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A Precision Air Pollution Control Approach for Mitigation of Regional and Urban Severe Haze Pollution

Severe and persistent haze pollution involving fine particulate matter (PM_{2.5}) concentrations reaching unprecedentedly high levels across many cities in China poses a serious threat to human health. Although mandatory temporary cessation of most urban and surrounding emission sources is an effective, but costly, short-term measure to abate air pollution, development of long-term crisis response measures remains a challenge, especially for curbing severe urban haze events on a regular basis. Here we introduce and evaluate a novel precision air pollution control approach (PAPCA) to mitigate severe urban haze events. The approach involves combining predictions of high PM_{2.5} concentrations, with a hybrid trajectory-receptor model and a comprehensive 3-D atmospheric model, to pinpoint the origins of emissions leading to such events and to optimize emission controls. Results of the PAPCA application to five severe haze episodes in major urban areas in China suggest that this strategy has the potential to significantly mitigate severe urban haze by decreasing PM_{2.5} peak concentrations by more than 60% from above 300 µg m⁻³ to below 100 µg m⁻³, while requiring ~30% to 70% less emission controls as compared to complete emission reductions. The PAPCA strategy has the potential to tackle effectively severe urban haze pollution events with economic efficiency.

Biography

Dr. Shaocai Yu is "1000 talent plan" Chair Professor in College of Environment and Natural Resources at Zhejiang University, a visiting professor at California Institute of Technology and Adjunct Professor at North Carolina State University (NCSU). He received his Ph.D. degree from NCSU and a B.S. degree from Peking University. His research interests include air pollution chemistry modeling and assessment and interactions among chemistry, cloud microphysics and climate. He has published more than 80 peer-reviewed journal publications, with papers published in Nature, Science, PNAS and New England of Medicine, etc. He was awarded a few prestigious research awards including Fellow of the Royal Meteorological Society (UK) (elected, 2011), winner of silver medal for superior service of 2011 U.S. EPA National honor awards, winner of the U.S. EPA's 2011 Level II Scientific and Technological Achievement Awards.