LOCA Projection Data

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This document provides a short summary of Downscaled climate simulation data, which can be used to inform modeling for extreme temperature events. Localized Constructed Analogs (LOCA) is a statistical technique to downscale CMIP5 climate projections.[[1]](#footnote-1) LOCA data is available at 1/16th degree resolution for North America for 32 climate models for rcp5.4 (mid-range CO2 future) and rcp8.5 (higher CO2 future) projections. Information on LOCA can be found at <http://loca.ucsd.edu/> can be downloaded from <https://gdo-dcp.ucllnl.org/downscaled_cmip_projections/dcpInterface.html#Welcome>

Data include simulations of daily maximum and minimum temperatures along with additional information such as relative humidity. The data sets are designed to allow for analysis of extreme temperature conditions and can be useful for modeling future heatwaves with climate change. Projections may not capture weather phenomenon such as the heat dome which recently impacted the Northwest. It also does not capture very fine spatial detail such as heat islands, which can significantly increase temperatures in cities. Combining with data such as from the Urban Heat Island Mapping Campaign[[2]](#footnote-2) could get at projections of future temperatures within individual cities during an extreme temperature event.

Figures below are for the rcp8.5 scenario using 10 models[[3]](#footnote-3). Note that the historical periods are not actual historical data but instead scenarios which are bias-corrected using the historical data. For the time periods[[4]](#footnote-4) 1980-1990, 2010-2020, and 2040-2050 I found the maximum daily temperature for each 10-year interval (1 in 10-year maximum temperature) along with the average number of days above 95F for each year. I then averaged these values across the 10 models to reduce model-specific biases.

We can intersect LOCA data with city longitude and latitude information to obtain temperature projections for a given city. Hence, we can have daily temperature and humidity projections for future years for cities of interest. Below are projected increases in maximum temperature and number of days above 95F for selected cities between the 1980-1990 period and 2040-2050 period. **Because maximum temperatures are expected to increase more than 8F in some locations, the use of historical extreme temperature events to forecast future heatwaves may significantly underestimate the prevalence and severity of future events**

1. CMIP stands for the Climate Model Intercomparison Project. [↑](#footnote-ref-1)
2. https://nihhis.cpo.noaa.gov/Urban-Heat-Island-Mapping https://medialibrary.climatecentral.org/resources/urban-heat-islands [↑](#footnote-ref-2)
3. I only used 10 instead of the 32 models available due to hard drive space constraints on my personal desktop. The 10 selected were chosen based on the suggestions of California study http://loca.ucsd.edu/~pierce/IEPR\_Clim\_proj\_using\_LOCA\_and\_VIC\_2016-06-13b.pdf [↑](#footnote-ref-3)
4. Am also looking at 2070-2080 but just haven’t completed the figures yet [↑](#footnote-ref-4)