

**Digital Appendix for:
Statistical evaluation of the orientation angle of
maximum spectral response for strike-slip horizontal
bi-directional ground motions**

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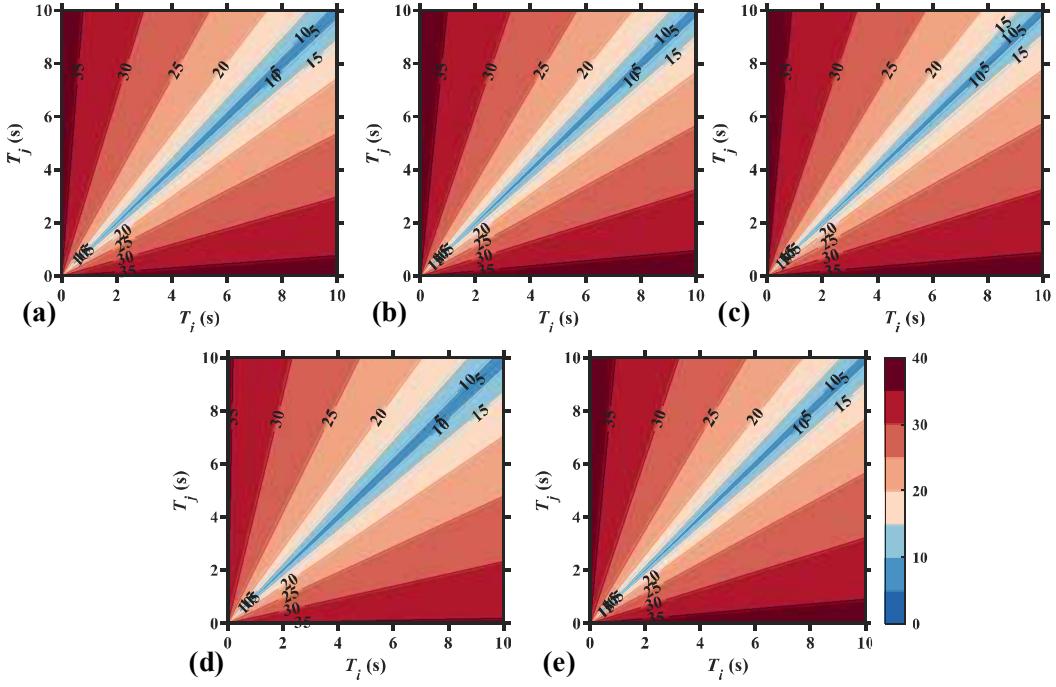


Figure A.1. Predicted mean of $\Delta\varphi$: (a) Site class A, (b) Site class B, (c) Site class C, (d) Site class D, and (e) All. [Unit: $^\circ$]

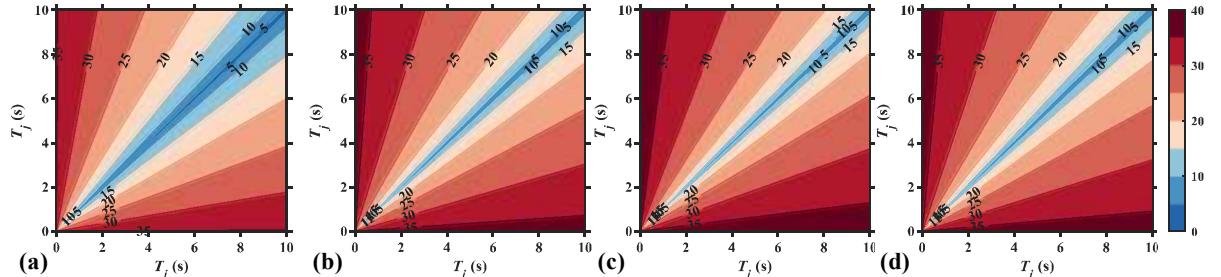


Figure A.2. Predicted mean of $\Delta\varphi$: (a) $D_{epi} < 30.0$ km, (b) $30.0 \text{ km} \leq D_{epi} < 100.0$ km, (c) $100.0 \text{ km} \leq D_{epi} < 400.0$ km, and (a) All. [Unit: $^\circ$]

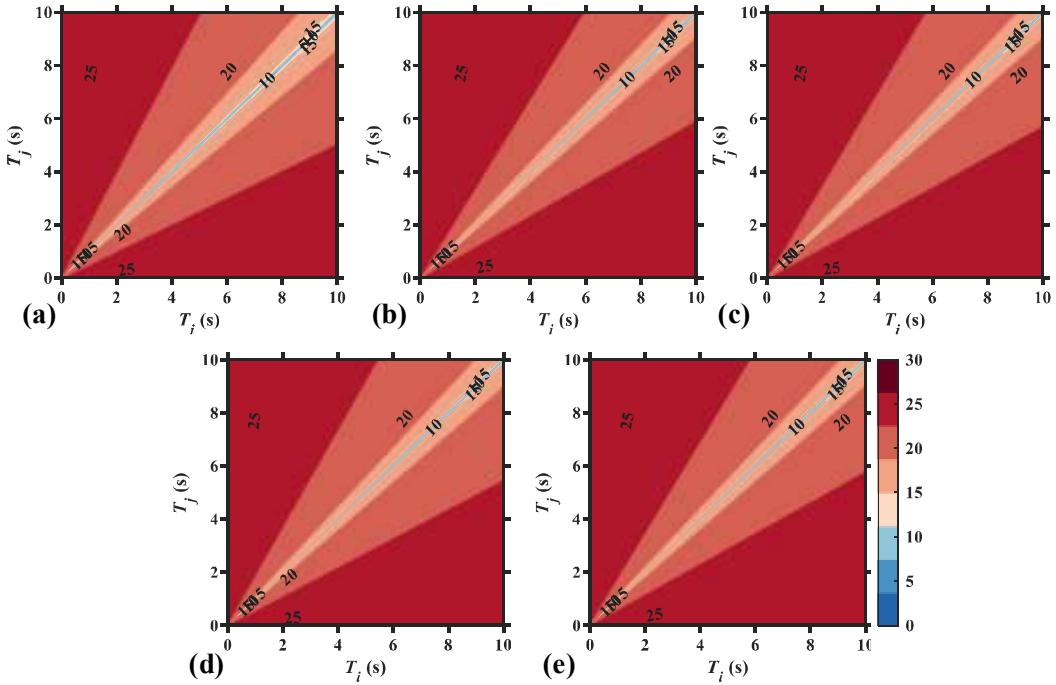


Figure A.3. Predicted standard deviation of $\Delta\varphi$: (a) Site class A, (b) Site class B, (c) Site class C, (d) Site class D, and (e) All. [Unit: $^{\circ}$]

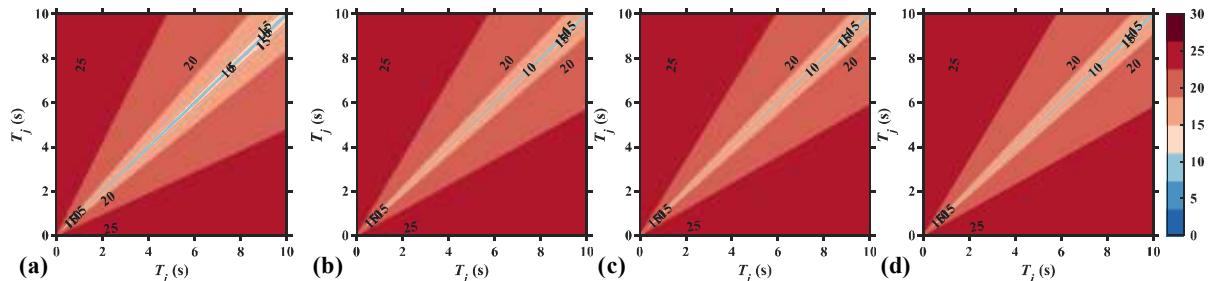


Figure A.4. Predicted standard deviation of $\Delta\varphi$: (a) $D_{epi} < 30.0$ km, (b) $30.0 \text{ km} \leq D_{epi} < 100.0$ km, (c) $100.0 \text{ km} \leq D_{epi} < 400.0$ km, and (d) All. [Unit: $^{\circ}$]

Table A.1 Estimated values of the coefficients b for the regression model of the angular distance distribution of $\Delta\varphi$ at two successive natural periods using Equation 6.

T (s)	b	T (s)	b	T (s)	b	T (s)	b	T (s)	b
0.01	0.09	2.01	1.35	4.01	0.68	6.01	0.32	8.01	0.22
0.02	3.99	2.02	1.40	4.02	0.60	6.02	0.31	8.02	0.17
0.03	7.21	2.03	1.58	4.03	0.79	6.03	0.31	8.03	0.19
0.04	11.03	2.04	1.43	4.04	0.73	6.04	0.44	8.04	0.19
0.05	15.22	2.05	1.63	4.05	0.68	6.05	0.36	8.05	0.21
0.06	16.88	2.06	1.89	4.06	0.56	6.06	0.35	8.06	0.18
0.07	19.33	2.07	1.37	4.07	0.67	6.07	0.31	8.07	0.22
0.08	19.71	2.08	1.48	4.08	0.65	6.08	0.30	8.08	0.18
0.09	20.85	2.09	1.48	4.09	0.68	6.09	0.34	8.09	0.22
0.10	21.50	2.10	1.27	4.10	0.66	6.10	0.25	8.10	0.25
0.11	20.88	2.11	1.61	4.11	0.74	6.11	0.38	8.11	0.22
0.12	20.05	2.12	1.53	4.12	0.48	6.12	0.33	8.12	0.18
0.13	20.27	2.13	1.49	4.13	0.66	6.13	0.33	8.13	0.19
0.14	19.63	2.14	1.62	4.14	0.67	6.14	0.38	8.14	0.21
0.15	18.61	2.15	1.57	4.15	0.51	6.15	0.37	8.15	0.19
0.16	18.54	2.16	1.32	4.16	0.62	6.16	0.35	8.16	0.18
0.17	18.16	2.17	1.40	4.17	0.71	6.17	0.29	8.17	0.17
0.18	17.21	2.18	1.30	4.18	0.78	6.18	0.43	8.18	0.21
0.19	16.62	2.19	1.42	4.19	0.52	6.19	0.34	8.19	0.23
0.20	16.25	2.20	1.55	4.20	0.60	6.20	0.30	8.20	0.17
0.21	15.82	2.21	1.32	4.21	0.67	6.21	0.36	8.21	0.21
0.22	14.70	2.22	1.60	4.22	0.60	6.22	0.35	8.22	0.23
0.23	14.42	2.23	1.45	4.23	0.73	6.23	0.35	8.23	0.19
0.24	13.55	2.24	1.43	4.24	0.57	6.24	0.30	8.24	0.20
0.25	13.99	2.25	1.39	4.25	0.59	6.25	0.29	8.25	0.21
0.26	13.55	2.26	1.24	4.26	0.48	6.26	0.31	8.26	0.21
0.27	12.66	2.27	1.41	4.27	0.66	6.27	0.38	8.27	0.18
0.28	12.39	2.28	1.33	4.28	0.60	6.28	0.28	8.28	0.22
0.29	12.29	2.29	1.43	4.29	0.60	6.29	0.36	8.29	0.22
0.30	11.28	2.30	1.38	4.30	0.53	6.30	0.33	8.30	0.25
0.31	10.78	2.31	1.49	4.31	0.61	6.31	0.29	8.31	0.20
0.32	10.73	2.32	1.25	4.32	0.59	6.32	0.36	8.32	0.21
0.33	10.75	2.33	1.38	4.33	0.60	6.33	0.39	8.33	0.17
0.34	10.85	2.34	1.40	4.34	0.54	6.34	0.33	8.34	0.22
0.35	9.73	2.35	1.36	4.35	0.55	6.35	0.29	8.35	0.24
0.36	10.20	2.36	1.08	4.36	0.49	6.36	0.32	8.36	0.30
0.37	9.53	2.37	1.10	4.37	0.54	6.37	0.29	8.37	0.18
0.38	9.17	2.38	1.16	4.38	0.61	6.38	0.30	8.38	0.24
0.39	9.22	2.39	1.25	4.39	0.52	6.39	0.39	8.39	0.24
0.40	9.00	2.40	1.19	4.40	0.64	6.40	0.30	8.40	0.24

0.41	8.99	2.41	1.25	4.41	0.52	6.41	0.25	8.41	0.17
0.42	8.93	2.42	1.26	4.42	0.57	6.42	0.29	8.42	0.18
0.43	8.79	2.43	1.37	4.43	0.55	6.43	0.26	8.43	0.17
0.44	8.28	2.44	1.12	4.44	0.45	6.44	0.22	8.44	0.19
0.45	7.63	2.45	1.19	4.45	0.63	6.45	0.36	8.45	0.21
0.46	7.91	2.46	1.28	4.46	0.45	6.46	0.29	8.46	0.21
0.47	7.55	2.47	1.26	4.47	0.39	6.47	0.33	8.47	0.18
0.48	7.66	2.48	1.13	4.48	0.49	6.48	0.31	8.48	0.21
0.49	7.41	2.49	1.08	4.49	0.52	6.49	0.29	8.49	0.19
0.50	7.57	2.50	1.23	4.50	0.61	6.50	0.24	8.50	0.17
0.51	7.17	2.51	1.20	4.51	0.58	6.51	0.34	8.51	0.19
0.52	6.94	2.52	1.37	4.52	0.67	6.52	0.31	8.52	0.17
0.53	6.53	2.53	1.07	4.53	0.59	6.53	0.29	8.53	0.17
0.54	6.99	2.54	1.11	4.54	0.63	6.54	0.37	8.54	0.21
0.55	6.65	2.55	1.03	4.55	0.51	6.55	0.31	8.55	0.17
0.56	6.15	2.56	1.44	4.56	0.45	6.56	0.35	8.56	0.20
0.57	6.08	2.57	1.06	4.57	0.44	6.57	0.28	8.57	0.17
0.58	6.70	2.58	1.16	4.58	0.48	6.58	0.30	8.58	0.17
0.59	5.92	2.59	1.18	4.59	0.50	6.59	0.22	8.59	0.17
0.60	5.99	2.60	1.44	4.60	0.54	6.60	0.30	8.60	0.17
0.61	5.87	2.61	0.92	4.61	0.52	6.61	0.31	8.61	0.19
0.62	5.93	2.62	1.12	4.62	0.48	6.62	0.29	8.62	0.17
0.63	6.09	2.63	0.97	4.63	0.51	6.63	0.29	8.63	0.18
0.64	5.61	2.64	1.23	4.64	0.67	6.64	0.39	8.64	0.17
0.65	5.45	2.65	0.98	4.65	0.50	6.65	0.24	8.65	0.17
0.66	5.71	2.66	1.19	4.66	0.53	6.66	0.25	8.66	0.28
0.67	5.58	2.67	0.93	4.67	0.51	6.67	0.33	8.67	0.17
0.68	5.42	2.68	0.90	4.68	0.52	6.68	0.28	8.68	0.18
0.69	5.06	2.69	1.14	4.69	0.45	6.69	0.28	8.69	0.18
0.70	5.10	2.70	1.19	4.70	0.45	6.70	0.27	8.70	0.21
0.71	5.14	2.71	1.22	4.71	0.47	6.71	0.39	8.71	0.17
0.72	5.10	2.72	1.08	4.72	0.45	6.72	0.23	8.72	0.18
0.73	4.66	2.73	1.10	4.73	0.46	6.73	0.28	8.73	0.17
0.74	4.96	2.74	1.03	4.74	0.44	6.74	0.26	8.74	0.17
0.75	5.01	2.75	1.12	4.75	0.55	6.75	0.32	8.75	0.18
0.76	4.79	2.76	1.07	4.76	0.44	6.76	0.33	8.76	0.20
0.77	4.66	2.77	1.10	4.77	0.57	6.77	0.28	8.77	0.18
0.78	4.69	2.78	1.11	4.78	0.52	6.78	0.28	8.78	0.21
0.79	4.41	2.79	1.05	4.79	0.47	6.79	0.22	8.79	0.23
0.80	4.25	2.80	0.98	4.80	0.52	6.80	0.28	8.80	0.27
0.81	4.64	2.81	1.01	4.81	0.48	6.81	0.28	8.81	0.19
0.82	4.32	2.82	1.00	4.82	0.51	6.82	0.28	8.82	0.17
0.83	4.29	2.83	0.95	4.83	0.55	6.83	0.32	8.83	0.17
0.84	4.52	2.84	1.10	4.84	0.38	6.84	0.25	8.84	0.27

0.85	4.24	2.85	0.90	4.85	0.52	6.85	0.27	8.85	0.21
0.86	4.08	2.86	1.05	4.86	0.46	6.86	0.26	8.86	0.20
0.87	4.44	2.87	1.03	4.87	0.52	6.87	0.25	8.87	0.18
0.88	4.32	2.88	1.05	4.88	0.53	6.88	0.28	8.88	0.21
0.89	4.16	2.89	0.88	4.89	0.50	6.89	0.21	8.89	0.19
0.90	3.81	2.90	1.10	4.90	0.42	6.90	0.26	8.90	0.20
0.91	4.17	2.91	1.01	4.91	0.41	6.91	0.27	8.91	0.17
0.92	3.90	2.92	1.14	4.92	0.50	6.92	0.28	8.92	0.22
0.93	3.59	2.93	0.98	4.93	0.49	6.93	0.33	8.93	0.20
0.94	3.90	2.94	0.86	4.94	0.42	6.94	0.23	8.94	0.17
0.95	3.78	2.95	0.98	4.95	0.40	6.95	0.25	8.95	0.17
0.96	3.96	2.96	1.02	4.96	0.49	6.96	0.27	8.96	0.18
0.97	3.69	2.97	0.96	4.97	0.49	6.97	0.24	8.97	0.19
0.98	3.74	2.98	0.92	4.98	0.47	6.98	0.22	8.98	0.17
0.99	3.55	2.99	1.05	4.99	0.42	6.99	0.20	8.99	0.17
1.00	3.26	3.00	1.02	5.00	0.50	7.00	0.28	9.00	0.17
1.01	3.33	3.01	0.92	5.01	0.60	7.01	0.21	9.01	0.17
1.02	3.27	3.02	0.94	5.02	0.45	7.02	0.25	9.02	0.17
1.03	3.65	3.03	0.96	5.03	0.48	7.03	0.24	9.03	0.17
1.04	3.48	3.04	0.99	5.04	0.44	7.04	0.21	9.04	0.17
1.05	3.60	3.05	1.04	5.05	0.48	7.05	0.28	9.05	0.17
1.06	3.41	3.06	0.95	5.06	0.37	7.06	0.35	9.06	0.19
1.07	3.21	3.07	0.94	5.07	0.49	7.07	0.21	9.07	0.20
1.08	3.15	3.08	1.05	5.08	0.54	7.08	0.23	9.08	0.17
1.09	3.11	3.09	1.04	5.09	0.46	7.09	0.25	9.09	0.17
1.10	3.26	3.10	0.96	5.10	0.44	7.10	0.23	9.10	0.17
1.11	3.14	3.11	0.94	5.11	0.41	7.11	0.36	9.11	0.17
1.12	2.92	3.12	1.01	5.12	0.45	7.12	0.30	9.12	0.17
1.13	3.26	3.13	0.97	5.13	0.35	7.13	0.27	9.13	0.20
1.14	3.04	3.14	1.04	5.14	0.47	7.14	0.23	9.14	0.19
1.15	3.06	3.15	0.84	5.15	0.41	7.15	0.20	9.15	0.20
1.16	3.07	3.16	0.89	5.16	0.54	7.16	0.30	9.16	0.19
1.17	3.01	3.17	1.00	5.17	0.49	7.17	0.28	9.17	0.17
1.18	3.03	3.18	0.84	5.18	0.40	7.18	0.25	9.18	0.17
1.19	2.82	3.19	0.89	5.19	0.41	7.19	0.31	9.19	0.19
1.20	3.13	3.20	0.99	5.20	0.45	7.20	0.25	9.20	0.17
1.21	2.81	3.21	0.88	5.21	0.47	7.21	0.20	9.21	0.24
1.22	3.13	3.22	0.87	5.22	0.41	7.22	0.24	9.22	0.19
1.23	2.76	3.23	0.80	5.23	0.52	7.23	0.27	9.23	0.17
1.24	2.97	3.24	0.88	5.24	0.48	7.24	0.21	9.24	0.18
1.25	2.68	3.25	0.79	5.25	0.50	7.25	0.21	9.25	0.17
1.26	2.63	3.26	0.91	5.26	0.44	7.26	0.22	9.26	0.19
1.27	2.77	3.27	0.98	5.27	0.37	7.27	0.20	9.27	0.17
1.28	2.54	3.28	0.88	5.28	0.40	7.28	0.24	9.28	0.17

1.29	2.99	3.29	0.88	5.29	0.42	7.29	0.23	9.29	0.17
1.30	2.86	3.30	0.71	5.30	0.32	7.30	0.20	9.30	0.17
1.31	2.86	3.31	0.82	5.31	0.40	7.31	0.22	9.31	0.17
1.32	2.50	3.32	0.82	5.32	0.53	7.32	0.29	9.32	0.18
1.33	2.65	3.33	0.84	5.33	0.34	7.33	0.27	9.33	0.20
1.34	2.22	3.34	0.79	5.34	0.43	7.34	0.21	9.34	0.20
1.35	2.68	3.35	0.95	5.35	0.37	7.35	0.21	9.35	0.17
1.36	2.50	3.36	0.89	5.36	0.44	7.36	0.33	9.36	0.21
1.37	2.67	3.37	0.64	5.37	0.40	7.37	0.24	9.37	0.17
1.38	2.23	3.38	0.81	5.38	0.46	7.38	0.20	9.38	0.17
1.39	2.27	3.39	0.88	5.39	0.36	7.39	0.27	9.39	0.17
1.40	2.51	3.40	0.80	5.40	0.50	7.40	0.28	9.40	0.17
1.41	2.34	3.41	0.73	5.41	0.43	7.41	0.23	9.41	0.17
1.42	2.61	3.42	0.93	5.42	0.45	7.42	0.25	9.42	0.17
1.43	2.50	3.43	0.91	5.43	0.36	7.43	0.24	9.43	0.18
1.44	2.48	3.44	0.68	5.44	0.46	7.44	0.25	9.44	0.17
1.45	2.19	3.45	0.86	5.45	0.38	7.45	0.22	9.45	0.18
1.46	2.33	3.46	0.81	5.46	0.45	7.46	0.26	9.46	0.21
1.47	2.12	3.47	0.86	5.47	0.43	7.47	0.22	9.47	0.17
1.48	2.48	3.48	0.89	5.48	0.37	7.48	0.23	9.48	0.17
1.49	2.37	3.49	0.72	5.49	0.37	7.49	0.25	9.49	0.17
1.50	2.15	3.50	0.86	5.50	0.42	7.50	0.20	9.50	0.17
1.51	2.26	3.51	0.71	5.51	0.26	7.51	0.26	9.51	0.17
1.52	2.31	3.52	0.88	5.52	0.34	7.52	0.22	9.52	0.17
1.53	2.10	3.53	0.76	5.53	0.38	7.53	0.30	9.53	0.17
1.54	2.33	3.54	0.90	5.54	0.43	7.54	0.17	9.54	0.19
1.55	2.12	3.55	1.01	5.55	0.37	7.55	0.28	9.55	0.17
1.56	2.05	3.56	0.76	5.56	0.27	7.56	0.21	9.56	0.21
1.57	2.02	3.57	0.83	5.57	0.37	7.57	0.22	9.57	0.17
1.58	2.16	3.58	0.74	5.58	0.43	7.58	0.19	9.58	0.17
1.59	2.04	3.59	0.65	5.59	0.39	7.59	0.22	9.59	0.17
1.60	2.19	3.60	0.71	5.60	0.35	7.60	0.19	9.60	0.17
1.61	2.11	3.61	0.77	5.61	0.44	7.61	0.28	9.61	0.17
1.62	1.85	3.62	0.73	5.62	0.37	7.62	0.23	9.62	0.17
1.63	1.98	3.63	0.65	5.63	0.34	7.63	0.26	9.63	0.17
1.64	1.97	3.64	0.79	5.64	0.41	7.64	0.23	9.64	0.17
1.65	1.81	3.65	0.80	5.65	0.32	7.65	0.19	9.65	0.17
1.66	2.14	3.66	0.63	5.66	0.35	7.66	0.26	9.66	0.17
1.67	2.07	3.67	0.73	5.67	0.48	7.67	0.23	9.67	0.21
1.68	2.16	3.68	0.80	5.68	0.39	7.68	0.22	9.68	0.17
1.69	1.86	3.69	0.69	5.69	0.41	7.69	0.17	9.69	0.17
1.70	1.86	3.70	0.69	5.70	0.35	7.70	0.20	9.70	0.18
1.71	1.93	3.71	0.87	5.71	0.39	7.71	0.23	9.71	0.17
1.72	1.81	3.72	0.75	5.72	0.32	7.72	0.19	9.72	0.17

1.73	1.90	3.73	0.76	5.73	0.42	7.73	0.20	9.73	0.17
1.74	2.16	3.74	0.73	5.74	0.45	7.74	0.29	9.74	0.17
1.75	1.82	3.75	0.84	5.75	0.36	7.75	0.20	9.75	0.17
1.76	1.92	3.76	0.73	5.76	0.36	7.76	0.20	9.76	0.17
1.77	1.91	3.77	0.64	5.77	0.36	7.77	0.23	9.77	0.17
1.78	1.59	3.78	0.56	5.78	0.27	7.78	0.22	9.78	0.17
1.79	1.98	3.79	0.66	5.79	0.34	7.79	0.22	9.79	0.17
1.80	1.81	3.80	0.94	5.80	0.28	7.80	0.17	9.80	0.18
1.81	1.89	3.81	0.79	5.81	0.30	7.81	0.26	9.81	0.17
1.82	1.73	3.82	0.74	5.82	0.31	7.82	0.27	9.82	0.17
1.83	1.67	3.83	0.60	5.83	0.41	7.83	0.17	9.83	0.17
1.84	1.73	3.84	0.63	5.84	0.31	7.84	0.21	9.84	0.17
1.85	1.82	3.85	0.73	5.85	0.37	7.85	0.17	9.85	0.17
1.86	1.73	3.86	0.72	5.86	0.40	7.86	0.24	9.86	0.17
1.87	1.71	3.87	0.59	5.87	0.34	7.87	0.22	9.87	0.17
1.88	1.71	3.88	0.69	5.88	0.44	7.88	0.24	9.88	0.17
1.89	1.71	3.89	0.60	5.89	0.37	7.89	0.21	9.89	0.17
1.90	1.67	3.90	0.76	5.90	0.35	7.90	0.24	9.90	0.17
1.91	1.61	3.91	0.72	5.91	0.30	7.91	0.22	9.91	0.17
1.92	1.62	3.92	0.66	5.92	0.38	7.92	0.20	9.92	0.20
1.93	1.68	3.93	0.78	5.93	0.31	7.93	0.22	9.93	0.21
1.94	1.60	3.94	0.65	5.94	0.38	7.94	0.28	9.94	0.17
1.95	1.56	3.95	0.62	5.95	0.41	7.95	0.23	9.95	0.17
1.96	1.75	3.96	0.66	5.96	0.33	7.96	0.23	9.96	0.20
1.97	1.93	3.97	0.70	5.97	0.34	7.97	0.18	9.97	0.18
1.98	1.43	3.98	0.64	5.98	0.39	7.98	0.21	9.98	0.17
1.99	1.45	3.99	0.71	5.99	0.34	7.99	0.18	9.99	0.20
2.00	1.40	4.00	0.56	6.00	0.30	8.00	0.28		

The following figures are the observed and fitted distributions of $\Delta\phi$ between two successive natural period using records from the strike-slip ground motion database in the functional form of Equation 6.

