Constraining global methane emissions using TROPOMI data

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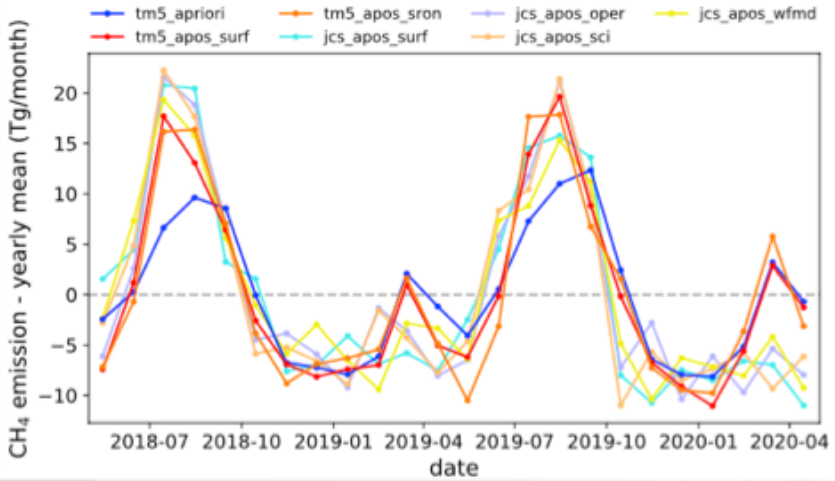
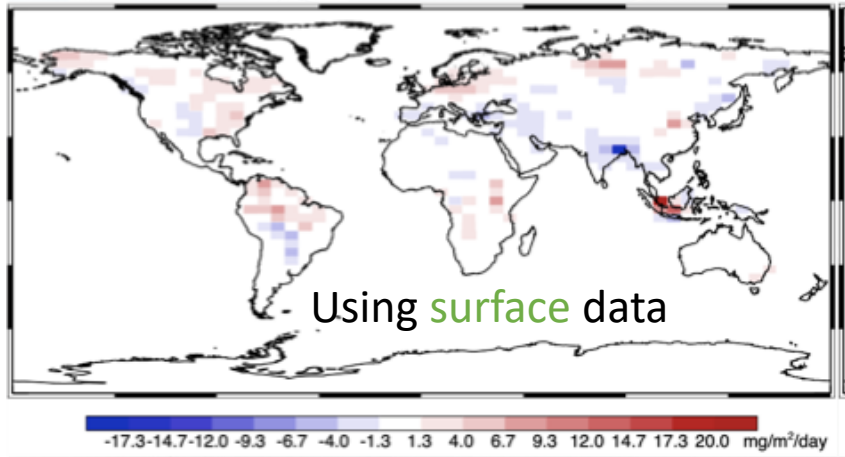
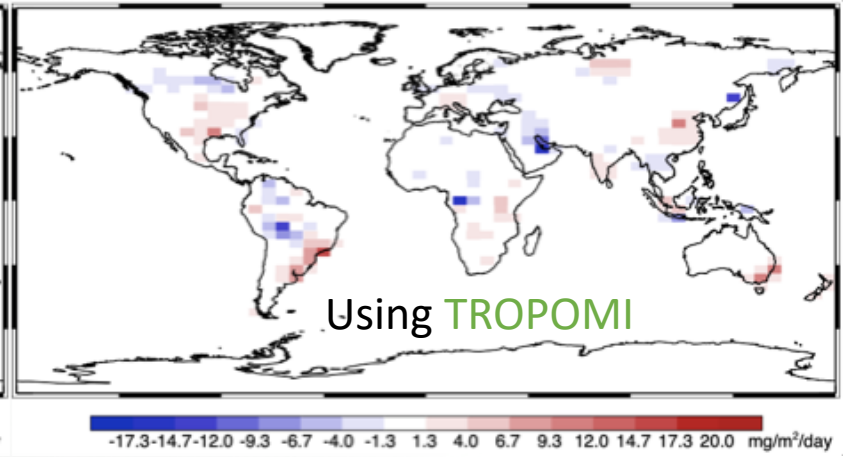
- ESA Methane+ TROPOMI inversions using TM5-4DVAR and Jena Carboscope
- Time window: May 2018 – April 2020 (2 years, excluding spin-up/spin-down)
- TROPOMI data used: Operational, SRON-scientific, iUP WFMD
- Encouraging consistency between TM5-4DVAR and Jena Carboscope
- Surface data show increasing emissions in northern high-latitudes, but less clear from TROPOMI

CH_4 emission Globe



(May 2019 to Apr 2020) – (May 2019 to Apr 2018)





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TM5-4DAR: Comparison with surface data

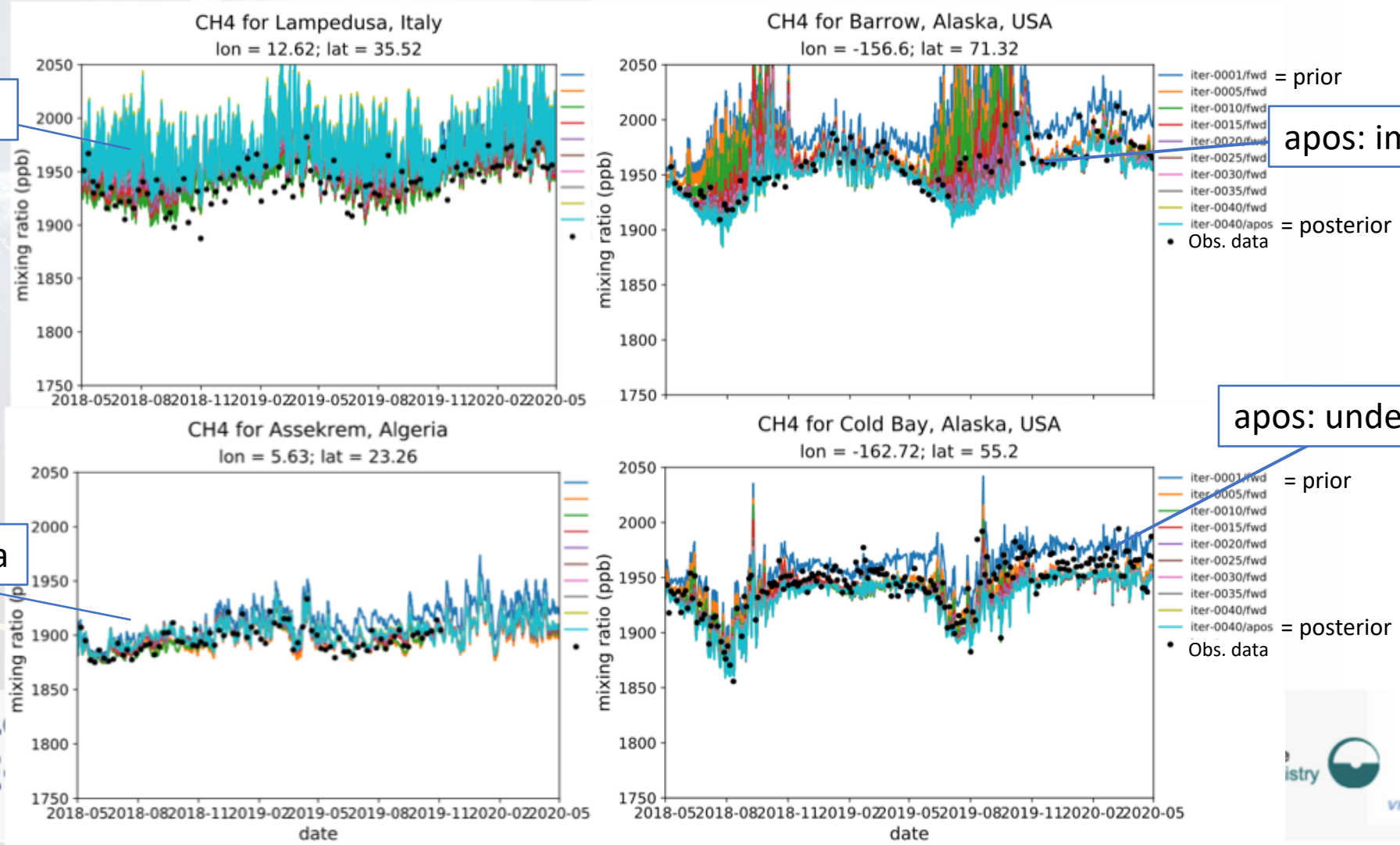
Inversion using TROPOMI SRON Scientific product, incl. bias correction

apos: dust problem?

apos: improved fit

apos: underestimation

apos: OK over Sahara



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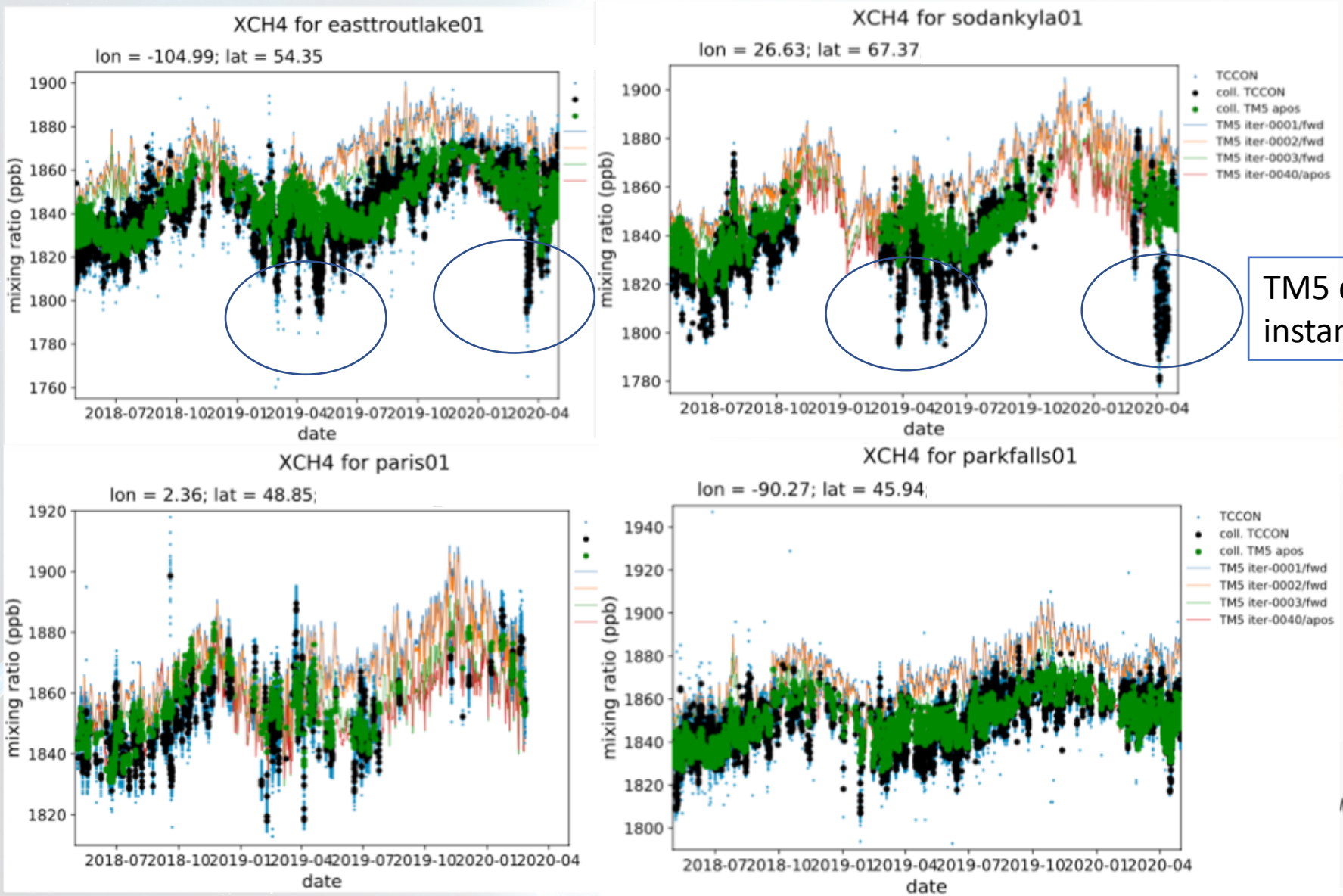
TM5-4DVAR: Comparison with total column data



TM5 doesn't catch instances of low XCH4

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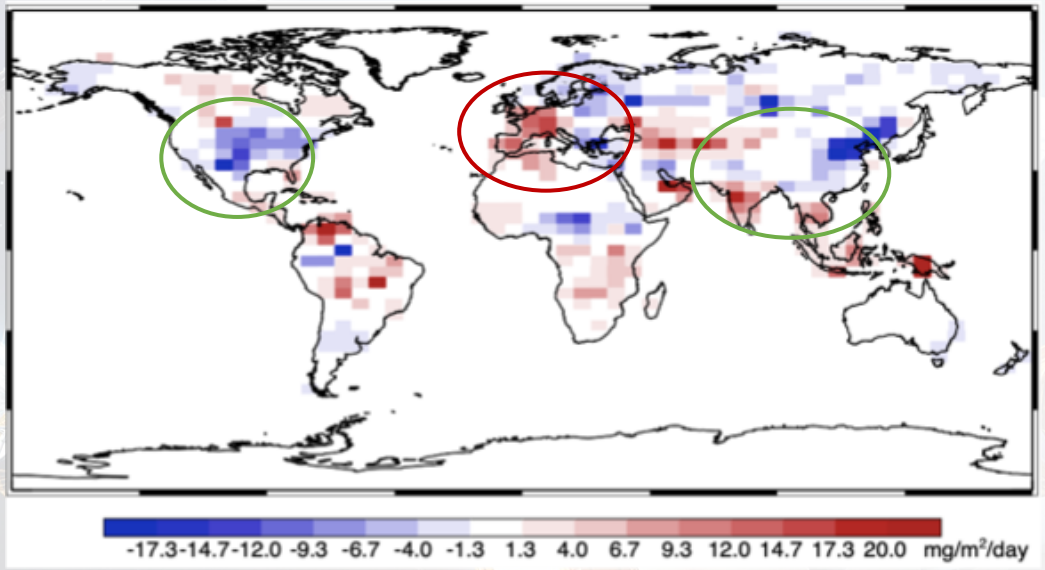
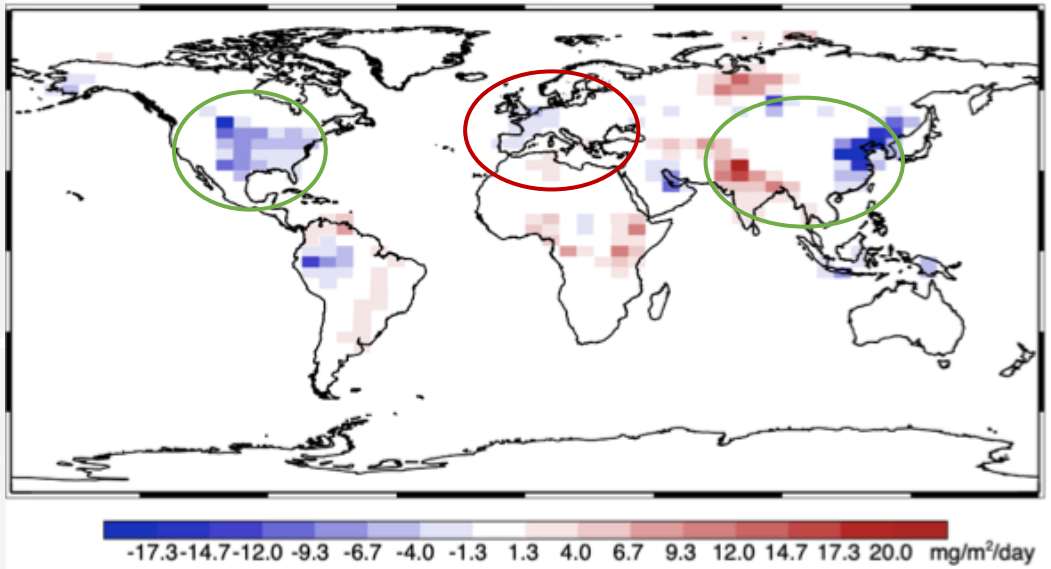
Comparison with CAMS reanalysis

- CAMS v19 reanalysis using GOSAT or surface data
- Averaging period: 201807 - 201906

TM5-4DVAR: TROPOMI – Surface data

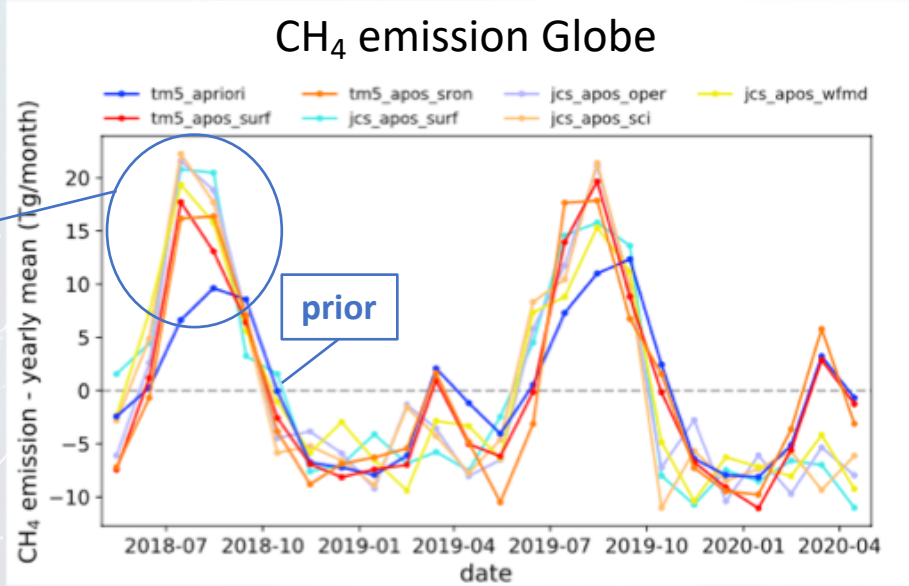


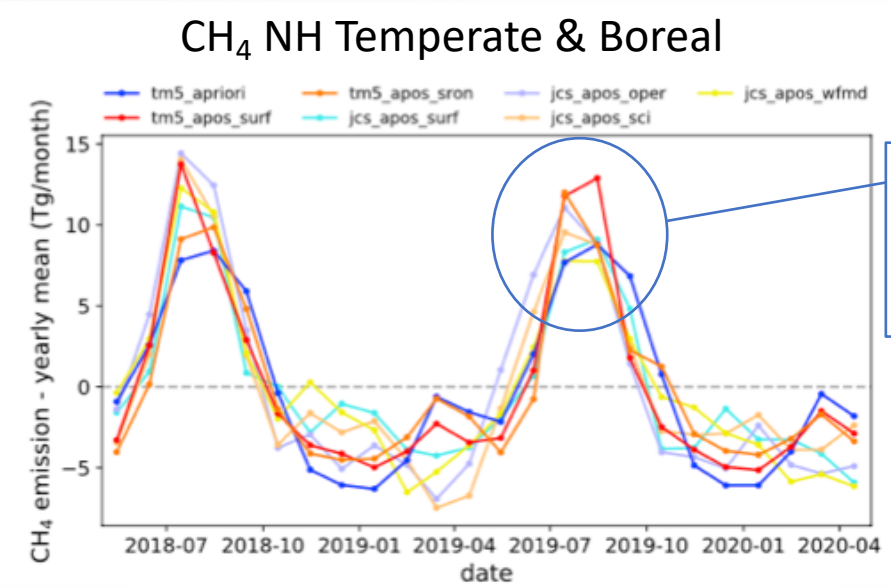
TM5-4DVAR: GOSAT – Surface data



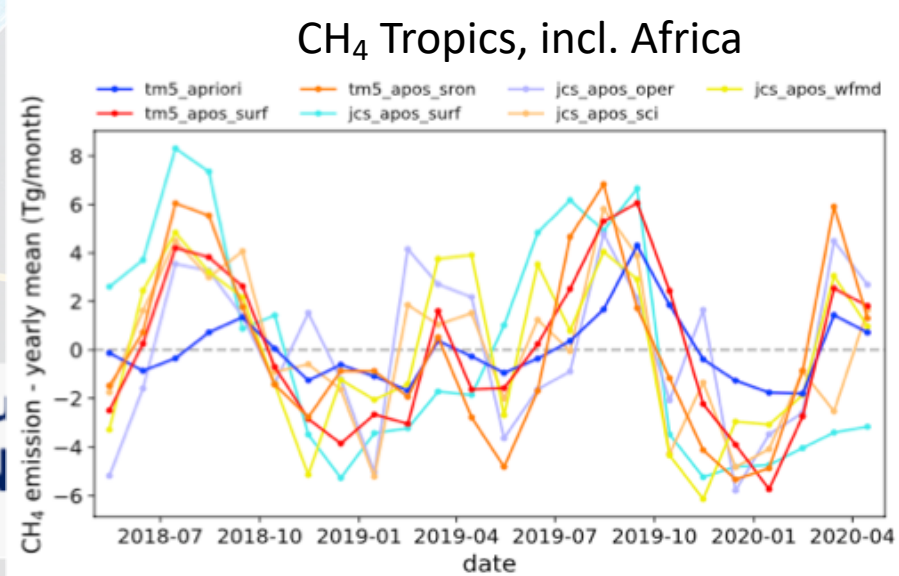
Comparing TM5-4DVAR - Carboscope

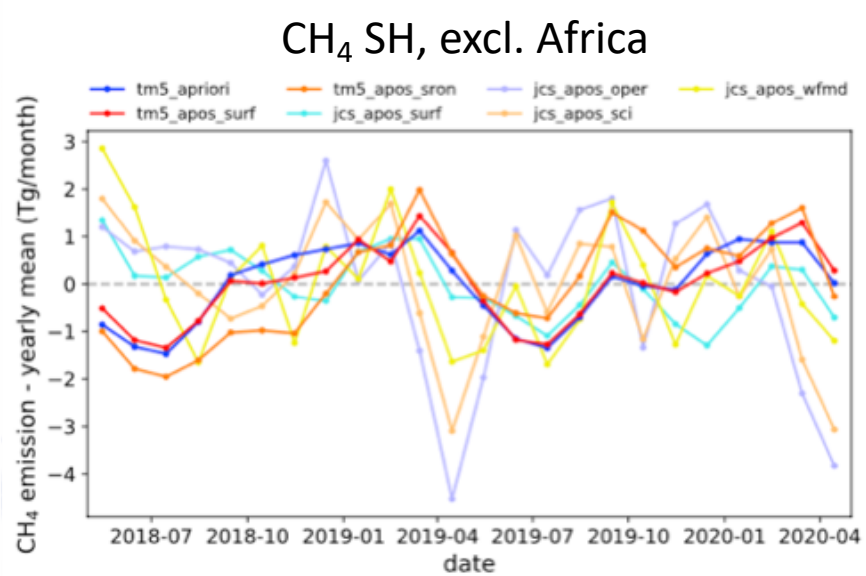
Upward correction NH summer





… driven by NH wetland emissions





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Comparison between the 2 years

- Results from TM5-4DVAR

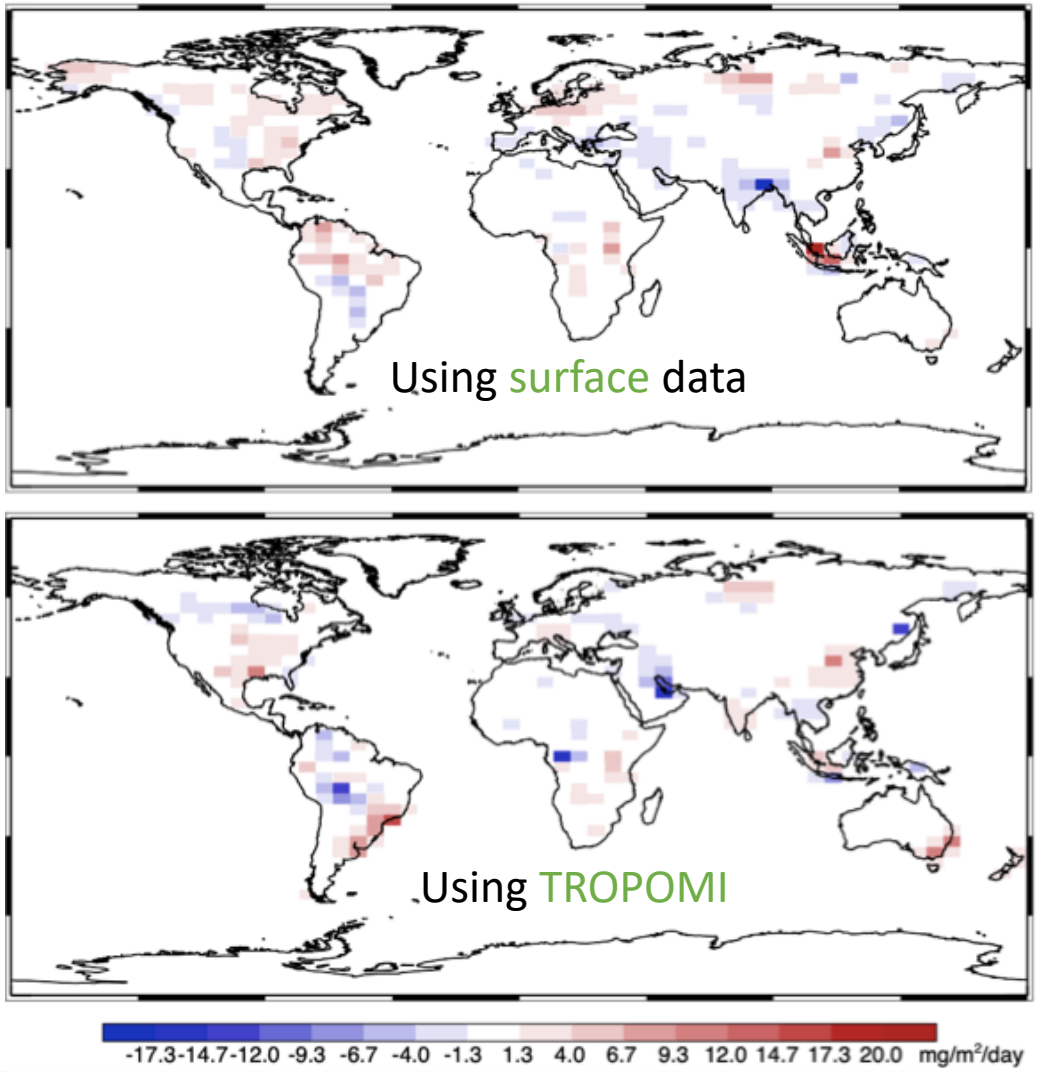
Emission increase:

Surface data: 10 $TgCH_4/yr$

TROPOMI: 5.5 $TgCH_4/yr$

Surface results show an increase in high northern latitudes, that is less clear using TROPOMI

(May 2019 to Apr 2020) – (May 2019 to Apr 2018)



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