International Center for Enterprise Preparedness (InterCEP)

Hurricane Season 2016: What to Expect & How to Prepare

Web Forum Summary

On May 17, 2016, Bryan Norcross, Senior Executive Director of Weather Content and Presentation, and Senior Hurricane Specialist at The Weather Channel, discussed the 2016 hurricane season. The web forum focused on:

- Current trends in the number of hurricanes that form in the Atlantic Ocean and the number of hurricanes that have made landfall relative to previous time periods;
- What we learned from last year’s hurricane season;
- What we can expect for this coming hurricane season; and
- What new information will be coming from the National Hurricane Center this season

Trends in Hurricanes and Major Storms

In thinking about the impact of hurricanes it is important to note that category 3-5 hurricanes are the ones we tend to remember since they cause about 80% of the damage recorded. For instance, a category 3 hurricane typically does 50 times as much damage as a category 1 hurricane. Figure 1 shows the number of category 3-5 hurricanes that have made landfall in the United States, by state, since 1878.

The records indicate that the frequency of hurricanes changes every few decades. For example:

- In the period 1945-1979 (25 years) there were 75 category 3-5 hurricanes
- In the period 1970-1994 (25 years) this figure went down to 38 hurricanes
- In the period 1995-2014 (20 years) the number went back up to 75 category 3-5 hurricanes

It is too early to tell whether we are returning to a period of fewer hurricanes. In the period the 1970-1994 there were fewer storms that made landfall than in the 1945-1979 period.

Another interesting comparison is the number of hurricanes that make landfall for different time periods. In Florida, for example, many more hurricanes made landfall in 1916-1965 than in the period 1966-2015. If the number of hurricanes that make landfall goes up to the levels observed in 1916-1965 we would probably not be prepared to address the impacts.
Although the number of storms have gone down when these two time periods are compared, other changes have taken place that make us more vulnerable. The number of built properties and people at risk have been increasing very rapidly. As a result, the damage caused by hurricanes is greater now than it was in earlier periods. This is clear from storms such as Ike, Sandy, Katrina and Andrew. The damage caused by Katrina, Ike and Sandy resulted mostly from water flooding. Images from the aftermath of the storms show relatively undamaged roofs. This is in contrast to Andrew, which was a category 5 storm and caused severe damage from wind. In the more recent hurricanes, which have been weaker than Andrew, storm surge has been the main problem. If the number of category 3-5 storms making landfall goes up there would be more critical infrastructure failures.

Figure 1. Number of Category 3-5 Hurricanes by State since 1878

Source: Hurricane Research Division, Atlantic Oceanographic & Meteorological Laboratory, National Oceanic and Atmospheric Administration (NOAA).
Lessons Learned from the 2015 Hurricane Season

Forecasts have improved significantly over time because computers have improved. As a result we are much better able to simulate the atmosphere today. But in 2015 the forecasts were not as good as they were in previous years. However, the trend in improved forecasts will probably continue. In 2015 the European model was the best performing model for hurricane prediction. It is the best model in the world today.

Hurricane Joaquin did extensive damage in Central Bahamas because they did not expect it would make landfall. The storm Intensified into a category 4 hurricane and stayed there for several days. The European model run was quite good in predicting the outcome of this storm. However, the ensemble of multiple model predictions, which is often used, was less good.

Another storm, Erika, caused major damage in Dominica. A state of emergency was declared in Florida for this storm but the forecast was not accurate. Legally, Florida had to do it but the storm never got to that state. The computer models did not have a good handle on Erika. So both Joaquin and Erika were not well forecast overall. Sandy and Katrina on the other hand were forecast very well.

It is important to note that about one third of the time a given storm is going to go outside the forecast cone. Communities should react to the risk posed by the storm not to the forecast, since there are errors in the forecast. For urban areas with large populations, such as New York City, the impacts from a hurricane can be extremely high so we need to pay attention to the risk not just the forecast.

The El Niño event last year resulted in cool waters in the Atlantic Ocean so few storms were predicted. However, a lot of storms developed but they did not reach the U.S.

Forecast for the Hurricane Season in 2016

At this point there are not strong signals regarding ocean water temperatures and atmospheric conditions and the expectation is that there will be slightly above average ocean temperatures that affect hurricanes in the Atlantic. Hence, the forecast is a low confidence forecast.

Looking back at the record, the year after an El Niño year is often characterized by atmospheric conditions that are somewhat more favorable for hurricanes. As a result, we need to prepare for this coming hurricane season. Florida, Texas, Louisiana and Mississippi are the states more likely to be affected. But New York is also at risk and a plan should be in place to address the risk.

Preparing for Potential Hurricanes

As mentioned earlier, the focus now is on storm surge. The government through the National Hurricane Center has created storm surge flood maps as a preparedness tool but they are pretty technical and
difficult to use to communicate the risk. These potential storm surge flood maps show a reasonable worse-case scenario for an area.

The National Hurricane Center will also issue a prototype Storm Surge Watch/Warning graphic. So there will be a number of maps with multiple messages related to storm surges. Communicating these and using them for decision-making will be very challenging. There will be a lot to communicate.

Q&A

What can businesses do to be prepared? Some important things organizations can do to prepare for hurricanes include the following:

- **Address potential infrastructure failures.** During a hurricane it is very likely that critical infrastructure, such as communications and mobile phones can fail. The infrastructure could be damaged or congested with too many people using their phones. Hence, preparedness can address what can be done when infrastructure fails.
- **Focus on risks not on forecasts.** Preparedness policies should be based on the risk of a hurricane, not on the forecast alone. This is something that was evident during Sandy and Joaquin, where focusing on the forecast led to poor decisions.
- **Incorporate hurricane days into emergency plans.** Emergency plans should have hurricanes built into them. Otherwise organizations are likely to be pressured to operate every day. In this case, organizations can follow the guidance of those that build snow days into their emergency plans and also include hurricane days.

Are the new levees in Louisiana likely to be more protective? Water is still likely to go over the levees during a major storm but the new levees should not fail like they did during Katrina. If the levees are not damaged during a hurricane it would prevent a major disaster like Katrina. This is a disaster mitigation measure not a hurricane protection measure.

Are communications infrastructure more vulnerable to storms now? The migration of phone lines from copper lines that are centrally powered to voiceover communications systems that rely on electric power and the Internet has resulted in far less robust personal emergency communications systems than we had before. This is a potential vulnerability.

Is the wind a threat to people in cars trying to evacuate? Yes, it is critical that people are off the road during a hurricane. They are safer staying in a building in an evacuation zone than to be in a car which is extremely dangerous during a hurricane. During a hurricane there should be a plan in place to tell people what to do and where to get to, and the plan should also have call areas outside the affected areas/town because sometimes those areas will have working communications infrastructure and be less congested.
Is there an online source for maps of urban areas that are at risk for flooding? Yes, NOAA’s ocean service has a page with maps (see references below).

Has the slowdown in hurricanes that make landfall observed in the Atlantic also been observed for Typhoons in Asia? There is much less variability in Asia’s storms because the Pacific Ocean is much larger but there has been somewhat of a slowdown there too.

In Summary:

- The National Hurricane Center is improving its hurricane prediction model (American Global Forecasting System (GFS) and they work with the Europeans and other groups to improve models but the European groups currently spend more money on that so they have the best model. These are global models to analyze the core of storms.
- The forecast for 2016 is for an average season or slightly above average season. That’s the best information we have at this point. We have unusually low confidence because we don’t have strong signals.
- On average, there are 1-2 hurricanes making landfall per year in the U.S.

Additional Resources

National Oceanic and Atmospheric Administration (NOAA) – National Hurricane Center: http://www.nhc.noaa.gov/

National Oceanic and Atmospheric Administration (NOAA) – National Hurricane Center - Potential Storm Surge Flooding Map: http://www.nhc.noaa.gov/surge/inundation/


National Oceanic and Atmospheric Administration (NOAA) - Atlantic Oceanographic & Meteorological Laboratory – Hurricane Research Division: http://www.aoml.noaa.gov/hrd/

The Weather Channel – Hurricane Center: https://weather.com/storms/hurricane-central

European Centre for Medium-Range Weather Forecasts: http://www.ecmwf.int/