CLIMATE CHANGE IMPACTS ON SO-CAL WATER RESOURCES

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The Issue

- Temperature/precipitation change over the next century in response to greenhouse gas (GHG) forcing is almost certain

- Changes will impact natural and human systems resulting in many dramatic ecological, economic, and sociological consequences

- We are particularly interested in the effects on highly populated regions. Southern California, which is currently home to 22.4 million people, is a location of major concern.

Climate Model

- To investigate potential impacts of climate change, we analyze output from high resolution nested climate model simulations.

- Two sets of data are analyzed: present climate (1961-1990) & simulated projected climate (2071-2100) under the IPCC SRES A2 GHG emissions scenario.

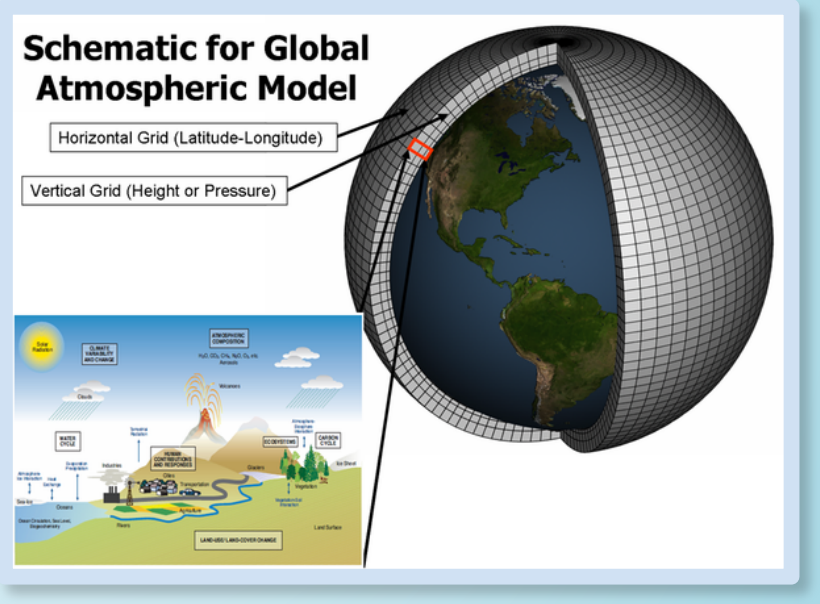


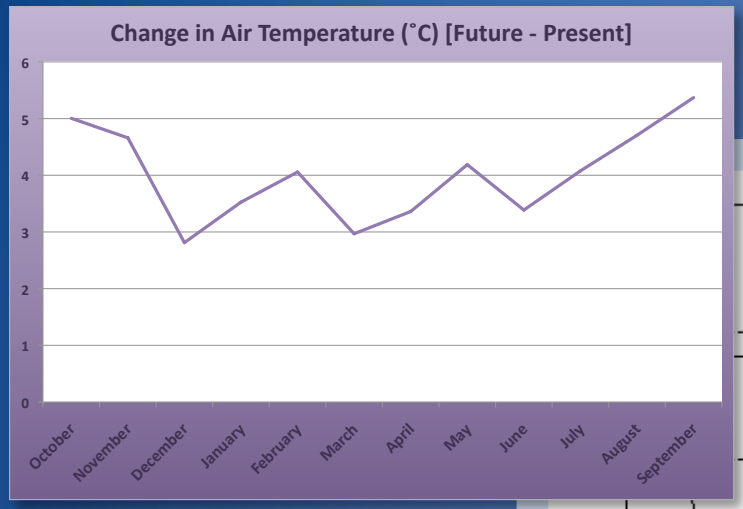
Image: gfdl.noaa.gov/climate-modeling

A2 in Southern California

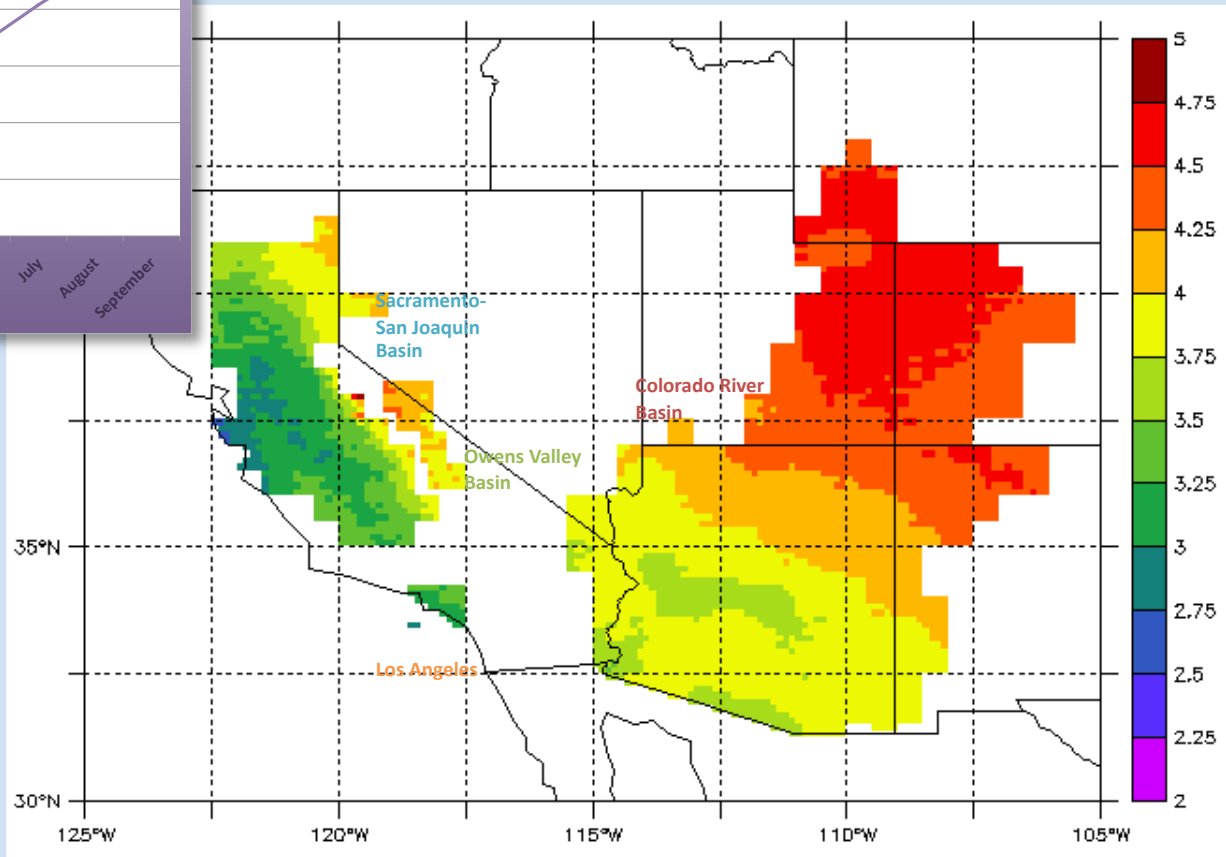
- The A2 scenario most notably considers a future of a divided world with independent nations, increasing population, and slow regional economic development.

- The analysis is applied to the watersheds serving as Southern California's primary water supply:
  - Colorado River
  - Owens Valley
  - San Joaquin/ Sacramento Rivers
  - Los Angeles

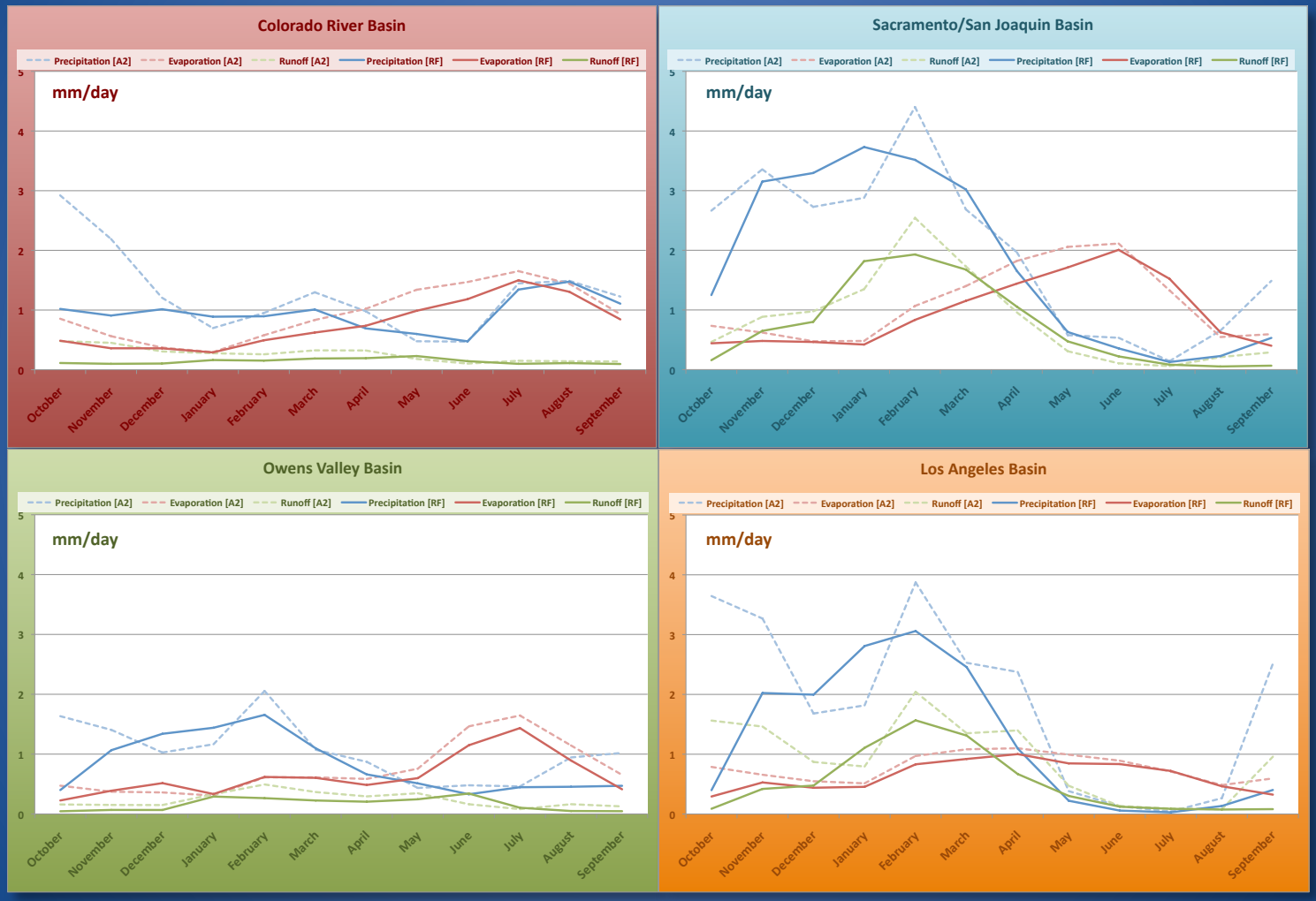
Air Temperature



Simulated change in average air temperature between the time periods [1960-1990] & [2070-2100] indicates warming of about 3°C - 5°C.

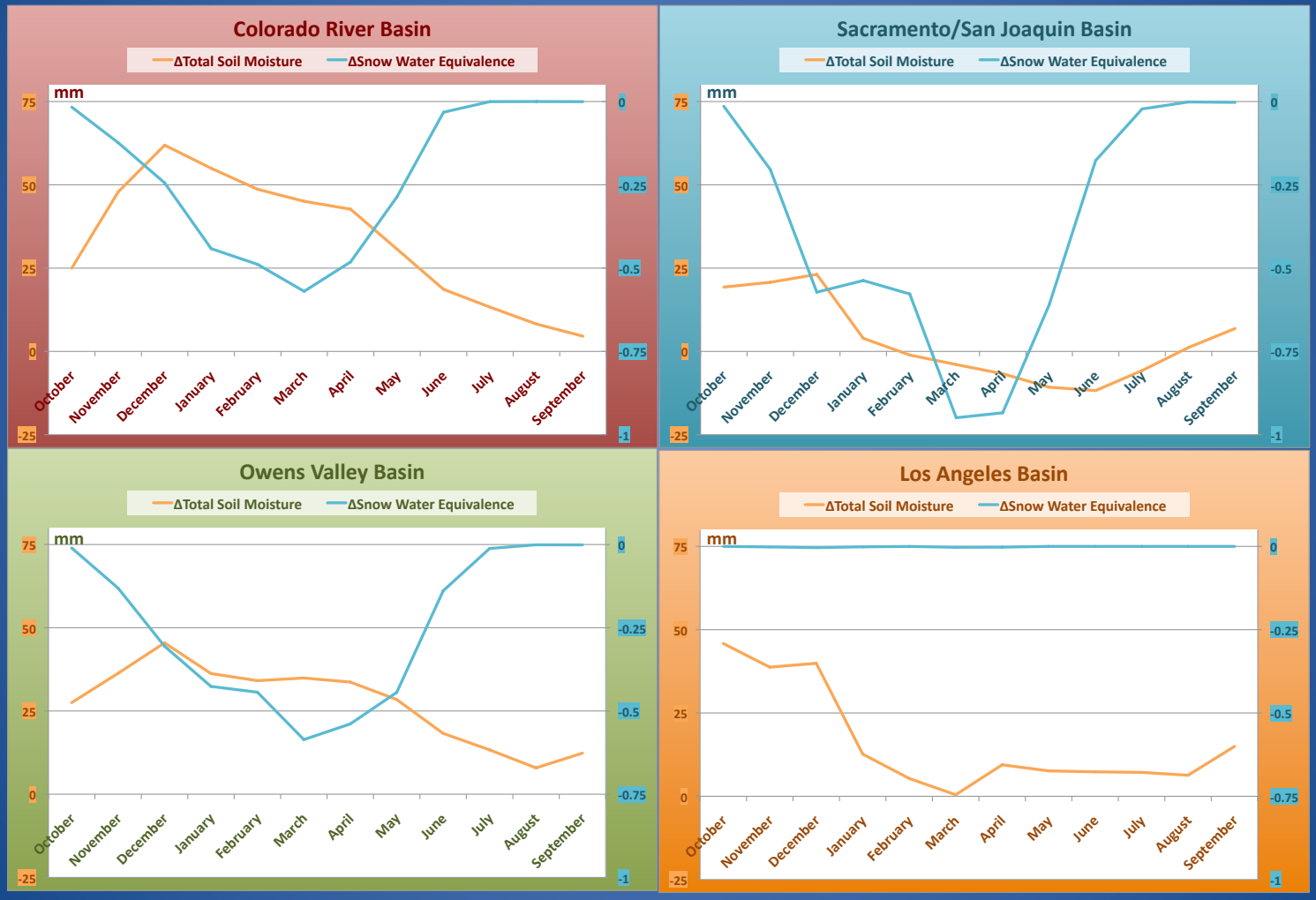


Rain & Evaporation



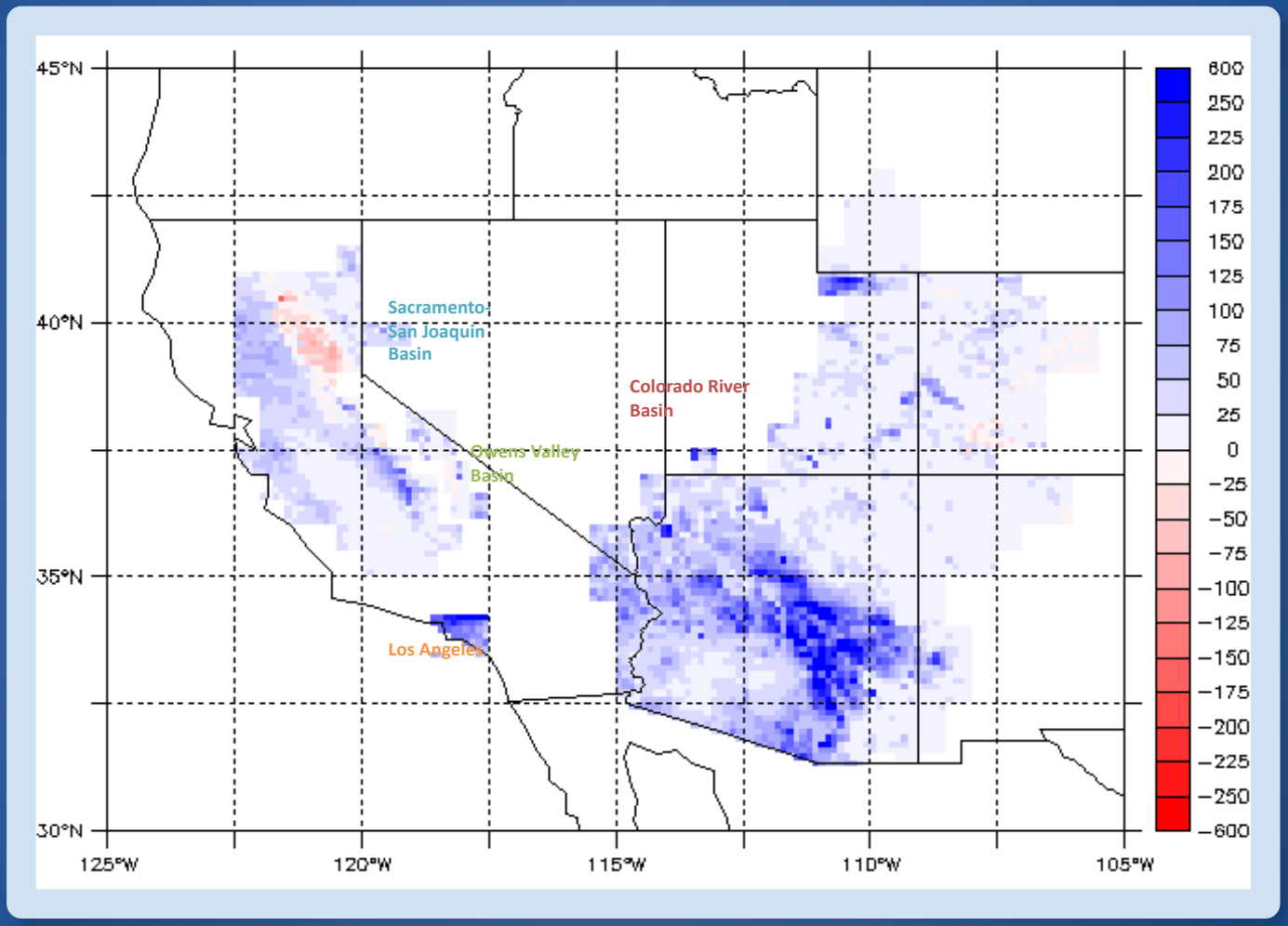
Daily average precipitation, evaporation, and runoff of each month for each of the basins in both the RF (1960-1991) and A2 (2071-2100).

Snow & Soil



Difference in average daily snow water equivalence and soil moisture of each month in the basin between RF and A2 time periods.

Runoff



Change in average annual runoff between the RF (1960-1990) and A2 (2070-2100) models. It indicates higher amounts of runoff in all basins. This is supported by significant increases in precipitation and decreases in snowpack.

Annual Averages

	Colorado River			Sacramento/San Joaquin		
	REF	**A2**	**Δ [A2-RF]**	**REF**	**A2**	**Δ [A2-RF]**
Avg **Air Temperature (ºC)**	11.9	16.1	4.2	13.5	16.9	3.4
Annual Avg **Precipitation (mm/yr)**	348	467	119	654	733	79
Annual Avg **Evaporation (mm/yr)**	279	345	66	350	403	53
Annual Avg **Runoff (mm/yr)**	51	95	44	273	301	27
Avg **Snow Water Equivalence (mm)**	0.32	0.10	-0.22	0.47	0.09	-0.38
Avg **Soil Moisture (mm)**	228	261	33	293	295	3
	Owens Valley			**Los Angeles**		
	REF	**A2**	**Δ [A2-RF]**	**REF**	**A2**	**Δ [A2-RF]**
Avg **Air Temperature (ºC)**	9.0	13.1	4.0	17.4	20.7	3.2
Annual Avg **Precipitation (mm/yr)**	300	383	82	447	685	239
Annual Avg **Evaporation (mm/yr)**	233	273	40	233	284	51
Annual Avg **Runoff (mm/yr)**	59	86	27	192	341	149
Avg **Snow Water Equivalence (mm)**	0.72	0.32	-0.40	0.00	0.00	0.00
Avg **Soil Moisture (mm)**	194	221	27	307	324	16

Averages of the temperature, precipitation, evaporation, runoff, snowmelt, and soil moisture values of the RF simulation (1960-1990) and A2 simulation (2070-2100).

Impacts

- Analysis of the simulations indicates a warmer, wetter future in all of the watersheds:
  - Increases in air temperature
  - Increases in precipitation (particularly in early fall)
  - Decreases in snowpack
  - Increases in earlier runoff
  - Increases in soil moisture

- May lead to increased agricultural productivity

- May meet water supply demands of growing population

- However, may also lead to increased incidence of natural disaster, such as flooding.