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*Supplement of*

## **Probabilistic seismic hazard analysis using the logic tree approach – Patna district (India)**

**Panjamani Anbazhagan et al.**

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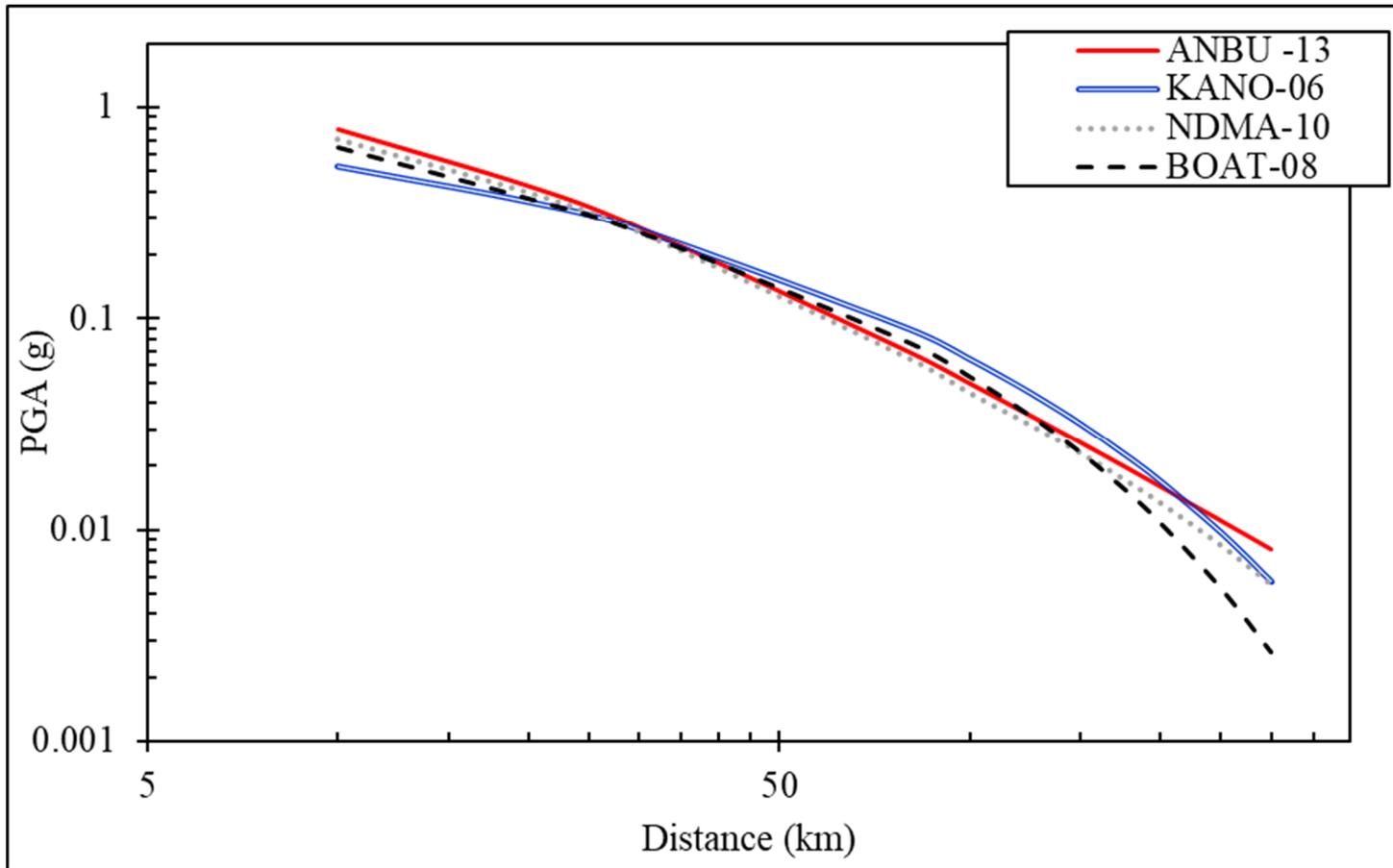


Figure S1: Comparison of GMPEs used in determination of Hazard Value

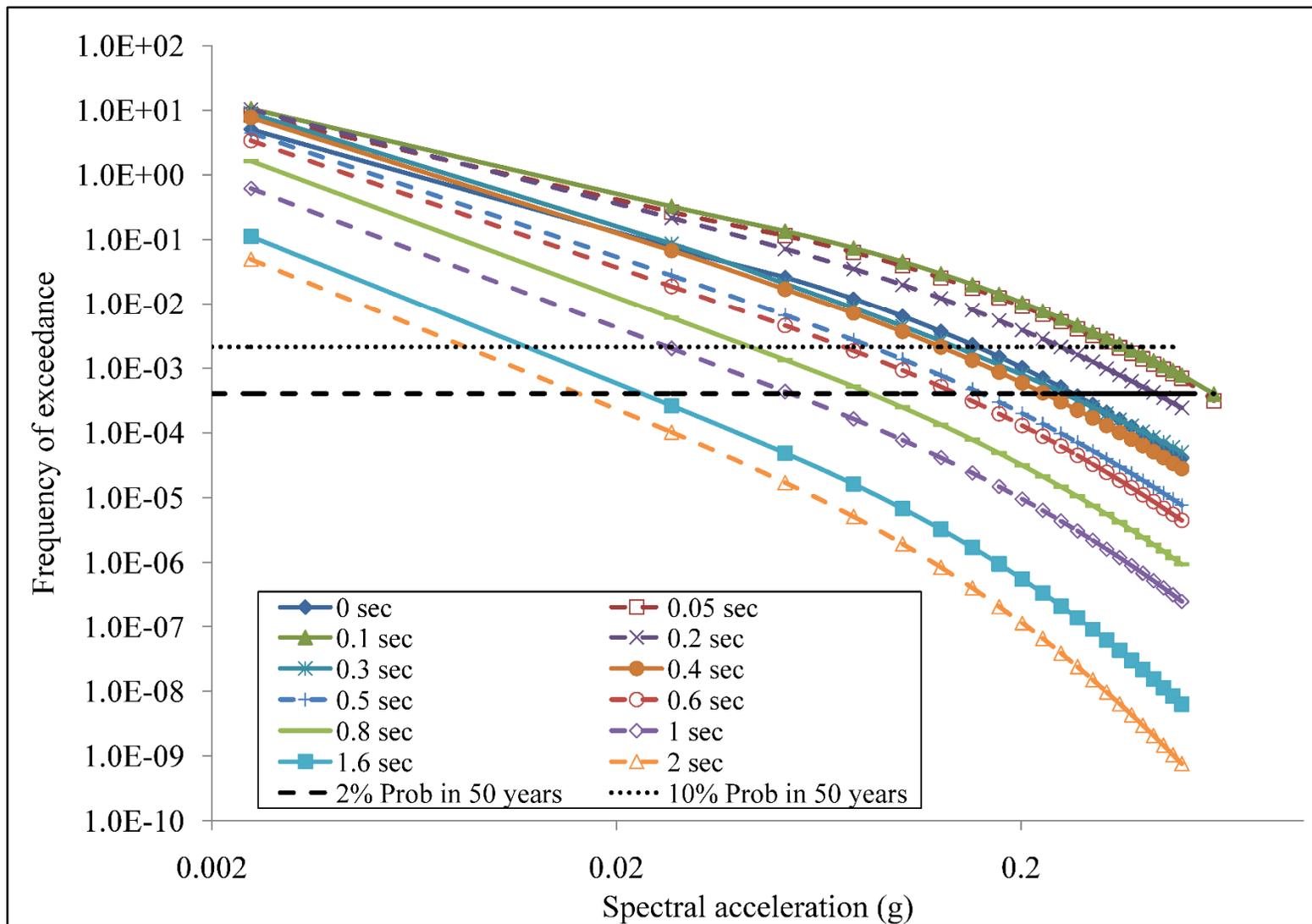


Figure S2: Hazard curve at Patna district for different periods using areal seismic zone (considering centre of zone 2)

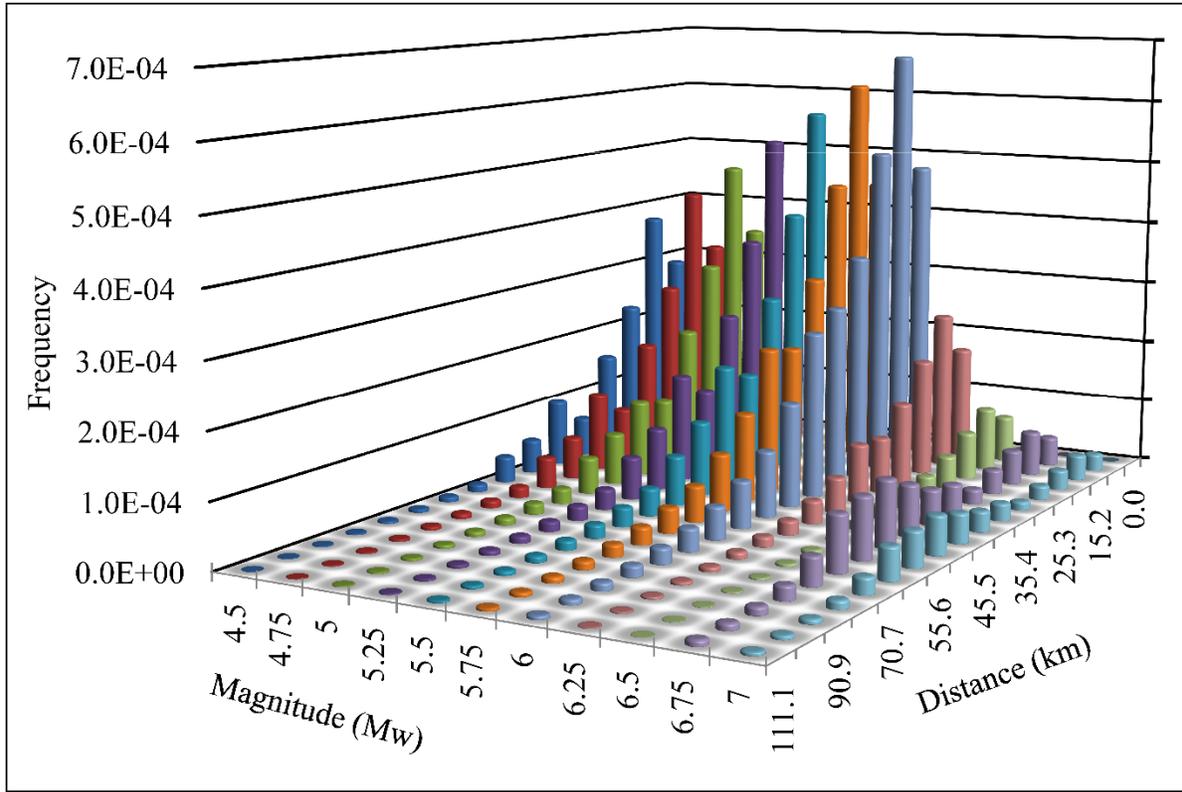


Figure S3 (a): Deaggregation of hazard value at Patna at bed rock at PGA for 2 % probability of exceedence in 50 years using areal seismic zone

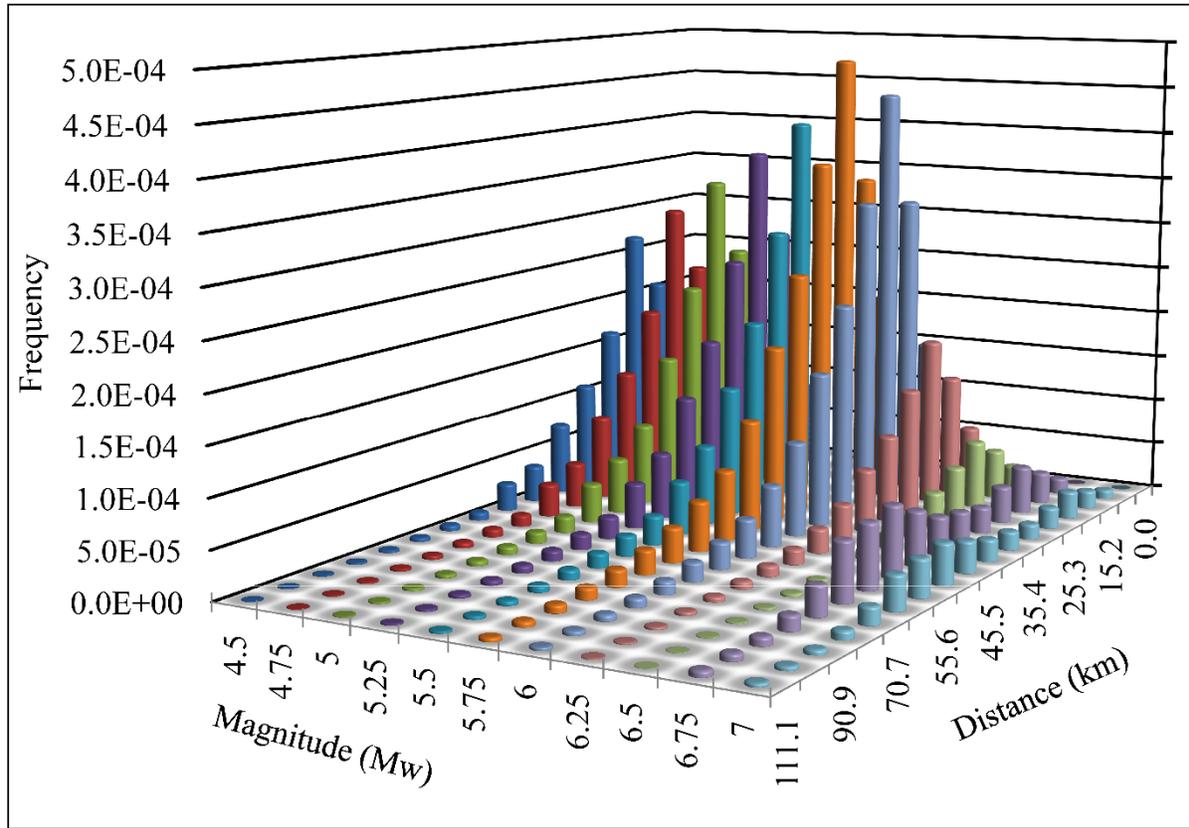


Figure S3 (b): Deaggregation of hazard value at Patna at bed rock at PGA for 10 % probability of exceedence in 50 years using areal seismic zone

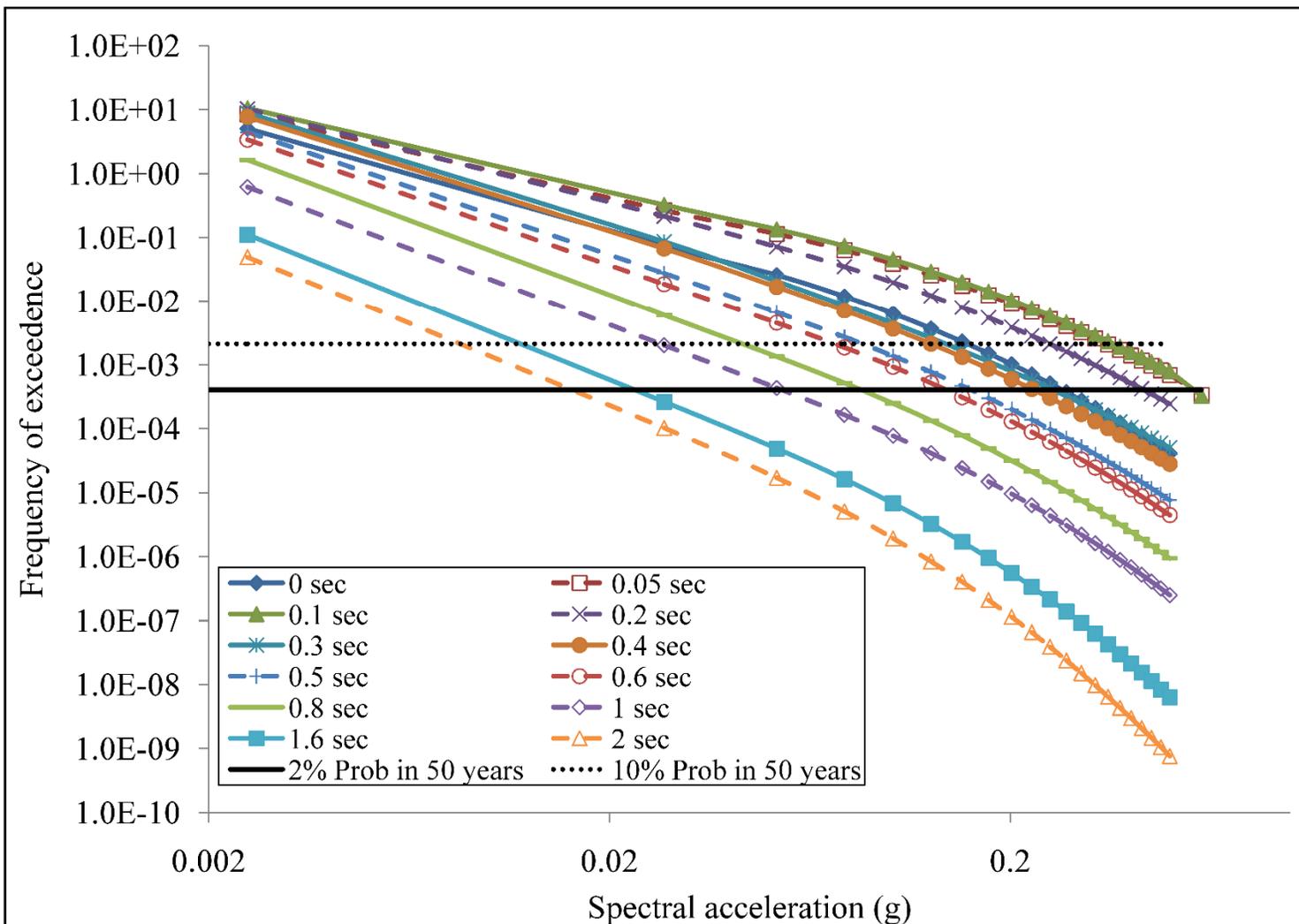


Figure S4: Hazard curve at Patna district centre for different periods using Frankel approach (1995)

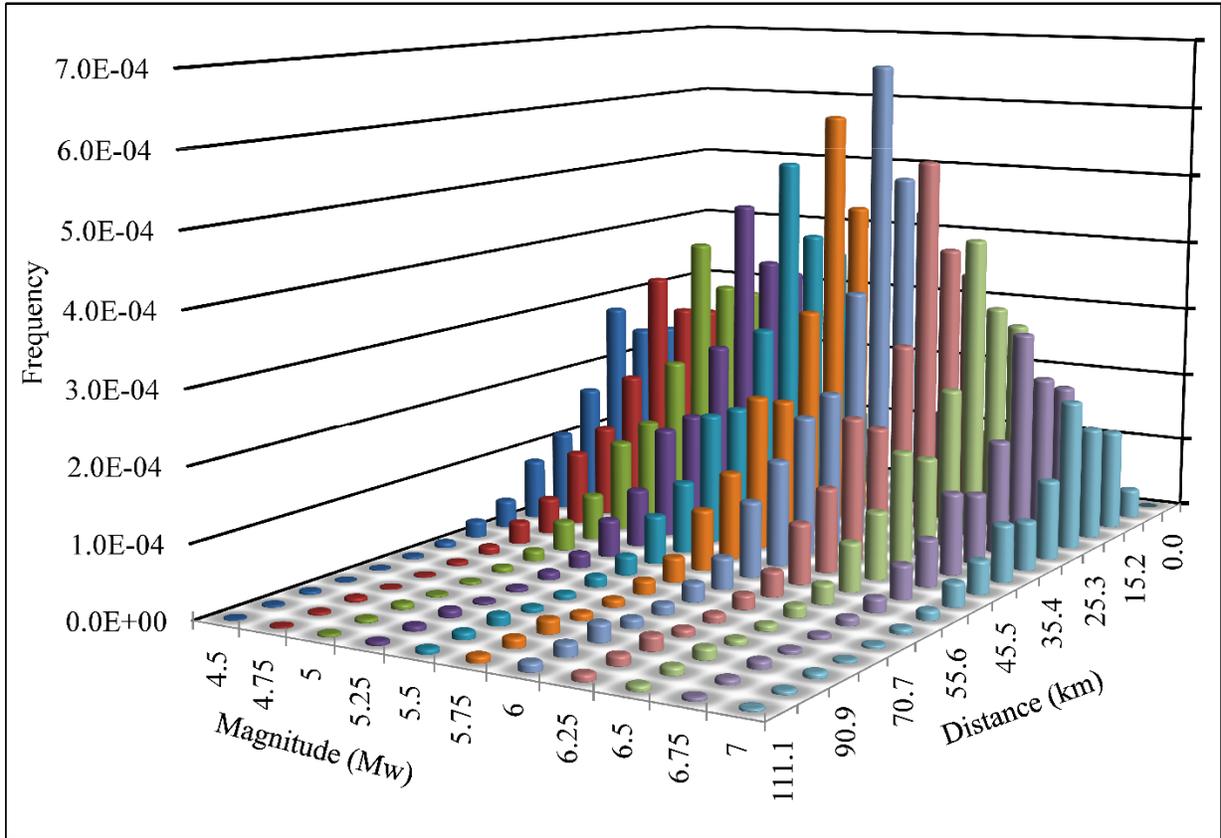


Figure S5 (a): Deaggregation of hazard value at Patna at bed rock at PGA for 2 % probability of exceedence in 50 years using Frankel approach (1995)

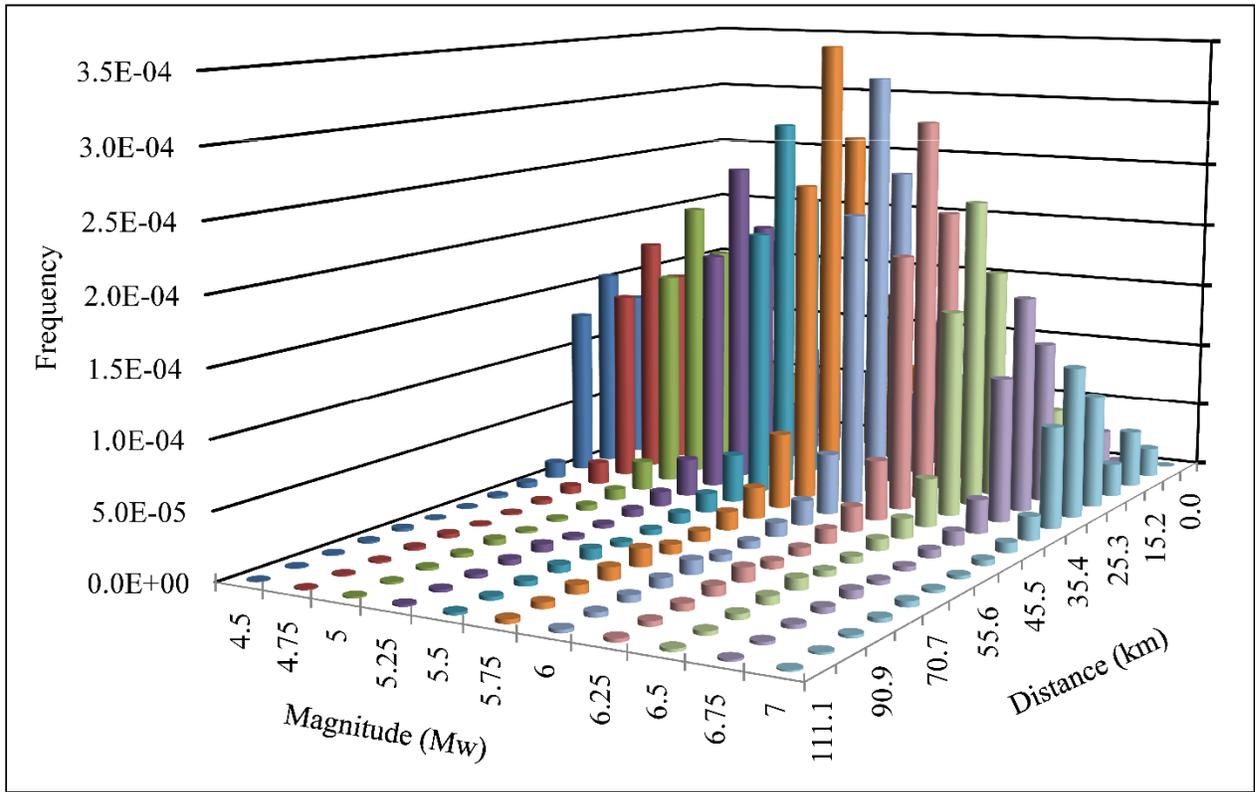
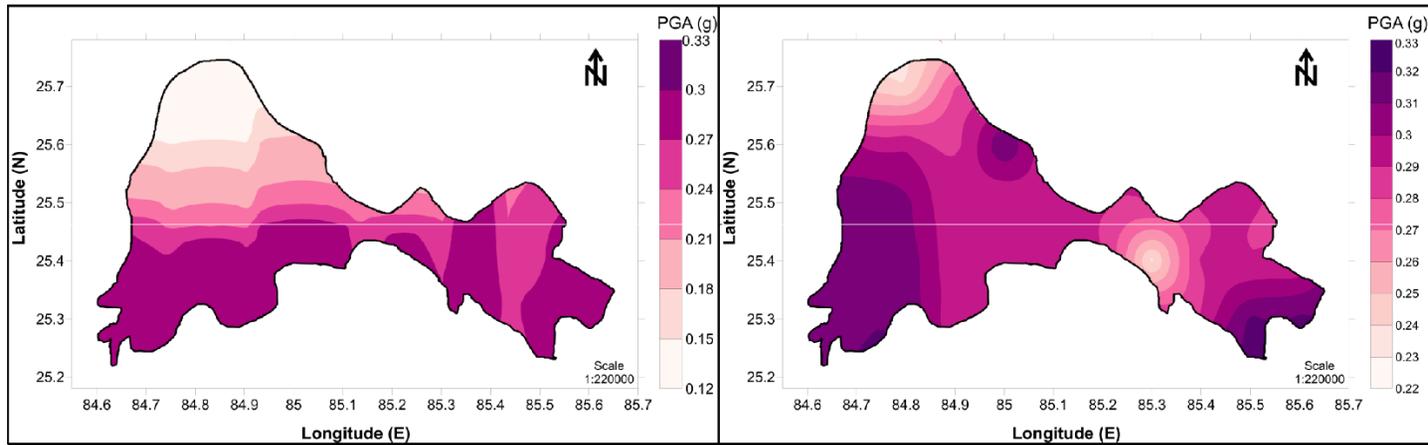
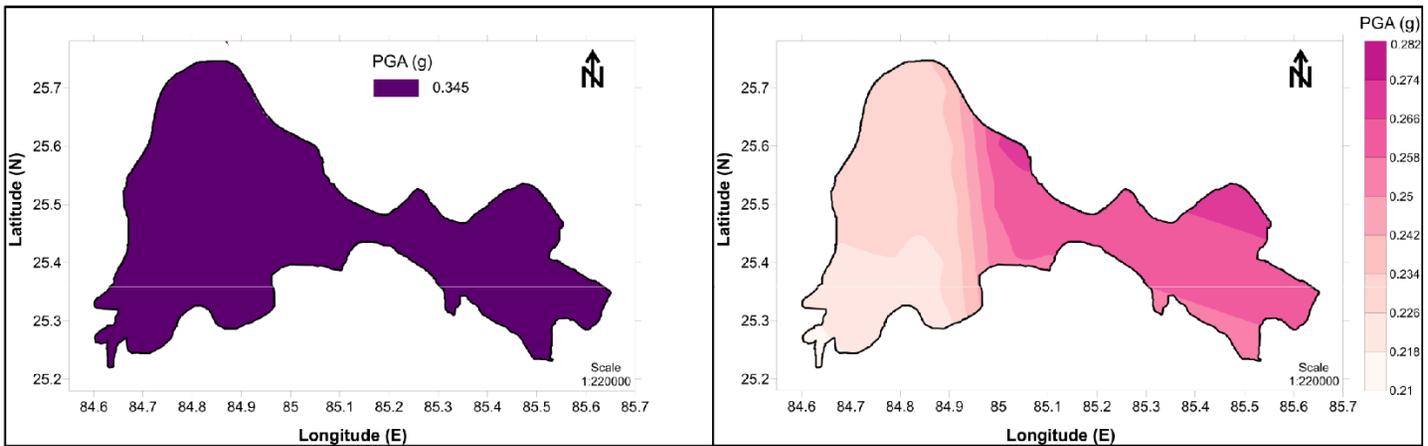


Figure S5 (b): Deaggregation of hazard value at Patna at bed rock at PGA for 10 % probability of exceedence in 50 years using Frankel approach (1995)



Model 1 (a)

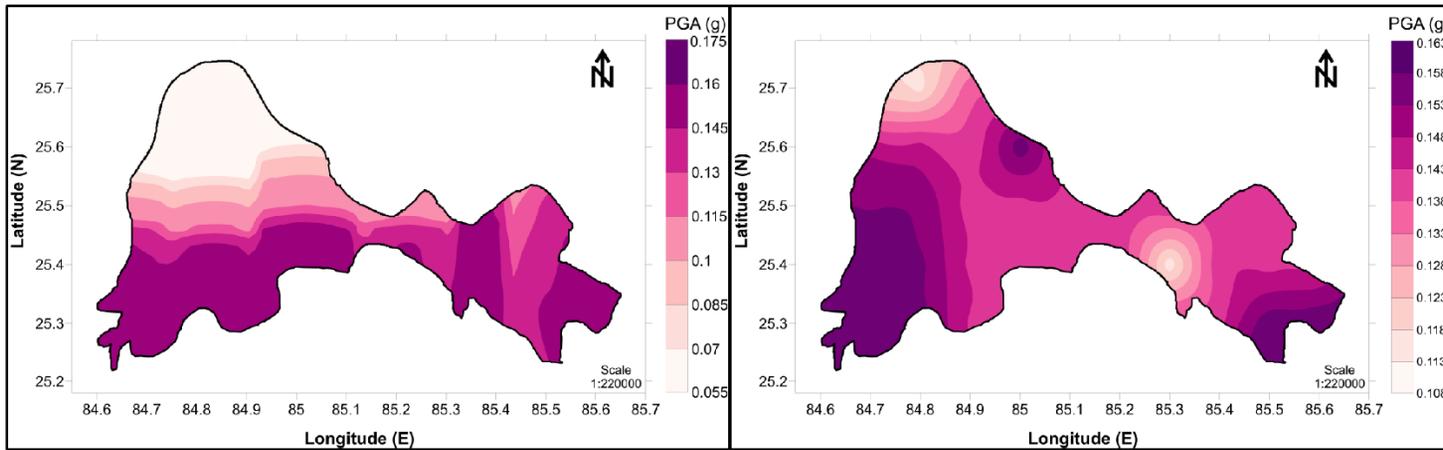
Model 2 (b)



Model 3 (c)

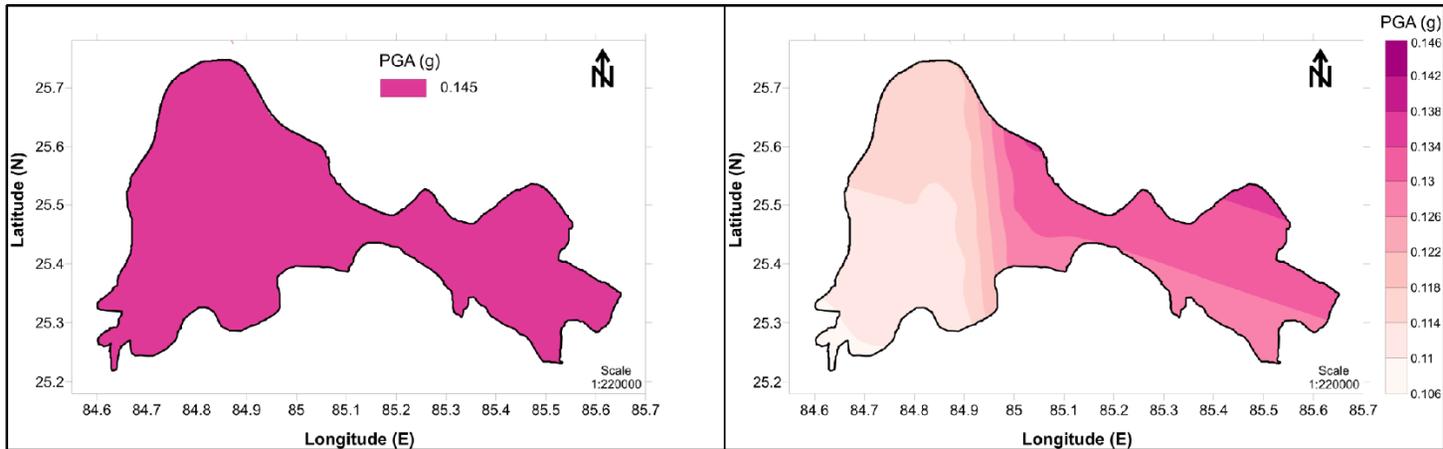
Model 4 (d)

Figure S6: PGA map of Patna SSA considering 2% probability in 50 years for model 1 (a), model 2 (b), model 3 (c) and model 4 (d) using Frankel approach (1995)



Model 1 (a)

Model 2 (b)



Model 3 (c)

Model 4 (d)

Figure S7: PGA map of Patna SSA considering 10% probability in 50 years for model 1 (a), model 2 (b), model 3 (c) and model 4 (d) using Frankel approach (1995)



## Probabilistic seismic hazard analysis using logic tree approach- Patna district (India)

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Table S1  $M_{max}$  corresponds to seismic sources used in the hazard analysis

Fault Name	Fault Coordinate				TFL	$M_{max}$ Estimation			$M_{max}$ taken for Hazard Analysis
	Long_1	Lat_1	Long_2	Lat_2		Kijko and Sellevoll (1989)	By Incremental value	By Rupture Characteristics	
MBT	82.21	28.81	89.51	26.68	844.92	8.0	8.5	8.1	8.2
MCT	82.86	29.44	88.31	27.61	638.78	7.0	7.5	7.9	7.5
s01	80.94	25.77	80.10	26.65	135.37	5.4	5.9	6.9	6.2
s02	82.16	26.30	80.47	25.53	206.58	5.4	5.9	7.2	6.3
s03	81.25	25.25	82.83	25.71	183.13	5.2	5.7	7.1	6.1
s04	83.98	26.00	81.25	25.06	321.03	5.1	5.6	6.2	5.7
s05	81.14	27.02	80.67	28.21	142.64	5.2	5.7	6.9	6.1
s06	80.92	26.82	81.36	27.88	128.34	5.9	6.3	6.9	6.4
s07	81.26	27.94	81.76	28.09	58.19	6.6	6.3	6.3	6.4
s08	82.06	26.15	81.48	27.87	202.28	4.5	5.0	7.2	5.7
s09	81.93	27.96	82.31	26.87	128.31	5.6	6.1	6.9	6.3
s10	81.73	27.16	82.63	27.74	118.41	6.0	6.5	6.8	6.5
s100	86.69	27.21	86.69	27.12	9.73	4.9	5.1	5.0	5.0
s101	86.91	27.16	86.87	27.03	15.26	6.0	5.3	5.3	5.5
s102	86.70	27.19	86.91	27.30	26.73	6.1	6.0	5.7	5.9
s103	87.24	27.40	87.12	27.36	13.63	4.9	5.1	5.2	5.1
s104	87.24	27.35	87.84	28.05	101.82	5.5	5.9	6.7	6.1
s105	87.30	26.77	88.29	27.89	166.32	6.8	7.3	7.1	7.1
s106	88.14	27.75	89.25	26.18	213.24	6.8	7.3	7.2	7.1

s107	88.47	26.90	88.55	26.52	43.23	5.7	6.1	6.1	6.0
s108	88.85	27.02	88.79	26.85	20.33	4.7	5.0	5.5	5.1
s109	89.06	27.38	89.72	26.06	163.44	6.7	7.2	7.0	7.0
s11	82.23	26.73	83.42	25.60	181.92	5.6	6.1	7.1	6.4
s110	88.18	25.83	88.88	25.93	78.61	4.6	5.0	6.5	5.5
s111	88.88	25.93	89.36	26.03	53.94	7.0	6.5	6.3	6.6
s112	88.35	25.72	88.98	25.40	78.44	6.3	6.7	6.5	6.5
s113	88.54	25.47	88.84	25.32	37.67	6.2	5.0	6.0	5.8
s114	88.12	25.52	88.51	25.19	56.12	6.1	6.5	6.3	6.3
s115	87.93	25.43	88.21	25.22	39.50	5.4	5.7	6.0	5.7
s116	88.23	25.21	88.39	25.08	22.73	6.2	5.0	5.6	5.6
s117	88.90	25.30	88.98	25.26	10.46	4.9	5.3	5.0	5.1
s118	88.98	25.26	89.02	25.24	5.15	6.1	4.7	4.5	5.0
s119	88.39	24.65	88.28	25.04	45.18	4.7	5.0	6.1	5.4
s12	82.65	26.65	83.47	27.42	125.31	6.4	6.9	6.9	6.7
s120	88.62	24.75	89.12	25.04	63.59	5.7	6.0	6.4	6.1
s121	89.02	25.18	89.37	25.21	38.23	5.7	6.0	6.0	5.9
s122	89.14	25.18	89.10	25.06	14.41	5.1	5.4	5.3	5.3
s123	89.58	25.55	89.32	25.21	47.03	5.9	6.3	6.2	6.1
s124	89.25	25.81	89.47	25.53	39.95	5.8	6.1	6.0	6.0
s125	89.41	25.89	89.79	25.30	77.77	6.6	6.3	6.5	6.5
s126	89.53	25.93	89.73	25.71	33.03	5.8	6.1	5.9	5.9
s127	88.77	27.82	89.00	27.48	44.64	6.2	6.4	6.1	6.2
s128	88.05	28.31	90.24	28.21	244.38	6.4	6.9	7.3	6.9
s129	87.85	28.08	88.22	28.55	67.07	6.2	6.4	6.4	6.3
s13	83.05	26.52	83.97	27.19	126.41	5.2	5.7	6.9	6.0
s130	88.72	23.77	90.10	24.96	203.22	6.8	7.3	7.2	7.1
s131	88.42	24.47	88.99	23.89	90.58	5.4	5.8	6.6	6.0
s132	88.66	24.04	88.92	24.10	29.06	5.8	5.8	5.8	5.8
s133	86.79	25.42	86.73	25.33	11.83	4.6	5.2	5.1	5.0

s134	86.78	25.12	86.79	25.36	27.08	6.1	6.0	5.7	5.9
s135	86.89	25.30	86.85	25.33	5.14	6.1	4.7	4.5	5.0
s136	86.74	25.16	86.69	25.12	7.94	6.1	4.7	4.8	5.2
s137	86.75	25.12	86.70	25.10	6.25	4.4	4.8	4.7	4.6
s138	85.91	24.63	86.14	24.67	26.63	5.3	5.6	5.7	5.6
s139	85.03	24.09	86.19	24.41	134.34	5.6	6.1	6.9	6.3
s14	84.23	26.56	83.11	26.50	124.58	5.2	5.6	6.8	6.0
s140	84.34	24.36	84.58	24.44	27.59	5.5	5.8	5.8	5.7
s141	83.64	24.19	84.22	24.98	108.66	6.3	6.7	6.7	6.6
s142	82.77	24.28	82.92	24.31	17.74	6.4	5.5	5.4	5.7
s143	82.16	24.27	82.56	24.38	45.91	6.1	6.3	6.1	6.2
s144	82.08	24.18	82.16	24.22	10.17	6.2	5.0	5.0	5.4
s145	82.56	24.39	82.63	24.29	13.21	5.5	5.0	5.2	5.3
s146	82.63	24.30	83.78	24.37	127.89	5.3	5.8	6.9	6.1
s147	82.47	24.04	82.85	23.84	47.52	5.2	5.6	6.2	5.7
s148	82.26	24.23	82.92	24.17	73.88	5.9	6.3	6.5	6.3
s149	82.97	24.14	83.03	24.08	9.86	5.5	5.0	5.0	5.2
s15	82.65	26.67	83.69	25.66	161.13	5.6	6.0	7.0	6.3
s150	82.79	24.17	82.94	23.95	29.79	5.5	5.8	5.8	5.7
s151	82.89	24.17	83.03	24.03	21.15	5.6	5.6	5.6	5.6
s152	82.45	24.15	82.49	24.19	6.56	4.4	4.8	4.7	4.6
s153	82.60	24.17	82.55	24.14	6.50	4.4	4.8	4.7	4.6
s154	83.00	24.24	82.83	24.24	19.19	5.3	5.6	5.5	5.5
s155	82.67	24.25	82.71	24.17	9.37	5.5	5.0	5.0	5.1
s156	82.50	24.26	82.60	24.23	11.40	5.1	5.2	5.1	5.1
s157	81.95	28.13	82.57	28.98	117.45	5.9	6.3	6.8	6.4
s158	82.65	28.08	83.29	28.50	84.81	5.7	6.0	6.6	6.2
s159	83.85	27.95	83.61	27.73	36.04	6.2	5.0	6.0	5.7
s16	83.79	25.79	83.06	26.46	110.65	5.6	6.0	6.8	6.2
s160	84.04	28.29	83.87	27.97	40.32	5.2	5.5	6.0	5.6

s161	85.14	26.15	83.96	27.61	208.22	6.2	6.7	7.2	6.8
s162	83.82	23.57	84.40	23.33	69.90	4.6	5.0	6.4	5.4
s163	83.47	23.54	84.07	23.62	67.96	6.2	5.0	6.4	5.9
s164	83.83	23.63	84.20	23.64	42.10	4.6	5.0	6.1	5.3
s165	83.80	23.71	84.08	23.69	31.32	6.2	5.0	5.9	5.7
s166	84.79	23.79	84.94	23.73	18.23	4.7	5.0	5.5	5.1
s167	85.35	23.93	85.41	23.85	10.70	5.1	5.2	5.1	5.1
s168	85.34	23.98	85.42	23.92	11.27	6.0	5.3	5.1	5.4
s169	86.54	23.78	86.58	23.87	11.36	4.9	5.1	5.1	5.0
s17	84.01	26.51	82.96	26.19	121.48	5.2	5.6	6.8	6.0
s170	86.63	23.85	86.67	23.79	7.87	5.5	5.0	4.8	5.1
s171	81.29	23.08	81.69	23.29	50.34	5.2	5.6	6.2	5.7
s172	81.59	23.69	80.84	22.99	113.76	5.2	5.7	6.8	6.0
s173	81.28	23.53	81.38	23.55	12.15	6.2	5.0	5.2	5.4
s174	84.80	22.37	84.98	22.42	21.41	5.7	5.7	5.6	5.7
s175	85.28	21.12	85.31	21.15	5.25	6.1	4.7	4.5	5.0
s176	85.31	21.15	85.28	21.12	5.42	5.4	4.5	4.6	4.8
s18	82.58	25.97	83.63	26.28	121.87	6.1	6.0	6.8	6.4
s19	84.12	26.15	82.44	26.05	186.75	5.5	6.0	7.1	6.3
s20	82.76	25.30	83.90	25.82	139.32	5.5	6.0	6.9	6.2
s21	79.13	23.10	82.20	24.49	374.57	5.2	5.7	6.4	5.8
s22	83.08	22.78	79.92	22.15	358.82	5.2	5.7	6.3	5.8
s23	82.96	22.87	82.98	22.82	6.10	6.1	4.7	4.7	5.1
s24	83.00	22.72	83.20	22.81	24.20	6.2	5.0	5.7	5.6
s25	81.95	22.40	84.41	22.98	280.49	4.5	5.0	7.4	5.8
s26	82.95	23.26	83.37	23.09	50.10	5.5	5.9	6.2	5.9
s27	82.59	23.23	83.30	23.43	82.36	5.6	5.9	6.6	6.1
s28	82.97	23.89	83.37	22.97	111.79	5.2	5.7	6.8	6.0
s29	83.19	23.55	83.88	23.71	78.63	5.3	5.7	6.5	5.9
s30	84.25	21.69	84.87	21.32	79.43	6.0	5.9	6.5	6.2

s31	84.94	21.28	85.72	21.04	90.25	5.3	5.7	6.6	6.0
s32	85.41	21.28	85.13	22.01	87.61	5.7	5.7	6.6	6.1
s33	85.37	21.66	85.92	21.11	86.13	6.2	6.4	6.6	6.4
s34	84.53	21.56	86.26	21.16	197.04	5.4	5.9	7.2	6.3
s35	86.83	22.37	85.85	22.71	115.30	4.5	5.0	6.8	5.6
s36	87.23	22.98	86.01	23.12	135.63	5.5	6.0	6.9	6.2
s37	86.67	23.43	86.20	23.42	51.78	5.4	5.7	6.2	5.8
s38	86.53	23.55	86.78	23.13	55.38	5.1	5.2	6.3	5.6
s39	86.06	23.18	86.72	23.51	81.66	5.3	5.7	6.6	5.9
s40	87.25	23.82	87.61	23.71	41.84	5.3	5.7	6.1	5.7
s41	87.67	23.47	87.25	23.68	51.74	6.4	6.2	6.2	6.3
s42	87.68	23.17	87.70	23.63	50.94	6.0	6.2	6.2	6.1
s43	87.27	23.23	87.82	22.68	86.35	4.7	5.1	6.6	5.6
s44	87.98	23.77	87.88	22.24	170.39	5.3	5.8	7.1	6.2
s45	88.13	22.15	88.15	24.11	217.61	6.8	7.3	7.3	7.1
s46	88.28	22.99	88.57	22.72	43.85	5.3	5.6	6.1	5.7
s47	88.61	23.08	88.47	22.88	27.72	8.0	5.3	5.8	6.3
s48	88.68	22.73	88.77	23.48	84.09	5.4	5.8	6.6	6.0
s49	88.63	23.10	87.72	23.45	108.20	5.8	6.2	6.7	6.3
s50	87.57	25.05	87.85	24.05	115.38	6.1	6.6	6.8	6.5
s51	87.86	24.04	88.06	23.76	37.33	5.1	5.2	6.0	5.5
s52	87.73	24.55	88.34	24.14	82.28	6.0	6.4	6.6	6.3
s53	88.04	25.05	88.15	24.11	104.40	6.0	6.4	6.7	6.4
s54	88.32	26.23	88.22	25.05	132.04	6.2	6.7	6.9	6.6
s55	87.93	25.26	87.98	25.05	24.84	4.9	5.1	5.7	5.3
s56	87.67	25.56	88.00	25.73	41.67	5.8	6.2	6.1	6.0
s57	87.23	27.82	87.88	25.94	221.60	6.7	7.2	7.3	7.1
s58	85.93	25.24	87.26	26.51	204.19	5.4	5.9	7.2	6.3
s59	86.72	26.51	85.53	25.48	174.90	6.8	7.3	7.1	7.1
s60	84.65	25.59	86.18	26.70	210.41	5.4	5.9	7.2	6.3

s61	87.24	28.59	85.24	26.77	300.17	5.7	6.2	6.2	6.1
s62	85.63	26.87	87.24	28.03	220.63	7.0	7.5	7.3	7.3
s63	84.80	27.69	85.19	28.30	80.58	6.5	6.8	6.6	6.6
s64	85.50	28.22	85.03	27.65	82.04	5.0	5.4	6.6	5.7
s65	85.22	27.52	85.44	27.75	35.94	6.0	6.2	6.0	6.0
s66	85.46	27.76	85.58	27.68	16.57	5.5	5.5	5.4	5.4
s67	85.64	27.66	85.99	27.51	42.12	5.2	5.6	6.1	5.7
s68	85.06	28.30	85.05	28.06	26.33	5.2	5.5	5.7	5.5
s69	84.29	28.08	85.08	28.84	121.58	6.3	6.7	6.8	6.6
s70	84.06	28.37	84.09	28.52	16.25	5.4	5.4	5.4	5.4
s71	85.32	28.56	85.51	29.05	58.33	4.8	5.2	6.3	5.5
s72	85.68	29.05	85.66	28.73	35.19	4.9	5.3	5.9	5.4
s73	85.60	29.05	86.50	28.86	101.99	6.5	6.8	6.7	6.7
s74	84.32	29.04	84.15	28.68	44.17	6.3	6.1	6.1	6.2
s75	84.06	28.70	84.08	29.04	37.41	5.5	5.5	6.0	5.7
s76	86.74	28.43	86.49	29.06	74.98	6.1	6.6	6.5	6.4
s77	86.59	29.06	86.81	28.34	83.29	5.1	5.4	6.6	5.8
s78	86.72	28.82	87.24	28.73	58.28	7.2	6.6	6.3	6.7
s79	87.24	28.57	87.69	29.03	72.12	6.0	6.4	6.5	6.3
s80	87.78	28.79	87.80	28.71	9.74	6.2	5.0	5.0	5.4
s81	87.43	28.72	87.54	28.71	12.52	5.7	5.1	5.2	5.3
s82	87.25	27.87	86.87	28.53	84.24	5.0	5.4	6.6	5.7
s83	87.40	28.17	88.67	29.04	171.10	5.8	6.3	7.1	6.5
s84	87.23	28.06	87.35	28.15	17.05	5.2	5.3	5.4	5.3
s85	87.73	28.38	87.57	28.16	30.56	5.6	6.0	5.8	5.8
s86	87.84	28.25	87.84	28.12	14.44	5.2	5.3	5.3	5.3
s87	87.85	28.40	87.85	28.29	12.91	5.4	5.4	5.2	5.3
s88	87.80	28.66	87.77	28.54	14.21	4.9	5.1	5.3	5.1
s89	87.94	28.49	87.98	28.67	21.10	5.6	5.6	5.6	5.6
s90	87.71	28.68	88.27	28.61	61.81	6.6	6.3	6.4	6.4

s91	87.57	28.12	87.56	28.05	7.04	5.5	5.0	4.8	5.1
s92	85.70	27.45	85.67	27.40	6.18	4.4	4.8	4.7	4.6
s93	85.67	27.25	85.70	27.20	6.88	5.5	5.0	4.7	5.1
s94	85.67	27.48	85.76	27.57	13.40	5.2	5.3	5.2	5.3
s95	85.84	27.46	85.82	27.40	7.38	4.4	4.8	4.8	4.7
s96	85.85	27.60	85.95	27.57	11.56	4.6	5.2	5.1	5.0
s97	87.15	27.59	87.00	27.50	19.40	5.2	5.6	5.5	5.4
s98	87.07	27.50	87.15	27.51	8.91	5.5	5.0	4.9	5.1
s99	86.28	27.29	86.33	27.21	10.57	4.7	5.0	5.1	4.9