

Supplementary material

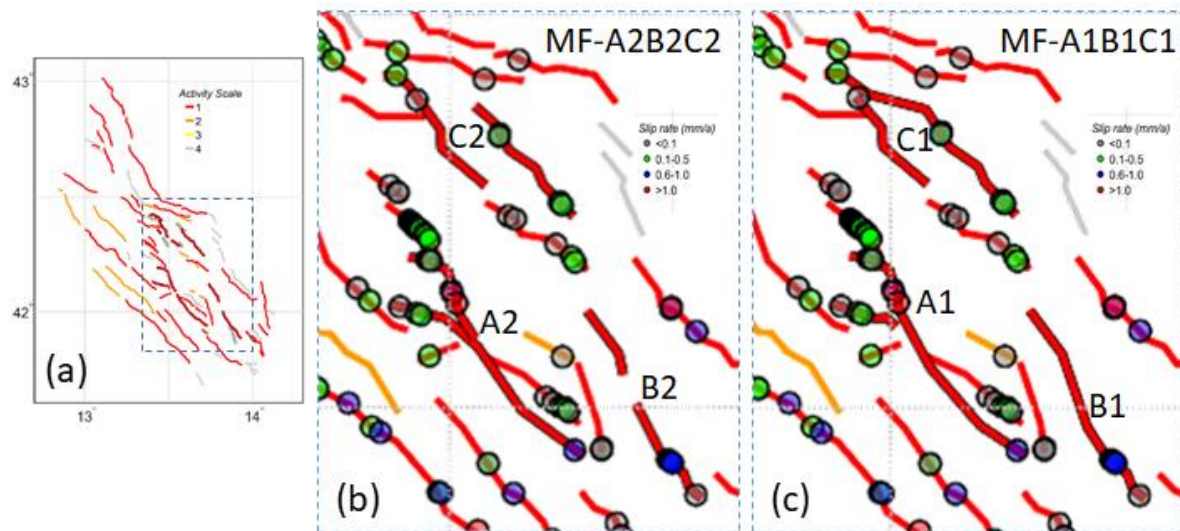


Figure S1 (a) Map of faults from which main fault options MF-A1B1C1 (b) and MF-A2B2C2 (c) and combinations therein can be extracted from the Fault2SHA CAD. In this work only MF-A1B1C1 option is considered (see Table S1 for faults affected in the construction of a main fault option and the kml file in <https://doi.pangaea.de/10.1594/PANGAEA.922582>). Faults involved in the definitions of the two options are shown with black borders.

Step-by step implementation	File name in Github repository
1. Choose Main fault option in the Database	INPUT/ Fault2SHA_CentralApennines_Database.xlsx
2. Read input data from INPUT/ Fault2SHA_CentralApennines_Database.xlsx and INPUT/MainFaults_lonlat to produce SHERIFS input files (Coordinates, slip rates and dips of the sections).	A1_script_DB2SHERIFSinputs.m
3. Calculate distances between all the sections in the fault system and create list of rupture scenarios for input to SHERIFS.	A2_script_Combine_Sections.m :
4. Run SHERIFS - See user manual at https://github.com/tomchartier/SHERIFS	
5. Create xml files for each rupture scenario	B1_script_BuildSourceModelForEachScenario.m
6. Run Openquake – See user manual at https://docs.openquake.org/manuals/	
7. Build a map of fault sections for a given AFOE (Annual Frequency Of exceedance)	C1_hazard_maps.m
8. Build a map of fault sections for a given fragility curve	C2_risk_maps.m D1_PartecipationHazard_by_section.m
9. Calculate the contribution of each fault section to the total hazard for a given AFOE, for a given site and for a given OpenQuake run	D2_ParticipationRisk_by_section.m:
10. Calculate the contribution of each fault section to the total risk for a given damage state and for a given site and for a given OpenQuake run	

Table S1 Step-by step implementation of the methodology and short summary of the Matlab codes. A user manual for the Matlab code is available at the Github repository (<https://github.com/fault2shaESCWG/CentralApenninesLabFAULT2RISK>).

Table S2 Master fault options in the Fault2SHA CAD. Here we use option MF-A1B1C1.

<u>options</u>	optionDescription	optionName	faultsAffected
A1	OvindoliPezza and SanBenedettoDeiMarsi faults are joined to form FucinoOvindoliPezza master fault through Celano	Fucino - A	GioiaVecchio. Magnola. OvindoliPezza. SanBenedettoDeiMarsi
A2	Magnola and SanBenedettoDeiMarsi faults are joined to form FucinoMagnola master fault through Celano		
B1	CastelDileri and Frattura faults connect to form Scanno master fault	Scanno - B	CastelDileri. Frattura. LagoDiScanno
B2	CastelDileri and Frattura faults do not connect		
C1	MtStabiata. MtRuzza and SanPioDelleCamere faults connect to form BariscianoMtStabiata master fault. Paganica and SanDemetrioNeVestini join to form PaganicaSanDemetrioNeVestini master fault	UpperAterno - C	Bazzano. Collebrincioni. Fossa. MtRuzza. MtStabiata. Paganica. SanDemetrioNeVestini. SanDemetrioEast. SanPioDelleCamere.
C2	MtStabiata. Paganica and SanDemetrioNeVestini connect to form PaganicaSanDemetrioMtStabiata master fault. MtRuzza and SanPioDelleCamere connect to form Barisciano master fault		

Table S3. Main fault sections ID, name, kinematics, upper and lower seismogenic depth, input slip rates and percentage of input slip rate not converted into earthquake rates considered as non-mainshock slip (NMS) in the SHERIFS framework.

<i>ID</i>	<i>name</i>	<i>Dip [°]</i>	<i>Dip direc tion</i>	<i>Kinemat ics</i>	<i>Upper / Lower seismogenic depth [km]</i>		<i>Slip rate (min. mean. max) [mm/yr]</i>			<i>Shear modulus [GPa]</i>	<i>NMS [%]</i>
1	Assergi_1	55	S	N	0	10	0.46	0.6	0.75	30	0
2	Assergi_2	55	S	N	0	10	0.46	0.6	0.76	30	0
3	Assergi_3	55	S	N	0	10	0.17	0.22	0.28	30	0
4	Barete_1	42	W	N	0	10	0.33	0.45	0.59	30	0
5	Barete_2	42	W	N	0	10	0.62	0.83	1.08	30	27.3
6	Barete_3	42	W	N	0	10	0.25	0.33	0.42	30	0
7	BariscianoMtStabiata_1	53	W	N	0	10	0.39	0.52	0.68	30	0
8	BariscianoMtStabiata_2	53	W	N	0	10	0.42	0.55	0.71	30	0
9	BariscianoMtStabiata_3	53	W	N	0	10	0.38	0.5	0.64	30	0
10	BariscianoMtStabiata_4	53	W	N	0	10	0.31	0.41	0.53	30	0
11	CampoFelice_1	54	W	N	0	10	0.57	0.63	0.71	30	0
12	CampolImperatoreEast_1	55	S	N	0	10	0.27	0.35	0.45	30	0
13	CampolImperatoreEast_2	55	S	N	0	10	0.24	0.32	0.41	30	0
14	CampolImperatoreEast_3	55	S	N	0	10	0.08	0.11	0.14	30	0
15	Carsoli_1	55	W	N	0	10	0.13	0.17	0.21	30	0
16	Carsoli_2	55	W	N	0	10	0.37	0.48	0.6	30	0
17	Carsoli_3	55	W	N	0	10	0.17	0.23	0.29	30	0
18	CerchioPescinaParasano_1	55	W	N	0	10	0.1	0.13	0.17	30	0
19	CerchioPescinaParasano_2	55	W	N	0	10	0.28	0.37	0.48	30	0
20	CerchioPescinaParasano_3	55	W	N	0	10	0.29	0.38	0.49	30	0

21	CinqueMigliaAremogna_1	54	W	N	0	10	0.14	0.19	0.24	30	0
22	CinqueMigliaAremogna_2	54	W	N	0	10	0.43	0.57	0.72	30	0
23	CinqueMigliaAremogna_3	54	W	N	0	10	0.47	0.64	0.84	30	30.1
24	FucinoOvindoliPezza_1	55	W	N	0	10	0.53	0.71	0.92	30	0
25	FucinoOvindoliPezza_2	55	W	N	0	10	1.41	1.87	2.42	30	26.5
26	FucinoOvindoliPezza_3	55	W	N	0	10	1.24	1.65	2.13	30	21
27	FucinoOvindoliPezza_4	55	W	N	0	10	0.99	1.32	1.71	30	26.2
28	Laga_1	53	W	N	0	10	0.23	0.31	0.42	30	0
29	Laga_2	53	W	N	0	10	0.55	0.75	1	30	25.3
30	Laga_3	53	W	N	0	10	0.2	0.28	0.37	30	0
31	Leonessa_1	55	N	N	0	10	0.15	0.2	0.25	30	0
32	Leonessa_2	55	N	N	0	10	0.29	0.38	0.48	30	0
33	Leonessa_3	55	N	N	0	10	0.1	0.13	0.16	30	0
34	Liri_1	55	W	N	0	10	0.48	0.66	0.89	30	0
35	Liri_2	55	W	N	0	10	0.81	1.06	1.34	30	6.7
36	Liri_3	55	W	N	0	10	0.91	1.16	1.44	30	8.2
37	Liri_4	55	W	N	0	10	1.09	1.42	1.79	30	30.1
38	Liri_5	55	W	N	0	10	0.67	0.88	1.11	30	30
39	Magnola_1	55	S	N	0	10	0.22	0.29	0.38	30	0
40	Maiella_1	53	W	N	0	10	0.46	0.59	0.74	30	0
41	Maiella_2	53	W	N	0	10	0.46	0.59	0.74	30	0
42	Maiella_3	53	W	N	0	10	0.15	0.19	0.24	30	0
43	MiddleAternoValley_1	55	W	N	0	10	0.22	0.3	0.42	30	0
44	MiddleAternoValley_2	55	W	N	0	10	0.28	0.37	0.49	30	0
45	MiddleAternoValley_3	55	W	N	0	10	0.35	0.46	0.61	30	1.1
46	MtMarsicano_1	55	W	N	0	10	0.15	0.19	0.23	30	0
47	MtMarsicano_2	55	W	N	0	10	0.52	0.69	0.88	30	28.9
48	MtMarsicano_3	55	W	N	0	10	0.54	0.76	1.04	30	40.3
49	MtPizzalto_1	52	W	N	0	10	0.12	0.16	0.21	30	0

50	MtVelino_1	55	W	N	0	10	0.02	0.03	0.04	30	0
51	MtVelino_2	55	W	N	0	10	0.1	0.13	0.17	30	0
52	MtVelino_3	55	W	N	0	10	0.32	0.44	0.58	30	0
53	MtVettore_1	55	W	N	0	10	0.34	0.43	0.51	30	0
54	MtVettore_2	55	W	N	0	10	0.89	1.12	1.34	30	29.2
55	MtVettore_3	55	W	N	0	10	0.82	1.02	1.23	30	22.7
56	MtVettore_4	55	W	N	0	10	0.78	0.98	1.18	30	23.9
57	Ocre_1	55	W	N	0	10	0.19	0.25	0.32	30	0
58	PaganicaSanDemetrioNeVestini_1	55	W	N	0	10	0.23	0.31	0.4	30	0
59	PaganicaSanDemetrioNeVestini_2	55	W	N	0	10	0.14	0.19	0.25	30	0
60	PaganicaSanDemetrioNeVestini_3	55	W	N	0	10	0.05	0.06	0.08	30	0
61	Rieti_1	55	W	N	0	10	0.31	0.41	0.53	30	0
62	Rieti_2	55	W	N	0	10	0.26	0.33	0.41	30	0
63	Rieti_3	55	W	N	0	10	0.1	0.12	0.15	30	0
64	SanSebastiano_1	55	W	N	0	10	0.14	0.19	0.24	30	0
65	Scanno_1	52	W	N	0	10	0.07	0.09	0.12	30	0
66	Scanno_2	52	W	N	0	10	0.21	0.28	0.38	30	0
67	Scanno_3	52	W	N	0	10	0.44	0.58	0.75	30	10.7
68	Scurcola_1	55	W	N	0	10	0.35	0.47	0.61	30	0
69	Scurcola_2	55	W	N	0	10	0.74	0.99	1.3	30	29.6
70	Scurcola_3	55	W	N	0	10	0.55	0.74	0.97	30	17.7
71	Scurcola_4	55	W	N	0	10	0.18	0.25	0.32	30	0
72	SellaDiCorno_1	55	W	N	0	10	0.14	0.18	0.23	30	0
73	SellaDiCorno_2	55	W	N	0	10	0.32	0.42	0.54	30	0
74	SellaDiCorno_3	55	W	N	0	10	0.15	0.19	0.25	30	0
75	Sulmona_1	54	W	N	0	10	0.54	0.7	0.9	30	13.6
76	Sulmona_2	54	W	N	0	10	0.97	1.26	1.6	30	30.8
77	Sulmona_3	54	W	N	0	10	0.39	0.51	0.64	30	0
78	Trasacco_1	55	W	N	0	10	0.17	0.22	0.27	30	0

79	Trasacco_2	55	W	N	0	10	0.58	0.76	0.97	30	24
80	Trasacco_3	55	W	N	0	10	0.66	0.88	1.13	30	42.6
81	TreMonti_1	55	S	N	0	10	0.26	0.35	0.44	30	0
82	ValleDelSalto_1	55	W	N	0	10	0.54	0.74	0.98	30	11.5
83	ValleDelSalto_2	55	W	N	0	10	1.09	1.48	1.97	30	43.4
84	ValleDelSalto_3	55	W	N	0	10	0.41	0.55	0.74	30	0
85	Ventrino_1	55	S	N	0	10	0.08	0.11	0.14	30	0