11B.5

A Severe Weather Climatology For The NWS WFO New Orleans-Baton Rouge County Warning Area (CWA)

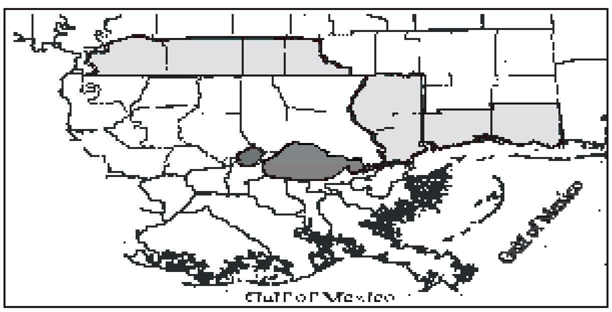
Suzanne Van Cooten*
NOAA-National Data Buoy Center

1. Introduction

National Weather Service (NWS) Weather Forecast Offices (WFO)s manage an integrated warning program to reduce fatalities, injuries, and property damage due to weather, water, and climate conditions. Although this integrated warning program combines the three equally important components of detection and warning, communication and dissemination, and response, the foundation to developing and maintaining a successful program is an analysis of the weather and water hazards threatening the area of responsibility. This historical summary of severe wind, hail, and tornadic events from 1950 through 2001 across southeast Louisiana and southern Mississippi was completed to provide a foundation to aid in the assessment of the frequency and risks associated with these hazards.

2. Characteristics and History of the CWA

Figure 1



During NWS Modernization efforts of the 1990s, NWS WFO New Orleans-Baton Rouge, assumed responsibilities for 22 parishes of southeast Louisiana and 8 counties of south Mississippi (shaded) Figure 1. This new CWA maintained the traditional service area of the NWS WFO and added Louisiana parishes previously serviced by NWS WSO Baton Rouge and Lake Charles, Louisiana, and Mississippi counties from NWS WSFO Jackson, Mississippi, and NWS WSO Mobile, Alabama. In addition to watch and warning responsibilities for these parishes and counties, NWS WFO New Orleans-Baton Rouge maintains an active marine program. Through mid-year 2000, the WFO was responsible for marine watches and warnings for the Gulf of Mexico. In late 2000, these responsibilities were realigned. Today, the WFO maintains watch and warning responsibilities for the tidal lakes of Pontchartrain and Maurepas and the coastal waters of southeast Louisiana and Mississippi from Atchafalaya Bay, Louisiana, to Pascagoula, Mississippi.

* *Corresponding author address*: Suzanne Van Cooten, National Data Buoy Center, Stennis Space Center, MS 39529-6000;e-mail: suzanne.van.cooten@noaa.gov

3. Limitations and Considerations

Recent severe weather climatologies, such as Hart et al (2001) and Calianese et al (1998), have expressed concerns on the underrepresentation of severe weather reports prior to 1975. Kelly et al (1985 and 1978), Hales (1993), Sammler (1993) and Brooks (2000), attribute this trend to the process by which events are observed, relayed, verified and recorded due to changes in NWS procedures, training programs, and population trends. To investigate these trends on the CWA historical event record, Figures 2 and 3 were constructed. These figures support concerns on driving future trends from this historical record due to the dramatic change in the apparent number of events across the CWA since 1975.

Figure 2- Severe Storm Events 1950-1975

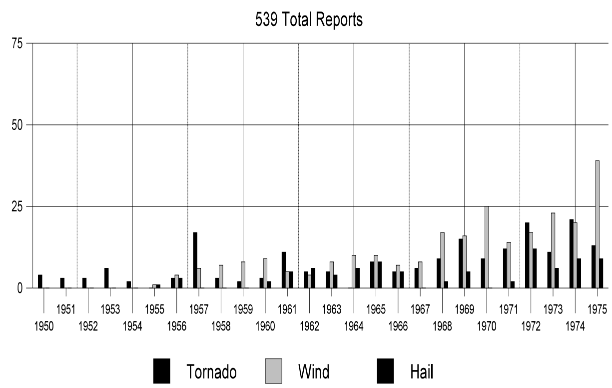
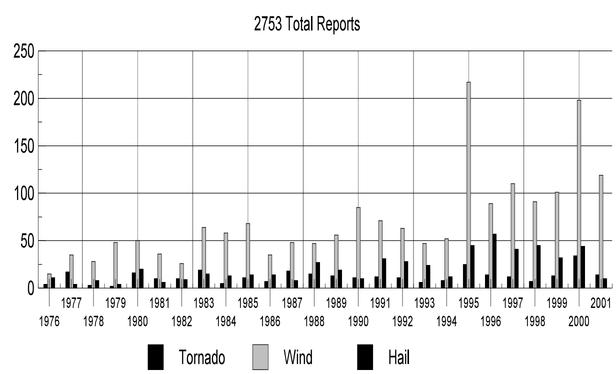


Figure 3-Severe Storm Events 1976-2001



4. Data and Analysis Process

This climatology is a compilation of tornado, hail, and wind events meeting or exceeding NWS Weather Service Operations Manual (WSOM) C-40 severe weather criteria of hail 3/4 inch (19 mm) in diameter and winds 50 knots (25.8 m/s). WSOM C-40 also states that "structural wind damage may imply the occurrence of a severe thunderstorm."

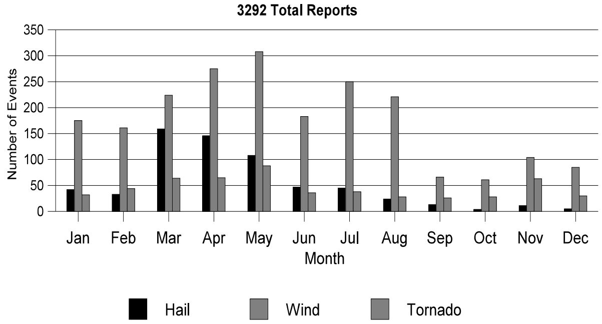
Data was compiled from three sources. Storm Prediction Center (SPC) online files were used for hail and wind reports from 1955-1995 and tornadoes from 1950-1995. The Online Storm Event Database from the National Climatic Data Center (NCDC) was the second source of event data. This database "Contains all weather events from 1993-Current, as entered into Storm Data. (Except 6/93 -7/93, which is missing) and additional data from SPC for Tornadoes 1950-1992, Thunderstorm Winds 1959-1992, and Hail 1959-1992." The third source of data was Storm Data publications (1975-1999).

To detect discrepancies in event reporting by the three data sources, individual QuattroPro spreadsheets were created containing hail, wind, and tornado events for the CWA counties/parishes. In discussions with the NWS WFO New Orleans-Baton Rouge Warning Coordination Meteorologist (WCM), an event report was included in the WFO database if it was reported by any of the three sources. It is from this synthesized WFO storm database, that this study's results are drawn from with results presented to illustrate the implications of using one data source exclusively.

5. Event Frequency Comparison

For the period of record from January 1, 1950 through December 31, 2001, there were 3,292 severe weather events reported within the NWS WFO New Orleans CWA. For this climatology, severe hail, wind, or tornado events which occurred coincident with a tropical system (depression, storm, or hurricane) passing within 60 miles of the CWA were not included. Events which occurred on the coastal waters or on Lakes Pontchartrain or Maurepas were also omitted from this study but were noted for future research.

Figure 4-Severe Storm Reports 1950-2001
3292 Total Reports

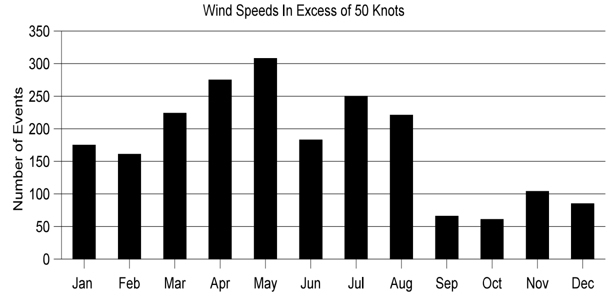


As shown in Figure 4, severe wind events occur 4 times more frequently than tornado or hail events for the period of record from 1950-2001. One possible reason may be due to the subjective nature of the reports which according to WSOM C-40 definition "Structural wind damage may imply the occurrence of a severe thunderstorm." Kelly et al (1985) note that there have also been changes in procedures used by the NWS for determining "Structural wind damage" from 1955-1983.

A comparison of Figure 4 with the rainfall patterns presented in a rainfall climatology by Van Cooten (2001), shows October has the least number of storm reports with 4 hail, 61 wind, and 28 tornadoes reported for the 51 year record which is not surprising considering October is historically the driest month. Similar to historical rainfall patterns, a peak in event reports is noted in April (486 reports) and May (504 reports). These two months account for one third of all severe weather events reported across the CWA. A secondary peak appears in July of primarily wind events, possibly correlated with late afternoon thunderstorms.

6. Wind Events

Figure 5-Severe Storm Wind Events 1955-2001
Wind Speeds In Excess of 50 Knots



There were 2113 wind events reported from 1950-2001. Figure 5 shows an increasing trend in the number of wind reports during spring months with a maximum in May with 308 events. Secondary peaks can be seen in July and November.

To discover temporal trends, wind reports were classified on the basis of Central Standard Time (CST) and Normalized Solar Time (NST). This conversion process is described in Kelly et al (1978) where it is referenced as Local Mean Solar Time (LST) and Doswell (1985). By taking the local sunrise and sunset for a day, the daylight and nighttime hours are calculated and then divided by 12 to "normalize" the day. By using NST, event dependency on the diurnal cycle can be seen. NST also helps identify events occurring during the day or at night since sunrise is set to to 6 NST and sunset to 18 NST.

Figure 6- Severe Storm Wind NSTDistribution

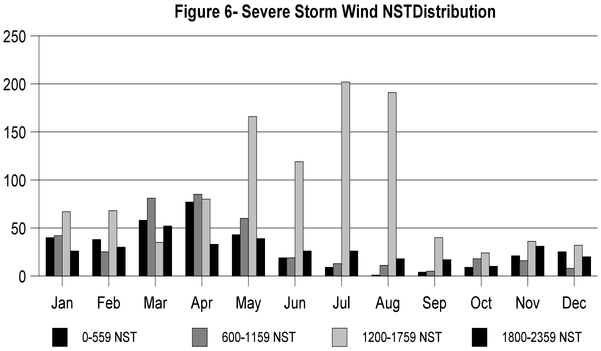
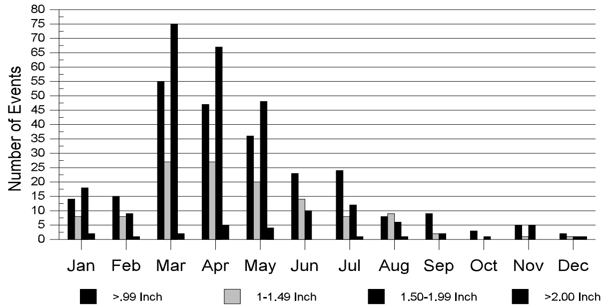


Figure 5 shows that for the months of May, June, July, and August there appears to be a dependency on solar heating. For June, July, and August, over 90 percent of events occur during the day and primarily from solar noon (12 NST) to sunset (1759 NST).

7. Hail Events

Figure 8 -Hailstone Diameter Distribution



For the period of record from January 1, 1955 to December 31, 2001, hail events occur most frequently in March (159 reports), followed by April (146 reports) and May (108 reports). For the period of record, 64 percent of the total hail reports received were during the spring months of March, April, and May.

There were 241 reports of hail less than .99 inch (25 mm) in diameter, 125 reports of hail 1.00 to 1.49 inch (26 mm-37 mm) in diameter, 254 reports of hail 1.50 to 1.99 inches (38 mm-49 mm) in diameter, and 17 reports of hail 2 inches or larger (50 mm) in diameter. Hailstones of diameter 1.50 to 1.99 Inches (38 mm-49 mm) were reported more frequently than hail less than .99 inch (25 mm) in diameter. When a classification of hailstone diameter is created representing reports from 1 to 1.99 inch (26 mm-49 mm) in diameter, 379 reports fall into this category which represents 59 percent of total reports. Although this distribution shows hail reports of 2 inches (50 mm) in diameter or larger are rare, April and May account for over half of the occurrences with 5 events reported in April and 4 events in May.

Figure 9- Hail NST Distribution

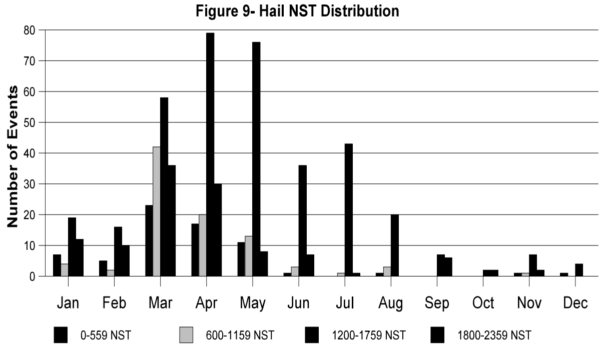
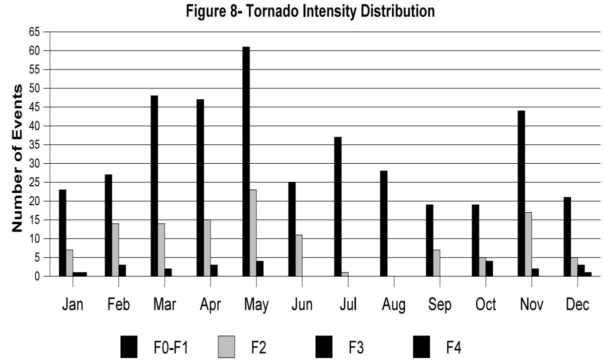


Figure 9 shows the temporal distribution of the hail reports received. The majority of reports, 367 reports (57 percent of the total received) occurred in the 12-1759 NST time interval. There were 114 reports (18 percent) in the 18-2359 NST time interval, 89 reports (14 percent) in the 6-1159 NST time interval, and 67 reports (11 percent) in the 0-559 NST time interval. No reports of hail 2 inches (50 mm) diameter or larger occurred in the 6-1159 NST time interval. For hail reports of 2 inches (50 mm) diameter or larger, over 90 percent of the reports occurred in the 12 to 1759 NST time interval.

8. TornadoEvents

This tornado climatology expands on the 1950-1990 data presented by Revitte (1992). Figure 8 shows the monthly frequency and intensity of tornadoes for the period of record from January 1, 1950 to December 31, 2001. The highest frequency of tornadoes historically occur during the months of March, April and May.

Figure 8- Tornado Intensity Distribution



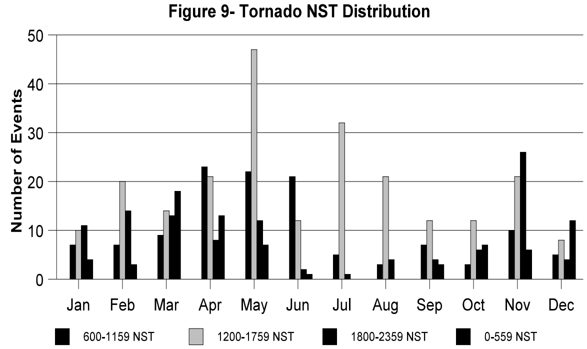
Forty percent of all tornadoes occur during these months. The month of May has the highest frequency of tornadoes with 88 reports (16 percent of total) where 61 events were F0/F1, 23 as F2, and 4 as F3. April has the second highest frequency of tornadoes with 65 reports (12 percent of total) with 47 events classified as F0/F1, 15 as F2, and 3 as F3. March is similar to April with 64 reports received (12 percent of total) with 48 classified as F0/F1, 14 as F2, and 2 as F3. Similar to the historical wind and hail trends, a secondary maximum occurs in November where 63 reports were received (12 percent of total) with 44 reports classified as F0/F1, 17 as F2, and 2 as F3. Another relative maximum was found in July where 38 reports were noted (7 percent of total). However, the majority of these tornadoes were weak with 37 classified as F0/F1and only one as an F2.

By examining Figure 9, no F3 or F4 tornadoes were reported in June, July, August, and September. In August, all 28 tornadoes reported were classified as F0/F1 intensity. Violent tornadoes of F4 intensity or greater are rare with only three reported for the 51 year period. However, one of these F4 tornadoes occurred October 3, 1964, in Lafourche Parish, Louisiana, associated with Hurricane Hilda. Due to its association with a tropical system, this F4 was not included in this study. For this study, only two F4 tornadoes, one F4 on January 10, 1975, in Pike County, Mississippi, which killed 4 and injured 200, and an F4 in St. John the Baptist Parish, Louisiana, on December 3, 1983, which produced 25 injuries but no fatalities were included. Both tornadoes occurred at night when CST time is converted to NST.

Figure 9 shows most tornadoes in November and December occur at night. In November, half of F0/F1 intensity tornadoes and 60 percent of F2 intensity tornadoes occur after sundown. In December, 29 percent of F0-F1 and 80 percent of F2 intensity tornadoes occur at night. This trend is not exclusive of these winter months. For March, 44 percent of F0/F1 and 64 percent of F2 intensity tornadoes occur at night. The nocturnal bias seems to reverse itself from late spring into summer.

In May, 75 percent of F0/F1 and 65 percent of F2 tornadoes occur during daylight hours. June reports similar numbers with 76 percent of F0/F1 and 55 percent of F2 tornadoes occurring during daylight hours. July and August show 84 percent and 82 percent, respectively, of F0/F1 tornadoes occur during daylight hours, which is even more important when the fact that all tornadoes reported historically for these two months were F0/F1 with the exception of one F2 in July.

Figure 9- Tornado NST Distribution



9. Implications of Using a Single Data Source

HAIL	**MS-SPC**	Storm Data	NCDC	**LA-SPC**	Storm Data	NCDC
1988	14	15	14	11	11	11
1989	9	10	9	8	9	8
1990	5	6	5	4	4	4
1991	6	8	6	16	23	17
1992	4	4	0	24	24	0
1993	9	9	6	11	15	12
1994	7	7	7	5	5	4
1995	17	17	16	25	25	14
SUM	71	76	63	104	116	70

WIND	**MS-SPC**	Storm Data	NCDC	**LA-SPC**	Storm Data	NCDC
1988	19	23	19	21	24	21
1989	9	11	10	39	45	39
1990	19	21	20	56	63	55
1991	10	11	10	54	59	54
1992	16	17	0	36	46	0
1993	9	9	6	25	37	23
1994	12	16	15	35	35	31
1995	29	32	30	159	172	124
SUM	123	76	110	425	481	347

For this summary, storm reports from SPC, NCDC, and Storm Data were compiled to create a WFO database. In the WFO hail, wind, and tornado databases, each report from these three sources was recorded to identify discrepancies in event reporting. By employing this method, it was discovered that the NCDC source did not contain any hail or wind reports for 1992. There are also many discrepancies in 1994 and 1995 between the SPC and NCDC databases. To illustrate the implications of using one data source exclusively to compile a historical record, two tables were constructed for wind and hail events reported by SPC and NCDC databases, and Storm Data for the period from 1988 to 1995 when all three of sources were available. As the tables of hail and wind reports for Louisiana and Mississippi show, a storm event summary based exclusively on NCDC, SPC, or Storm Data can yield dramatically different results. Although not presented, these discrepancies carry over to summaries of storm injuries and fatalities.

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