Workshop on "Recent advancements in remote sensing and modeling of aerosols, clouds and surfaces",
GRASP ACE Summer school,
Lille, France, May 22-26, 2023

Use of GRASP aerosol information in full-physics CO2 retrievals from CO2M measurements

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The retrieval of atmospheric carbon dioxide (CO2) concentrations from space is critically sensitive to light path changes caused by aerosols. Accurate characterization of aerosol optical properties is therefore of key importance for the generation of CO2 data products meeting the stringent requirements of the Copernicus Anthropogenic CO2 Monitoring mission (CO2M). For this reason, the CO2M mission will simultaneously operate a high-resolution spectrometer for CO2 measurements (CO2I) and a multi-angle polarimeter (MAP) for characterization of aerosol optical depth, microphysical properties and height.

Using aerosol information from MAP measurements in full physics CO2 retrievals requires the development of novel retrieval approaches or extensive modifications to existing retrieval schemes. In this presentation, we will discuss a sequential retrieval algorithm whereby aerosol retrievals from the CO2M MAP instrument are used to inform the aerosol prior setup for full-physics CO2 retrievals from the CO2I spectrometer. The aerosol retrievals are carried out with the Generalised Retrieval of Aerosol and Surface Properties (GRASP) algorithm [1], whereas the CO2 retrievals are performed with the University of Bremen full-physics CO2 retrieval scheme [2]. In this presentation we will present an evaluation of the proposed approach based on a large set of simulated CO2M measurements including CO2I and MAP measurements along CO2M orbits assuming a set of realistic atmospheric scenarios. We will discuss the setup of the simulations, the steps taken to ensure harmonization on the assumptions made by the GRASP and UOL-FP retrievals, and we will present the most recent results of our retrieval experiments. We will also discuss a number of important issues for successful use of MAP aerosol information in CO2 retrievals, in particular the correct inference of aerosol properties at shortwave infrared wavelengths.

Keywords: retrieval algorithm, aerosols, multi-angle polarimetry, CO2

References

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