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# *Interactive comment on* "snowScatt 1.0: Consistent model of microphysical and scattering properties of rimed and unrimed snowflakes based on the self-similar Rayleigh-Gans Approximation" *by* Davide Ori et al.

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This paper describes a new modeling system for computing the radiative properties of snow particles in the microwave band. As such, it has the potential to move the field of microwave radiative transfer from its earlier (though still relatively recent) numerical experiments and databases for a limited set of frequencies and particle shapes to a practical community resource that appears to be both easy to use and of wide potential applicability. It includes an impressive database of modeled snow aggregates, both rimed and unrimed, and it utilizes a computationally efficient and flexible numer-



ical methodology – the self-similar Rayleigh-Gans Approximation (SSRGA) – for the single-particle scattering calculations. I don't know of any other research group undertaking something comparably ambitious and versatile, and I predict that this will quickly become a go-to tool for radiative transfer calculations and as a foundation for inverse methods related to both passive and active microwave remote sensing.

Except for a few specific instances noted below, the paper is well-written and quite thorough in describing both the methods and the limitations of the tool.

I visited the github repository and found that the software is convenient to download and install, though I haven't tried using it yet. There's a good start on documentation, though some sections appear not to have been written yet.

My overall recommendation is to publish after considering the comments below.

Minor comments:

lines 54, 131: The SSRGA is introduced here with appropriate citations, but for readers who haven't read those other papers yet, an additional sentence or two explaining what "self-similar" means in this context could be helpful.

line 61: Offhand, at least, I don't know what a "Rayleigh distribution of polarimetric components" is, so maybe a slight elaboration would be useful here as well.

line 77: "parametrized" should be "parameterized"

Eq. (3): The RGA yields a symmetric scattering phase function, as shown by this equation. But I believe that for diameters $D$ (where $D$ is the dimension in the direction of the propagating wave) much greater than about 0.1$\lambda$, the phase function quickly shifts toward stronger forward scattering owing to consistently constructive interference in the forward direction (irrespective of size) and varying degrees of destructive interference in the backward direction. Since this is mainly a geometric effect, I'm not even sure whether small $|n-1|$ eliminates that asymmetry, so I'm wondering whether whether Eq. (2) tells the whole story. In other words, a particle with $kD \sim 1$ or greater, should not, I don't think, conform to Eq. (3) regardless of whether it satisfies Eqs. (1) and (2). If I'm mistaken on this, please disregard this comment, but it would be worth checking and clarifying, if needed.

line 119: Is $V$ the spherical-equivalent volume?

line 148: Fig. 1 is not completely convincing as regards the purported convergence of $\beta$ and $\gamma$. Any curve starts to look flat as it approaches zero on a linear axis. The point might be made more convincingly if a log vertical axis were used in the plot.

line 467: For what it's worth, Petty and Huang (2010) found that neither Bruggeman nor Maxwell-Garnett dielectric mixing formulas gave the best fit to DDA calculations for soft spheres but rather Sihvola (1989) with an exponent of 0.85.

General:

Several references are made to the computational cost of the DDA method. While true, note that Petty and Huang (2010) demonstrated a variation on the method that at least avoids the extremely large memory requirement of DDSCAT in the case of low-density aggregates and effectively allows smaller dense linear systems to be solved rather than very large sparse ones. In other words, I think DDSCAT might not be the ideal benchmark for evaluating the viability of the DDA approach in a resource-limited computational environment. DDA calculations can be run inexpensively on desktop workstations using the alternative approach.

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