

# CHE – VERIFY

## synergies / complementarities

- Complementarity in terms of
  - Products
  - model simulations
- Complementarity in terms of
  - GHG
  - Community (VERIFY involves Inventory agencies)
- Synergies for building a pre-operational GHG monitoring system
- Potential synergies for data management

# Task 6.2 - Clustering

## — Task Objectives

- **Ensuring interaction with other relevant H2020 projects to identify synergies, exploit them and possibly reinforce certain activities.**

## — Progress

- **Attended and presented CHE at relevant project meetings**
  - VERIFY, 13 - 15 February, Kick-off meeting
  - SCARBO, 14 March, Kick-off meeting
  - URBAN-FLUXES, 23 January 2018, Final progress meeting
  - COOP+ Conference on the Research Infrastructures and the Paris Agreement on climate, 20-21 November 2018
- **Report on Synergies and Complementarities between CHE and VERIFY**

# Task 6.2 - Clustering



## CHE-VERIFY Joint General Assembly

The H2020-funded projects CHE and VERIFY will hold a joint General Assembly between the 12th and 14th of March 2019 at ECMWF in Reading, UK. The meeting will consist of discussions on CHE and VERIFY work packages, collaboration opportunities, external lectures and working groups.

[Learn more](#)



- Coordinated planning of project meetings
- Participation in advisory boards



# VERIFY data products

Product	Definition
<b>P1</b>	GHG anthropogenic emissions and sinks across the EU, on a 10 km grid for bottom-up models with documentation.
<b>P2</b>	Attribution of GHG fluxes in the land-use sector to management versus climate drivers.
<b>P3</b>	Annually updated observation-based national GHG budgets of the EU countries for CO <sub>2</sub> , CH <sub>4</sub> and N <sub>2</sub> O.
<b>P4</b>	Annual synthesis and reconciliation of the GHG budgets of EU countries between observation-based estimates and UNFCCC inventories.
<b>P5</b>	Full documentation, system requirements, and implementation recommendations to operationalise the methodology of the project.
<b>P6</b>	Synthesis of observation-based estimates and UNFCCC GHG budgets for China, US, Indonesia, performed with foreign partners.

# Questions / Suggestions

- **Data management:**

Today data storage/visualisation & long-term perspectives

- Awareness:

Proposition for a dedicated meeting between “Inventory agencies” – “Stakeholders” – “climate scientists” ?

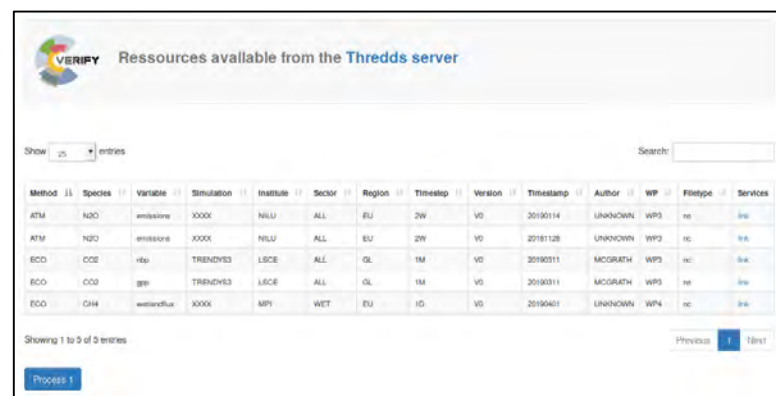
- Long term perspective:

Joint meeting around a future CO<sub>2</sub> (Natural and Anthropic) MVS system ? Which models, which DA ? Unique vs Multiple systems ?

- Others ?

# Data Management for VERIFY

- Simple data base at LSCE for the project duration
  - ✓ All data accessible from outside through Thredds
  - ✓ Simple data-base (table with meta-data)
  - ✓ Associated data visualisation based on the CATLAS facilities & new python-notebook



The screenshot shows the VERIFY Thredds server interface. At the top, it says "Resources available from the Thredds server". Below this, there is a search bar and a "Show 25 entries" dropdown. The main part of the interface is a table with the following columns: Method, Species, Variable, Simulation, Institute, Sector, Region, Timestep, Version, Timestamp, Author, WP, Filetype, and Services. The table contains five rows of data:

Method	Species	Variable	Simulation	Institute	Sector	Region	Timestep	Version	Timestamp	Author	WP	Filetype	Services
ATM	ADO	emissions	XXXX	NSU	ALL	EU	2W	V0	20190114	UNKNOWN	WP3	nc	vis
ATM	NDQ	emissions	XXXX	NSU	ALL	EU	2W	V0	20181128	UNKNOWN	WP3	nc	vis
ECO	CO2	rfp	TRENDV3	LSCE	ALL	GL	1M	V0	20190311	MCGRATH	WP3	nc	vis
ECO	CO2	gpp	TRENDV3	LSCE	ALL	GL	1M	V0	20190311	MCGRATH	WP3	nc	vis
ECO	GH4	waterflux	XXXX	MPY	WET	EU	1D	V0	20190401	UNKNOWN	WP4	nc	vis

At the bottom of the table, it says "Showing 1 to 5 of 5 entries". There are "Previous" and "Next" buttons, and a "Process 1" button.

- Longer term data storage
  - ✓ Use the ICOS-CP facility
  - ✓ Use the Copernicus Climate Data Store (CDS) ?

➔ How to make the best synergies with CHE ?

# Questions / Suggestions

## ➤ Data management:

Today data storage/visualisation & long-term perspectives

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## ➤ Others ?

# Model integration

## Bottom-up models

## Top-down models

Existing

Ensemble of models  
(process-based, statistical, sectorial)

Several inversion schemes  
(global, regional)

selection

Integration

VERIFY

Toward pre-operational

Model & Observation based GHG monitoring system

**ffCO<sub>2</sub>**  
(Dynamical  
inventory  
model)

**Biogenic - CO<sub>2</sub>**  
(ORCHIDEE / BLUE  
ECOSSE / EFICEN/  
DAYCENT / "IIASA")

**CH<sub>4</sub> / N<sub>2</sub>O**  
(ECOSSE, OCN,  
HIMMLI, CAPR,  
NEMO-Planktom)

**Community inversion framework**  
(Atm. Models: LMDz / TM5 / CHIMERE  
GEOSChem / STILT / FLEXPART)

- Which models, which DA ? Unique vs Multiple systems ?
  - What kind of QA / QC ?

# Questions / Suggestions

## ➤ Data management:

Today data storage/visualisation & long-term perspectives

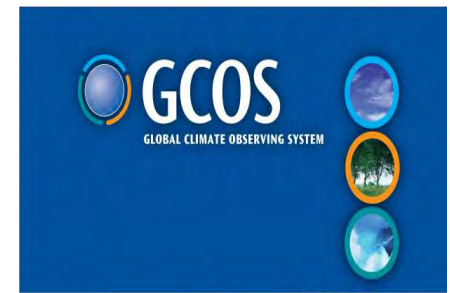
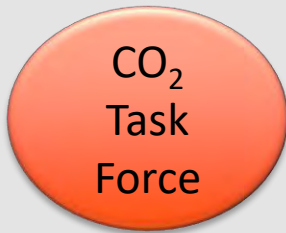
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## ➤ Long term perspective:

Joint meeting around a future CO<sub>2</sub> (Natural and Anthropic) MVS system ? Which models, which DA ? Unique vs Multiple systems ?

## ➤ Others ?



United Nations  
Framework Convention on  
Climate Change



**EU Member**



HORIZON 2020

The EU Framework Programme for Research and Innovation



# CHE Connectivity & Stewardship

- **External Advisory Board**

- Han Dolman, Chair (Vrije Universiteit, Netherlands),
- Guy Brasseur (WCRP, Germany),
- Werner Kutsch (ICOS, Finland),
- Pierre-Yves Le Traon (CMEMS, France),
- Philippe Peylin (Coordinator of VERIFY, LSCE, France)
- Sonia Seneviratne (ETH, Switzerland),

Advise from CHE reviewer and EEG to extend the EEG with people more closely related to international frameworks and especially UNFCCC process.

Currently, link with latter is mostly through VERIFY (WP1).

CHE will further investigate this.

- **External Expert Group**

- Peter Rayner, Chair (University of Melbourne, Australia)
- Arlyn Andrews (NOAA, United States)
- Kevin Bowman (NASA JPL, United States)
- Pep Canadell (CSIRO, Australia)
- Jing M. Chen (U NANJING, China; U TORONTO, Canada)
- David Crisp (NASA JPL, United States)
- Heather Graven (Imperial College, United Kingdom),
- Kevin Gurney (Arizona State University, United States)
- Shamil Maksyutov (CGER/NIES, Japan)
- Yasjka Meijer (ESA, EU)
- Chris O'Dell (Colorado State University, United States)
- Paul Palmer (University of Edinburgh, United Kingdom)
- Saroja Polavarapu (ECCC, Canada)
- Oksana Tarasova (WMO)
- Alex Vermeulen (ICOS, Lund University, Sweden)
- Ning Zeng (University of Maryland, United States)

# Task 6.1 - Liaison

## — Task Objectives

- **Liaison with the European Commission, ESA, EUMETSAT and the CO<sub>2</sub> Task Force to ensure the project is addressing the relevant questions for which the Task Force needs support.**

## — Progress

- CO<sub>2</sub> Monitoring MAG meeting, 12 - 13 June 2018
- CO<sub>2</sub> Monitoring MAG meeting, 1 - 2 October 2018
- CO<sub>2</sub> Monitoring MAG meeting, 30 - 31 January 2019
- CO<sub>2</sub> Task Force meeting, 22 January 2019
- CO<sub>2</sub> Task Force meeting, 12 March 2019

# Task 6.1 - Liaison

## Participation in Task Forces and MAG

### — CO2 Task Force

- Philippe Ciais, Hugo Denier van der Gon, Richard Engelen , Greet Maenhout, Marko Scholze

### — CO2 Monitoring MAG

- Hartmut Boesch, Michael Buchwitz , Philippe Ciais, Richard Engelen, Sander Houweling, Greet Maenhout

# Task 6.3 – Workshop organisation

## – Task Objectives

- **Organisation of two workshops open to the wider community to discuss, document and learn from the various efforts outside the project**

## – Progress

- The first workshop was anticipated to enable a meeting with Chinese colleagues to discuss scientific collaboration (in view of the Copernicus – China discussions on CO<sub>2</sub> monitoring). Due to lack of responsiveness from the Chinese colleagues, this had to be postponed.
- Plans to organise workshop on AFOLU (Agriculture, Forest and Other Land Use) towards end of 2019. This topic was suggested by the CO<sub>2</sub> Task Force at its last meeting. AFOLU addresses an important element of the carbon cycle with still large uncertainties.

# Task 6.4 - Events

## — Task Objectives

- **Participation at key events related to a future CO2 emission monitoring system and related international collaboration programmes, such as Transcom, Eurocom and ICOS.**

## — Progress

- EGU, 9 - 12 April 2018
- CEOS AC-VC-14 meeting, 2 – 4 May 2018
- CEOS GHG workshop, 18 – 19 June 2018
- IG3IS/Transcom meeting, 17 - 20 September 2018
- GEWEX SSG, 25 February – 1 March 2019

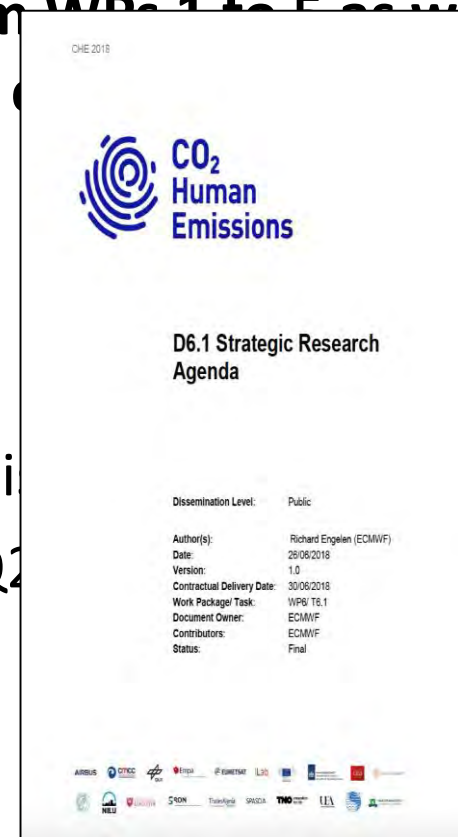
# Task 6.5 – Strategic Research Agenda

## — Task Objectives

- Development of the strategic research agenda documents that will use input from WPs 1 to 5 as well as the results from the liaison and coordination activities of this work package.

## — Progress

- First version of document was published in Q1 2018
- Update of document planned for Q2 2018



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Advise from CHE Review Meeting was to ensure that the SRA outlines required research activities for the development of the future CO<sub>2</sub> service.

The research activities need to be prioritized to ensure they are actionable.

ESA studies

Observation system

# First **draft** research recommendations from CHE

- WP2: Simulations of NO<sub>2</sub> should receive more attention
  - Accurately simulating NO<sub>2</sub> needs models with full interactive chemistry, but maybe a simplified NO<sub>2</sub> tracer with a constant lifetime would be sufficient for some applications such as identifying the location of plumes
- WP3: Improve the CCFFDAS quantitative network design system in terms of available observational data streams
  - The prototype CCFFDAS quantitative network design system has evolved into a powerful tool for quick exploration/assessment of design options of the MVS capacity. Initial assessments of the sensitivity with respect to observational data streams, prior information, and temporal domains in flux and observation spaces have demonstrated the potential of the approach
- WP4: Modelling of non-CO<sub>2</sub> tracers (biogenic <sup>14</sup>C fluxes, CO:CO<sub>2</sub> emission ratios, maybe other compounds) and their contribution to the network to refine the description of their space

list yet.

- No input from VERIFY yet.
- No input from ESA

# Summary

- The Copernicus CO<sub>2</sub> initiative as well as CHE are clearly on the international agenda
- Exchange of ideas in European and international context is happening.
- Good connections with IG3IS, GEO, GCOS and CEOS have been established
- Close links with CO<sub>2</sub> MAG and CO<sub>2</sub> Task Force are in place and help with exchange of information. This will also strongly support the definition of the work needed after CHE
- Fruitful collaboration established with VERIFY

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

# Relation with CHE

## → Complementary projects following « similar » goals

- VERIFY focusses not only on CO<sub>2</sub> but also on CH<sub>4</sub>, N<sub>2</sub>O
- CHE focusses more on system design studies with satellite data and futur satellite missions as the main target
- VERIFY will try to prepare a first « pre-operational » system based on existing state of the art methodologies
- VERIFY focuss on establishing a close link with stakeholders and the whole carbon community
- Many partners in common => facilitate the synergies

## → Existing deliverable on the CHE – VERIFY synergies