Western Region Technical Attachment
89-05
February 14, 1989

Comments on Western Region Technical Attachment 88-34

[Editor's Note -- Late last year, we published a TA which discussed a method whereby a forecaster might improve upon the regional MOS PoP equations. Prior to its publication, this TA created a lot of discussion among the author, SSD, and TDL. We all learned a lot through this experience. Even though we had reached a consensus on how this TA should be approached, new research by TDL has shed some new light on the validity of the technique outlined in Western Region Technical Attachment 88-34, and these results are attached.]

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

February 9, 1989 W/OSD21:EJ

MEMORANDUM FOR: W/WR3 - Kenneth B. Mielke

THRU: W/OSD21 - Gary M. Carter

FROM: W/OSD21 - Eli Jacks

SUBJECT: Comments on Western Region Technical Attachment No. 88-34 and Some Thoughts About the Effects of Regionalization on the MOS PoP Guidance

REFERENCE: W/OSD21 Memorandum of October 18, 1988 entitled: Adjusting the LFM-based MOS PoP Guidance for SLC and CDC

As you know, we use a regionalized technique to derive statistical forecast equations for elements (such as PoP) when there are not enough developmental data to derive single-station equations. Because regionalized equations are derived by using data from a group of stations, the climatic characteristics of individual stations usually are not taken into account. In the case of PoP, this means that the equations do not compensate for variations in the mean relative frequency (RF) of precipitation from station to station in a given region, even though these RF's are probably different from the RF for the entire region. In his analysis, Ed Carle of WSFO SLC suggested that because PoP equations are derived by using a 6-month seasonal stratification, a correction factor can be applied for "borderline" precipitation events to account for the monthly variation in RF at a given station. However, I don't think that this situation is as simple as it first appeared.

Ed suggested that for months where the RF at a given station is substantially lower (higher) than the regional RF for the season, forecasters should consider lowering (raising) the guidance if they are unsure about which way to modify the MOS PoPs. I verified data from three full cool seasons of data (October-March of 1985-86, 1986-87, and 1987-88) for six Western Region stations (see Attachment), and did not uncover any conclusive evidence that this theory is valid. For the 36 monthly comparisons, I subjectively determined that Ed's theory worked for 12 cases and did not work for 15 cases (the remaining nine cases were indeterminate).

I then considered those cases where the monthly climatic RF at a station differed from the developmental RF for the region by more than 5%. For the 17 cases that met this criterion, I determined that the theory worked for only 5 cases, while it failed 9 times (three cases were indeterminate). Examples of cases where the theory clearly did not work include October at North Bend (OTH) and October at Seattle (SEA). Thus, for this relatively small sample, it is possible that those cases for which the theory was borne out may have been due to random chance. It appears that the PoP equations do account for the fact that some months and locations are drier than others because the values of important predictors, such as LFM forecasts of mean RH and precipitation amount, are lower during these months.

In Part III of his series on "How To Use MOS Guidance Effectively" (Western Region Technical Attachment No. 87-37), George Maglaras suggested that "MOS PoP equations might tend to underforecast (overforecast) the PoP at stations that have a higher (lower) frequency of precipitation than the mean value for the region." However, for many locations the precipitation frequency at a station alone will not help determine the potential MOS bias. Rather, it is the relationship of the observed precipitation frequency to the average values of important predictors from the LFM that influences the MOS RF. Of course, within a fairly small PoP region, it is unlikely the LFM predictors will exhibit as much fine-scale detail as the observed precipitation frequencies.

Suppose a region contained a relatively dry area and a relatively moist area. As long as the important LFM predictors tended on average to be drier in the dry area and wetter in the moist area, I believe there would not be a problem. However, if there were a mountain range within the region that the LFM failed to resolve, I would expect MOS to overforecast precipitation at stations in the mountain's rain shadow and to underforecast precipitation at stations that experience orographic enhancement of precipitation. A comparison of the RF values at these stations with the regional RF for the season would be unimportant in this case.

Please call me if you have any questions about the topics covered here. We regret not having noticed the problem in Ed's paper before it was published as a Technical Attachment, but I think this has been a useful learning experience for all of us.

Attachment

cc:
W/ER3 - Hugh M. Stone
W/SR3 - Daniel L. Smith
W/CR3 - Joseph T. Schaefer
WSFO SLC - Ed Carle
WSFO ALB - George J. Maglaras

ATTACHMENT

ARE MOS POPS (0000 UTC CYCLE, 24-H FORECASTS) TOO HIGH (LOW) FOR THOSE MONTHS AT A GIVEN STATION WHERE THE MEAN RELATIVE FREQUENCY OF PRECIPITATION (RF) IS LOWER (HIGHER) THAN THE MEAN RF FOR THE DEVELOPMENTAL REGION?

STATION	MONTH	MEAN REGIONAL RF	CLIMATIC RF	OBS MONTHLY RF	MEAN MOS POP FCST
UIL	OCT	51%	44%	38%	26%
	NOV		62%	54%	52%
	DEC		65%	45%	43%
	JAN		56%	59%	58%
	FEB		64%	58%	47%
	MAR		56%	63%	53%
OTH	OCT	51%	29%	24%	12%
	NOV		53%	50%	40%
	DEC		54%	46%	38%
	JAN		43%	57%	52%
	FEB		54%	43%	35%
	MAR		52%	50%	41%
SEA	OCT	41%	26%	22%	20%
	NOV		45%	40%	40%
	DEC		46%	37%	30%
	JAN		42%	46%	42%
	FEB		43%	30%	34%
	MAR		36%	39%	38%
OLM	OCT	41%	33%	24%	18%
	NOV		53%	47%	39%
	DEC		57%	36%	31%
	JAN		44%	48%	42%
	FEB		56%	42%	33%
	MAR		47%	44%	36%
SLC	OCT	16%	15%	13%	12%
	NOV		19%	24%	22%
	DEC		23%	13%	16%
	JAN		21%	20%	18%
	FEB		22%	22%	19%
	MAR		27%	22%	19%
CDC	OCT	16%	11%	15%	15%
	NOV		12%	22%	18%
	DEC		10%	14%	14%
	JAN		16%	13%	14%
	FEB		11%	18%	14%
	MAR		23%	17%	16%

NOTE: All precipitation relative frequency data are valid for three cool seasons (October-March of 1985-86, 1986-87, 1987-88) and for the 12-h period between 1200 and 0000 UTC.