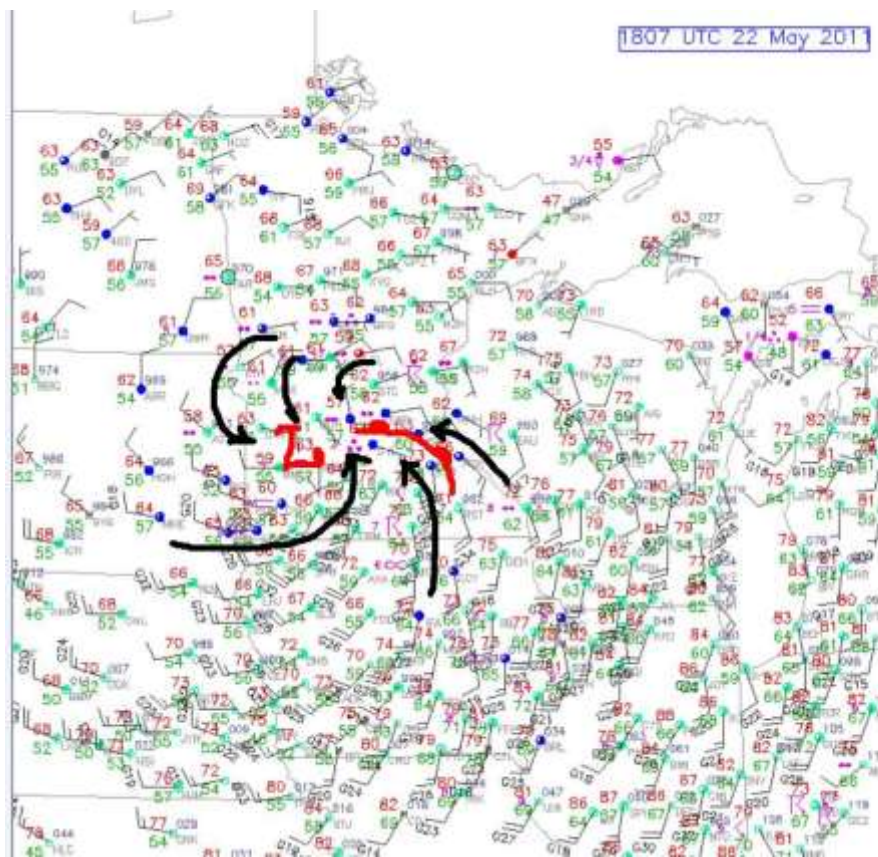
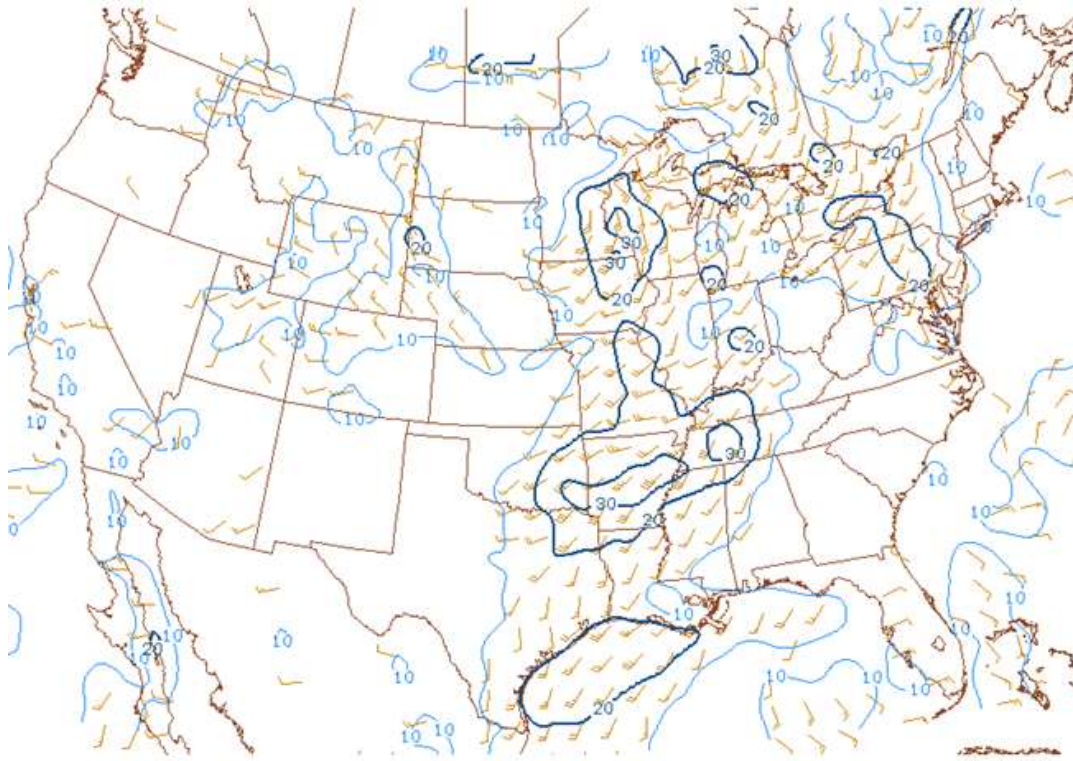
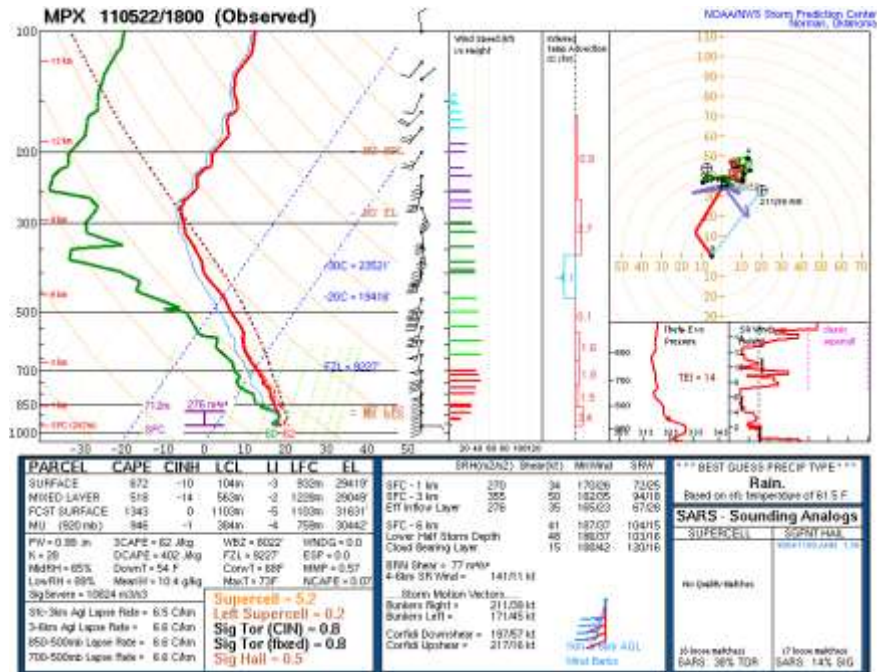


May 22, 2011: Tornadoes in Eastern Minnesota, including North Minneapolis

Weather Synopsis

A strong area of low pressure was noted across western Minnesota during the late morning of Sunday, May 22nd (surface analysis below with black arrows noting inflow and warm front overlaid). Ahead of this area of low pressure, a line of strong storms developed along the leading edge of drier air (air mass change) moving across south central Minnesota. Several thunderstorms moved rapidly northward across the southwest suburbs of the Twin Cities. There was a very well defined wind change from the south to southeast, then east across the Twin Cities Metro Area, which increased the surface helicity (see the MPX sounding below, note the strong 0-1km shear value (35 kts) for our area during the early afternoon) and caused the tornado to form. The other image is the 0-1 km shear across the nation, and the highlighted area of >30 kts in eastern Minnesota.

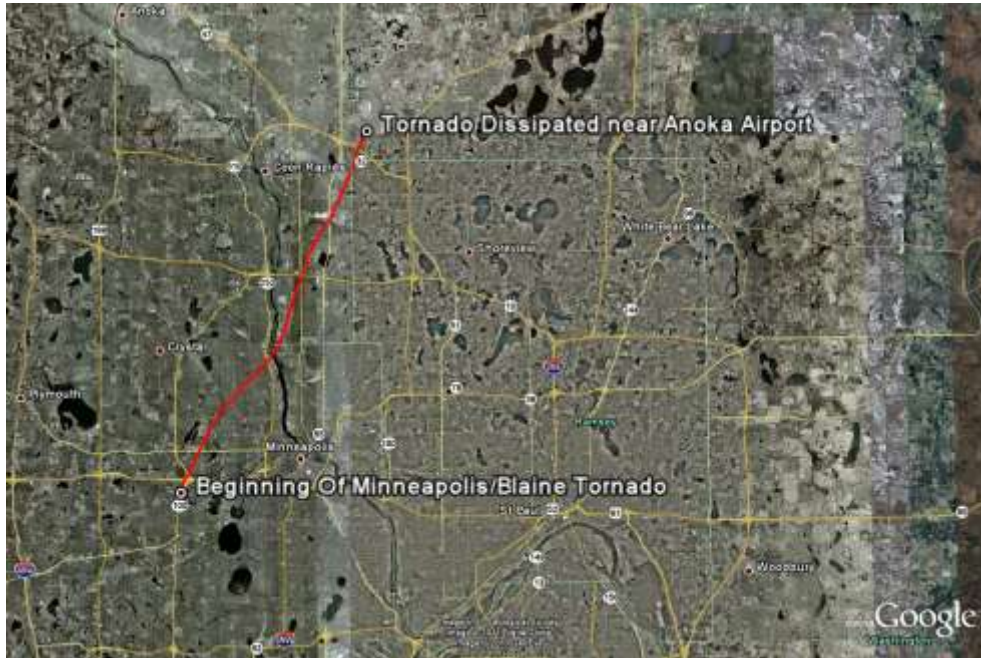




110522/1900 Surface - 1km shear vector

Damage Surveys

North Minneapolis Tornado



...STRONG EF-1 RATING ASSIGNED TO THE TORNADO THAT HIT NORTH MINNEAPOLIS AND OTHER AREAS...

WINDS OF 100 TO 110 MPH WERE PRODUCED BY THE TORNADO THAT HIT NORTH MINNEAPOLIS...ST. LOUIS PARK...GOLDEN VALLEY...FRIDLEY...MOUNDS VIEW AND BLAINE. IT WAS ON THE GROUND FOR SIX AND ONE QUARTER MILES IN HENNEPIN COUNTY...PLUS AN ADDITIONAL EIGHT MILES ACROSS ANOKA AND RAMSEY COUNTIES AS THE TORNADO WENT THROUGH PARTS OF FRIDLEY...MOUNDS VIEW...AND BLAINE.

THE TOTAL PATH LENGTH WAS 14 AND 1/4 MILES. THE TORNADO WAS ABOUT 1/2 MILE WIDE AT ITS WIDEST POINT. THE TIME OF TOUCHDOWN WAS APPROXIMATELY 215 PM...BUT THIS WILL BE FINE TUNED IN THE DAYS TO COME AS MORE EVIDENCE IS GATHERED. ACCORDING TO VARIOUS SECURITY CAMERAS...THE TORNADO MOVED INTO FRIDLEY AT 222 PM.

THE INITIAL TOUCHDOWN IN ST. LOUIS PARK WAS 3/4 OF A MILE SOUTH-SOUTHWEST OF THE INTERSECTION OF INTERSTATE 394 AND HIGHWAY 100 WHERE TWO BUSINESSES SUSTAINED ROOF DAMAGE. THE TORNADO MOVED NORTHEAST...CROSSING HIGHWAY 100 WHERE IT HIT THE FIRST RESIDENCES ALONG CEDAR LAKE ROAD. IT THEN ENTERED THE SOUTHEAST PORTION OF GOLDEN VALLEY...CROSSED INTERSTATE 394 AND HEADED FOR THEODORE WIRTH PARK. DURING THIS TIME IT TOOK A BIT OF A NORTHWARD TURN AND BEGAN MOVING TO THE NORTH-NORTHEAST.

THE TORNADO MOVED ACROSS WIRTH LAKE AND ENTERED THE CITY OF MINNEAPOLIS BETWEEN GLENWOOD AVENUE AND 16TH AVENUE. UP TO THIS POINT...DAMAGE WAS EF-0 WITH THE VAST MAJORITY OF THE DAMAGE BEING DOWNED TREES ATOP BUILDINGS AND VEHICLES. AS THE TORNADO ENTERED

MINNEAPOLIS, IT STRENGTHENED TO EF-1...AND BEGAN DEMOLISHING GARAGES...SHEDS...AND PARTIALLY REMOVING ROOFS. THERE WAS A HOUSE HERE OR THERE THAT HAD THEIR ROOFS COMPLETELY REMOVED...BUT ADJACENT HOUSES AND OTHER NEARBY STRUCTURES AND TREES DID NOT SUPPORT RAISING THE LEVEL TO EF-2.

THE TORNADO HEADED FOR THE AREA AROUND PENN AVENUE AND BROADWAY AVENUE...THEN LOWRY AVENUE AND LOGAN AVENUE...THEN TO 42ND AVENUE AND LYNDALE AVENUE. IT CROSSED THE MISSISSIPPI RIVER JUST NORTH OF THE CAMDEN BRIDGE...AND BEGAN CAUSING DAMAGE IN ANOKA COUNTY.

IT MOVED ACROSS THE MINNEAPOLIS WATER INTAKE FACILITY. AT THE WATER TREATMENT FACILITY...A FREE STANDING STORAGE GARAGE WAS COMPLETELY DESTROYED...WITH NUMEROUS COTTONWOOD TREES ON THE GROUNDS UPROOTED OR HAVING LARGE LIMBS SNAPPED OFF.

FROM THE WATER FACILITY...THE TORNADO TRACKED NORTHEAST TO A RAIL YARD AND A LARGE INDUSTRIAL FACILITY...WHERE A LARGE METAL BUILDING ON THE GROUNDS HAD PARTS OF TWO WALLS RIPPED OFF AND A LARGE SECTION OF THE ROOF BLOWN OFF.

AT THE RAIL YARD...EIGHT TRAIN CARS WERE TIPPED OVER. THIS CAN BE DONE BY WINDS LESS THAN 110 MPH. ON THE OTHER SIDE OF THE RAIL YARD...MORE INDUSTRIAL FACILITIES AND WAREHOUSES SUSTAINED DAMAGE ALONG MIAMI STREET...THE WORST BEING A WAREHOUSE THAT LOST PART OF ITS ROOFING.

THE STRONGER EF-1 DAMAGE OCCURRED IN THE AREA BETWEEN PENN AND BROADWAY AND THE CAMDEN BRIDGE.

THE TORNADO THEN MOVED ACROSS RESIDENTIAL SECTIONS OF FRIDLEY... WHERE EXTENSIVE TREE DAMAGE WAS DONE NORTHEAST OF THE MIDDLE SCHOOL. THE TORNADO THEN WEAKENED AS IT CONTINUED NORTHEAST ACROSS THE EAST SIDE OF OF FRIDLEY TO SPRING LAKE...WHERE IT MOVED INTO THE NORTHWEST SIDE OF MOUNDS VIEW. SPORADIC TREE DAMAGE OCCURRED DURING THIS TIME FRAME.

THE LAST SIGNS OF DAMAGE WERE SEEN ON THE SOUTH SIDE OF THE BLAINE-ANOKA COUNTY AIRPORT...WHERE A FEW HANGARS RECEIVED SOME MINOR EXTERIOR DAMAGE. THE TORNADO WAS ON THE GROUND FOR ABOUT 8 MILES FROM FRIDLEY TO BLAINE.

Anoka County Tornado

...ONE MORE TORNADO CONFIRMED IN ANOKA COUNTY ON SUNDAY MAY 22 - AND SOME MINOR DOWNBURST DAMAGE IN THE SOUTHEAST PART OF ANOKA COUNTY...

A BRIEF AND WEAK TORNADO WAS DETERMINED TO HAVE TOUCHED DOWN IN THE EASTERN PORTION OF HAM LAKE ON SUNDAY AFTERNOON MAY 22. THE TORNADO WILL BE RATED EF-0 WITH WINDS OF ABOUT 65 MPH. IT WAS ON THE GROUND FOR 0.2 MILE AND HAD A MAXIMUM WIDTH OF 30 YARDS. TOUCHDOWN TIME WAS 252 PM.

THE TORNADO TOUCHED DOWN ABOUT 1/4 MILE SOUTHWEST OF THE INTERSECTION OF 155TH AVENUE AND COUNTY ROAD 17. MOST OF THE DAMAGED TREES WERE IN A VERY CONCENTRATED AREA BEHIND SOME HOUSES...

AND IT WAS DEFINITELY INDICATIVE OF A TORNADIC PATTERN.

THE HAM LAKE TORNADO DEVELOPED FROM THE SAME THUNDERSTORM THAT PRODUCED THE NORTH MINNEAPOLIS TORNADO...WHICH DISSIPATED AT THE ANOKA COUNTY AIRPORT IN BLAINE. BUT THE PARENT THUNDERSTORM AND CIRCULATION REINTENSIFIED AS IT MOVED OVER HAM LAKE...AND THE RESULT WAS A BRIEF EF-0 TORNADO AT 252 PM.

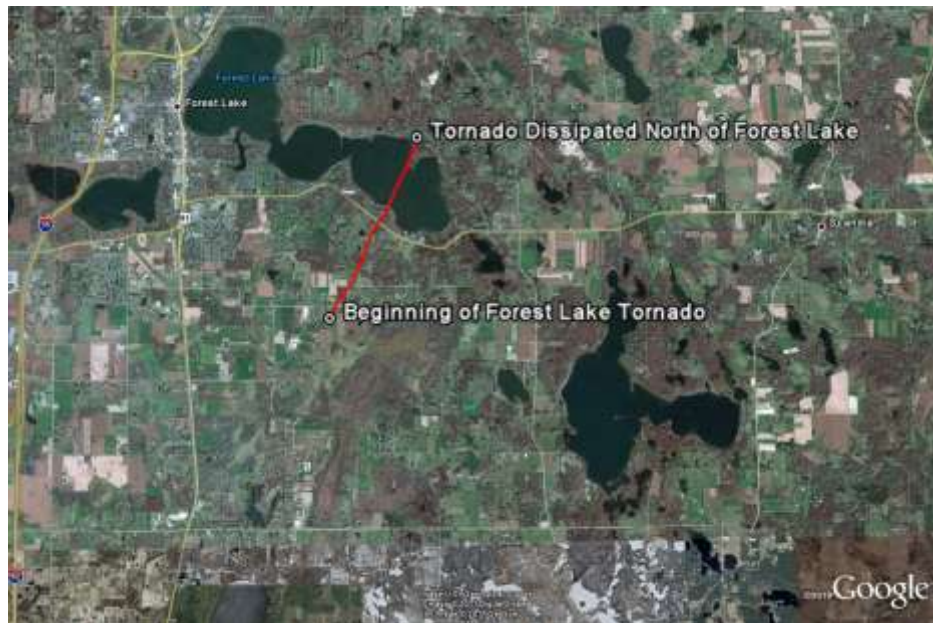
ANOTHER AREA OF TREE DAMAGE IN SOUTHEASTERN ANOKA COUNTY WAS ALSO SURVEYED...AND IT WAS DETERMINED THAT DOWNBURST WINDS KNOCKED DOWN ABOUT TWO DOZEN TREES. THIS WAS ABOUT ONE MILE SOUTHWEST OF THE INTERSECTION OF INTERSTATE 35 AND HIGHWAY 97 IN COLUMBUS.

Forest Lake Tornado

...SURVEY TEAM ASSESSMENT OF THE FOREST LAKE TORNADO...

THE TORNADO THAT OCCURRED IN FOREST LAKE WAS A HIGH END EF-0 WITH MAXIMUM SUSTAINED WINDS BETWEEN 80 AND 85 MPH. THERE WAS INTERMITTENT DAMAGE ALONG A PATH LENGTH OF APPROXIMATELY TWO AND SIX TENTHS OF A MILE. THE MAXIMUM PATH WIDTH OF 75 YARDS.

THE FIRST SIGN OF TREE DAMAGE OCCURRED ALONG 200TH STREET NEAR IMPERIAL AVENUE. THE TORNADO CONTINUED NORTH TO JUST WEST OF THE INTERSECTION OF 210TH STREET AND INGERSOLL AVENUE. THE WORST DAMAGE OCCURRED IN THIS AREA...WHERE A METAL POLE BARN HAD ITS ROOF LIFTED OFF AND DOOR BLOWN OUT. IN ADDITION...A NEIGHBORING PROPERTY HAD SEVERAL TREES UPROOTED OR SNAPPED OFF. THE TORNADO CONTINUED NORTH-NORTHEAST TO 215TH STREET...WHERE A LARGE OAK TREE FELL ON A HOUSE. AT THIS POINT...THE TORNADO CROSSED THE EAST SIDE OF THE BODY OF WATER KNOWN AS FOREST LAKE. AFTER CROSSING THE LAKE...THE TORNADO LIFTED UP NEAR SHADYLAND POINT...WHERE A FEW TREES WERE DOWN ALONG JASON AVENUE.



Brill, Wisconsin Tornado

THE TORNADO THAT OCCURRED NEAR BRILL, WISCONSIN WAS RATED A LOW END EF-1 WITH MAXIMUM SUSTAINED WINDS BETWEEN 90 AND 95 MPH. THERE WAS INTERMITTENT DAMAGE NOTED ALONG A PATH LENGTH OF APPROXIMATELY TWO MILES. THE MAXIMUM PATH WIDTH OF THE TORNADO WAS APPROXIMATELY 300 YARDS.

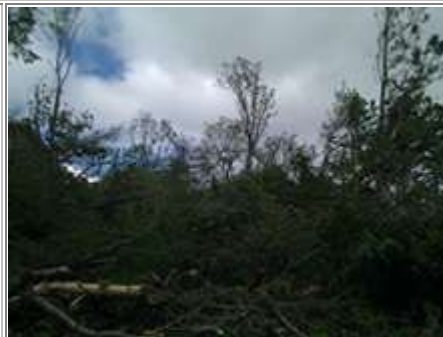
THE FIRST SIGN OF DAMAGE OCCURRED AT A RESIDENCE NEAR THE INTERSECTION OF 28TH AVENUE AND 26TH ST. A SMALL LOG HOME LOST ITS ROOF WITH SEVERAL LARGE TREES TOPPLED. A HOUSE ANTENNA APPROXIMATELY TWELVE FEET TALL WAS BENT OVER. INSULATION FROM THE HOME WAS BLOWN NORTH NORTHEAST APPROXIMATELY ONE EIGHTH OF A MILE. THE TORNADO MARCHED NORTH NORTHEAST DOWNING NUMEROUS LARGE TREES AFTER IT CROSSED 26TH STREET. ADDITIONAL LARGE TREES WERE DOWNED AT A FARMHOUSE SITUATED ON THE EAST SIDE OF 26TH STREET. HOME OWNER REPORTED A LARGE OAK TREE DOWN...ALONG WITH DAMAGE TO NUMEROUS OTHER TREES ON THE PROPERTY. IN ADDITION...TWO SEVEN FOOT TALL HORSE ENCLOSURES WERE DESTROYED. ONE SIX FOOT LONG 4 X 4 INCH WIDE BEAM...USED AS PORTION OF HORSE ENCLOSURE THROWN OVER 200 FEET AND EMBEDDED IN SOIL APPROXIMATELY TWO FEET DEEP. TORNADO CONTINUED TO TRACK NORTH NORTHEAST HITTING ANOTHER FARM RESIDENCE ON THE SOUTH SIDE OF 29TH AVENUE. HALF OF FARMHOUSE ROOF COMPLETELY RIPPED AWAY. PORTION OF BACK WALL OF HOME PIERCED BY LARGE LANDSCAPE CONCRETE BLOCK...WHILE A GLASS DOOR WAS TORN AWAY FROM ANOTHER PORTION OF REAR OF HOME. NUMEROUS LARGE TREES DOWNED AT THIS PROPERTY. TWO TWELVE FOOT TREES PARTIALLY DEBARKED AS WELL. TORNADO THEN PROCEEDED ON NORTH NORTHEAST TRAJECTORY...WHERE IT CROSSED 30TH AVENUE EXITING BARRON COUNTY. A FEW ADDITIONAL TREES WERE TOPPLED AS IT EXITED THE COUNTY.



Storm Damage Survey Photos From the Minneapolis Tornado



Roof Damage to a business in St Louis Park, MN



Tree damage in Golden Valley, MN



Home destroyed in Minneapolis, MN



Tree and vehicle damage in Minneapolis, MN



Home damage in Minneapolis, MN



Tree and vehicle damage in Minneapolis, MN



Large trees uprooted in Minneapolis, MN



Tree damage in Fridley, MN

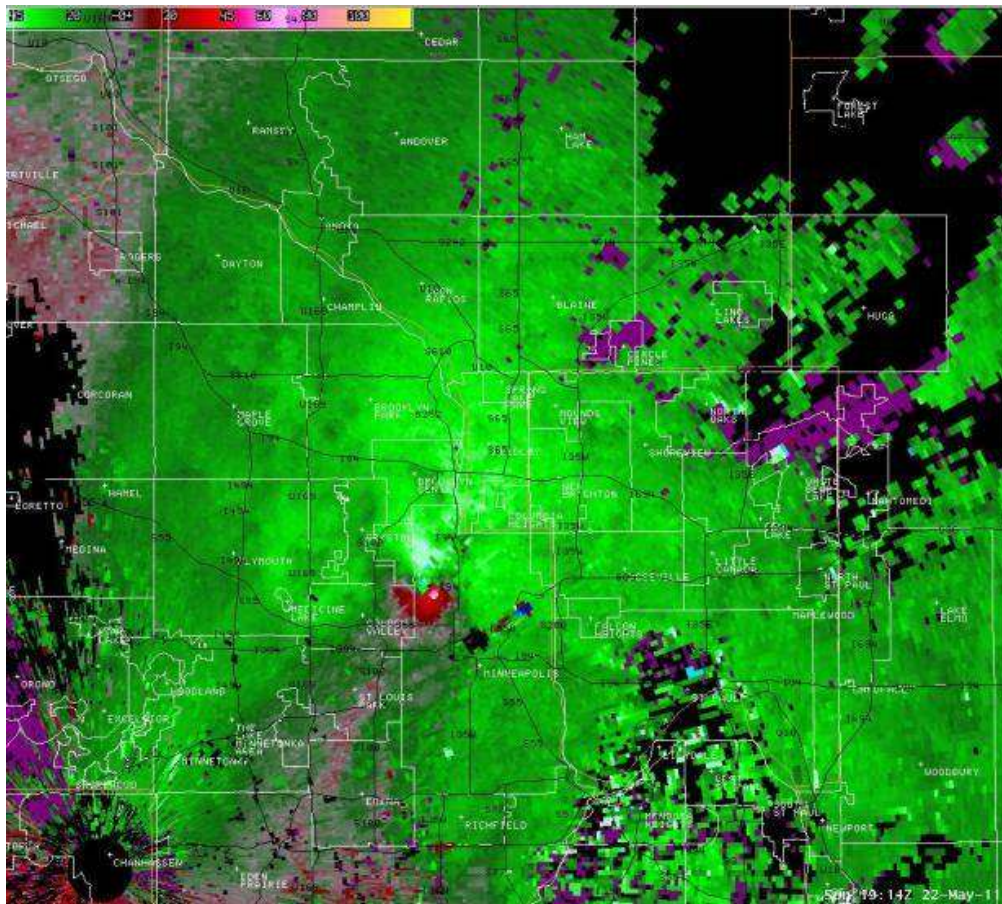


Home damage in Minneapolis, MN

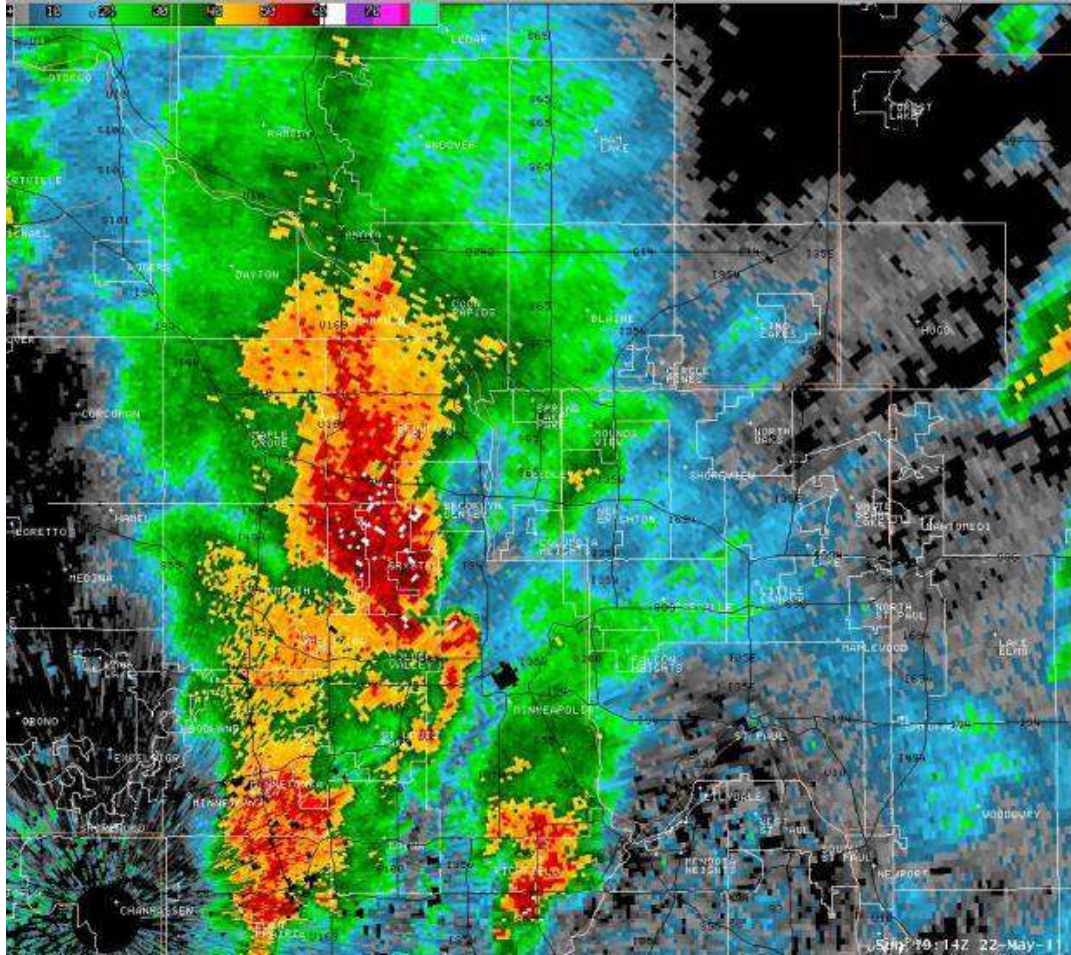
Radar Imagery

Below is a radar image from Sunday afternoon. This image shows SRM (Storm Relative Motion) and is used to diagnose circulation in thunderstorms. The couplet of bright green immediately adjacent to red indicates strong low level rotation in the

thunderstorm. The following image below shows radar reflectivity at the same time on Sunday afternoon, at 2:14 PM CDT. Below is a radar velocity image of the storm as the rotation was passing just to the east of Highway 100 and Golden Valley.

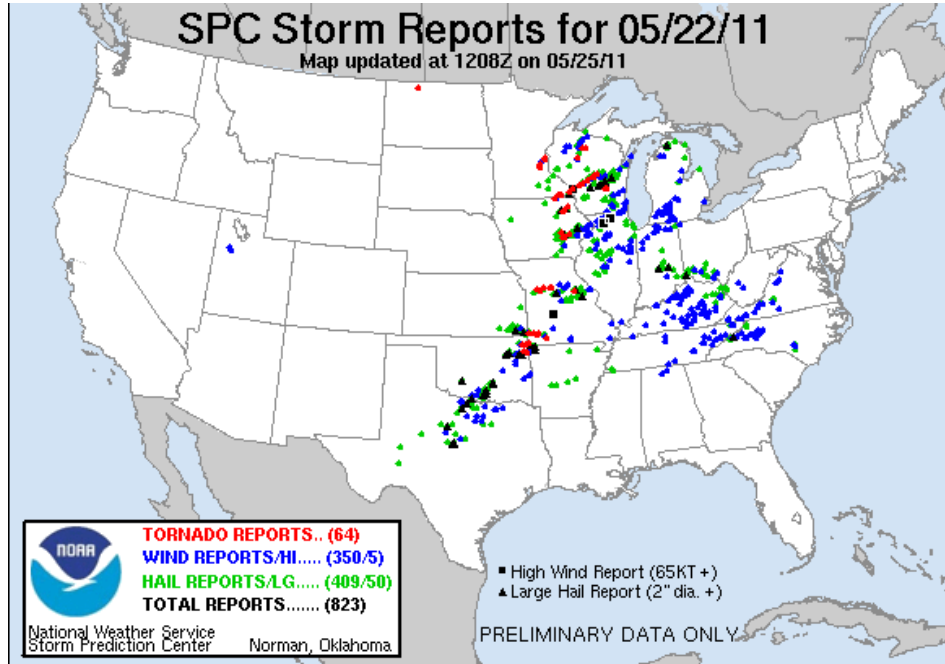


Below is a radar reflectivity image of the storm as the rotation was passing just to the east of Highway 100 and Golden Valley.



The following is a radar image of the thunderstorm that moved across Minneapolis.

Storm Reports



PRELIMINARY LOCAL STORM REPORT...SUMMARY

NATIONAL WEATHER SERVICE TWIN CITIES/CHANHASSEN MN

645 PM CDT SUN MAY 22 2011

..TIME...	...EVENT...	...CITY LOCATION...	...LAT.LON...
..DATE...MAG....	..COUNTY LOCATION..ST..	...SOURCE....
..REMARKS..			
1259 PM	HAIL	2 S WASECA	44.05N 93.50W
05/22/2011	M1.00 INCH	WASECA MN	911 CALL CENTER
0139 PM	HAIL	4 E FARIBAULT	44.30N 93.19W
05/22/2011	M0.88 INCH	RICE MN	AMATEUR RADIO
0144 PM	FUNNEL CLOUD	NEW GERMANY	44.88N 93.97W
05/22/2011		CARVER MN	911 CALL CENTER
0201 PM	HAIL	WANAMINGO	44.31N 92.79W
05/22/2011	M1.50 INCH	GOODHUE MN	TRAINED SPOTTER
0216 PM	TORNADO	ST LOUIS PARK	44.95N 93.36W
05/22/2011		HENNEPIN MN	TRAINED SPOTTER
DEBRIS CLOUD HIGHWAY 100 AND 394..SURFACE LEVEL ROTATION			
0216 PM	TORNADO	MINNEAPOLIS	44.96N 93.27W
05/22/2011		HENNEPIN MN	LAW ENFORCEMENT
TREES DOWN 21ST AND THOMAS NORTH			
0223 PM	TORNADO	BROOKLYN CENTER	45.07N 93.32W
05/22/2011		HENNEPIN MN	911 CALL CENTER
AT HIGHWAY 694 OVER MISSISSIPPI RIVER			
0227 PM	TORNADO	MINNEAPOLIS	44.96N 93.27W
05/22/2011		HENNEPIN MN	LAW ENFORCEMENT

29TH AND LOGAN NORTH

0230 PM HAIL FRIDLEY 45.08N 93.26W
05/22/2011 M1.00 INCH ANOKA MN TRAINED SPOTTER

ALSO WIND DAMAGE TO GARDEN SHEDS AT HIGHWAY 100 AND 694

0234 PM TORNADO FRIDLEY 45.08N 93.26W
05/22/2011 ANOKA MN LAW ENFORCEMENT

51ST AND UNIVERSITY AVENUE...ROOF OFF HOUSE

0235 PM HAIL 5 SE RED WING 44.54N 92.53W
05/22/2011 M1.00 INCH GOODHUE MN TRAINED SPOTTER

0237 PM FUNNEL CLOUD ST PAUL 44.95N 93.10W
05/22/2011 RAMSEY MN TRAINED SPOTTER

SOUTH SIDE LAKE COMO

0245 PM TSTM WND DMG FRIDLEY 45.08N 93.26W
05/22/2011 ANOKA MN TRAINED SPOTTER

CENTRAL AVE. AND 73RD ST 6 INCH TREE LIMBS DOWN

0245 PM TSTM WND DMG MINNEAPOLIS 44.96N 93.27W
05/22/2011 HENNEPIN MN TRAINED SPOTTER

FOLLOWUP REPORT...SOUTH OF 12TH AND UPTON EXTENSIVE TREE
DAMAGE SOME STRUCTURE DAMAGE AS WELL...APPEARS TO BE WIND
NOT TORNADO DAMAGE

0247 PM TSTM WND DMG MINNEAPOLIS 44.96N 93.27W
05/22/2011 HENNEPIN MN TRAINED SPOTTER

12 TO 18 INCH TREE LIMBS DOWN IN THEO. WIRTH
PARK...SPOTTER SAYS POSSIBLE TORNADO

0306 PM FUNNEL CLOUD N HUGO 45.16N 92.96W
05/22/2011 WASHINGTON MN TRAINED SPOTTER

WALL CLOUD WITH SIGNIFICANT ROTATION SEEMS TO BE DROPPING
FUNNELS

0312 PM HAIL 4 NW ELMWOOD 44.82N 92.21W
05/22/2011 M1.00 INCH PIERCE WI TRAINED SPOTTER

0314 PM HAIL 3 W ELMWOOD 44.77N 92.22W
05/22/2011 M1.50 INCH PIERCE WI TRAINED SPOTTER

0315 PM HAIL ELMWOOD 44.78N 92.15W
05/22/2011 M1.75 INCH PIERCE WI 911 CALL CENTER

HAD PING PONG TO GOLF BALL SIZE HAIL IN ELMWOOD. ALSO HAD
GUSTY WINDS...BUT NO REPORTS OF WIND DAMAGE.

0316 PM TORNADO S FOREST LAKE 45.28N 92.99W
05/22/2011 WASHINGTON MN TRAINED SPOTTER

SOUTH OF FOREST LAKE NEAR JCT 35W AND 35E

0319 PM TORNADO 3 ESE FOREST LAKE 45.26N 92.93W
05/22/2011 WASHINGTON MN TRAINED SPOTTER

0320 PM FUNNEL CLOUD CENTERVILLE 45.17N 93.05W
05/22/2011 ANOKA MN TRAINED SPOTTER

ROTATING WALL CLOUD 35E AND CR14

0323 PM FUNNEL CLOUD 5 ENE FOREST LAKE 45.30N 92.89W
05/22/2011 CHISAGO MN LAW ENFORCEMENT

0325 PM	TSTM WND DMG	4 E HAM LAKE		45.26N 93.12W
05/22/2011		ANOKA	MN	STORM CHASER
	1-2 FT DIA TREES DOWN..FLAG POLE SNAPPED IN HALF. TRREES BLOWN DOWN IN DIRRERENT DIRECTIONS. NARROW DAMAGE PATH. POSSIBLE TORNADO			
0325 PM	TORNADO	2 WSW CHISAGO CITY		45.36N 92.93W
05/22/2011		CHISAGO	MN	LAW ENFORCEMENT
	CAUGHT ON VIDEO NR CR36 AND IVYWOOD TRAIL			
0328 PM	HAIL	4 W MENOMONIE		44.89N 92.00W
05/22/2011	M0.25 INCH	DUNN	WI	911 CALL CENTER
0331 PM	TSTM WND DMG	MINNEAPOLIS		44.96N 93.27W
05/22/2011		HENNEPIN	MN	AMATEUR RADIO
	TORNADO DAMAGE...ROOFS AND 2ND STORIES MINNING OR DAMAGED TO HOUSES AT LOWRY AVE. AND LOGAN			
0331 PM	TSTM WND DMG	MINNEAPOLIS		44.96N 93.27W
05/22/2011		HENNEPIN	MN	911 CALL CENTER
	TORNADO DAMAGE REPORT OF ROOFS AND SECOND STORIES OF HOUSES MISSING OR DAMAGED.			
0340 PM	TSTM WND DMG	HAM LAKE		45.26N 93.20W
05/22/2011		ANOKA	MN	911 CALL CENTER
	MEDIUM TO SMALL BRANCHES DOWN...SHINGLES BLOWN OFF ROOFS			
0342 PM	FUNNEL CLOUD	LINDSTROM		45.39N 92.84W
05/22/2011		CHISAGO	MN	TRAINED SPOTTER
0349 PM	TSTM WND DMG	FOREST LAKE		45.28N 92.99W
05/22/2011		WASHINGTON	MN	TRAINED SPOTTER
	TORNADO DAMAGE..POLE BARN AND HOUSE WITH EXTENSIVE DAMAGE			
0400 PM	TSTM WND DMG	2 NW MIKANA		45.61N 91.63W
05/22/2011		BARRON	WI	911 CALL CENTER
	POSSIBLE TORNDAO. 2 HOMES SUSTAINED ROOF DAMAGE WITH NUMEROUS TREES DOWN BETWEEN MIKANA AND BRILL.			
0407 PM	HAIL	2 S CHIPPEWA FALLS		44.90N 91.39W
05/22/2011	M1.00 INCH	CHIPPEWA	WI	TRAINED SPOTTER
0445 PM	HAIL	1 S EAU CLAIRE		44.81N 91.49W
05/22/2011	M0.25 INCH	EAU CLAIRE	WI	TRAINED SPOTTER