

# **Past and future changes in air quality in China and associated transboundary transport**

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Decadal changes in air quality are driven by a combination of direct and precursor emissions and regional meteorological conditions. We summarize in this talk some of our recent studies that examined past and future changes in tropospheric ozone and aerosols in China. For historical changes in air quality, we examined the variations in air quality and associated transboundary transport driven by anthropogenic emissions, land use, and meteorological parameters. We found that the interannual variations (IAVs) of air quality in China were mainly driven by the IAVs of meteorological parameters. Process analyses were performed to identify the key meteorological parameters that determined the IAVs of different chemical species in different polluted regions in China. The variations in the East Asian Monsoon were found to have large impacts on the IAVs and decadal variations of tropospheric ozone and aerosols in China. For example, the impacts the East Asian Summer Monsoon strength on surface-layer ozone for certain years can be comparable in magnitude to the impacts on ozone by decadal changes in anthropogenic emissions. For future air quality, we investigated 2000–2050 changes in concentrations and numbers of exceedance days of ozone and aerosols in China and the associated transboundary transport under the IPCC emissions scenarios, by using the chemical transport model GEOS-Chem and the Goddard Institute for Space Studies (GISS) general circulation model. Future transboundary transport was simulated to be dominated by future change in climate. Under the IPCC A1B scenario, the annual outflow of PM<sub>2.5</sub> from eastern China to the western Pacific was estimated to change by –7.0 %, –0.7 %, and –9.0% over 2000–2050 owing to climate change alone, changes in emissions alone, and changes in both climate and emissions, respectively.

**Key words:** air quality, climate, ozone, aerosols, China