

## ISOLATED SEVERE THUNDERSTORM EVENT IN SOUTHEAST GEORGIA SEPTEMBER 29<sup>TH</sup> 1999

by Richard Thacker - Senior Meteorologist WFO Charleston, SC

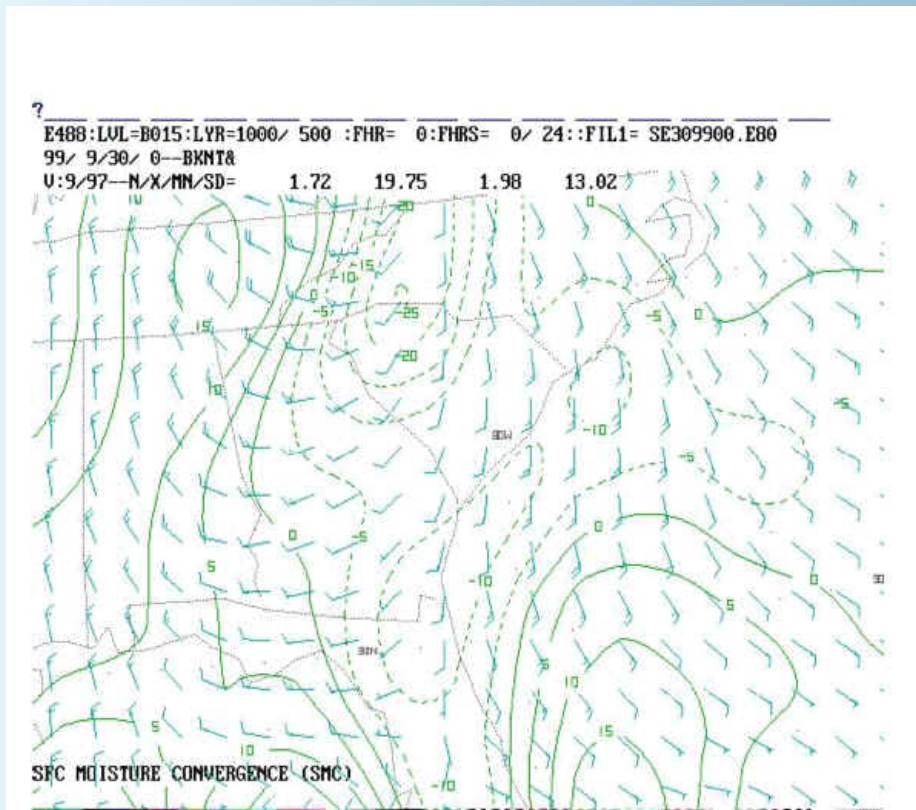
### LOCAL STUDY OVERVIEW

THE LAST WEEK OF SEPTEMBER 1999 WAS A WET PERIOD ACROSS EASTERN GEORGIA AND SOUTH CAROLINA AS A TROPICAL MOISTURE PLUME DOMINATED THE REGIONAL WEATHER. WEAK MID LEVEL SHORT WAVES MOVING NORTHWARD FROM FLORIDA AND THE WESTERN CARIBBEAN TRIGGERED PERIODS OF SHOWERS AND THUNDERSTORMS. A HEAVY RAIN EVENT ON SEPTEMBER 28<sup>TH</sup> IN THE CHARLESTON AREA BROUGHT FLOODING RAINS TO PARTS OF BERKELEY, DORCHESTER, AND CHARLESTON COUNTIES DURING THE LATE AFTERNOON AND EARLY EVENING HOURS. ON WEDNESDAY, SEPTEMBER 29<sup>TH</sup>, THE TROPICAL AIR MASS WAS BEGINNING TO EASE OFFSHORE AS A COLD FRONT APPROACHED THE SOUTHEAST STATES FROM THE WEST. TORNADIC SUPERCELL THUNDERSTORMS DEVELOPED ACROSS PARTS OF NORTHEAST SOUTH CAROLINA AND WEST CENTRAL NORTH CAROLINA DURING THE EVENING HOURS AND ISOLATED SEVERE THUNDERSTORMS AFFECTED SOUTHEAST GEORGIA FROM FORT STEWART TO SAVANNAH BETWEEN 800 PM AND 930 PM EDT.

### SYNOPTIC BRIEFING AT 0000Z SEPTEMBER 30 1999

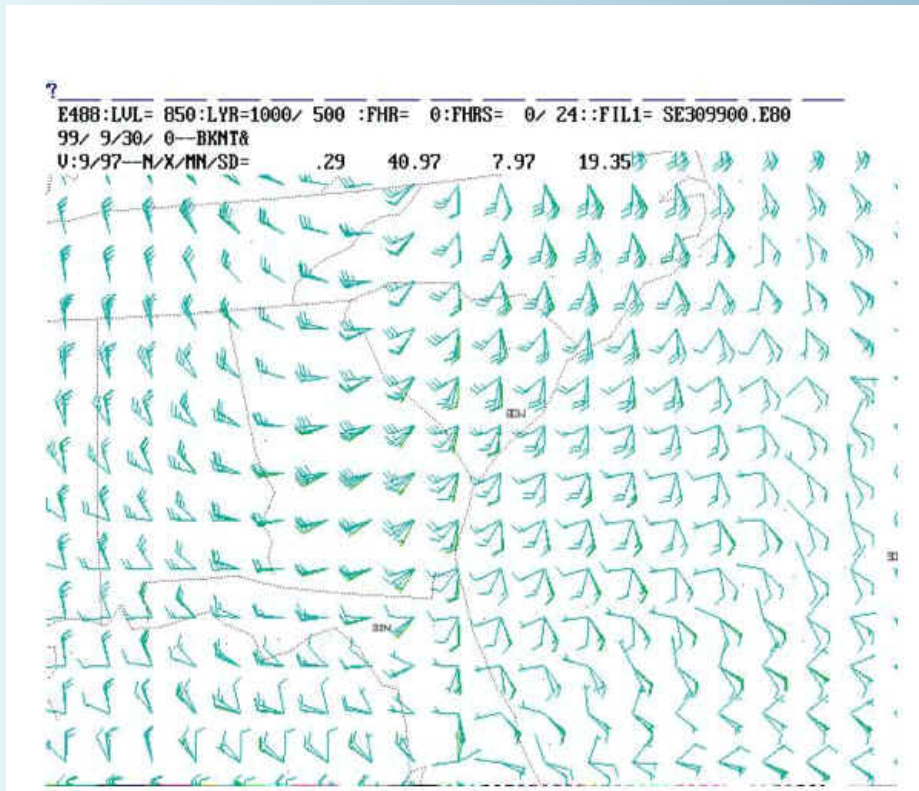
A SURFACE COLD FRONT EXTENDED ALONG THE APPALACHIAN MOUNTAINS SOUTHWEST TO THE WESTERN PANHANDLE OF FLORIDA. THE ATMOSPHERE ACROSS SOUTHEAST GEORGIA WAS CLEARLY IN A TRANSITIONAL PHASE FROM THE DEEP TROPICAL SOUTHEAST FLOW OF THE PAST FEW DAYS TO A MODIFIED CONTINENTAL AIR MASS. LOW LEVEL WIND FIELDS HAD BEGUN TO VEER ACROSS GEORGIA IN ADVANCE OF THE COLD FRONT. SURFACE MOISTURE CONVERGENCE WAS MAXIMIZED ACROSS THE WESTERN CAROLINAS AND COASTAL GEORGIA (FIG 1).

FIG 1



THE APPROACH OF A SIGNIFICANT LONG WAVE TROUGH WAS RESPONSIBLE FOR INCREASING MID TO UPPER LEVEL WIND FIELDS ACROSS THE SOUTHEAST STATES ON THE EVENING OF THE 29<sup>TH</sup>. THE SURFACE TO 850 MILLIBAR WIND ANALYSIS INDICATED INCREASING SPEED AND DIRECTIONAL SHEAR FROM COASTAL GEORGIA NORTHWARD TO THE CENTRAL CAROLINAS (FIG 2).

FIG 2



HELICITY VALUES RANGED FROM 50 TO 100 ACROSS COASTAL GEORGIA TO ALMOST 400 IN CENTRAL NORTH CAROLINA. BOTH SKEW-T DIAGRAMS AND HODOGRAPHS FOR KJAX, KCHS, AND KGSO (FIG 3-4-5) INDICATED MODERATE INSTABILITY, PRECIPITABLE WATER VALUES AROUND 2 INCHES, AND SOME DRIER AIR IN THE MID LEVELS AT CHARLESTON AND JACKSONVILLE.

FIG 3 - KCHS

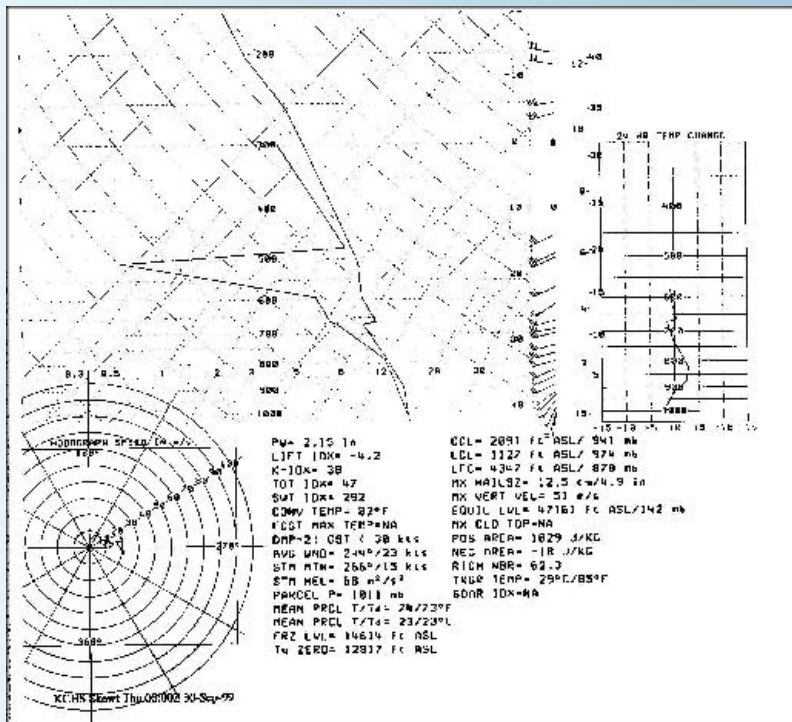


FIG 4 - KJAX

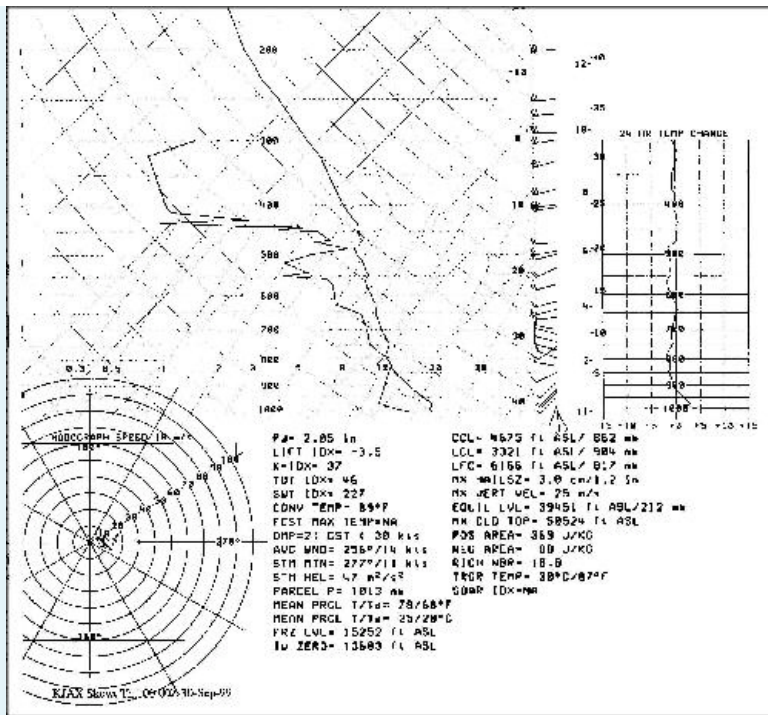
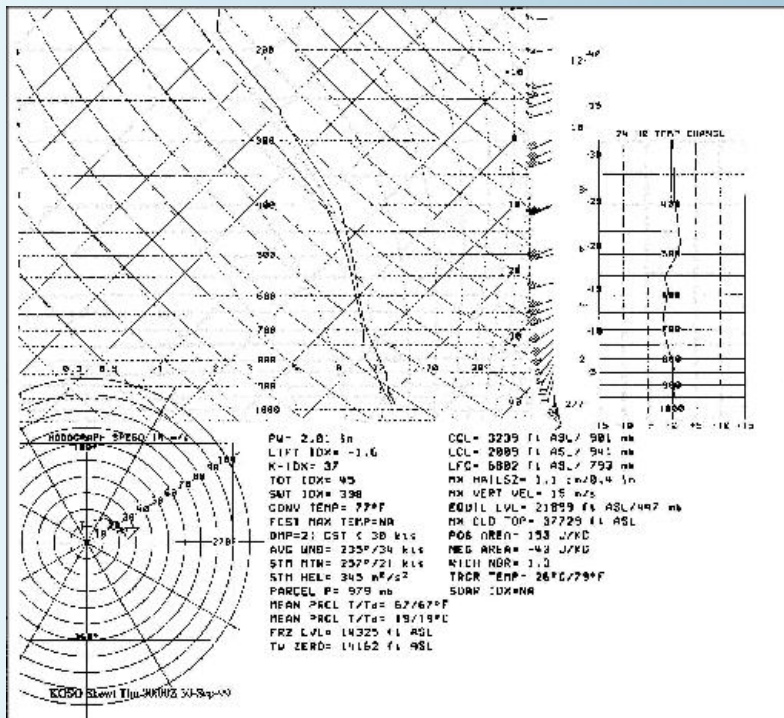
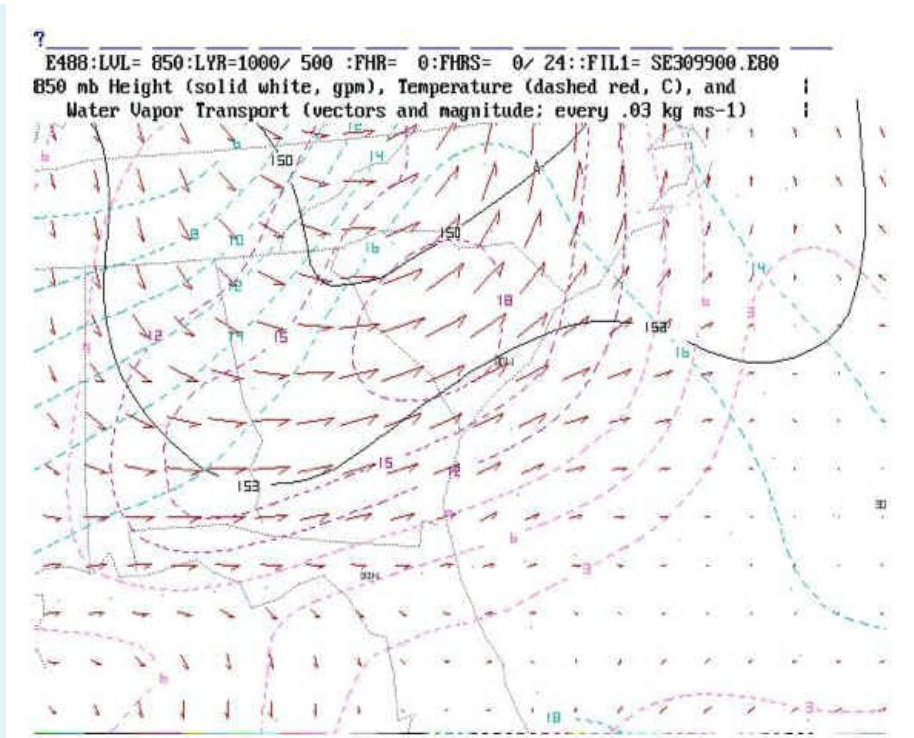


FIG 5-KGSO



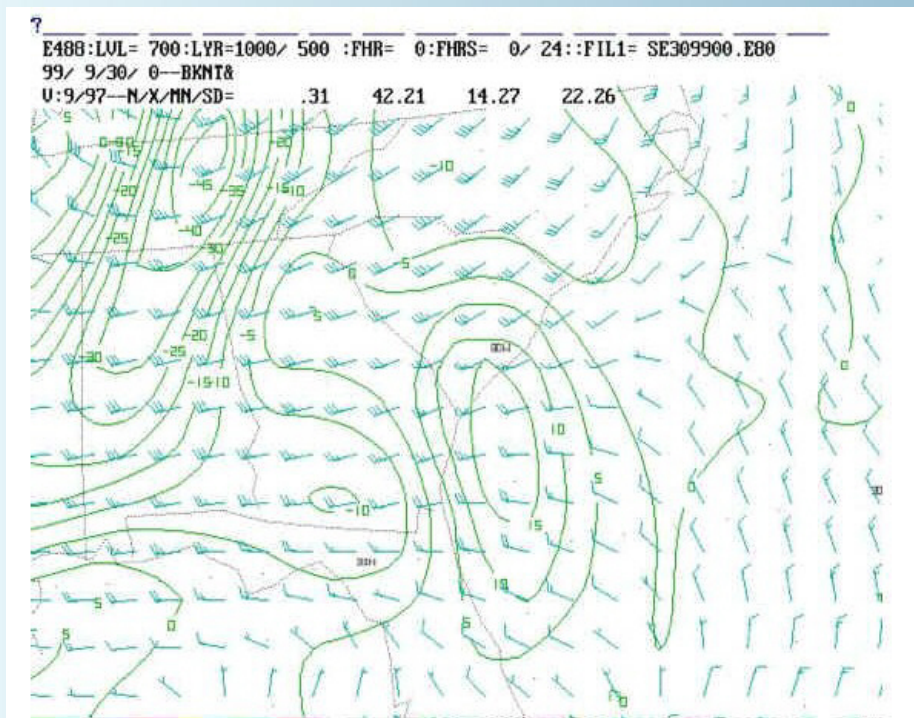
THE 850 MILLIBAR ANALYSIS INDICATED THE 850 FRONT WAS VERTICALLY STACKED WITH THE SURFACE FRONT. A THERMAL RIDGE EXTENDED FROM SOUTHEAST GEORGIA NORTH THROUGH THE CENTRAL CAROLINAS. WATER VAPOR TRANSPORT WAS MAXIMIZED BETWEEN CHARLOTTE NORTH CAROLINA AND SAVANNAH, ALTHOUGH INDICES WERE BELOW THOSE USUALLY OBSERVED DURING A SIGNIFICANT SEVERE WEATHER OUTBREAK (FIG 6).

FIG 6



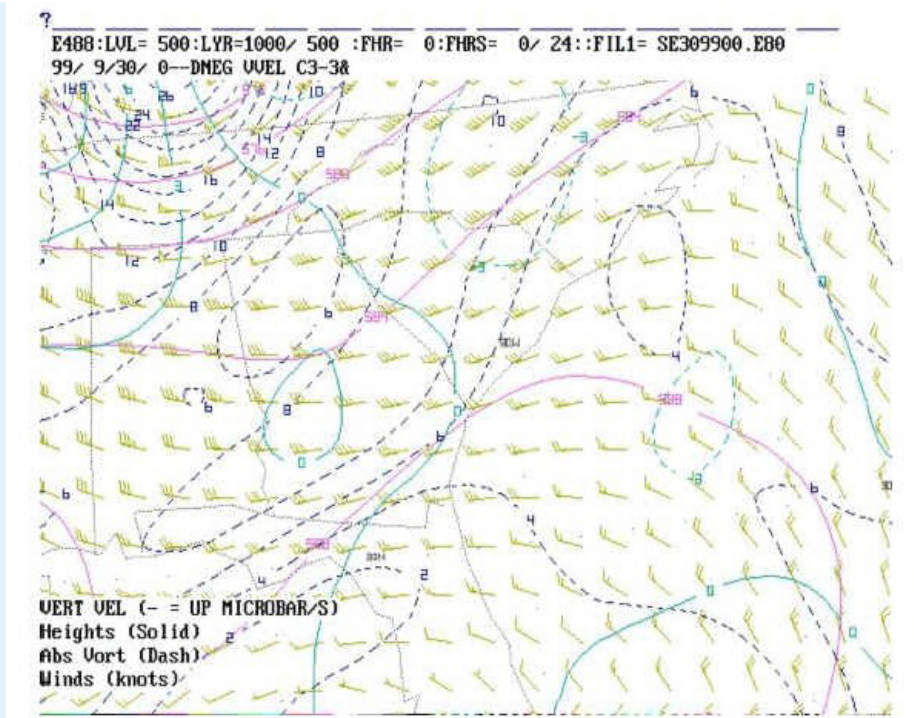
AT 700 MILLIBAR, WHILE MUCH DRIER AIR WAS STILL WEST OF GEORGIA, RELATIVE HUMIDITY ADVECTION ANALYSIS INDICATED DECREASING MOISTURE PUNCHING INTO SOUTHEAST GEORGIA (FIG 7).

FIG 7



AT 500 MILLIBAR, A NARROW 8-10 UNIT VORTICITY LOBE WAS DRAPED ACROSS THE SOUTHEAST U.S. AND WEAK UPWARD VERTICAL MOTION WAS MAINLY CONFINED TO THE CAROLINAS (FIG 8).

FIG 8



AT 300 MILLIBAR, A WEAK AGEOSTROPHIC CIRCULATION WAS NOTED ACROSS CENTRAL GEORGIA (FIG 9) AND AT 250 MILLIBAR, A WEAK DIFLUENT FLOW WAS OVER THE SOUTHEAST STATES, EAST SOUTHEAST OF THE ENTRANCE REGION OF THE UPPER JET. NOTE THE BEST AREAS OF DIVERGENCE ALOFT WERE ALIGNED IN THE SAME GENERAL REGION AS THE LOW LEVEL MOISTURE CONVERGENCE (FIG 10).

FIG 9

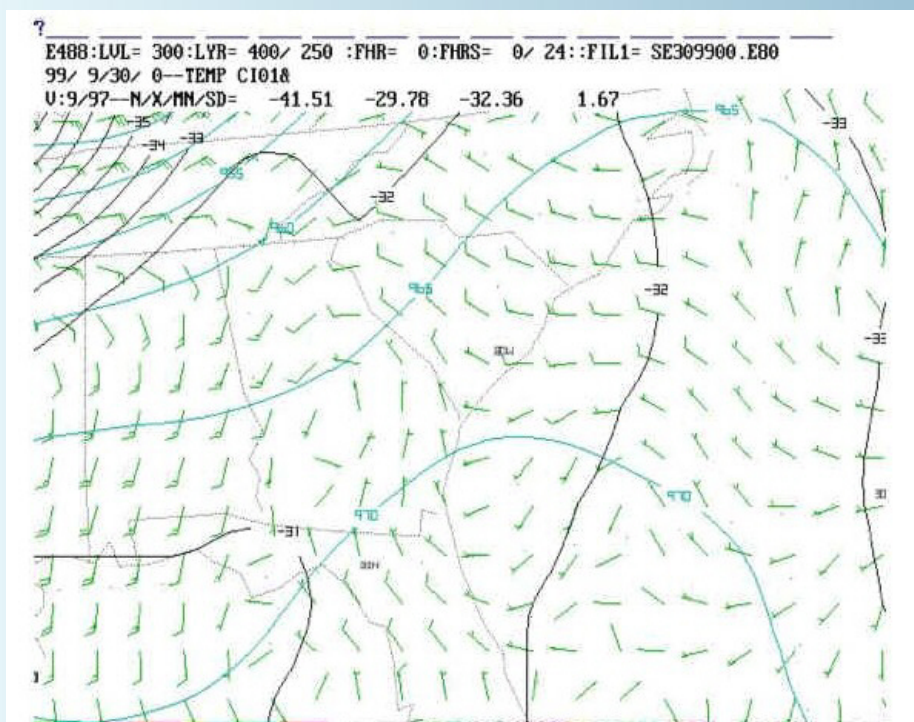
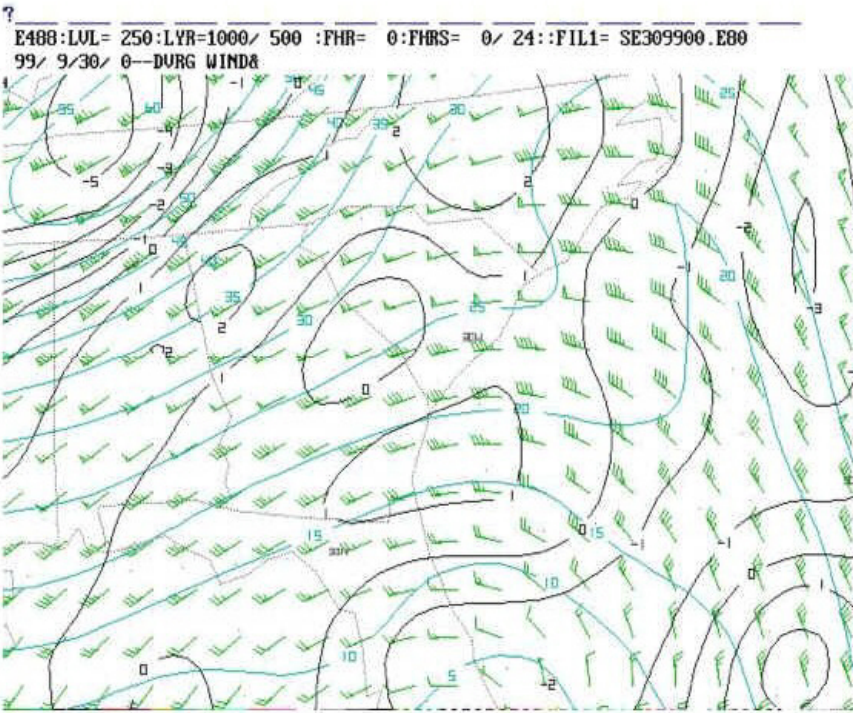


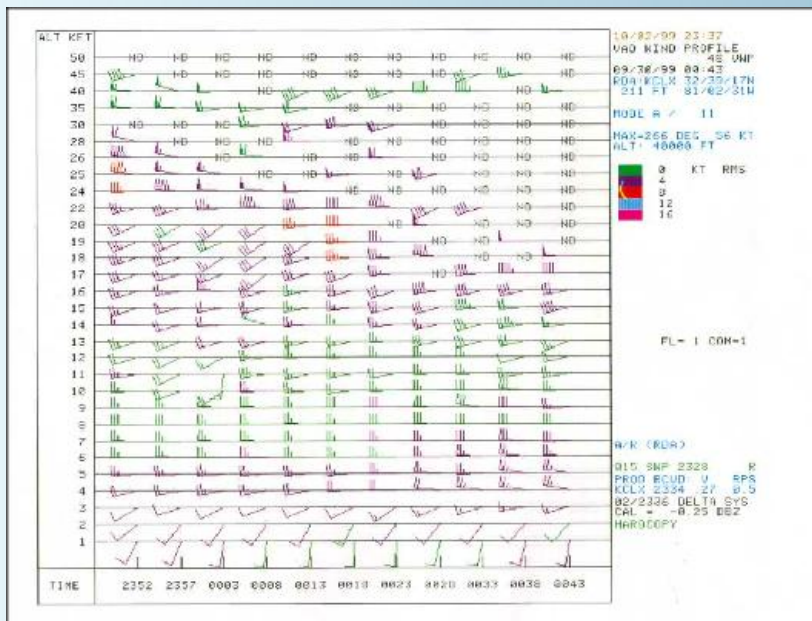
FIG 10



**KCLX RADAR PRODUCT ANALYSIS**

THE VAD WIND PROFILE FROM THE KCLX 88D SITE AT GRAYS SHOWED WEAK DIRECTIONAL AND SPEED SHEAR FROM THE BOUNDARY LAYER TO 5000 FEET BETWEEN 2345 UTC AND 0045 UTC. NOTE THE BACKING UPPER LEVEL FLOW AROUND 0000 UTC. (FIG 11).

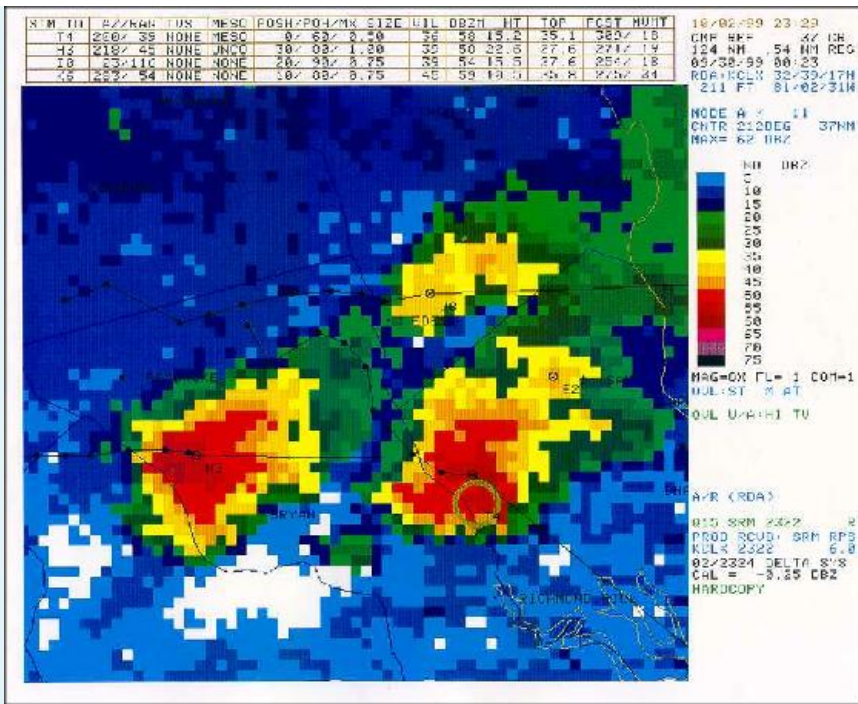
FIG 11



AT 0015Z, TWO DISTINCT CELLS WERE ISOLATED BETWEEN PEMBROKE AND SAVANNAH. THE EASTERNMOST STORM IN NORTHWEST CHATHAM COUNTY WILL BE INVESTIGATED AT 0023Z. THIS TIME WAS 5 TO 10 MINUTES PRIOR TO WIND DAMAGE THAT OCCURRED ALONG U.S. ROUTE 17 IN WESTERN CHATHAM COUNTY. NUMEROUS TREES WERE FELLED, SNAPPED ABOUT 15 FT ABOVE THE GROUND, OR UPROOTED. NUMEROUS POWER LINES WERE ALSO DOWN. ONE MOBILE HOME WAS DESTROYED AND THERE WAS ONE INJURY.

THE TWO CELLS ARE SHOWN IN COMPOSITE REFLECTIVITY, BOTH EXHIBITING SUPERCELL STRUCTURE (FIG 12).

FIG 12



BOTH CELLS HAD BEGUN TO MOVE FROM 310 DEGREES AT ABOUT 20 MPH ACROSS BRYAN AND CHATHAM COUNTY. THIS MOTION WAS TO THE RIGHT OF THE MEAN STEERING FLOW, WHICH WAS APPROXIMATELY FROM 270 DEGREES FROM 00Z SOUNDINGS AT CHARLESTON AND JACKSONVILLE. EACH CELL POSSESSED A VIL FROM 40 TO 45 WITH ECHO TOPS FROM 40 TO 45 KFT.

THE NEXT 2 GRAPHICS (FIG 13-14) DEPICT 4 PANEL LOWER ELEVATION CUTS OF BASE REFLECTIVITY AND STORM RELATIVE WINDS. NOTE THE OVERHANG AND A POSSIBLE BOUNDED WEAK ECHO REGION IN THE CHATHAM COUNTY CELL. IN THE VELOCITY DATA, SIGNIFICANT ROTATION CAN BE SEEN AT THE 1.5, 2.4, AND 3.4 DEGREE SLICES. RANGE FOLDING AND PRECIPITATION HINDERS SERIOUS INTERPRETATION OF THE 0.5 DEGREE SLICE.

FIG 13 - BASE REFLECTIVITY

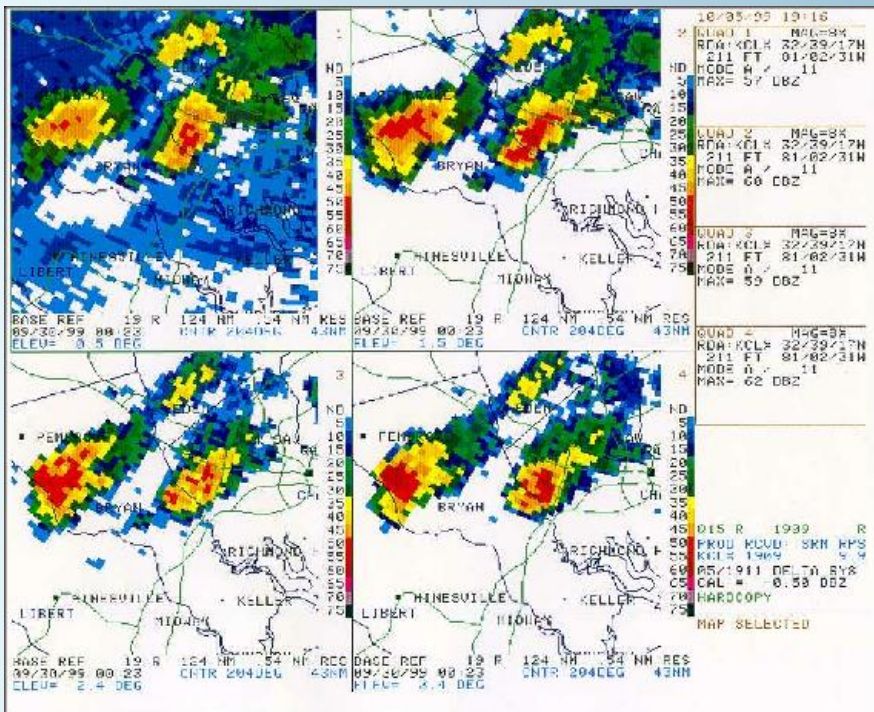
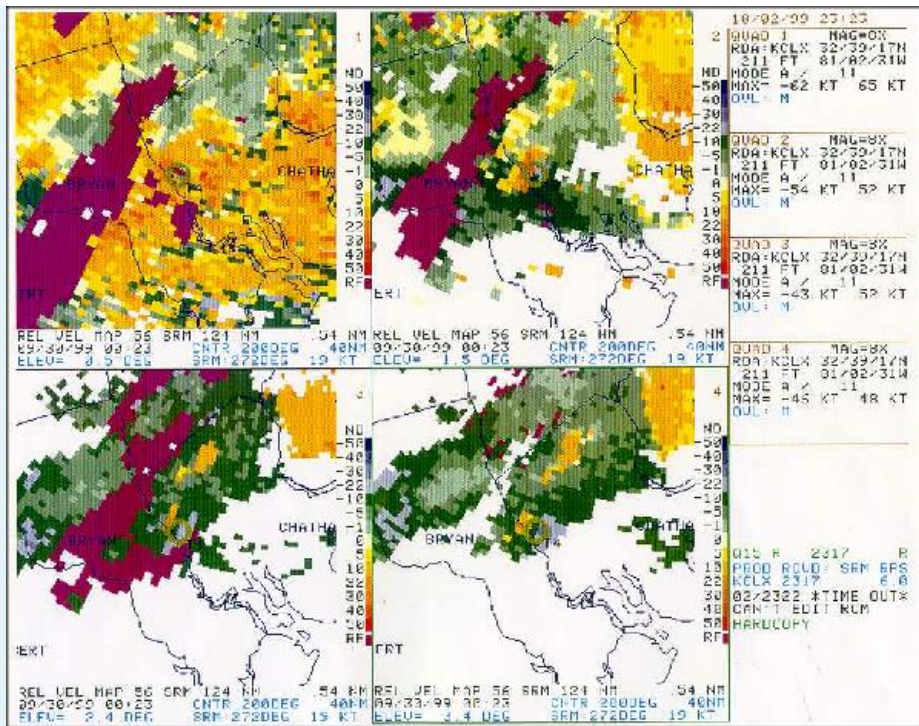


FIG 14 - SRM



ON THIS VOLUME SCAN (0023Z), A MESOCYCLONE WAS DETECTED BY THE 88D MESO ALGORITHM. SPECIFICS CAN BE SEEN IN FIG 15. NOTE THE MESO DEPTH OF 8 KFT WAS BASED AT 7.7 KFT. THE HEIGHT OF THE 0.5 DEGREE SLICE AT STORM DISTANCE IS 3.5 KFT AND THE 1.5 SLICE ELEVATION IS 7.2 KFT. AN IMPRESSIVE BYPRODUCT TO NOTE IS THE DOUBLE DIGIT SHEAR VALUE ON THE RIGHT.

FIG 15

```

ALPHA PRODUCT 60 (M KCLX 00:23 09:30/99) PAGE 1 OF 2
COMMAND: D.A.
FEEDBACK: EXECUTED - F11: ALPHANUMERIC HARDCOPY

      MESOCYCLONE
RADAR ID 333  DATE/TIME: 09:30:99/00:23:26  NUMBER OF STORMS 25

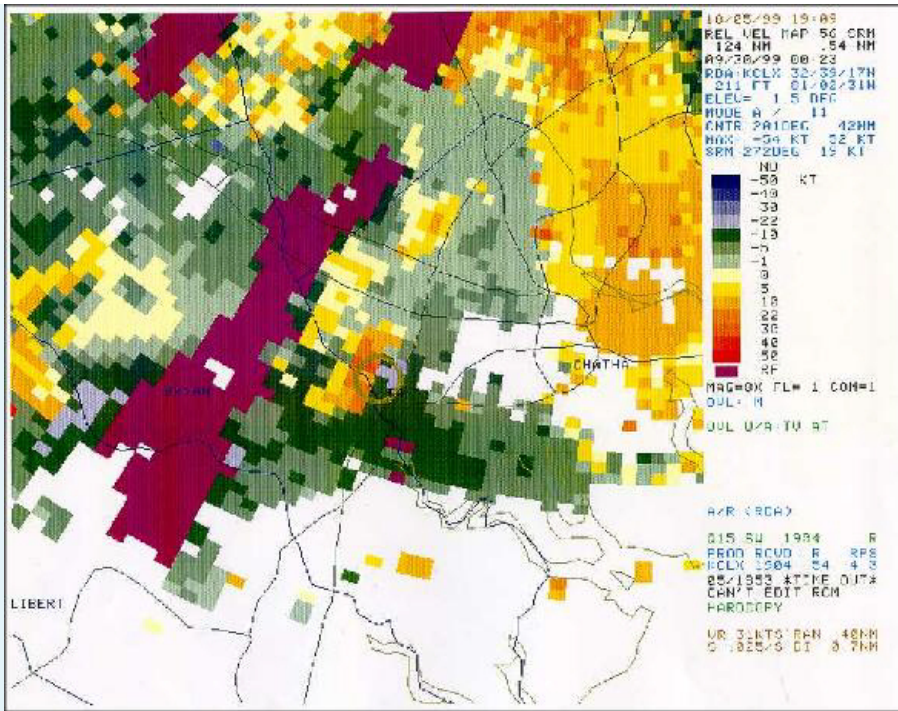
FEATURE STORM FEATURE BASE TOP AZRAN HGT DIAM(NM) SHEAR
  ID      ID  TYPE   KFT  KFT  DEG-NM  KFT  RAD  AZ  (E-3/S)
  1 - T4  MESO    7.7 15.6 200/ 40  7.7  2.6  2.2  11
  1 - H3  UNC SHR  4.2  4.2 216/ 49  4.2  2.2  2.4   6

02/2341 DELTA SYS DAL = -0.50 DBZ      010 STP KCLX 2334
                                           PROD RCUD: SRM RPS KCLX 2340      9.9
    
```

A CLOSER INSPECTION OF THE 1.5 DEGREE SRM PRODUCT INDICATED TIGHT GATE TO GATE CYCLONIC ROTATION, RESULTING IN A VR SHEAR DERIVED ROTATIONAL VELOCITY OF 31 KTS AND SHEAR EXCEEDING .025/S (FIG 16).

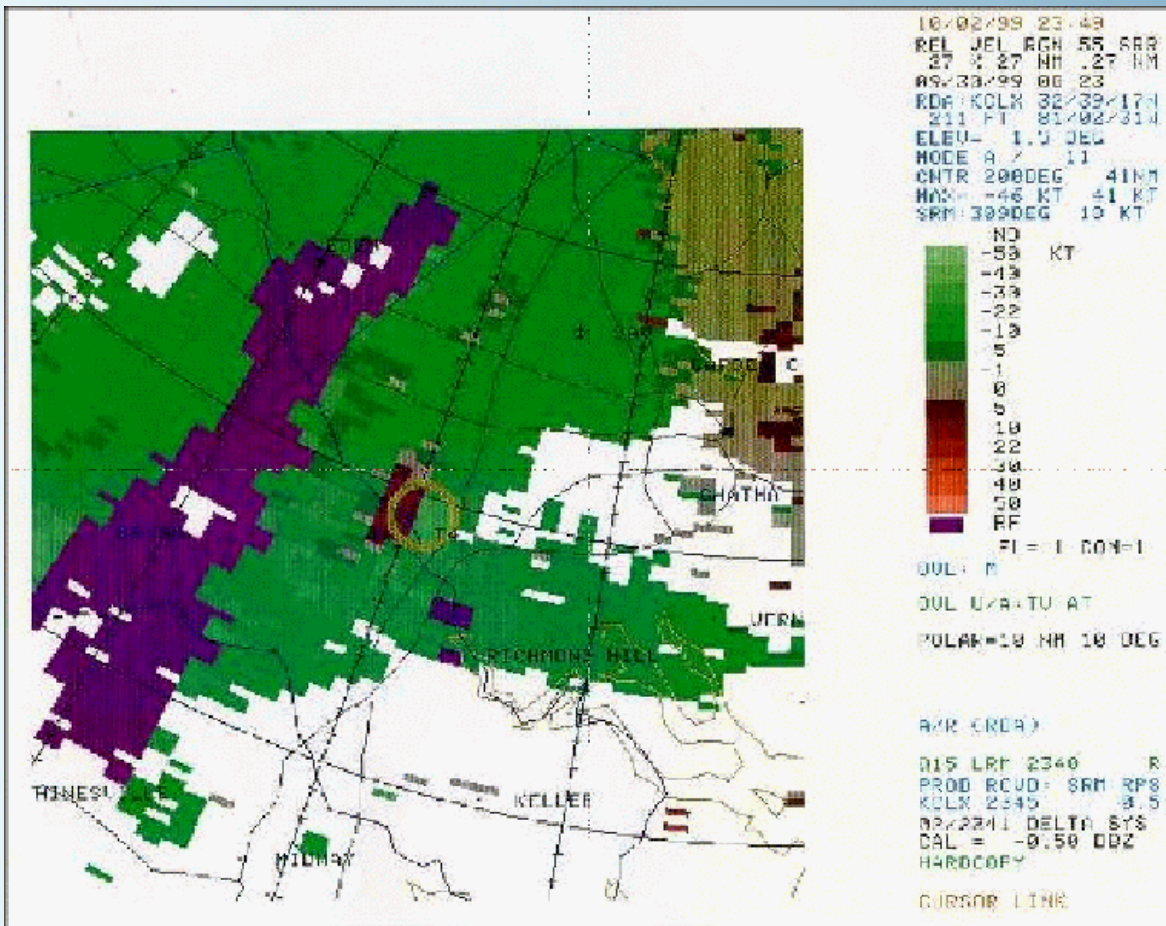
FIG 16





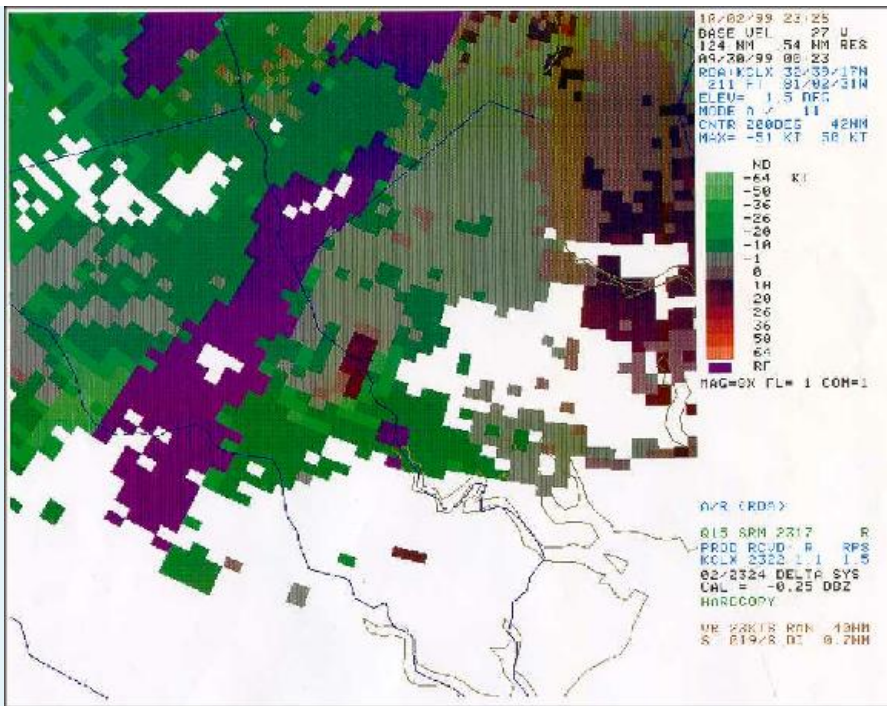
THIS COUPLET CAN ALSO BE SEEN IN THE SRR PRODUCT USING A STORM MOTION OF 309 DEGREES AT 18 KT (FIG 17).

FIG 17



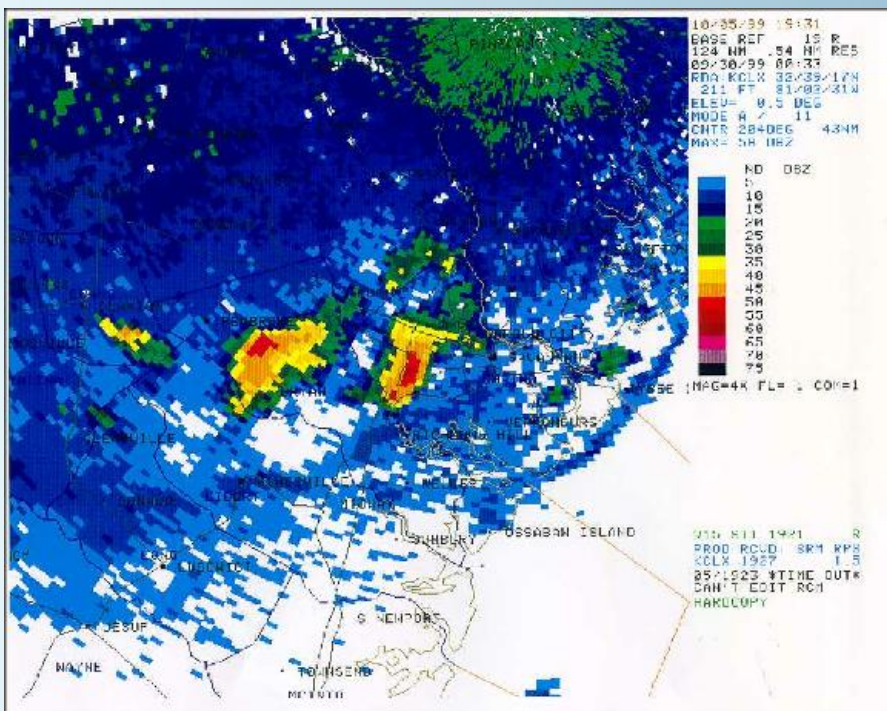
INSPECTION OF THE BASE VELOCITY PRODUCT AT 0.5 FEET SHOWED NO DISCERNABLE ROTATION, HOWEVER THE 1.5 DEGREE SLICE INDICATED A STRONG INBOUND/OUTBOUND COUPLET DIRECTLY AT THE UPDRAFT/ DOWNDRAFT INTERFACE ON THE SOUTHEAST FLANK OF THE STORM (FIG 18).

FIG 18



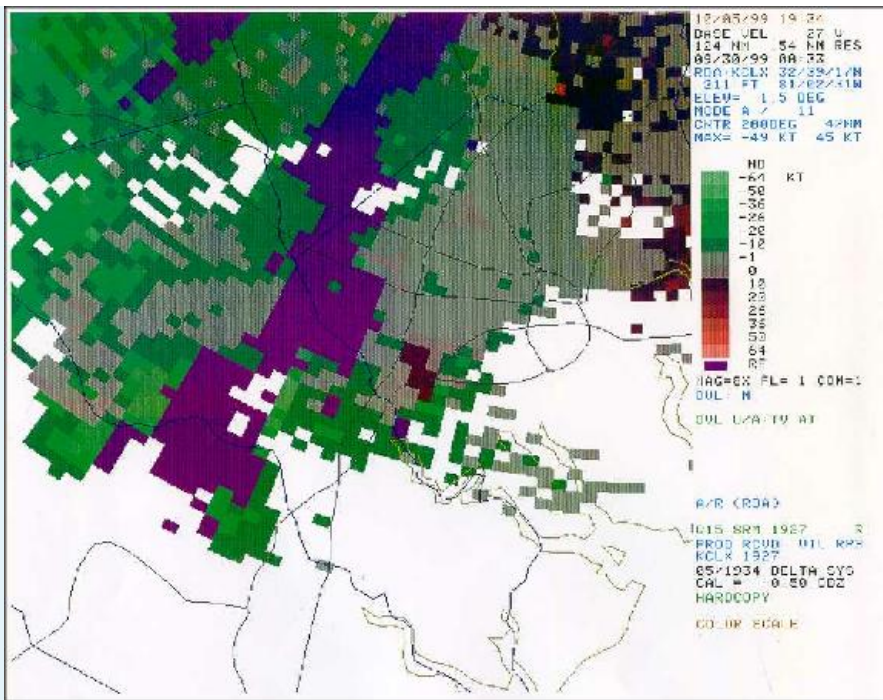
ON THE NEXT VOLUME SCAN, THE ROTATION HAD WEAKENED AND THE CELL WAS RAPIDLY COLLAPSING AND LOSING STRUCTURE. THE 1.5 DEGREE SLICE AT 0033Z SHOWS THE SECOND CELL IN BRYAN COUNTY HAD DEVELOPED A DISTINCT APPENDAGE ON ITS SOUTH FLANK JUST ACROSS THE LIBERTY COUNTY LINE (FIG 20).

FIG 20



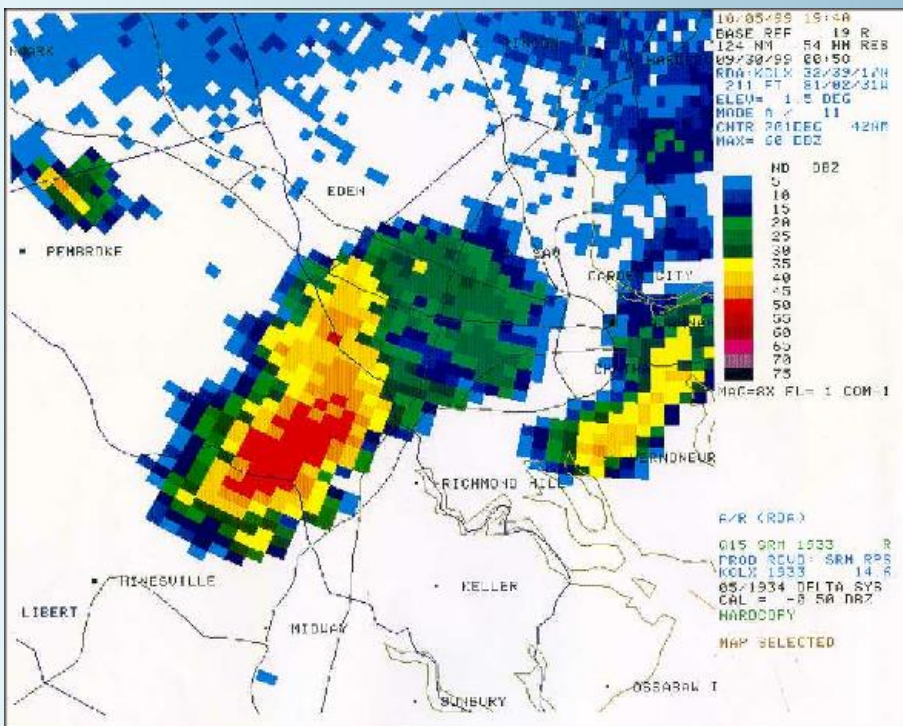
THIS WAS AROUND THE TIME (OR SHORTLY AFTER) OF THE WIND DAMAGE EVENT IN WESTERN CHATHAM COUNTY. THE CELL STILL EXHIBITED ROTATION AT 0033Z, ALTHOUGH WEAKER AT THE 1.5 DEGREE SLICE THAN IN PREVIOUS VOLUME SCANS (FIG 21).

FIG 21



THE SECOND CELL IN BRYAN COUNTY CONTINUED TO DEVELOP ALONG THE FIRST CELL'S REAR FLANKING BOUNDARY AND LIKELY GAINED INCREASING ROTATION. RANGE FOLDING HINDERED INVESTIGATING THE STRENGTH OF THE ROTATION. AS THE STORM MOVED TO THE SOUTHEAST, IT RAPIDLY UNDERWENT AN EVOLUTION FROM A SUPERCELL TO A BOW ECHO. BEFORE ITS DEMISE IN SOUTHEAST BRYAN COUNTY, THE CELL HAD A STRONG BOW SIGNATURE WITH SEVERAL REAR FLANK DOWNDRAFT NOTCHES (FIG 22).

FIG 22



IT IS UNKNOWN WHETHER THE STORM DAMAGE IN WESTERN CHATHAM COUNTY RESULTED FROM A MICROBURST, A WEAK TORNADO, OR BOTH. IT CAN BE SPECULATED THAT SINCE NUMEROUS TREES WERE SNAPPED OFF 15 FT ABOVE THE GROUND, THAT AN F0 OR F1 TORNADO MAY HAVE BEEN THE CULPRIT. GIVEN THE STORM'S SUPERCELL STRUCTURE AND MOTION, THIS ASSUMPTION SEEMS REASONABLE. IT WAS SURPRISING THAT NO DAMAGE WAS REPORTED IN BRYAN COUNTY. UPON INSPECTION OF THE RADAR DATA, IT WAS LIKELY THAT A SWATH OF DAMAGING WINDS AFFECTED UNINHABITED AREAS WEST THROUGH SOUTH OF RICHMOND HILL INCLUDING A SMALL PART OF LIBERTY COUNTY.

[Back to Local Studies Page](#)

[HOME](#)

