Near-backscattering optical properties of aerosols

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Knowledge of backscattering optical properties of aerosol particles plays an important role in active lidar remote sensing and particle characterization studies. However, it is challenging to accurately measure the backscattering optical properties of aerosols in a laboratory environment. On the other hand, accurate computation of backscattering optical properties of large-sized model particles has also been a challenging research subject. Therefore, a combination of near-backscattering measurements and modeling analysis [1] would be valuable to obtain a better knowledge of backscattering optical properties at 180°. In this study, we employed an invariant imbedding T-matrix method (IITM) [2,3] to compute the single scattering properties of randomly oriented particles with different size parameters, shape parameters (i.e., aspect ratio and roundness parameter), and refractive indices. For case studies, we applied the IITM to randomly oriented super-spheroids with a size parameter up to 150. The differences of lidar ratios and depolarization ratios at near-backscattering angles (173°, 175°, 178°) and exact-backscattering angle (180°) are quantified with respect to the size parameter and aerosol refractive indices. The findings in this study will be helpful to understand how backscattering ratios change at near backscattering angles, and the uncertainties if optical properties are measured at near-backscattering directions instead of 180°.

References

[1] Järvinen, E., O. Kemppinen, T., Nousiainen, *et al.*, 2016: Laboratory investigations of mineral dust near-backscattering depolarization ratios. *J. Quant. Spectrosc. Radiat. Transfer* **178**, 192–208.

[2] Bi, L., and P. Yang, 2014: Accurate simulation of the optical properties of atmospheric ice crystals with invariant imbedding T-matrix method. *J. Quant. Spectrosc. Radiat. Transfer* **138**, 17–35.

[3] Bi, L., W. Lin, D. Liu, and K. Zhang, 2018: Assessing the depolarization capabilities of nonspherical particles in a super-ellipsoidal shape space. *Opt. Express* **26**, 1726–1742.

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