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Multiwavelength Polarized Imaging Nephelometer (PI-Neph) in support of aerosol microphysical properties retrievals

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Atmospheric aerosol particles are the forcing agent with largest uncertainty in climate change estimations, mainly due to the high variability of their properties with space and time. Satellite remote sensing is necessary to reduce this uncertainty, since it allows the obtention of aerosol properties from wide regions all over the world with the use of inversion algorithms. However, inversion algorithms based on remote sensing measurements need a-priori information on how aerosol particles scatter incoming light at different angles, i.e., information of aerosol phase functions. Additionally, polarization improves the retrievals since it allows discrimination between light scattered by particles and light scattered by the surface [1].

The UGR station of AGORA (Andalusian Global ObseRvatory of the Atmosphere), located in Granada (Spain), counts with a Polarized Imaging Nephelometer (PI-Neph) [2] that allows continuous measurements of the P_{11} and P_{12} elements of the scattering matrix at three wavelengths (405, 515 and 660 nm) and gives information about phase functions and polarization of real aerosol samples. In this study, we present a wide description of the operation of the instrument and a comparison of the scattering coefficients measured by the PI-Neph and the TSI 3563 for validation of the measurements. We show measurements of scattering matrix elements for different atmospheric conditions, revealing huge differences depending on aerosol type. First results of GRASP inversions from PI-Neph data in Granada are also shown.

Keywords: aerosol scattering, phase function, polarization, multiwavelength nephelometry, inversion algorithms

References

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