FAST DETERMINATION OF MOMENT RUPTURE HISTORY: APPLICATION TO THE APRIL 6TH L'AQUILA EARTHQUAKE

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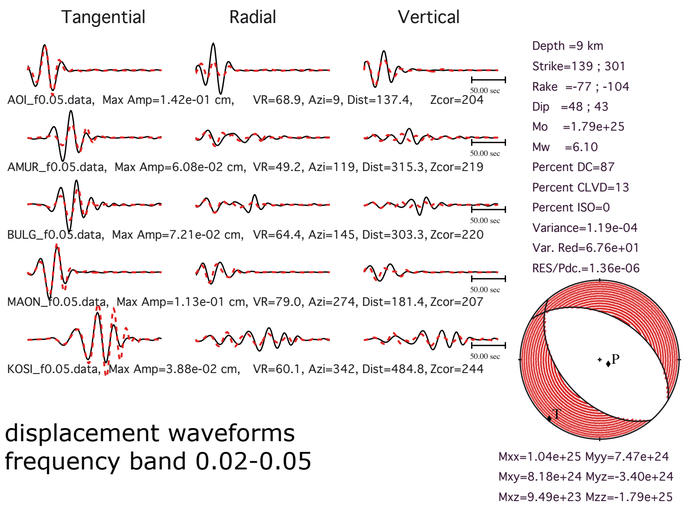
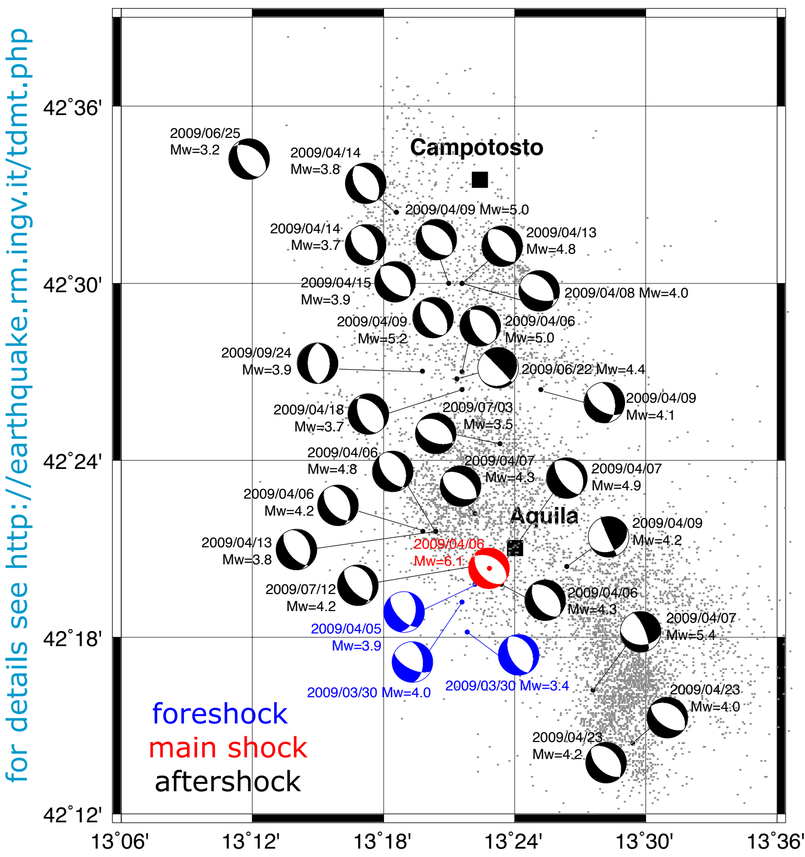
L'Aquila 25

Time Domain Moment Tensor Solutions (TDMT) for Ml > 3.7 earthquakes.



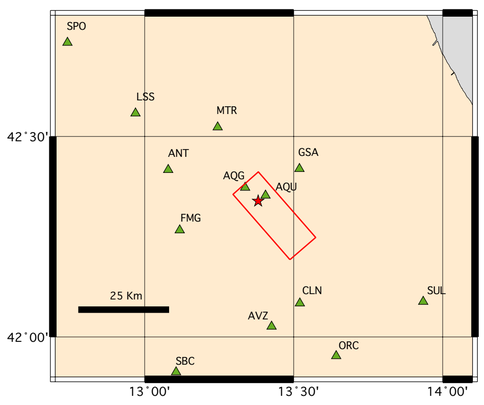
displacement waveforms
frequency band 0.02-0.05

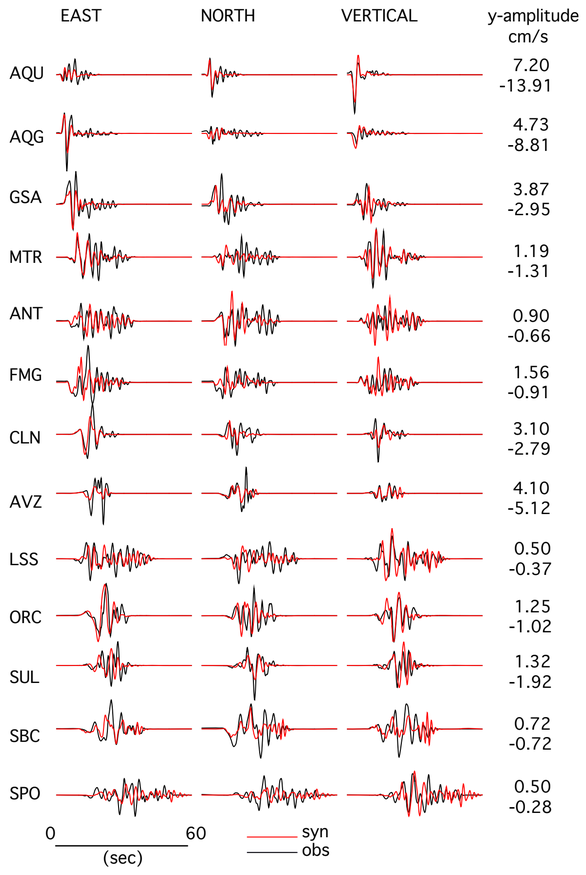
OUR PREFERRED MAIN SHOCK MOMENT TENSOR SOLUTION IS: STRIKE 139°, DIP 48°, RAKE -77 AND Mw 6.1

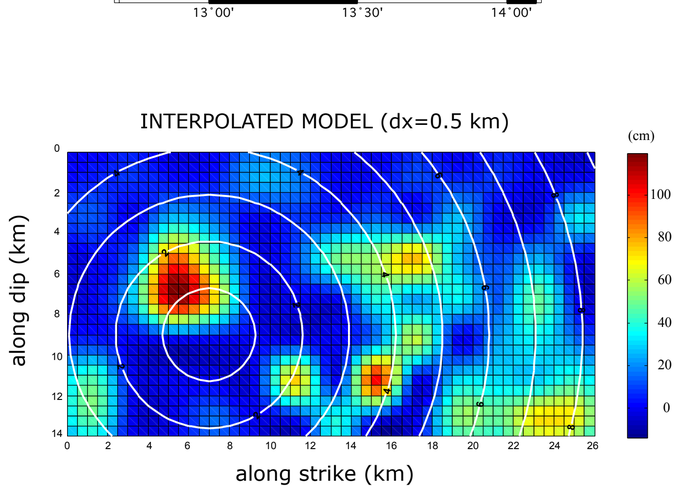


Finite Fault Solution for the Mainshock

Stations used for the inversion







DATA form Dipartimento Protezione Civile Rete Accelerometrica Nazionale Network.
CODE Rapid Finite Source Analysis, Dreger D.S. and Kaverina A. (GRL, 2000).

Using the main shock moment tensor solution to constrain the fault geometry, we invert the strong motion data provided by the Rete Accelerometrica Nazionale (RAN) and the MedNet station AQU to image the rupture history.
The inferred model is representative of a rapid finite-fault solution to be used immediately after an earthquake to get a preliminary interpretation of ground shaking.

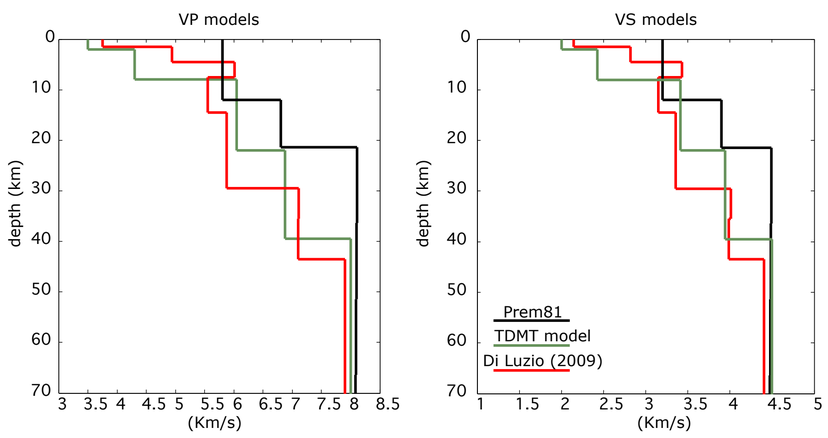
BEST SOLUTION: VR=2.3KM/S; RISE TIME=1.2 S; INFERRED MO=1.6E+25 DYNE CM (MW=6.07)

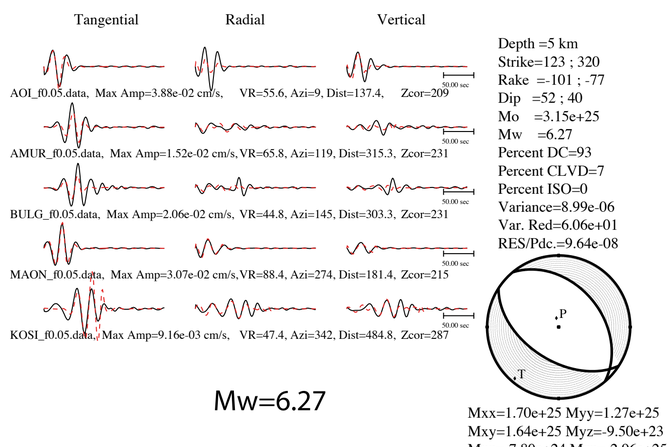
Fault parameters used in the inversion:

Fault dimension 14 km x 26 km
Top of the fault 1.6 km
Subfault dimensions: 2 km x 2 km
Inverted frequencies: 0.02 - 0.5 Hz
Explored rise time :0.7 - 2 s
STF: Triangular function
Explored constant rupture velocity 1.9 - 3.0 Km/s
Velocity Structure: C.It. A. Di Luzio et al Earth Plan Lettrs 280 (2009) 1-12 Fig 5.

The relevance of the velocity model on scalar moment

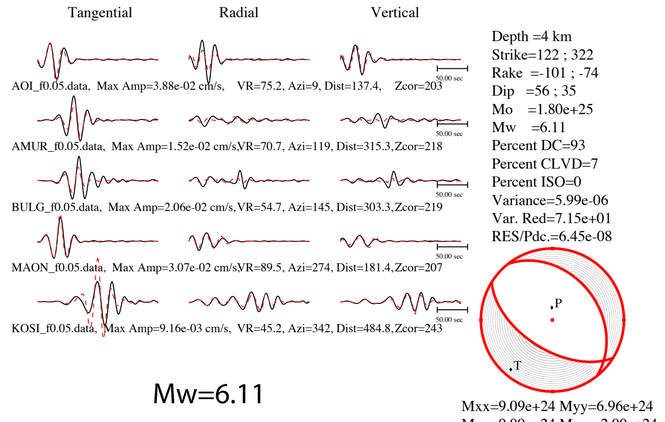
Our moment magnitudes of the main shock (point source and finite fault) underestimate the RCMT value (Mw 6.3).
We investigate this issue studying the effect of the velocity model on the determined Mw values.



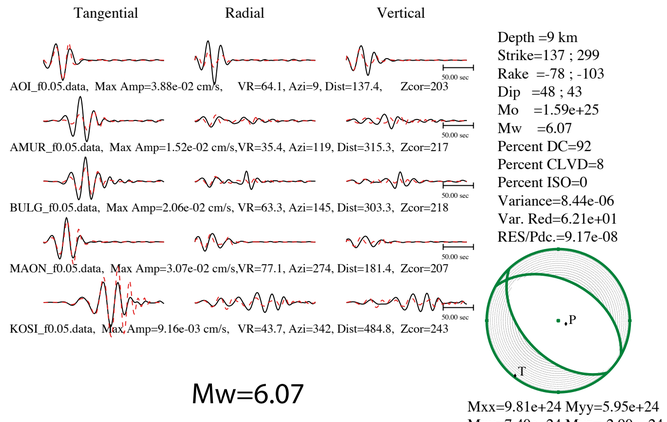


Mw=6.27

velocity waveforms
frequency band 0.02-0.05



Mw=6.11



Mw=6.07

Another test consisted of benchmarking TDMT code and Ammon/Hermann MT procedure. We have both computed the moment tensor solution for the L'aquila main shock using the same stations, the same velocity structure, and the same frequency band.
We have both obtained Mw=6.1 (see http://eqinfo.eas.slu.edu/Earthquake_Center/MECH.IT/20090406013239c/index.html, and poster *L'aquila 16* in this session).

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