



Anthropogenic carbon dioxide source regions observed from space

Oliver Schneising, Jens Heymann, Michael Buchwitz, Maximilian Reuter, Heinrich Bovensmann, and John P. Burrows

University of Bremen, Institute of Environmental Physics, Bremen, Germany (oliver.schneising@iup.physik.uni-bremen.de)

Urban areas, which are home to the majority of today's world population, are responsible for more than two-thirds of the global energy-related carbon dioxide emissions. Given the ongoing demographic growth and rising energy consumption in metropolitan regions particularly in the developing world, urban-based emissions are expected to further increase in the future. As a consequence, monitoring and independent verification of reported anthropogenic emissions is becoming more and more important.

It is demonstrated using CO₂ column-averaged mole fraction data retrieved from the SCIAMACHY instrument onboard ENVISAT that anthropogenic CO₂ emissions can be detected from space and that emission trends might be tracked using satellite observations. This is promising with regard to future satellite missions with high spatial resolution and wide swath imaging capability aiming at constraining anthropogenic emissions down to the point-source scale.

By subtracting retrieved background values from those retrieved over urban areas the regional contrasts are quantified and significant CO₂ enhancements are found for several anthropogenic source regions around the world. The order of magnitude of the enhancements is in agreement with what is expected for anthropogenic CO₂ signals. The validity of the retrieved spatial enhancement patterns and of the temporal trends of the retrieved enhancements is assessed by comparison with anthropogenic emissions from the Emission Database for Global Atmospheric Research (EDGAR).