



*Supplement of*

## **A top-down evaluation of bottom-up estimates to reduce uncertainty in methane emissions from Arctic wetlands**

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Table S1. Details of monitoring sites with CH<sub>4</sub> observations data used in the inverse model.

<b>Code</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Time-period</b>
ABT	49.01° N	122.34° W	2014 - 2020
ALF	8.92° S	56.79° W	2010 - 2018
ALT	82.45° N	62.50° W	2000 - 2021
AMB	69.62° N	162.30° E	2014 - 2021
AMT	45.03° N	68.68° W	2008 - 2021
AMY	36.54° N	126.33° E	2013 - 2021
ARH	77.83° S	162.20° E	2000 - 2021
ASC	7.97° S	14.40° W	2000 - 2021
ASK	23.26° N	5.63° E	2000 - 2021
ATT	2.14° S	58.99° W	2012 -2019
AZR	38.76° N	27.29° W	2000 - 2021
AZV	54.71° N	73.03° W	2009 - 2021
BCK	62.8° N	115.92° W	2010 - 2021
BHD	41.41° S	174.87° E	2000 - 2021
BIK	53.22° N	23.01° E	2005 - 2021
BIS	44.38° N	1.23° W	2009 - 2021
BKT	0.20° S	100.32° E	2004 - 2021
BLK	64.33° N	96.01° W	2017 - 2019
BMW	32.26° N	64.88° W	2000 - 2021
BRA	50.20° N	104.71° W	2009 - 2021
BRW	71.34° N	156.64° W	2000 - 2021
BRZ	56.15° N	84.33° E	2008 - 2019
CBA	55.21° N	162.72° W	2000 - 2021
CBW	51.97° N	4.93° E	2000 - 2021
CBY	69.13° N	105.06° W	2012 - 2021
CFA	19.28° N	147.06° E	2000 - 2021
CGO	40.68° S	144.69° E	2000 - 2021
CHL	58.74° N	93.82° W	2011 - 2021
CHR	1.70° N	157.17° W	2000 - 2020
CIB	41.81° N	4.93° W	2009 - 2021
CMN	44.19° N	10.70° E	2008 - 2021
COI	43.16° N	145.50° E	2000 - 2021
CPA	42.64° N	77.07° E	2016 - 2021
CPS	49.82° N	74.98° W	2011 - 2021
CPT	34.35° S	18.49° E	2000 - 2021
CRV	64.99° N	147.60° W	2011 - 2021
CRZ	46.43° S	51.85° E	2000 - 2021
CVO	16.86° N	24.87° W	2007 - 2021
CYA	66.28° S	110.52° E	2000 - 2021

DEM	59.79° N	10.87° E	2005 - 2021
DIK	73.51° N	80.52° E	2018 - 2021
DRP	59.16° S	62.59° W	2006 - 2021
DSI	20.69° N	116.73° E	2010 - 2021
EGB	44.23° N	79.78° W	2005 - 2021
EIC	27.15° S	109.45° W	2000 - 2019
ESP	49.38° N	126.54° W	2009 - 2021
EST	51.67° N	110.21° W	2010 - 2021
ETL	54.35° N	104.99° W	2005 - 2021
FNE	58.84° N	122.57° W	2014 - 2021
FSD	49.88° N	81.57° W	2000 - 2021
GAT	53.07° N	11.44° E	2016 - 2021
GMI	13.39° N	144.66° E	2000 - 2021
GPA	12.25° S	131.04° E	2010 - 2019
HAT	24.06° N	123.81° E	2000 - 2021
HBA	75.61° S	26.21° W	2000 - 2021
HNP	43.61° N	79.39° W	2014 - 2021
HPB	47.80° N	11.02° E	2006 - 2021
HSU	41.05° N	124.60° W	2008 - 2017
HTM	56.10° N	13.42° E	2016 - 2021
HUN	46.95° N	16.65° W	2000 - 2021
ICE	63.39° N	20.29° W	2000 - 2021
INU	68.32° N	133.53° W	2012 - 2021
IPR	45.81° N	8.63° E	2017 - 2021
IZO	28.31° N	16.49° W	2000 - 2021
JFJ	46.55° N	7.98° E	2007 - 2021
KAS	49.23° N	19.98° E	2000 - 2021
KEY	25.61° N	80.20° W	2000 - 2021
KJN	70.85° N	29.22° E	2014 - 2021
KRE	49.58° N	15.08° E	2017 - 2021
KRS	58.25° N	82.42° E	2004 - 2021
KUM	19.52° N	154.82° W	2000 - 2021
LAU	45.03° S	169.67° E	2009 - 2021
LEF	45.95° N	90.27° W	2010 - 2021
LEW	40.94° N	76.88° W	2013 - 2021
LIN	52.17° N	14.12° E	2015 - 2021
LLB	54.95° N	112.45° W	2007 - 2021
LLN	23.46° N	120.86° E	2006 - 2021
LMP	35.52° N	12.63° E	2008 - 2021
LUT	53.40° N	6.35° E	2006 - 2021
MAA	67.62° S	62.87° E	2000 - 2021

MBO	43.98° N	121.69° W	2011 - 2021
MEX	18.98° N	97.31° W	2009 - 2021
MHD	53.33° N	9.89° W	2000 - 2021
MID	28.22° N	177.37° W	2000 - 2021
MKN	0.06° S	37.30° E	2003 - 2011
MLO	19.53° N	155.58° W	2000 - 2021
MNM	24.29° N	153.98° E	2000 - 2021
MQA	54.48° S	158.97° E	2000 - 2021
MSH	41.66° N	70.50° W	2016 - 2021
MWO	34.22° N	118.06° W	2010 - 2021
NAT	5.51° S	35.26° W	2010 - 2020
NMB	23.58° S	15.03° E	2000 - 2021
NOR	60.09° N	17.48° E	2017 - 2021
NOY	63.43° N	75.78° E	2005 - 2016
NWP	4.09° S	152.2° E	2000 - 2017
NWR	40.05° N	105.63° W	2000 - 2021
OHP	43.92° N	5.75° E	2014 - 2021
OPE	48.56° N	5.5° E	2011 - 2021
OXK	50.03° N	11.81° E	2003 - 2021
PAL	67.97° N	24.12° E	2004 - 2021
PDI	21.57° N	103.52° E	2014 - 2020
PDM	42.94° N	0.14° E	2014 - 2021
POC	1.31° S	114.59° W	2000 - 2017
PRS	45.93° N	7.70° W	2005 - 2021
PSA	64.77° S	64.05° W	2000 - 2021
PUI	62.91° N	27.65° E	2016 - 2021
PUY	45.77° N	2.97° E	2011 - 2021
RBA	9.36° S	67.62° W	2010 - 2018
RGL	52.00° N	2.54° W	2012 - 2021
RPB	13.16° N	59.43° W	2000 - 2021
RUN	21.08° S	55.38° E	2014 - 2021
RYO	39.03° N	141.82° E	2000 - 2021
SAC	48.72° N	2.14° E	2015 - 2021
SAN	2.85° S	54.95° W	2004 - 2018
SCT	33.41° N	81.83° W	2015 - 2021
SEY	4.68° S	55.53° E	2000 - 2021
SGP	36.61° N	97.49° W	2002 - 2021
SHM	52.72° N	174.12° E	2000 - 2021
SIS	59.85° N	1.27° W	2003 - 2021
SMO	14.24° S	170.56° W	2000 - 2021
SMR	61.85° N	24.29° E	2015 - 2021

SPO	89.98° S	24.80° W	2000 - 2021
STR	37.76° N	122.45° W	2007 - 2014
SUM	72.59° N	38.42° W	2000 - 2021
SVB	64.26° N	19.77° E	2017 - 2021
SVV	51.33° N	82.13° E	2007 - 2014
SYO	69.01° S	39.58° E	2000 - 2021
TAB	5.98° S	69.70° W	2010 - 2012
TAC	52.52° N	1.14° E	2013 - 2021
TAP	36.73° N	126.13° E	2000 - 2021
TEF	3.70° S	66.50° W	2013 - 2018
TER	69.20° N	35.10° E	2000 - 2021
THD	41.05° N	124.15° W	2002 - 2017
TIK	71.59° N	128.89° E	2011 - 2018
TLL	30.17° S	70.80° W	2013 - 2021
TOH	51.81° N	10.53° E	2017 - 2021
TPD	42.64° N	80.56° W	2012 - 2021
TRN	47.96° N	2.11° E	2007 - 2021
ULD	37.48° N	130.9° E	2014 - 2021
USH	54.85° S	68.31° W	2000 - 2021
UTA	39.90° N	113.72° W	2000 - 2021
UTO	59.78° N	21.37° E	2012 - 2021
UUM	44.45° N	111.10° E	2000 - 2021
VGN	54.50° N	62.32° E	2008 - 2021
WBI	41.72° N	91.35° W	2007 - 2021
WGC	38.26° N	121.49° W	2007 - 2021
WIS	30.86° N	34.78° E	2000 - 2021
WKT	31.31° N	97.33° W	2001 - 2021
WLG	36.27° N	100.92° E	2000 - 2021
WSA	43.93° N	60.01° W	2003 - 2021
YON	24.47° N	123.01° E	2000 - 2021
ZEP	78.91° N	11.89° E	2000 - 2021
ZOT	60.80° N	89.35° E	2006 - 2021
ZSF	47.42° N	10.98° E	2002 - 2021

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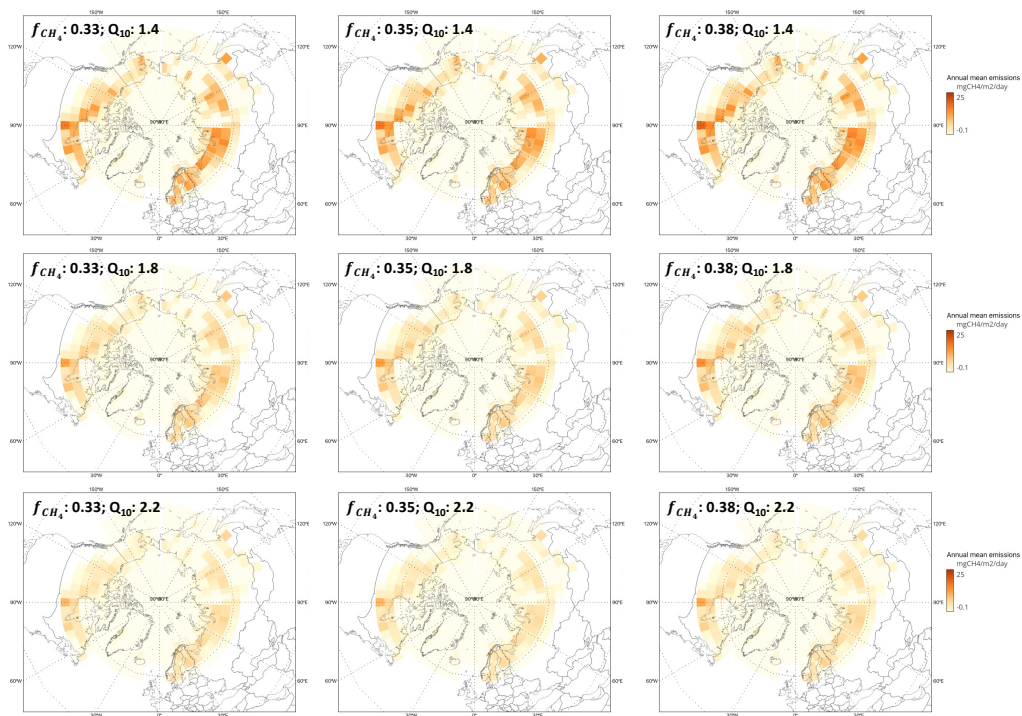


Figure S1. Annual mean wetland prior  $\text{CH}_4$  emissions (between 2010-2021) from nine JSBACH sensitivity experiments, each using different values of the  $Q_{10}$  parameter and the baseline  $f_{\text{CH}_4}$  fraction.

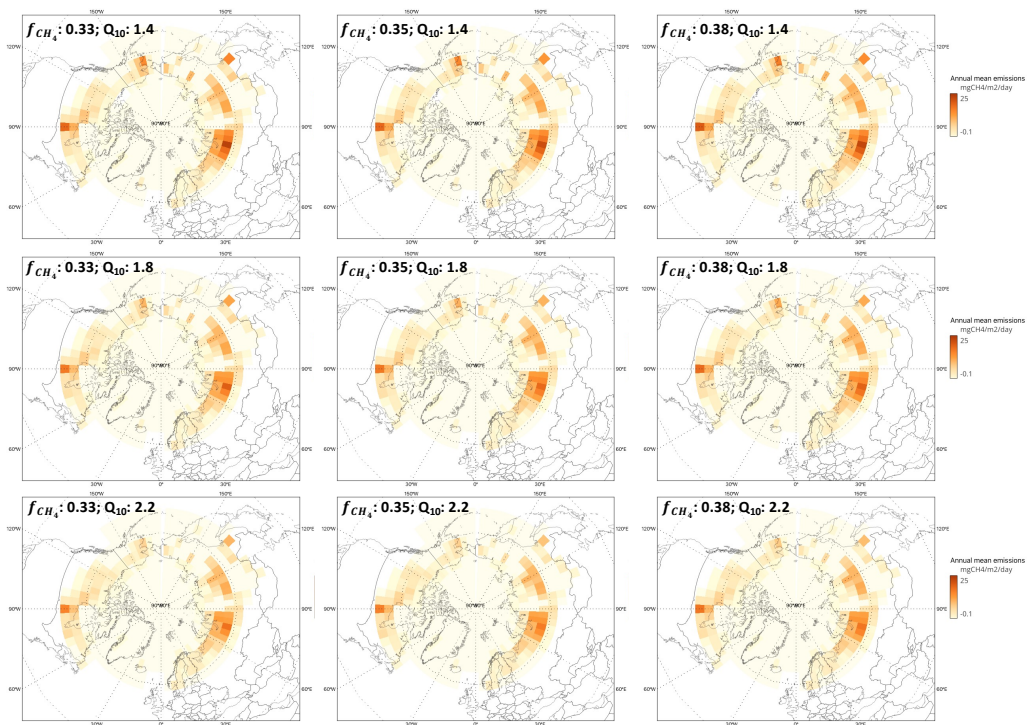


Figure S2. Annual mean posterior CH<sub>4</sub> emissions from wetlands (between 2010-2021) estimated from atmospheric inversions using nine JSBACH sensitivity experiments, each using the different JSBACH wetland emissions with different values of the  $Q_{10}$  parameter and the baseline  $f_{CH_4}$  fraction as wetland prior flux.