

Monitoring the Campi Flegrei caldera through Passive Image Interferometry

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Campi Flegrei caldera

High risk:

- Densely inhabited
- Potentially explosive

Unrest episodes: (*bradiseismic crises*)

- Changes in uplift rate
- gas emissions
- seismic swarms

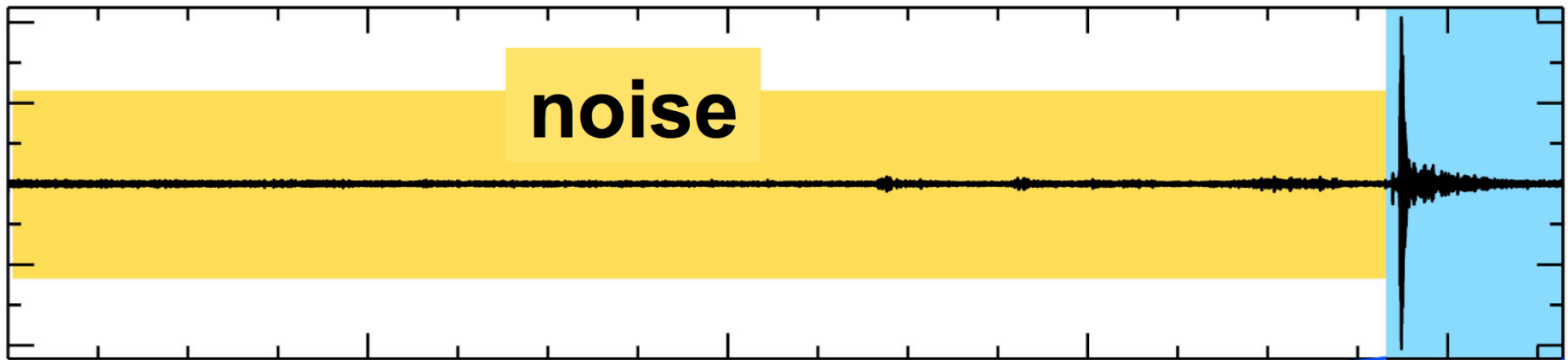
No seismic activity out of the unrests

→ **Passive Image Interferometry**

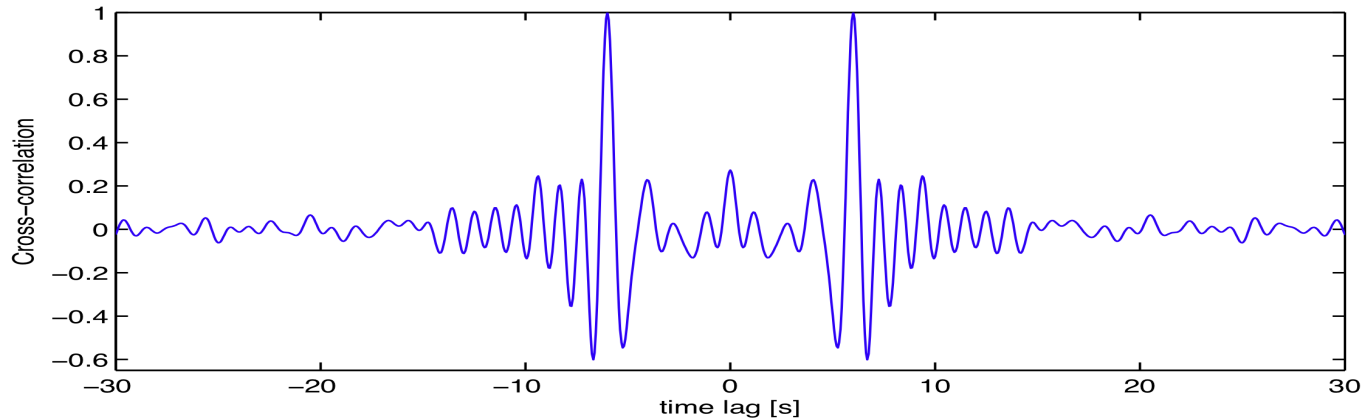
Passive Image Interferometry

Seismic ambient noise:

- ✓ no needs for earthquake occurrence
- ✓ continuous in time
- ✓ recorded everywhere
- ✓ repeatable



Passive Image Interferometry

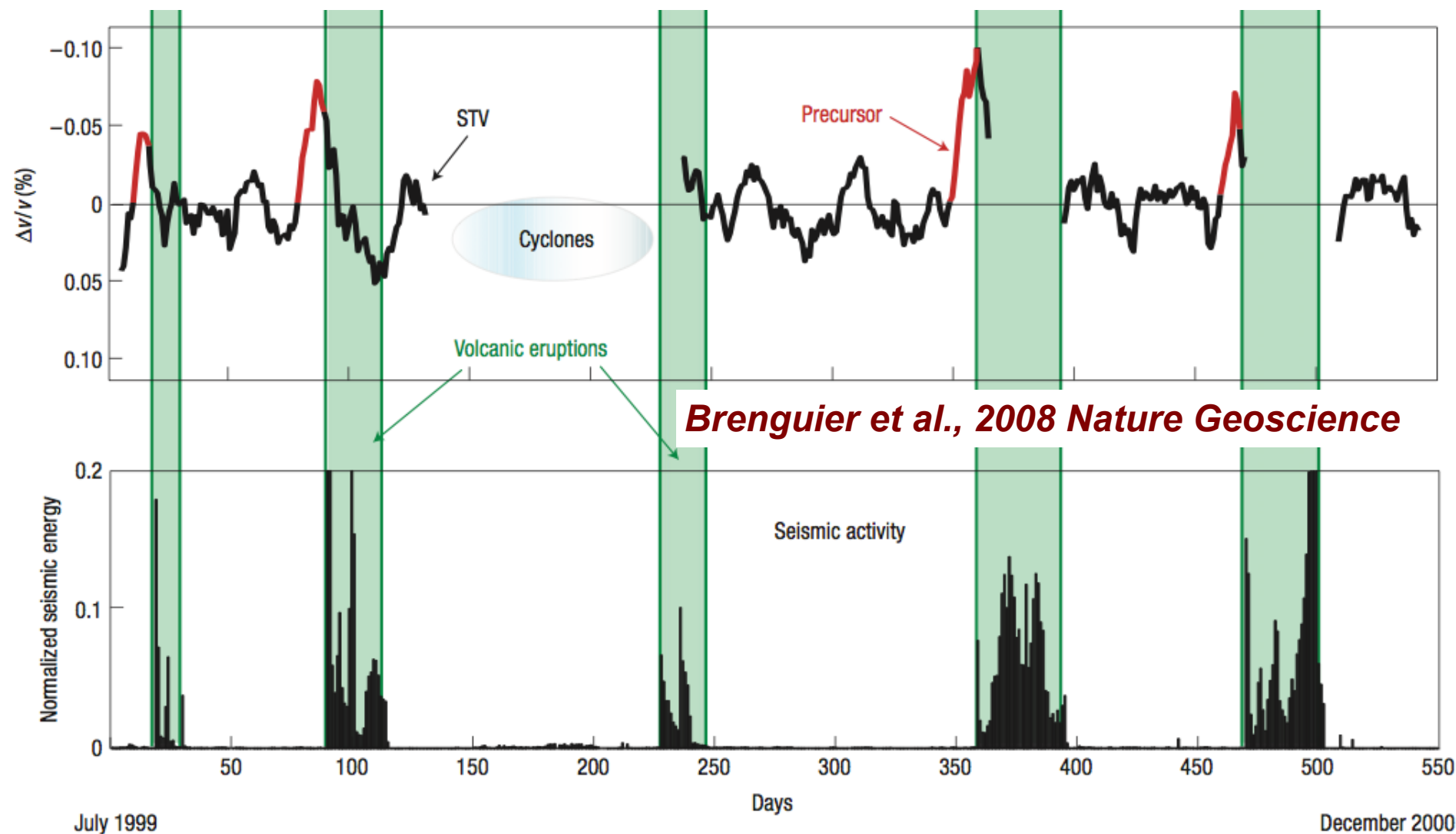


Cross-Correlation (CC) analysis:

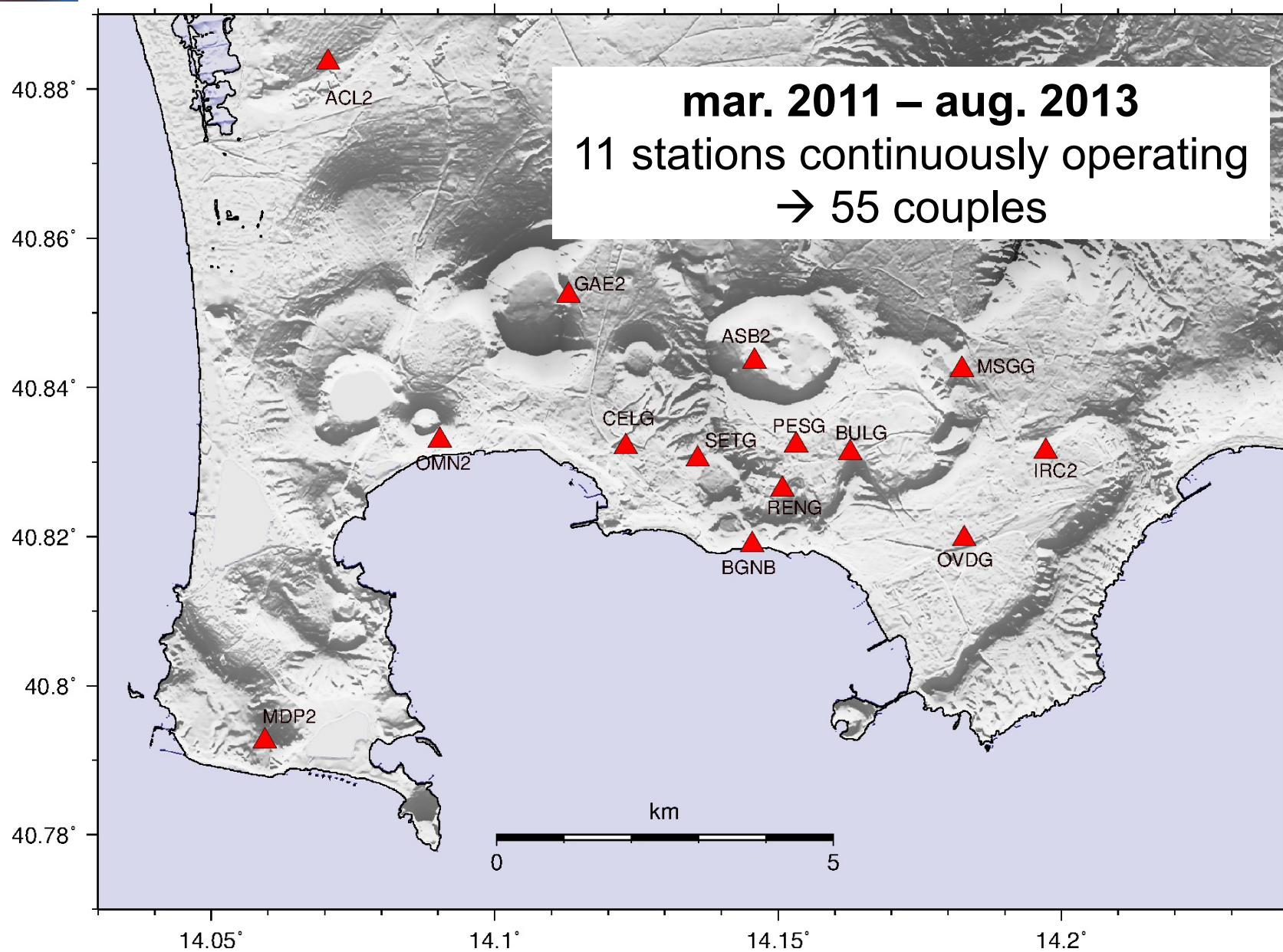
CC \leftrightarrow Green function

Campillo, 2006 Pure and Applied Geophysics

Passive Image Interferometry



Campi Flegrei seismic network - 2014



Passive Image Interferometry

Pre-processing:

- instrument correction
- time series synchronization
- filling the (small) gaps

Processing:

- whitening [0.1-1] Hz
- 1-bit normalization
- cross-correlation
- Multi Window Cross-Spectrum analysis
(Poupinet et al., 1984)

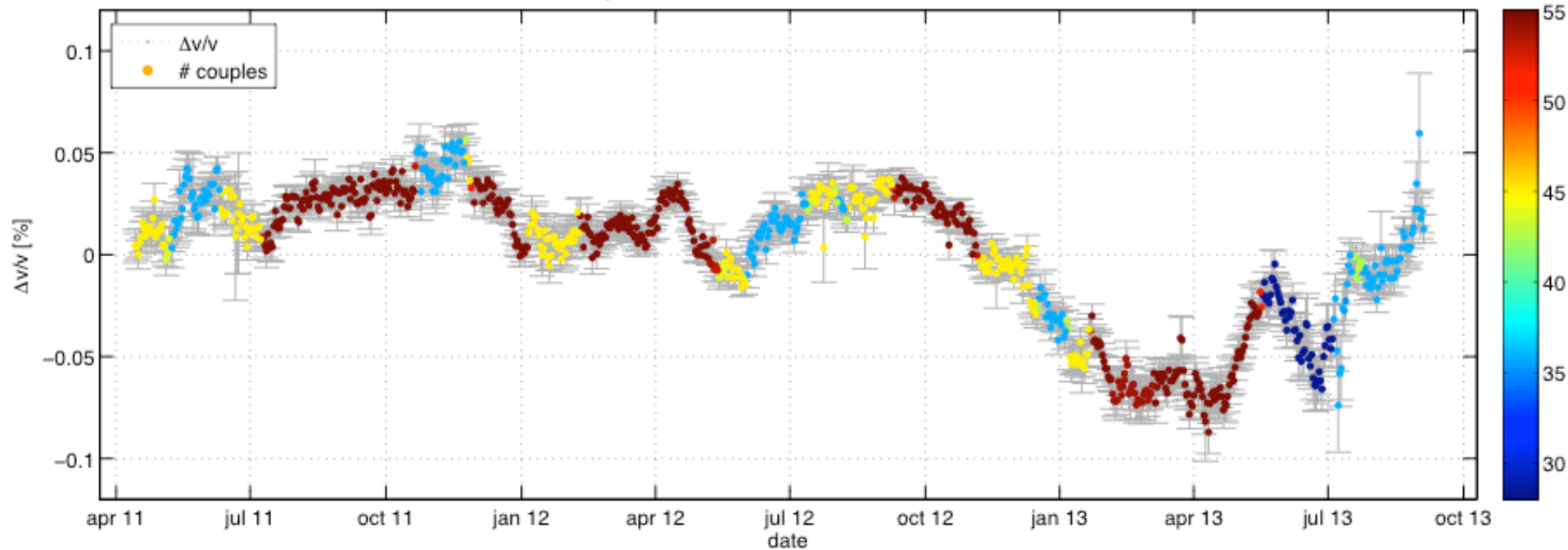
Reference CC = background = **CC**(3y)

Current CC = actual state = **CC**(40d)

trade-off between resolution and similarity

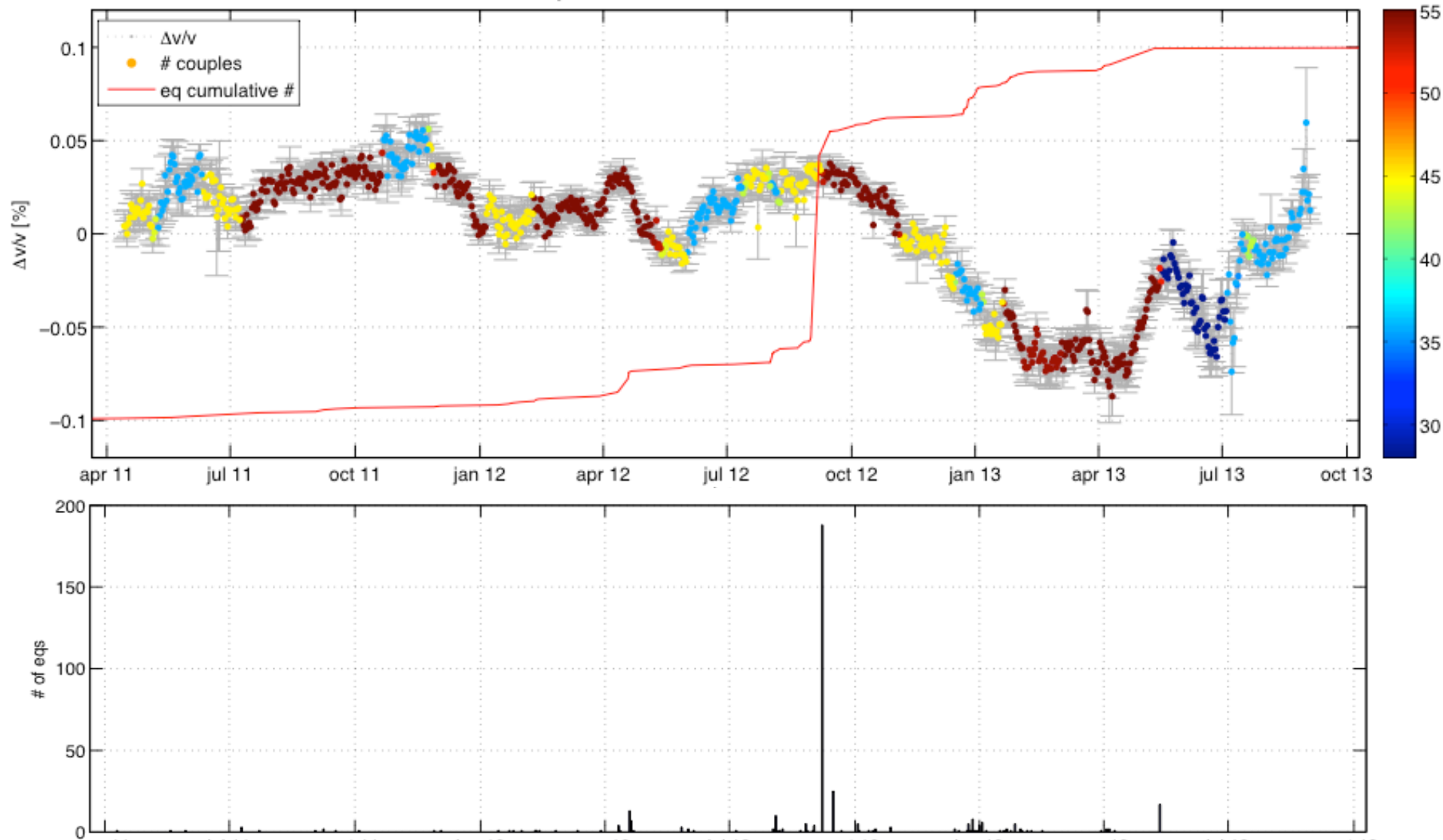
Results

40 day stack – int 80s; wind 2.5s; slid 0.5s; tout 25s



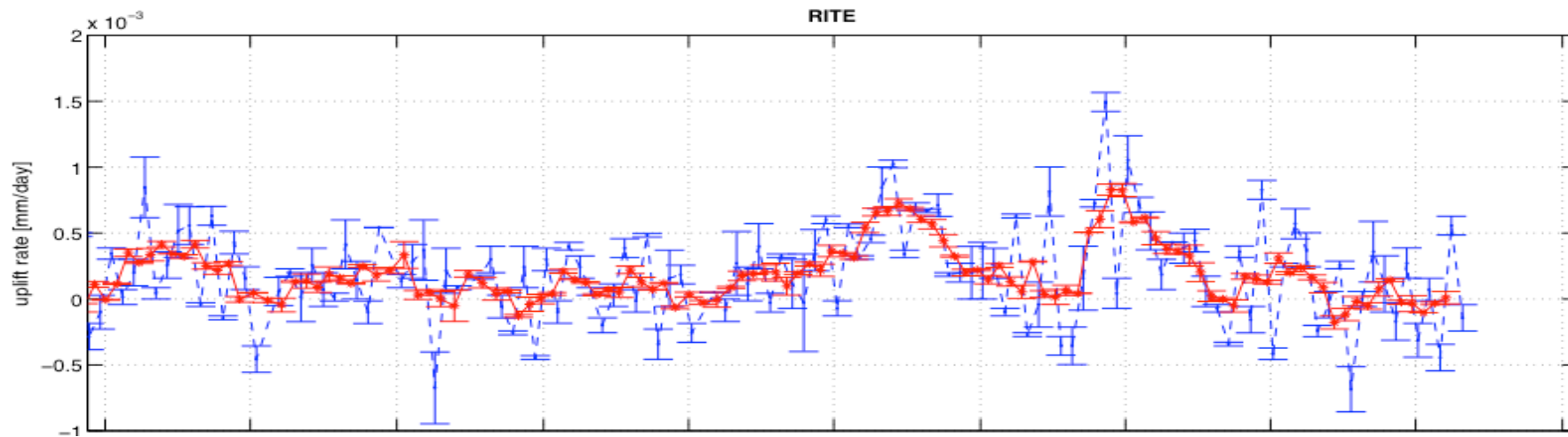
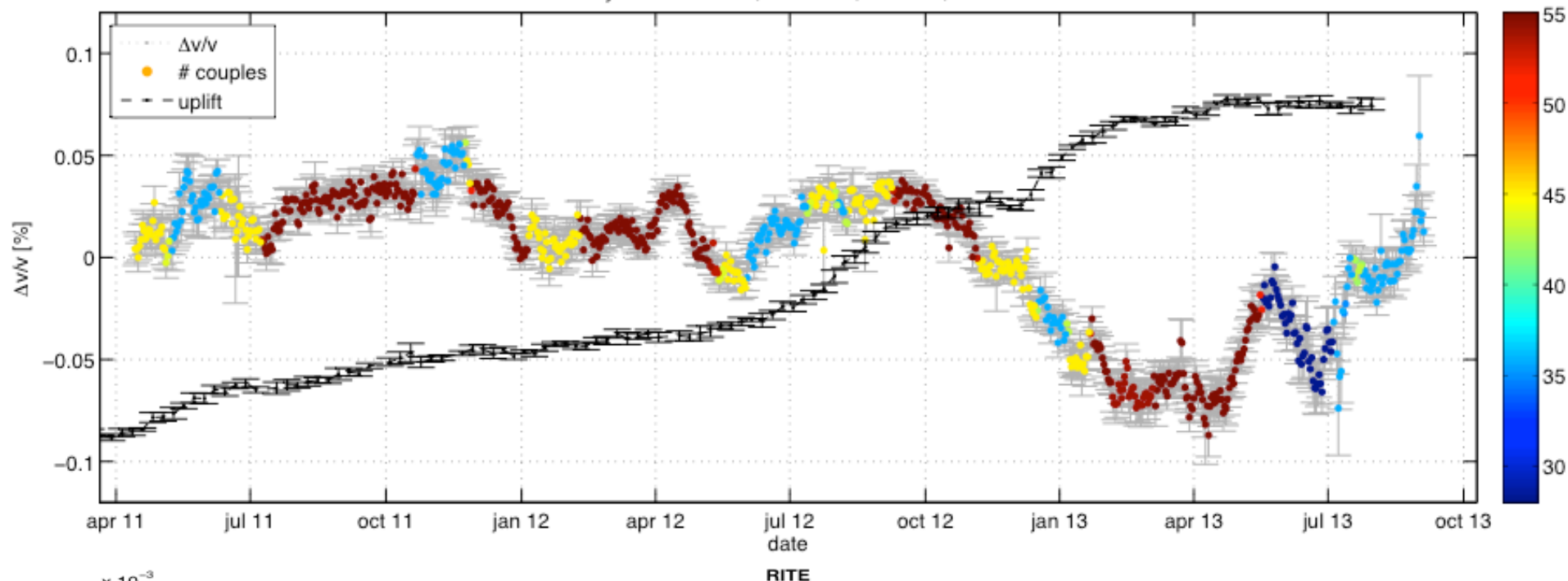
$\Delta v/v$ – seismicity

40 day stack – int 80s; wind 2.5s; slid 0.5s; tout 25s

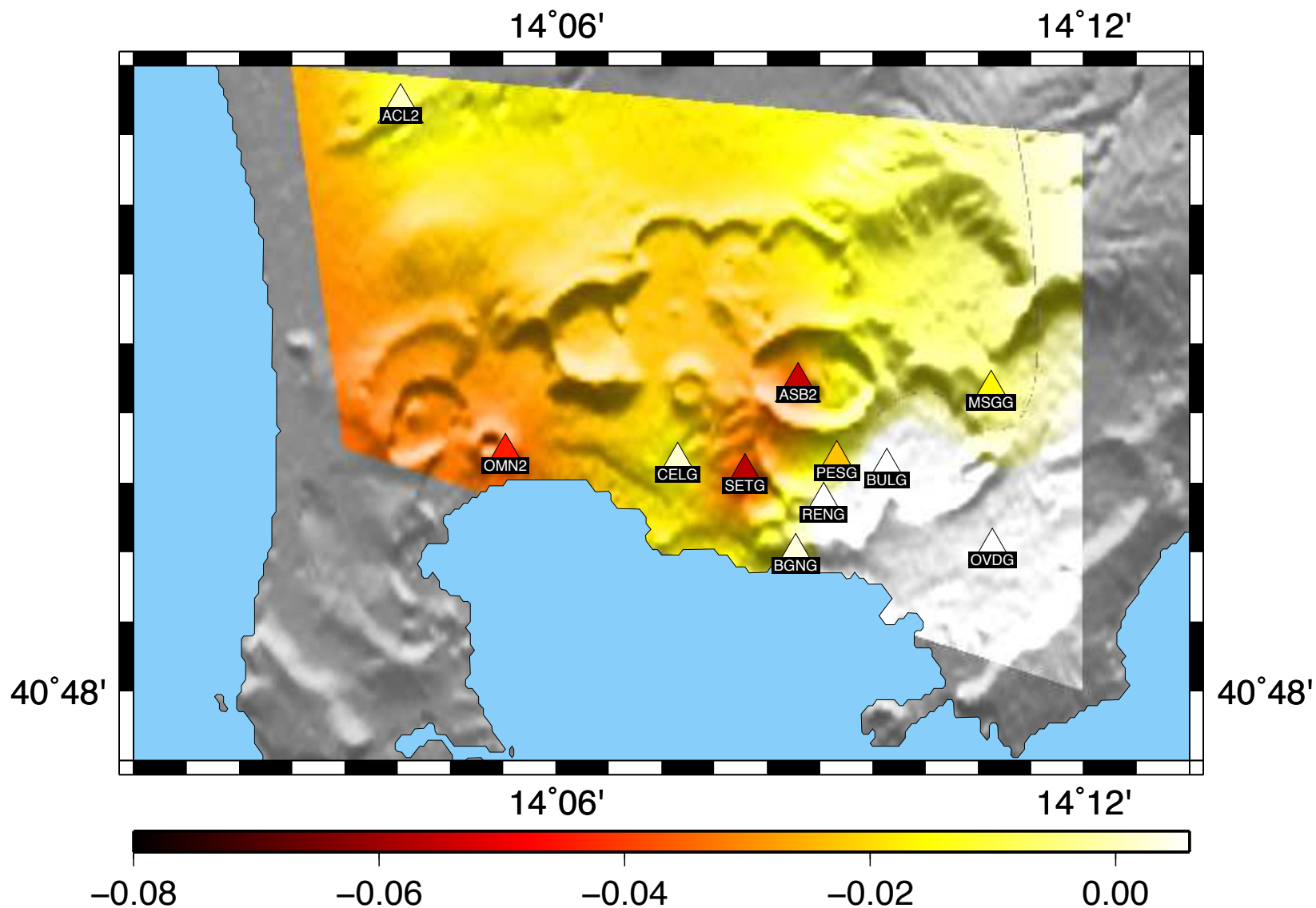


$\Delta v/v$ – uplift at RITE

40 day stack – int 80s; wind 2.5s; slid 0.5s; tout 25s



$\Delta v/v$ – spatial distribution



Conclusions:

Passive Image Interferometry is a promising technique for monitoring the variations of the crustal parameters at Campi Flegrei

More test/verification to perform:

- What happened in october 2012? (SWS)
- Comparison with other time series (geochemistry...)
- Setting a tool for real-time computations