MMM SEMINAR SERIES

How do warm clouds form? Basics of CCN activation and how turbulence can affect it

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Cloud droplets in natural clouds form because of the presence of sub-micron soluble aerosol particles called cloud condensation nuclei (CCN). Without them, formation of cloud droplets out of water vapor would never be possible in the Earth atmosphere. The theory describing formation of cloud droplets is referred to as the CCN activation. The equilibrium thermodynamics theory that explains CCN activation was developed close to a century ago by Hilding Köhler, a Swedish meteorologist from the University of Uppsala (Köhler 1936). I will review the Köhler theory and discuss how it is usually applied to explain observed concentrations of cloud droplets in natural clouds. The latter typically involves an adiabatic air parcel carrying CCN, rising though the cloud base, and forming cloud droplets.

In the second part, I will answer the question of what happens if the adiabatic parcel is also filled with turbulence. Since the parcel typically rises from the boundary layer, this is not unexpected. Numerical simulations suggest that turbulence can significantly impact CCN activation, increasing droplet spectral width when activation is completed several tens of meters above the cloud base.

Thursday, 7 April 2022, 2:00pm
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.