Table1

ACE SMFR Events and Model Fit Parameters

No.	SIMFR Start	SIMFR End	t_cen	Δt (hr)	Vrad (km/s)	d (1/Rc)	B0 (nT)	Rc (au)	θ (deg)	Φ (deg)	H	χn	CSEs covering > 10%	±3 days of HCSs
1	1998/02/06 22:59:00	1998/02/07 02:40:00	1998/02/07 00:49:27	3.70	335	0.54	8.52	0.02	17.46	117.56	1	-0.33	Y	N
2	1998/03/21 00:18:00	1998/03/21 04:56:00	1998/03/21 02:36:34	4.65	320	0.54	10.46	0.01	35.41	334.16	1	-0.53	Y	N
3	1998/04/24 11:52:00	1998/04/24 14:51:00	1998/04/24 13:21:34	3.00	409	0.69	13.55	0.01	-18.48	27.65	-1	-0.45	N	Y
4	1998/05/01 11:34:00	1998/05/01 15:10:00	1998/05/01 13:21:33	3.62	430	0.65	11.21	0.01	-10.19	201.46	1	-0.47	Y	N
5	1998/05/07 09:38:00	1998/05/07 12:37:00	1998/05/07 11:07:24	3.00	467	0.64	9.75	0.02	39.95	339.38	1	-0.39	Y	N
6	1998/07/11 01:53:00	1998/07/11 07:34:00	1998/07/11 04:43:33	5.70	359	0.57	17.17	0.02	38.59	202.77	1	-0.44	N	Y
7	1998/07/31 10:02:00	1998/07/31 14:32:00	1998/07/31 12:16:35	4.52	438	0.68	21.48	0.02	24.97	155.75	-1	-0.38	Y	N
8	1998/08/06 17:51:00	1998/08/06 22:46:00	1998/08/06 20:18:26	4.93	378	0.37	13.17	0.02	-17.03	45.06	1	-0.60	Y	N
9	1998/09/01 13:52:00	1998/09/01 20:02:00	1998/09/01 16:56:31	6.18	430	0.53	6.39	0.02	-5.05	203.24	1	-0.57	N	Y
10	1998/09/08 23:08:00	1998/09/09 02:47:00	1998/09/09 00:57:34	3.67	346	0.66	10.37	0.02	-21.33	228.85	1	-0.45	Y	N
11	1998/09/22 11:14:00	1998/09/22 14:32:00	1998/09/22 12:52:28	3.32	398	0.69	6.97	0.02	-45.06	198.57	-1	-0.52	Y	N
12	1998/10/25 14:33:00	1998/10/25 23:16:00	1998/10/25 18:54:32	8.73	408	0.61	7.35	0.03	-19.74	207.86	1	-0.35	Y	N
13	1998/10/26 05:26:00	1998/10/26 11:15:00	1998/10/26 08:20:24	5.83	402	0.68	7.55	0.03	-12.31	225.54	1	-0.55	N	Y
14	1998/12/29 16:45:00	1998/12/29 23:12:00	1998/12/29 19:58:24	6.47	410	0.04	9.58	0.03	-45.07	276.00	1	-0.58	Y	N
15	1999/01/12 14:34:00	1999/01/12 18:20:00	1999/01/12 16:27:26	3.78	364	0.46	6.16	0.01	10.95	339.24	-1	-0.45	N	Y
16	1999/01/14 05:04:00	1999/01/14 08:42:00	1999/01/14 06:52:30	3.65	425	0.53	20.54	0.02	-9.45	62.39	1	-0.36	N	Y
17	1999/04/04 09:04:00	1999/04/04 12:22:00	1999/04/04 10:42:28	3.32	397	0.68	7.57	0.02	-17.19	288.71	-1	-0.55	Y	N
18	1999/05/13 01:46:00	1999/05/13 05:59:00	1999/05/13 03:52:31	4.23	391	0.61	14.32	0.01	-17.08	335.47	1	-0.59	Y	N
19	1999/05/30 09:43:00	1999/05/30 13:22:00	1999/05/30 11:32:29	3.67	378	0.32	6.78	0.01	-24.76	54.88	1	-0.41	Y	N
20	1999/06/02 15:02:00	1999/06/02 20:59:00	1999/06/02 18:00:29	5.97	386	0.51	13.20	0.03	23.38	125.09	1	-0.24	N	Y
21	1999/06/03 19:13:00	1999/06/04 01:26:00	1999/06/03 22:19:24	6.23	404	0.01	7.79	0.03	24.85	70.83	1	-0.60	N	Y
22	1999/06/12 07:39:00	1999/06/12 13:35:00	1999/06/12 10:37:31	5.95	387	0.68	7.55	0.02	3.90	25.13	1	-0.30	Y	N
23	1999/10/21 20:05:00	1999/10/22 01:58:00	1999/10/21 23:01:31	5.90	468	0.52	24.93	0.00	2.28	6.83	1	-0.59	Y	N
24	1999/11/14 01:21:00	1999/11/14 10:18:00	1999/11/14 05:49:28	8.97	440	0.69	9.06	0.06	8.02	115.71	1	-0.51	N	Y
25	2000/03/01 22:19:00	2000/03/02 05:36:00	2000/03/02 01:57:33	7.30	438	0.01	6.70	0.03	-47.61	4.76	-1	-0.45	Y	N
26	2000/04/21 17:03:00	2000/04/21 20:03:00	2000/04/21 18:33:26	3.02	498	0.68	8.67	0.01	-15.18	206.58	-1	-0.50	Y	N
27	2000/05/18 14:53:00	2000/05/18 19:27:00	2000/05/18 17:10:27	4.58	483	0.64	10.96	0.01	-19.93	191.44	-1	-0.33	Y	N
28	2000/07/26 03:18:00	2000/07/26 07:56:00	2000/07/26 05:37:31	4.65	379	0.62	15.10	0.01	-25.73	343.91	-1	-0.35	Y	N
29	2000/07/26 21:58:00	2000/07/27 05:23:00	2000/07/27 01:40:27	7.43	374	0.44	7.03	0.02	1.34	319.28	1	-0.50	Y	N
30	2000/08/09 11:56:00	2000/08/09 17:43:00	2000/08/09 14:49:29	5.80	374	0.63	8.49	0.00	1.63	179.00	1	-0.39	Y	N
31	2000/09/10 06:34:00	2000/09/10 09:57:00	2000/09/10 08:15:32	3.40	378	0.22	5.49	0.01	-1.07	301.28	-1	-0.48	N	Y
32	2000/10/02 12:54:00	2000/10/02 20:04:00	2000/10/02 16:28:33	7.18	380	0.37	7.58	0.03	-31.38	73.59	-1	-0.57	N	Y
33	2000/11/04 01:36:00	2000/11/04 05:56:00	2000/11/04 03:45:34	4.33	405	0.05	18.57	0.02	-64.20	189.54	-1	-0.44	N	Y
34	2001/01/16 19:40:00	2001/01/17 01:00:00	2001/01/16 22:19:32	5.35	338	0.26	5.92	0.02	-58.80	116.77	1	-0.55	Y	N
35	2001/01/29 01:01:00	2001/01/29 04:00:00	2001/01/29 02:30:28	3.00	371	0.38	16.88	0.01	-8.01	66.03	-1	-0.32	N	Y
36	2001/02/01 03:18:00	2001/02/01 08:28:00	2001/02/01 05:52:34	5.18	406	0.00	6.19	0.03	-27.30	271.18	1	-0.58	N	Y
37	2001/03/13 09:44:00	2001/03/13 15:04:00	2001/03/13 12:24:29	5.35	372	0.68	10.75	0.02	20.23	321.86	1	-0.52	N	Y
38	2001/03/22 22:15:00	2001/03/23 04:15:00	2001/03/23 01:15:24	6.02	393	0.67	10.54	0.01	13.53	164.79	1	-0.47	Y	N
39	2001/03/28 04:49:00	2001/03/28 08:14:00	2001/03/28 06:31:31	3.43	624	0.07	14.19	0.02	17.52	144.85	1	-0.40	Y	N
40	2001/04/05 16:54:00	2001/04/05 21:01:00	2001/04/05 18:57:30	4.12	566	0.09	7.05	0.03	29.39	76.37	1	-0.37	Y	N
41	2001/04/23 03:56:00	2001/04/23 10:45:00	2001/04/23 07:20:31	6.83	331	0.01	8.32	0.03	-78.12	73.01	-1	-0.54	N	Y
42	2001/06/01 06:51:00	2001/06/01 09:57:00	2001/06/01 08:23:31	3.12	331	0.66	9.83	0.02	-18.31	70.48	1	-0.53	N	Y
43	2001/06/15 02:57:00	2001/06/15 08:49:00	2001/06/15 05:52:33	5.88	358	0.21	7.23	0.02	-22.33	112.80	1	-0.41	N	Y
44	2001/09/11 13:26:00	2001/09/11 19:21:00	2001/09/11 16:23:35	5.93	356	0.11	10.44	0.03	-80.41	191.23	-1	-0.56	N	Y
45	2001/09/30 09:54:00	2001/09/30 16:43:00	2001/09/30 13:18:28	6.83	482	0.68	12.29	0.05	-52.47	318.07	-1	-0.32	Y	N
46	2001/11/02 12:27:00	2001/11/02 18:26:00	2001/11/02 15:26:24	6.00	338	0.63	7.75	0.03	57.53	130.84	-1	-0.57	Y	N
47	2001/11/20 04:56:00	2001/11/20 10:59:00	2001/11/20 07:57:32	6.07	455	0.40	6.99	0.03	39.48	65.99	-1	-0.52	Y	N
48	2001/12/17 15:30:00	2001/12/17 18:45:00	2001/12/17 17:07:30	3.27	454	0.48	12.31	0.01	9.05	165.39	-1	-0.45	Y	N
49	2001/12/29 19:59:00	2001/12/29 23:02:00	2001/12/29 21:30:33	3.07	366	0.48	13.75	0.02	11.55	269.83	-1	-0.48	Y	N
50	2002/02/28 17:09:00	2002/02/28 23:02:00	2002/02/28 20:05:28	5.90	393	0.63	13.46	0.03	-65.27	335.01	1	-0.59	Y	N
51	2002/03/02 10:24:00	2002/03/02 13:30:00	2002/03/02 11:56:32	3.12	390	0.70	14.29	0.01	34.38	153.54	-1	-0.44	N	Y
52	2002/04/07 01:53:00	2002/04/07 05:07:00	2002/04/07 03:29:31	3.25	373	0.69	11.22	0.01	27.00	10.85	-1	-0.38	Y	N
53	2002/06/09 18:18:00	2002/06/09 21:17:00	2002/06/09 19:47:31	3.00	460	0.36	8.18	0.01	6.20	311.34	1	-0.54	Y	N
54	2002/07/26 10:23:00	2002/07/26 13:48:00	2002/07/26 12:05:33	3.43	426	0.68	11.04	0.02	70.80	12.15	1	-0.32	Y	N
55	2002/08/13 08:38:00	2002/08/13 11:44:00	2002/08/13 10:10:34	3.12	456	0.30	6.88	0.00	-0.66	179.32	-1	-0.54	Y	N
56	2002/09/11 01:06:00	2002/09/11 04:24:00	2002/09/11 02:45:24	3.32	425	0.70	8.37	0.02	42.03	328.32	1	-0.59	Y	N
57	2002/10/02 23:59:00	2002/10/03 04:02:00	2002/10/03 02:00:33	4.07	488	0.38	12.10	0.03	47.58	90.27	-1	-0.41	Y	N
58	2002/11/20 22:52:00	2002/11/21 04:15:00	2002/11/21 01:33:31	5.40	480	0.10	29.78	0.03	60.22	71.53	1	-0.37	N	Y
59	2002/12/22 19:10:00	2002/12/23 00:06:00	2002/12/22 21:38:31	4.95	484	0.40	15.37	0.02	-30.31	187.98	-1	-0.51	Y	N
60	2003/01/26 22:09:00	2003/01/27 03:55:00	2003/01/27 01:02:26	5.78	575	0.33	10.11	0.03	50.41	15.49	-1	-0.59	Y	N
61	2003/03/25 23:14:00	2003/03/26 02:36:00	2003/03/26 00:54:34	3.38	382	0.68	7.75	0.00	0.42	181.78	-1	-0.42	N	Y

62	2003/03/26 08:00:00	2003/03/26 12:52:00	2003/03/26 10:25:30	4.88	372	0.57	5.92	0.00	4.10	363.03	1	-0.55	N	Y
63	2003/04/07 14:20:00	2003/04/07 19:37:00	2003/04/07 16:58:32	5.30	370	0.69	6.41	0.02	3.58	49.07	-1	-0.60	N	Y
64	2003/05/10 04:46:00	2003/05/10 09:58:00	2003/05/10 07:22:28	5.22	635	0.43	6.72	0.04	-58.00	69.52	-1	-0.54	Y	N
65	2003/06/21 07:57:00	2003/06/21 12:28:00	2003/06/21 10:12:30	4.53	530	0.69	10.16	0.04	48.22	88.84	-1	-0.29	Y	N
66	2003/10/22 14:42:00	2003/10/22 21:07:00	2003/10/22 17:54:29	6.43	553	0.64	16.20	0.04	36.16	150.94	-1	-0.29	Y	N
67	2003/12/31 05:09:00	2003/12/31 09:37:00	2003/12/31 07:22:28	4.48	423	0.62	8.85	0.03	-31.04	282.82	-1	-0.44	N	Y
68	2004/01/10 06:39:00	2004/01/10 12:33:00	2004/01/10 09:35:30	5.92	553	0.05	14.20	0.03	61.22	165.36	-1	-0.52	Y	N
69	2004/01/13 18:59:00	2004/01/14 01:13:00	2004/01/13 22:06:26	6.25	568	0.64	6.97	0.05	32.91	245.41	-1	-0.54	N	Y
70	2004/04/26 22:04:00	2004/04/27 07:44:00	2004/04/27 02:54:28	9.68	459	0.62	8.75	0.05	36.27	41.40	-1	-0.42	Y	N
71	2004/06/10 07:09:00	2004/06/10 10:27:00	2004/06/10 08:48:30	3.32	473	0.68	9.33	0.02	52.45	176.79	-1	-0.47	N	Y
72	2004/10/04 06:33:00	2004/10/04 11:40:00	2004/10/04 09:06:29	5.13	373	0.69	9.26	0.03	59.79	62.61	1	-0.56	N	Y
73	2004/10/29 18:48:00	2004/10/29 23:26:00	2004/10/29 21:06:34	4.65	369	0.51	10.61	0.01	-16.30	202.71	-1	-0.57	N	Y
74	2004/10/30 04:27:00	2004/10/30 08:09:00	2004/10/30 06:17:30	3.72	406	0.61	8.53	0.00	4.86	186.25	-1	-0.60	N	Y
75	2004/11/20 09:50:00	2004/11/20 15:38:00	2004/11/20 12:43:35	5.82	445	0.27	9.48	0.03	-7.81	304.11	1	-0.60	Y	N
76	2005/02/19 23:41:00	2005/02/20 03:39:00	2005/02/20 01:40:26	3.98	508	0.23	10.07	0.02	78.50	193.63	-1	-0.35	Y	N
77	2005/03/29 08:14:00	2005/03/29 14:37:00	2005/03/29 11:25:25	6.40	486	0.37	7.96	0.03	44.79	25.21	1	-0.40	Y	N
78	2005/04/04 01:10:00	2005/04/04 05:48:00	2005/04/04 03:29:24	4.65	357	0.25	10.55	0.01	45.02	180.77	1	-0.51	N	Y
79	2005/05/30 14:36:00	2005/05/30 18:55:00	2005/05/30 16:45:32	4.33	448	0.68	22.18	0.02	-43.86	353.84	-1	-0.38	Y	N
80	2005/06/23 04:22:00	2005/06/23 13:40:00	2005/06/23 08:33:29	9.30	393	0.06	19.17	0.04	-56.53	283.78	1	-0.50	N	Y
81	2005/07/17 09:08:00	2005/07/17 12:53:00	2005/07/17 11:00:29	3.77	447	0.41	9.02	0.02	57.94	165.34	-1	-0.54	Y	N
82	2005/08/29 13:23:00	2005/08/29 19:18:00	2005/08/29 16:20:31	5.93	383	0.67	7.60	0.00	-1.78	4.63	-1	-0.42	N	Y
83	2006/03/26 04:33:00	2006/03/26 07:45:00	2006/03/26 06:08:33	3.22	349	0.58	7.17	0.02	75.06	190.40	1	-0.40	N	Y
84	2006/05/31 06:56:00	2006/05/31 12:52:00	2006/05/31 09:53:28	5.93	374	0.05	5.98	0.02	36.96	172.04	-1	-0.36	N	Y
85	2006/07/31 03:25:00	2006/07/31 09:50:00	2006/07/31 06:03:27	6.42	411	0.62	14.45	0.04	-23.41	255.32	1	-0.57	N	Y
86	2006/09/11 22:37:00	2006/09/12 03:55:00	2006/09/12 01:16:25	5.32	356	0.66	9.49	0.03	67.48	331.17	-1	-0.41	N	Y
87	2006/09/17 11:00:00	2006/09/17 14:13:00	2006/09/17 12:36:24	3.23	405	0.14	7.51	0.02	42.78	70.34	-1	-0.58	N	Y
88	2006/09/30 09:39:00	2006/09/30 15:25:00	2006/09/30 12:31:34	5.78	395	0.64	24.29	0.01	6.67	351.48	-1	-0.41	N	Y
89	2006/11/05 09:37:00	2006/11/05 13:04:00	2006/11/05 11:20:33	3.47	393	0.04	5.31	0.01	-34.57	355.39	1	-0.59	N	Y
90	2006/11/16 21:52:00	2006/11/17 03:48:00	2006/11/17 00:49:35	5.95	391	0.69	7.94	0.01	-16.38	350.16	-1	-0.37	N	Y
91	2006/11/17 09:21:00	2006/11/17 15:32:00	2006/11/17 12:26:31	6.20	361	0.68	6.96	0.01	-6.95	355.56	1	-0.59	N	Y
92	2007/01/01 09:27:00	2007/01/01 13:40:00	2007/01/01 11:02:33	4.22	372	0.58	11.88	0.02	-17.36	233.71	1	-0.50	N	Y
93	2007/06/08 11:15:00	2007/06/08 16:04:00	2007/06/08 13:39:30	4.83	366	0.35	7.94	0.02	-14.02	245.24	-1	-0.41	N	Y
94	2007/07/10 17:15:00	2007/07/10 23:40:00	2007/07/10 20:02:34	6.42	350	0.60	15.74	0.01	-0.44	345.45	-1	-0.37	N	Y
95	2007/07/20 23:06:00	2007/07/21 02:39:00	2007/07/21 00:52:24	3.57	476	0.27	6.79	0.02	2.65	271.89	-1	-0.56	N	Y
96	2007/07/21 14:34:00	2007/07/21 18:39:00	2007/07/21 16:36:24	4.10	468	0.56	6.02	0.01	-2.03	15.40	1	-0.54	N	Y
97	2007/09/14 18:35:00	2007/09/14 23:40:00	2007/09/14 20:33:28	5.08	331	0.03	10.68	0.01	30.99	348.21	-1	-0.38	N	Y
98	2008/07/05 08:16:00	2008/07/05 17:40:00	2008/07/05 12:32:28	9.40	375	0.67	9.49	0.01	5.44	8.70	-1	-0.51	N	Y
99	2009/02/21 03:31:00	2009/02/21 06:54:00	2009/02/21 05:12:33	3.40	352	0.43	5.92	0.02	57.22	73.56	1	-0.51	N	Y
100	2009/02/23 09:59:00	2009/02/23 15:57:00	2009/02/23 12:58:25	5.98	435	0.69	8.27	0.04	-40.78	278.04	-1	-0.36	N	Y
101	2009/03/12 16:29:00	2009/03/12 23:26:00	2009/03/12 19:57:34	6.97	382	0.62	21.85	0.02	-6.49	144.79	1	-0.32	N	Y
102	2009/06/27 21:27:00	2009/06/28 07:40:00	2009/06/28 02:33:33	10.23	393	0.37	8.77	0.05	67.27	340.93	1	-0.36	Y	N
103	2009/08/05 04:36:00	2009/08/05 10:01:00	2009/08/05 07:18:32	5.43	373	0.15	5.38	0.02	-63.28	131.98	1	-0.52	Y	N
104	2009/10/22 22:40:00	2009/10/23 02:29:00	2009/10/23 00:34:35	3.83	381	0.65	12.33	0.01	-4.25	156.98	-1	-0.33	N	Y
105	2010/01/30 01:23:00	2010/01/30 07:15:00	2010/01/30 04:19:24	5.88	346	0.54	10.22	0.03	9.59	86.16	-1	-0.41	N	Y
106	2010/02/12 02:25:00	2010/02/12 05:44:00	2010/02/12 04:04:27	3.33	352	0.67	9.85	0.00	1.23	361.67	-1	-0.32	Y	N
107	2010/02/18 03:42:00	2010/02/18 08:31:00	2010/02/18 06:06:34	4.83	397	0.68	9.40	0.02	36.18	169.39	-1	-0.49	N	Y
108	2010/03/02 11:14:00	2010/03/02 14:40:00	2010/03/02 12:57:28	3.45	380	0.43	7.02	0.01	-40.21	21.17	-1	-0.41	N	Y
109	2011/01/24 08:45:00	2011/01/24 14:44:00	2011/01/24 11:44:29	6.00	387	0.61	8.64	0.03	60.04	92.92	1	-0.33	N	Y

Parameters of the SIMFRs Involved in the Study

Parameter	Explanation
Δt	Duration of the SIMFR interval.
V_{rad}	averaged radial velocity.
d	Impact parameter, in units of R.
t_c	The time when the spacecraft arrives at the closest approach.
B_0	Magnetic field strength at the axis of the MFR.
Rc	The radius of the MC, in units of au.
θ	Elevation angle of the axis of the MFR in GSE coordinates.
Φ	Azimuthal angle of the axis of the MFR in GSE coordinates.
H	Handedness or sign of helicity, set to 1 (right) or -1 (left).
χ_n	Normalized rms of the difference between the modeled results and observed data.