

1.119 In-use heavy-duty diesel vehicle emission measurements used to investigate the durability of diesel particulate filters .

Early Career Scientist

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Abstract:

Heavy-duty diesel trucks are important sources of oxides of nitrogen and particulate emissions. The recent introduction of selective catalytic reduction systems (SCR) and diesel particulate filters (DPF) can dramatically lower the levels of both of these when properly maintained. The Ports of Los Angeles and Long Beach instituted a forced retirement program requiring all trucks operating to have 2007 U.S. compliant engines (requiring a DPF) by January 1, 2012. This fleet comprises one of the largest concentrations of DPF equipped heavy-duty diesel trucks making it an ideal fleet for studying particulate emission deterioration. The University of Denver has collected in-use fuel-specific emission measurements from heavy-duty trucks since 2008 at the Port of Los Angeles using optical remote sensing equipment. Beginning in 2013 we began using a new emission collection method that allowed for enhanced information of particle emissions at our Port of Los Angeles location and a new site on I-5 near Cottonwood, CA in Northern California.

The On-road Heavy-duty Vehicle Emission Monitoring System (OHMS) employs a 15.25m long tent and a perforated pipe to capture the integrated exhaust emissions of a heavy-duty truck as it drives through. Gaseous emissions collected include carbon monoxide, carbon dioxide, hydrocarbons, nitric oxide and total oxides of nitrogen. Particle mass and number concentration are measured with a Dekati Digital Mass Monitor while black carbon is quantified using a Droplet Measurement Technologies Photoacoustic Soot Meter. In two field campaigns in 2013 and 2015 we have collected more than 5000 fuel-specific emission measurements from the two sites. These data allow us for the first time to the investigation of the performance and durability of diesel engine emission controls. DPF's initially produced large reductions in particle mass and number emissions, however, the 2015 data shows increases in both raising concerns as to their durability.