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Mitigating the Climate Crisis from Space (6)

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THE CO2M MISSION: MONITORING ANTHROPOGENIC CO2 EMISSIONS FROM SPACE

Abstract

The Copernicus program is an Earth observation initiative led by the European Union (EU) and carried out in partnership with the European Space Agency (ESA) to access accurate and timely information services to better manage the environment, understand and mitigate the effects of climate change and ensure civil security. The Anthropogenic CO2 Monitoring (CO2M) Mission is part of the Copernicus Space Component Expansion Programme and shall observe the human-made atmospheric CO2 and CH4 content. The CO2M space segment, implemented by a consortium of which OHB System is the industry prime, will consist of at least two spacecraft in an orbit with a semi-major axis of 7113 km and a repeat cycle of 11 days. The mission kick-off took place in July 2020. The launch is targeted before end of 2025 to contribute to the collection of global stock take in 2026/2027. Each satellite carries an imaging spectrometer (CO2I) dedicated to measuring atmospheric CO2 content. These measurements allow to determine column-averaged mixing ratio of CO2 and CH4 in the atmosphere. An additional imaging spectrometer dedicated to measuring the atmospheric NO2 column is integrated into the CO2I. The NO2 measurements specifically enable better estimates of human-made CO2 emissions from high temperature combustion processes. In addition to CO2I, the CO2M spacecraft is equipped with a multi-angle polarimeter (MAP) and a cloud imager (CLIM). Aerosols in the atmospheric column viewed by the CO2I instrument perturb the light path and as such the accuracy of the CO2 retrieval. Accurate characterisation of aerosols is required and can be obtained through MAP measurements. Low water clouds and thin cirrus also affect the light path and hence the CO2 retrieval process. Measurements from a dedicated cloud imager (CLIM) will allow for detecting and filtering the data for cloud-contaminated cases. This allows to achieve a XCO2 precision of less than 0.7ppm and a systematic error below 0.5 ppm per spatial sample of 4km2 sampling size. The CO2M satellite utilises OHB's standard Earth Observation Platform, Eos. The Eos platform is founded on common and well-established state-of-the-art

technologies, thereby providing the opportunity of a fast track and low risk platform adaptation. This paper shall provide an overview of the mission, technology and outlook of the CO2M Satellite development progress to support the commitments made at the Paris Agreement.