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EGU22-10125
https://doi.org/10.5194/egusphere-egu22-10125
EGU General Assembly 2022

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A large number of Earth atmosphere observation missions based on Fourier Transform Spectroscopy produce interferograms, which are then processed for being used as spectral radiances. The idea that the useful information for retrieving a given set of atmospheric variables is concentrated in a small portion of the interferogram appeared in the late 1970s [1], [2]. More recently, the interest of such an approach has been demonstrated for the nadir measurement of atmospheric trace components (CO2, CO, CH4 and N2O): the biases induced by the uncertainties on H2O and temperature profiles are largely reduced and the method is totally insensitive to the ground background in IASI-Metop spectral range. Moreover, performing inversions directly on partial interferograms allows improving the signal-to-noise ratio of the data to be processed and thus the instrumental sensitivity [3], [4].
We are currently developing new spectro-imagers founded on the acquisition of partial interferograms, based on an innovative concept of static Fourier transform spectro-imager called imSPOC [5]. In the framework of the Strategic Research Initiative SPACEOBS, which aims at setting up a "space incubator", a laboratory demonstrator for the measurement of the CO total column measurement in solar occultation mode has been built. Its potential application is the estimation of anthropogenic emissions in urban area [6]. The imSPOC concept is also evaluated for the measurement of anthropogenic CO2 and CH4 emissions from a constellation of small satellites [7],[8].
Based on these developments, a retrieval algorithm for the simulation and exploitation of the imSPOC partial interferograms has been developed. This algorithm allows performing calculations with (i) a forward approach (performance assessment in the design phase) and (ii) a backward approach (performance assessment and optimization in the design phase, and exploitation of the acquired data). The interferograms can be generated on regular or non-regular grid of optical path differences, and the transmissions of the instrument and the interferometric cavity can be analytically calculated or experimentally determined. It is also possible to directly work on radiances, without computing any interferograms. We will present an application of this algorithm to the performance assessment of the CO prototype and we will demonstrate the interest of such concepts and the possibility of jointly retrieving geophysical parameters such as the total column of CO and H2O and instrumental parameters such as the temperature of the interferometer from a partial interferogram.

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