

STORMTRACK

The logo for StormTrack consists of a thick, black, curved line that forms a shallow arc. Inside this arc, two small, stylized human figures are depicted in a running or jumping pose. To the right of the arc, a vertical, black, spiral line extends upwards, resembling a stylized lightning bolt or a storm track.

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TIM MARSHALL, EDITOR

PHIL SHERMAN, ASSISTANT EDITOR

COVER PHOTO: Tornadic storm from top to bottom captured on May 2, 1988 near Regan, Oklahoma.

STORM TRACK

Stormtrack is a non-profit publication intended for the scientist and amateur alike who share an avid interest in the acquisition and advancement of knowledge concerning severe or unusual weather phenomena.

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CIRCLES IN ENGLAND: ARE THEY REALLY WHIRLWINDS?

I. COMMENTARY

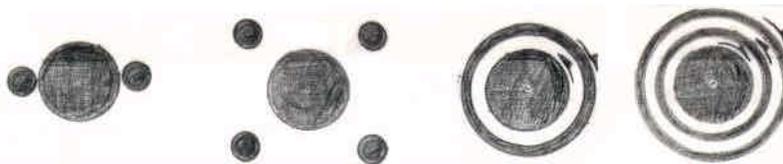
Let us forget about the U.S. tornado season and focus on what has happened in England. Interesting phenomena have occurred there which left the editor puzzled and in doubt. Scientists have discovered near perfect circles in England's wheat, rye, and corn fields. The damaged areas are always spiral-centered and have circular symmetry with a sharp cut-off at the perimeter where the crops have no damage what so ever. Over 150 circles have been documented and photographed from the ground and air. Most circles are singular spirals between 3 and 30 meters in diameter. About half of the circles spiral counter-clockwise, the remaining are clockwise. Even more amazing are the multiple circular patterns that have been discovered. The outer rings always spiral opposite the inner rings (see drawings below)!

In each circle, the crop is completely flattened. The stalks of each crop were not broken, just bent over just above the ground. In a few rare instances, some circles had layers where the crops were spiralled in different directions with a slight offset of the center. Some stalks were completely stripped of grain.

Apparently on two occasions people have witnessed the formation of a spiral complete with high-pitched humming sound, each lasting about 30 seconds. The people remarked how dust and debris were thrown up and outward, scattering broken straw and other crop debris on top of the surrounding (undamaged) crop. The spirals have formed by night as well as day, under cloudy skies as well as sunny skies.

So, these scientists in England have concluded the circles have been caused by descending atmospheric vortices which remain stationary for a few seconds. They go on to say the whirlwinds start from a few feet in diameter, widen, and then contract before dissipating. They attribute the formation of these crop spirals to whirlwinds generated by undulations in the local topography. I must say when I read this I thought it was something out of the National Enquirer! I'm sorry but I simply don't believe that explanation. Air is turbulent' especially in whirlwinds, and there is inflow.

So then, what caused the circles? Shall we try flying saucers? I'd bet the National Enquirer would love that one. How about some irate farmers taking their tractors out for a spin (or spin-up)? Are these mini-irrigation systems? But seriously, what caused these circles? How about it, Drs. Davies-Jones, Snow, Peterson? Anyone?



II. CHASER NEWS

Where is a good place to buy film in bulk? Try Liberty Supply Co., 6450 Santa Monica Blvd., Los Angeles, CA 90038. Ask for a price list. You can save \$3-\$4 per roll. ph: 1-800-634-2057.

III. LETTERS TO THE EDITOR

Gene Rhoden is impressed with the new Kodak VRG 200 film "If you've experimented with this film and find it comparable to the 100 film, you're right! When Kodak improved the 100 ISO to 200, it ended up with a grain structure as good as the old film. So for a little more money, you get an extra F-stop with the 200 film and the same quality results."

Tom Fava sent in his favorite list of recent articles on tornadoes. "Please, let me suggest the following:

- 1) "Tornados" by Peter Miller, National Geographic, June 1987, pp. 690-715.
- 2) "Year of the Tornado" by Steve Olson, Science 84, Nov. 1984, pp. 174-183.
- 3) "Tornado" by Civia Tamarkin, People, July 9, 1984, pp. 25-31.
- 4) "The Killer Winds of Spring" by Bruce Schechter, Discover, May 1981, pp. 18-24.
- 5) "Looking into Tornadoes" by Peter Gwynne, Audubon, March 1982, pp. 44-55.
- 6) "How Tornado Labs Tame Giant Twisters" by Franklynn Peterson and Judi Kesselman, Popular Mechanics, Aug. 1980, pp. 64-67.

Other favorites are listed in Weatherwise Magazine which publishes at least one tornado article per year. I do feel that these articles are the creme de la creme of the tornado literature I have encountered over the years. All of them are basically non-technical, heavily illustrated (many in color), and are an integral part of my tornado information collection. I hope STORM TRACK subscribers will check them out; they won't be disappointed!"

Roger Edwards summarizes his 1988 storm chase activities: "There were a few decent storms in Oklahoma, even into July (if you like big hail). I can only hope to share Dr. Gray's optimism about the upcoming tropical season. Although I saw no twisters this year, there were many interesting cloud features and lightning strikes to photograph. I went out on several 'cumulus photography excursions' and 'West Oklahoma tumbleweed tours'. Maybe next year!"

March 24: Richard Thompson and I got directly under the first storm, south of Bartlesville, OK. We saw some minor straight-line wind damage in Nowata, and punched six cores from Vinita to Muskogee as the storms built southwest and lined out. In each core, small hail was encountered, with 3/4 inch diameter hail in Muskogee.

March 28: Mike Eilts, Paul Eisenmenger, and myself photographed what would eventually be the Oklahoma City tornado producer. The storm developed near Anadarko. We followed it toward Mustang, plunging into sheets of rain and small hail that were moving rapidly southward. As we exited the precipitation, the movement of it was to the north. (Not something I wish to do again). We stopped in Newcastle, watching the mesocyclone occlude in heavy rain. Of course, we couldn't see the tornado through the green wall of hail and rain.

April 16: Richard Thompson, my wife Tanja and I caught an isolated storm northwest of Abilene, Texas between Jayton and Clairmont. We photographed a well defined wall cloud and very brief funnel to our west. After wall cloud dissipated, we moved under its previous location and found no damage. However, there was marble to golfball-size hail on the ground. We continued west and saw a rain-obscured wall cloud in Tahoka at sunset.

May 7: We spent two hours sitting in Apache, OK throwing rocks at a dumpster. A Big Bust! There was a stout inversion, we called a "nuclear cap". That is, it would of taken a nuclear warhead to break it. (Editors note: Many chasers, including myself, were also fooled on this one.)

May 15: Tanja and I got under the first storm north of Stillwater, OK and photographed a short-lived, weakly rotating wall cloud. More storms formed quickly, and we drove through marble, then golfball-size hail west of Cleveland. We hit and collected half dollar to tennis ball hail east of Cushing. "

Greg Story writes about the storms in Iowa on May 8th: "We had one great Mothers Day. I've seen pictures of tornadoes and talked to several people who saw them. One tornado was followed for 17 miles continuously on the ground in Iowa County, IA!"

John Mecikalski made his first serious storm chasing trip from Wisconsin to Kansas and Oklahoma. "Although the trips were unsuccessful for the most part, they proved to be fantastic experiences for both forecasting on the mesoscale and for understanding the connection between the upper atmosphere and severe weather development. The trip also turned out to be a heck of a lot of fun. "

C. L. Vlcek left the east coast and headed to the plains this year. We left Friday, May 13th' (Missed the great F0 outbreak on May 8th.) Steve Flood and myself left Washington D. C. in the morning and drove all night to NSSFC in Kansas City, MO by noon the next day. We continued to Emporia, KS to stay near a cold front. The next morning, May 15th, we drove southwest as a line of storms developed near Wichita, KS. The outflow boundary was marked by a small flat roll cloud. We stayed with the line all day and filmed a small wall cloud under a flanking line about 4 pm. Near the Cimmaron Turnpike on Rt. 18, we encountered strong winds and hail to 1-1/4 inches in diameter. It was over in five minutes. Car damage included partial loss of a side view mirror, and cracks in the tail light casing. For that price, I got some pretty decent video. We stayed at the OU Motel in Norman and spent the next few days touring West Texas, seeing Palo Duro Canyon. We encountered a strong storm near Dalhart, TX on May 19th, with rain and hail. On May 20th,

we saw heavy thunder near Lubbock, TX. Finally, we settled for an isolated outflow storm near Benjamin, TX on May, 21st and continued home the next two days. "

Jim Ladue tells about his May 30, 1988 chase. "Five students doing research from the Oklahoma University School of Meteorology were Herbert Stein, Steve Kruckenberg, Mark Shafer, Mike Kuetemeyer, and myself. We left Norman, OK at 9:45 am and headed west toward Amarillo ending up on the northern extension of an intense line of storms. What we found was supercell imbedded in heavy precipitation near Boise City, OK. We were positioned east of the storm which was perfect for the NNE moving cell. A tornado touched down at 8:09:30 pm about 8 miles WSW of Boise City and lasted a little over 2 minutes. A visible condensation funnel extended about 60% downward from a relatively flat rain free base. The inflow into the squall-line was an impressive 40- 50 knots with blowing dust and east winds. After the first tornado, 2 successive funnels were produced several miles north of the tornado. We were unable to pursue the storm further due to darkness and no road options. We were informed from the NWS that there was a 13 mile intermittent damage path which consisted of damaged barns and irrigation equipment. Amazing! A tornado in Oklahoma!

We observed another tornado near Ardmore, OK on May 2nd. We were in a good position to see the tornado about 3 miles west of Regan, OK. We were ahead of the wall cloud when the funnel touched down about 2 miles to our southwest. There was a short-lived debris cloud. We watched the tornado approach us, then lift about a half mile away. All in all, two tornadoes in a dried up season, I shouldn't complain. "

Jeff Piotrowski had a successful chase season this year: "On March 28, I observed a tornado south of Lawton, OK, about 25 miles north of the Red River. On April 1, I followed a tornado through northeast Texas. On April 16, I left Tulsa, OK about 4 am and drove to Abilene, TX as severe weather conditions were coming together over West Texas. One storm developed near Big Spring, TX but it moved northeastward into drier air. It did produce some hail northeast of Big Spring about 3 pm. I continued west to storms firing along the dryline and filmed two tornadoes. Our closest encounter was a tornado near Ardmore, OK on May 2. I was north of Troy which was the last place to report damage. I took video of the tornado as the sun streamed through the vortex. "



*Wall cloud in
Gaines County,
Texas on April 16,
1988. Photograph
by Jeff Piotrowski*

DENVER AREA TORNADOES: JUNE 15, 1988

by Richard Slonaker

June has proven to be a plentiful storm month in Colorado. I was fortunate to catch the storms that produced multiple tornadoes in the Denver area on June 15th of this year. There were a total of six tornadoes which caused extensive ground damage in the Denver area. Another tornado reportedly occurred around Fort Collins, CO at the same time, about 60 miles north of Denver.

On June 14th, a cold front moved through the Denver area producing thunderstorms. I escaped from work two hours early and gave chase almost to the Kansas border. These storms were fast moving and produced only some rain and lightning. However, the weather pattern set the stage for an explosion the following day.

The post-frontal conditions on June 15th were perfect for storm development. There was upper-level instability, plenty of low-level moisture, and clear skies for maximum surface heating. The National Weather Service had predicted a strong possibility of severe weather. As storms began exploding off the Front Range of the Rocky Mountains, I once again slipped away from work early.

At about 4:05 pm, the radio broadcast was interrupted with the announcement of a tornado at the Rocky Mountain Arsenal, just north of the Denver Stapleton Airport. My pulse quickened as I mapped out a plan to drive east, then north to catch the storm. It was reported that the control tower at the Airport was evacuated for 25 minutes.

At approximately 4:28 pm, I noticed this cloud that kept lowering to the ground. I took a road north and reached the ridge of a hill. There it was, a tornado. It was unbelievable! I stopped on the side of the road, set up my camera, and scribbled notes while trying to keep my eyes on the tornado. The tornado was to my northwest, about 13 miles away. I was just southeast of Aurora, a suburb east of Denver, at the time the tornado was near 16th and Monaco in central Denver. After squeezing off a half dozen frames in my camera, I proceeded down the road in search of a better view.

As I changed film, another funnel dipped out of the sky touching down at Broadway and Evans (southwest of the previous tornado). It was a much thinner funnel than the first (which was still going strong). However, it was still powerful enough to overturn several cars. The thin funnel dissipated before I had a chance to capture it on film. The first tornado dissipated about 4:44 pm. After the tornadoes had dissipated, I noticed a lot of lateral cloud-to-cloud lightning bolts with this storm. I have never noticed this type of lightning in other storms.

The Denver tornadoes were listed as F2 intensity on the Fujita tornado damage intensity scale. I think that was a bit optimistic. Damage to me seemed to be consistent with the F1 variety. Considering both tornadoes occurred in the heart of crowded Denver during rush hour, it was a miracle that no one was killed and few were injured. "

According to the Denver Post, Carol Reynolds watched the tornado from her backyard. "We could see the tree limbs and debris being drawn toward it as it moved down Colfax St. My husband's a weather nut. I couldn't get him inside." Sounds like an ST subscriber to me....



Denver Tornado photographs, 12 miles NW of my location from 4:40 to 4:47 pm
Photographs by Richard Slonaker.

WACO to WILLISTON

by David Hoadley

-which otherwise might be titled "Diary of a Lean Chase," After 10,957 miles and 16.1 days -one "landspout" and four weak funnels! That was my two week record this year. Lucky to have seen even one mini-tornado, I reluctantly gave up June 3rd and returned home. A few tornadoes were missed on two other days from closed upper lows -- each of which presented a confused air mass, misleading visual indicators and difficult choices -- when logic didn't seem to apply (more later).

My '88 chase spanned nine states from May 14-22 and May 27-June 3 (The week between I flew home and returned, naively hoping for better upper air support). This spring was dominated by strong troughs that initially looked great but then dug well south and became cut off from the jet stream as closed lows -producing widely scattered, marginally severe storms. Literally "driven" by Kansas City's Severe Storms Forecast Center, I chased widely scattered Slight Risk areas (ergo one round trip from Rapid City to Williston, North Dakota and back -the next day south to Colorado). It occurred to me more than once that I was hostage to the quiet electronic confusion of some computer chip in a large remote building, that was malevolently playing with my fate. Most of the time, "Thar warn't nuthin' thar" but scattered weak towers and non-sustaining showers.



1:24 PM MDT; 31 miles SSW of
Scottsbluff, NE

My only tornado was May 17, south of Scottsbluff, Nebraska. Starting from North Platte, I arrived at the Scottsbluff National Weather Service office and did several late morning surface map analyses. These confirmed Kansas City's early morning outlook and narrowed it to the immediate area. I drove about 25 miles south on State 71 and sat for the next, hour on some high ground, watching an isolated cumulus pocket develop to the southwest and move slowly toward me. Just prior to the tornado, it dropped a few "CG" (cloud-to-ground lightning) bolts in the largely evaporating rain shafts. At this time, its north-south extent was only 6-8 miles and east-west depth less than 3. That was the entire size of the cell, including cloud tops! The only anvil was a thin cap directly over the convection.

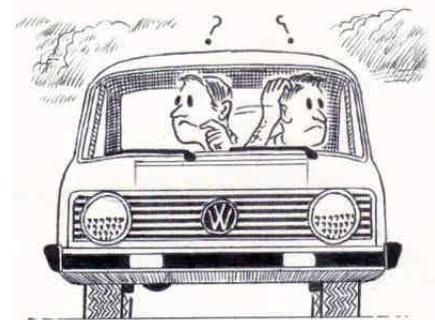
Subsequently, it spread to the northeast (Although Weather Channel radar that night barely picked it up). Small building towers scattered to the southwest. Otherwise, the sky was clear. The overall impression was of a very small, weak thundershower. However, having read of such western plains storms, I carefully watched the ground - not cloud base- for initial rotation. There was no visible condensation funnel under the slightly bumpy, small southern base --and there it, was! A small dust tube on the ground just below it, about 50' wide and several hundred feet high, moving northward. It lasted 2-3 minutes -initially as a laminar dust tube and the last couple of minutes as a weak (barely visible) low ground dust swirl. -- Big Wow! -- Actually, had I foreseen the rest of the chase, I should have done cartwheels right there.

Several tornadoes were missed. One was on the following Friday, May 20. Driving southwest from Wichita Falls toward Abilene, I was just east of a developing, high-base line squall, which I fully intended to cut through and head west toward Big

Springs. However, as I approached Abilene and I-20, that line intensified -resulting in several local storm warnings. Assuming that, this would modify (stabilize) the nearby air mass -but particularly to the west, I continued toward San Angelo -hoping for isolated convection in the clearer air to the southwest. However, the early/promising cell near there soon became linear and linked up with the old Abilene storm. At about this time, the Big Springs tornadic cell, reported in the May 31 ST, was forming. But all I could see in that direction was a building line squall 5-10 miles northwest of the city. Recalling the strong appearance of both storms this day, I was surprised that tornadic convection could form so close-by. Apparently, it was just another fluke of the closed low, according to Tim Marshall, who has had similar experience. In such cases, several closely adjacent storm lines can form along the leading quadrant, of the low (like hurricane cloud bands). However, the easternmost won't, necessarily go tornadic. If any will, you should look for the second or third convective lines or cells further west, (Of course, like all "free" advice, this will only work part of the time).

The second one missed was June 3 in north central Oklahoma (The Weather Channel reported two near and east of Pawnee). Driving south from Lincoln, Nebraska, I watched a squall line develop in southern Kansas. Shortly thereafter, Tulsa radio issued a severe warning for the pawnee area, which coincided with the severe watch box for northern Oklahoma and southwest Missouri. At this point, I was about to cross the Oklahoma border but was being pulled in two directions. To the immediate west, I saw an adjacent line squall building rapidly toward Pawnee (shades of Abilene a week earlier!). To the southwest a distant,

isolated cell was near there -- but competing with nearby cells for good structure. Also, local storms were moving to the southeast and likelier to be hailers. On the other hand -to the east I saw two new, isolated anvils building in clear air (better heating) and shearing to the northeast (better structure). So, I decided to go east. Logical? Not this time. The tornadoes were to my southwest! Another trick played on the old chaser by the closed "demon" low.



But, there were other compensations this spring: a pleasant picnic with some long time chase friends in Oklahoma and the renewing of old acquaintances with weather service personnel across the mid-west, whom I have known for years. Also, there was one marvelous day, when I didn't see anything but, enjoyed the special thrill of anticipation. It was a clear, sunny morning at the start of my second week. The future looked bright, with several possible days of severe weather, the old car running smooth and I was sailing across western Kansas -as the crisp morning air breezed through open windows. Gently rolling wheat fields stretched out to the north as I drove; no traffic (an occasional hawk lazily eyeing breakfast somewhere below). A moment of tranquility and fulfillment. Everything in its place and I more a part of the land than passing over it. A rare and magical moment, totally at peace, content, and alone with the quiet mysteries of life -a boundless horizon and an endless blue-on-blue sky. Something about that morning, remembered still and missed -- more than I can say.

Now, I join the rest of you as once again we begin the long, patient, and eternally hopeful wait for a new year -- with other diversions along the way (beach trips, good books, tearing of hair).

ARDMORE, OK TORNADOES

MAY 2, 1988

PART I: The Forecast

"Strong Dynamics, Weak Thermodynamics"

Had it been another chase year, the weather situation on May 2nd would have warranted a definite "let's go" chase strategy, but 1988 was different--yet again, a day in which I thought "if it's not one thing, it's another thing...". Many of the ingredients were present, for sure: a powerful storm system was winding up in the Texas Panhandle, poised to move onto the plains; the vertical wind structure and upper cold pool associated with it were favorable for severe weather; and a respectable dryline was beginning to advance eastward off of the Caprock Escarpment in Texas.

These strong dynamic parameters were offset by limited air-mass instability. Although the low-level winds were now blowing briskly from the south and southeast, a persistent surface high pressure area along the gulf coast had prevented the deep moisture from pouring more rapidly inland. Thus, the 60 degree Fahrenheit dewpoint line, which signified the northernmost extent of the better moisture field, was still south of Austin, TX at 7 a.m. A narrower channel of low-to-mid 50's dewpoints extended in an area 150 miles wide ahead of the dry-line from Hill City, KS to San Angelo, TX. Lifted indices were from 0 to -4 in the moist air, marginal for severe thunderstorm production.

Given the mixed scenario, I forecasted two possible areas for later severe weather during the day: (1) part of North Central Texas, along the leading edge of deeper moisture moving north, and (2) the area of Central Oklahoma that was ahead of an eastward bulging arc in the dryline. The SELS forecast of SLIGHT RISK mentioned that the low- and mid-level dry punch would continue to drive towards Southern Oklahoma and enhance the severity of any storms that did develop. Another favorable factor was an axis of diffluence at 500 MB that extended across North Texas and Southern Oklahoma. With the situation offering at least some promise, and relatively close to home, I decided to leave for work and prepare the car for a possible afternoon chase. Just before leaving, I obtained the 8 a.m. observations, noticing that a "line of CB's" had been reported near Abilene. "Looks like an 'early boom' in my forecast area", I thought.

By phone, I monitored the hourly observations for the target areas through noon, and found that dewpoints were rising steadily across the entire region, reaching 60 degrees at Dallas and 57 degrees at Ardmore. In addition, the skies outside IBM had rapidly become overcast with thick stratocumulus clouds surging northward. The dryline advanced to a Fort Sill, Wichita Falls, Brownwood line; the earlier line of CB's had apparently dissipated along it. Having skipped lunch and becoming increasingly committed to chasing, I decided that the 1 p.m. observations would provide my "now or never" choice. As a result of the following key changes, I chose "now": (a) surface convergence had increased significantly over South-Central Oklahoma, as Ardmore's winds had abruptly backed from 190 degrees to 120 degrees ahead of the dryline; (b) the thermodynamic pattern had also become favorable, with a strong warm/cool, dry/moist boundary well established (see 4 p.m. surface map); and, (c) a line of TCU had been reported east of Wichita Falls.

PART II: The Chase

I encountered scattered cumulus clouds surmounted by clear blue skies on my way north past Denton towards Ardmore, OK. The solid deck of strato-cumulus was about 20 miles to the east. I stopped a few times to get updated observations, so as to continue to verify the target area. As I approached Marietta, OK, an area of TCU's appeared to be developing to my northwest. I followed them north; one of the TCU's began developing more solidly at 4:00 p.m., near Springer, OK. I stopped and took some pictures of it, as the cloud tried to anvil, but its growth was overcome by the winds aloft--the top was pushed downstream at around 20,000 feet. I followed it east on Route 7 thru Davis.

Several chasers then crossed paths with me--Jeff Piotrowski of Tulsa and a van that was headed by Lou Wicker. Jeff quickly updated me on the weather situation, mentioning that an upper air sounding released close-by showed very strong wind shear in the low-levels and that cold advection aloft was moving in fast and was likely going to intensify the storms soon. My adrenalin began rising, as I watched towers trying to hold together north and south. At 4:45, I continued east to catch Route 12 going southeast, as the towers about 20 miles to the south had rapidly hardened.

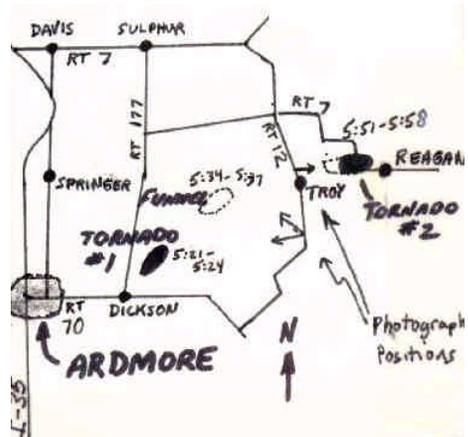
The car came to a halt 3 miles south of Troy--the young tower to the west that I saw go up only a half hour ago was producing a funnel! It was wrapped in light rain curtains, beneath a linear relatively rain-free base, below a line of towering cumulus that were barely 35,000 feet high. I snapped many photographs as the funnel, about 12-15 miles away, swung in the air from 6:21 to 5:24 p.m. The thick strato-cu deck that was overhead and to the east began to clear from the south, giving me a more illuminated view of the storm. I stopped a man in a pick-up truck that had a CB radio; he called the funnel in while we watched the cloud base swirl. A second, wider funnel formed at 5:34 p.m., looking like a large rounded cone that came only 1/3 way down from the base. It continued until 5:37 p.m., 5-7 miles' west of Troy.

At that point, as the rear flank downdraft cleared out the area behind the wall cloud, I noticed that the upper part of the updraft was overhanging the cloud base, creating a typical "edge of the mushroom" shape. Its leading edge became more cylindrical, with the solid strato-cu deck feeding into it right at its juncture with the rain area. Even with these severe storm signatures, the storm was still below 40,000 ft. It was really unusual.

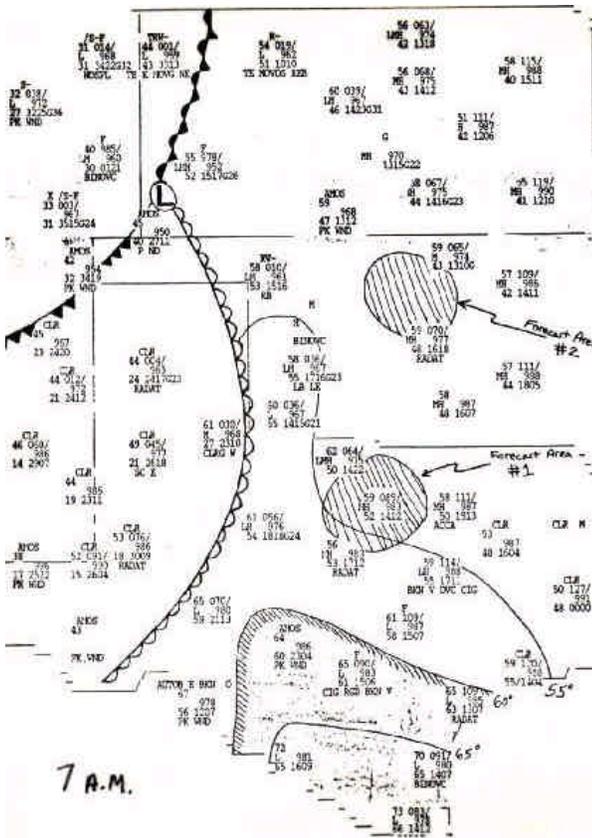
The updraft passed across the road a few miles to my north, and a third cone funnel formed at 5:51, just east of Troy. I shot photos of it from under the flanking line, looking into the downdraft area (picture #1). Moving further north to get in the sun, I began capturing the funnel as a "white tornado" from 6:55 to 5:57, at which time it roped out over the town of Regan. Although I never witnessed the condensation funnel touching ground, damage was reported in the area. My best shots included the white funnel dangling from the illuminated western side of the updraft (cover photo). The downdraft completely enveloped the tornado on the west and south sides. After the rope-out, the storm began to dissipate.



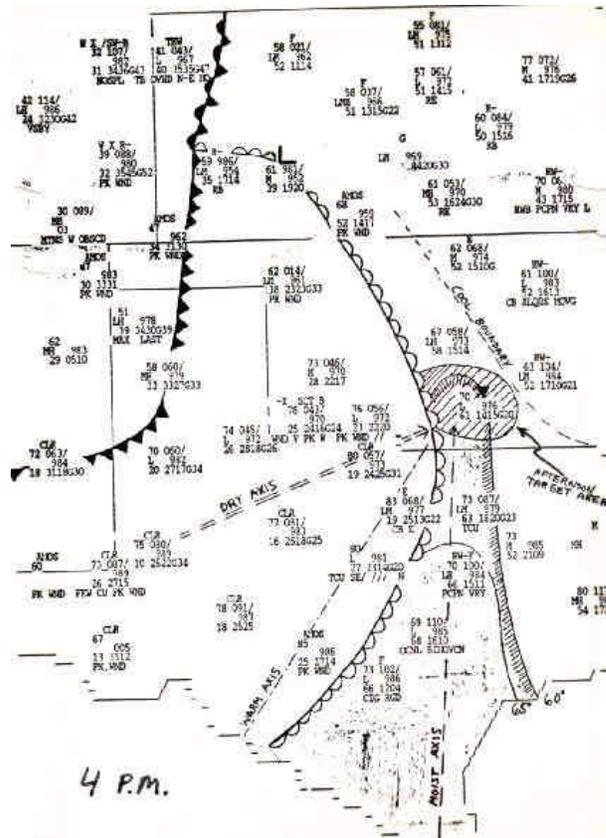
Fig 1. Photograph looking east toward Regan, OK of dissipating tornado at 5:58 pm. Photograph by Phil Sherman.



Area map around Ardmore, OK.



Computer generated surface map for 7 am on May 2, 1988.



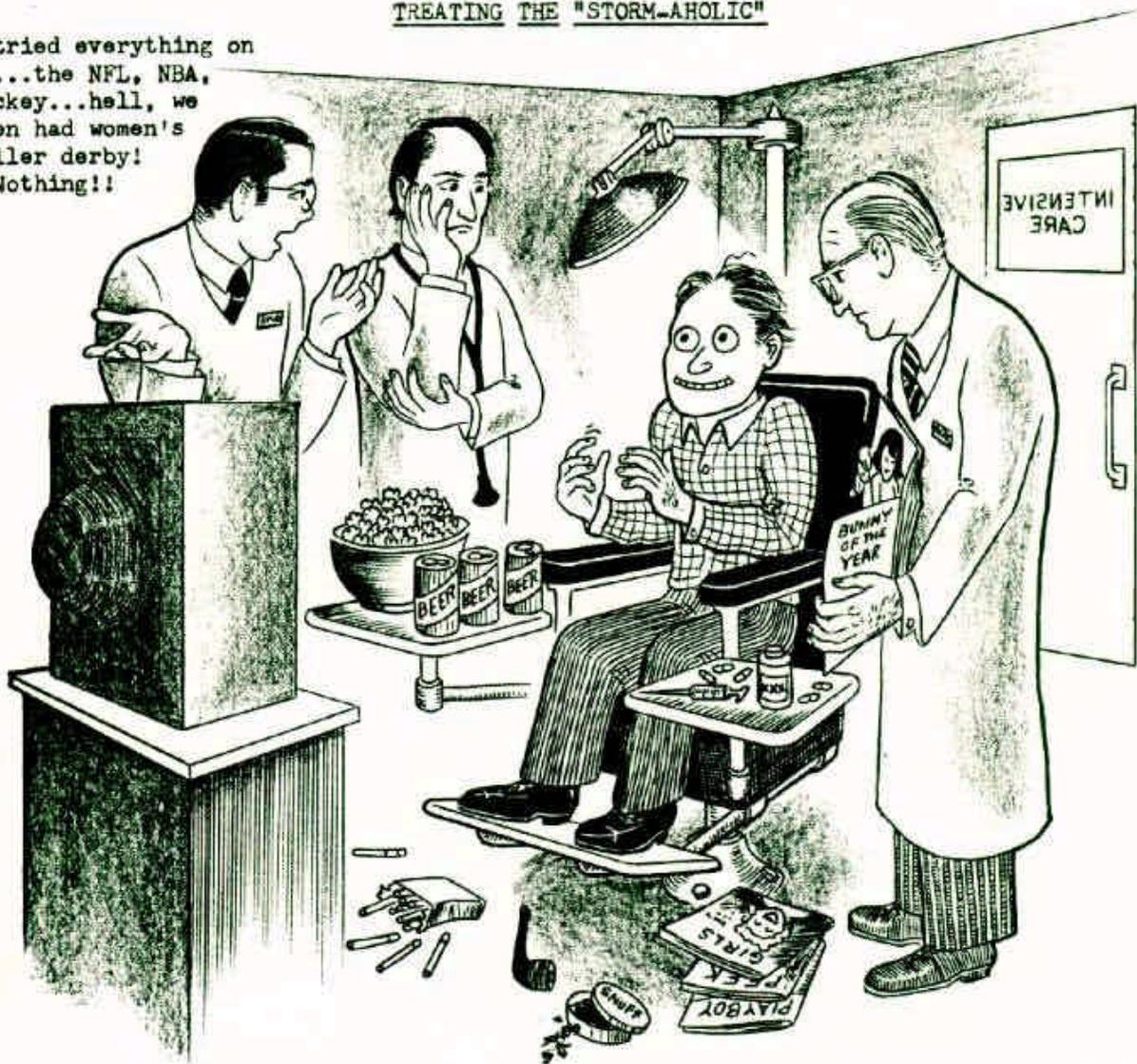
Computer generated surface map for 4 pm on May 2, 1988.

FUNNEL FUNNIES: Nothing Can Phase the Storm-aholics (Fact)

Nothing can phase the storm-aholics as they constantly live, breath, and eat storms.

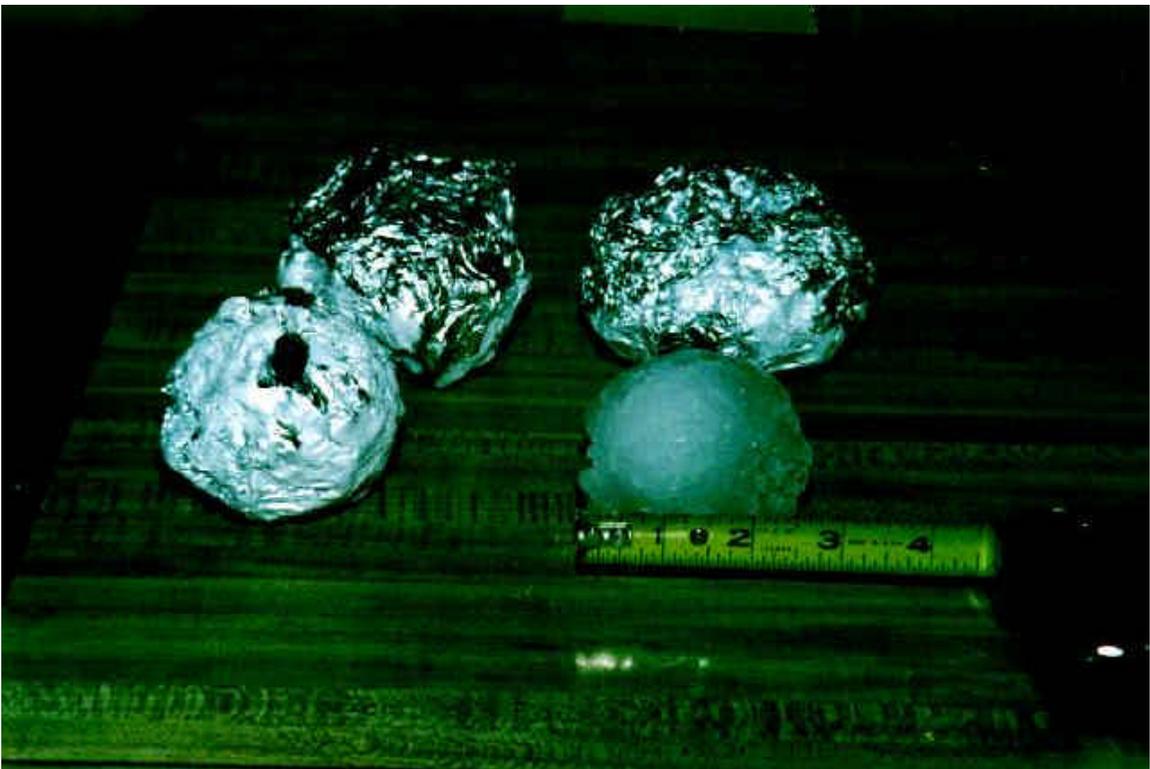
TREATING THE "STORM-AHOLIC"

- tried everything on
TV...the NFL, NBA,
hockey...hell, we
even had women's
roller derby!
- Nothing!!





Hailstones in Guthrie, OK on April 26, 1984, by Tim Marshall.



Hailstones in Del Rio, TX on March 16, 1987, by Don Boudreaux.