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**In this issue: TORNADOES NEAR SITKA, KS
and SALT LAKE CITY, UT**

Cover: Tornado looking southwest from near Sitka, Kansas on May 31, 1999. Photograph by Carson Eads.

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 storms. It is published bi-monthly by Master Graphics in Lewisville, Texas. David Hoadley founded the publication in 1977 and STORMTRACK has continued to grow and improve ever since. David Hoadley still contributes drawings and sketches. Darlene Egli designed the current cover. Right now, we have about 800 subscribers!

Anyone can submit an article or letter to STORMTRACK. Articles should be single-spaced and contain proper English. Right justified margins are preferred or the editor can retype the text. High contrast photographs reproduce best. Diagrams should be clear and legible, subject to photo-reduction. All articles will be edited.

Subscription rates are: U.S. First Class mail \$15/year. For Canadians, it's also \$15/year in U.S. Currency. Overseas is \$22/year in U.S. Currency. Individual regular issues are \$2.50 each, expanded issues are \$5.00 each, and double expanded issues are \$10 each. Hard copy issues are available for \$15 per year back to January 1996, or the complete 20 year set (1978-1997) can be purchased on **CD-ROM** for \$65. To subscribe or renew, send a check or money order PAYABLE ONLY to Tim Marshall, 4041 Bordeaux Circle, Flower Mound, Texas 75022-7050.

STORM TRACK CLASSIFIEDS

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THE MAY 3, 1999 OKLAHOMA TORNADO OUTBREAK- This video is a collection of tornado footage from the historic outbreak which ravaged central Oklahoma. Ride along with Tim Marshall up the Bailey Turnpike witnessing tornado after tornado including a close look at the F-5 Moore tornado from the top of a bridge. Travel with other chasers too as they witness tornado after tornado with a second storm to the west. You'll also take part in the damage survey following the event. 90 minutes, VHS only, color with sound. \$25 U.S., \$30 Canada, \$45 overseas (U.S. Currency please) Send check or money order to: Tim Marshall, 4041 Bordeaux Circle, Flower Mound, Texas 75022-7050.

STORMTRACK CD-ROM COLLECTION: ALL of the magazines are now on one CD-ROM from 1977 through 1997. There are 121 issues which include 1200 articles, 1000 photographs (mostly in color now!), 300 chase cases, and 110 funnel funnies. Contains easy to follow instructions to load on to your favorite web browser for IBM or MAC. Also has an index and search program. \$65 U.S. and Canada, \$75 overseas. Send check or money order to: Tim Marshall, 4041 Bordeaux Circle, Flower Mound, Texas 75022-7050.

OCTOBERFEST 1998 TORNADO CHASE VIDEO: On October 4, 1998, Carson Eads and Tim Marshall captured two high-contrast, long-tracked tornadoes in central Oklahoma. Ride along with their chase team to witness their best fall catch ever. Carsons' wide angle camera captured phenomenal storm structure while Tim zoomed in to the base of the tornadoes to show the violent swirling action near the ground. See trees lofted with root balls and all. See buildings disintegrate. See the sun illuminate the bottom of one tornado bright gold. 87 minutes, VHS only, color with sound. \$25 U.S., \$30 Canada, \$45 overseas (U.S. Currency please) Send check or money order to: Tim Marshall, 4041 Bordeaux Circle, Flower Mound, Texas 75022-7050.

1998 STORM CHASE MANUAL: It took 12 years, but the storm chaser manual has been completely revised, updated, expanded, and professionally printed. Contains twice the photographs (all half-toned) and twice the narrative of the 1986 version. Learn about chase objectives, equipment, documentation, photography, field strategy, the tornado, safety, forecast tips, and damage survey tips. 8-1/2 x 11 with glossy cover. 50 pages. \$15 post paid. Remit check or money order to: Tim Marshall, 4041 Bordeaux Circle, Flower Mound, Texas 75022-7050.



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CHASE HAZARDS

I. COMMENTARY

We all know there are hazards to storm chasing. However, this year I encountered more than the usual number of chase hazards which reminded me that we have to be careful out there. The typical chase hazards were driving long hours, encountered heavy rain and lightning, hydroplaning, and adding some hail dents to the car. However, this year, I lost both my front and back windshields on separate chases. A single “rouge” hailstone hit the middle of the front windshield on a tornadic storm near Allenreed, Texas on May 20th. Small shards of glass fell into the defogging fan and I still get a “shower” of glass when I turn the fan on. Glass got all over the floor and front seat and was difficult to pick up -even with a vacuum cleaner. Also, glass entered my camera case as it was open at the time.

Hurricane chasing presented even more hazards. In Hurricane Bret, I lost the back windshield when a small projectile impacted it when I was in the eye wall. I turned the vehicle around immediately to shield myself from the wind blown glass. The blinding rain made driving out of the hurricane almost impossible. Wind whipped froth in heavy rain -at night- obscured the painted lines in the roadway. I almost didn't see the downed power lines hanging across the road. In Hurricane Floyd, all roads out of Wilmington, NC were underwater the next day making it difficult for me to get out of the disaster area. After driving around for an hour, I picked the road that had the least amount of water depth and watched several vehicles cross the mile long lake before attempting to drive through it. Next time, I will rent a truck instead of a “Breeze”.

II. CHASER NEWS

80th AMS Annual Meeting - The annual meeting of the American Meteorological Society will be held at the Long Beach Convention Center in Long Beach, California from January 9-14, 2000. There will be many symposiums, however, symposiums of interest to chasers will be: **The Mystery of Severe Storms: A Tribute to the Work of T. Theodore Fujita** and **Project Vortex: What We Have Learned and Where We Must Go**. For registration, hotel, and general information contact the AMS or visit their web site at <http://www.ametsoc.org/AMS>, phone: 617-227-2426 x 226, or x227, or x305).

III. LETTERS/EMAIL TO THE EDITOR

Dr. Kazuya Fujita writes; “ I just read, with appreciation, your article on my father in the Nov.-Dec. 1998 issue of Stormtrack. I just wanted to correct one factual error. On p. 10, you note that he came to the US in 1956 with me. You state that it was Sumiko who came over at that time, but in fact Dad had a divorce in 1967 or 1968 (offhand I don't remember the exact year). My mother, Tatsuko, was the one who came over in 1956 and she was the one who helped with the Enoura tornado survey in 1948, as well as the Sakurajima survey in 1946. Dad married Sumiko in 1969 (I think). This is hard to pick up from his memoirs since there is no mention of a divorce or remarriage. Also of interest to you may be the fact that we are preparing a “complete” bibliography of his publications and reports (the list in his Memoir is selectively incomplete, especially with technical reports). We hope to issue this as SMRP report at the January AMS meeting. Other than that, I thought you wrote a very nice tribute. fujita@pilot.msu.edu

Nickolas Verge writes: “This May, I saw and photographed my first UK tornado (F0/T1-T2) with a well developed wall cloud beneath a large rotating rain-free base. As typical for UK funnel clouds/tornadoes, this tornado developed beneath a rapidly developing, weak thundershower (certainly NOT a supercell and apart from the tornado, NOT severe). Although at the time of the sighting, it was not possible to confirm that the funnel reached the ground, subsequent inspection of the suspected touchdown area confirmed a broad (100 meter) and poorly defined one kilometer damage/debris track through woodlands on the crest of a hill. Circulation speeds were estimated at between 60 and 70 mph or around 100 km/hr.

David Hoadley summarizes his chase season: “Since my naive presentation at The Weather Channel’s Storm Chasers Conference (way out of my depth), I have increasingly become aware of my limitations. Thus, less to say over the years. Recent long chases have also worn the old guy down — 33,400 miles last year (two good tornadoes) — but 35,000 miles this year yielded meager results. Trying to correctly read the models 3-4 days ahead, plus 8-10 trips each spring (to conserve annual leave) has been stressful, exhausting, and mostly frustrating. Several days before May 3, I analyzed “Slight Risk” of line storms and isolated tornadoes (not worth another 3,000 mile round trip), which was EXACTLY the early morning May 3 forecast. Then it changed, but too late for me. Just two tornadoes this year, one distant cone near Martin, SD on June 5 and a small ground tube southeast of McCook, NE on June 26. Noteworthy were the two cameramen and news director from the local CBS affiliate who took a week of their summer vacations to join me. They couldn’t leave before Friday evening, despite urgent warning to get there fast for a big show Saturday. So, they took turns driving straight through, led by my occasional pay-phone calls to their cell phone. Luckily, they arrived at the last possible minute (!) Saturday afternoon in northwest Nebraska. After a 1,500 mile “red-eye” drive, we met by the side of the road north of Merriman — just as the Martin tornado was coming down! They were delighted. I emphasized their good fortune, since a 10 minute delay anywhere en-route, and they would have missed it. The only other remarkable day was June 7 under a flanking line near Winner, SD and the best mammatus I have ever seen. Still, a long, hard season for little return. However, so long as I choose to forecast by my own skill (stubborn pride) and eschew cell phone advice in the field (asking others to “lead me” to the storm), it will be a hard road to travel.

IV. FUNNEL FUNNY

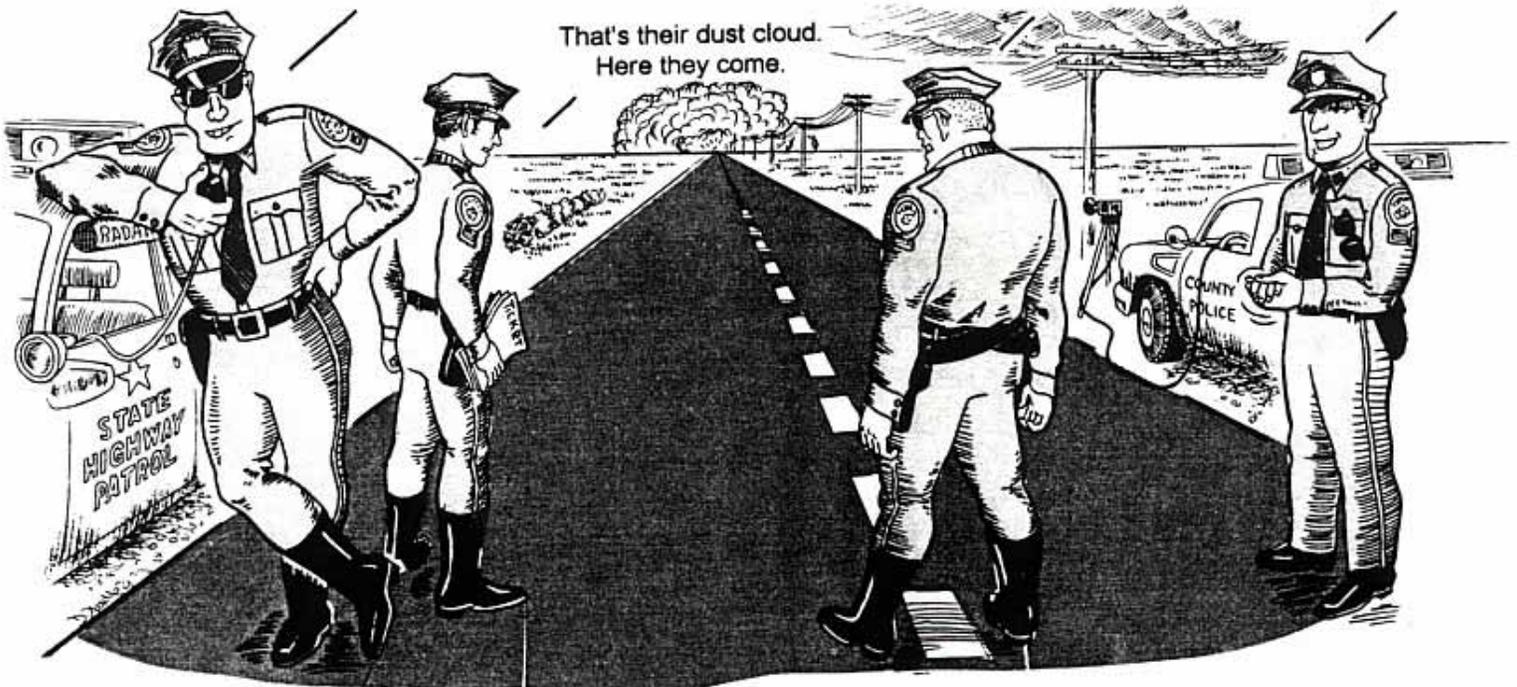
CHASER ROUNDUP

We lucked out chief. County tornado warning, and we're on the county line. The stampede is heading this way....

This is gonna "make my day."

Like taking candy from a baby.

That's their dust cloud. Here they come.

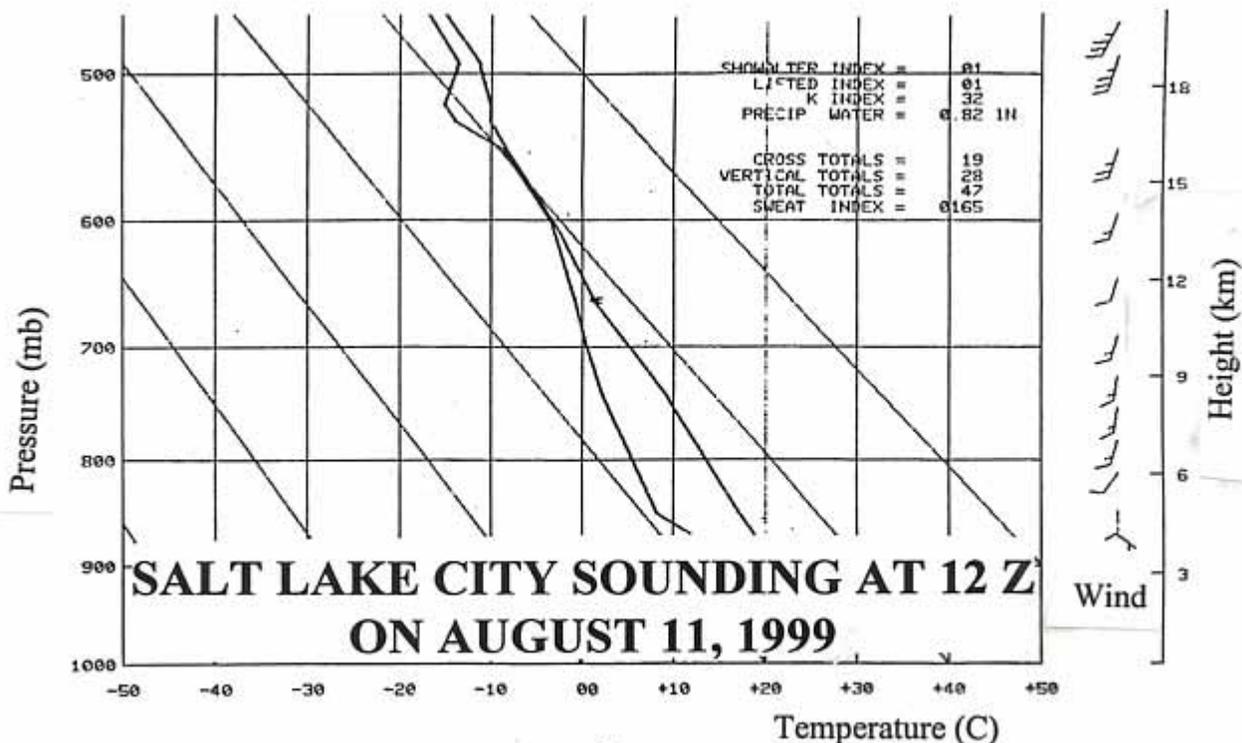


A TORNADO? WHERE? by Richard Conn

Get out your atlases storm chasers. How about chasing in Salt Lake City, Utah? I laugh too. Living here in Salt Lake City, I have learned it is a city known for NOT having tornadic storms, that is, until 12:55pm MDT on Wednesday, August 11, 1999. The day began looking like Oklahoma in April with strong convection beginning everywhere by 10am. The sky was dark to the north and northwest -but I thought the day would be another "paper tiger". On paper, surface dewpoints averaged a rousing 52 degrees F. The 700mb temperature was 5 degrees C with a dewpoint of 1 degree C. These 700mb values were lower than the previous 40 days or so when we typically have no rain. I noticed a rather sharp short-wave trough was poised on the Utah-Nevada border with a -14 degree C temperature at 500mb over Elko, Nevada. However, there was NO trace of directional shear in the area. Happily secure that this was just a typical stormy day, I went to work driving my route.

While driving around town, I saw that some of the pretty, big cumulus were now icing out in the usual western way of turning into "fuzzies", a common phenomena of valley storms which entrain dry air. Still, there was no reason to bring a camera or weather instruments on my route. Then at noon, I saw an explosion of new convection over the Oquirrh Mountains to the southwest of the city with an arm of convection extending eastward to downtown Salt Lake City. To the distant south, the air remained clear and copper in color. The clearing soon became obscured by a line of rain and small hail. Then, the parent storm reappeared and I started to hear about a tornado in downtown Salt Lake City on my car radio. I was north of the city at the time in Ogden. I spent a moment of depression, depravity, and dementia -but I recovered quickly and entered chase mode.

The storm over Salt Lake City moved rapidly northeast over the Wasatch Mountains taking most of its cool outflow to the other side of the mountains. This left the corridor from Ogden to the Idaho border with warm and humid conditions. The present darkness to my north appeared to be my only hope of avoiding a life-long disappointment. Large cumulonimbus were developing in the foreground along with a line of storms extending through the town of Tremouton in Box Elder County. They were feeding on a south wind moving over the Great Salt Lake converging with a gentle outflow from the north. As I arrived on the scene, the cumulonimbus were spectacular, forming over the same area north of the lake and training northeast towards the Utah-Idaho border in Cache County with a report of another tornado there. The storms formed along an east-west line and began to move towards Willrod Bay. By 1630 MDT, a small funnel cloud formed over the lake and moved towards shore. The updraft transformed into a rotating green-black boiling mass of cloud overhead, but quickly matured into another round of heavy rain and small hail. So, I felt a little vindicated. Then, strong outflow winds hit just as I opened the car door to get a better view. The winds twisted the door around the hinge and blew the door off the vehicle. Ah, a good storm chaser never goes home empty handed. Has anyone seen my car door?

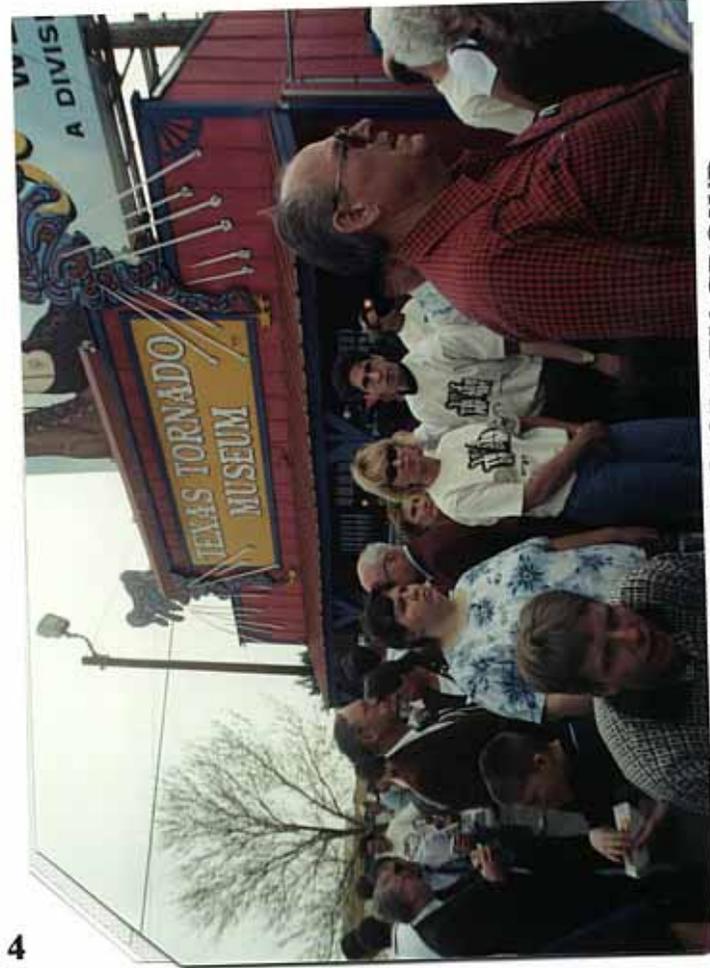


TEXAS TORNADO MUSEUM

The Texas Tornado Museum opened to an enthusiastic crowd on April fools day. The museum is located just west of the Big Texas Steakhouse at 7701 I-40 east in Amarillo, Texas 79120. Jim Leonard, Chuck Robertson and Tim Marshall were among the invited "seasoned" storm chasers. There were free hot dogs and cokes. The museum is open Monday through Saturday from noon until 6pm. You can purchase tornado photographs, videos, T-shirts, and other memorabilia. The museum is still looking for old newspaper accounts or photographs of Texas tornadoes. You can send them to Neoma Nelson at the above address or call 806-372-6000 or 657-7177.



OFFICIAL RIBBON CUTTING CEREMONY



WHAT A TORNADO CRAZY CROWD



EVEN GOLD MINERS SHOWED UP



TV-7 STEVE KERSCH SHOWS TWISTED CABLE



THE CROWD INSIDE THE MUSEUM



JIM LEONARD AND CHUCK ROBERTSON



TIM WITH AMARILLO SHERIFF AND MORTICIAN

SITKA, KANSAS CHASE STRATEGY: MAY 31, 1999 by Tim Marshall

What a classic set up for severe weather. The morning surface conditions revealed a broad area of northeast winds extending across western Kansas due to outflow from storms the previous evening. Surface winds across western Oklahoma were easterly (which is rare) -but this was excellent to provide the low-level turning of the winds needed to spin a storm. Also, the easterly surface winds would enhance the low-level moisture convergence in western Oklahoma. The big question was whether the outflow boundary would wash out in southwest Kansas, stall and lift north, or sag southward into the eastern Texas panhandle. I figured a good target was in the middle at Woodward, Oklahoma. Interestingly, three other chasers sent me emails that morning saying their target towns were Clinton, Oklahoma, Woodward, Oklahoma and Coldwater, Kansas. So, Woodward, Oklahoma looked good.

Upper air features showed a broad positive tilt trough over the inter-mountain region with elongated cold pool. The air temperature was -14C all the way down to Albuquerque at 500mb. Also, there was a 40 knot west wind extending through western Kansas at 500mb. Unfortunately, the Amarillo sounding information was missing. At 250mb, winds increased from 35 knots at Dodge City to 50 knots at Albuquerque. Those stronger winds would be over western Kansas and Oklahoma by late afternoon. The only negative feature I could see on the soundings was weakness in the 700 mb flow, but this is typical for this time of year. Both ETA and AVN numerical models indicated a dryline bulge was progged across central Oklahoma by evening.

Steve Tabb, Carson Eads, and I departed Dallas, Texas around 9am and headed for Woodward, Oklahoma arriving there around 3pm. We stopped for food and fuel, then set up the satellite dish and watched The Weather Channel. The first radar echoes were observed at 4:30pm near the Kansas-Colorado border so we departed and headed northwestward. We caught sight of a lone supercell with large anvil out in the clear air within the next hour. Vertical towers were feeding into the southeast side of the updraft. As we closed in from the southeast, we could see a large vault northeast of the updraft with the classic "cow catcher" feature and beaver tail extending north from the base of the updraft. We turned west onto Highway 160 and headed right for the center of the storm base stopping around 6pm near a playa lake about six miles east of Meade, Kansas. The beaver tail had a forked appearance extending to the northeast. At the southwest end of the updraft, the flared base gave way to crisp vertical towers that extended upward into the anvil. A cloud feature appearing as a stack of plates encircled the updraft crown reminiscent of an atomic blast. The updraft indented the bottom of the anvil and inverted cumulus were seen around the perimeter of this indentation. I sensed a tornadic storm was being born.

The storm began turning southeast (right mover). This was good for storm intensification (moving directly into the inflow) but bad for us as the road options were not too good. We retreated to the intersection of Highway 283 and 160 and were greeted by lots of chasers including Mike Foster, Gene Rhoden, Chuck Doswell and his wife Vicki. The storm intensified producing a nice wall cloud at the leading edge of a clear slot and precipitation curtains began wrapping around it. The updraft took on the classic backwards C-shape configuration and a second rotation center was noted at the very back (west) end of the updraft which produced a brief cone-shaped funnel around 7pm. We made the decision to head east on Rt. 160 through Ashland rather than going south on Rt. 283 (a good decision). We reached the intersection of Rt. 160 and 183 at 7:19pm and again set up our cameras. A dark precipitation area had developed northwest of the updraft. The cloud base was low, elongated, and ragged appearing as if it were to become outflow dominant. However, there was still a notch in the east side of the updraft and we had strong inflow winds. At 7:26 pm, an area of circulation tightened in the center of the base and a few brief dust whirls occurred below it. Two minutes later, condensation tubes began forming an dissipating under a distinct rotating lowering to our southwest.

We headed south through the town of Sitka, Kansas just as a tapered funnel extended down from the cloud base at 7:33pm and a cone-shaped tornado formed rapidly west of town. We stopped on a hill just south of town and filmed the tornado as it crossed open country heading southeast. I took video whereas Steve Tabb and Carson Eads shot still photographs. We had excellent contrast and an excellent position from which to view this tornado. The precipitation core finally caught up with us and the tornado crossed Highway 183 and changed into a cylinder with large dust bowl. The tornado tilted over to the southeast then dissipated around 7:40pm. The storm lined out after this producing a line of funnel clouds along the trailing shelf cloud. This chase was a perfect 10 for us. We made a good forecast, drove a long way right to the storm (without deviating), intercepted the storm from the southeast, stayed with it through a tough road network, filmed a high contrast tornado, and made it safely back to Woodward that evening. We even had time to catch dinner. If only more chases went like this.

THE OTHER STORM ON MAY 31 IN OKLAHOMA by Robert Satkus

After analyzing data, two areas had my attention: An area from the northeast Texas panhandle through northwest Oklahoma into southwest Kansas. The second area of interest was southwestern Oklahoma. An outflow boundary stretched from the northeast Texas panhandle through southwest Oklahoma into south-central Oklahoma and north Texas with very unstable conditions ahead of it. Although it seemed the best dynamics were over the first area, I really liked the instability over second target area. Bobby Payne and I headed west on I-40 to Sayre, Oklahoma putting ourselves in between the two target areas just in case. It was quite hot, with an air temperature of 94°F. We sat at the boundary, but there was no indication of anything going on. We explored an abandoned gas station and kicked a golf ball at each other. While we waited, an area of broken cirrus over spread us. An area of congestus developed to our southeast, but didn't lure us away from our target area. After waiting nearly two hours, we saw a few turkey towers to our northwest. We opted not to head that way and soon to my south, I could make out some cumulus bubbling up.

We went south to investigate and were greeted with a rapidly developing storm west of Altus. We continued on as new towers developed rapidly just west of us, but looked high based. Our storm was developing explosively and by the time we reached Mangum, Oklahoma, a razor sharp anvil was spreading out over us. We continued south to near Duke, Oklahoma with a rain free base visible to our southwest. We stopped and realized this was a left moving split. We continued south to Duke with the right mover just west of us. At the leading edge of the core we were hit with quarter hail. We stopped at Duke, but the storm didn't seem to be visually impressive. An LP (Low precipitation) storm was rapidly building to our south-southeast as well. We let the Duke storm go and decided to try our luck with the LP storm, following it to Altus. It looked good, but never was a tornadic threat. We found 1.50" hail on the ground just west of Altus. By this time other storms were exploding to our west and northwest. We could see one monster storm to our northwest, we guessed, near Shamrock Tx. We headed that way but were sidetracked by a rapidly developing severe storm in Harmon County, Oklahoma.

We made it to Gould, Oklahoma and went north, stopping in between the two storms to try and decide which was best. The first storm, now near Erick, Oklahoma was apparently tornadic, but the southern storm was looking better and better and we were closer to it. From a distance, we could see a large wall cloud with the first storm, but anvil precipitation from the second storm obscured our view. We went north a bit further, when a tornado warning was issued for the area west of Willow, Oklahoma. This surprised the heck out of us because by now we were at Willow. We stopped to get a look but couldn't see the base. Hail began to fall on us and as it reached quarter size, we dropped south. This storm was now moving southeast. I am not sure, but I believe the Erick storm merged with the southern storm. As we dropped south, the rain free base came into view, but it didn't look too impressive. It had more of a gust front look to it. Bobby and I decided to get a little closer and head a few miles west, but it just didn't look right. The road turned to mud, so we headed back east to Highway 283.

About this time, I looked to our southwest as we got to the Brinkman area, and from the featureless base, a cone-shaped funnel developed rapidly and extended to the ground. We didn't get video of the touchdown because it happened so fast and caught us by surprise. The funnel soon turned into a large, low hanging bowl, with dusty vortices visible underneath. Visibility was poor and even though sunset was nearly an hour away, it was very dark. The tornado moved east-southeast and was about two miles to our southwest. Occasional ground contact was apparent, until the funnel turned into a fat rope and was rapidly undercut by outflow. Bobby and I wanted to head south then east on Highway, but missed the road. When we realized what we did, we turned around to watch a partially rain wrapped wall cloud move over the intersection we were looking for. We drifted back north and watched rotating rain curtains a few hundred yards east of us. Bobby panicked a bit and turned back into the old core from the occluded updraft, which dumped what it had left on us, quarter hail and 60mph winds. After that we let this storm go and headed towards a new storm, once again near Duke. As we headed south, the storm was to our southeast as we reached Mangum, Oklahoma. In the fading light we could see a wall cloud several miles away, and at one point thought we could see a large tornado, but distance and fading light wouldn't let us confirm it. We headed back east on Highway 62 towards Altus, with lowerings visible and tornado warnings in effect. After dusk, northeast of Altus we once again thought we saw a nice stove-pipe tornado, but could not confirm it. We followed the storm to Lawton, staying behind it, and as we got to Lawton, saw quite a bit of wind damage. An area on the west edge of Lawton experienced an apparent microburst with winds near 120mph based on a National Weather Service survey. A large two-story house had most of the upper story removed. Numerous homes were damaged in this area. email: robsat@ionet.net

SITKA, KANSAS: THE ONE THAT GOT AWAY by Amos A. Magliocco

I don't know which moment was more painful: when we heard NOAA Weather Radio reporting a spotter sighting of a large tornado on the other side of the storm, or when we got to our motel room that night in Woodward, OK, and saw the electrifying video of a large, stovepipe-shaped twister on The Weather Channel. The Sitka, KS tornado was mere miles from us -the beginnings of which may have taken shape almost directly over our heads - but we missed it.

We were excited about the prospects this day. A significant weather event was in the cards with a triple point intersection of a cold front, dryline and surface low pressure system taking aim at southwest Kansas and the Oklahoma panhandle. We were in the entrance region of a jet maxima at 300mb, so in addition to our high surface CAPE (convective available potential energy), relatively positive speed and directional shear, we had some upper level dynamics to assist in the formation of severe storms. The Storm Prediction Center forecasted a moderate risk of severe storms in the area, and so we left Denton, Texas the night before to get a head start on the long drive ahead. As we left, I picked Liberal, Kansas as a potential target knowing very well that conditions in the morning could change that bulls-eye.

Weather systems rarely act in precise accordance with the models or the wishes of the forecaster. Still, Liberal seemed the logical place given the relatively good agreement between models concerning the movement of the entire system. However, this forecast turned out to be right for a few wrong reasons, which I'll discuss later. We pulled into Elk City, Oklahoma at nearly 5:00am to grab a few hours of sleep before we hit the surface plots and models again in the morning. That done and after a hearty plains breakfast, we sailed for Woodward, Oklahoma, not as a target area but as a staging ground for the final interception of whatever the day would bring. Along the way, my chase partner Blair Kooistra noted the ACCAS clouds overhead, a sign of turbulence in the upper levels.

At Woodward, we looked at charts and maps and read Dr. Erik Rasmussen's evaluation of the splitting jet maxima to the west-northwest and his conclusion that this could create a zone in between the split flow of the less than positive dynamics. So, he opted to direct his VORTEX armada to the northeast corner of the Texas Panhandle, near Canadian, TX. We thought this was reasonable and reverse-engineered his forecast to see the split flow and buy the argument. We headed that way, too. The VORTEX team launched a weather balloon around 4:30 PM and we listened in on their frequency to hear the results. When the data came back, they concluded the best chance for storms to fire was to the north some. It is very important to me to do my own forecast, badly or not, and I abhor the idea of tagging along without having convinced myself of the reasoning, however, I'm not going to argue with a team of research meteorologists who just launched a radiosonde. So we followed the VORTEX armada.

As we moved toward the sleepy Texas town of Darrouzett, Blair pointed out a solitary cumulus tower to the NW. It went up fast and hard, impressing us immediately. Our concern up until this point had been whether the cap would break at all, so when it did, we knew this storm should certainly become severe quickly. The boundary layer pot was boiling. It was hard to judge distance: when we first saw it, we thought it might as close as the Oklahoma/Texas border. Soon we revised that to the Oklahoma/Kansas border until we heard that this storm had formed 10 miles north of Liberal Kansas. So we went faster.

Around 6:00 PM, we arrived in Plains, KS at about the same time as the storm. We noticed some interesting lowerings were briefly rotating, and had a confusing picture of storm structure before us, with either new updrafts forming to the west and south of the original storm, or an old, shredded updraft skin still lingering with the associated scud junk. After a quick examination of the rotation, we moved east on Highway 160 where we encountered hail from pea to marble size, rattling the skin of the truck and my nerves. My new vehicle has one major chasing drawback: an overhead glass sunroof. Since it was the only four wheel drive 4Runner I could find in South Florida before I moved back to Texas, I accepted this potential hazard when I bought the truck with the

thought that I would find or have manufactured some sort of protective hard-plastic cover for the glass above my head. One baseball to softball hailstone and water would pour into the cabin, ruining the headliner and who knows what else.

As we pulled into Meade, we were in a pure hail shaft. No rain, just rocks pelting us without pause. I even recall sunlight at that point, a macabre scene considering the menacing storm nearby. The updraft was right behind us, and, while the hail held my full attention as we reached the city limits, we soon spotted a bigger problem. Just to our south, perfectly parallel to our course and moving at nearly the same speed spun a rapidly rotating, large wall cloud with tornado written all over it. It was no more than one-quarter mile away and loomed larger by the moment. Blair and I were quite excited and nervous, and I looked for the first possible road to turn left and get north away from this monster which I was convinced would start throwing around bits and pieces of Meade, Kansas at any moment. Blair kept the video rolling and his eye on the wall cloud (it's great to chase with photo-journalists) while I steered a course around slow-moving vehicles and, carefully as possible, through one red light and north on Highway 54 out of town. We went two or three miles before we stopped and looked back—the wall cloud still in sight and still ominous. Regaining our wits, we went back onto Highway 160 to head east and stay with the storm. But, like a centurion, the hail shaft stood between us and the now departing mesocyclone. We poked and prodded, and ultimately decided against punching through when a baseball hailstone smacked the driver's side door. This turned out to be our last best chance to get back into a favorable position. Reflecting on the decision now, I don't regret not going through. Reports from other spotters of hail even larger than what we encountered convinced me that had we gone through, we would have suffered serious damage to the vehicle, possibly losing that pesky glass over our heads, too.

We elected to move south and try to flank the storm by going around the corner of it, which proved an impossible task, given our distance from the mesocyclone at this point, and the scarcity of roads in southern Kansas and northern Oklahoma in this region. Around this time, a large, stovepipe-shaped tornado was tearing through an open field south of Sitka. We never saw a thing.

Racing east and north on Highway 34, we began to listen in on other chasers suffering the same fate, including one of the Cloud 9 tour buses, Al Moller from the Ft. Worth National Weather Service and Bruce Haynie among others. As we caught up to the storm, still exhibiting signs of rotation with lowerings and scud all around, we drove into a chaser convergence the likes of which I would imagine has never happened before. Blair and I estimated there were between 75 to 100 people and at least 40 different vehicles, perhaps more. One of the sights that is most memorable to me was a crowd of chasers up on an elevated area—like a mini-mesa—with tripods and other photo gear. It looked like an audience at an outdoor arena. Out on the lawn would be a great place to catch a Jimmy Buffett show, but elevation and tall metallic instruments around a severe thunderstorm are a recipe for lightning strikes.

I have not heard of anyone getting struck that day, and I am relieved and surprised. Considering the number of people and vehicles, I thought the armada behaved very well. There was one individual in the middle of the road at one point with a tripod. Blair and I couldn't understand why he would stand in the middle of the road rather than off to the side, or, for that matter, what he was shooting since at that point, we were still well behind the storm and there were no real features in sight.

Sam Barricklow and Tim Marshall both caught stunning video of the tornado and showed it to us after we all stopped at the same small diner that night in Woodward, Oklahoma. My congratulations to them again. As Al Moller reminded us all on the radio of one of chasing's golden rules: **OUTFLANK THE THING!** Many thanks to Blair Kooistra, my chase partner that day, for the excellent review of the chase he wrote that very night, which served as a primary source for this report. We'll get the next one, bud.

SITKA, KANSAS CHASE STRATEGY: MAY 31, 1999 by Tim Marshall

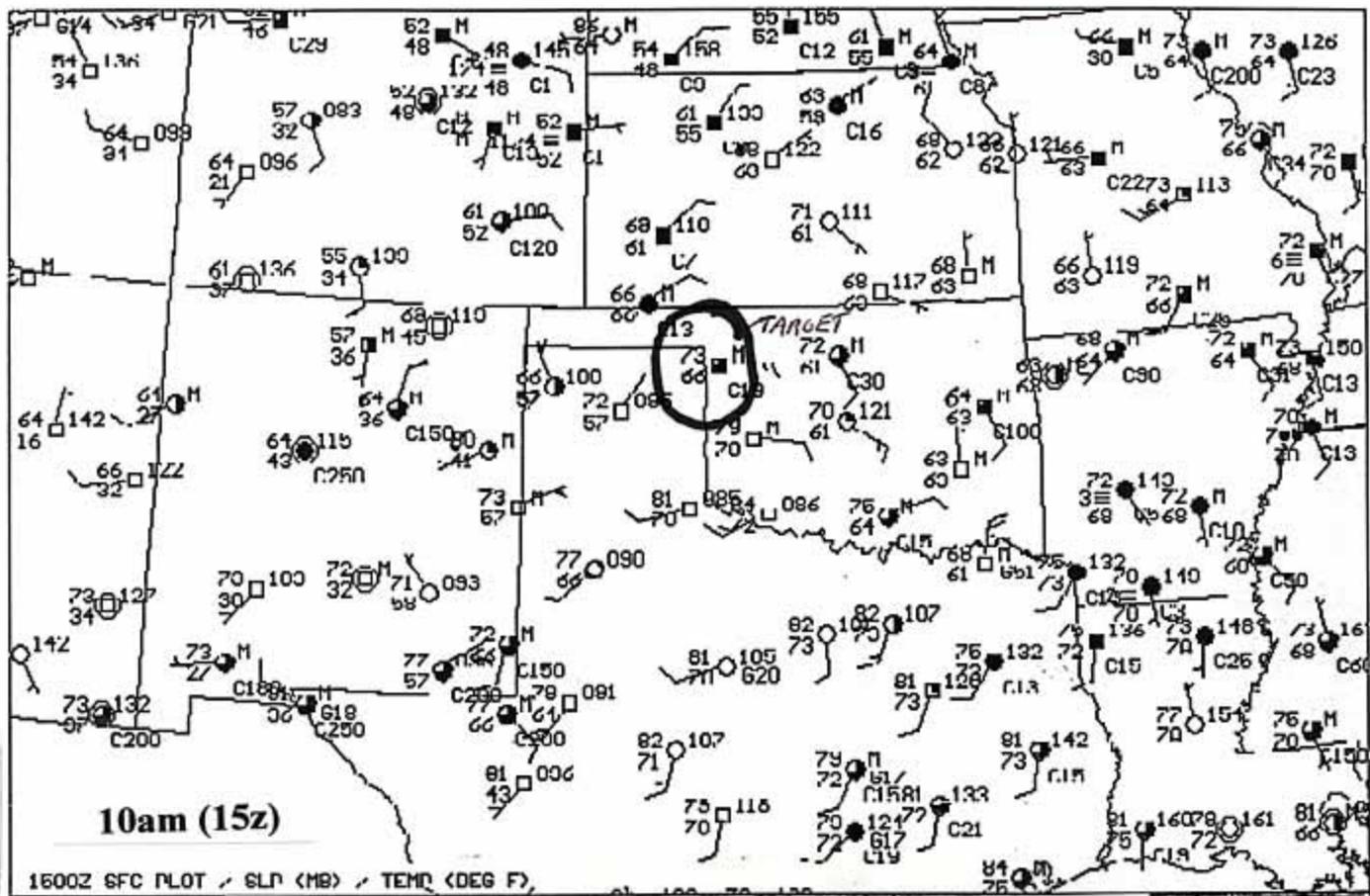
What a classic set up for severe weather. The morning surface conditions revealed a broad area of northeast winds extending across western Kansas due to outflow from storms the previous evening. Surface winds across western Oklahoma were easterly (which is rare) -but this was excellent to provide the low-level turning of the winds needed to spin a storm. Also, the easterly surface winds would enhance the low-level moisture convergence in western Oklahoma. The big question was whether the outflow boundary would wash out in southwest Kansas, stall and lift north, or sag southward into the eastern Texas panhandle. I figured a good target was in the middle at Woodward, Oklahoma. Interestingly, three other chasers sent me emails that morning saying their target towns were Clinton, Oklahoma, Woodward, Oklahoma and Coldwater, Kansas. So, Woodward, Oklahoma looked good.

Upper air features showed a broad positive tilt trough over the inter-mountain region with elongated cold pool. The air temperature was -14C all the way down to Albuquerque at 500mb. Also, there was a 40 knot west wind extending through western Kansas at 500mb. Unfortunately, the Amarillo sounding information was missing. At 250mb, winds increased from 35 knots at Dodge City to 50 knots at Albuquerque. Those stronger winds would be over western Kansas and Oklahoma by late afternoon. The only negative feature I could see on the soundings was weakness in the 700 mb flow, but this is typical for this time of year. Both ETA and AVN numerical models indicated a dryline bulge was progged across central Oklahoma by evening.

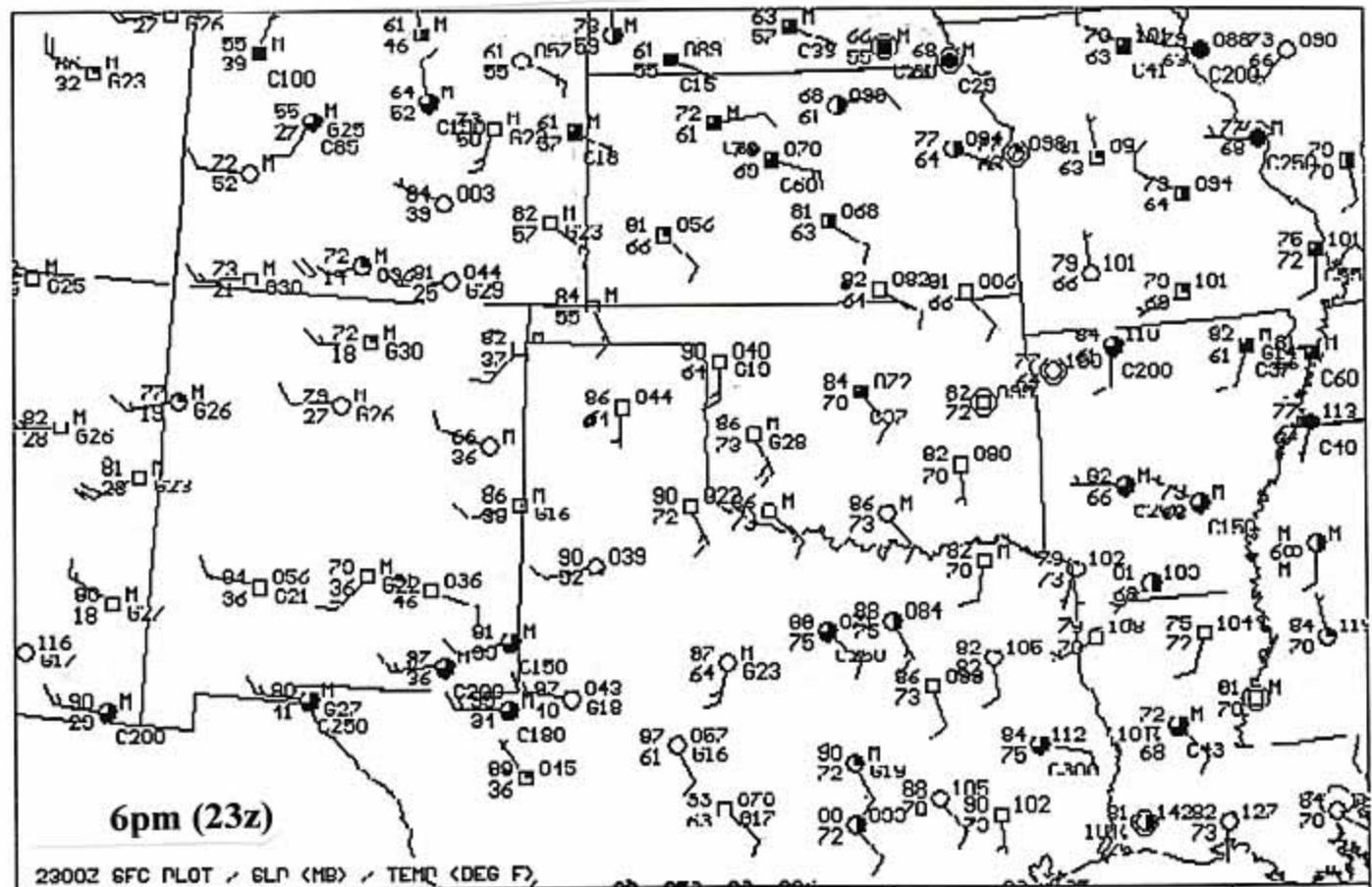
Steve Tabb, Carson Eads, and I departed Dallas, Texas around 9am and headed for Woodward, Oklahoma arriving there around 3pm. We stopped for food and fuel, then set up the satellite dish and watched The Weather Channel. The first radar echoes were observed at 4:30pm near the Kansas-Colorado border so we departed and headed northwestward. We caught sight of a lone supercell with large anvil out in the clear air within the next hour. Vertical towers were feeding into the southeast side of the updraft. As we closed in from the southeast, we could see a large vault northeast of the updraft with the classic "cow catcher" feature and beaver tail extending north from the base of the updraft. We turned west onto Highway 160 and headed right for the center of the storm base stopping around 6pm near a playa lake about six miles east of Meade, Kansas. The beaver tail had a forked appearance extending to the northeast. At the southwest end of the updraft, the flared base gave way to crisp vertical towers that extended upward into the anvil. A cloud feature appearing as a stack of plates encircled the updraft crown reminiscent of an atomic blast. The updraft indented the bottom of the anvil and inverted cumulus were seen around the perimeter of this indentation. I sensed a tornadic storm was being born.

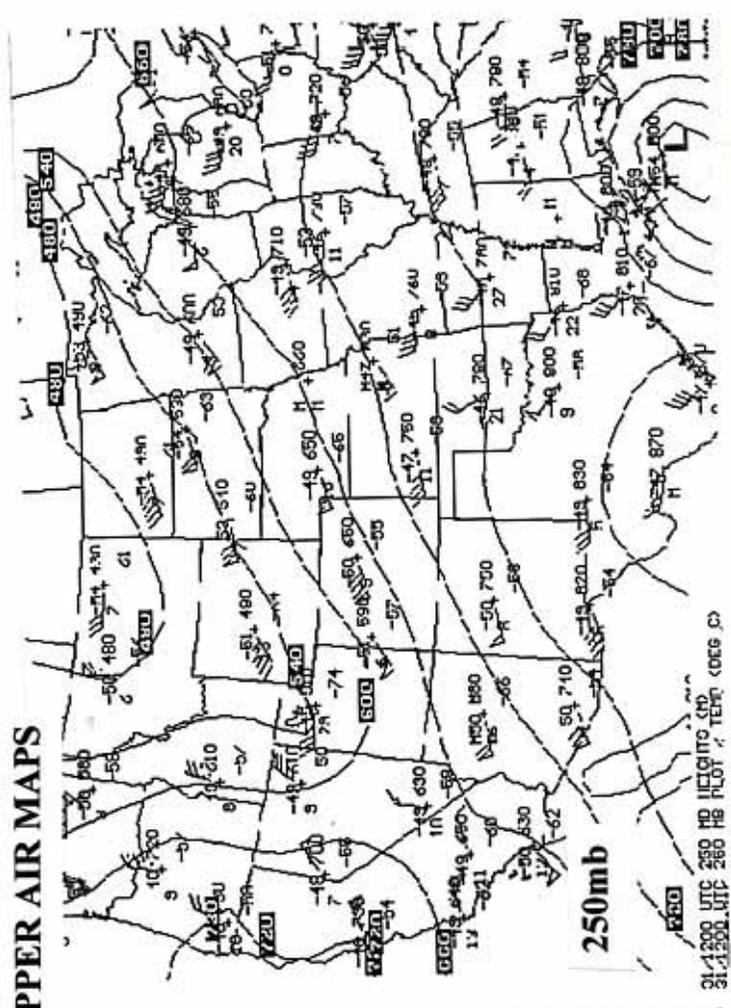
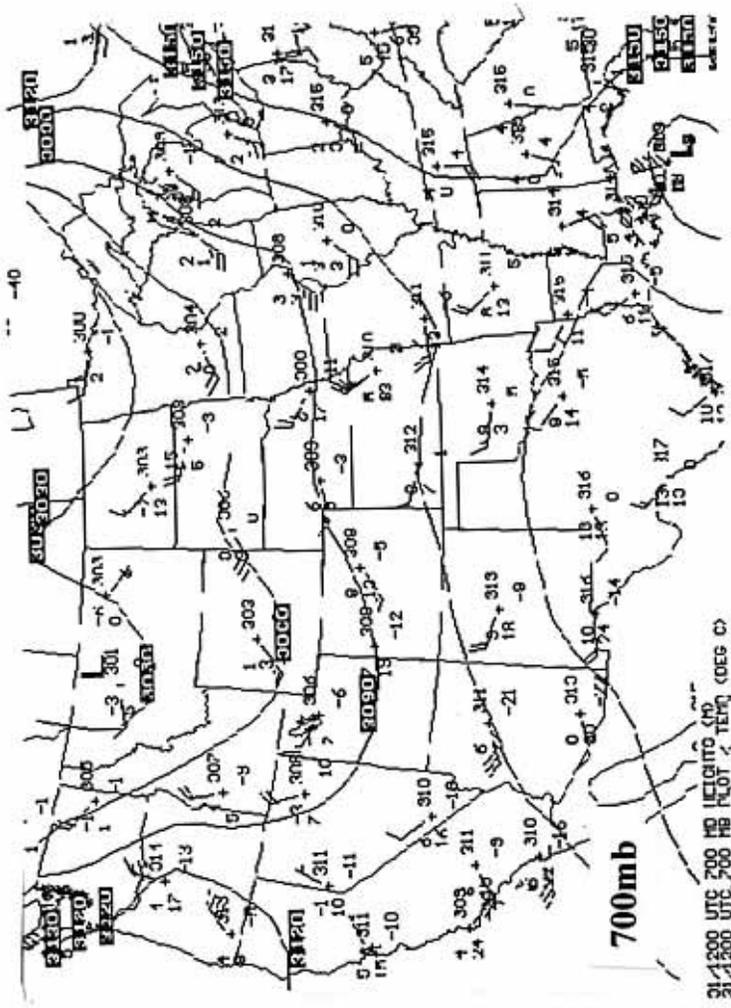
The storm began turning southeast (right mover). This was good for storm intensification (moving directly into the inflow) but bad for us as the road options were not too good. We retreated to the intersection of Highway 283 and 160 and were greeted by lots of chasers including Mike Foster, Gene Rhoden, Chuck Doswell and his wife Vicki. The storm intensified producing a nice wall cloud at the leading edge of a clear slot and precipitation curtains began wrapping around it. The updraft took on the classic backwards C-shape configuration and a second rotation center was noted at the very back (west) end of the updraft which produced a brief cone-shaped funnel around 7pm. We made the decision to head east on Rt. 160 through Ashland rather than going south on Rt. 283 (a good decision). We reached the intersection of Rt. 160 and 183 at 7:19pm and again set up our cameras. A dark precipitation area had developed northwest of the updraft. The cloud base was low, elongated, and ragged appearing as if it were to become outflow dominant. However, there was still a notch in the east side of the updraft and we had strong inflow winds. At 7:26 pm, an area of circulation tightened in the center of the base and a few brief dust whirls occurred below it. Two minutes later, condensation tubes began forming an dissipating under a distinct rotating lowering to our southwest.

We headed south through the town of Sitka, Kansas just as a tapered funnel extended down from the cloud base at 7:33pm and a cone-shaped tornado formed rapidly west of town. We stopped on a hill just south of town and filmed the tornado as it crossed open country heading southeast. I took video whereas Steve Tabb and Carson Eads shot still photographs. We had excellent contrast and an excellent position from which to view this tornado. The precipitation core finally caught up with us and the tornado crossed Highway 183 and changed into a cylinder with large dust bowl. The tornado tilted over to the southeast then dissipated around 7:40pm. The storm lined out after this producing a line of funnel clouds along the trailing shelf cloud. This chase was a perfect 10 for us. We made a good forecast, drove a long way right to the storm (without deviating), intercepted the storm from the southeast, stayed with it through a tough road network, filmed a high contrast tornado, and made it safely back to Woodward that evening. We even had time to catch dinner. If only more chases went like this.

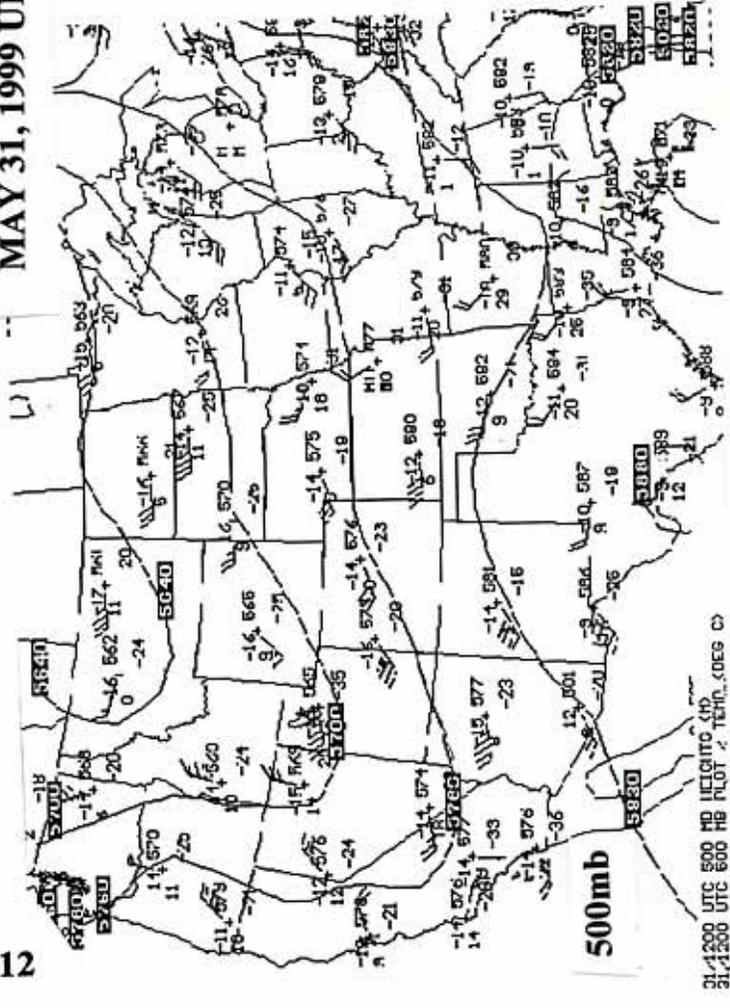
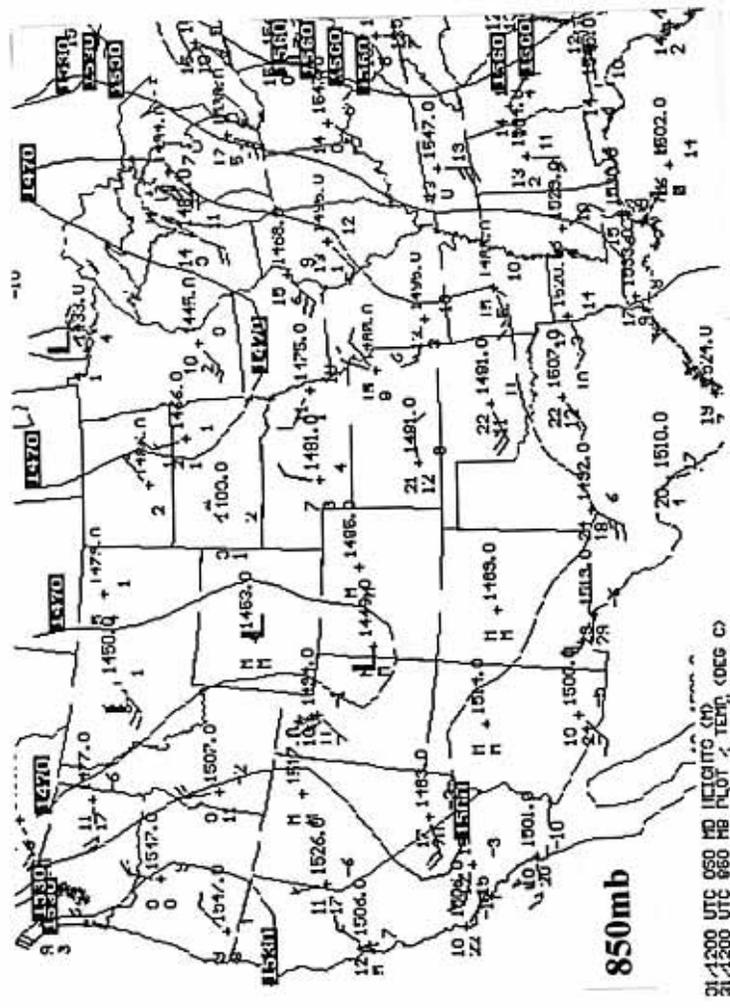


MAY 31, 1999 SURFACE WEATHER MAPS





MAY 31, 1999 UPPER AIR MAPS





Chase route of Tabb, Eads, and Marshall on May 31, 1999. Dashed line is storm path. Dark triangle indicates tornado.



Wide angle view of storm looking west at first film site.



Forked "beaver tail" and vault area on storm.

Photographs by Carson Eads and Tim Marshall.



Chaser convergence at second film site.



The Sitka, KS tornado and ragged cloud base.



Developing tornado southwest of Sitka, Kansas.



Gene Rhoden vehicle and large cone-shaped tornado.



Tornado tilts and enters the rope stage.

Photographs by Steve Tabb and Carson Eads.