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A passive DOAS instrument for trace gas measurements on medium sized UAS: Instrumental design and first measurements.

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Unmanned Aerial Systems (UAS) are a new powerful tool for observations in the atmospheric boundary layer. Recent developments in measuring technology allow the construction of compact and sensitive active and passive DOAS instruments which can fit the space and weight constraints on UAS. This opens new possibilities for trace gas measurements in the lower troposphere, especially in areas which are not accessible to manned aviation e.g. volcanic plumes or which should be monitored regularly (e.g. industrial emissions of a stack).

We present a new developed passive DOAS instrument for the APAESO Platform of the Cyprus Institute, a medium size UAS. It is equipped with two telescopes for observations in downward (nadir) and horizontal (limb) viewing direction, respectively. Thus it allows determining height profiles and the horizontal distribution of trace gases. This is accomplished by analyzing the radiation collected by the telescopes with compact spectrometers, which cover the UV-blue spectral range allowing to measure a broad variety of atmospheric trace gases (e.g. NO_2, SO_2, BrO, IO, H_2O ...) as well as aerosol properties via O_4 absorption. Additionally, the nadir direction is equipped with a VIS-NIR spectrometer. It is used to measure reflection spectra of different types of vegetation. These will serve as references for satellite measurements to create global maps.

First measurements on the APAESO platform were performed in October 2012 on Cyprus in a rural area south of Nicosia. The instrument is shown to work reliably and was able to detect NO_2, H_2O and O_4 at atmospheric column densities.

The instrumental design and first measurements will be presented and discussed.