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Final Report for LDRD project 03-ERD-021:
"Analyzing the Long-Range Transport of Asian
Aerosols Using an LLNL Atmospheric Model and
CAMS/NOAA Measurements from Northern
California"

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LLNL Atmospheric Model and CAMS/NOAA Measurements from
Northern California”**

Philip Cameron-Smith (PI)

Purpose of project

The primary purposes of this project were to (1) improve and validate the LLNL/IMPACT atmospheric chemistry and aerosol transport model, (2) experimentally analyze size- and time-resolved aerosol measurements taken during spring 2001 in Northern California, and (3) understand the origin of dust impacting Northern California.

Summary of Results

Under this project, we (1) more than doubled the resolution of the LLNL-IMPACT global atmospheric chemistry and aerosol model (to 1x1 degree), (2) added an interactive dust emission algorithm to the IMPACT model in order to simulate observed events, (3) added detailed microphysics to the IMPACT model to calculate the size-distribution of aerosols in terms of mass, (4) analyzed the aerosol mass and elemental composition of the size- and time- resolved aerosol measurements made by our UC Davis collaborators, and (5) determined that the majority of the observed soil dust is from intercontinental transport across the Pacific.

A detailed report on this project is in the attached document “Impact of Long-Range Dust Transport on Northern California in Spring 2002” (UCRL-TR-209597), except for the addition of aerosol microphysics, which is covered in the attached document “Implementation of the Missing Aerosol Physics into LLNL IMPACT” (UCRL-TR-209568).

In addition to the technical results, this project has (1) produced a journal article presenting our results that will be submitted shortly, (2) enabled collaborations with UC Davis and the California Air Resources Board, (3) generated a direct DOE request and large computer allocation to simulate the radiative impact of sulfate aerosols at high-resolution over the last 50 years, and (4) contributed to successful LLNL responses to requests for proposals from (a) the DOE Atmospheric Science Program (\$780k), (b) the DOE Atmospheric Radiation Measurement Program (\$720k), and (c) the NASA Global Modeling and Analysis Program (\$525k).

The journal article will be based on the report listed above (“Impact of Long-Range Dust Transport on Northern California in Spring 2002”), and will be submitted to the Journal of Geophysical Research in the near future.

The new collaborative relations developed under this project between LLNL staff and outside scientists include 4 scientists, a post-doc, and a graduate student at U.C. Davis (Tony Wexler, Steve Cliff, Peter Kelly, Tom Cahill, Max Zhang and James Kelly) and one scientist at the California Air Resources Board (Tony VanCuren).