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Project Information Form

Project Title	1. Measurement and Estimation of Particulate Matter Concentration on Highways in Southern California 2. Characterization of Diesel Emissions using In-door Smog Chamber
University	UC Riverside
Principal Investigator	Heejung Jung and Guoyuan Wu (dissertation awardee: Liem Pham)
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Funding Source(s) and Amounts Provided (by each agency or organization)	
Total Project Cost	$20,000
Agency ID or Contract Number	
Start and End Dates	Jan 2016 – Oct 2017
Brief Description of Research Project	1. This study will further explore the connection between the *measurement-based* approach for in-/near-source PM concentration assessment and *model-based* approach for on-road PM emissions assessment in Southern California; and identify the key traffic-related factors and their impacts on in-/near-source PM concentration. In this work, we built a mobile monitoring platform (on a probe vehicle) to collect on-road PM concentration data, and developed a comprehensive database to fuse information from various sources (including probe vehicle activity, traffic conditions, PM concentration measurement and PM emissions inventory) for modeling and analysis purpose. We will develop an integrated database by fusing a variety of data sources. Based on the archived data, we will investigate the relationship between traffic conditions and highway PM concentration. The proposed innovative tool, so-called PM Emissions Contour plot which can provide more in-depth insight for assessing in-source PM emissions (e.g., on highways). 2. The second part of this proposal is to study fuel effects on secondary organic aerosol formation (SOA). Biodiesel will be chosen as one of the fuel source because it is a sustainable, renewable, and cleaner emission energy source. As a result, there has been a steady increase of interest in using blended petrodiesel and biodiesel. However, there is a lack of studies to explain its SOA formation potential and contribution to the overall air pollution. Therefore, it is important to investigate and study the fuel effects on SOA in the battle to reduce air pollution.

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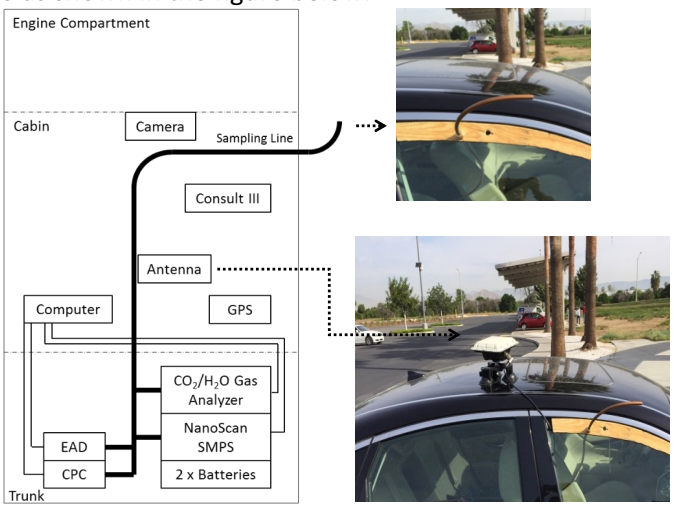
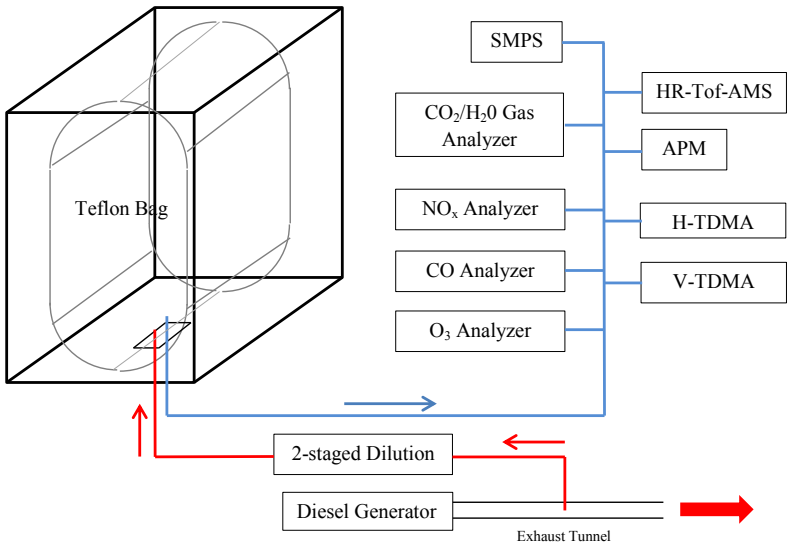
Describe Implementation of Research Outcomes (or why not implemented) (Attach Any Photos)	1. The mobile platform was installed in an Infinity M37 gasoline vehicle. The direction of the sampling probe was in line with the direction of the vehicle motion on the front passenger side. Particle concentration, size distribution, and active surface area will be measured. The mobile platform will be collecting from Highway 91 and 710 to represent commuter and heavy duty fleet composition respectively. The mobile platform will be tracked by a GPS as shown in the figure below.



2. Diesel exhaust will be diluted to quench any further chemical reactions. The diluted exhausts are transferred to the 12 m^3 FEP Teflon bag for aging and photochemical reactions to resemble realistic environment.



Particle size, concentration, and composition will be measures along with gas measurements such as NOx, CO, O_3, and CO_2. SOA yield can be determined from these measurements.

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Impacts/Benefits of Implementation (actual, not anticipated)	1. The benefit of this study is that the proposed model can predict the PM emission on highway with high correlation. It is a useful tool for assessing pollution for people who live near highways. 2. Since many heavy duty vehicles used in transportation are primarily powered by diesel engines, a slight regulatory change or an improvement on emission control devices can lead to a significant reduction in air pollution. Therefore, a fundamental understanding of how SOA formation is affected by diesel engines operating conditions, fuel types, and cetane index can give insights to the scientific community, but also has a significant impact on the environment, public health, and future transportation policies.
Web Links • Reports • Project website	https://ncst.ucdavis.edu/research/dissertation/