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Seismic background noise levels in the Italian strong-motion network

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1 Background Noise Level

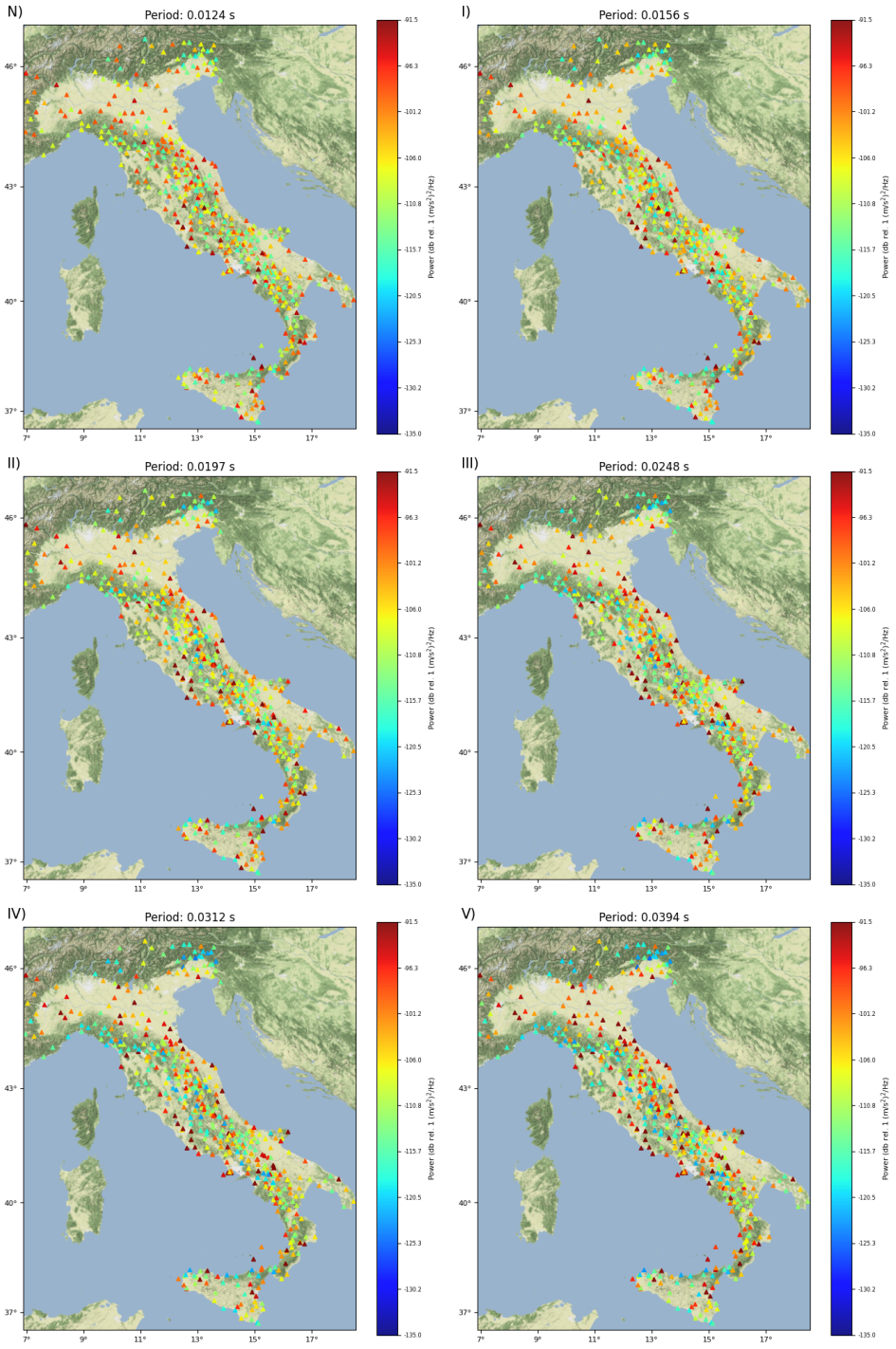

Figure S1: Background noise levels of Italian strong motion network. Basemap data are retrieved from © Stamen Design.

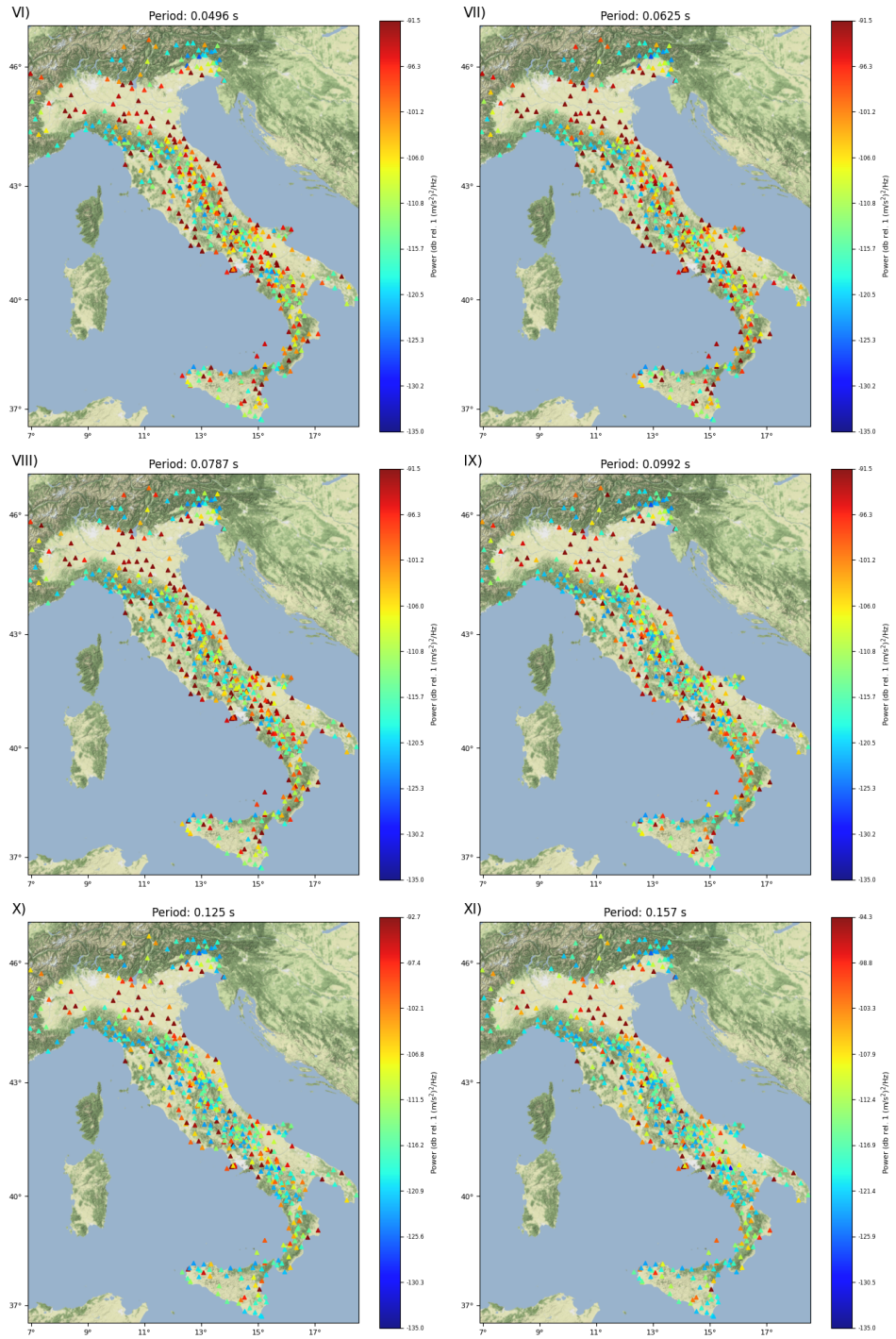

Figure S1 (cont.): Background noise levels of Italian strong motion network (cont.). Basemap data are retrieved from © Stamen Design.

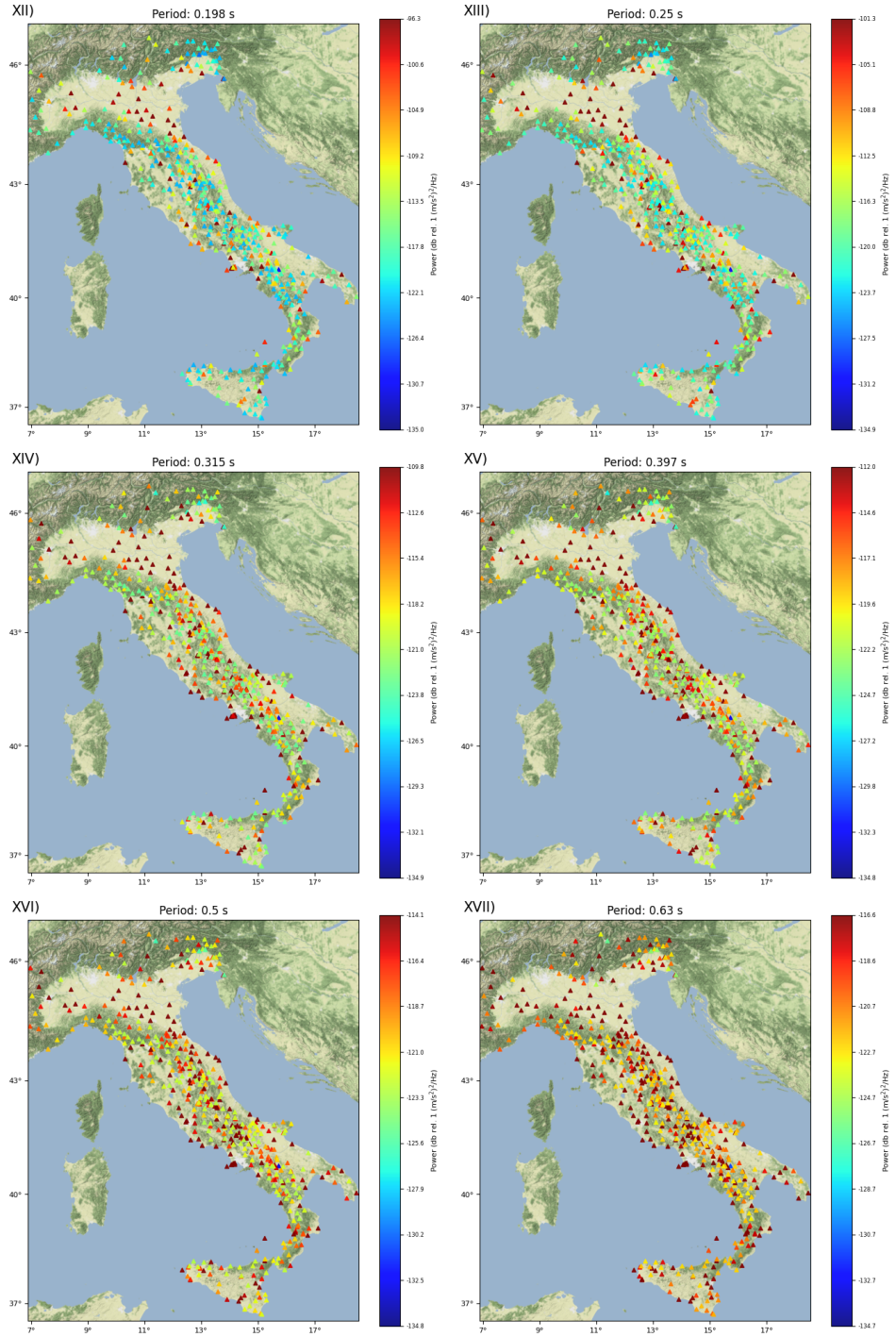

Figure S1 (cont.): Background noise levels of Italian strong motion network (cont.). Basemap data are retrieved from © Stamen Design.

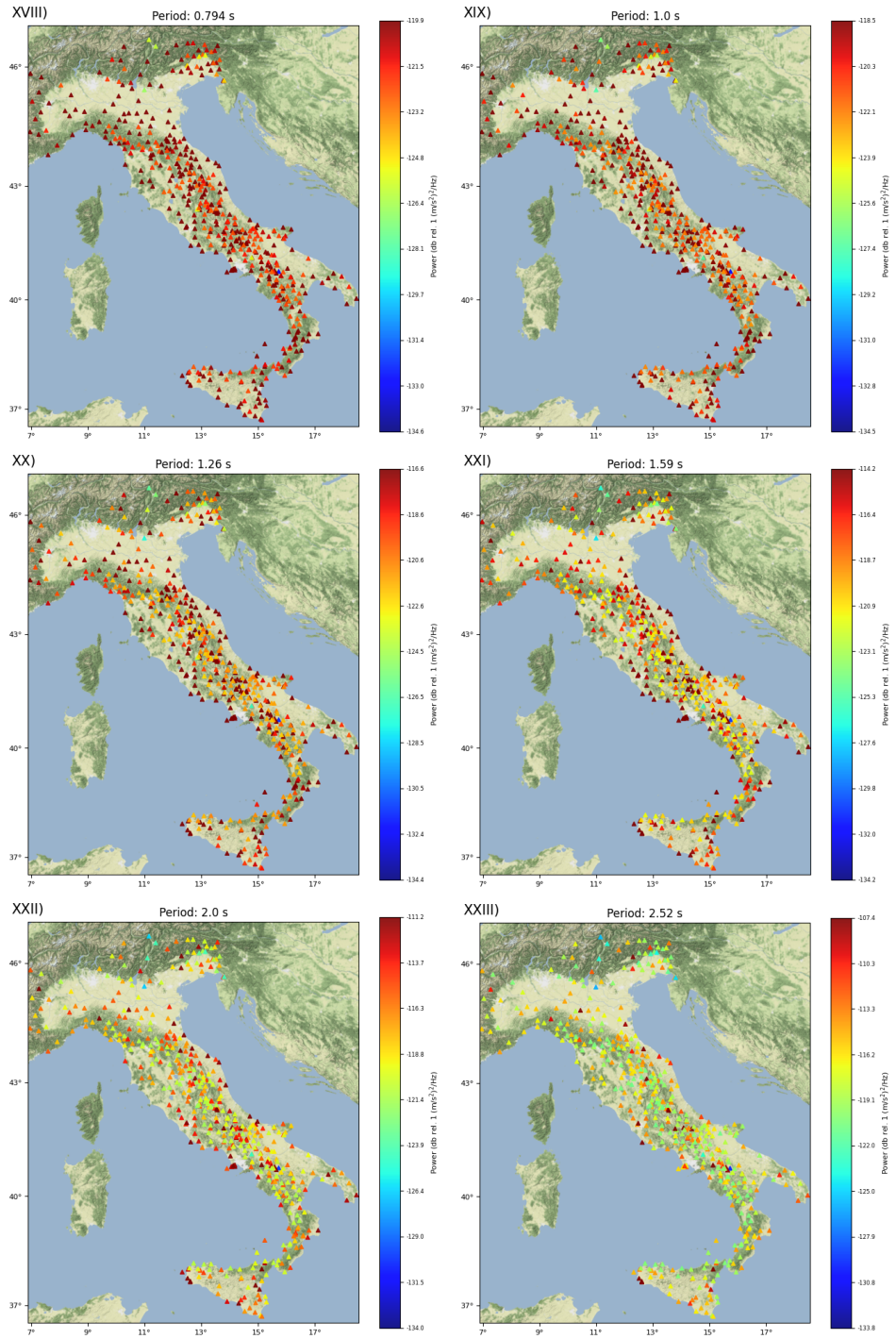

Figure S1 (cont.): Background noise levels of Italian strong motion network (cont.). Basemap data are retrieved from © Stamen Design.

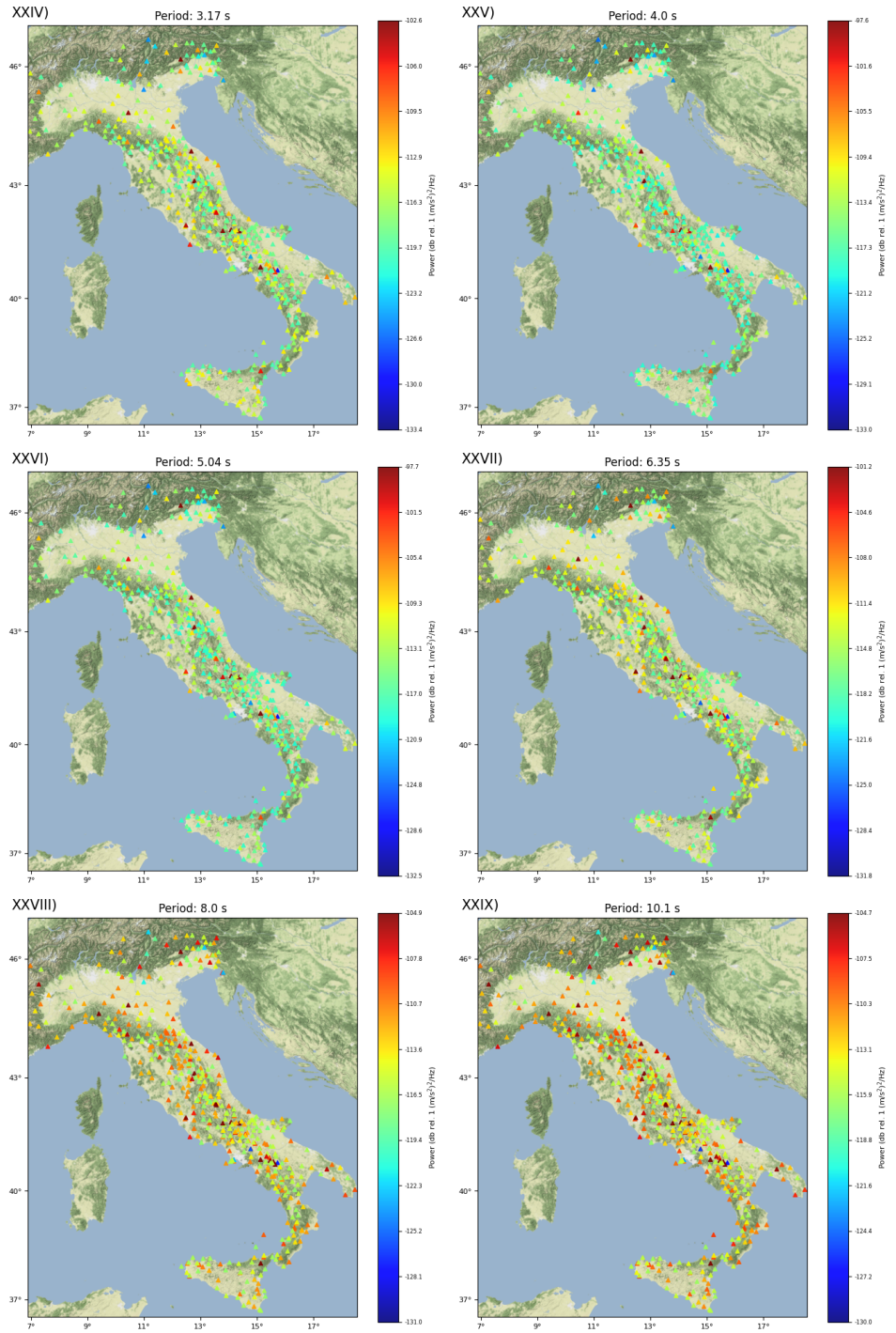

Figure S1 (cont.): Background noise levels of Italian strong motion network (cont.). Basemap data are retrieved from © Stamen Design.

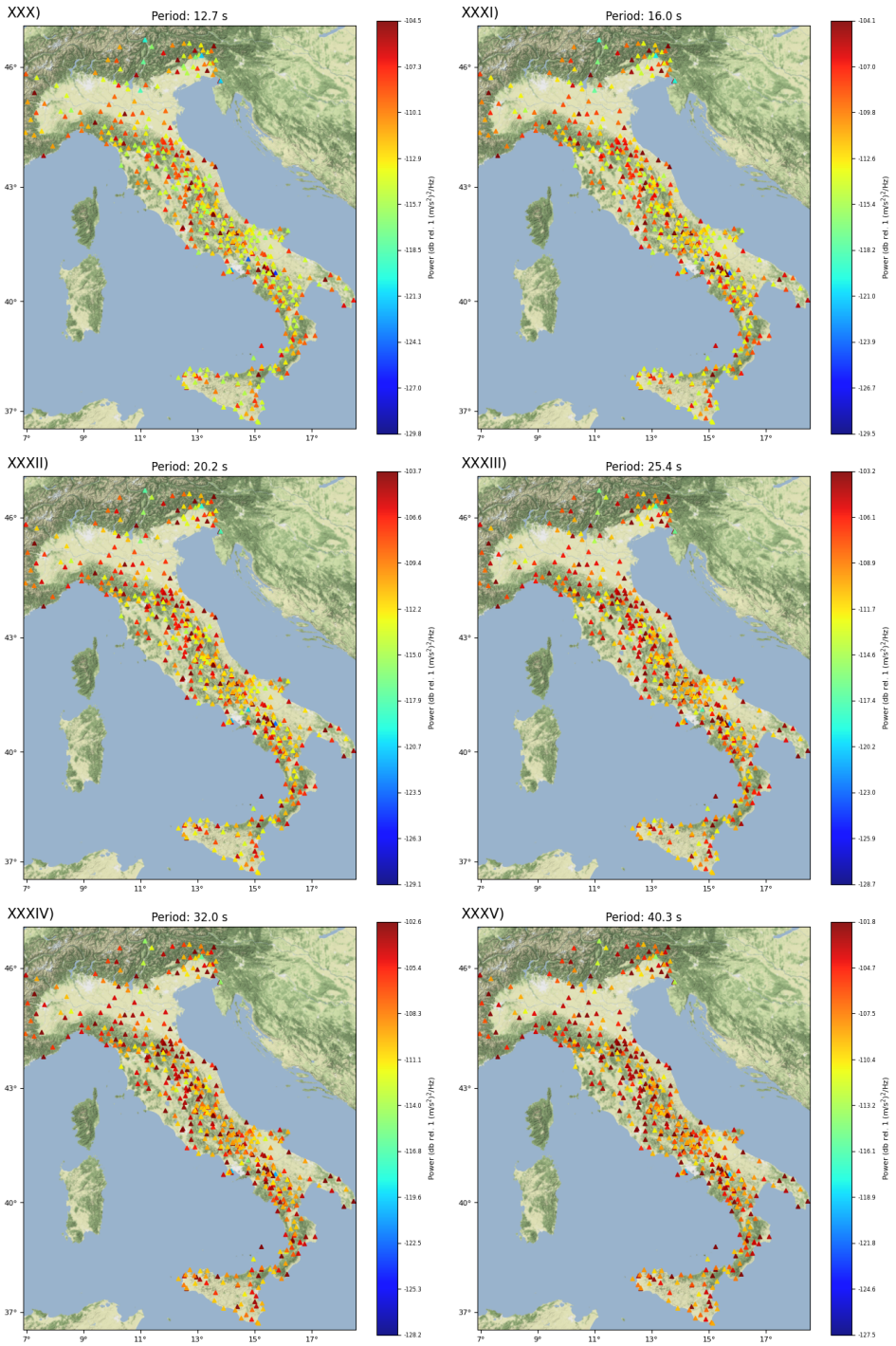

Figure S1 (cont.): Background noise levels of Italian strong motion network (cont.). Basemap data are retrieved from © Stamen Design.

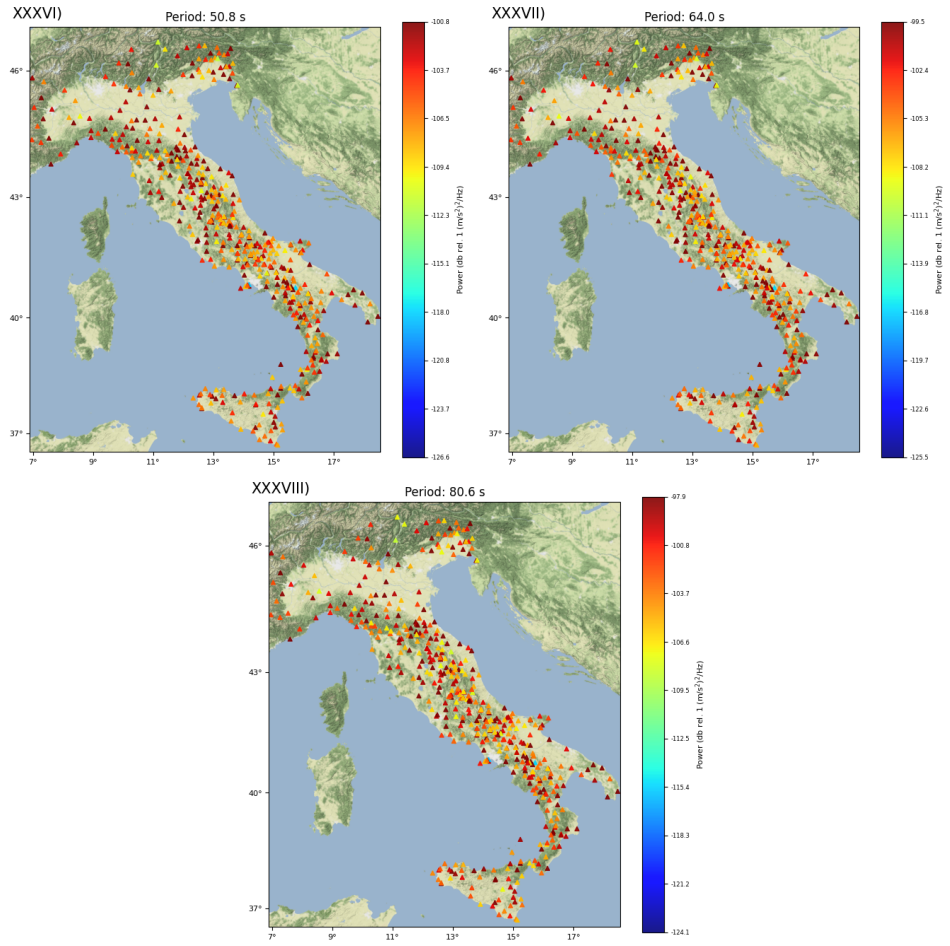

Figure S1 (cont.): Background noise levels of Italian strong motion network . Basemap data are retrieved from © Stamen Design.

2 Quietest and noisiest stations over lithology

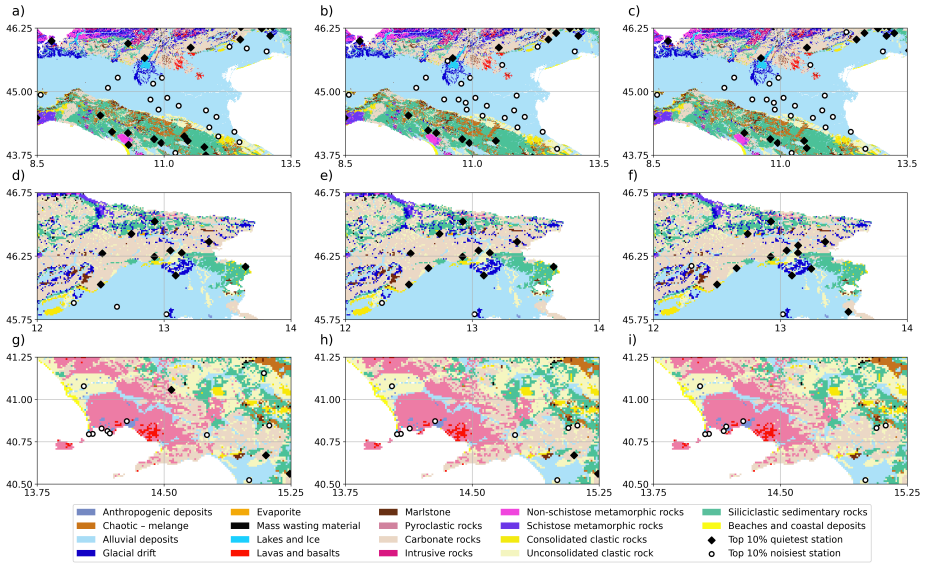

Figure S2: Top 10 % noisiest (white circles) and quietest (black diamonds) stations over lithology of Italy Bucci et al. (2022) for three regions (Po plain for panels a-b-c, North East Italy for panels d-e-f, and Naples surroundings for panels g-h-i) at three periods of interest (0.1 s for panels a-d-g, 0.25 s for panels b-e-h, and 0.5 s for panels c-f-i)

3 PSD values with respect to coastline distance

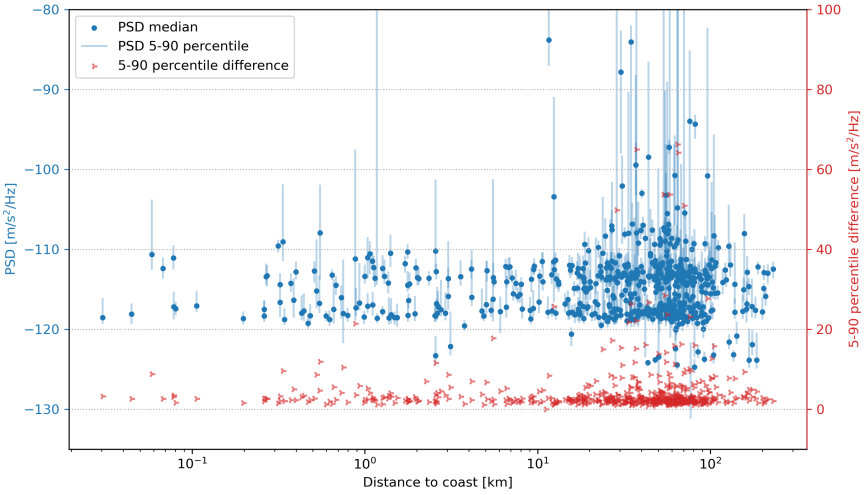

Figure S3: PSD values at 5 s with respect to the distance to the coastline: the blue markers and lines show, respectively, the median values and the range between the 5- and 95-percentile for each station; the red markers show the value of the difference between the 5- and 95-percentile for each station.

4 Carciotti Palace

Figure S4: left) Drawing of the salina part of the city of Trieste by Johann Weikhard von Valvasor in 1689 taken from © Wikipedia (https://upload.wikimedia.org/wikipedia/commons/6/67/Mesto_Trst-Valvasor-2.jpg, last access: 7 November 2022), right) Palazzo Carciotti.

5 Top 10 Noisy Stations

To show the worst examples of the RAN network, we choose the 10 most noisiest stations in the network (Figure S5). Raw traces of these stations are capable of detecting P wave arrivals of M4 earthquake up to 80km. In M3 earthquake it goes down about 10km and in M2 earthquake only CSA7 and SGMA can capture the P wave if the epicentral distance is less than 10km. There are tow important points of this analysis, first, corner frequencies of the earthquakes are for the P wave arrival. For the RAN only the peak ground parameters which are, usually, related to S wave. Second, noise can be reduced by adequate data filters.

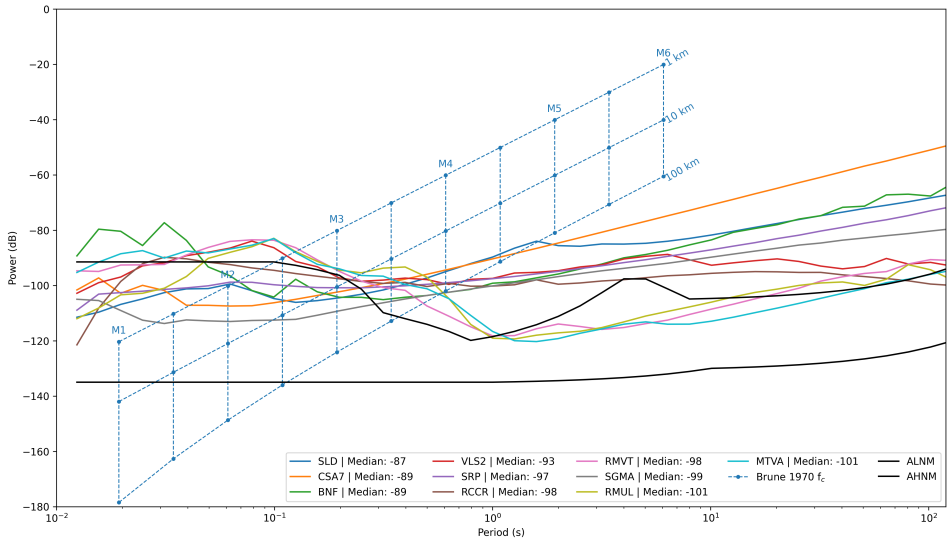

Figure S5: Noise levels of the 10 most noisy stations in the RAN network along with magnitude corner frequencies defined by Brune (1970). Solid black lines are the ALNM and AHNM defined by Cauzzi and Clinton (2014).

6 M2.5 earthquake

M2.5 earthquake occurred in central Italy on 22nd October 2022 and the background noise levels of 33 stations with epicentral distances (R_{epi}) between 10 km and 80 km from RAN network.

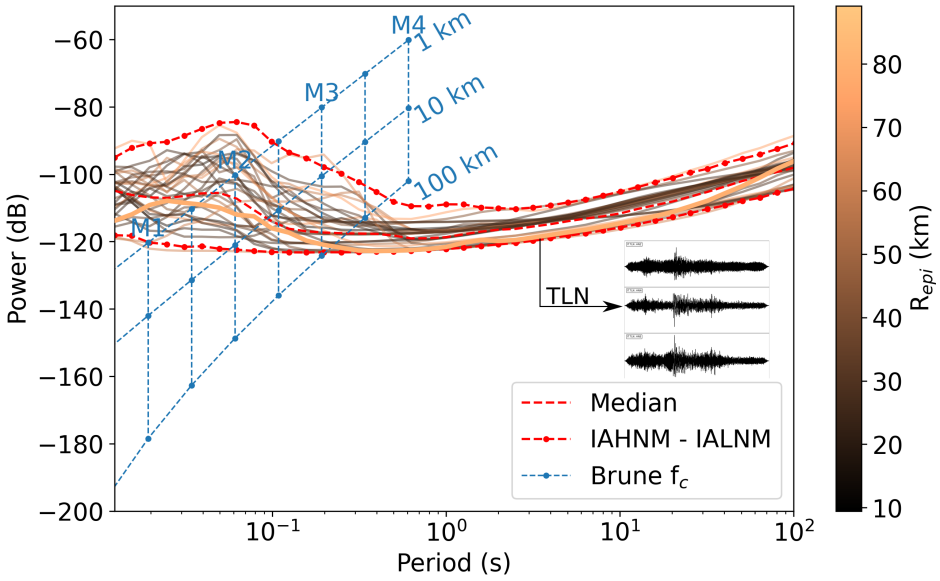

Figure S6: Background seismic noise levels of the stations recorded the M2.5 central Italy earthquake. Stations are colored with R_{epi} and the waveform of TLN station is given in center right.

7 Band I Comparison of D'Alessandro et al. (2021)

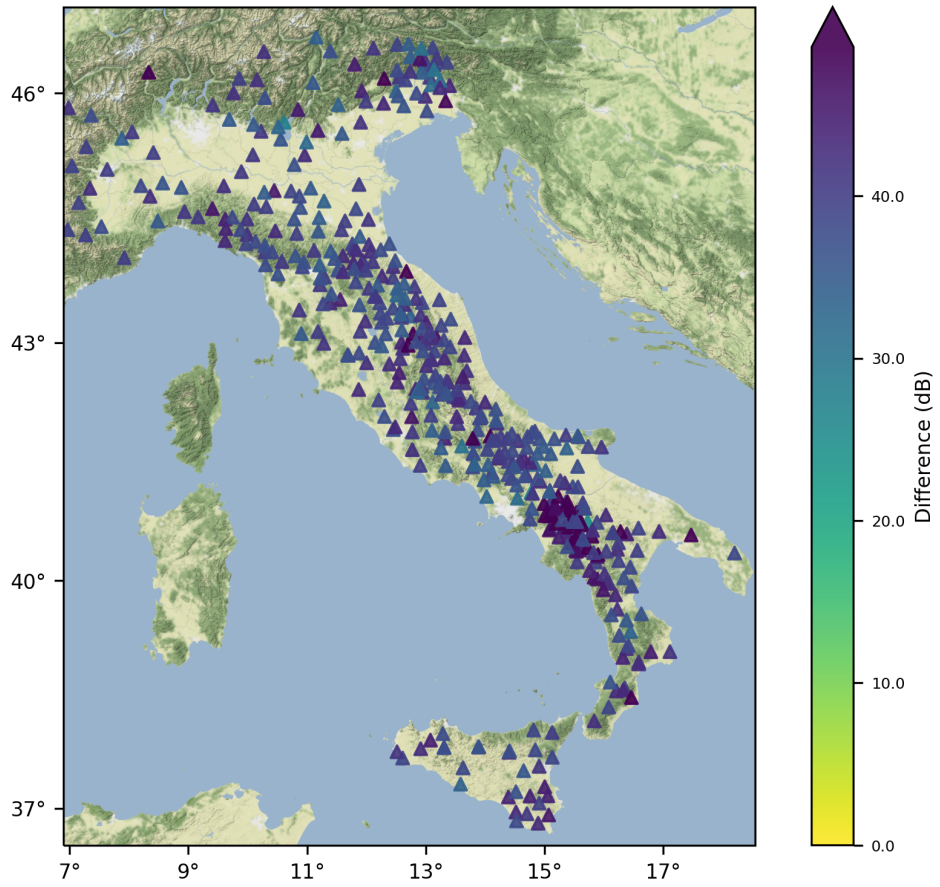

Figure S7: Difference between Band I defined in D'Alessandro et al. (2021) and our station.

8 Italian Accelerometric Noise Model

Table S1: Sampled Values of the Lower (IALNM) and Higher (IALNM) Limits of the Italian Accelerometric Noise Model; Power Values are in dB Relative to $(m/s^2)^2/Hz$

Period (s)	Median	IALNM	IAHNM
0.0124	-106.3058	-116.7292	-95.7203
0.0156	-105.4265	-118.3769	-95.2367
0.0197	-106.6431	-118.8383	-92.2544
0.0248	-107.3027	-120.3705	-90.8714
0.0312	-107.4877	-121.3111	-90.3643
0.0394	-107.2572	-121.5897	-88.6226
0.0496	-106.0609	-121.5514	-86.5540
0.0625	-106.1537	-122.0509	-84.8424
0.0787	-107.7490	-122.3949	-84.5274
0.0992	-111.4150	-122.7697	-85.7674
0.1250	-114.4946	-123.0926	-90.4552
0.1570	-116.4842	-123.2027	-93.5524
0.1980	-117.1546	-123.2453	-95.2688
0.2500	-117.4222	-123.1694	-98.5961
0.3150	-117.5607	-123.1707	-100.0067
0.3970	-117.6371	-123.1201	-102.3753
0.5000	-117.6540	-123.0270	-105.2551
0.6300	-117.9056	-122.9456	-108.3135
0.7940	-118.1976	-122.7732	-109.6636
1.0000	-118.5066	-122.5120	-109.2089
1.2600	-118.2592	-122.2280	-108.9092
1.5900	-117.5131	-121.8479	-108.3848
2.0000	-116.8487	-121.3349	-109.4770
2.5200	-116.3833	-120.8575	-109.5479
3.1700	-115.9115	-120.3854	-109.5574
4.0000	-115.3059	-119.7888	-108.6302
5.0400	-114.4667	-119.0633	-107.6052
6.3500	-113.5729	-118.2807	-106.6979
8.0000	-113.0395	-117.5776	-105.7548
10.1000	-112.2500	-116.7642	-104.4313
12.7000	-111.1875	-115.8729	-103.5013
16.0000	-109.9474	-114.8921	-102.0600
20.2000	-108.7333	-113.8633	-100.6792
25.4000	-107.5000	-112.7500	-99.3813
32.0000	-106.2222	-111.5556	-98.2254
40.3000	-104.8750	-110.4938	-97.0000
50.8000	-103.5000	-109.3333	-95.5050
64.0000	-101.8750	-108.0000	-94.0125
80.6000	-100.7500	-107.0000	-92.6708
102.0000	-99.3333	-105.6500	-91.0000

9 Period wise Statistics

Table S2: Stations with median noise level higher than AHNM in the network.

Period (s)	AHNM	Median	
		No. of station	Percentage of network (%)
0.0124	-91.50	5	1.01
0.0156	-91.50	11	2.23
0.0197	-91.50	19	3.85
0.0248	-91.50	29	5.87
0.0312	-91.50	32	6.48
0.0394	-91.50	44	8.91
0.0496	-91.50	62	12.55
0.0625	-91.50	82	16.60
0.0787	-91.50	78	15.79
0.0992	-91.50	57	11.54
0.1250	-92.73	36	7.29
0.1570	-94.31	28	5.67
0.1980	-96.33	27	5.47
0.2500	-101.34	41	8.30
0.3150	-109.85	90	18.22
0.3970	-112.02	88	17.81
0.5000	-114.06	92	18.62
0.6300	-116.64	146	29.55
0.7940	-119.88	260	52.63
1.0000	-118.53	219	44.33
1.2600	-116.63	168	34.01
1.5900	-114.21	85	17.21
2.0000	-111.20	34	6.88
2.5200	-107.39	14	2.83
3.1700	-102.62	6	1.21
4.0000	-97.63	4	0.81
5.0400	-97.66	5	1.01
6.3500	-101.25	9	1.82
8.0000	-104.91	15	3.04
10.1000	-104.71	16	3.24
12.7000	-104.46	20	4.05
16.0000	-104.14	28	5.67
20.2000	-103.74	35	7.09
25.4000	-103.24	43	8.70
32.0000	-102.60	57	11.54
40.3000	-101.81	73	14.78
50.8000	-100.80	89	18.02
64.0000	-99.53	97	19.64
80.6000	-97.93	79	15.99
102.0000	-95.87	76	15.38
Any	-	308	62.35