



Boğaziçi University
Kandilli Observatory and Earthquake Research Institute
Department of Earthquake Engineering

Kahramanmaraş - Gaziantep Türkiye M7.7 Earthquake, 6 February 2023 (04:17 GMT+03:00)

Strong Ground Motion and Building Damage Estimations Preliminary Report (v2)

Ufuk Hancılar, Karin Şeşetyan, Eser Çaktı

Nesrin Yenihayat, Nurullah Açıkgöz, Şahin Dede, Şükran Acar

07.02.2023 (v2)

06.02.2023 (v1)

What is new?

Ground motion distribution maps with different GMPEs and intensity prediction equations!

Regional scale damage estimation maps with different ground motion inputs!

Kahramanmaraş city scale damage estimation maps with different ground motion inputs!

Acceleration, velocity and displacement time history plots, Fourier amplitude spectra plots of the recorded data!

Note:

The information provided in this report is presented for scientific research purposes.

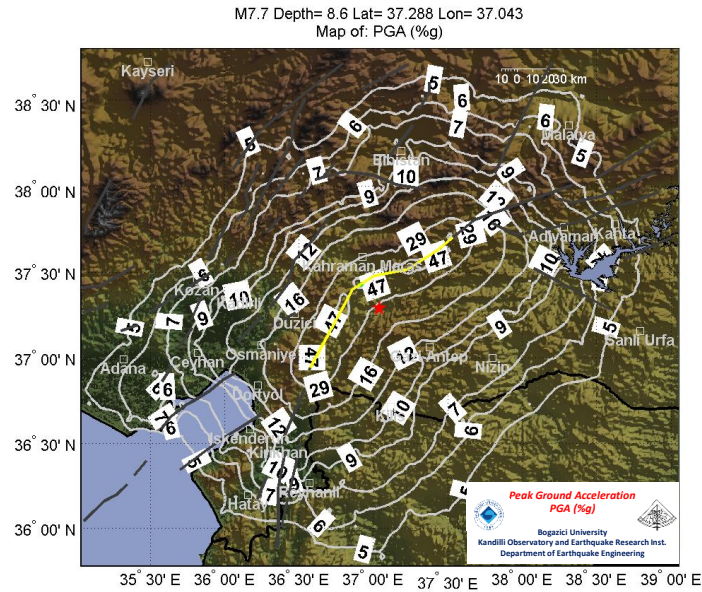
All analyses conducted with ELER (Earthquake Loss Estimation Routine) software.

<https://eqe.boun.edu.tr/en/eler-tool>

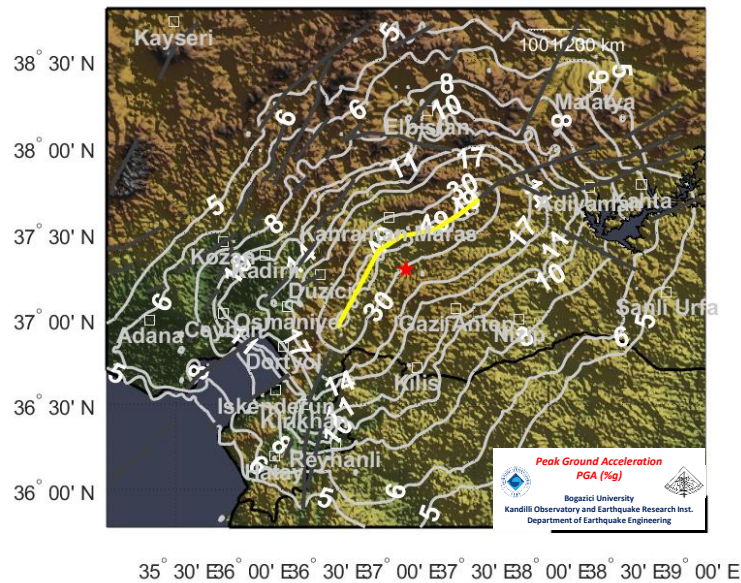
PGA MAPS

Associated fault line automatically chosen from the fault database. Ground motion estimations done without recorded data.

GMPE: CY2008 Computed values ranging between 0.011g and 0.66g (min. and max. computed values might not be visible on the contour map).



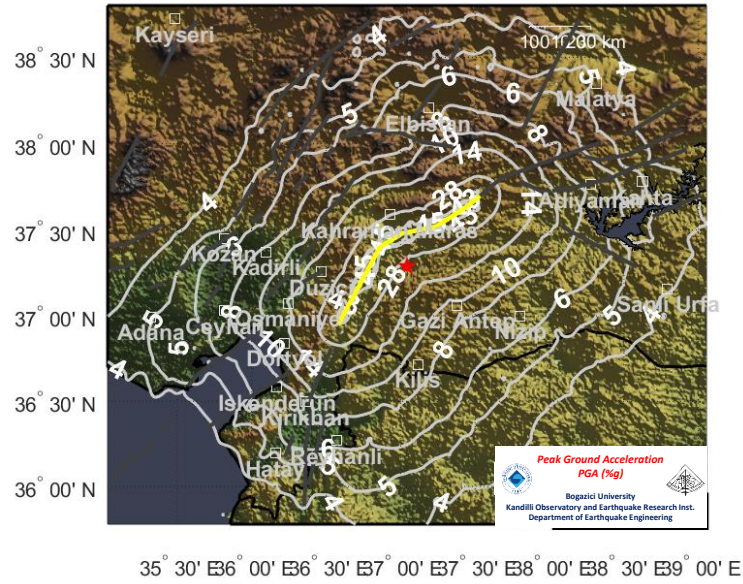
GMPE: CY2014 Computed values ranging between 0.014g and 0.69g (min. and max. computed values might not be visible on the contour map).



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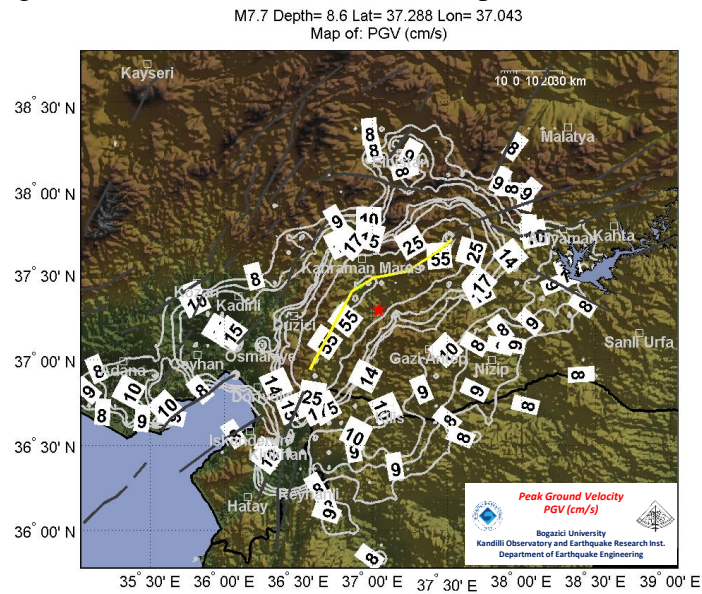
GMPE: ASB2014 Computed values ranging between 0.019g and 0.55g (min. and max. computed values might not be visible on the contour map).



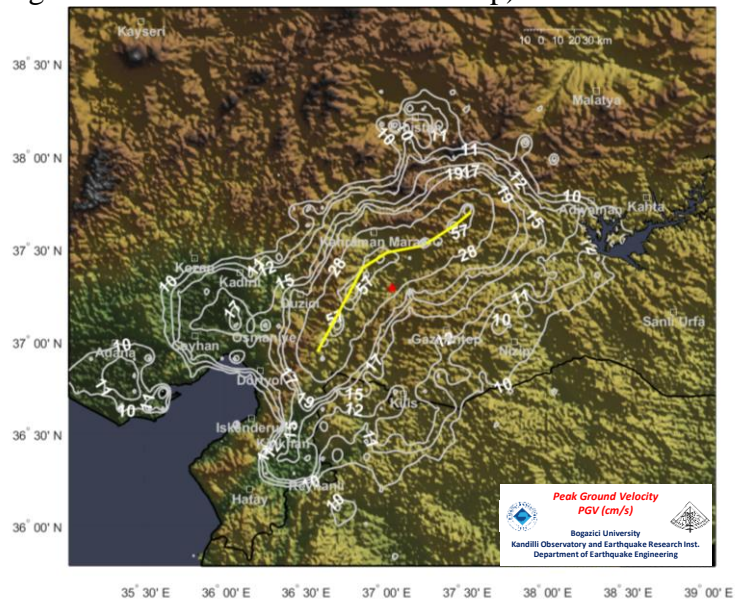
PGV MAPS

Associated fault line automatically chosen from the fault database. Ground motion estimations done without recorded data.

GMPE: CY2008 Computed values ranging between 2.2cm/s and 84cm/s (min. and max. computed values might not be visible on the contour map).



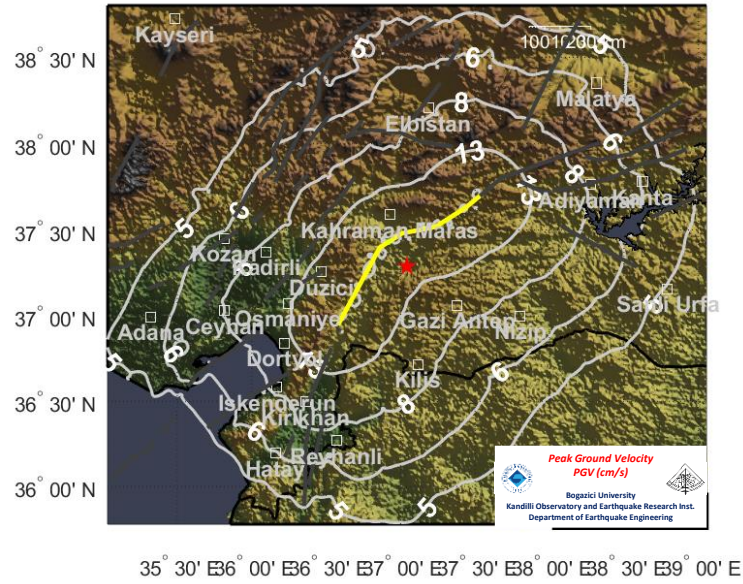
GMPE: CY2014 Computed values ranging between 2.8cm/s and 88cm/s (min. and max. computed values might not be visible on the contour map).



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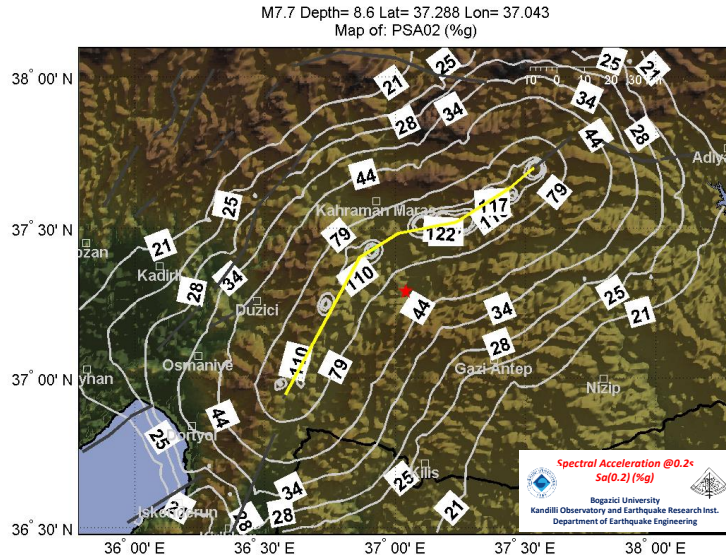
GMPE: ASB2014 Computed values ranging between 2.9cm/s and 38cm/s (min. and max. computed values might not be visible on the contour map).



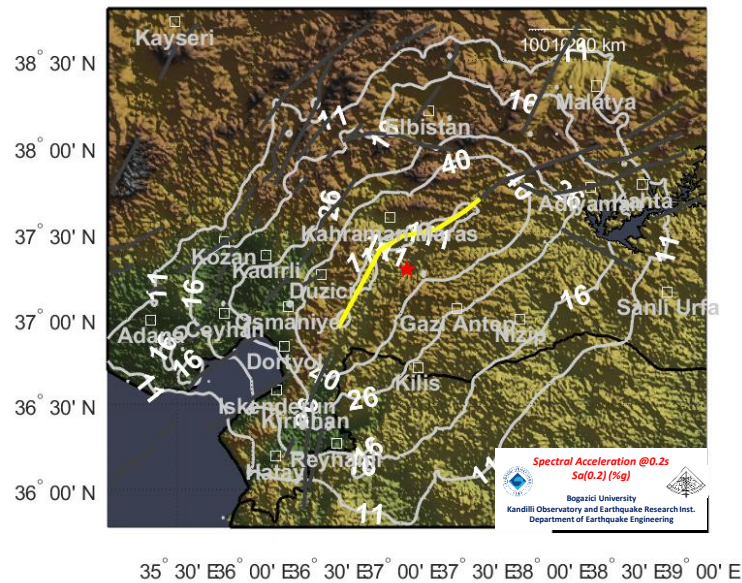
Sa(0.2s) MAPS

Associated fault line automatically chosen from the fault database. Ground motion estimations done without recorded data.

GMPE: CY2008 Computed values ranging between 0.027g and 1.68g (min. and max. computed values might not be visible on the contour map).



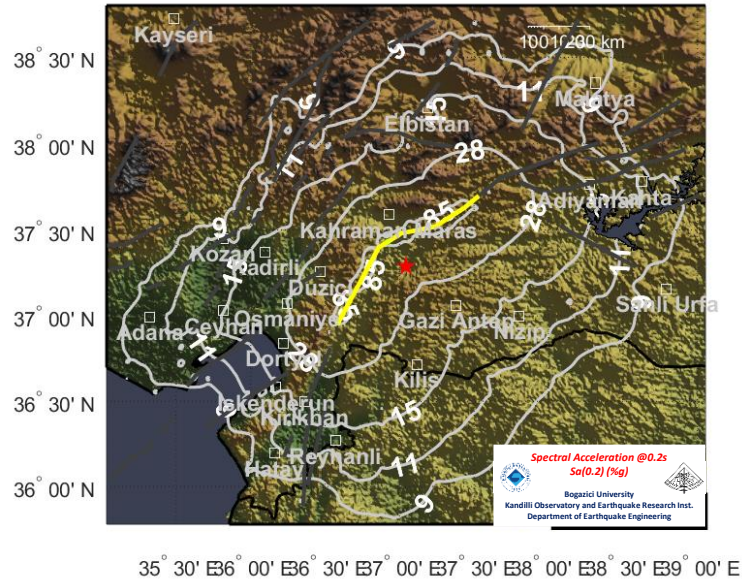
GMPE: CY2014 Computed values ranging between 0.02g and 1.60g (min. and max. computed values might not be visible on the contour map).



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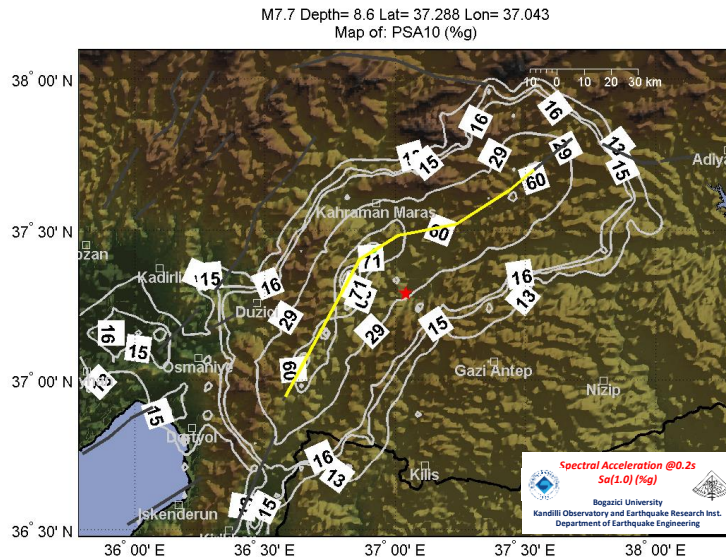
GMPE: ASB2014 Computed values ranging between 0.034g and 1.14g (min. and max. computed values might not be visible on the contour map).



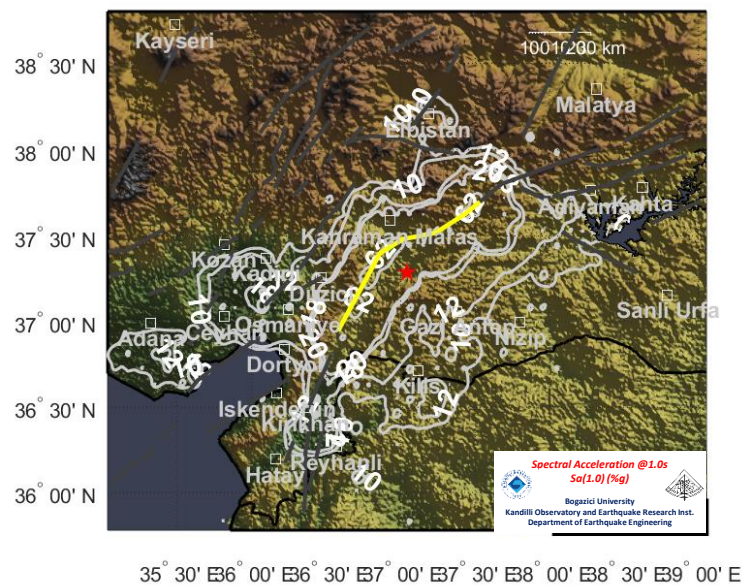
Sa(1.0s) MAPS

Associated fault line automatically chosen from the fault database. Ground motion estimations done without recorded data.

GMPE: CY2008 Computed values ranging between 0.024g and 0.89g (min. and max. computed values might not be visible on the contour map).



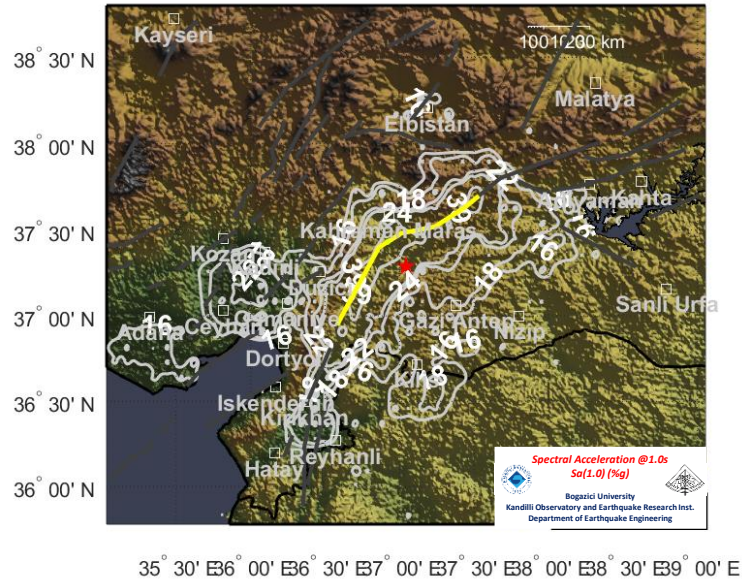
GMPE: CY2014 Computed values ranging between 0.015g and 1.08g (min. and max. computed values might not be visible on the contour map).



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GMPE: ASB2014 Computed values ranging between 0.043g and 0.59g (min. and max. computed values might not be visible on the contour map).



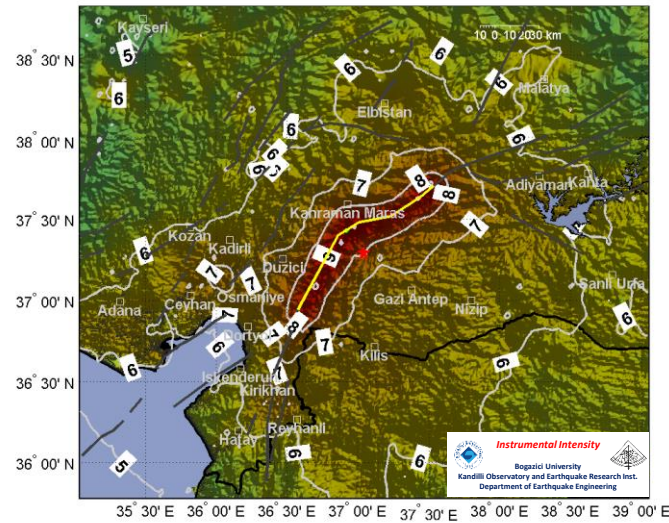
INTENSITY MAPS

Associated fault line automatically chosen from the fault database. Ground motion estimations done without recorded data.

GMPE : CY2008

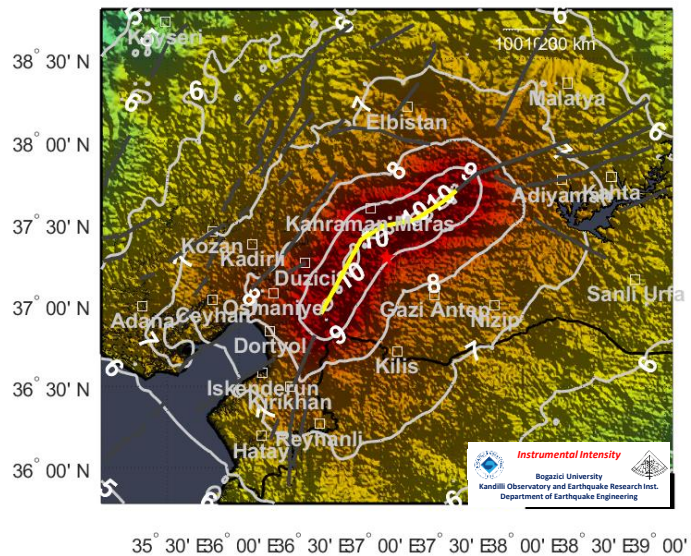
Intensity Equation : AK2007 Computed values ranging between 4.8 and 9.4 (min. and max. computed values might not be visible on the contour map).

M7.7 Depth= 8.6 Lat= 37.288 Lon= 37.043
Map of: INTENS



GMPE : CY2014

Intensity Equation : BA2014 Computed values ranging between 4.4 and 10.6 (min. and max. computed values might not be visible on the contour map).

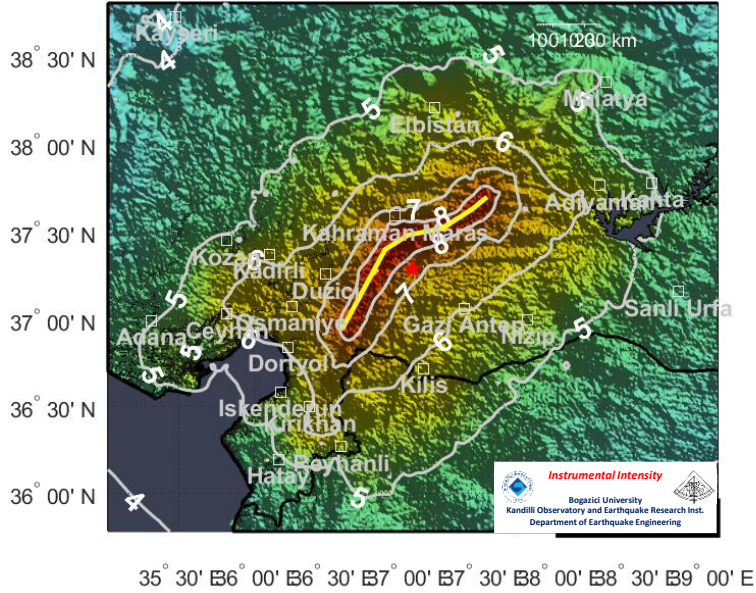


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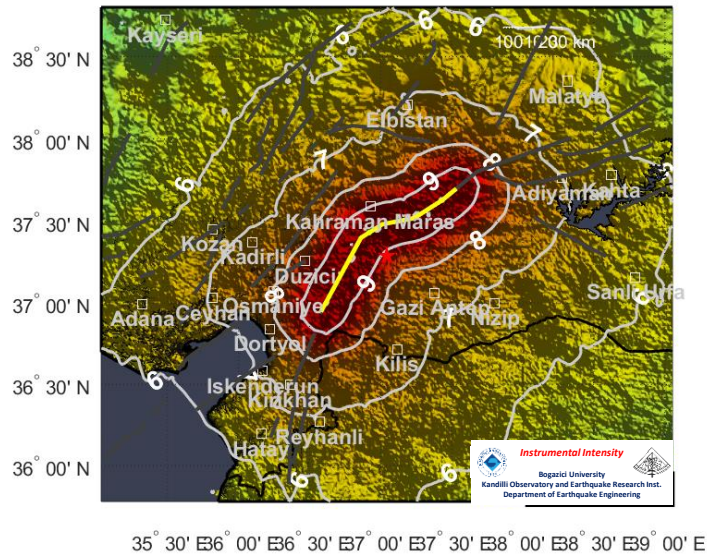
GMPE : CY2014

Intensity Equation : WQHK1999 Computed values ranging between 3.5 and 9.1 (min. and max. computed values might not be visible on the contour map).



GMPE : ASB2014

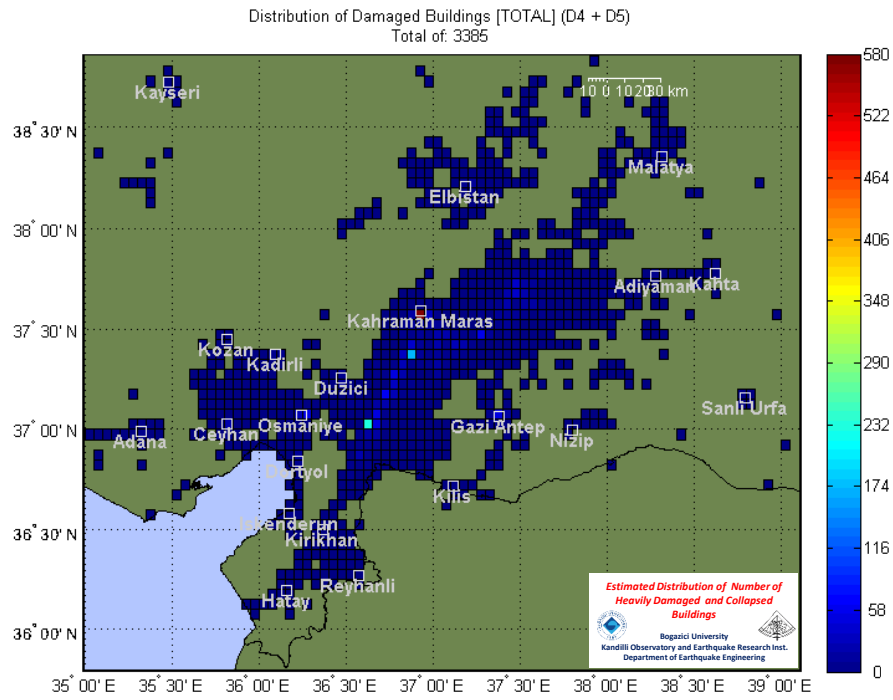
Intensity Equation : BA2014 Computed values ranging between 4.9 and 10.2 (min. and max. computed values might not be visible on the contour map).



INTENSITY BASED ESTIMATION of BUILDING DAMAGE DISTRIBUTION (REGIONAL SCALE)

GMPE : CY2008

Intensity Equation : AK2007

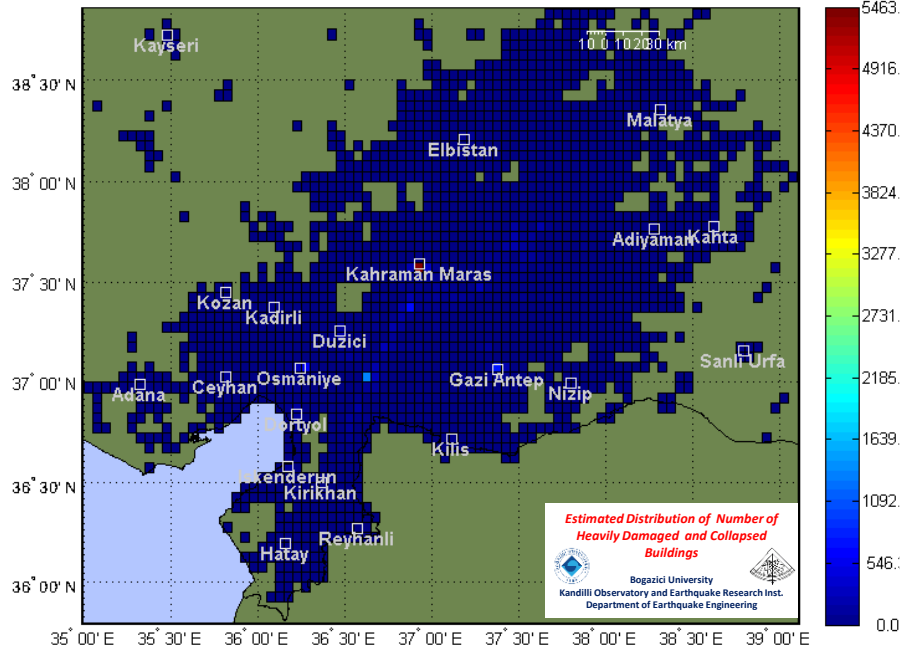


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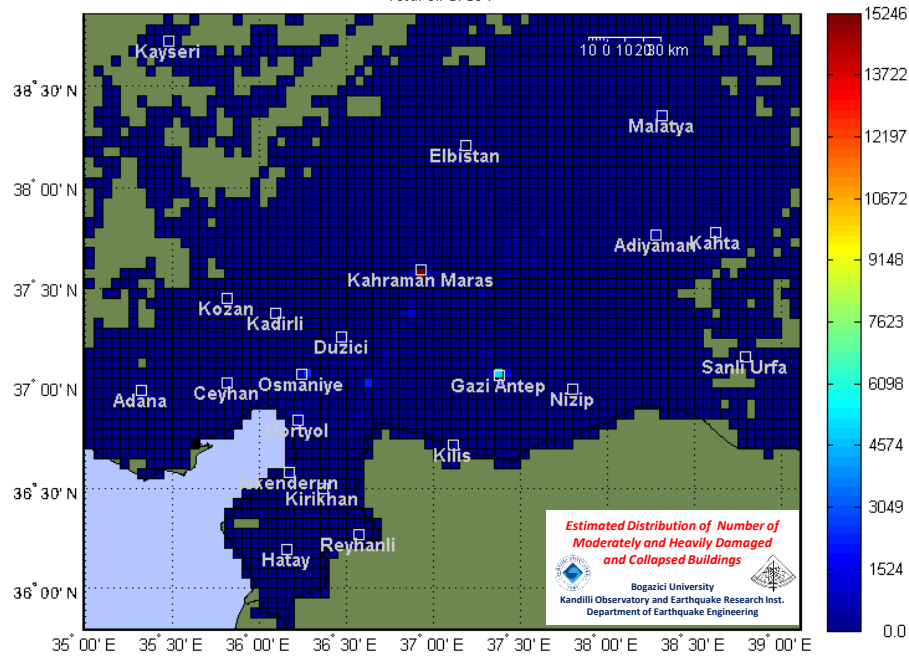
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GMPE : CY2014
Intensity Equation : BA2014

Distribution of Damaged Buildings [TOTAL] (D4 + D5)
Total of: 25711



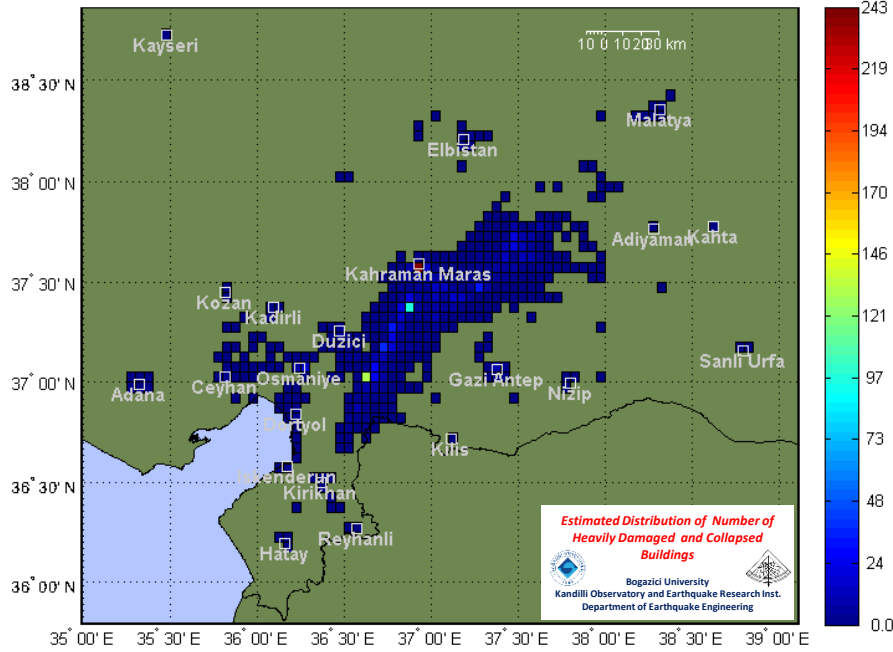
Distribution of Damaged Buildings [TOTAL] (D3 + D4 + D5)
Total of: 87094



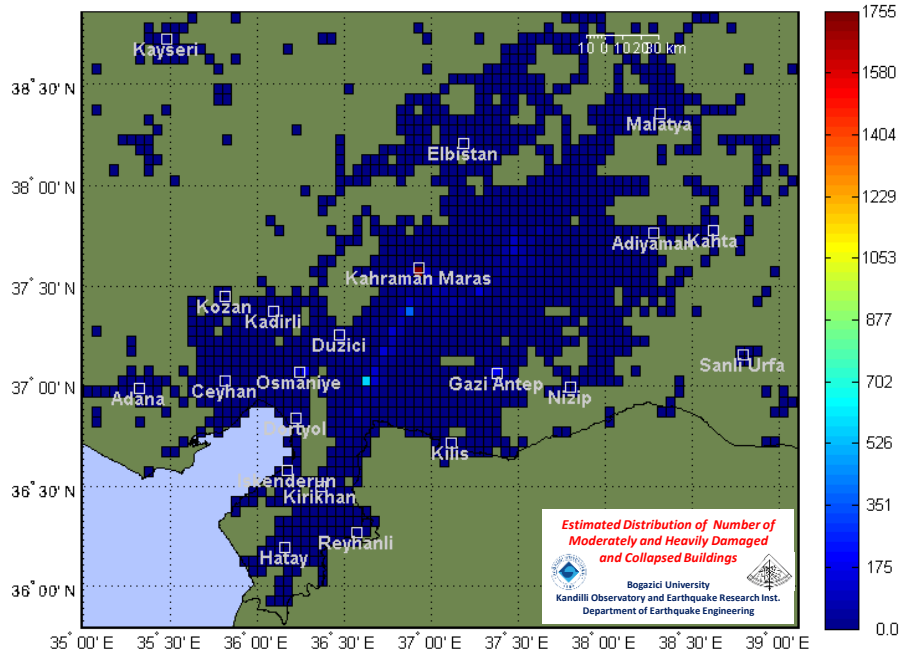
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GMPE : CY2014
Intensity Equation : WQHK1999

Distribution of Damaged Buildings [TOTAL] (D4 + D5)
Total of: 1547



Distribution of Damaged Buildings [TOTAL] (D3 + D4 + D5)
Total of: 9057

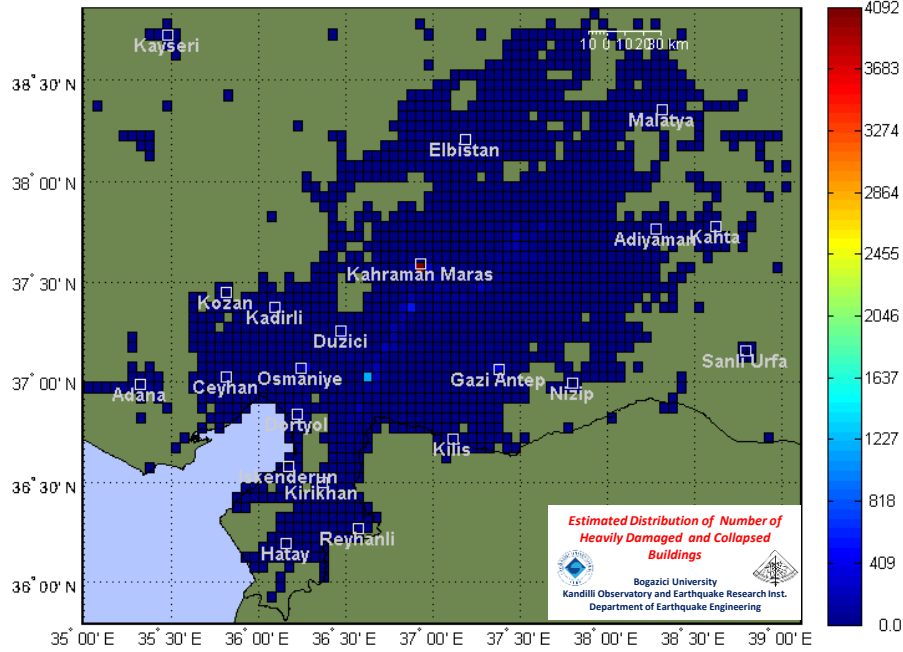


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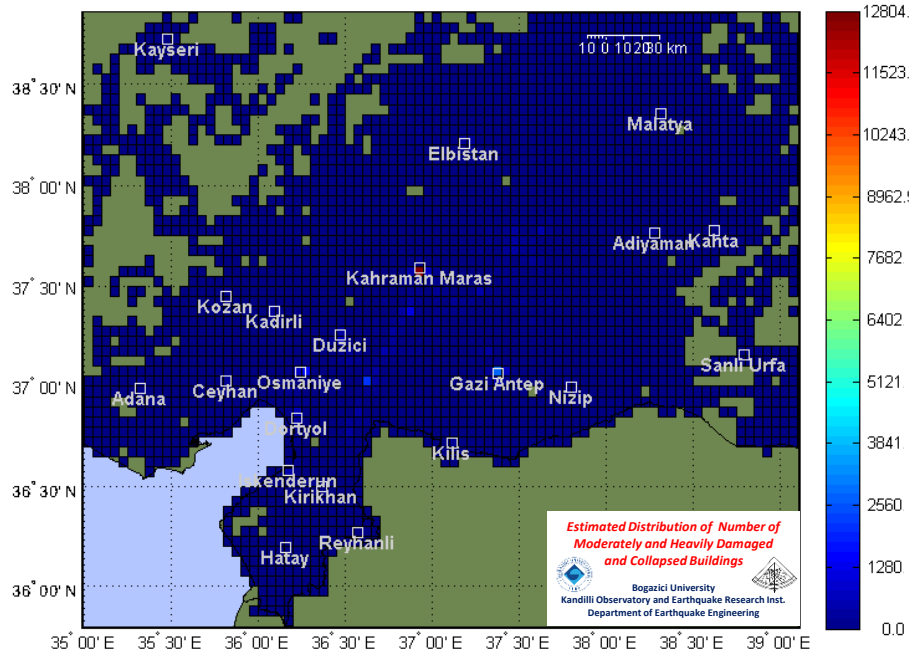
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GMPE : ASB2014
Intensity Equation : BA2014

Distribution of Damaged Buildings [TOTAL] (D4 + D5)
Total of: 18280



Distribution of Damaged Buildings [TOTAL] (D3 + D4 + D5)
Total of: 62938

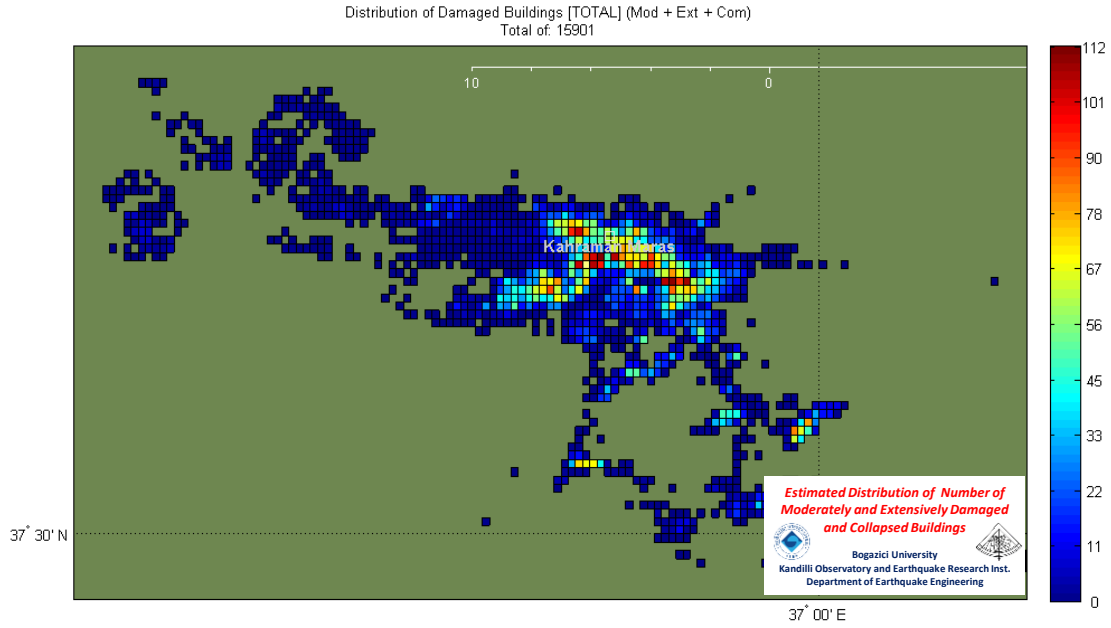


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SPECTRAL ACCELERATION-DISPLACEMENT BASED ESTIMATION of BUILDING DAMAGE DISTRIBUTION for KAHRAMANMARAS CITY

GMPE: CY2008

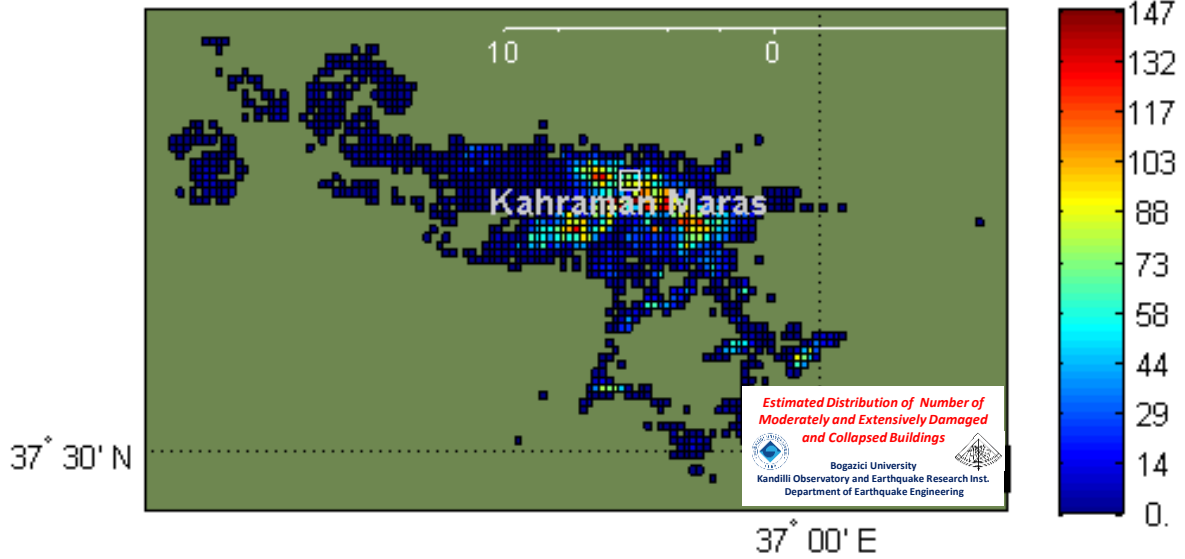


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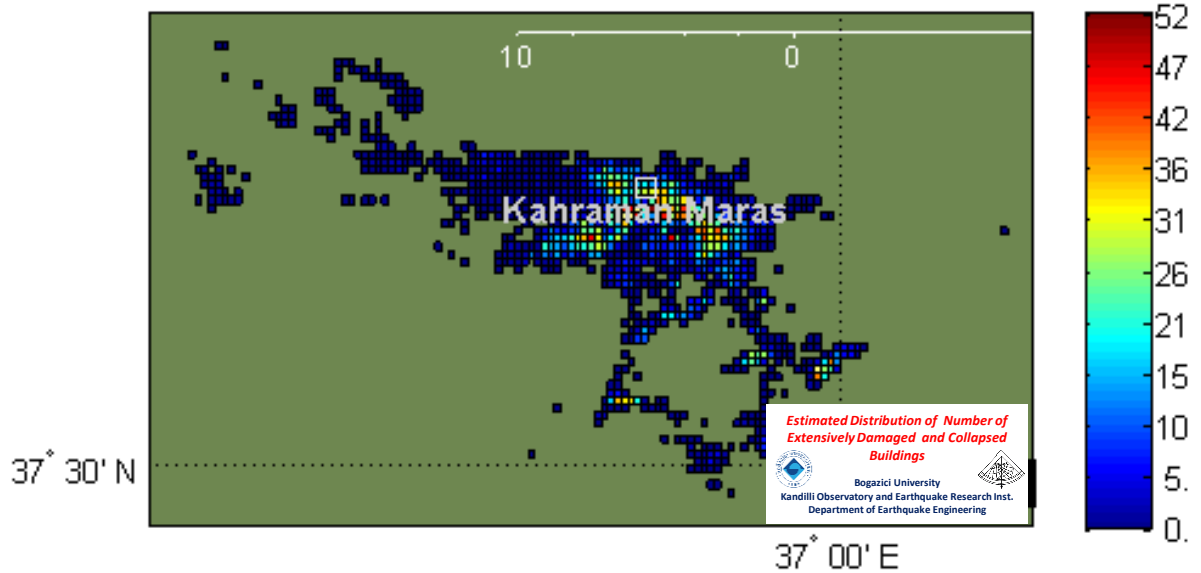
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GMPE: CY2014

Distribution of Damaged Buildings [TOTAL] (Mod + Ext + Com)
Total of: 20667

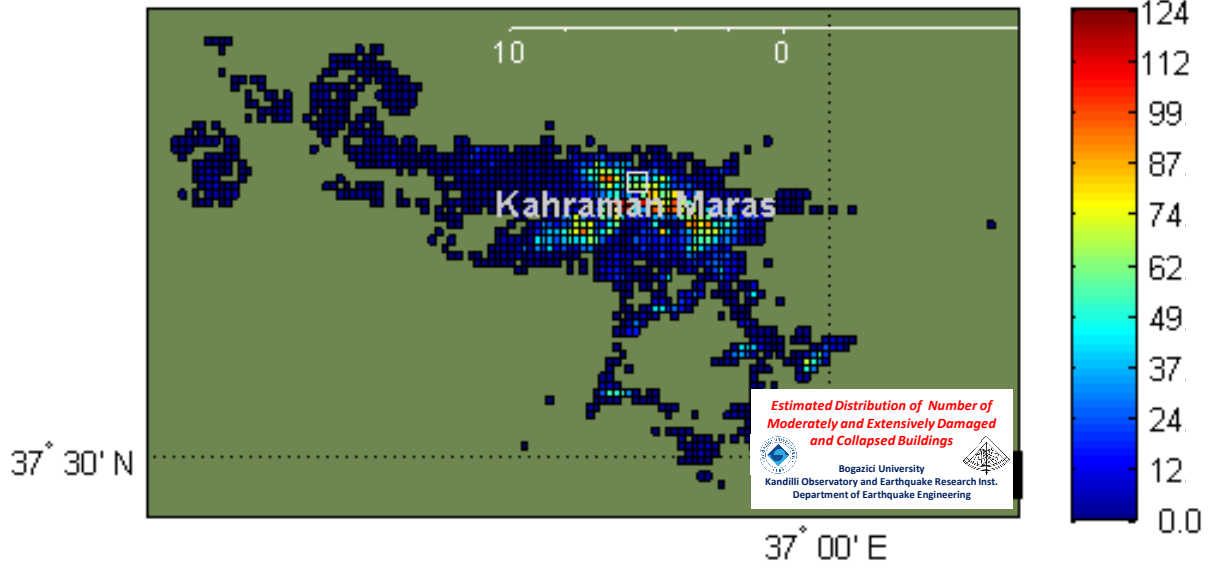


Distribution of Damaged Buildings [TOTAL] (Ext + Com)
Total of: 6649

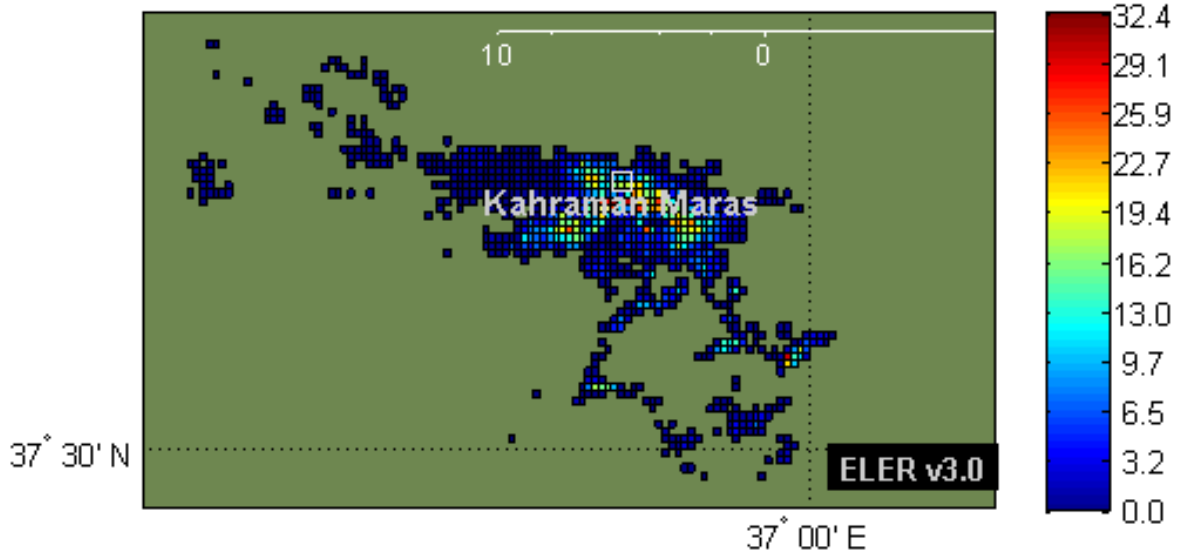


GMPE: ASB2014

Distribution of Damaged Buildings [TOTAL] (Mod + Ext + Com)
Total of: 15051



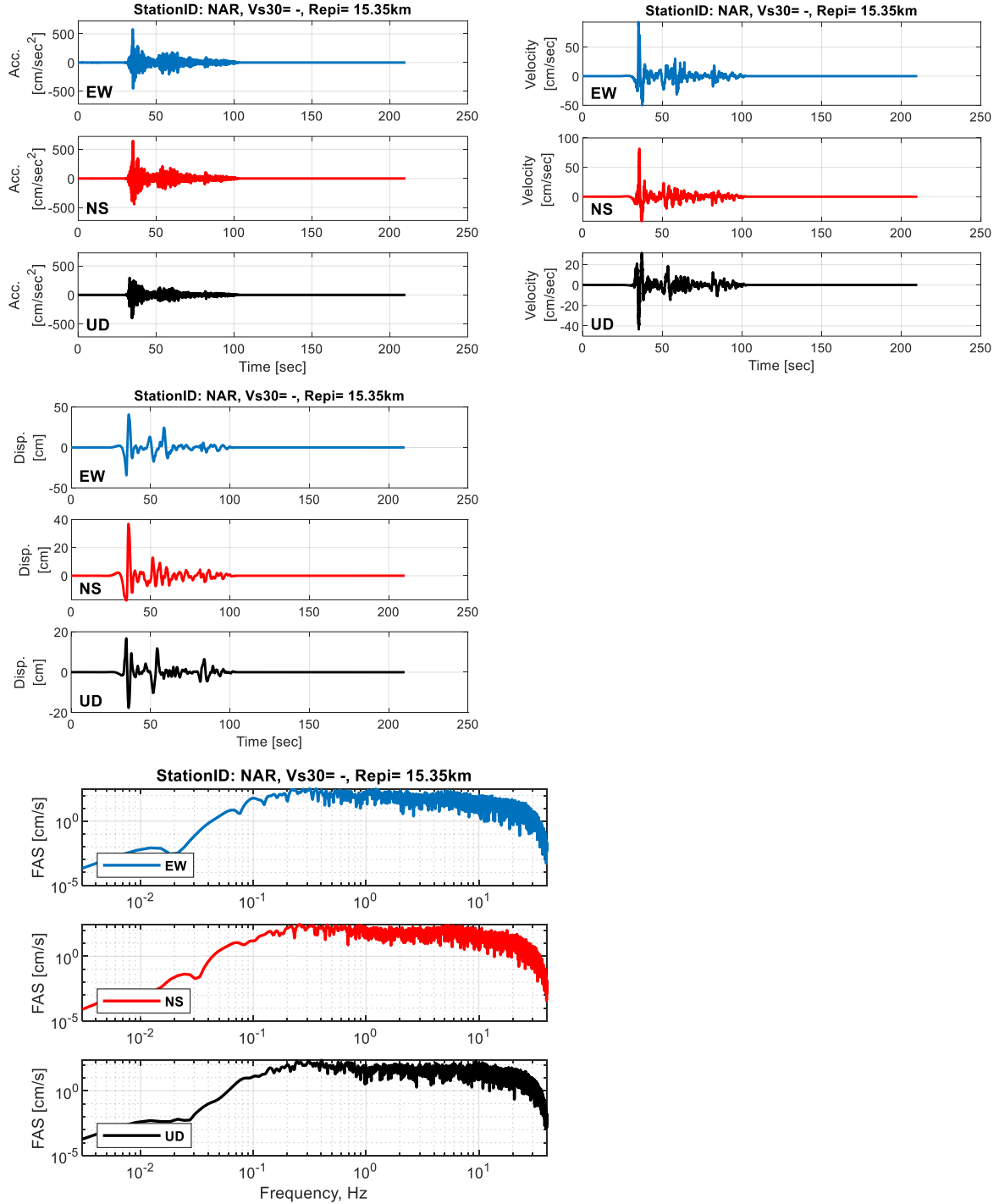
Distribution of Damaged Buildings [TOTAL] (Ext + Com)
Total of: 3721



Spectral acceleration-displacement based building damage estimation for Kahramanmaraş City

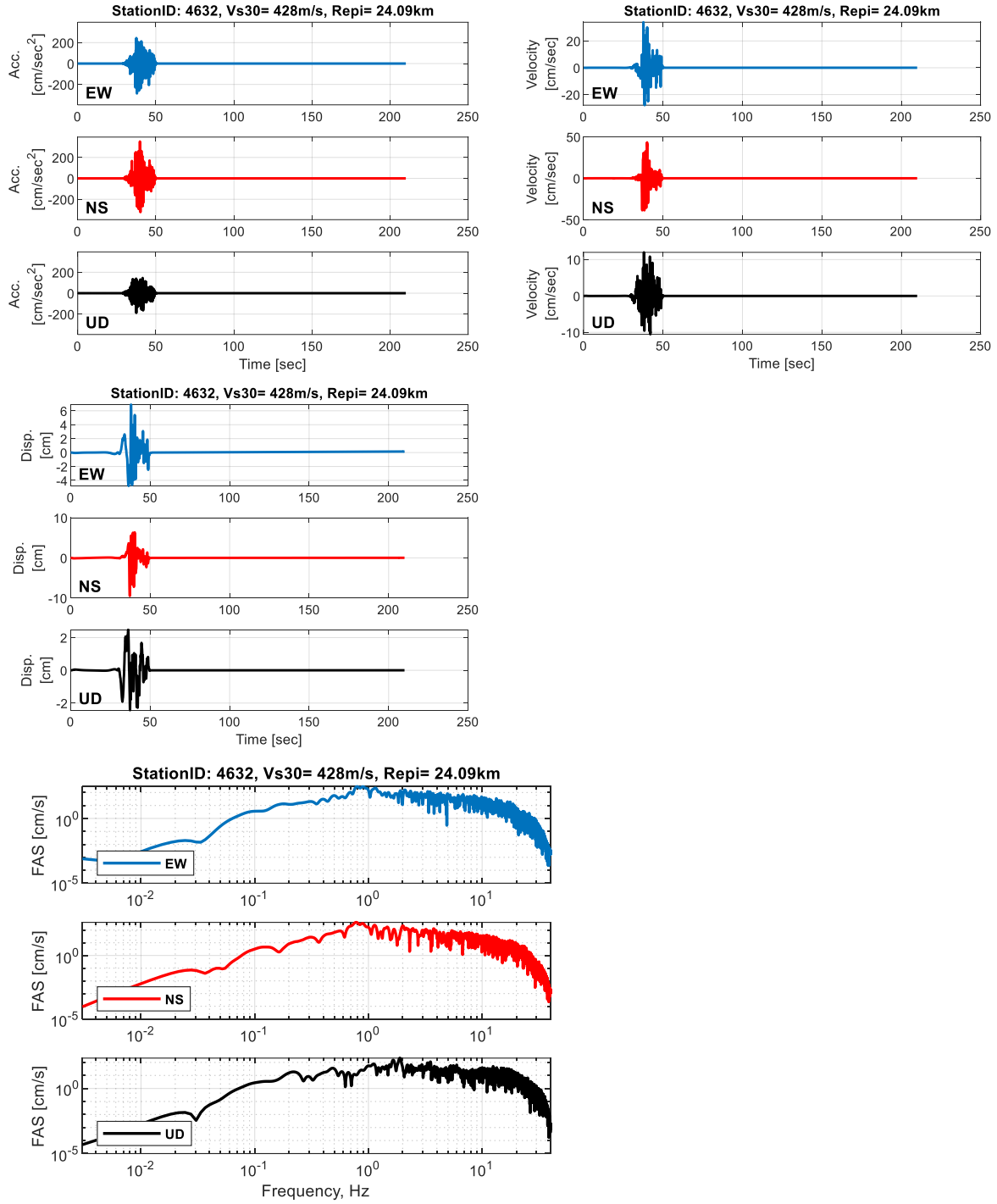
Damage State	Ground Motion Input			Average	% of total number of buildings
	CY2008	ASB2014	CY2014		
Complete	725	652	1415	931	2%
Extensive	3396	3069	5234	3900	9%
Moderate	11780	11330	14018	12376	27%
Slight	13387	13374	12943	13235	29%
None	16511	17373	12189	15358	34%

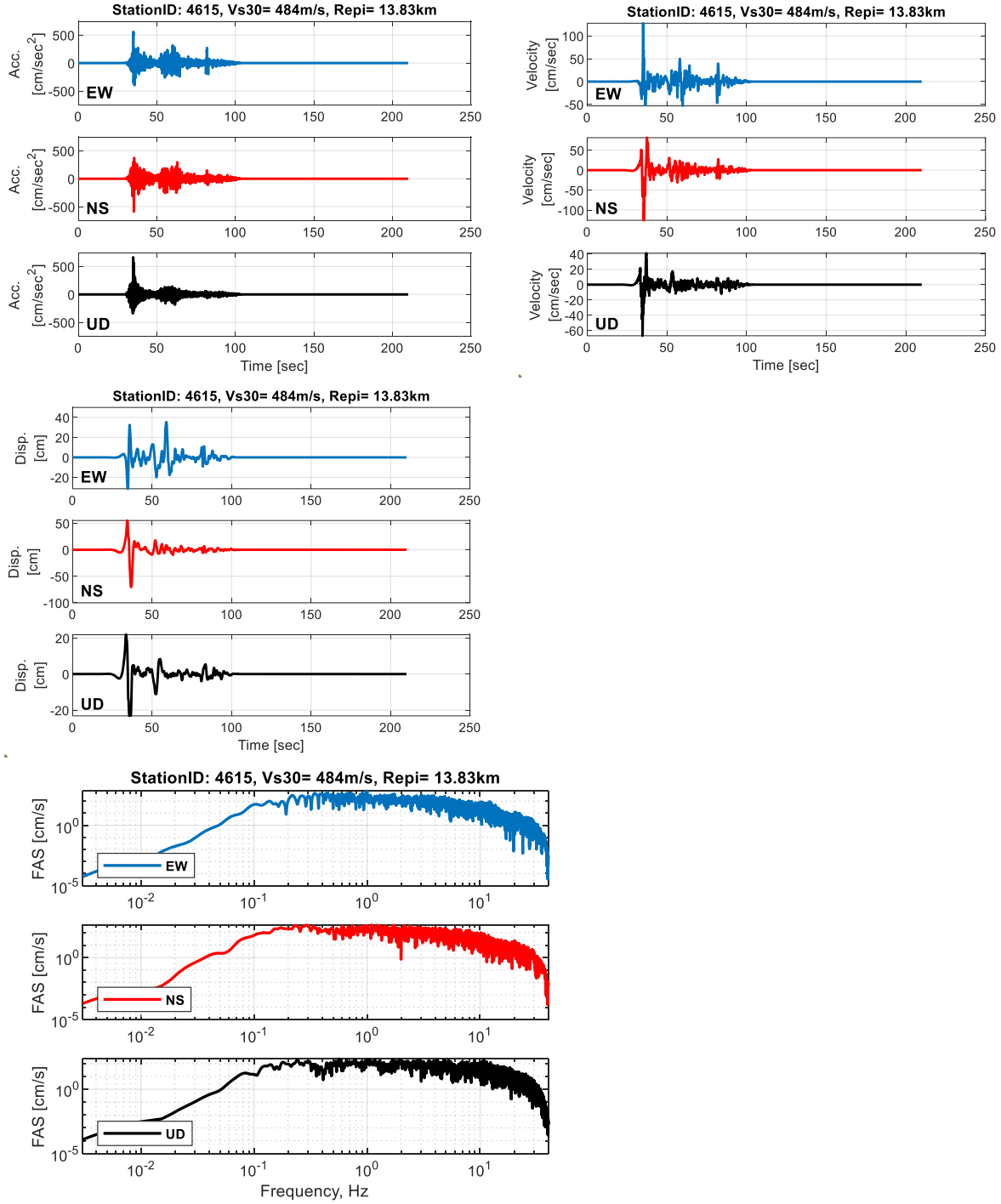
RECORDED DATA



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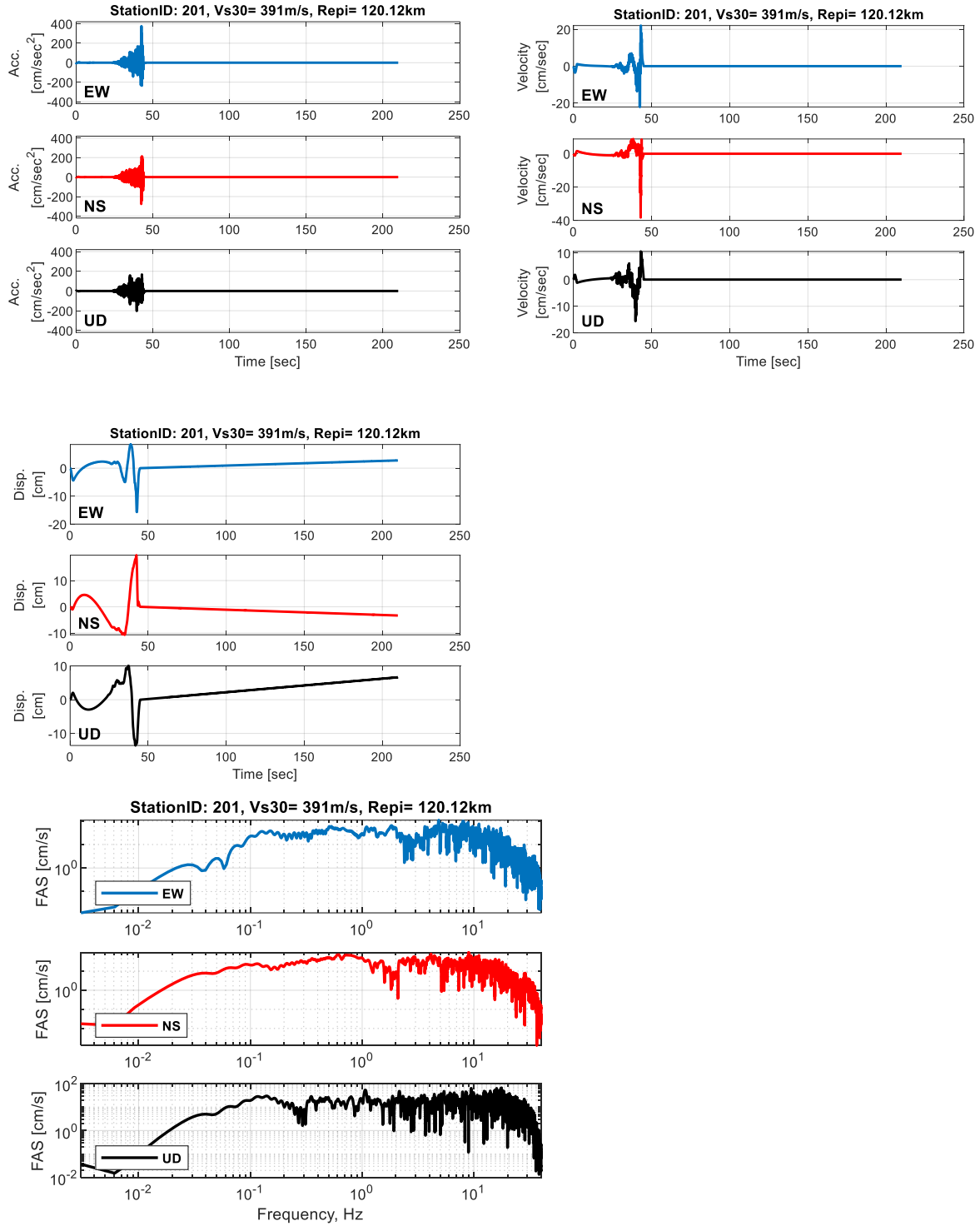
Preliminary Report v1





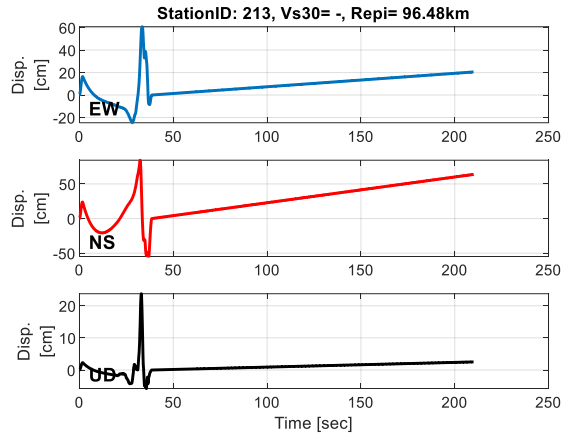
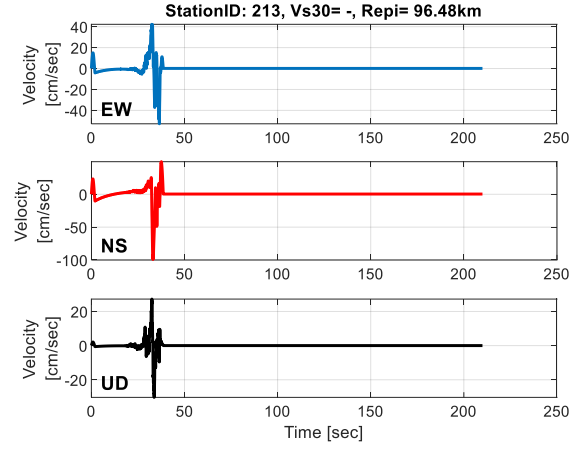
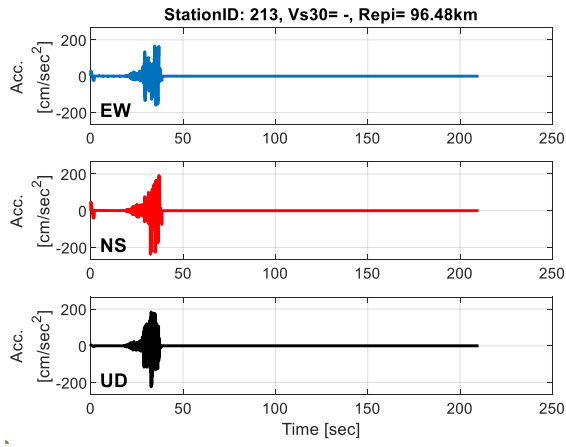
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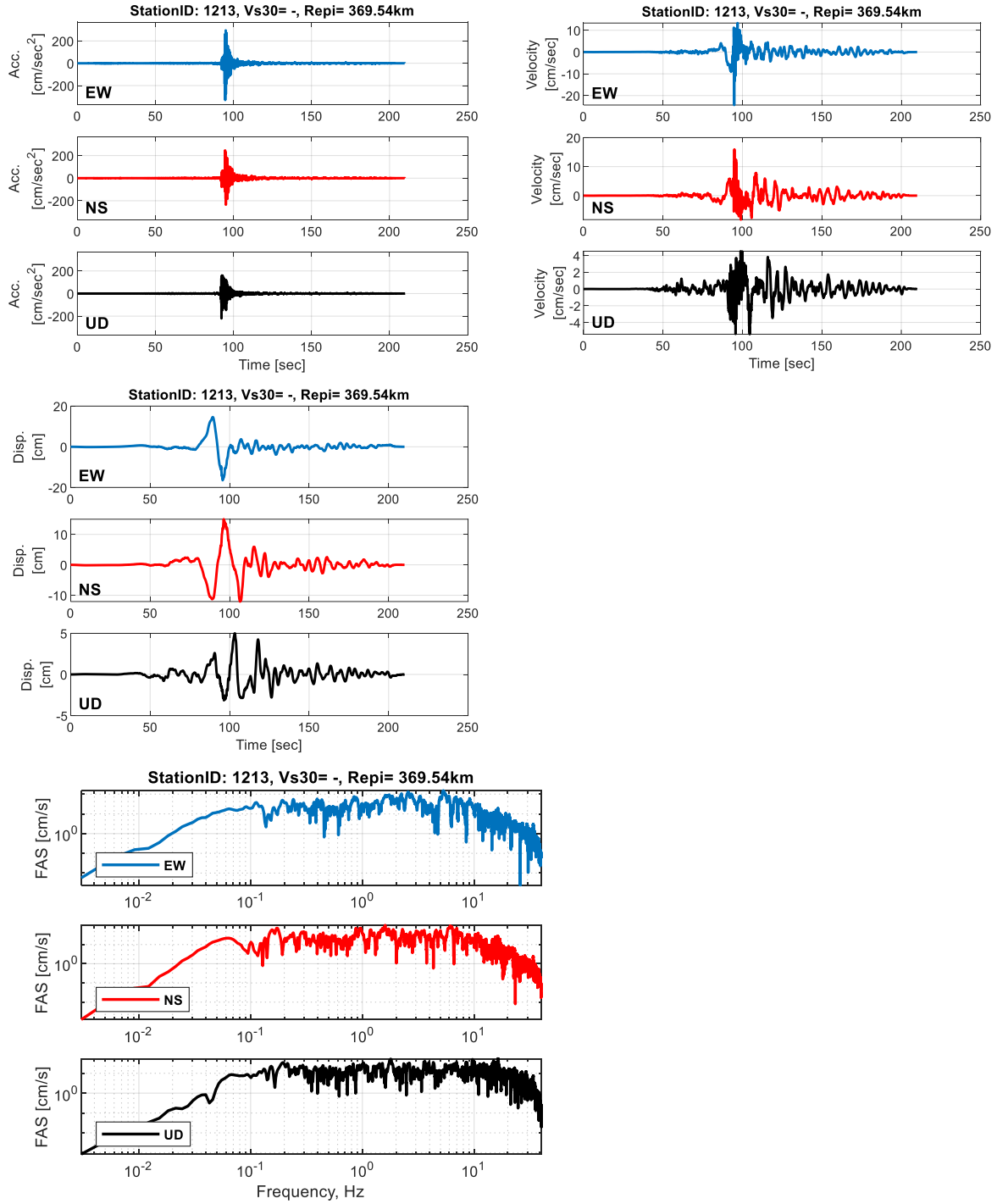
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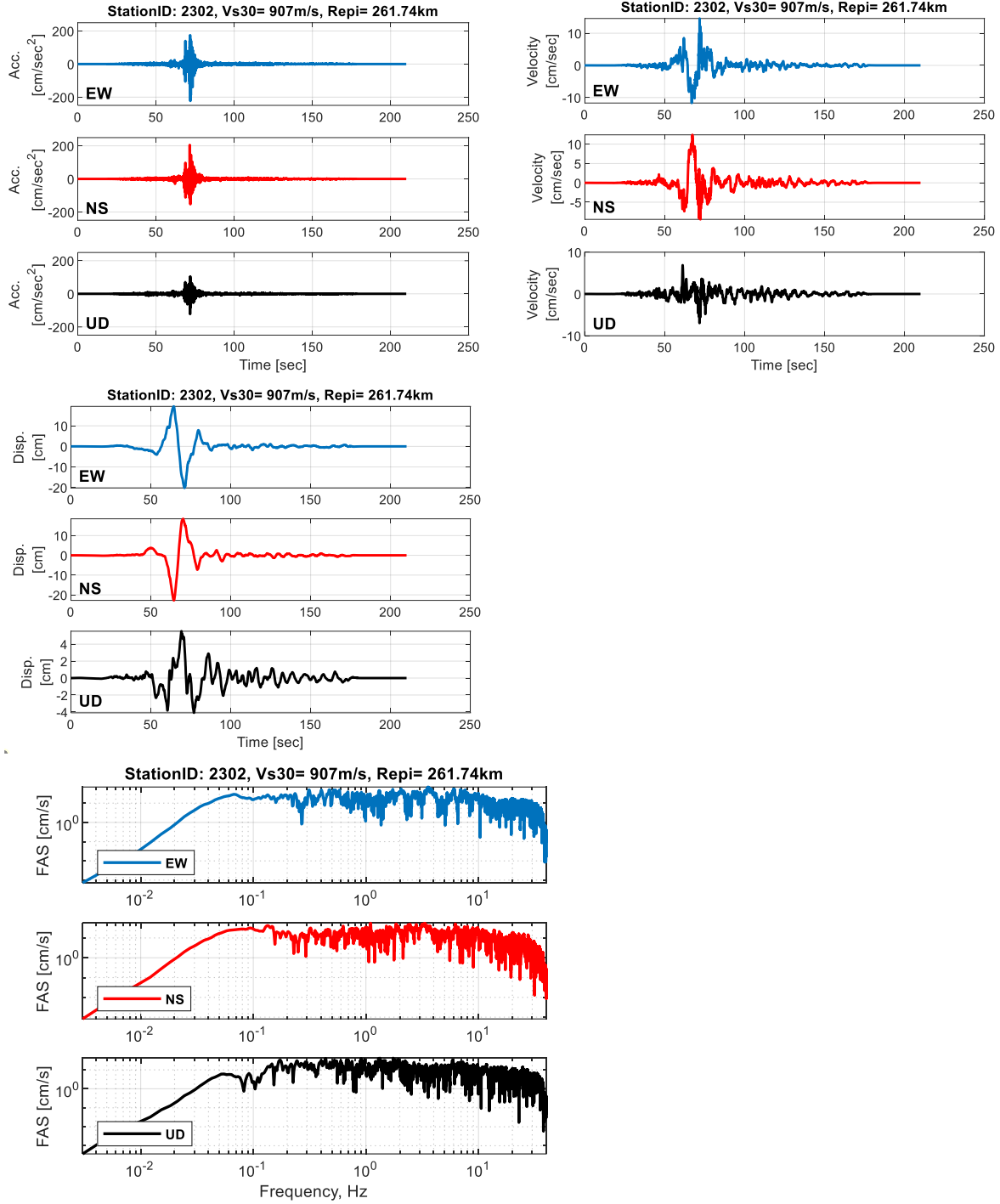
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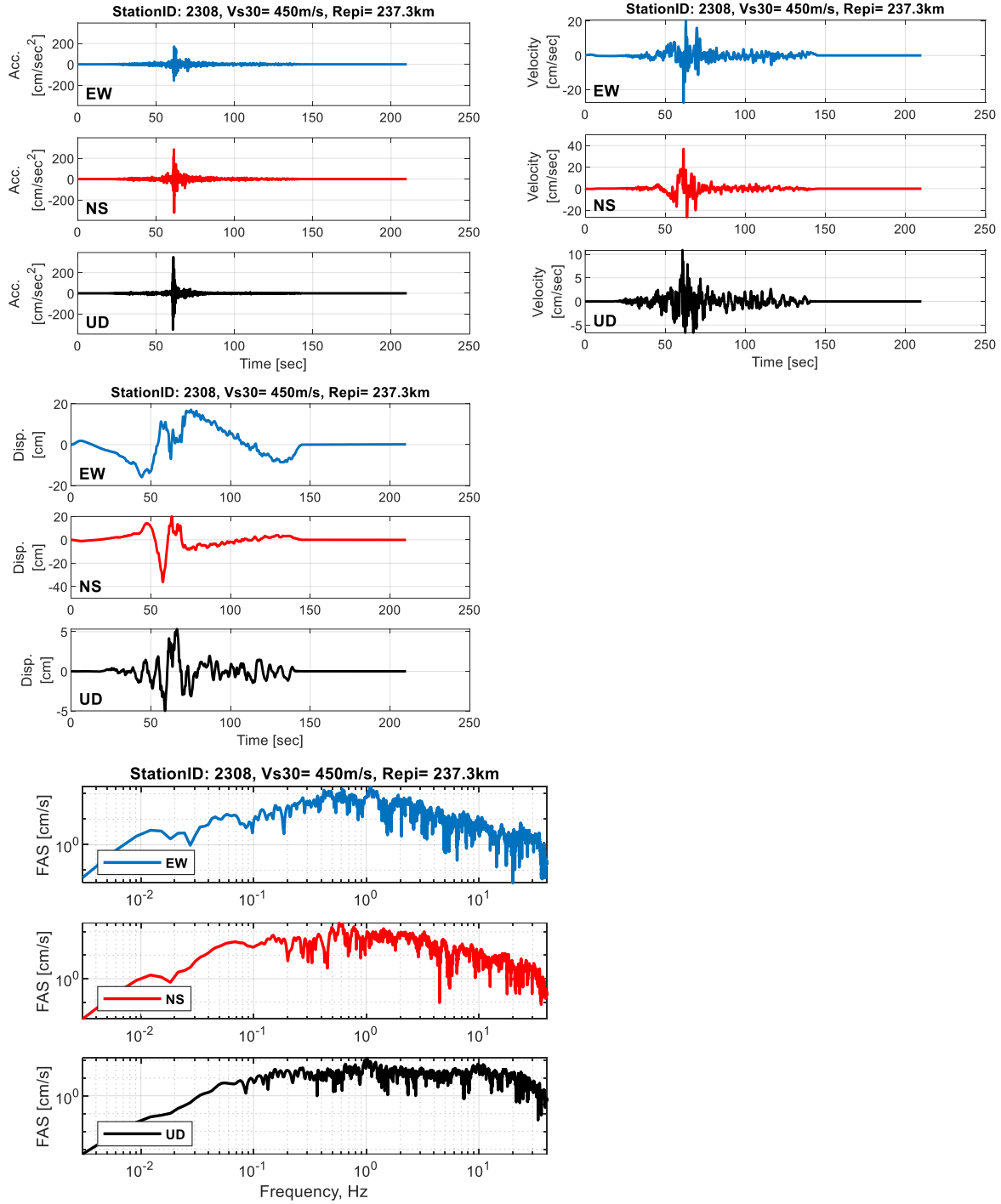
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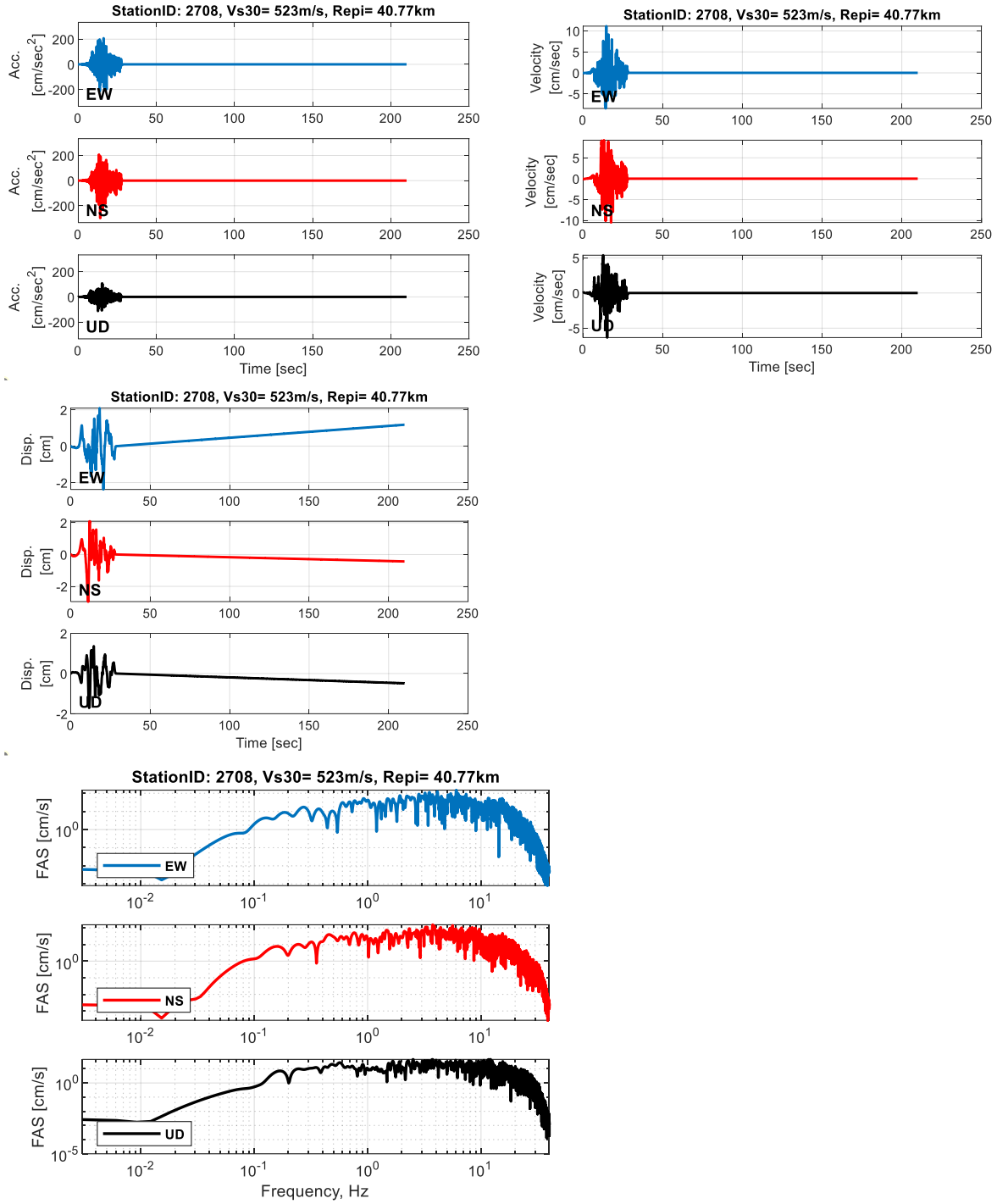
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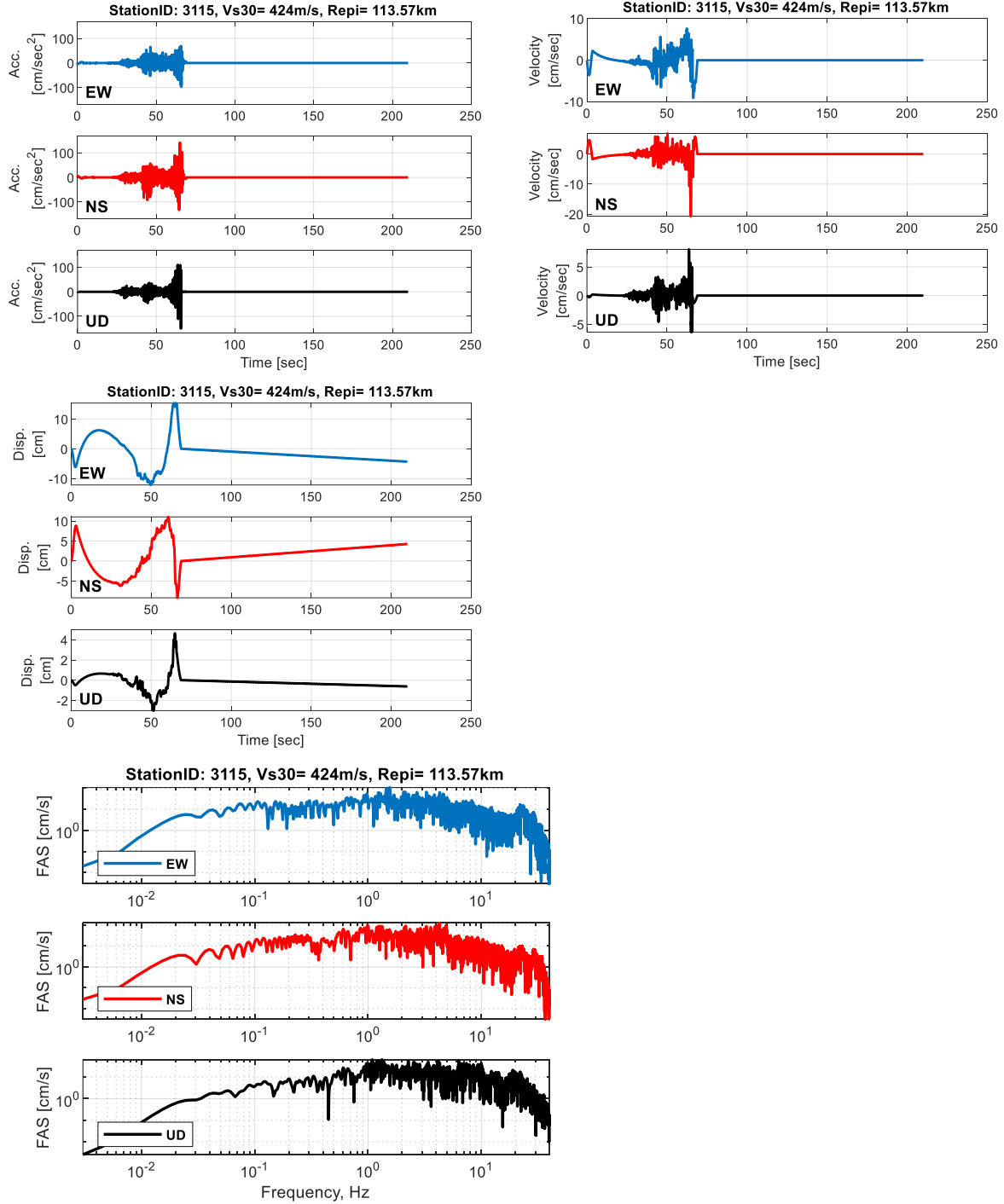
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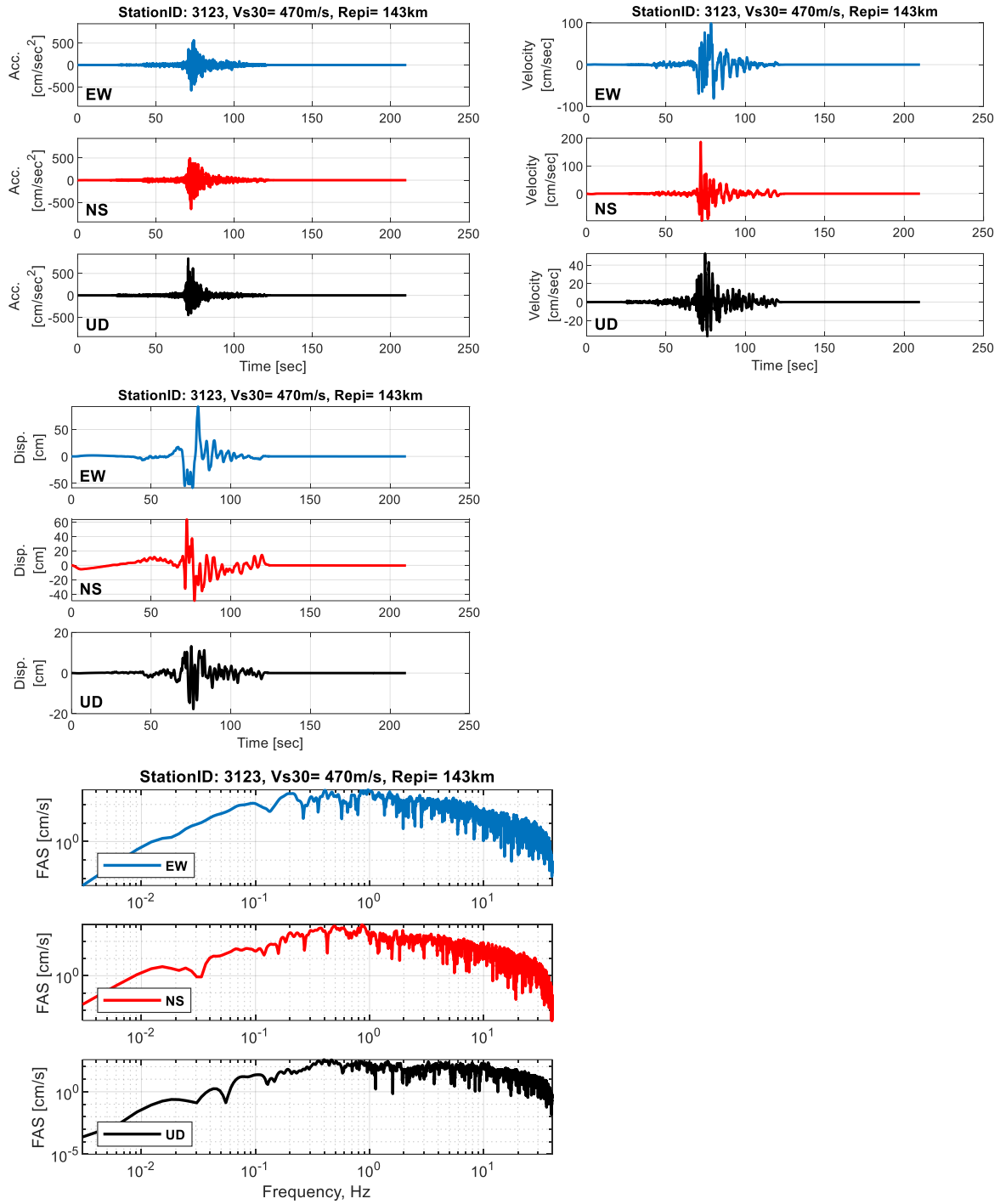
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ID	Latitude	Longitude	Vs30	Repi	Site Class	Component	PGA (cm/s^2)	PGV (cm/s)	PGD (cm)	AI (m/s)	DUR 5-95 (sec)	CAV (m/s)
201	37.76121	38.26742	391	120.12	B	(EW) (NS) (UD)	375.26 276.17 202.48	22.12 38.28 15.62	15.70 19.67 13.58	0.73 0.56 0.40	8.77 10.13 11.91	5.58 5.04 4.93
213	37.79667	37.92957	NaN	96.48	Unknown	(EW) (NS) (UD)	165.90 236.94 223.25	52.82 98.84 30.30	60.79 84.30 23.74	0.74 1.17 0.51	7.74 7.86 7.68	6.23 7.82 4.80
1213	39.231	40.4774	NaN	369.54	Unknown	(EW) (NS) (UD)	329.27 246.00 220.30	24.37 15.95 5.41	16.46 14.99 4.99	0.81 0.46 0.26	4.49 9.34 7.10	7.21 6.36 4.52
2302	38.39231	39.67541	907	261.74	A	(EW) (NS) (UD)	222.85 205.00 122.41	14.58 12.40 6.97	20.22 22.80 5.52	0.29 0.22 0.10	9.18 12.58 19.76	5.43 5.03 4.10
2308	38.45063	39.3102	450	237.3	B	(EW) (NS) (UD)	170.20 322.32 353.12	27.68 36.81 10.89	17.10 36.19 5.33	0.36 0.61 0.37	37.37 20.78 11.00	8.19 9.19 5.99
2708	37.09933	36.648373	523	40.77	B	(EW) (NS) (UD)	213.48 298.05 112.43	11.14 10.51 6.34	2.38 2.96 1.71	0.77 0.93 0.19	12.75 12.74 14.49	7.24 7.90 3.74
3115	36.54634	36.16459	424	113.57	B	(EW) (NS) (UD)	97.41 141.90 149.77	9.13 20.73 8.08	15.35 11.04 4.65	0.17 0.33 0.19	24.87 24.76 25.46	4.76 6.44 4.39
3123	36.21423	36.15973	470	143	B	(EW) (NS) (UD)	581.38 651.90 840.54	98.68 186.72 52.56	92.67 63.64 17.75	7.46 9.27 4.62	17.75 13.77 14.37	32.04 34.33 23.83
3124	36.2387	36.1722	283	140.11	C	(EW) (NS) (UD)	618.66 568.79 579.06	97.00 112.48 41.99	88.66 46.62 22.27	7.72 6.20 3.08	18.91 21.50 17.27	33.87 31.54 19.27

ID	Latitude	Longitude	Vs30	Repi	Site Class	Component	PGA (cm/s^2)	PGV (cm/s)	PGD (cm)	AI (m/s)	DUR 5-95 (sec)	CAV (m/s)
3131	36.19121	36.16328	567	144.98	B	(EW) (NS) (UD)	354.85 355.49 146.41	44.92 47.75 19.27	25.55 58.00 11.52	1.65 1.32 0.36	7.87 9.22 13.59	11.52 10.02 6.07
3132	36.20673	36.17159	377	143.12	B	(EW) (NS) (UD)	507.70 500.94 356.15	52.03 67.55 34.48	67.25 31.93 12.49	4.34 3.66 1.83	17.64 13.46 13.70	24.02 21.74 14.98
3133	36.2432	36.5736	377	123.47	B	(EW) (NS) (UD)	145.47 221.32 86.13	23.40 29.17 15.13	33.50 20.18 13.70	0.61 0.93 0.28	52.20 43.83 53.49	12.32 14.12 8.96
3134	36.82763	36.20485	374	90.29	B	(EW) (NS) (UD)	199.61 245.05 122.33	39.65 39.15 19.18	66.24 41.27 23.11	1.25 1.41 0.52	45.50 45.64 44.49	16.40 17.28 11.07
3136	36.11593	36.24722	344	148.38	C	(EW) (NS) (UD)	382.64 518.03 218.42	54.25 52.06 29.46	48.97 35.05 20.13	3.53 3.85 1.10	33.30 27.91 31.16	26.02 25.74 14.42
3137	36.69293	36.48852	688	82.48	B	(EW) (NS) (UD)	747.26 425.60 446.23	75.06 76.38 40.22	50.48 115.03 15.95	3.64 3.56 2.23	16.27 16.79 16.68	21.75 22.21 17.40
3139	36.58383	36.41439	272	96.19	C	(EW) (NS) (UD)	504.11 572.95 353.34	145.28 155.46 53.23	118.88 119.94 33.82	6.98 8.60 2.95	28.34 36.90 15.10	32.21 36.86 20.45
3142	36.49797	36.36612	539	106.49	B	(EW) (NS) (UD)	735.76 635.64 470.08	72.67 86.05 30.06	84.33 62.46 19.55	5.82 5.46 2.01	12.00 11.61 13.13	25.72 24.26 15.66
3144	36.75691	36.485742	485	77.04	B	(EW) (NS) (UD)	773.81 603.13 471.19	133.56 131.47 79.41	132.46 110.21 34.68	3.82 3.53 1.34	40.09 31.95 15.94	25.27 21.51 12.34

ID	Latitude	Longitude	Vs30	Repi	Site Class	Component	PGA (cm/s^2)	PGV (cm/s)	PGD (cm)	AI (m/s)	DUR 5-95 (sec)	CAV (m/s)
3145	36.64536	36.4064	533	91.13	B	(EW) (NS) (UD)	693.10 589.88 609.29	153.77 112.45 63.77	107.47 114.30 26.34	6.51 3.81 3.04	11.11 13.64 10.54	23.43 20.48 16.96
3146	36.490758	36.226952	NaN	114.57	Unknown	(EW) (NS) (UD)	324.94 463.19 273.11	54.73 42.24 19.45	70.81 51.86 9.50	3.07 4.55 1.73	17.03 16.84 17.89	18.69 21.98 14.42
4611	37.7472	37.28426	731	55.32	B	(EW) (NS) (UD)	311.25 339.30 165.08	37.84 30.73 13.82	24.61 19.25 9.29	2.49 2.69 0.73	44.09 43.13 47.66	22.65 23.22 12.59
4614	37.48513	37.29775	671	31.42	B	(EW) (NS) (UD)	1966.74 1948.77 1352.51	56.73 81.94 32.88	18.79 23.02 17.33	52.50 80.82 28.80	24.33 23.21 20.81	87.67 107.92 57.97
4615	37.38676	37.13803	484	13.83	B	(EW) (NS) (UD)	556.41 587.70 664.56	127.75 125.74 66.90	35.39 70.43 23.18	5.96 5.69 2.84	47.10 46.76 35.97	32.40 31.53 20.31
4624	37.5361	36.91765	280	29.73	C	(EW) (NS) (UD)	313.01 354.16 155.58	49.80 55.52 30.91	18.70 30.67 11.99	4.34 3.86 1.08	45.85 46.02 43.82	29.51 27.34 14.93
4629	37.287373	36.788705	382	22.5	C	(EW) (NS) (UD)	247.15 336.89 122.00	18.28 28.68 6.82	3.62 7.22 2.45	1.35 2.02 0.25	10.38 9.73 12.62	8.71 10.42 4.04
4632	37.256028	36.773694	428	24.09	B	(EW) (NS) (UD)	285.80 352.70 188.31	33.95 43.29 11.98	6.89 9.47 2.47	1.49 2.10 0.59	9.93 9.36 12.03	9.41 10.56 6.19
NAR	37.3919	37.1574	NaN	15.35	Unknown	(EW) (NS) (UD)	578.79 646.52 398.66	93.32 81.62 43.35	40.82 36.79 17.64	3.34 3.58 1.83	43.62 40.01 36.17	23.99 23.91 17.04

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