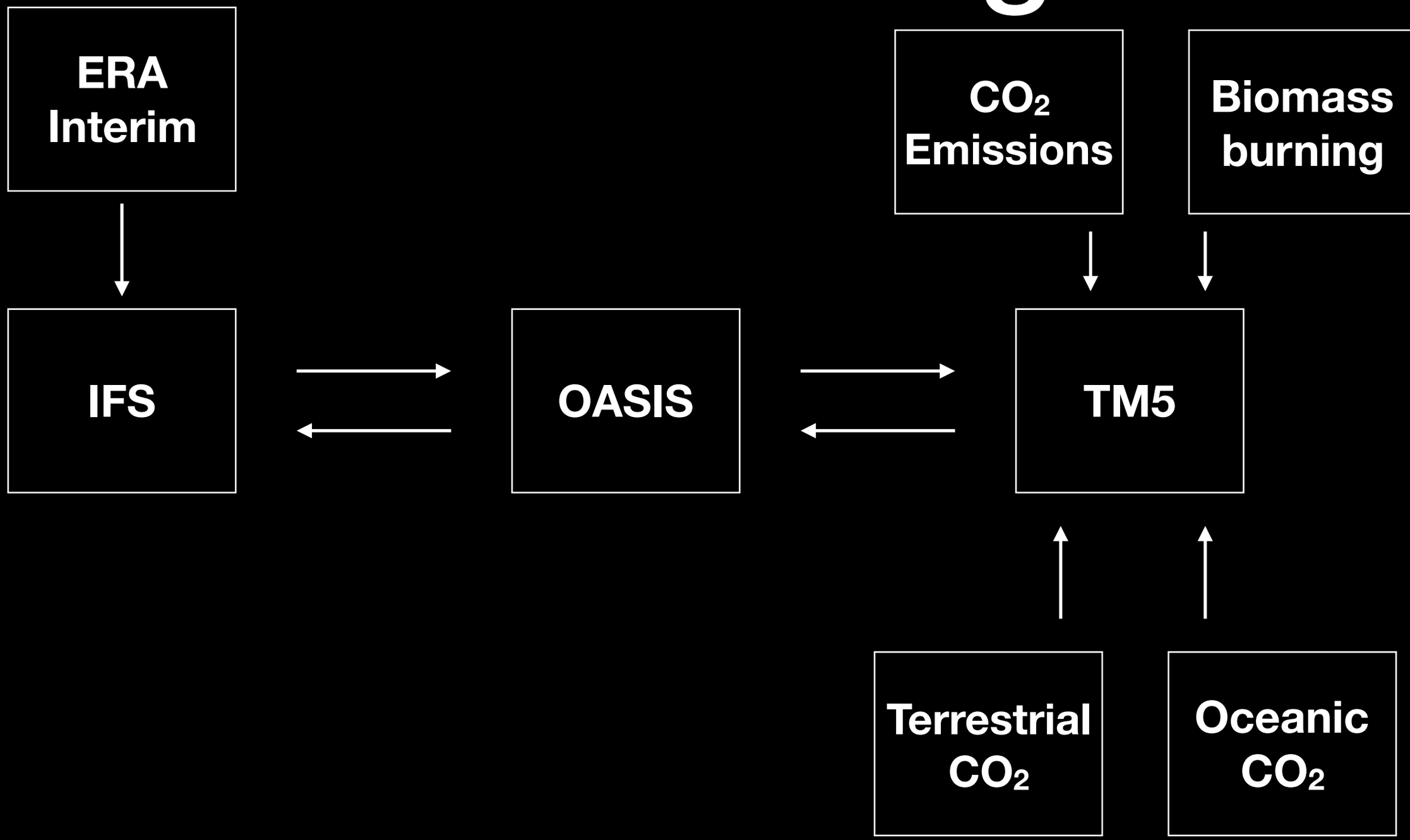
TM5 @ WUR

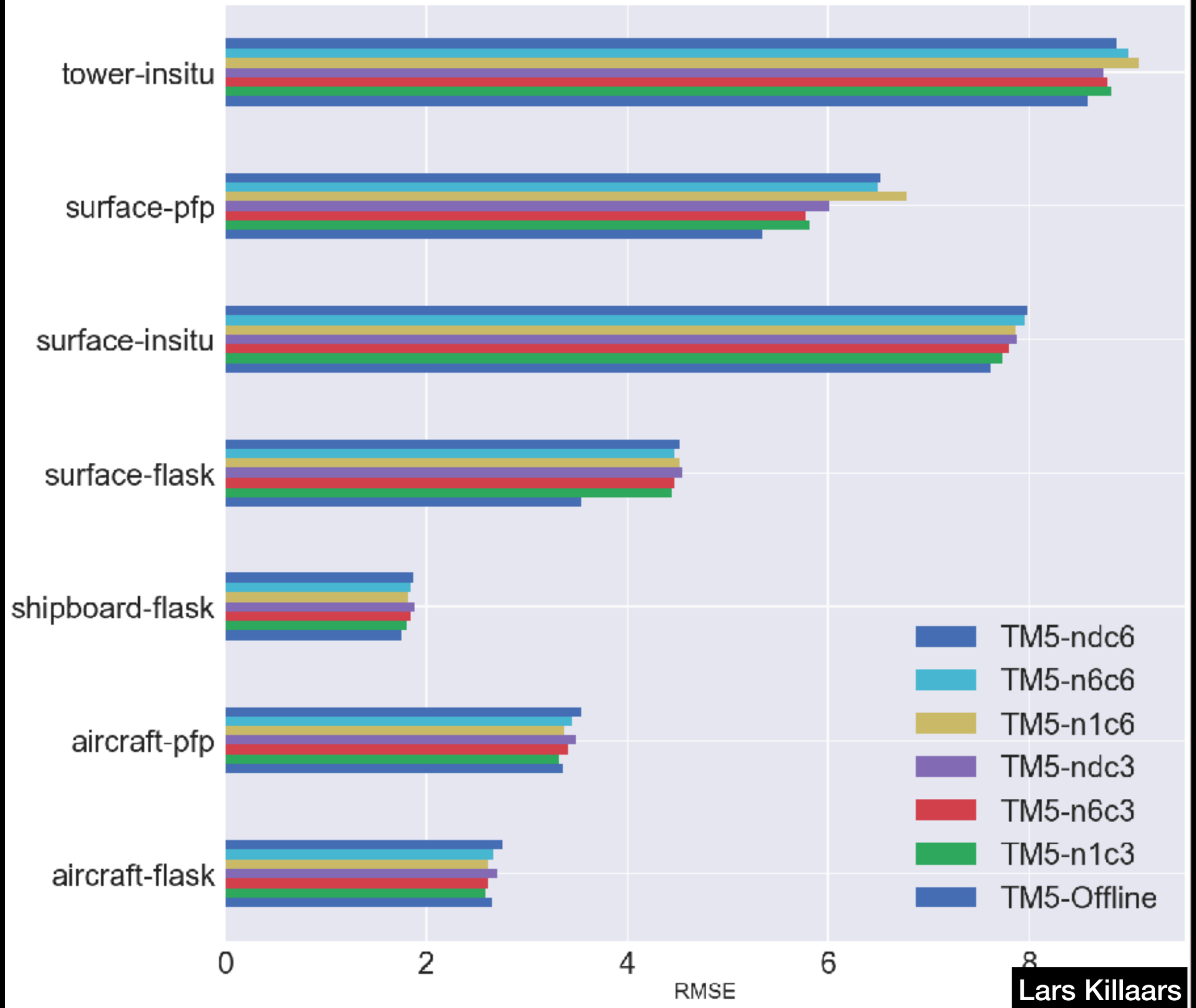
status update

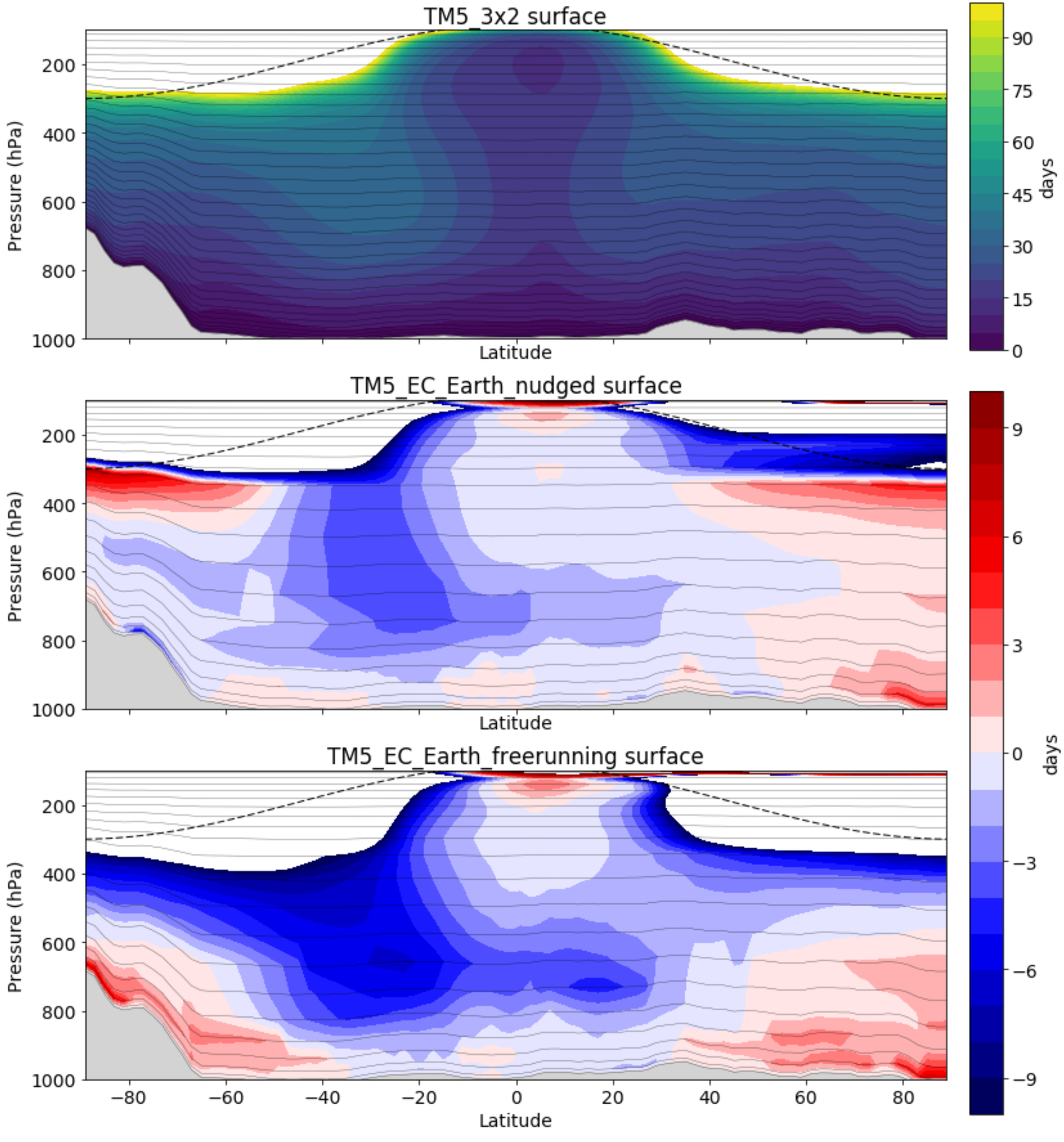
Wouter Peters, Ingrid van der Laan-Luijkx, Naomi Smith, Liesbeth Florentie, Gerbrand Koren, Erik van Schaik, Lars Killaars

- TM5-online vs offline update
- TM5 in inverse modeling
    - EUROCOM
    - CHE & CIF
    - Parameter optimization

TM5 Online nudged

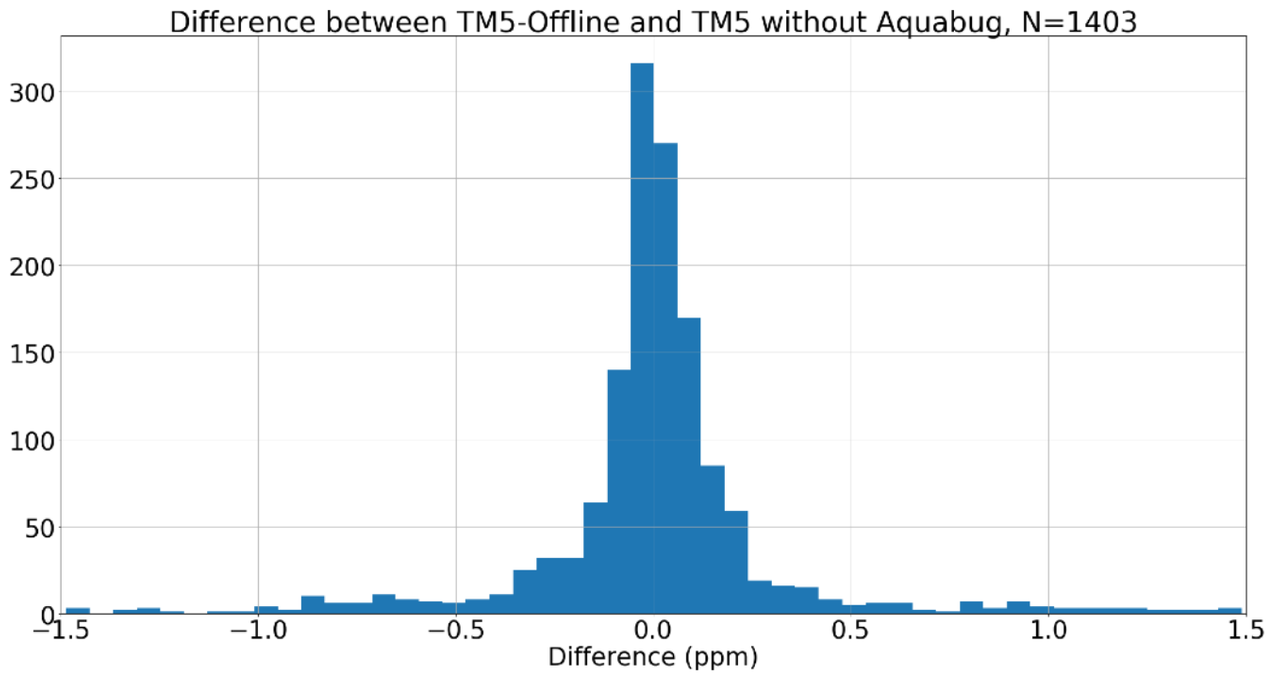


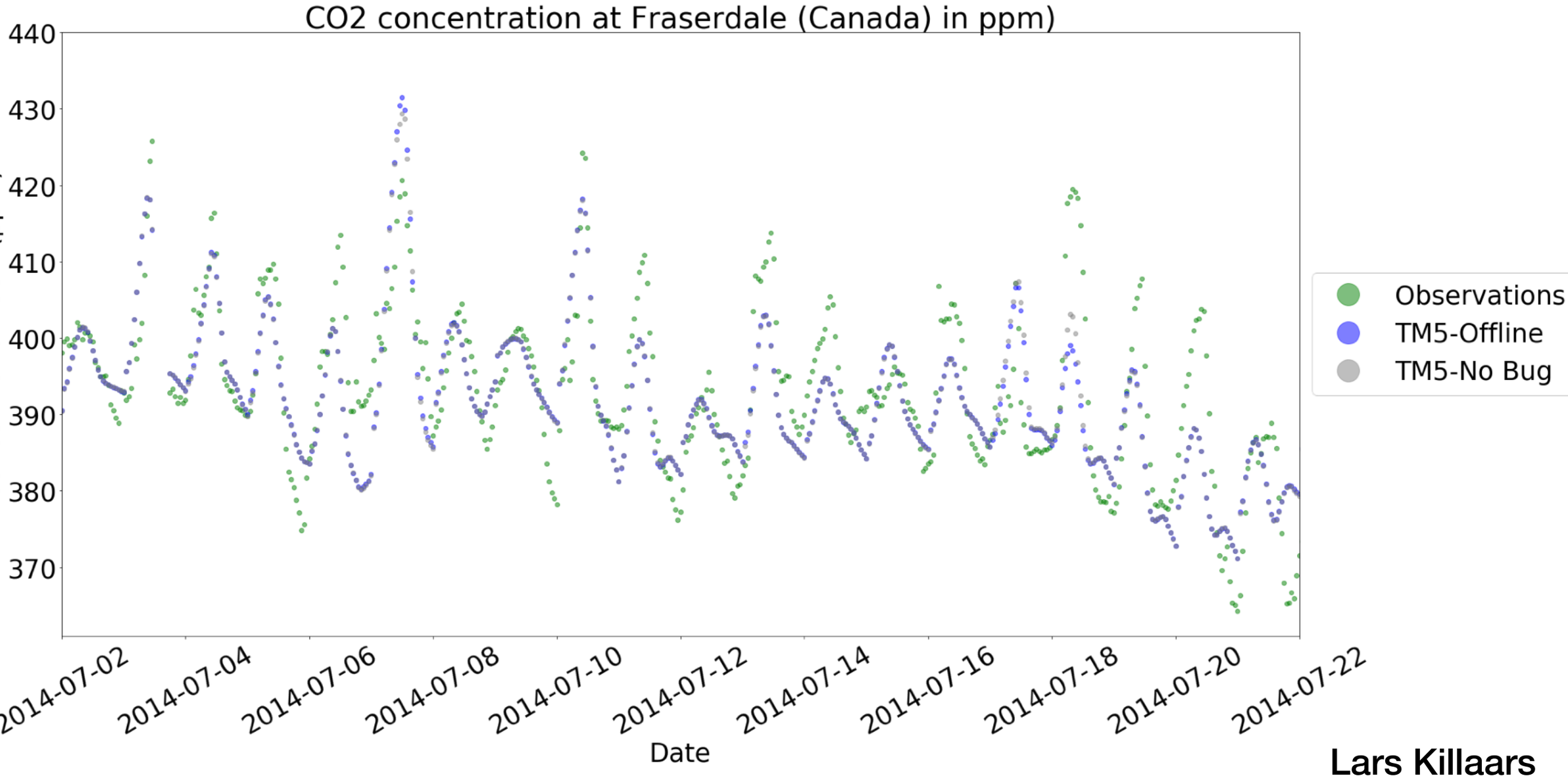




Lars Killaars

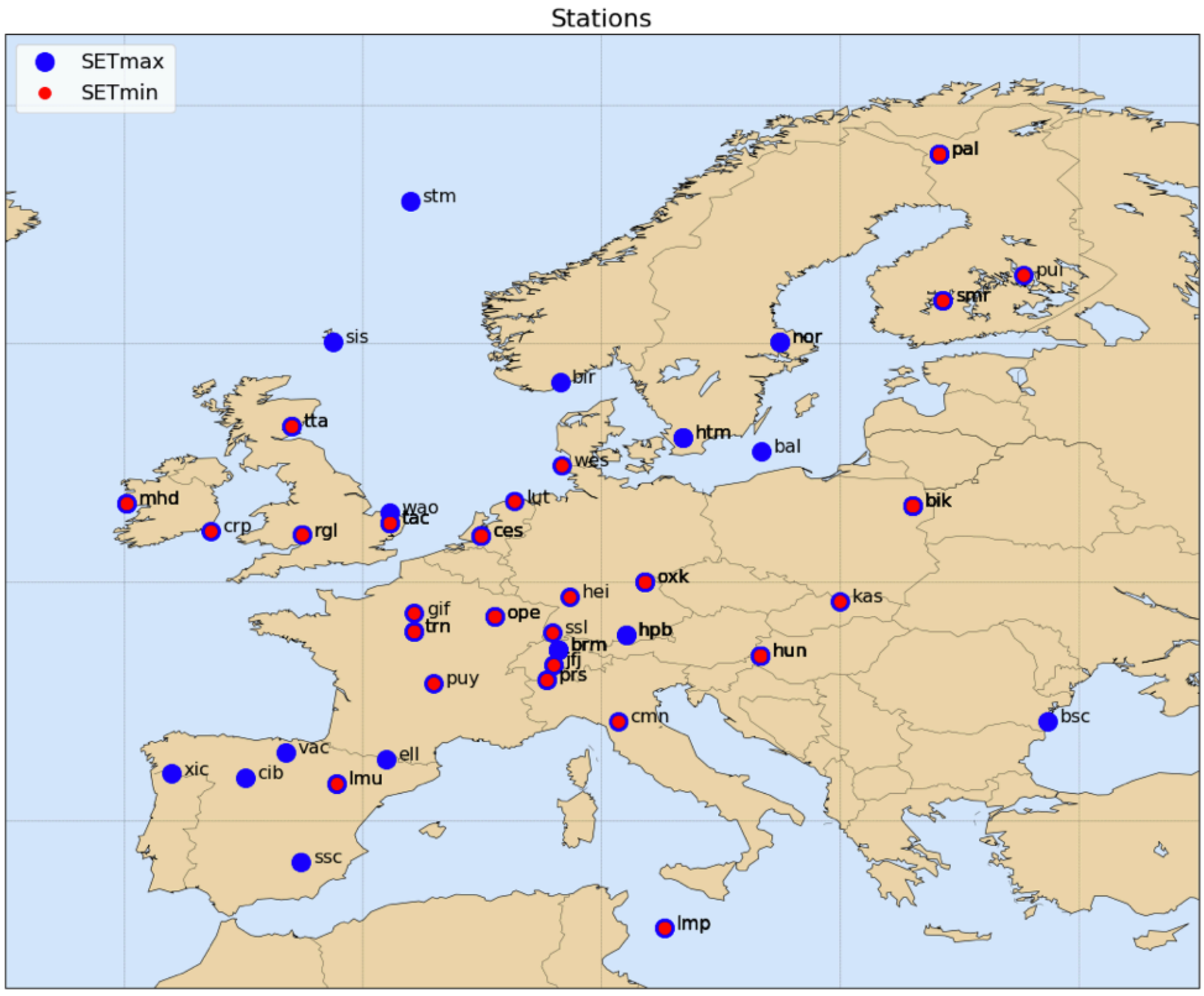
aqua
bug



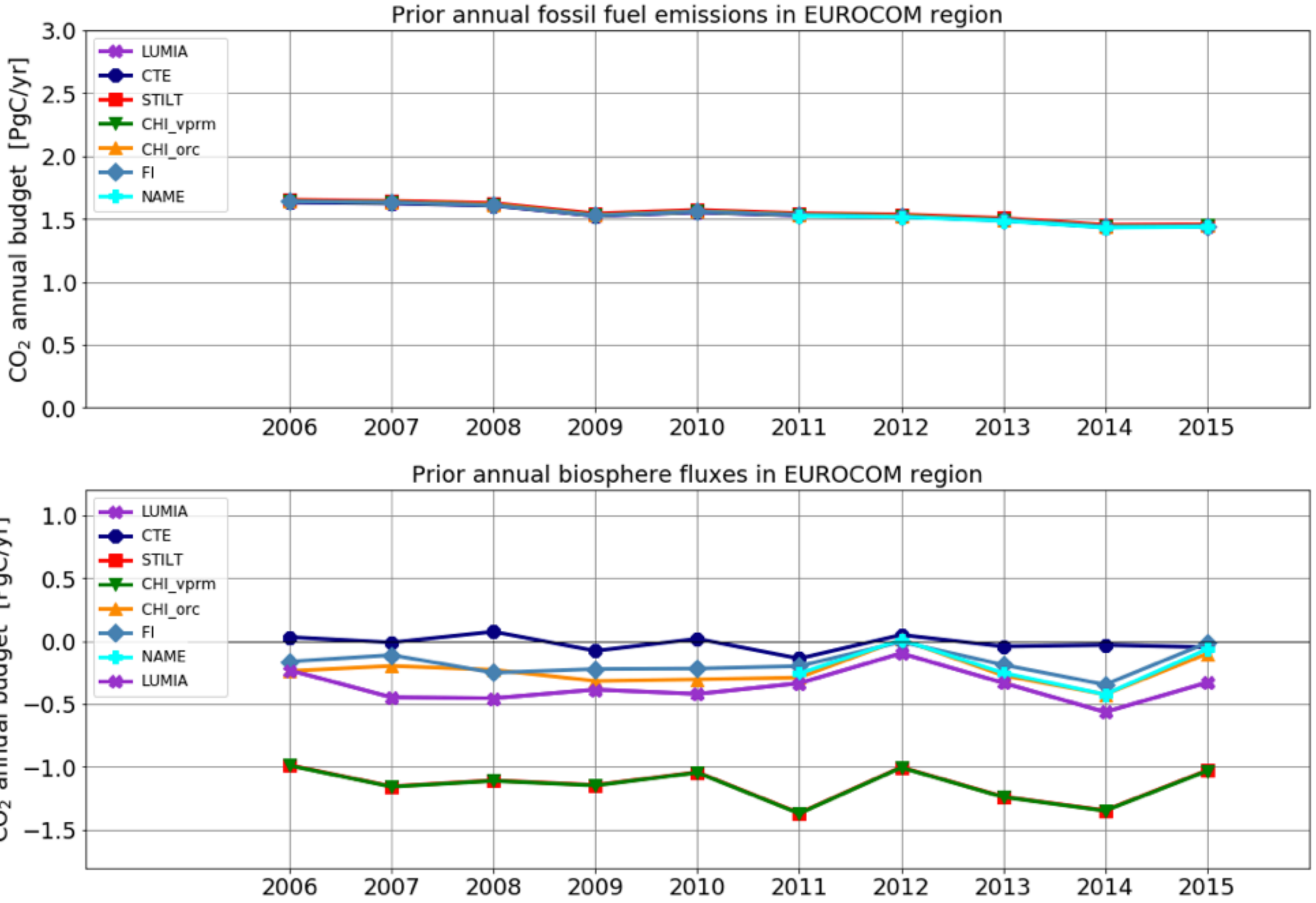


Lars Killaars

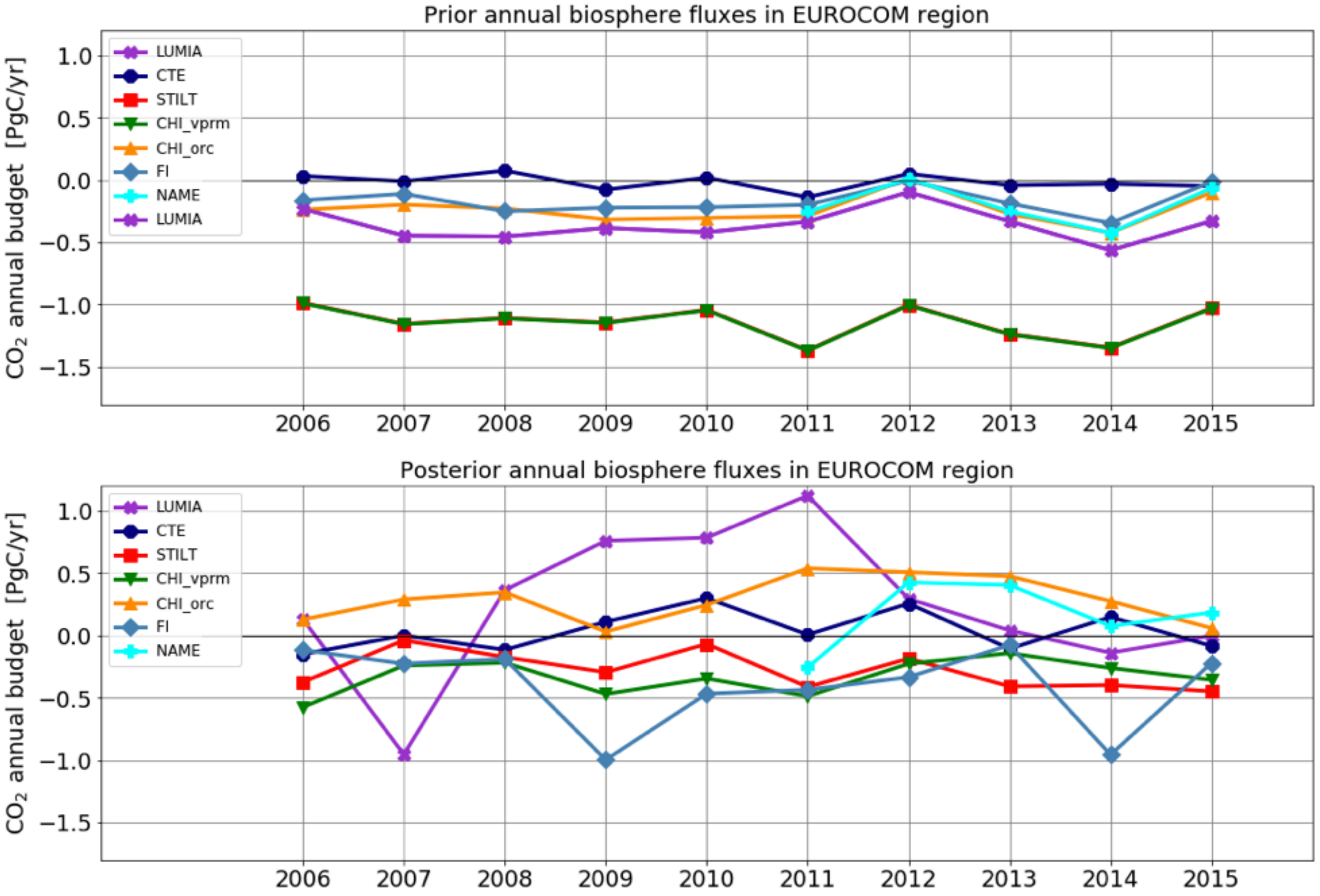
EUROCOM



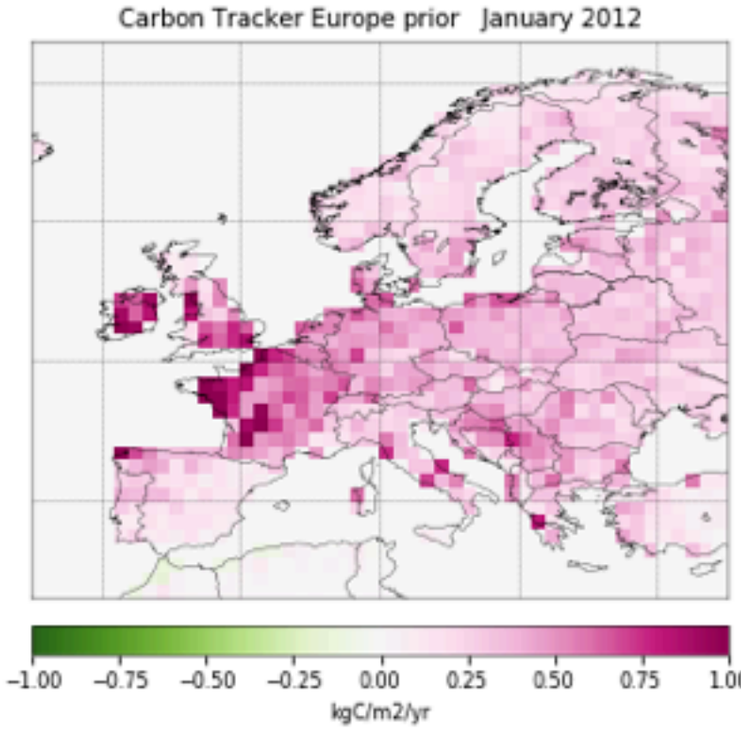
Naomi Smith & Ingrid van der Laan-Luijkx

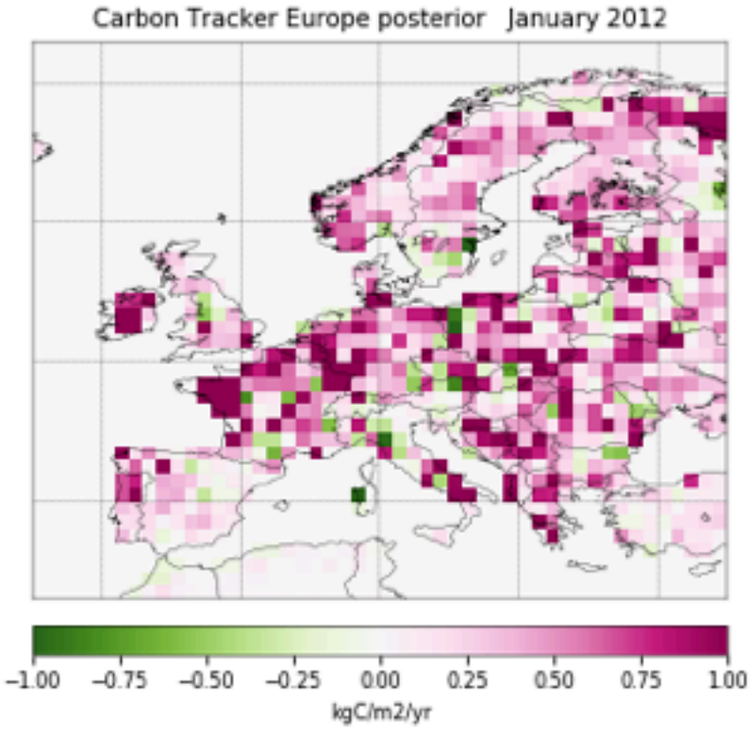


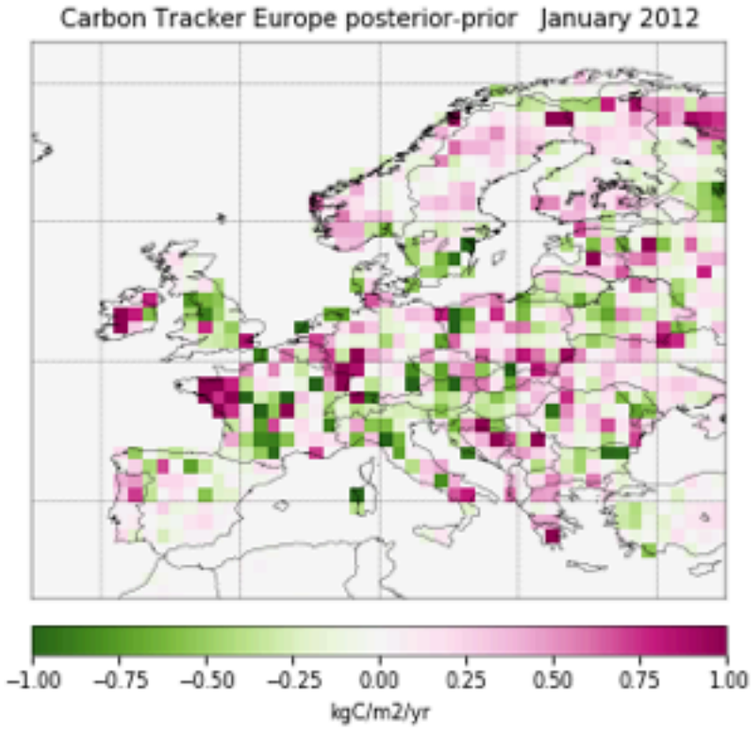
Naomi Smith & Ingrid van der Laan-Luijkx

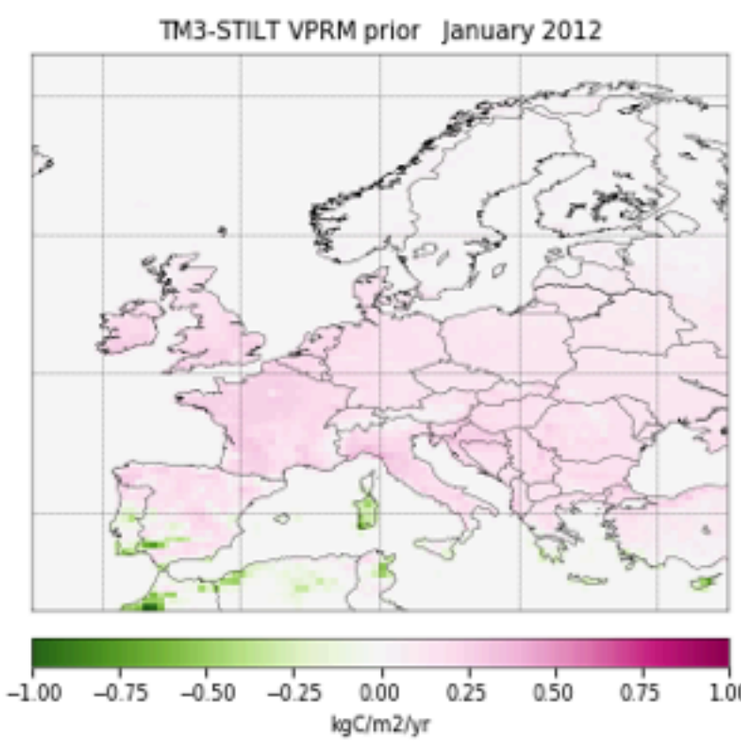


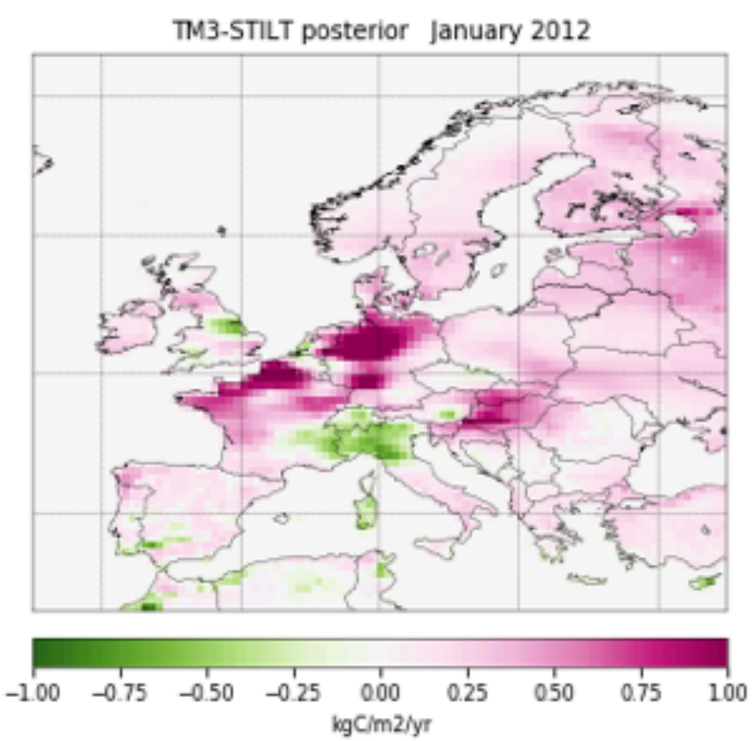
Naomi Smith & Ingrid van der Laan-Luijkx

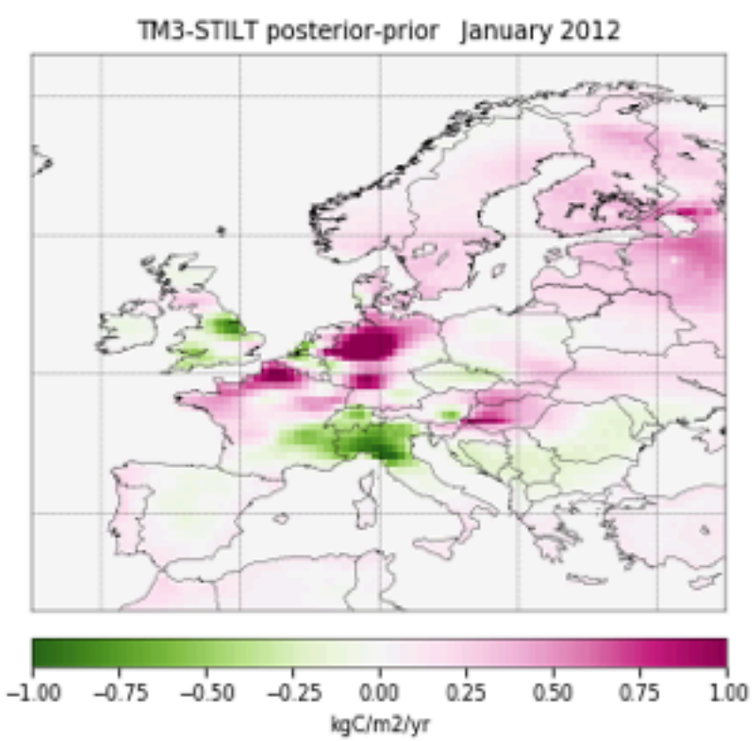












Naomi Smith & Ingrid van der Laan-Luijkx

CHE & CIF

Carbon Human Emissions & Common Inverse Framework

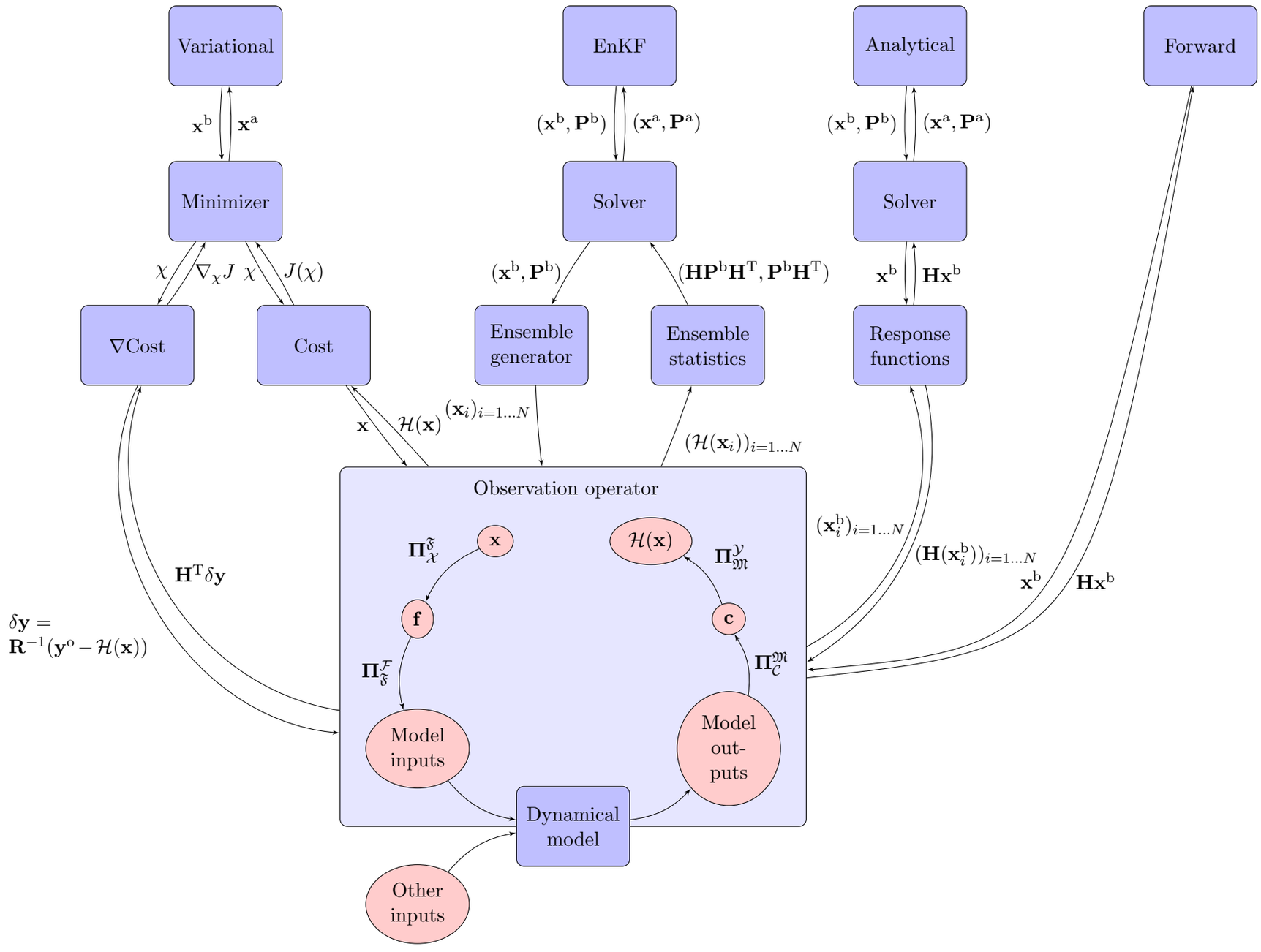


Figure 1: Schematic call chart of the CIF, with details on the observation operator. All operations in the observation operator must be provided an individual adjoint if the observation operator is to be run in adjoint mode.

Liesbeth Florentie

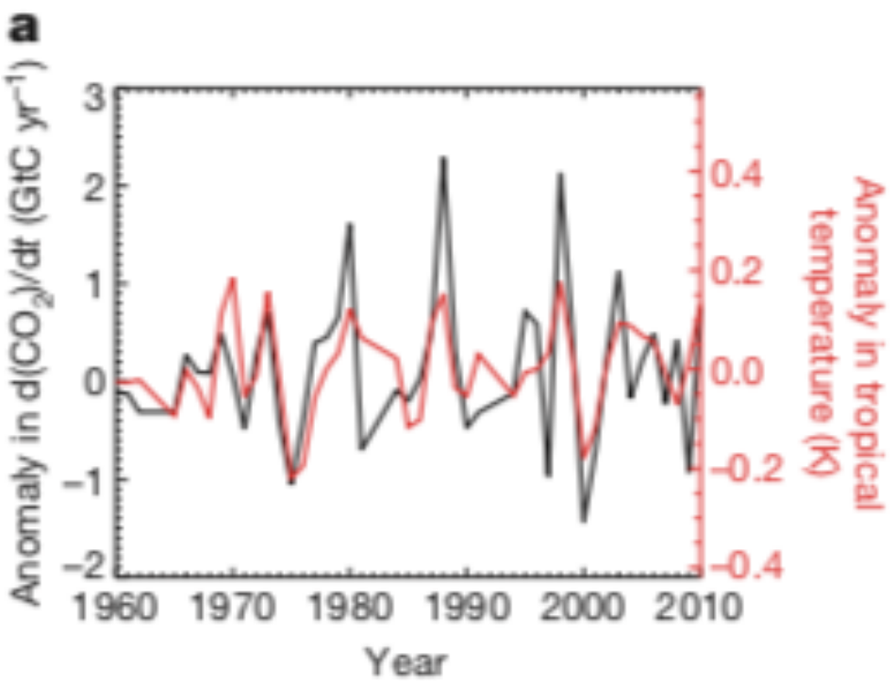
Parameter inversions

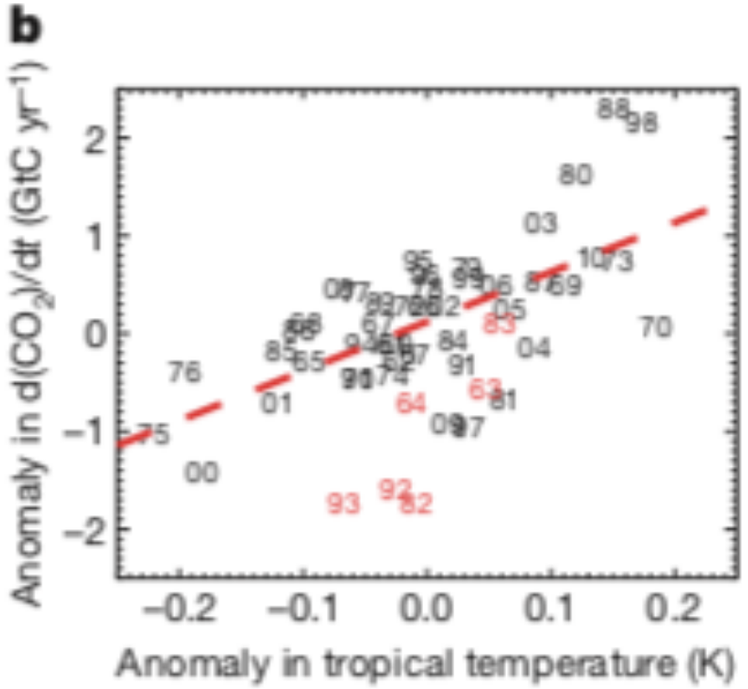
How does the terrestrial carbon exchange respond to inter-annual climatic variations? A quantification based on atmospheric CO_2 data

Christian Rödenbeck[1], Sönke Zaehle[1], Ralph Keeling[2], and Martin Heimann[1,3]

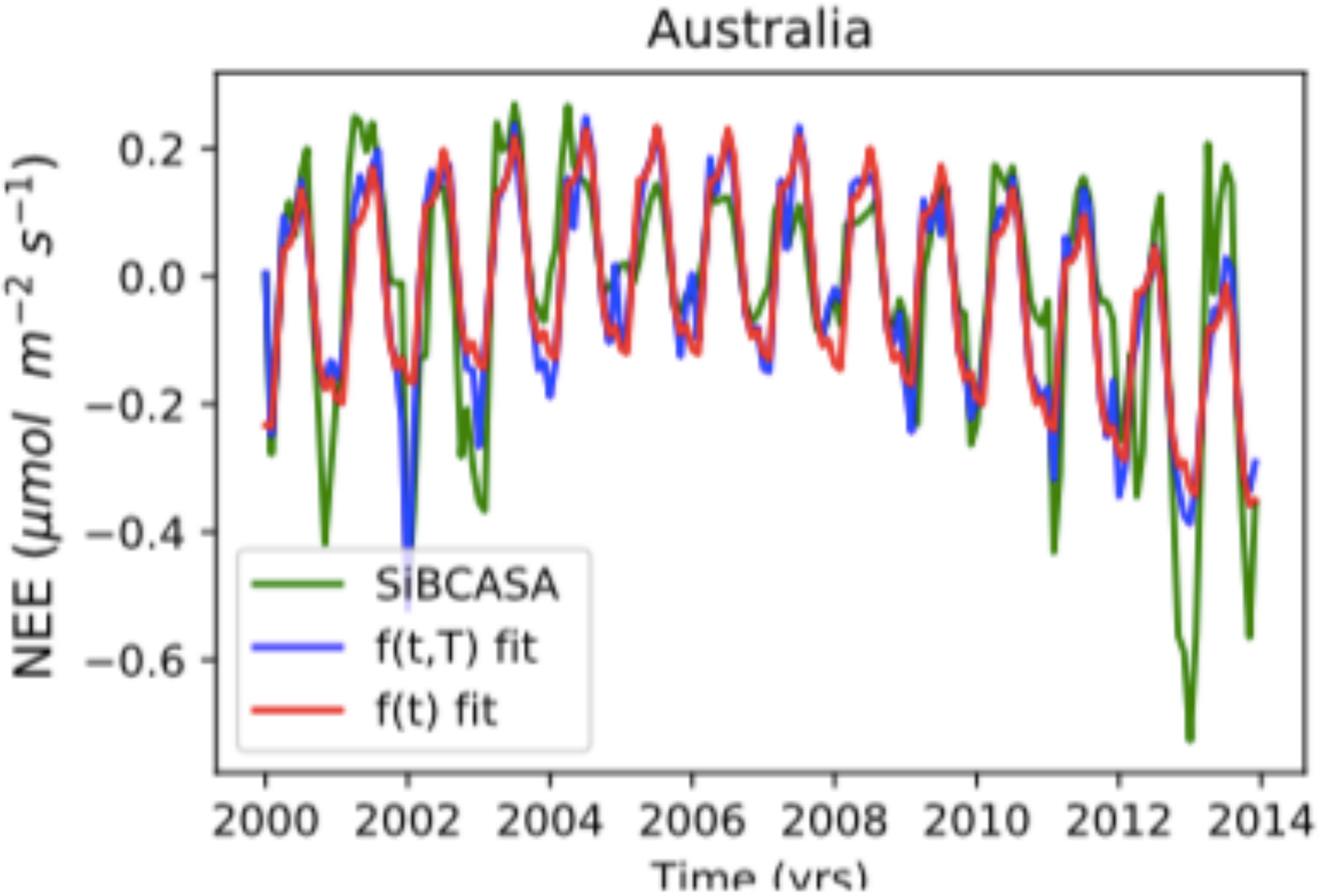
Sensitivity of tropical carbon to climate change constrained by carbon dioxide variability

Peter M. Cox[1], David Pearson[2], Ben B. Booth[2], Pierre Friedlingstein[1], Chris Huntingford[3], Chris D. Jones[2] & Catherine M. Luke[1]





γT = 5.1 PgC yr^{-1} K^{-1}



$$NEE(t) = a_0 + a_1 t + a_2 t^2 + \sum_{n=1}^{4} b_n sin(2\pi n t + \phi_n)$$

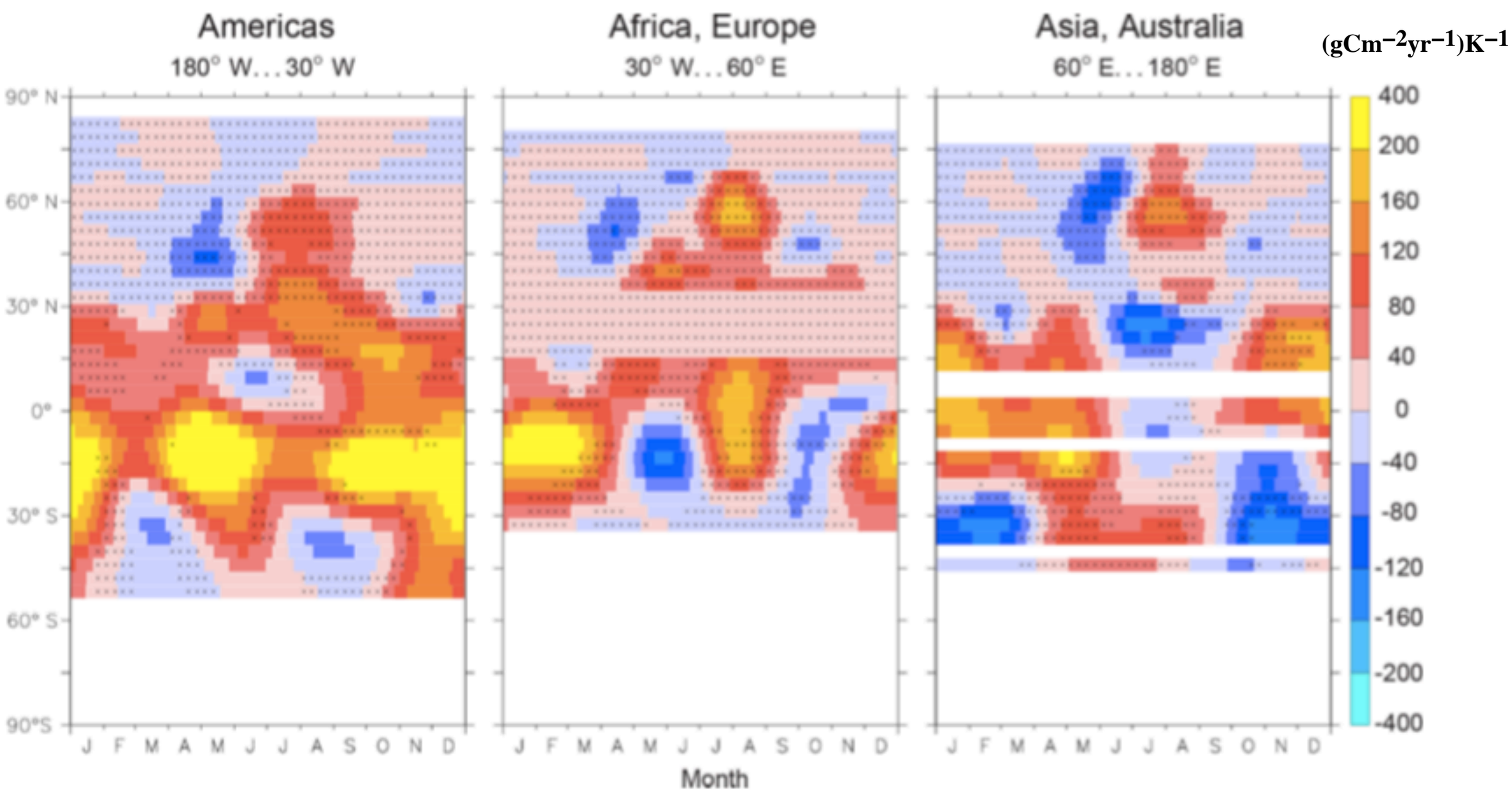
$$NEE(t,T) = a_0 + a_1 t + a_2 t^2 + \sum_{n=1}^{4} b_n sin(2\pi n t + \phi_n) + \gamma_T \Delta T$$

Rolf van der Vleugel

CO_2 inverse derived values of γ_T per month,

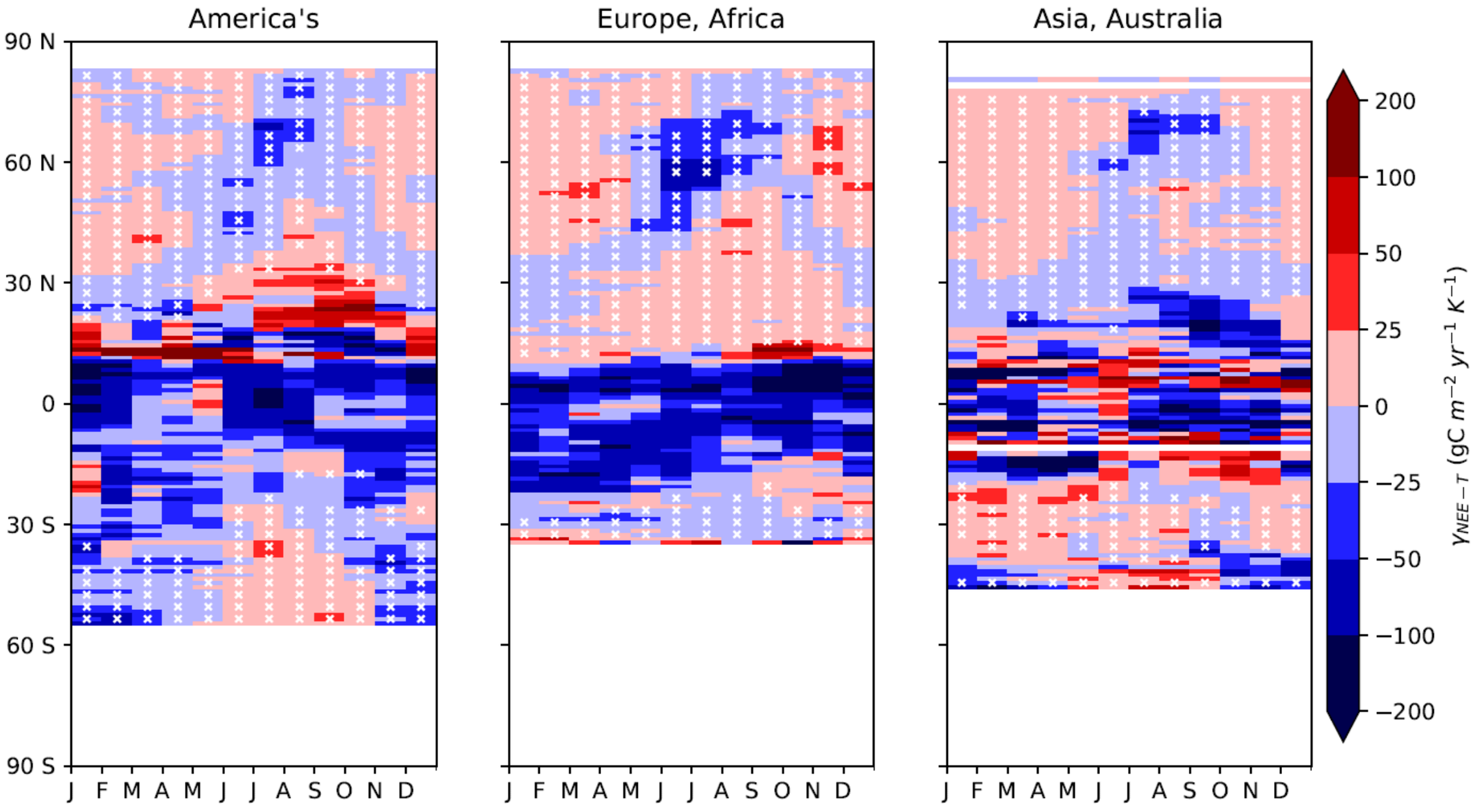
negative = more uptake when warmer

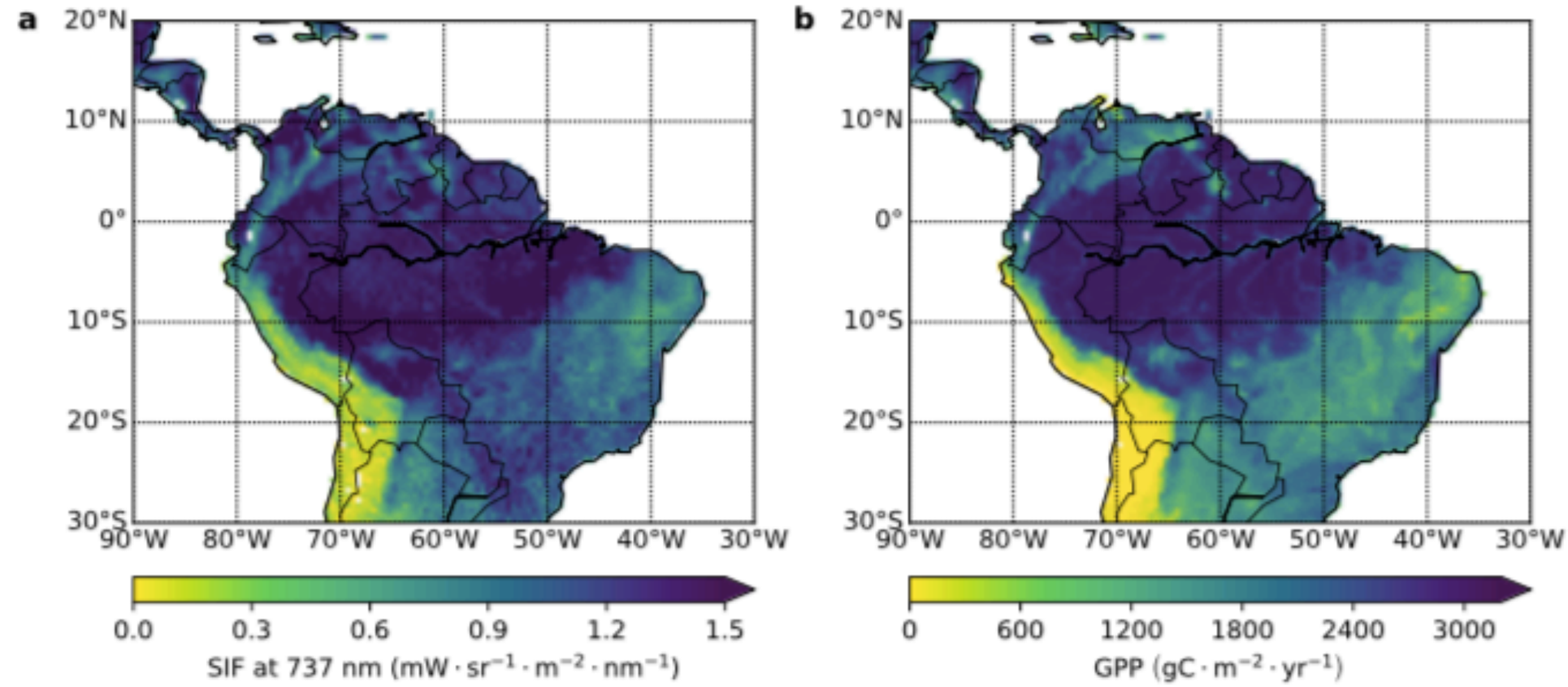
positive = less uptake when warmer



Rödenbeck et al., (2018), ACP

Estimate of γ_T based on fit to SIBCASA NEE





$$NEE(t,T) = a_0 + a_1 t + a_2 t^2 + \sum_{n=1}^{4} b_n sin(2\pi n t + \phi_n) + \gamma_{SIF}\Delta SIF + TER(t,T)$$

Summary

- Ongoing inversion projects at European/Global scales
- Ambition to go to longer time-scales (30+ years)
  - IFS-TM5-MP (nudged to ERA5)
    - good for reduced meteo storage (**factor -10.0**)…
    - … but not in clock time (**factor +2.5**) due to OASIS
  - parameter inversion for climate sensitivity
- Climate sensitivity => biosphere/climate models (EC-Earth)