Abstract: Milk consumption has a number of health benefits. Adding one serving of fluid milk to the current U.S. consumption may result in human health avoided impacts of 1.8 µDALY/serving (95% CI: 0.6-3.2) concerning colorectal cancer, stroke, and prostate cancer. At the same time there may be a substantial environmental health impact due to PM2.5 associated with the fluid milk life cycle. This presentation aims to quantify exposure and impacts of primary and secondary PM2.5 formation associated with dairy production. We first determine the emissions of primary PM2.5 and NH3, NOx and SO2 as precursors per serving of milk. We then estimate the PM2.5 intake fraction for rural area to determine the corresponding intake per milk serving, focusing on the marginal increase in secondary PM2.5 as a function of background precursor concentrations. We finally use epidemiologically-based dose-response to calculate human health impacts. The life cycle impact of an additional milk serving of the corresponding increased consumption estimated at 0.3 µDALY/serving (95% CI: 0.05-0.8). About 80% of this impact can be attributed to NH3 emissions that contribute to secondary PM2.5 formation by reacting with SO2 and NOx. Depending on the various precursor concentrations, we expect spatial differences in secondary PM2.5 formation. We therefore perform a spatialized analysis of the marginal increase in secondary PM2.5 exposure and impact linked to NH3 emissions and we contrast marginal increase in secondary PM2.5 in rural areas, which are primarily NOx and SO2 limited, and in close-to-urban areas, which are primarily NH3 limited. We will present a multi-scale emissions-to-health PM2.5 impact model, in order to quantify the change in PM2.5 human exposure levels for different archetypes. The findings allow for a better understanding and characterization of the total PM2.5 human exposure and the related health impact both locally and long distance associated with increased milk production.

Keywords: B-particulate matter, A-life cycle analysis, A-exposure models

Th-O-E2-02

Reactive Oxygen Species Associated with Water-Soluble PM2.5 in the Southeastern United States - Implications for Health Effects of Ambient Atmospheric Aerosols

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Abstract: The capability of ambient aerosols to generate reactive oxygen species (ROS) is identified as the major mechanism causing their adverse health effects. We assessed the potential of the water-soluble fraction of atmospheric fine aerosols in the southeastern US to generate ROS. ROS-generation potential of the aerosols was quantified by the dithiothreitol (DTT) assay and involved analysis of particulate matter (PM) extracted from high-volume quartz filters (23 h integrated daily samples) collected for one year at various sites in different environmental settings in the southeast, including four urban sites (three in Atlanta and one in Alabama), and two rural sites (Yorkville and Centerville). Water-soluble PM extracts were further separated into the hydrophobic and hydrophilic fractions using a C-18 column, and both fractions were analyzed for the ROS activity. Organic aerosol composition was measured at selected sites using a High-Resolution Aerosol Mass Spectrophotometer. Positive matrix factorization (PMF) was applied to apportion the relative contribution of various sources to the ROS generation potential of water-soluble PM2.5. PMF results showed that vehicular emissions contribute uniformly throughout the year (12 to 25 %), while secondary oxidation processes dominated the ROS activity in summer (46 %) and biomass burning in winter (47 %). Road dust was significant only during drier periods (~12 % in summer and fall). Biomass burning and oxygenated organic aerosols were most consistently linked with ROS, with intrinsic ROS activities of 151±20 and 36±22 pmol/min/µg, respectively. The chemical species contributing to the ROS were humic-like substances (HULIS), which are abundantly emitted in biomass burning and are formed secondarily in the aged aerosols. The ubiquitous nature of these two major sources of PM-associated ROS suggests widespread population exposures to aerosol components that have the ability to catalyze the production of oxidants in vivo.

Keywords: B-particulate matter, C-air, Reactive Oxygen Species, Biomass Burning, Secondary Organic Aerosols

Th-O-E2-03

Noise Based Microscopic Land-Use Regression Model resolves the Instantaneous Personal Exposure to Black Carbon

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Abstract: Traffic simultaneously emits noise and air pollution and this results in a high probability of correlation between the two environmental burdens in all micro-environments. Exposure to traffic related particulate matter, and especially Black Carbon and UFP, has a strong distance to source effect. This requires high-resolution models to capture the local traffic density and local traffic dynamics. Traffic data is scarcely available in the required spatial and temporal resolution. We propose an alternative method by using noise measurements and noise maps to quantify the local traffic flow, speed and dynamics. Actual noise exposure and the spectral decomposition of the noise exposure proved successful to predict exposure of cyclists in Europe and India for BC and UFP. In the next phase, the approach is extended to in-vehicle exposure and indoor exposure by using noise maps as an alternative layer for the traffic assessments. It improves spatial resolution of the particulate matter estimates by introducing the strong distance to source effects of noise exposure. Generalized additive models fit the non-linear behavior of the BC exposure based on noise as a proxy of traffic, background concentration and local dispersion effects. Microscopic land-use regression (µLUR) techniques map the in-vehicle exposure and indoor exposure successfully and are sensitive to instantaneous meteorological conditions and background concentrations. An external participatory sensing campaign acts as an independent validation set. The daily BC exposure pattern depends on the personal diurnal time-activity pattern and is estimated with µLUR models at home, in-traffic and at the destinations. The external validation reaches a correlation of 0.7 but lacks data to resolve the model for the high exposed dwellings. Resolving the complex behavior of local traffic emission and related I/O ratios will require more combined noise and indoor air pollution measurements at the high exposed dwellings.

Keywords: A-activity patterns, A-exposure models, A-geospatial analysis/GIS, B-nanoparticles, B-particulate matter

Th-O-F2: Mold and Microbes

Th-O-F2-01

Fecal Coliform and E. coli Concentrations in Effluent-Dominated Streams of the Upper Santa Cruz Watershed

Y. Yuan, E. Sanders, A. Pitchford; EPA, Las Vegas, NV

Withdrawn

Th-O-F2-02

Application of different models to estimate inhalation exposures to mold spores in a multi-apartment residential green building

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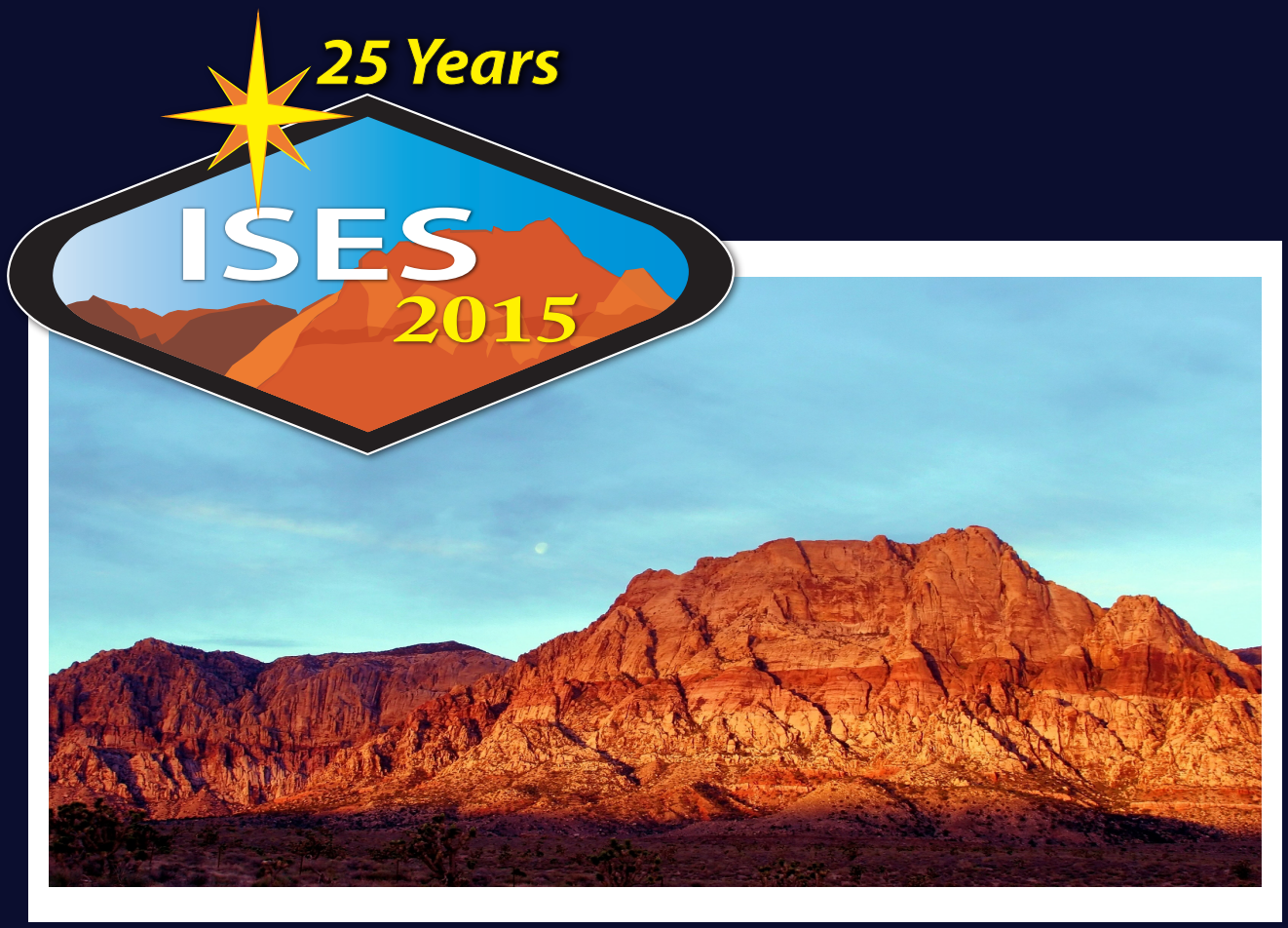

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