VERIFY: a European project to define an observation-based system for monitoring and verification of greenhouse gas fluxes

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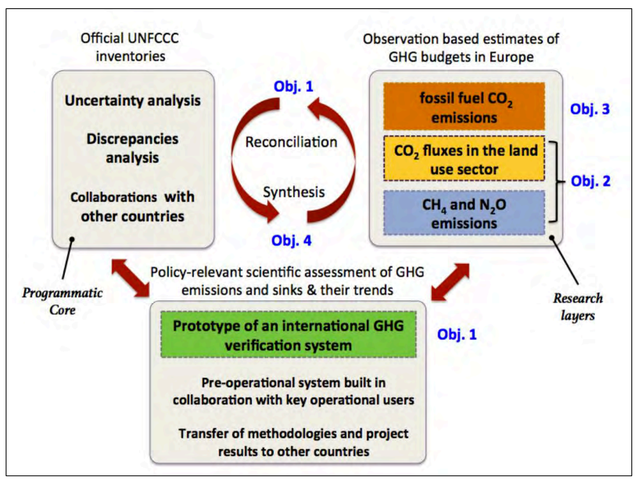
1 Objectives of VERIFY : A pre-operational system to support national GHG inventories to UNFCC

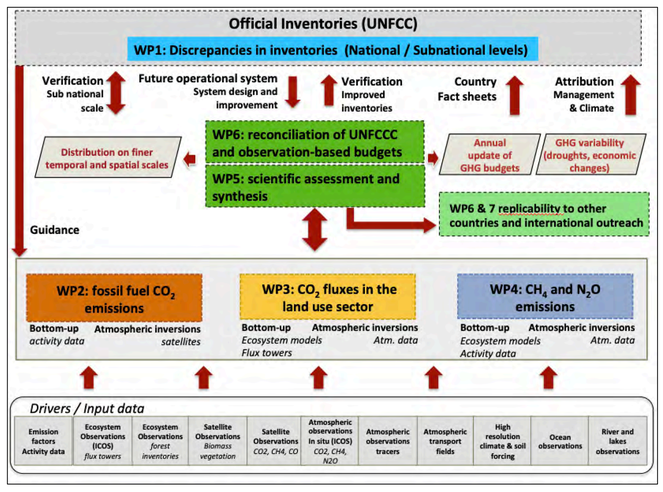
Objective 1. INTEGRATES EFFORTS between the research community, operational centers, national inventory compilers and international organizations .

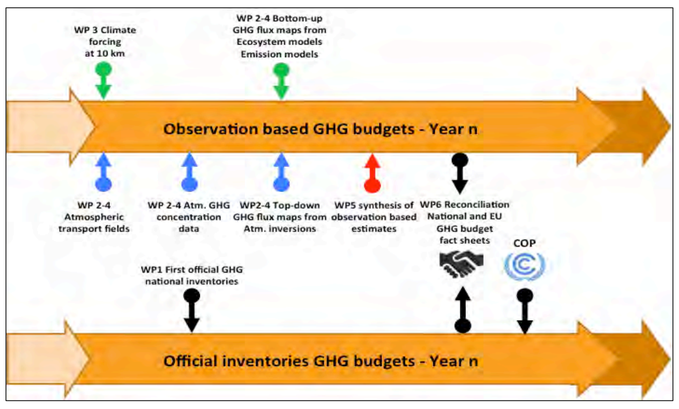
Objective 2. ENHANCE current observation and modeling abilities

Objective 3. DEVELOP NEW research approaches to monitor anthropogenic GHG emissions.

Objective 4. PRODUCE periodical scientific synthesis of the national GHG balance in Europe and policy-oriented assessments.





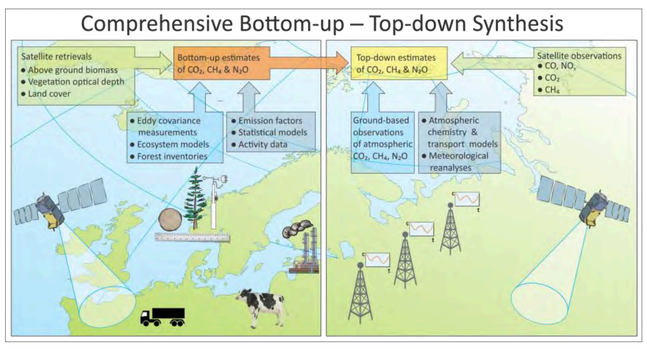


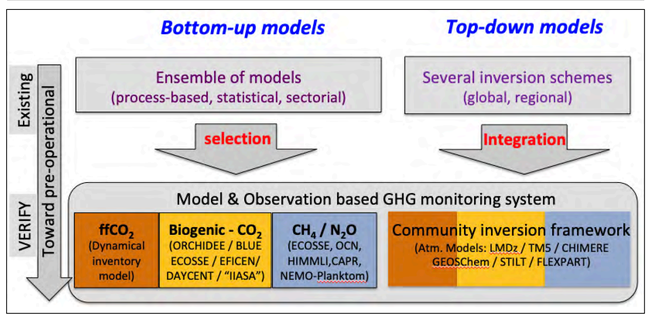
38 partners including

- Research institutes (26)
- Inventory agencies (DE, IT, FR, AT, NO, NE, IR)
- In situ infrastructure (ICOS)
- Operational centers (ECMWF)
- International organizations (KIC, WMO)
- Private company (ARTTIC)

2 Observation-based system to estimate GHG fluxes

Combining top-down and bottom up approaches

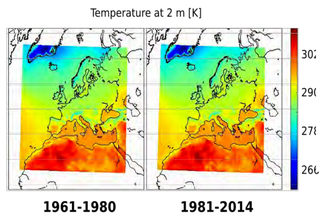




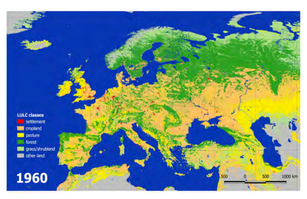
- Use of
- ✓ atmospheric & ecosystem measurements
- ✓ in situ and satellite

- Use existing systems
- ✓ Select complementary systems including process-based, data-driven & bookkeeping models
- ✓ Use Data assimilation

Define a simulation protocol for European GHG flux estimates



- ➢ Meteorological forcing at 11 Km res. from the 'HARMONY' reanalysis bias corrected with CRU data.

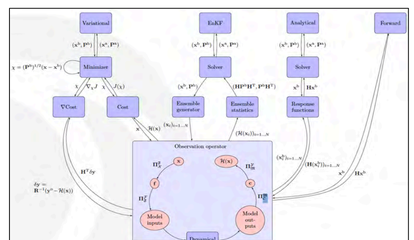


- ➢ High res. land cover data (HILDA+) combining several existing products

- ➢ Use European specific management data (crop rotation, N fertilisation, grassland & forest management), forest inventories, soil data, lake fluxes, river transfers and coastal ocean fluxes

Developing a new Community Inversion Framework (CIF)

- ➢ For an operational GHG monitoring system;
- ➢ To run with different atmospheric transport models (regional & global, Eulerian & Lagrangian); transport error assessment
- ➢ Flexible, transparent and open-source tool
- ➢ With an evaluation package to exploit campaign observations



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3 Snapshot of year 1 activities

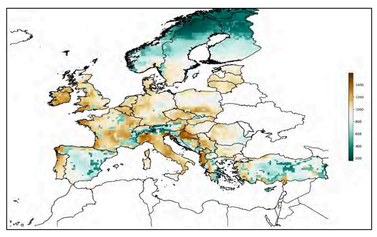
Inventory Agencies (WP1)

- ➢ Terminology analysis
- ➢ Challenges to confront Inventories to observation-based GHG estimates set up

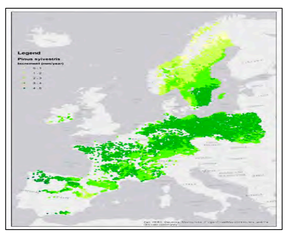
Links

Natural CO_2 fluxes (WP3)

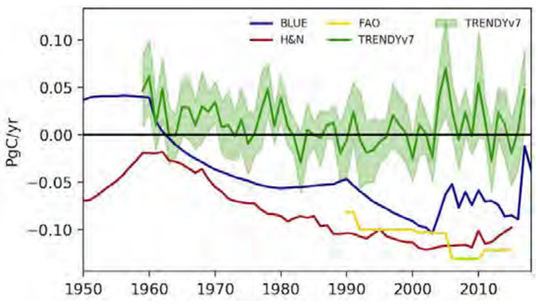
- ➢ Cropland CO_2 fluxes from ECOSSE



- ➢ Forest growth: Pinus sylvestria (EFISCEN)

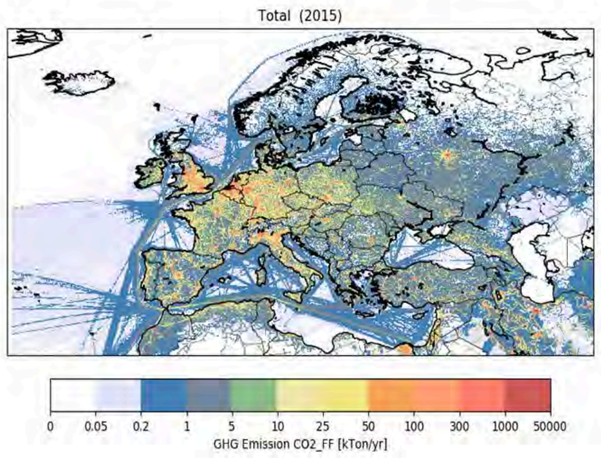


- ➢ Comparison of European CO_2 fluxes from Bookkeeping Model (BLUE; LMU) with Ecosytem models from TRENDY

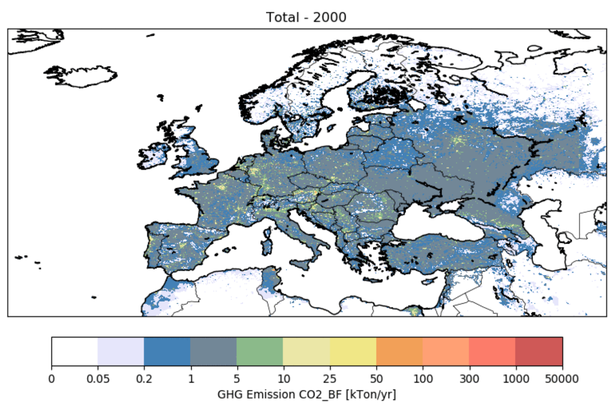


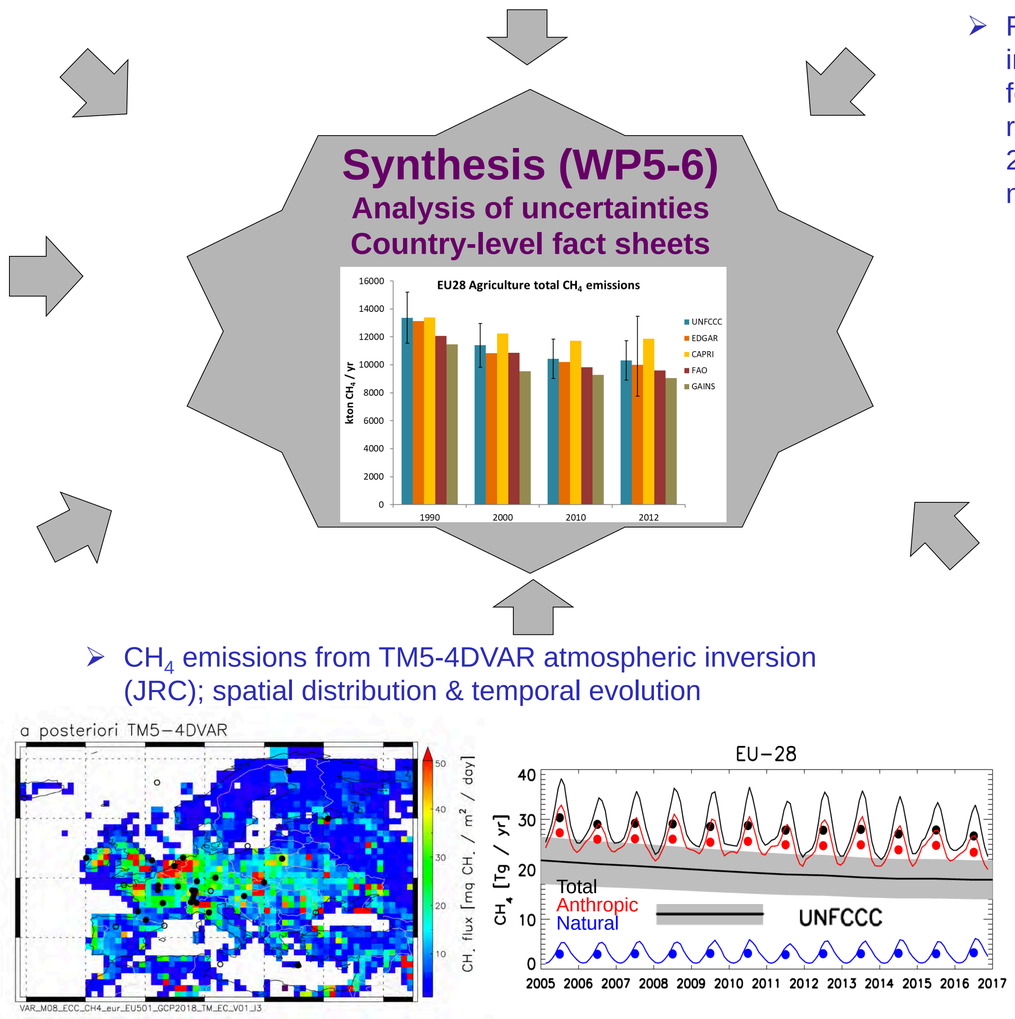
Fossil fuel CO_2 emissions (WP2)

- ➢ High Res. gridded maps (2005-2015; TNO)

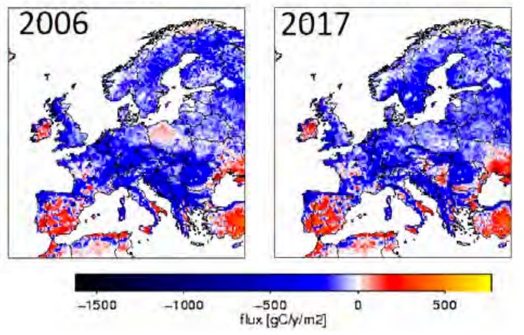


- ➢ CO_2 from biofuel: 10-15% of total emissions Significant temporal evolution (TNO)





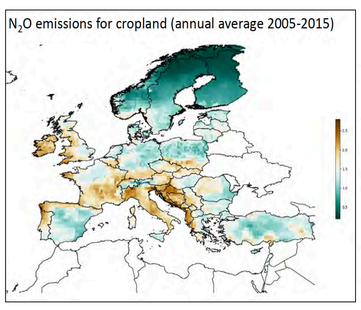
- ➢ Regional atmospheric inversion: CO_2 fluxes for from Carboscope-regional system for 2006 - 2017; STILT model; (MPI-JENA)



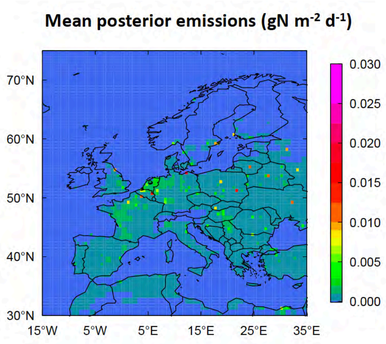
CH_4 & N_2O fluxes (WP4)

- ➢ CH_4 emissions from TM5-4DVAR atmospheric inversion (JRC); spatial distribution & temporal evolution

- ➢ N_2O emissions from FlexInvert atmospheric inversion (NILU)



- ➢ N_2O emission from ECOSSE model for cropland (UAberdeen)



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