UCLA Climate Research Lounge

What Climate Change Means for LA: What's Coming and What Choices We Face

Alex Hall

October 23, 2013

Road Map

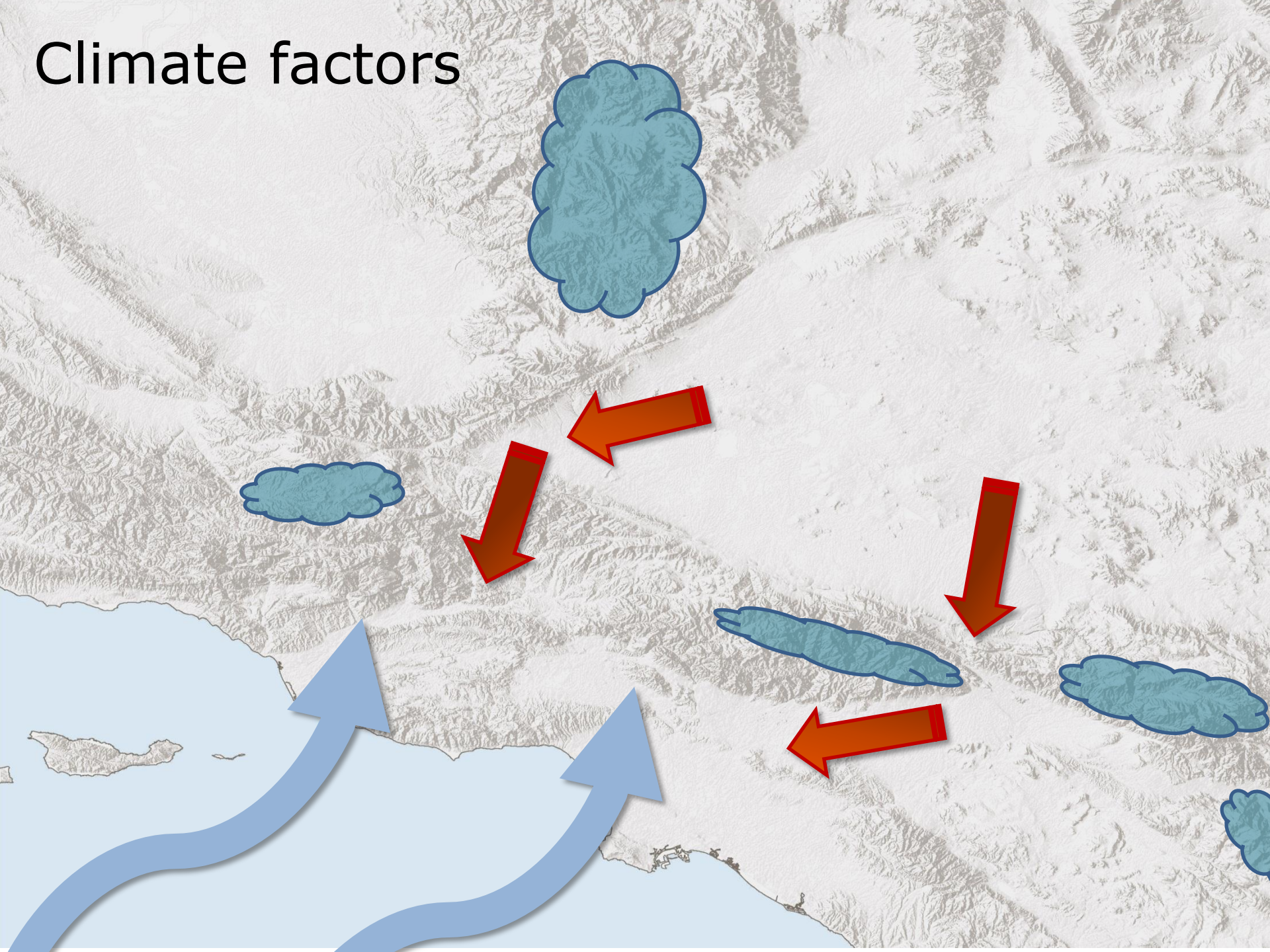
1. Climate modeling
2. The Climate Change in the LA Region Project
3. LA climate projections
4. What they mean for LA
5. The road ahead

The climate of Los Angeles

defines the city

The climate of LA is complex

Climate factors



Climate change is coming to us

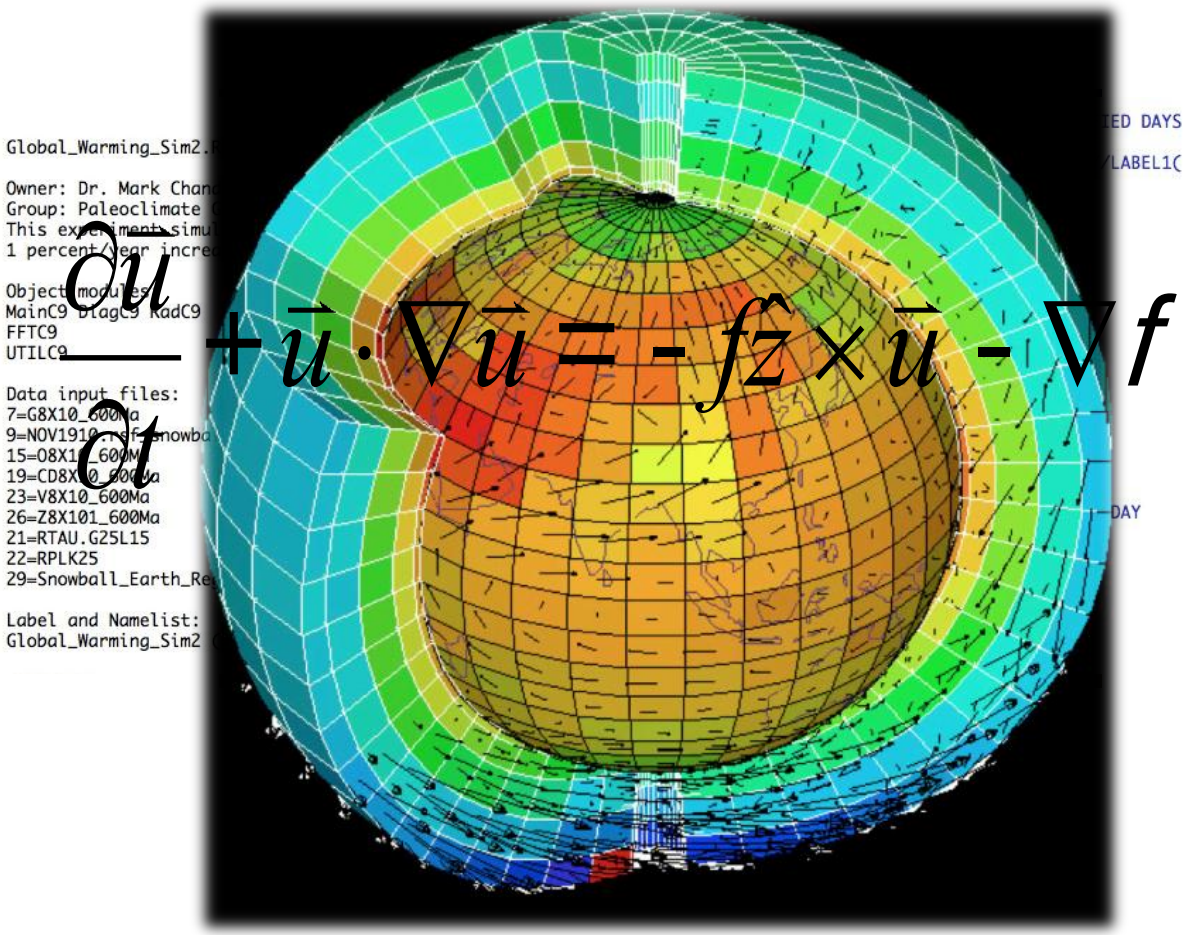
Hotter temperatures

Larger wildfires?

Less water?

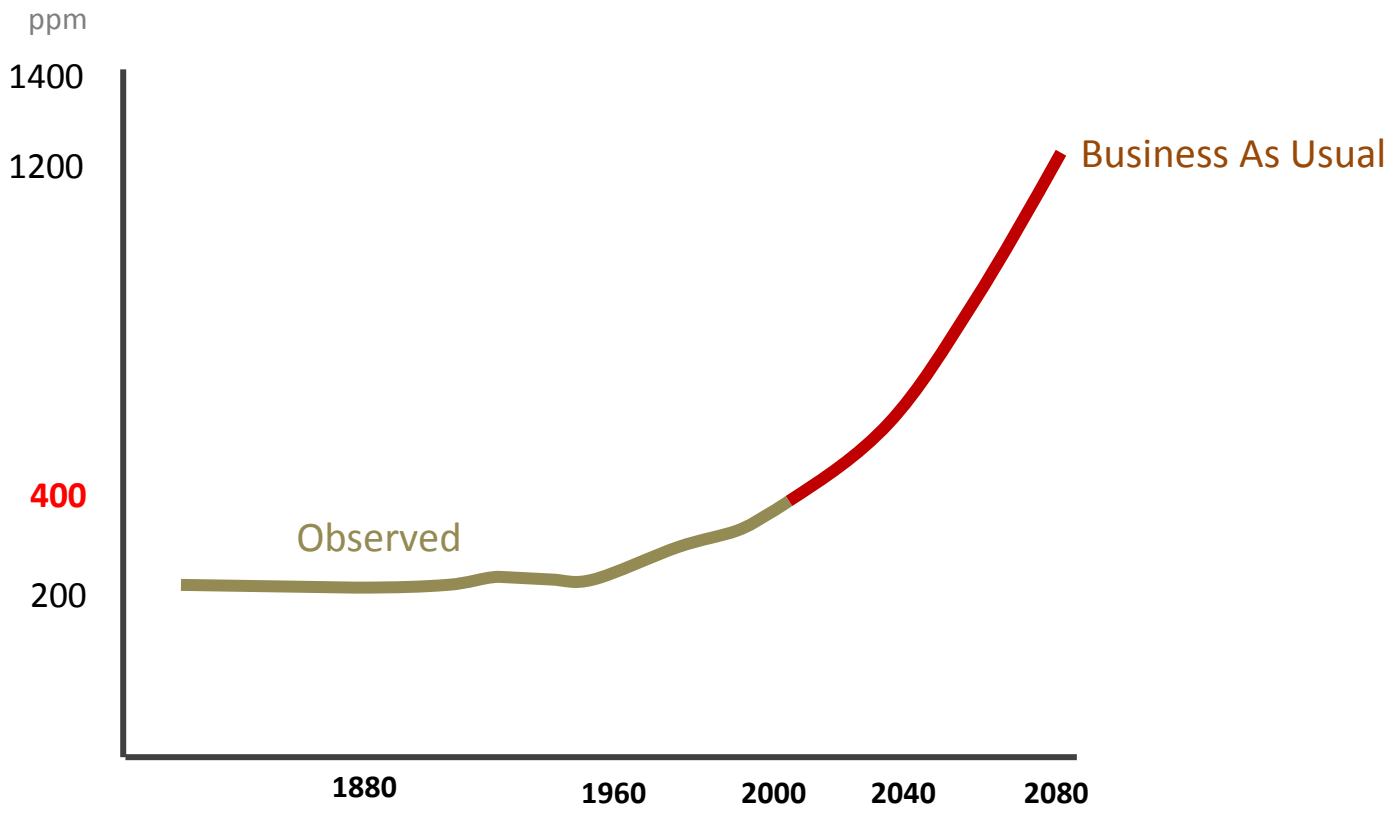
1. Climate Models

What is a climate model?

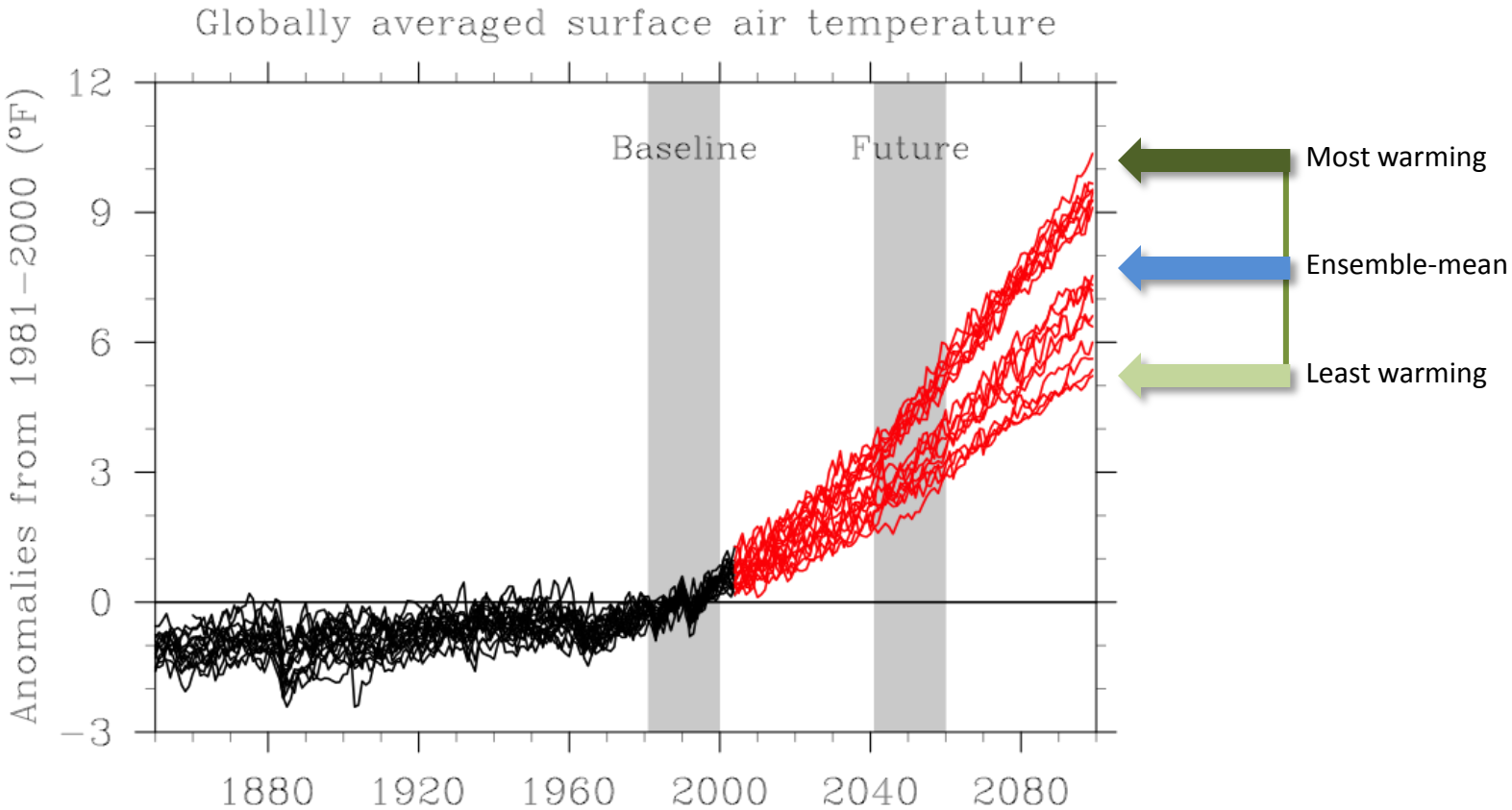


$$\frac{\partial \vec{u}}{\partial t} + \vec{u} \cdot \nabla \vec{u} = -f\hat{z} \times \vec{u} - \nabla f + \vec{F}$$

We can specify greenhouse gas concentration



Caveats about global climate models



Palmdale
San Fernando
Valley
Ventura
San Bernardino
Downtown LA
Santa Monica
Long Beach

The scientific challenge

- Bring global models to scale. How to zoom in on Los Angeles region?

- Account for different outcomes among the global climate models.

2. The Climate Change in LA Project

Neil Berg

Florent Brient

Scott Capps

Jerry Huang

Alexandre Jousse

Mark Nakamura

Xin Qu

Katharine Reich

Marla Schwartz

Fengpeng Sun

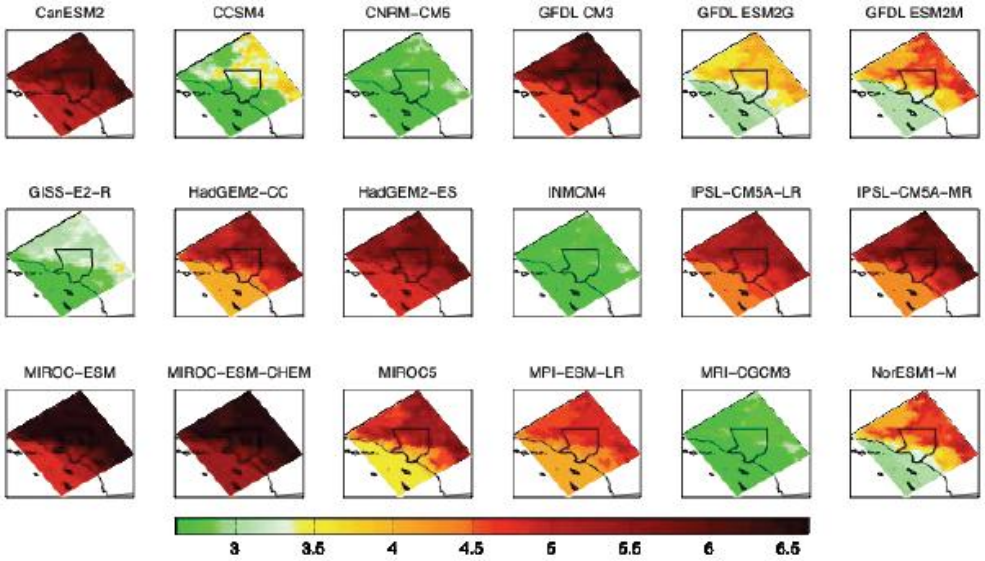
Daniel Walton

LA Climate Project Research Group
Dept. of Atmospheric and Oceanic Sciences, UCLA

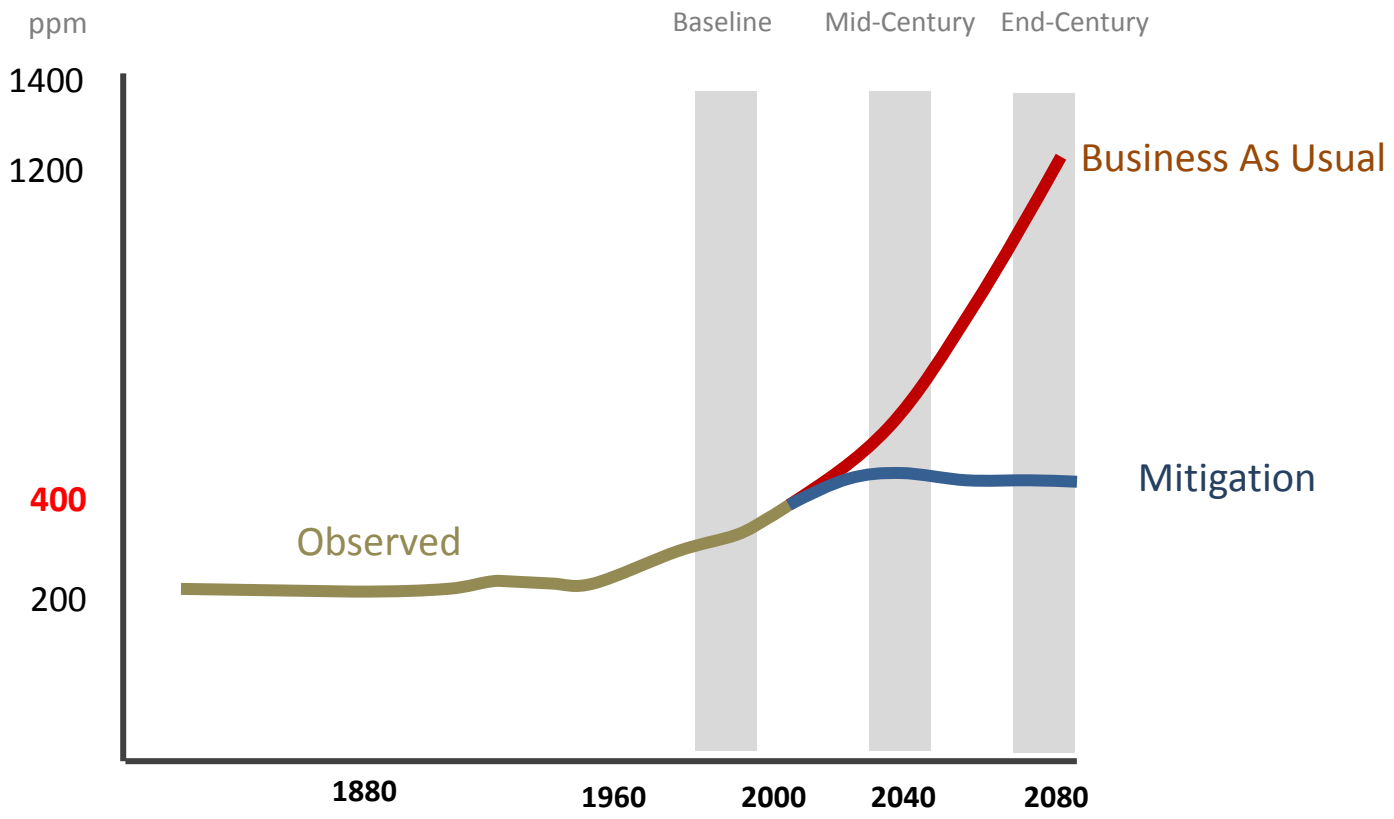
Palmdale
San Fernando
Valley
Ventura
San Bernardino
Downtown LA
Santa Monica
Long Beach

Burbank
Sherman Oaks
Glendale
Pasadena
Hollywood
Downtown LA
Santa Monica
Culver City
South
Los Angeles
Inglewood
Downey

We applied ~**30** global climate models to the Los Angeles region



We projected future climate for 2 scenarios



We looked at key elements of climate

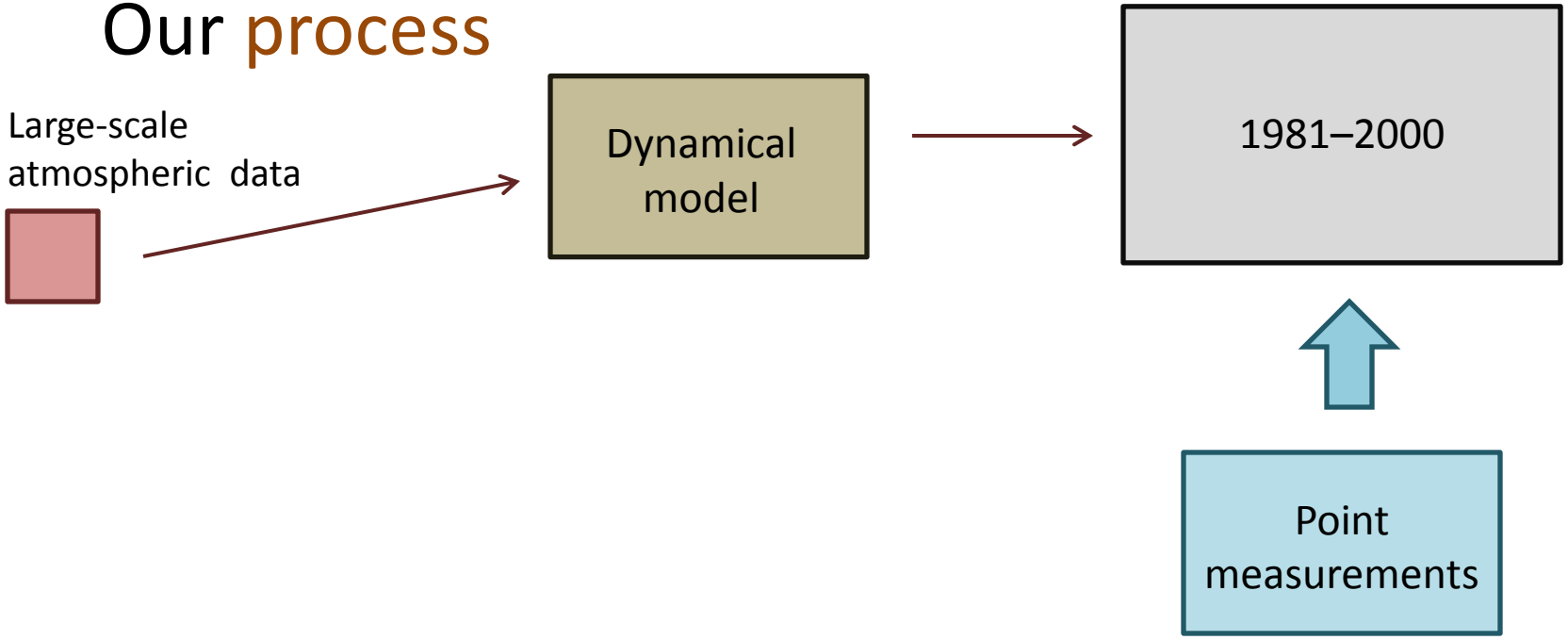
Temperature

Precipitation

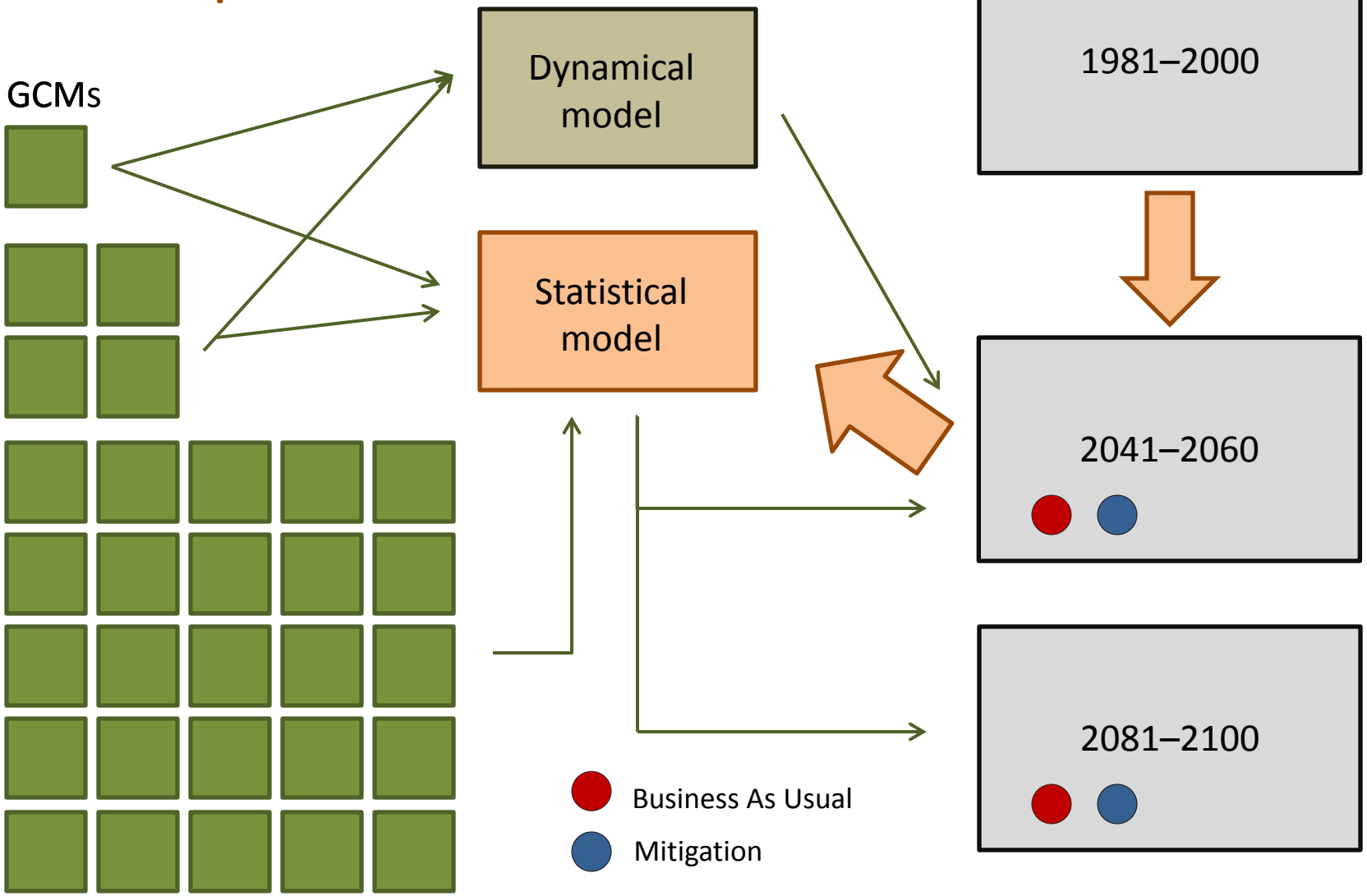
Snowfall

Fire

Our process


Large-scale
atmospheric data
Dynamical
model
1981–2000
Point
measurements

Our process

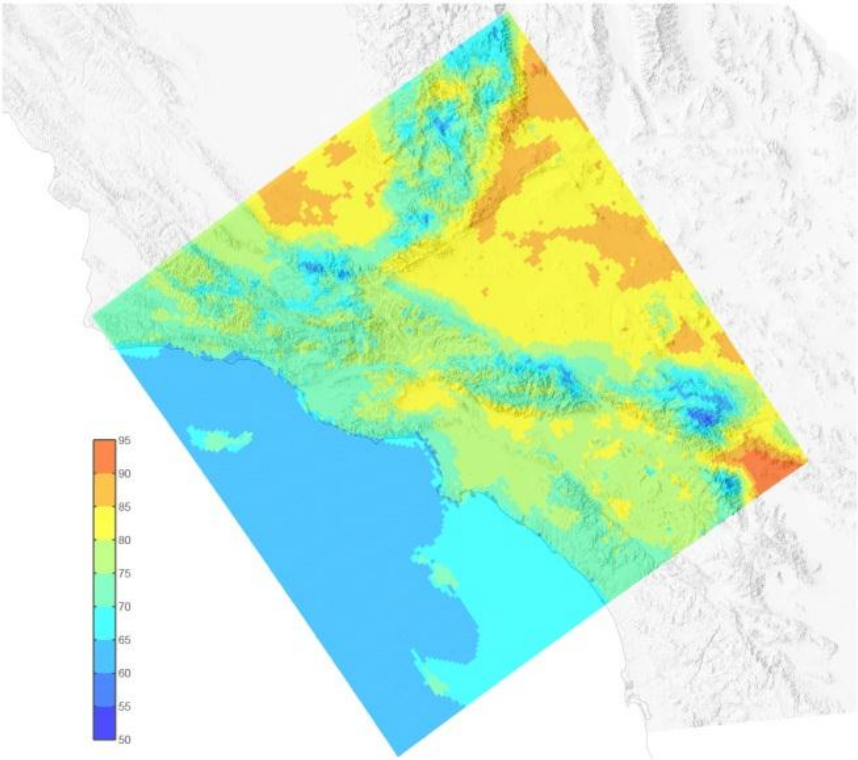

GCMs
Dynamical model
Statistical model
1981–2000
2041–2060
2081–2100
Business As Usual
Mitigation

3. LA Climate Projections

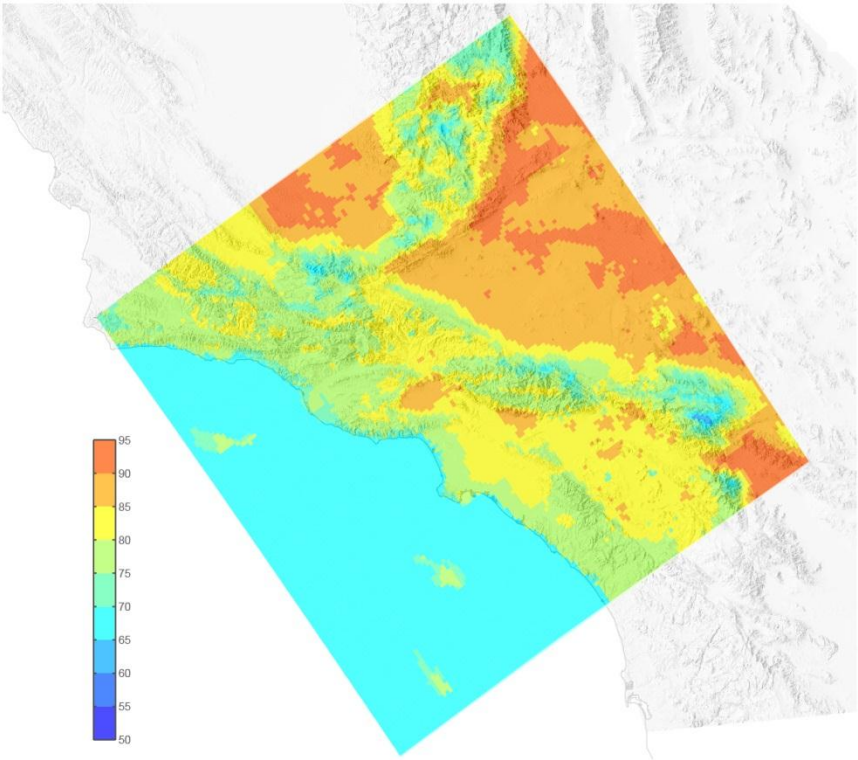
LA Projections

Temperature

Average August Temperature
1981–2000

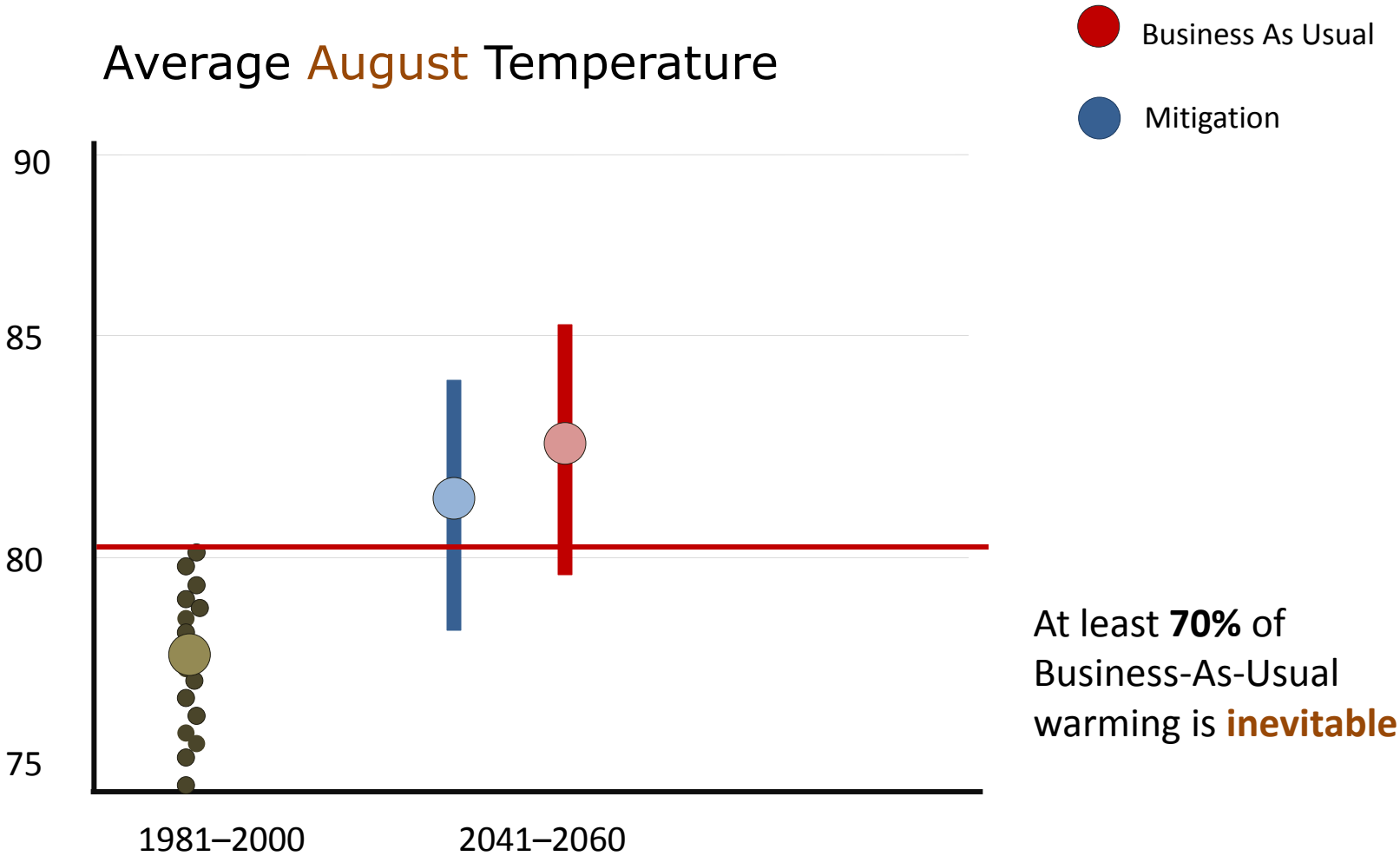


Average August Temperature
2041–2060: Business As Usual



Temperature

Average August Temperature



At least **70%** of Business-As-Usual warming is **inevitable**

Temperature

The number of very hot days (>95º) will increase

LA's New Heat Record: 113 Degrees

HEAT WAVE BREAKS OFFICIAL THERMOMETER

By Rob Quinn, Newser Staff
Posted Sep 28, 2010 3:57 AM CDT

STORY | COMMENTS (6)

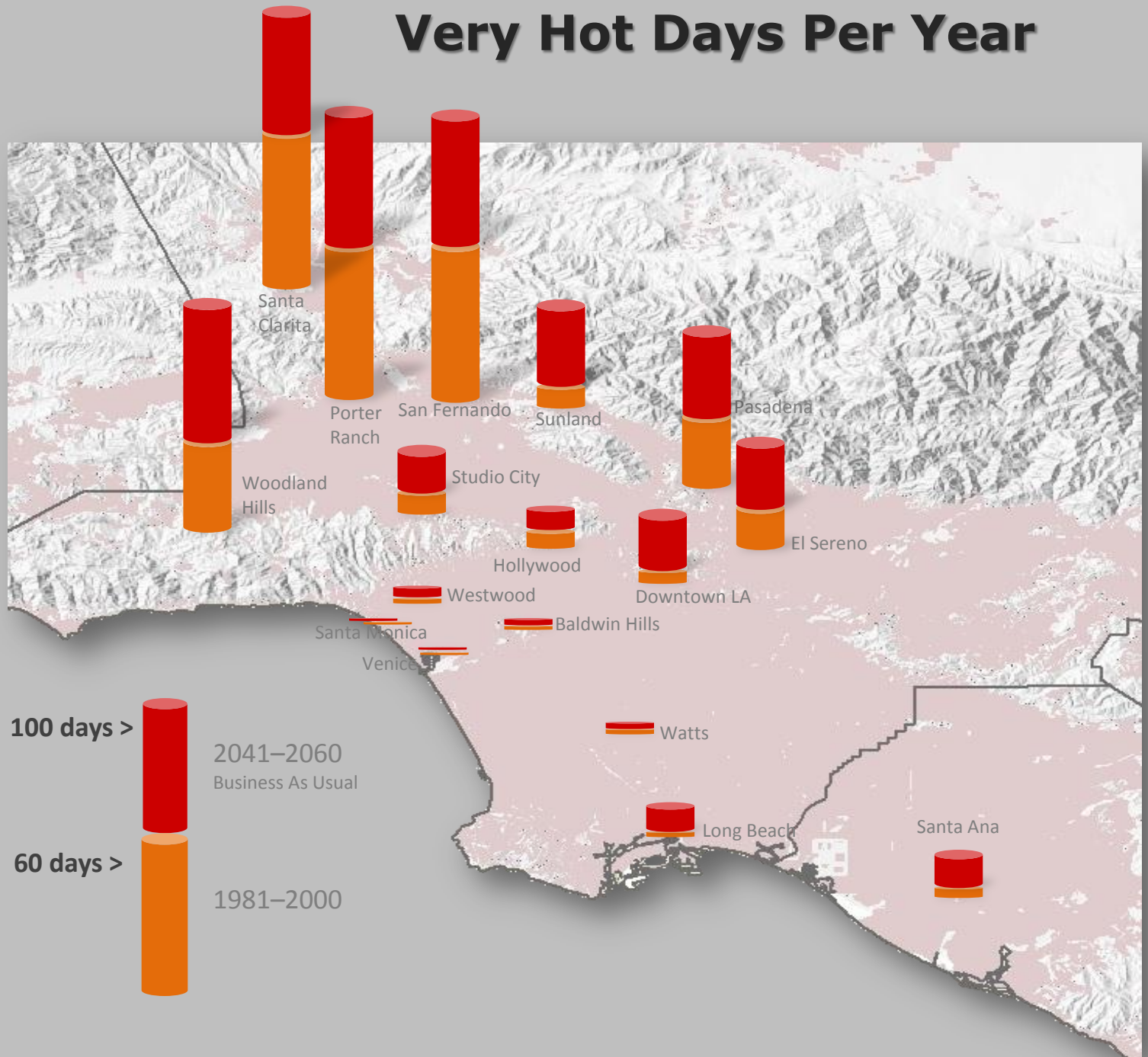
(NEWSER) – Heat records melted in a scorching day across southern California yesterday, with downtown Los Angeles recording the highest temperature since records began in 1877. The National Weather Service's thermometer hit 113º around noon before breaking down, and officials say the day's true temperature could have been even higher, the Los Angeles Times reports.

The region's heat wave follows a summer of record low temperatures. "Five days ago, we saw some of the lowest daytime temperatures we've seen in 50 years. And today was a once-in-a-century day," said a NASA climatologist. "So anybody that thinks Southern California doesn't have weather, we definitely have had a major exhibition by Mother Nature in the last five days."

(4 of 4) « Prev | Next » Slideshow

A girl plays in the sprinklers to beat the heat in Monterey Park, Calif., yesterday. (AP Photo/Nick Ut)

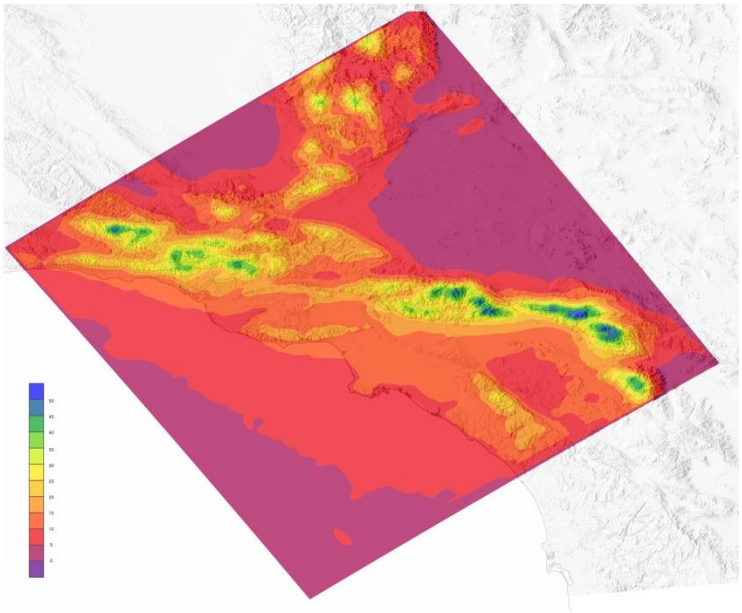
Very Hot Days Per Year



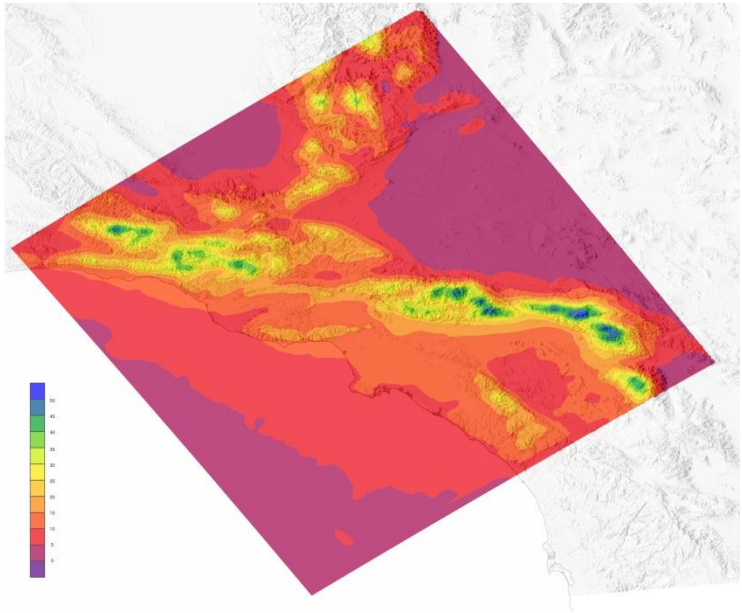
Precipitation

Little change in precipitation by mid-century*

Average Dec–Mar Precipitation 1981–2000



Average Dec–Mar Precipitation 2041–2060: Business As Usual



*Results are preliminary

Precipitation

But other factors affect water resources

- Snowpack
- Evaporation
- Streamflow

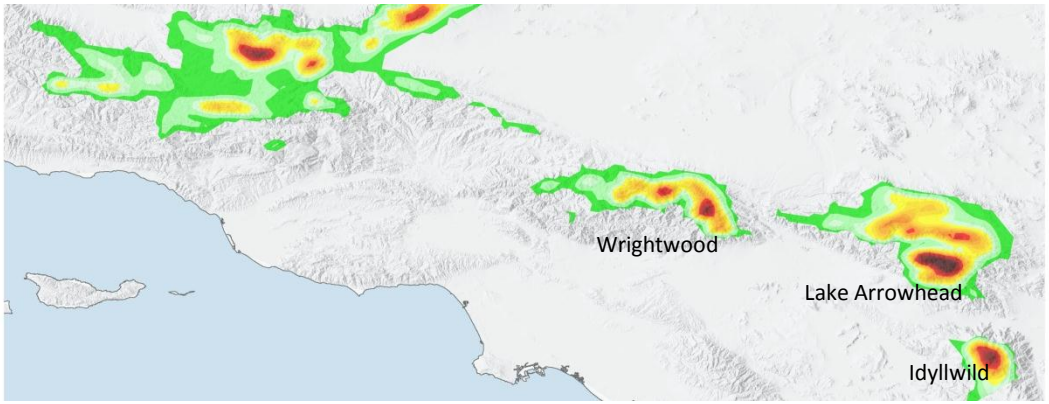
Snowfall

Snow in the LA region

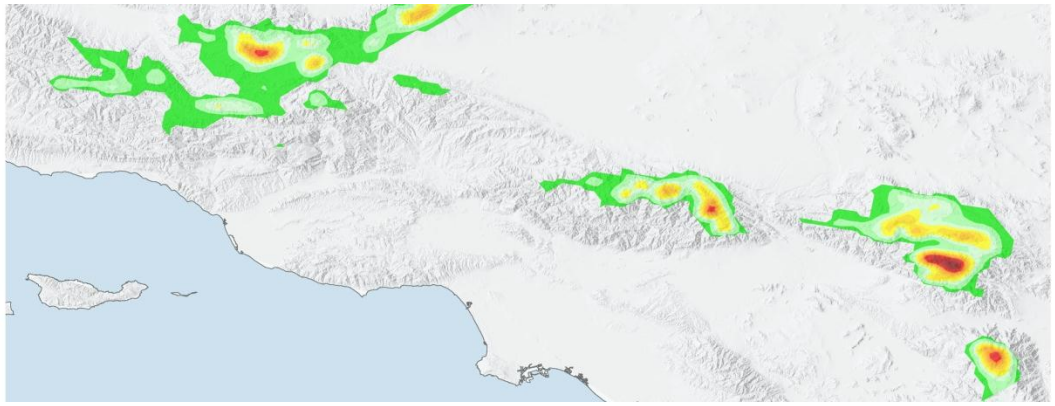
Snowfall

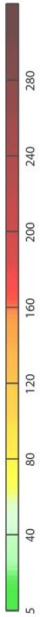
Average Annual Snowfall

1981–2000



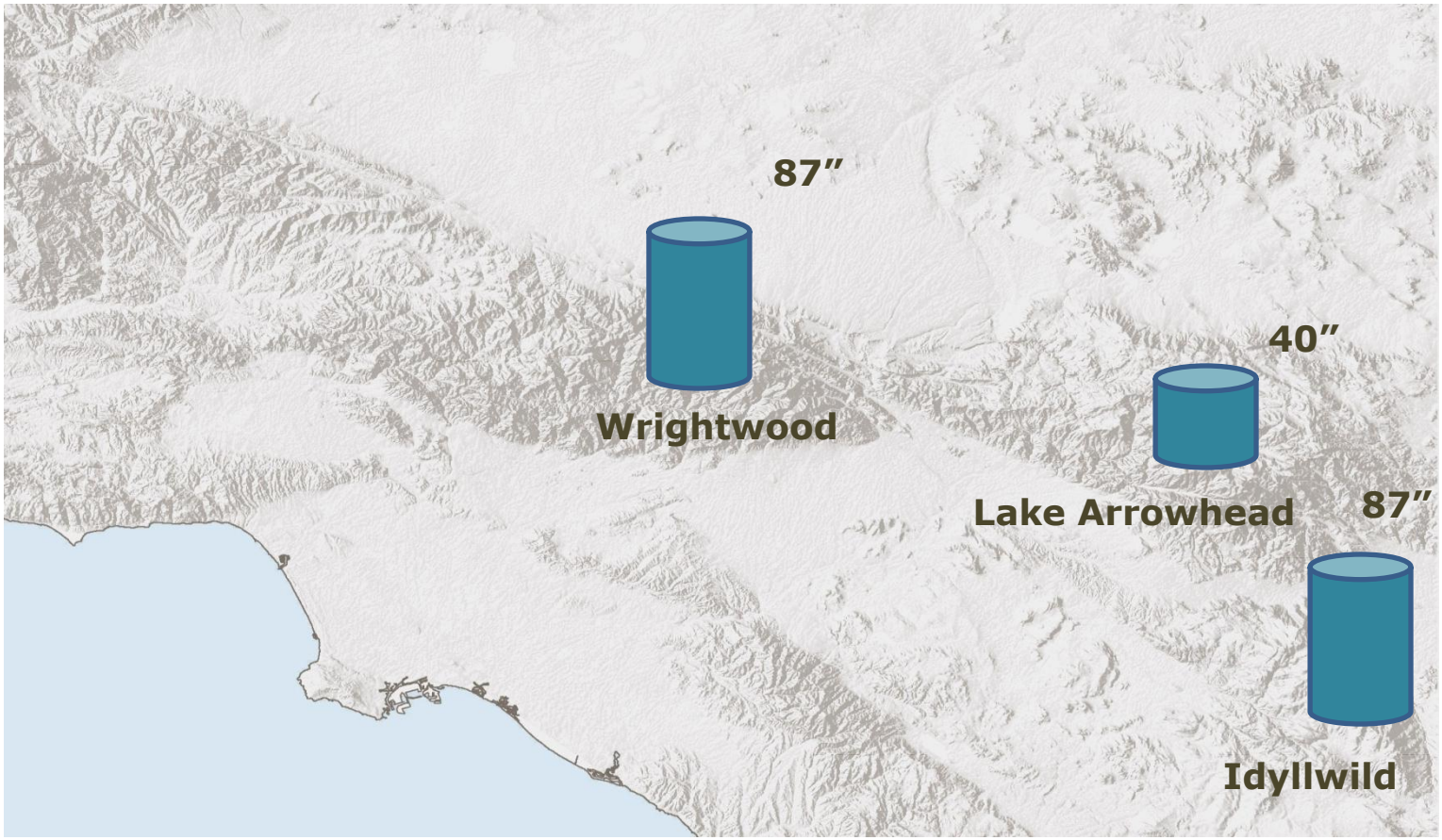
2041–2060
Business As Usual





Snowfall

Baseline Annual Snowfall



Snowfall

Mid-Century **Business As Usual**

LA Projections

Snowfall

Mid-Century

Mitigation

Fire

October 2007 Fires

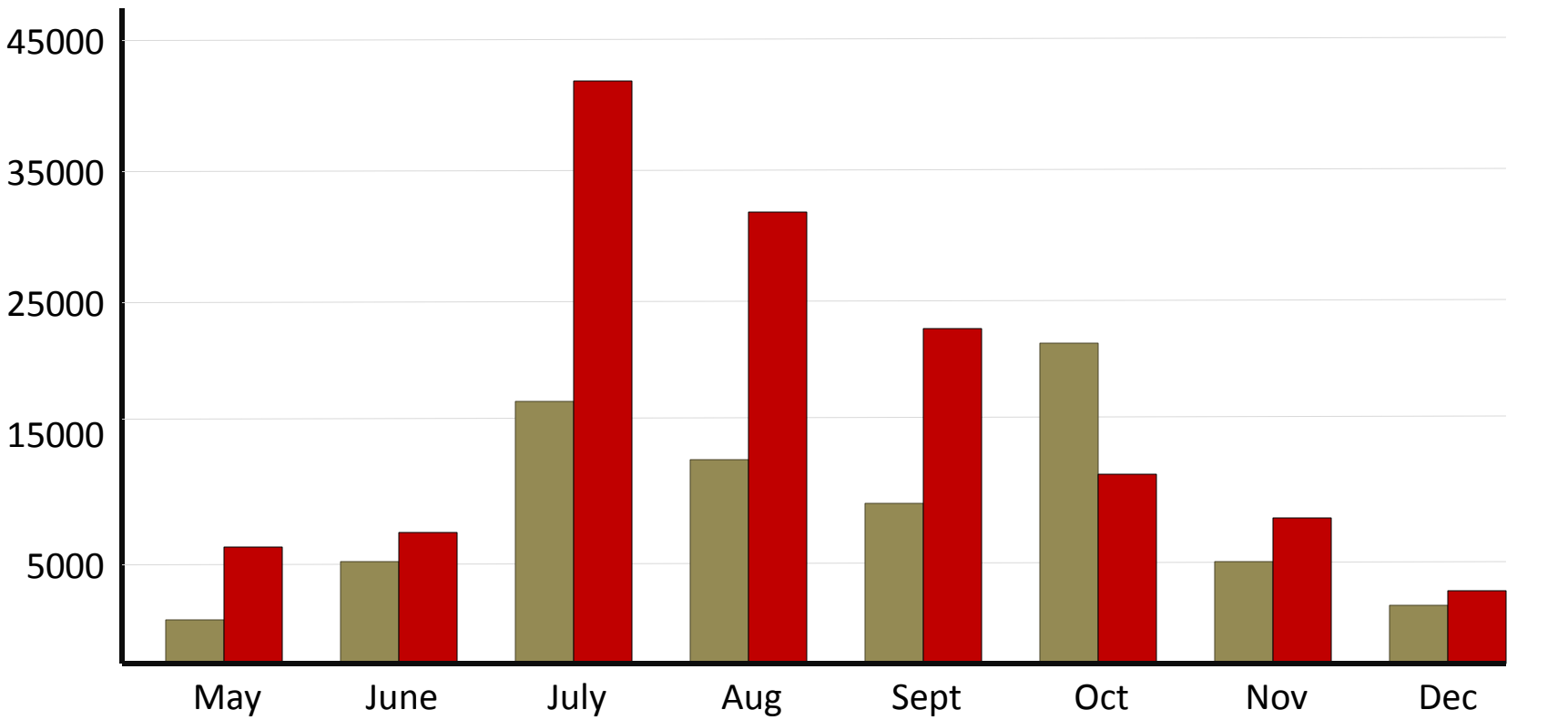
Fall fires: Santa Ana winds

Summer fires: high temperatures, low humidity

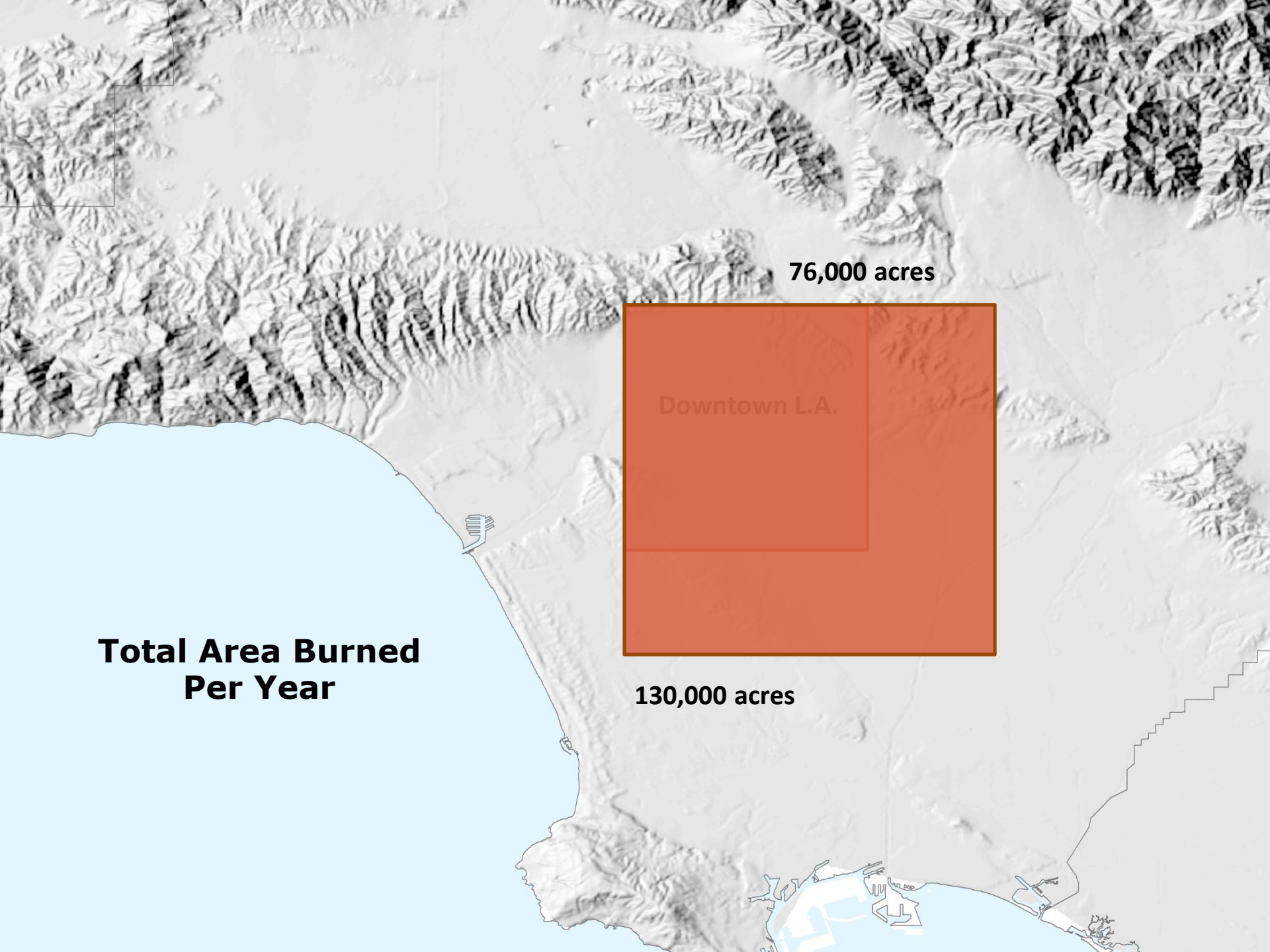
2009 Station Fire

Fire

Acres Burned by Wildfires*



*Preliminary results from fire study conducted in collaboration with Yufang Jin and Jim Randerson at UC Irvine


76,000 acres
Downtown L.A.
Total Area Burned
Per Year
130,000 acres

4. What Does All This Mean for LA?

Adaptation is inevitable.

Temperatures

Snow

Water resources

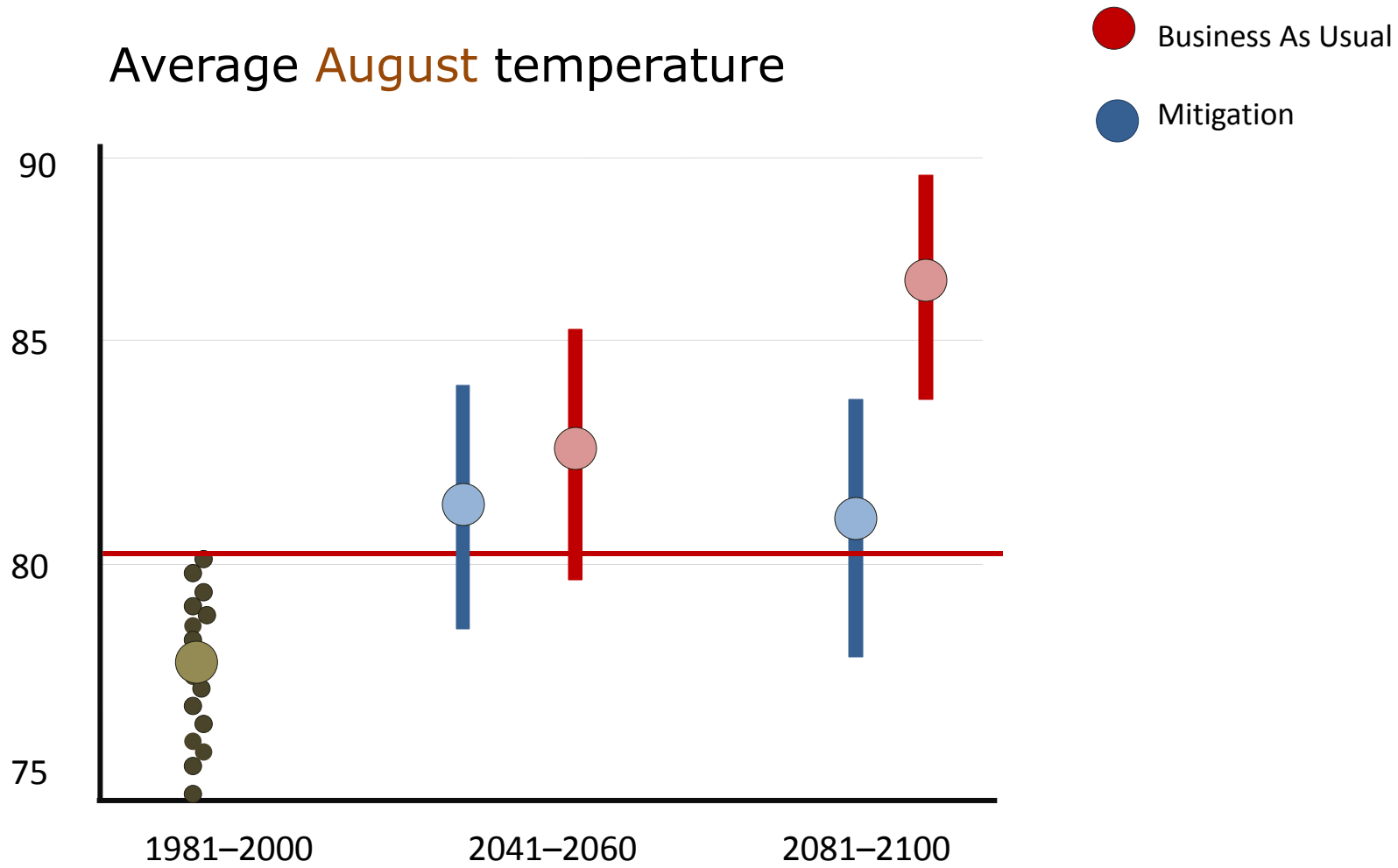
Ecosystem effects

Sea level rise

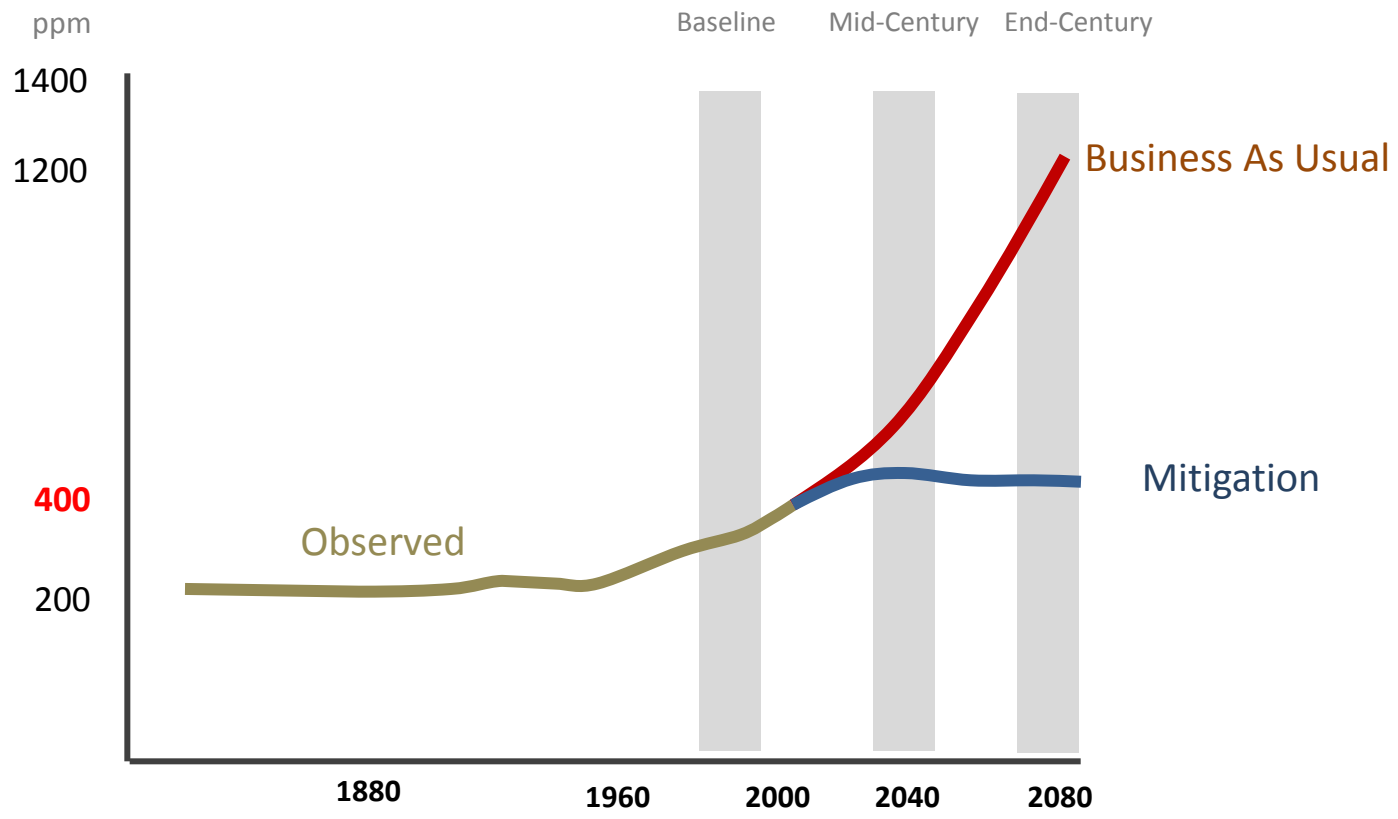
Fire

But is adaptation enough?

Temperature



Our actions matter.

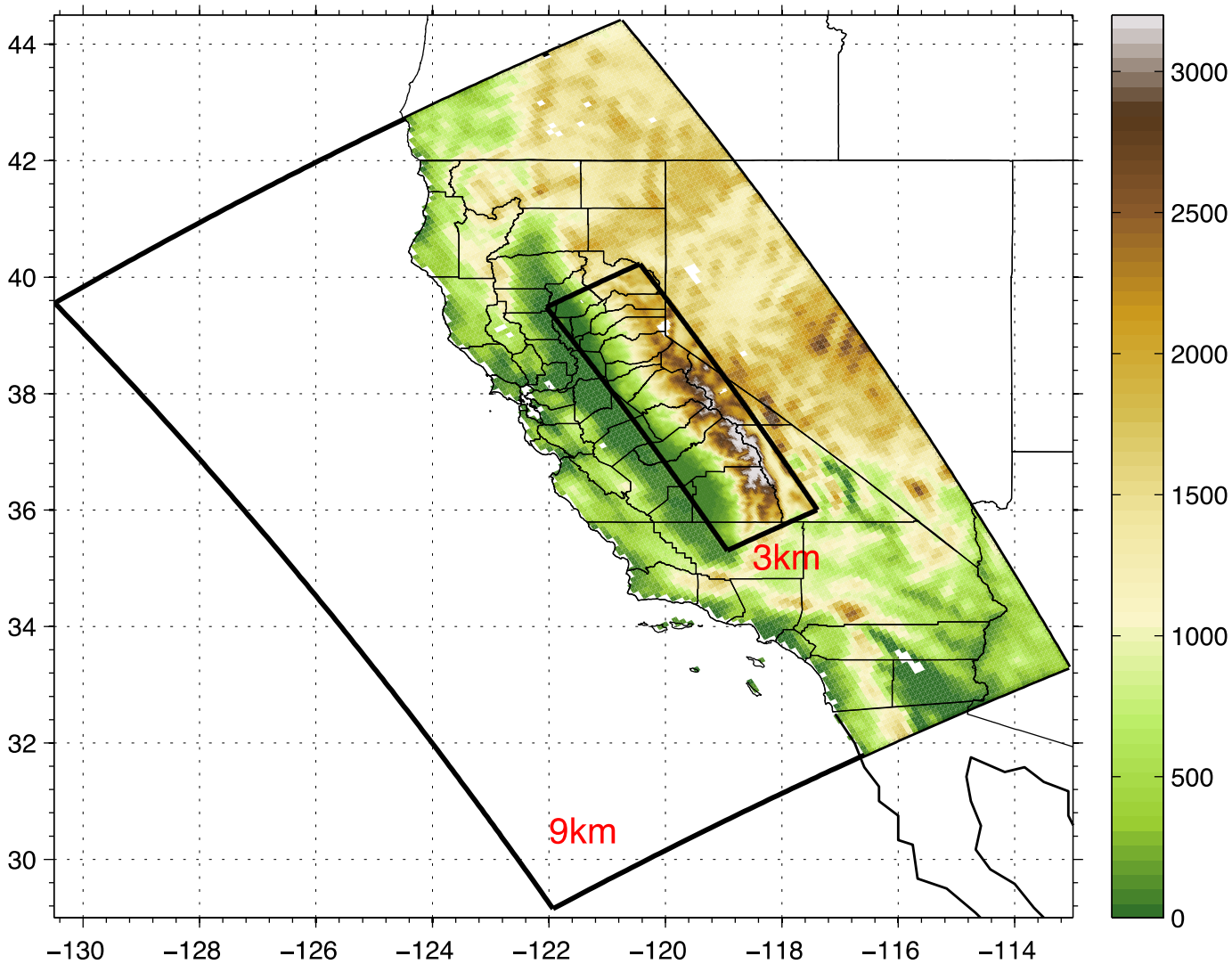


5. The Road Ahead

Future research

- Analyze evaporation, streamflow, and other factors affecting water resources in LA
- Conduct downscaling study for the rest of California and the Sierra Nevada
- Quantify likely impacts on air quality and public health

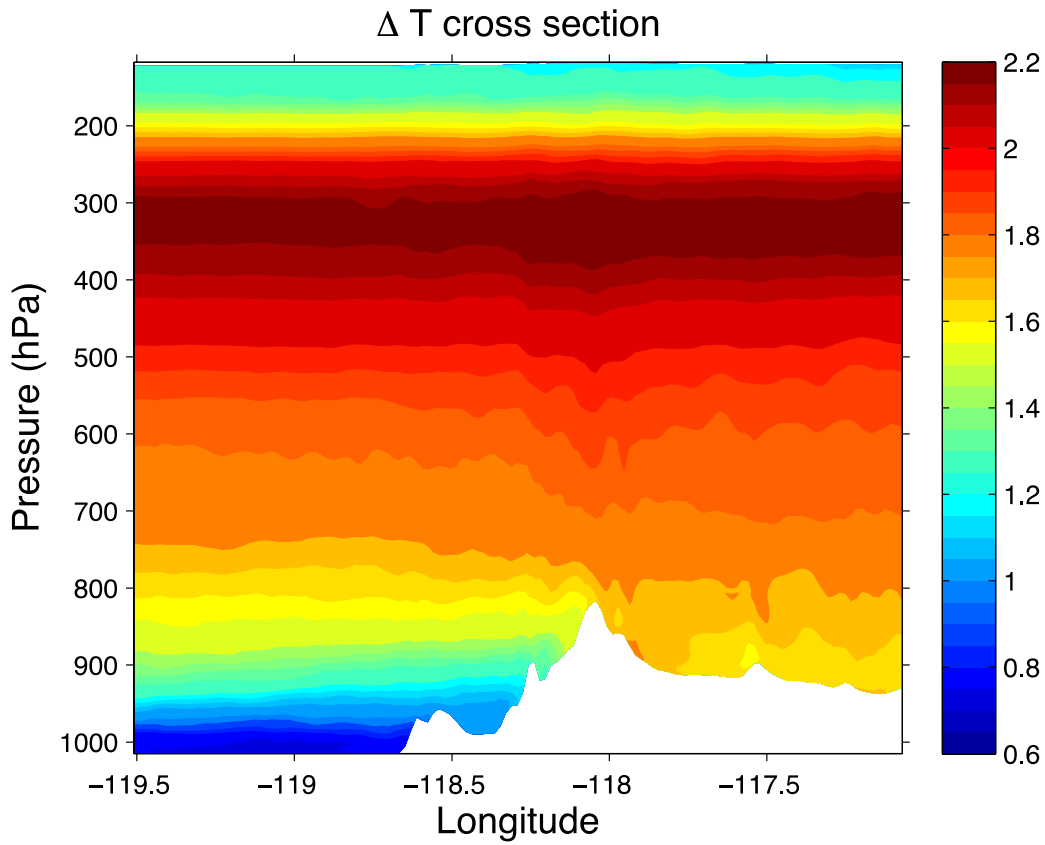
Climate Change Projections in the Sierra Nevada Project



Climate change and air quality

- Chemical reactions are affected by rising temperatures, potentially leading to worse air quality
- Climate change is associated with stronger inversions, trapping pollution

The temperature inversion strengthens in the future



Putting regional modeling to work

- Create ways for policymakers and the public to interact with and use our data
- Bring this scientific understanding and conversation to other cities

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For more on the Climate Change in LA Project:

C-CHANGE.LA

UCLA Climate Research Lounge

Thank You

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Credits

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GreenInfo Network

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