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CMAQ modeling of near-ground ozone pollution during the CAREBeijing-2006 campaign in Beijing, China

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The Community Multiscale Air Quality (CMAQ) modeling system, a 3-D regional chemical transport model, was used to simulate the O3 episodes during the Campaign of Air Quality Research in Beijing and surrounding areas in 2006 (CAREBeijing-2006). The model reproduced the temporal and spatial variations of the observed ozone and precursors well during the campaign. The modeling results showed the evolution of near ground O3 and the feature of vertical O3 profile on pollution days with different meteorological conditions. Process analysis was applied to investigate the contributions of local production and regional transport, and found different relative importance at different locations of Beijing. O3-NOx-VOCs sensitivity was also addressed with different precursor emission scenarios. The Beijing downtown area and downwind urban plume were usually in VOC-limited regime, whereas the upwind regions and northern mountain areas were generally characterized by NOx-sensitive chemistry. Ozone production efficiency of NOx was also calculated based on simulation results and compared with that derived from observations. For reducing O3 levels in Beijing, the above results suggest a regional emission control strategy with more emphasis on VOCs reduction in Beijing urban areas.