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Polarization Effects on Column CO_2 Retrievals from GOSAT Measurements

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The Japanese Space Exploration Agency (JAXA) successfully launched the Greenhouse Gases Observation Satellite (GOSAT), dedicated to the measurement of CO_2 columns, in 2009. The objective of GOSAT is to quantify the sources and sinks of CO_2 by making highly precise measurements of its column abundance. GOSAT measures absorption of reflected sunlight at the top of the atmosphere (TOA) in the short-wave infrared (SWIR) with spectrometers that are highly sensitive to atmospheric polarization. Consequently, one of the biggest challenges to accurate retrievals is the consideration of polarization in the modeling of the atmospheric radiative transfer.

We have developed a fast and accurate two orders of scattering (2OS) model to account for polarization effects due to the atmosphere and surface. We have shown that the 2OS model works very well for an Orbiting Carbon Observatory (OCO) like instrument. In this work, we apply the same model to GOSAT observations to investigate the impact of signal to noise ratio (SNR) and spectral resolution. GOSAT measures two orthogonal components of polarization (P and S) and we study the polarization effect on column CO_2 retrievals, comparing results derived separately for each component.