Retrieval of Aerosol Layer Height from Hyperspectral Satellite Data

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Aerosol Layer Height (ALH) is an important factor in radiative processes of the atmosphere and the ALH information will also improve the retrieval of other aerosol properties and trace gases with respect to air mass factor calculations. In principle, oxygen absoptions in the O_2A Band (758-772 nm) offer an opportunity to derive the height information of aerosols from remote sensing hyperspectral measurements.

In this work, we first conducted a retrieval study using synthetic data and then applied two algorithms to real measurements from the TROPOspheric Monitoring Instrument (TROPOMI) onboard Sentinel-5 Precursor. The first method is Tikhonov-based nonlinear least squares approach that is able to produce accurate retrieval results, but considerable processing effort is needed. Furthermore, we also introduced an efficient retrieval method that can be potentially used in future operational processing, employing the spectral sorting method together with machine learning techniques.