

**Table S1.** Bright spot characteristics

PJ	Date	Time	Peak's position		Power (GW)	Surface area ( $\times 10^6$ km <sup>2</sup> )	Magnetic flux ( $\times 10^9$ Wb)	Ionospheric local time	Vogt's mapping result	
			Latitude	Longitude					Position ( $R_J$ )	Local time (h)
PJ1	8/27/2016	10:00:01	67.3489	175.632	103.133	9.156	5580.420	7.116	143.393	2.84056
PJ1	8/27/2016	10:15:53	67.8432	175.539	68.922	10.477	6429.260	7.873	141.845	3.42373
PJ1	8/27/2016	10:19:28	66.8182	174.753	56.162	7.997	4823.740	7.972	141.502	3.70408
PJ3	12/11/2016	14:56:59	65.6758	164.029	39.371	4.102	2881.550	3.840	149.348	1.21778
PJ3	12/11/2016	15:01:32	66.9921	161.503	88.089	9.643	6839.500	4.589	146.267	2.29083
PJ3	12/11/2016	15:13:10	66.1218	160.968	78.691	8.134	5817.300	4.943	149.452	2.42041
PJ3	12/11/2016	15:21:15	65.458	162.437	23.956	2.967	2113.490	4.976	148.021	2.27462
PJ3	12/11/2016	15:42:27	64.2582	158.95	81.811	7.685	5722.400	6.038	143.476	3.34408
PJ3	12/11/2016	16:12:17	63.8974	158.489	14.468	1.364	1055.040	7.239	135.893	4.46139
PJ3	12/11/2016	14:45:21	64.0401	189.29	26.241	5.842	2799.420	23.034	131.527	20.7002
PJ3	12/11/2016	15:18:43	63.8654	188.179	56.005	5.051	2409.250	0.581	144.07	21.8748
PJ3	12/11/2016	15:52:34	64.3051	189.202	21.741	1.220	579.654	1.746	147.002	22.8547
PJ4	2/2/2017	14:18:13	-78.5853	14.0362	21.510	1.746	1926.980	12.695	92.0647	14.417
PJ4	2/2/2017	14:46:10	-78.9183	12.0115	54.170	5.377	5851.510	13.959	99.8606	15.9231
PJ4	2/2/2017	15:14:32	-79.0946	13.4486	89.820	9.207	10244.600	14.951	107.664	16.968
PJ4	2/2/2017	16:12:25	-80.2062	13.6005	50.826	5.617	6280.220	17.097	148.886	19.0696
PJ4	2/2/2017	16:40:22	-78.9944	12.0947	30.718	7.850	8758.550	18.544	149.374	19.8545
PJ4	2/2/2017	17:33:40	-79.9242	10.5392	29.904	8.175	9180.190	20.699	147.419	20.9001
PJ6	5/19/2017	03:51:39	62.1384	170.806	94.076	6.634	4229.370	10.531	102.831	8.03681
PJ6	5/19/2017	03:52:40	62.2641	171.266	71.978	6.519	4252.650	10.518	101.114	8.13232
PJ6	5/19/2017	03:54:11	62.0802	171.155	82.254	10.248	6869.470	10.579	99.3184	8.23206
PJ6	5/19/2017	04:08:49	62.2366	177.375	70.110	7.534	4405.250	10.257	148.593	5.13488
PJ6	5/19/2017	04:22:26	62.5093	173.532	60.703	8.077	5242.050	11.410	89.5063	9.26073
PJ8	9/1/2017	20:47:45	82.6612	216.511	2.594	0.445	320.956	11.965	73.5976	11.2746
PJ8	9/1/2017	22:42:39	-83.0653	329.47	3.312	0.350	423.032	18.407	149.99	20.3766
PJ8	9/1/2017	23:17:50	-82.7975	327.155	2.187	0.464	561.052	20.074	149.512	21.1154

PJ8	9/1/2017	23:30:55	-82.9264	326.482	10.164	1.576	1904.370	20.732	148.272	21.5613
PJ8	9/1/2017	23:46:30	-82.8045	332.071	9.689	1.719	2077.170	20.541	149.824	21.5275
PJ8	9/1/2017	23:56:04	-82.4445	329.534	7.907	1.782	2151.990	21.208	148.143	21.6553
PJ9	10/24/2017	20:58:31	-76.298	47.5094	34.796	4.385	5103.280	10.602	90.9659	10.0248
PJ9	10/24/2017	21:11:08	-77.6322	47.2704	49.057	9.472	11143.500	10.999	92.4111	10.4482
PJ9	10/24/2017	21:13:09	-77.1139	48.8785	29.783	5.557	6564.570	11.023	91.7053	10.5553
PJ9	10/24/2017	21:25:47	-77.3349	48.9452	109.941	14.299	16969.000	11.506	92.2943	11.0453
PJ9	10/24/2017	21:32:21	-78.3933	48.4926	34.513	4.490	5383.320	11.685	89.6168	11.2084
PJ9	10/24/2017	21:53:33	-78.9105	44.4383	48.733	7.516	9097.410	12.748	89.7743	12.8518
PJ9	10/24/2017	22:29:23	-79.8573	57.9946	98.037	13.737	17469.000	13.176	88.6372	12.0939
PJ9	10/24/2017	22:30:54	-80.6291	62.1759	146.325	20.701	26725.600	12.868	86.547	11.3414
PJ12	4/1/2018	10:59:35	-83.387	312.184	24.804	1.881	2291.500	6.902	137.352	4.34857
PJ12	4/1/2018	11:20:34	-84.2603	317.161	12.506	1.327	1703.070	7.799	122.933	5.83077
PJ12	4/1/2018	11:13:24	-81.1704	348.983	7.340	0.985	1119.500	2.435	79.4951	2.48828
PJ12	4/1/2018	11:18:31	-80.074	345.211	8.953	1.569	1736.150	3.147	147.444	1.71082
PJ12	4/1/2018	11:54:48	-79.7424	348.774	13.536	2.562	2768.200	4.236	132.883	2.79601
PJ12	4/1/2018	11:56:20	-80.7	349.061	41.316	3.887	4399.730	4.199	123.593	2.87237
PJ13	5/24/2018	04:22:10	65.1589	181.273	19.209	1.507	846.061	1.631	136.407	23.023
PJ13	5/24/2018	04:47:31	65.8103	182.611	17.498	1.549	867.602	2.420	136.157	23.6283
PJ14	7/16/2018	06:31:39	-87.8921	136.469	20.000	2.217	3252.040	11.966	97.5102	8.22648
PJ14	7/16/2018	06:33:39	-87.8866	139.399	30.891	2.884	4193.630	11.981	99.6099	7.96567
PJ14	7/16/2018	06:38:10	-87.8755	127.694	28.599	2.285	3338.340	12.430	93.1937	8.77023
PJ14	7/16/2018	06:55:12	-87.7722	149.036	8.764	1.031	1472.670	12.637	92.0644	9.15722
PJ14	7/16/2018	07:01:43	-87.8428	157.068	14.951	1.370	1958.270	12.707	86.5823	9.60095
PJ15	9/7/2018	02:28:55	-82.8799	58.1906	6.461	0.722	989.899	12.707	115.911	6.33337
PJ15	9/7/2018	03:02:29	-84.0993	56.1038	3.704	1.290	1763.750	10.998	94.4549	8.18897
PJ15	9/7/2018	04:33:42	-86.7499	48.8141	14.053	3.326	4669.580	13.434	90.586	10.3344
PJ15	9/7/2018	04:37:12	-88.283	32.2756	43.550	4.959	7211.750	12.094	93.0438	8.39585
PJ16	10/29/2018	23:00:33	-78.8204	24.8027	51.881	3.709	4241.330	8.240	148.995	4.94903
PJ16	10/29/2018	23:29:09	-78.6979	30.2284	31.638	4.645	5312.320	8.985	97.0588	8.13252

PJ16	10/29/2018	23:56:15	-77.8215	36.0007	18.909	3.266	3759.260	9.753	94.48	9.40275
PJ16	10/30/2018	00:26:21	-77.6031	36.1582	41.142	5.927	6749.550	10.979	87.0123	11.2907
PJ16	10/30/2018	00:48:26	-77.9568	38.7742	31.673	6.176	7216.400	11.639	90.4642	12.0096
PJ16	10/30/2018	01:29:05	-78.6268	38.9623	81.816	9.845	11463.300	13.180	91.1544	13.2555
PJ16	10/30/2018	01:52:04	-78.1764	38.6598	157.713	12.770	15025.000	14.185	94.0923	14.9941
PJ20	5/29/2019	09:08:12	-78.5023	56.7351	13.048	1.653	2089.040	10.929	94.2201	9.49789
PJ20	5/29/2019	09:11:46	-78.7181	56.9598	9.032	0.713	898.851	11.033	92.2378	9.61732
PJ20	5/29/2019	09:14:18	-78.6289	57.7071	19.086	1.707	2147.060	11.099	90.1268	9.67043
PJ20	5/29/2019	09:49:22	-79.387	55.6197	3.359	0.976	1220.710	12.548	88.5162	11.6019
PJ21	7/21/2019	05:17:40	-80.4162	328.092	7.064	0.636	719.276	13.056	96.7069	15.6174
PJ21	7/21/2019	06:59:00	-82.3281	2.86245	24.467	4.432	5438.680	12.848	92.2783	14.3567
PJ21	7/21/2019	07:46:09	-82.1031	1.66836	63.929	7.726	9279.190	14.950	107.442	17.0867
PJ21	7/21/2019	08:00:12	-80.2607	20.2918	69.460	9.043	10553.700	14.164	97.7403	15.6688
PJ22	9/12/2019	07:34:24	-78.4555	80.4122	144.630	17.417	22926.200	12.953	89.7742	10.5494
PJ22	9/12/2019	07:50:56	-79.5817	84.4996	124.978	14.869	19931.700	13.285	89.5918	10.6388
PJ23	11/4/2019	00:31:30	-85.3625	76.6513	32.664	2.363	3321.070	22.436	132.311	18.6968
PJ23	11/4/2019	01:06:41	-86.4431	81.3475	25.556	2.010	2924.850	23.265	136.222	19.2979
PJ23	11/4/2019	01:01:09	-83.9144	320.102	23.796	4.261	5293.730	11.929	91.2448	13.1339
PJ24	12/26/2019	19:20:32	-82.5578	20.487	19.534	2.043	2559.610	17.734	148.054	19.0153
PJ24	12/26/2019	20:00:32	-81.1849	26.3421	79.836	6.799	8310.690	19.287	149.448	19.7707
PJ24	12/26/2019	20:44:34	-81.6846	40.8878	17.765	2.700	3415.000	19.882	149.648	19.0486
PJ24	12/26/2019	20:49:38	-81.8746	62.468	20.984	5.386	7294.450	19.882	115.385	17.4216
PJ24	12/26/2019	21:33:40	-83.6333	71.7829	86.355	6.293	9185.660	19.615	114.031	17.4712