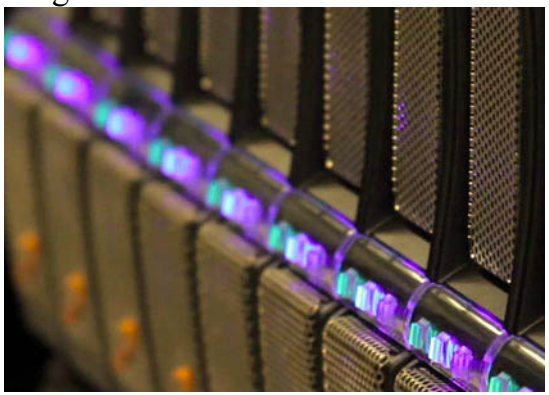
- In The News
- Contact


Groundbreaking Science

What did it take to get the best information on the future climate of Los Angeles?

The *Climate Change in the Los Angeles Region* project, initiated by the City of Los Angeles and UCLA, employs an innovative technique for applying global climate models to L.A. and the surrounding region to provide detailed projections of climate change.



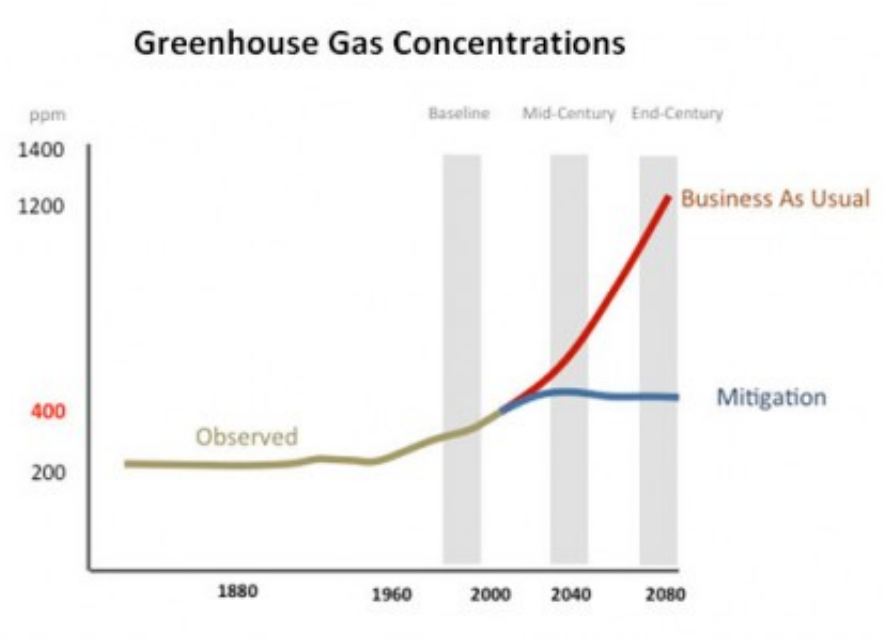
This research has brought climate projections down to the local level – identifying which neighborhoods will be most impacted by increasing temperatures and predicting a loss of snowfall to many of our region's mountains.

The first study, considering temperature changes, was released in June 2012. The second, focusing on impacts to regional snowfall, was released in June 2013.

**Taking Control of Our Future**

Each climate study estimated baseline levels for the very recent past (1981–2000) and compared them to mid-century (2041–2060) and end-of-century (2081–2100) estimates, taking into account climate change under two different scenarios:

- Scenario 1: We continue along a "business as usual" path of climate change pollution
- Scenario 2: Human-caused climate change is curbed with mitigation of global greenhouse gas emissions




*Observed greenhouse gas concentrations in the atmosphere are shown above. The "Climate Change in the Los Angeles Region" project considers climate impacts on both a 'business as usual' scenario and a 'mitigation' scenario.*

The scenarios correspond to "Representative Concentration Pathways" (RCPs) of projected radiative forcing due to greenhouse gas emissions into the atmosphere over the next century. RCPs were developed by the Intergovernmental Panel on Climate Change to ensure consistency and rigor in climate modeling. The "business as usual" and "mitigation" scenarios used in the study correspond to RCPs 8.5 and 2.6. The scenarios can be represented in terms of carbon dioxide equivalent ($CO_2$) concentrations in part per million (ppm) by volume as shown in the figure above.

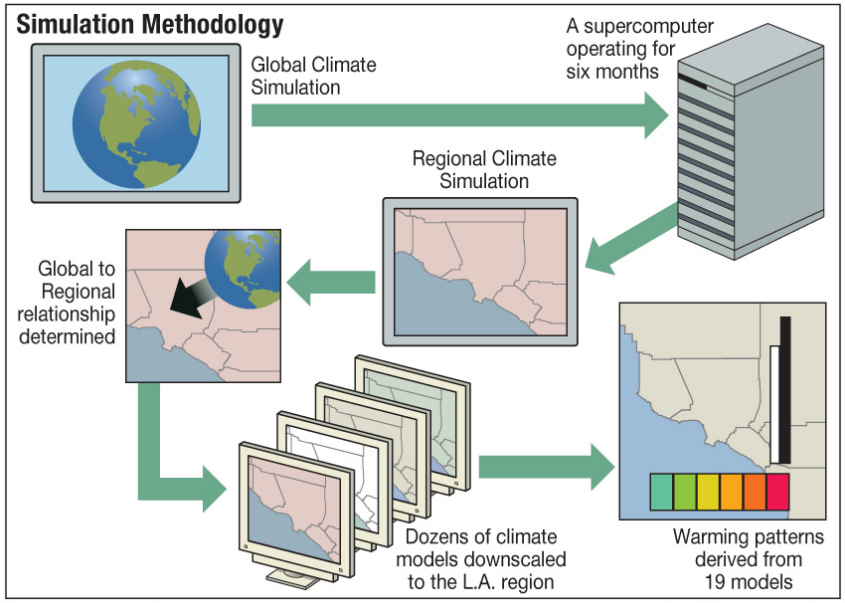
**Bringing Global Data to Los Angeles**

State-of-the-art global climate models published in the recently released data archive called the Fifth Coupled Model Intercomparison Project (CMIP5) were employed using both dynamical and statistical techniques to downscale the relatively coarse-resolution climate information from the global models to much finer scales. An in-depth discussion of the methodology can be found within either report.

Wanting to create a robust picture of the climate of the Los Angeles region, the authors of the *Climate Change in the Los Angeles Region* project, combined two reliable downscaling techniques to bring global climate models down to the regional scale: dynamical downscaling and statistical downscaling.

Dynamical downscaling is particularly accurate but takes months of computing on supercomputers. For the temperature, the dynamical downscaling portions took a little over nine months on some of the world's fastest supercomputers.

Statistical downscaling takes up much less time but needs some form of dynamical downscaling to uncover the particular relationship between the regional climate variables and the global climate variables.




*Source: UCLA LARC study, 2012* Graphic by Steve Greenberg

Basic steps in the methodology used in this study:

1. Dynamically downscale global climate models to the regional scale with UCLA supercomputers.

2. Determine the relationship between the global climate influences and the local climate influences.

3. Use that relationship to statistically relate other global climate models to the regional scale.

4. Calculate the average of all of those outcomes.

Once the authors recalculated the almost two dozen global models at the local level, the team analyzed the results and integrated them into an ensemble, or average, projection to create the forecast for the entire region. This average of the 22 different downscaled models represent the most likely outcome.

An in-depth discussion of the methodology can be found in each report.

## CLIMATE ASSESSMENTS

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