# NOAA Space Weather Prediction Center

## Solar Proton Events Affecting the Earth Environment

### 1976 - Present

| Begin Time Yr M/D (UTC) | Maximum Time Yr M/D (UTC) | >10 MeV Maximum (pfu) | Region | Location | Flare Maximum (UTC) | Type II Radio Emission | Type IV | Linear Speed | Imagery/Misc |
|---|---|---|---|---|---|---|---|---|---|
| 1115 | 1745 | 18 | 13386 | N10W63 | 0718 | Yes | No | N/A | 3386 |
| 2023 08/08 0115 | 2023 08/09 0025 | 47 | 13386 | Beyond west limb | X1 08/07 2046 | Yes | No | 1851 km/s | C2 X-Ray |
| 2023 09/01 0430 | 2023 09/01 0610 | 25 | 13413 | N09W75 | M1 09/01 0351 | Yes | Yes | 1339 km/s | C2 X-Ray DST |
| 2023 12/15 2345 | 2023 12/16 0015 | 13 | 13514 | N05W76 | N/A | Yes | Yes | N/A | Combination of flare activity from region 3514 and secondary CME enhancement |
| 2024 01/03 2005 | 2024 01/04 0835 | 20 | 13536 | N04E73 | X5/3B 12/31 2203 | Yes | Yes | N/A | C2 X-Ray DST |
| 2024 01/29 0615 | 2024 01/29 1805 | 137 | 13559 | N26E73 | M6.7/Sf 01/29 0438 | Yes | No | N/A | C2 Wind Waves |
| 2024 02/09 1530 | 2024 02/09 2355 | 187 | 13575 | Beyond SW limb | X3.3 02/09 1314 | Yes | Yes | N/A | N/A |
| 2024 02/12 0805 | 2024 02/13 1605 | 118 | 13576 | S16W30 | C9.6/Sf 02/12 0554 | No | Yes | N/A | N/A |
| 2024 03/23 0815 | 2024 03/23 1820 | 956 | 13614 | N27E08 | X1.1/2F 03/23 0133 | Yes | No | N/A | Assymetric halo Flux Plot |
| 2024 05/10 1335 | 2024 05/10 1745 | 208 | 13664 | S17W36 | X3.9 05/10 0654 | Yes | Yes | N/A | N/A |
| 2024 05/11 0210 | 2024 05/11 0910 | 116 | 13664 | S17W44 | X5.8 05/11 0123 | Yes | Yes | N/A | This event followed shortly after the previous had fallen below 10pfu |

**Please Note: Proton fluxes are integral 5-minute averages for energies >10 MeV, given in Particle Flux Units (pfu), measured by GOES spacecraft a Geosynchronous orbit: 1 pfu = 1 p cm-2 sr-1s-1. SESC 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 SWPC customer needs, allows multiple proton flares and/or interplanetary shock proton increases to occur within one SWPC proton event. Additional data may be necessary to more completely resolve any individual proton event.**

**Different detectors, onboard different 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 only since 1996, are necessary fully to characterize each event. The CME video loops in the "Imagery/Misc" column are maintained at the CDAW Data Center by NASA and The Catholic University of America in cooperation with the Naval Research Laboratory. SOHO is a project of international cooperation between ESA and NASA. CDAW Data Center. The hyperlinked flare maximum information is maintained by freeland@lmsal.com and is located at Solarsoft.**

**For more information on SEP events, contact Charles Carr or Rob Steenburgh of the NOAA Space weather Prediction Center.**