

Advances in digital holography of aerosol particles

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Digital holography has proven a powerful method to study aerosol particles. In the method, a particle is illuminated by an expanded laser beam and the interference pattern produced by unscattered and forward-scattered light from the particle is recorded on a sensor such as a CCD. This interference pattern is the hologram, and from it, an image of the particle can be unambiguously rendered. However, we have recently shown that other useful information may be obtained from a particle's hologram [1,2]. For example, we will explain here how the two-dimensional angular scattering pattern in the far-field can be generated from the hologram via Huygens's principle [2]. We will also discuss our ongoing laboratory and instrument-development work applying digital holography to atmospheric aerosols [3].

References

- [1] Berg, M. J., N. R. Subedi, and P. A. Anderson, 2017: Measuring extinction with digital holography: Nonspherical particles and experimental validation. *Opt. Lett.* **42**, 1011–1014.
- [2] Giri, R., C. Morello, Y. W. Heinson, O. Kemppinen, G. Videen, and M. J. Berg, 2019: Generation of aerosol-particle light-scattering patterns from digital holograms. *Opt. Lett.* **44**, 819–822.
- [3] Berg, M. J., Y. W. Heinson, O. Kemppinen, and S. Holler, 2017: Solving the inverse problem for coarse-mode aerosol particle morphology with digital holography. *Sci. Rep.* **7**, 9400.

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