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AFOS-ERA VERIFICATION OF GUIDANCE AND LOCAL AVIATION/PUBLIC WEATHER FORECASTS--NO. 1 (OCTOBER 1983-MARCH 1984)

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1. INTRODUCTION

This is the first in a new series of Techniques Development Laboratory (TDL) office notes which compare the performance of TDL's automated guidance with National Weather Service (NWS) local forecasts made at Weather Service Forecast Offices (WSFO's). All of the forecasts (both local and guidance) were collected locally at the WSFO's, transmitted via the Automation of Field Operations and Services (AFOS) system to the National Meteorological Center, and archived centrally by TDL. The local collection system is described by Heffernan et al. (1983), while guidelines for the public/aviation forecast verification program are given in National Weather Service (1983a).

In this report, we present verification statistics for the cool season months of October 1983 through March 1984 for probability of precipitation (PoP), precipitation type (rain, freezing rain, or snow), surface wind, cloud amount, ceiling height, visibility, and maximum/minimum (max/min) temperature. Snow amount forecast verification results are not available for the 1983-84 cool season due to a problem with the local AFOS software which decodes the synoptic reports. Verification summaries are provided for both forecast cycles, 0000 and 1200 GMT. The scores are those recommended in the NWS National Verification Plan (National Weather Service, 1982a).

The local public weather PoP and max/min forecasts used for this verification were official forecasts obtained from the Coded City Forecast (FPUS4) bulletin. All of the local aviation weather forecasts (except for precipitation type and cloud amount) were obtained from NWS official terminal forecasts (FT's). The local precipitation type and cloud amount forecasts were manually entered by the forecasters at the WSFO's. The local subjective forecasts may or may not be based on the objective guidance. Also, surface observations as late as 2 hours before the first valid forecast time may have been used in preparation of the local forecasts.

The automated guidance was based on forecast equations developed through application of the Model Output Statistics (MOS) technique (Glahn and Lowry, 1972). In particular, these prediction equations were derived by using archived surface observations and forecast fields from the Limited-area Fine Mesh (LFM) model (Gerrity, 1977; Newell and Deaven, 1981; National Weather Service, 1981a). The surface observations used in these equations were taken at least 9 hours before the first verification valid time.

As noted in the sections which follow for each of the various weather elements, implementation of the new AFOS-era verification system has introduced significant changes from past verifications in regard to the characteristics of the local forecasts and verifying observations. For example, the max/min temperature forecasts are now being verified by using max/min temperatures observed during 12-h instead of 24-h (calendar day) periods. Also, the cloud amount observations are given in terms of total sky cover rather than opaque sky cover. Many other changes are associated with obtaining the local forecasts from the FT's. Hence, in most cases, we do not think it is meaningful to compare results for the 1983-84 cool season with those for prior years which were based on the pre-AFOS verification system (e.g., Carter et al., 1983).

2. PROBABILITY OF PRECIPITATION

MOS PoP forecasts were produced by the cool season prediction equations described in Technical Procedures Bulletin No. 289 (National Weather Service, 1980b). This guidance was available for the first, second, and third periods, which correspond to 12-24, 24-36, and 36-48 hours, respectively, after 0000 and 1200 GMT. The predictors for the equation development were forecast fields from the LFM model and weather elements observed at the forecast site at 0300 or 1500 GMT. However, because of time restraints in day-to-day operations, surface observations at 0200 or 1400 GMT are used as input to the prediction equations about 50% of the time.

The forecasts were verified by computing Brier scores (Brier, 1950) for 93 of the 94 stations listed in Table 2.1. Please note that we used the standard NWS Brier score for PoP which is one-half the original score defined by Brier. Brier scores will vary from one station to the next and from one year to the next because of changes in the relative frequency of precipitation. In particular, the scores usually are better for periods of below normal precipitation. Therefore, we also computed the percent improvement over climate, that is, the percent improvement of Brier scores obtained from the local or guidance forecasts over analogous Brier scores produced by climatic forecasts. Climatic forecasts are defined as relative frequencies of precipitation by month and by station determined from a 15-yr sample (Jorgensen, 1967). Because local forecasters should be encouraged to depart from the guidance if they have reason to believe it is incorrect, the number of times local forecasters deviated from the guidance and the percent of these changes that were in the correct direction also were tabulated.

Tables 2.2 and 2.7 present the 1983-84 results for all 93 stations combined for the 0000 and 1200 GMT cycle forecasts, respectively. Tables 2.3-2.6 and Tables 2.8-2.11 show scores for the NWS Eastern, Southern, Central, and Western Regions, for the 0000 and 1200 GMT cycles, respectively. Comparison of the overall Brier scores and improvements over climate in Table 2.2 indicates the 0000 GMT cycle local forecasts were better than the guidance for all three periods. Local forecasters deviated from the guidance nearly 60% of the time and were correct when they did so 62%, 61%, and 57% of the time for the first, second, and third periods, respectively. On the regional level for the 0000 GMT cycle (Tables 2.3-2.6), with the exception of the third period forecasts for the Eastern and Central Regions, the local forecasts for all regions and periods were as good as, or better than, the guidance. Overall, as shown in Table 2.7, the 1200 GMT cycle local forecasts also were better than the guidance for all three periods. Local forecasters deviated from the guidance nearly 60% of the time and were correct when they did so 65%, 56%, and 62% of the time for the first, second, and third periods from 1200 GMT, respectively. Regionally (Tables 2.8-2.11), with the exceptions of the second period Eastern

Region and the third period Central Region forecasts, the local forecasts for all regions and periods were better than the guidance.

In terms of percent improvement over climate, the local and guidance forecasts for the 0000 GMT cycle were worse than the 1982-83 cool season (Carter et al., 1983) forecasts for the first and third periods, but better for the second period. For the 1200 GMT cycle, the 1983-84 forecasts were better than those for the previous cool season for the first and third period, but worse for the second period.

3. PRECIPITATION TYPE

The objective conditional probability of precipitation type (PoPT) forecast system described in Technical Procedures Bulletin No. 319 (National Weather Service, 1982b) and Bocchieri and Maglaras (1983) provides categorical forecasts for three categories: frozen (snow or ice pellets), freezing (freezing rain or drizzle), and liquid (rain). Precipitation in the form of mixed snow and ice pellets is included in the frozen category; any mixed precipitation type that includes freezing rain or drizzle is included in the freezing category; all other mixed precipitation types are included in the liquid category. In this report, the frozen, freezing, and liquid categories will be referred to as snow, freezing rain, and rain, respectively.

For verification purposes, local categorical forecasts of precipitation type are given for the 18-, 30-, and 42-h projections from 0000 and 1200 GMT. Note, this is a conditional forecast, that is, it's a forecast of the type of precipitation if precipitation actually occurs. Therefore, a precipitation type forecast is always recorded. Similarly, the PoPT guidance forecasts are conditional and are available whether or not precipitation occurs.

Table 3.1 lists the 86 stations used for the precipitation type verification. The sample included only those cases in which precipitation actually occurred either at or within ± 1 hour of the forecast valid time. Also, since we were concerned that some forecasters may not have put much effort into making the conditional forecasts when they considered precipitation to be unlikely, we used cases only when the local PoP was $\geq 30\%$. The PoP forecasts were valid for 12-h periods centered on the 18-, 30-, and 42-h projections from both 0000 and 1200 GMT.

Tables 3.2 and 3.3 show the contingency tables for the three categories of precipitation type for the local and guidance forecasts for the 18-, 30-, and 42-h projections from 0000 and 1200 GMT, respectively. From these tables, bias by category,[1] probability of detection (POD),[2] false alarm ratio (FAR),[3] skill

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[1]In the discussion of precipitation type, surface wind, opaque sky cover, ceiling height, and visibility, bias by category refers to the number of forecasts of a particular category (event) divided by the number of observations of that category. A value of 1.0 denotes unbiased forecasts for a particular category.

[2]The POD is the ratio of the number of times a particular category was correctly forecast to the total number of observations of that category.

[3]The FAR is the ratio of the number of times a particular category was incorrectly forecast to the total number of forecasts of that category.

score,[4] and percent correct were calculated. Tables 3.4 and 3.5 show the verification results for 0000 and 1200 GMT, respectively. The bias by category, POD, and FAR scores for freezing rain are shown but will not be mentioned in this discussion because of the small number of cases. For the 0000 GMT cycle (Table 3.4), the results in terms of percent correct and skill score for all stations combined indicate the local forecasts were better than the guidance for all three projections. In terms of bias by category, POD, and FAR, the comparisons varied from projection to projection, but the overall quality of the local and guidance forecasts was about the same. The 1200 GMT verification results for all stations combined (Table 3.5) indicate that, in terms of percent correct and skill score, the local forecasts were as good as the guidance for the 18-h projection, better than the guidance for the 30-h projection, and slightly worse than the guidance for the 42-h projection. In terms of bias by category, POD, and FAR, the results were similar to those for the 0000 GMT cycle which showed there was little difference overall between local and guidance forecasts.

4. SURFACE WIND

The objective surface wind forecasts were generated by the cool season, LFM-based equations described in Technical Procedures Bulletin No. 335 (National Weather Service, 1983b). Prior to the 1983-84 cool season, the surface wind prediction equations were rederived in order to take into account the most recent data available from the LFM model.

We verified the 12-, 18-, and 30-h forecasts from both 0000 and 1200 GMT. The objective surface wind forecast is defined in the same way as the observed wind, namely, the 1-min average wind direction and speed for a specific time. All objective forecasts of wind speed were adjusted by an "inflation" technique (Klein et al., 1959) involving the multiple correlation coefficient and the mean value of wind speed for each particular station and forecast valid time.

The local forecasts were obtained from the FT's. Since the FT's do not mention wind if the speed is expected to be less than 10 knots, the wind forecasts were verified in two ways. First, for all those cases where the FT's specified wind and for which the MOS speed forecasts were at least 10 knots, the mean absolute error (MAE) and the mean algebraic error of the speed forecasts were computed. Cases where the observed wind was calm were then eliminated from this sample and the MAE of direction was computed. Second, for all cases where both the FT's and the MOS forecasts were available, skill score, percent correct, bias by category, and the threat score[5] were computed from contingency tables of wind speed.

The threat score used here was calculated by combining events of the upper two categories. In addition, for all cases in which the wind speeds (forecasts and/or corresponding observations) were at least 10 knots, the skill score for

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[4]The skill score used throughout this report is the Heidke skill score (Panofsky and Brier, 1965).

[5]Threat score = H/(F+O-H) where H is the number of correct forecasts of a category, and F and O are the number of forecasts and observations of that category, respectively.

the wind direction forecasts was computed from contingency tables. The definitions of the categories used in the contingency tables for wind speed and direction are given in Table 4.1. The stations used in the verification are listed in Table 2.1.

It is important to note that several fundamental differences exist between the objective MOS forecasts and the local forecasts obtained from the FT's. In particular, the FT's are not as precise in regard to valid time as are the objective forecasts. Also, the 30-h local forecasts are different than the FT's issued for earlier time periods in that they are obtained from the last forecast group before the outlook period which corresponds to a 27- or 28-h projection depending on the time zone. Another point that needs to be considered is the nature of the wind forecast as it is given in the FT. It is unclear whether aviation forecasters tend to concentrate on a specific extreme wind or on an average wind over the forecast period. In this respect, an additional comparison was made between the objective and local forecasts using the highest observed wind within ±3 hours surrounding the verification time. Since the comparative results were similar to the results using the single observation at the verification time, they will not be presented here. Due to these and other possible differences between the MOS forecasts and local forecasts as obtained from the FT's, only conclusions of a general nature should be drawn from these verification statistics.

In addition, 42-h forecasts of winds ≥22 knots were collected as part of the AFOS-era verification system. The local forecasts were manually entered by forecasters at the WSFO's. However, the initial 6 months of this verification program did not result in a sufficient sample of 42-h forecasts for a meaningful comparative verification. We think this situation will improve as the local forecasters become more familiar with the new system.

The results for all 93 (94) stations combined for the 0000 (1200) GMT cycles are presented in Tables 4.2-4.4 (Tables 4.9-4.11). The direction MAE's and skill scores for the 0000 and 1200 GMT cycles, as given in Tables 4.2 and 4.9, show the local forecasters were superior to the guidance at the 12-h projection. In contrast, the guidance was better than the locals for both the 18- and 30-h projections. The speed MAE's, skill scores, and percents correct generally indicate the guidance was superior to the locals, except for the 12-h projection after 0000 GMT. The speed bias by category values in Tables 4.2 and 4.9 and the contingency tables in Tables 4.4 and 4.11, show the guidance overestimated winds stronger than 22 knots (i.e., categories 4, 5, and 6) for all three forecast projections, whereas the local forecasts underestimated speeds in these categories. This bias appears to be more pronounced for the 0000 GMT cycle scores. In terms of threat score for categories 5 and 6 combined, the local forecasters were superior to the guidance for the 12- and 18-h projections after both 0000 and 1200 GMT; the guidance was better at the 30-h projection.

Tables 4.5-4.8 and 4.12-4.15 show scores for the NWS Eastern, Southern, Central, and Western Regions, for 0000 and 1200 GMT, respectively. The regional comparisons generally have the same characteristics as for the entire group of stations. However, the advantage of the guidance over the local forecasts at 18 and 30 hours is less for the Western Region.

5. CLOUD AMOUNT

During the 1983-84 cool season, the opaque sky cover forecasts were produced by the prediction equations described in Technical Procedures Bulletin No. 303 (National Weather Service, 1981b). These regional, generalized-operator equations used LFM model output and 0300 (1500) GMT surface observations to produce probability forecasts of the four categories of cloud amount shown in Table 5.1. We converted the probability estimates to "best category" forecasts in a manner which produced good bias characteristics, that is, a bias value of approximately 1.0 for each category. The threshold technique described in Technical Procedures Bulletin No. 303 was used to obtain the best category.

We compared the local forecasts with a matched sample of MOS guidance forecasts for the 88 (86) stations listed in Table 2.1 for the 12-, 18-, and 24-h forecast projections from 0000 (1200) GMT. The local forecasts and the surface observations used for verification were converted to the cloud amount categories given in Table 5.1. Four-category (clear, scattered, broken, and overcast), forecast-observed contingency tables were prepared from the local and objective categorical predictions. Using these tables, we computed the percent correct, skill score, and bias by category. In past verifications only opaque sky cover amounts from surface observations were used in determining the observed categories. However, the hourly surface reports which are used now do not include the total opaque sky cover as part of the observation; hence, thin clouds also must be taken into account. For example, a report of overcast with eight tenths opaque and two tenths thin was put in the broken category previously, but now this report is categorized as overcast. The result of this change is to decrease (increase) the number of observations of the broken (overcast) category compared to previous verifications. This change has greatly affected the overall bias by category results for the guidance.

The results for all stations combined are shown in Tables 5.2 and 5.7 for the 0000 and 1200 GMT cycle forecasts, respectively. In terms of skill score, the 0000 GMT cycle local forecasts did better than the guidance for all three projections and were better than the guidance for the 12- and 18-h projections in terms of percent correct. Examination of the bias by category scores shows that the guidance forecasts were better (i.e., closer to 1.0) than the locals for most projections and categories. The bias results for the broken category for local and guidance forecasts were extremely poor; most likely, this was because of the changes in the verification process which were mentioned before. For 1200 GMT (Table 5.7), the local forecasts were better than, equal to, and worse than the guidance in terms of percent correct for the 12-, 18-, and 24-h projections, respectively. In regard to skill score, the local forecasts were better than the guidance for the 12- and 18-h projections. Again, the bias by category scores show that the guidance was better overall, and the results for the broken category were poor for both the local and guidance forecasts.

Tables 5.3-5.6 and Tables 5.8-5.11 show scores for the NWS Eastern, Southern, Central, and Western Regions, for the 0000 and 1200 GMT cycles, respectively. For both cycles, the scores varied from region to region, but in general followed the same trend as the overall results for each cycle.

6. CEILING AND VISIBILITY

During the 1983-84 cool season, the ceiling and visibility guidance was produced by the prediction equations described in Technical Procedures Bulletin No. 303 (National Weather Service, 1981b). Operationally, the guidance was based primarily on LFM model output and 0300 (1500) GMT surface observations.

Verification scores were computed for both local and guidance forecasts for the stations listed in Table 2.1. The local forecasts were obtained from the FT's. Persistence based on an observation taken at 0900 (2100) GMT for the 0000 (1200) GMT forecast cycle was used as a standard of comparison. The objective forecasts were verified for both cycles for 12-, 18-, and 24-h projections. The local and persistence forecasts were verified for 12-, 15-, 18-, and 24-h projections from 0000 and 1200 GMT. On station, the guidance and persistence observations usually were available in time for preparation of the local forecasts. As was the case for surface wind, the local ceiling and visibility forecasts from the FT's are not given for a specific valid time. Hence any comparisons with the results for the objective forecasts must be of a very general nature.

We constructed forecast-observed contingency tables for the four categories of ceiling and visibility given in Table 6.1. These categories were used for computing several different scores: bias by category, percent correct, skill score, and log score.[6] We have summarized the results in Tables 6.2-6.5. It should be noted that the persistence and local forecasts for the 12-, 15-, 18-, and 24-h projections are actually 3-, 6-, 9-, and 15-h forecasts, respectively, from the latest available surface observation, and in this sense, the guidance forecasts for the 12-, 18-, and 24-h projections are actually 9-, 15-, and 21-h forecasts.

Tables 6.2 and 6.4 show the scores for the ceiling forecasts from 0000 and 1200 GMT, respectively. In terms of log score, skill score, and percent correct, the 0000 GMT cycle local forecasts were better than persistence forecasts for all four projections, and better than the guidance forecasts for the 12- and 18-h projections (guidance forecasts are not available for the 15-h projection). Also, the persistence forecasts were better than the guidance for the 12-h projection. The 1200 GMT cycle comparisons among the three forecast systems were similar to those for the 0000 GMT cycle, except the local forecasts were also slightly better than the guidance for the 24-h projection. In addition, the persistence forecasts were better than the 1200 GMT cycle guidance for both the 12- and 18-h projections. In terms of bias by category, the guidance forecasts had the best overall scores for both cycles.

Tables 6.3 and 6.5 show the scores for the visibility forecasts for the 0000 and 1200 GMT cycle, respectively. In terms of log score and percent correct,

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[6]This is proportional to the absolute value of $\log_{10} f_i - \log_{10} O_i$ where f_i is the forecast category for each case and O_i is the observed category for each case. The result is averaged over all cases and scaled by multiplying by 50.

the 0000 GMT cycle local forecasts of visibility were worse than persistence for the 12-h projection, but they were better than persistence for the 15-, 18-, and 24-h projections. The locals were better than the guidance for the 12-, 18-, and 24-h projections. In contrast, the persistence forecasts were better than the guidance for the 12-h projection only. In terms of bias by category, the 0000 GMT cycle guidance forecasts had the best scores. Overall, the 1200 GMT cycle local forecasts were better than persistence for the 15-, 18-, and 24-h projections, and the locals were better than the guidance for the 12- and 18-h projections. However, persistence was the best forecast for the 12-h projection.

7. MAXIMUM/MINIMUM TEMPERATURE

The objective max/min temperature guidance for the 1983-84 cool season was generated by the LFM-based regression equations described in Technical Procedures Bulletin No. 285 (National Weather Service, 1980a). The guidance was based on equations developed by stratifying archived LFM model forecasts, station observations, and the first two harmonics of the day of the year into seasons of 3-mo duration (Dallavalle et al., 1980). We defined fall as September-November, winter as December-February, and spring as March-May. Since the MOS max/min guidance is valid for the local calendar day, the first period (approximately 24-h) objective forecast of the max based on 0000 GMT model data is for the calendar day starting at the subsequent midnight. The max/min guidance for the other periods (projections of approximately 36, 48, and 60 hours) also corresponds to specific calendar days. In contrast, the subjective local forecasts are for daytime max and nighttime min. Thus, the first period subjective max forecast from 0000 GMT data is for today's high. The second period forecast is for tonight's low and so forth. A similar procedure is followed for the 1200 GMT cycle except that the first period is tonight's min. For the local forecast, daytime is defined to be approximately from 1200 to 0000 GMT. Nighttime then extends approximately from 0000 to 1200 GMT except in the western parts of the Central and Southern Regions and throughout the Western Region where nighttime may go to nearly 1800 GMT. In this report, we present results for both objective guidance and subjective local forecasts which were verified by using an observation that is valid for a 12-h period. Thus, we used the 0000 GMT synoptic report of the max which is valid for the 1200 to 0000 GMT period. Similarly, the min temperature observation reported at 1200 GMT for the preceding 0000 to 1200 GMT period was used. While the 0000 GMT max temperature observation reasonably represents the daytime high, particularly during the cool season, the 1200 GMT min temperature observation is an inadequate indication of the nighttime low. Even in the eastern part of the United States, the wintertime low often occurs after 1200 GMT. Obviously, this problem is exacerbated in the western United States where 1200 GMT corresponds to 0400 LST, a time preceding the hour when the nighttime low usually occurs. Thus, we suspect that the errors for the min forecasts may be overestimates. Unfortunately, no synoptic report adequately represents the nighttime min. This problem with the verifying observations should be corrected next winter when new software is implemented on AFOS to derive an appropriate daytime max and nighttime low from both the synoptic and hourly reports.

We verified the local and MOS max/min temperature forecasts for both the 0000 and 1200 GMT cycles. The mean algebraic error (forecast minus observed temperature), mean absolute error, the number of absolute errors >10°F, the probability of detection[7] of min temperatures ≤32°F, and the false alarm ratio[8] for min temperatures ≤32°F were computed for 93 stations in the conterminous United States (Table 2.1). At 0000 (1200) GMT, the local max temperature forecasts are valid for daytime periods ending approximately 24 (36) and 48 (60) hours after 0000 (1200) GMT. Similarly, at 0000 (1200) GMT, the local min temperature forecasts are valid for nighttime periods ending approximately 36 (24) and 60 (48) hours after 0000 (1200) GMT.

For all stations combined, the results for 0000 and 1200 GMT are shown in Tables 7.1 and 7.6, respectively. A matched sample of approximately 12,000 cases per forecast projection was available. Similarly, Tables 7.2-7.5 give the 0000 GMT verification scores for the Eastern, Southern, Central, and Western Regions, respectively. Tables 7.7-7.10 show analogous scores by NWS region for the 1200 GMT cycle.

For all regions, both forecast cycles, and all projections, the local and MOS min temperature forecasts exhibited a pronounced cold bias (negative algebraic error). Tables 7.1 and 7.6 show for all stations combined that the bias in the MOS min forecasts ranged from -2.6°F for tonight's min (0000 GMT) to -3.1°F for tomorrow night's min (0000 GMT). For the local forecasts, the biases for the same projections were -1.2°F and -2.0°F, respectively. Although the cold bias in the min forecasts was persistent from region to region, the negative algebraic errors of both the guidance and local forecasts were greatest in the Western Region. As discussed previously, a large portion of this bias is likely due to the time of observation and not to a specific meteorological factor. Correspondingly, large mean absolute errors were associated with the large algebraic errors. For the four min projections and all stations combined, the mean absolute errors of the local forecasts were better than those for the MOS guidance by approximately 0.9°F. For these same projections, the guidance had a much higher percentage of forecasts with absolute errors greater than 10°F than did the local forecasters. Part of this large difference in quality between the local forecasts and the objective guidance is due to the improvement that the forecasters make to the MOS predictions; the particular verifying observation used also explains part of the discrepancy. Note, too, that, in general, the probability of detection of temperatures ≤32°F is greater for the guidance, but the local forecasts have a smaller false alarm ratio.

The biases for the max guidance tended to be much smaller than those for the min forecasts. For nearly all regions and all max forecast projections, both the MOS and local forecasts had a warm bias (positive algebraic error). The exception was in the Eastern Region for the forecast of tomorrow's max (both 0000 and 1200 GMT cycles) when the local forecasters had a very slight cold bias. As with the min forecasts, the bias in the max temperature guidance was much larger than that found in the local forecasts. We again think that the

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[7]Here, the probability of detection or prefigurance is defined to be the fraction of time the min temperature was correctly forecast to be ≤32°F when the previous day's min was ≥40°F.

[8]Here, the false alarm ratio is defined to be the fraction of forecasts of ≤32°F that failed to verify when the previous day's min was ≥40°F.

particular verifying observation used contributes to the forecast bias. Note, that for all regions and all projections combined, the local max temperature forecasts were about 0.4°F more accurate than the guidance in terms of mean absolute error.

Finally, the verifications in Tables 7.1 and 7.6 indicate that for approximately similar projections the min temperature was much more difficult to predict than the max. As an example, the mean absolute error for the 24-h projection of the min (tonight's min) from 1200 GMT was 3.7°F and 4.7°F for the local forecasts and the guidance, respectively. For the 24-h projection of the max (today's max) from 0000 GMT, the corresponding errors were 3.3°F and 3.9°F for the local forecasts and the guidance, respectively. For all four projections combined, the absolute error of the local and MOS min forecasts averaged 0.3°F and 0.8°F, respectively, more than the max forecasts. This trend in the relative difficulty of forecasting the max or min was evident in the scores for all four regions and all projections, but it was most pronounced in the Western Region. Although the time of the verifying observation contributed to this difference, we also know that during the cool season the min is usually more difficult to forecast than the max because of the greater variability of min temperatures. The difference in predictability is likely due to the effects of mesoscale phenomena on nighttime cooling. Factors such as drainage winds, soil moisture, stratus, and snow cover influence the minimum temperature. Clearly, both the guidance and the local forecasters often have similar difficulties in resolving these factors.

8. SUMMARY

Highlights of the 1983-84 cool season verification results, summarized by general type of weather element, are:

- Probability of Precipitation - The PoP verification involved 93 stations and forecast projections of 12-24, 24-36, and 36-48 hours from 0000 and 1200 GMT. The NWS Brier scores for all stations combined indicate the local forecasts were better than the MOS guidance for all three periods and for both forecast cycles. Improvements of the locals over guidance ranged from 7.8% for the first period, 0000 GMT cycle, to 1.7% for the third period, 1200 GMT cycle. Depending on the projection and cycle, the local forecasters deviated from the guidance about 60% of the time, and these changes were in the correct direction from 56% to 65% of the time.

- Precipitation Type - Local and guidance forecasts for 86 stations and projections of 18, 30, and 42 hours from 0000 and 1200 GMT comprised the comparative verification. Only those cases where the local PoP was $\geq$30% were verified, and surface observations at 1 hour before or after the forecast valid time were used whenever the verifying observation was missing or did not include precipitation. In regard to percent correct and skill score based on 3-category (freezing rain, snow, rain) contingency tables, the 0000 GMT cycle results for all stations combined indicate the local forecasts were better than the guidance for all three projections. For the 1200 GMT cycle the local forecasts were as good as or better than the guidance for the 18- and 30-h projections. In terms of bias by category, false alarm ratio, and probability of detection for the snow forecasts, the scores varied from projection to projection, but overall, the local and guidance forecasts were about the same.

- Surface Wind - The AFOS-era wind verification involved the comparison of surface wind speed and direction forecasts for 93 (94) stations for projections of 12, 18, and 30 hours from 0000 (1200) GMT. In this system, the local forecasts were obtained from NWS official terminal forecasts. Several fundamental differences exist between the MOS wind forecasts and those in the FT's. For example, the FT's are not as precise in regard to valid time as are the objective forecasts. Due to these differences, only conclusions of a general nature can be drawn from the results.

  The results for all stations combined for wind direction indicate the locals were able to improve upon MOS for the 12-h forecast projections from both 0000 and 1200 GMT. The guidance was superior to the locals for the 18- and 30-h projections. The overall results for the speed forecasts indicate the guidance was generally better than the locals for all three projections in terms of percent correct and skill score. However, there was little difference in the mean absolute errors associated with the two sets of forecasts.

- Cloud Amount - AFOS-era verification for cloud amount involved 88 (86) stations and forecasts for projections of 12, 18, and 24 hours from 0000 (1200) GMT. The skill scores for all stations combined indicate the 0000 GMT cycle local forecasts were better than the guidance for all three projections. In terms of percent correct, the local forecasts were better than the guidance for the 12- and 18-h projections. For the 1200 GMT cycle, the precents correct for local forecasts were better than, equal to, and worse than the guidance for the 12-, 18-, and 24-h projections, respectively. In regard to skill score, the local forecasts were better than the guidance for the 12- and 18-h projections. In terms of bias by category (clear, scattered, broken, and overcast) for both cycles and all projections, the results varied by category and forecast projection, but overall, the guidance was slightly better.

- Ceiling and Visibility - The verification involved the comparison of local forecasts, MOS guidance, and persistence for 93 (94) stations for projections of 12, 15, 18, and 24 hours from 0000 (1200) GMT. Direct comparison of local, MOS, and persistence forecasts was possible for the 12-, 18-, and 24-h projections. These are actually 3-, 9-, and 15-h forecasts from the latest available surface observations for the locals and persistence, and in this sense, they are 9-, 15-, and 21-h forecasts for the guidance. The results for both forecast cycles show that for the 12-h forecasts of visibility, persistence was better than either the guidance or the local forecasts. For the 0000 GMT cycle, most of the verification scores for ceiling and visibility indicate the local and persistence forecasts were better than the guidance for the 12-h projection. For the 18-h projection, the local forecasts were still better than the guidance, but persistence was not. For the 24-h projection, the guidance was slightly better than both the local forecasts and persistence. Overall, the 1200 GMT cycle local forecasts were more accurate than the guidance for all three projections.

o Maximum/Minimum Temperature - Objective and local forecasts were verified for 93 stations for both the 0000 and 1200 GMT cycles. At 0000 (1200) GMT, the local maximum temperature forecasts were valid for daytime periods approximately 24 (36) and 48 (60) hours in advance, while the minimum temperature forecasts were valid for nighttime periods ending approximately 36 (24) and 60 (48) hours after the initial model time. In contrast, the MOS guidance was valid for calendar day periods. As verifying observations, we used the max or min temperatures for 12-h periods ending at 0000 and 1200 GMT, respectively, which had been transmitted from the local stations over AFOS. For all stations and projections combined, we found that the mean absolute error of the local min (max) temperature forecasts averaged 0.9°F (0.4°F) less than that for the MOS guidance. Clearly, the local forecasters are improving over the guidance, although some of this improvement probably is associated with the differences between the valid periods of the two types of forecasts and the verifying observations. As is usual during the cool season, the maximum temperature forecasts verified better for the same projection than did the minimum temperature forecasts.

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Table 2.1. Ninety-four stations used for comparative verification of MOS guidance and local probability of precipitation, surface wind, cloud amount, ceiling height, visibility, and max/min temperature forecasts. Please note that LAX was not included in the PoP and max/min temperature verifications. MEM, BNA, DTW, GRR, LAX, and SAN were not included in the cloud amount verifications. TCC was not available during the 0000 GMT cycle for surface wind, ceiling height, and visibility. In addition, TOP and ICT were not available during the 1200 GMT cycle for cloud amount.

DCA	Washington, D.C.	ORF	Norfolk, Virginia
PWM	Portland, Maine	CON	Concord, New Hampshire
BOS	Boston, Massachusetts	PVD	Providence, Rhode Island
ALB	Albany, New York	BTV	Burlington, Vermont
BUF	Buffalo, New York	SYR	Syracuse, New York
LGA	New York (LaGuardia), New York	EWR	Newark, New Jersey
RDU	Raleigh-Durham, North Carolina	CLT	Charlotte, North Carolina
CLE	Cleveland, Ohio	CMH	Columbus, Ohio
PHL	Philadelphia, Pennsylvania	ACY	Atlantic City, New Jersey
PIT	Pittsburgh, Pennsylvania	ERI	Erie, Pennsylvania
CAE	Columbia, South Carolina	CHS	Charleston, South Carolina
CRW	Charleston, West Virginia	BKW	Beckley, West Virginia
BHM	Birmingham, Alabama	MOB	Mobile, Alabama
LIT	Little Rock, Arkansas	FSM	Fort Smith, Arkansas
MIA	Miami, Florida	TPA	Tampa, Florida
ATL	Atlanta, Georgia	SAV	Savannah, Georgia
MSY	New Orleans, Louisiana	SHV	Shreveport, Louisiana
JAN	Jackson, Mississippi	MEI	Meridian, Mississippi
ABQ	Albuquerque, New Mexico	TCC	Tucumcari, New Mexico
OKC	Oklahoma City, Oklahoma	TUL	Tulsa, Oklahoma
MEM	Memphis, Tennessee	BNA	Nashville, Tennessee
DFW	Dallas-Ft. Worth, Texas	ABI	Abilene, Texas
LBB	Lubbock, Texas	ELP	El Paso, Texas
SAT	San Antonio, Texas	IAH	Houston, Texas
DEN	Denver, Colorado	GJT	Grand Junction, Colorado
ORD	Chicago (O'Hare), Illinois	SPI	Springfield, Illinois
IND	Indianapolis, Indiana	SBN	South Bend, Indiana
DSM	Des Moines, Iowa	ALO	Waterloo, Iowa
TOP	Topeka, Kansas	ICT	Wichita, Kansas
SDF	Louisville, Kentucky	LEX	Lexington, Kentucky
DTW	Detroit, Michigan	GRR	Grand Rapids, Michigan
MSP	Minneapolis, Minnesota	DLH	Duluth, Minnesota
STL	St. Louis, Missouri	MCI	Kansas City, Missouri
OMA	Omaha, Nebraska	LBF	North Platte, Nebraska
BIS	Bismarck, North Dakota	FAR	Fargo, North Dakota
FSD	Sioux Falls, South Dakota	RAP	Rapid City, South Dakota
MKE	Milwaukee, Wisconsin	MSN	Madison, Wisconsin
CYS	Cheyenne, Wyoming	CPR	Casper, Wyoming
PHX	Phoenix, Arizona	TUS	Tucson, Arizona
LAX	Los Angeles, California	SAN	San Diego, California
SFO	San Francisco, California	FAT	Fresno, California
BOI	Boise, Idaho	PIH	Pocatello, Idaho
GTF	Great Falls, Montana	HLN	Helena, Montana
RNO	Reno, Nevada	LAS	Las Vegas, Nevada
PDX	Portland, Oregon	MFR	Medford, Oregon
SLC	Salt Lake City, Utah	CDC	Cedar City, Utah
SEA	Seattle-Tacoma, Washington	GEG	Spokane, Washington

Table 2.2. Comparative verification of MOS guidance and local PoP forecasts for 93 stations, 0000 GMT cycle.

Projection (h)	Type of Forecast	Brier Score	% Imp. Over Guid.	% Imp. Over Clim.	No. of Cases	No. of Changes to Guid.	% Changes Correct Direction
12-24	MOS	.0965		41.7			
(1st period)	Local	.0890	7.8	46.3	12067	6954	61.7
24-36	MOS	.1081		36.7			
(2nd period)	Local	.1045	3.4	38.8	12052	6854	60.9
36-48	MOS	.1211		26.8			
(3rd period)	Local	.1189	1.8	28.2	12022	6744	57.2

Table 2.3. Same as Table 2.2 except for 24 stations in the Eastern Region.

Projection (h)	Type of Forecast	Brier Score	% Imp. Over Guid.	% Imp. Over Clim.	No. of Cases	No. of Changes to Guid.	% Changes Correct Direction
12-24	MOS	.1108		48.0			
(1st period)	Local	.1106	0.1	48.1	2708	1666	56.8
24-36	MOS	.1225		42.0			
(2nd period)	Local	.1215	0.9	42.5	2739	1613	57.8
36-48	MOS	.1434		32.4			
(3rd period)	Local	.1445	-0.8	31.8	2697	1551	57.2

Table 2.4. Same as Table 2.2 except for 24 stations in the Southern Region.

Projection (h)	Type of Forecast	Brier Score	% Imp. Over Guid.	% Imp. Over Clim.	No. of Cases	No. of Changes to Guid.	% Changes Correct Direction
12-24	MOS	.0775		37.0			
(1st period)	Local	.0688	11.2	44.0	3320	1843	68.5
24-36	MOS	.0864		36.9			
(2nd period)	Local	.0818	5.3	40.0	3255	1873	69.2
36-48	MOS	.0921		26.2			
(3rd period)	Local	.0895	2.8	28.3	3299	1919	65.2

Table 2.5. Same as Table 2.2 except for 28 stations in the Central Region.

Projection (h)	Type of Forecast	Brier Score	% Imp. Over Guid.	% Imp. Over Clim.	No. of Cases	No. of Changes to Guid.	% Changes Correct Direction
12-24	MOS	.0974		43.2			
(1st period)	Local	.0883	9.3	48.5	3871	2259	59.8
24-36	MOS	.1121		37.1			
(2nd period)	Local	.1101	1.7	38.2	3890	2177	58.4
36-48	MOS	.1233		28.7			
(3rd period)	Local	.1236	-0.2	28.6	3858	2042	49.4

Table 2.6. Same as Table 2.2 except for 17 stations in the Western Region.

Projection (h)	Type of Forecast	Brier Score	% Imp. Over Guid.	% Imp. Over Clim.	No. of Cases	No. of Changes to Guid.	% Changes Correct Direction
12-24	MOS	.1062		34.1			
(1st period)	Local	.0939	11.6	41.7	2168	1186	61.5
24-36	MOS	.1154		26.8			
(2nd period)	Local	.1069	7.4	32.2	2168	1191	56.6
36-48	MOS	.1338		14.5			
(3rd period)	Local	.1243	7.8	21.2	2168	1232	57.5

Table 2.7. Comparative verification of MOS guidance and local PoP forecasts for 93 stations, 1200 GMT cycle.

Projection (h)	Type of Forecast	Brier Score	% Imp. Over Guid.	% Imp. Over Clim.	No. of Cases	No. of Changes to Guid.	% Changes Correct Direction
12-24	MOS	.0967		43.1			
(1st period)	Local	.0903	6.6	46.8	11821	6932	65.4
24-36	MOS	.1098		33.1			
(2nd period)	Local	.1076	2.0	34.5	11795	6787	56.3
36-48	MOS	.1200		28.7			
(3rd period)	Local	.1180	1.7	29.9	11770	6647	61.5

Table 2.8. Same as Table 2.7 except for 24 stations in the Eastern Region.

Projection (h)	Type of Forecast	Brier Score	% Imp. Over Guid.	% Imp. Over Clim.	No. of Cases	No. of Changes to Guid.	% Changes Correct Direction
12-24	MOS	.1103		47.4			
(1st period)	Local	.1093	0.9	47.8	2615	1648	59.9
24-36	MOS	.1287		39.0			
(2nd period)	Local	.1296	-0.7	38.6	2563	1556	56.0
36-48	MOS	.1366		34.1			
(3rd period)	Local	.1346	1.5	35.1	2593	1561	59.7

Table 2.9. Same as Table 2.7 except for 24 stations in the Southern Region.

Projection (h)	Type of Forecast	Brier Score	% Imp. Over Guid.	% Imp. Over Clim.	No. of Cases	No. of Changes to Guid.	% Changes Correct Direction
12-24	MOS	.0813		40.5			
(1st period)	Local	.0724	11.0	47.1	3211	1831	72.1
24-36	MOS	.0852		31.1			
(2nd period)	Local	.0820	3.7	33.6	3268	1882	59.5
36-48	MOS	.0966		28.4			
(3rd period)	Local	.0914	5.3	32.2	3206	1891	68.6

Table 2.10. Same as Table 2.7 except for 28 stations in the Central Region.

Projection (h)	Type of Forecast	Brier Score	% Imp. Over Guid.	% Imp. Over Clim.	No. of Cases	No. of Changes to Guid.	% Changes Correct Direction
12-24	MOS	.0999		44.3			
(1st period)	Local	.0928	7.2	48.3	3793	2224	65.0
24-36	MOS	.1116		35.2			
(2nd period)	Local	.1113	0.3	35.3	3765	2071	50.9
36-48	MOS	.1280		28.6			
(3rd period)	Local	.1314	-2.7	26.7	3784	1989	57.8

Table 2.11. Same as Table 2.7 except for 17 stations in the Western Region.

Projection (h)	Type of Forecast	Brier Score	% Imp. Over Guid.	% Imp. Over Clim.	No. of Cases	No. of Changes to Guid.	% Changes Correct Direction
12-24	MOS	.0971		37.1			
(1st period)	Local	.0895	7.8	42.1	2202	1229	63.7
24-36	MOS	.1212		22.6			
(2nd period)	Local	.1135	6.3	27.5	2199	1278	60.6
36-48	MOS	.1211		20.5			
(3rd period)	Local	.1142	5.7	25.0	2187	1206	58.5

Table 3.1. Eighty-six stations used for comparative verification of MOS guidance and local probability of precipitation type forecasts.

DCA	Washington, D.C.	ORF	Norfolk, Virginia
PWM	Portland, Maine	CON	Concord, New Hampshire
BOS	Boston, Massachusetts	PVD	Providence, Rhode Island
ALB	Albany, New York	BTV	Burlington, Vermont
BUF	Buffalo, New York	SYR	Syracuse, New York
LGA	New York (LaGuardia), New York	EWR	Newark, New Jersey
RDU	Raleigh-Durham, North Carolina	CLT	Charlotte, North Carolina
CLE	Cleveland, Ohio	CMH	Columbus, Ohio
PHL	Philadelphia, Pennsylvania	ACY	Atlantic City, New Jersey
PIT	Pittsburgh, Pennsylvania	ERI	Erie, Pennsylvania
CAE	Columbia, South Carolina	CHS	Charleston, South Carolina
CRW	Charleston, West Virginia	BKW	Beckley, West Virginia
BHM	Birmingham, Alabama	MOB	Mobile, Alabama
LIT	Little Rock, Arkansas	FSM	Fort Smith, Arkansas
ATL	Atlanta, Georgia	SAV	Savannah, Georgia
MSY	New Orleans, Louisiana	SHV	Shreveport, Louisiana
JAN	Jackson, Mississippi	MEI	Meridian, Mississippi
ABQ	Albuquerque, New Mexico	TCC	Tucumcari, New Mexico
OKC	Oklahoma City, Oklahoma	TUL	Tulsa, Oklahoma
MEM	Memphis, Tennessee	BNA	Nashville, Tennessee
DFW	Dallas-Ft. Worth, Texas	ABI	Abilene, Texas
LBB	Lubbock, Texas	ELP	El Paso, Texas
SAT	San Antonio, Texas	IAH	Houston, Texas
DEN	Denver, Colorado	GJT	Grand Junction, Colorado
ORD	Chicago (O'Hare), Illinois	SPI	Springfield, Illinois
IND	Indianapolis, Indiana	SBN	South Bend, Indiana
DSM	Des Moines, Iowa	ALO	Waterloo, Iowa
TOP	Topeka, Kansas	ICT	Wichita, Kansas
SDF	Louisville, Kentucky	LEX	Lexington, Kentucky
DTW	Detroit, Michigan	GRR	Grand Rapids, Michigan
MSP	Minneapolis, Minnesota	DLH	Duluth, Minnesota
STL	St. Louis, Missouri	MCI	Kansas City, Missouri
OMA	Omaha, Nebraska	LBF	North Platte, Nebraska
BIS	Bismarck, North Dakota	FAR	Fargo, North Dakota
FSD	Sioux Falls, South Dakota	RAP	Rapid City, South Dakota
MKE	Milwaukee, Wisconsin	MSN	Madison, Wisconsin
CYS	Cheyenne, Wyoming	CPR	Casper, Wyoming
BOI	Boise, Idaho	PIH	Pocatello, Idaho
GTF	Great Falls, Montana	HLN	Helena, Montana
RNO	Reno, Nevada	LAS	Las Vegas, Nevada
PDX	Portland, Oregon	MFR	Medford, Oregon
SLC	Salt Lake City, Utah	CDC	Cedar City, Utah
SEA	Seattle-Tacoma, Washington	GEG	Spokane, Washington

Table 3.2. Contingency tables for MOS guidance and local forecasts of PoPT for 86 stations, 0000 GMT cycle. Only cases where the local PoP was ≥30% were included.

18-h Forecasts

		Local						MOS			
		ZR	S	R	T			ZR	S	R	T
	ZR	12	17	2	31		ZR	9	16	6	31
OBS	SN	8	491	23	522	OBS	SN	9	494	19	522
	RN	7	33	836	876		RN	12	49	815	876
	T	27	541	861	1429		T	30	559	840	1429

30-h Forecasts

		Local						MOS			
		ZR	S	R	T			ZR	S	R	T
	ZR	13	18	9	40		ZR	17	16	7	40
OBS	SN	6	487	13	506	OBS	SN	26	461	19	506
	RN	17	59	744	820		RN	25	42	753	820
	T	36	564	766	1366		T	68	519	779	1366

42-h Forecasts

		Local						MOS			
		ZR	S	R	T			ZR	S	R	T
	ZR	11	10	6	27		ZR	13	9	5	27
OBS	SN	12	364	28	404	OBS	SN	22	353	29	404
	RN	6	56	693	755		RN	15	53	687	755
	T	29	430	727	1186		T	50	415	721	1186

Table 3.3. Same as Table 3.2 except for the 1200 GMT cycle.

18-h Forecasts

		Local						MOS			
		ZR	S	R	T			ZR	S	R	T
	ZR	18	17	3	38		ZR	19	16	3	38
OBS	SN	10	493	20	523	OBS	SN	20	484	19	523
	RN	18	61	751	830		RN	21	51	758	830
	T	46	571	774	1391		T	60	551	780	1391

30-h Forecasts

		Local						MOS			
		ZR	S	R	T			ZR	S	R	T
	ZR	9	11	4	24		ZR	10	9	5	24
OBS	SN	14	415	20	449	OBS	SN	18	409	22	449
	RN	10	46	691	747		RN	23	50	674	747
	T	33	472	715	1220		T	51	468	701	1220

42-h Forecasts

		Local						MOS			
		ZR	S	R	T			ZR	S	R	T
	Z	10	20	7	37		Z	18	15	4	37
OBS	S	14	425	21	460	OBS	S	33	397	30	460
	R	22	57	617	696		R	27	31	638	696
	T	46	502	645	1193		T	78	443	672	1193

Table 3.4. Comparative verification of MOS guidance and local forecasts of PoPT for 86 stations, 0000 GMT cycle. Only cases where the local PoP was ≥30% were included. Data for TCC were not available for the 30-h projection. The long dash (--) indicates there were no observations of freezing rain.

Projection (h)	Region (No. Stns)	Type of Forecast	Bias ZR	Bias S	Bias R	Percent Correct	Skill Score	POD ZR	POD S	FAR ZR	FAR S	Number of Cases
18	Eastern	MOS	1.19	1.11	0.93	89.4	.789	0.31	0.93	0.74	0.16	
	(24)	Local	0.75	1.09	0.96	93.6	.870	0.38	0.96	0.50	0.12	548
	Southern	MOS	1.00	0.90	1.01	96.4	.830	0.33	0.86	0.67	0.05	
	(22)	Local	0.33	1.00	1.01	97.4	.878	0.33	0.90	0.00	0.10	194
	Central	MOS	0.45	1.07	0.95	93.5	.875	0.18	0.98	0.60	0.09	
	(28)	Local	1.00	1.04	0.96	93.3	.872	0.36	0.96	0.64	0.07	433
	Western	MOS	3.00	1.02	0.97	92.9	.852	1.00	0.92	0.67	0.10	
	(12)	Local	3.00	0.93	1.03	91.7	.825	1.00	0.85	0.67	0.08	254
	All	MOS	0.97	1.07	0.96	92.2	.843	0.29	0.95	0.70	0.12	
	Stations	Local	0.87	1.04	0.98	93.7	.872	0.39	0.94	0.56	0.09	1429
30	Eastern	MOS	2.17	1.07	0.92	90.1	.806	0.50	0.94	0.77	0.12	
	(24)	Local	1.67	1.12	0.91	89.5	.793	0.33	0.96	0.80	0.15	504
	Southern	MOS	1.25	1.00	0.99	94.6	.678	0.50	0.73	0.60	0.27	
	(21)	Local	0.88	1.18	1.00	96.8	.808	0.63	0.91	0.29	0.23	221
	Central	MOS	1.63	1.00	0.95	90.3	.819	0.44	0.93	0.73	0.07	
	(28)	Local	0.56	1.07	0.95	92.1	.847	0.25	0.98	0.56	0.09	443
	Western	MOS	1.50	1.03	0.97	84.9	.699	0.00	0.83	1.00	0.19	
	(12)	Local	0.00	1.25	0.87	86.4	.730	0.00	0.95	--	0.24	198
	All	MOS	1.70	1.03	0.95	90.1	.808	0.42	0.91	0.75	0.11	
	Stations	Local	0.90	1.11	0.93	91.1	.825	0.32	0.96	0.64	0.14	1366
42	Eastern	MOS	1.53	1.09	0.93	86.4	.726	0.53	0.86	0.65	0.21	
	(24)	Local	0.94	1.10	0.95	88.1	.754	0.47	0.88	0.50	0.20	469
	Southern	MOS	2.33	0.71	1.01	93.6	.732	0.33	0.62	0.86	0.13	
	(22)	Local	1.00	0.86	1.02	96.0	.824	0.67	0.81	0.33	0.06	173
	Central	MOS	2.17	1.01	0.95	90.2	.813	0.33	0.92	0.85	0.08	
	(28)	Local	1.33	1.09	0.90	88.8	.784	0.17	0.94	0.88	0.13	356
	Western	MOS	4.00	1.05	0.95	87.8	.740	1.00	0.84	0.75	0.19	
	(12)	Local	2.00	0.98	1.00	92.0	.826	0.00	0.88	1.00	0.11	188
	All	MOS	1.85	1.03	0.95	88.8	.772	0.48	0.87	0.74	0.15	
	Stations	Local	1.07	1.06	0.96	90.1	.795	0.41	0.90	0.62	0.15	1186

Table 3.5. Same as Table 3.4 except for 1200 GMT cycle. Data for TCC were not available for the 18- and 42-h projections.

Projection (h)	Region (No. Stns)	Type of Forecast	Bias			Percent Correct	Skill Score	POD		FAR		Number of Cases
			ZR	S	R			ZR	S	ZR	S	
18	Eastern (24)	MOS	1.58	1.14	0.89	87.7	.763	0.25	0.94	0.84	0.18	497
		Local	0.92	1.15	0.91	88.3	.771	0.25	0.94	0.73	0.18	
	Southern (21)	MOS	1.86	1.00	0.97	95.3	.754	0.86	0.83	0.54	0.17	212
		Local	1.71	1.00	0.97	95.8	.774	0.86	0.83	0.50	0.17	
	Central (28)	MOS	1.71	1.01	0.93	93.0	.868	0.71	0.95	0.58	0.06	442
		Local	1.50	1.03	0.93	92.5	.858	0.64	0.96	0.57	0.07	
	Western (12)	MOS	0.80	0.99	1.01	88.3	.756	0.00	0.83	1.00	0.16	240
		Local	0.40	1.15	0.93	87.9	.753	0.00	0.92	1.00	0.21	
	All Stations	MOS	1.58	1.05	0.94	90.7	.819	0.50	0.93	0.68	0.12	1391
		Local	1.21	1.09	0.93	90.7	.819	0.47	0.94	0.61	0.14	
30	Eastern (24)	MOS	2.07	1.08	0.90	86.7	.745	0.47	0.91	0.77	0.16	467
		Local	1.13	1.09	0.94	88.2	.766	0.33	0.91	0.71	0.17	
	Southern (22)	MOS	--	0.94	0.99	96.4	.806	--	0.81	1.00	0.13	168
		Local	--	0.69	1.02	97.0	.813	--	0.69	1.00	0.00	
	Central (28)	MOS	1.63	1.05	0.91	90.9	.825	0.38	0.96	0.77	0.09	362
		Local	1.38	1.05	0.92	92.3	.851	0.38	0.96	0.73	0.08	
	Western (12)	MOS	4.00	0.96	1.00	88.3	.751	0.00	0.82	1.00	0.14	223
		Local	3.00	1.04	0.97	92.4	.839	1.00	0.91	0.67	0.12	
	All Stations	MOS	2.13	1.04	0.94	89.6	.794	0.42	0.91	0.80	0.13	1220
		Local	1.38	1.05	0.96	91.4	.827	0.38	0.92	0.73	0.12	
42	Eastern (24)	MOS	2.75	0.97	0.94	88.0	.770	0.58	0.86	0.79	0.12	459
		Local	1.92	1.07	0.92	86.5	.738	0.17	0.89	0.91	0.16	
	Southern (21)	MOS	2.00	0.58	1.00	93.6	.651	0.60	0.50	0.70	0.14	172
		Local	1.20	1.00	0.99	95.9	.783	0.40	0.83	0.67	0.17	
	Central (28)	MOS	2.00	0.99	0.91	87.6	.771	0.50	0.92	0.75	0.07	378
		Local	0.94	1.08	0.90	88.1	.770	0.38	0.95	0.60	0.11	
	Western (12)	MOS	0.75	0.94	1.04	85.3	.697	0.00	0.78	1.00	0.17	184
		Local	0.50	1.22	0.88	85.3	.710	0.00	0.93	1.00	0.24	
	All Stations	MOS	2.11	0.96	0.97	88.3	.777	0.49	0.86	0.77	0.10	1193
		Local	1.24	1.09	0.93	88.2	.773	0.27	0.92	0.78	0.15	

Table 4.1. Definition of the categories used for MOS guidance, local forecasts, and surface observations of wind direction and speed.

Category	Direction (degrees)	Speed (knots)
1	340-20	$\leq$ 12
2	30-60	13-17
3	70-110	18-22
4	120-150	23-27
5	160-200	28-32
6	210-240	$\geq$ 33
7	250-290	---
8	300-330	---

Table 4.2. Comparative verification of MOS guidance and local surface wind forecasts for 93 stations, 0000 GMT cycle.

		Direction			Speed												
								Contingency Table									
											Bias by Category						
Fcst. Proj. (h)	Type of Fcst.	Mean Abs. Error (Deg)	Skill Score	No. of Cases	Mean Abs. Error (Kts)	Mean Alg. Error (Kts)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 Kts)	1 (No. Obs)	2 (No. Obs)	3 (No. Obs)	4 (No. Obs)	5 (No. Obs)	6 (No. Obs)	No. of Cases
12	MOS	20	.590	2868	3.2	1.2	2881	.414	86.9	.10	1.00	1.02	0.87	1.12	0.86	***	12116
	Local	18	.605		3.0	1.4		.453	86.6	.26	0.97 (10606)	1.35 (1125)	0.85 (306)	0.65 (57)	0.73 (22)	* (0)	
18	MOS	24	.488	4926	3.4	1.2	4969	.398	75.7	.07	1.02	0.92	0.95	1.35	1.75	2.00	12007
	Local	26	.458		3.4	0.8		.350	73.8	.09	1.01 (8916)	1.10 (2262)	0.71 (655)	0.43 (146)	0.79 (24)	0.50 (4)	
30	MOS	28	.463	2982	4.1	2.2	3021	.327	83.5	.05	0.99	1.06	0.98	1.83	1.44	**	11948
	Local	35	.377		4.4	2.4		.257	79.5	.00	0.94 (10355)	1.48 (1197)	1.06 (333)	1.06 (47)	0.50 (16)	** (0)	

* This category was forecast once but was not observed.
** This category was forecast three times but was not observed.
*** This category was forecast four times but was not observed.

Table 4.3. Contingency tables for MOS guidance and local surface wind direction forecasts for 93 stations, 0000 GMT cycle.

12-h Forecasts — MOS

OBS	1	2	3	4	5	6	7	8	T
1	346	36	10	2	4	7	11	85	501
2	56	89	25	2	0	0	1	5	178
3	6	26	131	38	8	2	0	1	212
4	1	1	25	127	60	7	0	0	221
5	1	0	4	43	266	60	12	3	389
6	1	0	2	5	47	250	65	4	374
7	8	0	2	1	5	61	326	68	471
8	67	7	3	2	4	9	105	325	522
T	486	159	202	220	394	396	520	491	2868

12-h Forecasts — Local

OBS	1	2	3	4	5	6	7	8	T
1	362	46	7	5	3	3	4	71	501
2	31	110	31	4	0	0	0	2	178
3	0	19	138	47	5	1	1	1	212
4	1	1	20	134	62	1	1	1	221
5	2	0	4	37	277	58	10	1	389
6	1	0	3	3	47	244	69	7	374
7	8	2	2	0	11	61	285	102	471
8	84	0	5	3	4	8	74	344	522
T	489	178	210	233	409	376	444	529	2868

18-h Forecasts — MOS

OBS	1	2	3	4	5	6	7	8	T
1	413	64	14	6	7	8	28	186	726
2	63	86	51	17	10	9	4	11	251
3	13	37	155	63	20	8	2	3	301
4	5	2	36	164	133	9	12	0	361
5	6	2	6	91	521	185	27	3	841
6	1	0	0	3	134	446	167	13	764
7	10	0	0	2	22	139	528	134	835
8	132	6	6	4	6	16	214	463	847
T	643	197	268	350	853	820	982	813	4926

18-h Forecasts — Local

OBS	1	2	3	4	5	6	7	8	T
1	424	77	13	6	8	10	26	162	726
2	65	100	42	17	8	4	6	9	251
3	16	45	133	73	22	5	5	2	301
4	5	4	40	172	118	13	6	3	361
5	8	1	13	125	526	131	28	9	841
6	5	1	3	9	177	394	153	22	764
7	32	1	2	7	43	127	420	203	835
8	166	4	3	7	12	17	164	474	847
T	721	233	249	416	914	701	808	884	4926

30-h Forecasts — MOS

OBS	1	2	3	4	5	6	7	8	T
1	257	34	8	4	9	10	14	126	462
2	63	59	26	8	5	10	7	6	184
3	13	34	101	47	22	5	3	4	229
4	2	4	25	115	77	10	7	5	245
5	4	3	10	54	271	73	22	8	445
6	5	1	1	8	60	242	86	11	414
7	15	0	0	2	17	79	272	86	471
8	85	6	2	3	6	15	125	290	532
T	444	141	173	241	467	444	536	536	2982

30-h Forecasts — Local

OBS	1	2	3	4	5	6	7	8	T
1	230	71	13	14	15	13	13	93	462
2	48	59	32	16	12	7	4	6	184
3	15	29	84	61	26	7	2	5	229
4	4	5	20	111	90	8	4	3	245
5	5	5	13	60	251	76	25	10	445
6	13	5	4	12	80	181	96	23	414
7	28	4	4	12	34	63	197	129	471
8	123	8	14	10	14	22	73	268	532
T	466	186	184	296	522	377	414	537	2982

Table 4.4. Contingency tables for MOS guidance and local surface wind speed forecasts for 93 stations, 0000 GMT cycle.

12-h Forecasts — MOS

		1	2	3	4	5	6	T
	1	9987	552	57	8	2	0	10606
	2	559	443	102	17	3	1	1125
	3	56	140	84	20	6	0	306
OBS	4	8	14	17	11	6	1	57
	5	1	4	5	8	2	2	22
	6	0	0	0	0	0	0	0
	T	10611	1153	265	64	19	4	12116

12-h Forecasts — Local

		1	2	3	4	5	6	T
	1	9782	782	40	2	0	0	10606
	2	449	583	86	7	0	0	1125
	3	44	144	105	9	4	0	306
OBS	4	2	12	25	13	5	0	57
	5	2	2	4	6	7	1	22
	6	0	0	0	0	0	0	0
	T	10279	1523	260	37	16	1	12116

18-h Forecasts — MOS

		1	2	3	4	5	6	T
	1	7908	861	131	12	4	0	8916
	2	1055	919	227	55	6	0	2262
	3	94	262	208	72	15	4	655
OBS	4	4	30	50	46	14	2	146
	5	1	3	6	10	3	1	24
	6	0	0	1	2	0	1	4
	T	9062	2075	623	197	42	8	12007

18-h Forecasts — Local

		1	2	3	4	5	6	T
	1	7700	1139	72	4	1	0	8916
	2	1108	984	158	10	2	0	2262
	3	151	313	156	31	4	0	655
OBS	4	14	42	65	15	9	1	146
	5	2	6	12	2	1	1	24
	6	1	0	0	1	2	0	4
	T	8976	2484	463	63	19	2	12007

30-h Forecasts — MOS

		1	2	3	4	5	6	T
	1	9481	741	106	22	4	1	10355
	2	649	397	116	28	7	0	1197
	3	102	114	84	25	8	0	333
OBS	4	5	14	17	7	2	2	47
	5	3	3	4	4	2	0	16
	6	0	0	0	0	0	0	0
	T	10240	1269	327	86	23	3	11948

30-h Forecasts — Local

		1	2	3	4	5	6	T
	1	9001	1183	157	12	2	0	10355
	2	655	418	101	18	4	1	1197
	3	103	137	75	14	2	2	333
OBS	4	8	23	12	4	0	0	47
	5	1	6	7	2	0	0	16
	6	0	0	0	0	0	0	0
	T	9768	1767	352	50	8	3	11948

Table 4.5. Same as Table 4.2 except for 24 stations in the Eastern Region.

		Direction			Speed												
								Contingency Table									
											Bias by Category						
Fcst. Proj. (h)	Type of Fcst.	Mean Abs. Error (Deg)	Skill Score	No. of Cases	Mean Abs. Error (Kts)	Mean Alg. Error (Kts)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 Kts)	1 (No. Obs)	2 (No. Obs)	3 (No. Obs)	4 (No. Obs)	5 (No. Obs)	6 (No. Obs)	No. of Cases
12	MOS	21	.554	741	2.9	1.0	744	.408	86.3	.20	1.01	0.96	0.83	1.56	0.57	**	2881
	Local	20	.559		3.0	1.5		.427	84.6	.10	0.95 (2496)	1.46 (300)	0.77 (69)	1.22 (9)	0.43 (7)	** (0)	
18	MOS	24	.453	1294	3.1	0.9	1300	.390	74.4	.13	1.03	0.89	0.92	1.86	1.17	0.33	2841
	Local	27	.428		3.2	0.8		.337	71.6	.20	0.99 (2054)	1.11 (596)	0.66 (161)	0.95 (21)	1.33 (6)	0.33 (3)	
30	MOS	26	.466	756	3.8	1.7	769	.336	83.1	.14	1.01	0.89	0.91	1.92	1.67	*	2844
	Local	34	.352		4.5	2.5		.279	78.1	.00	0.93 (2418)	1.40 (343)	1.22 (68)	1.50 (12)	0.67 (3)	*** (0)	

* This category was neither forecast nor observed.
** This category was forecast once but was not observed.
*** This category was forecast twice but was not observed.

Table 4.6. Same as Table 4.2 except for 23 stations in the Southern Region.

		Direction			Speed												
								Contingency Table									
											Bias by Category						
Fcst. Proj. (h)	Type of Fcst.	Mean Abs. Error (Deg)	Skill Score	No. of Cases	Mean Abs. Error (Kts)	Mean Alg. Error (Kts)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 Kts)	1 (No. Obs)	2 (No. Obs)	3 (No. Obs)	4 (No. Obs)	5 (No. Obs)	6 (No. Obs)	No. of Cases
12	MOS	22	.557	690	3.5	2.0	692	.360	88.9	.14	0.98	1.31	0.93	2.00	1.50	**	3187
	Local	19	.599		3.1	1.8		.407	88.9	.67	0.96 (2920)	1.68 (203)	0.67 (58)	0.50 (4)	1.50 (2)	* (0)	
18	MOS	25	.461	1269	3.5	1.4	1276	.366	76.0	.06	1.00	0.97	0.97	1.48	0.88	***	3122
	Local	28	.447		3.4	0.5		.308	74.4	.00	1.01 (2395)	1.17 (542)	0.46 (148)	0.21 (29)	0.00 (8)	* (0)	
30	MOS	31	.419	717	4.2	2.9	722	.314	85.7	.25	0.96	1.36	1.35	2.17	0.25	*	3177
	Local	39	.339		4.2	2.5		.228	83.2	.00	0.95 (2868)	1.76 (233)	0.65 (66)	0.67 (6)	0.00 (4)	* (0)	

* This category was neither forecast nor observed.
** This category was forecast three times but was not observed.
*** This category was forecast four times but was not observed.

Table 4.7. Same as Table 4.2 except for 28 stations in the Central Region.

Fcst. Proj. (h)	Type of Fcst.	Direction: Mean Abs. Error (Deg)	Direction: Skill Score	Direction: No. of Cases	Speed: Mean Abs. Error (Kts)	Speed: Mean Alg. Error (Kts)	Speed: No. of Cases	Contingency Table: Skill Score	Contingency Table: Percent Fcst. Correct	Contingency Table: Threat Score (>27 Kts)	Bias by Category: 1 (No. Obs)	Bias by Category: 2 (No. Obs)	Bias by Category: 3 (No. Obs)	Bias by Category: 4 (No. Obs)	Bias by Category: 5 (No. Obs)	Bias by Category: 6 (No. Obs)	No. of Cases
12	MOS	17	.630	1146	3.1	0.8	1150	.454	84.2	.05	1.02	0.91	0.85	1.07	1.00	*	3866
	Local	16	.627		2.8	1.0		.482	83.7	.36	0.97 (3193)	1.22 (488)	0.92 (144)	0.60 (30)	0.73 (11)	* (0)	
18	MOS	21	.526	1939	3.2	1.0	1951	.415	72.5	.03	1.04	0.86	0.91	1.23	4.40	**	3887
	Local	24	.471		3.2	0.7		.357	69.3	.00	1.00 (2637)	1.10 (894)	0.85 (277)	0.43 (74)	1.60 (5)	* (0)	
30	MOS	26	.486	1207	4.1	1.9	1219	.334	79.8	.00	1.01	0.91	0.80	2.50	2.83	**	3830
	Local	33	.396		4.3	2.0		.266	74.8	.00	0.94 (3136)	1.35 (499)	1.04 (171)	1.17 (18)	0.83 (6)	* (0)	

* This category was neither forecast nor observed.
** This category was forecast three times but was not observed.

Table 4.8. Same as Table 4.2 except for 18 stations in the Western Region.

		Direction			Speed												
								Contingency Table									
											Bias by Category						
Fcst. Proj. (h)	Type of Fcst.	Mean Abs. Error (Deg)	Skill Score	No. of Cases	Mean Abs. Error (Kts)	Mean Alg. Error (Kts)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 Kts)	1 (No. Obs)	2 (No. Obs)	3 (No. Obs)	4 (No. Obs)	5 (No. Obs)	6 (No. Obs)	No. of Cases
12	MOS	26	.508	291	4.1	1.5	295	.357	89.6	.00	0.99	1.15	0.89	0.71	0.50	*	2182
	Local	24	.561		3.5	1.5		.437	90.9	.00	1.00 (1997)	1.12 (134)	1.00 (35)	0.43 (14)	1.00 (2)	* (0)	
18	MOS	31	.433	424	4.6	2.6	442	.372	82.5	.09	0.98	1.07	1.16	1.09	1.20	0.00	2157
	Local	32	.449		4.3	1.7		.346	83.9	.11	1.03 (1830)	0.90 (230)	0.77 (69)	0.23 (22)	0.60 (5)	1.00 (1)	
30	MOS	33	.366	302	4.9	3.5	311	.286	87.3	.00	0.96	1.59	1.43	0.45	0.00	*	2097
	Local	40	.354		5.3	3.7		.164	84.4	.00	0.95 (1933)	1.66 (122)	1.71 (28)	0.64 (11)	0.33 (3)	** (0)	

* This category was neither forecast nor observed.
** This category was forecast once but was not observed.

Table 4.9. Comparative verification of MOS guidance and local surface wind forecasts for 94 stations, 1200 GMT cycle.

Fcst. Proj. (h)	Type of Fcst.	Direction			Speed												
								Contingency Table									
											Bias by Category						
		Mean Abs. Error (Deg)	Skill Score	No. of Cases	Mean Abs. Error (Kts)	Mean Alg. Error (Kts)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 Kts)	1 (No. Obs)	2 (No. Obs)	3 (No. Obs)	4 (No. Obs)	5 (No. Obs)	6 (No. Obs)	No. of Cases
12	MOS	23	.520	3593	3.4	1.2	3619	.412	82.8	.07	1.01	0.96	0.88	1.40	0.81	0.57	11999
	Local	22	.528		3.4	1.6		.401	80.5	.24	0.95 (9937)	1.32 (1540)	1.14 (409)	0.74 (85)	0.52 (21)	1.00 (7)	
18	MOS	24	.512	2798	3.7	1.6	2825	.372	85.2	.06	1.00	1.01	0.90	1.40	0.88	*	11861
	Local	28	.425		3.8	1.6		.324	83.2	.12	0.98 (10291)	1.20 (1190)	0.93 (318)	0.47 (45)	0.47 (17)	* (0)	
30	MOS	27	.453	3772	3.6	1.4	3798	.355	74.1	.03	1.01	0.96	1.00	1.17	1.42	4.00	11656
	Local	34	.372		3.7	0.2		.247	73.6	.00	1.11 (8723)	0.75 (2158)	0.50 (610)	0.30 (138)	0.25 (24)	1.00 (3)	

* This category was forecast three times but was not observed.

Table 4.10. Contingency tables for MOS guidance and local surface wind direction forecasts for 94 stations, 1200 GMT cycle.

12-h Forecasts

MOS

		1	2	3	4	5	6	7	8	T
	1	333	43	10	6	5	4	19	111	531
	2	66	82	43	5	1	4	6	7	214
	3	10	34	138	59	11	4	2	5	263
OBS	4	2	8	42	174	77	9	2	2	316
	5	3	2	6	64	311	84	18	3	491
	6	2	4	0	5	65	254	120	12	462
	7	4	1	2	3	14	93	436	99	652
	8	106	1	2	4	5	6	154	386	664
	T	526	175	243	320	489	458	757	625	3593

Local

		1	2	3	4	5	6	7	8	T
	1	360	32	4	4	6	3	9	113	531
	2	62	93	47	3	1	4	1	3	214
	3	6	16	144	67	20	3	1	6	263
OBS	4	6	2	23	143	128	11	2	1	316
	5	2	1	2	36	317	114	17	2	491
	6	2	2	2	3	49	255	128	21	462
	7	8	1	1	7	12	75	399	149	652
	8	108	1	0	1	8	11	105	430	664
	T	554	148	223	264	541	476	662	725	3593

18-h Forecasts

MOS

		1	2	3	4	5	6	7	8	T
	1	264	34	11	3	7	5	17	101	442
	2	55	61	19	9	9	3	2	3	161
	3	12	28	119	45	15	2	2	2	225
OBS	4	1	4	43	139	69	7	2	3	268
	5	2	2	6	52	262	72	21	2	419
	6	3	2	0	4	45	223	79	5	361
	7	5	1	1	2	8	65	280	71	433
	8	74	3	3	2	6	11	117	273	489
	T	416	135	202	256	421	388	520	460	2798

Local

		1	2	3	4	5	6	7	8	T
	1	239	60	12	7	9	6	12	97	442
	2	41	63	31	7	7	3	2	7	161
	3	11	27	103	61	17	1	1	4	225
OBS	4	6	3	31	108	100	16	3	1	268
	5	2	3	4	51	250	85	20	4	419
	6	2	0	4	7	50	188	89	21	361
	7	15	3	2	5	19	51	210	128	433
	8	122	2	5	2	9	16	82	251	489
	T	438	161	192	248	461	366	419	513	2798

30-h Forecasts

MOS

		1	2	3	4	5	6	7	8	T
	1	321	43	12	8	14	12	35	168	613
	2	45	67	31	10	9	7	9	8	186
	3	12	31	103	52	27	7	3	7	242
OBS	4	3	3	23	99	98	16	6	3	251
	5	3	0	2	48	321	126	29	6	535
	6	2	1	0	7	96	333	100	12	551
	7	15	1	3	5	21	121	409	112	687
	8	98	4	4	2	7	16	212	364	707
	T	499	150	178	231	593	638	803	680	3772

Local

		1	2	3	4	5	6	7	8	T
	1	308	63	11	10	23	20	36	142	613
	2	51	60	35	10	6	4	8	12	186
	3	15	40	87	60	25	9	3	3	242
OBS	4	6	5	27	114	78	11	6	4	251
	5	6	5	7	92	283	104	24	14	535
	6	7	3	7	18	99	276	111	30	551
	7	48	7	8	11	50	101	289	173	687
	8	145	10	5	9	26	27	153	332	707
	T	586	193	187	324	590	552	630	710	3772

Table 4.11. Contingency tables for MOS guidance and local surface wind speed forecasts for 94 stations, 1200 GMT cycle.

12-h Forecasts — MOS

		1	2	3	4	5	6	T
	1	9183	668	73	13	0	0	9937
	2	753	619	131	35	1	1	1540
	3	72	167	118	39	10	3	409
OBS	4	4	27	31	20	3	0	85
	5	3	1	8	9	0	0	21
	6	0	1	0	3	3	0	7
	T	10015	1483	361	119	17	4	11999

12-h Forecasts — Local

		1	2	3	4	5	6	T
	1	8761	1075	91	10	0	0	9937
	2	622	732	181	5	0	0	1540
	3	40	193	142	28	4	2	409
OBS	4	4	23	40	15	2	1	85
	5	0	3	11	4	2	1	21
	6	0	0	0	1	3	3	7
	T	9427	2026	465	63	11	7	11999

18-h Forecasts — MOS

		1	2	3	4	5	6	T
	1	9586	621	69	15	0	0	10291
	2	621	429	113	23	4	0	1190
	3	81	125	83	22	7	0	318
OBS	4	3	22	13	2	2	3	45
	5	1	4	9	1	2	0	17
	6	0	0	0	0	0	0	0
	T	10292	1201	287	63	15	3	11861

18-h Forecasts — Local

		1	2	3	4	5	6	T
	1	9345	837	105	3	1	0	10291
	2	663	430	87	8	2	0	1190
	3	85	136	90	5	1	1	318
OBS	4	9	20	9	4	1	2	45
	5	2	5	6	1	3	0	17
	6	0	0	0	0	0	0	0
	T	10104	1428	297	21	8	3	11861

30-h Forecasts — MOS

		1	2	3	4	5	6	T
	1	7598	965	143	17	0	0	8723
	2	1034	832	234	52	5	1	2158
	3	127	235	176	52	14	6	610
OBS	4	10	34	46	30	14	4	138
	5	1	2	10	10	1	0	24
	6	0	1	0	1	0	1	3
	T	8770	2069	609	162	34	12	11656

30-h Forecasts — Local

		1	2	3	4	5	6	T
	1	7903	751	67	2	0	0	8723
	2	1458	577	109	12	2	0	2158
	3	282	233	80	12	2	1	610
OBS	4	33	49	39	13	2	2	138
	5	4	8	12	0	0	0	24
	6	1	0	0	2	0	0	3
	T	9681	1618	307	41	6	3	11656

Table 4.12. Same as Table 4.9 except for 24 stations in the Eastern Region.

Fcst. Proj. (h)	Type of Fcst.	Direction			Speed												
								Contingency Table									
											Bias by Category						
		Mean Abs. Error (Deg)	Skill Score	No. of Cases	Mean Abs. Error (Kts)	Mean Alg. Error (Kts)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 Kts)	1 (No. Obs)	2 (No. Obs)	3 (No. Obs)	4 (No. Obs)	5 (No. Obs)	6 (No. Obs)	No. of Cases
12	MOS	24	.475	780	3.3	1.0	787	.423	84.6	.11	1.02	0.88	0.79	1.41	0.60	1.00	2715
	Local	24	.438		3.5	1.4		.372	80.4	.25	0.95 (2277)	1.41 (330)	0.87 (85)	0.82 (17)	0.20 (5)	3.00 (1)	
18	MOS	24	.462	714	3.5	1.3	722	.350	83.8	.20	1.01	0.90	1.03	1.56	1.00	*	2737
	Local	30	.361		3.8	1.6		.309	81.4	.00	0.98 (2338)	1.11 (325)	1.23 (62)	0.78 (9)	0.67 (3)	** (0)	
30	MOS	26	.468	1005	3.3	1.2	1008	.339	71.9	.00	1.01	0.92	0.96	2.30	1.17	1.00	2618
	Local	33	.354		3.5	0.1		.257	71.7	.00	1.11 (1894)	0.79 (556)	0.41 (141)	0.40 (20)	0.33 (6)	0.00 (1)	

* This category was neither forecast nor observed.
** This category was forecast once but was not observed.

Table 4.13. Same as Table 4.9 except for 24 stations in the Southern Region.

Fcst. Proj. (h)	Type of Fcst.	Direction: Mean Abs. Error (Deg)	Direction: Skill Score	Direction: No. of Cases	Speed: Mean Abs. Error (Kts)	Speed: Mean Alg. Error (Kts)	Speed: No. of Cases	Contingency Table: Skill Score	Contingency Table: Percent Fcst. Correct	Contingency Table: Threat Score (>27 Kts)	Bias by Category: 1 (No. Obs)	2 (No. Obs)	3 (No. Obs)	4 (No. Obs)	5 (No. Obs)	6 (No. Obs)	No. of Cases
12	MOS	24	.475	875	3.6	1.6	887	.394	85.6	.14	1.00	0.97	1.07	1.35	0.40	0.00	3276
	Local	23	.514		3.5	2.2		.412	83.2	.25	0.93 (2839)	1.54 (325)	1.36 (86)	0.85 (20)	0.40 (5)	2.00 (1)	
18	MOS	25	.484	639	3.9	2.1	642	.341	87.1	.25	0.99	1.14	1.03	2.40	0.25	*	3147
	Local	27	.403		3.8	1.8		.296	85.8	.50	0.98 (2829)	1.38 (242)	0.66 (67)	0.40 (5)	0.50 (4)	* (0)	
30	MOS	30	.431	934	3.8	1.4	941	.309	74.4	.00	1.02	0.91	0.95	1.37	0.75	***	3200
	Local	37	.369		3.8	0.3		.203	74.3	.00	1.11 (2455)	0.72 (560)	0.41 (150)	0.22 (27)	0.00 (8)	** (0)	

* This category was neither forecast nor observed.
** This category was forecast once but was not observed.
*** This category was forecast twice but was not observed.

Table 4.14. Same as Table 4.9 except for 28 stations in the Central Region.

Fcst. Proj. (h)	Type of Fcst.	Direction: Mean Abs. Error (Deg)	Direction: Skill Score	Direction: No. of Cases	Speed: Mean Abs. Error (Kts)	Speed: Mean Alg. Error (Kts)	Speed: No. of Cases	Speed: Contingency Table: Skill Score	Speed: Contingency Table: Percent Fcst. Correct	Speed: Contingency Table: Threat Score (>27 Kts)	Bias by Category: 1 (No. Obs)	Bias by Category: 2 (No. Obs)	Bias by Category: 3 (No. Obs)	Bias by Category: 4 (No. Obs)	Bias by Category: 5 (No. Obs)	Bias by Category: 6 (No. Obs)	No. of Cases
12	MOS	19	.588	1362	3.3	1.1	1367	.414	80.0	.05	1.01	0.95	0.79	1.71	3.00	1.50	3755
	Local	19	.572		3.2	1.6		.422	77.6	.33	0.92 (2973)	1.35 (578)	1.21 (170)	0.68 (28)	1.25 (4)	0.50 (2)	
18	MOS	21	.557	1124	3.5	1.1	1129	.417	82.9	.00	1.03	0.88	0.72	1.63	1.57	**	3759
	Local	25	.463		3.6	1.0		.351	79.6	.10	0.99 (3078)	1.14 (493)	0.83 (162)	0.37 (19)	0.43 (7)	* (0)	
30	MOS	25	.456	1502	3.4	1.3	1508	.380	70.8	.03	1.01	0.96	0.99	0.84	3.00	9.00	3649
	Local	32	.369		3.6	0.0		.243	68.0	.00	1.14 (2499)	0.74 (828)	0.64 (245)	0.27 (70)	0.67 (6)	1.00 (1)	

* This category was forecast once but was not observed.
** This category was forecast three times but was not observed.

Table 4.15. Same as Table 4.9 except for 18 stations in the Western Region.

		Direction			Speed												
								Contingency Table									
											Bias by Category						
Fcst. Proj. (h)	Type of Fcst.	Mean Abs. Error (Deg)	Skill Score	No. of Cases	Mean Abs. Error (Kts)	Mean Alg. Error (Kts)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 Kts)	1 (No. Obs)	2 (No. Obs)	3 (No. Obs)	4 (No. Obs)	5 (No. Obs)	6 (No. Obs)	No. of Cases
12	MOS	27	.438	576	3.5	1.0	578	.405	81.5	.00	0.99	1.07	1.00	1.00	0.00	0.00	2253
	Local	25	.525		3.5	1.1		.365	81.3	.17	1.02 (1848)	0.91 (307)	1.01 (68)	0.65 (20)	0.43 (7)	0.33 (3)	
18	MOS	29	.421	321	4.5	2.8	332	.311	88.1	.00	0.96	1.54	1.41	0.50	0.00	*	2218
	Local	35	.383		4.8	3.0		.266	87.9	.00	0.98 (2046)	1.32 (130)	1.56 (27)	0.42 (12)	0.33 (3)	** (0)	
30	MOS	37	.364	331	5.0	2.9	341	.338	82.0	.14	0.97	1.17	1.19	0.95	0.75	0.00	2189
	Local	38	.349		4.7	1.4		.254	84.0	.00	1.06 (1875)	0.77 (214)	0.41 (74)	0.38 (21)	0.00 (4)	1.00 (1)	

* This category was neither forecast nor observed.
** This category was forecast once but was not observed.

Table 5.1. Definitions of the cloud amount categories used for the local forecasts and observations. The MOS guidance was based on these same categories for opaque amounts only.

Category	Cloud Amount
1	CLR, -SCT -BKN, -OVC, -X
2	SCT
3	BKN
4	OVC, X

Table 5.2. Comparative verification of MOS guidance and local forecasts of four categories of cloud amount (clear, scattered, broken, and overcast) for 88 stations, 0000 GMT cycle.

Projection (h)	Type of Forecast	Bias by Category				Percent Correct	Skill Score	Number of Cases
		1	2	3	4			
12	MOS	0.99	0.93	1.41	0.94	62.7	.448	10422
	Local	0.90	1.14	1.33	0.97	75.0	.631	
	No. Obs.	3603	1229	1016	4574			
18	MOS	0.97	0.93	1.67	0.84	56.8	.396	10439
	Local	0.81	1.25	1.75	0.82	58.6	.429	
	No. Obs.	3177	1590	1321	4351			
24	MOS	1.03	0.98	1.61	0.82	55.9	.382	10425
	Local	0.85	1.24	1.84	0.80	55.4	.386	
	No. Obs.	3363	1685	1152	4225			

Table 5.3. Same as Table 5.2 except for 24 stations in the Eastern Region.

Projection (h)	Type of Forecast	Bias by Category				Percent Correct	Skill Score	Number of Cases
		1	2	3	4			
12	MOS	0.94	0.82	1.40	1.00	63.1	.431	2574
	Local	0.91	1.00	1.31	0.98	71.6	.565	
	No. Obs.	619	353	272	1330			
18	MOS	0.93	0.87	1.54	0.93	60.1	.417	2549
	Local	0.74	1.13	1.71	0.89	60.9	.436	
	No. Obs.	593	386	333	1237			
24	MOS	1.05	1.01	1.53	0.87	61.3	.419	2548
	Local	0.85	1.37	1.84	0.83	58.7	.394	
	No. Obs.	692	301	251	1304			

Table 5.4. Same as Table 5.2 except for 22 stations in the Southern Region.

Projection (h)	Type of Forecast	Bias by Category				Percent Correct	Skill Score	Number of Cases
		1	2	3	4			
12	MOS	0.96	1.04	1.28	0.95	62.3	.443	2851
	Local	0.91	1.25	1.19	0.97	75.8	.644	
	No. Obs.	1246	314	310	981			
18	MOS	0.98	0.83	1.51	0.90	57.1	.405	2910
	Local	0.90	1.19	1.52	0.78	58.1	.428	
	No. Obs.	1105	520	400	885			
24	MOS	1.07	0.84	1.24	0.91	56.3	.375	2921
	Local	0.92	1.13	1.51	0.81	55.7	.382	
	No. Obs.	1211	571	339	800			

Table 5.5. Same as Table 5.2 except for 26 stations in the Central Region.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Percent Correct	Skill Score	Number of Cases
12	MOS	0.99	0.91	1.48	0.95	63.8	.449	3014
	Local	0.87	1.17	1.44	0.98	77.8	.664	
	No. Obs.	1029	343	237	1405			
18	MOS	0.98	1.04	1.74	0.82	56.4	.378	3008
	Local	0.68	1.54	1.83	0.84	59.3	.428	
	No. Obs.	888	402	336	1382			
24	MOS	1.04	0.96	1.72	0.83	55.8	.369	2992
	Local	0.72	1.41	1.99	0.82	55.9	.384	
	No. Obs.	880	466	296	1350			

Table 5.6. Same as Table 5.2 except for 16 stations in the Western Region.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Percent Correct	Skill Score	Number of Cases
12	MOS	1.08	1.01	1.54	0.81	61.1	.431	1983
	Local	0.90	1.15	1.45	0.94	74.0	.618	
	No. Obs.	709	219	197	858			
18	MOS	0.99	1.06	2.03	0.68	52.6	.352	1972
	Local	0.88	1.13	2.08	0.72	55.3	.388	
	No. Obs.	591	282	252	847			
24	MOS	0.91	1.20	2.04	0.62	48.6	.315	1964
	Local	0.87	1.07	2.11	0.68	50.1	.332	
	No. Obs.	580	347	266	771			

Table 5.7. Comparative verification of MOS guidance and local forecasts of four categories of cloud amount (clear, scattered, broken, and overcast) for 86 stations, 1200 GMT cycle.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Percent Correct	Skill Score	Number of Cases
12	MOS	1.03	0.95	1.58	0.84	58.4	.415	10083
	Local	0.95	0.99	1.47	0.92	70.4	.581	
	No. Obs.	3248	1633	1128	4074			
18	MOS	1.09	0.99	1.32	0.85	62.2	.434	9962
	Local	0.82	1.43	1.79	0.88	62.2	.455	
	No. Obs.	3865	1069	899	4129			
24	MOS	1.10	0.95	1.28	0.87	60.1	.409	9994
	Local	0.84	1.37	1.75	0.87	58.2	.402	
	No. Obs.	3473	1167	975	4379			

Table 5.8. Same as Table 5.7 except for 24 stations in the Eastern Region.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Percent Correct	Skill Score	Number of Cases
12	MOS	1.00	1.10	1.43	0.89	63.6	.452	2395
	Local	0.91	1.06	1.54	0.93	71.5	.569	
	No. Obs.	645	278	245	1227			
18	MOS	1.11	0.97	1.17	0.91	64.2	.439	2424
	Local	0.83	1.38	1.78	0.89	62.3	.429	
	No. Obs.	714	231	221	1258			
24	MOS	1.05	0.91	1.36	0.93	60.8	.403	2414
	Local	0.93	1.18	1.67	0.85	58.6	.388	
	No. Obs.	597	318	251	1248			

Table 5.9. Same as Table 5.7 except for 22 stations in the Southern Region.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Percent Correct	Skill Score	Number of Cases
12	MOS	1.07	0.82	1.24	0.91	59.0	.417	2906
	Local	1.04	0.90	1.25	0.90	72.5	.611	
	No. Obs.	1181	566	360	799			
18	MOS	1.06	0.83	1.08	0.94	64.6	.443	2814
	Local	0.86	1.36	1.60	0.91	63.7	.462	
	No. Obs.	1404	322	262	827			
24	MOS	1.04	1.00	0.97	0.95	62.1	.430	2808
	Local	0.88	1.40	1.46	0.88	59.8	.421	
	No. Obs.	1223	316	300	969			

Table 5.10. Same as Table 5.7 except for 24 stations in the Central Region.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Percent Correct	Skill Score	Number of Cases
12	MOS	1.07	0.93	1.72	0.83	58.4	.403	2825
	Local	0.87	1.11	1.60	0.92	70.4	.572	
	No. Obs.	842	429	267	1287			
18	MOS	1.12	1.06	1.54	0.80	60.4	.404	2826
	Local	0.78	1.69	1.77	0.89	63.3	.461	
	No. Obs.	1013	283	222	1308			
24	MOS	1.19	0.94	1.39	0.81	59.4	.389	2825
	Local	0.79	1.60	1.91	0.85	58.9	.405	
	No. Obs.	947	319	228	1331			

Table 5.11. Same as Table 5.7 except for 16 stations in the Western Region.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Percent Correct	Skill Score	Number of Cases
12	MOS	0.90	1.07	2.08	0.68	50.9	.342	1957
	Local	0.92	0.93	1.57	0.90	65.7	.526	
	No. Obs.	580	360	256	761			
18	MOS	1.06	1.13	1.55	0.75	58.6	.404	1898
	Local	0.80	1.26	2.10	0.83	58.2	.415	
	No. Obs.	734	233	194	737			
24	MOS	1.11	0.97	1.53	0.79	57.6	.379	1947
	Local	0.74	1.28	2.12	0.88	54.6	.355	
	No. Obs.	706	214	196	831			

Table 6.1. Definitions of the categories used for verification of persistence, local, and guidance forecasts of ceiling height and visibility.

Category	Ceiling (ft)	Visibility (mi)
1	$\leq$400	<1
2	500-900	1-2 3/4
3	1000-2900	3-6
4	$\geq$3000	>6

Table 6.2. Comparative verification of MOS guidance, persistence, and local ceiling height forecasts for 93 stations, 0000 GMT cycle.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Log Score	Percent Correct	Skill Score
12	MOS	1.18	0.83	0.99	1.00	3.655	72.2	.410
	Local	0.84	0.89	1.10	1.01	2.202	81.1	.597
	Persistence	0.89	0.95	0.95	1.03	2.263	81.1	.591
	No. Obs.	849	847	1872	8425			
15	Local	0.51	0.74	1.22	1.03	2.900	75.4	.474
	Persistence	0.94	0.83	0.93	1.04	3.193	74.4	.449
	No. Obs.	809	975	1938	8455			
18	MOS	1.16	0.83	1.03	1.00	3.131	72.4	.393
	Local	0.36	0.64	1.15	1.03	2.561	74.8	.421
	Persistence	1.54	0.97	0.84	1.01	3.551	70.9	.358
	No. Obs.	490	819	2111	8469			
24	MOS	1.25	0.77	0.95	1.02	2.618	77.1	.380
	Local	0.31	0.59	1.34	1.00	2.367	76.1	.361
	Persistence	1.92	1.22	1.10	0.93	4.071	68.3	.240
	No. Obs.	396	664	1624	9227			

Table 6.3. Same as Table 6.2 except for visibility, 0000 GMT cycle.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Log Score	Percent Correct	Skill Score
	MOS	1.30	1.04	1.06	0.97	3.334	73.0	.364
12	Local	0.84	0.83	1.30	0.97	2.066	79.7	.518
	Persistence	0.82	0.89	0.91	1.04	1.928	82.5	.553
	No. Obs.	536	753	1684	9016			
	Local	0.47	0.45	1.11	1.08	2.853	73.6	.354
15	Persistence	0.81	0.64	0.89	1.08	3.025	73.9	.366
	No. Obs.	549	1076	1747	8789			
	MOS	1.20	0.90	1.11	0.99	2.701	75.9	.336
	Local	0.33	0.42	1.11	1.06	2.215	78.4	.326
18	Persistence	1.38	0.81	1.13	0.98	3.047	74.2	.290
	No. Obs.	319	817	1341	9420			
	MOS	1.00	0.86	1.09	1.00	2.147	79.9	.329
	Local	0.28	0.43	1.10	1.04	1.888	81.3	.312
24	Persistence	2.00	1.02	1.33	0.94	3.141	73.5	.217
	No. Obs.	218	657	1159	9887			

Table 6.4. Same as Table 6.2 except for ceiling height for 94 stations, 1200 GMT cycle.

Projection (h)	Type of Forecast	Bias by Category				Log Score	Percent Correct	Skill Score
		1	2	3	4			
12	MOS	1.38	0.72	0.98	1.01	2.528	77.7	.399
	Local	0.74	0.82	1.25	0.98	1.468	84.7	.602
	Persistence	0.93	0.98	1.19	0.97	1.569	84.1	.591
	No. Obs.	370	663	1609	9141			
15	Local	0.65	0.90	1.24	0.98	1.981	80.6	.510
	Persistence	0.74	1.05	1.15	0.98	2.188	79.0	.472
	No. Obs.	464	638	1707	9187			
18	MOS	1.38	0.68	0.93	1.01	3.260	74.7	.369
	Local	0.64	0.87	1.32	0.97	2.538	76.5	.437
	Persistence	0.61	0.92	1.16	1.00	2.824	74.4	.370
	No. Obs.	546	708	1613	8737			
24	MOS	1.36	0.69	0.89	1.02	4.137	70.4	.357
	Local	0.56	0.99	1.31	0.98	3.607	69.7	.359
	Persistence	0.42	0.81	1.04	1.07	4.030	67.4	.253
	No. Obs.	811	808	1774	8175			

Table 6.5. Same as Table 6.2 except for visibility for 94 stations, 1200 GMT cycle.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Log Score	Percent Correct	Skill Score
12	MOS	1.31	0.79	1.04	1.00	2.018	81.4	.370
	Local	0.91	0.69	1.35	0.98	1.240	86.5	.560
	Persistence	1.17	1.05	1.03	0.99	1.298	87.2	.578
	No. Obs.	203	646	1147	9778			
15	Local	0.90	0.83	1.34	0.97	1.673	82.5	.441
	Persistence	1.14	1.24	0.97	0.99	1.824	82.7	.431
	No. Obs.	220	549	1246	9957			
18	MOS	1.30	0.83	1.02	1.00	2.523	78.8	.335
	Local	0.72	0.94	1.38	0.96	2.091	79.5	.394
	Persistence	0.78	1.25	0.91	1.01	2.306	79.7	.354
	No. Obs.	305	539	1278	9471			
24	MOS	1.51	0.91	0.99	0.98	3.772	71.3	.306
	Local	0.60	1.02	1.30	0.97	3.249	71.1	.307
	Persistence	0.47	0.93	0.73	1.09	3.514	71.6	.213
	No. Obs.	512	725	1573	8737			

Table 7.1. Verification of MOS guidance and local max/min temperature forecasts for 93 stations, 0000 GMT cycle.

Forecast Projection	Forecast Type	Number of Cases	Mean Algebraic Error (°F)	Mean Absolute Error (°F)	Percent of Absolute Errors >10°F	Probability of Detection (32°F)	False Alarm Ratio (32°F)
Today's	MOS		1.6	3.9	4.6	--	--
Max	Local	12192	0.6	3.3	2.4	--	--
Tonight's	MOS		-2.6	5.1	10.1	0.8	0.5
Min	Local	12061	-1.2	4.2	5.4	0.7	0.4
Tomorrow's	MOS		1.2	4.7	8.5	--	--
Max	Local	12163	0.3	4.4	7.0	--	--
Tomorrow	MOS		-3.1	5.9	15.6	0.7	0.6
Night's Min	Local	12022	-2.0	5.3	11.8	0.6	0.6

Table 7.2. Same as Table 7.1 except for 24 stations in the Eastern Region.

Forecast Projection	Forecast Type	Number of Cases	Mean Algebraic Error (°F)	Mean Absolute Error (°F)	Percent of Absolute Errors >10°F	Probability of Detection (32°F)	False Alarm Ratio (32°F)
Today's	MOS		1.3	3.7	3.6	--	--
Max	Local	2796	0.3	3.3	2.5	--	--
Tonight's	MOS		-2.4	5.1	9.6	0.7	0.6
Min	Local	2793	-0.9	4.2	4.8	0.7	0.5
Tomorrow's	MOS		0.6	4.3	6.7	--	--
Max	Local	2789	-0.2	4.2	6.2	--	--
Tomorrow	MOS		-2.9	6.1	16.3	0.8	0.6
Night's Min	Local	2788	-1.7	5.4	12.6	0.6	0.6

Table 7.3. Same as Table 7.1 except for 24 stations in the Southern Region.

Forecast Projection	Forecast Type	Number of Cases	Mean Algebraic Error (°F)	Mean Absolute Error (°F)	Percent of Absolute Errors >10°F	Probability of Detection (32°F)	False Alarm Ratio (32°F)
Today's	MOS		1.4	3.9	5.7	--	--
Max	Local	3362	0.6	3.4	3.5	--	--
Tonight's	MOS		-2.0	4.6	7.5	0.7	0.4
Min	Local	3239	-1.0	4.0	4.1	0.7	0.4
Tomorrow's	MOS		1.1	4.8	10.0	--	--
Max	Local	3352	0.5	4.5	8.5	--	--
Tomorrow	MOS		-2.6	5.4	12.4	0.8	0.5
Night's Min	Local	3232	-1.8	5.1	10.1	0.7	0.5

Table 7.4. Same as Table 7.1 except for 28 stations in the Central Region.

Forecast Projection	Forecast Type	Number of Cases	Mean Algebraic Error (°F)	Mean Absolute Error (°F)	Percent of Absolute Errors >10°F	Probability of Detection (32°F)	False Alarm Ratio (32°F)
Today's Max	MOS		2.4	4.3	5.7	--	--
	Local	3878	0.9	3.3	2.1	--	--
Tonight's Min	MOS		-2.9	5.5	13.3	0.8	0.5
	Local	3879	-1.1	4.4	6.3	0.7	0.3
Tomorrow's Max	MOS		1.9	5.2	9.9	--	--
	Local	3874	0.7	4.6	7.5	--	--
Tomorrow Night's Min	MOS		-3.4	6.4	18.8	0.6	0.6
	Local	3874	-2.0	5.6	13.6	0.6	0.6

Table 7.5. Same as Table 7.1 except for 17 stations in the Western Region.

Forecast Projection	Forecast Type	Number of Cases	Mean Algebraic Error (°F)	Mean Absolute Error (°F)	Percent of Absolute Errors >10°F	Probability of Detection (32°F)	False Alarm Ratio (32°F)
Today's Max	MOS		0.9	3.2	2.6	--	--
	Local	2156	0.3	3.0	1.6	--	--
Tonight's Min	MOS		-3.2	4.8	8.7	0.9	0.6
	Local	2150	-2.3	4.2	6.6	0.8	0.6
Tomorrow's Max	MOS		0.6	4.3	6.0	--	--
	Local	2148	0.0	3.9	4.4	--	--
Tomorrow Night's Min	MOS		-3.6	5.7	13.9	0.8	0.7
	Local	2128	-2.7	5.1	10.2	0.7	0.7

Table 7.6. Verification of MOS guidance and local max/min temperature forecasts for 93 stations, 1200 GMT cycle.

Forecast Projection	Forecast Type	Number of Cases	Mean Algebraic Error (°F)	Mean Absolute Error (°F)	Percent of Absolute Errors >10°F	Probability of Detection (32°F)	False Alarm Ratio (32°F)
Tonight's	MOS		-2.9	4.7	7.9	0.8	0.5
Min	Local	11845	-1.6	3.7	3.3	0.8	0.4
Tomorrow's	MOS		1.2	4.4	7.4	--	--
Max	Local	11951	0.2	3.9	4.4	--	--
Tomorrow	MOS		-2.9	5.7	14.3	0.8	0.6
Night's Min	Local	11823	-1.7	4.8	8.5	0.7	0.5
Day After	MOS		1.3	5.4	13.3	--	--
Tomorrow's Max	Local	11889	0.4	5.0	10.4	--	--

Table 7.7. Same as Table 7.6 except for 24 stations in the Eastern Region.

Forecast Projection	Forecast Type	Number of Cases	Mean Algebraic Error (°F)	Mean Absolute Error (°F)	Percent of Absolute Errors >10°F	Probability of Detection (32°F)	False Alarm Ratio (32°F)
Tonight's Min	MOS		-2.4	4.6	6.5	0.8	0.5
	Local	2674	-1.2	3.6	2.8	0.8	0.4
Tomorrow's Max	MOS		0.5	4.0	5.2	--	--
	Local	2657	-0.4	4.0	4.0	--	--
Tomorrow Night's Min	MOS		-2.8	5.9	15.0	0.9	0.5
	Local	2659	-1.2	4.9	8.8	0.8	0.4
Day After Tomorrow's Max	MOS		0.4	5.0	10.7	--	--
	Local	2639	-0.3	4.7	8.6	--	--

Table 7.8. Same as Table 7.6 except for 24 stations in the Southern Region.

Forecast Projection	Forecast Type	Number of Cases	Mean Algebraic Error (°F)	Mean Absolute Error (°F)	Percent of Absolute Errors >10°F	Probability of Detection (32°F)	False Alarm Ratio (32°F)
Tonight's Min	MOS		-2.6	4.4	6.7	0.8	0.4
	Local	3211	-1.6	3.5	2.5	0.8	0.3
Tomorrow's Max	MOS		1.0	4.5	8.6	--	--
	Local	3329	0.4	4.0	5.7	--	--
Tomorrow Night's Min	MOS		-2.3	5.2	11.4	0.7	0.5
	Local	3199	-1.4	4.6	7.0	0.7	0.4
Day After Tomorrow's Max	MOS		0.8	5.5	13.1	--	--
	Local	3317	0.6	5.2	12.0	--	--

Table 7.9. Same as Table 7.6 except for 28 stations in the Central Region.

Forecast Projection	Forecast Type	Number of Cases	Mean Algebraic Error (°F)	Mean Absolute Error (°F)	Percent of Absolute Errors >10°F	Probability of Detection (32°F)	False Alarm Ratio (32°F)
Tonight's	MOS		-3.2	5.3	11.0	0.8	0.5
Min	Local	3776	-1.5	3.9	3.9	0.8	0.3
Tomorrow's	MOS		2.0	4.8	9.6	--	--
Max	Local	3782	0.5	4.0	4.4	--	--
Tomorrow	MOS		-3.4	6.2	17.9	0.8	0.6
Night's Min	Local	3783	-1.7	5.1	9.8	0.7	0.5
Day After	MOS		2.2	6.1	17.0	--	--
Tomorrow's Max	Local	3763	0.9	5.4	12.3	--	--

Table 7.10. Same as Table 7.6 except for 17 stations in the Western Region.

Forecast Projection	Forecast Type	Number of Cases	Mean Algebraic Error (°F)	Mean Absolute Error (°F)	Percent of Absolute Errors >10°F	Probability of Detection (32°F)	False Alarm Ratio (32°F)
Tonight's	MOS		-3.3	4.5	6.2	0.8	0.5
Min	Local	2184	-2.4	3.8	3.7	0.9	0.5
Tomorrow's	MOS		1.0	3.8	4.2	--	--
Max	Local	2183	0.1	3.4	2.8	--	--
Tomorrow	MOS		-3.1	5.2	11.3	0.8	0.6
Night's Min	Local	2182	-2.5	4.7	8.1	0.8	0.6
Day After	MOS		1.4	4.9	10.0	--	--
Tomorrow's Max	Local	2170	0.3	4.3	7.0	--	--