Title:  Modeling inter-continenta l transport of ozone in North America with CAMx for the Air Quality Model Evaluation International Initiative (AQMEII) Phase 3

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Keywords: Ozone, US Emissions, Global Emissions, boundary conditions, tracer
Table S1: Definition of WRF 35 vertical levels and mapping to the 26 vertical layers used in CAMx. Heights (m) are geopotential heights above ground level. RTCMC aggregates O₃ boundary contributions from layers 1 to 16 (O₃A; O₃D), 17-23 (O₃B; O₃E), and 24-26 (O₃C; O₃F).

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O₃A, O₃D
O₃B, O₃E
O₃C, O₃F
Table S2: RTCMC input file for an active (A) and inert (D) tracer groups. Here tracer group A tracks boundary contributions from the lowest 16 layers. HOXA and O1DA are additional species added to track chemical destruction of O3A. An inert tracer O3D needs to be listed in the input file even though it does not undergo any chemical reaction. Other active (B,C) and inert (E,F) tracer groups have similar expressions.

# Equation ; Rate constants from CB05
001 [O3A] \rightarrow [O1DA] ; 0 0.000E+00 0.0000E+00
002 [O1DA] \rightarrow [O3A] ; 5 1.260E-09 1.020E+02
003 [O1DA] \rightarrow ; 15 1.320E-08 0.0000E+00
004 [O3A] + [OH] \rightarrow [HOXA] ; 2 1.020E-10 -9.4000E+02
005 [O3A] + [HO2] \rightarrow [HOXA] ; 2 6.000E-13 -4.9000E+02
006 [HOXA] + [NO] \rightarrow [O3A] ; 2 2.100E-10 2.5000E+02
007 [HOXA] + [HO2] \rightarrow ; 19 1.380E-11 6.00E+02 1.020E-31 1.00E+03
008 [HOXA] + [HO2] \rightarrow ; 20 1.932E-32 2.80E+03 1.428E-52 3.20E+03
009 [HOXA] + [MEO2] \rightarrow ; 2 2.460E-11 7.50E+02
010 [HOXA] + [XO2] \rightarrow ; 2 4.500E-11 7.0000E+02
011 [HOXA] + [XO2N] \rightarrow ; 2 4.500E-11 7.0000E+02
012 [HOXA] + [C2O3] \rightarrow (0.2) [O3A] ; 2 2.58E-11 1.0400E+03
013 [HOXA] + [C3O3] \rightarrow (0.2) [O3A] ; 2 2.58E-11 1.0400E+03
014 [O3A] + [ISOP] \rightarrow ; 2 4.71E-13 -1.9120E+03
015 [O3A] + [TERP] \rightarrow ; 2 7.2E-14 -8.2100E+02
046 [O3D] \rightarrow ; 1 0.0

Table S3: Model performance statistics for MDA8 O3 for CAMx basecase (no cutoff).

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Table S4: Model performance statistics for MDA8 O₃ with 40 ppb cutoff for CAMx basecase

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Figure S1: Circles represent 22 cities analysed in this study covering a wide variety of climatic and geographic environments. We chose their representative AQS monitoring site based on the monitoring site with highest H4MDA8 in the metropolitan statistical area.

Figure S2a: Spatial map of CAMx correlation coefficient for MDA8 O₃ with 40 ppb cutoff in spring
Figure S2b: Spatial map of CAMx NMB for MDA8 O$_3$ with 40 ppb cutoff in spring
Figure S2c: Spatial map of CAMx NME for MDA8 O$_3$ with 40 ppb cutoff in spring.

Figure S3a: Spatial map of CAMx correlation coefficient for MDA8 O$_3$ with 40 ppb cutoff in summer.
Figure S3b: Spatial map of CAMx NMB for MDA8 O₃ with 40 ppb cutoff in summer.

Figure S3c: Spatial map of CAMx NME for MDA8 O₃ with 40 ppb cutoff in summer.
Figure S4a: Spatial map of CAMx correlation coefficient for MDA8 O₃ with 40 ppb cutoff in fall.

Figure S4b: Spatial map of CAMx NMB for MDA8 O₃ with 40 ppb cutoff in fall.
Figure S4c: Spatial map of CAMx NME for MDA8 O₃ with 40 ppb cutoff in fall.

Figure S5a: Spatial map of CAMx correlation coefficient for MDA8 O₃ with 40 ppb cutoff in winter.
Figure S5b: Spatial map of CAMx NMB for MDA8 O₃ with 40 ppb cutoff in winter

Figure S5c: Spatial map of CAMx NME for MDA8 O₃ with 40 ppb cutoff in winter
Figure S6: Vertical distribution of \( \text{O}_3 \) at Trinidad Head (March-August 2010) up to 16 km.
Figure S7: Same as Figure S5 but up to 10 km.
Figure S8: The difference in seasonal average daily maximum 8-hour O$_3$ contribution from BCs inert and active O$_3$ tracers, i.e., inert minus active, at layers below 750 mb.

Figure S9: The difference in seasonal average daily maximum 8-hour O$_3$ contribution from BCs inert and active O$_3$ tracers, i.e., inert minus active, at layers between 240-750 mb.
Figure S10: The difference in seasonal average daily maximum 8-hour O₃ contribution from BCs inert and active O₃ tracers, i.e., inert minus active, at layers above 240 mb.