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# Chlorophyll fluorescence: implementation in the full physics RemoTeC algorithm

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Several operating and future satellite missions are dedicated to enhancing our understanding of the carbon cycle. They infer the atmospheric concentrations of carbon dioxide and methane from shortwave infrared absorption spectra of sunlight backscattered from Earth's atmosphere and surface. Exhibiting high spatial and temporal resolution, the inferred gas concentration databases provide valuable information for inverse modelling of source and sink processes at the Earth's surface.

However, the inversion of sources and sinks requires highly accurate total column $CO_2$ ($XCO_2$) and CH4 (XCH4) measurements, which remains a challenge. Recently, Frankenberg et al., 2012, showed that - beside $XCO_2$ and XCH4 - chlorophyll fluorescence can be retrieved from sounders such as GOSAT exploiting Fraunhofer lines in the vicinity of the $O_2$ A-band. This has two implications: a) chlorophyll fluorescence itself being a proxy for photosynthetic activity yields new information on carbon cycle processes and b) the neglect of the fluorescence signal can induce errors in the retrieved greenhouse gas concentrations.

Our RemoTeC full physics algorithm iteratively retrieves the target gas concentrations $XCO_2$ and XCH4 along with atmospheric scattering properties and other auxiliary parameters. The radiative transfer model (RTM) LINTRAN provides RemoTeC with the single and multiple scattered intensity field and its analytically calculated derivatives. Here, we report on the implementation of a fluorescence light source at the lower boundary of our RTM. Processing three years of GOSAT data, we evaluate the performance of the refined retrieval method. To this end, we compare different retrieval configurations, using the s- and p-polarization detectors independently and combined, and validate to independent data sources.