

2008 Scenarios Project

Guido Franco (PIER/CEC)

Dan Cayan (Scripps, UCSD, USGS)

Amy Luers (UCS)

Alan Sanstad (LBNL)

4th Annual Climate Change Conference
September 12, 2007
Sacramento, CA

Outline

- Overview – Guido
- Climate and sea level rise scenarios – Dan
- Sectoral/Economic studies – Alan
- Cross-cutting/Adaptation studies – Amy

- Q&A

Overview

Scenarios Project

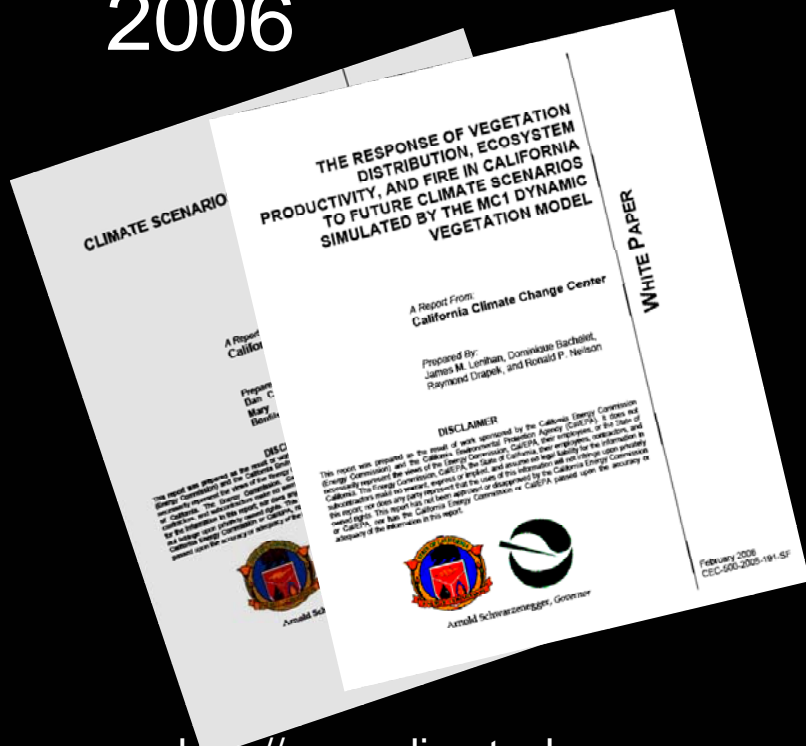
Background Information

- The June 1, 2005 Executive Order mandates the preparation of biennial scientific assessments on potential impacts and adaptation options

GOAL: Bring climate science to policy makers and managers

2006 Scenarios Report

- First Assessment released in March 2006

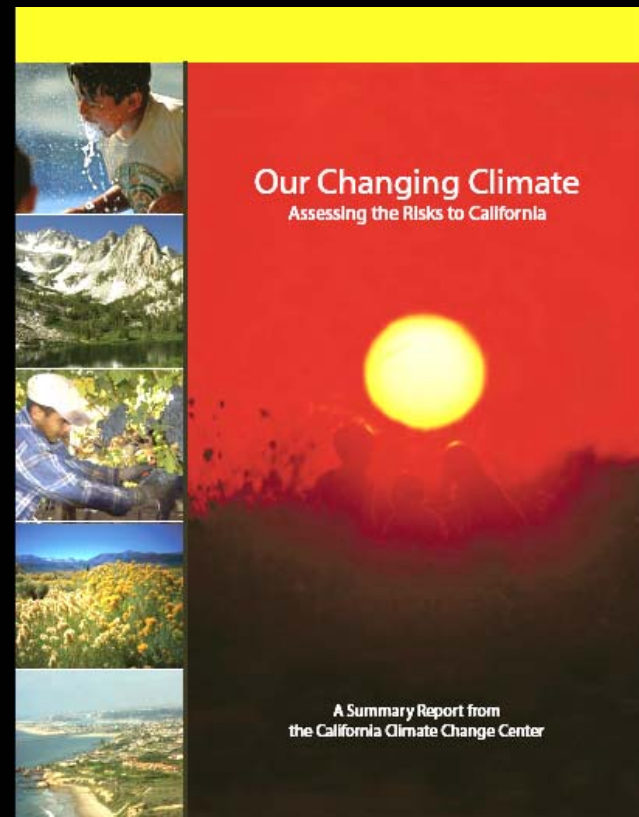


- Eighteen papers have been released involving researchers from:
- Scripps Institution of Oceanography,
 - UC Berkeley,
 - UC Davis,
 - Santa Clara University,
 - LBNL, LLNL,
 - US Forest Service,
 - Oregon State University,
 - Union of Concerned Scientists
 - State Agencies: ARB, DWR, and CEC.

2006 Synthesis Scenarios Report: Message to Public

•By comparing impacts under multiple climate change scenarios were able to highlight for the public that:

The consequences of climate inaction are high in CA



2006 Synthesis Scenarios Report: Message to Scientific Community

**20 papers from assessment
are in press in a special
issue of
Climatic Change**



2008 Scenarios Report (2nd report)

- Common set of climate and sea level scenarios
- Common set of demographic and urban projections intended to be consistent with the SRES scenarios
- Cover seven sectors:
 - Water resources, forests, agriculture, coasts, energy, air quality/public health
 - Cross-sector studies
- How the 2008 study will differ from the 2006 study:
 - Economics
 - More adaptation
 - Combine effect of climate change and population growth/urbanization

Organization

- Climate Action Team (CAT)
- Scenarios Subgroup
- Core Team
 - Dan Cayan (Scripps, USCD, USGS)
 - Alan Sanstad (LBNL)
 - Andrew Altevogt (CalEPA)
 - Amy Luers (UCS)
 - Bart Croes (ARB)
 - Guido Franco (Chair; PIER/CEC)
- Research Team (70+ scientists)

Collaborating Studies

- Requirements:
 - Use the same climate and sea level scenarios
 - Follow the same peer-review process
 - Willing to participate in meetings and conference calls to coordinate the different studies
 - Produce one or more papers to be submitted to a scientific journal (Special Issue)
- Some potential collaborating studies:
 - PPIC
 - JPL

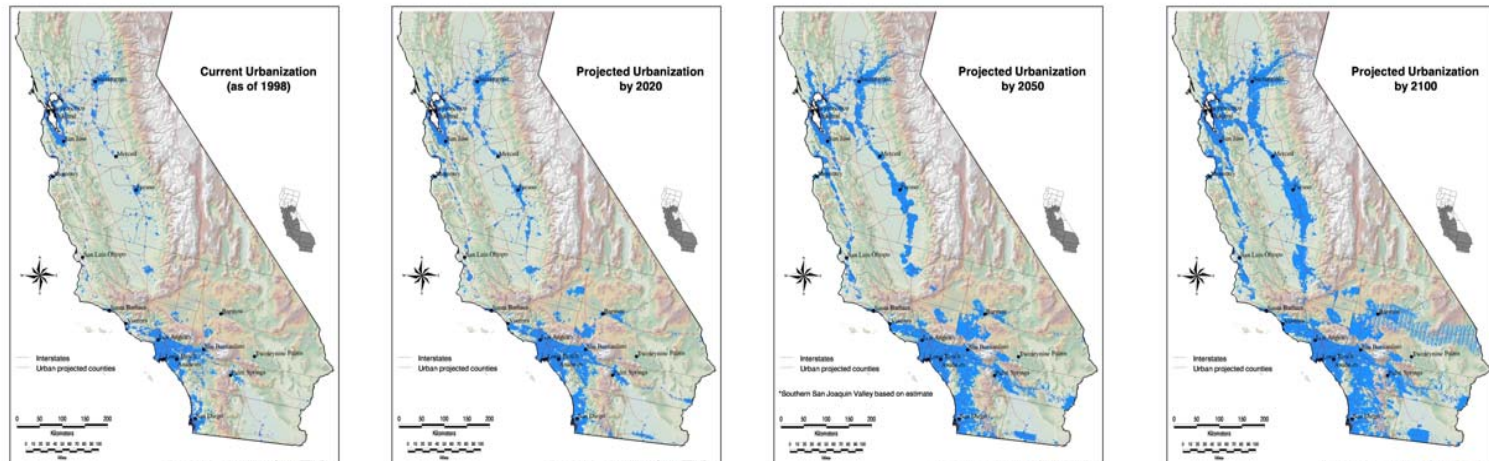
Time Line

- 2008 Scenario Study
 - Draft internal paper – May 2008
 - Final paper – October 2008
 - Outreach document - 2009
- 2010 Scenario Study
 - Several on-going or soon to start PIER projects will contribute to this report:
 - New set of climate scenarios – April 2009
 - Coastal evolution model
 - Ecological impact assessments
 - INFORM +
 - In-depth local/regional adaptation studies
 - Etc.
 - Studies would start early in 2009
- 2012 Scenario Study

Climate and Sea Level Rise Scenarios

Demographic and urban projections

- PPIC will develop the demographic projections (SRES scenarios)
- LLNL will develop the urban projections



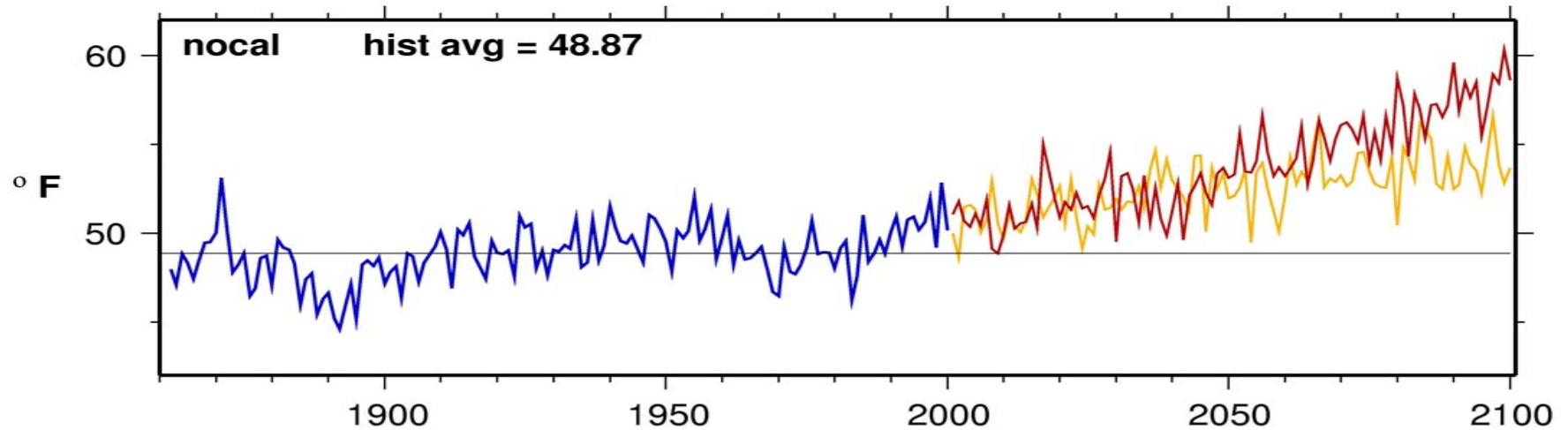
Landis et al. 2003
PIER Report

uncertainty grows

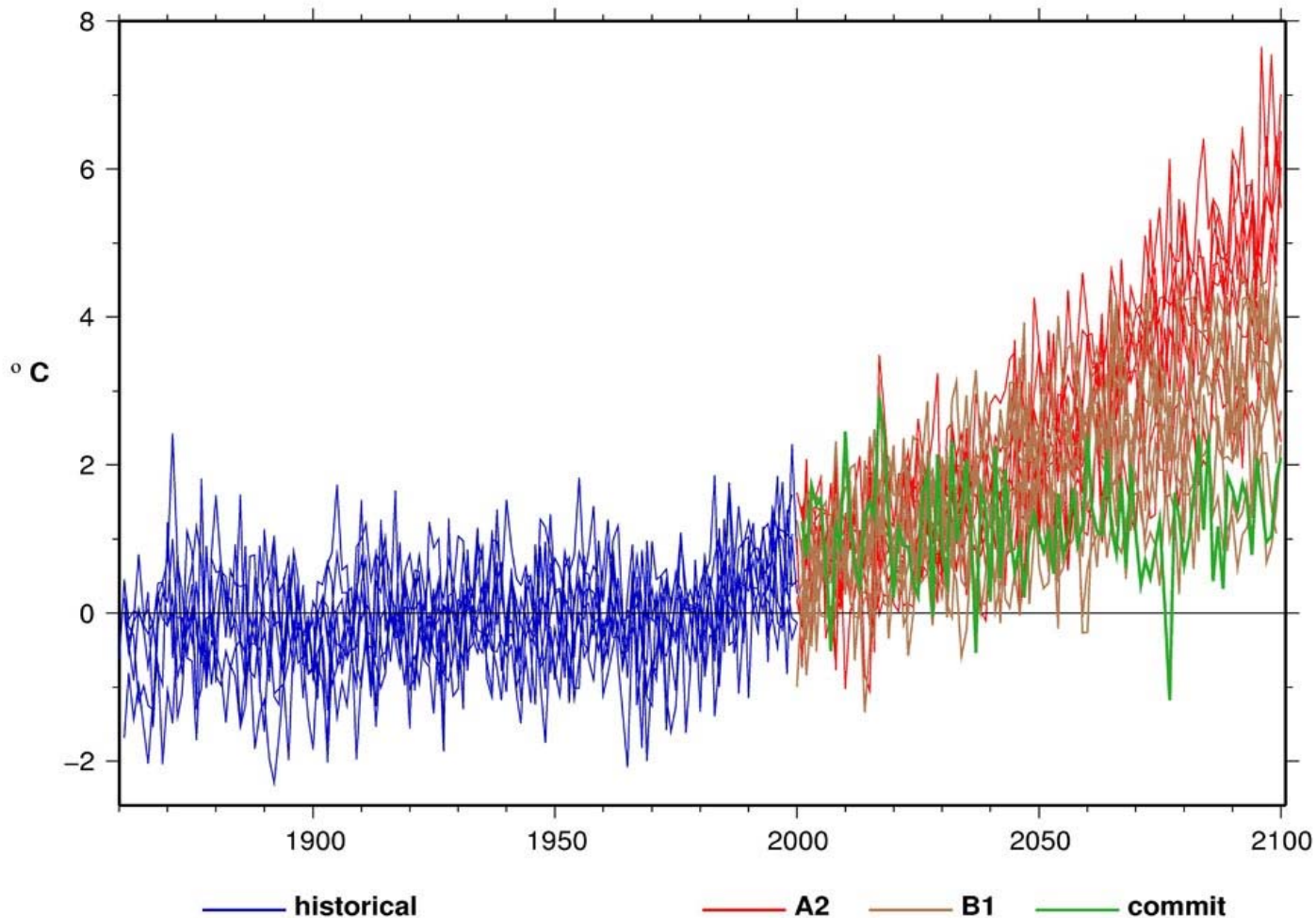
early, middle and later 21st Century--
adaptation to what?

difference in emissions pathway begins to emerge in mid century

GFDL CM2.1 annual temp



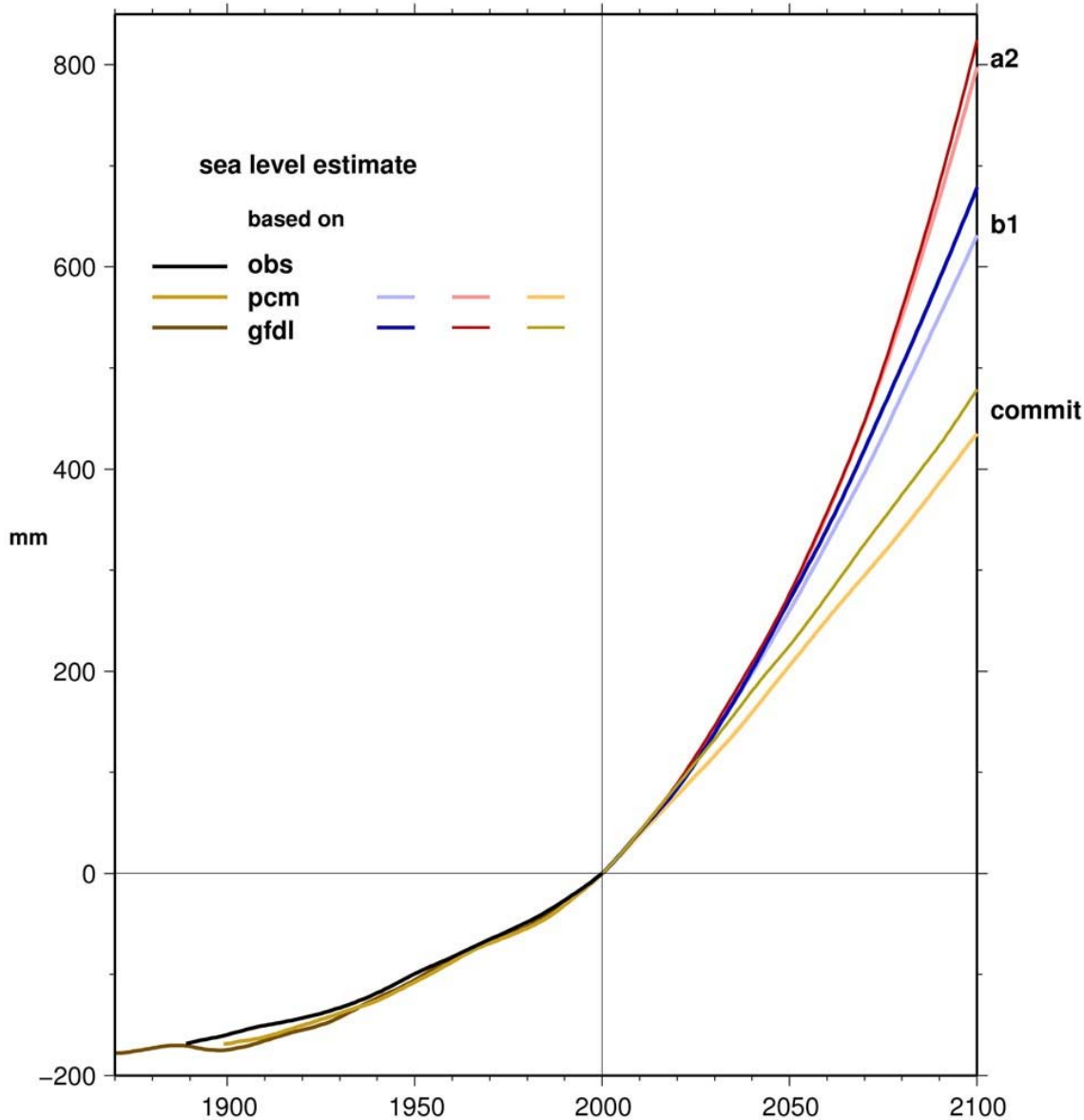
Annual Temperature Projections, Sacramento area from 8 IPCC AR4 global climate models, SRES A2, B1 and commit



GFDL CM2.1 -- NCAR PCM1 -- MIROC3.2 -- CSIRO Mk3.0
IPSL CM4.0 -- MPI ECHAM5 -- CNRM CM3.0 -- UKMO HadCM3

Global sea level projections from PCM and GFDL GCM simulations

after Rahmstorf (2007) Science VOL 315 pp 368–370

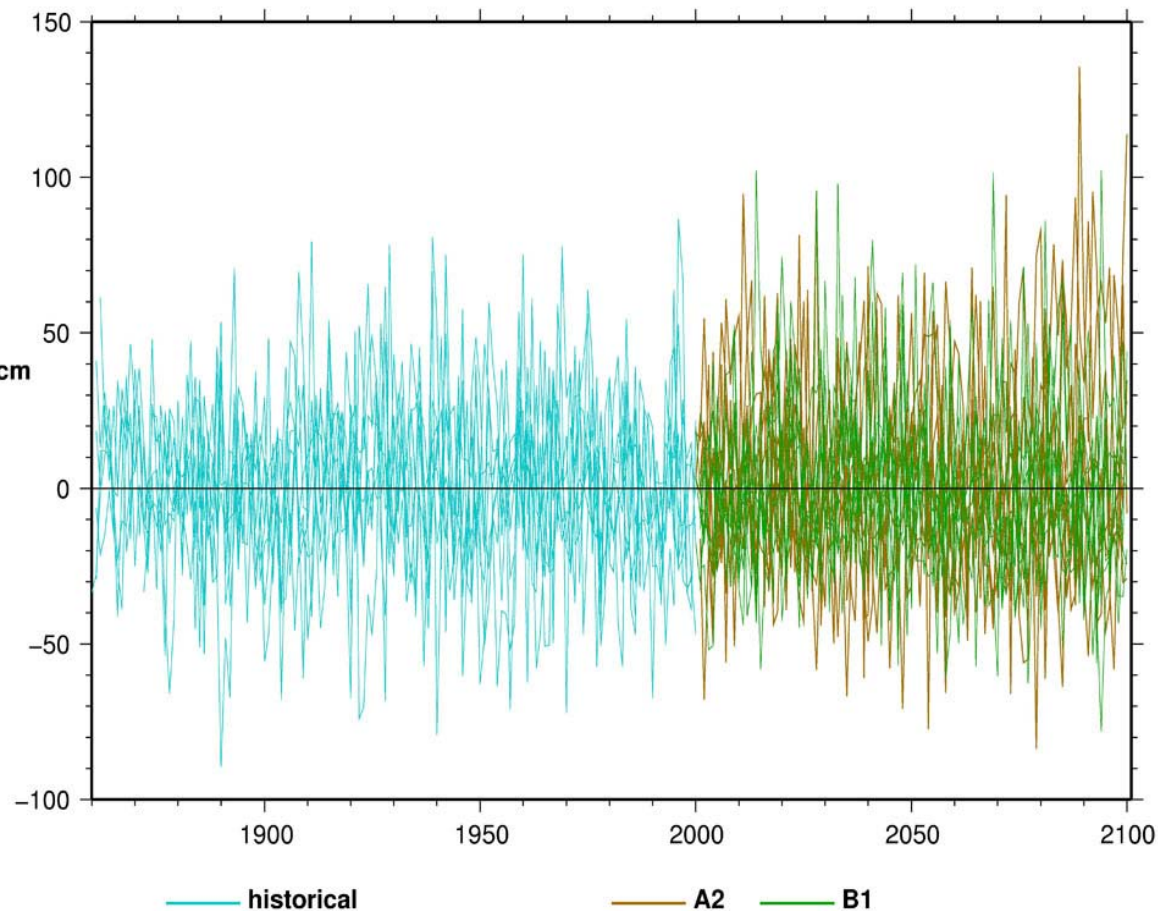


Sea Level Rise
estimated from GCM
global air temperature
Projections

after Rahmstorf 2007

Higher end s.l.r.
May not be high enough

Annual Precipitation Projections, Sacramento area
from 8 IPCC AR4 global climate models, SRES A2, B1

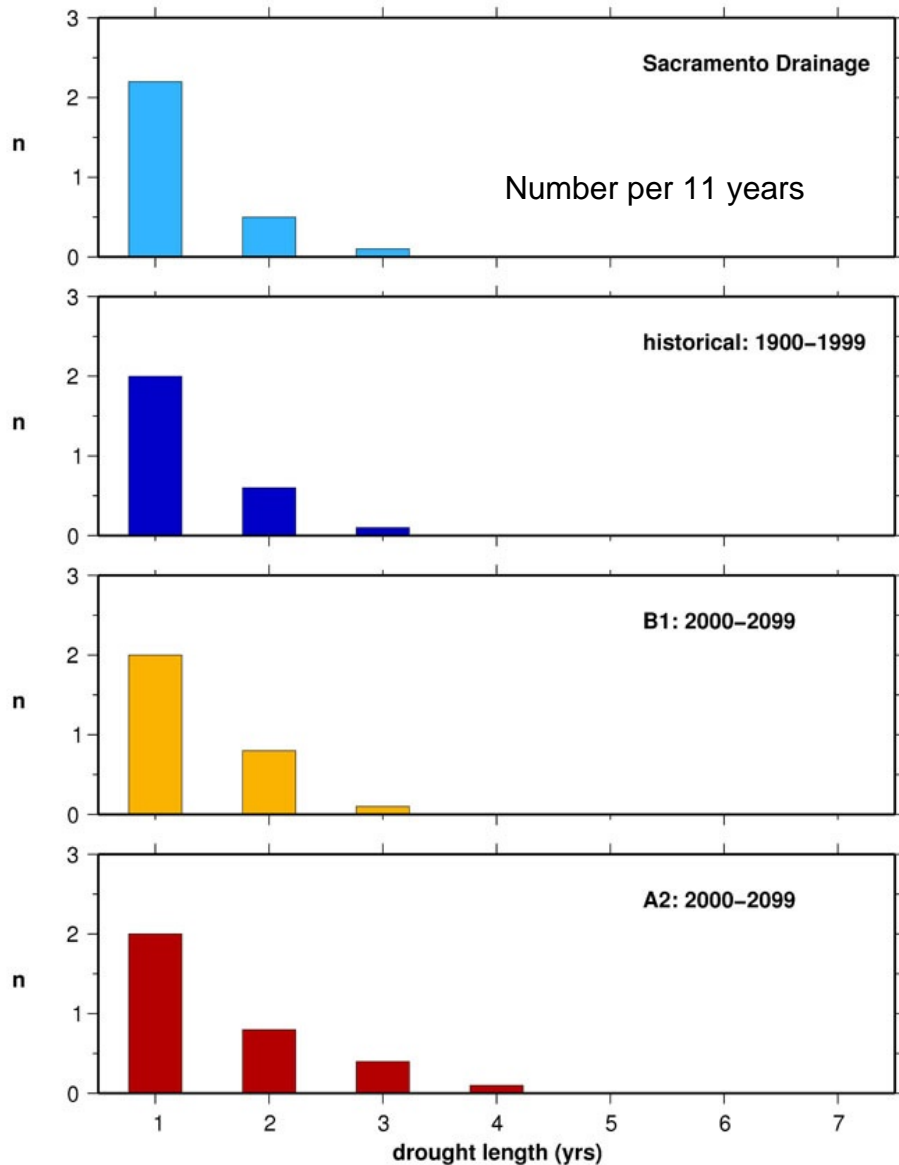


GFDL CM2.1 -- NCAR PCM1 -- MIROC3.2 -- CSIRO Mk3.0
IPSL CM4.0 -- MPI ECHAM5 -- CNRM CM3.0 -- UKMO HadCM3

Uncertain
precipitation changes

But faint trend
toward drying

Drought Occurrences from Climate Model Simulations
 8 IPCC AR4 climate models, SRES A2 and B1 scenarios
 "dry year" defined as having annual precip in lowest 25% of distribution

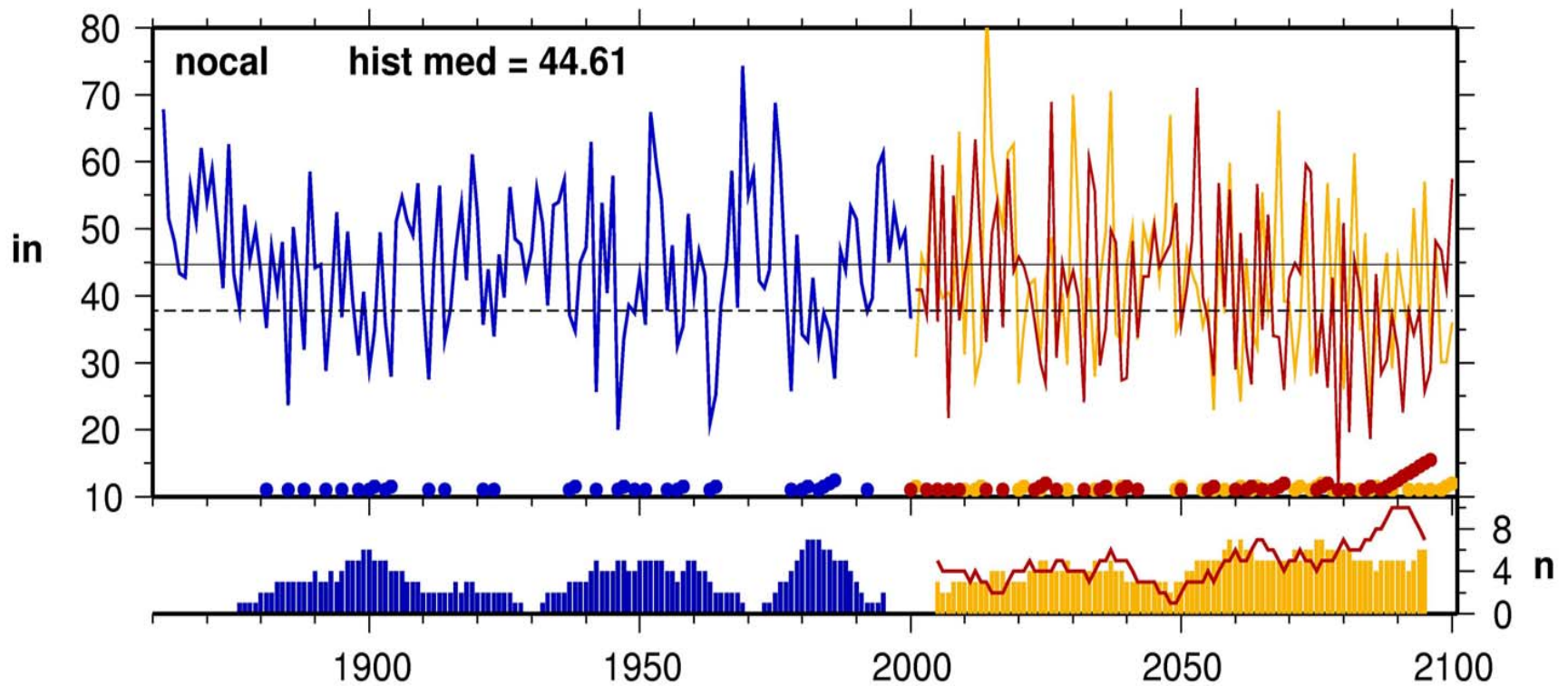


Extremely Dry Year Census
 1, 2, 3, 4 years in succession
 from 8 GCMs and observations

A2 simulations contain more dry years

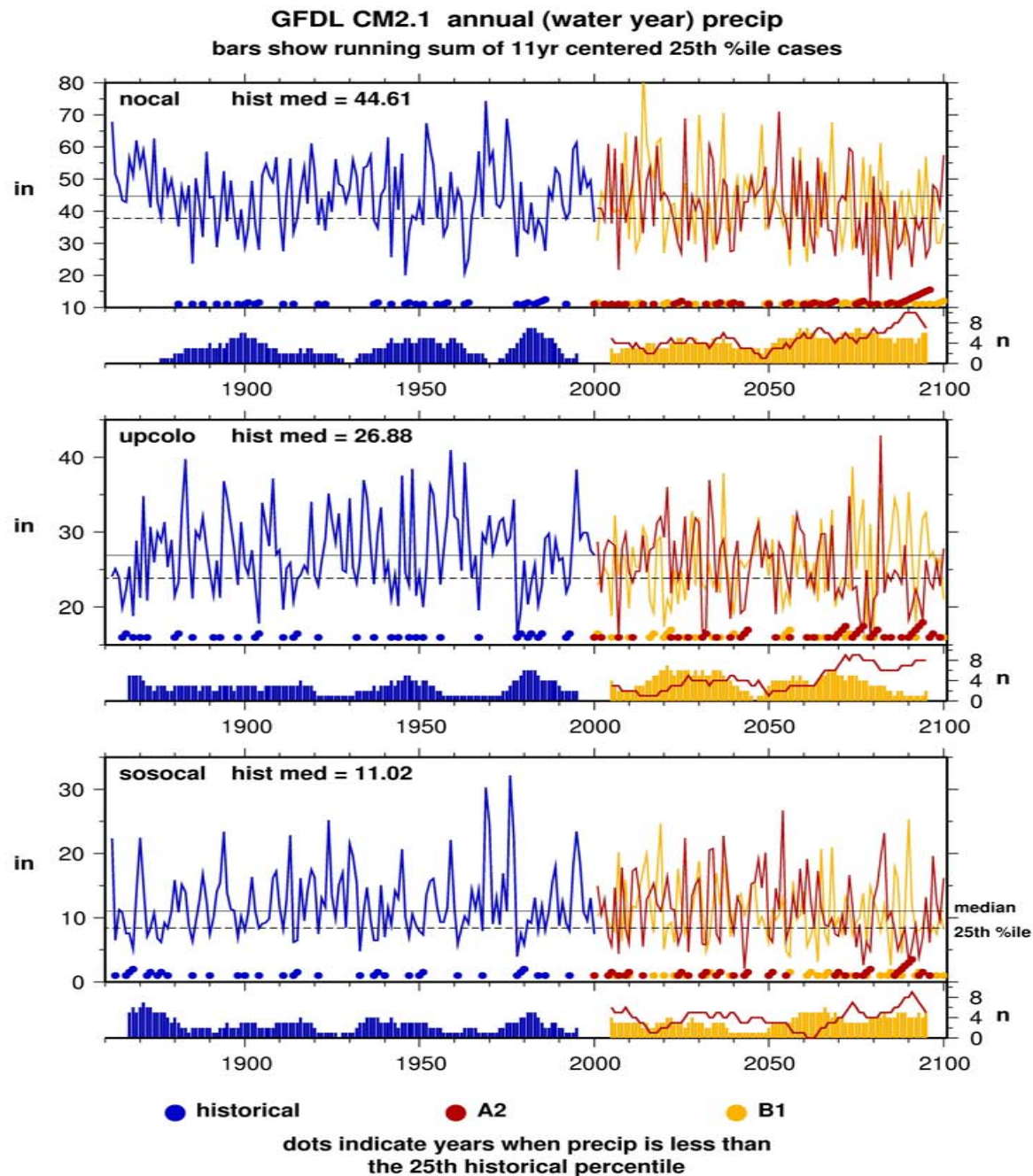
Towards a Drought Scenario

GFDL CM2.1 annual (water year) precip
bars show running sum of 11yr centered 25th %ile cases



Widespread drought

synchronous drying
in Sierra and Colorado?



Sectoral Studies

Sectoral Studies

- **Water Resources**

- CALVIN (Jay Lund – UC Davis)
- WEAP (John Dracup – UC Berkeley)
- CALSIM (California Department of Water Resources; US Bureau of Reclamation)
- Economic impacts (Michael Hanemann – UC Berkeley)

- **Agricultural Impacts**

- Crop simulation modeling (Johan Six – UC Davis)
- Empirical relationships between crop yields and weather (David Lobell – LLNL/Stanford)
- SWAP model (Richard Howitt – UC Davis)
- Economic impacts (Charles Kolstad – UC Santa Barbara)

Sectoral Studies (cont.)

- **Energy Impacts**

- CALVIN, CALSIM, WEAP – low elevation hydrologic units
- Engineering studies for high elevation units (J. Dracup – UC Berkeley)
- Statistical study for high elevation units (J. Lund – UC Davis)
- Econometric study (Max Auffhammer – UC Berkeley)

- **Coastal Resources**

- San Francisco Bay – (Peter Gleick – Pacific Institute)
- Use of the spectral wave model to estimate hot spots in Southern California (Peter Adams – U. of Florida)
- Economic impacts – Linwood Pendleton (UCLA)

Sectoral Studies (cont.)

- **Forest Resources**

- Dynamic Ecological Model (Lee Hannah – Conservation International)
- Forest fires (Tony Westerling – UC Merced)
- Forest Productivity (John Battles – UC Berkeley)
- Economics (UC Santa Barbara)

- **Air Quality**

- Trend of meteorological conditions conducive to high pollution levels (D. Cayan – Scripps)
- Temperature and emissions (Mike Kleeman – UC Davis)
- Air Quality simulations (Kleeman – UC Davis)
- Economics (ARB)

Sectoral Studies (cont.)

- **Public Health**

- Human mortality and morbidity (Bart Ostro – OEHHA)
- Strategies to reduce human mortality due to high temperatures (Hayhoe – U. Texas)
- Economic evaluations (ARB, OEHHA)

Economic Impacts

- Most previous work on climate change economics – in California and elsewhere – has focused on GHG mitigation
- New scientific evidence as well as accelerated policy-making are stimulating a new emphasis on impacts and adaptation

Economic Studies cont.

- Market and non-market impacts on California forests
- Economic impact and adaptation options for:
 - California agriculture
 - the SF Bay
 - the water sector
 - sea-level rise on Southern California beaches
 - forest fires
 - California energy demand
 - public health and air quality

Cross-cutting /Adaptation and Outreach Products

Crosscutting Studies/Adaptation

- **Agricultural adaptation**
(Louise Jackson – UC Davis)
 - Case study: Yolo County
- **Environmental Justice:** a scoping study
(Manuel Pastor - UCSC)
- **Extreme events**
(Steve Schneider - Stanford)
 - Each sector to define what constitutes extreme events
 - Estimate probability of single and multiple “simultaneous” events

Outreach and Synthesis Products

- Economic Impacts
- Focused Adaptation reports

