

Mitigation of OCO-2 CO₂ Biases in the Vicinity of Cloud

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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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