Novel Data Assimilation Technique for Spatiotemporal PM2.5 Source Impact Estimates

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In the Global Burden of Disease 2010 study, human exposure to ambient air pollution was ranked as the ninth of 67 risk factors contributing to premature death [1]. Exposure to ambient air pollution was ranked higher than poor sanitation, unimproved water, and vitamin/mineral deficiencies. An important aspect of this burden is that certain compounds, and the associated sources of those pollutants, may be more toxic than others. This suggests that there is a need to both improve our knowledge of the spatiotemporal dynamics of pollutant species and source impacts. Air quality scientists and epidemiologists are collaborating to determine correlations between human exposure to air pollution and adverse health impacts [2].

In this study, source impacts on PM2.5 species are estimated for 20 source categories for the year 2006. Sources include on road and off road vehicles, agriculture, fossil fuel combustion, biomass burning, sea salt, and dust. A novel hybrid source apportionment method is used that takes into account both modeled and observed species concentrations and uncertainties [3]. Observations from the Chemical Speciation Network are used for data assimilation, and the Community Multi-scale Air Quality (CMAQ) model was used to generate gridded source impacts over the continental U.S. at a 36-km resolution. The approach accounts for impacts from sources of both primary and secondary species.

The results of this study have strong human health and public policy implications. Results will determine which sources have the greatest impact on human health by correlating the source impact estimates with health events. Identifying the major contributors impacting human health will also aid in narrowing the scope of air pollution control efforts by focusing mitigation efforts on the most negatively impacting sources.

[1] Lim *et al* (2012), *Lancet* 2012, **380**: 2224–60 [2] Peel *et al* (2005), *Epidemiology*, **16**: 164-174 [3] Ivey *et al* (2013), Miami, FL 26-30 August.