Contributions of Airbus Defence and Space to Copernicus and GEOSS

Geospatial Industry Forging Ties with GEOSS: A Value Proposition Dialogue Forum

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Geospatial World Forum - 05 May 2014

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Outline

1. **Airbus Defence and Space**
2. **Data Synergies for GEOSS**
3. **Applications examples**
4. **Challenges and Opportunities**

Airbus Defence and Space: Market leading products

CASSIDIAN
AN EADS COMPANY

AIRBUS MILITARY

ASTRIUM
AN EADS COMPANY

→

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Airbus Defence and Space: Geo-Intelligence programme line

AIRBUS GROUP

Employees*: ~ 140,000
Revenues*: ~ € 56 bn

CASSIDIAN AN EADS COMPANY
AIRBUS MILITARY
ASTRIUM AN EADS COMPANY

Integration & Rebranding 2014

AIRBUS

Employees*: ~ 73,500
Revenues*: ~ € 39 bn

AIRBUS HELICOPTERS

Employees*: ~ 22,400
Revenues*: ~ € 6.3 bn

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Employees**: ~ 40,000
Revenues**: ~ € 14 bn

* in 2012
** estimate for 2014

Space Systems I Military Aircraft I Communication, Intelligence & Security I Electronics

- Geo-Intelligence
- SatComms
- Integrated Systems
- Secure Land Communications

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Airbus Defence and Space: Products & Services to Address Your Needs

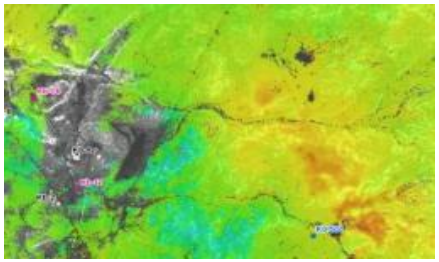
Optical Imagery

- Pléiades
- SPOT
- DEIMOS-1
- FORMOSAT-2

Software

- I4D
- Pixel & Street Factory
- SAFEcommand

Radar Imagery

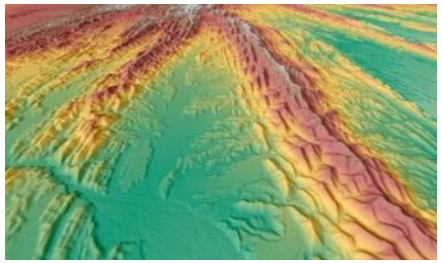


- TerraSAR-X
- TanDEM-X
- PAZ

Services

- GO Monitor
- GO Monitor Forest
- Global Seeps
- Geological Studies
- Maritime Surveillance
- Farmstar
- Surface Movement Monitoring
- Change Detection

Reference Layers



- GEO Elevation
- WorldDEM
- Ground Control Points
- SPOTMaps
- Airport Layer

Easy Access to Data

- Cloud Services
- GeoStore
- Direct Reception Services

A wide range of products and services to offer you the right solution for your needs and make your daily work easier

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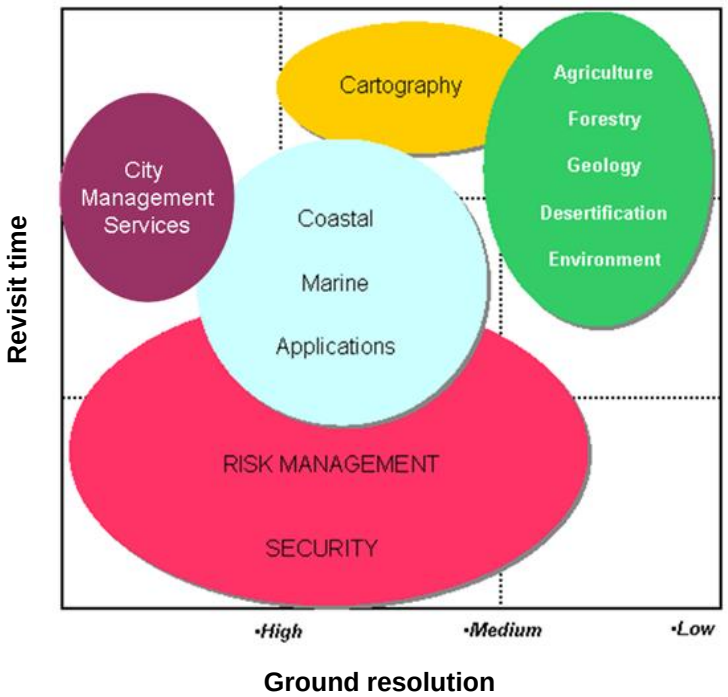
Current Situation

- The **Global Earth Observation System of Systems** addresses **nine areas** of critical importance to people and society, focusing on Disasters, Health, Energy, Climate, Water, Weather, Ecosystems, Agriculture and Biodiversity



Ground resolution and revisit time requirements in different application fields

- All these applications require various **scales** of analysis, from **global** to **local**
- As of today, institutional civil space-borne systems, such as Landsat or Sentinels, only provide up to High Resolution data, **Very High Resolution** data being available only through **commercial providers**
- For regional and local applications, **combination** of both types of resolution is strongly recommended, in order to achieve a **synergistic view** and to target local **details**

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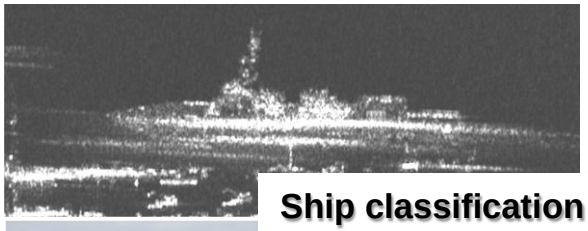
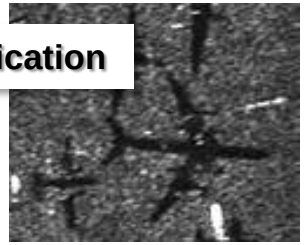
Synergies: C/X-Band Radar Benefits (1/2)

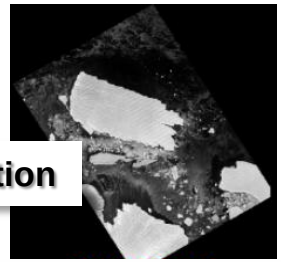


Ship classification

Airplane classification



Ice detection



Complementing Sentinel-1 with TSX/PAZ

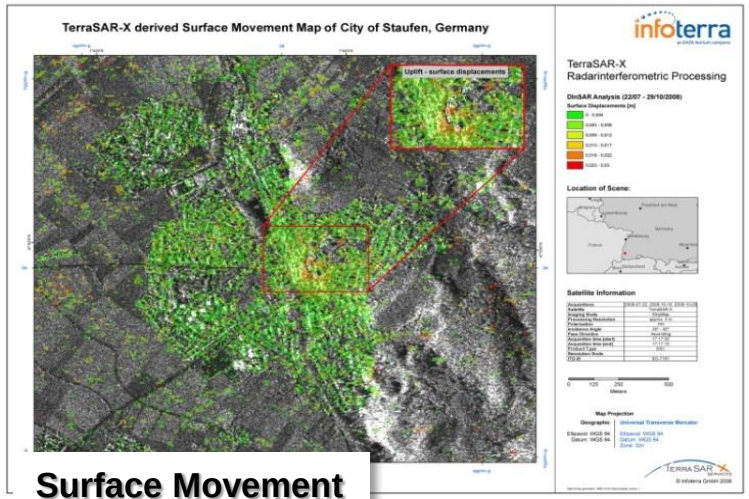
- **Combine** data-sets to meet revisit & coverage requirements (taking benefit of similar information content in C and X-Band)
- **Cross-cue** sensors using Sentinel-1 large area coverage with TSX/PAZ high resolution to identify small objects, e.g. icebergs, ridges, gaps in maritime environment or perform infrastructure integrity monitoring on land

Support to defence driven requirements:

- **Maritime:** ship detection, search & rescue
- **Terrestrial:** site monitoring (IMINT/GEOINT)

Support to non-defence driven requirements

- **Maritime:** ice monitoring/ship routing
- **Terrestrial:** law enforcement/risk awareness: oil/gas/minerals exploitation, infrastructure integrity



Surface Movement

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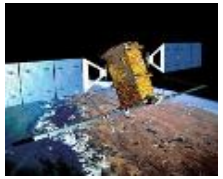
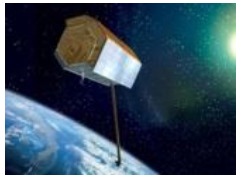
Synergies: C/X-Band Radar Benefits (2/2)

C/X Band Operational Benefit



Sentinel-1



TerraSAR-X/TanDEM-X/PAZ

	Complementarity Increased coverage and monitoring frequency	**Additional Information** Combining different resolution and C/X Band content
Ship	**Increased coverage and added capacity to survey large areas worldwide**	**Ship detection with Sentinel-1 and ship classification with TerraSAR-X in the same area**
Surface Movement	**Provision of a high monitoring frequency**	**Large scale movement rates (Sentinel-1) Small scale detailed movements (TerraSAR-X) Disaster Warning, Fracking, Pipeline monitoring**
GEOINT/ IMINT	**Increased scene density**	**Coherent Change Detection for smaller objects, detection of smaller targets**
Agriculture	**Increased coverage**	**Improves yield estimation**
Forest	**Quick coverage to cover in acquisition window**	**Detection of crown disturbance**

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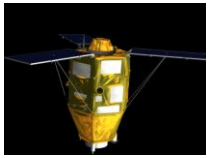
Synergies: Sentinel-2 / SPOT/Pleiades Benefits

S2/ S/P Operational Benefits

Sentinel-2



Pleiades/SPOT

	Complementarity Systematic coverage over large areas (S2) and high flexible tasking in VHR over hot spot areas (P/S)	**Additional Information** Combining different resolution allowing to address various scales (from national to local)
Risk & Emergency	**Base mapping with Sentinel-2 and damage assessment with Pleiades/SPOT**	**Information on houses and affected infrastructure**
Infra-structure	**Continental monitoring of sealing (Land Monitoring Core Service with Sentinel-2 and Urban Atlas (local urban mapping) with Pleiades/SPOT**	**High level of detail on buildings, roads, pipelines, railways etc.**
GEOINT/ IMINT	**Strategic monitoring with Sentinel-2 and tactical surveillance with Pleiades/SPOT**	**Detection of smaller targets**
Agriculture	**Regular frequent coverage on continental scale with Sentinel-2 and support of precision farming with Pleiades/SPOT**	**Support of single farmers / communities**
Forest	**Forest cover / type mapping with Sentinel-2 on national scale, stand-wise mapping over hot spots with Pleiades/SPOT**	**Detection of crown disturbance, logging impacts, policy enforcement in local areas**

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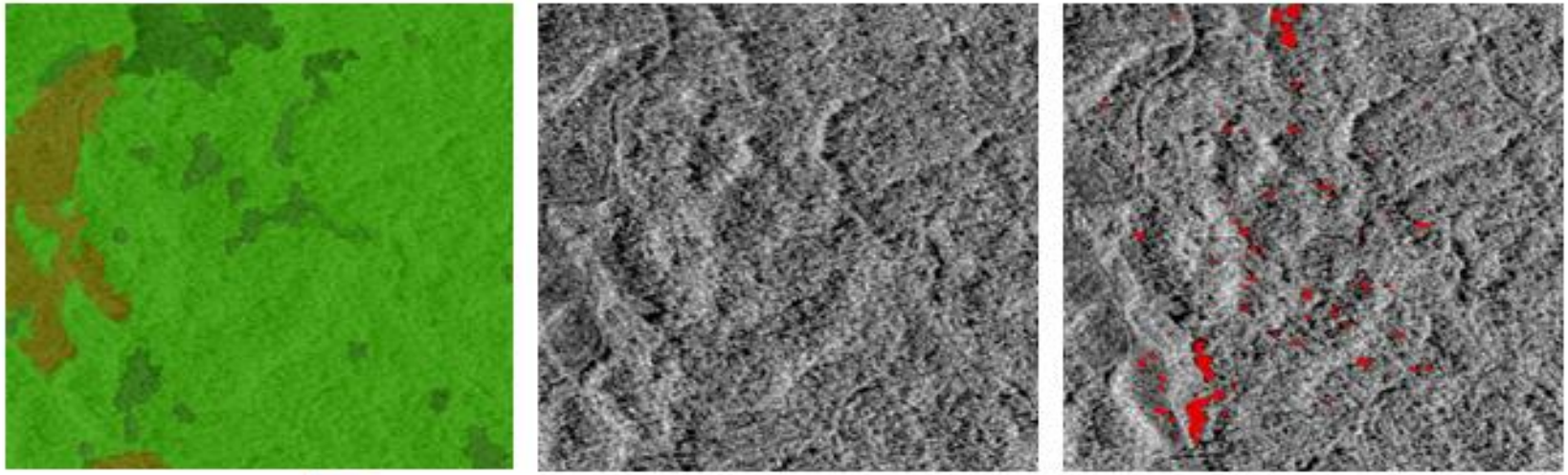
Applications: Monitoring based on global coverage

- Small scale selective logging activities detected by comparing TanDEM-X global reference dataset with TerraSAR-X StripMap
- Use of TanDEM-X information allows focusing on certain changes



a) Classification result showing the status of July 2011.

b) TanDEM-X active amplitude of July 18th 2011 serving as the reference data base.

c) TerraSAR-X amplitude of July 15th 2012 overlaid with the change layer "Backscatter decrease" in red.

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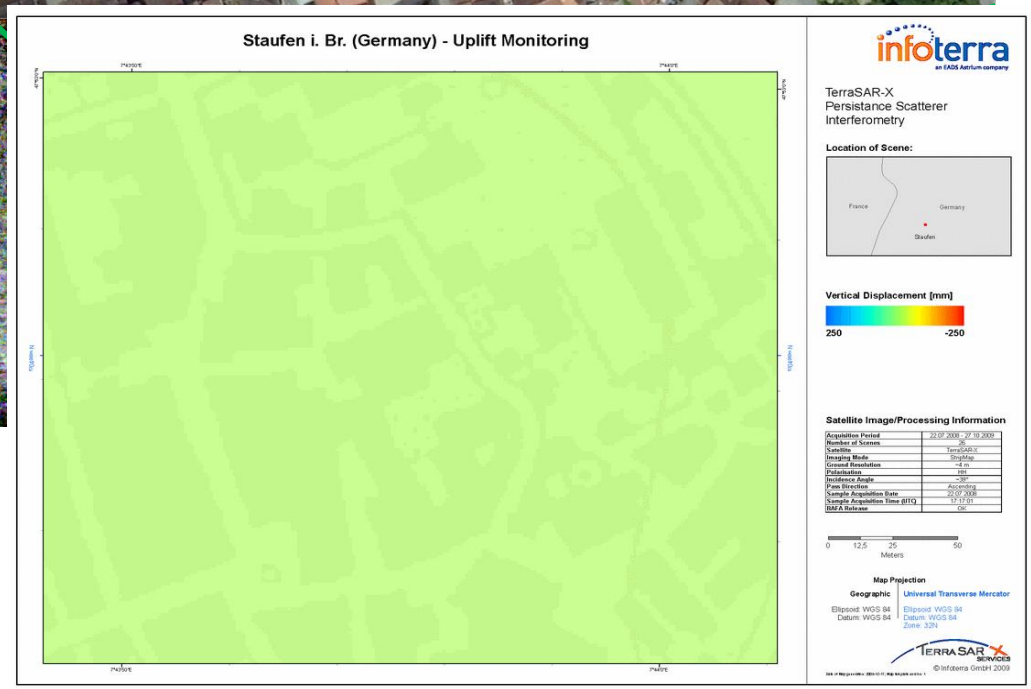
Applications: Infrastructure integrity

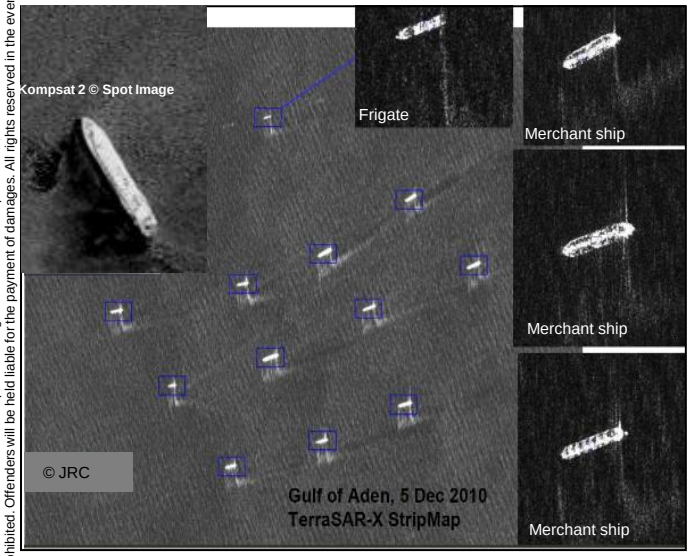


Urban Uplift (City of Staufen, Germany)

Applications: Integrated Maritime Security & Safety Services

Complementary capabilities of optical & SAR sensor systems

- Ship Detection & Tracking Service
- Oil Spill Detection Service
- Sea Ice / Iceberg Monitoring Service



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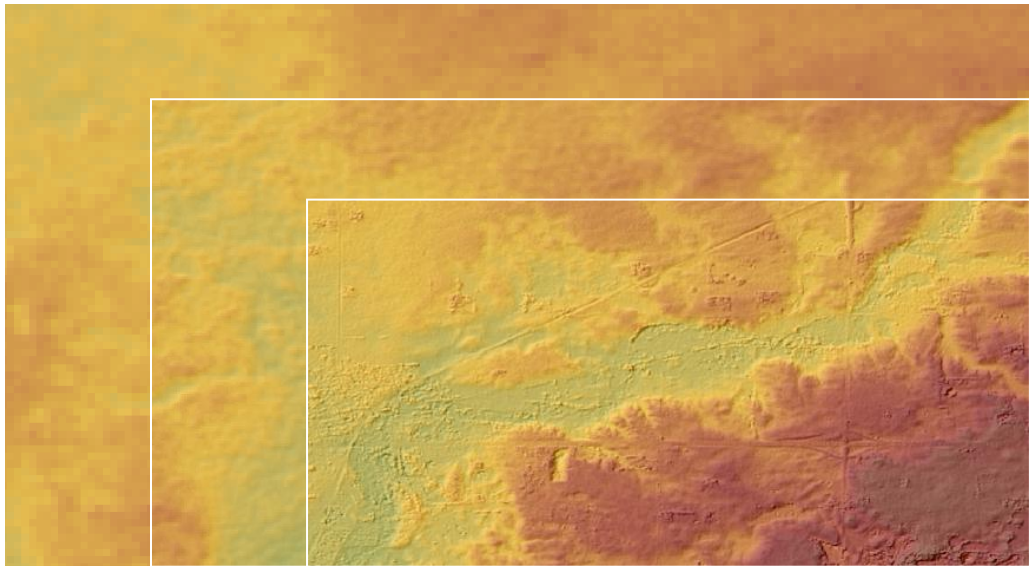
WorldDEM™ – Reaching New Heights

- **First worldwide, consistent and seamless DEM product**
  - Covering the entire Earth's land mass (pole-to-pole) with unprecedented accuracy and quality
- **TanDEM-X Mission**
  - Twin Satellites: TerraSAR-X & TanDEM-X flying in a very close and precise formation
  - Mission Goal: homogeneous, high-quality global DEM
  - Data acquisition within 3 years only (one unique source)
- **Public-Private Partnership (DLR/Airbus):**
  - Commercial exploitation: Airbus Defence and Space
- **Specifications:**

Product		DSM
Vertical Accuracy	**Abs.**	4m (LE90)
	Rel.	<2m (slope ≤20%) (LE90) <4m (slope >20%) (LE90)
Horizontal Accuracy	**Abs.**	<10m (CE90)

- **WorldDEM™ Product Line**
  - **Digital Surface Model (DSM)** representing the surface of earth including heights of buildings and other man-made objects, trees, forests and other vegetation
    - **WorldDEM$_{core}$** – incl. spikes, wells, voids
    - **WorldDEM** – editing of terrain features & water bodies
  - **Coming later: Digital Terrain Model (DTM)** represents the elevation of the bare earth, man-made objects and vegetation are removed
  - **WorldDEM™ commercially available from 2014**

SRTM 90m **SRTM 30m** **WorldDEM™ 12m**



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Challenges & Opportunities

- The **Copernicus** Program is aimed to be a **European contribution** to building the Global Observation System of Systems (GEOSS) and integrates from the beginning Contributing Missions and Sentinels

- Opportunity to make use of the data of the Contributing Missions for **GEOSS activities** depending on decision of the European Union and the Member states

- ***Access to Contributing Missions is possible and even encouraged for complementary and global images resources****; conditions such as pricing, licensing, and possible national law considerations (e.g German SatDsiG) to be agreed*

- Need for **national** and **international sponsors** for scientific as well as operational use of **Contributing Missions' data** (e.g. 30m Digital Elevation Model, Area Frame Sampling with Very High Resolution such as for forest degradation monitoring)

- Need for a **funding scheme** such as national budget in order to provide data from national missions to GEOSS

- Concrete examples are the French initiatives:
  - **SPOT World Heritage** (CNES)
  - "Observatoire Spatial des Forêts Tropicales" in the Congo Basin (AFD, CNES)

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Thank You

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