

1.116 Modeling the health impacts of PM_{2.5} exposure in China at 5 km resolution.

Early Career Scientist

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Abstract:

Abstract: Due to rapid urbanization and industrialization, air pollution is becoming more and more serious in China. Fine particulate matter (PM_{2.5}) is one of the major air pollutants affecting human health. In this study, a nested grid air quality model system (NAQPMS) was used to simulate PM_{2.5}, and to study the long-term health impacts of PM_{2.5} exposure across China from 2013-2015 at a high resolution of 5 km. A comparison with observations demonstrates that NAQPMS is able to reproduce the temporal and spatial variation of pollutants in China reasonably well. The simulation shows that high levels of PM_{2.5} are concentrated in mid-eastern China and the Sichuan Basin, with highest annual mean concentrations of 120 µg/m³. Integrated exposure-response relationships were used to estimate the mortality attributable to PM_{2.5} exposure across China based on the simulated spatial PM_{2.5} concentrations, population data and disease-specific mortality baselines at provincial level. The results show that PM_{2.5} concentrations caused 1.44 million premature deaths in 2015, 1.5% higher than in 2013. The numbers of premature deaths were 0.40, 0.42, 0.38, 0.16, and 0.08 million for stroke, ischemic heart disease, chronic obstructive pulmonary disease, lung cancer and lower respiratory infection in 2015, respectively, which increased from 2013. We also explore the short-term health impacts of PM_{2.5} during heavy pollution episodes, and compare these to the long-term impacts using the same model.

Key words: NAQPMS, 5 km horizontal resolution, 3 years, PM_{2.5} exposure, mortality