State of California
AIR RESOURCES BOARD

Characterization of PM2.5 Episodes in the San Joaquin Valley Based on Data Collected During the National Aeronautics and Space Administration DISCOVER-AQ Study in the Winter of 2013

RESEARCH PROPOSAL

Resolution 14-24

September 18, 2014

Agenda Item No.: 14-7-1

WHEREAS, the Air Resources Board (ARB) 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 2778-280, titled "Characterization of PM2.5 Episodes in the San Joaquin Valley Based on Data Collected During the National Aeronautics and Space Administration DISCOVER-AQ Study in the Winter of 2013," (Research Proposal) has been submitted by the University of California, Davis for a total amount not to exceed $200,000;

WHEREAS, the Research Division staff has reviewed the Research Proposal and finds that, in accordance with Health and Safety Code section 39701, research is needed to enhance the understanding of PM2.5 formation in the San Joaquin Valley in order to develop air quality attainment strategies**;** and

WHEREAS, in accordance with Health and Safety Code section 39705, the Research Screening Committee has reviewed and recommends funding the Research Proposal.

NOW, THEREFORE BE IT RESOLVED that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39700 through 39705, hereby accepts the recommendations of the Research Screening Committee and Research Division staff and approves the Research Proposal.

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 Proposal as further described in Attachment A, in an amount not to exceed $200,000.

I hereby certify that the above is a true and correct copy of Resolution 14-24 as adopted by the Air Resources Board.

/s/

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Tracy Jensen, Clerk of the Board

ATTACHMENT A

"Characterization of PM2.5 Episodes in the San Joaquin Valley Based on Data Collected During the National Aeronautics and Space Administration DISCOVER-AQ Study in the Winter of 2013"

Background

During wintertime stagnation events, the San Joaquin Valley (SJV) can experience some of the worst PM2.5 air pollution in the state, often exceeding the U.S. Environmental Protection Agency's 24-hour average standard. To help characterize occurrences of high PM2.5 concentrations, the National Aeronautics and Space Administration chose the SJV for one of its Deriving Information on Surface conditions from Column and Vertically Resolved Observations Relevant to Air Quality (DISCOVER-AQ) campaigns – a $30 million study to improve the ability of satellites to measure surface air quality. This measurement program created an extensive set of vertically resolved aircraft measurements of PM2.5 and important gaseous species for the SJV in January/February 2013. The aircraft measurements were complemented by a network of ground sites at which basic information on PM2.5 concentrations was collected and a "supersite" at ARB's Fresno-Garland monitoring station which provided more detailed measurements of PM2.5 composition and properties. Atmospheric conditions during the campaign were optimal for the study of air quality: two episodes occurred in which PM2.5 concentrations reached high levels and then dissipated.

Objective

The objective of this project is to conduct advanced analysis of aircraft and supersite measurements made during DISCOVER-AQ with the goal of improving the conceptual model of the origin, evolution, and spatial distribution of PM2.5 in the SJV. In addition, the researchers will work with ARB modeling staff on photochemical modeling of two PM2.5 episodes. Comparison of the data analysis results with ARB's modeling will help identify any deficiencies in the modeling and conceptual model of PM episode formation in the SJV.

Methods

Using the unique set of air pollution and meteorological measurements from surface sites and the P3-B aircraft, the researchers will investigate the relative importance of different factors that contributed to the extended PM episodes in the SJV during the DISCOVER-AQ field campaign; these include primary emissions (e.g., motor vehicles, wood burning), physical processes (e.g., stagnation), and chemical processes (e.g., fog chemistry). The extent to which mixing of PM, or PM precursors, formed aloft influences surface PM concentrations will be explored using the temporal evolution of vertical PM2.5 distributions. Measurements of particle composition, or surrogates of composition, will be used to identify the sources of aloft PM. Ground-based measurements, especially High Resolution Time-of-Flight Aerosol Mass Spectrometer measurements from the Fresno-Garland supersite will be used to understand diurnal patterns of particle composition and to assess the extent to which aloft aerosol is related to surface PM2.5 properties and concentrations.

Expected Results
The expected results from this work include identification of strengths and weaknesses in ARB's conceptual model of PM episode formation in the SJV and improvement of the conceptual model for the origin, evolution and spatial distribution of PM2.5 in the SJV.

Significance to the Board
This contract is vital to the development of effective PM2.5 attainment strategies in the SJV. The enhanced understanding of PM2.5 formation in the SJV will be of immediate value for developing air quality attainment strategies.

Contractor:
University of California, Davis

Contract Period:
30 months

Principal Investigator (PI):
Christopher Cappa, Ph.D.

Contract Amount:
$200,000

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:
Professor Cappa has extensive experience in the characterization and understanding of aerosol physical, optical, and chemical properties from laboratory and field observations, and in laboratory and model studies of organic aerosol formation and transformations. As a participant in the DISCOVER-AQ project in the SJV, he deployed a dual cavity ringdown photoacoustic spectrometer instrument at the ground site in Fresno.

Prior Research Division Funding to the University of California, Davis:

Year	2013	2012	2011
Funding	$1,131,716	$4,949,363	$1,394,560

B U D G E T S U M M A R Y

Contractor: University of California, Davis

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DIRECT COSTS AND BENEFITS				
1.	Labor and Employee Fringe Benefits	$	176,021	
2.	Subcontractors	$	0	
3.	Equipment	$	0	
4.	Travel and Subsistence	$	2,000	
5.	Electronic Data Processing	$	0	
6.	Reproduction/Publication	$	0	
7.	Mail and Phone	$	0	
8.	Supplies	$	0	
9.	Analyses	$	0	
10.	Miscellaneous	$	3,797	
	Total Direct Costs			$181,818
INDIRECT COSTS				
1.	Overhead	$	18,182	
2.	General and Administrative Expenses	$	0	
3.	Other Indirect Costs	$	0	
4.	Fee or Profit	$	0	
	Total Indirect Costs			$ 18,182
TOTAL PROJECT COSTS				**$200,000**