



*Supplement of*

## **Influences of hydroxyl radicals (OH) on top-down estimates of the global and regional methane budgets**

**Yuanhong Zhao et al.**

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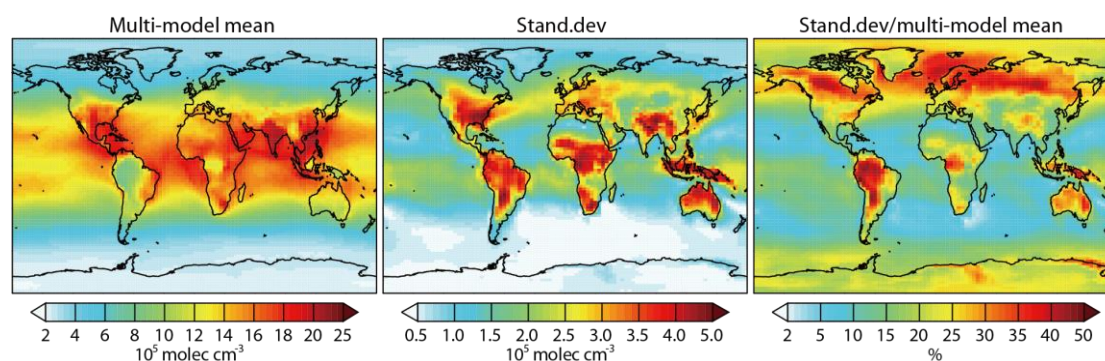
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**Table S1.** Location of the NOAA/ESRL aircraft sites.

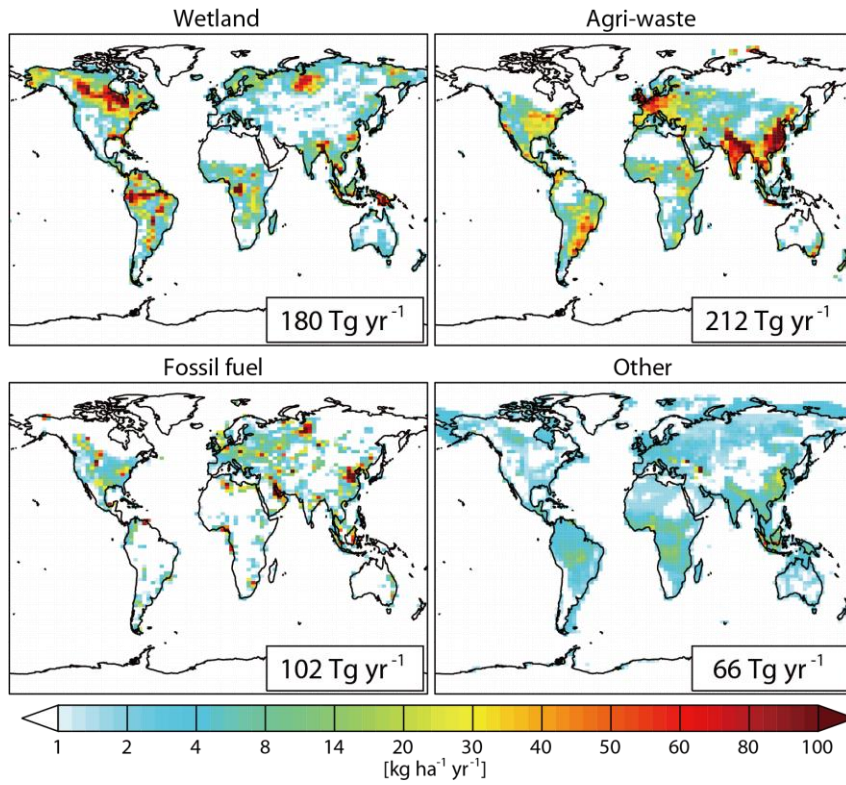
STATION ID	SITE LOCATION	BOTTOM ALT(m)	TOP ALT(m)	latitude	longitude
CAR	Briggsdale, CO	1658	11879	40° 22'N	104° 17'W
HAA	Molokai Island, HI	305	8104	21° 14'N	158° 57'W
HFM	Harvard Forest, MA	582	8063	42° 32'N	72° 10'W
PFA	Poker Flat, AK	131	7604	65° 04'N	147° 17'W

**Table S2.** Mean $\pm$ SD of the CH<sub>4</sub> reaction weighted tropospheric mean [OH] in 10<sup>5</sup> molec cm<sup>-3</sup> (8 original and scaled OH fields listed in Table 1 excluding SOCOL3 and MOCAGE) over 4 latitudinal intervals.

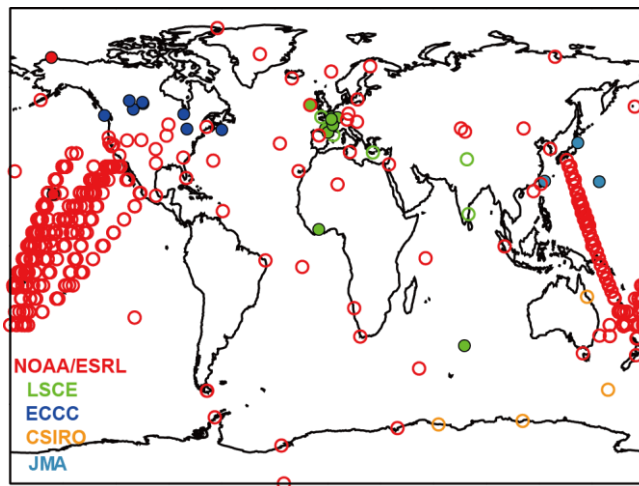
	30°N-90°N	0°-30°N	0-30°S	30°S-90°S
Original OH	8.7 $\pm$ 0.9	17 $\pm$ 1.5	15 $\pm$ 1.0	5.4 $\pm$ 0.6
Scaled OH	8.4 $\pm$ 0.6	16.2 $\pm$ 0.5	14.3 $\pm$ 0.7	5.2 $\pm$ 0.4



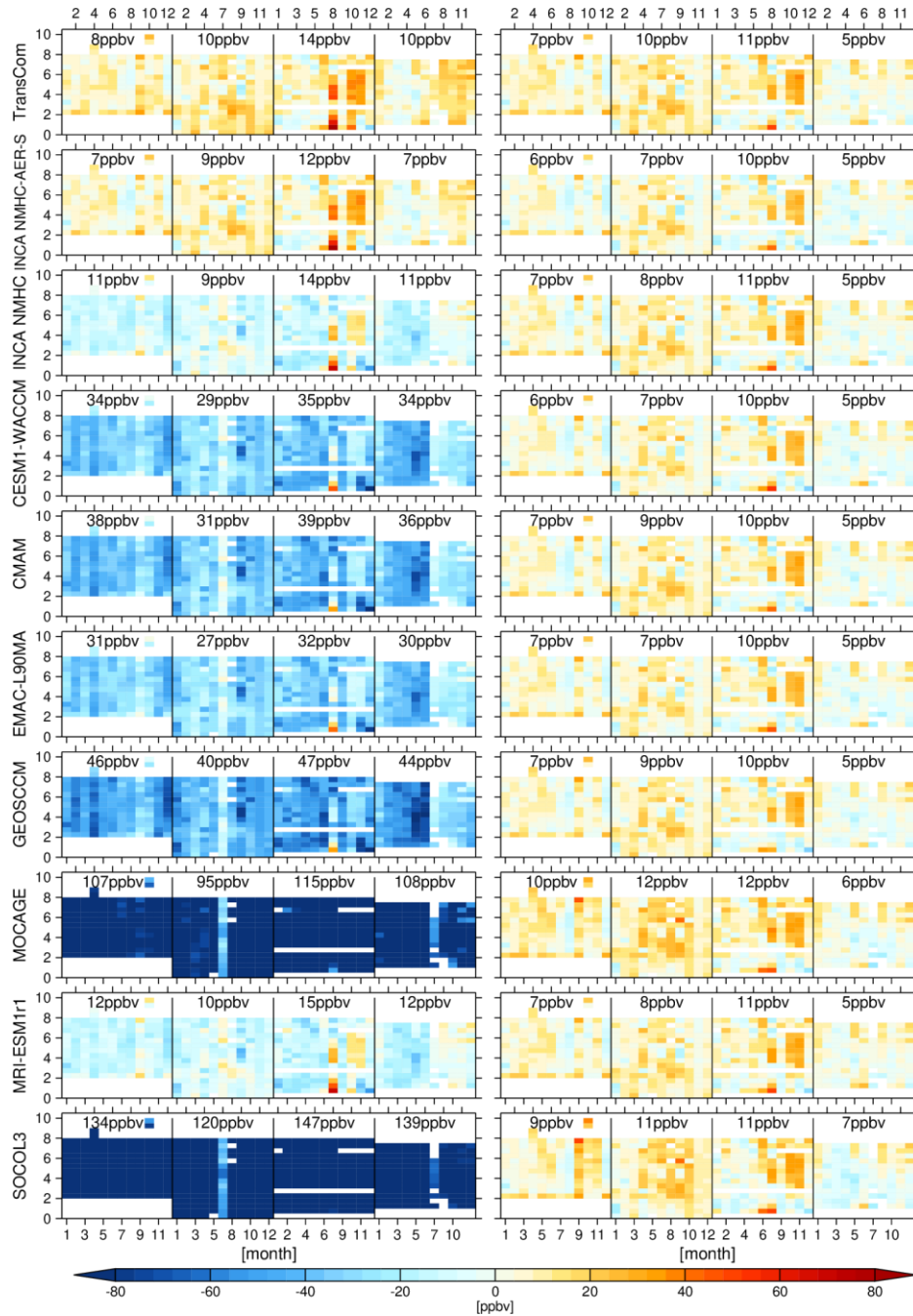
**Figure S1.** Spatial distribution of the multi-model mean (left), standard deviation (middle), and standard deviation relative to the multi-model mean (right) of CH<sub>4</sub> reaction weighted tropospheric mean [OH] (8 scaled OH fields listed in Table 1 excluding SOCOL3 and MOCAGE).



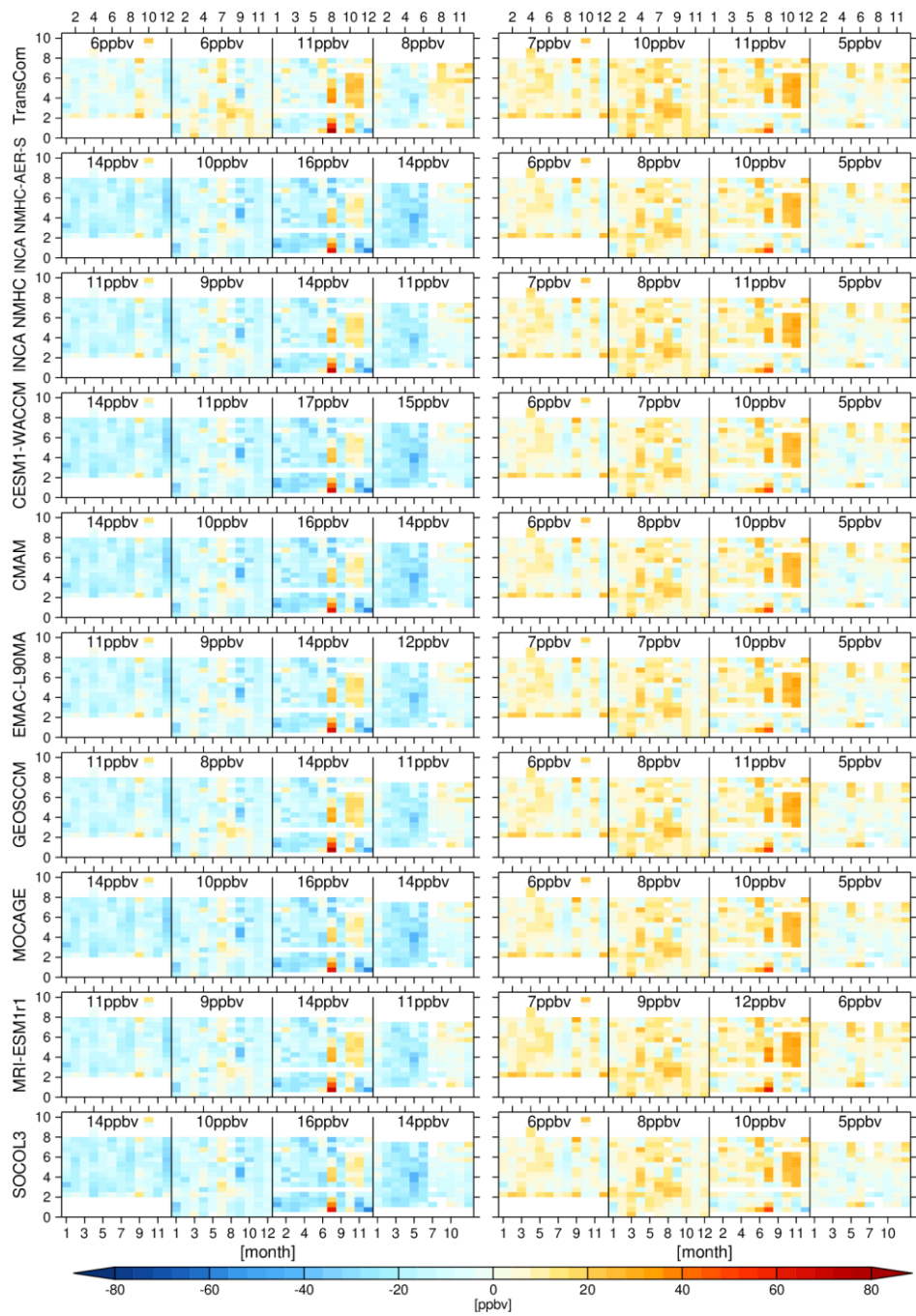
**Figure S2.** Spatial distribution of  $\text{CH}_4$  prior emissions from wetland, agriculture and waste, fossil fuel production and use, and other natural sources averaged over 2000-2016.



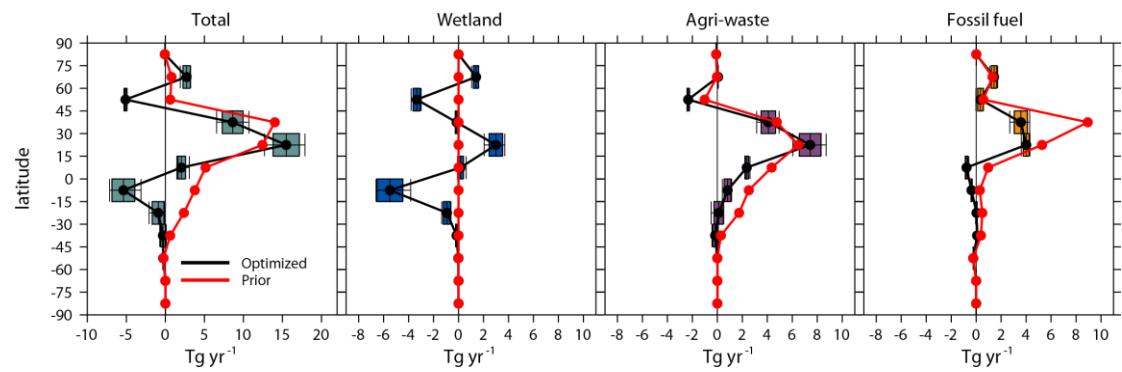
**Figure S3.** Locations of surface stations of  $\text{CH}_4$  observations used in the inversions. The open circles indicate the stations where flask samples are collected, whereas closed circles indicate the stations where continuous in-situ observations are obtained.



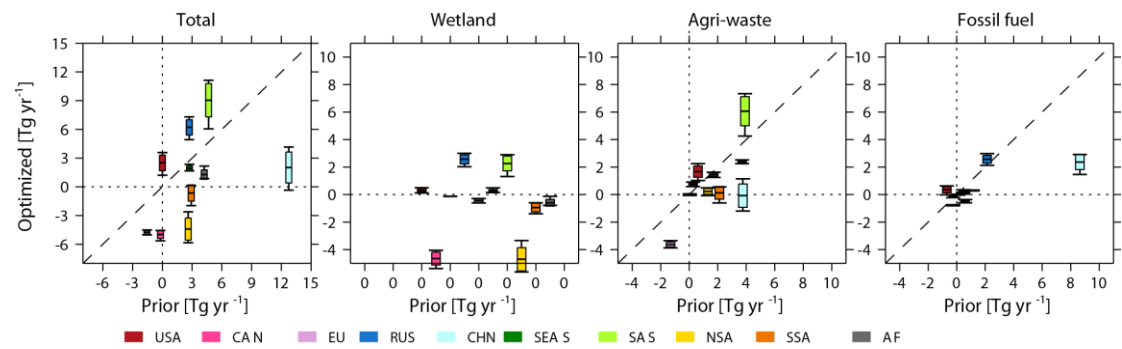
**Figure S4a.** The vertical profiles of the bias in LMDz simulated monthly CH<sub>4</sub> mixing ratios compare with measurements from the NOAA/ESRL Aircraft Project (model – observations) during July 2000-June 2002. The left panels show the bias simulated by prior emissions with 10 original OH fields and the right panels show the bias simulated by corresponding posterior emissions from Inv1. The mean square errors ( $RMSE = \sqrt{\frac{\sum(model-observation)^2}{n_{obs}}}$ ) for  $n_{obs}$  (number of observations) are shown inset.



**Figure S4b.** The same as figure S4a but for Inv2.



**Figure S5.** Same as top panels of Figure 6 but for OH fixed to 2000-2002 (Inv4-Inv2).



**Figure S6.** Same as top panels of Figure 7 but for OH fixed to 2000-2002 (Inv4-Inv2).