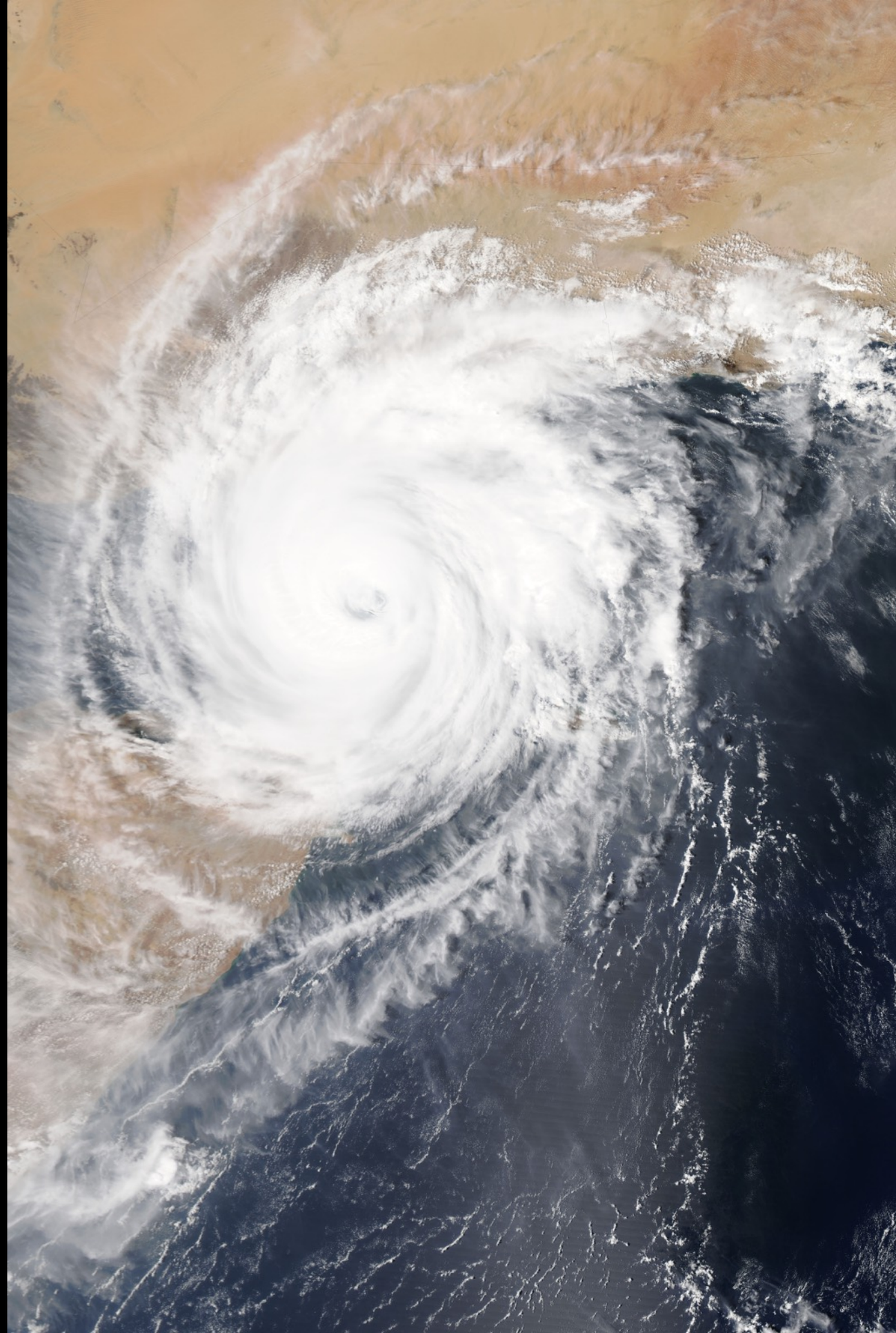
PROJECT 4- JULIA, DREW & JORIAN

AN EXAMINATION OF HURRICANE FATALITIES

PROJECT OBJECTIVE

Study past hurricane data and determine the factors that impact fatality rates to positively impact future survival rates via evacuation orders.



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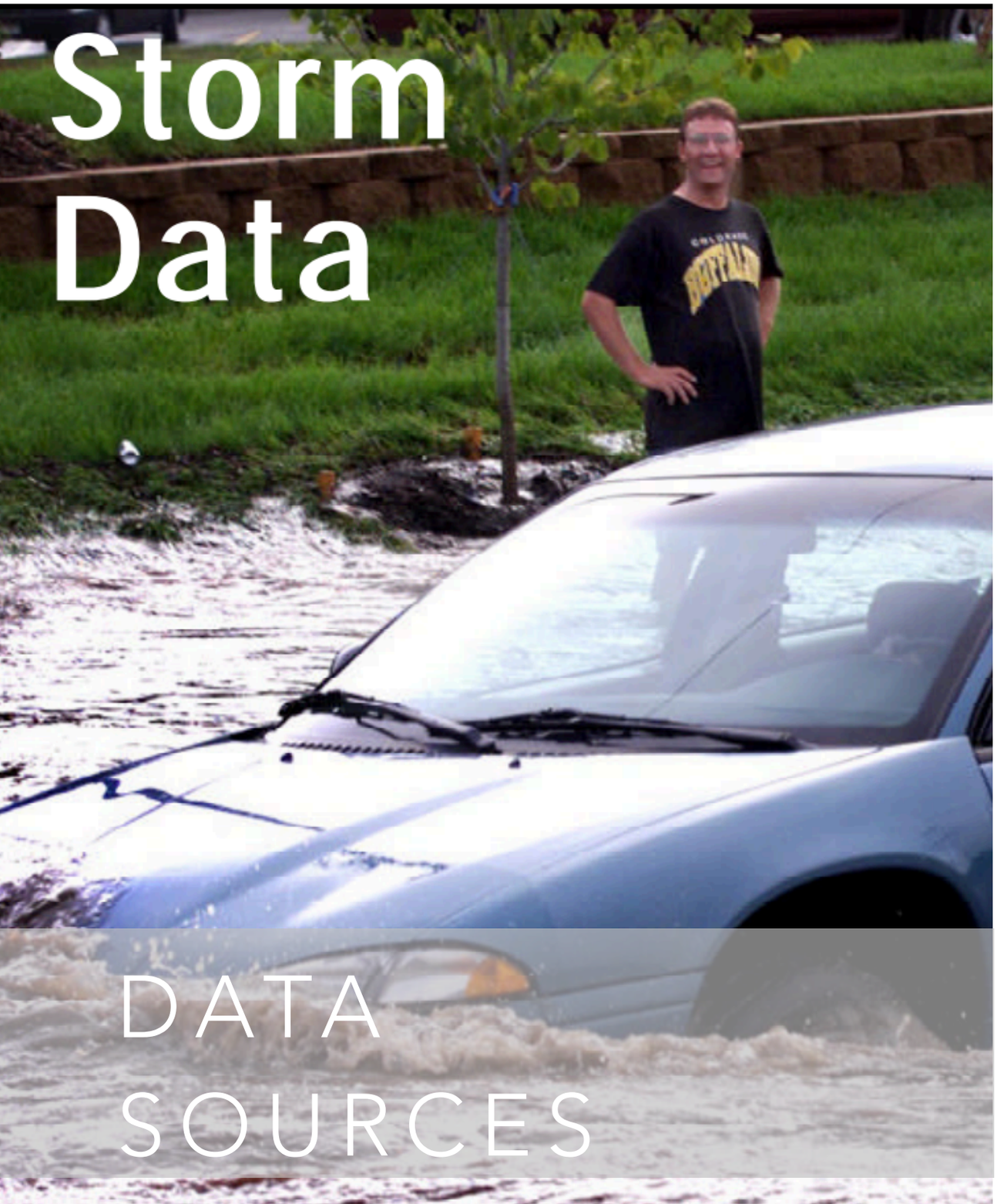


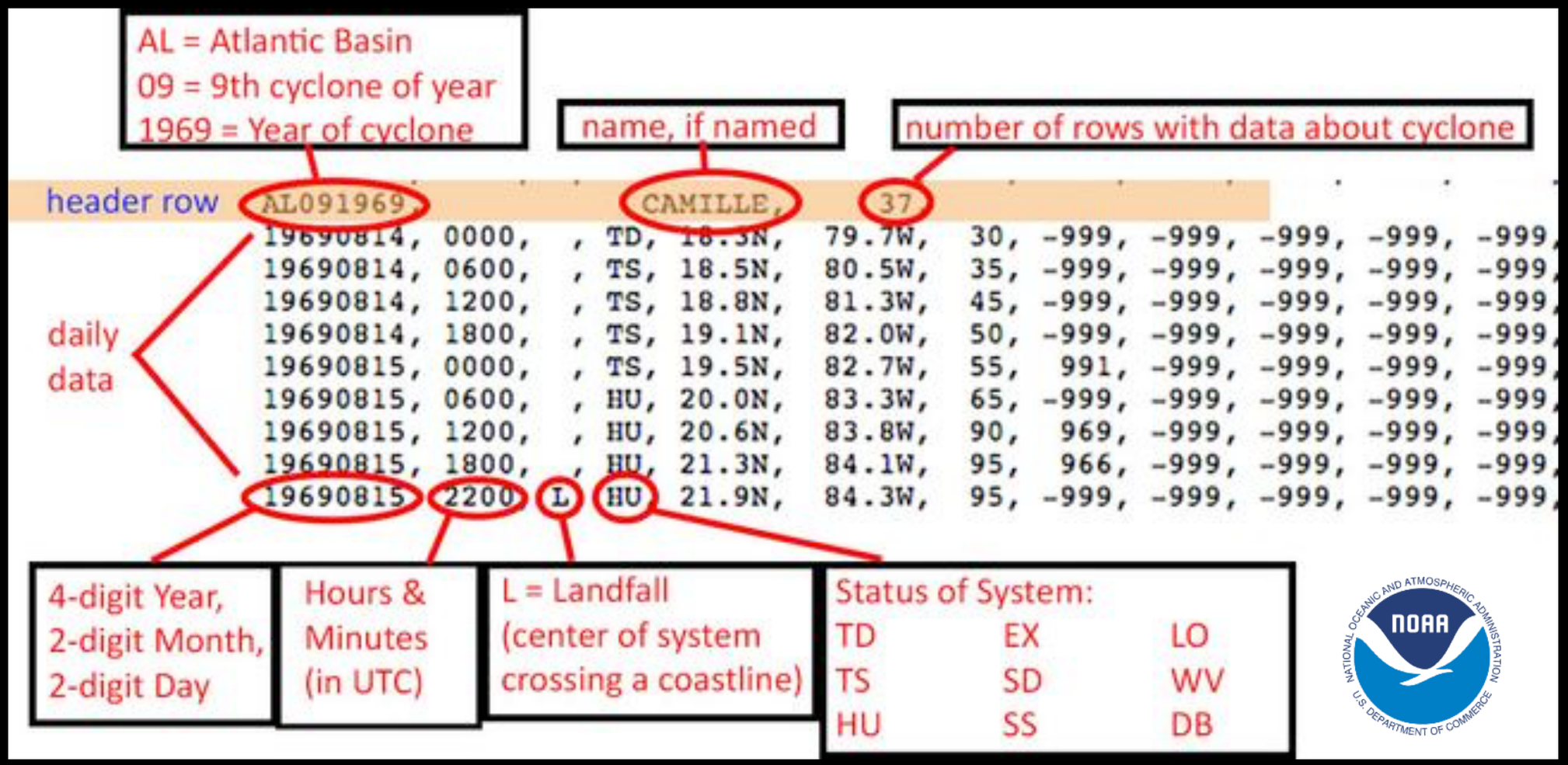
Storm Data

DATA SOURCES

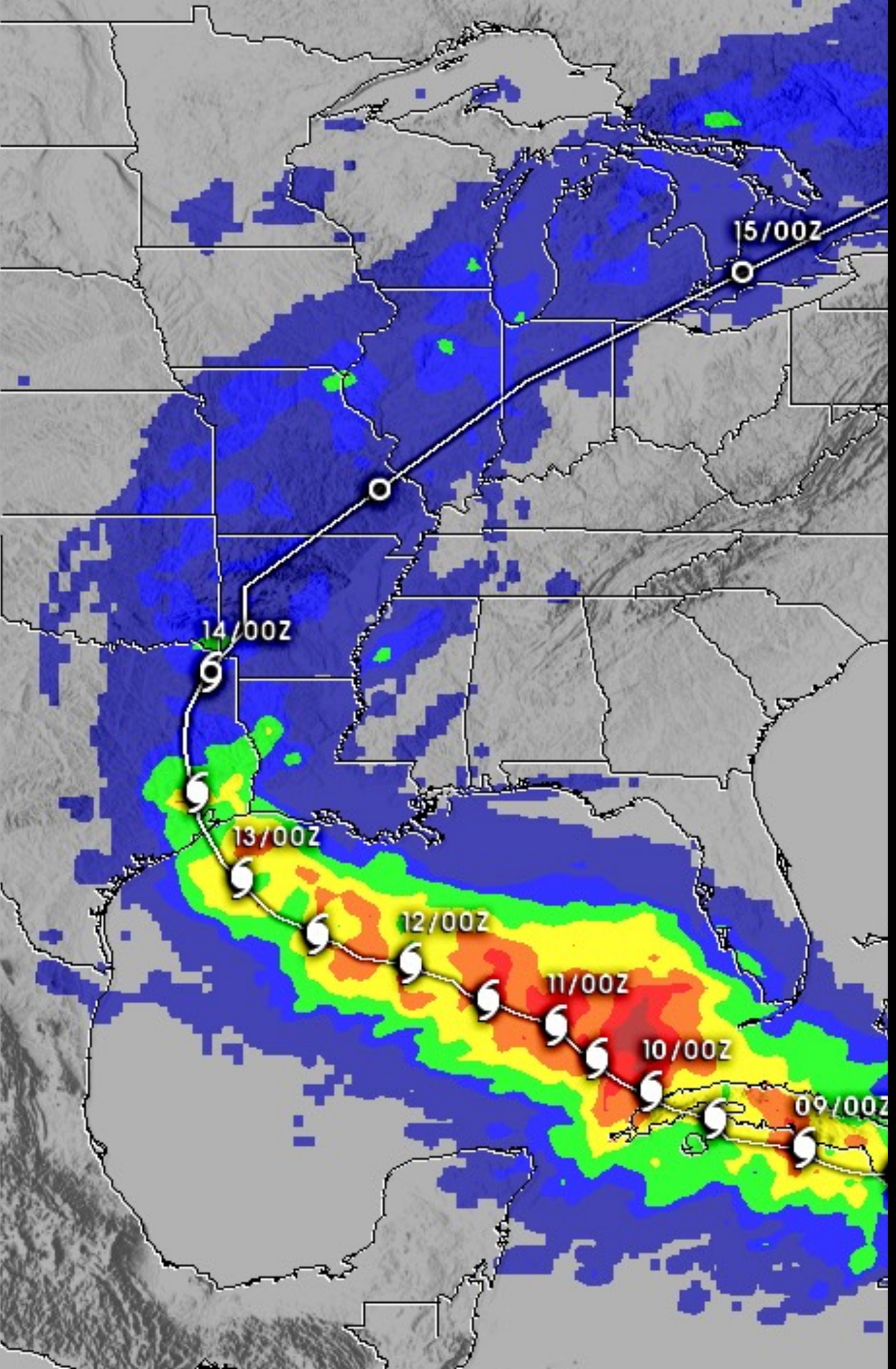
NATIONAL WEATHER SERVICE

United States™ Census Bureau

HURDAT



More complete HURDAT data begins in 2004



IMPACTED POPULATIONS

- We used K-Nearest Neighbors to help assign county based on latitude and longitude
- We then added population based on county with the intention of including fatalities by county

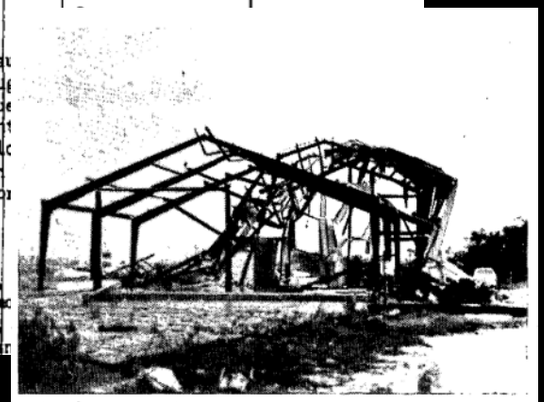
NOAA ANNUAL REPORTS

STORM DATA AND UNUSUAL WEATHER PHENOMENA

JANUARY 1969

PLACE	DATE	TIME - LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	NO. OF PERSONS		ESTIMATED† DAMAGE		CHARACTER OF STORM
					KILLED	INJURED	PROPERTY	CROPS	
Alabama									
N. Central, Alabama	23	1630			0	0	2	3	3/4 to 1" Hail
Alaska			None reported						
Arizona			None reported						
Arkansas									
Northwest half of State	Late 22nd and early 23rd	Numerous wind storms occurred late on the 22nd and early on the 23rd in scattered locations from Howard, Polk and Clark Counties in the southwest and west to Craighead and Greene Counties in the northeast.							
Russellville, Hector and Atkins - Pope County	23	12:30 a.					4		Wind
	Windstorm damaged large hen houses just east of Russellville. Roof and tree damage observed in Atkins from same windstorm. Mobile home upset at Hector with no serious injuries.								
Paragould - Greene County	23	3:00 a.					4		Wind
	Two barns demolished about 8 miles southeast of Paragould. A house trailer overturned in the same area.								
California									
Fresno	4	12:33 pm			0	0	0	0	Funnel cloud
	Personnel at Chandler Field tower reported a funnel cloud west of Fresno.								
Fresno 40 SE	4	4:02 pm			0	0	0	0	Funnel cloud
	Pilot reported a funnel cloud about 40 miles southeast of Fresno.								

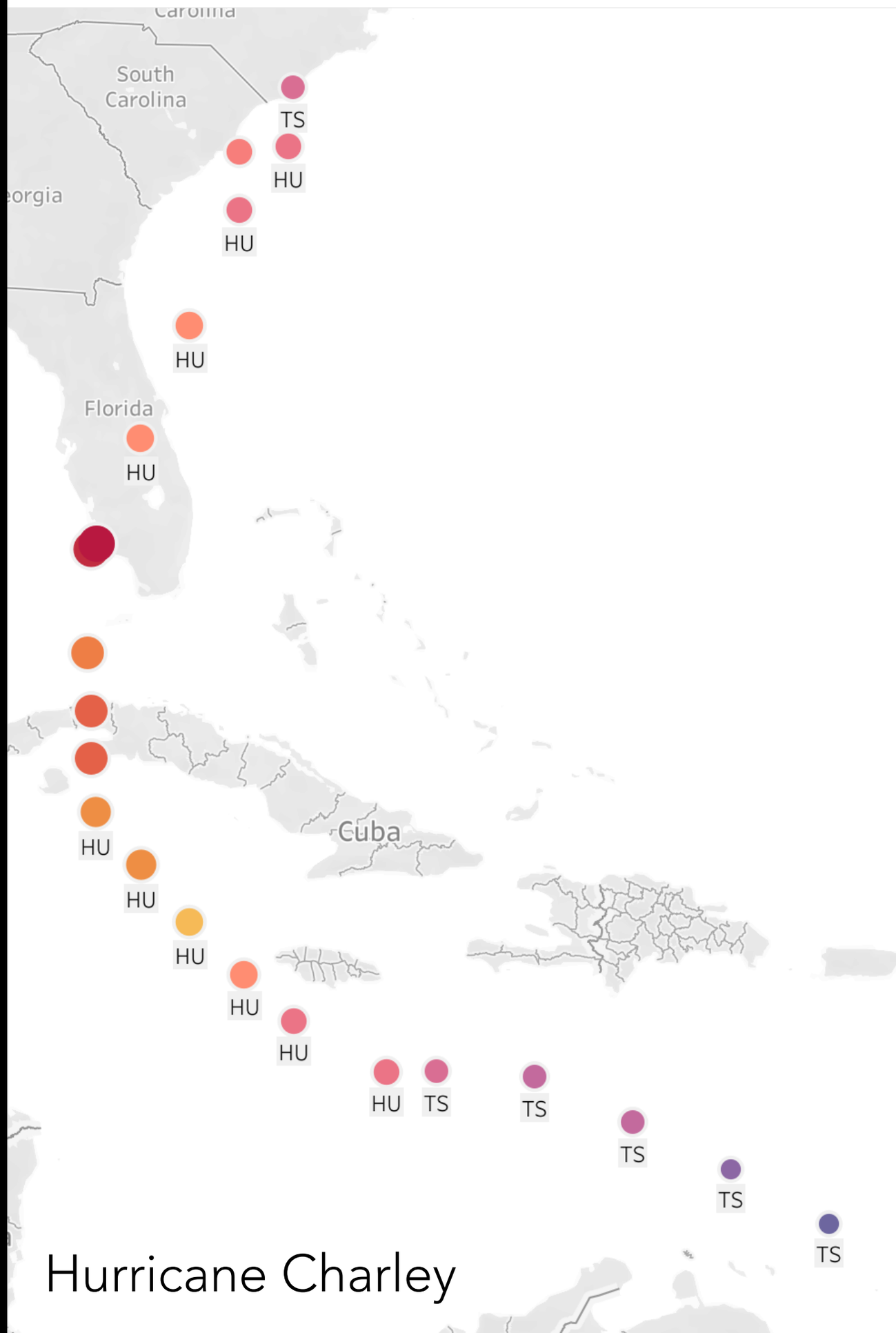
PLACE	DATE	TIME - LOCAL STANDARD	LENGTH OF PATH (MILES)	WIDTH OF PATH (YARDS)	NO. OF PERSONS		ESTIMATED† DAMAGE		CHARACTER OF STORM
					KILLED	INJURED	PROPERTY	CROPS	
Colorado (continued)									
	the same area a mobile home and a truck trailer were blown off the highway and demolished. At least 20 people in the Boulder area received light to serious injuries from flying debris, or from being blown into obstructions. Power lines and trees were downed over a wide area. Damage was relatively light in the Denver area, and in Loveland and Longmont. Many windows were broken in the Arvada area, northeast of Denver, and in the Englewood-Littleton area, south of Denver. A 27 year old fire lookout tower on Squaw Mountain, west of Denver, was blown away, and several radio relay towers at that location were blown down. At Fort Collins gusts measured to 75 mph. at 2:15 am. caused scattered mostly minor damage. At Estes Park a garage roof was blown off and a house damaged, plus other minor damage. Scattered damage occurred in the Pikes Peak area. Trucks were overturned near Georgetown and between Salida and Buena Vista. Mobile homes were overturned or damaged in several areas, with occupants receiving injuries in some cases.								
Western Slope	25-29						1	3	
	Unusually heavy snows blocked roads and cau several areas. A woman ski instructor caug Loveland Ski Basin was revived after rescue The town of Silverton in the San Juan Mount several days when all access roads were blo were buried by a snow slide on the 29th in Redcliff in Eagle County. Damage was mino								
Eastern Slopes of Mountains	31	4-8am						4	
	High winds caused widely scattered damage, severe and extensive than earlier in the m 80 mph. were reported in the Boulder area, damage. Schools were closed because of da								



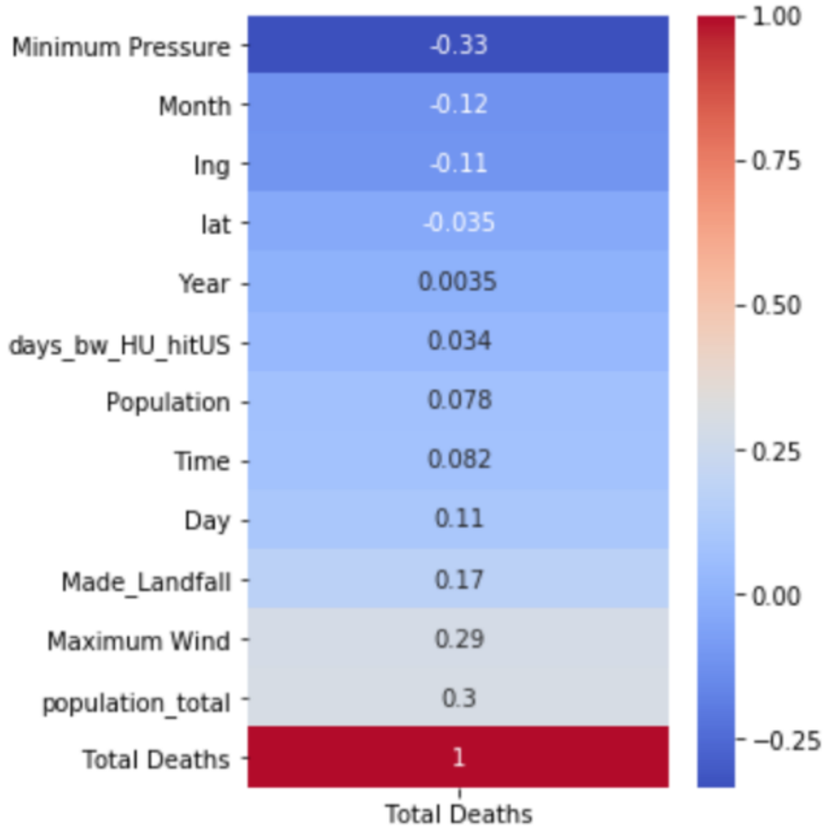
No! It's not a Calder, although the artwork HUGO's winds created of this pre-fab metal warehouse in Mt. Pleasant might well be described as resembling one of his works.

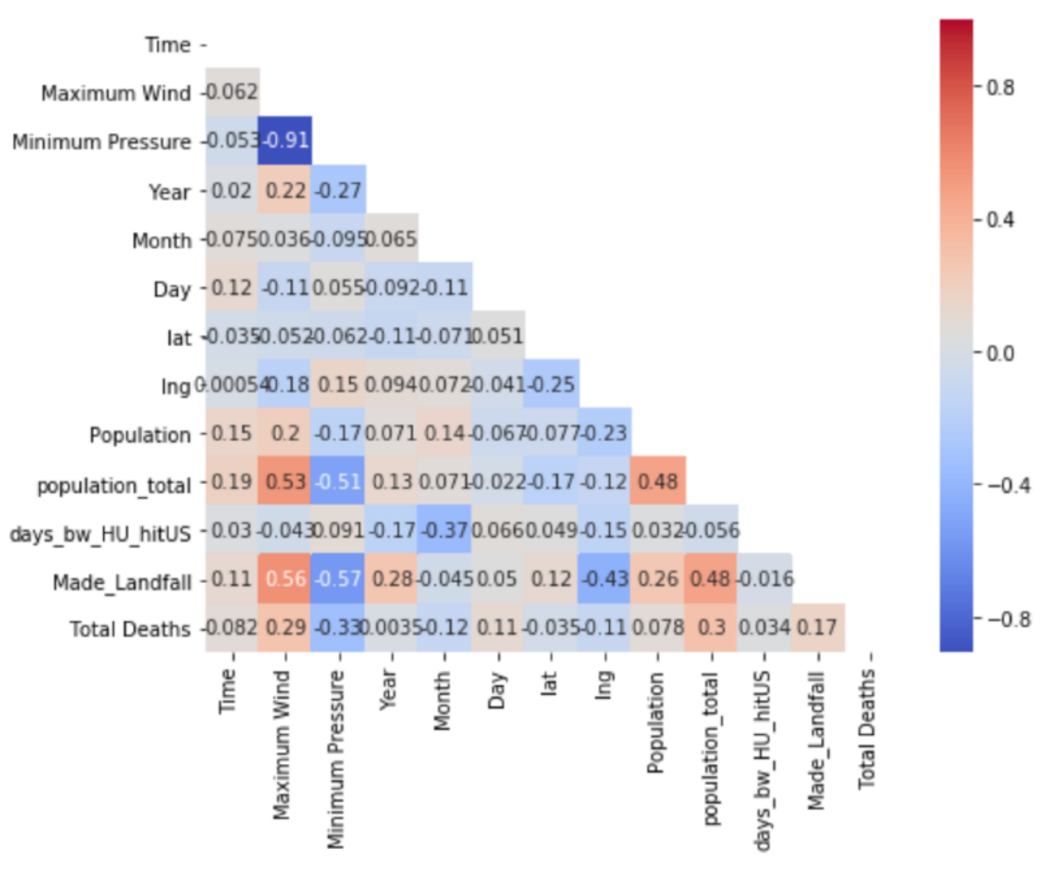
MODELING

- Used logistic regression in order to determine the status of the storm (hurricane, tropical storm, tropical depression, etc)
- Train Score: 0.83
- Test Score: 0.82



Hurricane Charley





MODELING

- Baseline was the mean deaths per storm- 14 with Katrina included, 7 deaths per storm with Katrina excluded
- Used k-nearest neighbors to predict hurricane fatalities using initial landfall data or the first point it was classified as a hurricane and the following features:
  - Max wind speed
  - Min pressure
  - Number of days since the previous hurricane
  - Time, Month, & Year
  - Population of Counties Near Landfall

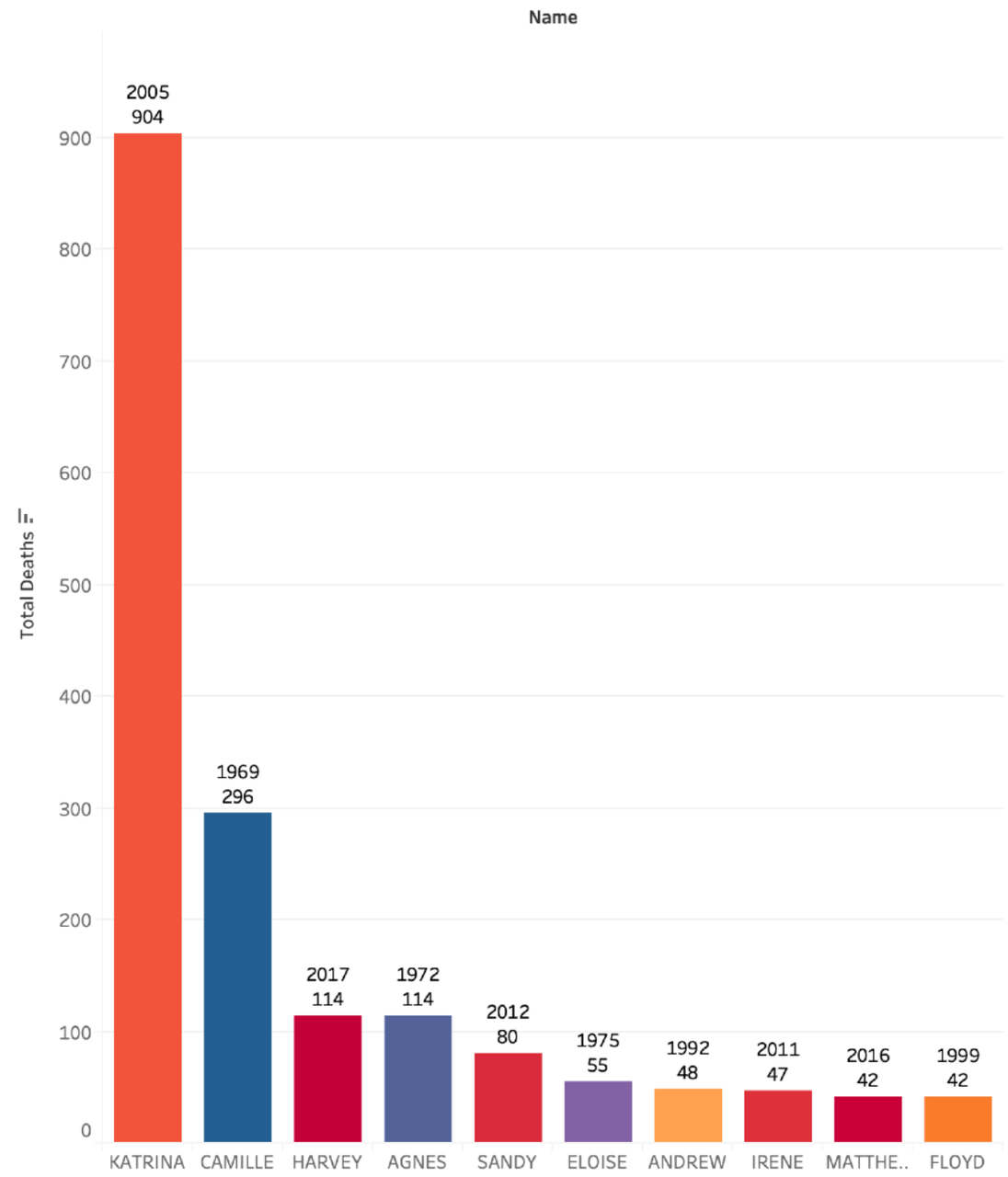
Train Score: 0.45

Test Score: 0.21

CV Score: 0.16

SERIOUS & NOT-SO-SERIOUS

LESSONS LEARNED



SERIOUS CONSIDERATIONS

- Sometimes you have a mega-outlier, like Katrina
- When working with large data sets, try to avoid using for loops for computational efficiency
- Verify your latitude and longitude sooner rather than later
- Check the integrity of your source data
- Understand the different GIS coordinate measures
- Without enough data, you can only improve your model so much

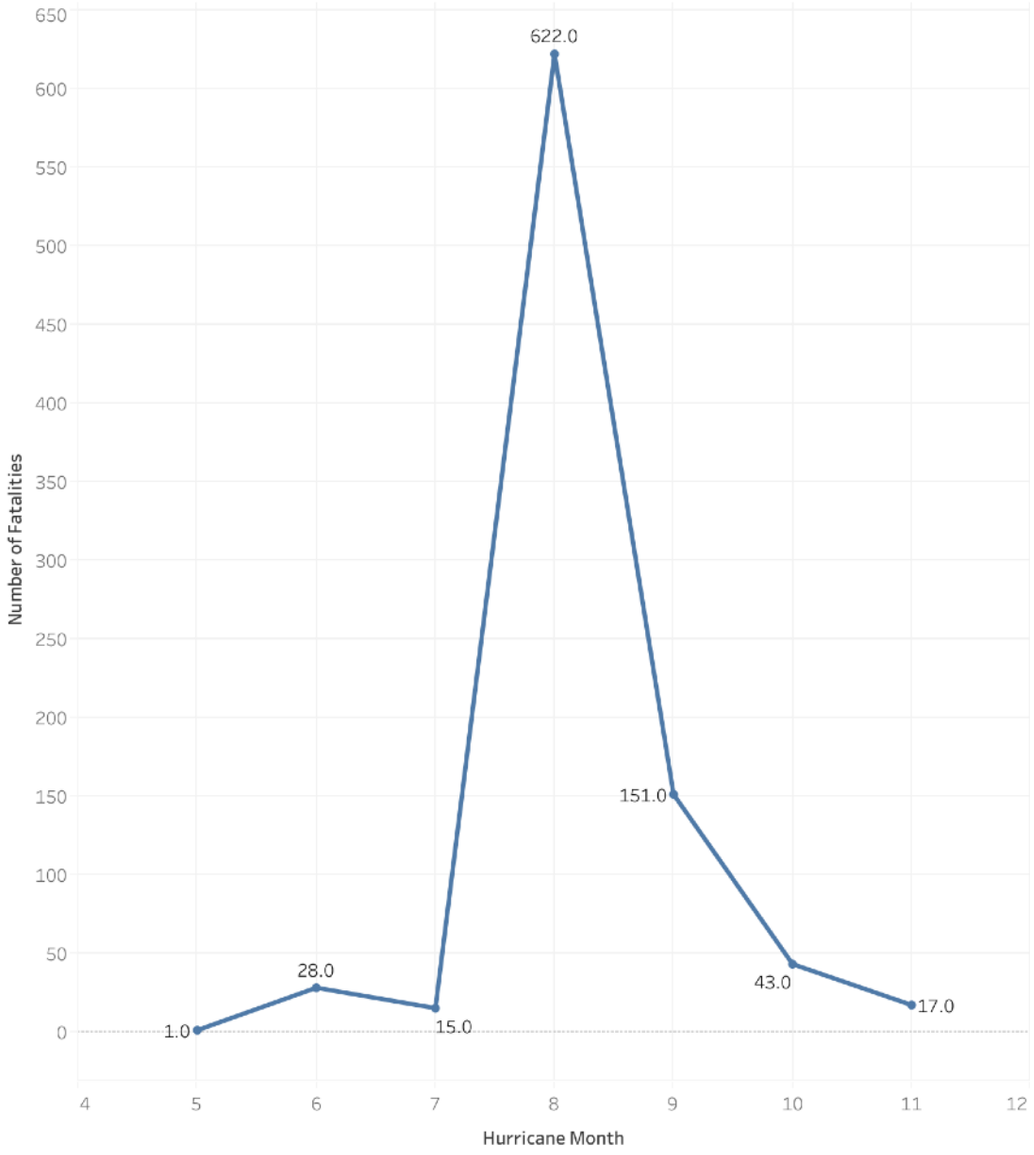
LESS SERIOUS CONSIDERATIONS

Given our extensive research of hurricane fatalities, we recommend you resist the temptation to:

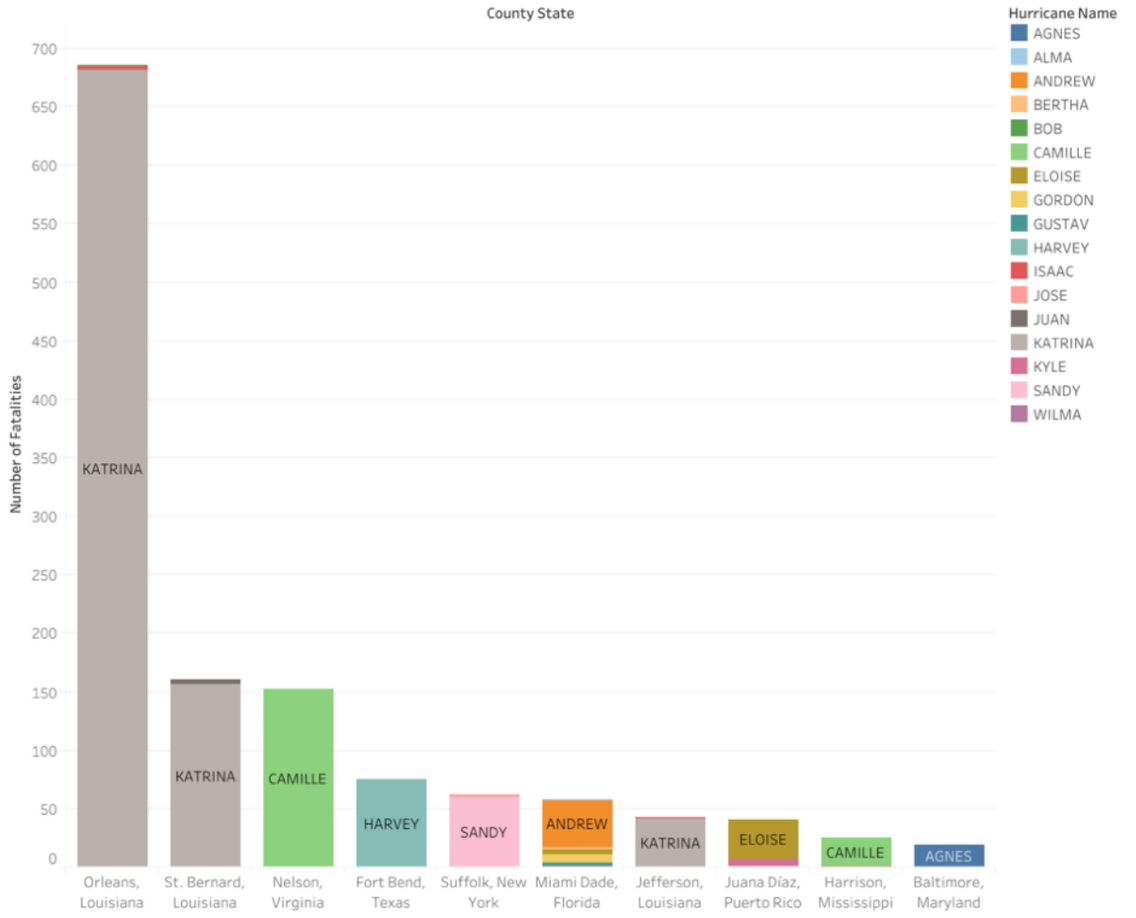
- Go swimming during a hurricane
- Go surfing during a hurricane
- Drive around police barricades and into flood waters
- Go to bed without blowing out your candles
- Stand in water containing downed power lines
- Let your guard down, even in New Mexico
- Disregard mandatory or voluntary evacuation orders in favor of hosting a hurricane party

HURRICANE KATRINA

Months to Stay Home

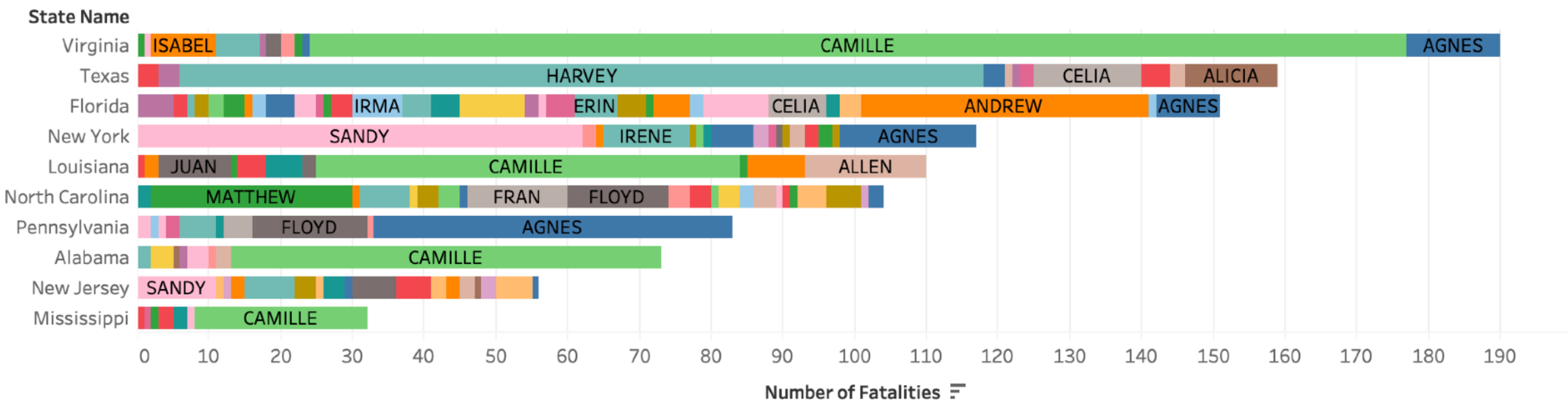


Most Fatalities by County



TRAVEL ADVISORIES

Fatalities by State



FURTHER CONSIDERATIONS & AVENUES OF STUDY

- Which governors have been the best forecasters? The worst? (In terms of evacuation orders).
- What are the most common ways to die during a hurricane? Can they be prevented?
- Narrow down the field of study to only storms after 2004 in order to have more complete meteorological data.
- We would’ve liked to have rainfall data, flood information, and storm surge info in order to better predict fatality rates
- Would have liked to try generalized linear models and gradient descent.
- Do different parts of the country get stronger storms during different times of year?
- Are hurricanes increasing in intensity related to climate change?
- Evacuation information.

SOURCES

- Data Sources:
  - Atlantic Hurricane Data, HURDAT2, NOAA
  - Storm Data by Year, NOAA
  - Wikipedia
  - US Census
  - SimpleMaps- USGS
  - EarthLabs HURDAT Visualization
  - Huge thanks to Stephen Jaye for help understanding the meteorology of hurricanes