

Battleground States lashed by Vicious November Storms

Just 11 days after a fiercely contested presidential election, nature delivered its own version of angst to these same states. On November 15, a fast-moving squall line took shape in Indiana and rocketed all the way to the Atlantic seaboard during the day.



The system fired up early, just like the more disastrous August 10 Derecho event this year; reports of downed trees and the like were coming into National Weather Service (NWS) offices by 9:30 a.m. The storms "hauled it" east and just two and a half hours later they were half-way across Ohio, a distance of 150 miles! Note the image above, these storms don't look all that impressive on radar compared to a typical squall line event, the very strong steering winds pushing them helped to give them higher winds than typical for storms of this strength.

A rather remarkable fact with this storm system, nearly 500 reports of high winds across more than a half dozen states, over a billion dollars in wind damage, and not **one** report of any significant (quarter size or larger) hail.



Six hours later the storms approached Philly – that's another350 miles / NWS radar data.

Some damage reports from the "Big Blast":

- Cleveland, Ohio: 79 mph wind gust along Lake Erie shore, widespread tree, power pole and roof damage, 150k people without power in northern Ohio. Extensive roof and window damage to Valley Forge High School.
- Newark, Ohio: A large portion of an old building undergoing renovation collapsed into the street.
- Parkersburg, West Virginia: High winds downed power lines, igniting a fire that destroyed four apartments.
- Wattsburg, PA: Fire Department roof destroyed, was just installed last year.
- Buffalo, New York: 63 mph winds along Lake Erie, flooding reported due to wind-driven waves around Erie, PA and Buffalo, NY
- New York City: Streets blocked off in "Midtown" due to falling debris. Emergency responders cordoned off the area. Unstable scaffolding was also reported at several points through the city.
- Norfolk, CT: A fire started after winds downed power lines.
- Wildwood, NJ: Numerous blown transformers as 65 mph winds roared through.



Overall, over one million people were left without power at some point during the storm. Compared to the fierce August 10th Derecho, this round of severe weather was much less intense but highly unusual for the time of year, and a huge area was impacted. What made it even worse were strong winds not only from thunderstorms but from deep low pressure passing through. In many cases 50+ mph winds battered cities for a number of hours after the storms were gone, increasing damage and slowing cleanup.



Surface Weather Map at 7:00 A.M. E.S.T.

The black lines on the map above are called isobars, when they are closely packed the greater pressure gradient (horizontal difference) makes for stronger winds. WPC map.



Unheard of Hurricane Event

On November 3, Hurricane "Eta" made landfall near Puerto Cabezas, Nicaragua as a Category 4 storm with 140 mph winds. The death toll reached the hundreds, an exact count may never be known as several landslides swallowed homes in roof-top deep mud. For instance, a single landslide through the Guatemalan village of Queja buried or destroyed 150 homes. A second landslide killed at least 25 Guatemalan citizens. In Honduras, the core of the destruction is near the north coast, around San Pedro Sula, home to more than 2 million people where citizens found up to three feet of water in the streets. The busy Central American port was put to standstill and much infrastructure is damaged.



A second punch to the gut came just two weeks later when an equally powerful hurricane, "lota", struck essentially in the same place near Puerto Cabezas. This "back-to-back" hurricane disaster has never happened before in more than 300 years of Atlantic hurricane record. That is, for two hurricanes of such great intensity to strike the same place so close together in time. Hurricane lota's eye hit the coast just 15 miles from where Eta made landfall. Officials along the coast described it this way, "What Eta didn't destroy was finished off by lota". Together the two storms were the 2nd and 3rd strongest to ever hit Central America. Only 1998's Hurricane "Mitch" was stronger.



Impact point of the two storms compared – unparalleled in more than 300 years of Atlantic hurricane records. GOES 16 colorized infrared image / NOAA

Hurricanes and Climate Change: Ready to open the Can of Worms?

The issue of climate change and its connection to more and stronger hurricanes has gotten so politicized it's getting hard to talk about. So, I'll keep this matter of fact and pretty short, and let you go from there.

Here's what we know for sure:

There are more tropical storms and hurricanes forming in the Atlantic, Caribbean and Gulf of Mexico than say 100 years ago, ON AVERAGE.

There tend to be more intense hurricanes in the past few decades, again, on average.

Sea temperatures have been running warmer than average more often than not.

Global temperatures both in the air and in the oceans have been slowly warming for many decades.

A single cold winter or hot summer does not prove or disprove climate change, we watch for <u>trends over time</u>. Most multi-year trends have been warmer for at least 100 years, some spots have cooled a bit such as over Antarctica but that's not the norm when taking the earth as a whole.

These warming points are not a slam dunk:

- 1. Weak systems like sub-tropical cyclones that last a day were probably missed by sailing ships 200 years ago, in my opinion naming these "wimpy" systems, of which we get quite a few, artificially inflate the total number of named storms. They should not be doing that, perhaps a separate accounting of such storms would help keep the records clear. For instance, three "sub-tropical storms" were counted in the past two years, one in 2020 and two in 2019. These would not have qualified for a name 30 years ago.
- 2. The coastal population is much greater than 100 or 200 years ago so figuring intensity of long-ago hurricanes require more guesswork. Weather historians have done great forensic work in this regard but it still leaves room for error that we just don't see today, i.e. modern-day hurricanes are pegged down to within just a few miles per hour for maximum winds.
- 3. Weather detection technology, most importantly satellite, did not exist until the 1960's so there's no doubt some smaller systems slipped through the cracks.
- 4. Solar cycles vary and this does have an impact on earth's radiation budget, but these changes have been too small to account for our temperature rises.
- 5. Water vapor is a greenhouse gas, but its concentration is not changing over time. There's the same amount of water on earth that there has been for a long time.

There is more, but hopefully the picture is becoming clearer. Climate change itself is pretty concrete, the earth is getting warmer. When it comes to hurricanes, *some* of the apparent increase in numbers as outlined above have more to do with our records and other influences, but certainly not all.

BUT....Hold on

Increased amounts of carbon dioxide and methane trap definitely more heat in the atmosphere, so that begs the question how much heat does it add? Climate models have a hard time figuring this out and you may have heard of anything from seven degrees to two degrees Celsius by the year 2100. You've no doubt heard about rising sea levels, melting ice caps and dying coral reefs, more heat waves, floods and so on.

The problem is – we're looking at a complex mix of natural and man-made elements, both of which contribute to our wild ride of weather. Back to the long-term trends though, the bottom line is the only real change over the past 150 years has been the CO_2 and methane levels and their steady rise. It <u>has</u> to be making some impact on our climate.

Logic, Captain: Live Long and Prosper

I'm a big fan of Star trek, one of my favorite characters is Mr. Spock. He lets logic prevail over emotion most of the time (a few cases where his "human half" gets the better, but I'll spare you!) When it comes to weather science his way makes the most sense. It's just numbers, if we can get honest results we can make decisions. Indeed that's the tough part sometimes, but that does not mean to give up, does it?

May I offer this observation - new technologies and the willingness to use them have generally made our modern civilization flourish, whether it's in medicine, sanitation, education, communication or transportation. We can all dredge up examples where that's not the case, like nuclear weapons, so I say in general.

And now, a heads up on what will probably be a very busy spring.

La Nina Update: Tornado impacts Looming for spring

This one is a bug-a-boo, this year's La Nina keeps getting stronger and stronger. We're now looking at a La Nina event similar to 2008 or 2011. You may recall that a La Nina is the opposite of an El Nino. Here's how these circulations impact the general weather patterns over North America:





There's a thermocline a few hundred feet below the ocean surface, the water is much colder under this permanent temperature boundary in the ocean. It may vary a bit in depth, but what happens in a strong La Nina is shown by the blue patch above: the strong east trade wind basically "pulls" the cooler water upward toward the surface, causing less energy for rain systems, just the opposite of El Nino. This has an impact on the jet stream over North America as seen here:



Evidence of this year's La Nina was front-and-center on November 15, the Great Lakes wind-blast (earlier in this letter) was consistent with the "wet" pattern seen over Ohio in the map above. Wet also means windy in the wintertime and we can expect rather stout winter storms from southern Canada across this same general path through the Great Lakes/New England. Time to tune up that snow blower!



Stronger La Nina's like we saw in 2008 and 2011 are proven to increase spring tornado activity, both of these years saw high-intensity tornado outbreaks, with 2011 being the most destructive in pure dollar damage on record and top 5 deadliest in human terms. Data from the Climate Prediction Center (CPC)

Each of the lines below represents a computer (model) output of ocean temperature changes through the spring, they all point to a moderate to strong La Nina which corresponds to the winter pattern above as well as a rough spring for the southern U.S.



When numerous models are tightly grouped like this, confidence in the forecast is high. There's a 95% chance of La Nina continuing well into the spring.

The most dangerous relationship, and the greatest impact on adjusters, comes then. A scientific paper authored by John Allen, Michael Tippett, and Adam Sobel (see map on next page) showed a clear correlation between moderate to strong La Nina's and higher numbers of damaging spring weather events. Why? La Nina's influence on the jet stream beefs up the temperature gradient, in this case the horizontal difference which makes the atmosphere more energetic by boosting both wind shear and lift.

Here are few examples of moderate to strong La Nina years and "famous" tornadoes that go with them:

- April 2-3, 1974: Super Outbreak, 148 tornadoes in 24 hours, strong La Nina
- May 3, 1999: Moore tornado, highest wind speed on record, 301 miles per hour, strong La Nina
- March 28, 2000: Fort Worth tornado, severe damage to many high-rise buildings, strong La Nina

- Feb 5-6, 2008: Super Tuesday outbreak, 87 tornadoes in 15 hours across the Mid-South, including 5-EF4's, moderate La Nina
- April 27, 2011: Mega-Outbreak, 200 tornadoes in 24 hours across the south, all time record, over \$5 billion in damage, hundreds killed, **moderate La Nina**

Wow, how depressing! But, for insurance work it means busy adjusters in the spring of 2021.



Red tinted areas represent less frequent, purple more frequent / John Allen, Michael Tippett, and Adam Sobel

Hurricane Season 2020 and 2021

Dare we forget, this year's La Nina helped make for an all-time record active hurricane season with 30 named storms, 13 of them hurricanes, just astounding. The previous record year was 28 named storms in 2005, also a La Nina year. For tropical systems a weaker summertime La Nina seems to be the key which we had this year and in '05. A lingering but slowly fizzling La Nina in 2021 will have some effect but probably not as great as this year, making for be a slightly above average hurricane season.



2020's Atlantic season storm tracks, an all-time record with 30 named storms / Pennsylvania State University

In the meantime keep safe and here's wishing you and yours a safe and bountiful Holiday!

Take Care,

Steve LaNore, CBM