

Energy Conversion within Current Sheets in the Earth's Quasi-parallel Magnetosheath: Supporting Information

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Contents of this file

1. Figure S1

2. Table S1

Additional Supporting Information (Files uploaded separately)

1. Caption for Dataset S1

Introduction

This Supporting Information contains a figure illustrating the method by which Wind plasma and magnetic field data were lagged to the location of the MMS spacecraft. It also includes a zip archive of plots in the same format as Figure 3 of the main paper for each of the 59 events used in the study. Some details for all the events are provided in Table S1.

Figure S1. Comparison of data from MMS1 after smoothing (thin) with data from the Wind spacecraft lagged by $23^m 10^s$ for the magnetosheath traversal studied in the main paper. This lag was determined through the intermediary step of data from the Themis-C (Artemis) spacecraft (not shown) which was closer upstream of MMS (see Figure 1h of the main paper) but which lacks instrumentation designed for resolving the solar wind. Magnetic field magnitude (a) and GSE components (b), (c) angle θ_{Bn} between the lagged Wind magnetic field and the shock normal based on a model scaled to fit the MMS shock crossing, (d) magnetic field clock angle ($\tan^{-1} B_y/B_z$); at the subsolar point, magnetic coplanarity preserves this angle from upstream to downstream

which enables a comparison between MMS in the magnetosheath and the lagged Wind values. Note the good fit between MMS and Wind across the entire plot range. Solar wind speed [(e),(g)] and GSE velocity components [(f),(h)] for protons/ions and electrons respectively. (i) number density, (j) electron temperatures and (k) ion temperatures. The interplanetary conditions were steady after 06:45 as can be seen in the Wind plasma and field parameters. The dashed vertical magenta lines indicate the interval of Wind data used to deduce the underlying interplanetary conditions and shock parameters.

Table S1 List of all 59 current events studied in the main paper, including start and end times, value of the integrated energy conversion, and category of qualitative nature of the event. Also shown is the figure index number of each event; plots are available in the archive (Data Set S1).

Data Set S1. DS01 is a zip archive containing plots identical in format to that of Figure 3 in the main paper for each of the 59 events used in this study.

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MMS1 & Wind (thick; lagged 23m 10s)

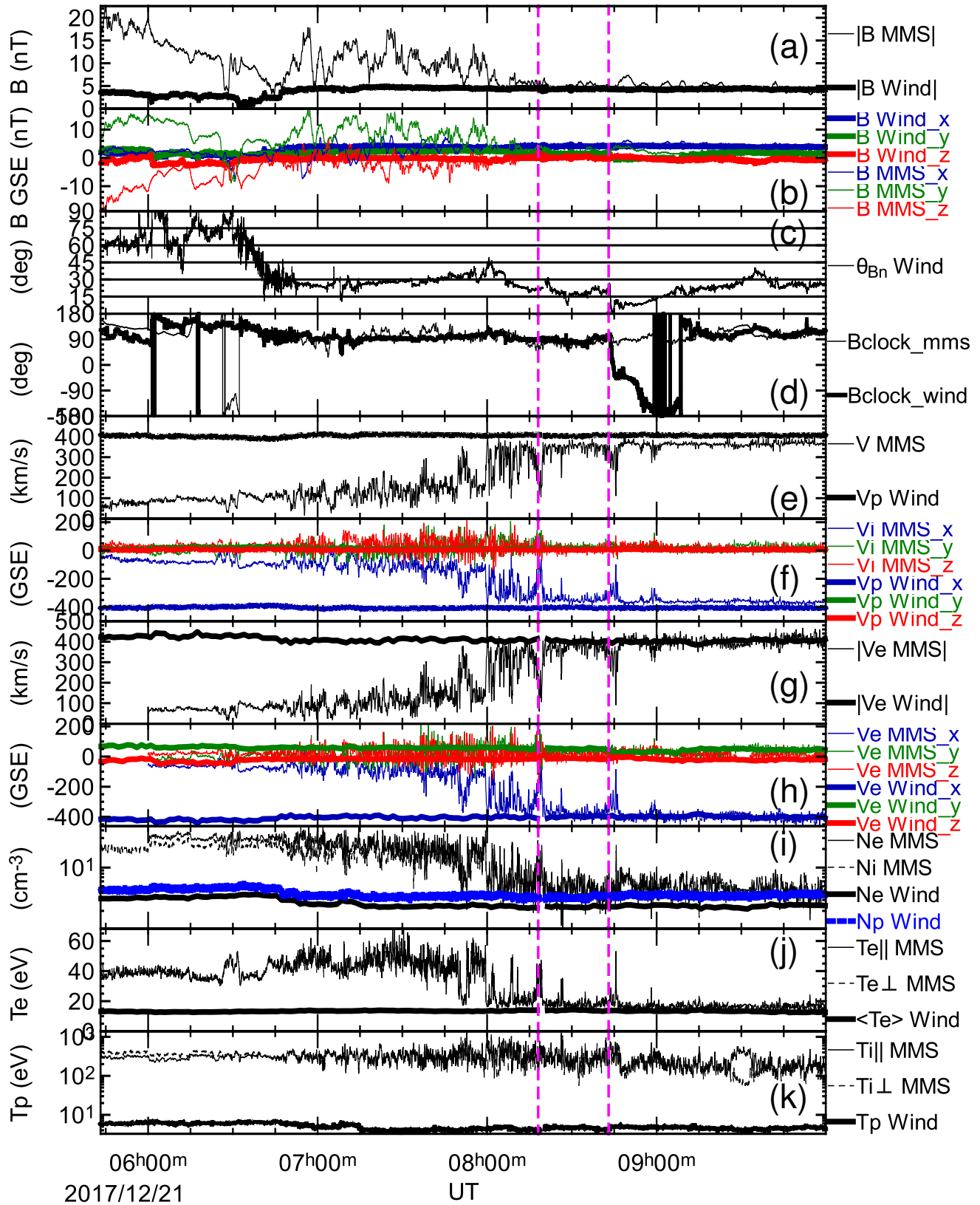


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Table S1. Current Events 2017-12-21 Magnetosheath

Fig no	Start time	End time	$\int \mathbf{j} \cdot \mathbf{E}' dt^1$	Cat ²
1	2017-12-21T06:43:11.102450	2017-12-21T06:43:11.877474	1.9	1
2	2017-12-21T06:43:52.343473	2017-12-21T06:43:55.064668	1.17	2
3	2017-12-21T06:44:56.381627	2017-12-21T06:44:57.983343	1.23	1
5	2017-12-21T06:45:33.199240	2017-12-21T06:45:35.214302	0.1	2
6	2017-12-21T06:46:15.614235	2017-12-21T06:46:16.527040	0.58	1
7	2017-12-21T06:47:59.133220	2017-12-21T06:48:01.664965	2.54	2
8	2017-12-21T06:48:28.317135	2017-12-21T06:48:31.003884	0.9	2
9	2017-12-21T06:52:21.951134	2017-12-21T06:52:24.310651	-0.152	1
10	2017-12-21T06:53:56.435223	2017-12-21T06:53:57.554702	0.44	4
11	2017-12-21T06:54:27.902201	2017-12-21T06:54:30.588950	0.53	4
12	2017-12-21T06:56:22.662678	2017-12-21T06:56:23.954384	-0.52	4
13	2017-12-21T06:58:19.564296	2017-12-21T06:58:20.942117	-0.69	1
14	2017-12-21T07:00:40.167183	2017-12-21T07:01:00.421140	1.1	6
15	2017-12-21T07:01:33.216487	2017-12-21T07:01:34.318743	0.36	4
16	2017-12-21T07:02:04.402691	2017-12-21T07:02:05.229383	1.37	1
17	2017-12-21T07:02:40.081670	2017-12-21T07:02:41.511159	1.94	1
18	2017-12-21T07:02:52.157496	2017-12-21T07:02:53.173638	0.2	4
21	2017-12-21T07:08:46.908785	2017-12-21T07:08:49.776373	0.78	6
22	2017-12-21T07:09:19.872507	2017-12-21T07:09:23.876797	2.02	2
23	2017-12-21T07:09:28.270908	2017-12-21T07:09:29.321496	0.23	4
24	2017-12-21T07:10:36.002549	2017-12-21T07:10:38.585962	1.28	4
25	2017-12-21T07:16:05.172733	2017-12-21T07:16:06.154430	0.41	1
26	2017-12-21T07:16:27.245998	2017-12-21T07:16:28.796046	3.72	1
27	2017-12-21T07:17:43.854349	2017-12-21T07:17:44.629373	0.89	1
28	2017-12-21T07:17:50.581643	2017-12-21T07:17:53.251170	0.61	3
29	2017-12-21T07:18:31.498364	2017-12-21T07:18:33.168971	0.45	1
30	2017-12-21T07:18:58.390998	2017-12-21T07:18:59.665481	-0.98	3
31	2017-12-21T07:20:20.010681	2017-12-21T07:20:23.351895	0.94	3
32	2017-12-21T07:20:34.226997	2017-12-21T07:20:46.317370	3.63	4
33	2017-12-21T07:22:37.121167	2017-12-21T07:22:39.377348	1.22	1
34	2017-12-21T07:22:57.601541	2017-12-21T07:23:02.329187	-0.49	2
35	2017-12-21T07:24:55.848104	2017-12-21T07:24:57.914835	3.37	1
36	2017-12-21T07:25:24.766692	2017-12-21T07:25:26.747308	3.17	1
37	2017-12-21T07:26:12.637723	2017-12-21T07:26:16.254501	-2.8	4
38	2017-12-21T07:29:31.054944	2017-12-21T07:29:33.621134	1.87	4
39	2017-12-21T07:30:16.032762	2017-12-21T07:30:19.391199	-1.21	4
40	2017-12-21T07:33:13.268205	2017-12-21T07:33:15.455494	1.21	1
41	2017-12-21T07:33:49.904569	2017-12-21T07:33:50.834597	0.62	4
42	2017-12-21T07:34:21.453782	2017-12-21T07:34:23.933858	4.3	1
43	2017-12-21T07:34:45.285519	2017-12-21T07:34:46.508334	0.17	1
44	2017-12-21T07:35:30.679710	2017-12-21T07:35:34.451492	0.61	4
45	2017-12-21T07:36:00.294907	2017-12-21T07:36:02.912766	1.54	4
46	2017-12-21T07:38:22.491826	2017-12-21T07:38:27.038633	1.32	1
47	2017-12-21T07:40:05.802071	2017-12-21T07:40:08.514655	1.88	1
48	2017-12-21T07:41:22.537474	2017-12-21T07:41:24.018631	1.38	1
49	2017-12-21T07:42:51.235817	2017-12-21T07:42:55.059268	1.63	1
50	2017-12-21T07:43:28.342479	2017-12-21T07:43:29.892527	-0.66	1
51	2017-12-21T07:45:20.044627	2017-12-21T07:45:22.128580	0.6	1
52	2017-12-21T07:46:14.301983	2017-12-21T07:46:18.917680	-0.38	1
53	2017-12-21T07:47:00.418123	2017-12-21T07:47:03.931565	-2.08	6
54	2017-12-21T07:47:16.625850	2017-12-21T07:47:17.745329	-0.74	1
55	2017-12-21T07:47:58.054875	2017-12-21T07:47:59.639369	1.5	1
56	2017-12-21T07:50:56.576075	2017-12-21T07:50:59.331715	-1.19	5
57	2017-12-21T07:51:10.838279	2017-12-21T07:51:11.682194	0.52	5
58	2017-12-21T07:53:20.482260	2017-12-21T07:53:22.945113	-4.62	5
59	2017-12-21T07:53:45.277912	2017-12-21T07:53:47.361865	-0.47	1
60	2017-12-21T07:54:37.853686	2017-12-21T07:54:48.704020	3.71	6
61	2017-12-21T07:59:30.267560	2017-12-21T07:59:33.806836	-7.52	6
62	2017-12-21T08:10:49.259706	2017-12-21T08:10:51.429773	4.64	6

¹ in $10^{-10}Ws/m^3$ ² 1 Recon; 2 Rope; 3 RD; 4 TD; 5 Wave; 6 other