The DYNAMO/AMIE International Field Campaign: Cloud Population of the Madden-Julian Oscillation

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and
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Presented at DYNAMO Radar Workshop, Seattle, 22-24 August 2012, Supported by DOE/ASR grant DE-SC0008452 and NSF grant AGS-1059611

Radar experiment goal

→ Characteristics and evolution of the MJO cloud population in the region where the disturbance builds up

→ Role of clouds in humidification of troposphere prior to MJO onset

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→ Characteristics and evolution of the MJO cloud population in the region where the disturbance builds up

→ **Role of clouds in humidification of troposphere prior to MJO onset**

DYNAMO Field Experiment (October 2011 – March 2012)


Falcon

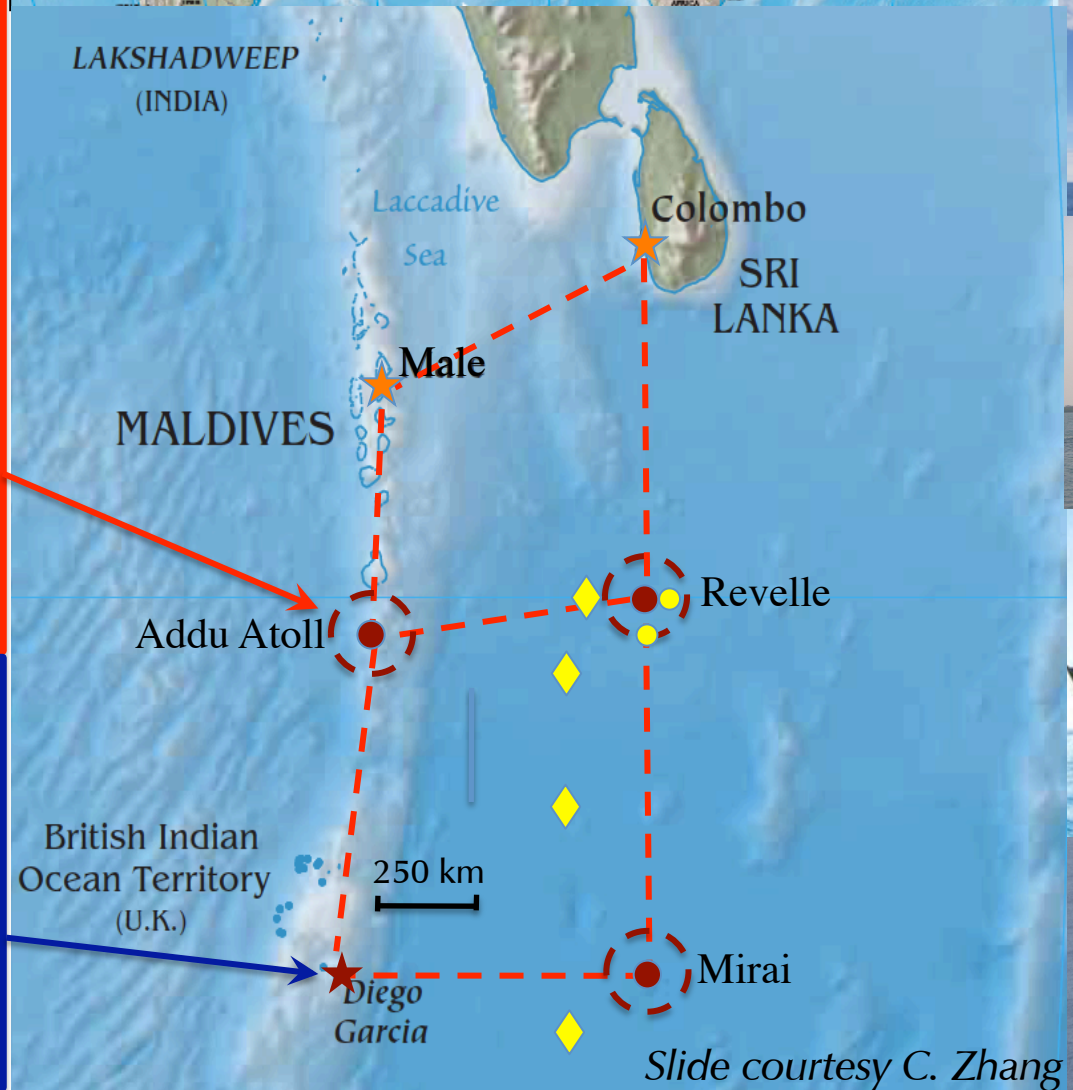

S-PolKa


SMART-R


AMF2


ISS


P-3



Slide courtesy C. Zhang


R/V B. Jaya-III


R/V R. Revelle

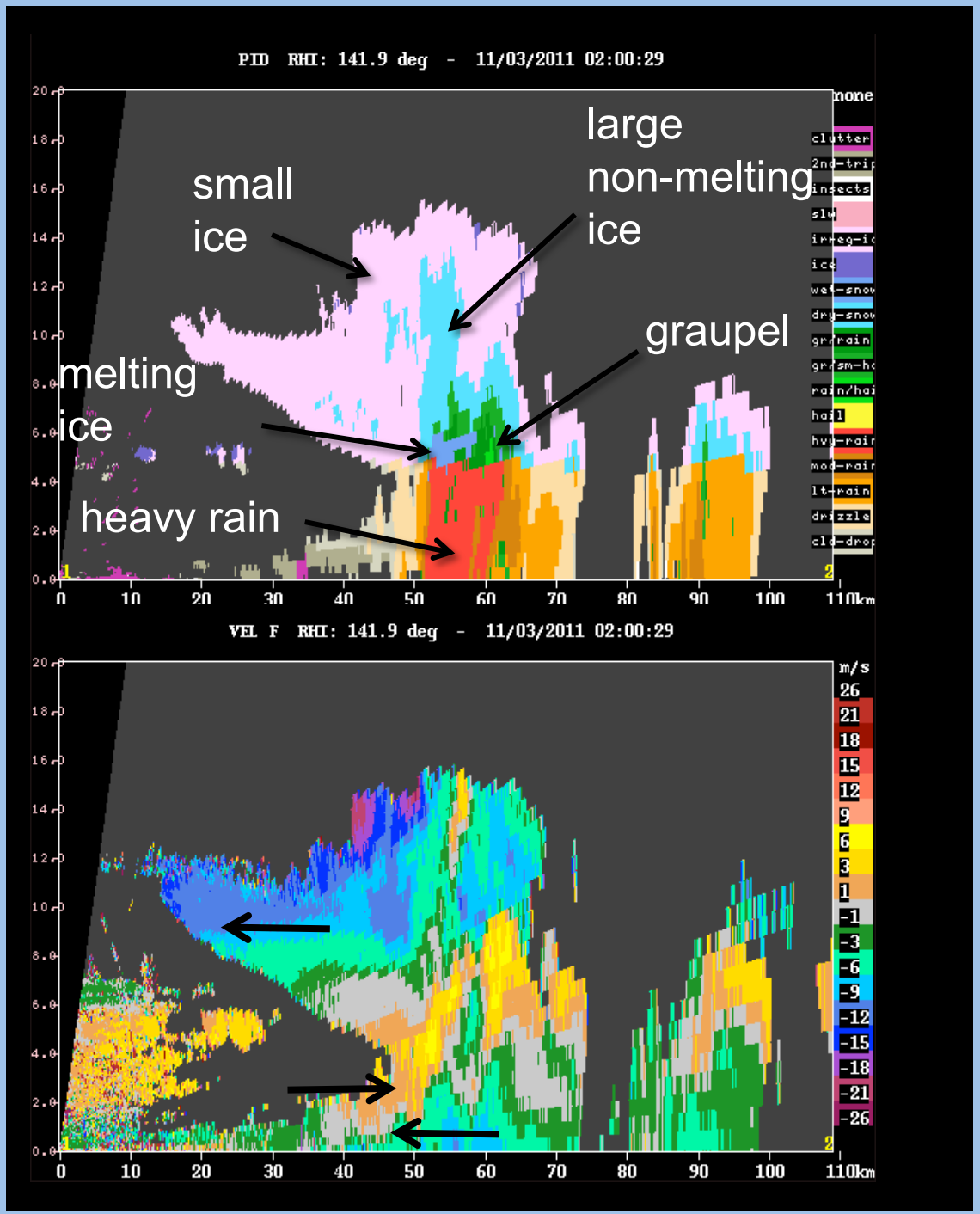

R/V S. Kanya


R/V Mirai

S-PolKa: Moderate cumulonimbus

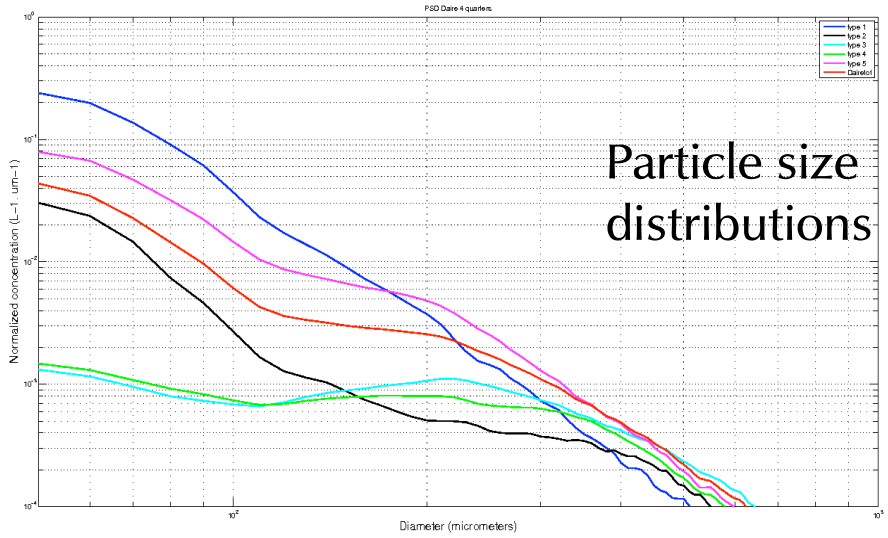
Hydrometeor type

Doppler velocity: range folding corrected

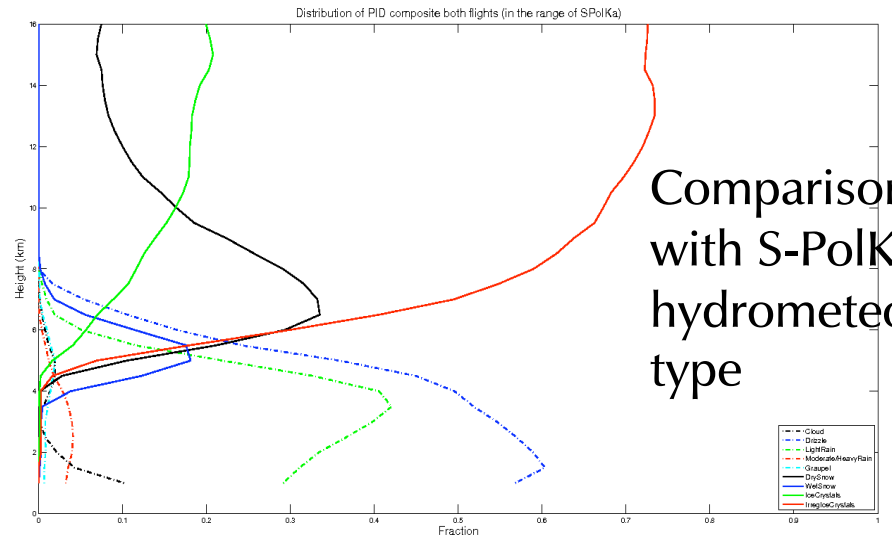


Slide courtesy R. Houze

Falcon (F-20) microphysical data

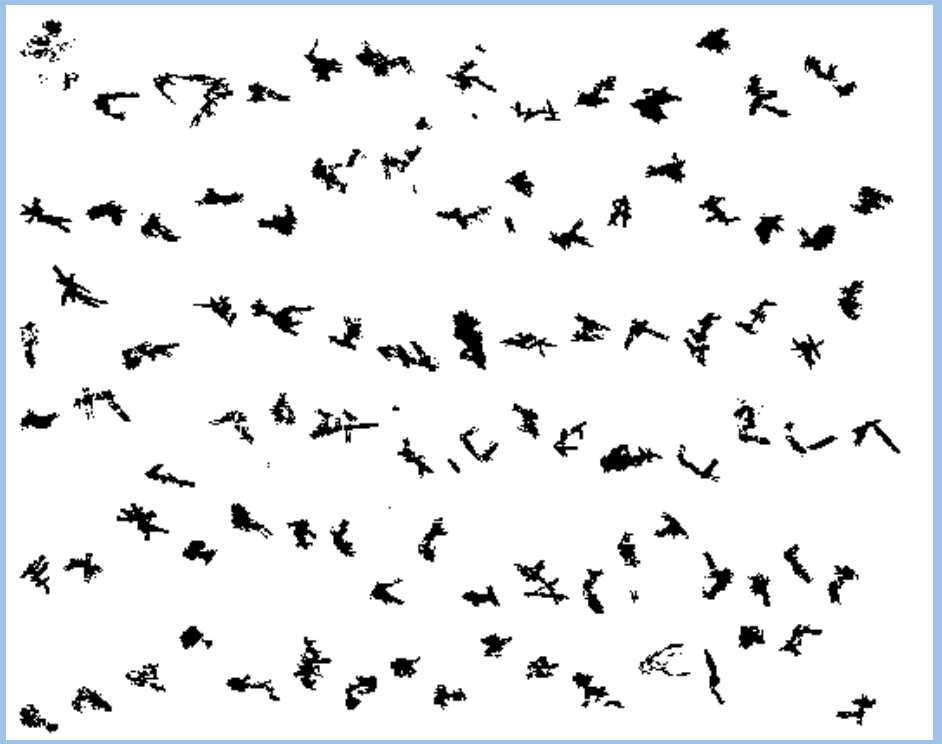


Particle size distributions



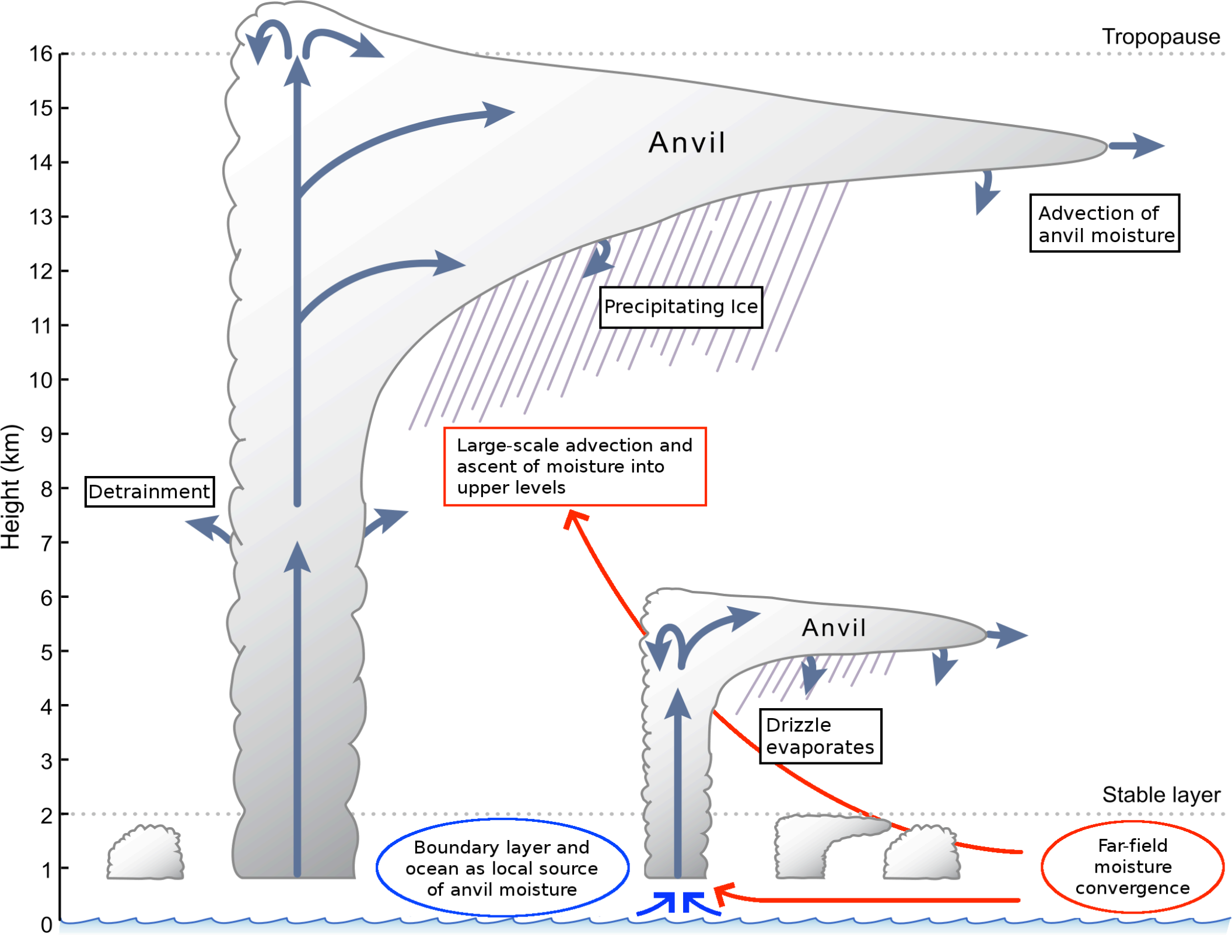
Comparison with S-PolKa hydrometeor type

Particle Images

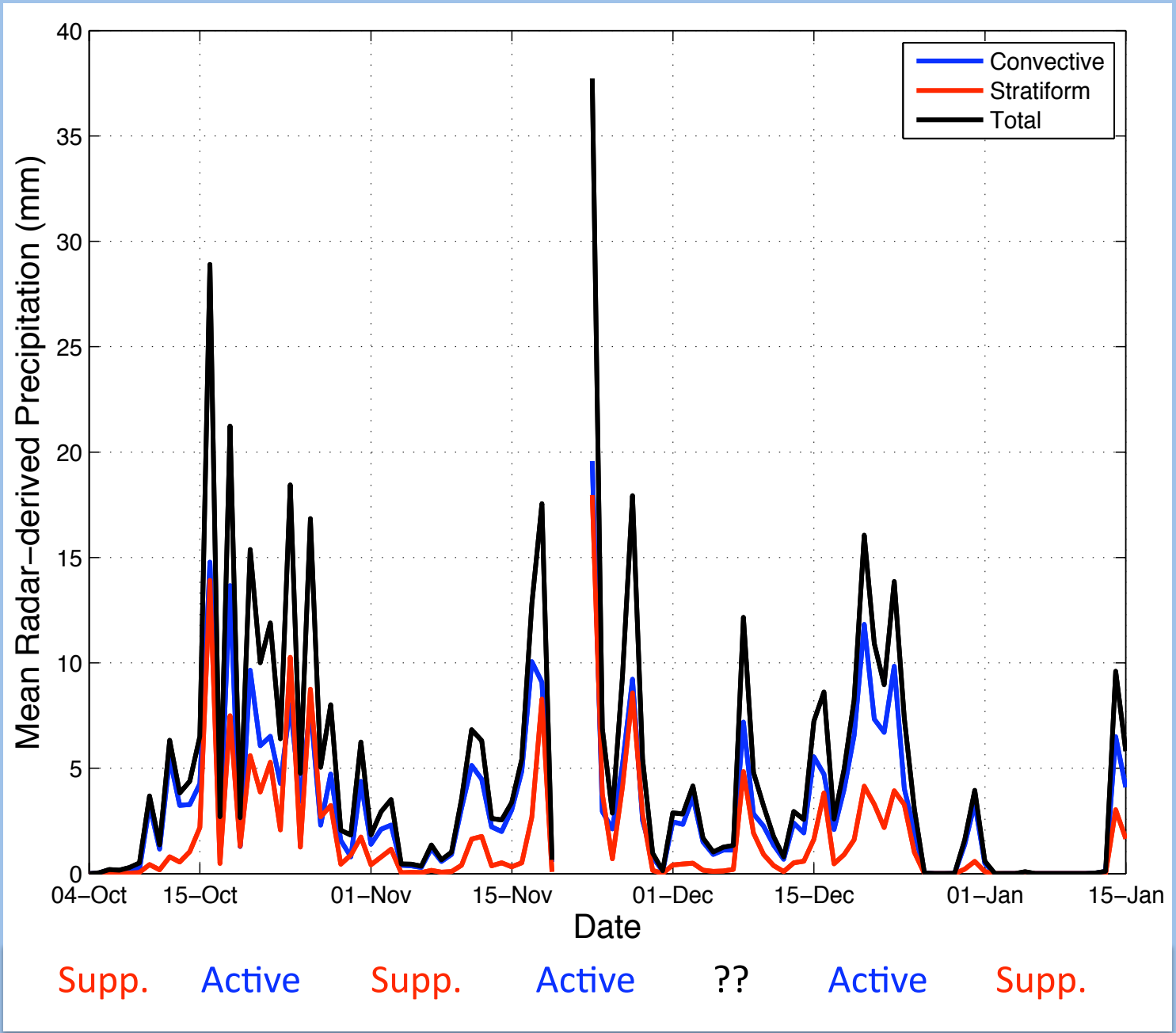


Figures courtesy D. Coppin

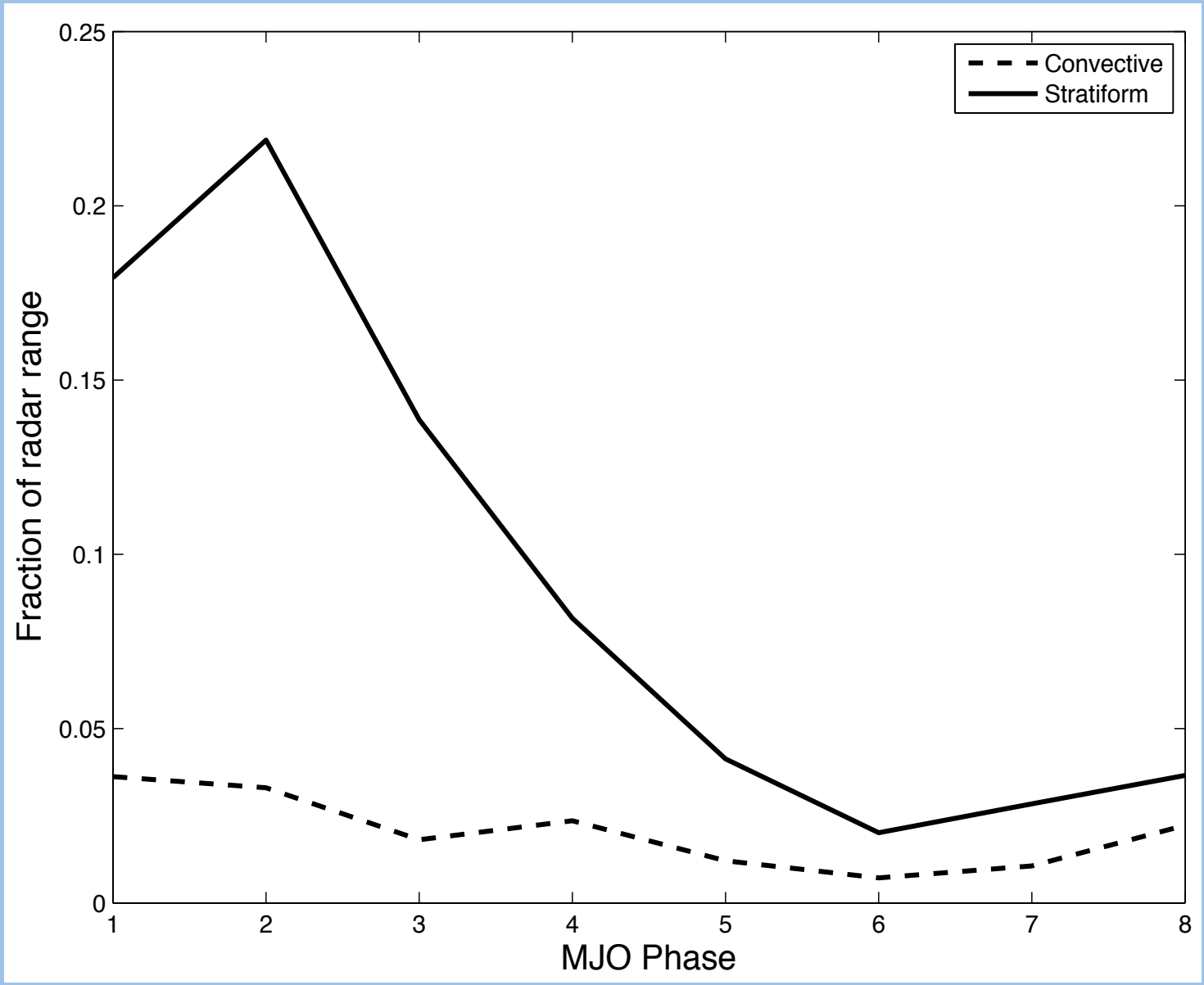
See Talks 3.1-6 (Friday, 9:45AM) and 3.2-5 (Friday at 11:30AM) in HS9.

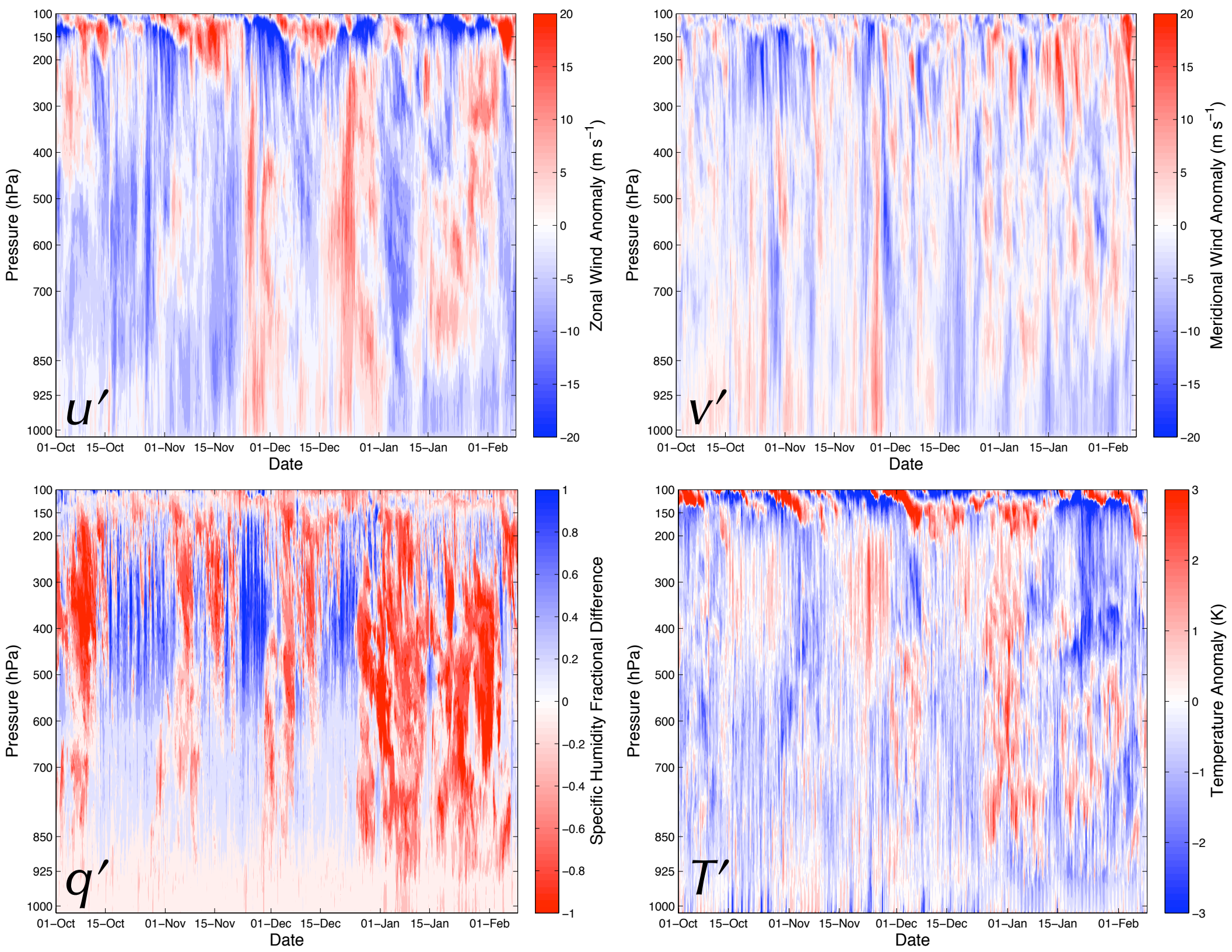

Tropopause
Anvil
Advection of anvil moisture
Precipitating Ice
Large-scale advection and ascent of moisture into upper levels
Detrainment
Anvil
Drizzle evaporates
Stable layer
Boundary layer and ocean as local source of anvil moisture
Far-field moisture convergence
Height (km)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

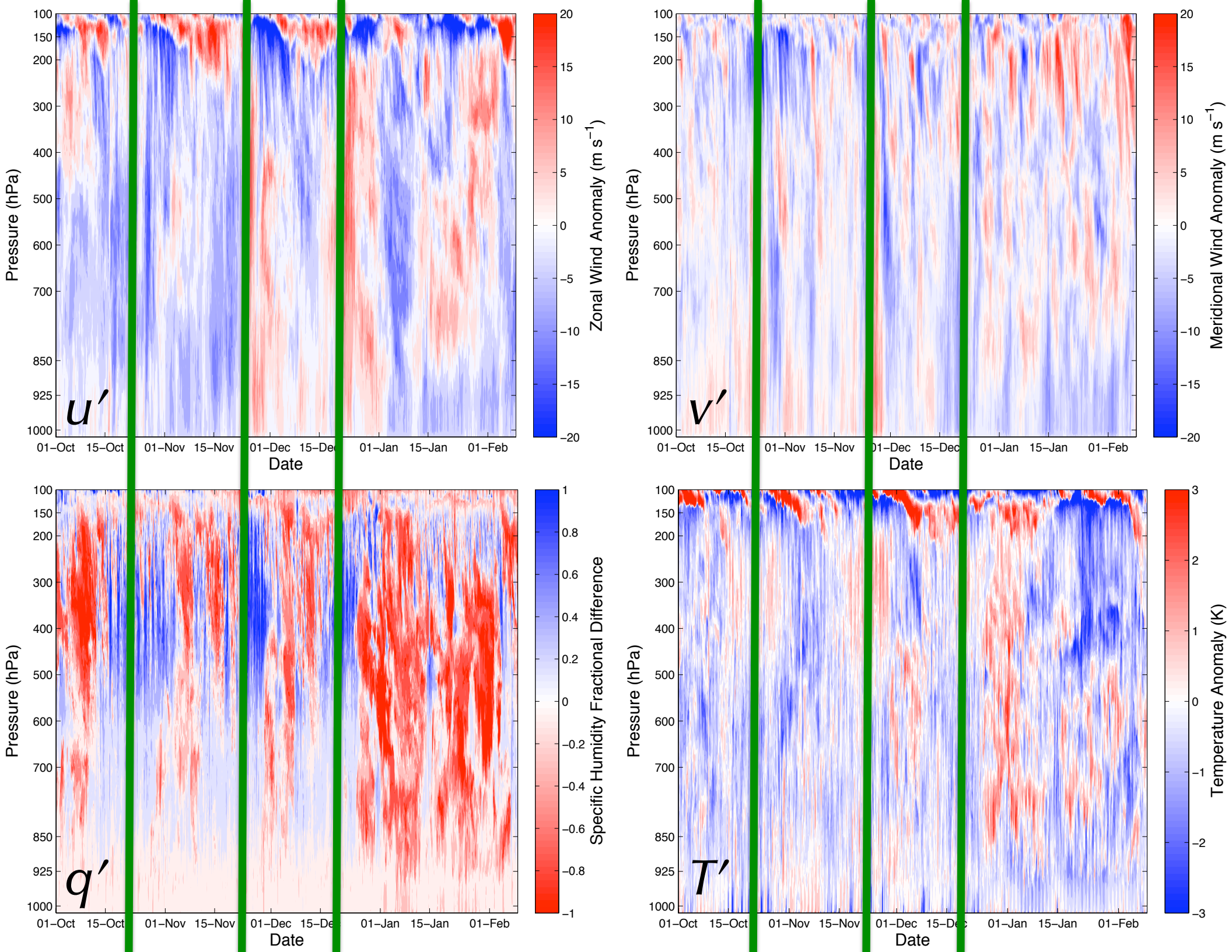
Precipitation at Addu



Convective and stratiform observed by S-PolKa




u′
v′
q′
T′
Pressure (hPa)
Date
Zonal Wind Anomaly (m s−1)
Meridional Wind Anomaly (m s−1)
Specific Humidity Fractional Difference
Temperature Anomaly (K)
100
150
200
300
400
500
600
700
850
925
1000
01–Oct
15–Oct
01–Nov
15–Nov
01–Dec
15–Dec
01–Jan
15–Jan
01–Feb
20
15
10
5
0
−5
−10
−15
−20
1
0.8
0.6
0.4
0.2
0
−0.2
−0.4
−0.6
−0.8
−1
3
2
1
0
−1
−2
−3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Date
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01–Nov
15–Nov
01–Dec
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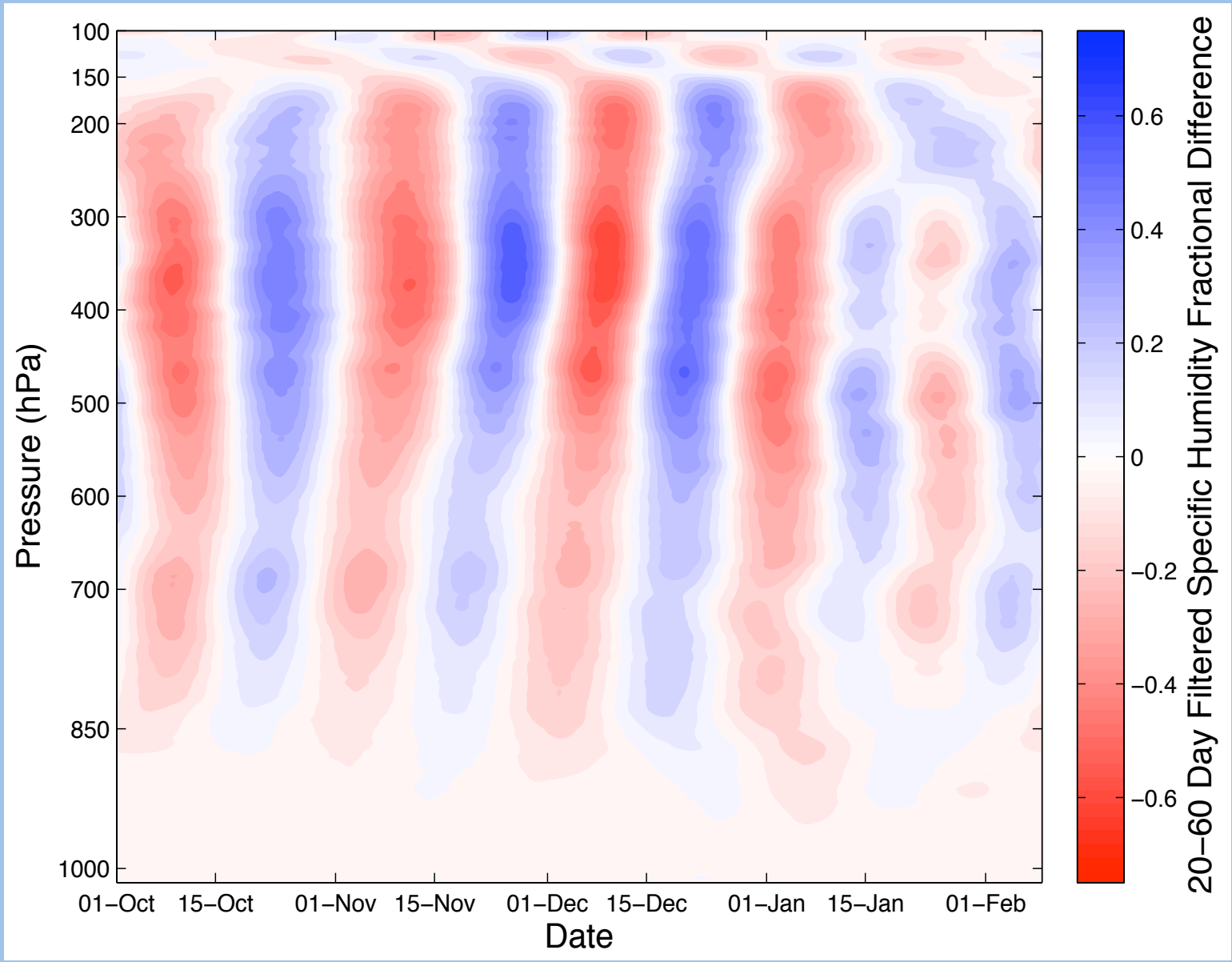
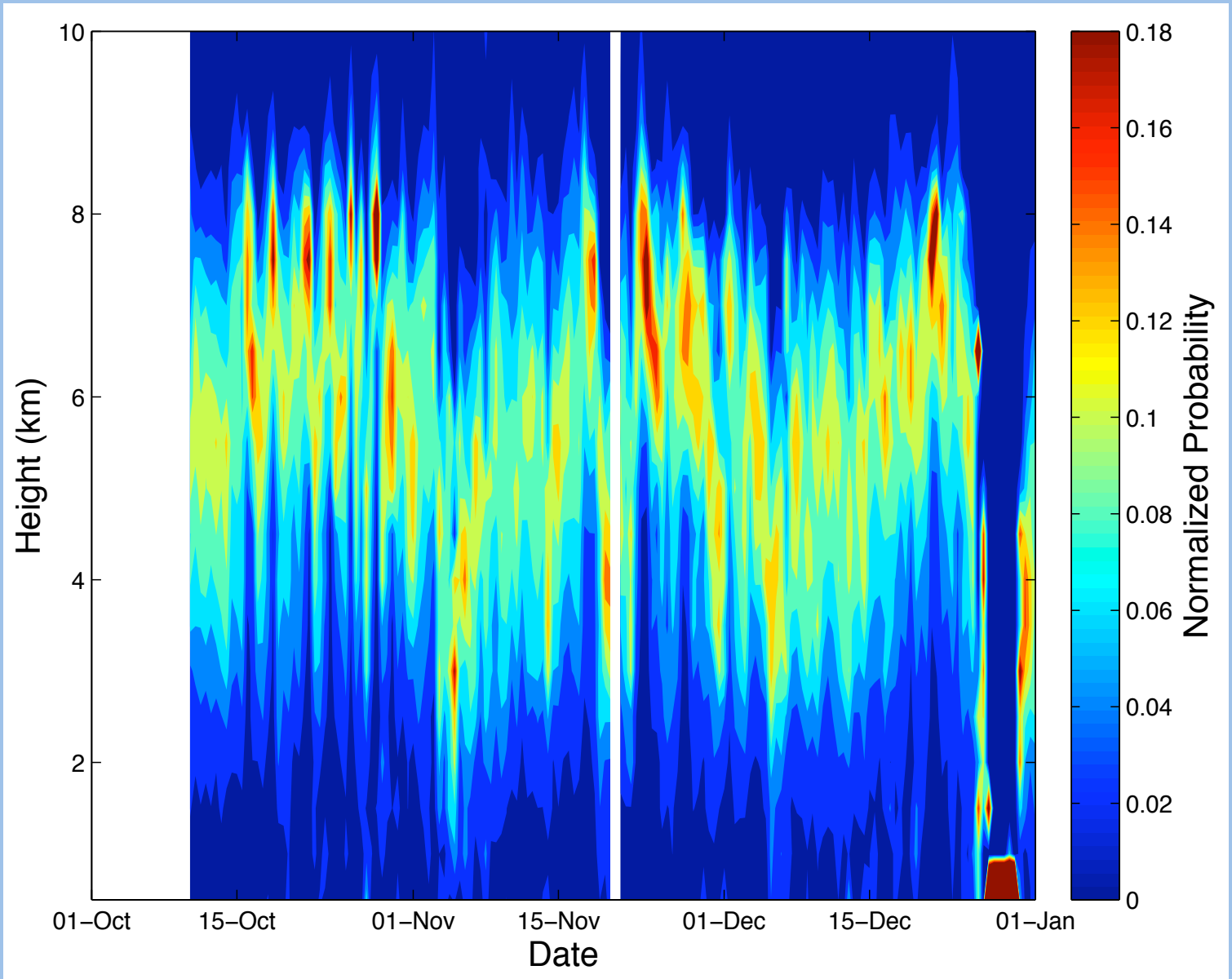
15–Jan
01–Feb
20
15
10
5
0
−5
−10
−15
−20
1
0.8
0.6
0.4
0.2
0
−0.2
−0.4
−0.6
−0.8
−1
3
2
1
0
−1
−2
−3

Filtered specific humidity anomalies

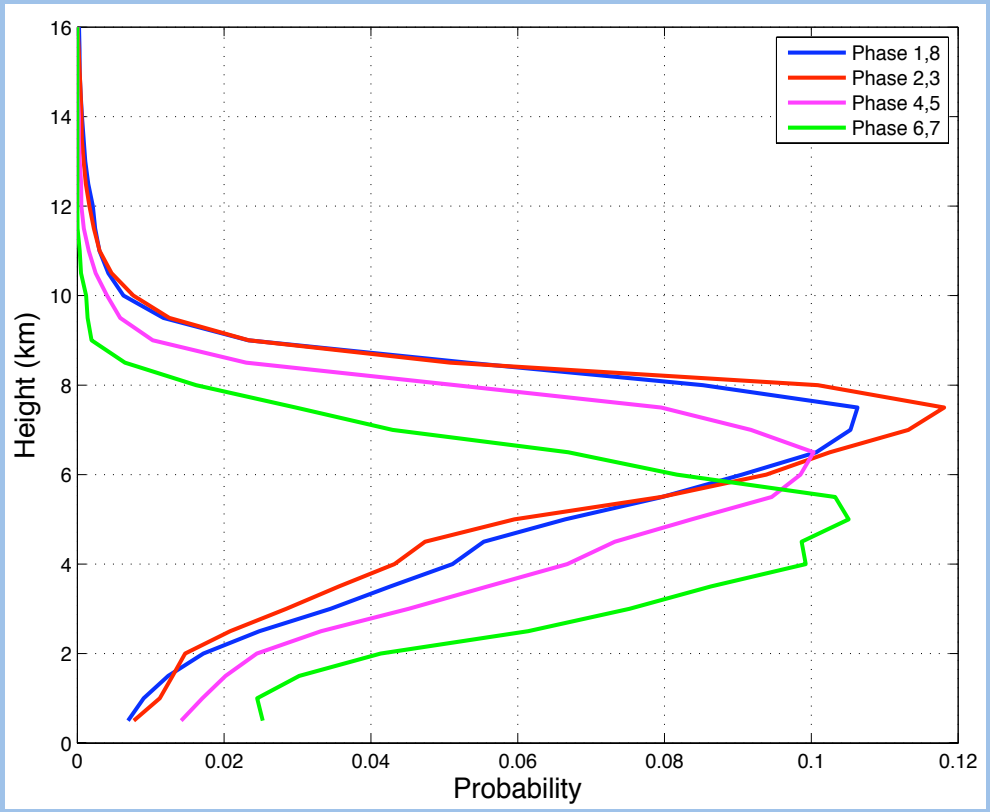


Convective echotops observed by S-PolKa

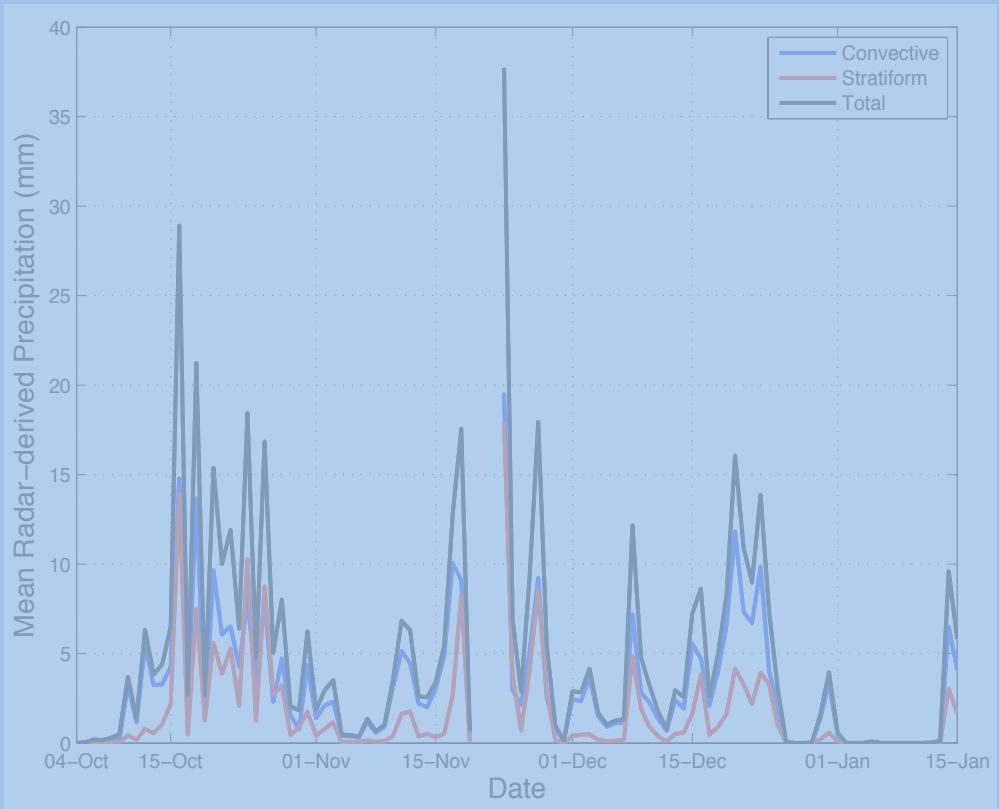


Convective echotops observed by S-PolKa

Echotop PDFs grouped by “bi-phase”



Echotop PDFs during “wet” and “dry” days of active phases



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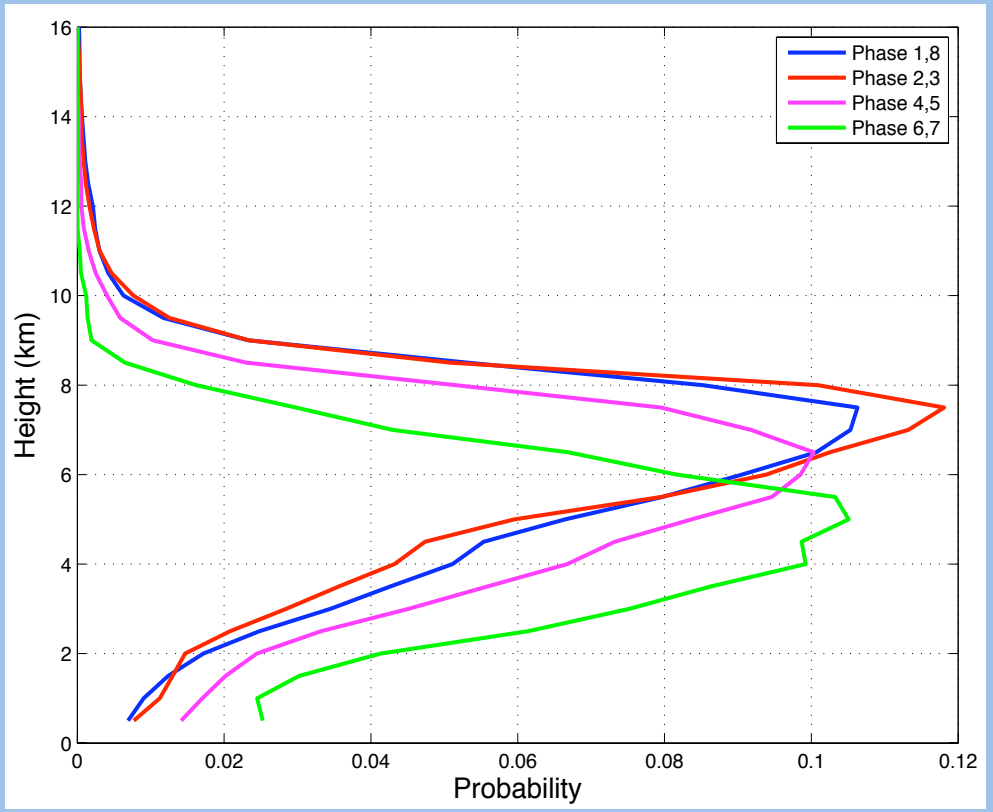

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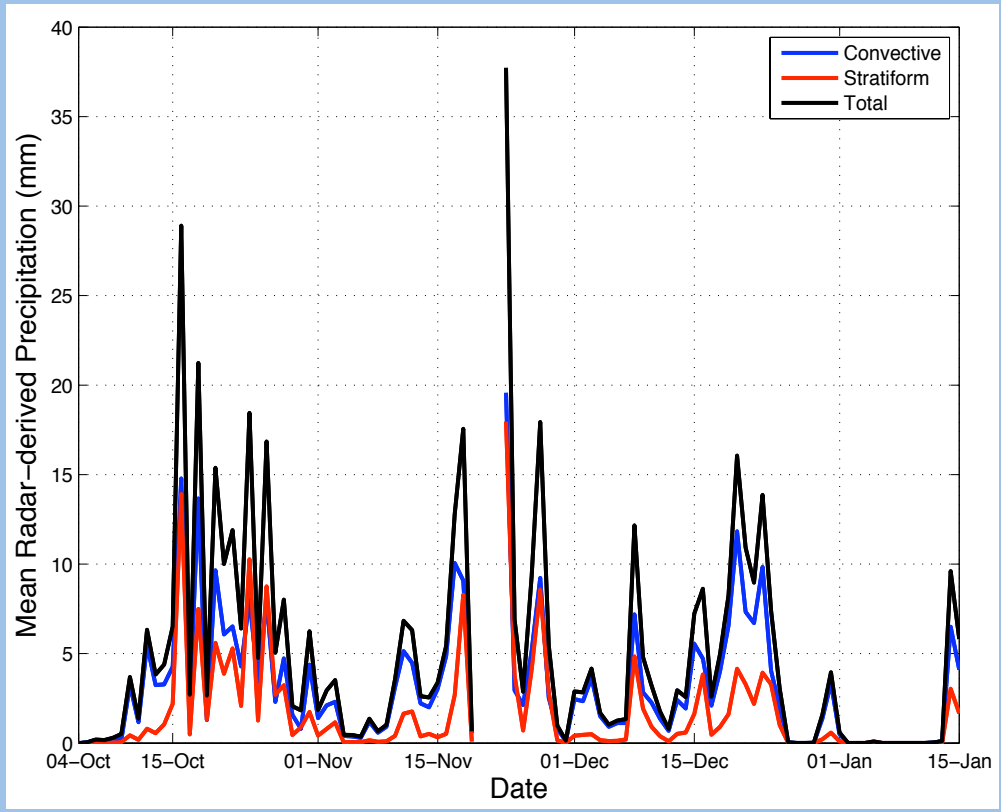

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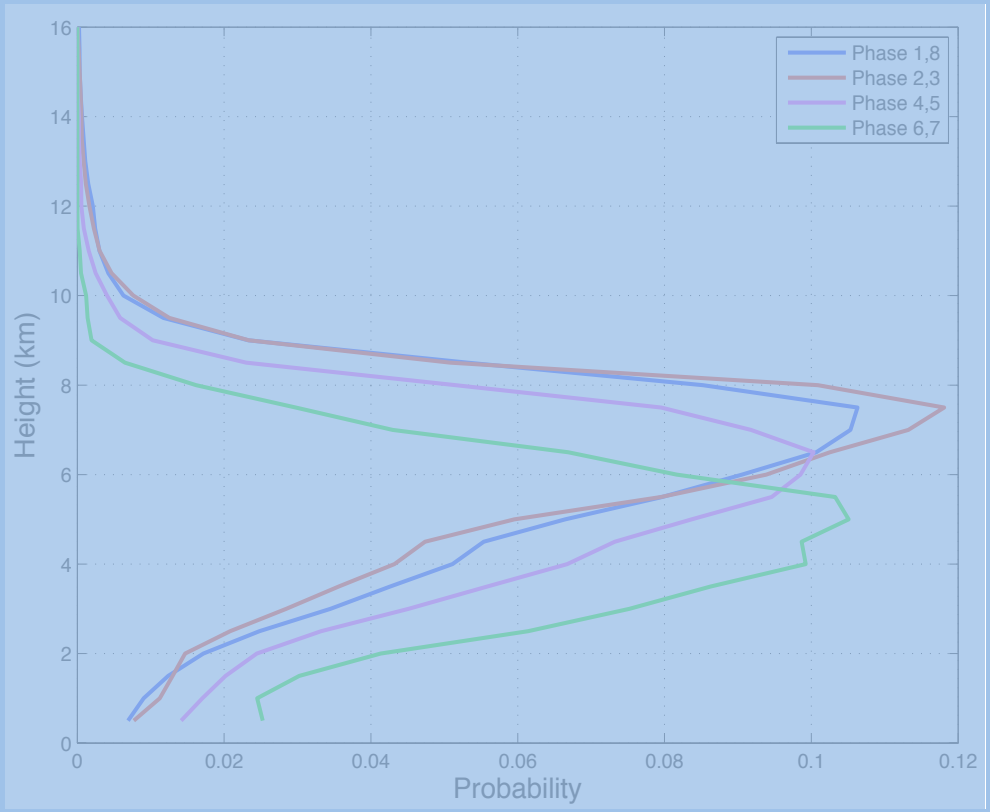

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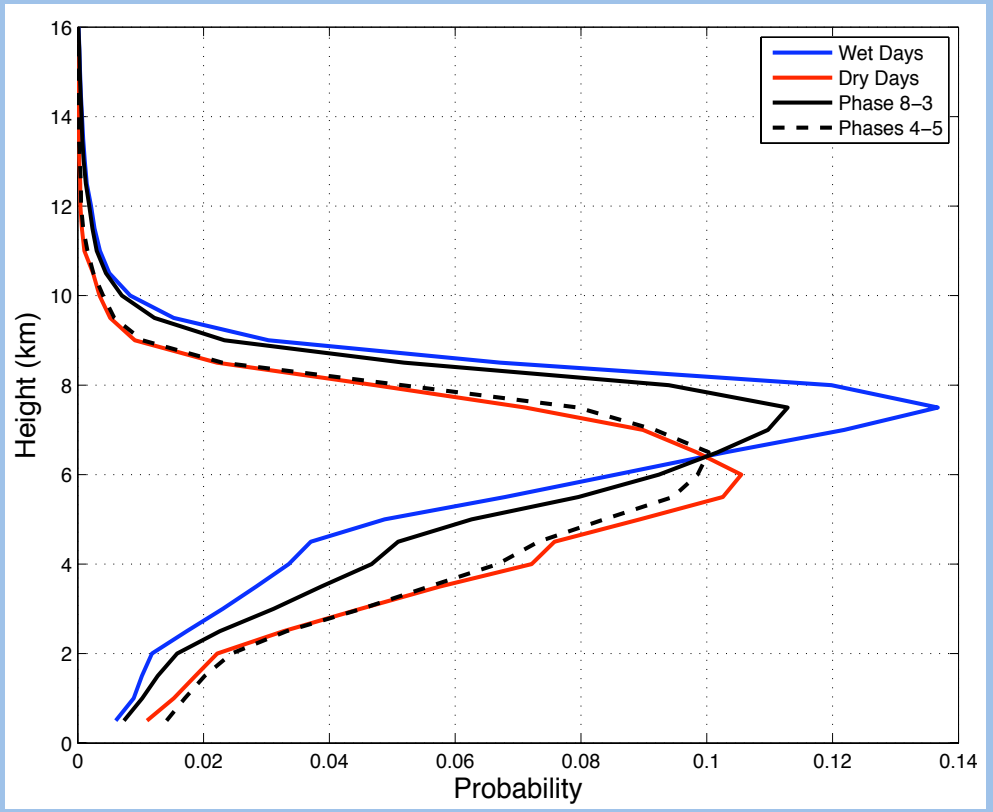
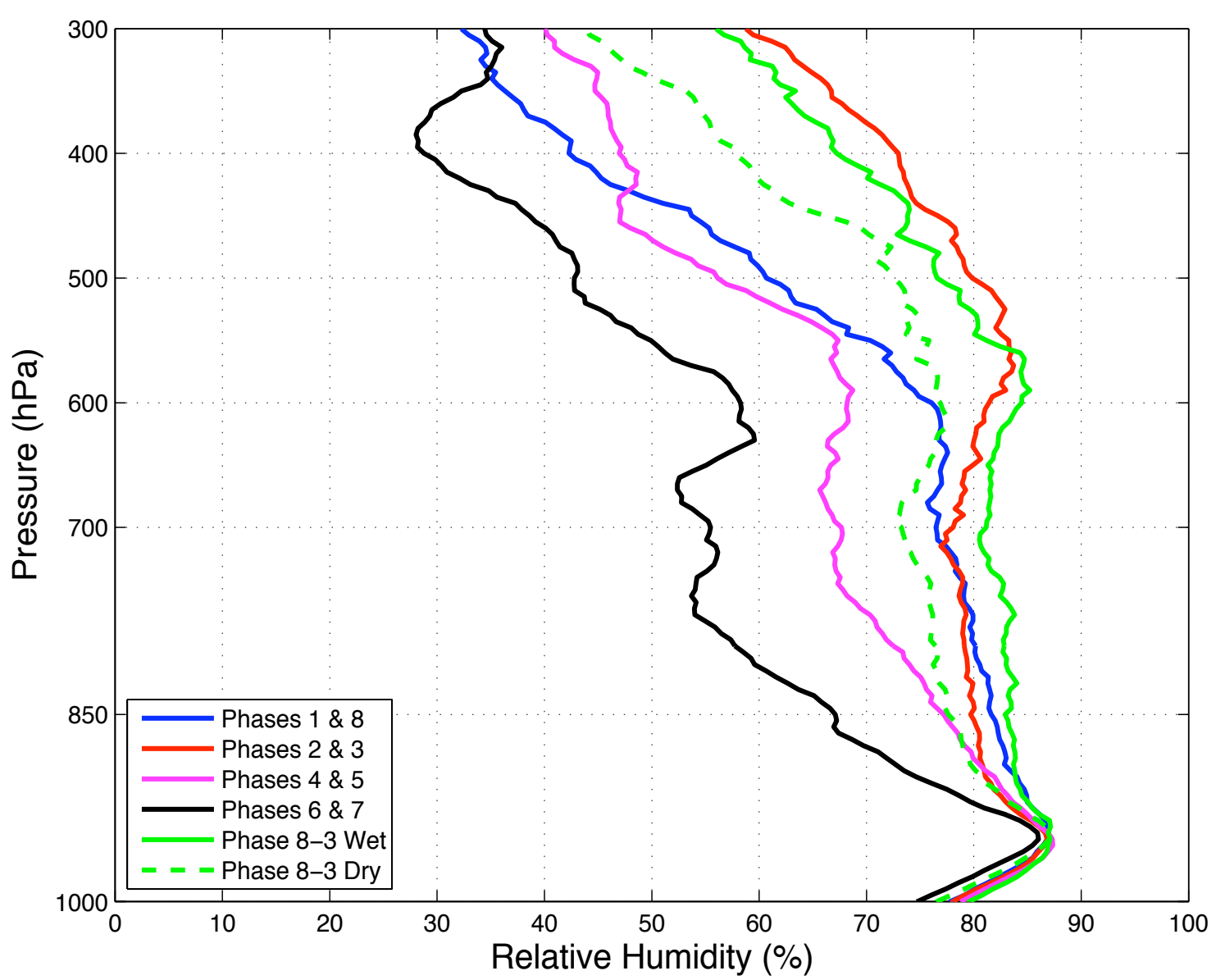
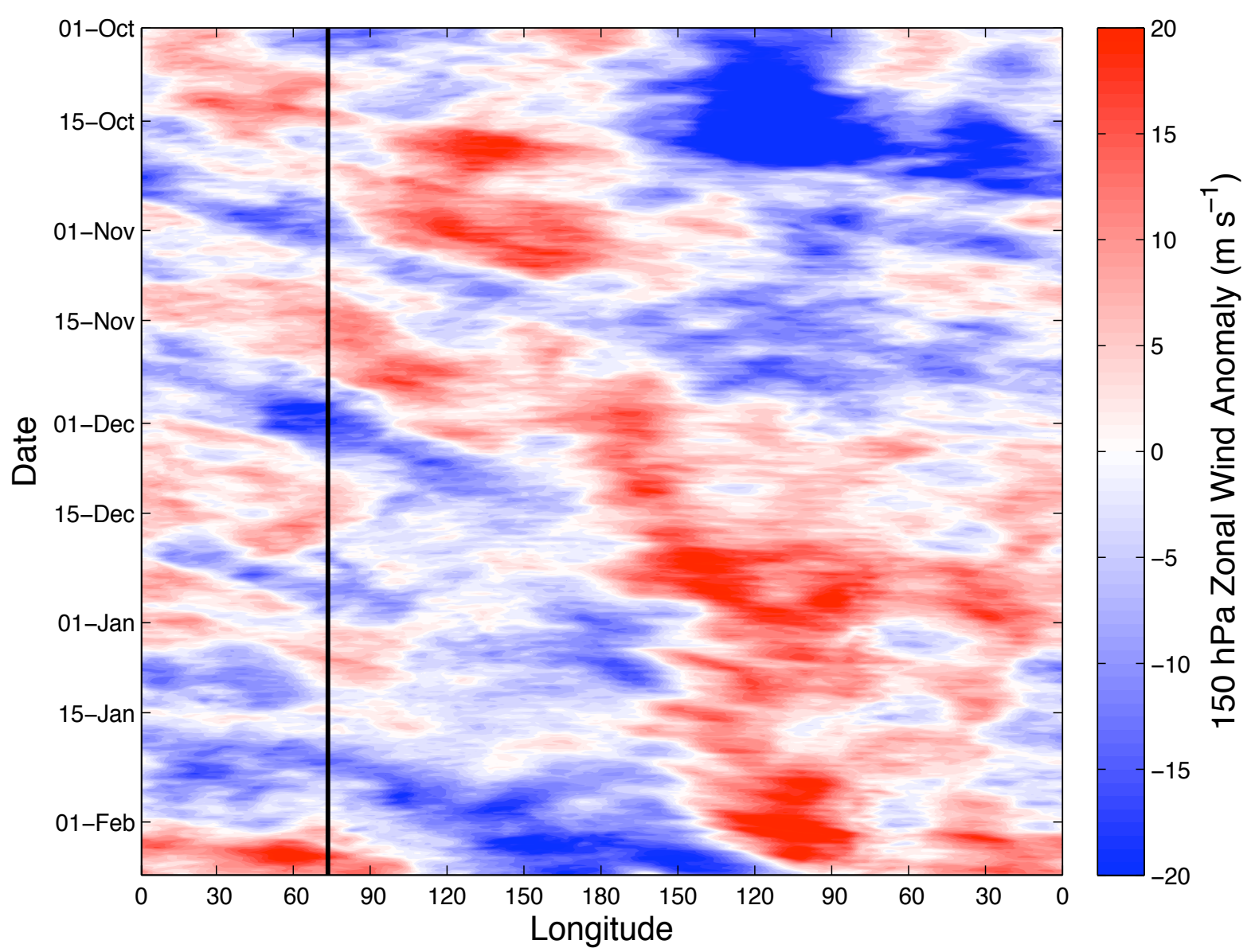


Relative Humidity profile comparison by phase



150 hPa zonal wind anomalies in ERA-I



Conclusions

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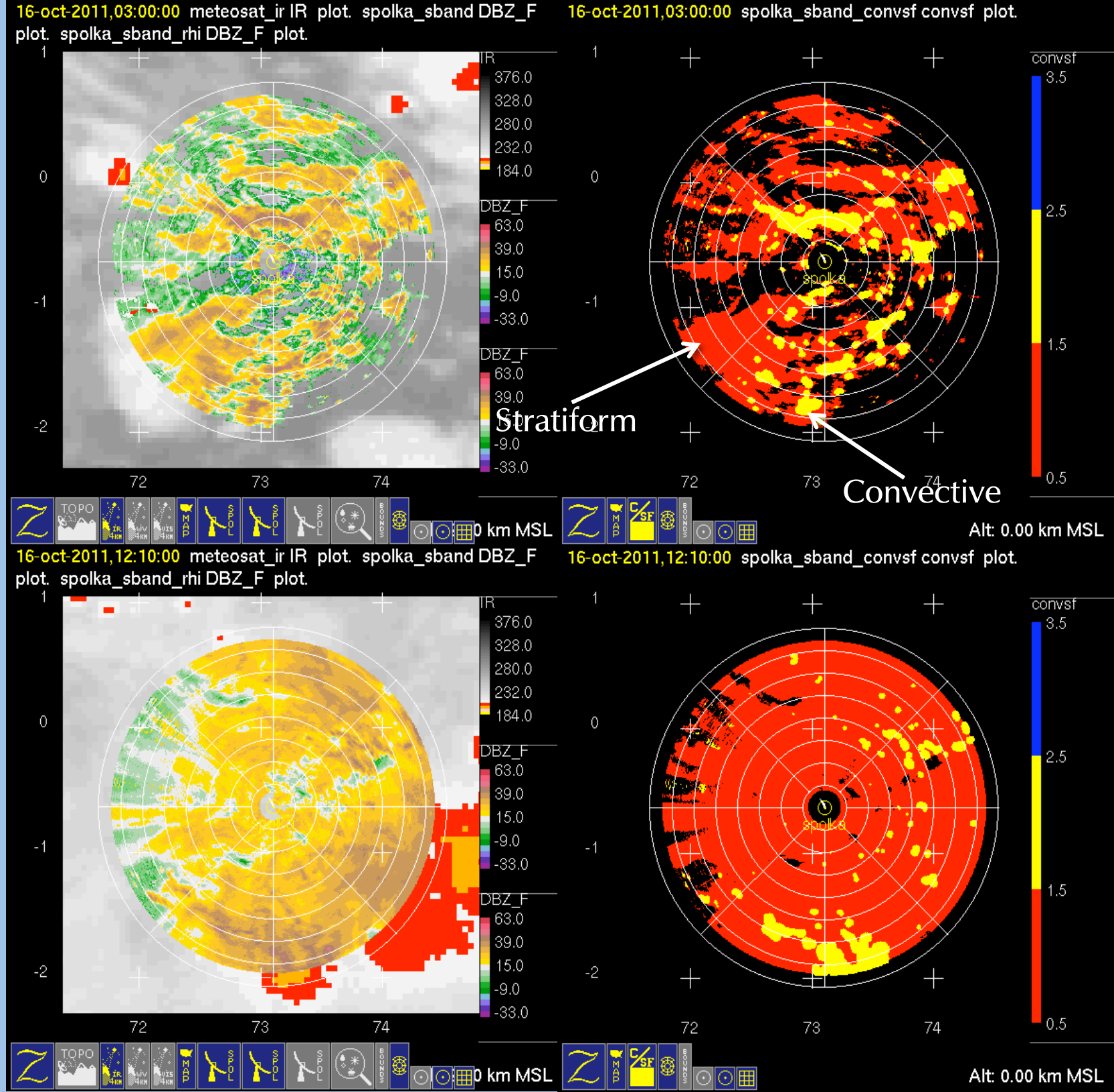
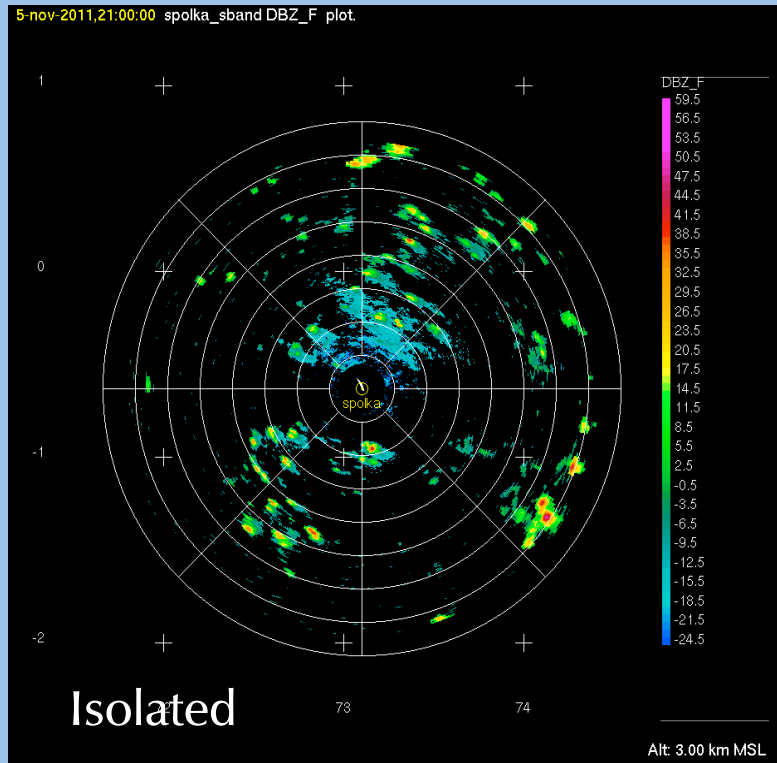
End

Large mesoscale system

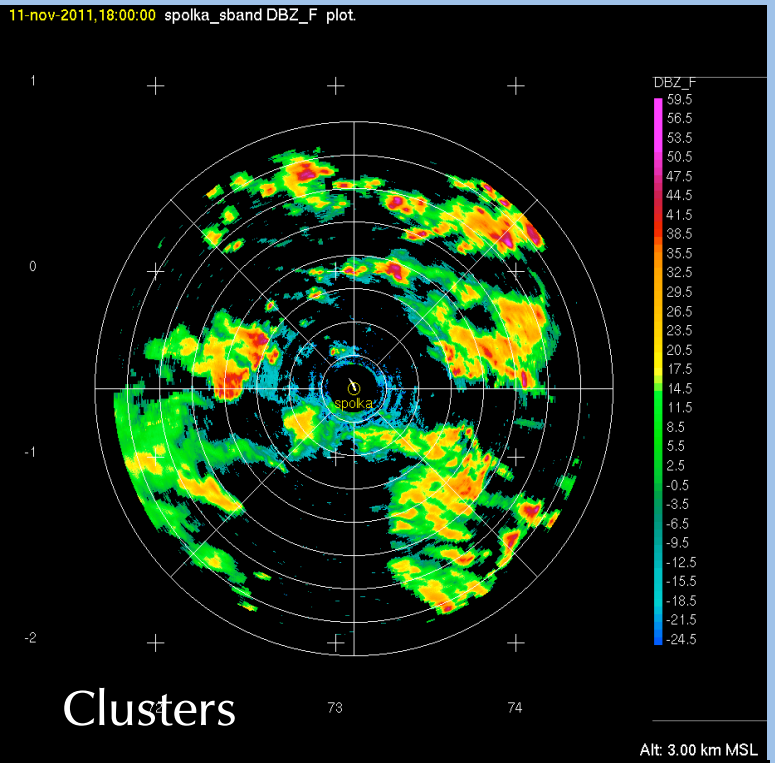


Slide courtesy R. Houze

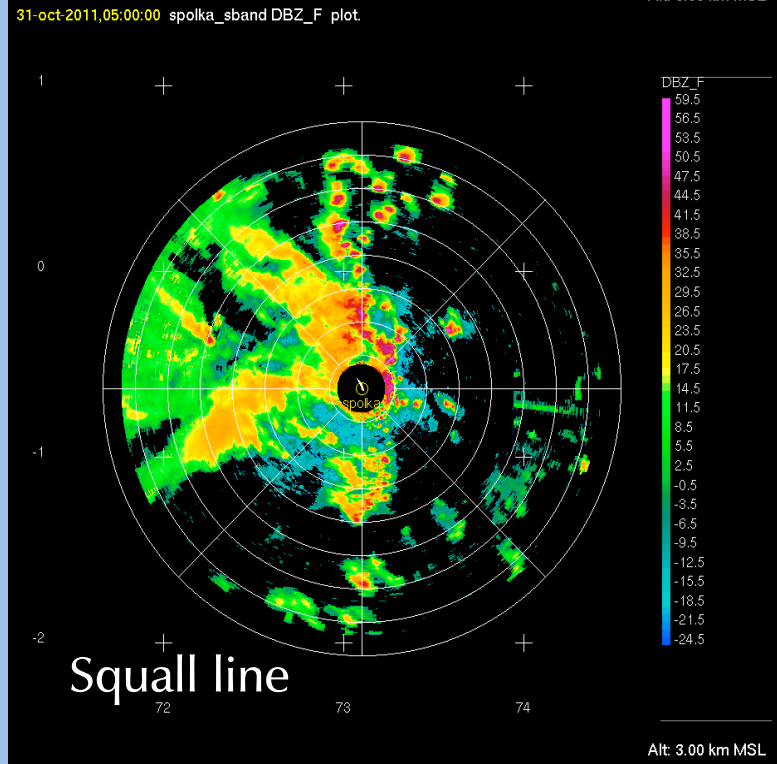
Organization of convection



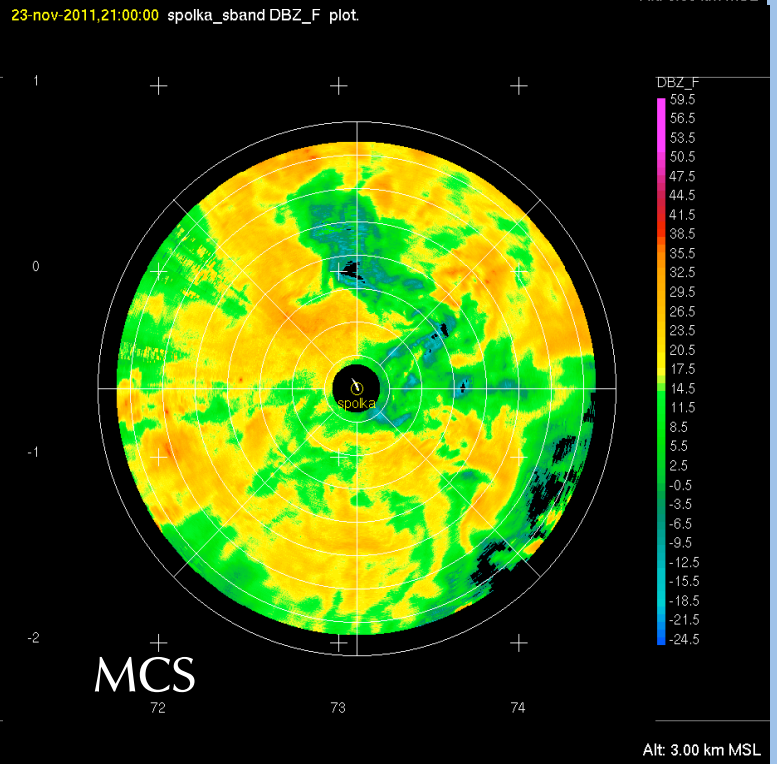
Isolated



Clusters



Squall line

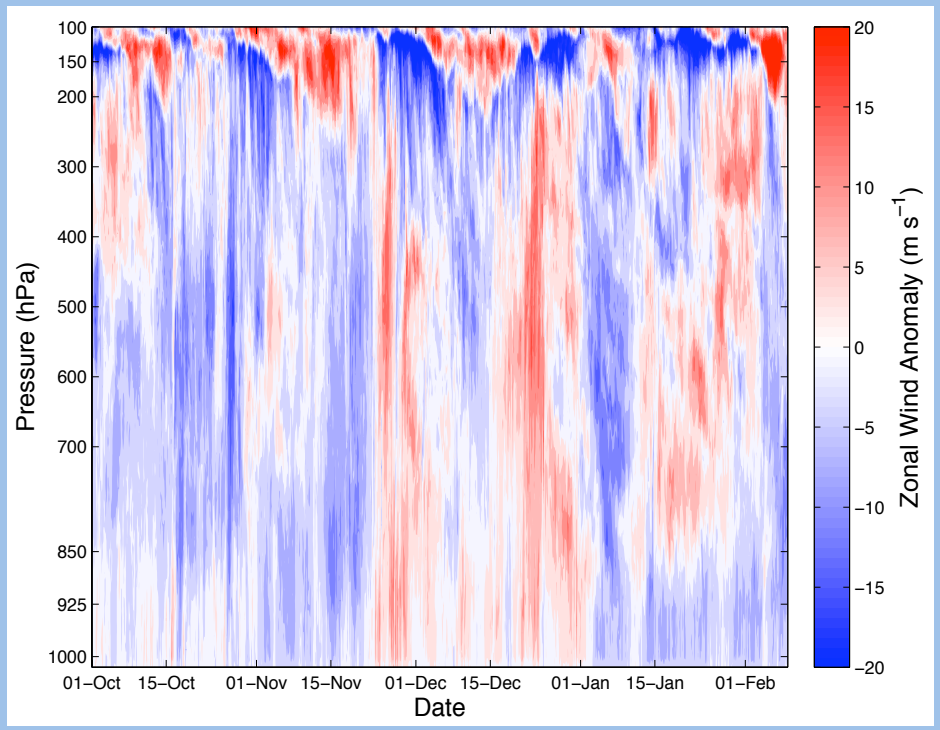


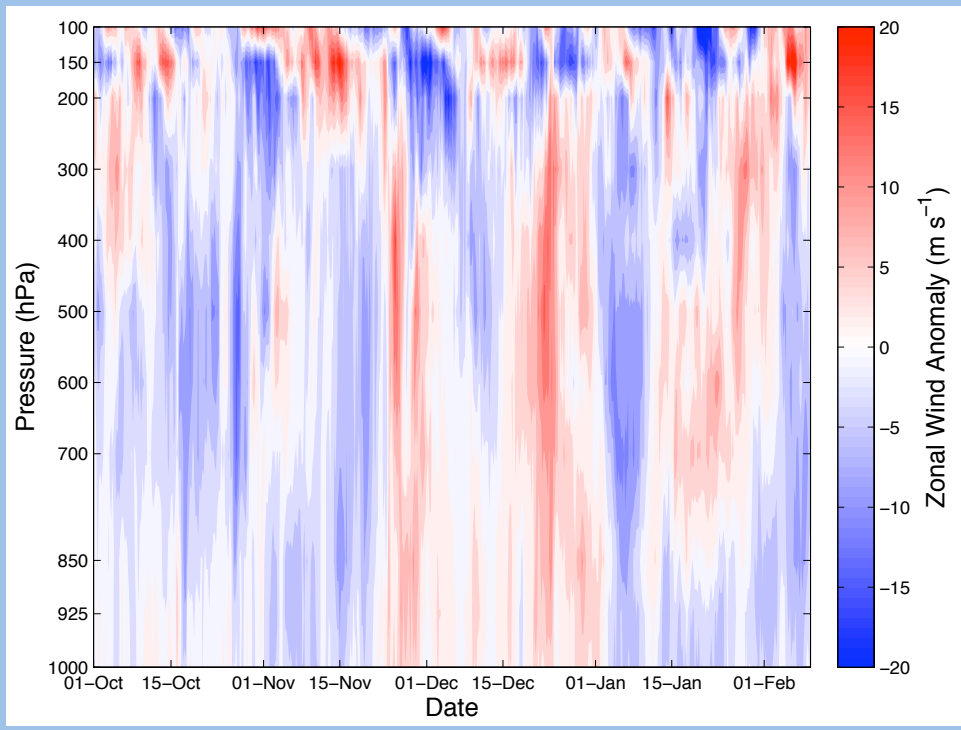
MCS

Radiosondes

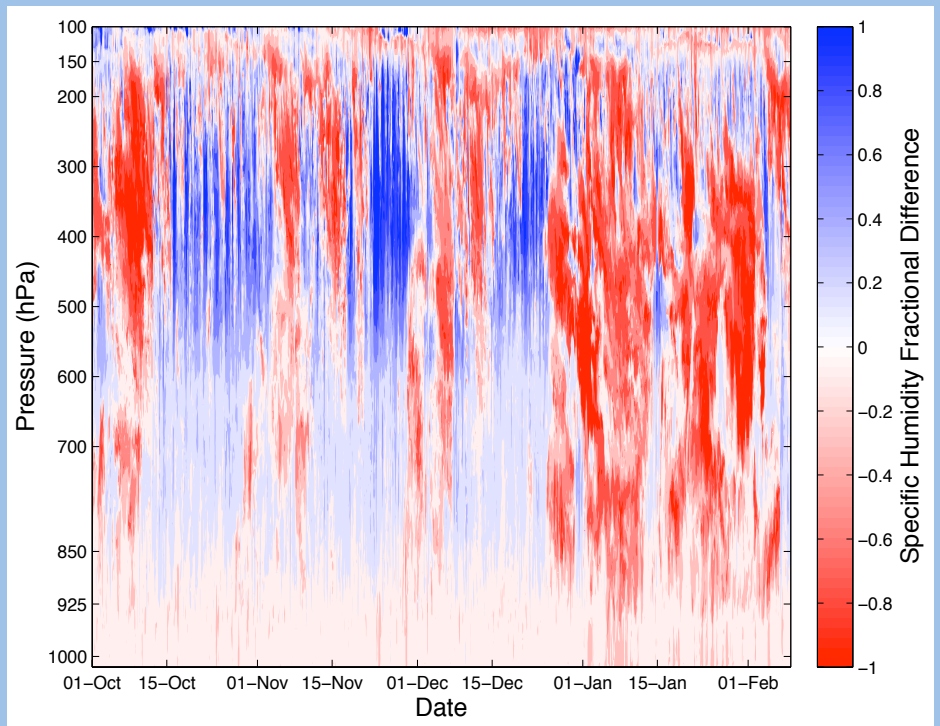
ERA-I

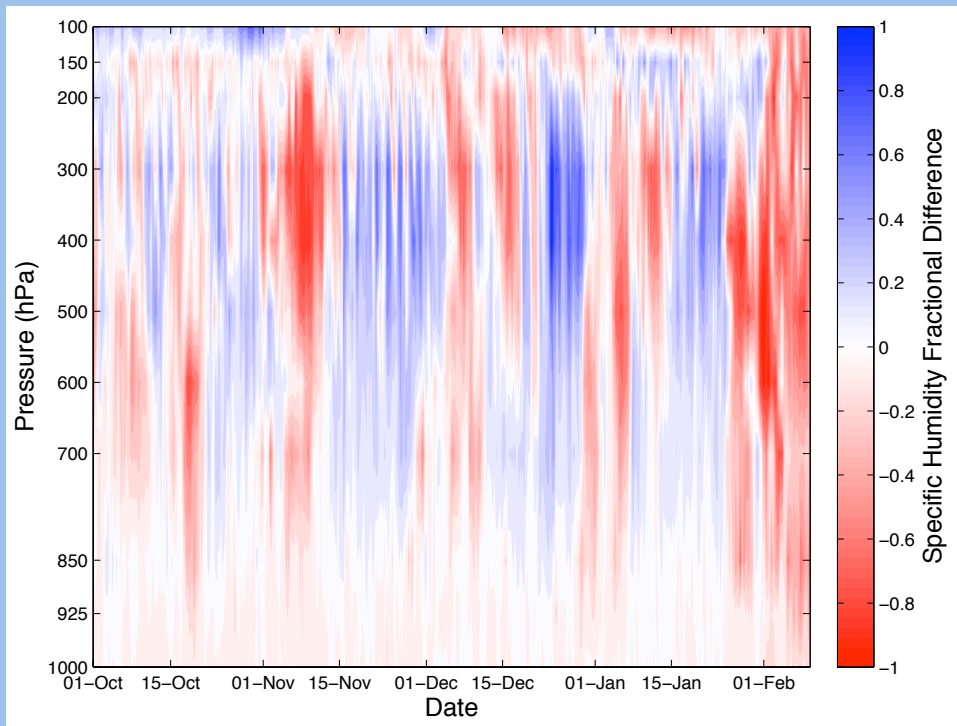
u'

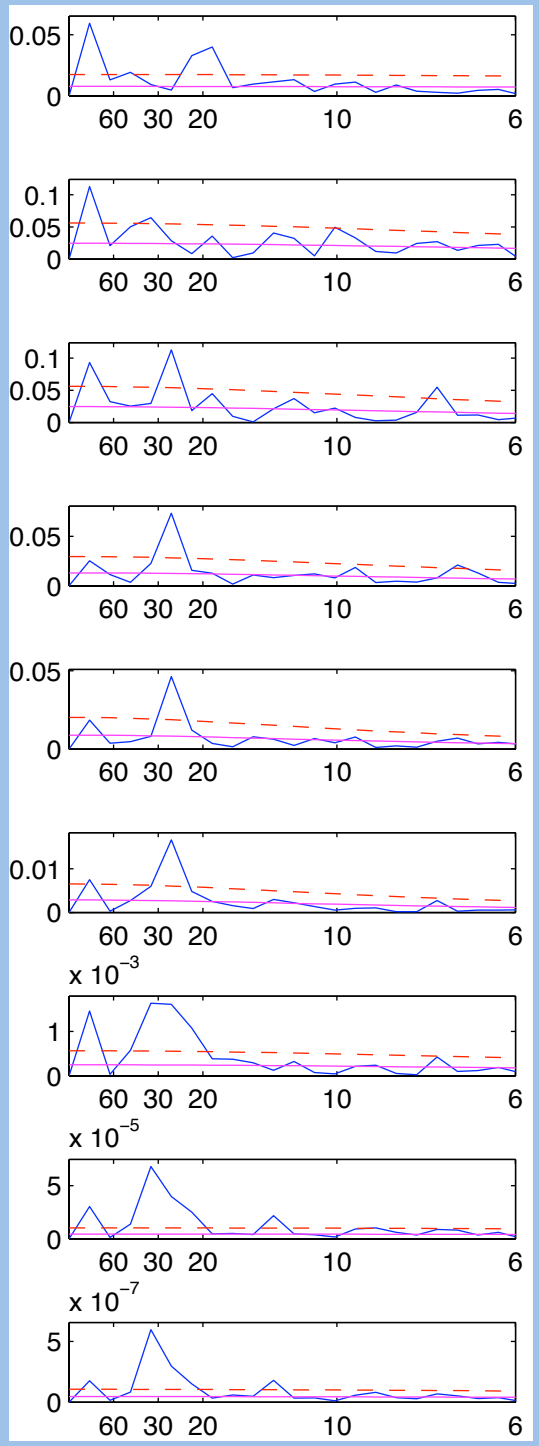




q'






0.05
0
60 30 20 10 6
0.1
0.05
0
60 30 20 10 6
0.1
0.05
0
60 30 20 10 6
0.05
0
60 30 20 10 6
0.05
0
60 30 20 10 6
0.01
0
60 30 20 10 6
x 10^-3
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0
60 30 20 10 6
x 10^-5
5
0
60 30 20 10 6
x 10^-7
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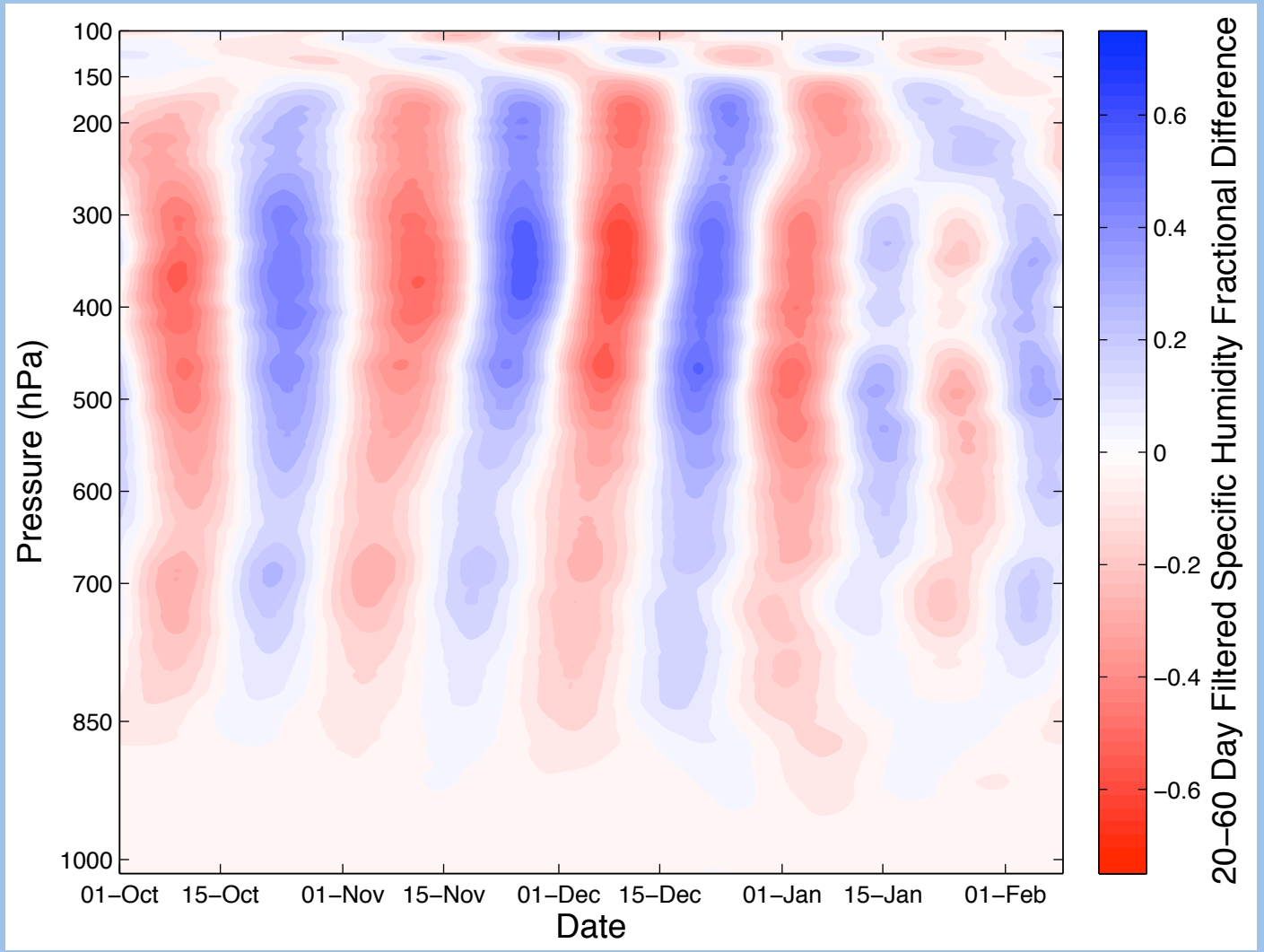
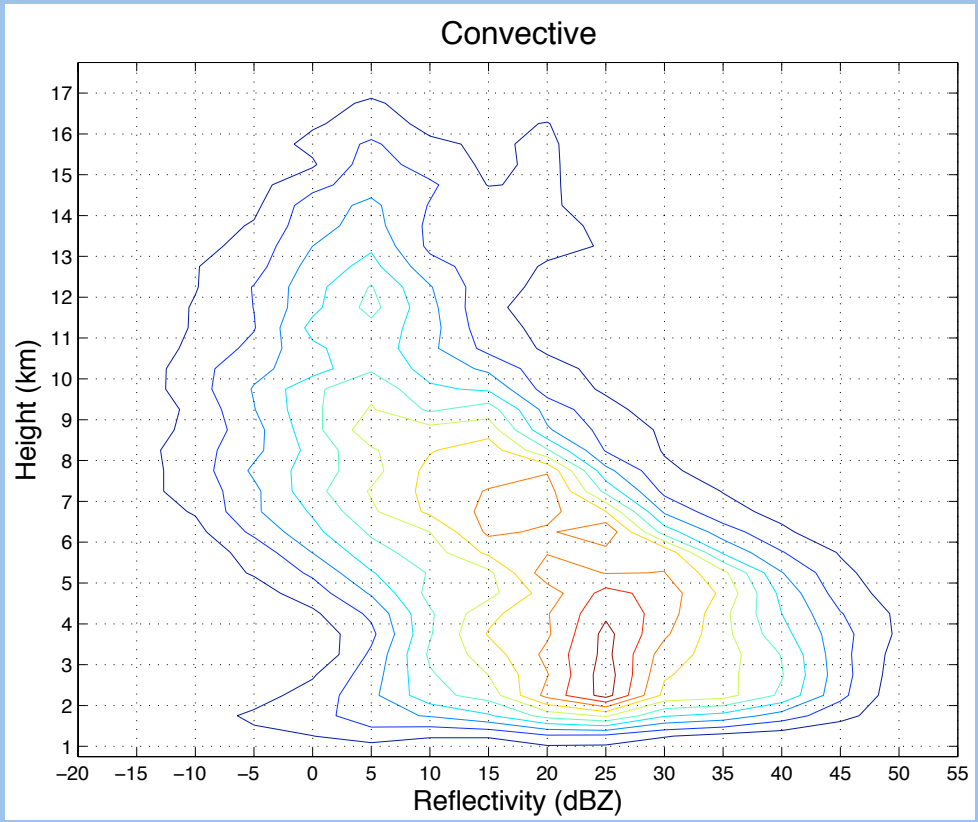
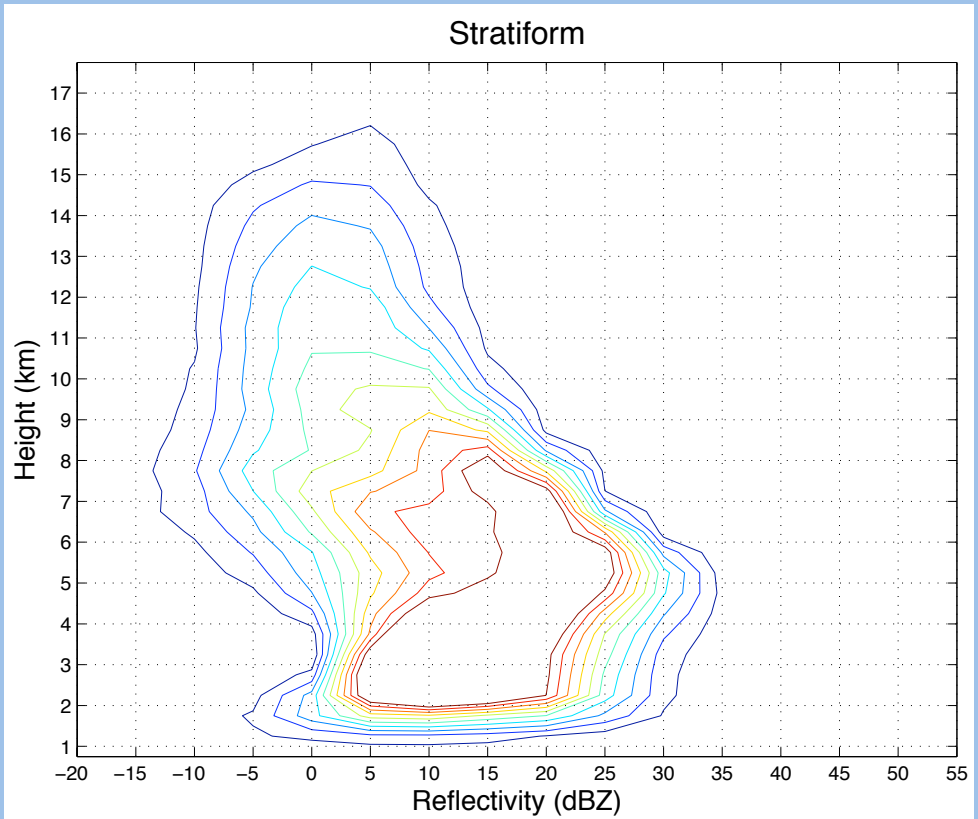
0
60 30 20 10 6


Pressure (hPa)
100
150
200
300
400
500
600
700
850
1000
01–Oct
15–Oct
01–Nov
15–Nov
01–Dec
15–Dec
01–Jan
15–Jan
01–Feb
Date
0.6
0.4
0.2
0
−0.2
−0.4
−0.6
20–60 Day Filtered Specific Humidity Fractional Difference

Reflectivity structure of precipitating clouds





Conclusions

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