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Aerosol Measurements at Sub-per-cent Precision Using Wide-field Stellar Photometry

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Wide-field stellar photometry –the process of simultaneous comparison of apparent and catalog brightness of a large amount of stars –has long been a promising method of atmospheric monitoring, as it can provide atmospheric transparency measurements with high temporal and spatial resolution without any artificial illumination of the sky which would disturb nearby optical experiments. However only recently we have developed methods of data analysis that allow an overall uncertainty in the Vertical Aerosol Optical Depth (VAOD) better than one per cent. Such a feat requires precise laboratory measurement of spectral and signal responses of the instruments as well as careful analysis of all systematic effects that can appear during the extraction of stellar signal from the images. We will present a summary of the method with emphasis on the reliability of the estimates of uncertainties. Furthermore, we will discuss various possible applications of the method in different modes of operation, a comparison with other methods of aerosol measurement and a selection of open questions and areas for further improvement.

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