1.147 How effective are short-term emission controls for mitigating urban air pollution?.

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Abstract:

Urban air pollution from fine particulate matter and atmospheric oxidants such as ozone poses serious health risks to residents of major cities across the world. Many cities are now experimenting with short-term emission controls, such as restrictions on private vehicle usage and temporary closure of polluting factories, when air pollution reaches or is expected to reach dangerous levels. Control of these local sources improves air quality, but often by a smaller margin than expected. This reflects the importance of atmospheric transport from surrounding regions and secondary chemical and microphysical transformation of pollutants from across a wider area. In this study we use a high-resolution, nested air quality model (WRF-Chem at 3 km scale) to investigate the effectiveness of the emission controls imposed in Beijing for the Asia-Pacific Economic Cooperation (APEC) forum in November 2014. The air quality during the forum was good, aided greatly by favourable meteorological conditions, and emission controls led to a reduction in PM2.5 of about 25% over Beijing, with daily mean concentrations averaging 50 ug/m3. While this was hailed as a success, we show that if the forum had been held two weeks earlier, the same emission controls would have led to a marginally smaller relative reduction in PM2.5 of 20%, and only brought mean particulate levels down to 130 ug/m3. This remains far in excess of current air quality standards. We investigate the controls needed to achieve good air quality under these conditions, and highlight the need for robust policy options that account for prevailing meteorological conditions.