

## Antenna Chetumal: Use Of Remote Sensing Data For Environmental And Civil Security Applications In Mexico

*TerraSAR-X Imagery Services*

*Reliability – Agility – Quality*

Mexico City, 22<sup>nd</sup>–24<sup>th</sup> April 2008

Presented by:

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*Business Development Manager, TerraSAR-X Services*



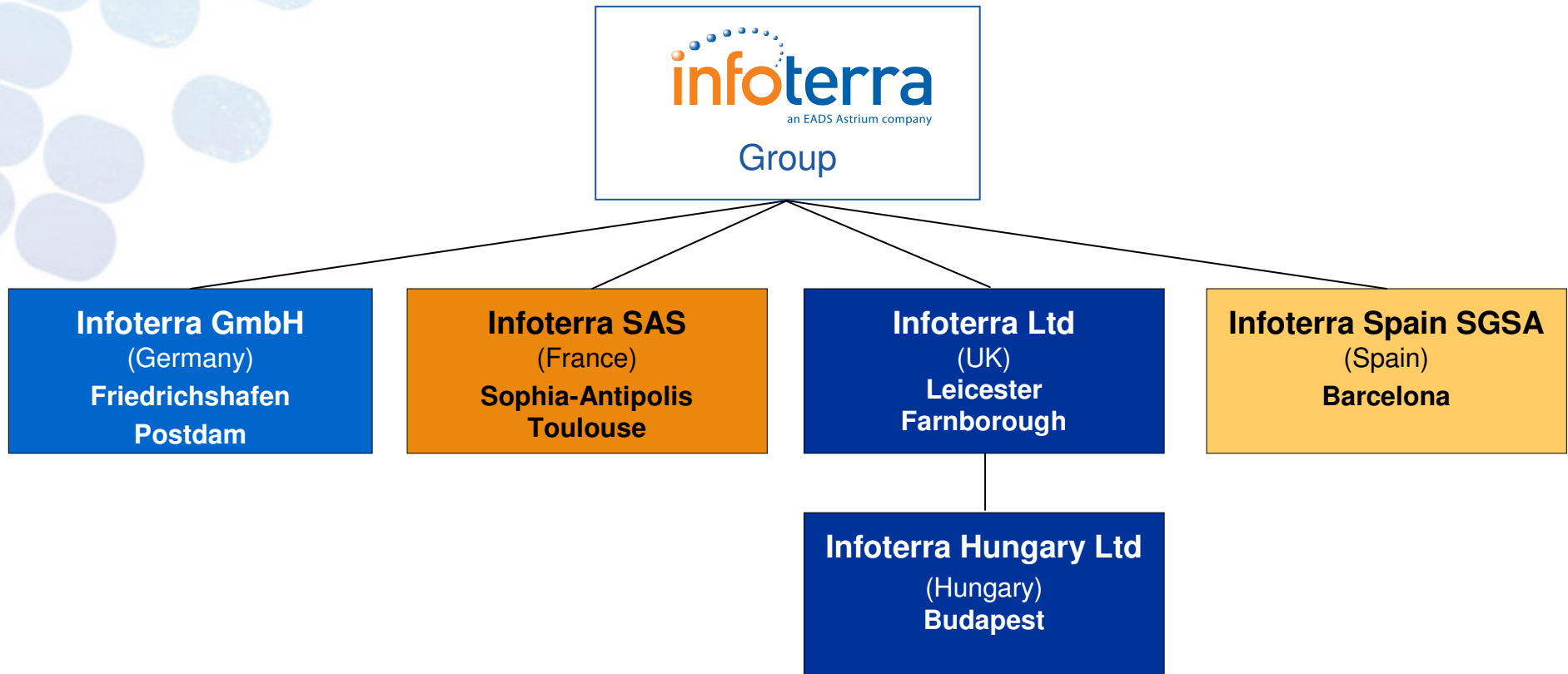
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# Infoterra within EADS



# Infoterra Group Structure



# Infoterra GmbH

- Created in 2001 to structure and market the TerraSAR-X Program
- TerraSAR-X Program implemented by Germany's first Public-Private Partnership (PPP), established March 2002
- PPP parties:
  - EADS Astrium GmbH
  - German Aerospace Centre (DLR)
- Infoterra GmbH holds exclusive commercial tasking and data rights for TerraSAR-X
- TerraSAR-X Data Services commercially available since Jan '08

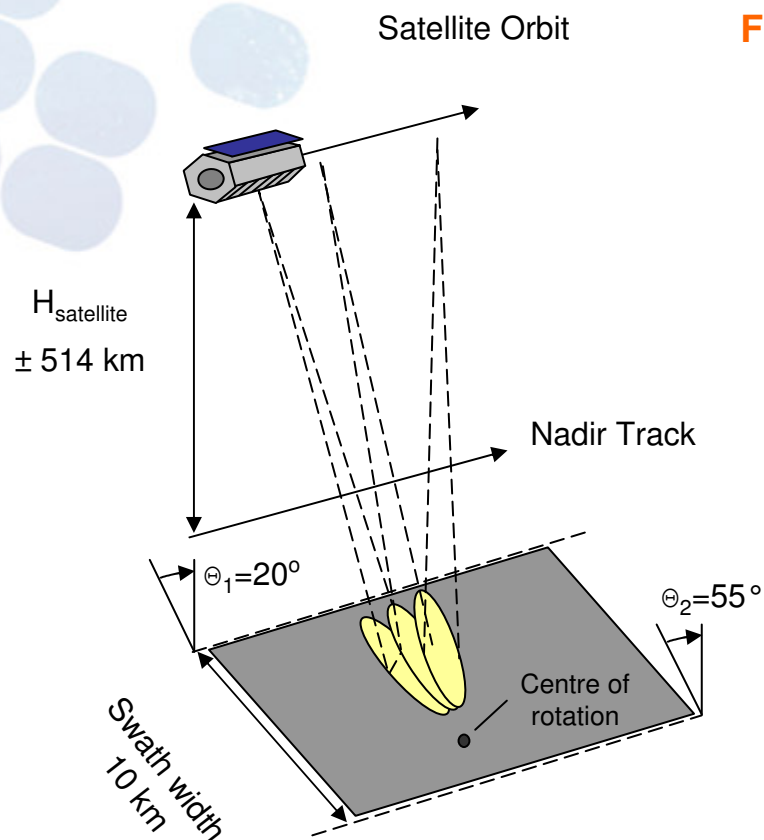


# TerraSAR-X Data Collection Modes

## SpotLight

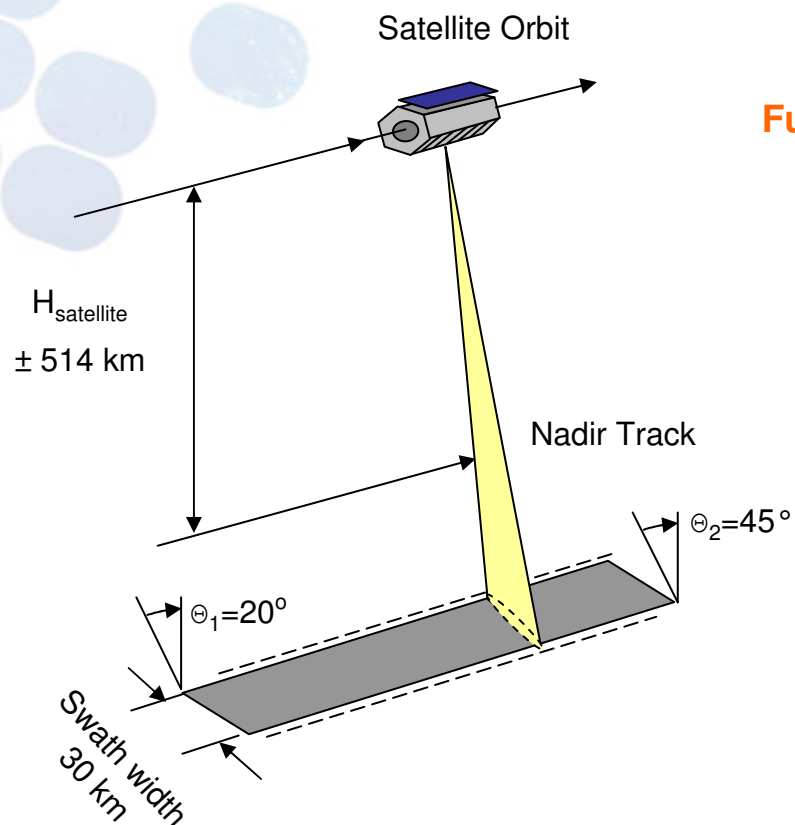
**Swath:**  
**Standard Scene Length:**  
**Azimuth Resolution:**  
**Polarization:**  
**Full Performance Range:**

10km (~7km for 300MHz (HS))  
5km (HS), 10km (SL)  
1.1m (HS), 2.2m (SL)  
Single (HH, VV), Dual (HH+VV)  
20° to 55°



# TerraSAR-X Data Collection Modes

## StripMap



**Swath:**  
**Standard Scene Length**  
**Azimuth Resolution:**  
**Polarization:**

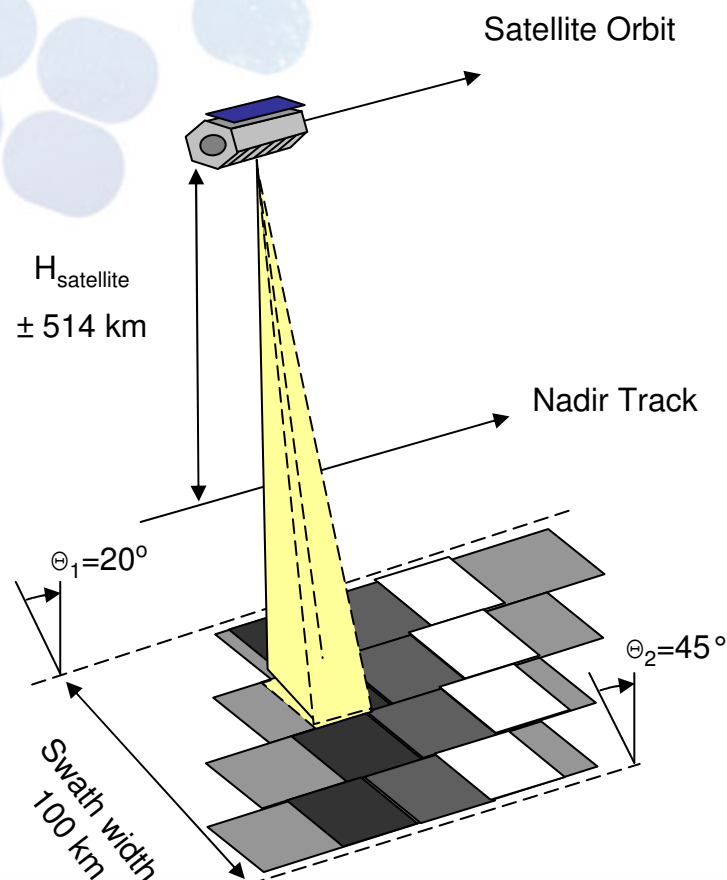
30km (15km for dual pol)  
50 km  
3.3m (6.6m for dual pol)  
**Single** (HH, VV)  
**Dual** (HH+VV, HH+HV, VV+VH)  
**Quad** (HH+VV+HV+VH)  
20° to 45°

**Full Performance Range:**

# TerraSAR-X Data Collection Modes

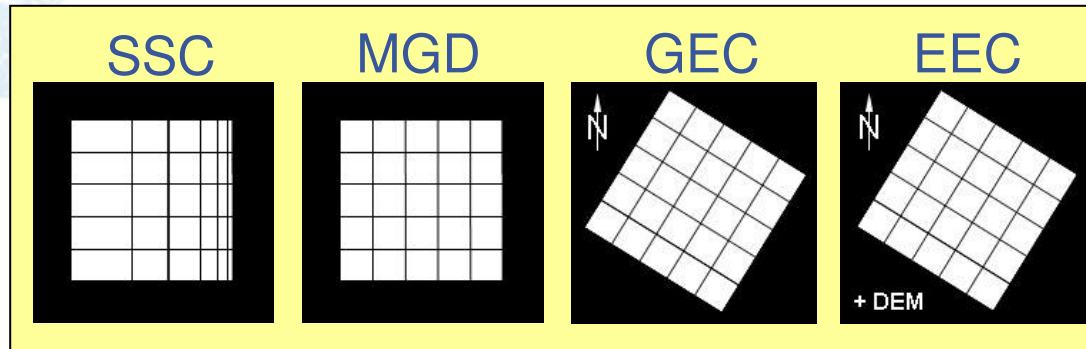
## ScanSAR

Swath:	100km
Standard Scene Length:	150km
Azimuth Resolution:	18.5m
Polarization:	Single (VV or HH)
Full Performance Range:	20° to 45°

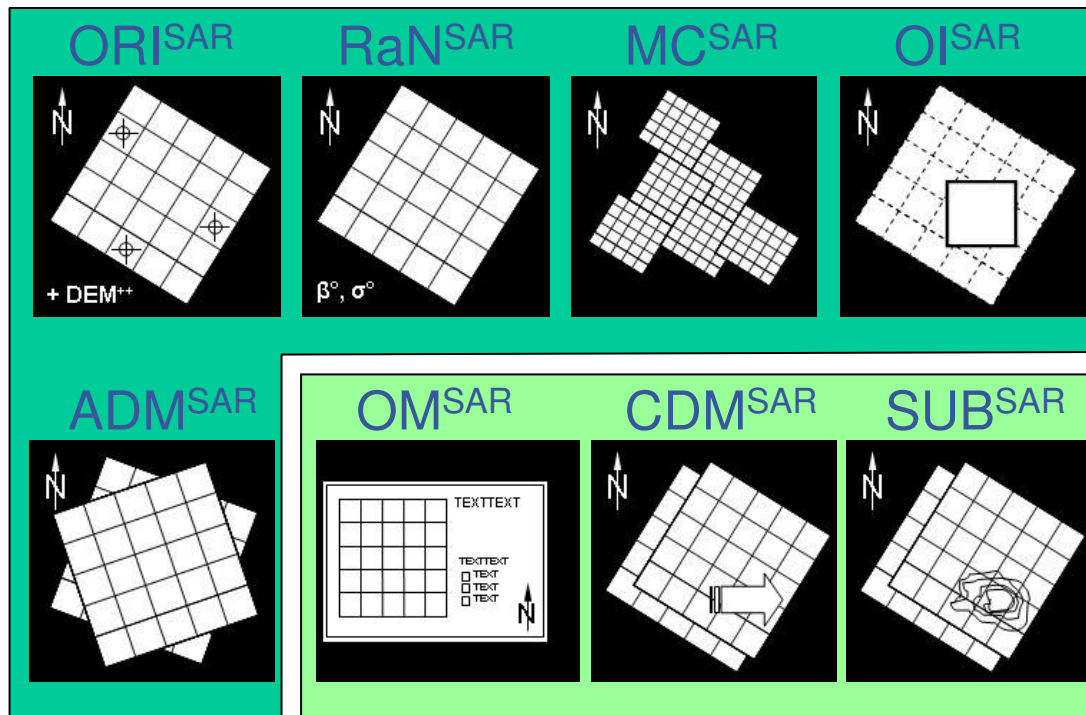


# Data Product Processing Levels

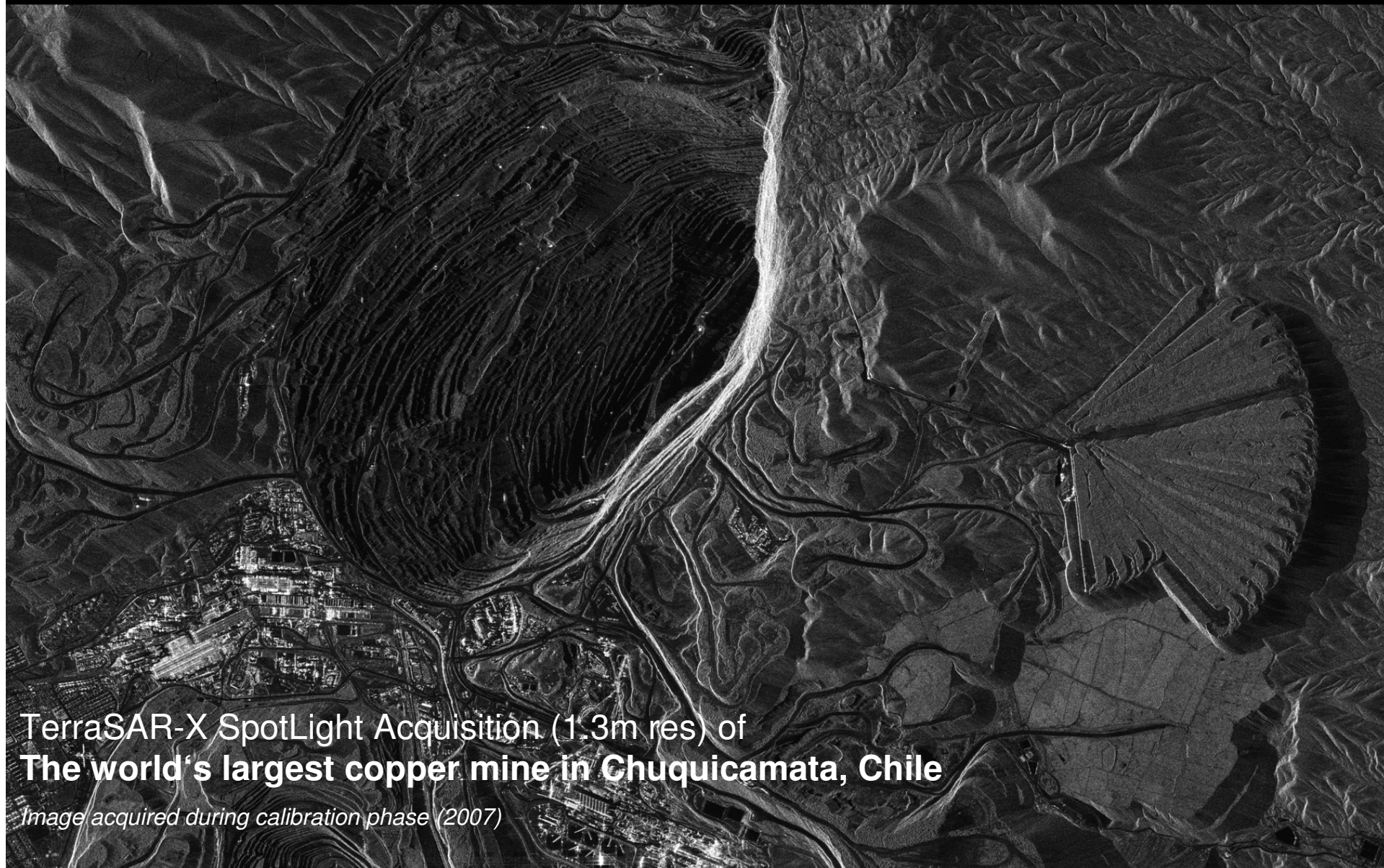
Basic  
Image  
Products



Enhanced  
Image  
Products



Geo-Information  
Products

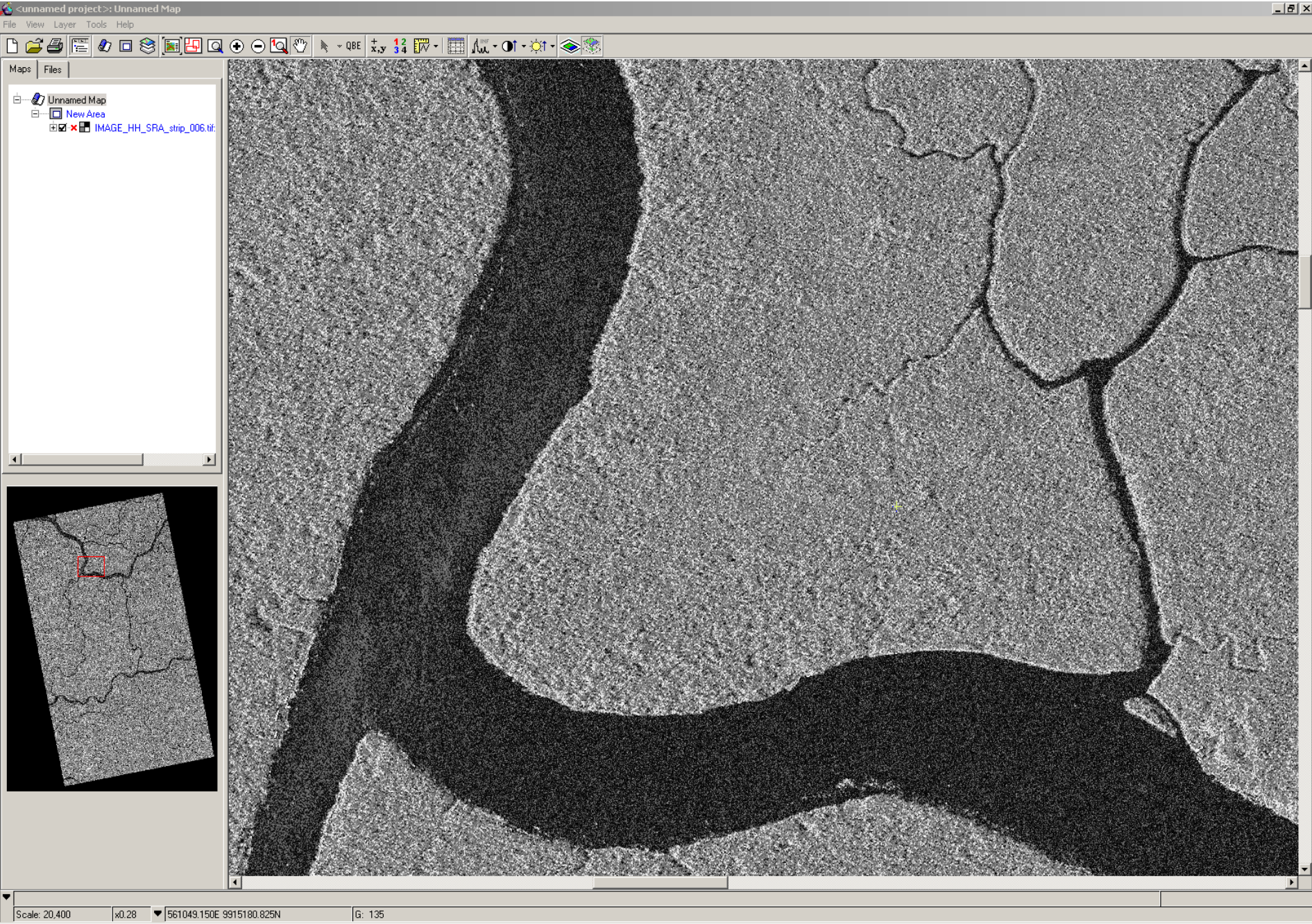


TerraSAR-X SpotLight Acquisition (1.3m res) of  
**The world's largest copper mine in Chuquicamata, Chile**

*Image acquired during calibration phase (2007)*

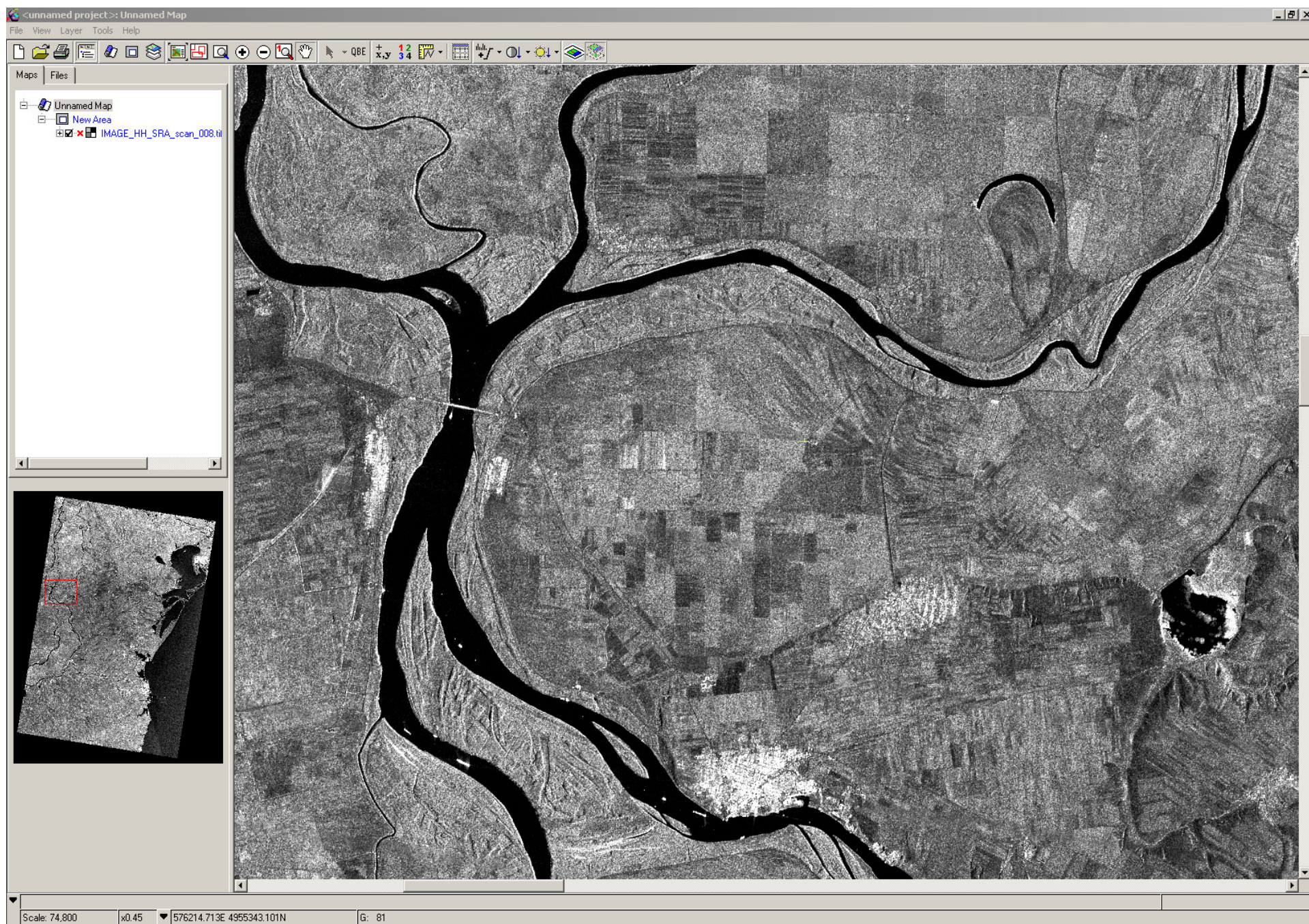


Amazon Forest, Brazil (DPL2409) – 22 Oct 2007 – StripMap (HH), EEC, SE - viewed with “Adaptive” visualisation enhancing method, scale 1:20,000





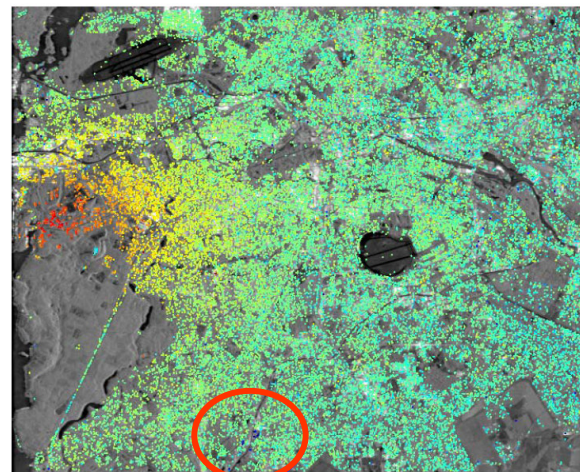
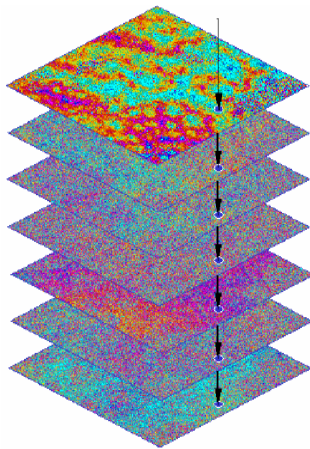
Romania (DPL2164) – 07 Oct 2007 – **ScanSAR** (HH), EEC, RE - viewed with “Adaptive” visualisation enhancing method, scale 1:75,000



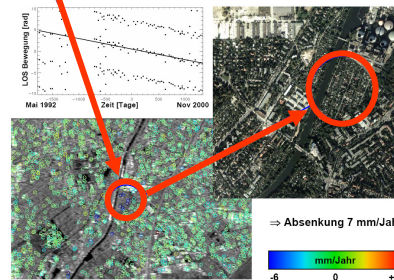
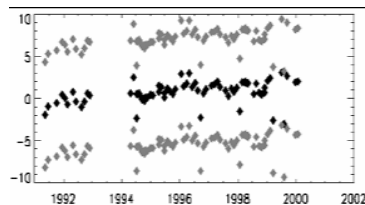


# Persistent Scatterer Interferometry – PSI (Subsidence)

- Use of stacks of interferograms
- Typically 50 – 100 data sets (time series analysis)
- Evaluation of single stable points or spatially in cities
- Separability of height, motion and atmosphere
- Accuracy: mm/year



Data © ESA processed by DLR



Example: Berlin built-up area

Extension: 27km x 24km

Stack size: 70 scenes

Period: ~~8.5 years~~

Subsidence 7mm/year

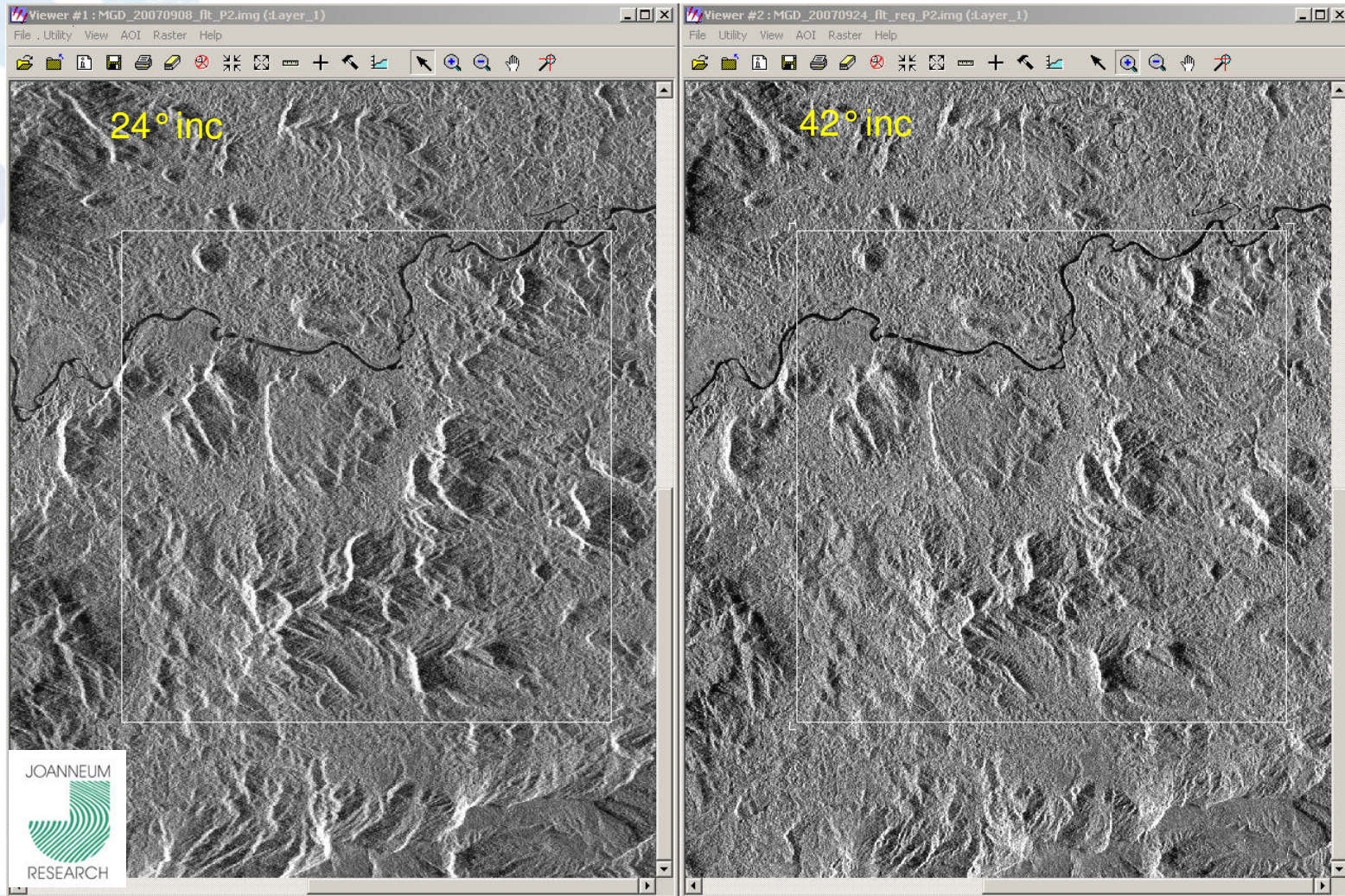
Confirmed by DLR

TerraSAR-X can reduce time-series period to a few months



# SAR 3D Measurements: Stereo 3D Reconstruction (Radargrammetry)

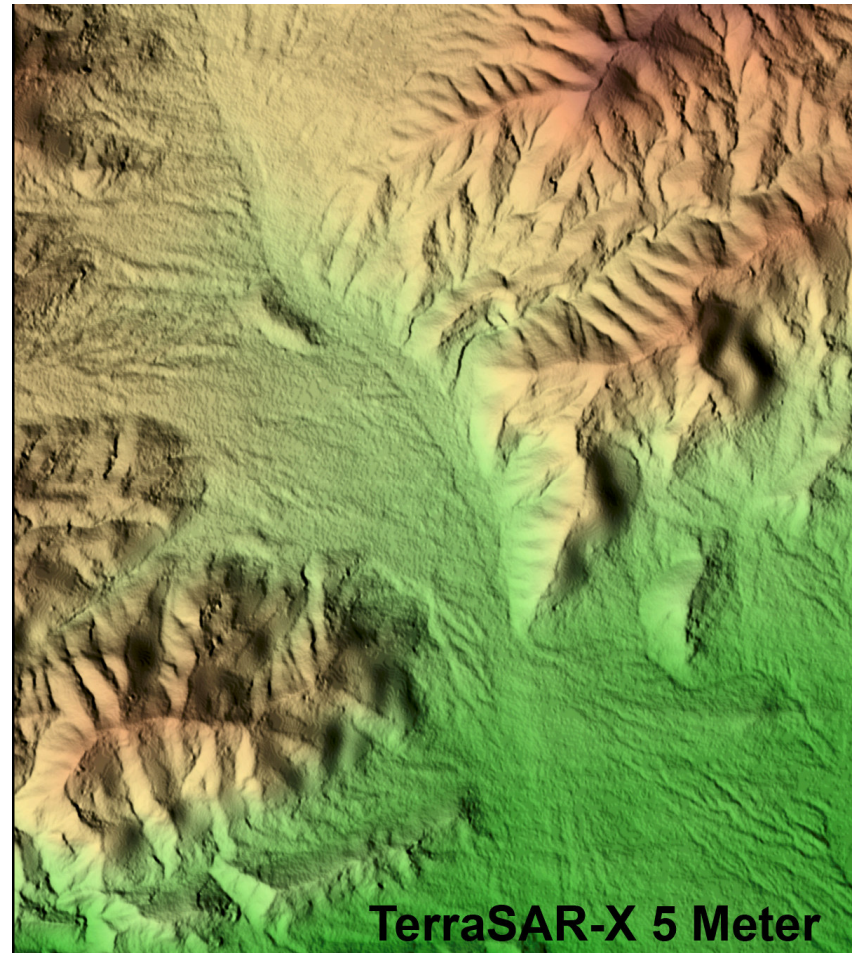
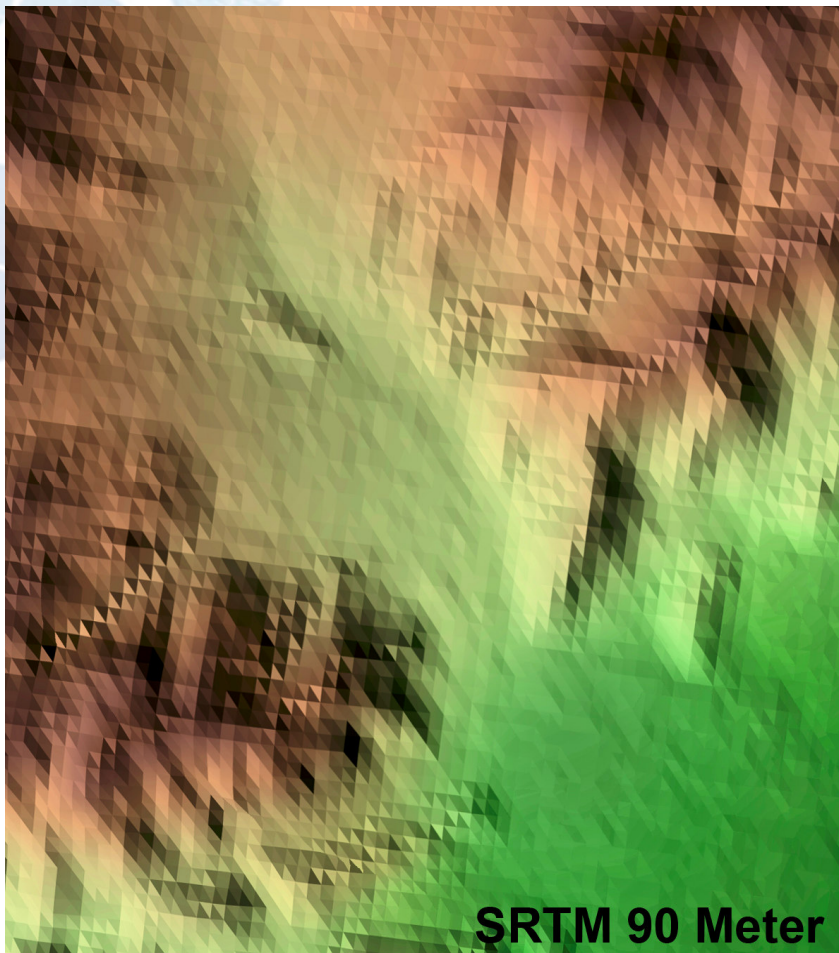
## Kalimantan (Indonesia) – MGD SE





# SAR 3D Measurements: InSAR (Interferometry)

## TerraSAR-X Dual Pass Interferometry – Las Vegas

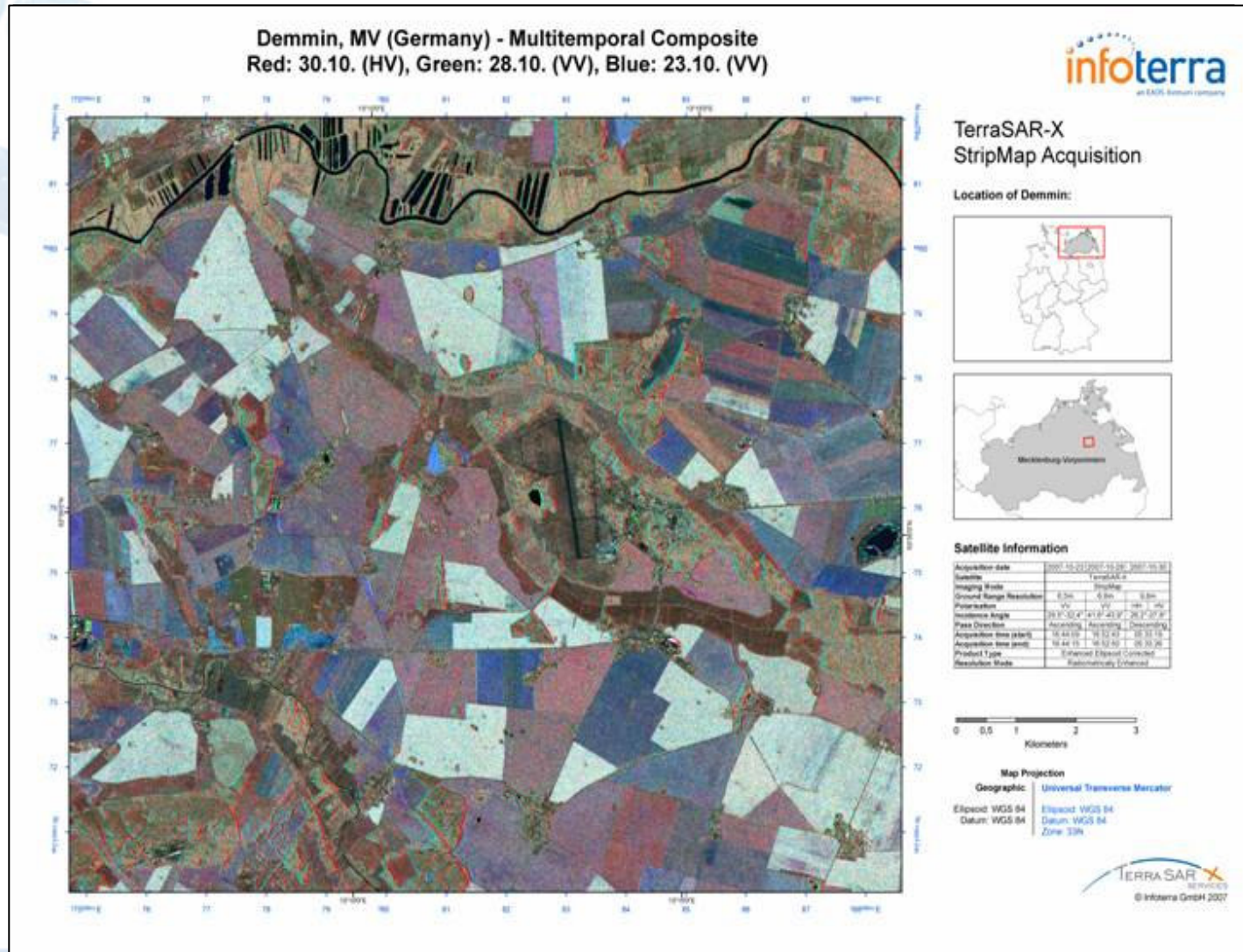


Credit: DLR; date: July 7, 2007; original resolution: 1 metre (reduced image); mode: SpotLight Mode; polarisation: VV



# Multi-temporal data Analysis : Agriculture

## Early Growing Season Identification of Oil Seeds





# Color Draping (using one dual-pol image)



Hyderabad, India

TerraSAR-X SpotLight Acquisition, dual pol, 2m

Composite: **R:G:B** = **HH:VV:HH+VV**

*Imagery acquired during calibration phase (2007)*



# Urban Area Visualization Using SAR

## Selective Speckle-Filtering (maintaining structure-integrity): False-color composite

*Courtesy: University of Wuerzburg, DLR-DFD*



SAR-Intensity (TerraSAR-X)

Speckle-Divergence

Composite

Intensity-Divergence



# Color Draping (using two single-pol images)



**AOI:** NW of Munich, Bavaria (GE)

**Scene Extent:** 30km x 20km

**Acquisition Dates:** 26JUN07 (VV) + 07JUL07 (HH)

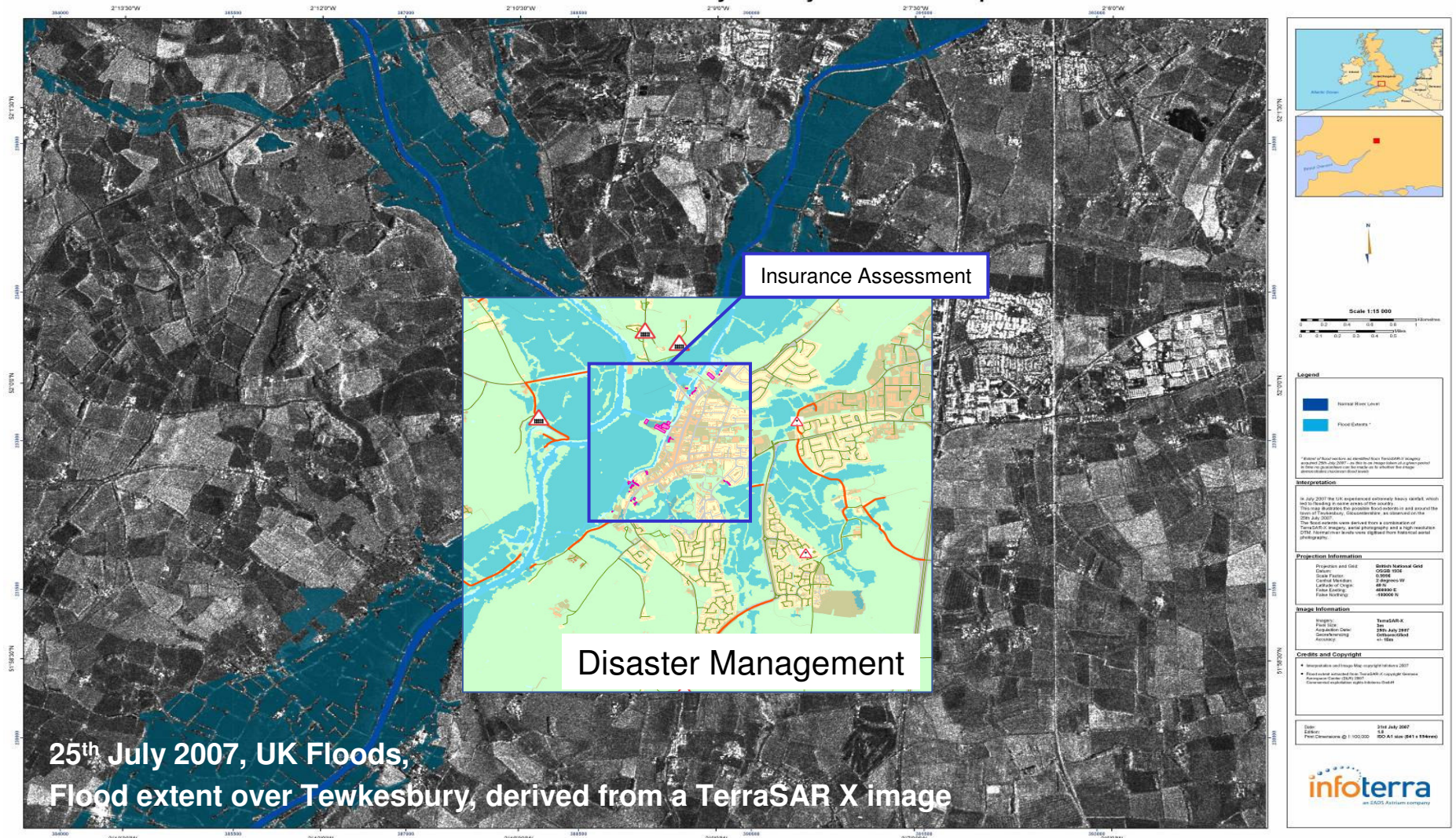
**Composite:** R:G:B = VV:HH:VV+HH



# Rapid Mapping: Flood Extent

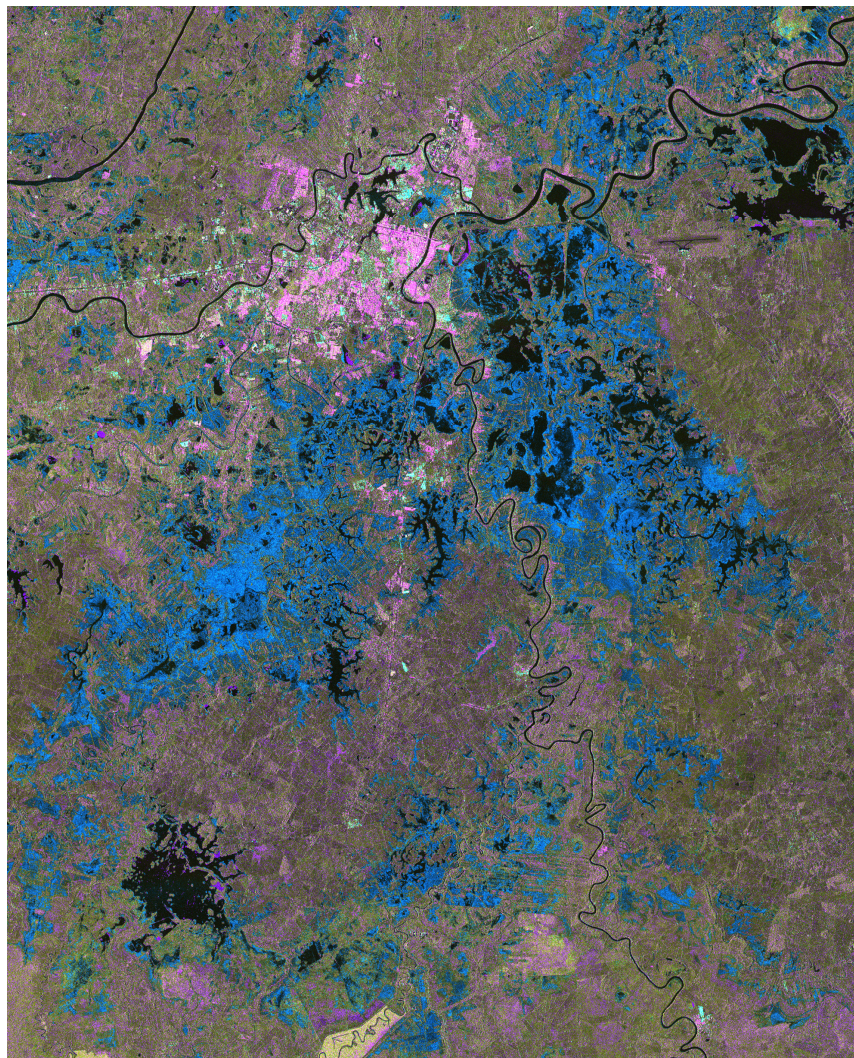
Scale: 1:15,000

UNITED KINGDOM - Tewkesbury - 25 July 2007 - Flood Map





## Villahermosa, Tabasco: 8<sup>th</sup> Nov 2007 – 2<sup>nd</sup> December 2007







# Detecting Unexpected Presence Of Metal





# STANAG 3596 - CAT 08 Shipping

## Vessels

Distinguish  
between

- naval

- civil:  
general cargo  
tanker

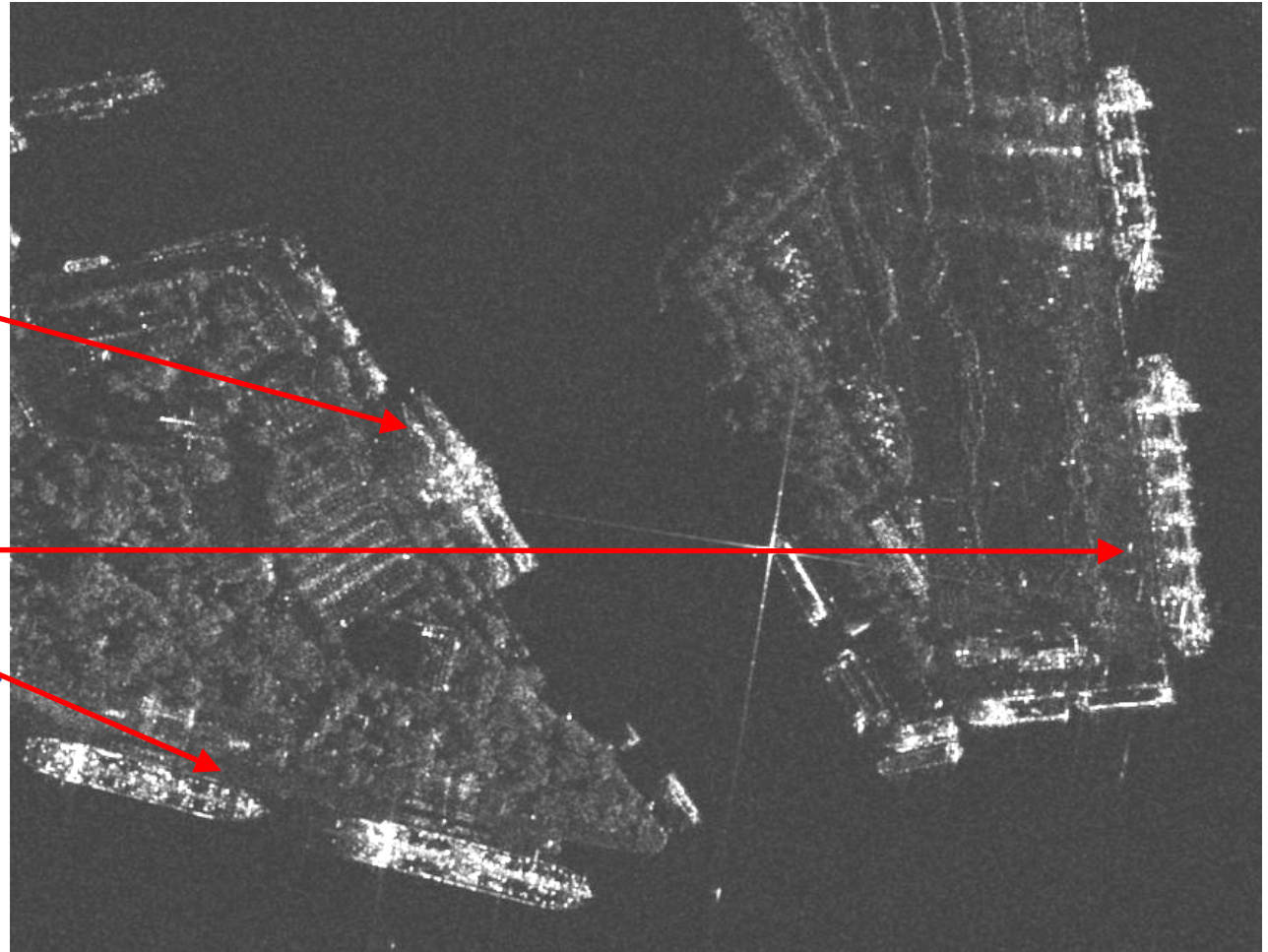
Date of acquisition 10.12.07

HS Spotlight 1m

Polarization VV

Spatially enhanced

Descending Orbit

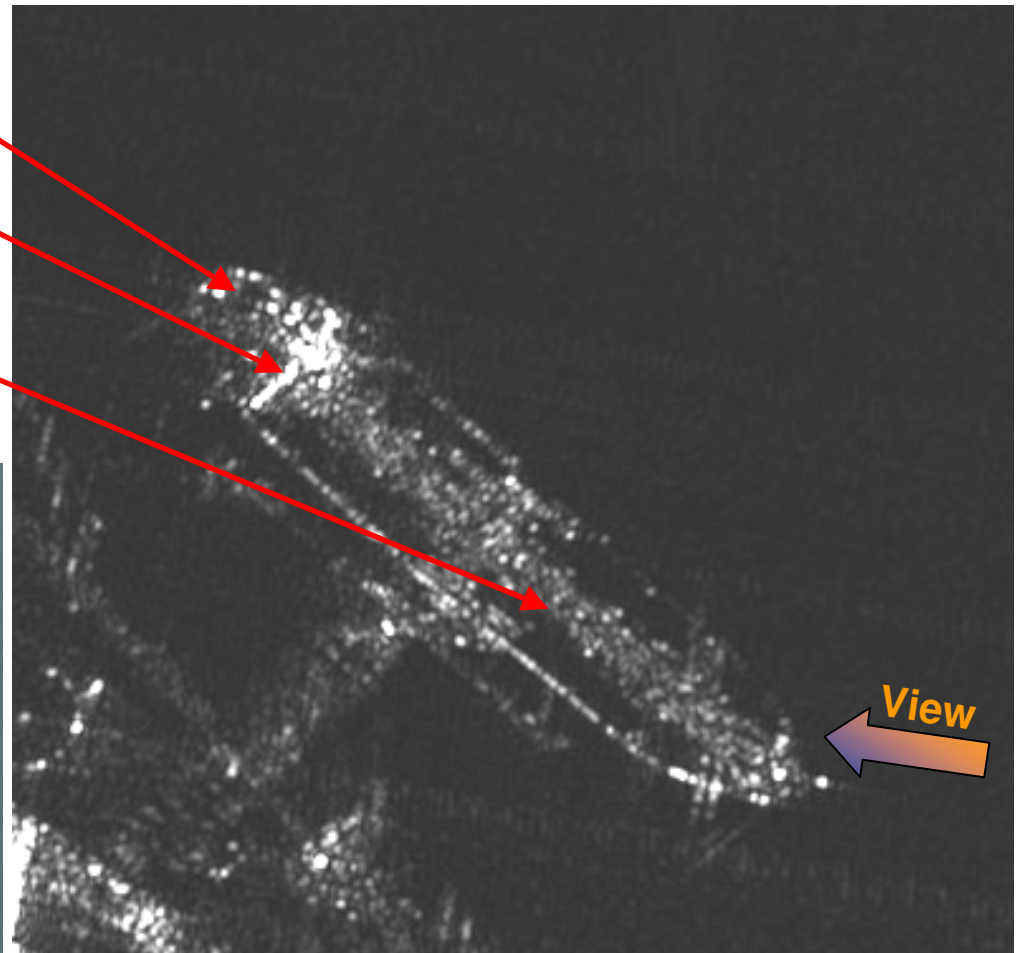


# Merchant Ship – Tanker (HS-300 MHz)

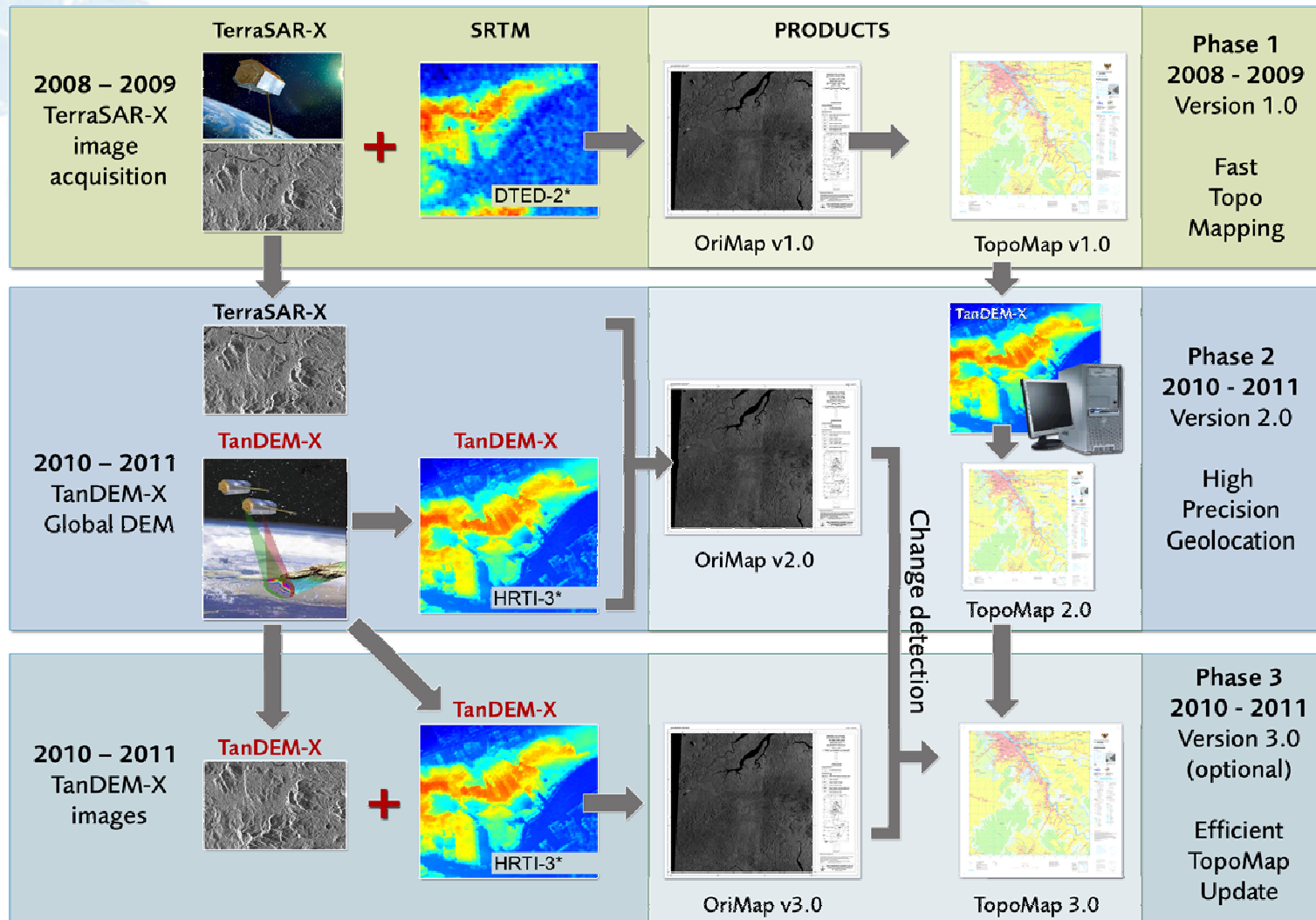
Funnel

Bridge deck at stern

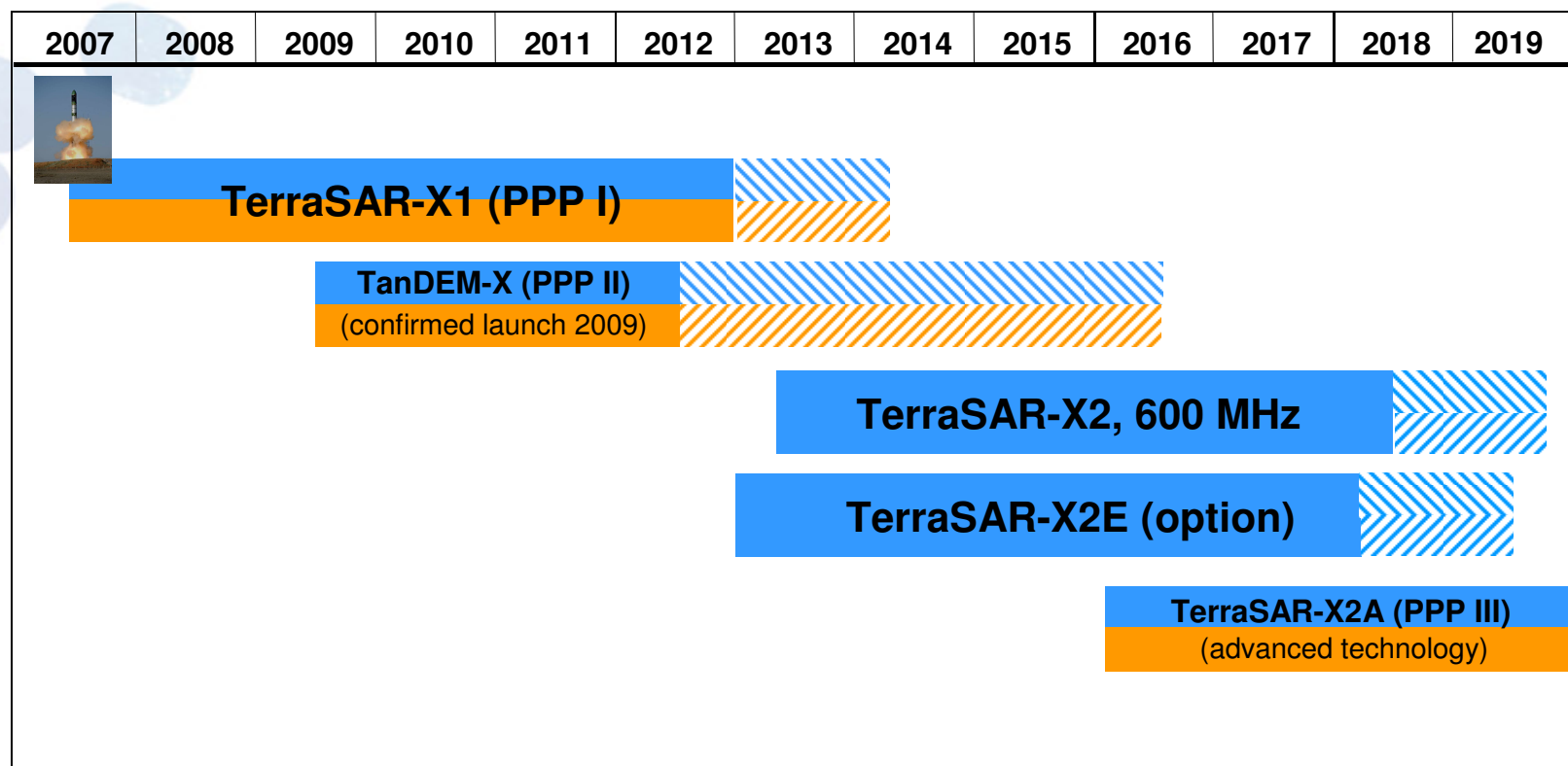
Pipelines



# TerraSAR-X/TanDEM-X Topo-Mapping Concept



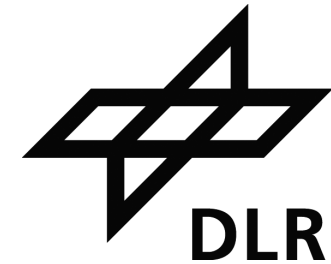
# Continuity Of Service: The TerraSAR Program



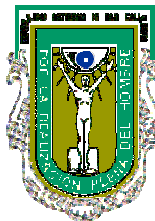
Use:  Commercial  
 Scientific



# What Is In It For Mexico? The WIIIFM Factor



SECRETARÍA DE AGRICULTURA,  
GANADERÍA, DESARROLLO RURAL,  
PESCA Y ALIMENTACIÓN | **SAGARPA**



# End Of Presentation

Thank you for your attendance and attention.

**[www.infoterra.de](http://www.infoterra.de)**

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