Co-ordinated by ECMWF

CoCO2
Prototype system for a Copernicus CO_2 service

COCO2 PRESENTATION DAY

WP8 User Engagement

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5/12/2022

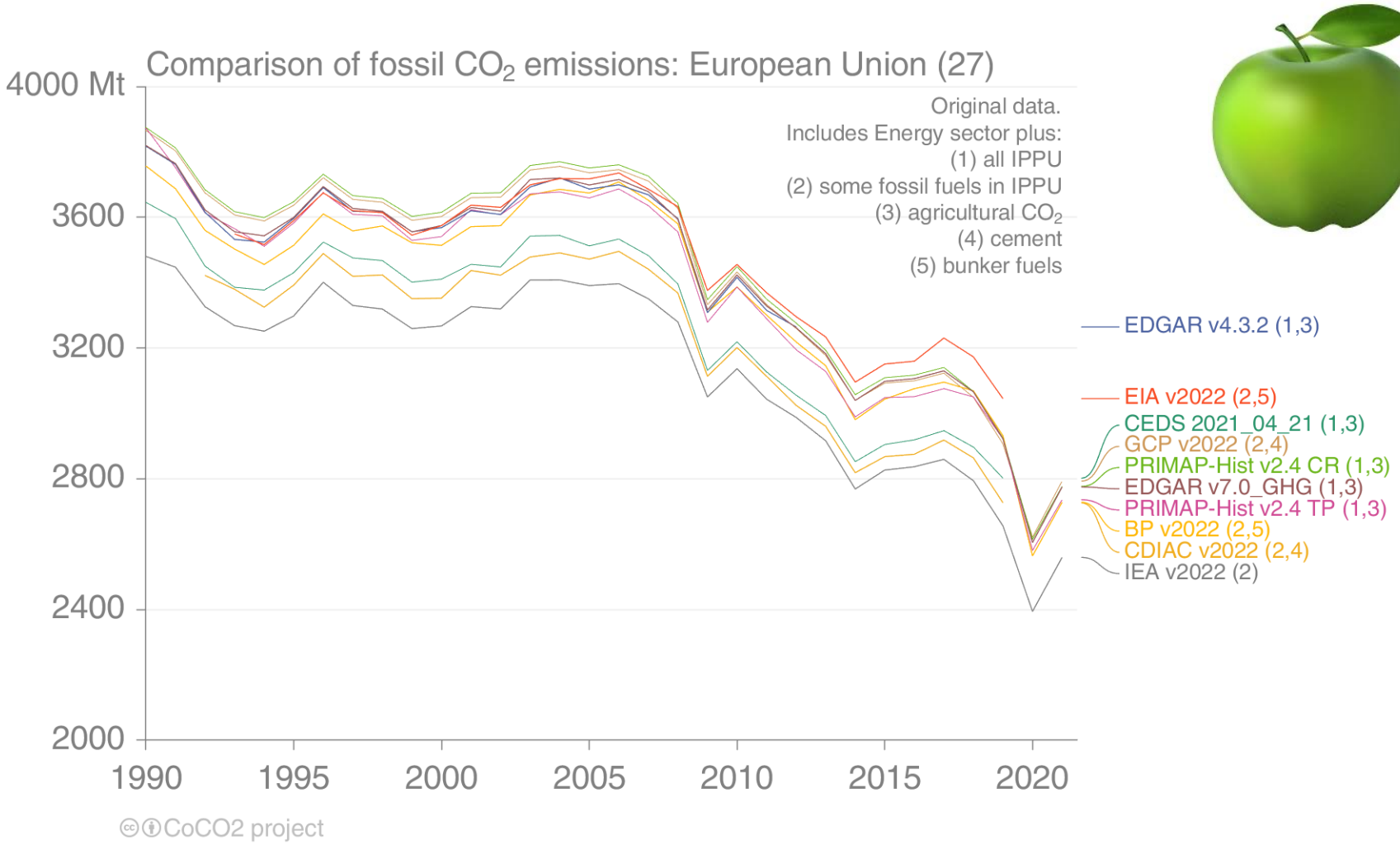
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 958927.

Overview of deliverables (past and future)

- Budget Estimates for CO_2 and CH_4 for major emitters
  - D8.1 (December 2021), D8.2 (December 2022), D8.3 (December 2023)
- Decision Support Blueprint
  - D8.4 (December 2022), D8.5 (July 2023)
- Catalogue of Studies
  - D8.6 (December 2022)
- Engagement and Implementation Plan
  - D8.7 (December 2021), D8.8 (December 2023)

- Starting point is really the country level (UNFCCC, GST, etc)

D8.2 Fossil CO_2 Inventory-based



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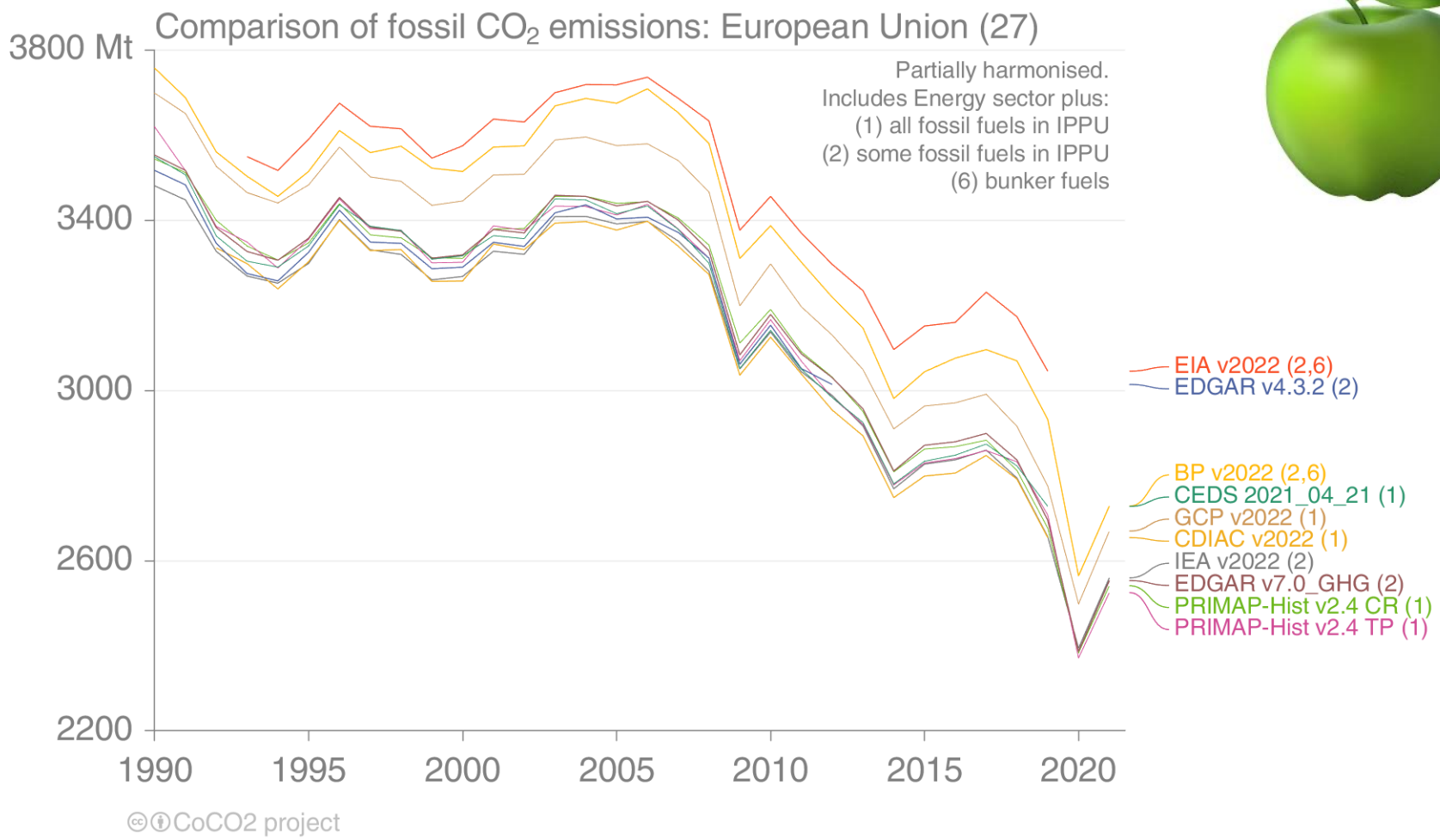
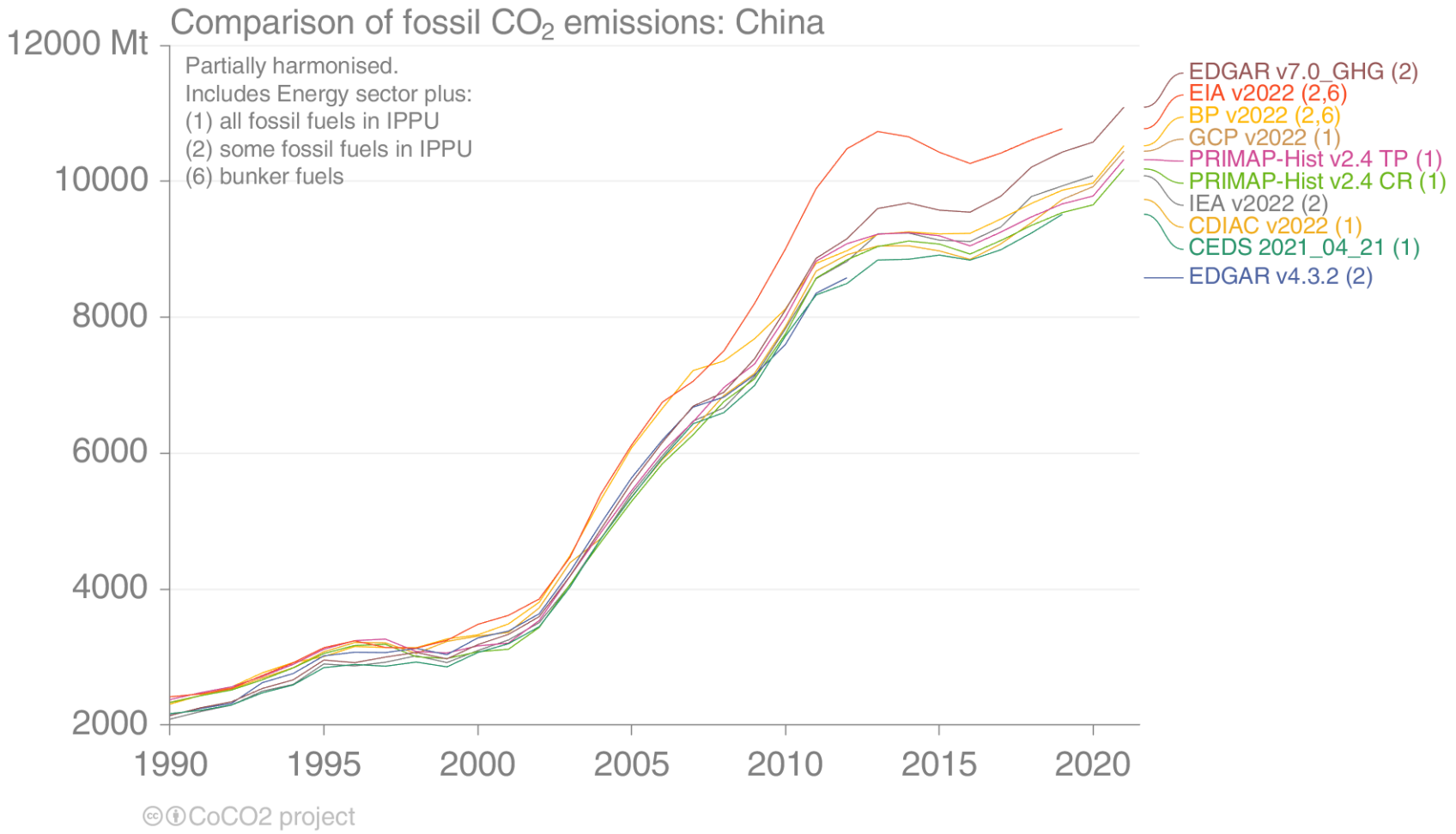
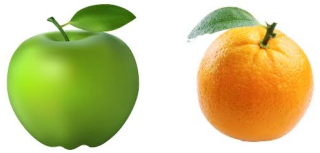


D8.2 Fossil CO_2 Inventory-based

Coming changes: updates on data & figures, inclusion of uncertainty



D8.2 Fossil CO_2 observation-based

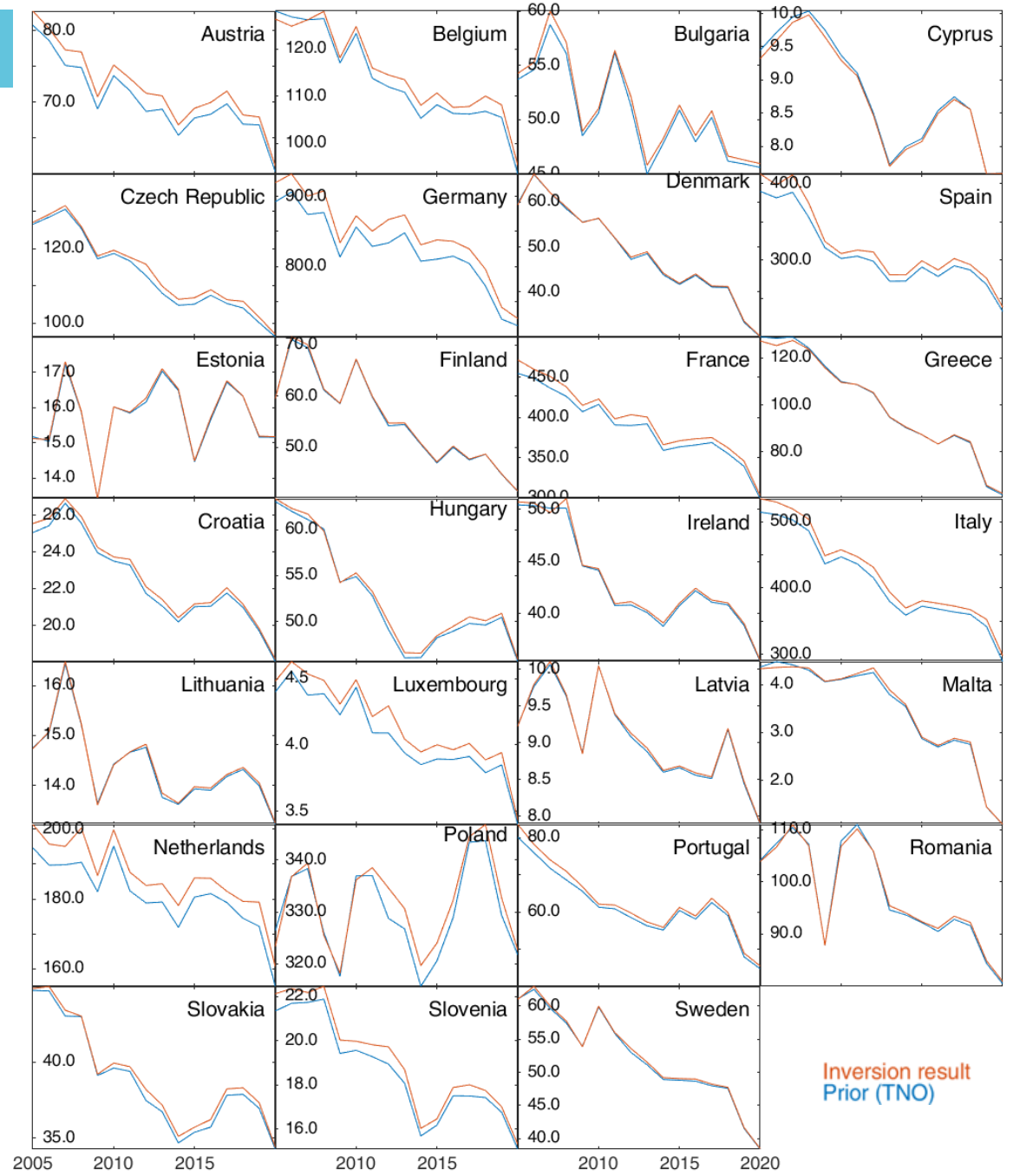


Current situation

- Prior: TNO (blue)
- Inversion: NOx/CIF/CHIMERE
- Not really ready for broader circulation (to users)
- Can’t communicate what is statistically significant
- Layer in better explanations of the status quo

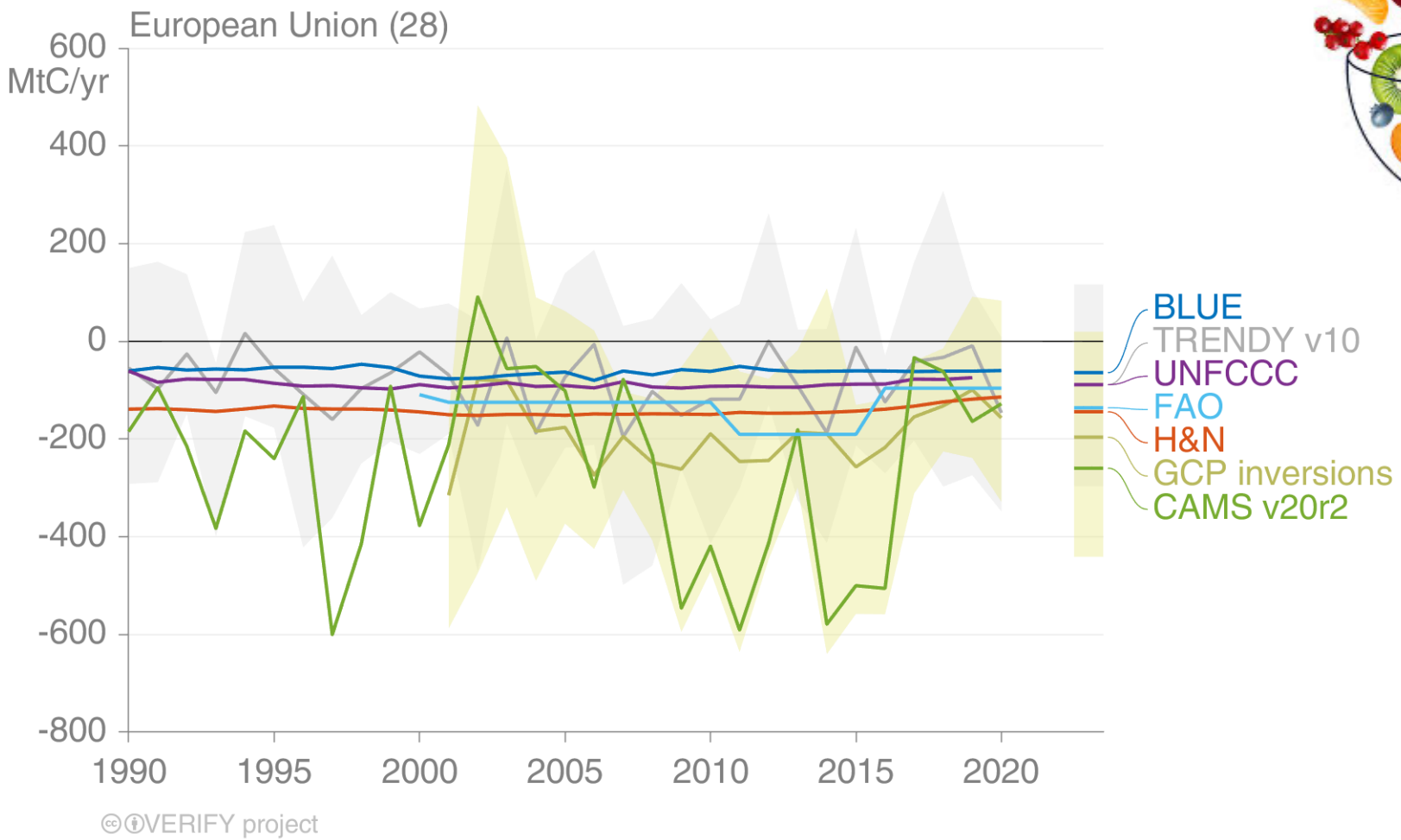
Hopefully in the next 12 months:

- Uncertainty information
- Non-EU countries



D8.2 CO_2 Land Use

Current approach provides too much information with too little detail!



D8.2 CO_2 Land Use

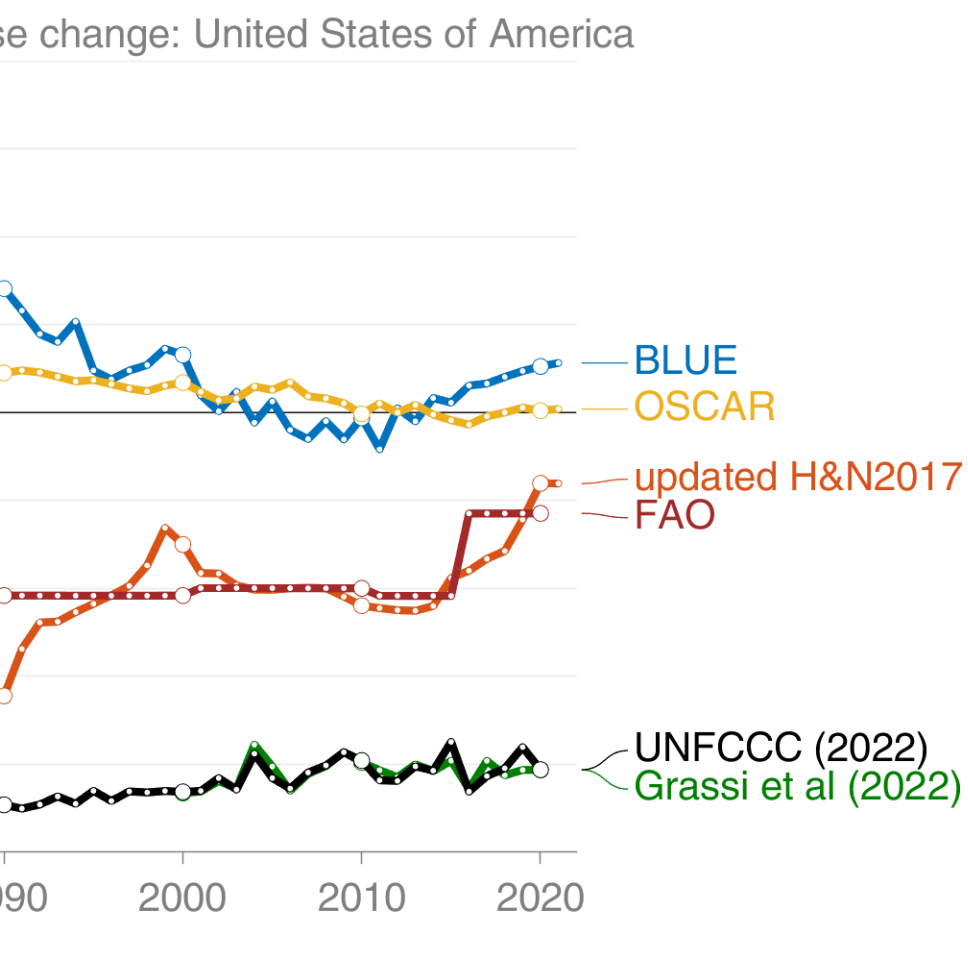
Changes to come

- Inventory-based (UNFCCC, BLUE, Houghton, OSCAR, FAO)
  - Opens a discussion for Grassi type of definitional issues, etc
- DGVM (UNFCCC and individual DGVMs)
  - Opens for discussion of variability
- Observation based (UNFCCC & inversions)
  - Opens for a discussion of what is possible
- Potential change (maybe in 2023):
  - Inventory by activity (deforestation, afforestation, harvest, etc)

D8.2 CO_2 Land Use: Inventory-based comparisons

Splitting the analysis by the type of estimate helps comparisons

It remains hard to explain differences & definitions differ (managed land)



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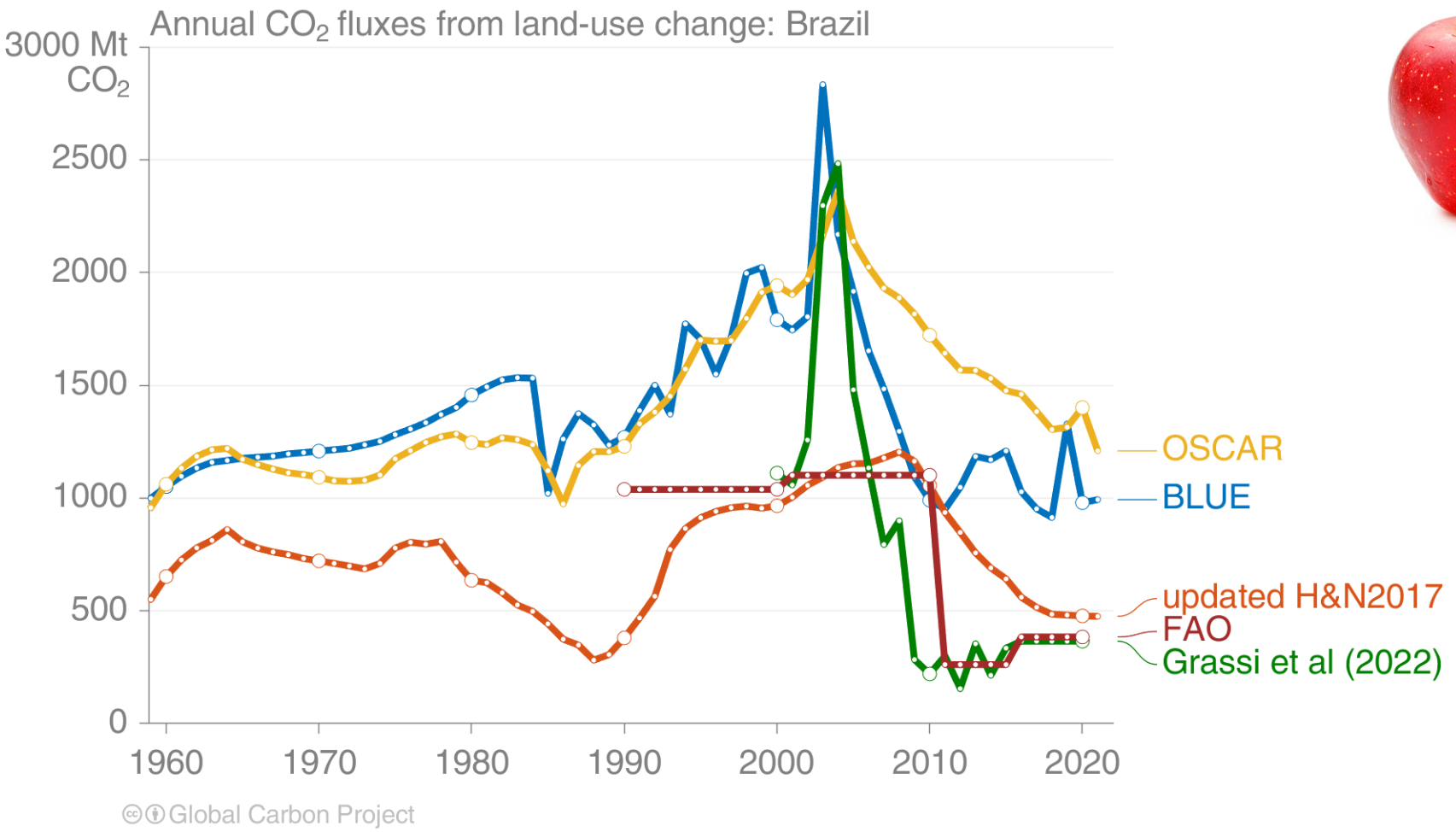
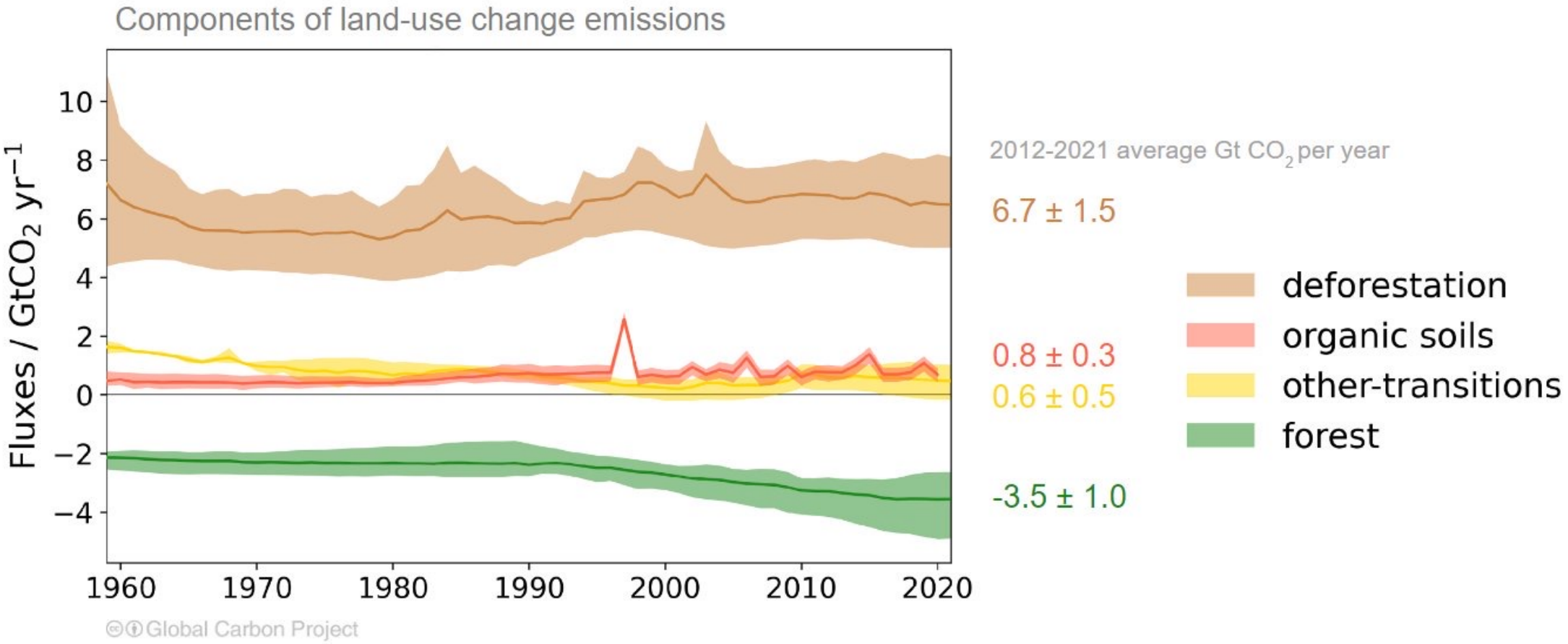


D8.2 CO_2 Land Use: Inventory-based comparisons

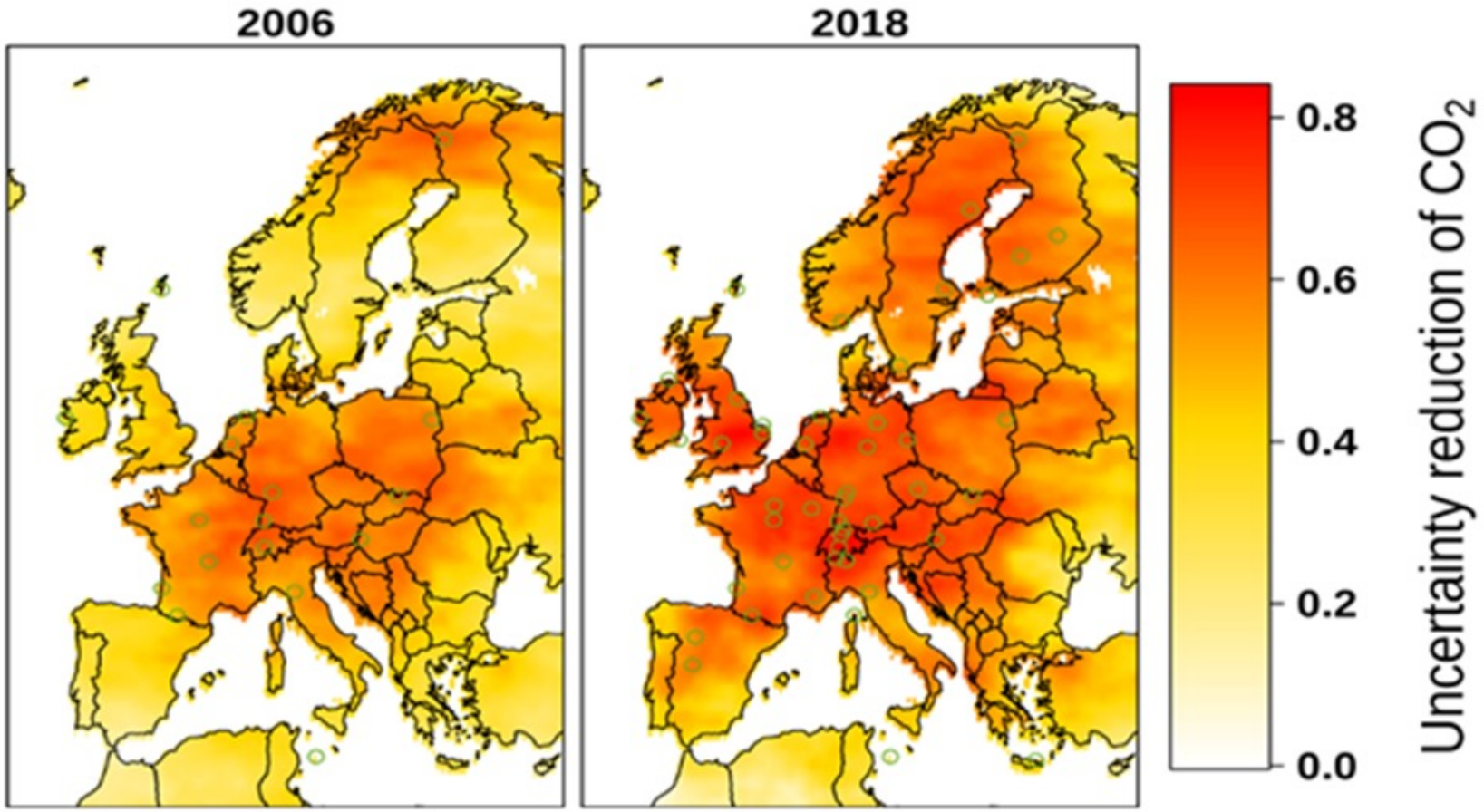
Potential change (2023) is to decompose country level estimates by component (global figure shown as an example)



D8.2 Land-based CO_2 observation-based (inversions)

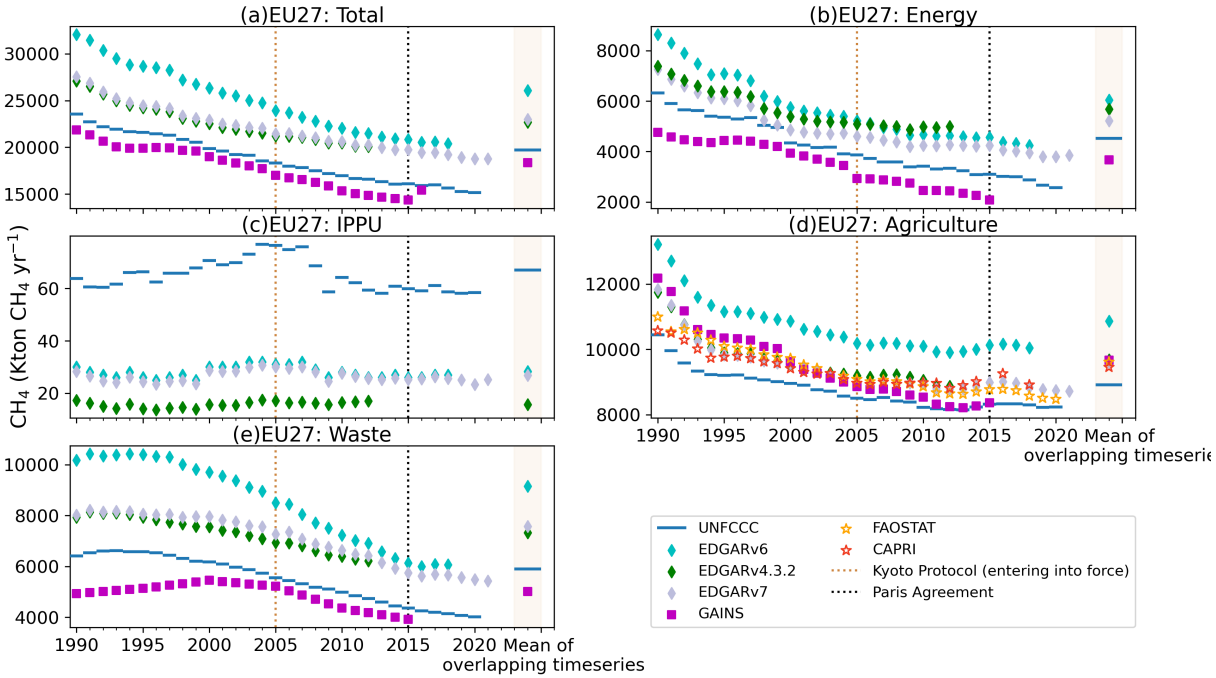
Uncertainty reduction maps: CarboScopeRegional: (1-Δpost/Δprior)

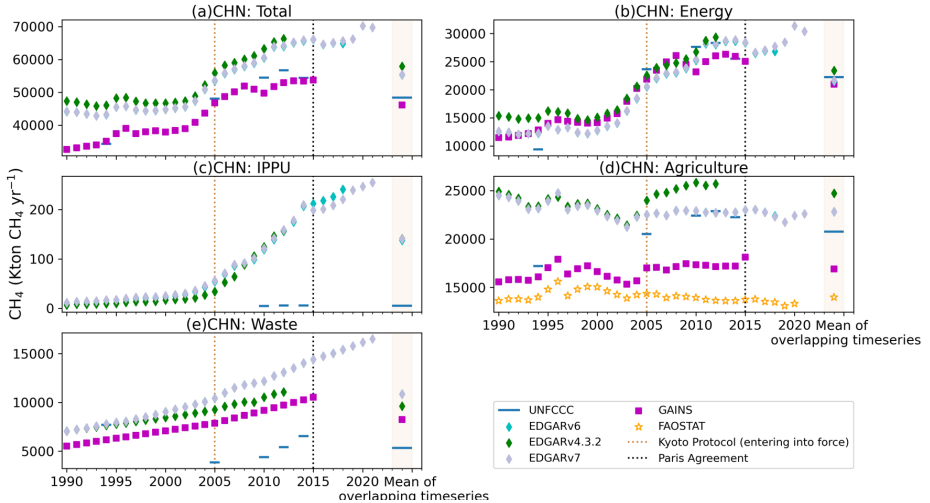
Uncertainty reduced with more observations (circles)

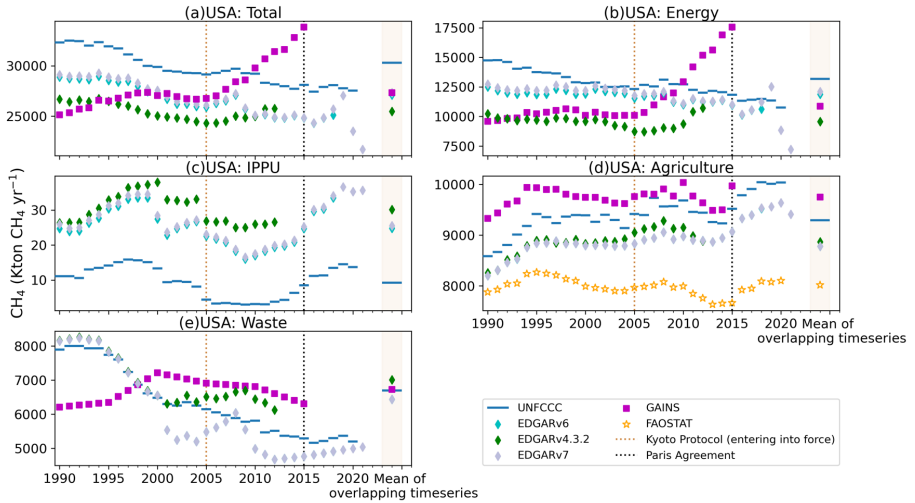


D8.2 Inventory-based CH_4 emissions

BU CH4: updated times series and added EDGARv4.3.2 , v7 and CAPRI_Agr for (EU27)



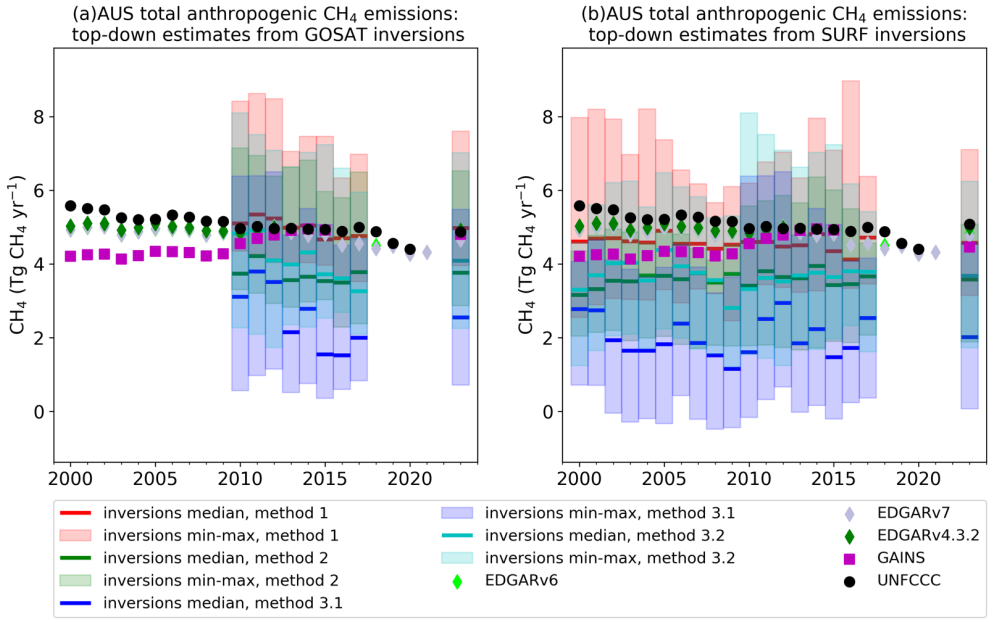


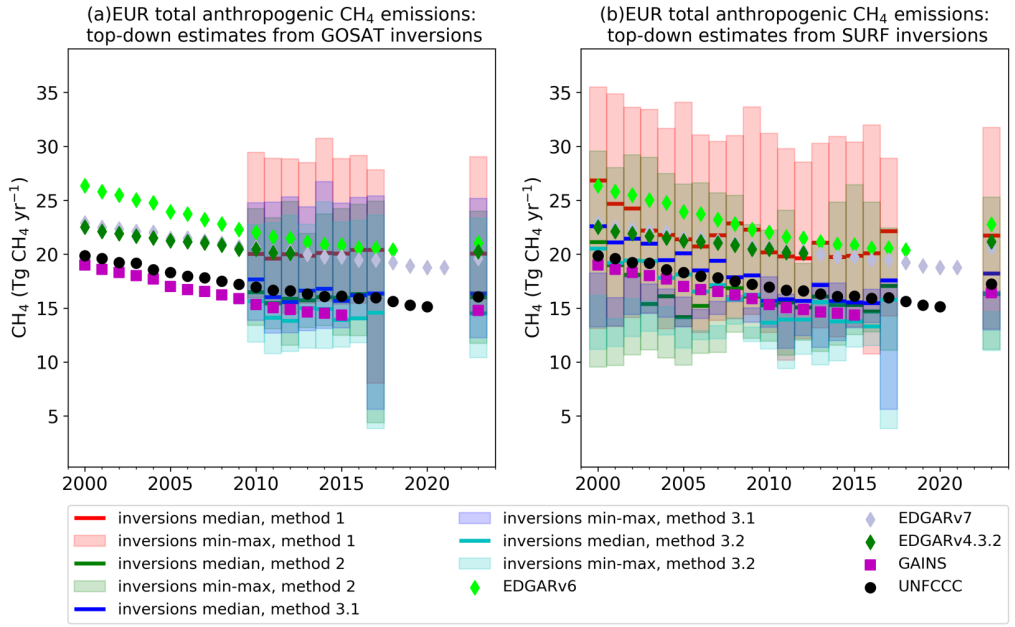


Discrepancies due to application of different Tiers (1, sometimes 2 for EDGAR, FAO), country specific AD and EFs (GAINS).
USA FAO's Agriculture differences are due to the estimates of enteric fermentation (lower for FAO, cattle stocks differences due to timeframe of statistics ingestion).

D8.2 Observation-based CH_4 estimates (inversions)

TD CH4: updated times series and added EDGARv4.3.2 and v7



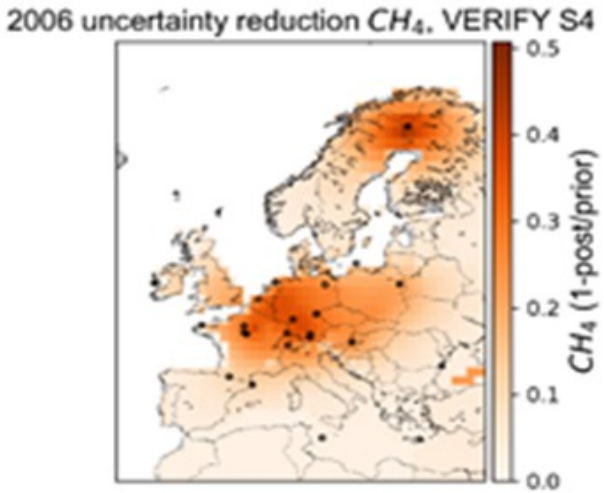


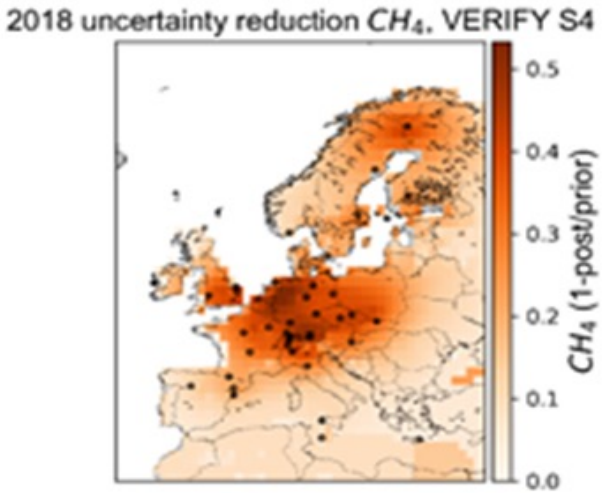
Australia: Pretty good agreement across BU and with method 1* of inverse estimates

Europe: Trend of BU and UNFCCC seen by inversions. EDGARv6 higher estimates (we know that already!)

*Four methodologies were used to separate CH4 anthropogenic emissions from inversions (Deng et al., 2022)

CH_4 Uncertainty reduction maps

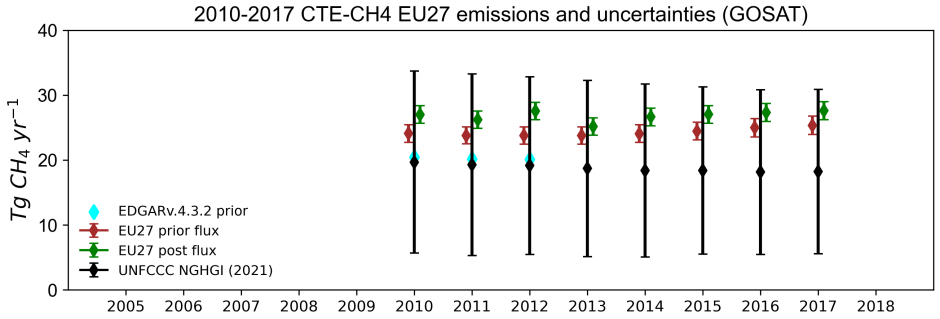


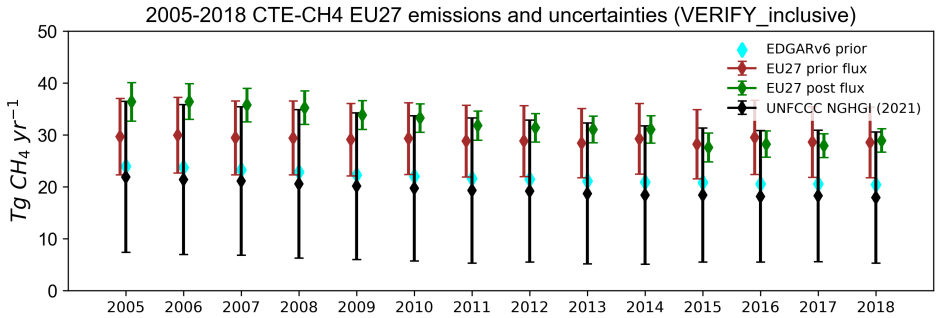


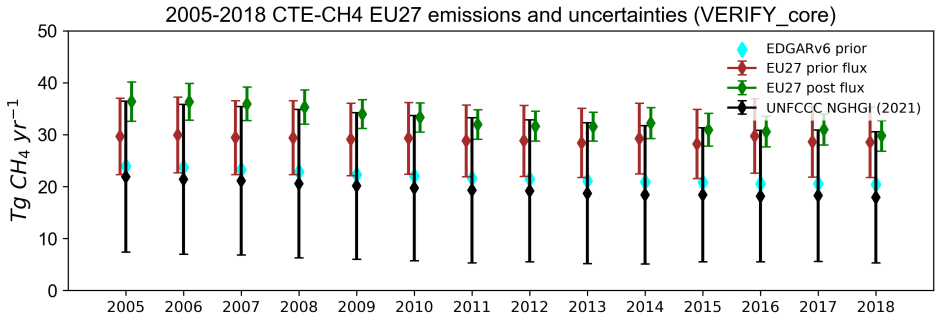
VERIFY_inclusive(S4) *inversion run, uncertainty reduction maps computed as* $(1 - \Delta post/\Delta prior)$ *for 2006 and 2018 with different sets of observation stations.*

Uncertainties reduced with more observations (circles)

D8.2 Observation-based CH_4 estimates (inversions)

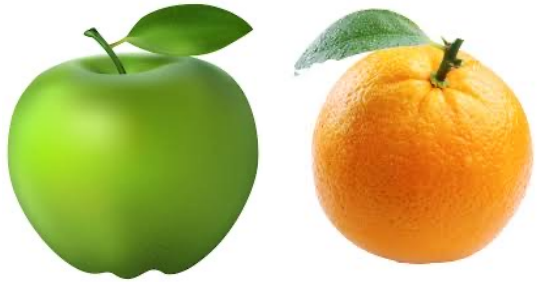






TD CH4: analysis of prior/posterior fluxes and uncertainties

- Ongoing work to try to identify/explain differences due to the priors used by BU and TD systems
- UNFCCC uncertainty is (too) high
- We can't compare uncertainties between figures



Some reasons for differences in inverse systems:

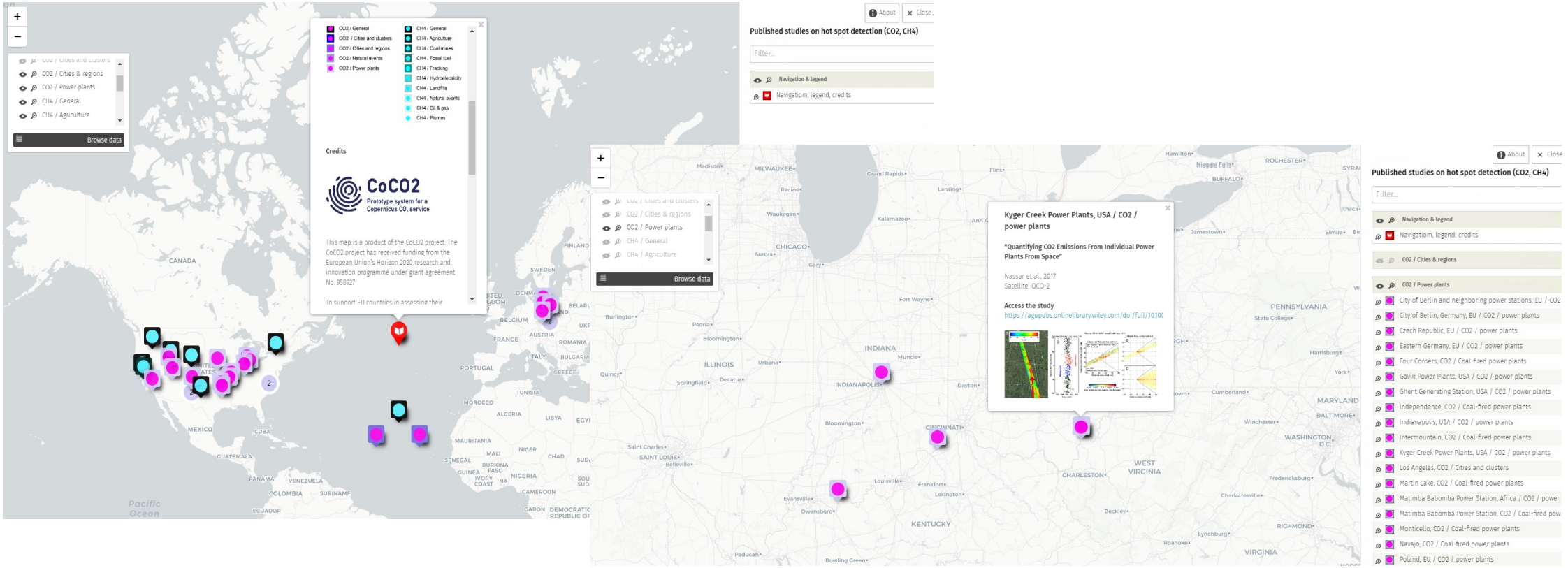
1. uncertainty assigned to the observations (i.e. how much weight/trust we put)
2. differences between prior/obs are large (i.e. 'wrong' magnitude or distribution of prior emissions, or bad transport modelling)
3. prior emissions around the sites are simply very small, and therefore the inversion does not change fluxes much (i.e. prior flux uncertainty is small).

D8.4 Decision Support Blueprint

- Background
  - What is and why do we need a CO2MVS?
- Overview of the status quo
  - Background of verification (through UNFCCC) & inversions
  - Current inventory activities (from National Inventory Reports)
  - Summary of events: VERIFY workshops, IPCC Expert Meeting, etc…
  - Summary of main concerns so far
- Moving beyond the status quo
  - How to respond to better meet user needs
- First half 2023 – user engagement (D8.5 July 2023)

D8.6 Catalogue of published studies on hot-spot detection of CO2/CH4

[Published studies on hot spot detection (CO2, CH4) - uMap (openstreetmap.fr)]



Examples of published studies are available for visualization here. It serves as good research examples and will stand as the scientific communication to inform a wide range of users (stakeholders, policy makers, local authorities) representing an educational link to fighting climate change.

Future work

- Budget Estimates for CO_2 and CH_4 for major emitters
  - Improvement of graphical presentation
  - Improvement in explanations
  - Understanding differences between estimates, requires 1-1 comparisons

- Decision Support Blueprint
  - First half of 2023 will be focused on user feedback and interaction
  - Workshops and involvement in ongoing events (WMO, inventory agencies, etc)
  - New version of blueprint in July 2023

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Prototype system for a Copernicus CO_2 service

THANK YOU

This presentation reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

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