

State of California
AIR RESOURCES BOARD

RESEARCH PROPOSAL

Resolution 09-12

February 26, 2009

Agenda Item No.: 09-2-2

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code sections 39700 through 39705;

WHEREAS, a research proposal, number 2678-263, entitled "Black Carbon and the Regional Climate of California," has been submitted by the University of California, San Diego;

WHEREAS, the Research Division staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

Proposal Number 2678-263, entitled "Black Carbon and the Regional Climate of California," has been submitted by the University of California, San Diego, for a total amount not to exceed \$796,403.

NOW, THEREFORE BE IT RESOLVED that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

Proposal Number 2678-263, entitled "Black Carbon and the Regional Climate of California," has been submitted by the University of California, San Diego, for a total amount not to exceed \$796,403.

BE IT FURTHER RESOLVED that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein, and as described in Attachment A, in an amount not to exceed \$796,403.

I hereby certify that the above is a true and correct copy of Resolution 09-12, as adopted by the Air Resources Board.

/s/

Monica Vejar, Clerk of the Board

ATTACHMENT A**“Black Carbon and the Regional Climate of California”****Background**

Impacts of climate change in California include more frequent and intense heat waves, summer water shortages, and increased wildfires. In December 2008, the California Air Resource Board adopted the nation's most comprehensive greenhouse gas (GHG) emissions plan (Scoping Plan) for meeting a 2020 cap established by the California Global Warming Solutions Act of 2006 (AB 32). Black carbon (BC), as the main light-absorbing component of soot, has also been recognized as a substantial contributor to global warming and to observed regional climate changes. Many scientists contend that reducing BC emissions could offer a sound strategy for mitigating climate change, particularly effective in the short term. Thus, efforts to better understand BC's contribution to climate change is an important area of research.

Objective

The primary objective of this research study is to assess the impact of BC on California's climate through a balanced approach involving observations, data analyses, and modeling studies. The three tasks in this study fall under two broad categories: observational estimates and regional modeling studies with data assimilation.

Methods

The approach consists of three steps: 1) creating an integrated observational data set of BC regional properties including time series of concentrations and composition, vertical profiles, the mixing state, and deposition on snow; 2) estimating the 3-dimensional structure of the radiative forcing of BC and other aerosols; and 3) estimating the impact on climate change and climate feedbacks, using a regional climate model. Specifically, the spatial and temporal variations in the ambient BC concentrations and optical properties throughout California will be evaluated based on multi-platform (satellite, aircraft, and surface) observational data assimilation for 1967 through 2007. Single-particle measurements will be used to make a first approximation of the BC mixing state. The investigators will estimate the total radiative forcing of BC based on the assimilated aerosol properties, and use a coupled regional chemical transport model to determine the anthropogenic fraction of the forcing and attribution to the regional sources. Based on the mass spectral fingerprints from the single particle analyses, which can uniquely identify the sources and degree of atmospheric processing of the soot particles, they will perform source apportionment and make a preliminary estimate of the BC radiative forcing associated with particular fuels (diesel, ships, biomass burning) using a radiation model. With the improvements in the estimated BC radiative forcing constrained by observations, the investigators will make an assessment of the regional climate response, including temperature, precipitation, and snow melt, based on the regional climate model simulations.

Expected Results

Results for this research project will address the question: how important is BC to regional climate change in California, particularly with respect to the recent observed trends of warming, drying and early melt of the snow packs. Secondly, this study will determine the radiative forcing of soot particles from different sources in California. At the conclusion of the research project, a final report will be prepared describing data, model simulations, analyses and results. Journal article preparation will be taken up as soon as results emerge, with manuscript(s) submitted to professional journals that target the air quality and the applied climate community. They will also discuss results at professional conferences and ARB Chair's Air Pollution Seminar.

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Significance to the Board

Policy makers and air quality regulators need to be fully informed of the magnitude and importance of the BC radiative impacts, and the subsequent climate response, in their decision making of control strategies on mitigating the climate effects of BC emissions. The proposed two-year effort combining observational and modeling studies will provide insights on the role of BC aerosols in California's weather and climate, and help remove barriers to decision-making involving BC and climate change policy.

Contractor:

Scripps Institution of Oceanography, University of California, San Diego (UCSD)

Contract Period:

24 months

Principal Investigator (PI):

Professor Veerabhadran Ramanathan

Contract Amount:

796,403

Basis for Indirect Cost Rate:

The State and the UC system have agreed to a ten percent indirect cost rate.

Past Experience with this Principal Investigator:

Dr. Ramanathan will serve as the principal investigator, coordinating and synthesizing the effort of other task leaders. Dr. Ramanathan is Victor Alderson Professor of Applied Ocean Sciences and director of the Center for Atmospheric Sciences at UCSD. He has led several major projects such as the Indian Ocean Experiment and the Earth Radiation Budget Experiment, and is known for his contributions atmospheric aerosol research. He currently chairs the U.S. National Academy of Sciences panel that provides strategic advice to the U.S. Climate Change Science Program, a \$2 billion/year inter-agency research program on climate change. The USCD proposal has also assembled a large number of experts with a wealth of knowledge in performing tasks identified in this study. Thus, the project team is well qualified to undertake this research project.

Prior Research Division Funding to UCSD:

Year	2008	2007	2006
Funding	\$33,779	\$194,304	\$174,998

BUDGET SUMMARY

Contractor: Scripps Institution of Oceanography, University of California, San Diego
Black Carbon and the Regional Climate of California

DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	\$ 273,572
2.	Subcontractors	\$ 462,750
3.	Equipment	\$ 0
4.	Travel and Subsistence	\$ 14,774
5.	Electronic Data Processing	\$ 0
6.	Reproduction/Publication	\$ 800
7.	Mail and Phone	\$ 2,480
8.	Supplies	\$ 1,845
9.	Analyses	\$ 0
10.	Miscellaneous	\$ 10,000

Total Direct Costs \$766,221

INDIRECT COSTS

1.	Overhead	\$ 30,182
2.	General and Administrative Expenses	\$
3.	Other Indirect Costs	\$
4.	Fee or Profit	\$

Total Indirect Costs \$30,182

TOTAL PROJECT COSTS **\$796,403**

Attachment 1**SUBCONTRACTORS' BUDGET SUMMARY**

Subcontractor: University of California Berkeley

Description of subcontractor's responsibility: Estimate the long term variations in black carbon (BC) concentrations in California. Compile an observational database of BC measurements from several sources to be used for data assimilation and calculation of radiative forcing using a coupled regional chemical transport model.

DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	\$	299,488
2.	Subcontractors	\$	0
3.	Equipment	\$	0
4.	Travel and Subsistence	\$	6,150
5.	Electronic Data Processing	\$	0
6.	Reproduction/Publication	\$	0
7.	Mail and Phone	\$	0
8.	Supplies	\$	27,825
9.	Analyses	\$	0
10.	Miscellaneous	\$	<u>20,939</u>
	Total Direct Costs		\$354,402

INDIRECT COSTS

1.	Overhead	\$	33,346
2.	General and Administrative Expenses	\$	0
3.	Other Indirect Costs	\$	0
4.	Fee or Profit	\$	<u>0</u>
	Total Indirect Costs		<u>\$33,346</u>

TOTAL PROJECT COSTS **\$387,748**

Attachment 2**SUBCONTRACTORS' BUDGET SUMMARY**

Subcontractor: Battelle Pacific Northwest Division

Description of subcontractor's responsibility: Perform regional climate simulations with or without the observationally-constrained estimate of black carbon forcing for the western U.S. Analyze the regional simulations, specifically for California, and relate the interannual variability of regional climate of BC forcing to better characterize the impacts of BC on the long term climate change over California.

DIRECT COSTS AND BENEFITS

11.	Labor and Employee Fringe Benefits	\$	30,310	
12.	Subcontractors	\$	0	
13.	Equipment	\$	0	
14.	Travel and Subsistence	\$	1,797	
15.	Electronic Data Processing	\$	0	
16.	Reproduction/Publication	\$	0	
17.	Mail and Phone	\$	0	
18.	Supplies	\$	3,899	
19.	Analyses	\$	0	
20.	Miscellaneous	\$	<u>0</u>	
	Total Direct Costs			\$36,006

INDIRECT COSTS

5.	Overhead	\$	38,994	
6.	General and Administrative Expenses	\$	0	
7.	Other Indirect Costs	\$	0	
8.	Fee or Profit	\$	<u>0</u>	
	Total Indirect Costs			<u>\$38,994</u>

	<u>TOTAL PROJECT COSTS</u>			<u>\$75,000</u>
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