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Date: February 14, 2024
Subject: Weather Data for CEN22LA386
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Synoptic Conditions

The NWS south-central Surface Analysis Chart for 1600 CDT is included as figure 1 with the approximate accident site marked by the red star. The chart depicted an outflow boundary extending from Mississippi, bowing southward into Louisiana and then into eastern Texas, and was located north of the accident site. Northerly winds were noted along and north of the boundary with broken to overcast clouds with rain and/or thunderstorms being reported. South of the outflow boundary the chart depicted southerly winds at 10 knots or less with relatively clear skies. The Station model closest to the accident site depicted a southerly wind of 5 knots, a thunderstorm reported within the hour, clear skies, with a temperature of 90°. Fahrenheit (F), and dew point temperature of 73° F.

National Composite radar Mosaic for 1720 CDT is included as figure 2 over the region with the accident site marked by a red star. The chart depicted several scattered heavy to intense echoes surrounding the area southwest through north and northeast of the accident site with an area of light intensity echoes south. The closest echo was about 10 miles northeast, which was associated with a dissipating intense echo.

Observations

The area was documented using official Aviation Routine Weather Reports (METAR) and Aviation Select Special Weather Reports (SPECI). Cloud heights are reported above ground level (agl) in the following section, and the magnetic variation was estimated at 2° east based on the latest sectional chart for the area.

Huntsville Municipal Airport (KUTS), Huntsville, Texas

The closest official weather reporting facility to the accident site was from Huntsville Municipal Airport (KUTS), Huntsville, Texas, located about 24 miles west at an elevation of 363 ft. The airport had an Automated Surface Observation System (ASOS) and was not augmented by any human observers. The raw observations surrounding the period were as follows:

VFR METAR KUTS 092053Z AUTO VRB03KT 10SM CLR 39/18 A2998 RMK AO2 LTG DSNT E AND SE SLP144

T03890183 56028=

VFR METAR KUTS 092153Z AUTO 09006KT 10SM SCT090 37/20 A2996 RMK AO2 LTG DSNT NE AND SE AND W SLP137 T03670200=

Accident 2215Z

VFR METAR KUTS 092253Z AUTO 12003KT 10SM FEW033 SCT075 SCT100 34/22 A2996 RMK AO2 RAB23E50 SLP138 P0000 T03390217=

VFR METAR KUTS 092353Z AUTO 11003KT 10SM CLR 36/21 A2997 RMK AO2 LTG DSNT N AND S AND SW SLP143 60000 T03560211 10400 20339 55001=

VFR METAR KUTS 100053Z AUTO VRB04KT 10SM CLR 34/23 A2998 RMK AO2 LTG DSNT N AND NW SLP145 T03390233=

The observations indicated VFR conditions prevailing with east to southeasterly winds at less than 10 knots. Light rain was recorded at KUTS between 1723 and 1750 CDT with lightning in the distance or between 10 and 30 miles to the northeast, southeast, and west. No strong outflow winds were observed during the period.

The Terminal Aerodrome Forecast (TAF) current for KUTS during the period was as follows.

TAF KUTS 091733Z 0918/1018 17005KT P6SM SCT050

FM092200 15010G18KT P6SM VCTS SCT060CB BKN100

FM100200 14006KT P6SM FEW050 SCT250

FM101400 23005KT P6SM SCT030 BKN080=

Conroe/North Houston Regional Airport (KCXO), Houston, Texas

The next closest station was from Conroe/North Houston Regional Airport (KCXO), Houston, Texas, located about 30 miles southsouthwest of the accident site at an elevation of 245 ft. The airport had an ASOS which was augmented by tower controllers during normal operating hours from 0800 through 1700 CDT. The raw METAR observations surrounding the period were as follows:

VFR METAR KCXO 091953Z 00000KT 10SM FEW080 BKN100 34/20 A3001 RMK AO2 SLP157 T03440200=

VFR SPECI KCXO 092051Z 11007G21KT 080V150 10SM VCTS FEW070 34/21 A2998 RMK AO2 WSHFT 2035 LTG DSNT NE=

VFR METAR KCXO 092053Z 13007G21KT 10SM VCTS FEW070 34/21 A2998 RMK AO2 WSHFT 2035 LTG DSNT NE SLP149 T03440211 56026=

VFR SPECI KCXO 092141Z 10010G18KT 10SM FEW060 36/21 A2997 RMK AO2 LTG DSNT NW-E T03560211=

VFR METAR KCXO 092153Z 12011G20KT 10SM FEW065 36/21 A2997 RMK AO2 LTG DSNT NE AND E SLP143 T03560211=

Accident 2215Z

VFR METAR KCXO 092253Z 15010G19KT 10SM CLR 35/21 A2996 RMK AO2 SLP142 T03500206=

VFR METAR KCXO 092353Z 13010KT 10SM CLR 33/21 A2997 RMK AO2 LTG DSNT W
SLP146 T03280211 10372 20328 55004=

VFR METAR KCXO 100053Z 16007KT 10SM CLR 31/22 A3000 RMK AO2 SLP153
T03110217=

Similar conditions were reported at KCXO with VFR conditions and lightning in the distance, with winds from the southeast at 10 knots gusting to 20 knots. The TAF also expected thunderstorms in the vicinity during the period.

TAF KCXO 091733Z 0918/1018 VRB05KT P6SM SCT050

FM092000 16011KT P6SM VCTS SCT050CB BKN100

FM100000 13009KT P6SM FEW050 SCT250

FM100600 00000KT P6SM FEW250

FM101200 00000KT P6SM SCT030 BKN180=

Angelina County Airport (KLFK), Lufkin, Texas

The next closest weather reporting location was from Angelina County Airport (KLFK), Lufkin, Texas, located about 33 miles north-northeast of the accident site at an elevation of 296 ft. The airport had an Automated Surface Observation System (ASOS) and was not augmented by any human observers. Surrounding the time of the accident the following conditions were being reported:

MVFR METAR KLFK 091953Z AUTO 28004KT 4SM +TSRA FEW055 BKN075 BKN090
27/22 A3003 RMK AO2 WSHFT 1912 RAB39 TSB09 SLP164 P0008 T02670222=

MVFR SPECI KLFK 092002Z AUTO 00000KT 5SM VCTS RA FEW060 BKN075 OVC090
27/24 A3002 RMK AO2 TSE1956 P0002 T02720244=

VFR METAR KLFK 092053Z AUTO 24004KT 10SM FEW110 27/26 A3000 RMK AO2
LTG DSNT NE-S RAE24 TSE1956 SLP156 P0003 60011 T02720256 57020=

**VFR METAR KLFK 092153Z AUTO 00000KT 10SM CLR 29/24 A2998 RMK AO2
LTG DSNT ALQDS SLP147 T02890244=**

Accident 2215Z

**VFR METAR KLFK 092253Z AUTO 16010KT 10SM CLR 33/23 A2999 RMK AO2
LTG DSNT NW-E SLP150 T03280228=**

VFR METAR KLFK 092353Z AUTO 07010KT 10SM VCTS FEW090 28/22 A3002 RMK
AO2 LTG DSNT E SLP160 60011 T02830222 10356 20261 53004=

The observations indicated VFR conditions prevailing with calm to southerly winds of 10 knots or less with lightning in the distant in all quadrants. The TAF also expected a period of temporary thunderstorms and rain during the period. The Terminal Aerodrome Forecast (TAF) current for KLFK during the period was as follows.

AMD TAF KLFK 092001Z 0920/1018 23007KT P6SM BKN050

TEMPO 0920/0923 P6SM TSRA BKN030CB

FM100300 11003KT P6SM OVC100

FM101300 25004KT P6SM OVC025=

Other unofficial weather systems in the area. A wind observation site on the Livingston Dam graphically depicted wind direction and speed (mph) are included as figure 3, and in table form below with wind speed converted to knots for consistency.

Livingston Dam observations:

Time Wind Dir/Speed (KTS)

2103 166° 9

2118 160°

2133 145° 5

2148 138°

2203 144° 7

2218 143°

2233 139° 6

2248 135° 6

Another observation site at Livingston Reservoir near Goodrich (station LVDT2) on the south side of Lake Livingston reported the following conditions surrounding the period.

Time) Wind Dir/Speed (KTS)

2100 148° 15

2115 163° 10

2130 165° 3

2145 184° 3

2200 156° 9

2215 159° 9

2230 159° 6

2245 161° 4

Sounding

A High-Resolution Rapid Refresh (HRRR) numerical model data was obtained from the NOAA Air Resource Laboratory archive using the closest grid point to the accident site coordinates. The HRRR model data was then plotted on a standard skew T log P diagram using the RAOB Analysis software for 1700 CDT (2200Z) and is included as figure 4. The sounding indicated an elevation of 157 ft over the grid point with a near surface temperature of 32.1° C (90° F), a dew point temperature of 21.5° C (71° F), with a relative humidity of 54%, with an approximate density altitude of 2,390 ft. The lifted condensation level (LCL) at about 4,500 ft agl, the level of free convection (LFC) at 6,165 ft agl, and the convective condensation level (CCL) at 6,950 ft agl. The atmosphere was characterized as conditionally unstable with a Lifted Index of -3.8, a K-index of 36.9, and a Convective Available Potential Energy (CAPE) of 1814 J/kg, a

downdraft or DCAPE value of 1177 J/ kg, with a precipitable water content of 1.95 inches. The RAOB Analysis program support general thunderstorms, with potential thunderstorm outflow winds and microbursts to 49 knots (T2Gust/Windex), and small hail to 0.25" in diameter.

The HRRR wind profile indicated a surface wind from 245° at 5 knots with winds backing to the southeast rapidly above 1,000 ft before veering to the west above 10,000 ft. The mean 0 to 6 km or 18,000 ft mean wind was from 290° at 4 knots. West with height with increasing wind speeds. The mean 0 to 6 km (or 18,000 ft) wind was from 290° at 22 knots.

A table of the HRRR parameters of height, pressure, temperature (T), dew point temperature (Td), relative humidity (RH), wind, and potential Clear Air Turbulence (CAT) intensity, Low-Level Wind Shear (LLWS) based on the vertical wind shear below 6,000 ft is included below.

Height (ft-msl)	Pres (hPa)	T (C)	Td (C)	RH (%)	Wind (deg/kts)	CAT (FAA)	LLWS (FAA)
157		1010	32.1	21.5	54	244/ 5	
186		1009	32.1	20.8	51	244/ 5	
274		1006	31.9	21.3	54	243/ 5	
421		1001	32.1	18.7	45	239/ 4	
718		991	31.7	18.0	44	195/ 3	LGT
1137	977	30.8	17.7	46	146/ 4		
1683	959	29.4	17.4	48	138/ 5		
2330	938	27.6	16.9	52	139/ 6		
3082	914	25.5	16.5	58	140/ 7		
3881	889	23.3	15.8	63	141/ 7		
4829	860	20.7	14.9	69	132/ 5	LGT	
5903	828	18.1	13.4	74	093/ 3		

The RAOB Analysis program detected no significant low-level wind shear or significant turbulence outside of convection due to the environmental wind profile of the HRRR.

Satellite Imagery

The GOES-16 infrared and visible imagery were downloaded and documented surrounding the time of the accident. Figures 5 and 6 are the GOES-16 infrared image at 4X magnification with a standard MB temperature enhancement curve applied and the GOES-16 visible image at 2X magnification for 1721 CDT. The images depict a decaying area of mid to high level clouds associated with a dissipating cumulonimbus cloud over the accident site, with a radiative cloud top temperature of 226 Kelvin or -47° C, which corresponded to cloud tops near 38,000 ft based on the HRRR sounding.

Weather Radar Imagery

The closest NWS Weather Surveillance Radar 1988 Doppler (WSR-88D) was from Houston/Galveston (KHGX) Weather Forecast Office (WFO) with the radar antenna located about 78 miles south of the accident site. The Level II archive data for KHGX was downloaded. The KHGX WSR-88D 0.44° base reflectivity image for 1715 CDT is included as figure 7 and depicted several scattered echoes surrounding the accident site with the closest about 5 miles north-northeast with a 42 dBZ cell which was observed dissipating with time. The KHGX radial velocity imagery did not detect any divergence signatures associated with any microburst or outflow boundaries. However, range limitation may have also hindered detection of any strong lowlevel winds over the area.

Area Forecast Discussion

NWS Houston/Galveston Area Forecast Discussion (AFD) issued at about 1600 CDT was as follows:

FXUS64 KHGX 092100

AFDHGX

Area Forecast Discussion

National Weather Service Houston/Galveston TX

400 PM CDT Tue Aug 9 2022

.SHORT TERM [Through Wednesday Night]...

Isolated to widely scattered showers with a few thunderstorms will continue to develop through early this evening, with better chances north of 1-10. This is in response to a weak boundary and mid-level shortwave extending along the Arklatex/Lower MS Valley. These features are contributing to steep low-level lapse rates along with strong/rich moisture transport with PWAT values above 2 inches. This activity will linger through sunset, though some showers may persist through late evening across our northern counties.

The environment will remain unstable through the end of the short-term with periods of showers and thunderstorms. Different impulses of energy/vort max embedded in the flow aloft will move southward into the region tonight into Wed night. In addition, daytime heating and weak sea/bay breezes could lead to scattered convection on Wed afternoon. Have increased PoPs to 50-60 percent chance for Wednesday. Temperatures will remain near normal for early August given increasing cloud cover and precipitation chances. Wednesday's highs will range from the mid to upper 90s inland, mid to upper 80s along the coast.

.AVIATION [18Z TAF Issuance]...

Showers and thunderstorms will continue to develop and move over the terminals this afternoon. There will be two areas to monitor for convection: (1) SHRA/TSRA along the sea/bay breezes this afternoon and (2) additional activity coming from the north due to a decaying outflow boundary. Precipitation should taper off around 7-9pm. Showers are again expected along the coastal terminals by early Wednesday morning, expanding inland by noon. South to southeasterly light winds are expected, strengthening in the afternoon. Otherwise, VFR conditions are expected through the period.

HGX WATCHES/WARNINGS/ADVISORIES...

TX...None.

GM...None.

In-flight Weather Advisories

The NWS Aviation Weather Center (AWC) and Houston Center Weather Service Unit (CWSU) issued several advisories over the region surrounding the period in the form of Center Weather Advisories (CWA) and Convective SIGMETs (WST). None of which directly impacted the accident location. The advisories were as follows:

FAUS21 KZHU 092103

ZHU1 CWA 092103

ZHU CWA 105 VALID UNTIL 092200

30N PSX

ISOL TS...DIAM 15NM...MOD/HVY RAIN. MOV FM 13010KT. TOP ABV FL420.

WKNG EXPD BY 2130Z. TX

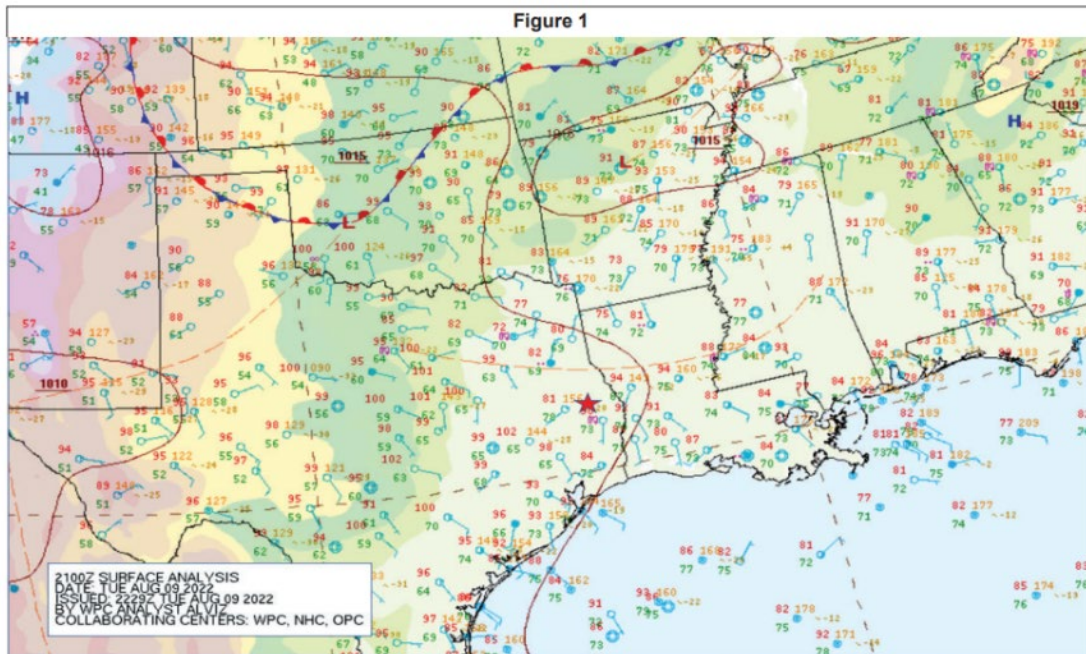
=

FAUS21 KZHU 092142
ZHU1 CWA 092143
ZHU CWA 106 VALID UNTIL 092200
FROM 35NNW PSX-30SSW IAH
LINE...20NM WIDE...EMBD TS. MOD/HVY RAIN. MOV FM 13010KT. TOPS ABV
FL400. ACT TO CONT BYD 22Z. TX

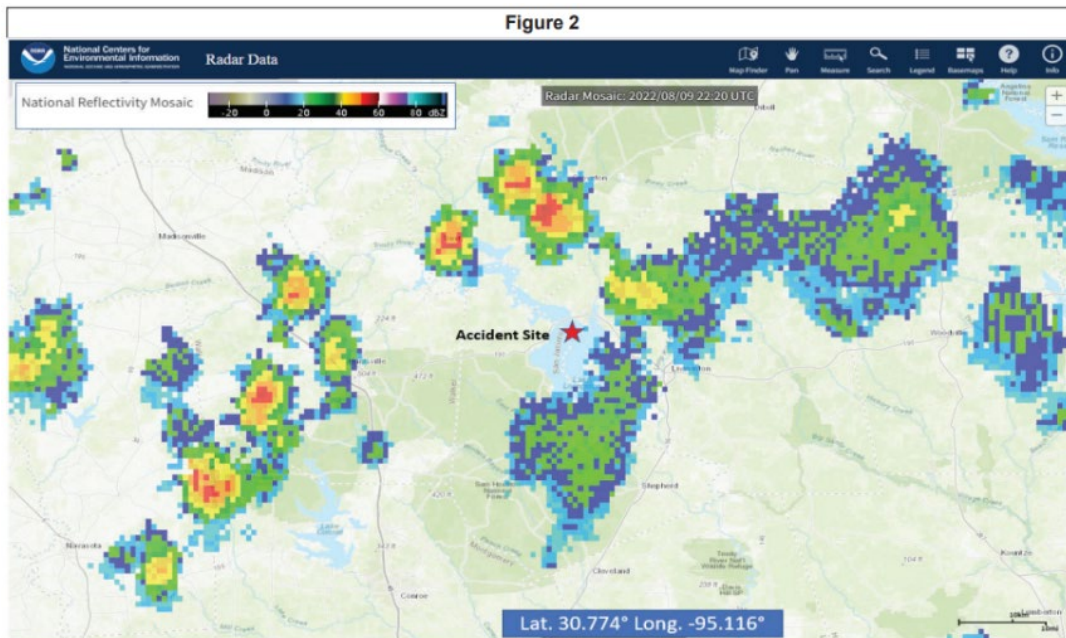
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WSUS32 KKCI 092155
SIGC
_MKCC WST 092155
CONVECTIVE SIGMET 09C
VALID UNTIL 2355Z
TX
FROM 60N LRD-20NW CRP-BRO-90W BRO-60N LRD
AREA EMBD TS MOV LTL. TOPS ABV FL450.

CONVECTIVE SIGMET 10C
VALID UNTIL 2355Z
AL MS LA AR TX OK AND MS LA TX CSTL WTRS
FROM 40NNW TXK-VUZ-40NNW CEW-30SW LEV-40WNW PSX-40NNW TXK
AREA EMBD TS MOV FROM 26005KT. TOPS ABV FL450.

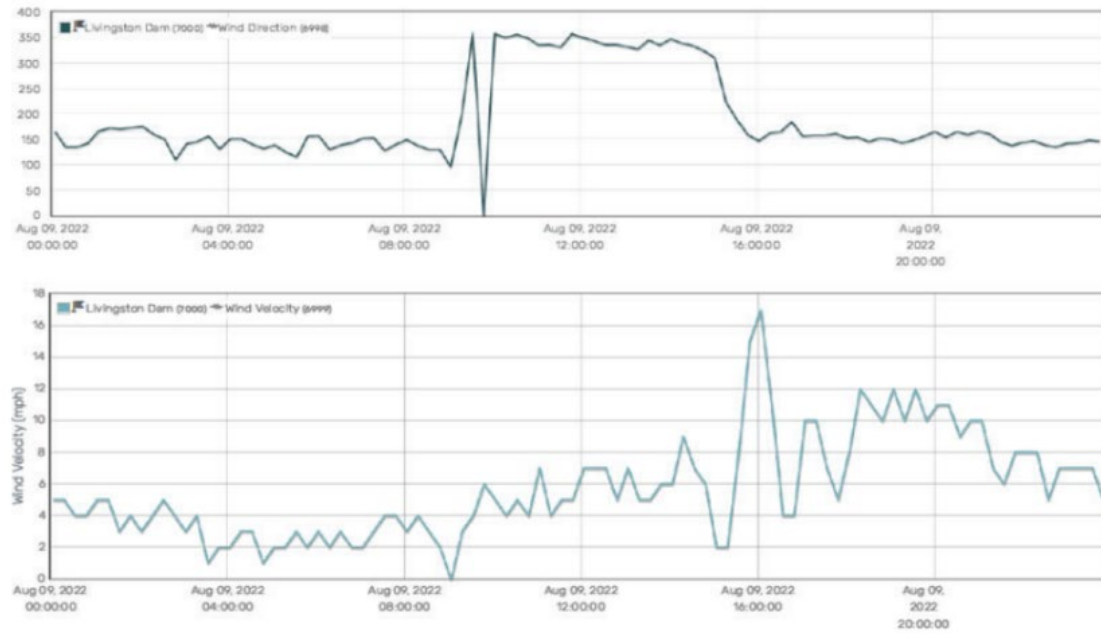


Caption South-central NWS Surface Analysis Chart for 1600 CDT with the accident site marked by the red star. An outflow boundary identified north of the accident site.



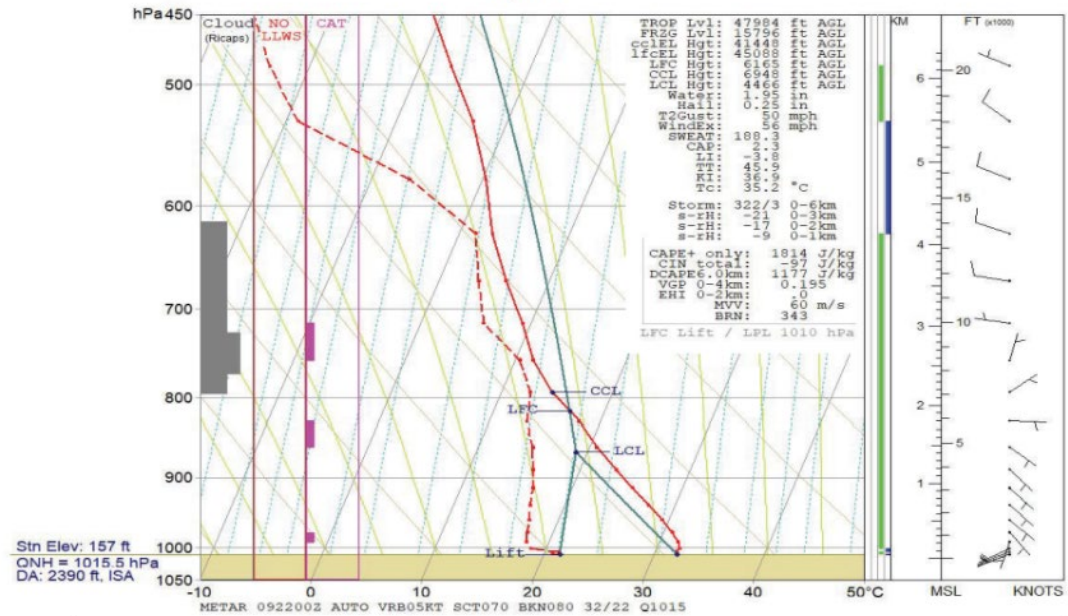
Caption Regional view of the National Composite Radar Mosaic for 1720 CDT over the area with the accident site marked by the red star. Several echoes depicted surrounding the site west through north, and northeast and south.

Figure 3

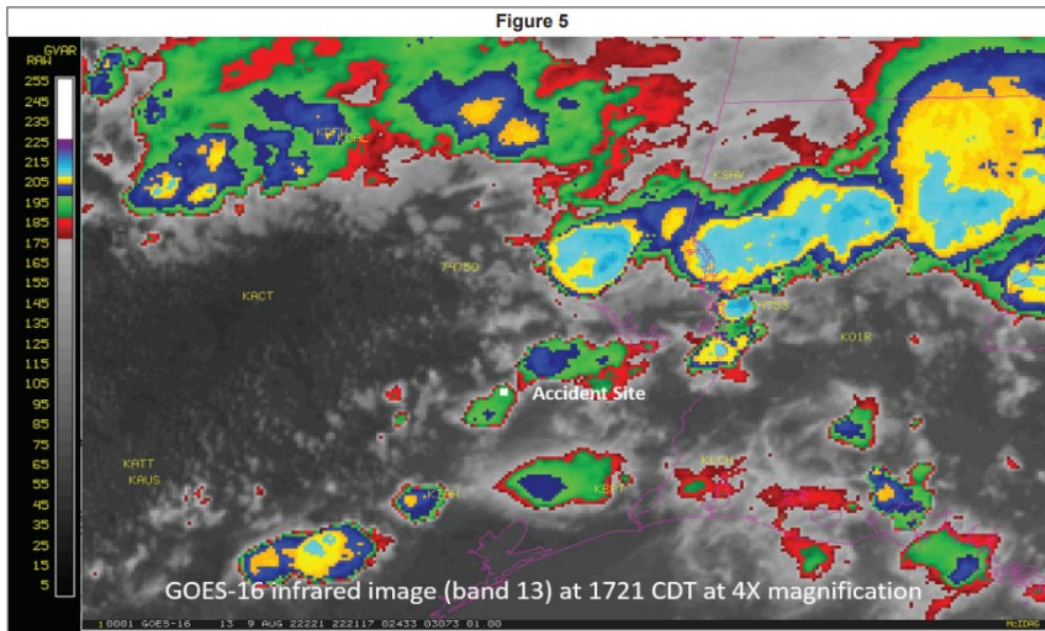


Caption Livingston Dam wind observations surrounding the period.

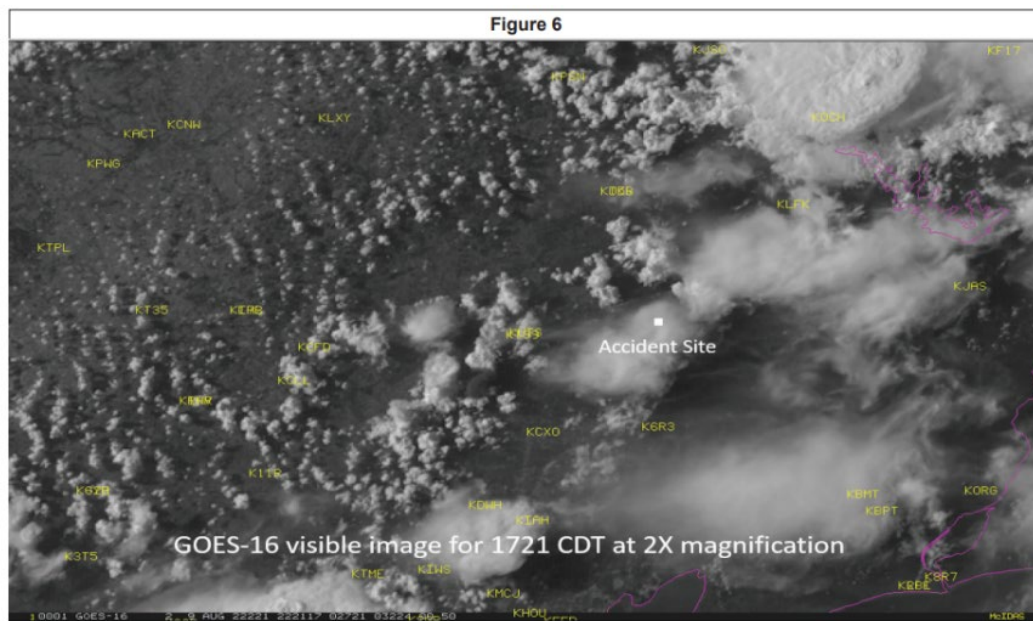
Figure 4



Caption HRRR numerical model sounding over the accident site for 1700 CDT depicting temperature, moisture, wind and other significant elements.



Caption GOES-16 infrared image for 1721 CDT at 4X magnification with a standard MB temperature enhancement curve applied.



Caption GOES-16 visible image at 1721 CDT at 2X magnification.

