Problems in using TM5-MP for validation of wetland CH_4 emissions

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October 22, 2020

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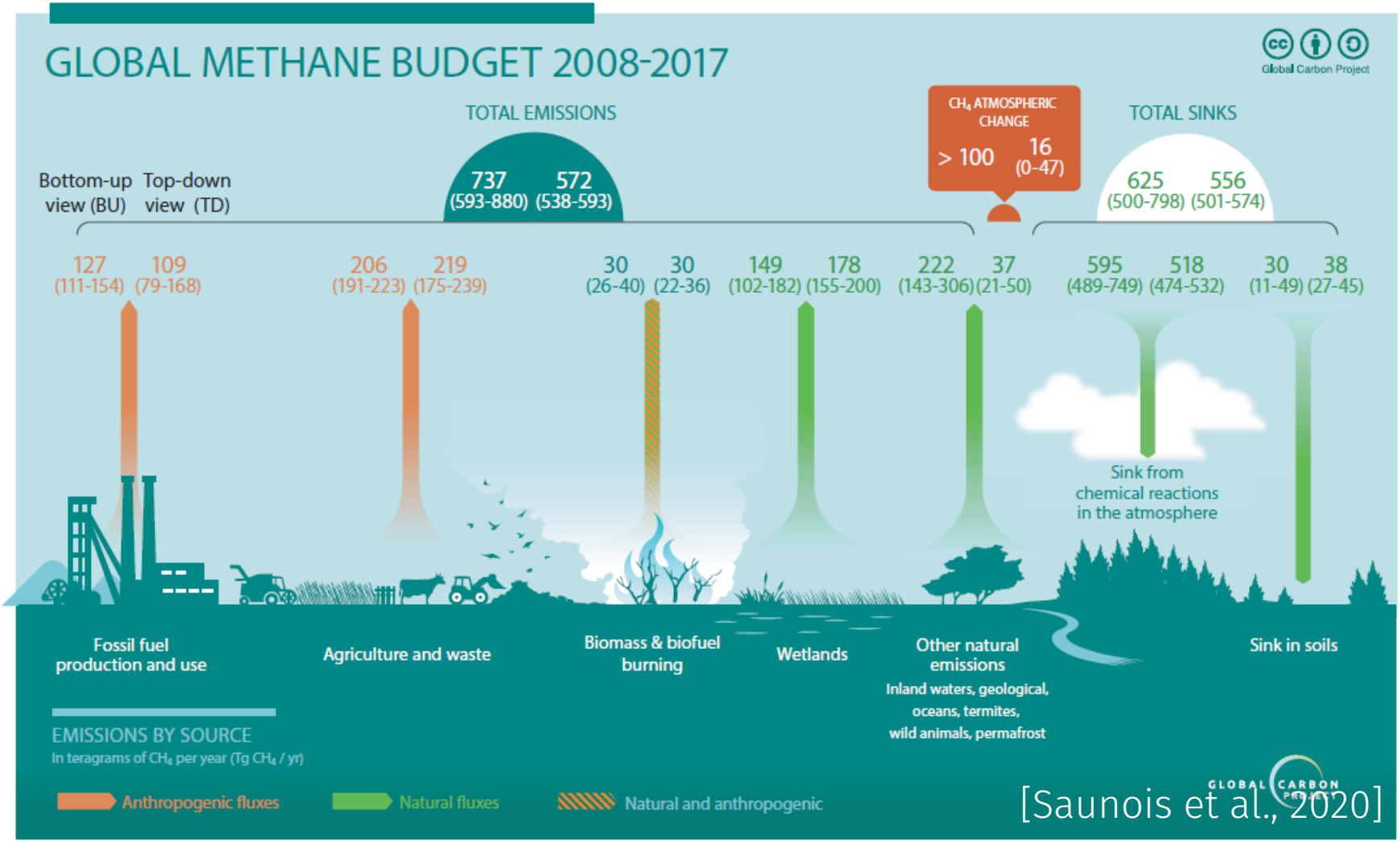
Global Methane Budget (Global Carbon Project)



[Saunois et al., 2020]

Figure 6: Global Methane Budget for the 2008-2017 decades. Both bottom-up (left) and top-down (right) estimates are provided for each emission and sink category in Tg CH_4 yr^{-1}, as well as for total emissions and total sinks.

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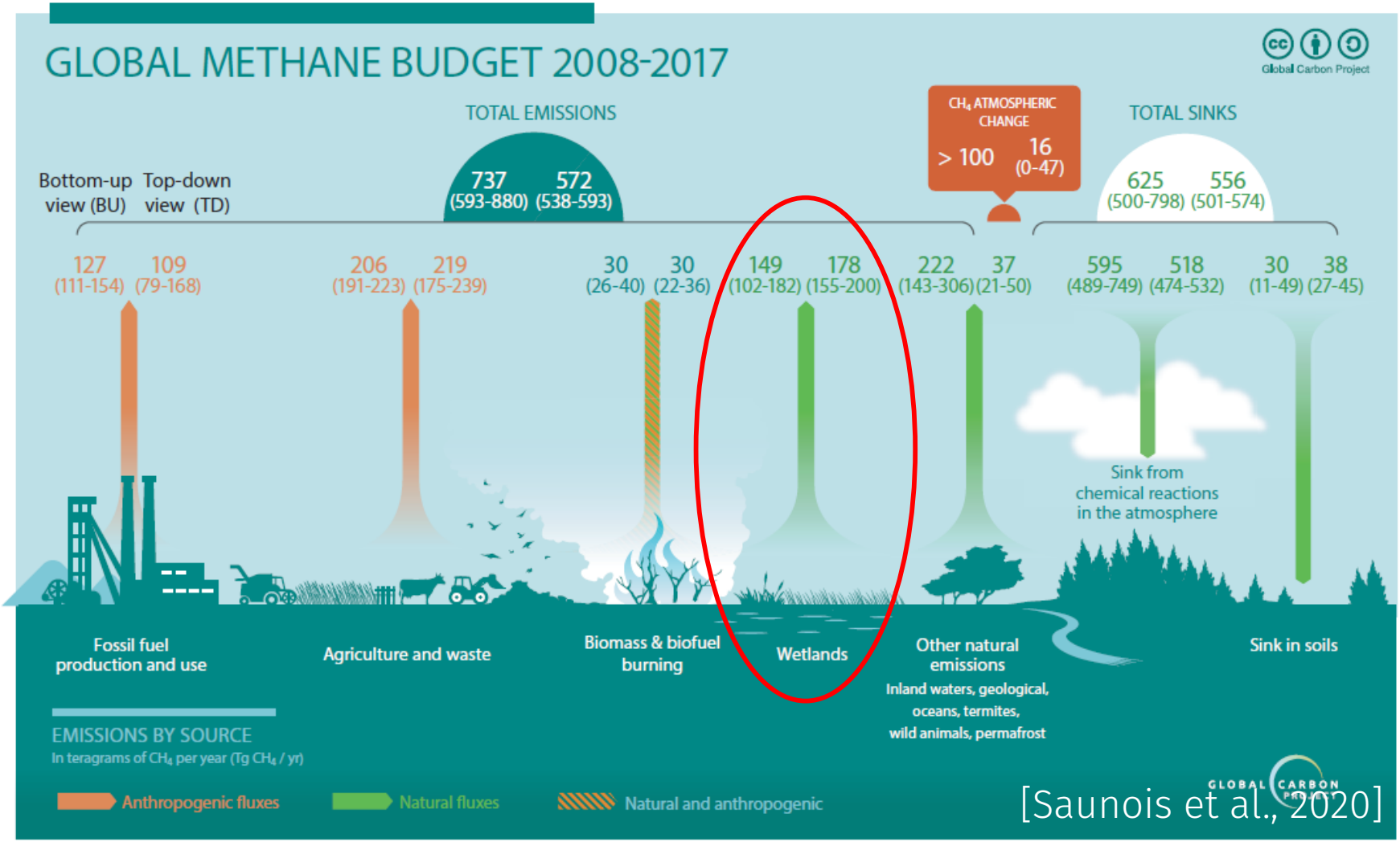

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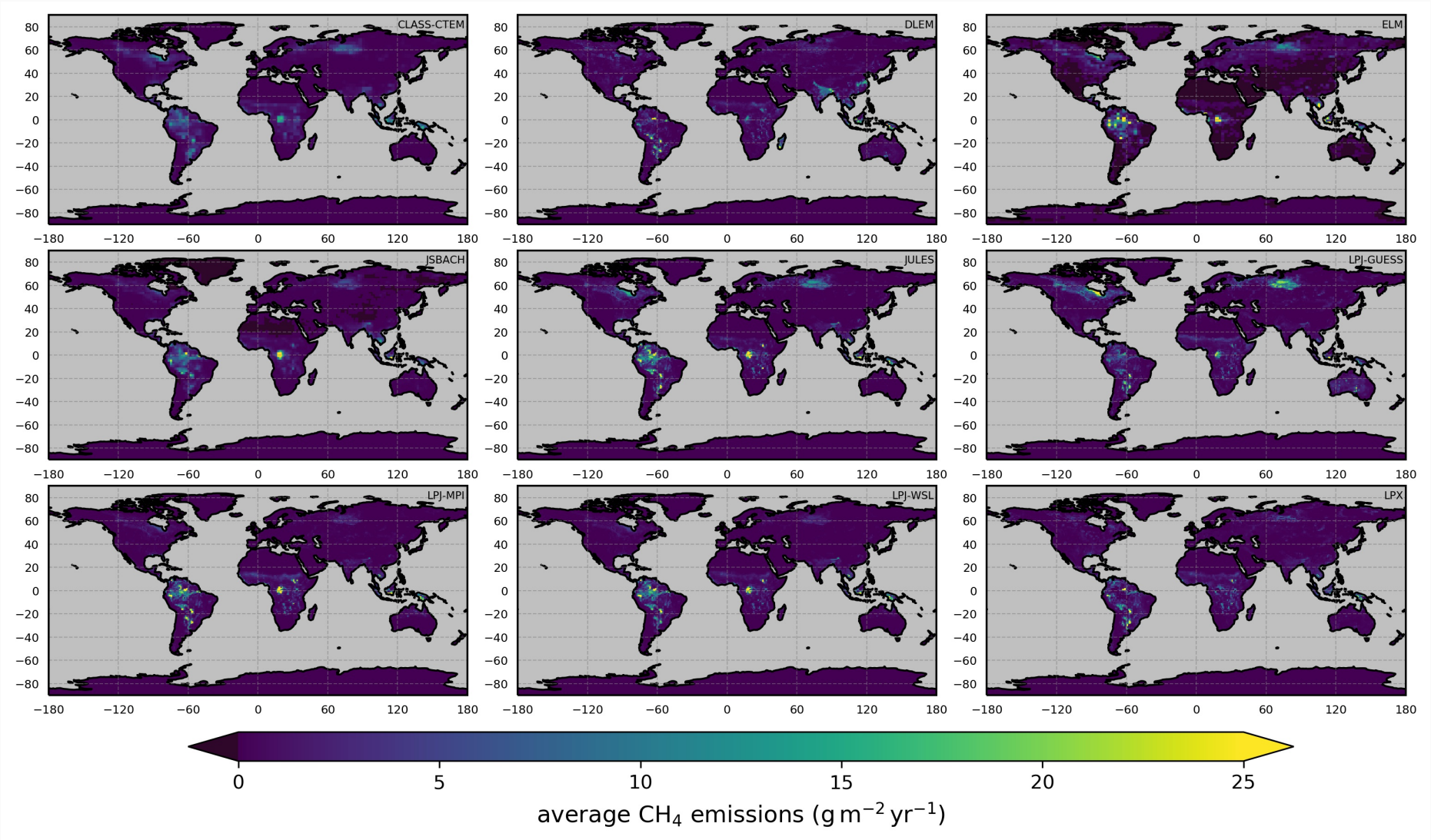
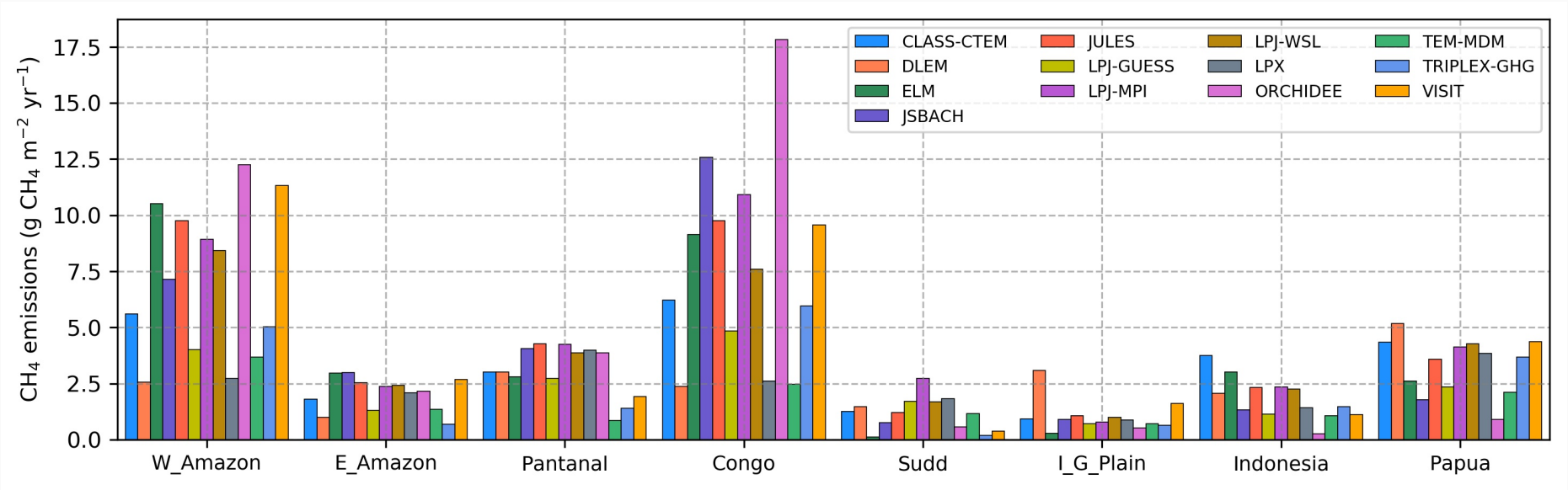
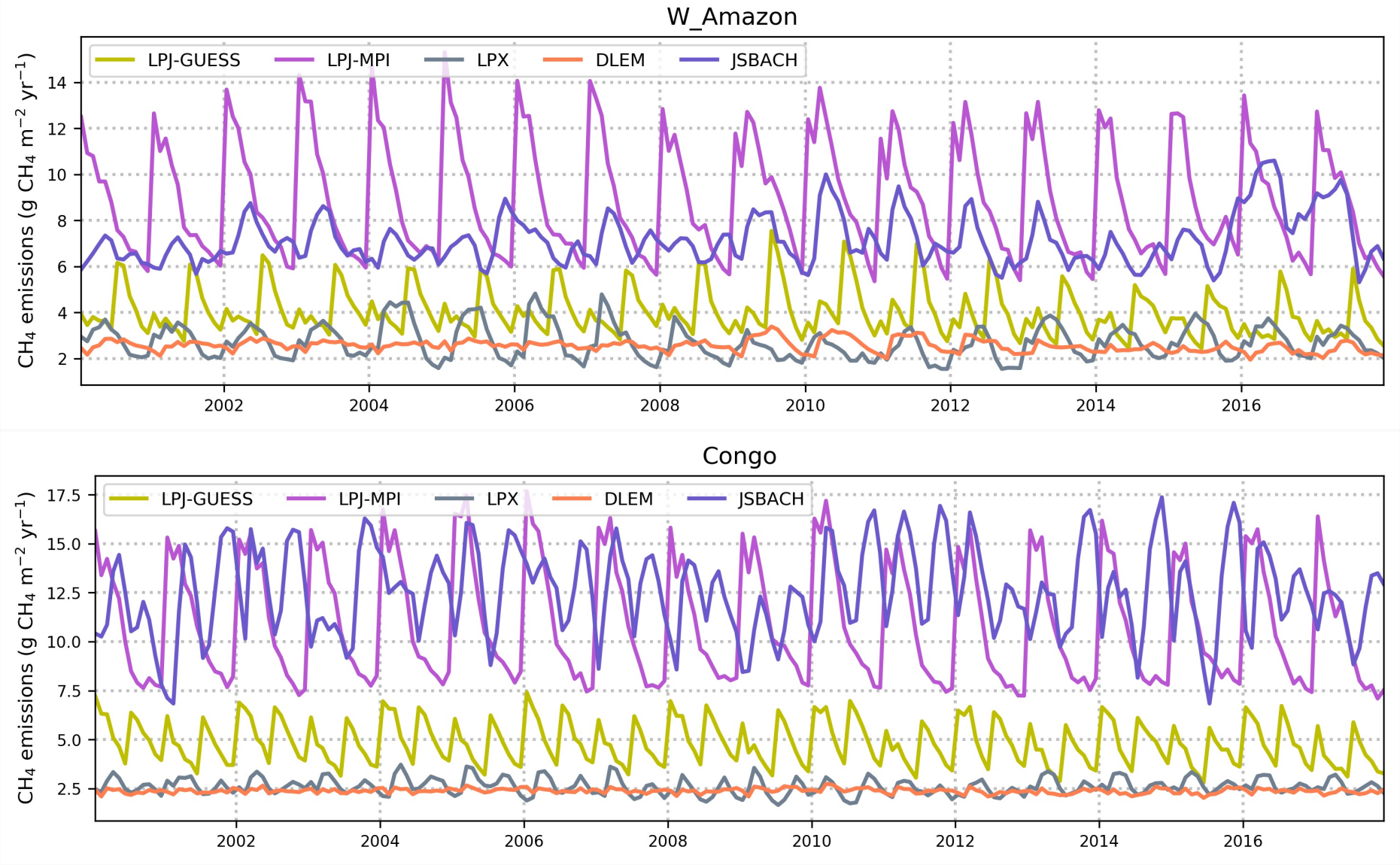
CH_4 wetland emissions datasets



CH_4 wetland emissions



Emission seasonality



Planned TM5 model runs

- 1 run for each data set
- comparison to satellite data

Planned TM5 model runs

- **1 run for each data set**
- comparison to satellite data

- **runs that exclude specific wetlands**
- comparison to normal runs

$\rightarrow$ see impact of specific wetlands

Model runs and resulting problems

1. Full chemistry run (cb05)

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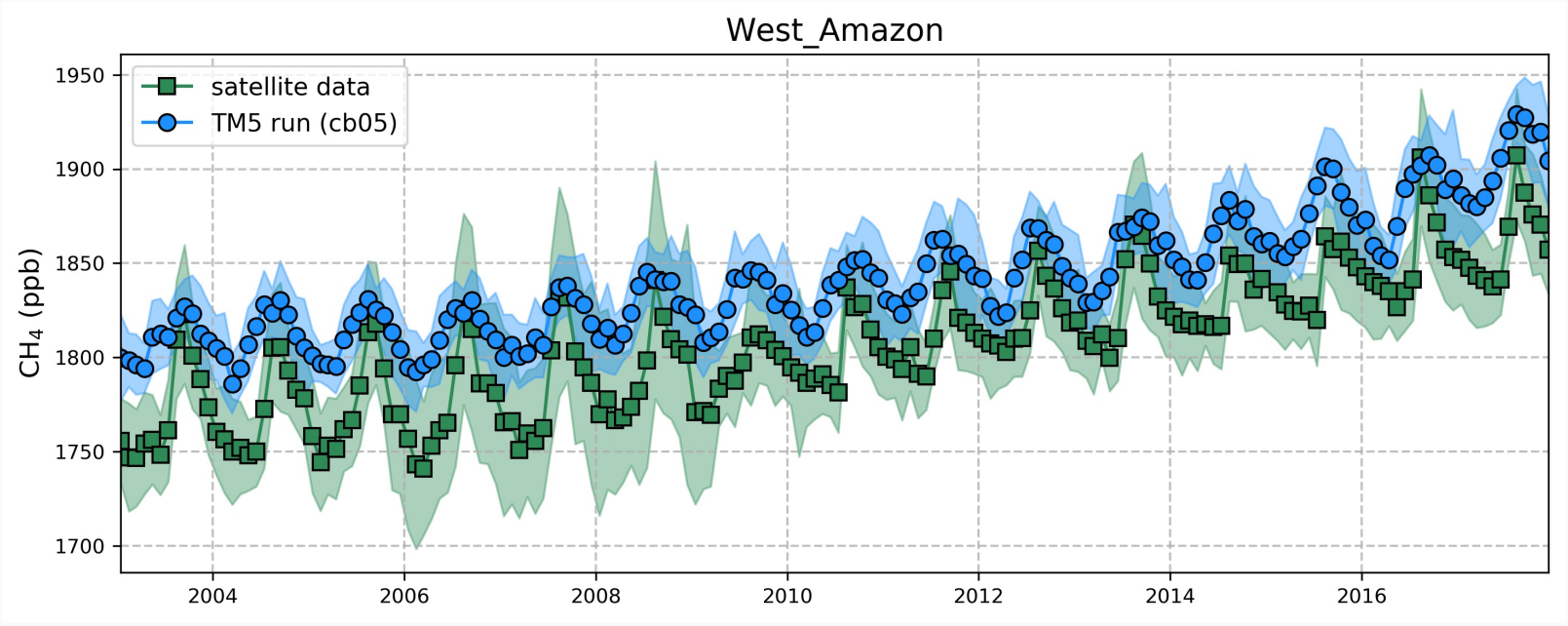

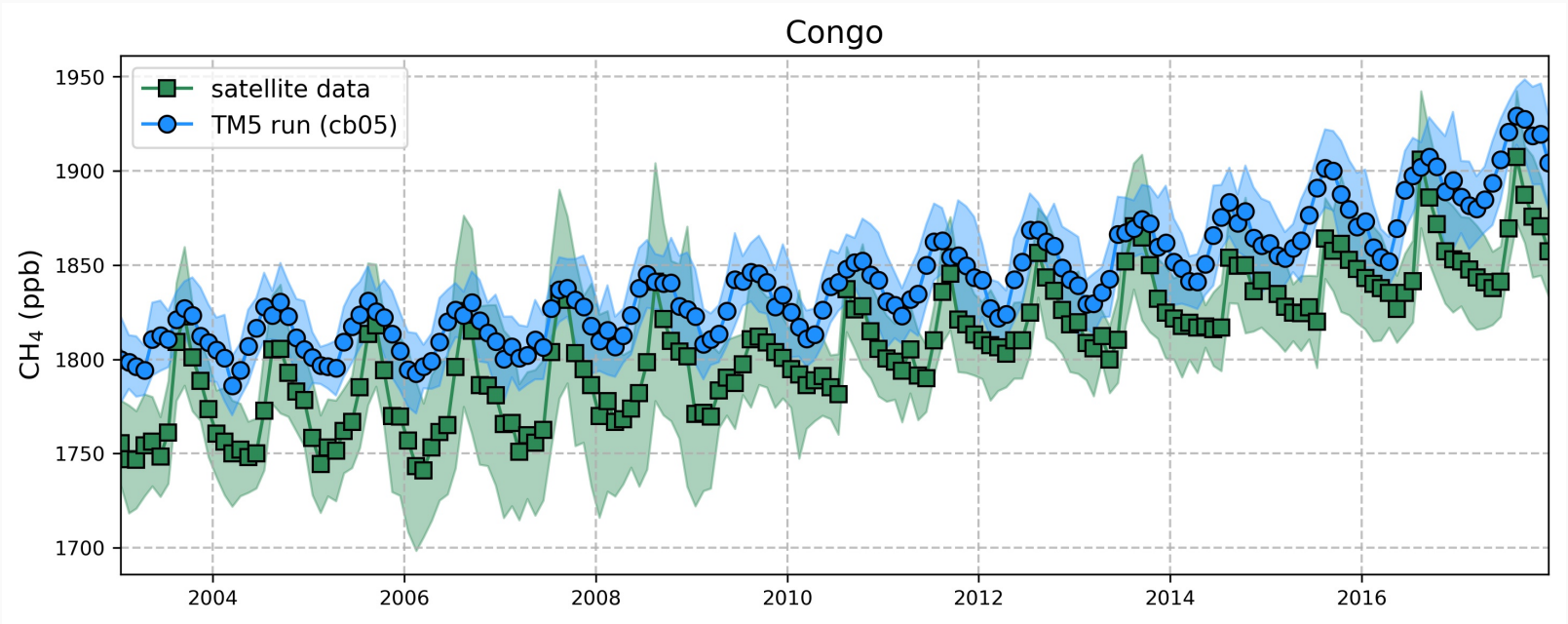

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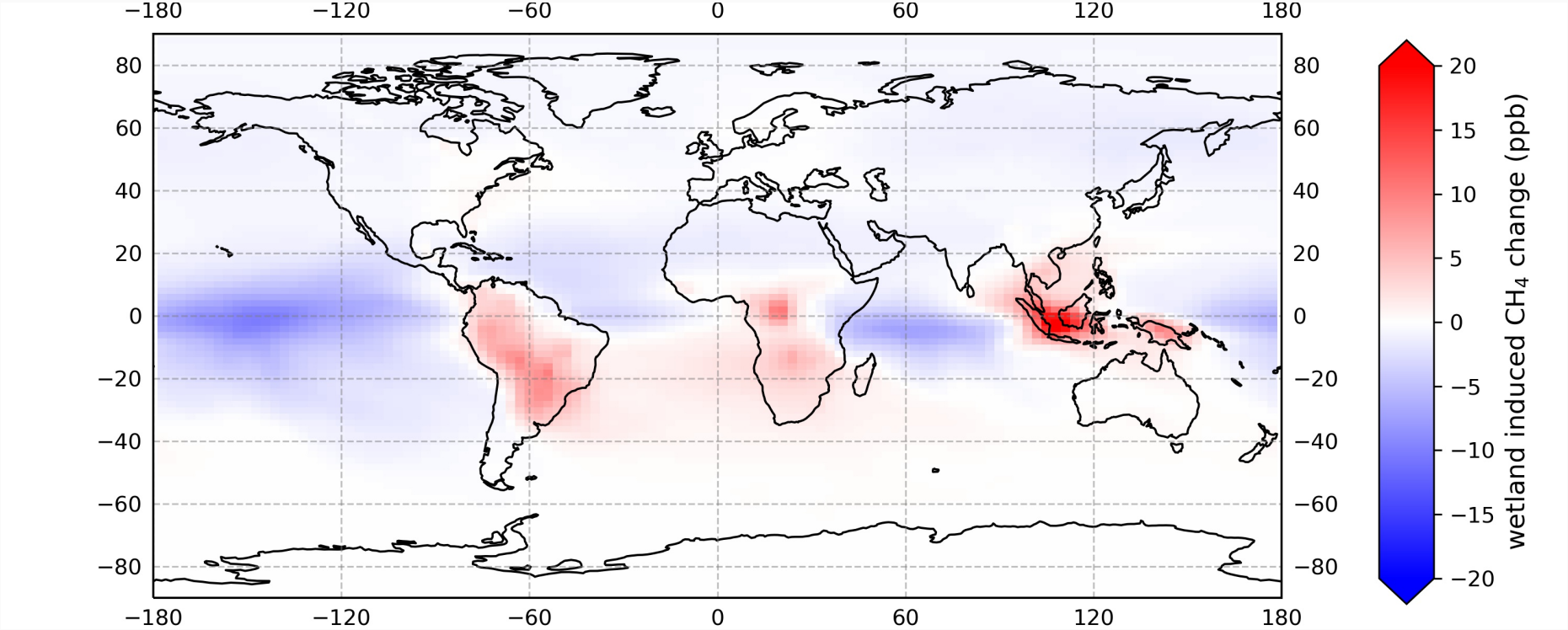

= CH_4(with wetland emissions) − CH_4(without wetland emissions)

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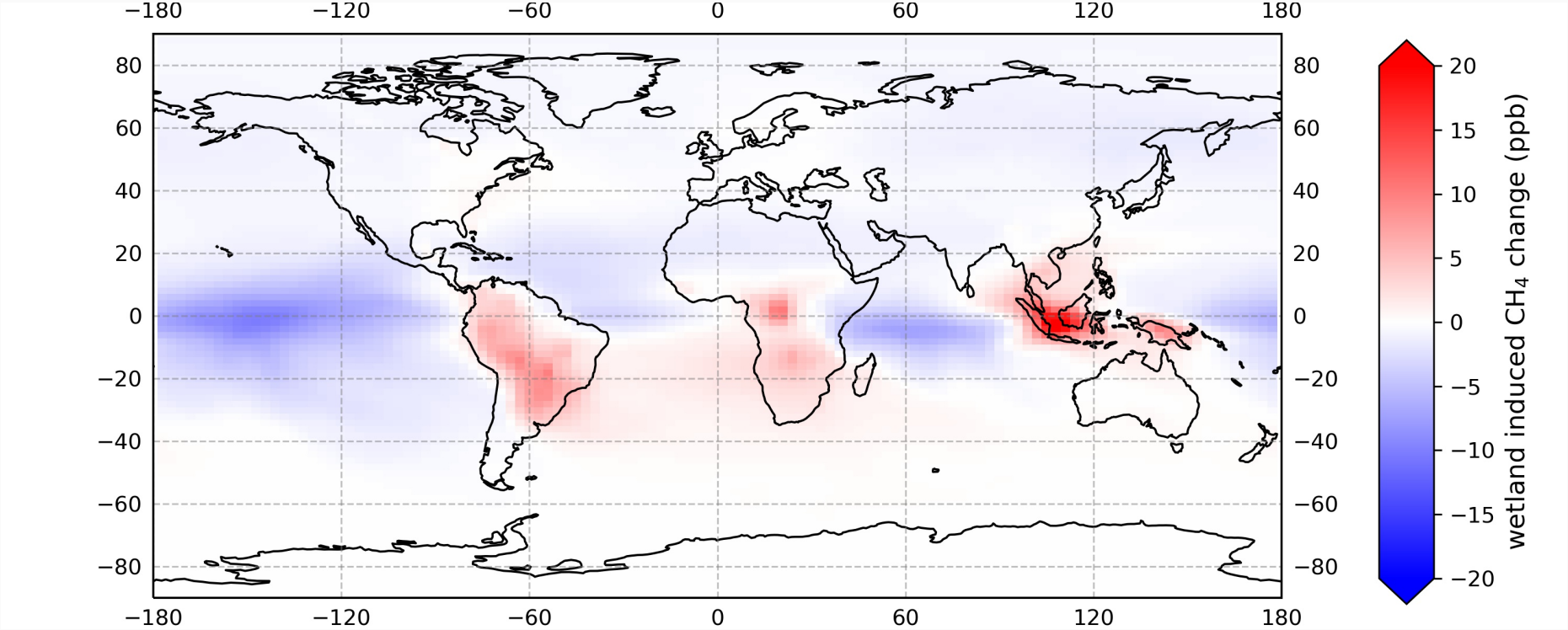
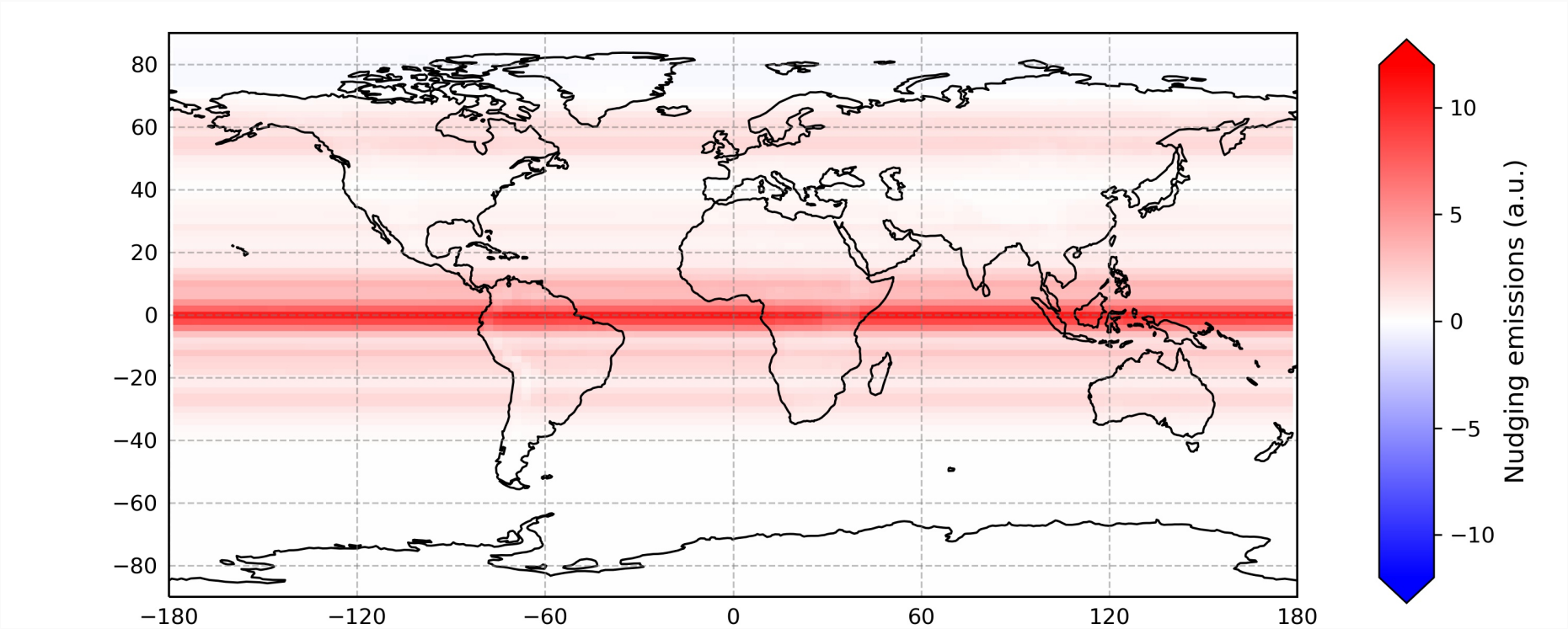


= CH_4(with wetland emissions) − CH_4(without wetland emissions)

- large areas with negative feedback due to increased emissions?

Full chemistry run (cb05) - the nudging term



- additional CH_4 source created to match atmospheric CH_4

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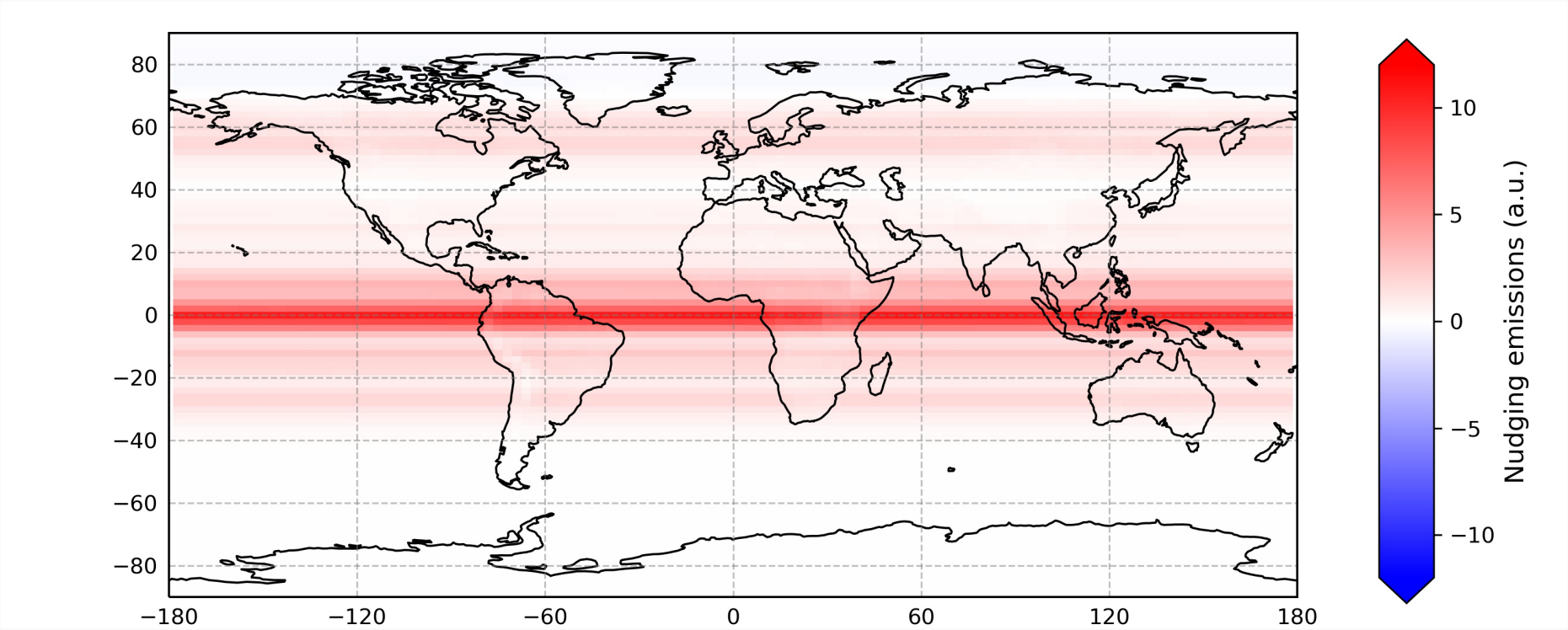

- additional CH_4 source created to match atmospheric CH_4
- nudging source differs for runs with different wetland datasets

Model runs and resulting problems

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1. **Full chemistry run (cb05)**

Problem: different nudging terms for the wetland datasets

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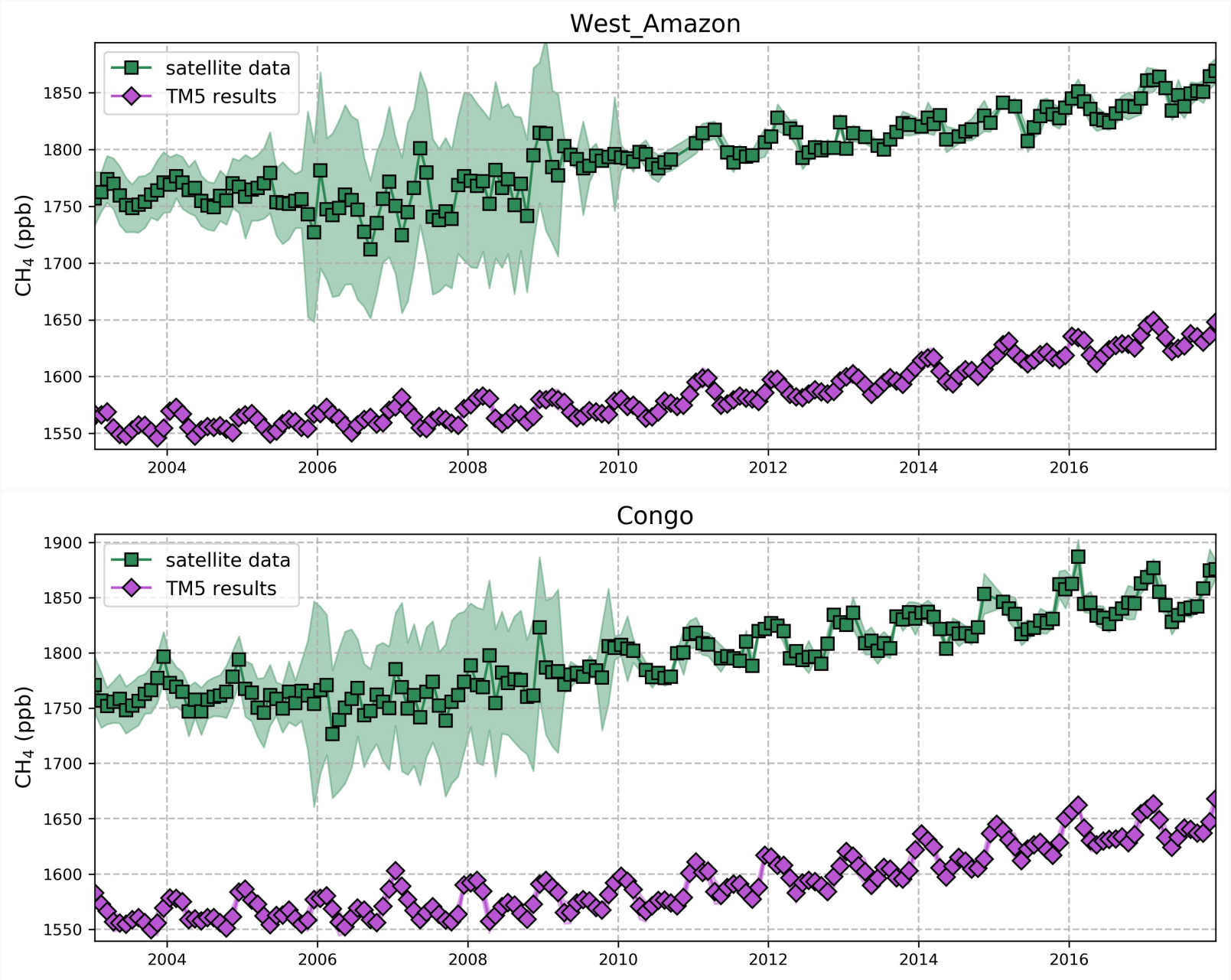
2. **cb05 run without nudging**

TM5 run without Nudging Term



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Problem: CH_4 emission deficit

Global Methane Budget (Global Carbon Project 2019)

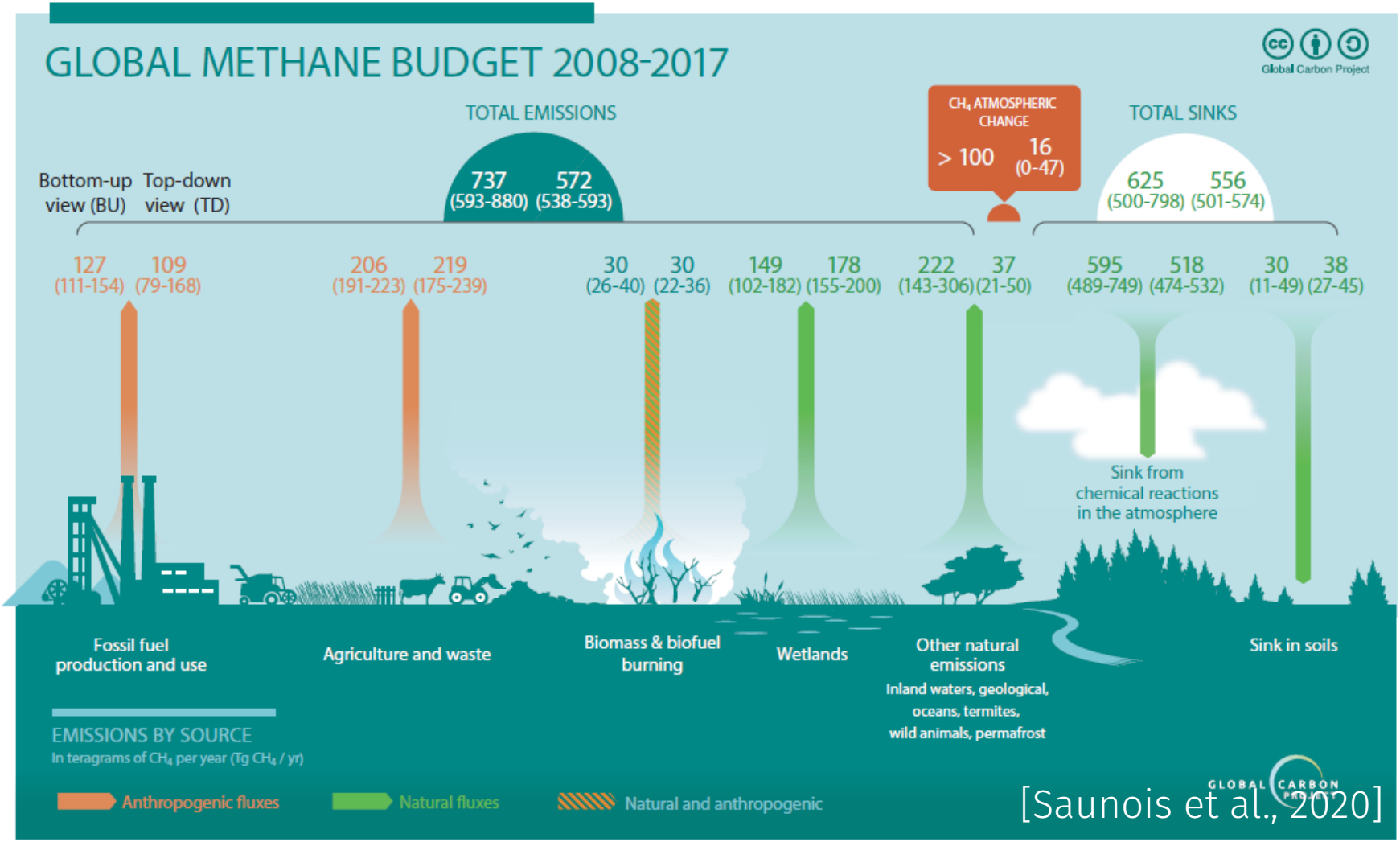

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Figure 6: Global Methane Budget for the 2008-2017 decades. Both bottom-up (left) and top-down (right) estimates are provided for each emission and sink category in Tg CH_4 yr^{-1}, as well as for total emissions and total sinks.

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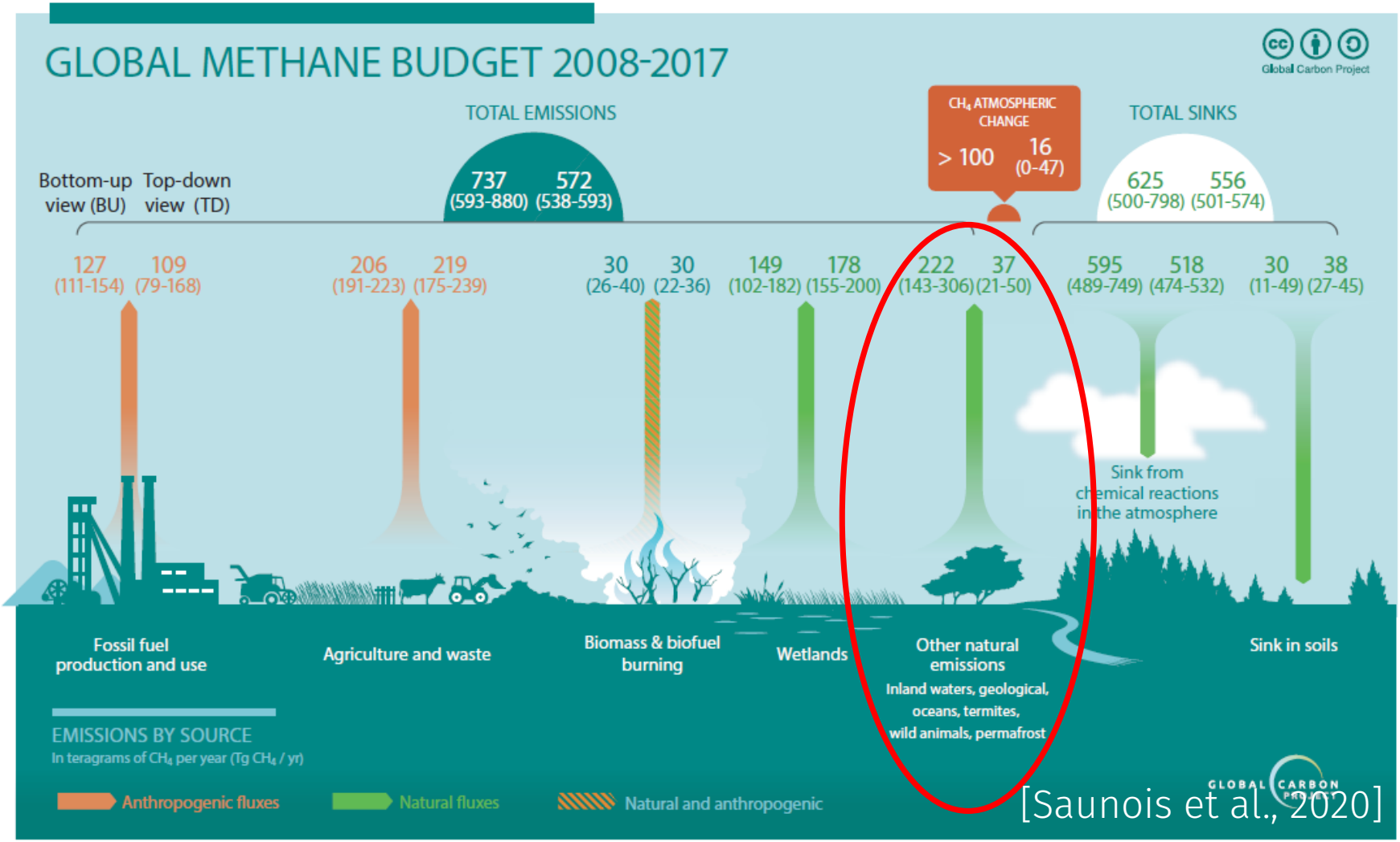

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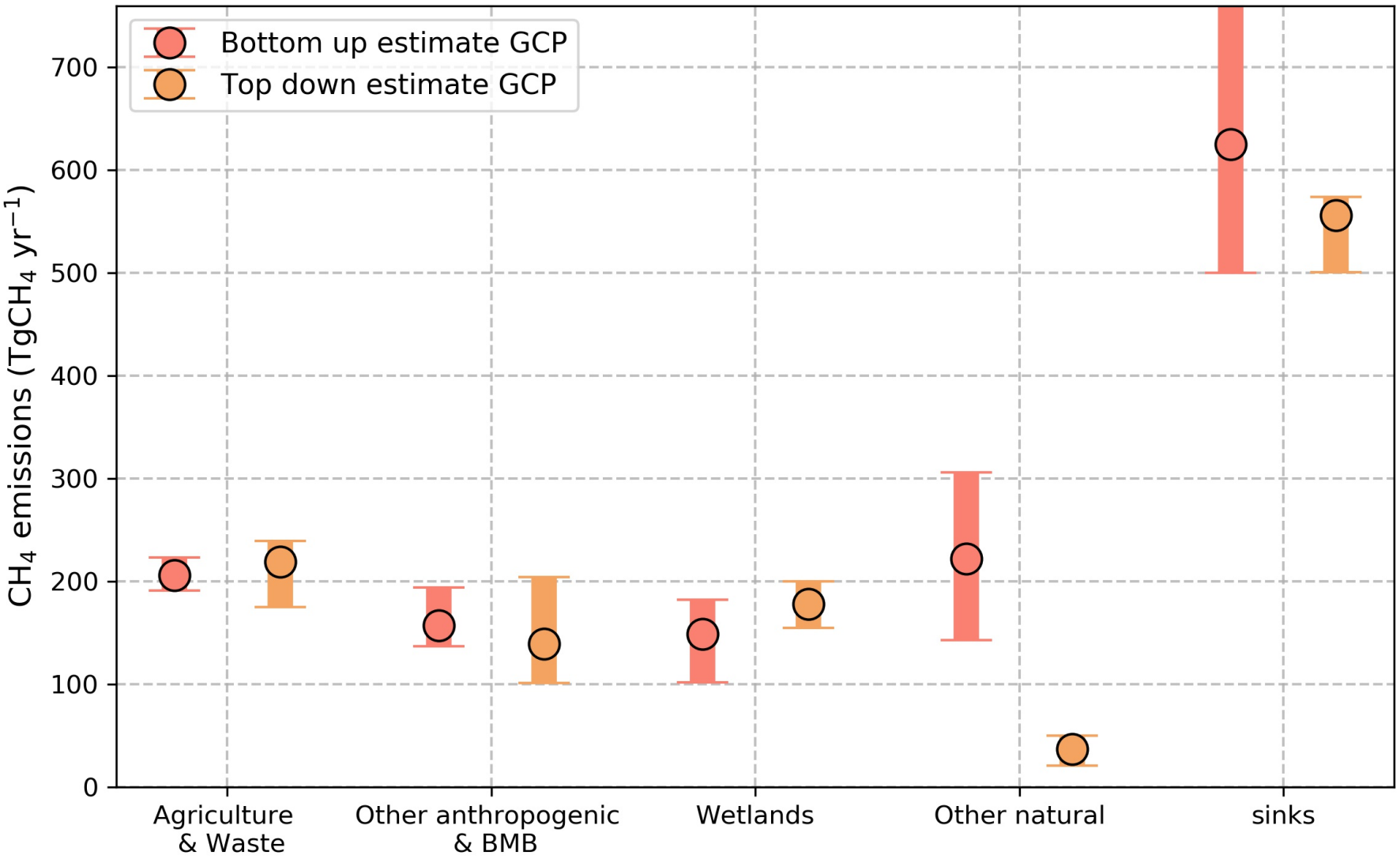
Budget Comparison



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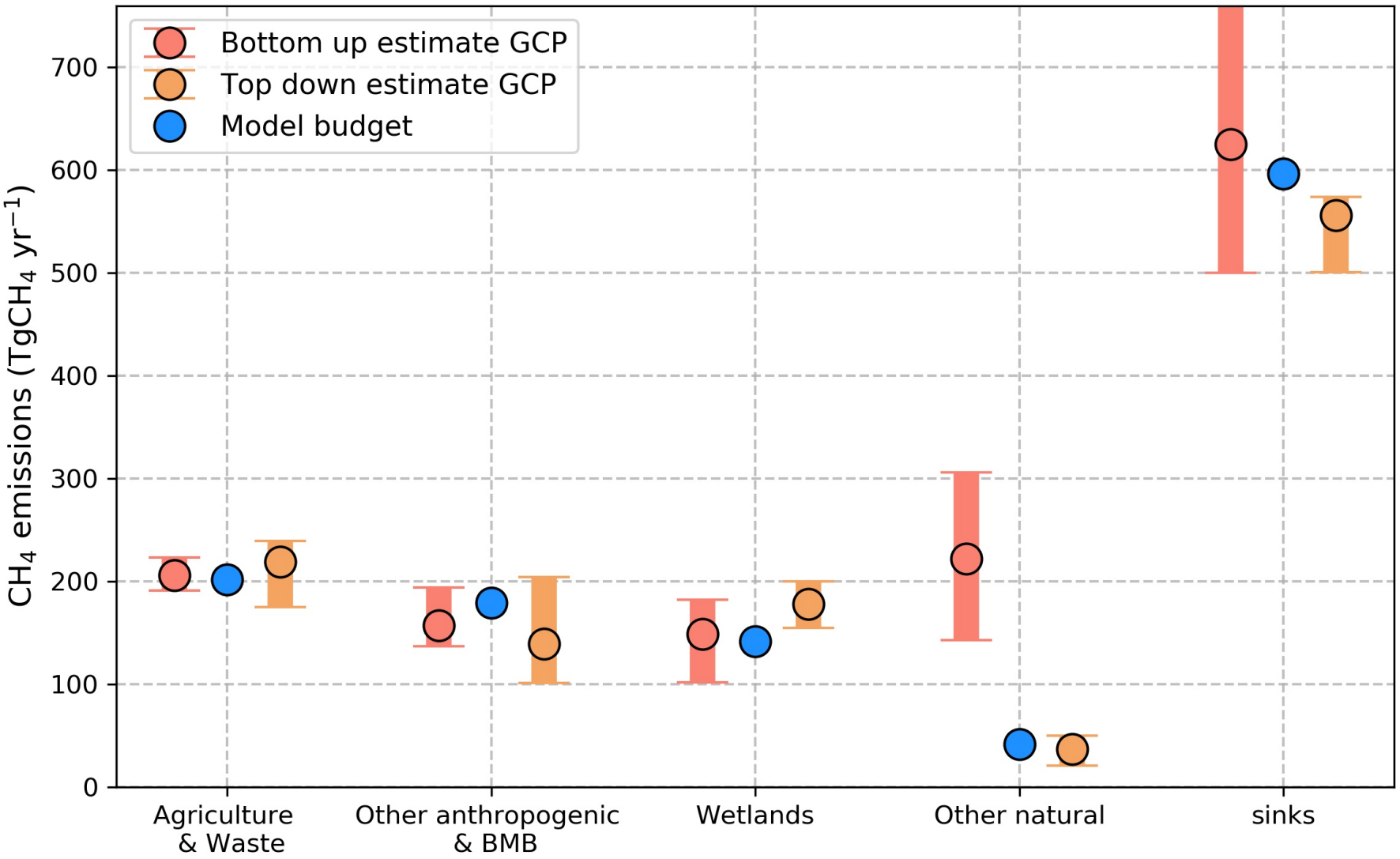

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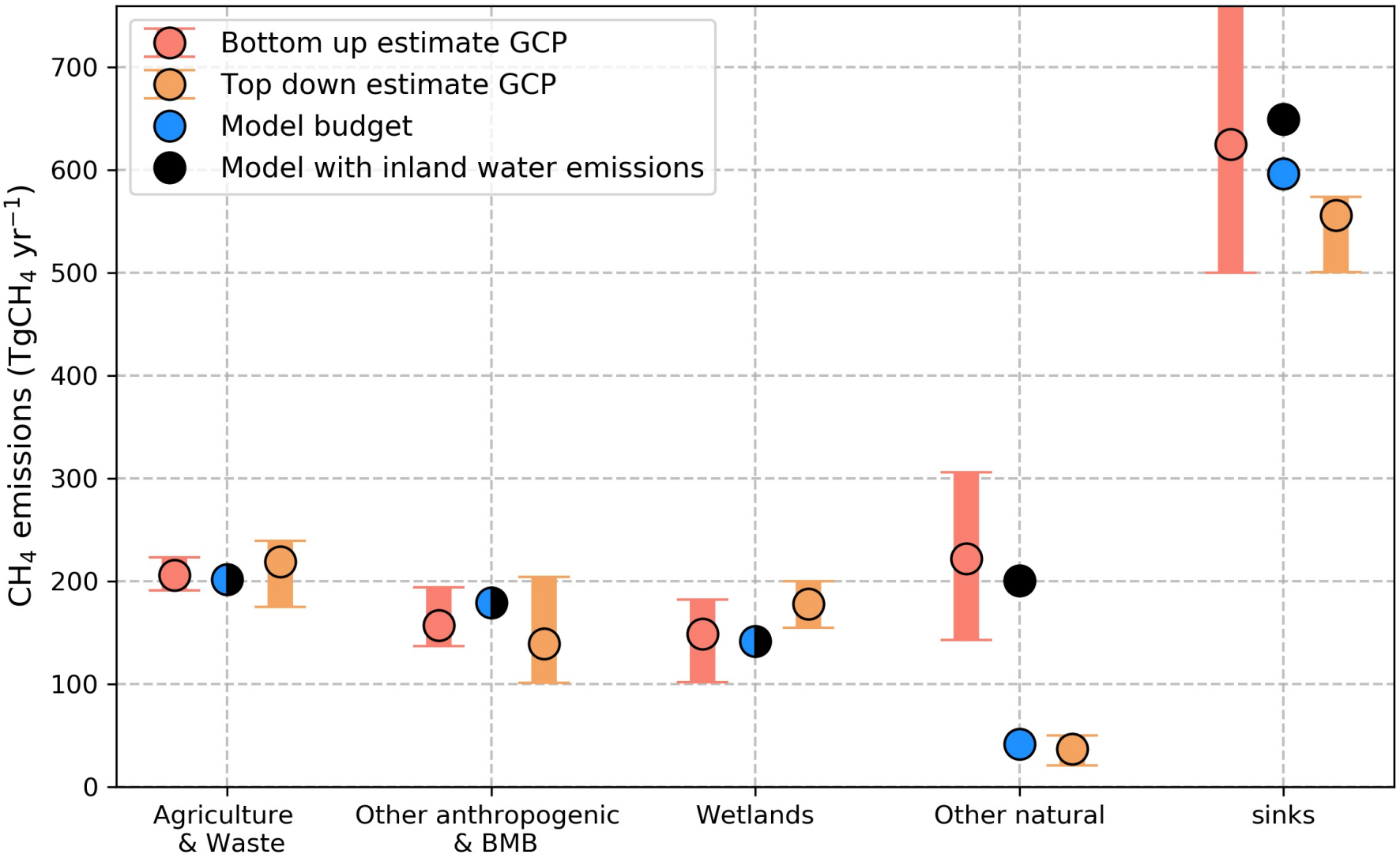

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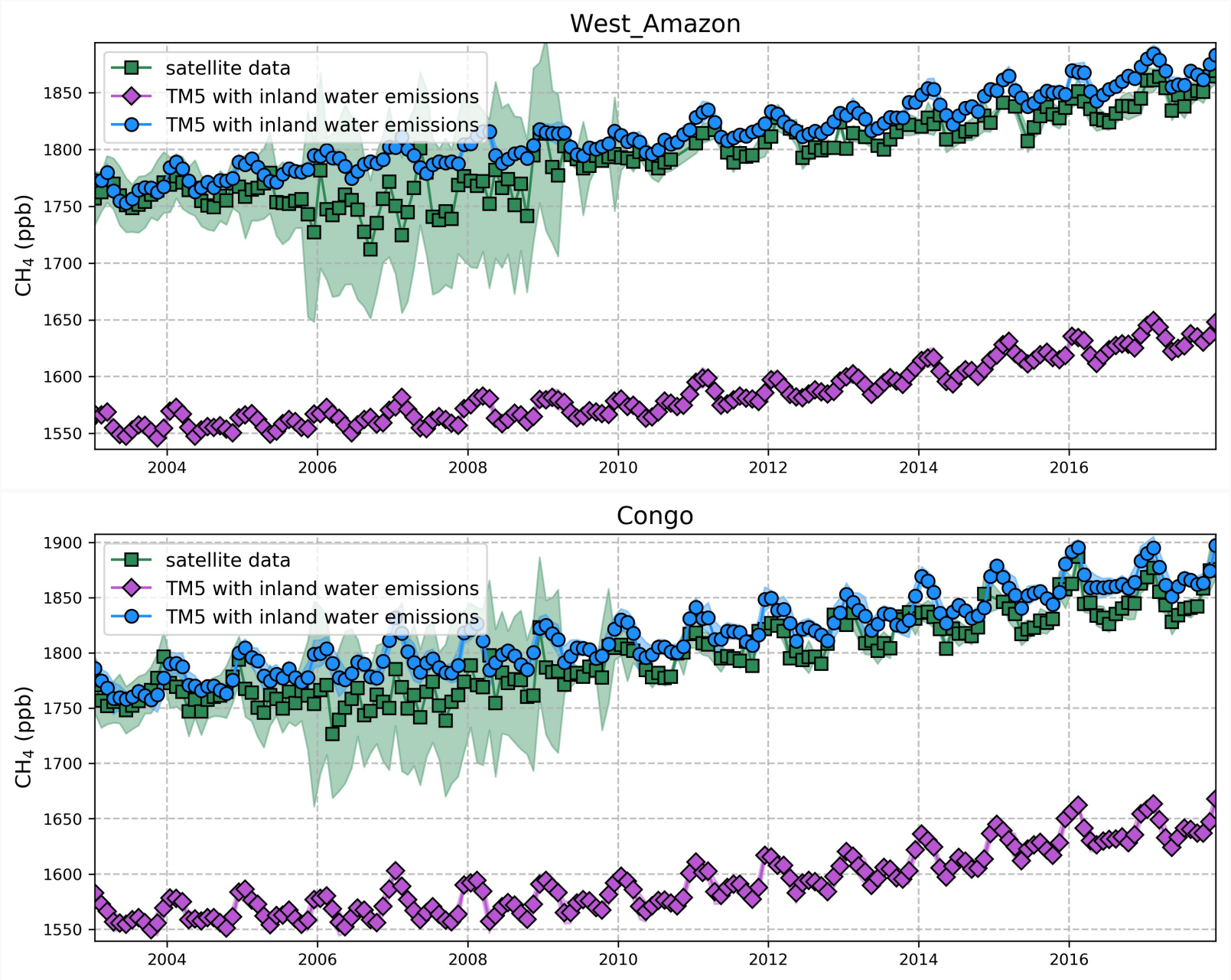
3. **cb05 run without nudging - Additional inland water emissions**

TM5 run with additional source



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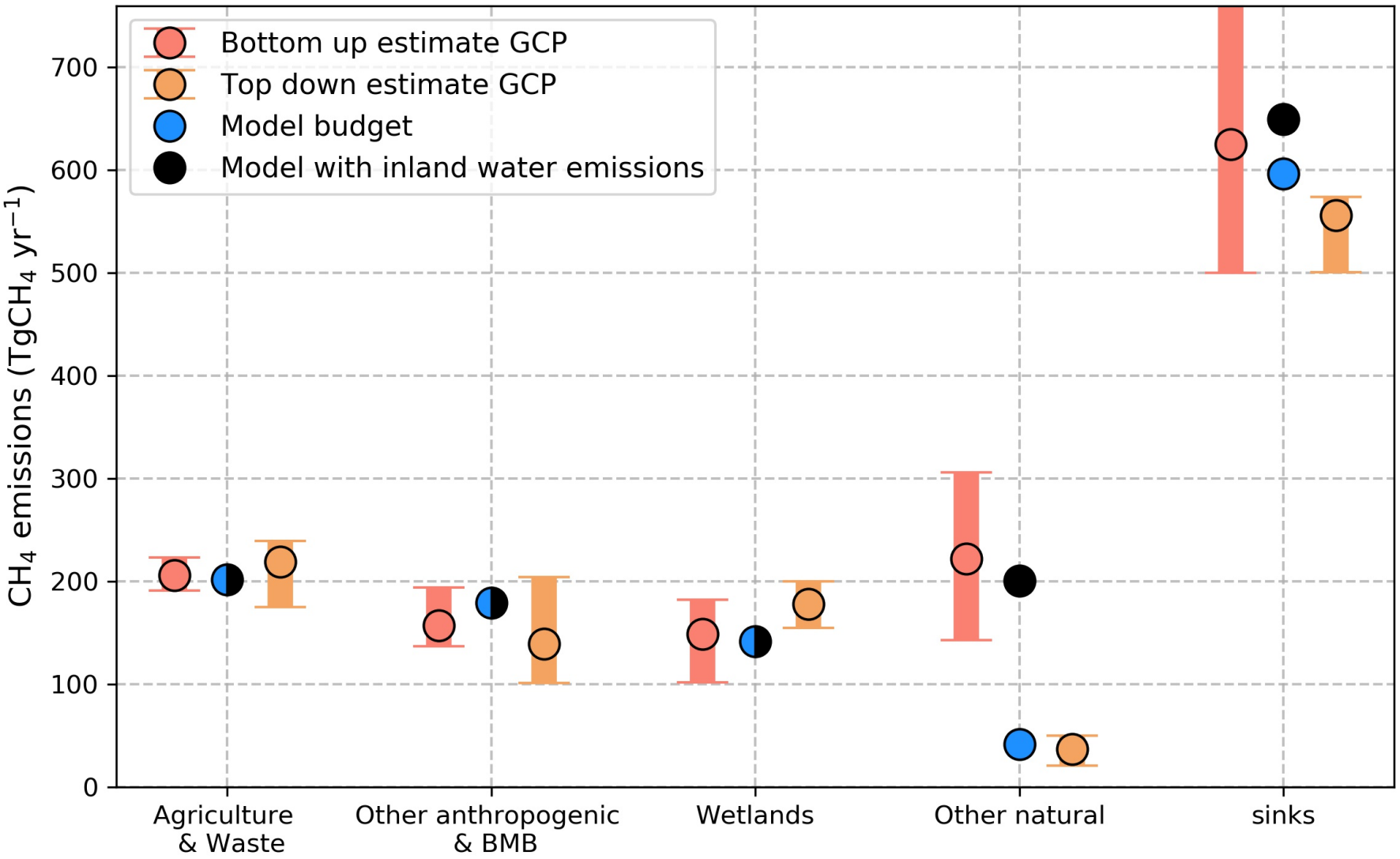

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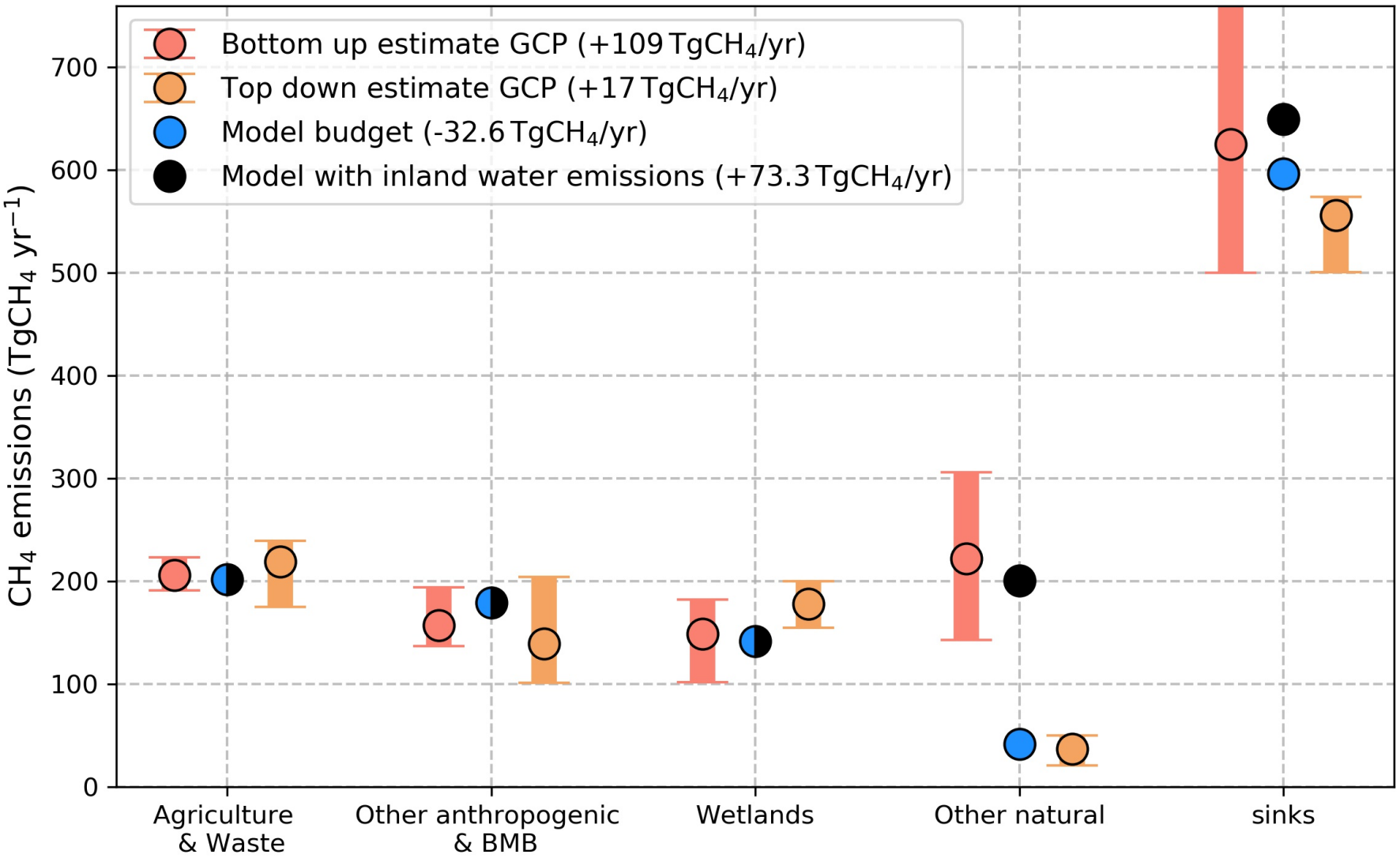

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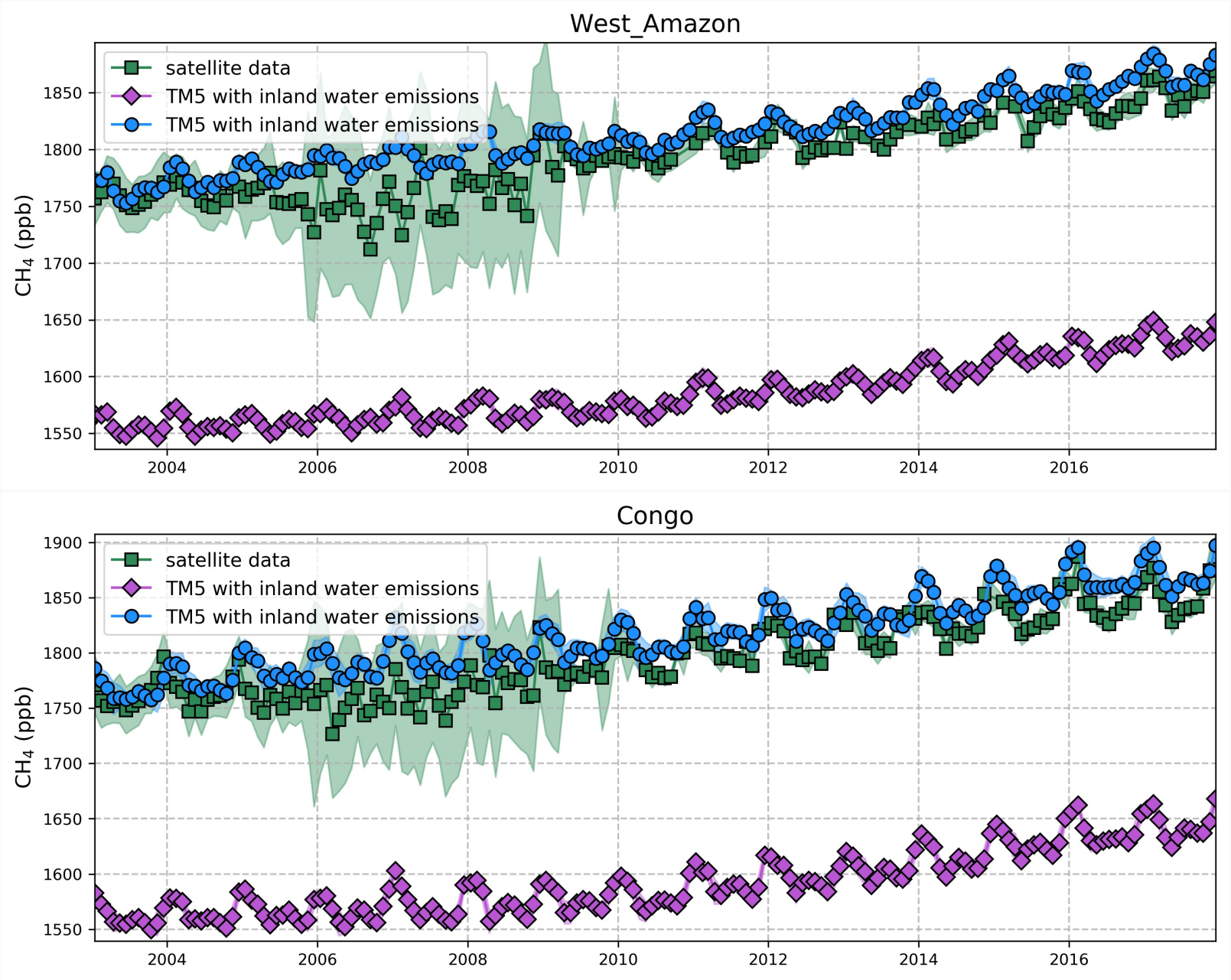

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4. **cb05 run without ground & stratospheric nudging**

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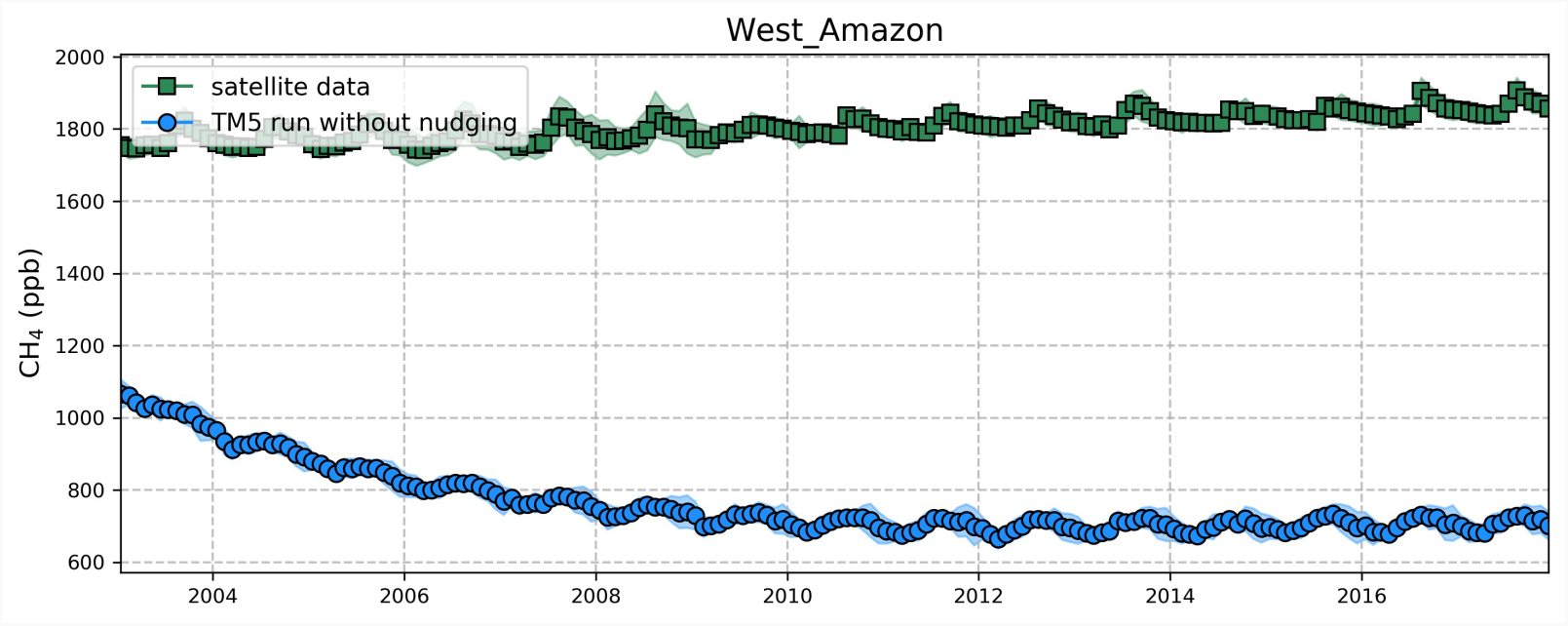

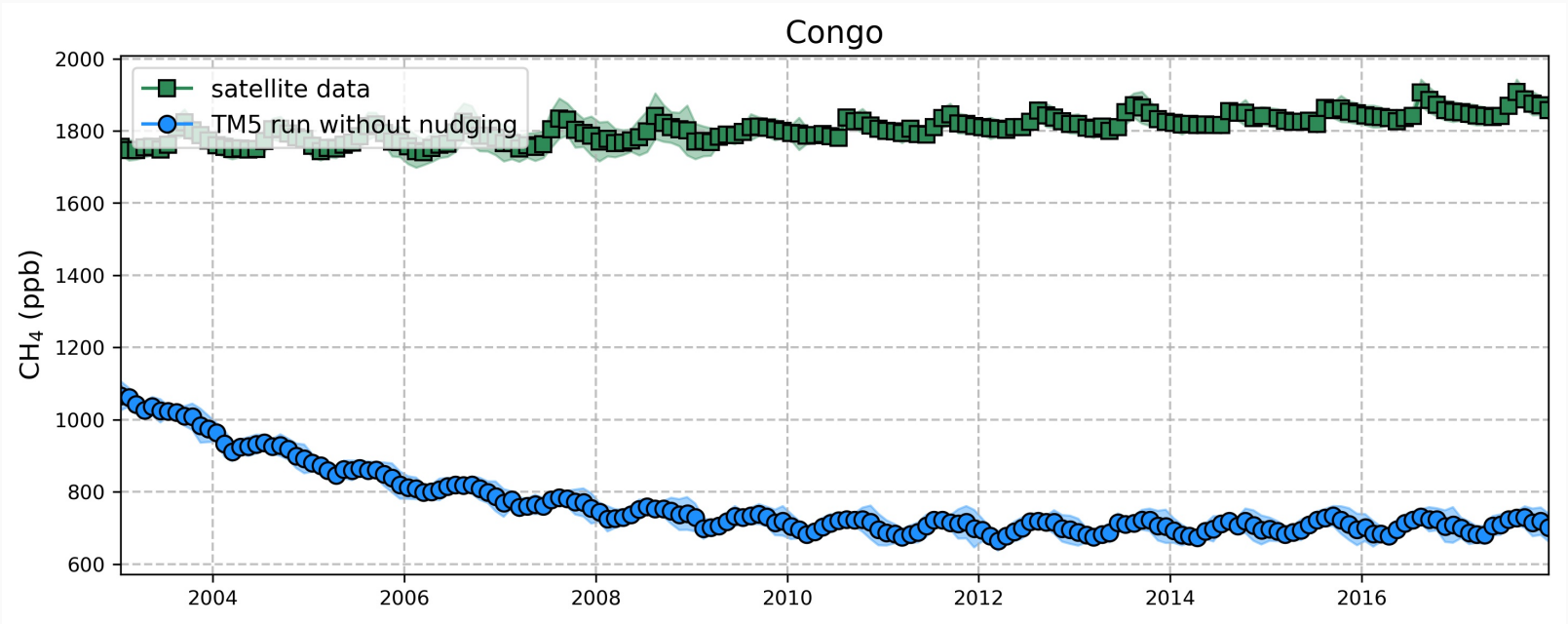

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Problem: none so far :)