

Contributions of Various Sources to the Higher-Concentration Center of CO within the ASM Anticyclone

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2023-6-8, Dhaka, Bangladesh

Background
Data and model
Analysis
Summary

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Background

UTLS highly concentrated CO and its surface emissions





Surface emissions

100hPa

Background

UTLS highly concentrated CO and deep convections





OLR (Outgoing Longwave Radiation)

100hPa

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Data and model

• Data

> CO: Aura MLS L3 V4.2

> OLR: NCAR/NCEP

> Reanalysis met field: MERRA-2

Model

CTM GEOS-Chem: surface~0.01hPa; 2x2.5 grid; MERRA-2 driven

Surface emissions: APEI V2016; NEI V2015-03; DICE-Africa; MIX V1.1; CEDS; GFED; MEGAN

> Tagged CO experiments

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Analysis: model evaluation

GEOS-Chem

90°S

180°

90°W

52 56 60 64 68 72 76 80 84 88

00



90°S

180°

90°W

52 56 60 64 68 72 76 80 84

90°E

88 92

96 100

180°

180°

90°E

92 96 100

MLS

Analysis: emission regions to ASM

(b) 2016

Surface emissions of CO

Rate of CO emission(kg/m2/s*10^-9)



Analysis: emission regions to ASM

South Asia; East Asia; Southeast Asian



Analysis: emission regions to ASM





Analysis: emissions, CH4, VOCs

- Sources and Sinks

	Troposphere	Stratosphere
Sources	Biomass burning; Fossil fuel burning; Domestic biofuel burning; Yield of chemical reaction of CH4; Yield of chemical reactions of VOCs	Yield of chemical reaction of CH4
Sinks	Reaction of CO+OH	Reaction of CO+OH
Life time	a few days	Weeks - months

Analysis: emissions, CH4, VOCs





Analysis: regions & chemicals

Differences in the CO concentration in two longitude ranges. Units: ppbv

Latitude (°N)	East Asia	South Asia	Southeast Asia	CO Emissions	CH ₄	NMVOCs	Control Experiment	MLS
-10-0	0.87	0.92	0.52	2.90	3.05	1.33	6.20	2.24
0–10	1.77	2.10	1.08	4.71	3.97	1.50	8.49	3.24
10-20	<u>2.51</u>	4.68	<u>1.27</u>	8.73	6.21	2.81	14.41	14.67
20-30	1.84	<u>8.18</u>	0.86	<u>11.86</u>	<u>7.19</u>	<u>3.90</u>	<u>17.95</u>	<u>21.88</u>
30-40	0.84	4.99	0.45	6.90	4.56	2.36	10.08	13.74
40-50	0.07	0.96	0.08	1.25	0.99	0.44	1.82	3.32
50–60	0.01	0.16	0.03	0.24	0.25	0.13	0.60	0.47

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Summary

Model well simulated CO in UTLS

Model results shows:

- ✓ Regarding effects of highly concentrated CO in ASM at 100 hPa, 43.18% originated from CH4, 20.81% from VOC, 63.33% from surface CO emissions, effect of sinks reached 27.32%
- ✓ Regarding surface CO emissions, East Asia contributed 13.56%, South Asia contributed 39.27%, and Southeast Asia contributed 7.15%.



Thanks for your listening! gian.li@mail.iap.ac.cn

Remote Sens. 2022, 14, 3322. https://doi.org/10.3390/rs14143322