Total Column Water Vapour Retrieval from S-5P/TROPOMI in the Visible Blue Spectral Range

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Atmospheric water plays a key role for the Earth's energy budget and temperature distribution via radiative effects (clouds and vapour) and latent heat transport. Thus, the distribution and transport of water vapour are closely linked to atmospheric dynamics on different spatio-temporal scales. In this context, global monitoring of the water vapour distribution is essential for numerical weather prediction, climate modeling and a better understanding of climate feedbacks.

Here, we present a total column water vapour (TCWV) retrieval using the absorption structures of water vapour in the visible blue spectral range. The retrieval consists of the common two-step DOAS approach: first the spectral analysis is performed within a linearized scheme. Then, the retrieved slant column densities are converted to vertical column densities (VCDs) using an iterative scheme for the water vapour a priori profile shape which is based on an empirical parameterization of the water vapour scale height.

We apply this novel retrieval to measurements of the TROPOspheric Monitoring Instrument (TROPOMI) onboard ESA's Sentinel-5P satellite and compare our retrieved H2O VCDs to a variety of different reference data sets. Furthermore we present a detailed characterization of this retrieval including theoretical error estimations for different observation conditions. In addition we investigate the impact of different input data sets (e.g. surface albedo) on the retrieved H2O VCDs.