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VERIFICATION OF POPA CATEGORICAL FORECASTS OF PRECIPITATION AMOUNT-- COOL SEASON

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1. INTRODUCTION

In a previous paper (Bermowitz and Zurndorfer, 1977), we described the 1976 warm season results of a comparative verification designed to test the categorical forecasts of precipitation amount made by our probability of precipitation amount (PoPA) system. This verification was continued into the 1976-77 cool season (October-March); the results obtained for that cool season are summarized in this note.

Details of the verification are given by Bermowitz and Zurndorfer (1977). Here, it suffices to say that we compared the PoPA categorical forecasts of precipitation amount against those made (1) subjectively at the National Meteorological Center (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) at 215 cities. Verification statistics included the threat score and bias. The period of verification consisted of about 175 days from October 1976 to March 1977.

2. RESULTS AND CONCLUSIONS

Results of the comparative verification are shown in Tables 1 and 2; Table 1 contains results for 24-hr periods and Table 2 has results for 6-hr periods. For the 6-hr periods, PoPA(L) means early guidance PoPA forecasts based on the LFM model. For all periods, PoPA forecasts based on the PE and trajectory (TJ) (Reap, 1972) models are denoted by PoPA. Also, subjectively prepared forecasts are denoted by SUBJ.

A comparison of PoPA forecasts against those of the PE and LFM models shows that, overall, the PoPA forecasts had better threat scores. This is especially so when PoPA is compared to the PE. On the other hand, PoPA generally had lower threat scores than SUBJ. When compared to the results obtained for the warm season (Bermowitz and Zurndorfer, 1977), there appears to be some degradation of the cool season PoPA forecasts with respect to those of SUBJ, PE and LFM. The bias indicates that PoPA and SUBJ tended to overforecast precipitation amount while the PE and LFM underforecast the higher amounts. These results are similar to those obtained for the warm season.

It is of interest to compare the PoPA forecasts (those based on the PE and TJ models) and PoPA(L) forecasts (those based on the LFM model) for the two 6-hr periods (Table 2). Both nearly always overforecast all categories. Although there was variation between periods, PoPA, overall, had somewhat higher threat scores than PoPA(L), a result that we also found for the warm season. However, PoPA overforecast precipitation amount more than PoPA(L) did, especially for the 12-18 hr

projection after 1200 GMT. (In order to improve the PoPA(L) forecasts we have derived new equations and threshold probabilities for the 1977-78 cool season using 2 additional seasons of data.)

It is also possible to compare forecasts of precipitation amount from the PE model to those of the LFM. Results indicated little overall difference between the two for forecasts of 24-hr amounts, but for the 6-hr amounts the LFM was better than the PE.

In short, the results indicate that the PoPA categorical forecasts were better than those of the PE and LFM models during the cool season at the 215 verification stations, but they were not as good as those prepared subjectively at NMC. Based on these results and those obtained for the warm season we feel that the PoPA categorical forecasts are useful guidance. They appear to be superior to the precipitation amount forecasts made by the PE and LFM models and appear to be almost as good as those prepared subjectively at NMC.

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Table 1. Comparative verification of 24-hr precipitation amount forecasts prepared (1) subjectively at NMC (SUBJ), (2) objectively with use of MOS and based on the PE and TJ models (POPA), and (3) by the LFM and PE models. Sample consisted of forecasts for 215 stations for the period October 1976 - March 1977.

Forecast Projection (hrs)	Verification Score	Category (inch) ≥ .25				≥ .50				≥ 1.0				≥ 2.0			
		SUBJ	POPA	LFM	PE	SUBJ	POPA	LFM	PE	SUBJ	POPA	LFM	PE	SUBJ	POPA	LEM	PE
12-36 from 0000 GMT	Threat Score	.396	.405	.349	.361	.341	.308	.280	.295	.227	.204	.200	.193	.085	.051	.051	.052
	Bias	1.81	1.49	1.36	1.49	1.74	1.77	1.42	1.53	1.78	2.03	1.43	1.36	1.43	2.04	1.19	0.71
	Number of Precip. Cases		2810				1523				566				95		
36-60 from 0000 GMT	Threat Score	.297	.285	--	.213	.235	.213	--	.158	.150	.124	--	.056	.033	.039	--	0.0
	Bias	1.77	1.53	--	1.61	1.52	1.64	--	1.51	1.41	1.40	--	1.01	0.73	1.90	--	0.13
	Number of Precip. Cases		2700				1464				547				91		
24-48 from 1200 GMT	Threat Score	.338	.351	.282	.289	.283	.266	.227	.223	.177	.153	.137	.140	.030	.034	.036	.007
	Bias	1.84	1.64	1.31	1.66	1.62	1.97	1.18	1.60	1.62	1.97	1.15	1.26	0.85	2.26	0.54	0.60
	Number of Precip. Cases		2727				1484				551				92		

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					≥ .50					≥ 1.0				
		SUBJ	POPA	POPA(L)	LFM	PE	SUBJ	POPA	POPA(L)	LFM	PE	SUBJ	POPA	POPA(L)	LFM	PE
18-24 from 0000 GMT	Threat Score	.219	.213	.215	.203	.178	--	.119	.088	.120	.063	--	.038	.007	.049	.016
	Bias	1.92	2.15	2.08	1.40	1.48	--	2.42	2.17	1.17	0.93	--	2.41	1.55	0.54	0.14
	Number of Precip. Cases			692					253					56		
12-18 from 1200 GMT	Threat Score	.237	.213	.216	.203	.196	--	.147	.139	.128	.107	--	.065	.064	.066	.035
	Bias	1.60	2.16	1.36	1.12	1.13	--	2.46	1.22	0.80	0.71	--	3.01	0.59	0.33	0.22
	Number of Precip. Cases			703					255					73		