

# The Geohazard Supersites and Natural Laboratories (GSNL).

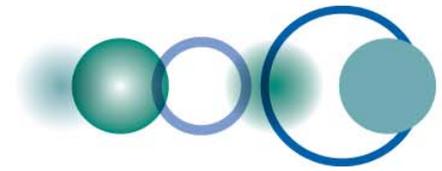
Falk Amelung, University of Miami

Mike Poland, Hawaii Volcano Observatory

Scott Baker, U of Miami, Unavco

## Outline:

- Overview over GSNL (Phase 2)
- Examples from Hawaii



# Group on Earth Observations

Intergovernmental Organization with 83 members and 59 participating organization  
Construct by 2015: **Global Earth Observation System of Systems (GEOSS)**

**GEO data sharing principles:  
open, free access for science**



# GEOSS - System of Systems



The Global Earth Observation System of Systems addresses nine areas of critical importance to people and society.

# Terms and Definitions

- **Permanent Supersites (“Supersites”)**

  - Seismic, GPS, SAR, optical (e-infrastructure)  
Proposal process. Reviewed by SAC, CEOS SST.

- **Candidate Supersites**

  - Sites that should become permanent Supersites.

- **Natural Laboratories**

  - Larger geographical regions exposed to geohazards.

- **Event Supersites**

  - Forum with data access.

# Permanent Supersites

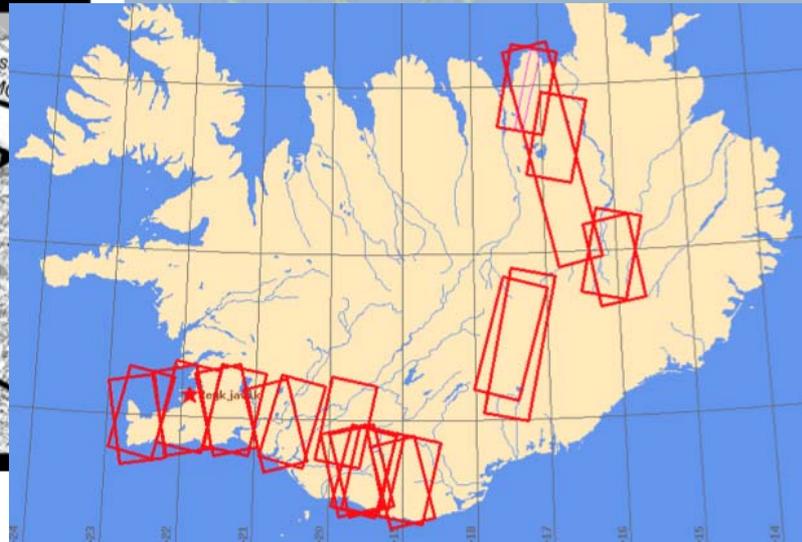
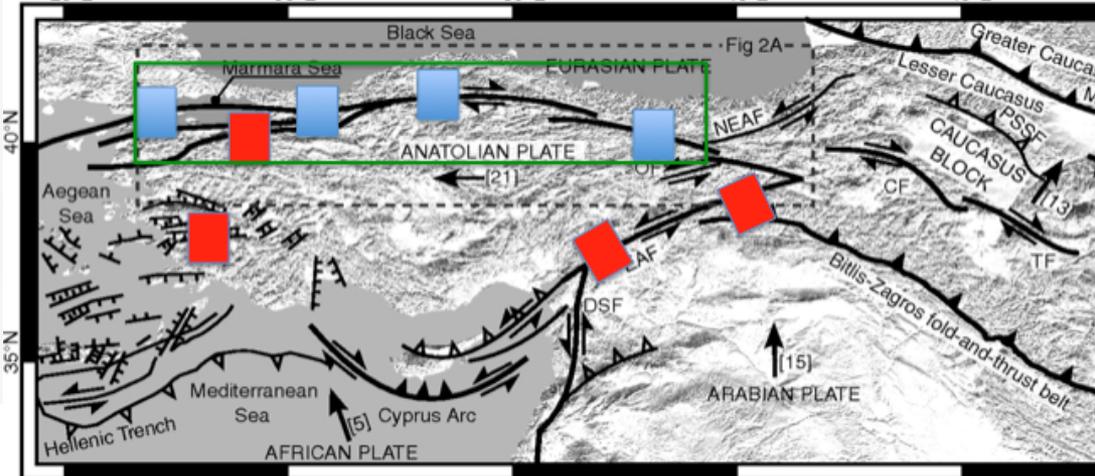


Proposal Process:

- Invitation by Scientific Advisory Committee (SAC)
- Review by SAC

accepted: Hawaii, Iceland,  
(North Anatolian Fault,  
San Andreas Fault)

# Permanent Supersites



3 European Supersites (6 Mill Euro each)

# Candidate Supersites – high priority



Formal interest expressed:

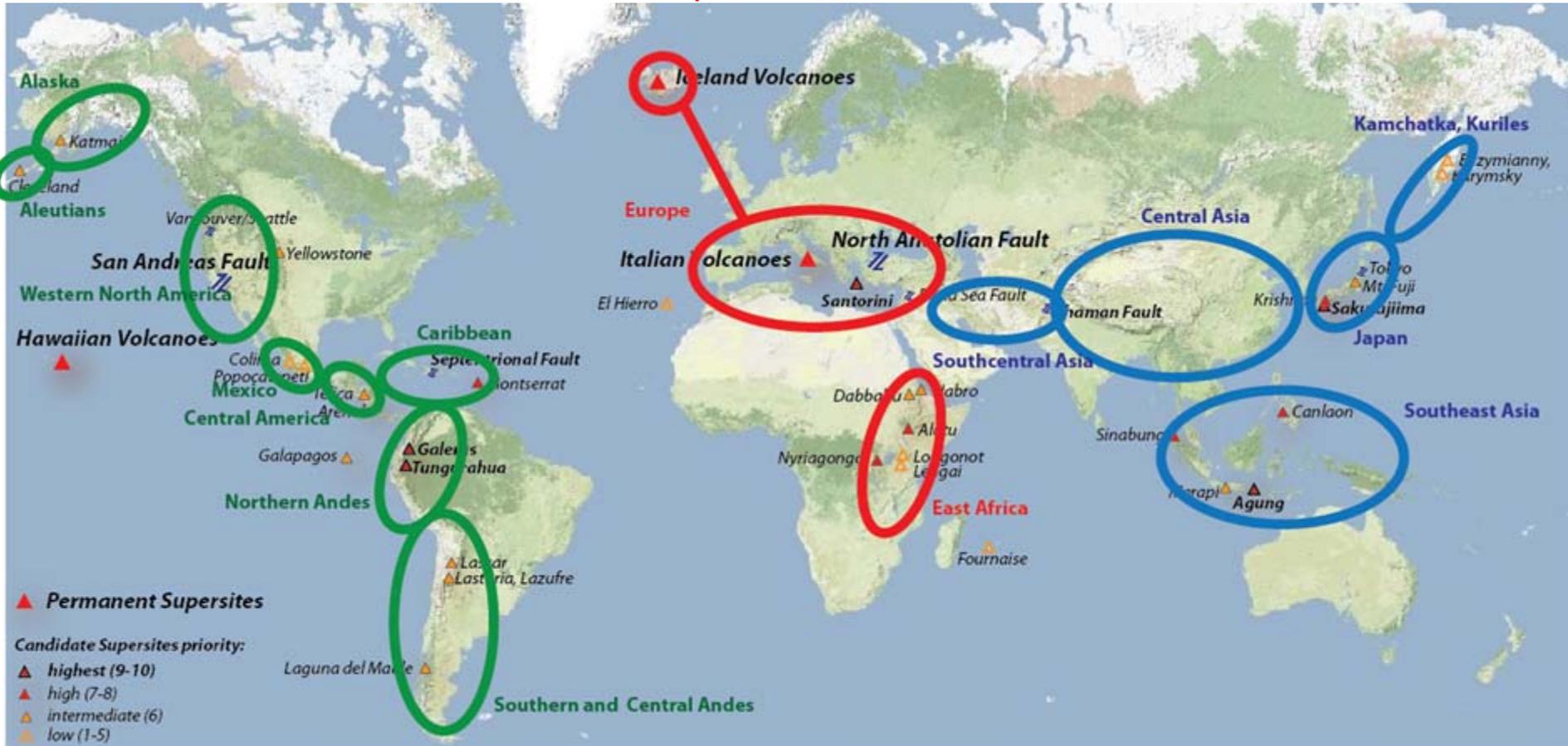
Tungarahua (Ecuador)  
Galeras (Colombia)  
Dead Sea fault  
Piton de La Fournaise  
(Santorini)

# Natural Laboratories

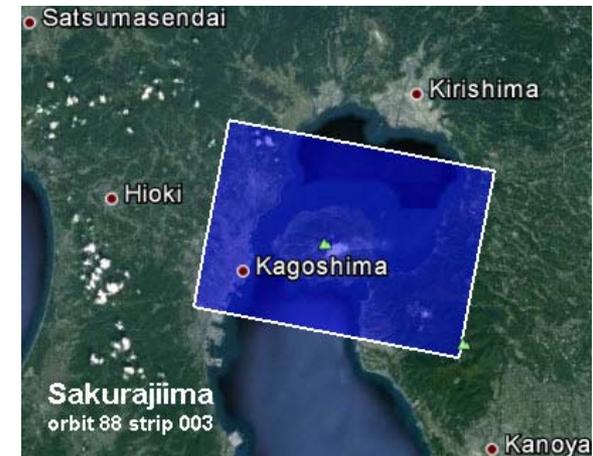
Americas - USGS

Europe/Africa - EPOS

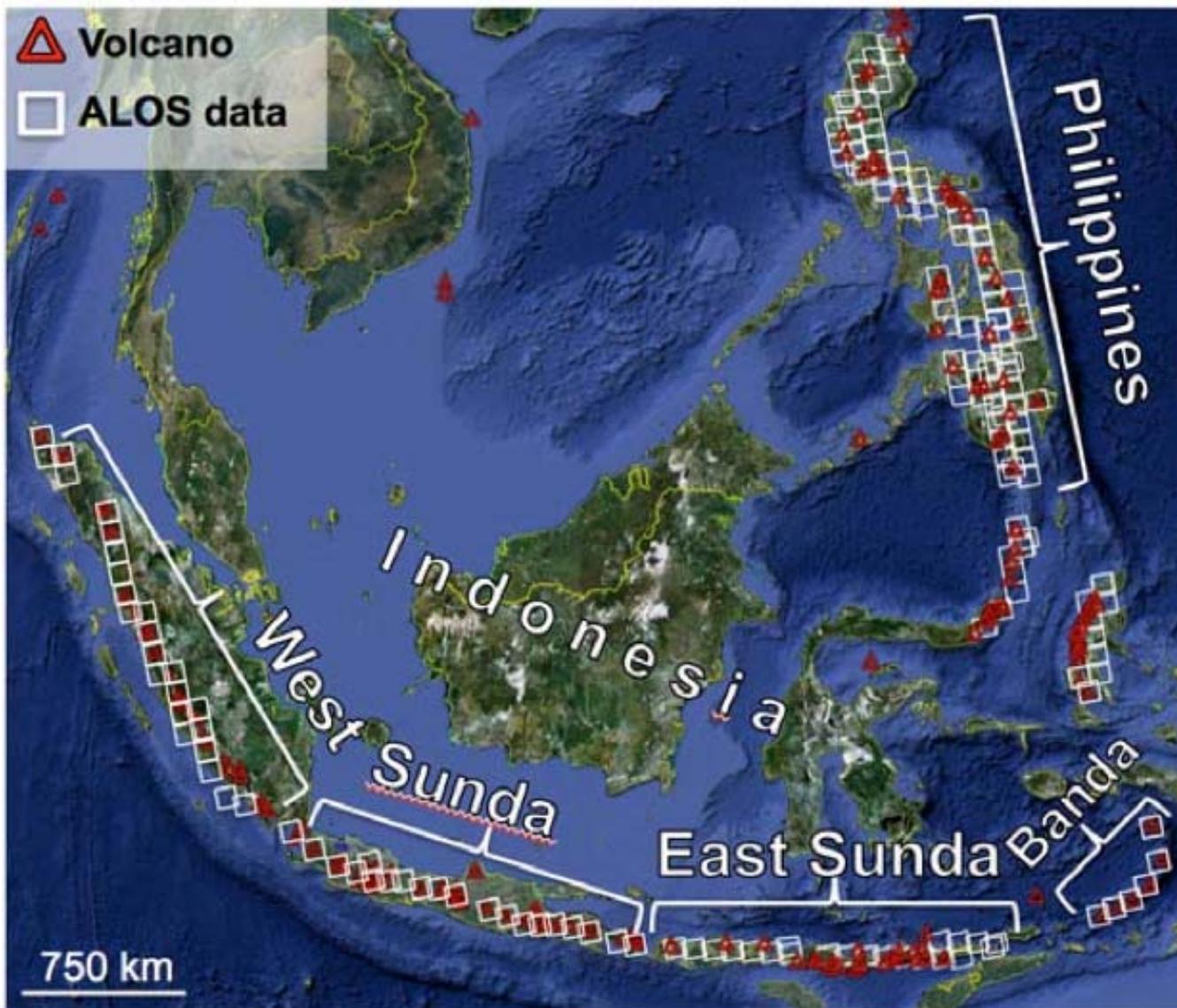
Asia - ?



# Candidate Supersites: TSX tasking initiated



# Plans for Southeast Asia Geohazard Natural laboratory: Volcano Monitoring



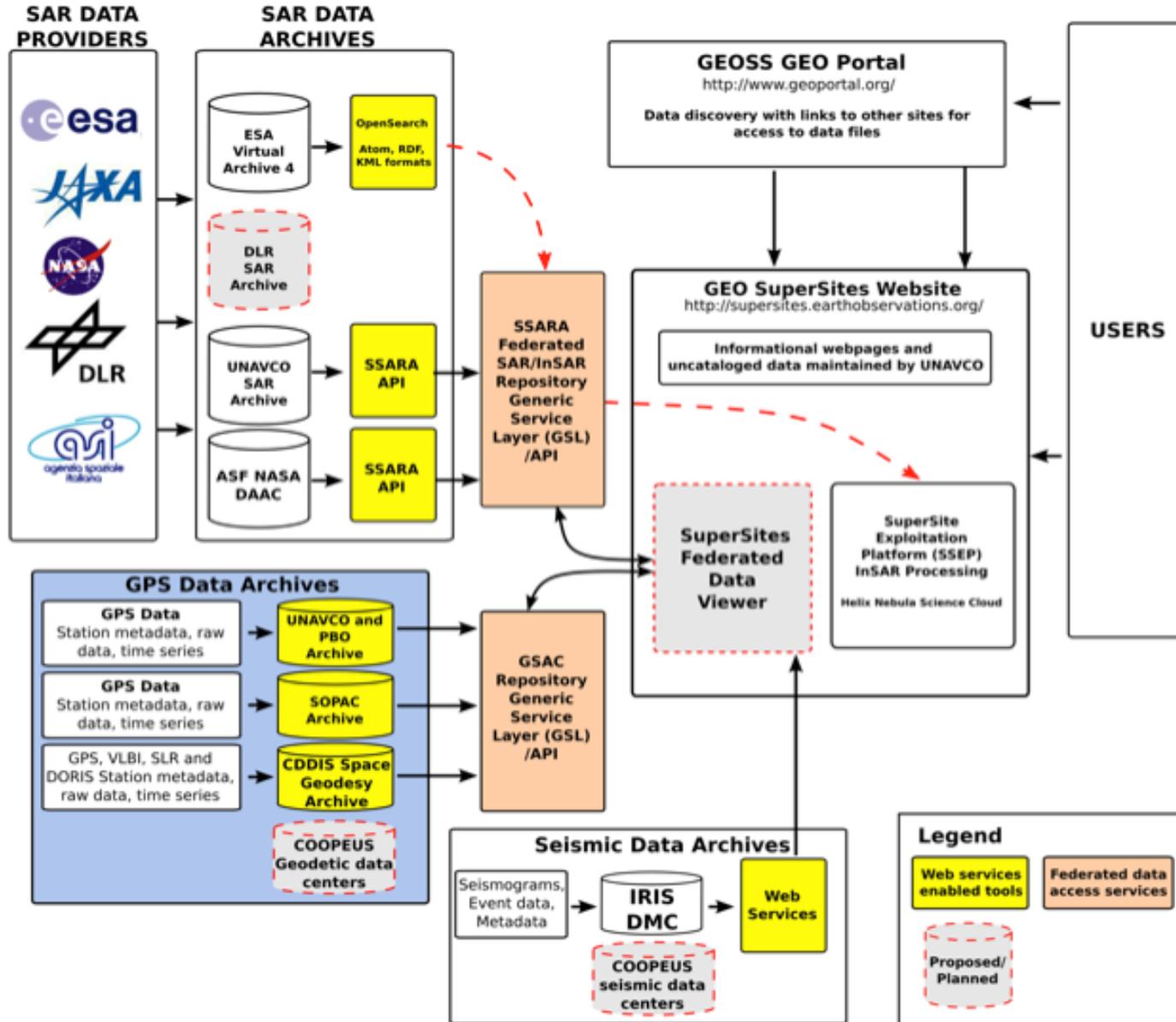
Background monitoring  
with Sentinel-1a,b, ALOS-2

High-res imaging of  
selected volcanoes with  
TerraSAR-X, Cosmo

In-situ data from PHIVOLCS,  
CVGHM

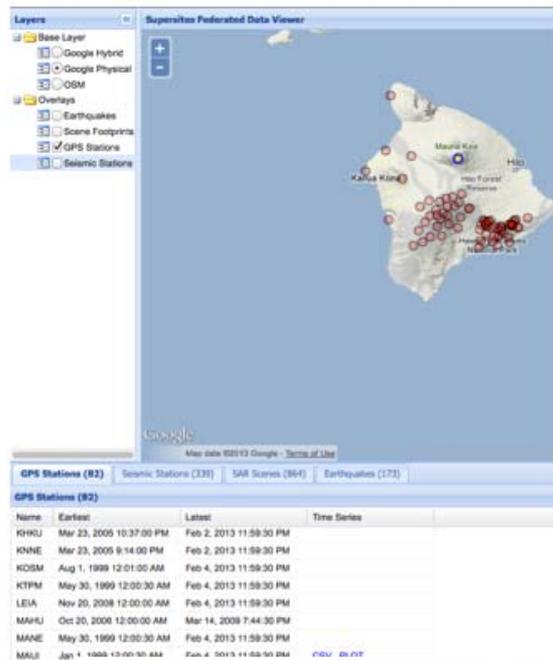
Special Session at  
Cities on Volcanoes,  
Yogyakarta, 9/2014

# Cyberinfrastructure (under development)

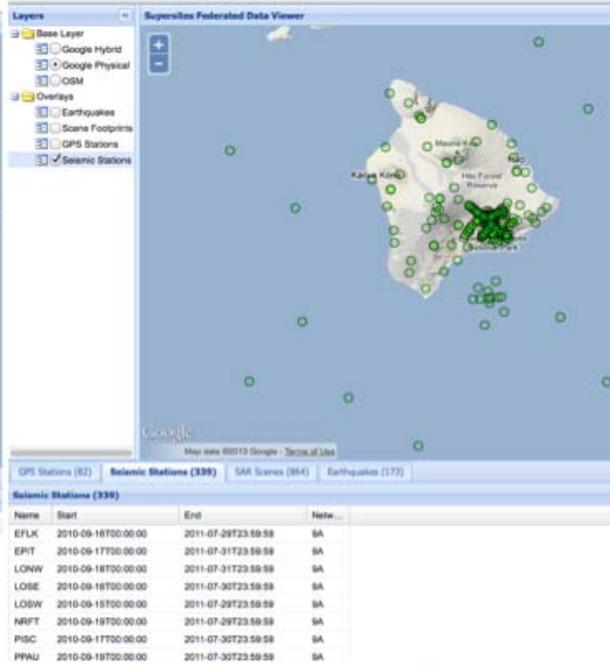


# Federated data viewer (under development)

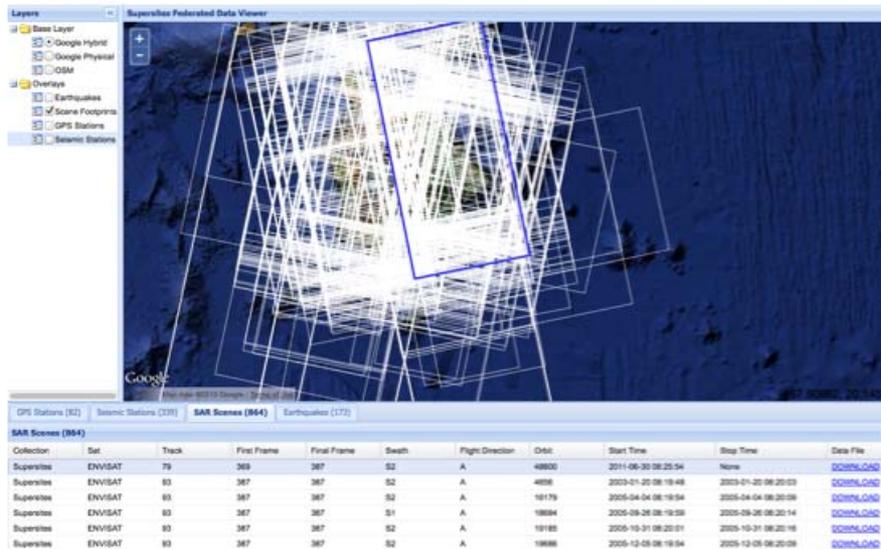
GPS stations



Seismic stations



SAR frames



Display all data,  
Initiate processing jobs  
on ESA's Science Cloud  
(InSAR, GPS, Seismic)

# Hawaii Supersite: data holdings

as of June 7, 2013

<u>COSMO-SkyMed:</u>	109 scenes	1.3 TB
<u>TerraSAR-X:</u>	184 scenes	3.7 TB
<u>ENVISAT:</u>	756 scenes	0.2 TB
<u>RADARSAT-1:</u>	500 scenes	0.2 TB
<u>ALOS-1:</u>	414 scenes	0.2 TB
<b>TOTAL HOLDINGS:</b>	<b>1963 scenes</b>	<b>5.6 TB</b>

Issue:  
No one-stop  
shopping  
archive yet.

## *Others:*

UAVSAR:	3 overflights
Cosmo-Skymed	~300 older scenes
Radarsat-2 approved	200 scenes just

## *No Supersite:*

# Major users

- USGS – Hawaiian Volcano Observatory
- University of Miami
- NASA Jet Propulsion Laboratory
- Stanford University
- University of Wisconsin
- Arizona State University
- UNAVCO
- IREA-CNR
- INGV
- Natural Resources Canada
- GFZ Potsdam

# Data Access

## Procedures

COSMO-SkyMed: made available to POC and distributed to registered users

TerraSAR-X: PIs submit proposals to DLR and order/receive data directly

TanDEM-X: currently only available to a small group via a PI project.

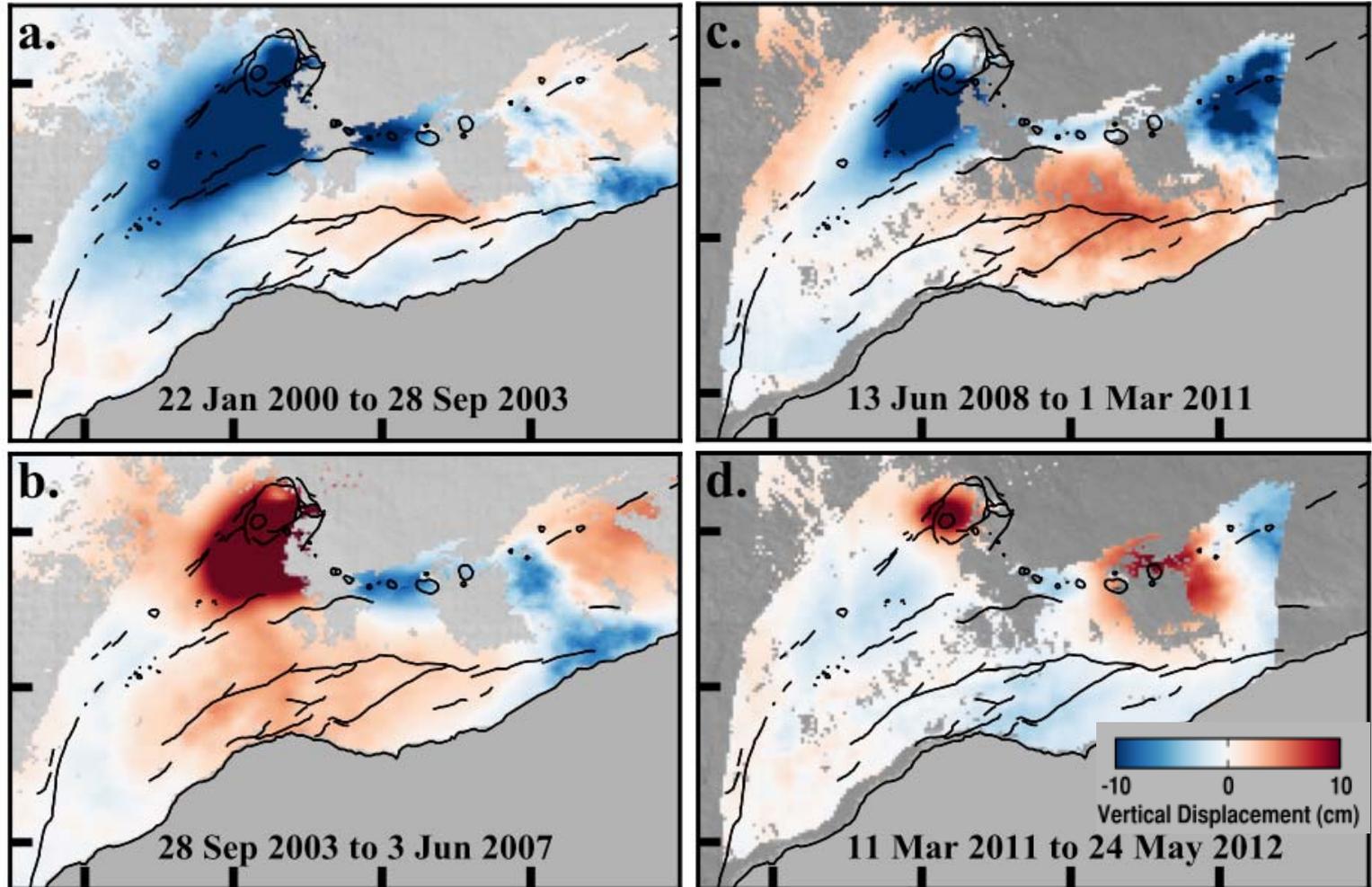
## Time delay

COSMO-SkyMed: email sent to PoC within 4 hours of data acquisition, interferograms available 2 hours later.

TerraSAR-X: downloaded following acquisition, interferograms available within 1-2 days (since March 2012, only about 1 scene/month owing to TDX operations).

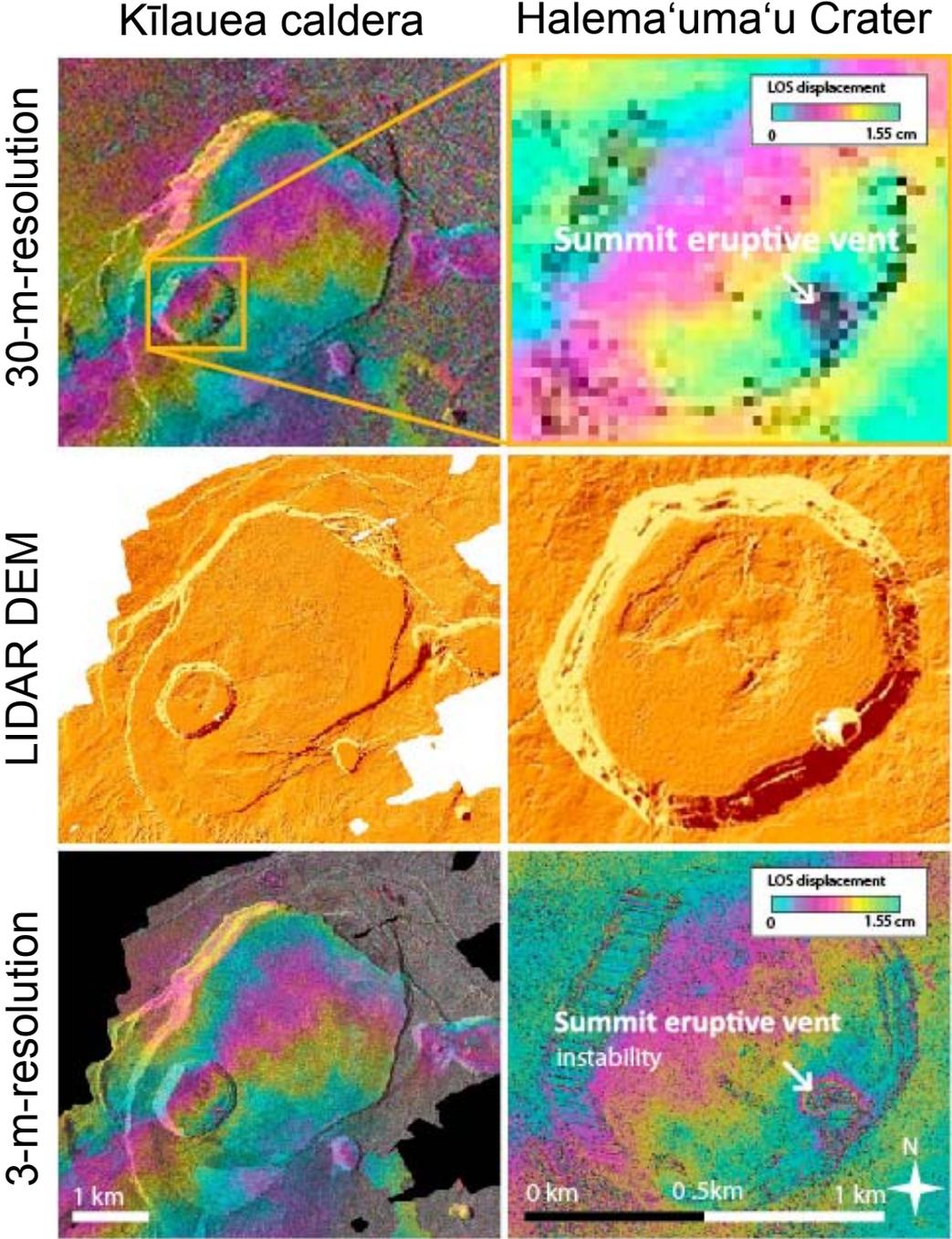
The Hawaiian Volcano Observatory uses data *for crisis response*.

# Vertical ground deformation 2000-2012 from multi-sensor InSARs (~1500 scenes)



Blue: subsidence, red: uplift

# Exceptional resolution of deformation

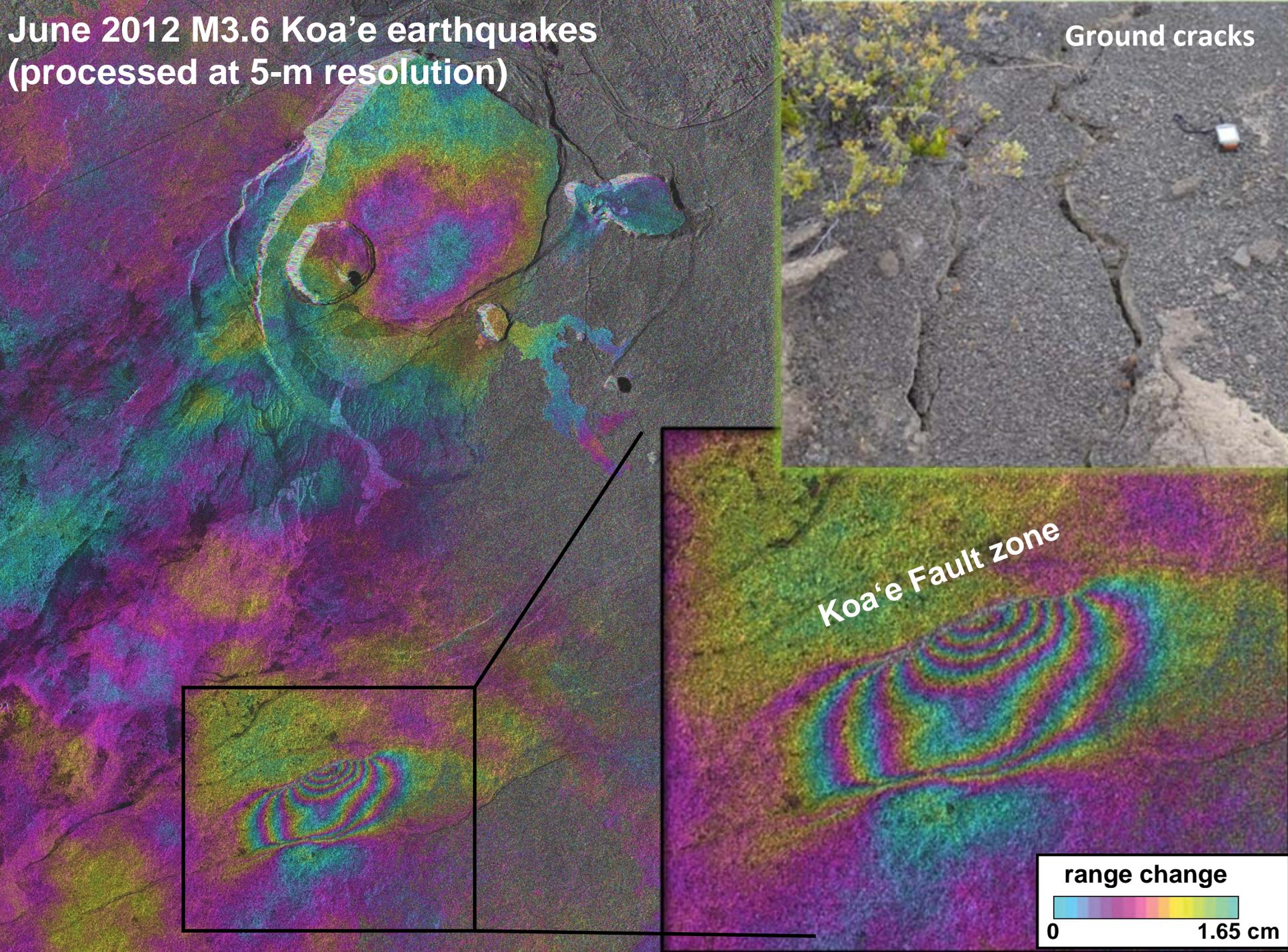


TSX interferogram spanning January 19 – April 17, 2009

3-m-resolution LIDAR DEM  
→ small-scale deformation pattern  
around summit vent visible

Richter et al., 2013

June 2012 M3.6 Koa'e earthquakes  
(processed at 5-m resolution)



# Conclusions

- Hawaii Supersite working well: ~2000 SAR observations.
- Archive growing at a rate of 200-400 observations/year.
- The Hawaiian Volcano Observatory uses data ***for crisis response***.
- Supersites data transformative for (1) Hawaii volcano science, (2) data analysis technique development, (3) computational methods.

**Issue:** Homogeneous archive and easier access needed.

## Technical and educational goal

**In 5 years, Remote Sensing students should be able to analyze the entire Hawaii archive within a few hours processing time!**