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Deriving spatial trends of air pollution at a neighborhood-scale through mobile monitoring

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Measuring air pollution in real-time using an instrumented vehicle platform has been an emerging strategy to resolve air pollution trends at a very fine spatial scale (10s of meters). Achieving second-by-second data representative of urban air quality trends requires advanced instrumentation, such as a quantum cascade laser utilized to resolve carbon monoxide and real-time optical detection of black carbon. An equally challenging area of development is processing and visualization of complex geospatial air monitoring data to decipher key trends of interest. EPA's Office of Research and Development staff have applied air monitoring to evaluate community air quality in a variety of environments, including assessing air quality surrounding rail yards, evaluating noise wall or tree stand effects on roadside and on-road air quality, and surveying of traffic-related exposure zones for comparison with land-use regression estimates. ORD has ongoing efforts to improve mobile monitoring data collection and interpretation, including instrumentation testing, evaluating the effect of post-processing algorithms on derived trends, and developing a web-based tool called Real-Time Geospatial Data Viewer (RETIGO) allowing for a simple plug-and-play of mobile monitoring data. Example findings from mobile data sets include an estimated 50% reduction in roadside ultrafine particle levels when immediately downwind of a noise barrier, increases in neighborhood-wide black carbon levels (30-104%) downwind of a rail yard relative to upwind neighborhoods, and that data smoothing approaches (spatially vs. temporally) can significantly affect inter-pollutant correlation estimates.