Cloud microphysical properties in cirrus during ATTREX

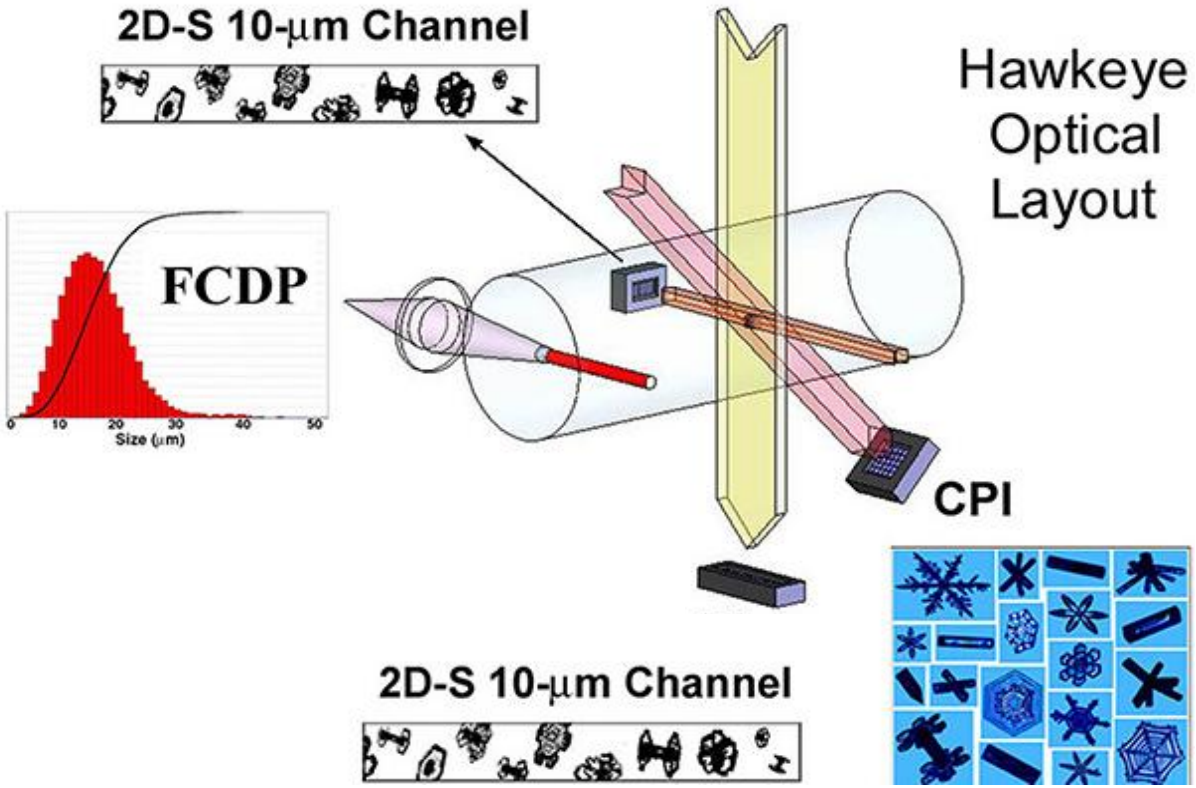
Sarah Woods[1], Sara Lance[1], Eric Jensen[2], Nick Krause[1] , R. Paul Lawson[1], Bruce Gandrud[1], Troy Thornberry[3], Andrew W. Rollins[3], Paul Bui[2]

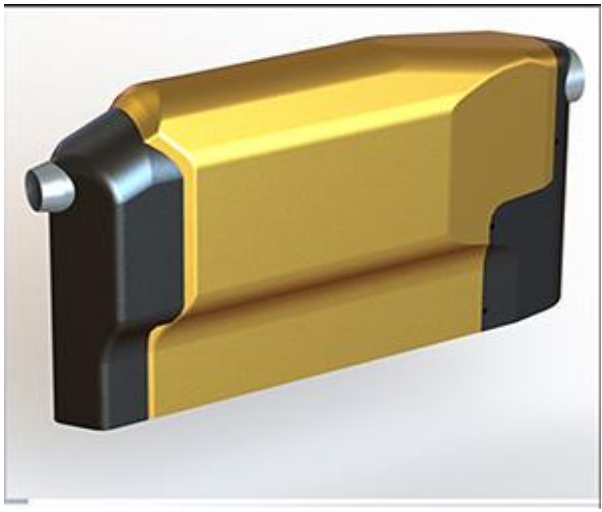
[1] SPEC Incorporated, Boulder, CO

[2] NASA Ames Research Center, Moffet Field, CA

[3] NOAA ESRL Chemical Sciences Division, Boulder, CO

Instrument	Resolution	Measurement Range	Measurement Technique
Hawkeye-CPI (cloud particle imager)	2.3 um	2.3 um - 2.36 mm	CCD (camera)
Hawkeye-FCDP	2 um	1 um - 50 um	Forward Scattering
Hawkeye-2D-S	10 um	10 um - 1.28 mm	Diode Array (128)





Habit Classification Feb 16, 2014

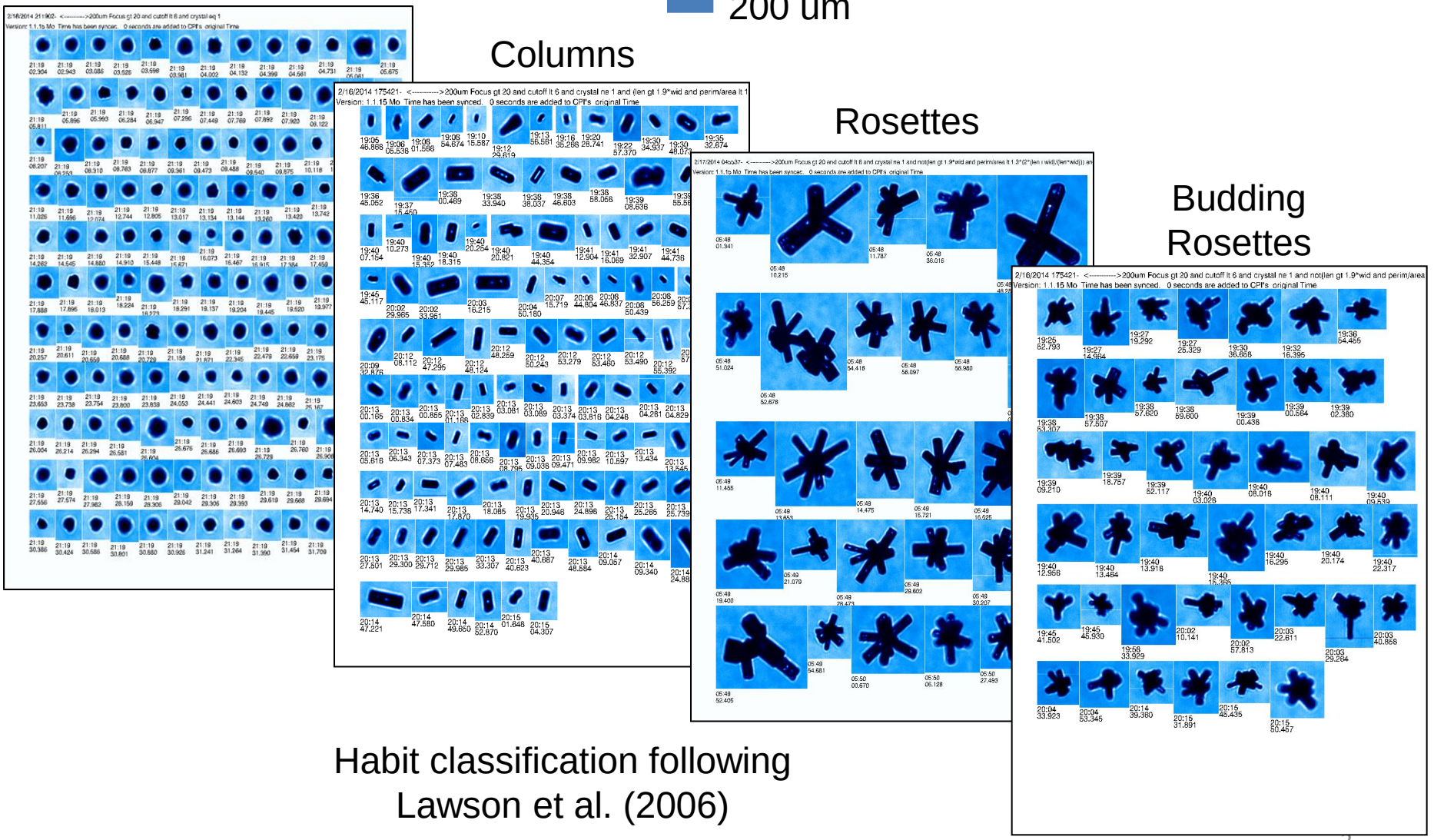
Spheroids

200 um

Columns

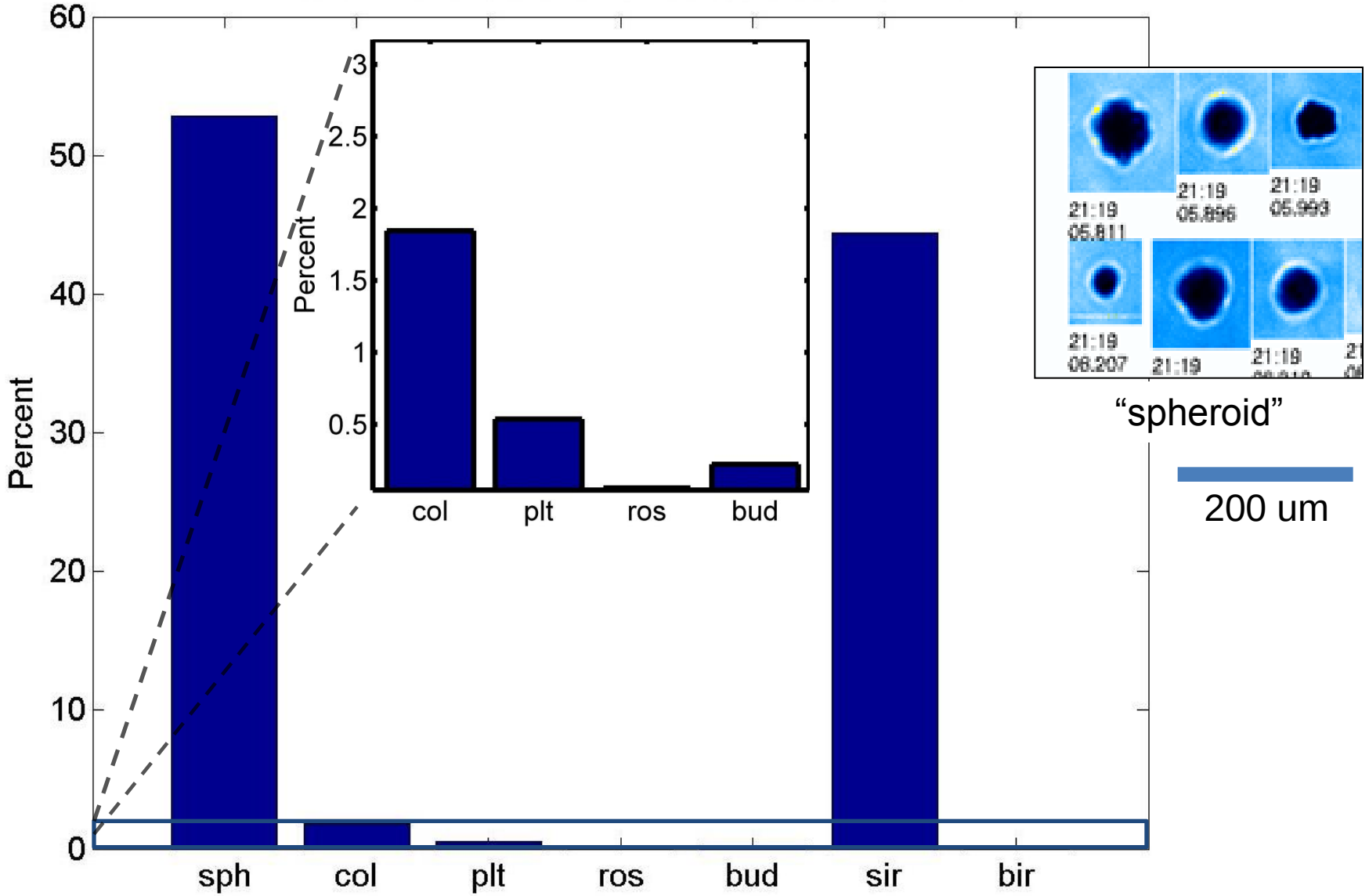
Rosettes

Budding Rosettes

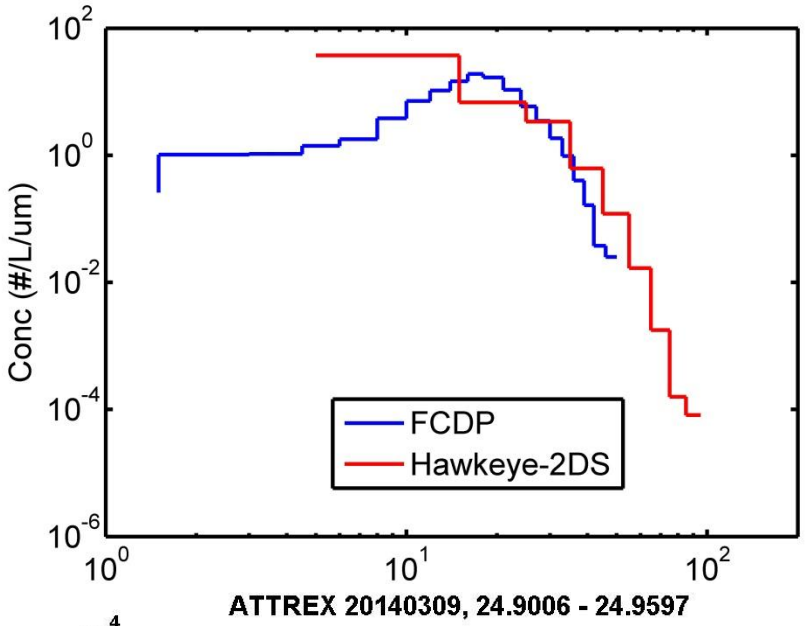


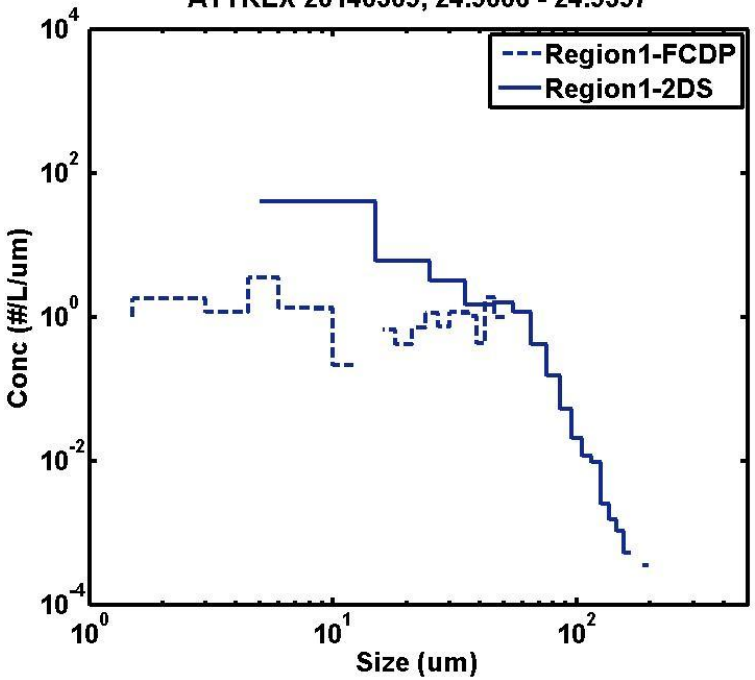
Habit classification following Lawson et al. (2006)

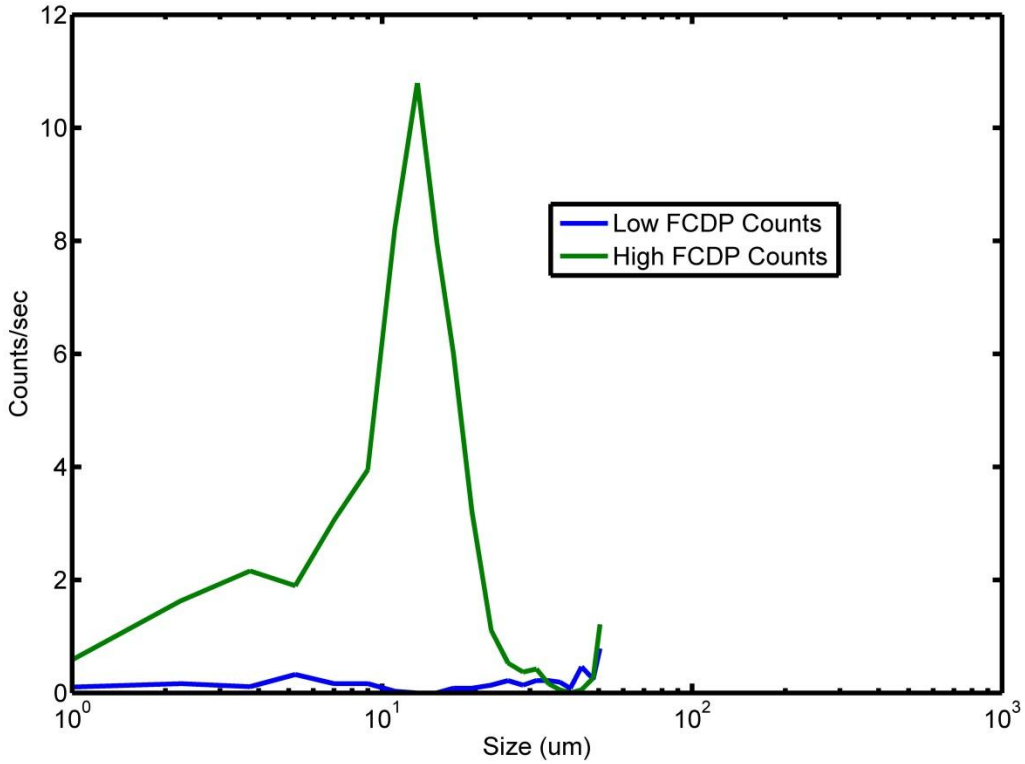
Habit Occurrence Feb 16, 2014



Size Distributions

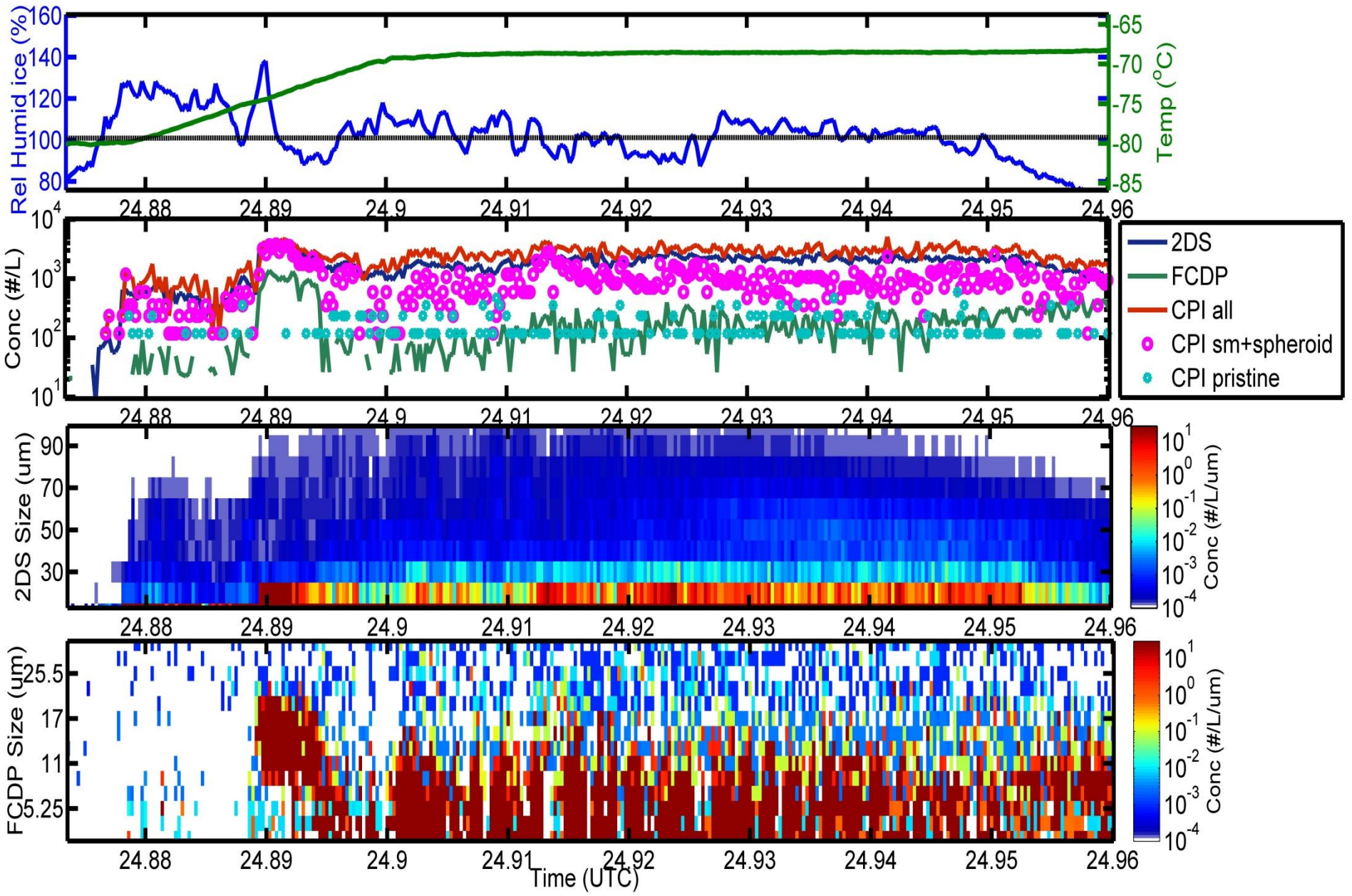




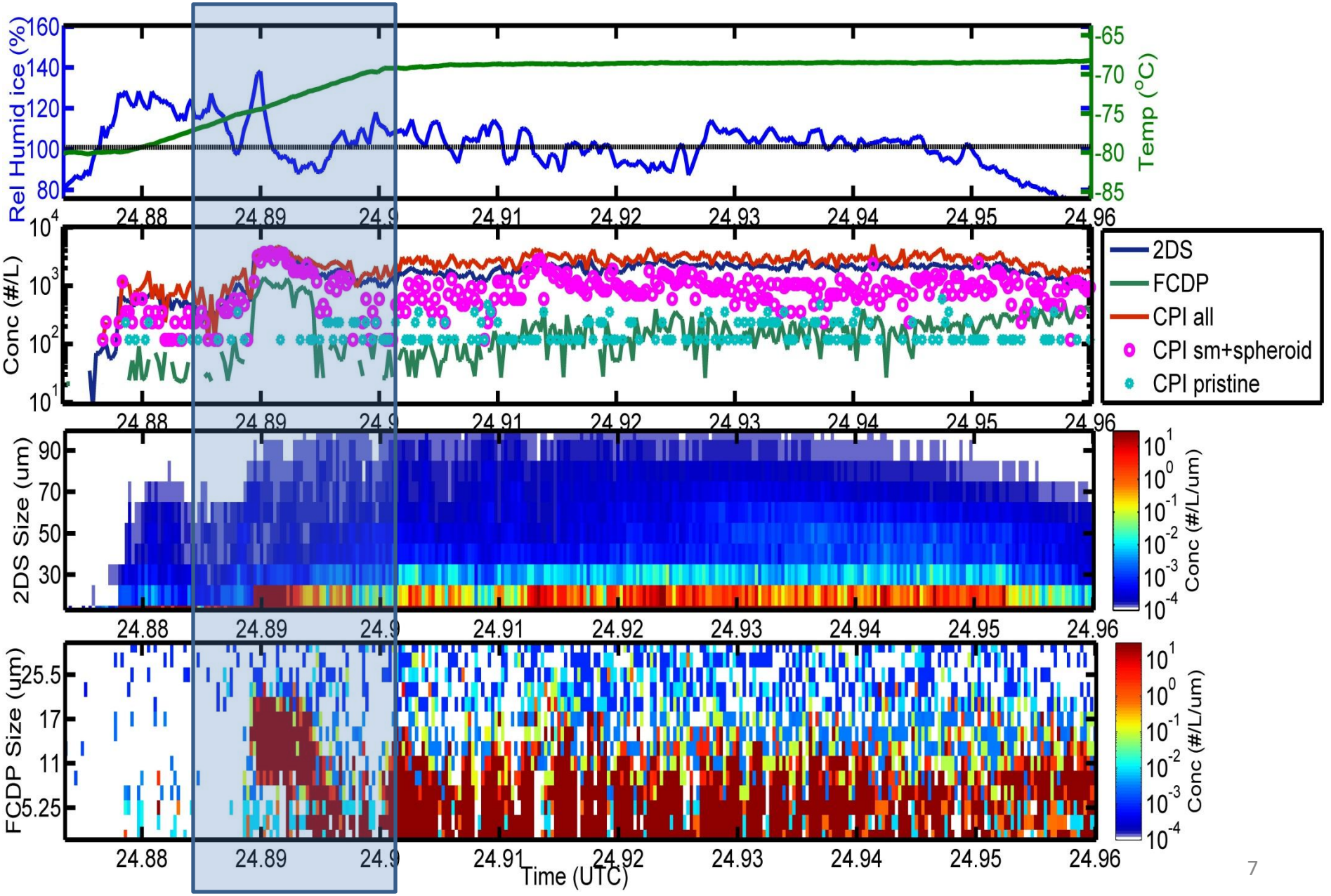


- If using FCDP, take a look at 2D-S as well
- Reliable FCDP measurements require higher bin counts per second

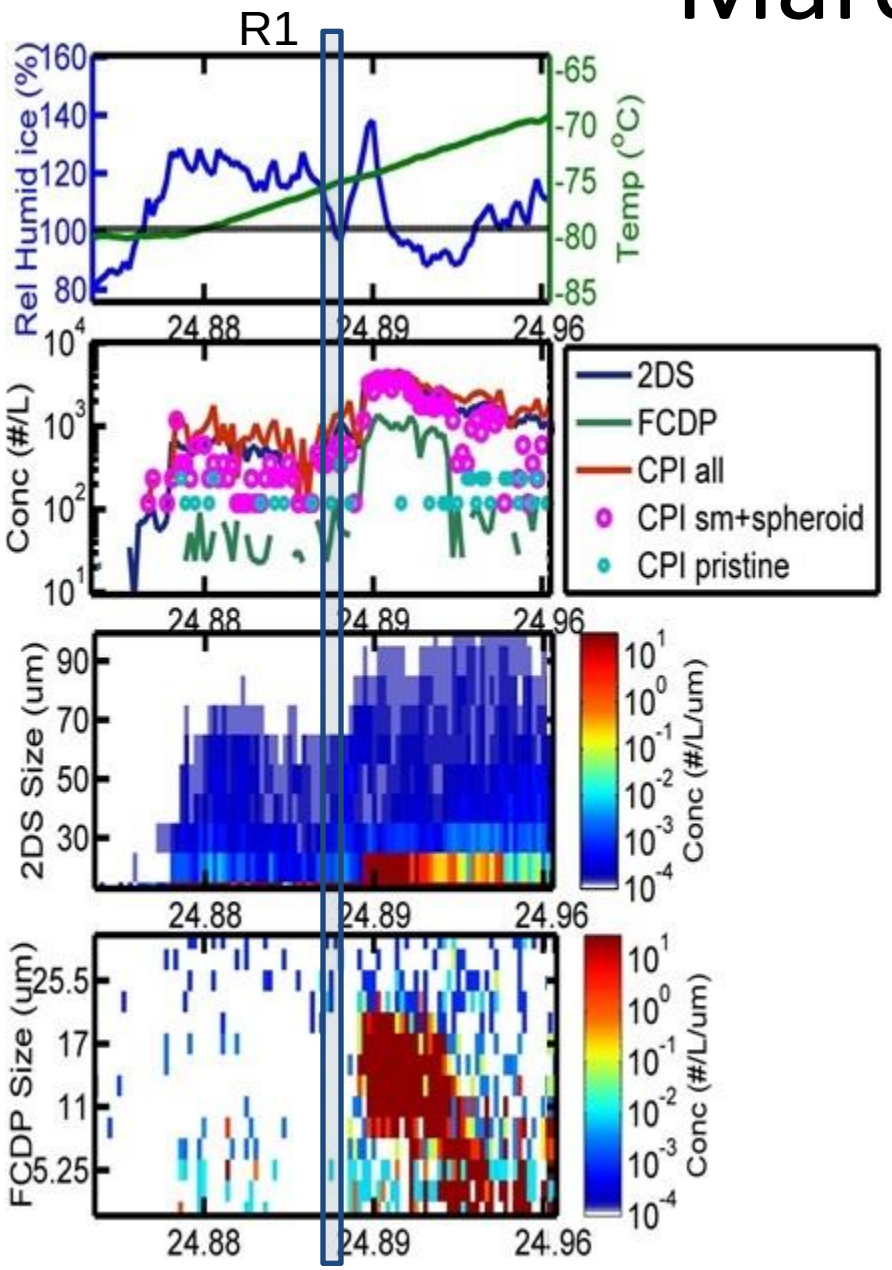
March 9-10


Rel Humid ice (%)
160
140
120
100
80
Temp (°C)
-65
-70
-75
-80
-85
24.88
24.89
24.9
24.91
24.92
24.93
24.94
24.95
24.96
Conc (#/L)
10^4
10^3
10^2
10^1
2DS
FCDP
CPI all
CPI sm+spheroid
CPI pristine
2DS Size (um)
90
70
50
30
Conc (#/L/um)
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
10^{-4}
FCDP Size (um)
25.5
17
11
5.25
Time (UTC)

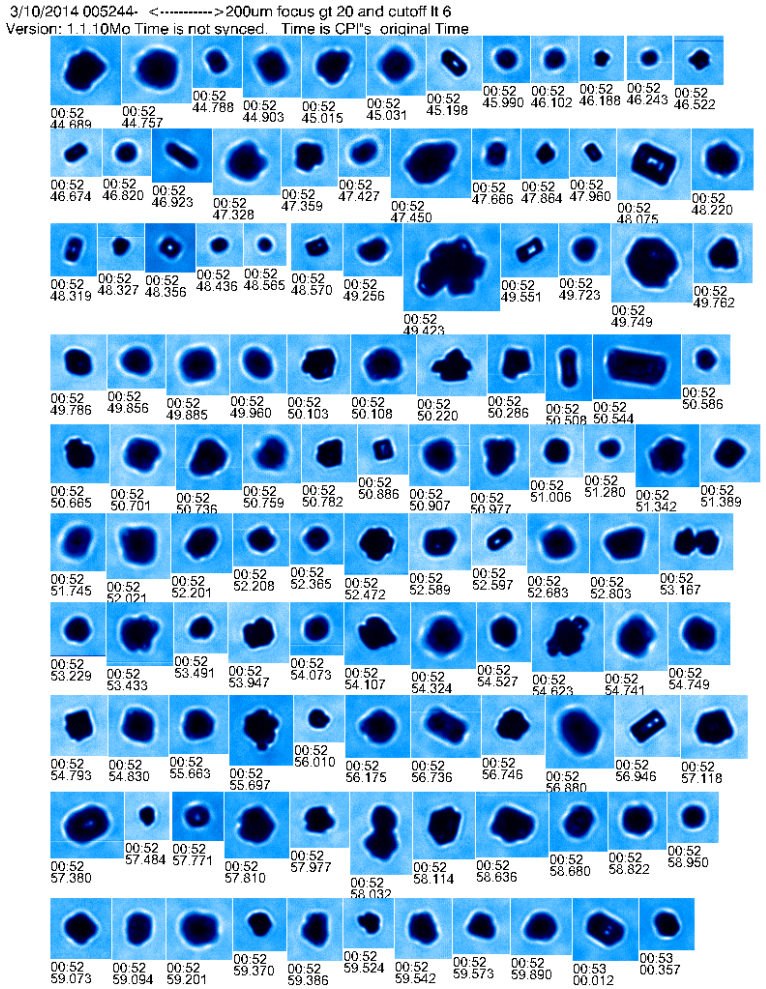
March 9-10


Rel Humid ice (%)
Temp (°C)
Conc (#/L)
2DS
FCDP
CPI all
CPI sm+spheroid
CPI pristine
2DS Size (um)
FCDP Size (um)
Conc (#/L/um)
Time (UTC)

March 9-10



Region 1



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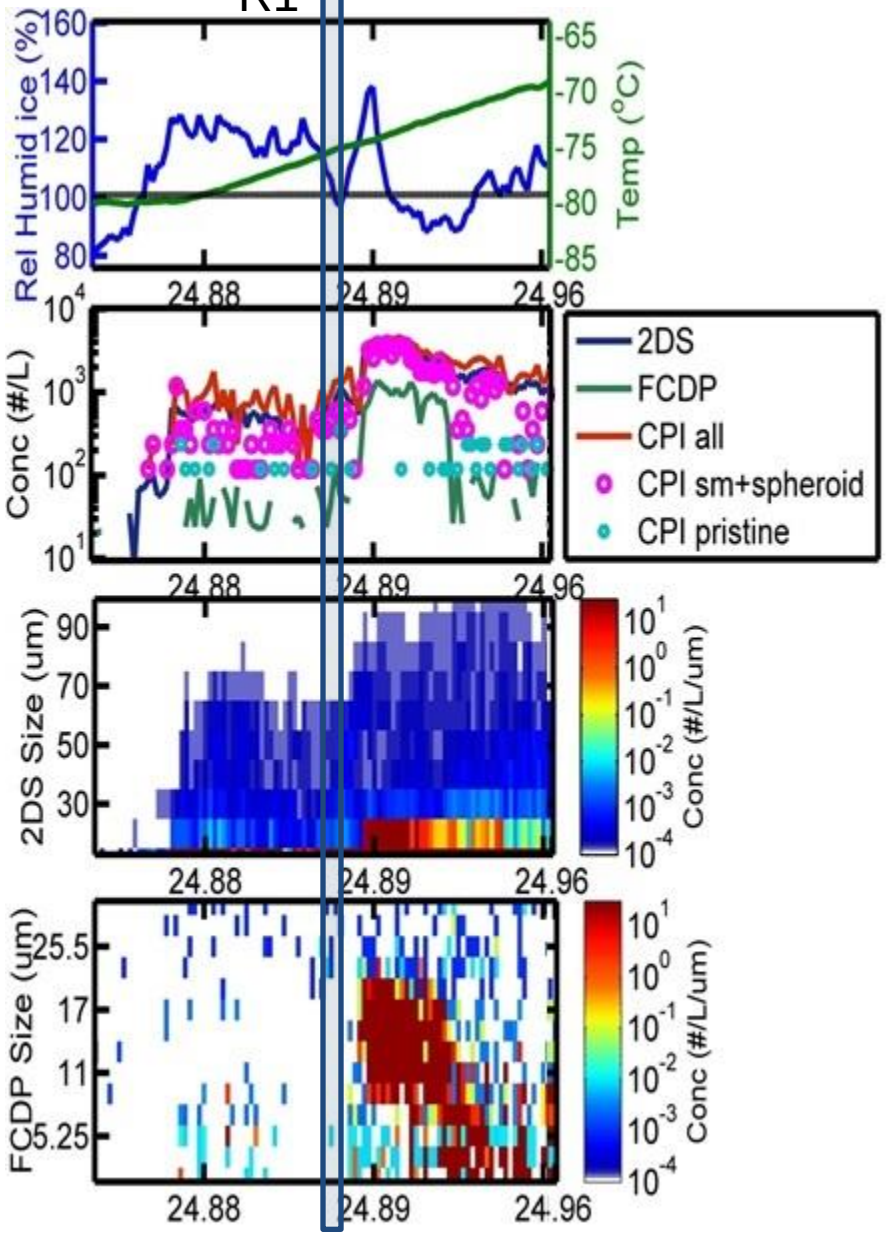
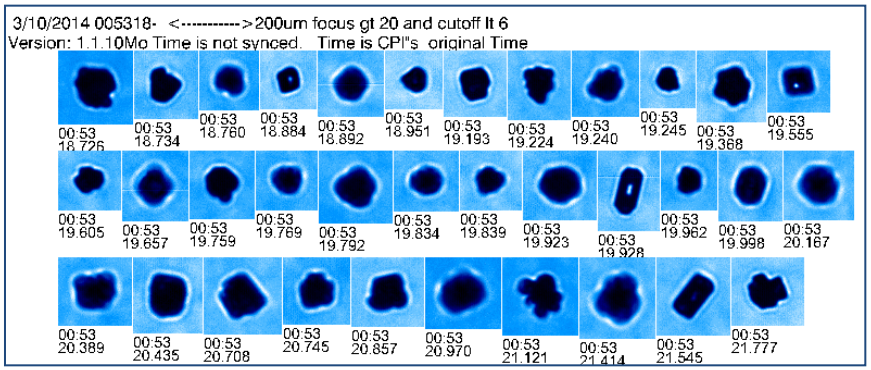
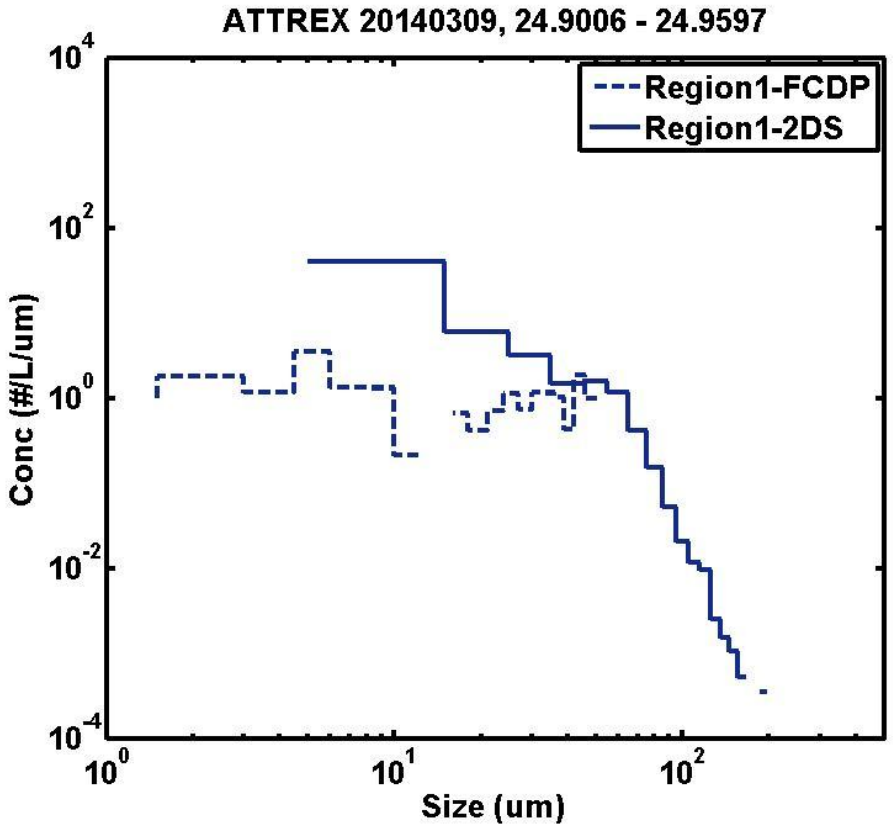
R1



Region 1





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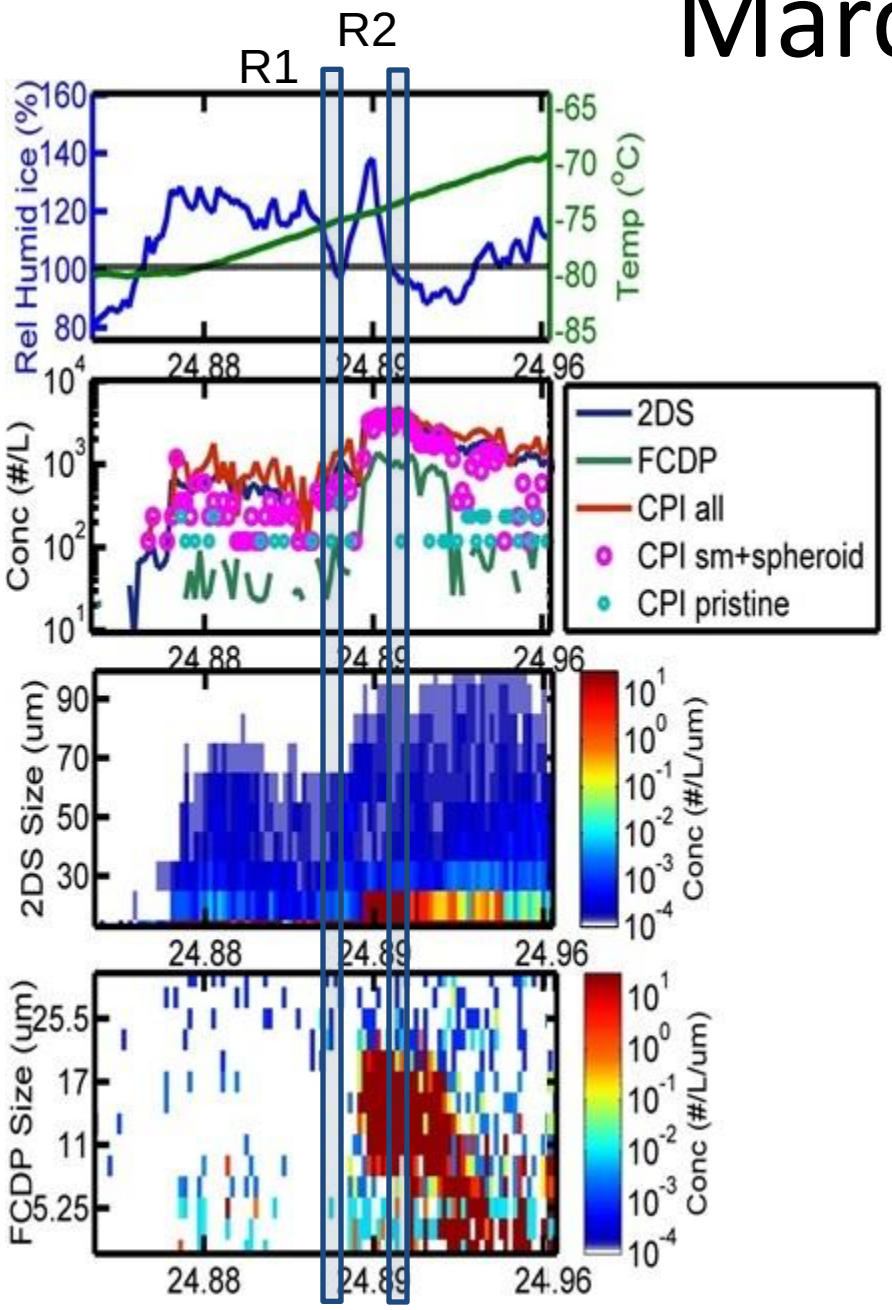
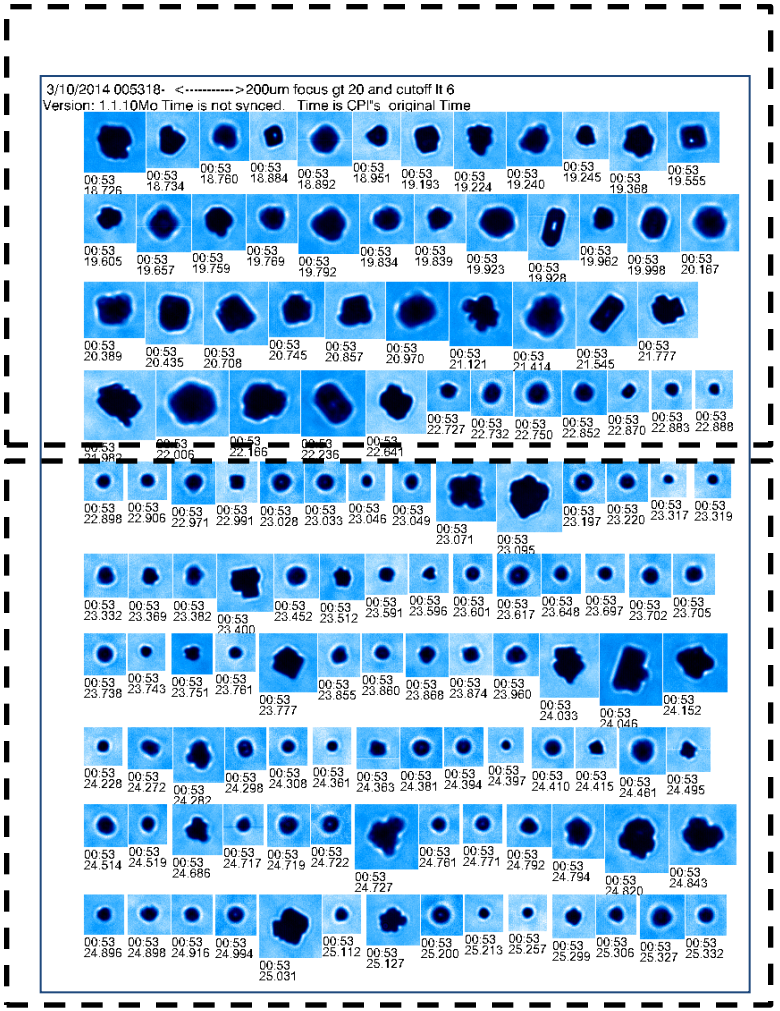


Region 1



Region 2

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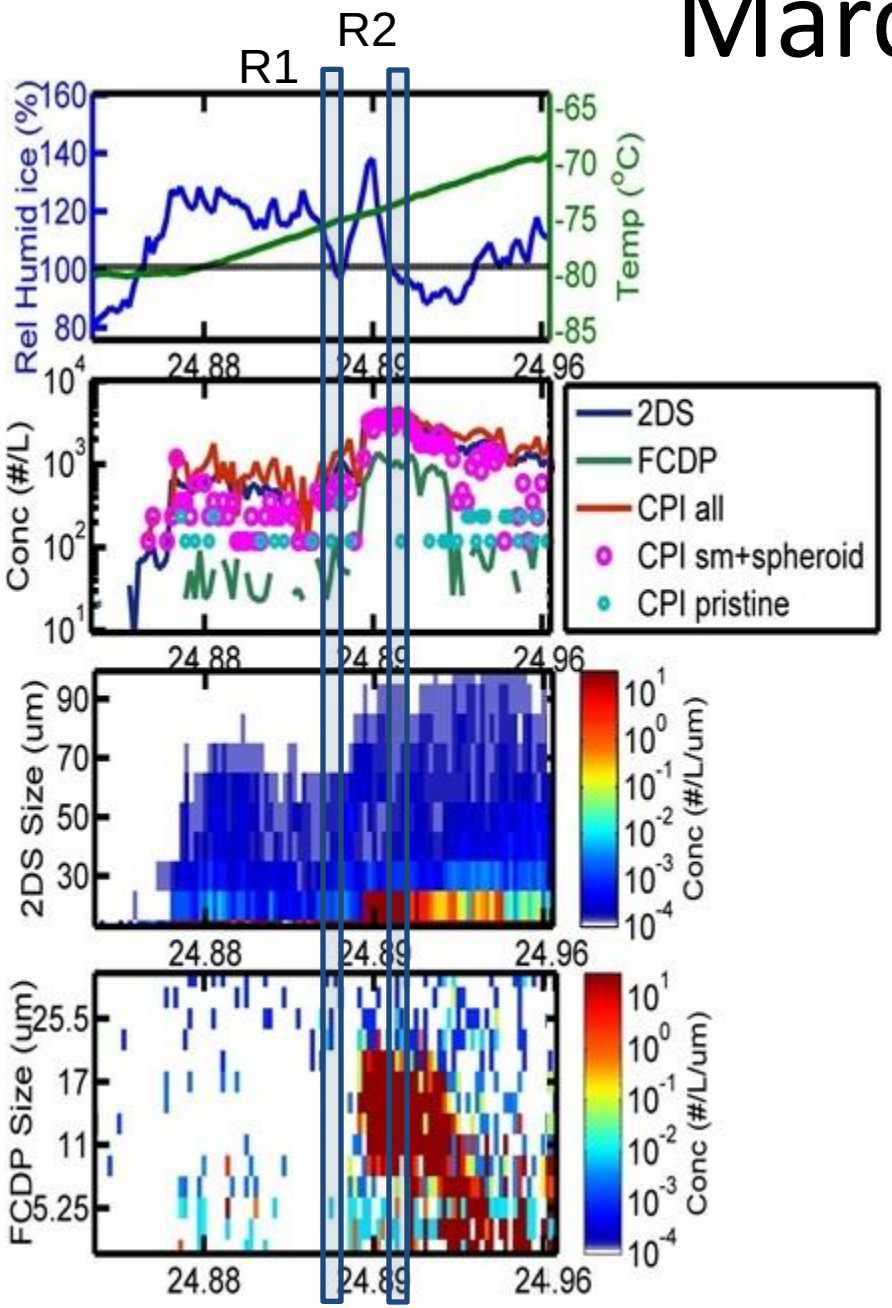
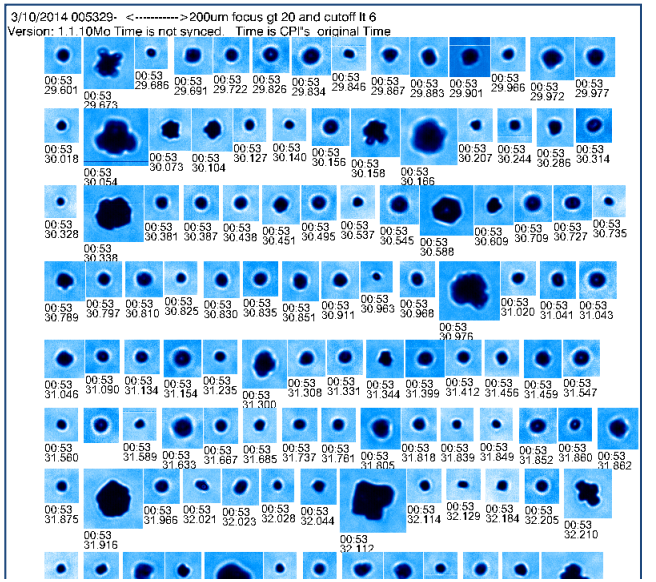
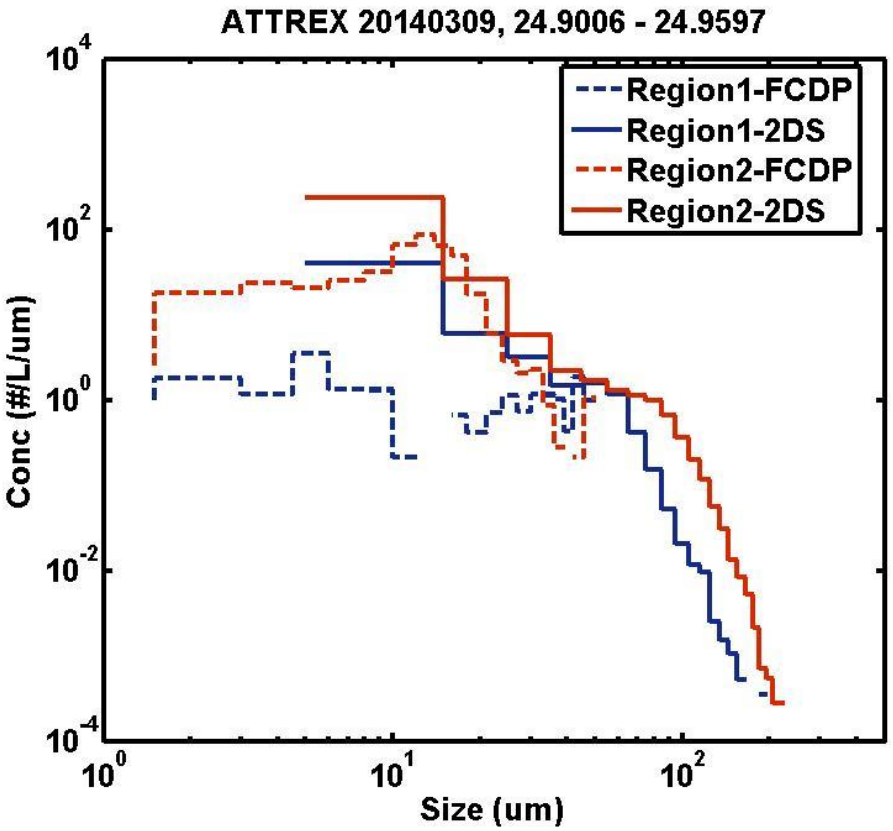


Region 2





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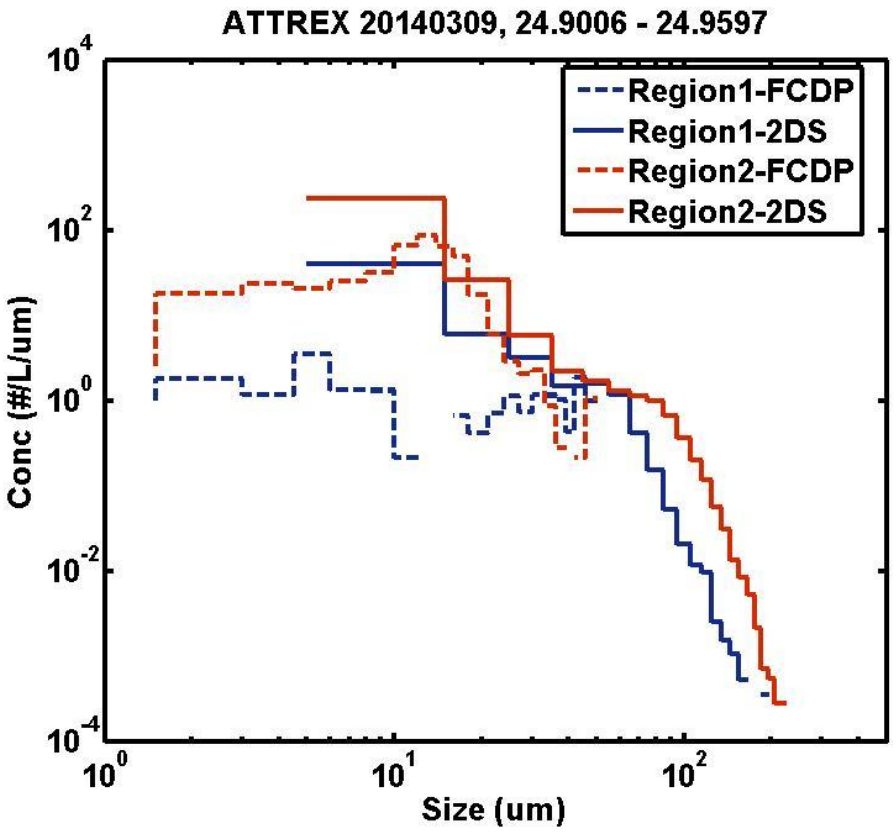
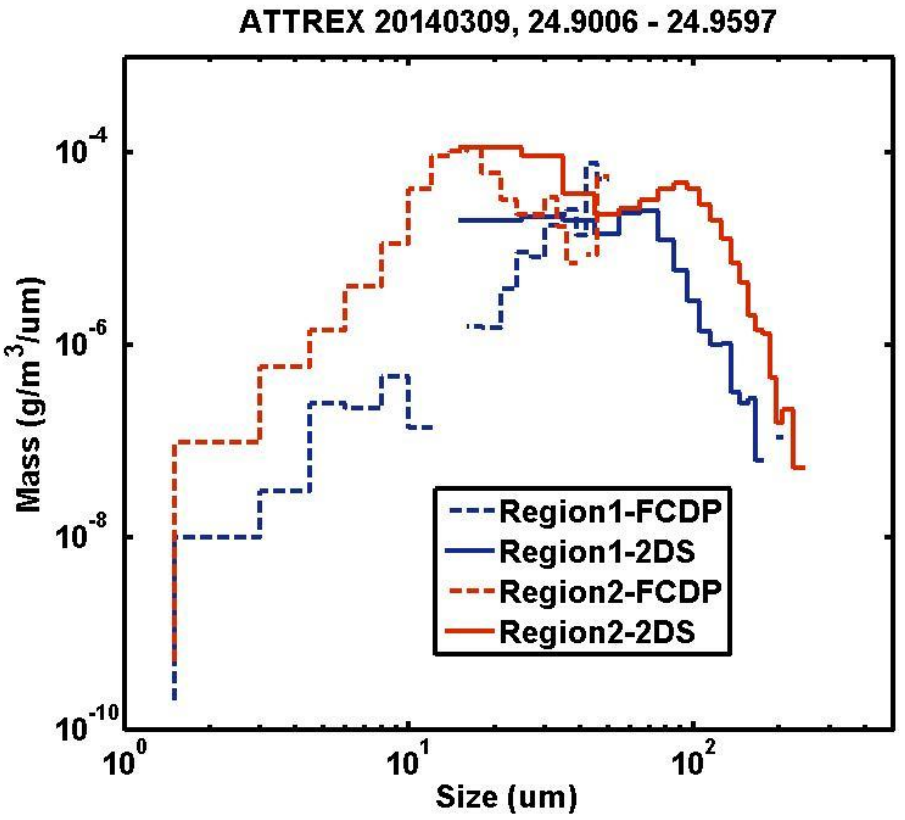
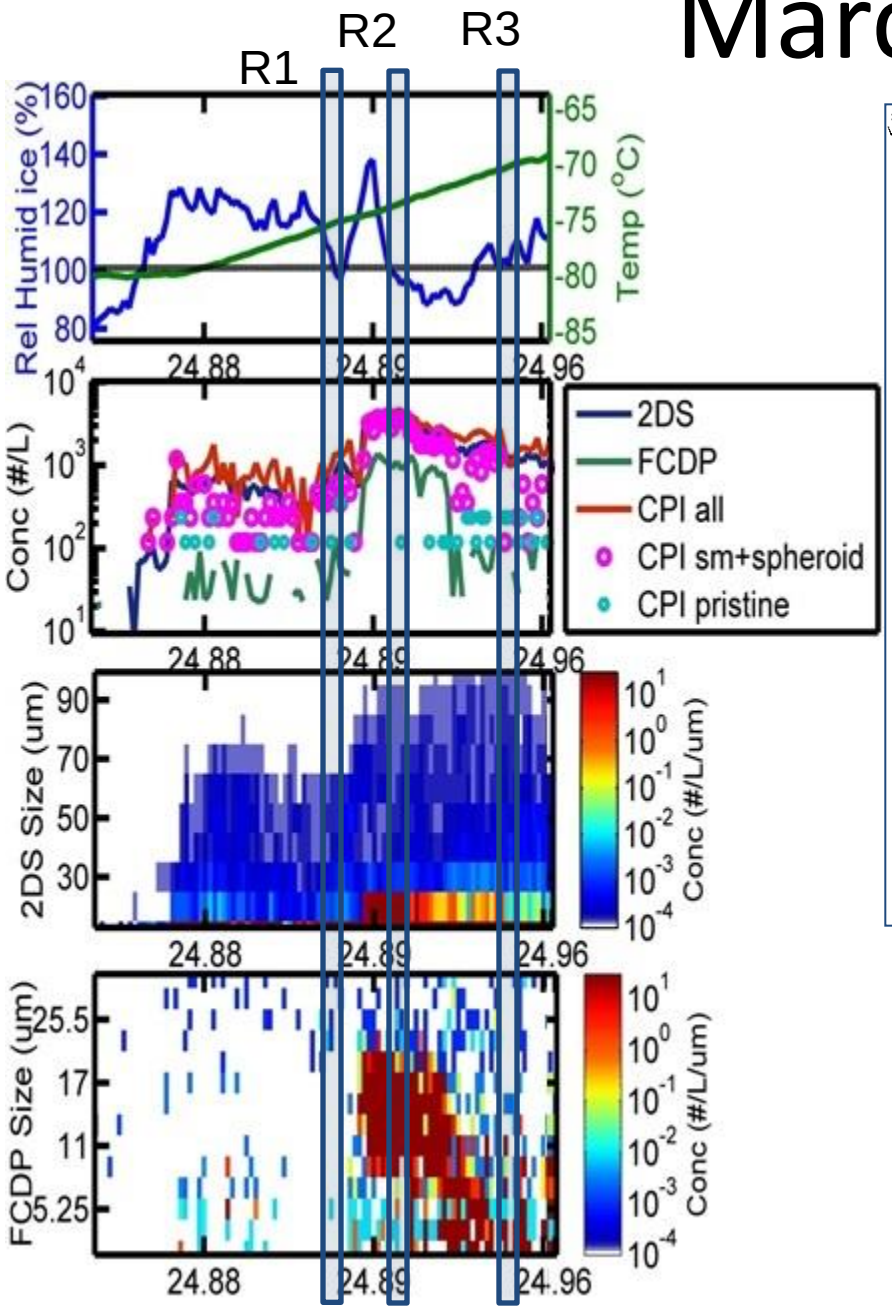

ATTREX 20140309, 24.9006 - 24.9597
Region1-FCDP
Region1-2DS
Region2-FCDP
Region2-2DS
Conc (#/L/um)
Size (um)


ATTREX 20140309, 24.9006 - 24.9597
Region1-FCDP
Region1-2DS
Region2-FCDP
Region2-2DS
Mass (g/m3/um)
Size (um)

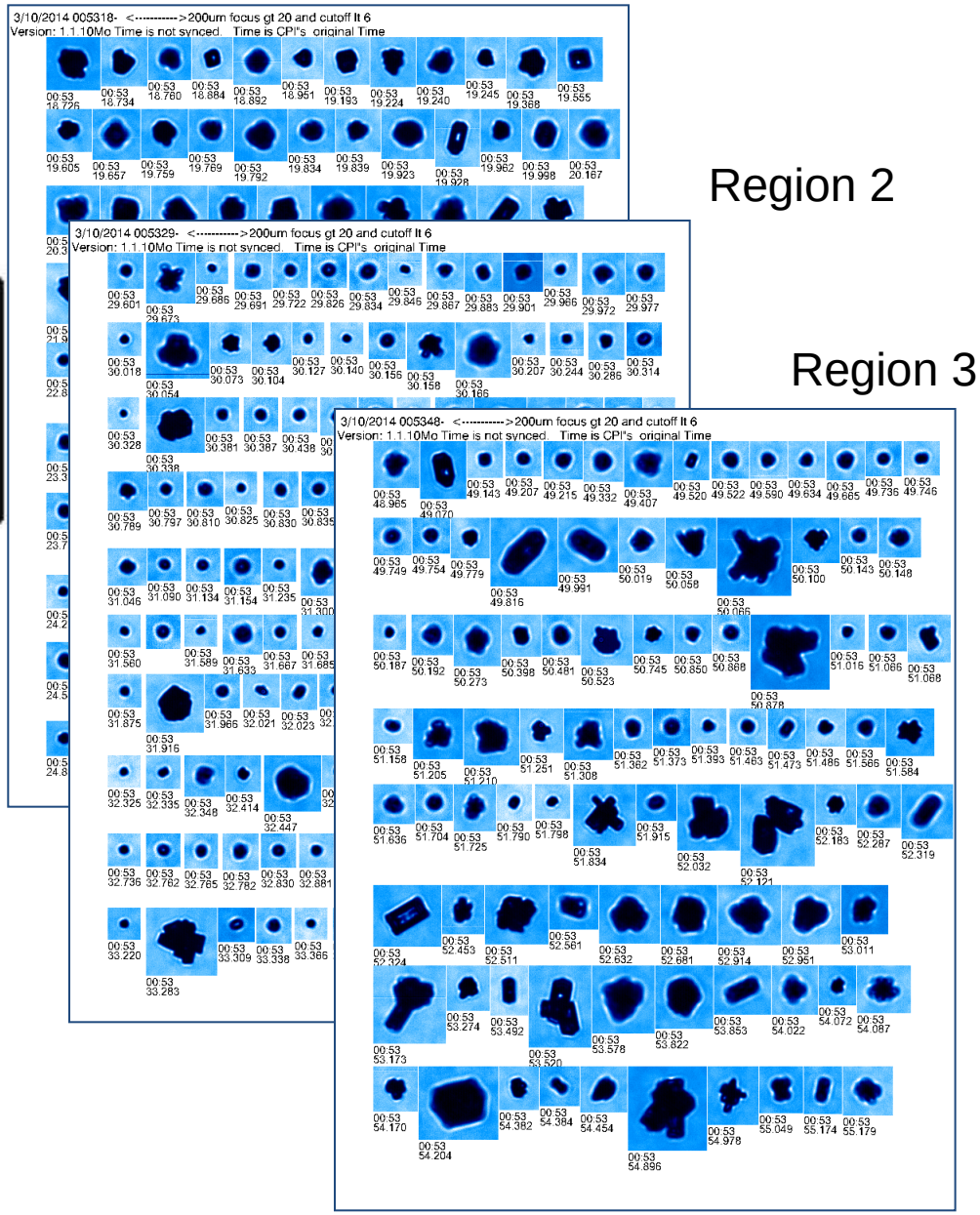
March 9-10



Region 1

Region 2

Region 3



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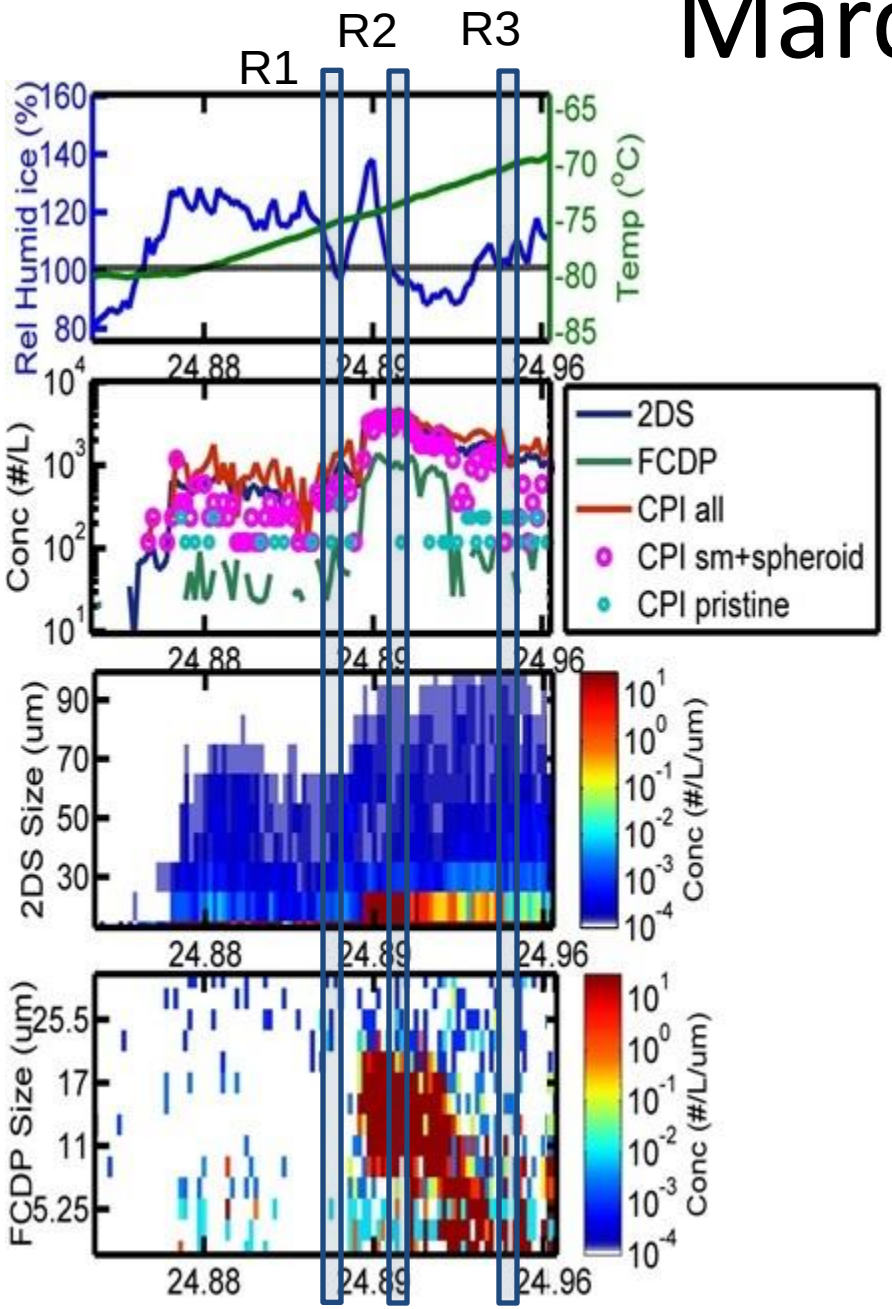
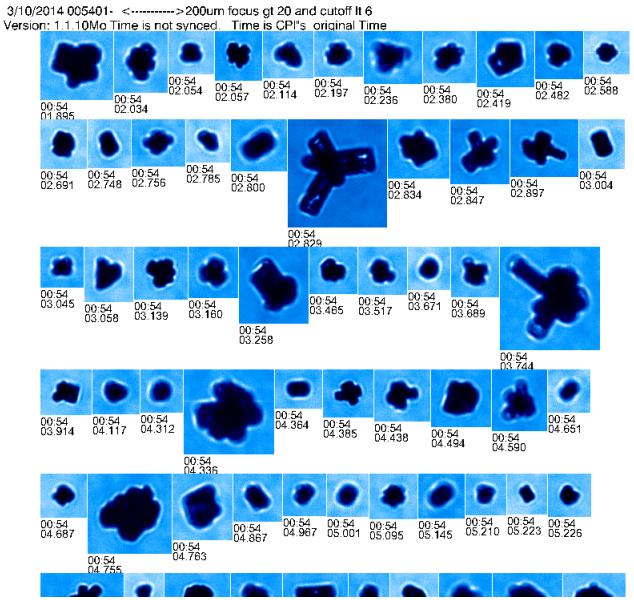
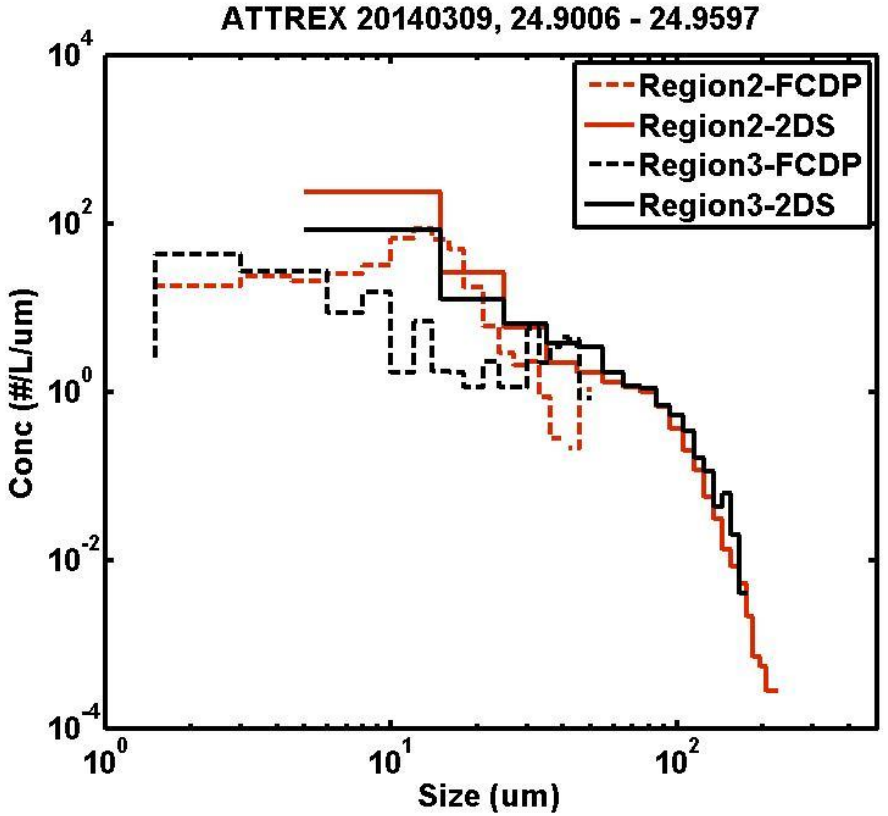


Region 3





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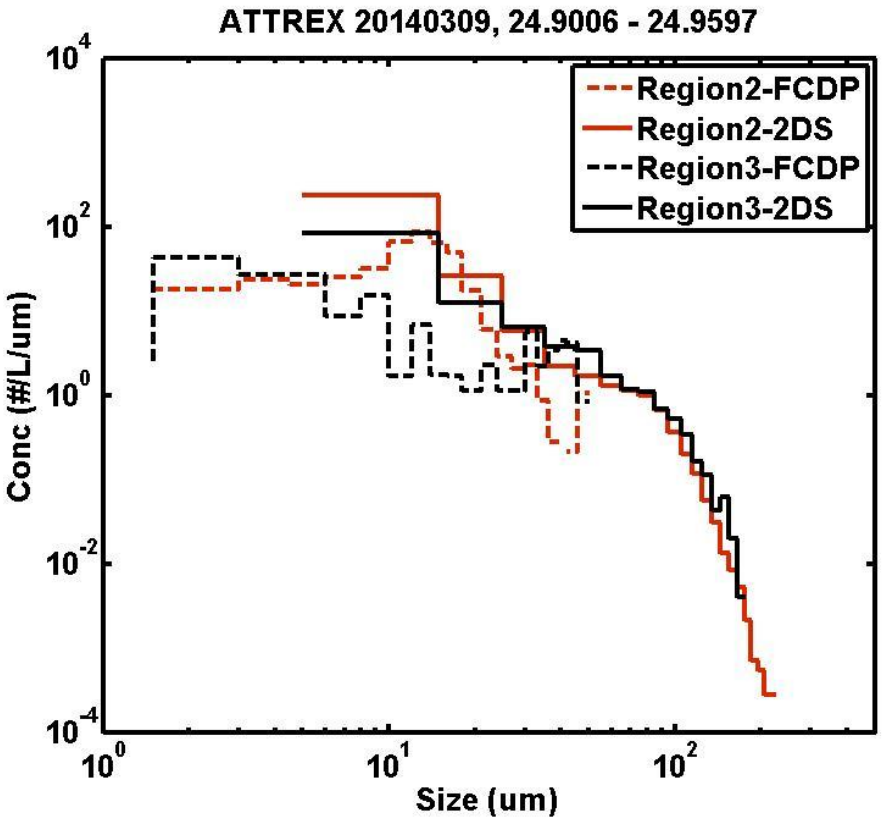
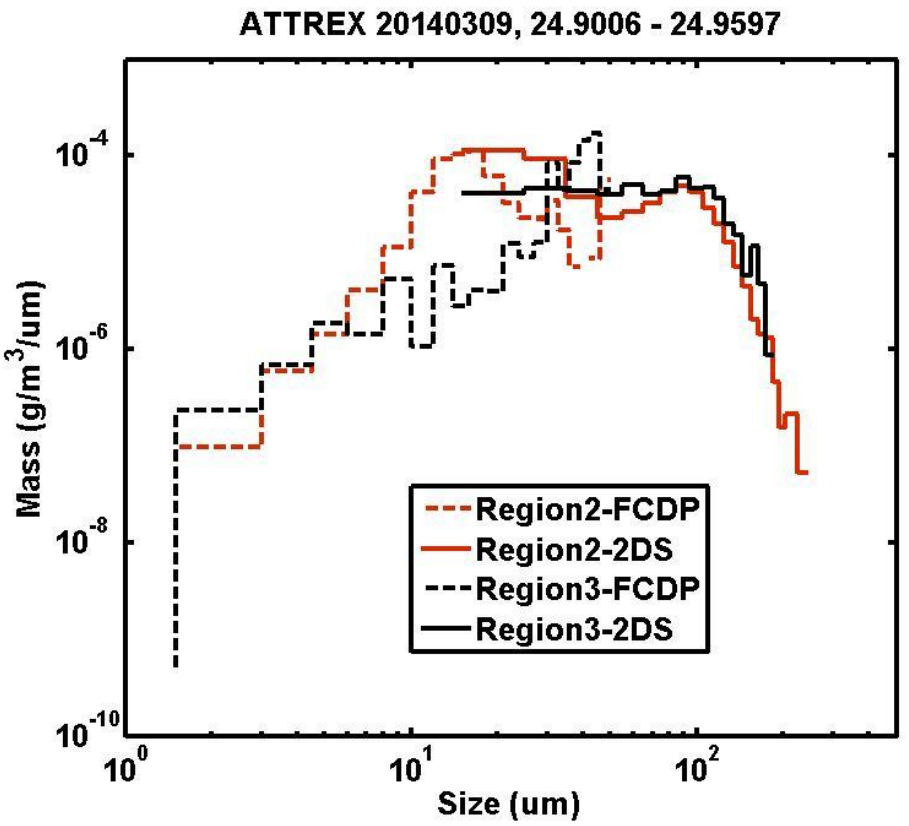
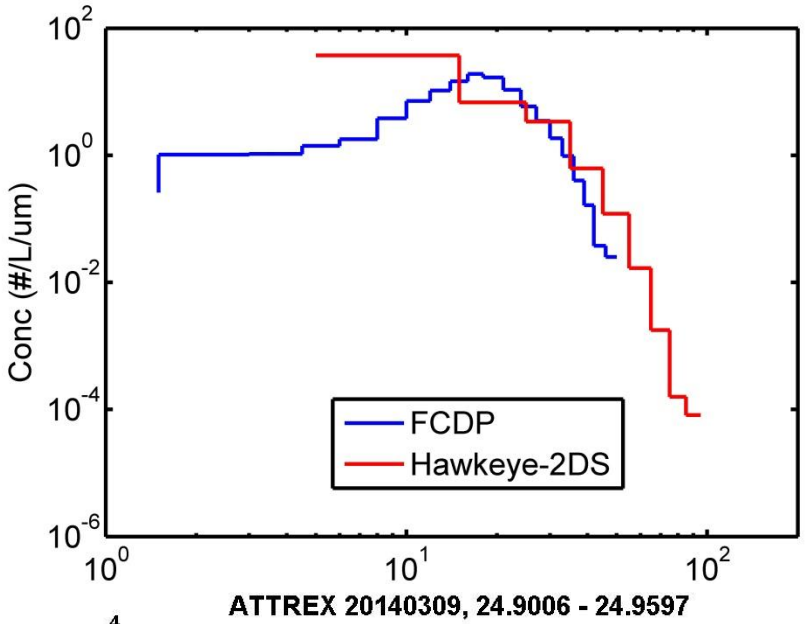

ATTREX 20140309, 24.9006 - 24.9597
Region2-FCDP
Region2-2DS
Region3-FCDP
Region3-2DS
Conc (#/L/um)
Size (um)

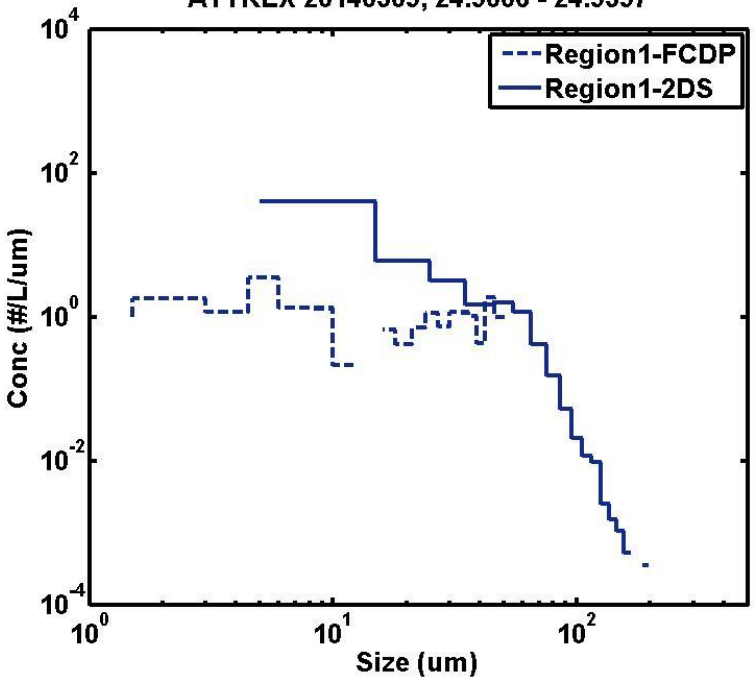

ATTREX 20140309, 24.9006 - 24.9597
Region2-FCDP
Region2-2DS
Region3-FCDP
Region3-2DS
Mass (g/m3/um)
Size (um)

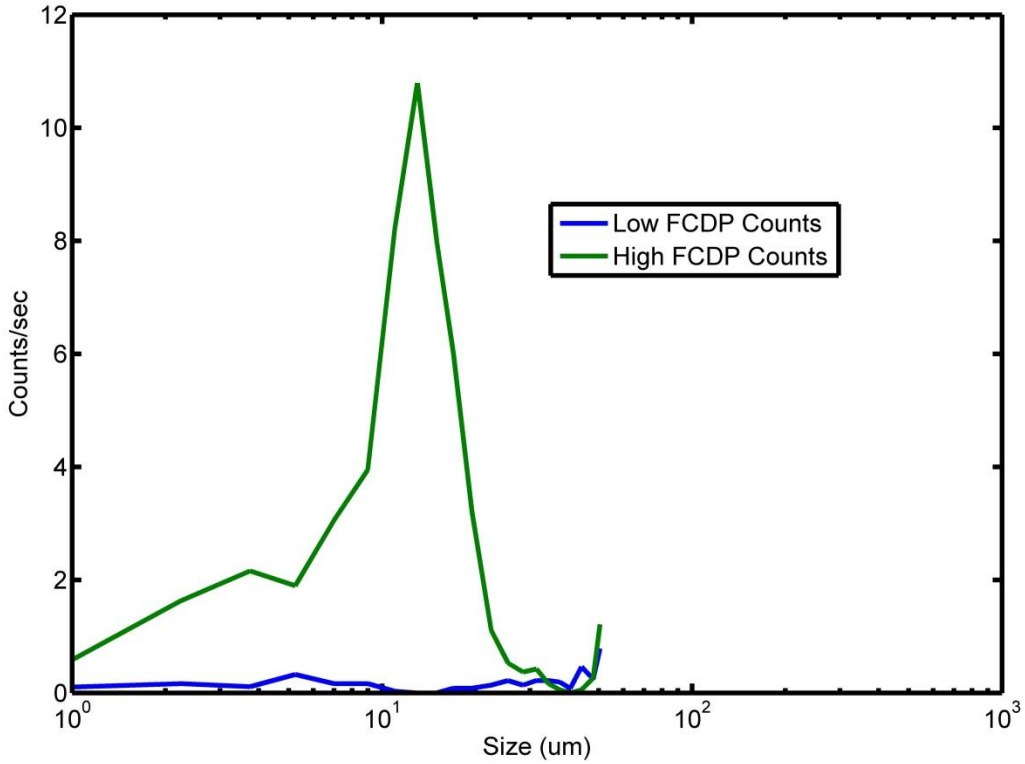
Summary

- High resolution images of cirrus particles allow for habit classification
  - Predominantly spheroid
  - Small irregulars
  - Small percentage of columns, plates, rosettes, bullet rosettes
- Continued investigation of habit classification as a function of RHice and temperature for varying cirrus types
- Good correlation between particle probes and NOAA water vapor observations
- Evidence of homogeneous nucleation
- For questions on Hawkeye or FCDP data please contact us

Size Distributions







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SSice vs Temperature Feb 16