S1 Proton Short Term Warning Verification

The Short-Term S1 Proton Warning is a "high-confidence" notification of solar particle activity expected to reach the S1 proton alert threshold (10 pfu at greater than 10 MeV).

S1 Proton Short Term Warning Statistics Table

Prepared by the U.S. Dept. of Commerce, NOAA, Space Weather Prediction Center.
Please send comments and suggestions to SWPC.Webmaster@noaa.gov
#
Annual Verification Statistics for Proton Short-Term Warnings
#
Missing data: -99999
#

Year	2013
Hits	7
Misses	0
False Alarms	2
Correct Rejections	356
Climatology	0.02
Probability of Detection	1.00
False Alarm Ratio	0.22
Success Ratio	0.78
Critical Success Index	0.78
Bias	1.28
Gilbert Score	0.78
Heidke Skill Score	0.87
True Skill Statistic	0.99
Year	2012
Hits	16
Misses	0
False Alarms	3
Correct Rejections	347
Climatology	0.04
Probability of Detection	1.00
False Alarm Ratio	0.16
Success Ratio	0.84
Critical Success Index	0.84
Bias	1.19
Gilbert Score	0.84
Heidke Skill Score	0.91
True Skill Statistic	0.99

Year	2011
Hits	8
Misses	0
False Alarms	1
Correct Rejections	356
Climatology	0.02
Probability of Detection	0.64
False Alarm Ratio	0.25
Success Ratio	0.75
Critical Success Index	0.53
Bias	0.85
Gilbert Score	0.52
Heidke Skill Score	0.69
True Skill Statistic	0.64

Year	2010
Hits	1
Misses	0
False Alarms	1
Correct Rejections	363
Climatology	0.00
Probability of Detection	1.00
False Alarm Ratio	0.50
Success Ratio	0.50
Critical Success Index	0.50
Bias	2.00
Gilbert Score	0.50
Heidke Skill Score	0.67
True Skill Statistic	1.00

Year	2009
Hits	0
Misses	0
False Alarms	0
Correct Rejections	365
Climatology	0.00
Probability of Detection	-99999
False Alarm Ratio	-99999
Success Ratio	-99999
Critical Success Index	-99999
Bias	-99999
Gilbert Score	-99999
Heidke Skill Score	-99999
True Skill Statistic	-99999

Year	2008
Hits	0
Misses	0
False Alarms	0
Correct Rejections	365
Climatology	0.00
Probability of Detection	-99999
False Alarm Ratio	-99999
Success Ratio	-99999
Critical Success Index	-99999
Bias	-99999
Gilbert Score	-99999
Heidke Skill Score	-99999
True Skill Statistic	-99999

Year	2007
Hits	0
Misses	0
False Alarms	0
Correct Rejections	365
Climatology	0.00
Probability of Detection	-99999
False Alarm Ratio	-99999
Success Ratio	-99999
Critical Success Index	-99999
Bias	-99999

Gilbert Score	-99999
Heidke Skill Score	-99999
True Skill Statistic	-99999

Year:	2006
Hits:	9
Misses:	1
False Alarms:	0
Correct Rejections:	357
Climatology:	0.03
Probability of Detection:	0.90
False Alarm Ratio:	0
Success Ratio:	1.00
Critical Success Index:	0.90
Bias:	0.90
Gilbert Score:	0.90
Heidke Skill Score:	0.94
True Skill Statistic:	0.90

Year:	2005
Hits:	7
Misses:	0
False Alarms:	1
Correct Rejections:	357
Climatology:	0.02
Probability of Detection:	1.00
False Alarm Ratio:	0.13
Success Ratio:	0.88
Critical Success Index:	0.88
Bias:	1.14
Gilbert Score:	0.87
Heidke Skill Score:	0.93
True Skill Statistic:	1.00

Year:	2004
Hits:	6
Misses:	0
False Alarms:	0
Correct Rejections:	360
Climatology:	0.02
Probability of Detection:	1.00
False Alarm Ratio:	0.00
Success Ratio:	1.00
Critical Success Index:	1.00
Bias:	1.00
Gilbert Score:	1.00
Heidke Skill Score:	1.00
True Skill Statistic:	1.00

Year:	2003
Hits:	9
Misses:	0
False Alarms:	1
Correct Rejections:	355
Climatology:	0.02
Probability of Detection:	1.00
False Alarm Ratio:	0.10

Success Ratio:	0.90
Critical Success Index:	0.90
Bias:	1.11
Gilbert Score:	0.90
Heidke Skill Score:	0.95
True Skill Statistic:	1.00

Year:	2002
Hits:	18
Misses:	0
False Alarms:	2
Correct Rejections:	345
Climatology:	0.05
Probability of Detection:	1.00
False Alarm Ratio:	0.10
Success Ratio:	0.90
Critical Success Index:	0.90
Bias:	1.11
Gilbert Score:	0.89
Heidke Skill Score:	0.94
True Skill Statistic:	0.99

Year:	2001
Hits:	21
Misses:	0
False Alarms:	5
Correct Rejections:	339
Climatology:	0.06
Probability of Detection:	1.00
False Alarm Ratio:	0.19
Success Ratio:	0.81
Critical Success Index:	0.81
Bias:	1.24
Gilbert Score:	0.80
Heidke Skill Score:	0.89
True Skill Statistic:	0.99

Year:	2000
Hits:	9
Misses:	3
False Alarms:	6
Correct Rejections:	348
Climatology:	0.03
Probability of Detection:	0.75
False Alarm Ratio:	0.40
Success Ratio:	0.60
Critical Success Index:	0.50
Bias:	1.25
Gilbert Score:	0.49
Heidke Skill Score:	0.65
True Skill Statistic:	0.73

Year:	1999
Hits:	2
Misses:	3
False Alarms:	1
Correct Rejections:	359

Climatology:	0.01
Probability of Detection:	0.40
False Alarm Ratio:	0.33
Success Ratio:	0.67
Critical Success Index:	0.33
Bias:	0.60
Gilbert Score:	0.33
Heidke Skill Score:	0.49
True Skill Statistic:	0.40

Year:	1998
Hits:	4
Misses:	4
False Alarms:	1
Correct Rejections:	356
Climatology:	0.02
Probability of Detection:	0.50
False Alarm Ratio:	0.20
Success Ratio:	0.80
Critical Success Index:	0.44
Bias:	0.63
Gilbert Score:	0.44
Heidke Skill Score:	0.61
True Skill Statistic:	0.50

Year:	1997
Hits:	2
Misses:	0
False Alarms:	0
Correct Rejections:	363
Climatology:	0.01
Probability of Detection:	1.00
False Alarm Ratio:	0.00
Success Ratio:	1.00
Critical Success Index:	1.00
Bias:	1.00
Gilbert Score:	1.00
Heidke Skill Score:	1.00
True Skill Statistic:	1.00

Year:	1996
Hits:	0
Misses:	0
False Alarms:	0
Correct Rejections:	366
Climatology:	0.00
Probability of Detection:	-99999
False Alarm Ratio:	-99999
Success Ratio:	-99999
Critical Success Index:	-99999
Bias:	-99999
Gilbert Score:	-99999
Heidke Skill Score:	-99999
True Skill Statistic:	-99999

Year:	1995
Hits:	0

Misses:	1
False Alarms:	0
Correct Rejections:	364
Climatology:	0.00
Probability of Detection:	0.00
False Alarm Ratio:	-99999
Success Ratio:	-99999
Critical Success Index:	0.00
Bias:	0.00
Gilbert Score:	0.00
Heidke Skill Score:	0.00
True Skill Statistic:	0.00

Year:	1994
Hits:	0
Misses:	2
False Alarms:	0
Correct Rejections:	363
Climatology:	0.01
Probability of Detection:	0.00
False Alarm Ratio:	-99999
Success Ratio:	-99999
Critical Success Index:	0.00
Bias:	0.00
Gilbert Score:	0.00
Heidke Skill Score:	0.00
True Skill Statistic:	0.00

Year:	1993
Hits:	1
Misses:	1
False Alarms:	2
Correct Rejections:	361
Climatology:	0.01
Probability of Detection:	0.50
False Alarm Ratio:	0.67
Success Ratio:	0.33
Critical Success Index:	0.25
Bias:	1.50
Gilbert Score:	0.25
Heidke Skill Score:	0.40
True Skill Statistic:	0.49

Year:	1992
Hits:	3
Misses:	3
False Alarms:	1
Correct Rejections:	359
Climatology:	0.02
Probability of Detection:	0.50
False Alarm Ratio:	0.25
Success Ratio:	0.75
Critical Success Index:	0.43
Bias:	0.67
Gilbert Score:	0.42
Heidke Skill Score:	0.59
True Skill Statistic:	0.50

Year:	1991
Hits:	5
Misses:	12
False Alarms:	2
Correct Rejections:	346
Climatology:	0.05
Probability of Detection:	0.29
False Alarm Ratio:	0.29
Success Ratio:	0.71
Critical Success Index:	0.26
Bias:	0.41
Gilbert Score:	0.25
Heidke Skill Score:	0.40
True Skill Statistic:	0.29

Year:	1990
Hits:	6
Misses:	6
False Alarms:	1
Correct Rejections:	352
Climatology:	0.03
Probability of Detection:	0.50
False Alarm Ratio:	0.14
Success Ratio:	0.86
Critical Success Index:	0.46
Bias:	0.58
Gilbert Score:	0.45
Heidke Skill Score:	0.62
True Skill Statistic:	0.50

Year:	1989
Hits:	3
Misses:	20
False Alarms:	9
Correct Rejections:	333
Climatology:	0.06
Probability of Detection:	0.13
False Alarm Ratio:	0.75
Success Ratio:	0.25
Critical Success Index:	0.09
Bias:	0.52
Gilbert Score:	0.07
Heidke Skill Score:	0.13
True Skill Statistic:	0.10

Year:	1988
Hits:	3
Misses:	7
False Alarms:	4
Correct Rejections:	352
Climatology:	0.03
Probability of Detection:	0.30
False Alarm Ratio:	0.57
Success Ratio:	0.43
Critical Success Index:	0.21
Bias:	0.70

Gilbert Score:	0.20
Heidke Skill Score:	0.34
True Skill Statistic:	0.29

Year:	1987
Hits:	1
Misses:	0
False Alarms:	0
Correct Rejections:	364
Climatology:	0.00
Probability of Detection:	1.00
False Alarm Ratio:	0.00
Success Ratio:	1.00
Critical Success Index:	1.00
Bias:	1.00
Gilbert Score:	1.00
Heidke Skill Score:	1.00
True Skill Statistic:	1.00

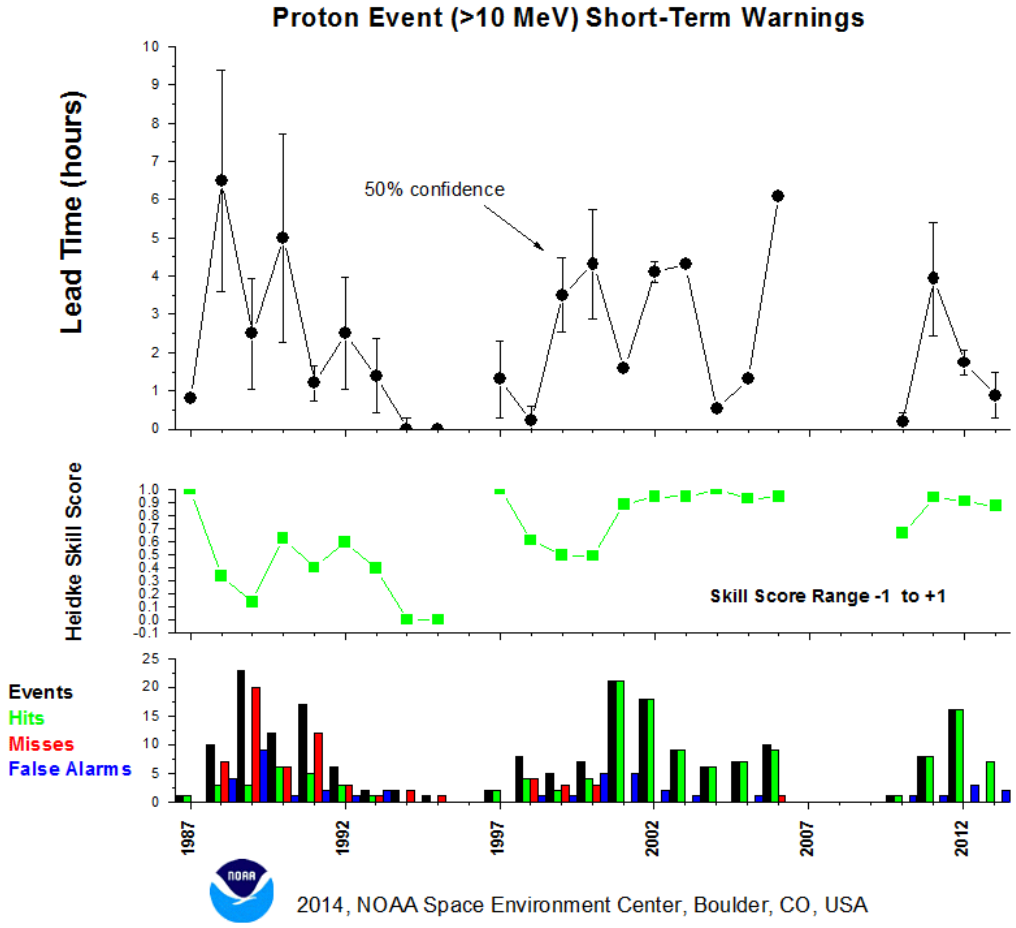
Proton Event Short-Term Warnings (1987-2013)
Contingency Table

Proton Warning Issued	Proton Event Observed: YES	Proton Event Observed: NO
YES	HIT 136	FALSE ALARM 42
NO	MISS 63	Correct Null 9,621

	Statistic	Value
1	Hits	136
2	Misses	63
3	False Alarms	42
4	Bias	0.89
5	Heidke Skill Score	0.72
6	Critical Success Index	0.56
7	Probability of Detection	0.68
8	False Alarm Ratio	0.24
9		
10		
11		
12		

Note: Please see verification glossary for statistics definitions

This 2x2 contingency table summarizes the joint distribution of S1 Proton Event short-term warnings during the period 1987 through 2013. The "Correct Null" value in the table represents the number of days in the period for which no warning was issued and no proton event activity occurred. The summary statistics derived from the contingency table include the Bias (values less than 1 indicate fewer warnings issued than events observed), Heidke skill score (a corrected skill score that accounts for hits due to chance), Critical Success Index (also called the Threat Score), Probability of Detection (POD), and the False Alarm Ratio (FAR). Detailed definitions of these metrics are in the Verification Glossary.



The top graph plots the annual average lead time of S1 Proton Event Short-Term Warnings. Lead time is defined as the time between the warning being issued and when the greater than 10 Mev proton flux at geosynchronous orbit exceeds the 10 pfu event threshold. A missed warning, where a proton event is observed but no warning was issued, is counted as a lead time of 0 minutes. The middle plot shows the annual average of the Heidke skill score. This score ranges from -1 to +1, where all correct warnings give a score of +1, no correct warnings give a score of -1, and no proton event observed or no warnings issued give a score of 0. The bottom histogram plots the annual frequency of proton events observed, warning hits, warning misses, and warning false alarms.