

Advanced Aerosol Characterization from Nephelometers using GRASP algorithm

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This work demonstrates the capability of characterizing aerosol optical and microphysical properties using phase function (P11) and degree of polarization (-P12/P11) measurements from nephelometers developed by Airphoton using GRASP (Generalized Retrieval of Aerosol and Surface Properties) algorithm.

The 3-wavelength polarized imaging nephelometer (PI-Neph) allows the accurate measurement of phase function (P11) and degree of polarization (-P12/P11), while the integrated nephelometer measures forward and backward scattering, with the capability to adjust the particle radius range of PM1, PM2.5, PM4, and PM10 by controlling inlet flow rate. GRASP as a next generation aerosol retrieval algorithm (<http://www.grasp-open.com>), has been applied in a variety of remote sensing/in situ observations [1]. In our study, the capability of GRASP for advanced aerosol characterization from different types of nephelometers have been demonstrated. For PI-Neph [2], both synthetic data with and without random noise added, and measurement data obtained in Granada, Spain, could be reproduced successfully, while aerosol size distribution and optical properties are retrieved with good accuracy compared to referenced data. While integrated nephelometer using nephelometer data only and synergy retrievals with aethalometer observations have been performed, it’s found out that fine mode size distribution can be retrieved with good accuracy without the combination with aethalometer observations. However, the coarse mode size distribution and refractive index retrieval have some uncertainties with the presence of random noise. Combining aethalometer data can reduce the uncertainty of imaginary refractive index retrieval from integrated nephelometer, and including size cut-off information can enhance the accuracy of size distribution retrieval. In general, GRASP demonstrate great potential of retrieving aerosol properties from nephelometer measurements.

Keywords: PI-Neph, integrated nephelometer, aerosol characterization, GRASP algorithm

References

- [1] Dubovik, O., *et al.*, 2014: GRASP: a versatile algorithm for characterizing the atmosphere. *SPIE: newsroom*, September 19.
- [2] Dolgos, G., Martins, J. V., 2014: Polarized Imaging Nephelometer for in situ airborne measurements of aerosol light scattering. *Optics Express*, 22(18), pp.21972–21990.

Preferred mode of presentation

- Oral
 Poster
 Either

Topic (check all that apply)

- Inversion algorithms - achievements and new ideas to derive aerosol, clouds and surface properties
 Characterization of aerosol, clouds and surface
 Modeling and inverse modeling of aerosol and clouds climatic effects
 Measurement synergy approaches
 In situ observations and field campaigns
 Upcoming and current satellite missions

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Other: if checked, enter description here