

# Slip behavior of the Campotosto normal fault (central Italy) from high-rate GPS, strong-motion and InSAR observations



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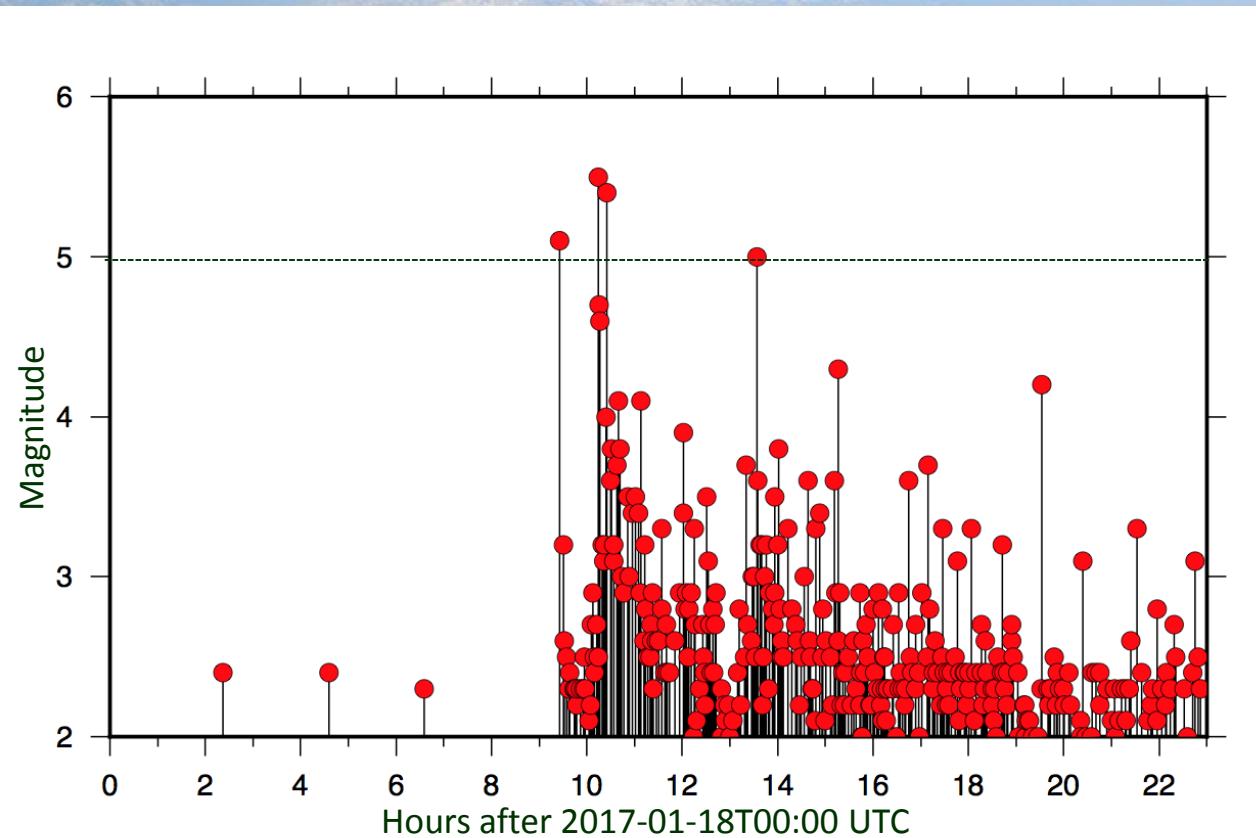
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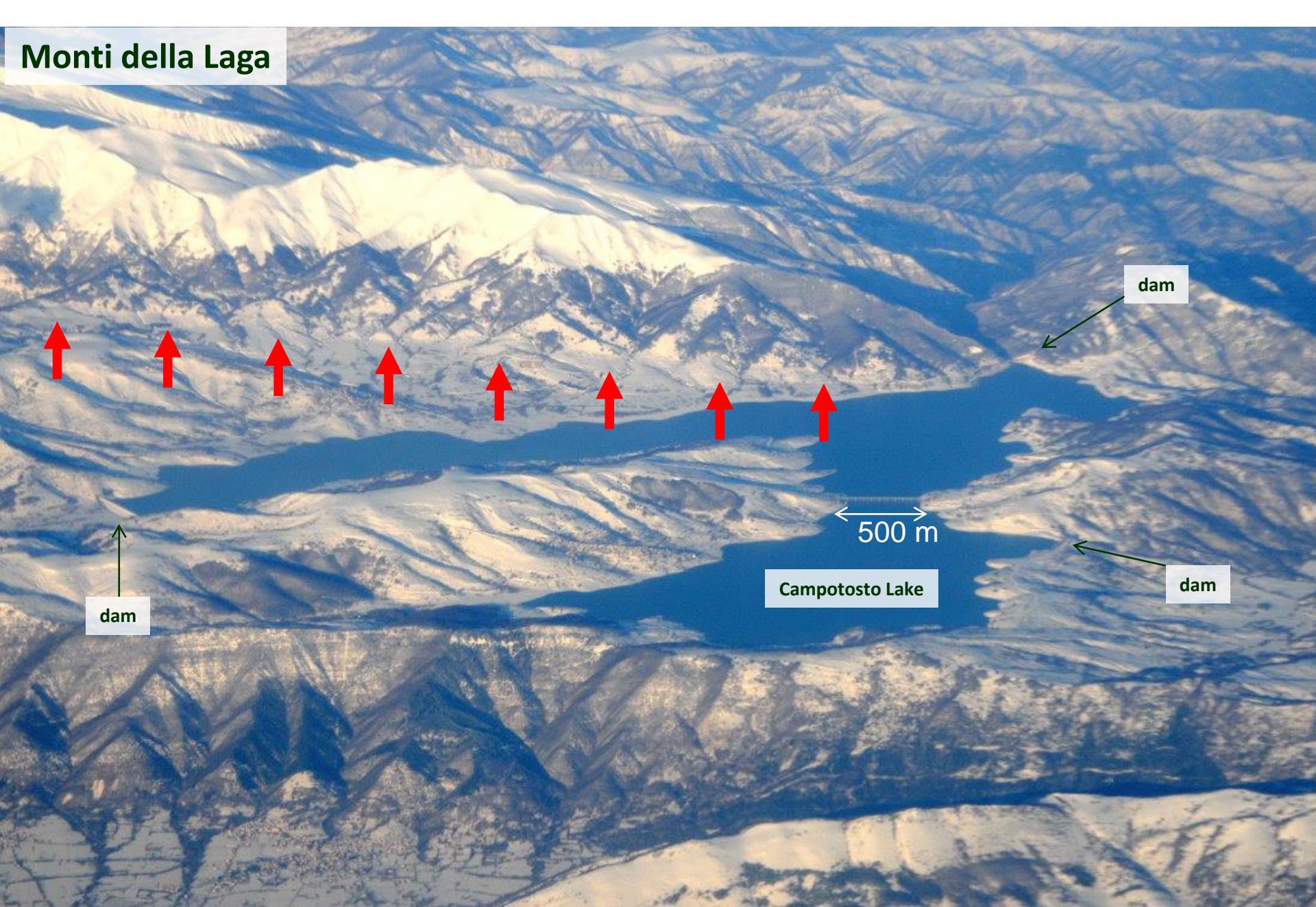
**19<sup>th</sup> General Assembly of WEGENER**  
on earth deformation & the study of earthquakes using geodesy and geodynamics

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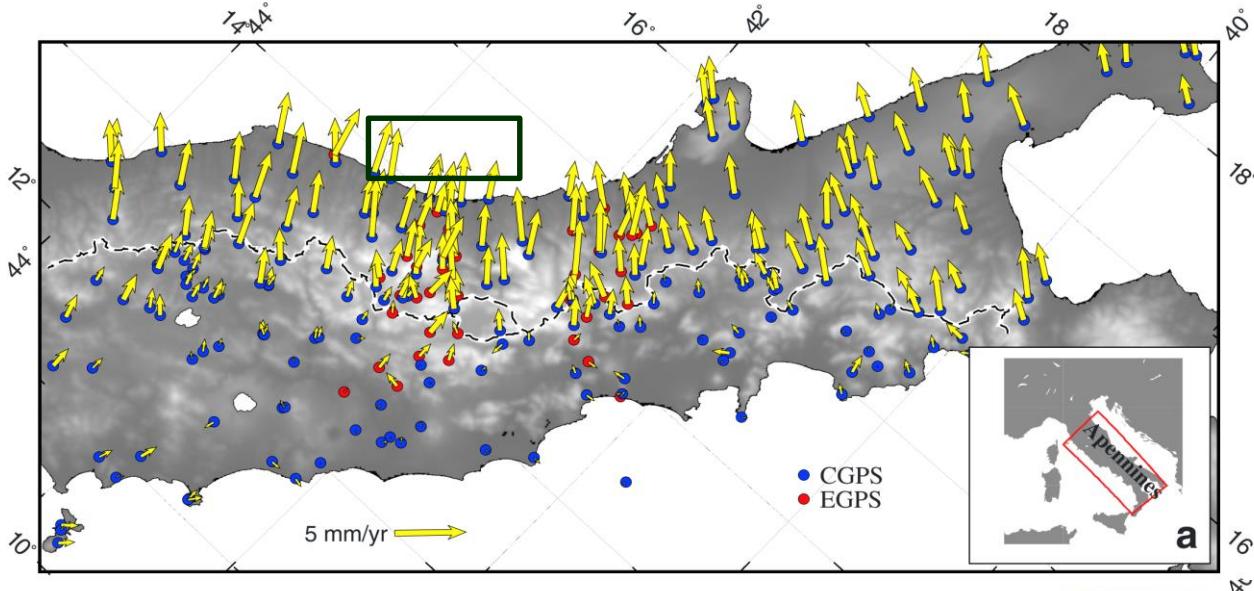
# Central Italy 2009-2017 seismic sequence



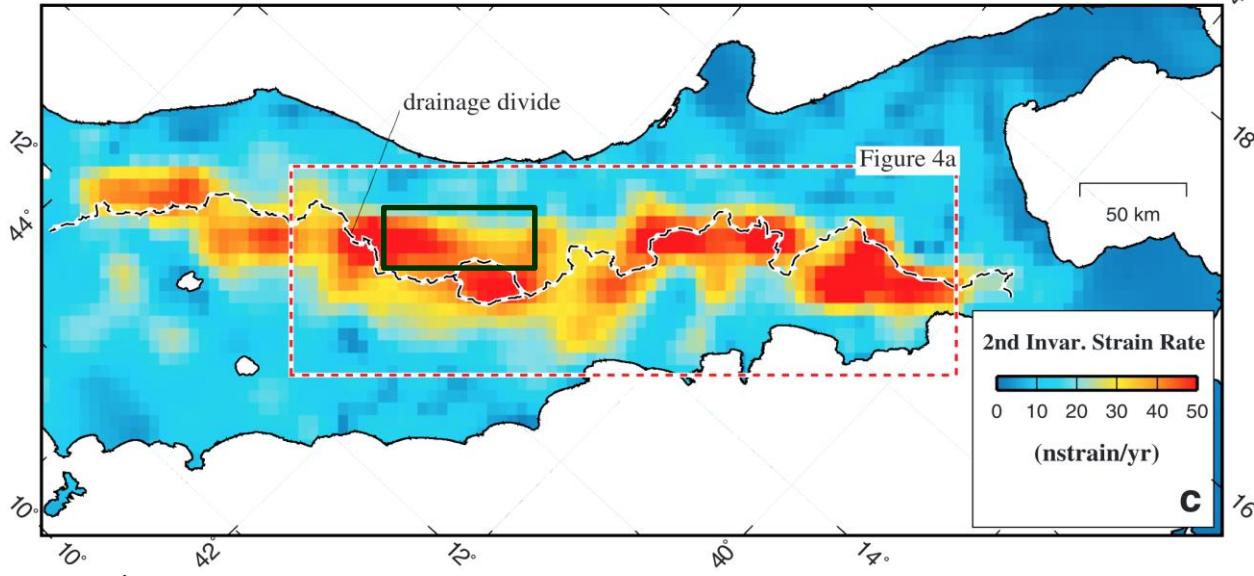
# Monti della Laga



# Interseismic strain accumulation



a



c

D'Agostino 2014

# Objectives and approach

## Objectives

- Slip distribution during the January 2017 multiple events sequence
- Rupture potential of the Campotosto Fault ?

## Approach

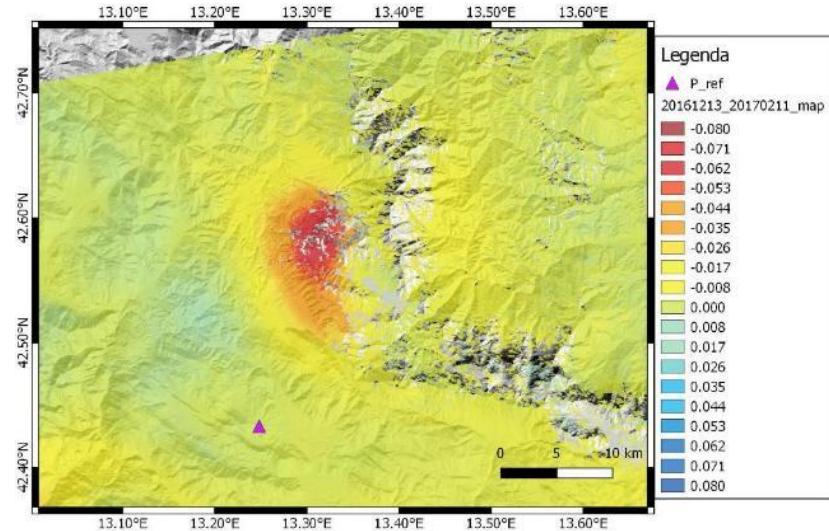
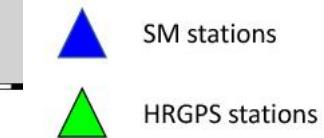
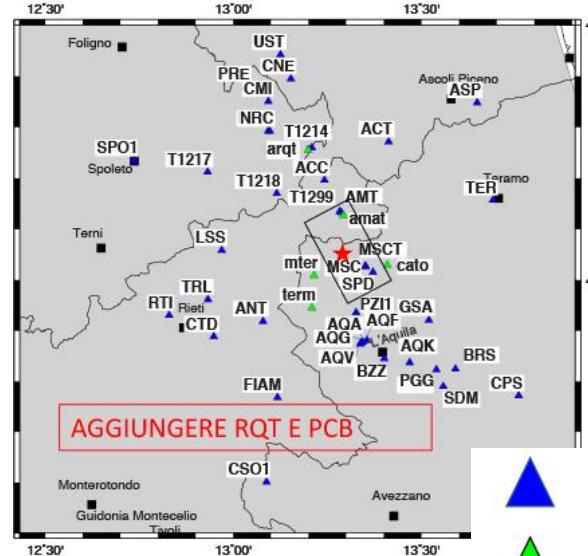
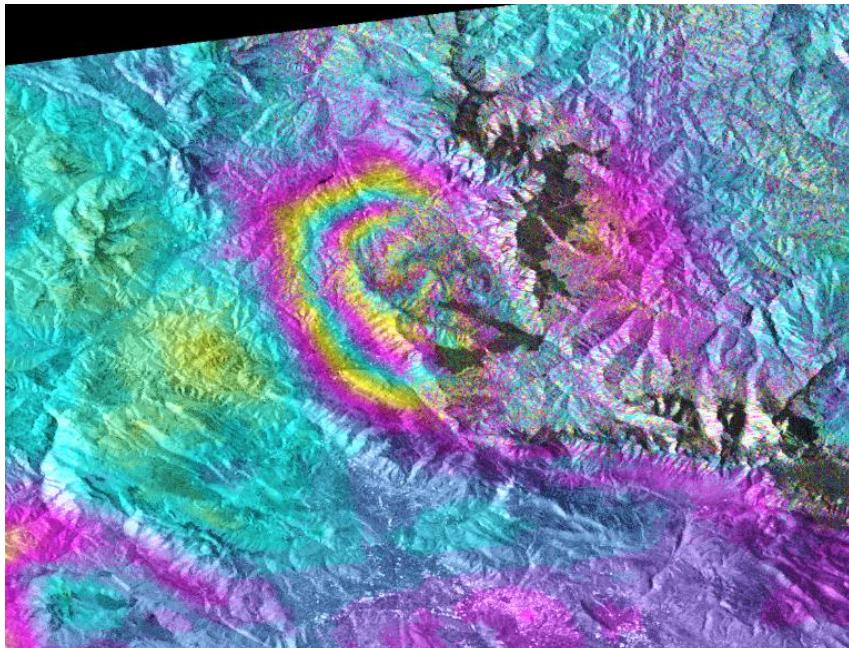
- Slip inversion of the cumulative sequence (GPS, InSAR)
- Kinematic finite fault slip inversions of the two largest events (Mw 5.4, Mw 5.5)

# DATA

**GPS:** Offsets from permanently installed stations (RING, ring.gm.ingv.it) or temporary deployments

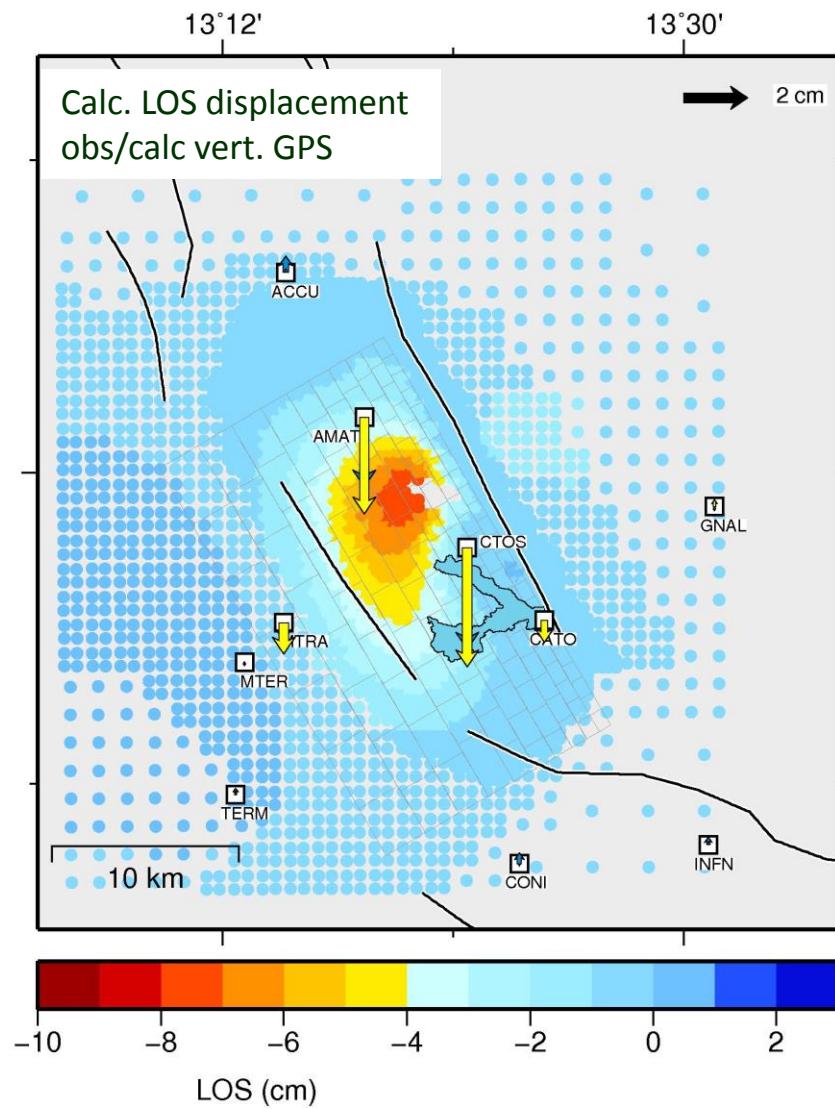
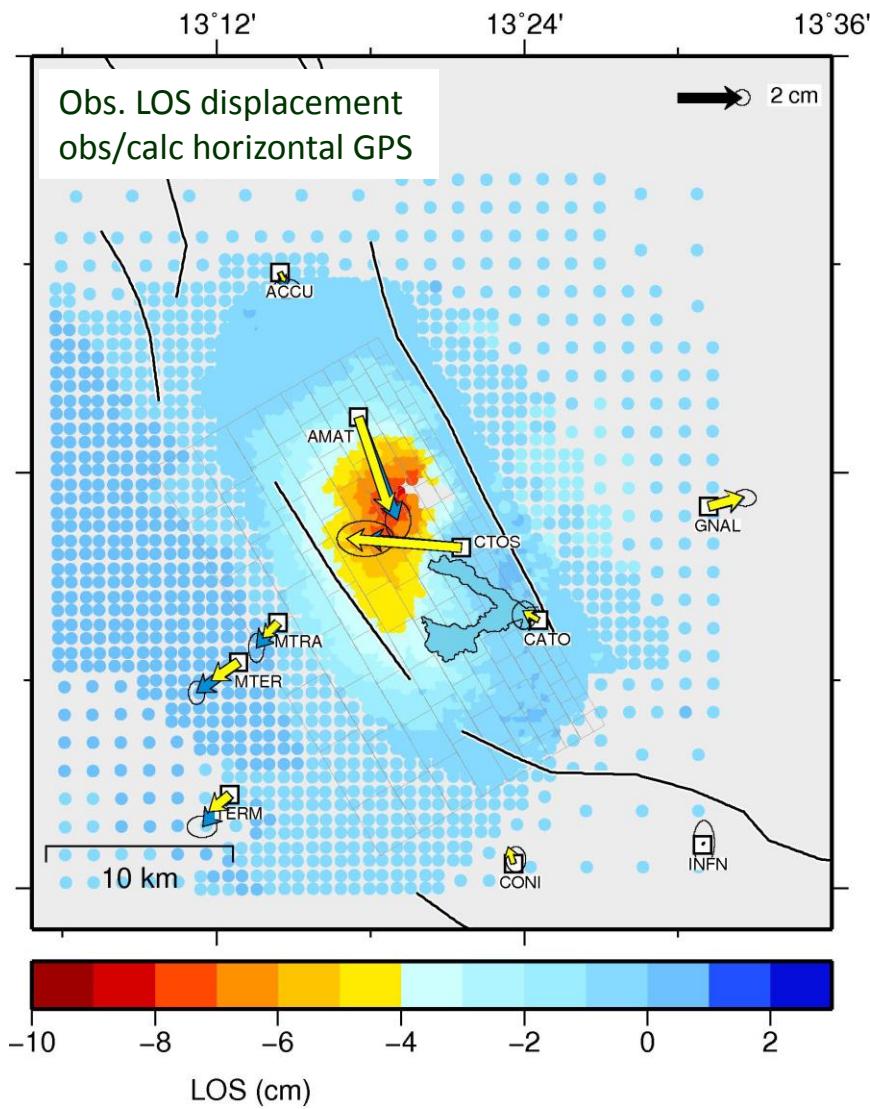
**Strong motion data:**  
band-pass filtered accelerograms (0.02/0.5 Hz)  
and HRGPS

**SAR interferometry:**  
Sentinel1 (13/12/2016-11/02/2017, ascending)

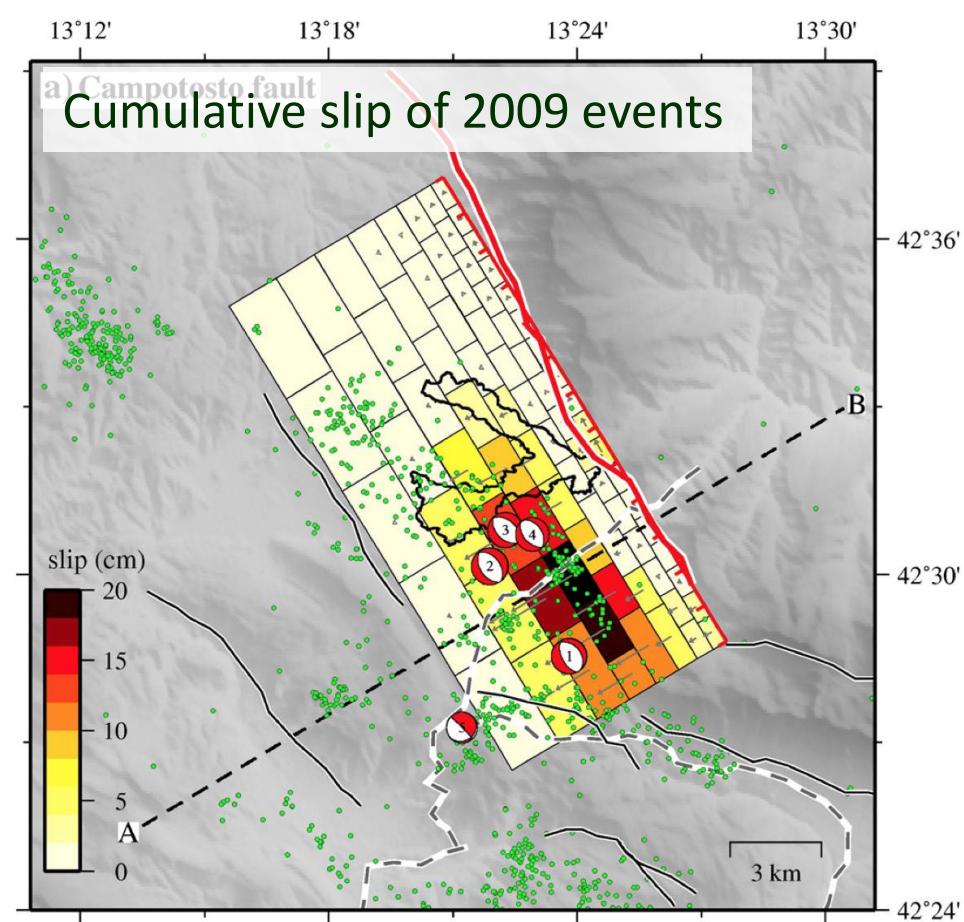
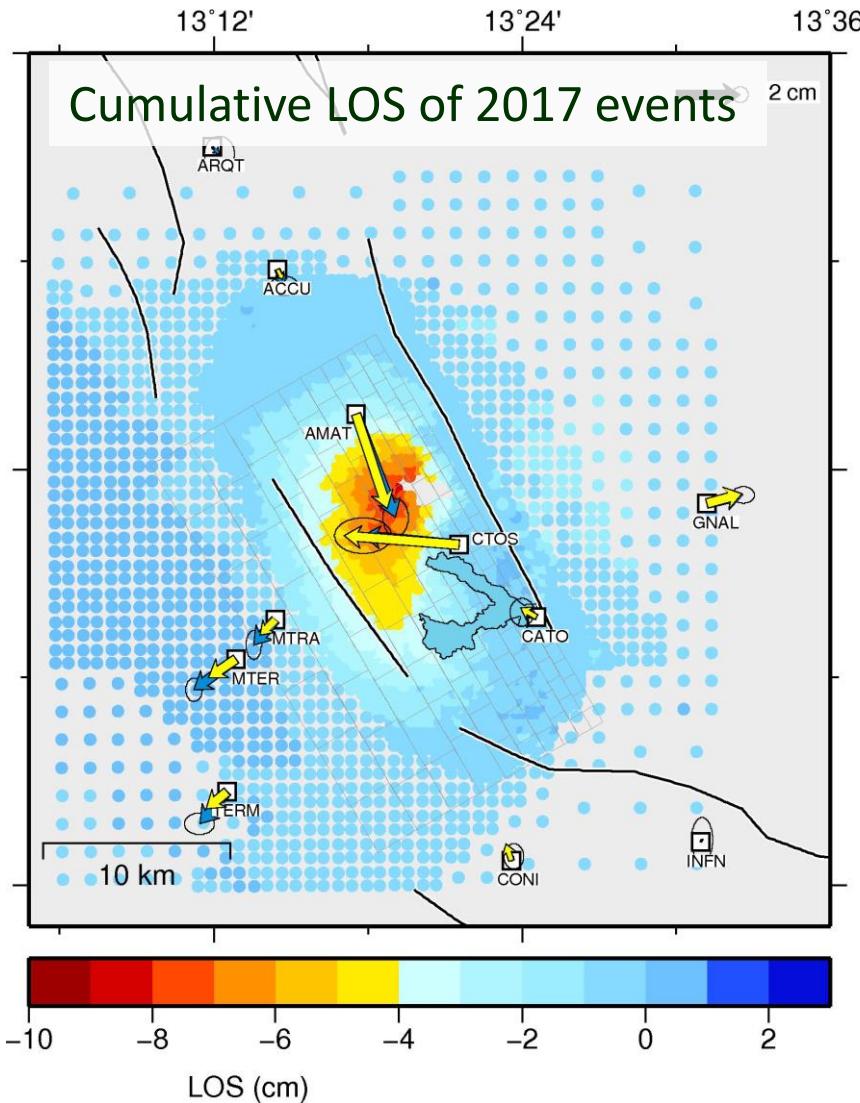


# Cumulative geodetic inversion (GPS, InSAR)

## 13/12/2016-11/02/2017

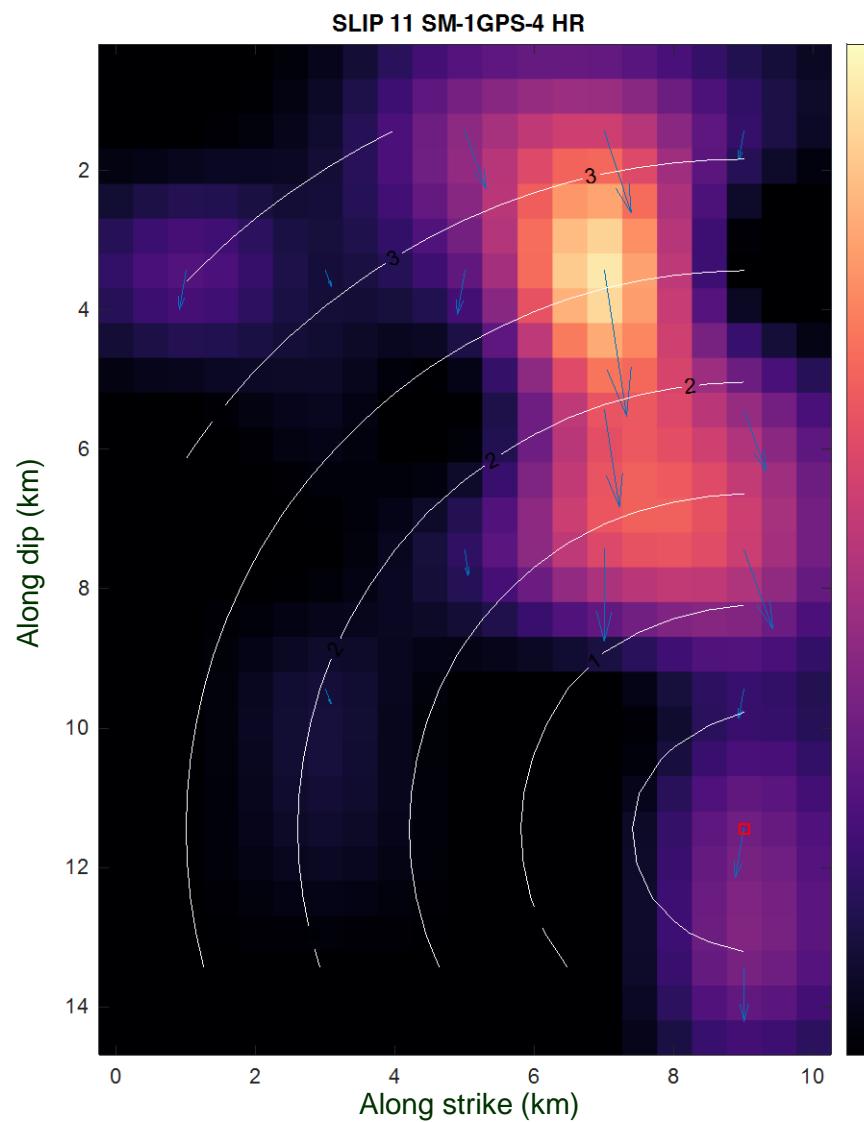


# Complementary slip distribution of 2009 and 2017 events



Cheloni et al., 2014

# Finite Fault inversions Mw 5.5



11 SM stations, 4HRGPS

Inversion approach:

Hartzell & Heaton, 1983; Dreger et al., 2005

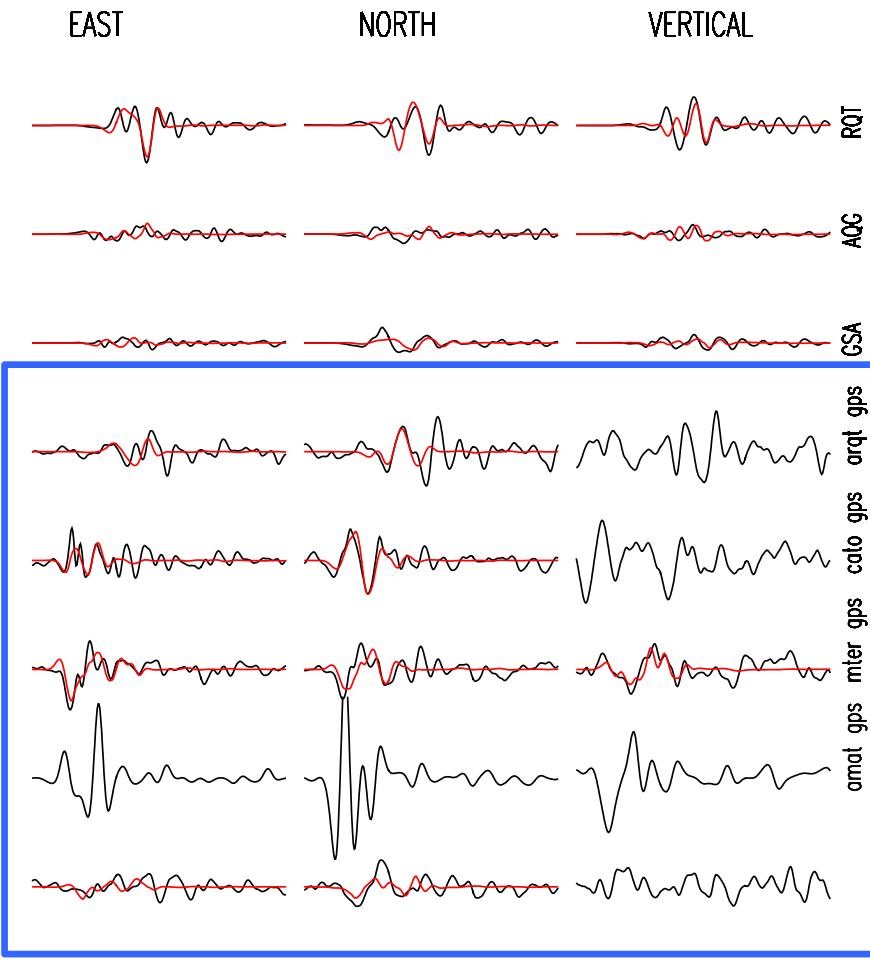
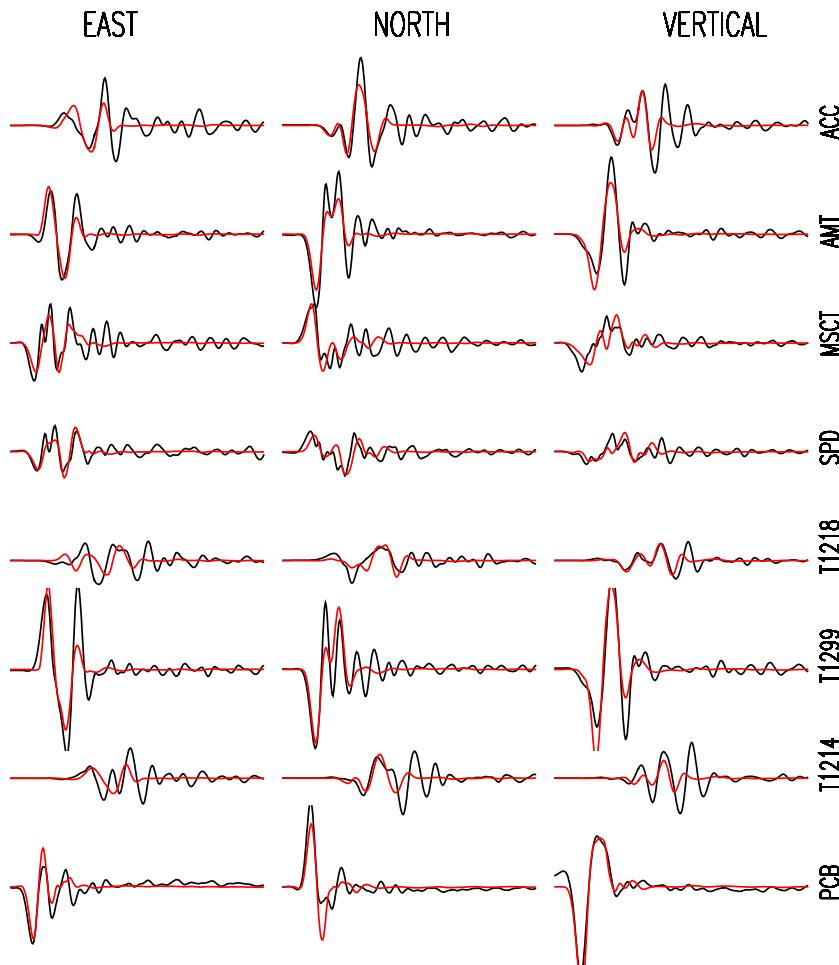
Variable Rake: -70; -100

Best-fit Rupture Velocity: 3.2 km/s

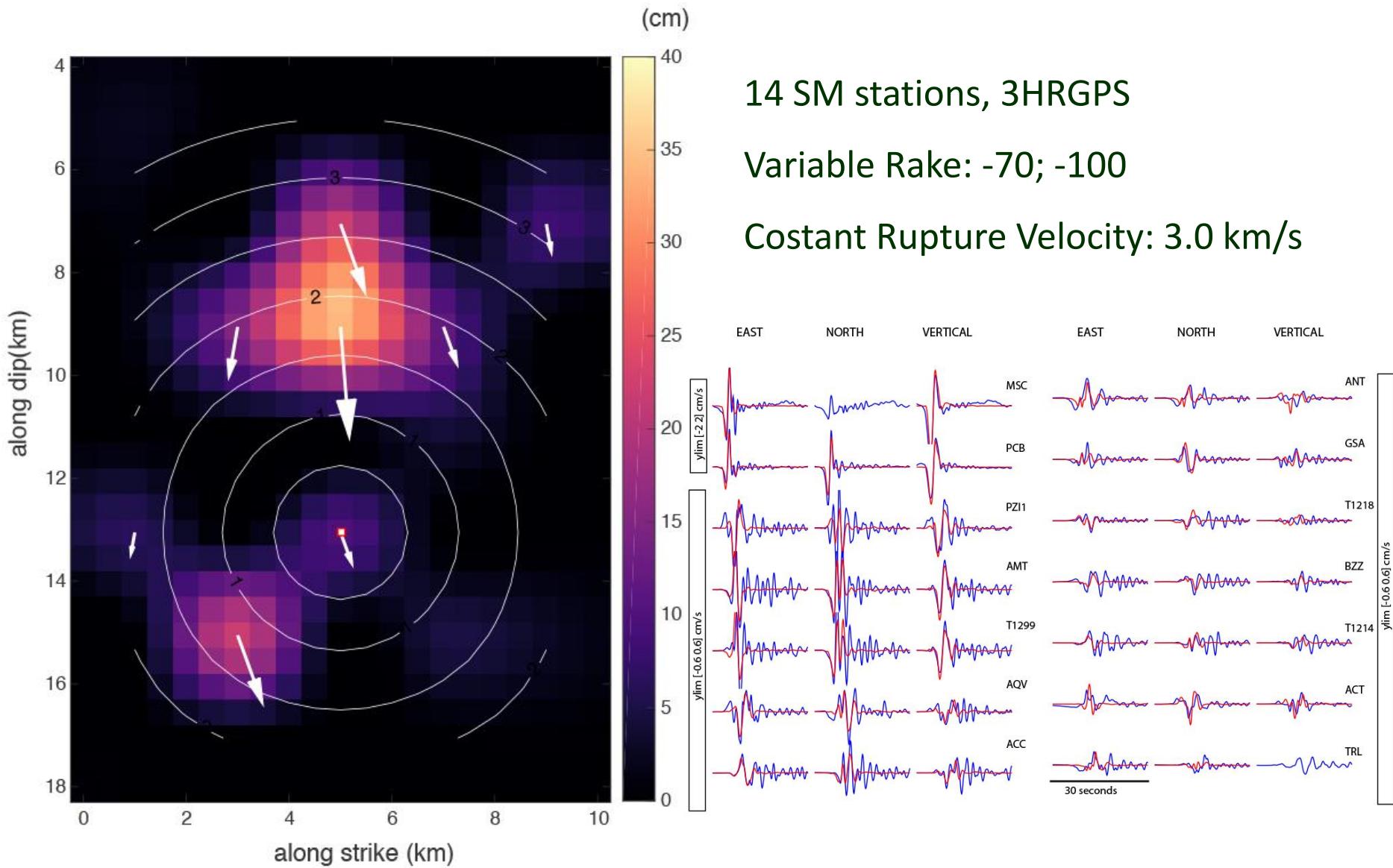
Best-fit Rise Time: 1.1 s

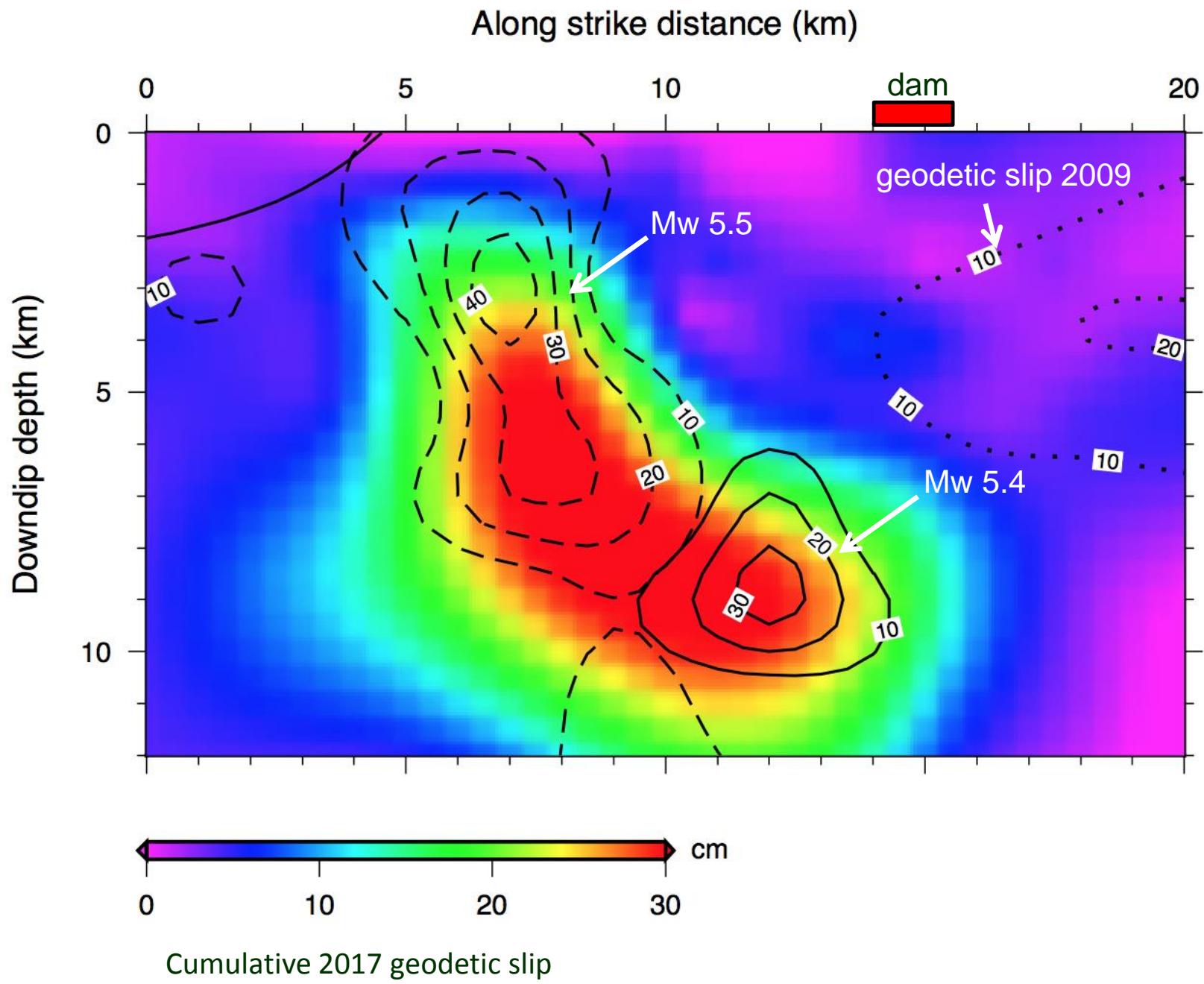
Variance Reduction = 64 %

# Finite Fault inversions Mw 5.5



# Finite Fault inversions Mw 5.4





# Conclusions

Complementary slip distributions of 2009 and 2017 events

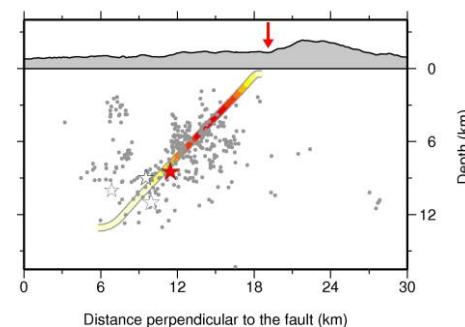
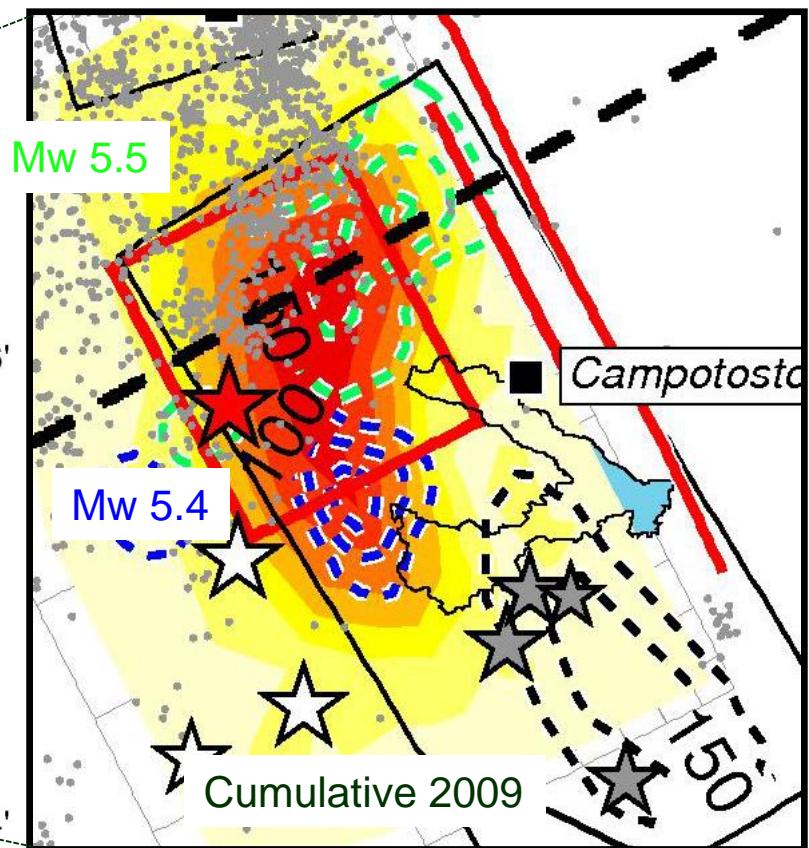
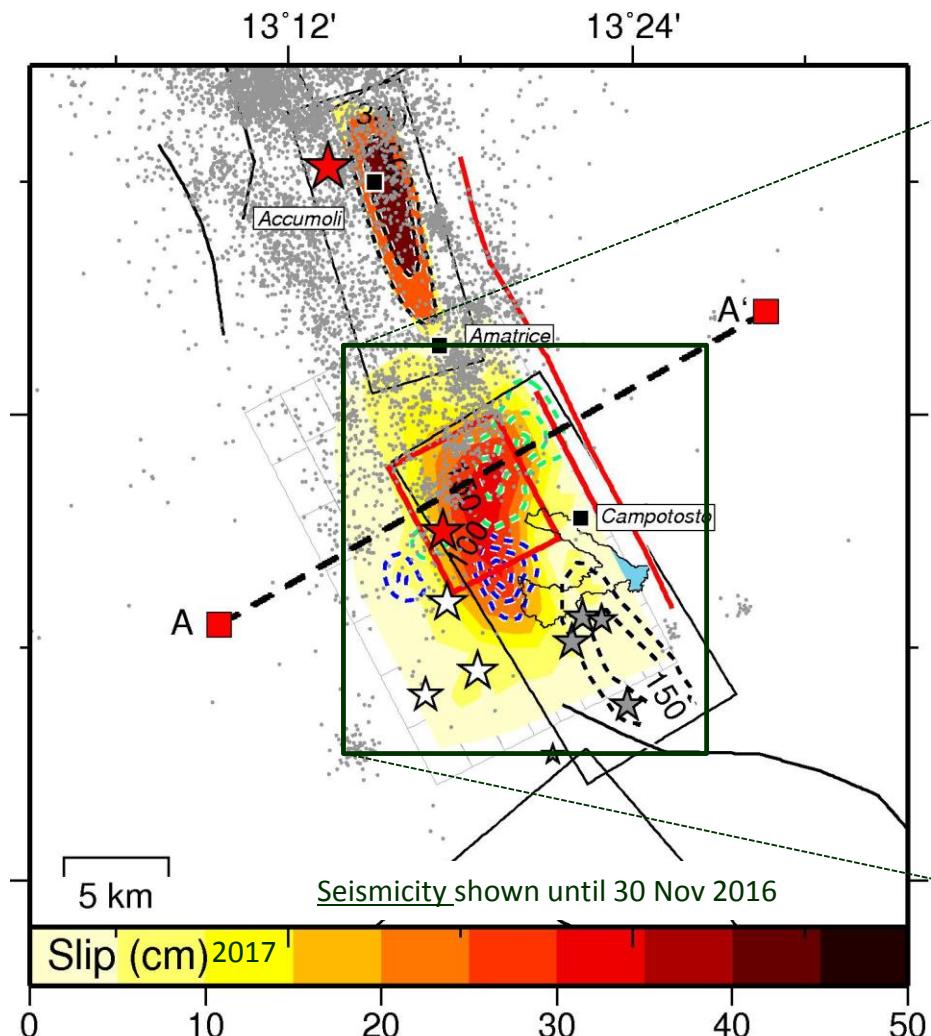
Unruptured fault patches consistent with  $Mw \sim 6$  event  
relevant for safety of existing dams

Cumulative slip on Campotosto fault not equivalent to Norcia and Amatrice segments. Different amount of strain release.

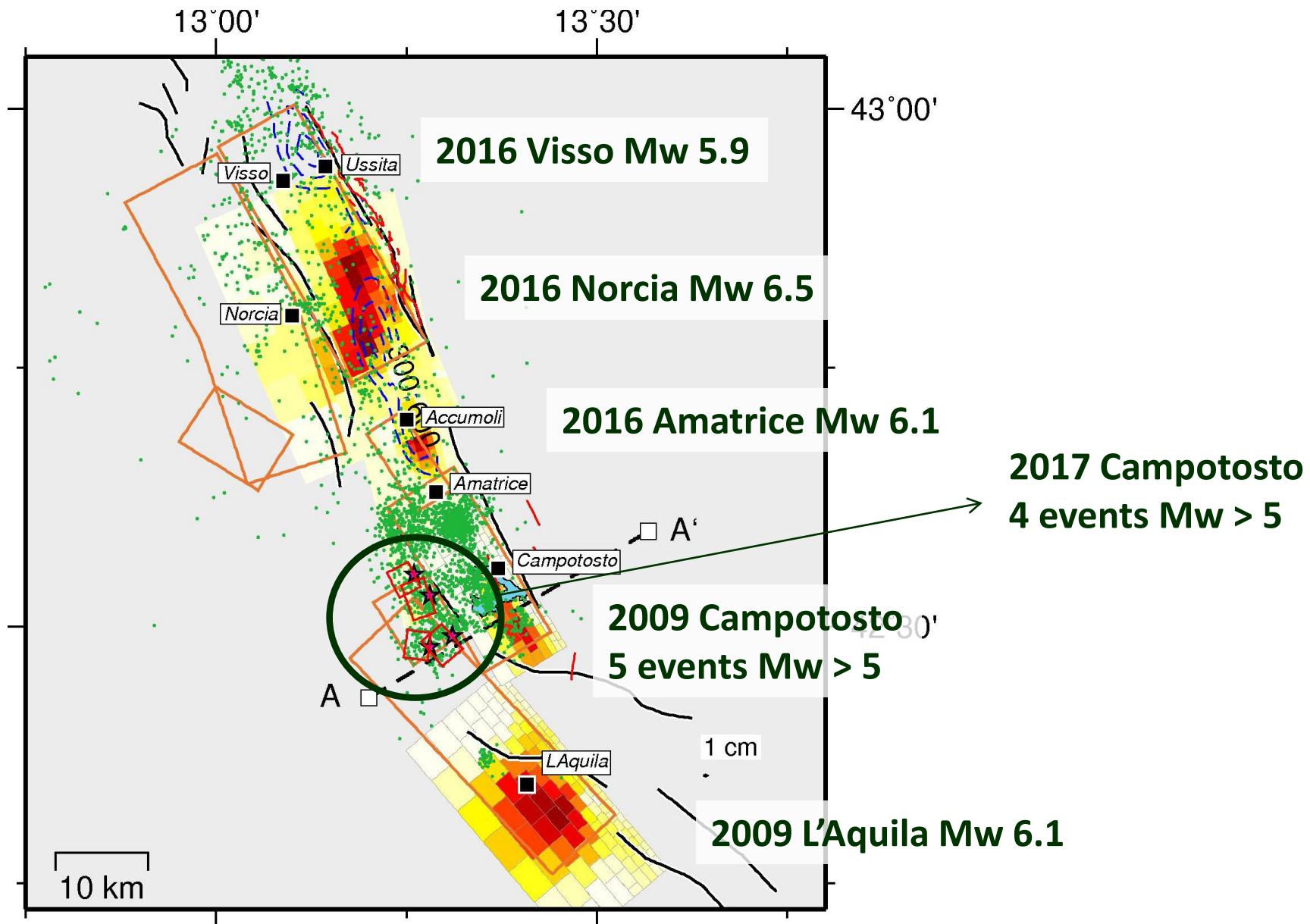
Heterogeneous slip behaviour:

- Recent strain release: multiple  $M \sim 5.5$  earthquakes
- Paleoseismological evidence of surface rupturing events ( $Mw 6.5$ )

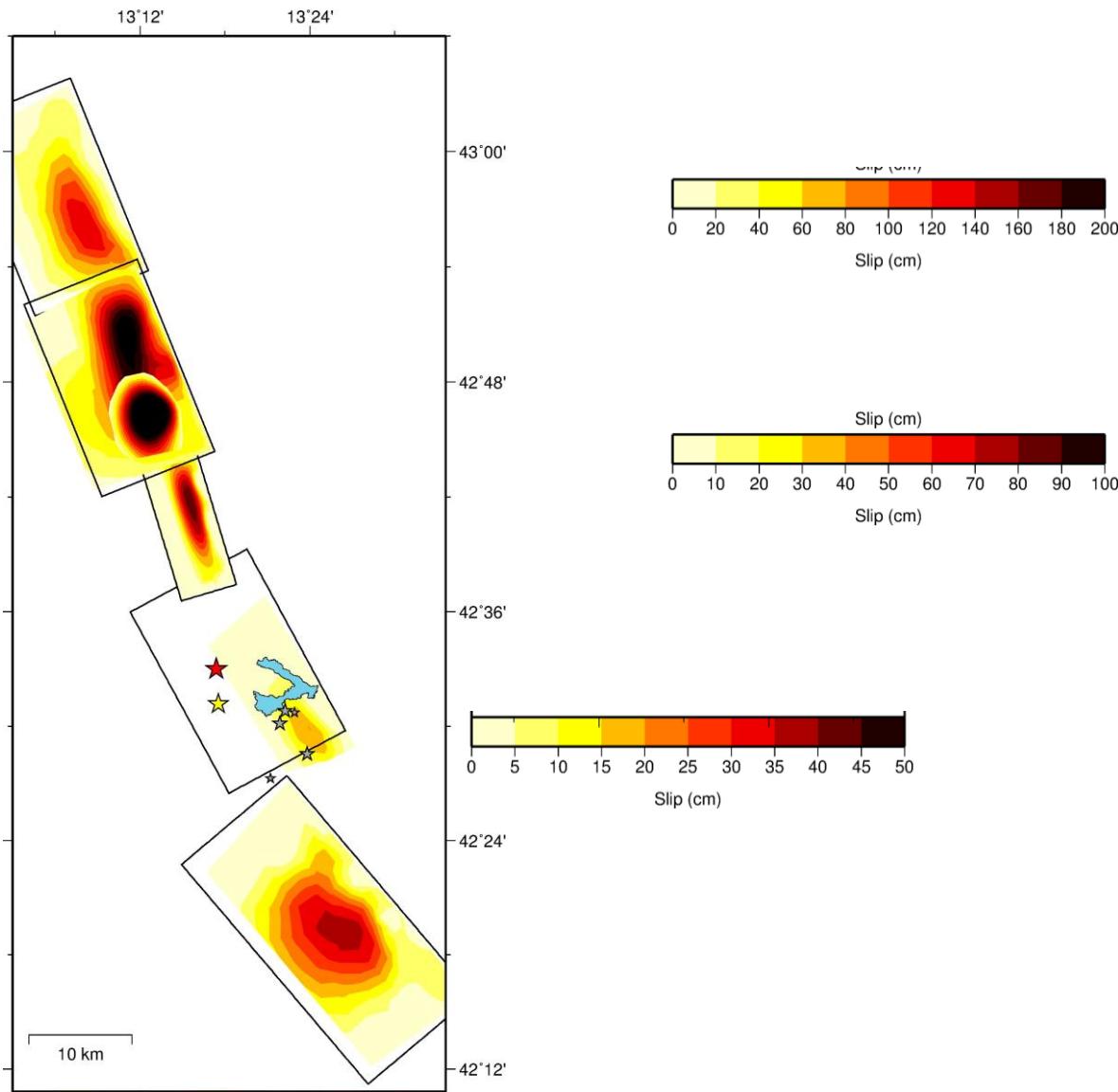
# Slip distributions

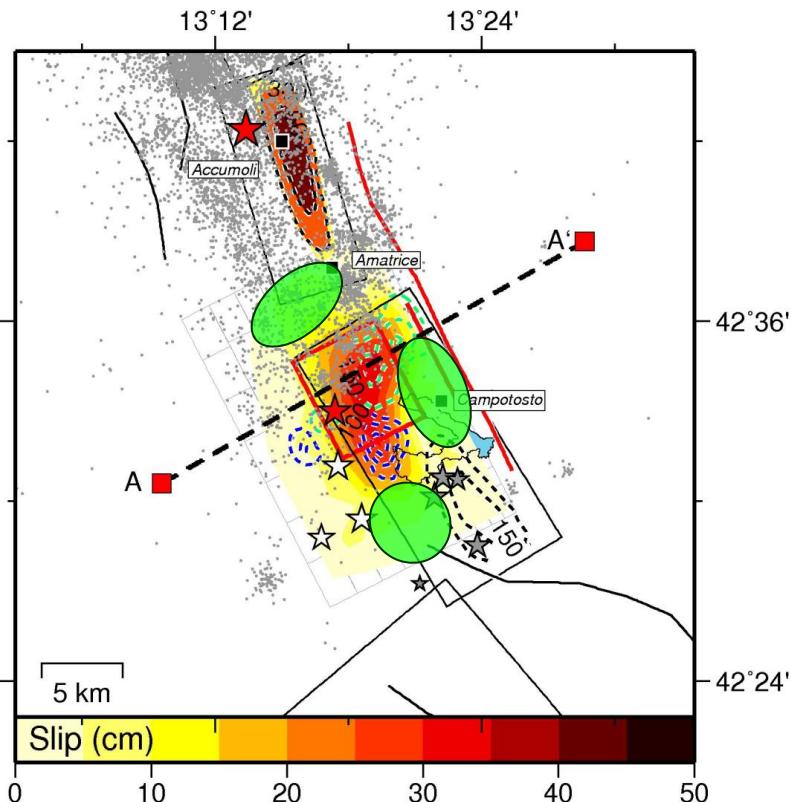


- First event (finite fault inversion):
- Mw 5.59 (Mo  $1.75 \times 10^{24}$  dyne cm)
- Second event (finite fault inversion):
- Mw 5.4 (Mo  $2.81 \times 10^{24}$  dyne cm)
  
- Cumulative events (geodetic):
- Mw 5.94 (Mo  $8.99 \times 10^{24}$  dyne cm)



# Central Italy 2009-2017 seismic sequence





Un-ruptured portions of the Campotosto fault ?

What is the seismogenic potential of the Campotosto fault?