

NAM-BASED MOS GUIDANCE - THE 0000/1200 UTC ALPHANUMERIC MESSAGES

by

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1. INTRODUCTION

This document describes the format and contents of the North American Mesoscale (NAM) MOS alphanumeric messages generated during the 0000 and 1200 UTC forecast cycles. These messages contain forecasts of the max/min temperature; time-specific surface temperature and dew point; total sky cover; surface wind direction and wind speed; probability of precipitation (PoP) for 6- and 12-h periods; categories of quantitative precipitation for 6- and 12-h periods; probability of thunderstorms and conditional probability of severe thunderstorms for 6- and 12-h periods; snowfall amount; and categories of ceiling height, visibility, and obstruction to vision. Guidance is provided for projections of 6 to 72 hours for most weather elements. Forecasts of conditional probability of precipitation type (freezing, snow, or liquid) and a corresponding category will be added at a later date. Note that a particular element line (see Sections 3 - 17) is not included in the message when all of the forecasts in that line are unavailable.

The contents of this document reflect changes made to the MOS guidance after the Eta model was replaced by the NAM Weather Research Forecast Non-hydrostatic Mesoscale Model (WRF-NMM). The Eta MOS message will be terminated and replaced with guidance based on output from the current operational NAM model. The new message is scheduled for implementation in December 2008. Note that not all elements described here have been redeveloped with NMM-based model output for the initial implementation. New replacement equations to predict 2-m temperature and dewpoint, daytime maximum/nighttime minimum temperature, probability of precipitation, quantitative precipitation amount, wind speed and direction, probability of a thunderstorm, and conditional probability of a severe thunderstorm have been developed from NAM WRF-NMM output. Equations to predict total sky cover, snowfall amount, visibility, ceiling, and obstruction to vision are based on output from the Eta model and are applied to output from the NAM WRF-NMM output. These elements will be redeveloped as a sufficient sample of NAM model data is collected. Technical Procedures Bulletin No. 486 which described the original Eta MOS message is obsolete.

2. MESSAGE HEADING

KORD	NAM MOS GUIDANCE	10/22/2008	1200 UTC	
DT /OCT	22/OCT	23	/OCT	24
HR	18 21 00 03 06 09 12 15 18 21 00 03 06 09 12 15 18 21 00 06 12			/OCT
				25

The message heading shown above (see Figs. 1 and 2 also) identifies the station for which the guidance is valid, the forecast cycle, and the day and hour for which the forecasts are valid. In this example, the message is

The "NAM MOS GUIDANCE" appearing on the same line as the station call letters identifies the message contents. The date of the forecast cycle during which the message is issued follows this information. The form of mm/dd/yyyy where mm is the month (1 through 12), dd is the day (1 through 31), and yyyy is the four-digit year is used. The forecast cycle is identified by the standard 0000 or 1200 UTC. In this example, the MOS guidance for KORD was issued from the 1200 UTC forecast cycle of the NAM model on October 22, 2008.

3. X/N - MAXIMUM/MINIMUM TEMPERATURE

The max/min surface temperature forecasts are displayed for projections of 24, 36, 48, 60, and 72 hours after the initial data time (0000 or 1200 UTC). Although the forecasts are presented at consecutive 12-h intervals, each forecast is actually valid for a daytime or nighttime period. For the NAM-based MOS guidance, daytime is defined as 7 a.m. to 7 p.m. Local Standard Time (LST). Nighttime is defined as 7 p.m. to 8 a.m. LST. Thus, the valid date in the appropriate column of the DT and HR lines must be converted by the forecaster to his/her local date. This local date then denotes the appropriate daytime or nighttime for the max or min temperature forecast. For the 0000 UTC forecast cycle, the temperatures are shown in max/min (X/N) order and are valid for today's max, tonight's min, tomorrow's max, tomorrow night's min, and the day after tomorrow's max. For the 1200 UTC cycle, the temperatures are shown in min/max (N/X) order and are valid for tonight's min, tomorrow's max, tomorrow night's min, the day after tomorrow's max, and the night after tomorrow night's min. Each temperature forecast is presented to the nearest whole degree Fahrenheit, and three characters are allowed. A missing forecast is indicated by a 999.

SC - > 2 to 4 octas of total sky cover;
 BK - > 4 to < 8 octas of total sky cover;
 OV - 8 octas of total sky cover or totally obscured.

7. WDR - SURFACE WIND DIRECTION / WSP - SURFACE WIND SPEED

KORD	NAM	MOS	GUIDANCE	10/22/2008	1200 UTC
DT	/OCT	22/OCT	23	/OCT	24
HR	18	21	00 03 06 09 12 15 18	21 00 03 06 09 12 15 18	21 00 06 12
...					
WDR	11	10	11 11 13 12 11 11 10	10 10 10 12 14 14 13	14 15 16 13 16 18
WSP	14	15	13 15 15 12 12 14 14	14 14 11 11 09 07 07	07 08 09 08 07 09

Surface wind direction (WDR) and speed (WSP) forecasts are given at 3-h intervals for projections of 6 to 60 hours, and then every 6 hours to 72 hours after the initial data times (0000 and 1200 UTC). These are forecasts of the 10-m winds (a 2-minute average) at specific times throughout each day (i.e., 0600, 0900, 1200 UTC, and so forth). The wind direction is given in tens of degrees and varies from 01 (10 degrees) to 36 (360 degrees). The normal meteorological convention for specifying wind direction is followed. The wind speed is given in knots; the maximum speed allowed in the message is 98 knots. For both direction and speed, missing forecasts are denoted by 99. A calm wind is indicated by a wind direction and speed of 00.

8. P06 - PROBABILITY OF PRECIPITATION IN A 6-H PERIOD

KORD	NAM	MOS	GUIDANCE	10/22/2008	1200 UTC
DT	/OCT	22/OCT	23	/OCT	24
HR	18	21	00 03 06 09 12 15 18	21 00 03 06 09 12 15 18	21 00 06 12
...					
P06		1	1	1	3
				8	2
				10	67
				34	30 56

The P06 forecasts are for the probability of 0.01 inches or more of liquid-equivalent precipitation (PoP) occurring during a 6-h period. The 6-h PoP's are valid for intervals of 6-12, 12-18, 18-24, 24-30, 30-36, 36-42, 42-48, 48-54, 54-60, 60-66, and 66-72 hours after the initial data times (0000 and 1200 UTC). In the message, the forecast values are displayed under the ending time of the 6-h period. The probability is given to the nearest percent. Values range from 0 to 100%. A missing forecast value is indicated by 999.

9. P12 - PROBABILITY OF PRECIPITATION IN A 12-H PERIOD

KORD	NAM	MOS	GUIDANCE	10/22/2008	1200 UTC
DT	/OCT	22/OCT	23	/OCT	24
HR	18	21	00 03 06 09 12 15 18	21 00 03 06 09 12 15 18	21 00 06 12
...					
P12			3	8	11
					74
					70

The P12 forecasts are for the probability of 0.01 inches or more of liquid-equivalent precipitation (PoP) occurring during a 12-h period. For nearly

all stations, the 12-h PoP's are valid for intervals of 12-24, 24-36, 36-48, 48-60, and 60-72 hours after the initial data times (0000 and 1200 UTC). For stations in Hawaii, however, the 12-h PoP's are valid for intervals of 6-18, 18-30, 30-42, 42-54, and 54-66 hours after 0000 and 1200 UTC. In the message, the forecast values are displayed under the ending time of the 12-h period. The probability is given to the nearest percent. Values range from 0 to 100%. A missing forecast value is indicated by 999.

10. Q06 - QUANTITATIVE PRECIPITATION AMOUNT IN A 6-H PERIOD

KORD		NAM MOS GUIDANCE						10/22/2008 1200 UTC														
DT /OCT		22/OCT 23						/OCT 24						/OCT 25								
HR		18	21	00	03	06	09	12	15	18	21	00	03	06	09	12	15	18	21	00	06	12
		...																				
006			0		0		0		0		0	...	0		0		3		1	1	1	

Guidance for liquid-equivalent precipitation amount (QPF) accumulated during a 6-h period is presented in categorical form on the line designated Q06. These forecasts are available for projections of 6-12, 12-18, 18-24, 24-30, 30-36, 36-42, 42-48, 48-54, 54-60, 60-66, and 66-72 hours after the initial data time (0000 and 1200 UTC). The forecasts are displayed beneath the hour indicating the end of the 6-h period. The Q06 guidance is a categorical forecast of liquid-equivalent precipitation equaling or exceeding certain specified amounts in the 6-h periods. The categories are as follows:

Q06 Categories

- 0 = no precipitation expected;
- 1 = 0.01 - 0.09 inches;
- 2 = 0.10 - 0.24 inches;
- 3 = 0.25 - 0.49 inches;
- 4 = 0.50 - 0.99 inches;
- 5 = $\geq$ 1.00 inches.

Missing forecasts are denoted by 9.

11. Q12 - QUANTITATIVE PRECIPITATION AMOUNT IN A 12-H PERIOD

KORD		NAM MOS GUIDANCE										10/22/2008 1200 UTC																																							
DT /OCT		22/OCT 23										/OCT 24										/OCT 25																													
HR		18	21	00	03	06	09	12	15	18	21	00	03	06	09	12	15	18	21	00	06	12																													
		...																																																	
012		0										0										0										3										2									

Guidance for liquid-equivalent precipitation amount (QPF) accumulated during a 12-h period is presented in categorical form on the line designated Q12. These forecasts are available for projections of 12-24, 24-36, 36-48, 48-60, and 60-72 hours after the initial data time (0000 and 1200 UTC). For stations in Hawaii, however, the 12-h QPF's are valid for intervals of 6-18, 18-30, 30-42, 42-54, and 54-66 hours after 0000 and 1200 UTC. The forecasts are displayed beneath the hour indicating the end of the 12-h period. The Q12 guidance is a categorical forecast of liquid-equivalent precipitation

equaling or exceeding certain specified amounts in the 12-h periods. The categories are as follows:

Q12 Categories

0 = no precipitation expected;
 1 = 0.01 - 0.09 inches;
 2 = 0.10 - 0.24 inches;
 3 = 0.25 - 0.49 inches;
 4 = 0.50 - 0.99 inches;
 5 = 1.00 - 1.99 inches;
 6 = ≥ 2.00 inches.

Missing forecasts are denoted by 9.

12. T06 - PROBABILITY OF THUNDERSTORMS/CONDITIONAL PROBABILITY OF SEVERE THUNDERSTORMS IN A 6-H PERIOD

KORD	NAM MOS GUIDANCE										10/22/2008	1200 UTC									
DT	/OCT 22/OCT 23											/OCT 24									
HR	18	21	00	03	06	09	12	15	18	21	00	03	06	09	12	15	18	21	00	06	12
	...																				
T06	0/ 0	0/ 1	0/ 0	0/ 5	1/ 0	2/ 2	3/ 1	4/ 2	4/ 5	2/ 0											

The T06 line represents forecasts for the probability of thunderstorms (to the left of the diagonal) and the conditional probability of severe thunderstorms (to the right of the diagonal) occurring during a 6-h period. The 6-h probability forecasts are valid for intervals of 6-12, 12-18, 18-24, 24-30, 30-36, 36-42, 42-48, 48-54, 54-60, and 66-72 hours after the initial data times (0000 and 1200 UTC). Because of the line width, the 60-66 h forecast is not available. In the message, the pair of forecast values is displayed under the ending time of the 6-h period. The thunderstorm probability is given to the nearest whole percent. Values range from 0 to 100%. A missing forecast value is indicated by 999. The conditional severe thunderstorm probability is given to the nearest whole percent. Values range from 0 to 98%. A missing forecast value is given by 99. Both the thunderstorm and conditional severe storm probabilities are available year-round for stations in the contiguous U.S. Note that these thunderstorm probabilities represent the likelihood of the event within a box approximately 40 km on a side and containing the station specified. The conditional severe thunderstorm probabilities represent the likelihood of the event within a box approximately 80 km on a side and containing the station specified. Forecasts are unavailable for stations in Alaska, Hawaii, or Puerto Rico because reports from the National Lightning Detection Network (NLDN) used to define the thunderstorm predictand were unavailable for locations in those areas.

13. T12 - PROBABILITY OF THUNDERSTORMS/CONDITIONAL PROBABILITY OF SEVERE THUNDERSTORMS IN A 12-H PERIOD

KORD	NAM	MOS	GUIDANCE	10/22/2008	0000 UTC
DT	/OCT	22/OCT	23	/OCT	24
HR	06	09	12 15 18 21 00	03 06 09 12 15 18 21 00	03 06 09 12 18 00
T12		0/ 1	0/ 5	2/ 2	5/ 2 4/ 5

The T12 line represents forecasts for the probability of thunderstorms (to the left of the diagonal) and the conditional probability of severe thunderstorms (to the right of the diagonal) occurring during a 12-h period. The 12-h probability forecasts are valid for intervals of 6-18, 18-30, 30-42, 42-54, and 54-66 hours after the initial data times (0000 and 1200 UTC). In the message, the pair of forecast values is displayed under the ending time of the 12-h period. The thunderstorm probability is given to the nearest whole percent. Values range from 0 to 100%. A missing forecast value is indicated by 999. The conditional severe thunderstorm probability is given to the nearest whole percent. Values range from 0 to 98%. A missing forecast value is given by 99. Both the thunderstorm and conditional severe storm probabilities are available year-round for stations in the contiguous U.S. Note that these probabilities represent the likelihood of the event within a box approximately 40 km on a side and containing the station specified. The conditional severe thunderstorm probabilities represent the likelihood of the event within a box approximately 80 km on a side and containing the station specified. Forecasts are unavailable for stations in Alaska, Hawaii, or Puerto Rico because reports from the NLDN used to define the thunderstorm predictand were unavailable for locations in those areas.

14. SNW - SNOWFALL AMOUNT CATEGORICAL FORECAST

KORD	NAM	MOS	GUIDANCE	10/22/2008	1200 UTC
DT	/OCT	22/OCT	23	/OCT	24
HR	18	21 00 03 06 09 12 15 18 21 00	03 06 09 12 15 18 21 00	06 09 12 15 18 21 00	06 12
SNW		0	0	0	0

Categorical forecasts of snowfall amount are available in the message for 24-h periods ending approximately 36 and 60 hours after 0000 UTC and approximately 24, 48, and 72 hours after 1200 UTC. Since observations from the cooperative observer network are used to define the event, the valid times are approximations. The categories are denoted as follows:

Snowfall Amount Categories

- 0 = no snow or a trace expected;
- 1 = > a trace to < 2 inches expected;
- 2 = 2 to < 4 inches;
- 4 = > 4 to < 6 inches;
- 6 = > 6 to < 8 inches;
- 8 = > 8 inches.

A missing forecast is denoted by 9; forecasts are disseminated only for the period of September 1 - May 31.

15. CIG - CEILING HEIGHT CATEGORICAL FORECASTS

KORD	NAM MOS GUIDANCE			10/22/2008 1200 UTC																	
DT /OCT	22/OCT 23			/OCT 24												/OCT 25					
HR	18	21	00	03	06	09	12	15	18	21	00	03	06	09	12	15	18	21	00	06	12
												° ° °									
CIG	8	8	8	8	8	8	8	8	8	8	8	8	8	7	7	2	3	5	5	5	2

Forecasts of eight categories of ceiling height (see the following table) are available for specific times valid every 3 hours from 6 to 60 hours and then every 6 hours to 72 hours after 0000 and 1200 UTC. The forecasts are displayed beneath the time of the day for which they are valid. Values of 1 through 8 are allowed for the categorical guidance; a value of 9 denotes a missing forecast. The categories are as follows:

Ceiling Height Categories

- 1 = ceiling height of < 200 feet;
- 2 = ceiling height of 200 - 400 feet;
- 3 = ceiling height of 500 - 900 feet;
- 4 = ceiling height of 1000 - 1900 feet;
- 5 = ceiling height of 2000 - 3000 feet;
- 6 = ceiling height of 3100 - 6500 feet;
- 7 = ceiling height of 6600 - 12,000 feet;
- 8 = ceiling height of > 12,000 feet or unlimited ceiling.

The categorical guidance is prepared by using probability forecasts of the same categories.

16. VIS - VISIBILITY CATEGORICAL FORECASTS

KORD		NAM MOS GUIDANCE										10/22/2008 1200 UTC										
DT /OCT		22/OCT					23					/OCT 24					/OCT 25					
HR		18	21	00	03	06	09	12	15	18	21	00	03	06	09	12	15	18	21	00	06	12
VIS		7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	5	5	5	7	5	4

Forecasts of seven categories of visibility (see the following table) are available for specific times valid every 3 hours from 6 to 60 hours and then every 6 hours to 72 hours after 0000 and 1200 UTC. The forecasts are displayed beneath the time of the day for which they are valid. Values of 1 through 7 are allowed for the categorical guidance; a value of 9 denotes a missing forecast. The categories are as follows:

Visibility Categories

- 1 = visibility of < 1/2 mi;
- 2 = visibility of 1/2 - < 1 mi;
- 3 = visibility of 1 to < 2 mi;
- 4 = visibility of 2 to < 3 mi;
- 5 = visibility of 3 to 5 mi;
- 6 = visibility of 6 mi;
- 7 = visibility of > 6 mi.

The categorical guidance is prepared by using probability forecasts of the same categories.

17. OBV - OBSTRUCTION TO VISION CATEGORICAL FORECASTS

KORD	NAM MOS GUIDANCE															10/22/2008 1200 UTC											
DT	/OCT 22/OCT 23					/OCT 24										/OCT 25											
HR	18	21	00	03	06	09	12	15	18	21	00	03	06	09	12	15	18	21	00	06	12						
OBV	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	BR	N	N	BR	BR					

Forecasts of five categories of obstruction to vision (see the following table) are available for specific times valid every 3 hours from 6 to 60 hours and then every 6 hours to 72 hours after 0000 and 1200 UTC. The forecasts are displayed in plain language beneath the time of the day for which they are valid. The categories are denoted by the letters "N", "HZ", "BR", "FG", and "BL"; a value of "X" denotes a missing forecast. The categories are as follows:

Obstruction to Vision Categories

N = none of the following;

HZ = haze, smoke, dust;

BR = mist (fog with visibility $\geq$ 5/8 mi);

FG = fog or ground fog (visibility < 5/8 mi);

BL = blowing dust, sand, snow.

The categorical guidance is prepared by using probability forecasts of the same categories. In the equation development, cases of fog or mist were not stratified by the occurrence of precipitation. Thus, a forecast of fog can be coincidental with a forecast of precipitation. Lower visibilities caused exclusively by precipitation occurrence are not indicated by the obstruction to vision guidance.

18. AVAILABILITY

The 0000 and 1200 UTC NAM MOS guidance will be available at approximately 0300 and 1500 UTC, respectively, in 10 alphanumeric messages transmitted to NWS AWIPS and Family of Services (FOS) circuits: six containing guidance for stations in the contiguous U.S., Puerto Rico, and the Virgin Islands; three containing guidance for Alaskan sites; and one containing guidance for stations in Hawaii. The following two-line WMO headers are used:

WMO Header - Region

FOPA40 KWN0 - Pacific Region

METPA0

FOUS44 KWN0 - Northeast U.S.

METNE1

FOUS45 KWN0 - Southeast U.S.

METSE1

FOUS46 KWN0 - North Central U.S.
METNC1

FOUS47 KWN0 - South Central U.S.
METSC1

FOUS48 KWN0 - Rocky Mountain Region (CONUS)
METRM1

FOUS49 KWN0 - West Coast Region (CONUS)
METWC1

FOAK47 KWN0 - Southeast Alaska (Juneau)
METAJK

FOAK48 KWN0 - Central Alaska (Anchorage)
METAFC

FOAK49 KWN0 - Northern Alaska (Fairbanks)
METAFG

19. STATION LIST

The NAM MOS guidance will be available for approximately 1687 stations. The guidance is transmitted in the 10 bulletins described in Section 18.

The user may check the following home pages for the station lists and corresponding WMO headers:

<http://www.nws.noaa.gov/mdl/synop/namstadrg.php>

Figure 1. Sample 0000 UTC message.

KORD	NAM	MOS	GUIDANCE	10/22/2008 0000 UTC																													
DT /OCT	22						/OCT 23						/OCT 24						/														
HR	06	09	12	15	18	21	00	03	06	09	12	15	18	21	00	03	06	09	12	18	00												
X/N							54							38							58					48	56						
TMP	44	41	39	45	51	52	47	44	43	41	40	47	54	56	51	50	51	50	49	53	51												
DPT	31	30	29	31	29	29	31	31	31	31	31	33	32	32	35	37	39	41	42	44	44												
CLD	SC	CL	FW	SC	BK	BK	BK	FW	FW	SC	CL	CL	CL	CL	FW	OV	OV	OV	OV	OV	OV												
WDR	07	08	10	11	09	10	10	11	11	11	10	11	10	10	11	12	15	11	15	16	13												
WSP	06	06	07	11	13	14	13	11	12	11	09	13	13	14	10	08	06	05	06	12	07												
P06							1			2			2			3			2			7			28			30	56	69			
P12													3							4							7			47	74		
Q06							0			0			0			0			0			1			0	3	2						
Q12													0							0							0			1	3		
T06			0/ 0			0/ 1			0/ 0			0/ 0			0/ 0			0/ 0			3/ 0			3/ 0			3/ 9						
T12									0/ 1									0/ 0									0/ 0			3/ 0			4/ 4
SNW																																	0
CIG	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	7	7	6	2	4												
VIS	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	3	5												
OBV	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	BR	HZ												

Figure 2. Sample 1200 UTC message.

KORD	NAM	MOS	GUIDANCE	10/22/2008 1200 UTC																													
DT /OCT	22/OCT 23						/OCT 24						/OCT 25																				
HR	18	21	00	03	06	09	12	15	18	21	00	03	06	09	12	15	18	21	00	06	12												
N/X							36							58							48							56	44				
TMP	50	52	47	43	41	40	39	46	55	57	52	52	52	50	49	51	53	54	51	49	46												
DPT	25	24	27	28	28	29	29	32	33	34	36	38	39	40	40	40	40	41	43	44	42												
CLD	OV	BK	FW	SC	SC	SC	CL	CL	CL	SC	SC	OV	OV	OV	OV	OV	OV	OV	OV	OV													
WDR	11	10	11	11	13	12	11	11	10	10	10	12	14	14	13	14	15	16	13	16	18												
WSP	14	15	13	15	15	12	12	14	14	14	11	11	09	07	07	07	08	09	08	07	09												
P06							1			1			1			3			8			2			10			67			34	30	56
P12													3							8							11			74	70		
Q06							0			0			0			0			0			3			1	1	1						
Q12													0							0							0			3	2		
T06			0/ 0			0/ 1			0/ 0			0/ 5			1/ 0			2/ 2			3/ 1			4/ 2			4/ 5			2/ 0			
T12									0/ 1									0/ 5									2/ 2			5/ 2			4/ 5
SNW																																	0
CIG	8	8	8	8	8	8	8	8	8	8	8	8	8	7	7	2	3	5	5	5	2												
VIS	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	5	5	5	7	5	4												
OBV	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	BR	N	N	BR	BR												