Status of Proteus Microphysics

Greg McFarquhar[1], Junshik Um[1], Matt Freer[1], Greg Kok[2], Jay Mace[3], Tim Tooman[4], Robert McCoy[4]

[1]University of Illinois, Urbana, IL

[2]DMT, Boulder, CO

[3] University of Utah, Salt Lake City, UT

[4]Sandia National Laboratories, Livermore, CA

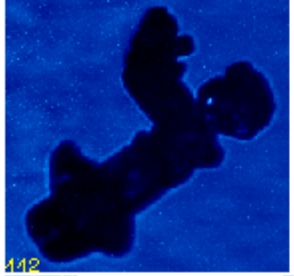
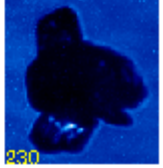
Summary of Probes

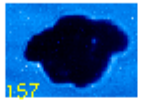
Instrument	Size Range	Parameters	Description
Cloud Particle Imager (CPI)	10 μm to ~ 1 mm	2.3 μm res images, SDs	Small sample volume
Cloud Aerosol Spectrometer (CAS)	0.35 to 50 μm	SDs	Forward scattering probe: enhanced small crystals?
Cloud Droplet Probe (CDP)	1 to 50 μm	SDs	Forward scattering probe: open path
Cloud Imaging Probe (CIP)	100 μm to 1.6 mm	SDs; two-d images	Shadowing of photodiodes
Counterflow virtual im-pactor (CVI)	Bulk measurement from >~ 5 μm	TWC	Evaporator probe
Nevzorov Probe	Bulk measurement	LWC, TWC	Hot wire probe
CIN: Cloud Integrating Nephelometer	Bulk measurement	β_e, asymmetry parameter	Light scattered by cloud particles

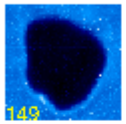
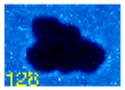
	Aircraft	Mission	Radar	LIdar	CAPS	CSI	CIN	State & CPI
1/22	Twin Otter Egrett	Fresh Anvil SW of Darwin	Fine* (some changes in noise between days)	OK				
1/23	Twin Otter Egrett	Maritime System	FIne	OK				
1/25	Proteus* Twin Otter Egrett	NE-SW legs along coast	Some odd data (Otter warm and flew > 10,000 ft)	PRIORITY		CSI flow low	Missing for all but 1st hour	CPI Missing sections due to freeze up
1/27	Proteus* Twin Otter Egrett	Aged cirrus over: ARM/coast	Fine	PRIORITY	Part missing ok for spiral		CIN started after spiral	
1/29	Proteus Twin Otter	Aged cirrus land-locked low	Fine	PRIORITY		CSI data may be high	missing	GPS altitude bad; use pressure altitude
2/2	Twin Otter Proteus Dimona	Convective event over Tiwis	Fine	OK			missing	
2/3	Twin Otter	Terra	FIne	OK				
2/6	Proteus Twin Otter Egrett	Hector system	Fine	OK	CIP partial			
2/8	Twin Otter Egrett	West end of Tiwis	Fine	PRIORITY				
2/9	Twin Otter Egrett	Survey over Tiwis	Fine	OK				
2/10	Proteus Egrett Twin Otter	Hector anvil over Tiwis	Fine	PRIORITY	CIP partial			
2/12	Proteus Twin Otter		Fine	PRIORITY	CIP N/A			

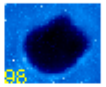
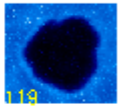
Archived Products

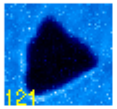
- CPI: Quality controlled images

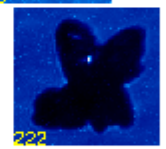
4:38:10:63  4:38:10:85  4:38:10:187 

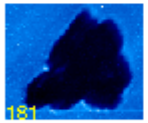
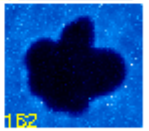
4:38:10:243  4:38:10:253  4:38:10:265 

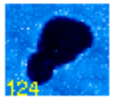
4:38:10:394  4:38:10:512  4:38:10:827 

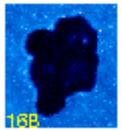
4:38:10:911  4:38:10:950  4:38:11:203  4:38:11:223 

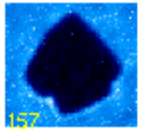
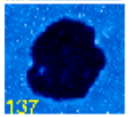
4:38:11:247  4:38:11:331  4:38:11:410 

4:38:11:851  4:38:11:873  4:38:11:955 

4:38:12: 0  4:38:12: 13  4:38:12: 45 

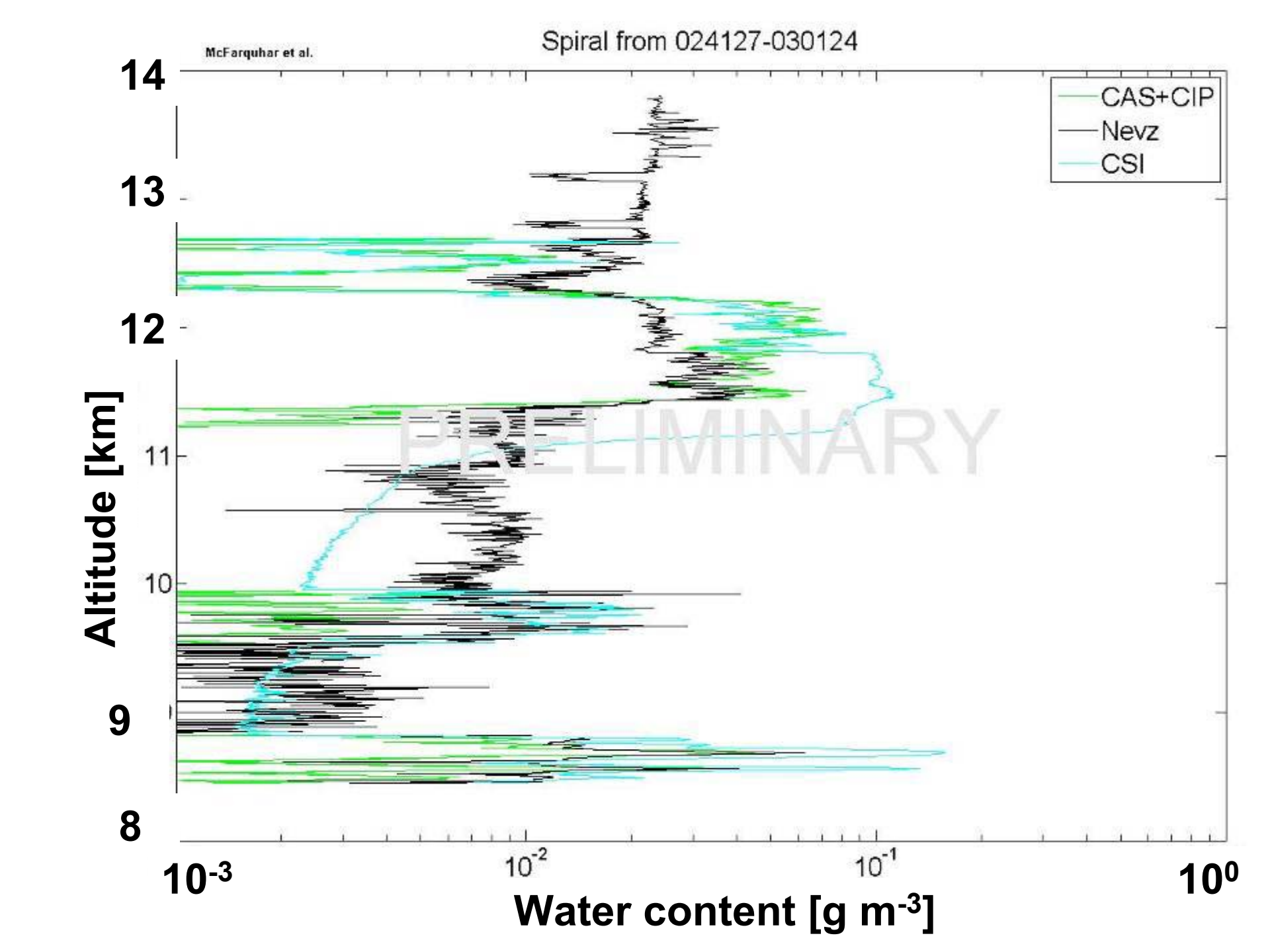
4:38:12:129  4:38:12:458  4:38:12:580  4:38:12:647 

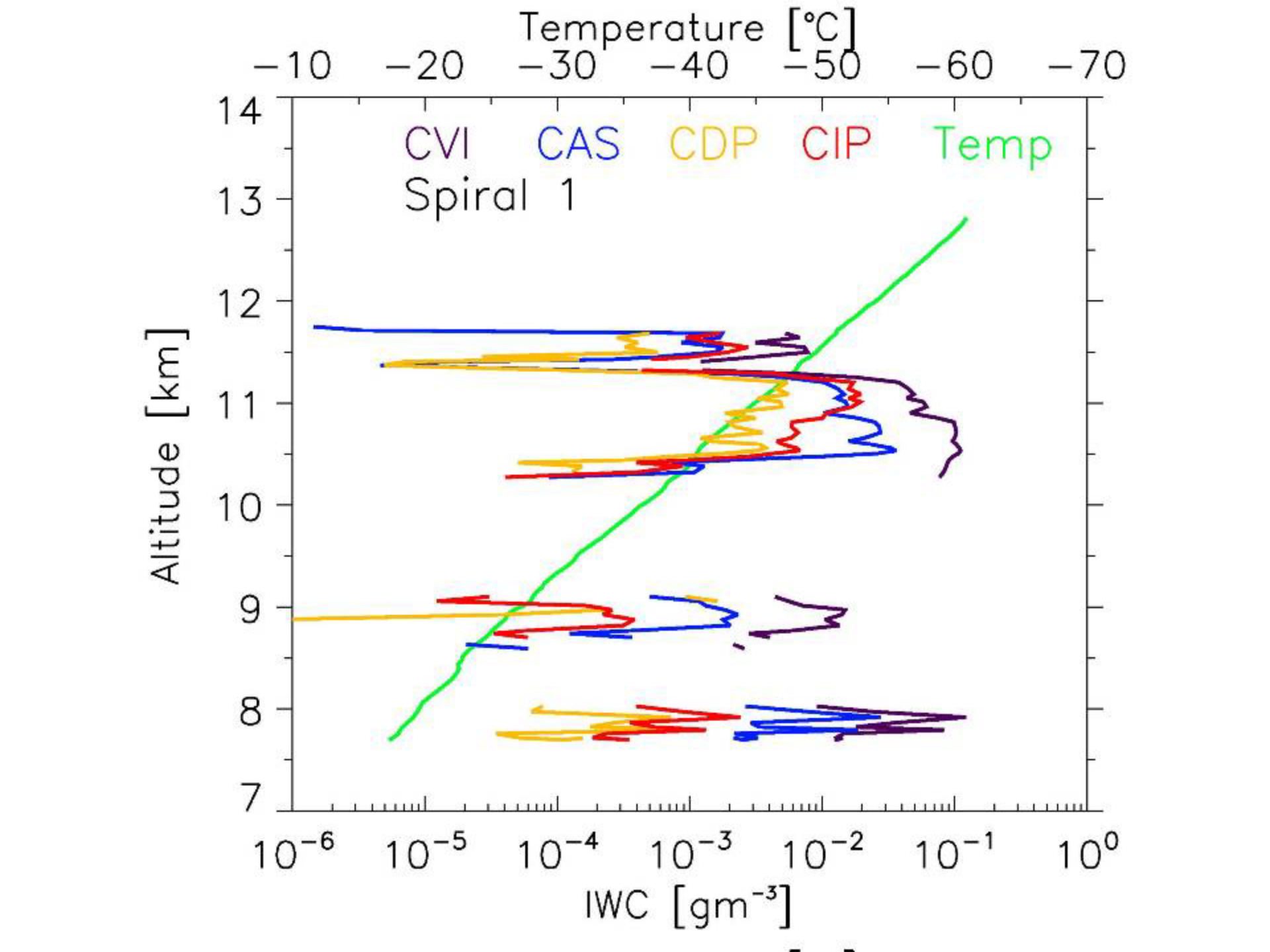
4:38:12:749  4:38:12:770  4:38:12:789 

4:38:12:893  4:38:12:997  4:38:13: 74 

Archived Products

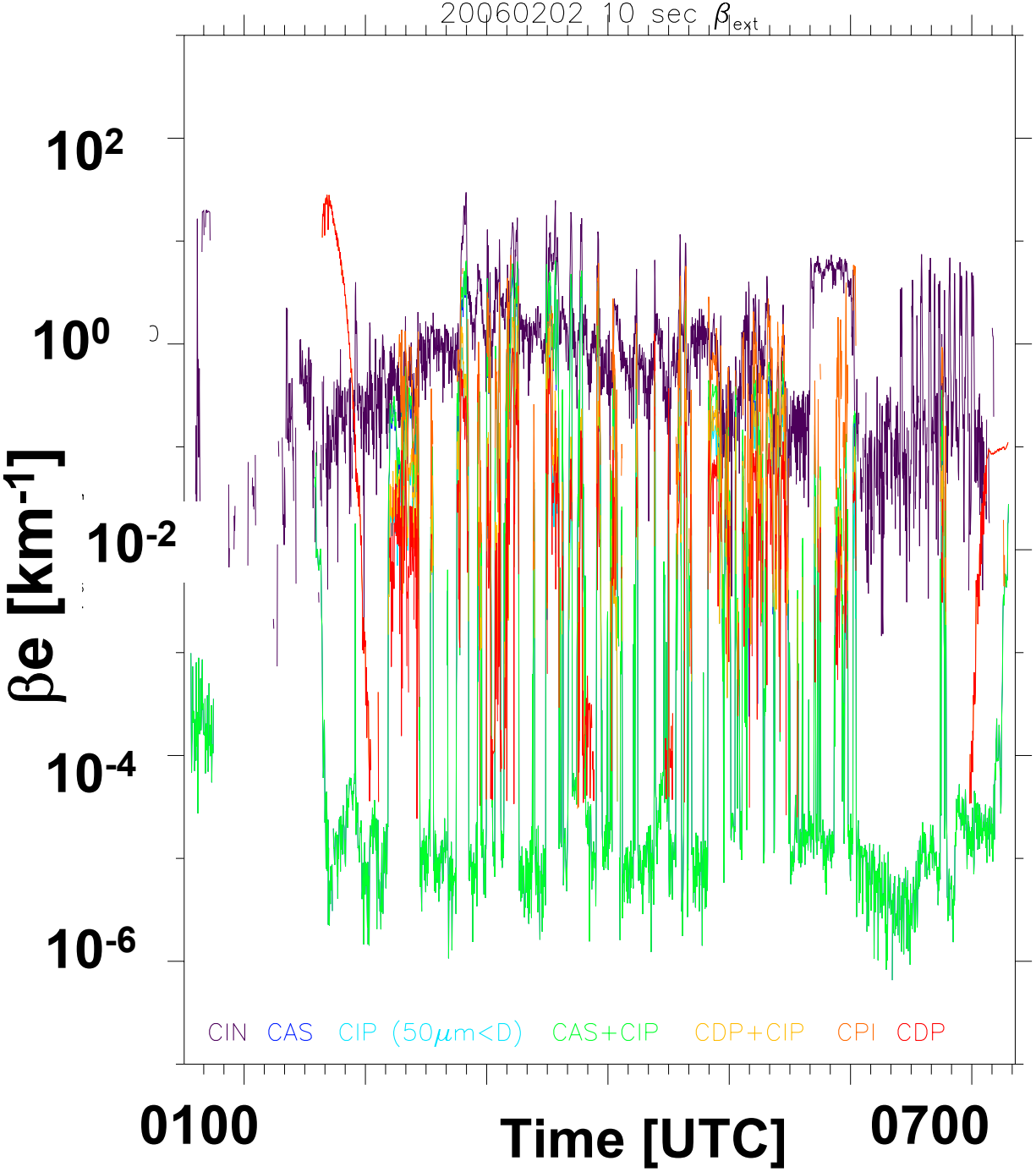
- CPI: Quality controlled images
- CVI: IWC (delayed flow at lower pressures gives roll off in IWC)
- Nevzorov probe: LWC and TWC (offsets not removed; TWC may be biased low)


McFarquhar et al.
Spiral from 024127-030124
CAS+CIP
Nevz
CSI
PRELIMINARY
Altitude [km]
14
13
12
11
10
9
8
10-3
10-2
10-1
100
Water content [g m-3]


Temperature [°C]
−10
−20
−30
−40
−50
−60
−70
CVI
CAS
CDP
CIP
Temp
Spiral 1
Altitude [km]
14
13
12
11
10
9
8
7
10^{-6}
10^{-5}
10^{-4}
10^{-3}
10^{-2}
10^{-1}
10^{0}
IWC [gm^{-3}]

Archived Products

- CPI: Quality controlled images
- CVI: IWC (delayed flow at lower pressures gives roll off in IWC)
- Nevzorov probe: LWC and TWC (offsets not removed)
- CIN: βe (estimates of g will follow)

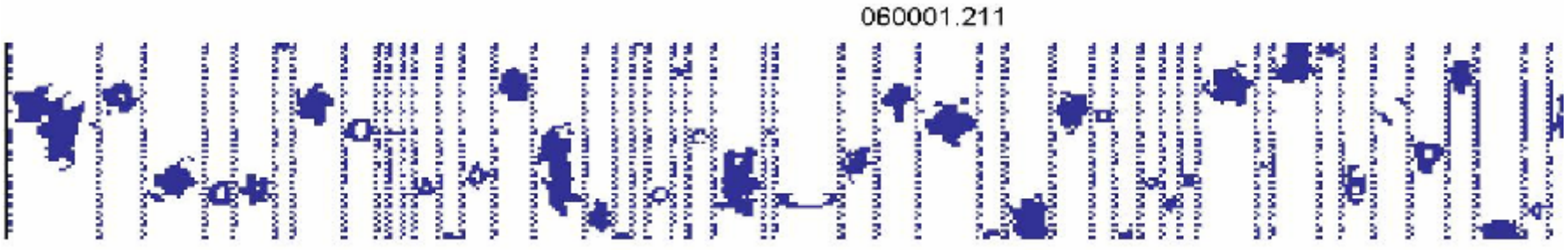

20060202 10 sec β_{ext}
10^2
10^0
10^{-2}
10^{-4}
10^{-6}
βe [km^{-1}]
CIN CAS CIP (50μm<D) CAS+CIP CDP+CIP CPI CDP
0100
Time [UTC]
0700

Archived Products

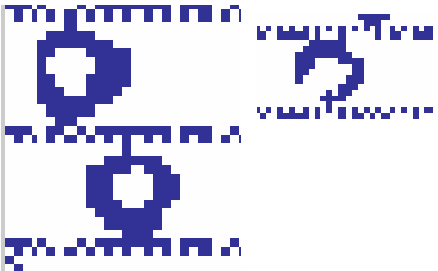
- CPI: Quality controlled images
- CVI: IWC (delayed flow at lower pressures gives roll off in IWC)
- Nevzorov probe: LWC and TWC (offsets not removed)
- CIN: βe (estimates of g will follow)
- CAPS: SDs from CAS & CIP
- CDP: SDs will follow in near future

Data Processing

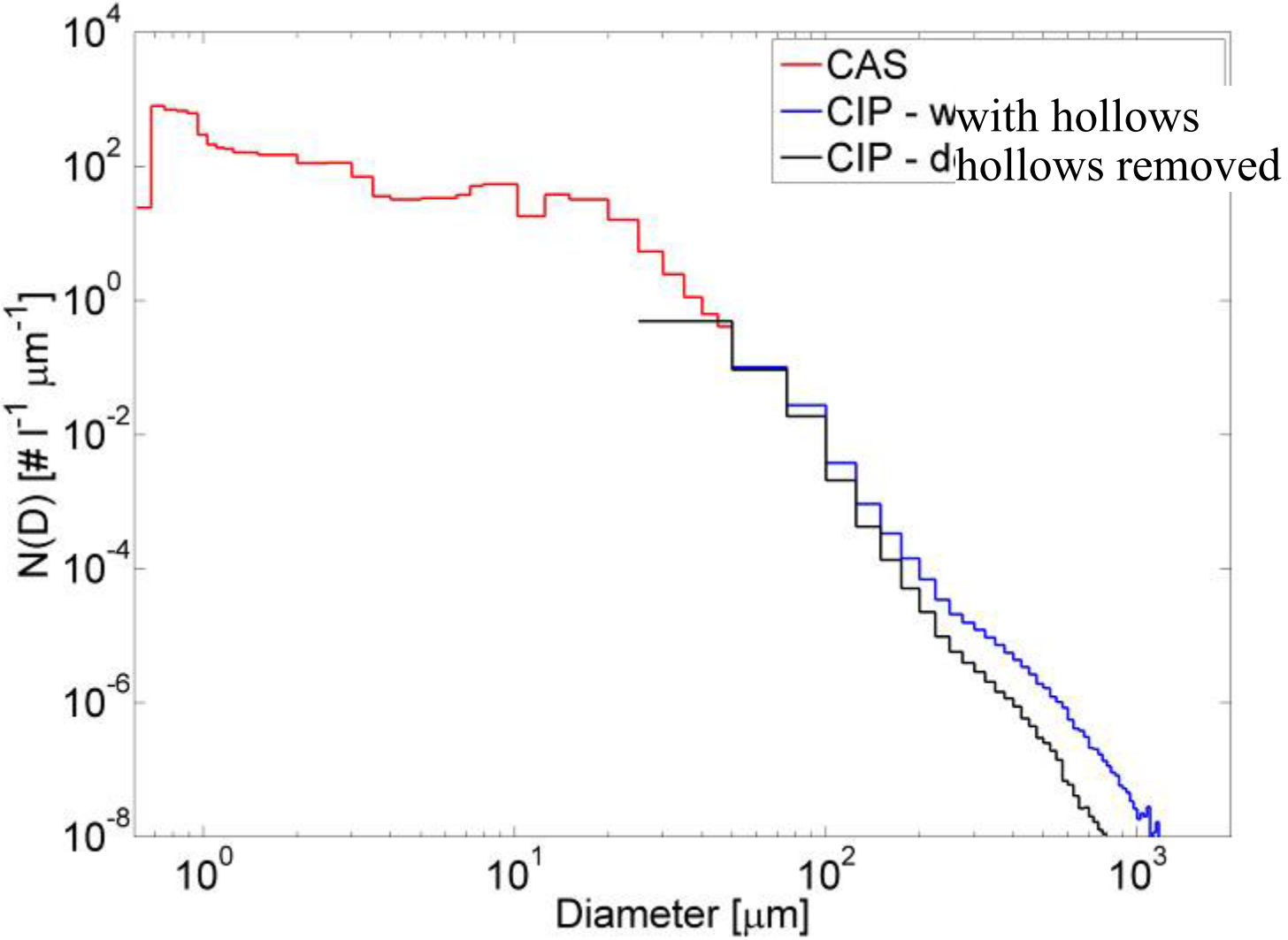
- Standard algorithms for all probes except for CIP, where hollow images are identified



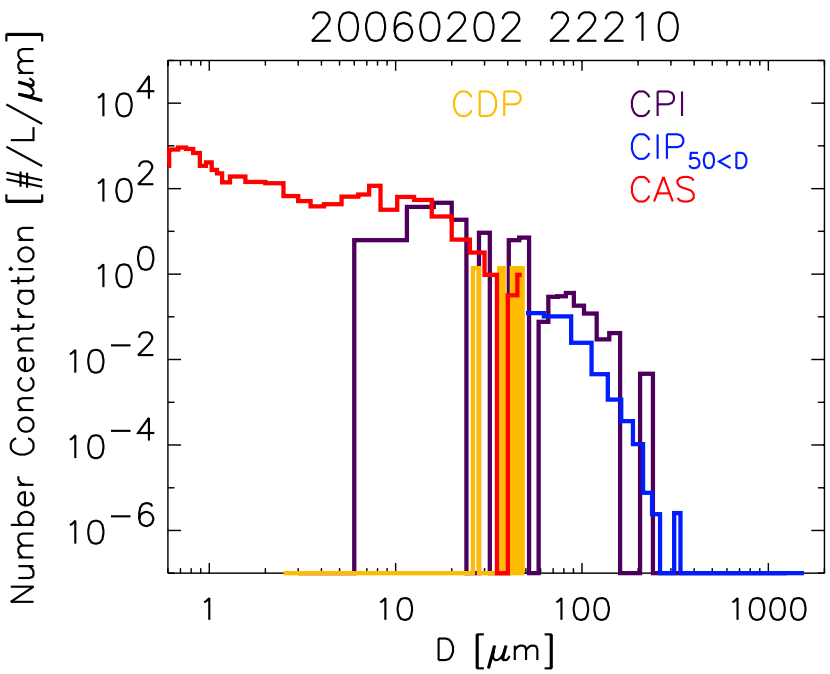
Identify hollows : if unlit diodes in middle of slice, particle hollow if end slice covers > 40% of hole

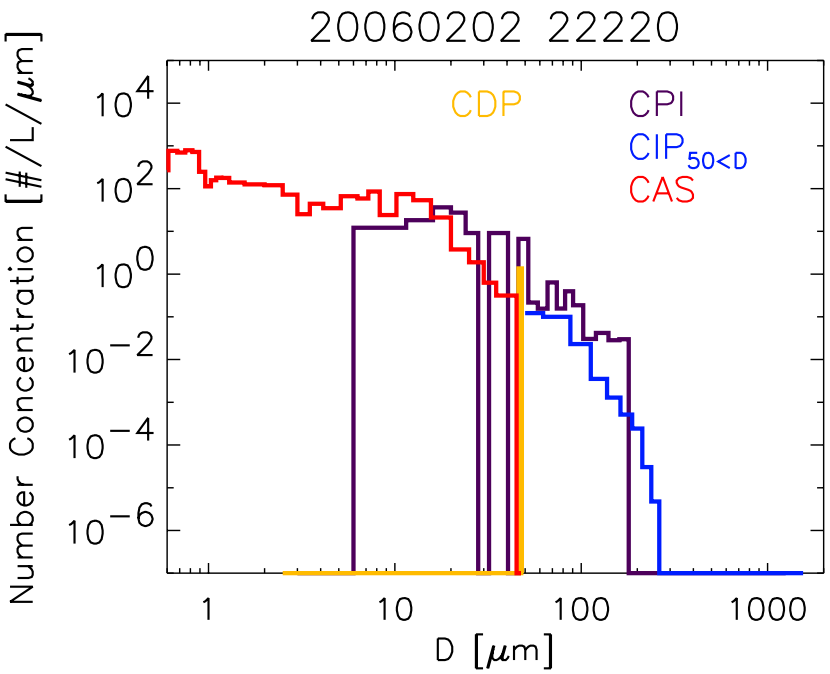
Hollow: 

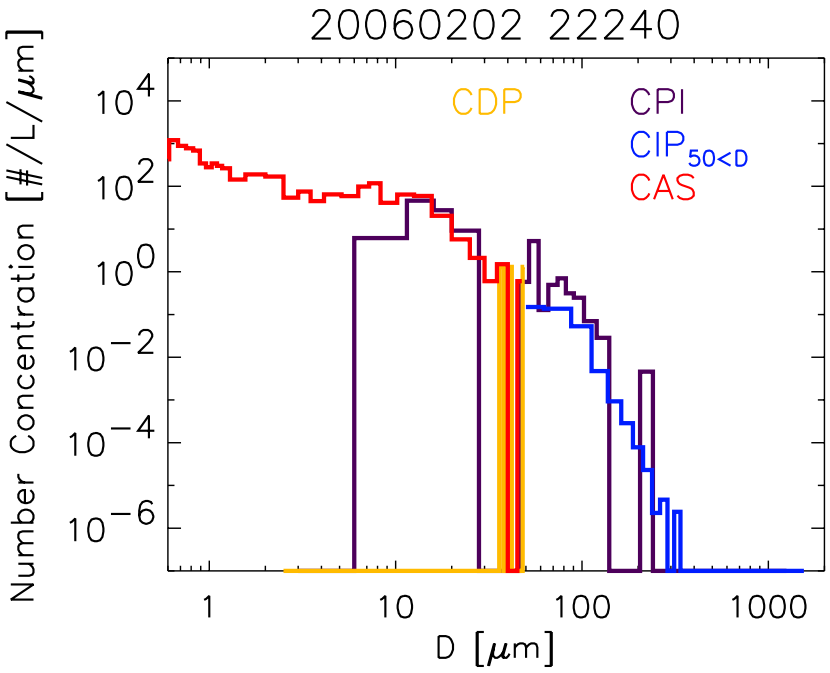
Not hollow: 



- **Removal of hollows has big impact on N(D) of particles with D > ~ 200 µm**
- **Currently adding correction for hollows based on Korolev**


20060202 22210
CDP
CPI
CIP50<D
CAS
Number Concentration [#/L/μm]
D [μm]


20060202 22220
CDP
CPI
CIP50<D
CAS
Number Concentration [#/L/μm]
D [μm]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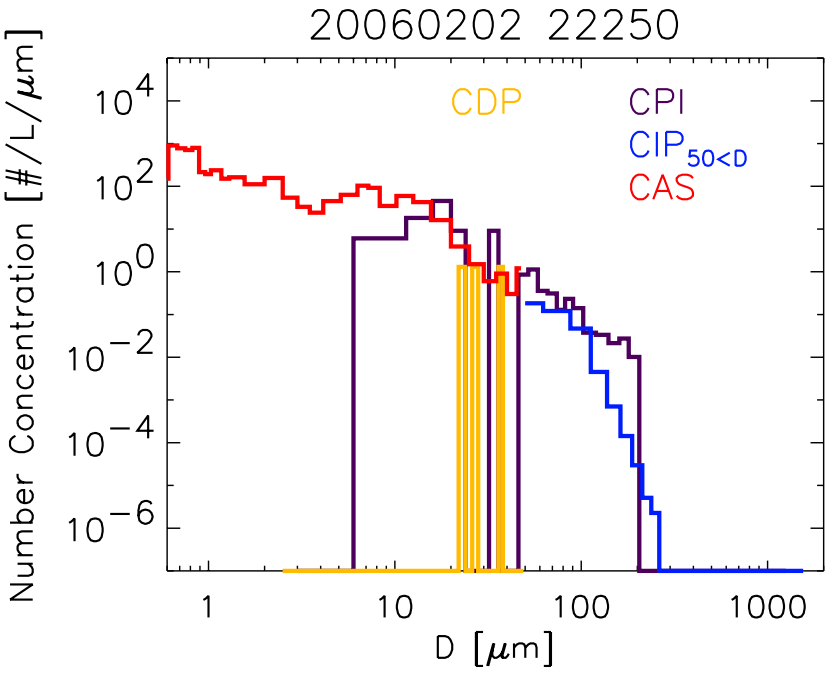
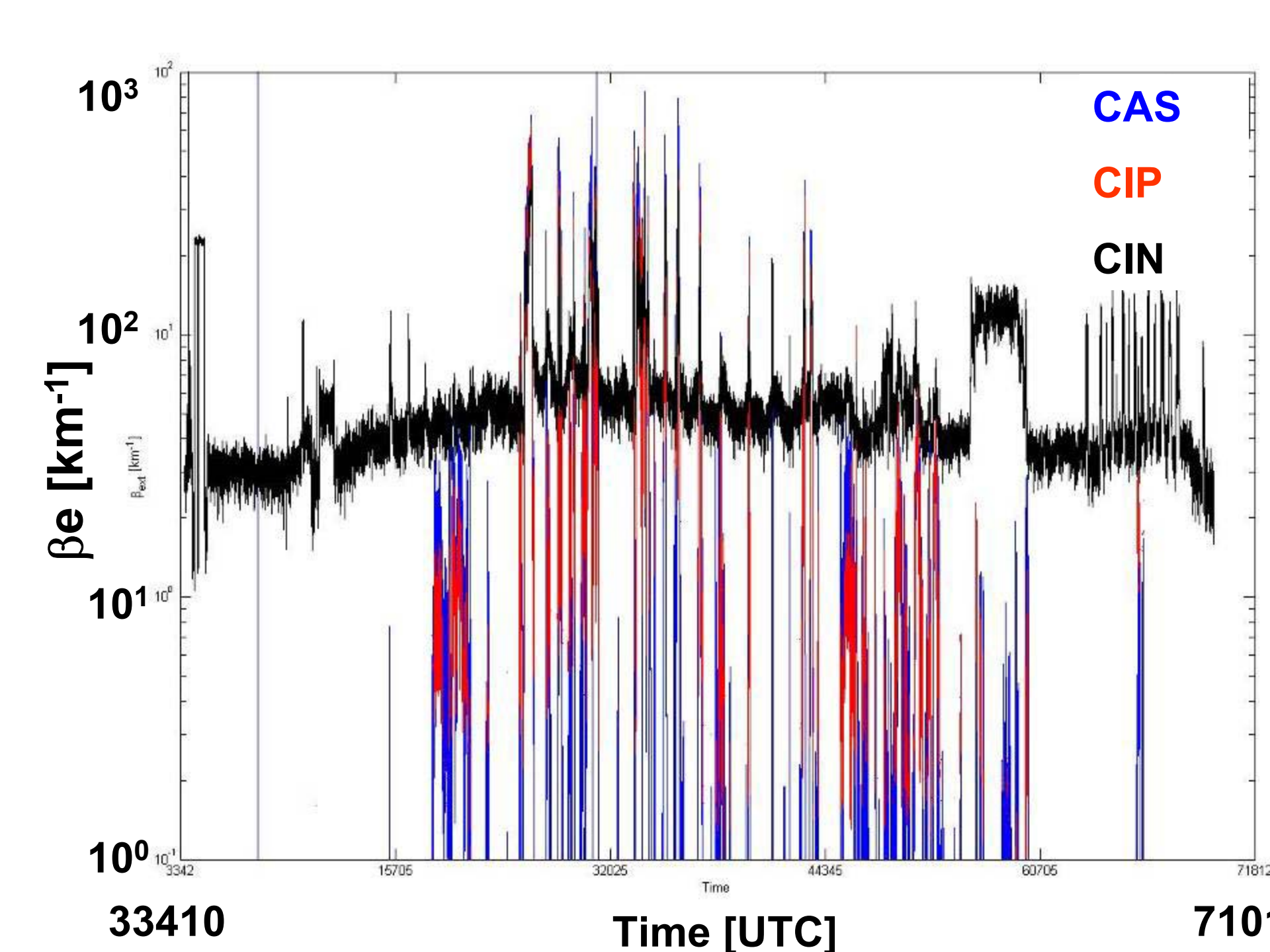
CDP
CPI
CIP50<D
CAS
Number Concentration [#/L/μm]
D [μm]


20060202 22250
CDP
CPI
CIP50<D
CAS
Number Concentration [#/L/μm]
D [μm]


CAS
CIP
CIN
βe [km-1]
10^3
10^2
10^1
10^0
βext [km-1]
3342
15705
32025
44345
60705
Time
33410
Time [UTC]

Summary of Flights

Conditions from 3 flights where we have best set of data:

27 January: Horizontal profiles through aged cirrus of varying lifetimes

29 January: Horizontal profiles looking at transition of anvil cirrus to more generic cirrus

2 February: Spiral ascents/descents in fresh anvils