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Supplementary Materials

Research on Dynamic Spatial Pose and Load of Hydraulic Support Under Inclined–Declined and Large-Dip-Angle Working Conditions for Product Design

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Abstract

Complete accompanying data have been provided for the 18 figures and tables in the paper, which are included as Supplementary Materials, along with explanatory notes for some of the figures.

S1. Data Description (required)

This section provides all raw and processed data corresponding to the figures and tables in this research paper. The detailed data content is presented below.

S1.1 Data Description for Figures and Tables in Section 4.2

In Figure 5(a), the X-axis represents the support height of the hydraulic support, the Y-axis represents the height of the strut, and the Z-axis represents the length of the balancing jack. The corresponding theoretical simulation data are shown in Table S1.

In Figure 5(b), the X-axis represents the support height of the hydraulic support, the Y-axis represents the types of joint angles, and the Z-axis represents the magnitude of joint angles. The corresponding theoretical simulation data are shown in Table S2.

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Table S1. *Theoretical simulation data corresponding to Figure 5(a).*

No.	Column height	Balance jack height	Support height	Table number	Column height	Balance jack height	Support height
1	2288.65	1136.21	3000.47	28	2462.2	1107.32	3174.69
2	2289.48	1136.08	3001.3	29	2475.59	1105	3188.12
3	2290.61	1135.89	3002.43	30	2489.35	1102.6	3201.93
4	2292.07	1135.66	3003.91	31	2503.48	1100.13	3216.1
5	2293.92	1135.36	3005.76	32	2517.93	1097.58	3230.6
6	2296.17	1135	3008.02	33	2532.68	1094.96	3245.4
7	2298.86	1134.56	3010.73	34	2547.71	1092.27	3260.48
8	2302.01	1134.05	3013.89	35	2562.98	1089.52	3275.8
9	2305.65	1133.47	3017.54	36	2578.47	1086.72	3291.33
10	2309.79	1132.8	3021.7	37	2594.14	1083.85	3307.05
11	2314.44	1132.04	3026.37	38	2609.97	1080.94	3322.93
12	2319.63	1131.2	3031.59	39	2625.92	1077.97	3338.93
13	2325.37	1130.26	3037.34	40	2641.97	1074.97	3355.02
14	2331.65	1129.24	3043.65	41	2658.08	1071.93	3371.18
15	2338.49	1128.12	3050.52	42	2674.23	1068.85	3387.37
16	2345.89	1126.9	3057.95	43	2690.38	1065.75	3403.57
17	2353.85	1125.59	3065.94	44	2706.51	1062.63	3419.75
18	2362.35	1124.19	3074.48	45	2722.58	1059.48	3435.86
19	2371.41	1122.69	3083.57	46	2738.57	1056.33	3451.9
20	2381.01	1121.09	3093.2	47	2754.46	1053.17	3467.83
21	2391.13	1119.4	3103.37	48	2770.21	1050	3483.62
22	2401.78	1117.61	3114.05	49	2785.79	1046.84	3499.25
23	2412.93	1115.73	3125.24	50	2801.19	1043.68	3514.7
24	2424.56	1113.76	3136.92	51	2816.39	1040.54	3529.93
25	2436.67	1111.7	3149.07	52	2831.35	1037.42	3544.93
26	2449.22	1109.55	3161.66	53	2846.05	1034.32	3559.68
27	2288.65	1136.21	3000.47	54	2860.48	1031.25	3574.15

Table S2. *Theoretical simulation data corresponding to Figure 5(b).*

No.	Joint angle 1	Joint angle 2	Joint angle 3	Joint angle 4	Joint angle 5	Joint angle 6	Joint angle 7	Support height
1	43.68	109.57	21	-42.31	100.12	-74.48	15.68	3000.47
2	43.7	109.53	21	-42.31	100.14	-74.48	15.68	3001.3
3	43.73	109.48	21	-42.31	100.16	-74.48	15.68	3002.43
4	43.77	109.41	21	-42.31	100.19	-74.48	15.68	3003.91
5	43.82	109.33	21	-42.31	100.22	-74.48	15.68	3005.76
6	43.88	109.23	21	-42.31	100.26	-74.48	15.68	3008.02

7	43.95	109.1	21	-42.31	100.31	-74.48	15.68	3010.73
8	44.04	108.96	21	-42.31	100.37	-74.48	15.68	3013.89
9	44.13	108.79	21	-42.31	100.44	-74.48	15.68	3017.54
10	44.24	108.61	21	-42.31	100.52	-74.48	15.68	3021.7
11	44.37	108.39	21	-42.31	100.61	-74.48	15.68	3026.37
12	44.51	108.15	21	-42.31	100.71	-74.48	15.68	3031.59
13	44.66	107.89	21	-42.31	100.82	-74.48	15.68	3037.34
14	44.83	107.6	21	-42.31	100.94	-74.48	15.68	3043.65
15	45.01	107.29	21	-42.31	101.07	-74.48	15.68	3050.52
16	45.21	106.95	21	-42.31	101.21	-74.48	15.68	3057.95
17	45.43	106.58	21	-42.31	101.36	-74.48	15.68	3065.94
18	45.66	106.19	21	-42.31	101.53	-74.48	15.68	3074.48
19	45.9	105.77	21	-42.31	101.7	-74.48	15.68	3083.57
20	46.17	105.32	21	-42.31	101.89	-74.48	15.68	3093.2
21	46.44	104.84	21	-42.31	102.08	-74.48	15.68	3103.37
22	46.73	104.35	21	-42.31	102.29	-74.48	15.68	3114.05
23	47.04	103.82	21	-42.31	102.51	-74.48	15.68	3125.24
24	47.36	103.27	21	-42.31	102.74	-74.48	15.68	3136.92
25	47.7	102.7	21	-42.31	102.97	-74.48	15.68	3149.07
26	48.05	102.1	21	-42.31	103.22	-74.48	15.68	3161.66
27	48.41	101.48	21	-42.31	103.48	-74.48	15.68	3174.69
28	48.79	100.83	21	-42.31	103.75	-74.48	15.68	3188.12
29	49.18	100.17	21	-42.31	104.03	-74.48	15.68	3201.93
30	49.58	99.48	21	-42.31	104.31	-74.48	15.68	3216.1
31	49.99	98.77	21	-42.31	104.6	-74.48	15.68	3230.6

32	50.42	98.05	21	-42.31	104.9	-74.48	15.68	3245.4
33	50.85	97.3	21	-42.31	105.21	-74.48	15.68	3260.48
34	51.3	96.54	21	-42.31	105.53	-74.48	15.68	3275.8
35	51.75	95.77	21	-42.31	105.85	-74.48	15.68	3291.33
36	52.21	94.98	21	-42.31	106.18	-74.48	15.68	3307.05
37	52.68	94.17	21	-42.31	106.51	-74.48	15.68	3322.93
38	53.16	93.36	21	-42.31	106.85	-74.48	15.68	3338.93
39	53.64	92.53	21	-42.31	107.19	-74.48	15.68	3355.02
40	54.13	91.7	21	-42.31	107.54	-74.48	15.68	3371.18
41	54.63	90.85	21	-42.31	107.89	-74.48	15.68	3387.37
42	55.13	90	21	-42.31	108.24	-74.48	15.68	3403.57
43	55.63	89.14	21	-42.31	108.6	-74.48	15.68	3419.75
44	56.13	88.28	21	-42.31	108.96	-74.48	15.68	3435.86
45	56.63	87.42	21	-42.31	109.32	-74.48	15.68	3451.9
46	57.14	86.56	21	-42.31	109.68	-74.48	15.68	3467.83
47	57.65	85.69	21	-42.31	110.03	-74.48	15.68	3483.62
48	58.15	84.83	21	-42.31	110.39	-74.48	15.68	3499.25
49	58.65	83.97	21	-42.31	110.75	-74.48	15.68	3514.7
50	59.15	83.11	21	-42.31	111.11	-74.48	15.68	3529.93
51	59.65	82.26	21	-42.31	111.46	-74.48	15.68	3544.93
52	60.15	81.41	21	-42.31	111.81	-74.48	15.68	3559.68
53	60.64	80.58	21	-42.31	112.16	-74.48	15.68	3574.15
54	61.12	79.75	21	-42.31	112.5	-74.48	15.68	3588.32

S1.2 Data Description for Figures and Tables in Section 5.1

In Figure 9(a), the X-axis represents the canopy load, the Y-axis represents the support height, and the Z-axis represents the balancing jack load. The corresponding

theoretical simulation data are shown in Table S3. The 32×32 data matrix provided in Table S3 corresponds to the theoretical simulation results of the surface shown in Figure 9(a). The column headers of this matrix correspond to the X-axis value range of 4000–10000 KN in Figure 9(a), the row headers correspond to the Y-axis value range of 3000–3600 mm, and the matrix element values represent the Z-axis values of each point on the surface.

In Figure 9(b), the X-axis represents the canopy load, the Y-axis represents the support height, and the Z-axis represents the upright column load. The corresponding theoretical simulation data are shown in Table S4. The 32×32 data matrix provided in Table S4 corresponds to the theoretical simulation results of the surface shown in Figure 9(b). The column headers of this matrix correspond to the X-axis value range of 4000–10000 KN in Figure 9(b), the row headers correspond to the Y-axis value range of 3000–3600 mm, and the matrix element values represent the Z-axis values of each point on the surface.

Table S3. *Theoretical simulation data corresponding to Figure 9(a).*

11	11	11	11	11	11	11	11	11	11	11	10	10	10	10	10	10	10	10	99	98	97	97	96	96	96	96	96	96	97	98	98
50	55	57	58	56	51	45	38	28	17	06	94	80	68	54	41	28	16	04	4.	5.	7.	1.	6.	3.	2.	3.	5.	9.	4.	0.	7.
.2	.2	.8	.3	.2	.7	.6	.0	.5	.8	.6	.0	.9	.1	.5	.2	.7	.4	.8	71	47	47	30	73	72	48	27	73	36	07	09	47
69	10	71	20	81	87	73	84	03	84	30	21	83	04	83	34	78	40	35	12	73	10	90	62	38	55	02	61	05	55	41	46
85	8	72	67	71	34	92	24	1	75	12	86	23	01	24	73	41	51	58	3	9	7	6	6	6	1	4	7	2		1	8
12	12	12	12	12	12	12	11	11	11	11	11	11	11	11	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
05	11	13	13	11	07	00	92	82	71	60	46	33	19	05	91	78	65	53	42	33	25	18	13	10	09	10	12	16	21	27	35
.9	.1	.6	.9	.7	.0	.8	.7	.7	.8	.0	.9	.2	.7	.5	.7	.6	.7	.6	.9	.4	.1	.6	.8	.6	.3	.2	.7	.4	.3	.5	.2
97	04	21	34	43	58	11	81	47	24	28	25	93	57	86	78	57	10	37	79	76	05	21	54	72	98	17	12	47	40	34	27
5	75	57		79	3	45	99	93	93	72	13	73	75	2	85	51	64	29	71	28	85	34	04	59	17	41	86	33	38	59	71
12	12	12	12	12	12	12	12	12	12	12	11	11	11	11	11	11	11	11	10	10	10	10	10	10	10	10	10	10	10	10	10
61	67	69	69	67	62	56	47	37	25	13	99	85	71	56	42	28	14	02	91	81	72	65	60	57	56	56	59	63	68	74	83
.6	.1	.7	.9	.5	.9	.2	.7	.3	.8	.3	.9	.6	.3	.5	.2	.4	.8	.3	.1	.1	.4	.6	.6	.3	.0	.8	.2	.3	.4	.9	.0
58	67	47	23	86	03	09	36	89	96	42	51	30	84	60	36	09	03	89	19	56	73	53	17	70	19	78	81	77	45	12	09
12	51	13	73	24	51	31	74	44	01	39	38	79	08	81	58	72	79	16	28		9	37	82	97	41	71	84	4	58	98	04
13	13	13	13	13	13	13	13	12	12	12	12	12	12	12	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
17	23	26	26	23	18	11	02	92	80	66	52	37	23	07	92	78	64	50	39	28	19	12	07	03	02	03	05	10	15	22	30
.2	.0	.0	.1	.6	.9	.7	.8	.3	.0	.9	.6	.9	.0	.8	.5	.1	.1	.9	.1	.5	.6	.5	.2	.8	.4	.2	.9	.2	.4	.3	.8
83	71	15	32	89	74	69	69	64	66	78	59	70	13	90	71	02	84	26	78	21	83	28	78	55	71	71	29	16	96	60	04
65		16	79	83	64	17	58	2	28	48	64	69	25	07	59	48	14	73	72	77	66	31	53	5	73	28	8	62	16	84	58
13	13	13	13	13	13	13	13	13	13	13	13	12	12	12	12	12	12	11	11	11	11	11	11	11	11	11	11	11	11	11	11
72	78	82	82	80	74	67	58	47	34	20	05	90	74	58	42	27	13	99	87	76	66	59	53	50	48	49	52	57	62	69	78
.9	.9	.1	.4	.0	.8	.3	.2	.0	.2	.6	.6	.3	.7	.8	.8	.8	.2	.4	.2	.1	.7	.3	.8	.2	.8	.6	.6	.0	.6	.8	.6
06	15	29	03	61	22	74	65	13	64	52	30	08	25	24	89	04	67	39	12	31	48	58	71	86	76	43	12	31	20	31	00
	4	73	6	51	31	76	76	75	7	13	03	04	57	46	51	97	18	02	87	46	94	9	77	06	47	38	69	06	12	47	28
14	14	14	14	14	14	14	14	14	13	13	13	13	13	13	12	12	12	12	12	12	12	12	12	11	11	11	11	12	12	12	12
28	34	38	38	36	30	22	13	01	88	74	58	42	26	09	93	77	62	48	35	23	13	06	00	96	95	96	99	03	09	17	26
.5	.7	.0	.5	.0	.5	.9	.3	.5	.4	.2	.7	.5	.4	.7	.2	.5	.3	.0	.2	.8	.9	.2	.5	.8	.3	.3	.3	.8	.8	.3	.3
57	43	83	76	40	64	08	53	88	17	67	30	93	20	27	34	83	15	04	93	36	81	61	26	26	46	05	47	87	07	05	82
1	58	98	2	85	53	61	95	54	26		87	38	7	62	88	65	84	24	79	55	64	45	08	66	35	25	07	92	65	98	06

14	14	14	14	14	14	14	14	14	14	14	14	13	13	13	13	13	13	12	12	12	12	12	12	12	12	12	12	12	12	12
84	90	94	94	91	86	78	68	56	42	27	11	94	78	60	43	27	11	96	83	71	61	53	47	43	41	43	46	50	56	64	74
.2	.5	.0	.6	.8	.1	.3	.4	.1	.5	.7	.5	.9	.0	.7	.6	.3	.5	.6	.3	.6	.3	.2	.3	.5	.9	.0	.1	.8	.9	.7	.1
32	91	31	09	90	74	60	36	79	04	69	96	52	76	10	39	44	71	65	97	10	37	49	76	15	37	05	62	01	88	61	53
63	71	86	23	99	41	76	45	68	24	63	4	64	91	34	86	69	34	54	13	33	52	46	81	77	73	86	5	58	38	95	41
15	15	15	15	15	15	15	15	15	14	14	14	14	14	14	13	13	13	13	13	13	13	13	12	12	12	12	12	12	13	13	13
39	46	50	50	47	41	33	23	10	96	81	64	47	29	11	94	77	60	45	31	19	08	00	94	90	88	89	92	97	04	12	21
.8	.5	.0	.6	.7	.9	.7	.3	.8	.6	.2	.4	.2	.7	.6	.1	.0	.8	.3	.5	.3	.6	.2	.1	.1	.5	.6	.6	.7	.1	.1	.9
87	75	56	60	76	79	95	32	83	06	72	83	83	26	58	01	39	22	14	05	20	63	45	35	60	10	90	98	04	26	42	36
15	62	87	29	51	05	86	4	85	24	17	6	59	95	57	74	3	88	64	62	15	12	73	49	06	01	8	43	86	1	45	49
15	16	16	16	16	15	15	15	15	15	15	15	14	14	14	14	14	14	13	13	13	13	13	13	13	13	13	13	13	13	13	13
95	02	06	06	03	98	89	78	65	50	34	17	99	81	62	44	26	09	93	79	66	55	47	40	36	35	36	39	44	51	59	69
.5	.5	.1	.7	.7	.0	.2	.4	.4	.7	.7	.7	.5	.3	.9	.4	.8	.6	.9	.6	.7	.9	.2	.7	.7	.0	.2	.3	.6	.2	.5	.7
32	15	24	18	04	30	36	24	02	11	78	76	72	77	88	53	42	85	59	43	17	82	38	60	92	76	22	75	04	40	47	24
08	42	54	56	9	91	15	49	28	23	21	27	57	7	89	71	11	93	97	42	89	4	82	74	74	77	42	01	14	18	41	89
16	16	16	16	16	16	16	16	16	16	15	15	15	15	15	14	14	14	14	14	14	14	13	13	13	13	13	13	13	13	14	14
51	58	62	62	59	53	44	33	19	04	88	70	51	33	13	94	76	58	42	27	14	03	94	87	83	81	82	86	91	98	06	17
.1	.3	.2	.7	.9	.6	.6	.5	.8	.8	.4	.6	.8	.0	.9	.8	.6	.8	.5	.7	.4	.2	.2	.5	.3	.6	.5	.1	.5	.3	.9	.5
80	92	47	74	27	74	74	73	61	15	12	55	61	78	98	06	45	66	54	82	25	03	33	40	42	45	92	69	04	23	87	11
21	39	75	43	66	24	72	15	23	23	24	54	31	83	26	19	42	58	64	4	52	48	58	78	22	37	81	56	75	47	19	52
17	17	17	17	17	17	17	16	16	16	16	16	16	15	15	15	15	15	14	14	14	14	14	14	14	14	14	14	14	14	14	14
06	14	18	18	15	09	00	88	74	58	42	23	04	84	64	45	26	08	91	75	62	50	41	34	29	28	29	32	38	45	54	65
.8	.2	.2	.8	.8	.2	.1	.6	.6	.8	.0	.4	.1	.8	.8	.1	.4	.2	.0	.9	.2	.4	.2	.3	.9	.2	.3	.9	.4	.4	.4	.2
44	48	41	18	15	67	04	82	18	71	07	38	48	29	76	64	51	01	98	28	29	53	37	77	60	06	32	73	12	78	38	89
31	62	57	3	56	86	63	57	31	83	04	79	92	33	7	5	54	16	24	87	79	48	45	2	08	63	65	24	02	47	46	29
17	17	17	17	17	17	17	17	17	17	16	16	16	16	16	15	15	15	15	15	15	14	14	14	14	14	14	14	14	15	15	
62	70	74	74	71	64	55	43	29	12	95	76	56	36	15	95	76	57	39	24	09	97	88	81	76	74	75	79	85	92	01	13
.5	.0	.1	.8	.7	.9	.5	.7	.2	.9	.5	.3	.4	.5	.9	.5	.2	.3	.7	.0	.9	.7	.2	.2	.6	.8	.9	.7	.3	.6	.9	.0
22	69	77	53	21	32	24	60	11	74	63	72	55	29	36	66	36	98	23	78	61	69	59	26	37	05	90	49	25	63	01	59
51	12	71	83	32	18	96	79	45	71	8	67	95	66	11	06	57	81	47	65	57	83	2	3	18	95	62	2	2	88	59	25
18	18	18	18	18	18	18	17	17	17	17	17	17	16	16	16	16	16	15	15	15	15	15	15	15	15	15	15	15	15	15	15
18	25	30	30	27	20	10	98	83	67	48	29	08	88	67	45	25	06	88	72	57	45	35	27	23	21	22	26	32	39	49	60
.1	.9	.2	.9	.5	.7	.9	.6	.9	.0	.9	.4	.7	.0	.1	.9	.9	.4	.5	.1	.5	.1	.2	.9	.2	.3	.5	.4	.2	.8	.2	.8

79	37	15	02	74	55	66	62	33	77	04	43	80	13	01	76	90	63	00	96	64	74	54	87	64	73	62	35	29	06	93	40
87	74	69	77	3	83	69	31	36	5	35	4	86	05	23	45	75	07	68	65	03	62	33	39	11	69	4	64	65	06	92	76
18	18	18	18	18	18	18	18	18	18	18	17	17	17	17	16	16	16	16	16	16	15	15	15	15	15	15	15	15	15	15	16
73	81	86	86	83	76	66	53	38	21	02	82	61	39	17	96	75	55	37	20	05	92	82	74	69	67	69	73	79	86	96	08
.8	.8	.3	.9	.4	.5	.4	.7	.5	.1	.4	.2	.1	.7	.8	.3	.7	.8	.0	.3	.3	.4	.2	.7	.8	.9	.3	.1	.1	.9	.6	.6
25	22	38	60	69	12	14	12	01	83	68	54	06	30	95	84	42	21	84	10	02	50	43	40	75	34	36	13	29	25	86	28
51	85	32	5	48	03	75		27	94	53	14	63	89	02	9	85	57	42	35	29	18	31	37	99	7	43	36	23	62	28	76
19	19	19	19	19	19	19	19	18	18	18	18	18	17	17	17	17	17	16	16	16	16	16	16	16	16	16	16	16	16	16	16
29	37	42	43	39	32	21	08	92	75	56	34	13	91	68	46	25	05	85	68	53	39	29	21	16	14	15	19	26	34	44	56
.4	.8	.3	.0	.5	.0	.8	.8	.8	.2	.0	.9	.4	.4	.7	.7	.4	.1	.6	.4	.1	.6	.2	.5	.4	.4	.8	.9	.0	.0	.1	.4
72	06	88	17	25	33	62	73	53	90	86	45	32	62	40	90	97	34	57	24	05	95	32	05	80	96	69	33	29	06	24	16
22	02	14	44	33	34	25	31	29	05	88	79	33	68	34	02	91	78	21	44	26	76	85	84	85	32	22	5	25	81	42	17
19	19	19	19	19	19	19	19	19	19	19	18	18	18	18	17	17	17	17	17	17	16	16	16	16	16	16	16	16	16	16	17
85	93	98	99	95	87	77	64	47	29	09	88	65	43	19	97	75	54	34	16	00	86	76	68	63	61	62	66	72	81	91	04
.1	.7	.3	.0	.5	.9	.2	.0	.6	.3	.6	.0	.6	.1	.9	.0	.3	.1	.2	.5	.6	.9	.2	.2	.1	.0	.3	.6	.9	.1	.5	.1
32	43	95	63	41	11	98	07	38	52	91	82	54	90	72	40	79	42	40	99	64	59	31	49	07	65	98	45	35	50	71	95
77	72	03	97	75	92	72	19	09	01	65	86	56	87	66	11	44	77	19	14	89	42	08	22	46	9	23	88	04	4	74	91
20	20	20	20	20	20	20	20	20	19	19	19	19	18	18	18	18	18	17	17	17	17	17	17	17	17	17	17	17	17	17	17
40	49	54	55	51	43	32	19	02	83	63	40	17	94	71	47	25	03	82	64	48	34	23	15	09	07	09	13	19	28	39	51
.8	.5	.3	.0	.4	.6	.7	.0	.1	.4	.2	.9	.9	.9	.0	.4	.1	.3	.8	.7	.4	.3	.2	.1	.8	.6	.0	.4	.8	.3	.0	.9
11	78	31	94	55	11	15	17	92	52	08	99	72	19	65	91	17	11	44	35	08	09	36	01	03	57	80	21	48	37	39	65
71	55	82	26	75	56	19	76	45	97	66	8	04	36	3	74	39	71	72	56	43	01	2	28	42	32	78	21	53	95	39	46
20	21	21	21	21	20	20	20	20	20	20	19	19	19	19	18	18	18	18	18	17	17	17	17	17	17	17	17	17	17	17	17
96	05	10	11	07	99	88	74	56	37	16	93	70	46	22	97	74	52	31	12	96	81	70	61	56	54	55	60	66	75	86	99
.4	.5	.3	.1	.3	.4	.1	.0	.6	.5	.6	.7	.4	.4	.2	.9	.8	.3	.6	.7	.2	.6	.2	.9	.4	.2	.7	.0	.7	.4	.4	.7
72	16	38	40	67	34	55	03	50	96	91	69	01	00	57	07	68	57	26	73	10	53	16	17	63	34	98	76	54	85	45	45
26	25	71	79	3		87	33	76	8	32	94	78	07	21	33	89	5	48	06	67	42	16	54	12	09	58	96	32	71	51	2
21	21	21	21	21	21	21	21	21	20	20	20	20	19	19	19	19	19	18	18	18	18	18	18	18	18	18	18	18	18	18	18
52	61	66	67	63	55	43	28	11	91	70	47	22	98	73	48	24	01	80	60	43	28	17	08	03	00	02	06	13	22	33	47
.1	.4	.3	.1	.1	.2	.6	.9	.7	.6	.1	.0	.6	.0	.1	.3	.6	.6	.2	.9	.6	.9	.2	.5	.1	.8	.4	.6	.6	.6	.8	.5
18	99	88	97	75	36	04	98	08	79	78	80	84	98	37	20	16	47	25	15	04	86	10	25	05	02	27	05	54	09	26	32
97	43	54	73	76	09	04	29	05	52		52	48	73	04	65	92	15	92	58	43	05	92	6	11	91	76	83	34	68	42	61

22	22	22	22	22	22	21	21	21	21	21	21	20	20	20	19	19	19	19	19	18	18	18	18	18	18	18	18	18	18
07	17	22	23	19	10	99	84	66	45	23	00	74	49	23	98	74	51	28	09	91	76	64	55	49	47	48	53	60	69	81	95
.7	.3	.5	.2	.2	.7	.0	.1	.3	.7	.7	.1	.9	.8	.8	.7	.3	.0	.7	.0	.1	.2	.2	.2	.6	.3	.6	.4	.5	.6	.2	.3
64	84	11	55	36	04	52	46	74	62	29	57	67	37	31	33	64	88	92	57	66	69	05	56	94	71	92	04	53	93	61	20
61	54	17	46	02	98	79	75	73	57	94	28	26	37	73	79	78	16	22	7	79	7	12	53	94	1	36	9	92	29	69	62
22	22	22	22	22	22	22	22	22	21	21	21	21	21	20	20	20	20	19	19	19	19	19	19	18	18	18	19	19	19	19	19
63	73	78	79	75	66	54	39	20	99	77	52	27	01	75	48	24	00	77	57	39	23	11	02	96	93	95	00	07	16	28	43
.4	.2	.5	.3	.2	.5	.4	.4	.7	.8	.5	.8	.2	.5	.0	.9	.2	.0	.3	.2	.0	.3	.2	.0	.2	.9	.3	.2	.4	.8	.7	.1
21	53	49	04	80	63	95	41	66	41	13	65	49	74	82	64	64	73	64	04	09	81	05	91	34	46	74	24	58	23	06	02
97	15	14	4	77	36	19	62	24	96	86	25	17	22	04	39	5	64	79	13	1	35	47	36	08	04	02	5	37	83	1	12
23	23	23	23	23	23	23	22	22	22	22	22	21	21	21	20	20	20	20	20	19	19	19	19	19	19	19	19	19	19	19	19
19	29	34	35	31	22	09	94	75	53	30	05	79	53	26	99	74	49	26	05	86	70	58	48	42	40	42	47	54	64	76	90
.1	.0	.4	.3	.1	.2	.9	.3	.2	.9	.9	.7	.5	.2	.1	.4	.0	.2	.0	.3	.7	.7	.2	.9	.9	.5	.0	.0	.3	.0	.1	.8
00	73	85	39	93	93	05	85	74	15	59	32	43	92	94	16	21	48	04	62	85	71	28	53	36	13	94	27	70	10	77	72
17	65	29	93	74	35	59	11	85	19	26	25	06	11		46	3	06	76	59	1	33	93	74	06	79	71	23	26	8	18	08
23	23	23	23	23	23	23	23	23	23	22	22	22	22	21	21	21	20	20	20	20	20	20	19	19	19	19	19	20	20	20	20
74	84	90	91	87	78	65	49	29	08	84	58	31	04	77	49	23	98	74	53	34	18	05	95	89	87	88	93	01	11	23	38
.7	.9	.4	.3	.1	.1	.3	.4	.9	.0	.3	.8	.8	.8	.3	.8	.6	.6	.6	.4	.3	.1	.2	.7	.5	.1	.6	.7	.2	.1	.6	.6
64	29	79	83	75	05	45	10	95	18	81	16	72	06	93	36	39	06	76	81	90	35	27	30	62	01	08	19	77	65	28	49
27	88	11	8	79	94	03	5	51	68	19	45	48	46	36	58	17	29	96	43	38	63	61	99	56	82	81	44	52	81	46	85
24	24	24	24	24	24	24	24	23	23	23	23	22	22	22	22	21	21	21	21	20	20	20	20	20	20	20	20	20	20	20	20
30	40	46	47	42	33	20	04	84	62	37	11	84	56	28	00	73	47	23	01	82	65	52	42	36	33	35	40	48	58	71	86
.4	.8	.6	.4	.8	.9	.7	.2	.6	.1	.8	.7	.2	.4	.3	.2	.4	.6	.3	.5	.0	.4	.2	.4	.1	.6	.4	.3	.1	.2	.0	.4
12	06	02	39	88	53	93	85	94	27	24	92	04	64	76	54	34	42	41	91	33	82	17	71	96	63	38	70	78	49	68	36
4	85	32	66	39	97	11	18	06	69	43	76	21	33	43	82	66	07	75	98	86	85	15	84	74	23	29	14	14	1	24	48
24	24	25	25	24	24	24	24	24	24	23	23	23	23	22	22	22	21	21	21	21	21	20	20	20	20	20	20	20	21	21	21
86	96	02	03	98	89	76	59	38	16	91	64	36	08	78	50	23	96	72	49	29	12	99	89	82	80	82	87	95	05	18	34
.0	.7	.6	.4	.9	.4	.2	.4	.9	.2	.4	.2	.5	.2	.9	.6	.2	.4	.0	.7	.9	.7	.2	.2	.7	.2	.0	.1	.0	.3	.4	.2
57	46	69	97	41	09	42	61	03	37	62	65	36	09	40	72	50	36	01	01	73	15	05	66	96	22	52	29	77	63	73	24
33	65	99	93	88	98	92	15	9	69	14	86	18	78	41	55	17	74	69	36	47	07	02	09	29	8	62	43	42	18	19	88
25	25	25	25	25	25	25	25	24	24	24	24	23	23	23	23	22	22	22	21	21	21	21	21	21	21	21	21	21	21	21	21
41	52	58	59	55	45	31	14	93	70	45	17	88	59	30	00	73	45	20	97	77	59	46	35	29	26	28	33	41	52	65	82
.7	.7	.6		.0	.1	.6	.6	.6	.3	.0	.3	.8	.9	.1	.9	.0	.8	.4	.8	.5	.9	.1	.9	.4	.7	.5		.9	.5	.8	.0

11	30	94	.5	11	96	87	36	29	39	95	79	13	54	78	33	67	28	03	45	33	54	98	98	04	87	20	.9	80	00	53	07
85	56	99	49	73	91	55	32	88	37	16	08	38	37	14	49	2	37	63	37	86	41	35	38	32	89	9	95	69	9	7	96
25	26	26	26	26	26	25	25	25	25	24	24	24	24	23	23	23	22	22	22	22	22	21	21	21	21	21	21	21	21	22	22
97	08	14	15	10	00	87	69	48	24	98	70	41	11	81	51	22	95	69	46	25	07	93	82	76	73	75	80	88	99	13	29
.3	.5	.6	.5	.9	.9	.0	.7	.3	.3	.6	.4	.0	.6	.3	.3	.8	.1	.1	.0	.1	.2	.2	.8	.0	.3	.1	.6	.8	.6	.3	.7
87	81	45	82	39	80	97	04	10	86	55	09	81	63	19	36	80	35	12	04	95	69	10	13	80	64	37	60	91	77	05	79
61	82	2	94	63	26	61	5	69	3	2	77	9	89	74	23	66	93	39	54	13	89	44	07	38	6	67	01	42	71	03	48
26	26	26	26	26	26	26	26	26	25	25	25	24	24	24	24	23	23	23	22	22	22	22	22	22	22	22	22	22	22	22	22
53	64	70	71	66	56	42	24	02	78	52	23	93	63	32	01	72	44	17	93	72	54	40	29	22	19	21	27	35	46	60	77
.0	.5	.6	.6	.9	.7	.5	.7	.9	.4	.1	.2	.5	.3	.2	.9	.4	.3	.6	.9	.9	.5	.1	.6	.7	.9	.5	.2	.7	.7	.6	.5
47	32	85	87	69	88	68	63	87	79	95	34	88	80	85	41	26	69	88	73	44	56	48	06	04	04	45	69	00	16	01	67
34	81	22		27	03	1	94	14	66	99	16	56	3	89	19	5	11	74	23	68	9	64	24	69	91	11	22	46	33	43	79
27	27	27	27	27	27	26	26	26	26	26	25	25	25	24	24	24	23	23	23	23	23	22	22	22	22	22	22	22	22	23	23
08	20	26	27	22	12	98	79	57	32	05	76	45	15	83	52	22	93	66	42	20	01	87	76	69	66	68	73	82	93	07	25
.6	.5	.8	.8	.5	.6	.0	.5	.6	.5	.7	.4	.8	.1	.5	.2	.1	.3	.2	.0	.3	.7	.0	.2	.2	.3	.2	.7	.4	.6	.8	.3
83	27	17	46	76	91	82	25	89	92	70	78	77	29	14	08	75	22	04	49	73	84	81	17	64	69	73	58	41	45	57	74
76	41	93	82	24	03	78	79	46	13	4	36	48	4	59	52	72	88	23	85	73	83	89	27	59	71	31	78	48	73	17	11
27	27	27	27	27	27	27	27	27	26	26	26	25	25	25	25	24	24	24	23	23	23	23	23	23	23	23	23	23	23	23	23
64	76	82	83	78	68	53	34	11	86	59	29	98	66	35	02	72	41	14	90	67	49	34	22	15	12	14	20	29	40	55	73
.3	.3	.9	.9	.7	.0	.5	.8	.7	.6	.3	.9	.1	.8	.1	.4	.0	.8	.7	.1	.6	.0	.0	.8	.8	.8	.9	.3	.2	.6	.3	.1
19	37	27	76	36	86	72	84	46	94	53	84	39	60	57	07	17	93	50	62	39	22	37	69	33	60	21	99	28	22	04	77
01	54	68	92	72	23	93	92	14	89	28	86	29	02	06	52	76	63	14	48	2	96	43	22	97	18	65	41	67	88	16	
28	28	28	28	28	28	28	27	27	27	27	26	26	26	25	25	25	24	24	24	24	23	23	23	23	23	23	23	23	23	24	24
19	32	38	39	34	23	08	90	66	40	13	82	50	18	85	52	21	91	63	38	15	96	81	69	62	59	61	67	76	87	02	20
.9	.1	.8	.9	.8	.6	.9	.1	.4	.7	.3	.4	.3	.7	.7	.6	.9	.4	.1	.3	.6	.0	.0	.7	.4	.4	.3	.4	.1	.8	.7	.9
75	07	61	91	83	91	69	93	64	58	14	85	39	87	16	77	30	67	68	83	18	68	78	79	03	48	82	65	76	14	92	55
25	01	03	83	04	82	93	24	18	41	9	44	21	4	82	35	63	44	48	05	1	71	42	08	33	35	85	8	22	74	53	01
28	28	28	28	28	28	28	28	28	27	27	27	27	26	26	26	25	25	25	24	24	24	24	24	24	24	24	24	24	24	24	24
75	87	94	95	90	79	64	45	21	94	66	35	02	70	36	03	71	41	12	86	63	43	28	16	09	06	08	14	23	35	50	68
.6	.8	.6	.8	.6	.4	.1	.2	.2	.7	.5	.0	.4	.2	.4	.0	.9	.0	.0	.7	.6	.6	.2	.8	.3	.2	.1	.3	.3	.2	.3	.6
74	54	03	05	80	55	85	08	57	12	74	53	57	61	64	91	40	94	86	79	96	79	71	40	11	13	83	56	98	27	29	86
63	67	17	53	56	3	12	61	25	41	05	4	75	63	09	91	77	32	35	25	41	99	67	4	36	26	84	45	46	84	65	69

Table S4. *Theoretical simulation data corresponding to Figure 9(b).*

42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
32	28	26	25	24	25	26	27	30	33	36	39	43	47	51	55	59	63	66	69	72	74	76	77	77	77	76	75	73	70	68	65
.0	.8	.5	.1	.6	.0	.1	.7	.2	.0	.1	.8	.7	.5	.7	.8	.6	.3	.9	.9	.5	.8	.3	.3	.7	.5	.5	.0	.1	.9	.4	.4
30	55	56	07	08	47	21	80	12	65	97	71	41	90	18	14	03	83	15	06	84	23	84	52	58	45	78	19	42	77	18	43
99	6	68	8	24	17	6	93	05	77	35	07	56	06	64	82	66	73	06	3	71	02	61	9	04	15	34	23	27	77	08	3
44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44
36	33	31	29	29	29	30	32	35	37	41	45	49	53	57	61	65	69	73	76	79	81	83	84	84	84	83	81	79	77	74	71
.7	.4	.1	.7	.2	.6	.7	.4	.0	.9	.2	.0	.0	.1	.4	.6	.6	.6	.3	.4	.2	.5	.1	.1	.6	.3	.3	.7	.8	.6	.9	.8
80	79	73	14	10	61	28	95	40	54	36	46	88	36	63	85	81	49	14	66	07	44	90	96	30	99	91	95	60	01	47	42
22	18	07	12	71	33	24	25	31	92	57	03	99	54	57	36	87	46	1	92	74	86	36	07	75	9	44	68	43	4	7	69
46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
41	38	35	34	33	34	35	37	39	42	46	50	54	58	63	67	71	75	79	83	85	88	90	91	91	91	90	88	86	84	81	78
.5	.0	.6	.1	.6	.0	.2	.1	.7	.7	.3	.1	.4	.6	.2	.5	.8	.9	.7	.0	.9	.3	.0	.1	.6	.3	.2	.7	.6	.2	.4	.2
55	38	46	76	66	58	32	07	15	89	01	67	20	87	12	83	03	76	27	72	48	64	99	67	02	59	97	36	18	66	91	34
02	53	19	97	88	64	95	8	14	07	37	82	38	19	34	64	13	92	35	73	55	89	63	66	26	25	29	3	63	34	79	82
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46	42	40	38	38	38	39	41	44	47	51	55	59	64	68	73	77	82	86	89	92	95	97	98	98	98	97	95	93	90	88	84
.3	.6	.0	.5	.0	.3	.6	.6	.2	.5	.2	.4	.7	.2	.8	.5	.9	.1	.2	.7	.8	.2	.0	.1	.6	.3	.3	.6	.3	.9	.0	.6
43	58	65	56	24	69	74	51	63	82	42	04	47	33	22	25	44	89	21	06	06	43	67	85	44	79	16	14	99	44	17	23
19	66	07	22	18	63	54	3	88	82	54	98	35	42	21	91	07	59	4	89	87	51	04	14	94	49	69	76	96	44	65	4
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.1	.3	.5	.9	.2	.7	.0	.0	.9	.3	.1	.5	.0	.7	.5	.4	.0	.5	.7	.3	.5	.1	.0	.2	.7	.4	.3	.4	.1	.6	.5	.0
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.9	.9	.0	.3	.6	.1	.5	.6	.6	.1	.1	.6	.4	.2	.3	.4	.1	.8	.2	.9	.3	.0	.0	.2	.7	.4	.2	.3	.9	.2	.0	.4
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17	15	01	65	18	75	00	56	30	57	43	87	74	10	09	02	49	01	37	23	08	18	04	44	85	37	31	77	23	87	05	72
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.7	.0	.6	.5	.7	.3	.9	.5	.0	.2	.0	.4	.1	.9	.9	.0	.7	.3	.5	.0	.0	.2	.6	.0	.6	.3	.8	.5	.7	.5	.7	.3
90	53	25	07	57	64	92	12	63	95	02	00	23	12	95	38	49	35	31	26	00	82	25	94	79	20	99	99	87	40	32	66
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.3	.3	.6	.3	.6	.2	.9	.7	.4	.9	.0	.6	.8	.0	.3	.8	.9	.9	.3	.2	.4	.9	.4	.0		.2	.7	.3	.3	.8	.8	.1

34	38	76	93	41	33	76	09	02	38	30	63	00	38	89	74	77	63	95	41	92	26	61	09	.6	65	66	21	15	41	02	54
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15	65	50	30	76	61	61	86	02	58	00	64	35	53	06	90	98	86	73	56	08	80	86	88	42	48	00	02	81	04	47	44
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95	54	52	67	54	73	46	22	80	78	50	09	70	62	03	08	17	26	56	71	99	46	11	69	38	30	67	03	47	79	78	35
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03	98	94	91	90	91	93	96	00	05	10	17	23	30	37	44	51	57	63	69	73	77	80	81	82	82	80	77	74	70	66	61
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.4	.8	.7	.1	.2	.0	.9	.9	.2	.2	.8	.3	.1	.0	.3	.5	.4	.0	.3	.6	.4	.3	.1	.8	.5	.1	.4	.7	.3	.4	.9	.7
38	06	15	55	78	09	33	61	11	37	96	54	81	85	59	85	13	88	06	69	02	33	53	88	93	80	51	06	74	79	30	23
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.2	.4	.2	.5	.7	.4	.4	.5	.9	.0	.8	.5	.4	.6	.0	.4	.5	.4	.7	.3	.0	.1	.0	.8	.5	.1	.3	.5	.1	.1	.4	.1
12	13	34	97	07	15	21	62	52	44	97	71	77	91	25	99	34	35	06	13	95	61	81	46	73	56	30	95	38	34	71	16
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93	02	35	34	73	27	06	59	73	72	97	85	27	13	09	13	56	84	77	17	44	94	05	67	59	34	49	45	05	97	20	07
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51	87	53	73	46	29	36	58	57	23	57	76	75	77	18	50	32	59	41	68	70	91	35	63	27	05	35	14	95	67	04	59
36	91	08	25	3	66	05	41	38	45	57	78	71	87	22	53	03	28	61	76	86	38	82	9	2	87	02	1	61	67	37	73
93	93	93	93	93	93	93	93	93	93	93	93	93	93	93	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94
51	44	39	36	35	35	38	42	47	53	60	68	77	85	94	03	12	20	28	35	41	45	49	51	52	51	49	46	42	37	31	25
.4	.3	.2	.1	.0	.9	.3	.0	.4	.6	.7	.7	.2	.8	.9	.9	.4	.7	.4	.1	.0	.9	.4	.6	.5	.9	.8	.3	.2	.4		.2

28	76	64	12	19	46	22	89	00	45	02	65	28	82	66	23	27	70	89	72	56	59	59	46	21	86	39	90	60	25	.7	51
47	8	36	7	34	56	57	61	35	3	58	57	43	54	07	11	22	42	97	04	35	9	52	73	81	96	91	77	87	84	53	54
95	95	95	95	95	95	95	95	95	95	95	95	95	95	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96	96
56	49	43	40	39	40	42	46	52	58	65	73	82	91	00	09	18	27	34	41	47	52	56	58	59	58	56	53	49	44	38	31
.1	.0	.8	.5	.4	.3	.8	.6	.0	.4	.6	.8	.5	.4	.6	.8	.5	.0	.9	.7	.8	.7	.3	.5	.4	.9	.7	.2	.0	.0	.2	.6
97	16	04	58	45	67	21	61	62	87	75	86	84	01	52	42	24	15	19	69	04	99	77	99	93	64	78	87	24	72	81	46
44	54	3	68	32	56	83	23	12	33	91	94	75	56	33	11	56	95	92	71	48	98	54	38	45	47	58	43	17	74		75
97	97	97	97	97	97	97	97	97	97	97	97	97	97	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98	98
60	53	48	44	43	44	47	51	56	63	70	79	87	96	06	15	24	33	41	48	54	59	63	65	66	65	63	60	55	50	44	38
.9	.6	.3	.9	.8	.7	.2	.2	.7	.3	.6	.0	.8	.9	.4	.6	.7	.2	.3	.4	.5	.6	.3	.5	.4	.9	.8	.1	.8	.7	.8	.0
72	16	08	76	30	76	96	33	23	10	54	83	50	16	04	82	23	86	98	37	14	47	16	60	81	48	02	95	25	71	67	36
69	25	22	63	64	58	92	23	11	89	42	02	53	55	26	27	16	85	88	62	46	45	37	89	44	32	13	78	24	37	07	
99	99	99	99	99	99	99	99	99	99	99	99	99	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
65	58	52	49	48	49	51	55	61	68	75	84	93	00	01	02	03	03	04	05	06	06	07	07	07	07	07	06	06	05	05	04
.7	.1	.7	.3	.3	.1	.7	.9	.3	.1	.6	.1	.1	2.	2.	1.	0.	9.	7.	5.	1.	6.	0.	2.	3.	2.	0.	7.	2.	7.	1.	4.
56	98	75	72	66	48	54	11	72	26	18	20	96	41	05	65	84	66	89	06	34	51	26	57	49	96	64	14	65	50	46	41
97	96	55	54	36	14	24	82	27	01	73	28	63	78	38	04	19	39	94	37	44	15	04	29	02	34	60	97	09	94	72	93
													1	8	7	7	9	4			5	9	7	8	4	1	7	7	1	6	
10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
17	16	15	15	15	15	15	16	16	17	18	18	19	20	21	22	23	24	25	26	26	27	27	27	28	27	27	27	26	26	25	25
0.	2.	7.	3.	2.	3.	6.	0.	6.	2.	0.	9.	8.	7.	7.	7.	6.	6.	4.	1.	8.	3.	7.	9.	0.	9.	7.	4.	9.	4.	7.	0.
54	85	25	78	70	70	22	37	25	94	58	06	55	92	54	64	92	19	38	67	23	38	19	57	49	97	54	03	45	22	99	80
16	40	23	03	29	42	15	27	79	55	06	04	35	66	50	55	52	24	92	68	92	01	72	44	50	04	31	22	94	90	99	41
3	4	2	7	5	3	2	6					7	8	7	1	2	6	4	9	6		4	6	5		7	6	2	7	8	1
10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
37	36	36	35	35	35	36	36	37	37	38	39	40	41	42	43	44	45	46	46	47	48	48	48	48	48	48	48	47	47	46	45
5.	7.	1.	8.	7.	8.	0.	4.	0.	7.	5.	4.	3.	3.	3.	3.	2.	2.	0.	8.	4.	0.	4.	6.	7.	6.	4.	0.	6.	0.	4.	7.
31	52	79	23	04	18	72	85	90	78	40	37	93	36	45	61	98	33	93	25	86	32	10	50	49	94	56	71	20	87	51	19
80	50	88	41	89	78	64	58	42	23	35	91	62	19	31	58	44	40	27	18	56	28	52	55	31	57	02	98	86	09	81	79
2	6	9	3	9	6	4	7	6	1	5	1	4	9	7	8		8	2	8			6	7	2	4	2		2	6	6	4
10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
58	57	56	56	56	56	56	56	57	58	59	59	60	61	62	63	64	65	66	67	68	68	69	69	69	69	69	68	68	67	67	66
0.	2.	6.	2.	1.	2.	5.	9.	5.	2.	0.	9.	9.	8.	9.	9.	9.	8.	7.	4.	1.	7.	0.	3.	4.	3.	1.	7.	2.	7.	1.	3.

07 74 6	20 51	42 08 6	76 8	52 97 5	62 29 3	30 38 9	45 30 9	53 03 1	66 42 1	49 39	67 82 4	35 40 6	97 45 5	29 45 1	53 53 2	01 09 4	46 17 1	28 85 7	76 53 3	46 07 2	05 67 3	96 18 7	38 23 8	39 45	86 30 7	44 32 8	54 29 7	85 66	43 32 6	01 74 3	60 82 6

S1.3 Data Description for Figures and Tables in Section 5.2.

In Figure 12(a), the X-axis represents the canopy load, the Y-axis represents the support height, and the Z-axis represents the balancing jack load. The corresponding theoretical simulation data are shown in Table S5. The 32×32 data matrix provided in Table S5 corresponds to the theoretical simulation results of the surface shown in Figure 12(a). The column headers of this matrix correspond to the X-axis value range of 4000–10000 KN in Figure 12(a), the row headers correspond to the Y-axis value range of 0-15°, and the matrix element values represent the Z-axis values of each point on the surface.

In Figure 12(b), the X-axis represents the canopy load, the Y-axis represents the support height, and the Z-axis represents the upright column load. The corresponding theoretical simulation data are shown in Table S6. The 32×32 data matrix provided in Table S6 corresponds to the theoretical simulation results of the surface shown in Figure 12(b). The column headers of this matrix correspond to the X-axis value range of 4000–10000 KN in Figure 12(b), the row headers correspond to the Y-axis value range of 0-15°, and the matrix element values represent the Z-axis values of each point on the surface.

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Table S5. *Theoretical simulation data corresponding to Figure 12(a).*

10	11	11	12	12	13	13	14	14	15	15	16	16	17	17	18	18	19	19	20	20	21	21	22	22	23	23	24	24	25	25	26
59	10	61	12	63	15	66	17	68	20	71	22	73	25	76	27	78	30	81	32	83	35	86	37	88	40	91	42	93	45	96	47
.0	.2	.5	.7	.9	.2	.4	.7	.9	.2	.4	.6	.9	.1	.4	.6	.9	.1	.3	.6	.8	.1	.3	.6	.8	.0	.3	.5	.8	.0	.3	.5
23	65	08	51	95	38	81	24	67	10	53	96	39	82	25	68	11	54	98	41	84	27	70	13	56	99	42	85	28	72	15	57
07	54	5	75	09	32	38	43	48	53	59	64	69	74	79	84	9	95		05	1	15	21	26	31	36	42	65	99	24	2	67
10	10	11	11	12	12	13	13	14	14	15	15	16	16	17	17	18	18	19	19	20	20	21	21	22	22	23	23	24	24	25	25
36	86	37	87	37	87	37	87	38	88	38	88	38	88	39	89	39	89	39	89	40	90	40	90	40	90	41	91	41	91	41	91
.7	.9	.1	.2	.4	.6	.7	.9	.1	.2	.4	.6	.7	.9	.1	.2	.4	.6	.7	.9	.1	.2	.4	.6	.7	.9	.1	.2	.4	.6	.7	.9
91	58	22	86	51	14	80	48	15	82	48	09	76	44	11	80	46	15	82	49	16	79	48	15	83	50	12	75	39	04	68	35
25	03	34	73	21	07	3	09	3	5	58	82	92	13	35	17	36	17	4	6	7	18	65	95	16	36	45	32	8	18	49	27
10	10	11	11	12	12	13	13	14	14	15	15	16	16	17	17	17	18	18	19	19	20	20	21	21	22	22	23	23	24	24	25
14	63	12	61	10	59	08	58	07	56	05	54	03	52	01	50	99	48	98	47	96	45	94	43	92	41	90	39	88	37	87	36
.4	.5	.6	.7	.8	.9	.9	.0	.1	.2	.3	.4	.5	.5	.6	.7	.8	.9	.0	.1	.2	.2	.3	.4	.5	.6	.7	.8	.8	.9	.0	.1
85	71	61	45	28	07	90	83	72	61	45	22	09	98	88	81	61	54	44	33	20	97	89	80	69	57	34	13	97	81	70	57
32	99	01	07	96	94	46	37	82	88	85	23	09	31	08	55	15	62	39	61	47	67	89	16	42	21	76	74	63	69	71	38
99	10	10	11	11	12	12	13	13	14	14	15	15	16	16	17	17	18	18	19	19	20	20	20	21	21	22	22	23	23	24	24
2.	40	88	36	84	32	80	28	76	24	72	20	68	16	64	12	60	08	56	04	52	00	48	96	44	92	40	88	36	84	32	80
10	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.2	.2	.2	.2	.2	.2	.2	.2	.2
79	05	20	24	24	19	15	27	36	43	44	36	41	48	59	68	61	70	81	88	93	84	91	03	10	16	09	04	05	08	24	21
9	19	94	07	92	8	11	59	37	46	7	24	21	07	04	26		22	18	05	02	94	4	45	38	46	46	34	19	32	07	27
96	10	10	11	11	12	12	12	13	13	14	14	15	15	16	16	17	17	18	18	19	19	20	20	20	21	21	22	22	23	23	24
9.	16	63	10	57	04	51	98	45	91	38	85	32	79	26	73	20	67	14	61	08	54	01	48	95	42	89	36	83	30	77	24
66	.5	.4	.4	.3	.2	.1	.0	.0	.9	.8	.7	.6	.5	.5	.4	.3	.2	.1	.1	.0	.9	.8	.7	.7	.6	.5	.4	.3	.2	.2	.1
19	69	96	24	39	49	57	81	07	28	45	51	71	93	20	40	46	65	92	14	34	41	58	84	08	28	36	46	61	89	17	24
7	11	68	55	3	66	76	55	73	16	15	84	26	53	25	17	03	96	68	95	37	02	41	94	41	1	55	91	66	53	1	24
94	99	10	10	11	11	12	12	13	13	14	14	14	15	15	16	16	17	17	18	18	19	19	20	20	20	21	21	22	22	23	23
7.	2.	38	84	30	76	22	67	13	59	05	51	97	42	88	34	80	26	72	17	63	09	55	01	47	92	38	84	30	76	22	67
14	96	.8	.6	.4	.2	.1	.9	.7	.6	.4	.2	.0	.9	.7	.5	.4	.2	.0	.9	.7	.5	.3	.2	.0	.8	.7	.5	.3	.2	.0	.8
99	70	00	39	74	97	18	50	85	19	47	68	97	32	67	97	16	46	80	15	44	65	93	28	63	93	16	38	74	13	46	63
9	6	09	21	75	51	41	72	9	57	2	63	9	76	41	28	26	13	79	64	91	88	99	24	39	68	03	79	33	46	48	56

92	96	10	10	11	11	11	12	12	13	13	14	14	15	15	15	16	16	17	17	18	18	19	19	19	20	20	21	21	22	22	23
4.	9.	14	58	03	48	92	37	82	27	71	16	61	06	50	95	40	85	29	74	19	64	08	53	98	43	87	32	77	21	66	11
57	30	.0	.7	.5	.2	.9	.7	.4	.2	.9	.6	.4	.1	.9	.6	.3	.1	.8	.5	.3	.0	.7	.5	.2	.0	.7	.4	.2	.9	.7	.4
47	02	38	82	26	63	95	34	75	16	51	83	21	62	03	40	71	08	48	90	27	59	95	35	77	15	47	84	28	72	11	36
6	4	38	62	52	46	52	13	53		81	32	1	3	18	02	24	09	97	17	94	42	23	7	1	71	81	74	64	89	03	51
90	94	98	10	10	11	11	12	12	12	13	13	14	14	15	15	16	16	16	17	17	18	18	19	19	19	20	20	21	21	22	22
1.	5.	9.	32	76	20	63	07	51	94	38	81	25	69	12	56	00	43	87	31	74	18	62	05	49	92	36	80	23	67	11	54
93	56	20	.8	.5	.1	.7	.4	.0	.7	.3	.9	.6	.2	.9	.5	.2	.8	.4	.1	.7	.4	.0	.6	.3	.9	.6	.2	.9	.5	.2	.8
41	27	58	55	04	46	80	22	70	16	57	91	31	78	25	68	00	42	87	33	77	11	51	96	42	86	23	63	12	61	04	35
5	2	7	13	05	02	1	88	09	37	5	6	74	84	63	27	89	19	64	39	94	85	68	61	47	93	4	96	37	13	29	38
87	92	96	10	10	10	11	11	12	12	13	13	13	14	14	15	15	16	16	16	17	17	18	18	19	19	19	20	20	21	21	21
9.	1.	4.	06	49	91	34	77	19	62	04	47	89	32	74	17	59	02	44	87	30	72	15	57	00	42	85	27	70	12	55	98
22	74	29	.8	.3	.9	.4	.0	.5	.1	.6	.1	.7	.2	.8	.3	.9	.4	.9	.5	.0	.6	.1	.7	.2	.8	.3	.8	.4	.9	.5	.0
20	88	49	47	99	39	76	13	61	13	57	90	29	73	26	73	02	43	90	42	91	19	57	03	55	07	37	75	25	77	30	55
8	8	6	57	4	97	58	72	16	79	06	86	6	62	97	32	95	51	46	8	06	76	81	72	03	57	25	55	13	74	28	2
85	89	93	98	10	10	11	11	11	12	12	13	13	13	14	14	15	15	16	16	16	17	17	18	18	18	19	19	20	20	20	21
6.	7.	9.	0.	22	63	05	46	87	29	70	12	53	95	36	78	19	60	02	43	85	26	68	09	51	92	33	75	16	58	99	41
44	86	31	76	.2	.6	.0	.5	.9	.4	.8	.2	.7	.1	.6	.0	.4	.9	.3	.8	.2	.6	.1	.5	.0	.4	.9	.3	.7	.2	.6	.1
31	78	43	61	14	50	81	27	61	11	56	85	32	64	12	61	87	26	75	31	69	93	28	76	35	75	00	35	85	45	87	07
	1		4	57	29	09	98	11	73	25	05	82	69	33	3	92	13	95	63	32	86	97	55	31	13	56	91	68	74	44	75
83	87	91	95	99	10	10	11	11	11	12	12	13	13	13	14	14	15	15	15	16	16	17	17	18	18	18	19	19	20	20	20
3.	3.	4.	4.	4.	35	75	15	56	96	36	77	17	57	98	38	78	19	59	99	40	80	20	61	01	42	82	22	63	03	43	84
60	92	26	61	95	.2	.6	.9	.2	.6	.9	.2	.6	.9	.2	.6	.9	.3	.6	.9	.3	.6	.9	.3	.6	.0	.3	.6	.0	.3	.6	.0
21	47	69	14	30	83	07	50	88	19	62	86	27	68	95	40	64	00	51	92	23	43	76	28	70	03	24	56	09	56	89	05
	3	7	1	6	08	88	11	77	26	42	21	35	26	45	73	35	81	94	1	53	91	51	46	99	08	32	76	49	5	07	25
81	84	88	92	96	10	10	10	11	11	12	12	12	13	13	13	14	14	15	15	15	16	16	17	17	17	18	18	19	19	19	20
0.	9.	9.	8.	7.	06	46	85	24	63	02	42	81	20	59	99	38	77	16	56	95	34	73	12	52	91	30	69	09	48	87	26
70	92	15	38	62	.8	.0	.2	.5	.7	.9	.2	.4	.6	.8	.1	.3	.5	.8	.0	.2	.4	.7	.9	.1	.4	.6	.8	.0	.3	.5	.7
39	24	33	69	01	44	63	94	27	55	82	01	31	65	95	20	40	75	07	37	63	79	12	46	75	02	19	50	89	21	47	59
6	4	1	2	2	45	25	22	81	9	86	65	8	51	51	16	79	41	72	31	46	68	05	1	58	46	51	18	05	1	85	89
78	82	86	90	94	97	10	10	10	11	11	12	12	12	13	13	13	14	14	15	15	15	16	16	17	17	17	18	18	18	19	19
7.	5.	3.	2.	0.	8.	16	54	92	30	68	07	45	83	21	59	97	35	73	11	50	88	26	64	02	40	78	16	55	93	31	69
75		97	10	22	34	.4	.5	.6	.8	.9	.0	.1	.2	.3	.5	.6	.7	.8	.9	.0	.2	.3		.5	.6	.7	.9	.0	.1	.2	.3

35	86	86	13	38	04	52	70	91	11	26	38	55	76	96	13	25	42	61	82	99	11	27	.4	67	85	97	15	37	60	77	83
5	1	1	8	7	8	52	75	35	16	33	33	89	34	52	1	49	1	95	07	29	1	52	47	26	16	12	03	39	04	53	88
76	80	83	87	91	94	98	10	10	10	11	11	12	12	12	13	13	13	14	14	15	15	15	16	16	16	17	17	18	18	18	19
4.	1.	8.	5.	2.	9.	6.	23	60	97	34	71	08	45	82	19	56	93	30	67	04	41	78	15	52	89	26	63	00	37	74	11
75	74	74	76	77	77	77	.7	.7	.7	.7	.7	.7	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8
21	41	95	00	02	43	17	77	85	92	96	93	98	05	12	17	15	17	25	33	38	37	37	44	53	59	58	59	69	80	86	80
1	3		4	9	3	8	37	5	85	14	6		3	34	12	28	37	18	24	42	42	48	99	28	21	49	36	89	72	38	28
74	77	81	84	88	92	95	99	10	10	11	11	11	12	12	12	13	13	13	14	14	14	15	15	16	16	16	17	17	17	18	18
1.	7.	3.	9.	5.	1.	7.	2.	28	64	00	36	72	08	44	80	15	51	87	23	59	95	31	67	03	38	74	10	46	82	18	54
68	56	44	34	24	13	01	89	.7	.6	.5	.4	.3	.2	.1	.0	.8	.7	.6	.5	.4	.3	.2	.1	.0	.8	.7	.6	.5	.4	.3	.2
95	87	85	58	45	27	62	76	91	86	75	52	40	32	27	18	97	80	68	65	58	38	24	07	04	99	80	70	50	50	45	23
2	4	4	3	9	9	8	9	22	93	5	96	86	54	9	62	51	83	77	78	84	68	48	66	89	62	78	67	51	19	93	8
71	75	78	82	85	89	92	96	99	10	10	11	11	11	12	12	12	13	13	13	14	14	14	15	15	15	16	16	16	17	17	17
8.	3.	8.	2.	7.	2.	7.	1.	6.	31	66	01	35	70	05	40	74	09	44	79	13	48	83	18	53	87	22	57	92	26	61	96
56	32	09	86	64	41	18	95	71	.4	.2	.0	.7	.5	.3	.1	.8	.6	.4	.1	.9	.7	.4	.2	.0	.8	.5	.3	.1	.8	.6	.4
91	84	77	34	75	89	08	39	60	95	68	25	94	71	53	18	75	51	09	83	63	23	98	58	28	10	72	48	13	77	61	22
	9	7	1		7	9	8	3	46	12	5	38	95	58	29	72	15	64	97	69	93	72	51	07	22	95	03	71	62	44	75
69	72	76	79	82	86	89	93	96	99	10	10	10	11	11	12	12	12	13	13	13	14	14	14	15	15	15	16	16	16	17	17
5.	9.	2.	6.	9.	3.	7.	0.	4.	8.	31	65	99	32	66	00	33	67	01	34	68	02	35	69	02	36	70	03	37	71	04	38
39	03	68	33	98	63	27	93	58	22	.8	.5	.1	.8	.4	.1	.7	.4	.0	.7	.3	.0	.6	.3	.9	.6	.2	.8	.5	.1	.8	.4
58	22	66	25	44	90	86	32	1	59	81	18	69	31	82	25	61	14	66	03	62	03	53	09	44	01	46	96	57	92	44	89
1	7	1	2	6	5	7	6			43	72	33	66	82	44	41	01	96	96	8	45	91	45	66	85	16	19	25	81	77	51
67	70	73	76	80	83	86	89	93	96	99	10	10	10	11	11	11	12	12	12	13	13	13	14	14	14	15	15	15	16	16	16
2.	4.	7.	9.	2.	4.	7.	9.	2.	4.	7.	29	62	95	27	60	92	25	57	90	22	55	87	20	52	85	17	50	82	15	47	80
17	68	21	74	26	79	31	84	37	89	42	.9	.4	.0	.5	.0	.5	.0	.6	.1	.6	.1	.7	.2	.7	.2	.8	.3	.8	.4	.9	.4
46	81	61	78	97	92	65	45	47	64	28	40	72	01	27	48	63	89	20	46	66	87	11	42	70	86	11	36	70	02	13	36
	3	4	3		4	5	9	6		6	08	78	92	32	74	24	53	39	29	08	13	92	88	87	8	56	36	51	38	61	49
64	68	71	74	77	80	83	86	90	93	96	99	10	10	10	11	11	11	12	12	12	13	13	13	14	14	14	14	15	15	15	16
8.	0.	1.	3.	4.	5.	7.	8.	0.	1.	2.	4.	25	57	88	19	51	82	14	45	76	08	39	71	02	33	65	96	28	59	90	22
91	30	70	10	50	90	30	70	10	50	90	29	.6	.0	.4	.8	.2	.6	.0	.4	.8	.2	.6	.0	.4	.8	.2	.6	.0	.4	.8	.2
04	04	02	41	78	57	04	05	25	38	01	70	96	97	98	96	89	88	90	92	91	84	83	84	86	86	80	79	83	87	87	76
3	9	2	6	6	3	6	3	3	8	7	2	48	68	66	85	89	86	61	57	36	89	1	62	78	8	3	19	18	41	42	07

625.6066	655.8694	686.1412	716.4171	746.6928	776.9641	807.2374	837.5030	867.7733	898.0595	928.3213	958.5872	988.8590	1019.133	1049.407	1079.678	1109.944	1140.215	1170.489	1200.763	1231.035	1261.301	1291.574	1321.845	1352.118	1382.390	1412.659	1442.928	1473.205	1503.481	1533.746	1564.016
602.2528	631.3853	660.5261	689.6730	718.8212	747.9610	777.0985	806.2334	835.3799	864.5268	893.6685	922.8052	951.9391	981.0845	1010.202	1039.375	1068.511	1097.645	1126.785	1155.937	1185.082	1214.216	1243.361	1272.496	1301.641	1330.759	1359.899	1389.018	1418.147	1447.276	1476.398	1505.532
578.8505	606.8480	634.8596	662.8772	690.8930	718.8971	746.9049	774.9099	802.9128	830.9310	858.9428	886.9447	914.9565	942.9557	970.9730	998.9791	1026.989	1055.002	1082.999	1111.013	1139.032	1167.067	1195.023	1223.051	1251.079	1279.007	1307.035	1335.063	1363.091	1391.101	1419.123	1447.126
555.4045	582.2690	609.1485	636.0324	662.9095	689.7787	716.6463	743.5265	770.3965	797.2704	824.1516	851.0185	877.8894	904.7713	931.6398	958.5239	985.3910	1012.270	1039.142	1066.092	1092.827	1119.746	1146.605	1173.563	1200.405	1227.373	1254.297	1281.207	1307.988	1334.852	1361.688	1388.511
531.9199	557.6511	583.3951	609.1374	634.8781	660.6121	686.3395	712.0855	737.8281	763.5603	789.3026	815.0345	840.7755	866.5190	892.2523	917.9924	943.7253	969.4655	995.2097	1020.946	1046.724	1072.498	1098.231	1123.975	1149.754	1175.499	1201.263	1226.521	1252.278	1278.036	1303.760	1329.996
508.4018	532.9973	557.5977	582.2012	606.8044	631.4035	655.9956	680.6009	705.2037	729.8060	754.4033	779.0013	803.6011	828.2039	852.8066	877.4033	902.0008	926.6013	951.2041	975.8070	1000.404	1025.049	1049.674	1074.298	1098.923	1123.548	1148.172	1172.797	1197.421	1221.846	1246.471	1271.046
484.8530	508.3077	531.7759	555.2323	578.6969	602.1515	625.6161	649.0707	672.5373	696.0046	719.4692	742.9292	766.3838	789.8413	813.3030	836.7676	860.2222	883.6818	907.1414	930.6061	954.0707	977.5252	1000.979	1024.434	1047.889	1071.343	1094.798	1118.252	1141.707	1165.161	1188.616	1212.070

503	937	045	477	891	934	718	851	132	363	347	099	187	457	711	749	491	529	783	052	141	895	8879	511	1391	7523	3312	9363	5776	2207	8314	3738
461.27778	483.5909 1	505.91 25	528.2373 3	550.5602 6	572.8763 9	595.1915 2	617.5127 3	639.8354 7	662.1574	684.4761 2	706.7907 4	729.1113 9	751.4340 1	773.7563 2	796.0755	818.3901 8	840.7100 9	863.0325 5	885.3551 1	907.6747	929.9901 2	952.3088 4	974.6307 8	996.9535 1	1019 .2 74 72	1041 .5 89 9	1063 .9 09 17	1086 .2 33 43	1108 .5 57 88	1130 .8 77 42	1153 .1 88 44
437.666 92	458.837 97	480.0 1 98 9	501.2019 8	522.3770 8	543.5498 5	564.7214 1	585.9013 2	607.0825 1	628.2606 3	649.4369 3	670.6076 3	691.7866 3	712.9680 3	734.1465 8	755.3237	776.4913	797.6719 8	818.8534 6	840.0325 6	861.2101 5	882.3809 6	903.5572 5	924.7353 8	945.9165 6	967.0964 7	988.2681 4	1009 .4 44 78	1030 .6 28 57	1051 .8 09 7	1072 .9 83 3	1094 .1 50 97
414.0209 3	434.0499 4	454.0888	474.1209 6	494.1519	514.1796 7	534.2076 7	554.2448	574.2799 6	594.3142 2	614.3453 7	634.3721 6	654.4086 2	674.4443 3	694.4785 3	714.5108 2	734.5369 9	754.5723 8	774.6071	794.6428 5	814.6759	834.7019 8	854.7331 3	874.7673 9	894.8025 5	914.8396 8	934.8683	954.9018 1	974.9412 7	994.9737 9	1015 .0 02 71	1035 .0 26 42
390.3384	409.2250 3	428.1129 2	446.9981 6	465.8833 2	484.7658 6	503.6502 9	522.5402 4	541.4283 5	560.3162 6	579.2014 6	598.0843 3	616.9746 7	635.8628 3	654.7507 9	673.6368 5	692.5187 6	711.4090 1	730.2972 9	749.1852 8	768.0720 2	786.9531 8	805.8383 7	824.7262 8	843.6143 9	862.5043 5	881.3889 8	900.2792 3	919.1679 2	938.0528 2	956.9365	975.8162 4
366.6178 7	384.3571 6	402.0951 3	419.8331 5	437.5712 1	455.3084 1	473.0474 1	490.7872 3	508.5267 5	526.2662 6	544.0051 8	561.7434 5	579.4834 9	597.2231	614.9625 2	632.7017 8	650.4393 6	668.1797 3	685.9192 5	703.6587 7	721.3982 3	739.1345 7	756.8734 8	774.613	792.3525 1	810.0923 4	827.8315 9	845.5727 2	863.3108 1	881.0485 6	898.7861 4	916.5218 7
342.8579 1	359.4475	376.0373 5	392.6273 5	409.2174	425.8074	442.3973	458.9872	475.5771	492.167	508.7569	525.3467 9	541.9366 9	558.5265 9	575.1164 9	591.7063 9	608.2962 9	624.8861 8	641.4760 8	658.0659 8	674.6558 8	691.2457 8	707.8356 8	724.4255 8	741.0154 8	757.6053 7	774.1952 8	790.7852 7	807.3753 2	823.9653 3	840.5551 8	857.1447 7

Table S6. *Theoretical simulation data corresponding to Figure 15(b).*

42	44	46	48	50	52	54	56	58	60	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91	93	95	97	10	10	10	10
47	53	58	64	69	75	81	86	92	97	03	08	14	19	25	30	36	41	47	53	58	64	69	75	80	86	91	97	00	20	41	61
.8	.3	.8	.4	.9	.5	.0	.6	.1	.6	.2	.7	.2	.8	.3	.9	.4	.9	.5	.0	.6	.1	.6	.2	.7	.3	.8	.3	2.	8.4	4.0	9.5
22	59	98	39	80	20	60	00	40	79	19	59	99	39	78	18	58	98	37	77	17	57	97	36	76	16	56	96	93	78	17	54
	15	52	19	27	85	64	42	19	96	74	51	29	06	83	61	38	16	93	7	48	25	03	8	57	35	14	72	78	47	84	99
42	44	46	48	50	52	54	56	58	60	62	64	66	68	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	10	10	10
35	39	44	49	54	59	64	69	74	79	84	89	94	98	03	08	13	18	23	28	33	38	43	48	53	58	62	67	72	17	38	58
.0	.9	.9	.8	.7	.6	.5	.4	.3	.3	.2	.1	.0	.9	.8	.8	.7	.6	.5	.5	.4	.3	.2	.1	.1	.0	.9	.8	.7	7.6	2.5	7.4
71	91	01	10	20	23	41	66	88	10	27	23	45	67	89	19	37	66	89	11	33	34	66	89	11	33	33	35	45	55	64	84
52	88	08	63	59	24	12	09	39	69	9	2	02	32	72	3	03	6		3	12	02	59	31	61	91	08	73	69	24	45	81
42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	81	83	85	87	89	91	93	95	97	99	10	10	10
21	26	30	34	39	43	47	51	56	60	64	69	73	77	81	86	90	94	99	03	07	11	16	20	24	29	33	37	41	14	35	55
.9	.2	.5	.8	.1	.3	.6	.9	.2	.5	.7	.0	.3	.6	.9	.2	.4	.7	.0	.3	.6	.9	.2	.5	.8	.0	.3	.5	.8	6.1	0.4	4.7
85	69	63	35	06	55	19	31	27	22	93	30	15	10	08	22	74	88	86	81	65	06	15	15	10	99	41	90	61	33	27	10
61	21	45	25	29	09	92	78	97	4	77	84	32	44	08	46	1	48	12	24	72	47	22	12	43	14	47	27	31	1	35	94
42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	95	97	99	10	10	10
08	12	15	19	23	26	30	33	37	41	44	48	52	55	59	63	66	70	74	77	81	84	88	92	95	99	03	06	10	11	31	52
.5	.1	.8	.5	.1	.7	.3	.9	.6	.2	.9	.4	.1	.7	.4	.1	.6	.3	.0	.6	.3	.8	.5	.2	.8	.4	.0	.6	.2	3.9	7.6	1.2
76	81	69	00	21	15	11	85	42	91	14	93	32	81	47	06	90	49	16	64	04	85	31	03	51	96	81	75	96	28	16	21
59	11	51	85	85	83	78	4	28	54	31	15	82	04	82	71	98	88	66	88	54	14	49	2	7	39	86	84	84	19	59	1
41	43	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	10	10	10
94	97	00	03	06	09	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	08	28	48
.8	.7	.7	.8	.7	.7	.6	.6	.6	.6	.5	.5	.4	.4	.4	.4	.3	.3	.3	.3	.3	.2	.2	.2	.2	.2	.1	.0	.0	1.0	4.0	7.0
56	79	94	11	68	05	32	30	39	22	89	10	88	79	90	71	88	68	80	71	49	70	39	49	46	25	54	91	48	65	80	02
75	45	57	08	2	47	53	55	4	24	52	14	43	57	86	42	32	88	17	31	6	05	15	58	16	65	27	54	66	17	29	99
41	43	45	47	49	51	53	55	57	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	10	10	10
80	83	85	87	90	92	94	96	99	01	03	06	08	10	13	15	17	19	22	24	26	29	31	33	35	38	40	42	45	04	24	45
.8	.0	.3	.7	.0	.3	.5	.8	.2	.5	.8	.0	.3	.6	.0	.3	.5	.8	.1	.5	.8	.0	.3	.6	.9	.2	.5	.8	.1	7.4	9.8	2.0
38	79	92	32	57	24	82	92	14	30	19	8	76	97	17	16	66	64	85	06	02	61	52	70	93	93	58	25	49	90	03	44
38	26	31	97	39		17		78	77	41		04	39	83	58	1	86	3	64	69	18	01	58	25	93	69	3	72	38	42	3

41	43	45	47	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	84	86	88	90	92	94	96	98	10	10	10
66	68	69	71	72	74	76	77	79	81	82	84	85	87	89	90	92	93	95	97	98	00	01	03	05	06	08	09	11	01	21	41
.5	.0	.6	.3	.9	.5	.1	.7	.3	.0	.6	.1	.7	.4	.0	.6	.2	.8	.4	.0	.6	.2	.8	.4	.1	.7	.2	.8	.5	3.1	4.7	6.3
33	85	95	32	67	71	53	65	89	09	08	87	95	18	40	44	22	25	47	70	78	58	56	76	01	12	94	98	34	71	80	32
79	94	37	41	89	87	79	32	5	46	35	78	57	81	65	22	32	89	72	97	75	01	89	86	04	57	66	64	13	17	6	75
41	43	45	47	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	10	10
51	52	53	54	55	56	57	58	59	60	60	61	62	63	64	65	66	67	68	69	69	70	71	72	73	74	75	76	77	78.	17	37
.9	.7	.6	.6	.5	.4	.3	.2	.1	.0	.9	.8	.7	.6	.5	.4	.3	.2	.1	.0	.9	.8	.7	.6	.5	.4	.3	.2	.1	11	9.0	9.8
44	84	90	25	57	55	27	33	55	72	66	33	33	54	73	73	30	30	48	68	71	38	31	47	68	75	48	44	77	10	16	60
18	08	78	08	59	1	4	77	19	39	36	32	48	02	16	54	85	32	55	19	32	16	24	53	04	55	24	7	12	9	63	46
41	43	45	47	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	10	10
37	37	37	37	37	37	38	38	38	38	38	39	39	39	39	39	39	40	40	40	40	40	40	41	41	41	41	41	42	42.	14	34
.0	.1	.3	.5	.7	.9	.1	.2	.4	.7	.8	.0	.1	.3	.6	.7	.9	.0	.2	.4	.6	.8	.9	.1	.3	.5	.7	.8	.1	33	2.5	2.6
54	60	58	82	79	67	12	94	98	08	78	09	94	92	04	86	02	80	87	91	82	10	76	82	89	81	21	88	12	31	10	35
15	46	93	42	73	16	68	68	79	89	79	65	46	74	87	3	53	05	86	76	99	42	79	35	07	49	62	56	69	5	62	37
41	43	45	47	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	10	10
21	21	20	20	19	19	18	17	17	16	16	15	15	14	14	13	12	12	11	11	10	10	09	09	08	08	07	06	06	05.	10	30
.8	.2	.7	.1	.6	.1	.4	.9	.4	.9	.3	.7	.1	.6	.1	.5	.9	.4	.8	.3	.8	.1	.6	.0	.5	.0	.4	.8	.3	82	5.2	4.6
66	37	13	79	64	07	99	72	23	03	44	26	95	46	21	77	53	02	79	46	08	87	22	99	68	35	25	59	57	53	91	65
35	62	18	4	65	02	88	56	38	25	57	13	3	01	59	98	14	26	31	11	47	15	11	93	06	97	04	52	72	1	85	87
41	43	45	47	49	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	10	10
06	05	03	02	01	99	98	97	95	94	93	92	90	89	88	86	85	84	82	81	80	78	77	76	75	73	72	71	69	68.	06	26
.3	.0	.7	.4	.1	.8	.5	.2	.9	.6	.3	.0	.7	.4	.1	.8	.4	.1	.9	.6	.3	.9	.6	.3	.1	.8	.4	.1	.8	62	7.3	5.9
84	20	28	49	96	78	18	37	60	62	68	00	11	38	38	54	88	98	14	40	45	74	73	90	16	28	65	66	93	37	41	60
08	31		35	18	8	43	28	1	82	66	9	73	55	35	34	42	45	43	74	01	95	66	87	3	31	9	28	02	1	7	21
40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	10	10
90	88	86	84	82	80	78	76	74	72	69	67	65	63	61	59	57	55	53	51	49	47	45	43	41	38	36	34	32	30.	02	22
.6	.4	.4	.3	.3	.2	.1	.1	.0	.0	.9	.8	.7	.7	.6	.6	.5	.4	.4	.3	.2	.1	.1	.0	.0	.9	.8	.7	.7	71	8.6	6.5
10	93	21	93	63	86	73	18	77	24	55	38	79	37	89	21	14	52	06	61	99	80	15	66	22	65	51	89	48	98	63	26
65	88	75	19	75	62	02	6	82	58	99	93	07	58	18	16	16	88	04	76	21	41	47	26	7	53	64	73	9	5	64	63
40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	93	95	97	99	10
74	71	68	65	63	60	57	54	51	48	46	43	40	37	34	31	29	26	23	20	17	14	11	09	06	03	00	97	94	92.	89.	18
.5	.6	.8	.9	.1	.3	.4	.6	.7	.9	.1	.2	.4	.5	.7	.8	.0	.1	.3	.5	.6	.8	.9	.1	.2	.4	.5	.7	.9	11	27	6.3

49	51	10	96	80	34	63	24	98	67	15	43	00	73	44	97	25	79	50	22	79	07	55	25	98	59	89	43	27	37	26	73
35	44	42	37	81	6	63	76	26	63	3	14	63	23	45	55	95	08	08	44	71	42	94	08	35	26	67	54	89	6	6	37
40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	73	75	77	79	81	83	85	87	89	91	93	95	97	99	10
58	54	50	47	43	40	36	32	29	25	21	18	14	10	07	03	00	96	92	89	85	81	78	74	70	67	63	60	56	52.	49.	14
.2	.5	.8	.2	.6	.0	.3	.7	.1	.5	.8	.1	.5	.9	.3	.6	.0	.3	.7	.1	.5	.8	.2	.5	.9	.3	.6	.0	.4	82	19	5.5
00	08	78	74	69	31	68	39	23	02	61	90	57	39	20	82	20	80	61	44	12	46	01	81	64	36	72	32	27	42	39	02
89	81	23	64	52	97	72	68	25	71	01	52	58	75	55	95	17	58	95	69	32	84	72	29	99	33	78	56	66	7	1	23
40	42	44	46	48	50	52	54	56	58	59	61	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91	93	95	97	99	10
41	37	32	28	23	19	14	10	06	01	97	92	88	83	79	74	70	66	61	57	52	48	43	39	34	30	26	21	17	12.	08.	10
.5	.0	.6	.2	.8	.3	.8	.4	.0	.6	.1	.6	.2	.8	.4	.9	.4	.0	.6	.2	.7	.2	.8	.4	.9	.5	.0	.6	.2	82	40	3.8
58	68	12	13	16	67	95	52	37	23	73	75	40	25	05	71	84	44	18	07	76	83	42	09	99	75	87	54	21	55	40	95
12	88	7	34	66	01	33	9	69	33	36	4	53	88	96	19	34	06	64	95	91	43	81	4	44	08	4	9	51	2	8	31
40	42	44	46	48	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	83	85	86	88	90	92	94	96	98	10
24	19	14	08	03	98	93	87	82	77	72	66	61	56	51	45	40	35	29	24	19	14	08	03	98	93	87	82	77	72.	66.	06
.6	.3	.0	.8	.6	.3	.0	.7	.5	.3	.0	.7	.4	.2	.0	.7	.4	.1	.9	.6	.4	.1	.8	.6	.3	.1	.8	.5	.3	11	88	1.5
23	02	56	06	04	37	28	92	38	13	48	22	74	45	05	54	29	86	29	98	58	35	82	28	89	59	45	93	56	22	81	58
57	34	97	9	4	31	58	71	05	8	03	12	47	37	1	26	85	97	5		4	53	35	11	72	02	49	26	75	6	3	92
40	42	43	45	47	49	51	53	55	57	59	61	63	65	67	69	71	73	74	76	78	80	82	84	86	88	90	92	94	96	98	10
07	01	95	89	83	76	70	64	58	52	46	40	34	28	22	16	09	03	97	91	85	79	73	67	61	55	48	42	36	30.	24.	01
.4	.2	.1	.0	.0	.9	.7	.7	.6	.5	.4	.3	.2	.1	.1	.0	.8	.7	.7	.6	.5	.4	.3	.2	.1	.0	.9	.8	.8	72	65	8.5
00	35	72	96	32	47	99	30	58	75	90	36	63	91	27	33	71	84	21	30	63	11	11	52	59	94	55	54	17	77	19	02
91	71	14	74	49	49	25	54	39	55	54	69	98	14	29	14	18	45	94	26	68	42	61	07	93	72	36	8	65		3	27
39	41	43	45	47	49	51	53	55	57	59	61	63	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	93	95	97	99
89	82	75	69	62	55	48	41	34	27	20	13	06	99	92	85	78	71	64	58	51	44	37	30	23	16	09	02	95	88.	81.	74.
.8	.8	.9	.0	.1	.2	.2	.2	.3	.4	.5	.5	.5	.6	.7	.8	.8	.8	.9	.0	.1	.1	.1	.2	.3	.3	.4	.4	.5	67	71	73
93	84	60	61	32	02	14	87	75	43	06	24	93	75	58	14	14	74	61	40	00	18	68	53	36	93	25	75	78	80	82	45
83	65	27	14	09	13	4	87	48	73	41	63	96	74	09	29	78	59		38	11	47	49	41	88	2	28	91	61	3	9	7
39	41	43	45	47	49	51	53	55	57	58	60	62	64	66	68	70	72	74	76	78	80	82	83	85	87	89	91	93	95	97	99
72	64	56	48	40	33	25	17	09	01	94	86	78	70	62	55	47	39	31	23	16	08	00	92	84	77	69	61	53	45.	38.	30.
.1	.2	.4	.6	.9	.1	.2	.4	.6	.9	.1	.2	.4	.6	.9	.1	.2	.4	.6	.8	.0	.2	.4	.6	.8	.0	.2	.4	.6	91	12	26
06	49	52	82	10	05	76	81	98	11	02	76	77	92	07	04	67	64	79	95	96	64	56	69	86	91	63	60	88	81	16	50
01	49	73	25	28	86	94	94	96	98	08	41	25	9	21	14	08	59	47	69	03	04	58	72	87	71	53	17	42	5		2

39	41	43	45	47	49	51	52	54	56	58	60	62	64	66	68	70	72	73	75	77	79	81	83	85	87	89	91	93	95	96	98
54	45	36	27	19	10	01	93	84	75	67	58	49	41	32	23	15	06	97	89	80	71	63	54	45	37	28	19	11	02.	93.	85.
.0	.3	.6	.9	.3	.6	.9	.2	.6	.9	.2	.5	.9	.2	.6	.9	.2	.5	.8	.2	.5	.8	.1	.4	.8	.1	.4	.7	.1	50	82	09
39	11	38	93	45	67	68	98	41	79	96	92	19	60	00	22	17	39	79	20	47	42	60	97	39	69	71	92	45	00	81	96
86	1	94	06	7	97	99	98		01	97	83	28	43	24	67	86	98	81	98	44	48	16	89	63	34	87	72	64	4	6	5
39	41	43	45	46	48	50	52	54	56	58	60	62	64	66	67	69	71	73	75	77	79	81	83	85	86	88	90	92	94	96	98
35	26	16	06	97	87	78	68	59	49	40	30	20	11	01	92	82	73	63	54	44	34	25	15	06	96	87	77	67	58.	48.	39.
.6	.0	.5	.9	.4	.8	.2	.7	.1	.6	.0	.4	.9	.3	.8	.2	.6	.0	.5	.0	.4	.8	.2	.7	.1	.6	.0	.4	.9	39	84	21
87	57	06	81	42	80	90	23	85	44	73	71	03	62	23	61	52	84	39	02	47	32	58	13	73	20	25	63	15	38	61	84
38	62	49	76	14	58	01	53	23	57	01	69	38	51	88	57	47	7	68	62	69	53	04	95	8	13	53	7	28	4	2	6
39	41	42	44	46	48	50	52	54	56	58	60	61	63	65	67	69	71	73	75	77	78	80	82	84	86	88	90	92	94	96	97
17	06	96	85	75	64	54	43	33	22	12	01	91	80	70	60	49	39	28	18	07	97	86	76	65	55	44	34	24	13.	03.	92.
.0	.5	.0	.6	.1	.7	.2	.7	.3	.8	.4	.8	.4	.9	.5	.1	.5	.1	.6	.2	.7	.2	.7	.3	.8	.4	.9	.4	.0	58	15	62
49	12	72	40	99	36	27	81	23	93	21	99	54	91	60	01	75	26	60	27	79	52	73	37	97	51	37	83	28	89	73	43
74	59	76	76	67	74	32	05	34	49	31	75	51	4	84	96	27	69	75	04	55	26	66	8	57	82	58	32	65		2	6
38	40	42	44	46	48	50	52	54	55	57	59	61	63	65	67	69	71	72	74	76	78	80	82	84	86	88	89	91	93	95	97
98	86	75	63	52	41	29	18	07	95	84	72	61	50	38	27	16	04	93	81	70	59	47	36	25	13	02	90	79	68.	56.	45.
.1	.6	.3	.9	.6	.2	.8	.4	.0	.7	.3	.9	.5	.1	.8	.4	.0	.6	.2	.9	.5	.1	.7	.3	.0	.6	.2	.8	.5	12	76	32
31	86	30	66	33	41	07	52	86	22	47	05	44	83	11	50	06	34	80	02	49	09	26	72	18	54	17	31	04	02	57	75
	45	05	19	33	52	43	81	14	27	95	48	19	79	8	42	14	98	29	24	21	79	04	36	4	66	14	83	73	4	6	
38	40	42	44	46	48	50	51	53	55	57	59	61	63	65	66	68	70	72	74	76	78	80	81	83	85	87	89	91	93	95	96
78	66	54	41	29	17	05	92	80	68	55	43	31	18	06	94	81	69	57	45	32	20	08	95	83	71	58	46	34	22.	09.	97.
.9	.5	.2	.9	.7	.3	.0	.7	.4	.1	.8	.4	.1	.9	.6	.3	.9	.6	.3	.0	.7	.4	.1	.8	.5	.2	.8	.5	.2	01	68	33
35	78	64	91	22	99	41	47	66	60	59	95	95	15	14	14	52	43	63	68	64	13	08	17	33	34	73	54	91	78	86	80
21	12	59	39	29	99	23	09	5	81	02	64	16	18	42	04	17	49	28	76	76	21	67	94	68	14	34	75	27	6	1	2
38	40	42	44	46	47	49	51	53	55	57	59	61	62	64	66	68	70	72	74	75	77	79	81	83	85	87	89	90	92	94	96
59	46	32	19	06	93	79	66	53	40	26	13	00	87	73	60	47	34	20	07	94	81	67	54	41	28	14	01	88	75.	61.	48.
.4	.1	.9	.6	.4	.2	.9	.6	.4	.2	.9	.6	.4	.1	.9	.7	.4	.1	.9	.7	.4	.1	.9	.6	.4	.1	.9	.6	.4	21	97	66
66	63	15	94	72	17	33	89	56	20	60	76	28	95	60	03	20	68	34	00	48	70	16	78	45	99	15	60	39	99	28	60
43	01	81	99	73	22	41	22	7	3	61	31	74	44	85	35	48	64	12	9	27	66	24	72	08	78	32	83	69	8	6	7
38	40	42	43	45	47	49	51	53	55	56	58	60	62	64	66	68	69	71	73	75	77	79	81	82	84	86	88	90	92	94	95
39	25	11	97	82	68	54	40	26	11	97	83	69	55	40	26	12	98	84	69	55	41	27	12	98	84	70	56	41	27.	13.	99.
	.4	.2	.0	.9	.7	.4	.2	.0	.8	.6	.4	.2	.0	.8	.6	.4	.1	.0	.8	.6	.3	.1	.9	.7	.5	.3	.1	.9	78	57	32

.7	72	68	89	09	00	71	69	79	85	71	39	34	43	50	41	08	99	06	15	10	78	64	70	80	78	49	40	60	24	84	09
29	19	25	81	93	97	64	65	33	12	46	67	22	03	56	21	52	18	7	52	07	45	78	57	26	27	28	95	99	6	4	1
38	40	41	43	45	47	49	51	52	54	56	58	60	62	64	65	67	69	71	73	75	77	78	80	82	84	86	88	89	91	93	95
19	04	89	74	59	43	28	13	98	83	67	52	37	22	07	92	76	61	46	31	16	01	85	70	55	40	25	09	94	79.	64.	49.
.7	.5	.3	.2	.0	.8	.6	.4	.3	.1	.9	.7	.6	.4	.2	.1	.8	.7	.5	.4	.2	.0	.8	.6	.5	.3	.1	.9	.8	70	52	28
32	05	44	08	58	54	42	78	27	68	85	69	01	48	93	13	98	24	70	16	40	30	47	89	37	73	62	83	43	45	76	36
55		08	65	22	43	85	95	01	81	35	72	39	58	3	49	33	22	12	85	23	89	43	23	29	39	16	07	11	9		9
37	39	41	43	45	47	49	50	52	54	56	58	60	61	63	65	67	69	71	72	74	76	78	80	82	83	85	87	89	91	93	94
99	83	67	51	34	18	02	86	70	54	37	21	05	89	73	57	40	24	08	92	76	60	43	27	11	95	79	63	47	30.	14.	98.
.4	.2	.1	.0	.8	.6	.4	.3	.2	.0	.8	.6	.5	.4	.2	.1	.9	.7	.6	.4	.3	.1	.9	.8	.6	.5	.3	.1	.0	96	78	55
71	67	47	29	56	65	65	29	04	55	92	84	42	19	73	16	06	55	32	91	37	31	67	18	93	58	58	97	92	74	26	14
87	2	87	81	92	72	08	95	83	69	18	78	46	04	27	26	65	4	53	05	71	13	63	49	36	24	37	57	92	2	9	5
37	39	41	43	45	46	48	50	52	54	56	57	59	61	63	65	67	68	70	72	74	76	78	79	81	83	85	87	88	90	92	94
78	61	44	27	10	93	75	58	41	24	07	90	73	55	38	21	04	87	70	53	35	18	01	84	67	50	32	15	98	81.	64.	47.
.9	.7	.6	.4	.3	.1	.9	.8	.6	.5	.3	.1	.0	.9	.7	.6	.4	.3	.1	.0	.8	.6	.5	.3	.2	.1	.9	.7	.6	54	35	13
35	53	49	92	25	34	44	26	93	52	87	88	65	36	95	39	35	03	79	38	88	83	18	77	44	26	37	95	95	13	88	55
6	82	48	48	92	41	73	74	31	83	91	72	5	36	38	4	34	77	47	04	71	24	31	84	4	42	93	21	51	7	9	5
37	39	41	43	44	46	48	50	52	53	55	57	59	61	63	64	66	68	70	72	73	75	77	79	81	83	84	86	88	90	92	93
58	39	21	03	85	67	49	30	12	94	76	58	40	21	03	85	67	49	31	13	94	76	58	40	22	04	85	67	49	31.	13.	95.
.1	.9	.7	.6	.4	.2	.0	.9	.7	.6	.4	.2	.1	.9	.8	.6	.4	.3	.2	.0	.8	.6	.5	.3	.2	.0	.9	.7	.6	44	26	04
12	50	99	27	54	60	81	46	96	45	72	81	49	99	48	82	84	51	02	52	91	87	14	63	13	77	00	67	22	74	28	73
39	97	38	07	06	52	78	45	65	24	53	56	26	82	85	91	41	4	95	17	57	2	49	08	28	95	82	76	53	7	8	4
37	39	40	42	44	46	48	50	51	53	55	57	59	60	62	64	66	68	69	71	73	75	77	78	80	82	84	86	87	89	91	93
36	17	98	79	60	41	21	02	83	64	45	25	06	87	68	49	30	10	91	72	53	34	14	95	76	57	38	19	99	80.	61.	42.
.9	.8	.6	.4	.2	.0	.8	.6	.5	.3	.1	.9	.7	.6	.4	.2	.0	.8	.7	.5	.3	.1	.9	.7	.6	.4	.2	.0	.8	69	50	29
90	10	20	30	40	44	61	85	07	29	46	57	83	05	27	46	53	81	03	25	46	43	59	81	03	27	47	81	91	96	62	81
9	77	34	24	52	04	62	75	41	08	05	99	73	4	07	8	25	63	39	05	28	01	98	65	32	44	05	4	92	8	3	7
37	38	40	42	44	46	47	49	51	53	55	56	58	60	62	64	65	67	69	71	73	74	76	78	80	82	83	85	87	89	91	92
15	95	75	54	34	14	94	74	53	33	13	93	72	52	32	12	92	71	51	31	11	91	70	50	30	10	89	69	49	29.	09.	88.
.5	.3	.1	.9	.6	.4	.2	.0	.8	.6	.4	.1	.9	.7	.5	.3	.1	.9	.6	.4	.2	.0	.8	.6	.4	.1	.9	.7	.5	33	11	89
59	42	27	13	99	85	70	55	40	26	11	96	81	66	51	37	22	07	92	77	62	47	33	18	03	88	73	59	45	18	66	93
75	48	26	24	59	48	65	8	95	1	25	4	55	7	85		15	3	44	59	74	89	04	19	34	49	66	55	9	8	6	9

S1.4 Data Description for Figures and Tables in Section 5.3.

In Figure 15(a), the X-axis represents the canopy load, the Y-axis represents the support height, and the Z-axis represents the balancing jack load. The corresponding theoretical simulation data are shown in Table S7. The 32×32 data matrix provided in Table S7 corresponds to the theoretical simulation results of the surface shown in Figure 15(a). The column headers of this matrix correspond to the X-axis value range of 4000–10000 KN in Figure 15(a), the row headers correspond to the Y-axis value range of 0-15°, and the matrix element values represent the Z-axis values of each point on the surface.

In Figure 15(b), the X-axis represents the canopy load, the Y-axis represents the support height, and the Z-axis represents the upright column load. The corresponding theoretical simulation data are shown in Table S8. The 32×32 data matrix provided in Table S8 corresponds to the theoretical simulation results of the surface shown in Figure 15(b). The column headers of this matrix correspond to the X-axis value range of 4000–10000 KN in Figure 15(b), the row headers correspond to the Y-axis value range of 0-15°, and the matrix element values represent the Z-axis values of each point on the surface.

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Table S7. *Theoretical simulation data corresponding to Figure 15(a).*

10	11	11	12	12	13	13	14	14	15	15	16	16	17	17	18	18	19	19	20	20	21	21	22	22	23	23	24	24	25	25	26
59	10	61	12	63	15	66	17	68	20	71	22	73	25	76	27	78	30	81	32	83	35	86	37	88	40	91	42	93	45	96	47
.0	.2	.5	.7	.9	.2	.4	.7	.9	.2	.4	.6	.9	.1	.4	.6	.9	.1	.3	.6	.8	.1	.3	.6	.8	.0	.3	.5	.8	.0	.3	.5
23	65	08	51	95	38	81	24	67	10	53	96	39	82	25	68	11	54	98	41	84	27	70	13	56	99	42	85	29	72	15	57
07	37	3	61	04	32	38	43	48	53	59	64	69	74	79	84	9	95		05	1	15	21	26	31	36	42	7	13	44	37	67
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06	22	35	47	60	71	86	03	19	36	51	59	75	92	08	26	41	60	76	92	09	19	38	55	71	87	97	08	20	33	46	61
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03	56	10	63	16	70	23	76	30	83	37	90	43	97	50	04	57	10	64	17	70	24	77	31	84	37	91	44	98	51	04	58
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.1	.6	.2	.7	.2	.7	.2	.7	.2	.7	.2	.7	.2	.7	.3	.8	.3	.8	.3	.8	.3	.8	.3	.8	.4	.9	.4	.9	.4	.9	.4	.9
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53	54	72	98	23	40	50	68	90	11	26	36	53	75	96	13	22	38	59	81	99	08	23	44	66	84	95	11	36	62	80	82
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.9	.6	.3	.1	.8	.5	.2	.9	.6	.3	.0	.7	.5	.2	.9	.6	.3	.0	.7	.4	.1	.8	.5	.3	.0	.7	.4	.1	.8	.5	.2	.9
92	80	95	17	25	42	39	58	75	89	92	85	03	21	35	41	31	42	62	73	82	80	88	08	22	25	29	37	63	83	78	80
02	04	94	69	28	1	84	08	45	4	45	42	16	69	86	5	52	6	77	5	31	06		25		78	62	56	71	72	82	05
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87	15	75	22	84	39	71	28	91	48	90	18	73	37	95	40	68	23	79	21	85	17	68	27	66	30	67	18	86	23	84	19
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.8	.6	.4	.2	.0	.8	.5	.3	.1	.9	.7	.5	.3	.1	.9	.6	.4	.2	.0	.8	.6	.3	.1	.9	.7	.5	.3	.0	.8	.6	.4	.2
94	62	45	34	40	25	92	82	78	74	55	19	06	02	00	84	49	42	18	15	10	77	68	44	37	36	06	98	79	69	71	37
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08	08	18	49	80	95	96	16	40	64	81	80	97	21	45	65	68	79	01	28	49	51	63	81	09	32	36	51	68	01	25	22
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25	50	94	47	00	43	77	22	71	19	60	94	37	86	34	76	10	52	01	50	94	28	68	16	65	10	45	86	39	93	37	63
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42	90	56	31	06	70	27	94	65	34	97	50	16	87	58	21	78	43	13	83	48	03	67	37	07	74	29	95	70	44	10	56
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.5	.3	.2	.1	.0	.9	.8	.7	.6	.5	.4	.3	.2	.1	.0	.9	.8	.7	.6	.5	.4	.3	.1	.1	.0	.9	.7	.6	.5	.5	.3	.2
05	78	83	89	98	87	64	69	78	81	69	42	45	48	39	46	20	18	29	35	29	00	92	04	12	08	81	73	88	00	97	63
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74	17	98	75	50	27	79	59	41	19	81	27	05	89	67	33	77	51	36	16	84	29	97	82	45	25	81	50	39	24	97	35
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.1	.0	.8	.7	.5	.4	.2	.1	.9	.8	.6	.5	.3	.2	.0	.9	.7	.5	.4	.3	.1	.9	.8	.6	.5	.3	.2	.0	.9	.8	.6	.4
89	13	68	13	85	34	60	15	77	36	78	00	52	14	75	21	42	88	50	13	63	85	38	85	34	99	28	70	36	03	56	73
55	58	82	83	98	44	39	76	65	13	61	67	17	32	16	41	11	95	41	98	3	63	16	78	15	23	82	37	39	35	54	88
15	16	16	17	18	19	19	20	21	22	22	23	24	25	25	26	27	28	28	29	30	31	31	32	33	34	34	35	36	37	37	38
46	21	95	70	45	20	95	70	44	19	94	69	44	18	93	68	43	18	93	67	42	17	92	67	41	16	91	66	41	16	90	65
.2	.0	.9	.7	.5	.4	.2	.0	.8	.6	.5	.3	.1	.9	.7	.6	.4	.2	.0	.8	.7	.5	.3	.1	.9	.8	.6	.4	.2	.1	.9	.7
95	97	07	44	85	03	04	29	60	91	11	08	30	61	93	17	14	32	62	95	22	22	45	60	95	26	29	43	78	15	42	37
17	48	97	33	47	84	26	3	8	66	23	97	99	7	98	36	61	99	67	46	5	92	43	36	77	56	15	57	72	31	53	92
15	16	17	17	18	19	20	20	21	22	23	23	24	25	26	27	27	28	29	30	30	31	32	33	33	34	35	36	36	37	38	39
66	42	17	93	69	45	21	96	72	48	24	99	75	51	27	03	78	54	30	06	82	57	33	09	85	60	36	12	88	64	39	15
.2	.0	.8	.6	.4	.2	.0	.7	.5	.3	.1	.9	.7	.5	.3	.1	.8	.6	.4	.2	.0	.8	.6	.4	.2	.9	.7	.5	.3	.1	.9	.7
86	50	41	42	43	30	05	96	91	85	72	46	35	30	25	14	87	75	69	64	55	32	13	08	05	97	73	59	58	59	49	17
82	98	1	62	55	77	52	24	77	7	89	31	53	62	18	28	66	01	48	49	02	28	86	98	7	62	05	19	93	27	3	05
15	16	17	18	18	19	20	21	22	22	23	24	25	25	26	27	28	28	29	30	31	31	32	33	34	35	35	36	37	38	38	39
86	62	39	16	93	69	46	23	00	76	53	30	07	83	60	37	14	90	67	44	21	97	74	51	28	04	81	58	35	11	88	65
.1	.8	.6	.4	.1	.9	.6	.4	.1	.9	.6	.4	.1	.9	.6	.4	.1	.8	.6	.4	.1	.8	.6	.4	.1	.9	.6	.3	.1	.9	.6	.4

60	89	40	01	62	11	51	03	59	14	61	00	50	06	62	11	50	98	54	10	60	99	46	01	58	09	50	99	59	21	71	00
55	61	44	76	49	24	62	24	67	51	33	69	89	97	51	11	1	7	24	32	52	95	77	6	03	66	17	19	89	17	96	72
16	16	17	18	19	19	20	21	22	23	23	24	25	26	26	27	28	29	30	30	31	32	33	33	34	35	36	37	37	38	39	40
05	83	61	39	16	94	72	49	27	05	82	60	38	16	93	71	49	26	04	82	60	37	15	93	70	48	26	03	81	59	37	14
.9	.6	.3	.0	.7	.4	.1	.8	.5	.2	.9	.6	.3	.0	.8	.5	.2	.9	.6	.3	.0	.7	.4	.1	.8	.5	.2	.9	.6	.4	.1	.7
24	08	19	41	57	51	42	52	67	80	82	71	79	94	08	12	01	07	21	36	41	32	35	47	62	73	63	67	87	08	13	90
21	28	77	75	56	4	04	3	49	09	31	28	71	54	35	07	23	29	59	23	26	81	03	63	82	08	86	87	99	7	58	91
16	17	17	18	19	20	20	21	22	23	24	24	25	26	27	28	28	29	30	31	31	32	33	34	35	35	36	37	38	39	39	40
25	04	82	61	40	18	97	76	54	33	12	90	69	48	26	05	84	62	41	20	98	77	55	34	13	91	70	49	27	06	85	63
.5	.2	.8	.5	.2	.8	.4	.1	.8	.4	.1	.7	.4	.1	.7	.4	.0	.7	.3	.0	.7	.3	.9	.6	.3	.9	.6	.2	.9	.6	.2	.8
79	15	87	59	08	50	88	53	23	82	35	71	33	03	63	19	54	12	82	45	02	38	91	51	20	85	23	78	55	24	69	95
11	55	12	21	73	71	8	87	05	35	73	04	14	03	71	77	17	6	71	16	73	38	76	06	24	3	72	21	82	85	49	
16	17	18	18	19	20	21	22	22	23	24	25	26	26	27	28	29	29	30	31	32	33	33	34	35	36	37	37	38	39	40	41
45	24	04	83	63	43	22	02	81	61	41	20	00	79	59	39	18	98	77	57	37	16	96	75	55	35	14	94	73	53	33	12
.1	.7	.3	.9	.5	.1	.6	.3	.9	.5	.1	.7	.3	.9	.5	.1	.7	.3	.9	.5	.1	.7	.3	.9	.5	.1	.7	.3	.9	.5	.1	.7
20	09	30	29	24	08	94	09	18	24	19	01	14	24	30	30	09	19	31	37	39	18	14	19	28	43	29	34	57	57	45	17
57	38	08	09	18	99	55	63	35	17	93	58	5	98	6	03	68	16	64	07	24	31	06	88	6	68	73	63	24	43	96	67
16	17	18	19	19	20	21	22	23	23	24	25	26	27	27	28	29	30	31	31	32	33	34	35	35	36	37	38	39	40	40	41
64	45	25	06	86	67	47	28	08	89	69	50	31	11	92	72	53	33	14	94	75	55	36	16	97	78	58	39	19	00	80	61
.5	.0	.6	.1	.6	.2	.7	.3	.8	.3	.9	.4	.0	.5	.1	.6	.1	.7	.2	.8	.3	.8	.4	.9	.4	.0	.5	.1	.6	.2	.7	.2
43	84	28	63	99	26	59	10	55	99	34	62	15	60	04	42	67	19	65	09	50	72	08	52	97	48	81	33	80	15	45	63
91	06	26	94	32	25	28	17	11	39	9	89	03	12	57	87	76	61	1	64	13	6	11	39	33	22	91	74	56	1	72	59
16	17	18	19	20	20	21	22	23	24	24	25	26	27	28	29	29	30	31	32	33	33	34	35	36	37	38	38	39	40	41	42
83	65	46	28	09	91	72	54	35	17	98	80	61	43	24	05	87	68	50	31	13	94	76	57	39	20	02	83	65	46	28	09
.8	.3	.7	.2	.7	.2	.6	.1	.6	.1	.5	.0	.5	.0	.4	.9	.4	.9	.3	.8	.3	.8	.2	.7	.2	.7	.1	.6	.1	.6	.0	.5
44	19	91	62	33	02	76	54	30	06	80	52	30	06	82	58	28	07	83	59	35	01	75	51	27	04	80	61	33	03	73	37
46	88	05	35	81	49	96	13	28	42	64	79	62	77	92	27	16	07	26	41	38	26	48	63	78	94	25	62	18	6	53	44
17	17	18	19	20	21	21	22	23	24	25	26	26	27	28	29	30	31	31	32	33	34	35	35	36	37	38	39	40	40	41	42
03	85	67	50	32	15	97	79	62	44	27	09	91	74	56	39	21	03	86	68	51	33	15	98	80	63	45	27	10	92	75	57
.0	.4	.8	.2	.6	.0	.4	.8	.2	.6	.0	.4	.8	.2	.6	.0	.4	.8	.2	.6	.0	.5	.9	.3	.7	.1	.5	.9	.3	.7	.1	.5
17	20	24	28	33	37	42	46	50	54	58	62	66	70	74	78	82	86	90	94	99	03	07	11	15	19	23	27	32	36	40	43
56	64	56	98	55	93	01	09	16	24	31	39	46	54	61	69	77	84	92	99	07	14	22	29	37	44	53	91	48	9	82	9

Table S8. *Theoretical simulation data corresponding to Figure 15(b).*

42	44	46	48	50	52	54	56	58	60	63	65	67	69	71	73	75	77	79	81	83	85	87	89	91	93	95	97	10	10	10	10
47	53	58	64	69	75	81	86	92	97	03	08	14	19	25	30	36	41	47	53	58	64	69	75	80	86	91.	97.	00	20	41	61
.8	.3	.8	.4	.9	.5	.0	.6	.1	.6	.2	.7	.2	.8	.3	.9	.4	.9	.5	.0	.6	.1	.6	.2	.7	.3	85	39	2.9	8.4	4.0	9.5
22	59	98	39	80	20	60	00	40	79	19	59	99	39	78	18	58	98	37	77	17	57	97	36	76	16	61	67	37	78	17	54
	05	4	11	24	85	64	42	19	96	74	51	29	06	83	61	38	16	93	7	48	25	03	8	57	35	4	5	88	59	94	99
42	44	46	48	50	52	54	57	59	61	63	65	67	69	71	73	75	77	79	81	83	85	87	90	92	94	96	98	10	10	10	10
60	66	72	78	84	91	97	03	09	15	21	27	34	40	46	52	58	64	70	77	83	89	95	01	07	13	20.	26.	03	23	44	65
.3	.5	.6	.7	.9	.0	.1	.3	.4	.6	.7	.8	.0	.1	.3	.4	.6	.7	.9	.0	.2	.3	.5	.6	.8	.9	07	20	2.3	8.4	4.6	0.7
80	25	58	92	26	52	95	44	91	38	80	99	45	92	39	93	36	90	37	84	30	55	13	60	07	54	71	36	37	71	04	49
37	26	57	25	34	86	17	84	74	64	27	15	56	46	47	92	08	53	53	44	84	54	1	43	33	24	4	5	75	43	74	63
42	44	46	48	50	53	55	57	59	61	63	65	67	69	71	73	75	77	79	82	84	86	88	90	92	94	96	98	10	10	10	10
72	79	86	92	99	06	12	19	26	33	39	46	53	60	66	73	80	87	93	00	07	13	20	27	34	40	47.	54.	06	26	47	68
.5	.3	.0	.7	.5	.2	.9	.6	.4	.1	.8	.5	.2	.0	.7	.5	.2	.0	.7	.5	.2	.9	.6	.4	.1	.9	60	30	1.0	7.7	4.4	1.2
90	22	65	85	04	00	12	74	19	62	81	65	98	42	89	52	51	15	62	06	39	26	84	33	77	15	44	03	19	39	82	14
69	69	74	5	47	37	9	23	29	54	86	58	5	46	03	98	82	76	34	3	22	76	87	79	94	25	3	2	3	06	11	11
42	44	46	49	51	53	55	57	59	61	63	65	67	69	71	73	76	78	80	82	84	86	88	90	92	94	96	98	10	10	10	10
84	91	99	06	13	20	28	35	42	50	57	64	72	79	86	94	01	08	15	23	30	37	45	52	59	67	74.	81.	08	29	50	71
.4	.7	.1	.4	.6	.9	.2	.5	.9	.2	.5	.7	.0	.4	.7	.0	.3	.6	.9	.3	.6	.8	.2	.5	.8	.1	43	70	8.9	6.2	3.6	0.9
65	40	03	06	98	62	29	76	05	27	21	69	81	02	41	73	27	59	99	19	31	81	00	45	66	83	85	28	95	98	60	35
73	93	18	23	54	81	12	03	57	2	35	92	6	15	96	6	79	42	24	79	47	86	47	4	24	14	8	5	16	21	45	66
42	45	47	49	51	53	55	57	59	61	63	65	67	69	72	74	76	78	80	82	84	86	88	90	92	94	97	99	10	10	10	10
96	03	11	19	27	35	43	51	58	66	74	82	90	98	06	14	21	29	37	45	53	61	69	76	84	92	00.	08.	11	32	53	73
.0	.8	.7	.6	.5	.3	.1	.0	.9	.8	.6	.5	.3	.2	.1	.0	.8	.7	.6	.5	.4	.2	.0	.9	.8	.7	57	41	6.2	4.1	2.0	9.9
18	33	45	58	09	40	60	53	58	36	98	12	85	72	79	55	64	40	47	34	07	20	84	91	83	57	96	02	61	74	85	01
25	82	3	21	49	17	27	99	96	93	76	17	42	01	51	11	66	27	76	35	6	83	55	15	38	88		9	57	48	95	52
43	45	47	49	51	53	55	57	59	61	63	65	68	70	72	74	76	78	80	82	84	86	88	91	93	95	97	99	10	10	10	10
07	15	24	32	40	49	57	66	74	83	91	99	08	16	25	33	41	50	58	67	75	83	92	00	09	17	26.	34.	14	35	55	76
.2	.6	.0	.5	.9	.3	.7	.1	.5	.0	.4	.7	.2	.6	.0	.4	.8	.2	.7	.1	.5	.9	.3	.7	.2	.6	02	41	2.8	1.3	9.7	8.0
61	16	47	07	49	32	06	33	74	08	14	90	03	43	81	97	62	78	16	56	69	43	51	87	28	46	74	01	52	12	43	98
01	94	76	22	83	47	34	81	72	59	08	46	63	06	54	53	42	41	89	31	48	69	45	99	79	78	8	1	72	19		93

43	45	47	49	51	53	55	57	59	61	64	66	68	70	72	74	76	78	80	82	84	87	89	91	93	95	97	99	10	10	10	10
18	27	36	45	53	62	71	80	89	98	07	16	25	34	43	52	61	70	79	88	97	06	14	23	32	41	50.	59.	16	37	58	79
.2	.0	.0	.0	.9	.9	.8	.8	.7	.7	.6	.5	.5	.4	.4	.4	.3	.2	.2	.1	.1	.0	.9	.9	.9	.8	78	72	8.7	7.6	6.6	5.5
06	95	44	21	97	40	60	10	74	34	71	89	36	99	60	02	18	61	22	85	32	49	87	46	10	61	17	46	00	77	26	15
77	89	45	65	25	15	15	89	75	24	86	29	14	03	46	93	98	45	89	77	62	87	48	97	83	57	7	6	26	47	02	14
43	45	47	49	51	53	55	57	60	62	64	66	68	70	72	74	76	78	80	83	85	87	89	91	93	95	97	99	10	10	10	10
28	38	47	57	66	76	85	95	04	14	23	32	42	51	61	70	80	89	99	08	18	27	36	46	55	65	74.	84.	19	40	61	82
.8	.2	.7	.2	.7	.1	.6	.0	.5	.0	.4	.9	.3	.8	.3	.7	.2	.6	.1	.6	.0	.5	.9	.4	.9	.4	83	29	3.7	3.2	2.7	2.1
59	58	25	21	16	73	07	74	56	34	87	14	77	57	37	97	12	73	53	34	95	22	76	54	36	03	51	25	87	83	49	49
97	05	66	93	22	19	07	75	58	03	38	13	05	86	21	1	96	41	34	73	76	59	5	53	93	9	2	6	43	9	98	92
43	45	47	49	51	53	55	58	60	62	64	66	68	70	72	74	76	79	81	83	85	87	89	91	93	95	97	10	10	10	10	10
39	49	59	69	79	89	98	08	18	28	38	48	58	68	78	88	98	08	18	28	38	48	58	68	78	88	98.	00	21	42	63	84
.2	.0	.0	.0	.0	.0	.9	.9	.9	.9	.8	.7	.7	.7	.7	.6	.5	.5	.5	.4	.4	.3	.3	.3	.3	.2	19	8.1	8.1	8.1	8.1	8.0
08	93	75	82	55	29	54	26	14	02	50	59	32	17	08	67	61	23	16	97	67	78	28	19	06	71	78	48	6	62	08	20
18	26	38	14	1	86	08	17		92	75	21	91	52	18	27	79	37	78	81	43	08	15	95	12	61	8	37		75	34	45
43	45	47	49	51	54	56	58	60	62	64	66	68	70	72	75	77	79	81	83	85	87	89	91	93	96	98	10	10	10	10	10
49	59	70	80	91	01	11	22	32	43	53	64	74	85	95	05	16	26	37	47	58	68	79	89	99	10	20.	03	24	45	66	87
.2	.6	.0	.5	.0	.5	.8	.3	.8	.3	.7	.1	.6	.0	.5	.9	.3	.8	.3	.7	.2	.6	.0	.5	.9	.4	86	1.3	1.8	2.2	2.7	3.1
48	19	99	60	51	02	93	69	34	15	52	31	01	68	47	99	72	28	06	63	37	18	60	42	96	75	87	09	15	67	42	22
89	44	89	81	58	15	35	44	7	39	88	7	95	73	68	32	5	76	77	34	92	56	08	08	34	47	6	33	54	37	17	23
43	45	47	49	52	54	56	58	60	62	64	66	68	71	73	75	77	79	81	83	85	87	89	92	94	96	98	10	10	10	10	10
58	69	80	91	02	13	24	35	46	57	68	79	89	00	11	22	33	44	55	66	77	88	99	10	21	31	42.	05	26	47	68	89
.9	.8	.7	.7	.6	.5	.4	.3	.3	.2	.1	.0	.9	.9	.8	.7	.6	.5	.5	.4	.3	.2	.1	.0	.0	.9	84	3.7	4.7	5.6	6.6	7.4
80	36	61	01	79	87	45	85	35	69	90	39	70	22	57	89	41	77	01	54	89	39	65	90	39	83	30	71	07	57	09	50
01	03	14	5	49	45	11	1	1	19	61	79	53	86	46	58	42	32	64	31	21	85	8	69	03	36	5	44	97	35		02
43	45	47	50	52	54	56	58	60	62	64	66	69	71	73	75	77	79	81	83	85	88	90	92	94	96	98	10	10	10	10	10
68	79	91	02	13	25	36	47	59	70	82	93	04	16	27	39	50	61	73	84	95	07	18	29	41	52	64.	07	28	49	70	92
.3	.7	.0	.5	.9	.2	.6	.9	.3	.7	.1	.4	.8	.2	.6	.0	.3	.7	.1	.5	.9	.2	.6	.9	.4	.7	11	5.4	6.8	8.3	9.6	0.9
99	19	83	00	17	83	07	94	95	87	60	80	60	61	57	34	64	37	32	34	17	37	08	98	01	89	60	93	87	06	96	98
43	77	08	75	78	13	26	03	45	6	81	35	97	28	33	38	88	65	71	79	12	77	66	25	44	95	4	21	56	65	62	58
43	45	48	50	52	54	56	58	60	62	64	67	69	71	73	75	77	79	81	84	86	88	90	92	94	96	98	10	10	10	10	10
77	89	01	12	24	36	48	60	72	83	95	07	19	31	42	54	66	78	90	02	13	25	37	49	61	72	84.	09	30	52	73	94
.5	.2	.0	.9	.7	.5	.3	.1	.0	.8	.6	.4	.2	.0	.9	.7	.5	.3	.1	.0	.8	.6	.4	.2	.0	.8	68	6.4	8.3	0.1	2.0	3.7

05	61	79	27	73	86	72	93	27	56	63	48	64	97	29	41	26	38	69	02	19	04	10	40	74	94	30	94	40	88	06	62
07	43	99	62	61	59	7	32	24	73	5	07	73	66	11	23	04	14	74	81	62	26	5	13	2	96	1	37	41	09	71	69
43	45	48	50	52	54	56	58	60	62	65	67	69	71	73	75	77	79	82	84	86	88	90	92	94	96	99	10	10	10	10	10
86	98	10	22	35	47	59	71	84	96	08	20	33	45	57	69	82	94	06	18	31	43	55	67	80	92	04.	11	32	54	75	96
.2	.4	.7	.9	.2	.5	.7	.9	.2	.4	.7	.9	.1	.4	.6	.9	.1	.3	.6	.8	.1	.3	.5	.8	.0	.3	53	6.7	9.0	1.3	3.5	5.7
96	77	22	96	68	05	17	64	24	80	13	15	58	18	76	12	24	61	19	78	21	28	60	16	76	23	25	70	42	16	61	40
26	1	06	09	47	94	93	66	8	51	44	79	91	29	19	61	29	62	26	38	24	2	87	52	61	39	6	69	98	91	78	65
43	46	48	50	52	54	56	58	60	63	65	67	69	71	73	75	77	80	82	84	86	88	90	92	94	97	99	10	10	10	10	10
94	07	20	32	45	58	70	83	95	08	21	33	46	59	71	84	97	09	22	35	47	60	73	85	98	11	23.	13	34	56	77	98
.7	.3	.0	.7	.4	.0	.6	.3	.9	.6	.3	.8	.5	.2	.9	.5	.1	.8	.4	.1	.8	.4	.0	.7	.4	.0	67	6.3	9.0	1.7	4.3	6.9
76	74	15	09	04	43	58	15	93	68	06	95	53	34	03	58	59	17	88	67	24	15	69	36	16	79	7	36	07	02	68	42
9	74	84	35	47	1	66	93	32	96	67	25	97	56	27	36	83	43	66	44	4	79	62	55	03	64		21	61	42	58	25
44	46	48	50	52	54	56	58	61	63	65	67	69	71	73	75	78	80	82	84	86	88	90	93	95	97	99	10	10	10	10	11
02	15	28	42	55	68	81	94	07	20	33	46	59	72	85	98	11	24	37	50	63	76	89	02	16	29	42.	15	36	58	79	00
.9	.9	.9	.0	.1	.1	.1	.2	.3	.3	.4	.4	.4	.5	.6	.6	.6	.7	.7	.8	.9	.8	.9	.9	.0	.1	12	5.1	8.2	1.3	4.4	7.3
45	23	89	53	56	90	81	55	18	98	32	06	69	46	02	66	43	03	67	45	04	79	27	93	68	36	03	69	51	25	00	64
93	79	49	78	87	75	87	17	1	44	49	8	98	33	42	9	13	98	92	37	87	41	41	92	52	66	4	19	47	48	15	84
44	46	48	50	52	54	56	59	61	63	65	67	69	71	73	76	78	80	82	84	86	88	91	93	95	97	99	10	10	10	10	11
10	24	37	51	64	77	91	04	18	31	45	58	71	85	98	12	25	39	52	65	79	92	06	19	33	46	59.	17	38	60	81	02
.8	.1	.6	.0	.5	.9	.3	.7	.2	.6	.0	.4	.8	.3	.7	.2	.5	.0	.4	.9	.3	.7	.1	.5	.0	.4	85	3.2	6.7	0.2	3.6	7.0
01	47	05	58	18	46	11	61	16	60	88	48	98	33	94	27	78	07	68	11	58	16	30	92	37	88	87	72	56	04	48	04
69	7	26	27	1	81	22	6	5	96	38	41	77	36	78	19	19	22	03	22	78	47	94	28	21	8	9	84	64	02	5	22
44	46	48	50	52	54	57	59	61	63	65	67	69	71	74	76	78	80	82	84	86	89	91	93	95	97	99	10	10	10	10	11
18	32	45	59	73	87	01	14	28	42	56	70	83	97	11	25	38	52	66	80	94	07	21	35	49	63	76.	19	40	61	83	04
.3	.0	.8	.7	.5	.3	.0	.8	.6	.4	.2	.0	.8	.6	.4	.2	.9	.7	.5	.3	.1	.9	.7	.5	.3	.1	88	0.6	4.5	8.3	2.1	5.8
42	56	64	01	10	09	46	51	72	79	71	17	10	25	45	36	62	51	69	85	82	23	01	17	36	34	85	67	03	37	20	56
48	65	48	03	79	15	86	79	69	19	83	59	8	33	59	3	06	13	54	16	75	6	63	92	23	4	7	39	12	5	55	19
44	46	48	50	52	54	57	59	61	63	65	67	69	72	74	76	78	80	82	84	87	89	91	93	95	97	99	10	10	10	10	11
25	39	53	67	82	96	10	24	38	52	66	81	95	09	23	37	51	65	80	94	08	22	36	50	64	79	93.	20	42	63	84	06
.5	.6	.7	.9	.1	.2	.3	.5	.6	.8	.9	.0	.2	.3	.5	.6	.7	.9	.0	.2	.3	.4	.6	.7	.9	.0	20	7.3	1.5	5.6	9.8	3.9
66	45	90	65	38	75	84	31	92	48	81	91	34	94	52	91	91	30	88	48	90	97	30	86	47	94	59	43	16	90	36	16
62	2	48	14	15	7	81	98	6	74	1	71	16	01	36	28	81	47	57	16	83	44	49	58	15	17		51	42	99	17	56

44	46	48	50	52	55	57	59	61	63	65	67	70	72	74	76	78	80	82	85	87	89	91	93	95	97	10	10	10	10	10	11
32	46	61	75	90	04	19	33	48	62	77	91	06	20	35	49	64	78	93	07	21	36	50	65	79	94	00	22	43	65	86	08
.4	.8	.3	.8	.3	.8	.3	.7	.2	.7	.2	.6	.1	.6	.1	.6	.0	.5	.0	.5	.9	.4	.8	.3	.8	.3	8.8	3.2	7.7	2.2	6.7	1.1
72	87	66	73	79	51	00	81	75	64	31	74	51	44	35	07	50	21	13	06	82	23	90	80	74	54	03	75	81	89	67	82
94	87	16	83	84	37	82	22	08	46	41	91	32	18	54	47	09	89	24	09	5	89	93	39	34	83	8	77	7	28	48	34
44	46	48	50	52	55	57	59	61	63	65	68	70	72	74	76	78	80	83	85	87	89	91	93	95	98	10	10	10	10	10	11
39	53	68	83	98	13	27	42	57	72	87	01	16	31	46	60	75	90	05	20	34	49	64	79	94	08	02	23	45	66	88	09
.0	.7	.5	.4	.2	.0	.8	.6	.4	.2	.0	.7	.5	.3	.2	.9	.7	.5	.3	.1	.9	.7	.4	.3	.1	.9	3.6	8.4	3.2	8.1	2.9	7.6
64	83	91	29	45	43	05	03	23	40	22	71	68	86	04	96	37	33	49	68	68	03	86	03	24	18	81	79	98	35	42	61
41	74	86	46	51	53	95	93	94	35	45	63	49	55	88	87	24	94	14	89	71	09	1	58	16	16	84	94	72	31	36	03
44	46	48	50	53	55	57	59	61	63	65	68	70	72	74	76	78	81	83	85	87	89	91	93	96	98	10	10	10	10	10	11
45	60	75	90	05	20	35	51	66	81	96	11	26	41	56	71	86	01	17	32	47	62	77	92	07	22	03	25	46	68	89	11
.3	.3	.4	.6	.7	.8	.8	.0	.1	.2	.3	.3	.4	.6	.7	.8	.8	.9	.0	.2	.3	.3	.4	.5	.6	.8	7.8	2.9	8.0	3.2	8.3	3.3
40	57	85	14	35	41	87	09	24	56	40	72	92	05	37	35	61	74	86	17	27	52	38	72	82	03	51	55	79	11	36	52
87	44	04	91	13	91	71	43	75	72	96	57	53	55	73	58	12	52	98	8	08	26	5	33	21	77	07	16	6	88	92	18
44	46	48	50	53	55	57	59	61	63	66	68	70	72	74	76	78	81	83	85	87	89	91	94	96	98	10	10	10	10	10	11
51	66	82	97	12	28	43	58	74	89	05	20	35	51	66	82	97	12	28	43	59	74	89	05	20	35	05	26	48	69	91	12
.3	.6	.0	.4	.8	.2	.5	.9	.3	.8	.1	.4	.9	.3	.7	.1	.4	.8	.2	.6	.0	.3	.7	.1	.5	.9	1.3	6.6	2.1	7.5	2.9	8.2
01	14	26	21	67	44	68	81	91	00	85	98	02	17	22	20	31	23	41	45	52	68	56	62	68	84	08	84	28	30	40	52
05	86	04	4	13	94	52	17	27	06	05	46	23	29	35	8	5	2	88	1	89	87	79	41	56	04	68	48	42	19	77	63
44	46	48	51	53	55	57	59	61	63	66	68	70	72	74	76	79	81	83	85	87	89	92	94	96	98	10	10	10	10	10	11
56	72	88	03	19	35	50	66	82	97	13	29	44	60	76	91	07	23	38	54	70	85	01	17	32	48	06	27	49	71	92	14
.9	.5	.1	.8	.6	.2	.8	.5	.2	.8	.5	.1	.8	.5	.1	.8	.4	.1	.7	.4	.1	.7	.4	.0	.7	.4	4.0	9.6	5.4	1.1	6.7	2.3
43	48	93	95	04	51	52	26	17	89	52	48	14	05	82	50	46	03	92	74	43	50	14	81	73	49	51	97	04	06	56	59
69	18	56	06	4	05	41	88	97	56	83	04	73	49	2	33	19	09	64	56	62	39	52	46	69	84	83	33	92	48	75	22
44	46	48	51	53	55	57	59	61	64	66	68	70	72	74	77	79	81	83	85	87	89	92	94	96	98	10	10	10	10	10	11
62	78	94	09	25	41	57	73	89	05	21	37	53	69	85	01	16	32	48	64	80	96	12	28	44	60	07	29	50	72	93	15
.2	.1	.0	.9	.9	.8	.7	.6	.5	.5	.4	.3	.2	.1	.1	.0	.9	.8	.7	.6	.6	.4	.4	.3	.2	.1	6.0	1.9	7.9	3.8	9.8	5.6
67	20	42	95	46	58	37	61	99	33	42	19	39	76	12	24	02	18	53	90	08	94	01	35	74	98	77	89	40	92	14	68
53	92	46	19	25	66	35	76	73	18	41	41	77	71	15	93	97	26	66	58	45	31	91	71	02	77	67	76	47	85	37	81
44	46	48	51	53	55	57	59	61	64	66	68	70	72	74	77	79	81	83	85	87	90	92	94	96	98	10	10	10	10	10	11
67	83	99	15	31	48	64	80	96	12	28	44	61	77	93	09	25	41	58	74	90	06	22	38	55	71	08	30	51	73	95	16
.2	.3	.5	.7	.9	.0	.2	.3	.5	.7	.8	.9	.1	.3	.5	.6	.7	.9	.1	.2	.4	.5	.7	.9	.0	.2	7.3	3.5	9.7	5.9	2.0	8.1

71	71	33	24	13	69	01	65	42	15	65	94	54	30	05	60	88	44	18	95	54	84	34	07	84	48	80	36	26	17	78	77
88	93	41	52	96	6	57	32	62	41	59	71	43	74	53	74	81	01	81	11	84	15	32	11	42	17	54	92	26	27	66	86
44	46	49	51	53	55	57	59	62	64	66	68	70	72	75	77	79	81	83	85	87	90	92	94	96	98	10	10	10	10	10	11
71	88	04	21	37	53	70	86	03	19	35	52	68	84	01	17	34	50	66	83	99	16	32	48	65	81	09	31	53	74	96	17
.9	.2	.6	.1	.5	.8	.2	.6	.0	.4	.8	.1	.5	.9	.3	.7	.0	.4	.8	.2	.6	.0	.3	.8	.2	.6	7.9	4.3	0.7	7.1	3.5	9.8
71	95	96	27	41	92	34	32	44	48	23	61	53	64	72	51	89	75	84	94	77	22	97	01	13	11	53	34	59	86	69	74
82	61	8	62	01	4	73	47	11	46	48	11	69	32	07	33	51	38	5	6	56	49	5	86	49	23	97	06	62	85	38	14
44	46	49	51	53	55	57	59	62	64	66	68	70	72	75	77	79	81	83	85	88	90	92	94	96	98	10	10	10	10	10	11
76	92	09	26	42	59	75	92	09	25	42	58	75	92	08	25	41	58	75	91	08	24	41	58	74	91	10	32	54	75	97	19
.3	.9	.5	.1	.7	.3	.8	.4	.1	.7	.3	.8	.4	.0	.7	.2	.8	.4	.0	.6	.2	.8	.4	.0	.6	.2	7.8	4.4	1.0	7.6	4.2	0.7
64	04	44	84	61	17	62	83	15	20	08	45	57	92	00	96	30	32	68	81	81	19	07	11	44	65	10	01	58	90	53	62
73	83	09	83	86	6	38	29	82	44	37	29	84	35	89	36	72	9	04	57	31	19	12	74	27	18	86	93	25	34	61	83
44	46	49	51	53	55	57	59	62	64	66	68	70	72	75	77	79	81	83	85	88	90	92	94	96	99	10	10	10	10	10	11
80	97	14	30	47	64	81	97	14	31	48	65	81	98	15	32	49	65	82	99	16	32	49	66	83	00	11	33	55	76	98	20
.4	.1	.0	.8	.5	.3	.0	.9	.7	.5	.3	.0	.8	.6	.4	.2	.0	.8	.6	.4	.2	.9	.7	.5	.3	.2	6.9	3.7	0.6	7.3	4.1	0.8
37	93	40	25	99	44	91	22	35	39	15	51	76	93	97	84	14	29	52	55	50	78	54	59	72	02	51	53	04	93	48	57
41	84	26	47	59	72	96	52	13	55	57	77	24	84	68	08	62	39	61	92	07	96	98	41	01	57	2	01	82	37	98	12
44	47	49	51	53	55	57	60	62	64	66	68	70	73	75	77	79	81	83	86	88	90	92	94	96	99	10	10	10	10	10	11
84	01	18	35	52	68	85	02	19	36	53	70	87	04	21	38	55	72	89	06	23	40	57	74	91	08	12	34	55	77	99	21
.1	.1	.1	.0	.0	.9	.9	.9	.9	.8	.8	.7	.7	.7	.7	.7	.6	.6	.6	.6	.5	.5	.4	.4	.4	.4	5.3	2.3	9.3	6.3	3.2	0.1
76	46	27	84	41	73	23	23	06	88	45	80	84	67	49	14	41	44	28	11	81	01	58	39	23	23	74	77	66	20	63	70
67	49	74	9	26	75	45	59	91	36	07	55	21	95	91	48	21	05	94	12	89	8	51	96	28	42	99	76	39	37	26	2
44	47	49	51	53	55	57	60	62	64	66	68	70	73	75	77	79	81	83	86	88	90	92	94	96	99	10	10	10	10	11	11
87	04	21	38	56	73	90	07	24	41	58	76	93	10	27	44	61	78	95	13	30	47	64	81	98	15	13	35	56	78	00	21
.5	.7	.8	.9	.0	.2	.3	.4	.6	.7	.8	.0	.1	.3	.4	.5	.7	.8	.9	.1	.2	.3	.5	.6	.8	.9	3.0	0.2	7.3	4.4	1.6	8.7
69	07	33	59	85	04	39	82	22	62	96	25	70	10	49	87	09	57	97	37	76	87	22	62	01	44	82	36	63	87	09	15
33	15		23	89	71	87	62	52	42	87	47	11	01	91	57	79	49	5	4	78	71	16	06	96	72	23	87	82	56	89	25
44	47	49	51	53	55	57	60	62	64	66	68	70	73	75	77	79	81	84	86	88	90	92	94	97	99	10	10	10	10	11	11
90	07	25	42	59	77	94	11	28	46	63	80	98	15	32	49	67	84	01	19	36	53	70	88	05	22	14	35	57	79	00	22
.6	.8	.1	.4	.7	.0	.3	.6	.8	.1	.4	.7	.0	.3	.6	.9	.1	.4	.7	.0	.3	.6	.9	.2	.4	.7	0.0	7.3	4.6	1.9	9.2	6.5
02	86	73	61	50	38	25	12	99	87	74	61	48	35	23	10	97	84	71	59	46	33	20	07	95	82	69	57	46	34	21	05
19	58	35	52	12	18	41	61	81	01	22	42	62	83	03	23	43	64	84	04	25	45	65	85	06	26	48	55	15	32	08	48

S1.5 Data Description for Figures and Tables in Section 5.4.

In Figure 17(a), the X-axis represents the canopy load, the Y-axis represents the support height, and the Z-axis represents the balancing jack load. The corresponding theoretical simulation data are shown in Table S9. The 32×32 data matrix provided in Table S9 corresponds to the theoretical simulation results of the surface shown in Figure 17(a). The column headers of this matrix correspond to the X-axis value range of 4000–10000 KN in Figure 17(a), the row headers correspond to the Y-axis value range of 40-60°, and the matrix element values represent the Z-axis values of each point on the surface.

In Figure 17(b), the X-axis represents the canopy load, the Y-axis represents the support height, and the Z-axis represents the non-tilted side column load. The corresponding theoretical simulation data are shown in Table S10. The 32×32 data matrix provided in Table S10 corresponds to the theoretical simulation results of the surface shown in Figure 17(b). The column headers of this matrix correspond to the X-axis value range of 4000–10000 KN in Figure 17(b), the row headers correspond to the Y-axis value range of 40-60°, and the matrix element values represent the Z-axis values of each point on the surface.

In Figure 17(c), the X-axis represents the canopy load, the Y-axis represents the support height, and the Z-axis represents the tilted side column load. The corresponding theoretical simulation data are shown in Table S11. The 32×32 data matrix provided in Table S11 corresponds to the theoretical simulation results of the surface shown in Figure 17(c). The column headers of this matrix correspond to the X-axis value range of 4000–10000 KN in Figure 17(c), the row headers correspond to the Y-axis value range of 40-60°, and the matrix element values represent the Z-axis values of each point on the surface.

Table S9. *Theoretical simulation data corresponding to Figure 17(a).*

18	18	19	19	19	20	20	21	21	21	22	22	23	23	23	24	24	24	25	25	26	26	26	27	27	28	28	28	29	29	30	30
40	79	17	56	95	34	72	11	50	88	27	66	05	43	82	21	59	98	37	75	14	53	92	30	69	08	46	85	24	63	01	40
.4	.2	.9	.6	.3	.0	.7	.4	.1	.8	.5	.3	.0	.7	.4	.1	.8	.5	.2	.9	.6	.4	.1	.8	.5	.2	.9	.6	.3	.0	.7	.4
99	09	18	28	38	47	57	67	76	86	96	05	15	25	34	44	54	63	73	83	92	02	12	21	31	41	50	60	70	8	89	99
35	03	7	38	06	74	41	09	77	45	12	8	48	16	83	51	19	87	54	22	9	58	25	93	61	29	96	64	32		67	35
18	18	19	19	20	20	20	21	21	22	22	22	23	23	23	24	24	25	25	25	26	26	27	27	27	28	28	28	29	29	30	30
53	91	30	69	08	46	85	24	62	01	40	79	17	56	95	33	72	11	50	88	27	66	04	43	82	21	59	98	37	75	14	53
.2	.9	.6	.3	.1	.8	.5	.2	.9	.6	.3	.0	.7	.4	.2	.9	.6	.3	.0	.7	.4	.1	.8	.5	.3	.0	.7	.4	.1	.8	.5	.2
68	78	87	97	07	17	26	36	46	55	65	75	84	94	04	13	23	33	42	52	62	71	81	91	00	10	20	29	39	49	58	68
62	3	98	65	33	01	69	36	04	72	4	07	75	43	1	78	46	14	81	49	17	85	52	2	88	56	23	91	59	27	94	62
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21	21	22	22	23	23	23	24	24	24	25	25	26	26	26	27	27	28	28	28	29	29	29	30	30	31	31	31	32	32	33	33
46	85	24	63	01	40	79	17	56	95	34	72	11	50	88	27	66	05	43	82	21	59	98	37	75	14	53	92	30	69	08	46
.9	.6	.3	.0	.8	.5	.2	.9	.6	.3	.0	.7	.4	.1	.8	.6	.3	.0	.7	.4	.1	.8	.5	.2	.9	.7	.4	.1	.8	.5	.2	.9
61	71	81	90	00	10	19	29	39	48	58	68	77	87	97	07	16	26	36	45	55	65	74	84	94	03	13	23	32	42	52	61
85	53	21	89	56	24	92	6	27	95	63	3	98	66	34	01	69	37	05	72	4	08	76	43	11	79	47	14	82	5	18	85
21	21	22	22	23	23	23	24	24	25	25	25	26	26	27	27	27	28	28	28	29	29	30	30	30	31	31	32	32	32	33	33
59	98	37	75	14	53	91	30	69	08	46	85	24	62	01	40	79	17	56	95	33	72	11	50	88	27	66	04	43	82	21	59
.7	.4	.1	.8	.5	.2	.9	.6	.4	.1	.8	.5	.2	.9	.6	.3	.0	.7	.5		.9	.6	.3	.0	.7	.4	.1	.8	.6	.3	.0	.7

31	40	50	60	69	79	89	98	08	18	27	37	47	56	66	76	85	95	05	.2	24	34	44	53	63	73	82	92	02	11	21	31
12	8	48	16	83	51	19	87	54	22	9	58	25	93	61	29	96	64	32	15	67	35	03	7	38	06	74	41	09	77	45	12
21	22	22	22	23	23	24	24	24	25	25	25	26	26	27	27	27	28	28	29	29	29	30	30	31	31	31	32	32	32	33	33
72	11	49	88	27	66	04	43	82	20	59	98	37	75	14	53	91	30	69	07	46	85	24	62	01	40	78	17	56	95	33	72
.5	.2	.9	.6	.3	.0	.7	.4	.1	.8	.5	.3	.0	.7	.4	.1	.8	.5	.2	.9	.6	.4	.1	.8	.5	.2	.9	.6	.3	.0	.7	.5
00	10	19	29	39	48	58	68	77	87	97	06	16	26	35	45	55	64	74	84	93	03	13	22	32	42	52	61	71	81	90	00
4	07	75	43	1	78	46	14	81	49	17	85	52	2	88	56	23	91	59	27	94	62	3	98	65	33	01	69	36	04	72	4
21	22	22	23	23	23	24	24	24	25	25	26	26	26	27	27	28	28	28	29	29	29	30	30	31	31	31	32	32	33	33	33
85	23	62	01	40	78	17	56	94	33	72	11	49	88	27	65	04	43	82	20	59	98	36	75	14	53	91	30	69	07	46	85
.2	.9	.6	.3	.1	.8	.5	.2	.9	.6	.3	.0	.7	.4	.2	.9	.6	.3	.0	.7	.4	.1	.8	.5	.3	.0	.7	.4	.1	.8	.5	.2
69	79	89	98	08	18	27	37	47	56	66	76	85	95	05	14	24	34	43	53	63	72	82	92	01	11	21	30	40	50	59	69
67	34	02	7	38	05	73	41	09	76	44	12	8	47	15	83	5	18	86	54	21	89	57	25	92	6	28	96	63	31	99	67
21	22	22	23	23	23	24	24	25	25	25	26	26	27	27	27	28	28	28	29	29	30	30	30	31	31	32	32	32	33	33	33
98	36	75	14	52	91	30	69	07	46	85	23	62	01	39	78	17	56	94	33	72	10	49	88	27	65	04	43	81	20	59	98
.0	.7	.4	.1	.8	.5	.2	.0	.7	.4	.1	.8	.5	.2	.9	.6	.3	.1	.8	.5	.2	.9	.6	.3	.0	.7	.4	.2	.9	.6	.3	.0
38	48	58	67	77	87	97	06	16	26	35	45	55	64	74	84	93	03	13	22	32	42	51	61	71	80	90	00	09	19	29	38
94	61	29	97	65	32		68	36	03	71	39	07	74	42	1	78	45	13	81	49	16	84	52	2	87	55	23	9	58	26	94
22	22	22	23	23	24	24	24	25	25	25	26	26	27	27	27	28	28	29	29	29	30	30	31	31	31	32	32	32	33	33	34
10	49	88	26	65	04	43	81	20	59	97	36	75	14	52	91	30	68	07	46	85	23	62	01	39	78	17	55	94	33	72	10
.8	.5	.2	.9	.6	.3	.0	.7	.4	.1	.9	.6	.3	.0	.7	.4	.1	.8	.5	.2	.0	.7	.4	.1	.8	.5	.2	.9	.6	.3	.0	.8
08	17	27	37	46	56	66	75	85	95	04	14	24	34	43	53	63	72	82	92	01	11	21	30	40	50	59	69	79	88	98	08
21	89	56	24	92	6	27	95	63	3	98	66	34	01	69	37	05	72	4	08	76	43	11	79	47	14	82	5	18	85	53	21
22	22	23	23	23	24	24	24	25	25	26	26	26	27	27	28	28	28	29	29	29	30	30	31	31	31	32	32	33	33	33	34
23	62	00	39	78	17	55	94	33	71	10	49	88	26	65	04	42	81	20	59	97	36	75	13	52	91	30	68	07	46	84	23
.5	.2	.9	.7	.4	.1	.8	.5	.2	.9	.6	.3	.0	.8	.5	.2	.9	.6	.3	.0	.7	.4	.1	.9	.6	.3	.0	.7	.4	.1	.8	.5
77	87	96	06	16	25	35	45	54	64	74	83	93	03	12	22	32	42	51	61	71	80	90	00	09	19	29	38	48	58	67	77
48	16	83	51	19	87	54	22	9	58	25	93	61	29	96	64	32		67	35	03	7	38	06	74	41	09	77	45	12	8	48
22	22	23	23	23	24	24	25	25	25	26	26	27	27	27	28	28	28	29	29	30	30	30	31	31	32	32	32	33	33	33	34
36	75	13	52	91	29	68	07	46	84	23	62	00	39	78	16	55	94	33	71	10	49	87	26	65	04	42	81	20	58	97	36
.3	.0	.7	.4	.1	.8	.6	.3	.0	.7	.4	.1	.8	.5	.2	.9	.7	.4	.1	.8	.5	.2	.9	.6	.3	.0	.7	.5	.2	.9	.6	.3
46	56	66	75	85	95	04	14	24	33	43	53	62	72	82	91	01	11	20	30	40	49	59	69	79	88	98	08	17	27	37	46
75	43	1	78	46	14	81	49	17	85	52	2	88	56	23	91	59	27	94	62	3	98	65	33	01	69	36	04	72	4	07	75

Table S10. *Theoretical simulation data corresponding to Figure 17(b).*

25	26	27	28	30	31	32	33	35	36	37	39	40	41	42	44	45	46	47	49	50	51	52	54	55	56	57	59	60	61	62	64
23	48	73	98	24	49	74	99	24	50	75	00	25	50	76	01	26	51	76	02	27	52	77	02	27	53	78	03	28	53	79	04
.2	.4	.6	.8	.0	.2	.4	.6	.8	.0	.2	.4	.6	.8	.0	.2	.4	.6	.8	.0	.2	.4	.5	.7	.9	.1	.3	.5	.7	.9	.1	.3
77	73	70	66	62	58	55	51	47	44	40	36	33	29	25	22	18	14	11	07	03	00	96	92	89	85	81	78	74	70	67	63
1	68	06	32	54	81	15	49	84	18	52	86	21	55	89	23	57	92	26	6	94	28	63	97	31	65	99	26	49	75	13	71
25	26	27	29	30	31	32	34	35	36	37	39	40	41	42	44	45	46	47	49	50	51	52	54	55	56	57	59	60	61	62	64
29	55	80	06	31	57	82	08	33	59	84	10	35	61	86	12	37	63	88	14	39	65	90	16	42	67	93	18	44	69	95	20
.7	.2	.7	.2	.8	.3	.8	.3	.8	.3	.8	.3	.8	.3	.9	.4	.9	.4	.9	.4	.9	.4	.9	.4	.0	.5	.0	.5	.0	.5	.0	.5
57	67	78	89	00	12	22	32	42	52	62	74	84	94	04	13	24	33	43	53	63	75	84	94	04	13	26	37	48	59	70	81
02	13	25	34	39	11	44	13	06		39	77	75	68	61	88	23	5	43	36	34	21	21	11	04	98		72	77	85	97	08
25	26	27	29	30	31	32	34	35	36	37	39	40	41	42	44	45	46	48	49	50	51	53	54	55	56	58	59	60	61	63	64
36	62	87	13	39	65	91	17	42	68	94	20	46	72	97	23	49	75	01	26	52	78	04	30	56	81	07	33	59	85	11	36
.2	.0	.9	.7	.5	.3	.2	.0	.8	.6	.5	.3	.1	.0	.8	.6	.4	.3	.1	.9	.7	.6	.4	.2	.0	.9	.7	.5	.3	.2	.0	.8
67	92	17	43	70	98	26	48	73	97	24	53	79	03	27	50	78	01	25	50	75	04	28	51	76	01	30	59	85	12	36	62
32	77	25	77	35	95	1	99	29	76	31	97	34	75	92	58	92	58	76	16	53	85	02	99	38	37	55	15	73	25	73	18
25	26	27	29	30	31	32	34	35	36	38	39	40	41	43	44	45	46	48	49	50	51	53	54	55	56	58	59	60	62	63	64
42	68	95	21	47	73	99	25	51	78	04	30	56	82	08	34	61	87	13	39	65	91	17	44	70	96	22	48	74	00	27	53
.8	.9	.0	.2	.3	.5	.6	.8	.9	.0	.2	.3	.5	.6	.7	.9	.0	.2	.3	.5	.6	.7	.9	.0	.2	.3	.4	.6	.7	.9	.0	.2
06	51	88	30	73	19	64	03	43	83	26	73	14	55	94	34	80	20	59	00	41	88	29	67	08	49	95	41	84	26	63	08
88	5	52	71	83	4	79	15	03	6	56	5	94	6	57	27	72	41	39	05	49	27	1	63	26	24	59	16	28	47	49	11
25	26	28	29	30	31	33	34	35	36	38	39	40	41	43	44	45	46	48	49	50	52	53	54	55	57	58	59	60	62	63	64
49	75	02	28	55	81	08	34	61	87	13	40	66	93	19	46	72	99	25	52	78	05	31	57	84	10	37	63	90	16	43	69
.3	.8	.2	.7	.2	.6	.1	.5	.0	.5	.9	.4	.8	.3	.8	.2	.7	.1	.6	.1	.5	.0	.4	.9	.3	.8	.3	.7	.2	.7	.1	.6
74	38	94	49	10	73	37	94	50	09	69	33	92	50	06	65	29	88	44	02	61	25	85	41	98	57	21	83	44	00	55	19
58	62	28	82	74	46	1	31	54	13	13	35	36	19	21		56	36	37	21	21	45	28	37	72	61	11	82	74	28	95	98
25	26	28	29	30	31	33	34	35	36	38	39	40	42	43	44	45	47	48	49	50	52	53	54	55	57	58	59	61	62	63	64
55	82	09	36	63	89	16	43	70	96	23	50	77	04	30	57	84	11	37	64	91	18	45	71	98	25	52	78	05	32	59	86
.9	.7	.5	.3	.0	.8	.6	.4	.1	.9	.7	.5	.3	.0	.8	.6	.4	.2	.9	.7	.5	.3	.0	.8	.6	.4	.2	.9	.7	.5	.3	.0
69	52	29	04	79	61	43	20	96	72	52	33	12	88	64	42	25	03	79	56	34	16	95	71	47	25	07	88	64	38	15	98
31	77	69	1	99	11		21	25	9	03	7	15	32	57	78	45	66	91	08	54	39	32	74	79	83	12	24	13	55	47	92

25	26	28	29	30	31	33	34	35	37	38	39	40	42	43	44	45	47	48	49	51	52	53	54	56	57	58	59	61	62	63	65
62	89	16	43	70	98	25	52	79	06	33	60	87	14	41	69	96	23	50	77	04	31	58	85	12	40	67	94	21	48	75	02
.5	.6	.7	.8	.9	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	.0	.1	.2	.3	.4	.5	.6
89	93	91	87	83	82	83	81	78	75	74	75	74	71	68	67	68	67	64	61	60	61	60	57	54	52	53	52	48	44	42	46
97	46	77	58	53	34	14	26	23	59	85	88	34	4	58	42	57	41	6	66	11	16	42	78	75	87	66	46	41	22	53	03
25	26	28	29	30	32	33	34	35	37	38	39	40	42	43	44	46	47	48	49	51	52	53	54	56	57	58	60	61	62	63	65
69	96	24	51	78	06	33	61	88	16	43	70	98	25	53	80	08	35	62	90	17	45	72	99	27	54	82	09	37	64	91	19
.2	.6	.1	.5	.9	.3	.8	.2	.6	.0	.4	.9	.3	.7	.1	.5	.0	.4	.8	.2	.6	.1	.5	.9	.4	.8	.2	.6	.0	.5	.9	.3
66	94	17	38	58	72	17	45	57	69	83	14	58	69	80	93	16	43	69	94	90	23	52	79	05	14	30	59	85	12	32	38
96	33	77	71	94	48	81	19	08	35	79	39	47	4	45	2	23	62	35	96	92	55	27	22	8	82	79	44	98	37	63	35
25	27	28	29	30	32	33	34	35	37	38	39	41	42	43	44	46	47	48	50	51	52	53	55	56	57	58	60	61	62	64	65
76	03	31	59	86	14	42	70	98	25	53	81	09	36	64	92	20	47	75	03	30	58	86	14	42	69	97	25	53	80	08	36
.0	.7	.5	.2	.9	.7	.5	.3	.1	.8	.5	.2	.0	.8	.5	.2	.0	.8	.5	.2	.9	.7	.5	.3	.0	.7	.5	.2	.0	.8	.4	.2
36	90	51	96	79	80	16	46	04	12	31	63	80	66	70	81	26	00	75	70	82	71	46	27	43	05	15	88	74	11	31	61
03	85	01	21	92	35	89	3	56	94	11	57	22	21	97	16	93	43	03	18	94	06	13	9	96	16	52	92	53	54	93	04
25	27	28	29	30	32	33	34	36	37	38	39	41	42	43	45	46	47	48	50	51	52	54	55	56	57	59	60	61	62	64	65
82	10	39	67	95	23	51	79	07	35	63	91	19	47	76	04	32	60	88	16	44	72	00	28	56	84	12	41	69	97	25	53
.8	.9	.0	.0	.1	.2	.3	.3	.5	.6	.6	.6	.7	.9	.0	.0	.1	.2	.2	.2	.3	.5	.6	.7	.6	.7	.8	.0	.1	.0	.1	.2
46	28	17	12	03	39	03	79	71	19	40	98	53	61	35	41	09	32	82	30	95	00	24	05	17	70	92	11	20	14	40	86
21	53	61	95	65	58	13	26	3	4	08	36	69	47	92	03	55	16	76	56	99	77	22	45	63	94	72	87	79	94	49	48
25	27	28	29	31	32	33	34	36	37	38	40	41	42	43	45	46	47	49	50	51	52	54	55	56	57	59	60	61	63	64	65
89	18	46	74	03	31	60	88	16	45	73	02	30	58	87	15	44	72	00	29	57	86	14	42	71	99	28	56	84	13	41	70
.6	.0	.4	.7	.2	.6	.0	.4	.9	.3	.7	.1	.4	.9	.4	.7	.1	.6	.8	.3	.7	.2	.6	.9	.3	.8	.2	.7	.9	.3	.8	.2
44	54	08	72	41	83	74	60	01	92	30	14	92	15	41	79	70	05	69	01	84	06	59	15	15	11	42	02	74	31	37	81
18	01	63	46	42	56	95	25	88	85	73	85		84	04	55	8	66	35	44	63	06	15	83	26	12	45	23	95	46	55	4
25	27	28	29	31	32	33	34	36	37	38	40	41	42	43	45	46	47	49	50	51	52	54	55	56	58	59	60	62	63	64	65
96	25	53	82	11	40	68	97	26	54	83	12	41	69	98	27	56	84	13	42	71	99	28	57	85	14	43	72	00	29	58	87
.3	.0	.7	.5	.2	.0	.7	.4	.2	.9	.7	.4	.1	.8	.6	.4	.1	.7	.5	.2	.0	.7	.4	.1	.9	.7	.4	.1	.8	.5	.3	.1
76	91	69	32	97	45	64	90	19	85	23	33	54	80	34	03	17	77	06	77	42	80	59	59	33	03	44	53	15	96	70	12
63	33	7	14	31	65	88	41	64	19	11	06	3	06	32	41	41	57	7	41	24	33	22	63	81	89	78	63	4	37	84	53
26	27	28	29	31	32	33	35	36	37	38	40	41	42	44	45	46	47	49	50	51	53	54	55	57	58	59	60	62	63	64	66
02	32	61	90	19	48	77	06	35	64	93	22	51	80	09	38	67	96	25	55	84	13	42	71	00	29	58	87	16	45	74	03
.9	.0	.0	.1	.2	.2	.3	.3	.4	.4	.5	.5	.6	.6	.7	.7	.8	.8	.9	.0	.0	.1	.1	.2	.2	.3	.3	.4	.4	.5	.6	.6

90	20	77	41	04	59	04	58	16	73	29	72	25	82	39	92	31	84	45	05	62	07	50	10	71	29	79	18	82	48	05	46
27	94	11	03	51	21	82	95	62	11	64	39	21	35	11	43	82	73	16	98	46	25	12	28	62	42	76	08	93	21	75	62
26	27	28	29	31	32	33	35	36	37	39	40	41	42	44	45	46	48	49	50	51	53	54	55	57	58	59	61	62	63	64	66
09	38	68	97	26	56	85	15	44	73	03	32	61	91	20	49	79	08	38	67	96	26	55	84	14	43	73	02	31	61	90	19
.4	.8	.2	.5	.9	.3	.6	.0	.4	.7	.1	.5	.8	.2	.6	.9	.3	.7	.1	.4	.8	.1	.5	.9	.3	.6	.0	.4	.7	.1	.5	.8
77	50	13	84	55	17	99	64	31	96	56	13	84	60	36	84	56	44	08	73	34	82	84	47	12	72	23	29	95	62	22	64
4	16	61	8	56	05	53	73	45	98	43	23	78	67	16	9	97	24	73	61	15	28	59	76	12	93	29	2	88	98	35	47
26	27	28	30	31	32	33	35	36	37	39	40	41	43	44	45	46	48	49	50	52	53	54	55	57	58	59	61	62	63	65	66
15	45	75	05	34	64	94	23	53	83	12	42	72	01	31	61	90	20	50	79	09	39	68	98	28	58	87	17	47	76	06	36
.9	.6	.3	.0	.7	.3	.0	.8	.5	.1	.7	.4	.1	.8	.5	.1	.8	.6	.3	.9	.6	.2	.9	.7	.4	.0	.6	.3	.2	.8	.4	.0
64	26	96	69	27	76	28	19	00	47	89	50	58	72	05	65	41	07	47	85	18	55	77	69	06	34	69	51	00	45	66	82
74	84	06	38	27	93	76	33	29	41	73	96	07	45	9	48	68	42	29	15	32	06	32	75	62	88	76	33	58	18	68	8
26	27	28	30	31	32	34	35	36	37	39	40	41	43	44	45	47	48	49	50	52	53	54	56	57	58	60	61	62	63	65	66
22	52	82	12	42	72	02	32	62	92	22	52	82	12	42	72	02	32	62	92	22	52	82	12	42	72	02	32	62	92	22	52
.4	.3	.3	.4	.4	.3	.3	.3	.4	.4	.3	.3	.3	.3	.1	.2	.2	.2	.3	.4	.3	.2	.1	.3	.4	.2	.2	.1	.2	.4	.2	.1
01	49	97	91	39	74	23	40	78	29	47	13	60	25	81	88	58	10	99	11	02	30	57	35	03	85	03	28	69	12	88	75
95	75	98	41	85	17	25	43	4	1	85	38	22	24	99	32	27	94	61	11	46	12	39	29	24	03	46	98	61	06	63	83
26	27	28	30	31	32	34	35	36	38	39	40	41	43	44	45	47	48	49	51	52	53	54	56	57	58	60	61	62	64	65	66
28	58	89	19	50	80	10	40	71	01	31	61	92	22	52	83	13	43	74	04	34	64	95	25	56	86	16	46	76	07	37	67
.7	.9	.2	.6	.0	.2	.4	.7	.1	.5	.7	.9	.3	.4	.8	.1	.4	.7	.0	.5	.7	.9	.2	.4	.0	.2	.4	.7	.9	.5	.8	.9
17	61	61	62	00	19	70	47	28	20	24	94	24	56	08	99	62	10	37	31	44	62	00	93	17	62	64	06	85	10	07	65
98	72	34	37	23	93	23	45	72	54	2	03	76	03	71	08	79	04	03	61	23	82	25	85	13	53	5	62	68	69	62	91
26	27	28	30	31	32	34	35	36	38	39	40	42	43	44	45	47	48	49	51	52	53	55	56	57	58	60	61	62	64	65	66
34	65	95	26	57	87	18	48	79	10	40	71	01	32	63	93	24	54	85	16	46	77	07	38	69	99	30	60	91	22	52	83
.8	.3	.9	.5	.2	.8	.3	.9	.5	.2	.8	.3	.8	.4	.1	.7	.3	.8	.4	.1	.8	.3	.8	.4	.0	.7	.2	.8	.4	.0	.8	.2
41	81	75	95	77	25	76	62	62	37	12	86	78	74	36	73	30	97	81	24	01	11	68	45	67	98	92	52	38	50	04	75
76	44	31	91	35	37	91	57	01	98	18	3	2	58	55	41	87	94	62	48	5	02	98	62	55	05	98	9	27	73	29	36
26	27	29	30	31	32	34	35	36	38	39	40	42	43	44	46	47	48	49	51	52	53	55	56	57	59	60	61	63	64	65	66
40	71	02	33	64	95	25	56	87	18	49	80	11	42	73	03	34	65	96	27	58	89	20	50	81	12	43	74	05	36	67	97
.7	.5	.4	.3	.2	.1	.9	.8	.7	.6	.5	.3	.2	.1	.0	.8	.7	.6	.4	.3	.2	.1	.0	.8	.7	.6	.5	.4	.2	.1	.0	.9
02	35	15	16	17	01	53	33	23	11	03	29	06	05	03	86	38	10	97	86	71	32	00	85	73	54	29	00	96	93	69	26
23	2	32	85	17	68		57	94	05	11	81	03	12	11	94	15	98	97	04	91	6	64	39	4	24	01	02	26	7	73	54

26	27	29	30	31	33	34	35	36	38	39	40	42	43	44	46	47	48	50	51	52	54	55	56	57	59	60	61	63	64	65	67
46	77	08	39	70	01	33	64	95	26	57	88	20	51	82	13	44	75	06	38	69	00	31	62	93	24	56	87	18	49	80	11
.2	.3	.5	.6	.8	.9	.1	.2	.4	.5	.7	.8	.0	.1	.3	.4	.6	.7	.9	.0	.2	.3	.4	.6	.7	.9	.0	.2	.3	.5	.7	.8
53	57	07	79	50	88	34	82	40	94	32	71	16	73	28	70	06	51	06	62	06	27	71	31	95	49	63	31	95	62	06	05
73	33	79	65	31	31	17	19	01	57	79	76	47	16	76	2	66	22	41	69	98	51	47	77	34	11	85	05	96	08	8	29
26	27	29	30	31	33	34	35	37	38	39	40	42	43	44	46	47	48	50	51	52	54	55	56	58	59	60	61	63	64	65	67
51	83	14	45	77	08	40	71	03	34	65	97	28	60	91	22	54	85	17	48	79	11	42	74	05	36	68	99	31	62	94	25
.6	.0	.4	.8	.2	.7	.0	.6	.0	.3	.7	.1	.6	.0	.4	.8	.1	.6	.1	.4	.8	.2	.6	.0	.5	.8	.2	.7	.2	.6	.0	.3
56	1	40	92	58	04	79	02	06	95	61	09	45	61	46	13	53	78	17	98	65	12	39	97	40	00	57	09	56	40	00	11
22		81	41	65	3	26	39	96	17	77	59	34	41	05	54	38	01	51	21	36	01		59	21	05	75	07	25	28	81	5
26	27	29	30	31	33	34	35	37	38	39	41	42	43	45	46	47	48	50	51	52	54	55	56	58	59	60	62	63	64	66	67
56	88	20	51	83	15	46	78	10	41	73	05	36	68	00	31	63	95	26	58	90	21	53	85	16	48	80	11	43	75	06	38
.8	.4	.1	.8	.4	.2	.7	.5	.3	.9	.5	.1	.7	.6	.2	.8	.4	.0	.9	.6	.1	.7	.4	.1	.6	.3	.0	.6	.5	.3	.8	.3
84	83	94	14	35	02	96	22	34	51	28	04	87	50	82	51	18	56	56	18	76	47	56	97	50	64	58	47	47	27	68	81
17		02	35		13	89	41	13	7	95	63	44	75	77	97	4	2	24	04	81	46	84	91	12	95	96	85	59	32	73	39
26	27	29	30	31	33	34	35	37	38	39	41	42	43	45	46	47	49	50	51	52	54	55	56	58	59	60	62	63	64	66	67
61	93	25	57	89	21	53	85	17	49	80	12	44	76	08	40	72	04	36	68	99	31	63	95	27	59	91	23	55	87	19	50
.8	.6	.5	.3	.4	.3	.2	.0	.1	.1	.9	.7	.5	.5	.6	.4	.2	.0	.0	.1	.9	.7	.7	.5	.3	.3	.2	.1	.0	.2	.0	.8
54	98	95	75	15	77	01	92	37	18	09	14	78	98	52	38	31	73	55	78	72	66	52	23	06	85	79	08	29	33	91	06
17	04	66	56	51	51	09	35	34	21	2	04	65	09	27	97	98	14	67	81	34	98	01	2	82	65	77	21	67	7	75	38
26	27	29	30	31	33	34	35	37	38	39	41	42	43	45	46	47	49	50	51	53	54	55	57	58	59	61	62	63	64	66	67
66	98	30	62	94	27	59	91	23	55	87	19	51	84	16	48	80	12	44	76	09	41	73	05	37	69	01	33	65	98	30	62
.4	.5	.5	.7	.9	.1	.1	.2	.4	.7	.7	.8	.9	.0	.3	.4	.4	.5	.6	.8	.0	.1	.2	.1	.4	.6	.7	.8	.9	.1	.4	.3
82	55	46	35	76	26	78	96	46	05	77	11	13	49	06	28	48	34	56	91	85	03	32	83	09	38	32	06	31	24	38	77
77	42	67	52	45	15	56	17	97	6	36	36	65	75	46	53	13	49	21	48	08	73	29	11	39	22	44	02	26	42	79	88
26	28	29	30	32	33	34	35	37	38	39	41	42	43	45	46	47	49	50	51	53	54	55	57	58	59	61	62	63	65	66	67
70	02	35	67	00	32	64	96	29	61	94	26	58	90	23	55	87	20	52	84	17	49	81	14	46	78	11	43	75	08	40	72
.6	.9	.2	.6	.0	.3	.6	.9	.3	.6	.0	.2	.5	.9	.2	.6	.9	.2	.5	.9	.3	.5	.8	.2	.5	.9	.2	.5	.9	.2	.6	.8
86	00	39	25	09	43	24	58	09	54	08	71	98	46	93	64	20	40	84	31	01	90	36	04	78	35	29	42	03	66	03	87
55	87	74	56	27	76	44	35	42	77	28	46	65	81	05	98	84	08	69	2	71	82	15	48	52	42	26	93	66	5	77	34
26	28	29	30	32	33	34	36	37	38	39	41	42	43	45	46	47	49	50	51	53	54	55	57	58	59	61	62	63	65	66	67
74	06	39	71	04	36	69	01	34	66	99	31	64	96	29	62	94	26	59	92	24	57	89	22	54	87	19	52	84	17	49	82
.3	.8	.3	.8	.4	.9	.4	.9	.4	.9	.4	.9	.4	.9	.5	.0	.4	.9	.5	.0	.5	.0	.5	.0	.5	.1	.5	.0	.6	.1	.7	.1

86	20	32	82	29	34	09	24	56	82	80	51	61	92	21	25	95	99	28	59	68	40	38	64	96	11	86	92	39	89	01	34
31	73	81	34	76	45	23	17	26	63	42	58	44	26	17	31	15	29	21	02	88	29	08	45	54	47	76	39	69	09	05	4
26	28	29	30	32	33	34	36	37	38	40	41	42	44	45	46	48	49	50	51	53	54	55	57	58	59	61	62	63	65	66	67
77	10	42	75	08	40	73	06	38	71	04	36	69	02	34	67	00	32	65	98	30	63	96	28	61	94	26	59	92	25	57	90
.6	.2	.9	.6	.3	.9	.5	.2	.9	.6	.3	.9	.5	.2	.9	.6	.2	.9	.6	.3	.9	.5	.2	.9	.6	.3	.9	.5	.2	.0	.6	.2
54	42	27	50	52	74	86	67	66	56	08	14	89	86	80	38	44	11	07	04	66	81	34	23	22	04	15	75	91	10	72	36
11		75	93	1	88	21	59	53	27	91	31	17	84	86	87	96	33	09	09	78	4	04	78	72	1	95	01	55	21	35	2
26	28	29	30	32	33	34	36	37	38	40	41	42	44	45	46	48	49	50	52	53	54	56	57	58	60	61	62	63	65	66	67
80	13	46	78	11	44	77	10	42	75	08	41	74	06	39	72	05	38	70	03	36	69	02	34	67	00	33	66	99	31	64	97
.5	.2	.1	.9	.7	.5	.2	.0	.9	.7	.5	.2	.0	.9	.7	.5	.2	.0	.9	.7	.5	.3	.1	.9	.7	.6	.3	.1	.0	.8	.6	.3
33	65	23	82	60	12	50	84	33	47	39	67	91	42	60	62	87	97	50	74	82	11	03	17	66	00	39	35	14	62	24	17
8	78	1	29	95	69	59	71	52	07	5	45	01	33	82	79	51	96	08	87	24	41	85	39	2	32	35	76	64	9	17	12
26	28	29	30	32	33	34	36	37	38	40	41	42	44	45	46	48	49	50	52	53	54	56	57	58	60	61	62	64	65	66	68
83	15	48	81	14	47	80	13	46	79	12	45	77	10	43	76	09	42	75	08	41	74	07	40	73	05	38	71	04	37	70	03
.0	.8	.8	.7	.6	.5	.4	.3	.3	.2	.1	.0	.9	.9	.8	.7	.6	.5	.5	.4	.3	.2	.1	.0	.0	.9	.8	.7	.7	.7	.5	.3
08	84	74	87	85	47	11	81	28	65	66	16	78	32	68	82	25	75	35	71	95	36	37	73	20	90	56	90	87	03	78	93
68	76	59	06	5	29	76	55	64	39	23	74	84	23	24	21	57	39	9	25		27	11	86	96	75	96	41	06	74	78	82
26	28	29	30	32	33	34	36	37	38	40	41	42	44	45	46	48	49	50	52	53	54	56	57	58	60	61	62	64	65	66	68
85	18	51	84	17	50	83	16	49	82	15	48	81	14	47	80	13	46	79	12	45	78	11	44	77	10	43	76	09	42	75	08
.0	.0	.1	.1	.1	.0	.0	.1	.1	.1	.1	.1	.2	.2	.2	.2	.2	.3	.3	.3	.4	.3	.3	.3	.4	.4	.4	.5	.5	.5	.5	.4
62	78	09	09	09	78	69	24	58	89	89	62	21	55	87	97	59	17	52	84	02	55	55	87	20	75	68	26	67	63	46	82
09	56	47	94	39	68	71	5	04	21	1	16	41	47	29	12	11	33	85	94	61	99	88	05	59	38	78	9	15	59	02	99
26	28	29	30	32	33	34	36	37	38	40	41	42	44	45	46	48	49	50	52	53	54	56	57	58	60	61	62	64	65	66	68
86	19	52	85	19	52	85	18	51	84	17	50	83	16	50	83	16	49	82	15	48	81	14	47	80	14	47	80	13	46	79	12
.6	.7	.8	.9	.0	.1	.2	.3	.4	.5	.6	.6	.8	.9	.0	.1	.1	.2	.4	.5	.6	.6	.7	.8	.9	.0	.1	.2	.3	.4	.5	.6
77	76	61	46	31	06	02	08	10	12	08	95	04	06	08	07	87	99	01	03	05	70	65	67	69	75	74	95	81	62	42	01
36	83	18	01	38	84	95	67	78	89	11	93	03	14	25	53	29	25	5	61	07	56	77	88	99	71	8	54	28	96	87	31
26	28	29	30	32	33	34	36	37	38	40	41	42	44	45	46	48	49	50	52	53	54	56	57	58	60	61	62	64	65	66	68
87	20	54	87	20	53	86	19	53	86	19	52	85	18	52	85	18	51	84	17	51	84	17	50	83	16	49	83	16	49	82	15
.8	.9	.1	.3	.4	.6	.7	.9	.1	.2	.4	.5	.7	.9	.0	.2	.3	.5	.6	.8	.0	.1	.3	.4	.6	.8	.9	.1	.2	.4	.6	.7
37	93	51	11	72	32	91	50	09	68	27	86	45	04	63	22	81	40	99	57	16	75	34	93	52	11	70	30	91	51	10	65
79	2	6	78	5	55	53	49	44	4	36	31	27	23	18	14	09	05	01	96	92	88	83	79	74	7	69	73	45	63	04	44

Table S11. *Theoretical simulation data corresponding to Figure 17(c).*

10	11	11	12	12	13	14	14	15	15	16	16	17	17	18	18	19	20	20	21	21	22	22	23	23	24	25	25	26	26	27	27
72	27	82	37	92	47	02	57	12	67	22	77	32	87	42	98	53	08	63	18	73	28	83	38	93	48	03	58	13	68	23	78
.8	.8	.8	.8	.8	.8	.8	.9	.9	.9	.9	.9	.9	.9	.9	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.1	.1	.2
14	23	35	49	64	78	90	03	16	28	41	54	66	79	92	04	17	30	42	55	68	81	93	06	19	31	44	58	73	87	99	07
75	28	31	42	17	12	83	51	19	87	55	23	91	59	27	95	63	31	99	67	35	03	71	39	07	75	46	41	15	26	3	83
10	10	11	11	12	12	13	14	14	15	15	16	16	17	17	18	18	19	19	20	20	21	21	22	23	23	24	24	25	25	26	26
30	83	36	89	42	95	48	01	54	07	60	13	66	19	72	25	78	31	84	37	90	43	96	49	02	55	08	61	14	67	20	73
.9	.9	.8	.8	.8	.7	.7	.7	.7	.7	.7	.6	.6	.6	.6	.5	.5	.5	.5	.5	.5	.4	.4	.4	.4	.4	.3	.3	.3	.2	.2	.2
46	29	94	60	26	81	60	50	36	22	00	43	29	15	01	98	77	74	61	47	32	84	86	73	59	45	94	49	15	81	46	29
37	28	51	31	74	6	57	76	74	72	64	86	07	05	19	68	41	9	04	01	23	32	56	19	16	14	49	35	78	58	81	71
98	10	10	11	11	12	12	13	13	14	14	15	15	16	17	17	18	18	19	19	20	20	21	21	22	22	23	23	24	24	25	25
8.	39	90	41	92	43	93	44	95	46	97	48	99	50	01	52	03	54	05	56	07	57	08	59	10	61	12	63	14	65	16	67
54	.4	.4	.3	.2	.0	.9	.9	.9	.8	.7	.6	.5	.4	.4	.4	.2	.2	.2	.1	.0	.9	.8	.8	.7	.7	.5	.4	.3	.2	.2	.1
68	72	15	21	27	98	94	64	10	53	59	11	38	82	30	04	79	54	01	45	72	30	96	47	91	25	85	56	62	69	11	37
5	5	02	98	75	3	24	65	24	05	34	32	36	26	16	55	6		9	8	84	65	14	61	81	56	86	41	18	14	66	31
94	99	10	10	11	11	12	12	13	13	14	14	15	15	16	16	17	17	18	18	19	19	20	20	21	21	22	22	23	23	24	24
5.	4.	43	92	41	89	38	87	36	85	34	82	31	80	29	78	27	76	24	73	22	71	20	69	18	66	15	64	13	62	11	59
63	43	.3	.2	.0	.8	.6	.5	.4	.2	.1	.8	.7	.6	.5	.3	.1	.0	.9	.8	.6	.4	.3	.2	.0	.9	.7	.5	.3	.1	.1	.9
56	70	71	15	42	27	15	25	10	82	12	73	30	01	01	88	58	45	45	16	73	36	04	12	83	48	19	04	31	75	09	11
6	5	27	15	64	35	17	99	31	54	85	59	64	24	22	73	06	56	55	14	2	72	36	15	19	2	43	14	63	51	74	13
90	94	99	10	10	11	11	12	12	13	13	14	14	15	15	16	16	16	17	17	18	18	19	19	20	20	21	21	22	22	23	23
2.	8.	5.	42	89	35	82	29	76	23	69	16	63	09	56	03	50	96	43	90	37	84	30	77	24	71	17	64	11	58	04	51
23	90	72	.5	.2	.9	.6	.4	.2	.0	.7	.4	.1	.9	.7	.5	.2	.9	.7	.5	.3	.0	.7	.5	.3	.1	.7	.4	.2	.0	.8	.5
22	50	42	45	72	68	48	40	49	17	61	30	91	72	85	50	13	78	91	72	33	02	48	60	50	13	95	91	18	39	58	31
7	6	2	57	87	74	44	51	74	77	16	67	5	67	76	18	79	21	3	47	3	53	81	54	32	05	23	1	4	75	91	7
85	90	94	99	10	10	11	11	12	12	13	13	13	14	14	15	15	16	16	17	17	17	18	18	19	19	20	20	21	21	21	22
8.	2.	7.	2.	36	81	26	70	15	60	04	49	93	38	83	27	72	17	61	06	51	95	40	84	29	74	18	63	08	52	97	41
35	90	55	26	.9	.5	.0	.7	.4	.0	.7	.2	.9	.5	.2	.8	.4	.0	.7	.4	.0	.6	.2	.9	.5	.2	.8	.3	.0	.7	.4	.9
61	03	88	10	37	22	94	47	21	84	04	79	11	82	53	88	46	82	52	24	56	28	51	18	92	31	13	98	74	76	35	79
6	6	4	4	53	47	05	43	32	47	29	71	26	88	07	92	8	65	83	45		1	4	61	33	24	24	19	67	88	35	56

814.0268	856.43146	898.926822	941.4659	984.002533	1026.48926	1068.941058	1111.439754	1153.958747	1196.470518	1238.949188	1281.397004	1323.898	1366.407004	1408.922205	1451.408813	1493.853888	1536.397	1578.854	1621.372198	1663.855597	1706.412155	1748.917922	1791.333126	1833.768398	1876.318	1918.761772	1961.259748	2003.796911	2046.352	2088.305656	2131.220322
769.209779	809.435655	849.764744	890.137578	930.508585	970.838359	1011.088821	1051.412116	1091.776773	1132.134662	1172.455564	1212.717676	1253.012492	1293.376773	1333.774039	1374.141228	1414.542407	1454.947471	1495.313187	1535.875746	1575.915463	1615.964698	1656.496888	1696.934257	1736.977702	1777.557983	1817.982069	1857.798362	1898.241411	1938.606884	1978.903803	2019.195943
723.8398711	761.858118	799.999213	838.187779	876.417978	914.494755	952.585653	990.613993	1028.771946	1066.991891	1105.139104	1143.219204	1181.219204	1219.357704	1257.606477	1295.791679	1333.871016	1371.090416	1410.481048	1448.248674	1486.245424	1524.623907	1562.000538	1600.387715	1638.771201	1677.153711	1715.539463	1753.911796	1791.294329	1829.675	1867.055	1905.705
677.9816216	713.776166	749.716566	785.754747	821.705475	857.543199	893.391911	929.348348	965.124912	1001.120242	1037.091677	1072.929967	1108.806311	1144.806311	1180.616349	1216.652133	1252.488833	1288.324024	1324.009509	1360.963295	1396.325373	1432.040444	1468.044127	1503.975396	1539.707963	1575.711	1611.747	1647.832	1683.897	1719.955	1755.911	1791.925
631.7033138	665.2810886	699.0299868	732.7880884	766.4587456	800.0665	833.6712666	867.4001616	901.0678989	934.6472727	968.4133636	1002.035784	1035.757042	1069.449037	1102.971373	1136.705248	1170.452748	1204.037205	1237.771259	1271.559519	1305.038811	1338.723233	1372.406279	1406.039754	1439.773207	1473.407	1507.040	1540.674	1574.308	1608.341	1641.975	1675.429
585.0732132	616.4346414	647.9051799	679.3399926	710.7702626	742.1501818	773.5108997	804.9514777	836.4077725	867.8024525	899.2073737	930.5740284	962.0116616	993.4724731	1024.856310	1056.287486	1087.719098	1119.150504	1150.581981	1181.913139	1213.344613	1244.776076	1276.107507	1307.539	1338.970	1370.401	1401.833	1433.264	1464.696	1496.127	1527.559	1558.990
538.1556	567.2439	596.3956	625.5674	654.7487	683.8787	712.9999	742.1414	771.3030	800.4646	829.5959	858.7070	887.8585	917.0101	946.1	975.3131	1004.433	1033.554	1062.675	1091.796	1121.050	1150.079	1179.208	1208.337	1237.466	1266.595	1295.725	1324.854	1353.983	1383.112	1412.241	1441.370

961	997	394	851	136	943	176	136	497	391	078	476	053	344	1748	349	323	7152	2817	8638	2745	3882	8318	3742	9633	4123	4997	0764	7874	5157	938	6999
490.97369	517.74361	544.61426	571.51552	598.41505	625.27776	652.0787	678.94959	705.83721	732.72016	759.57912	786.39897	813.25687	840.13189	867.00536	893.88263	920.69624	947.52633	974.41328	1001.30179	1028.17316	1055.0103	1081.81502	1108.70086	1135.59137	1162.46786	1189.30526	1216.13103	1243.01757	1269.92383	1296.79949	1323.60518
443.35701	467.863	492.29438	516.91909	541.56544	566.14369	590.6872	615.11419	639.70692	664.33974	688.92596	713.42018	737.95411	762.50926	787.14967	811.7383	836.23161	860.69028	885.20038	909.84923	934.47368	959.00259	983.51068	1007.94875	1032.59979	1057.23965	1081.77919	1106.34589	1130.71875	1155.38136	1180.03326	1204.56348
395.3707	417.56598	439.75699	461.8892	484.25757	506.54759	528.75969	551.00026	573.07459	595.40853	617.71835	639.88642	662.07568	684.38606	706.80444	728.9207	751.08589	773.39028	795.40229	817.65576	840.03539	862.25139	884.56988	906.59898	928.77753	951.18116	973.42146	995.74333	1017.84119	1039.92527	1062.34452	1084.59771
347.10177	366.95702	386.8969	406.70297	426.59793	446.59822	466.47076	486.42884	506.26237	526.06814	546.08681	565.92873	585.81949	605.93912	625.81765	645.60852	665.4456	685.4117	705.32167	724.9965	745.03187	764.93495	784.89318	804.84588	824.48704	844.48679	864.42783	884.37959	904.38175	924.02415	943.94923	963.92539
298.63723	316.15245	333.72959	351.31299	368.7827	386.40433	403.93732	421.52073	439.10901	456.58108	474.16186	491.67762	509.36265	526.94592	544.4547	561.95402	579.46298	597.04775	614.65237	632.17873	649.63712	667.22728	684.80819	702.41872	719.97512	737.36708	754.99408	772.57361	790.20016	807.7908	825.13276	842.76404
250.06409	265.23739	280.44403	295.66455	310.88429	326.07468	341.26732	356.47602	371.69107	386.90401	402.07769	417.30335	432.51096	447.71399	462.91631	478.10945	493.2903	508.49692	523.71272	538.92923	554.12503	569.3024	584.50726	599.72308	614.94102	630.14917	645.31597	660.5234	675.74815	690.97367	706.18532	721.33117

201.4385 2	214.2594 9	227.1095 3	239.9734 5	252.8365 9	265.6926 5	278.509	291.3649	304.2271 6	317.0873	329.9368 5	342.7535 2	355.6080 3	368.4703 1	381.3318 9	394.1842 8	407.0028 1	419.8512 1	432.7132 8	445.5760 6	458.4310 6	471.2674	484.1100 4	496.9632 8	509.8186 4	522.6676 4	535.5213 8	548.3423 4	561.2123 8	574.0832 1	586.9401 5	599.7672 6
152.5667 8	163.0168 7	173.4938 3	183.9855 7	194.5522 8	204.9973 4	215.4802 9	225.8305 8	236.3558 3	246.8961 7	257.4161 6	267.9142 4	278.2475 9	288.7561 1	299.3034 3	309.8358 3	320.3316 4	330.6783 6	341.1543 5	351.7084 2	362.2519	372.7312 3	383.1786 4	393.6344 1	404.1139 2	414.7806 3	425.1641 5	435.6024 1	445.9516 5	456.5246	467.0860 3	477.5879
103.4789 8	111.5547 4	119.6447	127.8486 1	136.0389 8	144.0319 7	152.1525 5	160.2167 6	168.1668 8	176.3770 3	184.5714	192.6959 6	200.8099 9	208.6939 1	216.6886 8	225.1094 6	233.2370 4	241.3971 5	249.2354 1	257.3899 3	265.6410 2	273.7629 6	281.7985 5	289.8602 7	298.2424 4	306.3195	314.3208	322.2528	330.3829 6	338.3953	346.6891	354.8642
54.2754	59.97682	65.74525	71.6360 4	77.2776	82.9218 7	88.6614	94.4396 1	100.0026 44	105.6898 7	111.5529 5	117.3015 4	123.1002 3	128.7250 5	134.2937 7	140.1804 6	145.9398 1	151.7507 2	157.4255 9	162.9075 1	168.7985 7	174.5631 2	180.1930 2	186.1084 3	192.0093 7	197.5621 6	203.2169 3	209.0217	214.8056 5	220.1867 2	226.0027 1	231.8594 6
5.05 63	8.39 433	11.8 876	15.2 1581	18.4 9105	21.7 9236	25.1 5086	28.5 2931	31.8 8984	35.0 92	38.5 1123	41.8 8384	45.2 7042	48.6 4849	51.8 5995	55.2 2431	58.6 1542	62.0 0812	65.4 0211	68.6 469	71.9 2509	75.3 3224	78.6 832	82.2 5528	85.5 251	88.7 6989	92.0 7814	95.4 7093	98.8 852	102. 2082 4	105. 3131 7	108. 8171 1
-44.0 7805	-43.0 5387	-42.0 8907	-41.1 3914	-40.1 8891	-39.2 312	-38.2 5367	-37.2 789	-36.3 0661	-35.3 3349	-34.4 0337	-33.4 0674	-32.4 2928	-31.4 5483	-30.4 801	-29.5 6764	-28.5 6066	-27.5 8039	-26.6 0369	-25.6 2727	-24.7 0615	-23.7 2915	-22.6 6901	-21.7 2351	-20.7 7883	-19.8 3168	-18.8 6996	-17.8 8723	-16.9 0939	-15.9 3185	-14.9 6512	-14.0 2417
-93.0	-94.4	-95.8	-97.2	-98.6	-100.	-101.	-102.	-104.	-105.	-107.	-108.	-109.	-111.	-112.	-114.	-115.	-116.	-118.	-119.	-121.	-122.	-123.	-125.	-126.	-128.	-129.	-130.	-132.	-133.	-135.	-136.

3176	204	2022	2544	3036	02912	42357	82381	22651	6284	02616	42009	8196	22212	62437	02305	41679	81547	21772	62025	01975	41372	81148	21336	61607	01631	41083	80973	21463	61983	01964	40812
-141.8724	-145.62362	-149.38894	-153.15966	-156.92721	-160.68345	-164.43805	-168.20275	-171.96997	-175.73587	-179.49642	-183.25016	-187.01391	-190.78095	-194.54747	-198.30879	-202.06264	-205.82517	-209.59193	-213.35887	-217.12087	-220.87595	-224.6365	-228.40239	-232.16962	-235.93431	-239.68898	-243.45046	-247.22022	-250.99028	-254.7522	-258.49996
-190.65712	-196.76957	-202.90009	-209.03088	-215.15006	-221.26536	-227.37867	-233.50585	-239.63514	-245.75935	-251.88051	-257.99239	-264.11804	-270.24769	-276.37262	-282.49516	-288.60657	-294.73033	-300.8601	-306.98593	-313.10925	-319.2213	-325.34247	-331.46667	-337.59597	-343.72314	-349.83661	-355.95835	-362.09198	-368.22119	-374.33786	-380.4447
-239.3835	-247.85719	-256.34727	-264.82621	-273.30312	-281.77476	-290.24678	-298.73397	-307.2179	-315.70033	-324.1776	-332.6476	-341.13369	-349.61852	-358.10085	-366.58	-375.04898	-383.5333	-392.01916	-400.50139	-408.98195	-417.45063	-425.92789	-434.41033	-442.89425	-451.38145	-459.85372	-468.33568	-476.82675	-485.30629	-493.77983	-502.24473
-288.04915	-298.88354	-309.72002	-320.55211	-331.38405	-342.21164	-353.04237	-363.88229	-374.71914	-385.55566	-396.38766	-407.2158	-418.05636	-428.89329	-439.7299	-450.56333	-461.38988	-472.23029	-483.06743	-493.90407	-504.73864	-515.56394	-526.39595	-537.23246	-548.06932	-558.90923	-569.7403	-580.5807	-591.41852	-602.25003	-613.07952	-623.90246
-336.65166	-349.83849	-363.02314	-376.20785	-389.39265	-402.57602	-415.76236	-428.95009	-442.13729	-455.3245	-468.51071	-481.69586	-494.88393	-508.07114	-521.25835	-534.44515	-547.62913	-560.81776	-574.00499	-587.19219	-600.37931	-613.56124	-626.74745	-639.93466	-653.12187	-666.30959	-679.49637	-692.68626	-705.87111	-719.05537	-732.23938	-745.42029

-385.1886 3	-400.7239 9	-416.2597 8	-431.7958 3	-447.3319 6	-462.8679 8	-478.4038 6	-493.9397 3	-509.4756	-525.0114 7	-540.5473 4	-556.0832 1	-571.6190 8	-587.1549 5	-602.6908 3	-618.2267	-633.7625 7	-649.2984 4	-664.8343 1	-680.3701 8	-695.9060 5	-711.4419 2	-726.9777 9	-742.5136 6	-758.0495 3	-773.5854	-789.1212 8	-804.6573 1	-820.1934 3	-835.7294 8	-851.2652 7	-866.8006 3

S1.6 Data Description for Figures and Tables in Section 6

In Figure 23(a), the X-axis represents the canopy load, the Y-axis represents the support height, and the Z-axis represents the balancing jack load. The theoretical simulation data are shown in Table S12, and the experimental data of the hydraulic support test platform are shown in Table S13.

The 32×32 data matrix provided in Table S12 corresponds to the theoretical simulation results of the surface shown in Figure 23(a). The column headers of this matrix correspond to the X-axis value range of 4000–10000 KN in Figure 23(a), the row headers correspond to the Y-axis value range of 0-15°, and the matrix element values represent the Z-axis values of each point on the surface.

In Figure 23(b), the X-axis represents the canopy load, the Y-axis represents the support height, and the Z-axis represents the upright column load. The theoretical simulation data are shown in Table S14, and the experimental data of the hydraulic support test platform are shown in Table S15.

The 32×32 data matrix provided in Table S14 corresponds to the theoretical simulation results of the surface shown in Figure 23(b). The column headers of this matrix correspond to the X-axis value range of 4000–10000 KN in Figure 23(b), the row headers correspond to the Y-axis value range of 0-15°, and the matrix element values represent the Z-axis values of each point on the surface.

In Figure 23(c), the X-axis represents the canopy load, the Y-axis represents the support height, and the Z-axis represents the balancing jack load. The theoretical simulation data are shown in Table S16, and the experimental data of the hydraulic support test platform are shown in Table S17.

The 32×32 data matrix provided in Table S16 corresponds to the theoretical simulation results of the surface shown in Figure 23(c). The column headers of this matrix correspond to the X-axis value range of 4000–10000 KN in Figure 23(c), the row headers correspond to the Y-axis value range of 0-15°, and the matrix element values represent the Z-axis values of each point on the surface.

In Figure 23(d), the X-axis represents the canopy load, the Y-axis represents the support height, and the Z-axis represents the upright column load. The theoretical simulation data are shown in Table S18, and the experimental data of the hydraulic support test platform are shown in Table S19.

The 32×32 data matrix provided in Table S18 corresponds to the theoretical simulation results of the surface shown in Figure 23(d). The column headers of this matrix correspond to the X-axis value range of 4000–10000 KN in Figure 23(d), the row headers correspond to the Y-axis value range of 0-15°, and the matrix element values represent the Z-axis values of each point on the surface.

In Figure 23(e), the X-axis represents the canopy load, the Y-axis represents the support height, and the Z-axis represents the balancing jack load. The theoretical simulation data are shown in Table S20, and the experimental data of the hydraulic support test platform are shown in Table S21.

The 32×32 data matrix provided in Table S20 corresponds to the theoretical simulation results of the surface shown in Figure 23(c). The column headers of this matrix correspond to the X-axis value range of 4000–10000 KN in Figure 23(d), the row headers correspond to the Y-axis value range of 40-60°, and the matrix element values represent the Z-axis values of each point on the surface.

In Figure 23(f), the X-axis represents the canopy load, the Y-axis represents the support height, and the Z-axis represents the non-tilted side column load. The theoretical

simulation data are shown in Table S22, and the experimental data of the hydraulic support test platform are shown in Table S23.

The 32×32 data matrix provided in Table S22 corresponds to the theoretical simulation results of the surface shown in Figure 23(f). The column headers of this matrix correspond to the X-axis value range of 4000–10000 KN in Figure 23(f), the row headers correspond to the Y-axis value range of 40-60°, and the matrix element values represent the Z-axis values of each point on the surface.

In Figure 23(g), the X-axis represents the canopy load, the Y-axis represents the support height, and the Z-axis represents the tilted side column load. The theoretical simulation data are shown in Table S24, and the experimental data of the hydraulic support test platform are shown in Table S25.

The 32×32 data matrix provided in Table S24 corresponds to the theoretical simulation results of the surface shown in Figure 23(g). The column headers of this matrix correspond to the X-axis value range of 4000–10000 KN in Figure 23(g), the row headers correspond to the Y-axis value range of 0-15°, and the matrix element values represent the Z-axis values of each point on the surface.

Table S12. *Theoretical simulation data corresponding to Figure 23(a).*

9.06616	11.1335	13.1605	15.2075	17.2595	19.3014	21.3493	23.3965	25.4473	27.4909	29.5381	31.5832	33.6325	35.6797	37.7269	39.7741	41.8213	43.8685	45.9157	47.9629	50.0101	52.0579	54.1049	56.1519	58.1988	60.2460	62.2932	64.3404	66.3876	68.4348	70.4820	72.5292
8.85077	10.8493	12.8479	14.8464	16.8450	18.8435	20.8420	22.8406	24.8392	26.8377	28.8363	30.8349	32.8334	34.8320	36.8306	38.8291	40.8277	42.8263	44.8248	46.8233	48.8219	50.8205	52.8191	54.8176	56.8161	58.8147	60.8133	62.8118	64.8104	66.8090	68.8075	70.8061
8.63504	10.5849	12.5347	14.4847	16.4345	18.3843	20.3340	22.2839	24.2337	26.1836	28.1333	30.0833	32.0332	33.9831	35.9329	37.8827	39.8326	41.7826	43.7322	45.6820	47.6319	49.5818	51.5317	53.4813	55.4312	57.3812	59.3311	61.2808	63.2307	65.1806	67.1304	69.0803
8.41898	10.3200	12.2212	14.1228	16.0239	17.9240	19.8252	21.7263	23.6275	25.5284	27.4294	29.3306	31.2316	33.1328	35.0337	36.9349	38.836	40.7371	42.6379	44.5389	46.4401	48.3419	50.2423	52.1431	54.0443	55.9453	57.8465	59.7474	61.6485	63.5496	65.4507	67.3518
8.20258	10.0546	11.9070	13.7592	15.6115	17.4633	19.3156	21.1678	23.0202	24.8725	26.7244	28.5764	30.4289	32.2812	34.1333	35.9858	37.8377	39.6908	41.5419	43.3941	45.2463	47.0987	48.9509	50.8028	52.6552	54.5073	56.3598	58.2116	60.0635	61.9161	63.7683	65.6201
7.98584	9.7889	11.5924	13.3957	15.1999	17.0019	18.8052	20.6085	22.4120	24.2150	26.0183	27.8215	29.6252	31.4282	33.2319	35.0364	36.8380	38.6412	40.4442	42.2476	44.0508	45.8543	47.6575	49.4605	51.2638	53.0672	54.8707	56.6735	58.4768	60.2801	62.0836	63.8867
7.76876	9.5228	11.2772	13.0316	14.7858	16.5398	18.2940	20.0484	21.8028	23.5568	25.3110	27.0653	28.8197	30.5739	32.3279	34.0826	35.8365	37.5908	39.3449	41.0991	42.8534	44.6078	46.3620	48.1161	49.8707	51.6247	53.3790	55.1330	56.8872	58.6416	60.3959	62.1501
7.55	9.25	10.9	12.6	14.3	16.077	17.7	19.4	21.1	22.8	24.6	26.3	28.0	29.7	31.4	33.1	34.8	36.5	38.2	39.9	41.6	43.3	45.0	46.7	48.4	50.18	51.8	53.5	55.2	57.0	58.7	60.4

13	64	61	66	71		82	87	92	97	02	07	13	18	23	28	33	38	43	49	54	59	64	69	74		85	90	95	00	05	10
5	3	64	86	98		15	38	58	61	71	93	14	28	28	46	69	87	9	01	23	44	55	57	77		17	17	29	51	72	8
7.	8.	10	12	13	15	17	18	20	22	23	25	27	28	30	32	33	35	37	38	40	42	43	45	47	48	50	52	53	55	57	58
33	98	.6	.3	.9	.6	.2	.9	.5	.2	.8	.5	.2	.8	.5	.1	.8	.4	.1	.7	.4	.1	.7	.4	.0	.7	.3	.0	.7	.3	.0	.6
36	95	45	01	57	13	69	25	81	37	93	49	05	61	17	73	29	85	41	97	53	09	65	20	76	32	88	44	00	56	12	68
	3	56	59	54	41	39	43	45	34	27	3	34	29	17	17	21	21	08	04	07	1	04	93	94	99	97	83	79	82	85	78
7.	8.	10	11	13	15	16	18	19	21	23	24	26	28	29	31	32	34	36	37	39	40	42	44	45	47	48	50	52	53	55	56
11	72	.3	.9	.5	.1	.7	.3	.9	.5	.1	.7	.3	.0	.6	.2	.8	.4	.0	.6	.2	.8	.4	.0	.6	.2	.8	.4	.1	.7	.3	.9
54	20	28	35	42	48	55	62	69	75	82	89	96	02	09	16	22	29	36	42	49	56	63	69	76	83	90	96	03	10	17	23
6	9	91	73	42	92	69	52	31	87	45	28	13	88	38	15	97	76	32	88	74	6	3	8	54	41	23	8	31	18	04	7
6.	8.	10	11	13	14	16	17	19	20	22	24	25	27	28	30	31	33	34	36	38	39	41	42	44	45	47	48	50	52	53	55
89	45	.0	.5	.1	.6	.2	.7	.3	.9	.4	.0	.5	.1	.7	.2	.8	.3	.9	.4	.0	.6	.1	.7	.2	.8	.3	.9	.5	.0	.6	.1
69	41	11	69	26	83	41	98	56	13	70	27	85	42	00	57	15	72	29	86	44	01	59	16	73	31	88	46	03	60	18	75
5	8	76	26	6	65	12	7	11	27	61	84	51	95	01	5	06	53	62	93	21	9	29	58	62	26	87		2	56	28	6
6.	8.	9.	11	12	14	15	17	18	20	21	23	24	26	27	29	30	32	33	35	36	38	39	41	42	44	45	47	48	50	51	53
67	18	69	.2	.7	.2	.7	.2	.7	.2	.7	.2	.7	.2	.7	.2	.8	.3	.8	.3	.8	.3	.8	.3	.8	.3	.8	.3	.9	.4	.9	.4
80	59	41	02	10	17	25	33	41	49	57	65	73	81	89	97	05	13	21	29	36	45	53	61	68	76	85	92	00	08	16	24
9	2	6	14	1	68	82	95	96	62	59	33	51	64	27	4	59	59	17	26	86	14	2		86	72	09	76	89	38	76	73
6.	7.	9.	10	12	13	15	16	18	19	21	22	23	25	26	28	29	31	32	34	35	37	38	40	41	42	44	45	47	48	50	51
45	91	37	.8	.2	.7	.2	.6	.1	.5	.0	.5	.9	.4	.8	.3	.7	.2	.7	.1	.6	.0	.5	.0	.4	.9	.3	.8	.2	.7	.2	.6
89	73	60	34	92	51	09	68	26	85	43	01	60	19	77	35	94	53	11	69	28	86	45	03	62	20	79	37	95	54	12	71
1	4	1	52	96	07	79	34	88	02	44	99	3	07	25	96	6	07	14	71	15	49	2	46	16	21	09	29	97	21	7	31
6.	7.	9.	10	11	13	14	16	17	18	20	21	23	24	25	27	28	30	31	33	34	35	37	38	40	41	42	44	45	47	48	49
23	64	05	.4	.8	.2	.6	.1	.5	.9	.3	.7	.1	.5	.9	.3	.7	.1	.5	.0	.4	.8	.2	.6	.0	.4	.8	.2	.6	.0	.5	.9
94	84	73	66	75	83	92	01	10	19	28	37	46	55	64	73	82	91	99	08	17	26	35	44	53	62	71	79	88	97	06	15
5	2	8	38	25	9	98	97	94	56	39	47	21	34	08	21	21	11	68	62	72	34	48	19	32	16	07	82	84	92	46	6
6.	7.	8.	10	11	12	14	15	16	18	19	20	22	23	25	26	27	29	30	31	33	34	35	37	38	40	41	42	44	45	46	48
01	37	73	.0	.4	.8	.1	.5	.8	.2	.6	.9	.3	.6	.0	.4	.7	.1	.4	.8	.2	.5	.9	.2	.6	.0	.3	.7	.0	.4	.7	.1
97	90	83	97	57	16	75	34	94	53	12	71	31	90	49	09	68	27	86	46	05	64	24	83	42	02	61	20	79	39	98	57
3	5	9	74	02	19	53	88	22	32	56	95	32	58	84	22	56	87	93	23	64	97	22	38	78	2	3	55	89	31	58	83
5.	7.	8.	9.	11	12	13	14	16	17	18	20	21	22	24	25	26	28	29	30	31	33	34	35	37	38	39	41	42	43	45	46
79	10	41	72	.0	.3	.6	.9	.2	.5	.8	.2	.5	.8	.1	.4	.7	.0	.3	.6	.9	.3	.6	.9	.2	.5	.8	.1	.4	.7	.0	.3

97	93	90	87	38	47	57	67	76	86	96	05	15	24	34	44	53	63	73	82	92	02	11	21	30	40	50	59	69	78	88	98
8	9	6	3	34	89	52	2	86	41	01	68	36	96	55	19	87	51	05	66	34	02	6	17	84	52	17	69	31	99	66	25
5.	6.	8.	9.	10	11	13	14	15	16	18	19	20	21	23	24	25	26	28	29	30	32	33	34	35	37	38	39	40	42	43	44
57	83	09	35	.6	.8	.1	.3	.6	.9	.1	.4	.6	.9	.2	.4	.7	.9	.2	.5	.7	.0	.2	.5	.8	.0	.3	.5	.8	.1	.3	.6
96	94	94	94	19	79	39	99	58	18	78	38	98	58	18	78	38	98	58	17	77	37	97	57	17	77	37	97	57	17	77	36
2	8	4	1	32	12	04	02	97	81	7	66	62	52	35	28	25	19	02	9	87	84	73	57	51	48	4	22	13	08	03	93
5.	6.	7.	8.	10	11	12	13	15	16	17	18	19	21	22	23	24	25	27	28	29	30	31	33	34	35	36	38	39	40	41	42
35	56	77	98	.1	.4	.6	.8	.0	.2	.4	.6	.8	.0	.3	.5	.7	.9	.1	.3	.5	.7	.9	.1	.4	.6	.8	.0	.2	.4	.6	.8
91	91	93	95	99	09	19	30	40	50	60	70	80	90	00	11	21	31	41	51	61	71	82	92	02	12	22	32	42	52	63	73
5	6	4	9	76	74	76	03	27	27	35	57	79	92	85	04	26	48	44	4	64	92	05	02	2	41	67	56	67	85	1	18
5.	6.	7.	8.	9.	10	12	13	14	15	16	17	19	20	21	22	23	24	26	27	28	29	30	31	32	34	35	36	37	38	39	41
13	29	45	61	77	.9	.0	.2	.4	.5	.7	.9	.0	.2	.3	.5	.7	.8	.0	.1	.3	.5	.6	.8	.9	.1	.3	.4	.6	.7	.9	.1
83	85	87	92	96	39	99	60	20	80	41	01	61	22	82	42	02	63	23	83	43	04	64	24	85	45	05	65	26	86	47	07
9	9	6	4	3	68	86	2	73	86	07	51	93	14	17	53	98	35	37	65	71	29	62	68	03	53	88	84	07	48	06	1
4.	6.	7.	8.	9.	10	11	12	13	14	16	17	18	19	20	21	22	23	24	26	27	28	29	30	31	32	33	34	36	37	38	39
91	02	13	24	35	.4	.5	.6	.8	.9	.0	.1	.2	.3	.4	.5	.6	.7	.9	.0	.1	.2	.3	.4	.5	.6	.7	.8	.0	.1	.2	.3
73	76	79	83	89	69	79	89	00	10	21	31	42	52	62	72	83	93	03	14	24	35	45	55	66	76	87	97	07	18	28	38
6	3	6	9	7	09	53	72	41	66		58	07	32	43	95	56	92	98	46	51	1	62	76	28	99	26	28	63	32	84	92
4.	5.	6.	7.	8.	9.	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	28	29	30	31	32	33	34	35	36	37
69	75	81	87	93	99	.0	.1	.1	.2	.3	.3	.4	.4	.5	.6	.6	.7	.7	.8	.9	.9	.0	.0	.1	.2	.2	.3	.3	.4	.5	.5
61	63	68	71	78	80	58	18	79	39	00	60	21	81	41	02	62	23	83	43	04	64	25	85	46	06	67	27	87	48	08	68
1	9	9	9	5	3	53	85	38	76	22	83	29	57	76	39	97	32	43	91	35	55	22	46	14	74	02	1	58	38	74	88
4.	5.	6.	7.	8.	9.	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
47	48	49	50	51	52	.5	.5	.5	.5	.5	.5	.5	.6	.6	.6	.6	.6	.6	.6	.6	.6	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7
46	49	54	58	63	65	37	47	57	68	78	89	99	10	20	30	41	51	61	72	82	93	03	13	24	35	45	55	66	76	87	97
5	4	3	3	2	6	02	5	8	26	77	28	7	02	29	9	35	71	88	31	86	04	62	94	62	04	36	52	15	68	03	23
4.	5.	6.	7.	8.	9.	10	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
25	21	17	13	09	05	.0	.9	.9	.8	.8	.8	.7	.7	.6	.6	.6	.5	.5	.4	.4	.4	.3	.3	.3	.2	.2	.1	.1	.1	.0	.0
30	33	37	41	44	47	15	75	35	96	56	17	77	37	98	58	18	79	39	99	60	20	80	41	01	62	22	82	43	03	63	24
3	3	3	4	6	5	14	56	92	25	68	06	45	77	09	51	89	25	47	84	27	68	98	37	79	16	5	73	23	59	95	21
4.	4.	5.	6.	7.	8.	9.	10	11	12	13	14	14	15	16	17	18	19	20	21	22	23	24	24	25	26	27	28	29	30	31	32
03	94	85	76	67	58	49	.4	.3	.2	.1	.0	.9	.8	.7	.6	.5	.5	.4	.3	.2	.1	.0	.9	.8	.7	.6	.6	.5	.4	.3	.2

126	152	183	214	242	265	293	0326	1356	2381	3407	4438	547	6497	7521	8551	9582	0612	1635	2663	3694	4726	5751	6777	7807	8839	9868	0891	1918	2949	398	5006
3.80935	4.66695	5.529971	6.389993	7.25001	8.1101019	8.9703038	9.83306	10.690881	11.55092	12.411008	13.27129	14.131151	14.991667	15.851778	16.711198	17.57222	18.4324	19.2925	20.152668	21.012889	21.873311	22.733326	23.593338	24.453558	25.313881	26.173999	27.034008	27.894226	28.754848	29.614969	30.474884
3.587277	4.39727	5.207331	6.010742	6.827477	7.637333	8.44474	9.257552	10.067654	10.877575	11.687749	12.497976	13.307868	14.117177	14.927559	15.737768	16.547979	17.358578	18.168774	18.979776	19.787887	20.597994	21.407994	22.217886	23.027996	23.838806	24.648407	25.457998	26.268003	27.078113	27.888818	28.698817
3.365061	4.121481	4.884644	5.646458	6.404446	7.161411	7.924033	8.683996	9.443779	10.203053	10.963333	11.723233	12.483113	13.243	14.002767	14.762761	15.522252	16.282237	17.042007	17.801992	18.561888	19.321769	20.081541	20.841424	21.601012	22.360107	23.120994	23.880861	24.640449	25.400043	26.160026	26.920006
3.142526	3.852009	4.561766	5.2714	5.9811	6.690652	7.400225	8.1098986	8.819555	9.529022	10.238363	10.948333	11.657994	12.367658	13.077702	13.786777	14.496436	15.206005	15.915549	16.625115	17.334382	18.044446	18.754054	19.463653	20.173728	20.882886	21.592955	22.301996	23.011167	23.720213	24.430397	25.140405
2.919944	3.579178	4.23886	4.897933	5.557377	6.216567	6.876022	7.535334	8.194777	8.853396	9.512335	10.171269	10.831321	11.491043	12.150764	12.810107	13.469442	14.128383	14.788801	15.447443	16.106775	16.766617	17.425246	18.084673	18.744412	19.403949	20.062689	20.722205	21.381949	22.040824	22.700024	23.359548
2.697133	3.306088	3.915166	4.524221	5.133328	5.742225	6.351313	6.960337	7.569444	8.178366	8.787743	9.396466	10.005054	10.614156	11.223253	11.832356	12.441663	13.050507	13.659596	14.268668	14.877773	15.486868	16.095079	16.704081	17.313182	17.922229	18.531295	19.140187	19.749493	20.358599	20.968707	21.577702
2.474144	3.032779	3.591488	4.150166	4.708844	5.267522	5.826262	6.384889	6.943588	7.502221	8.060609	8.619595	9.178288	9.736976	10.295636	10.854229	11.412998	11.971966	12.530303	13.088899	13.647468	14.206036	14.765603	15.323269	15.882837	16.441406	16.999975	17.558584	18.117107	18.675776	19.234345	19.793931
2.25	2.75	3.26	3.77	4.2841	4.79	5.30	5.80	6.31	6.82	7.33	7.84	8.35	8.85	9.36	9.87	10.3	10.8	11.4	11.9	12.4	12.9	13.4	13.9	14.4	14.9	15.4	15.9	16.4	16.9	17.4	18.0

09 7	92 5	75 3	58 1		23 8	06 6	89 5	72 3	55 1	37 9	20 8	03 6	86 4	69 2	52 1	83 49	91 77	00 05	08 34	16 62	24 9	33 19	41 47	49 75	58 03	66 32	74 6	82 88	91 16	99 45	07 73

Table S13. *Experimental data of the hydraulic support test platform corresponding to Figure 23(a).*

Balance jack load/(kg)		Inclined angle/(°)				
		3	6	9	12	15
Canopy Load/(kg)	50	9.26	8.21	5.85	4.37	3.58
	100	20.74	17.72	13.8	10.54	7.17
	150	28.56	23.79	18.12	13.08	8.12
	200	36.97	32.97	25.54	18.72	12.67
	250	45.41	40.03	30.84	22.25	14.11
	300	55.9	48.15	37.21	26.83	16.6
	350	66.91	55.78	43.08	30.93	18.61
	400	76.62	64.11	49.66	36.72	24.32

Table S14. *Theoretical simulation data corresponding to Figure 23(b).*

51.6 4335	63.3 0475	74.9 6616	86.6 2756	98.2 8896	109.95 0306	121.61 1777	133.27 3177	144.93 4577	156.59 5977	168.25 7377	179.91 8778	191.58 0188	203.24 1588	214.90 2988	226.56 4389	238.22 5789	249.88 7189	261.54 8589	273.20 9999	284.87 14	296.53 28	308.19 42	319.85 56	331.51 7001	343.17 8411	354.83 9811	366.50 1211	378.16 2611	389.82 4002	401.48 5422	413.14 6822
51.4 9828	63.1 2691	74.7 5571	86.3 8451	98.0 1328	109.64 1088	121.26 9889	132.89 8689	144.52 7466	156.15 5887	167.78 44	179.41 32	191.04 2001	202.67 0773	214.29 9332	225.92 8004	237.55 6844	249.18 5664	260.81 3533	272.44 2223	284.07 1033	295.69 9833	307.32 8662	318.95 6774	330.58 5554	342.21 4344	353.84 2999	365.47 1277	377.10 0005	388.72 8885	400.35 7765	411.98 6227
51.3 5091	62.9 4657	74.5 418	86.1 3778	97.7 3329	109.32 6722	120.92 2455	132.51 84	144.11 3622	155.70 8822	167.30 3655	178.89 9666	190.49 5222	202.09 1119	213.68 61	225.28 1446	236.87 7336	248.47 3223	260.06 6833	271.66 2055	283.25 8055	294.85 3422	306.44 9355	318.04 33	329.63 9225	341.23 5088	352.83 0699	364.42 4933	376.02 0444	387.61 6422	399.21 1655	410.80 73
51.2 0124	62.7 6279	74.3 2458	85.8 8679	97.4 4869	109.00 7776	120.57	132.13 1195	143.69 4188	155.25 4866	166.81 5776	178.37 8344	189.93 9699	201.50 2433	213.06 2522	224.62 5177	236.18 6844	247.74 9322	259.30 8661	270.87 0006	282.43 2449	293.99 4011	305.55 6227	317.11 5977	328.67 8588	340.24	351.80 2955	363.36 2466	374.92 4336	386.48 6577	398.04 8336	409.60 9991
51.0 4926	62.5 7575	74.1 0454	85.6 3152	97.1 5948	108.68 4119	120.21 2399	131.73 9311	143.26 8344	154.79 3999	166.32 0955	177.84 8511	189.37 6488	200.90 4477	212.42 96	223.95 86	235.48 5611	247.01 3899	258.53 8877	270.06 6444	281.59 3655	293.12 2099	304.64 9336	316.17 4833	327.70 3022	339.23 0244	350.75 9099	362.28 3888	373.81 1855	385.33 8833	396.86 7611	408.39 41
50.8 9498	62.3 8632	73.8 8035	85.3 7274	96.8 6567	108.35 6011	119.84 8811	131.34 1622	142.83 5559	154.32 6222	165.81 8722	177.31 0811	188.80 4475	200.29 7229	211.78 7466	223.28 12	234.77 44	246.26 6696	257.75 7763	269.25 0488	280.74 2688	292.23 6711	303.72 8655	315.21 9855	326.71 2133	338.20 5666	349.69 9911	361.18 9188	372.68 2111	384.17 45	395.66 8533	407.15 9887

50.7384	62.194959	73.652258	85.110445	96.567225	108.0232	119.4799494	130.939799	142.395933	153.851544	165.308288	176.7658	188.2238388	199.6809	211.1361 2	222.5939	234.052	245.5087 9	256.9648 7	268.4217 3	279.8794 8	291.3375 2	302.7941 2	314.2503 2	325.7072 8	337.1654 1	348.6230 1	360.0783 6	371.5351 7	382.9930 3	394.4510 3	405.9072 1
50.5795 2	62.000 29	73.421 91	84.843 57	96.264 6	107.6849 3	119.1062 1	130.5279 7	141.9495 2	153.3699 5	164.7908 4	176.2124 8	187.6341 7	199.0553	210.4754 9	221.8969 4	233.3186 8	244.7401 2	256.1605 5	267.5815 1	279.0032	290.4248 5	301.8457 7	313.2661 5	324.6877 1	336.1094 6	347.5308 1	358.9510 5	370.3720 8	381.7937 4	393.2153 6	404.6361 3
50.418333	61.802 85	73.187 97	84.573 13	95.957 81	107.3418 4	118.7266 9	130.1119 4	141.4969 9	152.8812 6	164.2657 7	175.6509 2	187.0306 11	198.4207 6	209.8048 9	221.1898 5	232.5750 9	243.9600 04	255.3441 9	266.7288 5	278.1140 4	289.4991 9	300.8837 2	312.2679 5	323.6530 1	335.0382 6	346.4231 1	357.8071 4	369.1918 2	380.5769 8	391.9621	403.3466 2
50.254 88	61.6 02	72.9 5049	84.2 9903	95.6 4659	106.9931 8	118.3413 9	129.6900 1	141.0382 1	152.3852 1	163.7326 8	175.0811 7	186.4297 6	197.7775 9	209.1239 2	220.4722 5	231.8208 5	243.1688	254.5158 6	265.8634 1	277.2119	288.5605 5	299.9080 5	311.2549 5	322.6031	333.9517 7	345.3000 1	356.6465	367.9940 8	379.3426 5	390.6911 8	402.0384
50.088 94	61.3 98 22	72.7 0992	84.0 2087	95.3 3144	106.6396 2	117.9507 2	129.2623 6	140.5725 3	151.8821 1	163.1927 3	174.5029 1	185.8147 2	197.1251	208.4332 4	219.7445 7	231.0560 6	242.3663 9	253.6754 9	264.9862	276.2966 9	287.6085 3	298.9183 8	310.2280 3	321.5379	332.8496	344.1608	355.4690 4	366.7795 1	378.0903 5	389.4021 6	400.7151 1
49.920 77	61.1 92 07	72.4 6619	83.7 3831	95.0 1172	106.2814 4	117.5551 1	128.8280 3	140.1011 9	151.3720 8	162.6447 5	173.9169 2	185.1906 1	196.4633 8	207.7333	219.0072 2	230.2798 2	241.5533	252.8235 8	264.0968 7	275.3675	286.6427 6	297.9148 4	309.1858 3	320.4588 7	331.7315 8	343.0054 2	354.2752 2	365.5487 6	376.8204 9	388.0947 2	399.3613
49.7	60.9	72.2	83.4	94.6	105.91	117.15	128.38	139.62	150.85	162.08	173.32	184.55	195.79	207.02	218.	229.49	240.72	251.96	263.19	274.42	285.66	296.89	308.12	319.36	330.59	341.83	353.06	364.30	375.53	386.76	398.00

50 31	83 64	18 39	52 74	87 42	86 9	40 8	77 5	32 5	51 8	87 6	39 4	76 3	25 1	42 3	25 96	34 6	88 1	02 2	45 7	93 2	33 4	75 8	96 1	52 3	85 1	40 3	53 8	02 3	43 8	89 8	24 6
49 .5 77 59	60 .7 72 51	71 .9 67 26	83 .1 63 39	94 .3 58 59	10 5. 55 14 1	11 6. 74 67 9	12 7. 94 23 5	13 9. 13 85 2	15 0. 33 15	16 1. 52 58	17 2. 72 21 8	18 3. 91 68 9	19 5. 11 25 8	20 6. 30 60 9	21 7. 50 12 6	22 8. 69 70 9	23 9. 89 3	25 1. 08 55 5	26 2. 28 04 6	27 3. 47 68 2	28 4. 67 12 7	29 5. 86 67 3	30 7. 05 98	31 8. 25 61 1	32 9. 45 15 5	34 0. 64 68	35 1. 83 96 9	36 3. 03 50 1	37 4. 23 12 1	38 5. 42 56 3	39 6. 62 06 8
49 .4 02 62	60 .5 57 73	71 .7 13 55	82 .8 69 74	94 .0 25 28	10 5. 17 94 9	11 6. 33 47	12 7. 49 09 8	13 8. 64 70 7	14 9. 80 10 9	16 0. 95 60 7	17 2. 11 22 9	18 3. 26 84 2	19 4. 42 36 9	20 5. 57 84 1	21 6. 73 37 7	22 7. 89 00 3	23 9. 04 59 9	25 0. 19 96 8	26 1. 35 50 5	27 2. 51 13 1	28 3. 66 72 9	29 4. 82 24 5	30 5. 97 65 6	31 7. 13 27	32 8. 28 90 3	33 9. 44 40 5	35 0. 59 83 3	36 1. 75 39 1	37 2. 91 01 6	38 4. 06 59 2	39 5. 22 09 8
49 .2 25 44	60 .3 40 6	71 .4 56 39	82 .5 72 21	93 .6 87 56	10 4. 80 21 4	11 5. 91 76 6	12 7. 03 35 7	13 8. 14 92 9	14 9. 26 40 3	16 0. 37 92 2	17 1. 49 50 3	18 2. 61 08 8	19 3. 72 61 4	20 4. 84 09 5	21 5. 95 65 7	22 7. 07 24 7	23 8. 18 80 9	24 9. 30 27 2	26 0. 41 80 5	27 1. 53 39 1	28 2. 64 97 2	29 3. 76 48 6	30 4. 87 96 9	31 5. 99 54 2	32 7. 11 13 4	33 8. 22 68 6	34 9. 34 14 2	36 0. 45 67 8	37 1. 57 26 1	38 2. 68 83 9	39 3. 80 35 4
49 .0 46 05	60 .1 20 68	71 .1 95 97	82 .2 71 29	93 .3 46 14	10 4. 42 01 8	11 5. 49 52	12 6. 57 06 1	13 7. 64 58 3	14 8. 72 00 8	15 9. 79 47 5	17 0. 87 00 6	18 1. 94 54	19 3. 02 01 7	20 4. 09 44	21 5. 16 95 1	22 6. 24 49 1	23 7. 32 00 3	24 8. 39 43	25 9. 46 90 5	27 0. 54 44	28 1. 61 97 1	29 2. 69 43 9	30 3. 76 86 3	31 4. 84 38 5	32 5. 91 92 5	33 6. 99 42 6	34 8. 06 83 3	35 9. 14 31 7	37 0. 21 84 9	38 1. 29 37 7	39 2. 36 84 2
48 .8 64 38	59 .8 97 83	70 .9 32 12	81 .9 66 82	93 .0 00 87	10 4. 03 35 2	11 5. 06 70 6	12 6. 10 18 6	13 7. 13 64 8	14 8. 16 90 1	15 9. 20 24 6	17 0. 23 71 3	18 1. 27 17 4	19 2. 30 54 9	20 3. 33 78 6	21 4. 37 23 2	22 5. 40 70 7	23 6. 44 09	24 7. 47 39 8	25 8. 50 75 9	26 9. 54 22 2	28 0. 57 69 4	29 1. 61 04 3	30 2. 64 29 3	31 3. 67 74 9	32 4. 71 22 4	33 5. 74 59 9	34 6. 77 85 7	35 7. 81 25 6	36 8. 84 72 1	37 9. 88 15 6	39 0. 91 50 6
48 .6 80 44	59 .6 72 68	70 .6 64 7	81 .6 58 35	92 .6 51 08	10 3. 64 13 5	11 4. 63 39 3	12 5. 62 68 8	13 6. 62 06 3	14 7. 61 11 4	15 8. 60 28 7	16 9. 59 66 5	18 0. 58 90 3	19 1. 58 19	20 2. 57 20 5	21 3. 56 54 5	22 4. 55 87 7	23 5. 55 12 6	24 6. 54 21	25 7. 53 50 3	26 8. 52 71 1	27 9. 52 10 2	29 0. 51 28 5	30 1. 50 32 9	31 2. 49 68 9	32 3. 48 99 8	33 4. 48 27 1	34 5. 47 28 9	35 6. 46 54 9	36 7. 45 90 7	37 8. 45 14 6	38 9. 44 35 4

48.49426	59.44391	70.39483	81.34557	92.29681	103.24454	114.19615	125.14599	136.09805	147.04653	157.9965	168.94815	179.89844	190.84934	201.79726	212.7491	223.6994	234.65093	245.599	256.55011	267.50002	278.45167	289.40179	300.35018	311.3021	322.25237	333.20385	344.15149	355.10253	366.0535	377.00458	387.95407
48.30586	59.2125	70.1218	81.02915	91.9381	102.84329	113.75222	124.66026	135.56882	146.47527	157.3833	168.29116	179.20004	190.10791	201.01359	211.92256	222.83046	233.73951	244.64481	255.55284	266.46171	277.36921	288.27743	299.18376	310.09244	321.00072	331.90946	342.81457	353.72337	364.63114	375.54032	386.44685
48.11526	58.97889	69.84482	80.71	91.575	102.43765	113.30303	124.16891	135.03329	145.89743	156.76248	167.6272	178.49312	189.3577	200.22113	211.08589	221.95159	232.81713	243.67965	254.54433	265.41036	276.27479	287.13991	298.00393	308.86863	319.73446	330.59972	341.4623	352.32742	363.19271	374.05852	384.92208
47.9225	58.74307	69.56487	80.38671	91.20761	102.02768	112.84921	123.67114	134.49263	145.31308	156.13408	166.95584	177.77769	188.59882	199.4191	210.2404	221.06229	231.88391	242.70366	253.52483	264.34671	275.1685	285.98939	296.80989	307.63142	318.45332	329.27481	340.09482	350.91588	361.73768	372.55944	383.37998
47.72759	58.50454	69.28205	80.05961	90.83671	101.6132	112.39046	123.1681	133.94555	144.72227	155.49921	166.27675	177.05433	187.83141	198.608	209.38536	220.16299	230.94035	241.71693	252.494	263.27159	274.04913	284.82607	295.60279	306.38024	317.15788	327.93514	338.71163	349.48873	360.26628	371.0438	381.82074
47.53055	58.26291	68.99603	79.72919	90.46189	101.19353	111.92639	122.65964	133.3927	144.12465	154.85711	165.59026	176.32344	187.05593	197.78789	208.52085	219.25409	229.98704	240.71884	251.4515	262.18468	272.91783	283.65026	294.38225	305.11531	315.84855	326.58135	337.31307	348.04578	358.77894	369.51206	380.24441
47.3	58.0	68.7	79.3	90.0	100.76	111.45	122.14	132.83	143.52	154.20	164.89	175.58	186.27	196.	207.	218.33	229.02	239.70	250.39	261.08	271.77	282.46	293.14	303.83	314.52	325.21	335.89	346.	357.27	367.96	378.

31 34	18 66	06 58	95 24	83 15	89 2	71 4	58 8	35 1	04 2	77 1	63 5	47 3	22 7	95 84	64 68	55 1	29 7	96 2	73 1	59 9	41 6	15 8	79 3	64 8	51 4	25 6	88 9	58 68	54 5	33 8	65 07
47 .1 29 95	57 .7 71 79	68 .4 13 83	79 .0 57 31	89 .7 00 05	10 0. 33 99 3	11 0. 98 31 5	12 1. 62 64 5	13 2. 26 85 7	14 2. 90 96 7	15 3. 55 14 6	16 4. 19 52 3	17 4. 83 72 8	18 5. 47 99 4	19 6. 12 01 3	20 6. 76 36 3	21 7. 40 66 1	22 8. 04 89 9	23 8. 68 95 2	24 9. 33 18 9	25 9. 97 55 7	27 0. 61 75 1	28 1. 25 98 4	29 1. 90 04	30 2. 54 41 1	31 3. 18 67 3	32 3. 82 93 4	33 4. 46 94 7	34 5. 11 22 2	35 5. 75 56 9	36 6. 39 77 3	37 7. 03 95 8
46 .9 26 38	57 .5 21 72	68 .1 18 69	78 .7 15 23	89 .3 12 6	99 .9 06 6	11 0. 50 43 9	12 1. 10 06 3	13 1. 69 78	14 2. 29 23 9	15 2. 88 86 8	16 3. 48 60 9	17 4. 08 23 3	18 4. 67 89	19 5. 27 31 6	20 5. 87 10 9	21 6. 46 71 4	22 7. 06 43 9	23 7. 65 85 5	24 8. 25 55 1	25 8. 85 24 8	26 9. 44 90 4	28 0. 04 50 5	29 0. 63 98 2	30 1. 23 77 7	31 1. 83 37 3	32 2. 43 09 1	33 3. 02 48 2	34 3. 62 21 9	35 4. 21 87 3	36 4. 81 57 1	37 5. 41 10 5
46 .7 20 64	57 .2 69 28	67 .8 20 12	78 .3 69 73	88 .9 20 81	99 .4 68 91	11 0. 02 00 3	12 0. 56 97 2	13 1. 12 05 1	14 1. 66 85 8	15 2. 21 90 5	16 2. 76 88 2	17 3. 31 94 5	18 3. 86 91 6	19 4. 41 74 8	20 4. 96 83 2	21 5. 51 82 4	22 6. 06 89 2	23 6. 61 66 9	24 7. 16 76 2	25 7. 71 72 4	26 8. 26 8	27 8. 81 72	28 9. 36 61 8	29 9. 91 66 2	31 0. 46 68	32 1. 01 72 6	33 1. 56 49 4	34 2. 11 60 2	35 2. 66 56 3	36 3. 21 64 7	37 3. 76 51 1
46 .5 12 72	57 .0 14 66	67 .5 18 13	78 .0 21 34	88 .5 24 66	99 .0 26 87	10 9. 52 99 8	12 0. 03 32 8	13 0. 53 67	14 1. 03 82 4	15 1. 54 16 4	16 2. 04 45 2	17 2. 54 79 9	18 3. 05 07 2	19 3. 55 29 8	20 4. 05 58 4	21 4. 55 92 2	22 5. 06 25 6	23 5. 56 39 6	24 6. 06 73 9	25 6. 57 04 5	26 7. 07 39 3	27 7. 57 63	28 8. 07 90 1	29 8. 58 17 4	30 9. 08 51 7	31 9. 58 83 8	33 0. 08 98 3	34 0. 59 31 5	35 1. 09 63 6	36 1. 59 98 3	37 2. 10 17 7
46 .3 02 63	56 .7 57 73	67 .2 13 32	77 .6 68 9	88 .1 24 31	98 .5 79 84	10 9. 03 52 8	11 9. 49 08 6	12 9. 94 64 4	14 0. 40 13 8	15 0. 85 69 4	16 1. 31 25 2	17 1. 76 81	18 2. 22 35 8	19 2. 67 86 8	20 3. 13 41 9	21 3. 58 97 7	22 4. 04 53 5	23 4. 50 03 4	24 4. 95 58 5	25 5. 41 14 3	26 5. 86 70 1	27 6. 32 23 4	28 6. 77 75 5	29 7. 23 31	30 7. 68 86 8	31 8. 14 42 6	32 8. 59 93 4	33 9. 05 47 5	34 9. 51 03 3	35 9. 96 59 2	37 0. 42 10 2
46 .0 90 36	56 .4 97 86	66 .9 05 36	77 .3 12 86	87 .7 20 36	98 .1 27 86	10 8. 53 53 6	11 8. 94 28 6	12 9. 35 03 6	13 9. 75 78 6	15 0. 16 53 6	16 0. 57 28 6	17 0. 98 03 6	18 1. 38 78 6	19 1. 79 53 6	20 2. 20 28 6	21 2. 61 03 6	22 3. 01 78 6	23 3. 42 53 6	24 3. 83 28 6	25 4. 24 03 6	26 4. 64 78 6	27 5. 05 53 6	28 5. 46 28 6	29 5. 87 03 6	30 6. 27 78 7	31 6. 68 53 7	32 7. 09 28 7	33 7. 50 03 7	34 7. 90 78 7	35 8. 31 53 7	36 8. 72 28 7

Table S15. *Experimental data of the hydraulic support test platform corresponding to Figure 23(b).*

Upright column load/(kg)		Inclined angle/(°)				
		3	6	9	12	15
Canopy Load/(kg)	50	52.06	50.73	49.4	47.92	46.37
	100	104.13	101.47	98.81	95.85	92.74
	150	156.19	152.2	148.21	143.77	139.11
	200	208.26	202.94	197.61	191.7	185.48
	250	260.32	253.67	247.02	239.62	231.85
	300	312.39	304.4	296.42	287.54	278.22
	350	364.45	355.14	345.82	335.47	324.59
	400	416.52	405.87	395.23	383.39	370.96

Table S16. *Theoretical simulation data corresponding to Figure 23(c).*

12.3	15.1	17.9	20.7	23.4	26.2	29.0	31.8	34.6	37.4	40.2	43.0	45.7	48.5	51.3	54.1	56.9	59.7	62.5	65.2	68.08	70.87	73.66	76.44	79.23	82.02	84.81	87.59	90.38	93.17	95.95	98.74
4325	3044	1763	0481	92	7919	6637	5356	4074	2793	1512	023	8949	7668	6386	5105	3823	2542	1261	979	698	417	135	854	572	291	01	728	447	166	884	603
12.5	15.3	18.2	21.0	23.8	26.7	29.5	32.3	35.2	38.0	40.8	43.7	46.5	49.3	52.2	55.0	57.8	60.7	63.5	66.3	69.23	72.06	74.89	77.73	80.56	83.40	86.23	89.06	91.90	94.73	97.57	100.4
5056	8456	186	5264	8667	2044	5448	8852	2256	5649	9046	245	5854	9256	2654	6056	946	2865	6644	9645	049	3453	657	242	646	051	4545	8484	244	6488	052	0451
12.7	15.6	18.5	21.3	24.2	27.1	30.0	32.9	35.8	38.6	41.5	44.4	47.3	50.2	53.0	55.9	58.8	61.7	64.6	67.4	70.37	73.25	76.13	79.01	81.89	84.77	87.65	90.53	93.41	96.29	99.17	102.0
5724	3799	1861	9945	8016	6029	4105	2188	0251	8313	6565	4549	2521	0605	8659	6725	4807	2887	0968	8968	052	8119	6201	4228	2311	39	4649	2499	57	654	716	5791
12.9	15.8	18.8	21.7	24.6	27.5	30.5	33.4	36.3	39.3	42.2	45.1	48.0	51.0	53.9	56.8	59.7	62.7	65.6	68.5	71.50	74.43	77.36	80.28	83.21	86.14	89.07	91.99	94.92	97.85	100.7	103.7
6328	9046	1772	4508	7237	9887	2625	5454	8092	0686	3387	6234	8947	9999	1726	4448	7192	9892	2548	5564	707	425	163	831	578	294	051	713	441	178	7903	0622
13.1	16.1	19.1	22.0	25.0	28.0	31.0	33.9	36.9	39.9	42.9	45.8	48.8	51.8	54.7	57.7	60.7	63.7	66.6	69.6	72.63	75.61	78.58	81.56	84.53	87.50	90.48	93.45	96.42	99.40	102.3	105.3
6868	4204	1604	8954	6331	3618	1001	8349	5756	3069	0418	7784	5161	2538	9837	7243	4593	1979	9274	664	996	638	474	052	4345	7951	1193	4822	8529	5909	2076	4945
13.3	16.3	19.4	22.4	25.4	28.4	31.4	34.5	37.5	40.5	43.5	46.5	49.6	52.6	55.6	58.6	61.6	64.7	67.7	70.7	73.76	76.78	79.80	82.82	85.84	88.86	91.88	94.90	97.92	100.9	103.9	106.9
7345	9296	1322	3302	5297	7221	9213	1205	3229	5361	7144	9116	1139	3124	5043	6961	8848	1074	2981	4974	949	975	943	89	868	88	889	806	801	4781	6807	8758
13.5	16.6	19.7	22.7	25.8	28.9	31.9	35.0	38.1	41.1	44.2	47.3	50.3	53.4	56.4	59.5	62.6	65.6	68.7	71.8	74.89	77.96	81.02	84.09	87.15	90.22	93.29	96.35	99.42	102.4	105.5	108.6
7758	4324	0941	7553	4137	0697	7278	3896	0511	7062	3643	0247	6865	3455	9995	6605	3224	0007	6371	2956	566	183	761	328	915	536	141	684	268	8881	5497	2063
13.7	16.8	20.0	23.1	26.2	29.3	32.4	35.5	38.6	41.7	44.8	48.0	51.1	54.2	57.3	60.4	63.5	66.6	69.7	72.9	76.0182	79.13	82.24	85.35	88.46	91.57	94.68	97.80	100.9	104.0	107.1	110.2

81 07	92 82	04 79	16 78	28 6	40 22	52 1	64 11	76 07	87 72	99 49	11 48	23 47	35 32	46 9	58 83	70 84	82 76	94 41	06 21		01 9	19 7	36 1	55 7	75 8	94 8	10 8	12 89	24 88	36 85	48 6
13 .9 83 94	17 .1 41 53	20 .2 99 28	23 .4 57 05	26 .6 14 68	29 .7 72 14	32 .9 29 82	36 .0 87 61	39 .2 45 35	42 .4 02 87	45 .5 60 46	48 .7 18 23	51 .8 76	55 .0 33 63	58 .1 91 11	61 .3 48 82	64 .5 06 61	67 .6 64 32	70 .8 21 81	73 .9 79 44	77. 13 72 1	80. 29 49 7	83. 45 25 7	86. 61 00 8	89. 76 78 2	92. 92 56 1	96. 08 32 9	99. 24 07 5	10 2.3 98 38	10 5.5 56 15	10 8.7 13 9	11 1.8 71 49
14 .1 86 2	17 .3 89 35	20 .5 92 85	23 .7 96 37	26 .9 99 61	30 .2 02 63	33 .4 06 06	36 .6 09 61	39 .8 13 01	43 .0 16 15	46 .2 19 48	49 .4 22 97	52 .6 26 47	55 .8 29 76	59 .0 32 67	62 .2 36 14	65 .4 39 7	68 .6 42 99	71 .8 46 15	75 .0 49 55	78. 25 30 4	81. 45 65 2	84. 65 97 1	87. 86 28 8	91. 06 63 3	94. 26 98 4	97. 47 32 2	10 0.6 76 19	10 3.8 79 59	10 7.0 83 06	11 0.2 86 52	11 3.4 89 64
14 .3 87 87	17 .6 36 41	20 .8 85 62	24 .1 34 59	27 .3 83 59	30 .6 31 86	33 .8 80 92	37 .1 30 12	40 .3 78 83	43 .6 27 61	46 .8 76 63	50 .1 25 57	53 .3 74 74	56 .6 23 51	59 .8 71 73	63 .1 20 9	66 .3 70 04	69 .6 18 76	72 .8 67 4	76 .1 16 49	79. 36 55 3	82. 61 46 6	85. 86 32 7	89. 11 19	92. 36 09 6	95. 61 00 9	98. 85 90 3	10 2.1 07 23	10 5.3 56 35	10 8.6 05 45	11 1.8 54 53	11 5.1 02 99
14 .5 88 92	17 .8 82 83	21 .1 77 52	24 .4 71 61	27 .7 66 33	31 .0 59 83	34 .3 54 44	37 .6 48 71	40 .9 43 25	44 .2 37 19	47 .5 31 55	50 .8 25 98	54 .1 20 55	57 .4 14 75	60 .7 08 28	64 .0 03 01	67 .2 97 07	70 .5 91 77	73 .8 85 52	77 .1 80 02	80. 47 44 9	83. 76 90 8	87. 06 30 6	90. 35 68 5	93. 65 15 3	96. 94 60 5	10 0.2 40 45	10 3.5 33 87	10 6.8 28 43	11 0.1 22 97	11 3.4 17 54	11 6.7 11 32
14 .7 89 3	18 .1 28 59	21 .4 68 22	24 .8 07 88	28 .1 47 77	31 .4 86 5	34 .8 26 37	38 .1 65 65	41 .5 05 8	44 .8 44 81	48 .1 84 22	51 .5 24 2	54 .8 63 8	58 .2 03 37	61 .5 42 22	64 .8 82 09	68 .2 21 34	71 .5 61 51	74 .9 00 36	78 .2 39 95	81. 57 98 7	84. 91 95 8	88. 25 89 2	91. 59 78 3	94. 93 78 2	98. 27 75 7	10 1.6 17 29	10 4.9 55 94	10 8.2 95 61	11 1.6 35 51	11 4.9 75 31	11 8.3 14 43
14 .9 89 01	18 .3 73 54	21 .7 58	25 .1 43 05	28 .5 27 84	31 .9 11 8	35 .2 96 4	38 .6 81 19	42 .0 66 31	45 .4 50 38	48 .8 34 8	52 .2 19 86	55 .6 04 58	58 .9 89 27	62 .3 73 43	65 .7 57 87	69 .1 42 78	72 .5 27 86	75 .9 11 8	79 .2 96 36	82. 68 13 9	86. 06 61 5	89. 45 07	92. 83 47 1	96. 21 96 7	99. 60 46	10 2.9 89 36	10 6.3 73 23	10 9.7 57 88	11 3.1 42 86	11 6.5 27 7	11 9.9 12 08
15 .1 88 01	18 .6 17 37	22 .0 47 04	25 .4 76 87	28 .9 06 49	32 .3 35 64	35 .7 65 03	39 .1 94 89	42 .6 24 69	46 .0 53 83	49 .4 83 24	52 .9 13 03	56 .3 42 81	59 .7 72 33	63 .2 01 6	66 .6 31	70 .0 60 87	73 .4 90 65	76 .9 19 69	80 .3 49 2	83. 77 89 9	87. 20 87 5	90. 63 82 2	94. 06 73 4	97. 49 70 8	10 0.9 26 89	10 4.3 56 49	10 7.7 85 57	11 1.2 15 13	11 4.6 44 89	11 8.0 74 63	12 1.5 04 06
15 .3	18 .8	22 .3	25 .8	29 .2	32 .7	36 .2	39 .7	43 .1	46 .6	50 .1	53 .6	57 .0	60 .5	64 .0	67 .5	70 .9	74 .4	77 .9	81 .3	84. 87	88. 34	91. 82	95. 29	98. 76	10 2.2	10 5.7	10 9.1	11 2.6	11 6.1	11 9.6	12 3.0

86	60	34	09	83	57	32	06	80	55	29	03	78	52	26	00	75	49	23	98	26	70	13	54	98	44	18	92	67	41	15	90
27	49	93	38	68	71	06	54	96	07	31	76	21	49	58	96	44	83	9	19	4	8	3	5	6	33	68	74	03	47	9	15
15	19	22	26	29	33	36	40	43	47	50	54	57	61	64	68	71	75	78	82	85.	89.	93.	96.	10	10	10	11	11	11	12	12
.5	.1	.6	.1	.6	.1	.6	.2	.7	.2	.7	.2	.8	.3	.8	.3	.8	.4	.9	.4	96	48	00	51	0.0	3.5	7.0	0.5	4.1	7.6	1.1	4.6
83	02	21	40	59	78	97	16	35	53	72	91	10	29	48	67	86	05	24	43	21	12	00	87	37	56	75	94	13	32	51	70
78	63	66	7	6	26	2	27	28	99	83	87	93	79	5	48	56	54	26	14	9	3	6	7	79	86	82	46	36	41	44	27
15	19	22	26	30	33	37	40	44	47	51	54	58	62	65	69	72	76	79	83	87.	90.	94.	97.	10	10	10	11	11	11	12	12
.7	.3	.9	.4	.0	.5	.1	.7	.2	.8	.4	.9	.5	.1	.6	.2	.7	.3	.9	.4	04	61	17	73	1.3	4.8	8.4	1.9	5.5	9.1	2.6	6.2
80	43	07	71	34	97	60	24	87	50	14	77	41	04	67	31	94	57	21	84	81	16	48	77	01	65	28	91	54	18	81	45
63	94	43	02	4	39	74	35	91	81	04	66	24	55	46	02	67	89	1	55	2	8	6	9	4	07	2	27	71	36	78	04
15	19	23	26	30	34	37	41	44	48	52	55	59	62	66	70	73	77	80	84	88.	91.	95.	98.	10	10	10	11	11	12	12	12
.9	.5	.1	.8	.4	.0	.6	.2	.8	.4	.0	.6	.2	.8	.4	.0	.6	.3	.9	.5	13	73	34	95	2.5	6.1	9.7	3.3	6.9	0.5	4.2	7.8
76	84	92	00	07	14	22	30	38	45	53	61	68	76	83	91	99	07	14	22	02	82	55	26	60	68	76	83	91	99	06	14
8	5	16	17	86	85	74	61	6	6	07	19	68	67	64	68	57	18	49	42	3	3	8	5	79	52	26	34	17	25	53	38
16	19	23	27	30	34	38	41	45	49	52	56	59	63	67	70	74	78	81	85	89.	92.	96.	10	10	10	11	11	11	12	12	12
.1	.8	.4	.1	.7	.4	.0	.7	.3	.0	.6	.3	.9	.6	.2	.9	.6	.2	.9	.5	20	86	51	0.1	3.8	7.4	1.1	4.7	8.4	2.0	5.7	9.3
72	23	76	27	79	30	83	34	87	38	89	42	93	45	97	49	00	53	04	56	84	05	20	63	15	67	19	70	22	74	26	78
26	9	03	96	92	84	16	96	18	28	97	12	75	98	01	33	82	2	36	38	1	6	8	28	64		46	47	64	33	3	1
16	20	23	27	31	34	38	42	45	49	53	57	60	64	68	71	75	79	82	86	90.	93.	97.	10	10	10	11	11	11	12	12	13
.3	.0	.7	.4	.1	.8	.5	.2	.9	.6	.3	.0	.7	.4	.1	.8	.4	.1	.8	.5	28	97	67	1.3	5.0	8.7	2.4	6.1	9.8	3.5	7.2	0.9
67	62	58	54	50	45	41	37	33	28	24	20	16	12	07	03	99	95	90	86	26	85	42	69	65	61	57	52	48	43	40	35
	42	78	5	5	38	57	59	57	77	61	16	39	37	45	51	13	57	58	38	3	5		52	37	14	54	49	65	93	42	96
16	20	24	27	31	35	38	42	46	50	53	57	61	65	68	72	76	80	83	87	91.	95.	98.	10	10	11	11	11	12	12	12	13
.5	.3	.0	.7	.5	.2	.9	.7	.4	.2	.9	.6	.4	.1	.9	.6	.3	.1	.8	.6	35	09	83	2.5	6.3	0.0	3.7	7.5	1.2	5.0	8.7	2.4
60	00	40	79	19	58	98	38	77	16	56	96	36	75	14	54	94	34	73	12	25	22	17	71	10	50	90	29	68	08	48	87
97	18	2	99	58	4	2	21	75	98	58		1	72	86	18	15	15		52	1	3	6	11	32	38	31	2	66	33	48	76
16	20	24	28	31	35	39	43	47	50	54	58	62	65	69	73	77	81	84	88	92.	96.	99.	10	10	11	11	11	12	12	13	13
.7	.5	.3	.1	.8	.6	.4	.2	.0	.8	.5	.3	.1	.9	.7	.5	.2	.0	.8	.6	41	20	98	3.7	7.5	1.3	5.1	8.9	2.6	6.4	0.2	4.0
54	37	20	03	87	69	53	36	19	02	85	69	52	35	18	01	85	68	51	34	81	15	46	67	50	34	17	00	83	66	50	33
16	14	56	99	09	85	16	62	95	84	85	27	73	94	76	93	41	8	51	68			2	45	74	23	59	4	35	82	28	29
16	20	24	28	32	36	39	43	47	51	55	59	62	66	70	74	78	81	85	89	93.	97.	10	10	10	11	11	12	12	12	13	13
.9	.7	.5	.4	.2	.0	.9	.7	.5	.3	.2	.0	.8	.6	.5	.3	.1	.9	.8	.6	47	30	1.1	4.9	8.7	2.6	6.4	0.2	4.0	7.9	1.7	5.5

46 54	73 09	99 84	26 61	53 21	79 6	06 26	33 05	59 78	86 24	12 79	39 55	66 33	92 92	19 34	46 04	72 83	99 53	25 95	52 54	93 1	60 7	32 63	59 08	85 81	12 61	39 27	65 65	92 26	19 02	45 78	72 33
17 .1 38 1	21 .0 07 88	24 .8 77 92	28 .7 47 97	32 .6 17 87	36 .4 87 38	40 .3 57 33	44 .2 27 42	48 .0 97 44	51 .9 67 07	55 .8 36 87	59 .7 06 92	63 .5 76 99	67 .4 46 81	71 .3 16 44	75 .1 86 42	79 .0 56 5	82 .9 26 49	86 .7 96 06	90 .6 65 94	94. 53 6	98. 40 60 5	10 2.2 75 85	10 6.1 45 49	11 0.0 15 51	11 3.8 85 6	11 7.7 55 53	12 1.6 25 07	12 5.4 94 96	12 9.3 65 02	13 3.2 35 06	13 7.1 04 83
17 .3 28 89	21 .2 41 72	25 .1 54 77	29 .0 68 08	32 .9 81 12	36 .8 93 4	40 .8 06 55	44 .7 19 89	48 .6 32 83	52 .5 45 52	56 .4 58 34	60 .3 71 64	64 .2 84 85	68 .1 97 76	72 .1 10 17	76 .0 23 39	79 .9 36 72	83 .8 49 6	87 .7 62 19	91 .6 75 15	95. 58 84 7	99. 50 16 1	10 3.4 14 47	10 7.3 26 96	11 1.2 40 23	11 5.1 53 54	11 9.0 66 41	12 2.9 78 89	12 6.8 91 93	13 0.8 05 24	13 4.7 18 28	13 8.6 31 12
17 .5 18 9	21 .4 74 64	25 .4 30 44	29 .3 86 76	33 .3 42 82	37 .2 97 86	41 .2 54 09	45 .2 10 34	49 .1 66 18	53 .1 21 65	57 .0 77 37	61 .0 33 79	64 .9 89 6	68 .9 45 63	72 .9 00 78	76 .8 57 1	80 .8 13 25	84 .7 69 18	88 .7 24 45	92 .6 80 37	96. 63 67 6	10 0.5 92 53	10 4.5 48 44	10 8.5 03 72	11 2.4 60 13	11 6.4 16 14	12 0.3 72 15	12 4.3 27 28	12 8.2 83 34	13 2.2 39 65	13 6.1 95 46	14 0.1 51 2
17 .7 08 13	21 .7 06 41	25 .7 05 27	29 .7 03 97	33 .7 02 97	37 .7 00 77	41 .6 99 92	45 .6 98 51	49 .6 97 44	53 .6 95 45	57 .6 94 07	61 .6 93 08	65 .6 91 68	69 .6 90 39	73 .6 88 28	77 .6 87 48	81 .6 86 01	85 .6 84 97	89 .6 82 82	93 .6 81 68	97. 68 05 3	10 1.6 79 25	10 5.6 77 76	10 9.6 75 83	11 3.6 75 04	11 7.6 73 54	12 1.6 72 47	12 5.6 70 24	12 9.6 69 24	13 3.6 67 94	13 7.6 66 8	14 1.6 65 07
17 .8 96 59	21 .9 37 34	25 .9 78 87	30 .0 19 96	34 .0 61 57	38 .1 02 13	42 .1 43 76	46 .1 84 87	50 .2 26 39	54 .2 66 93	58 .3 08 32	62 .3 49 47	66 .3 90 93	70 .4 32 05	74 .4 72 68	78 .5 14 21	82 .5 55 41	86 .5 96 89	90 .6 37 32	94 .6 78 88	98. 71 99 8	10 2.7 61 48	10 6.8 02 42	11 0.8 43 29	11 4.8 84 68	11 8.9 25 97	12 2.9 67 36	12 7.0 07 77	13 1.0 49 38	13 5.0 90 47	13 9.1 32	14 3.1 72 75
18 .0 84 28	22 .1 67 49	26 .2 51 25	30 .3 34 92	34 .4 18 62	38 .5 01 93	42 .5 85 56	46 .6 69 26	50 .7 53	54 .8 36 07	58 .9 19 81	63 .0 03 36	67 .0 87 12	71 .1 70 61	75 .2 53 94	79 .3 37 48	83 .4 21 21	87 .5 04 92	91 .5 87 94	95 .6 71 69	99. 75 53	10 3.8 39 06	10 7.9 22 43	11 2.0 05 92	11 6.0 89 42	12 0.1 73 16	12 4.2 56 83	12 8.3 39 87	13 2.4 23 57	13 6.5 07 24	14 0.5 91	14 4.6 74 21
18 .2 71 18	22 .3 96 82	26 .5 22 62	30 .6 48 43	34 .7 74 17	38 .8 99 96	43 .0 25 71	47 .1 51 52	51 .2 77 32	55 .4 02 9	59 .5 28 7	63 .6 54 5	67 .7 80 3	71 .9 06 07	76 .0 31 71	80 .1 57 48	84 .2 83 29	88 .4 09 09	92 .5 34 69	96 .6 60 47	10 0.7 86 27	10 4.9 12 07	10 9.0 37 79	11 3.1 63 46	11 7.2 89 25	12 1.4 15 06	12 5.5 40 86	12 9.6 66 49	13 3.7 92 23	13 7.9 18 04	14 2.0 43 84	14 6.1 69 48
18 .4	22 .6	26 .7	30 .9	35 .1	39 .2	43 .4 64	47 .6	51 .7	55 .9	60 .1	64 .3	68 .4	72 .6	76 .8	80 .9	85 .1	89 .3	93 .4	97 .6	10 1.8	10 5.9	11 0.1	11 4.3	11 8.4	12 2.6	12 6.8	13 0.9	13 5.1	13 9.3	14 3.4	14 7.6

57	25	92	60	28	96		31	99	67	35	02	70	38	06	74	41	09	77	45	12	80	48	16	84	51	19	87	55	22	90	58
32	1	88	66	44	22		79	57	35	13	91	69	47	25	04	82	6	38	16	94	72	5	29	07	85	63	41	19	97	75	54

Table S17. *Experimental data of the hydraulic support test platform corresponding to Figure 23(c).*

Balance jack load/(kg)		Declined angle/(°)				
		3	6	9	12	15
Canopy Load/(kg)	50	14.76	16.34	17.94	19.44	20.93
	100	25.52	28.67	31.89	34.88	37.86
	150	38.28	44.01	48.83	53.31	57.8
	200	53.04	59.35	65.78	71.75	77.73
	250	65.8	73.69	81.72	89.19	96.66
	300	78.56	88.02	97.66	106.63	115.59
	350	91.31	102.36	113.61	124.07	134.52
	400	104.07	116.7	129.55	141.5	153.46

Table S18. *Theoretical simulation data corresponding to Figure 23(d).*

53.5 84 86	65.6 84 67	77.7 84 48	89.8 84 28	101.98 40 9	114.08 39	126.18 37 1	138.28 35 2	150.38 33 2	162.48 31 3	174.58 29 4	186.68 27 5	198.78 25 5	210.88 23 6	222.98 21 7	235.08 19 8	247.18 17 8	259.28 15 9	271.38 14	283.48 12 1	295.58 10 1	307.68 08 2	319.78 06 3	331.88 04 4	343.98 02 4	356.08 00 5	368.17 98 6	380.27 96 7	392.37 94 7	404.47 92 8	416.57 90 9	428.67 89
53.6 90 22	65.8 13 8	77.9 37 56	90.0 61 33	102.18 50 7	114.30 77 6	126.43 15 2	138.55 52 9	150.67 90 3	162.80 23 7	174.92 58 5	187.04 96 2	199.17 33 9	211.29 70 7	223.42 06	235.54 42 9	247.66 80 6	259.79 18 2	271.91 46 1	284.03 82 6	296.16 20 3	308.28 58	320.40 95 5	332.53 25 8	344.65 63 5	356.78 01 2	368.90 37 2	381.02 69 3	393.15 06 7	405.27 44 3	417.39 81 9	429.52 17 7
53.7 93 1	65.9 40 24	78.0 86 92	90.2 34 41	102.38 13 9	114.52 61 4	126.67 33 5	138.82 08 1	150.96 74 9	163.11 41 3	175.26 03 9	187.40 79	199.55 49 4	211.70 24 2	223.84 87 6	235.99 55 8	248.14 29 9	260.29 03 5	272.43 52 8	284.58 19 5	296.72 94 6	308.87 63	321.02 37 3	333.16 90 3	345.31 64 9	357.46 38 1	369.61 09 1	381.75 65 2	393.90 35	406.05 09 9	418.19 76 7	430.34 48 1
53.8 93 5	66.0 62 98	78.2 32 72	90.4 02 91	102.57 27 6	114.73 95 7	126.90 97 9	139.07 97 1	151.24 99 1	163.41 84 5	175.58 72 4	187.75 78 2	199.92 70 8	212.09 78 5	224.26 57 5	236.43 64 2	248.60 60 2	260.77 65	272.94 35 5	285.11 29 2	297.28 33 5	309.45 27 9	321.62 30 3	333.79 05 3	345.96 11 4	358.13 04 8	370.30 14 6	382.46 87 5	394.63 86 1	406.80 88	418.97 85 3	431.14 80 1
53.9 91 42	66.1 82 21	78.3 75 47	90.5 66 79	102.75 91 7	114.94 80 4	127.14 06 7	139.33 19 3	151.52 54 4	163.71 53 4	175.90 66 3	188.09 85 7	200.29 09 6	212.48 33 6	224.67 26 8	236.86 61 8	249.05 75 3	261.25 02 5	273.43 94 2	285.63 13 6	297.82 29 3	310.01 58 2	322.20 74 5	334.39 71 4	346.58 97 7	358.78 13 3	370.97 46 7	383.16 36 3	395.35 60 1	407.54 73 3	419.74 05 9	431.93 13 8
54.0 86 86	66.2 98 86	78.5 13 76	90.7 26 9	102.94 06 2	115.15 15 5	127.36 51 2	139.57 87	151.79 35 4	164.00 47 8	176.21 80 3	188.43 08 5	200.64 56 5	212.85 89 5	225.06 97	237.28 42 9	249.49 82 9	261.71 16 1	273.92 28 9	286.13 65 2	298.34 94 5	310.56 43 5	322.77 7	334.98 88 5	347.20 18 7	359.41 62 4	371.63 05 1	383.84 11 5	396.05 48 7	408.26 80 1	420.48 29	432.69 49

54.179 82	66.4 1304	78.6 482	90.8 8322	103. 1171	115. 3500 6	127. 5838 7	139. 8191	152. 0542	164. 2867 9	176. 5206	188. 7552 6	200. 9905 1	213. 2246 2	225. 4567 9	237. 6917 3	249. 927	262. 1608 7	274. 3939 6	286. 6279	298. 8628 1	311. 0980 2	323. 3316 7	335. 5649	347. 7989 5	360. 0342 7	372. 269	384. 5013 1	396. 7352	408. 9702 1	421. 2053 8	433. 4385 9
54.270 31	66.5 2445	78.7 7951	91.0 3461	103. 2890 3	115. 5427	127. 7974	140. 0526	152. 3075 9	164. 5613 5	176. 8156 3	189. 0707 1	201. 3258 5	213. 5803 8	225. 8338 9	238. 0887 7	250. 3439 5	262. 5988 2	274. 8526	287. 1069 4	299. 3620 7	311. 6171 6	323. 8714 6	336. 1251 9	348. 3801 8	360. 6353 8	372. 8901 5	385. 1437 2	397. 3981 4	409. 6532 4	421. 9083	434. 1624 5
54.358 31	66.6 3248	78.9 073	91.1 8216	103. 4565 1	115. 7301 5	128. 0046 8	140. 2796 4	152. 5543 9	164. 8282 9	177. 1024 6	189. 3773 1	201. 6522	213. 9265 2	226. 2002 7	238. 4749 1	250. 7498 6	263. 0245	275. 2982 8	287. 5726	299. 8474 9	312. 1234	324. 3965 2	336. 6703 9	348. 9451 4	361. 2201	373. 4946 2	385. 7682 7	398. 0426 2	410. 3174 8	422. 5923	434. 8664 7
54.443 85	66.7 369	79.0 3135	91.3 2584	103. 6192 8	115. 9117 2	128. 2058 7	140. 5004 7	152. 7945 7	165. 0874 6	177. 3809 3	189. 6753 5	201. 9698 7	214. 2635 7	226. 5557	238. 8499 8	251. 1445 7	263. 4383 7	275. 7313 3	288. 0246	300. 3194 3	312. 6139	324. 9072 4	337. 2000 8	349. 4942	361. 7879	374. 0829 1	386. 3753 4	398. 6688 4	410. 9633 2	423. 2577 5	435. 5507 9
54.526 92	66.8 3821	79.1 5211	91.4 6518	103. 7779 7	116. 0881 1	128. 4013 8	140. 7152 3	153. 0274	165. 3391 8	177. 6520 3	189. 9644 6	202. 2784	214. 5908	226. 9008 6	239. 2144 3	251. 5280 9	263. 8404	276. 1516 6	288. 4646 6	300. 7774 4	313. 0913 6	325. 4031 6	337. 7148 5	350. 0271 6	362. 3409 8	374. 6542	386. 9643 2	399. 2771 6	411. 5902 7	423. 9041 2	436. 2153 8
54.607 52	66.9 3699	79.2 6948	91.5 9978	103. 9317 5	116. 2595 5	128. 5916	140. 9227 2	153. 2543	165. 5834 7	177. 9144 9	190. 2451 8	202. 5772	214. 9081 3	227. 2361 2	239. 5685	251. 8991 3	264. 2311 4	276. 5596 2	288. 8912 7	301. 2217 8	313. 5540 8	325. 8842 3	338. 2133 3	350. 5449 7	362. 8761 8	375. 2081 5	387. 5359 2	399. 8678 2	412. 1983	424. 5307 4	436. 8601 6
54.6	67.0	79.3	91.7	104. 08	116. 42	128. 77	141.	153. 47	165.	178. 16	190.	202. 86	215. 21	227. 56	239. 91	252. 25	264. 60	276. 95	289. 30	301. 65	314. 00	326. 35	338.	351. 04	363. 39	375.	388. 09	400. 43	412. 78	425. 13	437. 48

85 63	33 28	82 4	31 24	05 7	60 1	58 9	12 38	40 5	82 03	82 7	51 81	63 5	55 1	14 3	12 9	93 1	94 8	51 5	39 1	33 3	19 6	03 8	69 66	67 9	48 8	74 47	01 1	93 5	82 9	74 7	50 5
54 .7 61 25	67 .1 26 59	79 .4 91 71	91 .8 58 56	10 4. 22 43 8	11 6. 58 74 8	12 8. 95 32 5	14 1. 31 93 7	15 3. 68 63 1	16 6. 04 96 4	17 8. 41 43 7	19 0. 78 14 2	20 3. 14 67 9	21 5. 51 28 9	22 7. 87 67 5	24 0. 24 21 8	25 2. 60 86 3	26 4. 97 53 3	27 7. 33 81 8	28 9. 70 35 4	30 2. 07 05 5	31 4. 43 57 5	32 6. 80 15 4	33 9. 16 48 8	35 1. 53 17 6	36 3. 89 79 3	37 6. 26 37 6	38 8. 62 68 2	40 0. 99 25 9	41 3. 35 94 1	42 5. 72 46 8	43 8. 08 99 7
54 .8 34 35	67 .2 15 85	79 .5 98 24	91 .9 81 08	10 4. 36 31 8	11 6. 74 37 6	12 9. 12 53 6	14 1. 50 83	15 3. 89 10 4	16 6. 27 14 5	17 8. 65 29	19 1. 03 57 2	20 3. 41 84 7	21 5. 80 02 5	22 8. 18 13 5	24 0. 56 30 9	25 2. 94 60 3	26 5. 32 86 4	27 7. 70 86 8	29 0. 09 05 5	30 2. 47 34	31 4. 85 6	32 7. 23 76 6	33 9. 61 81 1	35 2. 00 08 3	36 4. 38 37 5	37 6. 76 54 3	38 9. 14 59 8	40 1. 52 80 6	41 3. 91 08 8	42 6. 29 32 9	43 8. 67 48 1
54 .9 04 94	67 .3 02 52	79 .7 00 82	92 .0 99 16	10 4. 49 69 8	11 6. 89 39	12 9. 29 19	14 1. 69 03 4	15 4. 08 85 7	16 6. 48 57 1	17 8. 88 33 3	19 1. 28 16 6	20 3. 68 00 3	21 6. 07 77 4	22 8. 47 49 1	24 0. 87 30 3	25 3. 27 14 6	26 5. 66 95 8	27 8. 06 65 8	29 0. 46 43 7	30 2. 86 27 4	31 5. 26 10 7	32 7. 65 86 6	34 0. 05 58 8	35 2. 45 41	36 4. 85 25 4	37 7. 25 05 4	38 9. 64 74 7	40 2. 04 52 9	41 4. 44 36 3	42 6. 84 19 2	43 9. 23 95 1
54 .9 73	67 .3 85 96	79 .7 99 62	92 .2 13 34	10 4. 62 65 2	11 7. 03 88 2	12 9. 45 21 9	14 1. 86 6	15 4. 27 95 9	16 6. 69 21	17 9. 10 50 9	19 1. 51 87 8	20 3. 93 25 2	21 6. 34 56	22 8. 75 81	24 1. 17 15 9	25 3. 58 53 9	26 5. 99 88 7	27 8. 41 14 2	29 0. 82 45 1	30 3. 23 82 5	31 5. 65 19 4	32 8. 06 49 3	34 0. 47 74 4	35 2. 89 10 3	36 5. 30 48 4	37 7. 71 82 1	39 0. 13 05 1	40 2. 54 36 9	41 4. 95 74 1	42 7. 37 10 7	43 9. 78 40 2
55 .0 38 57	67 .4 66 23	79 .8 94 73	92 .3 23 67	10 4. 75 18 7	11 7. 17 85 6	12 9. 60 63 3	14 2. 03 53 6	15 4. 46 41 9	16 6. 89 06 9	17 9. 31 82 6	19 1. 74 71 9	20 4. 17 60 5	21 6. 60 39 4	22 9. 03 03 3	24 1. 45 90 4	25 3. 88 80 8	26 6. 31 59 4	27 8. 74 31 9	29 1. 17 11 2	30 3. 59 99 7	31 6. 02 88 9	32 8. 45 64 4	34 0. 88 29 6	35 3. 31 18	36 5. 74 08 5	37 8. 16 85 5	39 0. 59 52 7	40 3. 02 34 9	41 5. 45 24 4	42 7. 88 09 2	44 0. 30 85 6
55 .1 01 64	67 .5 43 89	79 .9 85 93	92 .4 29 61	10 4. 87 22 4	11 7. 31 21 9	12 9. 75 49 1	14 2. 19 79	15 4. 64 16 4	16 7. 08 18	17 9. 52 33 9	19 1. 96 73 1	20 4. 40 94 5	21 6. 85 25	22 9. 29 23 4	24 1. 73 58 6	25 4. 17 91 5	26 6. 62 15 1	27 9. 06 22 5	29 1. 50 52 8	30 3. 94 75 2	31 6. 39 14	32 8. 83 29 6	34 1. 27 31 3	35 3. 71 69 2	36 6. 15 98 7	37 8. 60 25 4	39 1. 04 25 2	40 3. 48 51 9	41 5. 92 89	42 8. 37 08 2	44 0. 81 31 2

55.1622	67.617 48	80.074 29	92.530 74	104.98761	117.44064	129.89818	142.35379	154.81158	167.26538	179.72096	192.17836	204.63415	217.09104	229.54432	242.00204	254.45768	266.91524	279.36877	291.82561	304.28151	316.73891	329.19444	341.64827	354.10611	366.56158	379.01917	391.47222	403.92915	416.38553	428.84229	441.29762
55.220225	67.688 08	80.158 99	92.627 7	105.09795	117.56405	130.03 45	142.50405	154.97397	167.44142	179.91079	192.37971	204.85015	217.31952	229.78625	242.25656	254.72559	267.19639	279.66273	292.13205	304.60 25	317.07153	329.54084	342.00832	354.47 82	366.94768	379.41819	391.88432	404.35462	416.82318	429.29414	441.762
55.275 78	67.756 15	80.239 19	92.721 39	105.20324	117.68243	130.16481	142.64779	155.12 91	167.60989	180.09 18	192.57325	205.05637	217.53791	230.01805	242.49943	254.98223	267.46494	279.94407	292.42558	304.90867	317.39021	329.87 21	342.35292	354.83414	367.31713	379.79955	392.27876	404.76057	417.24273	429.72581	442.20621
55.328 77	67.821 63	80.315 92	92.810 26	105.30351	117.79574	130.28971	142.78415	155.27 81	167.77077	180.26 4	192.75827	205.25264	217.74618	230.23865	242.73228	255.22671	267.72083	280.21276	292.70629	305.20065	317.69491	330.18817	342.68083	355.17476	367.66921	380.16 32	392.65544	405.14865	417.64 3	430.13 73	442.63017
55.379 23	67.883 92	80.389 28	92.894 68	105.39955	117.90372	130.40877	142.91427	155.41956	167.92398	180.42867	192.93405	205.43949	217.94433	230.44861	242.95379	255.45928	267.96445	280.46872	292.97357	305.47 9	317.98438	330.48908	342.99349	355.49878	368.00428	380.50934	393.01 35	405.51837	418.02377	430.52913	443.03383
55.427 15	67.942 55	80.458 84	92.975 17	105.49098	118.00554	130.52153	143.03797	155.55419	168.06912	180.58464	193.10096	205.61732	218.13288	230.64782	243.16393	255.68035	268.19644	280.71 12	293.22695	305.74331	318.25963	330.77512	343.29009	355.80631	368.32275	380.83867	393.35333	405.86913	418.38547	430.90176	443.41716
55.4	67.9	80.5	93.0	105.57	118.10	130.62	143.	155.68	168.20	180.73	193.25	205.78	218.	230.83	243.36	255.89	268.41	280.94	293.46	305.99	318.52	331.04	343.57	356.09	368.62	381.15	393.67	406.20	418.72	431.25	443.78

72 53	98 13	24 42	51 55	78 3	16 2	82 6	15 55	14 5	65 7	21 1	92 4	60 7	31 19	61 1	29 6	01 6	59 2	07 3	67 4	39 2	04 9	61 9	06 6	76 8	48 3	05 3	49 7	12 5	83 9	46 8	02 7
55 .5 15 39	68 .0 50 66	80 .5 86 16	93 .1 23 32	10 5. 65 96 3	11 8. 19 26 2	13 0. 72 94 8	14 3. 26 64 4	15 5. 80 20 3	16 8. 33 64 3	18 0. 87 16 4	19 3. 40 91 4	20 5. 94 46 4	21 8. 48 08 6	23 1. 01 42	24 3. 55 13 9	25 6. 08 79 8	26 8. 62 38 7	28 1. 15 76 2	29 3. 69 34 9	30 6. 23 09	31 8. 76 62 7	33 1. 30 21	34 3. 83 58 8	35 6. 37 33 2	36 8. 90 94 8	38 1. 44 56 3	39 3. 97 89 1	40 6. 51 52 3	41 9. 05 23 9	43 1. 58 78 8	44 4. 12 31 5
55 .5 55 73	68 .0 99 47	80 .6 45 12	93 .1 90 27	10 5. 73 63 8	11 8. 27 85 6	13 0. 82 51 6	14 3. 36 99 5	15 5. 91 58 3	16 8. 45 87 1	18 1. 00 35 7	19 3. 54 97 2	20 6. 09 45 2	21 8. 63 97	23 1. 18 21 9	24 3. 72 89 5	25 6. 27 35 2	26 8. 81 95	28 1. 36 18 7	29 3. 90 75 1	30 6. 45 31 5	31 8. 99 83 2	33 1. 54 28 4	34 4. 08 59 3	35 6. 63 27 1	36 9. 17 71 9	38 1. 72 30 8	39 4. 26 51 6	40 6. 81 12 7	41 9. 35 64 2	43 1. 90 20 7	44 4. 44 58 2
55 .5 93 53	68 .1 45 54	80 .7 00 1	93 .2 53 24	10 5. 80 80 7	11 8. 35 94 5	13 0. 91 43 4	14 3. 46 75 6	15 6. 02 20 7	16 8. 57 34 1	18 1. 12 75 4	19 3. 68 08 5	20 6. 23 51 8	21 8. 78 84 3	23 1. 34 00 6	24 3. 89 46 2	25 6. 44 81 1	26 9. 00 24 8	28 1. 55 34 8	29 4. 10 81 5	30 6. 66 12 9	31 9. 21 57 7	33 1. 76 84 1	34 4. 32 08 2	35 6. 87 49 1	36 9. 42 87 1	38 1. 98 28 3	39 4. 53 37 2	40 7. 08 85 5	41 9. 64 16 9	43 2. 19 62 5	44 4. 74 82 6
55 .6 28 81	68 .1 89 07	80 .7 51 11	93 .3 12 84	10 5. 87 47	11 8. 43 52 8	13 0. 99 69	14 3. 55 87 5	15 6. 12 07 3	16 8. 68 05 2	18 1. 24 24 8	19 3. 80 38 3	20 6. 36 58 6	21 8. 92 70 5	23 1. 48 76 8	24 4. 04 90 1	25 6. 61 09 4	26 9. 17 28 3	28 1. 73 24 6	29 4. 29 44 6	30 6. 85 60 2	31 9. 41 80 6	33 1. 97 88 2	34 4. 53 99 7	35 7. 10 11 6	36 9. 66 31 5	38 2. 22 48 8	39 4. 78 45 8	40 7. 34 64 4	41 9. 90 81 8	43 2. 47 02 1	44 5. 03 04 8
55 .6 61 56	68 .2 29 92	80 .7 98 83	93 .3 67 75	10 5. 93 64 6	11 8. 50 53 2	13 1. 07 40 6	14 3. 64 29 7	15 6. 21 18 9	16 8. 78 00 5	18 1. 34 89 4	19 3. 91 78 5	20 6. 48 67 7	21 9. 05 55 6	23 1. 62 39 1	24 4. 19 27 4	25 6. 76 16 5	26 9. 33 05 6	28 1. 89 87 9	29 4. 46 76 2	30 7. 03 65 3	31 9. 60 54 4	33 2. 17 40 6	34 4. 74 25 4	35 7. 31 14 2	36 9. 88 03 3	38 2. 44 92 4	39 5. 01 75 7	40 7. 58 62 8	42 0. 15 52	43 2. 72 41 1	44 5. 29 24 7
55 .6 91 78	68 .2 67 34	80 .8 42 91	93 .4 18 47	10 5. 99 40 3	11 8. 56 96	13 1. 14 51 6	14 3. 72 07 2	15 6. 29 62 9	16 8. 87 18 5	18 1. 44 74 2	19 4. 02 29 8	20 6. 59 85 4	21 9. 17 41 1	23 1. 74 96 7	24 4. 32 52 3	25 6. 90 08	26 9. 47 63 6	28 2. 05 19 2	29 4. 62 74 9	30 7. 20 30 5	31 9. 77 86 1	33 2. 35 41 8	34 4. 92 97 4	35 7. 50 53	37 0. 08 08 7	38 2. 65 64 3	39 5. 23 19 9	40 7. 80 75 6	42 0. 38 31 2	43 2. 95 86 8	44 5. 53 42 5

Table S19. *Experimental data of the hydraulic support test platform corresponding to Figure 23(d).*

Upright column load/(kg)		Declined angle/(°)				
		3	6	9	12	15
Canopy Load/(kg)	50	54.03	54.63	55.24	55.68	56.03
	100	108.05	109.26	110.48	111.35	112.06
	150	162.08	163.9	165.72	167.03	168.09
	200	216.1	218.53	220.96	222.71	224.12
	250	270.13	273.16	276.19	278.38	280.15
	300	324.16	327.79	331.43	334.06	336.18
	350	378.18	382.43	386.67	389.73	392.21
	400	432.21	437.06	441.91	445.41	448.23

Table S20. *Theoretical simulation data corresponding to Figure 23(e).*

18.4	20.2	22.0	23.8	25.6	27.4	29.2	31.0	32.8	34.6	36.4	38.2	40.0	41.8	43.6	45.5	47.3	49.1	50.9	52.7	54.5	56.3	58.1	59.9	61.7	63.5	65.3	67.1	68.9	70.7	72.5	74.4
04	11	17	24	30	37	43	50	56	63	69	75	82	88	95	01	08	14	21	27	34	40	46	53	59	66	72	79	85	92	98	04
99	45	9	35	8	25	7	15	61	06	51	96	41	86	32	77	22	67	12	57	03	48	93	38	83	28	74	19	64	09	54	99
18.5	20.3	22.1	23.9	25.7	27.5	29.3	31.1	32.9	34.7	36.5	38.4	40.2	42.0	43.8	45.6	47.4	49.2	51.0	52.8	54.6	56.4	58.2	60.0	61.8	63.6	65.5	67.3	69.1	70.9	72.7	74.5
32	39	45	52	58	64	71	77	84	90	97	03	10	16	23	29	35	42	48	55	61	68	74	81	87	93	00	06	13	19	26	32
69	14	59	04	49	94	4	85	3	75	2	65	11	56	01	46	91	36	82	27	72	17	62	07	52	98	43	88	33	78	23	69
18.6	20.4	22.2	24.0	25.8	27.6	29.4	31.3	33.1	34.9	36.7	38.5	40.3	42.1	43.9	45.7	47.5	49.3	51.1	52.9	54.7	56.5	58.3	60.2	62.0	63.8	65.6	67.4	69.2	71.0	72.8	74.6
60	66	73	79	86	92	99	05	11	18	24	31	37	44	50	57	63	70	76	82	89	95	02	08	15	21	28	34	41	47	53	60
38	83	28	73	19	64	09	54	99	44	9	35	8	25	7	15	6	06	51	96	41	86	31	77	22	67	12	57	02	48	93	38
18.7	20.5	22.4	24.2	26.0	27.8	29.6	31.4	33.2	35.0	36.8	38.6	40.4	42.2	44.0	45.8	47.6	49.4	51.3	53.1	54.9	56.7	58.5	60.3	62.1	63.9	65.7	67.5	69.3	71.1	72.9	74.7
88	94	00	07	13	20	26	33	39	46	52	59	65	71	78	84	91	97	04	10	17	23	30	36	42	49	55	62	68	75	81	88
07	52	97	43	88	33	78	23	68	14	59	04	49	94	39	85	3	75	2	65	1	56	01	46	91	36	81	27	72	17	62	07
18.9	20.7	22.5	24.3	26.1	27.9	29.7	31.5	33.3	35.1	36.9	38.7	40.5	42.3	44.2	46.0	47.8	49.6	51.4	53.2	55.0	56.8	58.6	60.4	62.2	64.0	65.8	67.6	69.4	71.3	73.1	74.9
15	22	28	35	41	48	54	60	67	73	80	86	93	99	06	12	18	25	31	38	44	51	57	64	70	77	83	89	96	02	09	15
76	22	67	12	57	02	47	93	38	83	28	73	18	64	09	54	99	44	89	34	8	25	7	15	6	05	51	96	41	86	31	76
19.0	20.8	22.6	24.4	26.2	28.0	29.8	31.6	33.4	35.3	37.1	38.9	40.7	42.5	44.3	46.1	47.9	49.7	51.5	53.3	55.1	56.9	58.7	60.5	62.3	64.2	66.0	67.8	69.6	71.4	73.2	75.0
43	49	56	62	69	75	82	88	95	01	07	14	20	27	33	40	46	53	59	66	72	78	85	91	98	04	11	17	24	30	37	43
46	91	36	81	26	72	17	62	07	52	97	42	88	33	78	23	68	13	59	04	49	94	39	84	3	75	2	65	1	55	01	46
19.1	20.9	22.7	24.5	26.3	28.2	30.0	31.8	33.6	35.4	37.2	39.0	40.8	42.6	44.4	46.2	48.0	49.8	51.6	53.4	55.3	57.1	58.9	60.7	62.5	64.3	66.1	67.9	69.7	71.5	73.3	75.1
71	77	84	90	96	03	09	16	22	29	35	42	48	55	61	67	74	80	87	93	00	06	13	19	25	32	38	45	51	58	64	71
15	6	05	5	96	41	86	31	76	21	67	12	57	02	47	92	38	83	28	73	18	63	09	54	99	44	89	34	79	25	7	15
19.2	21.1	22.9	24.7	26.5	28.3	30.1	31.9	33.7	35.5	37.3	39.1	40.9	42.7	44.5	46.3	48.2	50.0	51.8	53.6	55.4	57.2	59.0	60.8	62.6	64.4	66.2	68.0	69.8	71.6	73.4	75.2
							44																							

98	05	11	18	24	31	37		50	56	63	69	76	82	89	95	02	08	14	21	27	34	40	47	53	60	66	73	79	85	92	98
84	29	75	2	65	1	55		46	91	36	81	26	71	17	62	07	52	97	42	87	33	78	23	68	13	58	04	49	94	39	84
19	21	23	24	26	28	30	32	33	35	37	39	41	42	44	46	48	50	51	53	55	57	59	60	62	64	66	68	70	71	73	75
.4	.2	.0	.8	.6	.4	.2	.0	.8	.6	.4	.2	.1	.9	.7	.5	.3	.1	.9	.7	.5	.3	.1	.9	.7	.5	.3	.2	.0	.8	.6	.4
26	32	39	45	52	58	65	71	78	84	91	97	03	10	16	23	29	36	42	49	55	62	68	74	81	87	94	00	07	13	20	26
54	99	44	89	34	79	24	7	15	6	05	5	95	41	86	31	76	21	66	12	57	02	47	92	37	83	28	73	18	63	08	54
19	21	23	24	26	28	30	32	34	35	37	39	41	43	44	46	48	50	52	53	55	57	59	61	62	64	66	68	70	71	73	75
.5	.3	.1	.9	.7	.5	.3	.1	.0	.8	.6	.4	.2	.0	.8	.6	.4	.2	.0	.8	.6	.4	.2	.1	.9	.7	.5	.3	.1	.9	.7	.5
54	60	67	73	80	86	92	99	05	12	18	25	31	38	44	51	57	63	70	76	83	89	96	02	09	15	21	28	34	41	47	54
23	68	13	58	03	49	94	39	84	29	74	2	65	1	55		45	91	36	81	26	71	16	61	07	52	97	42	87	32	78	23
19	21	23	25	26	28	30	32	34	35	37	39	41	43	44	46	48	50	52	54	55	57	59	61	63	64	66	68	70	72	73	75
.6	.4	.2	.1	.9	.7	.5	.3	.1	.9	.7	.5	.3	.1	.9	.7	.5	.3	.1	.0	.8	.6	.4	.2	.0	.8	.6	.4	.2	.0	.8	.6
81	88	94	01	07	14	20	27	33	39	46	52	59	65	72	78	85	91	98	04	10	17	23	30	36	43	49	56	62	69	75	81
92	37	82	28	73	18	63	08	53	99	44	89	34	79	24	69	15	6	05	5	95	4	86	31	76	21	66	11	57	02	47	92
19	21	23	25	27	28	30	32	34	36	37	39	41	43	45	46	48	50	52	54	55	57	59	61	63	64	66	68	70	72	74	75
.8	.6	.4	.2	.0	.8	.6	.4	.2	.0	.8	.6	.4	.2	.0	.9	.7	.5	.3	.1	.9	.7	.5	.3	.1	.9	.7	.5	.3	.1	.0	.8
09	16	22	28	35	41	48	54	61	67	74	80	87	93	99	06	12	19	25	32	38	45	51	58	64	70	77	83	90	96	03	09
61	06	52	97	42	87	32	77	23	68	13	58	03	48	94	39	84	29	74	19	65	1	55		45	9	36	81	26	71	16	61
19	21	23	25	27	28	30	32	34	36	38	39	41	43	45	47	48	50	52	54	56	57	59	61	63	65	66	68	70	72	74	75
.9	.7	.5	.3	.1	.9	.7	.5	.3	.1	.0	.8	.6	.4	.2	.0	.8	.6	.4	.2	.0	.8	.6	.4	.2	.0	.9	.7	.5	.3	.1	.9
37	43	50	56	63	69	76	82	88	95	01	08	14	21	27	34	40	46	53	59	66	72	79	85	92	98	05	11	17	24	30	37
31	76	21	66	11	56	02	47	92	37	82	27	73	18	63	08	53	98	44	89	34	79	24	69	14	6	05	5	95	4	85	31
20	21	23	25	27	29	30	32	34	36	38	39	41	43	45	47	48	50	52	54	56	58	59	61	63	65	67	68	70	72	74	76
.0	.8	.6	.4	.2	.0	.9	.7	.5	.3	.1	.9	.7	.5	.3	.1	.9	.7	.5	.3	.1	.0	.8	.6	.4	.2	.0	.8	.6	.4	.2	.0
65	71	77	84	90	97	03	10	16	23	29	35	42	48	55	61	68	74	81	87	94	00	06	13	19	26	32	39	45	52	58	65
	45	9	35	81	26	71	16	61	06	51	97	42	87	32	77	22	68	13	58	03	48	93	39	84	29	74	19	64	1	55	
20	21	23	25	27	29	31	32	34	36	38	40	41	43	45	47	49	50	52	54	56	58	59	61	63	65	67	68	70	72	74	76
.1	.9	.8	.6	.4	.2	.0	.8	.6	.4	.2	.0	.8	.6	.4	.2	.0	.9	.7	.5	.3	.1	.9	.7	.5	.3	.1	.9	.7	.5	.3	.1
92	99	05	12	18	24	31	37	44	50	57	63	70	76	83	89	95	02	08	15	21	28	34	41	47	53	60	66	73	79	86	92
69	14	59	05	5	95	4	85	3	76	21	66	11	56	01	47	92	37	82	27	72	18	63	08	53	98	43	88	34	79	24	69
20	22	23	25	27	29	31	32	34	36	38	40	41	43	45	47	49	51	52	54	56	58	60	61	63	65	67	69	70	72	74	76
.3	.1	.9	.7	.5	.3	.1	.9	.7	.5	.3	.1	.9	.8	.6	.4	.2	.0	.8	.6	.4	.2	.0	.8	.6	.4	.2	.0	.9	.7	.5	.3
								72																						

20	26	33	39	46	52	59	65		78	84	91	97	04	10	17	23	30	36	42	49	55	62	68	75	81	88	94	01	07	13	20
38	84	29	74	19	64	09	55		45	9	35	8	26	71	16	61	06	51	96	42	87	32	77	22	67	13	58	03	48	93	38
20	22	24	25	27	29	31	33	34	36	38	40	42	43	45	47	49	51	52	54	56	58	60	61	63	65	67	69	71	72	74	76
.4	.2	.0	.8	.6	.4	.2	.0	.8	.7	.5	.3	.1	.9	.7	.5	.3	.1	.9	.7	.5	.3	.1	.9	.8	.6	.4	.2	.0	.8	.6	.4
48	54	60	67	73	80	86	93	99	06	12	19	25	31	38	44	51	57	64	70	77	83	90	96	02	09	15	22	28	35	41	48
08	53	98	43	88	33	79	24	69	14	59	04	5	95	4	85	3	75	21	66	11	56	01	46	92	37	82	27	72	17	63	08
20	22	24	25	27	29	31	33	35	36	38	40	42	44	45	47	49	51	53	54	56	58	60	62	63	65	67	69	71	72	74	76
.5	.3	.1	.9	.8	.6	.4	.2	.0	.8	.6	.4	.2	.0	.8	.6	.4	.2	.0	.8	.7	.5	.3	.1	.9	.7	.5	.3	.1	.9	.7	.5
75	82	88	95	01	08	14	20	27	33	40	46	53	59	66	72	79	85	91	98	04	11	17	24	30	37	43	49	56	62	69	75
77	22	67	12	58	03	48	93	38	83	29	74	19	64	09	54		45	9	35	8	25	71	16	61	06	51	96	41	87	32	77
20	22	24	26	27	29	31	33	35	36	38	40	42	44	45	47	49	51	53	55	56	58	60	62	64	65	67	69	71	73	74	76
.7	.5	.3	.1	.9	.7	.5	.3	.1	.9	.7	.5	.3	.1	.9	.8	.6	.4	.2	.0	.8	.6	.4	.2	.0	.8	.6	.4	.2	.0	.8	.7
03	09	16	22	29	35	42	48	55	61	67	74	80	87	93	00	06	13	19	26	32	38	45	51	58	64	71	77	84	90	97	03
46	91	37	82	27	72	17	62	08	53	98	43	88	33	78	24	69	14	59	04	49	95	4	85	3	75	2	66	11	56	01	46
20	22	24	26	28	29	31	33	35	37	38	40	42	44	46	47	49	51	53	55	56	58	60	62	64	65	67	69	71	73	75	76
.8	.6	.4	.2	.0	.8	.6	.4	.2	.0	.8	.7	.5	.3	.1	.9	.7	.5	.3	.1	.9	.7	.5	.3	.1	.9	.7	.6	.4	.2	.0	.8
31	37	44	50	56	63	69	76	82	89	95	02	08	15	21	27	34	40	47	53	60	66	73	79	85	92	98	05	11	18	24	31
15	61	06	51	96	41	86	32	77	22	67	12	57	03	48	93	38	83	28	74	19	64	09	54	99	45	9	35	8	25	7	15
20	22	24	26	28	29	31	33	35	37	39	40	42	44	46	48	49	51	53	55	57	58	60	62	64	66	67	69	71	73	75	76
.9	.7	.5	.3	.1	.9	.7	.6	.4	.2	.0	.8	.6	.4	.2	.0	.8	.6	.4	.2	.0	.8	.7	.5	.3	.1	.9	.7	.5	.3	.1	.9
58	65	71	78	84	91	97	04	10	16	23	29	36	42	49	55	62	68	74	81	87	94	00	07	13	20	26	33	39	45	52	58
85	3	75	2	65	11	56	01	46	91	36	82	27	72	17	62	07	53	98	43	88	33	78	23	69	14	59	04	49	94	4	85
21	22	24	26	28	30	31	33	35	37	39	40	42	44	46	48	49	51	53	55	57	59	60	62	64	66	68	69	71	73	75	77
.0	.8	.6	.5	.3	.1	.9	.7	.5	.3	.1	.9	.7	.5	.3	.1	.9	.7	.6	.4	.2	.0	.8	.6	.4	.2	.0	.8	.6	.4	.2	.0
86	92	99	05	12	18	25	31	38	44	51	57	63	70	76	83	89	96	02	09	15	22	28	34	41	47	54	60	67	73	80	86
54	99	44	9	35	8	25	7	15	6	06	51	96	41	86	31	77	22	67	12	57	02	48	93	38	83	28	73	19	64	09	54
21	23	24	26	28	30	32	33	35	37	39	41	42	44	46	48	50	51	53	55	57	59	60	62	64	66	68	69	71	73	75	77
.2	.0	.8	.6	.4	.2	.0	.8	.6	.4	.2	.0	.8	.6	.5	.3	.1	.9	.7	.5	.3	.1	.9	.7	.5	.3	.1	.9	.7	.6	.4	.2
14	20	27	33	40	46	52	59	65	72	78	85	91	98	04	11	17	23	30	36	43	49	56	62	69	75	81	88	94	01	07	14
23	68	14	59	04	49	94	39	85	3	75	2	65	1	56	01	46	91	36	81	27	72	17	62	07	52	98	43	88	33	78	23
21	23	24	26	28	30	32	33	35	37	39	41	43	44	46	48	50	52	53	55	57	59	61	62	64	66	68	70	71	73	75	77
.3	.1	.9	.7	.5	.3	.1	.9	.7	.5	.4	.2	.0	.8	.6	.4	.2	.0	.8	.6	.4	.2	.0	.8	.6	.5	.3	.1	.9	.7	.5	.3

41	48	54	61	67	74	80	87	93	99	06	12	19	25	32	38	45	51	58	64	70	77	83	90	96	03	09	16	22	29	35	41
93	38	83	28	73	18	64	09	54	99	44	89	35	8	25	7	15	6	05	51	96	41	86	31	76	22	67	12	57	02	47	93
21	23	25	26	28	30	32	34	35	37	39	41	43	44	46	48	50	52	53	55	57	59	61	63	64	66	68	70	72	73	75	77
.4	.2	.0	.8	.6	.5	.3	.1	.9	.7	.5	.3	.1	.9	.7	.5	.3	.1	.9	.7	.5	.4	.2	.0	.8	.6	.4	.2	.0	.8	.6	.4
69	76	82	88	95	01	08	14	21	27	34	40	47	53	59	66	72	79	85	92	98	05	11	18	24	30	37	43	50	56	63	69
62	07	52	97	42	88	33	78	23	68	13	59	04	49	94	39	84	3	75	2	65	1	55	01	46	91	36	81	26	72	17	62
21	23	25	27	28	30	32	34	36	37	39	41	43	45	46	48	50	52	54	55	57	59	61	63	64	66	68	70	72	73	75	77
.5	.4	.2	.0	.8	.6	.4	.2	.0	.8	.6	.4	.2	.0	.8	.6	.5	.3	.1	.9	.7	.5	.3	.1	.9	.7	.5	.3	.1	.9	.7	.5
97	03	10	16	23	29	36	42	48	55	61	68	74	81	87	94	00	06	13	19	26	32	39	45	52	58	65	71	77	84	90	97
31	76	21	67	12	57	02	47	92	38	83	28	73	18	63	09	54	99	44	89	34	8	25	7	15	6	05	5	96	41	86	31
21	23	25	27	28	30	32	34	36	37	39	41	43	45	47	48	50	52	54	56	57	59	61	63	65	66	68	70	72	74	75	77
.7	.5	.3	.1	.9	.7	.5	.3	.1	.9	.7	.5	.4	.2	.0	.8	.6	.4	.2	.0	.8	.6	.4	.2	.0	.8	.6	.4	.3	.1	.9	.7
25	31	37	44	50	57	63	70	76	83	89	95	02	08	15	21	28	34	41	47	54	60	66	73	79	86	92	99	05	12	18	25
	46	91	36	81	26	71	17	62	07	52	97	42	87	33	78	23	68	13	58	04	49	94	39	84	29	75	2	65	1	55	
21	23	25	27	29	30	32	34	36	38	39	41	43	45	47	48	50	52	54	56	57	59	61	63	65	67	68	70	72	74	76	77
.8	.6	.4	.2	.0	.8	.6	.4	.3	.1	.9	.7	.5	.3	.1	.9	.7	.5	.3	.1	.9	.7	.5	.4	.2	.0	.8	.6	.4	.2	.0	.8
52	59	65	72	78	84	91	97	04	10	17	23	30	36	43	49	55	62	68	75	81	88	94	01	07	13	20	26	33	39	46	52
7	15	6	05	5	95	41	86	31	76	21	66	12	57	02	47	92	37	83	28	73	18	63	08	54	99	44	89	34	79	25	7
21	23	25	27	29	31	32	34	36	38	40	41	43	45	47	49	50	52	54	56	58	59	61	63	65	67	68	70	72	74	76	77
.9	.7	.5	.3	.2	.0	.8	.6	.4	.2	.0	.8	.6	.4	.2	.0	.8	.6	.4	.3	.1	.9	.7	.5	.3	.1	.9	.7	.5	.3	.1	.9
80	86	93	99	06	12	19	25	32	38	44	51	57	64	70	77	83	90	96	02	09	15	22	28	35	41	48	54	61	67	73	80
39	84	29	74	2	65	1	55		45	91	36	81	26	71	16	62	07	52	97	42	87	32	78	23	68	13	58	03	49	94	39
22	23	25	27	29	31	32	34	36	38	40	41	43	45	47	49	51	52	54	56	58	60	61	63	65	67	69	70	72	74	76	78
.1	.9	.7	.5	.3	.1	.9	.7	.5	.3	.1	.9	.7	.5	.3	.2	.0	.8	.6	.4	.2	.0	.8	.6	.4	.2	.0	.8	.6	.4	.3	.1
08	14	20	27	33	40	46	53	59	66	72	79	85	91	98	04	11	17	24	30	37	43	50	56	62	69	75	82	88	95	01	08
08	53	99	44	89	34	79	24	69	15	6	05	5	95	4	86	31	76	21	66	11	57	02	47	92	37	82	28	73	18	63	08
22	24	25	27	29	31	33	34	36	38	40	42	43	45	47	49	51	52	54	56	58	60	61	63	65	67	69	71	72	74	76	78
.2	.0	.8	.6	.4	.2	.0	.8	.6	.4	.3	.1	.9	.7	.5	.3	.1	.9	.7	.5	.3	.1	.9	.7	.5	.3	.2	.0	.8	.6	.4	.2
35	42	48	55	61	68	74	80	87	93	00	06	13	19	26	32	39	45	51	58	64	71	77	84	90	97	03	09	16	22	29	35
77	23	68	13	58	03	48	94	39	84	29	74	19	65	1	55		45	9	36	81	26	71	16	61	07	52	97	42	87	32	77
22	24	25	27	29	31	33	35	36	38	40	42	44	45	47	49	51	53	54	56	58	60	62	63	65	67	69	71	72	74	76	78
.3	.1	.9	.7	.5	.3	.2	.0	.8	.6	.4	.2	.0	.8	.6	.4	.2	.0	.8	.6	.4	.2	.1	.9	.7	.5	.3	.1	.9	.7	.5	.3

63	69	76	82	89	95	02	08	15	21	27	34	40	47	53	60	66	73	79	86	92	98	05	11	18	24	31	37	44	50	57	63
47	92	37	82	27	73	18	63	08	53	98	44	89	34	79	24	69	14	6	05	5	95	4	85	31	76	21	66	11	56	02	47

Table S21. *Experimental data of the hydraulic support test platform corresponding to Figure 23(e).*

Balance jack load/(kg)		Large dip angle/(°)					
		40	44	48	52	56	60
Canopy Load/(kg)	50	20.95	21.67	22.51	23.47	24.11	24.97
	100	28.95	30.05	30.75	31.75	32.2	32.99
	150	37.08	38.01	38.21	39.52	40.31	41.31
	200	45.58	46.33	47.07	47.97	48.67	50.11
	250	52.77	53.68	54.28	55.2	55.69	56.5
	300	61.27	62.11	64.13	64.51	65.97	65.86
	350	70.11	70.17	71.96	72.39	73.07	74.02
	400	76.79	77.98	79.24	79.91	81.57	82.23

Table S22. *Theoretical simulation data corresponding to Figure 23(f).*

31.540896	38.844808	46.14472	53.450332	60.753444	68.056656	75.359568	82.66628	89.965692	97.269004	104.5721616	111.8752528	119.1784	126.4815152	133.7846464	141.0877776	148.3908088	155.694	162.9971712	170.3002024	177.6033336	184.9064648	192.20096	199.5127272	206.8158584	214.1189896	221.4220208	228.7252	236.0283832	243.3314144	250.6345456	257.9376768
31.638852	38.963444	46.28888	53.614016	60.939352	68.263695	75.589031	82.914167	90.240403	97.565353	104.8897977	112.2151313	119.5404049	126.8654547	134.1902028	141.5156564	148.841	156.1663636	163.4907079	170.8161615	178.1415151	185.4668687	192.7918484	200.1167671	207.4420727	214.7674742	222.0927278	229.4173731	236.7425858	244.0679793	251.3932329	258.7181816
31.734	39.07972	46.4272	53.774774	61.122219	68.467656	75.813668	83.161622	90.508076	97.853565	105.2002026	112.5478	119.8953534	127.2413313	134.5867674	141.9328428	149.2818183	156.6286863	163.9736361	171.3207077	178.6686831	186.0158585	193.3636209	200.7074745	208.0546469	215.4022323	222.7497977	230.0954949	237.4411747	244.7887871	252.1362626	259.482
31.827474	39.194484	46.562616	53.931884	61.300088	68.666694	76.032661	83.402023	90.771791	98.136353	105.5038383	112.8735351	120.2426262	127.6097097	134.9743743	142.3439391	149.7135358	157.0793939	164.4460602	171.8143043	179.1839398	186.5525254	193.9198985	201.2868681	208.6534349	216.0231737	223.3925256	230.7578781	238.1241412	245.4935737	252.8632324	260.2292
31.918772	39.308025	46.693664	54.085225	61.475225	68.860605	76.247216	83.637375	91.029007	98.413117	105.8007071	113.1924626	120.5807676	127.9699774	135.3534346	142.7447473	150.1356568	157.5212122	164.9080803	172.2976698	179.6887	187.0755555	194.4651252	201.8534727	209.2386485	216.6300002	224.0207078	231.4048481	238.7928282	246.1822288	253.5739399	260.9597975
32.007796	39.417791	46.822256	54.234774	61.645454	69.049224	76.458525	83.866686	91.279999	98.683757	106.0912441	113.5044147	120.9097474	128.3214743	135.7243695	143.1313695	150.5470705	157.9541413	165.3596964	172.7690902	180.1818186	187.5867647	194.9979792	202.4058	209.8112128	217.2225256	224.6344444	232.0372725	239.448	246.8548484	254.2681814	261.6736366

32.095 12	39.5 2405	46.9 4956	54.3 8015	61.8 1167	69.2 3383	76.6 6585	84.0 9079	91.5 2466	98.9 473	106.37 544	113.80 856	121.23 222	128.66 488	136.08 681	143.52 038	150.94 715	158.37 72	165.80 084	173.23 065	180.66 272	188.08 692	195.51 823	202.94 435	210.37 195	217.80 076	225.23 354	232.65 512	240.08 804	247.51 193	254.94 565	262.37 093
32.1 802	39.6 2699	47.0 7518	54.5 2173	61.9 7364	69.4 1425	76.8 6729	84.3 0986	91.7 631	99.2 0565	106.65 345	114.10 44	121.54 82	128.99 996	136.44 101	143.89 446	151.33 759	158.78 987	166.23 165	173.68 183	181.13 076	188.57 635	196.02 607	203.46 994	210.92 064	218.36 507	225.81 807	233.25 844	240.71 133	248.15 412	255.60 652	263.05 155
32.2 632	39.7 2746	47.1 978	54.6 6	62.1 3144	69.5 9051	77.0 6258	84.5 2458	91.9 953	99.4 5733	106.92 515	114.39 14	121.85 716	129.32 672	136.78 689	144.25 868	151.71 998	159.19 213	166.65 205	174.12 212	181.58 598	189.05 425	196.52 142	203.98 305	211.45 468	218.91 603	226.38 805	233.84 719	241.31 841	248.78 191	256.25 075	263.71 553
32.3 4411	39.8 2585	47.3 1581	54.7 9549	62.2 8509	69.7 6261	77.2 5223	84.7 355	92.2 2125	99.7 0276	107.18 997	114.67 116	122.15 856	129.64 517	137.12 444	144.61 249	152.09 377	159.58 4	167.06 205	174.55 098	182.03 106	189.51 997	197.00 428	204.48 367	211.97 406	219.45 415	226.94 346	234.42 138	241.90 981	249.39 531	256.87 841	264.36 287
32.4 2295	39.9 2216	47.4 2974	54.9 2873	62.4 3458	69.9 3055	77.4 3678	84.9 4099	92.4 4107	99.9 4196	107.44 733	114.94 529	122.45 185	129.95 529	137.45 367	144.95 591	152.45 845	159.96 546	167.46 165	174.96 789	182.46 599	189.97 32	197.47 467	204.97 181	212.47 932	219.97 997	227.48 431	234.98 101	242.48 605	249.99 164	257.49 024	264.99 357
32.4 9971	40.0 1639	47.5 4013	55.0 5971	62.5 799	70.0 9433	77.6 1675	85.1 3946	92.6 5561	100.17 491	107.69 672	115.21 326	122.73 682	130.25 709	137.77 446	145.29 159	152.81 348	160.33 653	167.85 085	175.37 23	182.89 024	190.41 395	197.93 258	205.44 747	212.97 099	220.49 188	228.01 059	235.52 608	243.04 76	250.57 087	258.08 681	265.60 763
32.5	40.1	47.6	55.1	62.7	70.2	77.7	85.3	92.8	100.40	107.93	115.47	123.01	130.55	138.08	145.61	153.	160.69	168.22	175.76	183.30	190.84	198.	205.91	213.44	220.98	228.52	236.05	243.59	251.13	258.66	266.20

7438	0854	4761	8575	2107	5395	9239	3143	6547	162	813	452	357	056	581	956	1584	719	965	583	322	226	378	065	967	827	247	658	445	355	866	504
32.646998	40.19844	47.752261	55.306085	62.858824	70.40944	77.96365	85.517772	93.070665	100.6220 9	108.174255	115.728116	123.282355	130.835722	138.387099	145.939111	153.493328	161.047455	168.595804	176.150008	183.704222	191.2584	198.810944	206.361299	213.915499	221.469771	229.020105	236.572522	244.126388	251.680622	259.234177	266.785811
32.717 5	40.285 64	47.854 93	55.424 25	62.992 69	70.560 62	78.129 88	85.699 18	93.268 47	100.836 32	108.404 83	115.973 409	123.541 338	131.112 256	138.679 922	146.249 91	153.818 835	161.387 61	168.958 584	176.526 407	184.093 335	191.661 261	199.231 4	206.798 895	214.368 24	221.937 54	229.505 646	237.073 9	244.646 317	252.212 5	259.781 79	267.349 93
32.785 93	40.370 02	47.954 35	55.538 71	63.123 01	70.707 07	78.291 29	85.875 63	93.459 96	101.044 409	108.628 825	116.212 555	123.796 796	131.381 188	138.965 524	146.549 544	154.134 383	161.718 122	169.302 199	176.888 65	184.473 082	192.057 512	199.639 937	207.223 337	214.808 77	222.392 003	229.976 333	237.560 032	245.145 462	252.728 897	260.313 33	267.897 422
32.852 29	40.451 36	48.050 68	55.650 02	63.249 3	70.848 27	78.447 55	86.046 87	93.646 18	101.245 18	108.844 42	116.443 37	124.043	131.642 3	139.241 35	146.840 62	154.439 99	162.039 18	169.638 24	177.237 54	184.836 84	192.436 13	200.035 36	207.634 35	215.233 65	222.832 97	230.432 25	238.031 22	245.630 51	253.229 85	260.829 16	268.428 26
32.916 56	40.529 65	48.143 9	55.758 17	63.371 55	70.984 43	78.598 64	86.212 9	93.827 14	101.439 965	109.053 338	116.666 76	124.281 83	131.895 01	139.508 19	147.122 39	154.737 66	162.350 73	169.964 401	177.577 19	185.191 42	192.805 63	200.419 37	208.033 187	215.646 611	223.260 36	230.874 23	238.486 62	246.100 84	253.715 12	261.329 36	268.942 46
32.978 75	40.605 09	48.234 22	55.863 38	63.489 69	71.115 76	78.744 78	86.373 92	94.001 76	101.627 88	109.255 34	116.884 43	124.513 48	132.140 44	139.769 595	147.393 504	155.021 412	162.651 06	170.278 32	177.907 528	185.534 34	193.163 43	200.790 89	208.416 166	216.045 28	223.674 41	231.300 67	238.929 26	246.555 83	254.184 99	261.813 46	269.440 01

33.038887	40.677791	48.321887	55.964889	63.605009	71.242585	78.886818	86.530311	94.169702	101.8098	109.4504	117.0944	124.7366	132.3775	140.0150	147.6587	155.3024	162.9411	170.5820	178.2231	185.8653	193.5093	201.1499	208.7874	216.4313	224.0748	231.7139	239.3529	246.9956	254.6396	262.2796	269.9209
33.069	40.748443	48.407703	56.061646	63.716 5	71.365678	79.023205	86.680661	94.331661	101.9856 1	109.6390 8	117.2976 4	124.9504 3	132.6067 4	140.2559 1	147.9138 1	155.5705 5	163.2225 3	170.8753 6	178.5316 6	186.1844 5	193.8430 2	201.4964 9	209.1462 4	216.8046	224.4603 5	232.1139 1	239.7642 4	247.4206 2	255.0787 4	262.7295 3	270.3851 9
33.152586	40.816888	48.489228	56.153 09	63.823 75	71.484 54	79.155 59	86.824 62	94.489 52	102.151 511	109.821 4	117.493 43	125.151 635	132.827 4	140.484 841	148.160 24	155.827 6	163.494 65	171.158 27	178.829 33	186.492 24	194.164 28	201.830 56	209.492 52	217.164 85	224.830 32	232.499 47	240.160 99	247.838 085	255.501 25	263.167 47	270.838 282
33.206 73	40.883 25	48.567 99	56.242 46	63.926 85	71.599 15	79.283 55	86.961 6	94.642 14	102.318 38	109.997 48	117.686 118	125.356 03	133.030 975	140.712 58	148.396 76	156.073 67	163.756 65	171.430 79	179.111 45	186.789 36	194.473 06	202.151 216	209.829 633	217.515 15	225.185 638	232.874 7	240.545 318	248.222 639	255.909 668	263.585 456	271.263 81
33.258 52	40.947 54	48.642 63	56.329 58	64.025 78	71.709 59	79.406 41	87.093 17	94.788 63	102.474 54	110.167 31	117.863 034	125.548 95	133.243 77	140.928 44	148.625 35	156.311 14	164.000 794	171.694 29	179.387 72	187.070 633	194.769 36	202.462 127	210.147 65	217.840 43	225.530 14	233.226 91	240.910 8	248.606 777	256.293 502	263.981 861	271.678 15
33.308 23	41.009 75	48.712 65	56.413 92	64.120 55	71.815 88	79.523 64	87.220 92	94.928 88	102.626 618	110.330 61	118.030 93	125.734 58	133.439 47	141.135 97	148.842 97	156.540 81	164.248 898	171.949 461	179.646 951	187.353 16	195.050 347	202.757 79	210.456 449	218.161 91	225.861 06	233.568 78	241.263 86	248.971 488	256.666 898	264.373 61	272.075 85
33.3	41.0	48.7	56.4	64.2	71.918	79.6	87.3	95.0	102.77	110.48	118.19	125.91	133.62	141.33	149.04	156.76	164.47	172.18	179.90	187.61	195.32	203.04	210.75	218.46	226.17	233.89	241.60	249.31	257.02	264.74	272.45

55 87	69 49	79 68	94 96	11 16		34 71	44 33	62 89	07 2	67 3	56 1	23 7	68 6	51 9	99 2	13 7	96 2	59 2	04 1	71 6	60 5	20 5	28 5	51 3	86 3	60 9	23 6	99 6	85 4	69 5	69 1
33 .4 01 42	41 .1 26 02	48 .8 45 32	56 .5 72 16	64 .2 97 61	72 .0 15 96	79 .7 39 61	87 .4 62 88	95 .1 90 66	10 2. 90 90 2	11 0. 63 51 2	11 8. 35 43 9	12 6. 08 18 7	13 3. 80 59 1	14 1. 52 60 8	14 9. 24 78 1	15 6. 97 25 6	16 4. 69 98 6	17 2. 41 68 2	18 0. 14 08 6	18 7. 86 83 5	19 5. 58 76 1	20 3. 31 37 1	21 1. 03 62 5	21 8. 75 63 8	22 6. 48 23 1	23 4. 20 88 4	24 1. 92 63	24 9. 65 17	25 7. 37 31 9	26 5. 10 11 5	27 2. 82 13 2
33 .4 44 89	41 .1 78 81	48 .9 09 05	56 .6 45 27	64 .3 79 89	72 .1 09 76	79 .8 41 04	87 .5 75 99	95 .3 12 18	10 3. 04 10 8	11 0. 77 52 8	11 8. 50 67 4	12 6. 24 30 8	13 3. 97 66 5	14 1. 70 80 8	14 9. 43 82 4	15 7. 17 38 1	16 4. 90 97	17 2. 63 73 3	18 0. 37 09	18 8. 10 72 4	19 5. 83 87	20 3. 57 29	21 1. 30 58 6	21 9. 03 56 7	22 6. 77 16 5	23 4. 50 70 3	24 2. 23 56 7	24 9. 96 83	25 7. 70 23 8	26 5. 43 87 1	27 3. 16 90 9
33 .4 86 28	41 .2 27 86	48 .9 70 21	56 .7 14 47	64 .4 58 02	72 .1 98 75	79 .9 39	87 .6 83 21	95 .4 27 47	10 3. 16 69	11 0. 90 87 9	11 8. 65 19 4	12 6. 39 62	13 4. 13 90 7	14 1. 88 02 9	14 9. 62 06 8	15 7. 36 49 4	16 5. 10 91 3	17 2. 84 74 3	18 0. 59 03	18 8. 33 45 6	19 6. 07 77 1	20 3. 81 96	21 1. 56 11 5	21 9. 30 24 2	22 7. 04 66 8	23 4. 79 06 5	24 2. 53 04 9	25 0. 27 13 8	25 8. 01 54 2	26 5. 75 96 8	27 3. 50 02 2
33 .5 25 59	41 .2 75 86	49 .0 27 89	56 .7 79 98	64 .5 31 99	72 .2 81 91	80 .0 32 58	87 .7 84 67	95 .5 36 77	10 3. 28 64 8	11 1. 03 72 6	11 8. 78 93 6	12 6. 54 14 5	13 4. 29 31 7	14 2. 04 26 9	14 9. 79 40 5	15 7. 54 61 4	16 5. 29 82 4	17 3. 04 71 3	18 0. 79 88 5	18 8. 55 09 4	19 6. 30 30 4	20 4. 05 38 2	21 1. 80 37 3	21 9. 55 55 3	22 7. 30 76 2	23 5. 05 97 2	24 2. 80 99 9	25 0. 56 02 2	25 8. 31 23 1	26 6. 06 44 1	27 3. 81 47 1
33 .5 62 82	41 .3 22 26	49 .0 82 14	56 .8 42 02	64 .6 01 89	72 .3 60 85	80 .1 20 72	87 .8 80 6	95 .6 40 48	10 3. 39 98 1	11 1. 15 93 1	11 8. 91 91 9	12 6. 67 90 6	13 4. 43 89 4	14 2. 19 78 9	14 9. 95 77 7	15 7. 71 76 5	16 5. 47 75 2	17 3. 23 64 3	18 0. 99 63 1	18 8. 75 61 9	19 6. 51 60 6	20 4. 27 55 6	21 2. 03 49 4	21 9. 79 48 2	22 7. 55 47	23 5. 31 45 7	24 3. 07 36 2	25 0. 83 34 1	25 8. 59 32 8	26 6. 35 31 6	27 4. 11 25 5
33 .5 97 97	41 .3 65 58	49 .1 33 18	56 .9 00 79	64 .6 68 4	72 .4 36	80 .2 03 61	87 .9 71 21	95 .7 38 82	10 3. 50 64 2	11 1. 27 40 3	11 9. 04 16 4	12 6. 80 92 4	13 4. 57 68 5	14 2. 34 44 5	15 0. 11 20 6	15 7. 87 96 6	16 5. 64 72 7	17 3. 41 48 8	18 1. 18 24 8	18 8. 95 00 9	19 6. 71 76 9	20 4. 48 53	21 2. 25 29 1	22 0. 02 05 1	22 7. 78 81 2	23 5. 55 57 2	24 3. 32 33 3	25 1. 09 09 3	25 8. 85 85 4	26 6. 62 61 5	27 4. 39 37 5

Table S23. *Experimental data of the hydraulic support test platform corresponding to Figure 23(f).*

Non-tilted side column load/(kg)		Large dip angle/(°)					
		40	44	48	52	56	60
Canopy Load/(kg)	50	33.54	34.33	34.56	34.98	35.48	35.61
	100	66.88	67.84	67.97	68.92	69.73	70.52
	150	98.23	100.76	101.61	102.83	103.92	105.11
	200	130.95	134.64	135.13	137.02	138.15	139.23
	250	162.91	166.47	168.67	170.51	172.04	173.75
	300	196.34	198.84	202.39	204.39	206.52	208.76
	350	227.75	231.89	235.75	238.63	240.83	242.99
	400	260.89	265.03	269.25	272.46	274.95	277.62

Table S24. *Theoretical simulation data corresponding to Figure 23(g).*

13.4	16.6	19.8	23.0	26.2	29.4	32.6	35.8	39.0	42.2	45.5	48.7	51.9	55.1	58.3	61.5	64.7	67.9	71.1	74.3	77.5	80.8	84.0	87.2	90.4	93.6	96.8	100.0	103.2	106.4	109.6	112.8
10	19	28	37	46	55	64	73	82	91	00	09	19	28	37	46	55	64	73	82	91	00	09	18	27	37	46	55	64	73	82	91
18	26	33	4	48	55	62	7	77	84	91	99	06	13	21	28	35	43	5	57	64	72	79	86	94	01	08	16	23	3	37	45
12.8	15.9	19.0	22.1	25.2	28.2	31.3	34.4	37.5	40.6	43.7	46.8	49.8	52.9	56.0	59.1	62.2	65.3	68.4	71.4	74.5	77.6	80.7	83.8	86.9	90.0	93.1	96.18	99.27	102.3	105.4	108.5
65	50	37	23	09	94	81	67	53	38	24	11	97	83	68	55	41	27	12	99	85	71	57	43	29	15	01	70	32	59	45	31
18	87	17	46	75	78	07	37	66	78	92	21	5	28	83	12	41	71	73	03	32	61	38		29	59	88	3		49	79	41
12.3	15.2	18.2	21.2	24.1	27.1	30.0	33.0	36.0	38.9	41.9	44.9	47.8	50.8	53.7	56.7	59.7	62.6	65.6	68.5	71.5	74.5	77.4	80.4	83.4	86.3	89.3	92.29	95.26	98.22	101.1	104.1
17	78	41	05	68	28	90	53	17	76	39	02	66	27	87	51	14	77	37	99	63	26	88	48	11	75	38	97	06	40	87	48
32	25	6	04	36	8	29	73	17	97	12	56		3	82	26	7	13	04	96	4	84	48	92	95	39	83	7	5	9	53	5
11.7	14.6	17.4	20.2	23.1	25.9	28.7	31.6	34.4	37.3	40.1	42.9	45.8	48.6	51.4	54.3	57.1	60.0	62.8	65.6	68.5	71.3	74.2	77.0	79.8	82.7	85.5	88.39	91.22	94.06	96.90	99.74
66	03	41	81	21	57	92	32	73	06	43	84	24	61	94	35	75	10	47	85	26	65	02	39	75	16	56	06	65	67	73	27
59	43	32	83	37	03	04	48		58	83	34	08	03	57		52	72	05	66	17	16	42	21	61	13	26	8	8	9		1
11.2	13.9	16.6	19.3	22.0	24.7	27.4	30.2	32.9	35.6	38.3	41.0	43.7	46.4	49.1	51.9	54.6	57.3	60.0	62.7	65.4	68.1	70.8	73.6	76.3	79.0	81.7	84.46	87.17	89.88	92.60	95.31
13	27	15	53	68	77	87	03	20	27	39	56	69	83	89	06	23	32	42	56	73	84	99	12	20	37	53	05	29	72	47	40
01	15	24	55	67	25	77	33	6	6	33	85	62	32	79	64	06	03	76	42	9	67	2	03	52	5	66	5	3	9	5	3
10.6	13.2	15.8	18.4	21.0	23.5	26.1	28.7	31.3	33.9	36.5	39.1	41.7	44.2	46.8	49.4	52.0	54.6	57.2	59.8	62.4	64.9	67.5	70.1	72.7	75.3	77.9	80.51	83.10	85.68	88.27	90.86
56	45	27	19	10	90	78	66	59	40	26	19	02	94	73	66	55	41	24	12	05	87	78	65	48	39	31	04	06	55	93	24
56	74	64	9	25	84	72	07	62	05	04	7	54	17	56	46	85	08	16	58	72	57	81	16	19	2	04		8	9	9	8
10.0	12.5	15.0	17.4	19.9	22.3	24.8	27.3	29.7	32.2	34.7	37.1	39.6	42.0	44.5	47.0	49.4	51.9	54.3	56.8	59.3	61.7	64.2	66.6	69.1	71.6	74.0	76.54	79.00	81.46	83.93	86.38
97	59	16	80	46	98	64	21	90	43	04	71	26	93	45	14	73	36	91	54	20	76	41	99	59	21	88	02	76	26	11	80
26	19	41	62	1	72	89	34	06	92	17	86	53	58	9	19	15	61	27	4	65	06	27	33	42	19	4	3	3	4	5	5
9.53	11.8	14.2	16.5	18.8	21.2	23.5	25.8	28.2	30.5	32.8	35.2	37.5	39.8	42.2	44.5	46.8	49.2	51.5	53.8	56.2	58.5	60.8	63.2	65.5	67.8	70.2	72.55	74.89	77.21	79.56	81.89
51																															

	6823	0327	3607	7624	0087	426	6991	1191	3921	7372	1258	4159	8155	0679	4908	7717	1784	4408	8187	1794	4942	8657	1569	5419	8408	2574	004	156	918	002	073
8.97007	11.17387	13.38602	15.58698	17.80065	19.99731	22.21183	24.41253	26.62519	28.82592	31.03461	33.24114	35.44699	37.65808	39.85624	42.07039	44.27011	46.48476	48.68259	50.89437	53.09761	55.30692	57.51471	59.71488	61.92881	64.1286	66.34306	68.53983	70.75319	72.95594	75.16602	77.37054
8.40219	10.47666	12.56243	14.63407	16.71935	18.78802	20.87332	22.9499	25.02989	27.10405	29.18603	31.25975	33.34201	35.42317	37.49426	39.5774	41.65125	43.73739	45.80679	47.89115	49.96333	52.04767	54.12568	56.19692	58.28329	60.35549	62.44036	64.50959	66.59326	68.67291	70.74925	72.82746
7.83144	9.77658	11.73323	13.67806	15.63233	17.57301	19.5278	21.47982	23.42616	25.3736	27.32721	29.27063	31.22588	33.17682	35.12083	37.07012	39.01985	40.97572	42.9167	44.8715	46.81511	48.77126	50.7195	52.66179	54.61834	56.56546	58.51765	60.45934	62.41249	64.3664	66.3107	68.26151
7.25784	9.07364	10.89916	12.71895	14.53958	16.35229	18.17599	20.00009	21.81515	23.63456	25.45742	27.27304	29.0983	30.91903	32.73579	34.55222	36.37519	38.19974	40.01231	41.83467	43.65221	45.47768	47.29615	49.10951	50.93471	52.75631	54.57491	56.38907	58.21153	60.0364	61.85118	63.67267
6.68137	8.36785	10.06109	11.75305	13.44112	15.12584	16.81822	18.51141	20.19772	21.88695	23.57667	25.26621	26.95943	28.6498	30.33778	32.0237	33.71662	35.40947	37.09361	38.78288	40.47381	42.16699	43.85565	45.54007	47.23323	48.92582	50.61236	52.29877	53.99036	55.68364	57.37142	59.06096
6.10205	7.65891	9.21961	10.78035	12.33717	13.89368	15.45422	17.01493	18.57386	20.13076	21.68863	23.24892	24.80959	26.36913	27.92593	29.48362	31.04425	32.60489	34.16062	35.71834	37.27893	38.83958	40.39799	41.95338	43.51407	45.07478	46.63153	48.18846	49.74867	51.30941	52.8692	54.42636
5.51986	6.94636	8.37445	9.80257	11.22947	12.65568	14.08371	15.51181	16.93988	18.36599	19.79299	21.22103	22.6491	24.07702	25.50245	26.93037	28.35841	29.78644	31.21305	32.63967	34.06774	35.49578	36.92316	38.34886	39.77693	41.20503	42.63259	44.05813	45.48618	46.9143	48.34239	49.76888
4.93	6.2299	7.5253	8.82	10.1	11.4	12.7	14.0	15.2	16.5	17.8	19.1	20.4	21.7	23.0	24.3	25.6	26.9	28.2	29.5	30.8	32.1	33.4	34.7	36.0	37.3	38.6	39.90	41.20	42.49	43.79	45.08

48 2			07 4	16 1	11 04	06 39	01 8	97 19	92 33	87 49	82 85	78 24	73 62	68 66	64 01	59 36	54 72	49 75	45 13	40 52	35 88	31 18	26 13	21 52	16 93	12 29	72 2	25 8	80 2	34 2	85 3
4. 34 69 1	5. 50 92 4	6. 67 18 9	7. 83 45 8	8. 99 71 9	10 .1 59 37	11 .3 21 97	12 .4 84 63	13 .6 47 27	14 .8 09 49	15 .9 72 04	17 .1 34 64	18 .2 97 28	19 .4 59 91	20 .6 22 19	21 .7 84 79	22 .9 47 39	24 .1 09 99	25 .2 72 3	26 .4 34 93	27 .5 97 56	28 .7 60 17	29 .9 22 71	31 .0 84 91	32 .2 47 55	33 .4 10 21	34 .5 72 81	35. 73 49 9	36. 89 76 1	38. 06 02 9	39. 22 29 4	40. 38 52 9
3. 75 61 5	4. 78 43 9	5. 81 42 2	6. 84 40 8	7. 87 27 2	8. 90 06 7	9. 93 04 5	10 .9 60 29	11 .9 90 11	13 .0 17 55	14 .0 46 68	15 .0 76 46	16 .1 06 27	17 .1 34 63	18 .1 62 99	19 .1 92 76	20 .2 22 53	21 .2 52 2	22 .2 80 7	23 .3 09 06	24 .3 38 87	25 .3 68 65	26 .3 97 77	27 .4 25 21	28 .4 55 03	29 .4 84 86	30 .5 14 17	31. 54 14 5	32. 57 12 4	33. 60 11 1	34. 63 09 3	35. 65 91 7
3. 16 25 3	4. 05 56 3	4. 95 25 6	5. 84 95 4	6. 74 26	7. 63 53 4	8. 53 21 2	9. 42 90 7	10 .3 24 23	11 .2 17 03	12 .1 11 67	13 .0 08 56	13 .9 05 39	14 .7 99 35	15 .6 91 31	16 .5 88 18	17 .4 85 06	18 .3 78 98	19 .2 73 36	20 .1 67 31	21 .0 64 15	21 .9 61 03	22 .8 55 67	23 .7 47 3	24 .6 44 23	25 .5 41 17	26 .4 34 16	27. 32 73 3	28. 22 37 8	29. 12 07 5	30. 01 67 8	30. 91 01 8
2. 56 60 4	3. 32 32 5	4. 08 72 2	4. 84 99 1	5. 60 87 1	6. 36 41 7	7. 12 72 7	7. 89 12	8. 64 82 4	9. 40 79 3	10 .1 67 32	10 .9 31 24	11 .6 92 89	12 .4 52 9	13 .2 07 77	13 .9 71 35	14 .7 35	15 .4 91 65	16 .2 51 45	17 .0 11 45	17 .7 73 1	18 .5 37 02	19 .2 96 41	20 .0 51 56	20 .8 15 45	21 .5 78 77	22 .3 36 04	23. 09 31 9	23. 85 55	24. 61 95 2	25. 37 80 3	26. 13 83
1. 96 67	2. 58 77 3	3. 21 84 7	3. 84 34 9	4. 46 93 5	5. 08 72 8	5. 71 62 1	6. 34 55 3	6. 96 58 2	7. 59 02 5	8. 21 39 5	8. 84 46 5	9. 46 74 1	10 .0 95	10 .7 12 79	11 .3 42 57	11 .9 70 77	12 .5 92 43	13 .2 15 23	13 .8 42 83	14 .4 65 59	15 .0 96 29	15 .7 19 99	16 .3 38 57	16 .9 68 99	17 .5 95 82	18 .2 19 64	18. 83 90 3	19. 46 67 2	20. 09 68 1	20. 71 68 2	21. 34 35 4
1. 36 44 9	1. 84 93 5	2. 34 57 2	2. 83 02 7	3. 32 42 6	3. 80 46 7	4. 29 91 8	4. 79 09 2	5. 27 69 7	5. 76 39 9	6. 25 19 5	6. 74 78 2	7. 23 11 5	7. 72 56 7	8. 20 63 8	8. 70 19 6	9. 19 14 1	9. 68 04 2	10 .1 64 72	10 .6 59 24	11 .1 42 57	11 .6 38 44	12 .1 26 41	12 .6 08 42	13 .1 04 69	13 .5 91 54	14 .0 83 44	14. 56 48 5	15. 05 77 2	15. 55 13 5	16. 03 53 7	16. 52 59
0. 75 94 3	1. 10 81 1	1. 46 81	1. 81 39 5	2. 17 34 5	2. 51 63 4	2. 87 58 6	3. 22 66 5	3. 58 08 5	3. 92 91 5	4. 28 13 8	4. 63 99 3	4. 98 63 2	5. 34 49	5. 68 85 2	6. 04 88 8	6. 39 69 4	6. 75 43	7. 09 99 1	7. 45 84 9	7. 80 48 9	8. 16 34 4	8. 51 56 6	8. 86 11 2	9. 22 17	9. 56 81 2	9. 92 72 1	10. 27 06 5	10. 62 85 3	10. 98 24	11. 33 29 6	11. 68 53 9
0. 15 15	0. 36	0. 58	0. 79	1. 01	1. 22	1. 44	1. 65	1. 87 63	2. 08	2. 30	2. 52	2. 73 22	2. 95	3. 15	3. 38	3. 59	3. 81	4. 02 08	4. 24	4. 45	4. 67	4. 88	5. 09	5. 31	5. 52	5. 75	5.9 56 43	6.1 78 51	6.3 89 97	6.6 08 76	6.8 21 99

	401	487	454	693	229	552	493		573	222	024		269	922	258	102	387		129	325	127	776	665	929	779	096					
-0.45928	-0.38294	-0.30469	-0.22869	-0.14532	-0.07748	0.00745	0.07797	0.16318	0.23373	0.31408	0.38876	0.46804	0.54904	0.61848	0.70235	0.77365	0.85914	0.92739	1.00838	1.08766	1.16235	1.2427	1.31502	1.39673	1.46983	1.55469	1.62219	1.70692	1.77774	1.86179	1.93571
-1.07293	-1.1333	-1.19838	-1.25647	-1.31329	-1.38297	-1.4391	-1.50495	-1.55853	-1.62686	-1.68395	-1.75083	-1.80688	-1.86606	-1.9337	-1.99254	-2.05588	-2.10988	-2.18032	-2.23949	-2.29555	-2.36243	-2.41952	-2.48376	-2.54597	-2.60651	-2.66159	-2.73207	-2.78696	-2.85426	-2.90805	-2.97345
-1.68943	-1.88806	-2.09397	-2.28951	-2.48697	-2.69418	-2.89411	-3.09457	-3.28882	-3.49602	-3.69258	-3.89854	-4.0932	-4.29259	-4.49732	-4.69988	-4.89831	-5.09321	-5.30233	-5.50173	-5.69638	-5.90234	-6.09891	-6.30037	-6.50514	-6.70193	-6.8979	-7.10635	-7.30387	-7.50677	-7.70077	-7.90549
-2.3088	-2.64796	-2.99219	-3.32818	-3.66638	-4.01111	-4.3539	-4.69165	-5.02769	-5.37376	-5.71254	-6.05508	-6.39092	-6.73056	-7.07315	-7.41749	-7.75438	-8.09084	-8.43865	-8.77829	-9.11412	-9.45666	-9.79545	-10.13593	-10.48075	-10.81708	-11.15423	-11.50065	-11.84158	-12.18053	-12.51638	-12.86041
-2.93102	-3.413	-3.89393	-4.37223	-4.85151	-5.33467	-5.81848	-6.29684	-6.77514	-7.26008	-7.74164	-8.22146	-8.69976	-9.17997	-9.66246	-10.14608	-10.62438	-11.10276	-11.58926	-12.06947	-12.54777	-13.02759	-13.50915	-13.99117	-14.47359	-14.95189	-15.43058	-15.91497	-16.39789	-16.8765	-17.3548	-17.83821
-3.55611	-4.1795	-4.80047	-5.42135	-6.04235	-6.66623	-7.28906	-7.90994	-8.53082	-9.15498	-9.77766	-10.39854	-11.01942	-11.64083	-12.26524	-12.88713	-13.50801	-14.12889	-14.75417	-15.37558	-15.99646	-16.61734	-17.24002	-17.8639	-18.48519	-19.10607	-19.72695	-20.35034	-20.97378	-21.59466	-22.21554	-22.83889

-4.1840545	-4.9481919	-5.7117172	-6.4752525	-7.2387879	-8.0035959	-8.7671712	-9.5306065	-10.294919	-11.058446	-11.822252	-12.586005	-13.349759	-14.113512	-14.877792	-15.641445	-16.404999	-17.168652	-17.933838	-18.696692	-19.460445	-20.223998	-20.988804	-21.752525	-22.515178	-23.279232	-24.042985	-24.807753	-25.571118	-26.334472	-27.098825	-27.862245
-4.8148486	-5.7211292	-6.6273738	-7.5336364	-8.4398989	-9.3461615	-10.252441	-11.158667	-12.064993	-12.971719	-13.877745	-14.783871	-15.689897	-16.595623	-17.502049	-18.408074	-19.313315	-20.221026	-21.127552	-22.033378	-22.940404	-23.846463	-24.752556	-25.658582	-26.565082	-27.471734	-28.377766	-29.283885	-30.190101	-31.096637	-32.000263	-32.906889

Table S25. *Experimental data of the hydraulic support test platform corresponding to Figure 23(g).*

Tilted side column load/(kg)		Large dip angle/(°)					
		40	44	48	52	56	60
Canopy Load/(kg)	50	15.41	12.23	9.14	5.83	2.65	-6.81
	100	29.76	23.53	16.49	9.82	3.23	-10.91
	150	44.01	33.92	23.83	13.62	3.75	-14.84
	200	58.42	44.71	31.39	17.81	4.27	-18.86
	250	72.27	55.77	38.83	21.74	4.79	-23.11
	300	86.46	66.63	46.28	25.95	5.49	-27.32
	350	100.68	77.59	53.74	29.92	6.03	-31.23
	400	115.12	88.42	61.54	34.43	6.98	-35.91