

Scientists advance in detection and attribution of climate change

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Access to the next generation of climate change experiments has helped scientists obtain more comprehensive estimates of the expected “signal” of human influences on climate.

Improved knowledge of this signal, and a better understanding of uncertainties in temperature observations, have helped to advance “detection and attribution” (“D&A”) studies, which assist in unraveling the causes of recent climate change.

“The climate system is telling us an internally consistent story,” said Ben Santer, an atmospheric scientist at Lawrence Livermore National Laboratory. “We’ve observed warming of the Earth’s land surface and oceans, cooling of the stratosphere, an increase in height of the tropopause, retreat of Arctic sea ice, and widespread melting of glaciers. These changes are difficult to reconcile with purely natural causes.”

Santer reports today on the identification of human influences on recent atmospheric temperature changes during a climate change session at the American Association for the Advancement of Science annual meeting in Washington, D.C. The title of the panel is “Detection and Attribution – Methods and Results – of Climate Trends in Temperature Sensors, Species and Glaciers.”

Santer works in Livermore’s Program for Climate Model Diagnosis and Intercomparison (PCMDI), and has compared new computer model simulations performed at several different research institutes to observational records of recent temperature change.

The climate models analyzed by Santer and colleagues included changes in both manmade forcings (well-mixed greenhouse gases, tropospheric and stratospheric ozone, and the scattering effects of sulfate aerosols) and natural external forcings (solar irradiance and volcanic aerosols).

Earlier Livermore research has determined that human-induced changes in ozone and well-mixed greenhouse gases are the primary drivers of recent changes in the height of the tropopause – the boundary between the turbulently mixed troposphere and the more stable stratosphere. Research with new model and observational datasets strengthens these findings.

“With new model experiments coming online, we’re now in a much better position to estimate how climate changed in response to combined human and natural influences,” Santer said.

PCMDI is archiving data from recently completed experiments performed with coupled ocean-atmosphere general circulation models that took place at more than a dozen research institutes worldwide. “This data will be a very valuable resource for the Laboratory and the whole community,” Santer said. “We are sitting on a real scientific goldmine.”

Founded in 1952, Lawrence Livermore National Laboratory has a mission to ensure national security and to apply science and technology to the important issues of our time. Lawrence Livermore National Laboratory is managed by the University of California for the U.S. Department of Energy's National Nuclear Security Administration.

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