

The ESA Helix Nebula flagship project:

SuperSites Exploitation Platform (SSEP)

Description, Status and Plan

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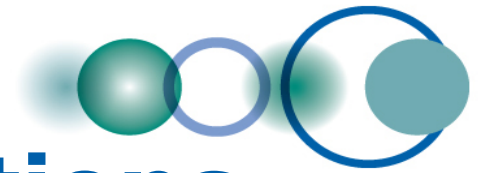
1. SSEP Project Description
2. Status and Achievements
3. Next Steps

Problem – '4th Paradigm' EO data Exploitation (for Geohazards)



Data deluge

Many users



Group on Earth Observations

Intergovernmental Organization with 83 members and
59 participating organizations (as of October 2010)

Construct by 2015: **G**lobal **E**arth **O**bservation **S**ystem of **S**ystems (**GEOSS**)



U.S. Department of State, Washington DC
July 31, 2005

**GEO data sharing principles
approved in 2010 Plenary:
open & free data access for
science**

The Geohazard Supersites



Support GEO to better understand the geophysical processes causing **Geohazards** (earthquakes and volcanoes)

- Global partnership of scientists, satellite and in-situ data providers (**multi-sensor InSAR, seismic, GPS - complete data sets**)

⇒ Brings together community & relevant data

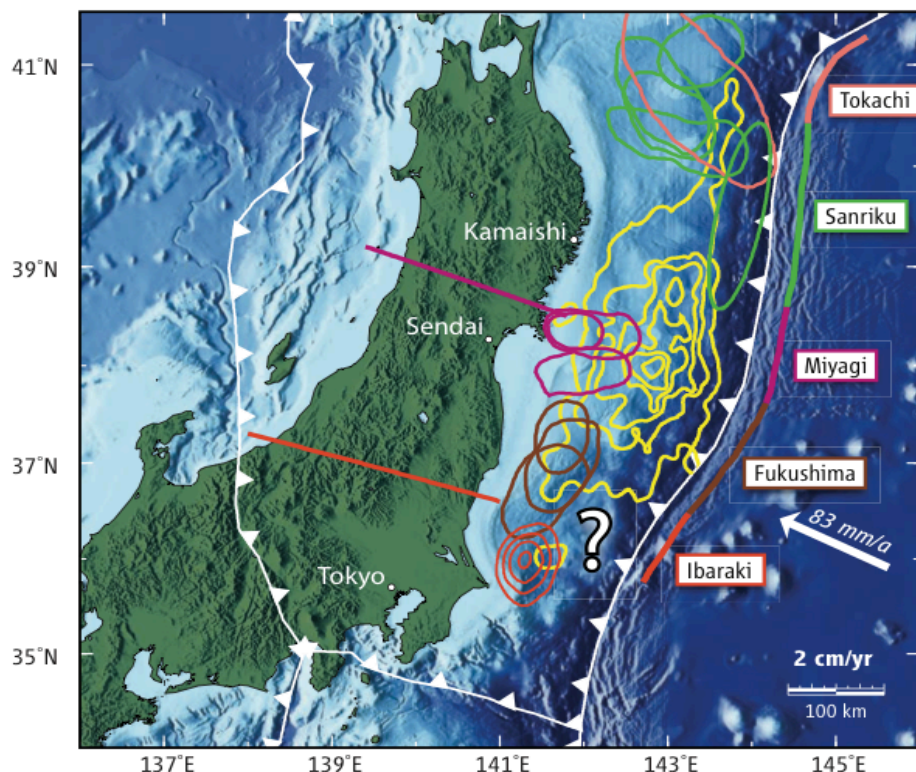
- Support national authorities and policy makers in risk assessment and mitigation strategies for Geohazards



Summary

Supersites is an initiative of the geohazard scientific community. The Supersites provide access to spaceborne and in-situ geophysical data of selected sites prone to earthquake, volcano or other hazards. The initiative began with the "Frascati declaration" at the conclusion of the 3rd International Geohazards workshop of the Group of Earth Observation (GEO) held in November 2007 in Frascati, Italy. The recommendation of the workshop was "to stimulate an international and intergovernmental effort to monitor and study selected reference sites by establishing open

EARTHQUAKES OF THE JAPAN TRENCH



A game of ring toss. March's huge quake (yellow contours) and past smaller quakes (colored loops) have left a patch of threatening fault (question mark).

- Tohoku-oki: unprecedented >50 m slip in places (Simons et al., Science 2011, NASA-funded study).

- **Will another magnitude 9 occur further south?**

- It is unknown whether this fault segment has been accumulating slip.

- Need all InSAR, GPS, Seismic, Petrology, Geochemistry, ... !

- (-2004 magnitude 9.2 Sumatra earthquake was followed by magnitude 8.7 half-a-year later)

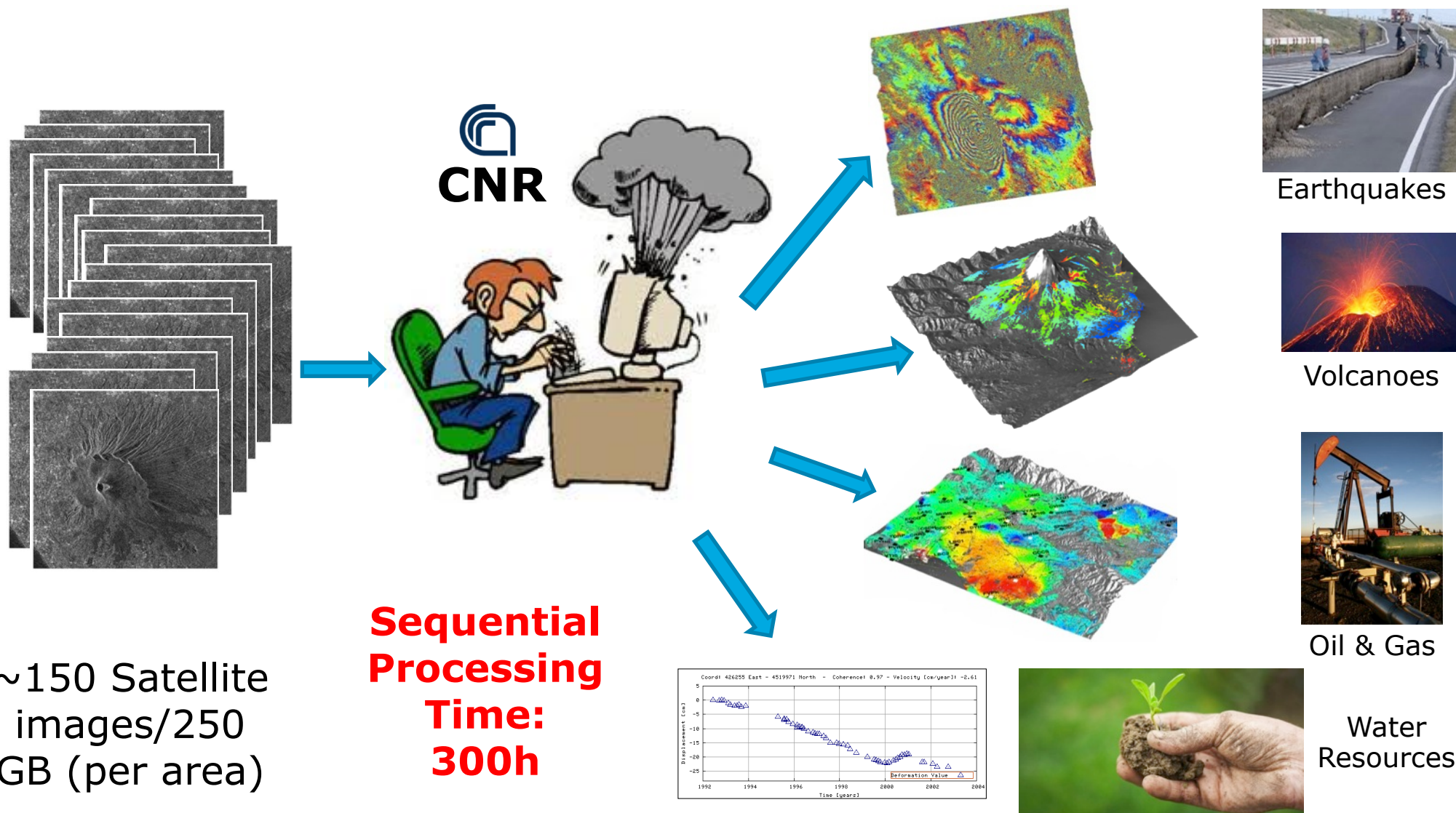
The Geohazard Supersites Exploitation Platform (SSEP)



=> The PoC for a natural evolution of the Geohazard Supersites

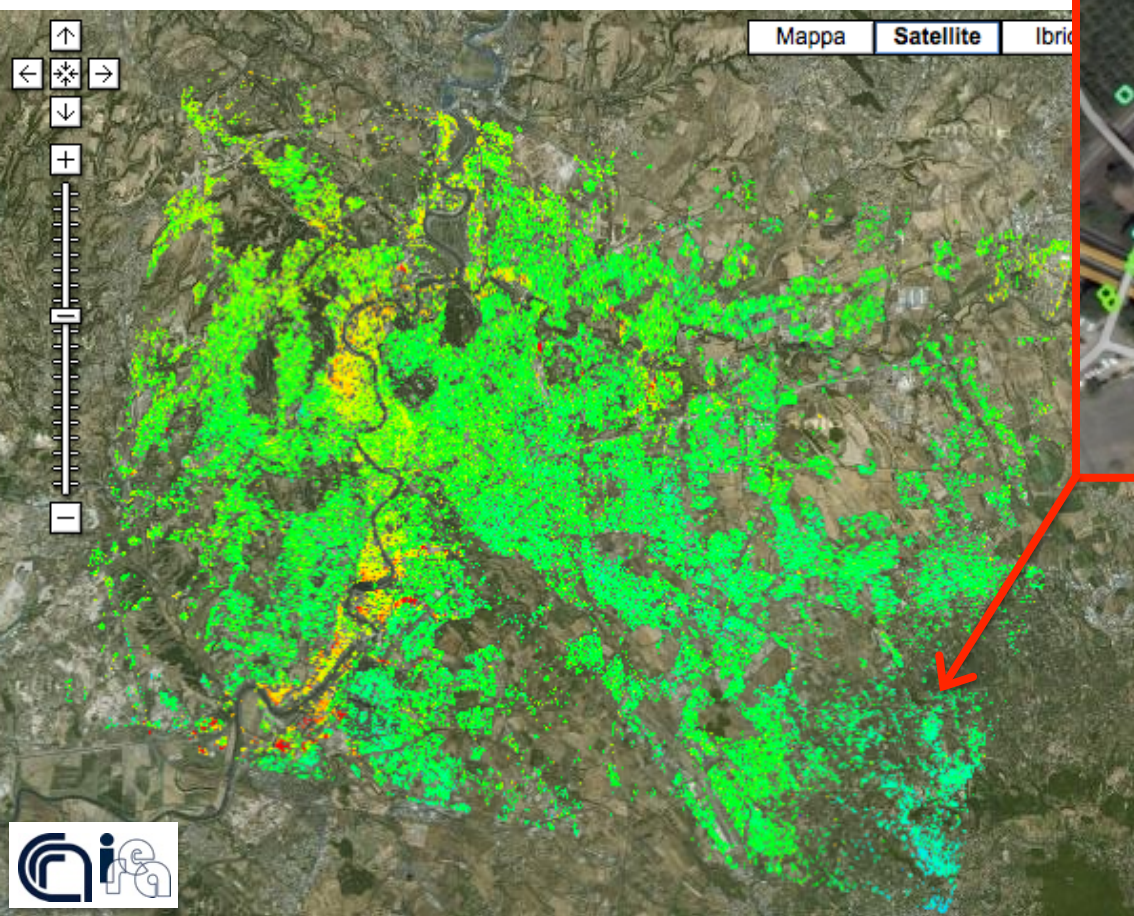
- An e-Infrastructure supporting quick and global **access to data; tools** for the study of natural hazards in geologically active regions; and the **resources** required for processing
- (Up to) **100TB** of data spanning an observation period of **20 years**

➔ Outputs: displacement maps, subsidence measurements, stress assessments, support to modeling

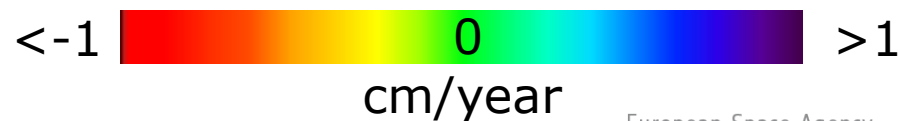


Building and infrastructures analysis:
the **Roma** case study

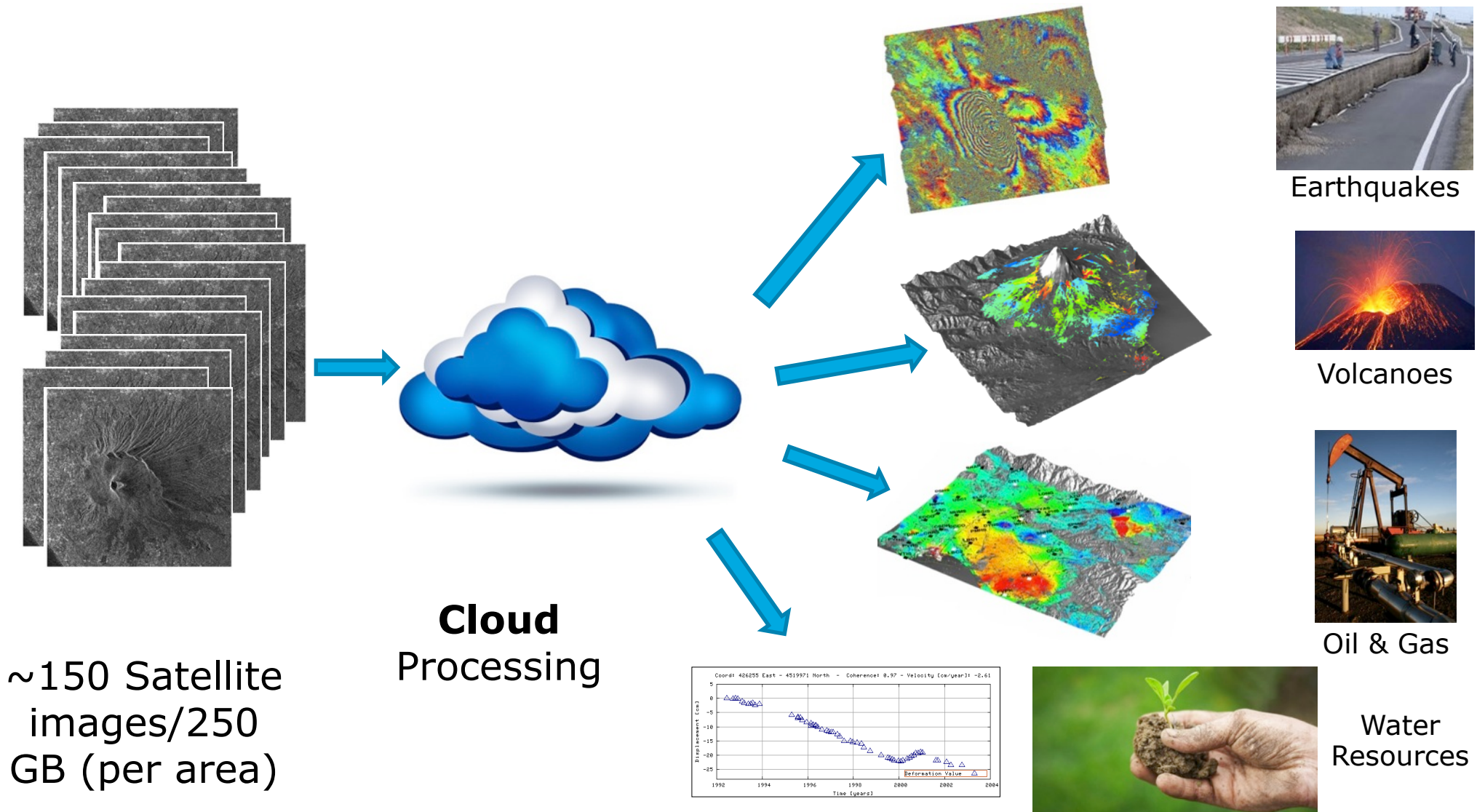
ESA - ESRIN



**YOU ARE HERE
(and safe)!**



Target (SBAS) Processing Scenario in SSEP



1. Provision IaaS resources from different cloud providers as well as private cloud resources (**hybrid multi-sourced cloud**)
2. Allow users (scientists) to search and **access/download data at high performance** and data providers (ESA and other agencies) to upload data.
3. Allow users (scientists) to process data on **dedicated sandboxes**; for algorithm development and small data processing
4. Provider users (scientists) access to **large data processing** where to deploy and exploit their applications via a portal.
5. All nicely integrated with a **common security framework**

1. Provision IaaS resources from different cloud providers as well as private cloud resources (**hybrid multi-sourced cloud**)

Done

- a) Proof of concept completed with: ATOS, CloudSima and Interoute
- b) API Integration with T-Systems
- c) Deployment of small private cloud at ESA

To be completed

- a) API integration with other Cloud Suppliers in HN
- b) Use of the federation layer

2. Allow users (scientists) to search and **download/access data at high performance** and data providers (ESA and other agencies) to **upload data**.

Done

- a) All ESA data on SuperSites moved to Interoute (13TB)
- b) Data accessible through secured URLs

To be completed

- a) Announcement and opening to SuperSites users
- b) Inclusion of data from other data providers

ESA SuperSites Data Deployed (13TB)



GEO Geohazards Supersite :: OpenSea... x Helix Nebula - The Science Cloud, Re... x +

eo-virtual-archive4.esa.int

geo supersites

GEO Geohazards Supersite
Group on Earth Observations

Search Search

Found 56360 results in 15 digital repositories From 1 Jan, 1992 to Jan 11, 2013

Orbits from to
Tracks from to
Frames from to
Paths All

About Search My Data

☐ ASAR Image Mode source packets Level 0
(ASA_IM_OP)
[Found 24419 results] [Showing from 0 to 19]
first next last

ASA_IM_OCNPDE20120329_071134_000000163113_00121_52721_6279.
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☐ ERS-2 SAR Image SAR Annotated Raw Data
Product Level 0 (ER02_SAR_RAW_OP)
[Found 12234 results] [Showing from 0 to 19]
first next last

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ER02_SAR_RAW_OP_20100118T174929_20100118T174945_ESR_77106.C
ER02_SAR_RAW_OP_20090831T174944_20090831T175000_ESR_75102
ER02_SAR_RAW_OP_20090831T174944_20090831T175000_ESR_75102.C
ER02_SAR_RAW_OP_20090831T174929_20090831T174945_ESR_75102
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Data CC-BY-SA by OpenStreetMap, TerraDue Srl. Copyright 2008-11, All Rights Reserved

2000 km
1000 mi

-108.17, 80.59

The download of products requires a EO Single Sign On username/password.
You can login when accessing the data or login [here](#). To register go [here](#).

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space Agency

3. Allow users (scientists) to process data on dedicated sandboxes; for algorithm development and small data processing

Done

- a) Deployment of first sandbox to CNR
- b) "Cloudification" of SBAS application (by CNR)
- c) Provisioning of Gamma software licenses for use in the cloud

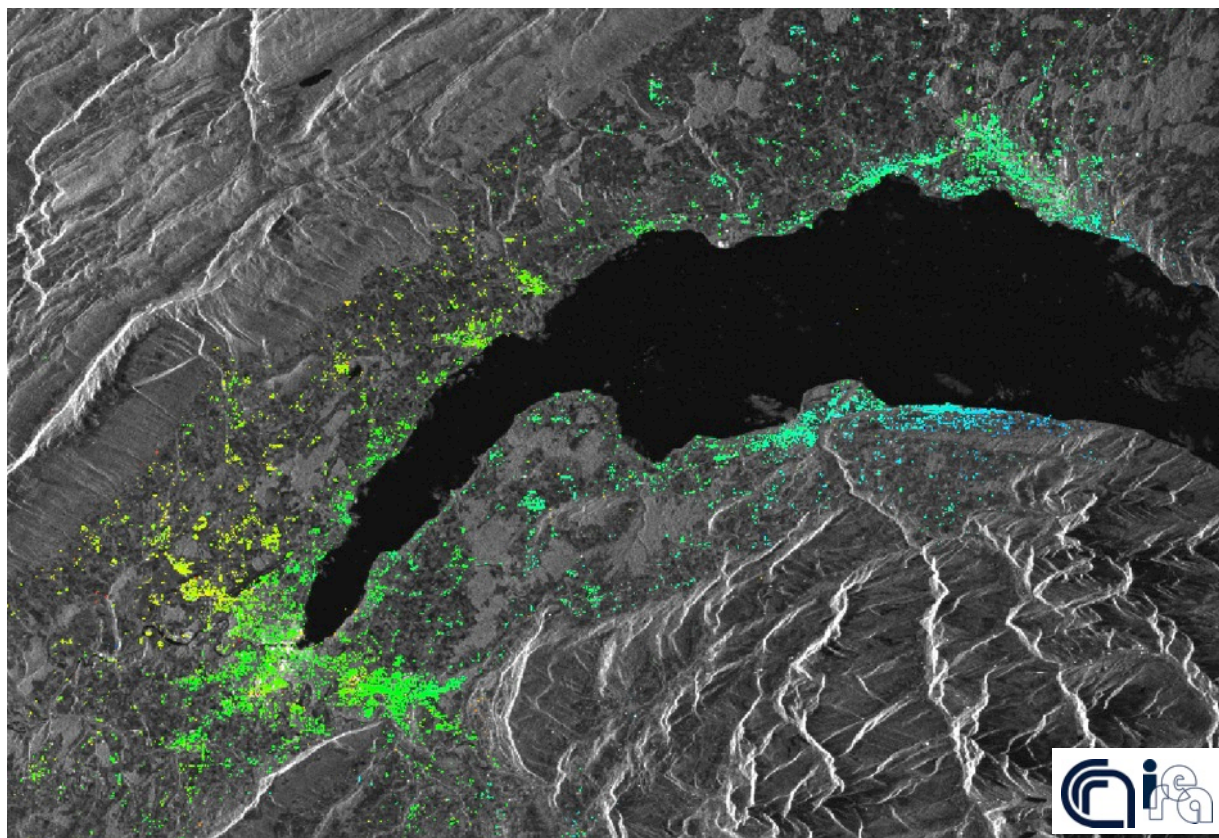
To be completed

- a) Qualification of the sandbox solution
- b) Deployment of the sandbox solution to users

Geneva

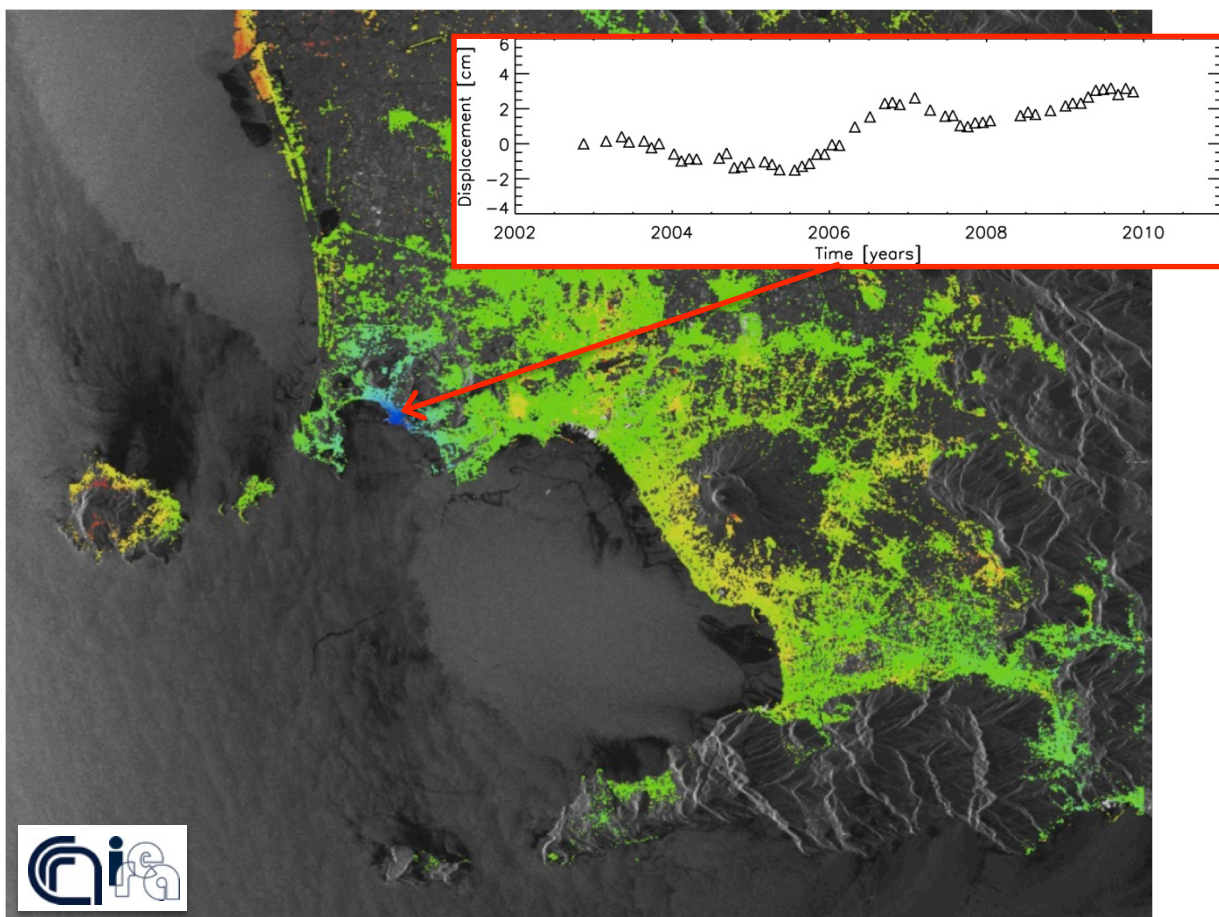
Shown at GA1

	Public Cloud Amazon
#Images	32 ERS
Time	10h
#Nodes	32
RAM	34GB



<-1  >1
cm/year

Analyzed time interval: 1992-2000



Napoli Bay area

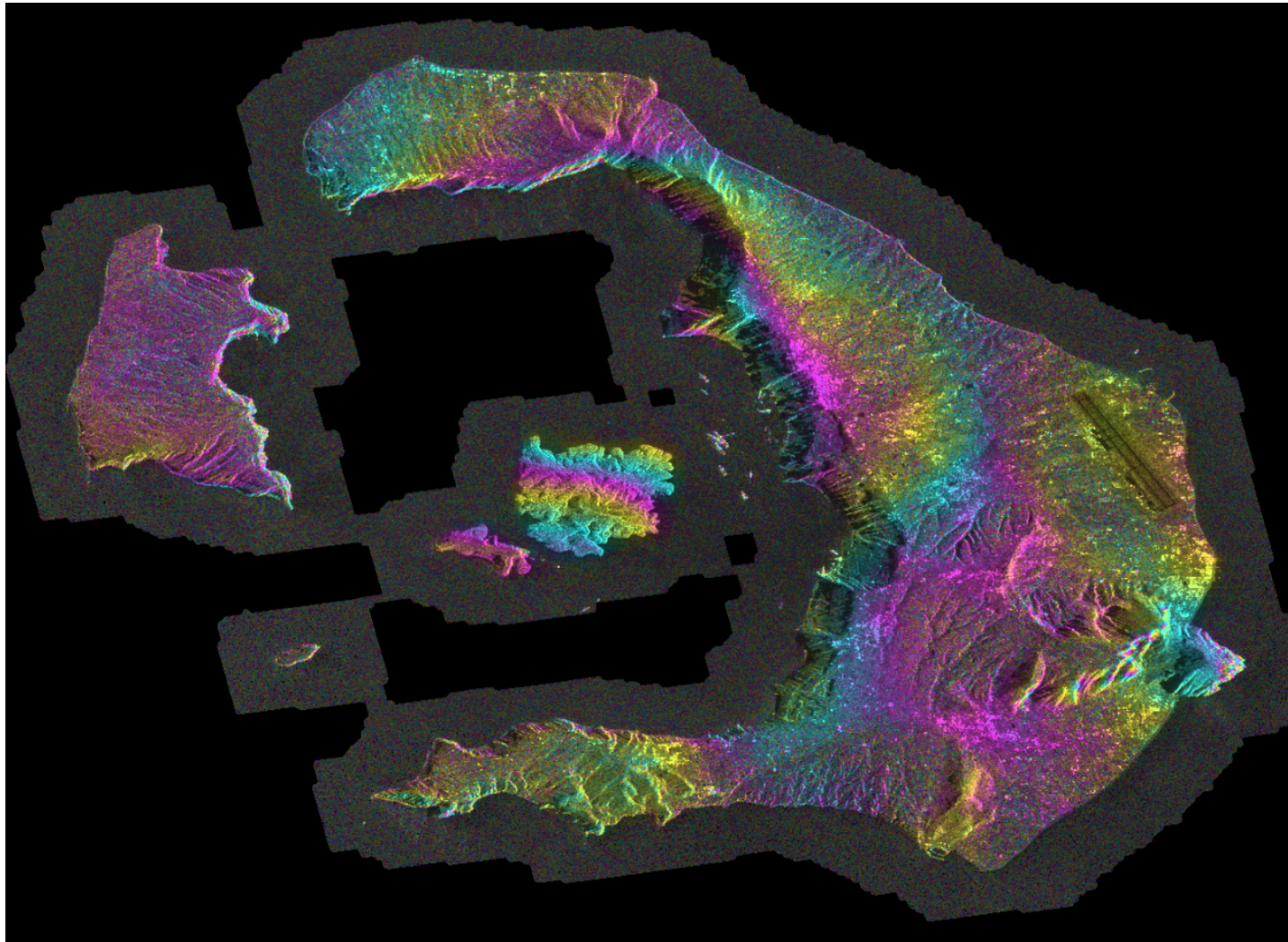
New achievement

	Private Cloud ESA
#Images	55 ENV
Time	48h
#Nodes	8
RAM	8GB

<-1  >1
cm/year

Analyzed time interval: 2002-2010

Santorini island differential interferogram



Processed by Gamma Sw
on Interoute
in Jan 2013

4. Provider users (scientists) access to **large data processing** where to deploy and exploit their applications via a portal.

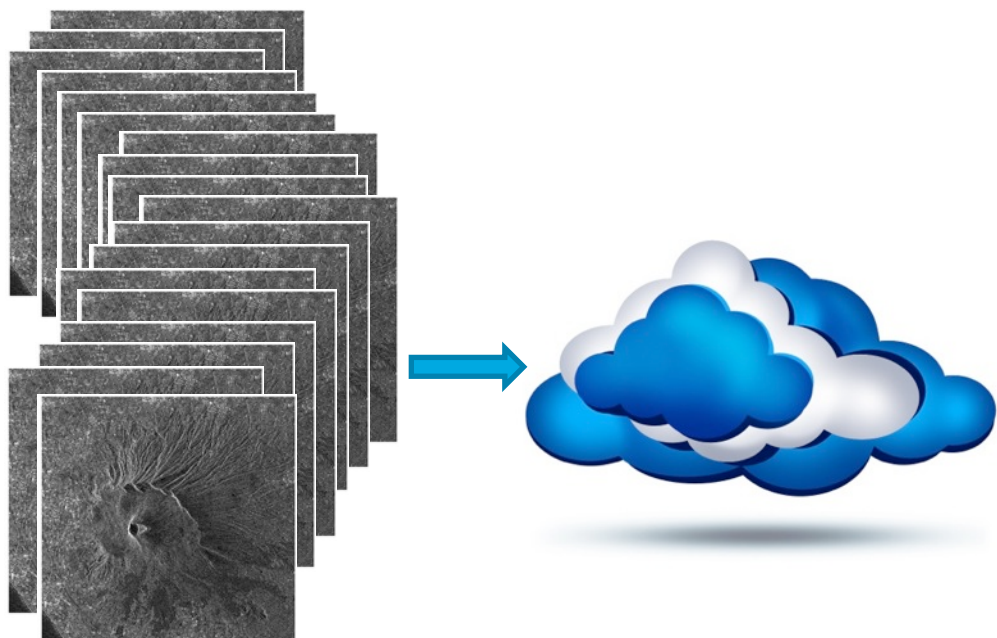
Done

- a) Large provisioning's done during PoC (Phase 1) – CloudSigma, ATOS, Interoute
- b) Dynamic provisioning via API tested with T-Systems

To be completed

- a) Qualify processing on-demand solution for the cloud
- b) Deploy on a second cloud provider (Interoute)
- c) Deploy over whole HN cloud providers using federated API

Target Processing Scenario



Cloud
Processing

~150 Satellite
images/250
GB (per area)



	Routine	Emergency
#Images	150	150
Time	48h	12h
# Nodes	24	96
RAM	16GB	16GB

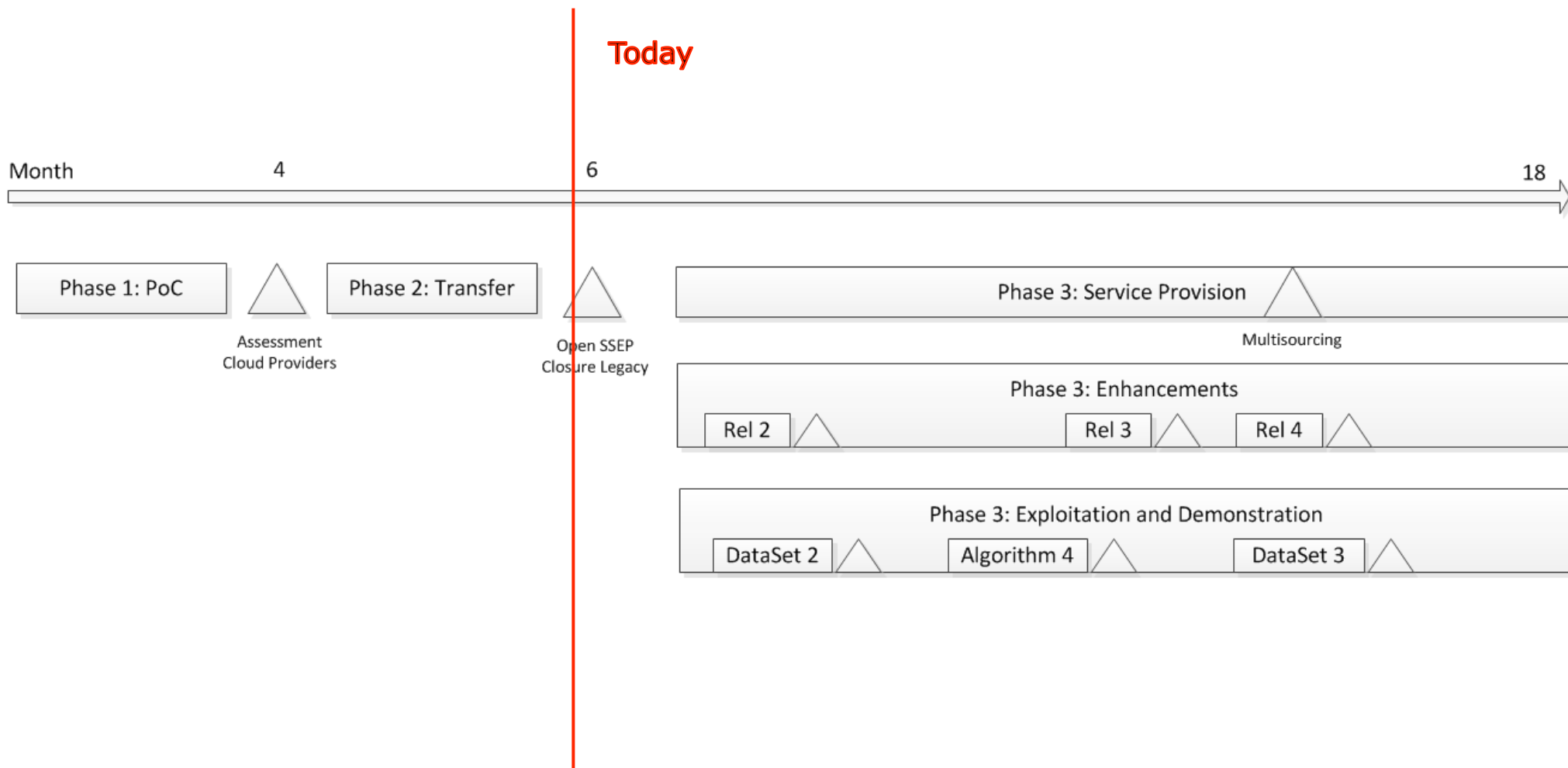
5. All nicely integrated with a **common security framework**

Done

- a) Secure access to SuperSites data in the cloud (Interoute) via ESA's Single-Sign-On system (SSO).
- b) Secure access to Processing-On-Demand Portal via ESA's SSO.

To be completed

- a) Extension to data/applications in other Cloud Providers.



1. **Open data access** to scientific community
2. Complete and deploy **SBAS + Gamma processing** on demand on HN
3. Benchmark HN **"federation layer"** and adopt
4. **Promote and facilitate** the use of HN among the scientific SuperSites community:
 1. Data hub
 2. Processing on demand
 3. User hosting (IaaS + Data Access + Licenses for scientists)
 4. User services deployment