

Note: Last day analyzed is 12/31/2020 for STA and 9/27/2014 for STB. List is updated on 12/24/2022.

The event list is compiled by Dr. Lan Jian for reference purpose. Data of 8 s^{-1} (32 s^{-1} if available) cadence are used. The shock parameters are determined using the shock coplanarity theorem (for shocks before August 2018) and using Rankine-Hugoniot relations including plasma data (since August 2018 with the assist of Dr. Tarik Salman). Some of the parameter determinations are arguable. Some analysis was done when only 10-min plasma data was available early in the mission and requires a check as 1-min plasma data is now available. For event details and ambiguous event, please consult Dr. Lan Jian at lan.jian@nasa.gov. The criteria of event classification are published in the following paper.

L.K. Jian, C.T. Russell, J.G. Luhmann, A.B. Galvin, K.D.C. Simunac, Solar Wind Observations at STEREO: 2007 – 2011, Amer. Inst. Phys. Proceedings of Solar Wind 13, 1539, 191-194, doi: 10.1063/1.4811020, 2013.

In addition, there is a shock list at <http://ipshocks.fi/> including STEREO shocks. Note these two lists are identified independently and based on different methods.

Interplanetary Shocks at STEREO A

#	Year	Month	Day	Hour	Minute	Second	$B_{\text{down}}/B_{\text{up}}^1$	θ_{Bn}^2	β^3	Mach Num. ⁴	32 s^{-1} data availability ⁵	Source	Forward/Reverse Shock
1	2007	1	14	19	35	8	1.19	67.6	DG	1.1	Y	ICME	F
2	2007	2	12	8	10	6	1.27	47.3	DG	1.28	N	data gap, probably a SIR	F
3	2007	2	12	8	39	13	1.36	76.6	DG	1.28	N	data gap, probably a SIR	F
4	2007	4	21	18	59	15	1.57	76.6	3.91	1.4	N	SIR	F
5	2007	4	23	6	53	44	1.32	73.0	1.67	1.22	N	SIR	R
6	2007	5	7	8	11	54.4	1.72	80.3	4.35	1.53	N	SIR	F

7	2007	6	9	13	15	50	1.28	67.0	1.81	1.22	N	small SIR-like structure	F
8	2007	6	10	12	55	35	1.22	64.0	0.76	1.18	N	small SIR-like structure	R
9	2007	7	4	22	9	40	1.35	38.9	2.02	1.43	Y	SIR	R, not very sharp B change
10	2007	7	11	20	22	25	2.25	61.8	1.04	2.2	N	SIR	R
11	2007	8	25	20	30	1	2.01	70.4	3.85	1.83	Y	ICME+SIR	F
12	2007	9	15	1	54	34.5	1.36	75.4	1.25	1.26	Y	SIR	F
13	2007	9	15	15	35	3	1.3	70.3	0.70	1.22	N	SIR	R
14	2007	9	23	11	31	58	1.36	79.4	0.75	1.28	N	SIR	R
15	2007	9	30	11	9	6	1.55	76.5	0.30	1.42	N	SIR	R
16	2007	10	18	16	46	12	1.19	21.4	3.24	1.5	Y	SIR	F
17	2008	1	8	1	48	30	1.36	66.3	0.57	1.28	N	SIR	R
18	2008	2	29	22	51	2.5	1.41	84.5	6.38	1.29	N	SIR	F
19	2008	3	8	18	16	32	1.31	66.8	1.67	1.28	Y	SIR	F
20	2008	3	9	19	50	7.33	1.59	79.4	1.39	1.44	N	SIR	R
21	2008	3	29	18	12	58	1.25	35.5	1.23	1.28	N	SIR	R
22	2008	4	8	7	34	40	1.19	51.6	0.92	1.16	N	SIR	R
23	2008	4	24	13	6	55	2.46	81.9	4.11	2.25	N	SIR	F
24	2008	5	11	6	31	9.5	1.67	75.5	DG	1.52	N	ICME	F
25	2008	5	19	9	18	42.5	1.48	76.7	1.14	1.36	Y	in slow wind	F, strong upstream waves
26	2008	5	21	0	41	35	1.57	38.9	1.13	1.61	Y	SIR	F
27	2008	7	5	0	47	53.67	1.65	43.6	0.85	1.62	Y	ICME	F
28	2008	9	16	13	49	29	1.71	79.6	2.36	1.54	N	SIR	F
29	2008	9	17	8	8	21.5	1.42	68.0	0.97	1.32	N	SIR	R
30	2008	10	12	17	12	56	1.5	83.7	9.24	1.38	N	SIR	F

31	2008	10	26	17	17	21	1.49	60.1	2.30	1.41	Y	in slow wind, a small speed increase, T_p decreases a little	F
32	2008	10	31	3	24	55	1.54	42.7	1.39	1.6	N	SIR, 9 hr before ICME	F
33	2008	11	1	7	59	17	1.65	60.9	1.84	1.58	Y	SIR	R, V_p increase is not sharp
34	2008	11	9	0	38	46	1.34	42.6	17.74	1.45	N	SIR	F
35	2008	11	28	16	44	26	1.45	46.8	5.51	1.5	Y	SIR, 5 hr before ICME?	F, strong plasma signatures, upstream and downstream waves
36	2008	12	6	5	42	30	1.42	45.2	7.50	1.5	Y	SIR	F
37	2008	12	25	9	45	8	1.12	55.0	2.58	1.11	N	in slow wind, a small SIR-like structure	F
38	2009	1	25	18	22	52.33	1.46	79.4	1.14	1.34	Y	ICME	F, downstream waves
39	2009	2	13	10	20	58	1.42	61.2	2.00	1.35	N	slow wind, a small V_p increase, T_p is constant	F
40	2009	2	18	1	54	56	1.79	60.1	0.94	1.7	Y	SIR	R, downstream waves
41	2009	3	9	20	17	19	1.65	44.0	10.08	1.82	Y	SIR	F, downstream waves
42	2009	4	27	21	42	22	1.45	39.2	2.00	1.55	N	a small bump in slow wind ~ 300 km/s	F
43	2009	6	3	17	7	44	1.3	70.7	0.30	1.23	N	ICME	F
44	2009	6	30	5	14	45	1.22	32.5	1.00	1.27	N	SIR	R
45	2009	7	26	14	42	5	1.23	42.9	1.00	1.22	N	SIR	F
46	2009	9	8	5	30	54	1.43	32.6	20.00	1.87	N	SIR	F
47	2009	10	16	14	56	55	1.25	58.9	1.00	1.21	Y	ICME	F

48	2009	11	26	23	6	27	1.3	73.1	3.01	1.2	N	in slow wind, 12 hrs after SIR	F, weak plasma signatures, upstream waves
49	2009	12	1	4	9	10	1.52	69.4	1.49	1.4	N	SIR	R, clear plasma signatures
50	2009	12	8	23	37	45.3	1.92	75.0	27.69	1.72	Y	ICME	F, clear plasma signatures, downstream waves
51	2009	12	14	6	8	59	1.2	64.9	1.74	1.15	Y	a small Vp increase in slow wind < 300 km/s	F, clear plasma signatures except no Tp increase, strong upstream and downstream waves
52	2009	12	22	23	51	15	1.59	30.0	0.95	1.78	Y	SIR	R, weak plasma signatures, not a neat B rise
53	2009	12	31	12	52	31.5	1.67	53.7	7.54	1.68	Y	SIR	F, clear plasma signatures, upstream waves
54	2010	2	5	3	33	13	2.28	49.3	3.77	2.7	Y	ICME+SIR	F, clear plasma signatures, upstream and downstream waves
55	2010	2	15	4	41	31	1.55	71.6	1.57	1.42	N	~ 2 days after a SIR, a bump in slow wind	F, clear plasma signatures, downstream waves
56	2010	3	11	19	9	23	1.42	50.7	2.91	1.42	Y	SIR	F, plasma signatures except slow Tp increase, upstream waves
57	2010	3	15	13	39	26	1.49	47.4	1.90	1.5	Y	a big bump in fast wind ~ 700 km/s	F, plasma signatures
58	2010	4	4	1	10	4.75	1.47	84.3	1.23	1.35	Y	SIR	F, upstream and downstream waves, clear plasma signatures

59	2010	4	23	0	34	36	1.55	73.5	2.78	1.4	N	ICME	F, plasma signatures except no Tp increase, downstream waves
60	2010	5	8	9	24	7	1.51	82.1	0.66	1.39	Y	SIR	R, weak plasma signatures, downstream waves
61	2010	5	30	14	59	19	1.63	58.1	2.76	1.56	N	ICME	F, plasma signatures, upstream waves
62	2010	6	3	8	36	28.5	2.12	67.2	14.62	2	Y	ICME	F, downstream waves, plasma signatures
63	2010	6	5	7	30	10	1.37	63.8	0.37	1.3	N	SIR	R, downstream waves, plasma signatures
64	2010	8	20	16	13	39.5	2.91	56.8	0.75	4.05	Y	ICME	F, upstream and downstream waves, clear plasma signatures
65	2010	8	21	16	57	26	1.19	69.3	0.27	1.15	N	3 hrs after an ICME, a faster solar wind overtaking the ICME	R, upstream waves, weak plasma signatures
66	2010	9	7	8	29	6.4	1.37	86.7	1.21	1.28	Y	ICME	F, upstream and downstream waves, plasma signatures
67	2010	9	11	6	58	47	2.08	75.0	1.42	1.92	Y	ICME	F, upstream and downstream waves, plasma signatures
68	2010	9	17	22	33	43.5	1.43	53.3	0.54	1.36	N	ICME	F, upstream waves, plasma signatures
69	2010	10	31	10	4	13	1.58	40.7	0.39	1.52	N	SIR	R, upstream and downstream waves, plasma signatures

70	2010	11	16	19	25	53.5	1.09	15.5	DG	1.18	Y	SIR	R, downstream waves, weak plasma signatures
71	2010	12	4	0	10	21	1.86	70.4	3.70	1.7	N	SIR	F, upstream and downstream waves, plasma signatures
72	2010	12	14	17	15	32.5	1.46	71.0	1.98	1.35	Y	ICME	F, downstream waves, weak plasma signatures
73	2011	1	17	18	31	0	1.45	40.9	0.65	1.42	N	8 hrs after an ICME, caused by a fast wind ~ 530 km/s	R, waves in the transition region
74	2011	1	23	17	6	3.2	1.48	59.3	1.76	1.4	Y	SIR	F, upstream waves, Vp and Np increase, but Tp does not increase promptly
75	2011	1	25	0	6	27	1.21	59.1	0.61	1.16	N	SIR	R, upstream waves (not sure of the origin), ICWs upstream, field change is not very sharp, changes of plasma parameters are not abrupt
76	2011	2	18	17	43	0.25	1.22	72.2	2.32	1.16	Y	a small Vp increase in slow wind ~ 350 km/s	F, large-amplitude upstream waves of fs/c ~ 1.4 Hz, increases of plasma parameters are small

77	2011	3	9	6	47	40	1.62	28.7	6.23	2.56	Y	ICME	F, no upstream or downstream waves, clear plasma signatures
78	2011	3	19	11	24	39.3	1.84	84.3	1.06	1.66	N	ICME	F, upstream and downstream waves, prominent plasma signatures
79	2011	3	22	3	57	37.7	1.5	71.6	0.96	1.38	Y	ICME	F, large-amplitude upstream waves of fs/c ~ 1.5 Hz, clear plasma parameters
80	2011	3	22	18	21	6.3	2.02	77.5	0.18	1.9	Y	ICME	F, strong field increase, clear Vp, Np, Tp increases, but there are holes of Np and Tp before it
81	2011	3	31	12	37	10	1.14	29.1	1.58	1.2	Y	SIR	R, plasma signatures, low frequency upstream waves, a dip in B downstream, bidirectional suprathermal electron flux upstream
82	2011	4	9	13	39	33	1.17	76.9	DG	1.12	Y	data gap, probably a SIR	R, no upstream or downstream waves, plasma data gap
83	2011	4	11	12	8	0	1.89	71.4	0.75	1.74	Y	ICME	F, downstream waves, clear plasma signatures, Vp increase lasts < 1hr
84	2011	4	22	10	59	16.8	1.21	77.9	0.68	1.16	N	just after an ICME, a faster solar wind	F, upstream and downstream waves, weak plasma signatures

85	2011	5	7	11	32	53	1.62	82.0	0.63	1.48	N	SIR	R, clear plasma signatures, sharp B decrease, there are current sheets near the shock though
86	2011	6	4	18	48	50	1.6	20.7	1.46	3.5	Y	SIR	R, clear plasma signatures, B decrease takes 2.5 seconds
87	2011	6	5	18	59	0.5	1.57	52.6	1.50	1.54	Y	ICME	F, clear plasma signatures
88	2011	6	9	22	40	53	1.44	60.2	1.82	1.38	N	SIR	F, weak plasma signatures, upstream waves, increase of suprathermal electron flux
89	2011	6	12	0	2	24	1.28	49.6	1.18	1.25	N	SIR	R, weak plasma signatures, two B decreases separated by 16 s, this is the 2nd one to match the time of plasma data
90	2011	6	16	3	10	22.5	1.61	25.4	2.68	2.7	Y	SIR	F, abrupt plasma changes, upstream and downstream waves
91	2011	7	12	3	47	4	1.2	48.4	0.35	1.16	Y	ICME	F, abrupt plasma changes, downstream waves, a dip of B in 4 minutes
92	2011	7	23	9	41	9.3	1.43	38.4	4.18	1.6	N	ICME	F, clear plasma signatures, upstream and downstream waves, B decreased in 40 min

93	2011	7	24	22	36	5	1.03	13.3	1.61	1.16	Y	11 hrs after ICME, faster solar wind of only about 440 km/s	R, plasma signatures, waves in upstream, downstream, and ramp
94	2011	8	6	12	42	39.8	2.18	52.2	1.88	2.32	Y	ICME	F
95	2011	8	11	5	38	57.5	2.65	73.9	DG	2.7	N	unclear driver, because of DG	F
96	2011	8	13	19	43	20.5	2	83.1	0.38	1.86	Y	ICME	F
97	2011	9	8	16	1	27	1.28	60.7	1.40	1.23	Y	ICME	F
98	2011	9	11	8	51	29.3	1.64	89.0	0.18	1.5	Y	faster wind overtaking preceding ICME	F
99	2011	9	21	22	35	45	1.06	23.1	0.81	1.07	N	unclear driver, in the trailing part of a SIR, followed by a faster wind although of only 400 km/s	F
100	2011	9	24	8	30	40.5	1.29	70.1	5.49	1.22	Y	ICME	F
101	2011	9	28	3	54	29.5	1.44	57.2	0.46	1.36	Y	SIR	F
102	2011	10	2	6	53	15	1.1	32.9	0.81	1.11	N	ICME	F
103	2011	10	3	2	28	25	1.49	75.5	0.69	1.38	N	ICME	F
104	2011	10	6	3	55	7	1.32	53.1	0.83	1.29	Y	in slow wind	F
105	2011	10	7	17	15	23.5	1.77	54.2	3.47	1.77	N	SIR	F

106	2011	10	23	20	59	0.4	1.28	76.8	0.66	1.22	Y	in slow wind	F
107	2011	10	25	4	51	14.3	1.9	76.3	0.89	1.74	Y	ICME	F
108	2011	11	5	21	12	9.6	1.48	70.9	1.78	1.38	N	SIR	F
109	2011	11	6	12	35	14	1.61	27.8	0.46	1.67	Y	SIR	R
110	2011	11	20	21	50	23	1.48	67.4	1.06	1.39	N	SIR	R
111	2011	11	23	17	35	5	1.52	82.2	0.67	1.41	N	SIR	R
112	2011	11	25	21	39	3.7	1.36	55.2	0.87	1.31	Y	ICME	F
113	2011	11	26	18	9	24	1.51	22.9	0.85	1.79	Y	ICME	F
114	2011	11	28	14	51	25.5	1.83	61.7	0.62	1.73	N	ICME	F
115	2011	12	12	3	47	21	1.36	80.7	0.94	1.27	Y	SIR	R
116	2011	12	17	2	5	7	1.8	54.2	1.69	1.77	Y	SIR	F
117	2011	12	21	0	30	0	1.64	68.9	0.39	1.5	Y	SIR	R
118	2011	12	21	9	27	28	1.16	10.8	1.91	2.3	Y	ICME	F
119	2011	12	28	1	28	46	1.63	75.9	4.55	1.47	Y	SIR	F
120	2011	12	28	20	47	9	2.01	51.8	0.39	1.98	Y	SIR	R
121	2012	1	1	13	22	21	2.02	80.6	1.20	1.84	Y	ICME	F
122	2012	1	4	16	40	40	1.54	66.5	1.60	1.42	Y	SIR (embedded ICME starts 29 hr after the shock)	F, weak plasma signatures
123	2012	1	23	1	7	0	1.58	49.8	1.36	1.54	Y	SIR	F
124	2012	1	29	2	13	36	1.66	34.1	2.88	2.1	N	ICME	F
125	2012	1	29	13	4	18.8	2.15	87.7	0.41	2	Y	ICME	F

126	2012	2	19	20	52	4.3	1.48	78.5	2.17	1.35	Y	in slow wind	F
127	2012	2	20	19	17	48	1.71	37.4	2.06	2	N	SIR+ICME (ICME embedded, 10 hr after the shock)	F
128	2012	2	28	23	20	13	1.48	78.4	1.88	1.36	N	SIR	R
129	2012	3	14	6	51	37.8	1.6	73.4	2.77	1.46	Y	SIR	F
130	2012	3	15	22	32	31	1.28	38.5	6.24	1.39	Y	ICME	F
131	2012	3	18	15	3	40	1.1	15.3	0.81	1.14	Y	ICME	F, weak plasma signatures
132	2012	3	18	19	30	46	1.26	12.3	0.62	1.35	Y	ICME	F
133	2012	3	19	19	17	44	1.34	43.7	0.35	1.3	Y	ICME	F
134	2012	3	23	10	14	42.5	1.37	32.0	0.52	1.36	Y	in the trailing part of fast wind	F, Vp and Tp do not have clear increases, slight Np increase, prominent B increase
135	2012	3	23	19	7	15	1.18	3.4	0.59	1.24	Y	in slow wind V ~ 400 km/s	F
136	2012	3	26	9	59	34	1.24	51.1	1.79	1.22	Y	in fast wind V ~ 450 km/s	F
137	2012	4	3	20	47	13	1.26	70.2	6.66	1.51	N	15 hr before the start of a SIR	F, mirror mode storms 7 min after the shock
138	2012	4	4	10	40	11	1.12	50.1	1.56	1.11	N	SIR	F
139	2012	5	18	12	43	18.3	1.96	63.2	0.95	1.85	Y	ICME	F
140	2012	5	24	1	0	21.5	1.82	65.2	0.23	1.59	Y	ICME	F
141	2012	5	28	2	48	40.75	2.7	74.8	0.20	2.85	Y	ICME	F
142	2012	5	28	19	53	47	1.24	34.1	0.04	1.18	N	trailing edge of ICME, probably due to overtaking of the following fast wind	R

143	2012	6	5	14	17	49	1.24	71.4	2.71	1.18	N	in slow wind	F, weak
144	2012	6	25	20	55	59.6	2.27	68.5	0.73	2.2	Y	ICME	F
145	2012	6	30	12	39	33	1.29	39.4	0.24	1.24	Y	in slow wind	F
146	2012	7	8	18	42	35	1.12	74.7	0.96	1.09	N	SIR	F
147	2012	7	9	2	33	26.7	2.05	35.3	0.67	2.5	Y	SIR	F
148	2012	7	10	18	55	15.2	1.18	13.4	2.59	2.05	Y	ICME	F
149	2012	7	20	6	0	58	1.97	46.4	0.81	2.05	Y	SIR	F
150	2012	7	20	22	43	11.2	1.16	22.1	1.25	1.28	N	ICME	F
151	2012	7	23	20	55	25	2.17	45.5	DG	2.46	N	ICME	F, questionable, a shock attempts to form, Vp increases, avoided a short-lived B enhancement ahead, coincides with current sheet, a lot of large-amplitude fluctuations downstream
152	2012	8	1	16	51	53	1.2	72.3	5.76	1.15	Y	SIR	F, weak
153	2012	8	3	3	15	18	1.38	59.7	1.27	1.32	Y	SIR	R
154	2012	8	13	14	23	32.5	1.87	49.7	6.68	2	Y	ICME	F
155	2012	8	18	11	43	13	1.12	53.0	1.34	1.11	Y	in slow wind	F
156	2012	9	11	17	10	22	1.4	38.3	8.51	1.64	Y	ICME	F
157	2012	9	11	18	13	52.8	2.61	64.6	21.50	2.75	Y	ICME	F
158	2012	9	16	23	11	3.3	1.36	22.0	3.49	2.05	Y	ICME	F
159	2012	9	19	21	45	46.8	1.38	71.6	14.73	1.68	N	ICME	F
160	2012	9	21	22	35	46	1.21	71.0	2.08	1.16	Y	fast wind overtaking ICME	F
161	2012	9	23	14	28	45.2	1.9	71.0	6.57	1.72	N	ICME	F
162	2012	9	29	18	36	44	1.75	51.6	9.45	1.79	N	slow wind	F
163	2012	10	1	19	29	2.5	1.32	52.8	3.01	1.3	Y	slow wind	R
164	2012	10	5	2	51	26.7	1.55	70.1	7.09	1.41	Y	ICME	F

165	2012	10	11	1	46	1.5	1.82	73.6	4.58	1.64	N	ICME	F
166	2012	10	22	15	35	54	1.21	73.0	4.45	1.14	N	ICME	F
167	2012	10	22	23	30	0	1.28	84.9	6.15	1.19	N	ICME	F
168	2012	10	26	0	42	30	1.35	83.2	5.48	1.24	Y	ICME	F
169	2012	10	28	5	48	9	1.54	78.2	4.82	1.38	Y	slow wind	F
170	2012	10	31	7	28	45	1.19	33.4	3.78	1.29	N	slow wind	R
171	2012	11	6	21	48	30	1.36	65.6	5.31	1.29	N	slow wind	F
172	2012	11	10	22	30	3.75	1.71	61.5	5.14	1.63	Y	ICME	F
173	2012	11	12	13	49	24.5	1.39	52.5	1.92	1.36	Y	inside ICME, at the start of the flux rope, due to interaction between 2 ICMEs	R
174	2012	11	12	15	23	30	1.29	80.6	2.61	1.2	Y	inside ICME, at the start of the flux rope, due to interaction between 2 ICMEs	R
175	2012	11	13	20	57	3	1.56	46.5	3.08	1.6	Y	ICME	F
176	2012	11	23	4	4	17	1.33	79.8	2.69	1.24	Y	14-hr before ICME	F
177	2012	11	23	18	27	37.3	1.49	82.5	12.88	1.35	N	ICME	F
178	2012	11	26	7	57	49.5	1.77	81.2	5.07	1.58	Y	ICME	F
179	2012	12	6	3	40	58	1.28	86.3	10.50	1.18	N	SIR	F
180	2012	12	17	16	58	24	1.09	12.4	3.46	1.75	Y	DG for event identification	F

181	2013	1	9	2	25	10	1.44	7.46	4.19	7.02	N	ICME	F? plasma signatures although some of the changes are gradual, B decreased within 1 min after the shock, current sheet 15 ms apart, downstream waves, Mach number determined by case study
182	2013	1	25	0	14	12	1.32	69.73	1.26	1.25	N	ICME	F? weak plasma signatures, B decreased within 1 min and increased to post-shock scale in 2 min, no upstream or downstream waves
183	2013	2	8	7	44	0	1.33	86.83	1.40	1.22	N	ICME	F, plasma signatures, downstream waves
184	2013	2	28	21	14	33	1.73	56.59	0.35	1.63	N	ICME	F, prominent plasma signatures, upstream and downstream waves
185	2013	3	8	2	20	15.8	1.71	67.3	1.23	1.59	N	ICME	F, plasma signatures, upstream and downstream waves
186	2013	3	26	2	45	43.5	1.92	52.84	1.06	1.91	N	ICME	F, plasma signatures, downstream waves
187	2013	3	30	5	14	22	1.18	71.18	1.02	1.13	N	in slow wind	F, weak plasma signatures, prompt and small rise of B
188	2013	4	8	8	41	30	1.79	85.97	1.99	1.60	N	SIR	R, plasma signatures, downstream waves

189	2013	4	16	15	36	37	1.75	86.49	0.15	1.60	N	ICME	F, prominent plasma signatures, downstream waves
190	2013	4	19	14	19	14	1.27	60.14	0.48	1.21	N	SIR	R, weak plasma signatures, upstream waves
191	2013	4	22	10	8	20.5	1.68	63.06	1.73	1.57	N	ICME	F, prominent plasma signatures, a few upstream and downstream waves
192	2013	4	27	4	19	44	1.61	22.7	2.18	3.30	N	ICME	F, prominent plasma signatures, upstream and downstream waves
193	2013	4	27	23	32	15	1.28	59.66	2.09	1.22	N	ICME	F, plasma signatures, a B dip after the shock
194	2013	4	30	4	17	41	1.58	22.21	1.26	2.45	N	SIR	F, plasma signatures, upstream waves
195	2013	5	2	21	2	27	1.48	25.24	0.55	1.55	N	ICME	F, prominent plasma signatures, upstream and downstream waves, amplified at the ramp
196	2013	5	6	6	36	37	1.48	25.17	3.45	2.23	N	SIR	F, weak plasma signatures, few downstream waves
197	2013	5	12	23	30	46	1.56	87.29	1.43	1.41	N	ICME	F, weak plasma signatures, downstream waves
198	2013	5	16	5	22	35	1.19	32.09	2.78	1.29	N	SIR	F, weak plasma signatures, upstream and downstream waves, including at the ramp

199	2013	5	16	9	42	43.3	2.32	55.91	3.35	2.48	N	SIR	F, prominent plasma signatures, near HCS, downstream waves
200	2013	5	17	0	5	35	1.55	37.45	0.54	1.53	N	SIR	R, weak plasma signatures, upstream and downstream waves
201	2013	5	24	6	51	46	1.22	47.7	1.17	1.21	N	in slow wind	F, weak plasma signatures, downstream waves
202	2013	5	25	6	5	8.5	1.78	13.25	4.40	7.59	N	ICME	F, plasma signatures, downstream waves, Mach number determined by case study
203	2013	6	3	17	12	30	1.44	80.88	1.11	1.33	N	SIR	R, plasma signatures, downstream waves
204	2013	6	10	8	45	58	1.14	47.9	0.44	1.12	N	SIR	F, very weak plasma signatures, little increase of T_p , little increase of B, waves lasted long upstream and downstream
205	2013	6	11	3	37	16	1.83	73.1	1.10	1.67	N	SIR	R, plasma signatures, downstream waves
206	2013	6	11	14	4	50	1.31	39.46	0.92	1.32	N	SIR	R, little increase of V, weak plasma signatures, shock ramp lasted 20 ms, waves upstream, downstream and at the ramp

207	2013	6	27	16	17	42.3	1.59	82.57	0.93	1.45	N	ICME	F, prominent plasma signatures, upstream and downstream waves
208	2013	7	25	6	12	48	3.12	55.94	7.74	6.00	N	ICME	F, prominent plasma signatures, sharp rise of suprathermal electron flux, fluctuations downstream, Mach number is 2 using V&S method
209	2013	8	4	13	42	51	1.09	49.71	1.96	1.09	N	SIR	F, weak plasma signatures, gradual change of B, intermittent LFWs at the two sides
210	2013	8	10	9	18	3	1.84	56.91	1.76	1.78	N	ICME	F, clear plasma signatures, rise of suprathermal e flux, upstream and downstream waves
211	2013	8	12	13	46	0	1.57	85.93	0.81	1.43	N	SIR	F, prominent plasma signatures, waves upstream and at ramp
212	2013	8	18	14	42	9	1.41	82.81	0.22	1.32	N	slow wind	F, weak plasma signatures, downstream waves
213	2013	8	22	7	5	50	2.42	81.4	3.12	2.24	N	ICME	F, plasma signatures, downstream waves
214	2013	9	2	2	20	0	1.25	23.88	0.78	1.31	N	SIR	F, plasma signatures, LFWs lasted long

215	2013	9	10	11	9	56	1.22	76.4	1.65	1.16	N	slow wind	F, weak plasma signatures, rise and diffusion of suprathermal e flux
216	2013	10	4	4	28	16	1.27	57.82	2.91	1.23	N	ICME	F, weak plasma signatures, rise of suprathermal e flux
217	2013	10	21	12	54	34	1.08	79.05	0.89	1.06	N	slow wind	F, weak plasma signatures, upstream and downstream waves
218	2013	10	26	2	25	15	1.3	45.87	1.38	1.30	N	SIR	R, weak plasma signatures, waves upstream and at ramp
219	2013	11	1	10	55	16.5	1.83	84.07	1.13	1.65	N	ICME	F, plasma signatures, weak upstream and downstream waves, a direction change of By 15 s downstream
220	2013	11	4	8	57	25	2.21	69.84	0.29	2.12	N	ICME	F, prominent plasma signatures, short upstream waves
221	2013	11	5	22	24	10	1.29	72.7	0.41	1.22	N	SIR overtaking ICME, there is a residual of CME in the trailing part of the fast wind	F, weak and transient plasma signatures, upstream waves, increase of suprathermal e flux
222	2013	11	5	23	53	9	1.57	73.41	0.47	1.45	N	SIR overtaking ICME	F, clear plasma signatures, short downstream waves
223	2013	11	10	0	26	0	1.41	53.87	1.14	1.37	N	in the trailing part of fast wind	F, plasma signatures, gradual increase of B

224	2013	11	11	10	31	52	1.45	61.78	4.33	1.37	N	ICME	F, plasma signatures, downstream waves
225	2013	11	13	17	0	55	1.55	77.71	DG	1.42	N	ICME	F, Vp increases, DG of Np and Tp at the shock, upstream waves
226	2013	11	14	5	50	48	1.62	34.61	10.80	1.75	N	ICME	F, clear plasma signatures, B decreased 1 min after the shock, many fluctuations upstream and downstream
227	2013	11	18	18	24	0	1.57	44.24	1.46	1.61	N	ICME	F, Np and Tp spikes downstream, upstream and downstream waves
228	2013	11	20	23	52	7	1.29	76.11	0.41	1.22	N	SIR	F, clear plasma signatures, downstream waves
229	2013	11	24	3	51	30	1.31	45.8	1.53	1.32	N	in the trailing part of fast wind	F, plasma signatures, intermittent fluctuations during 1 hr around the shock
230	2013	12	1	22	29	46.5	2.76	81.3	0.34	2.92	N	ICME	F, prominent plasma signatures, overshoot, downstream waves
231	2013	12	17	16	7	44	1.88	53.1	0.52	1.83	N	SIR	R, clear plasma signatures, upstream and downstream waves
232	2013	12	24	20	6	47	1.14	80.54	1.41	1.10	N	SIR with an embedded ICME	F, weak plasma signatures

233	2013	12	24	22	18	38	1.18	82.33	0.52	1.13	N	SIR with an embedded ICME, 13 hr ahead of ICME	F, weak plasma signatures
234	2013	12	26	5	4	12	1.53	83.27	0.90	1.40	N	SIR with an embedded ICME	R, weak plasma signatures, downstream waves
235	2013	12	29	3	39	5	1.25	51.26	0.91	1.21	N	SIR, at the trailing edge of ICME	F, weak plasma signatures, fluctuations last long time around the shock
236	2013	12	29	7	15	51	1.76	50.54	0.96	1.73	N	SIR	F, plasma signatures, upstream and downstream waves
237	2013	12	31	13	31	40	1.5	66.1	0.89	1.40	N	ICME	F, plasma signatures, a short B dip after the shock
238	2014	1	9	13	17	36	1.2	41.3	0.41	1.16	N	ICME embedded within SIR	F, 2-min plasma DG at the shock, plasma signatures, extensive upstream and downstream waves
239	2014	1	12	19	11	41.5	1.27	65.73	2.31	1.21	N	in the declining part of fast wind	F, plasma signatures, waves upstream and downstream
240	2014	1	14	23	59	9	1.52	82.93	0.29	1.4	N	in ICME	F, 3-min plasma DG at the shock, nice waves upstream and downstream
241	2014	1	17	10	52	22.8	1.44	70.43	4.25	1.34	N	in slow wind	F, weak plasma signatures
242	2014	1	20	19	21	50	1.79	74.29	0.18	1.65	N	front edge of SIR	F, plasma signatures, moderate-amplitude waves upstream and downstream

243	2014	1	22	15	14	30.8	1.39	76.74	1.17	1.3	N	within SIR	F, plasma signatures
244	2014	1	29	18	13	27	1.53	49.97	0.93	1.49	N	ICME	F, clear plasma signatures, sharp increase of suprathermal e flux, waves upstream and at the foot
245	2014	2	1	6	19	28	1.33	33.46	0.97	1.36	N	in slow wind	F, weak plasma signatures, upstream waves last long
246	2014	2	2	0	18	17	1.41	81.35	1.94	1.3	N	ICME	F, plasma signatures
247	2014	2	5	3	27	37.5	1.64	84.73	3.07	1.47	N	ICME	F, plasma signatures, downstream waves
248	2014	2	7	20	59	3.8	1.66	78.1	0.46	1.52	N	ICME	F, clear plasma signatures, increase of suprathermal e flux, waves upstream and downstream
249	2014	2	15	5	50	4.5	1.37	75.18	4.55	1.26	N	leading SIR with ICME embedded	F, weak plasma signatures, abrupt B increase, downstream waves
250	2014	2	16	7	50	14.5	1.88	12.62	0.36	2.72	N	ICME replacing fast wind in SIR	F, 3-min plasma DG upstream, upstream waves, B spike at the ramp, Mach number needs further check
251	2014	2	22	8	0	3.7	1.93	61.32	1.41	1.84	N	ICME	F, plasma signatures, short upstream waves
252	2014	2	22	23	6	24	1.93	70.81	1.85	1.76	N	ICME	F, plasma signatures, upstream and downstream waves

253	2014	2	25	12	15	56	1.15	53.02	0.93	1.12	N	ICME	F, plasma signatures, gradual increase of B, small-amplitude downstream waves, sharp change of suprathermal e flux
254	2014	2	27	20	46	45	1.42	46.57	0.69	1.38	N	ICME	F, plasma signatures, low frequency waves upstream and downstream
255	2014	3	7	18	35	13	1.35	80.66	0.70	1.25	N	ICME replacing fast wind in SIR	F, weak plasma signatures, sharp rise of suprathermal e flux
256	2014	3	11	9	37	10	2.05	70.21	0.83	1.9	N	ICME	F, plasma signatures, downstream waves
257	2014	3	14	16	37	40	1.18	64.01	0.39	1.14	N	ICME in fast wind of SIR	F, plasma signatures, change in suprathermal e flux, gradual rise of B, waves upstream and at the ramp
258	2014	3	30	21	38	4	1.97	55.47	0.60	1.91	N	ICME	r, plasma signatures, rise of suprathermal e flux, step rise of B, upstream and downstream waves, B dips downstream
259	2014	4	8	22	51	35	1.17	57.27	2.26	1.14	N	in slow wind, 14 hrs ahead of ICME	F, weak plasma signatures, change of suprathermal e flux, upstream waves
260	2014	4	9	13	7	45	1.55	80.81	0.65	1.4	N	ICME	F, plasma signatures, upstream and downstream waves, not much change in suprathermal e flux
261	2014	4	11	15	24	2	1.21	14.01	0.24	1.17	N	ICME	F, extensive upstream and downstream waves
262	2014	4	25	17	15	11	1.32	86.26	0.75	1.23	N	SIR	R, weak plasma signatures, weak downstream waves

263	2014	5	10	13	26	41.5	2.03	69.12	0.88	1.89	N	in slow wind, 1 day ahead of ICME	F, plasma signatures, V increase > 50 km/s, upstream and downstream waves last short
264	2014	5	11	12	33	49	1.47	64.04	1.46	1.38	N	ICME	F, plasma signatures
265	2014	6	9	9	30	27	1.3	64.45	0.35	1.22	N	ICME	F, plasma signatures, upstream and downstream waves last long
266	2014	6	9	12	50	2.5	1.68	63.53	0.90	1.56	N	ICME	F, plasma signatures
267	2014	6	11	0	14	42.5	2.09	82.31	1.21	1.9	N	ICME	F, plasma signatures, upstream and downstream waves
268	2014	6	27	21	58	6	1.23	72.18	1.08	1.17	N	1 day before a SIR with ICME embedded	F, weak plasma signatures
269	2014	7	4	16	54	24	1.47	87.08	2.14	1.34	N	SIR with ICME embedded	F, plasma signatures, upstream and downstream waves
270	2014	7	12	17	19	11	2.2	64.5	1.16	2.12	N	ICME	F, prominent plasma signatures, upstream and downstream waves
271	2014	7	27	9	47	54	1.38	83.42	2.64	1.26	N	SIR	F, plasma signatures, downstream waves
272	2014	8	11	9	3	25	1.94	29.95	0.11	1.92	N	ICME	F, prominent plasma signatures, intense upstream and downstream waves
273	2014	9	25	20	38	51	1.59	39.09	0.21	1.50	N	fast wind overtake an ICME	F, large upstream waves, plasma signatures, a short data gap upstream

274	2014	10	16	20	5	3	1.39	54.99	0.78	1.34	N	ICME	F, small upstream waves, few plasma signatures
275	2014	10	16	20	11	43.3	2.89	62.88	0.60	3.50	N	ICME	F, sharp B rise, prominent plasma signatures
276	2015	11	19	6	46	36	1.24	46.69	1.86	1.24	N	SIR	R, weak plasma signatures, Bz crosses 0 30s away from the shock
277	2015	12	1	13	37	52	1.83	32.24	2.68	2.72	N	SIR with an ICME embedded	F, plasma signatures, upstream waves
278	2015	12	7	17	33	2	1.7	73.04	10.66	1.53	N	a bump in slow wind	F, plasma signatures, upstream and downstream waves
279	2016	1	9	18	8	20	1.41	48.52	1.89	1.41	N	ICME	F, plasma signatures, upstream and downstream waves
280	2016	1	18	6	43	25	1.74	52.09	0.64	1.68	N	SIR	R, plasma signatures, a current sheet within 1 min
281	2016	2	12	18	28	2	1.31	75.35	1.31	1.22	N	SIR	R, weak plasma signatures, downstream waves
282	2016	3	13	17	40	34	1.48	43.3	5.16	1.60	N	ICME	F, prominent plasma signatures, downstream waves
283	2016	4	15	1	26	0	1.35	74.87	1.49	1.26	N	ICME	F, plasma signatures, sharp B rise, downstream waves
284	2016	4	27	9	7	30	1.23	32.69	2.64	1.36	N	SIR	F, weak plasma signatures, waves, 15 s for ramp, current sheets within 2 min

285	2016	5	14	21	23	37	1.17	47.81	1.58	1.17	N	SIR	F, weak plasma signatures, small amplitude waves
286	2016	5	24	12	38	33	1.23	77.08	0.99	1.18	N	SIR	R, weak plasma signatures, downstream waves
287	2016	6	24	12	34	50	1.38	77.78	2.65	1.27	N	SIR	F, clear plasma signatures, 15 s for ramp
288	2016	7	2	20	48	54	1.4	60.54	0.35	1.34	N	ICME	F, prominent plasma signatures except 3 plasma data points are missing at the ramp, upstream and downstream waves
289	2016	7	5	10	9	27	1.27	53.55	0.28	1.22	N	faster wind overtaking ICME	F, plasma signatures, upstream and downstream waves
290	2016	7	22	23	12	12	1.6	73.28	0.41	1.46	N	SIR	R, prominent plasma signatures, upstream and downstream waves
291	2016	8	3	17	11	28.5	1.45	78.15	1.62	1.34	N	SIR	F, plasma signatures, downstream waves
292	2016	8	4	8	24	27	1.53	58.72	0.49	1.44	N	SIR	R, plasma signatures, downstream waves
293	2016	8	18	21	37	1	1.09	57.86	1.33	1.07	N	inside SIR	F, V and Tp increase, a small increase of B, a small B dip downstream
294	2016	9	1	5	16	14	1.54	81.06	0.29	1.42	N	SIR	R, plasma signatures, downstream waves

295	2016	9	19	12	26	6	1.16	57.41	0.77	1.14	N	in fast wind, 1 day after SIR	R, weak plasma signatures
296	2016	9	27	14	0	2	1.94	47.98	2.71	2.10	N	SIR	F, prominent plasma signatures, upstream and downstream waves of different frequencies
297	2016	9	28	2	15	55	1.45	44.28	1.67	1.48	N	SIR	R, plasma signatures, upstream and downstream waves
298	2016	10	14	3	33	48	1.3	73.81	0.75	1.23	N	SIR	F, slight increases of V and Np, upstream and downstream waves last short
299	2016	10	29	1	4	44	1.36	50.67	3.22	1.34	N	SIR+ICME	F, weak plasma signatures, long-lasting waves in T and N components
300	2016	11	7	21	43	10	1.13	46.97	1.40	1.12	N	SIR	F, weak plasma signatures
301	2016	11	13	17	33	50	1.67	15.25	0.39	2.10	N	SIR	R, plasma signatures, waves at the ramp
302	2016	12	3	7	38	38	1.32	38.64	1.11	1.34	N	about 9 hours ahead of SIR, count as SIR	F, slight increases of V and Np, waves throughout the shock, higher frequency ones at the ramp
303	2016	12	19	16	54	46	1.36	80.29	1.20	1.26	N	in slow wind	F, prominent plasma signatures, downstream waves
304	2017	1	3	15	45	15	1.17	31.77	1.36	1.21	N	SIR	R, weak plasma signatures, B decreases gradually, whistler waves and upstream waves

305	2017	1	18	9	15	57	1.31	53.44	15.96	1.32	N	SIR	F, moderate plasma signatures, current sheet with mirror mode waves occurs 1 min after the B jump
306	2017	1	19	5	10	20	1.47	22.04	1.28	2.00	N	SIR	R, prominent plasma signatures, clear change in pitch angle distribution of suprathermal e flux, large-amplitude waves throughout the shock
307	2017	3	24	16	22	51	1.04	29.01	2.48	1.04	N	ICME	F, prominent plasma signatures, clear change in pitch angle distribution of suprathermal e flux, large-amplitude waves throughout the shock
308	2017	4	11	20	20	0	1.19	57.18	1.10	1.14	N	SIR	F, weak plasma signatures, B increases gradually, upstream and downstream waves
309	2017	4	19	9	25	4.3	1.22	54.30	0.84	1.18	Y	SIR	F, weak plasma signatures, upstream waves
310	2017	5	4	21	1	27	1.33	80.09	3.65	1.22	N	SIR	F, weak plasma signatures, sharp rise of B, downstream waves
311	2017	5	9	10	30	38.6	2.88	54.10	1.20	2.20	N	SIR	F, prominent plasma signatures, clear change in pitch angle distribution of suprathermal e flux, long-period downstream waves
312	2017	5	10	2	20	33	1.43	68.92	0.66	1.34	N	SIR	R, weak plasma signatures, downstream waves

313	2017	5	22	17	22	19	1.34	80.59	6.19	1.23	N	in slow wind, 0.5-day ahead of SIR	F, weak plasma signatures, upstream and downstream waves
314	2017	6	20	8	38	0.4	1.72	75.63	4.14	1.55	N	in slow wind, increase of Q_Fe about 1 day later	F, clear plasma signatures, weak upstream and downstream waves
315	2017	7	16	19	39	29.5	1.38	45.24	3.19	1.42	N	SIR	F, clear plasma signatures, weak upstream and downstream waves
316	2017	7	24	13	22	41	1.92	47.92	1.35	2.00	N	ICME	F, plasma signatures except Np, upstream and downstream waves
317	2017	7	24	14	36	31.4	1.57	47.5	1.19	2.40	N	ICME	F, plasma signatures, waves at the foot and downstream
318	2017	7	25	7	3	46.5	1.59	66.62	0.11	1.46	N	ICME	R, no clear plasma signatures, upstream and downstream waves
319	2017	7	28	0	19	37	1.14	51.61	1.58	1.12	N	in intermediate-speed solar wind	F, weak plasma signatures, upstream and downstream waves
320	2017	7	28	19	45	45	1.27	45.94	2.15	1.28	N	in intermediate-speed solar wind	F, plasma signatures
321	2017	9	13	16	50	2	1.31	61.34	7.93	1.26	Y	SIR	F, plasma signatures, upstream and downstream waves

322	2017	9	19	2	56	25	2.33	44.9	1.50	2.59	N	ICME	F, prominent plasma signatures, upstream and downstream waves
323	2017	9	20	0	50	18	1.6	44.39	0.54	1.54	Y	within ICME, faster solar wind overtaking slower part	plasma signatures, upstream and downstream waves
324	2017	9	21	13	34	47	1.73	79.32	6.19	1.54	N	in fast wind	weak plasma signatures, 5 min before HCS
325	2017	10	9	1	10	25	1.25	72.71	2.93	1.18	Y	in slow wind	weak plasma signatures, upstream and downstream waves
326	2017	10	15	7	49	16	1.28	62.79	3.08	1.22	N	SIR	weak plasma signatures
327	2017	10	15	22	47	31	1.49	66.94	1.13	1.39	N	SIR	plasma signatures
328	2017	10	21	3	24	57.1	2.46	88.29	4.48	2.23	N	ICME	clear plasma signatures, downstream waves
329	2017	11	17	21	53	7	1.71	86.44	2.00	1.54	Y	SIR	clear plasma signatures, downstream waves
330	2017	11	18	12	23	48	1.36	53.52	1.23	1.32	N	in fast wind	weak plasma signatures, downstream waves
331	2018	1	17	17	39	31	1.57	54.23	2.10	1.52	Y	SIR	clear plasma signatures, upstream and downstream waves
332	2018	3	15	21	52	56	1.16	47.06	0.99	1.15	N	SIR	weak plasma signatures, upstream waves

333	2018	4	3	5	30	27.5	1.58	61.74	0.99	1.46	N	SIR	plasma signatures
334	2018	4	11	3	9	44.5	1.34	73.42	49.71	1.24	N	SIR	weak plasma signatures, upstream and downstream waves
335	2018	4	11	8	11	14	1.21	77.47	2.10	1.15	N	SIR	plasma signatures, magnetic humps further downstream
336	2018	4	19	1	14	21.5	1.21	68.56	0.90	1.16	Y	SIR	weak plasma signatures, downstream waves
337	2018	4	22	8	3	6	1.19	84.94	0.93	1.13	N	SIR	weak plasma signatures
338	2018	5	23	12	49	57	1.34	86.51	5.26	1.24	N	SIR	weak plasma signatures, 1-min ahead of a current sheet
339	2018	7	2	16	42	40	1.1	20.28	3.65	1.32	N	in intermediate-speed (400 km/s) solar wind after a increase of V for 9 hr	weak plasma signatures, B decreases gradually with upstream and downstream waves
340	2018	7	12	5	33	10	1.29	54.13	2.64	1.26	N	SIR	weak plasma signatures, whistler waves at the ramp
341	2018	8	3	15	4	48	1.68	8	4.04	1.14	N	within SIR	F
342	2018	9	8	4	49	12	1.45	65	0.54	4.26	N	SIR	R, speed spike for 5-10 min downstream
343	2018	11	11	16	5	24	1.62	21	1.71	1.49	N	SIR	F

344	2018	12	5	1	41	24	1.48	31	5.63	1.38	N	a small V increase in slow wind, after declining of fast wind	F, very small V increase
345	2018	12	6	16	16	12	1.31	45	0.95	1.03	N	a small V increase in slow wind	F
346	2018	12	8	14	30	0	1.32	68	1.07	0.92?	N	SIR	F
347	2018	12	13	19	7	12	1.67	2	1.06	1.26	N	in slow wind	F
348	2019	1	27	4	23	24	1.29	43	1.79	1.08	Y	in slow wind	F
349	2019	1	28	1	33	36	1.31	10	0.43	1.39	N	ICME	F
350	2019	1	31	22	32	24	3.4	48	5.07	2.10	N	SIR, Tp only has one spike for the increase though	F
351	2019	3	9	16	20	24	1.99	6	1.17	2.58	N	in slow wind	F
352	2019	4	7	14	13	12	1.52	39	0.31	0.63?	N	SIR	F
353	2019	5	6	22	13	12	3.13	61	0.42	3.94	N	ICME	F
354	2019	5	10	6	45	0	1.88	7	0.37	5.64	N	ICME	F
355	2019	6	25	8	56	24	1.89	71	0.22	1.53	N	ICME, clear plasma signatures	F
356	2019	8	12	16	52	48	1.57	63	1.20	0.73	N	SIR	F
357	2019	10	7	17	28	48	1.42	55	0.11	2.11	N	SIR	F
358	2019	10	14	7	43	12	1.82	62	0.81	0.70	N	SIR	F
359	2019	10	17	16	4	48	1.87	52	0.93	1.69	N	SIR	F
360	2019	11	30	3	48	0	2.11	55	0.94	1.77	Y	ICME	F

361	2020	3	6	15	18	0	1.43	30	0.56	1.32	N	ICME	F
362	2020	7	9	14	16	48	1.85	51	0.41	1.26	N	ICME	F
363	2020	8	12	20	9	0	1.71	22	1.10	1.70	Y	in slow wind	F
364	2020	8	19	21	9	36	2.41	76	1.43	2.28	Y	ICME	F
365	2020	8	31	18	24	0	1.49	28	0.66	1.23	N	ICME	F
366	2020	10	27	12	24	0	1.76	24	0.62	0.85	N	ICME	F
367	2020	12	3	18	4	48	1.65	55	0.09	1?	N	ICME, plasma data gap upstream near the ramp	F
368	2020	12	31	8	51	36	2.58	13	1.54	2.27	N	ICME, plasma data gap upstream near the ramp	F

Interplanetary Shocks at STEREO B

#	Year	Month	Day	Hour	Minute	Second	$B_{\text{down}}/B_{\text{up}}$	θ_{Bn}	β	Mach Num.	32 s ⁻¹ data availability	Source	Forward/Reverse Shock
1	2007	1	14	20	1	27	1.24	65.4	DG	1.18	N	ICME	F
2	2007	4	22	6	9	27.5	1.58	39.6	5.70	1.81	Y	SIR	F
3	2007	4	23	13	21	10	1.65	33.9	4.32	2.12	N	SIR	developing R, with waves
4	2007	5	7	9	42	49	1.65	62.5	2.24	1.55	N	SIR	F, downstream waves, clear plasma signatures, 1 minute away from a current sheet

5	2007	5	17	21	23	19	1.37	61.7	2.09	1.31	N	SIR	F
6	2007	5	22	17	29	52.5	1.33	80.7	0.24	1.25	Y	middle ICME	F
7	2007	7	11	7	44	44	1.97	62.7	0.94	1.83	N	SIR	R
8	2007	7	13	22	0	30	1.57	48.7	1.65	1.56	Y	SIR	F
9	2007	7	20	1	22	15	1.45	51.6	0.44	1.38	N	SIR	F
10	2007	8	10	16	39	10	1.69	34.3	1.63	2.05	Y	fast wind (~570 km/s) overtaking a SIR-like structure	R
11	2007	8	14	16	31	4	1.25	57.0	2.66	1.22	N	SIR	F
12	2007	8	24	14	16	33	1.58	69.0	2.09	1.45	N	SIR	F
13	2007	9	2	0	9	16.5	1.61	63.2	1.33	1.44	N	SIR	R
14	2007	9	13	18	34	19	1.67	70.8	7.02	1.52	Y	like a SIR including ICME, but the flux rope is not nice and the Vp is flat and slow	F
15	2007	9	19	18	15	3	1.64	65.6	29.46	1.52	N	SIR	F
16	2007	9	28	5	53	27	1.61	73.9	2.31	1.46	N	SIR	R

17	2007	11	9	0	10	8	2.04	61.9	2.35	1.96	N	SIR-like structure with concave Pt profile	F
18	2007	11	19	13	49	36	1.84	62.0	2.34	1.84	N	SIR including an ICME	F
19	2007	12	8	23	2	2.5	1.43	75.5	4.88	1.33	Y	SIR	F
20	2007	12	16	0	16	33.5	1.16	82.4	3.07	1.12	N	SIR	weak F
21	2008	2	9	18	42	7.5	1.90	53.1	2.21	1.92	Y	SIR	R
22	2008	4	4	7	41	44.5	1.40	75.1	1.33	1.3	N	SIR	R
23	2008	4	29	14	10	8.5	1.97	68.9	0.25	1.86	N	ICME	F
24	2008	6	6	15	35	46	1.75	38.4	6.98	2.2	N	ICME	F
25	2008	6	12	21	35	20.75	1.35	82.8	0.63	1.27	N	SIR	F
26	2008	7	19	7	28	18	1.34	73.5	2.21	1.25	N	SIR	F
27	2008	7	20	22	27	38.08	2.11	63.8	2.43	2.08	N	SIR	F
28	2008	7	21	10	30	40	2.23	60.8	1.60	2.2	Y	SIR	R, gradual variation of B
29	2008	8	6	21	17	40	1.55	60.8	1.02	1.45	N	SIR	F
30	2008	8	16	1	16	1.5	1.49	73.6	0.87	1.38	N	SIR	F
31	2008	9	29	13	8	2	1.31	70.4	1.51	1.24	N	SIR	R, little change of Tp
32	2008	9	30	22	20	37	1.54	40.5	2.60	1.68	Y	in fast wind	R, plasma signatures
33	2008	11	21	21	16	58	1.59	73.6	1.84	1.46	N	SIR	F
34	2008	12	7	4	35	30	1.27	42.0	5.14	1.34	N	SIR	F
35	2008	12	15	2	12	22	1.31	70.2	2.47	1.23	N	in slow wind ~ 300 km/s, a small SIR- like structure	F

36	2009	2	11	10	20	58	1.52	50.2	3.00	1.56	Y	SIR	R, upstream waves
37	2009	2	22	12	12	14	1.33	73.6	2.20	1.26	N	in slow wind, 1.5 days before SIR	F
38	2009	3	10	14	47	34	2.21	76.7	0.59	2.1	N	SIR	R, upstream and downstream waves
39	2009	3	14	9	46	30	1.5	33.6	DG	1.6	N	a sharp bump in slow wind	F, many waves
40	2009	3	24	18	42	17	1.65	44.3	1.41	1.7	N	SIR	R, downstream waves
41	2009	6	5	9	29	49.17	1.61	72.6	9.10	1.44	N	SIR	F
42	2009	6	19	0	23	34	1.95	80.1	5.87	1.73	Y	ICME	F
43	2009	7	18	11	35	15.3	1.74	83.4	3.75	1.55	N	SIR	F
44	2009	7	19	2	8	36	1.96	56.6	1.06	1.9	N	SIR	R, upstream waves
45	2009	8	5	22	35	17	1.57	47.5	4.69	1.62	Y	ICME	F
46	2009	8	7	5	24	29.5	1.70	68.4	1.75	1.6	Y	fast wind (510 km/s) overtaking ICME	R
47	2009	8	30	2	49	50.5	1.42	75.7	2.48	1.34	Y	ICME	F
48	2009	8	31	3	40	46	1.55	85.8	0.27	1.43	N	a sharp and high bump in ICME	F, weak downstream wave
49	2009	10	2	15	43	50.75	1.68	46.5	16.50	2.3	Y	ICME	F, plasma signatures, upstream and downstream waves

50	2009	10	4	17	46	47.5	1.44	46.4	21.92	1.52	N	faster wind (~320 km/s) overtaking ICME	R
51	2009	10	26	11	27	33	2.05	43.1	6.40	2.6	Y	SIR	F
52	2009	11	3	1	7	55	1.43	50.6	8.38	1.5	Y	SIR	F, upstream waves
53	2009	11	8	15	54	23	1.35	40.7	3.43	1.45	Y	a bump in slow wind ~ 330 km/s	F, upstream waves
54	2009	11	26	16	18	56	1.43	29.0	12.42	2	Y	a SIR-like structure including ICME, V_p does not increase monotonically	F, upstream and downstream waves
55	2009	12	13	19	50	14	1.54	52.6	0.22	1.45	N	SIR	R, clear plasma signatures
56	2010	2	13	11	52	15	1.24	71.0	0.50	1.18	Y	SIR	F, downstream waves, plasma signatures
57	2010	2	14	7	49	55	1.29	40.4	0.10	1.22	Y	SIR	R, upstream waves last short, downstream waves last long, T_p does not decrease

58	2010	2	28	19	49	55	1.22	68.6	0.90	1.17	Y	in slow wind, 22 hrs before SIR	F, upstream waves, clear plasma signatures
59	2010	3	9	4	17	17	1.33	65.5	4.04	1.27	Y	a bump in the slow wind (360 km/s)	F, B increases gradually; plasma signatures are clear
60	2010	3	11	8	49	24	1.53	72.7	0.21	1.42	Y	SIR	R, downstream waves, plasma signatures
61	2010	3	20	10	51	22	1.26	42.1	0.44	1.22	Y	SIR	R, many upstream waves
62	2010	4	26	15	2	50	1.42	59.4	0.70	1.34	Y	a small bump in the slow wind (300 km/s), 20 hrs before SIR	F, waves at the foot
63	2010	5	15	1	19	2	1.89	63.9	6.75	1.76	Y	SIR	F, waves at the shock
64	2010	6	2	20	46	30	1.59	23.2	0.89	2	Y	SIR	R, clear plasma signatures, upstream waves
65	2010	6	7	4	8	48	1.97	84.5	3.17	1.74	Y	ICME	F, nice
66	2010	6	11	4	41	28	1.42	65.1	1.11	1.32	Y	SIR	F, upstream and downstream waves
67	2010	6	12	4	59	20	1.65	62.6	0.56	1.54	N	SIR	R, clear plasma signatures

68	2010	6	30	5	45	0	1.48	44.0	3.97	1.55	N	a sharp bump in slow wind ~ 400 km/s	F, clear plasma signatures, upstream and downstream waves
69	2010	7	8	16	42	10	1.55	45.8	2.73	1.58	N	SIR	F
70	2010	8	2	15	31	0	1.98	55.5	1.18	1.94	Y	13 hrs before ICME	F, upstream and downstream waves
71	2010	8	3	5	0	54	1.89	76.7	0.10	1.74	Y	ICME	F, nice and strong, downstream waves
72	2010	8	4	7	9	21	1.48	58.2	0.07	1.38	Y	fast wind overtaking ICME	R
73	2010	8	11	9	31	47	2.44	43.7	8.22	3.85	Y	SIR	F, a lot of B fluctuations downstream
74	2010	8	20	10	27	57	1.72	62.4	0.56	1.62	Y	SIR	R, downstream waves, plasma signatures
75	2010	9	12	5	26	45	1.29	46.5	1.83	1.3	Y	SIR	F, upstream waves last long
76	2010	9	15	7	18	4	1.78	40.9	22.75	1.36	Y	in slow wind, > 1 day of ICME	F
77	2010	9	28	7	16	37	1.27	51.8	4.45	1.27	N	a small bump in the slow wind (300 km/s)	F, B increases gradually; plasma signatures are clear; Vp increase is weak
78	2010	11	7	19	5	5	1.90	73.9	3.79	1.72	N	SIR including an ICME	F, downstream waves, plasma signatures

79	2010	11	19	20	26	0	1.47	50.1	1.71	1.46	N	ICME	F, upstream waves
80	2010	12	29	11	24	11	2.20	64.4	12.44	2.1	Y	SIR	F, plasma signatures
81	2011	1	12	22	36	35	1.22	47.0	3.53	1.24	Y	a small bump in the slow wind (320 km/s)	F, downstream waves, small Vp and Np increase, no Tp increase
82	2011	1	17	15	46	6.2	1.38	75.1	2.02	1.28	Y	ICME	F, plasma parameters increases are not prompt
83	2011	3	6	13	38	3.25	1.31	80.2	1.06	1.23	Y	a small bump in slow wind, 18 hrs before ICME	F, upstream and downstream waves, small increases of Vp and Np, no increase of Tp
84	2011	3	7	8	31	50	1.60	38.9	3.77	1.84	Y	ICME	F, upstream waves, clear plasma signatures
85	2011	3	7	12	22	46.3	1.84	80.4	3.69	1.63	Y	ICME	F, upstream and downstream waves, prompt plasma signatures
86	2011	3	20	17	17	24	1.21	34.8	1.26	1.26	N	ICME	F, increases of Vp and Np, no increase of Tp
87	2011	3	21	18	42	9	1.33	80.4	0.16	1.25	N	within ICME	F, increase of Vp, a small and transient increase of Tp, sharp rise of B, weak upstream waves

88	2011	4	23	1	21	57	1.14	59.6	0.86	1.12	Y	11 hrs before SIR	F, upstream waves, B increases over 20 seconds, small increases of Vp, Np, and Tp
89	2011	4	24	11	7	21	2.17	85.7	DG	2	Y	SIR	R, upstream and downstream waves, plasma data gap
90	2011	5	12	4	45	7	1.54	30.8	3.26	2.04	Y	a sharp bump in the trailing part of fast wind ~ 450 km/s	F, upstream and downstream waves, clear plasma signatures
91	2011	6	9	9	50	10	1.24	50.7	1.86	1.23	Y	a small bump in the trailing part of fast wind ~ 450 km/s	F, upstream waves of fs/c ~ 0.6 Hz, small increases of Vp and Np, Tp does not increase
92	2011	6	16	19	36	23	1.22	51.1	1.43	1.2	Y	SIR	F, small B increase, clear plasma signatures
93	2011	6	17	2	12	23.6	1.67	69.6	0.88	1.54	Y	SIR	R, downstream waves, plasma signatures
94	2011	6	18	13	49	10	1.25	47.2	0.61	1.22	N	fast wind catching up with an ICME	R, upstream waves
95	2011	7	4	23	12	10	1.35	57.8	0.90	1.3	N	SIR-like small structure	F, waves at the transition region

96	2011	7	19	18	45	57	1.47	86.6	1.64	1.34	Y	SIR	F, sharp, nice plasma signatures
97	2011	8	20	21	51	46.5	1.63	70.7	0.90	1.5	Y	ICME	F, nice upstream waves, Tp decreases to pre-shock level after 10 min
98	2011	8	27	2	3	36	1.37	85.7	1.45	1.28	Y	SIR	F, weak, downstream waves, small Vp and Np increases, Tp does not increase at the time
99	2011	9	4	12	38	3.5	1.40	61.9	2.65	1.34	Y	6.5 hr before SIR	F, upstream whistler waves, weak plasma signatures, no Tp increase
100	2011	9	21	1	26	55.5	1.38	78.8	1.55	1.29	Y	SIR+ICME	F, very close to another shock
101	2011	9	21	1	27	12.5	1.34	67.4	1.63	1.27	Y	SIR+ICME	F, weak plasma signatures, 2 B increases 17-s separated
102	2011	9	24	9	6	10	1.33	77.7	1.34	1.24	N	ICME	F, waves upstream and downstream, gradual B increase, weak plasma signatures, no Tp increase
103	2011	10	3	11	48	17	1.19	63.5	1.46	1.15	Y	ICME, but over 10 hrs ahead	F, plasma signatures, upstream and downstream waves, gradual B increase, and close to a current sheet

104	2011	10	3	22	23	25	2.13	73.0	3.90	1.96	Y	ICME	F, prominent plasma signatures, upstream and downstream waves, current sheets near by
105	2011	10	7	11	26	41.3	1.65	51.0	2.75	1.64	Y	ICME	F, clear plasma signatures, upstream waves of about 2 Hz
106	2011	10	18	19	20	10	1.42	53.0	1.13	1.37	Y	ICME	F, clear plasma signatures, upstream and downstream waves
107	2011	11	1	2	19	55	1.25	30.0	1.89	1.4	N	a faster wind overtaking, half a day after ICME	R, small changes of plasma parameters, gradual B decrease, some upstream waves
108	2011	11	2	22	7	39.3	1.42	79.0	1.26	1.32	N	in the slow wind	F, clear plasma signatures, sharp B change, upstream and downstream waves
109	2011	11	6	5	10	45	1.07	29.1	0.37	1.07	Y	ICME	F, plasma signatures, upstream and downstream waves, gradual B increase, and close to a current sheet
110	2011	11	17	2	3	15	1.34	37.8	0.87	1.4	N	in slow wind, >3 days ahead of ICME	F, plasma signatures, after 8 min of the shock, B increases and there is a current sheet

111	2011	11	18	3	29	43.5	1.24	66.6	1.59	1.18	N	in slow wind, >2 days ahead of ICME	F, plasma signatures although they are small changes, B increase is sharp, B decreases after 20 minutes
112	2011	11	19	7	42	41	1.54	67.5	4.15	1.43	Y	>1 day ahead of ICME	F, prominent plasma signatures, upstream and downstream waves, a small current sheet crossing at the shock
113	2011	11	20	13	38	42.8	2.01	85.7	1.37	1.82	N	ICME	F, prominent plasma signatures, nice downstream waves
114	2011	12	2	16	3	59.7	1.73	78.8	0.45	1.58	Y	ICME	F, prominent plasma signatures, upstream and downstream waves
115	2011	12	13	4	52	19.5	1.67	69.8	0.52	1.54	Y	SIR	R, clear plasma signatures, upstream and downstream waves
116	2011	12	26	23	50	46	1.85	71.2	3.49	1.67	Y	ICME+SIR	F, clear plasma signatures, short upstream and downstream waves
117	2012	1	6	12	13	14	1.32	38.3	0.72	1.32	Y	SIR	F, plasma signatures, large-amplitude waves upstream and at the ramp

118	2012	1	16	9	49	15.5	1.55	31.0	1.43	1.81	Y	ICME	F, prominent plasma signatures, a B dip after the ramp
119	2012	1	19	1	46	1.25	2.62	81.5	2.64	2.54	Y	ICME	F, plasma signatures, weak upstream waves, strong downstream waves
120	2012	1	30	11	7	52.5	1.74	50.4	1.74	1.74	N	ICME	F, plasma signatures except little T_p increase
121	2012	2	3	5	46	37	1.51	77.8	4.17	1.38	Y	SIR	F, plasma signatures, sharp B increase, downstream waves
122	2012	2	3	15	20	48	1.47	60.2	0.47	1.37	Y	SIR	R, plasma signatures except nearly constant T_p with a data spike, B decrease is gradual, change in suprathermal electron flux too
123	2012	2	8	18	9	36	1.08	75.1	1.50	1.05	Y	20 hrs ahead of SIR	F, plasma signatures except no T_p increase, B increase is gradual, clear change in suprathermal electron flux
124	2012	2	20	10	27	40	1.46	75.7	1.66	1.34	N	SIR	F, weak plasma signatures, B increase is gradual

125	2012	3	7	18	14	0.6	1.49	51.0	3.06	1.48	Y	SIR	F, plasma signatures, change in suprathermal electron flux, strong upstream waves last long, probably whistlers
126	2012	3	8	13	36	43.5	1.60	58.7	0.17	1.48	Y	ICME	F, prominent plasma signatures, strong waves at the ramp
127	2012	3	10	21	17	12	1.36	40.3	0.65	1.35	Y	ICME	F, prominent plasma signatures, change of suprathermal electron flux, B dip in 10 min, waves at ramp and downstream
128	2012	3	26	16	30	30.8	2.15	86.7	6.18	1.9	Y	ICME	F, prominent plasma signatures
129	2012	3	28	21	37	32.6	1.64	68.7	1.14	1.52	N	ICME	F, plasma data changes are gradual, sharp increase of suprathermal electron flux, downstream waves
130	2012	4	17	3	36	38.6	1.99	85.7	1.29	1.8	Y	ICME	F, prominent plasma signatures, change of suprathermal electron flux, upstream and downstream waves
131	2012	4	18	11	1	0	1.25	25.2	1.10	1.36	N	in fast wind, after ICME, no clear driver	F, weak plasma signatures, B increase is gradual, waves at the ramp

132	2012	4	19	5	18	48	1.37	36.4	0.16	1.3	Y	a jump in the trailing part of fast wind	F, plasma signatures, Np decreases in 20 min, a short B dip downstream
133	2012	5	7	1	6	58.8	1.55	85.6	0.53	1.41	Y	SIR with an ICME embedded, the ICME starts more than one day after the shock	F, clear plasma signatures, increase of suprathermal electron flux, sharp B increase
134	2012	5	7	3	33	42.2	1.85	87.5	1.15	1.66	Y	SIR with an ICME embedded, the ICME starts more than one day after the shock	F, prominent plasma signatures, 2 hrs after the previous shock, enhanced suprathermal electron flux, upstream and downstream waves
135	2012	5	8	14	55	13.7	1.46	78.8	0.83	1.36	Y	ICME embedded within a SIR	F, prominent plasma signatures, upstream waves
136	2012	5	8	14	55	18.5	1.37	83.0	0.83	1.28	Y	ICME embedded within a SIR	F, downstream waves, 5 s after the previous f.s.
137	2012	5	12	23	8	30.7	1.60	87.0	1.32	1.45	Y	ICME	F, plasma signatures, nice upstream and downstream waves
138	2012	5	20	12	14	45	1.24	57.2	1.18	1.21	Y	in the middle of SIR	F, plasma signatures, whistlers upstream and at the ramp

139	2012	6	11	21	6	27.7	1.73	72.7	0.44	1.6	Y	ICME	F, plasma signatures, upstream and downstream waves
140	2012	6	27	12	40	24.6	1.55	56.1	0.29	1.45	Y	SIR	F, plasma signatures, upstream and downstream waves
141	2012	6	27	19	3	20	1.83	31.2	0.51	2.02	Y	SIR	R, weak plasma signatures, waves at the ramp
142	2012	7	4	6	56	37	2.54	86.3	2.98	2.36	N	ICME	F, prominent plasma signatures, short downstream waves
143	2012	7	23	21	21	1	1.27	27.3	2.49	1.53	Y	ICME	F, prominent plasma signatures, B increase is gradual, no significant change of suprathermal
144	2012	7	28	14	58	41	1.78	30.5	1.72	2.56	N	ICME	F, plasma signatures except little T_p increase, small current sheet near the shock
145	2012	8	23	17	26	46	1.48	84.4	2.54	1.35	Y	in slow wind, more than one day ahead of an ICME	F, plasma signatures, upstream and downstream waves
146	2012	8	29	6	35	22	1.51	79.5	0.88	1.38	Y	ICME	F, plasma signatures, sharp increase of suprathermal electron flux

147	2012	9	3	7	11	55.5	1.93	83.4	0.78	1.75	Y	ICME	F, plasma signatures, sharp increase of suprathermal electron flux, upstream and downstream waves
148	2012	9	19	7	26	6	1.36	61.9	2.84	1.3	Y	SIR	F, weak plasma signatures, increase of suprathermal electron flux, near current sheet
149	2012	9	23	8	45	32	1.93	67.4	15.79	1.77	Y	ICME	F, plasma signatures, sharp rise of suprathermal electron flux, downstream waves
150	2012	9	24	16	30	41	1.49	65.3	7.92	1.42	N	possibly glancing of ICME	F, plasma signatures, sharp rise of suprathermal electron flux, short upstream and downstream waves
151	2012	9	24	23	48	38.5	1.41	57.8	0.38	1.33	Y	possibly glancing of ICME	R, no plasma signatures except T_p decrease, weak change in suprathermal electron flux, upstream waves
152	2012	9	25	16	26	48.3	2.39	78.5	0.24	2.32	N	ICME	F, strong plasma signatures, long upstream and downstream waves
153	2012	9	30	7	54	33	1.78	65.0	1.32	1.66	Y	SIR	F, plasma signatures, many upstream and downstream waves, upstream waves of ~ 1.6 Hz and propagate 24-30° with respect to B

154	2012	10	17	6	57	21	2.25	42.0	1.59	2.95	Y	ICME	F, clear plasma signatures, a field dip and rotation downstream
155	2012	10	25	19	10	38	2.93	80.0	43.61	2.96	N	ICME	F, clear plasma signatures, B dip for 6s downstream
156	2012	11	19	9	50	5.5	1.72	83.4	9.86	1.52	N	ICME	F, many B fluctuations afterwards
157	2012	11	21	5	54	40	1.20	60.9	0.78	1.15	N	fast wind overtaking ICME, however, there is a period of slow wind after the ICME, so 17 hrs after ICME	R, weak plasma signatures, no clear Vp increase, clear change in suprathermal electron distribution, many upstream and downstream waves
158	2012	11	28	3	36	19	2.36	79.9	31.06	2.12	Y	ICME	F, strong plasma signatures, change of suprathermal electron flux, overshoot, downstream waves
159	2012	12	18	20	6	4	1.63	58.5	1.13	1.54	Y	in slow wind, 28 hrs ahead of an ultra-low density region	F, strong plasma signatures, change of suprathermal electron flux, oblique whistler waves upstream

160	2012	12	25	0	37	44.5	1.85	77.1	4.54	1.64	N	ICME	F, strong plasma signatures, upstream and downstream waves
161	2012	12	25	6	33	5	1.30	81.3	3.08	1.2	N	ICME	F, clear plasma signatures, strong change of suprathermal electron flux, gradual increase of B, weak downstream waves
162	2013	1	13	17	2	44	1.27	80.8	0.59	1.2	N	SIR	F, Vp and Np increase, rapid B increase, downstream waves
163	2013	1	16	16	47	28	1.26	57.7	2.50	1.22	N	in slow wind	F, clear plasma signatures, magnetic hole at 4 min before the shock
164	2013	2	18	3	6	56	2.59	84.6	13.62	2.39	N	ICME	F, clear plasma signatures, downstream waves
165	2013	2	24	12	9	35	1.48	67.8	0.31	1.38	N	SIR	R, Vp increase, Np and Tp do not change much, B is weak
166	2013	3	4	4	5	15	1.14	42.0	0.54	1.12	N	in slow wind, a small 4-hr flux rope after 2 hrs	F, plasma signatures, large-scale waves at ramp and around the shock
167	2013	3	5	19	57	36	1.38	62.8	DG	1.3	N	SIR	F, Tp increases slightly, Np and Tp have DG before the event, upstream waves

168	2013	3	7	12	23	48	1.79	60.2	1.60	1.69	N	ICME	F, prominent plasma signatures, short upstream waves
169	2013	3	10	16	33	6	1.18	49.1	0.27	1.14	N	fast wind overtakes ICME	R, prominent plasma signatures, very short upstream waves
170	2013	3	18	0	24	25	1.22	63.5	2.32	1.18	N	SIR	F, plasma signatures, magnetic humps downstream
171	2013	4	9	6	40	42	1.92	79.7	DG	1.74	N	SIR	F, Vp increases slightly, DG of Np and Tp before the shock, downstream waves
172	2013	4	27	1	9	57	1.36	76.4	2.96	1.27	N	ICME	F, clear plasma signatures, change of suprathermal electron flux
173	2013	4	28	19	38	12	1.42	22.5	0.89	1.66	N	ICME	F, clear plasma signatures, upstream and downstream waves
174	2013	5	4	4	52	47	1.91	36.7	4.75	2.66	N	ICME	F, prominent plasma signatures, downstream waves
175	2013	5	7	4	37	8	1.45	74.7	0.39	1.35	N	ICME	F, Vp and Tp increase, not much increase of Np, upstream waves
176	2013	5	15	13	34	54	1.29	16.1	8.65	3.1	N	ICME	F, plasma signatures, upstream and downstream waves, a B dip and current sheet downstream

177	2013	5	17	2	54	1	1.52	70.0	1.62	1.41	N	ICME	F, prominent plasma signatures, waves at ramp and downstream
178	2013	5	23	22	21	18.5	1.16	46.9	0.40	1.13	N	SIR	R, plasma signatures, upstream and downstream waves, a B dip and current sheet downstream
179	2013	5	30	20	25	0	1.22	19.8	0.68	1.28	N	SIR	F, prominent plasma signatures, upstream and downstream waves, upstream waves lasted ~ 1 hr
180	2013	6	2	6	9	10	1.22	74.7	2.83	1.16	N	ICME	F, Vp and Np increase, upstream and downstream waves especially large-amplitude waves right after shock
181	2013	6	20	2	47	5	1.42	53.2	0.01	1.32	N	ICME	F, clear plasma signatures, upstream and downstream waves
182	2013	6	26	13	18	44	1.33	80.1	0.82	1.24	N	SIR	F, small increases of Vp, Np, and Tp, upstream and downstream waves
183	2013	7	5	7	4	30.5	1.84	86.8	2.00	1.63	N	ICME	F, prominent plasma signatures, upstream and downstream waves
184	2013	7	15	22	20	3	1.20	76.4	0.43	1.15	N	SIR	F, weak plasma signatures with small increases

185	2013	7	25	7	52	14	1.16	43.0	0.74	1.15	N	13 hr before SIR	F, plasma signatures, B fluctuates downstream for 1 hr
186	2013	8	5	9	21	41.4	1.44	81.5	0.77	1.33	N	SIR	F, clear plasma signatures, upstream and downstream waves
187	2013	8	11	14	49	21	1.56	28.5	0.94	1.79	N	SIR	R, plasma signatures, upstream and downstream waves
188	2013	8	22	2	9	49	1.16	50.0	0.16	1.12	N	ICME	F, plasma signatures, upstream and downstream waves
189	2013	9	3	15	50	33	1.86	32.1	5.41	3.05	N	ICME	F, clear plasma signatures, B dip and current sheet downstream
190	2013	9	7	22	2	22	1.62	47.5	0.88	1.6	N	ICME-like structure	F, plasma signatures, upstream and downstream waves, BDE upstream
191	2013	9	9	14	32	11.2	1.93	70.9	0.58	1.79	N	ICME	F, clear plasma signatures, upstream and downstream waves
192	2013	10	8	4	54	47	2.35	60.7	4.52	2.4	N	ICME	F, clear plasma signatures, upstream and downstream waves
193	2013	10	12	17	9	28	1.13	47.9	1.26	1.12	N	in slow wind	F, small increases of V_p and N_p , waves at ramp and long-lasting upstream

194	2013	10	15	15	52	45	1.15	45.6	0.54	1.13	N	in slow wind	F, small increases of Vp, Np, and Tp, gradual increase of B, upstream and downstream waves
195	2013	10	21	18	23	10	1.13	64.9	4.33	1.1	N	ICME	F, clear plasma signatures, gradual increase of B, magnetic humps at the ramp, questionable shock
196	2013	10	29	13	27	41.5	1.48	75.6	2.24	1.36	N	in slow wind	F, plasma signatures, upstream and downstream waves
197	2013	11	5	2	43	25.2	2.15	81.5	0.55	2	N	ICME	F, prominent plasma signatures, downstream waves
198	2013	11	6	2	0	26.5	2.02	64.3	1.01	1.92	N	ICME	F, plasma signatures, downstream waves, coincides with a current sheet
199	2013	11	8	13	28	35	1.41	37.3	DG	1.46	N	ICME	F, plasma DG, upstream and downstream waves, a B dip and current sheet downstream
200	2013	12	8	18	22	41	1.19	33.2	1.58	1.24	N	ICME	F, prominent plasma signatures, upstream and downstream waves
201	2013	12	14	14	24	14	1.31	55.8	0.90	1.26	N	15 hrs before SIR	F, small increases of Vp and Np, upstream and downstream waves

202	2013	12	15	1	8	9	1.51	64.6	0.58	1.42	N	SIR	F, clear plasma signatures, upstream and downstream waves
203	2013	12	17	13	29	41	1.57	36.8	3.41	1.84	N	ICME	F, prominent plasma signatures, upstream waves, a B dip and current sheet downstream
204	2013	12	22	0	9	44.6	1.92	41.9	1.12	2.12	N	SIR	F, clear plasma signatures, upstream waves, coincides with a current sheet
205	2013	12	28	17	6	36	2.38	63.1	22.68	2.38	N	ICME	F, prominent plasma signatures, many fluctuations downstream
206	2013	12	30	21	58	1	1.63	68.7	2.20	1.5	N	fast wind overtakes ICME	F, plasma signatures, upstream waves lasted 4 min, downstream waves, a current sheet 10-min downstream
207	2014	1	24	7	13	45	2.04	56.0	2.10	2.08	N	SIR including an ICME	F, prominent plasma signatures, fluctuations at the foot
208	2014	1	24	14	14	54	1.22	72.1	4.60	1.16	N	ICME	F, plasma signatures, magnetic humps upstream and downstream
209	2014	1	26	11	42	19	1.52	75.4	0.82	1.4	N	SIR including an ICME	R, weak plasma signatures, downstream waves

210	2014	1	29	5	19	50	1.29	38.5	0.50	1.26	N	ICME	F, plasma signatures, upstream waves of two frequencies, large-amplitude downstream waves
211	2014	2	6	12	3	3.5	1.69	87.0	0.36	1.54	N	ICME	F, prominent plasma signatures, downstream waves
212	2014	2	8	10	39	24	1.47	59.9	0.38	1.38	N	faster wind overtaking ICME	F, plasma signatures, upstream waves of two frequencies, large-amplitude downstream waves
213	2014	2	12	12	15	52	2.02	31.2	DG	DG	N	SIR	F, plasma signatures, Np and Tp DG for 2 min, waves at foot and upstream
214	2014	2	13	12	47	46	1.34	50.1	0.13	1.26	N	within SIR	F, plasma signatures, upstream coherent waves
215	2014	2	21	7	17	0	DG	DG	DG	DG	N	ICME	F? plasma signatures, e flux increases, no B data
216	2014	2	22	8	10	0	DG	DG	DG	DG	N	fast wind overtaking ICME	F? plasma signatures, e flux increases, no B data
217	2014	2	28	4	23	15.5	2.12	74.2	1.13	1.98	N	ICME	F, plasma signatures, waves at foot and downstream, overshoot

218	2014	3	8	4	41	57.3	3.03	75.5	1.50	3.45	N	ICME	F, plasma signatures, large-amplitude downstream waves
219	2014	3	14	23	10	18	3.40	66.7	4.69	6.95	N	ICME	F, prominent plasma signatures, 12-s ramp
220	2014	3	30	6	20	38	1.48	84.5	5.54	1.34	N	within SIR	F, weak plasma signatures, upstream and downstream waves
221	2014	4	1	4	53	36.5	2.16	40.1	2.60	3	N	ICME	F, prominent plasma signatures, large-amplitude waves at foot and upstream, waves of lower frequency futher upstream
222	2014	4	12	2	27	41	2.42	53.8	0.40	2.6	N	ICME	F, prominent plasma signatures and increase of suprathermal e flux, upstream and downstream fluctuations, B decreases soon after
223	2014	5	8	1	37	30	1.35	36.7	2.62	1.48	N	ICME	F, weak plasma signatures, B increases gradually for 1 min
224	2014	5	13	13	45	19	1.86	43.1	1.91	2.04	N	SIR	F, plasma signatures, upstream and downstream waves
225	2014	6	5	10	52	4	1.38	80.5	1.10	1.28	N	SIR	F, plasma signatures, upstream waves

226	2014	6	9	1	18	41	1.70	87.7	5.95	1.5	N	ICME	F, weak plasma signatures, downstream waves
227	2014	6	10	17	10	2.5	1.39	67.5	0.24	1.3	N	fast wind overtaking ICME	F, weak plasma signatures, upstream waves
228	2014	6	13	18	59	51.5	1.59	65.1	0.83	1.48	N	slow wind	F, plasma signatures, upstream and downstream waves
229	2014	6	16	18	52	47	1.64	67.4	0.58	1.52	N	within SIR	F, plasma signatures, near a current sheet, downstream waves
230	2014	6	27	18	27	24	1.71	67.7	1.18	1.59	N	ICME	F, plasma signatures, upstream and downstream waves
231	2014	7	1	12	51	28.5	1.79	79.8	1.36	1.62	N	ICME	F, weak plasma signatures, large-amplitude waves at foot and downstream
232	2014	7	2	0	34	45	1.59	42.8	DG	DG	N	within ICME+SIR	R, plasma signatures, Np and Tp DG upstream, upstream and downstream waves
233	2014	7	2	18	48	23	1.54	51.3	0.09	1.42	N	fast wind overtaking ICME+SIR	F, prominent plasma signatures, waves at the ramp
234	2014	7	4	15	31	7	1.36	61.6	2.06	1.29	N	in the trailing part of fast wind, more than 1.5 days after ICME+SIR	F, plasma signatures

235	2014	7	29	19	40	54.5	1.29	75.0	0.58	1.21	N	12 hr ahead of SIR	F, weak plasma signatures, downstream waves
236	2014	8	6	12	35	42	1.21	46.3	2.23	1.22	N	SIR	F, plasma signatures, downstream waves, gradual change of B
237	2014	8	8	21	9	10	1.26	44.9	1.76	1.27	N	SIR	F, weak plasma signatures, gradual increase of B over 30s
238	2014	8	16	6	7	21	1.25	79.0	2.95	1.18	N	in slow wind	F, weak plasma signatures, downstream waves
239	2014	8	16	17	53	28	1.13	54.6	1.46	1.11	N	in slow wind	F, weak plasma signatures
240	2014	8	24	11	10	1	1.47	60.5	0.99	1.4	N	SIR	F, weak plasma signatures, large-amplitude waves upstream
241	2014	8	31	17	45	4	1.73	28.7	5.69	2.95	N	ICME	F, plasma signatures, upstream and downstream fluctuations
242	2014	9	3	7	45	19	2.09	44.2	DG	DG	N	ICME	F, Np DG, fluctuations at foot and downstream
243	2014	9	4	6	7	25	1.07	47.9	DG	DG	N	within ICME	F, weak plasma signatures, upstream and downstream waves

244	2014	9	25	5	34	15	1.81	66.0	2.15	1.68	N	ICME	F, plasma signatures, waves at foot and downstream
245	2014	9	25	14	9	54.2	2.49	81.3	11.16	2.28	N	ICME	F, prominent plasma signatures, many magnetic holes downstream
246	2014	9	25	17	6	7	1.60	55.3	4.06	1.56	N	ICME	F, Vp and Np increase, B sharp increase
247	2014	9	26	16	32	46.4	1.32	43.5	DG	DG	N	at the trailing edge of ICME	F? plasma DG, upstream and downstream waves

¹ $B_{\text{down}}/B_{\text{up}}$: ratio of downstream magnetic field intensity to upstream magnetic field intensity

² θ_{Bn} : shock normal angle

³ β : the ratio of plasma thermal pressure to magnetic pressure upstream of the shock, assumed as 1 for further shock analysis when there is data gap (DG)

⁴ Mach Num: magnetosonic Mach number

⁵ Y or N indicates the availability of 32 s^{-1} MAG data for this shock. The last day of such 32 s^{-1} data is 10 January 2013 for STA and 8 January 2013 for STB

Records:

1. 3/13/2010: Revise.

2. 7/20/2010: Based on the updated plasma data, change the comment for the 5/7/2007 shock of STB.

3. 2/2/2011: Based on the updated plasma data, change the comment for the 9/13/2007 shock of STA.

4. 3/15/2011: After moving the downstream interval closer to the shock, the shock parameters of 10/26/2009 at STB are changed.
5. 4/8/2011: Extend the investigation period from 10/31/2009 to 5/31/2010 for STA, and to 11/30/2010 for STB.
6. 5/31/2011: Extend the investigation period to the end of 2010. Some plasma data gap are filled using the reprocessed PLASTIC data. Some events are deleted because they miss the plasma signatures of shocks. If two of the three plasma parameters (V_p , N_p , and T_p) show strong shock signature, we do not require the third parameter necessarily has the signature, but we require it does not vary in the opposite way.
7. 10/27/2011: Extend the investigation to the end of PLASTIC data available at the time: 4/30/2011 for STA, 6/30/2011 for STB.
8. 3/19/2012: Add 10/2/2009 shock at STB. Extend the shock list of STB to 9/30/2011.
9. 4/4/2012: Add two missed shocks for STA (1/25 and 3/31), and extend the shock list of STA to 7/31/2011.
10. 4/13/2012: Extend the shocks of STB to 12/31/2011.
11. 7/30/2012: Extend the shocks of STA to 12/31/2011.
12. 3/7/2013: Add the sources of shocks.
13. 3/18/2013: Change the source of 11/19/2007 shock at STB.
14. 4/11/2013: Extend the shock survey of STA to 8/31/2012.
15. 6/4/2013: Extend the shock survey of STB to 8/31/2012.
16. 10/28/2013: Extend the shock survey of STB to 12/31/2012.
17. 11/4/2013: Extend the shock survey of STA to 12/31/2012.
18. 5/28/2014: Extend the shock survey of STA to 6/30/2013, correct the $B_{\text{down}}/B_{\text{up}}$ of STA shocks in Sept-Dec 2012. The error was made because the copy and paste function of Excel carried the formula rather than the value.
19. 9/4/2014: Extend the shock survey of STB to 12/31/2014.
20. 9/17/2014: Add the shock at STA on 7/23/2012.
21. 9/26/2014: Add shocks at STA in July - Dec. of 2013.

22. 11/6/2014: Add shock at STB on March 21, 2011, because the plasma data gap is filled in newer version.
23. 2/11/2015: Change the comment for the shock at STA on 11/5/2013 22:24.
24. 3/4/2015: Add shocks at STA in Jan. - June of 2014.
25. 10/28/2015: Add the note of shock list posted at <http://ipshocks.fi/>.
26. 12/3/2015: Add shocks at STB in Jan. - Sept. of 2014.

27. 5/16/2016: remove the shock at STA on May 8, 2007, because the solar wind speed increase is not at the same time as other parameter changes (overlooked when using 10-min data early in the mission), and there is a current sheet closeby.

28. 11/9/2016: Add shocks at STA in July - Aug. of 2014. The survey will be extended after more Level 2 PLASTIC data become available.

29. 8/17/2017: Update shocks at STA to Dec. 2016, whenever the plasma data are available.

30. 4/9/2019: Update shocks at STA to July 2018.

31. 12/24/2022: Update shocks at STA to Dec 2020, with the assist of Dr. Tarik Salman using Rankine-Hugoniot relations including plasma data, rather than using shock coplanarity theorem.