



Towards disentangling natural and anthropogenic GHG emissions by space-based atmospheric concentration imaging - The CarbonSat Earth Explorer 8 Candidate Mission

Heinrich Bovensmann (1), Konstantin Gerilowski (1), Thomas Krings (1), Max Reuter (1), John P. Burrows (1), Michael Buchwitz (1), Hartmut Bösch (2), Dominik Brunner (3), Philippe Ciais (4), Francois-Marie Breon (4), David Crisp (5), Han Dolman (6), Garry Hayman (7), Sander Houweling (8), Günter Lichtenberg (9), Paul Ingmann (10), and Yasjka Meijer (10)

(1) University of Bremen, FB1, Institute of Environmental Physics, Bremen, Germany
(heinrich.bovensmann@iup.physik.uni-bremen.de), (2) University of Leicester, UK, (3) EMPA, Dübendorf, CH, (4) LSCE, Gif-sur-Yvette, F, (5) JPL, Pasadena, USA, (6) Free University Amsterdam, NL, (7) CEH, Wallingford, UK, (8) SRON, Utrecht, NL, (9) DLR-IMF, Oberpfaffenhofen, D, (10) ESA ESTEC, Noordwijk, NL

CarbonSat was selected by ESA as a candidate for the 8 Earth Explorer Opportunity (EE8). The objective of the CarbonSat mission is to determine natural and anthropogenic sources and sinks of the two most important greenhouse gases, carbon dioxide and methane. The unique features of the CarbonSat mission concept are that it offers a combination of high spatial resolution ($2 \times 2 \text{ km}^2$) and broad swath (240 km) to provide global imaging of localised strong emission source areas such as large cities (Megacities), landfills, power plants, volcanoes, etc. and to be able to separate anthropogenic from natural fluxes. In addition, CarbonSat data will also quantify natural fluxes of CO₂ and CH₄ (biospheric CO₂, wetland CH₄ etc.) and their changes, to better understand these important sources and sinks and their sensitivity to a changing climate.

CarbonSat aims to deliver global data sets of dry column mixing ratios of CO₂ and CH₄ with high precision (goal: CO₂ < 1 ppm, CH₄ < 9 ppb) and accuracy. Benefiting from its imaging capabilities, CarbonSat will provide an at least one order of magnitude larger number of cloud free measurements than GOSAT and OCO and one order of magnitude better spatial coverage than OCO. The CarbonSat mission concept builds on the heritage and lessons learned from SCIAMACHY (2002-2012), GOSAT (2009-present) and OCO-2 (2014 onwards) to make scientifically and strategically important measurements of the amounts and distribution of CO₂ and CH₄ for biogeochemical and climate change research.

CarbonSat entered industrial system feasibility activities in 2012, which are supported by scientific studies and campaigns. The current status of the mission concept and selected results from the scientific studies documenting the expected data quality and characteristics will be presented.