

Single scattering albedo of agglomerated debris particles and homogeneous spheres: a comparison

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The aerosol single scattering albedo (SSA) is the dominant intensive particle parameter determining aerosol radiative forcing in the earth's atmosphere [1–3]. We build on previous work that used Mie theory to examine the behavior of SSA as a function of size parameter x and complex refractive index m for homogeneous spherical particles [4,5].

Here, we investigate the behavior of SSA as a function of size parameter x for agglomerated debris particles [6] that are a much more realistic model for atmospheric mineral dust particles than homogeneous spheres. We use discrete dipole approximation (DDA) calculations to obtain SSA as function of size parameter and imaginary part of the refractive index. These results are compared with Mie theory results for homogeneous spherical particles and we show that SSAs for agglomerated debris particles and homogeneous spheres converge in the small particle and geometric optics regimes if complex refractive indices are adjusted properly using effective medium theory [7]. However, in the intermediate transition regime there are substantial differences in the SSAs of these two types of particles that greatly affect their radiative forcing.

References

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