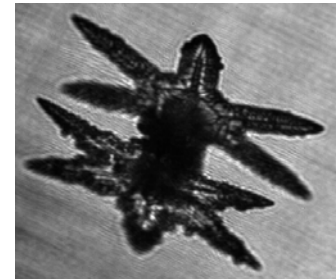


Cumulus Experiment: Objectives and possible methods

- What are the structural, dynamic and microphysical feature that accompany the appearance of *first ice* and what are rates of spread?
- What factors influence the evolution of ice concentrations with space and time?
- In situ aircraft and airborne radar techniques
- Ground based radars
- Mobile radars?
- Which ones are best suited?
 - Can first ice be found or only “early ice”?
 - What conditions are ideal—continental congestus? Other?



Objectives and Methods, cont.

What ice formation mechanisms are active and to what extent important.

Primary formation

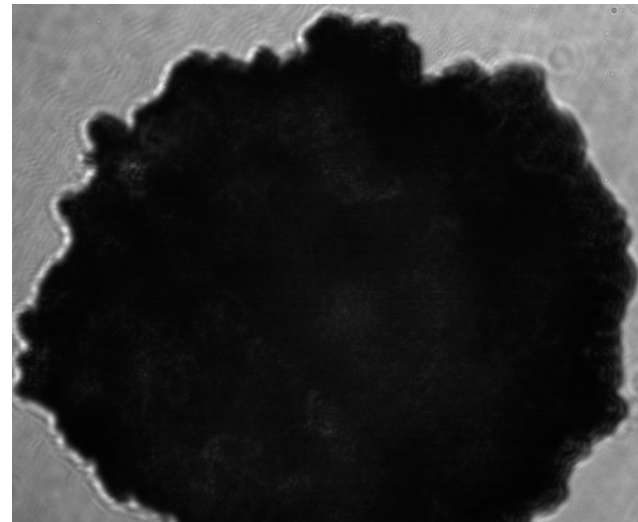
Mode of nucleation

Secondary production

H-M Rime splintering

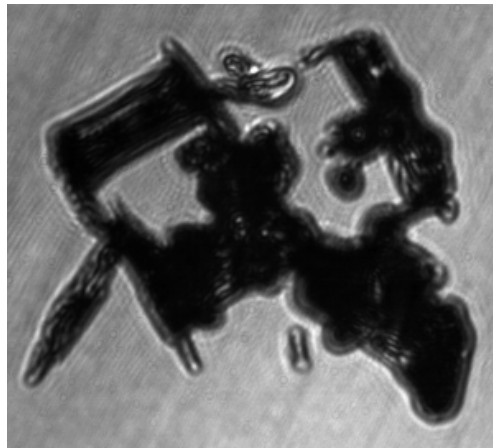
Other?

- In situ aircraft



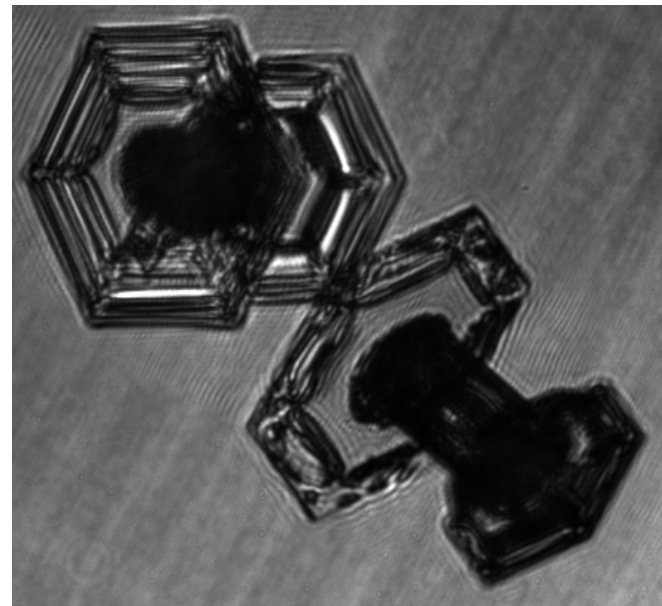
Objectives and Methods, cont.

- What aerosol are important for ice formation?
- Can we connect aerosol measurements to observed ice in clouds?
- Airborne CCN, GCCN, IN, High Volume TDMA, single particle MS, CVI.
- Understanding of aerosol source regions
 - Satellite data
 - Aerosol Models
- Microphysical cloud models



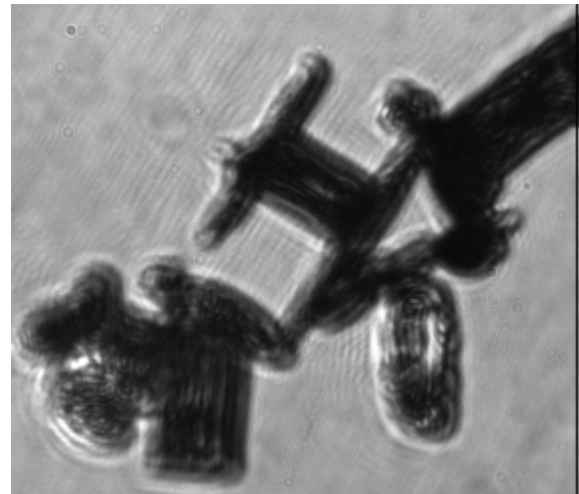
Objectives and Methods, cont.

- Does evaporation or mixing affect ice formation?
- Are certain air trajectories favored for ice formation, such as cloud cycling?
- Does cloud cycling/evaporation affect cloud active properties of aerosol?
- Airborne aerosol and cloud particle measurements.
- Passive or active tracer experiments.



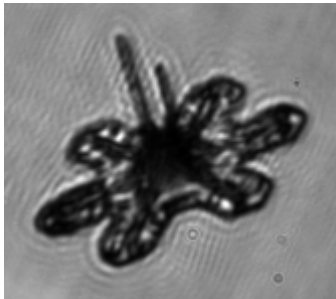
Types of sampling

- Desire to get variety of conditions (continental, maritime, low base, high base, different airmass, different sizes of clouds, etc.)
- Need to be connected to ground radars, profilers, etc.
- Sample in one (two) location (s) over long periods.
- Use mobility of aircraft to sample multiple locations.

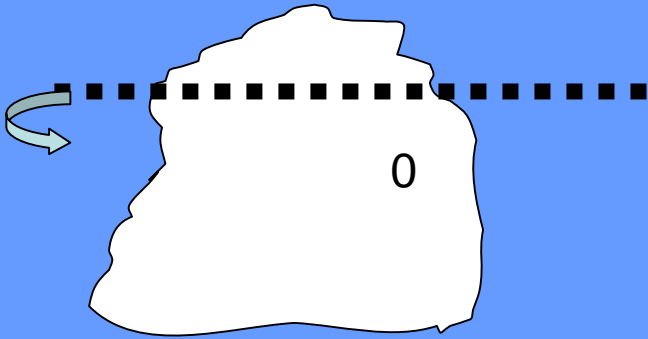


Possible Locations

- Continental
- Maritime
 - Midlatitude costal
 - Tropical
- US high plains
- West cost
- Caribbean



Flight Plans: Many possibilities



- Profiles of aerosol properties
- through depth of cloud
- In Situ Sampling
 - Following a region (e.g. cloud top)
 - Characterizing cloud base
 - Or in survey mode
 - Coordinating with Radar
 - Guided by numerical model
 - Tracer or seeding experiments
- Single and multiple aircraft considerations—e.g. airborne radar.