Last updated at NGDC: 10 Jun 2014

Prepared by the U.S. Dept. of Commerce, NOAA, Space Weather Prediction Center

Solar Proton Events Affecting the Earth Environment

January 1976 - Present

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-------------PARTICLE EVENT---------- ASSOCIATED ---------FLARE AND ACTIVE REGION----------

Start Maximum Proton Flux CME Flare Max. Importance Location Region#

(Day/UT) (pfu @ >10 MeV) (Loc./ Day UT)(Xray/Opt.) (SWO)

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1976

Apr 30/2120 May 01/1700 12 Apr 30/2114 X2/2B S09W47 700

1977

Sep 19/1430 Sep 19/2130 200 Sep 19/1054 X2/3B N08W58 889

Nov 22/1400 Nov 22/1800 160 Nov 22/1006 X1/2N N24W38 939

1978

Feb 13/0930 Feb 14/1000 850 Feb 13/0255 M7/0B N22W13 1001

Apr 11/1530 Apr 11/1630 65 Apr 11/1353 X2/2B N19W54 1057

Apr 29/0445 Apr 30/2000 1000 Apr 28/1306 X5/4B N22E41 1092

May 07/0420 May 07/0420 100 May 07/0330 X2/2B N22W64 1095

Jun 02/0730 Jun 02/0935 19 May 31/1009 M5/2B N23W50 1129

Jun 24/0900 Jun 25/0230 25 Jun 22/1709 M2/3B N19E18 1164

Jul 13/0300 Jul 13/1000 20

Sep 23/1035 Sep 24/0400 2200 Sep 23/1023 X1/3B N35W50 1294

Nov 10/2130 Nov 10/2140 38 Nov 10/0042 M1/2N N17E02 1385

1979

Feb 17/2020 Feb 17/2205 31 Feb 16/0200 X2/2B N15E48 1574

Apr 03/1600 Apr 03/2310 45

Jun 06/1850 Jun 07/0005 950 Jun 05/0529 X2/1N N20E16 1781

Jul 07/0015 Jul 07/1010 50

Aug 19/0850 Aug 21/0740 500 Aug 18/1416 X6/1B N10E90 1943

Sep 15/1500 Sep 16/1200 60 Sep 14/0802 X2/ N10E90 1994

Nov 16/0430 Nov 16/1300 75 Nov 15/1639 M1/0B N34W25 2110

1980

Feb 06/1340 Feb 06/1850 12

Jul 17/2300 Jul 19/1930 100 Jul 17/0603 M3/1B S12E06 2562

1981

Mar 30/0900 Mar 30/2115 30 Mar 30/0049 M3/2N N13W74 2993

Apr 10/1745 Apr 11/1400 50 Apr 10/1655 X2/3B N09W40 3025

Apr 24/1515 Apr 24/2330 160 Apr 24/1400 X5/2B N18W50 3049

May 09/1200 May 10/2130 150 May 08/2252 M7/2B N09E37 3099

May 15/0300 May 16/1950 130 May 13/0425 X1/3B N11E58 3106

Jul 20/1430 Jul 20/1825 100 Jul 20/1329 M5/1B S26W75 3204

Jul 25/0600 Jul 25/1320 18

Aug 10/0115 Aug 10/0435 57 Aug 07/1916 M4/2B S10E24 3257

Oct 08/1235 Oct 13/2247 2000 Oct 07/2308 X3/1B S19E88 3390

Dec 10/0545 Dec 11/0900 65 Dec 09/1854 M5/3B N12W16 3496

1982

Jan 31/0055 Jan 31/1630 830 Jan 30/2358 X1/3B S13E19 3576

Jun 06/0245 Jun 06/0245 10 Jun 03/1146 X8/2B S09E72 3763

Jun 09/0040 Jun 09/0510 30 Jun 06/1637 X12/3B S11E26 3763

Jul 11/0700 Jul 13/1615 2900 Jul 09/0742 X9/3B N17E73 3804

Jul 22/2030 Jul 23/0220 240 Jul 22/1734 M4/0F N29W86 3804

Sep 05/2205 Sep 06/0100 66 Sep 04/0400 M4/3N N11E30 3886

Nov 22/1940 Nov 22/2140 40 Nov 22/1828 M7/1N S11W43 3994

Nov 26/0605 Nov 26/1500 25 Nov 26/0253 X4/2B S11W87 3994

Dec 08/0010 Dec 08/1000 1000 Dec 07/2354 X2/0B S14W81 4007

Dec 17/1845 Dec 18/0945 130 Dec 15/0202 X12/2B S10E24 4026

Dec 19/1920 Dec 20/0515 85 Dec 19/1624 M9/2B N10W75 4022

Dec 27/0600 Dec 27/1345 190 Dec 25/0752 X2/1B S14E31 4033

1983

Feb 03/1200 Feb 04/1620 340 Feb 03/0619 X4/3B S19W08 4077

Jun 15/0435 Jun 15/1800 18 Jun 14 S09W90 4201

1984

Feb 16/0915 Feb 16/1005 660 Feb 16 S12W90 4408

Feb 19/1310 Feb 21/1415 55 Feb 17/2301 X2/2B N16E82 4421

Mar 13/1440 Mar 13/1450 10

Mar 14/0405 Mar 14/0505 100 Mar 14/0334 M2/2B S12W42 4433

Apr 25/1330 Apr 26/1420 2500 Apr 25/0005 X13/3B S12E43 4474

May 24/1045 May 24/1140 31 May 22/1503 M6/2B S09E24 4492

May 31/1315 May 31/1415 15 May 31/1142 M1 S09W90 4492

1985

Jan 22/0415 Jan 22/0550 14 Jan 21/2350 X4/2B S08W38 4617

Apr 25/1430 Apr 26/0600 160 Apr 24/0935 X1/3B N06E27 4647

Jul 09/0235 Jul 09/0325 140 Jul 09/0204 M2/1B S16W36 4671

1986

Feb 06/0925 Feb 07/1730 130 Feb 06/0625 X1/3B S04W06 4711

Feb 14/1155 Feb 15/0400 130 Feb 14/0929 M6/1B N01W76 4713

Mar 06/1835 Mar 06/1930 21 Mar 06/1703 C4/1F N02E01 4717

May 04/1255 May 04/1320 16 May 04/1007 M1 N06W90 4717

1987

Nov 08/0200 Nov 08/0940 120 Nov 07/2014 M1 N31W90 4875

1988

Jan 02/2325 Jan 03/0835 92 Jan 02/2145 X1/3B S34W18 4912

Mar 25/2225 Mar 25/2330 58 Mar 25/2145 EPL N22W90 4965

Jun 30/1055 Jun 30/1140 21 Jun 30/0906 M9/2B S16E22 5060

Aug 26/0000 Aug 26/0045 42 Aug 23/1804 M2/EPL N24E90 5125

Oct 12/0920 Oct 12/0930 12 Oct 12/0511 X2/2N S20W66 5175

Nov 08/2225 Nov 09/0635 13 Nov 07/1105 M3/1N S17W47 5212

Nov 14/0130 Nov 14/0235 13 Nov 13/2309 M3/1N S23W27 5227

Dec 17/0610 Dec 17/0855 18 Dec 15/0505 X1/1N N27E59 5278

Dec 17/2000 Dec 18/0150 29 Dec 16/0841 X4/1B N26E37 5278

1989

Jan 04/2305 Jan 05/0130 28 Jan 04/1753 M4/1N S20W60 5303

Mar 08/1735 Mar 13/0645 3500 Mar 06/1405 X15/3B N35E69 5395

Mar 17/1855 Mar 18/0920 2000 Mar 17/1744 X6/2B N33W60 5395

Mar 23/2040 Mar 24/0110 53 Mar 23/1948 X1/3B N18W28 5409

Apr 11/1435 Apr 12/0125 450 Apr 09/0105 X3/4B N35E29 5441

May 05/0905 May 05/1000 27 May 04/1115 M5/2N S20W36 5464

May 06/0235 May 06/1045 110 May 05/0737 X2/3B N30E01 5470

May 23/1135 May 23/1350 68

May 24/0730 May 24/0905 15 May 22/0037 M5/2B S21E16 5497

Jun 18/1650 Jun 18/1910 18 Jun 18/1447 C4/0F N12W31 5534

Jun 30/0655 Jun 30/0710 17 Jun 29/2127 M3/2B N26W60 5555

Jul 01/0655 Jul 01/0720 17

Jul 25/0900 Jul 25/1225 54 Jul 25/0844 X2/2N N25W84 5603

Aug 12/1600 Aug 13/0710 9200 Aug 12/1427 X2/2B S16W37 5629

Sep 04/0120 Sep 04/0510 44 Sep 03/1432 X1/1B S18E16 5669

Sep 12/1935 Sep 13/0825 57 Sep 12/0814 M5/EPL S18W79 5669

Sep 29/1205 Sep 30/0210 4500 Sep 29/1133 X9/EPL S26W90 5698

Oct 06/0050 Oct 06/0825 22

Oct 19/1305 Oct 20/1600 40000 Oct 19/1258 X13/4B S27E10 5747

Nov 09/0240 Nov 09/0610 43

Nov 15/0735 Nov 15/0910 71 Nov 15/0659 X3/3B N11W26 5786

Nov 27/2000 Nov 28/1105 380 Nov 25/2355 X1/2N N30E05 5800

Nov 30/1345 Dec 01/1340 7300 Nov 30/1229 X2/3B N26W59 5800

1990

Mar 19/0705 Mar 19/2315 950 Mar 19/0508 X1/2B N31W43 5969

Mar 29/0915 Mar 29/1005 16 Mar 28/0751 M4/2N S04W37 5988

Apr 07/2240 Apr 08/1330 18 Apr 04/1338 M7/0N N22E72 6007

Apr 11/2120 Apr 11/2130 13

Apr 17/0500 Apr 17/0655 12 Apr 15/0302 X1/2B N32E57 6022

Apr 28/1005 Apr 28/1735 150

May 21/2355 May 22/0750 410 May 21/2219 X5/2B N35W36 6063

May 24/2125 May 25/0115 180 May 24/2051 X9/1B N33W78 6063

May 28/0715 May 29/0100 45

Jun 12/1140 Jun 12/1700 79 Jun 12/0541 M6/2B N10W33 6089

Jul 26/1720 Jul 26/2315 21

Aug 01/0005 Aug 01/2015 230 Jul 30/0736 M4/2B N20E45 6180

1991

Jan 31/1130 Jan 31/1620 240 Jan 31/0230 X1/2B S17W35 6469

Feb 25/1210 Feb 25/1305 13 Feb 25/0819 X1/2N S16W80 6497

Mar 23/0820 Mar 24/0350 43000 Mar 22/2247 X9/3B S26E28 6555

Mar 29/2120 Mar 30/0330 20

Apr 03/0815 Apr 04/1000 52 Apr 02/2327 M6/3B N14W00 6562

May 13/0300 May 13/0910 350 May 13/0144 M8 S09W90 6615

May 31/1225 Jun 01/0445 22

Jun 04/0820 Jun 11/1420 3000 Jun 04/0352 X12/3B N30E70 6659

Jun 14/2340 Jun 15/1950 1400 Jun 15/0821 X12/3B N33W69 6659

Jun 30/0755 Jul 02/1010 110 Jun 28/0626 M6 N30E85 6703

Jul 07/0455 Jul 08/1645 2300 Jul 07/0223 X1/2B N26E03 6703

Jul 11/0240 Jul 11/0450 30 Jul 10/1228 M3/2N S22E34 6718

Jul 11/2255 Jul 12/0205 14

Aug 26/1740 Aug 27/1830 240 Aug 25/0115 X2/2B N25E64 6805

Oct 01/1740 Oct 01/1810 12 Sep 29/1533 M7/4B S21E32 6853

Oct 28/1300 Oct 28/1440 40 Oct 27/0548 X6/3B S13E15 6891

Oct 30/0745 Oct 30/0810 94 Oct 30/0634 X2/3B S08W25 6891

1992

Feb 07/0645 Feb 07/1115 78 Feb 06/1048 M4/2B S13W10 7042

Mar 16/0840 Mar 16/0840 10 Mar 15/0154 M7/3B S14E29 7100

May 09/1005 May 09/2100 4600 May 08/1546 M7/4B S26E08 7154

Jun 25/2045 Jun 26/0610 390 Jun 25/2014 X3/2B N09W67 7205

Aug 06/1145 Aug 06/1210 14 Aug 03/0706 M4/1N S09E68 7248

Oct 30/1920 Oct 31/0710 2700 Oct 30/1816 X1/2B S22W61 7321

1993

Mar 04/1505 Mar 04/1735 17 Mar 04/1240 C8/2N S14W56 7434

Mar 12/2010 Mar 13/0155 44 Mar 12/1815 M7/3B S00W51 7440

1994

Feb 20/0300 Feb 21/0900 10000 Feb 20/0141 M4/3B N09W02 7671

Oct 20/0030 Oct 20/0340 35 Oct 19/2127 M3/1F N12W24 7790

1995

Oct 20/0825 Oct 20/1210 63 Oct 20/0607 M1/0F S09W55 7912

1996

none

1997

Nov 04/0830 Nov 04/1120 72 W/04 0610 Nov 04/0558 X2/2B S14W33 8100

Nov 06/1305 Nov 07/0255 490 W/06 >1300 Nov 06/1155 X9/2B S18W63 8100

1998

Apr 20/1400 Apr 21/1205 1700 W/20 1007 Apr 20/1021 M1/EPL S43W90 8194

May 02/1420 May 02/1650 150 Halo/02 1406 May 02/1342 X1/3B S15W15 8210

May 06/0845 May 06/0945 210 W/06 0829 May 06/0809 X2/1N S11W65 8210

Aug 24/2355 Aug 26/1055 670 NA Aug 24/2212 X1/3B N30E07 8307

Sep 25/0010 Sep 25/0130 44 NA Sep 23/0713 M7/3B N18E09 8340

Sep 30/1520 Oct 01/0025 1200 NA Sep 30/1350 M2/2N N23W81 8340

Nov 08/0245 Nov 08/0300 11 ?

Nov 14/0810 Nov 14/1240 310 NA Nov 14/0518 C1/BSL N28W90 8375?

1999

Jan 23/1105 Jan 23/1135 14 NA Jan 20/2004 M5 N27E90

Apr 24/1804 Apr 25/0055 32 Halo/24 1331 NW limb 8517?

May 05/1820 May 05/1955 14 Halo/03 0606 May 03/0602 M4/2N N15E32 8525

Jun 02/0245 Jun 02/1010 48 Halo/01 <1937 Jun 01/~1930

Jun 04/0925 Jun 04/1055 64 NW/ 04 0726 Jun 04/0703 M3/2B N17W69 8552

2000

Feb 18/1130 Feb 18/1215 13 W/18 0954 Feb 17/2035 M1/2N S29E07 8872

Apr 04/2055 Apr 05/0930 55 W/04 1632 Apr 04/1541 C9/2F N16W66 8933

Jun 07/1335 Jun 08/0940 84 Halo/06 1554 Jun 06/1525 X2/3B N20E18 9026

Jun 10/1805 Jun 10/2045 46 Halo/10 1708 Jun 10/1702 M5/3B N22W38 9026

Jul 14/1045 Jul 15/1230 24000 Halo/14 1054 Jul 14/1024 X5/3B N22W07 9077

Jul 22/1320 Jul 22/1405 17 NW/22 1230 Jul 22/1134 M3/2N N14W56 9085

Jul 28/1050 Jul 28/1130 18 ?

Aug 11/1650 Aug 11/1740 17 ?

Sep 12/1555 Sep 13/0340 320 Halo/12 1331 Sep 12/1213 M1/2N S17W09 Filament

Oct 16/1125 Oct 16/1840 15 Halo/16 0727 Oct 16/0728 M2 N04W90 9182?

Oct 26/0040 Oct 26/0340 15 Halo/25 0826 Oct 25/1125 C4 N00W90

Nov 08/2350 Nov 09/1555 14800 Halo/08 2306 Nov 08/2328 M7/multiple N00-10W75-80 9212,13,18

Nov 24/1520 Nov 26/2030 940 Halo/24 0530 Nov 24/0502 X2/3B N20W05 9236

2001

Jan 28/2025 Jan 29/0655 49 Halo/28 1554 Jan 28/1600 M1/1N S04W59 9313

Mar 29/1635 Mar 30/0610 35 Halo/29 1026 Mar 29/1015 X1/1N N14W12 9393

Apr 02/2340 Apr 03/0745 1110 NW/02 ~2200 Apr 02/2151 X20 N18W82 9393

Apr 10/0850 Apr 11/2055 355 Halo/10 0530 Apr 10/0526 X2/3B S23W09 9415

Apr 15/1410 Apr 15/1920 951 W/15 1430 Apr 15/1350 X14/2B S20W85 9415

Apr 18/0315 Apr 18/1045 321 SW/18 0230 Apr 18/0214 C2 S20W limb 9415

Apr 28/0430 Apr 28/0500 57 Halo/26 1230 Apr 26/1312 M7/2B N17W31 9433

May 07/1915 May 08/0755 30 NW/07 ~1000 NW limb

Jun 15/1750 Jun 16/0005 26 W/15 1648 W limb

Aug 10/1020 Aug 10/1155 17 W/09 1030 Aug 09/1122 C3 Disk center

Aug 16/0135 Aug 16/0355 493 Halo /15 2330 Far Backside

Sep 15/1435 Sep 15/1455 11 SW/15 1154 Sep 15/1128 M1/1N S21W49 9608

Sep 24/1215 Sep 25/2235 12900 Halo/24 1030 Sep 24/1038 X2/2B S16E23 9632

Oct 01/1145 Oct 02/0810 2360 SW/01 0530 Oct 01/0515 M9 S22W91 9628

Oct 19/2225 Oct 19/2235 11 Halo/19 1650 Oct 19/1630 X1/2B N15W29 9661

Oct 22/1910 Oct 22/2130 24 SE/22 1826 Oct 22/1759 X1/2B S18E16 9672

Nov 04/1705 Nov 06/0215 31700 Halo/ 04 1635 Nov 04/1620 X1/3B N06W18 9684

Nov 19/1230 Nov 20/0010 34 Halo/17 0530 Nov 17/0525 M2/1N S13E42 9704

Nov 22/2320 Nov 24/0555 18900 Halo/22 2330 Nov 22/2330 M9/2N S15W34 9704

Dec 26/0605 Dec 26/1115 779 W/26 0530 Dec 26/0540 M7/1B N08W54 9742

Dec 29/0510 Dec 29/0815 76 E/28 2006 Dec 28/2045 X3 S26E90 9767

Dec 30/0245 Dec 31/1620 108

2002

Jan 10/2045 Jan 11/0530 91 E/08 1754 Jan 08/2025 C9 E limb

Jan 15/1435 Jan 15/2000 15 Halo/14 0525 Jan 14/0627 M4 W limb

Feb 20/0730 Feb 20/0755 13 W/20 0630 Feb 20/0612 M5/1N N12W72 9825

Mar 17/0820 Mar 17/0850 13 Halo/15 2306 Mar 15/2310 M2/1F S08W03 9866

Mar 18/1300 Mar 19/0650 53

Mar 20/1510 Mar 20/1525 19 W/18 0254 Mar 18/0231 M1 S09W46 near 9866

Mar 22/2020 Mar 23/1320 16 Halo/22 1106 Mar 22/1114 M1 W limb 9866

Apr 17/1530 Apr 17/1540 24 Halo/17 0826 Apr 17/0824 M2/2N S14W34 9906

Apr 21/0225 Apr 21/2320 2520 W/21 0127 Apr 21/0151 X1/1F S14W84 9906

May 22/1775 May 23/1055 820 Halo/22 0326 May 22/0354 C5/DSF S19W56

Jul 07/1830 Jul 07/1955 22 W/07 1106 Jul 07/1143 M1 W limb 17

Jul 16/1750 Jul 17/1600 234 Halo/15 2030 Jul 15/2008 X3/3B N19W01 30

Jul 19/1050 Jul 19/1515 13

Jul 22/0655 Jul 23/1025 28 Halo/20 2042 Jul 20/2130 X3 SE limb 39

Aug 14/0900 Aug 14/1620 26 NW/14 0206 Aug 14/0212 M2/1N N09W54 61

Aug 22/0440 Aug 22/0940 36 SW/22 0200 Aug 22/0157 M5/2B S07W62 69

Aug 24/0140 Aug 24/0835 317 W/24 0127 Aug 24/0112 X3/1F S08W90 69

Sep 07/0440 Sep 07/1650 208 Halo/05 1654 Sep 05/1706 C5/DSF N09E28 102

Nov 09/1920 Nov 10/0540 404 SW/09 1331 Nov 09/1323 M4/2B S12W29 180

2003

May 28/2335 May 29/1530 121 Halo/28 0050 May 28/0027 X3/2B S07W17 365

May 31/0440 May 31/0645 27 W/31 0230 May 31/0224 M9/2B S07W65 365

Jun 18/2050 Jun 19/0450 24 Halo/17 2330 Jun 17/2255 M6 S08E61 386

Oct 26/1825 Oct 26/2235 466 Halo/26 1754 Oct 26/1819 X1/1N N02W38 484

Oct 28/1215 Oct 29/0615 29500 Halo/28 1054 Oct 28/1110 X17/4B S16E08 486

Nov 02/1105 Nov 03/0815 1570 Halo/02 0954

Nov 04/2225 Nov 05/0600 353 Halo/04 1954 Nov 04/1929 X28/3B S19W83 486

Nov 21/2355 Nov 22/0230 13 SW/21 0026 Nov 20/2353 M5/2B N02W17 501

Dec 02/1505 Dec 02/1730 86 Halo/02 1026 Dec 02/0948 C7 W limb

2004

Apr 11/1135 Apr 11/1845 35 SW/11 0430 Apr 11/0419 C9/1F S14W47 588

Jul 25/1855 Jul 26/2250 2086 Halo/25 1530 Jul 25/1514 M1/1F N08W33 652

Sep 13/2105 Sep 14/0005 273 Halo/12 0036 Sep 12/0056 M4/2N N04E42 672

Sep 19/1925 Sep 20/0100 57 W/19 2224 Sep 19/1712 M1 N03W58 672

Nov 01/0655 Nov 01/0805 63 W/01 0606 Backside

Nov 07/1910 Nov 08/0115 495 Halo/07 1706 Nov 07/1606 X2 N09W17 696

2005

Jan 16/0210 Jan 17/1750 5040 Halo/15 2306 Jan 15/2302 X2 N15W05 720

May 14/0525 May 15/0240 3140 Halo/13 1722 May 13/1657 M8/2B N12E11 759

Jun 16/2200 Jun 17/0500 44 W/16 2003 Jun 16/2022 M4 N09W87 775

Jul 14/0245 Jul 15/0345 134 Halo/13 1430 Jul 13/1449 M5 N10W80 786

Jul 27/2300 Jul 29/1715 41 Halo/27 0454 Jul 27/0502 M3 N11E90 792

Aug 22/2040 Aug 23/1045 330 Halo/22 1730 Aug 22/1727 M5/1N S12W60 798

Sep 08/0215 Sep 11/0425 1880 E/07 1723 Sep 07/1740 X17/3B S06E89 808

2006

Dec 06/1555 Dec 07/1930 1980 Halo Dec 05/1035 X9/2N S07E79 930

Dec 13/0310 Dec 13/0925 698 Halo/13 0254 Dec 13/0240 X3/4B S05W23 930

2007

none

2008

none

2009

none

2010

Aug 14/1230 Aug 14/1245 14 W/14 1325 Aug 14/1005 C4/0F N17W52 1099

2011

Mar 08/0105 Mar 08/0800 50 NW/07 2000 Mar 07/2012 M3/SF N24W59 1164

Mar 21/1950 Mar 22/0135 14 NW/21 0236 N/A N/A N/A 1169

Jun 07/0820 Jun 07/1820 72 SW/08 1750 Jun 07/0803 M2/2N S21W64 1226

Aug 04/0635 Aug 05/2150 96 NW/06 0515 Aug 04/0412 M9/2B N15W49 1261

Aug 09/0845 Aug 09/1210 26 NW/09 1710 Aug 09/0805 X6/2B N17W83 1263

Sep 23/2255 Sep 26/1155 35 NE/27 0430 Sep 22/1101 X1/2N N11E74 1302

Nov 26/1125 Nov 27/0125 80 NW/28 0145 Nov 26/0710 N/A N08W49 1353

2012

Jan 23/0530 Jan 24/1530 6310 NW/23 0400 Jan 23/0359 M8/2B N28W36 1402

Jan 27/1905 Jan 28/0205 796 NW/27 1827 Jan 27/1837 X1/1F N27W71 1402

Mar 07/0510 Mar 08/1115 6530 NE/07 0036 Mar 07/0024 X5/3B N17E15 1429

Mar 13/1810 Mar 13/2045 469 NW/13 1736 Mar 13/1741 M7/ N18W62 1429

May 17/0210 May 17/0430 255 NW/17 0148 May 17/0147 M5/1F N12W89 1476

May 27/0535 May 27/1045 14 /27 2112 N/A N/A N/A 1482

Jun 16/1955 Jun 16/2020 14 SE/14 1430 Jun 14/1435 M1/1N S17E14 1504

Jul 07/0400 Jul 07/0745 25 SW/06 2312 Jul 06/2308 X1/ S18W50 1515

Jul 12/1835 Jul 12/2225 96 SW/12 1649 Jul 12/1710 X1/2B S16W09 1520

Jul 17/1715 Jul 18/0600 136 SW/17 1348 Jul 17/1715 M1/ S17W75 1520

Jul 23/1545 Jul 23/2145 12 SW/23 0236 S16W86 1520

Sep 01/1335 Sep 02/0859 59 SE/31 2012 Aug 31/2043 C8/2F S06E20

Sep 28/0300 Sep 28/0445 28 NW/28 0018 Sep 27/2357 C3/1F N08W41 1577

2013

Mar 16/1940 Mar 17/0700 16 NE/15 0712 Mar 15/0658 M1/1F N11E12 1692

Apr 11/1055 Apr 11/1645 114 NE/11 0724 Apr 11/0716 M6/3B N09E12 1719

May 14/1325 May 17/1720 41 NE/15 0148 May 15/0148 X1/2N N11E51 1748

May 22/1420 May 23/0650 1660 NW/22 1325 May 22/1322 M5/3N N15W70 1745

Jun 23/2014 Jun 24/0520 14 SE/21/0312 Jun 21/0314 M2/1F S16E66 1777

Sep 30/0505 Sep 30/2005 182 NW/29 2212 Sep 29/2337 N/A N15W40 N/A

Dec 28/2150 Dec 28/2315 29 SE/28 1736 Dec 28/1802 C9/SN S18E07 1936

2014

Jan 06/0915 Jan 06/1600 42 SE/06 0800 N/A N/A S15E90 1936

Jan 06/0915 Jan 09/0340 1033 SW/07 1824 Jan 07/1832 X1/2N S15W11 1944

Feb 20/0850 Feb 20/0925 22 SW/20 0800 Feb 20/0756 M3/SN S15W67 1976

Feb 25/1355 Feb 28/0845 103 SE/25/0130 Feb 25/0049 X4/2B S12E82 1990

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-------------PARTICLE EVENT---------- ASSOCIATED ---------FLARE AND ACTIVE REGION---------

Start Maximum Proton Flux CME Flare Max. Importance Location Region#

(Day/UT) (pfu @ >10 MeV) (Loc./ Day UT)(Xray/Opt.) (SWO)

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Please Note: Proton fluxes are integral 5-minute averages for energies > 10 MeV, given in Particle

Flux Units (pfu), measured by GOES spacecraft at Geosynchronous orbit: 1 pfu = 1 p/sq. cm-s-sr. SWO

defines the start of a proton event to be the first of 3 consecutive data points with fluxes greater

than or equal to 10 pfu. The end of an event is the last time the flux was greater than or equal to

10 pfu. This definition, motivated by SWO customer needs, allows multiple proton flares and/or

interplanetary shock proton increases to occur within one SWO proton event. Additional data may be

necessary to more completely resolve any individual proton event.

Different detectors, onboard various GOES spacecraft, have taken the data since 1976. These proton

data were processed using various algorithms. To date, no attempt has been made to cross-normalize

the resulting proton fluxes.

Flare associations are given, although data about individual Coronal Mass Ejections (CMEs), available

from SOHO since 1996 only, are necessary to fully characterize each event.