



CarbonSat - Quantification of natural and man-made greenhouse gas surface fluxes from satellite observations of atmospheric CO₂ and CH₄ column amounts

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The column amounts of carbon dioxide (CO₂) and methane (CH₄) are modulated directly by anthropogenic activity (fossil fuel combustion, biomass burning, agriculture and land usage change) and natural phenomena. Increases of these greenhouse gases are predominantly responsible for global climate change (IPCC 2007). Adequate knowledge of the sources and sinks of these gases and their feedbacks is a pre-requisite for the reliable prediction of the climate of our planet. In spite of the recognised importance of this issue, our current understanding about sources and sinks of the greenhouse gases CO₂ and CH₄ is inadequate. While ground based in situ measurements of fluxes and of CO₂ and CH₄ concentrations are highly accurate, they are sparse. Global measurements of the CO₂ and CH₄ from instruments on satellite platforms coupled with inverse modelling schemes, are required to study local and regional surface fluxes. To significantly improve global greenhouse gas monitoring capabilities and extend it to the regional and local scale, the CarbonSat mission concept was proposed to and selected by ESA for Phase A/B1 as Earth Explorer 8 mission candidate. CarbonSat is based on the same observational principles as SCIAMACHY, GOSAT and OCO, but optimized with respect to spectral and spatial coverage, as well as accuracy. CarbonSat determines the dry column mixing ratios of CO₂ and CH₄ with high accuracy (goal: CO₂ < 1 ppm, CH₄ < 10 ppb), high spatial resolution (2 km) and good coverage (500 km swath), to allow for the first time to quantify anthropogenic and natural localised sources of CO₂ and CH₄ – so called “emission hot spots” – like power plants, seeps, volcanoes, large cities etc. from space. This will result in a better discrimination between natural and anthropogenic greenhouse gas fluxes. In addition, it will provide Europe with data to quantify global greenhouse gas emissions independently. The overall mission concept, the expected data quality and selected application areas will be presented.