State of California
AIR RESOURCES BOARD

RESEARCH PROPOSAL

Resolution 09-14

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 2674-263, entitled "Nocturnal Chemistry in the Urban Boundary Layer of Los Angeles," has been submitted by the University of California, Los Angeles;

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 2674-263 entitled "Nocturnal Chemistry in the Urban Boundary Layer of Los Angeles," submitted by the University of California, Los Angeles, for a total amount not to exceed $289,090.

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 2674-263 entitled "Nocturnal Chemistry in the Urban Boundary Layer of Los Angeles," submitted by the University of California, Los Angeles, for a total amount not to exceed $289,090.

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 $289,0970.

I hereby certify that the above is a true and correct copy of Resolution 09-14, as adopted by the Air Resources Board.

Monica Vejar

Monica Vejar, Clerk of the Board

ATTACHMENT A

"Nocturnal Chemistry in the Urban Boundary Layer of Los Angeles"

Background

The proposed project is an integral component of the CalNex 2010 Study, a major field campaign planned by ARB and the National Oceanic and Atmospheric Administration, that will address important gaps in the understanding of nocturnal chemical and meteorological processes. While the hydroxyl radical dominates daytime chemical processes in the atmosphere, its concentration falls to near zero during nighttime. Its counterpart, the nitrate radical (NO_3), which is formed predominantly by the reaction of ozone with nitrogen dioxide (NO_2), drives chemical reactions during the night. Several key nocturnal processes, however, remain poorly understood. For example, dinitrogen pentoxide (N_2O_5), which acts as a storage reservoir for NO_3, is hydrolyzed on water droplets and aerosols to form nitric acid; the rate of this process is highly uncertain and depends on the substrate. An additional challenge in the understanding and description of nocturnal processes is the weak mixing of the atmosphere caused by radiative cooling of the ground at night. This causes stratification in the atmosphere and allows pollutants emitted at ground level to accumulate and form large vertical gradients in concentration. The proposed project will address several important, but poorly understood, areas of nocturnal urban chemistry by conducting field observations during CalNex 2010 of the vertical structure of key nocturnal chemical species at a site near downtown Los Angeles.

Objectives

The proposed research has the following objectives:

1. Measure the vertical concentration distributions ozone, NO_2, NO_3, and HONO, as well as HCHO, SO_2, and glyoxal in the lowest 200 – 300 m of the atmosphere.
2. Estimate the vertical nocturnal budgets of ozone and NO_X using known chemical constraints and 1-D modeling.
3. Investigate the formation of HONO in the South Coast Air Basin and develop a parameterization for it for use in urban air quality models.
4. Study the impact of nocturnal chemistry and species on daytime ozone and PM formation using measurements coupled with 1D modeling.

Methods

The central component of the proposed project is the setup of an urban field site in the Los Angeles region during the 2010 CalNex study. Professor Stutz's long-path DOAS instrument will provide continuous measurements of the vertical distribution of ozone, NO_2, NO_3, HONO, HCHO, glyoxal, SO_2, and meteorological in-situ sensors placed at different altitudes will supplement the DOAS measurements. The suite of measurements will be used both directly to validate the urban airshed models used by ARB and as constraints in Professor Stutz's 1D chemical transport model, which will provide further insights into various aspects of coupling between chemistry and meteorology that occurs in the South Coast Air Basin at night.

Expected Results
The expected results from this work are a greatly improved understanding of nocturnal chemistry and meteorology and of its impact on daytime ozone and particle formation in urban atmospheres.

Significance to the Board
This work will give important, new information concerning nocturnal tropospheric chemistry and ambient vertical concentrations in the South Coast Air Basin. This information is fundamental to correctly modeling the formation of ozone and secondary aerosols, and hence to assess various strategies for air pollution controls.

Contractor:
University of California, Los Angeles (UCLA)

Contract Period:
36 months

Principal Investigator (PI):
Jochen Stutz

Contract Amount:
$280,090

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 Jochen Stutz has recently successfully completed work for ARB project, 05-307, "Impact of Reactive Halogens on the Air Quality in California Coastal Areas." For this project, Professor Stutz carried out field site setup, ambient measurements, data analysis and final report writing on budget and within the originally planned time frame. Staff have great confidence that Professor Stutz's proposed study will be successful and yield new and important information about nocturnal chemistry in urban areas.

Prior Research Division Funding to UCLA:

Year	2008	2007	2006
Funding	$61,959	$616,171	$348,990

BUDGET SUMMARY

Contractor: University of California, Los Angeles

Nocturnal Chemistry in the Urban Boundary Layer of Los Angeles

DIRECT COSTS AND BENEFITS			
1.	Labor and Employee Fringe Benefits	$ 223,914	
2.	Subcontractors	$ 0	
3.	Equipment	$ 12,000	
4.	Travel and Subsistence	$ 2,839	
5.	Electronic Data Processing	$ 946	
6.	Reproduction/Publication	$ 631	
7.	Mail and Phone	$ 631	
8.	Supplies	$ 1,576	
9.	Analyses	$ 2,000	
10.	Miscellaneous	$ 22,000	
	Total Direct Costs		$266,537
INDIRECT COSTS			
1.	Overhead	$ 22,553	
2.	General and Administrative Expenses	$ 0	
3.	Other Indirect Costs	$ 0	
4.	Fee or Profit	$ 0	
	Total Indirect Costs		$22,553
TOTAL PROJECT COSTS			**$289,090**