

Overview of Measurements for Understanding Precipitation Enhancement



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Gas Concentrations + Aerosol Transport

Gas Analyzers

Aircraft, Satellite



Aerosol Spectrum

DMA, PCASP

Aerosol Spectrum + Aerosol Chemistry

DMA, PCASP

Filter Pack



CCN Spectrum

CCN Counter

CCN Spectrum + Updraft + Moist

CCN Counter

AIMMS

DP Sensor



Droplet Spectrum

FSSP

Droplets Spectrum + Instability

FSSP

Balloon, Aircraft



Drizzle

FSSP, 2D-C

Drizzle + Collision/Coalescence

FSSP, 2D-C



Rain

2D-P, Radar

Rain

+

Humidity Profile

2D-P, Radar

Balloon, Aircraft



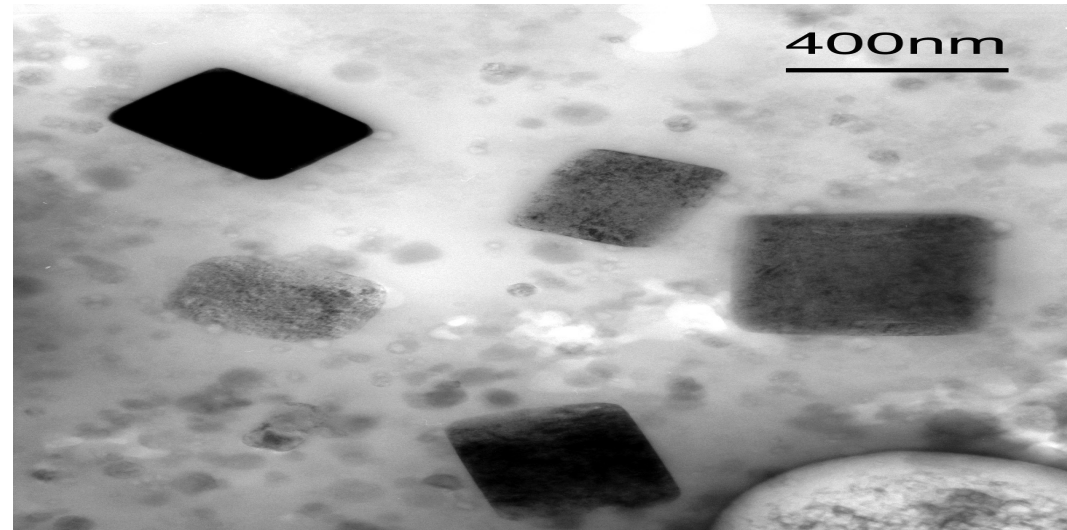
Precipitation

Rain Gauge

Gas Concentrations + Aerosol Transport
Gas Analyzers Aircraft, Satellite



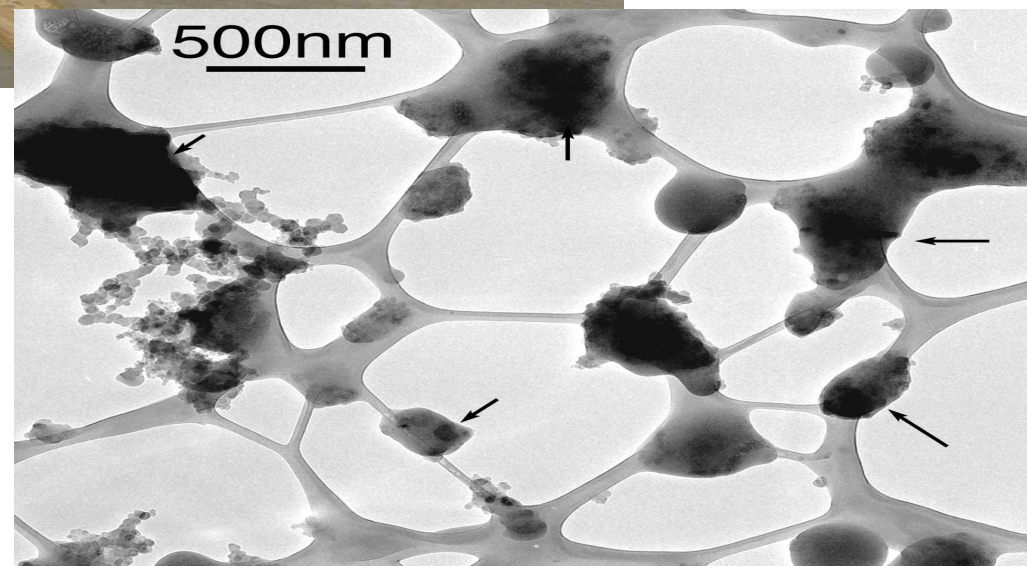
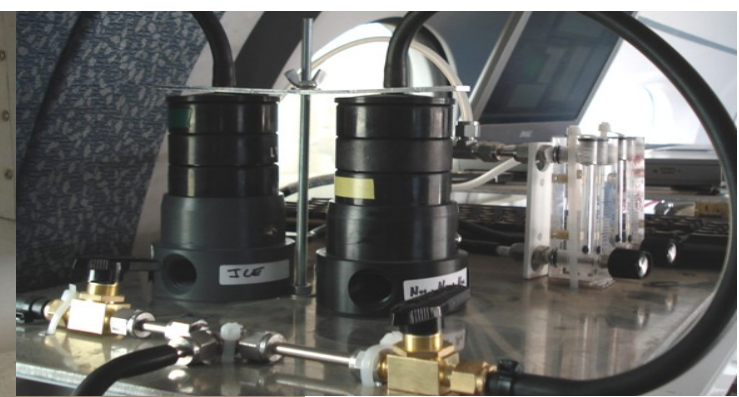
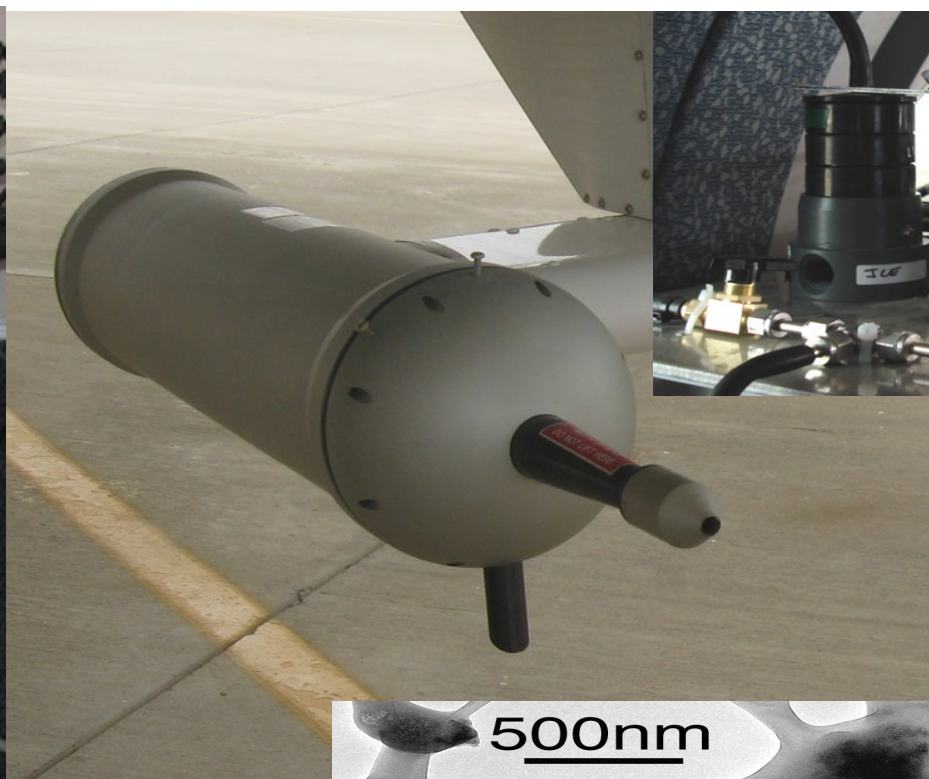
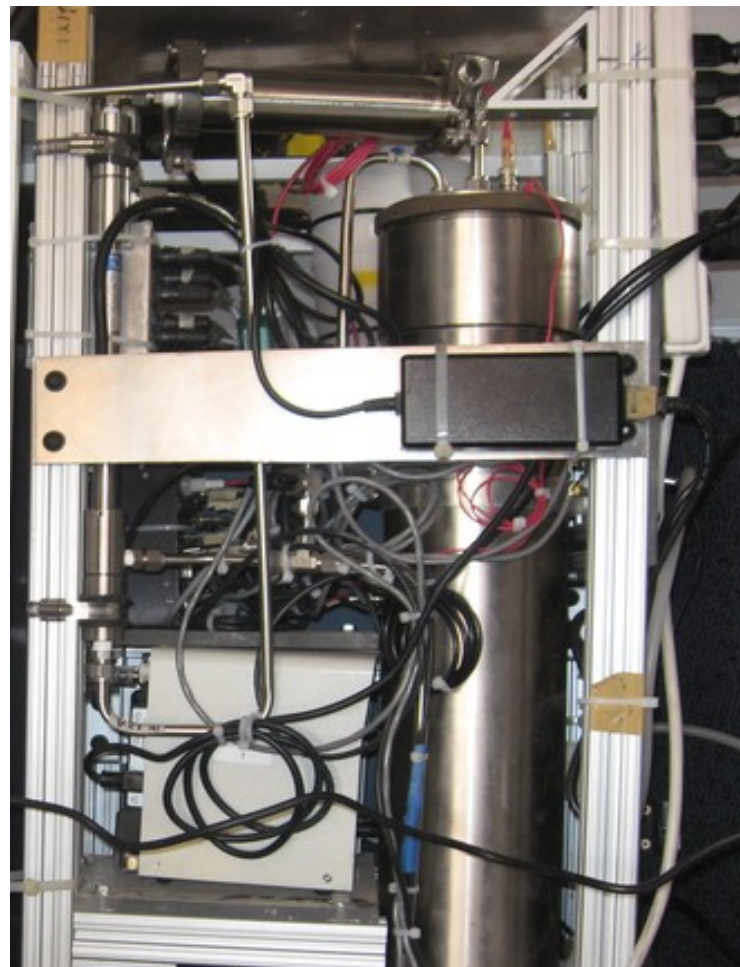
Aerosol Spectrum
DMA, PCASP



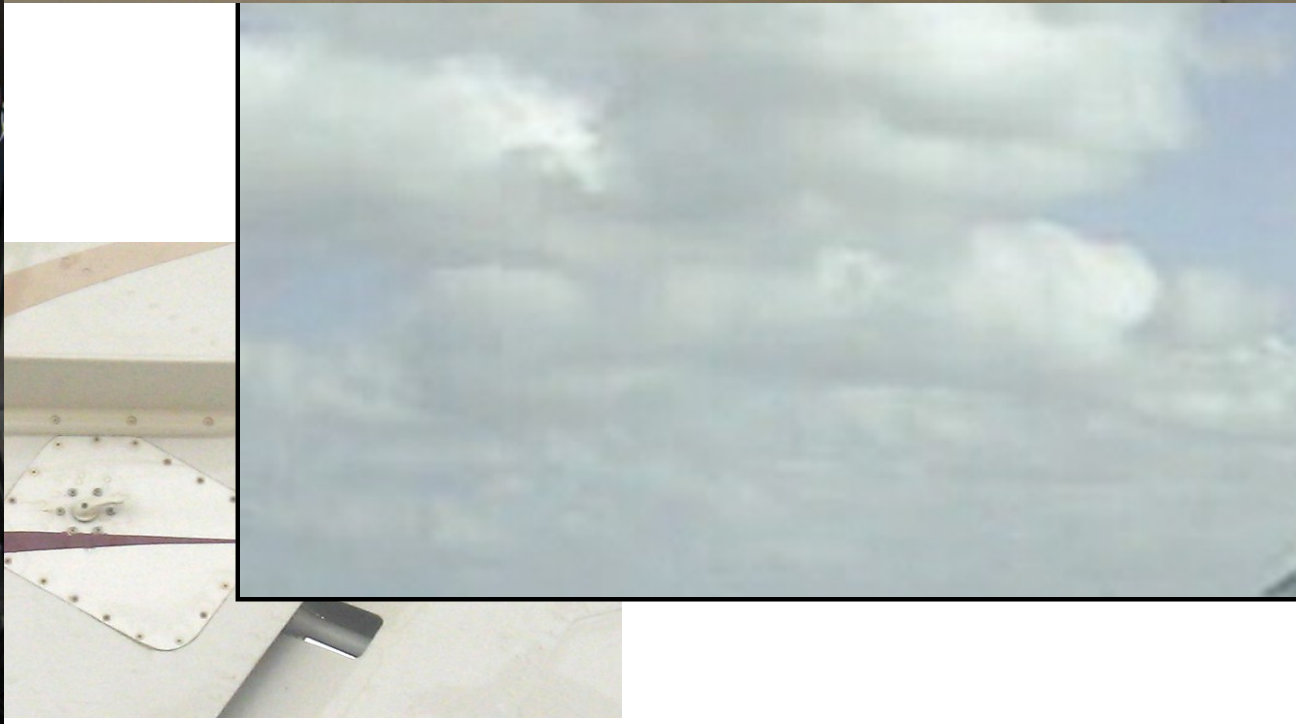
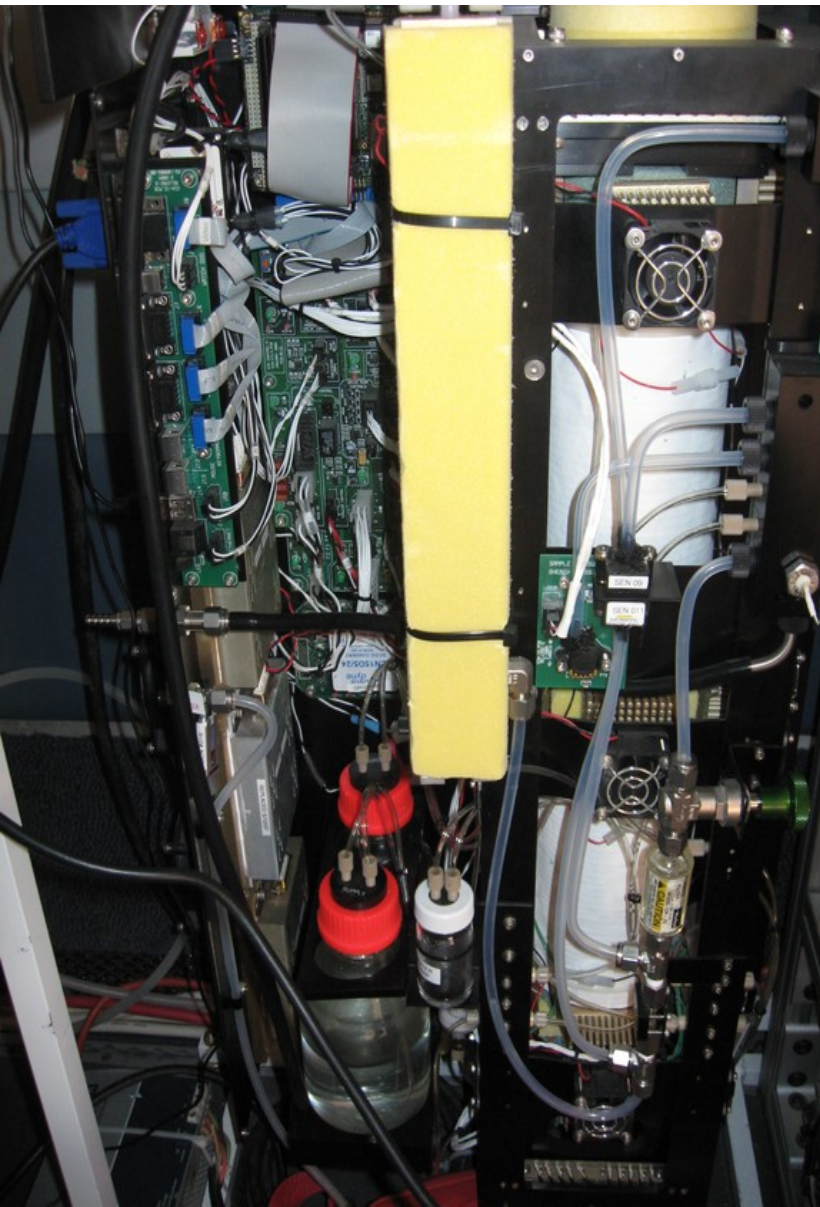
Aerosol Spectrum + **Aerosol Chemistry**
DMA, PCASP Filter Pack



CCN Spectrum
CCN Counter



CCN Spectrum + **Updraft** + **Moist** → **Droplet Spectrum**
CCN Counter AIMMS DP Sensor FSSP



Droplets Spectrum + **Instability**
FSSP Balloon, Aircraft



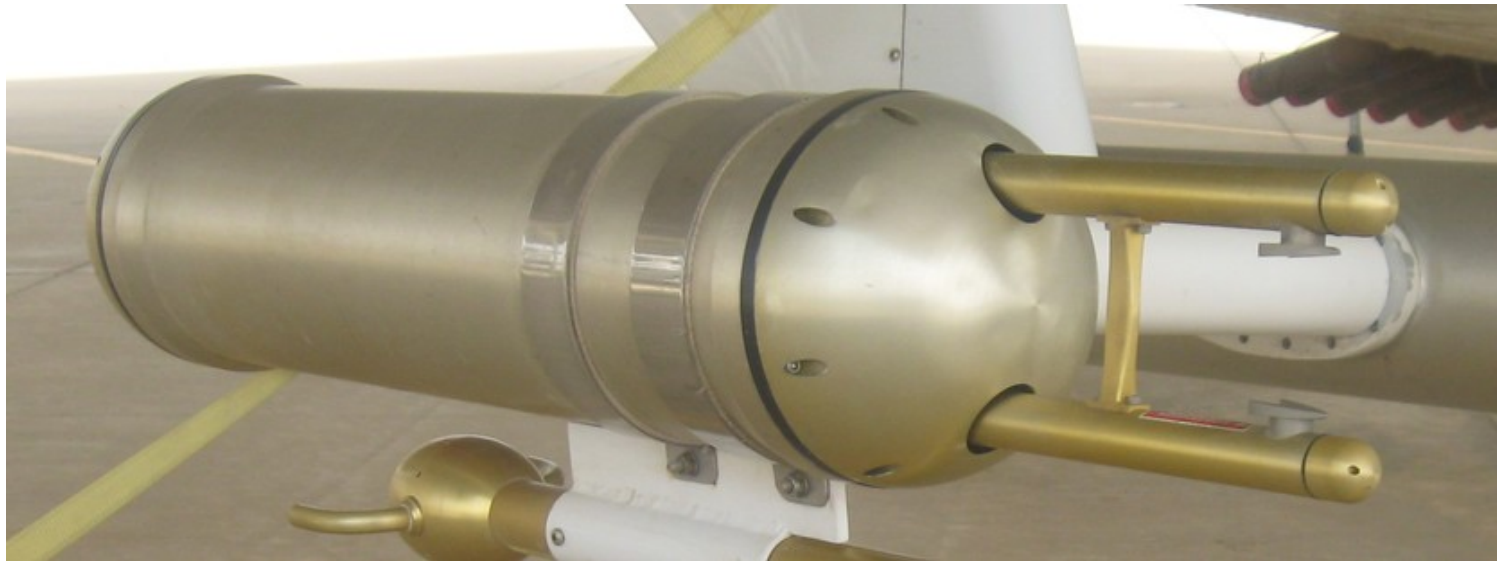
Drizzle
FSSP, 2D-C



Drizzle + **Collision/Coalescence**
FSSP, 2D-C



Rain
2D-P, Radar



Rain
2D-P, Radar

+

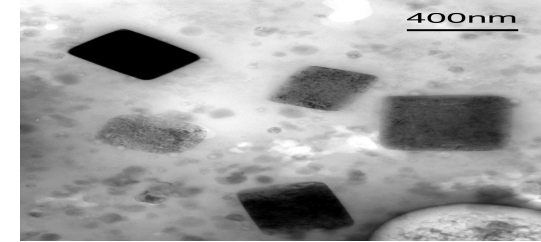
Humidity Profile
Balloon, Aircraft



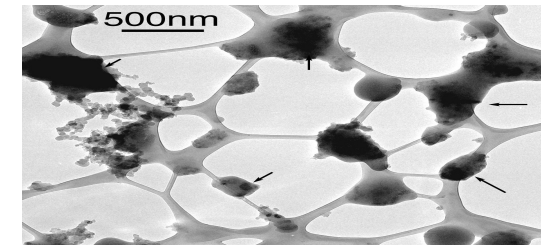
Precipitation
Rain Gauge



Gas Concentrations + Aerosol Transport
Gas Analyzers Aircraft, Satellite



Aerosol Spectrum + Aerosol Chemistry
DMA, PCASP Filter Pack



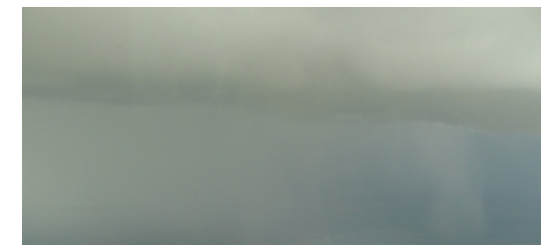
CCN Spectrum + Updraft + Moist
CCN Counter AIMMS DP Sensor



Droplets Spectrum + Instability
FSSP Balloon, Aircraft



Drizzle + Collision/Coalescence
FSSP, 2D-C



Rain + Humidity Profile
2-DP, Radar Balloon, Aircraft

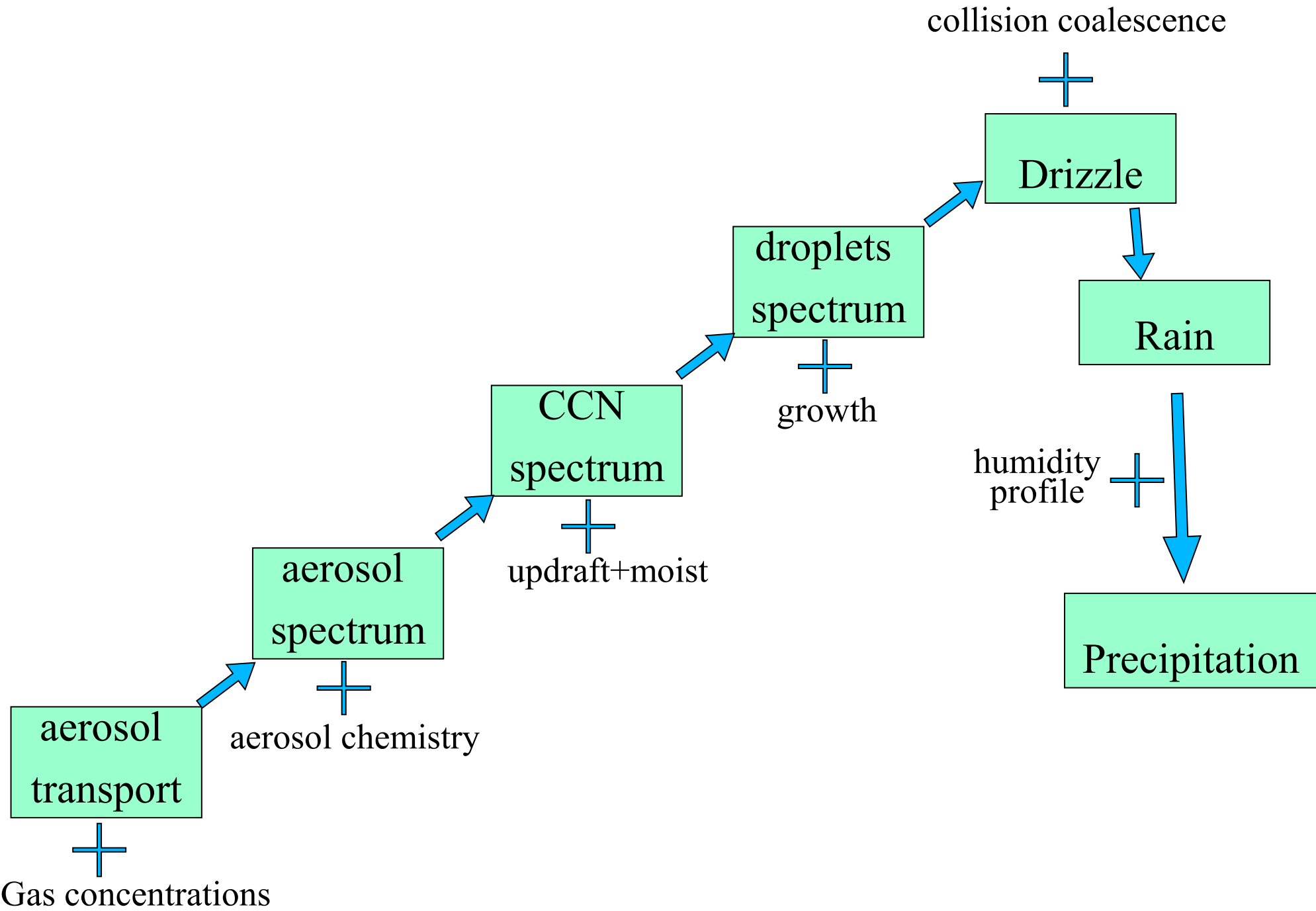


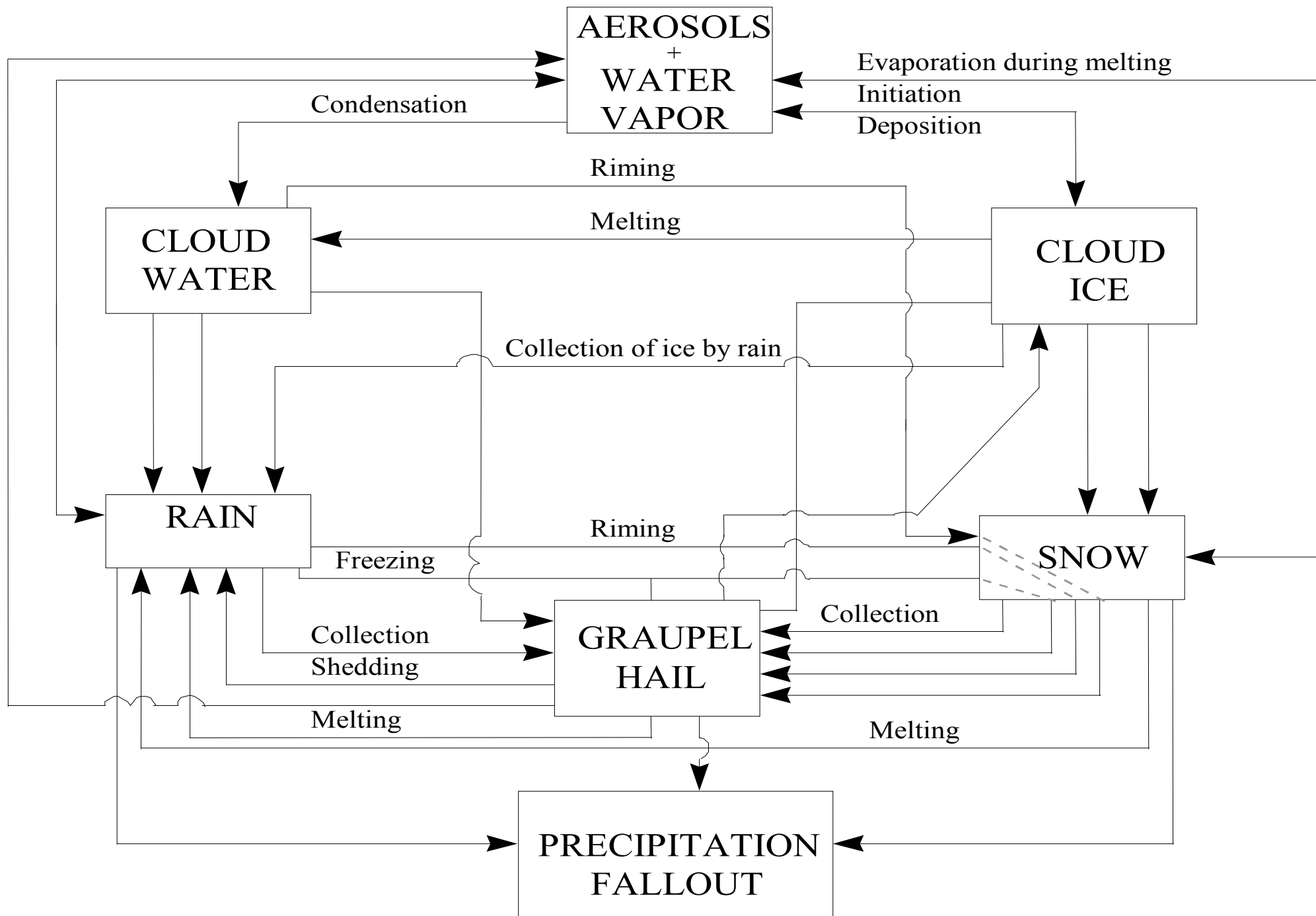
Conclusions

- To understand who precipitation enhancement works requires airborne measurements over 5 order of magnitude
- To understand the precipitation processes requires a lot of advanced scientific instruments.

Any Questions?







Synoptic - Mesoscale- Storm → ←

Cloud Processes →

