Geophysical Research Abstracts
Vol. 19, EGU2017-15903, 2017
EGU General Assembly 2017

CO_2, H_2O, and chlorophyll fluorescence retrieved from OCO-2 measurements using a fast radiative transfer model approximating multiple scattering effects

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Carbon dioxide is the most important anthropogenic greenhouse gas. Its global increasing concentration in the Earth's atmosphere is the main driver for global climate change. In spite of its importance, there are still large uncertainties on its global sources and sinks. Satellite measurements have the potential to reduce these surface flux uncertainties.

However, the demanding accuracy requirements usually involve the need for precise radiative transfer calculations in a scattering atmosphere. These can be computationally so expensive that hundreds or thousands of CPU cores are need to keep up with the data stream of an instrument like OCO-2. Future instruments will further increase the amount of soundings at least by an order of magnitude.

A radiative transfer model has been developed approximating scattering effects by multiple scattering at an optically thin scattering layer reducing the computational costs by several orders of magnitude. The model can be used to simulate the radiance in all three OCO-2 spectral bands allowing the simultaneous retrieval of CO_2, H_2O, and chlorophyll fluorescence. First retrieval results for OCO-2 data will be presented.