



Improving short-term emission controls in Beijing: temporal, regional and sectoral source contributions

Tabish Umar Ansari, Edmund Ryan, and Oliver Wild

Lancaster University, UK, Lancaster Environment Centre, Lancaster, United Kingdom (t.ansari@lancaster.ac.uk)

We investigate the contributions of major local and regional emission sources to air quality in Beijing to inform short-term emission controls aimed at mitigating major pollution episodes. We use the WRF-Chem model at 3 km horizontal resolution, demonstrating that it captures the magnitude and variability of observed meteorological variables and pollutant concentrations. Considering the October-November 2014 period, we explore the temporal contribution of local and regional sources to air quality in Beijing under a wide range of meteorological conditions. We consider feasible reductions across industry, power, residential and transport sectors of 40-50% similar to those applied during the APEC summit period. We find that while the effect of local emission cuts is greatest (up to 38%) on the day of control, they can still have a small contribution (up to 8%) five days later under stagnant conditions. Controls in surrounding regions have greatest effect (up to 18%) on the second day but may have a negligible effect on clean days when local emissions dominate. To determine the effect of different emission sectors and regions, we consider the four main emission sectors over local (Beijing), near-neighbourhood (Hebei) and far-neighbourhood (North China) regions. We first use simple one-at-a-time sensitivity studies to identify the regional and sectoral contributions over a 10-day period that encompasses a range of differing meteorological conditions. We then apply a novel Gaussian Process Emulation approach to build pollutant response surfaces over this period, and use these surfaces to identify the short-term emission controls needed to meet the national air quality target of daily average $PM_{2.5} < 75 \text{ ug/m}^3$ (Air Pollution Index, API = 100).