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Cloud detection by inversion of MAX-DOAS measurements

— •JAN-MARCUS NASSE¹, JOHANNES ZIELCKE¹, UDO FRIESS¹, JOHANNES LAMPEL², GERT KÖNIG-LANGLO³, and ULRICH PLATT¹ —

¹Institut für Umweltphysik, Heidelberg — ²Max-Planck-Institut für Chemie, Mainz — ³Alfred-Wegener Institut, Helmholtz-Zentrum für Polar- und Meeresforschung, Bremerhaven

Multi-Axis Differential Optical Absorption Spectroscopy (MAX-DOAS) is a widely used technique for the detection of atmospheric trace gases, e.g. NO₂, SO₂, but also for the oxygen collision complex O₄, whose atmospheric distribution is well known. By comparing measured O₄ differential slant column densities (dSCDs) with modelled ones, information on aerosol distributions and optical properties can be gained. In combination with a radiative transfer model, an inversion of measured dSCDs allows the retrieval of vertical aerosol extinction profiles and properties.

Here the ability of MAX-DOAS observations to detect cloud altitude and cloud optical properties of different cloud covers will be discussed. An accurate retrieval of these parameters is crucial for an interpretation of trace gas dSCDs and a subsequent retrieval of vertical profiles from MAX-DOAS measurements under cloudy conditions.

The ability of MAX-DOAS to retrieve cloud layer height and optical properties will be demonstrated with a comparison to co-located measurements of a commercial Ceilometer during several cruises of the German research vessel Polarstern. Advantages, limitations and possible applications of the technique will be discussed.

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Email: jan.nasse@iup.uni-heidelberg.de