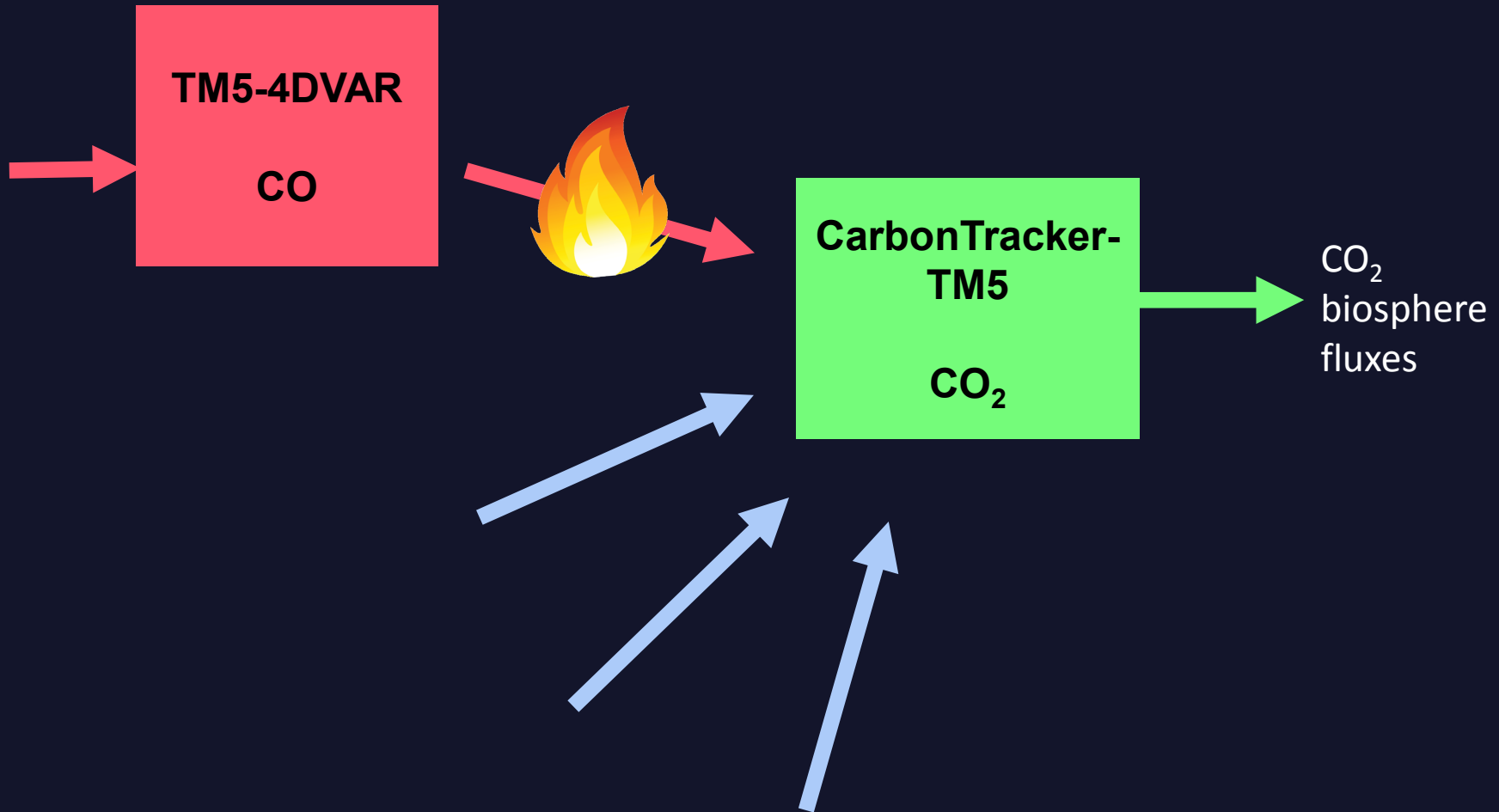


CO inversions over the Amazon with TM5-4DVAR

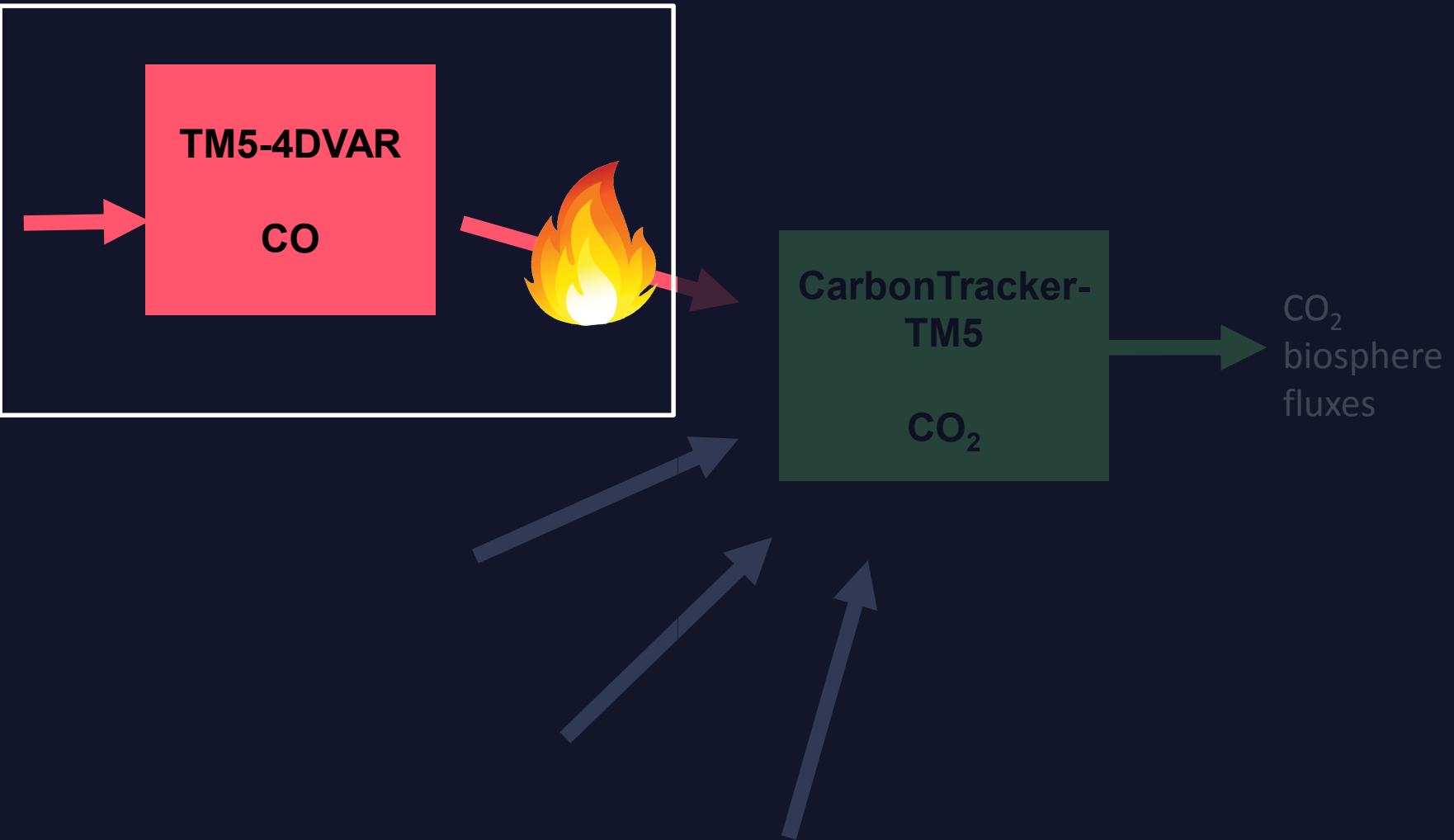
Stijn Naus, N Banda, M Krol, L Domingues, G Koren, I van der Laan-Luijkx, W Peters



Use an inversion of CO to constrain biomass burning of CO₂



Use an inversion of CO to constrain biomass burning of CO₂

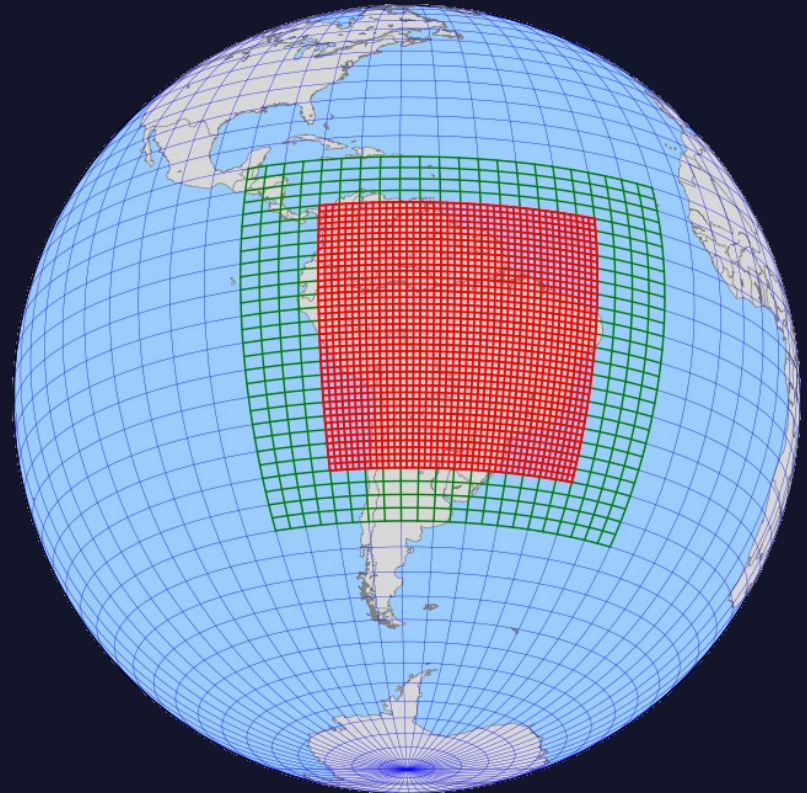


Outset of research

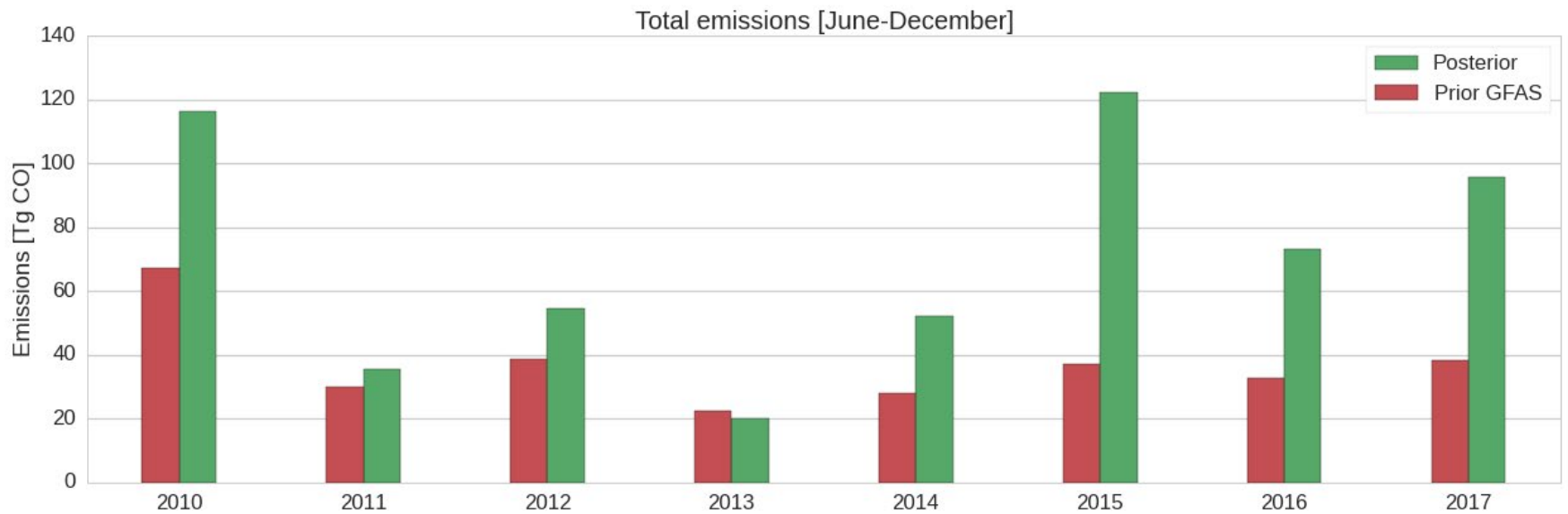
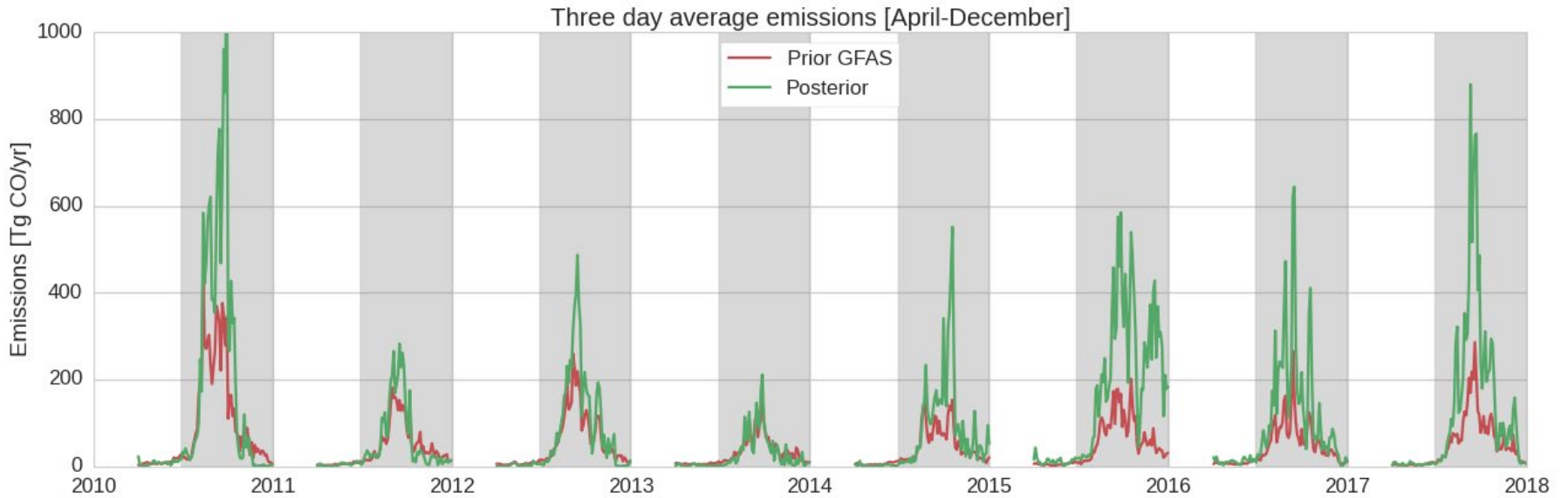
- van der Laan-Luijkx et al. (2015):
 - Influence of drought / El Niño on Amazonian carbon cycle (2010-2011)
 - Amazon a source of carbon in 2010 and a sink in 2011
 - Biomass burning showed high interannual variability
- How anomalous were these events?

The CO inversions

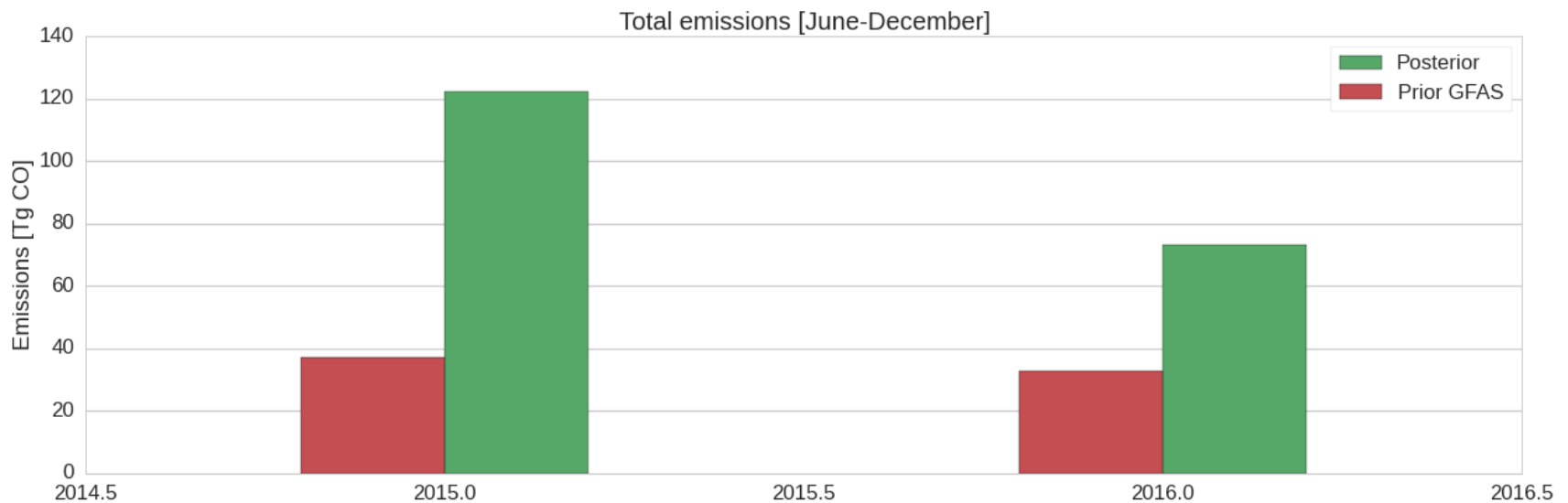
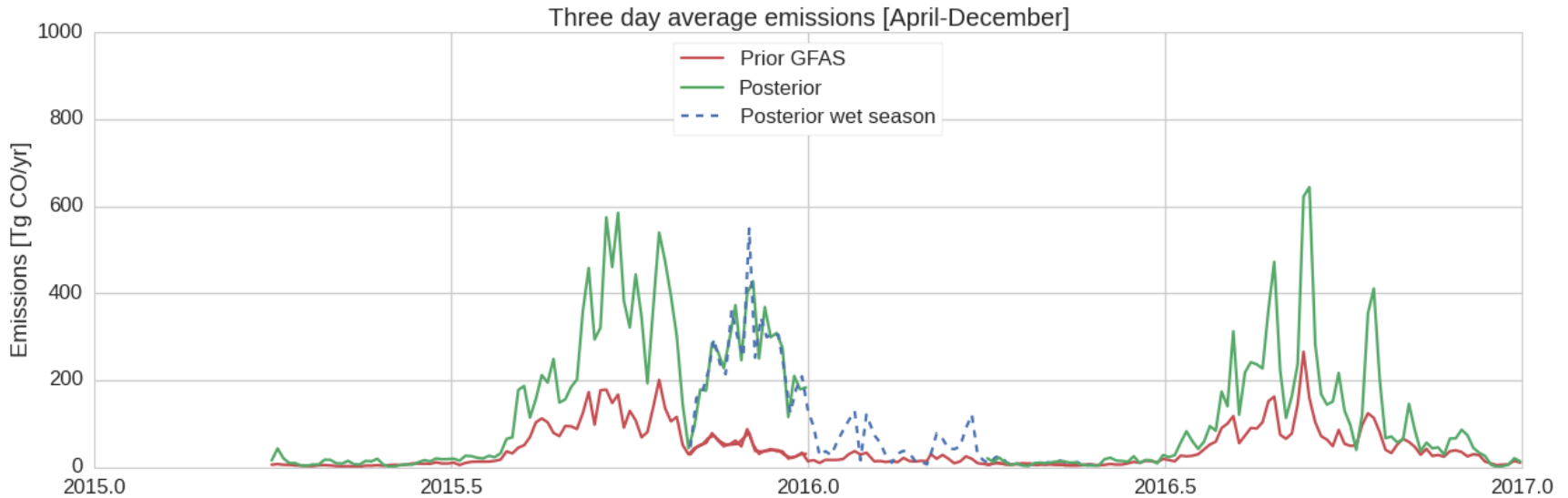
- Zoom version of TM5-4DVAR
- 2010-2017: April - December
- We optimize:
 - biomass burning over Amazon
 - total emissions globally
- Observations:
 - IASI
 - NOAA surface network
- GFAS emissions as prior



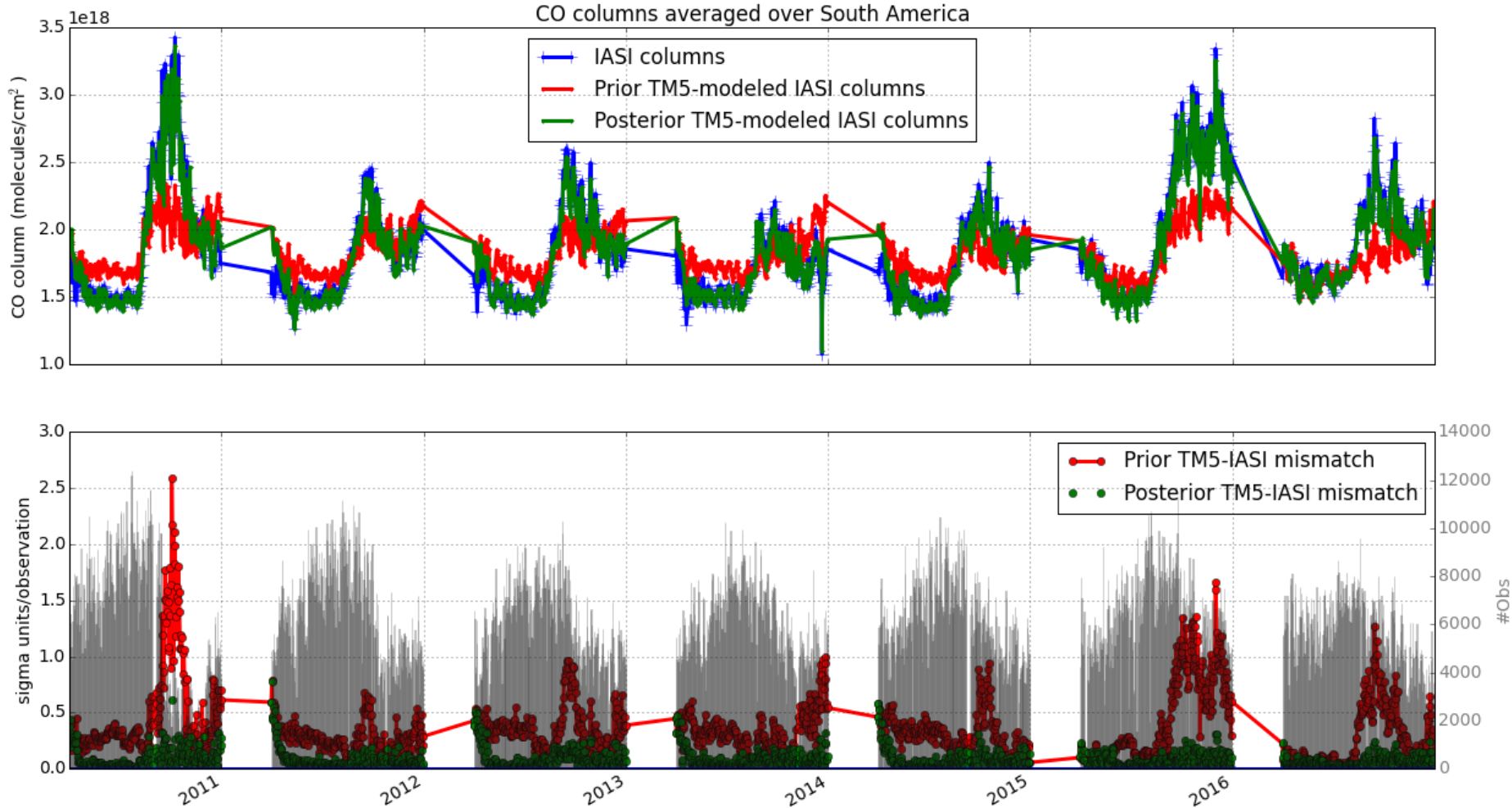
Biomass burning



Ongoing fires in 2015-2016 wet season

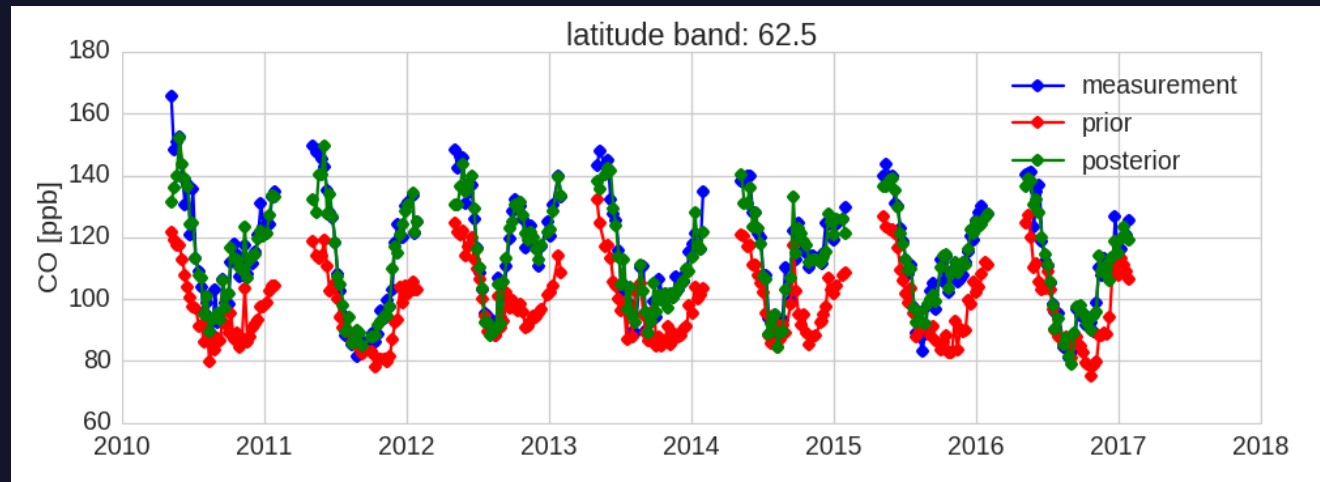


IASI



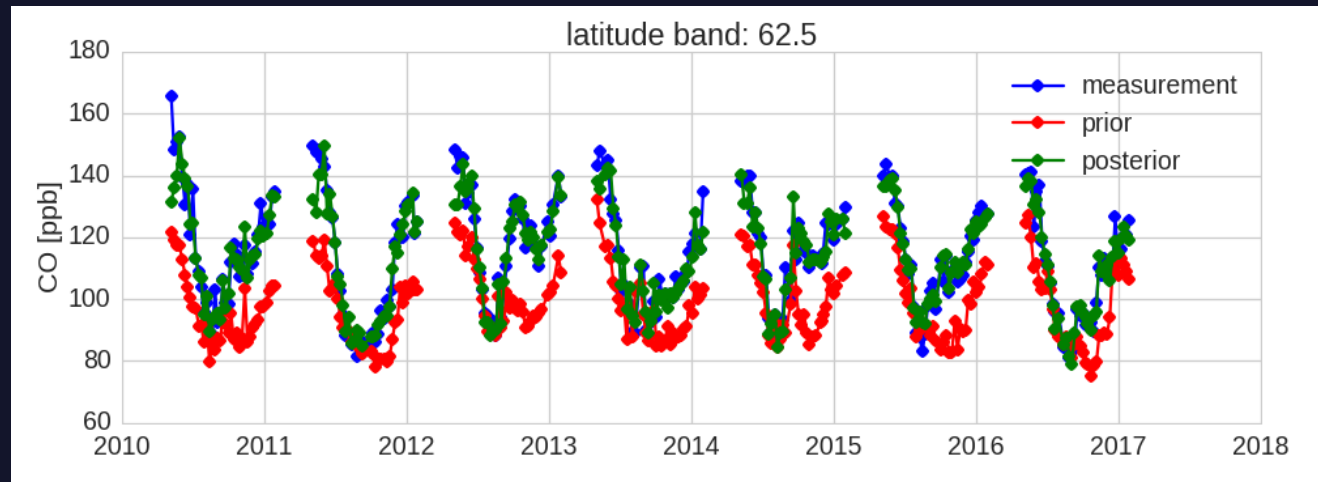
NOAA surface network

In the NH:
Excellent

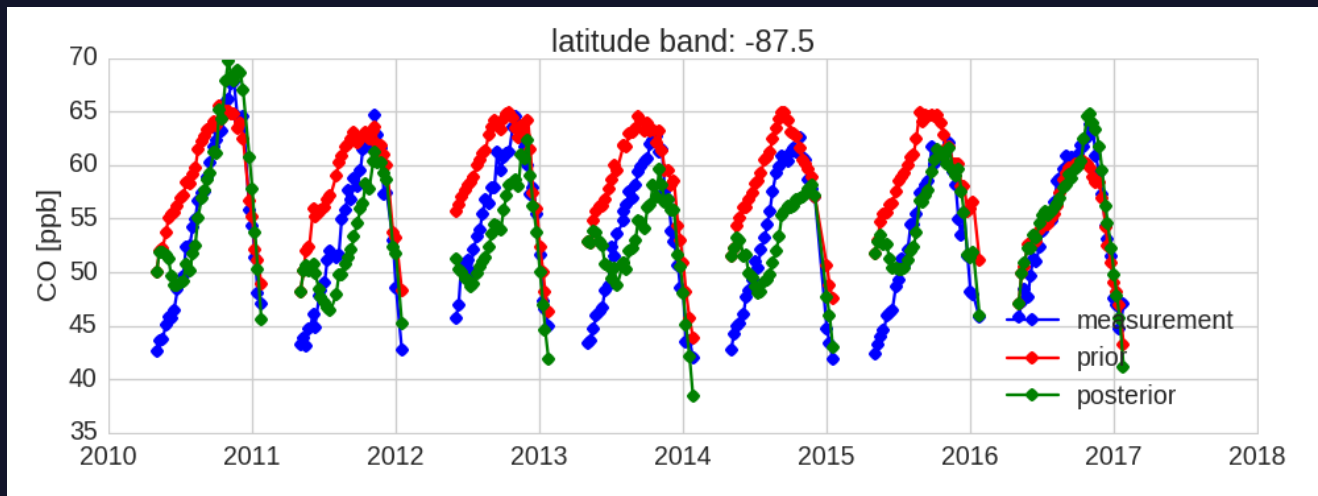


NOAA surface network

In the NH:
Excellent

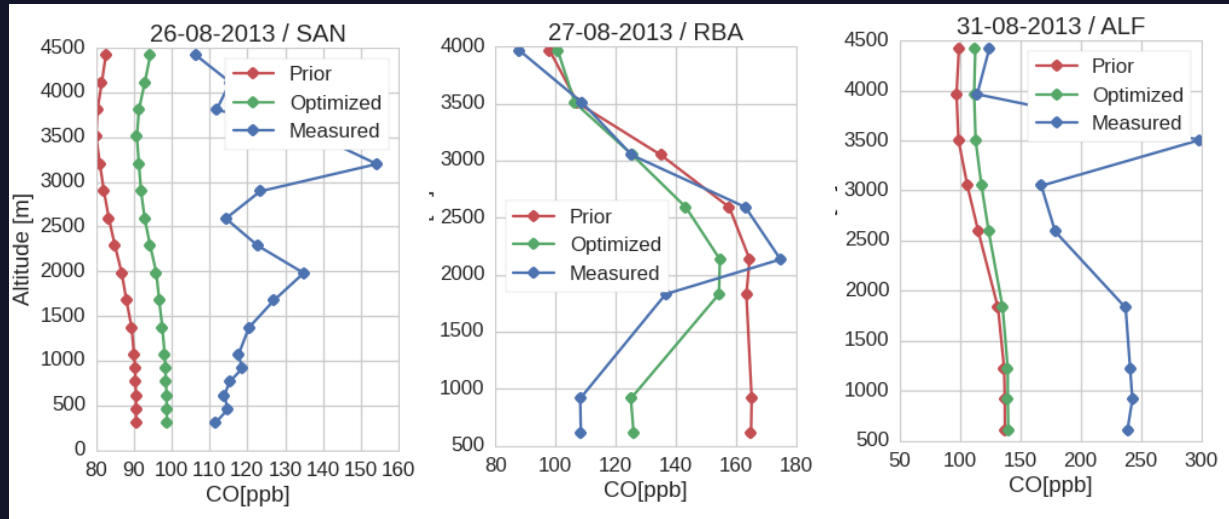


In the SH:
Less excellent
(near IASI)

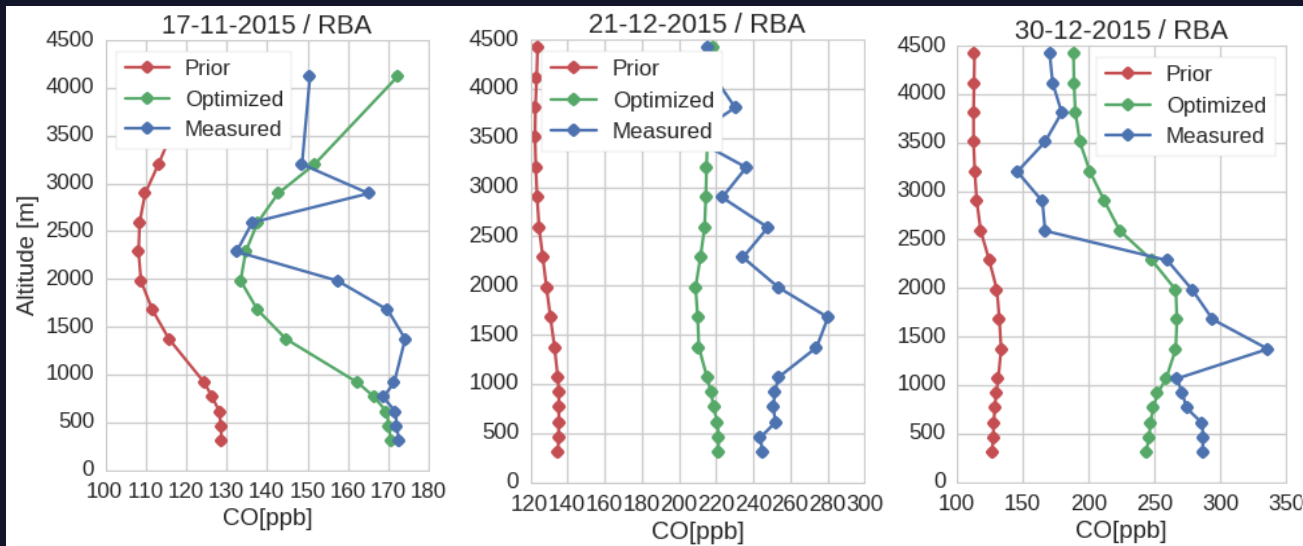


Aircraft profiles

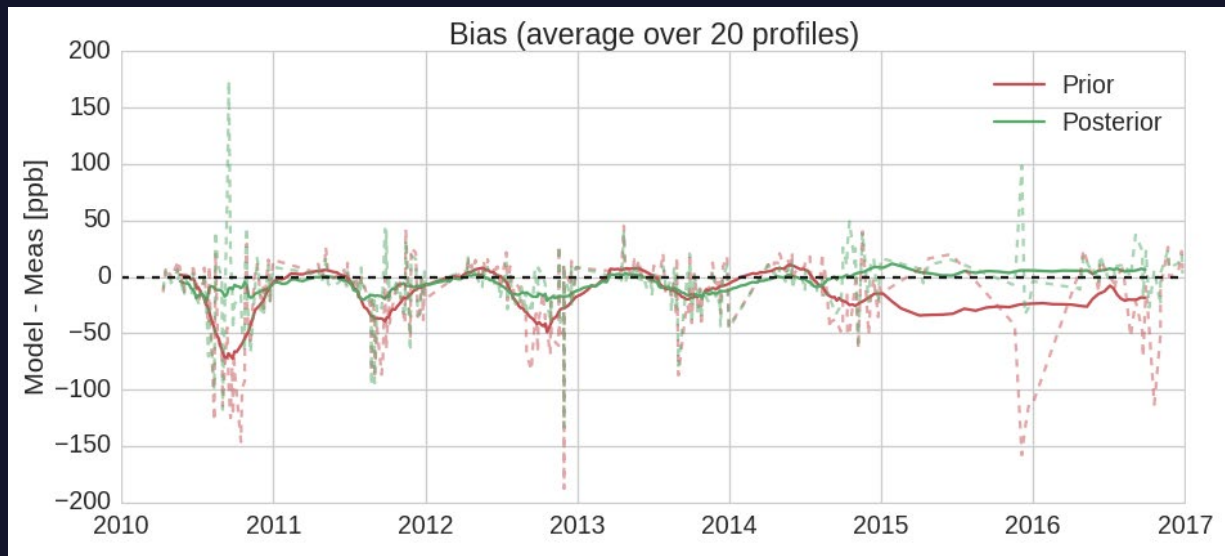
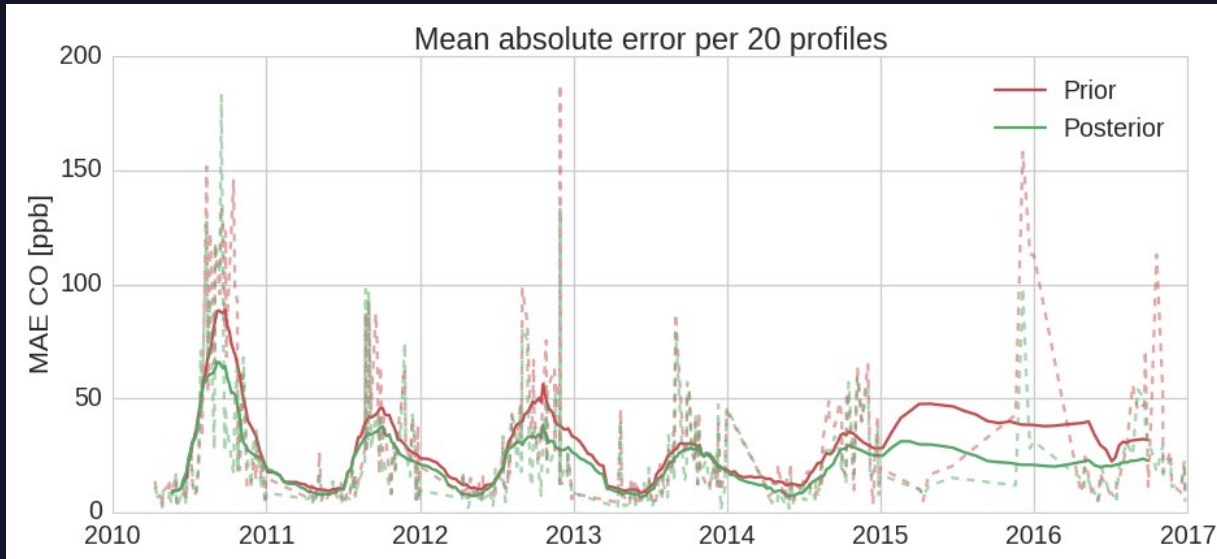
2013



2015



Aircraft profiles



Emission inventories underestimate biomass burning, or....

... we forget the contribution from OH

... we are wrong on some other source: NMHC?

Conclusions

- Biomass burning of CO underestimated in GFAS
- Biomass burning persists in 2015-2016 wet season
- Inversion improves match with aircraft profiles

Conclusions

- Biomass burning of CO underestimated in GFAS
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Outlook

- Vertical injection profile
- Other emission inventories
- Non-methane hydrocarbon production fields
- Assimilate aircraft profiles

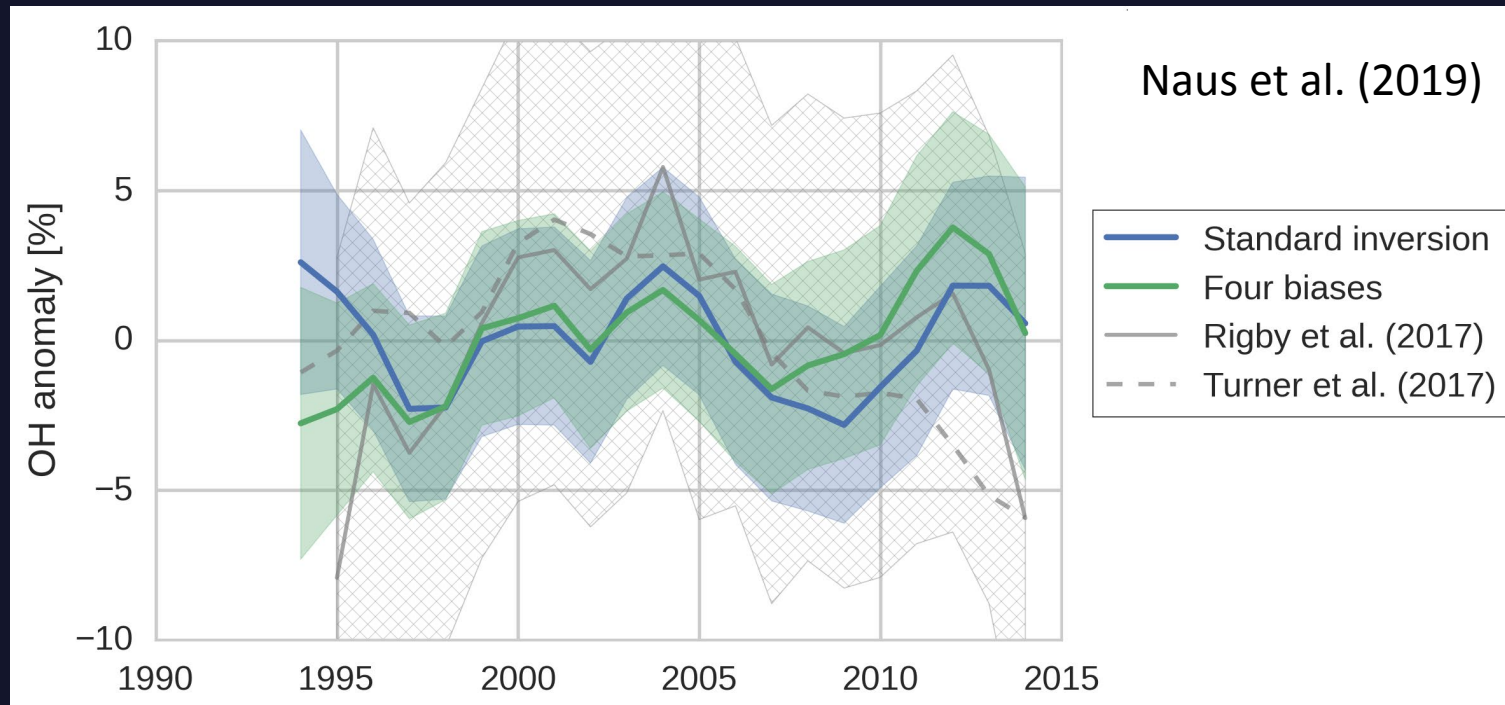
OH inversion

- Objective: Better constraints on large-scale, interannual variability of OH

OH inversion

- Objective: Better constraints on large-scale, interannual variability of OH

Previous work: Two-box model



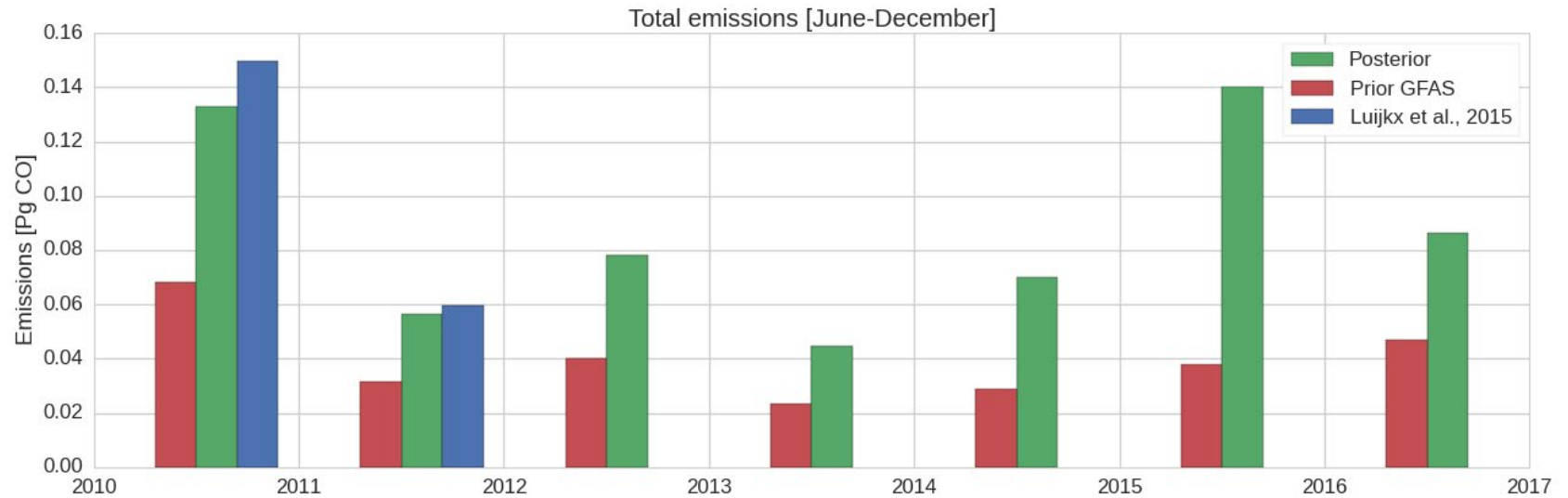
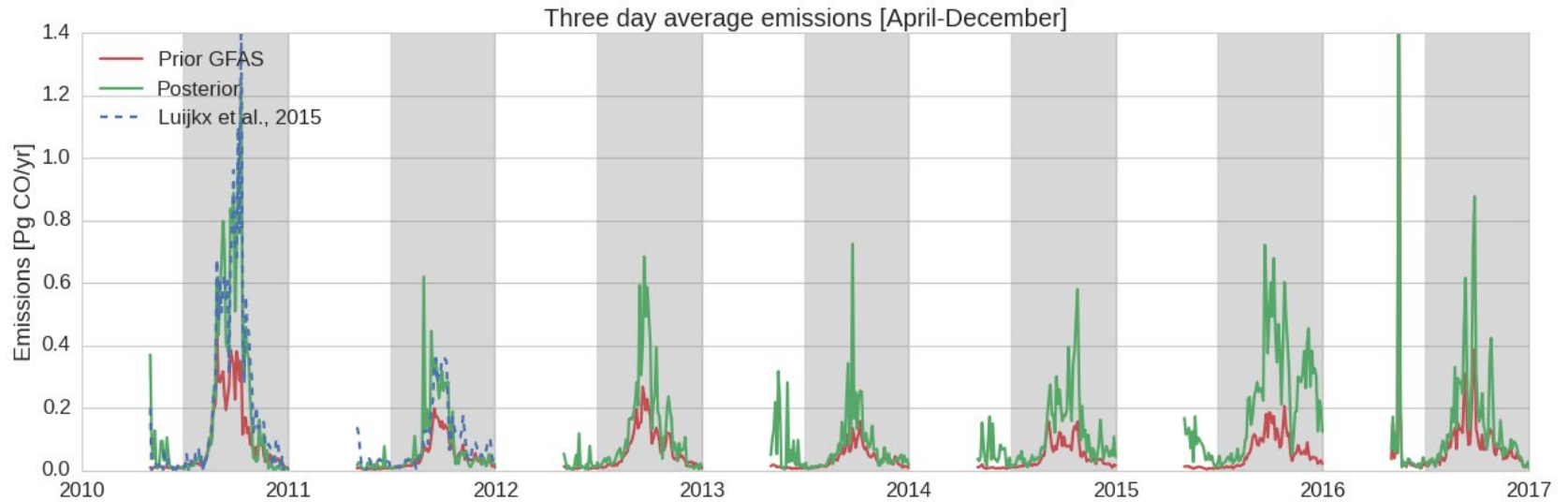
OH inversion

- Objective: Better constraints on large-scale, interannual variability of OH
- But next: A TM5-4DVAR inversion of MCF from 1998 to 2018

OH inversion

- Objective: Better constraints on large-scale, interannual variability of OH
- But next: A TM5-4DVAR inversion of MCF from 1998 to 2018
- Complications:
 - 20 years too long for one inversion, MCF lifetime too long to split it up in much smaller windows (?)
 - Non-linearity (OH*MCF)
 - The problem is extremely under-constrained

Biomass burning



Aircraft profiles

2013

