

Supplementary Material B – Eruption Frequency-Magnitude Relationships

A disruption scoring framework for critical infrastructure exposed to multiple hazard sources: tephra fall on Japan's electricity network

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Updated annual eruption probabilities for the 62 volcanoes in this study. The volcanoes were selected from the Global Volcanism Program (GVP) Holocene Volcano List (v 5.3.4) if they are located on mainland Japan and have at least one confirmed Holocene eruption. Annual eruption probabilities were updated using eruption records from the Volcanoes of the World eruptions database (GVP, 2025; v 5.3.4.), following the methodology from Jenkins et al. (2018) which accounts for record completeness. The eruption probabilities were used to weight the disruption scores for each volcano.

GVP Volcano No.	GVP Volcano Name	Any VEI	VEI ≤ 3	VEI ≥ 4	VEI 4	VEI 5	VEI 6	VEI 7
283001	Abu	1.13E-04	9.86E-05	1.41E-05	1.28E-05	1.25E-06	-	-
283170	Adatarayama	7.05E-03	6.38E-03	6.67E-04	4.63E-04	1.67E-04	3.45E-05	2.56E-06
282080	Aira	5.60E-02	5.46E-02	1.34E-03	7.42E-04	3.31E-04	2.31E-04	4.01E-05
285070	Akan	3.97E-02	3.94E-02	3.50E-04	1.93E-04	8.61E-05	6.00E-05	1.04E-05
283230	Akita-Komagatake	8.83E-03	7.99E-03	8.36E-04	5.79E-04	2.10E-04	4.32E-05	3.20E-06
283260	Akita-Yakeyama	2.38E-02	2.34E-02	3.30E-04	2.29E-04	8.28E-05	1.71E-05	1.26E-06
283110	Asamayama	2.36E-01	2.35E-01	9.96E-04	6.91E-04	2.50E-04	5.15E-05	3.82E-06
282110	Asosan	2.64E-01	2.64E-01	3.30E-04	1.82E-04	8.13E-05	5.66E-05	9.85E-06
282070	Ata	4.06E-03	3.45E-03	6.09E-04	3.36E-04	1.50E-04	1.05E-04	1.82E-05
283180	Azumayama	1.56E-02	1.41E-02	1.47E-03	1.02E-03	3.69E-04	7.62E-05	5.64E-06
283160	Bandaisan	5.21E-03	4.72E-03	4.93E-04	3.42E-04	1.24E-04	2.55E-05	1.89E-06
283220	Chokaisan	1.30E-02	1.17E-02	1.23E-03	8.51E-04	3.08E-04	6.35E-05	4.70E-06
285011	Esan	4.82E-03	3.61E-03	1.20E-03	6.81E-04	5.23E-04	-	-
283030	Fujisan	5.71E-03	5.17E-03	5.41E-04	3.75E-04	1.36E-04	2.80E-05	2.07E-06
283250	Hachimantai	2.02E-04	1.82E-04	1.91E-05	1.32E-05	4.79E-06	9.86E-07	7.31E-08
283280	Hakkodasan	2.07E-03	1.87E-03	1.96E-04	1.36E-04	4.92E-05	1.01E-05	7.51E-07
283020	Hakoneyama	3.24E-03	2.93E-03	3.06E-04	2.13E-04	7.69E-05	1.59E-05	1.17E-06
283050	Hakusan	1.59E-02	1.55E-02	3.54E-04	2.46E-04	8.89E-05	1.83E-05	1.36E-06
283122	Harunasan	6.62E-04	5.99E-04	6.26E-05	4.34E-05	1.57E-05	3.24E-06	2.40E-07

283131	Hiuchigatake	2.19E-03	1.99E-03	2.08E-04	1.44E-04	5.21E-05	1.07E-05	7.96E-07
285020	Hokkaido-Komagatake	2.63E-02	2.50E-02	1.33E-03	9.23E-04	3.34E-04	6.89E-05	5.10E-06
283270	Iwakisan	1.90E-02	1.72E-02	1.80E-03	1.25E-03	4.52E-04	9.32E-05	6.90E-06
283240	Iwatesan	8.45E-03	7.65E-03	8.00E-04	5.55E-04	2.01E-04	4.14E-05	3.06E-06
283010	Izu-Tobu	2.32E-03	2.03E-03	2.89E-04	2.64E-04	2.57E-05	-	-
282090	Kirishimayama	1.17E-01	1.16E-01	6.75E-04	5.30E-04	7.23E-05	4.82E-05	2.41E-05
282120	Kujusan	7.31E-03	6.62E-03	6.92E-04	4.80E-04	1.74E-04	3.58E-05	2.65E-06
283210	Kurikomayama	1.05E-02	9.54E-03	9.97E-04	6.91E-04	2.50E-04	5.16E-05	3.82E-06
283120	Kusatsu-Shiranesan	4.37E-02	4.34E-02	3.30E-04	2.29E-04	8.28E-05	1.71E-05	1.26E-06
285080	Kussharo	7.67E-04	6.52E-04	1.15E-04	6.35E-05	2.83E-05	1.97E-05	3.43E-06
285034	Kuttara	2.27E-03	2.05E-03	2.15E-04	1.49E-04	5.39E-05	1.11E-05	8.23E-07
285061	Maruyama	2.07E-03	1.87E-03	1.96E-04	1.36E-04	4.92E-05	1.01E-05	7.51E-07
285081	Mashu	6.62E-04	5.63E-04	9.92E-05	5.48E-05	2.44E-05	1.70E-05	2.96E-06
283262	Megata	2.20E-04	1.93E-04	2.75E-05	2.51E-05	2.45E-06	-	-
283080	Midagahara	4.46E-03	4.04E-03	4.22E-04	2.93E-04	1.06E-04	2.18E-05	1.62E-06
283100	Myokosan	1.26E-03	1.15E-03	1.20E-04	8.30E-05	3.00E-05	6.19E-06	4.59E-07
283141	Nantaisan	8.65E-05	7.83E-05	8.18E-06	5.67E-06	2.05E-06	4.23E-07	3.14E-08
283200	Naruko	6.23E-04	5.29E-04	9.33E-05	5.15E-05	2.30E-05	1.60E-05	2.79E-06
283150	Nasudake	1.04E-02	9.37E-03	9.80E-04	6.79E-04	2.46E-04	5.07E-05	3.75E-06
283090	Niigata-Yakeyama	2.64E-02	2.61E-02	3.48E-04	1.96E-04	1.51E-04	-	-
283140	Nikko-Shiranesan	1.51E-02	1.46E-02	5.08E-04	3.99E-04	5.44E-05	3.63E-05	1.81E-05
285031	Niseko	1.44E-04	1.31E-04	1.37E-05	9.48E-06	3.43E-06	7.07E-07	5.24E-08
283060	Norikuradake	3.08E-04	2.79E-04	2.92E-05	2.02E-05	7.33E-06	1.51E-06	1.12E-07
283151	Numazawa	1.84E-04	1.78E-04	6.18E-06	4.86E-06	6.62E-07	4.42E-07	2.21E-07
283142	Omanago Group	1.97E-04	1.48E-04	4.93E-05	2.78E-05	2.14E-05	-	-
283040	Ontakesan	8.28E-03	7.50E-03	7.84E-04	5.43E-04	1.97E-04	4.05E-05	3.00E-06
283290	Osorezan	4.20E-03	3.80E-03	3.98E-04	2.76E-04	9.98E-05	2.06E-05	1.52E-06
285082	Rausudake	2.84E-03	2.57E-03	2.68E-04	1.86E-04	6.74E-05	1.39E-05	1.03E-06

283002	Sanbesan	3.59E-04	3.25E-04	3.39E-05	2.35E-05	8.52E-06	1.76E-06	1.30E-07
285040	Shikotsu	7.14E-02	7.04E-02	9.93E-04	5.48E-04	2.44E-04	1.70E-04	2.96E-05
285090	Shiretoko-Iozan	9.98E-03	9.04E-03	9.45E-04	6.55E-04	2.37E-04	4.89E-05	3.62E-06
285060	Taisetsuzan	9.57E-04	8.66E-04	9.06E-05	6.28E-05	2.27E-05	4.68E-06	3.47E-07
283143	Takaharayama	1.52E-04	1.37E-04	1.43E-05	9.95E-06	3.60E-06	7.42E-07	5.50E-08
285050	Tokachidake	3.69E-02	3.66E-02	3.30E-04	2.29E-04	8.28E-05	1.71E-05	1.26E-06
283271	Towada	6.62E-04	5.63E-04	9.92E-05	5.48E-05	2.44E-05	1.70E-05	2.96E-06
285030	Toya	1.02E-02	8.78E-03	1.40E-03	9.74E-04	3.52E-04	7.26E-05	5.38E-06
282100	Unzendake	1.13E-02	1.03E-02	1.07E-03	7.44E-04	2.69E-04	5.55E-05	4.11E-06
283070	Yakedake	5.62E-02	5.59E-02	3.44E-04	2.38E-04	8.62E-05	1.78E-05	1.32E-06
283031	Yokodake	8.25E-04	7.47E-04	7.80E-05	5.41E-05	1.96E-05	4.04E-06	2.99E-07
282081	Yonemaru-Sumiyoshiike	4.14E-03	3.62E-03	5.18E-04	4.72E-04	4.60E-05	-	-
285032	Yoteizan	3.59E-04	3.25E-04	3.39E-05	2.35E-05	8.52E-06	1.76E-06	1.30E-07
282130	Yufu-Tsurumi	3.31E-04	2.48E-04	8.27E-05	4.68E-05	3.60E-05	-	-
283190	Zaozan [Zaosan]	5.53E-02	5.50E-02	3.38E-04	2.34E-04	8.48E-05	1.75E-05	1.29E-06