

Aerosol size distributions –
nucleation to coarse mode
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Aerosols & TORERO science goals

- *Vertical distribution of aerosol particles*
- *Stable layers & stratification*
- *Sources, transport & mixing of particles*
 - *especially new formation*
 - *association with trace gas data*
- *Scavenging/removal processes*

Aerosol instruments

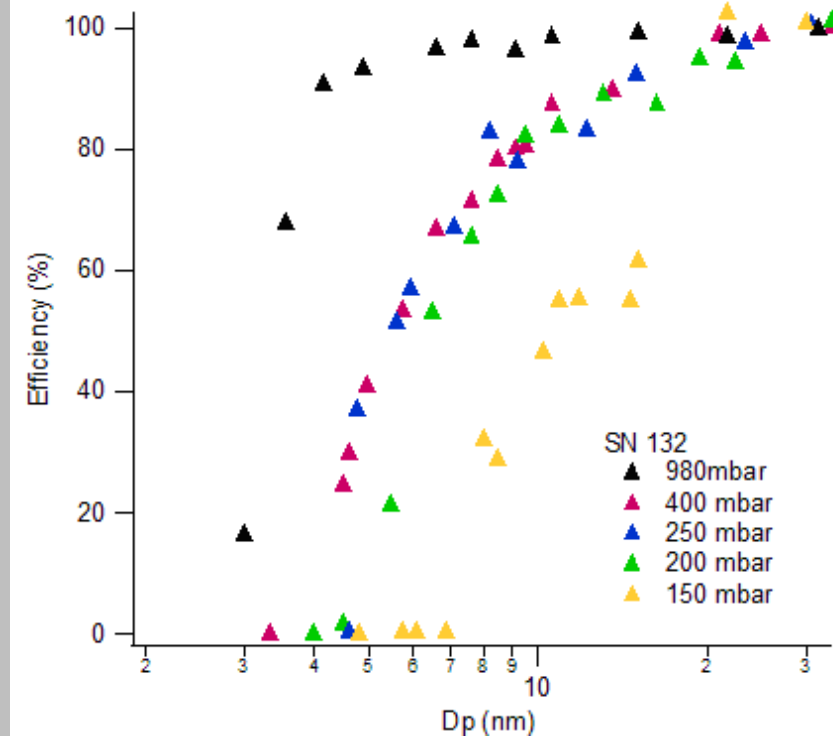
UHSAS – *Ultra-High Sensitivity Aerosol Spectrometer*

- 60 – 1,000 nm in 100 size bins, 10 sps
- resolution ~1%

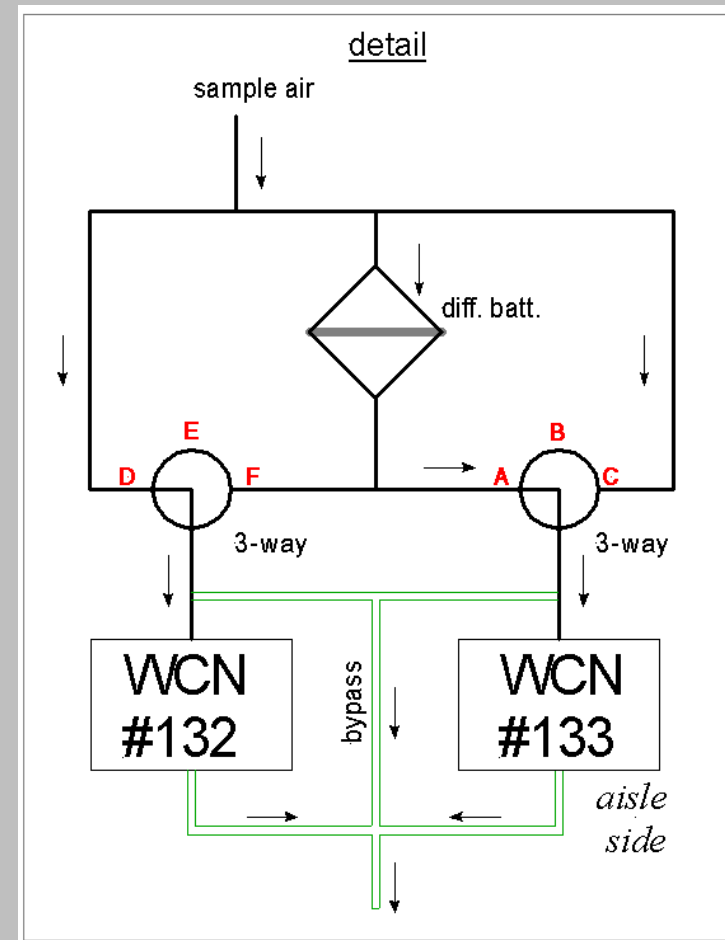
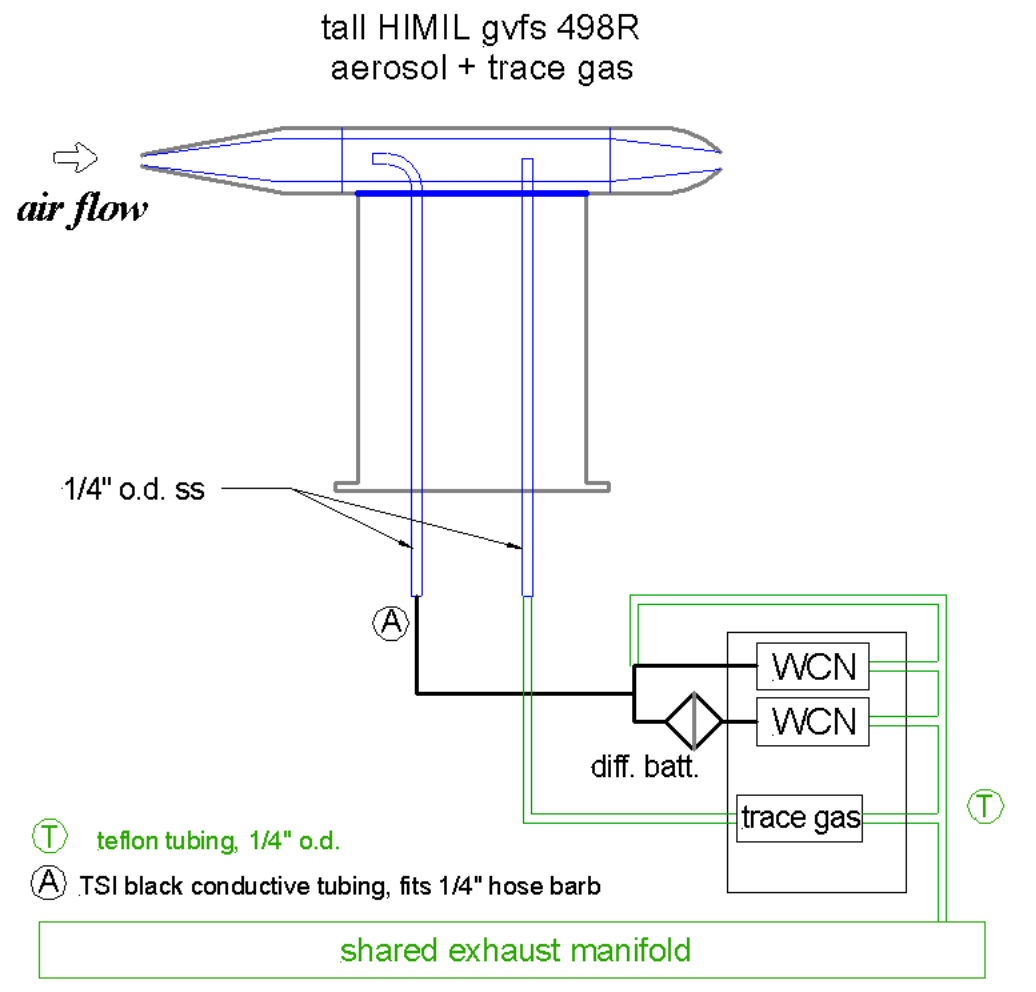
Water-based CN counter (WCN)

- total conc, particles larger than ~7 nm
- 10 sps
- ~1 sec response

use 2 WCN & adjust threshold sizes to 7 nm and 30 nm = *development project*



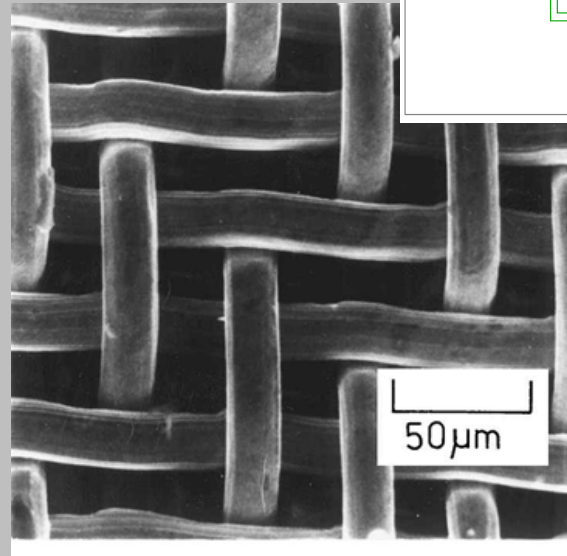
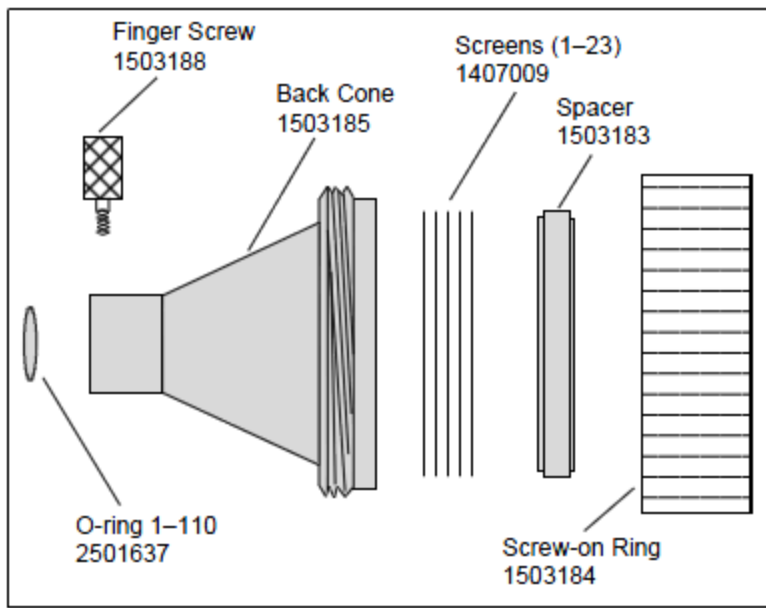
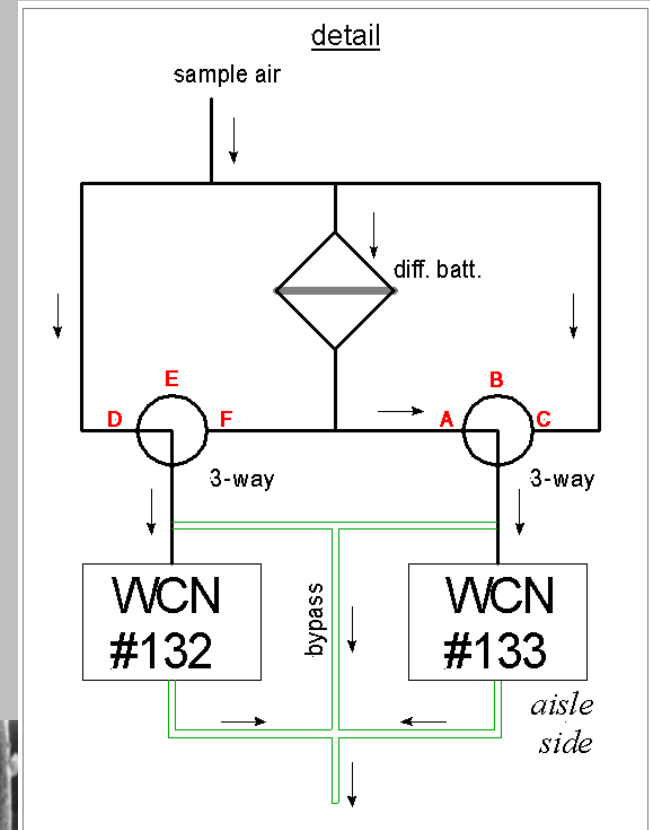
Operator reminder → *Log positions of 3-way valves on chat!*
Typical = AD or CF



Aerosol diffusion battery

- removes smallest particles
- stack of 8 screens 100 μm mesh

		fractional penetration of aerosol through diffusion battery with 8 screens								
		particle diameter (μm)								
		0.010	0.014	0.020	0.027	0.038	0.054	0.075	0.105	
pressures (mb)	150	0.012	0.058	0.161	0.309	0.470	0.613	0.727	0.812	
	200	0.026	0.095	0.221	0.379	0.534	0.666	0.767	0.840	
	300	0.060	0.165	0.314	0.474	0.617	0.731	0.814	0.873	
	400	0.098	0.225	0.383	0.538	0.669	0.770	0.842	0.891	
	500	0.135	0.276	0.436	0.585	0.706	0.796	0.860	0.904	
	600	0.169	0.319	0.478	0.620	0.733	0.815	0.873	0.912	
	700	0.200	0.355	0.513	0.648	0.754	0.830	0.883	0.919	
	800	0.229	0.387	0.541	0.671	0.770	0.842	0.891	0.924	
	900	0.255	0.415	0.566	0.690	0.784	0.851	0.897	0.928	
	1000	0.280	0.439	0.587	0.707	0.796	0.859	0.902	0.931	



Some flight measurements
– RF02
flight track

Descents cross MBL

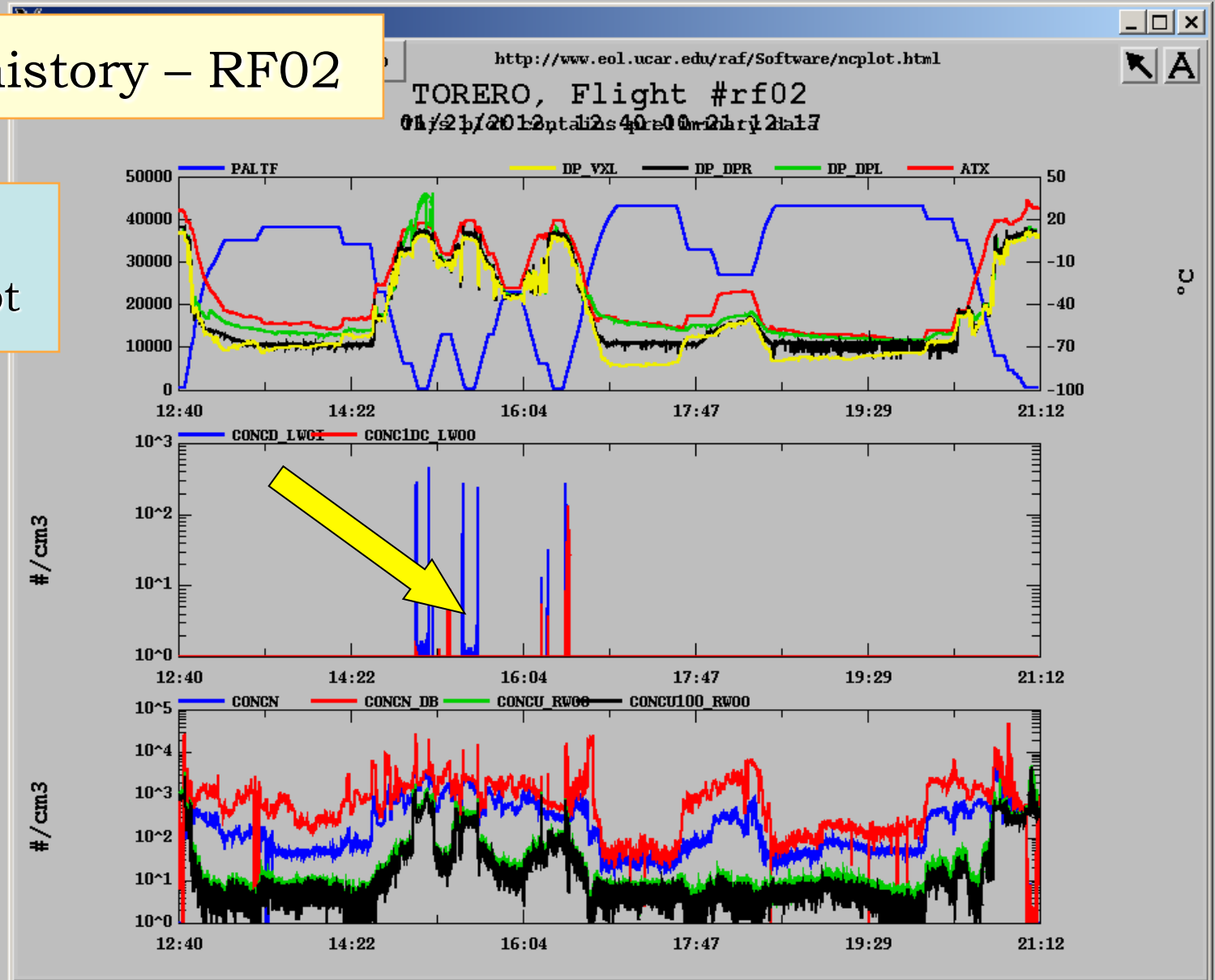


Total history - RF02

Altitude,
Temp, dewpt

clouds at
MBL
inversion

aerosols



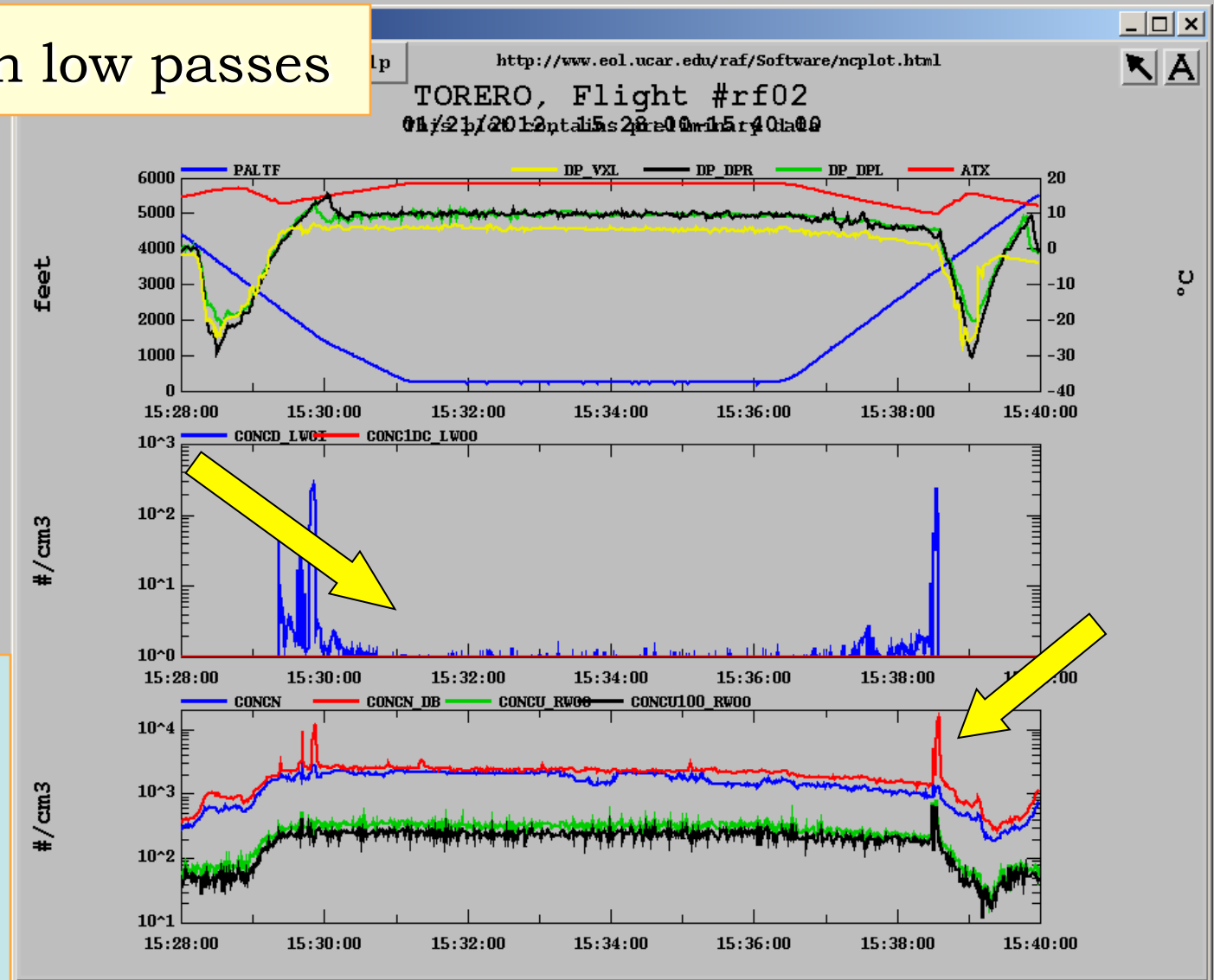
Zoom in on low passes

Inversion:
temp, dewpt

aerosol > 1 μ m in
BL detected by
CDP

Aerosol conc
greater in BL.

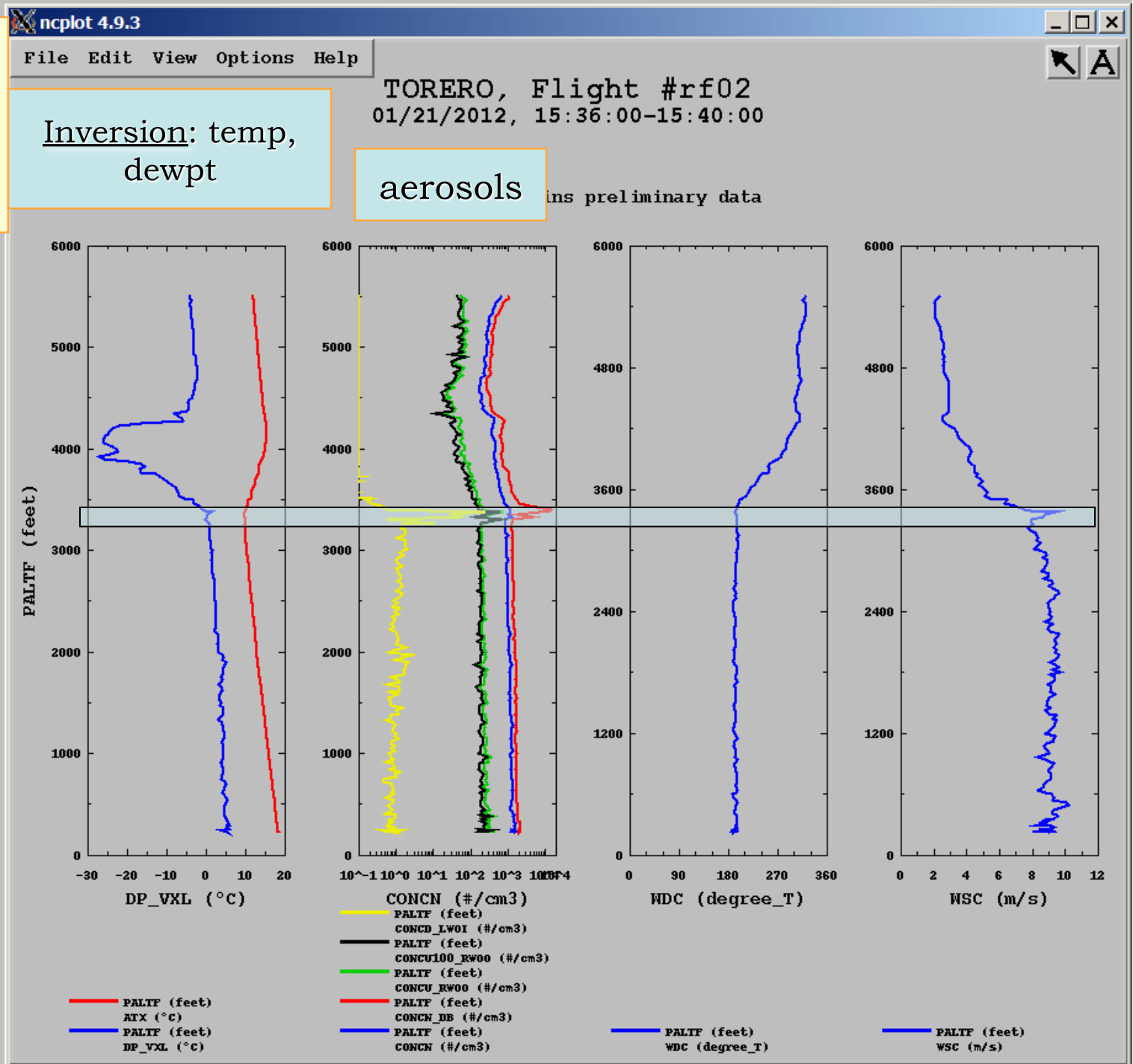
spike in clouds =
sampling artifact



Profile view:

BL ~3000ft deep

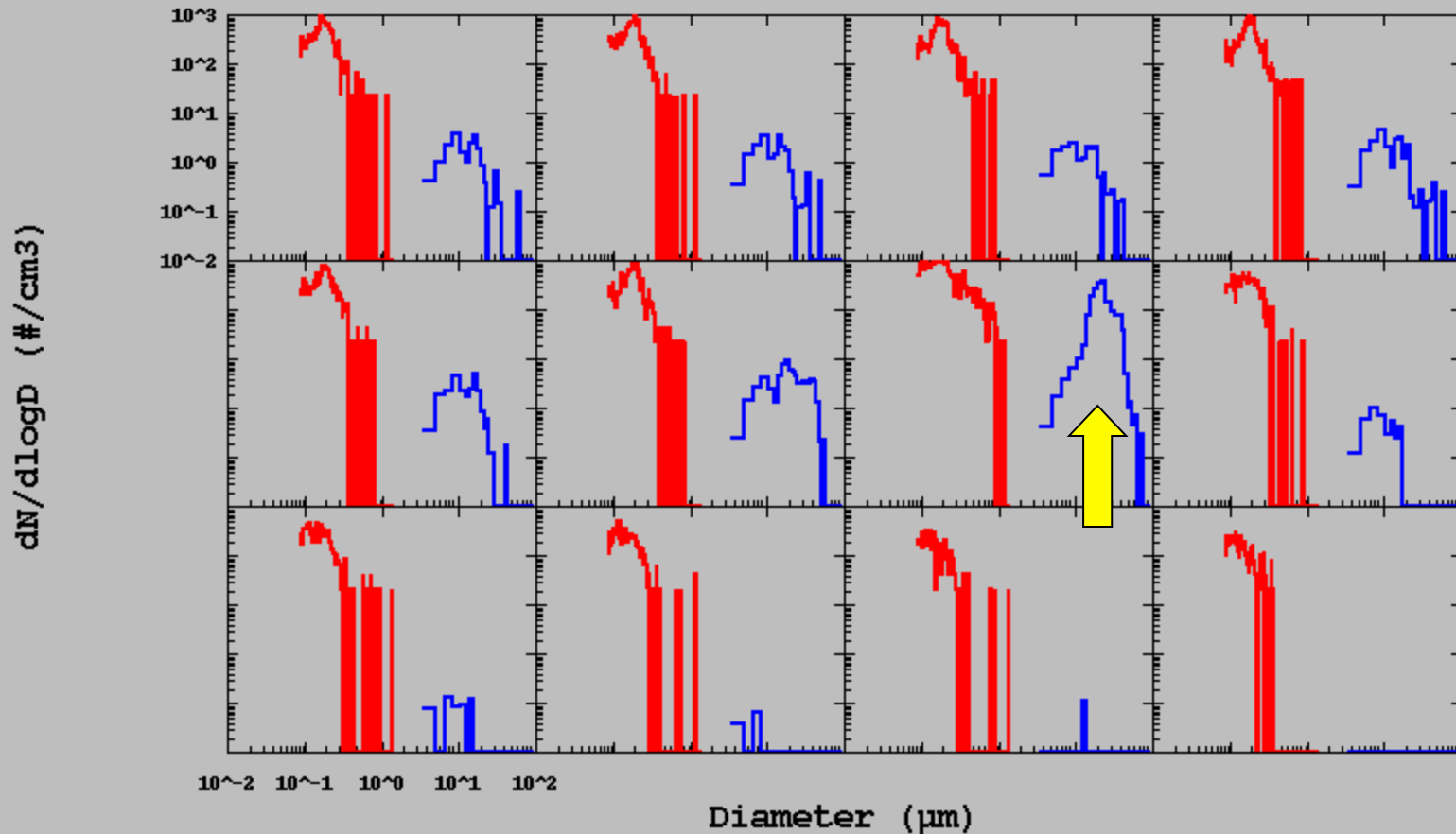
thin cloud at base of MBL inversion



Particle size distr during climb

...r.edu/raf/Software/ncpp.html

TORERO, Flight #rf02
01/21/2012, 15:38:00 - 15:39:00, 5 second average
This plot contains preliminary data



— UHSAS_RW00
— CDP_LW01

To do: *fix size bins, explore adding smallest sizes from WCN/ diff.battery data*