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## Outpacing climate change with atmospheric research collaboration

### New institute brings together experts, instruments, and computer models in aerosol chemistry

RICHLAND, Wash. – Tiny particles in air called aerosols create smog, seed clouds, and control how much of the sun's heat makes it through the atmosphere. And yet these particles are the least understood aspect of climate research. Now, two research institutions are working together to tackle the role of aerosols in climate change -- specifically how aerosols from pollution, oceans and wildfires contribute to shifting weather.

The Aerosol Chemistry and Climate Institute will focus on these particulates – rather than the more commonly studied greenhouse gases – to better understand changes in regional climate: as wildfires increase due to altered weather, for example, aerosols from those fires will influence the climate, and so on. The institute is a partnership between the Department of Energy's Pacific Northwest National Laboratory and the University of California, San Diego. Co-directing the institute are PNNL's Charlette Geffen and UC San Diego's Kim Prather.

“In climate science, atmospheric aerosols have been like a locked box. With this institute, we can crack open that box and transform the ability to predict climate change and its impacts,” said Geffen, director of PNNL's Atmospheric Sciences and Global Change division.

One hundred and fifty years of industrialization have altered the earth's climate. And while researchers have made great strides in understanding this effect, aerosols represent one of the cloudiest aspects of atmospheric science. Made up of water, condensed gases, and bits of matter such as soot and dust, aerosols exhibit considerable variability in size and composition. This diversity creates enormous complexity for scientists studying them in the field and modeling how aerosols behave in the atmosphere, making progress slow.

The oceans also play a major role in understanding earth system dynamics. The ocean is a giant sink for water, gases and particulate matter. How the ocean interacts with aerosols and clouds, and how that link contributes to weather are key questions in regional and global climate change research.

(more)



Ocean View: Researchers from PNNL and UC San Diego will build a new atmospheric observatory on the Scripps Institution of Oceanography pier for their first collaboration.

*Courtesy of University of California, San Diego.*

One of the first projects of the new collaboration will be to build an observatory on the pier at the Scripps Institution of Oceanography. Using the observatory, scientists will precisely identify the major sources of pollution in San Diego's air, helping to reveal how aerosols blown in from Asia, Mexico and Los Angeles influence regional climate. These measurements will help scientists better understand how urban pollution mixes with marine aerosols to form clouds and influence weather patterns along the southern California coast.

Global warming is also expected to result in more frequent wildfires, which spew aerosols into the air. This new joint venture will seek to understand the complex weather cycles created by escalating aerosols amid a rising global temperature.

"Changes in aerosols could affect Earth's temperature on a much shorter time scale than greenhouse gases," says Prather, who holds appointments in both the Department of Chemistry and Biochemistry and the Scripps Institution of Oceanography at UC San Diego. "Sorting out the role of aerosols in climate could buy us some time as we grapple with the challenge of controlling levels of those gases."

The institute will draw on complementary work in aerosol chemistry, atmospheric and oceanic science, and climate change modeling at the two organizations. Both groups excel at studying individual aerosol particles' size, shape and chemistry, and have collections of advanced mobile instruments that allow them to study aerosols in various regions of the world.

PNNL scientists have extensive experience in climate modeling, as well as novel instruments at PNNL and EMSL, the DOE's Environmental Molecular Sciences Laboratory located on the PNNL campus. UC San Diego scientists have considerable expertise in ocean chemistry and biology.

"Access to a broader range of instrumentation through this new agreement will help us extend our investigations," said Mark Thiemens, dean of the Division of Physical Sciences at UC San Diego. "The collaboration will strengthen the division's contributions to finding solutions that will help to sustain a healthy global environment."

The collaboration will benefit from atmospheric science contributions of Nobel laureates at UC San Diego. Institute participants Mario Molina and Paul Crutzen received the 1995 Nobel Prize in Chemistry for their work on the formation and breakdown of ozone. (Their co-winner F. Sherwood Rowland can be found at the University of California, Irvine.)

In addition, the institute will foster exchange of staff. The agreement will bring graduate students from UC San Diego to PNNL's campus in southeastern Washington. PNNL researchers will serve as adjunct professors at UC San Diego where they will help advise environmental chemistry and climate science students.

Slated for the first adjunct positions are PNNL researchers Jean Futrell, who studies organics in aerosols, and Dan Cziczo, who studies aerosols that cause clouds to form. Other scientists involved in initial studies include UC San Diego's Thiemens and Lynn Russell, Scripps's V. Ramanathan and PNNL's Phil Rasch, Ruby Leung and Steven Ghan.

For more information, visit the Aerosol Chemistry and Climate Institute website ([www.pnl.gov/atmospheric/programs/acci](http://www.pnl.gov/atmospheric/programs/acci)).

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EMSL, the Environmental Molecular Sciences Laboratory ([www.emsl.pnl.gov](http://www.emsl.pnl.gov)) is a national scientific user facility sponsored by the Department of Energy's Office of Science, Biological and Environmental Research program that is located at Pacific Northwest National Laboratory. EMSL offers an open, collaborative environment for scientific discovery to researchers around the world. EMSL's technical experts and suite of custom and advanced instruments are unmatched. Its integrated computational and experimental capabilities enable researchers to realize fundamental scientific insights and create new technologies.

Pacific Northwest National Laboratory ([www.pnl.gov](http://www.pnl.gov)) is a Department of Energy Office of Science national laboratory where interdisciplinary teams advance science and technology and deliver solutions to America's most intractable problems in energy, national security and the environment. PNNL employs 4,000 staff, has a \$855 million annual budget, and has been managed by Ohio-based Battelle since the lab's inception in 1965.