**PROPOSED**

State of California
AIR RESOURCES BOARD

RESEARCH PROPOSAL

Resolution 12-3

January 26, 2012

Agenda Item No.: 12-1-1

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 2731-272, entitled "Modeling the Formation and Evolution of Secondary Organic Aerosol during CalNex 2010," has been submitted by the University of Colorado, Boulder;

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

WHEREAS, the Air Resources Board will fund this proposal for a total amount $350,000; and

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

> Proposal Number 2731-272 entitled "Modeling the Formation and Evolution of Secondary Organic Aerosol during CalNex 2010," submitted by the University of Colorado, Boulder, for a total amount not to exceed $350,000.

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 2731-272 entitled "Modeling the Formation and Evolution of Secondary Organic Aerosol during CalNex 2010," submitted by the University of Colorado, Boulder for a total amount not to exceed $350,000.

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 $350,000.

## ATTACHMENT A

## "Modeling the Formation and Evolution of Secondary Organic Aerosol during CalNex 2010"

### Background

The ability of regulators to develop effective control strategies for particulate matter rests on their ability to accurately predict effects of alternative emission control scenarios on ambient air quality. For organic aerosols, and especially secondary organic aerosols (SOA), this skill is compromised by the poor performance of current SOA models in predicting the sources, evolution and concentrations of SOA. In general, traditional 3-D photochemical models that use estimates of SOA formation from oxidation of volatile organic compound (VOC) precursors underestimate ambient organic aerosol concentrations observed with aerosol mass spectrometers, typically by a factor of two to three.

Important steps in updating and improving OA models for California were taken by the Jimenez Group during the CalNex LA 2010 field campaign, where they deployed a high resolution aerosol mass spectrometer (HR-AMS) system and complementary instrumentation (Thermal Denuder and Potential Aerosol Mass (PAM) instruments) to the Pasadena site in order to better characterize ambient aerosols. In addition to the Jimenez Group's instruments, approximately 70 additional instruments were deployed by other groups at the site, making this one of the largest studies of aerosols and their precursors ever carried out in California. These data will form the constraints from which OA modeling improvements will be based.

### Objective

The objective of the project is to improve models for sources, composition and evolution of organic aerosols in California. This will be accomplished through evaluation of a variety of state-of-the-science SOA models with AMS and supporting measurements taken during the CalNex 2010 field study and adjustments to the parameters in these models to improve their accuracy.

### Methods

The proposed project will consisted of five tasks. First a pseudo-Lagrangian box model will be developed for the Pasadena supersite that incorporates state-of-the-science SOA formation estimates from VOCs and primary semivolatile and intermediate VOCs. Several different descriptions of SOA formation will be tested. The results from these simulations will be compared with CalNex field measurements. Next 3-D modeling of the Los Angeles region will be carried out using the WRF/Chem community model with a nested 4 km grid domain. For this work, a less computationally intensive approach will be used to describe SOA formation. The potential SOA measured in different air masses will be compared with model estimates of total SOA formation. Analysis of high resolution aerosol mass-spectroscopy data from the Pasadena site will be performed. This extended analysis will provide better characterization of the organic aerosol classes for the Pasadena site and correspondingly better constraints on SOA formation. Lastly, the impact of different emission reductions on organic aerosols and PM2.5

concentrations will be explored using the most accurate models developed through earlier tasks.

**Expected Results**
The results of this study will be used to help identify sources of SOA and improve models that quantitatively predict the evolution of SOA.

**Significance to the Board**
The improvements to SOA characterization and modeling as a result of this research will aid in the development of effective strategies to reduce SOA pollution in California and in predictions of future climate change.

**Contractor:**
University of Colorado, Boulder

**Contract Period:**
36 months

**Principal Investigator (PI):**
Professor Jose-Luis Jimenez

**Contract Amount:**
$350,000

**Basis for Indirect Cost Rate:**
The State and the University of Colorado, Boulder have agreed to a ten percent indirect cost rate.

**Past Experience with this Principal Investigator:**
Professor Jose Jimenez was a co-PI for the Pasadena supersite during CalNex 2010. He is recognized as an expert in organic aerosols and has published numerous papers on this topic.

**Prior Research Division Funding to University of Colorado, Boulder**

| Year | 2011 | 2010 | 2009 |
|---|---|---|---|
| Funding | $0 | $0 | $834,999 |

# BUDGET SUMMARY

Contractor: University of Colorado at Boulder

"Modeling the Formation and Evolution of Secondary Organic Aerosol during CalNex 2010"

| | | | |
|---|---|---|---|
| **DIRECT COSTS AND BENEFITS** | | | |
| 1. | Labor and Employee Fringe Benefits | $ 285,363 | |
| 2. | Subcontractors | $ 0 | |
| 3. | Equipment | $ 0 | |
| 4. | Travel and Subsistence | $ 10,651 | |
| 5. | Electronic Data Processing | $ 858 | |
| 6. | Reproduction/Publication | $ 280 | |
| 7. | Mail and Phone | $ 586 | |
| 8. | Supplies | $ 6,525 | |
| 9. | Analyses | $ 0 | |
| 10. | Miscellaneous | $ 14,906 | |
| | Total Direct Costs | | $319,169 |
| **INDIRECT COSTS** | | | |
| 1. | Overhead | $ 30,831 | |
| 2. | General and Administrative Expenses | $ 0 | |
| 3. | Other Indirect Costs | $ 0 | |
| 4. | Fee or Profit | $ 0 | |
| | Total Indirect Costs | | $ 30,831 |
| **TOTAL PROJECT COSTS** | | | **$350,000** |