



Regional and Global Impacts of Megacity Air Pollution in China

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Air quality has deteriorated in many megacities of China because of their rapid economic developments. For example, as the world's second largest economy, China has experienced severe air pollution, with aerosols or fine particulate matter less than 2.5 micrometers (PM_{2.5}) reaching unprecedented high levels across many cities in recent winters. In addition to the impacts of aerosols on air chemistry, visibility, and human health, intense aerosol pollution is believed to exert profound impacts on the regional and global atmosphere and climate. In the first part of the talk, perspectives are provided on formation and transformation of haze in China. In the second part the long-term impacts of aerosols on precipitation and lightning over a megacity area in China will be presented, on the basis of atmospheric observations and simulations using a cloud-resolving WRF model. Our results reveal that elevated aerosol loading suppresses light and moderate precipitation, but enhances heavy precipitation. Also, we demonstrate climatically modulated mid-latitude cyclones by Asian pollution over past three decades, using a novel hierarchical modeling approach and observational analysis. Our results unambiguously reveal a large impact of the Asian pollutant outflows on the global general circulation and climate.