



Supplement of

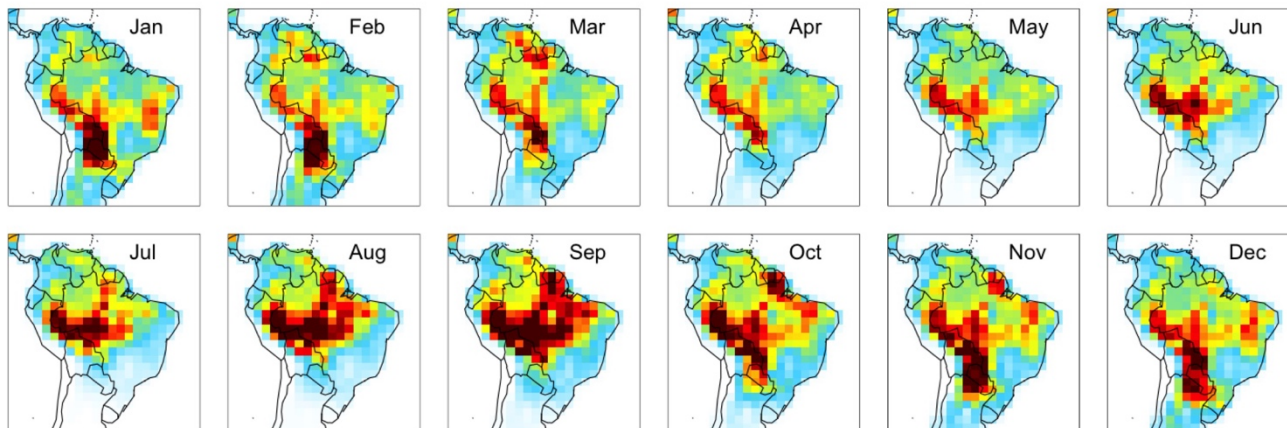
Seasonal isoprene emission estimates over tropical South America inferred from satellite observations of isoprene

Shihan Sun et al.

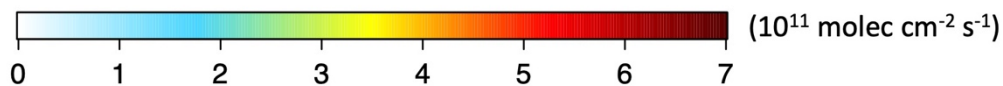
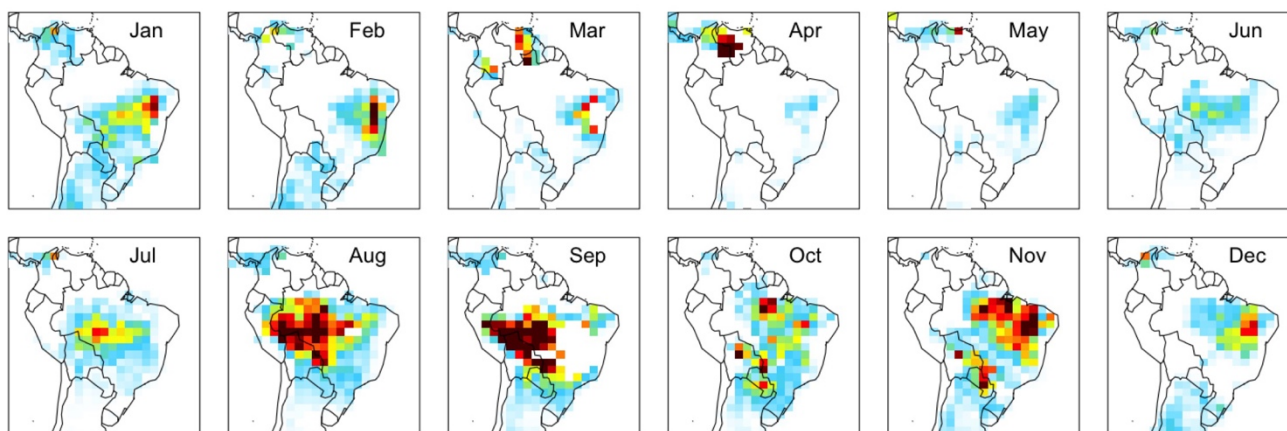
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(a) MEGAN isoprene emission rates for 2019



(b) TROPOMI HCHO inferred isoprene emission rates for 2019



10 Figure S1: Monthly mean (a) MEGAN and (b) TROPOMI HCHO derived isoprene emission rates ($10^{11} \text{ molec cm}^{-2} \text{ s}^{-1}$) across tropical South America for 2019.

Table S1: Direct isoprene flux measurements and modelled isoprene flux.

Location	Season	Sampling period	Sampling method	Observed isoprene flux [mg m ⁻² h ⁻¹]	MEGAN isoprene flux* [mg m ⁻² h ⁻¹]	CrIS-based isoprene flux* [mg m ⁻² h ⁻¹]	References
ATTO site 150km northeast of Manaus, Brazil	Dry-to-wet	11–21 Nov 2015	Mean daytime (09:00–17:00 LT); Eddy covariance	3.1	3.0	1.2	Alves et al. (2023)
Cuieiras Biological Reserve (TT34-ZF2), Manaus, Brazil	Dry Wet	Jan – Dec 2013	Mean daytime (09:00–17:00 LT); disjunct eddy covariance technique	2.8 1.9	3.5 3.0	2.5 2.7	Langford et al. (2022)
Cuieiras Biological Reserve (TT34-ZF2), Manaus, Brazil	Dry Dry-to-wet Wet	Sep–Oct 2010 Nov 2010 Dec 2010–Jan 2011	Mean daytime (10:00–14:00 LT); PTR-MS, gradient profile and gradient flux	1.4 1.4 0.5	4.8 4.5 3.7	3.9 1.6 1.3	Alves et al. (2016)
Cuieiras Biological Reserve (TT34-ZF2), Manaus, Brazil	Dry-to-wet	Sep–Dec 2010	Mean daytime (10:00–16:00, LT) at 35m; PTR-MS, gradient profile and gradient flux	1.4	3.8	2.1	Jardine et al. (2012)
Cuieiras Biological Reserve (C14-ZF2), Manaus, Brazil	Dry	Sep 2004	Mean daytime (12:00–14:00, LT); PTR-MS, disjunct eddy covariance	8.3	5.6	6.1	Karl et al. (2007)
Cuieiras Biological Reserve (K34-ZF2), Manaus, Brazil	Dry	Jul 2001	Mean daytime (10:00–15:00 LT); GC-FID, relaxed eddy accumulation	2.4	4.3	3.7	Kuhn et al. (2007)
Tapajós National Forest, Brazil	Wet-to-dry	Jun 2014	Daytime; PTR-TOF-MS, eddy covariance (~65m)	0.7	2.1	1.0	Sarkar et al. (2020)

***MEGAN isoprene flux and CrIS based isoprene flux are for year 2019.**

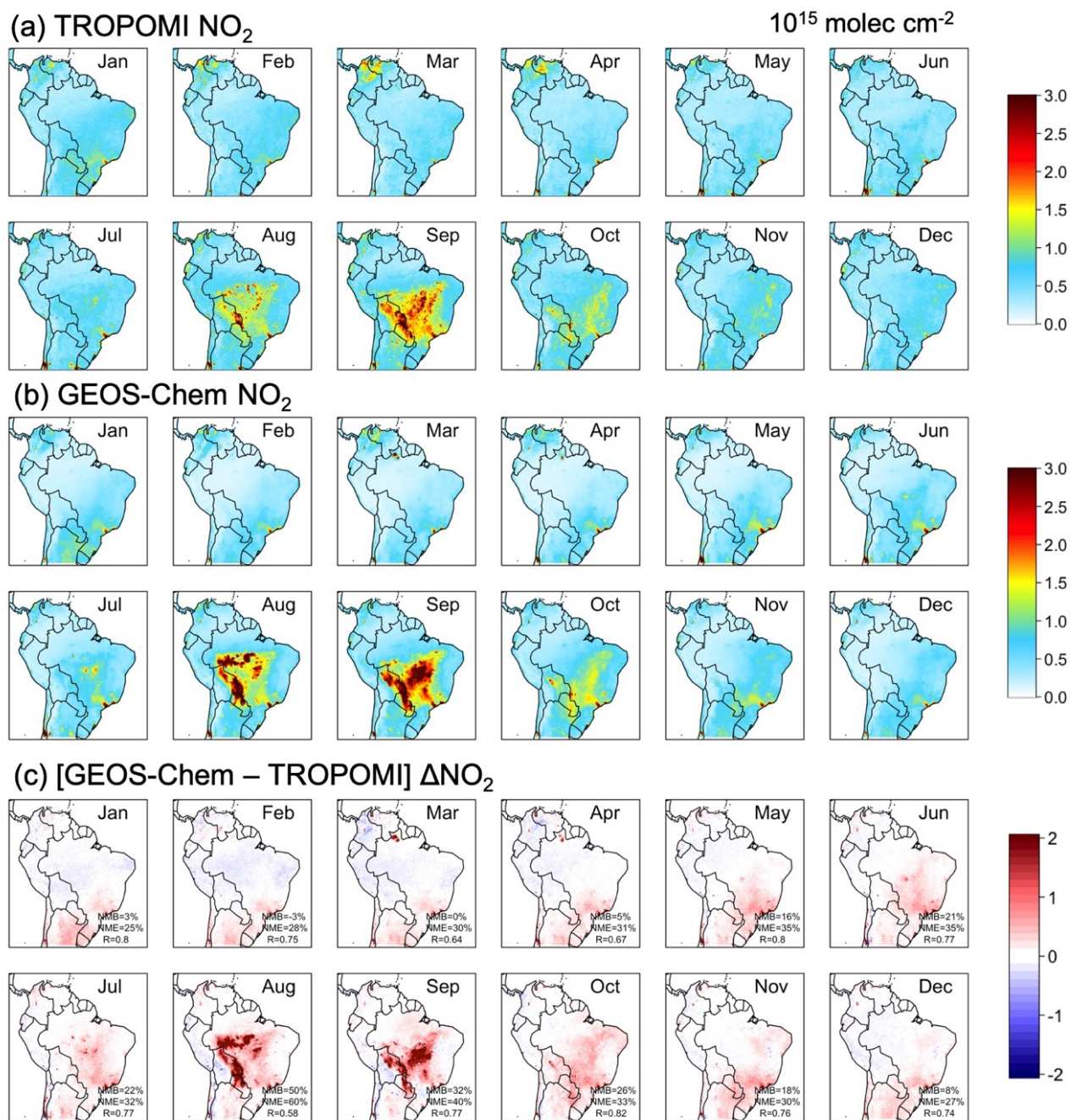
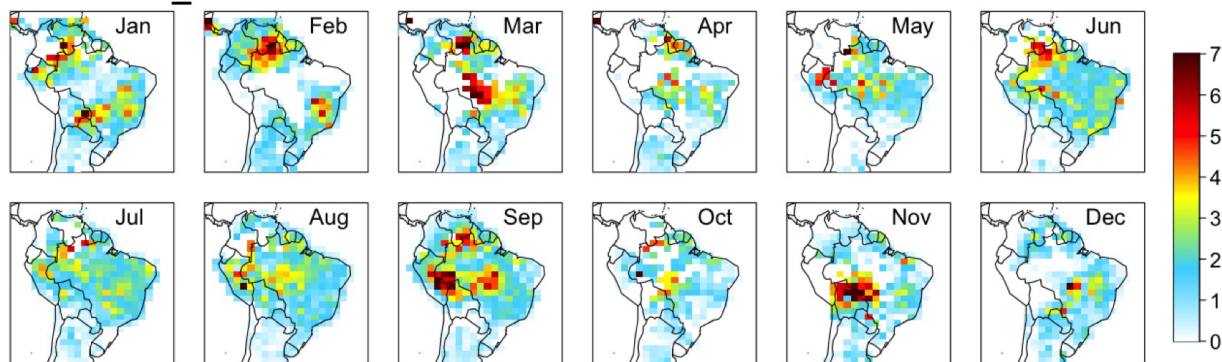
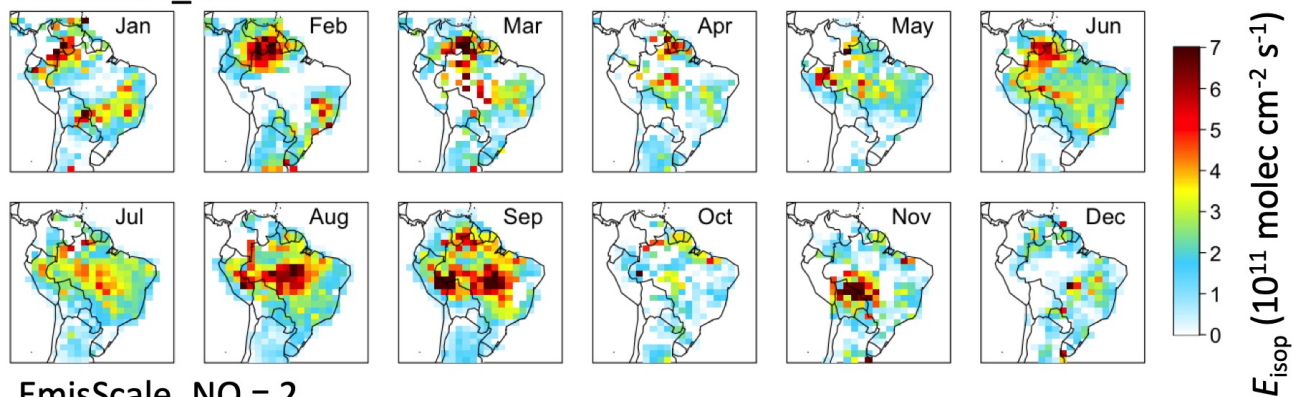


Figure S2: Comparison between (a) TROPOMI and (b) GEOS-Chem NO₂ columns. (c) the difference between model and satellite NO₂ columns.

EmisScale_NO = 0.25



EmisScale_NO = 1



EmisScale_NO = 2

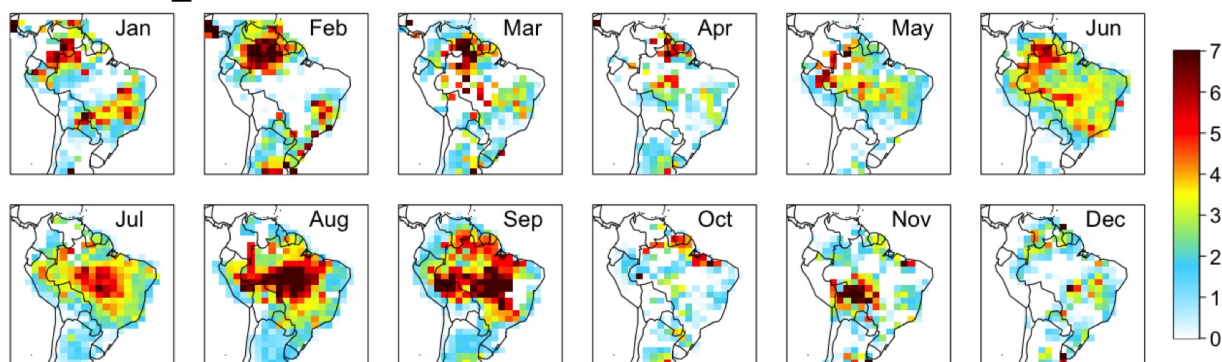


Figure S3: Monthly CrIS derived isoprene emission rates (E_{isop} , 10^{11} molec cm⁻² s⁻¹) with different NO₂ emission level (scale factor = 0.25, 1, 2).

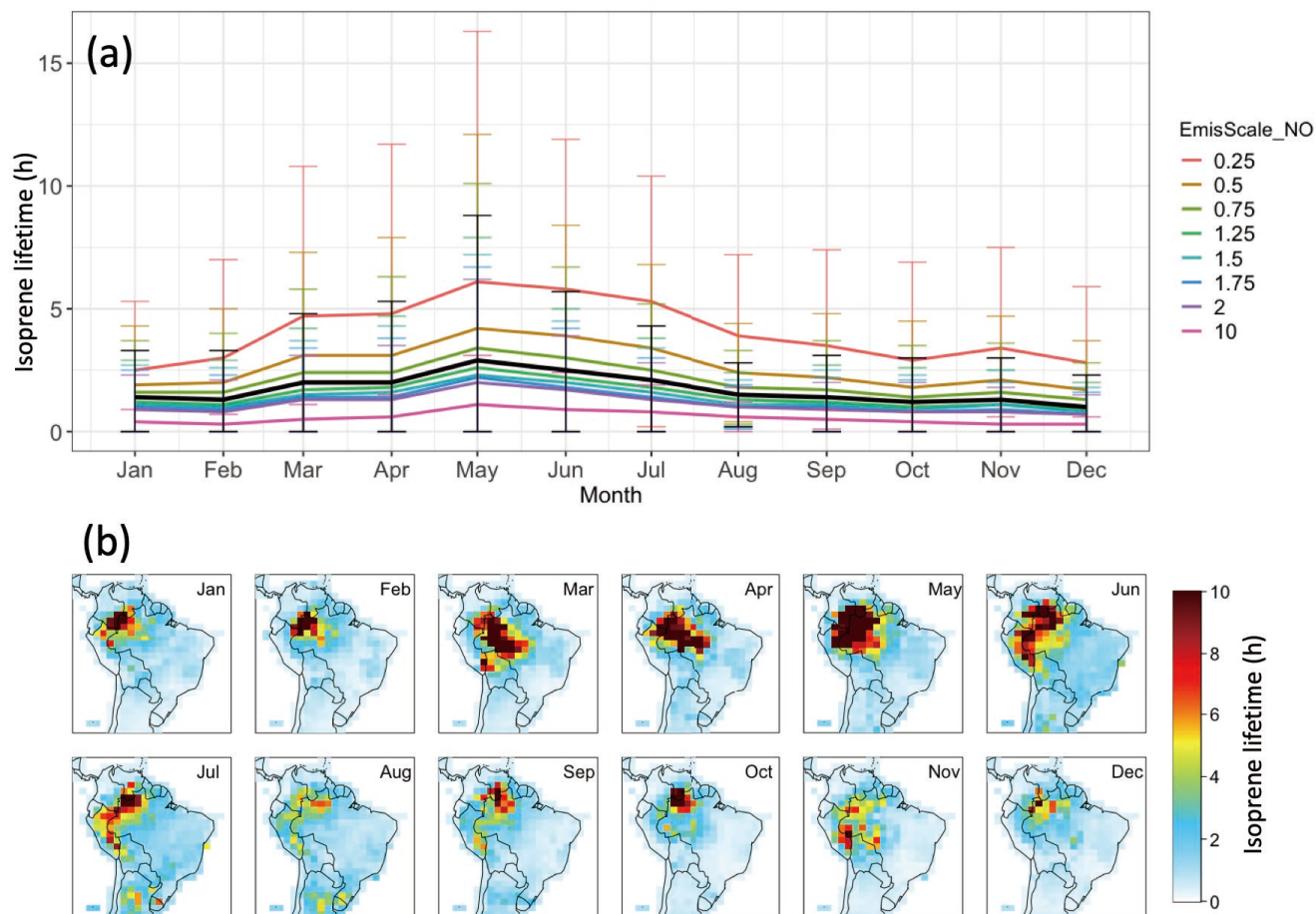


Figure S4: (a) Simulated monthly mean midday isoprene lifetime (hr) over Tropical South America with different NO_x emission levels. Error bars indicate standard deviation over the studied region. (b) Monthly distribution of mean isoprene lifetime (hr) with default NO_x emissions ($\text{EmisScale_NO} = 1$).

Table S2: Relative changes (%) in monthly CrIS derived isoprene emission rates over the Amazon under different NOx emission levels compared with default case (EmisScale_NO = 1).

		EmisScale_NO							
		0.25	0.5	0.75	1.25	1.5	1.75	2	10
Amazon	Dry	−60%	−40%	−20%	+19%	+38%	+56%	+75%	+697%
ΔNO ₂	Wet	−72%	−48%	−24%	+23%	+47%	+70%	+94%	+1525%

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Table S3: Relative changes (%) in simulated NO₂ columns over the Amazon under different NOx emission levels compared with default case (EmisScale_NO = 1).

		0.25	0.5	0.75	1.25	1.5	1.75	2	10
Amazon	Dry	−14%	−6%	−3%	+2%	+4%	+9%	+12%	+87%
Δ <i>E</i> _{isop} (%)	Wet	−26%	−15%	−7%	+7%	+12%	+18%	+25%	+149%

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