



On the role of particle-flow interactions in cloud microphysics

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Different microphysical processes and background turbulence influence the dynamics of hydrometeors, whether we are interested in studying them in isolation or their interaction leading to aggregation and growth. In this talk, I will discuss two scenarios: the orientation dynamics of ice crystals in mixed-phase clouds and droplet coalescence in warm cumulus clouds.

In the first part, I will focus on the dynamics of anisotropic particles in turbulent flows, primarily motivated by the behaviour of ice crystals in mixed-phase clouds. The competition between gravitational alignment and turbulent randomization is a crucial process that affects the scattering of electromagnetic radiation from these icy clouds. I will highlight the theoretical calculation of orientation dynamics of an anisotropic particle settling in homogeneous isotropic turbulence with comparisons made with numerical simulations and experimental observations.

The second part of the talk will discuss calculating the collision rate of droplets sedimenting in a turbulent flow, which is necessary to capture the evolution of the drop size distribution in warm clouds. Raindrop formation from nucleating aerosol particles can occur via a zoo of physical processes that can dictate the relative approach of two droplets - van der Waals forces, gas compressibility, and drop deformation, to name a few! Using a combination of asymptotic calculations and numerical simulations, I will show that the non-continuum effects are essential to induce collisions; it is incorrect to use the continuum equations when the gap between the two drops is comparable to the mean free path of the gas.

Thursday, 12 June 2024, 2:00PM

Refreshments 1:45PM

Please also join colleagues for refreshments and informal discussion after the seminar until 3:30pm

NCAR-Foothills Laboratory, 3450 Mitchell Lane

FL2-1022, Large Auditorium

Seminar will also be live webcast

<https://operations.ucar.edu/live-mmm>

Participants may ask questions during the seminar via Slido.