

Supplementary Materials

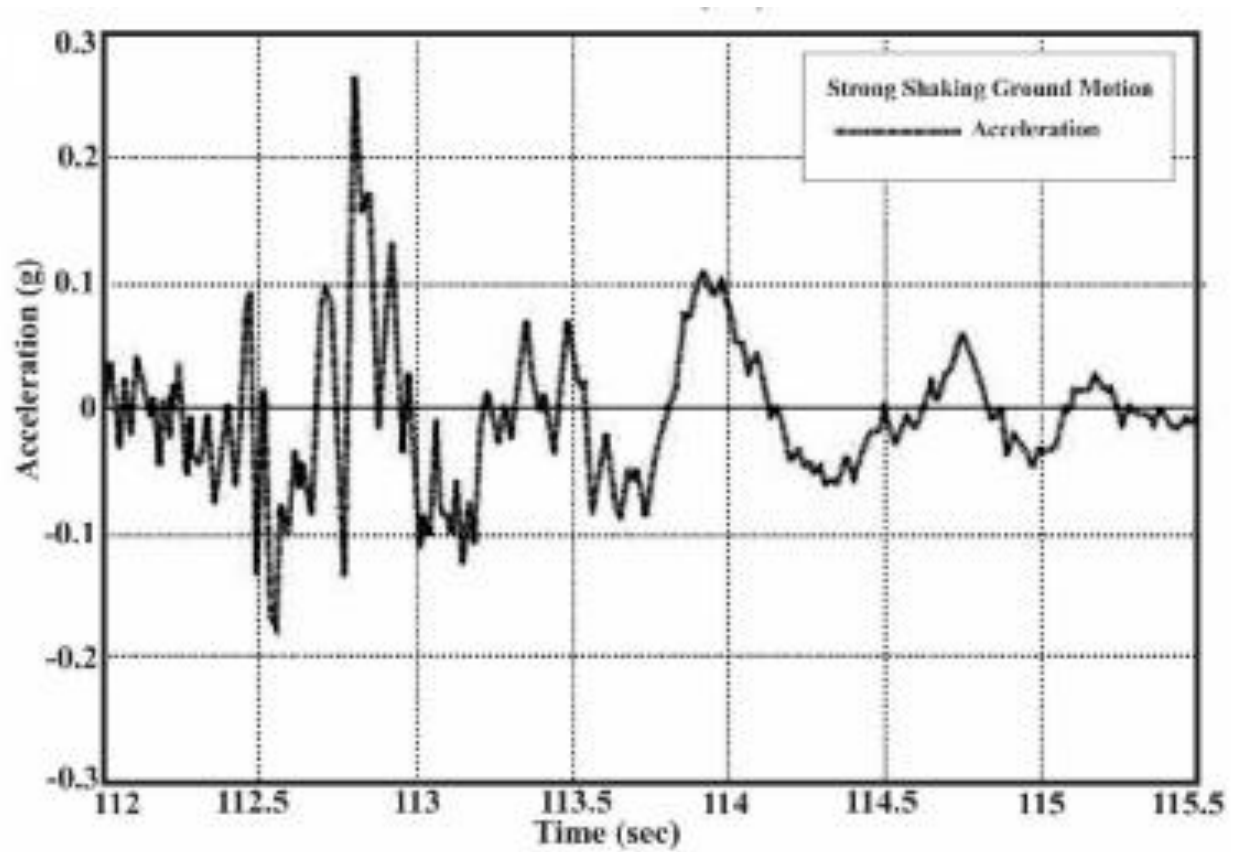


Figure S1. The recorded ground motion data at PHA2 seismic station from the epicenter which shows PGA value of 0.268g. The seismic station was located at 9.3 km north of the epicenter.

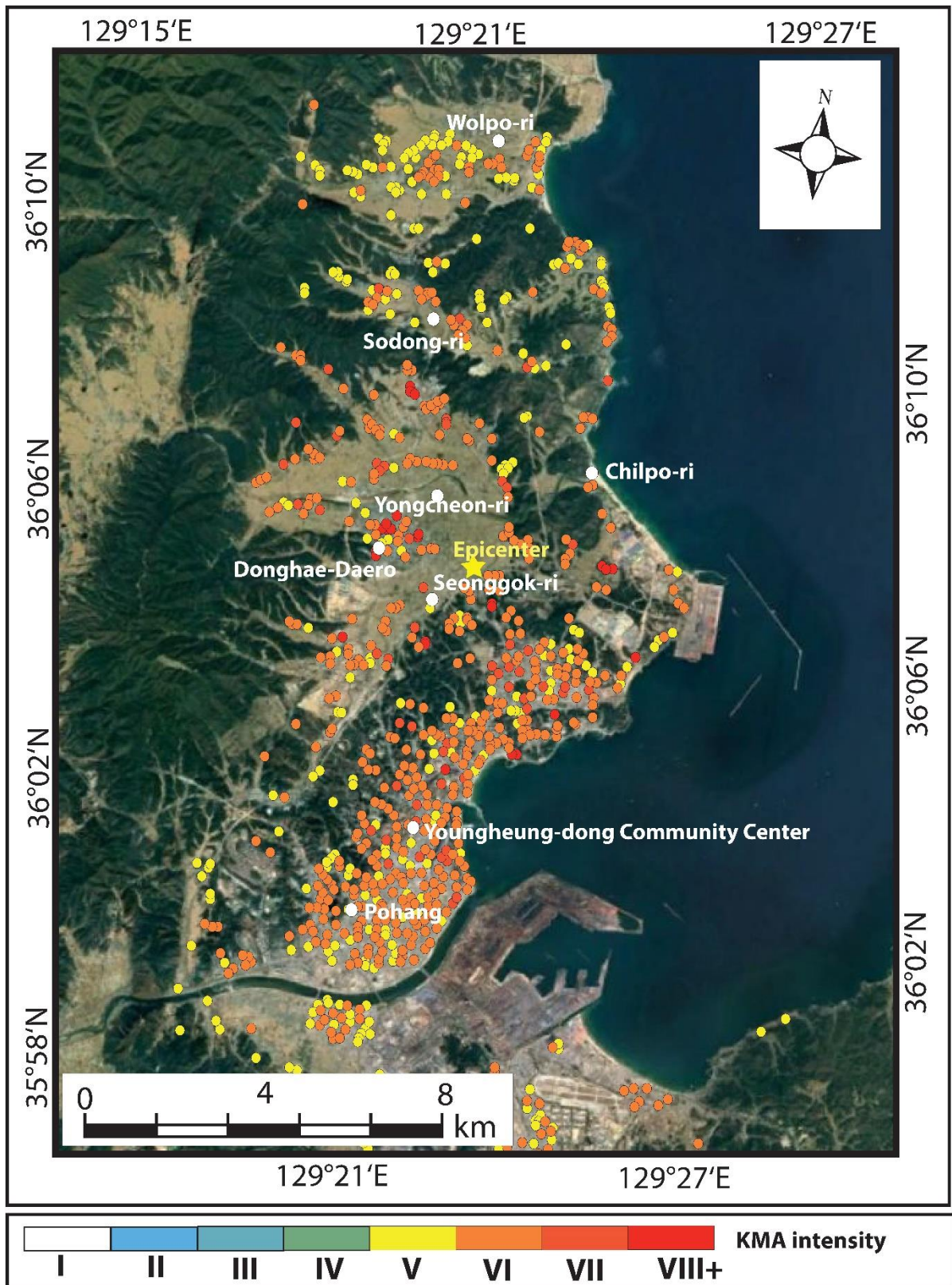


Figure S2. Korean Meteorological Administration (KMA) Intensity map showing the observed seismic intensity around the epicentral area of 2017 Pohang earthquake (Modified from [15]).

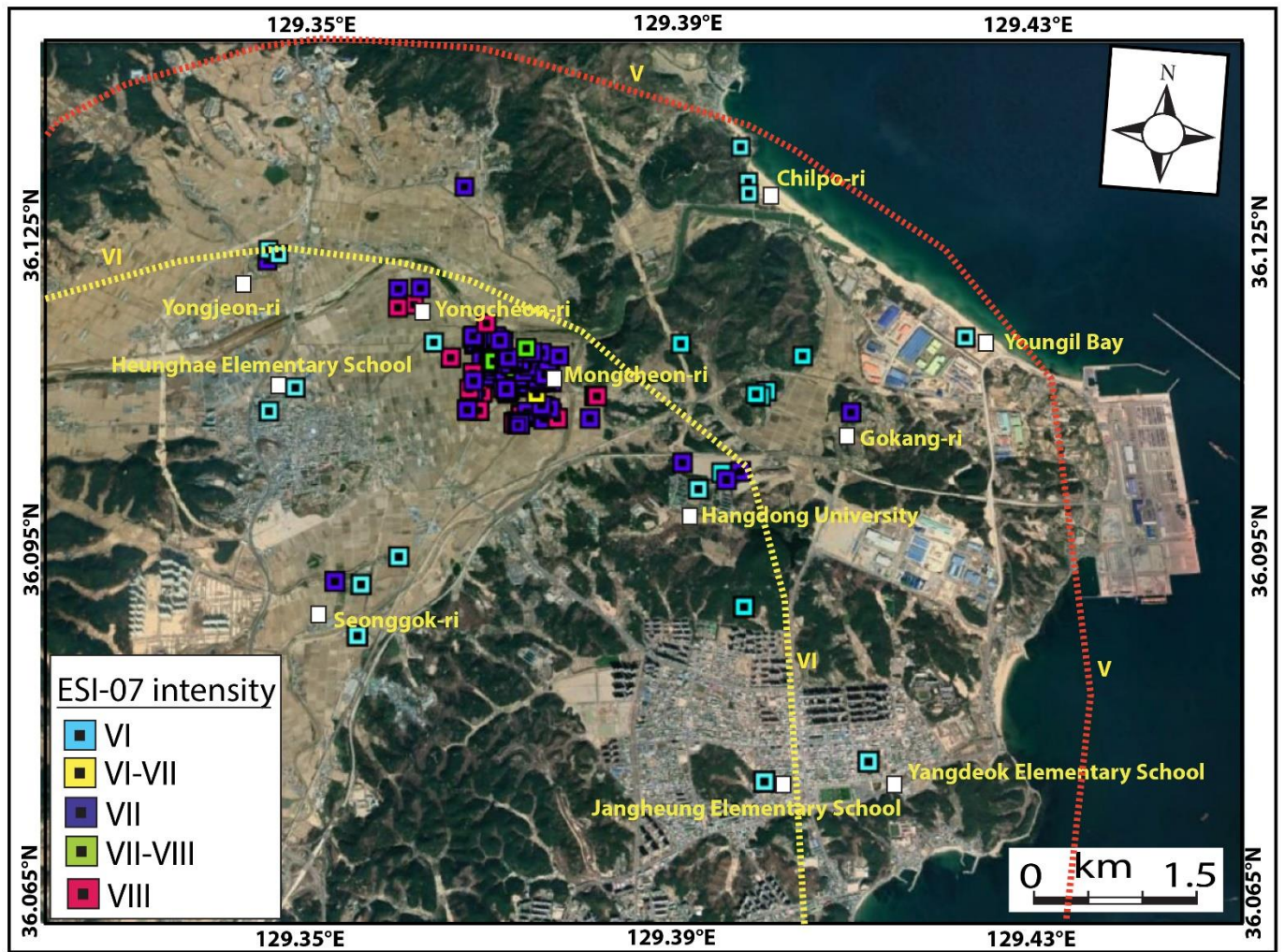


Figure S3. Map showing the ESI-07 intensity derived from observed EEWs and MM intensity contours for the 2017 Pohang earthquake.

Table S1. Estimation of ESI-07 intensity based on EEEs such as liquefaction features (mainly liquefaction) for the 2017 Pohang earthquake.

Serial Number	Latitude	Longitude	Dimensions of liquefaction phenomena (Length in m; and Diameter in cm)	ESI-07 intensity	MM intensity from USGS
1	36.113913°	129.371426°	9.92m, 18-20cm	VII	VI
2	36.113910°	129.371416°	9.2m, 10-20cm	VII	VI
3	36.113902°	129.371391°	9.2m,22-30cm	VII	VI
4	36.116384°	129.366606°	16.84m, 45-70cm	VII	VI
5	36.115900°	129.367600°	3.51m, 28-66 cm	VII	VI
6	36.115874°	129.367585°	6.90m, 35-47 cm	VII	VI
6	36.115893°	129.367623°	6.90m, 24-66 cm	VII	VI
7	36.115916°	129.367591°	6.90m,44-47cm	VII	VI
8	36.115939°	129.367353°	27.62 cm	VII	VI
9	36.115942°	129.367346°	31.54 cm	VII	VI
10	36.115939°	129.367330°	51.02 cm	VII	VI
11	36.115964°	129.367095°	4.92m,20-25cm	VII	VI
12	36.115191°	129.365652°	5.18m, 20-53 cm	VII	VI
13	36.113483°	129.365580°	37.88 cm	VII	VI
14	36.115152°	129.365579°	11m, 37-67 cm	VII	VI
15	36.114447°	129.365635°	9.62m, 30-67 cm	VII	VI
16	36.113286°	129.366510°	1.28m, 104 cm	VIII	VI
17	36.111761°	129.364845°	2.79m, 52-100 cm	VIII	VI
18	36.111764°	129.364845°	0.50m, 52 -96cm	VII	VI
19	36.111312°	129.372727°	8.27m, 15-27 cm	VII	VI
20	36.111225°	129.372735°	4.1m, 29-43.50 cm	VII	VI
21	36.111195°	129.372790°	1.8m, 28 -45cm	VII	VI
22	36.111057°	129.372969°	5.62m, 28-47 cm	VII	VI
23	36.111009°	129.372986°	5.54m, 16-46 cm	VII	VI
24	36.111114°	129.372885°	80 cm	VIII	VI
25	36.111307°	129.371181°	52 cm	VIII	VI
26	36.110877°	129.373103°	1.2m, 20-40cm	VII	VI
27	36.110644°	129.373346°	3.1m,40-51cm	VII	VI
28	36.110645°	129.373346°	2.24m,25-63 cm	VII-VIII	VI
29	36.110586°	129.374388°	22 cm	VII	VI
30	36.111273°	129.371285°	49.14 cm	VII	VI
31	36.110849°	129.371230°	66.76 cm	VIII	VI
32	36.110390°	129.369753°	38 cm	VII	VI
33	36.110968°	129.370556°	3.58m, 45-56cm	VII	VI
34	36.110481°	129.370055°	3-4m, 26 cm	VII	VI
35	36.110956°	129.370641°	50 cm	VII	VI

36	36.110954°	129.370627°	74 cm	VIII	VI
37	36.110931°	129.370632°	82 cm	VIII	VI
38	36.110908°	129.370578°	2.63m,68cm	VIII	VI
40	36.111007°	129.370603°	72 cm	VIII	VI
41	36.111009°	129.370562°	75.76 cm	VIII	VI
42	36.111068°	129.370676°	5.31m, 48-56cm	VII-VIII	VI
43	36.111078°	129.370588°	2.93m, 22 -34cm	VII	VI
44	36.111077°	129.370588°	2.63m, 22 -34cm	VII	VI
45	36.110264°	129.370102°	1.56m, 90 cm	VIII	VI
46	36.110238°	129.370139°	40 cm	VII	VI
47	36.110254°	129.370321°	70 cm	VIII	VI
48	36.110236°	129.370360°	48 cm	VII	VI
49	36.110260°	129.370335°	48 cm	VII	VI
50	36.110344°	129.370321°	54 cm	VIII	VI
51	36.110325°	129.370251°	4.36m, 26 cm-160cm	VII-VIII	VI
52	36.111665°	129.366115°	98 cm	VIII	VI
53	36.110275°	129.372284°	3.68m,22-30cm	VI-VII	VI
54	36.111646°	129.366103°	23.1m, 32-160cm	VII-VIII	VI
55	36.113855°	129.371247°	8.73m, 24-306cm	VII-VIII	VI
56	36.113839°	129.371265°	154cm	VIII	VI
57	36.113890°	129.371283°	7m, 88-126cm	VIII	VI
58	36.113913°	129.371316°	106cm	VIII	VI
59	36.113876°	129.371336°	3.73m,100 -146cm	VIII	VI
60	36.114076°	129.371561°	7.1m, 32-60cm	VII-VIII	VI
61	36.113840°	129.371265°	30cm	VII	VI
62	36.113857°	129.371252°	30cm	VII	VI
63	36.113851°	129.371098°	1.55m, 30cm	VII	VI
64	36.113858°	129.371137°	24cm	VII	VI
65	36.113842°	129.371084°	40cm	VII	VI
66	36.113884°	129.371268°	6.84m, 21 -30cm	VII	VI
67	36.113849°	129.371379°	1.52m, 22-30cm	VII	VI
68	36.113876°	129.371336°	14cm	VII	VI
69	36.113871°	129.371330°	26cm	VII	VI
70	36.114098°	129.371099°	14.50m, 30-50cm	VII-VIII	VI
71	36.114164°	129.371235°	3.73m, 40 -50cm	VII-VIII	VI
72	36.114206°	129.371157°	2.50m, 60 -100cm	VIII	VI
73	36.114295°	129.371257°	2.74m, 36cm	VII	VI
74	36.114244°	129.371223°	5.58m, 30-42cm	VII	VI
75	36.114326°	129.371096°	7.16m, 38-66cm	VII-VIII	VI
76	36.114370°	129.370367°	1.55m, 22-36cm	VII	VI

77	36.114166°	129.370421°	70cm	VIII	VI
78	36.114161°	129.370550°	56cm	VIII	VI
79	36.114285°	129.370392°	4.38m, 28-40cm	VII	VI
80	36.114429°	129.370221°	52cm	VIII	VI
81	36.114089°	129.370706°	60cm	VIII	VI
82	36.114643°	129.370490°	44cm	VII	VI
83	36.114558°	129.370442°	34cm	VII	VI
84	36.114585°	129.370547°	60cm	VIII	VI
85	36.113690°	129.370680°	30cm	VII	VI
86	36.114580°	129.370343°	5.27m, 26-42cm	VII	VI
87	36.114438°	129.370622°	5.17m, 44 -54cm	VII-VIII	VI
88	36.114628°	129.370773°	2.16m, 26-32cm	VII	VI
89	36.114660°	129.370816°	3.17m, 16-18	VII	VI
90	36.113673°	129.370669°	44cm	VII	VI
91	36.113774°	129.370664°	32cm	VII	VI
92	36.113769°	129.370657°	26cm	VII	VI
93	36.113781°	129.370677°	22cm	VII	VI
94	36.112457°	129.378727°	200cm	VIII	VI
95	36.112504°	129.378459°	200cm	VIII	VI
96	36.112483°	129.378602°	234cm	VIII	VI
97	36.113693°	129.370687°	32cm	VII	VI
98	36.110284°	129.370200°	150cm	VIII	VI
99	36.111059°	129.373793°	26cm	VII	VI
100	36.110317°	129.370257°	160cm	VIII	VI
101	36.110327°	129.370251°	76cm	VIII	VI
102	36.110346°	129.370321°	54cm	VIII	VI
103	36.110262°	129.370335°	48cm	VII	VI
104	36.110237°	129.370360°	48cm	VII	VI
105	36.110255°	129.370321°	70cm	VIII	VI
106	36.110239°	129.370139°	40cm	VII	VI
107	36.110264°	129.370103°	90cm	VIII	VI
108	36.111068°	129.370675°	56cm	VIII	VI
109	36.111085°	129.370669°	48cm	VII	VI
110	36.111008°	129.370602°	72cm	VIII	VI
111	36.110908°	129.370577°	68cm	VIII	VI
112	36.110968°	129.370555°	56cm	VIII	VI
113	36.110956°	129.370642°	50cm	VIII	VI
114	36.110482°	129.370055°	26cm	VII	VI
115	36.110952°	129.370556°	26cm	VII	VI
116	36.110390°	129.369752°	38cm	VII	VI

117	36.111276°	129.371284°	49.14cm	VII	VI
118	36.110433°	129.377834°	32cm	VII	VI
119	36.110588°	129.374388°	122cm	VIII	VI
120	36.110562°	129.372929°	26cm	VII	VI
121	36.110323°	129.369752°	60cm	VIII	VI
122	36.110878°	129.373103°	20cm	VII	VI
123	36.111034°	129.372959°	32-36cm	VII	VI
124	36.111309°	129.371181°	52cm	VII	VI
125	36.111010°	129.372985°	16.78cm	VII	VI
126	36.111116°	129.372885°	80cm	VIII	VI
127	36.111031°	129.372962°	19.92cm	VII	VI
128	36.113691°	129.365173°	96cm	VIII	VI
129	36.111764°	129.364845°	52cm	VIII	VI
130	36.115156°	129.365578°	67.08cm	VIII	VI
131	36.115941°	129.367330°	51.02cm	VIII	VI
132	36.115944°	129.367346°	31.54cm	VII	VI
133	36.115941°	129.367353°	37.62cm	VII	VI
134	36.115910°	129.367586°	52.64cm	VIII	VI
135	36.115913°	129.367600°	65.96cm	VIII	VI
136	36.115913°	129.367590°	44.76cm	VII	VI
137	36.115917°	129.367591°	47.06.cm	VII	VI
138	36.115193°	129.365653°	53.68cm	VIII	VI
139	36.116732°	129.363272°	52.84cm	VIII	VI
140	36.116732°	129.363280°	75.46cm	VIII	VI
141	36.117911°	129.365873°	2.28m,21-28cm	VII	VI
142	36.117882°	129.365883°	1.50m,28-33cm	VII	VI
143	36.118004°	129.365977°	40.58cm	VII	VI
144	36.118011°	129.365976°	41.78cm	VII	VI
145	36.118013°	129.365971°	28.84cm	VII	VI
146	36.117908°	129.366228°	8.17m, 27-38cm	VII	VI
147	36.118044°	129.366255°	25.96cm	VII	VI
148	36.118041°	129.366206°	26.94cm	VII	VI
149	36.118041°	129.366257°	21.86cm	VII	VI
150	36.118039°	129.366258°	24.84cm	VII	VI
151	36.116512°	129.366837°	10.20m, 30-58cm	VII-VIII	VI
152	36.116700°	129.367111°	37.14cm	VII	VI
153	36.118187°	129.367735°	50.10cm	VIII	VI
154	36.118211°	129.367719°	1.60m, 29-46cm	VII	VI
155	36.118174°	129.367731°	51.44cm	VIII	VI
156	36.118004°	129.367704°	0.93m, 14-17cm	VII	VI

157	36.118041°	129.367608°	0.94m, 24-25cm	VII	VI
158	36.117725°	129.367668°	1.81m, 22-29cm	VII	VI
159	36.117688°	129.367671°	1.82m, 20-38cm	VII	VI
160	36.118470°	129.365662°	4.82m, 34-60cm	VII-VIII	VI
161	36.118269°	129.365950°	1.84m, 34-47cm	VII	VI
162	36.118042°	129.365899°	1.21m, 27-34cm	VII	VI
163	36.118052°	129.365971°	31.72cm	VII	VI
164	36.118048°	129.365942°	36.44cm	VII	VI
165	36.118053°	129.365975°	29.54cm	VII	VI
166	36.118060°	129.366003°	36.44cm	VII	VI
167	36.118060°	129.366007°	32.88cm	VII	VI
168	36.118064°	129.366046°	45.52cm	VII	VI
169	36.118068°	129.366070°	30.24cm	VII	VI
170	36.118293°	129.366630°	2.68m, 29-31cm	VII	VI
171	36.119832°	129.367248°	16.50m, 119.12cm	VIII	VI
172	36.118534°	129.365883°	1.23m, 48-54cm	VII-VIII	VI
173	36.118547°	129.365922°	3.24m, 41-47cm	VII	VI
174	36.118566°	129.365714°	3.86m, 21-31cm	VII	VI
175	36.118711°	129.365883°	24.56cm	VII	VI
176	36.118712°	129.365886°	21.26cm	VII	VI
177	36.118676°	129.365750°	38.16cm	VII	VI
178	36.114566°	129.368077°	1.80m, 28-77cm	VII -VIII	VI
179	36.114935°	129.367718°	1.23m, 78.36cm	VIII	VI
180	36.114790°	129.367577°	4.92m, 25-40cm	VII	VI
181	36.114892°	129.367647°	2.48m,34-38cm	VII	VI
182	36.114908°	129.367680°	41.80cm	VII	VI
183	36.114840°	129.367602°	5.0m, 22-29cm	VII	VI
184	36.115311°	129.367848°	1.70m, 29-41cm	VII	VI
185	36.115687°	129.367826°	3.32m, 28-36cm	VII	VI
186	36.115925°	129.368431°	1.84m, 21-25cm	VII	VI
187	36.116005°	129.368003°	2.27m, 20-40cm	VII	VI
188	36.116204°	129.367850°	10.07m, 24-50cm	VI-VIII	VI
189	36.113630°	129.368752°	5.88m, 18-24cm	VII	VI
190	36.114310°	129.369147°	5.87m, 25-38cm	VII	VI
191	36.114675°	129.369535°	28.26cm	VII	VI
192	36.114723°	129.369820°	48.34cm	VII	VI
193	36.114636°	129.369402°	4.48m, 25-34cm	VII	VI
194	36.114678°	129.369544°	2.29m, 34-38cm	VII	VI
195	36.114692°	129.369690°	3.49m, 30-38cm	VII	VI
196	36.115121°	129.368990°	5.99m, 33-45cm	VII	VI

197	36.115443°	129.370058°	6.34m, 39-59cm	VII-VIII	VI
198	36.115455°	129.370177°	1.96m, 47-56cm	VII-VIII	VI
199	36.111530°	129.373141°	16.83m, 19-54cm	VII VIII	VI
200	36.111566°	129.372927°	5.63m, 50.42cm	VIII	VI
201	36.111600°	129.372890°	1.24m, 48.08cm	VII	VI
202	36.111642°	129.372826°	6.12m, 28-43cm	VII	VI
203	36.111664°	129.372788°	3.50m, 38-45cm	VII	VI
204	36.111741°	129.373088°	1.50m, 19-29cm	VII	VI
205	36.111661°	129.373207°	11.80m, 27-43cm	VII	VI
206	36.111543°	129.373660°	12.7m, 20-44cm	VII	VI
207	36.111841°	129.372760°	2.71m, 20-25cm	VII	VI
208	36.113431°	129.369440°	7.68m,20-33cm	VII	VI
209	36.113163°	129.369237°	43.62cm	VII	VI
210	36.113166°	129.369244°	27.56cm	VII	VI
211	36.113159°	129.369229°	43cm	VII	VI
212	36.113384°	129.369288°	5.24m, 17-24cm	VII	VI
213	36.113391°	129.369222°	0.52m, 28.80cm	VII	VI
214	36.113389°	129.369210°	0.63m, 26.80cm	VII	VI
215	36.113385°	129.369142°	0.44m, 27.78cm	VII	VI
216	36.113386°	129.369181°	0.79m, 22.98cm	VII	VI
217	36.113530°	129.369264°	3.30m, 18- 29cm	VII	VI
218	36.113541°	129.369078°	1.92m,15-44cm	VII	VI
219	36.114353°	129.371517°	6.00m, 28-37cm	VII	VI
220	36.114605°	129.371169°	6.47m, 22-35cm	VII	VI
221	36.113979°	129.373949°	3.45m, 20-25cm	VII	VI
222	36.114068°	129.373290°	3.42m,15-23cm	VII	VI
223	36.114110°	129.373309°	2.15m, 18-27cm	VII	VI
224	36.114286°	129.373369°	7.00m, 17-28cm	VII	VI
225	36.114329°	129.373225°	2.50m, 16-20cm	VII	VI
226	36.114258°	129.373126°	8.70m, 19-37cm	VII	VI
227	36.113959°	129.372753°	10.74m,26-63cm	VII	VI
228	36.114029°	129.372689°	6m,26-30cm	VII	VI
229	36.114178°	129.372381°	4.9m7,22-30cm	VII	VI
230	36.114382°	129.372522°	9.80m, 22-33cm	VII	VI
231	36.115201°	129.372308°	4.99m,18-22cm	VII	VI
232	36.114968°	129.372402°	13.92m,18-30cm	VII	VI
233	36.115070°	129.371028°	49.50m, 16-50cm	VII	VI
234	36.115549°	129.371668°	12.50m,34-36cm	VII	VI
235	36.116379°	129.374929°	8.88m,19-44cm	VII	VI
236	36.115608°	129.373922°	7.1m, 15-23cm	VII	VI

237	36.114595°	129.373552°	12.1m, 19-34cm	VII	VI
238	36.114685°	129.373288°	4.22m, 15-22cm	VII	VI
239	36.115999°	129.373716°	13.1m,26-40cm	VII	VI
240	36.116783°	129.373059°	4.12m,17-25cm	VII	VI
241	36.115979°	129.369058°	6.28m,23-39cm	VII	VI
242	36.115896°	129.369260°	5.10m, 12-25cm	VII	VI
243	36.115876°	129.369643°	9.59m,21-29cm	VII	VI
244	36.115950°	129.370641°	3.68m,21-25cm	VII	VI
245	36.116083°	129.370738°	3.39m,27-47cm	VII	VI
246	36.116115°	129.370713°	2.43m, 22-27cm	VII	VI
247	36.116340°	129.370044°	7.1m,25-41cm	VII	VI
248	36.116458°	129.369471°	14.50m,15-37cm	VII	VI
249	36.116873°	129.371369°	34.7m,24-37cm	VII	VI
250	36.116881°	129.372056°	6.78m, 18-25cm	VII	VI
251	36.117272°	129.371430°	20m,38-68cm	VII-VIII	VI
252	36.117997°	129.368981°	8m,30-42cm	VII	VI
253	36.118164°	129.368634°	9.52m, 19-25cm	VII	VI
254	36.118373°	129.368243°	6.17m,25-31cm	VII	VI
255	36.118552°	129.368236°	8.1m2,10-25cm	VII	VI
256	36.126944°	129.343500°	40cm -1m	VII	VI

Table S2. Estimation of ESI-07 intensity based on EEEs such as ground cracks and rockfall for the 2017 Pohang earthquake.

Serial Number	Latitude	Longitude	Dimensions Length (m) Ground cracks and volume of Rock fall	ESI-07 intensity	MM intensity from USGS
1	36.09306	129.39241	Ground cracks, 5-10cm, 2m long	VI	VI
2	36.09306	129.39241	Ground cracks, few meter long, 4cm wide	VI	VI
3	36.11219	129.39687	1 cm wide, around 2-3m long fracture in paved road	VI	V
4	36.11195	129.39568	Few cm wide and few meter long ground cracks	VI	V
5	36.11701	129.38812	Few cm wide and few meter long ground cracks	VI	V
6	36.1049	129.39131	20-30 cm wide, meters of long cracks, 20 cm vertical displacement	VII	VI
7	36.10598	129.38728	20-30 wide, meters of long cracks, 20 cm vertical displacement	VII	VI
8	36.13261	129.39708	Upliftment of ground around 6 cm	VI	V
9	36.112522°	129.343784°	Ground settlement around 15 cm	VI	VI
10	36.118250°	129.361500°	2-13cm diameter, 1.40 -3.8m wide, 10-60cm wide	VI	VI
11	36.127500°	129.344722°	10-20cm diameter, 2m long, 7-84cm wide	VI	V
12	36.128000°	129.343611°	2.40m long, 2-5cm wide	VI	V
13	36.079736°	129.403383°	Ground settlement around 39 cm	VI	V
14	36.078575°	129.392892°	Ground settlement around 10 cm	VI	VI
15	36.103533°	129.388737°	Ground settlement around 9 cm	VI	VI
16	36.114603°	129.346581°	Ground settlement around 12cm	VI	VI
17	36.116336°	129.418872°	Ground settlement around 5 cm	VI	V
18	36.109825°	129.405611°	Ground crack about 10m long, 3 cm wide	VII	V
19	36.104257°	129.391749°	Paved road cracks around 10 m long and width of 6 cm	VII	VI
20	36.097002°	129.350655°	Ground cracks of few meter long and few cm wide	VI	VI
21	36.092249°	129.352904°	Ground cracks of few meter long and few cm wide	VI	VI
22	36.038336°	129.357789°	Land creep of 6.67 cm	VI	VI
23	36.1153	129.4011	Rockfall ($\leq 10^3$ m ³)	VI	V
24	36.11172	129.39619	Rockfall ($\leq 10^3$ m ³)	VI	V
25	36.13143	129.39703	Rock fall, few cm diameter rocks were fallen ($\leq 10^3$ m ³)	VI	V
26	36.13621	129.39662	Rock fall, few cm diameter rocks were fallen ($\leq 10^3$ m ³)	VI	V