Towards a database of ensemble rather than single-scattering properties of ice and snow particles

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Scattering properties of ice and snow particles are essential components but also currently one of the biggest challenges for radiative transfer models (RTM) in the microwave. Large progress has been made during recent years in developing databases of single particle scattering properties including an increasing number of more and more realistic particle habits. However, by using single scattering properties, we strongly idealize the fact that any sensor observes scattering from an ensemble of particles rather than one specific habit.

Recently, the so called Self-similar Rayleigh Gans Approximation (SSRGA) has been presented as a new way to tackle this problem. SSRGA utilizes the self-similarity of snow aggregates to derive their ensemble scattering properties with the Rayleigh-Gans approximation. After deriving a number of coefficients for the particle structures, all non-polarimetric scattering properties can be derived for a wide frequency range with analytic formulas.

In this contribution, we will present the performance of the SSRGA derived for over 100’000 various aggregate types and compare their physical as well as scattering properties with well-established single-scattering databases. We will also show evaluations of the new SSRGA to observed scattering signatures observed by multi-frequency radar observations. Finally, a python tool will be introduced which allows the scientific community to easily infer scattering and particle properties similar to well-established single-scattering scattering databases.