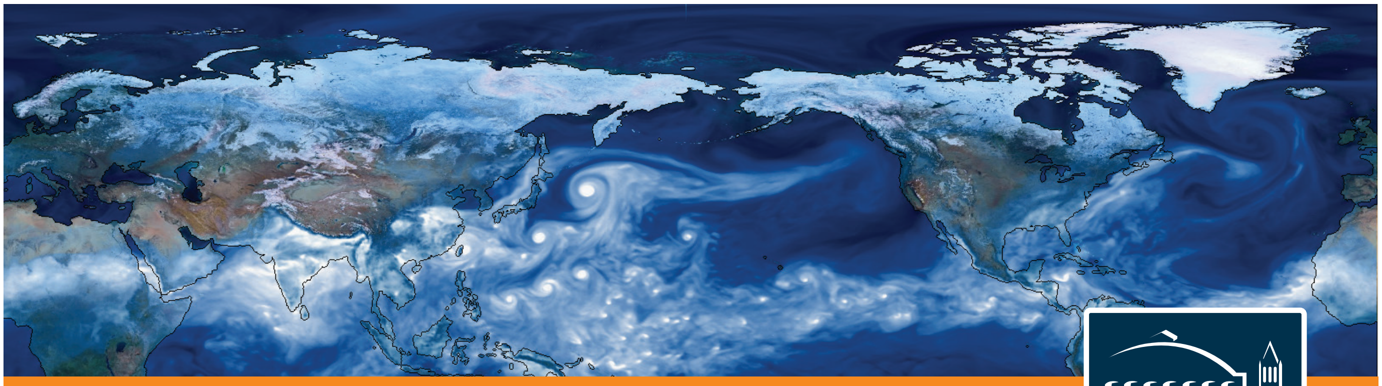
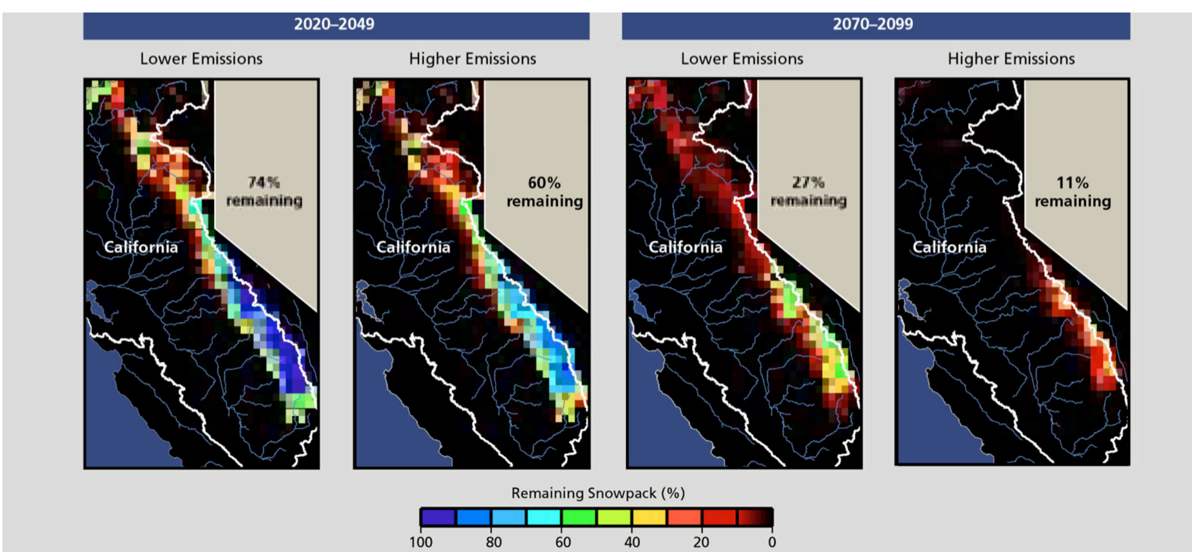


Climate Prediction

Rising sea levels will have a profound effect on coastal communities, and no climate-related issue is more important to California than the effects of rising global temperatures on water supplies. At blazing speeds measured in petaflops — quadrillions of operations per second — Berkeley Lab supercomputers are giving our scientists increasingly powerful modeling tools to predict extreme weather events, from floods to droughts, and to gauge the long-term impact of climate change on the mountain snowpacks that store California's water for our homes, agriculture, industry, and wildlife.

Predicting with Precision

For centuries, scientists have relied on more precise and powerful instruments to improve our understanding of the hidden worlds under a microscope slide or in the far reaches of space. To improve our understanding of complex climate cycles in the 21st century, researchers today depend on the increasing precision and power of supercomputer simulations.



Previous climate projections sponsored by CEC illustrate the challenges ahead for California's snow pack and water supplies [Hayhoe et al]. Using LBNL's new supercomputers, Berkeley Lab scientists are working to refine these projections.

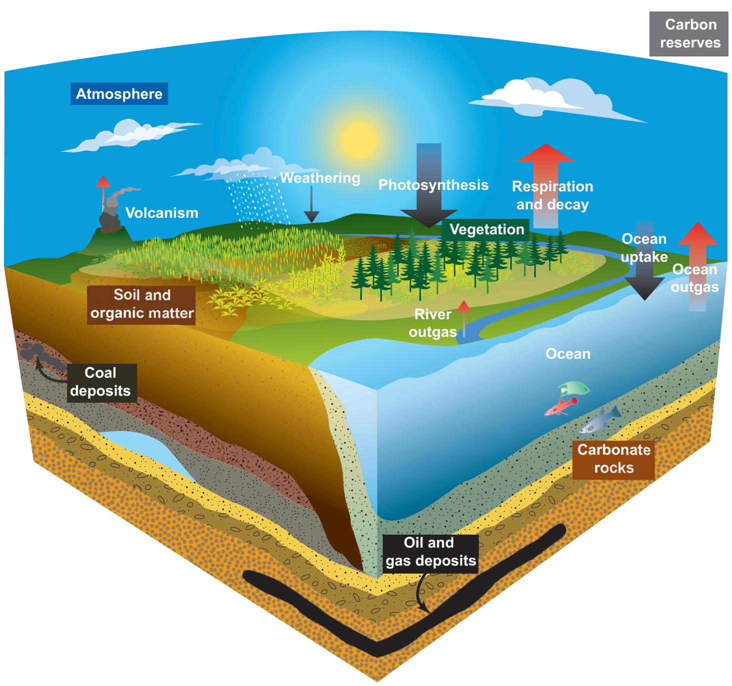
The precision of global climate mapping is directly related to the power of the computers that make such models possible. In 1990, supercomputers made global models of squares 500 kilometers across. Resolution continually improved with computer speeds. Today, with computers operating a million times faster, resolutions of 25 km are possible. Within a decade, new generations of supercomputers, like those that will be housed at Berkeley Lab's Computational Research and Theory (CRT) facility, will enhance resolution to 1 km.

This kind of precision will allow California scientists to build climate models able to predict the effects of rising global temperatures at a highly local level and with greater statistical certainty. It will improve the ability to forecast the size of the state's winter snowpack, and the amount of water that can be expected to flow from it through the following seasons.

Using current modeling technology, climate scientists can produce statewide watershed maps displaying the likely snowpack under high- and low-carbon emission scenarios, during the first and second half of this century. More precise models will enhance the power of California to plan for the environmental changes that lie ahead.

Balancing the Carbon Cycle

Increased concentrations of greenhouse gases such as carbon dioxide (CO_2) and methane (CH_4) are disrupting the Earth's natural carbon cycle, where carbon is exchanged in the air, the sea, the soil, and living things with an equilibrium maintained for tens of thousands of years. Berkeley Lab researchers working from the Arctic tundra to the Amazon rainforests to the world's great oceans are carefully observing the complex components of the carbon cycle. With new data and superfast computers, they are refining models of how changes to different elements of today's cycle will affect the carbon balance, for better or for worse, in the future.



Berkeley Lab and the IPCC

Berkeley Lab research has been so central to the study of climate change that 23 of its scientists shared the 2007 Nobel Peace Prize as contributors to the United Nations' Intergovernmental Panel on Climate Change. In collaboration with the University of California and national laboratories headquartered in the state, Berkeley Lab brings together world-class scientific computers and interdisciplinary teams of scientists to address the challenges of a changing climate.