NOAA Technical Memorandum NWS SR-77

SOME ASPECTS OF PoP FORECAST PERFORMANCE BY SOUTHERN REGION WSFOs -- REVISITED

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Southern Region
Fort Worth, Texas
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Robert M. White, Administrator

National Weather
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George P. Cressman, Director

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INTRODUCTION

NOAA Technical Memorandum NWS SR-57 (May 1971) examined probability of precipitation (PoP) forecasts issued by WSFOs in the Southern Region (SR) for the year November 1969 through October 1970. A lot of water has fallen on (or near) the bridge since those forecasts were generated -- PEATMOS PoPs and other new guidance products have become available, wholesale changes in personnel and staffing patterns have taken place and three new SR forecast offices (JAN, LIT, LBB) have been established -- and it is time now to take an analogous look at PoP performance.

The primary purpose of SRTM-57 was to afford SR forecast offices the opportunity to compare their PoP product with that of other WSFOs and encourage forecasters and station managers to use verification as a tool for forecast improvement. This present Tech Memo additionally seeks to show whether or not and how the complexion of the SR PoP product may have changed, as well as where in the regional hierarchy of performance the newer forecast offices may fit. The period of record here is April 1973 through March 1974 with cold and warm seasons divided Oct-Mar and Apr-Sep, one month different than previously. The format of text and treatment of data here parallels SRTM-57 exactly, albeit concisely. There seems little point in reiteration of definitions, qualifications, ideas or whatever which are set down there and with which forecasters and supervisors concerned about this matter are already familiar. That issuance is available on-station and should be at hand for reference while reading this one.

THE RELIABILITY DATA

Figures 1-13 depict the reliability data from the verification printouts in graph form.

A Regional view. Figure 1 is a composite for all forecasts in the Region during the period April 1973 through March 1974. As before in Period 1 all points except that in the >95% category are within 5% of perfect reliability. This desirable feature is lost beyond 60% in Period 2 and beyond 50% in Period 3. The root-mean-square reliability errors (ER) for the three periods are 2.3%, 2.8% and 4.4%, respectively. The ER for all periods combined, regionwide, is 3.2%, the same as for the 1969-70 period. Again we see the general inability to successfully use high probabilities after Period 1, the progressive concentration of forecasts near the mean climatological value with increasing lead time and the overuse of "near zero" in Periods 2 and 3. The overall tendency to overforecast precipitation seems less pronounced than in 1969-70. It is interesting to note that in only six instances during the whole year did a SR forecaster choose to assess the probability of measurable precipitation as being >95% -- and in none of these did the event occur.

in Period 3

The record of the WSFOs. Examination of Figures 2-13 will reveal the biases and limitations each WSFO has shown. Station managers should compare this recent record with the 1969-70 period to see if any deterioration in PoP performance has taken place. In the light of developments during the early 1970s it may be that "deterioration" comprises an absence of demonstrable improvement. In some cases a less-than-best-possible performance level may be traceable to individuals whose performance records are available on-station. Corrective action is a local responsibility.

As an example of the sort of thing to look for notice, say, the approximate frequency of precipitation events in Period 3 at Memphis for a near zero-probability forecast. It is too high. Further it can be seen that the number of zero forecasts does not decrease significantly with increasing lead time. This might be interpreted as meaning that the forecasters (as a group) believe that they can claim such an extreme degree of certainty in an event -- the event: no rain -- about as often for Period 3 as they can for Period 1. This is desirable but not realistic.

Generalized guidelines for greater reliability. Attention is invited to the parallel section in SRTM-57 -- general comments made there will not be repeated.

The systematic increase in regional ER is distressing since the ER should not be a function of forecast lead time but only of awareness of the limitations of forecasting abilities. Certainly some WSFOs (and at each one, certain individuals) contribute more heavily to this effect than others. Again, each is encouraged to make these computations for its own product and take such corrective action as may be indicated.

CERTAIN ASPECTS OF THE S-SCORES

The regression lines in Figure 14 again clearly depict the inverse relation between lead time and forecast utility. The linear correlation for this sample is much better than for the 1969-70 data (note r-values). If in fact it can be supposed, as suggested in SRTM-57, that Miami ought not to be included, then the assumed linear relationship of S-score and precipitation frequency becomes really convincing (see Figure 15) and it is not unreasonable to argue that WSFOs above the dashed line have the better performance records -- the farther above the better still (above meaning parallel to S- axis, not perpendicular to the regression line).

Figure 16 illustrates the seasonal influence on forecast skill. The correlation coefficients suggest that the greater part of the problem at Miami is still in the warm season, although its cold season performance is not so sharply better as it was in 1969-70. It is not intituitively obvious that the unique peninsular environment of the forecast points should act negatively on performance potential.

CONCLUDING REMARKS

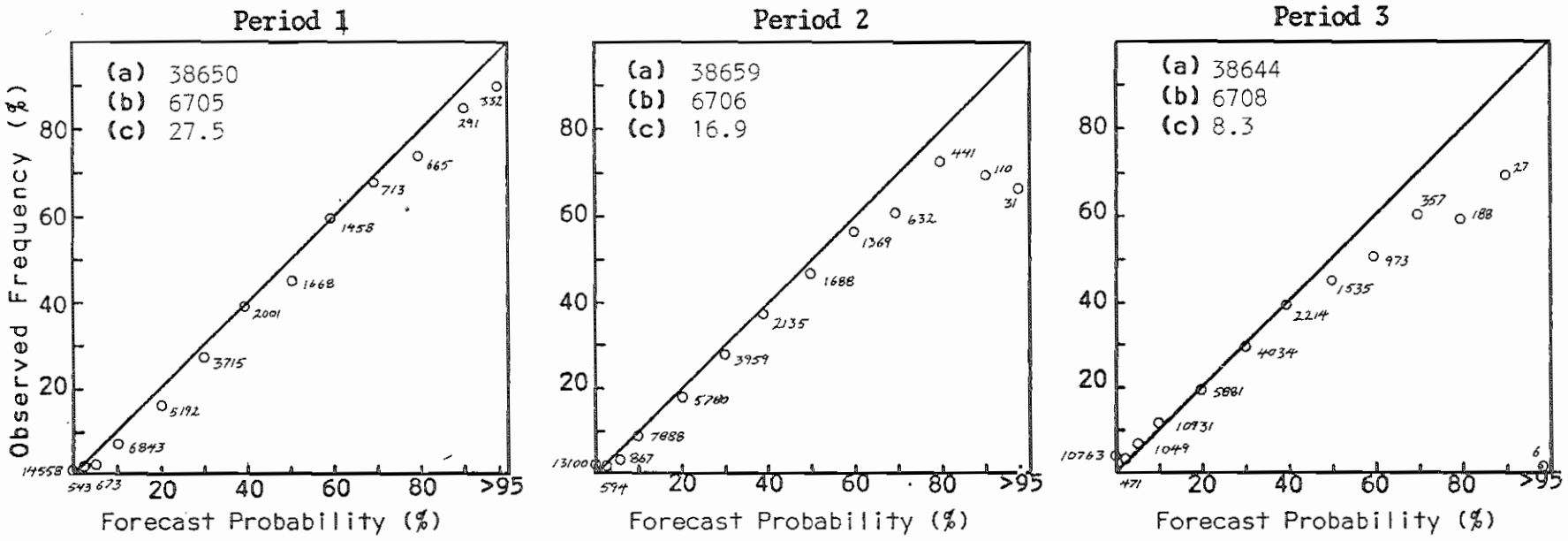
In general SR PoP forecasts are not significantly better or worse than they were three and one-half years ago. Probably the forecasting art (or science) is on a plateau that slopes upward no more than slightly and continued diminishing returns in performance measures can scarcely be avoided. Barring some unforeseeable breakthrough the PoP product will not undergo any dramatic improvement. Gains must therefore be made when, where and in however small steps they can -- one possible avenue is the verification program. Again MICs are urged to take a hard look at what long-term improvement might be possible through a sustained local program of quality control for probability forecasts.

ACKNOWLEDGMENT

Special thanks to Dan Smith, SSD, SRH, who drafted the figures.

REFERENCE

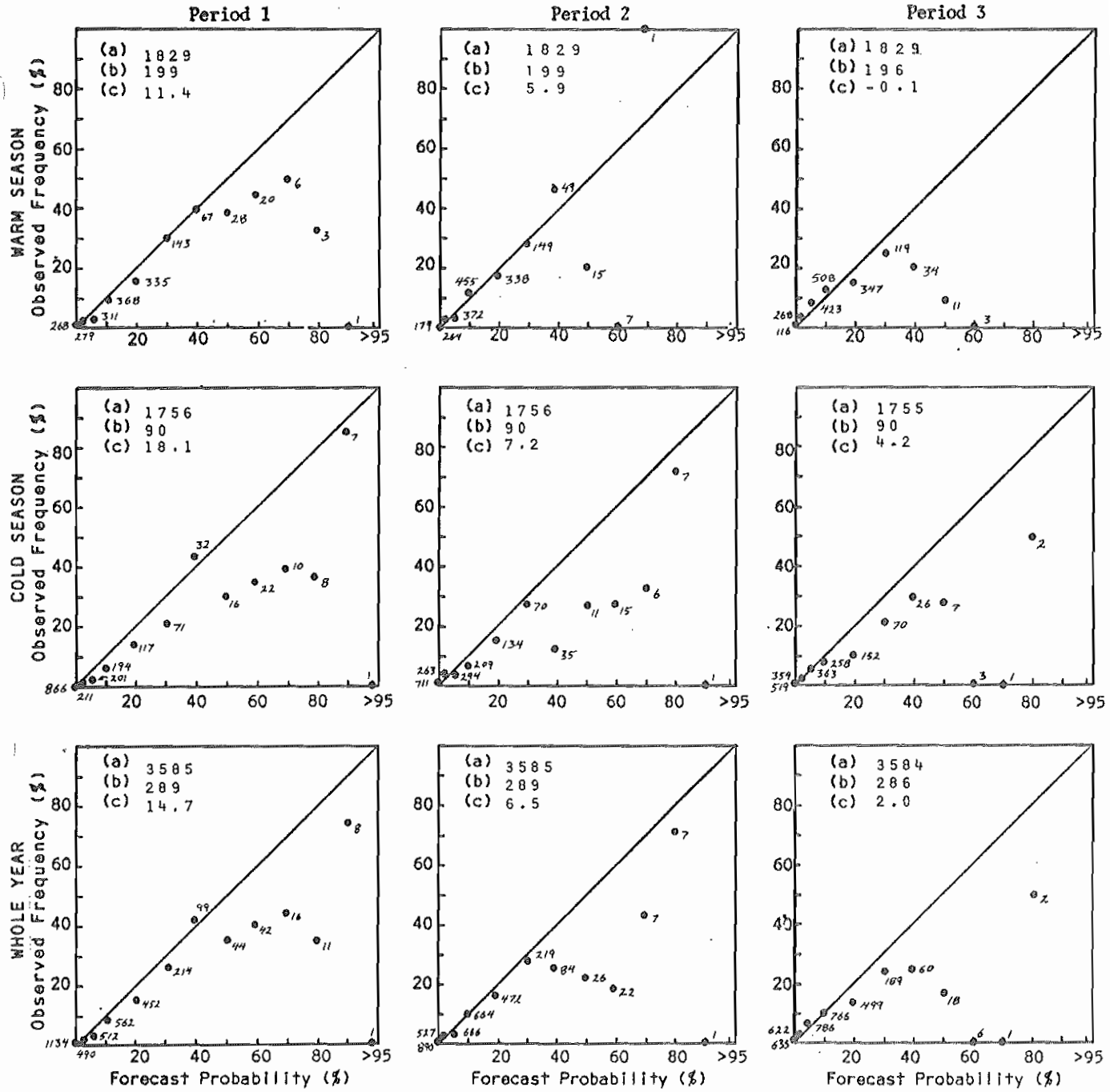
Cummings, Allen D., 1971: Some Aspects of Probability of Precipitation Forecast Performance by WSFOs in the Southern Region -- November 1969 Through October 1970. NOAA TM NWS SR-57, 35 pp.



(a) Total number of forecasts
(b) Number of precipitation cases
(c) Improvement over climatology (%) (weighted mean)

Figure 1. Forecast probability vs. observed frequency of occurrence of measurable precipitation in the indicated 12-hour periods for all forecasts (06Z and 18Z combined) issued by

ALL STATIONS -- Whole Year



(a) TOTAL NUMBER OF FORECASTS*
(b) NUMBER OF PRECIPITATION CASES
(c) IMPROVEMENT OVER CLIMATOLOGY (%)
(*NUMBERS OF FORECASTS IN EACH CATEGORY ENTERED NEAR PLOTTED POINTS)

FIGURE 2. FORECAST PROBABILITY VS. OBSERVED FREQUENCY OF OCCURRENCE OF MEASURABLE PRECIPITATION IN THE INDICATED 12-HOUR PERIODS FOR ALL FORECASTS (06Z and 18Z MAPS COMBINED) ISSUED BY

ALBUQUERQUE

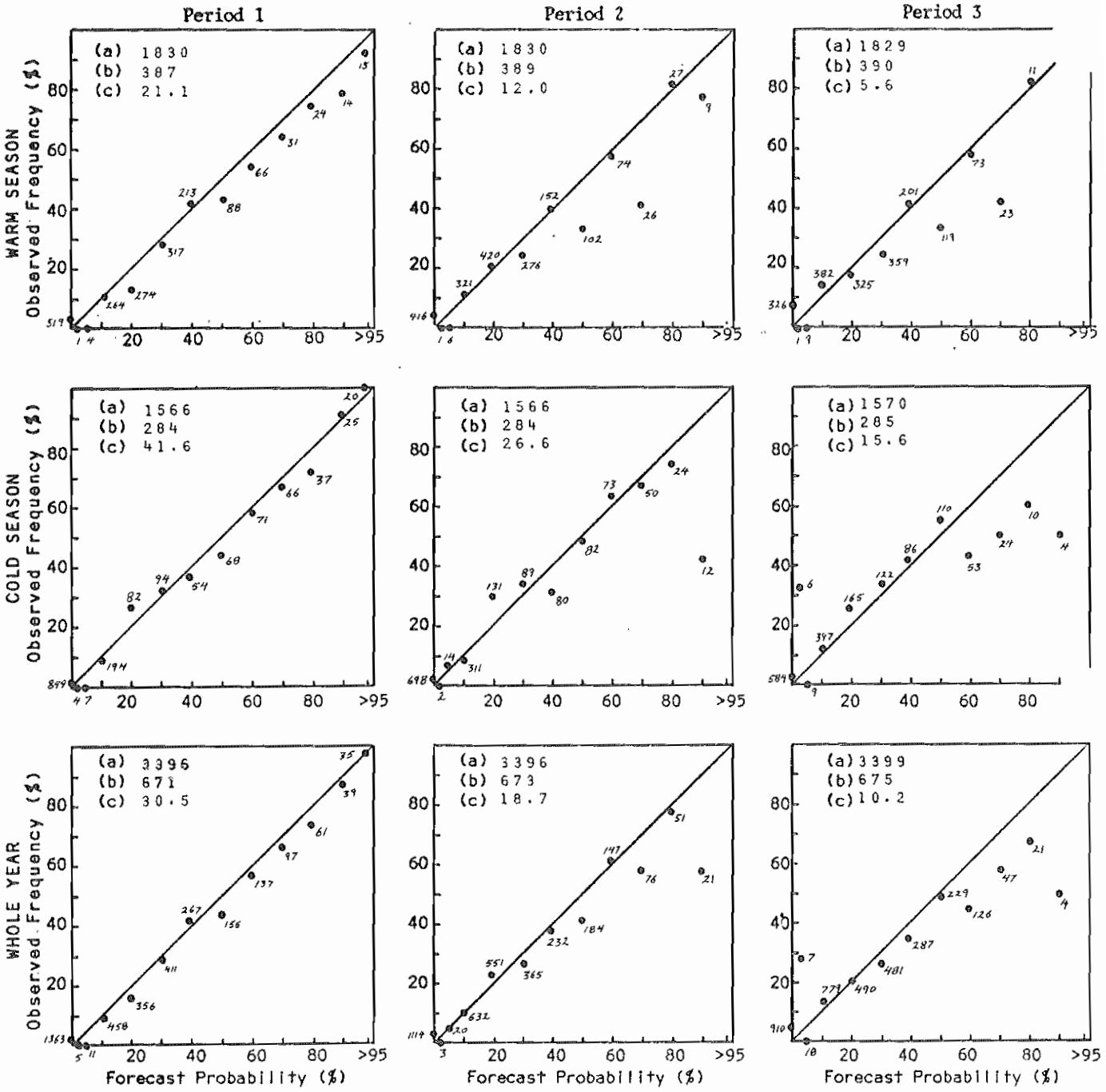


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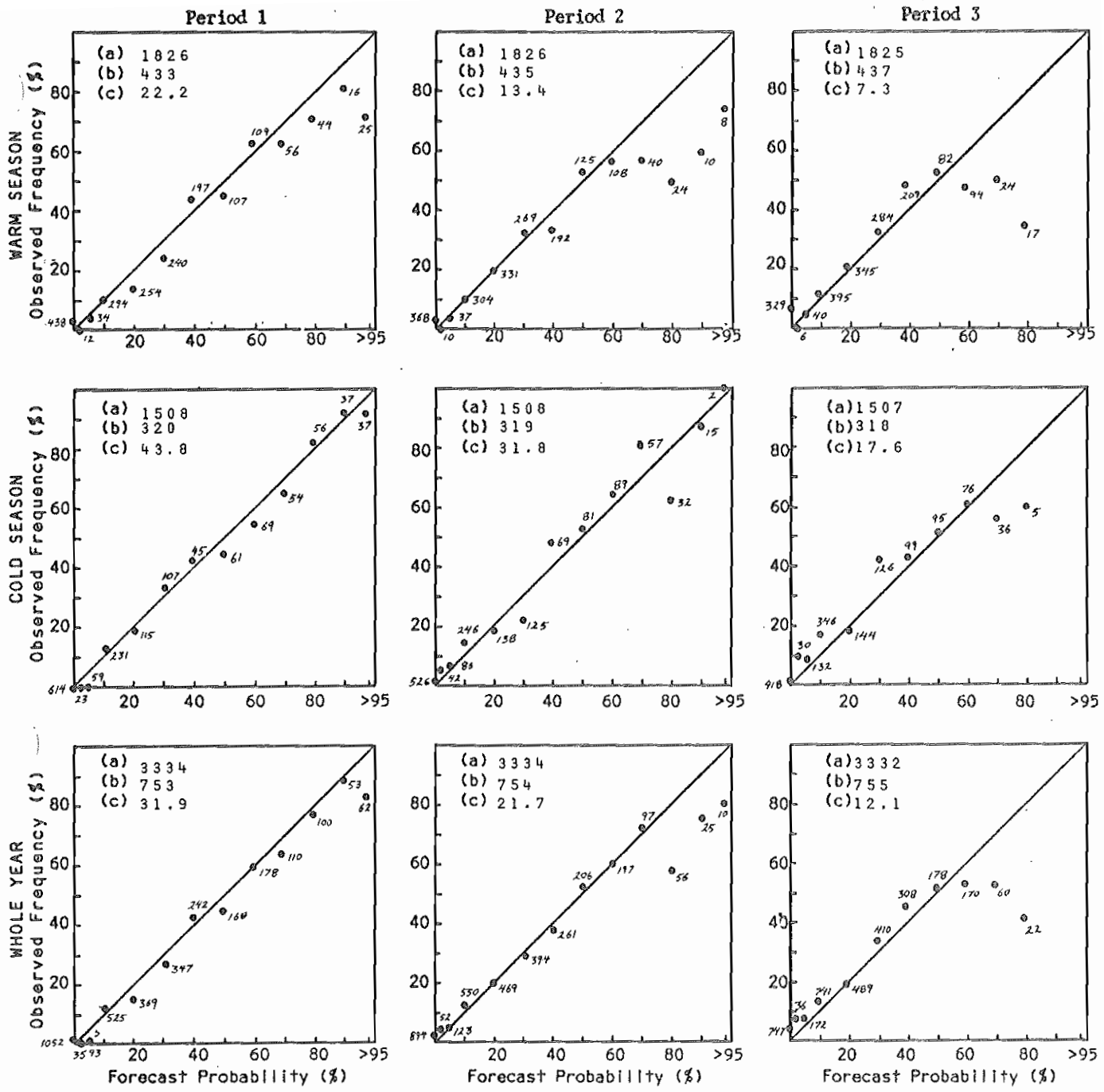
FIGURE 3. FORECAST PROBABILITY VS. OBSERVED FREQUENCY OF OCCURRENCE OF MEASURABLE PRECIPITATION IN THE INDICATED 12-HOUR PERIODS FOR ALL FORECASTS (06Z and 18Z MAPS COMBINED) ISSUED BY

ATLANTA



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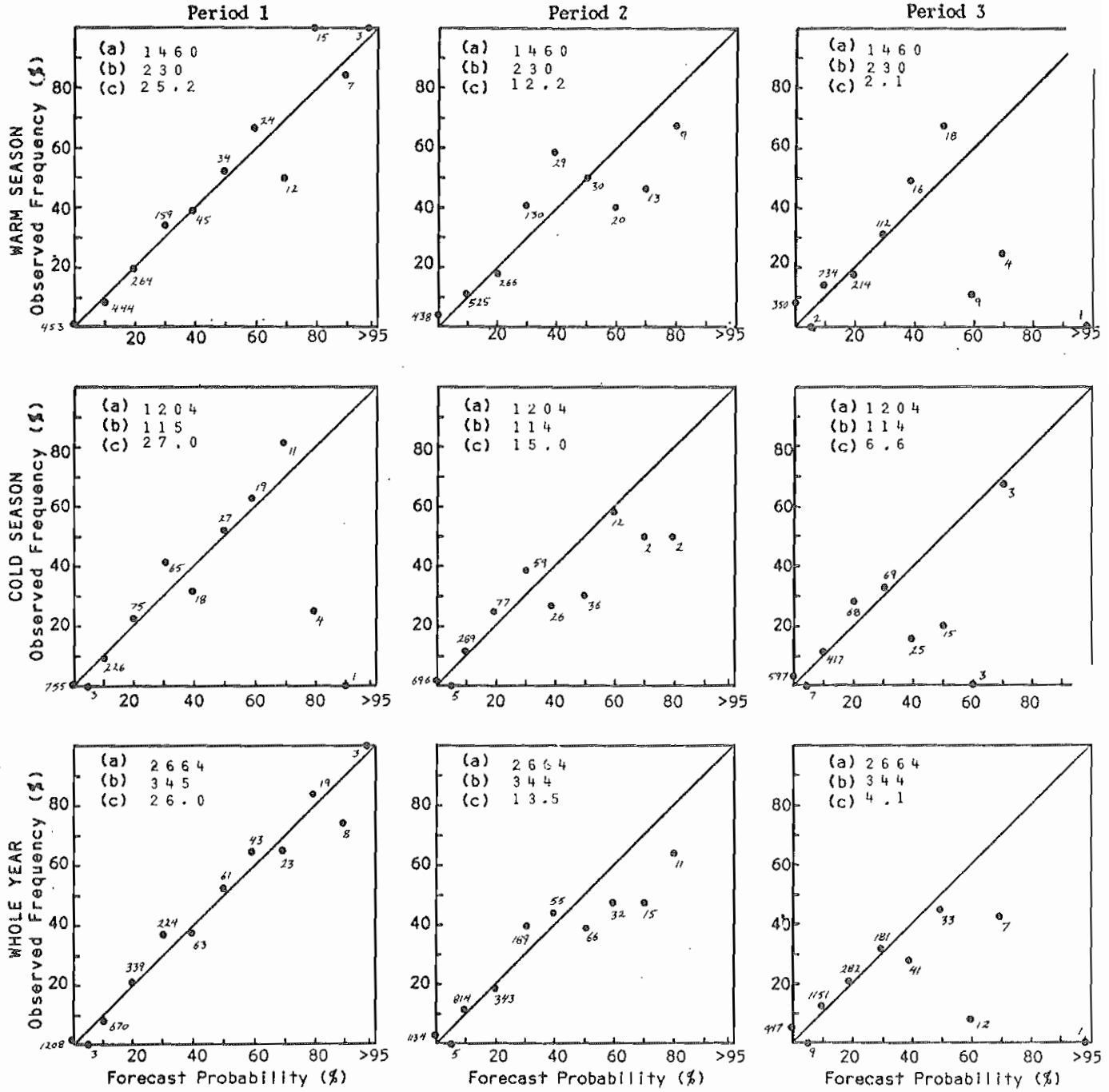
BIRMINGHAM



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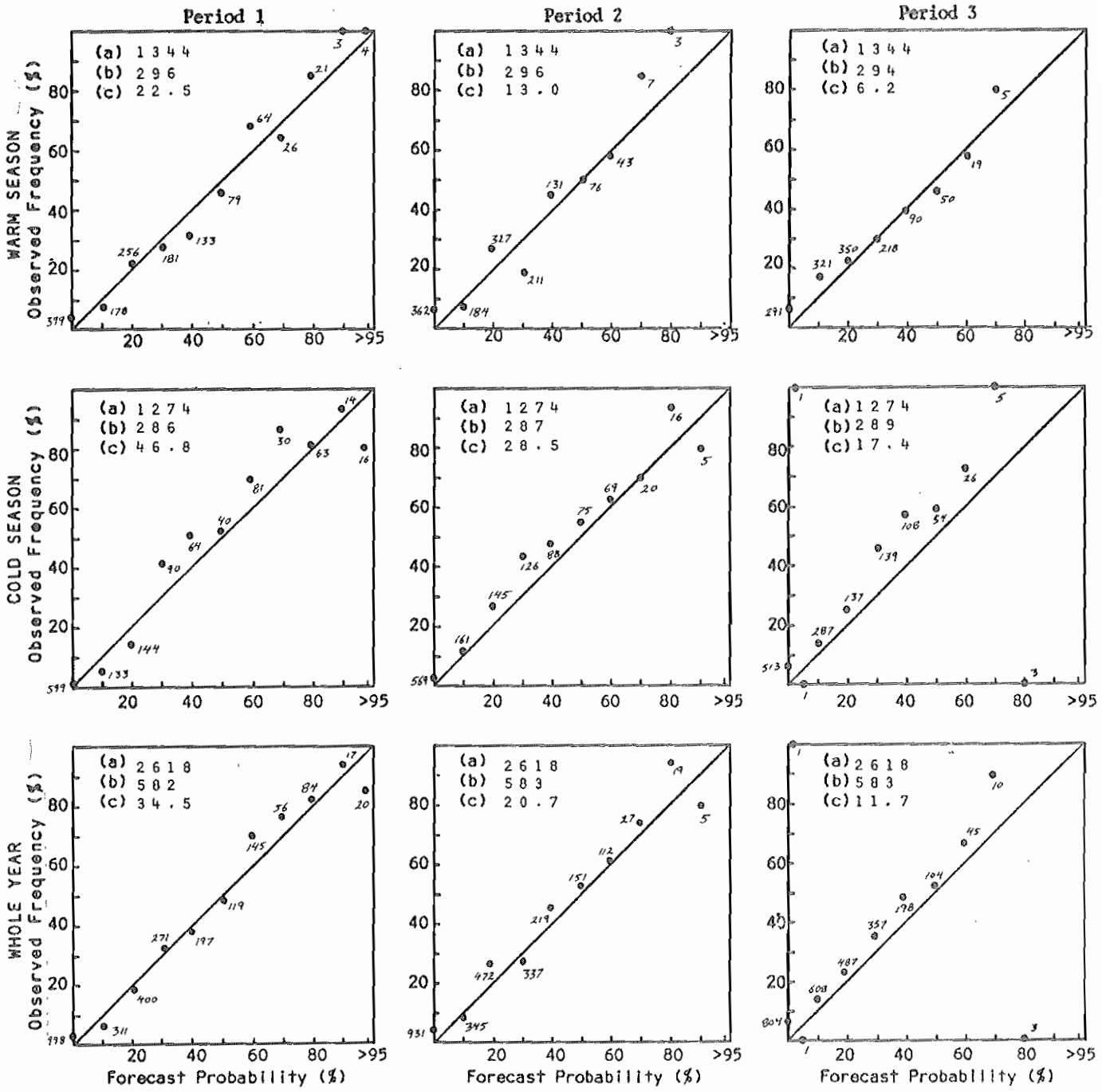
FORT WORTH



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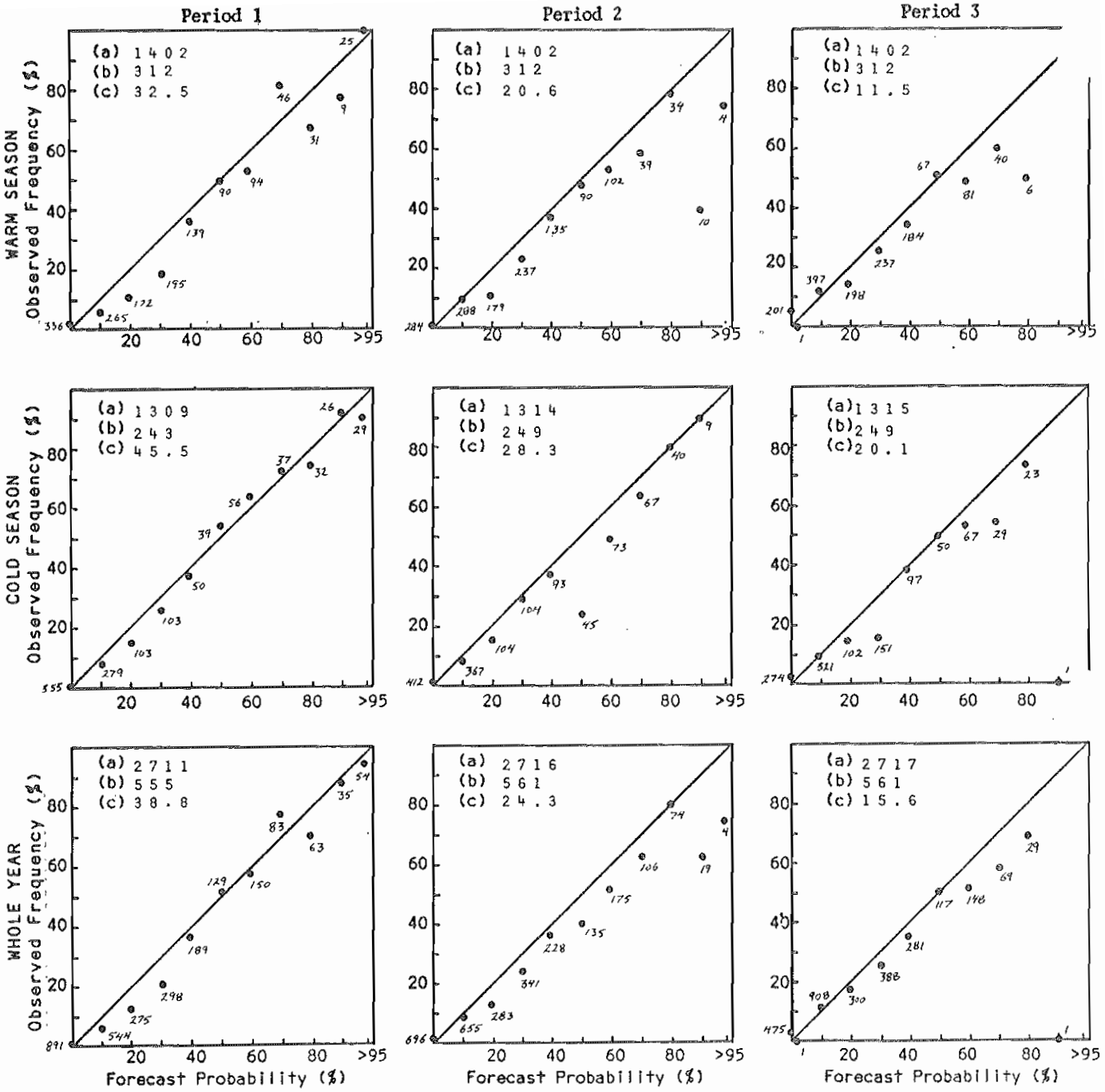
JACKSON



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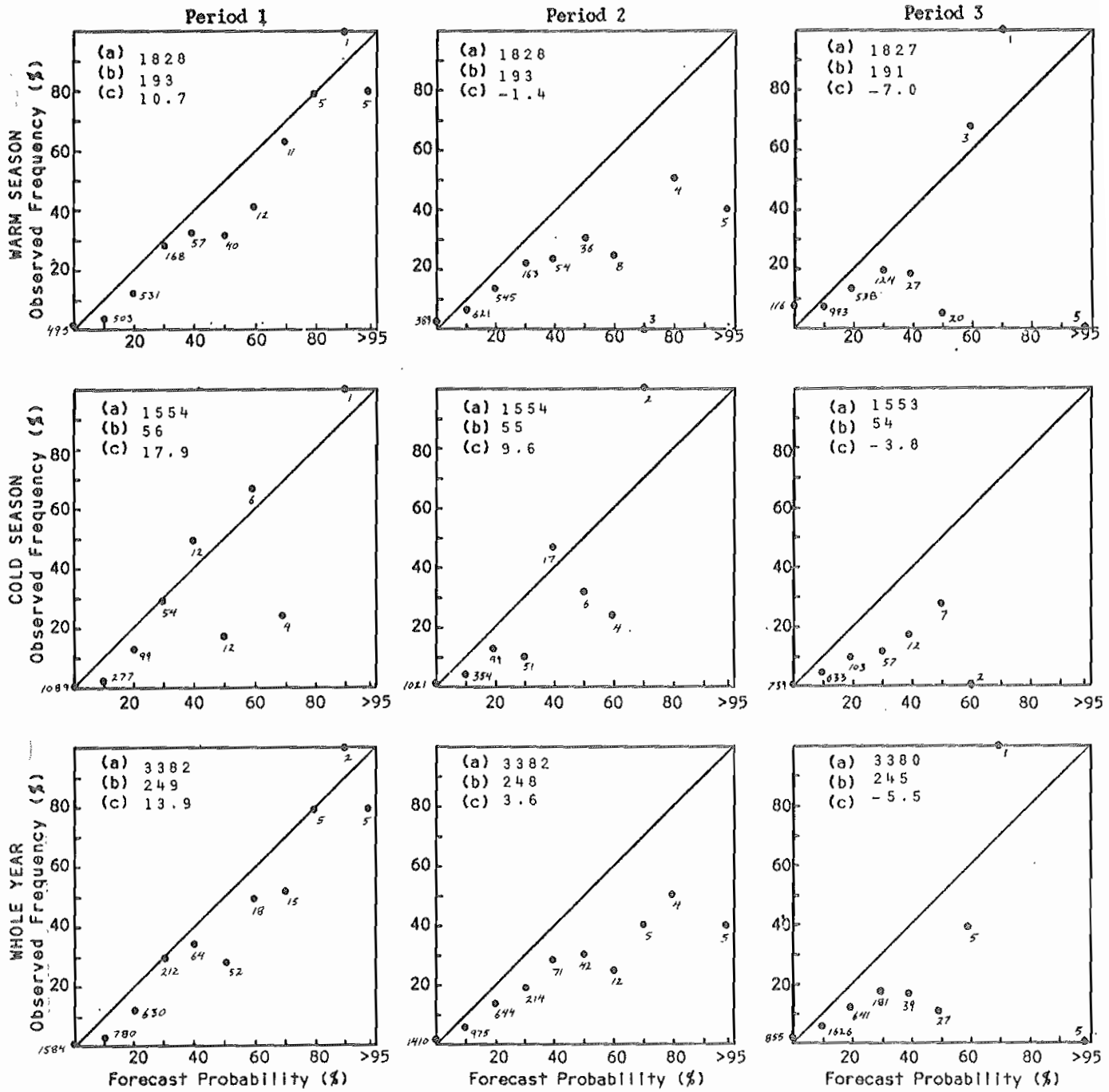
LITTLE ROCK



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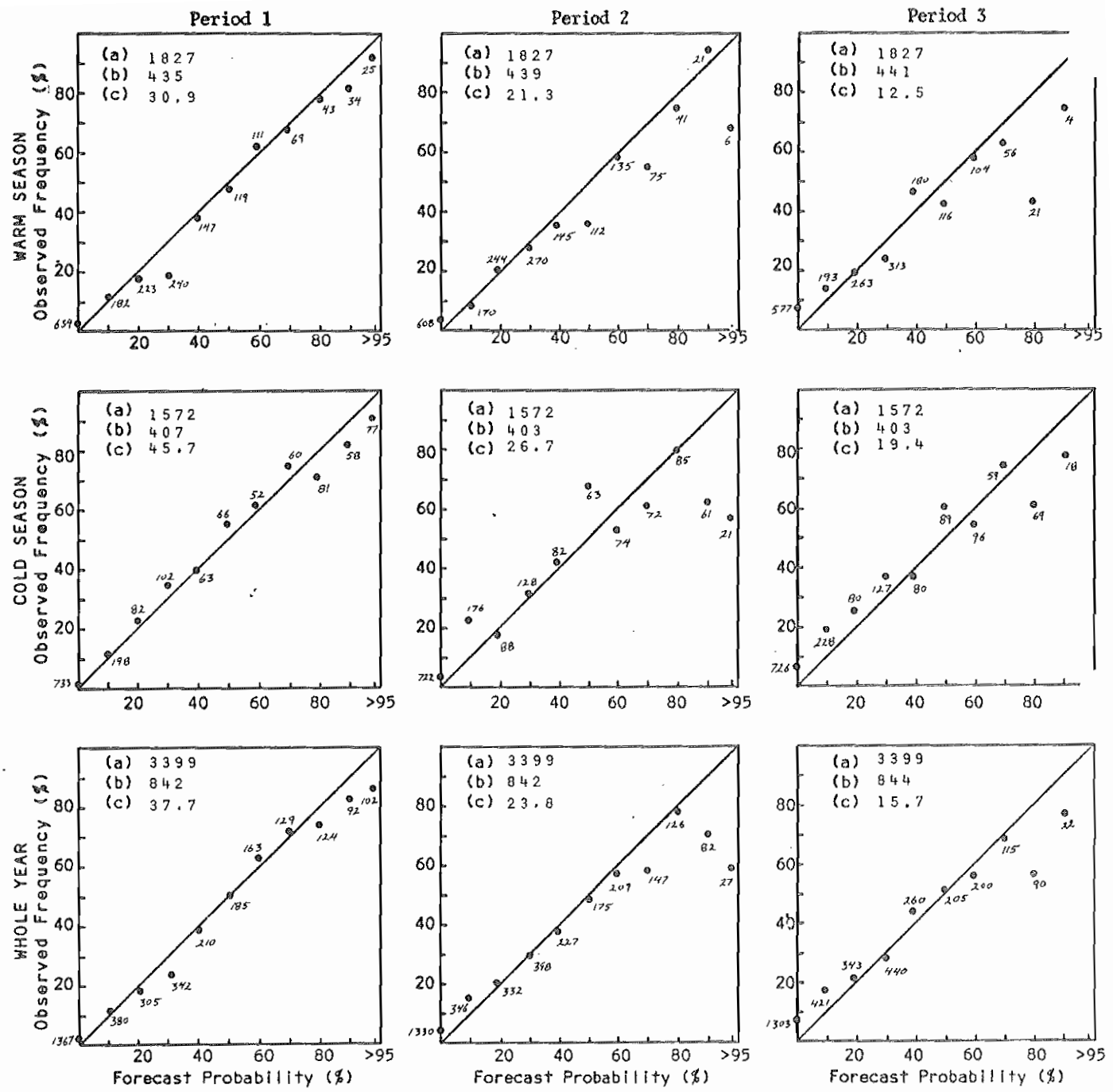
LUBBOCK



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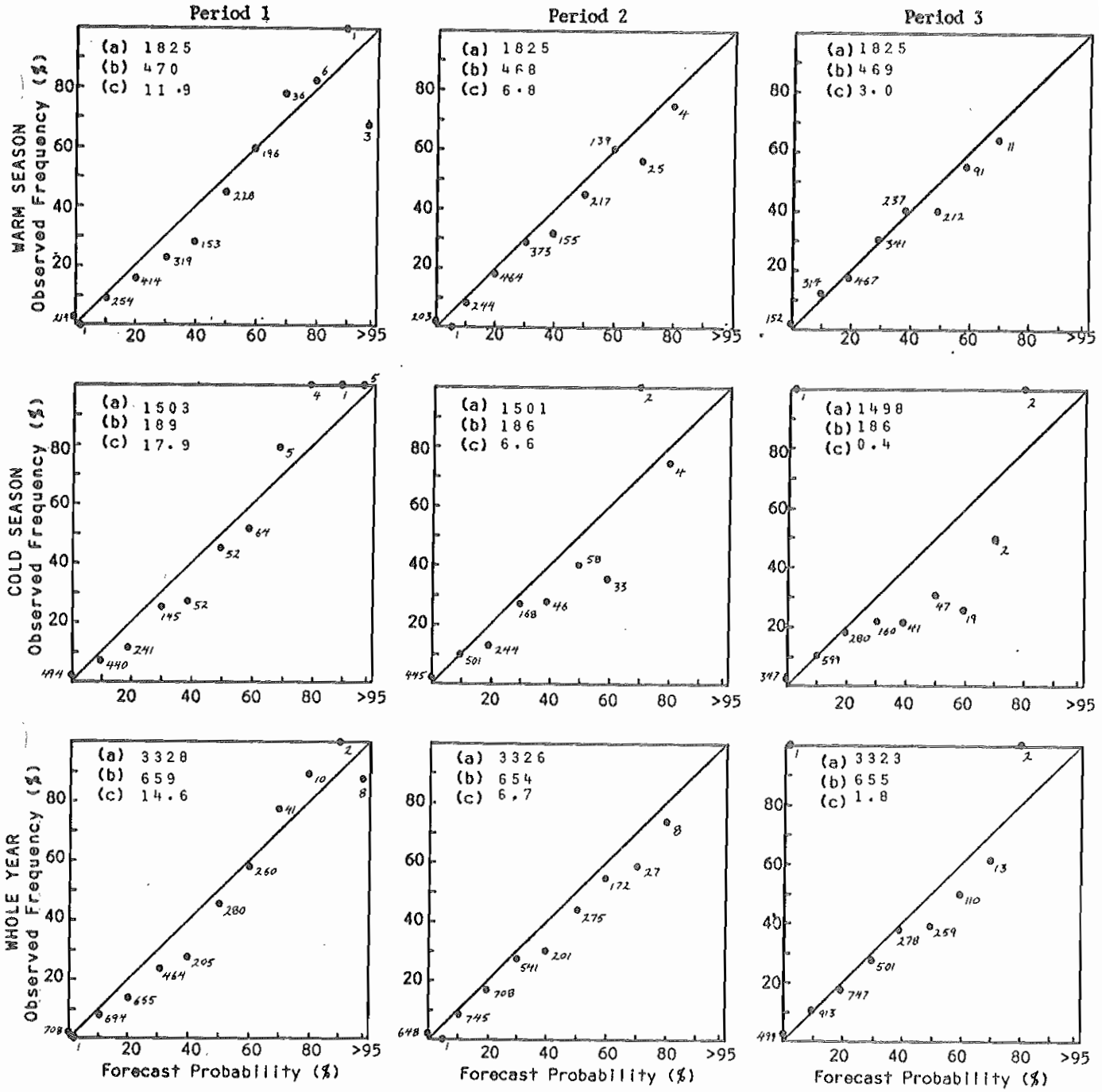
MEMPHIS



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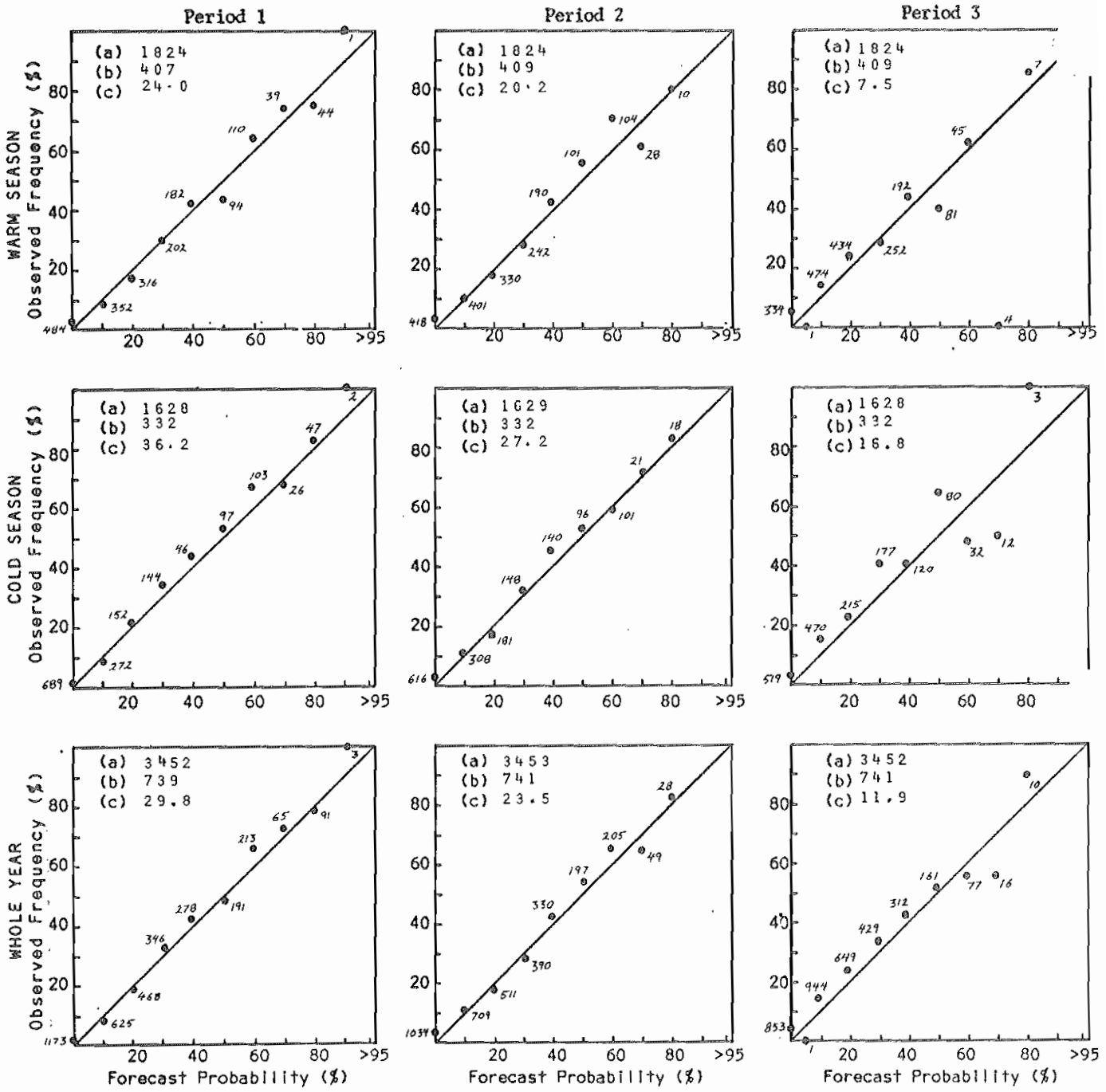
MIAMI



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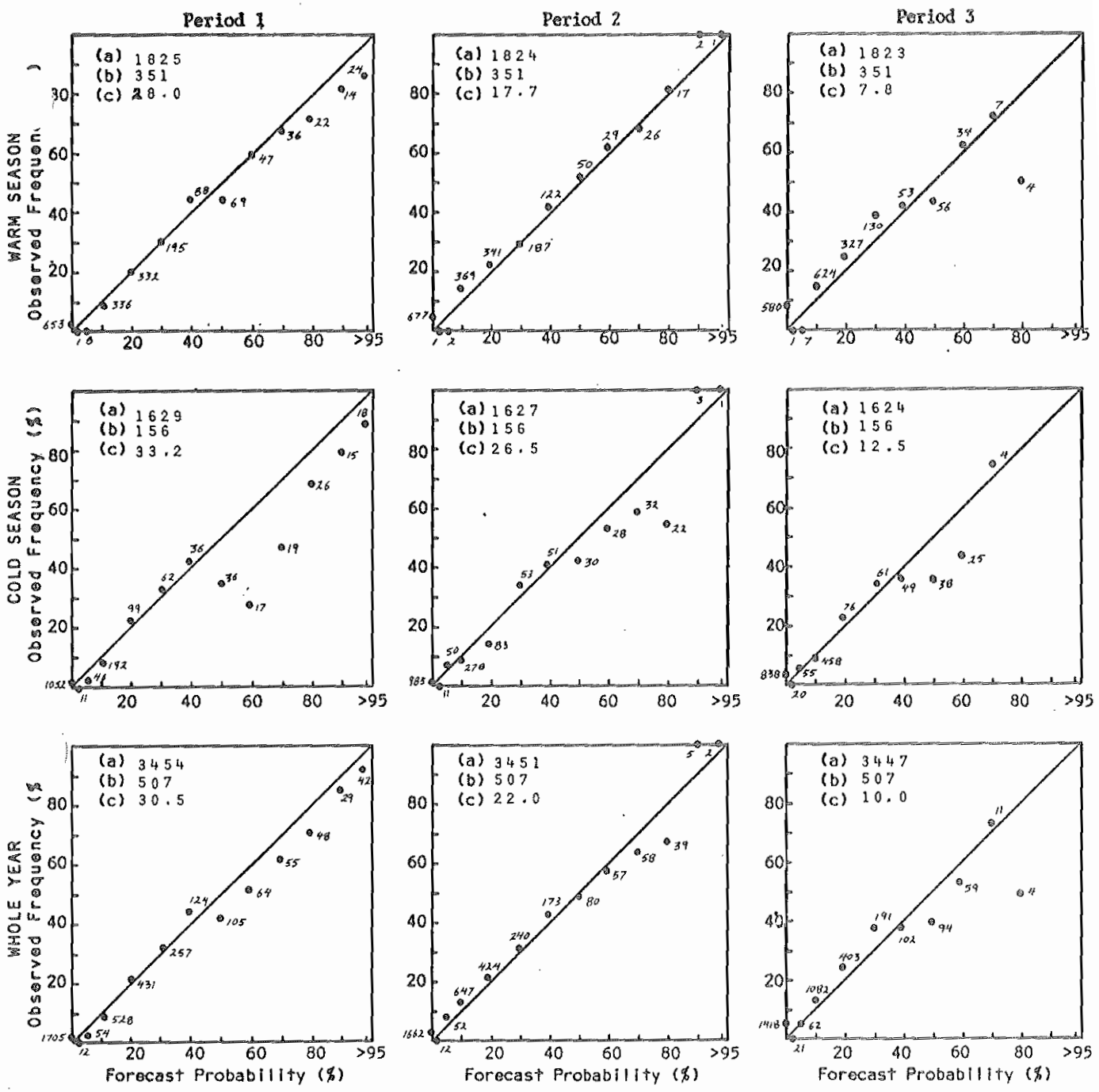
NEW ORLEANS



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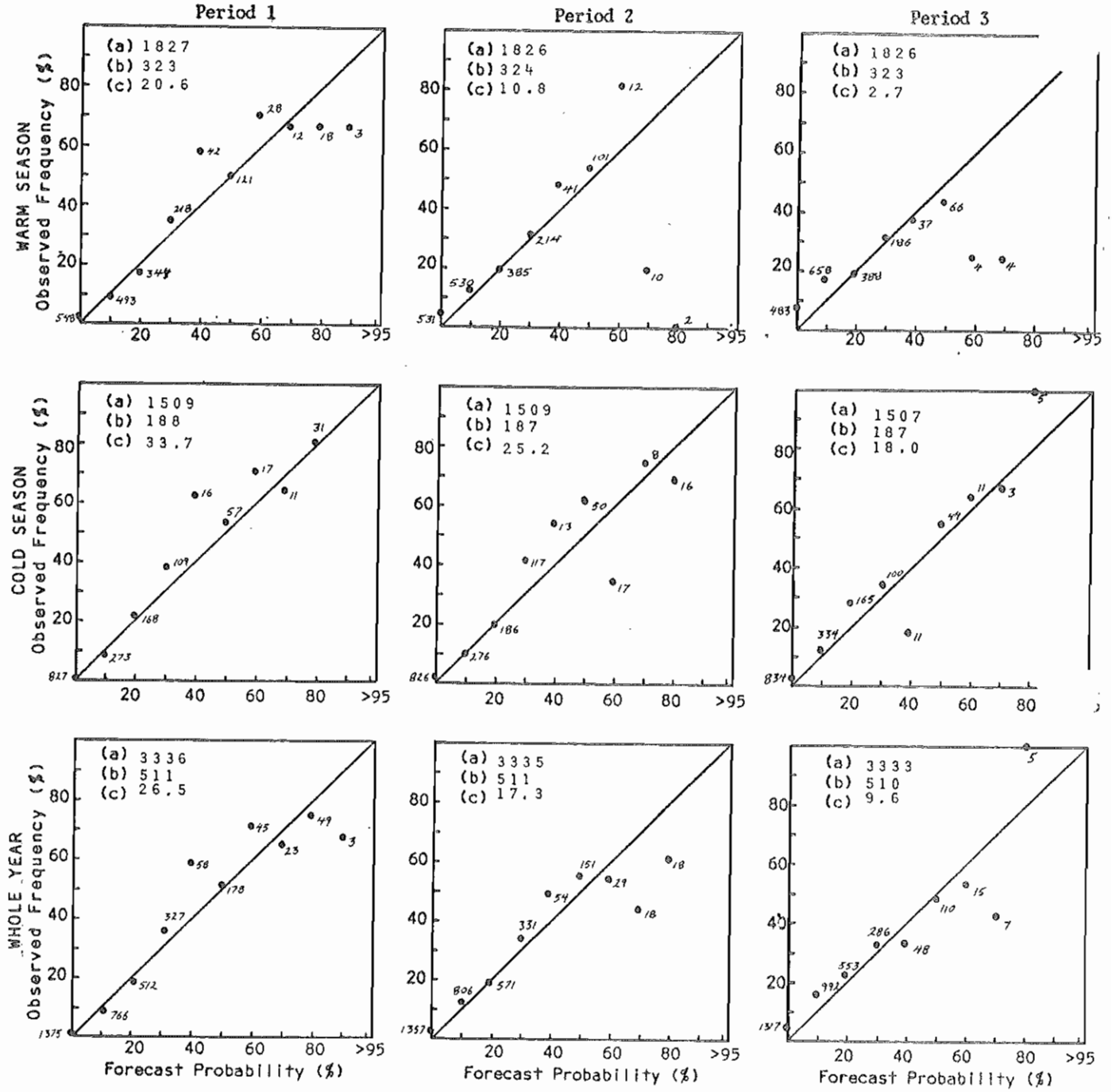
OKLAHOMA CITY



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SAN ANTONIO

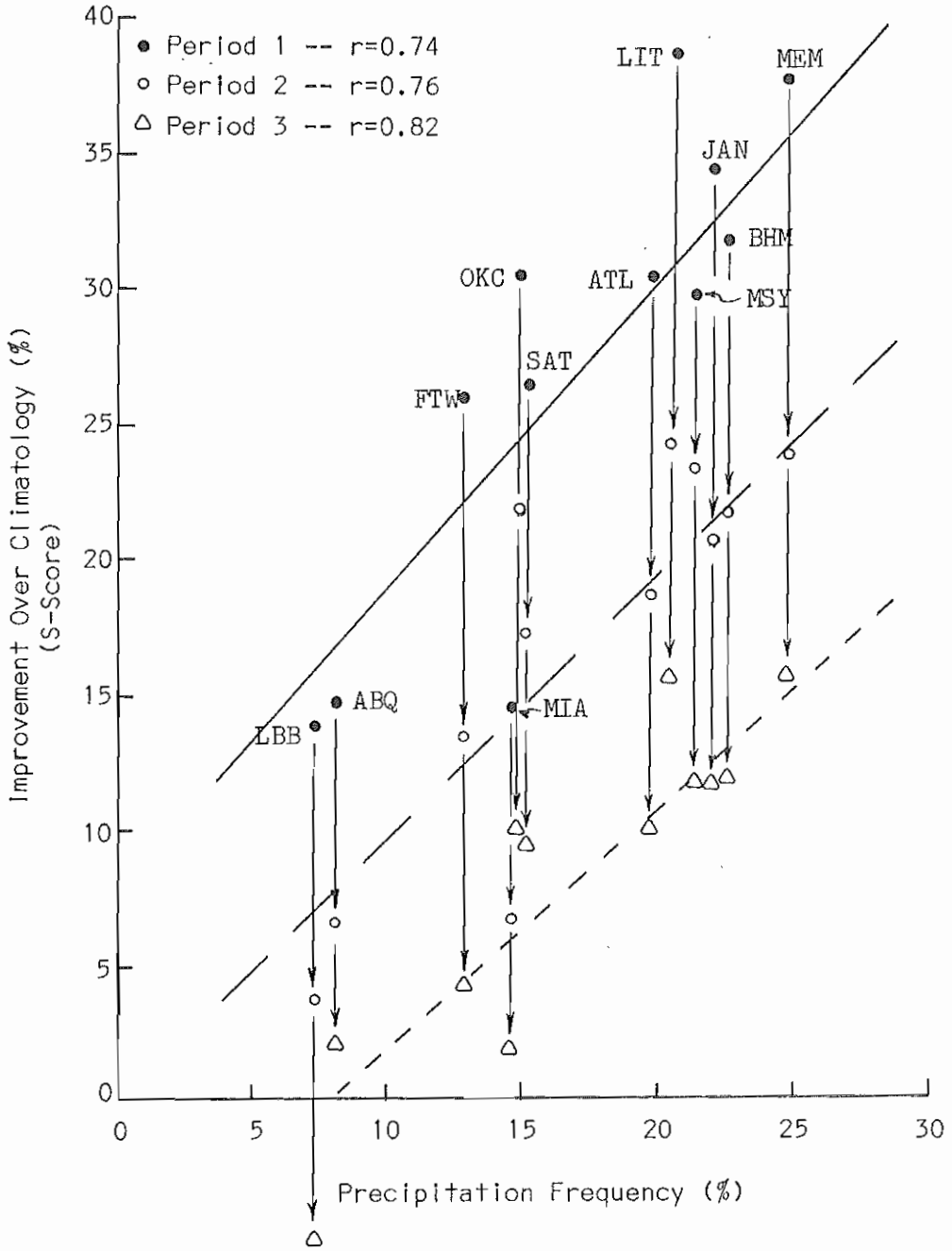

Figure 14. S-Score vs. precipitation frequency. Solid line is least-squares fit for Period 1, long dashes for Period 2, short dashes for Period 3. Plotted points are for all forecasts, whole year. (r is linear correlation coefficient)

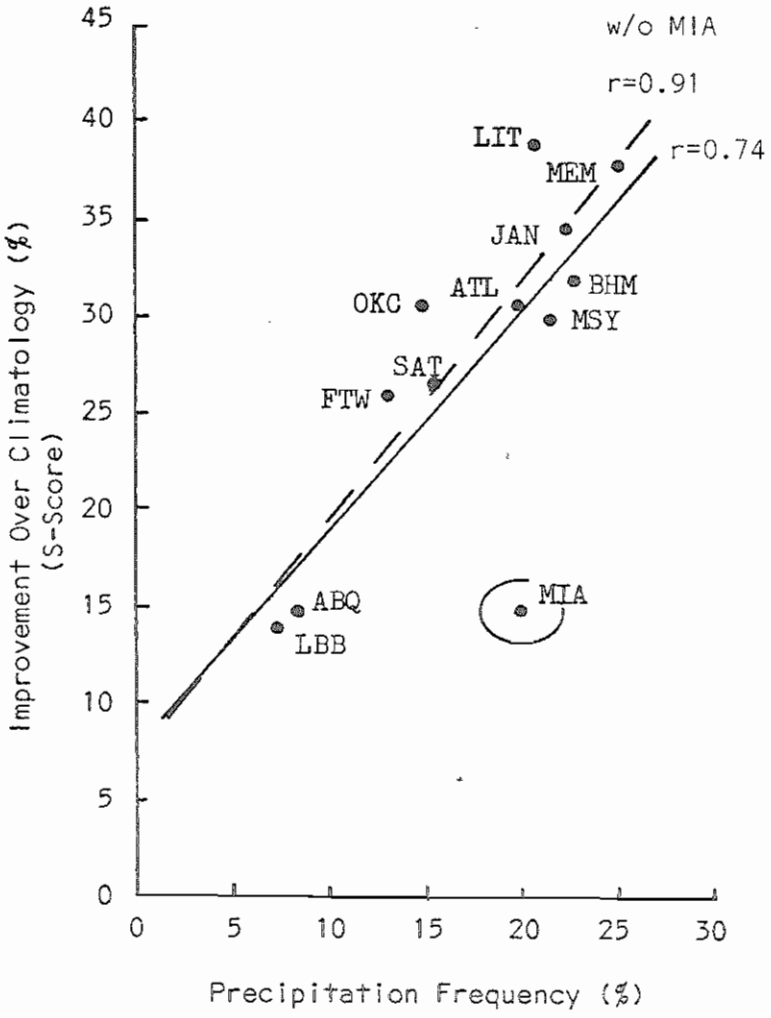

Figure 15. S-Score vs. precipitation frequency for Period 1. Solid line same as in Fig. ; dashed line is least squares fit omitting MIA.

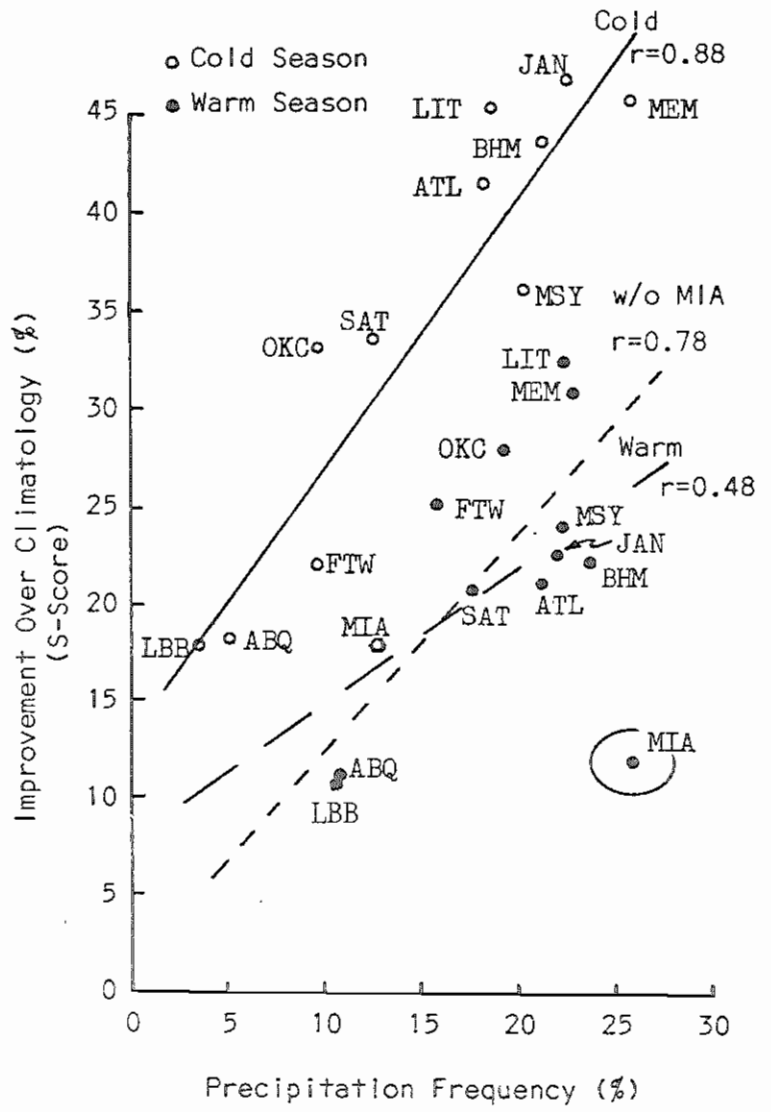

Figure 16. S-Score vs. precipitation frequency for Period 1 by seasons. Solid line is least squares fit for cold season, long dashes for warm season, short dashes for warm season omitting MIA.