

Supplementary information

Clock advance and magnitude limitation through fault interaction: the case of the 2016 central Italy earthquake sequence

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Supplementary Table 1 Fault plane solutions and moment magnitude (M_w) for the strongest earthquakes in the Amatrice 2016 seismic sequence¹.

Origin time (UTC)	M_w	Fault mechanism (strike, dip, rake)
24 August 2016 03:36:32	6.0	<i>P1</i> 155°, 49°, -87° <i>P2</i> 331°, 41°, -93°
26 October 2016 17:10:36	5.4	<i>P1</i> 161°, 38°, -90° <i>P2</i> 341°, 52°, -90°
26 October 2016 19:18:05	5.9	<i>P1</i> 159°, 47°, -93° <i>P2</i> 344°, 43°, -87°
30 October 2016 06:40:17	6.5	<i>P1</i> 151°, 47°, -89° <i>P2</i> 330°, 43°, -91°

P1 = Principal fault plane

P2 = Auxiliary fault plane

Supplementary Table 2 Structural and rheological model used to compute Coulomb stress change.

The model is obtained by merging information from several crustal^{2,3,4,5,6} and viscoelastic models⁷.

Depth (km)	V_P (km/s)	V_S (km/s)	ρ (kg/m ³)	η_1 (Pa*s)	η_2 (Pa*s)	γ
0.0 - 1.5	3.75	2.14	2275	-0.1E+00	-0.1E+00	1.000
1.5 - 4.5	4.94	2.82	2486	-0.1E+00	-0.1E+00	1.000
4.5 - 7.5	6.01	3.44	2706	-0.1E+00	-0.1E+00	1.000
7.5 - 16.5	5.55	3.15	2609	-0.1E+00	-0.1E+00	1.000
16.5 - 29.5	5.88	3.36	2677	0.01E+19	-0.1E+00	0.800
29.5 - 43.5	7.10	4.00	3000	1.00E+19	-1.00E+00	0.800
43.5 - ∞	7.90	4.40	3276	1.00E+19	-1.00E+00	0.800

V_P = P-wave velocity

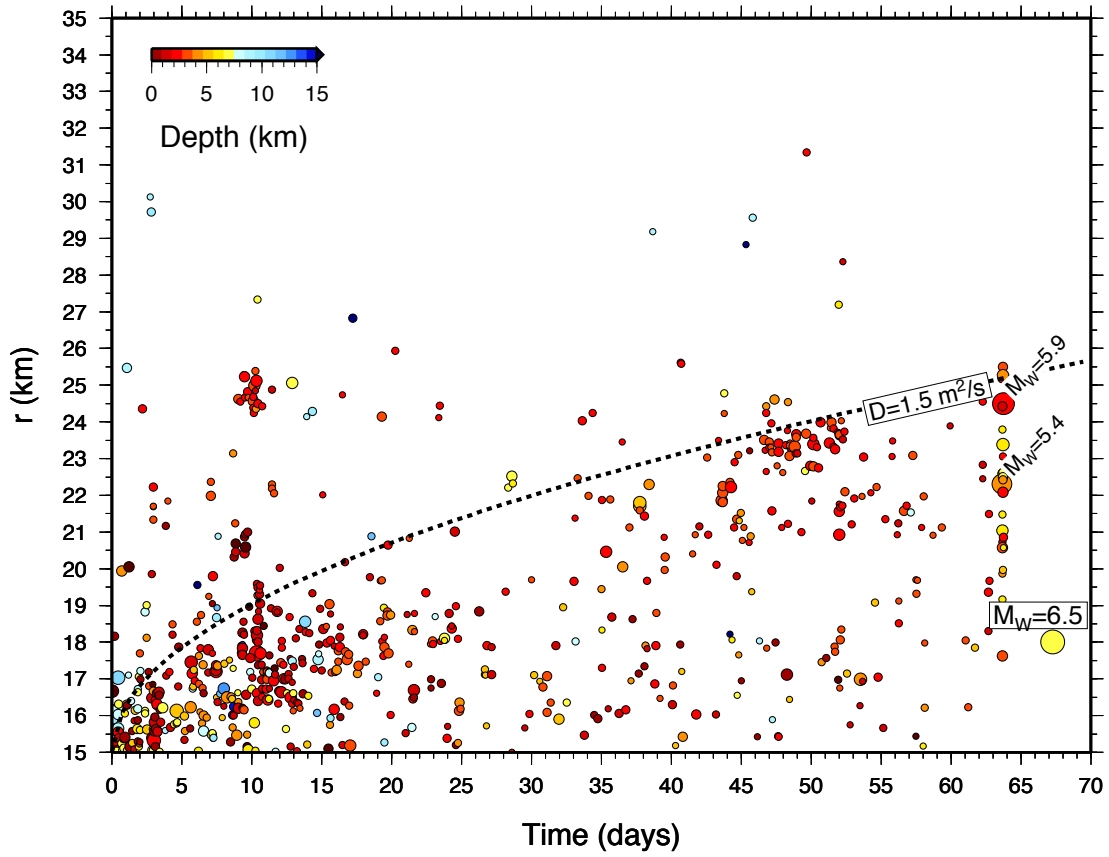
V_S = S-wave velocity

ρ = density

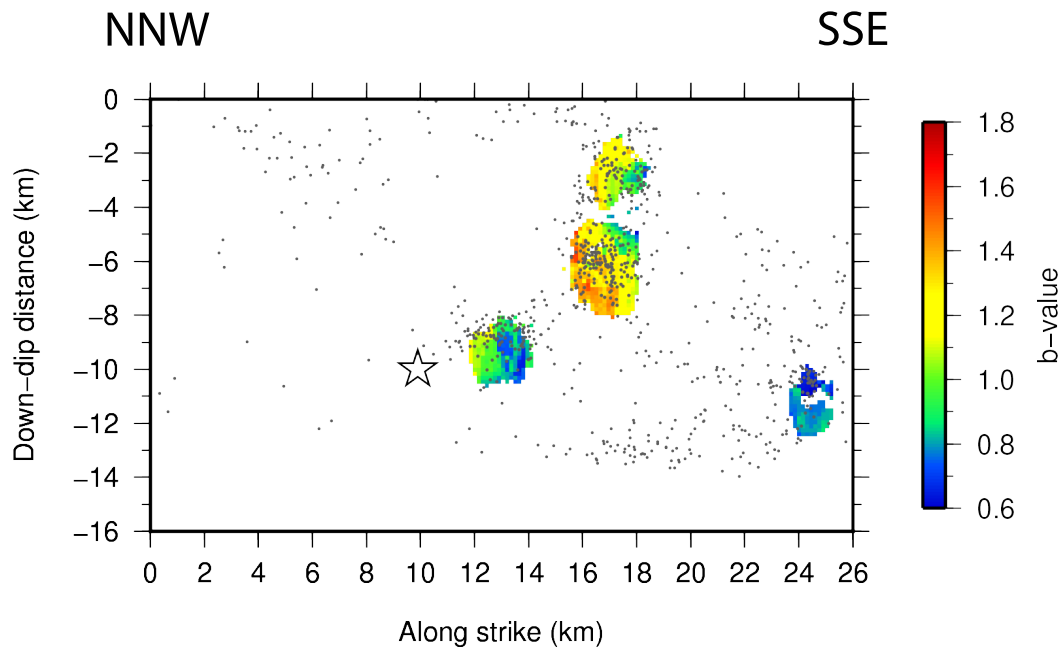
η_1 = transient viscosity

η_2 = steady-state viscosity

γ = ratio between the effective (μ) and the unrelaxed shear modulus μ_0



Supplementary Figure 1: A r-t (epicentral distance vs time) plot for the aftershocks occurred from the 24 August 2016 03:36:32, $M_W=6.0$, through the 26 October 2016, 19:18:05, $M_W=5.9$. The minimum M_W is 1.7, corresponding to the maximum completeness magnitude throughout the whole analysed period, except for the first 4 days from the beginning of the sequence⁸. The symbols are color coded according to the event hypocentral depth and scaled by magnitude. A minimum epicentral distance of 15 km is considered, to exclude the events on the fault plane of the 24 August earthquake and related to its rupture process. Dashed curve corresponds to the theoretical function $r=(4\pi Dt)^{1/2}$, computed for diffusivity values $D=1.5 \text{ m}^2/\text{s}$ (assumed homogeneous and isotropic), and represent the position of the fluid triggering front for a step-like pressure point source located at northern end of the 24 August 2016 03:36:32, $M_W=6.0$ fault. Events above the fluid triggering front correspond to earthquakes favoured by Coulomb static stress transfer or dynamic triggering⁹. The two 26 October Visso events and the 30 October Norcia event are also reported. The position of the $M_W=6.5$ Norcia suggests that its occurrence is not primarily promoted by the fluid diffusion process.



Supplementary Figure 2: *b*-value map computed on the fault plane of the 30 October 2016, Norcia earthquake, by using the events (black dots) located within 350 m (see Methods section) from the plane. The star indicates the hypocenter of the Norcia earthquake.

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