Towards a European Monitoring and Verification Support Capacity

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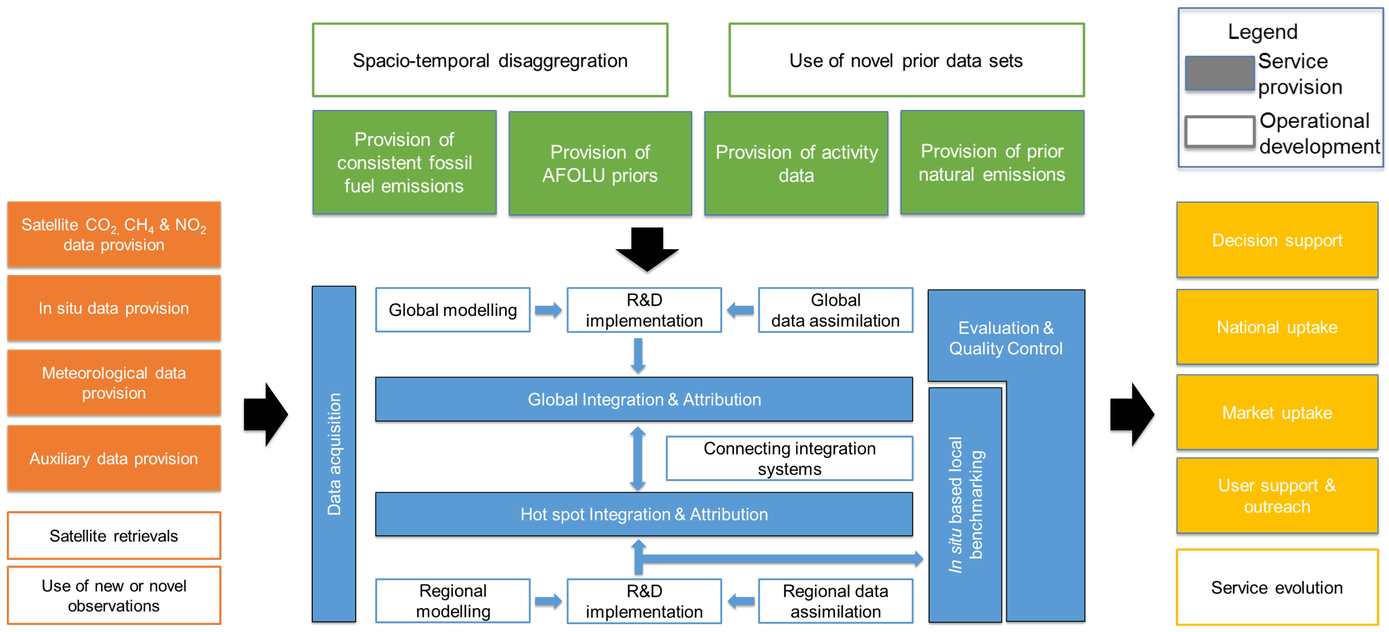
The European Union is the first major economy to put in place a legally binding framework to deliver on its pledges under the Paris Agreement. The ambition to reach climate neutrality by 2050 is supported by an **unprecedented effort to set up an operational anthropogenic CO_2 emissions Monitoring & Verification Support (MVS) capacity.** Developed as a service to the countries and their inventory communities, the MVS will bring together meteorological and satellite data (including from the future Sentinel constellation), high-quality in situ observations, as well as advanced modelling and data assimilation capacities.

The resulting MVS will allow to reduce the existing uncertainties in the national budgets of CO_2 and potentially other main GHGs (CH_4, N_2O), identify and monitor hot spots of fossil fuel emissions, and assess changes in emission patterns against local and national reduction actions. This will provide actionable knowledge at country and city scales, and support the national climate plans. Supported in its design by the European Commission through several H2020 projects, the MVS is a joint endeavour of the major European actors in each field, under the leadership of Copernicus.

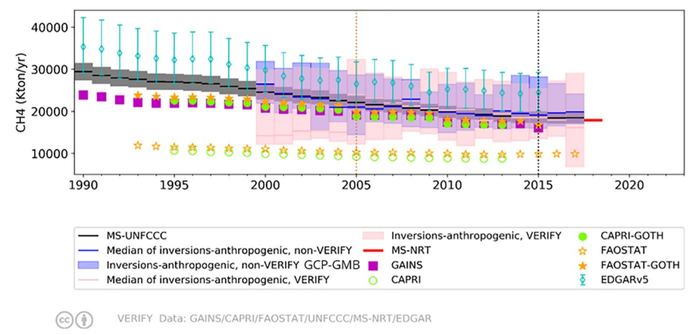
Service Architecture



Further cooperation at the global level, for instance under the umbrella of WMO and CEOS, is welcome in order to contribute to the improvement of GHG reporting and monitoring towards the 2nd Global Stocktake in 2028.

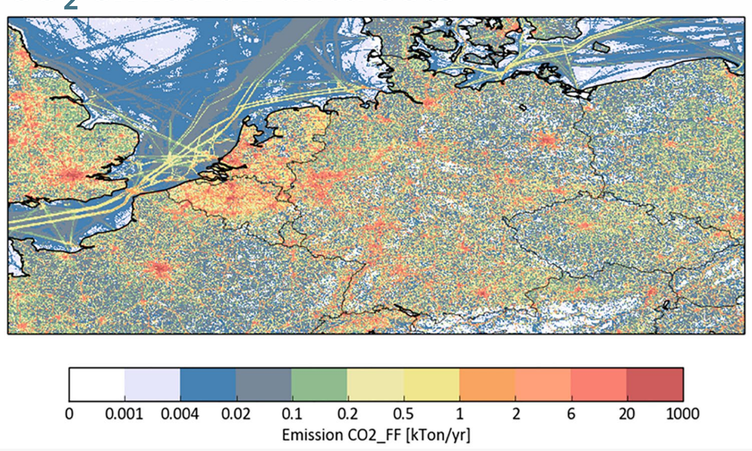
First Results

VERIFY – First CH_4 flux reconciliation for Europe (EU28): preliminary results



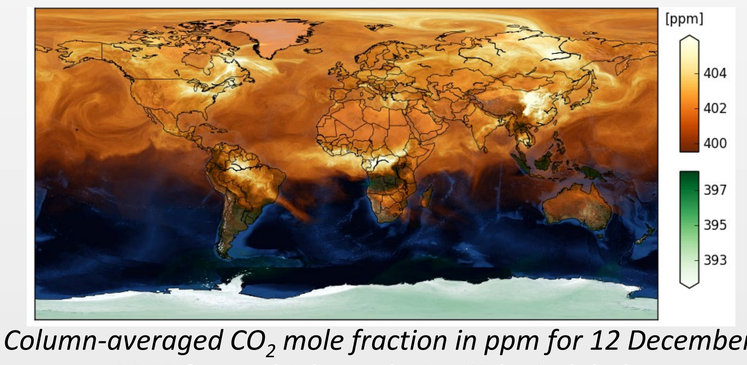
Bottom-up vs. top-down anthropogenic emission estimates using VERIFY and non-VERIFY flux estimates. Credit: R. Petrescu, P. Ciais

CHE – Ensemble of high-resolution CO_2 emission data sets



High-resolution (1 x 1 km²) CO_2 fossil fuel emission map for 2015. Credit: H. Denier van der Gon

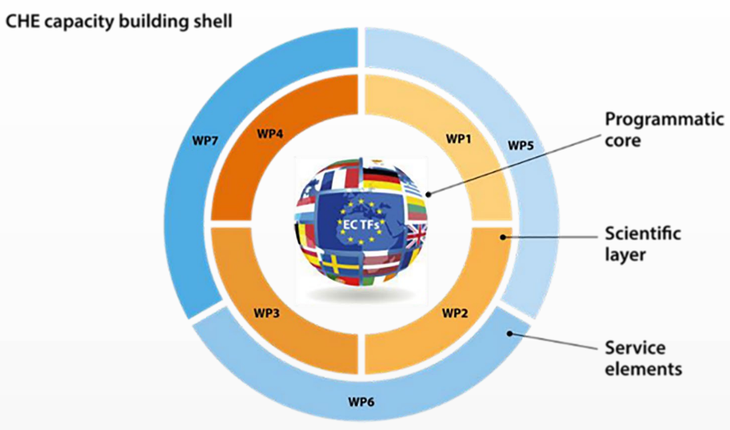
XCO_2 column integral on 12.12.2015 (Paris Agreement's day at COP21)



Column-averaged CO_2 mole fraction in ppm for 12 December 2015 from a high-resolution (9 km) global computer simulation produced in the CHE project. Credit: ECMWF

Design Activities

CO_2 Human Emissions



CHE coordinates efforts towards developing the European CO_2 MVS capacity, using a requirement-driven integration of Earth observations, from remote sensing and in situ, with enhanced (inverse) modelling capabilities for CO_2 fossil fuel emissions and natural fluxes. The project aims to provide first building blocks as well as recommendations for further research & development, including accuracy estimations.

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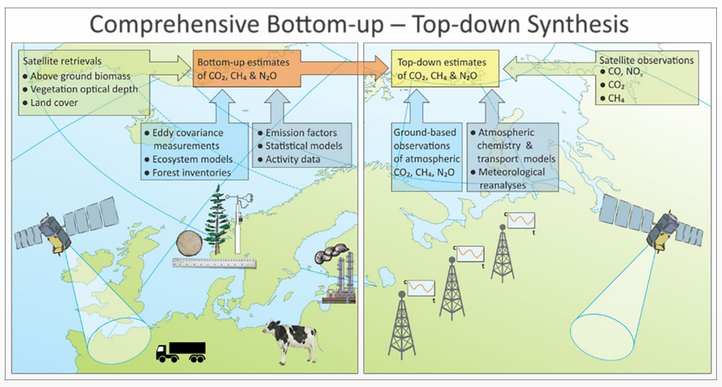
VERIFY



VERIFY develops a system to estimate GHG emissions and sinks based on land, ocean and atmospheric observations, as well as their associated uncertainties. Two complementary approaches relying on observational data streams are used to quantify GHG fluxes: 1. atmospheric GHG concentrations from satellites and ground-based networks (top-down atmospheric inversion models) 2. bottom-up activity data (e.g. fuel use and emission factors) and ecosystem models.

More information
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ICOS Integrated Carbon Observation System · ECMWF · Copernicus · esa · EUMETSAT

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