



**United States Department of Energy**  
**Office of Public Affairs**  
*Washington, DC 20585*



**NEWS MEDIA CONTACT:**  
**Jeff Sherwood, (202) 586-5806**

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## Climate Change Science Program Issues Report on Climate Models

**WASHINGTON, DC** – The U.S. Climate Change Science Program (CCSP) today announced the release of the report “Climate Models: An Assessment of Strengths and Limitations,” the next in a series of 21 Synthesis and Assessment Products (SAPs) managed by U.S. federal agencies. Developed under the leadership of the U.S. Department of Energy (DOE), this report, SAP 3.1, describes computer models of the Earth’s climate and their ability to simulate current climate change.

“Complex climate models are tools that provide insights and knowledge into how future climate may evolve. To assure that future climate projections are used appropriately, it is crucial to understand what current models can simulate well, and where models need improvements,” said David Bader, with DOE’s Lawrence Livermore National Laboratory and the coordinating lead author for this SAP report. “This report makes an important contribution in helping to describe and explain the current state of high-end climate modeling for the non-specialist.”

The SAP 3.1 report describes complex mathematical models used to simulate the Earth’s climate on some of the most powerful supercomputers, and assesses their ability to reproduce observed climate features, and their sensitivity to changes in conditions such as atmospheric concentrations of carbon dioxide. The report notes that “the science of climate modeling has matured through finer spatial resolution, the inclusion of a greater number of physical processes, and through comparison to a rapidly expanding array of observations.” The authors find that the “models have important strengths and limitations.” The report assesses how well models simulate the recent observational period; it does not deal with climate change predictions.

The report organizes the discussion of these strengths and limitations around a series of questions, including: What are the major components and processes of the climate system that are included in present state-of-the-art climate models? How uncertain are climate model results? How well do climate models simulate natural variability? How well do climate models simulate regional climate variability and change?

The report documents the improvement in climate model fidelity over the past decade. As emphasized by the Intergovernmental Panel on Climate Change (IPCC), modern models faithfully simulate continental to global scale temperature patterns and trends observed during the 20th century. Despite this progress, a number of systematic biases across the set of climate models remain, particularly in the simulation of regional precipitation. On smaller geographic scales, when compared against the current climate, the simulated climate varies substantially from model to model. The report notes that “an average over the set of models clearly provides climate simulation superior to any individual model,” and concludes that “no current model is superior to others in all respects, but rather different models have differing strengths and weaknesses.”

The report also describes “downscaling,” which is the use of methodologies to generate higher resolution information from global models results for applications on the regional and local scales. Several downscaling examples such as applications focusing on water resources and surface climate change are illustrated to demonstrate how model results can be applied to a diverse set of problems.

To develop the SAP 3.1, DOE chartered a Federal Advisory Committee comprised of 29 members drawn from academia, government scientists, non-profit and for-profit organizations that drafted and oversaw the review of the report in accordance with the CCSP guidelines. The lead authors include David Bader (coordinating lead author) and Curt Covey, Lawrence Livermore National Laboratory; William J. Gutowski Jr., Iowa State University; Isaac Held, NOAA Geophysical Fluid Dynamics Laboratory; Kenneth Kunkel, Illinois State Water Survey; Ronald Miller, NASA Goddard Institute for Space Studies; Robin Tokmakian, Naval Postgraduate School; and Minghua Zhang, State University of New York, Stony Brook. SAP 3.1 is the third and final SAP that DOE coordinated for the CCSP.

The SAP 3.1 report and additional information about the CCSP are available at:  
[www.climatescience.gov](http://www.climatescience.gov)

Information about DOE’s climate change research is available at:  
[http://www.sc.doe.gov/ober/CCRD\\_top.html](http://www.sc.doe.gov/ober/CCRD_top.html)

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