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Cloud retrieval using the oxygen A-band in support of trace gas retrievals from TROPOMI

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TROPOMI (TROPOspheric Monitoring Instrument) is a nadir viewing shortwave spectrometer to measure the tropospheric composition for climate and air quality applications. The TROPOMI instrument, an initiative from the Netherlands and developed in co-operation with ESA, will be launched in December 2014 as a single payload on the ESA/GMES Sentinel 5 Precursor mission. This mission is an important step forward from the current OMI on NASA EOS Aura and SCIAMACHY on Envisat towards the operational Sentinel 5 mission that is planned around 2020.

TROPOMI will measure the UV-visible wavelength range from (270 – 500 nm), the near infrared (710 – 770 nm) and the shortwave infrared (2314 – 2382 nm). TROPOMI will have an unprecedented spatial resolution of about $7 \times 7\,\mathrm{km}^2$ at nadir. The spatial resolution is combined with a wide swath to allow for daily global coverage.

The science requirements formulated for the trace-gases are challenging, requiring advanced retrieval techniques. One of the areas where the TROPOMI science team wants to improve upon the current generation of retrieval algorithms is in the estimated precision of the retrieved values. This will require appropriate error propagation and the use of a-priori information to guide the retrieval. This suggests that optimal estimation is the method of choice for TROPOMI level 2 retrievals.

A characterization of cloud in the field of view is needed for the trace gas retrievals. For some trace gases – such as methane – this cloud information acts as a filter, removing cloud-contaminated pixels altogether. For other trace gases there is room within the science requirements to include clouds in the retrieval, and obtain results from a larger number of observations. The O_2 A-band observations of TROPOMI are intended for accurate cloud corrections. To take the presence of clouds into account in the precision estimate for the (tropospheric) trace gas column, the cloud product will need to provide a full error covariance matrix. This allows the trace gas retrieval to pick up where the cloud retrieval finished.

In this presentation some early model results will be shown. Also some anticipated challenges in the operational use of this algorithm will be discussed.