Flux inversion capabilities in CAMS and related H2020 research projects

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The European Commission plans a new Copernicus CO$_2$ service as part of CAMS.

Synergies with existing Copernicus services will be exploited, especially with CAMS plans for emissions estimation for CO and NO$_2$. 
Atmosphere Monitoring

Roadmap

CO₂ Monitoring Task Force

- 2015: MRD
- 2018: CO₂
- 2020: CO₂
- 2022: 1st global stocktake
- 2024: Launch of the CO₂ Sentinel constellation

R&D Support Actions

- Prototyping activities including relevant CO₂ satellite missions from international space agencies
- 2026: Copernicus service in full operations using CO₂ Sentinels and international virtual constellation

2015 2018 2020 2022 2024 2026 2028
Annual net CO₂ flux due to natural effects (vegetation and fires) over land (blue), and net fluxes of CH₄ (purple) and N₂O (green) associated with different regions of the globe.

Credit: Copernicus Atmosphere Monitoring Service (CAMS) /ECMWF /LSCE /TNO /NILU.
5-yearly-mean net CO₂ flux for eight regions, combining human and natural effects (fossil fuel burning, cement production, vegetation and fires). In blue is the best estimate and light blue shows its estimated uncertainty. The regions are chosen to give estimates for the eight largest parties to the United Nations Framework Convention on Climate Change (UNFCCC), based on geographical area.

Credit: Copernicus Atmosphere Monitoring Service (CAMS) /ECMWF /LSCE
• Increase the horizontal resolution within the next few years, likely to 2.5 x 1.25 deg²

• Use satellite data for this indicator. The consistence between the satellite-driven inversion and the surface-driven inversion is now fairly good but could still be further improved.
Policy relevant products/interfaces are being developed together with key user communities. This ensures the services will be fit-for-purpose.
CoCO2 plans - focus on 2021

- Extend VERIFY annual factsheets for 2021 (based
- Emission estimates from each prototype system for 2021 (depending on maturity)

Prototype case studies based on existing observations

Global estimates

Local estimates
Prototype examples

CHE - global CO inversions with ECMWF 4D-Var system (ECMWF)

SMARTCARB – identification of individual plumes (EMPA)

SMARTCARB

Atmosphere Monitoring
Presenting results

European State of the Climate 2019

Observations

Fire emissions

Flux estimates
More and more exciting results are becoming available!

However, these are mostly not targeting the Global Stocktake yet.

Work in progress to discuss with relevant user communities how observation-based information can provide added value.

This means not just provision of data but also building policy-relevant interfaces.

2021 is approaching fast, so focus will be on showing potential. 2nd Global Stocktake is the goal.

MIP2 and similar activities are very useful to see where we are and to get a better grip on current uncertainties and future development goals.