Visible and near-infrared differential optical absorption spectroscopy (doas) for the measurement of nitrogen dioxide, carbon dioxide and water vapor

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Abstrak

The spectral intensity of direct and scattered solar radiation is of fundamental importance for various studies in civil engineering, agriculture, solar power generation, and radiation budget estimation. In this paper, we describe a ground-based, wide-spectral-range sensor that can be used for measuring spectral intensities both in the visible and near-infrared spectral regions. The measurements are conducted either with artificial light sources or direct/scattered solar radiation. The measured spectra yields information on the absorption features of atmospheric gases such as nitrogen dioxide (NO2), carbon dioxide (CO2) and water vapor, as well as aerosol optical properties in the atmosphere. Relatively weak absorption of nitrogen dioxide is measured with the technique of differential optical absorption spectroscopy (DOAS), whereas aerosol, carbon dioxide, and water vapor amounts are measured by matching the observed spectra with simulated ones. Both High Resolution Transmission (HITRAN) and Moderate Resolution Atmospheric Transmission (MODTRAN) database/codes are used to derive column amounts of absorbing molecular species and to characterize aerosol optical properties.