

Data supplement: Force chains as the link between particle and bulk friction angles in granular material

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Table S1. Friction angles (θ , in degrees) for gravel tilting table experiments as described in section 2.1, and used to generate Figure 2a and b.

Trial number	Number of particles		
	$N=1$	$N=2$	$N=4$
1	31.2	15.1	27.3
2	47.7	29.9	29.9
3	60.5	70.1	38.8
4	42.5	21.1	52.6
5	51.1	45.2	38.8
6	39.6	52.6	51.1
7	41.6	27.3	29.9
8	47.7	49.5	48.6
9	33.4	38.8	42.5
10	66.1	71.4	40.7
11	25.8	43.5	47.7
12	36.7	39.6	25.8
13	55.0	61.4	40.7
14	25.8	48.6	27.3
15	51.1	52.6	42.5
16	47.7	76.9	41.6
17	34.6	51.1	39.6
18	44.3	54.1	46.9
19	57.1	65.0	34.6
20	66.9	66.6	34.6
21	51.1	27.3	24.5
22	25.8	27.3	24.5
23	49.5	38.8	29.9
24	35.7	25.8	42.5
25	31.2	39.6	31.2
26	42.5	44.3	43.5
27	51.1	38.8	31.2
28	66.6	64.4	41.6
29	35.7	38.8	42.5
30	81.1	61.4	39.6
31	78.5	39.6	43.5
32	61.4	52.6	36.7
33	61.6	24.5	38.8
34	51.8	39.6	46.9
35	39.6	49.5	48.6
36	27.3	19.3	32.3
37	54.1	36.7	33.4
38	66.3	41.6	53.3
39	60.0	43.5	32.3
40	34.6	32.3	31.2
41	48.6	45.2	33.4

42	49.5	51.1	41.6
43	49.5	27.3	39.6
44	24.5	28.6	42.5
45	45.2	51.1	43.5
46	46.1	28.6	33.4
47	69.1	50.2	29.9
48	54.1	35.7	22.8
49	70.4	43.5	24.5
50	28.6	35.7	41.6
51	48.6	41.6	46.1
52	47.4	46.9	25.8
53	49.5	61.6	51.1
54	40.7	36.7	31.2
55	42.5	24.5	49.5
56	63.1	44.3	44.3
57	37.7	17.2	36.7
58	68.1	52.6	52.6
59	71.8	77.4	25.8
60	53.3	37.7	40.7
61	56.1	31.2	27.3
62	64.2	51.1	46.1
63	63.6	64.7	44.3
64	54.1	38.8	39.6
65	51.8	59.3	42.5
66	47.7	65.5	40.7
67	52.6	47.7	35.7
68	42.5	40.7	35.7
69	42.5	71.1	31.2
70	46.9	41.6	41.6
71	58.4	71.4	38.8
72	41.6	48.6	35.7
73	34.6	28.6	45.2
74	36.7	25.8	34.6
75	38.8	33.4	39.6
76	56.9	60.9	34.6
77	62.4	52.6	44.3
78	41.6	45.2	35.7
79	40.7	25.8	41.6
80	38.8	32.3	24.5
81	29.9	24.5	45.2
82	51.1	51.1	32.3
83	31.2	38.8	51.8
84	41.6	24.5	32.3
85	33.4	47.7	28.6
86	35.7	29.9	25.8
87	62.6	35.7	46.1

88	67.2	29.9	51.8
89	54.1	63.6	24.5
90	32.3	51.1	34.6
91	50.2	45.2	46.1
92	51.8	37.7	27.3
93	35.7	29.9	
94	51.8	38.8	
95	63.6	75.0	
96	43.5	39.6	
97	75.9	73.3	
98	68.1	48.6	
99	62.4	67.2	
100	57.1	40.7	
101	68.7	62.9	
102	75.5	48.6	
103	61.6	35.7	
104	29.9	36.7	
105	50.2	49.5	
106	46.1	34.6	
107	45.2	38.8	
108	51.1	44.3	
109	36.7		
110	32.3		
111	29.9		
112	28.6		
113	37.7		
114	53.3		
115	63.9		
116	42.5		
117	55.0		
118	40.7		
119	64.2		
120	54.1		
