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Spectroscopic challenges for improving atmospheric CO_2 retrievals

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Numerous surface, suborbital and satellite assets will be deployed during the next decades in an intensive effort to answer the fundamental science questions surrounding atmospheric CO_2 and its link to climate change. High-resolution near infrared (NIR, 4000 $-$ 10,000 cm^{-1}) remote sensing provides an excellent method for measuring the total column abundance and vertical profiles of atmospheric CO_2, but remote sensing techniques must obtain column CO_2 measurements with a precision of 1 part in 370 (0.3 percent) to enable synthesis inversion and data assimilation models to characterize carbon sources and sinks on regional scales. This paper addresses the technical difficulties associated with obtaining the fundamental spectroscopic parameters to support high precision CO_2 retrievals.