bms.

2017 – A year to Forget or a Year to Remember and Learn From?

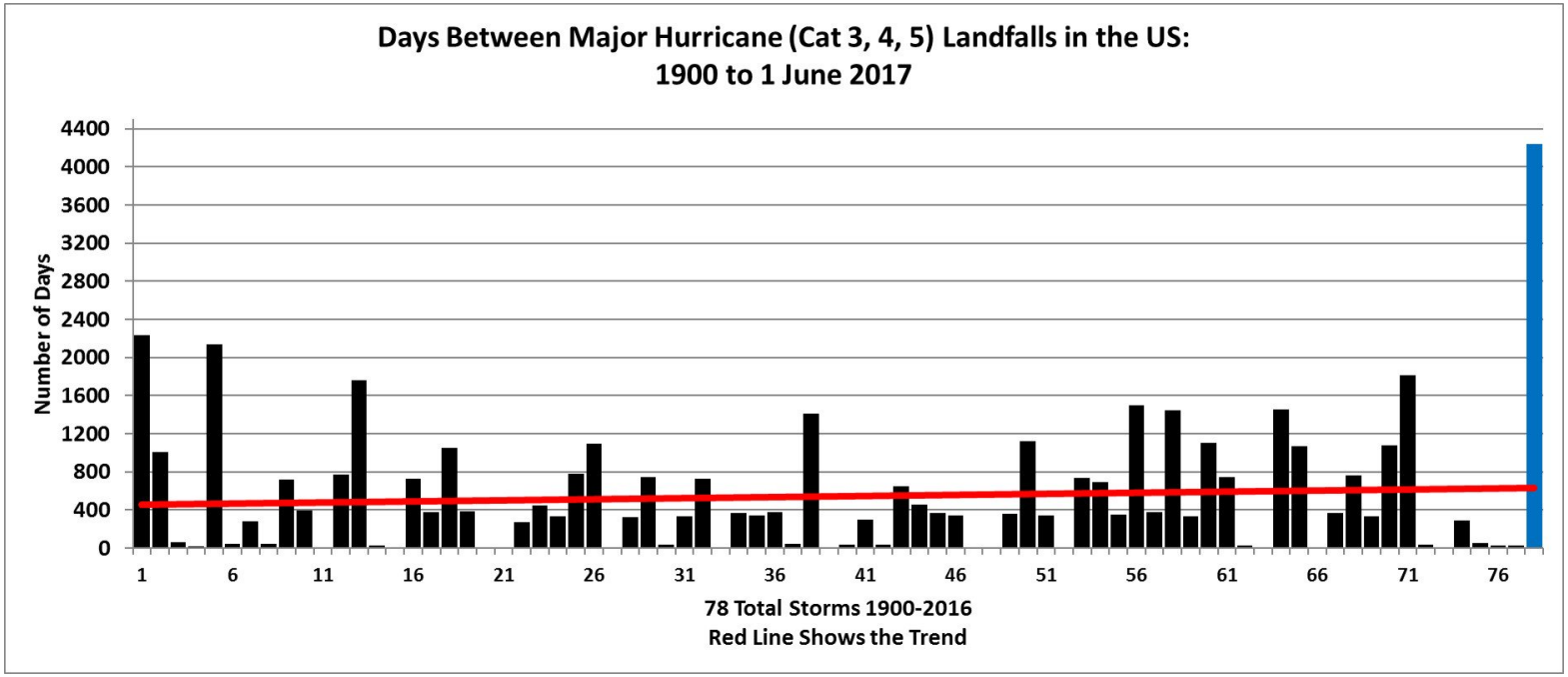
A review of 2017, a look ahead to 2018

Named Storm and Wildfire Focused

June 27th, 2018

Takeaways from the Extreme Weather Events of 2017

The Major Hurricane Drought is Over



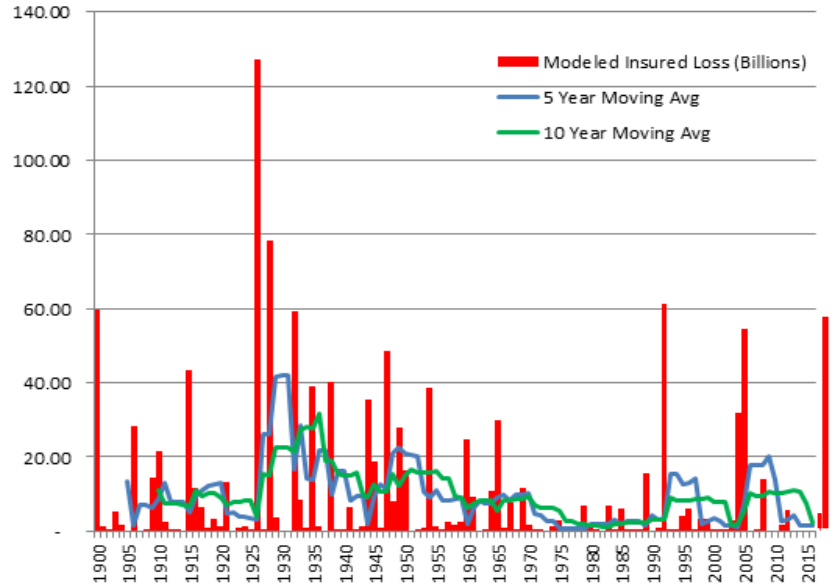
In the 114 years of landfall records, never has there been a period of time this long without a major hurricane landfall (roughly 12 years or 142 months, but exactly 4,323 days).

Twenty-seven major hurricanes have occurred in the Atlantic Ocean basin between Wilma, which struck Florida in 2005, and Harvey, which ended the record drought.

The odds of this occurring are 1 in 2,300, according to Phil Klotzbach at Colorado State University (CSU).

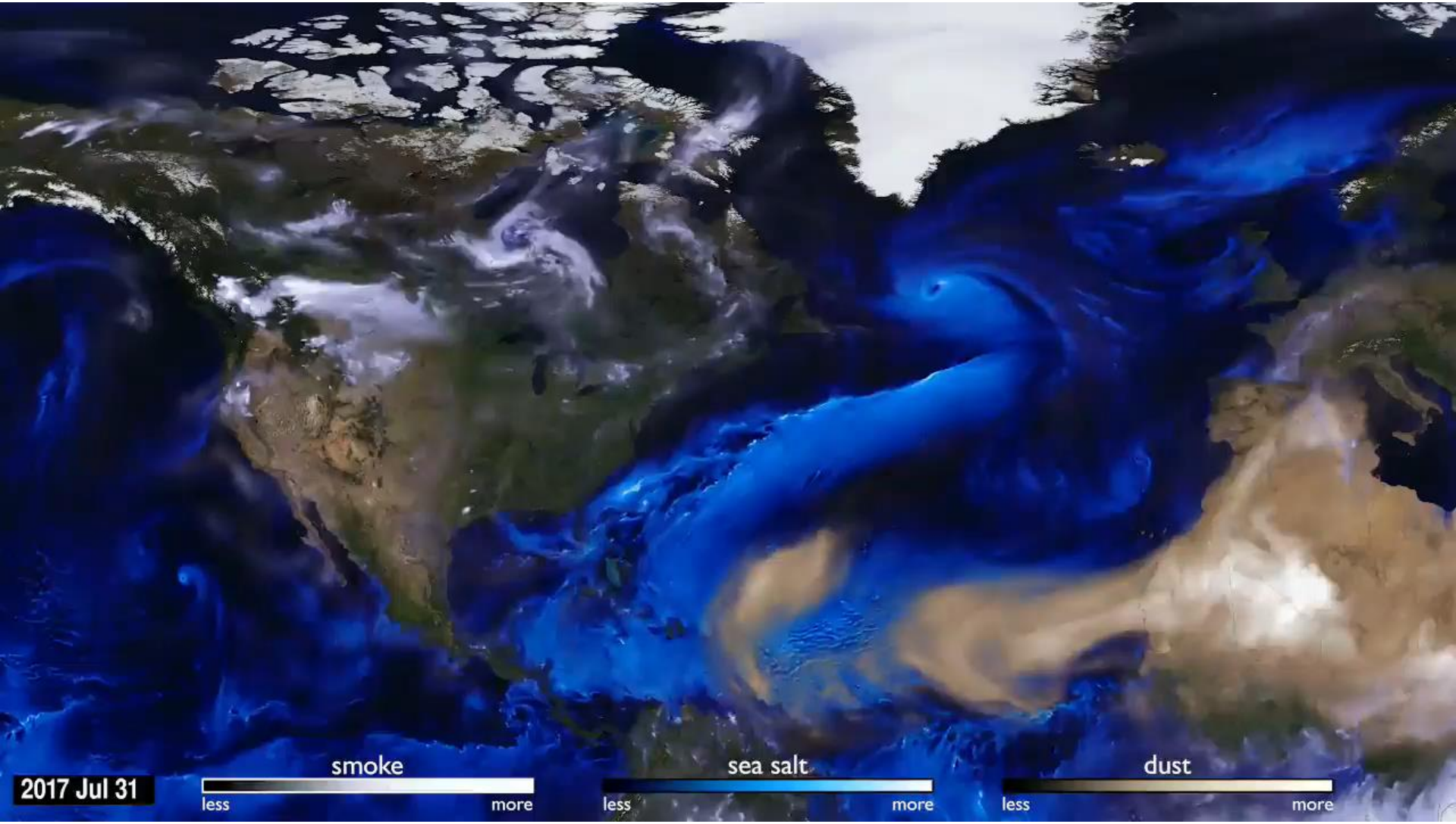
Hurricane Events

- 2017 Atlantic hurricane season was remarkable.
- No matter how you spin it, 2017 will be one of the costliest seasons ever recorded in terms of both economic and insured losses.

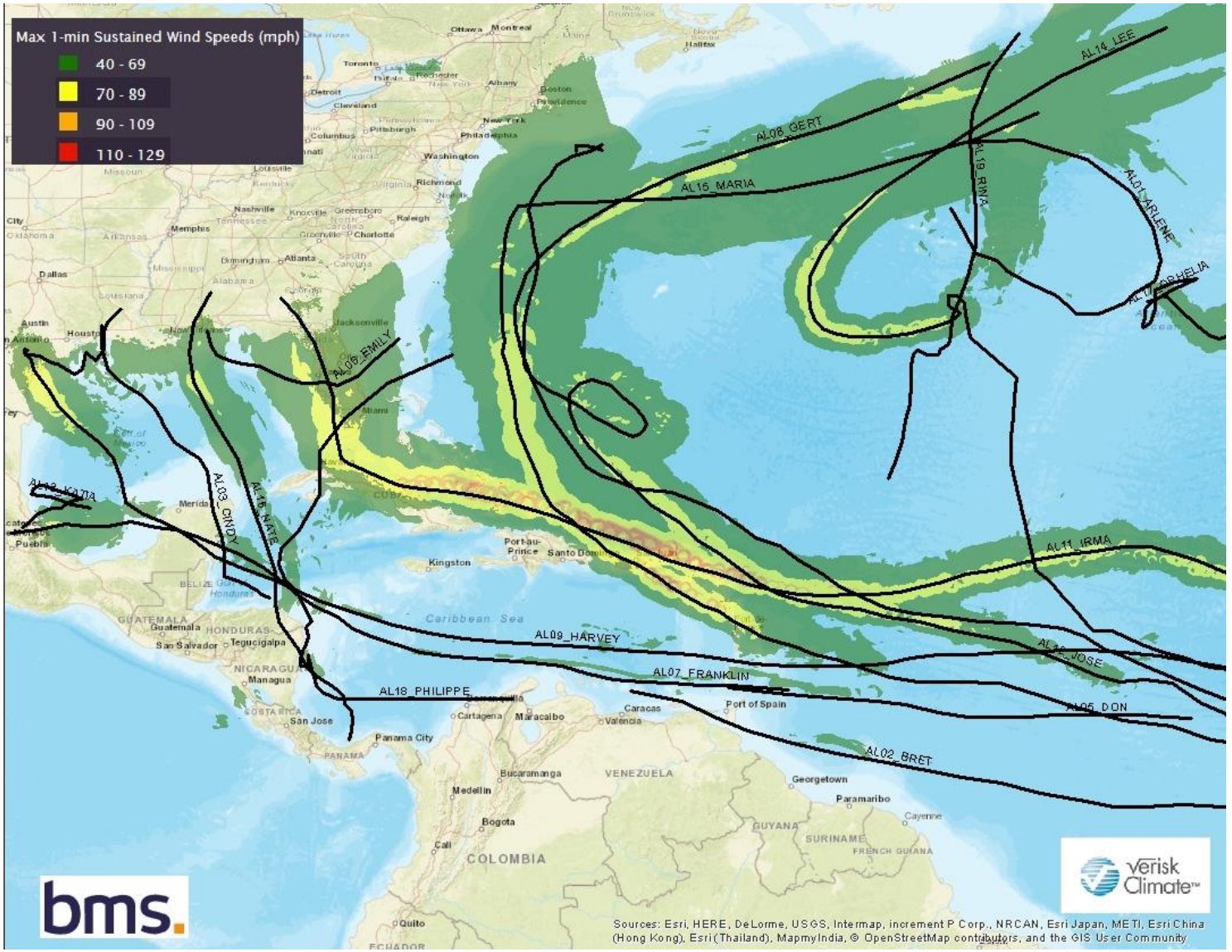


- Using model losses removes the uncertainty of adjusting historical losses to account for socioeconomic factors.
- Insured losses are at multi-decadal lows, with much higher insured losses occurring between 1930–1960.

2017 Hurricane Season

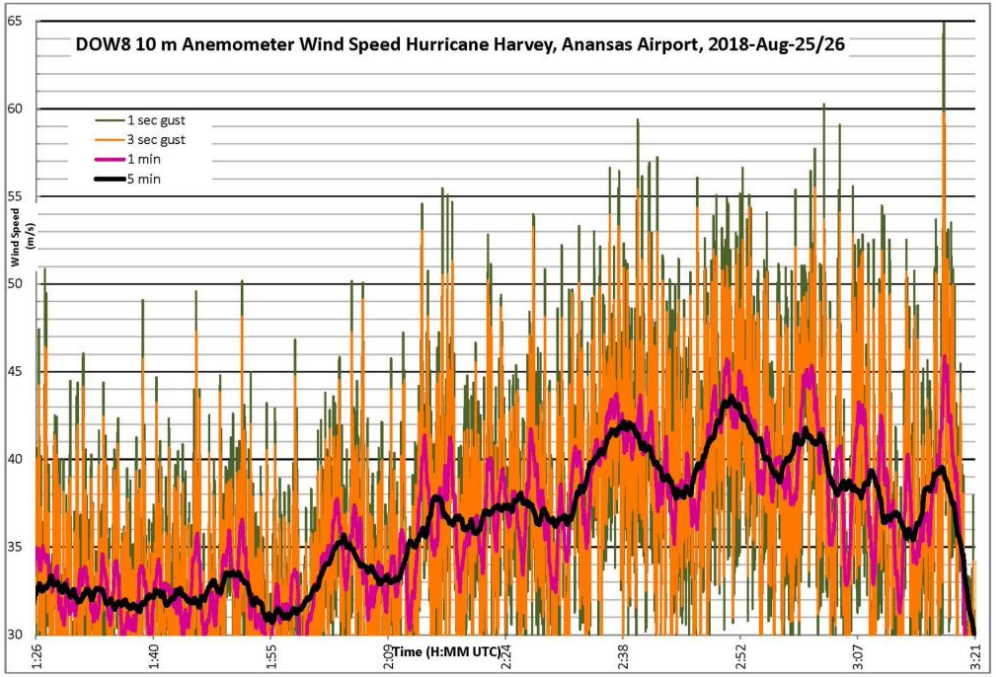


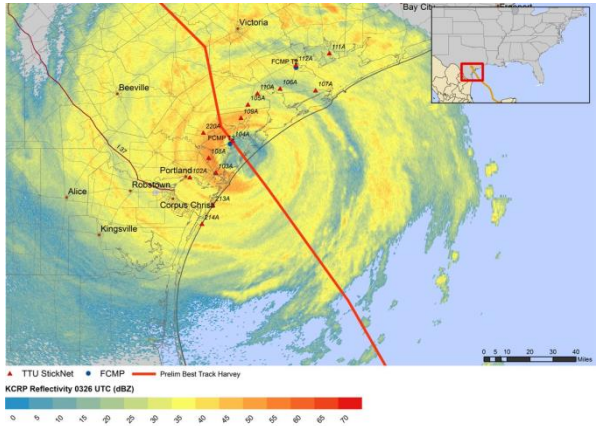
Each Event is Different



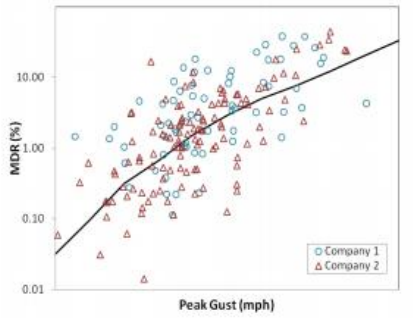
Valuable Data Collected

Each event this year has provided much-needed data points for the industry's records, especially high wind speed events, which, historically have offered few data points.

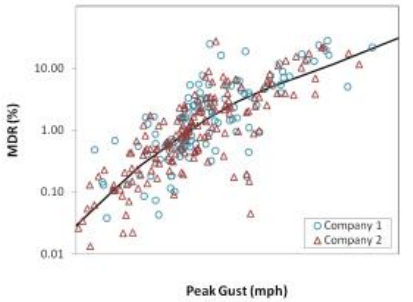




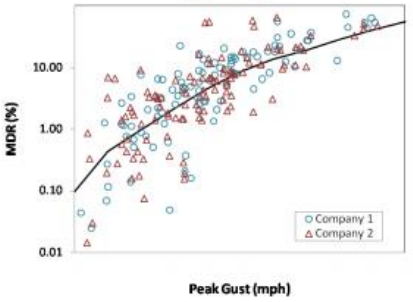
Valuable Data Collected



(a) Wood Frame



(b) Masonry



(c) Mobile Homes

When this wind speed data is combined with claims data, it will provide critical knowledge of how high wind speeds damage different types of construction and occupancies in a real-world setting.

Patio screening and carports are common damage points, but are easily preventable losses with correct bracing.

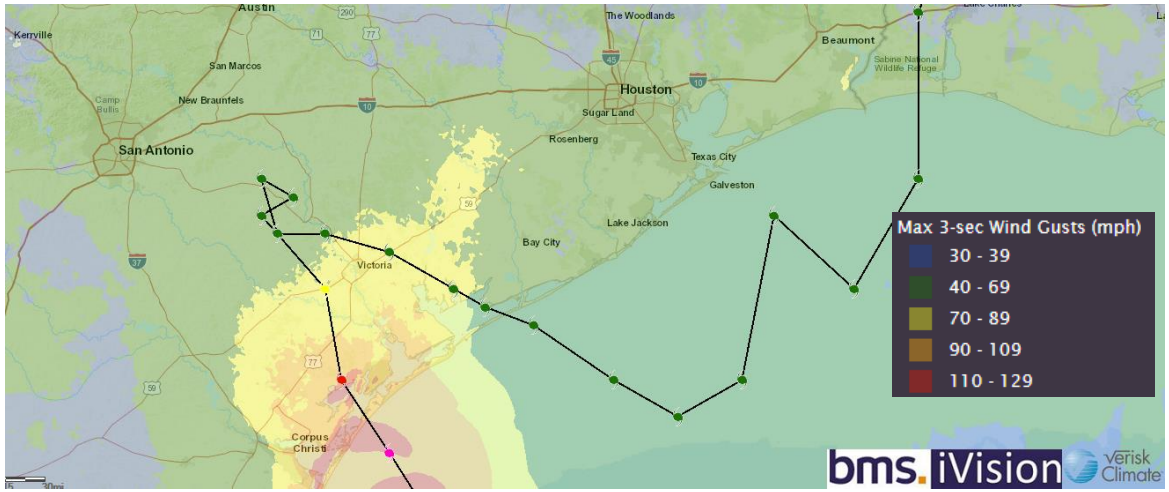
This newer home on the east side of Big Pine Key, FL fared well during Irma. Strong building codes make a difference.

Damage Surveys

Much needed high intensity damage survey's

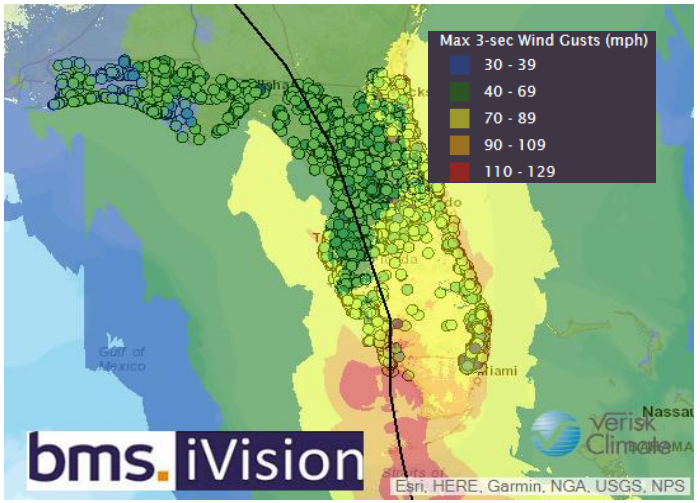
- New code residential construction performed very well, even though no window protection was required. Although some homes did have window protection, windows, including plexiglass window protection, had been broken by shingles.
- Older construction, unless protected by a tree canopy, did not perform well due to a combination of inadequate codes, poor construction quality and poor maintenance.
- New Housing and Urban Development Code for mobile homes performed well.
- Caribbean risks are complex. Structure could be sound, but roof and other features are weak allowing for loss.

Hurricane Harvey Wind Gust Swath



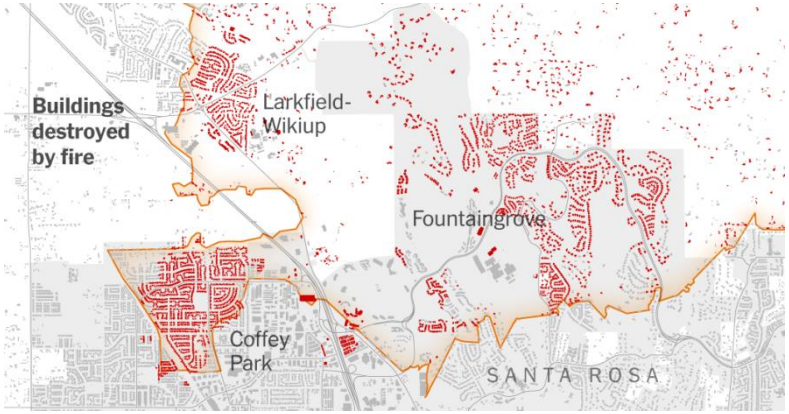
Better Concentration Analysis

Major Hail loss event in north Minneapolis June 11th



Hurricane Irma wind gust swath across Florida.

Hurricane Harvey NOAA NGS Flood imagery.

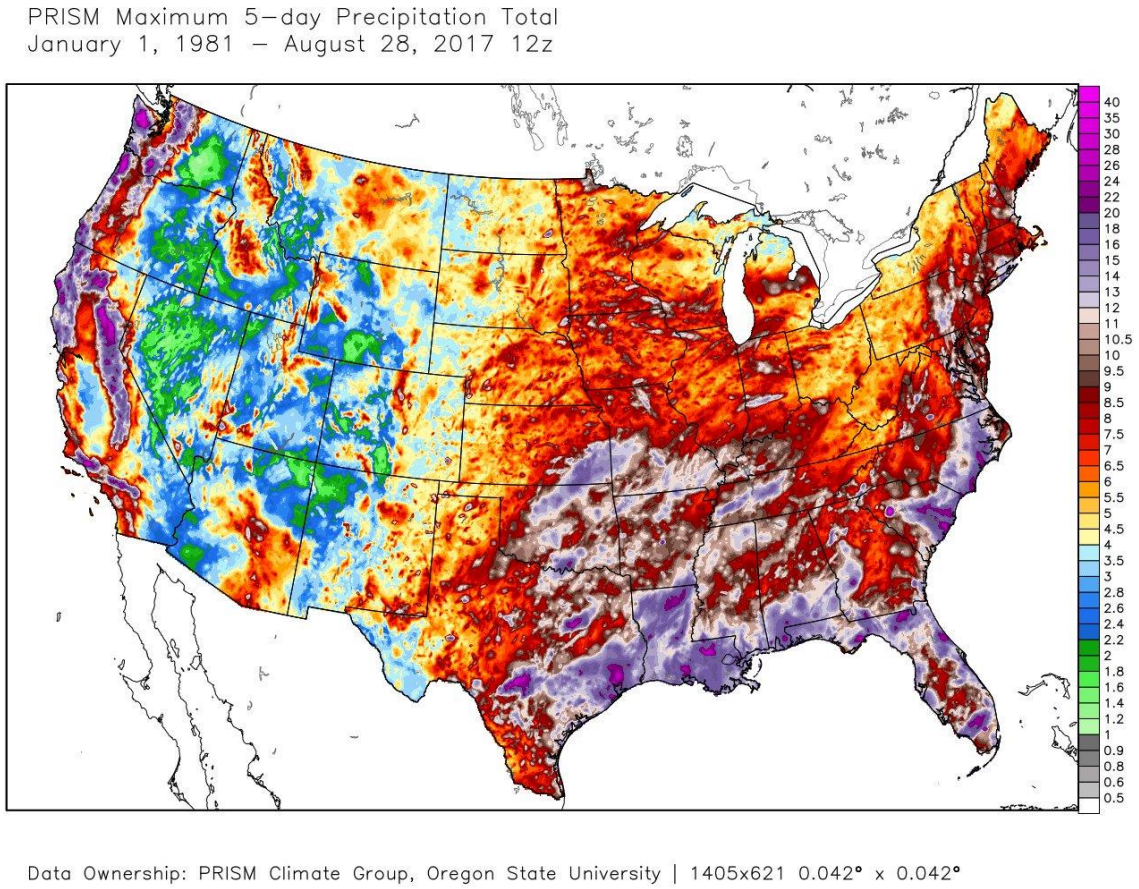


Building destroyed by Tubbs Fire near Santa Rosa, CA

Each event this year is a great example of why exposure management is so important in the insurance industry.

How Much Rain Can Fall?

Maximum five-day precipitation totals (1981-2017) from PRISM

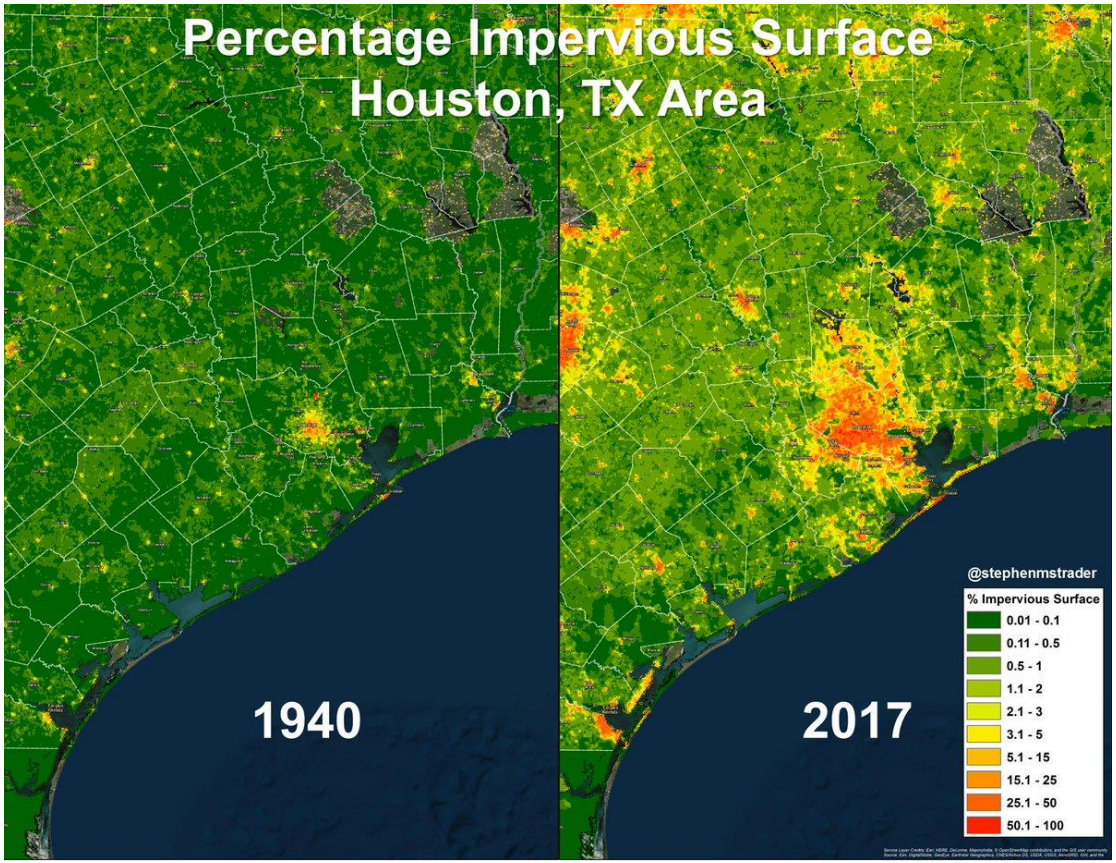


Using historical data can give a regional estimate of how much rain can fall.

Houston, we have a problem.

The U.S. has unchecked sprawl, with Houston being a perfect example of the destruction of prairie wildland. Combine this with 1940s-era infrastructure and, of course, the current political climate, and heavy rainfall just becomes part of the “New Normal.”

There is a need for more cities to have green space, but balancing this need against the desire for growth is a challenge. Green space does not pay for infrastructure needs unless property taxes are raised, which citizens may oppose.

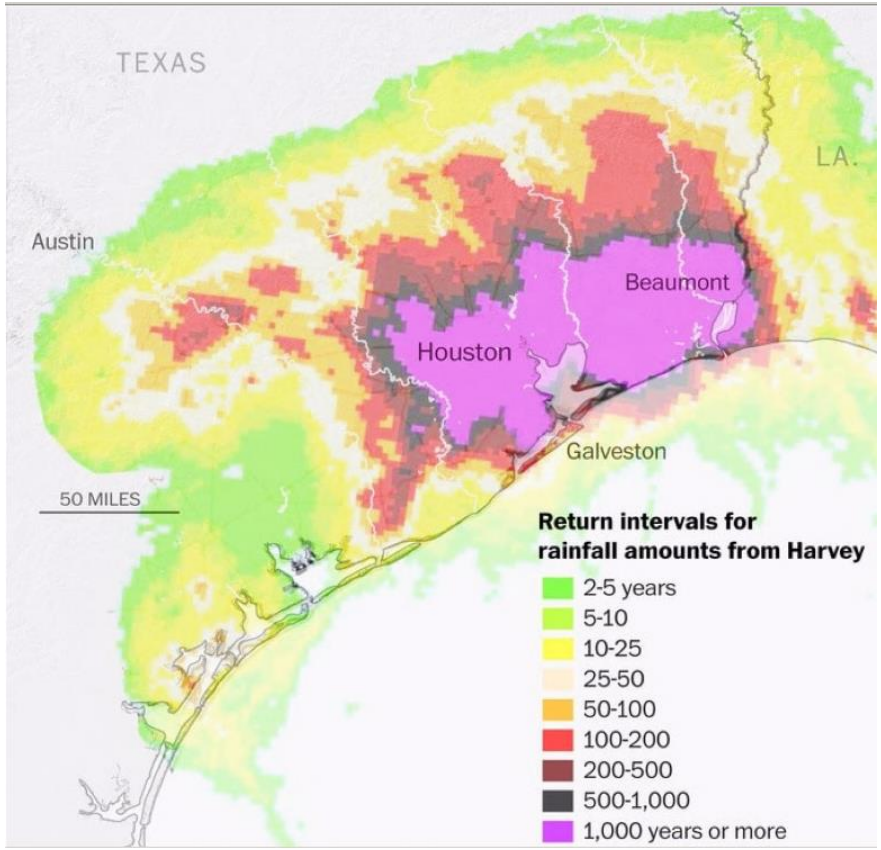


Harvey Return Period

Rainfall and flood data generally go back only 100 years, so statistical tricks must be applied to determine what 500-year and 1,000-year events actually represent.

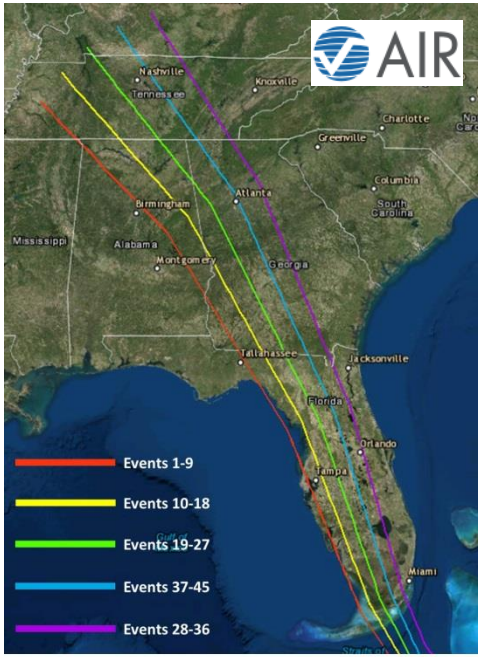
The University of Wisconsin's Space Science and Engineering Center has determined that Harvey is a 1-in-1,000-year flood event, which has overwhelmed an enormous section of southeast Texas. The area covered in more than 40 inches of rain was equivalent to the size of the state of New Jersey.

It signifies just a 0.1% chance of such an event happening in any given year. Or, in other words, 99.9% of the time, such an event will never occur.

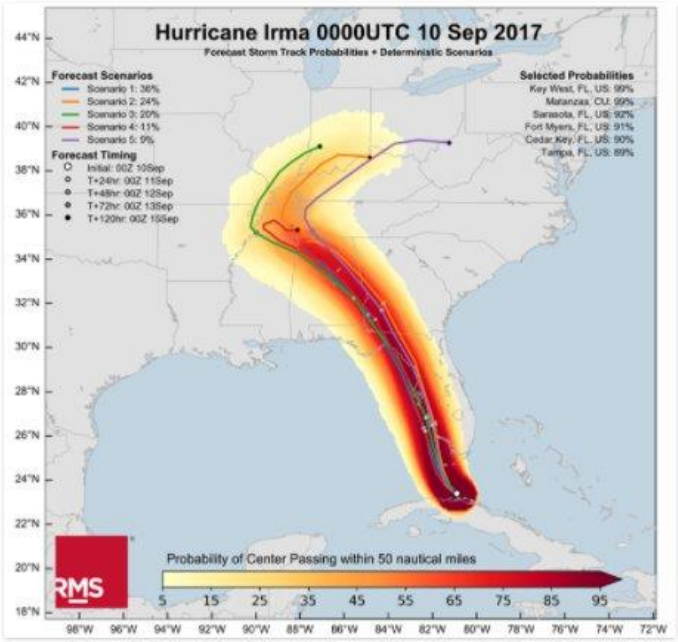


Forecast Uncertainty

Insured losses in just Miami from Irma could be in $200B range



AIR estimates industry insured losses for the United States resulting from Hurricane Irma will range from $25B to $35B.



RMS said its modelling of the storm's path over Florida indicated a 10% chance of insured wind losses exceeding $60B.

Hurricane landfalls raise questions regarding the value of early landfall loss projection

Takeaways From the 2017 Events

- **Testing of New Systems**
  2017 was a great test for these "systems," with no major lapses occurring thus far. Expect further system enhancements in the future as insuretech slowly builds momentum and marketplace.

- **Demand Surge**
  Where to start? The lack of adjusters created a major bottleneck that led to very high loss adjustment expenses. More adjusters are needed.

- **Business Interruption Insurance**
  Survival of the fittest — those with the best insurance will come out on top after an event. Few small business have enough business interruption coverage.

- **New Data Lessons and Thinking**
  The data sets that the insurance industry is collecting from the 2017 extreme events will be very valuable, both meteorologically and financially.

- **2017 catastrophic events will help the insurance industry and its customers by**
  - Providing better loss models in the future from the valuable data that is collected.
  - Provides lessons for loss mitigation and resiliency to limit future losses.

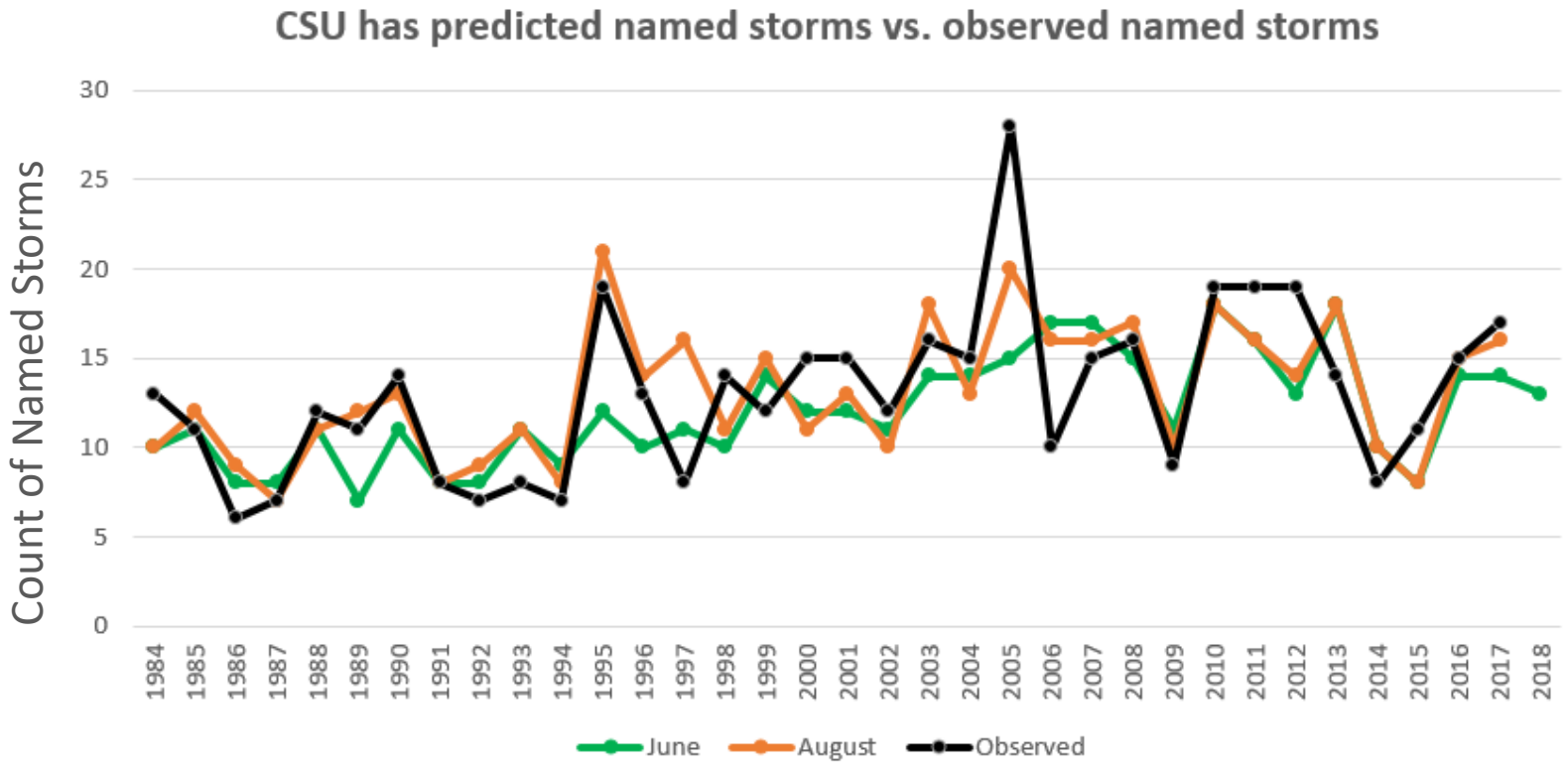
- **The insurance industry can seize the opportunity**
  - It is unfortunate, but take-up rates for insurance often spike after an event.
  - Insurers can't radically increase premiums in random states to make up for large payouts, but a ripple effect can occur.
  - Taking steps to mitigate loss worldwide as take-up rates are low.

2018 Climate Forcers - What to Expect

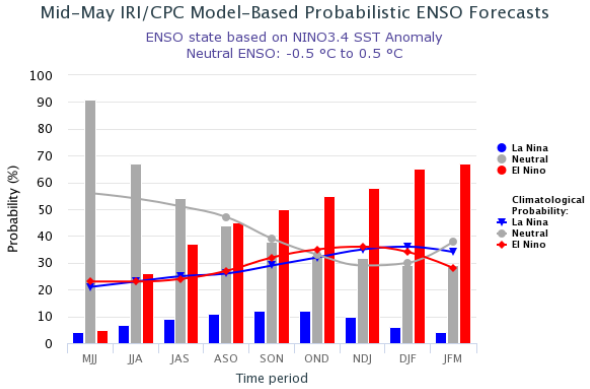
Early Season Hurricane Forecast Skill

CSU has predicted named storms vs. observed named storms based on for June and August forecasts since 1984.

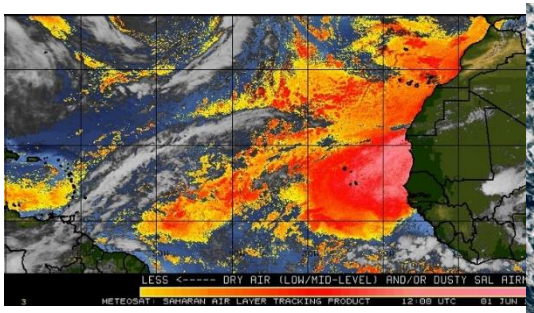
- The R^2 for June is 0.60
- The R^2 for August is 0.75

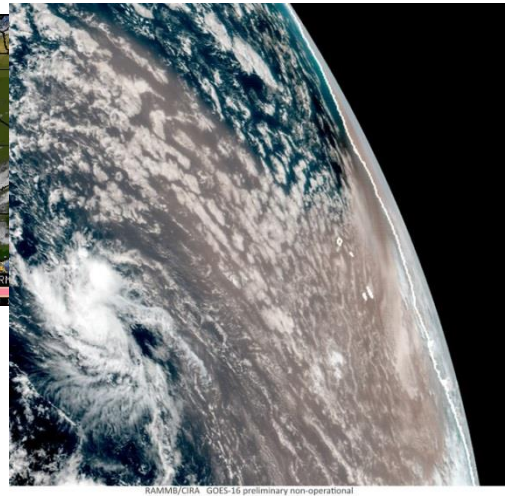


Climate Forcers for 2018 Atlantic Season

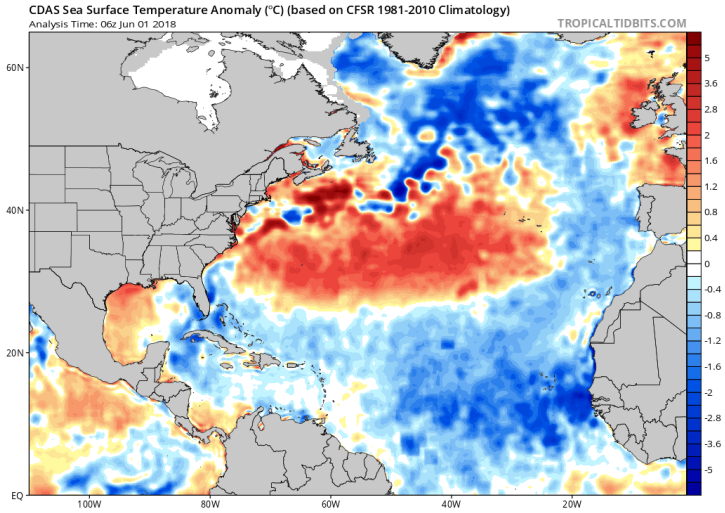


El Niño/ La Niña: El Niño Southern Oscillation (ENSO) is expected to be Weak El Niño

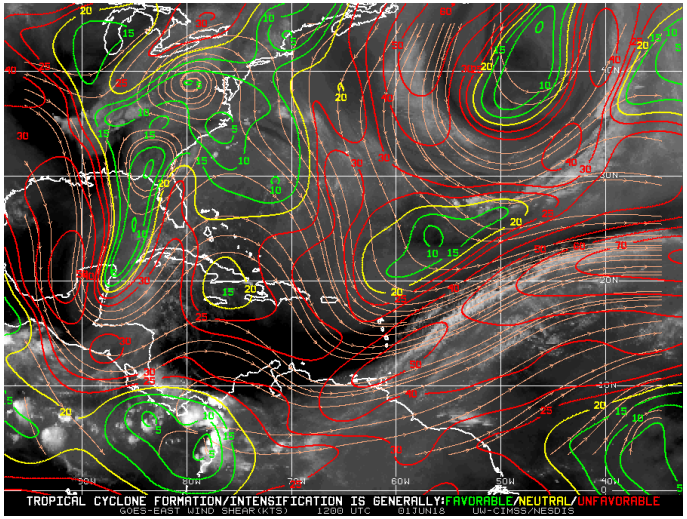




African dust is hampering development. Peaks mid-July, but if continues, could be a negative for tropical development over MDR.



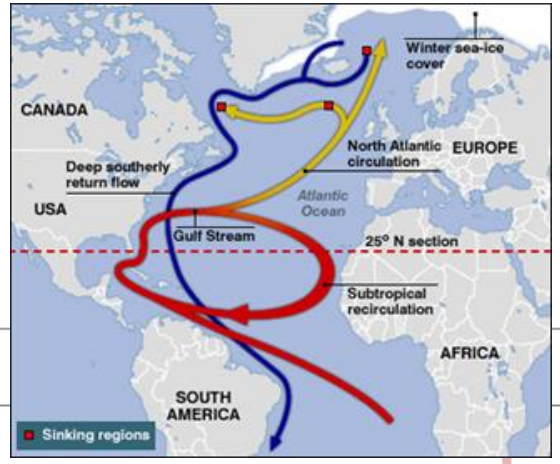
Sea surface temperatures are warm enough for tropical development and exceptionally warm off the East Coast of the U.S.

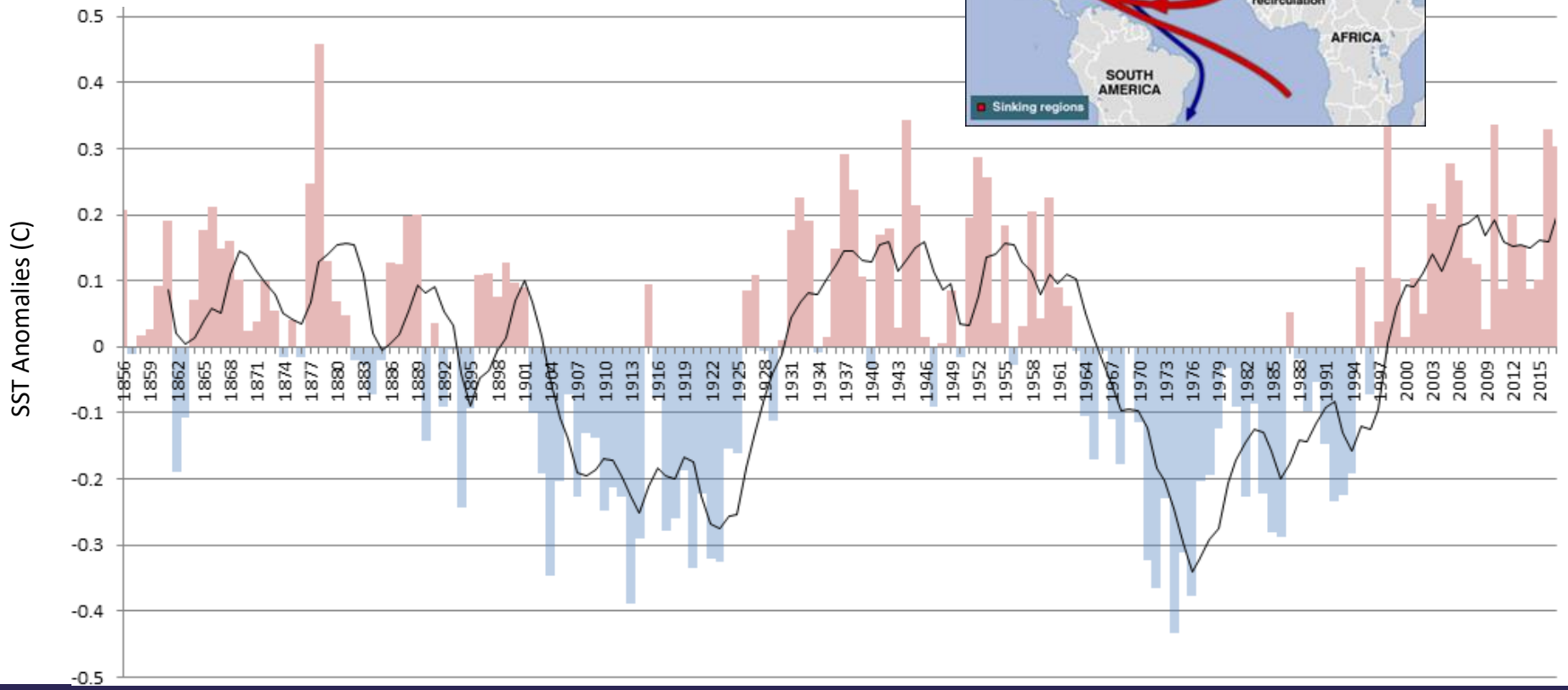


Shear: There continues to be pockets of high wind shear across the Caribbean and Atlantic, which hampers named storm development.

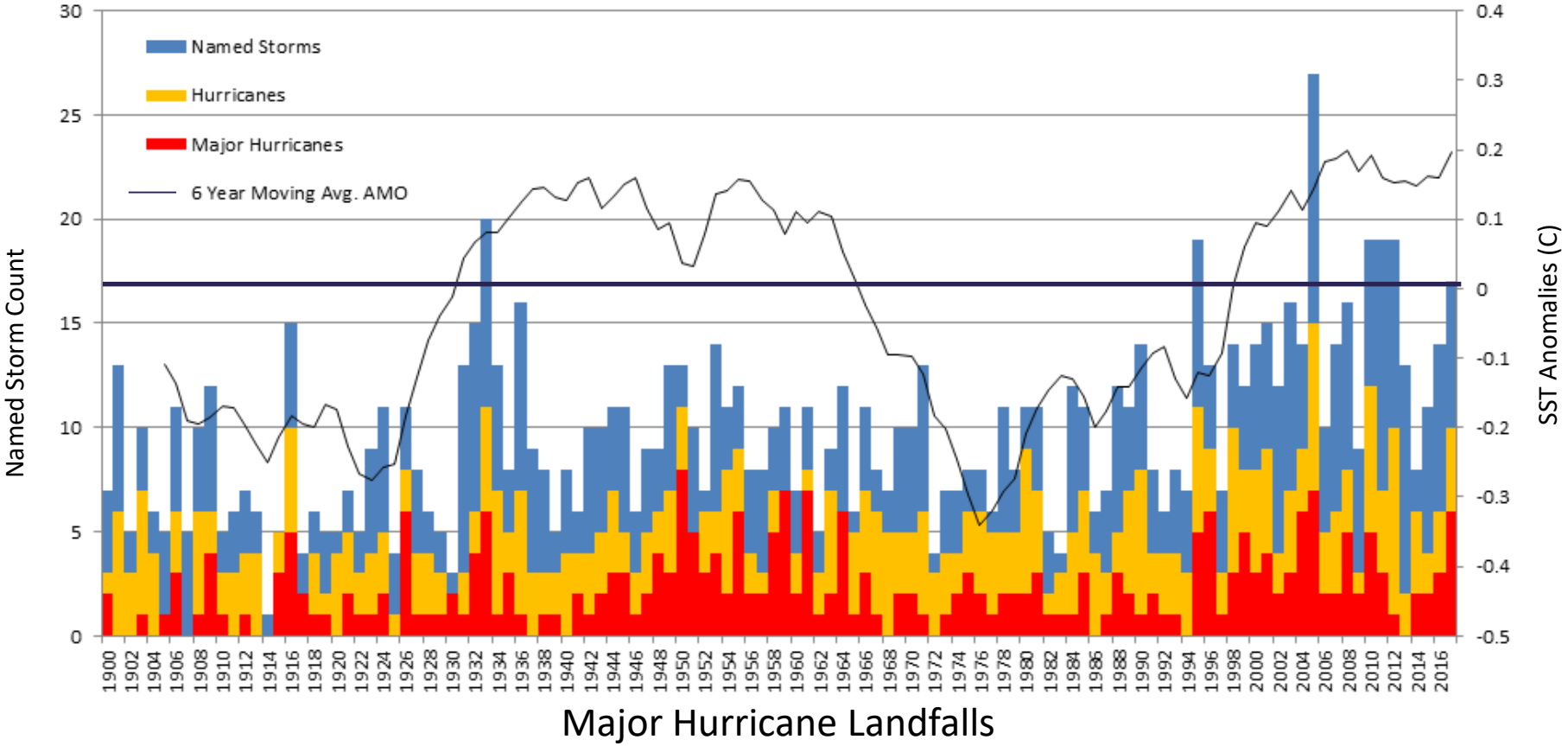
Atlantic Multidecadal Oscillation (AMO)

AMO is likely a variability that is associated with small changes in the North Atlantic branch of the thermohaline circulation, but limited data hinders our ability to understand what exactly causes the AMO.

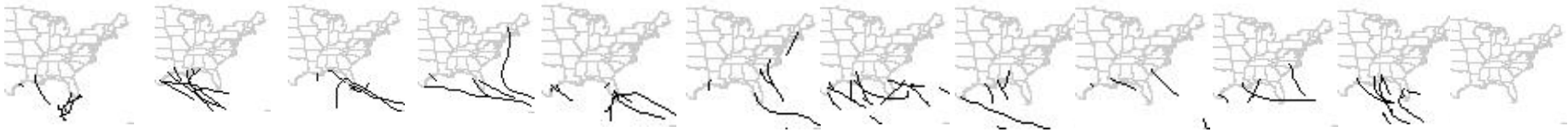




Atlantic Named Storm Activity



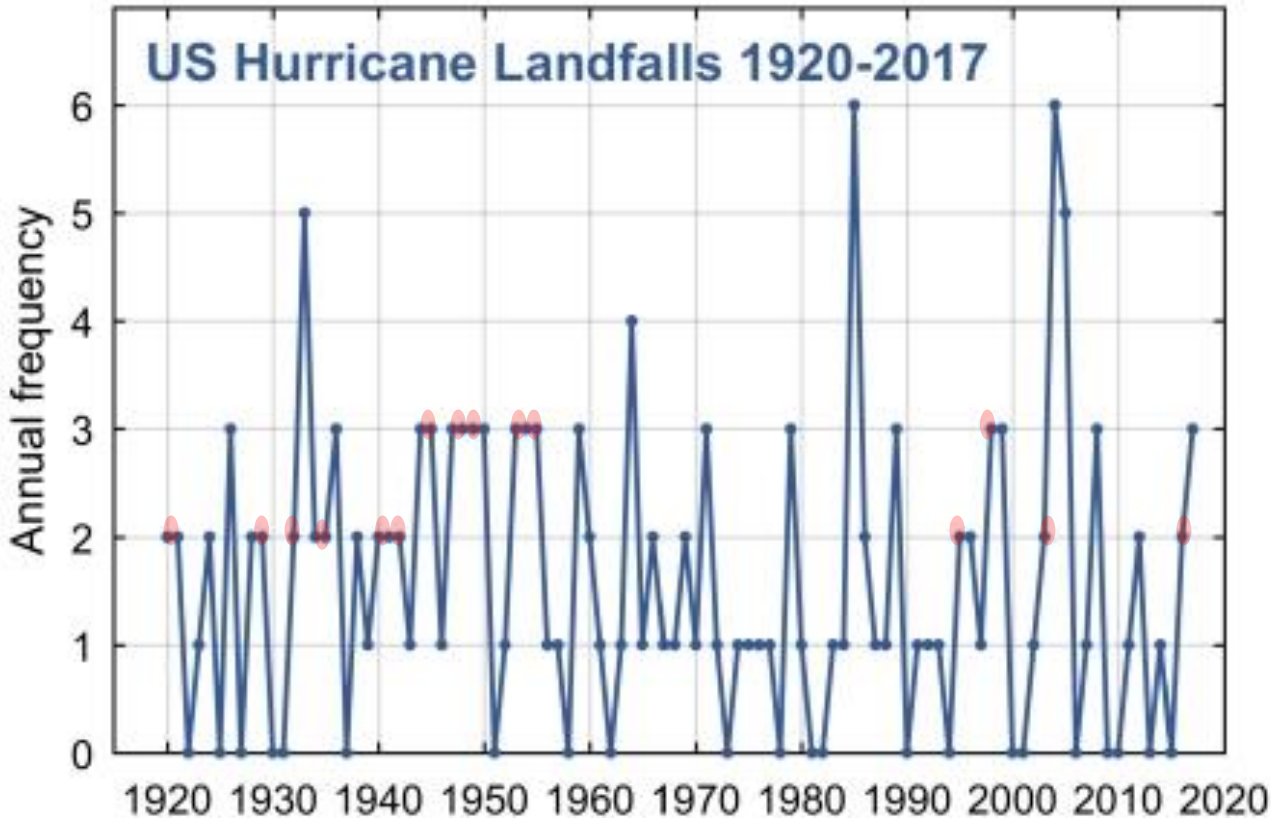
Major Hurricane Landfalls



1901-1910 1911-1920 1921-1930 1931-1940 1941-1950 1951-1960 1961-1970 1971-1980 1981-1990 1991-2000 2001-2010 2011-2016

There is a good correlation between the warm and cold phases of the AMO and the overall named storm activity in the Atlantic basin.

How many landfalling hurricanes in 2018?



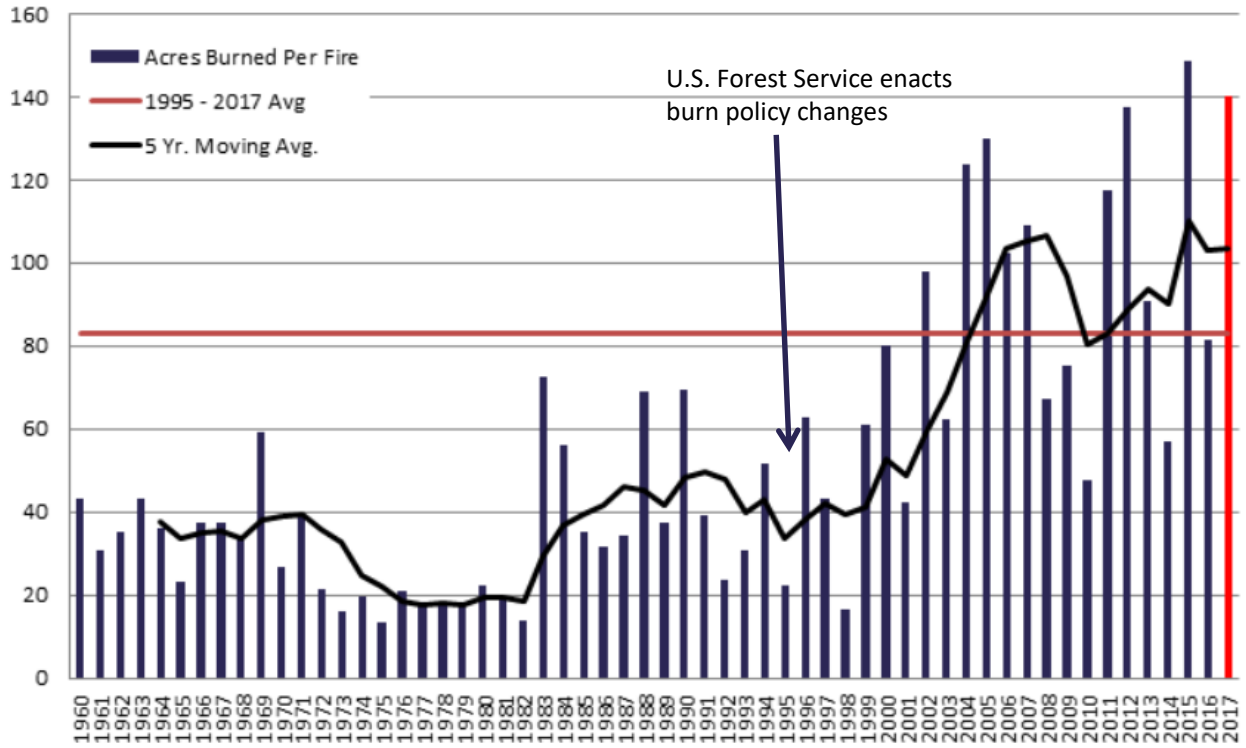
Since 1920, there are only 16 years in which two or more hurricanes made landfall in one season that have resulted in two or more landfalls in the next season.

Climate Forcers suggest that stronger storms if they develop would occur closer to the U.S. coastline and track closer to the East Coast of the U.S. for the 2018 season.

Wildfire Review and Update

U.S. Wildfire Burn Frequency

The National Interagency Fire Center (NIFC) and National Interagency Coordination Center maintained wildfire records from 1960 to 1982 before the NIFC began its current method of data compilation from states and other agencies in 1983.



Source: NIFC

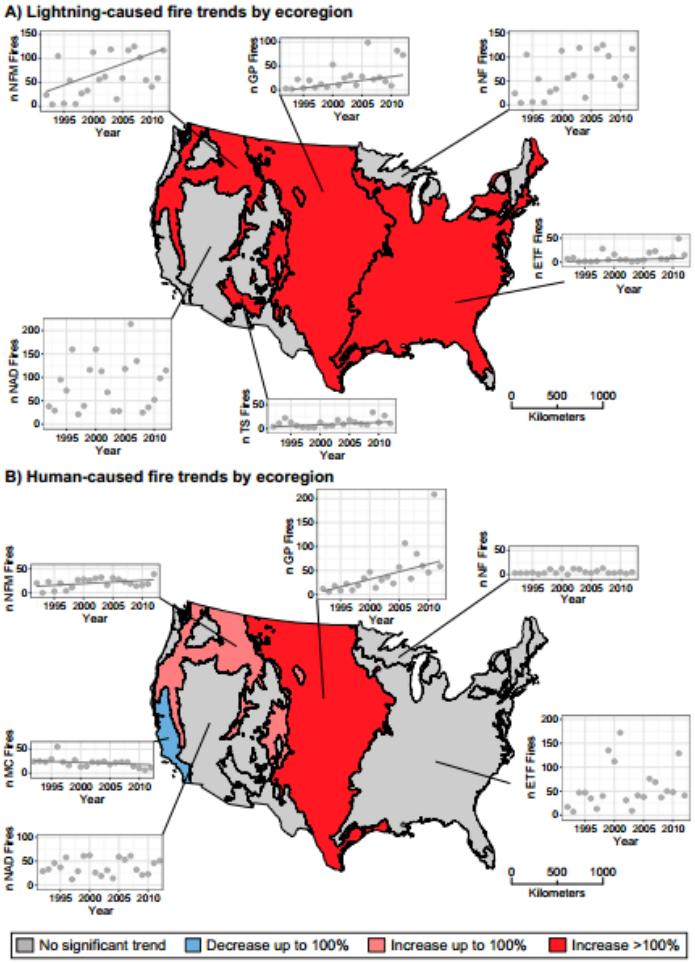
Reasons?

Larger Fires - Changing firefighting tactics and land use.

Extended fire season - more heat and fuel, and shifts between wet and dry periods.

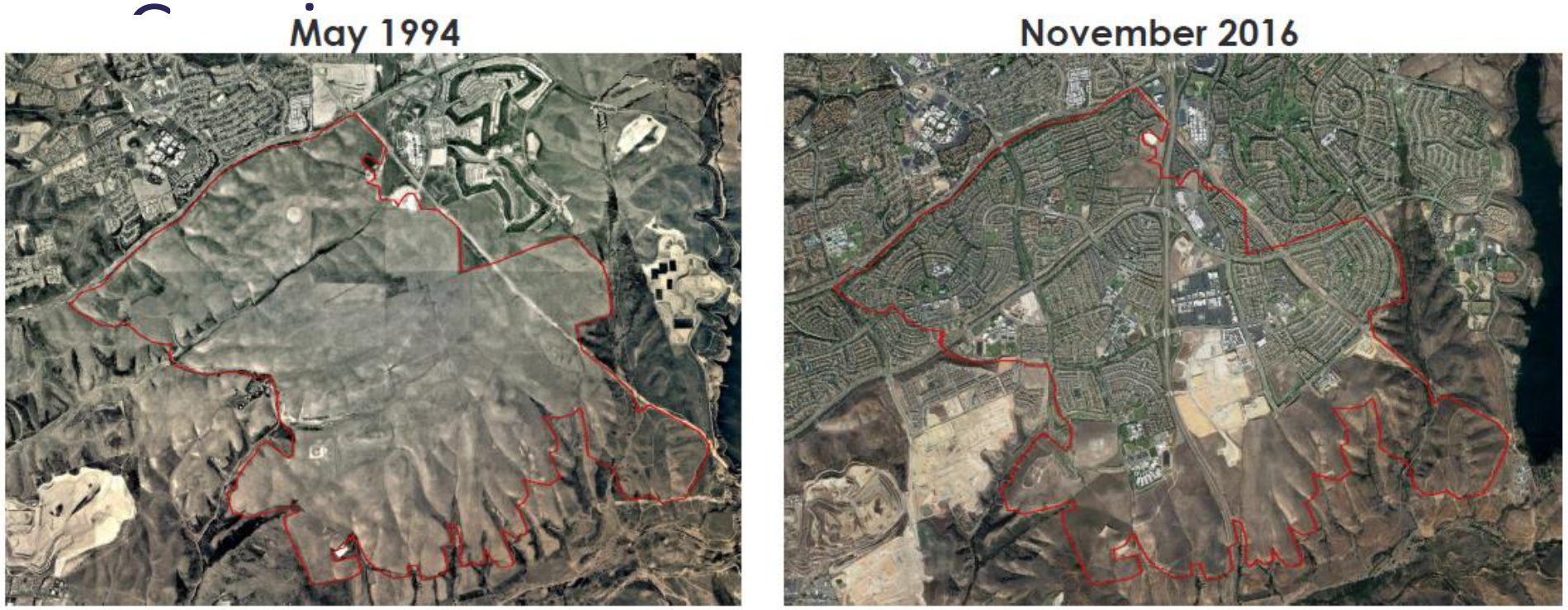
Human-caused Fires

- 2017 and 2016 were large loss years for wildfires.
- Both the Fort McMurray and Gatlinburg fires were caused by human action and totaled $3.6B in insured losses.
- Humans cause 84% of wildfires in forests.
- Lightning accounts for the rest, occurring mainly in mountainous, sparsely populated areas.
- Observations show climate change has extended fire season across the U.S. by zero to two weeks, while human-started fires increased the length by three months!
- Humans extend fire season into colder parts of the season. Lightning fire season has changed very little and is still common in the warm season, as expected.



Source: Human-started wildfires expand the fire niche across the United States.
http://www.pnas.org/content/early/2017/02/21/1617394114

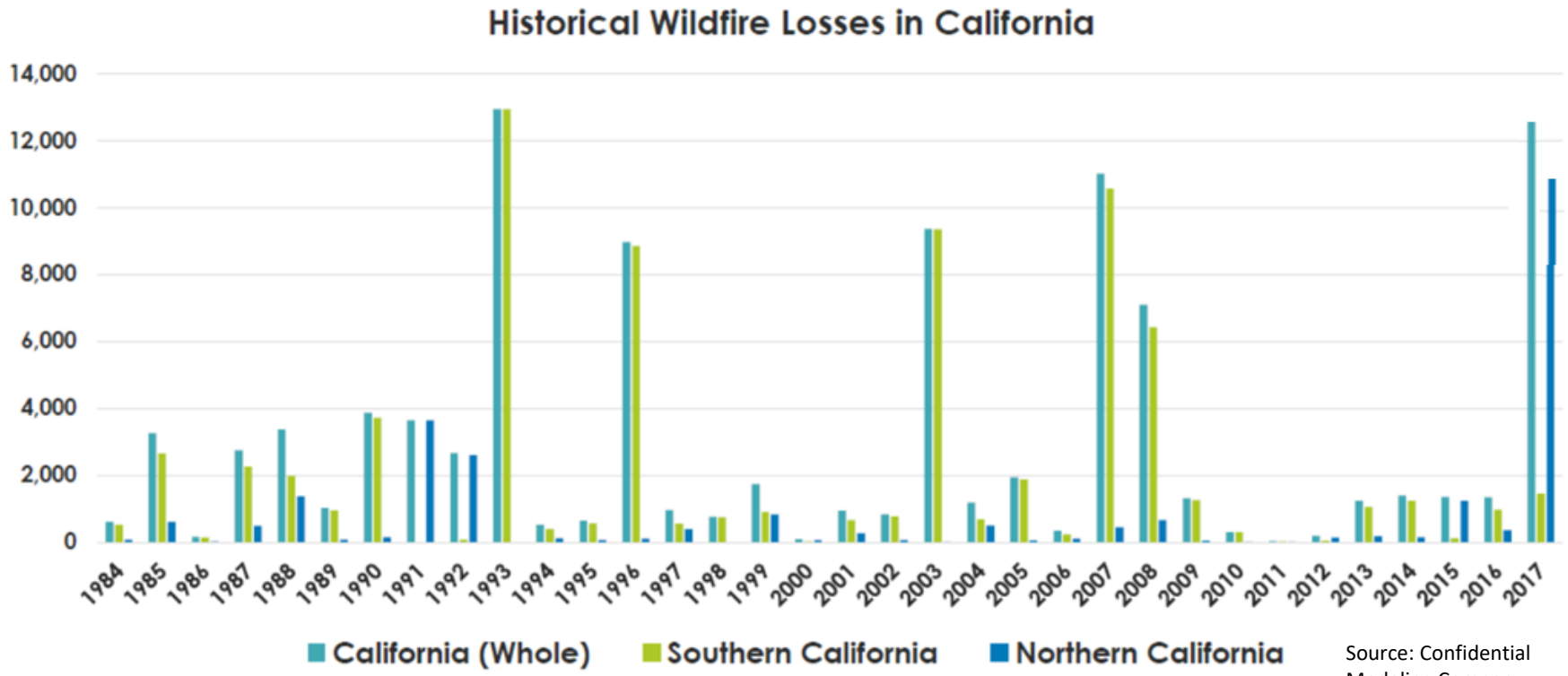
Wildland-Urban Interface (WUI) is



Source: Monitoring Trends in Burn Severity (MTBS Unnamed California Wildfire San Diego Area

This unnamed wildfire that occurred in San Diego in 1994 burned very few structures. Today it would be a major wildfire loss for the insurance industry. The WUI is growing more populous, the likely result being greater wildfire losses in the future.

Model Adjusted Wildfire Loss



Source: Confidential Modeling Company

Based on historical analysis of wildfire perimeters and adjusted for new exposure that has moved into the WUI, 2017 wildfire losses don't appear to be that large.

Unlike this year, historically Southern California has had several large fires.

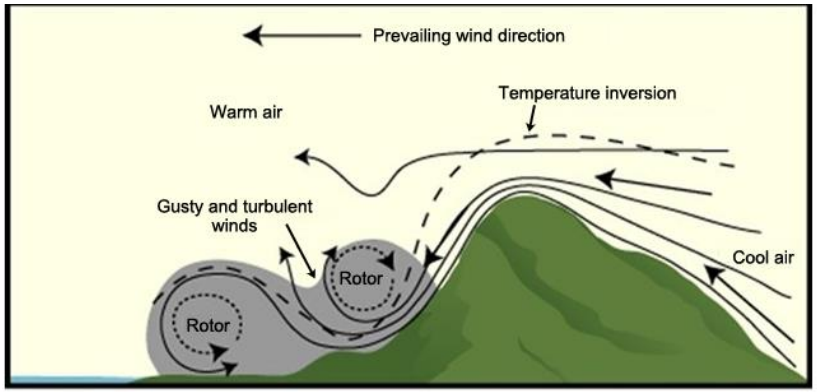
(Note that the modeling company here can't be named)

The Real Story Behind the California Wildfires

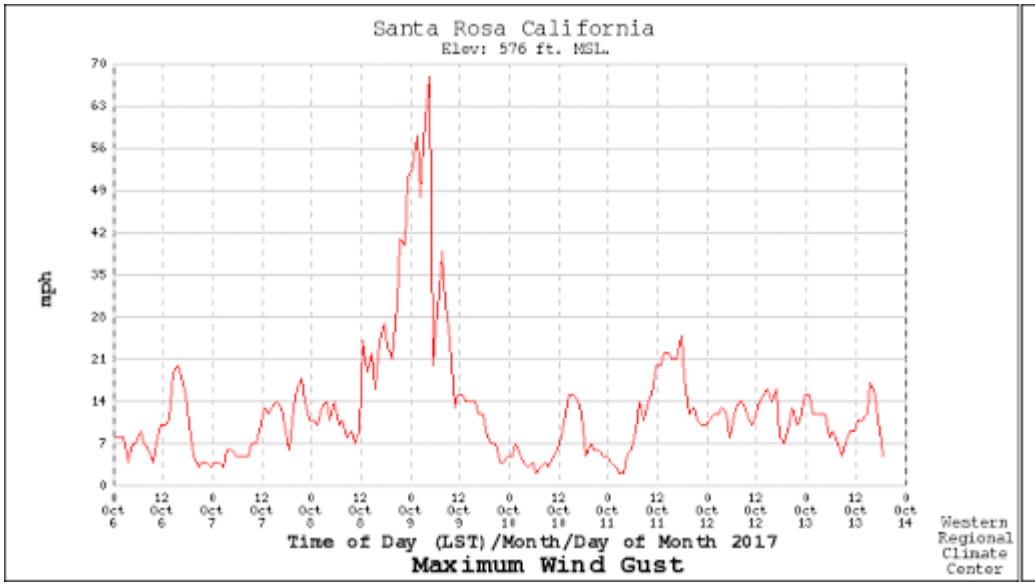
Media stories have blamed the catastrophic fires on many things:

- A dry environment after the heavy winter rain and than typical summer drought
- Global warming/Climate Change
- Lack of vegetative maintenance (clearing of the power lineright-of-ways) by the local utility (PG&E).

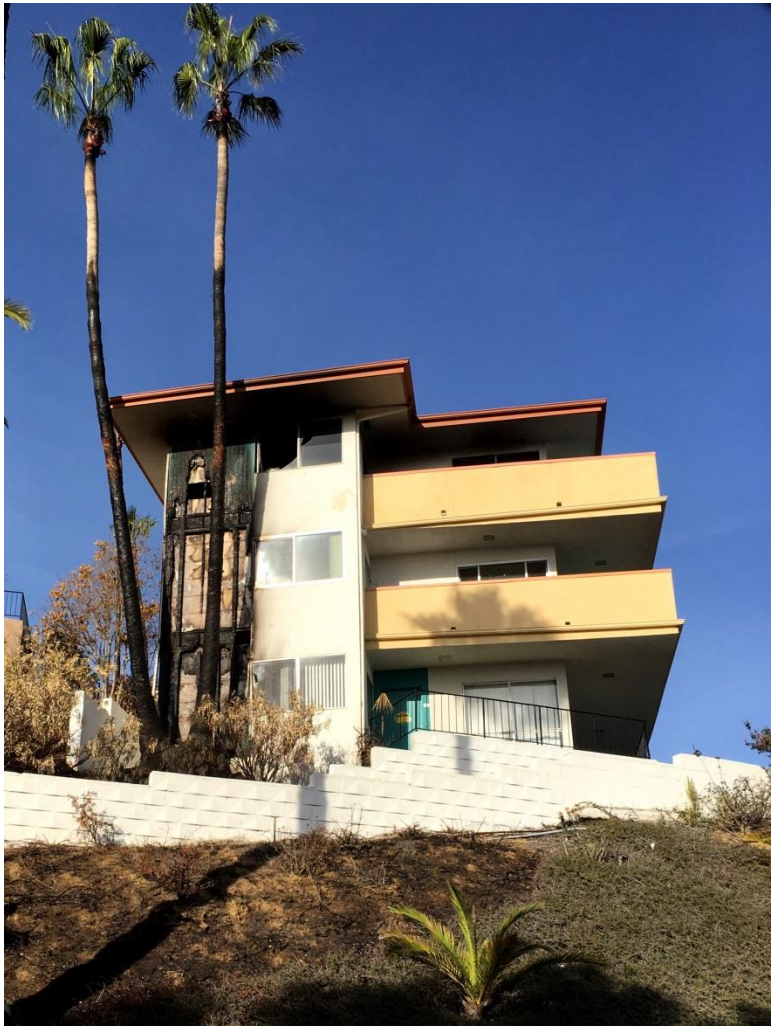
The Real Reason: A unique mountain-wave windstorm produced the strongest winds in the historical record at some locations. An event produced by the unlucky development of just the right weather regime that interacted with regional mountains to produce extreme winds.



When strong flow interacts with terrain, the air can be accelerated. The schematics above show a situation where air accelerated over and downstream of mountain crests.



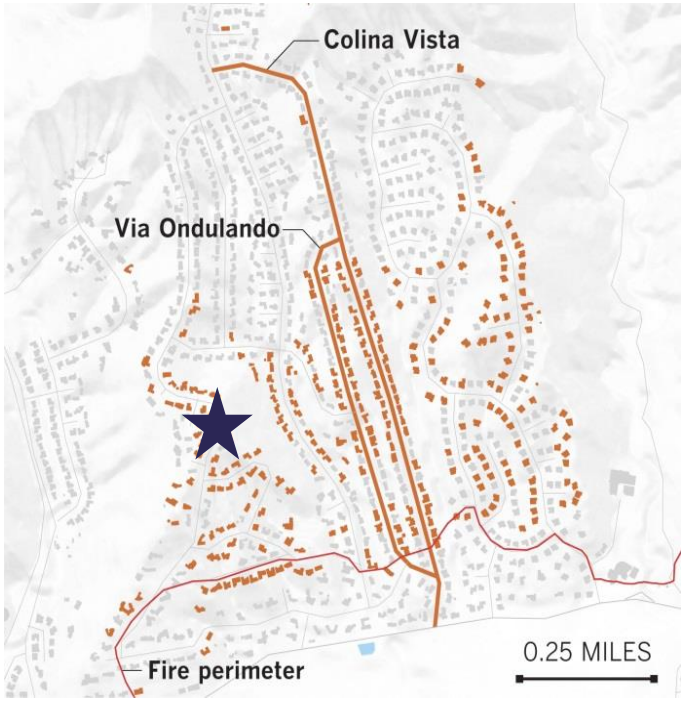
Clear Defensible Space Works



Source: JLT Re and RAA

Example of how two palm trees growing too close to apartment in downtown Ventura can cause a loss, if it was not for the palm tree it would have been untouched by fire.

Fickle Nature of Damage



Source: JLT Re and RAA

Like other hazard perils some houses in the Thomas wildfire in Ventura remained untouched next to completely damaged homes. This could be due to fire fighting or mitigation or luck.

Takeaways From the Wildfire 2017 Events

- Wildfires are nothing new especially in California, but when combined with the extreme nature of the winds that occurred in Northern California on October 8 we have an extreme loss scenario.
- If you account for development in the Wildland Urban Interface (WUI) large wildfire losses have occurred in the past, but still uncertainty how loss would be handled today
- Homes and businesses within the WUI are at the highest risk for losses from wildfire
- Fire dynamics are complex, however, the combination of ground spread and blowing embers aloft cannot be overstated. Areas that were once considered to be safe, having natural barriers such as roads, golf greens, etc. can no longer be viewed as such
- Clear, defensible space can dramatically reduce the severity of losses
- Wildfire models are helping understand risk, but these are largely still untested
- Wildfire is still largely a concentration management exercise

Thank You

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