THE DEVASTATING DECEMBER STORMS OF ARKANSAS

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ABSTRACT

On December 2-3, 1982, a rare and extraordinary weather event affected much of the lower and mid Mississippi Valley, including Arkansas. During the two-day period, at least 9 tornadoes skipped through central Arkansas. Additionally, torrential rains fell in the northwestern half of the state, with amounts which have rarely been seen in Arkansas. This report will try to explain why the events occurred, thus aiding forecasters in better prediction of such events in the future.

1. STORM SUMMARY

Torrential rains totaling ten inches or more fell in west and north Arknasas during a relatively short period from the afternoon of Thursday, December 2 to Friday morning December 3, 1982 (Figure 1). Extensive flooding occurred in these regions, both flash floods and river flooding. Particularly astounding was the rise on the Buffalo River at St. Joe, Arkansas. This small undammed river in a National Wilderness Area rose from 6.4 feet the morning of December 2 to 53.7 feet at noon December 3, a nearly 50 foot rise in one day (2)! Clinton, Arkansas, the county seat of Van Buren County, was especially hard hit by flooding. The entire business district was under 8-10 feet of water by the morning of December 3. Six people drowned in flood waters in the state.

The floods were accompanied by severe weather. During the December 2-3 period, at least 9 tornadoes hit central Arkansas, with more elsewhere in the state. Two deaths were attributed to tornadoes.

Over 2,000 families were displaced by the floods and tornadoes, with material loss estimated at nearly 370 million dollars. Thirty-seven counties were eventually included in a request for a Presidential Declaration of Disaster.

It is no surprise that the Arkansas Gazette would later describe this early December storm as the worst natural disaster in Arkansas's history.

2. WHY THE STORMS? A SYNOPSIS

Storminess of this magnitude usually occurs in the Spring and late Fall (through November), when the flow at the surface and aloft is usually from the south or southwest, bringing in Gulf moisture. In December the flow climatologically becomes more west or northwest, bringing in drier air. However, December 1982 saw southerly flow continue.

This type of flash flood event is often accompanied by severe weather, as was the case here. Flooding came about from heavy thunderstorms moving repeatedly over the same area. In this situation, the thunderstorms were moving to the north-northeast at 50-55 MPH while the line itself remained stationary.

3. SYNOPTIC FEATURES

A) Surface: A warm front moved northward across the Gulf coastline on November 29 and by December 1 had reached the Ohio Valley, allowing moisture from the Gulf of Mexico to spread into Arkansas. Dewpoints reached the 60's on December 1, and by December 2 had reached the lower 70's in southern Arkansas.

A very active Pacific cold front brought widely publicized storms to the California coast on November 30, and moved into northwestern Arkansas on December 2, where it stalled. The stalling of this front proved to be very devastating to Arkansas.

A low pressure system formed on the stalled front in south Texas, then moved northeastward along the front, reaching Texarkana early on the morning of December 3. It took the rest of the 3rd for the low to move through western Arkansas.

B) Upper Air: A broad 500 MB ridge extended from the eastern Gulf of Mexico into the western Atlantic and was increasing in amplitude. This ridge blocked an advancing trough, causing a cut-off 500 MB low to form over Utah by early morning on December 1. By the evening of December 2, another, stronger low was forming over west Texas, the Utah low having moved northward. (Figure 2).

The new Texas low was primarily responsible for the strong dynamics associated with the heavy rain event during the night of December 2 (Figure 3).

Meanwhile, height rises continued over the eastern U.S. and also began occurring over the Arkansas-Oklahoma-Kansas areas by sun-

set on December 2 (Figure 2). These rises particularly gave clues that the surface front would indeed stall in Arkansas. Note the 50 meter rise at Oklahoma City, and 70 meter rise at Dodge City.

The 850 MB analyses of December 2 at 6:00 a.m. and 6:00 p.m. local time (Figures 4 and 5) showed strong moisture convergence and a straight shot of moisture from the Gulf coming into Arkansas at 50 knots or greater. This moisture advection eventually increased precipitable water values to over 300 percent of normal at Little Rock by the early morning of December 3.

4. COMPUTER MODELS...HOW DID THEY DO?

In short, the Spectral Model did better than the LFM in forecasting 500 MB features. In fact, the Spectral forecast a cut-off 500 MB low in west Texas 4 days in advance. (This 96 hour Spectral 500 MB prog from the 12Z run on November 29, and valid for 12Z December 2, positioned the 500 MB low better than the 24-hour LFM 500 MB forecast valid at the same time.)

Other than the Spectral long range progs, what other clues did we have that the 500 MB low would cut off in west Texas? One clue was the 300 MB jet off the west coast (Figure 6). This north-south jet would indicate a further digging of the southwest trough, and it is possible that the LFM has trouble forecasting downstream development with a strong jet having a marked southerly component.

Another clue was the 500 MB height rises in the central U.S. referred to earlier in Figure 2. These rises tended to supress the low and cut it off.

Otherwise, it was the human factor (the forecasters) which enabled the Little Rock Forecast Office of the National Weather Service to issue timely watches and warnings throughout the entire 2-day period. The forecasters anticipated an unusual and potentially dangerous weather event.

5. SUMMARY

Generally, anytime dewpoints rise into the 70's during December, forecasters at Little Rock expect severe weather. Also, anytime precipitable water values rise to over 200 percent of normal on the heels of strong 850 MB moisture advection, one can expect potential flooding.

Since both these parameters were present in early days of December 1982, watches and warnings were timely. However, certain specifics were lacking in the issuances. Some occurrences were so excessive that they would probably never be included (such as forecasting 8-10 feet of water in downtown Clinton instead of issuing a Flash Flood Warning). Perhaps more work needs to be done in this area, such as developing a computer program which includes flood information for specific areas.

At any rate, we should never be satisfied with the status quo when it comes to issuing severe weather or flood warnings. There's always room for improvement.

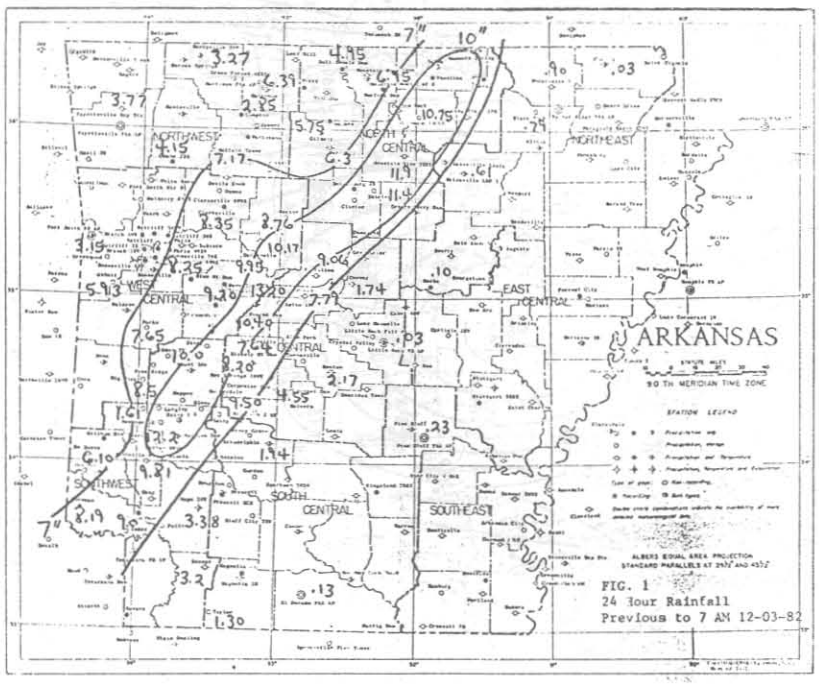

Figure 1.

Twenty four hour rainfall; previous to 7:00 a.m., December 3, 1982.

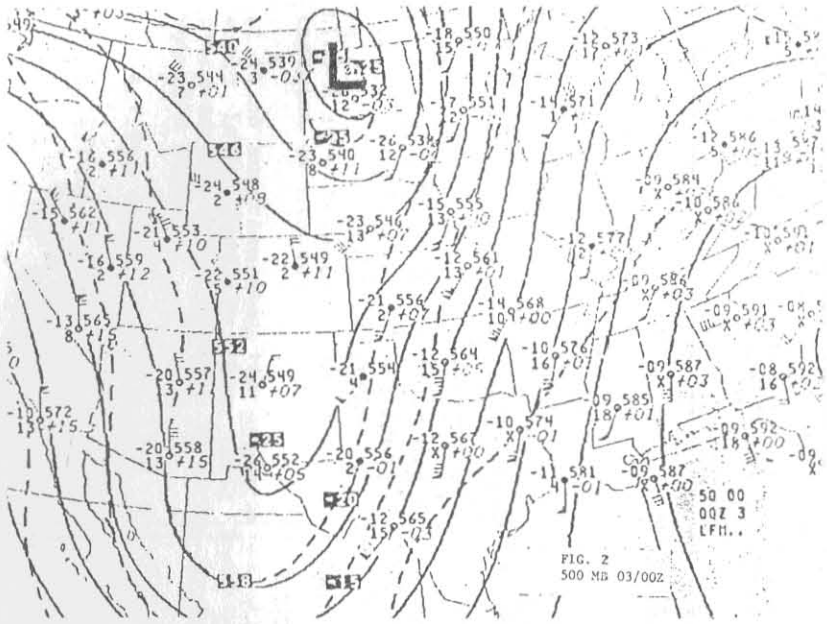

Figure 2. 500 MB Chart, 00Z, December 3, 1982

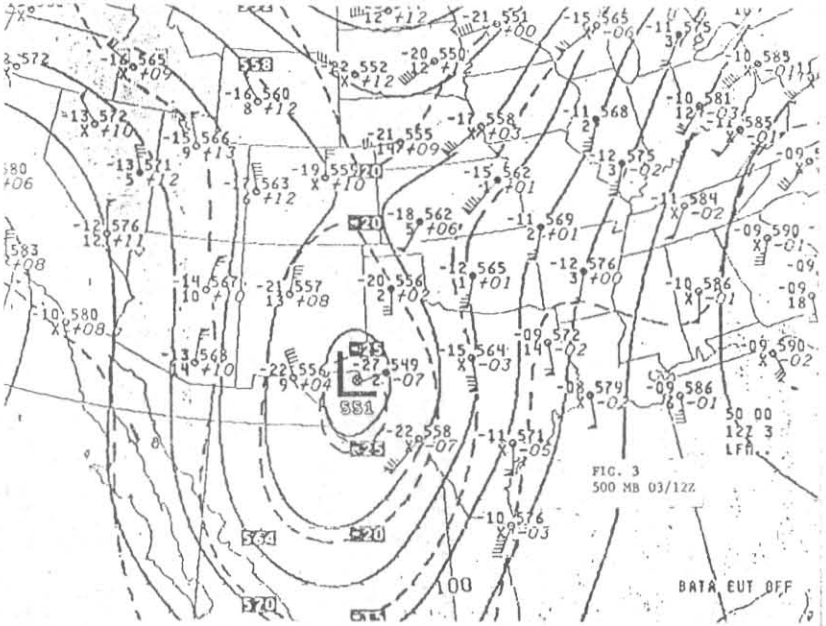

Figure 3. 500 MB Chart, 12Z, December 3, 1982

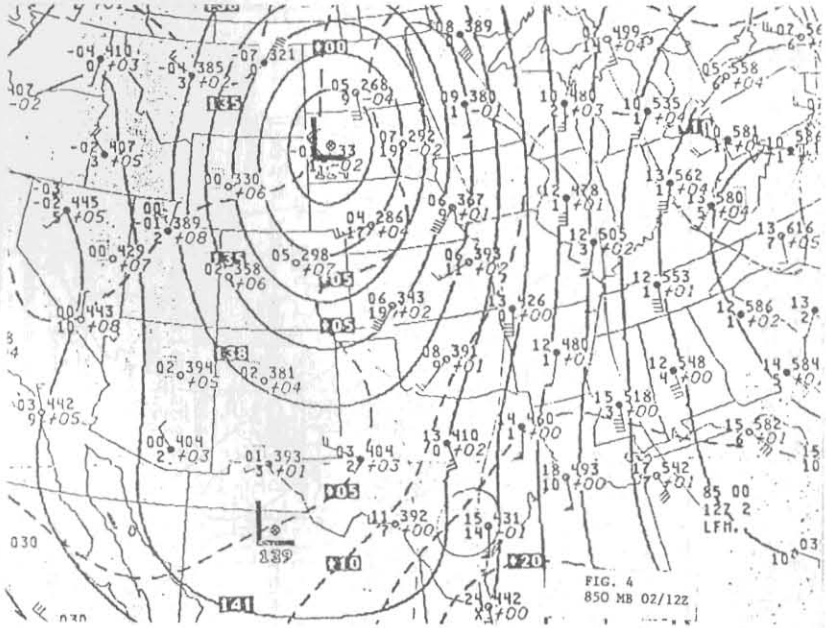

Figure 4. 850 MB Chart, 12Z, December 2, 1982

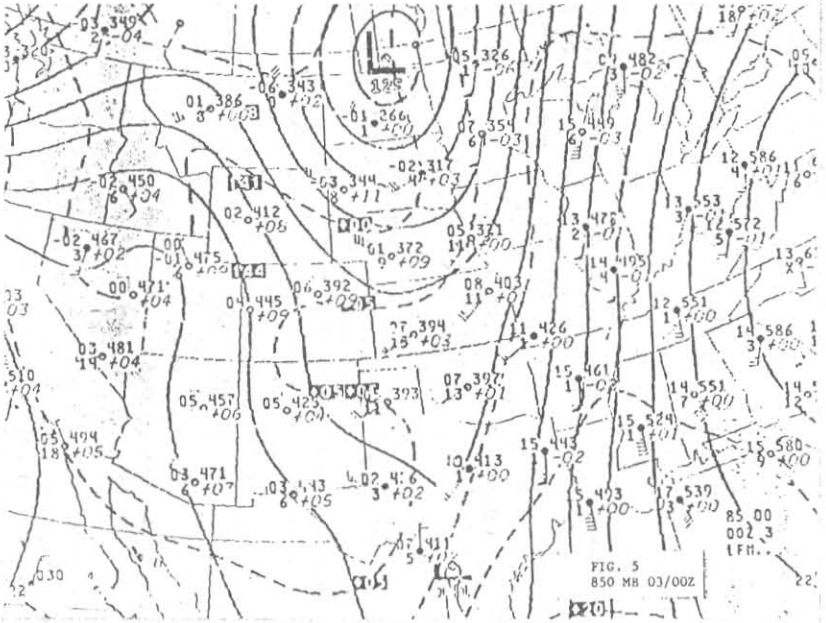

Figure 5. 850 MB Chart, 00Z, December 3, 1982

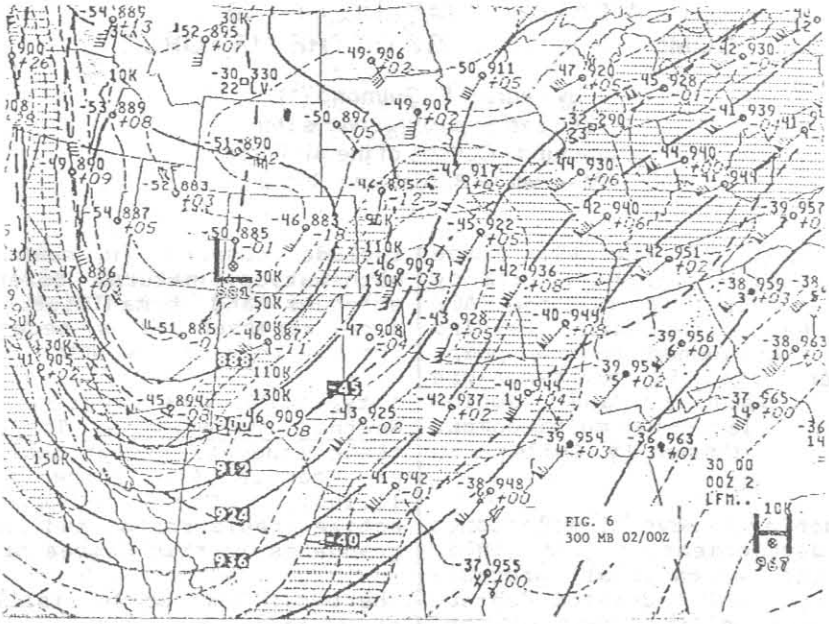

FIG. 6
300 MB 02/00Z

Figure 6. 300 MB Chart, 00Z, December 2, 1982

FOOTNOTES AND REFERENCES

1. Mike Thompson and Ken Ziegenbein are both Forecasters at the WSFO in Little Rock, Arkansas. (Mike is a Forecaster-in-Charge, Ken is a Forecaster.) Both have B.S. Degrees in Meteorology from Texas A&M University.

2. The Buffalo River is in a wilderness area and is bounded by steep, sometimes rocky walls. There are no dams or controls of any kind on this river, so heavy rains at the right spots can cause rapid rises. The rise to 53.7 feet, however, was a record high stage.