Supplement of Nat. Hazards Earth Syst. Sci., 26, 2691–2715, 2026
https://doi.org/10.5194/nhess-26-2691-2026-supplement

Natural Hazards and Earth System Sciences
Open Access
EGU

Supplement of

Consistency of seismic hazard estimates from a physics-based earthquake simulator: a case study in south-eastern Spain

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Table S1. Macroseismic intensities recorded at the different cities considered in the study. Data is obtained from Instituto Geográfico Nacional database (IGN, 2025).

Localities	MI	Year	Mw
Lorca	7	1579	5.4
Lorca	5.5	1674	4.6
Lorca	8	1674	6
Lorca	5.5	1783	4.6
Lorca	6.5	1818	5.1
Lorca	5	1829	6.6
Lorca	3	1863	4.3
Lorca	7	2011	5.1
Vera	7.5	1406	5.7
Vera	8.5	1518	6.2
Vera	6	1863	4.3
Vera	4	2011	5.1
Murcia	7	1743	5.4
Murcia	6.5	1746	5.1
Murcia	5	1818	5.1
Murcia	7	1829	6.6
Murcia	4.5	1837	5.1
Murcia	2.5	1863	4.3
Murcia	5	1883	4.1
Murcia	4	2011	5.1
Almería	8	1487	6
Almería	8.5	1522	6.5
Almería	6	1550	4.9
Almería	8	1658	6
Almería	2	2011	5.1
Torrevieja	6.5	1802	5.1
Torrevieja	6.5	1823	5.1
Torrevieja	7	1828	5.4
Torrevieja	9.5	1829	6.6
Torrevieja	5.5	1829	4.6
Torrevieja	6.5	1829	5.1
Torrevieja	5.5	1829	4.6
Torrevieja	6.5	1837	5.1
Torrevieja	5.5	1844	5.1
Torrevieja	3	2011	5.1

Table S2. Coordinates and Vs30 values for the different cities and accelerometric stations used for the consistency analysis.

Site / Station	Coordinates (lon, lat)	Vs30 (m/s)	Period activity	Vs30 Source
Lorca	-1.7017, 37.67119	360	N/A	Herrero-Barbero et al. (2023)
Vera	-1.869775, 37.247574	360		
Murcia	-1.1285, 37.9843	150		
Almería	-2.4641, 36.838	180		
Torrevieja	-0.683, 37.9777	180		
EXLO	-1.7002, 37.6767	683.7	1989-2025	Instituto Geográfico Nacional
EXNIJ	-2.207, 36.9715	616.2	2002-2025	
M04	-1.1296, 37.9899	150	2008-2025	Herrero-Barbero et al. (2023)
EXTO	-0.6894, 37.9917	726	1993-2025	Instituto Geográfico Nacional
EXVE2	-1.8705, 37.2522	316.3	2012-2025	

Table S3. PGA records of the Mw 5.1 2011 Lorca earthquake at the different accelerometric stations where it was recorded. Data is obtained from Instituto Geográfico Nacional database (IGN, 2025).

Event	Date	MI	Mw	Epicentre	Station	PGA (mg) N-S	PGA (mg) E-W	Mean PGA (g)
1060340	11/05/2011	VII	5.1	NE LORCA	EXLO	360.4	150.8	0.2556
1060340	11/05/2011	VII	5.1	NE LORCA	EXVE2	5.94	7.13	0.006535
1060340	11/05/2011	VII	5.1	NE LORCA	M04	7.17	8.46	0.007815

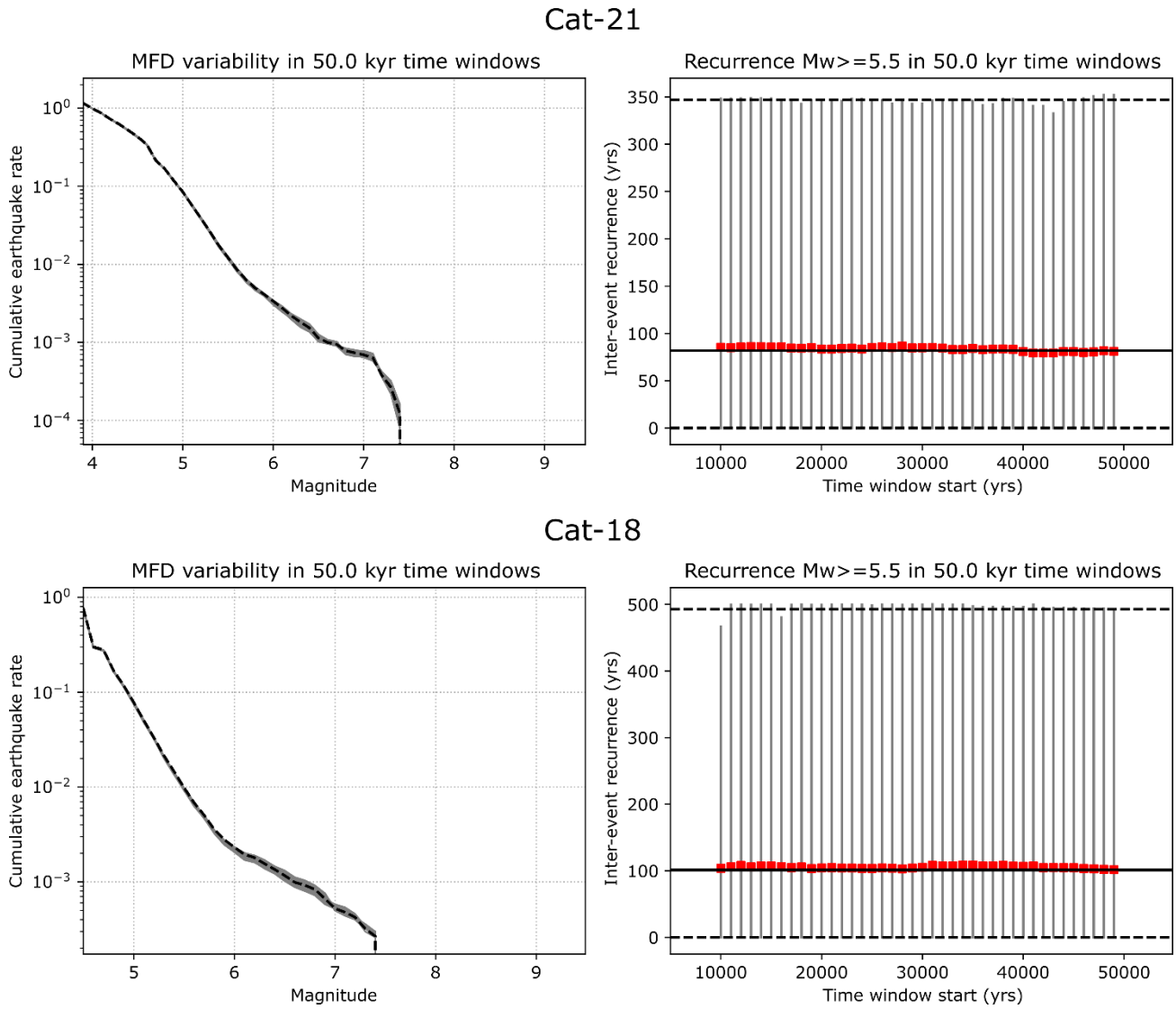
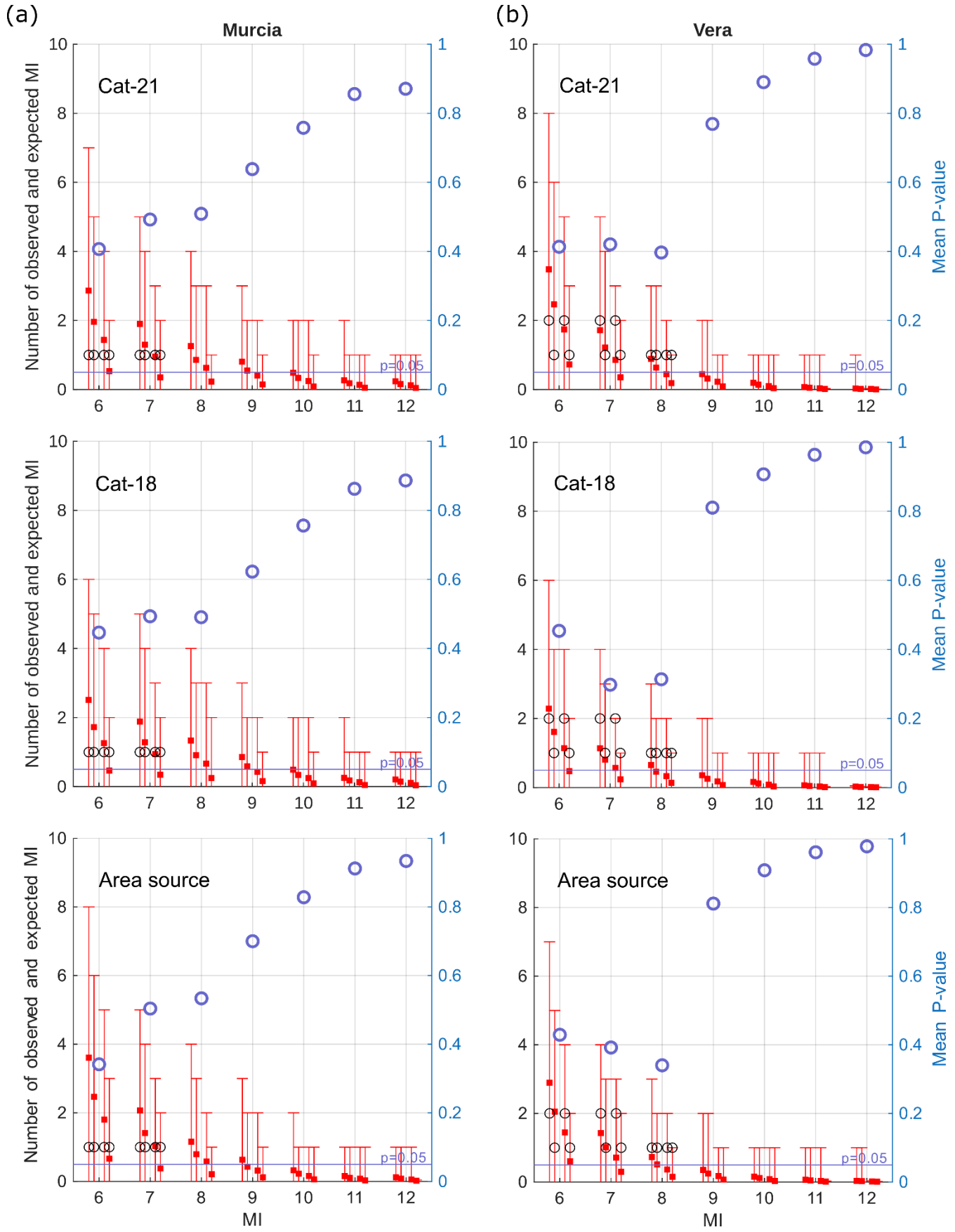


Figure S1. (Left) Magnitude-frequency distributions of 50 kyr long sub-catalogues (grey lines) moved across the full 100 kyr long simulated catalogue (black dashed line) in 1 kyr long time steps for Cat-21 and Cat-18. **(Right)** Average inter-event recurrences for Mw≥5.5 earthquakes of the 50 kyr long sub-catalogues (red squares) and their respective 2.5-97.5% percentile ranges (grey lines), plotted against the average inter-event recurrence and interquartile range of the full 100 kyr simulated catalogue (black solid and dashed lines, respectively).



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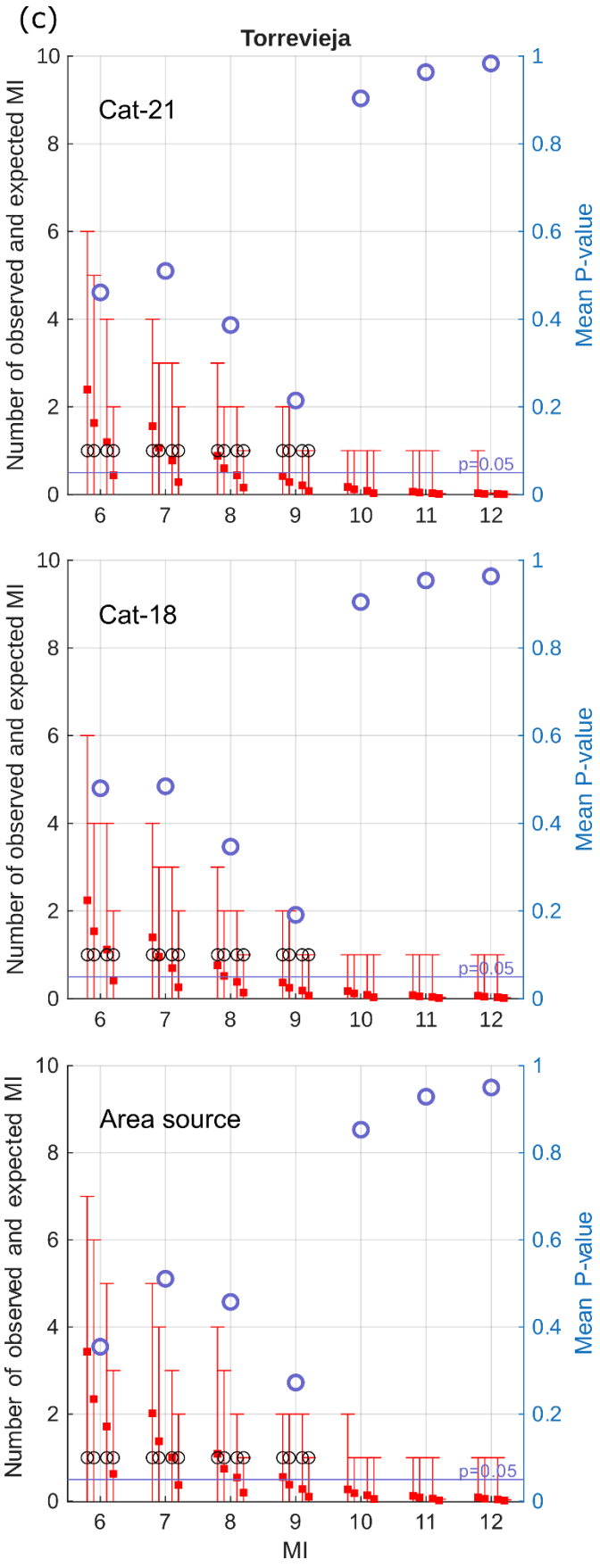


Figure S2. Same as figure 8 of the paper but for the rest of the city locations (Murcia, Vera and Torrevieja).

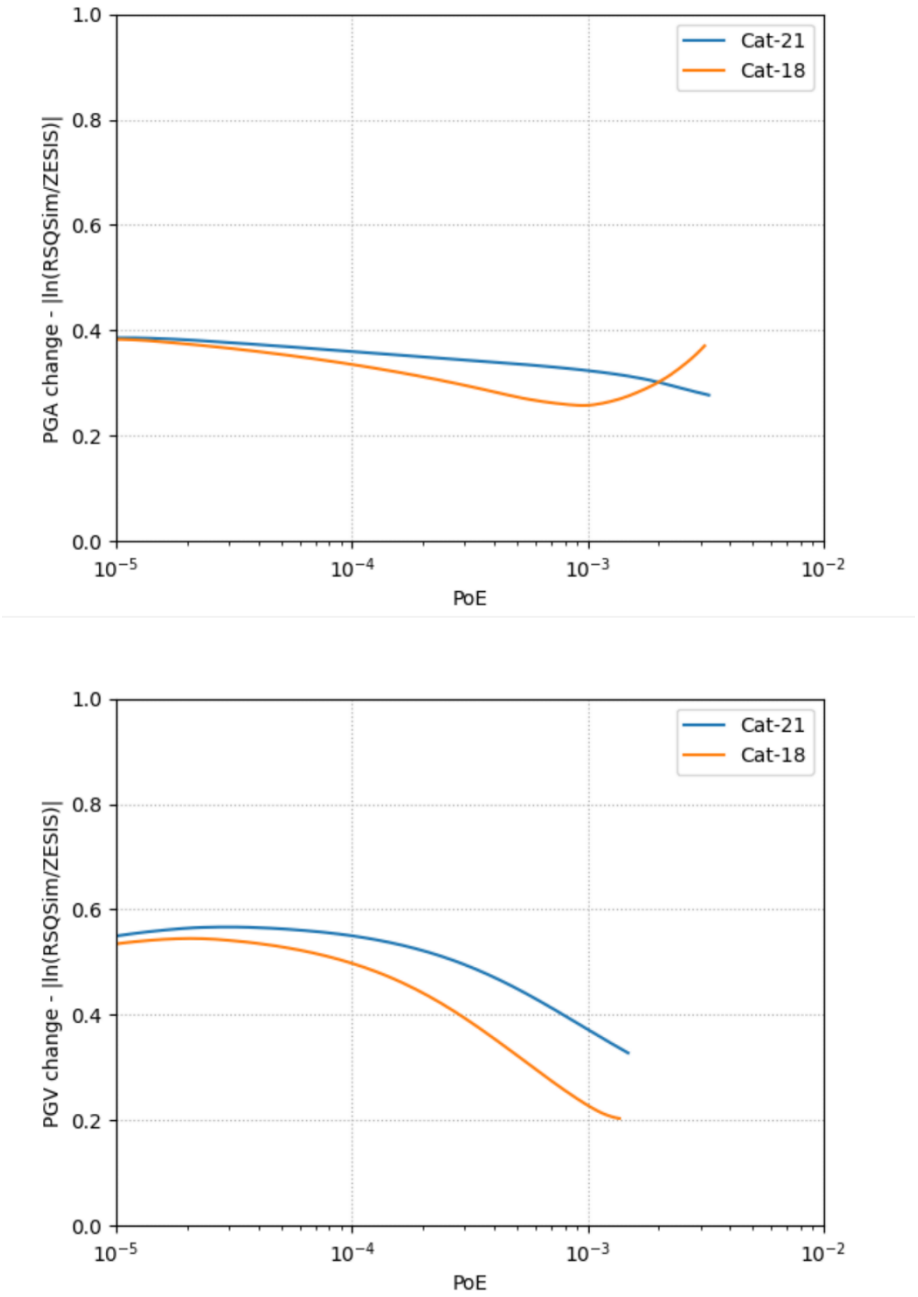


Figure S3. PGA (top) and PGV (bottom) variation of the probabilities of exceedance of Cat-21 and Cat-18 with respect to the ZESIS area source model. Changes are computed using <|ln(RSQSim-ZESIS)|>.

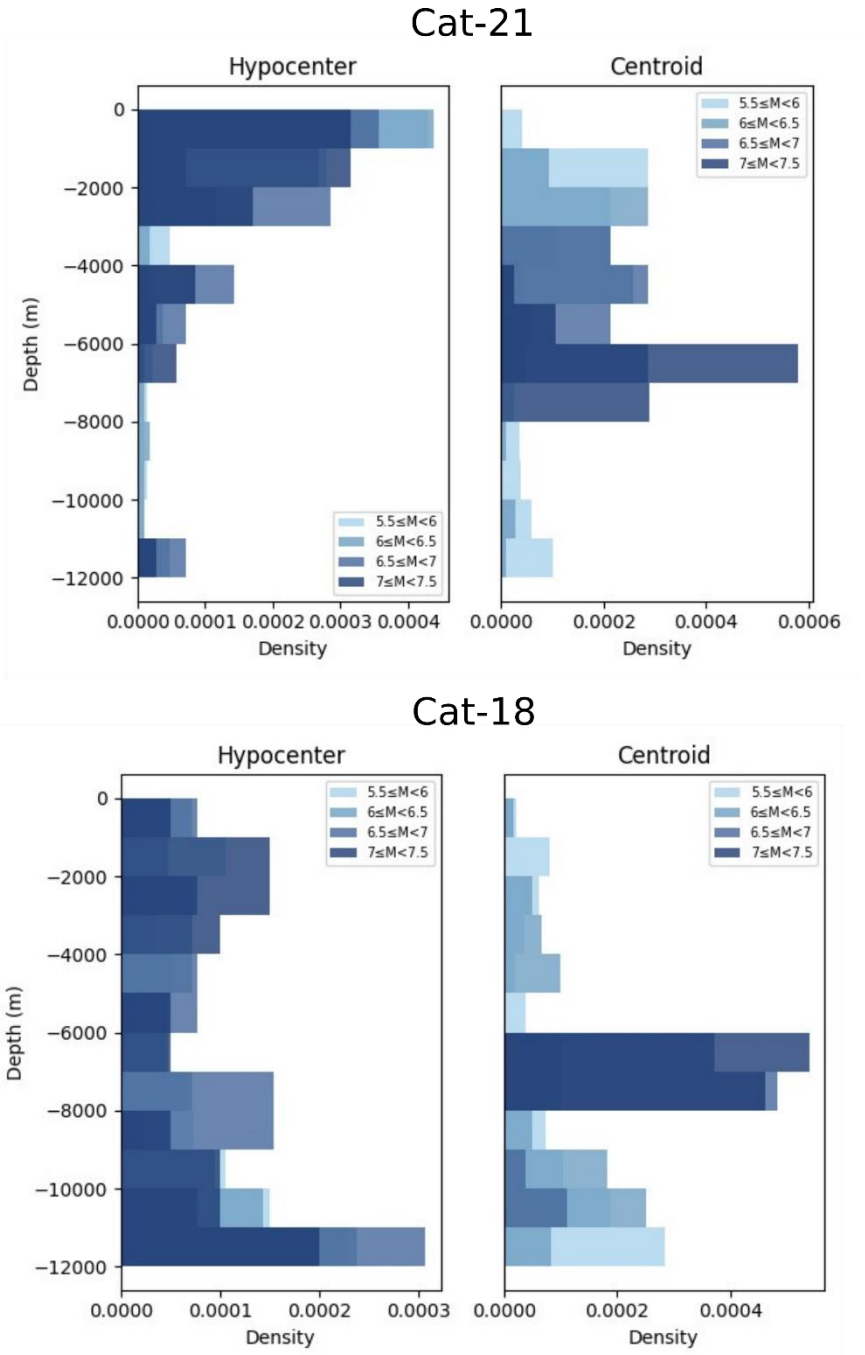


Figure S4. Depth distribution of hypocenters (left column) and rupture centroids (right column) for simulated catalogues Cat-21 and Cat-18.

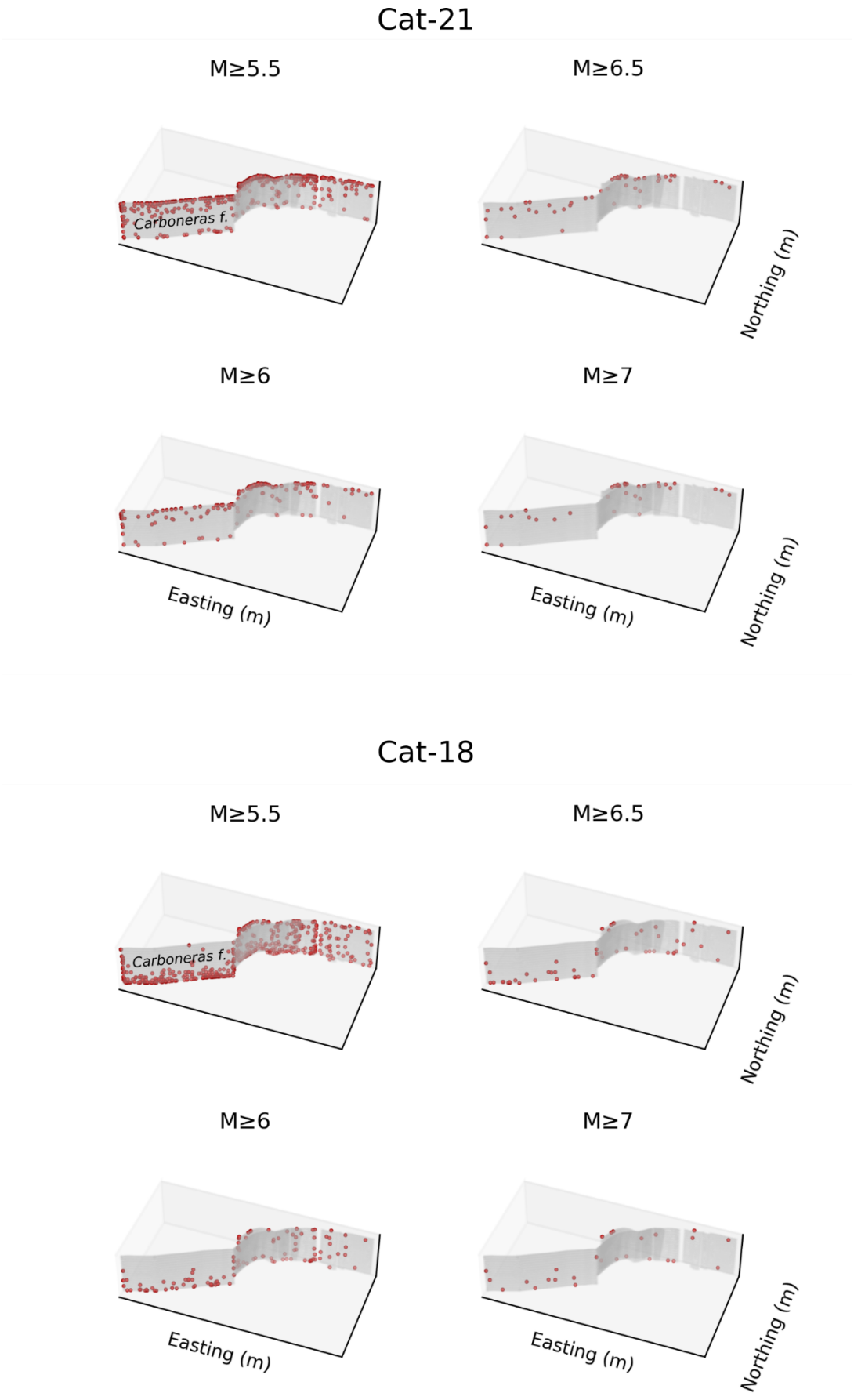


Figure S5. Distribution of hypocenters for simulated catalogues Cat-21 and Cat-18 along the EBSZ faults. The Carboneras fault is indicated for reference.

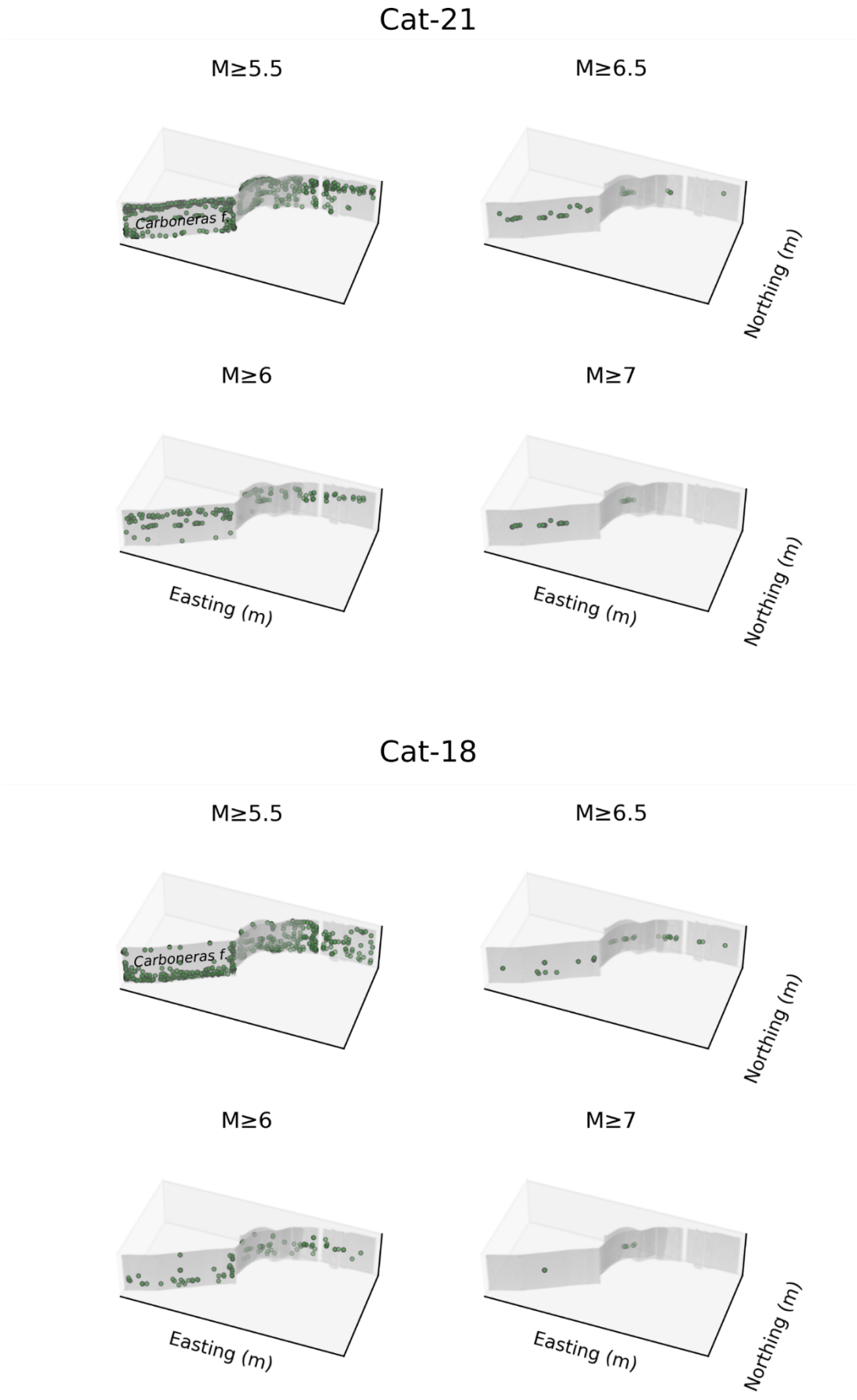


Figure S6. Distribution of rupture centroids for simulated catalogues Cat-21 and Cat-18 along the EBSZ faults. The Carboneras fault is indicated for reference.

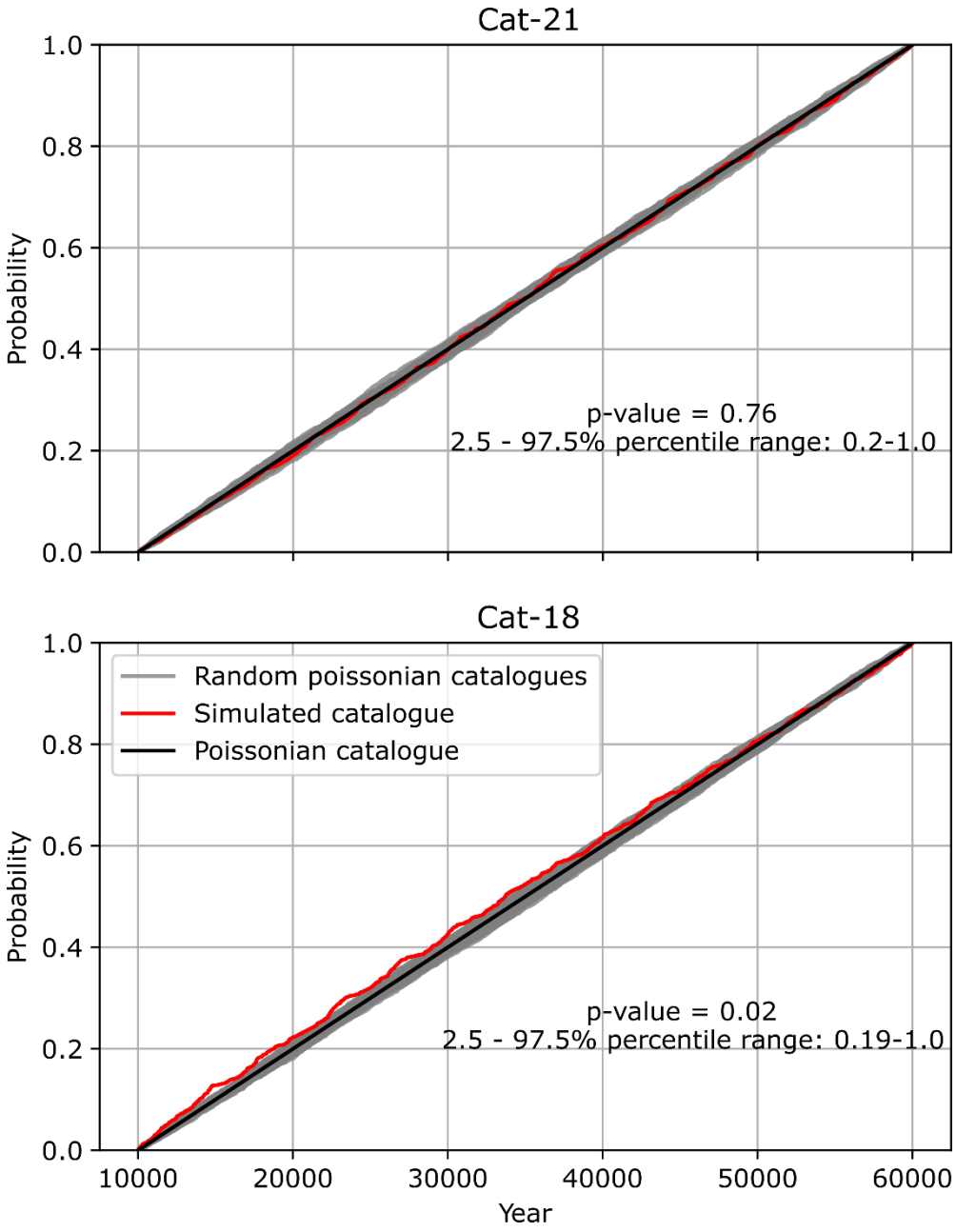
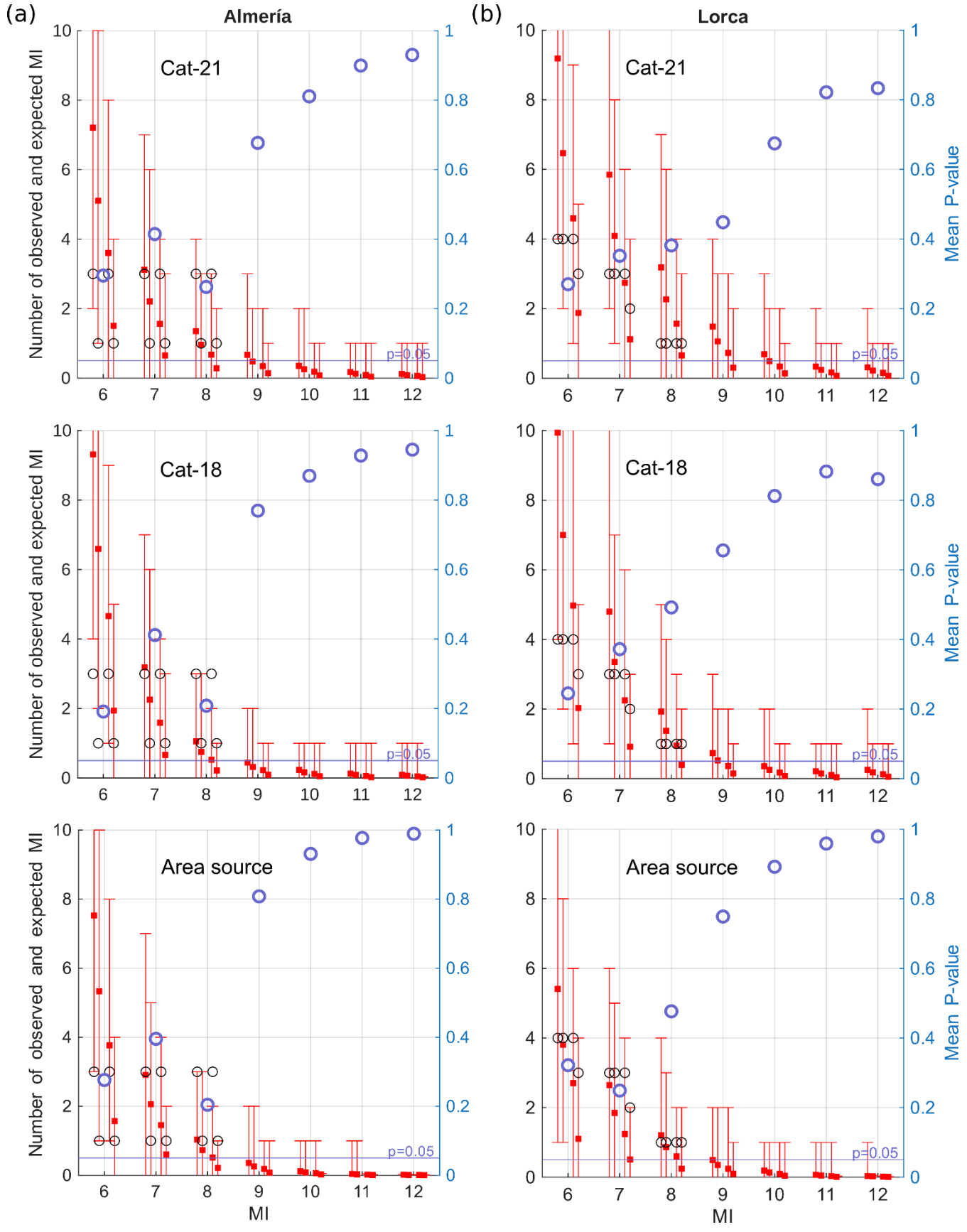


Figure S7. Kolmogorov–Smirnov (KS) test results for the temporal distribution of simulated ruptures in the Cat-21 (top) and Cat-18 (bottom) catalogues considering all ruptures of magnitude equal or above Mw 5.



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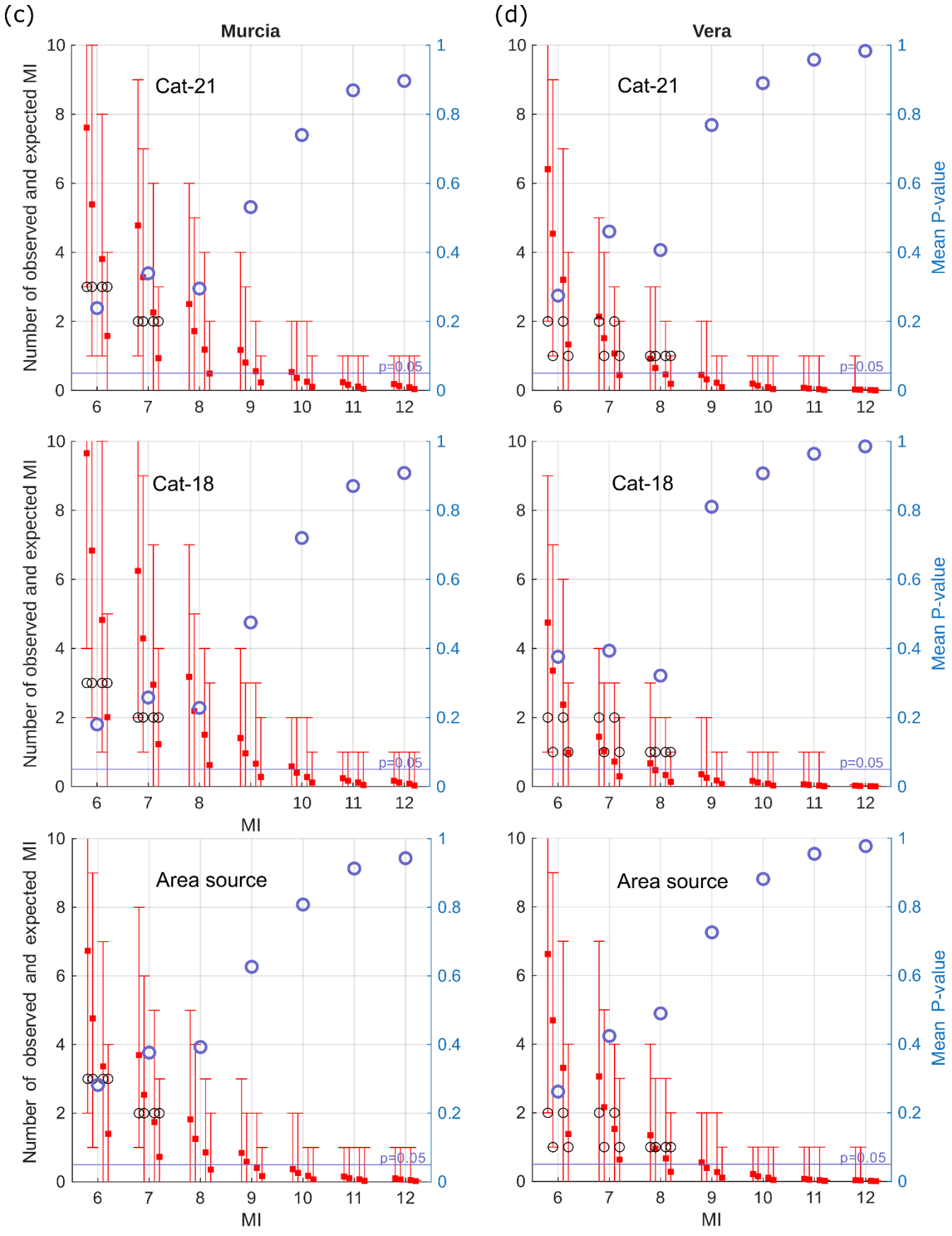

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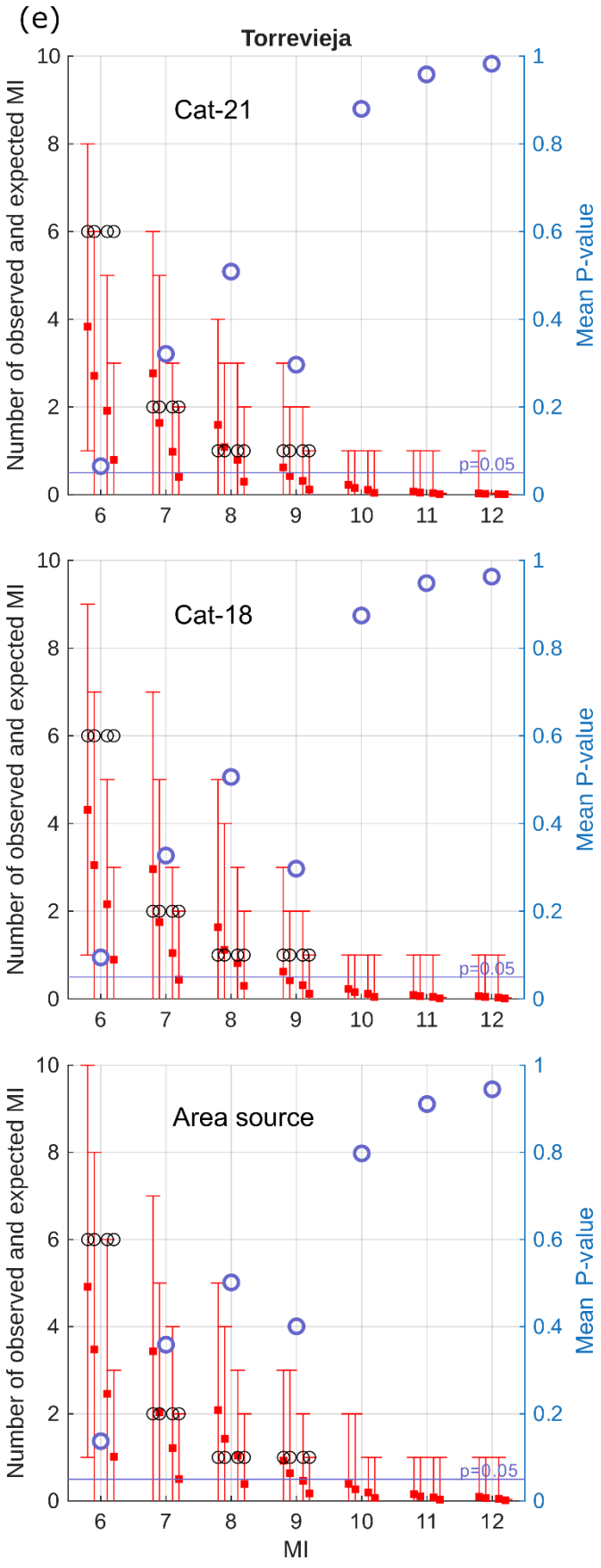

Figure S8. Same as figure S2 but considering observations and forecasts for magnitudes above or equal to Mw 5 and for all five city localities in the study.

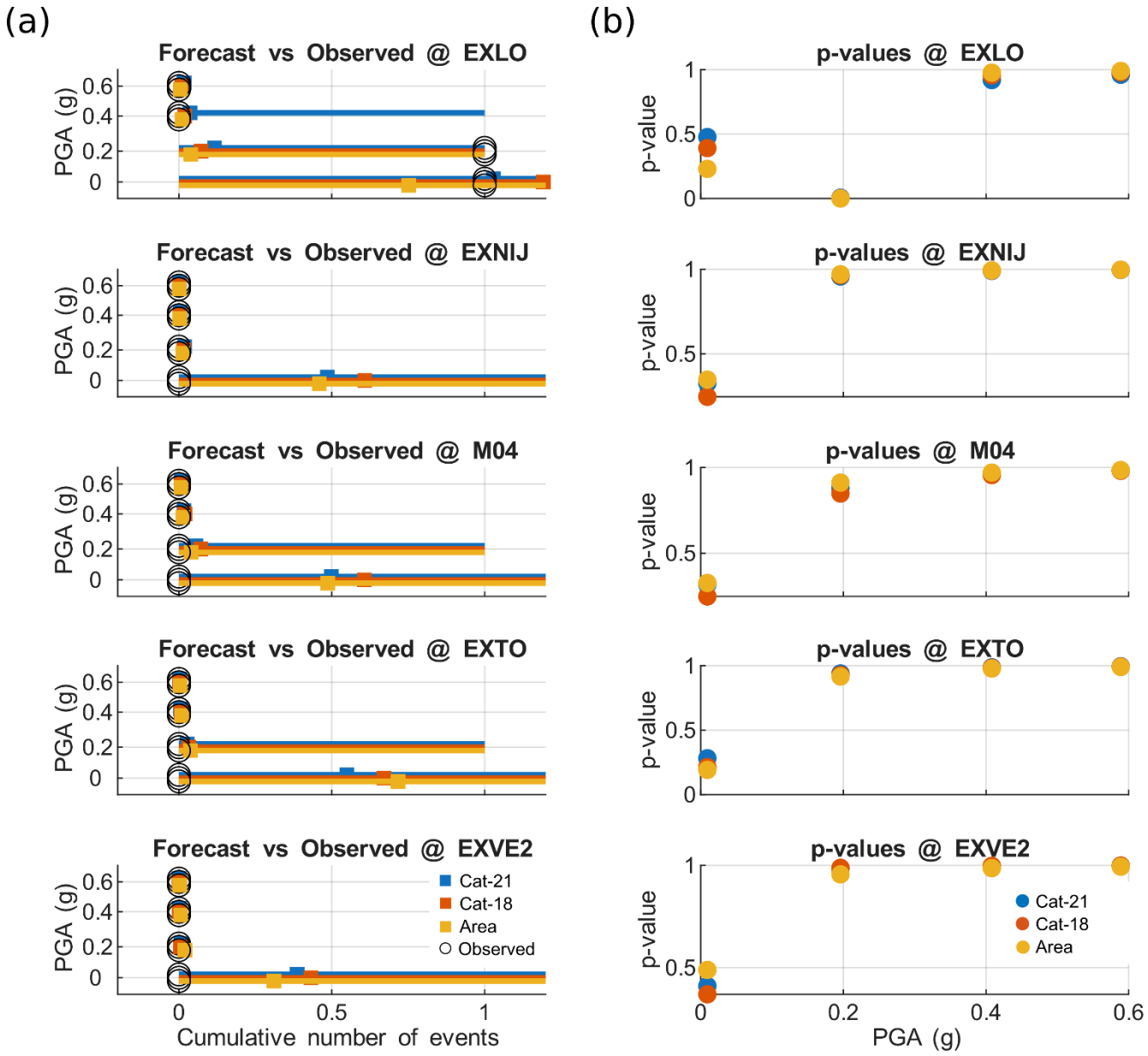

Figure S9. Same as figure 9 of the article but considering observations and forecast for magnitudes equal or above Mw 5 at the different accelerometric stations of the study.

		Macroseismic intensity		
Site	**Model**	**MI 6**	**MI 7**	**MI 8**
Lorca	Cat-21	-1.309	-1.045	-0.963
	Cat-18	-1.406	-0.988	-0.709
	Area	-1.134	-1.391	-0.741
Vera	Cat-21	-1.292	-0.776	-0.900
	Cat-18	-0.978	-0.933	-1.136
	Area	-1.340	-0.858	-0.714
Murcia	Cat-21	-1.433	-1.081	-1.221
	Cat-18	-1.715	-1.355	-1.479
	Area	-1.265	-0.977	-0.935
Almería	Cat-21	-1.221	-0.881	-1.338
	Cat-18	-1.653	-0.888	-1.570
	Area	-1.287	-0.928	-1.588
Torrevieja	Cat-21	-2.734	-1.136	-0.676
	Cat-18	-2.358	-1.118	-0.681
	Area	-1.987	-1.025	-0.690

		PGA		
Station	**Model**	**0.2g**	**0.4g**	**0.6g**
EXLO	Cat-21	-2.209	-0.036	-0.017
	Cat-18	-2.662	-0.019	-0.009
	Area	-3.273	-0.010	-0.004
EXNIJ	Cat-21	-0.019	-0.004	-0.002
	Cat-18	-0.016	-0.003	-0.001
	Area	-0.013	-0.003	-0.001
M04	Cat-21	-0.056	-0.016	-0.007
	Cat-18	-0.071	-0.019	-0.008
	Area	-0.040	-0.013	-0.006
EXTO	Cat-21	-0.027	-0.005	-0.002
	Cat-18	-0.032	-0.007	-0.003
	Area	-0.038	-0.009	-0.004
EXVE2	Cat-21	-0.007	-0.001	-0.000
	Cat-18	-0.005	-0.001	-0.000
	Area	-0.019	-0.006	-0.003

TOTAL	Cat-21	**-20.415**
	Cat-18	**-21.825**
	Area	**-20.302**

Figure S10. *LogP* scores obtained for the three tested hazard models, Cat-21, Cat-18, and the area source model, across five localities and five instrumental stations, and for all magnitudes equal or above to Mw 5. With green background, we mark the best model for each situation.

References

Herrero-Barbero, P., Álvarez-Gómez, J. A., Tsige, M., Martínez-Díaz, J. J.: Deterministic seismic hazard analysis from physics-based earthquake simulations in the Eastern Betics (SE Iberia), Engineering Geology, 327, 107364 https://doi.org/10.1016/j.enggeo.2023.107364, 2023.

Instituto Geográfico Nacional (IGN): Seismic Alert Network Stations, [data set], https://www.ign.es/web/ca/ign/portal/sis-area-sismicidad, 2025.