G2 (K6) Short Term Warning Verification

The Short-Term G1 Warning is a "high-confidence" notification of geomagnetic activity expected to reach the G2 alert threshold (Kp=6).

G2 (K6) Short Term Warning Statistics Table

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# 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 K6 Short-Term
Warnings
#
# Missing data: -99999
#

Year                        2013
Hits                        9
Misses                      0
False Alarms                3
Correct Rejections          2908
Climatology                 0.00
Probability of Detection    1.00
False Alarm Ratio           0.25
Success Ratio               0.75
Critical Success Index      0.75
Bias                        1.33
Gilbert Score               0.75
Heidke Skill Score          0.86
True Skill Statistic        1.00

Year                        2012
Hits                        16
Misses                      0
False Alarms                9
Correct Rejections          2903
Climatology                 0.01
Probability of Detection    1.00
False Alarm Ratio           0.36
Success Ratio               0.64
Critical Success Index      0.64
Bias                        1.56
Gilbert Score               0.64
Heidke Skill Score          0.78
True Skill Statistic        1.00
```

```
Year                      2011
Hits                       8
Misses                     0
False Alarms               6
Correct Rejections        2906
Climatology                0.00
Probability of Detection   1.00
False Alarm Ratio          0.43
Success Ratio              0.57
Critical Success Index     0.57
Bias                       1.75
Gilbert Score              0.57
Heidke Skill Score         0.73
True Skill Statistic       1.00


Year                      2010
Hits                       2
Misses                     1
False Alarms               3
Correct Rejections        2914
Climatology                0.00
Probability of Detection   0.67
False Alarm Ratio          0.60
Success Ratio              0.40
Critical Success Index     0.33
Bias                       1.67
Gilbert Score              0.33
Heidke Skill Score         0.50
True Skill Statistic       0.67


Year                      2009
Hits                       0
Misses                     0
False Alarms               1
Correct Rejections        2919
Climatology                0.00
Probability of Detection  -99999
False Alarm Ratio          1.00
Success Ratio              0.00
Critical Success Index     0.00
Bias                      -99999
Gilbert Score              0.00
Heidke Skill Score         0.00
True Skill Statistic      -99999
```

```
Year                        2008
Hits                        0
Misses                      1
False Alarms                1
Correct Rejections          2926
Climatology                 0.00
Probability of Detection    0.00
False Alarm Ratio           1.00
Success Ratio               0.00
Critical Success Index      0.00
Bias                        1.00
Gilbert Score               0.00
Heidke Skill Score          0.00
True Skill Statistic        0.00

Year                        2007
Hits                        2
Misses                      2
False Alarms                2
Correct Rejections          2914
Climatology                 0.00
Probability of Detection    0.50
False Alarm Ratio           0.50
Success Ratio               0.50
Critical Success Index      0.33
Bias                        1.00
Gilbert Score               0.33
Heidke Skill Score          0.50
True Skill Statistic        0.50

Year                        2006
Hits                        14
Misses                      6
False Alarms                0
Correct Rejections          2900
Climatology                 0.01
Probability of Detection    0.70
False Alarm Ratio           0
Success Ratio               1.00
Critical Success Index      0.70
Bias                        0.70
Gilbert Score               0.70
Heidke Skill Score          0.82
True Skill Statistic        0.70
```

Year	2005
Hits	28
Misses	13
False Alarms	10
Correct Rejections	2869
Climatology	0.01
Probability of Detection	0.68
False Alarm Ratio	0.26
Success Ratio	0.74
Critical Success Index	0.55
Bias	0.93
Gilbert Score	0.54
Heidke Skill Score	0.71
True Skill Statistic	0.68
Year	2004
Hits	33
Misses	5
False Alarms	8
Correct Rejections	2882
Climatology	0.01
Probability of Detection	0.87
False Alarm Ratio	0.20
Success Ratio	0.81
Critical Success Index	0.72
Bias	1.08
Gilbert Score	0.71
Heidke Skill Score	0.83
True Skill Statistic	0.87
Year	2003
Hits	39
Misses	19
False Alarms	14
Correct Rejections	2848
Climatology	0.02
Probability of Detection	0.67
False Alarm Ratio	0.26
Success Ratio	0.74
Critical Success Index	0.54
Bias	0.91
Gilbert Score	0.54
Heidke Skill Score	0.70
True Skill Statistic	0.67

```
Year                         2002
Hits                         10
Misses                       15
False Alarms                 3
Correct Rejections           2900
Climatology                  0.01
Probability of Detection     0.40
False Alarm Ratio            0.23
Success Ratio                0.77
Critical Success Index       0.36
Bias                         0.52
Gilbert Score                0.36
Heidke Skill Score           0.52
True Skill Statistic         0.40

Year                         2001
Hits                         14
Misses                       3
False Alarms                 6
Correct Rejections           2897
Climatology                  0.01
Probability of Detection     0.82
False Alarm Ratio            0.30
Success Ratio                0.70
Critical Success Index       0.61
Bias                         1.18
Gilbert Score                0.61
Heidke Skill Score           0.76
True Skill Statistic         0.82

Year                         2000
Hits                         13
Misses                       10
False Alarms                 6
Correct Rejections           2899
Climatology                  0.01
Probability of Detection     0.57
False Alarm Ratio            0.32
Success Ratio                0.68
Critical Success Index       0.45
Bias                         0.83
Gilbert Score                0.45
Heidke Skill Score           0.62
True Skill Statistic         0.56
```

Year	1999
Hits	6
Misses	6
False Alarms	0
Correct Rejections	2908
Climatology	0.00
Probability of Detection	0.50
False Alarm Ratio	0.00
Success Ratio	1.00
Critical Success Index	0.50
Bias	0.50
Gilbert Score	0.50
Heidke Skill Score	0.67
True Skill Statistic	0.50

K6 Short-Term Warnings (1999-2013)
Contingency Table

K6 Observed

	YES	NO
K6 Warning Issued YES	HIT 194	FALSE ALARM 72
K6 Warning Issued NO	MISS 81	Correct Null 43,485

	Statistic	Value
1	Hits	194
2	Misses	81
3	False Alarms	72
4	Bias	0.97
5	Heidke Skill Score	0.72
6	Critical Success Index	0.56
7	Probability of Detection	0.70
8	False Alarm Ratio	0.27
9		
10		
11		
12		
13		

Note: Please see verification glossary for statistics definitions

2014, NOAA Space Weather Prediction Center, Boulder, CO, USA

This 2x2 contingency table summarizes the joint distribution of K6 short-term warnings during the period 1999 (when the warning product was first introduced) through 2013. The "Correct Null" value in the table represents the number of 3-hour geomagnetic intervals in the four year period for which no warning was issued and no K6 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.

K6 Short-Term Warnings
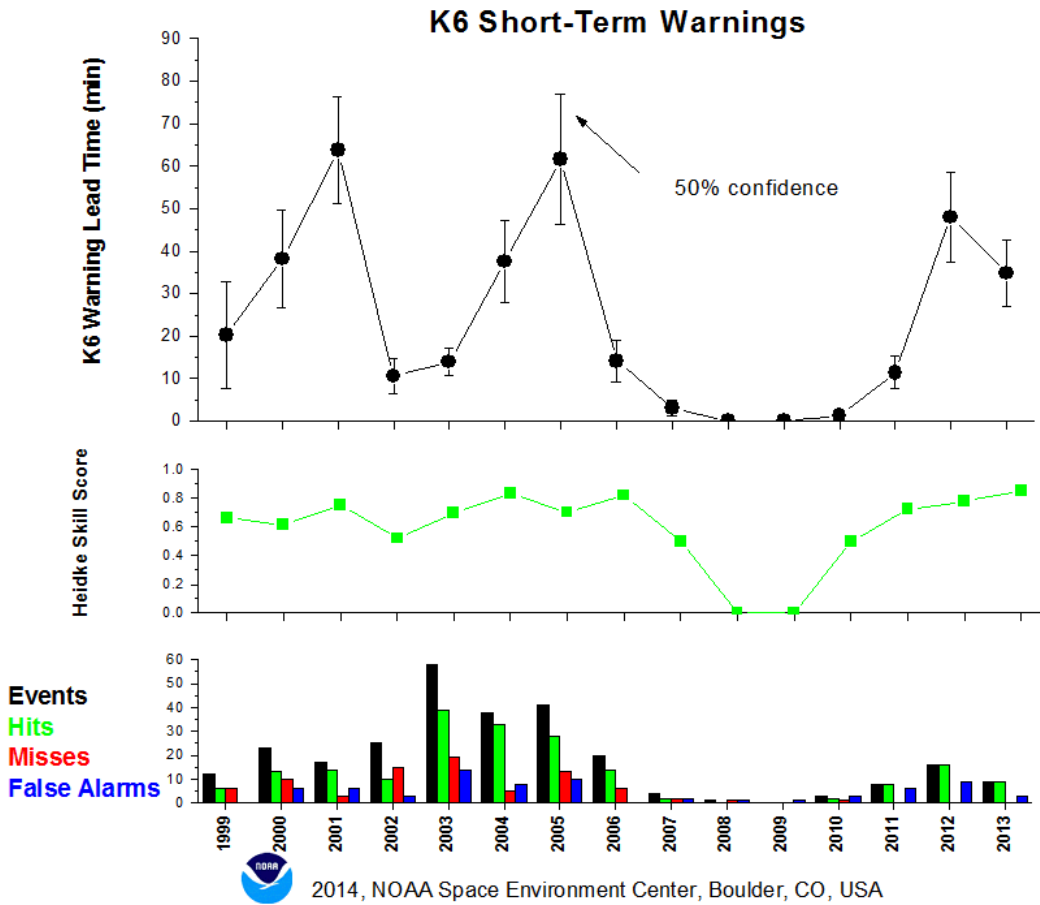
The top graph plots the annual average lead time of K6 Short-Term Warnings. Lead time is defined as the time between the warning being issued and when a K6 is measured at the Boulder magnetometer. A missed warning, where a K6 is observed but no warning was issued, is counted as a lead time of 0 minutes. 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 K6 observed or no warnings issued give a score of 0. The bottom histogram plots the annual frequency of K6 observed, warning hits, warning misses, and warning false alarms. Boulder, Colorado observations were used for K6 warnings prior to 2012 and NOAA estimated Kp was used thereafter. The K6 warning began in 1999 following the availability of continuous real-time solar wind data from the NASA ACE spacecraft.