State of California
AIR RESOURCES BOARD

Research Screening Committee Meeting
Cal/EPA Headquarters Building
1001 I Street
Conference Room 510
Sacramento, California 95814
(916) 445-0753

November 12, 2009
9:00 a.m.

ADVANCE AGENDA

Interagency Agreements

1. "Aircraft Measurements of the Vertical Mixing State of Soot Aerosols in California," University of California, San Diego, $400,000, Proposal No. 2689-265

   Particles in the atmosphere impact human health and climate, the former by inhalation, and the latter primarily by modifying radiative transfer in the atmosphere. Human health impacts occur in the lowest layers of the atmosphere, and are mediated by particle concentration, chemical composition, and size distribution. Climate effects are also modulated by particle concentration, chemical composition, and size distribution, but radiation effects also are driven by dry air light scattering by particles, the interaction between clouds and particles ("cloud brightening"), and by light absorption by particles. Unlike health effects, which are similar wherever the particles are inhaled, the location of the particles in the atmospheric column can modify the climate effects. This project will help meet one of the goals of the CalNex program, that of looking at both air quality and climate effects of air pollution over California, by adding measurements of particle properties from an aircraft. This will be the first time that these types of measurements will be made from an aircraft in California. Addition of this project to CalNex will be a significant improvement to efforts to characterize the effects of particles on air quality and climate in California.

2. "Improved Characterization of Primary and Secondary Carbonaceous Particles," University of California, San Diego, $255,000, Proposal No. 2681-265

   Carbonaceous compounds can constitute the largest fraction of fine particulate matter (PM2.5) in many regions, but their composition is usually the least understood. Better understanding and characterization of carbonaceous aerosols through improved measurements are needed in order to identify their emission sources and impacts on health, visibility, and climate. The proposed research will include measurements of organic mass (OM) concentration by Aerosol Mass Spectroscopy and Fourier transform infrared spectroscopy, as well as x-ray

Fluorescence for elemental tracers. Since emissions of volatile organic compounds (VOC) can produce organic PM by forming secondary organic aerosol (SOA), simultaneous measurements of VOC and organic PM will be performed to investigate the discrepancies between emission inventories and atmospheric measurements. These techniques allow not only quantitative characterization of the organic composition of fine aerosol, but also identification of source categories and quantitative source contributions through the use of elemental tracers and positive matrix factorization analysis. This research is expected to provide useful new measurements and statistical analysis for developing air quality attainment strategies in California and for understanding the pathways leading to SOA that may also be of importance in climate change. The better characterization of organic carbon will also improve our ability to identify organic functional groups in particles that reduce air quality and harm health.

Standard Agreements

3. "AMAX-DOAS Trace Gas Column Observations from Research Aircraft Over California," University of Colorado at Boulder, $549,999, Proposal No. 2687-265

   The proposed research is a key component of the CalNex 2010 field campaign planned by ARB and National Oceanic and Atmospheric Administration (NOAA), that will improve the understanding and characterization of sources and chemical processing of gaseous species and organic aerosols throughout California with emphasis on the Southern South Coast Air Basin (SoCAB) and San Joaquin Valley (SJV). This proposed project is to deploy the University of Colorado Airborne Multi AXis DOAS instrument (CU AMAXDOAS) on the NOAA Optical Remote Sensing TwinOtter research aircraft during the eight-week CalNex period and following for an additional four weeks. The AMAXDOAS will measure pollutant concentrations in and above the boundary layer, probing directly the horizontal and vertical distributions of NO_2, HCHO, O_4, and possibly glyoxal boundary layer columns over the SoCAB, SJV, and ocean. The measurement results will be used to test and constrain atmospheric models, validate satellite measurements, and provide improvements for models and validated satellite data for better management of air resources. The project will address aspects of emissions strength and atmospheric chemistry which are not only important scientifically but also of practical concern to the ARB for management of air quality.

Draft Final Reports

4. "Ultrafine Particle Concentrations in Schoolrooms and Homes," University of California, Berkeley, $300,000, Contract No. 05-305

   Ultrafine particles (UFP) may harm human health, but little is known about exposures and factors that play a role in causing elevated concentrations and exposures. This study aimed to increase the knowledge base regarding concentrations of UFPs in houses and classrooms and to better understand the

factors influencing UFP levels in those indoor environments. Working in the San Francisco Bay Area, California, the researchers measured particle number concentrations; studied the sources of UFPs in houses and classrooms, including vehicle emissions from nearby major roadways and cooking and cleaning activities; measured co-pollutants; and assessed human exposure from UFPs indoors. The researchers identified four key findings: 1) UFP levels were much higher in indoor environments when occupants were present than when they were not; 2) the portion of indoor UFP entering from the outdoors tends to be higher in classrooms than in homes; 3) indoor emission sources are important contributors to particle number levels in houses but not in classrooms; and 4) the daily average particle number exposures per person were much higher in houses than in classrooms. While important observations were made in this initial study of UFP in California homes and schools, the small single-location sample size does not fully represent conditions found in the many diverse types of homes, occupant activities, and regional differences across the state. The results suggest that ARB should consider possible future actions to reduce ultrafine particles when occupants are in houses and classrooms, methods to reduce indoor emissions from cooking appliances in houses, and approaches to reduce infiltration of outdoor particles into classrooms from outdoor sources.

5. “Impact of Reactive Halogen Species on the Air Quality in California Coastal Areas,” University of California, Los Angeles, $166,964, Contract No. 05-307

   Air pollution in coastal areas remains an important challenge in California. In current airshed models, which form the basis in the development of effective air pollution mitigation strategies, the chemistry of air pollution is driven by hydroxyl radicals during the day and nitrate radicals during the night. Much less attention has been paid to the interaction between urban air pollution chemistry and chemical species of marine and coastal origins - in particular, reactive halogen species (RHS). The recently completed project, dubbed the California Halogen Field Experiment (CalHal), addressed this gap in knowledge by conducting field observations of RHS, their precursors, and their reaction products at Zuma Beach in Malibu, California. In this study, co-funded by the Coordinating Research Council (CRC), four groups, each with a unique expertise in RHS measurement, deployed a comprehensive set of instruments for the study. The measurements clearly showed the presence of RHS and their precursors at the Zuma site and in the SoCAB. Modeling results showed that the RHS concentrations were high enough to impact ozone levels in the range 3–8 percent. Further work is necessary to lower the uncertainties in the understanding of this chemistry and to construct suitable mechanisms for airshed models.

Interim Report

6. ”Deployment of a Novel Aerosol Mobility/Mass Spectrometer for Quantitative Chemical Analysis of Organic Aerosols from Mobile Sources,” University of Southern California, $245,339, Contract No. 06-330

   This interim report for Phase 1 of a project on the deployment of a novel chemical ionization mobility/mass spectrometer documents progress made in its construction. Several obstacles were encountered in the development of the unit, which have caused significant delays in testing and field deployment. Currently, a thermal desorption, chemical ionization spectrometer has been assembled and tested; and an ion mobility cell has been developed in tandem. The completed instrument should provide unique in-situ, quantitative measurements of organic compounds in ambient fine and ultrafine aerosols, as well as in gases. Plans for the next phase of the project include incorporating the mobility cell with the mass spectrometer, further testing, and deploying the unit in several field studies. This work promises significant contributions to the understanding of the chemical composition and evolution of aerosols in the SoCAB, and to existing health, air pollutant formation, and climate change studies.