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DOAS observations of atmospheric trace gases, aerosols and surface properties from unmanned aerial systems

Thomas Wagner, Steffen Beirle, Reza Shaiganfar, and Marloes Penning de Vries
Max Planck Institute for Chemistry, Mainz, Germany (thomas.wagner@mpic.de, +49-(0)6131-305388)

We propose performing Differential Optical Absorption Spectroscopy (DOAS) measurements from unmanned aerial systems (UAS). DOAS observations are possible using miniature spectrometers (typical size: 10x7x4cm), which can be easily integrated in small measurement platforms. Depending on the aim of the observations, different spectral ranges can be used: if the focus is on atmospheric trace gases and aerosols, measurements in the UV-blue spectral range should be chosen. If the focus is on surface properties, a broader spectral range (e.g. from the blue to the near IR spectral range) would be more appropriate. Water vapor should also be measured at larger wavelengths (e.g. in the green or red spectral range).
We give a detailed overview on possible instrumental set-ups and the specific requirements for selected applications (spectral ranges, spectral resolution, integration time, detection limits). These requirements are based on radiative transfer simulations and the experience gained from satellite observations. Also specific recommendations for selected case studies using UAS are given.