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The CO_2 Human Emissions (CHE) project - first developments toward a European capacity to monitor anthropogenic CO_2 emissions

Richard Engelen (1), Gianpaolo Balsamo (1), Anna Agusti-Panareda (1), Dominik Brunner (2), Frédéric Chevallier (3), Hugo Denier van der Gon (4), Greet Janssens-Maenhout (5), Corinne Le Quéré (6), Julia Marshall (7), Wouter Peters (8), Marko Scholze (9), and Daniel Thiemert (1)

(1) European Centre for Medium-Range Weather Forecasts (ECMWF), Reading, United Kingdom (richard.engelen@ecmwf.int), (2) Eidgenössische Materialprüfungs- und Forschungsanstalt (EMPA), Dübendorf, Switzerland, (3) Commissariat à l'énergie atomique et aux énergies alternatives (CEA), Gif-sur-Yvette, France, (4) Nederlandse Organisatie voor toegepast-natuurwetenschappelijk onderzoek (TNO), Utrecht, The Netherlands, (5) Joint Research Centre (JRC), Ispra, Italy, (6) University of East Anglia (UEA), Norwich, United Kingdom, (7) Max-Planck-Institute for Biogeochemistry (MPI-BGC), Jena, Germany, (8) Wageningen University & Research, Wageningen, The Netherlands, (9) Lund University, Lund, Sweden

At the United Nations Paris Climate Agreement in December 2015, 195 nations signed up to limit their greenhouse gas emissions through Nationally Determined Contributions and a 5-yearly Global Stocktake. To support this process the European Commission initiated the design and development of a new Copernicus service that will use Earth observation to specifically target anthropogenic CO_2 emissions.
Two European Commission reports discussed this European capacity for monitoring anthropogenic CO_2 emissions and concluded that a comprehensive observing system should be based on a combination of space-borne observations and ground-based monitoring networks. The observing system must allow the impact of anthropogenic emissions to be separated from the effect of the complex natural carbon cycle, both of which affect atmospheric CO_2 concentrations. Observations from satellites as well as ground-based observation networks and aircraft provide CO_2 information at specific times and locations, but alone do not constitute a continental to global monitoring capacity across different time scales. Moreover, these observations mostly measure atmospheric CO_2 concentrations, which are an indirect measure of the underlying carbon emissions or uptake. Therefore, the use of an Earth System modelling infrastructure is required to combine Earth observations (ground-based, aircraft and satellite) with detailed CO_2 emissions inventory data.
The foreseen Copernicus monitoring and verification support capacity also aligns with the aims of WMO's IG3IS framework and will support worldwide efforts under the UNFCCC. The Copernicus programme already has an excellent track record of converting science into user-driven services.
Having officially started on 1st of October 2017 with a duration of 39 months, the CO_2 Human Emissions (CHE) project, funded through the H2020 programme, is coordinating efforts towards developing the European monitoring and verification support capacity for anthropogenic CO_2 emissions. To tackle the challenges of an integrated support capacity on a global scale, it is paramount to identify the complementarity between observations, modelling and data assimilation methodologies by establishing their limitations and strengths. CHE is addressing these aspects in seven work packages that use existing capabilities to provide supportive datasets and assessments of the current state of affairs, while at the same time bringing innovation to the various components with an eye on overall integration in a fully comprehensive system. The innovation includes reconciling bottom-up and top-down approaches and handling systematic errors of satellite observations. Earth observations from satellites will be combined with in situ CO_2 observations and information from co-emitters or isotopes to support the attribution of fossil fuel emissions and reduce uncertainties. In addition, CHE will identify the operational aspects of all the components to ensure a realistic architecture.
In this presentation, we will provide an overview of the CHE project and show examples of progress so far. Current ideas for further developments will also be presented to solicit feedback from the user and science communities.