

Supplementary Materials for

Pyrogenic iron: The missing link to high iron solubility in aerosols

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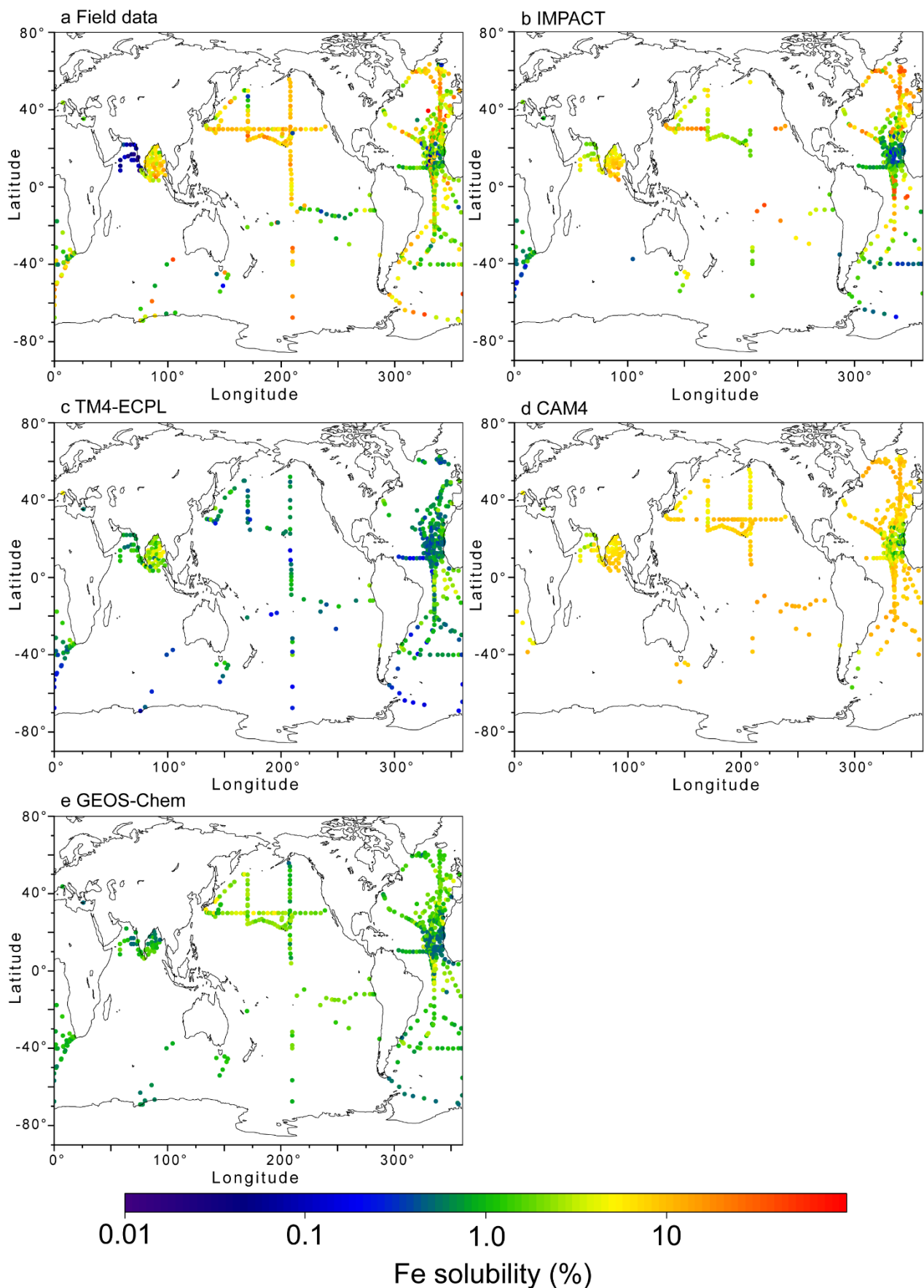


Fig. S1. Fe solubility (%) of aerosols collected during multiple field campaigns for the field data and the simulated estimates from models used in this study.

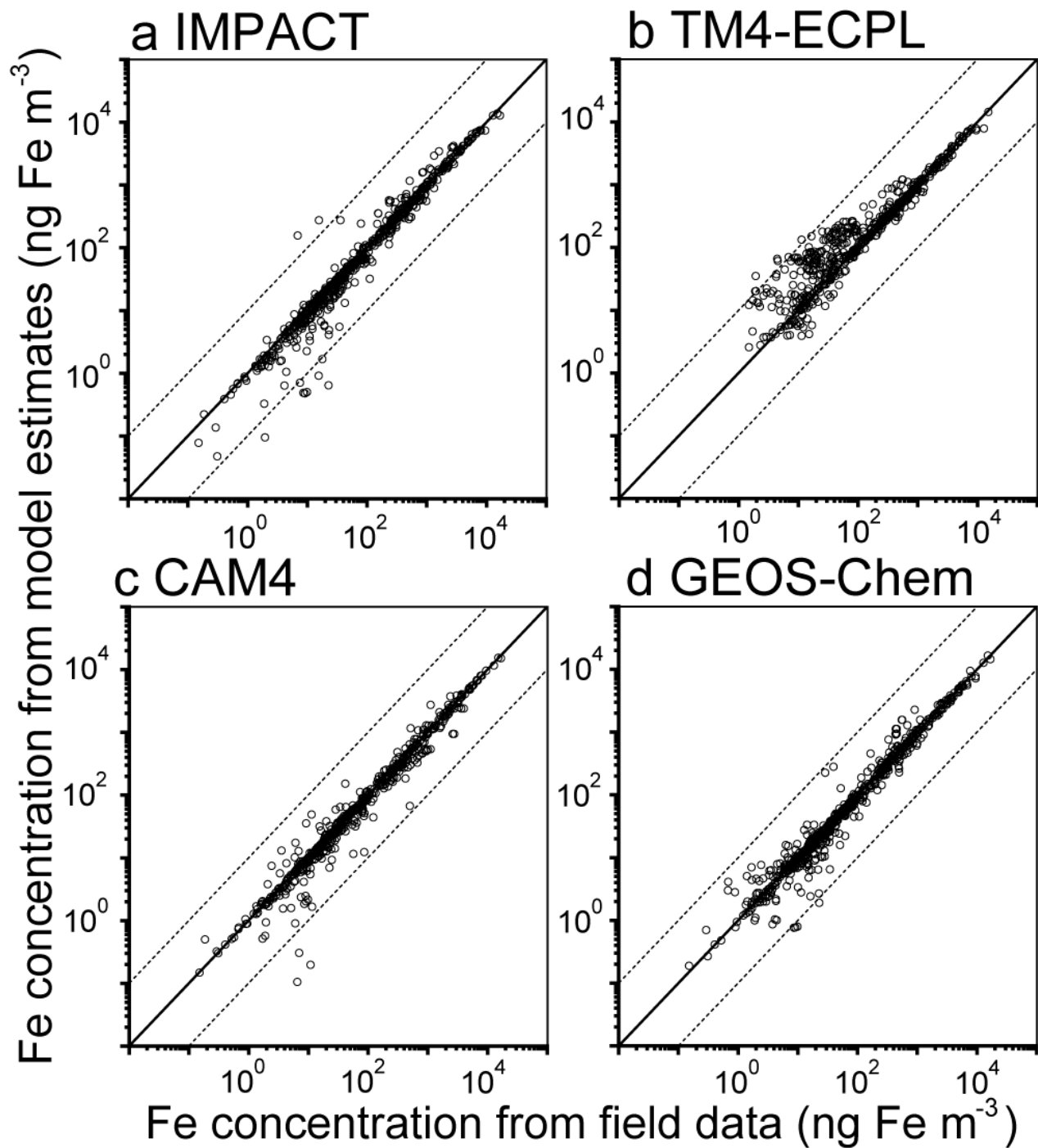


Fig. S2. Comparison of simulated estimates and observed values for total Fe concentration (ng m^{-3}). The solid line represents a 1-to-1 correspondence. The dashed lines show deviations from the solid line by a factor of ± 10 .

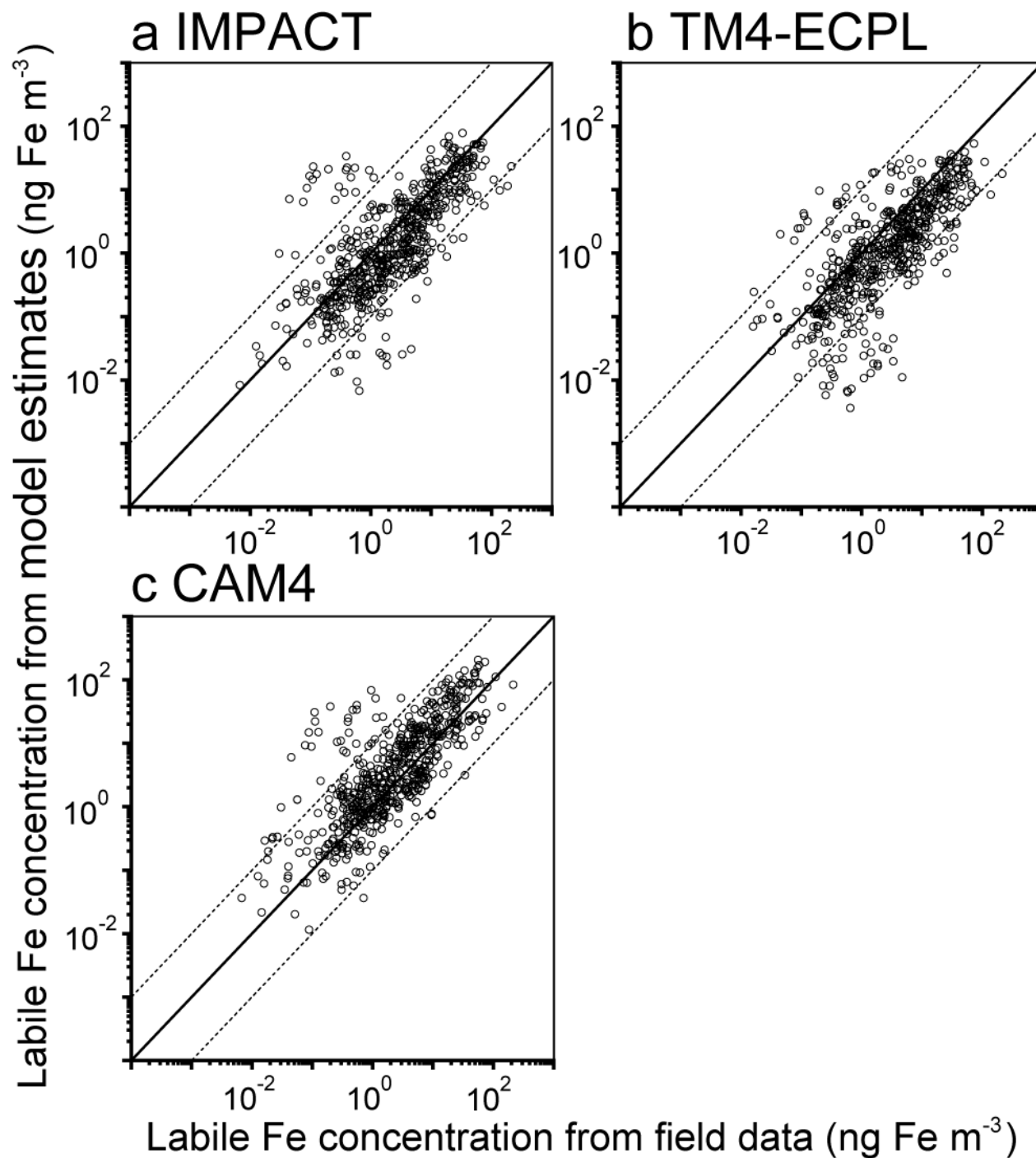


Fig. S3. Comparison of simulated estimates with combustion aerosols plus mineral dust and observed values for labile Fe concentration (ng m^{-3}). The solid line represents a 1-to-1 correspondence. The dashed lines show deviations from the solid line by a factor of ± 10 .

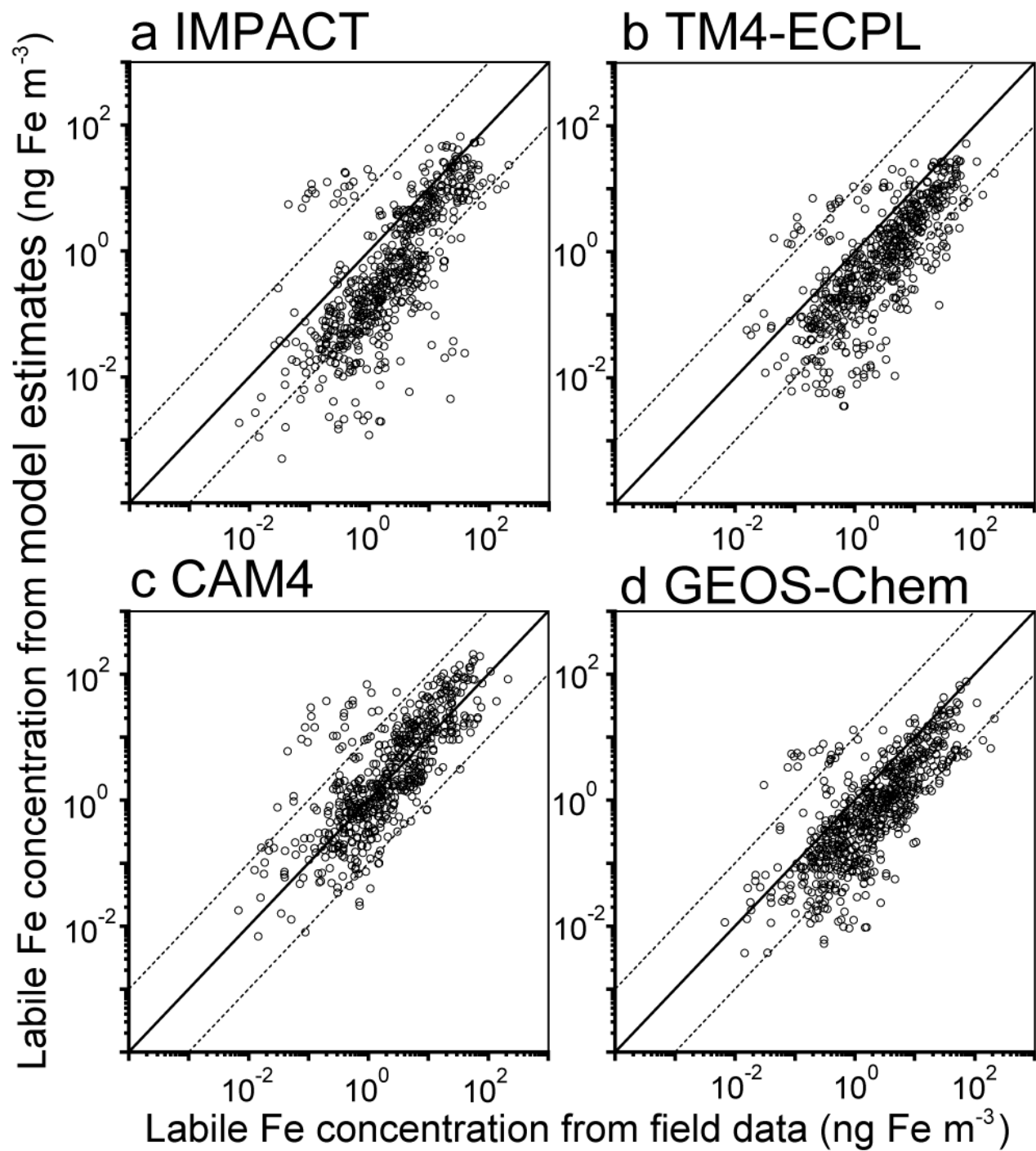


Fig. S4. Comparison of simulated estimates with mineral dust only and observed values for labile Fe concentration (ng m⁻³). The solid line represents a 1-to-1 correspondence. The dashed lines show deviations from the solid line by a factor of ± 10 .

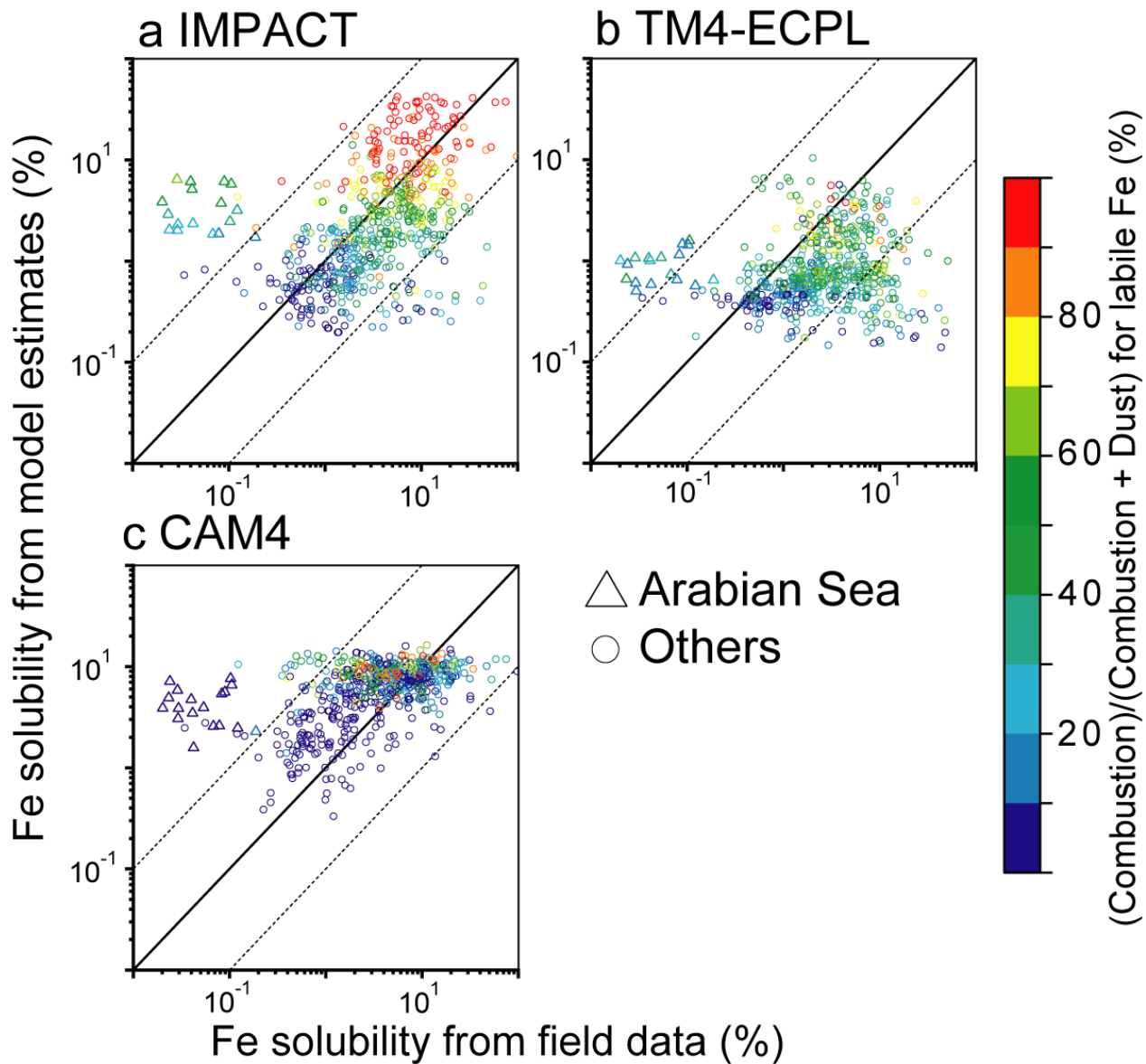


Fig. S5. Model estimates of Fe solubility in aerosols versus field data collected during multiple field campaigns (triangles for Arabian Sea and circles for others). The color represents the (combustion)/(combustion + dust) ratio (percent) for labile Fe concentration in aerosols. The solid line represents a 1-to-1 ratio. The dashed lines show deviations from the solid line by a factor of ± 10 .

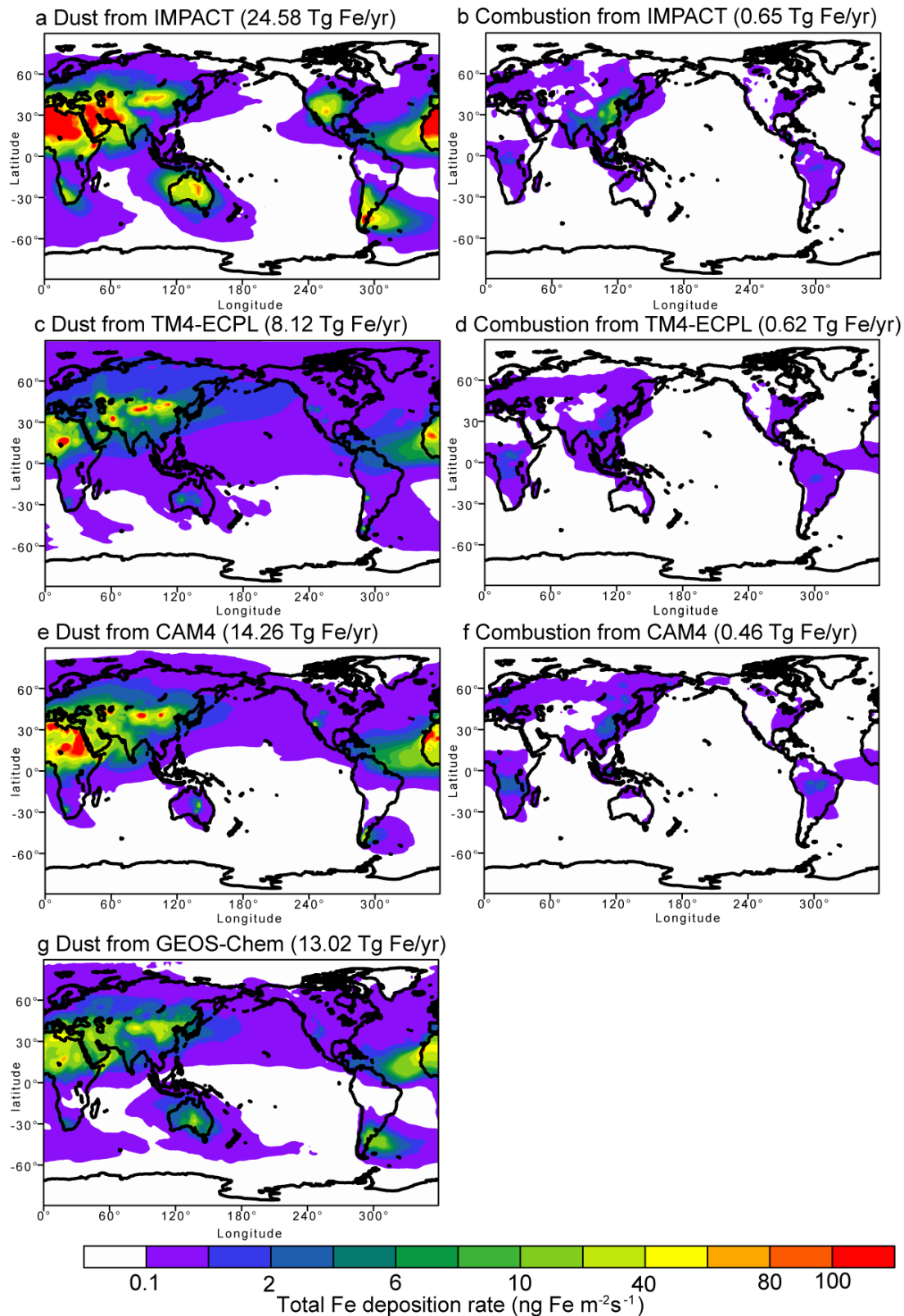


Fig. S6. Deposition fluxes of total Fe ($\text{ng Fe m}^{-2}\text{s}^{-1}$) from dust (a, c, e, and g) and combustion (b, d, and f) sources to present-day oceans. The parentheses represent total Fe deposition to the oceans (Tg Fe yr^{-1}). The oceans include the North Atlantic, the South Atlantic, the North Pacific, the South Pacific, the Indian, the Arctic ($> 66^\circ\text{N}$), and the Southern ($< 60^\circ\text{S}$) oceans, as classified by HTAP phase-2 (available online via the HTAP Wiki). We bias-correct the size-resolved mineral dust loading and deposition fluxes calculated by each model using recently-obtained constraints on size-resolved dust loading (34, 51).

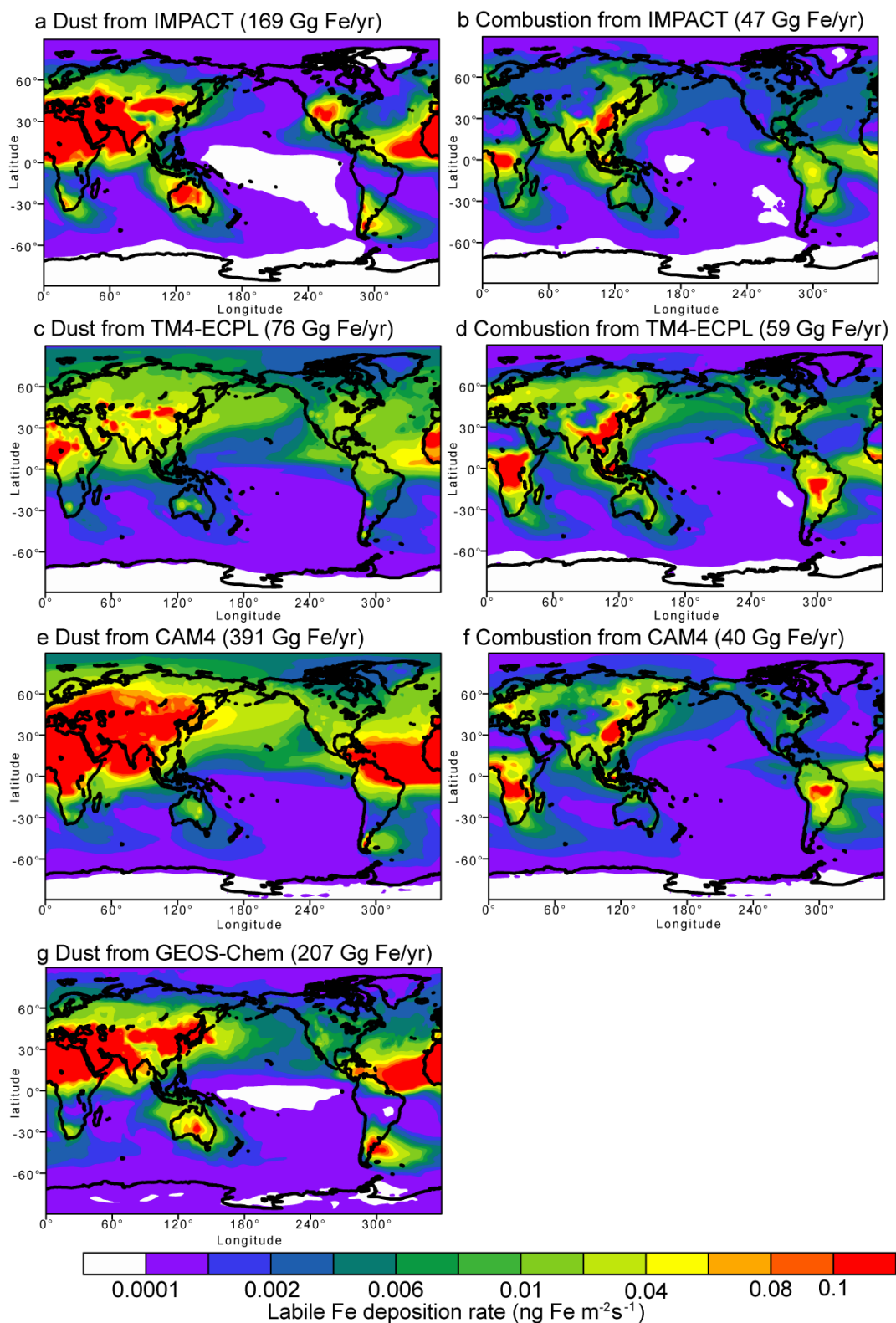


Fig. S7. Deposition fluxes of labile Fe ($\text{ng Fe m}^{-2}\text{s}^{-1}$) from dust (a, c, e, and g) and combustion (b, d, and f) sources to present-day oceans. The parentheses represent labile Fe deposition to the oceans (Gg Fe yr^{-1}). The oceans include the North Atlantic, the South Atlantic, the North Pacific, the South Pacific, the Indian, the Arctic ($> 66^\circ\text{N}$), and the Southern ($< 60^\circ\text{S}$) oceans, as classified by HTAP phase-2 (available online via the HTAP Wiki). We bias-correct the

size-resolved mineral dust loading and deposition fluxes calculated by each model using recently-obtained constraints on size-resolved dust loading (34, 51).

Table S1. Summary of averaged Fe solubility in atmospheric models used in this study.

Model	Source			Deposition to the ocean		
	Dust	Combustion	Sum	Dust	Combustion	Sum
IMPACT (28)	0.10%	0.32% (58%, 0%, and 0%)	0.10%	0.69%	7.2%	0.86%
TM4-ECPL (18)	0.32%	11% (81%, 12%, and 8%)	0.86%	0.93%	9.5%	1.5%
CAM4 (19)	0.31%	4.0% (4%, 4%, and 4%)	0.40%	2.7%	8.8%	2.9%
GEOS-Chem (15)	0.45%	-	0.45%	1.6%	-	1.6%

We bias-correct the size-resolved mineral dust emission and deposition fluxes calculated by each model on the basis of constraints on the dust size distribution (34, 51). The parentheses in the initial Fe solubility for combustion aerosols represent oil combustion from shipping, biomass burning, and other combustion sources, respectively.

Table S2. Latitude, longitude, month, and Fe solubility (%) in aerosols for the intercomparison study.

Lat	Lon	Mon	Observation	IMPACT (28)	TM4-ECPL (18)	GAM4 (19)	GEOS-Chem (15)
32.24	295.13	7	2.23 (58)	3.49	NaN	NaN	NaN
32.24	295.13	8	2.13 (58)	3.89	NaN	5.84	NaN
32.24	295.13	8	3.14 (58)	5.06	2.13	5.62	NaN
32.24	295.13	8	1.69 (58)	4.75	2.03	NaN	NaN
32.24	295.13	9	2.79 (58)	3.28	NaN	NaN	NaN
32.24	295.13	9	2.31 (58)	NaN	NaN	7.08	NaN
32.24	295.13	10	8.94 (58)	NaN	NaN	7.27	NaN
32.24	295.13	5	6.48 (58)	6.36	2.22	4.94	1.28
35.32	25.67	12	1.09 (58)	8.36	4.33	6.70	1.15
35.32	25.67	2	4.30 (58)	9.17	4.26	6.82	1.14
35.32	25.67	3	0.83 (58)	7.88	3.66	6.32	1.05
35.32	25.67	3	1.19 (58)	NaN	1.12	6.79	NaN
35.32	25.67	4	0.39 (58)	NaN	2.24	6.09	NaN
35.32	25.67	11	1.20 (58)	NaN	2.18	6.68	NaN
35.32	25.67	12	1.48 (58)	7.93	4.63	6.95	1.27
13.10	80.30	12	7.65 (37)	5.75	5.52	7.07	NaN
15.49	81.80	12	5.81 (37)	NaN	1.46	NaN	NaN
13.15	83.00	12	6.83 (37)	NaN	1.50	NaN	NaN
12.88	84.95	12	4.30 (37)	NaN	1.93	NaN	NaN
17.09	85.00	12	6.01 (37)	7.34	4.91	7.44	NaN
20.19	86.96	1	3.56 (37)	7.57	3.98	7.86	NaN
19.49	86.78	1	3.32 (37)	9.10	4.69	8.11	NaN
17.43	87.48	1	2.54 (37)	NaN	2.71	9.34	NaN
13.34	87.55	1	4.69 (37)	17.94	1.64	8.57	NaN
12.00	87.63	1	9.45 (37)	13.52	3.93	10.63	NaN
13.62	90.01	1	6.86 (37)	NaN	4.00	9.08	NaN
17.91	90.00	1	6.22 (37)	NaN	3.12	8.49	NaN
21.00	90.56	1	7.25 (37)	NaN	0.92	NaN	NaN
17.80	92.50	1	1.40 (37)	NaN	2.16	9.03	NaN
14.83	92.88	1	5.18 (37)	12.01	3.79	9.54	NaN
13.09	96.10	1	7.47 (37)	11.40	3.24	9.15	1.49
8.87	96.10	1	14.58 (37)	NaN	3.10	9.57	NaN
6.16	97.54	1	8.61 (37)	NaN	4.37	7.83	2.17
7.62	94.37	1	5.66 (37)	4.89	2.02	5.22	0.60
11.22	94.37	1	12.73 (37)	3.03	2.71	4.85	0.57
12.27	93.37	1	9.30 (37)	4.26	2.52	5.96	0.58
10.91	92.84	1	7.11 (37)	6.06	1.83	5.53	0.53
7.29	92.00	1	10.39 (37)	4.53	1.38	4.61	0.59
3.50	91.90	1	3.22 (37)	4.58	5.14	NaN	0.51
5.28	89.50	1	23.89 (37)	5.23	1.13	4.40	0.54
8.94	89.50	1	11.88 (37)	6.75	1.60	4.92	0.76
7.24	87.00	1	3.51 (37)	6.91	5.67	5.58	0.61
3.50	86.85	1	2.73 (37)	7.04	2.37	6.10	0.91
3.50	84.52	1	6.87 (37)	8.09	3.64	6.97	1.79
7.30	84.50	1	6.57 (37)	6.59	2.71	NaN	1.59
8.47	83.00	1	3.05 (37)	5.58	3.39	7.16	1.55

4.73	83.00	1	5.22 (37)	6.10	1.71	7.59	1.60
6.40	79.31	1	3.45 (37)	8.37	0.49	NaN	1.60
17.77	84.50	3	5.27 (26)	10.84	1.46	6.40	0.92
20.39	88.16	3	4.31 (26)	16.13	0.91	8.27	NaN
19.00	88.94	3	6.21 (26)	6.57	2.41	NaN	NaN
18.32	86.08	3	4.28 (26)	7.54	1.86	NaN	NaN
16.99	89.46	3	6.59 (26)	7.04	0.51	NaN	NaN
16.07	93.25	3	4.15 (26)	NaN	1.01	NaN	NaN
15.02	89.81	3	6.97 (26)	4.25	0.75	5.00	1.26
15.00	86.16	3	3.24 (26)	3.92	1.03	4.90	1.03
14.01	82.83	3	3.80 (26)	NaN	1.08	3.92	0.83
13.00	86.31	3	3.78 (26)	3.83	1.00	3.88	0.95
11.51	86.78	3	11.97 (26)	3.74	1.15	5.37	0.93
11.51	82.33	3	7.24 (26)	6.10	1.06	4.73	1.77
10.82	80.56	4	6.85 (26)	5.78	1.58	6.58	1.22
10.01	84.26	4	5.64 (26)	6.40	1.07	5.82	0.58
9.99	88.19	4	13.59 (26)	6.10	1.46	5.57	0.49
12.00	90.41	4	2.95 (26)	2.04	0.92	7.14	0.50
9.67	91.81	4	5.18 (26)	2.34	0.59	1.57	0.48
6.50	91.36	4	11.12 (26)	2.46	1.43	7.63	0.49
6.31	87.94	4	13.09 (26)	5.12	1.00	3.47	1.40
5.67	84.80	4	3.47 (26)	NaN	0.86	NaN	NaN
5.51	80.74	4	2.56 (26)	1.86	0.65	2.60	0.83
7.37	77.81	4	2.35 (26)	3.17	0.57	2.46	1.27
8.76	76.48	4	2.58 (26)	2.31	0.50	3.86	1.03
9.97	76.23	4	0.05 (26)	2.01	0.60	3.05	NaN
8.57	75.00	4	0.02 (26)	1.72	0.65	2.28	NaN
8.57	58.00	4	0.08 (26)	1.84	0.73	2.57	0.82
11.00	58.00	4	0.04 (26)	2.89	0.66	4.89	1.29
11.00	74.16	4	0.11 (26)	6.46	0.53	NaN	1.27
14.00	73.00	4	0.03 (26)	4.25	0.26	NaN	1.96
14.00	70.00	4	0.09 (26)	2.27	0.50	NaN	0.69
17.00	70.00	4	0.02 (26)	2.45	0.66	NaN	0.91
17.00	68.00	4	0.04 (26)	NaN	0.76	NaN	1.11
14.00	68.00	4	0.10 (26)	2.82	0.70	NaN	1.09
14.00	58.00	4	0.04 (26)	3.25	0.65	4.82	1.08
22.00	61.00	4	0.43 (26)	4.36	2.24	5.43	5.27
22.00	63.70	5	0.08 (26)	3.12	NaN	5.77	4.88
15.50	62.00	5	0.12 (26)	4.78	NaN	6.57	1.68
16.00	65.00	5	0.03 (26)	4.45	0.70	4.78	2.35
22.00	67.00	5	0.03 (26)	13.36	NaN	7.50	3.13
22.00	70.00	5	0.19 (26)	4.40	2.00	7.40	4.23
20.00	72.00	5	0.07 (26)	1.98	1.31	NaN	1.82
15.40	73.80	5	0.02 (26)	2.78	0.69	NaN	1.94
29.00	140.75	5	3.35 (21)	NaN	0.58	NaN	1.60
28.02	142.02	5	8.95 (21)	4.02	0.54	9.06	4.48
29.98	143.49	5	5.58 (21)	7.08	NaN	8.62	2.49
31.69	144.78	5	7.39 (21)	6.17	NaN	8.15	2.30
34.13	146.67	5	6.00 (21)	NaN	0.40	NaN	1.77
34.46	147.02	5	7.14 (21)	NaN	0.63	NaN	2.65

34.44	146.69	5	5.42 (21)	3.66	NaN	6.87	2.88
35.88	141.85	5	1.86 (21)	3.39	0.77	6.65	2.96
37.17	143.83	5	4.16 (21)	2.59	0.76	4.75	1.78
38.49	145.90	5	5.50 (21)	2.76	0.35	4.82	2.35
41.23	150.33	5	7.53 (21)	2.92	0.42	4.44	1.86
44.00	155.00	5	52.60 (21)	2.79	0.51	4.09	1.83
44.00	155.00	5	19.32 (21)	2.43	0.61	3.93	1.35
44.38	155.73	5	11.03 (21)	3.09	NaN	7.63	2.85
46.02	158.89	5	3.25 (21)	2.98	NaN	6.95	2.48
50.00	167.00	5	4.04 (21)	3.79	NaN	7.04	3.05
50.00	167.76	5	1.01 (21)	5.43	NaN	7.14	3.01
49.76	170.58	5	4.67 (21)	2.48	0.49	7.39	2.69
46.94	170.58	5	0.35 (21)	3.25	NaN	7.09	2.38
44.90	170.58	5	1.02 (21)	2.98	NaN	7.36	1.65
41.88	170.58	5	1.40 (21)	2.61	NaN	7.08	2.14
39.85	170.58	5	3.32 (21)	3.13	NaN	7.48	2.14
39.29	170.57	5	7.91 (21)	2.68	NaN	7.24	2.04
37.31	170.58	5	7.25 (21)	2.49	NaN	7.28	1.56
34.33	170.58	5	9.32 (21)	2.17	1.00	7.61	2.43
33.77	170.57	5	12.53 (21)	NaN	0.69	6.88	1.96
30.50	170.58	5	5.77 (21)	2.48	NaN	8.49	2.28
28.47	170.50	5	13.24 (21)	2.16	NaN	7.64	2.38
26.59	170.42	5	31.30 (21)	2.70	NaN	8.64	2.73
24.25	170.33	5	9.61 (21)	1.81	NaN	8.16	2.36
24.25	170.33	5	19.31 (21)	1.99	NaN	7.84	2.07
24.27	170.42	5	13.64 (21)	1.74	0.59	7.90	2.40
24.70	172.47	5	8.58 (21)	1.67	0.59	7.55	2.18
25.33	175.45	5	8.36 (21)	1.24	0.60	8.49	1.83
25.78	177.62	5	7.43 (21)	NaN	NaN	8.47	3.06
26.44	180.81	5	12.53 (21)	NaN	NaN	7.82	2.99
26.92	183.11	5	8.14 (21)	NaN	NaN	9.60	2.29
26.06	184.90	5	10.10 (21)	NaN	NaN	7.68	3.62
26.00	185.00	5	19.84 (21)	NaN	NaN	9.71	3.01
25.60	187.76	5	19.14 (21)	12.13	NaN	5.49	6.48
25.19	189.88	5	11.37 (21)	12.17	NaN	6.20	5.65
24.76	192.45	5	7.31 (21)	NaN	0.77	NaN	1.26
24.07	194.46	5	10.28 (21)	15.26	NaN	8.64	7.94
23.13	197.02	5	8.04 (21)	3.88	0.29	NaN	1.26
22.48	199.12	5	5.67 (21)	10.13	NaN	8.70	6.27
22.74	201.97	5	5.70 (21)	NaN	1.98	NaN	2.04
22.75	202.00	5	6.46 (21)	12.81	NaN	7.32	6.30
22.87	202.24	5	8.73 (21)	9.20	NaN	8.29	1.50
23.74	204.04	5	11.92 (21)	9.16	NaN	9.09	1.07
24.95	206.56	6	5.92 (21)	9.48	NaN	8.33	2.49
25.92	208.61	6	4.26 (21)	17.32	NaN	NaN	1.94
27.99	209.85	6	0.38 (21)	16.64	NaN	NaN	3.15
28.84	209.55	6	6.44 (21)	18.26	NaN	11.38	3.86
26.49	207.83	6	7.41 (21)	34.36	NaN	NaN	4.24
61.90	340.00	6	8.59 (52)	24.81	NaN	NaN	3.06
60.05	340.00	6	14.45 (52)	NaN	0.30	NaN	NaN

58.05	340.00	6	10.91 (52)	NaN	NaN	10.61	5.31
55.75	340.00	6	10.35 (52)	NaN	NaN	11.71	2.03
53.50	340.00	6	20.07 (52)	NaN	NaN	11.45	2.69
51.25	340.00	6	25.52 (52)	NaN	NaN	10.19	4.38
49.30	340.00	6	18.93 (52)	NaN	NaN	11.50	2.85
47.85	340.00	6	12.09 (52)	NaN	NaN	10.31	5.33
46.55	340.00	6	7.43 (52)	NaN	NaN	11.02	6.59
45.25	340.00	6	4.72 (52)	NaN	NaN	9.50	2.46
41.25	340.00	7	46.74 (52)	NaN	NaN	8.70	NaN
39.75	340.00	7	31.00 (52)	NaN	NaN	9.63	2.43
38.25	340.00	7	18.06 (52)	NaN	NaN	9.93	2.02
36.75	340.00	7	22.28 (52)	NaN	NaN	10.35	2.54
35.10	339.50	7	17.78 (52)	NaN	NaN	8.11	2.45
31.80	337.65	7	21.89 (52)	NaN	NaN	7.84	2.78
30.90	337.80	7	14.90 (52)	NaN	NaN	9.32	1.61
30.80	338.60	7	11.16 (52)	NaN	NaN	9.49	1.85
30.00	337.50	7	10.14 (52)	NaN	NaN	9.51	1.46
28.30	335.65	7	27.49 (52)	NaN	NaN	8.83	1.74
26.75	334.80	7	18.66 (52)	NaN	NaN	9.81	2.00
25.20	333.95	7	14.77 (52)	27.03	NaN	10.67	1.69
23.70	333.10	7	13.17 (52)	15.48	NaN	8.37	2.10
22.05	332.15	7	7.17 (52)	13.34	NaN	6.83	1.24
20.30	331.30	7	17.27 (52)	NaN	0.87	NaN	NaN
18.75	331.00	7	2.85 (52)	NaN	0.70	NaN	NaN
17.15	331.00	7	2.97 (52)	NaN	0.54	NaN	2.54
15.65	331.00	7	7.34 (52)	NaN	0.53	11.06	0.71
14.20	331.00	7	5.10 (52)	NaN	0.22	8.38	1.16
12.55	331.00	7	7.87 (52)	NaN	NaN	12.20	1.93
10.85	331.25	7	16.90 (52)	NaN	0.15	5.95	0.69
9.35	331.85	7	15.19 (52)	1.86	NaN	8.83	2.98
8.10	332.50	7	19.25 (52)	1.86	NaN	8.40	1.12
6.60	333.25	7	17.69 (52)	4.13	NaN	6.30	2.09
4.85	334.10	8	21.90 (52)	NaN	0.59	5.01	1.63
3.15	334.75	8	13.30 (52)	NaN	0.93	8.07	0.73
1.65	335.00	8	21.35 (52)	1.84	NaN	5.70	1.60
0.30	335.00	8	11.87 (52)	1.82	NaN	8.68	0.83
-1.20	335.00	8	13.78 (52)	NaN	0.68	NaN	1.02
-2.50	335.00	8	5.44 (52)	NaN	0.81	3.74	0.76
-3.00	335.00	8	8.80 (52)	NaN	NaN	7.34	1.79
31.87	133.59	6	3.51 (49)	NaN	0.54	4.75	1.52
31.32	133.97	6	3.24 (49)	NaN	NaN	5.74	1.79
30.24	134.48	6	8.95 (49)	NaN	NaN	7.80	0.95
30.38	135.53	6	3.30 (49)	NaN	0.73	5.00	1.06
30.00	136.61	6	15.98 (49)	NaN	0.49	5.18	0.84
30.00	137.76	6	21.88 (49)	NaN	0.90	4.83	1.27
30.00	137.92	6	9.06 (49)	5.18	NaN	4.63	0.70
30.00	140.98	6	15.11 (49)	NaN	NaN	5.07	0.47
30.00	143.45	6	7.76 (49)	NaN	1.53	8.06	1.32
30.01	144.91	6	12.61 (49)	1.34	0.78	NaN	0.75
30.00	148.61	6	11.49 (49)	1.66	0.58	6.44	1.61

30.00	152.84	7	10.11 (49)	NaN	0.52	NaN	0.58
30.00	156.70	7	11.57 (49)	NaN	1.79	NaN	2.78
30.00	160.60	7	10.08 (49)	NaN	1.11	NaN	2.37
30.00	164.73	7	6.99 (49)	2.33	0.61	6.50	1.45
30.00	168.17	7	8.32 (49)	4.89	0.55	10.23	1.96
30.00	172.47	7	6.61 (49)	14.79	NaN	10.67	1.22
30.00	175.86	7	10.48 (49)	12.39	NaN	10.41	1.57
30.00	180.78	7	11.20 (49)	6.43	NaN	9.21	1.33
30.00	184.48	7	6.82 (49)	8.41	NaN	10.70	1.19
30.00	188.33	7	16.26 (49)	10.36	NaN	13.45	1.76
30.00	192.25	7	3.15 (49)	27.10	NaN	11.03	1.50
30.00	194.06	7	6.82 (49)	21.38	NaN	10.22	1.72
30.00	196.88	7	9.66 (49)	19.26	NaN	10.58	1.40
30.00	197.99	8	5.59 (49)	25.68	NaN	10.73	1.18
30.00	199.88	8	5.29 (49)	25.29	NaN	10.78	0.89
26.44	200.51	8	3.16 (49)	12.56	NaN	10.13	2.41
22.33	200.76	8	5.50 (49)	4.26	NaN	11.63	1.49
27.54	200.92	8	11.47 (49)	2.50	NaN	9.12	1.63
30.00	201.76	8	17.42 (49)	3.62	NaN	8.06	2.40
30.00	203.81	8	10.06 (49)	9.57	NaN	9.58	3.89
30.00	207.84	8	8.47 (49)	5.53	NaN	8.84	1.99
30.00	212.44	8	8.61 (49)	3.56	NaN	9.16	1.79
30.00	217.10	8	15.15 (49)	1.23	NaN	7.76	3.28
30.00	221.61	8	5.59 (49)	15.95	NaN	10.78	2.17
30.00	226.41	8	6.61 (49)	21.05	NaN	8.65	2.27
30.00	230.46	8	13.92 (49)	6.86	NaN	6.62	1.81
30.00	235.08	8	5.73 (49)	3.63	NaN	5.33	2.18
31.29	238.76	8	9.16 (49)	3.11	NaN	11.16	2.37
-67.50	210.00	2	29.05 (49)	0.63	NaN	5.09	2.68
-56.50	210.00	2	16.56 (49)	1.01	NaN	NaN	0.59
-40.00	210.00	1	4.33 (49)	1.15	NaN	NaN	1.22
-38.41	210.00	1	7.90 (49)	1.08	NaN	NaN	1.52
-33.37	210.00	1	11.60 (49)	0.53	0.44	2.08	0.48
-31.50	210.00	1	28.09 (49)	0.56	0.45	2.08	0.46
-8.90	209.00	2	3.81 (49)	0.59	NaN	3.11	0.60
-6.00	209.00	2	11.06 (49)	1.81	NaN	4.56	1.89
-3.60	208.99	2	7.57 (49)	1.18	NaN	3.40	1.41
-1.50	209.00	2	4.69 (49)	2.93	NaN	8.24	5.28
0.40	209.00	2	4.78 (49)	6.09	NaN	10.95	5.59
2.00	209.00	2	5.45 (49)	25.27	NaN	11.29	3.53
4.00	209.00	2	7.62 (49)	22.58	NaN	10.84	1.93
6.80	208.71	2	7.51 (49)	22.47	NaN	10.73	3.53
9.00	208.25	2	8.17 (49)	33.15	NaN	10.06	3.25
11.70	208.00	2	18.56 (49)	2.56	2.92	6.48	3.93
14.00	208.00	2	10.25 (49)	5.10	2.38	5.13	0.47
16.10	208.06	3	9.60 (49)	3.57	0.69	7.46	1.61
18.50	208.04	3	7.71 (49)	5.90	NaN	7.96	0.93
21.60	204.72	3	7.52 (49)	6.12	0.47	9.29	1.29
22.70	208.00	3	10.75 (49)	5.20	NaN	7.71	1.15
25.00	208.00	3	9.65 (49)	3.07	NaN	5.88	0.92

27.00	208.00	3	11.19 (49)	0.52	0.30	1.68	0.46
29.00	208.00	3	13.55 (49)	0.58	0.47	0.79	0.47
31.20	208.00	3	14.59 (49)	0.61	0.45	0.57	0.47
36.00	208.00	3	10.77 (49)	0.68	0.42	0.46	0.47
38.00	208.00	3	9.20 (49)	0.88	0.44	1.27	0.46
40.00	208.00	3	7.17 (49)	0.51	0.36	2.23	0.48
42.00	208.00	3	13.76 (49)	0.48	0.52	2.06	0.46
45.00	208.00	3	8.69 (49)	1.13	0.52	8.01	0.56
47.00	208.00	3	10.26 (49)	3.55	2.29	5.10	0.82
49.40	208.00	3	9.98 (49)	NaN	1.99	NaN	0.53
52.00	208.00	3	10.14 (49)	3.78	2.09	5.30	0.95
54.00	208.00	3	9.82 (49)	2.36	1.72	5.29	0.97
55.70	207.05	3	8.36 (49)	4.03	1.40	5.76	0.71
-4.07	278.01	10	2.42 (53)	2.73	NaN	6.47	1.29
-12.01	280.80	10	2.00 (53)	7.32	NaN	8.00	1.95
-12.05	282.34	11	1.27 (53)	14.69	NaN	9.31	1.55
-11.99	278.50	11	1.93 (53)	6.72	NaN	6.81	1.28
-11.99	273.50	11	4.75 (53)	20.41	NaN	8.98	1.58
-12.00	266.00	11	1.55 (53)	19.19	NaN	9.26	1.43
-14.00	261.00	11	0.94 (53)	4.84	NaN	10.46	1.01
-16.00	256.00	11	0.69 (53)	7.77	NaN	9.70	0.78
-15.00	250.81	11	0.56 (53)	NaN	0.61	9.54	1.66
-14.99	247.25	11	1.47 (53)	2.06	0.71	13.39	2.99
-14.77	245.00	11	0.83 (53)	11.72	NaN	7.50	0.69
-14.00	240.00	11	0.49 (53)	6.55	NaN	7.59	1.22
-12.54	235.00	12	0.35 (53)	0.55	0.37	2.11	0.63
-11.67	232.00	12	1.27 (53)	NaN	NaN	1.69	NaN
-11.60	225.00	12	1.22 (53)	1.18	0.41	4.37	0.50
-11.31	220.00	12	1.68 (53)	0.60	0.36	2.31	0.51
-11.03	217.05	12	0.69 (53)	0.28	0.32	1.06	0.50
38.32	350.34	10	1.91 (23)	0.36	0.37	0.39	0.47
38.33	350.34	10	3.66 (23)	0.71	0.23	0.86	0.47
36.77	347.17	10	4.82 (23)	15.56	NaN	7.41	NaN
34.65	343.21	10	20.69 (23)	9.97	NaN	9.34	1.22
32.70	340.42	10	1.70 (23)	5.97	NaN	8.16	1.35
29.32	338.06	10	2.09 (23)	7.02	NaN	10.13	1.35
25.77	337.99	10	2.91 (23)	9.15	NaN	11.25	2.05
20.68	339.87	10	0.51 (23)	21.93	NaN	9.78	2.04
17.36	341.34	10	0.45 (23)	19.53	NaN	11.99	1.28
17.36	341.34	10	0.27 (23)	15.45	NaN	11.25	3.03
17.35	339.58	10	0.27 (23)	7.56	NaN	14.81	1.43
17.36	339.15	10	0.20 (23)	12.87	NaN	12.18	1.58
17.35	338.15	10	0.57 (23)	15.46	NaN	9.69	1.26
17.35	338.15	11	0.14 (23)	24.34	NaN	10.19	0.94
17.37	335.47	11	0.42 (23)	26.45	NaN	11.79	1.47
39.71	290.16	11	3.20 (23)	30.61	NaN	11.94	NaN
39.53	290.33	11	2.73 (23)	9.39	NaN	11.09	0.89
39.00	290.63	11	0.84 (23)	15.44	NaN	16.05	NaN
38.35	291.13	11	2.27 (23)	4.36	NaN	11.40	1.46
37.97	291.37	11	5.64 (23)	9.58	NaN	11.41	1.44

37.62	291.62	11	3.09 (23)	0.60	0.40	2.09	0.47
31.89	295.69	11	8.78 (23)	0.45	0.49	0.56	0.48
31.65	296.20	11	3.53 (23)	0.33	0.49	0.49	0.63
30.62	299.90	11	5.09 (23)	0.28	0.65	0.94	0.48
28.64	306.77	11	17.62 (23)	1.67	1.42	2.54	0.50
27.57	310.41	11	4.39 (23)	NaN	0.81	NaN	0.53
26.93	312.53	11	16.51 (23)	1.82	1.60	2.39	0.53
26.21	314.93	11	11.36 (23)	NaN	1.81	NaN	0.59
25.86	315.78	11	2.49 (23)	0.69	0.75	1.39	NaN
24.85	318.12	11	2.37 (23)	NaN	NaN	NaN	NaN
24.15	319.78	12	4.83 (23)	0.80	0.57	1.03	NaN
23.43	321.52	12	7.59 (23)	NaN	2.61	NaN	1.10
22.53	323.70	12	0.38 (23)	0.78	0.60	4.61	1.01
22.37	324.13	12	0.31 (23)	0.89	0.31	4.21	1.11
21.63	325.88	12	0.41 (23)	0.61	0.76	4.10	1.65
20.16	329.00	12	0.31 (23)	0.90	0.53	6.96	1.72
19.43	330.62	12	0.42 (23)	0.92	0.72	4.45	2.91
18.78	332.24	12	0.22 (23)	5.57	0.65	9.79	1.95
17.58	335.08	12	0.43 (23)	0.55	0.49	1.00	0.50
40.33	349.96	5	2.87 (23)	0.50	0.44	1.43	0.46
40.86	346.95	5	3.39 (23)	0.62	0.58	2.99	0.83
41.38	346.11	5	4.29 (23)	0.57	0.62	3.23	0.49
41.38	346.11	5	4.65 (23)	0.54	0.47	2.56	0.46
42.58	344.54	5	3.38 (23)	NaN	0.32	6.42	NaN
46.17	340.62	5	5.16 (23)	NaN	0.41	NaN	0.91
48.78	338.57	6	3.49 (23)	0.53	0.60	3.79	1.10
51.85	336.16	6	6.68 (23)	NaN	0.93	6.40	NaN
54.46	334.11	6	19.57 (23)	26.67	2.05	9.01	5.11
56.86	331.78	6	11.67 (23)	4.75	0.81	8.08	3.58
58.70	327.75	6	7.73 (23)	NaN	0.87	8.10	3.63
59.41	323.13	6	5.81 (23)	1.11	0.44	4.30	NaN
59.71	319.52	6	21.32 (23)	1.36	0.52	3.00	NaN
59.80	318.00	6	12.50 (23)	1.06	0.71	9.55	1.20
59.39	315.69	6	9.42 (23)	1.32	0.44	8.14	0.99
56.32	312.21	6	6.74 (23)	0.88	0.88	9.03	1.44
54.32	310.22	6	3.31 (23)	1.06	0.93	5.11	1.27
52.46	307.38	6	1.90 (23)	1.05	0.87	3.87	0.81
-45.01	142.98	1	0.47 (43)	1.46	0.77	NaN	1.90
-54.00	145.98	2	1.35 (43)	1.35	0.50	4.15	1.83
-50.99	148.57	2	0.19 (43)	0.83	0.85	NaN	1.72
-47.00	152.07	2	1.48 (43)	1.61	0.60	7.69	NaN
-45.50	153.20	2	1.62 (43)	1.49	0.37	10.07	1.79
-45.27	153.01	2	2.52 (43)	NaN	1.82	8.05	1.70
-44.24	150.20	2	17.65 (43)	NaN	0.67	9.72	1.25
-37.50	104.50	11	40.74 (50)	11.75	1.59	5.97	1.28
-59.00	86.00	11	27.00 (50)	0.48	0.27	0.33	0.46
-69.00	76.00	12	23.57 (50)	0.45	0.49	0.63	0.48
-66.50	88.50	1	6.50 (50)	0.54	0.61	3.13	0.49
-65.00	106.50	1	1.14 (50)	NaN	0.77	4.47	0.48
-65.50	98.50	1	0.74 (50)	1.85	0.79	5.74	0.62

-67.00	80.00	1	3.43 (50)	0.51	0.85	NaN	0.84
-69.00	78.00	2	1.65 (50)	0.88	2.63	8.28	NaN
-69.00	77.00	2	1.47 (50)	NaN	0.92	9.01	3.50
-69.00	77.00	2	5.45 (50)	1.22	1.14	9.88	2.39
-69.00	76.00	2	9.31 (50)	1.86	1.80	10.02	2.45
-63.00	76.00	2	1.27 (50)	NaN	0.83	7.54	NaN
-51.00	88.50	3	0.76 (50)	10.66	0.69	6.76	3.08
-40.00	99.00	3	0.87 (50)	NaN	0.57	8.48	2.26
17.00	342.50	3	0.68 (56)	11.80	0.68	6.40	1.78
17.25	343.00	3	1.02 (56)	6.22	0.68	8.40	NaN
18.25	343.15	3	0.99 (56)	0.62	0.46	2.17	0.54
19.00	342.70	3	1.82 (56)	0.75	0.50	2.14	0.82
20.55	342.05	3	13.38 (56)	1.19	0.77	6.28	1.33
19.55	342.85	3	2.41 (56)	NaN	0.64	5.82	1.17
19.90	342.25	3	15.58 (56)	1.18	NaN	7.58	1.99
17.80	342.90	3	2.50 (56)	3.35	NaN	9.87	2.50
17.30	339.45	4	2.94 (56)	12.98	NaN	10.60	2.05
18.75	343.00	4	2.21 (56)	10.86	NaN	9.00	2.05
18.50	342.00	4	2.28 (56)	1.67	0.37	5.91	0.46
34.82	338.32	6	1.59 (41)	NaN	0.51	NaN	0.48
10.59	328.71	6	0.92 (41)	2.61	0.69	10.31	0.46
3.17	333.13	5	2.26 (41)	1.66	0.49	7.90	0.57
23.15	326.12	6	1.82 (41)	14.03	0.71	7.51	1.61
28.03	331.65	6	3.34 (41)	4.12	NaN	10.19	0.99
-30.58	331.79	5	0.55 (41)	0.67	0.42	13.84	0.49
-6.37	335.00	5	1.25 (41)	12.86	0.64	8.17	1.61
-27.67	334.21	5	6.96 (41)	1.64	0.43	13.77	1.06
16.38	325.19	6	3.27 (41)	3.35	1.67	NaN	1.44
-32.83	328.97	5	1.35 (41)	2.12	0.52	8.75	1.44
-11.68	335.12	5	2.36 (41)	21.35	0.60	NaN	1.38
43.34	340.69	6	1.99 (41)	3.48	0.66	7.28	2.24
-15.58	335.00	5	3.13 (41)	3.19	0.65	7.80	1.51
-23.67	335.00	5	2.48 (41)	3.29	0.65	7.93	1.68
-19.52	335.00	5	1.24 (41)	2.16	1.01	8.21	2.75
18.68	341.56	9	0.52 (41)	2.49	0.78	7.30	1.67
20.52	340.84	9	0.50 (41)	8.06	0.63	NaN	2.20
24.31	339.29	9	1.67 (41)	1.53	0.74	NaN	NaN
15.05	340.06	9	0.58 (41)	3.14	1.56	8.35	0.50
10.76	338.45	9	0.85 (41)	1.04	0.61	2.75	0.50
41.24	339.41	9	5.29 (41)	3.06	1.14	3.13	1.48
6.93	337.21	9	1.35 (41)	1.59	0.60	1.80	0.60
27.22	339.19	9	1.35 (41)	1.54	1.42	5.43	0.94
44.88	341.68	9	8.80 (41)	3.09	NaN	10.18	1.37
-1.48	335.14	9	2.24 (41)	NaN	1.63	9.86	1.69
-5.83	335.00	9	9.27 (41)	10.73	0.88	6.19	1.54
2.87	335.91	9	8.08 (41)	5.85	0.49	7.21	1.06
-22.08	335.00	10	6.71 (41)	0.41	NaN	1.37	0.46
31.40	338.51	9	6.16 (41)	0.40	0.37	1.25	0.45
35.34	336.42	9	2.47 (41)	0.41	0.35	1.48	0.45
-27.39	333.29	10	11.96 (41)	NaN	0.41	1.36	0.46

-33.49	328.30	10	7.43 (41)	0.34	0.35	1.63	0.46
-39.55	320.44	10	9.95 (41)	0.20	0.35	1.40	0.45
-18.20	335.00	10	16.09 (41)	0.47	0.43	1.73	0.49
-9.88	335.00	9	34.02 (41)	0.41	0.36	1.54	0.48
-14.04	335.01	10	13.89 (41)	0.57	0.34	1.72	0.46
6.70	332.44	5	1.61 (41)	0.34	0.39	2.13	0.46
10.31	331.05	5	1.94 (41)	0.65	0.38	2.43	0.63
-0.84	334.92	5	2.36 (41)	0.88	0.31	0.78	0.53
35.38	336.35	5	4.87 (41)	0.61	0.37	1.69	0.53
2.59	334.02	5	1.80 (41)	1.35	0.50	9.38	0.71
37.82	339.49	5	4.62 (41)	0.81	0.44	3.02	0.64
21.73	326.51	5	2.05 (41)	0.52	0.39	3.99	0.71
13.99	329.63	5	2.39 (41)	0.31	0.58	0.77	0.73
33.08	331.32	5	2.65 (41)	0.30	0.57	10.37	0.52
18.02	328.02	5	3.58 (41)	0.31	0.52	4.74	0.86
25.28	325.03	5	2.36 (41)	1.02	0.43	1.75	0.73
28.58	324.27	5	2.20 (41)	4.82	1.52	5.38	1.81
30.91	326.65	5	4.74 (41)	4.96	1.37	8.55	0.80
-41.69	317.55	5	0.73 (41)	2.80	0.47	11.84	1.79
49.19	349.58	5	1.90 (41)	3.08	0.58	3.59	3.90
41.28	340.98	5	2.88 (41)	2.45	0.58	3.71	3.89
-16.58	335.01	5	2.61 (41)	0.56	0.67	4.29	0.52
49.89	357.35	5	10.20 (41)	0.34	0.82	7.52	0.93
-8.85	335.01	5	2.01 (41)	0.52	0.55	1.58	0.45
-37.51	323.14	5	1.00 (41)	0.43	0.45	0.86	0.45
-32.15	329.97	5	1.54 (41)	0.69	0.88	1.41	0.46
-24.49	335.00	5	1.31 (41)	0.36	0.41	0.89	0.46
-28.08	333.97	5	0.70 (41)	0.73	0.43	2.49	0.48
-20.87	335.01	5	2.26 (41)	0.82	0.40	2.78	0.47
21.31	341.08	10	1.20 (41)	0.73	0.56	1.01	0.45
21.34	341.53	10	1.80 (41)	2.17	0.59	3.50	0.51
20.88	341.78	9	1.81 (41)	0.72	0.53	1.01	0.45
29.64	342.08	9	2.97 (41)	0.26	0.49	4.61	0.46
8.41	336.90	10	2.10 (41)	1.64	0.24	NaN	0.48
21.70	340.92	9	3.15 (41)	1.05	0.57	2.72	0.69
0.48	335.21	10	3.14 (41)	1.54	0.21	6.25	0.75
32.25	339.63	9	4.91 (41)	1.50	0.41	8.84	1.05
5.47	336.16	10	3.80 (41)	2.03	0.63	3.33	0.51
-13.56	335.00	10	2.74 (41)	1.97	0.71	3.93	0.63
2.94	335.67	10	5.46 (41)	0.55	0.45	2.87	2.79
39.59	339.75	9	3.90 (41)	0.90	0.64	3.35	1.98
-9.85	335.00	10	3.64 (41)	1.00	0.47	2.91	1.91
-2.77	335.00	10	3.72 (41)	1.85	0.64	12.64	1.34
-6.33	335.00	10	2.49 (41)	0.88	0.64	12.50	0.61
-38.06	1.43	10	7.45 (41)	1.96	0.64	9.45	1.65
-38.21	10.94	10	2.40 (41)	1.76	0.64	12.81	1.94
-32.23	356.91	10	6.51 (41)	1.62	0.71	10.36	1.67
-24.12	343.69	10	2.56 (41)	1.65	0.80	9.85	1.48
-20.83	337.55	10	2.23 (41)	1.89	0.64	10.64	1.69
-27.41	350.85	10	2.30 (41)	1.46	0.80	10.87	1.42

47.90	345.74	9	3.39 (41)	0.77	0.64	5.77	0.51
43.15	340.38	9	1.85 (41)	0.84	0.70	5.38	1.61
48.26	349.39	9	3.11 (41)	NaN	1.41	NaN	1.00
46.37	342.44	9	4.01 (41)	4.88	2.95	8.65	1.19
-17.34	335.01	10	3.10 (41)	3.01	1.44	7.10	3.39
11.21	329.62	6	0.12 (41)	NaN	1.00	3.64	3.83
17.48	326.53	6	0.88 (41)	21.36	NaN	7.62	2.90
5.52	332.36	6	0.58 (41)	15.08	NaN	8.18	4.33
34.64	319.75	6	0.61 (41)	5.03	NaN	6.72	3.13
-25.87	340.86	5	1.22 (41)	1.46	0.84	1.96	0.45
-0.26	334.42	6	0.12 (41)	2.14	0.91	3.74	0.45
24.32	323.02	6	10.15 (41)	1.57	0.84	1.75	0.46
-27.84	349.58	5	1.63 (41)	1.67	0.47	5.09	0.45
30.07	318.83	6	10.26 (41)	1.90	0.68	2.26	0.55
-14.91	335.00	6	2.99 (41)	1.09	0.89	3.01	0.79
-32.37	13.58	5	3.63 (41)	0.85	0.41	3.56	0.54
-29.64	358.95	5	2.48 (41)	1.46	0.83	5.15	0.46
45.10	340.88	6	3.63 (41)	0.63	0.20	4.08	0.60
39.52	329.56	6	97.96 (41)	NaN	1.75	NaN	0.49
13.03	328.74	11	1.36 (41)	0.80	0.32	NaN	0.81
1.41	334.33	11	3.01 (41)	2.41	1.83	9.44	0.56
-2.31	335.00	11	2.62 (41)	0.80	0.21	2.11	0.56
9.08	330.77	11	2.20 (41)	2.24	NaN	8.85	0.50
15.90	327.32	11	2.28 (41)	0.87	0.29	NaN	0.72
36.62	332.15	10	1.92 (41)	0.59	0.17	4.89	0.65
4.32	332.95	11	5.68 (41)	0.76	0.31	4.95	0.81
-17.81	335.00	11	1.79 (41)	1.61	2.01	8.33	2.67
-6.73	335.00	11	3.66 (41)	0.70	0.18	NaN	0.95
-21.86	339.24	11	0.91 (41)	NaN	1.90	9.96	1.11
-13.79	335.00	11	1.54 (41)	1.11	0.54	10.47	0.96
20.26	325.08	11	2.10 (41)	1.53	0.46	4.74	0.57
-31.26	1.27	11	1.39 (41)	NaN	0.41	12.69	0.52
-27.84	352.92	11	1.33 (41)	1.61	1.61	8.21	2.90
-24.47	345.12	11	2.00 (41)	3.20	NaN	5.61	0.46
40.84	337.52	10	3.40 (41)	0.99	0.62	6.24	1.34
24.86	322.76	11	2.07 (41)	2.95	1.85	8.22	1.90
47.10	342.88	10	3.04 (41)	1.57	NaN	10.47	2.51
27.99	322.36	10	3.78 (41)	0.61	0.45	1.37	0.46
49.73	346.12	10	1.54 (41)	0.42	0.46	1.73	0.46
37.15	333.49	10	7.69 (41)	0.87	0.46	1.69	0.55
37.71	334.38	10	1.54 (41)	0.81	0.46	2.10	0.55
37.09	333.69	10	6.46 (41)	0.55	0.47	1.79	0.53
30.11	325.13	10	1.24 (41)	0.84	0.46	2.01	0.68
-20.40	336.31	11	1.54 (41)	0.59	0.60	NaN	NaN
35.00	329.01	10	2.25 (41)	0.55	0.54	1.82	0.64
44.48	341.04	10	2.32 (41)	0.77	0.53	NaN	0.55
-33.40	7.74	11	1.24 (41)	0.52	0.48	NaN	0.65
-10.45	335.00	11	3.81 (41)	0.54	0.59	1.65	0.93
12.25	339.53	11	3.33 (41)	0.90	0.53	NaN	0.68
8.74	341.20	11	3.79 (41)	NaN	0.54	NaN	0.64

16.14	339.13	10	3.72 (41)	NaN	0.54	NaN	0.64
-13.08	358.45	11	2.21 (41)	0.91	0.52	NaN	0.71
24.01	340.81	10	3.40 (41)	0.77	0.52	NaN	NaN
-7.42	353.96	11	1.48 (41)	0.72	0.97	2.38	0.83
-10.36	356.30	11	0.39 (41)	0.63	0.96	1.92	NaN
27.55	342.93	10	2.61 (41)	1.79	2.03	3.93	4.33
20.43	339.29	10	1.61 (41)	1.06	1.12	2.08	NaN
5.37	343.91	11	20.80 (41)	0.49	1.10	NaN	NaN
1.97	346.65	11	20.05 (41)	NaN	1.67	NaN	NaN
39.10	348.91	10	4.80 (41)	NaN	0.87	NaN	NaN
-4.08	351.37	11	1.69 (41)	NaN	0.68	NaN	NaN
-17.69	2.20	11	0.73 (41)	NaN	0.33	NaN	NaN
-23.54	7.18	11	2.55 (41)	NaN	0.32	NaN	NaN
31.55	344.57	10	1.03 (41)	37.15	0.35	9.69	1.20
-0.95	348.94	11	8.10 (41)	NaN	0.35	NaN	NaN
-33.99	17.47	2	2.08 (10)	36.75	0.32	9.81	1.19
-34.05	16.02	2	10.05 (10)	36.11	0.29	9.88	1.23
-55.28	359.98	3	47.81 (10)	37.62	NaN	11.87	1.27
-41.81	9.39	2	15.25 (10)	37.10	NaN	11.88	1.25
-35.27	14.17	2	5.99 (10)	35.22	NaN	9.45	1.20
-38.66	11.64	2	9.99 (10)	34.04	0.41	9.13	1.28
-50.09	1.80	3	15.79 (10)	33.65	0.49	9.64	NaN
-45.80	6.01	2	22.35 (10)	NaN	0.90	9.34	1.11
16.21	329.35	1	0.33 (56)	NaN	0.46	NaN	NaN
20.89	333.04	1	0.48 (56)	NaN	0.90	9.26	1.00
16.22	329.35	1	0.45 (56)	2.44	NaN	NaN	NaN
24.02	332.33	1	0.53 (56)	12.56	NaN	9.94	1.10
16.22	329.36	1	0.58 (56)	11.63	NaN	8.75	1.04
17.78	332.32	1	1.34 (56)	NaN	NaN	NaN	NaN
12.65	333.19	1	0.41 (56)	NaN	NaN	NaN	NaN
12.56	328.08	1	0.70 (56)	NaN	NaN	NaN	NaN
12.61	330.84	1	0.57 (56)	NaN	1.00	5.59	NaN
16.40	330.28	1	0.65 (56)	NaN	0.92	5.12	NaN
16.16	329.36	1	1.67 (56)	1.81	0.45	NaN	0.46
25.77	332.94	1	1.14 (56)	NaN	NaN	8.99	1.26
24.91	338.72	1	1.09 (56)	11.04	NaN	7.25	1.35
13.85	334.31	1	1.65 (56)	0.55	0.38	1.13	0.45
12.54	325.68	1	1.20 (56)	0.33	0.36	1.71	0.45
18.07	335.45	1	2.00 (56)	0.24	0.33	1.94	0.45
25.74	335.28	1	1.47 (56)	0.22	0.32	3.65	0.46
16.36	335.11	1	4.32 (56)	0.23	0.47	0.68	0.46
19.42	334.69	1	1.62 (56)	0.28	0.30	1.80	0.45
21.60	333.49	1	1.61 (56)	0.20	0.42	3.24	0.45
23.96	332.16	1	4.71 (56)	0.22	0.47	3.65	0.45
25.99	331.00	1	5.65 (56)	0.23	0.45	0.77	0.45
14.31	329.36	1	3.57 (56)	NaN	1.45	0.99	0.51
12.57	326.01	1	3.56 (56)	NaN	1.29	2.54	3.82
12.55	328.37	1	3.56 (56)	1.43	0.31	NaN	NaN
26.43	335.16	2	2.54 (56)	1.76	0.46	5.52	0.61
26.51	332.08	1	9.41 (56)	1.96	0.47	7.21	0.78

-40.02	3.19	10	0.54 (54)	8.01	0.43	6.16	1.05
-37.59	11.18	11	1.82 (54)	3.89	0.46	7.42	1.10
-35.42	15.38	10	1.01 (54)	2.62	NaN	7.49	2.38
-36.67	12.70	11	0.87 (54)	5.11	NaN	6.00	1.47
-35.16	15.80	11	0.62 (54)	4.07	NaN	7.30	1.41
-39.10	7.96	10	0.50 (54)	2.83	NaN	10.86	2.43
-37.27	11.95	10	0.54 (54)	4.36	NaN	4.80	3.97
-34.51	17.33	11	2.60 (54)	5.40	NaN	7.25	0.95
-40.01	359.17	10	2.12 (54)	26.72	NaN	6.02	0.90
-35.90	10.91	11	0.72 (54)	0.30	0.36	3.05	0.45
-38.92	0.24	10	0.34 (54)	0.29	0.39	3.53	0.46
12.58	337.31	2	0.67 (56)	0.35	0.40	3.42	0.46
12.58	336.34	2	0.45 (56)	0.33	0.46	1.93	0.52
10.88	334.59	2	0.81 (56)	0.32	0.62	1.30	0.93
12.42	335.47	2	0.51 (56)	0.32	0.63	5.65	1.34
13.48	331.16	3	0.03 (56)	0.23	0.51	2.75	0.47
16.47	331.41	3	0.06 (56)	0.37	0.68	1.71	1.81
12.87	342.23	2	0.62 (56)	0.65	0.66	6.35	1.34
6.85	334.45	2	0.65 (56)	0.98	0.88	7.00	1.79
12.58	341.80	2	0.98 (56)	4.67	1.84	7.16	1.97
12.56	339.66	2	1.24 (56)	0.26	0.87	6.64	1.93
2.92	334.60	2	0.57 (56)	0.34	0.69	7.18	2.18
5.53	332.55	3	1.43 (56)	20.78	0.81	6.72	1.39
-1.94	334.30	3	1.36 (56)	0.58	0.81	3.14	1.17
2.99	333.32	3	1.36 (56)	7.11	0.43	6.67	1.56
1.22	333.97	3	1.26 (56)	0.53	0.61	5.94	0.62
7.89	331.87	3	1.17 (56)	0.58	0.72	2.66	0.53
10.17	331.35	3	1.27 (56)	0.34	0.69	6.52	2.98
-1.38	334.77	3	2.93 (56)	14.54	NaN	4.76	0.67
20.19	333.16	3	0.43 (56)	14.99	1.20	5.11	1.58
22.34	335.95	3	0.43 (56)	1.04	0.94	1.60	0.46
-6.56	334.95	3	0.43 (56)	0.86	0.65	4.35	0.46
18.30	331.75	3	0.52 (56)	0.68	0.47	2.21	0.47
-5.37	334.93	3	0.65 (56)	0.38	0.41	1.22	0.47
-4.53	334.66	3	1.29 (56)	1.02	0.40	1.41	0.46
27.59	337.25	5	4.59 (56)	1.23	0.76	4.99	0.55
27.63	336.77	5	2.68 (56)	1.23	0.35	1.34	0.48
27.81	336.66	5	4.37 (56)	1.91	0.80	6.14	0.72
27.79	336.66	5	6.19 (56)	3.51	2.51	5.82	2.19
27.81	337.59	5	3.53 (56)	1.38	4.10	7.01	0.80
27.88	338.54	5	4.67 (56)	2.44	5.59	6.37	0.59
27.86	336.94	5	4.30 (56)	3.92	3.51	5.18	1.45
27.86	338.56	5	5.10 (56)	2.41	3.79	4.86	1.01
-40.01	342.35	1	0.70 (54)	1.70	6.39	3.52	0.74
-40.00	338.02	1	1.52 (54)	NaN	6.25	NaN	0.93
-39.02	313.30	1	2.29 (54)	2.09	5.24	3.16	0.97
-40.11	347.39	1	1.48 (54)	2.09	6.16	3.14	1.25
-39.99	356.60	1	5.19 (54)	2.09	4.40	3.15	0.67
-38.89	8.04	12	2.10 (54)	2.09	10.42	3.14	1.25
-40.00	331.38	1	1.48 (54)	2.09	6.15	3.15	0.87

-40.02	2.13	1	1.48 (54)	1.33	5.52	6.35	0.47
-40.10	351.80	1	1.48 (54)	1.91	6.63	6.35	0.47
-36.39	13.59	12	1.48 (54)	1.91	4.43	6.16	0.48
-40.00	322.54	1	1.24 (54)	1.33	1.30	6.35	0.47
-37.51	308.26	1	6.36 (54)	1.91	6.60	6.51	0.47
-36.77	307.19	1	1.87 (54)	NaN	0.71	NaN	NaN
-35.83	305.96	1	1.48 (54)	NaN	0.90	NaN	NaN
17.97	341.51	9	1.42 (11)	NaN	0.92	NaN	NaN
-34.50	306.65	10	5.17 (11)	NaN	1.13	NaN	NaN
13.06	341.65	9	1.73 (11)	1.60	2.30	NaN	1.62
-5.07	346.56	9	5.60 (11)	1.47	1.53	NaN	1.48
22.66	341.71	9	3.78 (11)	NaN	NaN	NaN	1.07
3.55	343.25	9	4.24 (11)	NaN	1.51	NaN	2.22
-23.65	323.41	10	5.19 (11)	2.55	NaN	10.57	1.80
-1.20	344.21	9	5.59 (11)	3.33	0.55	12.45	1.56
-9.83	342.96	10	4.98 (11)	3.86	NaN	12.20	1.64
27.76	342.48	9	4.80 (11)	NaN	NaN	11.45	2.05
-32.66	309.61	10	8.72 (11)	NaN	1.10	11.39	2.01
-10.91	346.04	10	4.23 (11)	NaN	NaN	11.40	1.98
36.86	345.51	9	50.83 (11)	NaN	NaN	12.74	2.58
-13.85	337.39	10	4.58 (11)	NaN	0.44	12.76	2.05
-5.79	345.14	9	5.35 (11)	NaN	0.64	NaN	NaN
42.03	348.70	9	14.57 (11)	NaN	NaN	NaN	NaN
-20.68	327.75	10	6.19 (11)	NaN	NaN	NaN	NaN
-17.74	331.91	10	7.80 (11)	NaN	0.79	NaN	NaN
-47.15	302.96	10	4.61 (11)	NaN	NaN	NaN	NaN
-38.75	303.81	10	11.32 (11)	31.70	NaN	14.57	1.97
46.56	352.09	9	23.02 (11)	42.44	NaN	16.34	1.39
32.61	343.87	9	4.60 (11)	17.41	0.49	12.15	2.13
-29.63	314.40	10	13.14 (11)	5.56	0.35	10.75	1.29
-25.71	320.37	10	10.20 (11)	6.16	NaN	11.36	1.63
11.00	340.28	11	0.54 (42)	0.45	3.28	4.88	1.19
10.79	342.02	11	0.90 (42)	NaN	0.58	NaN	1.00
9.46	335.31	11	0.63 (42)	NaN	0.17	NaN	NaN
10.16	340.29	11	0.95 (42)	NaN	0.26	NaN	NaN
11.04	342.25	11	1.57 (42)	NaN	NaN	NaN	NaN
11.26	339.82	11	1.96 (42)	41.34	NaN	9.95	4.44
10.00	328.22	10	0.68 (42)	38.57	NaN	10.56	4.61
10.81	336.83	11	1.61 (42)	37.83	NaN	11.16	3.14
10.00	316.72	10	1.20 (42)	NaN	NaN	NaN	NaN
3.76	352.04	11	2.29 (42)	NaN	0.69	NaN	NaN
10.28	307.44	10	0.71 (42)	NaN	0.92	NaN	1.51
8.15	341.96	11	1.96 (42)	NaN	1.01	NaN	3.09
10.00	331.09	10	0.54 (42)	NaN	0.55	NaN	NaN
7.18	335.63	11	1.93 (42)	NaN	0.46	NaN	NaN
10.78	303.80	10	1.02 (42)	NaN	NaN	NaN	NaN
10.01	325.19	10	1.12 (42)	NaN	NaN	NaN	NaN
10.02	322.39	10	1.92 (42)	NaN	3.63	8.95	0.49
0.01	335.26	10	4.06 (42)	37.82	3.32	8.28	3.77
10.00	313.57	10	1.22 (42)	17.58	1.04	12.85	1.15

3.55	356.33	11	2.40 (42)	5.60	0.30	12.09	0.94
10.00	310.30	10	2.22 (42)	5.34	0.20	10.21	1.04
8.50	333.06	10	2.00 (42)	2.87	0.16	6.01	1.09
4.68	348.08	11	3.19 (42)	4.18	1.39	13.46	1.12
1.03	336.52	10	2.23 (42)	41.13	NaN	9.52	2.90
6.13	344.60	11	2.96 (42)	12.01	1.90	11.62	1.57
10.00	319.69	10	2.51 (42)	NaN	0.95	11.54	2.65
1.56	333.90	10	7.91 (42)	0.62	0.95	NaN	0.72
5.04	333.67	10	3.19 (42)	NaN	0.60	NaN	NaN
18.08	343.25	7	0.77 (56)	NaN	0.48	NaN	NaN
18.51	343.50	7	1.06 (56)	0.68	0.82	6.94	0.80
19.31	342.20	7	0.91 (56)	1.62	0.93	NaN	2.77
18.78	342.16	7	0.60 (56)	NaN	0.84	NaN	1.23
18.33	343.50	7	1.11 (56)	1.91	0.86	NaN	0.97
18.00	341.99	7	1.57 (56)	NaN	0.61	NaN	NaN
20.06	342.70	7	1.02 (56)	NaN	2.01	9.87	NaN
18.97	343.22	7	1.46 (56)	6.60	2.43	8.03	NaN
19.72	341.43	7	1.27 (56)	1.87	2.08	7.93	2.11
18.00	339.99	7	1.68 (56)	4.69	2.69	8.01	NaN
18.00	338.00	7	1.88 (56)	0.49	0.46	NaN	1.07
18.54	341.58	7	1.65 (56)	0.74	0.39	NaN	0.94
18.37	342.53	7	1.36 (56)	3.85	0.44	10.22	1.05
18.34	343.29	7	1.57 (56)	NaN	0.57	10.35	1.02
18.86	340.77	7	1.95 (56)	NaN	1.35	10.54	NaN
20.14	342.12	7	1.58 (56)	NaN	0.56	10.12	1.04
17.94	335.43	7	1.98 (56)	NaN	1.48	9.72	NaN
21.20	339.24	8	1.93 (56)	NaN	0.57	NaN	NaN
26.18	342.00	8	7.21 (56)	4.29	0.18	10.53	7.10
23.97	340.17	8	2.93 (56)	NaN	0.55	NaN	NaN
19.77	339.24	8	2.48 (56)	NaN	0.74	9.69	NaN
59.60	339.83	8	1.63 (10)	0.70	1.92	3.91	1.35
59.31	340.90	8	6.08 (10)	NaN	0.66	NaN	0.80
58.53	347.58	8	12.06 (10)	NaN	2.50	7.53	4.53
59.60	340.29	8	2.40 (10)	NaN	0.70	8.91	NaN
59.20	340.16	8	2.80 (10)	NaN	2.03	7.88	3.08
59.91	340.66	8	16.00 (10)	NaN	0.63	NaN	NaN
59.52	341.01	8	8.57 (10)	NaN	1.14	8.03	NaN
59.51	340.11	8	8.81 (10)	1.11	0.67	NaN	0.80
59.80	339.41	8	17.13 (10)	0.77	0.66	9.77	0.80
59.31	340.52	8	74.69 (10)	1.20	0.46	10.40	1.03
59.62	340.93	8	58.49 (10)	NaN	0.69	8.77	NaN
59.22	340.03	8	23.15 (10)	0.62	0.67	NaN	1.08
59.71	344.10	8	4.86 (10)	NaN	1.08	8.77	NaN
61.16	341.18	8	5.08 (10)	0.83	1.15	8.22	1.60
60.72	321.51	8	3.65 (57)	NaN	3.98	7.68	1.63
61.18	337.59	8	5.81 (57)	NaN	1.37	7.66	2.20
59.42	326.60	7	9.63 (57)	NaN	2.34	8.25	2.78
63.41	330.57	8	9.77 (57)	0.62	1.37	6.72	0.92
60.00	321.41	7	13.37 (57)	1.03	1.29	5.02	1.32
61.19	327.03	8	9.96 (57)	5.04	2.29	9.74	2.23

63.10	341.25	7	0.30 (57)	0.80	NaN	4.43	1.35
63.09	340.93	7	0.33 (57)	2.25	2.58	5.18	1.49
63.39	338.69	5	0.76 (57)	0.46	0.59	NaN	0.94
62.50	340.03	5	4.90 (57)	0.88	1.58	NaN	1.18
60.98	337.13	5	4.54 (57)	1.66	0.75	11.97	0.96
60.00	324.99	5	3.00 (57)	NaN	0.34	NaN	0.80
59.98	329.74	5	7.44 (57)	0.60	0.52	NaN	0.89
57.60	343.18	4	2.10 (57)	1.51	0.59	NaN	1.03
18.00	338.40	5	0.40 (56)	0.71	0.50	NaN	0.81
17.55	336.35	4	0.72 (56)	0.65	0.87	NaN	0.80
18.25	343.00	2	0.71 (56)	0.69	0.41	NaN	0.86
18.95	342.75	2	1.06 (56)	NaN	0.40	NaN	NaN
18.00	341.75	2	1.59 (56)	1.33	1.24	NaN	1.18
18.00	340.15	2	0.56 (56)	0.38	0.34	NaN	0.75
19.55	342.70	2	1.38 (56)	0.56	0.55	NaN	0.83
18.65	342.75	2	1.09 (56)	NaN	NaN	NaN	NaN
20.40	342.30	2	1.00 (56)	NaN	0.25	NaN	0.54
22.05	342.70	2	3.73 (56)	2.02	0.15	13.44	1.29
24.40	343.30	2	3.30 (56)	NaN	0.75	10.47	0.70
30.98	339.27	2	1.52 (56)	NaN	0.61	13.44	0.79
30.84	340.00	2	1.62 (56)	1.32	0.57	14.20	0.83
33.50	337.35	10	4.19 (56)	0.34	0.75	NaN	0.86
25.00	337.48	10	14.41 (56)	0.31	0.69	NaN	0.88
31.69	339.00	10	7.19 (56)	0.56	0.80	NaN	1.37
31.66	337.00	10	2.53 (56)	0.39	0.67	NaN	1.16
25.00	339.93	10	4.65 (56)	0.55	1.33	12.06	1.02
26.08	340.58	10	7.45 (56)	0.81	0.76	NaN	1.21
28.31	336.13	10	3.64 (56)	0.76	0.62	NaN	1.83
27.85	341.75	10	7.38 (56)	0.51	1.02	NaN	1.02
26.68	337.80	10	15.04 (56)	0.45	0.99	NaN	1.02
31.04	342.75	10	9.22 (56)	0.76	0.71	NaN	0.99
16.63	337.96	10	0.69 (10)	0.55	0.68	NaN	1.30
15.22	334.67	10	0.56 (10)	1.51	2.25	NaN	2.57
16.29	334.82	2	0.71 (10)	1.70	2.85	NaN	2.28
17.17	336.49	2	0.90 (10)	2.39	3.12	NaN	2.26
12.54	334.10	2	13.72 (10)	2.10	0.98	NaN	0.46
13.91	334.34	2	9.95 (10)	42.25	3.51	8.32	3.17
16.92	338.05	2	0.53 (10)	NaN	2.21	NaN	NaN
13.44	333.21	2	5.29 (10)	NaN	3.91	8.52	2.44
19.32	331.14	2	1.78 (10)	NaN	2.15	7.07	2.55
19.30	334.01	2	3.51 (10)	4.57	0.87	NaN	0.65
21.49	331.79	1	7.82 (10)	3.01	1.54	7.83	0.50
16.93	336.64	2	7.26 (10)	NaN	1.85	8.96	NaN
15.94	335.20	1	8.88 (10)	29.81	3.55	8.75	NaN
28.17	332.39	2	3.01 (10)	6.69	0.73	13.26	1.10
19.14	336.41	2	3.72 (10)	3.48	1.60	12.34	1.55
24.68	332.41	2	7.25 (10)	2.71	0.78	3.76	0.93
21.49	332.40	2	0.86 (10)	2.74	0.24	11.71	0.88
18.31	336.27	2	1.61 (10)	5.44	0.38	12.72	1.07
15.83	334.84	2	5.86 (10)	0.26	NaN	NaN	0.69

29.09	340.57	2	31.63 (10)	NaN	0.26	NaN	0.87
29.82	334.00	2	31.64 (10)	1.62	0.18	NaN	0.86
-58.60	301.22	2	4.50 (10)	1.45	2.04	NaN	2.28
-41.15	9.83	2	6.39 (10)	1.69	0.30	8.68	2.06
-68.22	355.66	1	2.37 (10)	1.98	1.02	NaN	1.18
-68.59	346.73	2	3.64 (10)	3.45	0.48	11.12	1.84
-64.33	359.77	4	7.17 (10)	1.37	0.92	10.26	1.16
-61.02	0.01	2	7.96 (10)	1.50	0.28	11.03	0.86
-67.46	0.06	2	2.02 (10)	2.13	0.50	NaN	1.01
-56.76	0.02	3	11.73 (10)	5.13	0.79	NaN	1.23
-67.37	336.47	2	3.08 (10)	6.08	0.73	NaN	1.15
-53.01	0.02	2	20.06 (10)	4.86	0.79	8.11	1.15
-65.85	326.14	3	43.32 (10)	4.81	1.31	7.16	1.13
-64.70	316.45	3	22.60 (10)	0.41	0.34	NaN	0.86
-63.61	309.02	2	8.66 (10)	NaN	0.30	NaN	0.69
-59.91	304.27	3	9.30 (10)	NaN	0.18	NaN	0.95
-68.94	356.51	2	4.07 (10)	NaN	NaN	NaN	0.62
-45.37	6.37	3	3.69 (10)	NaN	NaN	NaN	NaN
-49.40	2.31	3	4.02 (10)	NaN	NaN	NaN	NaN
-56.88	297.71	3	4.44 (10)	NaN	0.44	NaN	0.58
-55.63	295.39	4	13.74 (10)	NaN	NaN	NaN	0.67
-12.77	214.06	10	9.55 (59)	NaN	NaN	NaN	0.68
-9.62	220.50	10	11.19 (59)	NaN	NaN	NaN	0.66
-17.68	234.63	11	2.04 (59)	NaN	NaN	NaN	0.65
-26.60	248.28	11	0.84 (59)	NaN	NaN	NaN	0.56
-29.58	259.76	11	2.31 (59)	NaN	NaN	NaN	NaN
-35.21	286.85	12	5.46 (59)	NaN	0.36	NaN	0.79
43.68	7.33	10	2.25 (59)	1.38	0.20	NaN	0.81
43.68	7.33	11	2.80 (59)	0.31	0.21	NaN	0.88
43.68	7.33	12	3.11 (59)	0.41	0.31	NaN	1.04
43.68	7.33	2	3.11 (59)	1.47	0.33	2.03	0.88
43.68	7.33	3	9.87 (59)	NaN	NaN	NaN	NaN
43.68	7.33	4	4.43 (59)	NaN	NaN	NaN	0.62
43.68	7.33	6	0.51 (59)	NaN	NaN	NaN	NaN
43.68	7.33	8	6.63 (59)	NaN	0.26	NaN	0.60
43.68	7.33	8	0.60 (24)	NaN	NaN	NaN	NaN
43.68	7.33	8	1.16 (24)	NaN	0.21	NaN	0.62
43.68	7.33	8	1.19 (24)	0.47	0.24	NaN	0.57
43.68	7.33	8	2.02 (24)	0.22	NaN	NaN	0.51
43.68	7.33	8	1.92 (24)	0.25	0.27	NaN	0.65
43.68	7.33	9	0.92 (24)	0.57	0.14	NaN	0.72
43.68	7.33	9	1.10 (24)	0.46	0.17	NaN	0.52
43.68	7.33	9	1.36 (24)	0.51	0.15	NaN	0.56
43.68	7.33	9	1.59 (24)	1.43	0.25	NaN	0.60
43.68	7.33	9	0.63 (24)	NaN	0.20	NaN	0.51
-20.70	170.05	3	1.88 (55)	0.34	0.33	NaN	0.97
-19.09	191.25	3	1.67 (55)	0.22	0.26	NaN	0.59
-18.30	196.15	3	47.29 (55)	1.32	0.33	1.58	0.58
-18.34	197.05	3	0.53 (55)	1.36	0.42	NaN	0.51

Longitudes are all east and range from 0° to 360°. NaN represents the data that the maximum likelihood estimates of Fe concentration did not fall within $\pm 2\sigma_o$ of the measurements.

Table S3. Comparison of Fe solubility (%) between the simulated estimates from models and field data.

	Mean	Weighted mean	Min	Max	Data point	Error	RMSE	Bias	r
Field data	6.1±8.2	1.2±0.08 (5.0 and 104)	0.020	98	795				
IMPACT	5.3±7.9	1.0±0.07 (5.1 and 115)	0.20	42	592	5.1	9.4	-1.1	0.38
TM4-ECPL	1.1±1.2	0.7±0.04 (1.6 and 33)	0.14	10	580	3.7	7.0	-3.4	0.01
CAM4	6.8±3.3	2.4±0.08 (2.9 and 42)	0.33	16	595	4.7	8.0	0.6	0.31
IMPACT dust only	1.3±0.8	0.7±0.02 (1.8 and 33)	0.14	4.9	592	5.3	10	-5.0	0.18
TM4-ECPL dust only	0.8±0.9	0.5±0.02 (1.5 and 37)	0.08	8.0	580	3.9	7.1	-3.8	0.00
CAM4 dust only	6.4±3.1	2.3±0.07 (2.8 and 42)	0.33	16	595	4.5	8.0	0.14	0.31
GEOS-Chem dust only	1.5±1.1	0.6±0.01 (2.5 and 74)	0.45	7.9	676	5.1	9.7	-4.9	0.22

The solubility of Fe for each data point is calculated from the concentrations of labile Fe and total Fe concentrations in aerosols, and then is used to estimate the arithmetic averages. The weighted mean values are calculated from the cumulated values of labile Fe and total Fe for all data points. In the parentheses in the weighted mean values column, the ratios of the arithmetic averages to weighted averages and the ratios of their standard deviations are given. The minimum, maximum, number of data points, the mean error (Error), the root mean square errors (RMSE), the mean bias (Bias), and correlation coefficient (r) in Fe solubility between the model results and field data are also listed. Only the simulated data for which maximum likelihood estimates (MLEs) of total Fe concentrations fall within $\pm 2\sigma_0$ of the measurements are used for the comparison with field data, as is described in the Methods. In other words, if all the daily estimates in a given month significantly overestimated or underestimated Fe concentration, they are not used in our analysis. The sources of the data are shown in table S2.