U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL WEATHER SERVICE
Silver Spring, Md. 20910

Date: January 2, 1975

Reply to Attn of: W42x1

Subject: Revision of TDL Office Note 74-12 "Comparative Verification of Local and Guidance Surface Wind Forecasts"

To: Recipients of TDL Office Notes

Are our faces red!

Yes, we made an error (programming, no less) in some of the computations in TDL Office Note 74-12. I'm attaching a corrected copy.

The corrected copy bears a new date, and "No. 1" has been added to the title. We will soon distribute a "No. 2" dealing with the summer season; No. 1 contains wintertime verification.

The errors were in the mean absolute error of direction; speed computations were O.K. Tables 2 through 6 have been corrected. The actual direction errors are considerably lower than what our original version shows. However, the comparative skill of local and guidance forecasts did not change (guidance forecasts were better), and the text is virtually unaltered.

We regret any inconvenience this error caused you. We hope that you will destroy the incorrect version.

Harry R. Glahn

Harry R. Glahn
Deputy Director, TDL

Attachment

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

TDL Office Note 74-12
(Revised)

COMPARATIVE VERIFICATION OF LOCAL AND GUIDANCE SURFACE WIND FORECASTS --NO. 1

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and
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December 1974

Comparative Verification of Local and Guidance Surface Wind Forecasts--No.1

by

Gary M. Carter, Harry R. Glahn, and George W. Hollenbaugh

The Techniques Development Laboratory's (TDL's) automated forecasts of surface wind, described in National Weather Service (NWS) Technical Procedures Bulletins No. 86 (NWS, 1973a) and 98 (NWS, 1973b) have been available on request/reply basis for use by field forecasters since May 1973. Archiving of the forecasts was started on a routine basis in November 1973. Recently, TDL's automated forecasts from cool season (October-March) equations (see NWS, 1973b) have been verified in conjunction with the NWS combined aviation/public weather verification system (NWS, 1973c). These objective guidance forecasts were compared with the official local forecasts prepared at various Weather Service Forecast Offices (WSFOs) for the 92 stations shown in Table 1. The local forecasts were received from the WSFOs and processed by the Technical Procedures Branch of the Office of Meteorology and Oceanography.

Since the local forecasts were recorded as calm if the wind speed was expected to be less than 8 knots, the comparison was made in two ways. For all those cases where both the local and guidance forecasts were at least 8 knots, the mean absolute error (MAE) of direction and speed, and the bias (mean forecast minus mean observed) of speed were computed. Cases where both the local and guidance forecasts were at least 8 knots and the observed wind was calm were eliminated from the MAE calculations for wind direction. Also, for all cases when local and guidance forecasts were available, skill score, percent correct, and bias by category were computed from wind speed contingency tables which had categories of less than 8, 8-12, 13-17, 18-22, and greater than 22 knots. Tables 2-6 show verification scores for the 5-month period November 1973 through March 1974. Three projections were verified. For the guidance forecasts, which were made from 0000 GMT data, these are 18, 30, and 42 hours, and are so listed in the tables. However, the local forecasts are not released until 1000 GMT, so about 9 hours later data were available for their preparation. It should be noted that the speed forecasts during the period December 1973 through March 1974 were enhanced by the method described in NWS Technical Procedures Bulletin No. 102 (NWS 1973d).

Statistics for all 92 stations combined are shown in Table 2. The MAE scores for both direction and speed, as well as the skill scores and percents correct, indicate that the guidance forecasts were superior to local forecasts for all three projections. The magnitude of this advantage did not vary much with projection. The guidance forecasts were nearly unbiased in the mean; however, the individual biases by category from the contingency tables reveal a tendency to underforecast the higher wind speeds. The local forecasts were much better in this regard.

Similar results for the NWS Eastern, Southern, Central, and Western Regions are shown in Tables 3-6, respectively. Category two (8-12 knots) was overforecast by the objective system for all three projections in each region, while the frequencies of occurrence of categories four (18-22 knots) and five (greater than 22 knots) were underforecast.

For each Region, the mean absolute errors, skill scores, and percents correct for the objective guidance forecasts were superior to those for the local forecasts produced at the WSFO's. This difference may in part be the result of a lack of familiarity by the field forecasters with this relatively new guidance product. It is also apparent that the objective system has a tendency to underforecast strong winds; a method for correcting this inadequacy is currently being investigated.

ACKNOWLEDGEMENT

We wish to thank the Technical Procedures Branch of the Office of Meteorology and Oceanography, and especially Gerry Cobb who processed the data, for providing us with the local forecasts.

REFERENCES

NWS, "Surface Wind Forecasts Based on Model Output Statistics (MOS)--No. 1," Technical Procedures Bulletin, No. 86, 1973a, 11 pp.

NWS, "Surface Wind Forecasts Based on Model Output Statistics (MOS)--No. 3," Technical Procedures Bulletin, No. 98, 1973b, 6 pp.

NWS, "Combined Aviation/Public Weather Forecast Verification," National Weather Service Operations Manual, Chapter C-73, 1973c, 14 pp.

NWS, "Surface Wind Forecasts Based on Model Output Statistics (MOS)--No. 4," Technical Procedures Bulletin, No. 102, 1973d, 4 pp.

Table 1. Ninety-two stations used to test the operational, cool season surface wind forecasting equations.

PWM	Portland, Maine	ABQ	Albuquerque, New Mexico
BTV	Burlington, Vermont	FMN	Farmington, New Mexico
CON	Concord, New Hampshire	SSM	Sault Ste Marie, Michigan
BOS	Boston, Massachusetts	DTW	Detroit, Michigan
PVD	Providence, Rhode Island	SBN	South Bend, Indiana
HFD	Hartford, Connecticut	IND	Indianapolis, Indiana
BUF	Buffalo, New York	LEX	Lexington, Kentucky
SYR	Syracuse, New York	SDF	Louisville, Kentucky
ALB	Albany, New York	MSN	Madison, Wisconsin
JFK	New York, New York	MKE	Milwaukee, Wisconsin
ERI	Erie, Pennsylvania	ORD	Chicago, Illinios
PIT	Pittsburgh, Pennsylvania	SPI	Springfield, Illinios
ABE	Allentown, Pennsylvania	STL	St. Louis, Missouri
PHL	Philadelphia, Pennsylvania	MCI	Kansas City, Missouri
CLE	Cleveland, Ohio	TOP	Topeka, Kansas
CMH	Columbus, Ohio	DDC	Dodge City, Kansas
CRW	Charleston, West Virginia	DEN	Denver, Colorado
HTS	Huntington, West Virginia	GJT	Grand Junction, Colorado
DCA	Washington, D. C.	SHR	Sheridan, Wyoming
ORF	Norfolk, Virginia	CYS	Cheyenne, Wyoming
RDU	Raliegh-Durham, North Carolina	BIS	Bismarck, North Dakota
CLT	Charlotte, North Carolina	FAR	Fargo, North Dakota
CAE	Columbia, South Carolina	RAP	Rapid City, South Dakota
CHS	Charleston, South Carolina	FSD	Sious Falls, South Dakota
ATL	Atlanta, Georgia	BFF	Scottsbluff, Nebraska
SAV	Savannah, Georgia	OMA	Omaha, Nebraska
MIA	Miami, Florida	MSP	Minneapolis, Minnesota
JAX	Jacksonville, Florida	DSM	Des Moines, Iowa
BHM	Birmingham, Alabama	BRL	Burlington, Iowa
MOB	Mobile, Alabama	INL	International Falls, Minnesota
TYS	Knoxville, Tennessee	FLG	Flagstaff, Arizona
MEM	Memphis, Tennessee	PHX	Phoenix, Arizona
MEI	Meridian, Mississippi	SLC	Salt Lake City, Utah
JAN	Jackson, Mississippi	RNO	Reno, Nevada
MSY	New Orleans, Louisianna	SAN	San Diego, California
SHV	Shreveport, Louisianna	LAX	Los Angeles, California
IAH	Houston, Texas	FAT	Fresno, California
SAT	San Antonio, Texas	SFO	San Francisco, California
DFW	Fort Worth, Texas	PDX	Portland, Oregon
ABI	Abilene, Texas	PDT	Pendleton, Oregon
LBB	Lubbock, Texas	SEA	Seattle, Washington
ELP	El Paso, Texas	GEG	Spokane, Washington
LIT	Little Rock, Arkansas	BOI	Boise, Idaho
FSM	Fort Smith, Arkansas	PIH	Pocatello, Idaho
TUL	Tulsa, Oklahoma	MSO	Missoula, Montana
OKC	Oklahoma City, Oklahoma	GTF	Great Falls, Montana

Table 2. Comparative verification scores for NWS official local and TDL guidance surface wind forecasts at 92 stations across the United States during November 1973 through March 1974.

FCST PROJ (HRS)	TYPE OF FCST.	DIRECTION		SPEED (KTS)												
		MEAN ABS. ERROR (DEG)	NO. OF CASES	MEAN ABS. ERROR	MEAN FCST.	MEAN OBS	BIAS	NO. OF CASES	CONTINGENCY TABLE							
									SKILL SCORE	PERCENT FCST. CORRECT	BIAS BY CATEGORY					NO. OF CASES
											CAT1	CAT2	CAT3	CAT4	CAT5	
18	GUIDANCE	31	8356	3.2	11.9	11.8	+0.1	8440	.28	51	.64	1.48	.94	.59	.23	11764
	LOCALS	35		3.8	13.3	11.8	+1.5		.22	45	.57	1.23	1.23	1.22	.66	
30	GUIDANCE	36	4833	3.4	10.5	10.4	+0.1	4941	.29	57	.91	1.40	.61	.18	.05	10994
	LOCALS	42		4.1	11.9	10.4	+1.5		.21	49	.69	1.49	1.07	.91	.56	
42	GUIDANCE	43	8482	3.6	11.4	11.3	+0.1	8611	.20	46	.51	1.71	.88	.31	.09	11778
	LOCALS	51		4.1	12.3	11.3	+1.0		.15	41	.58	1.45	1.08	.66	.26	

Table 3. Comparative verification scores for NWS official local and TDL guidance surface wind forecasts at 24 stations in the Eastern Region of the NWS during November 1973 through March 1974.

FCST PROJ (HRS)	TYPE OF FCST.	DIRECTION		SPEED (KTS)											
		MEAN ABS. ERROR (DEG)	NO. OF CASES	MEAN ABS. ERROR	MEAN FCST.	MEAN OBS	BIAS	NO. OF CASES	CONTINGENCY TABLE						
									SKILL SCORE	PERCENT FCST. CORRECT	BIAS BY CATEGORY				NO. OF CASES
											CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	
18	GUIDANCE	31	2416	3.0	12.1	11.9	+0.2	2435	.26	49	.57	1.43	1.00	.66	.21	3107
	LOCALS	34		3.8	13.5	11.9	+1.7		.18	42	.43	1.25	1.15	1.39	.93	
30	GUIDANCE	37	1462	3.3	10.7	10.8	-0.1	1477	.30	56	.86	1.46	.64	.29	.00	2916
	LOCALS	41		4.1	12.4	10.8	+1.7		.21	48	.68	1.41	1.08	1.24	.96	
42	GUIDANCE	41	2439	3.3	11.6	11.3	+0.2	2466	.18	45	.40	1.67	.89	.40	.16	3088
	LOCALS	47		4.0	12.5	11.3	+1.2		.13	41	.48	1.44	1.01	.92	.27	

Table 4. Comparative verification scores for NWS official local and TDL guidance surface wind forecasts at 24 stations in the Southern Region of the NWS during November 1973 through March 1974.

FCST PROJ (HRS)	TYPE OF FCST.	DIRECTION		SPEED (KTS)												
		MEAN ABS. ERROR (DEG)	NO. OF CASES	MEAN ABS. ERROR	MEAN FCST.	MEAN OBS	BIAS	NO. OF CASES	CONTINGENCY TABLE							
									SKILL SCORE	PERCENT FCST. CORRECT	BIAS BY CATEGORY					NO. OF CASES
											CAT1	CAT2	CAT3	CAT4	CAT5	
18	GUIDANCE	30	2216	2.9	11.6	11.5	+0.1	2235	.27	52	.57	1.50	.82	.59	.27	3067
	LOCALS	35		3.4	12.9	11.5	+1.4		.21	46	.61	1.17	1.19	1.14	.63	
30	GUIDANCE	33	887	3.2	10.2	10.3	-0.1	908	.30	62	1.03	1.18	.50	.02	.11	2860
	LOCALS	38		3.7	11.4	10.3	+1.1		.21	53	.80	1.46	.85	.55	.33	
42	GUIDANCE	42	2283	3.3	10.9	11.0	-0.2	2310	.16	46	.37	1.81	.73	.17	.00	3070
	LOCALS	51		3.8	12.0	11.0	+0.9		.13	42	.60	1.40	1.04	.45	.19	

Table 5. Comparative verification scores for NWS official local and TDL guidance surface wind forecasts at 28 stations in the Central Region of the NWS during November 1973 through March 1974.

FCST PROJ (HRS)	TYPE OF FCST.	DIRECTION		SPEED (KTS)												
		MEAN ABS. ERROR (DEG)	NO. OF CASES	MEAN ABS. ERROR	MEAN FCST.	MEAN OBS	BIAS	NO. OF CASES	CONTINGENCY TABLE							
									SKILL SCORE	PERCENT FCST. CORRECT	BIAS BY CATEGORY					NO. OF CASES
											CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	
18	GUIDANCE	31	2860	3.3	12.0	11.6	+0.3	2899	.23	48	.46	1.48	1.06	.57	.25	3475
	LOCALS	36		3.9	13.1	11.6	+1.5		.16	41	.28	1.33	1.31	1.17	.48	
30	GUIDANCE	37	1860	3.4	10.5	10.0	+0.5	1915	.20	50	.74	1.52	.67	.22	.00	3104
	LOCALS	45		4.0	11.4	10.0	+1.4		.13	43	.44	1.66	1.08	.76	.26	
42	GUIDANCE	46	2938	3.8	11.7	11.3	+0.5	2996	.15	42	.30	1.69	1.08	.38	.08	3496
	LOCALS	54		4.2	12.2	11.3	+1.0		.09	38	.31	1.57	1.18	.59	.08	

Table 6. Comparative verification scores for NWS official local and TDL guidance surface wind forecasts at 16 stations in the Western Region of the NWS during November 1973 through March 1974.

FCST PROJ (HRS)	TYPE OF FCST.	DIRECTION		SPEED (KTS)											
									CONTINGENCY TABLE						
		MEAN ABS. ERROR (DEG)	NO. OF CASES	MEAN ABS. ERROR	MEAN FCST.	MEAN OBS	BIAS	NO. OF CASES	SKILL SCORE	PERCENT FCST. CORRECT	BIAS BY CATEGORY				NO. OF CASES
											CAT 1	CAT 2	CAT 3	CAT 4	CAT 5	
18	GUIDANCE	34	864	4.0	11.7	12.5	-0.8	871	.32	57	.90	1.52	.73	.50	.21	2115
	LOCALS	36		4.5	14.0	12.5	+1.6		.30	54	.90	1.06	1.31	1.10	.69	
30	GUIDANCE	39	624	3.9	10.4	10.8	-0.4	641	.32	64	1.00	1.36	.57	.11	.14	2114
	LOCALS	45		5.1	12.8	10.8	+2.1		.22	54	.84	1.31	1.36	.92	.66	
42	GUIDANCE	44	822	4.2	10.9	11.5	-0.6	839	.25	53	.90	1.60	.64	.24	.11	2124
	LOCALS	52		5.1	12.9	11.5	+1.4		.17	46	.88	1.28	1.11	.69	.57	