# ISDAC Model Case Study

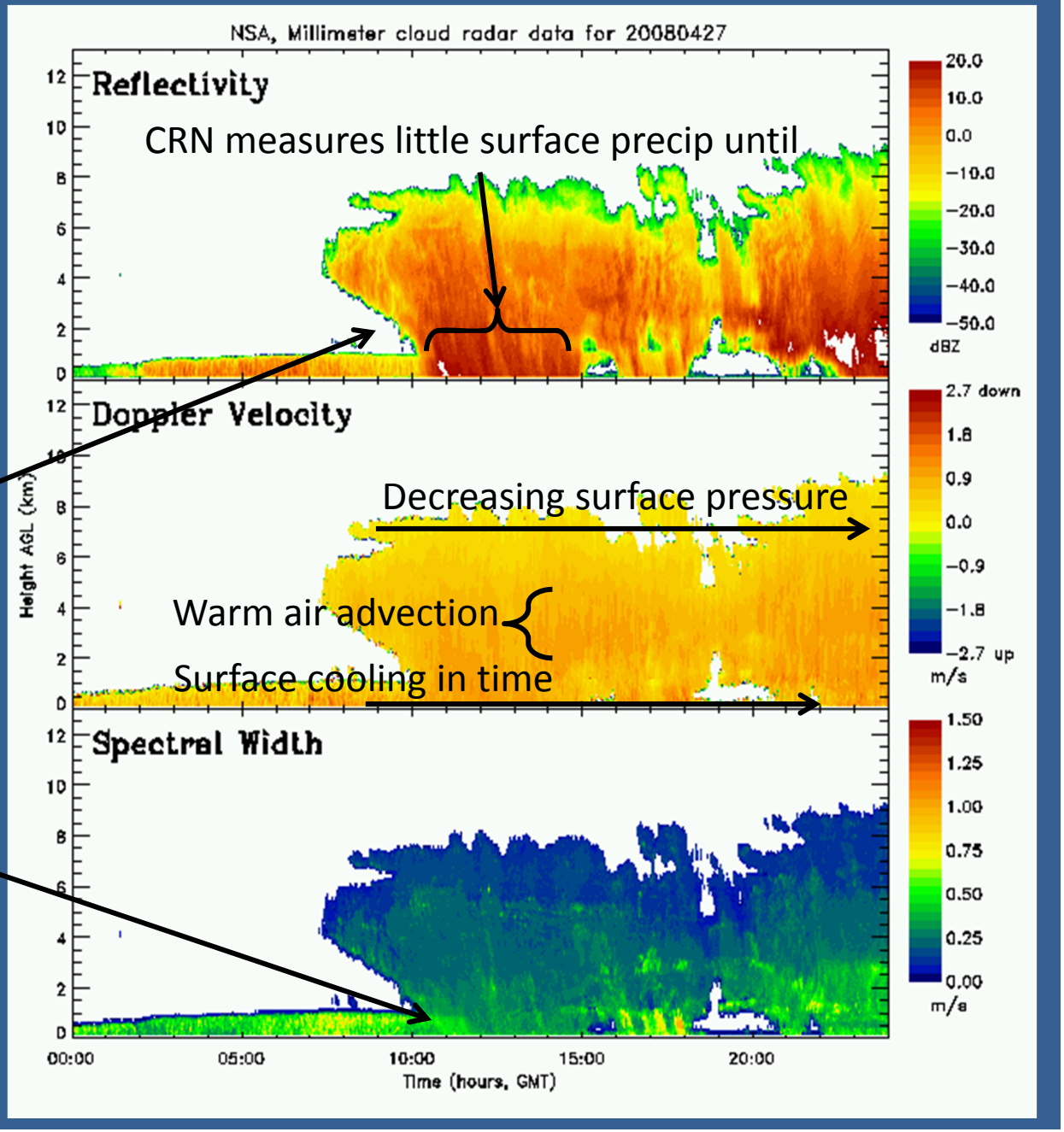
***27 April 2008***

**A ground-based perspective from Barrow**

***Matthew Shupe***
***CIRES/NOAA***

Radiative shading may be occurring after 7 or 8 Z

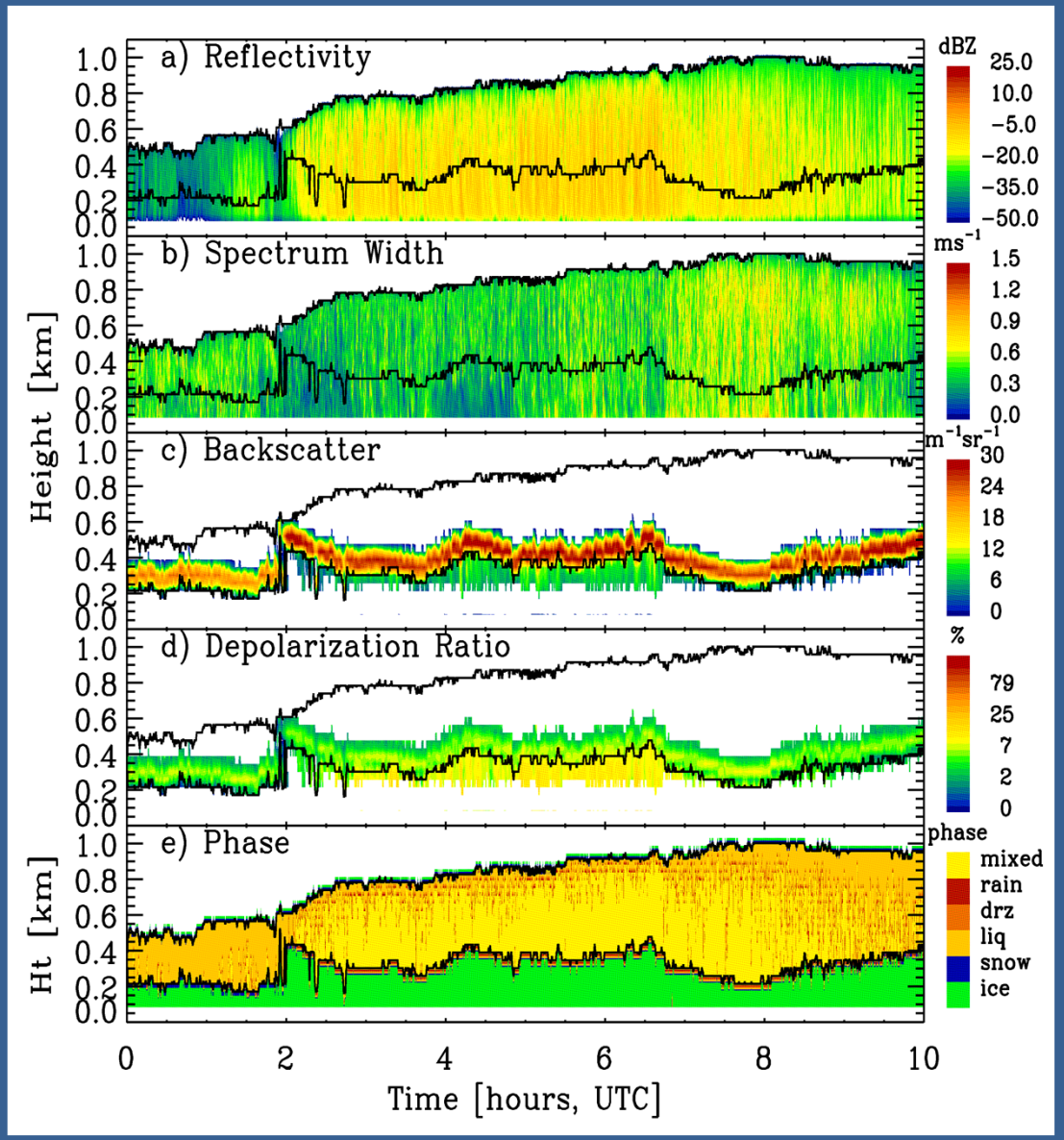
Abrupt loss of cloud water



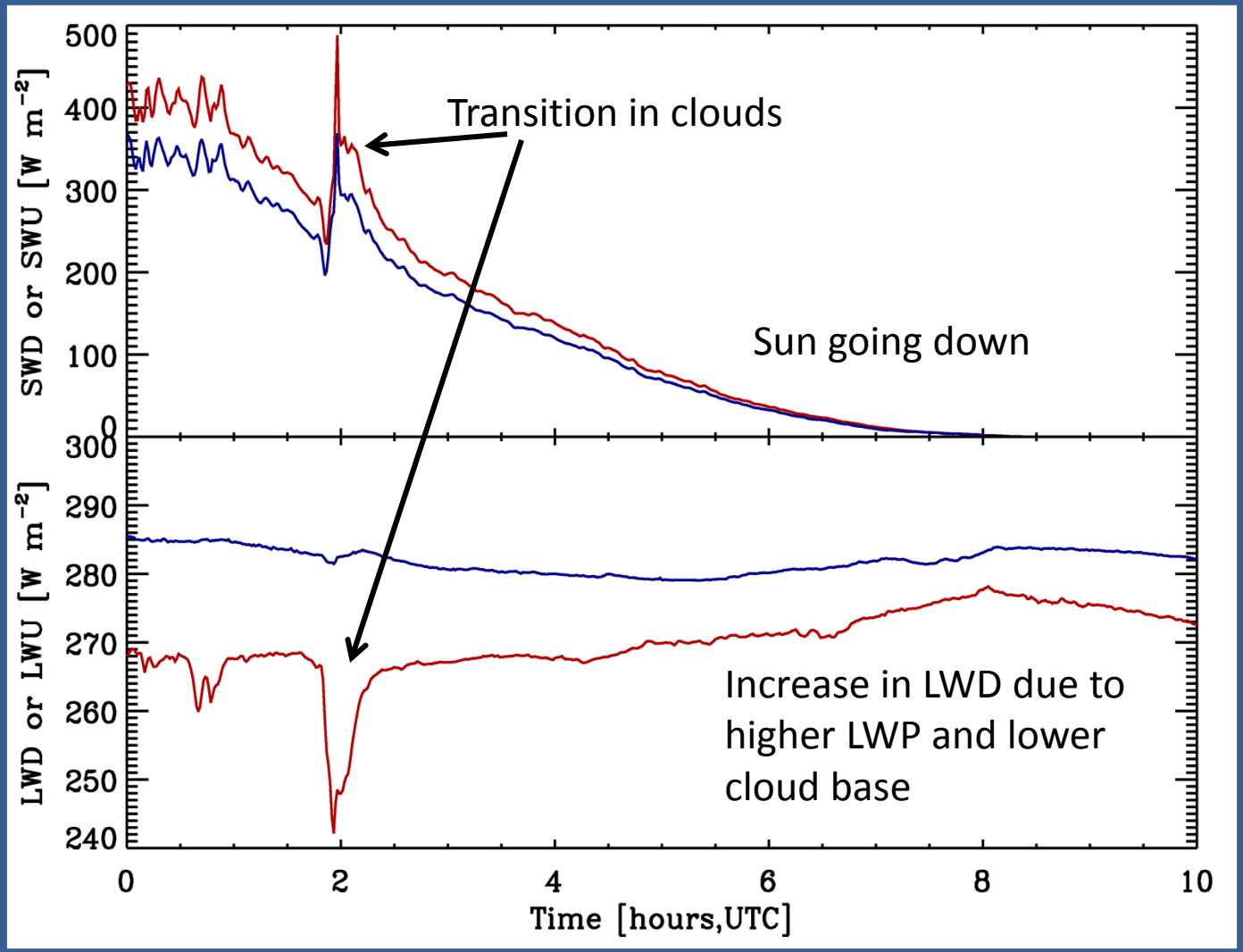

***ISDAC model breakout***
***ASR Fall Meeting***
***14 Sept 2011***

# Active sensor measurements and phase classification

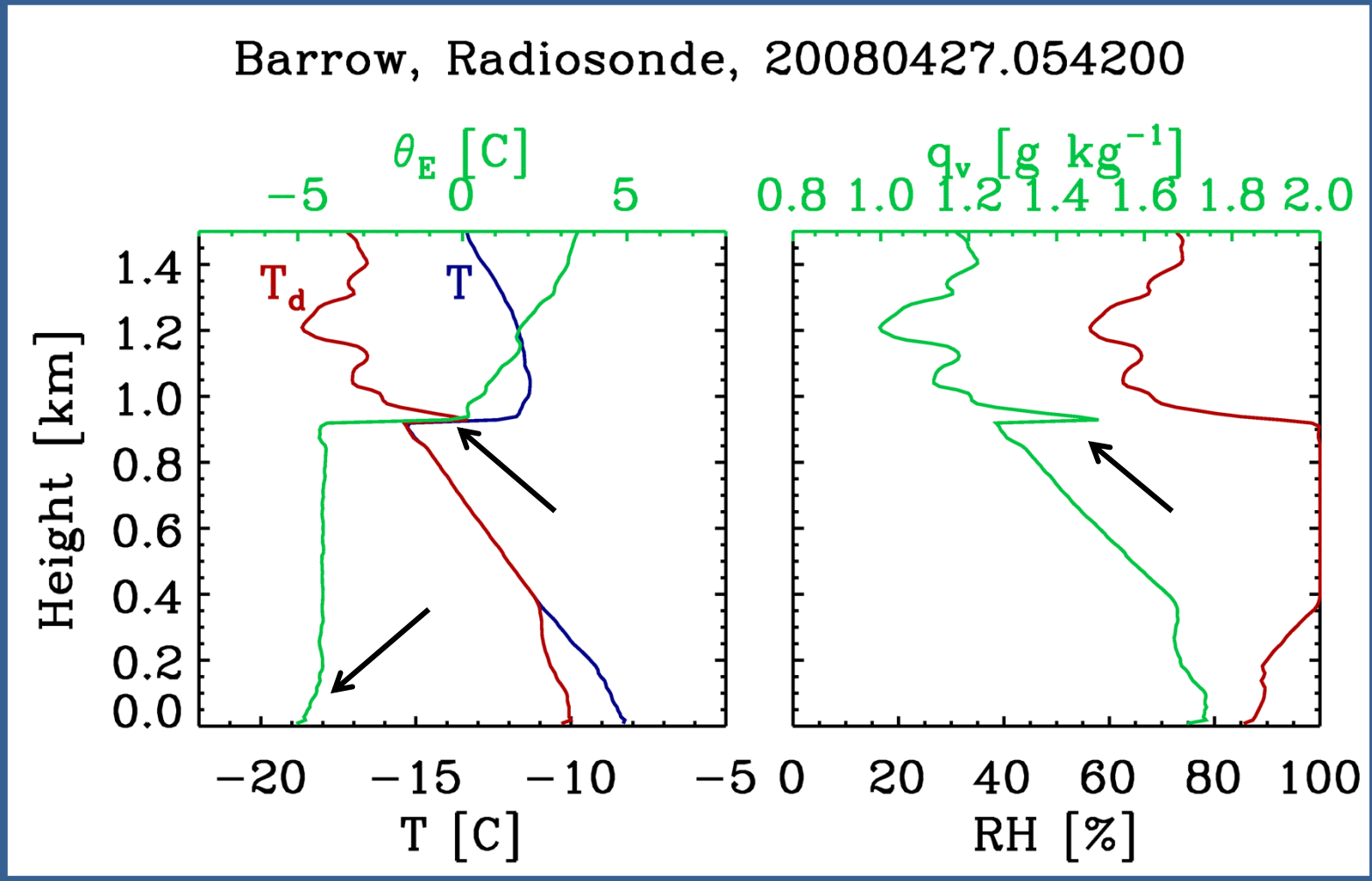
- Single-layer Arctic mixed-phase stratocumulus.
- Liquid cloud layer deepening in time
- Transition at 02:00



# Broadband Radiation



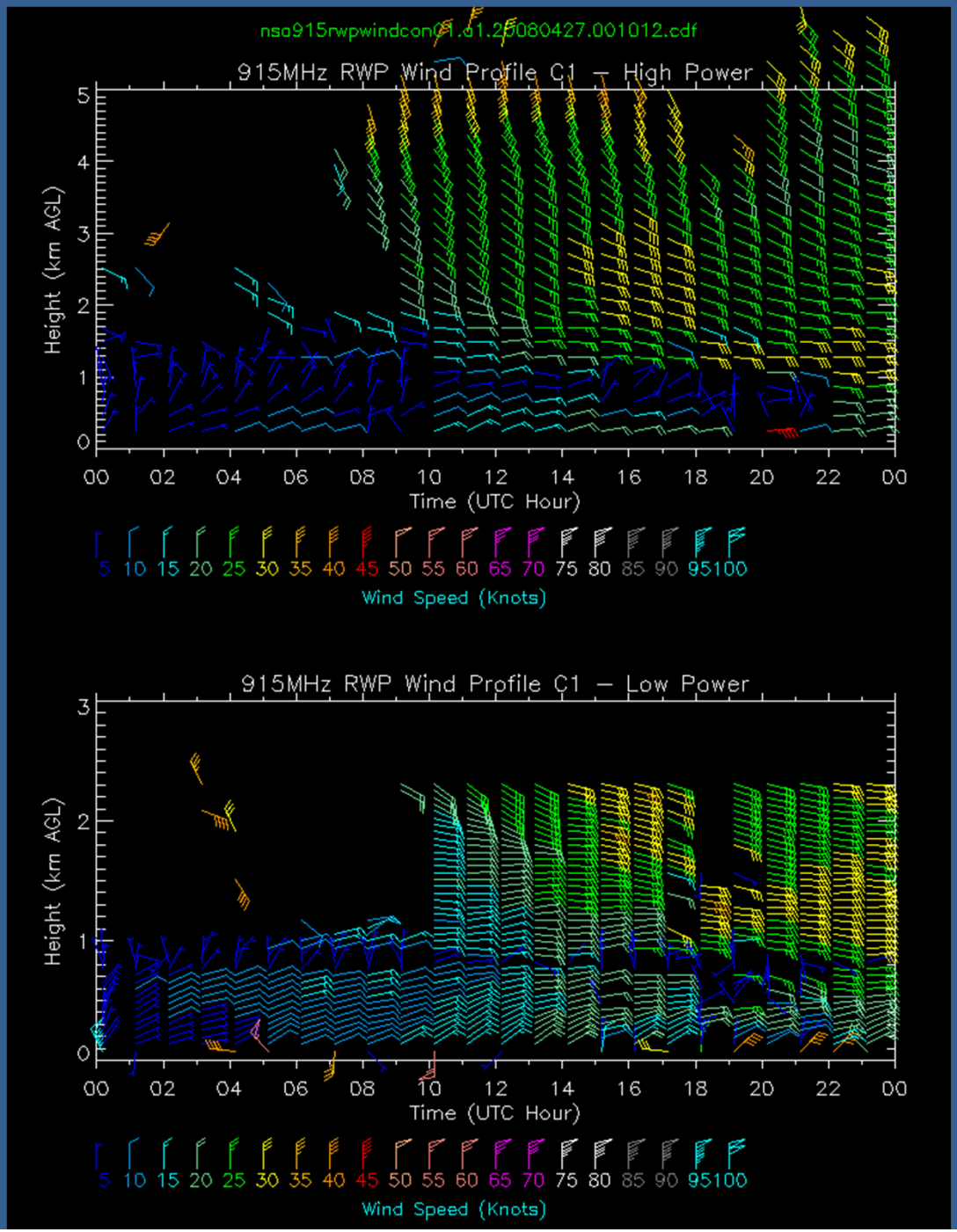
## Radiosonde




Moisture inversion, cloud extending into T inversion, decoupled

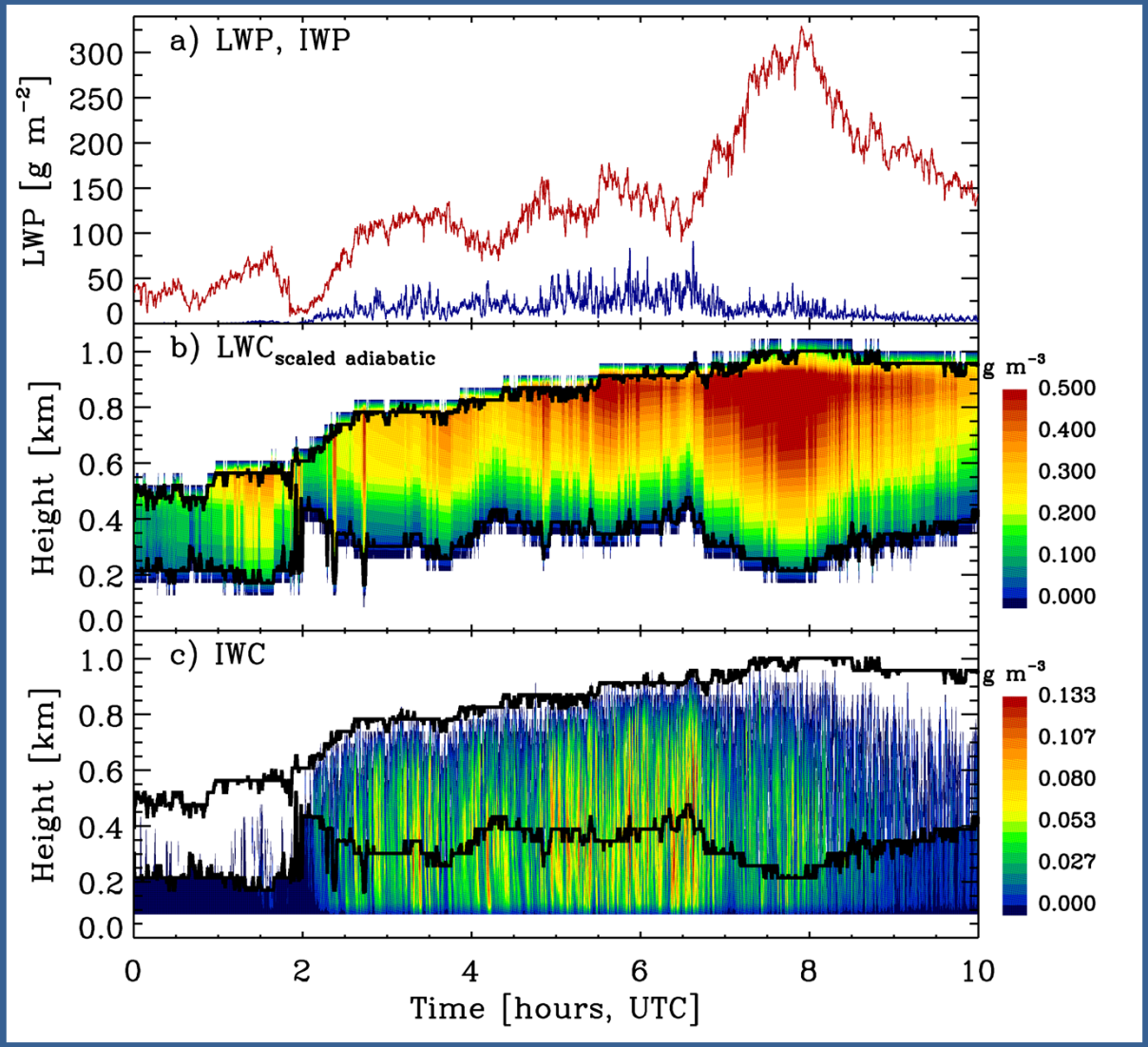
# Wind Profiler

- Weak N winds in cloud layer with shear below and perhaps above.
- Clear transition in cloud layer wind direction as deeper system moves in.



# Cloud microphysics retrievals

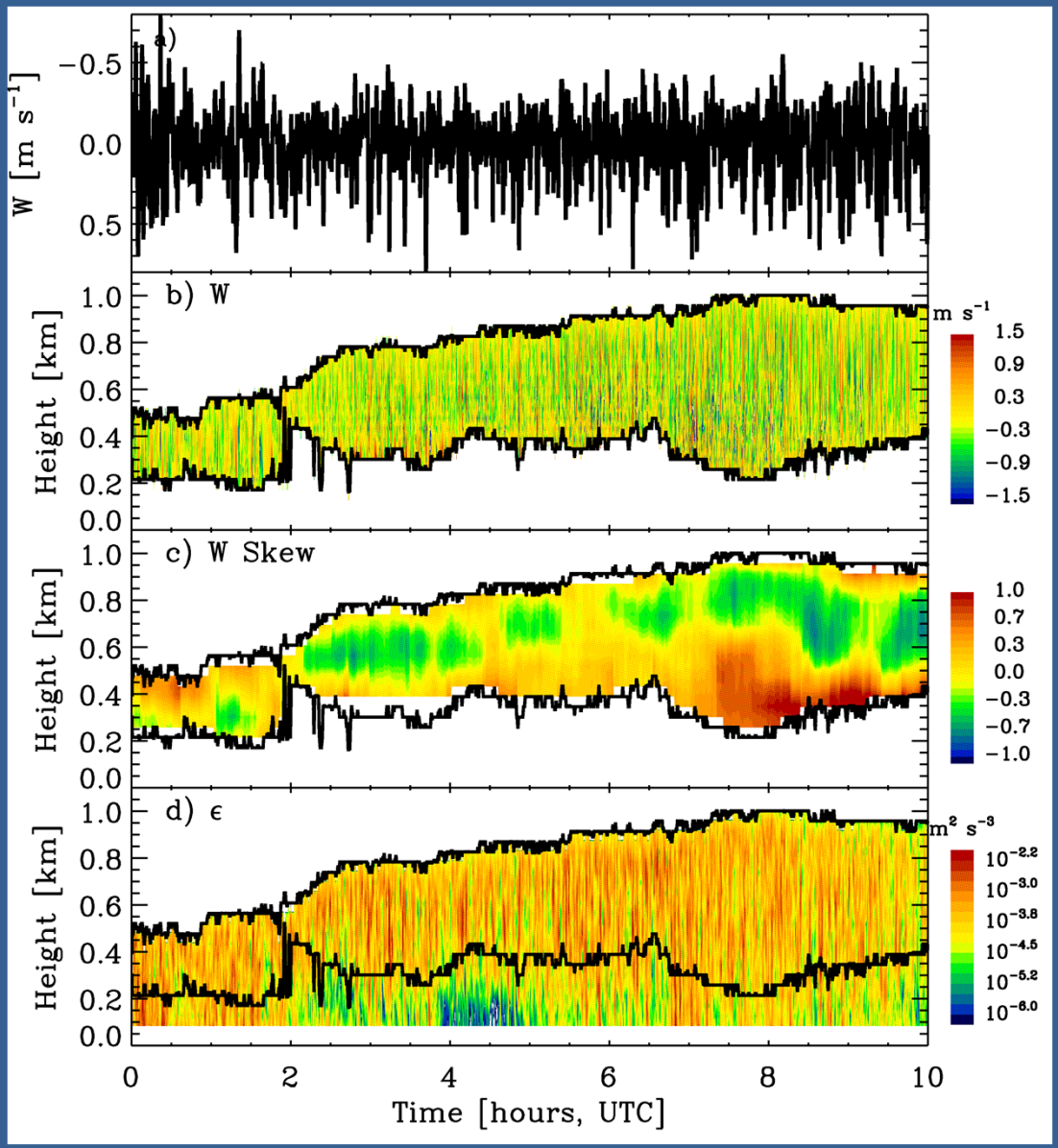
- More liquid than ice
- Ice production mostly starts after 02:00 and slows after 07:00 (coincident with shading?)
- Liquid production decreases after 08:00 (shading?)
- Microphysical values are comparable with aircraft (though no full analysis yet)




- Liquid profile is approximate, but it is important to understand the distribution near cloud top.

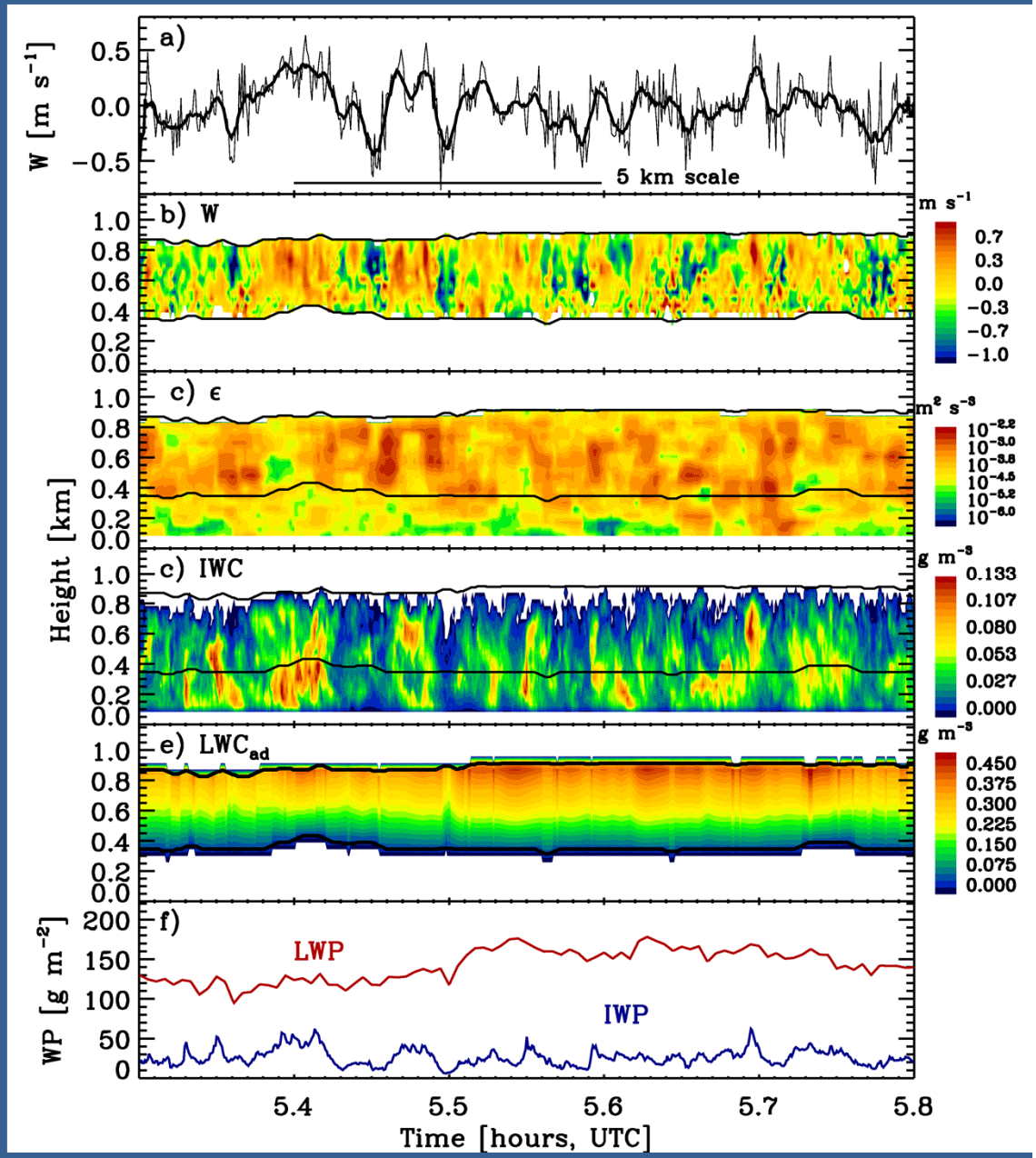
# Cloud Dynamics Retrievals

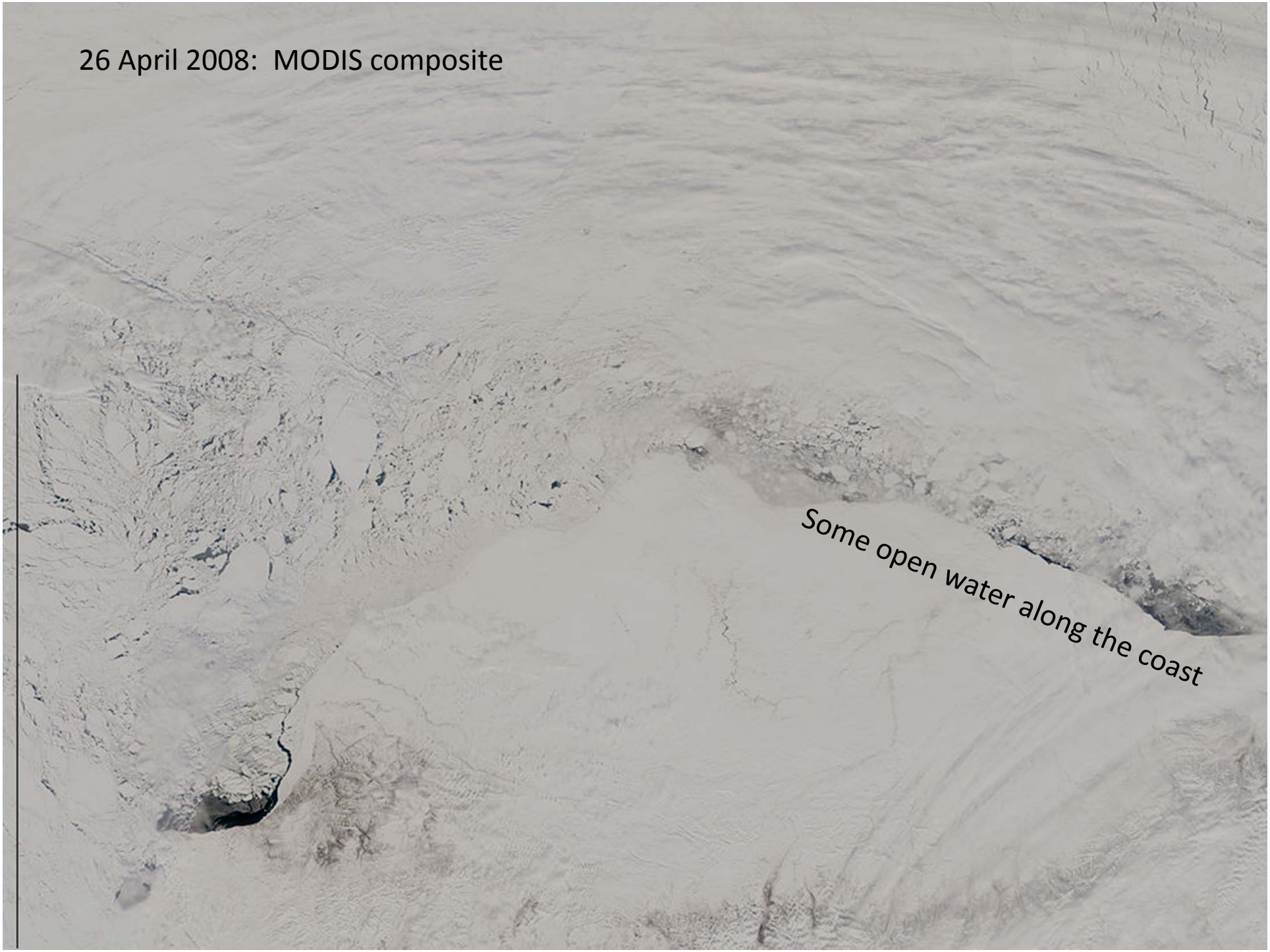
- Relatively weak circulations
- Turbulence profiles for most of case suggest decoupling; consistent with radiosonde at 5.75.
- W skewness consistent with decoupled situation.
- Apparent transition at ~07:00 as cloud base lowers. Skewness near base suggests more forcing from below. Turbulence also suggests there may be more interaction with surface. (Transition also happens to be coordinated w/ the upper cloud shading.)

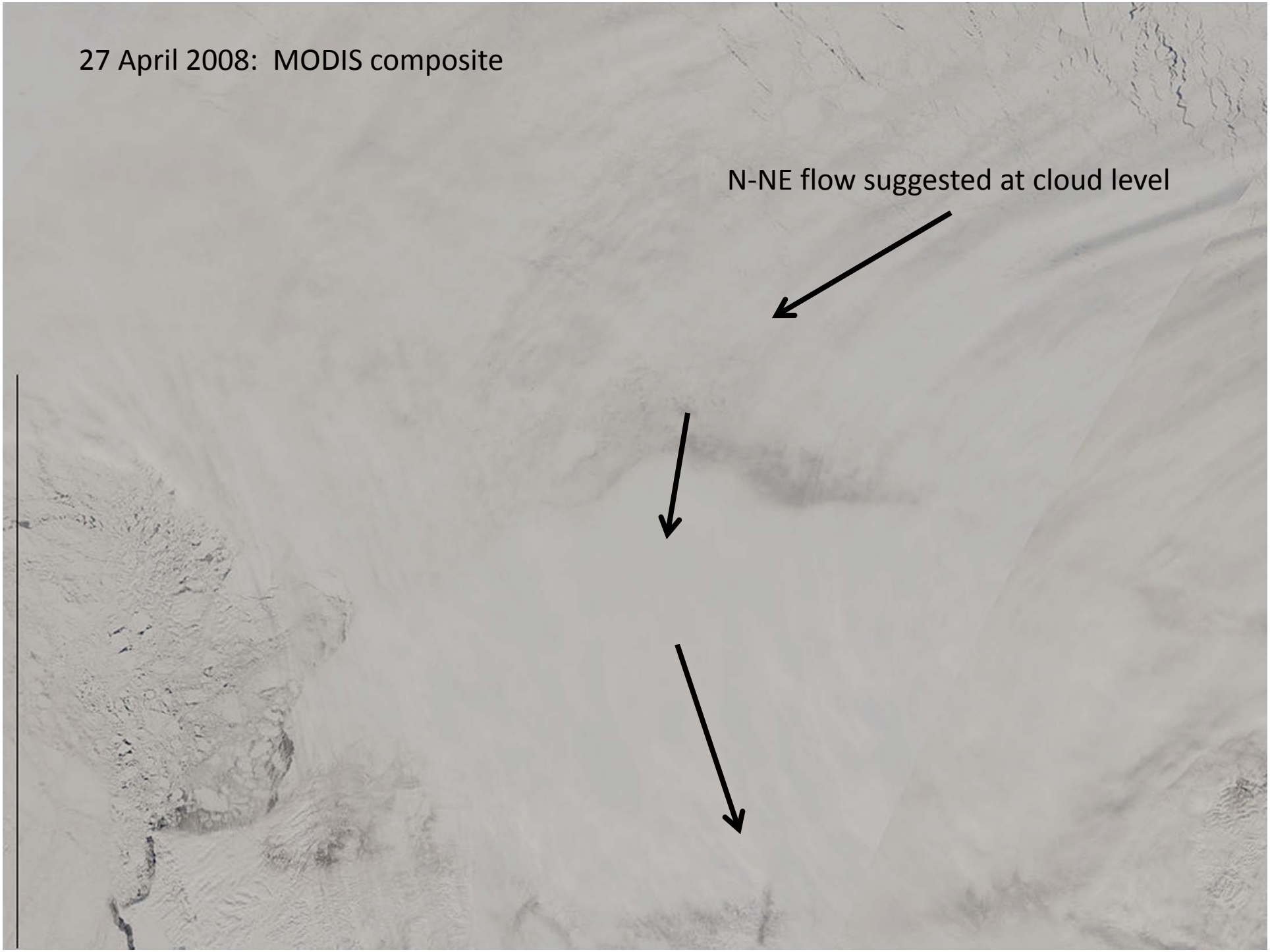


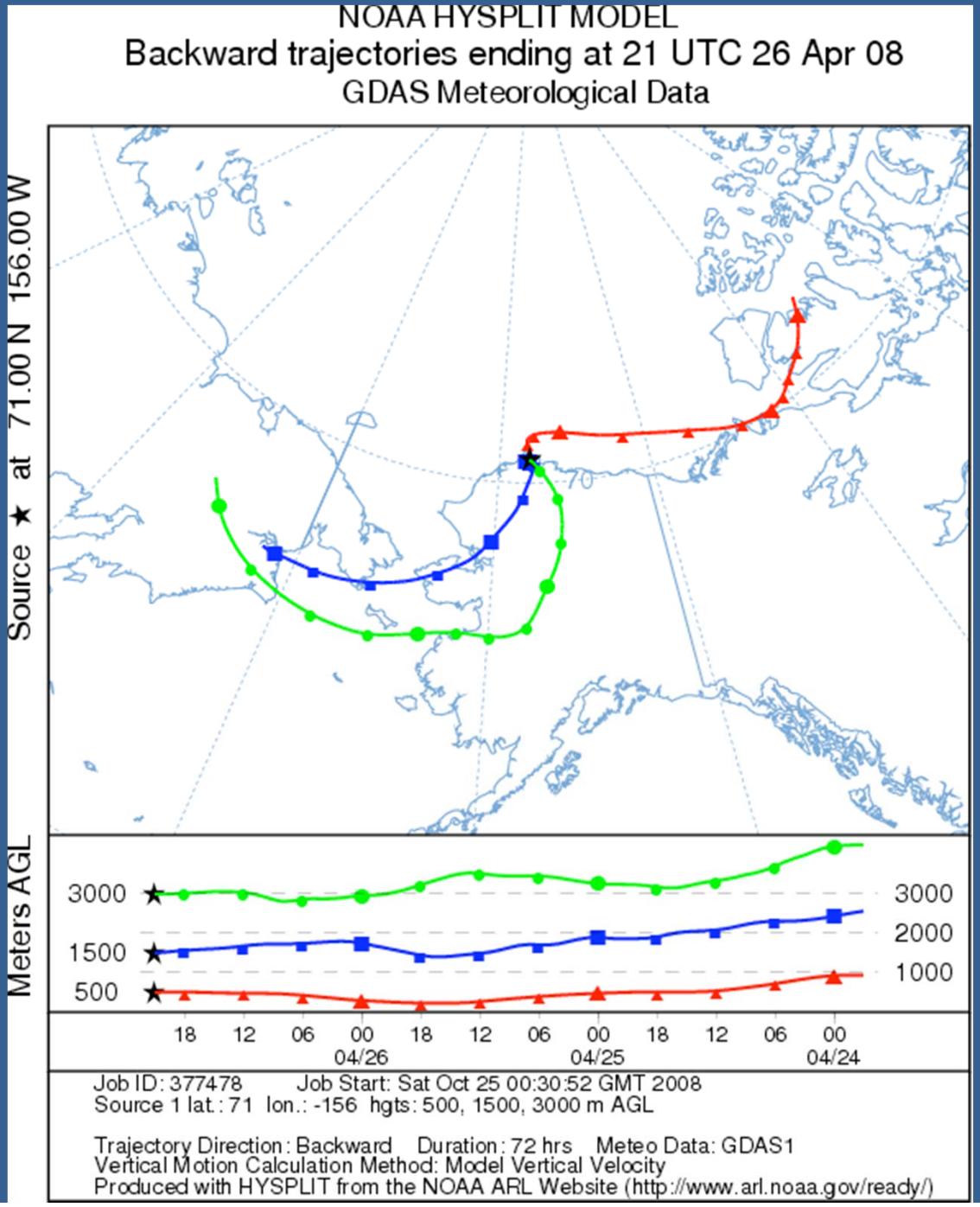
# Zooming in on the sounding time period

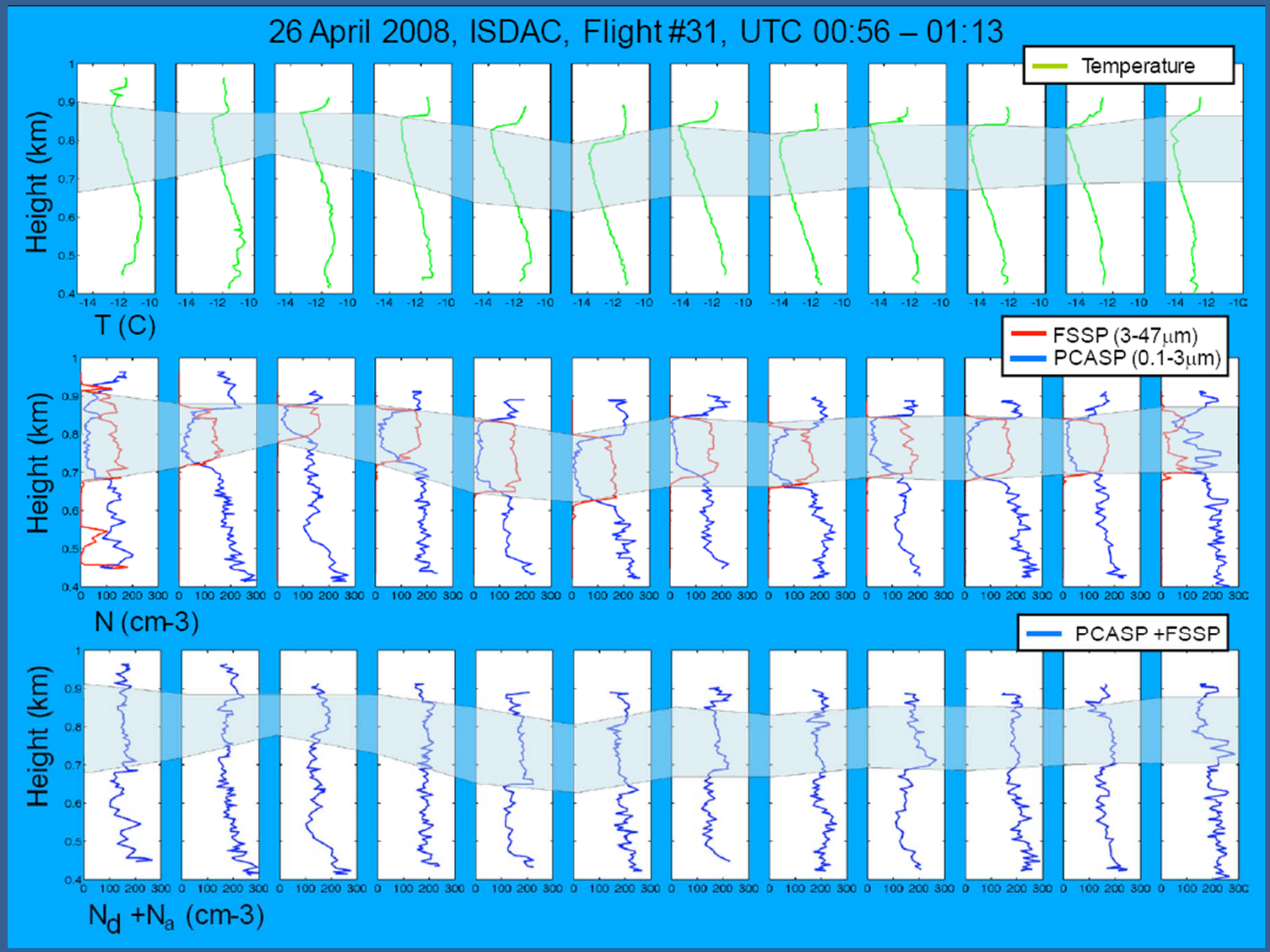
- Primary variability on a number of scales ranging from 0.5 to 2 km.
- Loosely see more correlation between W-IWP than W-LWP. Possibly because of cloud formation within the inversion which is presumably independent of primary mixed-layer circulations.

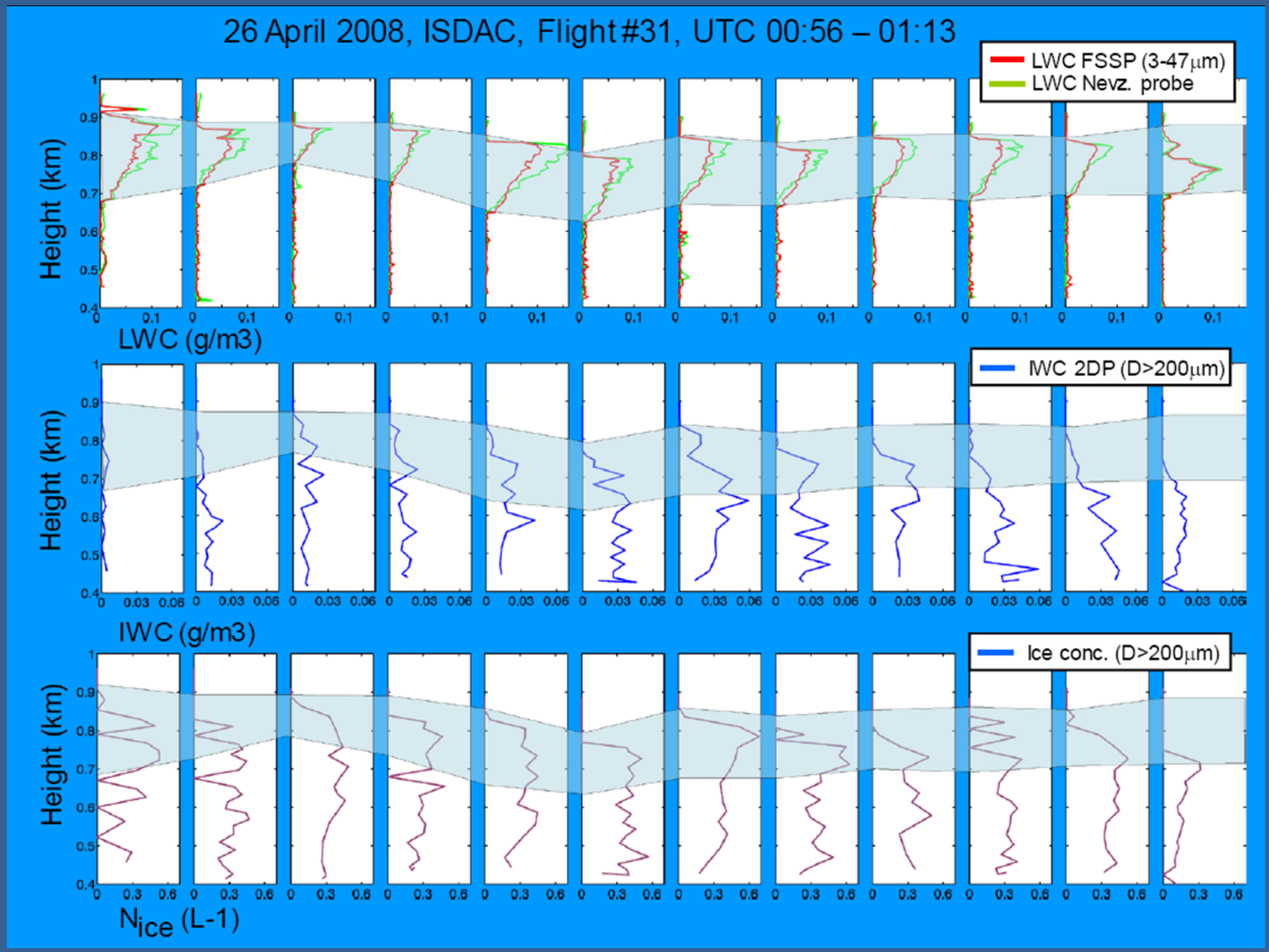



26 April 2008: MODIS composite
Some open water along the coast


27 April 2008: MODIS composite
N-NE flow suggested at cloud level


NOAA HYSPLIT MODEL
Backward trajectories ending at 21 UTC 26 Apr 08
GDAS Meteorological Data
Source ★ at 71.00 N 156.00 W
Meters AGL
3000
1500
500
3000
2000
1000
18 12 06 00 18 12 06 00 18 12 06 00
04/26 04/25 04/24
Job ID: 377478 Job Start: Sat Oct 25 00:30:52 GMT 2008
Source 1 lat.: 71 lon.: -156 hgts: 500, 1500, 3000 m AGL
Trajectory Direction: Backward Duration: 72 hrs Meteo Data: GDAS1
Vertical Motion Calculation Method: Model Vertical Velocity
Produced with HYSPLIT from the NOAA ARL Website (http://www.arl.noaa.gov/ready/)


26 April 2008, ISDAC, Flight #31, UTC 00:56 – 01:13
Temperature
Height (km)
T (C)
FSSP (3-47μm)
PCASP (0.1-3μm)
N (cm-3)
PCASP +FSSP
$N_d + N_a$ (cm-3)


26 April 2008, ISDAC, Flight #31, UTC 00:56 – 01:13
LWC FSSP (3-47μm)
LWC Nevz. probe
Height (km)
LWC (g/m3)
IWC 2DP (D>200μm)
IWC (g/m3)
Ice conc. (D>200μm)
N_ice (L-1)