Impacts of reductions in emissions of multipollutants in China on air quality and climate over 2005-2030

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Many societal activities lead to emissions to the atmosphere that affect both air quality and climate. We examine how particular policies in China may be able to provide benefits in both these areas using the NCAR Community Earth System Model (CESM). The anthropogenic emissions for years 2005 and 2030 are taken from the datasets generated by the International Institute for Applied Systems Analysis (IIASA) GAINS (Greenhouse gas-Air pollution Interactions and Synergies) model. The 2030 emissions scenarios include (1) a Reference Scenario, (2) a Low GWP scenario, and (3) the Lowest Emissions scenario. The Reference Scenario assumes that all agreed air pollution policies are being implemented, and the other two scenarios have additional reductions in emissions based on a selected set of measures. We firstly evaluate the model predictions for 2005, and then investigate the simulated year 2030 concentrations of ozone, sulfate, black carbon, and organic carbon, aerosol optical depth, as well as year 2030 radiative forcing relative to 2005. Both direct and indirect radiative forcings of aerosols are considered. Our model results suggest that taking measures to reduce emissions in China can reduce year 2030 PM2.5 concentrations in China by 25% and help to mitigate near-term regional climate change.