

THE GREAT LOUISIANA HURRICANE OF AUGUST 1812

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Historical data, consisting of diaries, ship logbooks, ship protests, and newspapers, reconstruct the path, intensity, and societal impacts of a major hurricane in 1812 that is the closest known storm to pass New Orleans.

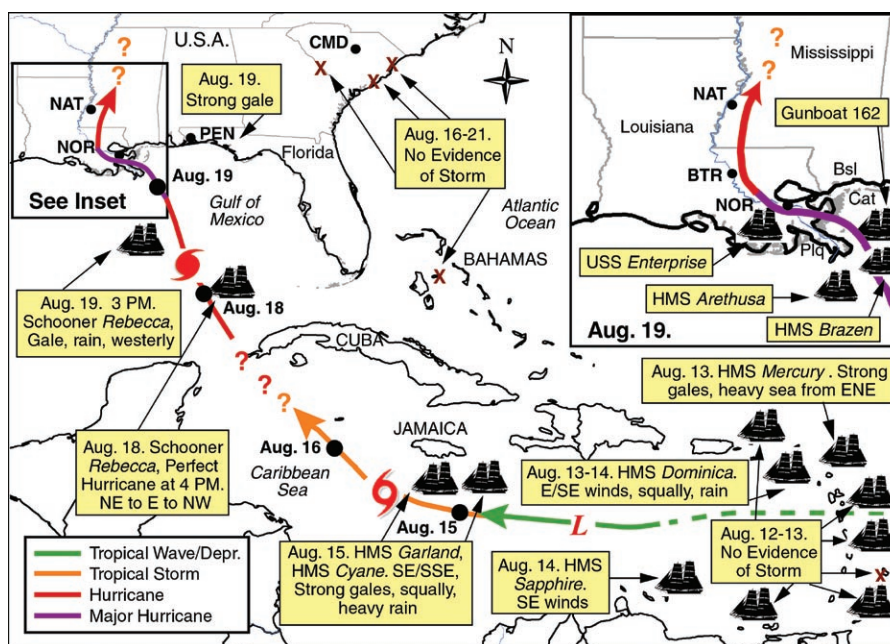


FIG. 1. Reconstructed track, positions of selected ships discussed in the text, and selected verbal information on the hurricane of Aug 1812. The dates next to the filled circles on the track indicate the storm center in the afternoon; “Depr.” is an abbreviation for depression.

Hurricanes are a significant, expensive, and life-threatening natural hazard along the coastal regions of the United States. The most costly, and among the most deadly, U.S. hurricane on record is Hurricane Katrina, which struck near New Orleans, Louisiana, in 2005. Katrina resulted in at least 1833 deaths and over \$81 billion of damage (U.S. dollars, 2005; Knabb et al. 2005). The event of Hurricane Katrina is likely not the worst-case scenario for New Orleans, however. Although its eye reached as close as about 50 km to the east of New Orleans, its strongest winds at major hurricane strength were likely present over water east of the eye (Knabb et al. 2005). Other storms, such as Hurricane Betsy in 1965, also devastated New Orleans with ►

a track 150 km to the west of the city, enabling a deadly storm surge.

Instrumental and documentary records have been successfully utilized to reconstruct Atlantic hurricanes prior to the first official U.S. hurricane warnings of the early 1870s. These reconstructions include various case studies at sub-regional spatial scales that reveal potential worst-case scenarios that are considered “unprecedented” when examining just the modern record alone (Ho 1989). Hurricane histories of worst-case scenarios are very important to understand because potential damage can be associated with insured property losses worth up to tens of billions of dollars (Pielke et al. 2008) and hurricane recovery aspects that encompass many decades (Kates et al. 2006). Historical reconstructions can also be compared with research results from other paleotempestology proxies (e.g., Frappier et al. 2007) as well as with modeling simulations (e.g., Jarvinen 2006). The high-resolution historical source consists of records such as ship logs, diaries, annals, and newspapers (e.g., Chenoweth 2006), enabling even some detailed subdaily hurricane reconstructions (e.g., Vaquero et al. 2008). Recently, Mock (2008) reconstructed a continuous tropical cyclone chronology for Louisiana that dates back to 1799. Mock (2008) and Ludlum (1963) referred to a storm that struck near New Orleans in 1812, which is likely to be the closest major hurricane that ever passed by the city. Ludlum (1963) named this storm “The Great Louisiana Hurricane of 1812.” This paper describes this August 1812 storm in detail as reconstructed

TABLE 1. Locations of selected geographic locations shown in Fig. 1 that provided detailed daily weather information for the hurricane of 1812. Cities are in all capital letters; other geographic names are in capital letter first followed by lower case.

Location identification	Geographic location
BTR	Baton Rouge, Louisiana
CMD	Camden, South Carolina
NAT	Natchez, Mississippi
NOR	New Orleans, Louisiana
PEN	Pensacola, Florida
Bsl	Bay of St. Louis, Mississippi
Cat	Cat Island, Mississippi
Plq	Plaquemines Parish, Louisiana

from all of the available historical data, including its origin in the Caribbean, its track, and its specific damages and societal impacts in Louisiana.

HISTORICAL DATA. Although no systematic instrumental weather data were recorded in Louisiana or the adjacent areas during 1812, copious documentary data enabled a detailed reconstruction of the storm. The study area encompasses the entire state of Louisiana and adjacent coastal Mississippi, Alabama, and Florida, given that these areas were all impacted by the 1812 storm. However, this study also extends south and east to include the Gulf of Mexico and the Caribbean Sea to reconstruct the track of the storm (Fig. 1; Table 1). All of the available primary and secondary sources were examined in this study, with data taken from various archives (Table 2). The following types of historical data were utilized in this study.

Newspapers. Newspapers provided the most detailed documentary source of tropical cyclones, as previously demonstrated by Atlantic basin reconstructions by Chenoweth (2006), Chenoweth and Divine (2008), and Mock (2004, 2008). Information provided by newspapers includes descriptive aspects on the hourly timing of storm impact, wind direction, wind intensity, rainfall, tide height, damage to buildings and trees, specifics on geographic extent of damage, various societal impacts, and deaths. However, the amount of detail on tropical cyclones varied by newspaper and by storm intensity, although generally, a major hurricane impact receives widespread press coverage in newspapers up to several months after the storm. This study utilized information from 28 different newspaper titles, which include 5 from Louisiana, 17 from other U.S. states, and 6 from

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outside the United States. Care was taken to utilize all of the most original newspaper descriptions and unedited versions.

Ship logbooks. Ship logbooks are the only documentary source with weather descriptors derived from continuous observations and typically are recorded every 2–4 h in the early nineteenth century (e.g., Chenoweth and Divine 2008). This detail normally included prevailing wind direction and verbal remarks on wind intensity, precipitation, and thermal aspects of the weather. Latitude and longitude were determined each day at local noon, weather permitting, and the mention of place names also helps in finding specific locations of ships. The British Royal Navy enforced a blockade of American ports during the War of 1812, and thus their logbooks provided particularly valuable information in the Gulf of Mexico and Caribbean Sea (Admiralty Captains’ Logs 1812; Admiralty Masters’ Logs 1812). This study utilized information from one American navy logbook (USS *Enterprise* 1812), one American merchant logbook, and 12 British Navy logbooks.

Diaries, letters, and ship protests. Diaries, letters, and ship protests supplement newspaper and logbook in-

formation by providing daily weather activity during, both just prior to and soon after tropical cyclone events (e.g., Dudley et al. 1992). This information occasionally also included wind direction, but mostly it related to storm damage and societal impacts. The information in these manuscripts provided valuable information for remote areas over both land and sea that was not documented in newspapers and logbooks, including Spanish archives from the Archivo General de Indias (General Indies Archive) in Seville, Spain (Garcia-Herrera et al. 2007). Ship protests from the New Orleans Notarial Archives are particularly unique, because when a mishap occurred at sea or on inland waterways in the Mississippi River Delta, a ship’s captain normally informed the mishap immediately to a notary when arriving at New Orleans. The purpose was to have a written record in case of later legal action involving damaged cargo and deaths at sea, because hurricanes were sometimes stated as the cause of the mishap. The weather data in ship protests contained plenty of storm information. However, caution must also be exercised on the potential excessive duplication of text from ship protests, because some protests do not stand alone as separate unique records. This study utilized 22 ship protests from the New Orleans Notarial Archives (1812), of which 18

TABLE 2. Locations of historical archives and repositories visited in person for primary sources in this study. All locations are in the United States, unless noted.

Archive name	Archive location
American Philosophical Society	Philadelphia, Pennsylvania
Archivo General de Indias	Seville, Spain
Boston Public Library	Boston, Massachusetts
British Library	London, United Kingdom
Hill Memorial Library, Louisiana State University	Baton Rouge, Louisiana
Historic New Orleans Collection	New Orleans, Louisiana
Latin American Library, University of Florida	Gainesville, Florida
Library of Congress	Washington, D.C.
Marlene and Nathan Addlestone Library, College of Charleston	Charleston, South Carolina
Massachusetts Historical Society	Boston, Massachusetts
McKeldin Library, University of Maryland	College Park, Maryland
U.S. National Archives	Washington, D.C.
U.K. National Archives	London, United Kingdom
New Orleans Notarial Archives	New Orleans, Louisiana
New Orleans Public Library	New Orleans, Louisiana
Rhode Island Historical Society	Providence, Rhode Island
South Caroliniana Library, University of South Carolina	Columbia, South Carolina
Thomas Cooper Library, University of South Carolina	Columbia, South Carolina

were recorded by Notary John Lynd. The study also utilized information from nine land-based diaries and recollections in the New Orleans area.

METHODOLOGY. Methods on reconstructing the track of the 1812 storm follows similar guidelines as done in previous studies related to the North Atlantic Hurricane Database (HURDAT; Landsea et al. 2004). To conclusively utilize data that are representative of the 1812 storm's track, the data must clearly exhibit characteristics of tropical systems. The main characteristics examined for tropical systems include 1) sustained strong winds for much longer than several hours, 2) specific wind direction changes that are consistent with the direction of movement of the tropical cyclone relative to a particular location, 3) descriptions of tropical cyclone damage, 4) the absence of hints of substantial drops in temperature, which suggest extratropical frontal activity, and 5) information concerning storm surges. Under no circumstances were data used if collocated records reveal conflicting implications. All of the historical data that were representative of wind directions of tropical activity were plotted on maps representative for each day (afternoon), and estimated latitudes and longitudes of tropical cyclone centers for 15, 16, 18, and 19 August were determined. Data that were suspected of being of poor quality and inhomogeneous were not used in the mapping procedure. For areas near landfall at Louisiana with more copious data, tropical cyclone positions were assessed for more detailed positions of several times within a day. A master track was compiled from analyses of all of the maps.

Tropical cyclone intensity analysis was mostly restricted to the Louisiana area, given its more plentiful data, although some conservative analyses were possible from ship logbooks and newspapers in the Caribbean as well. Intensity was determined by using a conservative categorical (content analysis) approach to categorize tropical cyclone intensity into three classes consistent with the Saffir–Simpson scale used today: tropical storm, category 1–2, and category 3+ (Mock 2008). Assessments of historical information were made by directly comparing them with similar modern data, based on conservative qualitative criteria (e.g., Boose et al. 2001). Building construction practices in 1812 were quite different in standards and characteristics than those in the present day. Thus, detailed damages on historical buildings could not be used to estimate specific hurricane intensity, as conducted today, with widespread devastating damage being suggestive of major hurricane impacts

(Sandrik and Landsea 2003; Boose et al. 2001, 2004). Tree-based damage, however, is a reliable criterion for directly comparing historical and modern data. Storm surge aspects also were generally more reliable, but the different aspects of levees, swamp vegetation, and sea level in 1812 permit conservative suggestions. The content analysis was done separately in regards to three types of damage: wind-based damage, storm surge, and vegetation-based damage. Purely local information was not emphasized because it may represent impact from urban-induced hurricane gusts or poor-quality data, as opposed to broad sustained winds in a tropical system.

THE TRACK OF THE AUGUST 1812 STORM.

The earliest data indicating the formation of the August 1812 storm come from the logbook of the His Majesty's Ship (HMS) *Mercury*, which was moored at English Harbor, Antigua, on 12 August (Fig. 1). A low pressure disturbance likely passed to the south of Antigua. Winds on 12 August were mostly from the northeast, changing late in the day to the southeast direction, with squally conditions and rain. On 13 August as the HMS *Mercury* sailed westward from Antigua, it experienced alternating Northeast and southeast winds, at times reaching gale force and with a heavy sea. Numerous other British logbooks in the eastern Caribbean, however, do not have clear evidence of an organized tropical system; thus, its strength at this time was likely a strong tropical wave. The tropical disturbance continued its westward motion on 13–14 August, as indicated by the logbook of the HMS *Dominica*, anchored at James Point, Saint Thomas. The east-southeast winds with squalls and rain indicate that it received the northern fringe of the disturbance.

The lack of an observed distinctive wind shift and southeast winds from the HMS *Sapphire* (located near Curacao) do not provide evidence of a system with a closed circulation by 14 August as it moved into the mid-Caribbean. If the system did not have a closed circulation, then it likely was still a strong tropical wave at this point, because on occasion tropical waves can contain gale-force winds. Several British logbooks and newspapers reveal the cyclone as developing toward tropical storm strength on its approach to Jamaica by late on 15 August and likely continuing to strengthen early into 16 August (Chenoweth 2003). The HMS *Garland*, south of Jamaica, reported persistent southeast winds, squally weather, and strong gales, which are indicative of tropical storm strength, although there is still not yet definite evidence of a closed circulation. The HMS *Cyane*,

sailing near the Black River south of western Jamaica, experienced mostly east-southeast winds late on 15 August, with strong gales and heavy rain, and these continued through midday into 16 August as it approached eastern Jamaica. The *Jamaica Royal Gazette* (1812) summarizes the impact on Jamaica, likely wind-related damage, in a clipping dated 22 August as follows:

“The late stormy weather has done considerable damage in many parts of this side of the island, where the land has a south eastern exposure, particularly to plantain-walks and cornfields; but the wind having remained steadily in the south-east point, the principal part of the shipping, as well as the plantain-walks and cornfields on the north side have experienced but little injury.” (*Jamaica Royal Gazette* 1812).

After passing to the south and west of Jamaica, the storm likely took a northwest turn and passed near the Isle of Youth, possibly making landfall in extreme western Cuba and entering the southern Gulf of Mexico. Perez Suarez et al. (2000) did not document this storm for Cuba, but given the sparse data during this time for this region, it likely went unreported. The onset of the War of 1812 with the British blockade created a sharp reduction of commercial shipping, likely relating to the unfortunate lack of data found for this area. The storm’s forward speed likely slowed in the northwest Caribbean Sea, consistent with at least a dozen other historical storms that followed a similar track (McAdie et al. 2009).

The only detailed account of the storm in the middle of the Gulf of Mexico is from the schooner *Rebecca*, filed in a ship protest by Notary Marc Lafitte (Lafitte 1812). Bound from western Cuba toward New Orleans, in the south-central area of the Gulf of Mexico on 18 August and extending into the next day, the ship protest described the following (sic indicates “spelling incorrect” as in the original document):

Commenced with a heavy gale at N.E. doubled reefed by 4 P.M. Gale increased [sic] to a perfect Hurricane wind[?] to [from] the Eastward and hove too under double reefed foresail by sunset a very heavy sea, and Wind increasing, [k]notted [sic] the foresail—one pump constantly going, dreadful Weather during the night and at day light threatened worse Vessel literally under Water, the sea running over the rough trees & long boat, secured the latter by additional tacking to the ring bolts & scuppers, a heavy sea stove the caboose house and carried it

away, worked off though we[ll] nailed down the companion of the steerage hatchway, and much water got down it, consequently much damaged to be apprehended there—about noon the Wind having shifted to the N.W. raising a prodigious sea across the former one at N.E. the vessel plunging some times near half at her foremast in—washed away the flying jib from the board and also washed loose the standing jib—ripping almost every seam in it, got it seamed without loss. (Lafitte 1812)

The shift of winds from the northeast to northwest suggests that the storm track passed to the east of the schooner *Rebecca*. A minimum forward speed of the storm is about 21 km h^{-1} , given a straight line distance of about 1,000 km from the ship’s location on 18 August with the last detailed report of 2 days earlier west of Jamaica, assuming no abnormal curvy tracks. The specific distances from the ship to the storm center remains uncertain because of the relatively low quantity of data from Jamaica through the Gulf of Mexico, but one can surmise that with such a speed and track through the gulf that the storm was about typical of those in the area with winds of at least strong tropical storm force, and perhaps at hurricane strength, by 18 August.

Several ships describe the hurricane’s position closely as it approached the southeast Louisiana coast (Figs. 1 and 2). Given that the ships’ precise locations and details from the logbooks are hourly, the storm track’s initial approach is toward Mississippi, but then turned northwest toward Louisiana as it approached landfall in the afternoon of 19 August. The HMS *Arethusa*, located about 13 km south of Pilottown in far southeastern Louisiana, experienced light Northeast winds ahead of the storm late in the morning of 19 August, with winds changing to the north and then west-southwest into the afternoon as hurricane force winds occurred. The HMS *Brazen* and U.S. *Gunboat 162*, located north and east of the HMS *Arethusa*, recorded mostly easterly winds in the late afternoon. Dominique You (1812), who was aboard the French corsair *Le Pandoure* in the Plaquemines area of the Mississippi River of far southeastern Louisiana, noted “violent wind” and “waves” being noticeable around the same time. Meanwhile, New Orleans itself was experiencing Northeast winds, as recorded in several newspapers and from the United Seaman’s Service (USS) *Enterprise*, but these were below hurricane strength. All of these observations imply that the storm approached the mouth of the Mississippi River delta from a southeasterly direction but stayed offshore, traversing through the

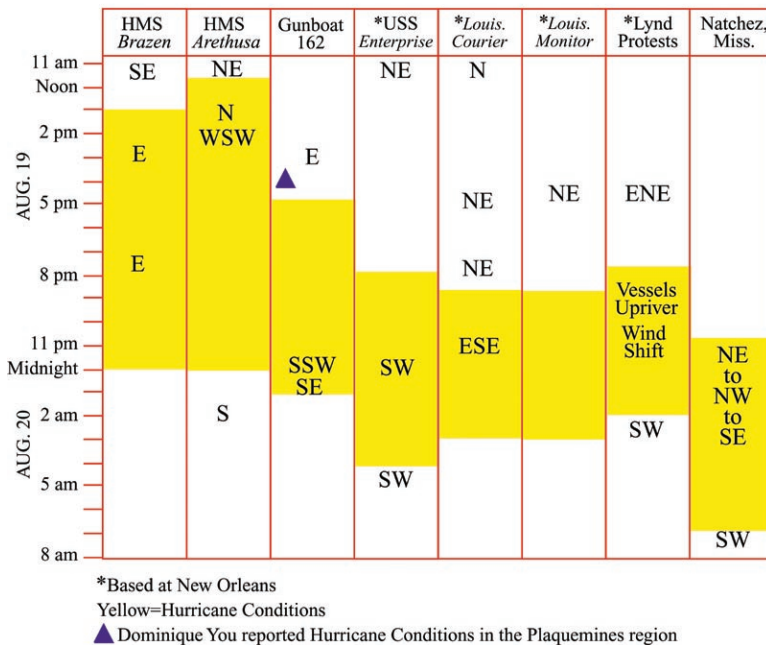


FIG. 2. Compilation of wind direction data for the Louisiana and western Mississippi region during 19–20 Aug 1812. Refer to Fig. 1 for locations. The data from Lynd are a composite summary based on 18 ship protests.

Chandeleur and Breton Sounds, and making landfall along north Black Bay, about 60 km from New Orleans, at about 1800–1900 LT 19 August (Figs. 1 and 2). The distance traveled from its position late on 18 August, based on the Lafitte ship protest of the schooner *Rebecca*, is about 440 km over a 26-h period, suggesting an estimate of minimum forward speed of the hurricane at about 17 km h⁻¹.

Although the outer effects of the storm started to impact New Orleans as early as midday on 19 August it seems that hurricane-force winds did not begin there until around 2000 LT (Fig. 2). Several newspapers, numerous protests signed by Notary John Lynd from ships moored at New Orleans near the present-day central business district, and the logbook of the USS *Enterprise* indicate that Northeast winds prevailed until very late in the evening. The USS *Enterprise* possesses the most detailed and numerous wind observations at New Orleans, and a change in winds to the southwest around local midnight suggests that the storm center passed to the west of New Orleans. The closest approach of the hurricane to New Orleans could have been from 5 to 30 km southwest of the city at closest approach, with New Orleans on the strong right side of the storm center. The east-southeast winds reported in the *Louisiana Courier* seems to have occurred just prior

to the USS *Enterprise*'s southwest observation; these two wind directions imply that the eye was very close to New Orleans, although no historical data indicate any calmness that could represent an eye passage directly over the city.

The hurricane moved to the northwest and weakened, according to a report from Baton Rouge, Louisiana. A meteorological record at Natchez, Mississippi, kept by Winthrop Sargent (1812), started to record substantial impact from the hurricane around local midnight on 18/19 August, and it describes a northeast–northwest shift with gale-force winds. Sargent also made reference to the storm as “prostrating many Trees to the SE”. This record suggests that the center passed to the east very close to Natchez. The specific timing of the storm’s passage is not known, although at 0800 LT 20 August the wind and storm “veered to SW and west and

abated,” which may be incorrect or not related to the storm. Generally assuming passage of the storm at Natchez about 0500 LT 20 August, but realizing it could have been as late as 0800 LT, and using a distance of New Orleans to Natchez of about 215 km (straight line), the forward motion of the storm was in the range of about 18–26 km h⁻¹ while over land from New Orleans to Natchez. A meteorological record from Camden, South Carolina, by James Kershaw (1812) records prevailing southwesterly flow from 17 to 21 August, likely indicating the influence of the western end of a high pressure system. The increase in forward speed of the hurricane farther west in Louisiana and Mississippi may be due to both the influence from the upper-level westerlies and the western periphery of the high pressure system. Little is known on the storm history and its remnants after its impact at Natchez. Records from South Carolina and Georgia show no sign of any tropical rainfall likely resulting from the high pressure, so the remnants kept to their west. A meteorological record from Beersheeba in eastern Ohio by George G. Miller (Heckewelder 1812) indicates “hard rain” on 20–21 August and persistent east winds through at least the morning of 23 August before a shift to the southwest on August 24. These conditions may represent the storm remnants merging with a fron-

tal system, but detailed synoptic mapping would be needed at a broader scale to verify this scenario.

AUGUST 1812 STORM IMPACTS. Discussion on hurricane intensity and societal impacts focused on Louisiana, given that the most copious historical data are concentrated in that region (Fig. 1). The ship protest by Marc Lafitte of the Schooner *Rebecca* describes a position of about 255 km south-southeast of Louisiana at 1500 LT 19 August, reporting westerly winds and gale conditions. The *Rebecca* was determined to be located on the southern edge of the storm, perhaps about 160 km from the storm center. A Spanish document from the Archivo General de Indias (General Indies Archive 1812), written very shortly after the occurrence of the storm, indicates gale winds and very heavy damages for Pensacola, Florida, and requests aid, because without these new supplies “only a God’s miracle” will make the province survive. If sustained hurricane-force winds extended to Pensacola, it would indicate a possible larger diameter that could be capable of generating a widespread stronger storm surge. Dan Dexter’s detailed letter from *Gunboat 162* (Dudley et al. 1992, 403–405) made mention of gale conditions at Cat Island, near the Bay of St. Louis, and he also adds that “Several vestiges of wrecks have drifted ashore near us, which proves that the damage has been extensive.” However, a newspaper report indicated that overall “The Gun-Boats and [USS] *Syren*, at Bay St. Louis, have weathered the gale pretty well” (*Daily National Intelligencer* 1812b, p. 3). Overall, the size of the hurricane was likely about “average” or perhaps “smaller than average,” which probably could not generate a storm surge at the higher magnitude or with the widespread aspects as done by Hurricane Katrina in 2005. The damage report from Pensacola may be indicative of some severe storm bands and sub-hurricane-force winds on the outer eastern edges of the hurricane.

Historical data from the HMS *Brazen*, HMS *Arethusa*, and *Gunboat 162* all indicate high winds and seas that can be assessed conservatively as being at hurricane strength. They likely encountered weather conditions away from the eyewall, and thus one cannot assess directly their reports as representing major hurricane status. Assessments of the magnitude of the storm surge, although limited geographically because of the likely smaller hurricane size, reveal pronounced impacts. The most detailed historical data were from geographic locations on the west side of the track, which would be expected to generally have weaker surge as the hurricane made

landfall, resulting from the changing winds to the north and southwest. Several reports of the storm tide in the Plaquemines area of southeastern Louisiana conservatively indicate major hurricane status at landfall. The *Louisiana Courier* (1812, p. 2) reported that a storm surge at Plaquemines “fifteen feet in some places, and joining those of the Mississippi, changed all the country into a temporary sea for about eighty miles (130 km) upriver.” Dominique You (1812), also in the Plaquemines area and seeking refuge on top of a home in a narrow escape from death, described water above ground of at least 10 feet (3.0 m). An extract of a letter from a plantation, about 72 km below New Orleans, described that the water “during the storm, upon an average, was from 7–8 feet (2.1–2.4 m) deep, over the whole country,” but that “the river must have rose 17 or 18 feet (5.2–5.5 m), to agree with the above, as it must have been 10 or 11 feet (3.0 or 3.3 m) below the banks, at the time of year when the gale happened” (*Rhode Island American* 1812, p. 3).

Toward New Orleans, the storm surge had significant impact on the levees. For example, the *Orleans Gazette* (1812, p. 2) reported that the “The levee almost entirely destroyed; the beach covered with fragments of vessels, merchandize, trunks, and here and there the eye falling on a mangled corpse. In short, what a few hours before was life and property, presented to the astonished spectator only death and ruin.” Twenty-three ship protests, signed by notary John Lynd, describe the distinctive movement of ships from their moorings at New Orleans upriver in the Mississippi and then later returning downriver after the storm center passed. Numerous ship protests from vessels at New Orleans as well as many newspaper accounts describe the transport of many vessels upriver after 2100 LT but returning downriver toward midnight, likely relating to the storm surge moving upriver and then normal strong currents pushing the vessels downstream. The ship protest from the Ship *Otho* of New York describes the following typical example:

the said ship being well and sufficiently moored at the Levee of this City, on the 19th day of August last, at meridian, it began to blow fresh from E.N.E. and in the afternoon increased to a gale. At 8 P.M. the wind shifted . . . and blew with increased violence: at 10 P.M. it became a tremendous Hurricane; and about eleven a great many vessels broke adrift, and one after the other fell foul of the *Otho*; and at length her fasts also parting she was in her turn driven up the River, striking continually against other vessels, w[hen] she took the ground when she

now lays stranded. After she grounded the wind shifted, and the ships which had been forced up the River, were now driven down again, and the *Otho* suffered considerable injury by several of them falling onboard. At Daylight they found her then stove in a hole in her bottom made apparently by another ship's anchor; the Head, Bowsprit, Channels, and Lanyards carried away; foretop, and foretopmast broken. (New Orleans Notorial Archives 1812)

Dr. John Monette (cf. Ludlum 1963) described that the hurricane "inundated all the marshes toward the city, as well as all the plantations and settlements for many miles below New Orleans." (Ludlum 1963, p. 75) Sullivan (1986) estimated that saltwater intrusion extended up to 75 miles (121 km) inland from landfall, which is indicative of a major hurricane. Numerous independent accounts of hurricane impacts in New Orleans reveal that the material damage was of a widespread nature; however, some accounts suggest it was also likely a major hurricane. The following is a typical example from the *Louisiana Courier* (1812) that suggests hurricane intensity of at least a strong category 2 to weak category 3 hurricane:

Nearly all the buildings in the city have suffered more or less; several being half destroyed; a great many made roofless; the market place near the river bank, between St. Ann and Dumaine streets, blown down; a wall of Mr. Coquet's theatre, carried away; in the City Hall the records of the Mayor's office and of the two Courts of Justice damaged by the rain, as well as those of the Senate, of the House of Representatives, and of the Governor, in the State-House All the vessels in port sustained serious injury; nearly all the street lamps were broken; the United States store-houses, the convent of the Nuns, the barracks, the military hospital, etc. were seriously damaged. Many lives were lost on the river. The country in the vicinity of New Orleans was laid bare and desolate. (*Louisiana Courier* 1812, p. 2)

Similar descriptions appeared in the *Moniteur de la Louisiane* (1812). This newspaper, as well as others such as the *New Orleans Trumpeter*, referred to specific buildings. Clearly when consulting old New Orleans city directories and building histories, it was found that many of these were of recent construction, of solid foundation, and well built for that time. Newspaper information also revealed much damage on the riverbanks. Hurricane-force winds seem to have been the major cause of much damage within New Orleans, because there was not much reference

of flooding and surge impacts in the French Quarter area (the highest elevation around New Orleans). A ship protest, referring to the Ship *Ohio*, described it as having "flowed over the Levee," (New Orleans Notorial Archives 1812) indicative of a maximum surge perhaps approaching near the elevation of downtown New Orleans. Winthrop Sargent (1812) wrote in his papers that the river at New Orleans "rose as high as the Levee," and that "thirty miles [48 km] above the Town it fell Eleven foot" (3.3 m).

Up to around 55 ships, comprising nearly every ship moored at New Orleans, were sunk, dismasted, or severely damaged. All of the small river craft such as barges and market boats were "crushed to atoms" (*Orleans Gazette* 1812, p. 2). Tree and vegetation damage was not a big characteristic of the Louisiana hurricane landscape during 1812, but some short accounts suggests that it was widespread, suggesting a strong hurricane. For example, the *Louisiana Courier* (1812, p. 2) described all "orange, fig, and every other tree in the city, blown up by the roots." The *New-England Palladium* (1812, p. 1) described that "the damage in the country is equally great, mostly all the Sugar, estates are wholly or partly destroyed, and the cane leveled with the earth."

The hurricane weakened as it progressed toward Baton Rouge and Natchez. The Winthrop Sargent record from Natchez revealed that many trees were prostrated, which is quite conservative in relating to possible category-1 hurricane strength, although tropical storm status cannot be ruled out. Natchez is within the area of possible hurricane-force winds inland, assuming a major hurricane landfall farther south (Kaplan and DeMaria 1995). The lowest reading of the barometer was at 29.12 in. (986.0 hPa). Correcting for an elevation of about 250 ft (76.2 m) and using an outdoor temperature of 71°F (21.7°C) yields a value of 29.38 in., but nothing is known regarding Sargent's reading in terms of barometric calibration. If this reading is accurate, it corresponds to a value of 995.0 hPa. Considering conservative uncertainties of Sargent's specific elevation ranging from 200 to 300 ft (61–91 m), barometric corrections vary from 993.2 to 996.7 hPa, which would not be a central pressure value. The pressure readings at Natchez are broadly consistent with filling rates inland of major hurricanes (Ho et al. 1987). Assuming the possible intensity ranges of the storm as a category-1 hurricane near Natchez, the distance from water, and the hours over land (7–12 h) in the Kaplan and DeMaria (1995) inland decay model, calculations conservatively illustrate that intensity at landfall was a major hurricane of at least 100 kt.

From newspaper accounts, 45 people were confirmed as drowning in the Plaquemines Parish of southeastern Louisiana around Fort St. Philip, and small numbers of likely described fatalities in scattered areas around New Orleans increase the death toll to the high 50s. However, some estimates of fatalities from the newspapers are as high as “hundreds” (e.g., *Daily National Intelligencer* (1812a, p. 3). In reality the true number of fatalities resulting from the storm remains unknown. A Spanish translation of an account from Manuel Lopez (1812) on 25 August 1812 states the following:

we experienced the most terrible hurricane, as never seeing before by the inhabitants here; the village and nearby places have been ruined and desolated; down the river there have been but very few houses left standing, and Plaquemine has been washed away. Boats, not one has been left that can be of service, either here or on the river . . . The number of people lost in this terrible hurricane is very much high and up until now no figure can be had.

Chaos and rumors reigned in the aftermath of the hurricane. The *Daily National Intelligencer* (1812a, p. 3) noted that “To add to the distresses of the inhabitants [of New Orleans], a report was put in circulation that the Negroes were to fire the city and murder its white inhabitants”. This report seems not to have been without some foundation. It was also believed that the defenseless garrison at Fort St. Phillip was captured by the British. However, the hurricane weakened the British ships, and the vast hurricane damage in southeast Louisiana likely presented a harsh environment unfit for conducting prompt military operations. The logbook of the HMS *Brazen* describes that she lost her masts in the hurricane. The HMS *Arethusa* and HMS *Southampton*, two other nearby British vessels at the mouth of the Mississippi chasing privateers during this time, were also damaged by the storm and left the area immediately thereafter. Some mention has been made of the hurricane damage severely setting back the U.S. Navy’s buildup and ability to conduct operations in the War of 1812 in the region, but the area remained relatively quiet in terms of naval operations for the next two years (Ludlum 1963).

CONCLUSIONS. This study reconstructed a major hurricane that is particularly distinctive for being the closest one that passed just to the west of New Orleans. The size of the hurricane was probably about or less than average, which likely diminished the surge potential. The forward movement of the storm seemed

normal as for most gulf hurricanes, though it picked up speed immediately preceding and after landfall, perhaps influenced by midtropospheric flow. The geographic location of hurricane landfall provided little time for it to weaken (several hours) before its closest approach to New Orleans, and, unfortunately, the full strength of the storm hit very near the city.

However, several features of the environment of the Louisiana coastline and New Orleans were quite different in 1812 as compared to today. A hurricane like the one in August 1812 would rank among the worst Louisiana hurricanes in dollar damage if it occurred today. The following environmental aspects made Louisiana and New Orleans less vulnerable to major hurricanes during 1812: a) global sea level was likely at least a half foot (0.15 m) lower than today (Jevrejeva et al. 2008), b) protective wetlands around New Orleans and the Louisiana coast were much more extensive, c) coastal erosion was less prominent, and d) the core New Orleans area [the French Quarter, which is 12 ft (3.66 m) high in elevation today] was at least 5 ft higher in elevation in 1812 as compared to today. This elevation change is an extremely conservative estimate based on the 1895 surveys (cf. Campanella 2006) prior to human-induced subsidence. Fitzpatrick et al. (2008), for example, particularly noted the important effects of wetlands, although no clear rule of thumb exists to quantify their effects given varying complex impacts from different storm scenarios. Regardless, around 1812, the vast additional wetlands around New Orleans would undoubtedly have a significant effect on reducing the surge of at least several feet. All of these aspects would decrease the storm surge hazard, particularly for the center of New Orleans. In the early nineteenth-century era prior to modern levees, storm surges may well have backed up the Mississippi River and routinely forced its water over the levees in Plaquemines and St. Bernard, and encroach Lakes Borgne and Pontchartrain. However, in 1812, if a storm at the size and strength of Hurricane Katrina occurred and took the exact path of the August 1812 storm, it likely would have caused a storm surge that flooded all over New Orleans.

The reconstruction of the Great New Orleans Hurricane of August 1812 is an excellent example of how a case study can assess the range of extreme events that have happened in the past and may happen in the future. Its sudden change in track as it approached landfall reveals a challenge for predicting such storm tracks more accurately, because such changes can have a huge impact on decision making in large-scale hurricane evacuations. The legacy of this Great New Orleans Hurricane was never widely

published, most likely because of it being absorbed in the news of the War of 1812. However, the 1812 hurricane is probably not the worst-case scenario for New Orleans. If a larger and stronger storm followed with a similar track, its effects would be much worse. Such an event is possible in the future, because storms in the past, such as the category-4 Last Island Hurricane of 1856, impacted very nearby but had a different track (Landsea et al. 2004). Other earlier hurricanes prior to 1812 in Louisiana also may have hit very close to New Orleans. A longer temporal perspective on hurricanes reveals a clearer picture to assess periodicities and probabilities of extreme events, and this study provides an excellent example of adding mostly noninstrumental data to provide a further understanding of past hurricanes that are directly comparable with those in our modern record.

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