



# Proposed Upgrades to the MICROBASE VAP

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# MICROBASE\_PI

ARSCL

MPL, Ceilometer, MMCR

Soundings

LIQUID

Phase Separation by  
Temp (Ice Fraction)

ICE

Liao and Sassen (1994)

Liu, Illingworth (2000)

LWC

IWC

### Assumptions:

- Adiabaticity- no entrainment
- Non-precipitation
- $Nd=const$

### Assumptions:

- Size/density relationship constant
- No aggregates
- Mid-lat cirrus

Miller notes (2000)

Ivanova et al 2001

Re liquid

Re ice

LWC

Re liq



IWC

Re ice



# Spectra Processing

MMCR/WACR



Disdrometer

Phase Identification  
(Kollias, Luke and Shupe 2006)  
Liquid – Mixed - Ice

94 GHz WACR

ARSCL  
MMCR (35GHz), MPL, Ceilometer



Cloud Type Classification  
(Kollias et al 2006)  
Low-Middle-High-Precip

LIQUID

Mixed-Phase

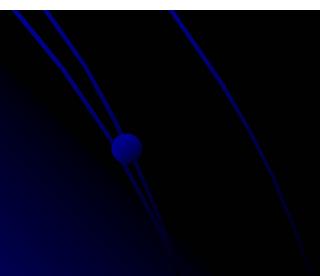
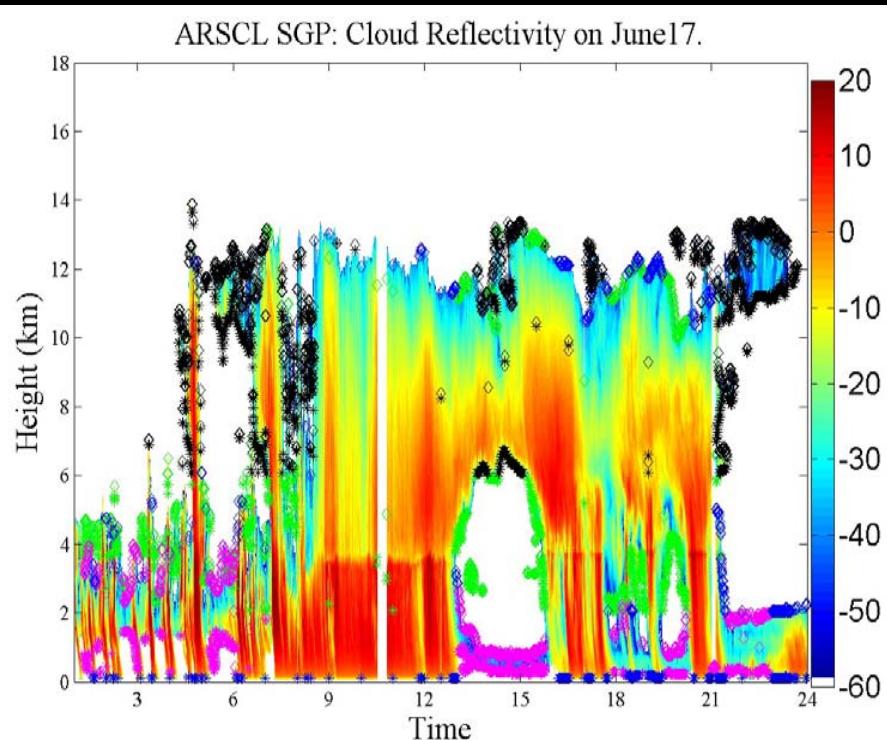
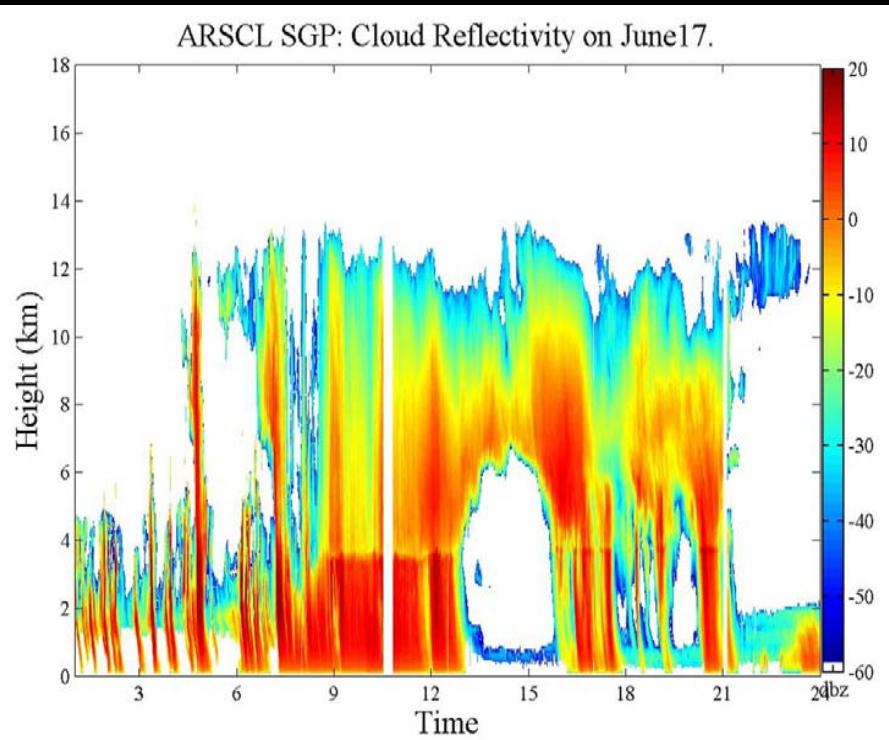
ICE

Non-Precipitating  
Drizzle  
Deep Precipitation

Unimodal  
Bimodal

Small Crystal  
Large Crystal

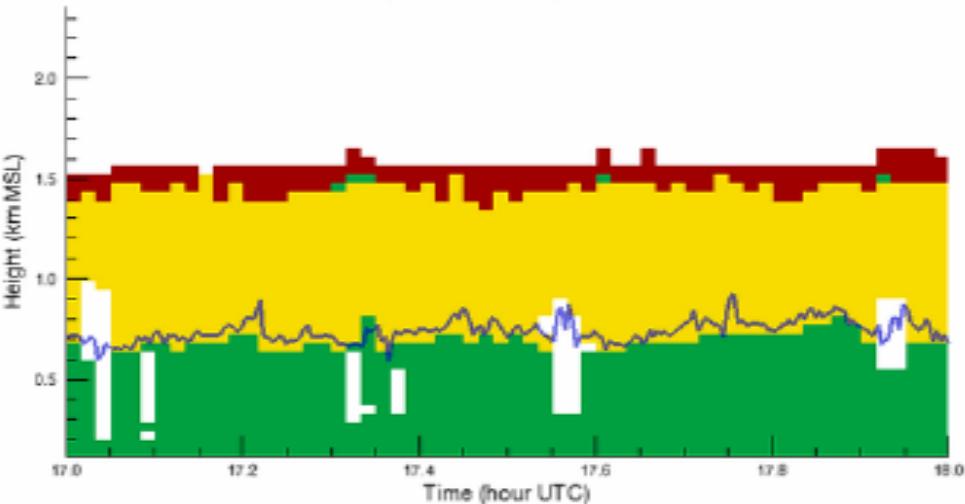
# Cloud Type Classification



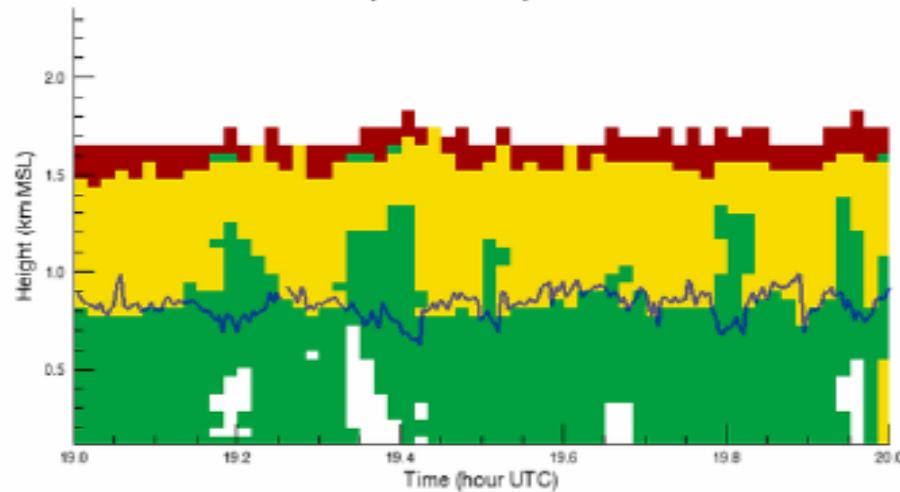
# High Spectral Resolution Lidar + MMCR moments + MWR (provided by Shupe and Eloranda)

Liquid  
Ice  
Mixed

NSA 20041009 Shupe Solid/Liquid/Mixed Classifications

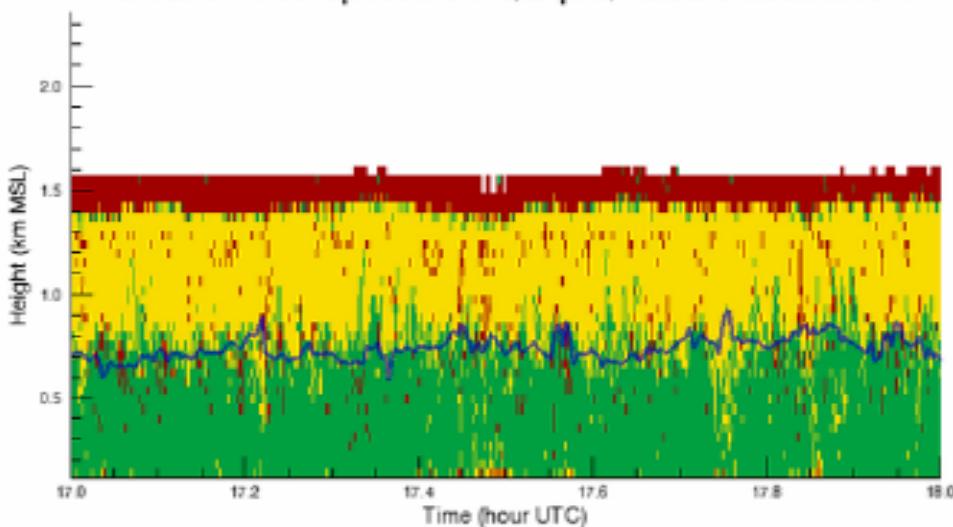


NSA 20041009 Shupe Solid/Liquid/Mixed Classifications

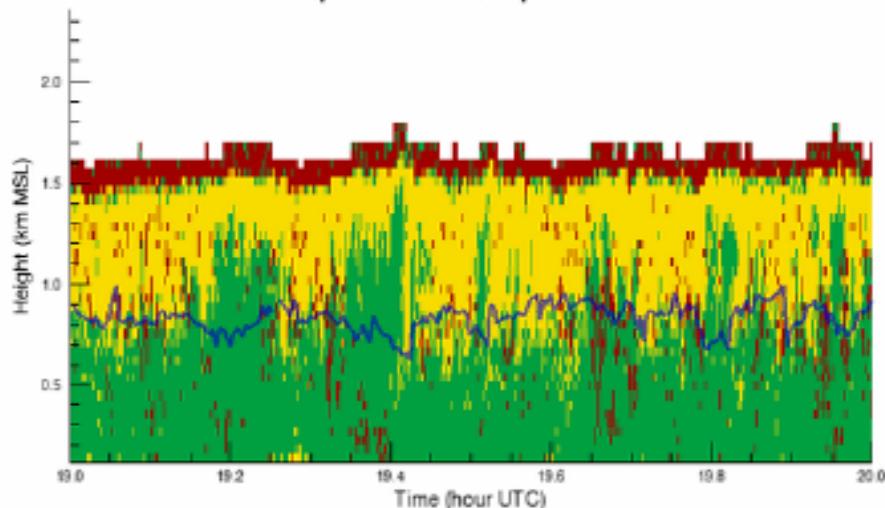


Doppler spectra-based cloud phase retrieval technique (Kollias et al., 2006)

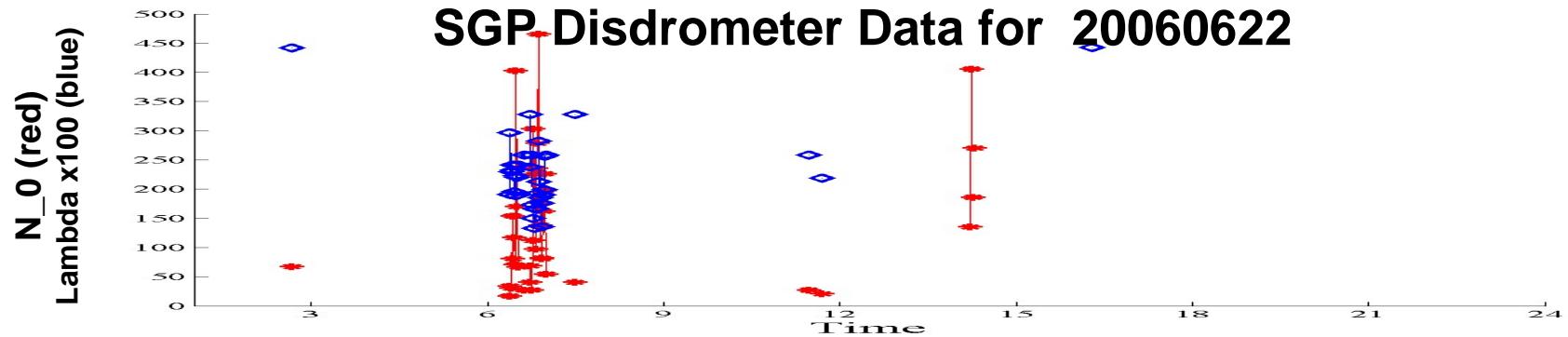
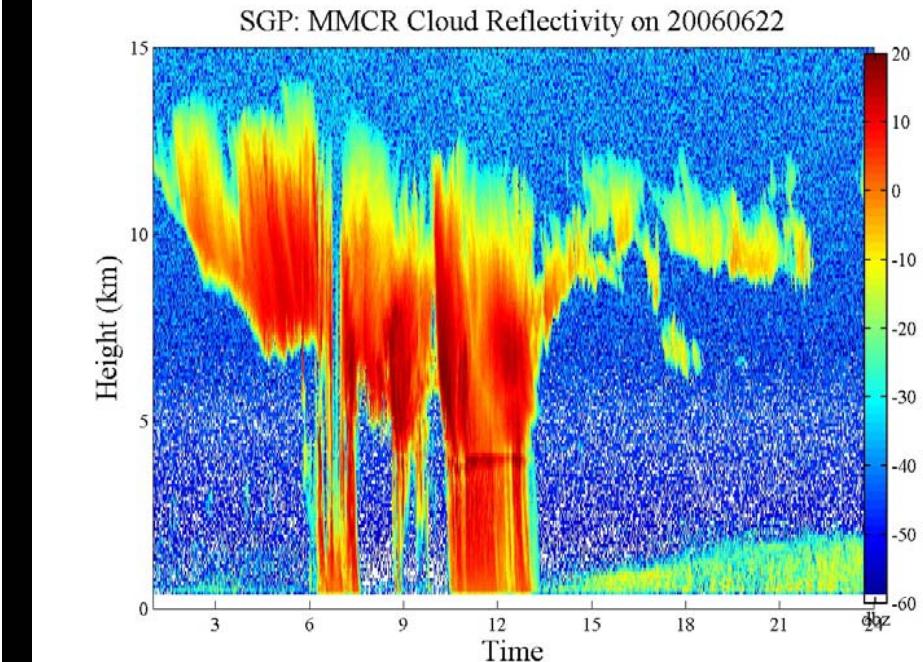
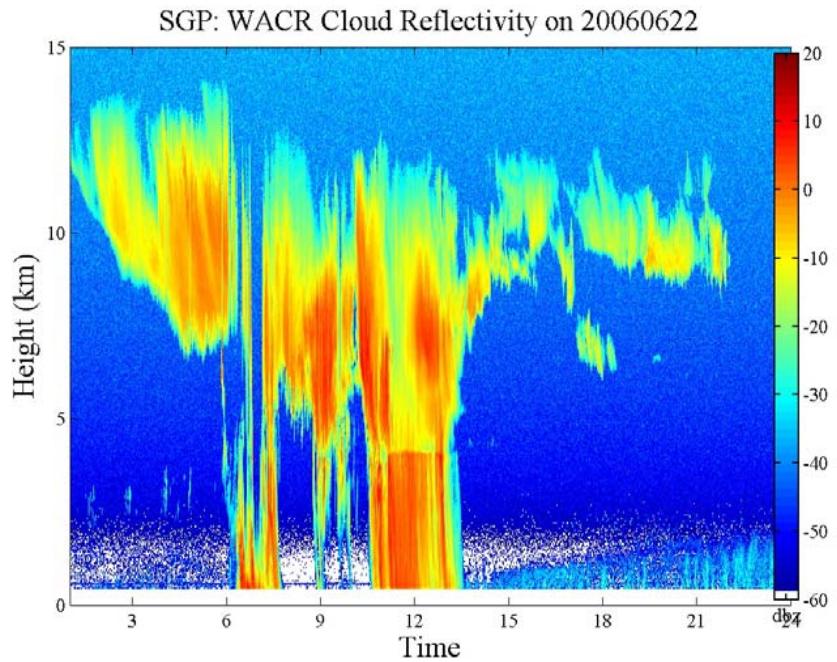
NSA 20041009 Spectra Solid/Liquid/Mixed Classifications

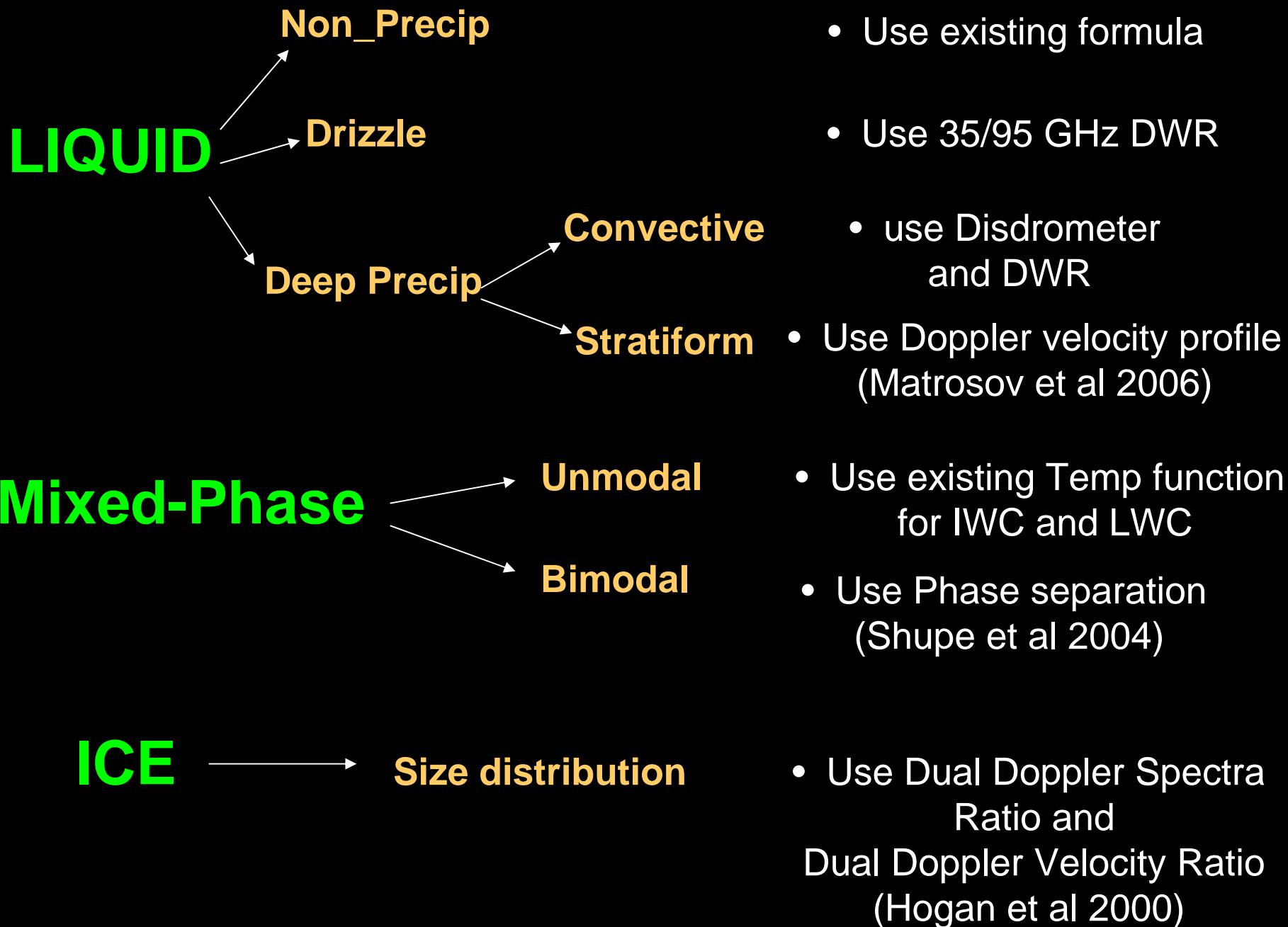


NSA 20041009 Spectra Solid/Liquid/Mixed Classifications

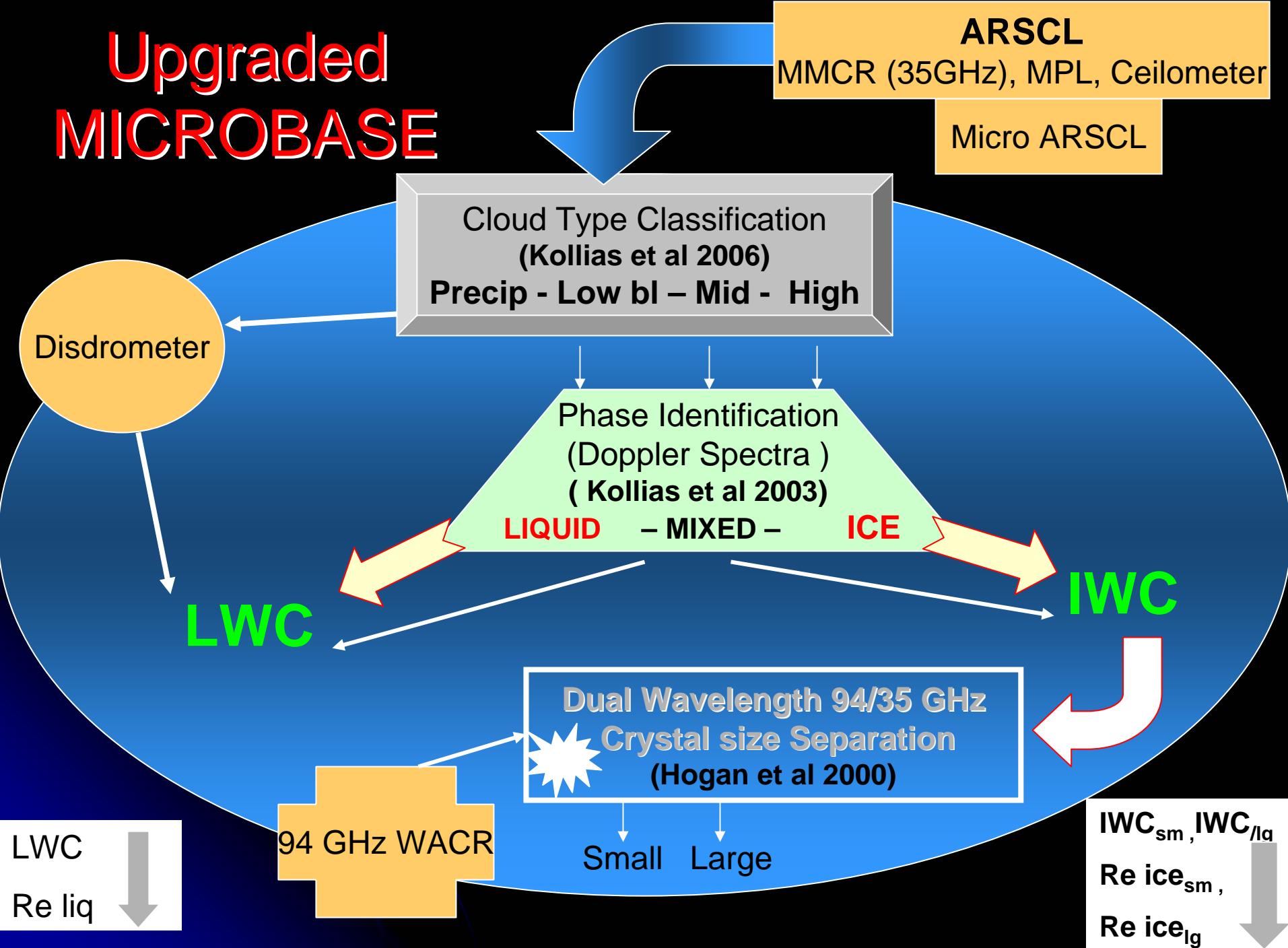


# Dual Wavelength Ice Crystal Size Fractionation





# Upgraded MICROBASE



# Summary

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- Create a micro-VAP for Classification of Cloud types for appropriate phase determinations.
- Create a micro-VAP for the separation of mixed phase clouds into ice and water phases using MMCR spectral width analysis.
- Create a micro-VAP to determine ice crystal size using dual wavelength MMCR and WACR radar.
- Precipitation flags to indicate drizzle and drop size from Distrometer measurements.

