Air quality and climate change, Topic 3 of the Model Inter-Comparison Study for Asia Phase III (MICS-Asia III) – Part 1: Overview and model evaluation

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Abstract. Topic 3 of the Model Inter-Comparison Study for Asia (MICS-Asia) Phase III examines how online coupled air quality models perform in simulating high aerosol pollution in the North China Plain region during wintertime haze events and evaluates the importance of aerosol radiative and microphysical feedbacks. A comprehensive overview of the MICS-Asia III Topic 3 study design, including descriptions of participating models and model inputs, the experimental designs, and results of model evaluation, are presented. Six modeling groups from China, Korea and the United States submitted results from seven applications of online coupled chemistry–meteorology models. Results are compared to meteorology and air quality measurements, including data from the Campaign on Atmospheric Aerosol Research Network of China (CARE-China) and the Acid Deposition Monitoring Network in East Asia (EANET). The correlation coefficients between the multi-model ensemble mean and the CARE-China observed near-surface air pollutants range from 0.51 to 0.94 (0.51 for ozone and 0.94 for PM$_{2.5}$) for January 2010. However, large discrepancies exist between simulated aerosol chemical compositions from different models. The coefficient of variation (SD divided by the mean) can reach above 1.3 for sulfate in Beijing and above 1.6 for nitrate and organic aerosols in coastal areas.

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