U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE
SYSTEMS DEVELOPMENT OFFICE
TECHNIQUES DEVELOPMENT LABORATORY

TDL Office Note 77-2

VERIFICATION OF WARM SEASON POPA CATEGORICAL FORECASTS OF PRECIPITATION AMOUNT

Robert J. Bermowitz and Edward A. Zurndorfer

February 1977

Verification of Warm Season PoPA Categorical Forecasts of Precipitation Amount

Robert J. Bermowitz and Edward A. Zurndorfer

1. INTRODUCTION

Our probability of precipitation amount (PoPA) system for making both probabilistic and categorical forecasts of precipitation amount has been described in detail in a previous report (Bermowitz and Zurndorfer, 1975) The PoPA forecasts are supplied as guidance to the National Meteorological Center (NMC) twice per day. Until now, comparative verification of the PoPA system has been quite limited; consequently, the quality of the guidance received by NMC is relatively unknown.

To test the categorical forecasts made by our PoPA system, we established a comparative verification program with the assistance of NMC. This program and the results we have obtained so far are described in this paper.

2. VERIFICATION PROGRAM

We compared our PoPA categorical forecasts against those produced (1) subjectively at NMC, (2) by the limited area fine mesh (LFM) model (Howcroft and Desmarais, 1971) and (3) by the primitive equation (PE) model (Shuman and Hovermale, 1968). Threat scores[1] and biases[2] were computed for all forecast systems at 215 cities for the categories $\geq$ .25, $\geq$ .50, $\geq$ 1.0, and $\geq$ 2.0 inches for projections 12-36 and 36-60 hr after 0000 GMT and 24-48 hr after 1200 GMT. They were also computed for the categories $\geq$ .25, $\geq$ .50, and $\geq$ 1.0 inch for projections 18-24 hr after 0000 GMT and 12-18 hr after 1200 GMT. Subjectively prepared forecasts for these 6-hr projections were verified only for the category $\geq$ .25 inch, since NMC did not record categorical forecasts greater than that.

The period of verification consisted of about 100 days during the four months June-September 1976; missing forecasts caused some variation in sample size from projection to projection. Observations and subjectively prepared forecasts were recorded and supplied by NMC. LFM and PE precipitation amount forecasts were obtained from the Techniques Development Laboratory's (TDL's) collection of gridpoint fields of these models by interpolating to stations with use of a special interpolation algorithm (Gerrity and Newell, 1976). PoPA forecasts were retrieved from the operational computer runs.

---

[1] 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.

[2] Bias is the number of forecasts of a category divided by the number of observations of that category. A categorical bias equal to 1 means unbiased forecasts of that category.

that the PE was better than the LFM in forecasting 24-hr amounts, except for the category $\geq$ 2.0 inches. For the 6-hr amounts, the LFM appeared to have a slight advantage, but the threat scores indicate little skill for categories $\geq$ .50 inch for both models. Indeed, the bias shows that the models forecasted very few occurrences of 6-hr amounts $\geq$ .50 inch at the 215 stations during the verification period.

To summarize, the results indicate that the PoPA forecasts were better than those of the PE and LFM models during the warm season at the 215 verification stations. Although there was considerable variation, the results also indicate that the PoPA forecasts were slightly better than those subjectively prepared at NMC. Therefore, we feel that the PoPA forecasts supplied to NMC should be useful guidance, at least for the summer season.

ACKNOWLEDGMENTS

We wish to thank David Olson, Chief, Quantitative Precipitation Branch, NMC, for supplying a significant amount of the data used in this verification.

REFERENCES

Bermowitz, R. J., and E. A. Zurndorfer, 1975: Current status of probability of precipitation amount (PoPA) forecasting. TDL Office Note 75-10, 6 pp.

Gerrity, J. P., and J. Newell, 1976: Postprocessing the LFM forecasts. NWS Tech. Proc. Bull., No. 175, 14 pp.

Howcroft, J. and A. Desmarais, 1971: The limited area fine mesh model. NWS Tech. Proc. Bull., No. 67, 11 pp.

Reap, R. M., 1972: An operational three-dimensional trajectory model. J. of Appl. Meteor., 11, 1193-1202.

Shuman, F. G., and J. B. Hovermale, 1968: An operational six-layer primitive equation model. J. of Appl. Meteor., 7, 525-547.

Table 2. Same as Table 1 for 6-hr periods. Objective forecasts based on the LFM model, PoPA(L), have been added.

Forecast Projection (hrs)	Verification Score	Category (inch) ≥ .25 SUBJ	POPA	POPA(L)	LFM	PE	≥ .50 SUBJ	POPA	POPA(L)	LFM	PE	≥ 1.0 SUBJ	POPA	POPA(L)	LFM	PE
18-24 from 0000 GMT	Threat Score	.116	.137	.119	.079	.077	--	.076	.076	.027	.016	--	.035	.029	.007	0.0
	Bias	1.85	2.10	1.11	.66	.48	--	1.90	1.24	.29	.14	--	1.47	.88	.05	0.0
	Number of Precip. Cases			766					384					131		
12-18 from 1200 GMT	Threat Score	.103	.110	.105	.067	.056	--	.075	.042	.016	.008	--	.037	.020	0.0	0.0
	Bias	2.03	1.24	1.03	.45	.62	--	1.37	.83	.20	.16	--	.45	.97	0.0	0.0
	Number of Precip. Cases			491					218					78		