

RICO Modeling Studies

Group interests

RICO data in support of studies

Group Activities

- Microphysical processes on cloud scale (giant aerosol particles, entrainment and mixing-- influence on droplet size distributions and precipitation formation)
 - U. of Illinois
 - U. of Utah
 - NOAA
 - Purdue U.
- Statistics of cloud ensembles & obs to constrain LES of cloud fields
 - UCLA
- Obs to constrain regional-scale parameterizations of shallow clouds and interaction with ambient aerosol
 - CSU

RICO Data Needed: *Characterizing the Environment*

- Daily (or more frequent) soundings
- Rawinsonde data incorporated into GTS for inclusion in NWP analyses & forecasts
- Daily horizontal and vertical mapping of aerosol, CCN, and giant/ultrafine aerosol
- Temporal evolution of sfc fluxes & state variables at sfc and beneath cloud base
- State variables at cloud heights but outside cloud, and above cloud
- Profiles of trace gases and aerosol upshear and downshear of clouds
- Integrated total water from ship radiometer
- Detailed measurements of aerosol and winds beneath cloud bases from ship Doppler lidar

RICO Data Needed: *Characterizing the Environment*

- Within ship-centered control volumes
 - estimates of surface fluxes and temperature
 - radiative fluxes at the top and bottom of the control volume, i.e., at the surface and at some level some hundreds of meters above the highest clouds
 - profiles of the thermodynamic quantities and horizontal winds through the depth of the boundary layer, extending perhaps to 1km above the highest clouds for the purposes of radiative calculations.
 - turbulent fluxes of heat, moisture and momentum in the sub-cloud layer
 - cloud and environmental statistics at several levels within the cloud layer
 - interface statistics indicating the height and variability of the trade inversion and the transition layer often observed at cloud base.

RICO Data Needed: *Characterizing the Clouds*

- Accumulation mode aerosol, CCN, giant/ultra-giant aerosol beneath cloud bases
- Aircraft documentation of cloud base height and thermodynamic properties
- Radar coverage of cloud properties: cloud top heights and widths, echo evolution from initial stages through precipitation formation
- Multilevel, in-situ characterization of:
 - **Cloud IWC**
 - **Drop size distributions**
 - **Temperature**
 - **Water vapor**
 - **Winds**
 - **Dissipation rate of the**

RICO Data Needed: *Characterizing the Clouds*

- Raindrop size distributions and rainrate estimates
- Liquid water paths from ship-based microwave radiometer
- High-res mapping of in-cloud velocities at different levels in cloud with Wyoming cloud radar

