# **TEMPERATURE AND PRECIPITATION RELATIONSHIPS FOR THE NYC AREA: CLIMATOLOGIES AND EXTREMES**

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#### Abstract:

Precipitation is a weather phenomenon that affects everyone around the world, and while small amounts pose only a minor inconvenience, precipitation extremes (PE) can cause natural hazards, like floods, and extreme damage to infrastructure. To address this issue, we need to improve our understanding of PE. In New York City, there are three potential causes for PE: tropical storms or hurricanes, extratropical cyclones, and quasi-linear convective systems, which preferentially occur at different times of the year. By investigating PE in NYC and their relationship with the region spatially and the annual cycle/temperature, we may have a better understanding of the cause of the extremes.

### The Annual Cycle for NYC Weather Disturbances WINTER Extratropica Cyclones SPRING FALL 'not including





Acknowledgements:



#### **Objective/Goal:**

The main objective of this project is to explore the different ways temperature relates to precipitation:

- 1. By using the relationship between temperature and saturated vapor pressure to predict the amount of precip there should be on a certain day.
- 2. By looking at precip climatologies to attempt to detect a seasonal rain cycle and its relationship with the seasonal temperature cycle.
- 3. By creating a time evolution for precip and temperature for precip extremes and examining the different patterns and the timing of these events.

#### **Methods/Tools**

- · MATLAB- used to do calculations, process data, and create figures accordingly
- · NOAA Weather Station Data- readings of the total daily precipitation measurement and average daily temperature from 1979 to 2014
- · Climatology a daily average of weather conditions like precip and temp
- Running Average used to smooth information graphs by plotting each day as the average of the surrounding n values
- Time Evolution the surrounding conditions (temp/precip) x days from a certain event.





## **Conclusion:**

- 1. Using saturation vapor pressure to estimate the amount of precip, we can almost accurately predict the precip in the spring and winter. While it overpredicts the precip for the summer and fall, we also know that when it does rain during those months it rains heavier than in the other seasons.
- 2. A precip climatology shows that it rains slightly more often in the spring, and there are significantly more days without rain in the fall (specifically September). However, it also rains harder when it does rain in the summer and the fall.
- 3. When looking at precip extremes, they occur more often from June to October, peaking in August. When looking at the time evolution of these events, we notice that there are small showers on either side of the precip extreme, and the temperature time evolution changes based on the month, but the overall average shows a small decrease in temperature around the events.

In these figures we assume that the height of the different pressures in the atmosphere and the cloud depth remain constant for the entire year in order to make a general prediction of the precipitation, based on the derived 500-hPa temperature.