State of California
AIR RESOURCES BOARD

RESEARCH PROPOSAL

Resolution 06-31

November 16, 2006

Agenda Item No.: 06-10-2

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; and

WHEREAS, a research proposal, number 2618-253, entitled "Analysis of Satellite Measurements to Improve California's Models for O_3 and PM" has been submitted by the University of California, Berkeley; and

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 2618-253 entitled, "Analysis of Satellite Measurements to Improve California's Models for O_3 and PM," has been submitted by the University of California, Berkeley, for a total amount not to exceed $350,724.

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 2618-253, entitled "Analysis of Satellite Measurements to Improve California's Models for O_3 and PM," has been submitted by Prof. Ronald Cohen, University of California, Berkeley, for a total amount not to exceed $350,724;

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 $350,724.

I hereby certify that the above is a true and correct copy of Resolution 06-31, as adopted by the Air Resources Board.

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Lori Andreoni, Clerk of the Board

ATTACHMENT A

"Analysis of Satellite Measurements to Improve California's Models for O_3 and PM"

Background

Spatially and temporally resolved emissions data are needed to run air quality models, devise emission control strategies, and evaluate environmental justice. The costs and commitment of highly skilled labor involved in developing such inventories by conventional methods has limited their preparation to a few air basins and to brief episodes associated with exceedances of Federal or State Air Quality Standards. Contemporary modeling must address not only these traditional exceedance event analyses, but now also needs to model long periods over large areas to evaluate compliance with 8-hr, 24-hr, and annual standards. These new needs demand new methods to develop temporally and spatially resolved emissions data for large areas and long periods (months, seasons, or years). Recent advances in satellite sensing of air pollutants offer one potential means to efficiently map emissions with high temporal and spatial resolution. This project will test whether current satellite data are adequate for the task.

Objective

The objective of this project is to test the utility of low resolution satellite measurements of total column nitrogen dioxide (NO_2), carbon dioxide (CO_2), formaldehyde (H_2CO), glyoxal (CHOCHO), and aerosols to map emissions at scales useful for regional and urban air quality monitoring and modeling.

Methods

The project will use total column nitrogen dioxide (NO_2), carbon dioxide (CO_2), formaldehyde (H_2CO), glyoxal (CHOCHO), and aerosols measured by the Scanning Imaging Absorption Spectrometer for Atmospheric Chartography (SCIAMACHY) instrument on the European Space Agency ENVISAT satellite and the Ozone Mapping Instrument (OMI) on the U.S. Terra satellite. The experimenters will refine the spatial resolution of the data and use modeling to convert column burden to emission fluxes. Raw satellite column data with varying resolution and pixel location will be mapped onto a higher resolution grid, and higher resolution column concentration maps generated as migrating large pixels capture or miss spatially localized column concentrations. The spatially resolved column data will then be converted to ground level concentrations by using local meteorological data and an air quality model to stratify the column into a presumed mixing layer, and to invert wind drift and dispersion to estimate NO_x emission fluxes.

Expected Results

The investigators will report to ARB the spatially and temporally (day of week and season) resolved NO_x inventory created from the satellite observations, discuss the

resolution achieved and uncertainties in the results, and compare the satellite-derived inventory to current "conventional" inventories.

Significance to the Board
Emissions inventories are one of the key tools used in air quality regulation. However, development of highly spatially or temporally resolved emission inventories are very labor intensive, so such inventories exist only for limited times and places in California. Satellite-based methods could be powerful tools for building or validating such inventories. The objective of this project is to test the utility of satellite measurements in the construction of a NO_x emission inventory. If successful, this project will produce an emission inventory for NO_x with high spatial resolution and near complete spatial coverage. It could also lay the groundwork for application of these techniques to other chemical species observed from space.

Contractor:
University of California, Berkeley

Contract Period:
30 months

Principal Investigator (PI):
Professor Ronald Cohen

Contract Amount:
$350,724

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:
ARB Research Staff has had extensive interaction with Professor Cohen both as a contractor and collaborator. Professor Cohen's previous projects have been successfully completed with valuable research information generated. ARB believes that Professor Cohen is well qualified to perform the research as proposed.

Prior Research Division Funding to UCB:

Year	2005	2004	2003
Funding	$1,829,446*	$920,205	$715,194*

* The California Energy Commission contributed a total of $1,003,850 to projects during these fiscal years.

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

University of California, Berkeley

Analysis of Satellite Measurements to Improve California's Models for O_3 and PM

DIRECT COSTS AND BENEFITS			
1.	Labor and Employee Fringe Benefits	$231,976	
2.	Subcontractors	$ 0	
3.	Equipment	$ 0	
4.	Travel and Subsistence	$ 4,625	
5.	Electronic Data Processing	$ 24,000	
6.	Reproduction/Publication	$ 1,000	
7.	Mail and Phone	$ 1,000	
8.	Supplies	$ 3,500	
9.	Analyses	$ 0	
10.	Miscellaneous	$ 57,513[1]	
	Total Direct Costs		$323,614
INDIRECT COSTS			
1.	Overhead	$27,110	
2.	General and Administrative Expenses	$ 0	
3.	Other Indirect Costs	$ 0	
4.	Fee or Profit	$ 0	
	Total Indirect Costs		$ 27,110
TOTAL PROJECT COSTS			**$350,724**

[1] Miscellaneous costs include publication costs and two years of non-resident graduate, student registration fees.