Floridian Heatwaves and Extreme Precipitation: Future Climate Projections

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1 Background and Motivation
- Heatwaves result in more deaths than any other weather events (Borden and Cutler 2008, Int. J. of Health Geographics)
  - 2015 Indian heatwave claimed upwards of 2,500 lives (Wehner 2016, BAMS)
  - 1995 U.S. heatwave showed the effect of urban heat islands (Changnon et al. 1996, BAMS)
- The heatwave claimed 500 lives in Chicago and over 800 lives nationwide
- In the United States, Luber et al. (2006, MMWR) found that from 1999–2003, excessive heat exposure was a causal/contributing factor to ~700 deaths per year nationwide. Heatwaves are dubbed "silent killer" for reasons such as damaging health impacts after prolonged exposure to daytime heat and/or uncomfortable high nighttime temperatures.
- Adjacent bodies of water moderate Florida's climate, therefore heatwave projections in Florida have largely been understudied.

2 Objectives
- Compare the frequency, intensity, and duration of heatwaves (i.e., June–July–August) in Florida between the present (i.e., control run or CTL) and the future pseudo-global warming (PGW, i.e., same weather but future climate under RCP8.5 scenario) runs of a high-resolution convection allowing modeling experiment (i.e., Liu et al. 2017, Clim. Dyn.).
- Investigate whether heavy precipitation events occur shortly after the passage of a heatwave and document changes in the characteristics of the precipitation between the CTL and PGW runs over Florida.

3 Study Region and Temperature Distribution
- Fig. 1: (a) The location of the six cities over Florida. The numbers next to the red boxes correspond to the name of the city described in Fig. 1c. The blue boxes consisting of grid points represent the location of the airport from which the model OBS was obtained in each city. (b) The population and number of grid points used in defining each city. (c) Table showing the number of grid point for each city (red boxes in Fig. 1a).

4 Heatwaves in the Present and Future Climate
- Fig. 3: As in Fig. 2 but depicted using a boxplot. a) shows the station observations, and b) and c) shows the CTL and PGW temperatures. The numbers above the individual boxplots represent the mean (red) and standard deviation (blue) of the distribution. T95 (top whisker), 95% 5, and 25th percentile (top and bottom parts of the box), and T95 (bottom whisker) are represented using the box and whiskers.

5 Precipitation Characteristics During a Heatwave
- Fig. 7: Distribution of summer (JJA) precipitation obtained for a) the CTL and PGW runs. The difference between the light precipitation categories, and b) heavy precipitation categories.

6 Concluding Remarks
- Under the RCP 8.5 emissions scenario for the late 21st century (2070–2099), we may expect Floridian heatwaves to increase in frequency, intensity, and duration.
- The late 21st-century climate could witness heavier heatwave-associated extreme precipitation events, and a decrease in the frequency of light-moderate precipitation events.

Special thanks to...