



# The COSMO-SkyMed Programme

## Mission, System & Results Examples

SkyMed

**Maria VIRELLI**

**CSK - MISSION ENGINEER - ITALIAN SPACE AGENCY**

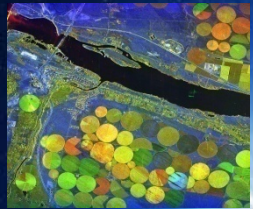
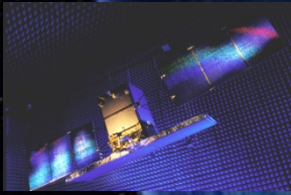
**on BEHALF OF**

**Alessandro COLETTA**

**COSMO-SkyMed MISSION MANAGER – ITALIAN SPACE AGENCY**

# The COSMO-SkyMed PROGRAMME

DUAL USE SYSTEM



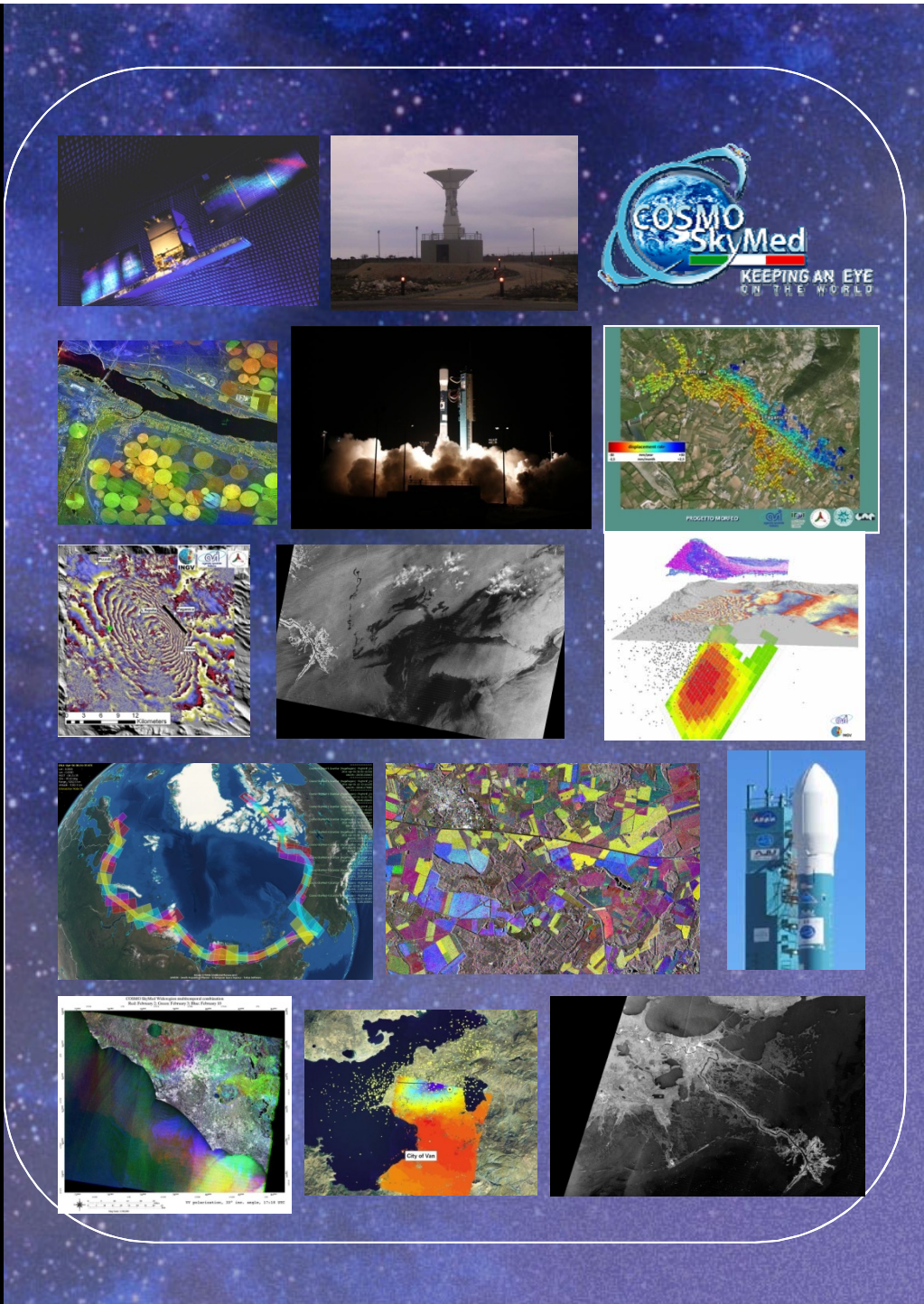
- ❑ The Largest Italian investment in Space System for Earth Observation

- ❑ A National Program conceived by Italian Space Agency (ASI) and funded by It. Ministry of Research & It. Ministry of Defence

- ❑ Managed by ASI in cooperation with the It. MoD

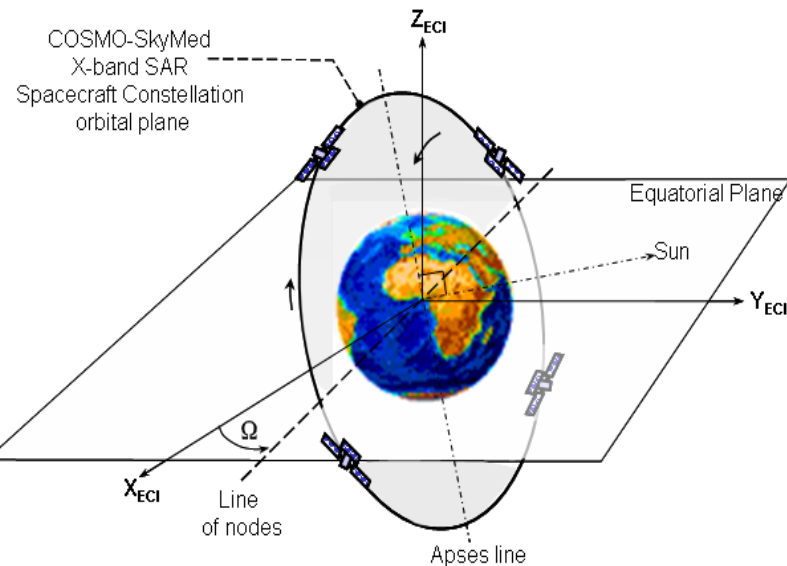
- ❑ Developed by the Italian National Industry







# DUAL USE SYSTEM



- ❑ **WORLDWIDE GLOBAL COVERAGE**
- ❑ **ALL WEATHER NIGHT / DAY ACQUISITIONS**

- ❑ **4 SAR SATELLITES CONSTELLATION**
- ❑ **SENSOR X-BAND SAR (9.6 GHz)**
- ❑ **BANDWIDTH 400 MHz**
- ❑ **HEIGHT 619.6 Km**
- ❑ **ORBIT SSO**
- ❑ **INCLINATION 97.8°**
- ❑ **ORBITAL PERIOD ~ 97 m**

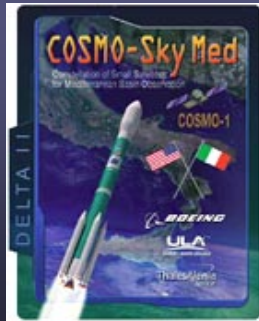
**REVISIT TIME**

**4 SATELLITES**

**MAX < 12h (worst case)**



# CONSTELLATION SATELLITES LAUNCH DATES



8 JUN. - 2007  
**COSMO-1**



5 NOV. - 2010  
**COSMO-4**



9 DEC. - 2007  
**COSMO-2**



25 OCT. - 2008  
**COSMO-3**



**KIRUNA (SWEDEN)**  
S/X BAND

**ITALY**  
S/X BAND



**CORDOBA (ARG.)**  
S/X BAND

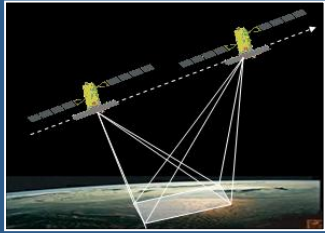


OPERATIONAL MODE	RESPONSE TIME (REQUIREMENT)	RESPONSE TIME (OPERATIONAL)
ROUTINE	≤ 72 h	24 - 72 h
CRISIS	≤ 36 h	12 - 36 h
VERY URGENT	≤ 18 h	6 - 18 h

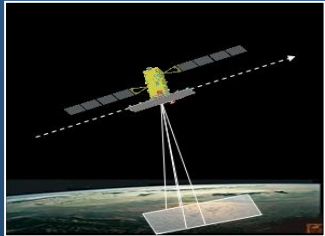
**GEOGRAPHICALLY DISTRIBUTED  
GROUND SEGMENT**



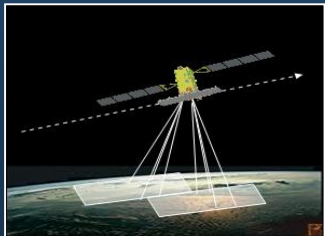
# MULTI-MODE ACQUISITION CAPABILITY



**SPOTLIGHT**  
10 Km X 10 Km  
1 m Resol.



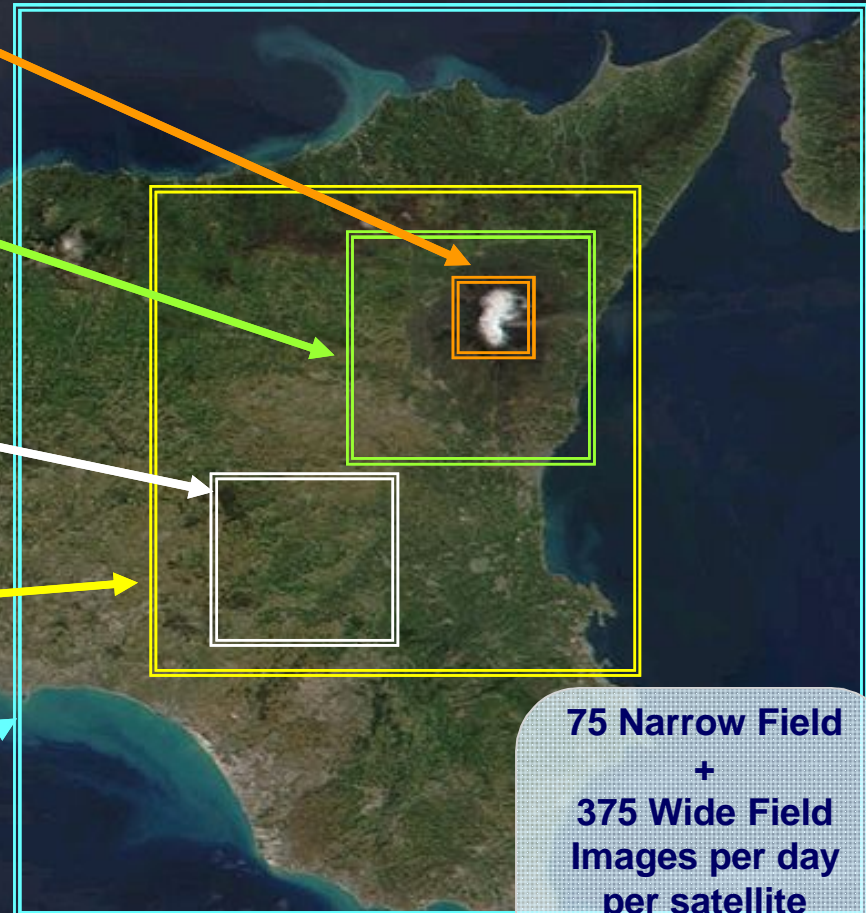
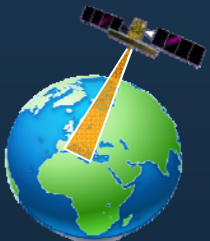
**STRIPMAP - HIMAGE**  
40 Km X 40 Km  
3 m Resol.



**STRIPMAP - PING PONG**  
30 Km X 30 Km  
15 m Resol.

**SCANSAR WIDE**  
100 Km X 100 Km  
30 m Resol.

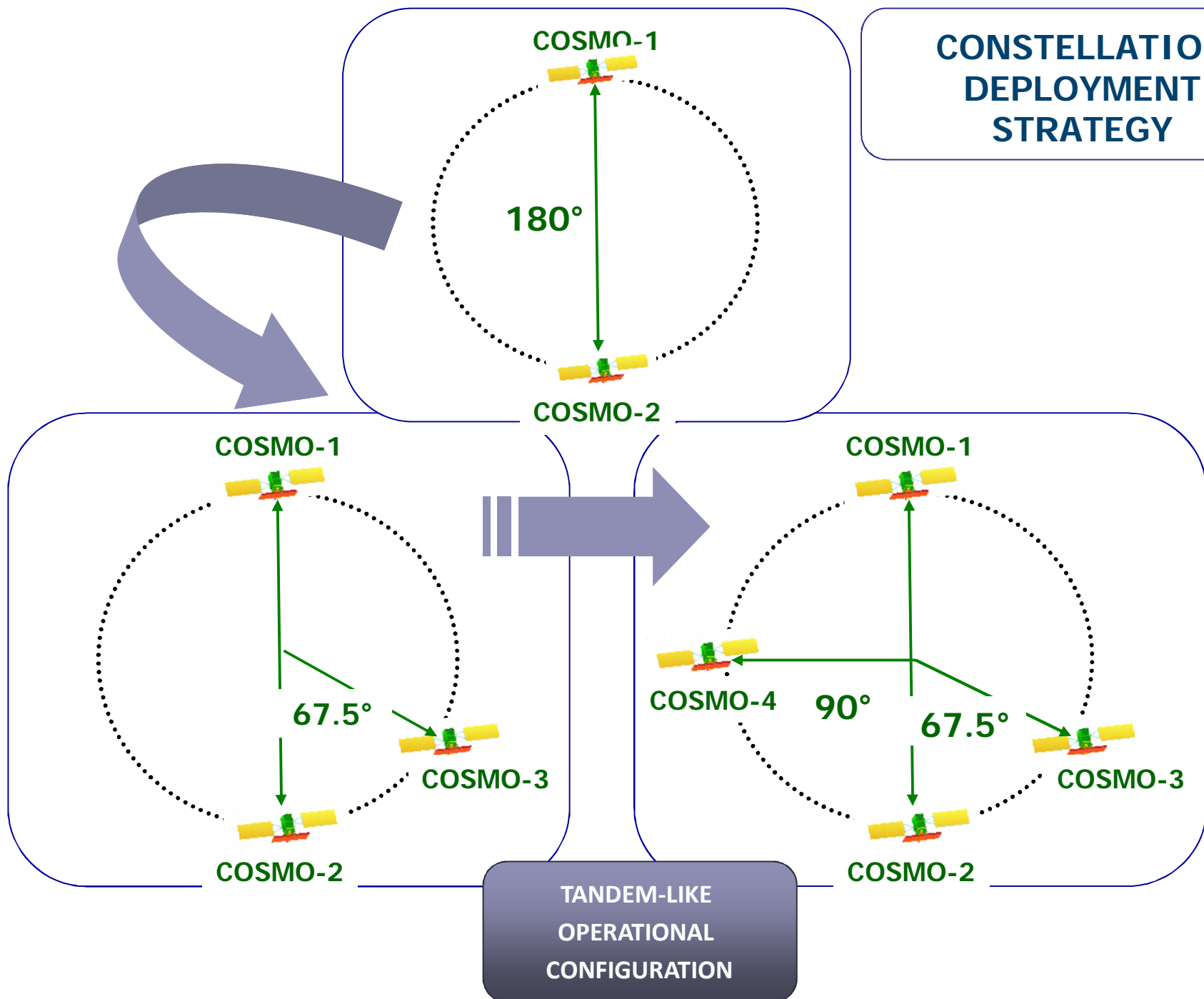
**SCANSAR HUGE**  
200 Km X 200 Km  
100 m Resol.



75 Narrow Field  
+  
375 Wide Field  
Images per day  
per satellite

1800 images  
per day  
(end-to-end  
system)

**CONSTELLATION  
DEPLOYMENT  
STRATEGY**





## RESPONSE TIME

### 4 SATELLITES (worst case)

VERY URGENT

18 h

CRISIS

36 h

ROUTINE

72 h

### 4 SATELLITES

VERY URGENT

6-18 h

CRISIS

12-36 h

ROUTINE

24-72 h

## PRODUCTS

### STANDARD PRODUCTS

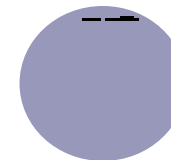
- LO** (Received SAR Echo Signal)
- SCS** (Single look, Complex, Slant range)
- DGM** (Detected, Ground projected, Multi-look)
- GEC** (Geo-coded, Ellipsoid Corrected)
- GTC** (Geo-coded, Terrain Corrected)

### HIGHER LEVEL PRODUCTS

- Quick look
- Speckle Filtered
- Co-registered
- Backscattering
- Mosaiked
- DEM & Interferometric Products
- Coherence map; Interferograms



# WIDE APPLICATION RANGE IN A DUAL SCENARIO



RISK MONITORING AND  
MANAGEMENT OF  
EMERGENCIES



OCEAN AND ICE  
MONITORING



MONITORING AND MANAGEMENT  
OF COASTAL LINES AND  
INLAND WATERS



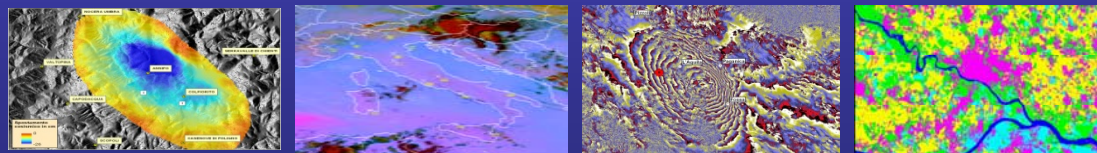
MONITORING AND MANAGEMENT  
OF FORESTRY AND  
AGRICULTURAL RESOURCES



MAPPING –  
URBAN PLANNING



SCIENTIFIC  
APPLICATIONS

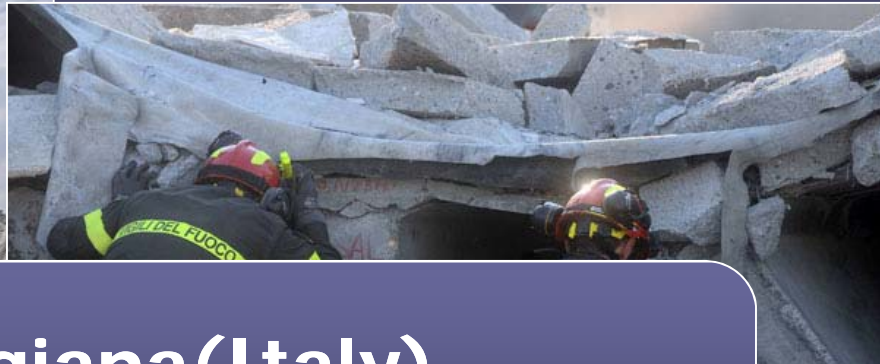
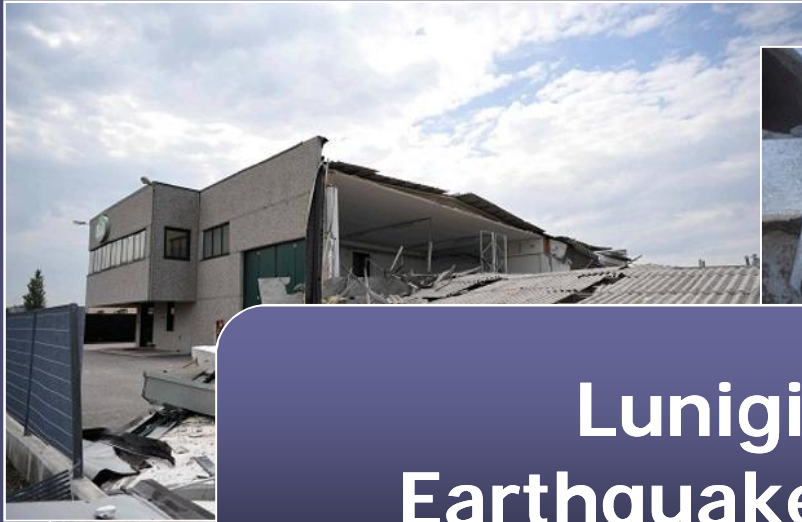


SECURITY APPLICATIONS





# EMERGENCIES



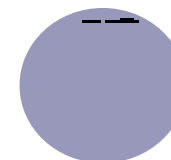
Lunigiana (Italy)  
Earthquake(s) June 2013







# WIDE APPLICATION RANGE IN A DUAL SCENARIO



RISK MONITORING AND MANAGEMENT OF EMERGENCIES



OCEAN AND ICE MONITORING



MONITORING AND MANAGEMENT OF COASTAL LINES AND INLAND WATERS



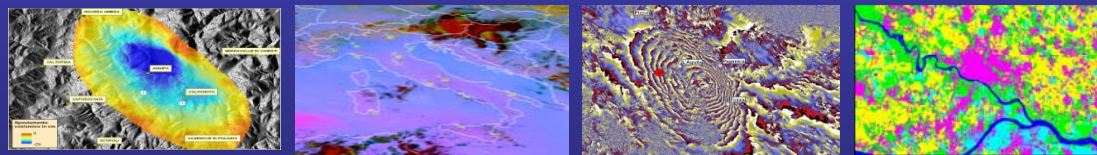
MONITORING AND MANAGEMENT OF FORESTRY AND AGRICULTURAL RESOURCES



TECHNICAL CARTOGRAPHY - URBAN PLANNING



SCIENTIFIC APPLICATIONS



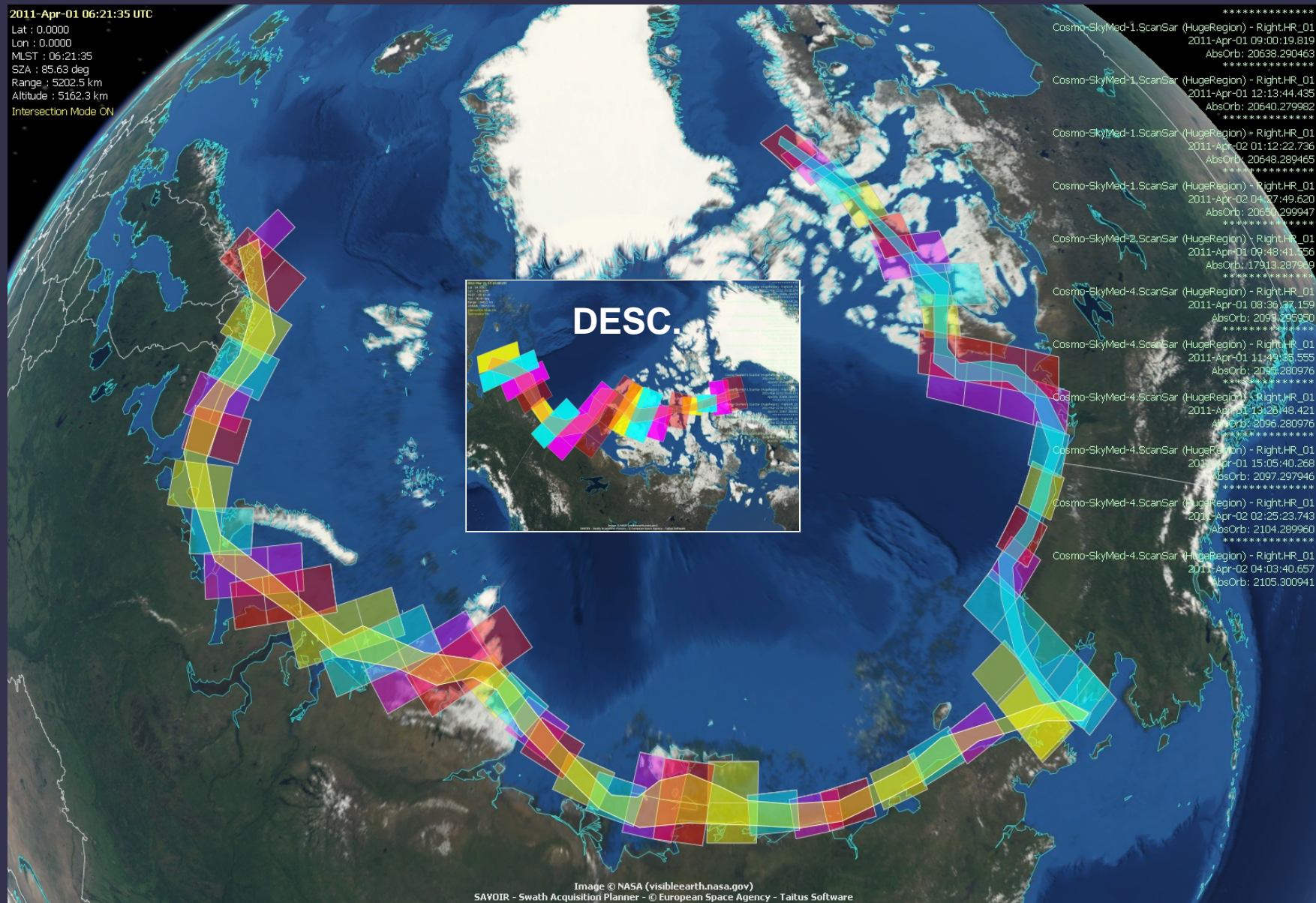
SECURITY APPLICATIONS



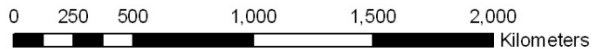


# Polar routes monitoring scenario (one day)

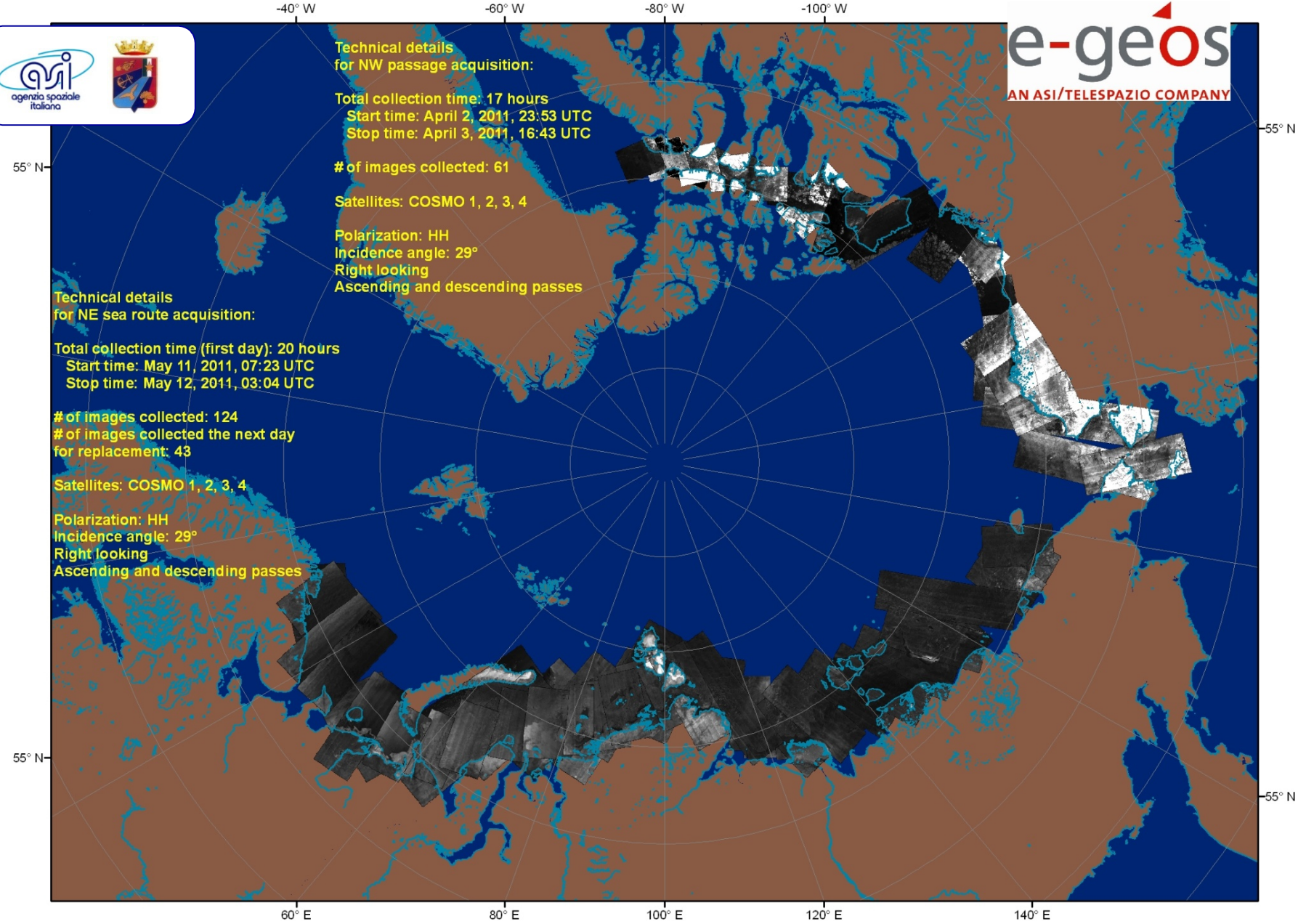
2011-Apr-01 06:21:35 UTC  
 Lat : 0.0000  
 Lon : 0.0000  
 MLST : 06:21:35  
 SZA : 85.63 deg  
 Range : 5202.5 km  
 Altitude : 5162.3 km  
 Intersection Mode ON







# COSMO-SkyMed Northern Routes test collection



**Technical details for NW passage acquisition:**

Total collection time: 17 hours  
 Start time: April 2, 2011, 23:53 UTC  
 Stop time: April 3, 2011, 16:43 UTC

# of images collected: 61  
 Satellites: COSMO 1, 2, 3, 4

Polarization: HH  
 Incidence angle: 29°  
 Right looking  
 Ascending and descending passes

**Technical details for NE sea route acquisition:**

Total collection time (first day): 20 hours  
 Start time: May 11, 2011, 07:23 UTC  
 Stop time: May 12, 2011, 03:04 UTC

# of images collected: 124  
 # of images collected the next day for replacement: 43

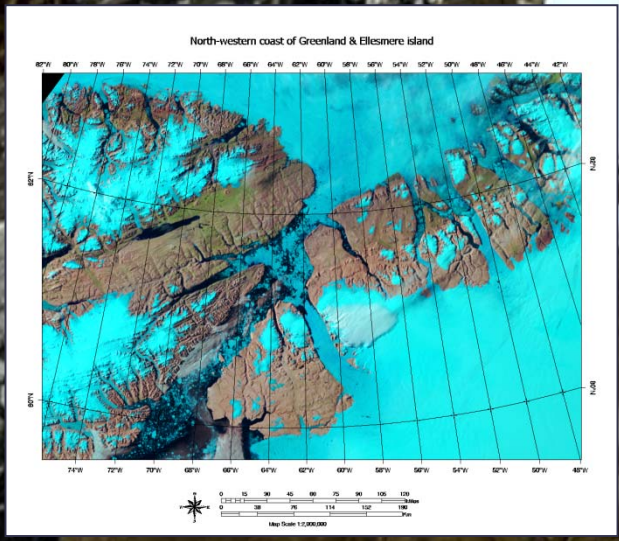
Satellites: COSMO 1, 2, 3, 4

Polarization: HH  
 Incidence angle: 29°  
 Right looking  
 Ascending and descending passes

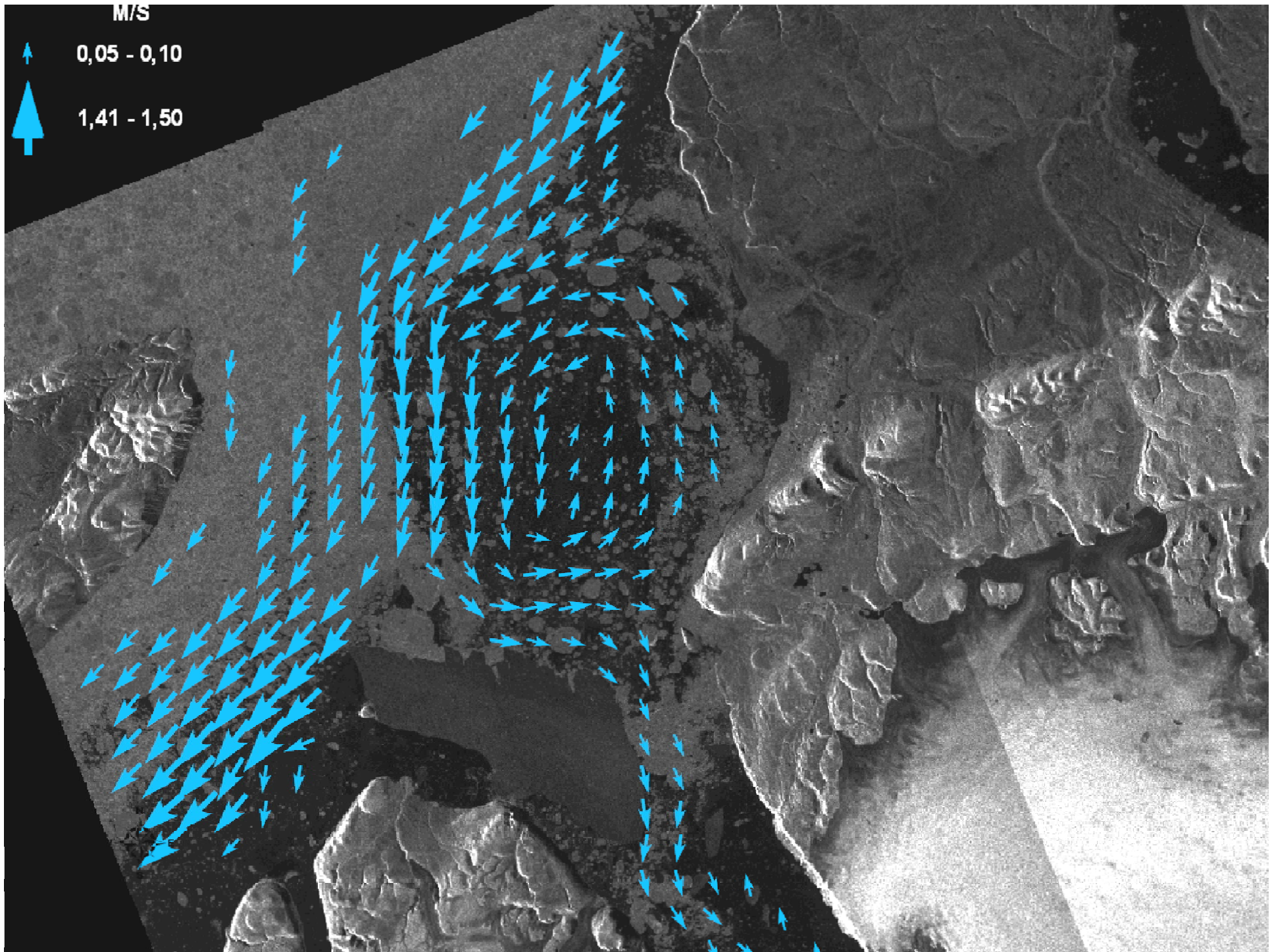


08 September 2010 am

Greenland : Petermann glacier monitoring with COSMO-SkyMed



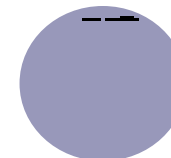








# WIDE APPLICATION RANGE IN A DUAL SCENARIO



RISK MONITORING AND MANAGEMENT OF EMERGENCIES



OCEAN AND ICE MONITORING



MONITORING AND MANAGEMENT OF COASTAL LINES AND INLAND WATERS



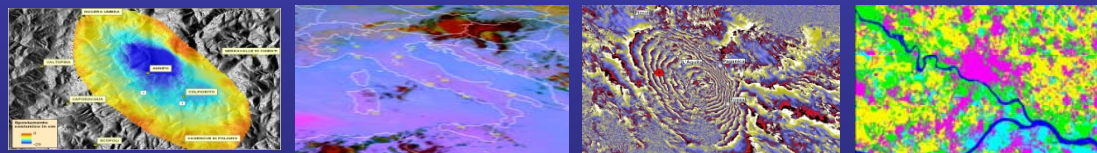
MONITORING AND MANAGEMENT OF FORESTRY AND AGRICULTURAL RESOURCES



MAPPING – URBAN PLANNING



SCIENTIFIC APPLICATIONS



SECURITY APPLICATIONS







# MAPPING: ITALY STRIPMAP MOSAIC



- ☐ 16 DAYS PASSAGES (INTERFEROMETRIC ACQUIS.)
- ☐ ASC./DESC. PASSAGES

© 2009 E-GEOS





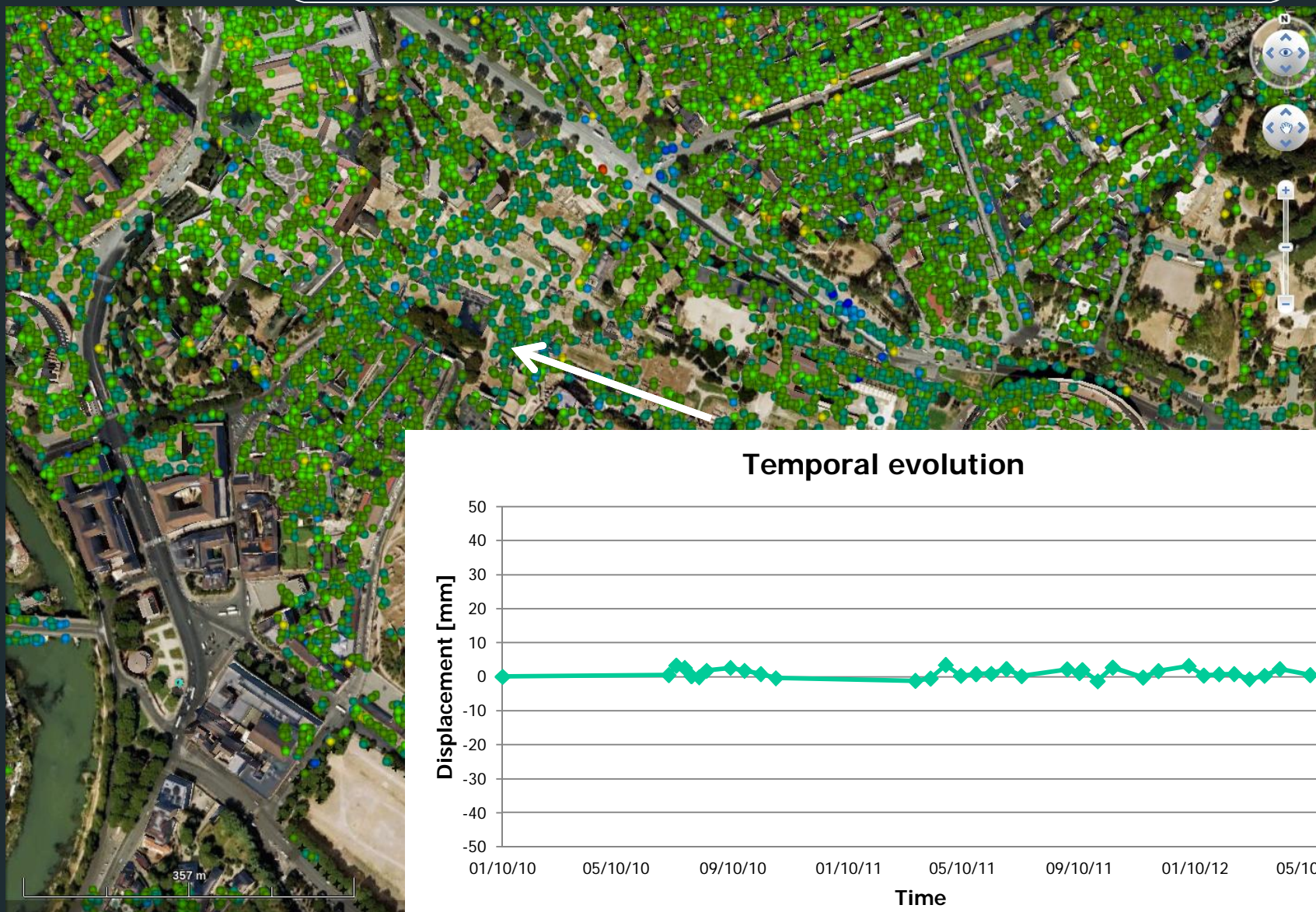
# MAPPING: ITALY STRIPMAP MOSAIC

e-geos  
AN ASI/TELESPAZIO COMPANY





# Area Archeologica Centrale - Roma

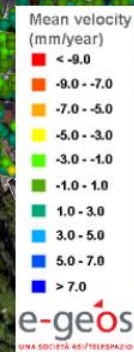
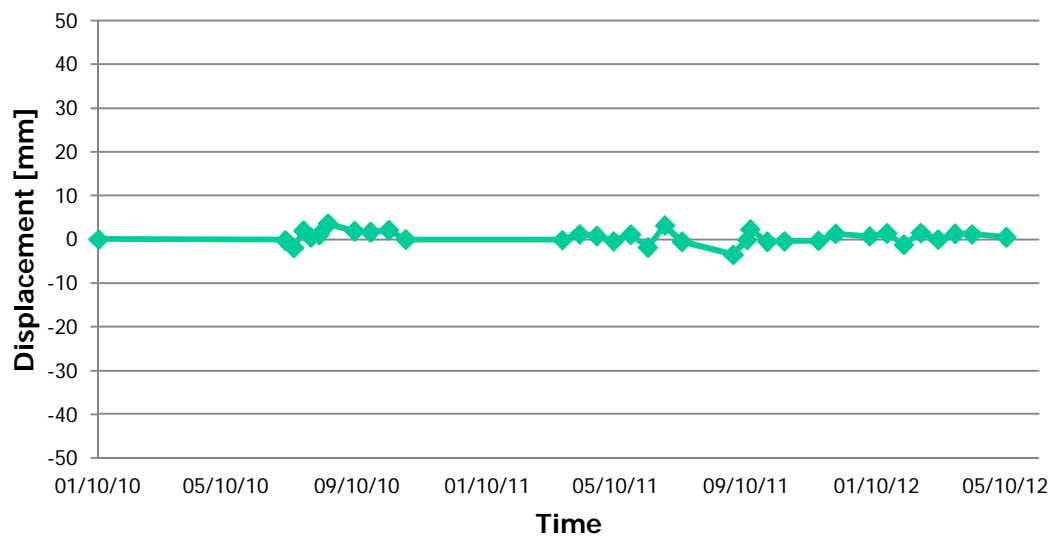




# Area Archeologica Centrale - Roma



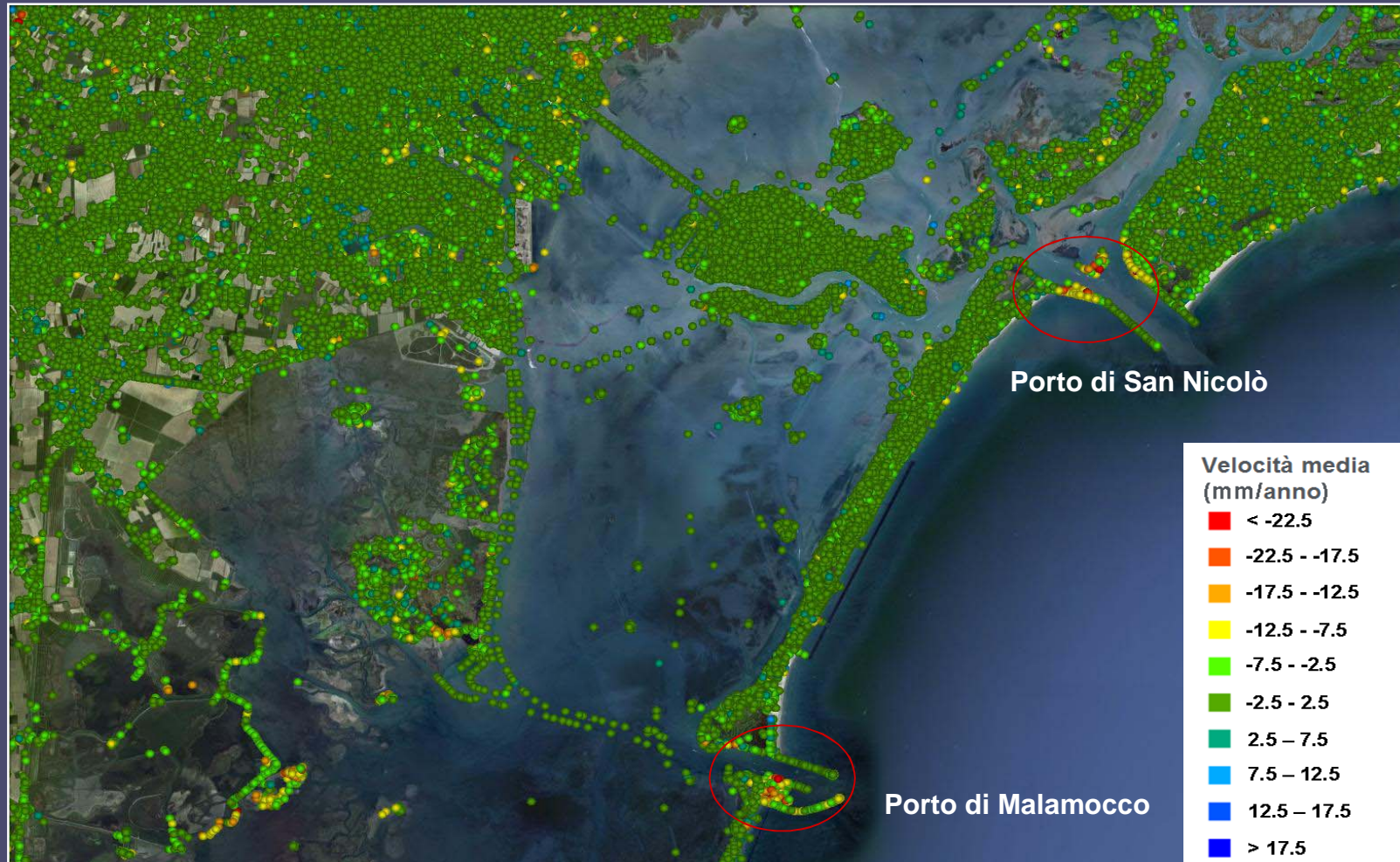
### Temporal evolution





# COSMO-SkyMed 2009-2010

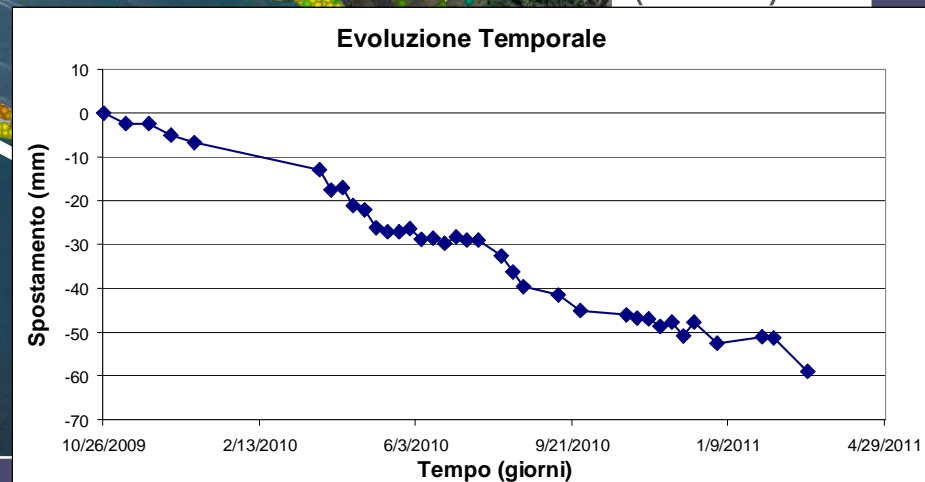
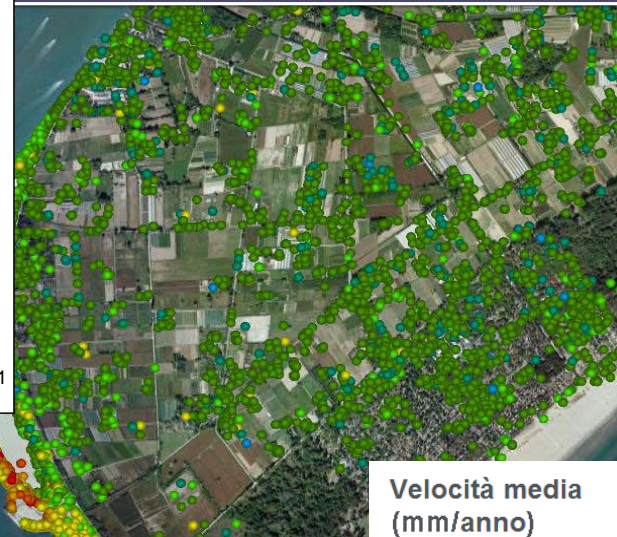
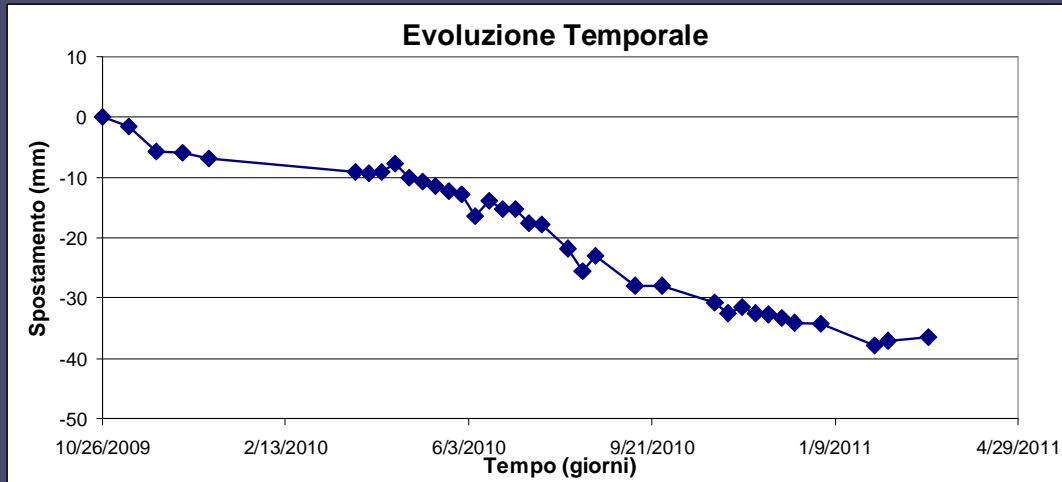
## Laguna di Venezia



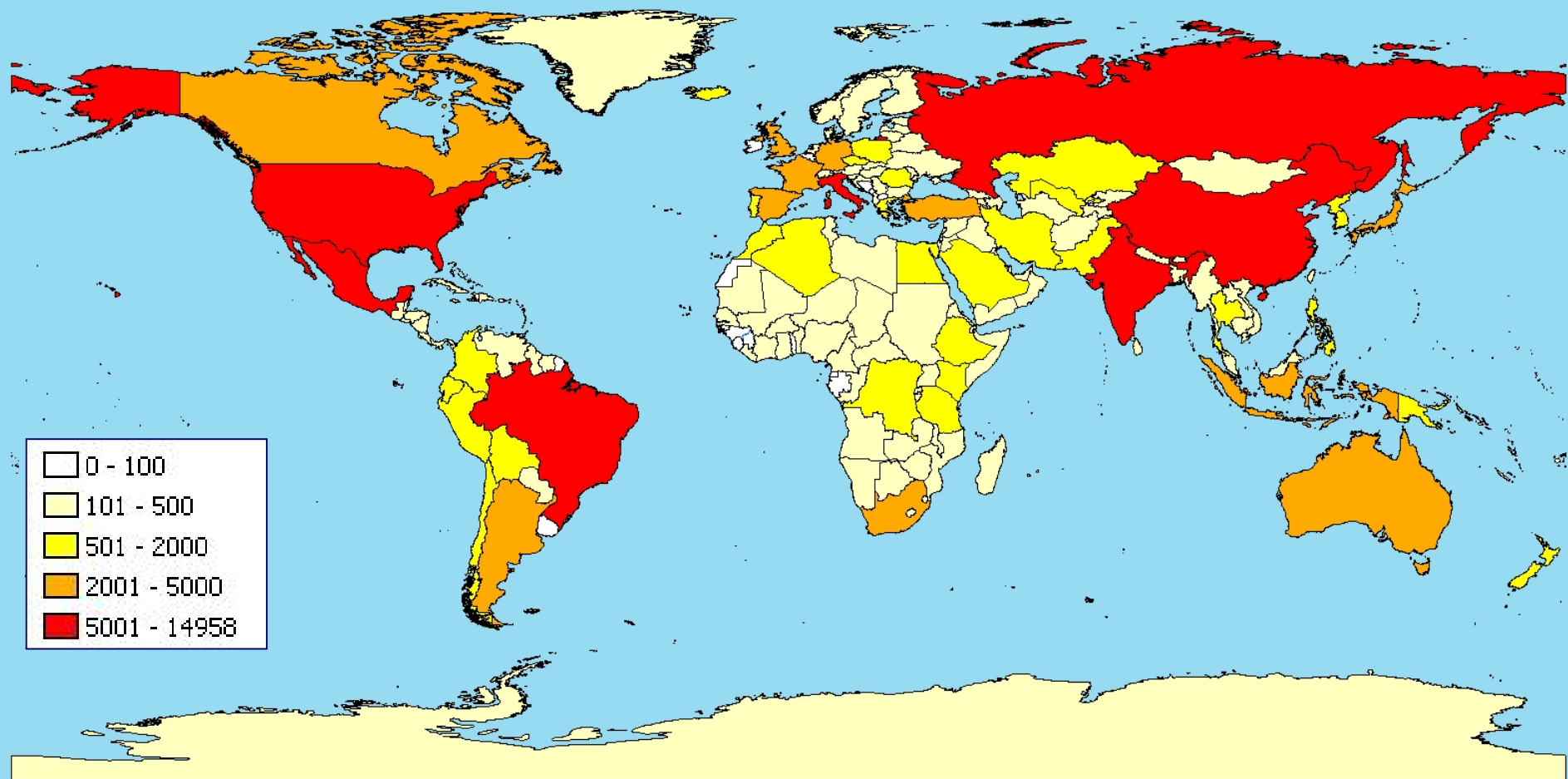
**Conferenza Nazionale ASITA 2011**  
15-18 novembre, Reggia di Colorno (Parma)



# COSMO-SkyMed 2009-2010 Laguna di Venezia



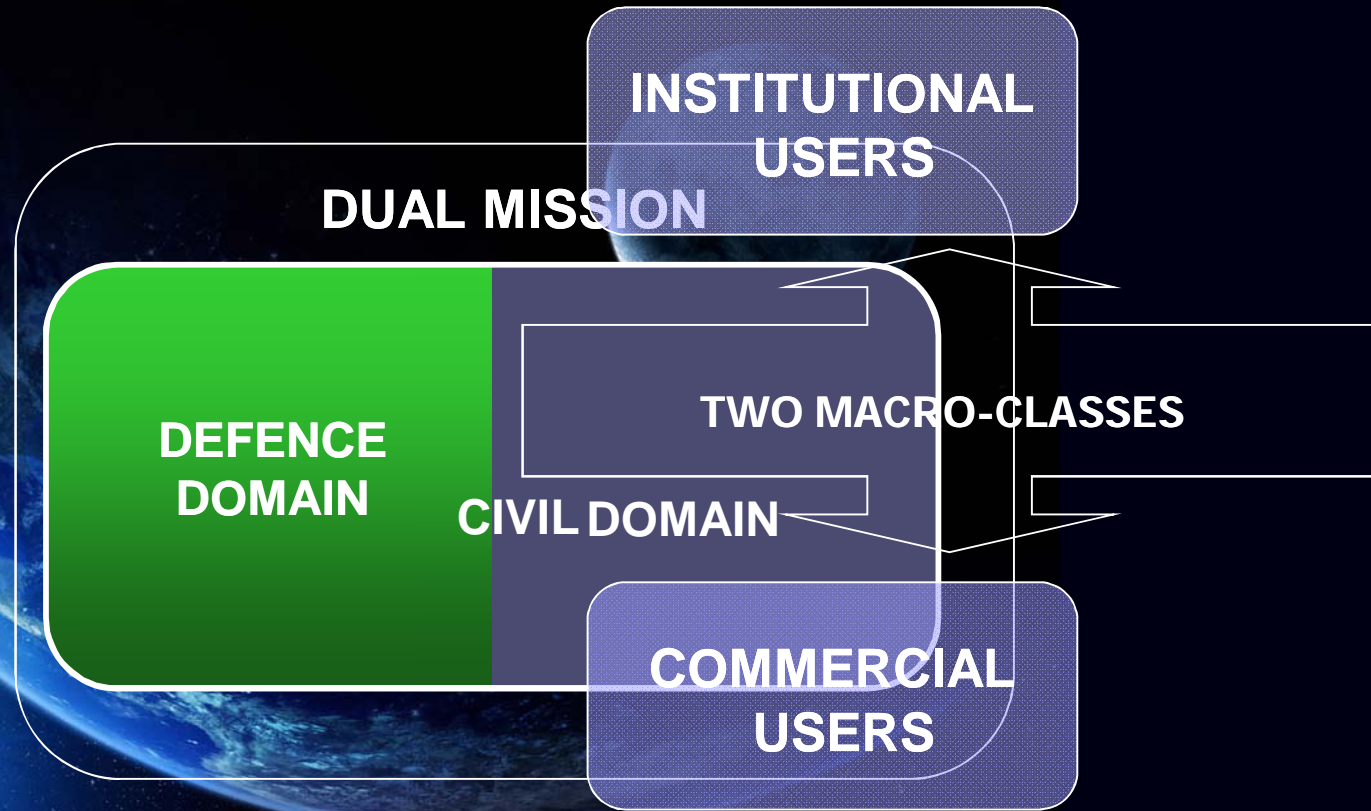




**DISTRIBUZIONE PRODOTTI COSMO-SkyMed  
> 400.000 PRODOTTI GENERATI**



# ACCESSING THE SYSTEM





# ACCESSING THE SYSTEM

**INSTITUTIONAL  
USERS**

- **SYSTEM OWNERS (ASI)**
- **INTERNATIONAL PARTNERS**
- **NATIONAL & INTERNATIONAL INST. USERS (NAT. ADM. – INT. ORG., e.g. ESA)**

**TWO MACRO-CLASSES**

**COMMERCIAL  
USERS**

- **ALL THE OTHERS**



# ACCESSING THE SYSTEM



## ASI – CONAE SIASGE PROGRAM:

2 SAOCOM SAT. (L BAND) – 4 CSK SAT. (X-BAND)

- CONAE Handbook (~ 3000 products/year)
- Emergency events
- CONAE CORDOBA X-/S-Band Ground Station



## ASI – CNES ORFEO FEDERATED SYSTEM:

2 PLEIADES SAT. (OPT.) – 4 CSK SAT. (X-BAND)

- JOINT DP&RS TO BE FINALIZED



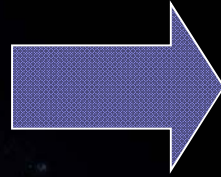
## ASI – JAXA COOPERATION ORFEO:

ALOS SAT. (L-BAND) – 4 CSK SAT. (X-BAND)

- FEASIBILITY STUDY AND JOINT RESEARCH ACTIVITIES IN SATELLITE DISASTER MONITORING COOPERATION

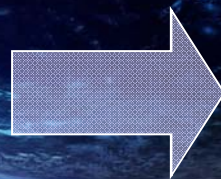
# ACCESSING THE SYSTEM

**INSTITUTIONAL  
USERS**



- **SPECIFIC AGREEMENT WITH ASI**
- **TERMS AND CONDITIONS**
- **PROJECT FORM**

**COMMERCIAL  
USERS**



- **TERMS AND CONDITIONS**
- **COMMERCIAL CONTRACT**



# ACCESSING THE SYSTEM

**INSTITUTIONAL  
USERS**



ASI supports the **INSTITUTIONAL**  
(incl. **SCIENTIFIC**) data exploitation

[www.cosmo-skymed.it](http://www.cosmo-skymed.it)

**COMMERCIAL  
USERS**

# ACCESSING THE SYSTEM

SYSTEM LOGIN

GEOGRAPHICAL AREA SELECTION

NEW ACQUISITIONS

PRODUCTS CATALOGUE

INFO SERVICE, REPORTS

ETC....

The screenshot displays the COSMO-SkyMed website interface. On the left, there is a navigation menu with options like 'User', 'Profile', 'Contents', 'Services', 'Orders', 'Reports', 'Info', and 'Home'. The main content area features a 'Standard Products Catalogue' table with columns for 'Service', 'Spatial Resolution (meters)', and 'Number of Satellites (min. Clouds)'. Below the table, there are sections for 'Disaster Monitoring' and 'Coastal Monitoring' with accompanying satellite imagery. A large blue box in the center of the screenshot contains the website URL: [www.cosmo-skymed.it](http://www.cosmo-skymed.it).

Service	Spatial Resolution (meters)	Number of Satellites (min. Clouds)
RAW_B(L) CATALOGUE	0.01	11
MOS_B CATALOGUE	0.01	21
MOS_C CATALOGUE	0.01	20
MOS_D CATALOGUE	0.01	16
CRG_A from SCS_B CATALOGUE	0.01	14
CRG_A from SCS_U CATALOGUE	0.01	14

PRODUCTS ORDER

SERVICES AND NEW ACQUISITION LISTS



# ACCESSING THE SYSTEM

**INSTITUTIONAL  
USERS**



ASI supports the **INSTITUTIONAL**  
(incl. **SCIENTIFIC**) data exploitation

**IF REQUESTED**

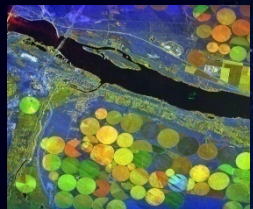
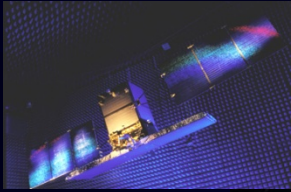
[www.cosmo-skymed.it](http://www.cosmo-skymed.it)

**COMMERCIAL  
USERS**



e-GEOS supports the  
**COMMERCIAL** data exploitation

[www.e-geos.it](http://www.e-geos.it)



# COSMO-SkyMed *SECOND GENERATION*



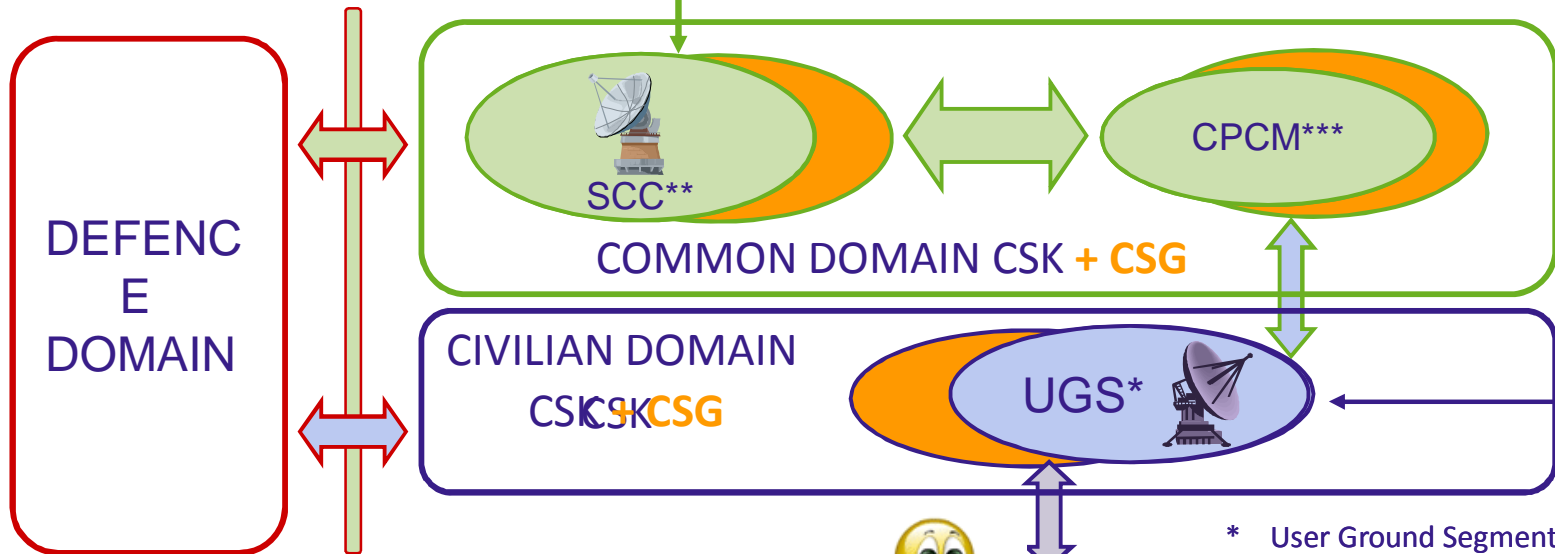


# THE SYSTEM - Concept

## Space Segment



## Ground Segment



 CSG Ground Segment specific Update/Improvements

- \* User Ground Segment
- \*\* Satellite Control Centre
- \*\*\* Planning Centre and Mission Control



Thank you

SkyMed