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Improving atmospheric remote sensing of carbon dioxide (CO_2)

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The Orbiting Carbon Observatory (OCO) has been designed to provide retrievals of the CO_2 column-integrated dry air mole fraction (X_{CO2}) having precisions of 1 - 2 ppm (0.3 - 0.5% of 370 ppm) and the spatial/temporal coverage needed to characterize CO_2 sources and sinks on regional scales. OCO X_{CO2} precision requirements place unprecedented demands on the CO_2 spectroscopic parameters that are needed as inputs for atmospheric radiative transfer (forward) models to retrieve X_{CO2} from measured radiances. The design of OCO instrumentation, observational strategies, calibration and validation, as well as the interpretation of the current archive of atmospheric spectra all require extensive knowledge of the line-by-line parameters associated with the observed spectral features in the 4000 - 10,000 cm^{-1} range. We present an analysis in the impact of improved CO_2 spectral databases on X_{CO2} retrievals from ground-based solar-viewing high-resolution Fourier transform spectrometer data and discuss the implications of the results for general remote sensing problems.