

Extreme Weather Changes in the Piedmont

Hurricanes

So far, the 2020 Atlantic hurricane season is one for the record books. There were two storms in May, before the season's official start on June 1. Also, this is the first year since storm record-keeping began in 1851 in which nine named tropical cyclones have formed before August (thirteen before September). Increases in air and ocean temperatures due to climate change are having wide-ranging effects on hurricane precipitation, intensity, and coastal flooding. Warmer temperatures increase the rate of water evaporation from land and sea, which feeds moisture and energy into storms. Warmer air can hold more moisture, which increases the amount of water available for storms to dump out as rain. Additionally, warming oceans and melting land ice have caused sea level rise, which boosts storm surges, the name for the temporary increase in sea level due to storm conditions.

On a global scale, the intensity of the strongest hurricanes is *highly likely* to increase with warming. And, while confidence for North Carolina is lower than for the entire globe, there is no known reason that North Carolina would be protected from stronger hurricanes. An active hurricane season is especially dangerous this year because of the compounded public health risks that evacuations or displacements cause as COVID-19 continues to spread. These risks are disproportionately concentrated in low-income communities and communities of color.

- Climate change resulted in increased rainfall during Hurricanes Florence, Maria, Irma, Harvey, Sandy, Katrina, and Tropical Storm Imelda
- Climate change is leading to more intense hurricanes:
 - In almost every region of the world where hurricanes form, their maximum sustained winds are getting stronger due to human-caused climate change.
 - Climate change is contributing to sea surface temperature increases in the Atlantic and Pacific regions where hurricanes form, increasing the energy available to intensifying storms.
 - Global warming has likely increased the relative number of hurricanes reaching Category 3 intensity or higher since the 1980s
- Due to climate change, hurricane storm surges are reaching further inland and causing more flooding
- Heavy precipitation accompanying hurricanes that pass near or over North Carolina are *very likely* to increase, increasing the potential for freshwater flooding in the state.

Thunderstorms & Tornadoes

Tornado and severe thunderstorm events cause significant loss of life and property more than one-third of the \$1 billion weather disasters in the United States during the past 25 years were due to such events. A particular challenge in quantifying these events arises from the data source. Rather than measurements, most occurrences of tornadoes and severe thunderstorms are determined by visual sightings by eyewitnesses or post-storms in the form of damage assessments. Changes in population density, reporting procedures and training, and the introduction of video and social media have led to non-meteorological biases in the long-term

data record. Nonetheless, the database has revealed important information about tornado trends.

- It is *likely* that the frequency of severe thunderstorms in North Carolina will increase.
- The frequency of days with large numbers of tornadoes—tornado outbreaks—appears to be increasing in the US.
- The length of the season for tornado activity is increasing as well, with high tornado activity starting earlier in the year.

Winter Storms

In the Piedmont of North Carolina winter precipitation usually falls as rain because temperatures are above freezing near the surface. Winter temperatures, critical to changes in snowfall, are projected to be warmer, and a northward shift in the rain–snow transition zone in the central and eastern United States is projected. By the end of the 21st century, large areas that are currently snow dominated in winter are expected to be rain dominated.

Another consequence of warming, however, is an expected increase in precipitation intensity due to melting of arctic ice. For events where air is sufficiently cold for precipitation to fall as snow, heavier totals could occur in the coming decades before more extensive warming leads to only rare snowfall

- It is *very likely* that winter storms of similar intensity to historical trends will produce heavier precipitation, in forms other than snowfall.
- It is *very likely* that total snowfall will decrease.
- It is *likely* that the number of heavy snowstorms will decrease.
- There is uncertainty concerning future changes in the number of ice storms.

*The words “likely,” etc. have precise definitions in the reports cited:

- very certain – 99-100% probability of outcome
- very likely – 90-100%
- likely – 66-100%
- about as likely as not – 33-66
- unlikely – 0-33%
- very unlikely – 0-10%
- exceptionally unlikely – 0-1%

Information sourced from the [North Carolina Climate Science Report](#)