



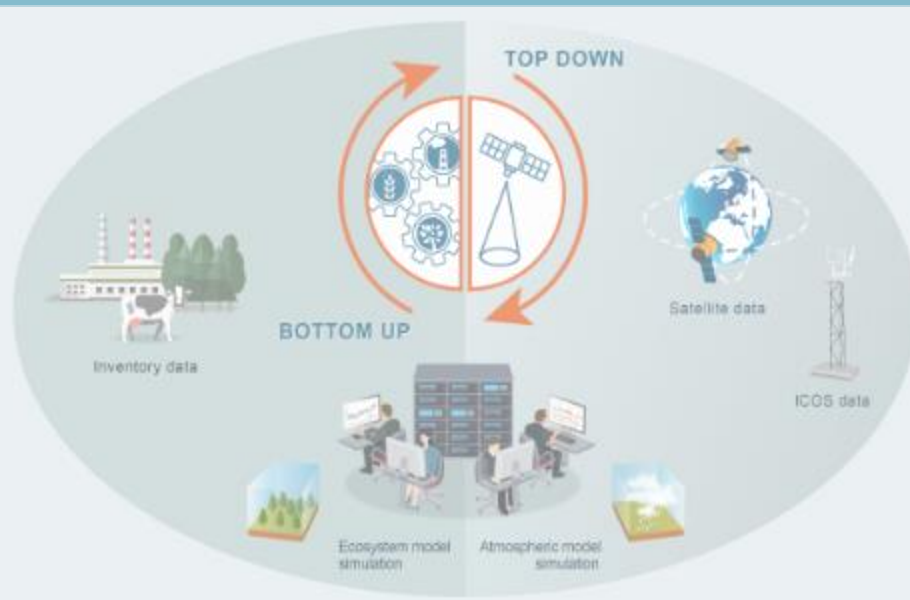
# Messages from the synthesis: CO<sub>2</sub> land

Thursday 12<sup>th</sup>, 2020

By Teleconference

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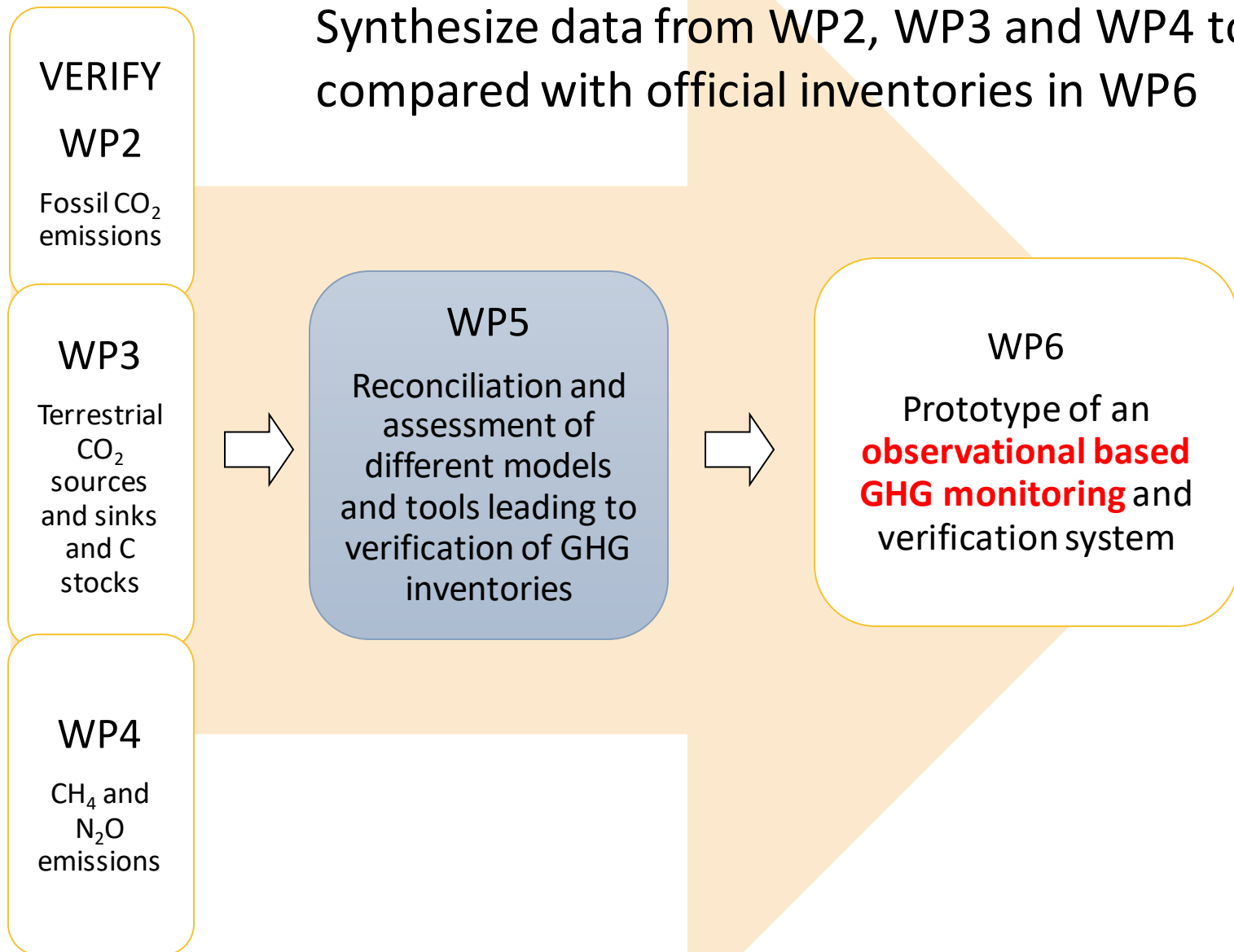


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776810

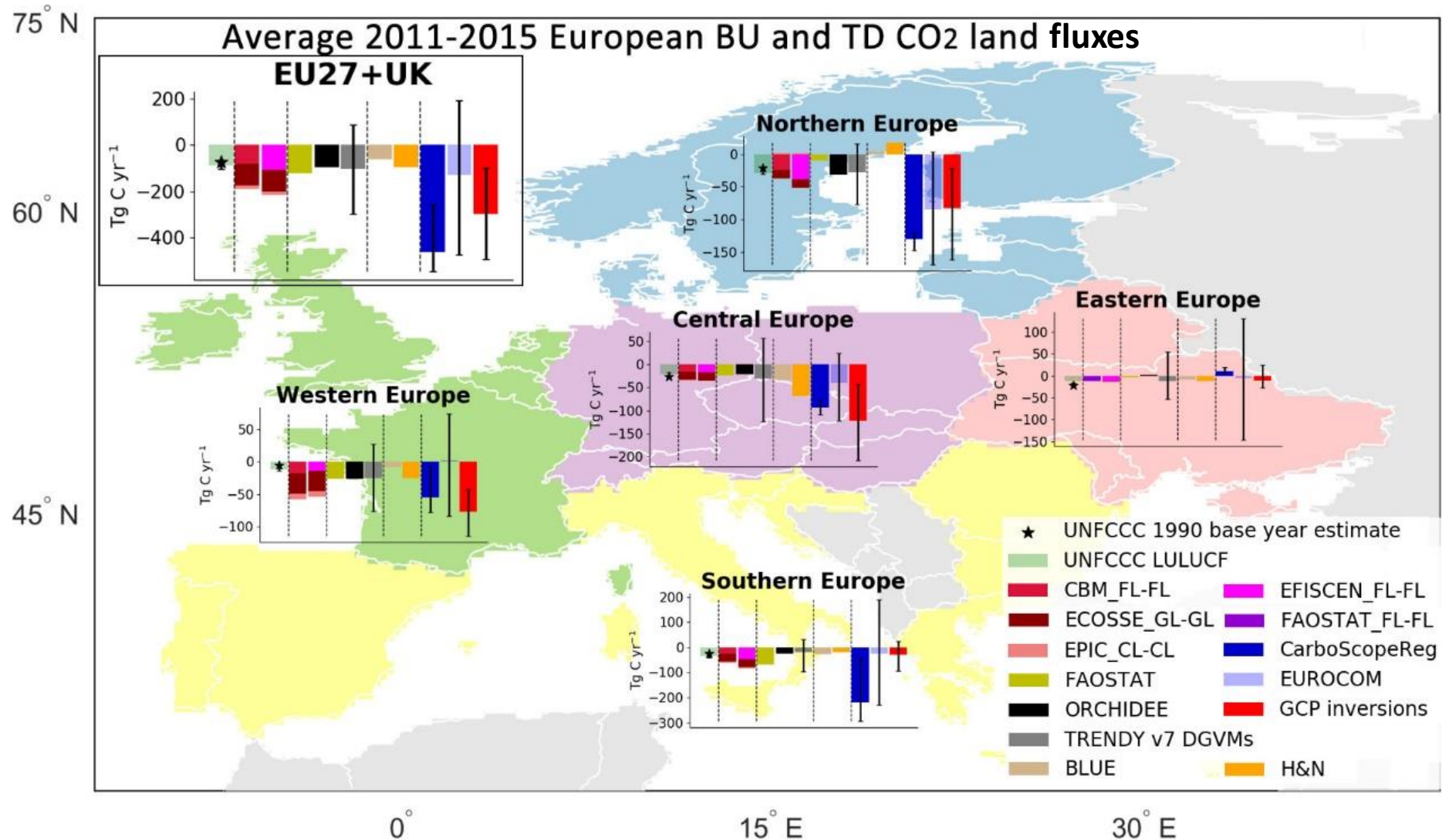


## VERIFY's synthesis objective:

Synthesize data from WP2, WP3 and WP4 to be compared with official inventories in WP6

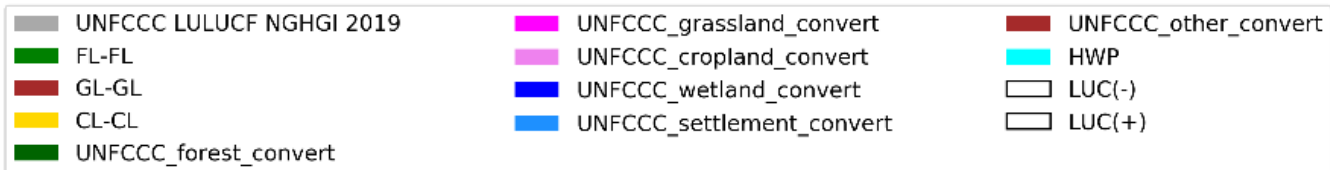
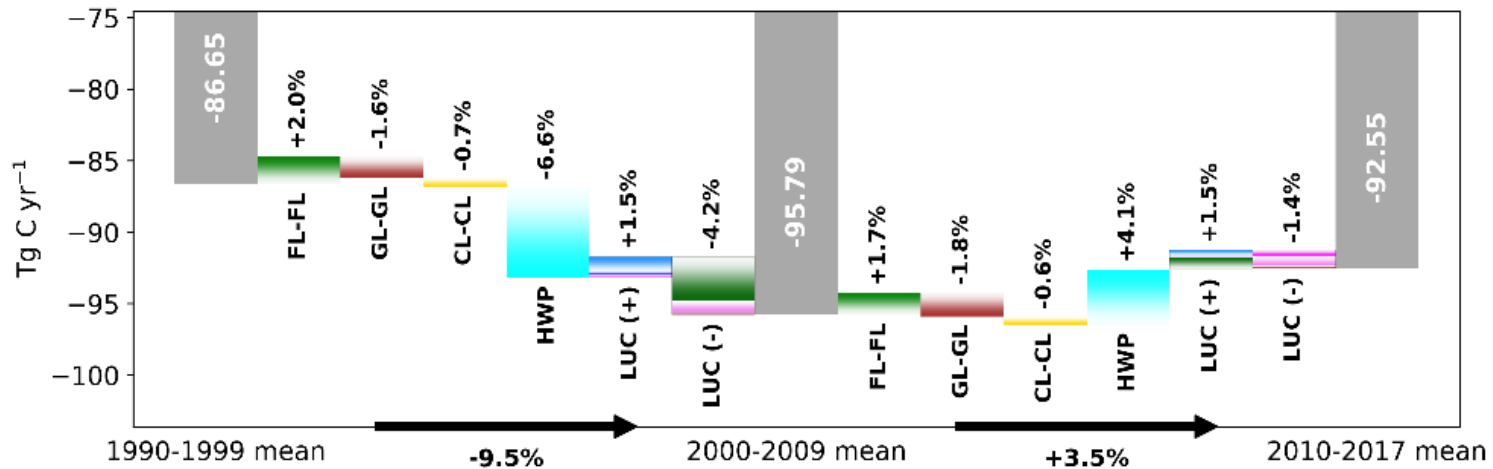


# OVERALL CO<sub>2</sub> LAND LULUCF FLUXES

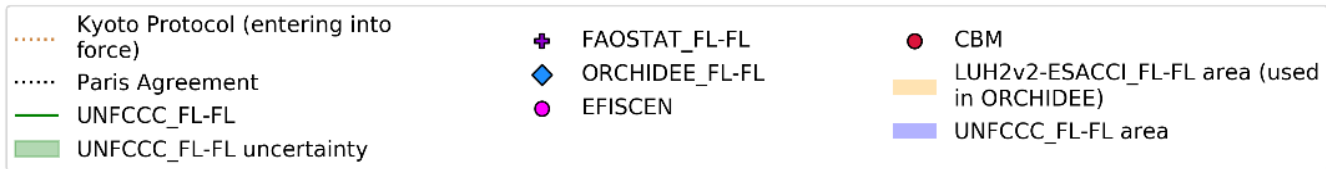
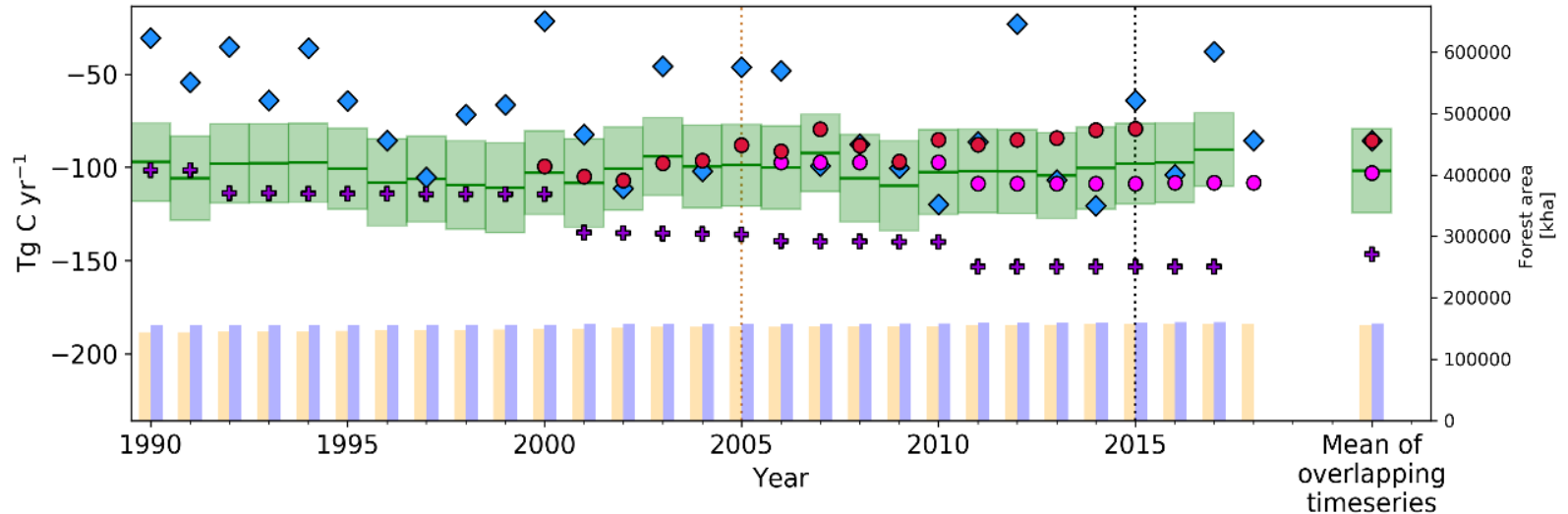


# TRENDS IN CO<sub>2</sub> LAND FOR UNFCCC (2019)

CO<sub>2</sub> LULUCF flux decadal change from UNFCCC NGHGI (2019) for EU27 + UK

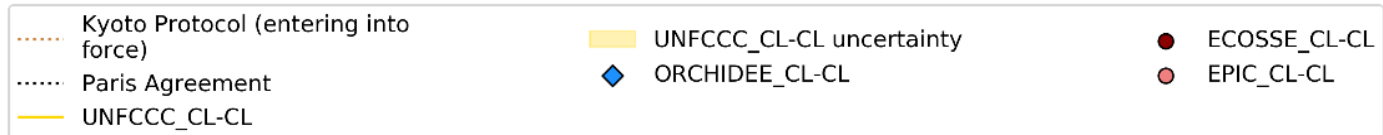
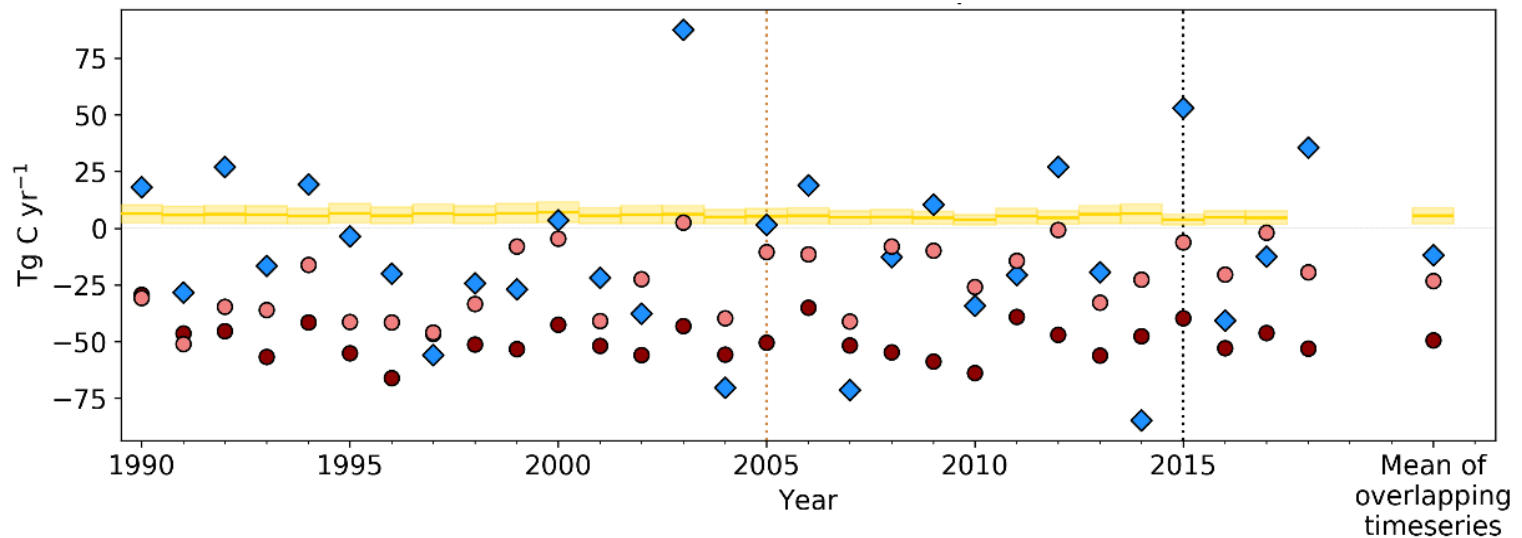


Net CO<sub>2</sub> flux from forestland remaining forestland (FL-FL) estimates for EU27+UK



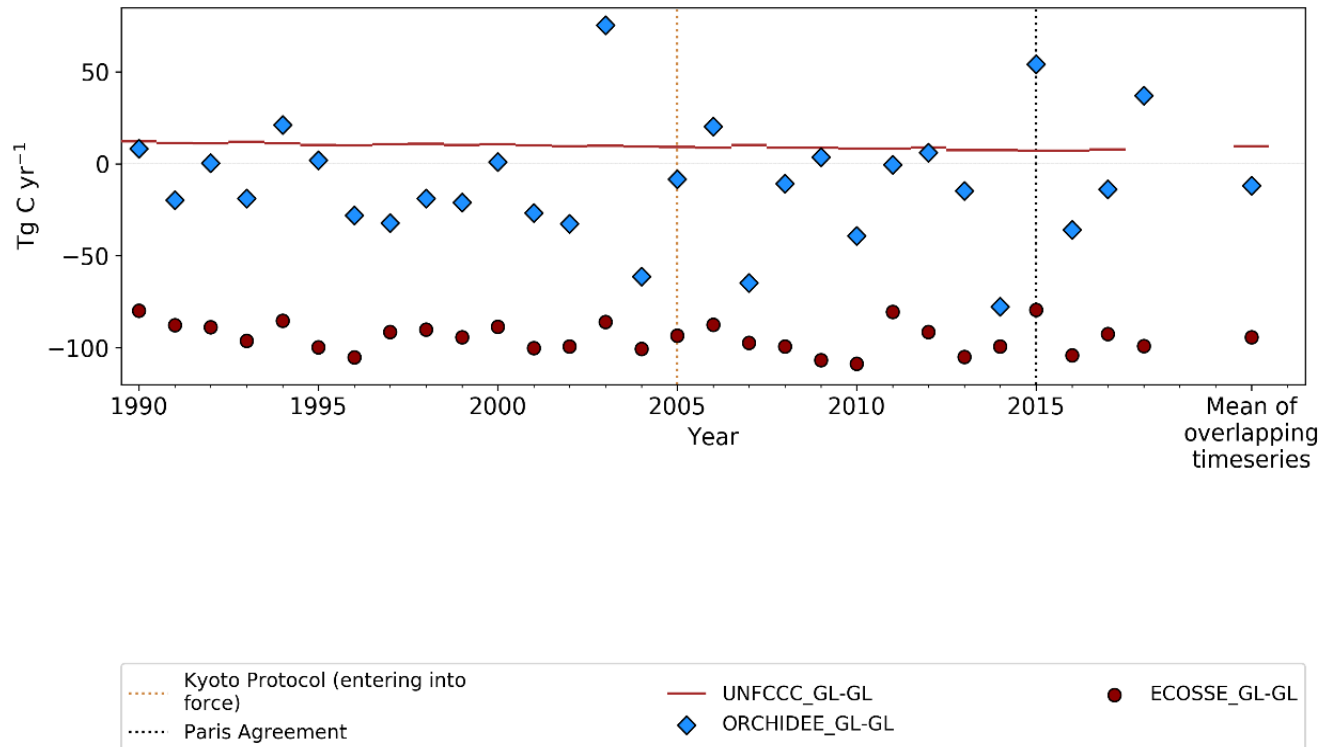
# CROPLAND UNFCCC AND OTHER BOTTOM-UP FLUXES

Net CO<sub>2</sub> flux from cropland remaining cropland (CL-CL) estimates for EU27+UK



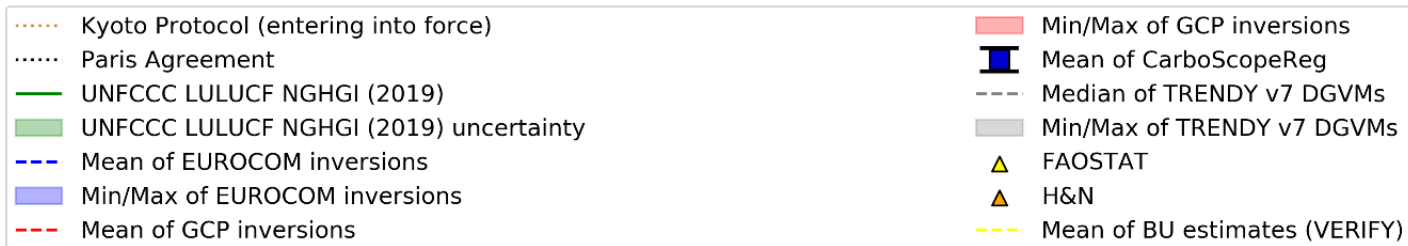
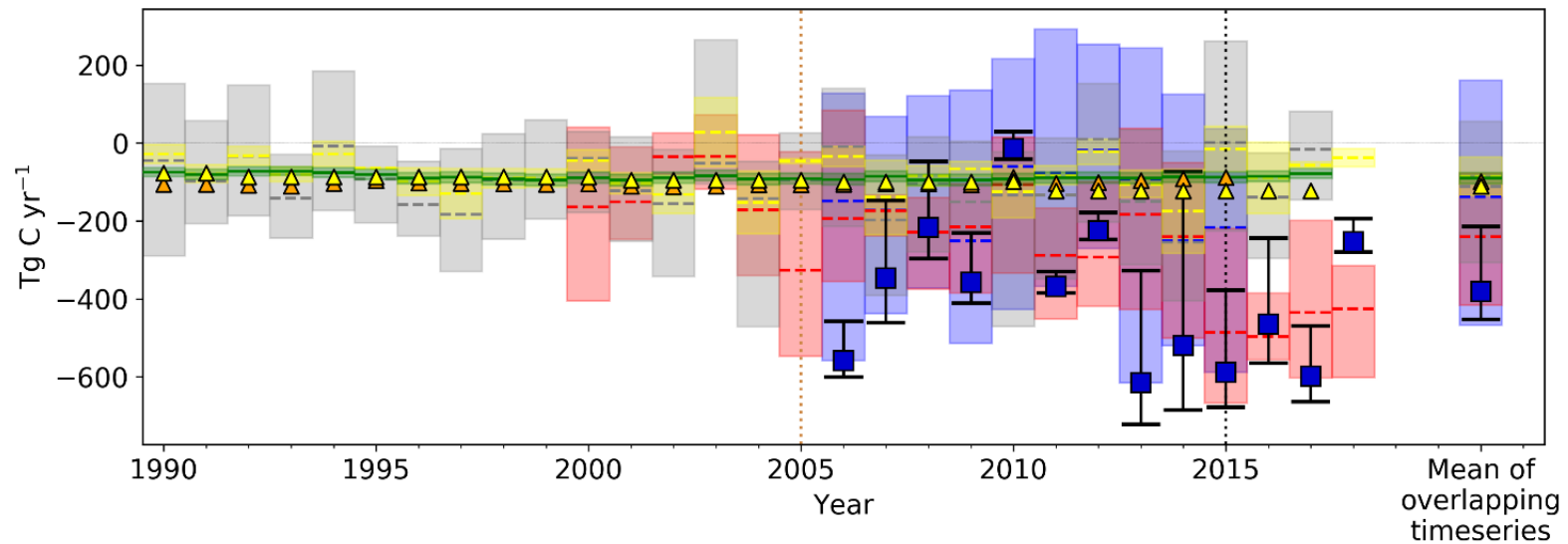
# GRASSLAND UNFCCC AND OTHER BOTTOM-UP FLUXES

Net CO<sub>2</sub> flux from grassland remaining grassland (GL-GL) estimates for EU27+UK



# BOTTOM-UP AND TOP-DOWN CO<sub>2</sub> LAND ESTIMATES

Total CO<sub>2</sub> flux from UNFCCC, BU and TD estimates for EU27+UK

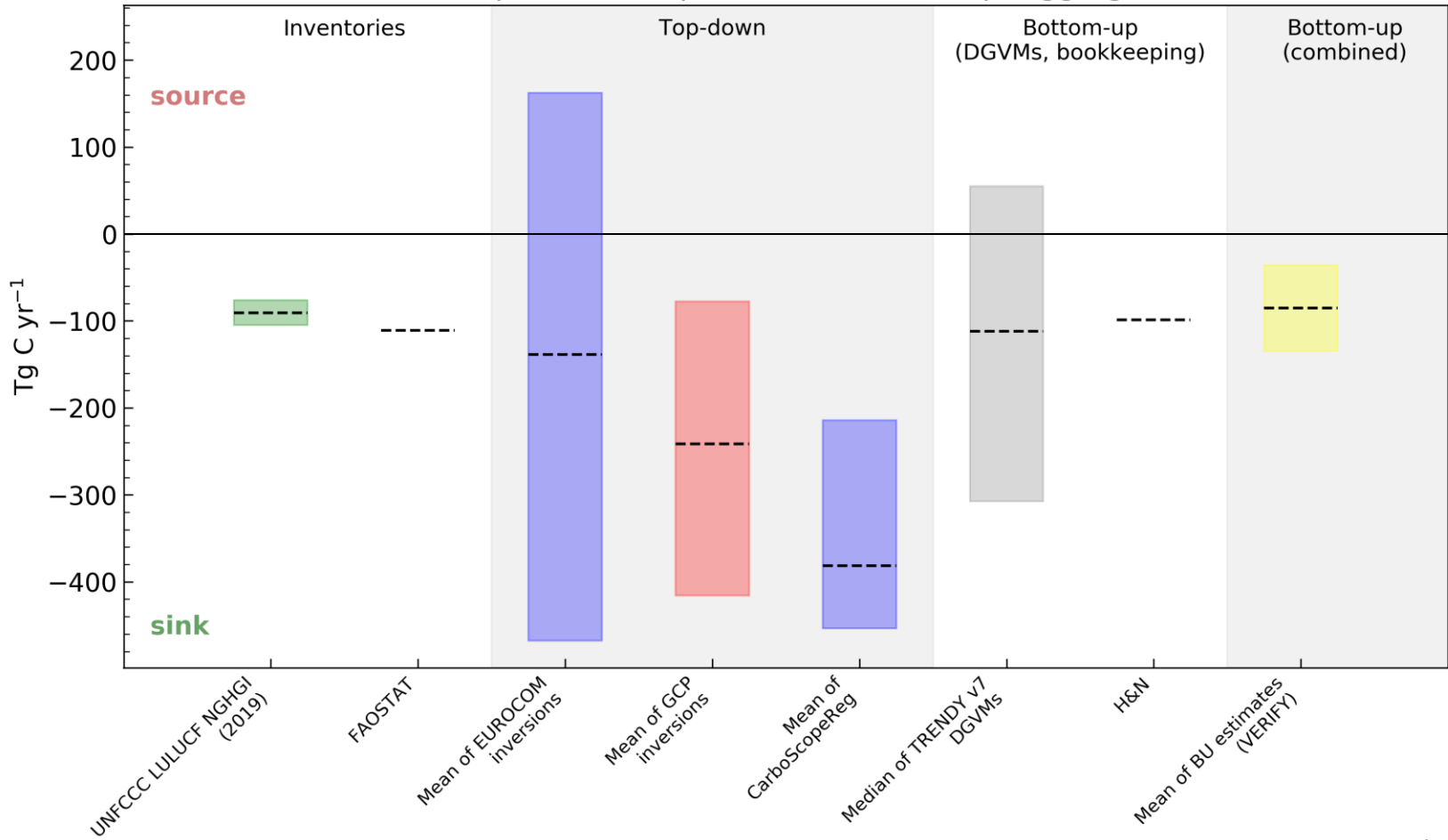


**BU estimates (VERIFY) include ORCHIDEE and BLUE**

# SUMMARY OF THE SYNTHESIS – CO<sub>2</sub> LAND

Mean of overlapping timeseries

FCO2 land - EU27+UK : Comparison of top-down vs. bottom-up (aggregated) net land CO<sub>2</sub> fluxes



- TD results show a much higher variability (min and max) as well in the extremes of the min/max.
- Regional EUROCOM ensemble mean seems to be the closest to the NGHGI but it shows high variability:
- BB will be included in the next comparison with TD (in 2017, BB in EU27+UK emitted 4 Tg C)

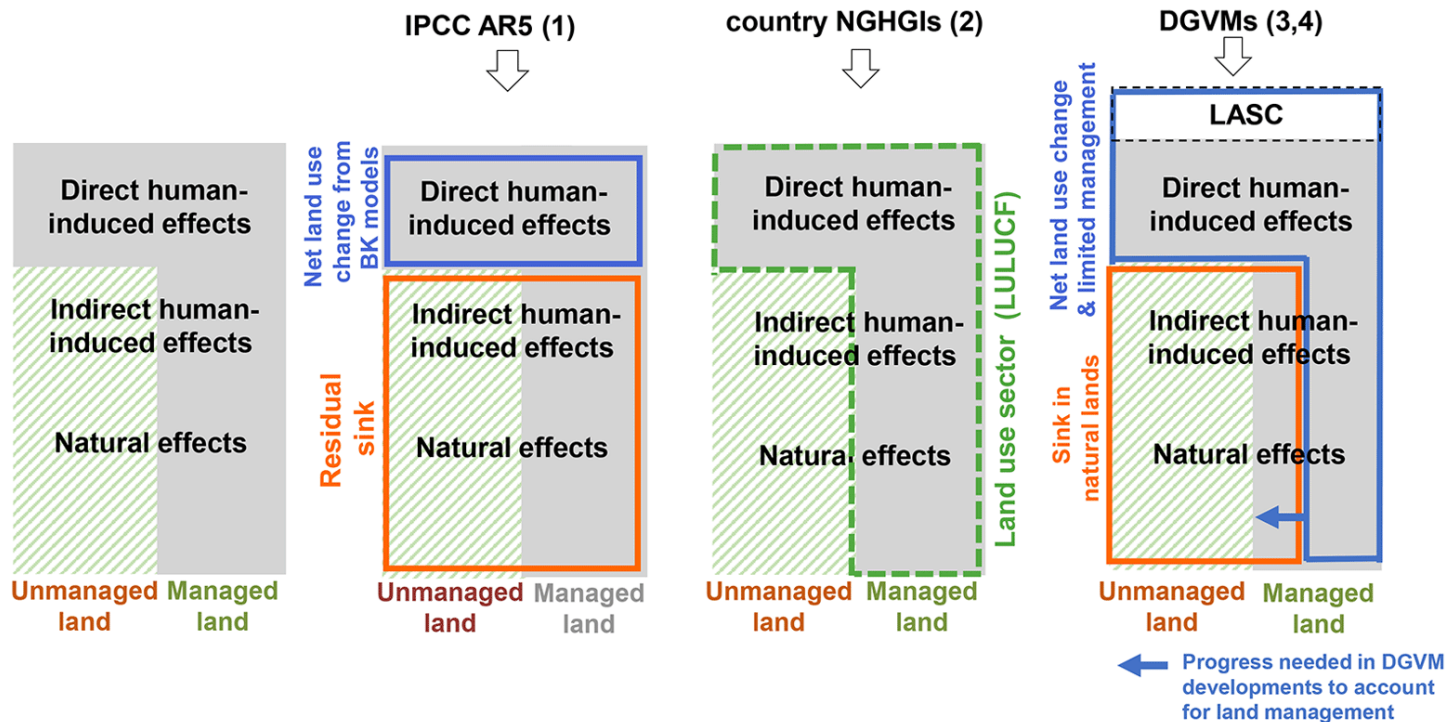
# BOUNDARY ISSUES IN DEFINING CO<sub>2</sub> LAND

(a) Effects of various factors on the forest CO<sub>2</sub> fluxes

(b) Where these effects occur

(c) How these effects are captured in

- Direct human-induced effects**
  - Land use change
  - Forestry management
  - Cropland and pasture management
  - Conservation / restoration management
- Indirect human-induced effects**
  - Climate-change-induced change in T°, precipitation, length of growing season
  - Atmospheric CO<sub>2</sub> fertilisation and N deposition, impact of air pollution
  - Changes in natural disturbances regime
- Natural effects**
  - Natural interannual climate variability
  - Natural disturbances



- (1) In IPCC AR5, the residual sink is inferred as a difference between FF emissions + net land use – growth rate – ocean uptake, and thus matches the observed CO<sub>2</sub> growth rate by construction. In this method, a bias on net land use change is transferred to the inferred residual sink.
- (2) In NGHGI, the LULUCF C balance only covers direct management actions and does not match the CO<sub>2</sub> growth rate. Any difference with the CO<sub>2</sub> growth rate can be attributed to errors in NGHGI estimates and / or fluxes on unmanaged lands.
- (3) In DGVMs, net land use change includes a source corresponding to the loss of additional sink capacity (LASC). Some models include limited land management (wood harvest, crop harvest). Nonmodeled management from forestry, cropland and pasture management, conservation / restoration management, being in the grey area part of the orange box.
- (4) DGVMs have parameterizations and structural uncertainties, and their net land flux does not match the global CO<sub>2</sub> growth rate, leading to a global BIM (budget imbalance).

ESSD Petrescu et al., 2020

## MAIN FINDINGS

- The bottom-up mean agrees generally well with the UNFCCC estimates, but show larger (climate) variability (i.e. ORCHIDEE)
- The top-down ensemble estimates of CO<sub>2</sub> show large variability and uncertainty
- Regional EUROCOM ensemble mean seems to be the closest to the NGHGI but it shows high variability
- Biomass Burning needs to be included in the comparisons with TD (in 2017, BB in EU27+UK emitted 4 Tg C)
- For CO<sub>2</sub> and LULUCF sector, there is the need to reduce the gap between inventories and models by defining common definitions in land use reporting



# Thank you for your attention

For questions/comments please send an email to:  
[a.m.r.petrescu@vu.nl](mailto:a.m.r.petrescu@vu.nl)



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