



Supplement of

Satellite quantification of methane emissions from South American countries: a high-resolution inversion of TROPOMI and GOSAT observations

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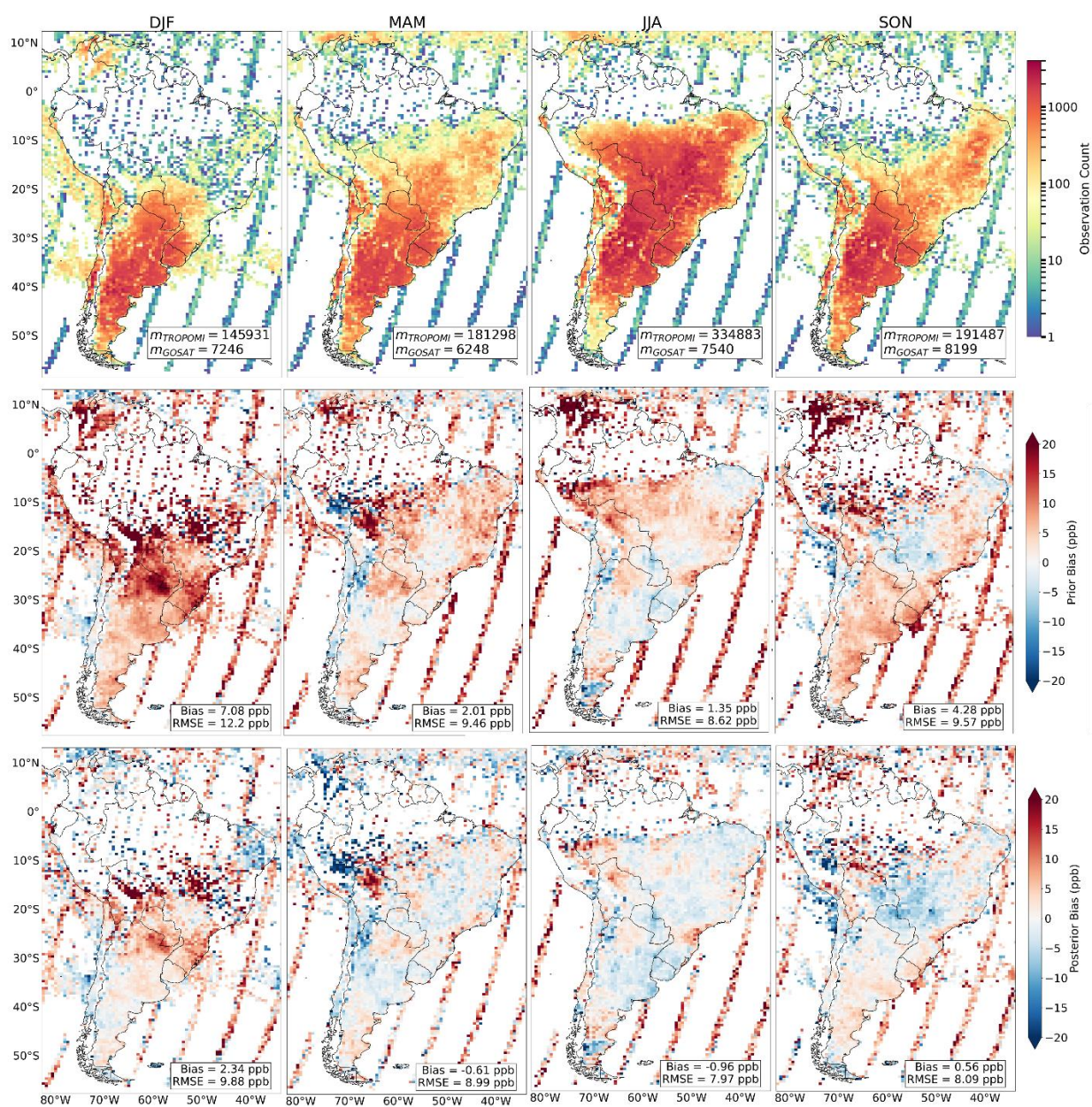


Figure S1: Seasonality of the TROPOMI and GOSAT methane data in 2021. The top row shows the number of observations for each season in 2021 shown on a $0.5^\circ \times 0.625^\circ$ grid for visibility. The observations have been filtered as described in Sect. 2.1. The center and bottom rows show the differences between methane dry column mixing ratios (X_{CH_4}) observed by TROPOMI+GOSAT and simulated by GEOS-Chem with prior emissions (including wetland emissions averaged across WetCHARTs and LPJ-MERRA2) and posterior emissions (median of the inversion ensemble) for each season.

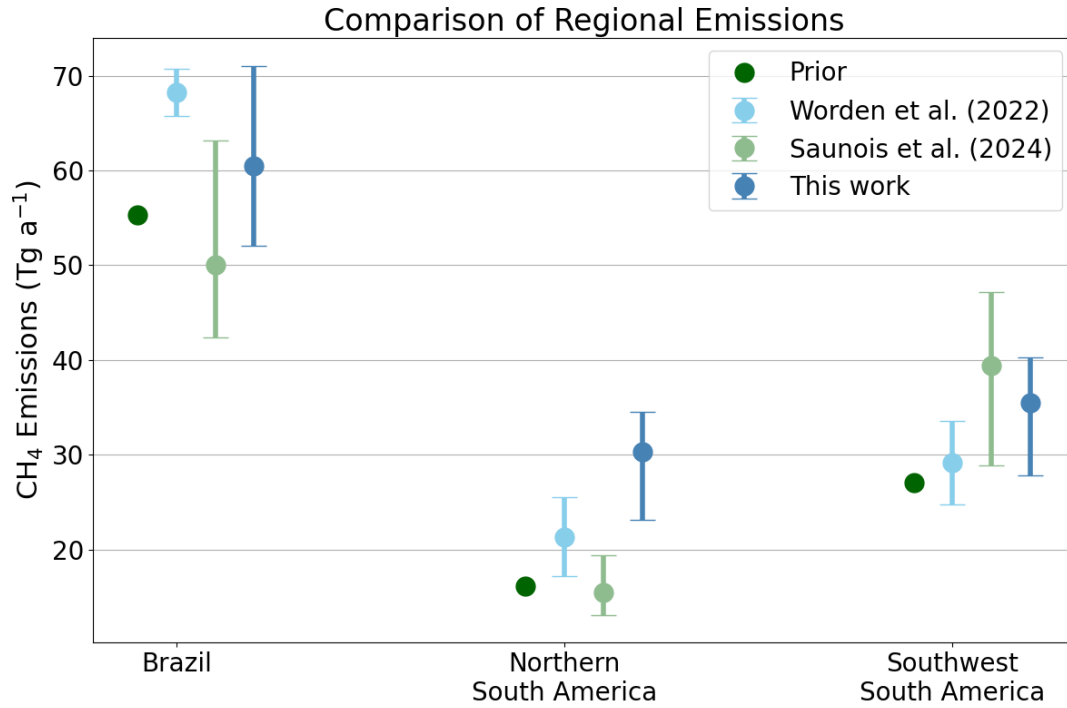


Figure S2: Regional methane emissions from Brazil, Northern South America (Colombia, French Guiana, Guyana, Suriname, and Venezuela), and Southwest South America (Argentina, Bolivia, Chile, Ecuador, Peru, Paraguay, and Uruguay). Posterior estimates from our work are compared to our prior estimates, to 2019 emissions from a GOSAT inversion reported by Worden et al. (2022), and to a range of top-down estimates for 2021 from Saunois et al. (2024). Vertical bars are reported uncertainty ranges for total emissions (Worden et al.), ranges across top-down estimates (Saunois et al.), and ranges across the inversion ensemble (this work).

Table S1: Sources for countries' UNFCCC totals by sector^a (Gg a⁻¹)

Country	Report Type ^b	Report Year	Emission year	Source ^c	GWP (if used)	Enteric Fermentation	Manure Management	Landfills	Wastewater	Rice	Link to report
Argentina	BUR 4	2022	2018	Report	21 <i>Capítulo 2, pg. 129</i>	2644.52 CH₄ <i>Table 2, pg. 174</i>	81.58 CH₄ <i>Table 2, pg. 174</i>	9639.35 CO₂e <i>Tabla 2, pg. 22</i>	5770.29 CO₂e <i>Tabla 2, pg. 22</i>	17.52 CH₄ <i>Table 2, pg. 176</i>	https://unfccc.int/documents/419772
Bolivia	NC 3	2020	2008	Report	23 <i>Tabla 18, pg. 115</i>	12467 CO₂e <i>Tabla 32, pg. 142</i>	527.17 CO₂e <i>Tabla 32, pg. 142</i>	1176.2 CO₂e <i>Tabla 32, pg. 142</i>	828.82 CO₂e <i>Tabla 32, pg. 142</i>	393.77 CO₂e <i>Tabla 32, pg. 142</i>	https://unfccc.int/documents/257158
Brazil		2020	2016	Data portal							
Chile	BUR 5	2022	2020	Report		177 CH₄ <i>Capítulo 2, pg. 62</i>	53.7 CH₄ <i>Capítulo 2, pg. 62</i>	233.9 CH₄ <i>Capítulo 2, pg. 62</i>	53.7 CH₄ <i>Capítulo 2, pg. 63</i>	7.7 CH₄ <i>Capítulo 2, pg. 62</i>	https://unfccc.int/documents/624735
Colombia	BUR 3	2022	2018	Report	28 <i>Tabla 1-5, pg. 50</i>	42303.01 CO₂e <i>Tabla 2-1, pg. 101</i>	1883.51 CO₂e <i>Tabla 2-1, pg. 101</i>	10636.94 CO₂e <i>Tabla 2-1, pg. 105</i>	8578.42 CO₂e <i>Tabla 2-1, pg. 106</i>	828.75 CO₂e <i>Tabla 2-1, pg. 105</i>	https://unfccc.int/documents/510821
Ecuador	BUR 2	2023	2018	Report	25 <i>Tabla 1, pg. 12</i>	9572.64 CO₂e <i>Section 11.3.2.1, pg. 38</i>	9.59 CH₄ <i>Tabla 5, pg.20</i>	66 CH₄ <i>Tabla 5, pg.20</i>	27.08 CH₄ <i>Tabla 5, pg.20</i>	430.27 CO₂e <i>Section 11.3.2.2, pg.39</i>	https://unfccc.int/documents/626650
Guyana		2012	2004	Data portal						-	
Paraguay		2022	2017	Data portal						-	
Peru	BUR 2	2019	2014	Report	21 <i>Footnote 11, pg. 13</i>	9316.9 CO₂e <i>Anexo III, pg. 316</i>	305.13 CO₂e <i>Anexo III, pg. 316</i>	6439.12 CO₂e <i>Anexo III, pg. 316</i>	2653.27 CO₂e <i>Tabla N° 4, pg. 50</i>	1134.04 CO₂e <i>Anexo III, pg. 316</i>	https://unfccc.int/documents/209403
Suriname	NC 3	2023	2017	Report	21 <i>Section 3.2, pg. 117</i>	49.2 CO₂e <i>Figure 41, pg. 144</i>	7.4 CO₂e <i>Figure 41, pg. 144</i>	1.576 CH₄ <i>Table 40, pg. 154</i>	2.375 CH₄ <i>Table 40, pg. 154</i>	241.1 CO₂e <i>Figure 41, pg. 144</i>	https://unfccc.int/documents/627964
Uruguay		2022	2019	Data portal							
Venezuela	NC 2	2018	2010	Report		850 CH₄ <i>Capítulo 2, pg. 161</i>	37 CH₄ <i>Capítulo 2, pg. 161</i>	213 CH₄ <i>Capítulo 2, pg. 179</i>	45 CH₄ <i>Capítulo 2, pg. 179</i>	19 CH₄ <i>Capítulo 2, pg. 179</i>	https://unfccc.int/documents/89289

^a All totals are given either in Gg a⁻¹ CH₄ or Gg a⁻¹ CO₂-equivalent (CO₂e). If any totals from a report are given in CO₂e, the GWP used to convert the total to Gg a⁻¹ CH₄ is also provided. For each total and GWP value within the table, the numeric value is displayed first in **bold** with the exact source (i.e. *section, page number*) displayed in smaller italic text below.

^b Reports are either Biennial Update Reports (BURs) or National Communications (NC). The number denotes the indicates the report iteration, with higher values corresponding to more recent submissions.

^c National sectoral totals for Brazil, Guyana, Paraguay, and Uruguay are from the UNFCCC GHG Data Interface (https://di.unfccc.int/detailed_data_by_party, last accessed Jan 20, 2023) and can be found in Table 2. All other countries have produced more recent reports that are unavailable in the UNFCCC GHG Data Interface, and thus the numbers are obtained directly from these reports as detailed here.