

S1 Proton Event Forecast Verification

S1 Proton Event forecasts are daily probabilistic forecasts, ranging from 1% (0.01) to 99% (0.99), of the likelihood of a S1 Proton Event occurring within the specified 24-hour day. The event threshold [proton flux](#) is 10 pfu (particle flux units = particles / cm²-s-sr) at greater than 10 MeV as measured by the NOAA GOES spacecraft. Forecast lead times range from one to three days. Verification results are provided on forecasts from July 1986 (the beginning of solar cycle 22) through December 2013.

The proton event forecast was fundamentally changed in Jan 2000. Prior to this date the forecast was for the likelihood (probability) of the >10 MeV proton flux passing the 10 pfu event threshold (event onset). Events already in progress were not counted as events on subsequent days. In Jan 2000 the forecast was changed to be the likelihood that the >10 MeV proton flux would be above the 10 pfu event threshold on a given day. Thus events lasting several days after Jan 2000 constitute proton events on each of the days the event threshold is exceeded, not just on the day of event onset as before Jan 2000.

S1 Proton Event Forecast Statistics Tables

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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 Daily Proton Event Probability Forecasts
#
# Lead Time:           Forecast lead time
# Total Records:      Total number of daily forecast/observation records used to
generate statistic
# Event Days:         Total number of days in the sample on which a proton event
occurred (see note below)
# Mean (f):           Mean forecast
# Mean (x):           Mean observation
# Median (f):         Median forecast
# Std Dev (f):        Standard deviation of forecasts
# Std Dev (x):        Standard deviation of observations
# Std Dev (f-x):      Standard deviation of forecasts minus observations
# Mean (f|x=1):       Mean forecast given the occurrence of an event
# Mean (f|x=0):       Mean forecast given the non-occurrence of an event
# Median (f|x=1):     Median forecast given the occurrence of an event
# Median (f|x=0):     Median forecast given the non-occurrence of an event
# Std Dev (f|x=1):   Standard deviation of forecasts given the occurrence of an
event
# Std Dev (f|x=0):   Standard deviation of forecasts given the non-occurrence
of an event
# Discrimination:     The difference between [Mean (f|x=1)] and [Mean (f|x=0)]
# ME:                 Mean error
# MAE:                 Mean absolute error
# MSE:                 Mean square error
# RMSE:               Root mean square error
# Linear Assoc:       Linear correlation between forecasts and observations
# Skill:              Forecast skill with respect to observed climatology (same
as prediction efficiency)
#
# Missing data:       -99999
#
# Note:               The proton event forecast was fundamentally changed in Jan
2000. Prior to this
#                     the forecast was for the likelihood (probability) of the >10
MeV proton flux passing
#                     the 10 pfu event threshold (event onset). Events already in
progress were not
#                     counted as events on subsequent days. In Jan 2000 the
forecast was changed to
#                     be the likelihood that the >10 proton flux would be above the
10 pfu event threshold
#                     on a given day. Thus events lasting several days now
constitute proton events on each
#                     of the days the event threshold is exceeded, not just on the
day of event onset
#                     as before.
#
```

Forecast Type: Likelihood (probability) of the occurrence of a proton event
Year: 2013
Start: 1/1/13
End: 12/31/13

| Lead Time: | Day 1 | Day 2 | Day 3 |
|------------------|-------|-------|--------|
| Total Records: | 365 | 365 | 365 |
| Events: | 19 | 19 | 19 |
| Mean (f): | 0.069 | 0.058 | 0.049 |
| Mean (x): | 0.052 | 0.052 | 0.052 |
| Median (f): | 0.010 | 0.010 | 0.010 |
| Std Dev (f): | 0.175 | 0.145 | 0.119 |
| Std Dev (x): | 0.222 | 0.222 | 0.222 |
| Std Dev (f-x): | 0.139 | 0.199 | 0.215 |
| Mean (f x=1): | 0.654 | 0.352 | 0.216 |
| Mean (f x=0): | 0.037 | 0.042 | 0.039 |
| Median (f x=1): | 0.750 | 0.150 | 0.010 |
| Median (f x=0): | 0.010 | 0.010 | 0.010 |
| Std Dev (f x=1): | 0.387 | 0.381 | 0.313 |
| Std Dev (f x=0): | 0.069 | 0.097 | 0.091 |
| Discrimination: | 0.617 | 0.310 | 0.177 |
| ME: | 0.017 | 0.006 | -0.004 |
| MAE: | 0.053 | 0.073 | 0.078 |
| MSE: | 0.019 | 0.040 | 0.046 |
| RMSE: | 0.139 | 0.199 | 0.215 |
| Linear Assoc: | 0.782 | 0.477 | 0.330 |
| Skill: | 0.606 | 0.196 | 0.066 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event
Year: 2012
Start: 1/1/12
End: 12/31/12

| Lead Time: | Day 1 | Day 2 | Day 3 |
|------------------|--------|--------|--------|
| Total Records: | 366 | 366 | 366 |
| Event Days: | 39 | 39 | 39 |
| Mean (f): | 0.093 | 0.064 | 0.045 |
| Mean (x): | 0.107 | 0.107 | 0.107 |
| Median (f): | 0.010 | 0.010 | 0.010 |
| Std Dev (f): | 0.234 | 0.171 | 0.108 |
| Std Dev (x): | 0.309 | 0.309 | 0.309 |
| Std Dev (f-x): | 0.191 | 0.254 | 0.281 |
| Mean (f x=1): | 0.623 | 0.346 | 0.177 |
| Mean (f x=0): | 0.029 | 0.030 | 0.029 |
| Median (f x=1): | 0.800 | 0.100 | 0.100 |
| Median (f x=0): | 0.010 | 0.010 | 0.010 |
| Std Dev (f x=1): | 0.395 | 0.385 | 0.204 |
| Std Dev (f x=0): | 0.072 | 0.070 | 0.076 |
| Discrimination: | 0.594 | 0.315 | 0.148 |
| ME: | -0.014 | -0.043 | -0.061 |
| MAE: | 0.066 | 0.097 | 0.114 |
| MSE: | 0.037 | 0.066 | 0.082 |
| RMSE: | 0.192 | 0.257 | 0.287 |
| Linear Assoc: | 0.786 | 0.570 | 0.425 |
| Skill: | 0.614 | 0.305 | 0.135 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event
Year: 2011
Start: 1/1/11

| | | | |
|------------------|----------|--------|--------|
| End: | 12/31/11 | | |
| Lead Time: | Day 1 | Day 2 | Day 3 |
| Total Records: | 365 | 365 | 365 |
| Event Days: | 20 | 20 | 20 |
| Mean (f): | 0.058 | 0.044 | 0.034 |
| Mean (x): | 0.055 | 0.055 | 0.055 |
| Median (f): | 0.010 | 0.010 | 0.010 |
| Std Dev (f): | 0.172 | 0.127 | 0.087 |
| Std Dev (x): | 0.228 | 0.228 | 0.228 |
| Std Dev (f-x): | 0.168 | 0.211 | 0.224 |
| Mean (f x=1): | 0.542 | 0.259 | 0.119 |
| Mean (f x=0): | 0.030 | 0.032 | 0.029 |
| Median (f x=1): | 0.900 | 0.100 | 0.010 |
| Median (f x=0): | 0.010 | 0.010 | 0.010 |
| Std Dev (f x=1): | 0.452 | 0.358 | 0.225 |
| Std Dev (f x=0): | 0.074 | 0.084 | 0.069 |
| Discrimination: | 0.512 | 0.227 | 0.090 |
| ME: | 0.003 | -0.010 | -0.021 |
| MAE: | 0.053 | 0.071 | 0.076 |
| MSE: | 0.028 | 0.044 | 0.050 |
| RMSE: | 0.168 | 0.211 | 0.225 |
| Linear Assoc: | 0.679 | 0.408 | 0.236 |
| Skill: | 0.456 | 0.142 | 0.026 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event

| | | | |
|------------------|----------|--------|--------|
| Year: | 2010 | | |
| Start: | 1/1/10 | | |
| End: | 12/31/10 | | |
| Lead Time: | Day 1 | Day 2 | Day 3 |
| Total Records: | 365 | 365 | 365 |
| Event Days: | 1 | 1 | 1 |
| Mean (f): | 0.011 | 0.011 | 0.011 |
| Mean (x): | 0.003 | 0.003 | 0.003 |
| Median (f): | 0.010 | 0.010 | 0.010 |
| Std Dev (f): | 0.007 | 0.007 | 0.007 |
| Std Dev (x): | 0.052 | 0.052 | 0.052 |
| Std Dev (f-x): | 0.053 | 0.053 | 0.053 |
| Mean (f x=1): | 0.010 | 0.010 | 0.010 |
| Mean (f x=0): | 0.011 | 0.011 | 0.011 |
| Median (f x=1): | -99999 | -99999 | -99999 |
| Median (f x=0): | 0.010 | 0.010 | 0.010 |
| Std Dev (f x=1): | -99999 | -99999 | -99999 |
| Std Dev (f x=0): | 0.007 | 0.007 | 0.007 |
| Discrimination: | -0.001 | -0.001 | -0.001 |
| ME: | 0.008 | 0.008 | 0.008 |
| MAE: | 0.014 | 0.014 | 0.014 |
| MSE: | 0.003 | 0.003 | 0.003 |
| RMSE: | 0.053 | 0.053 | 0.053 |
| Linear Assoc: | -0.007 | -0.007 | -0.007 |
| Skill: | -0.044 | -0.044 | -0.044 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event

| | | | |
|----------------|----------|-------|-------|
| Year: | 2009 | | |
| Start: | 1/1/09 | | |
| End: | 12/31/09 | | |
| Lead Time: | Day 1 | Day 2 | Day 3 |
| Total Records: | 365 | 365 | 365 |

| | | | |
|------------------|--------|--------|--------|
| Event Days: | 0 | 0 | 0 |
| Mean (f): | 0.010 | 0.010 | 0.010 |
| Mean (x): | 0.000 | 0.000 | 0.000 |
| Median (f): | 0.010 | 0.010 | 0.010 |
| Std Dev (f): | 0.000 | 0.000 | 0.000 |
| Std Dev(x): | 0.000 | 0.000 | 0.000 |
| Std Dev (f-x): | 0.000 | 0.000 | 0.000 |
| Mean (f x=1): | -99999 | -99999 | -99999 |
| Mean (f x=0): | 0.010 | 0.010 | 0.010 |
| Median (f x=1): | -99999 | -99999 | -99999 |
| Median (f x=0): | 0.010 | 0.010 | 0.010 |
| Std Dev (f x=1): | -99999 | -99999 | -99999 |
| Std Dev (f x=0): | 0.000 | 0.000 | 0.000 |
| Discrimination: | -99999 | -99999 | -99999 |
| ME: | 0.010 | 0.010 | 0.010 |
| MAE: | 0.010 | 0.010 | 0.010 |
| MSE: | 0.000 | 0.000 | 0.000 |
| RMSE: | 0.010 | 0.010 | 0.010 |
| Linear Assoc: | -99999 | -99999 | -99999 |
| Skill: | -99999 | -99999 | -99999 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event

| | | | |
|------------------|----------|--------|--------|
| Year: | 2008 | | |
| Start: | 1/1/08 | | |
| End: | 12/31/08 | | |
| Lead Time: | Day 1 | Day 2 | Day 3 |
| Total Records: | 366 | 366 | 366 |
| Event Days: | 0 | 0 | 0 |
| Mean (f): | 0.010 | 0.010 | 0.010 |
| Mean (x): | 0.000 | 0.000 | 0.000 |
| Median (f): | 0.010 | 0.010 | 0.010 |
| Std Dev (f): | 0.000 | 0.000 | 0.000 |
| Std Dev(x): | 0.000 | 0.000 | 0.000 |
| Std Dev (f-x): | 0.000 | 0.000 | 0.000 |
| Mean (f x=1): | -99999 | -99999 | -99999 |
| Mean (f x=0): | 0.010 | 0.010 | 0.010 |
| Median (f x=1): | -99999 | -99999 | -99999 |
| Median (f x=0): | 0.010 | 0.010 | 0.010 |
| Std Dev (f x=1): | -99999 | -99999 | -99999 |
| Std Dev (f x=0): | 0.000 | 0.000 | 0.000 |
| Discrimination: | -99999 | -99999 | -99999 |
| ME: | 0.010 | 0.010 | 0.010 |
| MAE: | 0.010 | 0.010 | 0.010 |
| MSE: | 0.000 | 0.000 | 0.000 |
| RMSE: | 0.010 | 0.010 | 0.010 |
| Linear Assoc: | -99999 | -99999 | -99999 |
| Skill: | -99999 | -99999 | -99999 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event

| | | | |
|----------------|----------|-------|-------|
| Year: | 2007 | | |
| Start: | 1/1/07 | | |
| End: | 12/31/07 | | |
| Lead Time: | Day 1 | Day 2 | Day 3 |
| Total Records: | 365 | 365 | 365 |
| Event Days: | 0 | 0 | 0 |
| Mean (f): | 0.012 | 0.012 | 0.012 |
| Mean (x): | 0.000 | 0.000 | 0.000 |

| | | | |
|------------------|--------|--------|--------|
| Median (f): | 0.010 | 0.010 | 0.010 |
| Std Dev (f): | 0.013 | 0.014 | 0.014 |
| Std Dev(x): | 0.000 | 0.000 | 0.000 |
| Std Dev (f-x): | 0.013 | 0.014 | 0.014 |
| Mean (f x=1): | -99999 | -99999 | -99999 |
| Mean (f x=0): | 0.012 | 0.012 | 0.012 |
| Median (f x=1): | -99999 | -99999 | -99999 |
| Median (f x=0): | 0.010 | 0.010 | 0.010 |
| Std Dev (f x=1): | -99999 | -99999 | -99999 |
| Std Dev (f x=0): | 0.013 | 0.014 | 0.014 |
| Discrimination: | -99999 | -99999 | -99999 |
| ME: | 0.012 | 0.012 | 0.012 |
| MAE: | 0.012 | 0.012 | 0.012 |
| MSE: | 0.000 | 0.000 | 0.000 |
| RMSE: | 0.017 | 0.019 | 0.019 |
| Linear Assoc: | -99999 | -99999 | -99999 |
| Skill: | -99999 | -99999 | -99999 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event

Year: 2006

Start: 1/1/06

End: 12/31/06

| Lead Time: | Day 1 | Day 2 | Day 3 |
|------------------|-------|--------|--------|
| Total Records: | 365 | 365 | 365 |
| Event Days: | 10 | 10 | 10 |
| Mean (f): | 0.032 | 0.023 | 0.018 |
| Mean (x): | 0.027 | 0.027 | 0.027 |
| Median (f): | 0.010 | 0.010 | 0.010 |
| Std Dev (f): | 0.131 | 0.087 | 0.061 |
| Std Dev (x): | 0.163 | 0.163 | 0.163 |
| Std Dev (f-x): | 0.066 | 0.109 | 0.146 |
| Mean (f x=1): | 0.752 | 0.430 | 0.187 |
| Mean (f x=0): | 0.011 | 0.011 | 0.013 |
| Median (f x=1): | 0.950 | 0.400 | 0.100 |
| Median (f x=0): | 0.010 | 0.010 | 0.010 |
| Std Dev (f x=1): | 0.310 | 0.327 | 0.223 |
| Std Dev (f x=0): | 0.014 | 0.016 | 0.042 |
| Discrimination: | 0.741 | 0.419 | 0.174 |
| ME: | 0.004 | -0.005 | -0.009 |
| MAE: | 0.018 | 0.027 | 0.035 |
| MSE: | 0.004 | 0.012 | 0.021 |
| RMSE: | 0.066 | 0.109 | 0.146 |
| Linear Assoc: | 0.923 | 0.786 | 0.462 |
| Skill: | 0.837 | 0.553 | 0.203 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event

Year: 2005

Start: 1/1/05

End: 12/31/05

| Lead Time: | Day 1 | Day 2 | Day 3 |
|----------------|-------|-------|-------|
| Total Records: | 365 | 365 | 365 |
| Event Days: | 34 | 34 | 34 |
| Mean (f): | 0.091 | 0.063 | 0.053 |
| Mean (x): | 0.093 | 0.093 | 0.093 |
| Median (f): | 0.010 | 0.010 | 0.010 |
| Std Dev (f): | 0.233 | 0.162 | 0.141 |
| Std Dev (x): | 0.291 | 0.291 | 0.291 |

| | | | |
|------------------|--------|--------|--------|
| Std Dev (f-x): | 0.147 | 0.231 | 0.254 |
| Mean (f x=1): | 0.719 | 0.371 | 0.269 |
| Mean (f x=0): | 0.027 | 0.032 | 0.031 |
| Median (f x=1): | 0.900 | 0.250 | 0.100 |
| Median (f x=0): | 0.010 | 0.010 | 0.010 |
| Std Dev (f x=1): | 0.352 | 0.344 | 0.326 |
| Std Dev (f x=0): | 0.051 | 0.081 | 0.077 |
| Discrimination: | 0.692 | 0.339 | 0.238 |
| ME: | -0.002 | -0.030 | -0.040 |
| MAE: | 0.050 | 0.087 | 0.096 |
| MSE: | 0.022 | 0.054 | 0.066 |
| RMSE: | 0.147 | 0.233 | 0.256 |
| Linear Assoc: | 0.865 | 0.609 | 0.491 |
| Skill: | 0.744 | 0.357 | 0.222 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event

| | | | |
|------------------|----------|--------|--------|
| Year: | 2004 | | |
| Start: | 1/1/04 | | |
| End: | 12/31/04 | | |
| Lead Time: | Day 1 | Day 2 | Day 3 |
| Total Records: | 366 | 366 | 366 |
| Event Days: | 18 | 18 | 18 |
| Mean (f): | 0.061 | 0.036 | 0.032 |
| Mean (x): | 0.049 | 0.049 | 0.049 |
| Median (f): | 0.010 | 0.010 | 0.010 |
| Std Dev (f): | 0.167 | 0.056 | 0.052 |
| Std Dev (x): | 0.217 | 0.217 | 0.217 |
| Std Dev (f-x): | 0.150 | 0.197 | 0.205 |
| Mean (f x=1): | 0.591 | 0.150 | 0.108 |
| Mean (f x=0): | 0.033 | 0.030 | 0.028 |
| Median (f x=1): | 0.900 | 0.150 | 0.150 |
| Median (f x=0): | 0.010 | 0.010 | 0.010 |
| Std Dev (f x=1): | 0.428 | 0.127 | 0.076 |
| Std Dev (f x=0): | 0.070 | 0.042 | 0.047 |
| Discrimination: | 0.558 | 0.120 | 0.080 |
| ME: | 0.012 | -0.013 | -0.017 |
| MAE: | 0.052 | 0.070 | 0.071 |
| MSE: | 0.022 | 0.039 | 0.042 |
| RMSE: | 0.150 | 0.197 | 0.206 |
| Linear Assoc: | 0.724 | 0.464 | 0.335 |
| Skill: | 0.520 | 0.169 | 0.097 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event

| | | | |
|----------------|----------|-------|-------|
| Year: | 2003 | | |
| Start: | 1/1/03 | | |
| End: | 12/31/03 | | |
| Lead Time: | Day 1 | Day 2 | Day 3 |
| Total Records: | 365 | 365 | 365 |
| Event Days: | 22 | 22 | 22 |
| Mean (f): | 0.064 | 0.051 | 0.042 |
| Mean (x): | 0.060 | 0.060 | 0.060 |
| Median (f): | 0.010 | 0.010 | 0.010 |
| Std Dev (f): | 0.170 | 0.127 | 0.091 |
| Std Dev (x): | 0.238 | 0.238 | 0.238 |
| Std Dev (f-x): | 0.164 | 0.179 | 0.190 |
| Mean (f x=1): | 0.549 | 0.389 | 0.281 |
| Mean (f x=0): | 0.033 | 0.030 | 0.027 |

| | | | |
|------------------|-------|--------|--------|
| Median (f x=1): | 0.500 | 0.250 | 0.250 |
| Median (f x=0): | 0.010 | 0.010 | 0.010 |
| Std Dev (f x=1): | 0.415 | 0.325 | 0.231 |
| Std Dev (f x=0): | 0.063 | 0.053 | 0.040 |
| Discrimination: | 0.516 | 0.359 | 0.254 |
| ME: | 0.003 | -0.009 | -0.018 |
| MAE: | 0.058 | 0.065 | 0.069 |
| MSE: | 0.027 | 0.032 | 0.036 |
| RMSE: | 0.164 | 0.179 | 0.191 |
| Linear Assoc: | 0.725 | 0.675 | 0.666 |
| Skill: | 0.526 | 0.434 | 0.357 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event

| | | | |
|------------------|----------|--------|--------|
| Year: | 2002 | | |
| Start: | 1/1/02 | | |
| End: | 12/31/02 | | |
| Lead Time: | Day 1 | Day 2 | Day 3 |
| Total Records: | 365 | 365 | 365 |
| Event Days: | 53 | 53 | 53 |
| Mean (f): | 0.113 | 0.077 | 0.057 |
| Mean (x): | 0.145 | 0.145 | 0.145 |
| Median (f): | 0.050 | 0.050 | 0.050 |
| Std Dev (f): | 0.231 | 0.157 | 0.110 |
| Std Dev (x): | 0.353 | 0.353 | 0.353 |
| Std Dev (f-x): | 0.240 | 0.300 | 0.334 |
| Mean (f x=1): | 0.526 | 0.279 | 0.142 |
| Mean (f x=0): | 0.043 | 0.043 | 0.043 |
| Median (f x=1): | 0.500 | 0.100 | 0.100 |
| Median (f x=0): | 0.050 | 0.050 | 0.050 |
| Std Dev (f x=1): | 0.395 | 0.328 | 0.189 |
| Std Dev (f x=0): | 0.047 | 0.051 | 0.082 |
| Discrimination: | 0.483 | 0.237 | 0.099 |
| ME: | -0.032 | -0.068 | -0.088 |
| MAE: | 0.106 | 0.141 | 0.161 |
| MSE: | 0.058 | 0.094 | 0.119 |
| RMSE: | 0.242 | 0.307 | 0.345 |
| Linear Assoc: | 0.739 | 0.534 | 0.319 |
| Skill: | 0.530 | 0.239 | 0.039 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event

| | | | |
|------------------|----------|-------|-------|
| Year: | 2001 | | |
| Start: | 1/1/01 | | |
| End: | 12/31/01 | | |
| Lead Time: | Day 1 | Day 2 | Day 3 |
| Total Records: | 365 | 365 | 365 |
| Event Days: | 68 | 68 | 68 |
| Mean (f): | 0.174 | 0.114 | 0.088 |
| Mean (x): | 0.186 | 0.186 | 0.186 |
| Median (f): | 0.050 | 0.050 | 0.050 |
| Std Dev (f): | 0.289 | 0.177 | 0.122 |
| Std Dev (x): | 0.390 | 0.390 | 0.390 |
| Std Dev (f-x): | 0.259 | 0.338 | 0.363 |
| Mean (f x=1): | 0.624 | 0.299 | 0.181 |
| Mean (f x=0): | 0.072 | 0.071 | 0.067 |
| Median (f x=1): | 0.900 | 0.150 | 0.100 |
| Median (f x=0): | 0.050 | 0.050 | 0.050 |
| Std Dev (f x=1): | 0.401 | 0.299 | 0.194 |

| | | | |
|------------------|--------|--------|--------|
| Std Dev (f x=0): | 0.094 | 0.093 | 0.085 |
| Discrimination: | 0.552 | 0.228 | 0.114 |
| ME: | -0.012 | -0.072 | -0.098 |
| MAE: | 0.128 | 0.189 | 0.207 |
| MSE: | 0.067 | 0.119 | 0.141 |
| RMSE: | 0.259 | 0.345 | 0.376 |
| Linear Assoc: | 0.746 | 0.501 | 0.366 |
| Skill: | 0.556 | 0.214 | 0.067 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event

Year: 2000
 Start: 1/1/00
 End: 12/31/00

| Lead Time: | Day 1 | Day 2 | Day 3 |
|------------------|-------|--------|--------|
| Total Records: | 366 | 366 | 366 |
| Event Days: | 33 | 33 | 33 |
| Mean (f): | 0.091 | 0.075 | 0.066 |
| Mean (x): | 0.090 | 0.090 | 0.090 |
| Median (f): | 0.050 | 0.050 | 0.050 |
| Std Dev (f): | 0.195 | 0.145 | 0.123 |
| Std Dev (x): | 0.287 | 0.287 | 0.287 |
| Std Dev (f-x): | 0.212 | 0.243 | 0.253 |
| Mean (f x=1): | 0.507 | 0.320 | 0.250 |
| Mean (f x=0): | 0.050 | 0.051 | 0.048 |
| Median (f x=1): | 0.350 | 0.200 | 0.100 |
| Median (f x=0): | 0.050 | 0.050 | 0.050 |
| Std Dev (f x=1): | 0.446 | 0.359 | 0.322 |
| Std Dev (f x=0): | 0.060 | 0.064 | 0.054 |
| Discrimination: | 0.457 | 0.269 | 0.202 |
| ME: | 0.001 | -0.015 | -0.024 |
| MAE: | 0.090 | 0.107 | 0.111 |
| MSE: | 0.045 | 0.059 | 0.064 |
| RMSE: | 0.212 | 0.243 | 0.254 |
| Linear Assoc: | 0.673 | 0.534 | 0.472 |
| Skill: | 0.453 | 0.281 | 0.214 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event

Year: 1999
 Start: 1/1/99
 End: 12/31/99

| Lead Time: | Day 1 | Day 2 | Day 3 |
|------------------|--------|--------|--------|
| Total Records: | 365 | 365 | 365 |
| Event Days: | 5 | 5 | 5 |
| Mean (f): | 0.048 | 0.047 | 0.046 |
| Mean (x): | 0.014 | 0.014 | 0.014 |
| Median (f): | 0.010 | 0.010 | 0.010 |
| Std Dev (f): | 0.055 | 0.057 | 0.058 |
| Std Dev (x): | 0.116 | 0.116 | 0.116 |
| Std Dev (f-x): | 0.131 | 0.132 | 0.132 |
| Mean (f x=1): | 0.026 | 0.018 | 0.026 |
| Mean (f x=0): | 0.048 | 0.047 | 0.047 |
| Median (f x=1): | 0.010 | 0.010 | 0.010 |
| Median (f x=0): | 0.010 | 0.010 | 0.010 |
| Std Dev (f x=1): | 0.022 | 0.018 | 0.022 |
| Std Dev (f x=0): | 0.056 | 0.057 | 0.058 |
| Discrimination: | -0.022 | -0.029 | -0.021 |
| ME: | 0.034 | 0.033 | 0.033 |

| | | | |
|---------------|--------|--------|--------|
| MAE: | 0.061 | 0.060 | 0.059 |
| MSE: | 0.018 | 0.019 | 0.018 |
| RMSE: | 0.135 | 0.136 | 0.136 |
| Linear Assoc: | -0.046 | -0.060 | -0.042 |
| Skill: | -0.355 | -0.377 | -0.365 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event

| | | | |
|------------------|----------|--------|-------|
| Year: | 1998 | | |
| Start: | 1/1/98 | | |
| End: | 12/31/98 | | |
| Lead Time: | Day 1 | Day 2 | Day 3 |
| Total Records: | 365 | 365 | 365 |
| Event Days: | 8 | 8 | 8 |
| Mean (f): | 0.043 | 0.041 | 0.038 |
| Mean (x): | 0.022 | 0.022 | 0.022 |
| Median (f): | 0.010 | 0.010 | 0.010 |
| Std Dev (f): | 0.071 | 0.067 | 0.064 |
| Std Dev (x): | 0.147 | 0.147 | 0.147 |
| Std Dev (f-x): | 0.150 | 0.148 | 0.144 |
| Mean (f x=1): | 0.135 | 0.134 | 0.147 |
| Mean (f x=0): | 0.041 | 0.039 | 0.035 |
| Median (f x=1): | 0.100 | 0.100 | 0.150 |
| Median (f x=0): | 0.010 | 0.010 | 0.010 |
| Std Dev (f x=1): | 0.168 | 0.167 | 0.164 |
| Std Dev (f x=0): | 0.066 | 0.062 | 0.058 |
| Discrimination: | 0.094 | 0.095 | 0.112 |
| ME: | 0.021 | 0.019 | 0.016 |
| MAE: | 0.059 | 0.057 | 0.053 |
| MSE: | 0.023 | 0.022 | 0.021 |
| RMSE: | 0.151 | 0.149 | 0.145 |
| Linear Assoc: | 0.195 | 0.207 | 0.257 |
| Skill: | -0.066 | -0.037 | 0.022 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event

| | | | |
|------------------|----------|-------|-------|
| Year: | 1997 | | |
| Start: | 1/1/97 | | |
| End: | 12/31/97 | | |
| Lead Time: | Day 1 | Day 2 | Day 3 |
| Total Records: | 365 | 365 | 365 |
| Event Days: | 2 | 2 | 2 |
| Mean (f): | 0.014 | 0.014 | 0.014 |
| Mean (x): | 0.005 | 0.005 | 0.005 |
| Median (f): | 0.010 | 0.010 | 0.010 |
| Std Dev (f): | 0.021 | 0.021 | 0.021 |
| Std Dev (x): | 0.074 | 0.074 | 0.074 |
| Std Dev (f-x): | 0.064 | 0.068 | 0.068 |
| Mean (f x=1): | 0.175 | 0.130 | 0.130 |
| Mean (f x=0): | 0.013 | 0.013 | 0.013 |
| Median (f x=1): | 0.250 | 0.250 | 0.250 |
| Median (f x=0): | 0.010 | 0.010 | 0.010 |
| Std Dev (f x=1): | 0.106 | 0.170 | 0.170 |
| Std Dev (f x=0): | 0.016 | 0.017 | 0.017 |
| Discrimination: | 0.162 | 0.117 | 0.117 |
| ME: | 0.008 | 0.008 | 0.008 |
| MAE: | 0.017 | 0.018 | 0.018 |
| MSE: | 0.004 | 0.005 | 0.005 |
| RMSE: | 0.065 | 0.068 | 0.068 |

| | | | |
|---------------|-------|-------|-------|
| Linear Assoc: | 0.572 | 0.414 | 0.412 |
| Skill: | 0.231 | 0.141 | 0.140 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event

| | | | |
|------------------|----------|--------|--------|
| Year: | 1996 | | |
| Start: | 1/1/96 | | |
| End: | 12/31/96 | | |
| Lead Time: | Day 1 | Day 2 | Day 3 |
| Total Records: | 366 | 366 | 366 |
| Event Days: | 0 | 0 | 0 |
| Mean (f): | 0.011 | 0.011 | 0.011 |
| Mean (x): | 0.000 | 0.000 | 0.000 |
| Median (f): | 0.010 | 0.010 | 0.010 |
| Std Dev (f): | 0.009 | 0.007 | 0.007 |
| Std Dev (x): | 0.000 | 0.000 | 0.000 |
| Std Dev (f-x): | 0.009 | 0.007 | 0.007 |
| Mean (f x=1): | -99999 | -99999 | -99999 |
| Mean (f x=0): | 0.011 | 0.011 | 0.011 |
| Median (f x=1): | -99999 | -99999 | -99999 |
| Median (f x=0): | 0.010 | 0.010 | 0.010 |
| Std Dev (f x=1): | -99999 | -99999 | -99999 |
| Std Dev (f x=0): | 0.009 | 0.007 | 0.007 |
| Discrimination: | -99999 | -99999 | -99999 |
| ME: | 0.011 | 0.011 | 0.011 |
| MAE: | 0.011 | 0.011 | 0.011 |
| MSE: | 0.000 | 0.000 | 0.000 |
| RMSE: | 0.014 | 0.013 | 0.013 |
| Linear Assoc: | -99999 | -99999 | -99999 |
| Skill: | -99999 | -99999 | -99999 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event

| | | | |
|------------------|----------|--------|--------|
| Year: | 1995 | | |
| Start: | 1/1/95 | | |
| End: | 12/31/95 | | |
| Lead Time: | Day 1 | Day 2 | Day 3 |
| Total Records: | 365 | 365 | 365 |
| Event Days: | 1 | 1 | 1 |
| Mean (f): | 0.010 | 0.010 | 0.010 |
| Mean (x): | 0.003 | 0.003 | 0.003 |
| Median (f): | 0.010 | 0.010 | 0.010 |
| Std Dev (f): | 0.006 | 0.003 | 0.002 |
| Std Dev (x): | 0.052 | 0.052 | 0.052 |
| Std Dev (f-x): | 0.053 | 0.052 | 0.052 |
| Mean (f x=1): | 0.010 | 0.010 | 0.010 |
| Mean (f x=0): | 0.010 | 0.010 | 0.010 |
| Median (f x=1): | -99999 | -99999 | -99999 |
| Median (f x=0): | 0.010 | 0.010 | 0.010 |
| Std Dev (f x=1): | -99999 | -99999 | -99999 |
| Std Dev (f x=0): | 0.006 | 0.003 | 0.002 |
| Discrimination: | 0.000 | 0.000 | 0.000 |
| ME: | 0.008 | 0.007 | 0.007 |
| MAE: | 0.013 | 0.013 | 0.013 |
| MSE: | 0.003 | 0.003 | 0.003 |
| RMSE: | 0.053 | 0.053 | 0.053 |
| Linear Assoc: | -0.004 | -0.004 | -0.003 |
| Skill: | -0.034 | -0.024 | -0.022 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event
Year: 1994
Start: 1/1/94
End: 12/31/94

| Lead Time: | Day 1 | Day 2 | Day 3 |
|------------------|--------|--------|--------|
| Total Records: | 365 | 365 | 365 |
| Event Days: | 2 | 2 | 2 |
| Mean (f): | 0.012 | 0.012 | 0.012 |
| Mean (x): | 0.005 | 0.005 | 0.005 |
| Median (f): | 0.010 | 0.010 | 0.010 |
| Std Dev (f): | 0.010 | 0.009 | 0.009 |
| Std Dev (x): | 0.074 | 0.074 | 0.074 |
| Std Dev (f-x): | 0.075 | 0.075 | 0.075 |
| Mean (f x=1): | 0.010 | 0.010 | 0.010 |
| Mean (f x=0): | 0.012 | 0.012 | 0.012 |
| Median (f x=1): | 0.010 | 0.010 | 0.010 |
| Median (f x=0): | 0.010 | 0.010 | 0.010 |
| Std Dev (f x=1): | 0.000 | 0.000 | 0.000 |
| Std Dev (f x=0): | 0.010 | 0.009 | 0.009 |
| Discrimination: | -0.002 | -0.002 | -0.002 |
| ME: | 0.007 | 0.006 | 0.006 |
| MAE: | 0.017 | 0.017 | 0.017 |
| MSE: | 0.006 | 0.006 | 0.006 |
| RMSE: | 0.075 | 0.075 | 0.075 |
| Linear Assoc: | -0.016 | -0.015 | -0.015 |
| Skill: | -0.029 | -0.026 | -0.027 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event
Year: 1993
Start: 1/1/93
End: 12/31/93

| Lead Time: | Day 1 | Day 2 | Day 3 |
|------------------|--------|--------|--------|
| Total Records: | 365 | 365 | 365 |
| Event Days: | 2 | 2 | 2 |
| Mean (f): | 0.026 | 0.025 | 0.024 |
| Mean (x): | 0.005 | 0.005 | 0.005 |
| Median (f): | 0.010 | 0.010 | 0.010 |
| Std Dev (f): | 0.043 | 0.041 | 0.040 |
| Std Dev (x): | 0.074 | 0.074 | 0.074 |
| Std Dev (f-x): | 0.077 | 0.078 | 0.077 |
| Mean (f x=1): | 0.150 | 0.130 | 0.130 |
| Mean (f x=0): | 0.025 | 0.025 | 0.024 |
| Median (f x=1): | 0.250 | 0.250 | 0.250 |
| Median (f x=0): | 0.010 | 0.010 | 0.010 |
| Std Dev (f x=1): | 0.141 | 0.170 | 0.170 |
| Std Dev (f x=0): | 0.041 | 0.040 | 0.038 |
| Discrimination: | 0.125 | 0.105 | 0.106 |
| ME: | 0.020 | 0.020 | 0.019 |
| MAE: | 0.030 | 0.029 | 0.028 |
| MSE: | 0.006 | 0.006 | 0.006 |
| RMSE: | 0.080 | 0.080 | 0.079 |
| Linear Assoc: | 0.216 | 0.189 | 0.196 |
| Skill: | -0.161 | -0.173 | -0.146 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event
Year: 1992
Start: 1/1/92

| | | | |
|------------------|----------|--------|--------|
| End: | 12/31/92 | | |
| Lead Time: | Day 1 | Day 2 | Day 3 |
| Total Records: | 366 | 366 | 366 |
| Event Days: | 6 | 6 | 6 |
| Mean (f): | 0.038 | 0.037 | 0.034 |
| Mean (x): | 0.016 | 0.016 | 0.016 |
| Median (f): | 0.010 | 0.010 | 0.010 |
| Std Dev (f): | 0.052 | 0.051 | 0.049 |
| Std Dev (x): | 0.127 | 0.127 | 0.127 |
| Std Dev (f-x): | 0.137 | 0.136 | 0.136 |
| Mean (f x=1): | 0.040 | 0.047 | 0.038 |
| Mean (f x=0): | 0.038 | 0.037 | 0.034 |
| Median (f x=1): | 0.050 | 0.050 | 0.050 |
| Median (f x=0): | 0.010 | 0.010 | 0.010 |
| Std Dev (f x=1): | 0.035 | 0.044 | 0.036 |
| Std Dev (f x=0): | 0.053 | 0.051 | 0.049 |
| Discrimination: | 0.002 | 0.010 | 0.005 |
| ME: | 0.022 | 0.020 | 0.017 |
| MAE: | 0.053 | 0.052 | 0.049 |
| MSE: | 0.019 | 0.019 | 0.019 |
| RMSE: | 0.139 | 0.137 | 0.137 |
| Linear Assoc: | 0.004 | 0.025 | 0.012 |
| Skill: | -0.196 | -0.165 | -0.156 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event

| | | | |
|------------------|----------|--------|--------|
| Year: | 1991 | | |
| Start: | 1/1/91 | | |
| End: | 12/31/91 | | |
| Lead Time: | Day 1 | Day 2 | Day 3 |
| Total Records: | 365 | 365 | 365 |
| Event Days: | 17 | 17 | 17 |
| Mean (f): | 0.117 | 0.111 | 0.107 |
| Mean (x): | 0.047 | 0.047 | 0.047 |
| Median (f): | 0.050 | 0.050 | 0.050 |
| Std Dev (f): | 0.138 | 0.136 | 0.137 |
| Std Dev (x): | 0.211 | 0.211 | 0.211 |
| Std Dev (f-x): | 0.238 | 0.235 | 0.233 |
| Mean (f x=1): | 0.192 | 0.196 | 0.202 |
| Mean (f x=0): | 0.113 | 0.107 | 0.102 |
| Median (f x=1): | 0.200 | 0.200 | 0.100 |
| Median (f x=0): | 0.050 | 0.050 | 0.050 |
| Std Dev (f x=1): | 0.139 | 0.141 | 0.173 |
| Std Dev (f x=0): | 0.137 | 0.135 | 0.133 |
| Discrimination: | 0.079 | 0.089 | 0.100 |
| ME: | 0.070 | 0.065 | 0.060 |
| MAE: | 0.146 | 0.140 | 0.135 |
| MSE: | 0.061 | 0.059 | 0.058 |
| RMSE: | 0.248 | 0.243 | 0.240 |
| Linear Assoc: | 0.121 | 0.139 | 0.155 |
| Skill: | -0.381 | -0.331 | -0.301 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event

| | | | |
|----------------|----------|-------|-------|
| Year: | 1990 | | |
| Start: | 1/1/90 | | |
| End: | 12/31/90 | | |
| Lead Time: | Day 1 | Day 2 | Day 3 |
| Total Records: | 365 | 365 | 365 |

| | | | |
|------------------|--------|--------|--------|
| Event Days: | 12 | 12 | 12 |
| Mean (f): | 0.061 | 0.058 | 0.056 |
| Mean (x): | 0.033 | 0.033 | 0.033 |
| Median (f): | 0.050 | 0.020 | 0.020 |
| Std Dev (f): | 0.072 | 0.071 | 0.070 |
| Std Dev (x): | 0.179 | 0.179 | 0.179 |
| Std Dev (f-x): | 0.187 | 0.187 | 0.185 |
| Mean (f x=1): | 0.091 | 0.087 | 0.095 |
| Mean (f x=0): | 0.060 | 0.057 | 0.055 |
| Median (f x=1): | 0.050 | 0.050 | 0.050 |
| Median (f x=0): | 0.020 | 0.020 | 0.020 |
| Std Dev (f x=1): | 0.097 | 0.099 | 0.118 |
| Std Dev (f x=0): | 0.071 | 0.070 | 0.067 |
| Discrimination: | 0.031 | 0.031 | 0.040 |
| ME: | 0.028 | 0.025 | 0.023 |
| MAE: | 0.087 | 0.085 | 0.083 |
| MSE: | 0.036 | 0.036 | 0.035 |
| RMSE: | 0.189 | 0.188 | 0.186 |
| Linear Assoc: | 0.077 | 0.077 | 0.103 |
| Skill: | -0.126 | -0.117 | -0.089 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event

| | | | |
|------------------|----------|--------|--------|
| Year: | 1989 | | |
| Start: | 1/1/89 | | |
| End: | 12/31/89 | | |
| Lead Time: | Day 1 | Day 2 | Day 3 |
| Total Records: | 365 | 365 | 365 |
| Event Days: | 23 | 23 | 23 |
| Mean (f): | 0.129 | 0.127 | 0.123 |
| Mean (x): | 0.063 | 0.063 | 0.063 |
| Median (f): | 0.100 | 0.100 | 0.100 |
| Std Dev (f): | 0.129 | 0.128 | 0.124 |
| Std Dev (x): | 0.243 | 0.243 | 0.243 |
| Std Dev (f-x): | 0.273 | 0.275 | 0.270 |
| Mean (f x=1): | 0.141 | 0.124 | 0.137 |
| Mean (f x=0): | 0.129 | 0.127 | 0.122 |
| Median (f x=1): | 0.100 | 0.100 | 0.100 |
| Median (f x=0): | 0.100 | 0.100 | 0.100 |
| Std Dev (f x=1): | 0.119 | 0.112 | 0.121 |
| Std Dev (f x=0): | 0.130 | 0.129 | 0.124 |
| Discrimination: | 0.012 | -0.002 | 0.015 |
| ME: | 0.066 | 0.064 | 0.060 |
| MAE: | 0.175 | 0.174 | 0.168 |
| MSE: | 0.079 | 0.080 | 0.076 |
| RMSE: | 0.280 | 0.282 | 0.276 |
| Linear Assoc: | 0.023 | -0.005 | 0.030 |
| Skill: | -0.331 | -0.348 | -0.290 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event

| | | | |
|----------------|----------|-------|-------|
| Year: | 1988 | | |
| Start: | 1/1/88 | | |
| End: | 12/31/88 | | |
| Lead Time: | Day 1 | Day 2 | Day 3 |
| Total Records: | 366 | 366 | 366 |
| Event Days: | 9 | 9 | 9 |
| Mean (f): | 0.078 | 0.074 | 0.072 |
| Mean (x): | 0.025 | 0.025 | 0.025 |

| | | | |
|------------------|--------|--------|--------|
| Median (f): | 0.050 | 0.050 | 0.050 |
| Std Dev (f): | 0.101 | 0.100 | 0.100 |
| Std Dev (x): | 0.155 | 0.155 | 0.155 |
| Std Dev (f-x): | 0.177 | 0.177 | 0.178 |
| Mean (f x=1): | 0.140 | 0.131 | 0.120 |
| Mean (f x=0): | 0.076 | 0.073 | 0.071 |
| Median (f x=1): | 0.100 | 0.100 | 0.150 |
| Median (f x=0): | 0.050 | 0.050 | 0.040 |
| Std Dev (f x=1): | 0.160 | 0.155 | 0.105 |
| Std Dev (f x=0): | 0.099 | 0.098 | 0.099 |
| Discrimination: | 0.064 | 0.058 | 0.049 |
| ME: | 0.053 | 0.050 | 0.047 |
| MAE: | 0.096 | 0.093 | 0.090 |
| MSE: | 0.034 | 0.034 | 0.034 |
| RMSE: | 0.184 | 0.184 | 0.184 |
| Linear Assoc: | 0.098 | 0.090 | 0.077 |
| Skill: | -0.417 | -0.406 | -0.406 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event

Year: 1987
Start: 1/1/87
End: 12/31/87

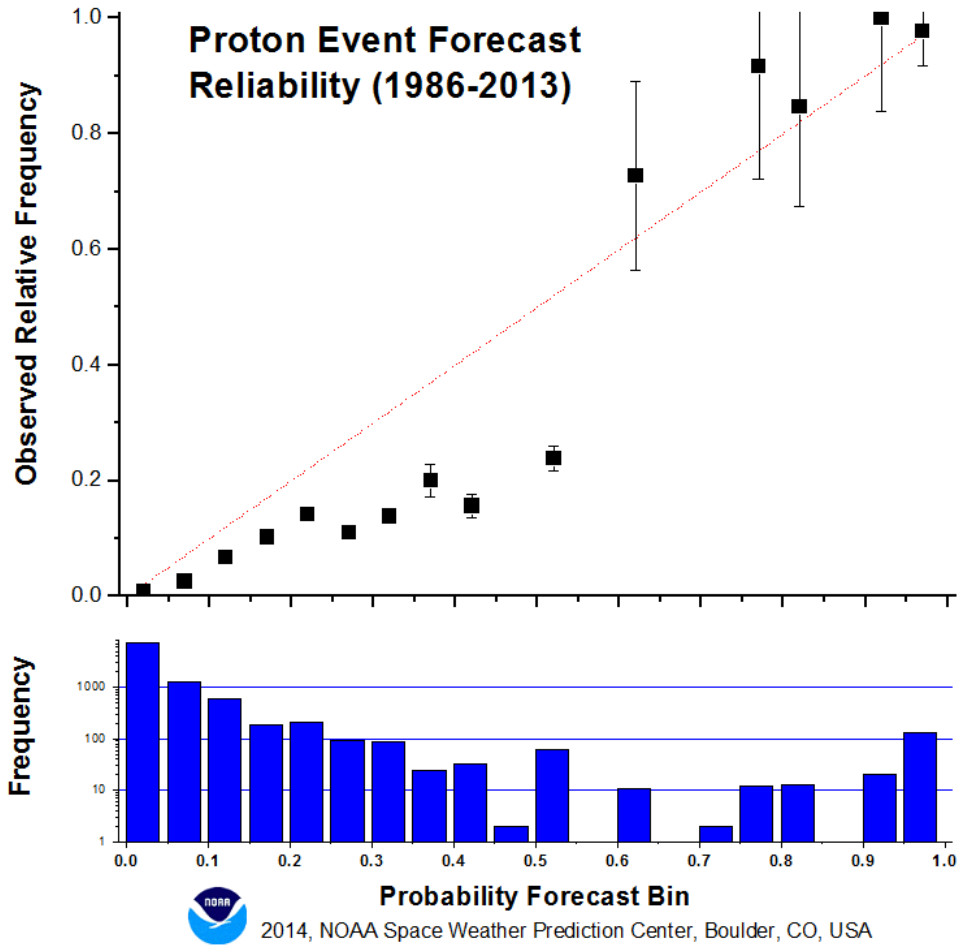
| Lead Time: | Day 1 | Day 2 | Day 3 |
|------------------|--------|--------|--------|
| Total Records: | 365 | 365 | 365 |
| Event Days: | 1 | 1 | 1 |
| Mean (f): | 0.013 | 0.014 | 0.014 |
| Mean (x): | 0.003 | 0.003 | 0.003 |
| Median (f): | 0.010 | 0.010 | 0.010 |
| Std Dev (f): | 0.012 | 0.015 | 0.017 |
| Std Dev (x): | 0.052 | 0.052 | 0.052 |
| Std Dev (f-x): | 0.054 | 0.055 | 0.055 |
| Mean (f x=1): | 0.010 | 0.010 | 0.010 |
| Mean (f x=0): | 0.013 | 0.014 | 0.014 |
| Median (f x=1): | -99999 | -99999 | -99999 |
| Median (f x=0): | 0.010 | 0.010 | 0.010 |
| Std Dev (f x=1): | -99999 | -99999 | -99999 |
| Std Dev (f x=0): | 0.012 | 0.015 | 0.017 |
| Discrimination: | -0.003 | -0.004 | -0.004 |
| ME: | 0.011 | 0.011 | 0.011 |
| MAE: | 0.016 | 0.017 | 0.017 |
| MSE: | 0.003 | 0.003 | 0.003 |
| RMSE: | 0.055 | 0.056 | 0.056 |
| Linear Assoc: | -0.015 | -0.014 | -0.013 |
| Skill: | -0.098 | -0.132 | -0.159 |

Forecast Type: Likelihood (probability) of the occurrence of a proton event

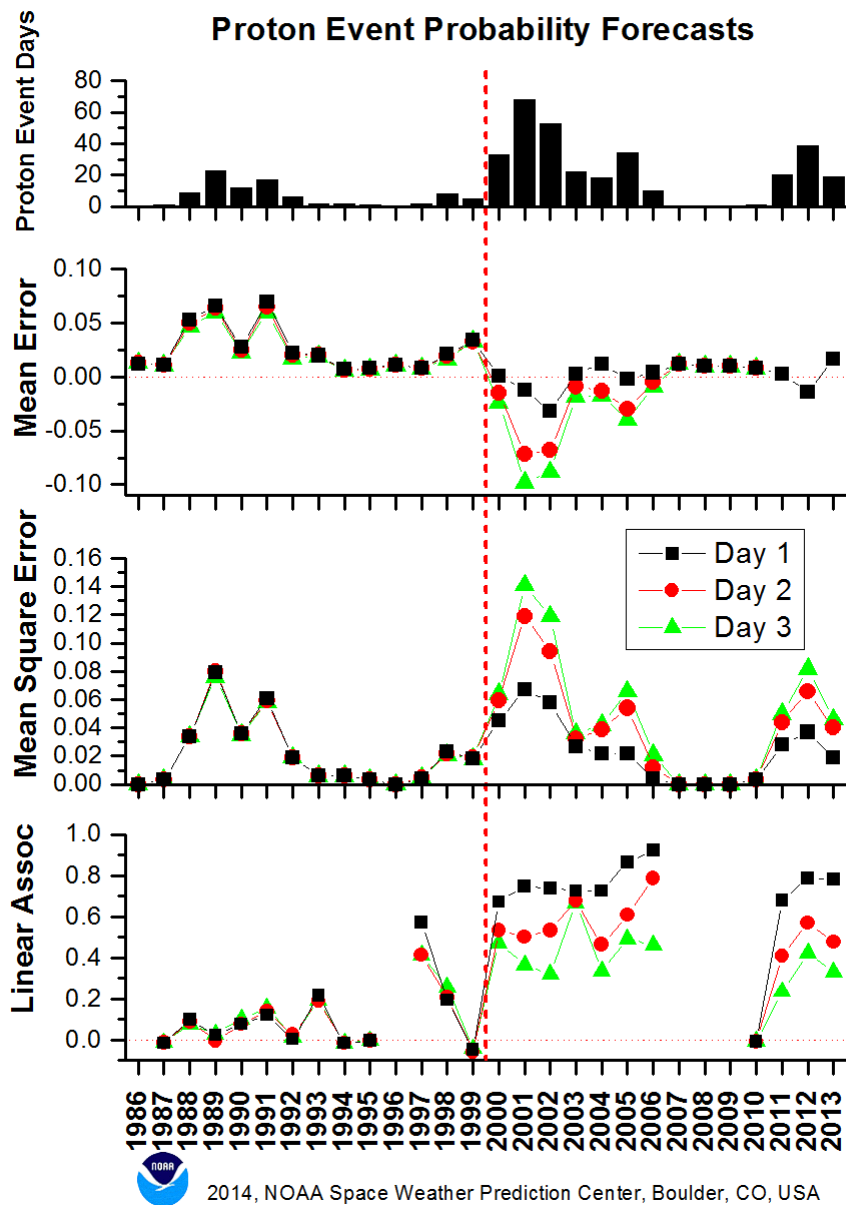
Year: 1986
Start: 7/1/86
End: 12/31/86

| Lead Time: | Day 1 | Day 2 | Day 3 |
|----------------|-------|-------|-------|
| Total Records: | 184 | 184 | 184 |
| Event Days: | 0 | 0 | 0 |
| Mean (f): | 0.012 | 0.013 | 0.013 |
| Mean (x): | 0.000 | 0.000 | 0.000 |
| Median (f): | 0.010 | 0.010 | 0.010 |
| Std Dev (f): | 0.009 | 0.012 | 0.017 |
| Std Dev (x): | 0.000 | 0.000 | 0.000 |

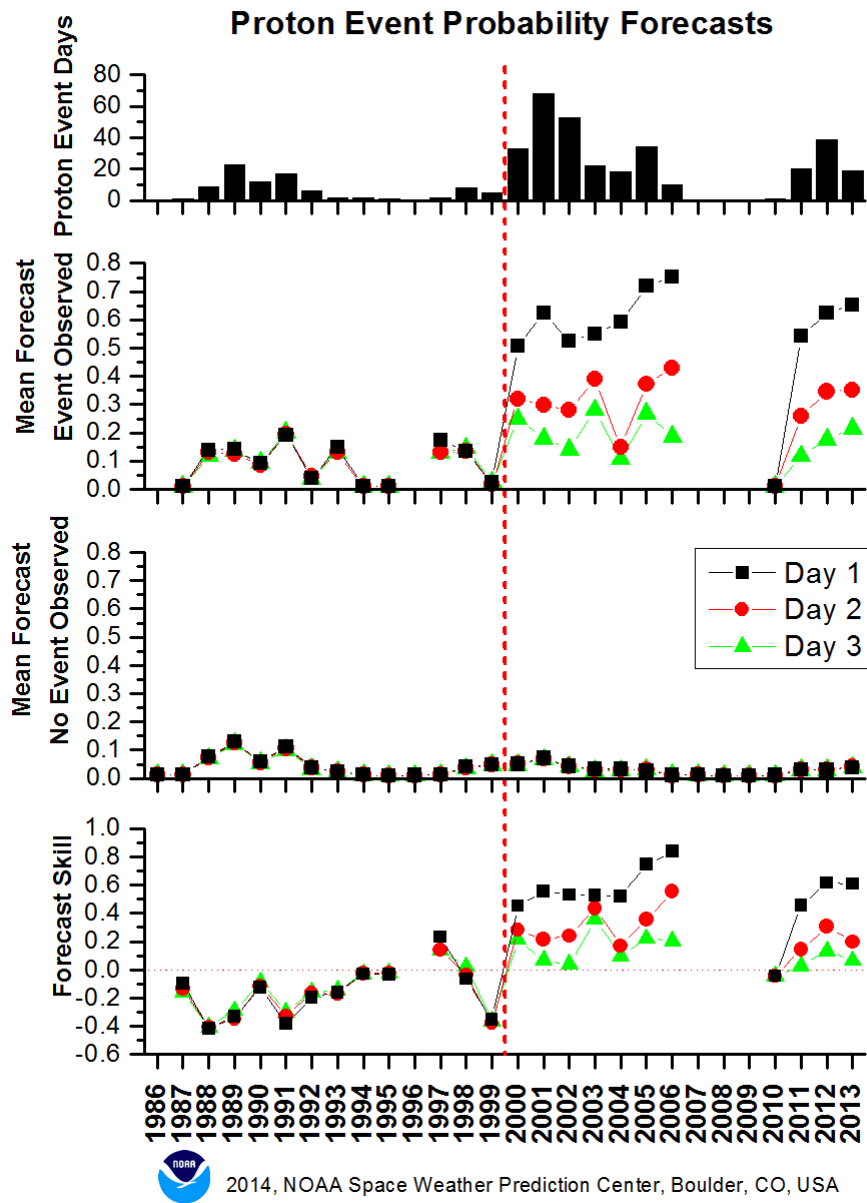
| | | | |
|------------------|--------|--------|--------|
| Std Dev (f-x): | 0.009 | 0.012 | 0.017 |
| Mean (f x=1): | -99999 | -99999 | -99999 |
| Mean (f x=0): | 0.012 | 0.013 | 0.013 |
| Median (f x=1): | -99999 | -99999 | -99999 |
| Median (f x=0): | 0.010 | 0.010 | 0.010 |
| Std Dev (f x=1): | -99999 | -99999 | -99999 |
| Std Dev (f x=0): | 0.009 | 0.012 | 0.017 |
| Discrimination: | -99999 | -99999 | -99999 |
| ME: | 0.012 | 0.013 | 0.013 |
| MAE: | 0.012 | 0.013 | 0.013 |
| MSE: | 0.000 | 0.000 | 0.000 |
| RMSE: | 0.015 | 0.017 | 0.022 |
| Linear Assoc: | -99999 | -99999 | -99999 |
| Skill: | -99999 | -99999 | -99999 |



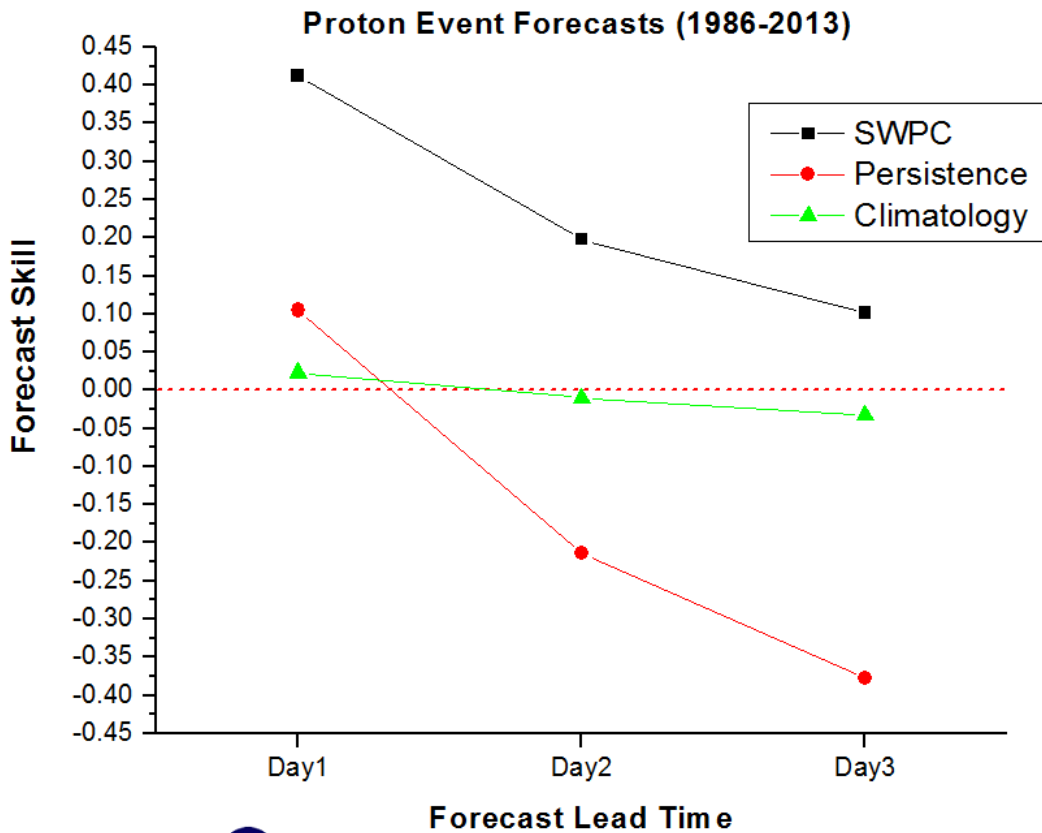
This plot shows the SWPC next-day (1-day lead time) S1 Proton Event forecast "reliability" during the period 1986 to 2013. The top panel plots the observed relative frequency of 10 MeV Proton Events against their corresponding forecasts, grouped in 5% (0.05) bins. The dashed diagonal line represents perfect correspondence. Points falling below the diagonal indicate a tendency of the forecasts within that bin to overpredict the occurrence of Proton Events while points above the diagonal indicate underprediction. The error bars in the top panel correspond to the standard error associated with the number of forecasts in each bin. The number of forecasts in each bin is plotted in the bottom panel histogram. Note that the histogram Y-axis scale is logarithmic.



These plots show the annual trend, from 1986 to 2013, of various verification metrics for S1 Proton Event forecasts with lead times of one to three days. The top panel plots the number of days on which a Proton Event occurred during the year (event climatology), the second panel plots the mean error (or bias) of the forecasts, the third panel shows the mean square error of the forecasts, and the bottom panel displays the linear association (correlation) between the forecasts and observations. The vertical red dashed line marks Jan 2000 when the proton event forecast was changed from event "onset" days to all days for which the proton event 10 pfu threshold was exceeded.



These plots show the annual trend, from 1986 to 2013, of various verification metrics for S1 Proton Event forecasts with lead times of one to three days. The top panel plots the number of days on which a proton event occurred during the year (event climatology), the second panel plots the mean value of the forecasts associated with days on which a proton event occurred, the third panel plots the mean value of the forecasts associated with days on which a proton event did not occur, and the bottom panel displays annual SWPC forecast skill relative to sample climatology forecasts (prediction efficiency). The vertical red dashed line marks Jan 2000 when the proton event forecast was changed from event "onset" days to all days for which the proton event 10 pfu threshold was exceeded.



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

This plot shows SWPC forecast skill as a function of lead-time for S1 Proton Event probability forecasts during the period 1986 to 2013. The skill of forecasts produced by SWPC is compared to that of forecasts produced by short-term (30-day) climatology and 1-day persistence. This skill metric is based on the relative error of the forecasts with respect to constant forecasts of sample climatology (the mean observation during the period) and is sometimes called the “prediction efficiency.” The upper bound for this metric is "one" and there is no lower bound. Negative values indicate no skill above constant forecasts of sample climatology.