Co-ordinated by ECMWF

CO_2 Human Emissions

CHE – AFOLU

Introduction to CHE workshop on «Agriculture, Forestry & Other Land Use» (AFOLU)

Richard Engelen & Gianpaolo Balsamo

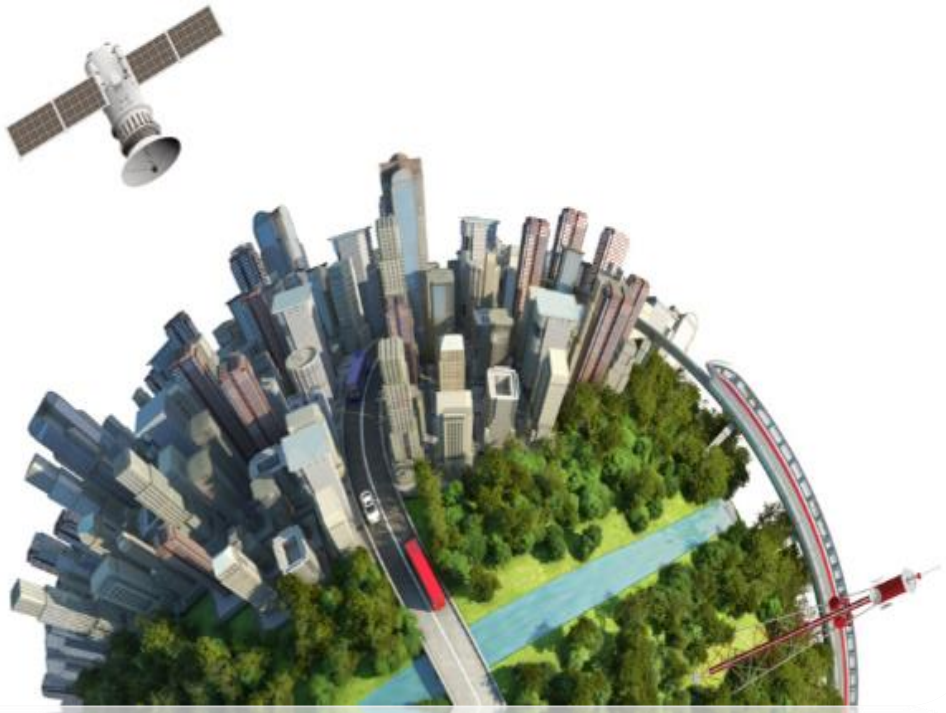
25.11.2020 CHE project workshop on AFOLU

CHE project (2017 - 2020) – Month 38 of 39 ☺

Aim:
Build European monitoring capacity for anthropogenic CO_2 emissions

How:
CO_2 emission estimation system driven by Earth observations (remote sensing and in situ) combined with enhanced modelling system

Why:
To support the Paris Climate Agreement and its implementation



Project Duration:
39 month (38 ✓)

Project Funding:
3.75 M€ (1.25 M€/year)

Consortium Numbers
22 partners Institutes

Work Content Numbers
7 work-packages:
5-Science development,
1-International liaison,
1-Management & Coms
7 Milestones (6 ✓)
45 Deliverables (35 ✓)

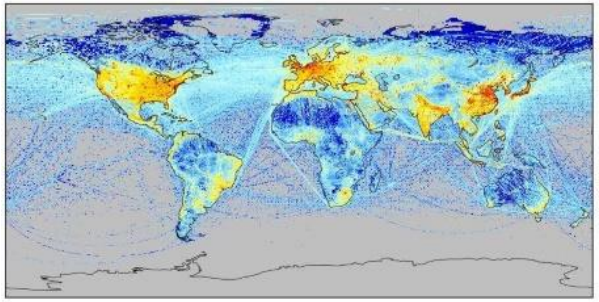
344.25 Person Month
(Eq 8.8 FTE)

CHE/CAMS Global system based on ECMWF IFS

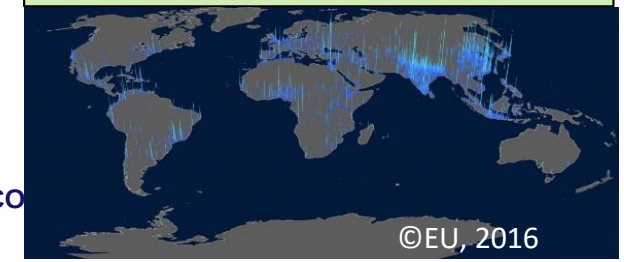
INPUT DATASETS

IFS FORECAST MODEL & DATA ASSIMILATION

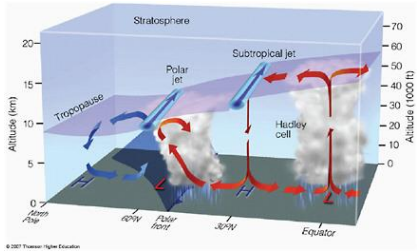
EMISSION INVENTORIES WITH TEMPORAL/VERTICAL PROFILES & UNCERTAINTIES (JRC EDGAR,TNO/BSC, CAMS81)



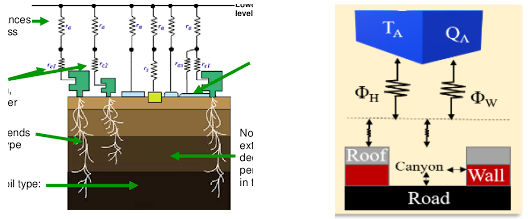
VEGETATION & URBAN MAPS (ESA-CCI, JRC GHSL) OCEAN FLUXES (CMEMS)



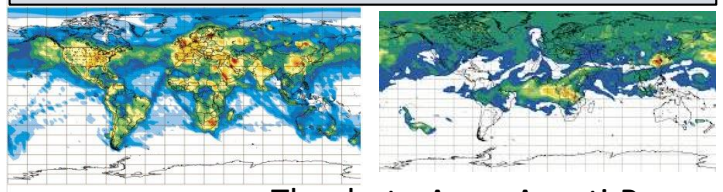
IFS ATMOSPHERIC TRANSPORT



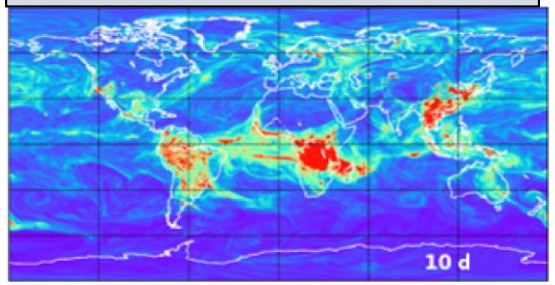
URBAN & VEGETATION MODEL, LAND SURFACE DATA ASSIMILATION



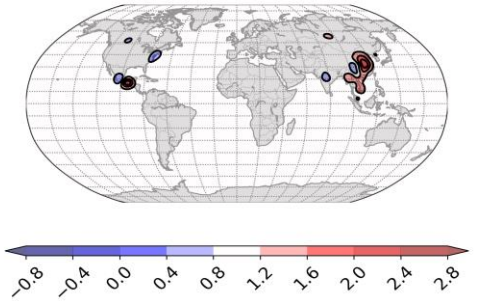
CAMS REACTIVE SPECIES (NOx, CO, CH4)



ENSEMBLE APPROACH (uncertainty propagation)



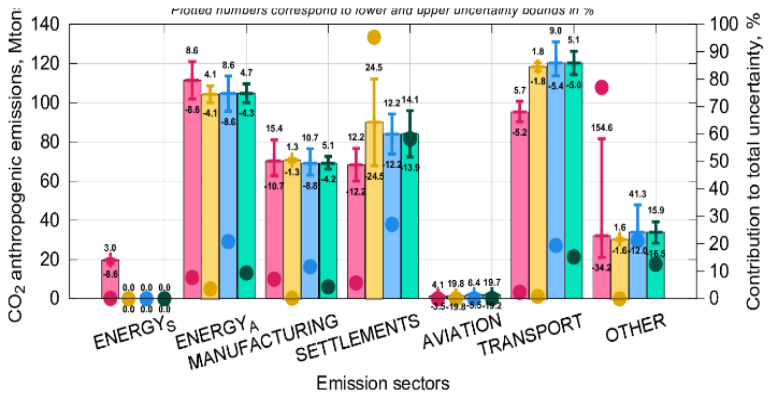
4DVAR ATMOSPHERIC ANALYSIS & INVERSION CAPABILITY



Thanks to Anna Agusti-Panareda ECMWF

CHE: 3 achievements to prepare the Global- MVS

CO_2 Anthropogenic Sectors Mapping:
CO_2 Global Fossil-fuel emissions from
IPCC / UNFCCC / JRC-EDGAR
gridded & clustered in 7 groups for IFS
Choulga et al. 2020 (in discussion)



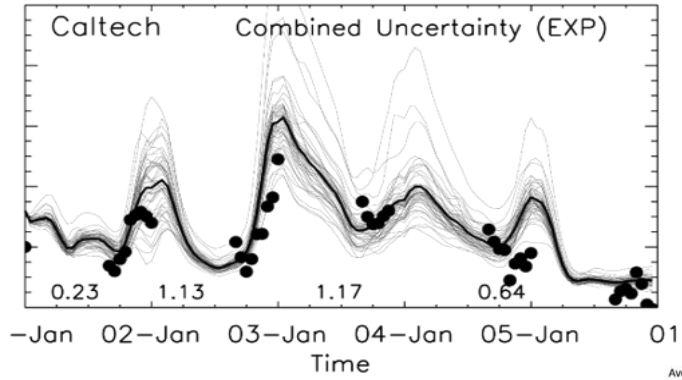
CHE-UK (ex)

UNFCCC

TNO v1.1 Tier 1

TNO v1.1 Tier 2

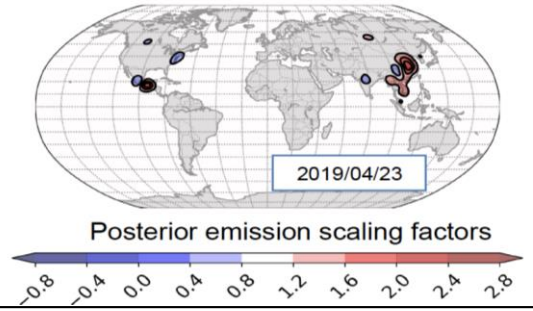
CO_2 Ensemble-based Modelling:
CO_2 emissions and concentrations
represented using HRES & ENS
to characterise Uncertainties
McNorton et al. 2020 (final accepted)
Agustì-Panareda et al. 2019, 2020 (in prep.)

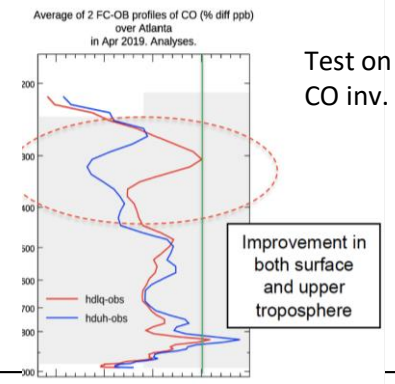


CHE-ENS __ (@Caltech)

TCCON Obs ●

CO_2 4D-Var-based Inversion:
Using the ACV infrastructure CO2
fluxes & concentration are corrected
Bousserez et al. 2020 (in prep.)



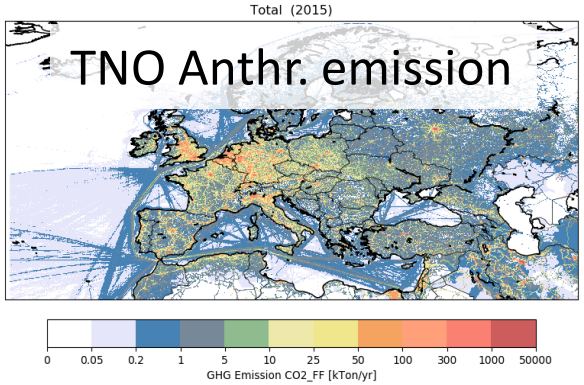


Test on
CO inv.

Linking Global to Regional/Local-scale runs: the value of resolution

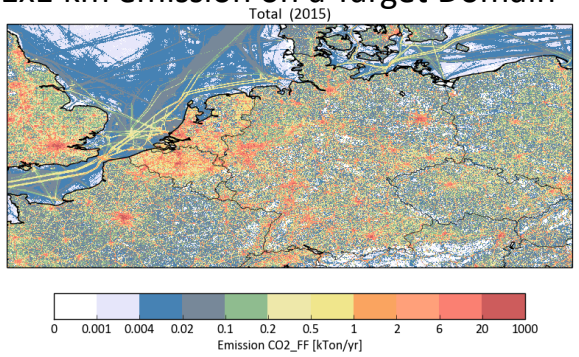
Tier-1 (CAMS), 9km, EDGAR emissions

COSMO 1km, TNO emissions

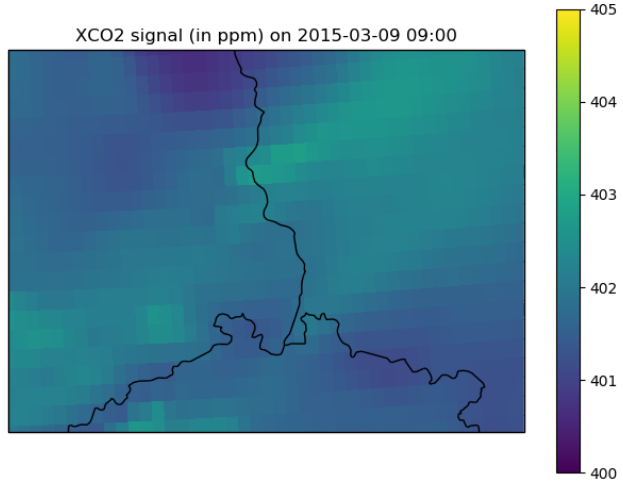


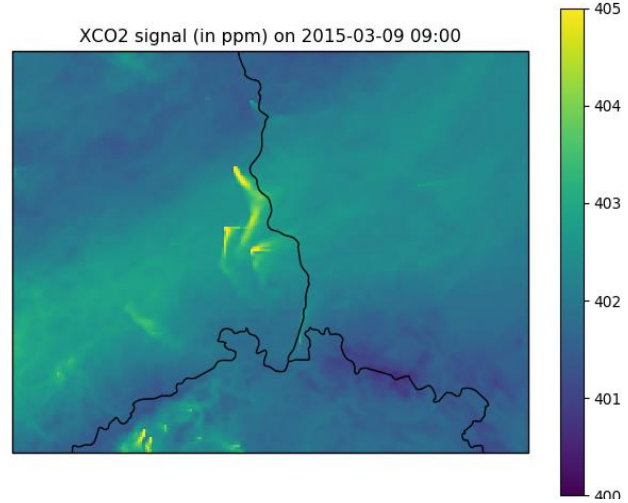
5x5 km emission over Europe

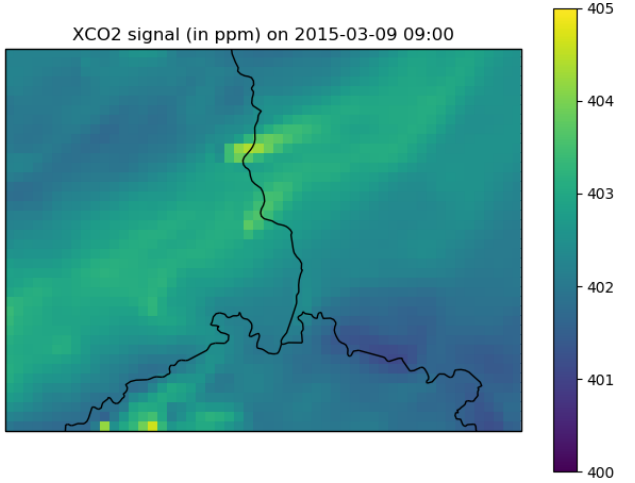
1x1 km emission on a Target Domain

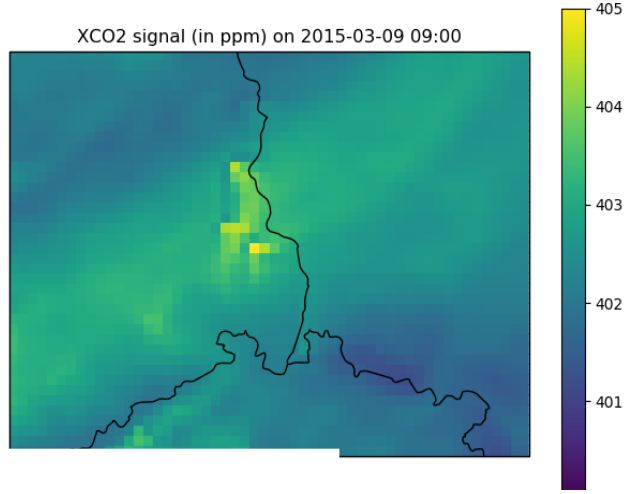


https://doi.org/10.5194/acp-2019-696









Point sources will need km-scale!

CO_2 HUMAN EMISSIONS

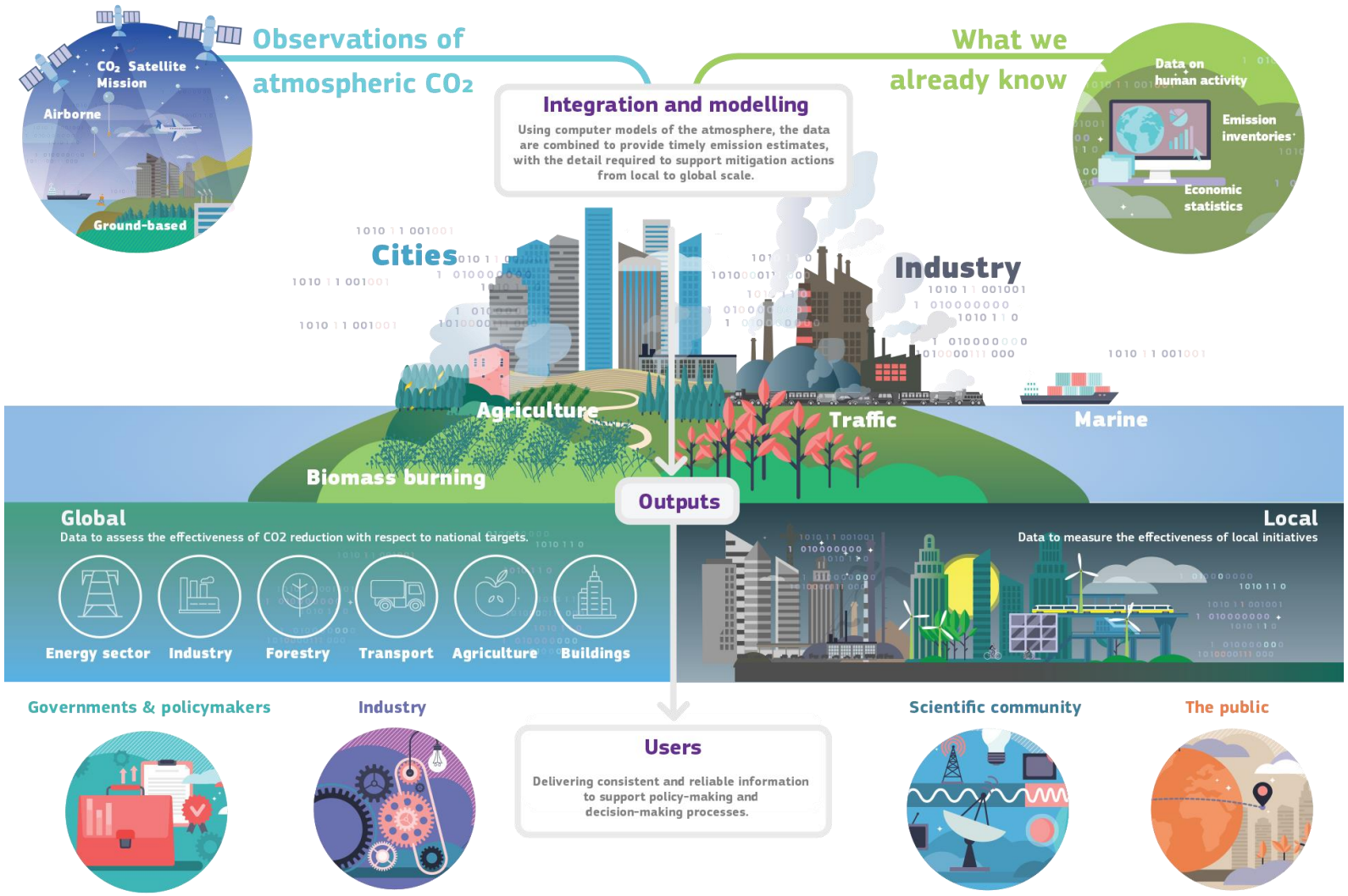
COSMO 5km, EDGAR emissions

COSMO 5km, TNO emissions

Thanks to Ingrid Super, Hugo Denier van der Gon, TNO

Thanks to Jean-Matthieu Haussaire, Dominik Brunner, EMPA

Proposed Copernicus CO2 MVS capacity



CHE AFOLU Workshop - Aim

- Define a European consolidated view on the needs (for UNFCCC/Paris Agreement, EU carbon neutrality targets) with respect to the AFOLU sector, which then can be translated into technical requirements for the CO2 MVS capacity.
- Define the agenda for a wider AFOLU workshop in 2021 with international outreach.

CHE AFOLU Workshop - Questions

- What are the UNFCCC requirements for the AFOLU sub-sectors and how are these currently handled in the official reporting?
- Are there specific areas for which the reporting and/or monitoring could be improved by using additional information?
- What is the current state of science (both bottom-up and top-down and how they converge)?
- What observations do we have to support observation-based estimates?
- Is there a role to play for an integrated system approach for AFOLU, such as the Copernicus CO2MVS?
- To what extent do we need to account for AFOLU in the CO2MVS anyway in order to close the carbon cycle?

CHE AFOLU Workshop – Notes from Day 1

- AFOLU reporting is complex. Detailed IPCC guidelines are followed, but can we implemented differently depending on data availability in countries
- Uncertainties are large but have been significantly reduced over the last decade
- Definitions for reporting are often different from what is used in modelling and Earth observation
- Earth observation offers many products already, mostly focused on land cover and biomass
- Earth observation and modelling can provide a consistent (independent?) view and can also address specific uncertainties
- How do we deal with relationship between land cover, land use and actual emissions?

CHE AFOLU Workshop – Day 2

09:30 Introduction Richard Engelen & Gianpaolo Balsamo

09:45 Science perspective — Roxana Petrescu

10:15 Outcomes from VERIFY workshop — Lucia Perugini

10:45 Break

11:00 Discussion, using “Padlet” tool.

12:00 Wrap-up and topics for next workshop

12:30 End of meeting

Housekeeping notes

Please keep your camera turned on and your microphone muted throughout the meeting.

If you would like to make a comment or ask a question, please raise your hand by using the hand icon.

You will find this by clicking on the "Participants list" at the bottom centre of your screen.

Once in the list at the bottom of the window, click the button labelled "Raise Hand" that appears at the bottom.

Please also be ready to use Padlet throughout the event the link will be sent in the chat and can be found in your delegate information email

CO_2 Human Emissions

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