



# Constelación Terrasar X – Tandem X - PAZ

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All the space you need



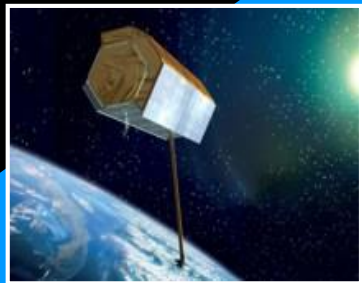
# Constelación TerraSAR-X –Tandem X - PAZ

- 2007: Lanzamiento de Terrasar X
- 2010: TanDEM-X – Misión Worlddem
- 2014: PAZ Satélite Español SAR

**TerraSAR-X & TanDEM-X & PAZ definirán en 2014 una nueva constelación de satélites radar, consiguiendo una mayor capacidad de revisita y ofreciendo nuevos servicios integrados**



2007



TerraSAR-X

2010

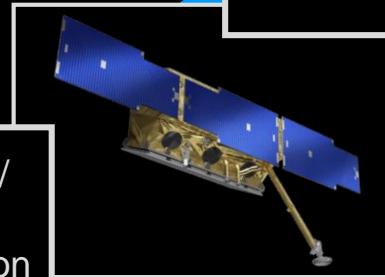


TanDEM-X

2014

TerraSAR/  
PAZ  
Constellation

2015

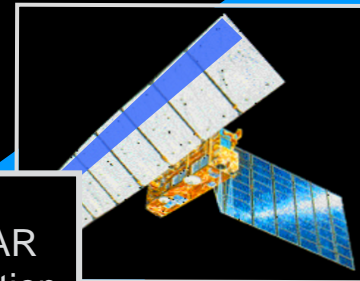


TerraSAR-X2

2017

WorldSAR  
Constellation

~ 2019



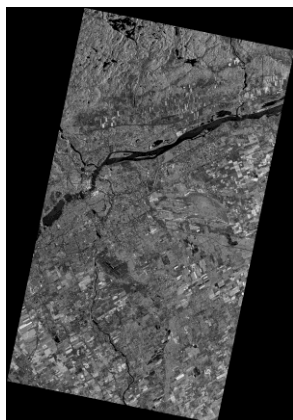
HRWS

# Flexibilidad: Tres Modos de Adquisición



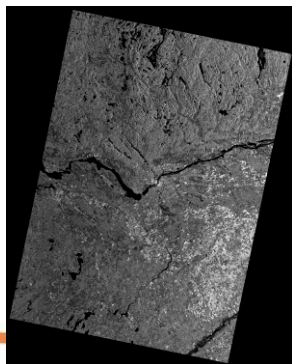
## Adquisición Spotlight

- resolución: 1m
- Tamaño de escena: 10x10 sqkm



## Adquisición StripMap

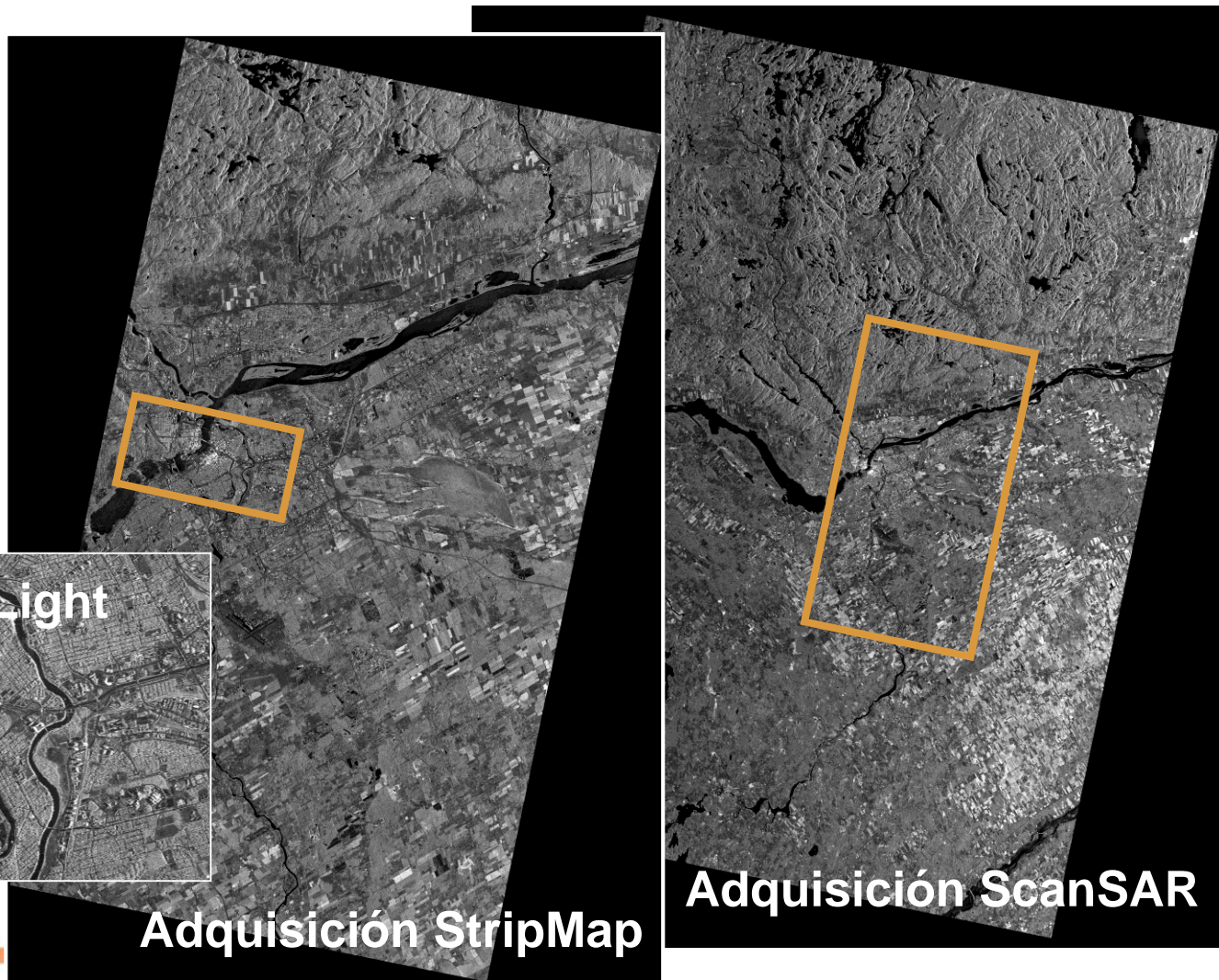
- resolución: 3m
- Tamaño de escena: 30x50 sqkm



## Adquisición ScanSAR

- resolución: 18m
- Tamaño de escena: 100x150 sqkm

# TerraSAR-X Modos de Adquisición



Adquisición StripMap

Adquisición ScanSAR

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# Adquisición SpotLight (1m res) de Ottawa, Canada



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 **ASTRIUM**  
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# Adquisición StripMap (3m res) de Ottawa, Canada

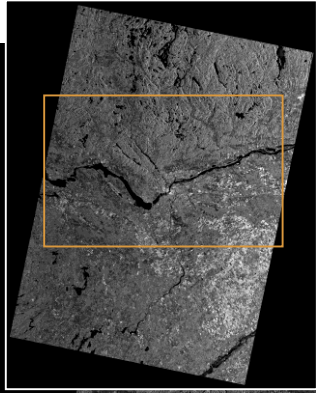


All the space you need

infoterra

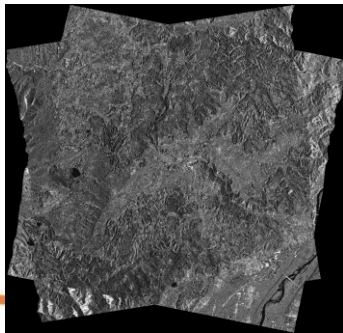
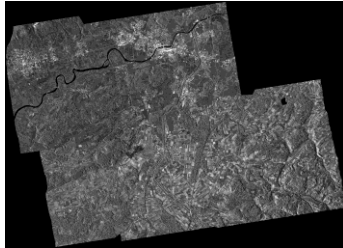
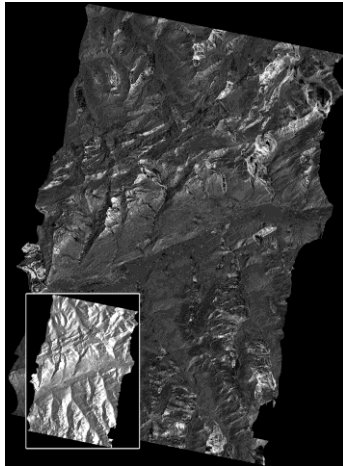
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# Adquisición ScanSAR (16m res) de Ottawa, Canada





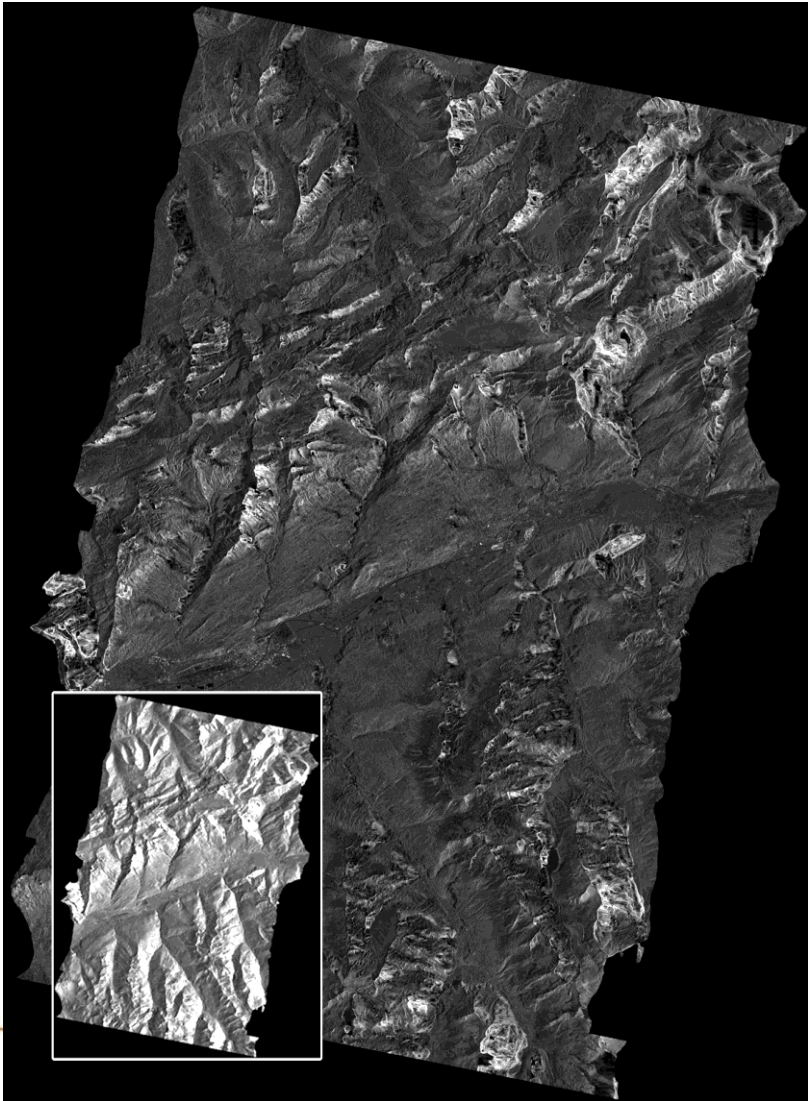
# Enhanced Radar Imagery



- RaN<sup>SAR</sup>: Correcciones Radiométricas
- ORI<sup>SAR</sup>: Imágenes Ortorectificadas
- MC<sup>SAR</sup>: Mosaicos Radar
- ADM<sup>SAR</sup>: Fusiones Ascendentes-Descendentes

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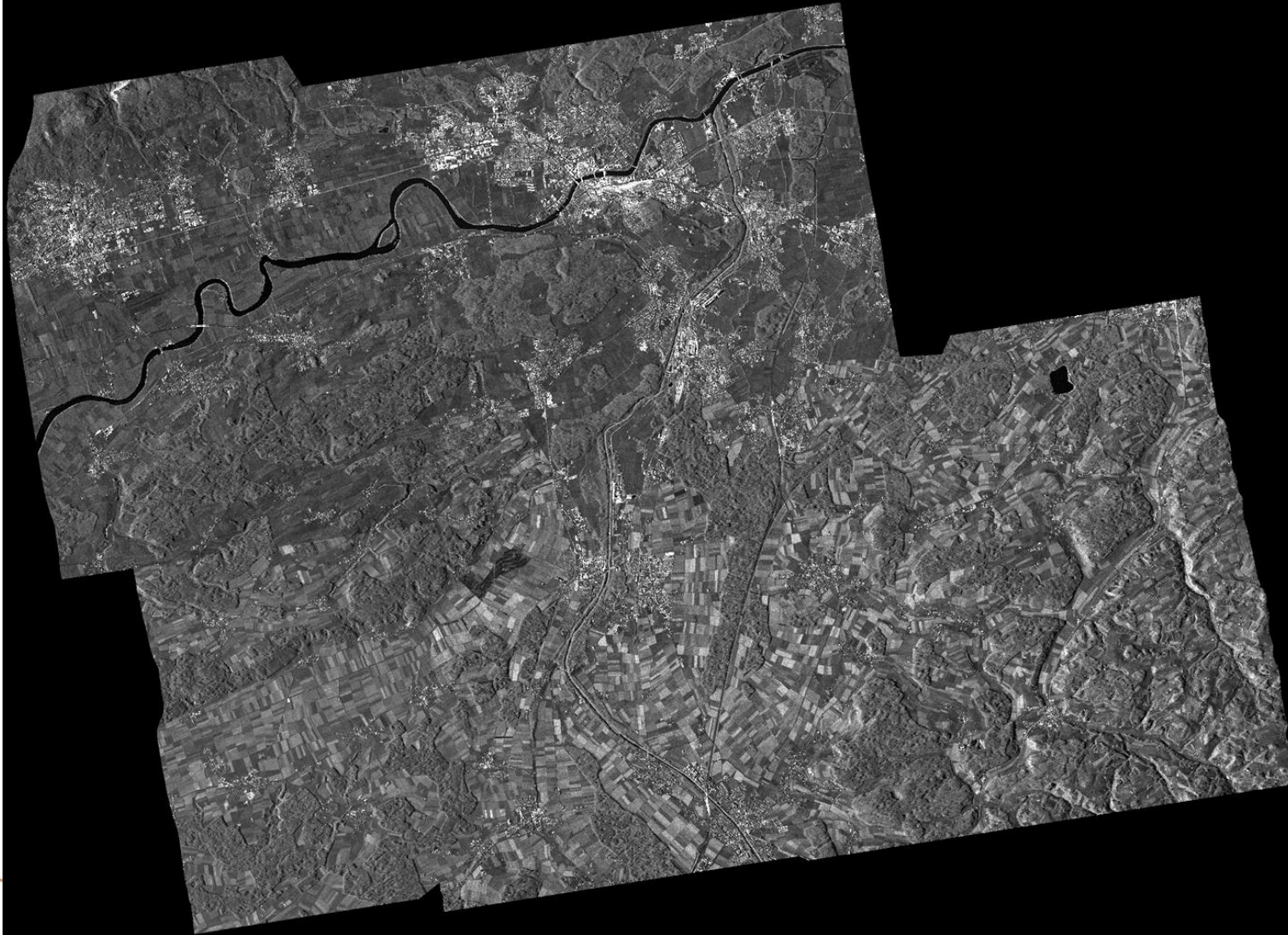
# RaNSAR: Correcciones Radiométricas



Calibración absoluta:  
imágenes comparables y  
compatibles con las imágenes  
adquiridas en otro momento  
en el tiempo o por otros  
sensores.

# MC<sup>SAR</sup>: Mosaico Radar

combina  
imágenes

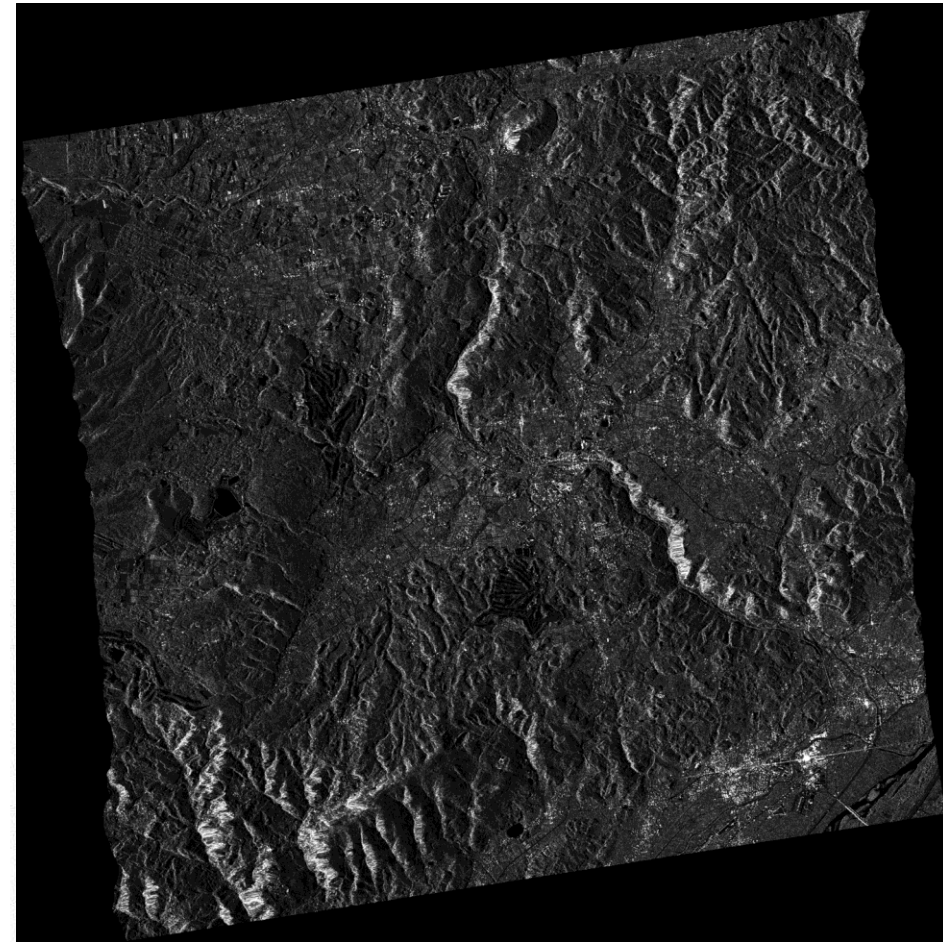


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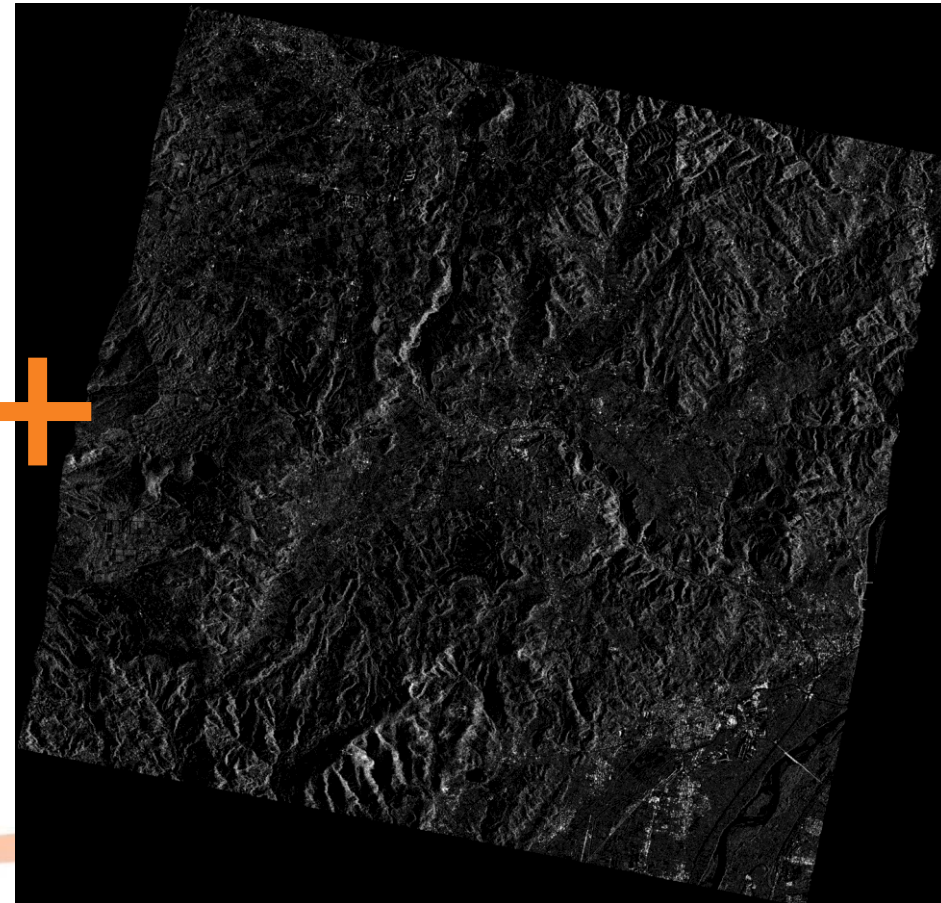
All the space you need



# ADM<sup>SAR</sup>: Fusiones Ascendentes- Descendentes

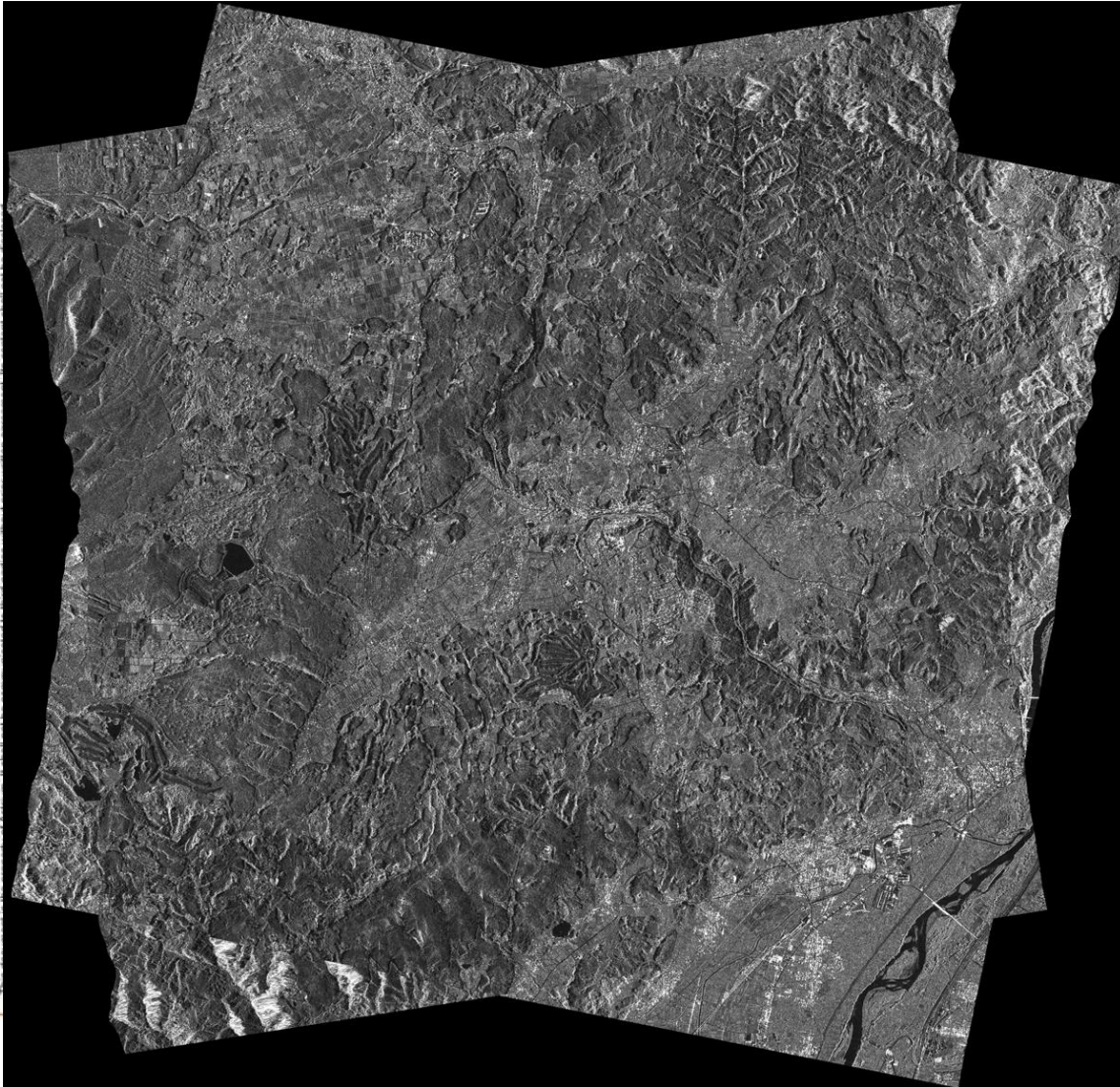


Órbita Ascendente



Órbita Descendente

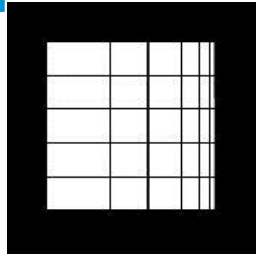
# ADM<sup>SAR</sup>: Fusiones Ascendentes- Descendentes



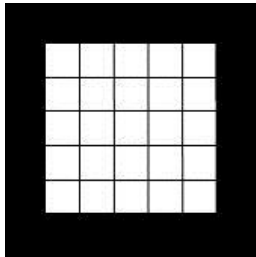
combina escenas de  
la misma zona de  
adquisición registrada  
en órbitas  
ascendentes y  
descendentes

reduce los efectos de  
sombras y pendientes

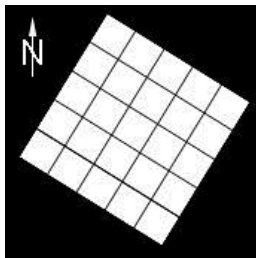
# 4. Productos Básicos TerraSAR-X: Opciones de procesamiento



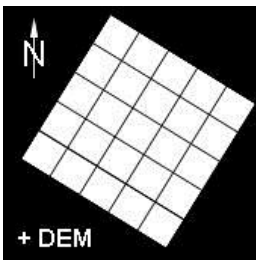
- Productos en Geometría Inclínada
  - SSC – Single Look Slant Range Complex



- Productos Demodulados (Detected Products)



- MGD – Multi Look Ground Range Detected



- GEC – Geocoded Ellipsoid Corrected

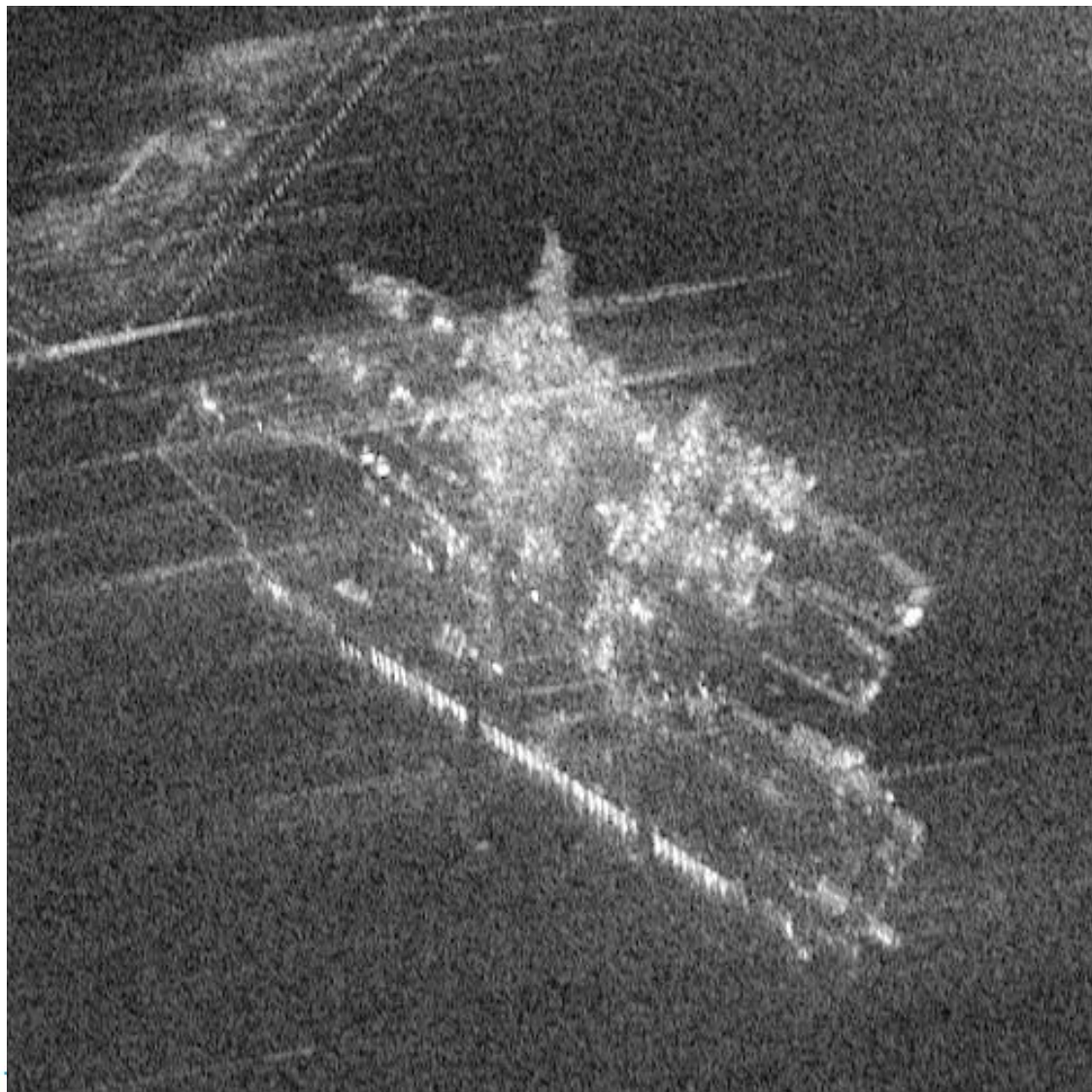
- EEC – Enhanced Ellipsoid Corrected



# 1 Que hay de nuevo en TerraSAR-X?



# Que ven ustedes?



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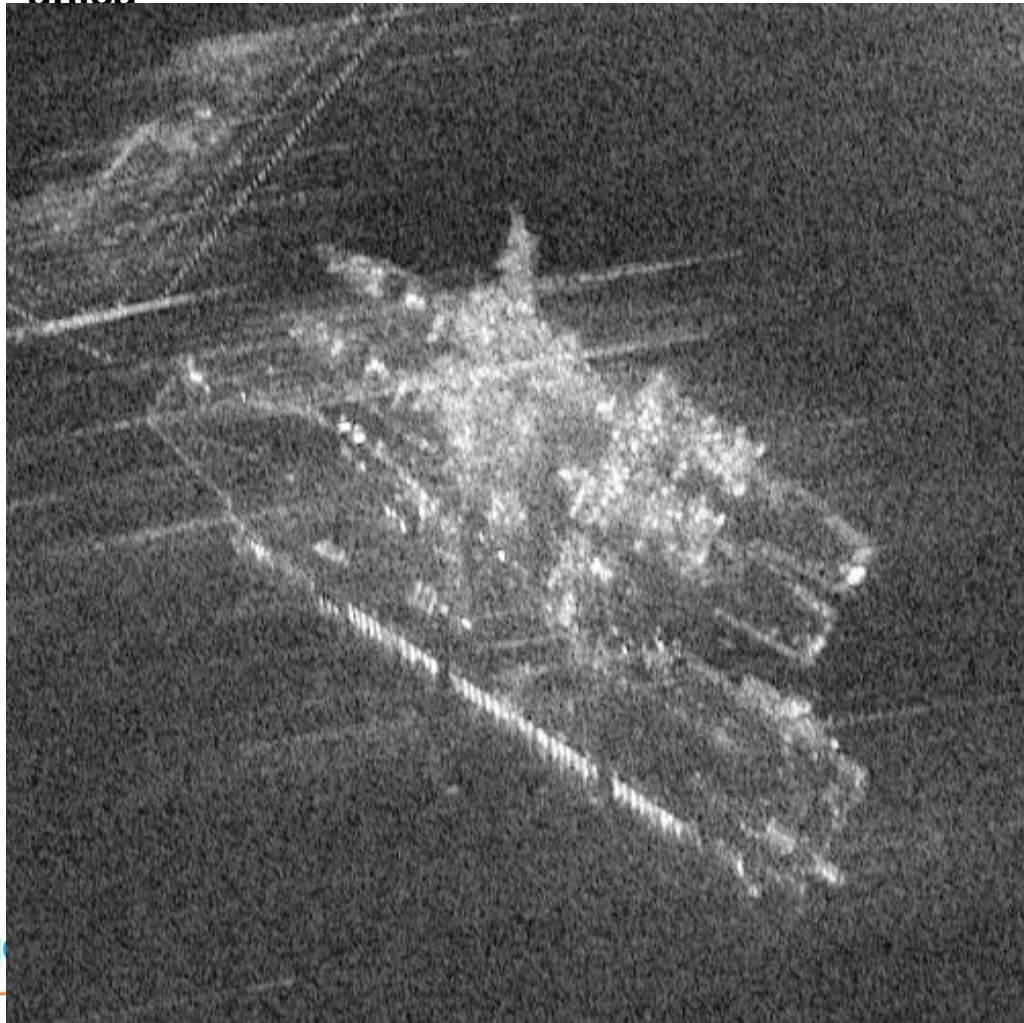






# TerraSAR-X Nuevo Modo Staring Spotlight (ST)

disponible en Octubre 2013: ~0.5 m -0.25 m VHR SAR datos & calidad radiometrica unica



Porta-aeronaves y fragatas atracadas en puerto

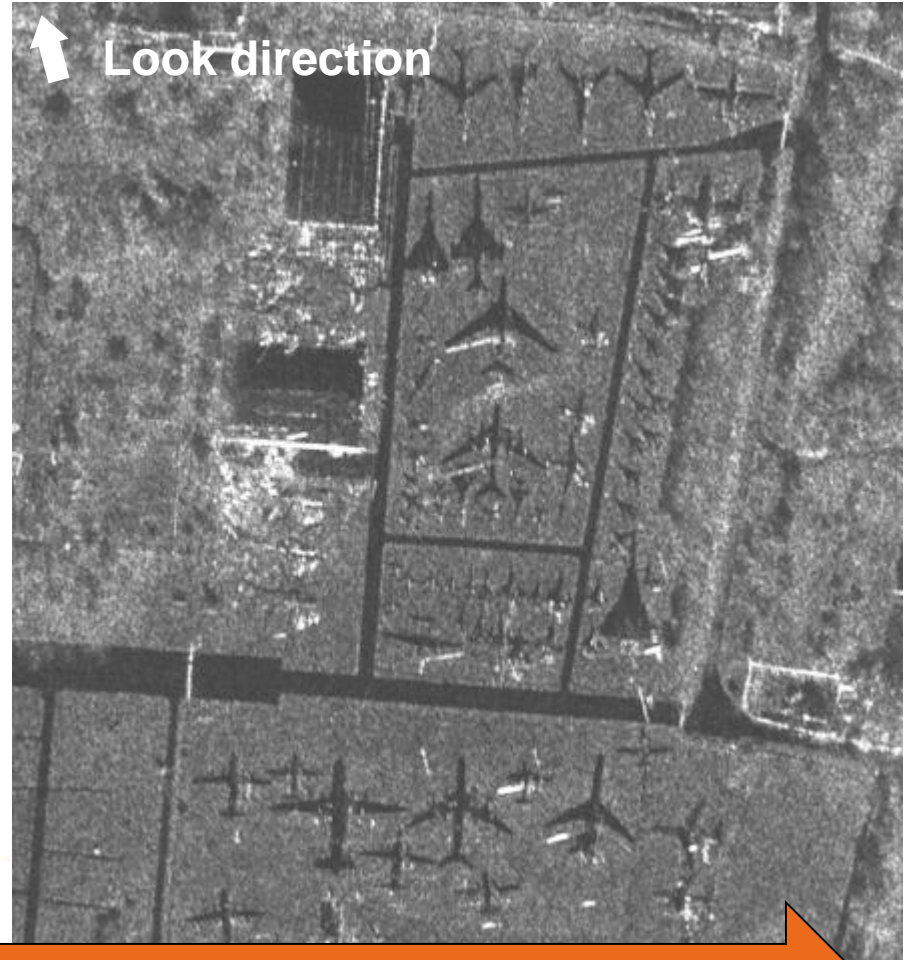


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# TerraSAR-X Nuevo Modo Staring Spotlight (ST)

~0.5 / 0.25 m resolución espacial & calidad radiométrica única beneficiando la interpretación IMINT applications



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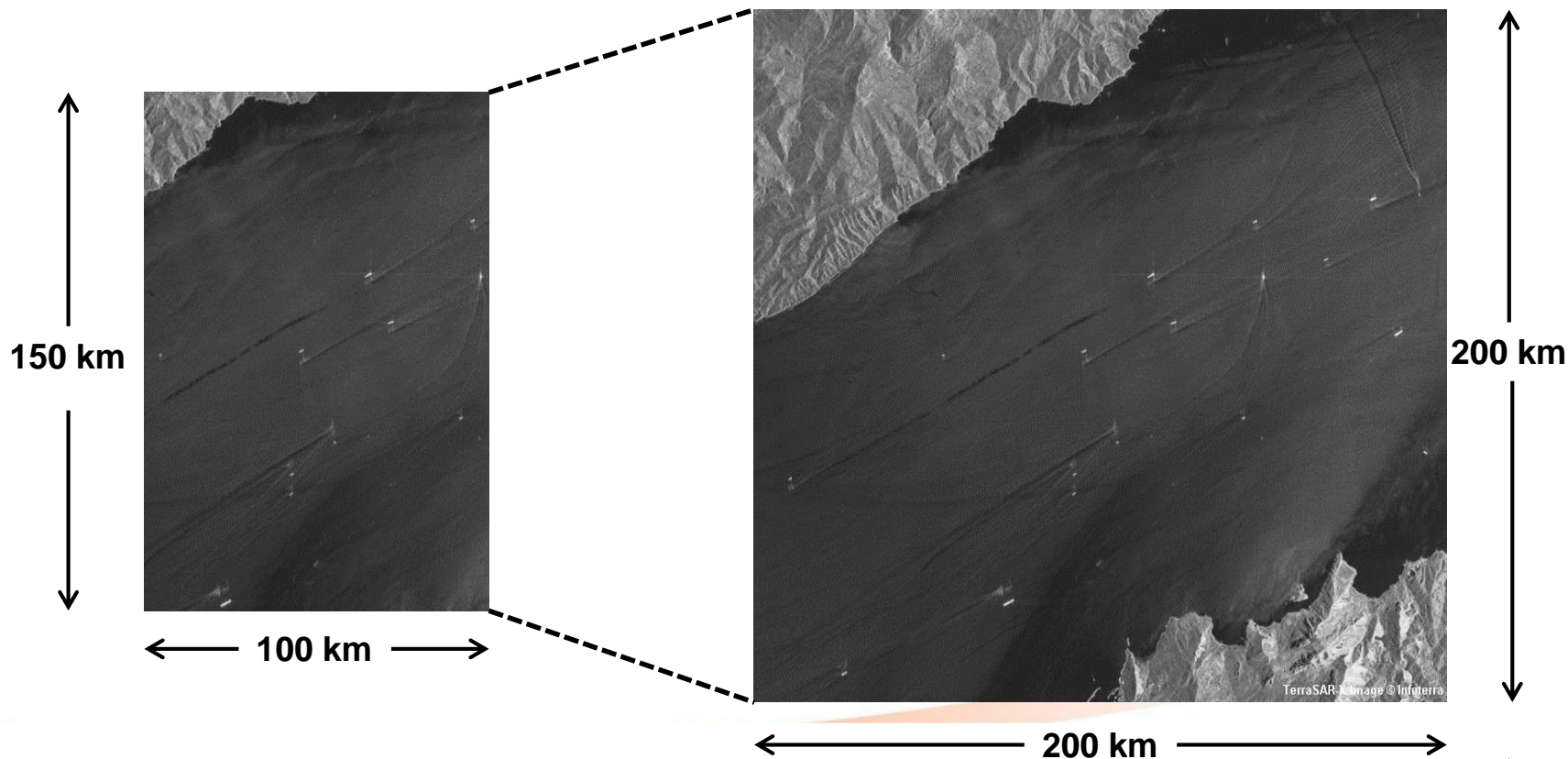
**TSX HS**      **Resolucion & Calidad Radiométrica en VHR**      **New TSX XS**



# TerraSAR-X Nuevo Modo Wide ScanSAR (WSC)

200 – 270 x 200 km @ 38 m resolución espacial

mejorando la captura de grandes zonas marítimas y aplicaciones de monitorización



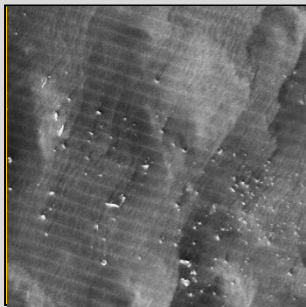
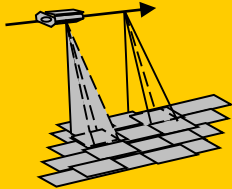
TSX SC

Incrementando la cobertura de 15.000 a 40.000 km<sup>2</sup>

New TSX WSC

# Típos de Imágenes Terrasar

**WSC**



**res. 40 m**

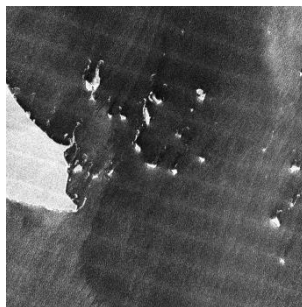
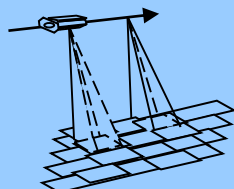
**200 – 270 x 200 km<sup>2</sup>**

**Large area maritime monitoring of traffic, oil spills, sea ice,..**

**Monitoring**

**TerraSAR-X  
new mode 2013**

**ScanSAR**



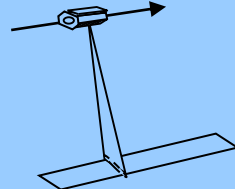
**res. 18 m**

**100 x 150 km<sup>2</sup>**

**Detailed maritime monitoring & detection**

**Detection**

**StripMap**



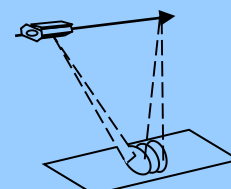
**res. 3 m**

**30 x 50 km<sup>2</sup>**

**Detection & classification of vessels, infrastructure, etc.**

**Recognition & Classification**

**SpotLight**

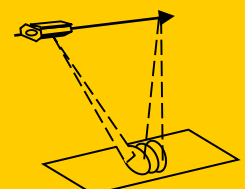


**res. 1 m**

**10 x 5 km<sup>2</sup>**

**Recognition of objects (airplanes, hangars, vessels,..)**

**ST**



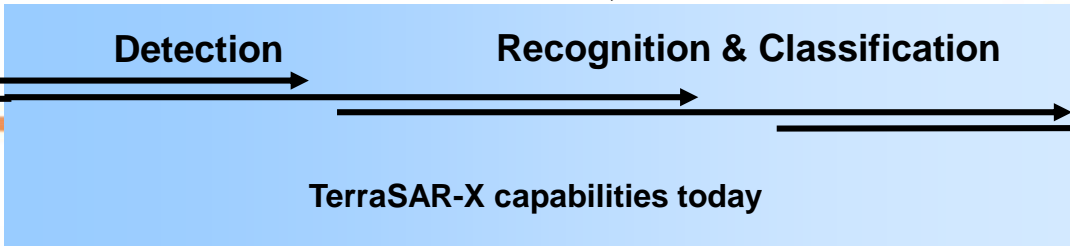
**res. 0.25 m**

**4 x 3.7 km<sup>2</sup> or  
2.5 x 7.5 km<sup>2</sup>,**

**Identification of objects**

**Identification**

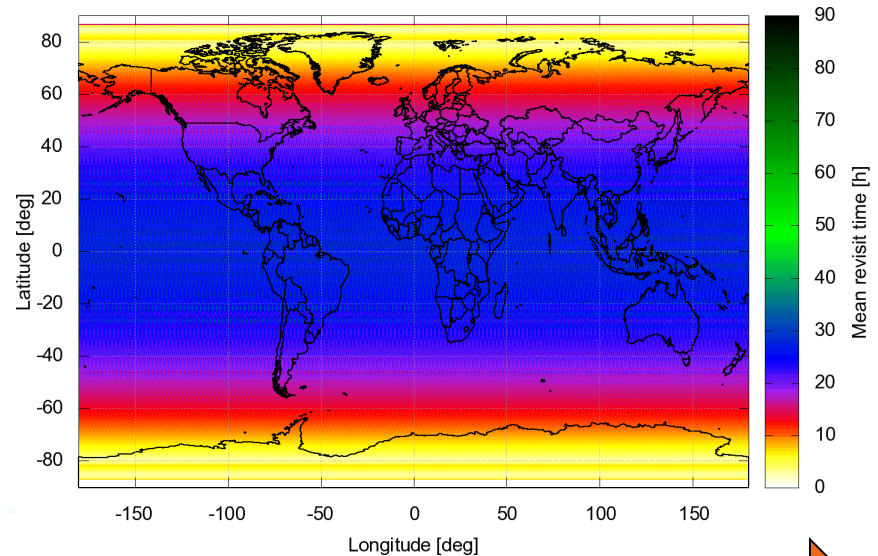
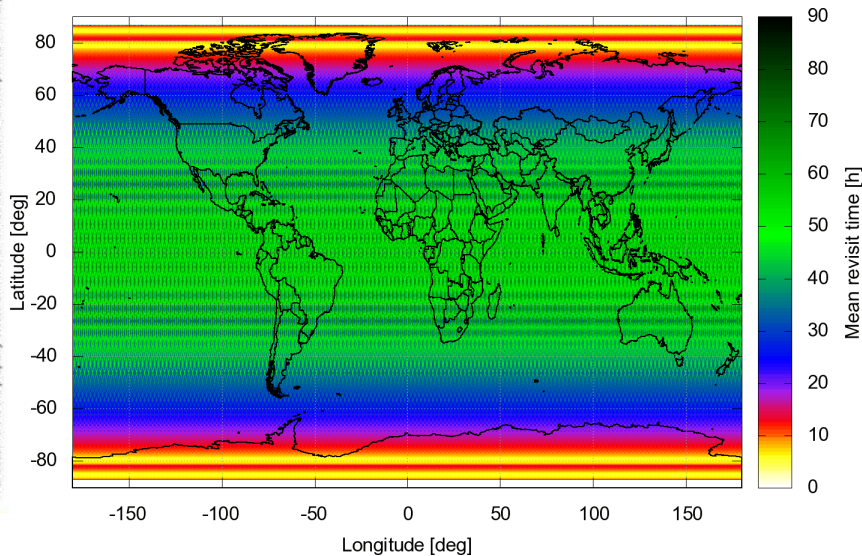
**TerraSAR-X  
new mode 2013**



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# New TerraSAR-X TanDEM-X - PAZ Constellation

- TerraSAR-X & TanDEM-X configuraran una nueva constelacion con el satelite SAR -PAZ en 2014 consiguiendo una mayor capacidad de revisita.
  - **Frecuencia de monitorización incrementada:** tiempo de revisita pasa de 43 h actuales a ~21 h en 2014
  - **Incremento de disponibilidad de datos** para servicios con gran demanda de actualización ejemplo: Monitorización maritima
  - **AIS (Automatic Identification System)** informacion en el mismo momento de la captura de la imagen mediante el sistema montado en el satelite PAZ



TSX

Increasing Mean Revisit Time

TSX-PAZ Constellation

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# New TerraSAR-X TanDEM-X - PAZ Constellation

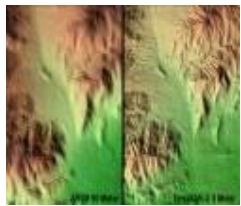
- Los tres satélites serán operados en constelación, suministrando a sus clientes una amplia gama de beneficios, como:
- tiempo revisita mas corto
- capacidad de adquisición incrementada
- características de imagen y modos de adquisición idénticos en los 3 satélites (incluidos los nuevos Staring SpotLight y Wide ScanSAR específico para IMINT y las aplicaciones de monitorización marítima),

TSX

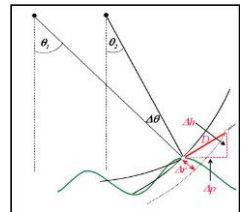
Increasing Mean Revisit Time

TSX-PAZ Constellation

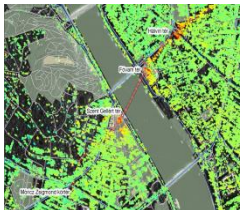
# TerraSAR-X Aplicaciones



Modelos Digitales de Elevación (Precisiones < 2 m)



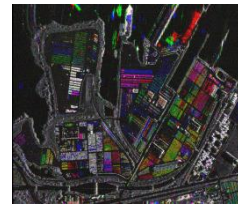
Puntos de Control en campo GCP (3D Precision < 1 m)



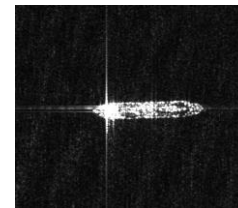
Monitorización movimientos del terreno (velocidad < 5mm/año)



Mapas Topograficos (hasta 1:25,000)



Deteccion cambios (ACD, CCD)



Deteccion buques (Long. barcos > 10 m)

# TerraSAR-X Imaging Service

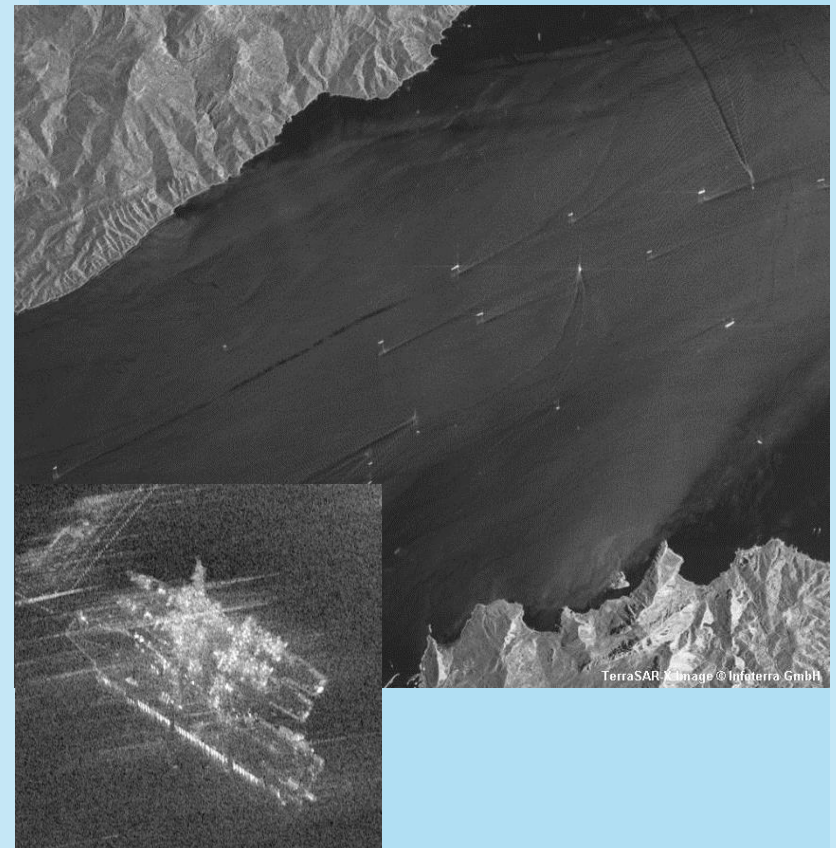
## Multi-Mode X-Band SAR Satellite providing

- continuous, weather & daylight independent monitoring
- varying spatial resolution modes & swath width for broad applications portfolio:
  - **Staring Spotlight:** ~0.5 m @ 8 x 4 km (in 2013)
  - **SpotLight:** 1 m @ 10 km
  - **StripMap:** 3 m @ 30 km
  - **ScanSAR:** 18 m @ 100 km
  - **Wide ScanSAR:** 38 m & 200 - 270 km (2013)
- **TerraSAR-X - PAZ Constellation** (2014): Global mean revisit time increasing from 43 h today to ~ 21, AIS information at same time as SAR imagery

## Key Benefits

- Thanks to sensor specifications and operations performance, suitable monitoring mean for:
  - **Maritime services: Vessels Detection, Sea Ice Monitoring, Oil Spill Detection**
  - **Surface Movement Monitoring**
  - **Image Intelligence**
  - **Change Detection**
  - **Digital Elevation Model (DEM)**

## SAR - weather & daylight independent Monitoring



TerraSAR-X Image © Infoterra GmbH



# TerraSAR-X Change Detection Services

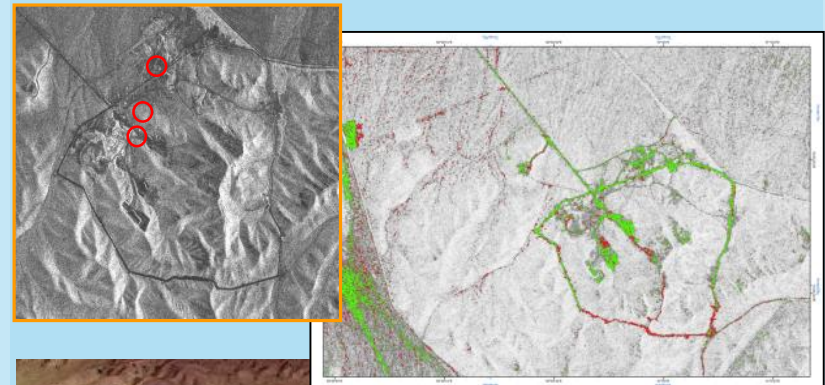
## TerraSAR-X Change Detection Services reliably providing detailed information

- **TerraSAR-X change detection services** providing information on **even little surface changes** independently of weather & daylight, e.g. vehicle tracks, construction of facilities, illegal logging, etc.
- **Amplitude change detection (ACC):** computation of amplitude difference between two acquisition dates indicates changes
- **Coherence Change Detection (CCD):** phase is sensitive to even little surface changes
- Products & Formats: GeoTIFF, shp, report

## Key Benefits

- **Automatic processing enabling large data volume throughput and fast information delivery:**
- **Detection of even small scaled objects** enabled by high resolution TerraSAR-X data
- **Detection of even small surface changes in the range of cm** due to accurate X-band phase measurement

## Fast detection of surface changes



# TerraSAR-X Imagery for Surface Movement Monitoring

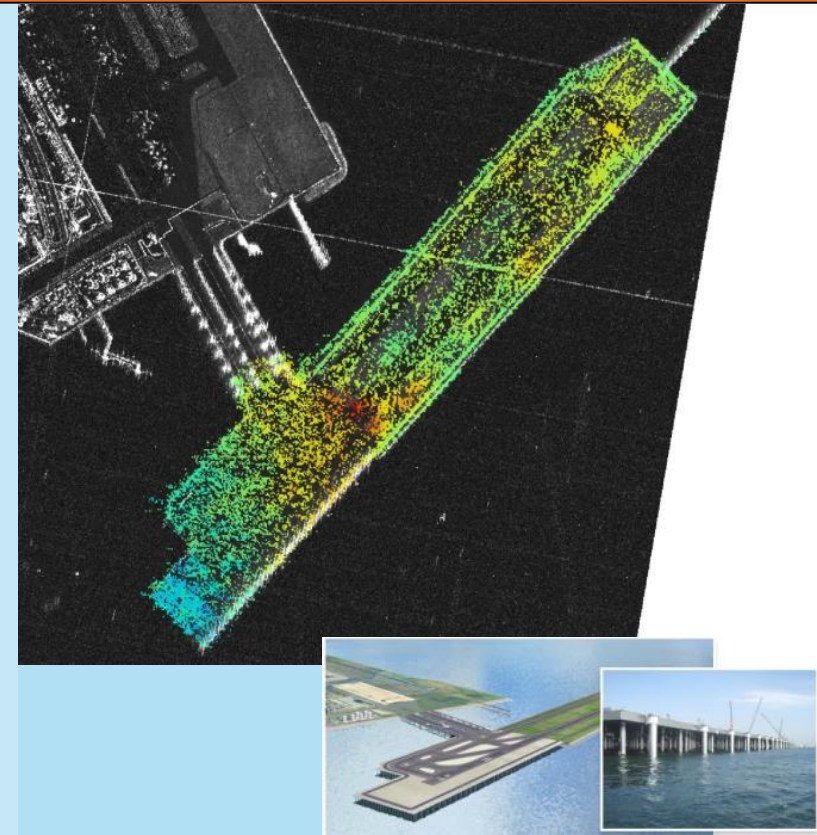
**TerraSAR-X Imagery sets for Surface Movement allow accurately measure even small scaled surface movements**

- **Surface Movement Maps** based on interferometric processing of SAR data time series
- **Persistent Scatterer Interferometry (PSI)**: point information for surfaces varying in scattering behavior over time (e.g. due to vegetation, agricultural activity);
- **Differential Interferometry (DInSAR)** areal information on surface with stable scattering behavior (e.g. urban areas, dry & bare soils, etc.)
- Reliable and efficient data acquisition through Astrium GEO's information for monitoring of land slides, dam and construction stability, oil field management, etc.

## Key Benefits

- TerraSAR-X high revisit time benefitting monitoring of highly dynamic processes
- TerraSAR-X high spatial resolution data enabling measurement of spatially complex and small-scaled surface movement phenomena due to high density of measurement points
- X-band data benefitting measurement of surface changes in range of mm

## Accurate measurement of surface movements



# TerraSAR-X GCP Service

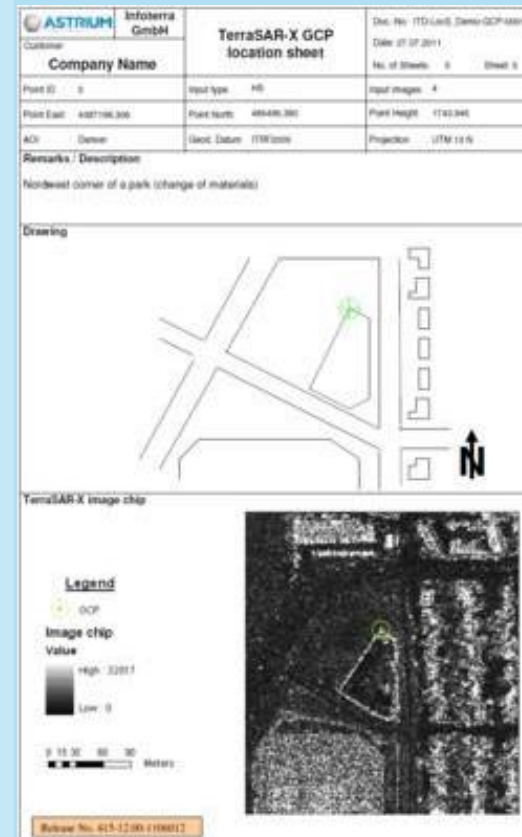
## TerraSAR-X Ground Control Point Information

- Extraction of high accuracy Ground Control Points (GCP's) in denied areas enabling accurate image orthorectification, mosaicing & target localization
- Delivery of comprehensive GCP package including:
  - X, Y, Z coordinates of GCPs,
  - Radar image chip of surroundings
  - Verbal description of each GCP and comprehensive statistics
  - corresponding .kml-file
- Orthorectification service building on Astrium GEO's SAR experts' experience offered on demand

## Key Benefits

- Cloud, weather and day-time independent GCP acquisition for denied areas
- Very high 3D accuracy (x, y, z) due to extremely high orbit accuracy and sensor stability
- x, y, z accuracy of up to 1 m
- Image position error of 0.3 m in range and 0.5 m in azimuth

## Accurate image orthorectification over denied areas



# TerraSAR-X IMINT Manual TIM

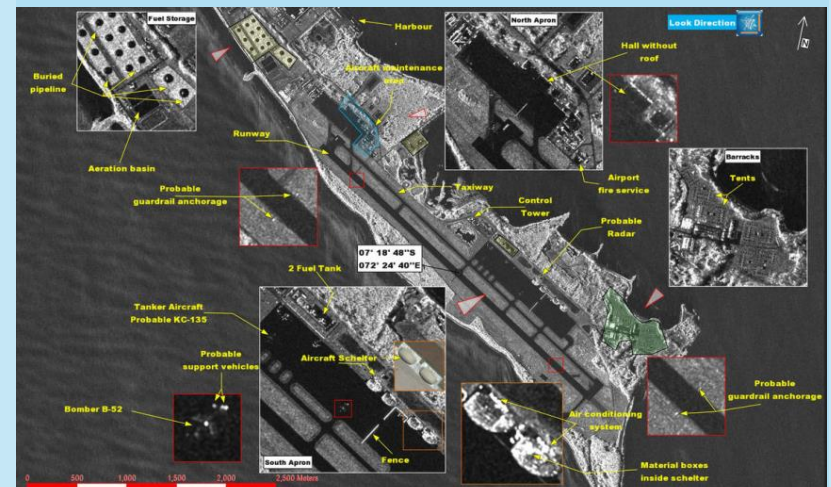
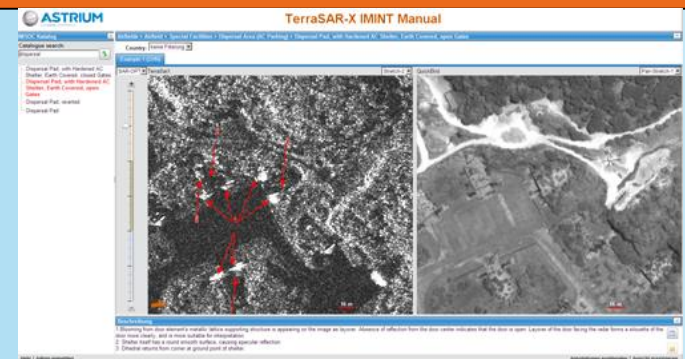
## TerraSAR-X TIM

- **TIM: Analysis support tool for image intelligence**
- Amplitude reference guide for interpretation of VHR SAR images
- Data base can be expanded with own examples and knowledge
- Comparison to optical imagery
- Configuration according STANAG 3596
- Description of object related SAR-Effects
- Easy to use search & filter functions

## Key Benefits

- Base configuration with 200 Examples
- Several extension packs available
- Each extension pack comes with 50 more examples
- Individual AOI analysis on demand
- Supports change over from the optical to the SAR world

## Learning to see the SAR



# TerraSAR-X Direct Access Service

TerraSAR-X Direct Access Service is offering the most direct means to access TerraSAR-X data

- **Direct Access Service to TerraSAR-X data** based on **own ground receiving station**
- TerraSAR-X Direct Access Terminal: certified processor and equipment ensures best performance
- **Secure Domestic Tasking** option enables to virtually task the satellite on your own without revealing intention where to monitor
- **Direct Access Service License:** customer contract for internal use only or partner contract with re-sales intention

## Key Benefits

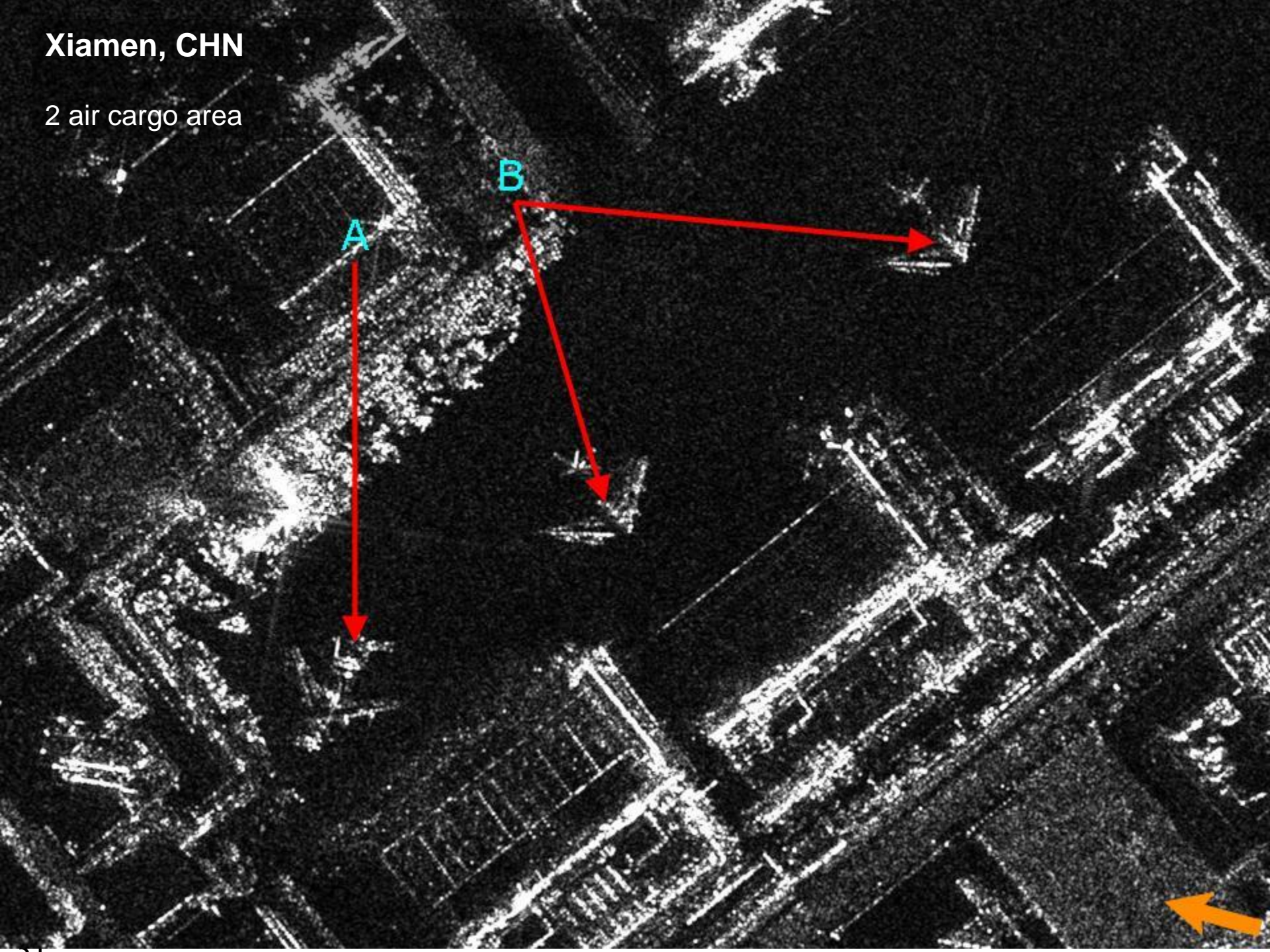
- **Secure Domestic Tasking:** system response time < 2h (change acquisition in target area), image age after local downlink < 1h
- **Satellite receiving station upgrade and enhancement packages**
- **Station setup support**
- **Service and terminal maintenance**
- **TerraSAR-X terminal operator training**

## Direct & fast access to TerraSAR-X



Xiamen, CHN

2 air cargo area



Xiamen, CHN

2 air cargo area

