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Dry and wet snow particle radiative properties at radar and microwave frequencies

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The present work aims at providing a database of single-scattering properties of wet and dry snow crystals to be implemented in accurate precipitation retrieval algorithms.
Since it has been demonstrated that simplified microphysical models (assuming spherical or spheroidal shapes) are not adequate to represent the radiative properties of large and complex snowflakes, an innovative database of realistic snow particles, including pristine and aggregated crystals, has been simulated. The model algorithm used to define the microphysical aspects of the snow particles accounts for snow growth processes including water vapour deposition, aggregation for differential sedimentation and aggregation for turbolent mixing. The derived database spans over the natural variability of snow particle's microphysical properties such as maximum diameter, aspect ratio and mass-size relation, as it has been measured in various field campaigns. Considering the importance of melting processes related with snow precipitation at extra-tropical latitudes, an original melting scheme has been applied in order to model mixed-phase particles for multiple solid/liquid fraction.

The radiative properties of any single particle have been calculated using a Discrete Dipole Approximation code which is sufficiently flexible to model irregurarly shaped particles. The investigated frequencies range from 5.6 GHz to 190 GHz and cover various microwave channels that are commonly used in both active and passive remote sensing instruments.