Overview of Climate-change Scenarios being Analyzed (and provided) by the California Climate Action Team

In 2005, to meet California's greenhouse gas reduction targets, Governor Arnold Schwarzenegger directed the Secretary of the California Environmental Protection Agency (CalEPA) to coordinate with several agencies, forming the Climate Action Team -- CAT). CAT releases a bi-annual report on the progress made toward meeting the statewide greenhouse gas targets and towards identifying significant risks and challenges that climate change will impose upon the State. See http://meteora.ucsd.edu/cap/pdffiles/CA_climate_Scenarios.pdf for a summary of the results of the first biennial assessment, in 2006.

Now, in summer 2008, the CAT is again in the process of completing a second biennial assessment of potential climate change impacts in the State. At the core of this effort are climate-change scenarios derived from six global climate models:

- From France: CNRM CM3
- From USA: GFDL CM2.1
- From Japan: MIROC3.2 (med)
- From Germany: MPI ECHAM5
- From USA: NCAR CCSM3
- From USA: NCAR PCM1

These models were chosen on the basis of the availability of detailed outputs for use in various parts of the assessment process and upon consideration of certain aspects of their performance. The availability of daily simulation outputs of surface-air temperatures and precipitation were required so that the scenarios could be used to drive hydrologic models over the State; subdaily outputs were also valued for use in coastal wave models and sea-level projections. In some cases, models were chosen because they were preferred by the original model groups (e.g., the GFDL CM2.1 model was chosen over the GFDL CM2.0 model at the recommendation of the GFDL modeling group) or because they were better documented than alternatives. Data was obtained via the model centers and not just from the Intergovernmental Panel on Climate Change (IPCC) web pages, to acquire the most recent data and more complete data in many cases. Models were assessed in terms of their abilities to reproduce El Nino-Southern Oscillation (ENSO)-like climate variations and their tendency to produce periods of drought over California. Models needed to yield reasonably realistic annual cycles of monthly temperature and precipitation over California. The models chosen also had to perform on reasonably detailed global grids (e.g., models with grid spacings greater than about 5º were not included). Finally models chosen had to provide historical and future climate simulations under specific greenhouse-gas emissions scenarios, so that all the model outputs could be directly compared. (More model details can be found at http://meteora.ucsd.edu/cap/ipcc4.html.)

Simulations of historical climates under historical greenhouse-gas concentrations in the atmosphere and future climates under A2 and B1 emissions scenarios provide inputs to impact assessments being completed by a multidisciplinary collections of scientists,

economists, and engineers around the State. These emissions scenarios are products of the IPCC activities and reflect possible futures with generally higher emissions (A2) and lower emissions (B1) in the 21st Century. The A2 scenario is a "storyline" of future global emissions and economic growth based on strong economic priorities (somewhat at expense of environmental priorities) and more regional than global economic coordination, but with strong emphasis on self-reliance of nations, large population increases and relatively slow economic growth overall; the result is rapid growth of greenhouse-gas emissions throughout the 21st Century. The B1 scenario reflects a possible future in which there is more global economic coordination and a stronger emphasis on environmental sustainability. Under this scenario, populations peak and then steady and growing economies are based more on services and information. The result is that emissions during the 21st Century are less than under A2, although most of the differences in the emissions emerge after about 2050.

With two emissions scenarios and six climate models, a total of 12 climate-change scenarios are at the focus of the 2008 assessment activities. The figure below shows projected mean water-year precipitation totals (as percentages of historical normals) and winter temperatures from the various models under the A2 emissions scenario. See http://meteora.ucsd.edu/cap/cat2008_peak.html for more broad comparisons of the changes projected for northern California's climate in the 21st Century by the various models.

The climate scenarios can be accessed directly through http://meteora.ucsd.edu/cap/scen08_data.html .

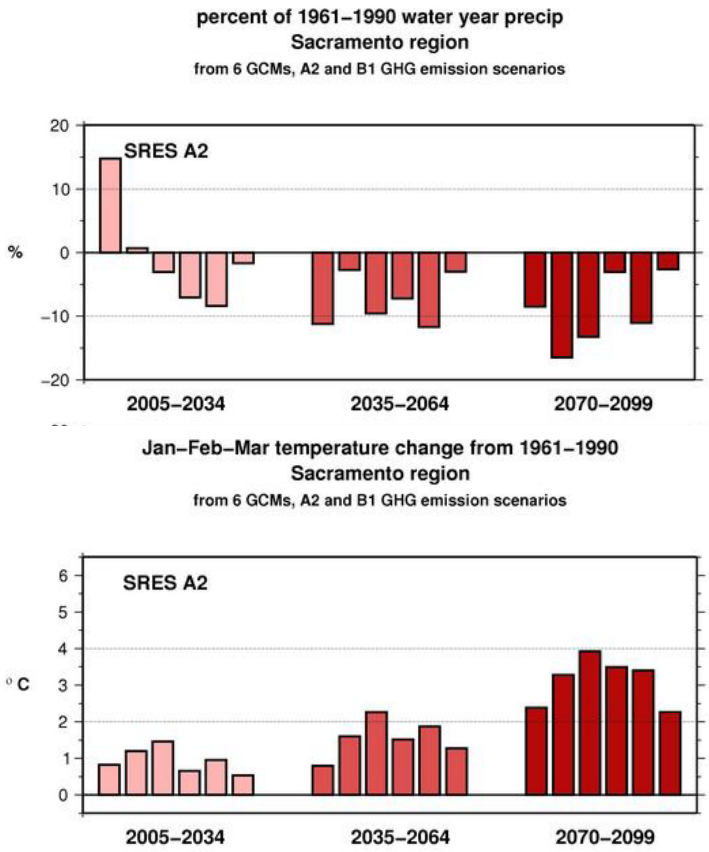

Fig. 1—Changes in water-year precipitation (as percentage of historical normal) and January-March temperatures projected for the Sacramento area by various climate models during several 30-yr periods in the 21st Century; the model results are presented in this order: 1, CNRM CM3; 2, GFDL CM2.1; 3, MIROC3.2; 4, MPI ECHAM5; 5, NCAR CCSM3; and 6, NCAR PCM1. Changes are relative to conditions during 1961-1990.