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Effects of future climate change on air quality over East Asia

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Air pollutant concentrations such as tropospheric ozone and aerosols are affected by meteorological variables including temperature, mixing depth, precipitation, and so on. Future climate is expected to be different from the present and so are those meteorological variables mainly due to human perturbations to the atmospheric levels of the long-lived greenhouse gases and aerosols. East Asia is one of important source regions of both anthropogenic and natural greenhouse gases and air pollutant precursors. Therefore, significant environmental changes are expected in the future. We here use an offline coupling of a 3-D chemical transport model and a climate model to examine the effects of future climate change induced by the long-lived greenhouse gases on air pollutant concentrations over East Asia. Climate change simulations were conducted using the NCAR Community Atmosphere Model version 3 (CAM3) with the IPCC SRES A2, A1B, and B1 scenarios. Simulated meteorological variables were used to drive the GEOS-Chem chemical transport model to simulate future environmental conditions for 2050 and 2100. Ozone concentrations over East Asia are found to be sensitively perturbed in the future relative to the present depending on the different emission scenarios. Important factors affecting future ozone include temperature and mixing depth over the continent and changes in synoptic pattern induce different transport pathways of air pollutants. Future climate changes may play an important role in air quality conditions over East Asia.