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Poster
The NASA Orbiting Carbon Observatory (OCO-2/3) satellites provide precise measurements of the column-averaged CO2 dry air mixing ratio (XCO2). However, adjacent clouds can induce biases in XCO2 retrievals (Massie et al., 2023). These biases result from neglecting the scattering caused by the nearby cloud in the retrieval algorithm, a phenomenon termed the three-dimensional (3D) effect.

Schmidt et al. (2016) initially proposed a linear approximation to model the 3D cloud effect, significantly reducing the computational load for simulating the spectra for OCO-2/3 spectrometers. Following this, we have developed a parameterization method for the coefficients in this linear approximation based on the effective cloud distance and proposed a targeted mitigation approach for land-nadir measurements of OCO-2. This study introduces a novel mitigation strategy for OCO-2's land-nadir measurements that applies spectral adjustment to counteract the 3D cloud spectroscopic effect. Our approach effectively reduces the XCO2 retrieval errors near clouds over land, marking a significant improvement in the accuracy of CO2 monitoring for climate research and emission tracking. This preliminary investigation enhances our ability to precisely measure atmospheric CO2 levels, contributing to our understanding of climate change.
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