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The methane retrieval algorithm for TROPOMI aboard Sentinel-5 Precursor

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The Tropospheric Monitoring Instrument (TROPOMI) is scheduled for launch on board ESA's Sentinel-5 Precursor satellite in 2015. One of TROPOMI's goals will be to accurately monitor methane concentrations in the Earth's atmosphere by measuring spectra of backscattered sunlight in the shortwave-infrared (SWIR) spectral range. The key improvement of TROPOMI methane measurements compared to earlier instruments is its very good spatial coverage (global coverage within one day). The main challenge when retrieving methane abundances from SWIR spectra is to properly account for light path modifications by aerosol particles and cirrus clouds. We present a retrieval algorithm that accounts for light path modifications by simultaneously retrieving methane concentrations and atmospheric scattering properties. The algorithm is based on online radiative transfer calculations but is still sufficiently fast for operational processing. We show that our method is accurate and robust by testing the retrieval performance for a global ensemble of simulated observations of aerosol and cirrus loaded scenes. Furthermore, we perform a sensitivity analysis with respect to errors in the measured spectrum and in the assumed pressure, temperature and absorber profiles.