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

<table>
<thead>
<tr>
<th>Year</th>
<th>Hits</th>
<th>Misses</th>
<th>False Alarms</th>
<th>Correct Rejections</th>
<th>Climatology</th>
<th>Probability of Detection</th>
<th>False Alarm Ratio</th>
<th>Success Ratio</th>
<th>Critical Success Index</th>
<th>Bias</th>
<th>Gilbert Score</th>
<th>Heidke Skill Score</th>
<th>True Skill Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
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<td>Year</td>
<td>Hits</td>
<td>Misses</td>
<td>False Alarms</td>
<td>Correct Rejections</td>
<td>Climatology</td>
<td>Probability of Detection</td>
<td>False Alarm Ratio</td>
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</tbody>
</table>
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
<table>
<thead>
<tr>
<th>Year</th>
<th>Hits</th>
<th>Misses</th>
<th>False Alarms</th>
<th>Correct Rejections</th>
<th>Climatology</th>
<th>Probability of Detection</th>
<th>False Alarm Ratio</th>
<th>Success Ratio</th>
<th>Critical Success Index</th>
<th>Bias</th>
<th>Gilbert Score</th>
<th>Heidke Skill Score</th>
<th>True Skill Statistic</th>
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</thead>
<tbody>
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</tbody>
</table>
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
<table>
<thead>
<tr>
<th>Year</th>
<th>Hits</th>
<th>Misses</th>
<th>False Alarms</th>
<th>Correct Rejections</th>
<th>Climatology</th>
<th>Probability of Detection</th>
<th>False Alarm Ratio</th>
<th>Success Ratio</th>
<th>Critical Success Index</th>
<th>Bias</th>
<th>Gilbert Score</th>
<th>Heidke Skill Score</th>
<th>True Skill Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
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</table>
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
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.