AGU 100 FALL MEETING
Washington, D.C. | 10–14 Dec 2018

A14A-08: Lorenz–Mie scattering in an absorbing host medium

Monday, 10 December 2018
17:45 - 18:00
Walter E Washington Convention Center - 151B

Many applications of electromagnetic scattering in remote sensing involve particles immersed in an absorbing rather than lossless medium, thereby making the conventional scattering theory potentially inapplicable. To analyze this issue quantitatively, we employ the FORTRAN program developed on the basis of the first-principles electromagnetic theory to study far-field scattering by spherical particles embedded in an absorbing host. We identify and examine the spectacular phenomenon of negative extinction for monodisperse spheres and summarize evidence in favor of its interference origin. We identify the main effects of increasing the width of the size distribution on the ensemble-averaged extinction efficiency factor and show that negative extinction can be eradicated by averaging over a very narrow size distribution provided that absorption in the host medium is sufficiently weak. We also analyze the effects of absorption inside the host medium and ensemble averaging on the phase function and other elements of the Stokes scattering matrix. It is shown that increasing absorption significantly suppresses the interference structure and can result in a dramatic expansion of the areas of positive polarization. Furthermore, the phase functions computed for larger effective size parameters can develop a very deep minimum at side-scattering angles bracketed by a strong diffraction peak in the forward direction and a pronounced backscattering maximum.

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