Ground-Based Cloud Characterization during ISDAC
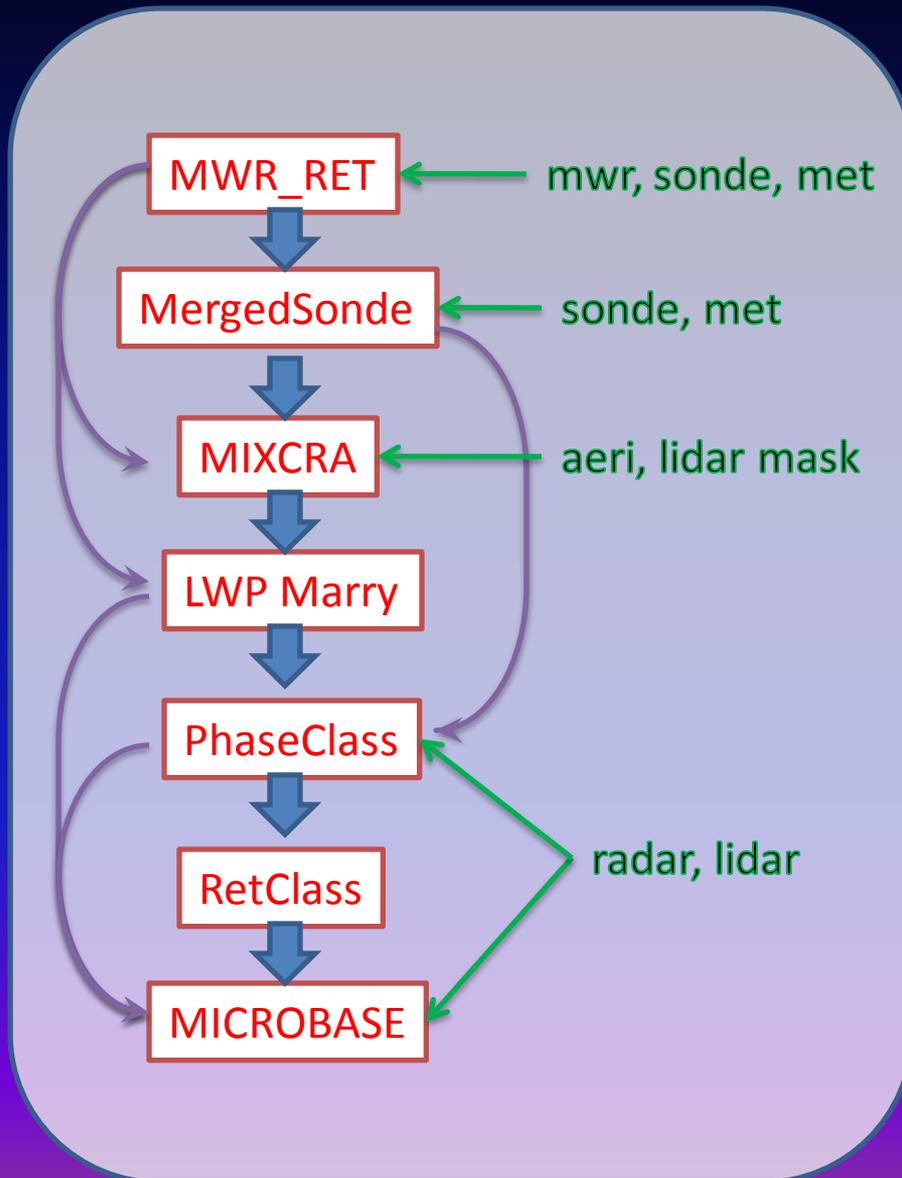
Matthew Shupe
University of Colorado & NOAA-ESRL
David Turner
University of Wisconsin

Arctic Cloud Properties Retrieval System

"ShupeTurner" MICROBASE

MWR_RET ← mwr, sonde, met

MergedSonde ← sonde, met

MIXCRA ← aeri, lidar mask

LWP Marry

PhaseClass

RetClass

MICROBASE ← radar, lidar

Primary Products:
Cloud fraction
Cloud type mask
Water content (ice and liquid)
Water path (ice and liquid)
Particle size (ice and liquid)

Related Products:
In-cloud vertical velocity
In-cloud turbulence
Optical depth (ice and liquid)

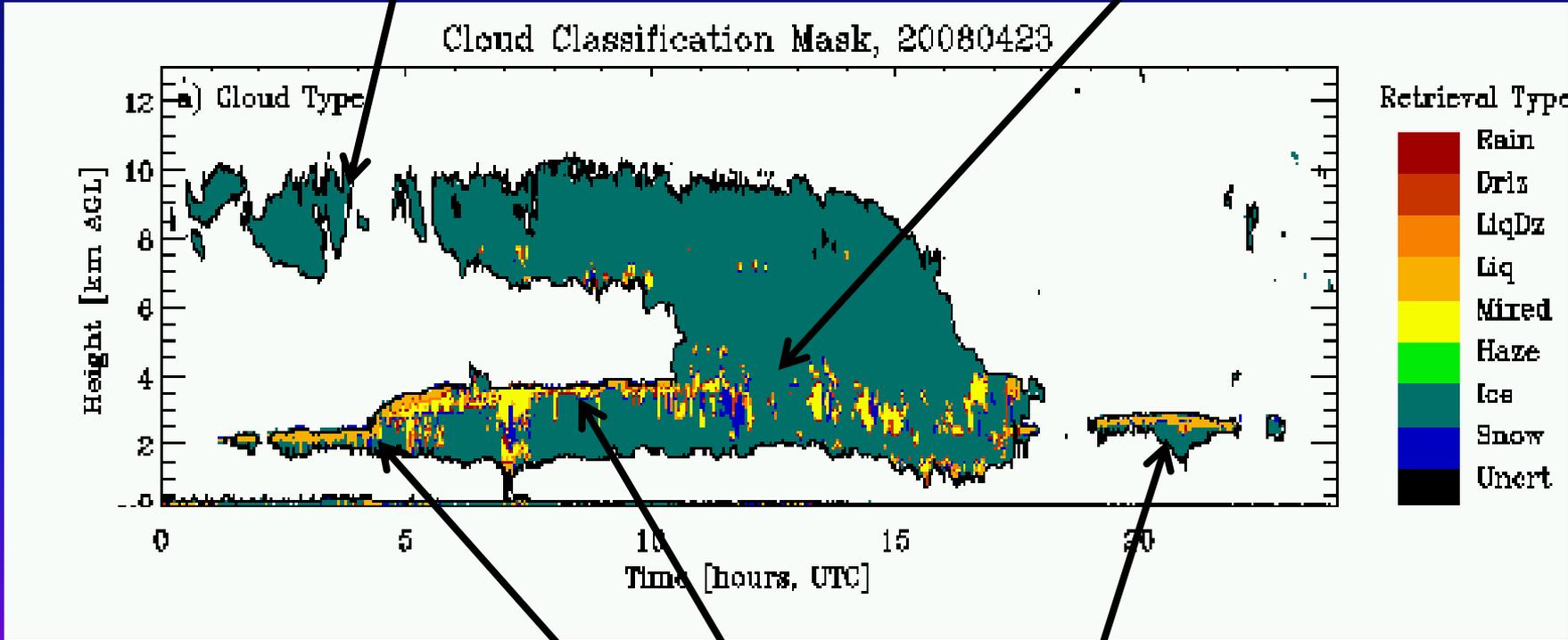Interested in these products?
Please contact me:
matthew.shupe@noaa.gov

Examples: Cloud Phase Mask

Derived using phase-specific signatures from radar, lidar, microwave radiometer, and temperature soundings.
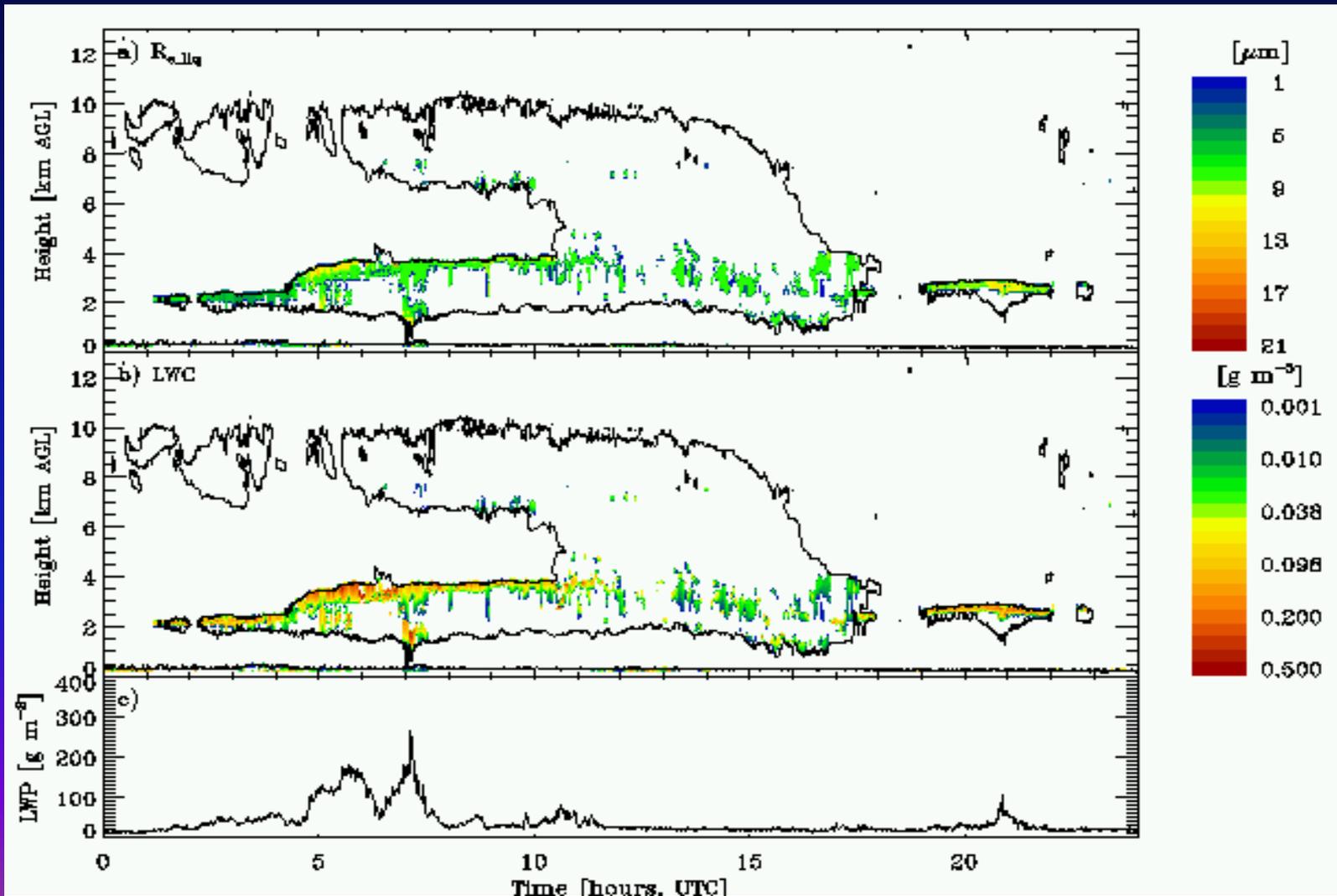
Cirrus cloud (all-ice)   Falling ice glaciates much of cloud layer
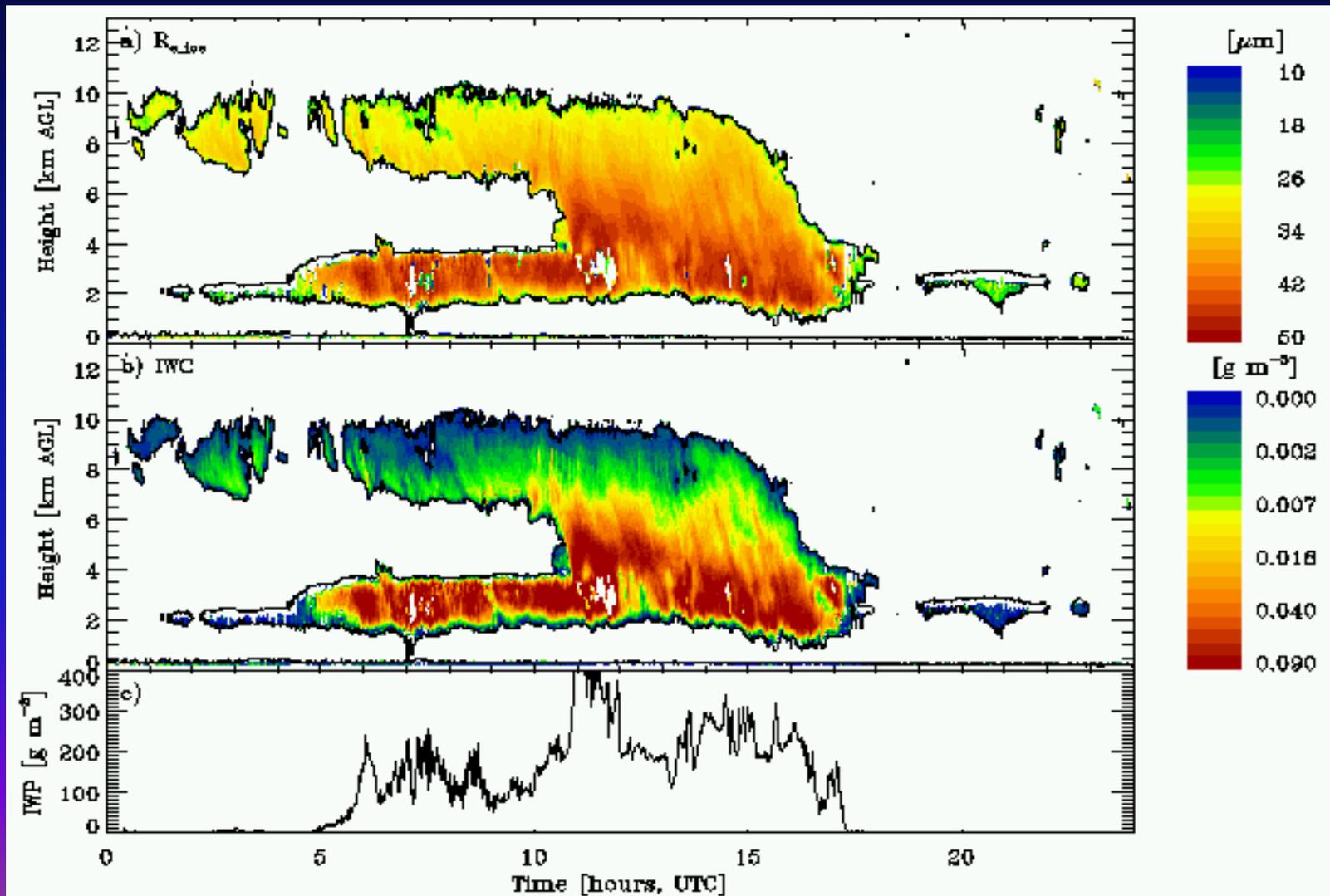

Super-cooled liquid at top with precipitating ice

Examples: Cloud liquid properties

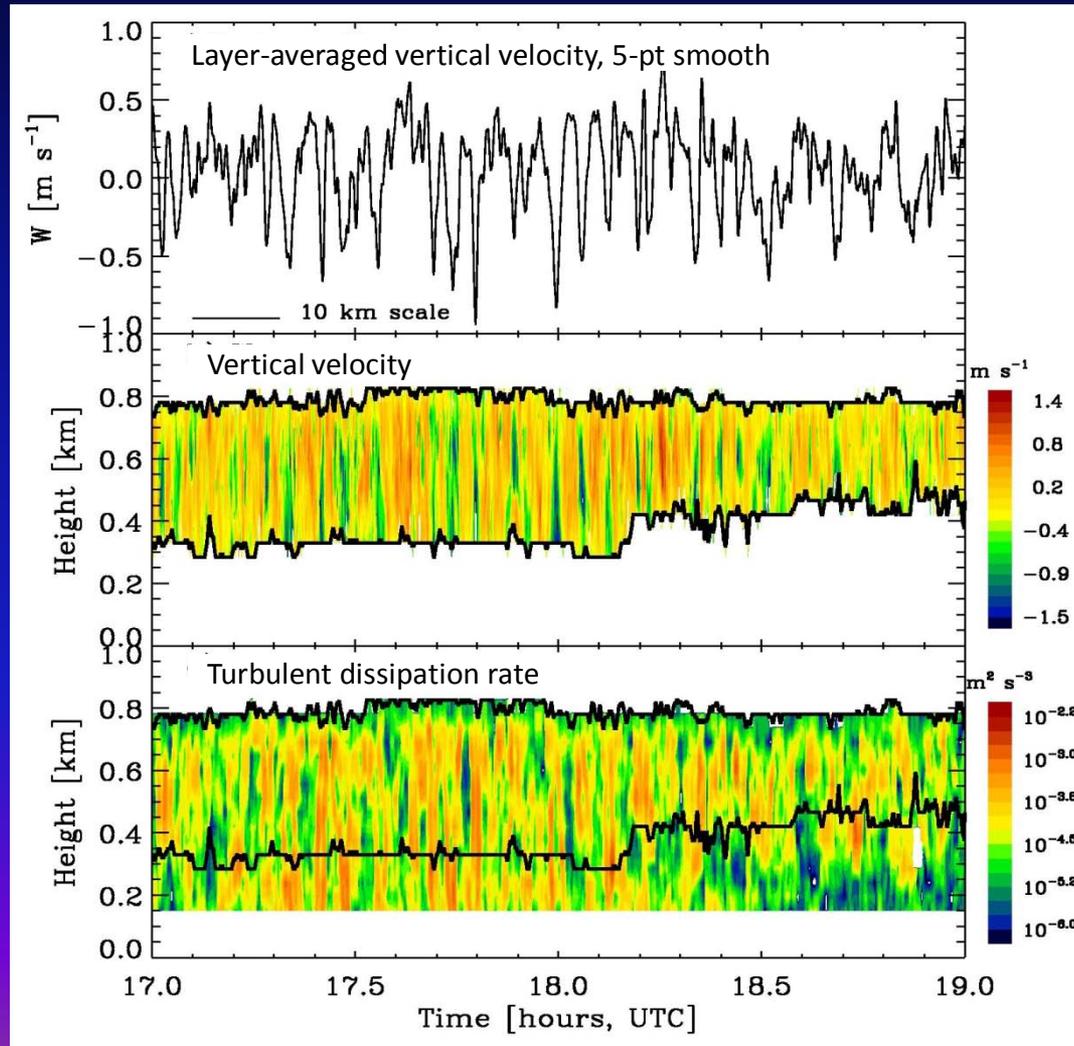Derived using AERI-MWR liquid water path and adiabatic assumption.

Examples: Cloud ice properties

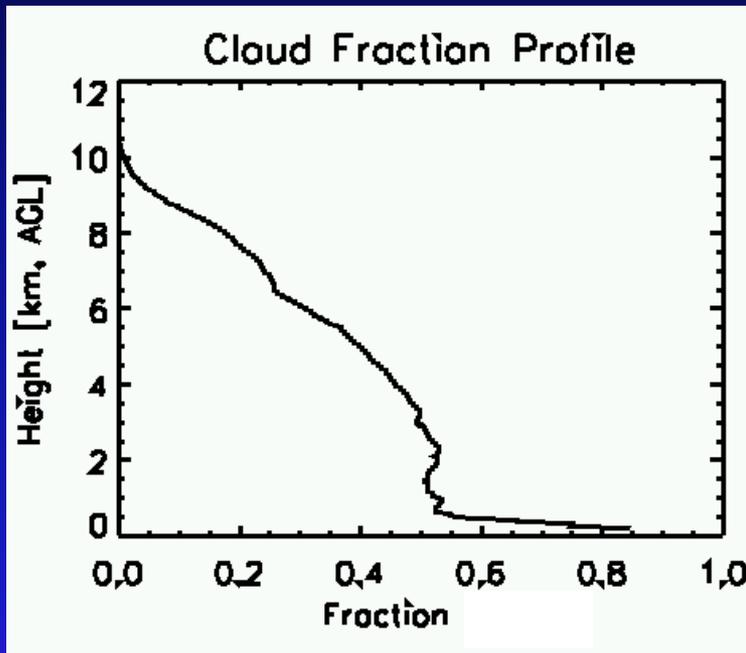Derived using radar reflectivity power law and PSD assumptions.

Examples: Dynamical properties

Derived from radar Doppler spectra and time-variance of radar velocity.
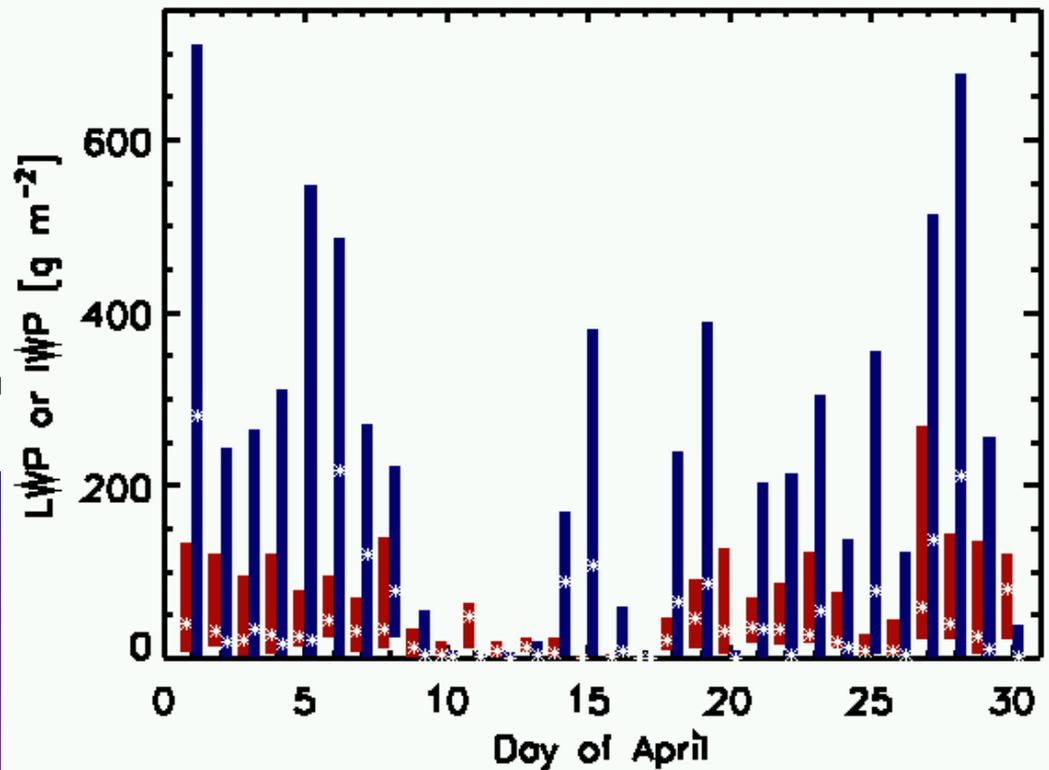
A few summary statistics for April 2008 at Barrow

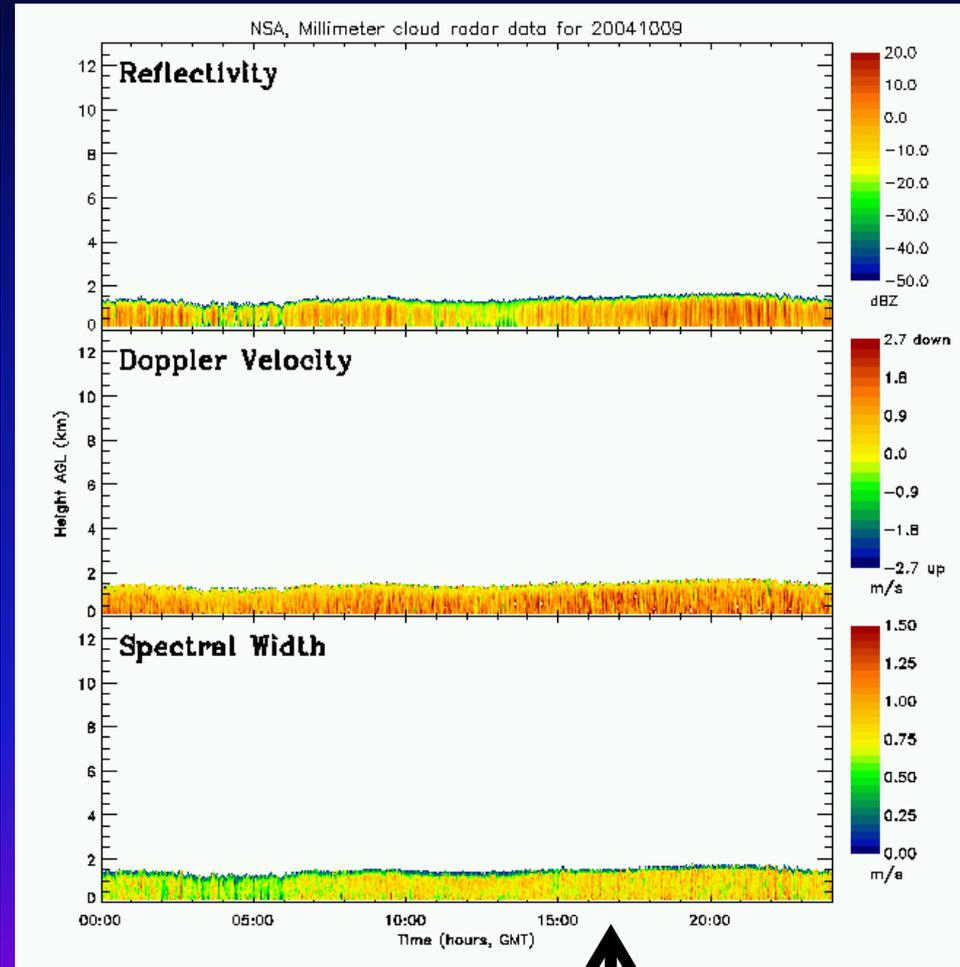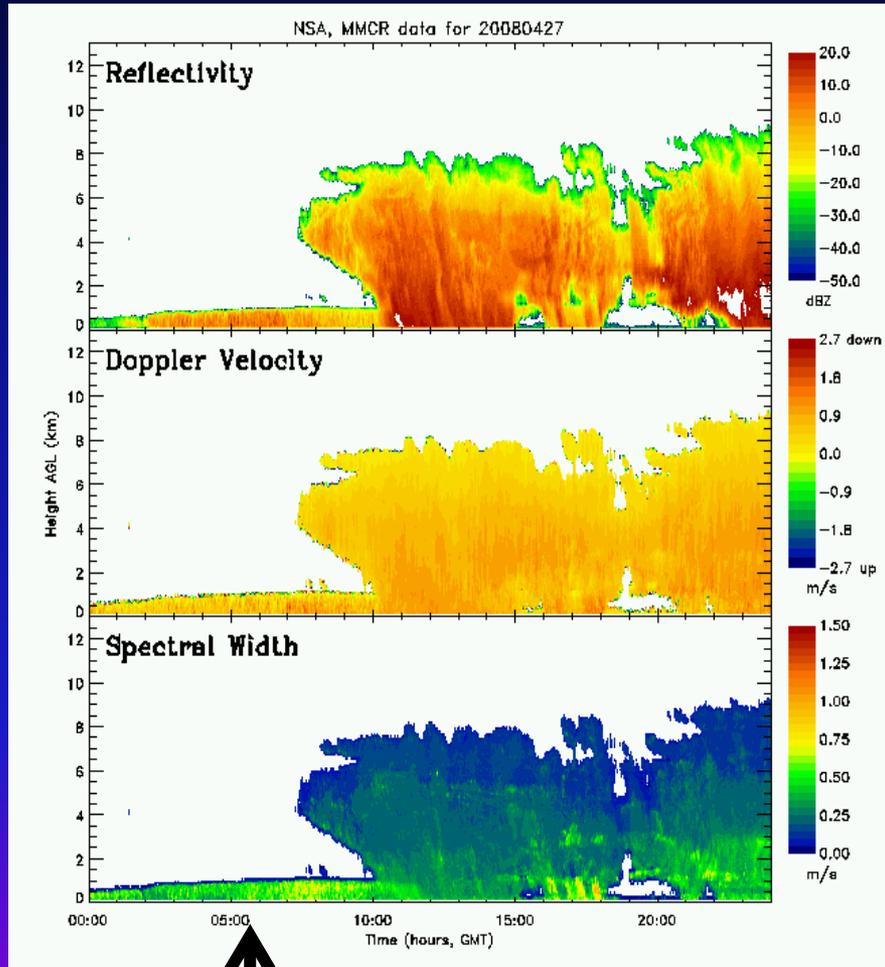~95% Total Cloud Fraction
with lots of low-level clouds

Verlinde's synoptic classification

III
Omega Block
(SW flow)

I
S flow

II
NE flow

IV
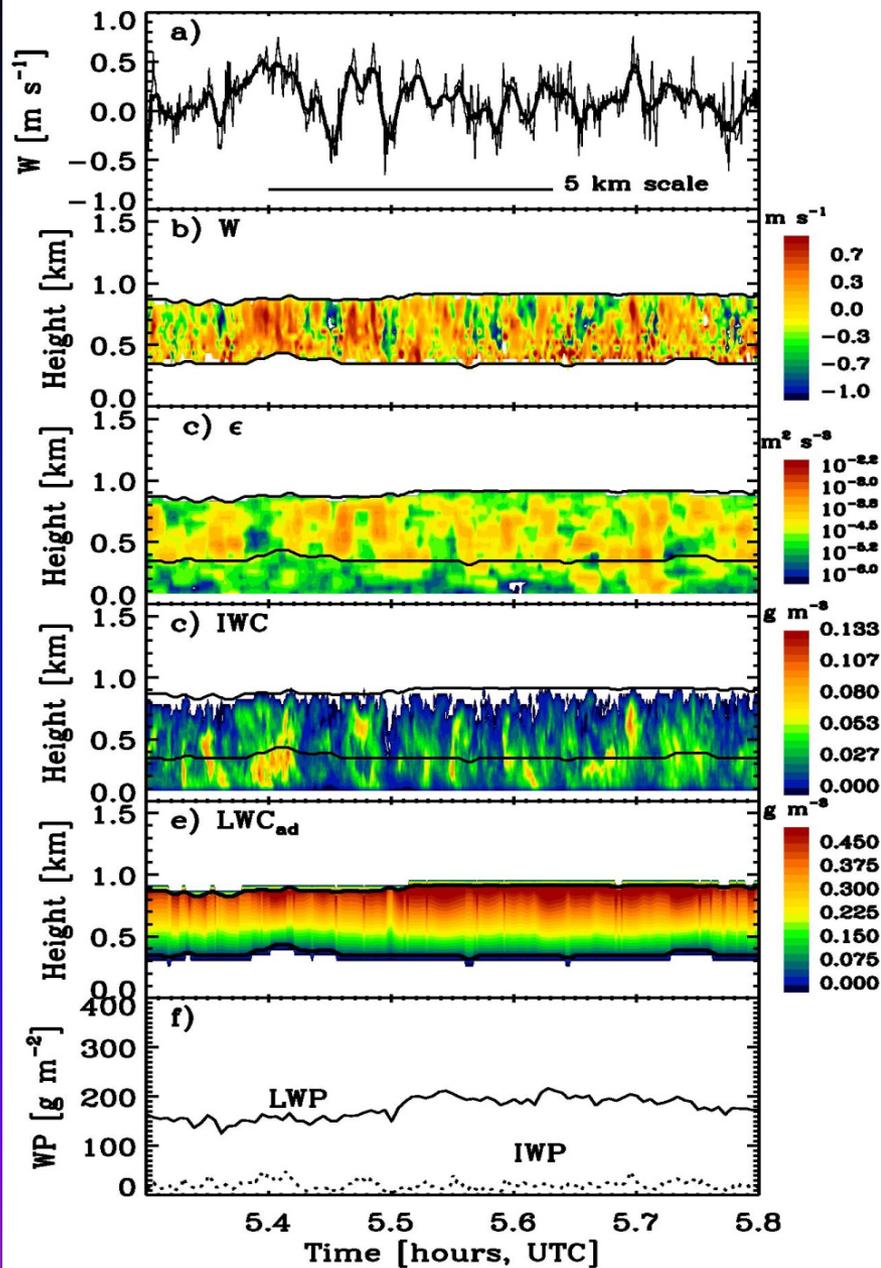SE flow

Comparing spring and fall mixed-phase clouds

27 Apr 2008 "Spring"   9 Oct 2004 "Fall"
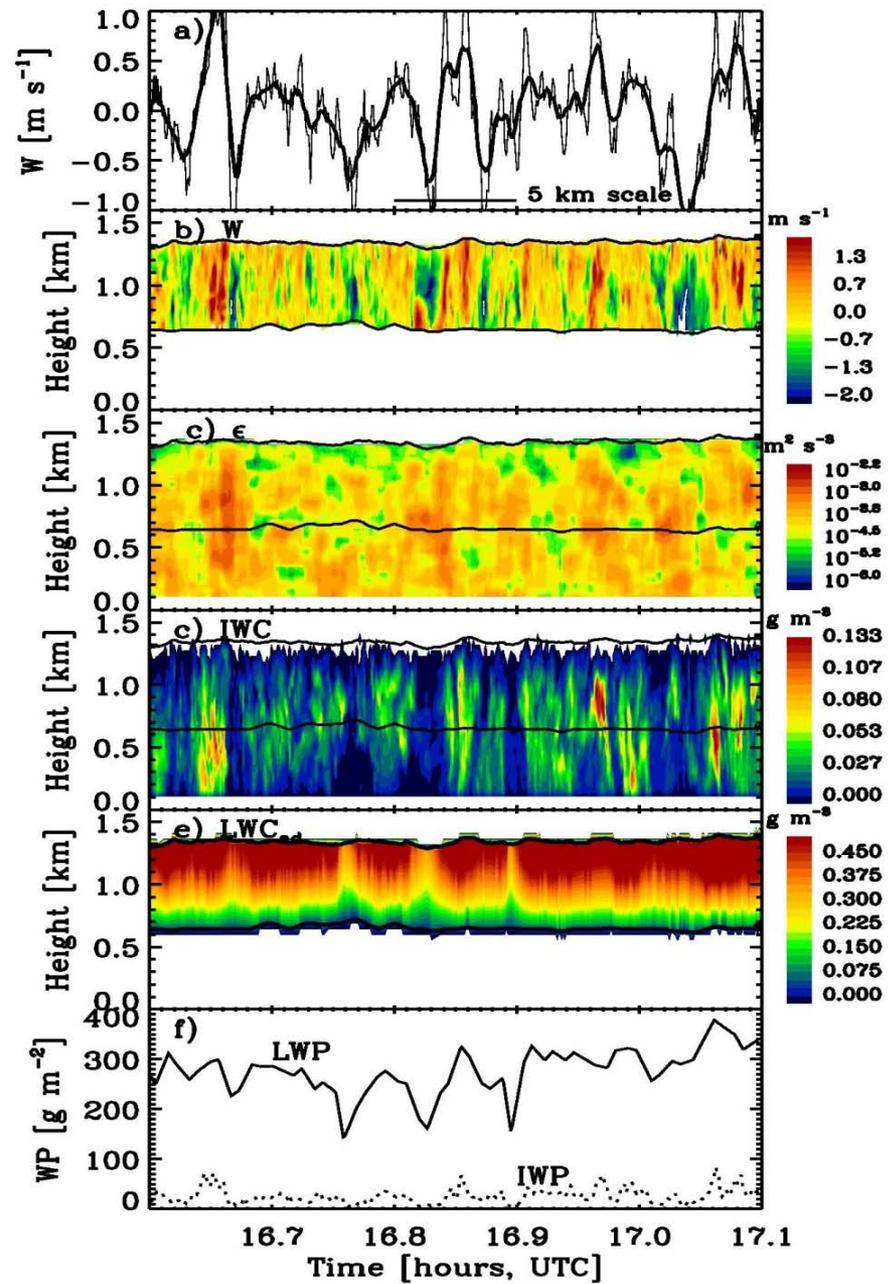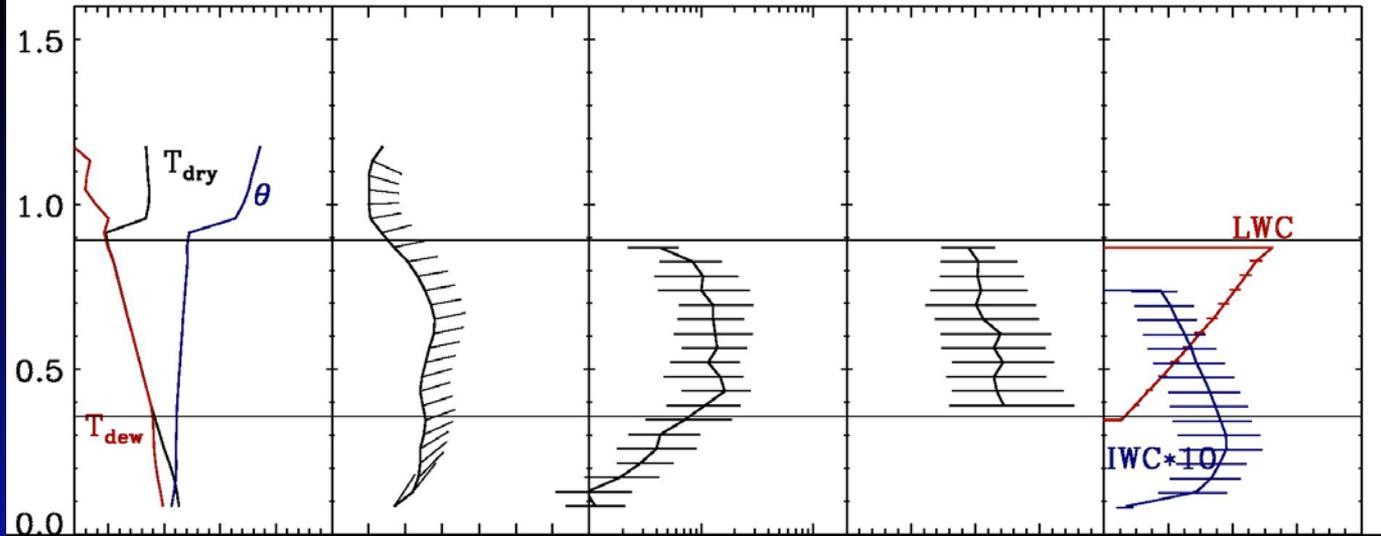
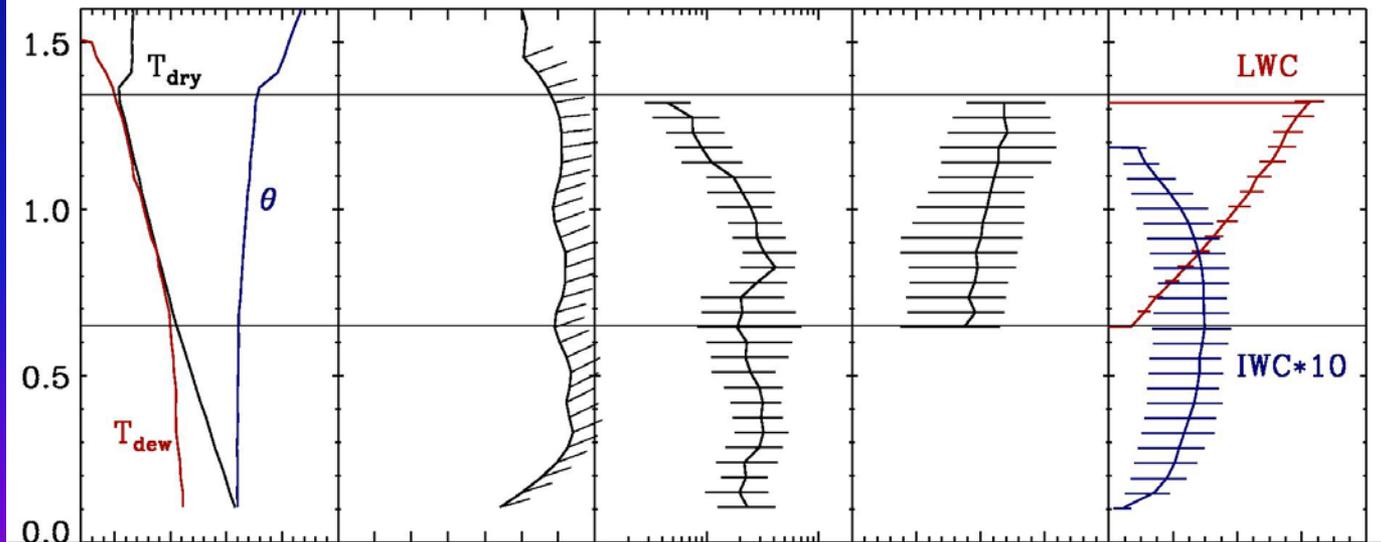27 Apr 2008 "Spring"   9 Oct 2004 "Fall"

27 Apr 2008
Radiatively-driven, weak shallow convection, Possibly decoupled from surface

9 Oct 2004
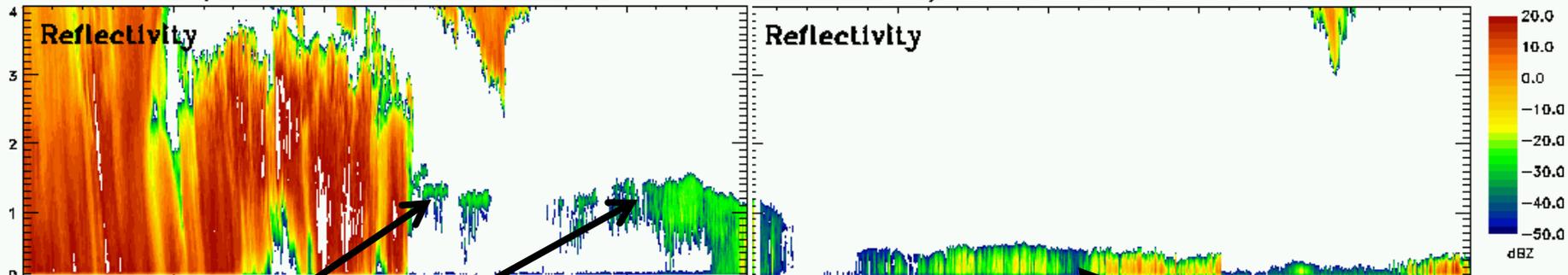Surface-forced shallow convection. Deeper, juicier cloud layer

19-20 April "polluted" case.....
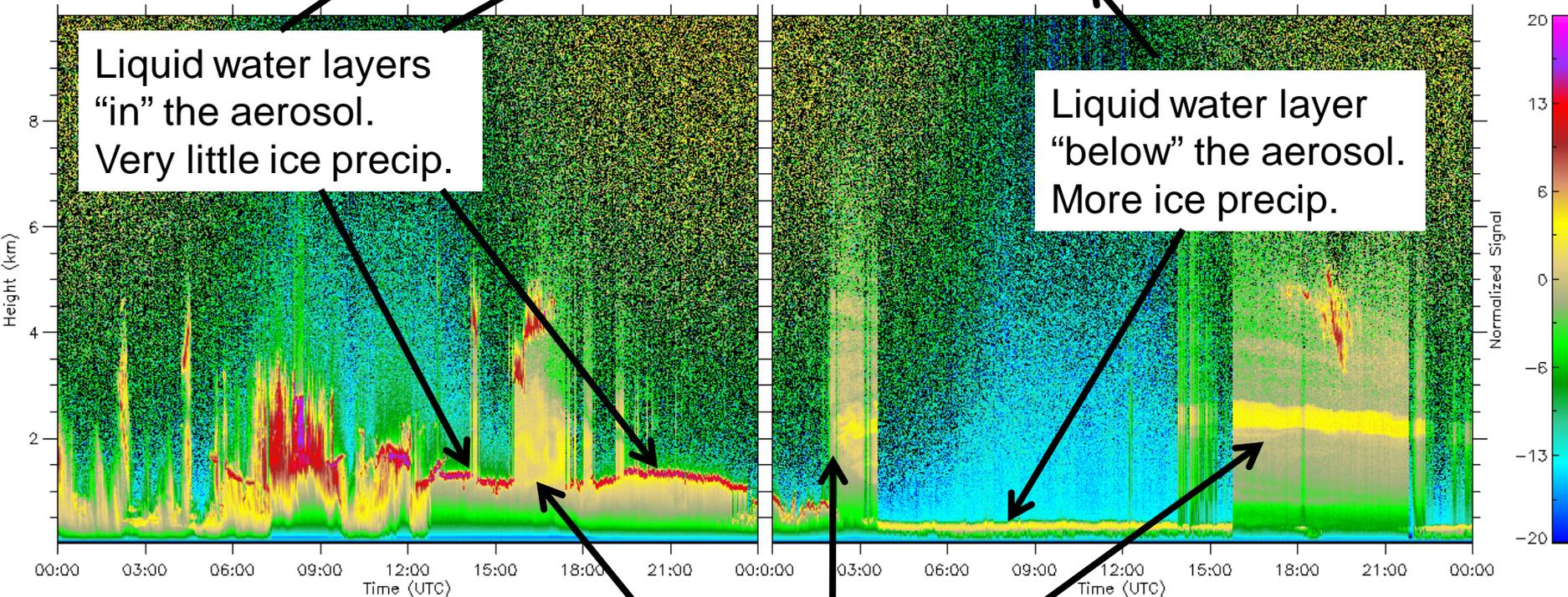## ......looks interesting but no analysis yet!

NSA4, Millimeter cloud radar data for 20080419

NSA4, Millimeter cloud radar data for 20080420

Reflectivity

Reflectivity

Liquid water layers "in" the aerosol. Very little ice precip.

Liquid water layer "below" the aerosol. More ice precip.

Indication of aerosol layers (smoke from Siberia)