pixel accuracy has been achieved on 100% of delivered images, with average RMSE near 1/2 pixel

Radiometric Quality

- A radiometric optimization is applied before the delivery of each image
- The 16-bit histograms are analyzed, and optimally scaled to produce 8-bit images
- Optimization is computed by defining a minimum and maximum value of useful data within the scene, in order to obtain more contrast while maintaining radiometric quality in 8-bit images

