

WESTERN REGION TECHNICAL ATTACHMENT
NO. 86-36
December 16, 1986

LATE AUTUMN TORNADOES IN ARIZONA
David L. Bjorem, WSFO Phoenix

Two public reports and one pilot report of a tornado just north of Eloy (about 50 miles southeast of the Phoenix forecast office) were received at about 3 p.m. MST (21Z) on Tuesday November 18, 1986. Shortly after 5 p.m. (23Z) another tornado was sighted near Apache Junction (about 30 miles east of the forecast office). This tornado was sighted by a TV news helicopter crew and recorded on videotape. A photograph, which appeared on the front page of the Arizona Republic the next morning, is shown in Figure 1. It was estimated that about 60 homes were damaged by this tornado.

A review of Arizona Historical Weather, a compilation of storm reports in Arizona since the late 1800s by R. J. Schmidli of Phoenix, revealed only six previous tornado events reported in the state in the months of November and December. Obviously, tornadoes are rare in Arizona during the late autumn, and forecasters do not think in terms of "possible tornado". The Arizona forecast issued the morning of the 18th called for "showers or thunderstorms", in recognition of the relative instability in the lower troposphere.

Meteorological analysis revealed low-level instability typical of severe weather events in the eastern two-thirds of the United States. However, before getting to the stability analysis, let's quickly review the synoptic scale weather pattern. Figure 2 shows the 500-mb and vorticity analyses for 12Z of the 18th and 00Z of the 19th. There is a split flow pattern along the coast and in the western states with a low-latitude trough moving into southern California and Arizona. There is nothing unusual about either the intensity or the geographical location of the trough.

The satellite picture for 14Z, shown in Figure 3, reveals a typical eastward-moving stream of subtropical mid and high clouds from low latitude up across the southeast half of Arizona. Also typical of such low-latitude systems is the small area of convection off the southern California and northern Baja California coasts associated with the vorticity maximum. Now, if one is tired of all this "typical" stuff, let us note an anomaly on the early morning of the 18th which was related to the ensuing events in the afternoon. The southeast portion of the cloud mass from central California east through Utah was very "rich" in low-level moisture. Southern Nevada had flash floods on the early morning of the 18th. There was considerable low-level cloudiness in the darker area through western Arizona and southern California at 14Z. Imperial, California had fog and a dewpoint in the mid 60s at 15Z and 16Z. There was significant evidence the low-level air ahead of the approaching trough was anomalously moist.

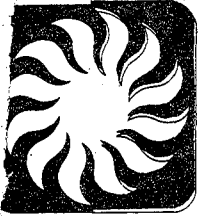
Figure 4 (four 12Z raobs) reveals a regional perspective, and Figure 5 indicates conditions in the vicinity of Phoenix that afternoon. The 12Z Tucson raob shows deep moisture but only moderate instability in the subtropical stream. The 12Z Winslow raob shows the high-level subtropical stream had already passed the station as indicated by the dryness above 600 mb. Desert Rock data shows the deep moisture that was also indicated on the satellite pictures in the far north-east quadrant of the approaching short-wave trough. San Diego, which was near the

center of the approaching trough, reported significant moisture below 710 mb with dry air above. Obviously, what is common to all these soundings is the significant low-level moisture. The consequence in the afternoon was a Showalter index of -5 at Tucson. A constructed sounding for Phoenix at about 3 p.m. based on observed surface temperature and dewpoint and an estimated 500-mb temperature of -14C gave a lifted index of slightly lower than -6. Now that is significant instability! This value is comparable to values experienced during some of the heaviest summertime severe weather outbreaks in the Phoenix area.

Figure 6 shows the character of Phoenix area weather near tornado time. The relatively solid central Arizona cloudiness is over the mountains north of Phoenix, which is in relatively clear air. The nearly north-to-south oriented bands in south central Arizona were the culprits. Radar tops were generally 25- to 30-thousand feet with VIP levels up to 5. Locally intense rain was reported in real time by both the public and ALERT rain gauges.

The afternoon dewpoints in Phoenix were in the lower 60s. From the forecaster's viewpoint, if surface dewpoints had been in the mid 50s, which would have been more typical, the lifted index would have been about -2. Phoenix records for Novembers back to 1968 reveal no cases in which dewpoint values exceeded upper 50s. Moreover, the highest dewpoints for partly cloudy weather (which was the character of the weather at the time of the tornadoes) were only in the mid 50s.

It is apparent the tornadoes in the vicinity of Phoenix on the 18th were the result of extreme lower tropospheric instability which in turn was the consequence of anomalously moist low-level air. Dewpoint temperatures were the highest ever recorded in November since any of the current forecast staff began working at Phoenix in the late 1960s.



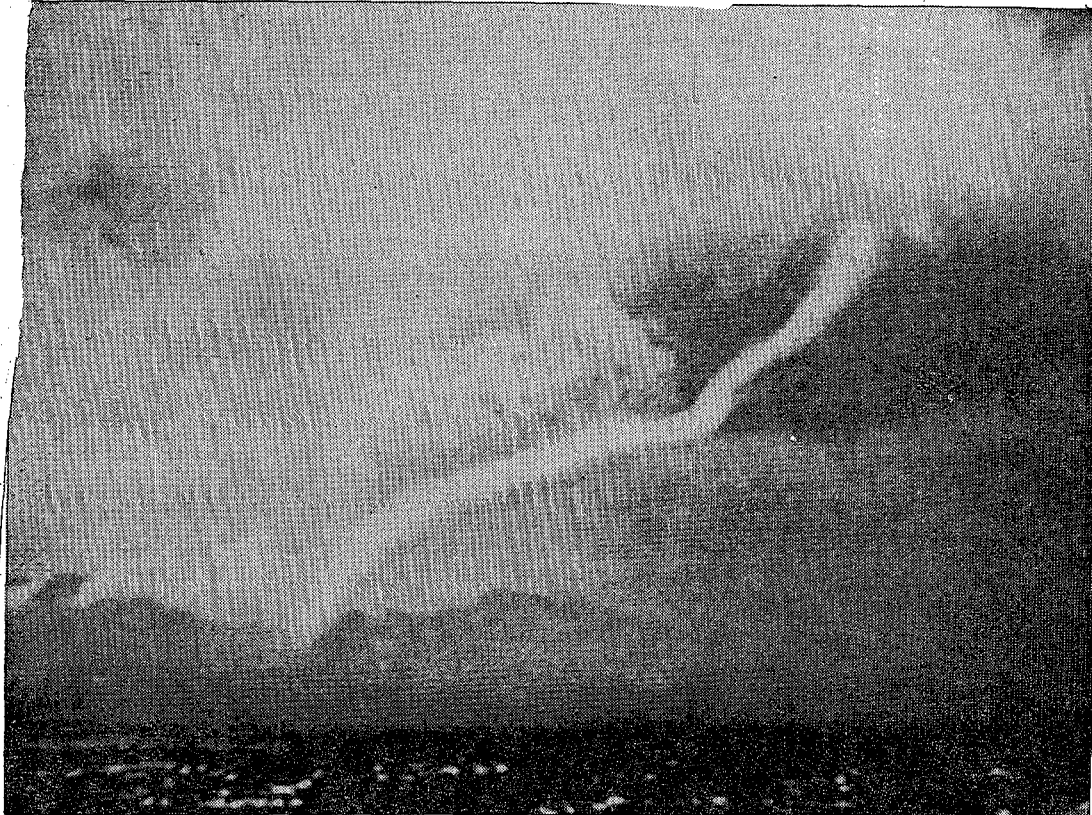
THE ARIZONA REPUBLIC

Copyright 1986, The Arizona Republic

WEDNESDAY, NOVEMBER 19, 1986

PHOENIX, ARIZONA

FIGURE 1. A portion of pages 1 and 2 from the Arizona Republic the morning of November 19.



The long, thin funnel of the tornado stretches across the sky above Apache Junction in a photo taken from a KTVK-TV (Channel 3) helicopter. Another tornado was sighted Tuesday afternoon north of Eloy, the National Weather Service said.

"I could see several pieces of metal spiraling in the air," said Kachelhoffer, whose home and at least a dozen others also were damaged in an Aug. 11 storm.

The first tornado sighting Tuesday came at about 3:30 p.m. north of Eloy, the National Weather Service said.

Within 90 minutes, however, the Apache Junction Police Department was flooded with calls from people who had spotted a funnel cloud.

"We've gotten about 30 calls of a reported sighting of a tornado," Lt. Reed Cox said.

The tornadoes were the first in Arizona since March 15, 1985, when a funnel cloud touched down in Coolidge and tore the roof off a tavern. Several funnel clouds were sighted last summer, but none touched down.

The storm system that spawned the twisters also pounded the east Valley with heavy rain and pea-size hail Tuesday afternoon, dumping 1.2 inches of rain on east Mesa in 15 minutes.

The storms prompted the weather service to issue a tornado warning for eastern Pinal and southern Gila counties. Authorities in those areas reported only rain and moderate winds, however.

A strong thunderstorm was reported north of the Santa Catalina Mountains near Tucson.

By 5 p.m., the weather-service station at Sky Harbor International Airport had recorded only 0.03 inch of rain.

Phoenix Deer Valley Municipal Airport was hit with rain, hail and 15- to 20-mph winds.

Most of the state was covered by clouds and scattered showers Tuesday afternoon, with the strongest activity in the central and south-central portions.

The North Rim of the Grand Canyon recorded 1.11 inches of rain by 5 p.m. Bullhead City received 0.62 inch, and 0.59 inch was recorded at Lake Havasu City and Parker.

The thunderstorms were sparked by a low-pressure system over southern California that pushed warm, moist tropical air into Arizona.

Twister hits 60 east Valley homes

No one injured; is 1 of 2 seen in Pinal County

By ALAN ARIAV
And SAM STANTON
The Arizona Republic

APACHE JUNCTION — Two tornadoes were sighted Tuesday in Pinal County, and one ripped through two mobile-home parks near Apache Junction, damaging at

least 60 homes but injuring no one. "It was a great big black funnel," said Tommy Howe, a resident of the Bonita Vista Mobile Park. "Stuff was flying around everywhere."

Awning panels flew into the air and came crashing down onto citrus trees, and "cut lemons in half right off the trees," Howe said. "That stuff was moving, let me tell you."

Park manager Bob Rush said 40 to 45 mobile homes were damaged. Most had windows blown out or

awnings torn away. Five received structural damage, he said.

"I saw panels of awnings 60 to 70 feet in the air," Rush said. "I immediately got back in my office. I get in the house when something like that happens. It looked like big blades flying around in the air."

The tornado hit at about 5 p.m. It also damaged at least 20 homes at the nearby Sierra del Saguaro mobile-home park.

"Everybody ducked in their houses," Stanley Bristol, a park

resident, said. "My wife was out in the front street when she saw the tornado swirling."

"I looked out the back window, and everything was swirling around. It took only about a minute or so before everything quieted down. It was definitely a tornado."

Victor Kachelhoffer, who has lived at the park for five years, said the tornado ripped a metal chimney off his home and tore off a 60-foot aluminum patio roof.

— Twister, A2

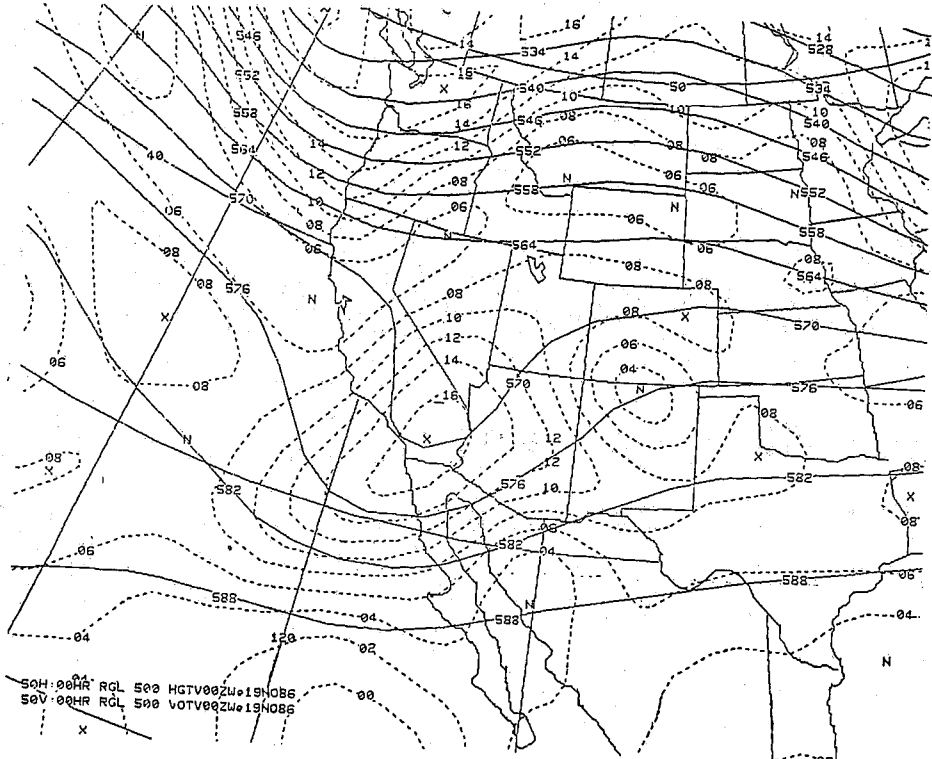
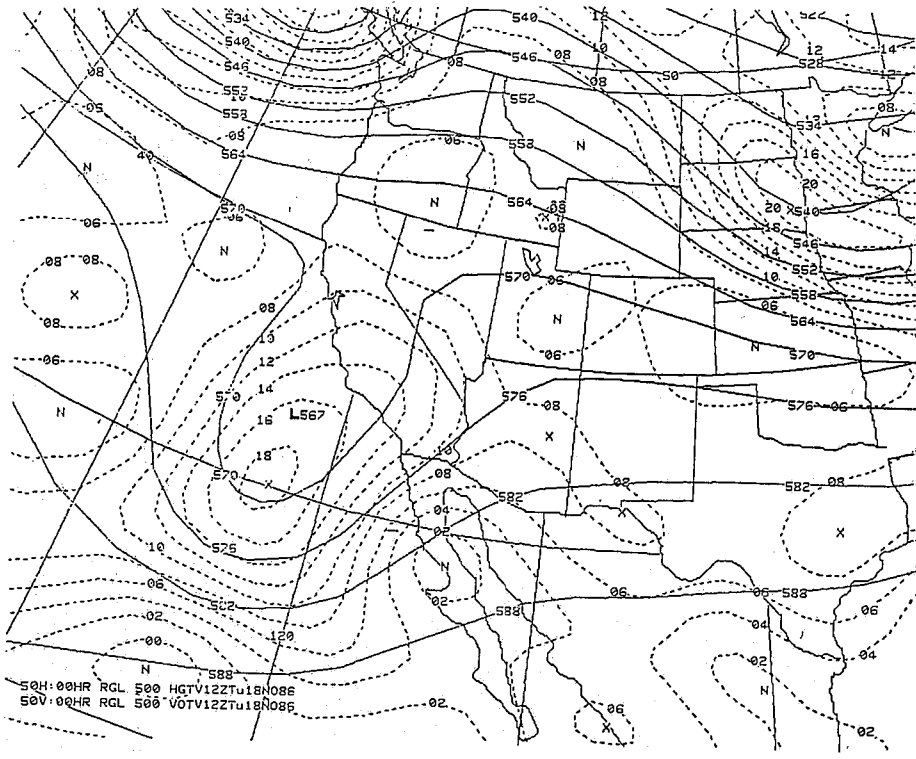


FIGURE 2. 500-mb height and vorticity analyses from the Nested Grid Model for 12Z on the morning of the 18th and 00Z in the afternoon of the 18th.

2231 18NO86 28E-2ZA 00944 13271 SB3

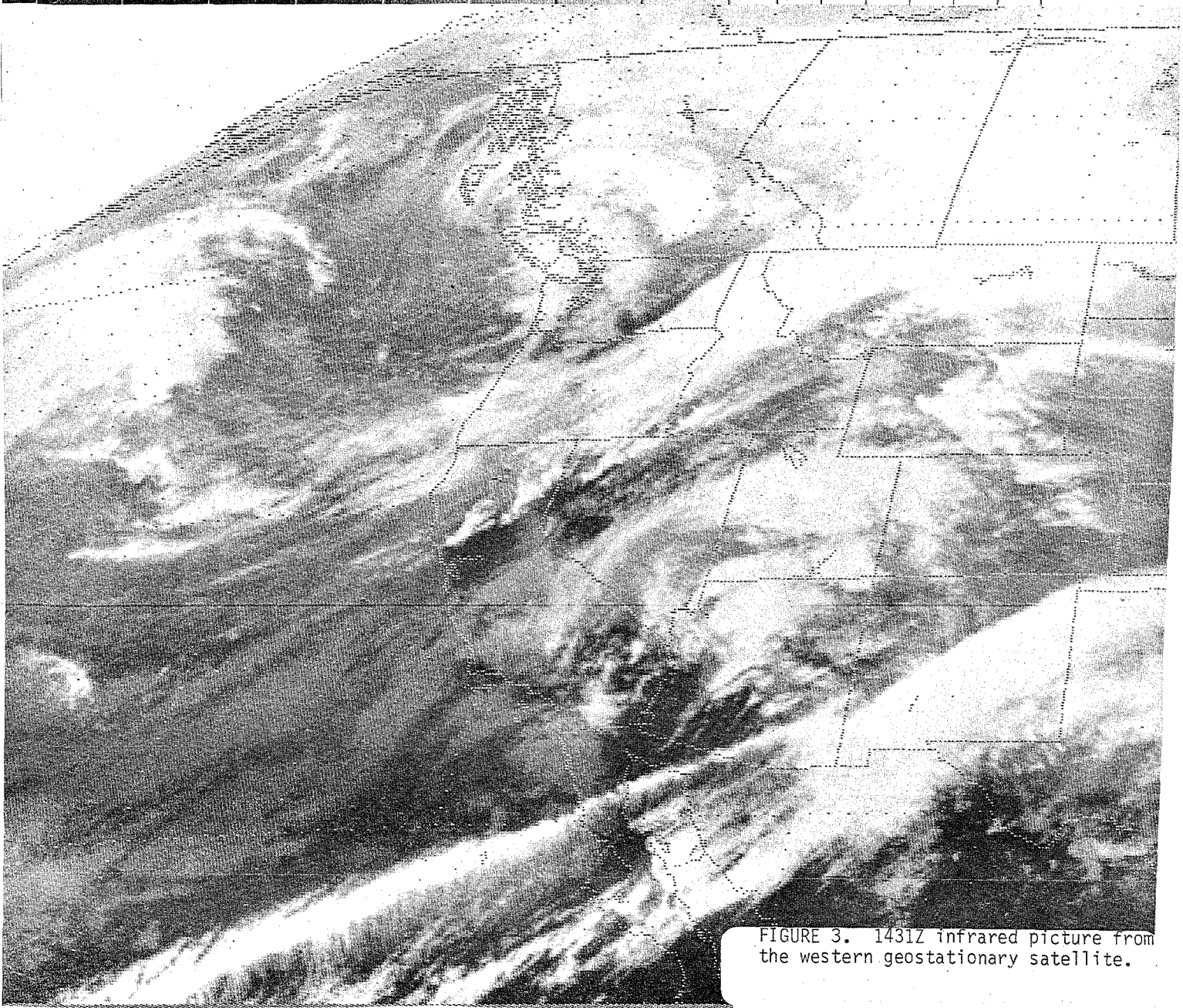


FIGURE 3. 1431Z infrared picture from the western geostationary satellite.

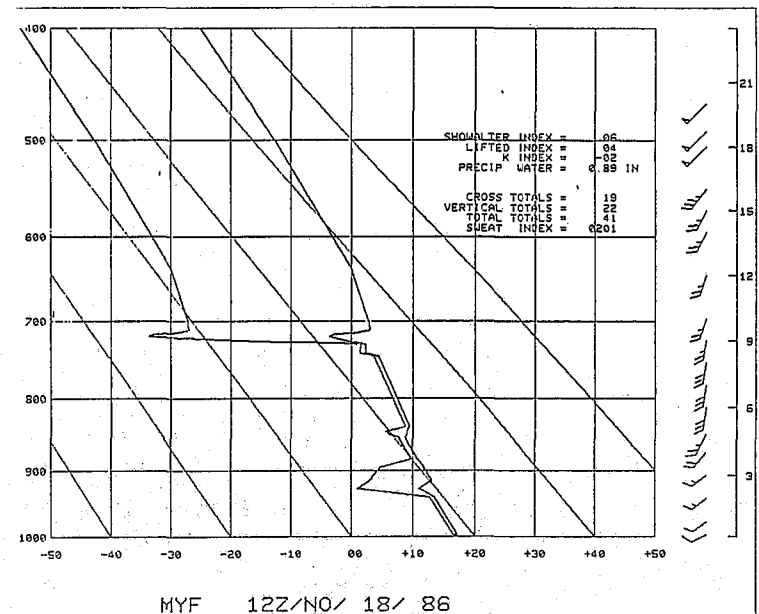
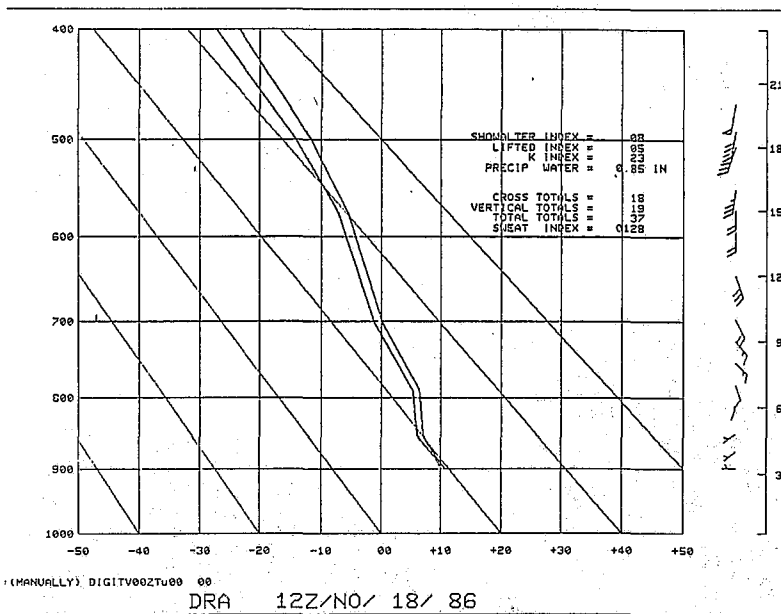
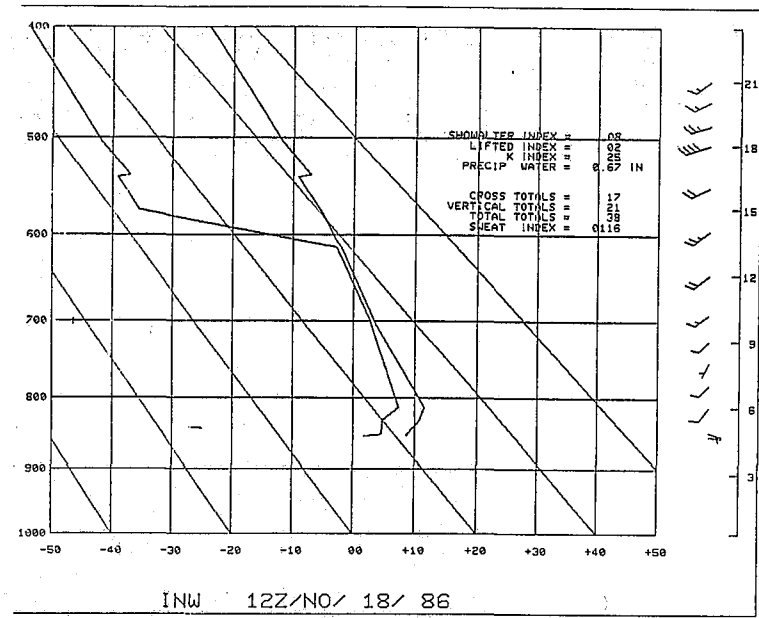
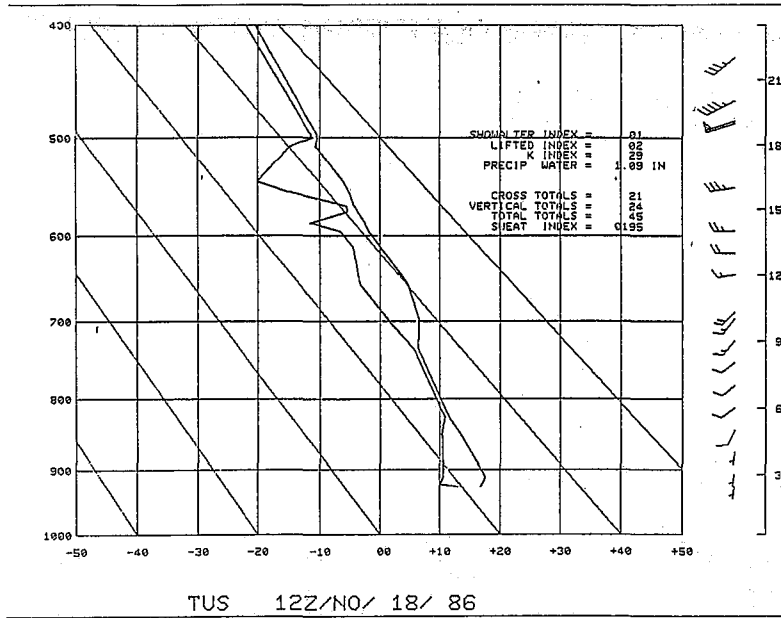


FIGURE 4. The 12Z raobs from the morning of the 18th for Tucson, Winslow, Desert Rock and San Diego.

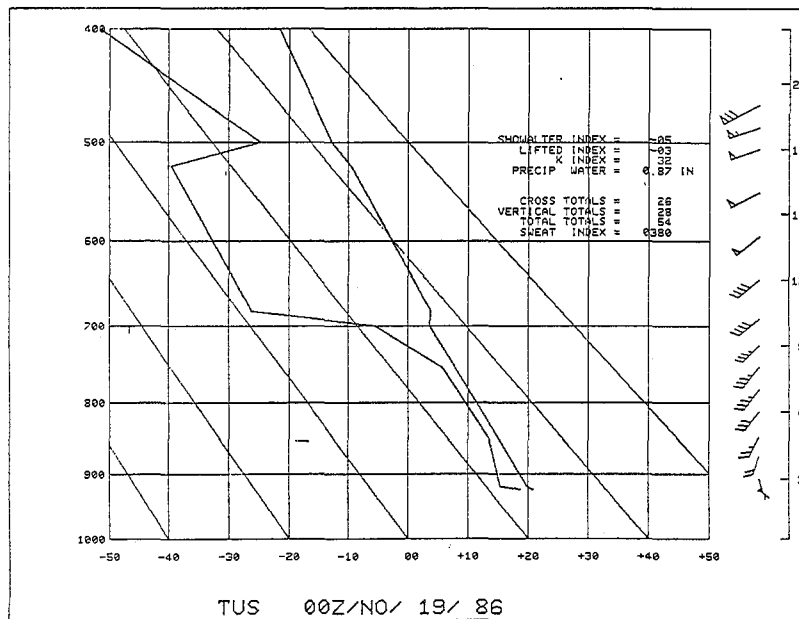


FIGURE 5. The 00Z raob from the afternoon of the 18th for Tucson.

↑ 14:31 18NO86 28A-Z 0090-1640 FULL DISC IR ↓

WSFO SFO SFSS
STLT ANLYS

SFC-BLACK
JA-WHITE

60N

50N

140W

130W

FIGURE 6. 2231Z infrared picture from the western geostationary satellite.

