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

TDL Office Note 75-7

COMPARATIVE VERIFICATION OF LOCAL AND GUIDANCE CLOUD AMOUNT FORECASTS--NO. 1

Gary M. Carter

October 1975

COMPARATIVE VERIFICATION OF LOCAL AND GUIDANCE CLOUD AMOUNT FORECASTS--NO. 1

Gary M. Carter

We have computed comparative verification scores for TDL's automated guidance and National Weather Service (NWS) local forecasts of cloud amount during December 1974 through March 1975. Our guidance forecasts were based on the cool season (October-March) regression equations described in NWS Technical Procedures Bulletin No. 124 (NWS, 1974a). The Technical Procedures Branch of the Office of Meteorology and Oceanography furnished us with the local forecasts. We conducted this verification study in conjunction with the NWS combined aviation/public weather verification system (NWS, 1973). Table 1 shows the 88 stations we used.

We transformed the local forecasts prepared at Weather Service Forecast Offices (WSFO's) into categories of clear (1), scattered (2), broken (3), and overcast (4) in the manner shown below.

Category Number	Cloud Amount (tenths)
1	0-1
2	2-5
3	6-9
4	10

We used these transformed subjective forecasts and the objective best category estimates (NWS, 1974b) to prepare four-category, forecast-observed contingency tables. Percent correct, skill score, bias by category (i.e., the number of forecasts in a particular category divided by the number of observations in that category) were computed from these tables.

Tables 2-6 show the comparative verification scores for December 1974 through March 1975 for three different projections. These are 18, 30 and 42 hours for the guidance forecasts which were made from 0000 GMT data. However, the local forecasts were not released until 1000 GMT, so about 9 hours later data were available for their preparation.

Table 2 shows the verification statistics for all the stations combined. The percents correct and skill scores indicate that our guidance forecasts of cloud amount were better for the longer (30- and 42-hr) projections, while the two were about equal in skill for the shorter (18-hr) projection. The bias by category results show that the guidance tended to overforecast the occurrence of clear skies (category 1), while the local forecasts always overestimated scattered and broken conditions (categories 2 and 3).

Tables 3-6 show results for the NWS Eastern, Southern, Central, and Western Regions, respectively. These verification scores have the same general characteristics as those for all 88 stations combined, with the exception of those for the Western Region. Here, the guidance was more skillful than the local forecasts only at the 30-hr projection.

ACKNOWLEDGEMENT

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

REFERENCES

NWS, 1973: Combined aviation/public weather forecast verification. National Weather Service Operations Manual, Chapter C-73, 15 pp.

NWS, 1974a: Cloud amount forecasts based on Model Output Statistics (MOS). Technical Procedures Bulletin, No. 124, 9 pp.

NWS, 1974b: Cloud amount forecasts based on Model Output Statistics (MOS)--No. 2. Technical Procedures Bulletin, No. 125, 6 pp.

Table 1. Eighty-eight stations used in comparative verification of guidance and local cloud amount forecasts.

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

Table 2. Verification of subjective local and objective guidance forecasts of four categories of cloud amount (clear, scattered, broken, and overcast) at 88 stations across the United States during December 1974 through March 1975. Each category had at least 811 observations for the bias computations.

PROJECTION (HOURS)	TYPE OF FORECAST	BIAS - NO. FCST/NO. OBS				PERCENT CORRECT	SKILL SCORE	NO. OF CASES
		CAT 1	CAT 2	CAT 3	CAT 4			
18	GUIDANCE	1.28	0.88	0.88	0.96	51	0.31	8124
	LOCAL	0.66	1.44	1.35	0.83	50	0.32	
30	GUIDANCE	1.23	0.80	0.81	0.93	57	0.35	8048
	LOCAL	0.60	2.12	2.31	0.69	44	0.25	
42	GUIDANCE	1.31	0.86	0.80	0.98	47	0.26	8134
	LOCAL	0.47	1.78	1.54	0.68	39	0.19	

Table 3. Verification of subjective local and objective guidance forecasts of four categories of cloud amount (clear, scattered, broken, and overcast) at 20 stations in the Eastern Region of the NWS during December 1974 through March 1975. Each category had at least 135 observations for the bias computations.

PROJECTION (HOURS)	TYPE OF FORECAST	BIAS - NO. FCST/NO. OBS				PERCENT CORRECT	SKILL SCORE	NO. OF CASES
		CAT 1	CAT 2	CAT 3	CAT 4			
18	GUIDANCE	1.27	0.90	1.01	0.95	54	0.33	1846
	LOCAL	0.71	1.42	1.45	0.78	54	0.34	
30	GUIDANCE	1.16	0.97	1.08	0.91	61	0.39	1852
	LOCAL	0.59	2.24	3.29	0.65	46	0.26	
42	GUIDANCE	1.40	1.01	0.85	0.93	51	0.28	1854
	LOCAL	0.51	1.81	1.82	0.58	39	0.17	

Table 4. Verification of subjective local and objective guidance forecasts of four categories of cloud amount (clear, scattered, broken, and overcast) at 24 stations in the Southern Region of the NWS during December 1974 through March 1975. Each category had at least 229 observations for the bias computations.

PROJECTION (HOURS)	TYPE OF FORECAST	BIAS - NO. FCST/NO. OBS				PERCENT CORRECT	SKILL SCORE	NO. OF CASES
		CAT 1	CAT 2	CAT 3	CAT 4			
18	GUIDANCE	1.22	0.93	0.95	0.87	53	0.35	2166
	LOCAL	0.72	1.69	1.32	0.72	49	0.33	
30	GUIDANCE	1.18	0.75	0.77	0.94	58	0.36	2162
	LOCAL	0.68	2.17	1.91	0.71	46	0.27	
42	GUIDANCE	1.26	0.81	0.98	0.90	48	0.28	2169
	LOCAL	0.51	2.15	1.52	0.54	36	0.17	

Table 5. Verification of subjective local and objective guidance forecasts of four categories of cloud amount (clear, scattered, broken, and overcast) at 28 stations in the Central Region of the NWS during December 1974 through March 1975. Each category had at least 245 observations for the bias computations.

PROJECTION (HOURS)	TYPE OF FORECAST	BIAS - NO. FCST/NO. OBS				PERCENT CORRECT	SKILL SCORE	NO. OF CASES
		CAT 1	CAT 2	CAT 3	CAT 4			
18	GUIDANCE	1.44	0.83	0.82	0.94	48	0.27	2613
	LOCAL	0.44	1.47	1.42	0.87	48	0.29	
30	GUIDANCE	1.38	0.76	0.70	0.89	57	0.34	2532
	LOCAL	0.44	2.46	2.35	0.73	43	0.22	
42	GUIDANCE	1.39	0.80	0.72	1.03	45	0.23	2607
	LOCAL	0.20	1.66	1.49	0.87	40	0.18	

Table 6. Verification of subjective local and objective guidance forecasts of four categories of cloud amount (clear, scattered, broken, and overcast) at 16 stations in the Western Region of the NWS during December 1974 through March 1975. Each category had at least 202 observations for the bias computations.

PROJECTION (HOURS)	TYPE OF FORECAST	BIAS - NO. FCST/NO. OBS				PERCENT CORRECT	SKILL SCORE	NO. OF CASES
		CAT 1	CAT 2	CAT 3	CAT 4			
18	GUIDANCE	1.14	0.90	0.74	1.11	48	0.28	1499
	LOCAL	0.82	1.08	1.18	0.97	50	0.33	
30	GUIDANCE	1.17	0.77	0.80	1.02	51	0.30	1502
	LOCAL	0.69	1.56	2.04	0.65	42	0.23	
42	GUIDANCE	1.23	0.87	0.65	1.13	44	0.23	1504
	LOCAL	0.77	1.44	1.34	0.70	41	0.22	