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Lampiran 1. Contoh data katalog gempa bumi Jawa Timur tahun 2016 hingga tahun 2021

No.	Date	Time	Latitude	Longitude	Depth	Magnitude
1	01/06/2021	53:47.3	8.43	114.76	200	4.4
2	01/06/2021	01:22.8	7.69	111.39	10	3.2
3	31/05/2021	24:31.6	8.6	113	85	4.2
4	28/05/2021	18:54.1	8.74	111.57	27	2.9
5	24/05/2021	19:58.3	8.04	114.2	10	2.7
6	21/05/2021	31:30.7	8.75	112.32	79	3.1
7	21/05/2021	09:22.9	8.68	112.31	115	5.8
8	21/05/2021	08:26.5	7.82	111.62	128	2.8
9	09/05/2021	54:24.2	8.2	114.76	13	2
10	09/05/2021	47:11.0	8.21	114.16	188	3.3
11	03/05/2021	22:37.2	7.78	112.33	167	3.8
12	30/04/2021	19:05.8	7.3	112.49	10	3.1
13	30/04/2021	18:30.5	8.57	111.96	77	3.6
14	27/04/2021	37:38.6	8.7	113.55	83	3.4
15	26/04/2021	56:57.3	7.22	114.51	10	3.1
16	20/04/2021	02:30.5	6.87	114.54	10	3.6
17	18/04/2021	01:17.5	7.37	114.5	12	3
18	13/04/2021	37:55.3	8.42	112.6	121	3.9
19	13/04/2021	24:01.2	8.01	112.87	10	2.9
20	10/04/2021	54:58.3	8.74	112.41	104	4.8
21	28/03/2021	26:00.4	8.31	114.77	12	2.2
22	23/03/2021	43:34.5	7.72	112.64	18	2.8
23	18/03/2021	33:20.5	8.67	112.1	105	3.1
24	14/03/2021	40:40.4	8.7	111.11	75	4.1
25	13/03/2021	34:38.3	7.75	112.12	196	3.6
26	06/03/2021	31:16.2	8.4	111.92	10	5.2
27	25/02/2021	14:28.7	8.62	112.1	103	3.1
28	24/02/2021	44:10.1	8.77	112.04	30	3.4
29	18/02/2021	52:21.4	8.02	114.74	170	2.9
30	11/02/2021	19:20.5	8.48	111.41	107	3.1
31	08/02/2021	09:28.9	8.73	113.01	114	3.4
32	01/02/2021	54:36.7	8.01	114.2	10	2.8
33	01/02/2021	50:45.5	8.02	114.2	10	2.7
34	27/01/2021	10:17.4	8.56	111.65	57	3
35	13/01/2021	00:14.3	8.71	114.36	79	3.5
36	11/01/2021	14:14.1	8	114.19	10	3.1

Lampiran 2. Perhitungan PGA menggunakan metode empiris Esteva

Perhitungan PGA - Excel																		
Data Parameter Gempabumi				Depth	Magnitudo		Latitude	Longitude	Koordinat episenter			(R)	PGA	(R)	PGA	(R)	PGA	
Year	Time	Magnitude	Depth	mb	ms	Lat	Long	Xh	Yh	Zh	R	PGA	R	PGA	R	PGA		
01/06/2021	53:47.3	4.4	ml	200	5.0264	3.797143	-8.43	114.76	-2551	5545.811	-904.219	389.7649	1.024337	349.2777	1.248491	311.1064	1.534712	
01/06/2021	01:22.8	3.2	ml	10	4.1576	2.245714	-7.69	111.39	-2293.32	5871.901	-850.757	125.4785	2.645446	146.2769	2.087681	178.6665	1.515017	
31/05/2021	24:31.6	4.2	ml	85	4.8836	3.542143	-8.6	113	-2422.83	5723.726	-939.506	167.8053	3.733396	128.487	5.679167	98.3025	8.428638	
28/05/2021	18:54.1	2.9	ml	27	3.9359	1.849821	-8.74	111.57	-2299.48	5833.559	-963.491	30.14919	11.57993	67.73841	4.909192	114.5209	2.386583	
24/05/2021	19:58.3	2.7	ml	10	3.7871	1.584107	-8.04	114.2	-2576.11	5747.63	-889.229	288.1793	0.45086	241.327	0.613538	195.6935	0.874116	
21/05/2021	31:30.7	3.1	ml	79	4.0839	2.114107	-8.75	112.32	-2356.07	5755.256	-956.679	105.0437	3.178635	81.58299	4.523688	84.17108	4.33708	
21/05/2021	09:22.9	5.8	ml	115	6.0036	5.542143	-8.68	112.31	-2342.03	5723.806	-943.654	133.973	19.15803	117.0514	23.50881	119.3067	22.8479	
21/05/2021	08:26.5	2.8	ml	128	3.8616	1.717143	-7.82	111.62	-2273.18	5752.122	-849.003	165.9279	1.240444	175.0121	1.137842	196.2331	0.942597	
09/05/2021	54:24.2	2	ml	13	3.26	0.642857	-8.2	114.76	-2629.85	5717.216	-906.378	343.753	0.188346	295.4989	0.246421	247.6546	0.33521	
09/05/2021	47:11.0	3.3	ml	188	4.2311	2.376964	-8.21	114.16	-2499.07	5586.175	-882.498	333.0784	0.5638	295.3946	0.697611	261.3476	0.864151	
03/05/2021	22:37.2	3.8	ml	167	4.5956	3.027857	-7.78	112.33	-2329.82	5688.315	-839.411	211.5069	1.850731	200.7526	2.019767	201.5436	2.006559	
30/04/2021	19:05.8	3.1	ml	10	4.0839	2.114107	-7.3	112.49	-2407.72	5832.032	-807.85	186.6195	1.302098	168.9336	1.53187	164.7048	1.595815	
30/04/2021	18:30.5	3.6	ml	77	4.4504	2.768571	-8.57	111.96	-2321.73	5774.532	-937.445	85.71557	6.31216	82.59306	6.637803	105.3911	4.719334	
27/04/2021	37:38.6	3.4	ml	83	4.3044	2.507857	-8.7	113.55	-2477.76	5700.518	-950.65	219.8238	1.259248	175.4702	1.831025	134.3899	2.795286	
26/04/2021	56:57.3	3.1	ml	10	4.0839	2.114107	-7.22	114.51	-2612.15	5744.607	-799.044	355.5256	0.427454	313.3341	0.535633	273.5548	0.680161	
20/04/2021	02:30.5	3.6	ml	10	4.4504	2.768571	-6.87	114.54	-2617.13	5747.572	-760.5	378.794	0.568794	338.9951	0.694527	302.04	0.852712	
18/04/2021	01:17.5	3	ml	12	4.01	1.982143	-7.37	114.5	-2609.46	5741.334	-815.298	346.7091	0.412787	303.5024	0.523161	262.4715	0.674723	
13/04/2021	37:55.3	3.9	ml	121	4.6679	3.156964	-8.42	112.6	-2370.3	5710.297	-914.717	161.486	3.123899	136.9136	4.051953	127.2487	4.533787	

Lampiran 3. Perhitungan PGA menggunakan metode empiris Donovan

No	Data Parameter Gempabumi				Depth	Magnitudo		Latitude	Longitude	Koordinat episerter			PGA	Koordinat titik pegamat			PGA		
	Date	Time	Magnitude	Depth		mb	ms			Xh	Yh	Zh		Xs	Ys	Zs		Xs	Ys
7	01/06/2021	53:47.3	4.4	ml	200	5.0264	3.797143	-8.43	114.76	-2551	5545.811	-904.219	389.7649	2.52618					
9	01/06/2021	01:22.8	3.2	ml	10	4.1576	2.245714	-7.69	111.39	-2293.32	5871.901	-850.757	125.4785	4.434128					
10	31/05/2021	24:31.6	4.2	ml	85	4.8836	3.542143	-8.6	113	-2422.83	5723.726	-939.506	167.8053	6.112701					
11	28/05/2021	18:54.1	2.9	ml	27	3.9359	1.849821	-8.74	111.57	-2299.48	5833.559	-963.491	30.14919	13.68597					
12	24/05/2021	19:58.3	2.7	ml	10	3.7871	1.584107	-8.04	114.2	-2576.11	5747.63	-889.229	288.1793	1.21049					
13	21/05/2021	31:30.7	3.1	ml	79	4.0839	2.114107	-8.75	112.32	-2356.07	5755.256	-956.679	105.0437	5.033829					
14	21/05/2021	09:22.9	5.8	ml	115	6.0036	5.542143	-8.68	112.31	-2342.03	5723.806	-943.654	133.973	21.43572					
15	21/05/2021	08:26.5	2.8	ml	128	3.8616	1.717143	-7.82	111.62	-2273.18	5752.122	-849.003	165.9279	2.486273					
16	09/05/2021	54:24.2	2	ml	13	3.26	0.642857	-8.2	114.76	-2629.85	5717.216	-906.378	343.753	0.609435					
17	09/05/2021	47:11.0	3.3	ml	188	4.2311	2.376964	-8.21	114.16	-2499.07	5586.175	-882.498	333.0784	1.507731					
18	03/05/2021	22:37.2	3.8	ml	167	4.5956	3.027857	-7.78	112.33	-2329.82	5688.315	-839.411	211.5069	3.609447					
19	30/04/2021	19:05.8	3.1	ml	10	4.0839	2.114107	-7.3	112.49	-2407.72	5832.032	-807.85	186.6195	2.647054					
20	30/04/2021	18:30.5	3.6	ml	77	4.4504	2.768571	-8.57	111.96	-2321.73	5774.532	-937.445	85.71557	8.634872					
21	27/04/2021	37:38.6	3.4	ml	83	4.3044	2.507857	-8.7	113.55	-2477.76	5700.518	-950.65	219.8238	2.658957					
22	26/04/2021	56:57.3	3.1	ml	10	4.0839	2.114107	-7.22	114.51	-2612.15	5744.607	-799.044	355.5256	1.220083					
23	20/04/2021	02:30.5	3.6	ml	10	4.4504	2.768571	-6.87	114.54	-2617.13	5747.572	-760.5	378.794	1.564878					
24	18/04/2021	01:17.5	3	ml	12	4.01	1.982143	-7.37	114.5	-2609.46	5741.334	-815.298	346.7091	1.178074					
25	13/04/2021	37:55.3	3.9	ml	121	4.6679	3.156964	-8.42	112.6	-2370.3	5710.297	-914.717	161.486	5.268618					

Lampiran 4. Perhitungan PGA menggunakan metode empiris Mc Guirre

Data Parameter Gempabumi										Magnitudo			Latitude		Longitude		Koordinat episenter			(R)	PGA	(R)	PGA
				mb	ms					Xh	Yh	Zh											
01/06/2021	53:47.3	4.4	ml	200	5.0264	3.797143	-8.43	114.76	-2551	5545.811	-904.219	389.7649	0.51726		349.2777	0.591213	311						
01/06/2021	01:22.8	3.2	ml	10	4.1576	2.245714	-7.69	111.39	-2293.32	5871.901	-850.757	125.4785	1.272492		146.2769	1.075245	178						
31/05/2021	24:31.6	4.2	ml	85	4.8836	3.542143	-8.6	113	-2422.83	5723.726	-939.506	167.8053	1.308061		128.487	1.759903	98						
28/05/2021	18:54.1	2.9	ml	27	3.9359	1.849821	-8.74	111.57	-2299.48	5833.559	-963.491	30.14919	4.220702		67.73841	2.146457	114						
24/05/2021	19:58.3	2.7	ml	10	3.7871	1.584107	-8.04	114.2	-2576.11	5747.63	-889.229	288.1793	0.41015		241.327	0.506413	195						
21/05/2021	31:30.7	3.1	ml	79	4.0839	2.114107	-8.75	112.32	-2356.07	5755.256	-956.679	105.0437	1.484865		81.58299	1.923513	84						
21/05/2021	09:22.9	5.8	ml	115	6.0036	5.542143	-8.68	112.31	-2342.03	5723.806	-943.654	133.973	2.88513		117.0514	3.340067	119						
21/05/2021	08:26.5	2.8	ml	128	3.8616	1.717143	-7.82	111.62	-2273.18	5752.122	-849.003	165.9279	0.80939		175.0121	0.761895	196						
09/05/2021	54:24.2	2	ml	13	3.26	0.642857	-8.2	114.76	-2629.85	5717.216	-906.378	343.753	0.257203		295.4989	0.308687	247						
09/05/2021	47:11.0	3.3	ml	188	4.2311	2.376964	-8.21	114.16	-2499.07	5586.175	-882.498	333.0784	0.42679		295.3946	0.493223	261						
03/05/2021	22:37.2	3.8	ml	167	4.5956	3.027857	-7.78	112.33	-2329.82	5688.315	-839.411	211.5069	0.872755		200.7526	0.927228	201						
30/04/2021	19:05.8	3.1	ml	10	4.0839	2.114107	-7.3	112.49	-2407.72	5832.032	-807.85	186.6195	0.788078		168.9336	0.882837	164						
30/04/2021	18:30.5	3.6	ml	77	4.4504	2.768571	-8.57	111.96	-2321.73	5774.532	-937.445	85.71557	2.184458		82.59306	2.267295	105						
21/04/2021	37:38.6	3.4	ml	83	4.3044	2.507857	-8.7	113.55	-2477.76	5700.518	-950.65	219.8238	0.725086		175.4702	0.940418	134						
26/04/2021	56:57.3	3.1	ml	10	4.0839	2.114107	-7.22	114.51	-2612.15	5744.607	-799.044	355.5256	0.367314		313.3341	0.427995	273						
20/04/2021	02:30.5	3.6	ml	10	4.4504	2.768571	-6.87	114.54	-2617.13	5747.572	-760.5	378.794	0.405738		338.9951	0.464381	3						
18/04/2021	01:17.5	3	ml	12	4.01	1.982143	-7.37	114.5	-2609.46	5741.334	-815.298	346.7091	0.365434		303.5024	0.429167	262						
13/04/2021	37:55.3	3.9	ml	121	4.6679	3.156964	-8.42	112.6	-2370.3	5710.297	-914.717	161.486	1.231094		136.9136	1.479532	127						

Lampiran 5. Perhitungan PGA menggunakan metode empiris Lin dan Wu

Data Parameter Gempabumi		Depth	Magnitudo		Latitude	Longitude	Koordinat episenter			1 lat		1 long		2		3	
			mb	ms			Xh	Yh	Zh	R	PGA	R	PGA	R	PGA	R	PGA
01/06/2021	53:47.3	4.4 ml	200	5.0264	3.797143	-8.43	114.76	-2551	5545.811	-904.219	389.7649	32.03561	349.2777	33.45396	311.1064	35.01877	
01/06/2021	01:22.8	3.2 ml	10	4.1576	2.245714	-7.69	111.39	-2293.32	5871.901	-850.757	125.4785	35.48666	146.2769	33.4007	178.6665	30.86335	
31/05/2021	24:31.6	4.2 ml	85	4.8836	3.542143	-8.6	113	-2422.83	5723.726	-939.506	167.8053	42.18924	128.487	46.8814	98.3025	52.11191	
28/05/2021	18:54.1	2.9 ml	27	3.9359	1.849821	-8.74	111.57	-2299.48	5833.559	-963.491	30.14919	57.17236	67.73841	41.52601	114.5209	33.74741	
24/05/2021	19:58.3	2.7 ml	10	3.7871	1.584107	-8.04	114.2	-2576.11	5747.63	-889.229	288.1793	22.12754	241.327	23.73399	195.6935	25.78264	
21/05/2021	31:30.7	3.1 ml	79	4.0839	2.114107	-8.75	112.32	-2356.07	5755.256	-956.679	105.0437	36.98783	81.58299	40.87127	84.17108	40.37018	
21/05/2021	09:22.9	5.8 ml	115	6.0036	5.542143	-8.68	112.31	-2342.03	5723.806	-943.654	133.973	73.085	117.0514	77.08878	119.3067	76.50985	
15/05/2021	08:26.5	2.8 ml	128	3.8616	1.717143	-7.82	111.62	-2273.18	5752.122	-849.003	165.9279	28.32251	175.0121	27.73244	196.2331	26.50666	
09/05/2021	54:24.2	2 ml	13	3.26	0.642857	-8.2	114.76	-2629.85	5717.216	-906.378	343.753	16.87262	295.4989	17.91144	247.6546	19.20572	
09/05/2021	47:11.0	3.3 ml	188	4.2311	2.376964	-8.21	114.16	-2499.07	5586.175	-882.498	333.0784	24.83672	295.3946	26.043	261.3476	27.33371	
03/05/2021	22:37.2	3.8 ml	167	4.5956	3.027857	-7.78	112.33	-2329.82	5688.315	-839.411	211.5069	34.31601	200.7526	35.0307	201.5436	34.97633	
30/04/2021	19:05.8	3.1 ml	10	4.0839	2.114107	-7.3	112.49	-2407.72	5832.032	-807.85	186.6195	29.47623	168.9336	30.65859	164.7048	30.96714	
30/04/2021	18:30.5	3.6 ml	77	4.4504	2.768571	-8.57	111.96	-2321.73	5774.532	-937.445	85.71557	46.28512	82.59306	46.96857	105.3911	42.65721	
21/04/2021	37:38.6	3.4 ml	83	4.3044	2.507857	-8.7	113.55	-2477.76	5700.518	-950.65	219.8238	30.12177	175.4702	32.92605	134.3899	36.58433	
26/04/2021	56:57.3	3.1 ml	10	4.0839	2.114107	-7.22	114.51	-2612.15	5744.607	-799.044	355.5256	22.85104	313.3341	24.02022	273.5548	25.34355	
20/04/2021	02:30.5	3.6 ml	10	4.4504	2.768571	-6.87	114.54	-2617.13	5747.572	-760.5	378.794	25.73539	338.9951	26.88894	302.04	28.14327	
18/04/2021	01:17.5	3 ml	12	4.01	1.982143	-7.37	114.5	-2609.46	5741.334	-815.298	346.7091	22.42403	303.5024	23.63447	262.4715	25.0301	
13/04/2021	37:55.3	3.9 ml	121	4.6679	3.156964	-8.47	112.6	-2370.3	5710.297	-914.717	161.486	39.29042	136.9136	41.9376	127.2487	43.168	

Lampiran 6. Perhitungan PGA menggunakan metode empiris Fukushima

Data Parameter Gempabumi													Koordinat episenter		Koordinat titik pegama		PGA	
Date	mb	ms	Latitude	Longitude	Xh	Yh	Zh	R	PGA	Xs	Ys	Zs	Xs	Ys	Zs	Xs	Ys	
01/06/2021	53.47.3	4.4	ml	200	5.0264	3.797143	-8.43	114.76	-2551	5545.811	-904.219	389.7649	0.153367	-8.77748	112.1355	-971.709	-2412.35	5816.011
01/06/2021	01:22.8	3.2	ml	10	4.1576	2.245714	-7.69	111.39	-2293.32	5871.901	-850.757	125.4785	1.214893	-8.77748	112.5846	-971.709	-2412.35	5816.011
31/05/2021	24:31.6	4.2	ml	85	4.8836	3.542143	-8.6	113	-2422.83	5723.726	-939.506	167.8053	1.668443	-8.77748	112.5846	-971.709	-2412.35	5816.011
28/05/2021	18:54.1	2.9	ml	27	3.9359	1.849821	-8.74	111.57	-2299.48	5833.559	-963.491	30.14919	7.946061	-8.77748	112.5846	-971.709	-2412.35	5816.011
24/05/2021	19:58.3	2.7	ml	10	3.7871	1.584107	-8.04	114.2	-2576.11	5747.63	-889.229	288.1793	0.092664	-8.77748	112.5846	-971.709	-2412.35	5816.011
21/05/2021	31:30.7	3.1	ml	79	4.0839	2.114107	-8.75	112.32	-2356.07	5755.256	-956.679	105.0437	1.548885	-8.77748	112.5846	-971.709	-2412.35	5816.011
21/05/2021	09:22.9	5.8	ml	115	6.0036	5.542143	-8.68	112.31	-2342.03	5723.806	-943.654	133.973	11.78653	-8.77748	112.5846	-971.709	-2412.35	5816.011
21/05/2021	08:26.5	2.8	ml	128	3.8616	1.717143	-7.82	111.62	-2273.18	5752.122	-849.003	165.9279	0.459991	-8.77748	112.5846	-971.709	-2412.35	5816.011
09/05/2021	54:24.2	2	ml	13	3.26	0.642857	-8.2	114.76	-2629.85	5717.216	-906.378	343.753	0.025985	-8.77748	112.5846	-971.709	-2412.35	5816.011
09/05/2021	47:11.0	3.3	ml	188	4.2311	2.376964	-8.21	114.16	-2499.07	5586.175	-882.498	333.0784	0.099322	-8.77748	112.5846	-971.709	-2412.35	5816.011
03/05/2021	22:37.2	3.8	ml	167	4.5956	3.027857	-7.78	112.33	-2329.82	5688.315	-839.411	211.5069	0.647416	-8.77748	112.5846	-971.709	-2412.35	5816.011
30/04/2021	19:05.8	3.1	ml	10	4.0839	2.114107	-7.3	112.49	-2407.72	5832.032	-807.85	186.6195	0.461476	-8.77748	112.5846	-971.709	-2412.35	5816.011
30/04/2021	18:30.5	3.6	ml	77	4.4504	2.768571	-8.57	111.96	-2321.73	5774.532	-937.445	85.71557	3.521136	-8.77748	112.5846	-971.709	-2412.35	5816.011
27/04/2021	37:38.6	3.4	ml	83	4.3044	2.507857	-8.7	113.55	-2477.76	5700.518	-950.65	219.8238	0.400831	-8.77748	112.5846	-971.709	-2412.35	5816.011
26/04/2021	56:57.3	3.1	ml	10	4.0839	2.114107	-7.22	114.51	-2612.15	5744.607	-799.044	355.5256	0.064657	-8.77748	112.5846	-971.709	-2412.35	5816.011
20/04/2021	02:30.5	3.6	ml	10	4.4504	2.768571	-6.87	114.54	-2617.13	5747.572	-760.5	378.794	0.081022	-8.77748	112.5846	-971.709	-2412.35	5816.011
18/04/2021	01:17.5	3	ml	12	4.01	1.982143	-7.37	114.5	-2609.46	5741.334	-815.298	346.7091	0.064646	-8.77748	112.5846	-971.709	-2412.35	5816.011
13/04/2021	37:55.3	3.9	ml	121	4.6679	3.156964	-8.42	112.6	-2370.3	5710.297	-914.717	161.486	1.375333	-8.77748	112.5846	-971.709	-2412.35	5816.011