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A PRELIMINARY ANALYSIS OF THE NGM MOS FOR REDDING, CALIFORNIA

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Introduction

In mid-November 1992, the National Meteorological Center (NMC) introduced a new Model Output Statistical (MOS) package derived from the Nested Grid Model (NGM). Redding, California was one of the sites for which NGM MOS was generated.

Since this package had no history, forecasters were unable to adjust the output for local effects not resolved by the NGM. This study evaluates the NGM MOS temperature forecasts at Redding for bias and accuracy in an attempt to help forecasters use the output more effectively.

Results

The temperature data generated for Redding, from both the 0000 UTC and 1200 UTC NGM model run, was collected from mid-November 1992 through the end of August 1993. The actual highs and lows for the Redding WSO were also recorded. The data were then rearranged into groups consisting of the actual maximum or minimum temperature and four attendant MOS forecast values. The four values were further grouped according to forecast projection time (12 hours, 24 hours, 36 hours, and 48 hours).

An error value was computed for each forecast. The actual maximum or minimum temperature was subtracted from the forecast value. In this way, a positive error represents too warm of a forecast, and vice versa. All of the error values were sorted by maximum or minimum temperature forecast and length of the forecast projection (12 hours, 24 hours, etc.).

Each subset was averaged to determine bias. Bias is the tendency of the model to forecast consistently too warm or too cold. The errors in a model with a neutral bias will produce an average value close to zero. A warm bias will result in a positive average; likewise, a cold bias results in a negative average.

The four maximum temperature groups showed a pronounced positive (warm) bias as follows: the 12-hour group = 1.09; the 24-hour group = 1.73; the 36-hour group = 1.38; and the 48-hour group = 1.42. The four minimum temperature groups had a neutral bias with no value greater than 1 or less than -1. More specifically the biases for each forecast group were: the 12-hour group = 0.68; the 24-hour group = -0.59; the 36-hour group = 0.09; and the 48-hour group = -0.21.

The absolute average of each subset was taken to establish the accuracy of each forecast group. Accuracy is defined here as the absolute error in the forecasted temperature. Values close to zero indicate a high accuracy. The absolute average was determined by first taking the absolute value of each element in the subset and then averaging them.

The four maximum groups showed a decrease in accuracy with time. The 12-hour group was off by 2.97, while the second was 3.56, the third 3.75, and the fourth was the worst at 4.05. The four minimum groups all had a value near 4 with no trend. Their values from the 12-hour group to the 48-hour group were 3.72, 3.68, 3.78, and 4.02, respectively.

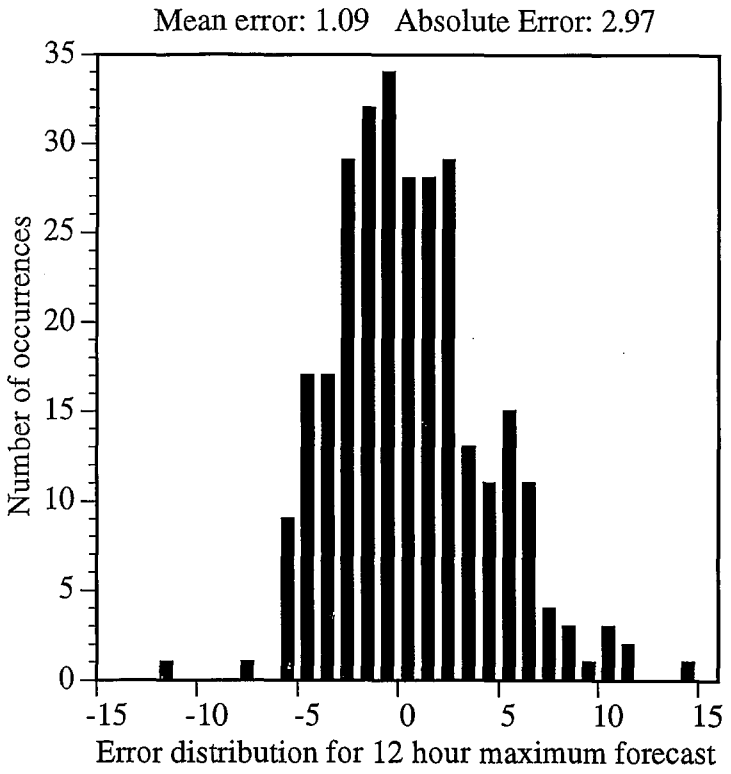
In order to visualize the data, a frequency distribution of the errors was generated for each subset. The distribution was then plotted as a vertical bar graph. Bias can be visualized by how symmetrical the distribution lies around the zero axis. Perfect symmetry indicates no bias. Accuracy is represented by how tightly the error values are clustered around the zero axis. The tighter the clustering, the more accurate the data. Attachment 1 shows the graphs for all eight groupings.

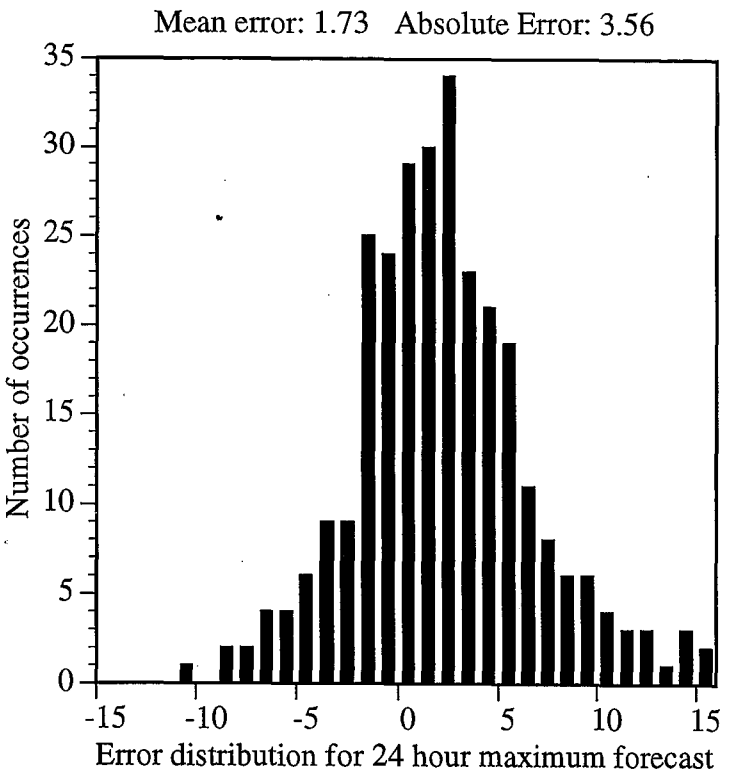
Conclusion

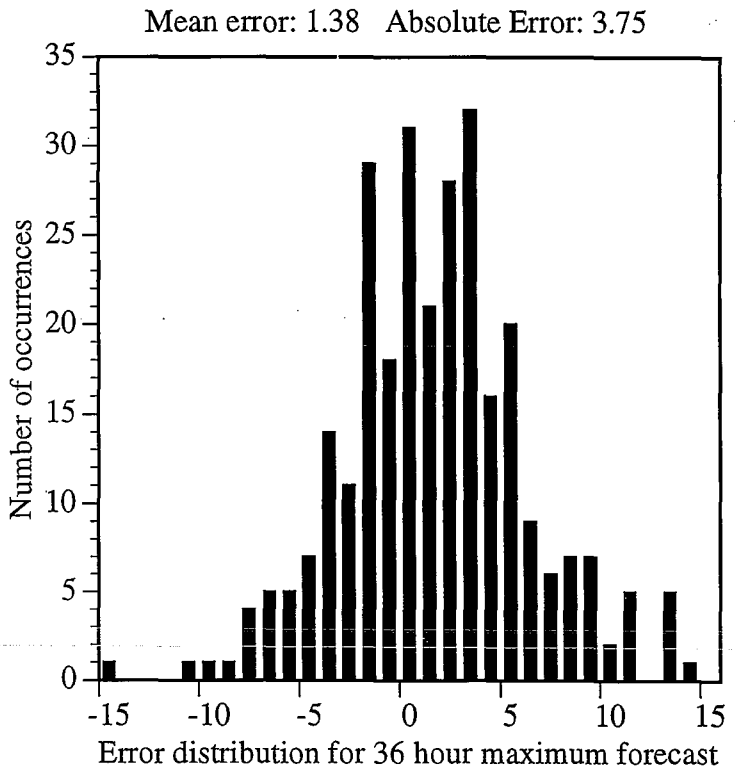
Despite the relatively small data set used for this study (less than one year), several interesting trends began to emerge. The maximum temperatures forecast by the NGM MOS for each period had a definite warm bias and became more inaccurate with time. The minimum temperatures showed little bias and were less accurate than the maximum temperature forecasts in the first two periods. The minimum temperature forecast's accuracy did not change appreciably with time.

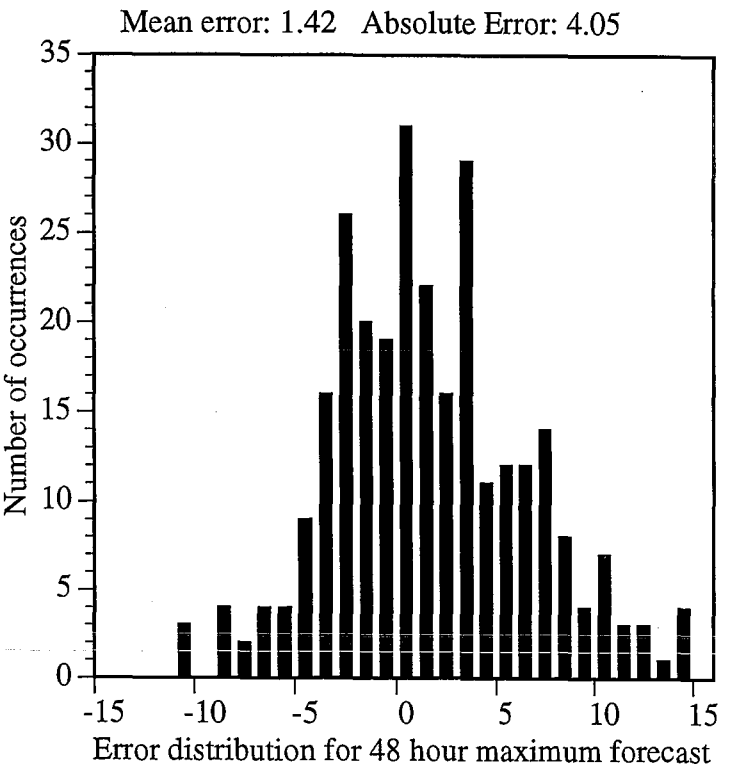
Further studies with a data set encompassing a larger time period are needed to see whether these trends are associated with a particular year or whether the NGM MOS has certain tendencies unique to Redding. Also, it would be interesting to know if similar trends showed up for other FWC sites during the same time period, which would indicate whether these problems are local or are inherent within the model as a whole.

Frequency distribution of NGM MOS forecast maximum errors at WSO RDD









Frequency distribution of NGM MOS forecast minimum errors at WSO RDD