

Prepared by the U.S. Dept. of Commerce, NOAA, Space Weather Prediction Center

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### 2013 Verification Statistics for Daily M flare, X flare, and Proton Event Probability Forecasts

Forecast Type: Likelihood (probability) of the occurrence of an M flare, X flare, or Proton Event

Note: Mpred1 = M flare PREDiction day 1  
Mpred2 = M flare PREDiction day 2  
Mevents = Observed number of M flares,  
etc.

Missing data: NA

Total Records: Total number of daily forecast/observation records used to generate statistics  
365

Event Days: Total number of days in the sample on which at least one (M, X, Proton event) occurred

| Mevents | Xevents | Pevents |
|---------|---------|---------|
| 63      | 10      | 21      |

Mean observation

| Mevents | Xevents | Pevents |
|---------|---------|---------|
| 0.17    | 0.027   | 0.058   |

Mean, Median, and Standard Deviation of all forecasts

|        | Mpred1 | Mpred2 | Mpred3 | Xpred1 | Xpred2 | Xpred3 | Ppred1 | Ppred2 | Ppred3 |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| mean   | 0.23   | 0.22   | 0.22   | 0.051  | 0.050  | 0.048  | 0.069  | 0.058  | 0.049  |
| median | 0.15   | 0.15   | 0.15   | 0.010  | 0.010  | 0.010  | 0.010  | 0.010  | 0.010  |
| sd     | 0.19   | 0.19   | 0.19   | 0.085  | 0.084  | 0.084  | 0.175  | 0.145  | 0.119  |

Mean, Median and Standard Deviation of forecast given the non-occurrence ( $f|x=0$ ) of an event

|        | Mpred1 | Mpred2 | Mpred3 | Xpred1 | Xpred2 | Xpred3 | Ppred1 | Ppred2 | Ppred3 |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| mean   | 0.19   | 0.19   | 0.19   | 0.046  | 0.045  | 0.044  | 0.036  | 0.040  | 0.039  |
| median | 0.15   | 0.10   | 0.10   | 0.010  | 0.010  | 0.010  | 0.010  | 0.010  | 0.010  |
| sd     | 0.17   | 0.18   | 0.18   | 0.075  | 0.077  | 0.081  | 0.068  | 0.095  | 0.091  |

Mean, Median and Standard Deviation of forecast given the occurrence ( $f|x=1$ ) of an event

|        | Mpred1 | Mpred2 | Mpred3 | Xpred1 | Xpred2 | Xpred3 | Ppred1 | Ppred2 | Ppred3 |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| mean   | 0.40   | 0.37   | 0.34   | 0.25   | 0.22   | 0.17   | 0.61   | 0.35   | 0.21   |
| median | 0.40   | 0.40   | 0.30   | 0.22   | 0.25   | 0.17   | 0.75   | 0.20   | 0.01   |
| sd     | 0.19   | 0.20   | 0.20   | 0.15   | 0.13   | 0.11   | 0.40   | 0.36   | 0.30   |

Discrimination: The difference between [Mean (f|x=1)] and [Mean (f|x=0)]

| Mpred1 | Mpred2 | Mpred3 | Xpred1 | Xpred2 | Xpred3 | Ppred1 | Ppred2 | Ppred3 |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0.21   | 0.18   | 0.16   | 0.20   | 0.18   | 0.13   | 0.57   | 0.31   | 0.17   |

Linear correlation (r) between forecasts and observations

| Mpred1 | Mpred2 | Mpred3 | Xpred1 | Xpred2 | Xpred3 | Ppred1 | Ppred2 | Ppred3 |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0.41   | 0.35   | 0.31   | 0.39   | 0.34   | 0.25   | 0.76   | 0.49   | 0.33   |

Mean Error, Mean Absolute Error, Mean Square Error, and Root Mean Square Errors of forecasts.

|      | Mpred1 | Mpred2 | Mpred3 | Xpred1 | Xpred2 | Xpred3 | Ppred1 | Ppred2 | Ppred3 |
|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| ME   | 0.057  | 0.27   | 0.14   | 0.024  | 0.065  | 0.027  | 0.011  | 0.076  | 0.05   |
| MAE  | 0.050  | 0.27   | 0.35   | 0.022  | 0.066  | 0.153  | 0.001  | 0.082  | 0.15   |
| MSE  | 0.043  | 0.12   | 0.36   | 0.020  | 0.024  | 0.158  | -0.009 | 0.023  | 0.20   |
| RMSE | 0.264  | 0.13   | 0.37   | 0.065  | 0.025  | 0.165  | 0.056  | 0.042  | 0.22   |

Forecast skill with respect to observed climatology (same as prediction efficiency)

| Mpred1 | Mpred2 | Mpred3 | Xpred1 | Xpred2 | Xpred3 | Ppred1 | Ppred2 | Ppred3 |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0.134  | 0.080  | 0.043  | 0.120  | 0.070  | -0.023 | 0.577  | 0.230  | 0.073  |