

(a) January





Figure S1 Diurnal variation of integrated process contributions to surface O_3 concentration in JJJ (a: January; b: July; The calculation is based on the average of grid cells in JJJ; a. Baseline is the simulated O_3 in SimBL, unit: ppb hr⁻¹; b. Δ Dynamic is the difference in normalized IPRs between SimSF and SimNF, unit: hr⁻¹; d. Δ Photolysis is the difference in normalized IPRs between SimNF and SimBL, unit: hr⁻¹; c. Δ Total is the difference in normalized IPRs between SimSF and SimBL, unit: hr⁻¹; c. Δ Total is the difference in normalized IPRs between SimSF and SimBL, unit: hr⁻¹, colored bars represent three periods of early morning (blue), noon (red), and late afternoon (green))



(a) January



Figure S2 same as Figure S1, but in YRD



(a) January



Figure S3 same as Figure S1, but in PRD



(a) January



(b) July

Figure S4 same as Figure S1, but in HUZ



(a) January



(b) July

Figure S5 same as Figure S1, but in SCH



Figure S6 Diurnal variation of surface NO and NO₂ concentrations and their response to ADE in JJJ (Baseline is the simulated NO_X in SimBL, unit: ppb; b. Δ Dynamic is the difference in the NO_X concentration between SimSF and SimNF, unit: ppb; c. Δ Photolysis is the difference in the NO_X concentration between SimSF and SimBL, unit: ppb; d. Δ Total is the difference in the NO_X concentration between SimSF and SimBL, unit: ppb)





Figure S7 Integrated process contributions to daytime near-ground-level O3 under different PM2.5 level in 5 regions (between the ground and 350m

AGL, model layer 1-5; a. Baseline is the normalized IPRs in SimBL, unit: hr⁻¹; b. ΔDynamic is the difference in normalized IPRs between SimSF and SimNF, unit: hr⁻¹; d. ΔPhotolysis is the difference in normalized IPRs between SimNF and SimBL, unit: hr⁻¹; c. ΔTotal is the difference in normalized IPRs between SimSF and SimBL, unit: hr⁻¹)





Figure S8 Vertical profile of integrated reaction rates in YRD at noon (a: January; b: July; full-layer heights above ground are 40, 96, 160, 241, 355, 503, 688, 884, 1100, 1357m; Baseline is the simulation in SimBL; Δ Dynamic is the difference between SimSF and SimNF; Δ Photolysis is the difference between SimSF and SimBL; Δ Total is the difference between SimSF and SimBL; P_{totalOx} is total O_x production rate, unit: ppb hr⁻¹; OH CL is OH chain length; P_{NewOH} is the production rate of new OH, unit: ppb hr⁻¹; P_{ReactedOH} is the production rate of reacted OH, unit: ppb hr⁻¹; P_{H2O2} is the production rate of H₂O₂, unit: ppb hr⁻¹; P_{HNO3} is the production rate of P_{H2O2}/P_{HNO3} is only shown for layer 1-5)





Figure S9 Same as Figure S8, but in PRD





Figure S10 Same as Figure S8, but in HUZ





Figure S11 Same as Figure S8, but in SCH