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AFOS-ERA VERIFICATION OF GUIDANCE AND LOCAL AVIATION/PUBLIC WEATHER FORECASTS--NO. 22 (APRIL 1994 - SEPTEMBER 1994)

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1. INTRODUCTION

This office note continues the series of Techniques Development Laboratory (TDL) office notes which present verification results for TDL's automated guidance and National Weather Service (NWS) local forecasts made at Weather Service Forecast Offices (WSFO's). Verification statistics are presented here for the warm season months of April 1994 through September 1994 for maximum/minimum (max/min) temperature, probability of precipitation (PoP), cloud amount, surface wind, ceiling height, and visibility. Specific details about the local and objective forecasts and the verifying observations are summarized in Table 1.1. It's important to consider this information when interpreting the verification scores. For example, the objective max/min temperature forecast system is based on calendar day observations for Alaska, but on daytime/nighttime periods for the conterminous U.S. For Alaska, the definitions of the official local max/min temperature forecasts and verifying observations, in turn, differ from those of the guidance. Dagostaro and Dallavalle (1991) provide more specific information about the forecasts, observations, and verification procedure for each weather element.

For this season, the objective guidance was based on forecast equations developed by use of the Model Output Statistics (MOS) technique (Glahn and Lowry 1972) and applied to forecast fields from the Nested Grid Model (NGM) (Hoke et al. 1989) and the Limited-area Fine-mesh Model (LFM) (Gerrity 1977; Newell and Deaven 1981). Additional information about the objective guidance prediction equations is available from the references listed in Table 1.2. Details regarding the local data collection in the conterminous U.S. and Alaska are described briefly in Dagostaro and Dallavalle (1991). For additional information about the local data collection process, see Ruth and Alex (1987). The central data collection and data processing system is described in Dagostaro (1985).

Verification statistics are provided for the 101 stations in the conterminous U.S. and Alaska listed in Table 1.3. The scores are those recommended in the NWS National Verification Plan (National Weather Service 1982). Definitions of the categories used for verification are given in Table 1.4. For the aviation weather elements, we verified the local forecasts associated with the FT issuance times of approximately 0900 and 1800 UTC. Objective guidance for the aviation weather elements, as well as all local and guidance forecasts for the public weather elements, were verified for the 0000 and 1200 UTC forecast cycles. Because verification data or forecast projections for Alaska differ from those of the conterminous U.S., data for the six Alaskan stations were verified separately from those of the conterminous U.S.

For most weather elements, verification results are presented for all stations in the conterminous U.S. combined, followed by results for each of the four NWS regions in the conterminous U.S. and for the Alaska Region. Max/min temperature and PoP scores are presented in Tables 2.1 - 2.12 and

3.1 - 3.12, respectively. Tables 4.1 - 4.12 show cloud amount verification scores. For wind speed and direction, objective guidance verification results are presented in Tables 5.1 - 5.12, while the analogous local scores are given in Tables 5.13 - 5.24. Verification results for the 42-h significant wind speed are presented for the Alaska Region only in Tables 5.25 and 5.26. For ceiling height, Tables 6.1 - 6.4 contain the objective forecast results for the conterminous U.S. stations combined and for the Alaska Region, while Tables 6.5 - 6.8 contain ceiling height scores for the local forecasts. Tables 7.1 - 7.8 show objective and local visibility forecast results for the conterminous U.S. stations combined and for the Alaska Region.

2. SUMMARY (APRIL 1994 - SEPTEMBER 1994)

During the 1994 warm season, the NGM-based MOS was the official objective guidance for stations in the conterminous U.S., and LFM-based MOS was the official objective guidance for stations in Alaska. Please note that for some weather elements, forecast definitions for LFM and NGM MOS differ slightly. For stations in the conterminous U.S., LFM-based MOS max/min temperature and PoP guidance were discontinued in August 1994; thus, LFM MOS forecasts were not included in the comparative verification of local and MOS max/min temperature and PoP forecasts.

Beginning in July 1993, NGM MOS ceiling height and visibility forecasts were provided for the 15-h projection from model cycle time for stations in the conterminous U.S. (Dallavalle et al. 1992.) However, because ceiling height and visibility forecasts for the 15-h projection were not available in the previous LFM-based MOS system, the local data collection software in use at some forecast offices at the beginning of the 1994 warm season did not collect the new 15-h NGM MOS forecasts. Once an updated version of the software was installed at forecast offices, data for the 15-h projection were collected. As a consequence, the number of cases verified for the 15-h projection is slightly less than the number verified for the 12-, 18-, and 24-h projections.

On May 1, 1994, Brownsville, Texas, was commissioned as an ASOS site, and on August 1, 1994, Great Falls, Montana; Louisville, Kentucky; Fort Smith, Arkansas; and Portland, Maine, were commissioned. Because the ASOS cloud amount observations are incomplete, we set to missing the observed cloud amount data for those stations after they were commissioned. Observed cloud amount data were also set to missing for the AEV ASOS sites listed in Table 1.3 that were commissioned prior to the 1994 warm season.

Dagostaro and Dallavalle (1993) documented a problem that affected the verifications of the 42-h significant wind for stations in the conterminous U.S. Thus, the 42-h wind verification results for the conterminous U.S. are not included for the 1994 warm season.

Similarly, a problem affecting the PoP verifications for Alaska was documented in Dagostaro and Dallavalle (1995). For the 1994 warm season, we've computed a subset of the usual PoP verification scores for the local AEV PoP forecasts and the centrally-archived LFM MOS forecasts whose valid periods matched those of the local forecasts. The comparative verification results for Alaska are presented in Tables 3.11 and 3.12.

3. REFERENCES

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Table 1.1. Forecasts and observations in the NWS verification data.

Weather Element	Type of Data	Data Source[1]	Projections From Forecast Cycle	Forecast Cycle (UTC)	Comments
Max temp	LFM MOS	FMAK1	24, 48 36, 60	0000 1200	Calendar day max temperature forecast for Alaska; guidance no longer available for the conterminous U.S.
	NGM MOS	FWC	24, 48 36, 60	0000 1200	Daytime max temperature forecast for the conterminous U.S.; no guidance for Alaska.
	Local Fcst	FP	24, 48 36, 60	0000 1200	Daytime max temperature for all stations. In the conterminous U.S., actual daytime period depends on time zone. For Alaska, forecasts are valid for 12-h periods ending at 30 (42) and 54 (66) hours after 0000 (1200) UTC.
	Obs	SAO			Corresponds closely to the local and NGM MOS definitions of the max for all stations.
Min temp	LFM MOS	FMAK1	36, 60 24, 48	0000 1200	Calendar day min temperature forecast for Alaska; guidance no longer available for the conterminous U.S.
	NGM MOS	FWC	36, 60 24, 48	0000 1200	Nighttime min temperature forecast for the conterminous U.S.; no guidance for Alaska.
	Local Fcst	FP	36, 60 24, 48	0000 1200	Nighttime min temperature for all stations. In the conterminous U.S., actual nighttime period depends on time zone. For Alaska, forecasts are valid for 12-h periods ending at 30 (42) and 54 (66) hours after 1200 (0000) UTC.
	Obs	SAO			Corresponds closely to the local and NGM MOS definitions of the min for all stations.
PoP	LFM MOS	FMAK1	30, 42, 54	0000, 1200	For Alaska, forecasts are for 12-h periods ending at the indicated projections. Guidance for the conterminous U.S. is no longer available.
	NGM MOS	FWC	24, 36, 48	0000, 1200	For the conterminous U.S., forecasts are for 12-h periods ending at the indicated projections. There is no NGM-based PoP guidance for Alaska.
	Local Fcst	FP	24, 36, 48	0000, 1200	Same as the guidance. For Alaska, the local forecasts are valid 30, 42, and 54 hours from the forecast cycle.
	Obs	SAO			Precipitation amount for 12-h periods that match those of the local forecasts.

Table 1.1. Continued.

Weather Element	Type of Data	Data Source[1]	Projections From Forecast Cycle	Forecast Cycle (UTC)	Comments
Precipitation type[2]	LFM MOS	FMAK1	18, 30, 42	0000, 1200	For Alaska, guidance is for frozen and unfrozen precipitation (freezing is considered unfrozen) but is not verified. There is no guidance for the conterminous U.S.
	NGM MOS	FWC	18, 30, 42	0000, 1200	For the conterminous U.S., forecasts are valid at specific hours corresponding to the indicated projections. Guidance is for freezing, frozen, and liquid precipitation (mixed frozen and liquid is considered liquid). There is no guidance for Alaska.
	Local Fcst	MEF	18, 30, 42	0000, 1200	Forecasts of freezing, frozen, and liquid precipitation (mixed frozen and liquid is considered frozen) for all stations. Forecasts are valid at specific hours corresponding to the indicated projections.
	Obs	SAO			Obs are collected at the verifying time and $\pm$ 1 hour of the verifying time.
Snow amount[2]	LFM MOS				For Alaska, appropriate guidance is not available; no guidance for the conterminous U.S.
	NGM MOS	FWC	24	0000, 1200	For the conterminous U.S., categorical forecasts of snow amount for the 12-h period ending at the indicated projection; no comparable guidance for Alaska.
	Local Fcst	MEF	24	0000, 1200	Snow amount forecast in inches for the 12-h period ending at the indicated projection.
	Obs	SSM			12-h snow amount.
Cloud amount	LFM MOS	FMAK1	12, 18, 24	0000, 1200	Categorical forecasts of opaque sky cover for Alaska; no guidance for the conterminous U.S.
	NGM MOS	FWC	12, 18, 24	0000, 1200	Categorical forecasts of opaque sky cover for the conterminous U.S.; no guidance for Alaska.
	Local Fcst	MEF	12, 18, 24	0000, 1200	Categorical forecasts of sky cover.
	Obs	SAO			Observed total sky cover (includes thin clouds) at the verifying hour.
Wind speed	LFM MOS	FMAK2	12, 18, 24, 42	0000, 1200	For Alaska, forecasts are valid at specific hours after 0000 or 1200 UTC; no guidance for the conterminous U.S.
	NGM MOS	FWC	12, 18, 24, 42	0000, 1200	For the conterminous U.S., forecasts are valid at the indicated hours after 0000 or 1200 UTC; no guidance for Alaska.
	Local Fcst	FT	3, 9, 15	0900, 1800	Aviation terminal forecasts are valid for variable time periods. Forecasts valid for the "projections" at left are verified. Approximate FT issuance times, at left, depend on time zone where station is located.
		MEF	42	0000, 1200	A yes/no forecast of $\geq$ 22 kt wind speed valid at the specific hour after 0000 or 1200 UTC.
	Obs	SAO			Observed values collected at the stations for the specific hour and $\pm$ 3 hours (highest sustained wind) correspond to the valid times of the local aviation terminal forecasts. Observed values corresponding to the 42-h significant wind should be based on 0000 or 1200 UTC, but are erroneously based on the FT issuance time for the conterminous U.S. Verifying obs corresponding to the guidance are from TDL hourly archives.

Table 1.1. Continued.

Weather Element	Type of Data	Data Source[1]	Projections From Forecast Cycle	Forecast Cycle (UTC)	Comments
Wind direction	LFM MOS	FMAK2	12, 18, 24	0000, 1200	For Alaska, forecasts are valid at specific hours after 0000 or 1200 UTC; no guidance for the conterminous U.S.
	NGM MOS	FWC	12, 18, 24	0000, 1200	For the conterminous U.S., forecasts are valid at the indicated hours after 0000 or 1200 UTC; no guidance for Alaska.
	Local Fcst	FT	3, 9, 15	0900, 1800	Same as for local aviation terminal forecasts of wind speed.
	Obs	SAO			Observed values collected at the stations for the specific hour correspond to the valid time of the local forecasts. Verifying obs corresponding to the guidance are from TDL hourly archives.
Ceiling height	LFM MOS	FMAK2	12, 18, 24	0000, 1200	Categorical value. Definitions of categories match the official definitions of LIFR and IFR, but differ slightly from the official definitions of MVFR and VFR; no guidance for the conterminous U.S.
	NGM MOS	FWC	12, 15, 18, 24	0000, 1200	Categorical value. Definitions of categories match the official definitions of LIFR, IFR, MVFR, and VFR; no guidance for Alaska.
	Local Fcst	FT	3, 6, 9, 15	0900, 1800	Forecasts are converted to categorical values. See wind speed for FT valid times and issuance times.
	Persis	SAO			Persistence observations used for comparison with the local forecasts are collected at the stations and are the latest hourly obs available at the scheduled FT release time. Since March 1987, persistence obs used for comparison with the MOS guidance are from hourly obs taken at 0900 (2100) UTC for the 0000 (1200) UTC cycle. These latter obs are collected at TDL.
	Obs	SAO			Observations taken at specific hours. Obs corresponding to the valid times of the local forecasts are collected at the stations. Verifying obs that correspond to the valid times of the MOS guidance are from hourly obs collected at TDL.
Visibility	LFM MOS	FMAK2	12, 18, 24	0000, 1200	See ceiling height.
	NGM MOS	FWC	12, 15, 18, 24	0000, 1200	See ceiling height.
	Local Fcst	FT	3, 6, 9, 15	0900, 1800	See ceiling height.
	Persis	SAO			See ceiling height.
	Obs	SAO			See ceiling height.

[1]Data sources are as follows:

FMAK1, FMAK2 - bulletins contain LFM-based MOS guidance for all weather elements for stations in Alaska; LFM-based MOS guidance for the conterminous U.S. is no longer available
FWC - FWC bulletin contains NGM-based MOS guidance for all weather elements for stations in the conterminous U.S. only; there is no NGM-based guidance for Alaska at this time
FP - Coded city forecast (FPUS4) bulletin containing official local public weather element forecasts in the conterminous U.S.; data in Alaska are obtained from the FPAK4 bulletin
FT - Aviation terminal forecast containing official local forecasts for aviation weather elements
MEF - Manually entered forecast product containing official local forecasts of some weather elements
SAO - Surface airways observation containing verifying observations corresponding to local and MOS forecasts for most weather elements
SSM - Surface synoptic report containing verifying observations of snow amount

[2]Precipitation type and snow amount forecasts are not verified for the warm season months of April through September.

Table 1.2. National Weather Service Technical Procedures Bulletins (TPB's) containing information about MOS guidance.

Geographical Area	Subject	Forecast Model	TPB No.
Conterminous U.S.	max/min temperature	NGM	387
	PoP	NGM	409
	precipitation type	NGM	421
	snow amount	NGM	420
	cloud amount	NGM	387
	surface wind	NGM	399
	ceiling height	NGM	414
	visibility	NGM	408
Alaska	max/min temperature	LFM	329
	PoP	LFM	329
	cloud amount	LFM	329
	surface wind	LFM	329
	ceiling height	LFM	338
	visibility	LFM	338

Table 1.3. Ninety-five stations in the conterminous U.S. and six stations in Alaska used for verification of MOS guidance and local forecasts of max/min temperature, probability of precipitation, cloud amount, surface wind, ceiling height, and visibility.

DCA	Washington, D.C.	ORF	Norfolk, Virginia
PWM[1]	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[1]	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	AVP	Scranton, Pennsylvania
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
AMA[1]	Amarillo, Texas		
LIT	Little Rock, Arkansas	FSM[1]	Fort Smith, Arkansas
MIA	Miami, Florida	TPA	Tampa, Florida
ATL	Atlanta, Georgia	SAV	Savannah, Georgia
MSY	New Orleans, Louisiana	SHV	Shreveport, Louisiana
JAN[1]	Jackson, Mississippi	MEI	Meridian, Mississippi
ABQ	Albuquerque, New Mexico	TCC[2]	Tucumcari, New Mexico
OKC[1]	Oklahoma City, Oklahoma	TUL[1]	Tulsa, Oklahoma
MEM	Memphis, Tennessee	BNA	Nashville, Tennessee
DFW	Dallas-Ft. Worth, Texas	ABI	Abilene, Texas
LBB[3]	Lubbock, Texas	ELP[3]	El Paso, Texas
SAT	San Antonio, Texas	BRO[1]	Brownsville, 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[1]	Topeka, Kansas	ICT[1]	Wichita, Kansas
SDF[1]	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[1]	Phoenix, Arizona	TUS	Tucson, Arizona
LAX[4]	Los Angeles, California	SAN	San Diego, California
SFO	San Francisco, California	FAT	Fresno, California
BOI	Boise, Idaho	PIH	Pocatello, Idaho
GTF[1]	Great Falls, Montana	BIL	Billings, 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
ANC	Anchorage, Alaska	BET	Bethel, Alaska
FAI	Fairbanks, Alaska	OME	Nome, Alaska
JNU[5]	Juneau, Alaska	YAK	Yakutat, Alaska

[1]Cloud amount observations were not used after the station was commissioned as an ASOS site.
[2]TCC had no data for the max/min temperature and PoP verifications. Data also were not available for the cloud amount verification for the 1200 UTC cycle, the local ceiling height, visibility, and surface wind verifications for the FT release time of approximately 0900 UTC, the MOS surface wind verification for the 1200 UTC cycle, and the MOS ceiling height and visibility verifications for the 0000 and 1200 UTC cycles.
[3]LBB and ELP were not included in the local ceiling height, visibility, and surface wind verifications.
[4]LAX was not included in the max/min temperature and PoP verifications.
[5]JNU had no data for the PoP verification.

Table 1.4. Definitions of categories used for verification.

Category	Precipitation Type	Snow Amount* (in)	Cloud Amount	Wind Speed (kt)	Wind Direction (degrees)	Ceiling Height (ft)	Visibility (mi)
1	ZL, ZR, any combination of precipitation types that includes ZL or ZR	<2	CLR, -SCT, -BKN, -OVC, -X	≤12	340-20	≤400	<1
2	IC, IP, IPW, S, SG, SP, SW, any combination of frozen and liquid	2-3	SCT	13-17	30-60	500-900	1-2 3/4
3	L, R, RW	4-5	BKN	18-22	70-110	1000-3000	3-5
4		≥6	OVC, X	23-27	120-150	≥3100	>5
5				28-32	160-200		
6				≥33	210-240		
7					250-290		
8					300-330		

*Scores based on cumulative snow amount categories of ≥ 2, ≥ 4, and ≥ 6 inches are noted in the verification tables.

Table 2.1. Comparative verification of local and NGM MOS max/min temperature forecasts for 93 stations in the conterminous U.S., 0000 UTC 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)	Improvement Over Climate
Today's Max	LOCAL		-0.1	2.5	1.0	--	--	81.5
	NGM MOS	16500	-0.7	2.8	1.1	--	--	78.2
Tonight's Min	LOCAL		-0.4	2.6	0.7	0.49	0.34	73.9
	NGM MOS	16428	-0.7	2.8	0.9	0.64	0.36	71.0
Tomorrow's Max	LOCAL		-0.2	3.2	2.6	--	--	70.9
	NGM MOS	16470	-0.8	3.5	3.1	--	--	66.5
Tomorrow Night's Min	LOCAL		-0.5	3.2	1.8	0.27	0.58	62.1
	NGM MOS	16393	-0.7	3.2	1.9	0.35	0.61	61.5

Table 2.2. Same as Table 2.1 except for the 1200 UTC 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)	Improvement Over Climate
Tonight's Min	LOCAL		-0.4	2.5	0.5	0.51	0.34	77.0
	NGM MOS	16531	-0.4	2.6	0.7	0.55	0.31	75.1
Tomorrow's Max	LOCAL		-0.1	2.9	1.8	--	--	75.7
	NGM MOS	16560	-0.4	3.2	2.3	--	--	71.0
Tomorrow Night's Min	LOCAL		-0.4	2.9	1.1	0.41	0.34	69.2
	NGM MOS	16480	-0.5	3.0	1.3	0.49	0.44	67.3
Day After Tomorrow's Max	LOCAL		-0.2	3.6	4.1	--	--	62.8
	NGM MOS	16528	-0.7	3.8	4.4	--	--	59.3

Table 2.3. Comparative verification of local and NGM MOS max/min temperature forecasts for 24 stations in the Eastern Region, 0000 UTC 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)	Improvement Over Climate
Today's Max	LOCAL	4312	0.0	2.5	0.9	--	--	79.1
	NGM MOS		-0.6	2.8	1.1	--	--	76.1
Tonight's Min	LOCAL	4311	-0.5	2.6	0.5	0.48	0.50	77.1
	NGM MOS		-0.6	2.8	0.5	0.66	0.42	75.7
Tomorrow's Max	LOCAL	4308	-0.2	3.1	2.1	--	--	70.1
	NGM MOS		-0.6	3.3	2.2	--	--	67.6
Tomorrow Night's Min	LOCAL	4308	-0.6	3.2	1.8	0.27	0.70	65.3
	NGM MOS		-0.5	3.2	1.6	0.30	0.74	65.5

Table 2.4. Same as Table 2.3 except for the 1200 UTC 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)	Improvement Over Climate
Tonight's Min	LOCAL	4324	-0.5	2.5	0.2	0.62	0.44	79.9
	NGM MOS		-0.4	2.5	0.4	0.62	0.42	78.7
Tomorrow's Max	LOCAL	4317	0.0	2.9	1.8	--	--	73.6
	NGM MOS		-0.2	3.0	2.0	--	--	71.5
Tomorrow Night's Min	LOCAL	4311	-0.4	2.8	0.7	0.43	0.50	73.4
	NGM MOS		-0.4	2.8	0.8	0.50	0.52	73.1
Day After Tomorrow's Max	LOCAL	4310	-0.2	3.5	3.5	--	--	62.5
	NGM MOS		-0.4	3.5	3.4	--	--	61.7

Table 2.5. Comparative verification of local and NGM MOS max/min temperature forecasts for 24 stations in the Southern Region, 0000 UTC 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)	Improvement Over Climate
Today's Max	LOCAL		0.1	2.1	0.8	--	--	76.0
	NGM MOS	4235	-0.5	2.5	0.9	--	--	70.4
Tonight's Min	LOCAL		-0.4	2.4	0.7	0.17	0.50	68.9
	NGM MOS	4217	-1.1	2.8	1.4	0.00	1.00	60.6
Tomorrow's Max	LOCAL		0.2	2.7	1.9	--	--	62.4
	NGM MOS	4227	-0.6	3.0	2.5	--	--	54.6
Tomorrow Night's Min	LOCAL		-0.5	2.8	1.5	0.20	0.50	57.9
	NGM MOS	4214	-1.1	3.1	2.1	0.20	0.75	51.1

Table 2.6. Same as Table 2.5 except for the 1200 UTC 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)	Improvement Over Climate
Tonight's Min	LOCAL		-0.5	2.3	0.5	0.17	0.00	72.0
	NGM MOS	4241	-0.7	2.5	1.0	0.33	0.33	66.6
Tomorrow's Max	LOCAL		0.1	2.4	1.4	--	--	68.6
	NGM MOS	4248	-0.3	2.9	2.0	--	--	58.2
Tomorrow Night's Min	LOCAL		-0.4	2.6	1.0	0.20	0.00	63.1
	NGM MOS	4233	-0.8	2.8	1.8	0.00	1.00	57.0
Day After Tomorrow's Max	LOCAL		0.4	3.0	2.6	--	--	54.7
	NGM MOS	4241	-0.2	3.2	2.9	--	--	48.4

Table 2.7. Comparative verification of local and NGM MOS max/min temperature forecasts for 28 stations in the Central Region, 0000 UTC 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)	Improvement Over Climate
Today's Max	LOCAL	5008	-0.2	2.8	1.4	--	--	83.6
	NGM MOS		-0.8	3.0	1.4	--	--	81.8
Tonight's Min	LOCAL	4987	-0.3	2.8	0.8	0.62	0.13	76.7
	NGM MOS		-0.5	2.9	0.8	0.79	0.30	75.7
Tomorrow's Max	LOCAL	5002	-0.4	3.6	3.9	--	--	72.8
	NGM MOS		-1.1	3.9	4.5	--	--	69.4
Tomorrow Night's Min	LOCAL	4976	-0.4	3.4	2.0	0.37	0.43	64.8
	NGM MOS		-0.6	3.4	2.2	0.51	0.44	65.9

Table 2.8. Same as Table 2.7 except for the 1200 UTC 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)	Improvement Over Climate
Tonight's Min	LOCAL	5009	-0.4	2.6	0.5	0.57	0.23	79.9
	NGM MOS		-0.1	2.7	0.6	0.55	0.18	79.0
Tomorrow's Max	LOCAL	5027	-0.2	3.2	2.4	--	--	78.3
	NGM MOS		-0.3	3.5	3.2	--	--	75.0
Tomorrow Night's Min	LOCAL	5001	-0.2	3.1	1.4	0.43	0.12	72.0
	NGM MOS		-0.3	3.1	1.4	0.63	0.31	71.5
Day After Tomorrow's Max	LOCAL	5022	-0.3	4.1	6.3	--	--	64.8
	NGM MOS		-0.7	4.3	6.7	--	--	62.2

Table 2.9. Comparative verification of local and NGM MOS max/min temperature forecasts for 17 stations in the Western Region, 0000 UTC 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)	Improvement Over Climate
Today's Max	LOCAL		-0.3	2.4	0.7	--	--	84.7
	NGM MOS	2945	-1.0	2.8	0.8	--	--	79.6
Tonight's Min	LOCAL		-0.5	2.7	0.9	0.18	0.60	66.6
	NGM MOS	2913	-0.7	2.8	0.8	0.36	0.43	63.4
Tomorrow's Max	LOCAL		-0.5	3.1	1.8	--	--	74.7
	NGM MOS	2933	-1.2	3.5	2.7	--	--	68.9
Tomorrow Night's Min	LOCAL		-0.7	3.1	1.9	0.00	1.00	54.4
	NGM MOS	2895	-0.6	3.1	1.6	0.00	1.00	55.4

Table 2.10. Same as Table 2.9 except for the 1200 UTC 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)	Improvement Over Climate
Tonight's Min	LOCAL		-0.4	2.5	0.8	0.18	0.50	70.4
	NGM MOS	2957	-0.4	2.5	0.7	0.45	0.38	68.9
Tomorrow's Max	LOCAL		-0.5	2.8	1.5	--	--	78.6
	NGM MOS	2968	-1.1	3.3	1.9	--	--	72.3
Tomorrow Night's Min	LOCAL		-0.7	2.9	1.4	0.36	0.33	61.6
	NGM MOS	2935	-0.8	3.0	1.3	0.27	0.57	58.6
Day After Tomorrow's Max	LOCAL		-0.6	3.6	3.4	--	--	65.9
	NGM MOS	2955	-1.5	4.0	4.4	--	--	59.0
						--	--	

Table 2.11. Comparative verification of local and LFM MOS max/min temperature forecasts for 6 stations in the Alaska Region, 0000 UTC 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)	Improvement Over Climate
Today's Max	LOCAL	1037	0.1	3.0	1.7	--	--	67.1
	LFM MOS		0.4	2.9	1.1	--	--	70.6
Tonight's Min	LOCAL	1036	-0.4	3.1	1.6	0.00	1.00	55.5
	LFM MOS		-0.7	3.0	1.5	0.09	0.50	59.1
Tomorrow's Max	LOCAL	1035	-0.5	3.7	3.1	--	--	52.6
	LFM MOS		-0.2	3.4	2.9	--	--	58.2
Tomorrow Night's Min	LOCAL	1035	-0.6	3.6	3.0	0.00	1.00	40.8
	LFM MOS		-0.8	3.5	2.4	0.00	*	44.8

* Events of ≤ 32°F were observed but not forecast.

Table 2.12. Same as Table 2.11 except for the 1200 UTC 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)	Improvement Over Climate
Tonight's Min	LOCAL	1054	-0.8	2.9	0.9	0.17	0.60	60.9
	LFM MOS		-1.1	3.0	0.9	0.00	1.00	58.3
Tomorrow's Max	LOCAL	1054	-0.5	3.4	2.3	--	--	59.2
	LFM MOS		-0.5	3.3	2.5	--	--	60.0
Tomorrow Night's Min	LOCAL	1040	-1.0	3.4	1.8	0.09	0.67	45.7
	LFM MOS		-1.3	3.5	2.6	0.00	1.00	42.4
Day After Tomorrow's Max	LOCAL	1040	-0.7	4.0	5.5	--	--	42.2
	LFM MOS		-0.6	3.8	3.9	--	--	47.9

Table 3.1. Comparative verification of local and NGM MOS PoP forecasts for 93 stations in the conterminous U.S.

Forecast Projection (h)	Type of Forecast	Brier Score	Local % Imp. Over Guid.	% Imp. Over Clim.	No. of Cases	Changes GE 20% to Guidance: Guid. Brier Score	Changes GE 20% to Guidance: Local % Imprv.	Changes GE 20% to Guidance: No. of Changes
12-24 (1st period)	LOCAL	0.0983		33.0				
	NGM MOS	0.0988	0.5	32.6	15565	0.1905	1.0	1902
24-36 (2nd period)	LOCAL	0.1020		28.8				
	NGM MOS	0.1022	0.2	28.7	15564	0.1999	0.4	1606
36-48 (3rd period)	LOCAL	0.1133		23.4				
	NGM MOS	0.1132	-0.1	23.5	15537	0.1861	-0.2	1614

Table 3.2. Same as Table 3.1 except for the 1200 UTC cycle.

Forecast Projection (h)	Type of Forecast	Brier Score	Local % Imp. Over Guid.	% Imp. Over Clim.	No. of Cases	Changes GE 20% to Guidance: Guid. Brier Score	Changes GE 20% to Guidance: Local % Imprv.	Changes GE 20% to Guidance: No. of Changes
12-24 (1st period)	LOCAL	0.0969		32.3				
	NGM MOS	0.0979	1.0	31.6	15654	0.1983	0.7	2109
24-36 (2nd period)	LOCAL	0.1061		28.0				
	NGM MOS	0.1056	-0.5	28.4	15631	0.1936	-3.9	1697
36-48 (3rd period)	LOCAL	0.1108		23.1				
	NGM MOS	0.1087	-1.9	24.5	15619	0.1942	-9.3	1544

Table 3.3. Comparative verification of local and NGM MOS PoP forecasts for 24 stations in the Eastern Region, 0000 UTC cycle.

Forecast Projection (h)	Type of Forecast	Brier Score	Local % Imp. Over Guid.	% Imp. Over Clim.	No. of Cases	Changes GE 20% to Guidance: Guid. Brier Score	Changes GE 20% to Guidance: Local % Imprv.	Changes GE 20% to Guidance: No. of Changes
12-24 (1st period)	LOCAL	0.1179		36.9				
	NGM MOS	0.1178	-0.1	37.0	4170	0.1877	-2.2	624
24-36 (2nd period)	LOCAL	0.1163		33.3				
	NGM MOS	0.1168	0.4	33.0	4169	0.2151	1.9	489
36-48 (3rd period)	LOCAL	0.1329		29.5				
	NGM MOS	0.1307	-1.7	30.7	4167	0.1741	-14.0	510

Table 3.4. Same as Table 3.3 except for the 1200 UTC cycle.

Forecast Projection (h)	Type of Forecast	Brier Score	Local % Imp. Over Guid.	% Imp. Over Clim.	No. of Cases	Changes GE 20% to Guidance: Guid. Brier Score	Changes GE 20% to Guidance: Local % Imprv.	Changes GE 20% to Guidance: No. of Changes
12-24 (1st period)	LOCAL	0.1125		35.4				
	NGM MOS	0.1115	-0.9	36.0	4184	0.1993	-2.3	656
24-36 (2nd period)	LOCAL	0.1277		32.2				
	NGM MOS	0.1242	-2.8	34.1	4180	0.1906	-10.8	550
36-48 (3rd period)	LOCAL	0.1274		27.4				
	NGM MOS	0.1243	-2.5	29.2	4178	0.1968	-12.3	536

Table 3.5. Comparative verification of local and NGM MOS PoP forecasts for 24 stations in the Southern Region, 0000 UTC cycle.

Forecast Projection (h)	Type of Forecast	Brier Score	Local % Imp. Over Guid.	% Imp. Over Clim.	No. of Cases	Changes GE 20% to Guidance: Guid. Brier Score	Changes GE 20% to Guidance: Local % Imprv.	Changes GE 20% to Guidance: No. of Changes
12-24	LOCAL	0.1147		24.2				
(1st period)	NGM MOS	0.1133	-1.3	25.2	3804	0.1826	-5.9	525
24-36	LOCAL	0.1047		17.4				
(2nd period)	NGM MOS	0.1038	-0.8	18.1	3801	0.1965	-4.6	394
36-48	LOCAL	0.1284		16.0				
(3rd period)	NGM MOS	0.1309	1.9	14.4	3794	0.2072	7.5	447

Table 3.6. Same as Table 3.5 except for the 1200 UTC cycle.

Forecast Projection (h)	Type of Forecast	Brier Score	Local % Imp. Over Guid.	% Imp. Over Clim.	No. of Cases	Changes GE 20% to Guidance: Guid. Brier Score	Changes GE 20% to Guidance: Local % Imprv.	Changes GE 20% to Guidance: No. of Changes
12-24	LOCAL	0.1005		20.6				
(1st period)	NGM MOS	0.1012	0.7	20.1	3820	0.1946	1.6	544
24-36	LOCAL	0.1220		19.5				
(2nd period)	NGM MOS	0.1233	1.0	18.7	3817	0.2113	0.7	493
36-48	LOCAL	0.1108		13.6				
(3rd period)	NGM MOS	0.1086	-2.0	15.3	3810	0.2009	-7.5	332

Table 3.7. Comparative verification of local and NGM MOS PoP forecasts for 28 stations in the Central Region, 0000 UTC cycle.

Forecast Projection (h)	Type of Forecast	Brier Score	Local % Imp. Over Guid.	% Imp. Over Clim.	No. of Cases	Changes GE 20% to Guidance: Guid. Brier Score	Local % Imprv.	No. of Changes
12-24 (1st period)	LOCAL	0.0963		36.0				
	NGM MOS	0.0975	1.3	35.2	4780	0.1916	4.1	588
24-36 (2nd period)	LOCAL	0.1100		32.6				
	NGM MOS	0.1102	0.2	32.4	4784	0.1872	0.5	525
36-48 (3rd period)	LOCAL	0.1159		23.6				
	NGM MOS	0.1150	-0.7	24.2	4776	0.1746	-1.0	515

Table 3.8. Same as Table 3.7 except for the 1200 UTC cycle.

Forecast Projection (h)	Type of Forecast	Brier Score	Local % Imp. Over Guid.	% Imp. Over Clim.	No. of Cases	Changes GE 20% to Guidance: Guid. Brier Score	Local % Imprv.	No. of Changes
12-24 (1st period)	LOCAL	0.1015		37.6				
	NGM MOS	0.1041	2.5	36.0	4810	0.2001	2.4	682
24-36 (2nd period)	LOCAL	0.1048		30.7				
	NGM MOS	0.1042	-0.6	31.1	4802	0.1787	-7.5	480
36-48 (3rd period)	LOCAL	0.1200		26.3				
	NGM MOS	0.1182	-1.5	27.5	4802	0.1883	-9.7	523

Table 3.9. Comparative verification of local and NGM MOS PoP forecasts for 17 stations in the Western Region, 0000 UTC cycle.

Forecast Projection (h)	Type of Forecast	Brier Score	Local % Imp. Over Guid.	% Imp. Over Clim.	No. of Cases	Changes GE 20% to Guidance: Guid. Brier Score	Changes GE 20% to Guidance: Local % Imprv.	Changes GE 20% to Guidance: No. of Changes
12-24 (1st period)	LOCAL	0.0505		31.9				
	NGM MOS	0.0534	5.4	28.0	2811	0.2225	19.1	165
24-36 (2nd period)	LOCAL	0.0638		25.8				
	NGM MOS	0.0647	1.5	24.7	2810	0.2030	5.9	198
36-48 (3rd period)	LOCAL	0.0594		20.2				
	NGM MOS	0.0602	1.4	19.0	2800	0.2048	20.0	142

Table 3.10. Same as Table 3.9 except for the 1200 UTC cycle.

Forecast Projection (h)	Type of Forecast	Brier Score	Local % Imp. Over Guid.	% Imp. Over Clim.	No. of Cases	Changes GE 20% to Guidance: Guid. Brier Score	Changes GE 20% to Guidance: Local % Imprv.	Changes GE 20% to Guidance: No. of Changes
12-24 (1st period)	LOCAL	0.0615		29.1				
	NGM MOS	0.0632	2.6	27.2	2840	0.1987	2.4	227
24-36 (2nd period)	LOCAL	0.0548		26.4				
	NGM MOS	0.0564	3.0	24.1	2832	0.1942	12.1	174
36-48 (3rd period)	LOCAL	0.0705		18.8				
	NGM MOS	0.0698	-1.0	19.6	2829	0.1902	-1.1	153

Table 3.11. Comparative verification of local and centrally archived LFM MOS PoP forecasts for 5 stations in the Alaska Region, 0000 UTC cycle.

Forecast Projection (h)	Type of Forecast	Brier Score	Local % Imp. Over Guid.	% Imp. Over Clim.	No. of Cases	Changes GE 20% to Guidance: Guid. Brier Score	Local % Imprv.	No. of Changes
18-30	LOCAL	0.132		*				
(1st period)	LFM MOS	0.134	1.5	*	807	**	**	**
30-42	LOCAL	0.150		*				
(2nd period)	LFM MOS	0.144	-4.0	*	797	**	**	**
42-54	LOCAL	0.143		*				
(3rd period)	LFM MOS	0.147	3.1	*	805	**	**	**

Table 3.12. Same as Table 3.11 except for the 1200 UTC cycle.

Forecast Projection (h)	Type of Forecast	Brier Score	Local % Imp. Over Guid.	% Imp. Over Clim.	No. of Cases	Changes GE 20% to Guidance: Guid. Brier Score	Local % Imprv.	No. of Changes
18-30	LOCAL	0.134		*				
(1st period)	LFM MOS	0.130	-2.5	*	819	**	**	**
30-42	LOCAL	0.140		*				
(2nd period)	LFM MOS	0.137	-2.1	*	825	**	**	**
42-54	LOCAL	0.147		*				
(3rd period)	LFM MOS	0.143	-2.9	*	819	**	**	**

* Percent improvement over climate scores were not available.
** This score was not computed.

Table 4.1. Comparative verification of local and NGM MOS forecasts of four categories of cloud amount (clear, scattered, broken, and overcast) for 87 stations in the conterminous U.S., 0000 UTC cycle.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Percent Correct	Skill Score
12	LOCAL	0.73	1.43	1.57	0.80	57.2	0.425
	NGM MOS	0.74	1.62	1.21	0.84	52.2	0.354
	No. Obs.	5679	2779	2060	4111		
18	LOCAL	0.59	1.37	1.65	0.52	48.0	0.307
	NGM MOS	0.62	1.46	1.26	0.71	51.6	0.351
	No. Obs.	4251	4174	2824	3477		
24	LOCAL	0.58	1.41	1.93	0.51	43.2	0.252
	NGM MOS	0.60	1.58	1.39	0.66	46.4	0.286
	No. Obs.	4658	3805	2403	3757		

Table 4.2. Same as Table 4.1 except for 86 stations for the 1200 UTC cycle.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Percent Correct	Skill Score
12	LOCAL	0.71	1.31	1.65	0.63	53.2	0.378
	NGM MOS	0.66	1.53	1.34	0.67	49.4	0.324
	No. Obs.	4665	3833	2422	3784		
18	LOCAL	0.62	1.89	2.09	0.64	47.0	0.288
	NGM MOS	0.79	1.69	1.20	0.85	53.8	0.349
	No. Obs.	6945	2409	1704	3626		
24	LOCAL	0.68	1.65	1.71	0.64	45.3	0.274
	NGM MOS	0.68	1.73	1.28	0.82	49.2	0.319
	No. Obs.	5678	2793	2061	4162		

Table 4.3. Comparative verification of local and NGM MOS forecasts of four categories of cloud amount (clear, scattered, broken, and overcast) for 23 stations in the Eastern Region, 0000 UTC cycle.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Percent Correct	Skill Score
12	LOCAL	0.61	1.64	1.70	0.80	52.3	0.366
	NGM MOS	0.69	1.67	1.23	0.90	52.0	0.351
	No. Obs.	1400	672	580	1405		
18	LOCAL	0.51	1.22	1.70	0.58	46.4	0.280
	NGM MOS	0.50	1.36	1.32	0.73	51.5	0.342
	No. Obs.	785	1195	882	1195		
24	LOCAL	0.53	1.53	2.08	0.62	42.5	0.250
	NGM MOS	0.57	1.79	1.48	0.69	44.7	0.270
	No. Obs.	1253	851	601	1348		

Table 4.4. Same as Table 4.3 except for the 1200 UTC cycle.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Percent Correct	Skill Score
12	LOCAL	0.59	1.44	1.90	0.70	49.0	0.330
	NGM MOS	0.60	1.74	1.41	0.72	49.2	0.327
	No. Obs.	1253	857	598	1361		
18	LOCAL	0.58	2.00	2.18	0.74	46.1	0.285
	NGM MOS	0.76	1.83	1.17	0.91	54.3	0.362
	No. Obs.	1724	532	467	1338		
24	LOCAL	0.62	1.65	1.78	0.74	45.5	0.278
	NGM MOS	0.66	1.72	1.29	0.88	49.2	0.316
	No. Obs.	1393	679	573	1423		

Table 4.5. Comparative verification of local and NGM MOS forecasts of four categories of cloud amount (clear, scattered, broken, and overcast) for 21 stations in the Southern Region, 0000 UTC cycle.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Percent Correct	Skill Score
12	LOCAL	0.62	1.42	1.54	0.76	53.4	0.384
	NGM MOS	0.74	1.54	1.15	0.77	48.6	0.313
	No. Obs.	1142	758	573	835		
18	LOCAL	0.51	1.36	1.35	0.44	48.3	0.278
	NGM MOS	0.71	1.34	1.04	0.67	54.5	0.369
	No. Obs.	742	1148	879	640		
24	LOCAL	0.48	1.39	1.69	0.42	39.9	0.189
	NGM MOS	0.66	1.46	1.13	0.64	45.9	0.264
	No. Obs.	853	1023	686	743		

Table 4.6. Same as Table 4.5 except for 20 stations for the 1200 UTC cycle.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Percent Correct	Skill Score
12	LOCAL	0.65	1.35	1.48	0.47	52.0	0.351
	NGM MOS	0.75	1.38	1.07	0.70	48.8	0.305
	No. Obs.	852	1029	693	747		
18	LOCAL	0.52	2.00	1.85	0.49	41.5	0.223
	NGM MOS	0.82	1.57	1.02	0.82	50.3	0.300
	No. Obs.	1535	658	478	641		
24	LOCAL	0.64	1.73	1.58	0.44	40.2	0.213
	NGM MOS	0.70	1.60	1.17	0.76	45.8	0.277
	No. Obs.	1132	758	580	850		

Table 4.7. Comparative verification of local and NGM MOS forecasts of four categories of cloud amount (clear, scattered, broken, and overcast) for 26 stations in the Central Region, 0000 UTC cycle.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Percent Correct	Skill Score
12	LOCAL	0.78	1.35	1.62	0.79	57.8	0.426
	NGM MOS	0.69	1.73	1.24	0.83	52.1	0.353
	No. Obs.	1780	868	553	1235		
18	LOCAL	0.51	1.48	1.84	0.51	45.2	0.275
	NGM MOS	0.53	1.58	1.36	0.69	48.7	0.314
	No. Obs.	1344	1230	735	1127		
24	LOCAL	0.48	1.46	2.12	0.51	41.9	0.238
	NGM MOS	0.52	1.58	1.55	0.66	46.6	0.290
	No. Obs.	1419	1197	676	1150		

Table 4.8. Same as Table 4.7 except for the 1200 UTC cycle.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Percent Correct	Skill Score
12	LOCAL	0.69	1.23	1.78	0.69	53.8	0.387
	NGM MOS	0.63	1.51	1.51	0.62	49.1	0.320
	No. Obs.	1418	1208	683	1158		
18	LOCAL	0.61	1.90	2.42	0.62	47.2	0.289
	NGM MOS	0.77	1.76	1.30	0.83	55.1	0.362
	No. Obs.	2183	727	444	1110		
24	LOCAL	0.68	1.71	1.85	0.58	44.9	0.267
	NGM MOS	0.59	1.82	1.48	0.80	48.4	0.312
	No. Obs.	1780	870	557	1255		

Table 4.9. Comparative verification of local and NGM MOS forecasts of four categories of cloud amount (clear, scattered, broken, and overcast) for 17 stations in the Western Region, 0000 UTC cycle.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Percent Correct	Skill Score
12	LOCAL	0.87	1.29	1.32	0.88	67.6	0.536
	NGM MOS	0.86	1.48	1.24	0.81	56.9	0.383
	No. Obs.	1357	481	354	636		
18	LOCAL	0.76	1.47	1.88	0.54	54.3	0.355
	NGM MOS	0.72	1.61	1.49	0.72	52.8	0.335
	No. Obs.	1380	601	328	515		
24	LOCAL	0.82	1.23	1.80	0.39	49.9	0.312
	NGM MOS	0.69	1.50	1.41	0.62	49.0	0.304
	No. Obs.	1133	734	440	516		

Table 4.10. Same as Table 4.9 except for the 1200 UTC cycle.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Percent Correct	Skill Score
12	LOCAL	0.90	1.24	1.35	0.57	59.4	0.435
	NGM MOS	0.67	1.52	1.39	0.64	50.8	0.329
	No. Obs.	1142	739	448	518		
18	LOCAL	0.77	1.60	1.84	0.59	54.3	0.341
	NGM MOS	0.81	1.62	1.36	0.76	55.0	0.341
	No. Obs.	1503	492	315	537		
24	LOCAL	0.78	1.44	1.62	0.81	51.5	0.319
	NGM MOS	0.78	1.76	1.16	0.80	54.3	0.356
	No. Obs.	1373	486	351	634		

Table 4.11. Comparative verification of local and LFM MOS forecasts of four categories of cloud amount (clear, scattered, broken, and overcast) for 6 stations in the Alaska Region, 0000 UTC cycle.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Percent Correct	Skill Score
12	LOCAL	0.80	0.97	1.35	0.98	57.1	0.346
	LFM MOS	0.77	1.07	0.99	1.06	57.0	0.326
	No. Obs.	193	153	155	549		
18	LOCAL	0.77	1.17	1.16	0.96	53.2	0.294
	LFM MOS	0.87	0.92	1.00	1.06	54.7	0.299
	No. Obs.	162	143	205	533		
24	LOCAL	0.59	0.97	1.35	0.97	50.1	0.266
	LFM MOS	0.99	0.70	1.05	1.09	54.6	0.319
	No. Obs.	135	194	220	496		

Table 4.12. Same as Table 4.11 except for the 1200 UTC cycle.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Percent Correct	Skill Score
12	LOCAL	0.98	0.79	1.32	0.95	55.7	0.354
	LFM MOS	1.18	0.75	1.02	1.04	53.5	0.313
	No. Obs.	135	199	222	498		
18	LOCAL	0.56	0.93	1.49	1.00	48.7	0.250
	LFM MOS	0.90	1.05	1.00	1.02	49.9	0.266
	No. Obs.	192	170	201	499		
24	LOCAL	0.51	0.98	1.64	1.00	50.1	0.239
	LFM MOS	0.83	0.96	0.97	1.08	52.8	0.259
	No. Obs.	197	156	157	555		

Table 5.1. Verification of NGM MOS surface wind forecasts for 95 stations in the conterminous U.S., 0000 UTC 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 (kt)	Mean Alg. Error (kt)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 kt)	1 No. Obs	2 No. Obs	3 No. Obs	4 No. Obs	5 No. Obs	6 No. Obs
12	NGM	24	0.521	3048	3.6	2.5	3078	0.352	91.9	0.18	0.98 15506	1.25 820	1.34 128	1.69 13	0.83 6	* 0
18	NGM	26	0.443	6951	3.1	1.5	6973	0.421	80.2	0.18	0.97 13374	1.09 2516	1.19 579	1.05 113	1.13 15	0.60 5
24	NGM	29	0.446	6694	3.5	2.0	6722	0.358	80.0	0.12	0.96 13685	1.21 2044	1.11 566	1.38 101	0.71 17	1.25 4

Table 5.2. Same as Table 5.1 except for 94 stations for the 1200 UTC 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 (kt)	Mean Alg. Error (kt)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 kt)	1 No. Obs	2 No. Obs	3 No. Obs	4 No. Obs	5 No. Obs	6 No. Obs
12	NGM	27	0.450	6665	3.3	1.9	6688	0.393	81.1	0.11	0.96 13725	1.21 2054	1.03 564	1.56 102	1.53 17	0.50 4
18	NGM	27	0.474	3546	3.9	2.7	3585	0.327	90.1	0.00	0.98 15403	1.35 935	1.21 159	0.68 34	0.17 6	* 0
24	NGM	26	0.484	3051	3.8	2.5	3085	0.322	91.6	0.22	0.99 15550	1.22 825	1.26 129	1.29 14	0.33 6	* 0

* This category was forecast but was not observed.

Table 5.3. Verification of NGM MOS surface wind forecasts for 24 stations in the Eastern Region, 0000 UTC 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 (kt)	Mean Alg. Error (kt)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 kt)	1 No. Obs	2 No. Obs	3 No. Obs	4 No. Obs	5 No. Obs	6 No. Obs
12	NGM	23	0.471	995	3.2	2.2	1003	0.357	90.9	0.00	0.98 3992	1.31 255	2.35 17	0.33 3	0.00 1	** 0
18	NGM	26	0.409	2165	3.1	1.7	2172	0.397	76.8	0.00	0.94 3348	1.16 772	1.67 131	1.22 18	1.00 1	** 0
24	NGM	28	0.399	1386	3.7	2.8	1391	0.263	84.2	0.00	0.94 3879	1.68 322	1.57 49	2.00 6	0.00 2	** 0

Table 5.4. Same as Table 5.3 except for the 1200 UTC 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 (kt)	Mean Alg. Error (kt)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 kt)	1 No. Obs	2 No. Obs	3 No. Obs	4 No. Obs	5 No. Obs	6 No. Obs
12	NGM	27	0.405	1370	3.4	2.5	1373	0.341	86.3	0.00	0.94 3886	1.60 324	1.45 51	0.57 7	0.00 2	** 0
18	NGM	27	0.410	892	3.9	3.0	906	0.295	91.4	0.00	0.96 4084	1.83 174	2.19 16	0.40 5	0.00 1	** 0
24	NGM	24	0.483	971	3.5	2.4	980	0.323	90.2	0.00	0.97 4003	1.36 256	2.18 17	0.33 3	0.00 1	** 0

** This category was neither forecast nor observed.

Table 5.5. Verification of NGM MOS surface wind forecasts for 25 stations in the Southern Region, 0000 UTC 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 (kt)	Mean Alg. Error (kt)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 kt)	1 No. Obs	2 No. Obs	3 No. Obs	4 No. Obs	5 No. Obs	6 No. Obs
12	NGM	26	0.519	439	3.6	2.0	443	0.331	95.2	0.00	1.01 3968	0.99 129	0.40 30	0.17 6	* 0	** 0
18	NGM	25	0.445	1477	3.2	1.5	1484	0.390	83.8	0.20	0.99 3626	1.12 475	0.95 123	0.74 19	1.00 2	1.00 1
24	NGM	28	0.417	1373	3.5	2.0	1384	0.385	85.5	0.29	0.98 3605	1.17 405	1.01 88	1.07 15	0.67 3	0.33 3

Table 5.6. Same as Table 5.5 except for 24 stations for the 1200 UTC 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 (kt)	Mean Alg. Error (kt)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 kt)	1 No. Obs	2 No. Obs	3 No. Obs	4 No. Obs	5 No. Obs	6 No. Obs
12	NGM	27	0.428	1286	3.3	1.7	1296	0.418	86.8	0.14	1.00 3605	1.05 407	0.96 89	1.07 14	0.67 3	0.00 3
18	NGM	28	0.470	641	4.0	2.3	646	0.322	92.1	0.00	1.00 3884	1.13 204	0.49 39	0.15 13	0.00 3	** 0
24	NGM	30	0.452	440	3.8	1.9	443	0.267	94.9	**	1.01 3967	0.86 131	0.40 30	0.14 7	** 0	** 0

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

Table 5.7. Verification of NGM MOS surface wind forecasts for 28 stations in the Central Region, 0000 UTC 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 (kt)	Mean Alg. Error (kt)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 kt)	1 No. Obs	2 No. Obs	3 No. Obs	4 No. Obs	5 No. Obs	6 No. Obs
12	NGM	21	0.574	1202	3.6	2.7	1211	0.361	88.8	0.25	0.97 4561	1.31 333	1.49 59	5.33 3	1.00 4	* 0
18	NGM	24	0.490	2504	2.9	1.2	2508	0.435	75.8	0.22	0.97 3657	1.04 989	1.20 246	1.11 64	1.09 11	0.67 3
24	NGM	30	0.445	2337	3.5	1.9	2346	0.362	75.9	0.08	0.95 3898	1.19 768	1.26 223	1.00 43	1.50 4	* 0

Table 5.8. Same as Table 5.7 except for the 1200 UTC 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 (kt)	Mean Alg. Error (kt)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 kt)	1 No. Obs	2 No. Obs	3 No. Obs	4 No. Obs	5 No. Obs	6 No. Obs
12	NGM	27	0.476	2339	3.3	1.8	2345	0.390	77.2	0.05	0.95 3916	1.19 767	1.13 219	1.19 43	3.50 4	* 0
18	NGM	26	0.480	1333	3.8	2.5	1344	0.350	87.5	0.00	0.97 4518	1.30 373	1.21 77	0.69 13	0.50 2	* 0
24	NGM	24	0.505	1212	3.9	2.8	1228	0.341	88.7	0.29	0.97 4579	1.28 329	1.53 59	4.67 3	0.50 4	* 0

* This category was forecast but was not observed.

Table 5.9. Verification of NGM MOS surface wind forecasts for 18 stations in the Western Region, 0000 UTC 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 (kt)	Mean Alg. Error (kt)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 kt)	1 No. Obs	2 No. Obs	3 No. Obs	4 No. Obs	5 No. Obs	6 No. Obs
12	NGM	31	0.435	412	4.2	3.1	421	0.302	93.8	0.00	0.99 2985	1.22 103	1.45 22	4.00 1	0.00 1	** 0
18	NGM	36	0.302	805	3.6	1.7	809	0.398	87.3	0.00	1.01 2743	1.01 280	0.76 79	1.00 12	2.00 1	0.00 1
24	NGM	28	0.397	1598	3.2	1.4	1601	0.359	73.5	0.08	1.00 2303	1.00 549	0.87 206	1.84 37	0.50 8	0.00 1

Table 5.10. Same as Table 5.9 except for the 1200 UTC 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 (kt)	Mean Alg. Error (kt)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 kt)	1 No. Obs	2 No. Obs	3 No. Obs	4 No. Obs	5 No. Obs	6 No. Obs
12	NGM	29	0.366	1670	3.2	1.7	1674	0.372	72.8	0.19	0.96 2318	1.13 556	0.84 205	2.34 38	1.25 8	0.00 1
18	NGM	27	0.450	680	3.9	3.0	689	0.308	89.7	**	0.98 2917	1.25 184	1.67 27	3.33 3	** 0	** 0
24	NGM	32	0.408	428	4.0	2.7	434	0.279	93.7	0.00	0.99 3001	1.17 109	1.04 23	2.00 1	0.00 1	** 0

** This category was neither forecast nor observed.

Table 5.11. Verification of LFM MOS surface wind forecasts for 6 stations in the Alaska Region, 0000 UTC 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 (kt)	Mean Alg. Error (kt)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 kt)	1 No. Obs	2 No. Obs	3 No. Obs	4 No. Obs	5 No. Obs	6 No. Obs
12	LFM	25	0.473	204	4.2	2.7	205	0.321	89.9	0.00	0.98 979	1.33 58	1.36 11	3.00 1	0.00 2	** 0
18	LFM	34	0.354	287	4.3	2.7	289	0.292	83.7	0.00	0.98 923	1.13 99	1.37 19	1.00 6	1.00 1	** 0
24	LFM	43	0.287	479	4.5	3.1	481	0.233	73.5	0.00	0.89 881	1.64 123	1.29 38	1.14 7	* 0	** 0

Table 5.12. Same as Table 5.11 except for the 1200 UTC 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 (kt)	Mean Alg. Error (kt)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 kt)	1 No. Obs	2 No. Obs	3 No. Obs	4 No. Obs	5 No. Obs	6 No. Obs
12	LFM	37	0.343	429	3.8	2.3	430	0.305	78.4	0.00	0.95 898	1.33 129	0.94 36	1.00 7	* 0	** 0
18	LFM	33	0.374	290	4.0	2.8	294	0.267	85.3	0.00	0.99 955	0.92 93	1.81 16	2.33 3	0.00 1	** 0
24	LFM	29	0.441	218	4.8	3.3	222	0.289	89.0	0.00	0.97 1000	1.56 57	1.00 12	5.00 1	0.00 2	** 0

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

Table 5.13. Verification of local surface wind forecasts for 92 stations in the conterminous U.S. for the FT release time of approximately 0900 UTC.

		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 (kt)	Mean Alg. Error (kt)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 kt)	1 No. Obs	2 No. Obs	3 No. Obs	4 No. Obs	5 No. Obs	6 No. Obs
3	LOCAL	27	0.491	3829	3.6	2.6	3893	0.363	93.3	0.00	0.99 15290	1.28 675	0.92 119	0.24 21	* 0	** 0
9	LOCAL	33	0.383	8725	3.3	1.7	8788	0.375	80.2	0.00	0.99 13115	1.17 2321	0.70 528	0.30 102	0.08 12	0.00 1
15	LOCAL	35	0.369	9701	3.4	1.9	9770	0.326	76.7	0.05	0.97 12924	1.26 2395	0.79 632	0.41 120	0.18 17	0.00 1

Table 5.14. Same as Table 5.13 except for 93 stations for the FT release time of approximately 1800 UTC.

		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 (kt)	Mean Alg. Error (kt)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 kt)	1 No. Obs	2 No. Obs	3 No. Obs	4 No. Obs	5 No. Obs	6 No. Obs
3	LOCAL	31	0.407	10052	3.0	1.2	10097	0.407	77.9	0.06	1.00 12498	1.10 2843	0.77 721	0.35 149	0.42 24	0.50 2
9	LOCAL	39	0.324	6317	4.3	3.3	6480	0.267	86.0	0.00	0.95 14826	1.69 1067	0.89 227	0.58 33	0.50 8	0.00 2
15	LOCAL	37	0.333	4393	4.3	3.4	4586	0.268	91.0	0.00	0.98 15270	1.48 750	0.79 110	0.38 26	0.67 3	** 0

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

Table 5.15. Verification of local surface wind forecasts for 24 stations in the Eastern Region for the FT release time of approximately 0900 UTC.

		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 (kt)	Mean Alg. Error (kt)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 kt)	1 No. Obs	2 No. Obs	3 No. Obs	4 No. Obs	5 No. Obs	6 No. Obs
3	LOCAL	23	0.529	1056	3.5	2.7	1084	0.364	93.9	**	0.99 4098	1.20 181	0.89 18	0.50 2	** 0	** 0
9	LOCAL	30	0.389	2631	3.1	1.5	2644	0.343	78.5	0.00	1.01 3433	1.08 731	0.50 111	0.19 21	0.00 2	** 0
15	LOCAL	35	0.339	2514	3.7	2.5	2536	0.290	79.4	0.00	0.93 3689	1.57 516	0.57 75	0.11 19	0.00 2	** 0

Table 5.16. Same as Table 5.15 except for the FT release time of approximately 1800 UTC.

		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 (kt)	Mean Alg. Error (kt)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 kt)	1 No. Obs	2 No. Obs	3 No. Obs	4 No. Obs	5 No. Obs	6 No. Obs
3	LOCAL	29	0.408	2692	2.8	1.0	2704	0.356	76.7	0.00	1.03 3294	0.99 845	0.57 152	0.24 21	2.00 1	** 0
9	LOCAL	38	0.281	1681	4.5	3.8	1747	0.210	87.0	0.00	0.94 4058	2.15 219	1.23 30	1.00 3	* 0	0.00 1
15	LOCAL	38	0.289	1248	4.6	4.0	1322	0.208	90.8	0.00	0.95 4135	2.08 159	3.25 8	1.00 2	0.00 1	** 0

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

Table 5.17. Verification of local surface wind forecasts for 22 stations in the Southern Region for the FT release time of approximately 0900 UTC.

		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 (kt)	Mean Alg. Error (kt)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 kt)	1 No. Obs	2 No. Obs	3 No. Obs	4 No. Obs	5 No. Obs	6 No. Obs
3	LOCAL	27	0.466	630	3.8	2.8	639	0.363	95.1	0.00	0.99 3721	1.39 104	0.85 27	0.25 4	* 0	** 0
9	LOCAL	31	0.379	1743	3.2	1.9	1754	0.405	85.8	0.00	0.98 3367	1.34 369	0.60 94	0.33 12	0.00 3	** 0
15	LOCAL	35	0.320	1985	3.5	2.3	2007	0.340	82.9	0.00	0.96 3360	1.53 372	0.61 107	0.62 13	** 0	0.00 1

Table 5.18. Same as Table 5.17 except for 23 stations for the FT release time of approximately 1800 UTC.

		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 (kt)	Mean Alg. Error (kt)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 kt)	1 No. Obs	2 No. Obs	3 No. Obs	4 No. Obs	5 No. Obs	6 No. Obs
3	LOCAL	31	0.392	2137	3.0	1.8	2158	0.394	83.3	0.20	0.98 3336	1.26 454	0.74 111	0.39 18	0.25 4	* 0
9	LOCAL	35	0.297	1181	4.2	3.4	1209	0.304	91.0	0.00	0.97 3657	1.87 162	0.59 37	0.00 5	2.00 1	** 0
15	LOCAL	35	0.350	762	4.5	3.4	802	0.264	93.9	0.00	0.99 3708	1.37 123	0.41 22	0.00 8	0.00 1	** 0

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

Table 5.19. Verification of local surface wind forecasts for 28 stations in the Central Region for the FT release time of approximately 0900 UTC.

		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 (kt)	Mean Alg. Error (kt)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 kt)	1 No. Obs	2 No. Obs	3 No. Obs	4 No. Obs	5 No. Obs	6 No. Obs
3	LOCAL	27	0.490	1539	3.5	2.4	1556	0.371	90.0	**	0.97 4509	1.45 289	1.04 54	0.23 13	** 0	** 0
9	LOCAL	32	0.404	3053	3.3	1.5	3072	0.362	73.7	0.00	0.95 3667	1.30 899	0.81 236	0.31 55	0.17 6	0.00 1
15	LOCAL	35	0.383	3253	3.4	1.6	3269	0.322	70.7	0.10	0.94 3611	1.32 935	0.89 253	0.41 56	0.38 8	** 0

Table 5.20. Same as Table 5.19 except for the FT release time of approximately 1800 UTC.

		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 (kt)	Mean Alg. Error (kt)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 kt)	1 No. Obs	2 No. Obs	3 No. Obs	4 No. Obs	5 No. Obs	6 No. Obs
3	LOCAL	29	0.425	3327	2.9	0.9	3329	0.418	73.3	0.04	0.97 3433	1.19 1085	0.84 273	0.31 74	0.35 17	0.00 2
9	LOCAL	39	0.335	2184	4.2	3.2	2233	0.290	82.8	0.00	0.92 4378	1.92 387	0.84 93	0.50 16	0.25 4	** 0
15	LOCAL	35	0.355	1750	4.1	3.1	1801	0.305	87.6	0.00	0.97 4479	1.49 332	0.78 58	0.33 12	* 0	** 0

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

Table 5.21. Verification of local surface wind forecasts for 18 stations in the Western Region for the FT release time of approximately 0900 UTC.

		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 (kt)	Mean Alg. Error (kt)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 kt)	1 No. Obs	2 No. Obs	3 No. Obs	4 No. Obs	5 No. Obs	6 No. Obs
3	LOCAL	34	0.393	604	3.7	2.6	614	0.298	95.2	**	1.01 2962	0.81 101	0.70 20	0.00 2	** 0	** 0
9	LOCAL	45	0.259	1298	3.8	2.2	1318	0.364	85.8	0.00	1.03 2648	0.80 322	0.82 87	0.43 14	0.00 1	** 0
15	LOCAL	33	0.336	1949	3.2	1.1	1958	0.325	74.6	0.00	1.09 2264	0.72 572	0.84 197	0.50 32	0.00 7	** 0

Table 5.22. Same as Table 5.21 except for the FT release time of approximately 1800 UTC.

		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 (kt)	Mean Alg. Error (kt)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 kt)	1 No. Obs	2 No. Obs	3 No. Obs	4 No. Obs	5 No. Obs	6 No. Obs
3	LOCAL	36	0.326	1896	3.2	1.5	1906	0.424	80.0	0.00	1.03 2435	0.93 459	0.85 185	0.47 36	0.50 2	** 0
9	LOCAL	42	0.295	1271	4.1	2.8	1291	0.245	83.8	0.00	1.01 2733	0.98 299	0.96 67	0.89 9	0.00 3	0.00 1
15	LOCAL	46	0.253	633	4.2	3.1	661	0.239	93.3	0.00	1.01 2948	0.82 136	0.32 22	1.00 4	0.00 1	** 0

** This category was neither forecast nor observed.

Table 5.23. Verification of local surface wind forecasts for 6 stations in the Alaska Region for the FT release time of approximately 0900 UTC.

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 (kt)	Mean Alg. Error (kt)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 kt)	1 No. Obs	2 No. Obs	3 No. Obs	4 No. Obs	5 No. Obs	6 No. Obs
3	LOCAL	24	0.479	317	3.0	2.3	320	0.592	94.9	0.50	1.00 978	0.95 57	0.92 12	2.00 1	0.00 2	* 0
9	LOCAL	38	0.354	337	3.5	1.4	339	0.298	87.7	0.00	1.05 919	0.64 97	0.47 19	0.50 6	0.00 1	** 0
15	LOCAL	43	0.258	402	3.4	1.1	404	0.242	81.8	**	1.07 876	0.80 124	0.24 38	0.57 7	** 0	** 0

Table 5.24. Same as Table 5.23 except for the FT release time of approximately 1800 UTC.

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 (kt)	Mean Alg. Error (kt)	No. of Cases	Skill Score	Percent Fcst. Correct	Threat Score (>27 kt)	1 No. Obs	2 No. Obs	3 No. Obs	4 No. Obs	5 No. Obs	6 No. Obs
3	LOCAL	40	0.319	500	3.3	1.6	501	0.338	82.6	0.00	1.02 887	0.98 124	0.53 36	0.86 7	* 0	** 0
9	LOCAL	45	0.294	492	4.6	3.5	515	0.233	83.5	0.00	0.98 944	1.19 96	1.19 16	1.67 3	0.00 1	** 0
15	LOCAL	54	0.208	471	5.5	4.8	508	0.193	84.9	0.00	0.93 992	2.07 57	1.77 13	2.00 1	0.00 2	** 0

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

Table 5.25. Comparative verification of local and LFM MOS 42-h significant wind forecasts for 6 stations in the Alaska Region, 0000 UTC cycle.

Type of Verifying Observation	Type of Forecast	Bias by Category		Skill Score	Percent Forecast Correct	Threat Score ≥22 kt
		< 22 kt	≥ 22 kt			
1-min Avg	LOCAL	1.00	0.56	0.000	98.6	0.00
	LFM MOS	1.00	1.22	0.091	98.3	0.05
	No. Obs.	1022	9			
± 3-h Max	LOCAL	1.02	0.22	0.000	97.3	0.00
	LFM MOS	1.01	0.48	0.224	97.5	0.13
	No. Obs.	1007	23			

Table 5.26. Same as Table 5.25 except for the 1200 UTC cycle.

Type of Verifying Observation	Type of Forecast	Bias by Category		Skill Score	Percent Forecast Correct	Threat Score ≥22 kt
		< 22 kt	≥ 22 kt			
1-min Avg	LOCAL	0.99	2.17	0.000	98.2	0.00
	LFM MOS	1.00	1.50	0.127	98.8	0.07
	No. Obs.	1043	6			
± 3-h Max	LOCAL	1.00	0.87	0.059	97.5	0.04
	LFM MOS	1.01	0.60	0.073	97.9	0.04
	No. Obs.	1033	15			

Table 6.1. Comparative verification of NGM MOS and persistence ceiling height forecasts for 94 stations in the conterminous U.S., 0000 UTC cycle.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Log Score	Percent Correct	Skill Score
12	MOS	0.92	0.92	1.17	0.99	2.227	82.0	0.384
	PERSISTENCE	0.81	0.76	0.86	1.03	1.596	87.1	0.510
	No. Obs.	457	634	1315	12549			
15	MOS	0.93	0.98	1.12	0.98	1.651	82.5	0.428
	PERSISTENCE	1.86	0.88	0.60	1.05	1.879	83.0	0.365
	No. Obs.	171	464	1528	10516			
18	MOS	1.22	1.08	1.18	0.98	1.194	85.1	0.374
	PERSISTENCE	4.64	1.81	0.75	0.99	1.827	83.4	0.281
	No. Obs.	78	265	1501	13063			
24	MOS	1.34	0.98	1.09	0.99	0.760	91.7	0.323
	PERSISTENCE	5.04	2.43	1.68	0.93	1.807	84.9	0.157
	No. Obs.	70	191	642	13741			

Table 6.2. Same as Table 6.1 except for the 1200 UTC cycle.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Log Score	Percent Correct	Skill Score
12	MOS	1.07	1.01	1.11	0.99	0.724	91.9	0.339
	PERSISTENCE	0.81	0.97	1.36	0.98	0.569	93.2	0.481
	No. Obs.	75	187	647	13800			
15	MOS	1.06	1.00	0.86	1.01	0.857	91.9	0.351
	PERSISTENCE	0.52	0.81	1.30	0.99	0.784	91.7	0.384
	No. Obs.	106	194	576	11938			
18	MOS	0.97	0.85	0.92	1.01	1.259	88.8	0.334
	PERSISTENCE	0.30	0.54	1.03	1.02	1.161	88.8	0.291
	No. Obs.	200	340	853	13452			
24	MOS	0.76	0.88	1.04	1.01	2.361	81.6	0.333
	PERSISTENCE	0.13	0.29	0.68	1.10	2.175	81.9	0.169
	No. Obs.	458	619	1303	12497			

Table 6.3. Comparative verification of LFM MOS and persistence ceiling height forecasts for 6 stations in the Alaska Region, 0000 UTC cycle.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Log Score	Percent Correct	Skill Score
12	MOS	0.43	1.04	1.68	0.92	2.963	72.9	0.334
	PERSISTENCE	0.70	0.79	0.99	1.03	1.780	85.3	0.580
	No. Obs.	44	56	125	810			
18	MOS	0.40	1.14	1.65	0.87	3.398	66.1	0.310
	PERSISTENCE	0.78	0.65	0.71	1.11	2.961	74.0	0.334
	No. Obs.	40	69	174	747			
24	MOS	0.17	1.23	1.83	0.82	2.130	72.2	0.366
	PERSISTENCE	4.83	0.94	0.74	1.03	2.495	75.5	0.281
	No. Obs.	6	48	166	815			

Table 6.4. Same as Table 6.3 except for the 1200 UTC cycle.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Log Score	Percent Correct	Skill Score
12	MOS	1.20	1.47	1.44	0.88	2.043	75.2	0.402
	PERSISTENCE	2.60	1.26	1.15	0.94	1.403	82.9	0.552
	No. Obs.	5	47	171	823			
18	MOS	0.30	1.47	1.99	0.86	2.236	74.6	0.336
	PERSISTENCE	0.57	1.55	1.63	0.90	2.279	75.4	0.316
	No. Obs.	23	38	119	864			
24	MOS	1.52	1.27	1.92	0.81	4.107	66.0	0.281
	PERSISTENCE	0.31	1.04	1.47	0.96	3.064	70.6	0.249
	No. Obs.	42	56	132	816			

Table 6.5. Comparative verification of local and persistence ceiling height forecasts for 92 stations in the conterminous U.S. for the FT release time of approximately 0900 UTC.

Projection (h)	Type of Forecast	Bias by Category				Log Score	Percent Correct	Skill Score
		1	2	3	4			
03	LOCAL	0.67	0.86	1.02	1.02	1.615	86.9	0.480
	PERSISTENCE	0.66	0.74	0.83	1.04	1.445	88.4	0.509
	No. Obs.	467	616	1281	13739			
06	LOCAL	0.32	0.53	0.93	1.05	1.582	84.0	0.378
	PERSISTENCE	1.08	0.68	0.63	1.06	1.761	84.4	0.378
	No. Obs.	283	664	1687	13433			
09	LOCAL	0.22	0.38	0.76	1.05	1.036	86.7	0.339
	PERSISTENCE	3.26	1.61	0.61	1.02	1.670	83.8	0.271
	No. Obs.	94	282	1734	13961			
15	LOCAL	0.25	0.50	1.43	0.99	0.672	91.7	0.322
	PERSISTENCE	4.25	2.69	1.48	0.94	1.612	86.0	0.141
	No. Obs.	72	169	716	15111			

Table 6.6. Same as Table 6.5 except for 93 stations for the FT release time of approximately 1800 UTC.

Projection (h)	Type of Forecast	Bias by Category				Log Score	Percent Correct	Skill Score
		1	2	3	4			
03	LOCAL	0.60	0.85	1.37	0.98	0.694	90.7	0.428
	PERSISTENCE	1.48	1.58	1.72	0.94	0.818	89.2	0.437
	No. Obs.	62	182	1020	14963			
06	LOCAL	0.41	0.64	1.71	0.97	0.685	91.3	0.368
	PERSISTENCE	1.24	1.71	2.41	0.92	1.032	87.3	0.288
	No. Obs.	74	168	728	15190			
09	LOCAL	0.19	0.78	1.67	0.98	0.769	90.7	0.328
	PERSISTENCE	0.97	1.36	2.48	0.93	1.155	86.4	0.247
	No. Obs.	94	211	704	15134			
15	LOCAL	0.21	0.87	1.54	0.98	1.522	85.3	0.343
	PERSISTENCE	0.30	0.62	1.63	0.98	1.798	82.3	0.206
	No. Obs.	309	463	1072	14288			

Table 6.7. Comparative verification of local and persistence ceiling height forecasts for 6 stations in the Alaska region for the FT release time of approximately 0900 UTC.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Log Score	Percent Correct	Skill Score
03	LOCAL	0.71	0.82	1.21	0.99	1.938	83.5	0.556
	PERSISTENCE	0.67	0.79	0.98	1.04	1.788	85.1	0.575
	No. Obs.	42	57	128	810			
06	LOCAL	0.46	1.06	1.19	1.00	2.823	75.5	0.385
	PERSISTENCE	0.46	0.94	0.87	1.07	2.656	78.1	0.404
	No. Obs.	61	49	143	788			
09	LOCAL	0.33	0.70	1.11	1.04	2.705	74.7	0.391
	PERSISTENCE	0.67	0.68	0.72	1.11	2.935	74.1	0.332
	No. Obs.	42	66	173	749			
15	LOCAL	0.17	0.40	1.28	0.99	1.548	79.8	0.430
	PERSISTENCE	4.67	0.96	0.76	1.02	2.495	75.0	0.269
	No. Obs.	6	48	164	814			

Table 6.8. Same as Table 6.7 except for the FT release time of approximately 1800 UTC.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Log Score	Percent Correct	Skill Score
03	LOCAL	1.50	0.53	1.23	0.98	1.605	80.2	0.456
	PERSISTENCE	2.17	1.27	1.17	0.94	1.457	82.4	0.545
	No. Obs.	6	49	167	812			
06	LOCAL	0.67	0.60	1.58	0.94	1.860	78.5	0.366
	PERSISTENCE	1.08	1.48	1.53	0.90	2.001	78.5	0.413
	No. Obs.	12	42	129	856			
09	LOCAL	0.30	0.82	1.75	0.92	2.191	75.8	0.310
	PERSISTENCE	0.57	1.56	1.62	0.90	2.318	74.9	0.317
	No. Obs.	23	39	122	857			
15	LOCAL	0.23	0.66	1.64	0.96	3.010	70.8	0.257
	PERSISTENCE	0.30	1.09	1.47	0.95	3.131	70.0	0.246
	No. Obs.	44	56	134	810			

Table 7.1. Comparative verification of NGM MOS and persistence visibility forecasts for 94 stations in the conterminous U.S., 0000 UTC cycle.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Log Score	Percent Correct	Skill Score
12	MOS	1.16	1.39	1.34	0.92	2.331	77.3	0.379
	PERSISTENCE	0.62	0.44	0.75	1.08	1.459	85.1	0.452
	No. Obs.	303	819	1912	13319			
15	MOS	0.90	1.15	1.48	0.96	1.204	85.7	0.346
	PERSISTENCE	2.88	1.01	1.21	0.97	1.424	85.7	0.310
	No. Obs.	59	326	1016	12368			
18	MOS	0.76	1.26	1.52	0.97	0.804	90.4	0.291
	PERSISTENCE	5.05	1.70	2.03	0.93	1.400	86.0	0.180
	No. Obs.	37	213	722	15445			
24	MOS	1.38	1.16	1.34	0.98	0.764	91.3	0.287
	PERSISTENCE	5.03	1.68	2.18	0.93	1.396	86.0	0.164
	No. Obs.	37	213	666	15419			

Table 7.2. Same as Table 7.1 except for the 1200 UTC cycle.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Log Score	Percent Correct	Skill Score
12	MOS	0.85	1.21	1.34	0.98	0.725	91.4	0.289
	PERSISTENCE	0.85	0.89	0.90	1.01	0.502	94.5	0.452
	No. Obs.	40	207	659	15374			
15	MOS	1.06	1.23	1.17	0.99	0.733	91.1	0.308
	PERSISTENCE	0.91	1.18	0.80	1.01	0.627	93.0	0.366
	No. Obs.	35	142	695	13111			
18	MOS	0.83	1.27	1.26	0.98	1.008	88.5	0.323
	PERSISTENCE	0.37	0.80	0.60	1.03	0.877	90.8	0.268
	No. Obs.	93	230	1015	15011			
24	MOS	0.92	1.29	1.39	0.93	2.336	77.1	0.368
	PERSISTENCE	0.11	0.23	0.32	1.17	2.118	80.3	0.111
	No. Obs.	302	813	1914	13263			

Table 7.3. Comparative verification of LFM MOS and persistence visibility forecasts for 6 stations in the Alaska Region, 0000 UTC cycle.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Log Score	Percent Correct	Skill Score
12	MOS	0.15	0.62	1.63	1.01	2.007	83.8	0.269
	PERSISTENCE	0.24	0.92	0.82	1.04	1.522	89.2	0.452
	No. Obs.	33	39	57	909			
18	MOS	0.06	0.62	1.72	0.99	1.662	83.9	0.199
	PERSISTENCE	0.47	0.92	0.89	1.02	1.784	85.4	0.190
	No. Obs.	17	39	53	925			
24	MOS	**	0.56	2.66	0.96	0.950	88.6	0.215
	PERSISTENCE	*	1.33	1.47	0.97	1.345	87.9	0.122
	No. Obs.	0	27	32	978			

Table 7.4. Same as Table 7.3 except for the 1200 UTC cycle.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Log Score	Percent Correct	Skill Score
12	MOS	**	0.68	2.03	0.98	0.831	90.6	0.246
	PERSISTENCE	*	1.04	1.43	0.98	0.575	94.4	0.531
	No. Obs.	0	28	30	990			
18	MOS	0.00	0.73	1.95	0.97	1.172	87.5	0.231
	PERSISTENCE	0.50	0.88	1.05	1.00	1.031	90.4	0.298
	No. Obs.	4	33	41	970			
24	MOS	0.58	1.13	2.29	0.93	2.613	78.4	0.223
	PERSISTENCE	0.06	0.74	0.74	1.06	2.086	84.8	0.164
	No. Obs.	33	39	58	921			

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

Table 7.5. Comparative verification of local and persistence visibility forecasts for 92 stations in the conterminous U.S. for the FT release time of approximately 0900 UTC.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Log Score	Percent Correct	Skill Score
03	LOCAL	0.55	0.49	1.17	1.01	1.635	82.8	0.434
	PERSISTENCE	0.51	0.44	0.72	1.08	1.420	85.7	0.461
	No. Obs.	314	704	1911	13171			
06	LOCAL	0.25	0.30	0.96	1.04	1.275	85.2	0.308
	PERSISTENCE	1.39	0.62	0.89	1.02	1.425	85.3	0.342
	No. Obs.	114	502	1530	13919			
09	LOCAL	0.11	0.20	0.89	1.02	0.650	92.0	0.236
	PERSISTENCE	4.18	1.39	1.79	0.95	1.300	86.7	0.203
	No. Obs.	38	225	761	15043			
15	LOCAL	0.14	0.22	0.75	1.02	0.572	93.1	0.201
	PERSISTENCE	4.42	1.62	2.06	0.94	1.347	86.2	0.137
	No. Obs.	36	193	664	15173			

Table 7.6. Same as Table 7.5 except for 93 stations for the FT release time of approximately 1800 UTC.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Log Score	Percent Correct	Skill Score
03	LOCAL	0.56	0.38	1.07	1.01	0.506	93.7	0.365
	PERSISTENCE	1.44	1.11	1.19	0.99	0.537	93.9	0.459
	No. Obs.	25	204	652	15340			
06	LOCAL	0.33	0.31	0.95	1.01	0.564	93.3	0.292
	PERSISTENCE	0.92	1.18	1.16	0.99	0.688	92.4	0.332
	No. Obs.	39	194	666	15255			
09	LOCAL	0.35	0.41	1.06	1.01	0.612	92.1	0.279
	PERSISTENCE	1.16	1.27	1.02	1.00	0.750	91.5	0.282
	No. Obs.	31	180	761	15171			
15	LOCAL	0.22	0.67	1.27	0.99	1.304	85.0	0.301
	PERSISTENCE	0.22	0.72	0.56	1.06	1.306	86.7	0.205
	No. Obs.	166	316	1373	14275			

Table 7.7. Comparative verification of local and persistence visibility forecasts for 6 stations in the Alaska Region for the FT release time of approximately 0900 UTC.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Log Score	Percent Correct	Skill Score
	LOCAL	0.47	0.69	1.29	1.01	1.617	87.4	0.413
03	PERSISTENCE	0.25	0.87	0.84	1.04	1.522	89.2	0.443
	No. Obs.	32	39	56	907			
	LOCAL	0.48	0.69	1.31	1.01	2.029	83.1	0.235
06	PERSISTENCE	0.28	0.87	0.79	1.04	1.887	85.4	0.253
	No. Obs.	29	39	61	909			
	LOCAL	0.24	0.53	1.29	1.02	1.663	85.3	0.185
09	PERSISTENCE	0.47	0.83	0.94	1.02	1.761	85.6	0.195
	No. Obs.	17	40	51	919			
	LOCAL	**	0.19	1.47	1.01	0.672	92.3	0.251
15	PERSISTENCE	*	1.27	1.50	0.97	1.302	88.2	0.126
	No. Obs.	0	26	32	972			

Table 7.8. Same as Table 7.7 except for the FT release time of approximately 1800 UTC.

Projection (h)	Type of Forecast	Bias by Category 1	2	3	4	Log Score	Percent Correct	Skill Score
	LOCAL	*	0.36	1.61	1.00	0.741	91.6	0.257
03	PERSISTENCE	*	1.04	1.35	0.99	0.585	94.3	0.531
	No. Obs.	0	28	31	971			
	LOCAL	0.50	0.41	1.37	1.00	0.780	91.2	0.270
06	PERSISTENCE	1.00	1.07	1.11	0.99	0.846	91.3	0.323
	No. Obs.	2	27	38	967			
	LOCAL	0.00	0.24	1.51	1.01	0.956	89.6	0.204
09	PERSISTENCE	0.50	0.88	1.08	1.00	1.035	90.4	0.292
	No. Obs.	4	33	39	962			
	LOCAL	0.09	0.38	1.07	1.05	2.053	84.0	0.163
15	PERSISTENCE	0.06	0.74	0.68	1.06	2.091	84.6	0.160
	No. Obs.	32	39	60	909			

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