



FAB
SPACE 2.0



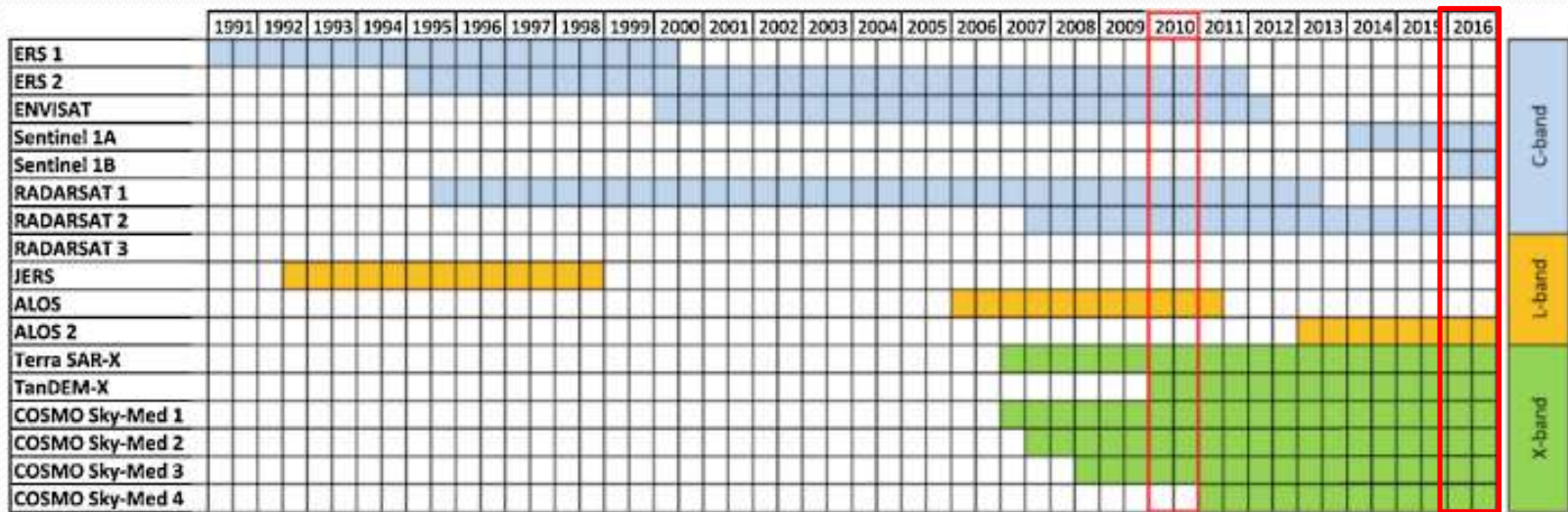
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Il Telerilevamento applicato allo studio di fenomeni naturali ed attività antropica

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SAR RS: improvements on Science and Technology

- SAR satellite sensors: from medium to VH resolution
- SAR satellite missions: from single satellite toward constellations
- SAR satellite wavelength: from C-, to C-L-, to X-C-L-Band



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Surface movements: Natural and/or Man Made

- Seismology
 - Seismic cycle (co-seismic, post-seismic, interseismic displacements)
 - Aseismic
- Volcanology
 - unrest, pre-eruptive and eruptive volcano dynamics
- Subsidence
 - fluid extraction (agriculture, industry, gas storage, ...)
 - soil compaction due to urban expansion
 - mining activities, nuclear tests



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Applications: seismology



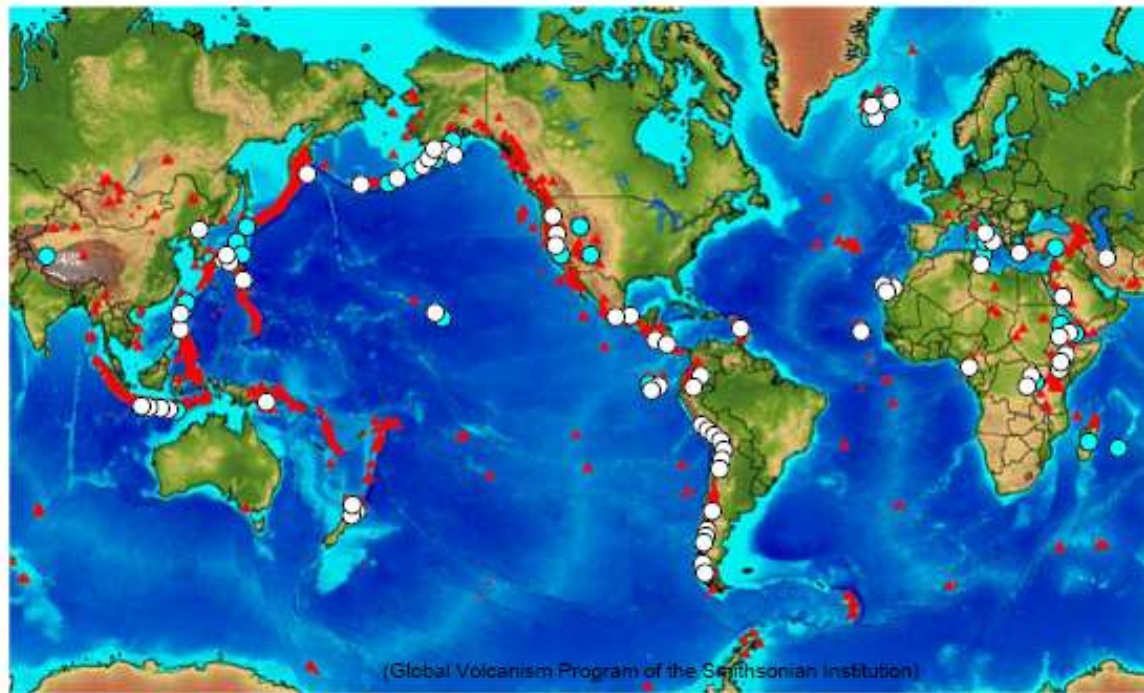
from B. Parsons, Santorini Forum, May 2012



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1992-2013 about 100 earthquakes studied with InSAR

Applications: volcanology



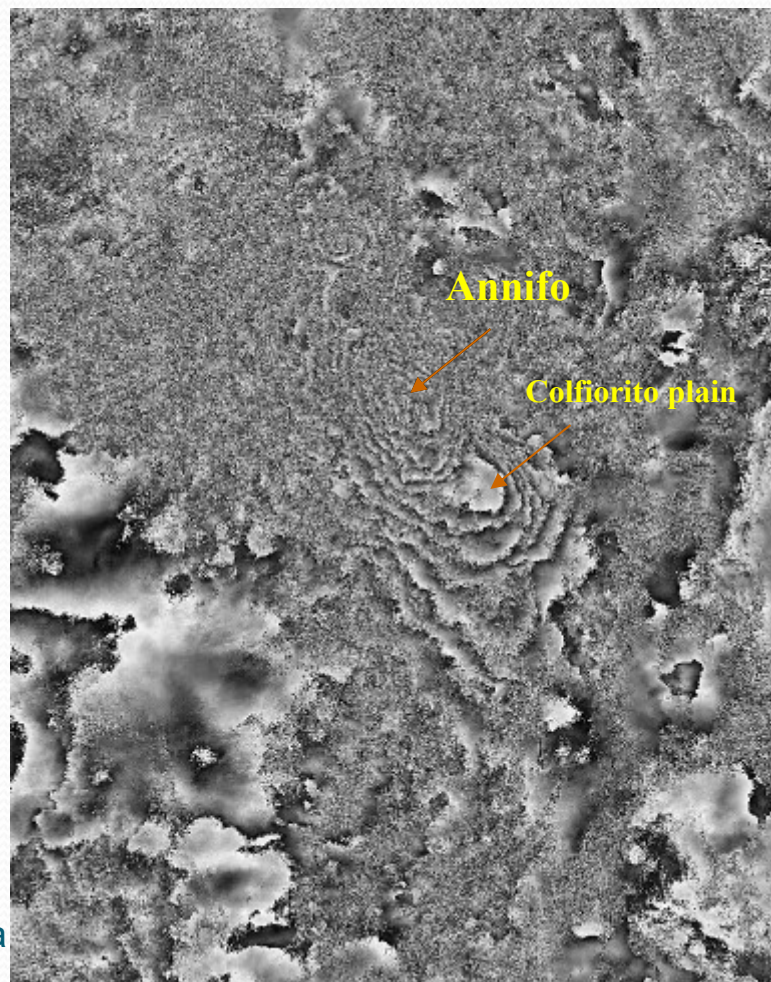
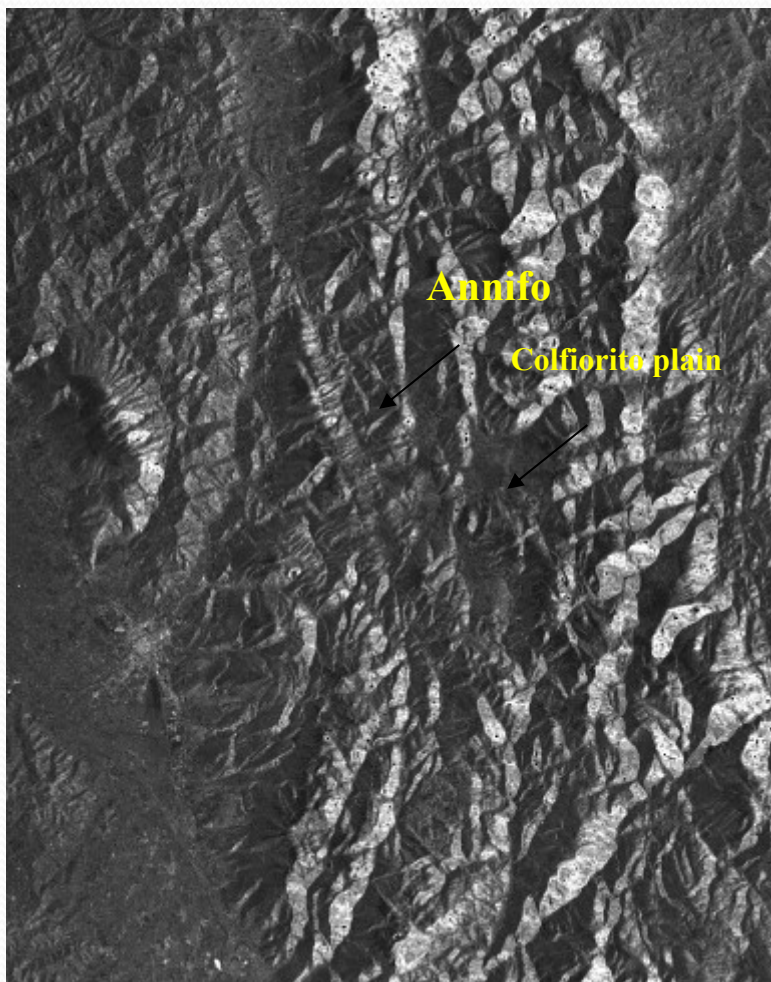
Studied by using InSAR 2002-2012

from G. Puglisi, Santorini Forum, May 2012

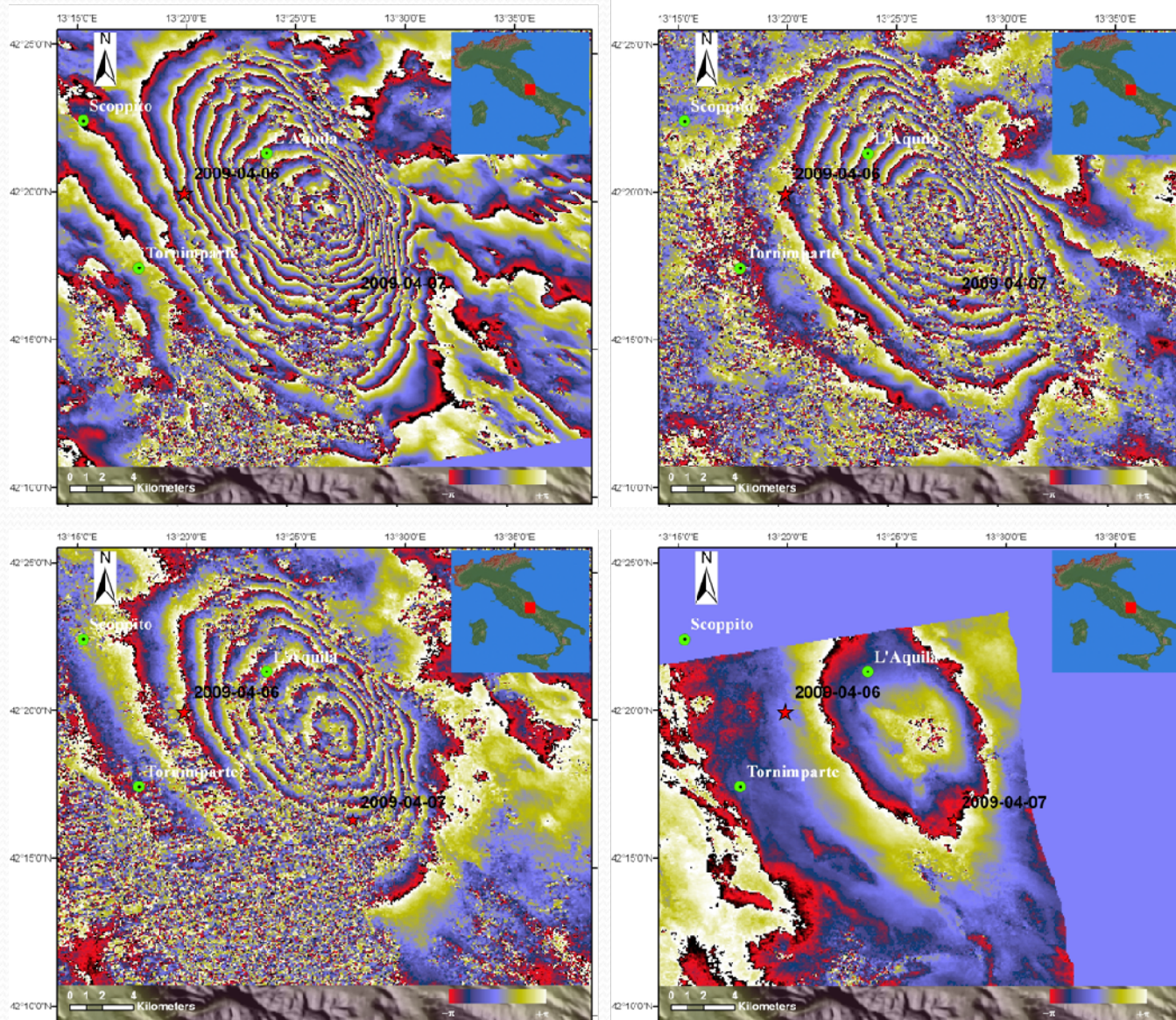


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1997 – terremoto di “Assisi”

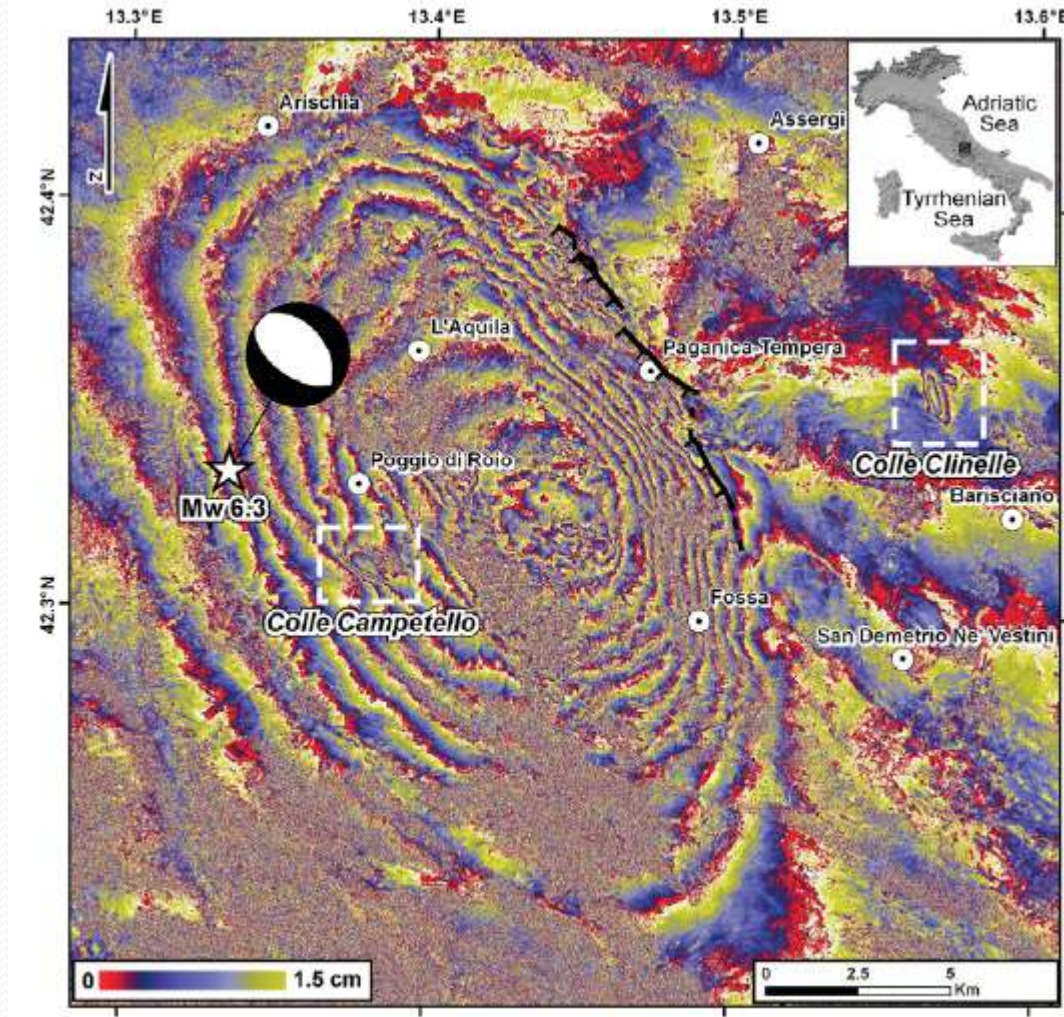


2009 – L'Aquila



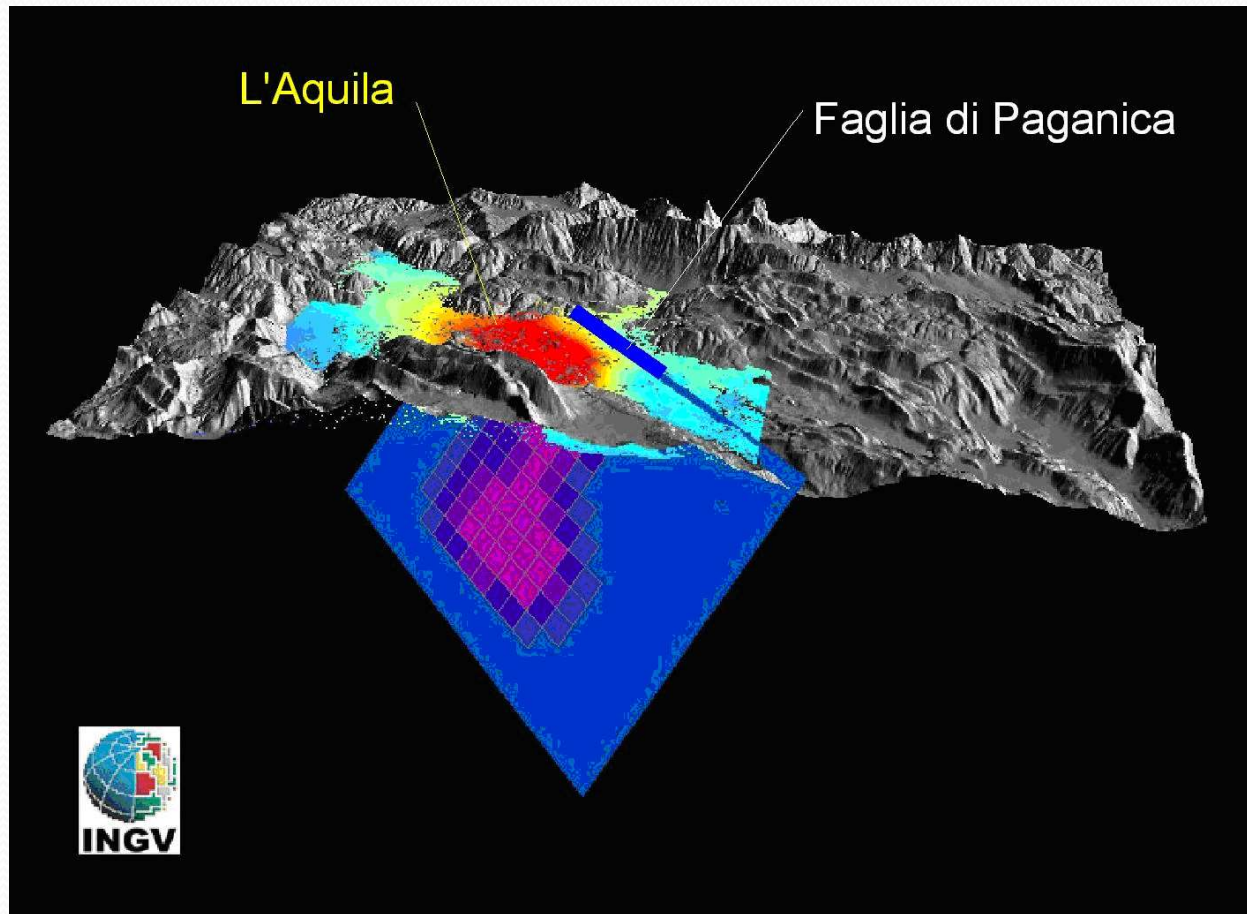
28/04/2017

2009 – L'Aquila

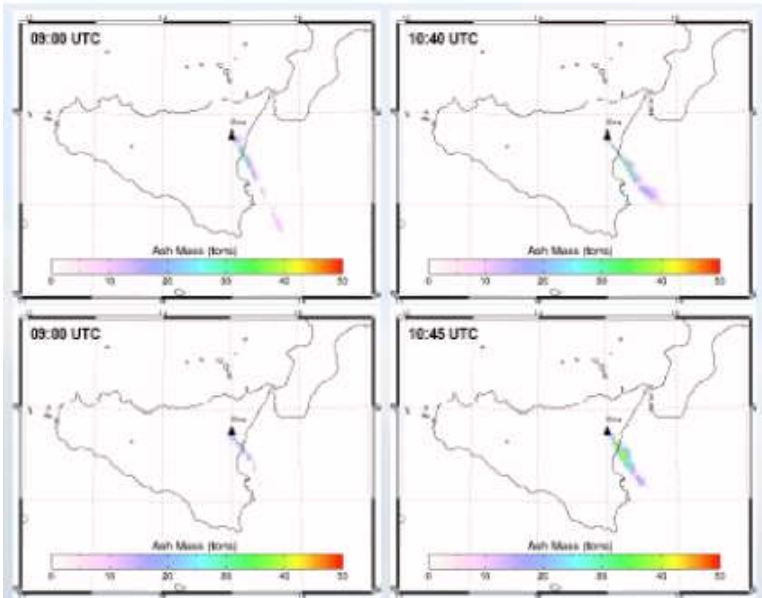
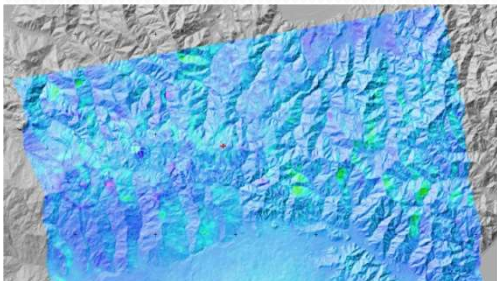


28/04/2017

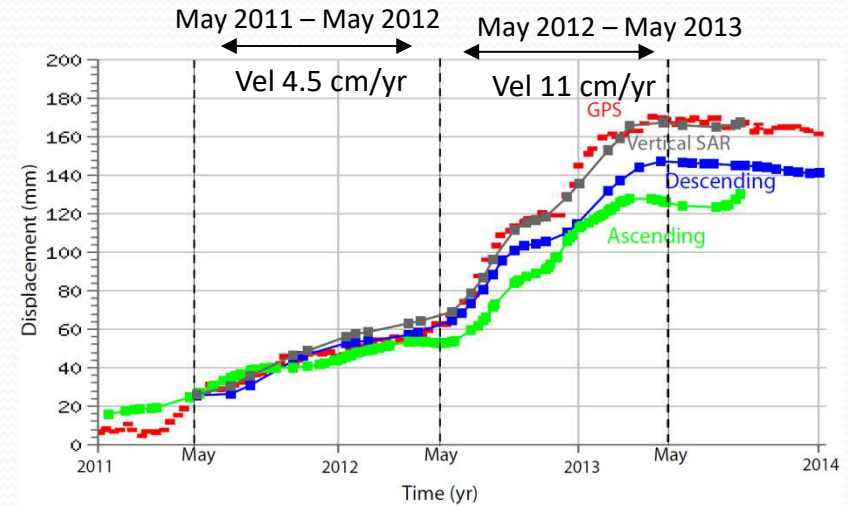
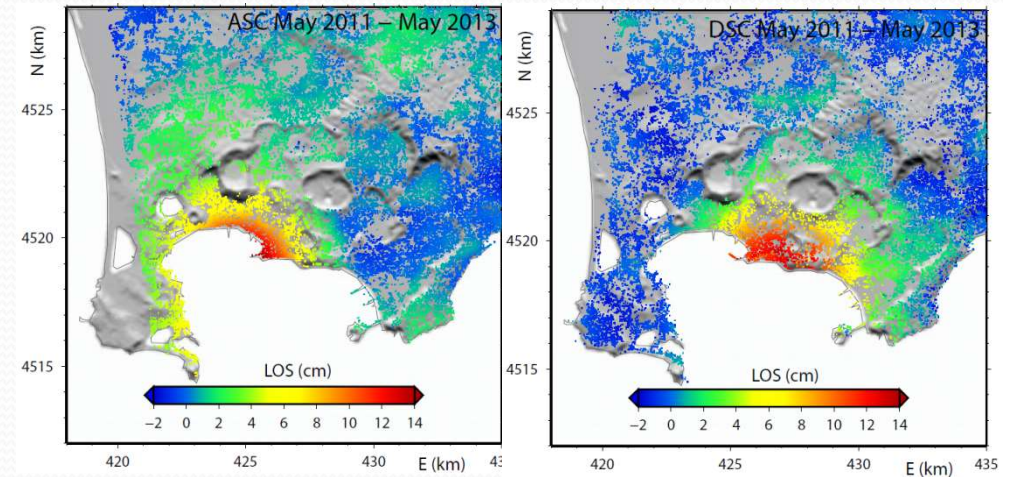
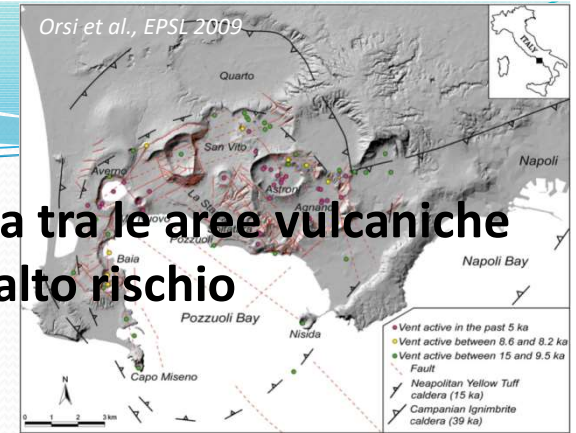
2009 – L'Aquila



→ l'Etna: uno dei vulcani meglio monitorati



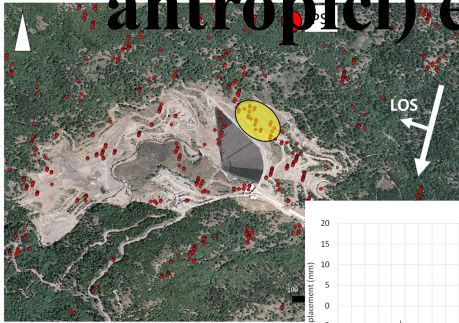
→ Una tra le aree vulcaniche a più alto rischio





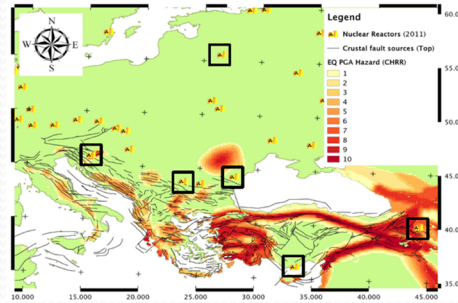
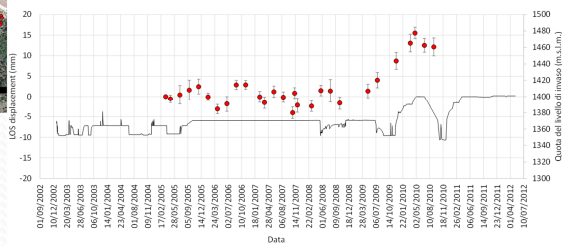
Studio di fenomeni deformativi lenti (naturali e/o antropici) e di infrastrutture

InSAR monitoring of geotechnical structures



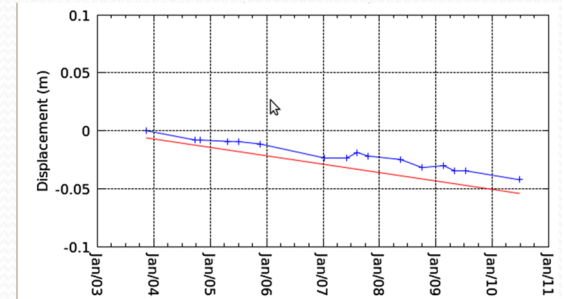
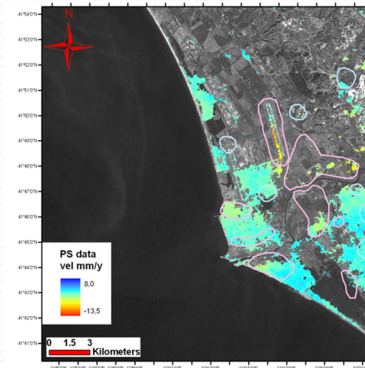
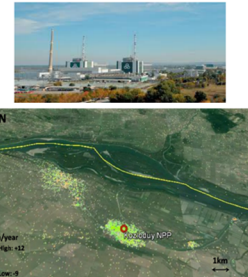
Red circles: mean LOS displacement profile for points on the dam (yellow ellipse)

Black line: level of the reservoir's water. Below 1370 meters the reservoir is empty.

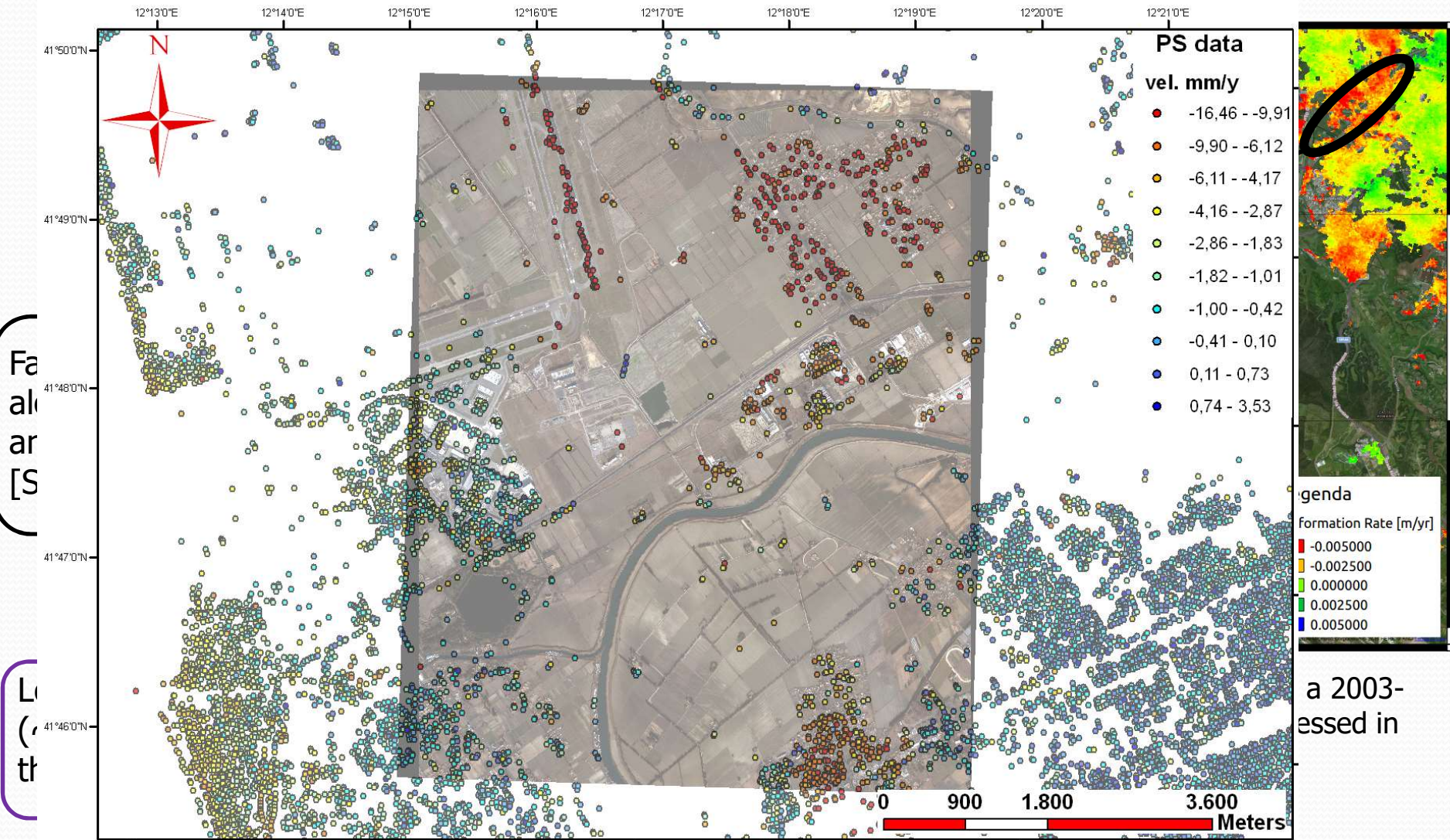


Kozloduy, Bulgaria

- biggest NPP in Bulgaria
- since 1975 in operations
- no active seismicity
- uplift phenomena



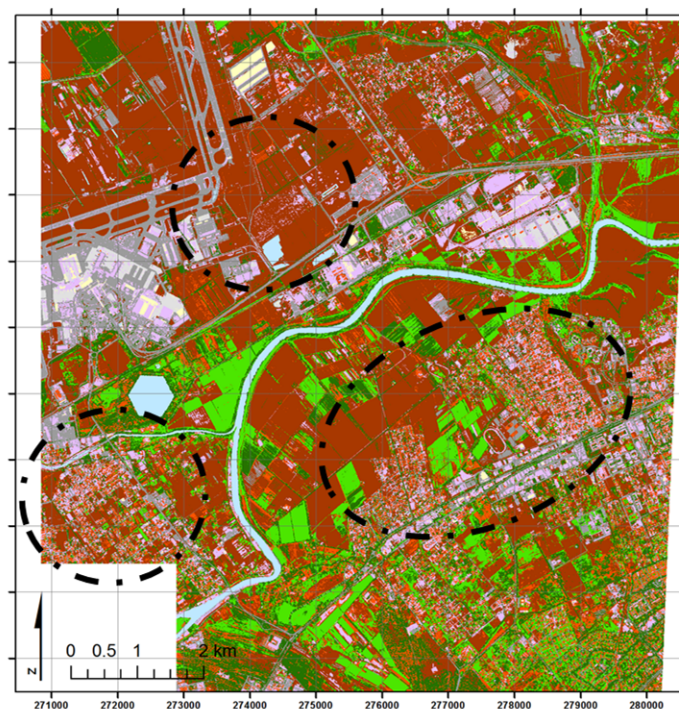
Studio di fenomeni deformativi lenti (naturali e/o antropici) e di infrastrutture



Urban growth -> impact on loading and water resources exploitation



January 2002



June 2012

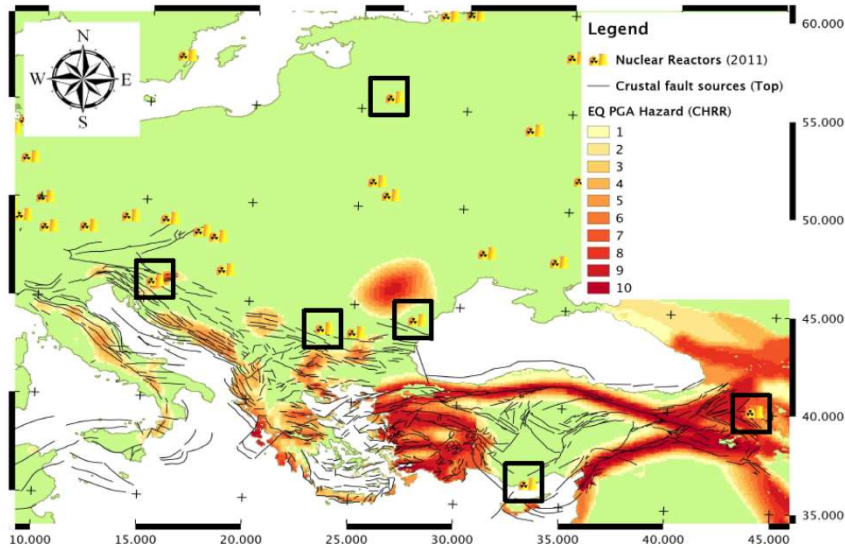


Optical Very High Resolution images used for Land Use classification map

Studio di fenomeni deformativi lenti (naturali e/o antropici) e di infrastrutture

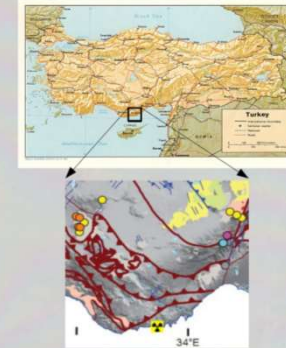


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× Akkuyu NPP in Turkey

- × under construction
- × operations begin in 2019
- × near Ecemitt fault, Hellenic Belt
- × data base:
 - × ERS 1 & 2
 - × 1992 - 1999
 - × 32 scenes for desc. track
 - × Envisat
 - × 2003 - 2010
 - × 25 scenes for desc. track
 - × 25 scenes for asc. track



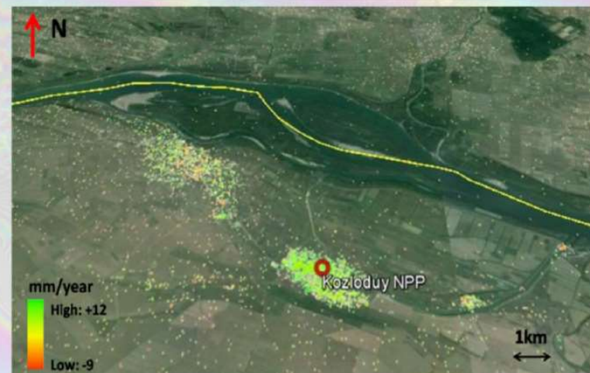
- ← horizontal E-W movement
- × NPP spot itself → stable
- × On a regional scale detectable motions

- vertical movement →
- × No significant subsidence/uplift
- × surroundings exhibit instability

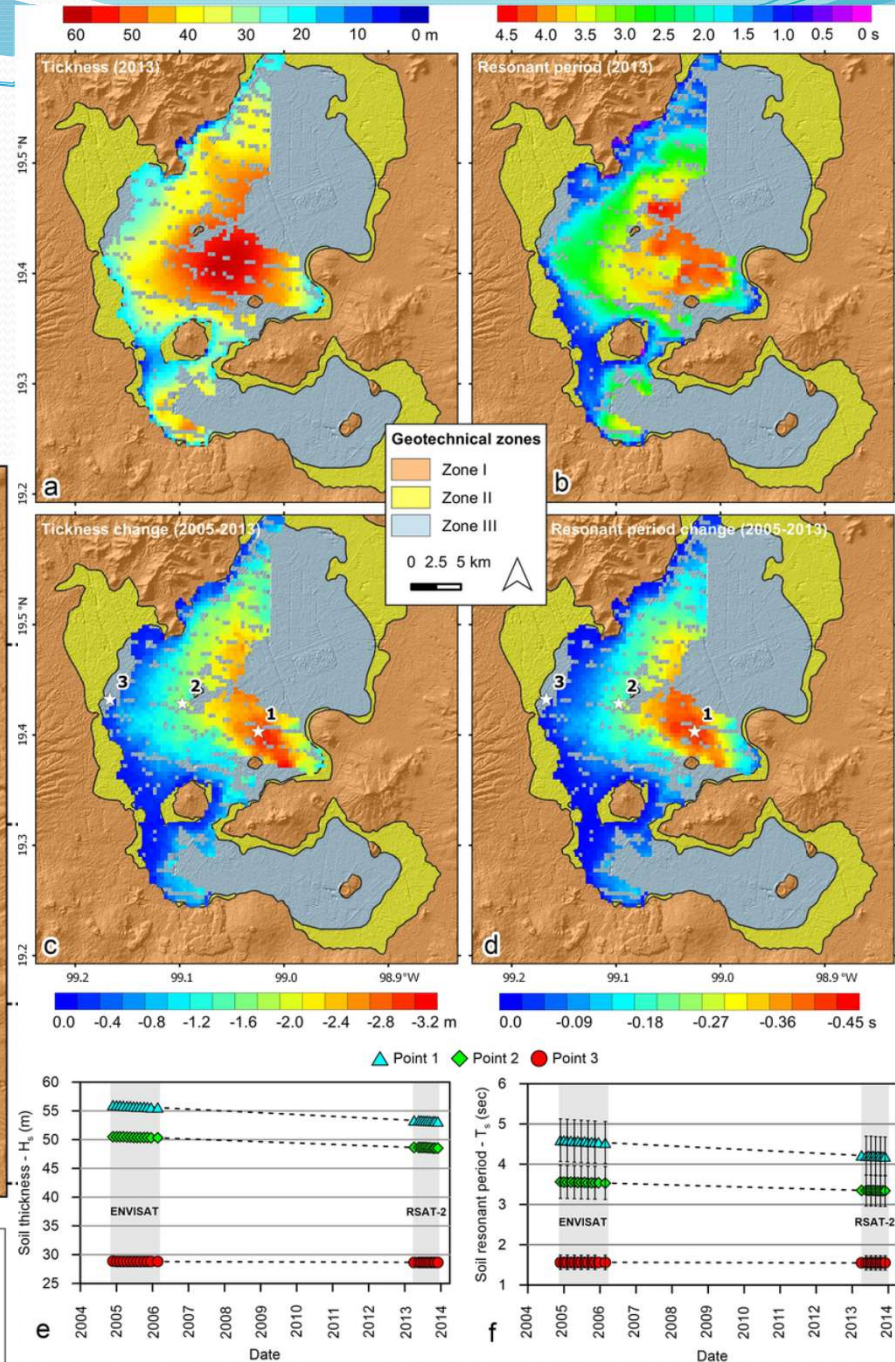
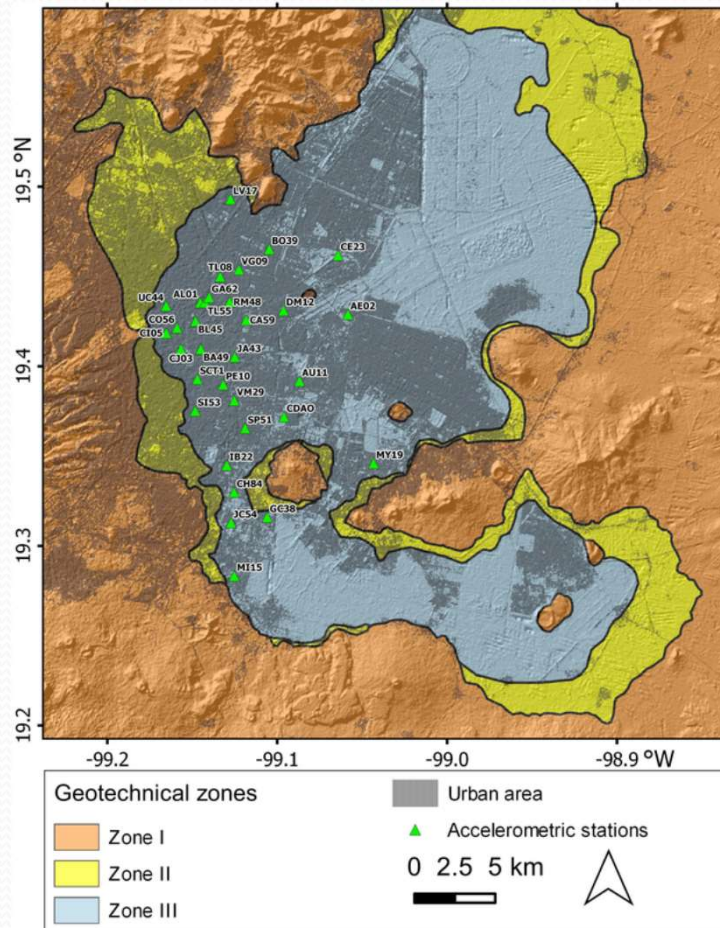


Kozloduy, Bulgaria

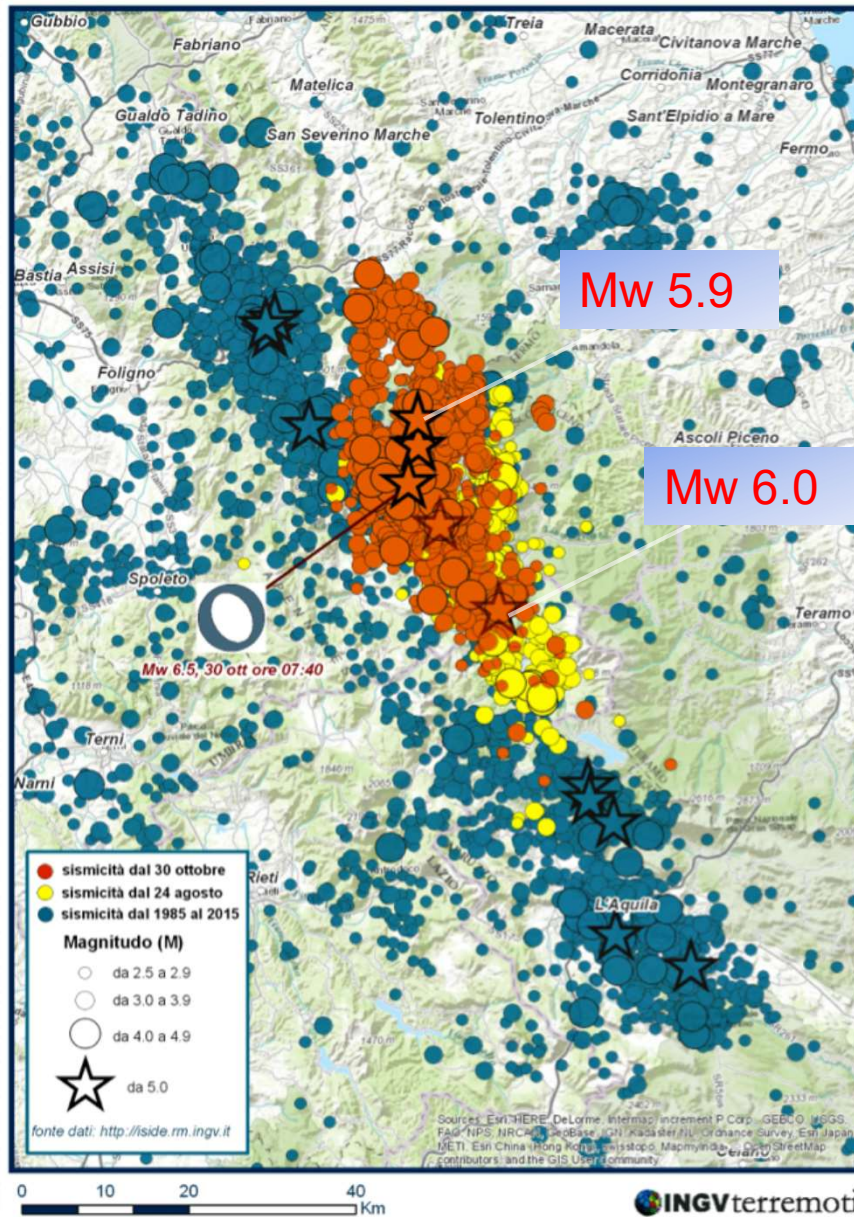
- × biggest NPP in Bulgaria
- × since 1975 in operations
- × no active seismicity
- × uplift phenomena



Città del Messico: stima delle variazioni delle frequenze di oscillazione del suolo



Recent seismic sequences in Italy



Mw 6.0 2016-08-24 01:36:32
UTC

Mw 5.9 2016-10-26 19:18:05
UTC

Mw 6.5 2016-10-30 06:40:17
UTC

From 2016-08-24, the RSNC
registered > 49000
earthquakes with M>2

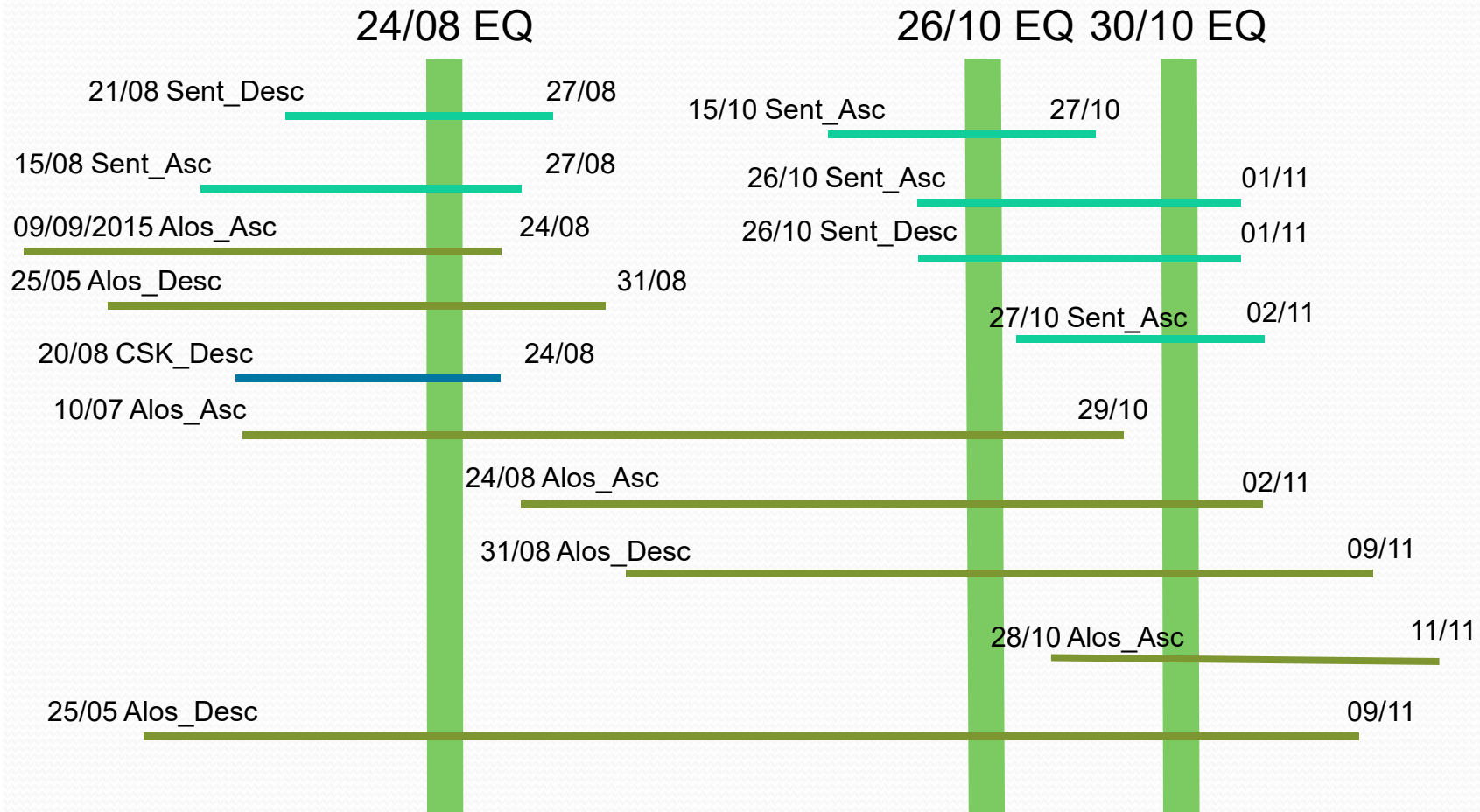
Surface faulting detected



SAR data



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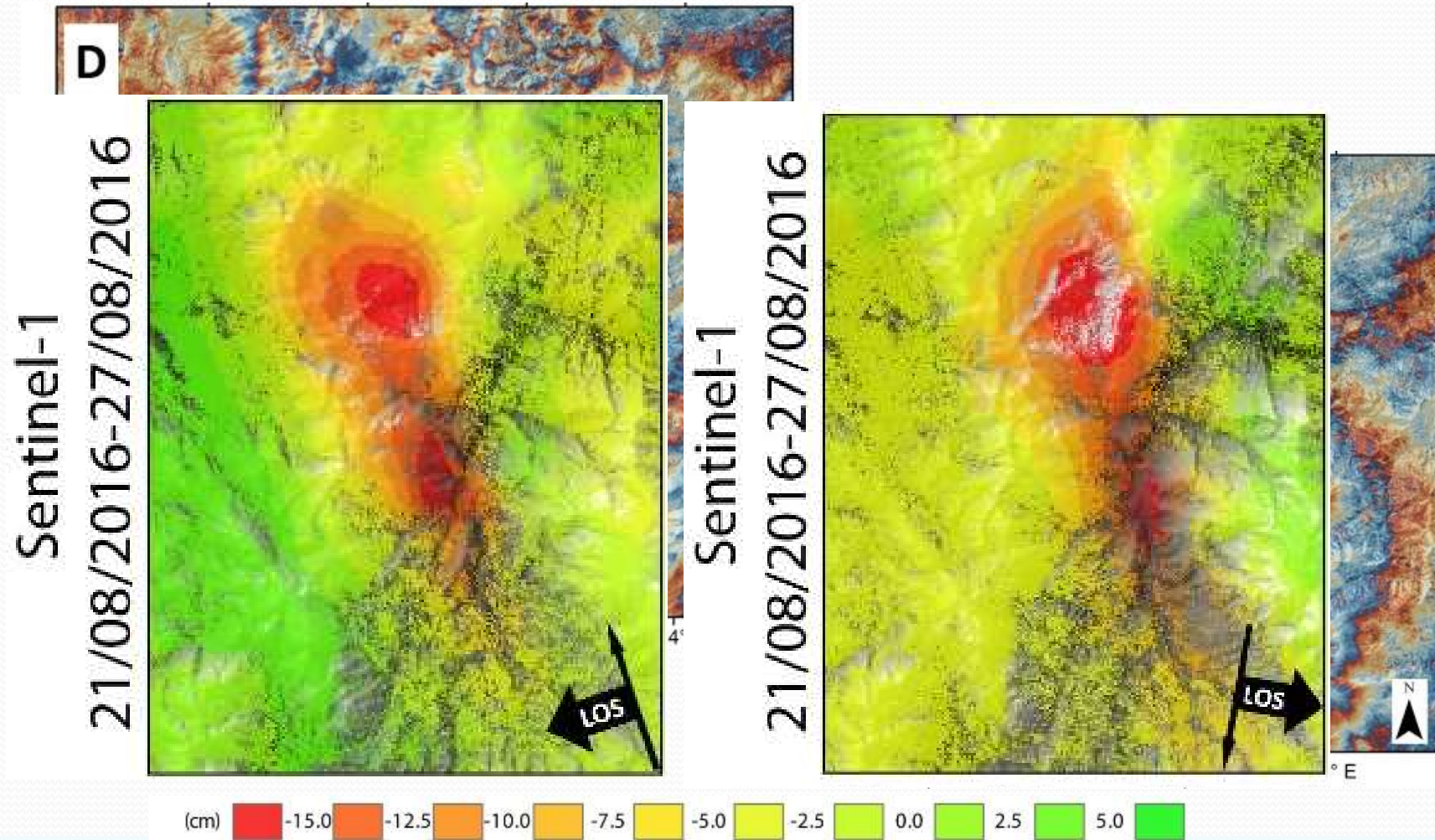
Time line



24th August EQ - Sentinel-1



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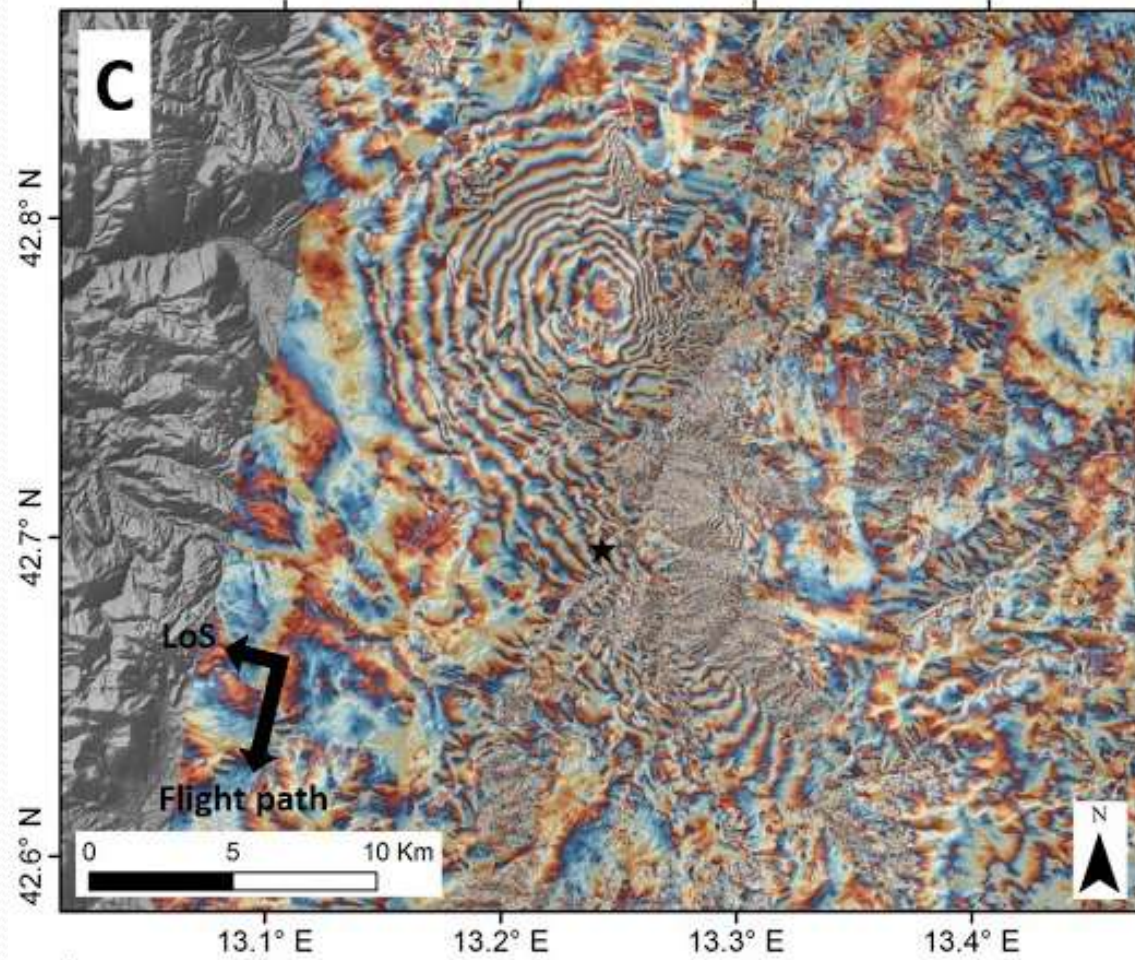


- **Ascending pair time span: 15/08/2016 - 27/08/2016**
- **Descending pair time span: 21/08/2016 - 27/08/2016**
- **Maximum co-seismic displacement in line of sight of 25 cm moving away from the satellite**

24th August EQ. - COSMO-SkyMed



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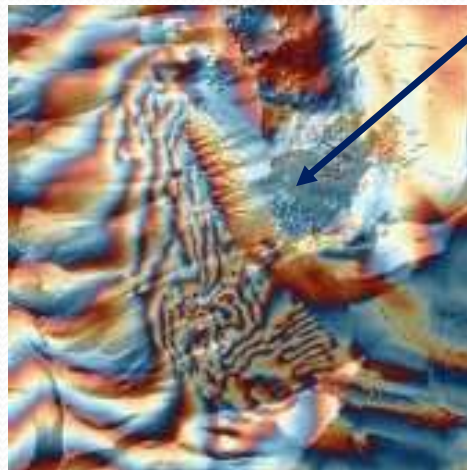
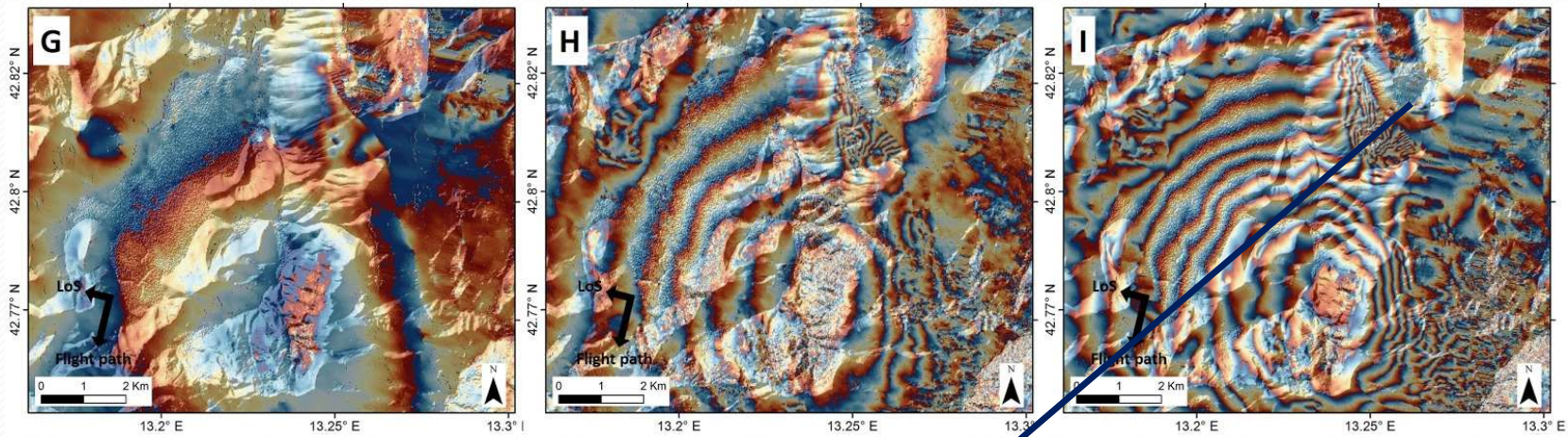


- **Ascending pair time span: 20/08/2016 - 24/08/2016**
- **Maximum co-sesimic displacement in line of sight of 25 cm moving away from the satellite**

24th August EQ. - COSMO-SkyMed



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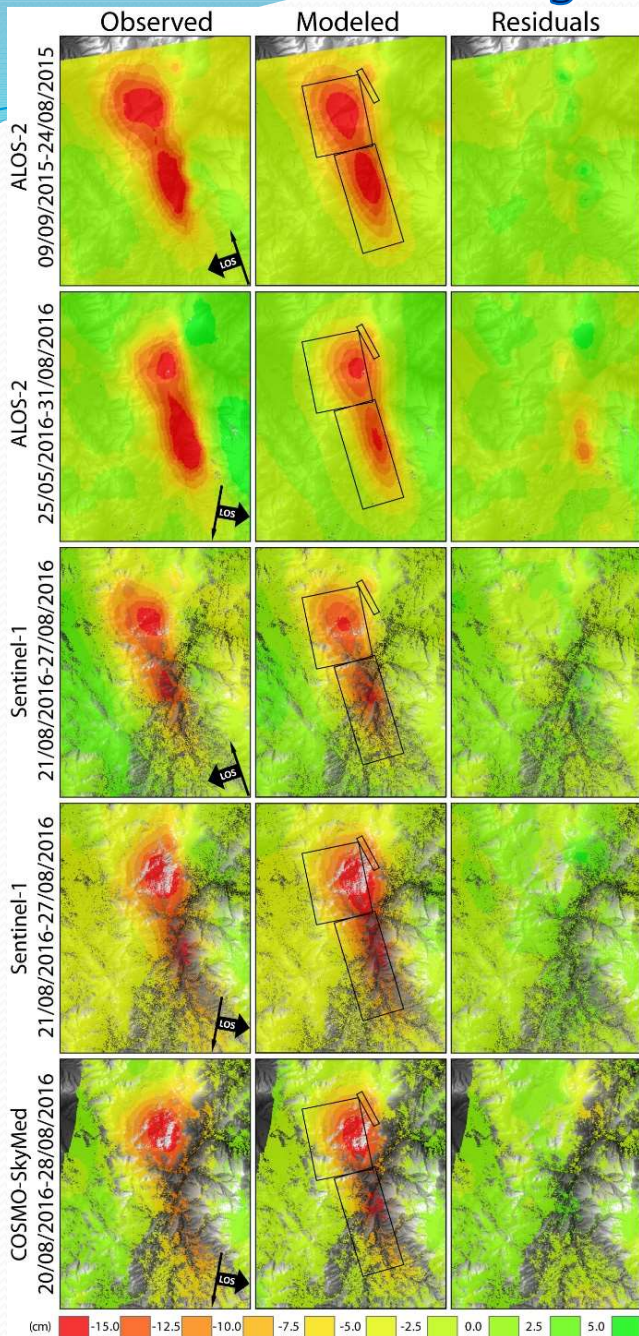


Mt. Vettore

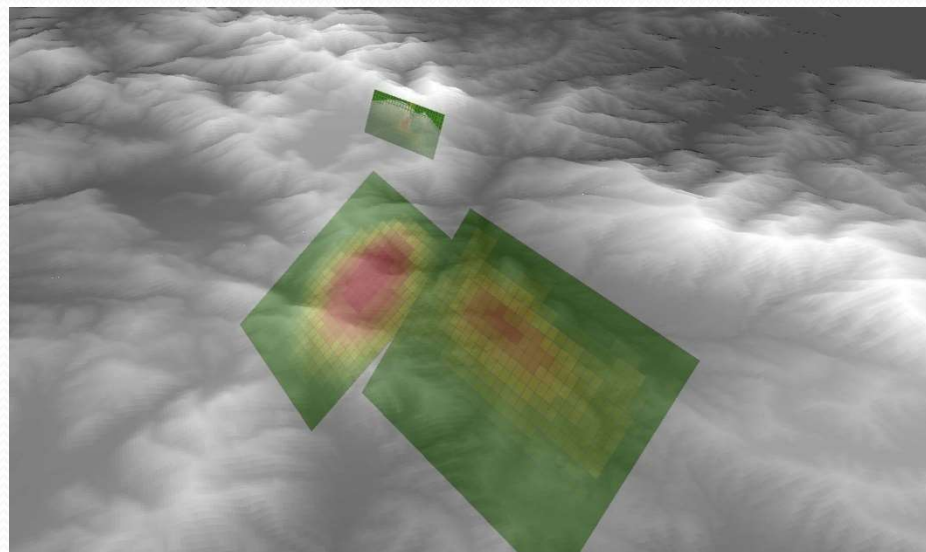
24th August earthquakes - Modelling



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- Synthetic displacement field is well reproduced by the activation of a NNW-SSE normal fault
- Slip distribution shows two maxima located on two fault segments, with about 1.4 m and 0.9 m pick of slip (Geodetic moment: 6.2)
- Local displacement on the western flank of the Mt. Vettore, can be simulated with a shallow slip of 0.9 m along a fault plane that can be linked at depth with the main fault plane.
- Total slip along the Monte Vettore fault portion corresponds to Magnitude 4.5.

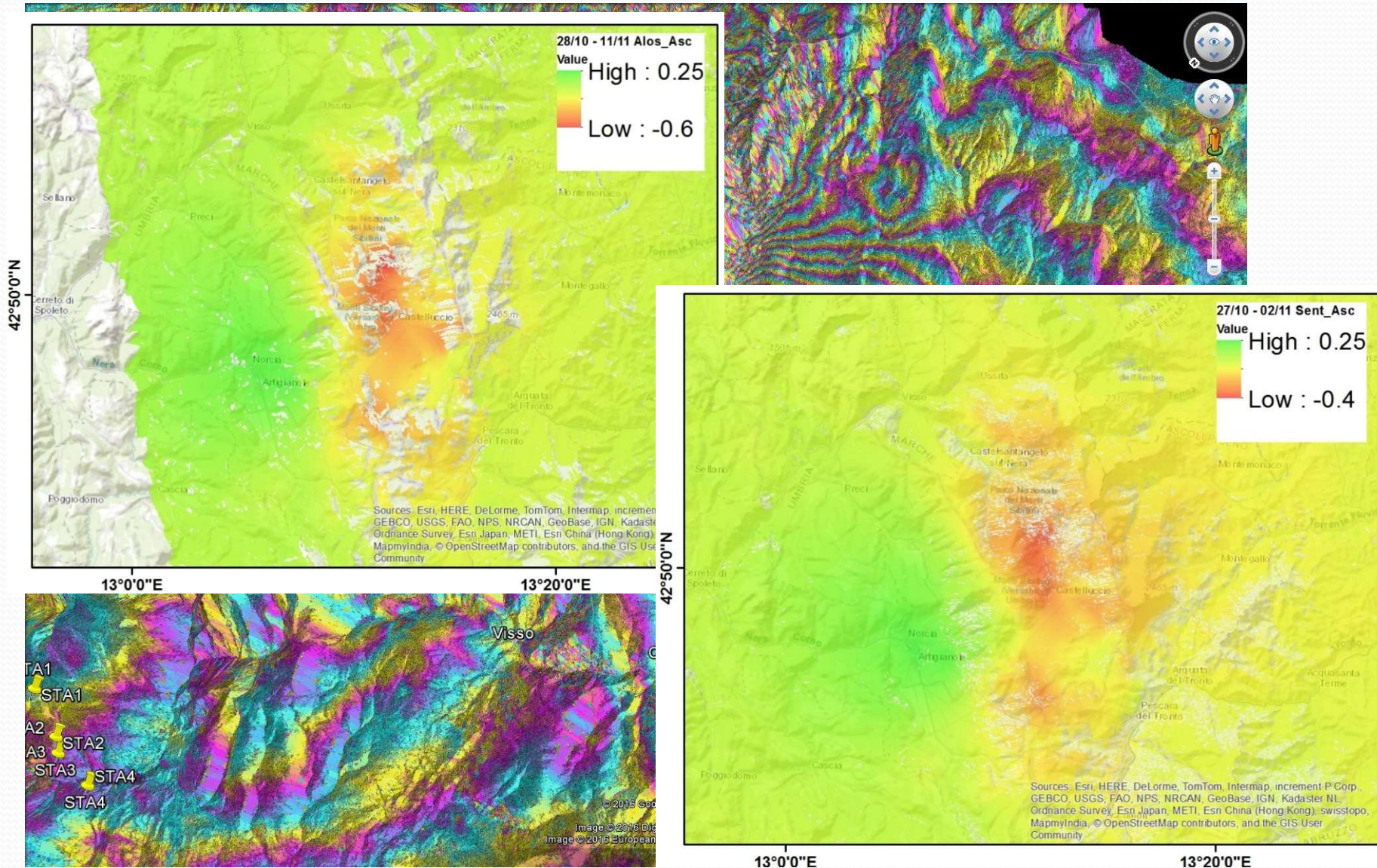


Only 30th October EQ. – Alos-Sentinel



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- **Ascending Alos-2 pair time span: 28/10/2016- 11/11/2016**
- **Ascending Sentinel-1 pair time span: 27/10/2016- 02/11/2016**
- *Maximum co-seismic displacement in LoS of 80 cm*

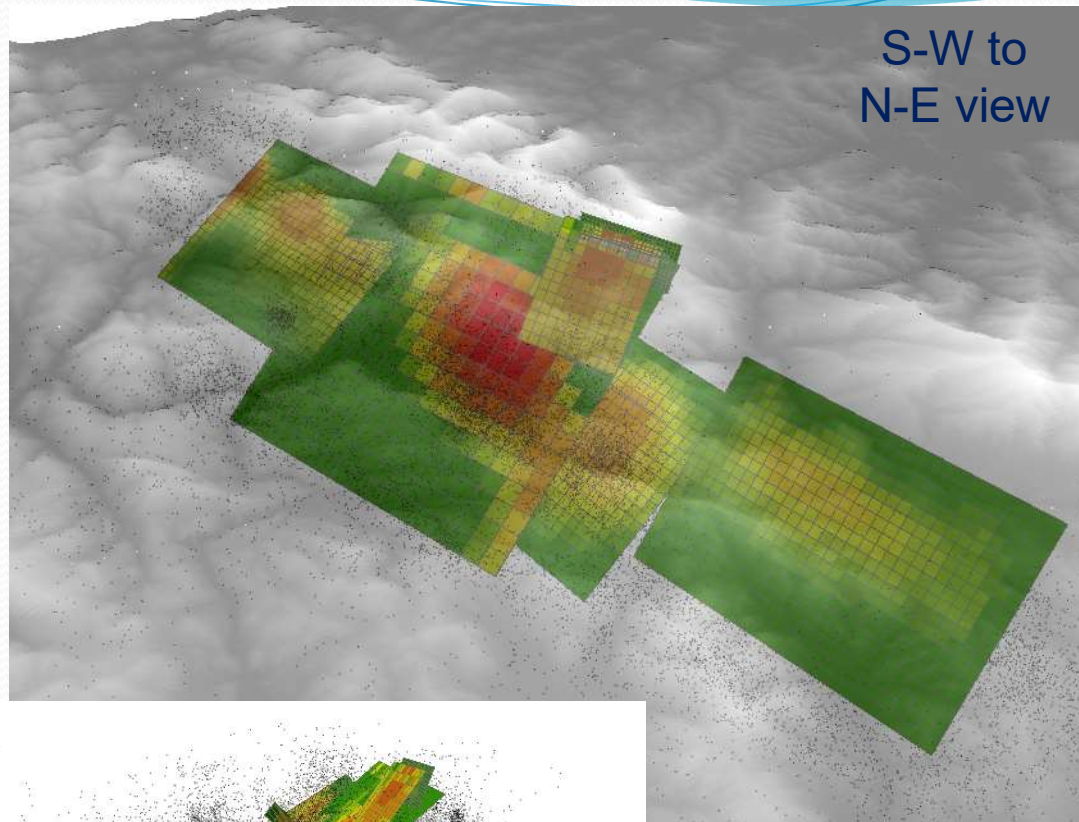


30th October earthquakes – Modelling

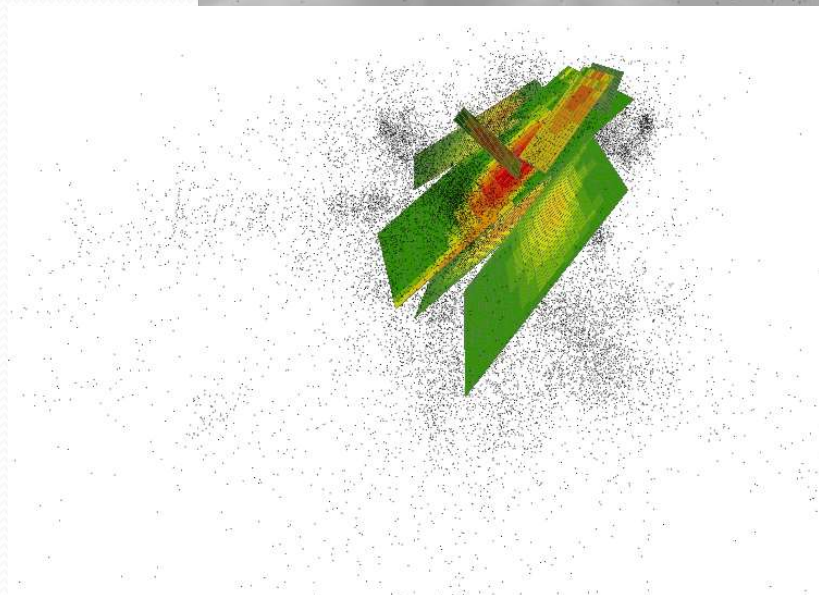


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S-W to
N-E view



South to
north
view





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Grazie per l'attenzione

Per dettagli e/o chiarimenti

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