

South American Biomass Burning Revisited

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TM meeting, fall 2013, SRON, the Netherlands

What will I discuss today?

- Hooghiemstra paper 2012
- MOPIIT CO data assimilation
- Linearisation was applied
- This appeared inadequate when deviations from prior profile are large
- Correction written and published
- “Independent” verification with IASI

Global CO sources (Tg CO yr^{-1})



Fossil/Bio-Fuel



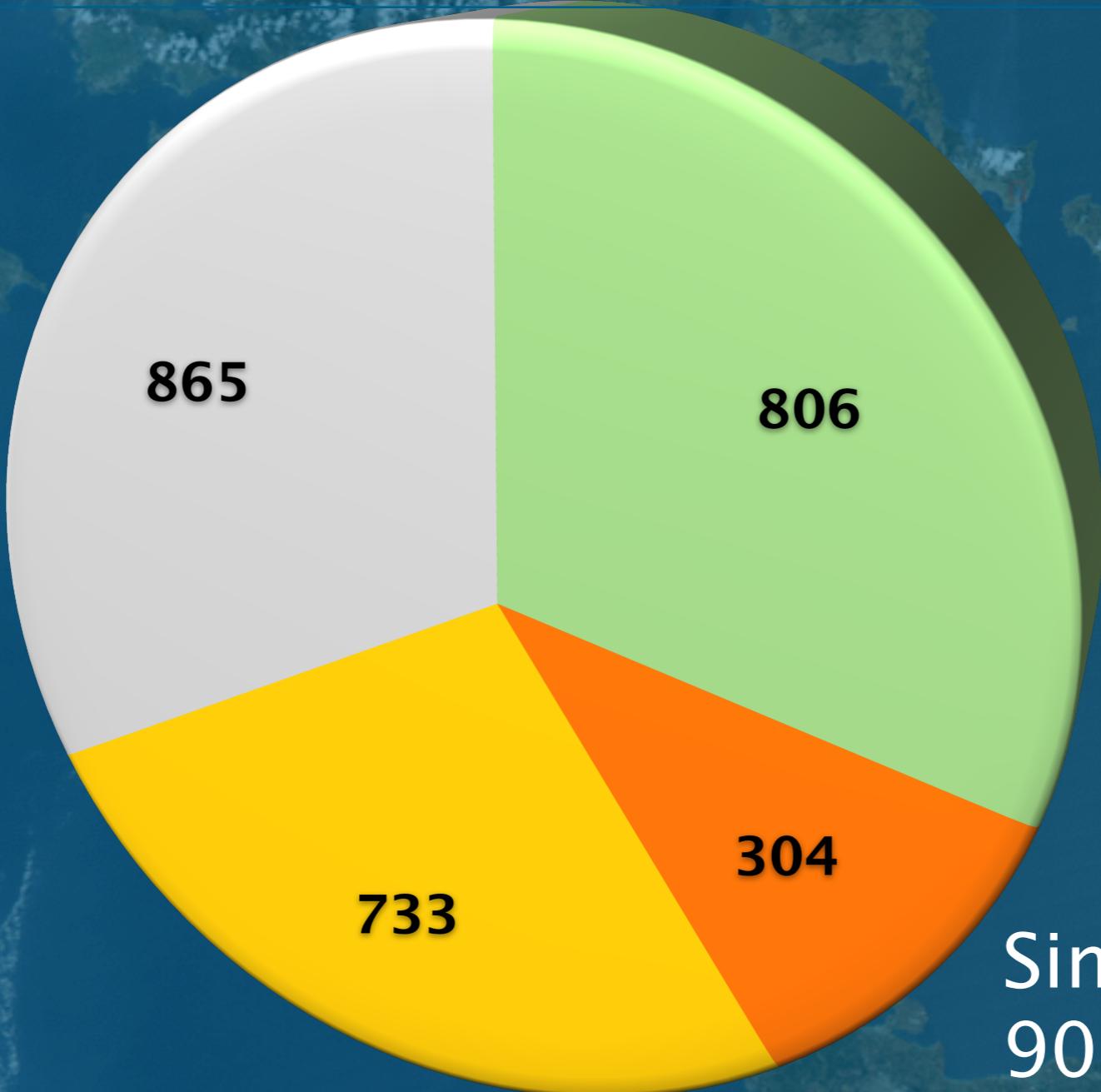
Oxidation NMVOC



Biomass Burning



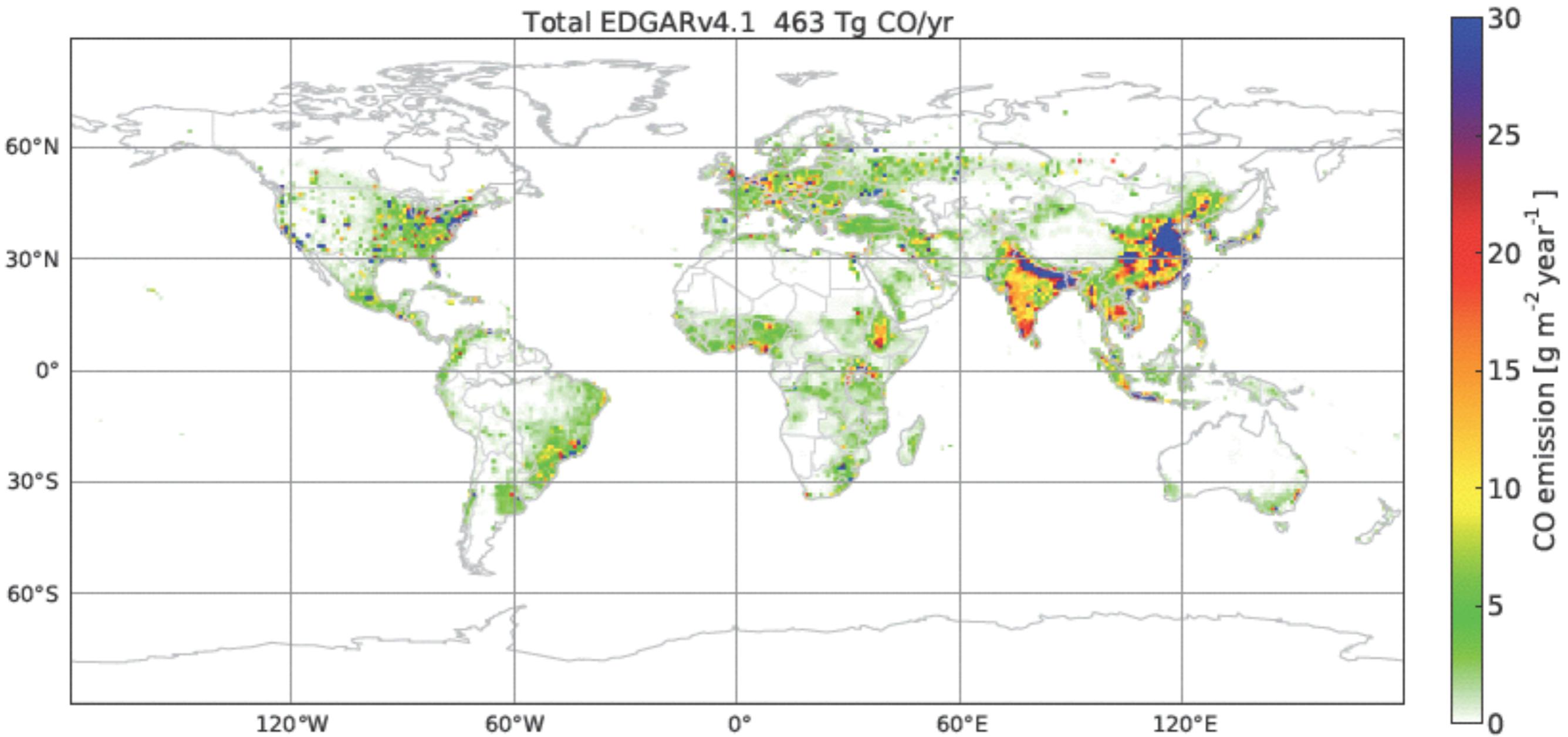
Oxidation CH4



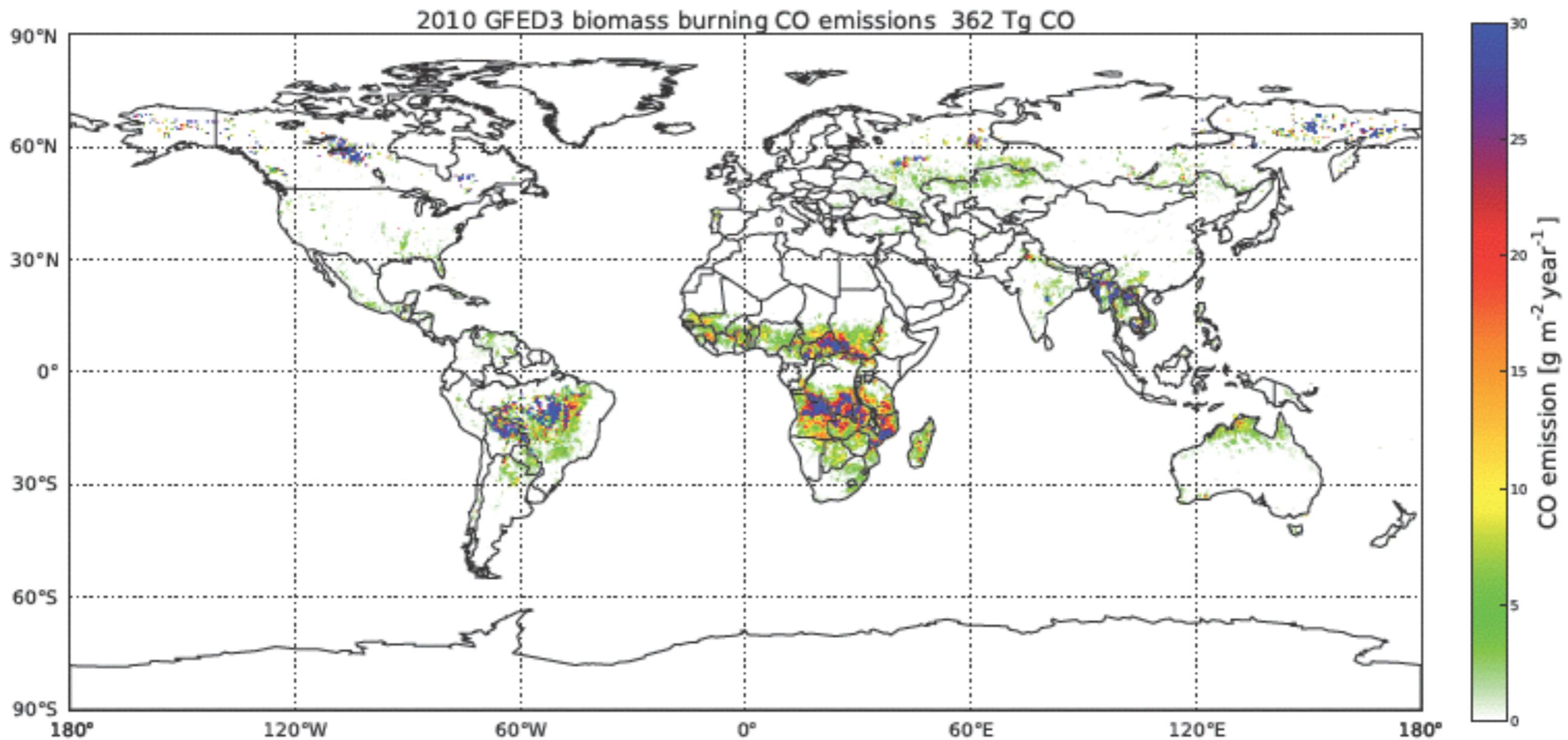
Sinks

90 % OH oxidation
10 % soil deposition

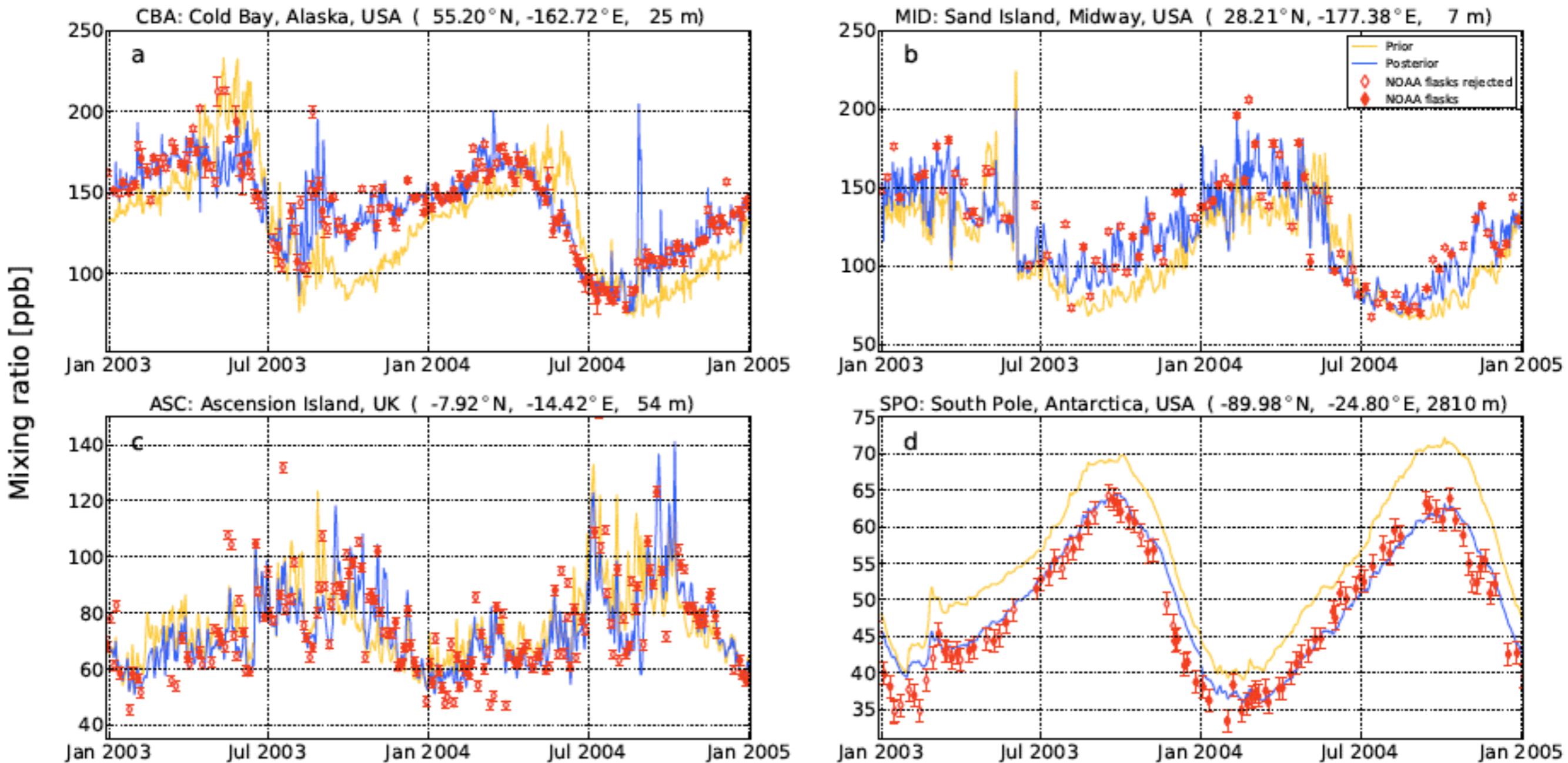
Anthropogenic Emissions (EDGAR-V4.1)



Biomass Burning Emissions (GFED-3)

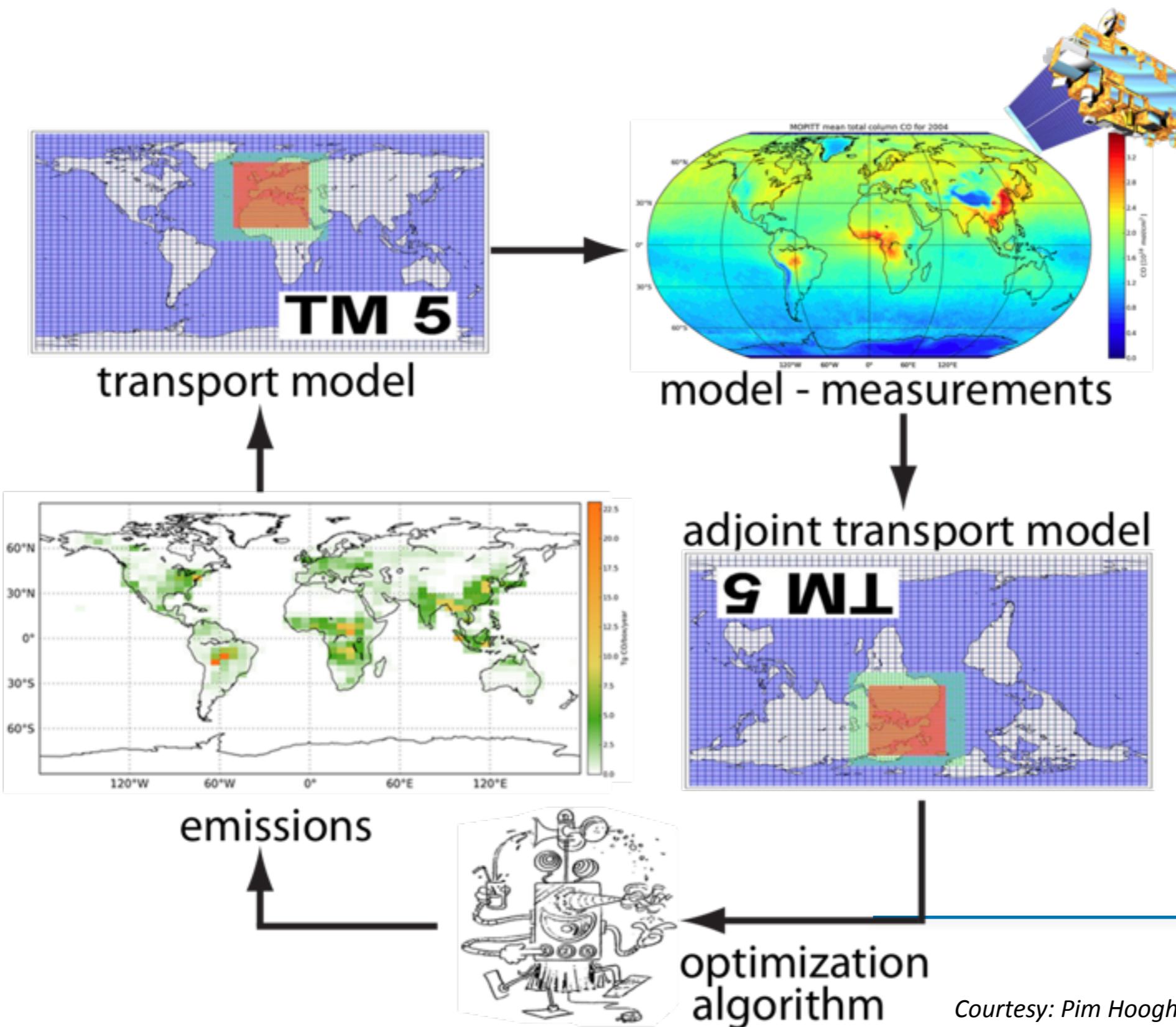


(Inverse) Modelling



Adjust CO sources, until an optimal fit between model and observations is obtained

4D-VAR in a nutshell

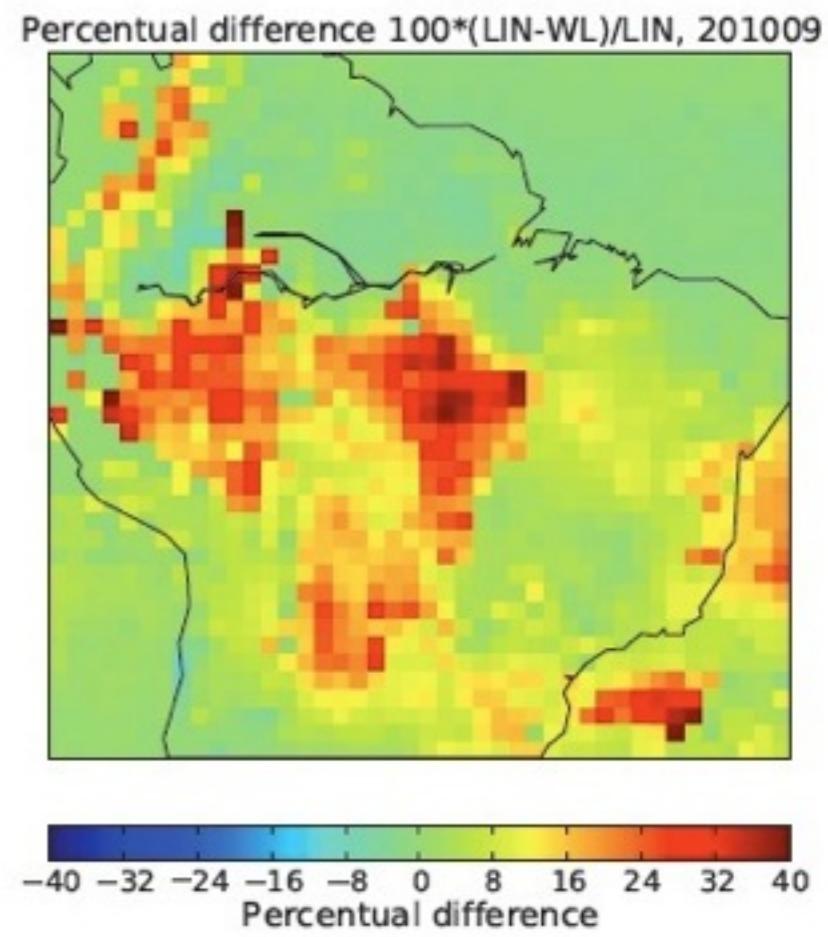
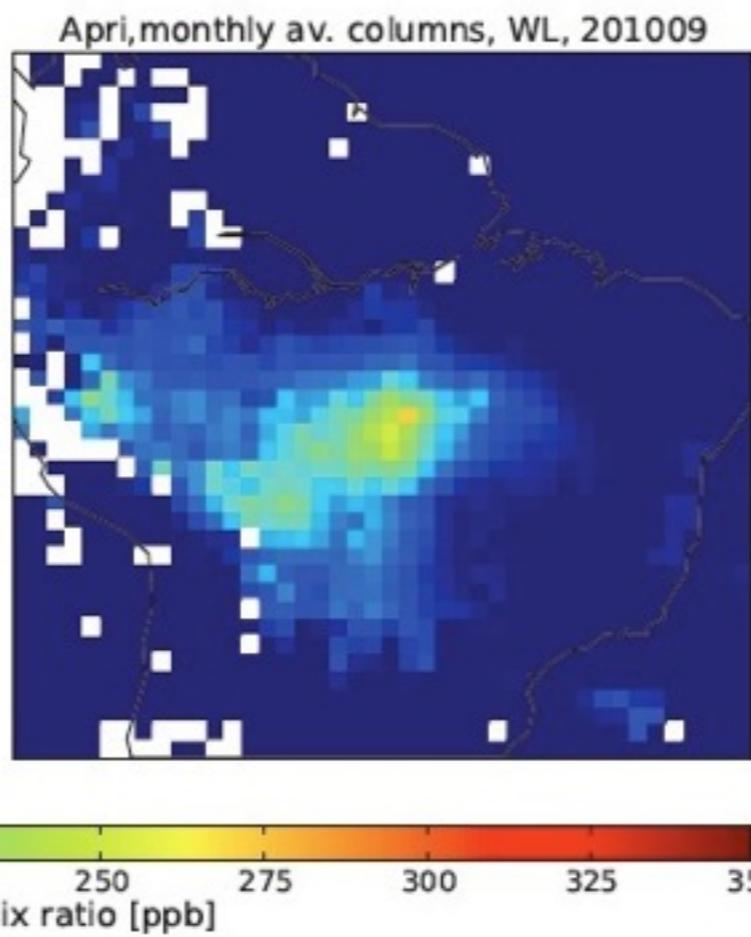
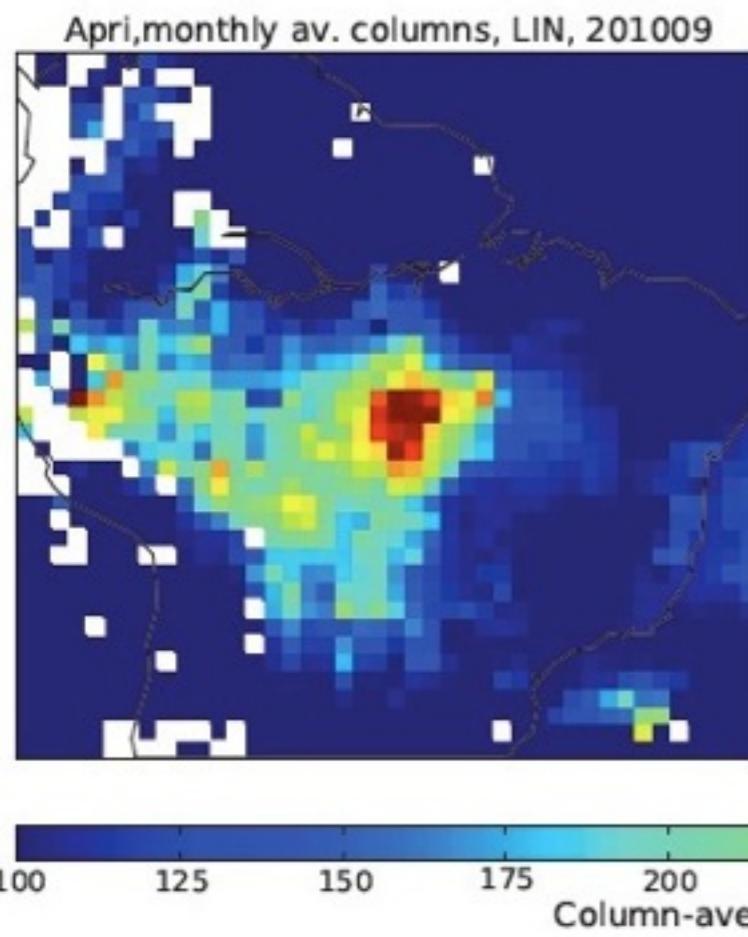


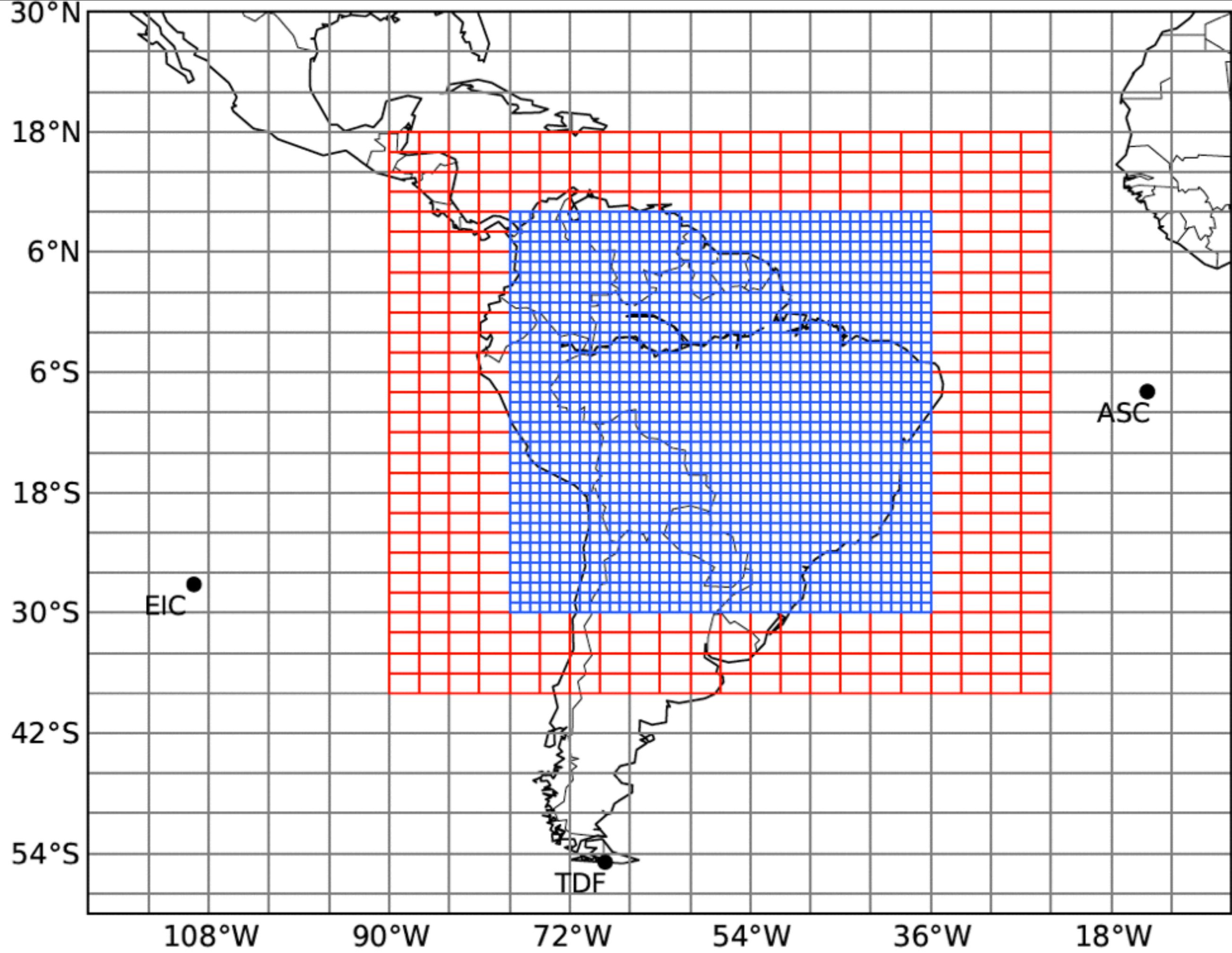
Courtesy: Pim Hooghiemstra, Maarten Krol

What went wrong?

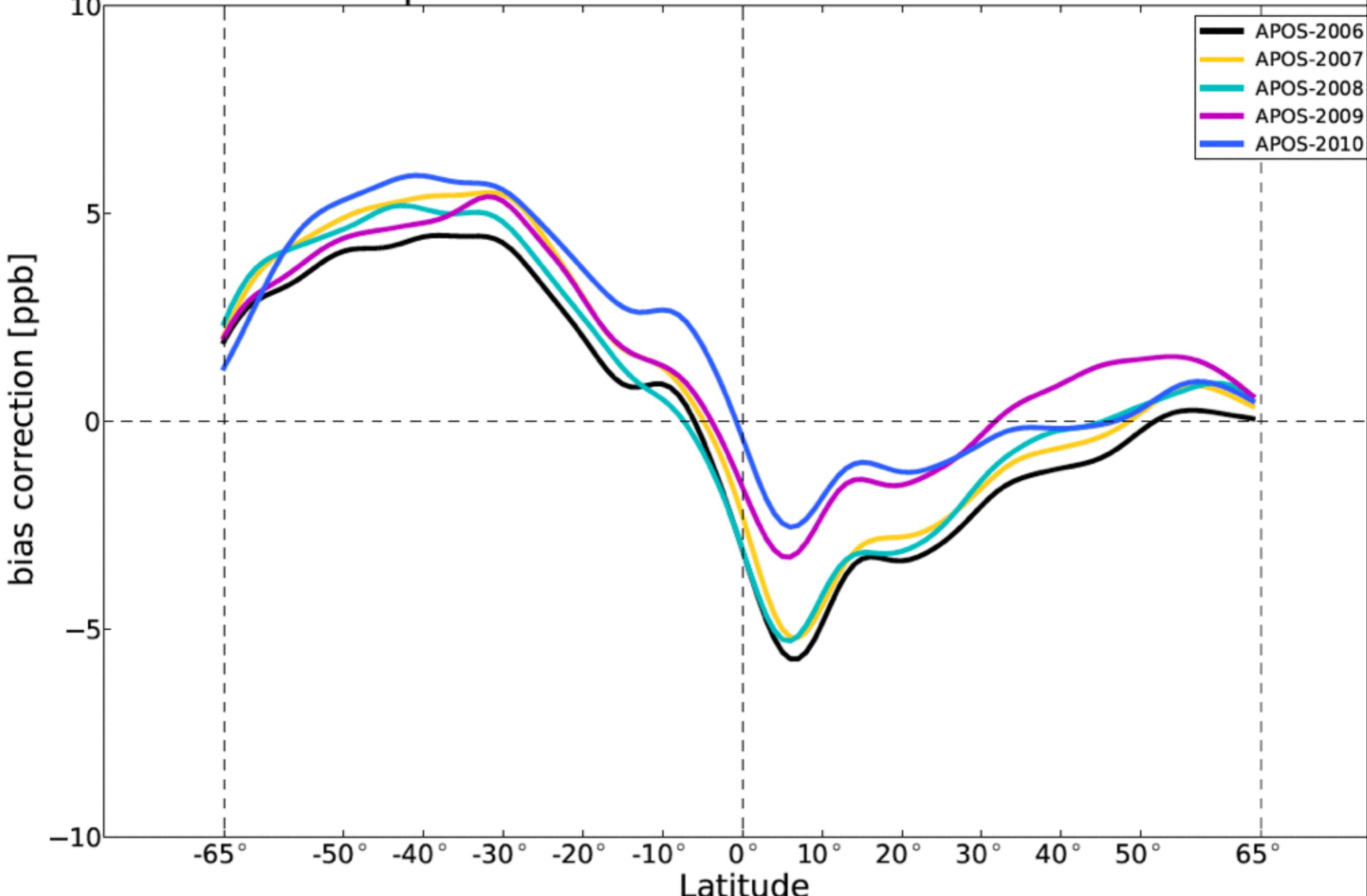
$$\ln(x_{\text{ps}}) = \ln(x_a) + A(\ln(x_m) - \ln(x_a)).$$

$$x_{\text{ps}} = x_a + \tilde{A}(x_m - x_a)$$

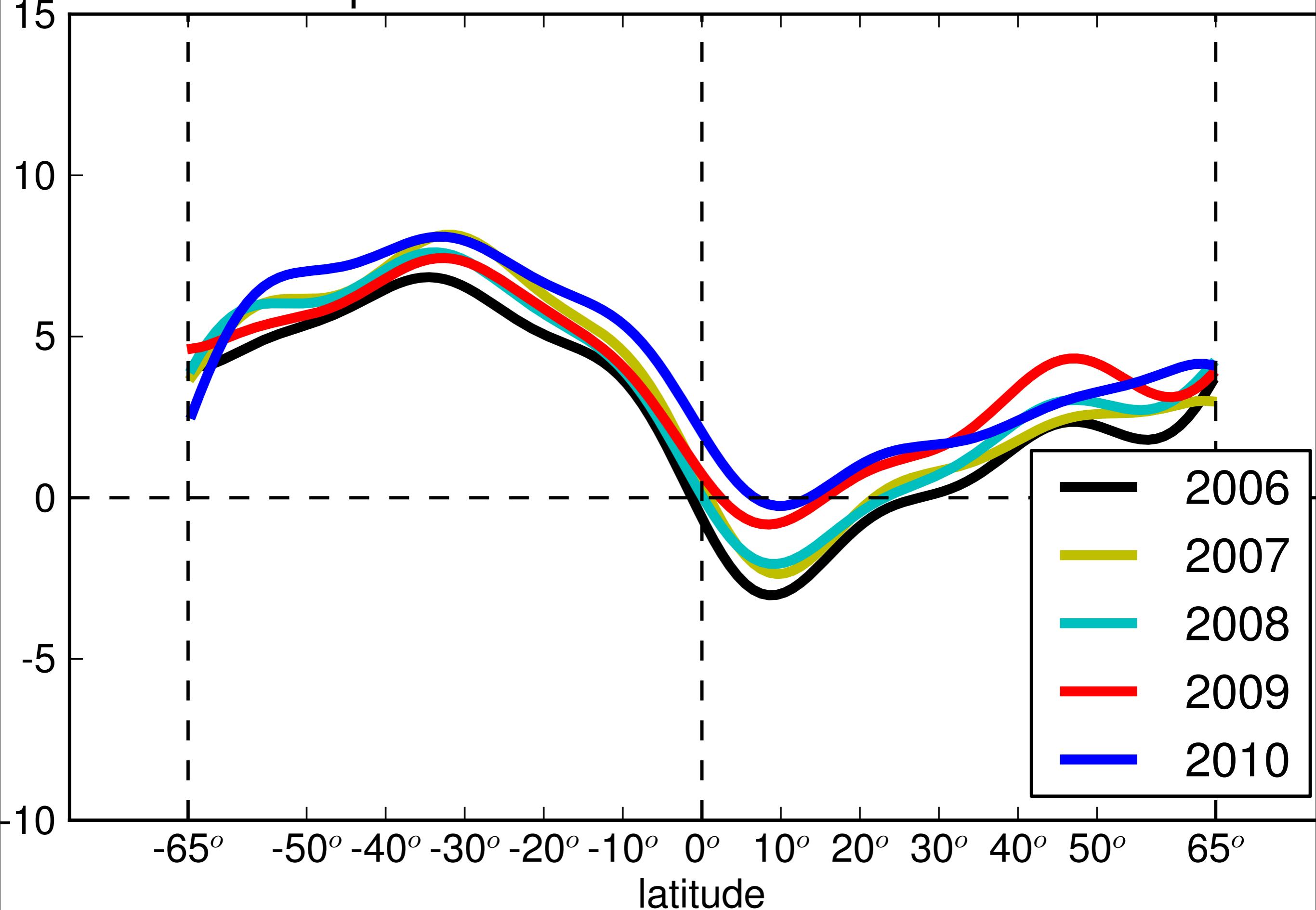




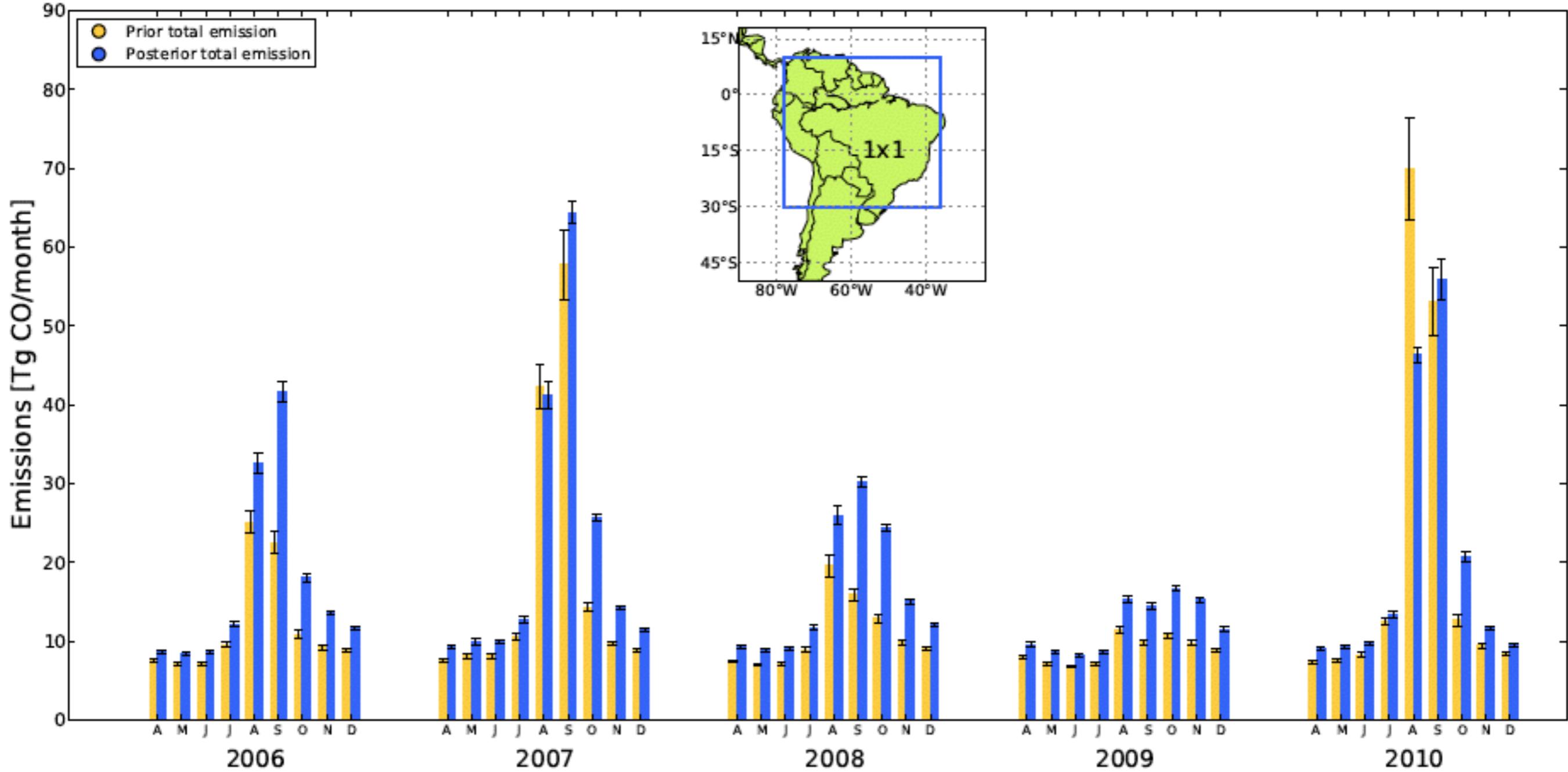
Optimized bias correction 2006-2010



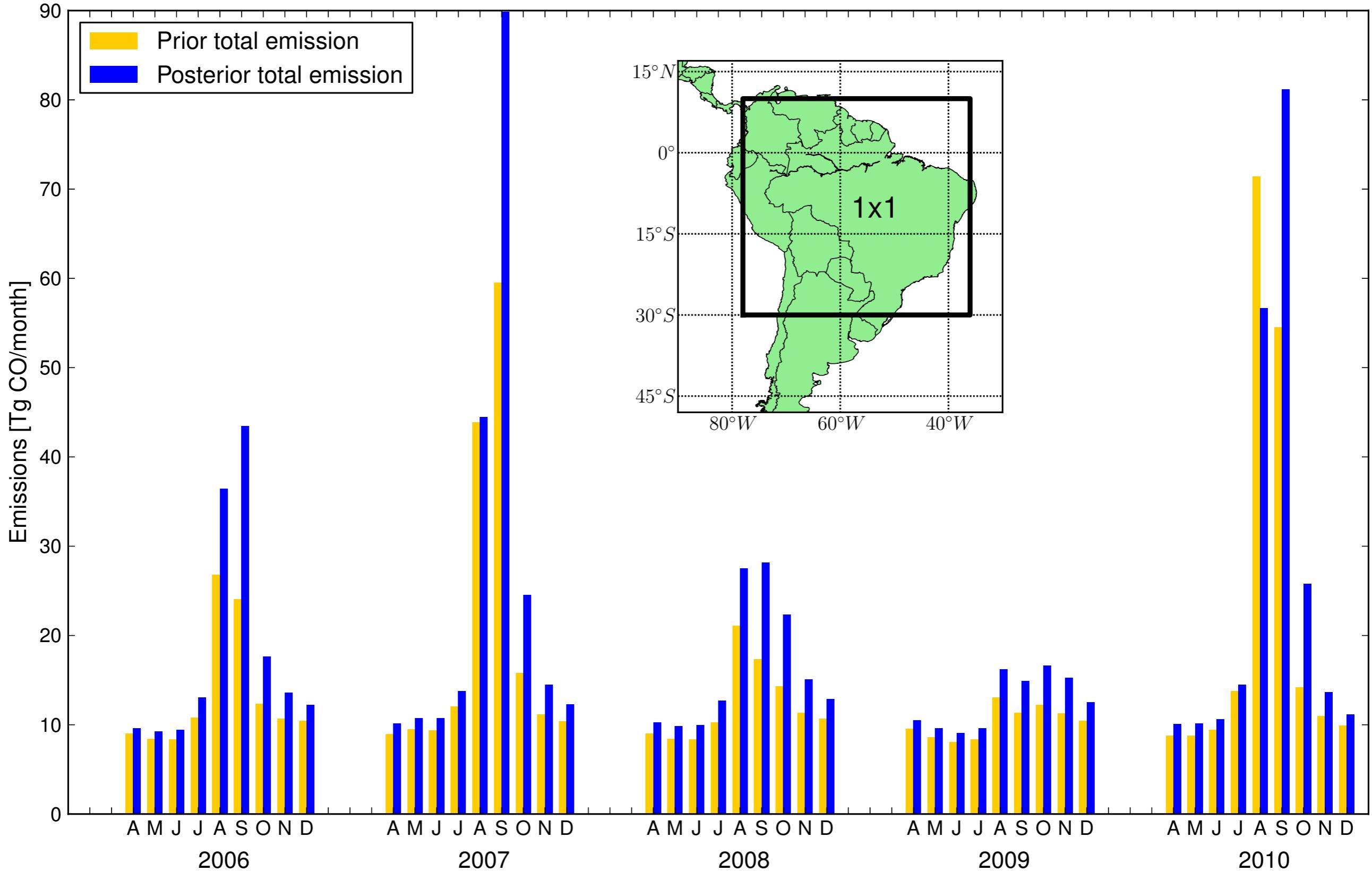
Optimized bias correction 2006-2010



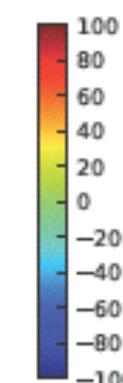
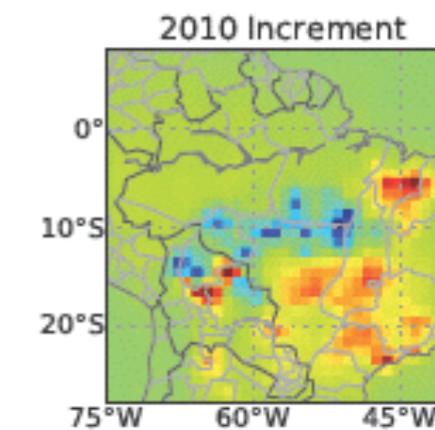
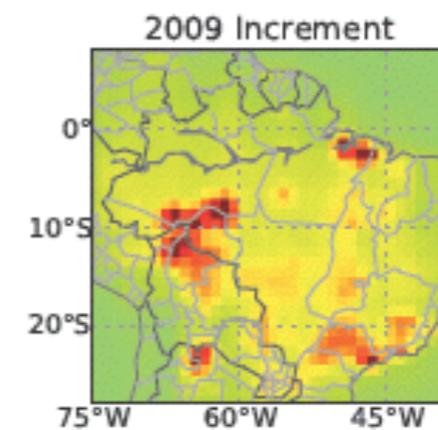
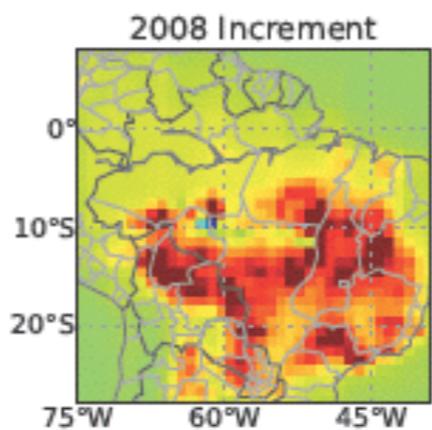
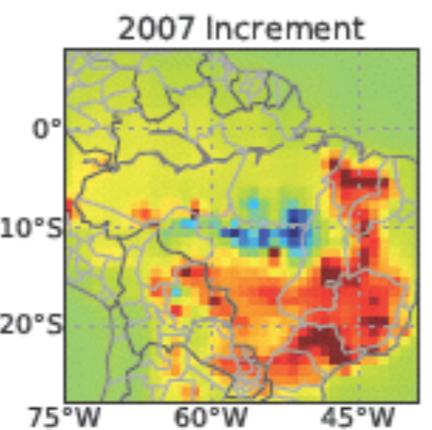
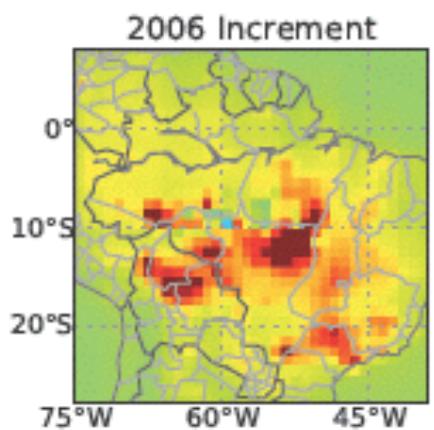
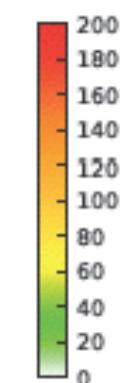
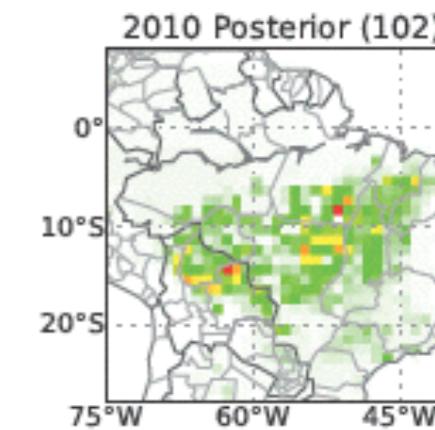
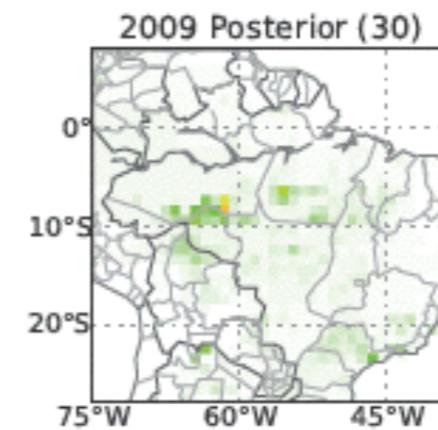
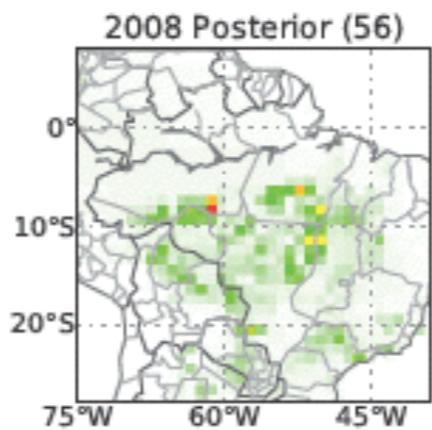
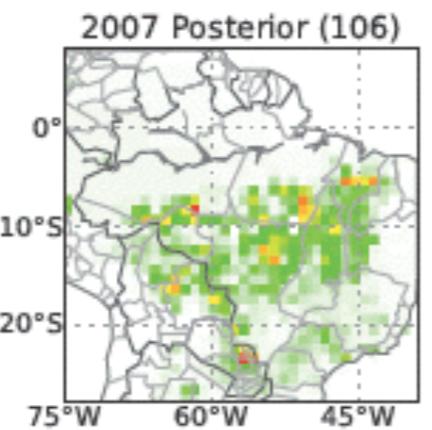
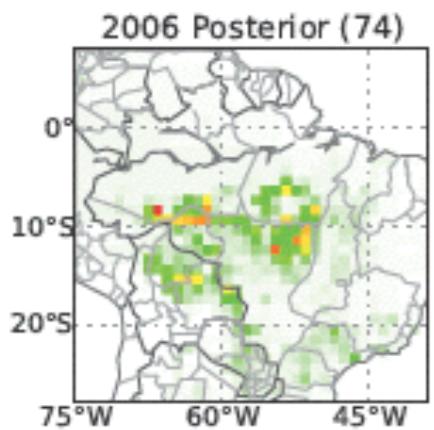
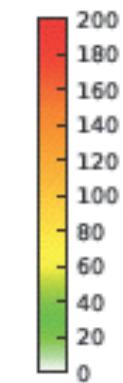
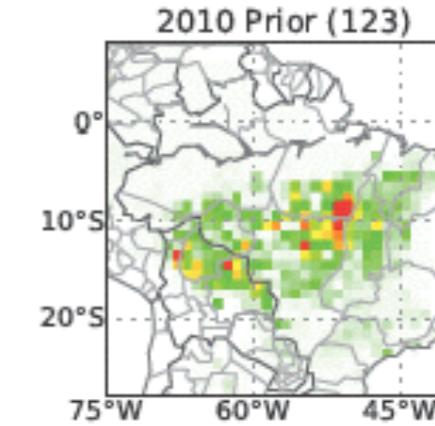
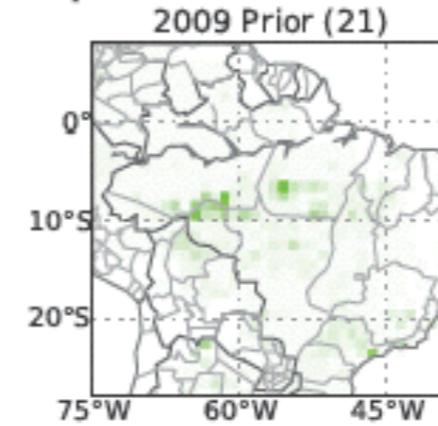
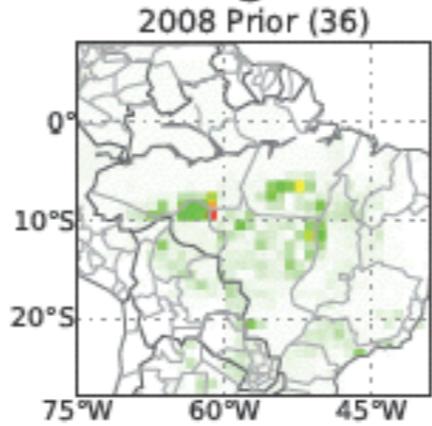
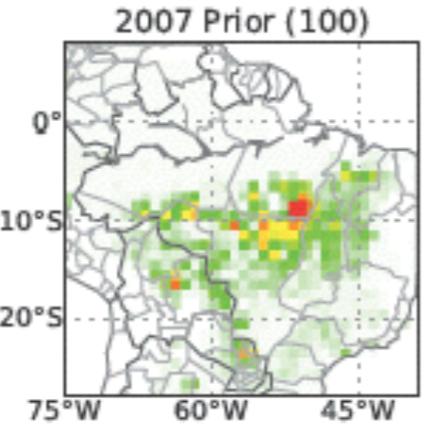
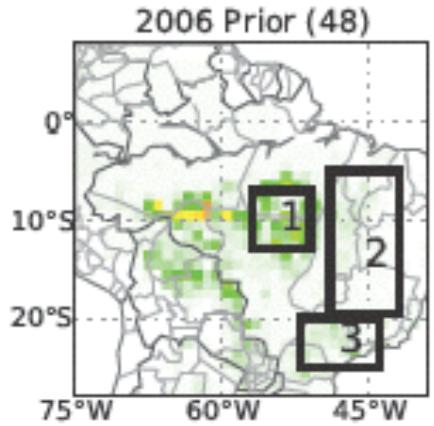
Optimized Emissions (Prior = GFED3)

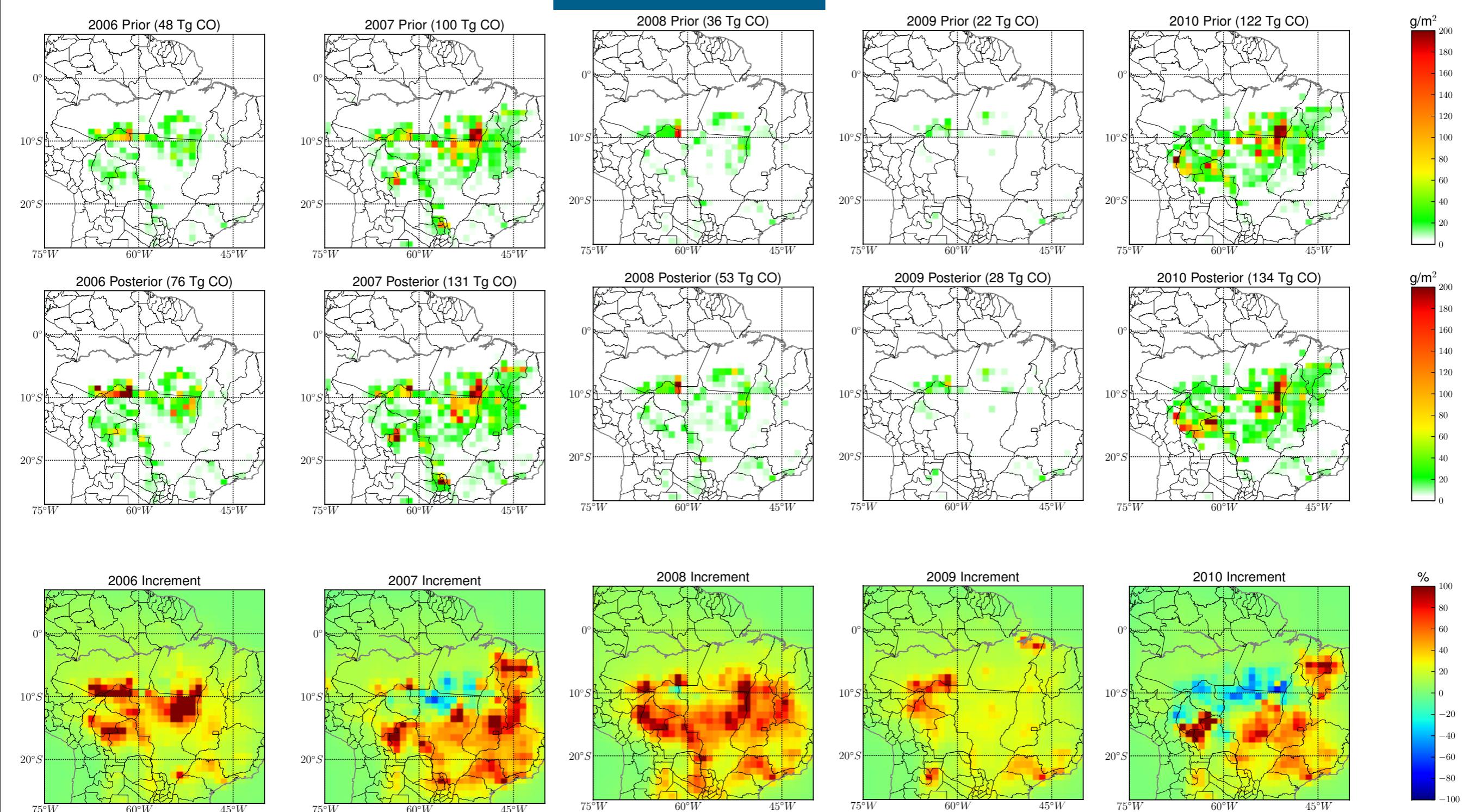


Optimized Emissions (Prior = GFED3)

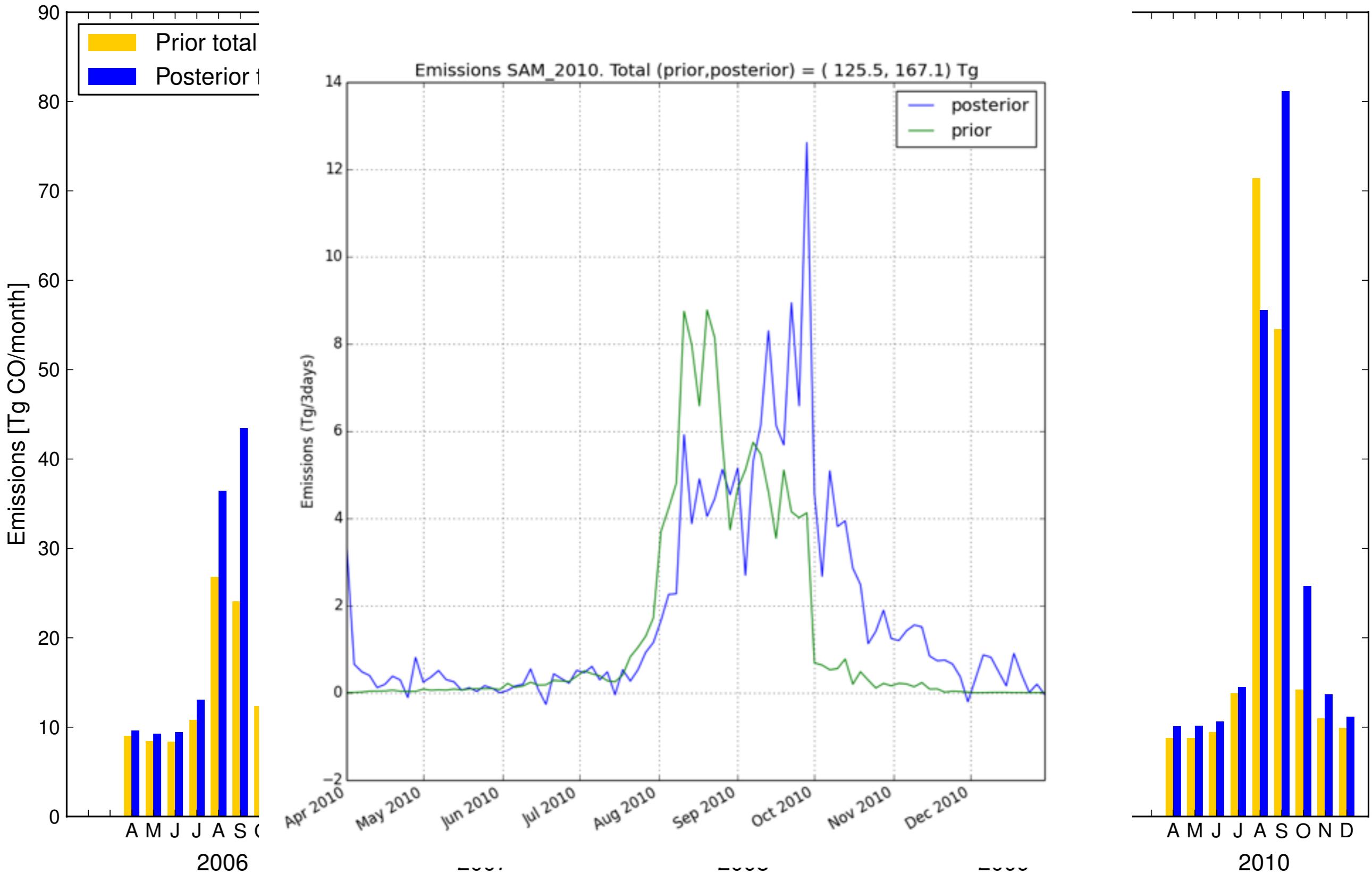


Total emissions August and September





IASI Assimilation 2010



Conclusions

- MOPIIT-linearization not recommended
- Use non-linear optimisation (M1QN3)
- Or....Use IASI
- But MOPIIT V5/6 uses $\ln(x)$