Climate Change in the Los Angeles Region: Temperature Results

Alex Hall, PhD
UCLA Dept. of Atmospheric and Oceanic Sciences
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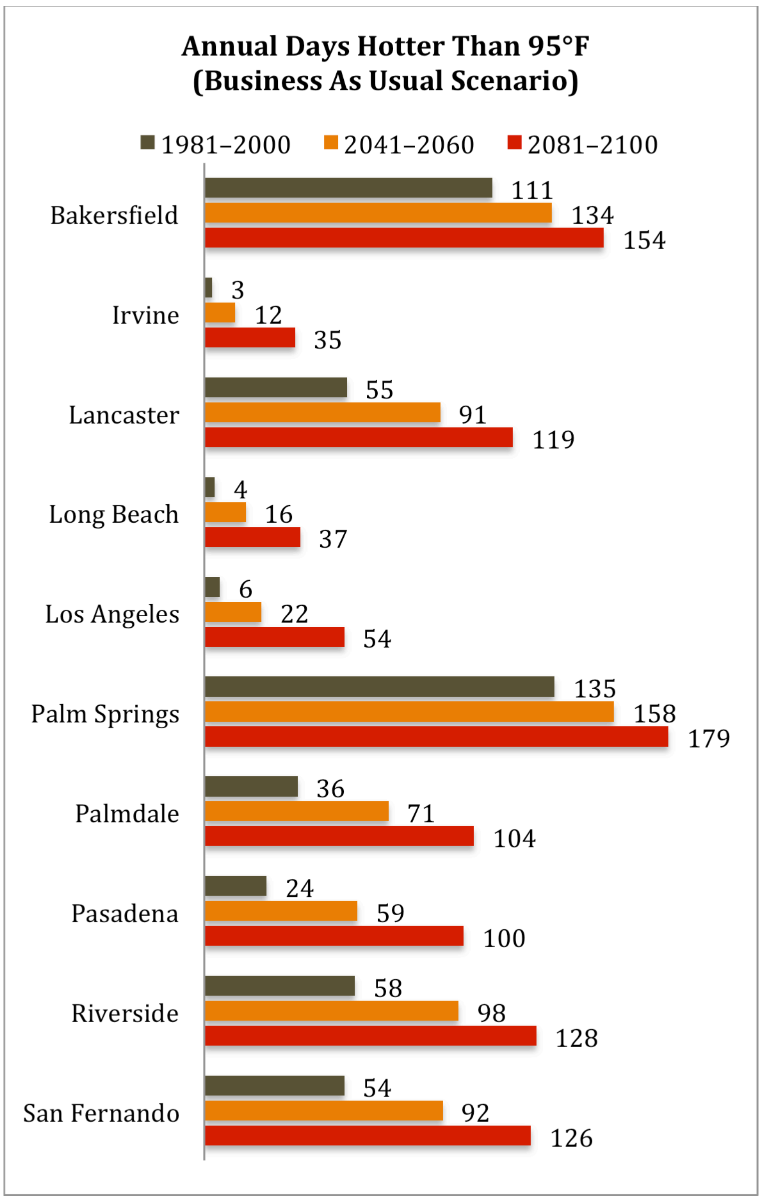
Background

As the Intergovernmental Panel on Climate Change (IPCC) recently reaffirmed in its Fifth Assessment Report, global climate is changing in response to human emissions of greenhouse gases. With the help of global climate models (GCMs), computer models that simulate the climate system, scientists are able to project the future state of the climate given different scenarios of greenhouse-gas emissions. While GCMs can tell us a lot about climate change over large regions, they do not provide enough detail to help us understand likely impacts in our own backyards. That's why UCLA professor Alex Hall and his research team undertook a comprehensive study of climate change in the Los Angeles region, using a new technique to *downscale* information from multiple GCMs and produce neighborhood-by-neighborhood projections of future climate. This fact sheet summarizes the study's findings on likely temperature changes by the middle and end of this century.

Fig. 3: Change in Extreme Heat Days Under Business As Usual Emissions



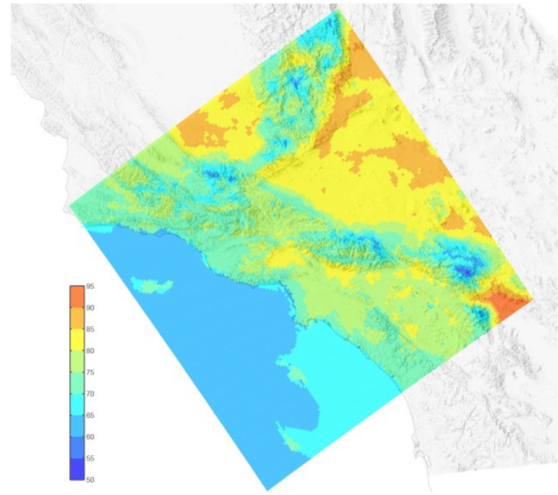


Fig. 1: Average August Temperature 1981–2000

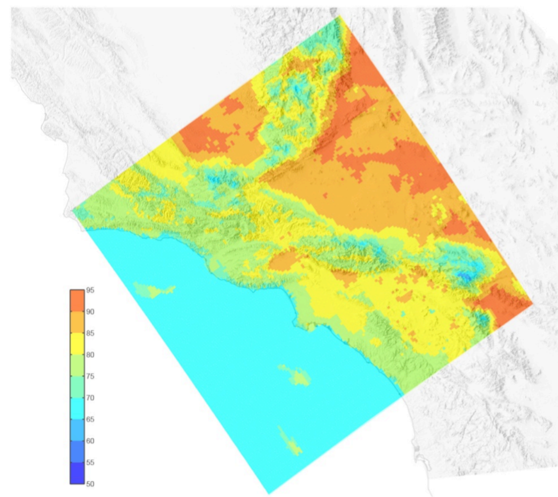


Fig. 2: Average August Temperature 2041–2060 (Business As Usual Scenario)

Study Methods

- Dr. Hall's group downscaled 32 global climate models (GCMs) to 2-km resolution using combination of dynamical and statistical techniques.
- The team simulated 1981–2000 climate and produced projections for two future time periods (2041–2060 and 2081–2100), under two different greenhouse gas emissions scenarios: Business As Usual and Mitigation.
- Findings include most likely projections (an average of the downscaled GCM results) and the range of possible outcomes (from the GCM showing the least change to the one showing the most change).

Mid-Century (2041–2060) Findings

- Most likely warming at mid-century in business as usual scenario is 4.3°F, averaged over the region's land area.
- The number of days hotter than 95°F increases across the region, but to a greater extent in the interior compared with coastal areas. (See Fig. 3)
- Temperature changes in the Mitigation scenario are about 70% of those in Business As Usual, meaning significant effects are inevitable.

End-Century (2081–2100) Findings

- In the Business As Usual scenario, temperatures continue to rise. By end-century, average temperatures across the land region are most likely to be 8.2°F warmer than they were in 1981–2000.
- The number of days hotter than 95°F also continues to rise in the Business As Usual scenario. (See Fig. 3.)
- In the Mitigation scenario, temperatures level off after mid-century. On average, end-century temperatures are about 3°F warmer than in 1981–2000.
- The number of days hotter than 95°F does not increase from mid-century to end-century in the mitigation scenario. (See Fig. 4.)

Frequently Asked Questions

What is the significance of these results?
These results show that significant temperature increases are coming to the Los Angeles region by mid-century, and that they won't affect all neighborhoods equally. Areas near the coast will experience less warming. Areas in the interior, particularly those separated from the coast by a mountain range, will experience more warming. By comparing the Business As Usual and Mitigation scenarios, we see that at mid-century, some warming is inevitable and must be adapted to. By end-century, further warming can be prevented if the world follows the Mitigation path.

What is the difference between the Business As Usual and Mitigation scenarios?
Business As Usual assumes that the level of greenhouse-gas emissions continues to increase at the same rate it has been increasing in recent years. Mitigation assumes the world comes together to reduce greenhouse-gas emissions in the coming decades. These are standardized scenarios created by the IPCC for use in climate modeling studies.

Why is the research team confident in these findings?
Different GCMs give different results, and downscaling not just one but many GCMs allowed Dr. Hall and his team to account for these differences. In addition, developing the statistical downscaling techniques employed in the study required the team to understand the physics underpinning climate change in the region, enhancing the credibility of their results.

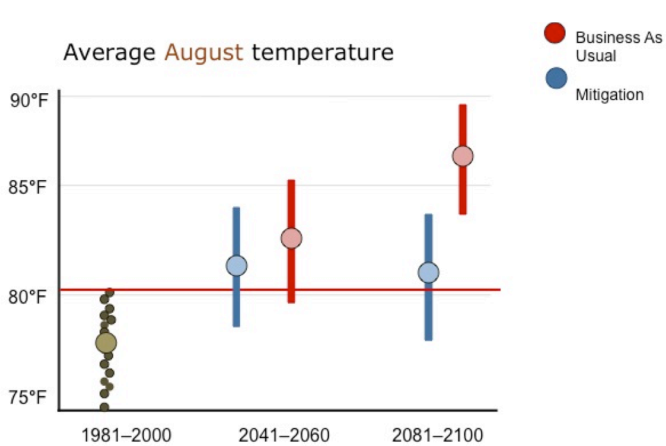


Fig. 5: Average August Temperature Across Time Periods and Greenhouse-Gas Emissions Scenarios

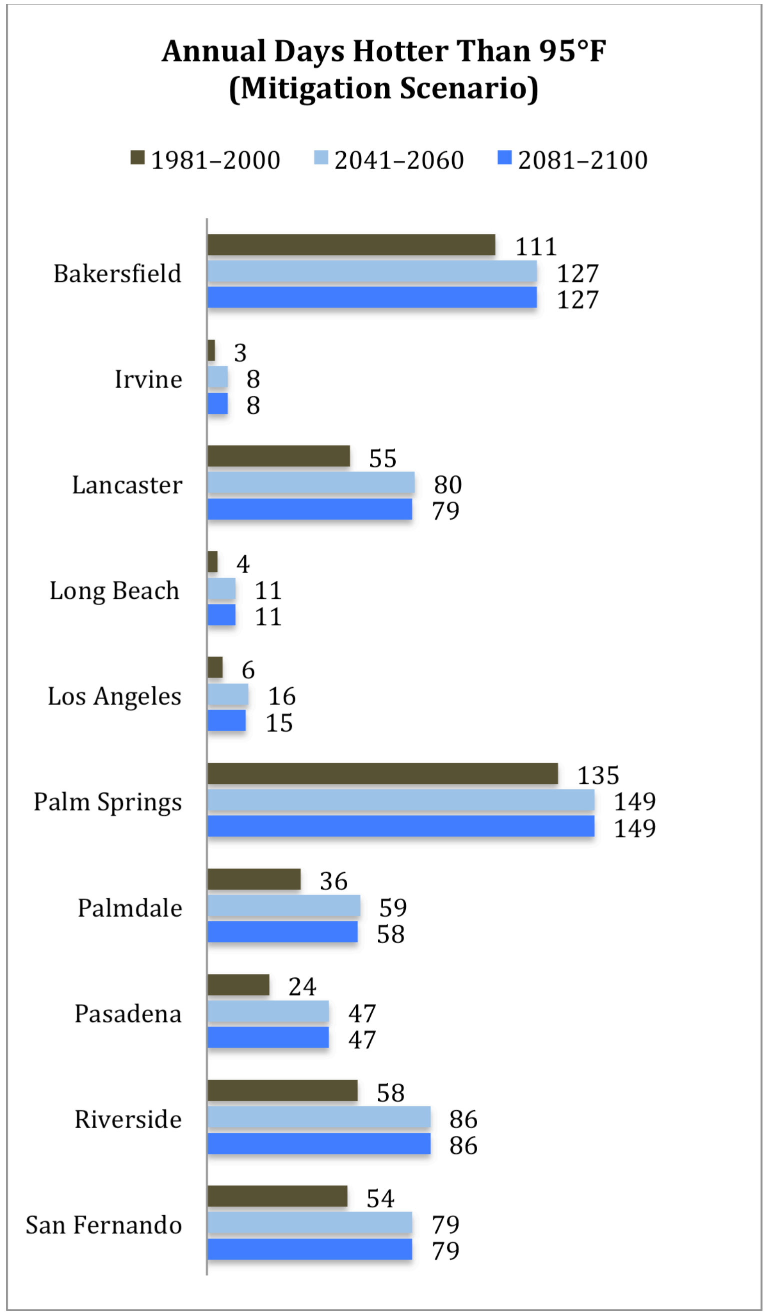


Fig. 4: Change in Extreme Heat Days Under "Mitigation" Emissions

More About the Project
The Climate Change in the Los Angeles Region project was commissioned by the City of Los Angeles in partnership with the Los Angeles Regional Collaborative for Climate Action, with support from the US Department of Energy.

In addition to temperature changes in the Los Angeles region, Dr. Hall's group has also reported on changes to snowfall in the region's mountains. Analysis is ongoing on other aspects of climate, including overall precipitation, stream flow and runoff, Santa Ana winds, and area burned by wildfires. For more information, visit http://c-change.la.