



Co-ordinated by  
**ECMWF**



**CoC02**

Prototype system for a  
Copernicus CO<sub>2</sub> service

# WORK PACKAGE 9

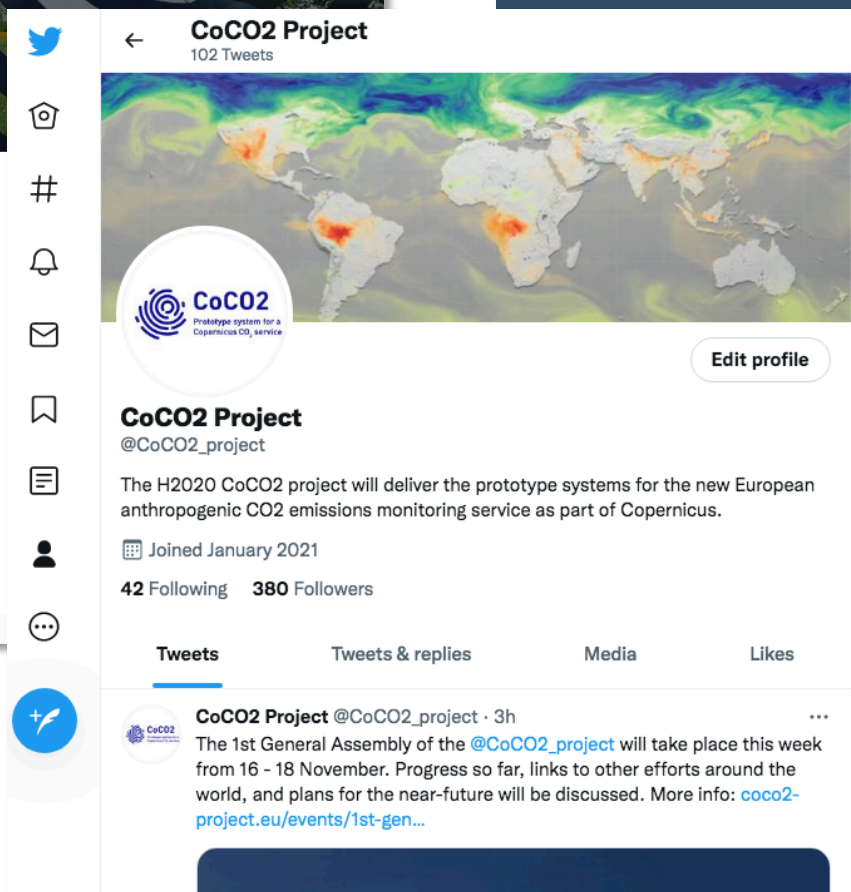
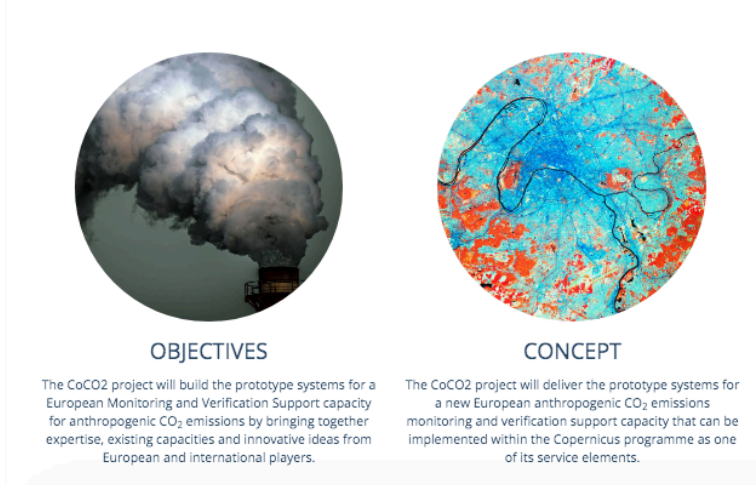
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Coordination, Dissemination,  
Exploitation and International  
Liaison

Daniel Thiemert, Richard Engelen, & Gianpaolo Balsamo  
ECMWF  
16/11/2021



# Website, Twitter & Newsletter





## International liaison

The CoCO2 project has been presented through presentations at various events:

- CO2 Task Force meeting - January
- **Event organised by the Panel for the Future of Science and Technology (STOA) of the European Parliament with several MEPs attending** - February
- CAMS User Workshop for Norway - March
- CO2M Mission Advisory Group - April
- ESA EO4UNFCCC workshop - April
- VERIFY General Assembly - April
- EGU - April
- ACTRIS Innovation in Atmospheric Sciences Virtual Workshop - May
- CAMS General Assembly - June
- CEOS-AC-VC meeting - June
- IWGGMS-17 - June
- **NASA Carbon Research Program Policy Speaker Series** – June
- CAMS User Workshop for France – June
- CO2 Task Force meeting – August
- CO2M MAG meeting – September
- **Copernicus Relay seminar on remote sensing-based GHG assessment in AFOLU, Latvia** – October
- **COP26** - November





# COP26 - Earth Information Day



## Moving towards a European capacity to monitor anthropogenic / natural CO<sub>2</sub> emissions

### The CoCO<sub>2</sub> and VERIFY European projects



Philippe Peylin (LSCE), Richard Engelen (ECMWF), Gianpaolo Balsamo (ECMWF) on behalf of the VERIFY Team (<http://verify.lscce.ipsl.fr/> - 40 partners) and the CoCO<sub>2</sub> Team (<https://coco2-project.eu> - 25 partners)

## Objectives: An operational system to support national GHG inventories

➤ INTEGRATE EFFORTS from the research community, national inventory compilers, operational centers, international organizations.



- ENHANCE current observation & modeling abilities.
- DEVELOP NEW research approaches to monitor anthropogenic GHG fluxes.
- PRODUCE annual synthesis of GHG balance in Europe.

➤ DEVELOP a Copernicus CO<sub>2</sub> Monitoring and Verification Support Capacity (CO2MVS)



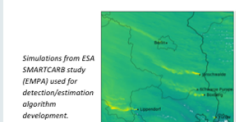
## Method: Observation-based system to estimate GHG fluxes

⇒ Use of atmospheric & ecosystem measurements (in situ and satellite) with existing modeling systems

- Combine complementary approaches including atmospheric inversions and process-based / data-driven models: global & regional (Europe) applications
- Data Assimilation to merge information from model and observations
- Develop a Community Inversion Framework
- Exploit Anthropogenic Activity Data as demonstrated by carbonmonitor.org

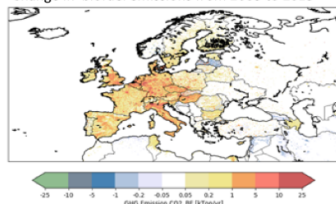


➤ Develop smart algorithms to estimate emissions from satellite-observed hotspots.

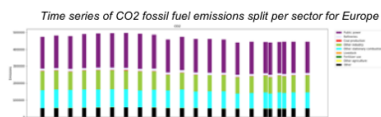


## CO<sub>2</sub> fossil / biofuel

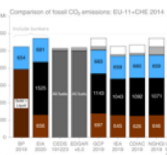
Change in biofuel emissions from 2005 to 2015



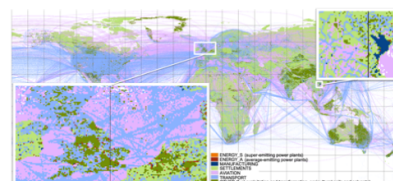
➤ Large increase in biofuel use in Europe over the past decades.



- Fossil sources, CO<sub>2</sub> inc and estimate (IAP RAS).
  - Differences most different accounting systems: understanding them for further analysis and communication
- Inversions are still very uncertain and at their infancy.

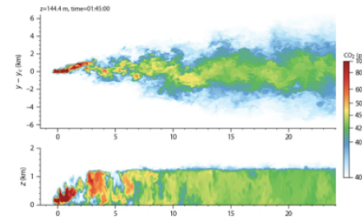


➤ Sectoral CO<sub>2</sub> fossil fuel emissions and uncertainties allow attribution from atmospheric inversions. Dominant emissions groups are shown in the figure.



Dominant sector of the CO<sub>2</sub> fossil fuel emissions (Choulga et al. 2021) based on EDGAR 4.3.2 global emissions dataset.

➤ Detailed modelling supports the satellite detection and estimation of emissions from power plants.

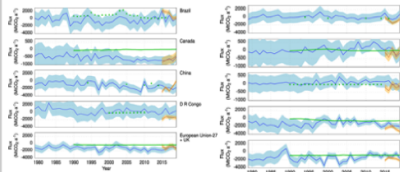


Detailed atmospheric modelling of the behaviour of CO<sub>2</sub> plumes emitted from large power plants. These simulations support a more accurate interpretation of the satellite and in-situ observations of atmospheric CO<sub>2</sub>.

➤ Results for all EU countries under: <http://webportals.ipsl.jussieu.fr/VERIFY/FactSheets/>

## CO<sub>2</sub> land biosphere

➤ Global: Inversions (CAMS system) using either in situ surface (blue) or OCO-2 satellite (orange) observations show larger variability compared to National Inventories (green)



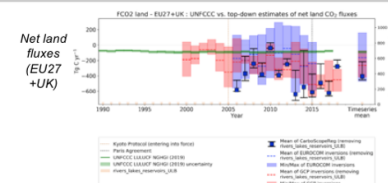
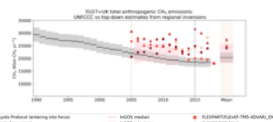
Annual CO<sub>2</sub> flux from the Agricultural, Forestry and Other Land Use (AFOLU) sector in ten large countries or groups of countries estimated by the 1-σ uncertainty envelope of the two CAMS atmospheric inversions (blue with surface data and orange with satellite-data). Green curve is for the reported fluxes to UNFCCC by all countries. Positive values indicate that the country is a source of CO<sub>2</sub> to the atmosphere. Chevallier et al., GRL, 2021.

### Europe

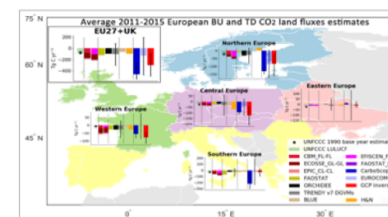
- ⇒ Bottom-up models (process-based and data-driven) show large interannual variations but agree with National GHG Inventories (NGHGs) reported to UNFCCC.
- ⇒ Top-down inversions generally indicate stronger sinks compared to NGHGs, with significant variations between individual members of each ensemble.
- ⇒ Care must be taken with inversions for small regions ! (Petrescu et al., ESSD, 2021a)

## CH<sub>4</sub> anthropogenic

- CH<sub>4</sub> total regional inversions (Europe) larger than total NGHGI emissions
- Differences due to underestimated natural fluxes or anthropogenic fluxes (Petrescu et al. ESSD, 2021b)



➤ Above: Regional (blue) and global (Red) inversions compared to National Inventories (green) for Europe. Below: European synthesis of process-based/statistical models, atmospheric inversions and National Inventories.



## Acknowledgement

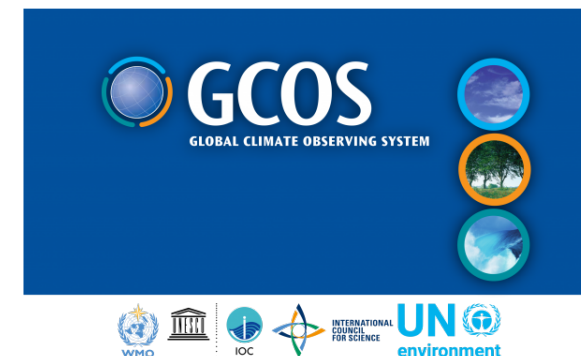
The CoCO<sub>2</sub> / VERIFY projects have received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 958927 / No 770810. This presentation reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.





# Global coordination

CoCO2 collaborates with or is represented within various international collaboration frameworks.



**United Nations**  
Framework Convention on  
Climate Change



# Deliverables

**D9.1 Risk and Quality Management Plan**



**D9.2 Project Website**



**D9.3 Dissemination and Exploitation Plan**



**D9.4 Media and Communication Plan**



**D9.5 Data Management Plan**



**D9.6 Mid-Term Dissemination and Exploitation Report**

**D9.9 1<sup>st</sup> Overview of sensitivity studies performed in CoCO2**





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[coco2-project.eu](http://coco2-project.eu)



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