EASTERN REGION TECHNICAL ATTACHMENT
No. 78-10
May 30, 1978

HOW TO NOT ISSUE A FLASH FLOOD WATCH

On March 16, 1978, we issued a Guide for Recognition of Flash Flood Threats, and a copy appears at the end of this Attachment. Fortunately, the Eastern Region has not experienced any flash floods since that time, although this must certainly be a coincidence. However, there is the question of how well has this guide performed thus far? To the best of our knowledge, the technique has not produced any false alarms thus far.

The northern half of the Eastern Region was faced with a threat of heavy rainfall during the period May 23-25, 1978, and we decided to test this technique using trajectory model, LFM, and FDUS winds aloft forecasts as described on the reverse side of the guide. During this period, a 500 mb ridge was located in the Eastern Region with a shortwave trough moving around it, the atmosphere was unusually moist and unstable, and a quasi-stationary frontal system was located from Maryland westward through Ohio. Based on the trajectory model, LFM, and FDUS, the threat situation was evaluated for the evening of May 24 (00-06Z, May 25). Here are forecasts of the parameters required for use of the guide:

Forecasts Valid for 00-06Z, May 25, 1978

	City						
Parameter	DCA	CRW	PIT	IPT	LGA	GSO	CAE
Departure of Precipitable Water from Monthly Normal	+83%	+67%	+87%	+100%	+81%	+80%	+32%
Surface Dew Point	65°F	65°F	62°F	58°F	54°F	68°F	68°F
K Index	38	30	32	36	36	35	32
Lifted Index	-1	-2	-1	+1	+4	-1	-2
850 mb Wind Speed	14kt	15kt	12kt	11kt	8kt	18kt	12kt
500 mb Wind Speed	19kt	29kt	24kt	18kt	12kt	27kt	19kt

A single underline means that these values did not meet the criteria for considering the issuance of a flash flood watch, and a double underline means that the lower criteria for intensifying the weather watch were not met. Washington came closest to meeting the flash flood criteria; however, according to the Recognition Guide, all criteria must be met before considering a flash flood watch. During the period

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May 23-25, small-stream flooding occurred in Western Pennsylvania, West Virginia and Central New Jersey. Maximum rainfall did not exceed 3.5" anywhere to our knowledge. There were a few flash flood watches and warnings issued which might have been more appropriately issued as small-stream flooding statements.

A word of caution--this technique is relatively untested, and professional judgment should take precedence over the mechanical application of any technique. We believe this technique does show real promise as an objective forecast aid. It worked very well in the case cited above, and we would be interested in receiving documentation of other forecast cases (successes and failures) from WSFOs.

SCIENTIFIC SERVICES DIVISION, ERH
May 30, 1978

Attachment

FEATURES COMMON TO FLASH FLOOD EVENTS IN THE EASTERN REGION

MESOHIGH EVENTS

1. Convective storms and/or new cells repeatedly form and move over same area.
2. Storm area is very near 500 MB ridge position.
3. A weak mid-level short-wave trough moving through or around ridge helps to trigger and focus storms.
4. The storms usually occur during nighttime hours.
5. Severe thunderstorm phenomena usually do not occur in the heavy rain area.
6. A quasi-stationary mesoscale outflow boundary, generated by previous thunderstorm activity, help to trigger and focus the storms.

FRONTAL EVENTS

1. Convective storms and/or new cells repeatedly form and move over same area.
2. Storm area is very near 500 MB ridge position.
3. A weak mid-level short-wave trough moving through or around ridge helps to trigger and focus storms.
4. The storms usually occur during nighttime hours.
5. Severe thunderstorm phenomena usually do not occur in the heavy rain area.
6. A quasi-stationary large scale frontal system helps to trigger and focus the storm.

FORECAST TECHNIQUES FOR FLASH FLOOD PARAMETERS

The guide on the reverse side will generally be used with observed parameters. For an early evaluation of the potential for flash flooding, the guide can also be applied to numerical model output.

1. Twenty-four hour precipitable water forecasts may be derived from the dew point forecasts of the trajectory model. Apply the dew point forecasts to any thermodynamic diagram and find the mixing ratio (m) at the surface, 850 mb and 700 mb levels. The 500 mb dew point and mixing ratio may be approximated by extending the dew point curve (from the surface, 850 mb & 700 mb dew point forecasts) to 500 mb. Precipitable water should be computed for relatively thin layers of the atmosphere, but can be approximated as follows:

   Precipitable water (surface-850 mb) = 0.03 (^{m}sfc + $^{m}850$) inches
   +
   Precipitable water (850-700 mb) = 0.03 ($^{m}850$ + $^{m}700$) inches
   +
   Precipitable water (700-500 mb) = 0.04 ($^{m}700$ + $^{m}500$) inches

   Precipitable water (surface-500 mb) = (sum of layers above) inches

   where: m = mixing ratio & $^{m}850$ = mixing ratio at 850 mb, etc.

2. The 24-hour surface dewpoint and K value forecast are available from the trajectory model.
3. The lifted index can be obtained from the 6-hourly LFM output (FOUS).
4. The 850 mb and 500 mb wind speeds can be approximated from the 6,000' and 18,000' levels of the winds aloft forecasts (FD).

GUIDE FOR RECOGNITION OF FLASH FLOOD THREAT

METEOROLOGICAL PARAMETERS

PARAMETER		CONSIDER FLASH FLOOD WATCH	INTENSIFY WEATHER WATCH
DEPARTURE OF PRECIPITABLE WATER FROM MONTHLY NORMAL		≥ 70%	≥ 30%
		and	
SURFACE DEW POINT		> 65°F	> 55°F
		and	
K INDEX		≥ 38	≥ 24
		and	
LIFTED INDEX		≤ -5	≤ -1
		and	
850 MB WIND SPEED		< 25 KTS.	< 45 KTS.
		and	
500 MB WIND SPEED		< 25 KTS.	< 60 KTS.

Precipitable Water (surface-500 mb) Normals & Departures

Location ______________

	J	F	M	A	M	J	J	A	S	O	N	D
Normal (in.)												
+30% of Normal												
+70% of Normal												

Location ______________

	J	F	M	A	M	J	J	A	S	O	N	D
Normal (in.)												
+30% of Normal												
+70% of Normal												

Adapted from Meteorological Aspects of Twenty Significant Flash Flood Events, Robert A. Maddox and Charles F. Chappell, 1978.

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