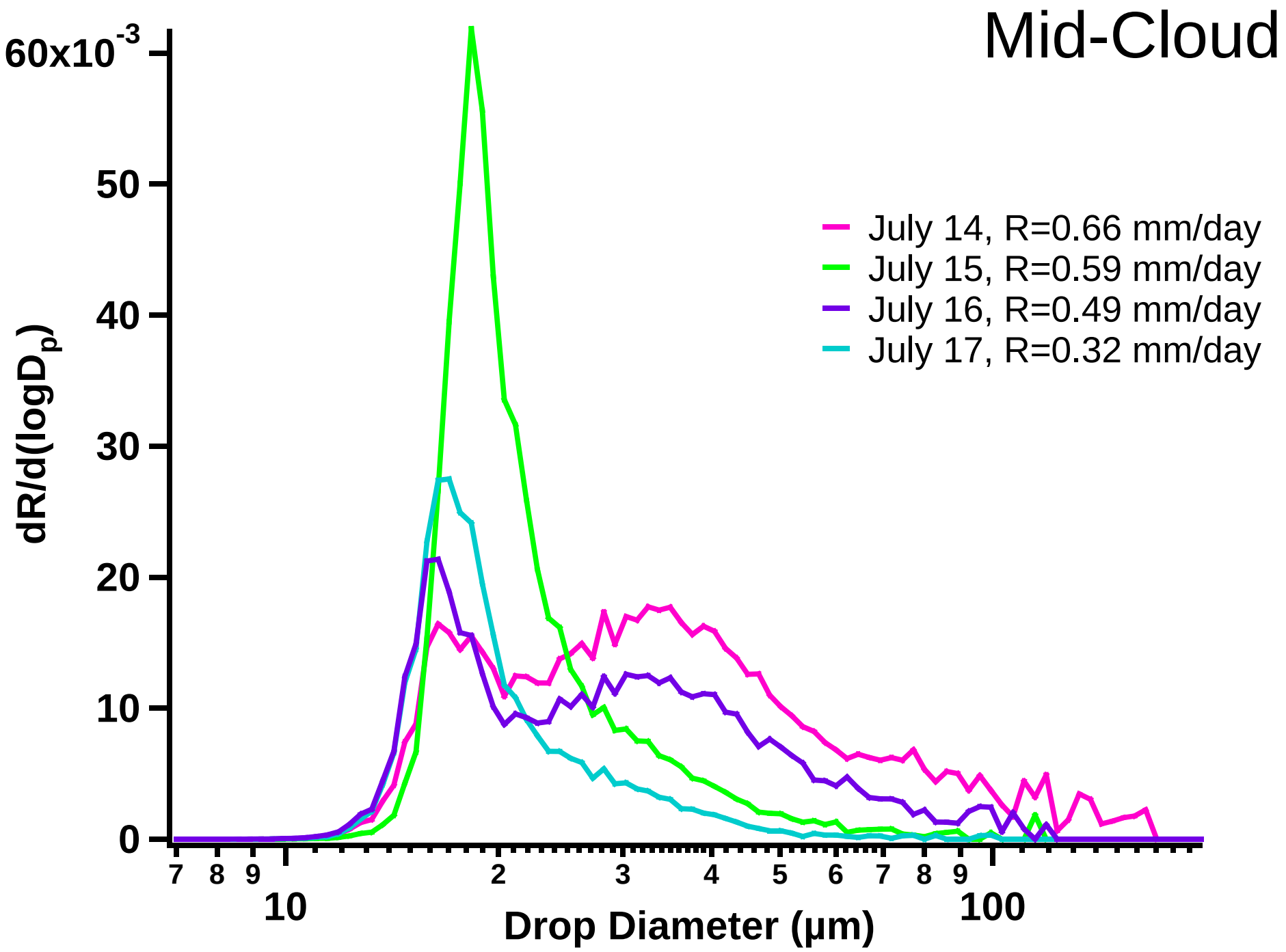
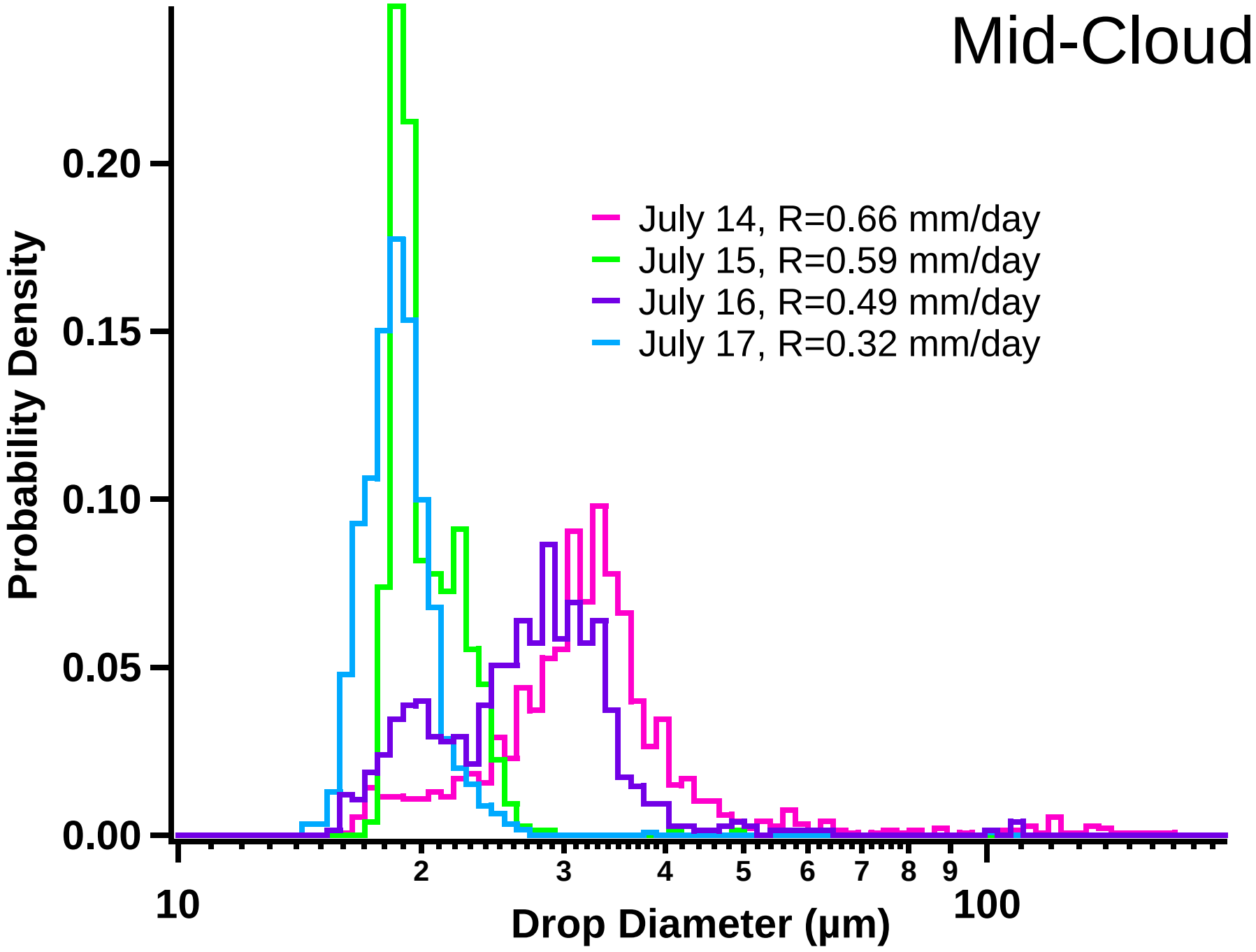
UC Santa Cruz PDI Data

Why use PDI data?

- High diameter resolution to 100 um diameter using one instrument (bin width: 3.5% of bin diameter) [contrast w/ CIP with 25 um resolution]
- Important for resolving collision-coalescence mode and drizzle
- Instrument view volume & therefore concentration values are computed using data!


Mid-Cloud
60x10-3
50
40
30
20
10
0
dR/d(logDp)
July 14, R=0.66 mm/day
July 15, R=0.59 mm/day
July 16, R=0.49 mm/day
July 17, R=0.32 mm/day
7 8 9
10
2
3
4
5
6
7
8
9
100
Drop Diameter (μm)


Mid-Cloud
July 14, R=0.66 mm/day
July 15, R=0.59 mm/day
July 16, R=0.49 mm/day
July 17, R=0.32 mm/day
Probability Density
0.20
0.15
0.10
0.05
0.00
10
2
3
4
5
6
7
8
9
100
Drop Diameter (μm)

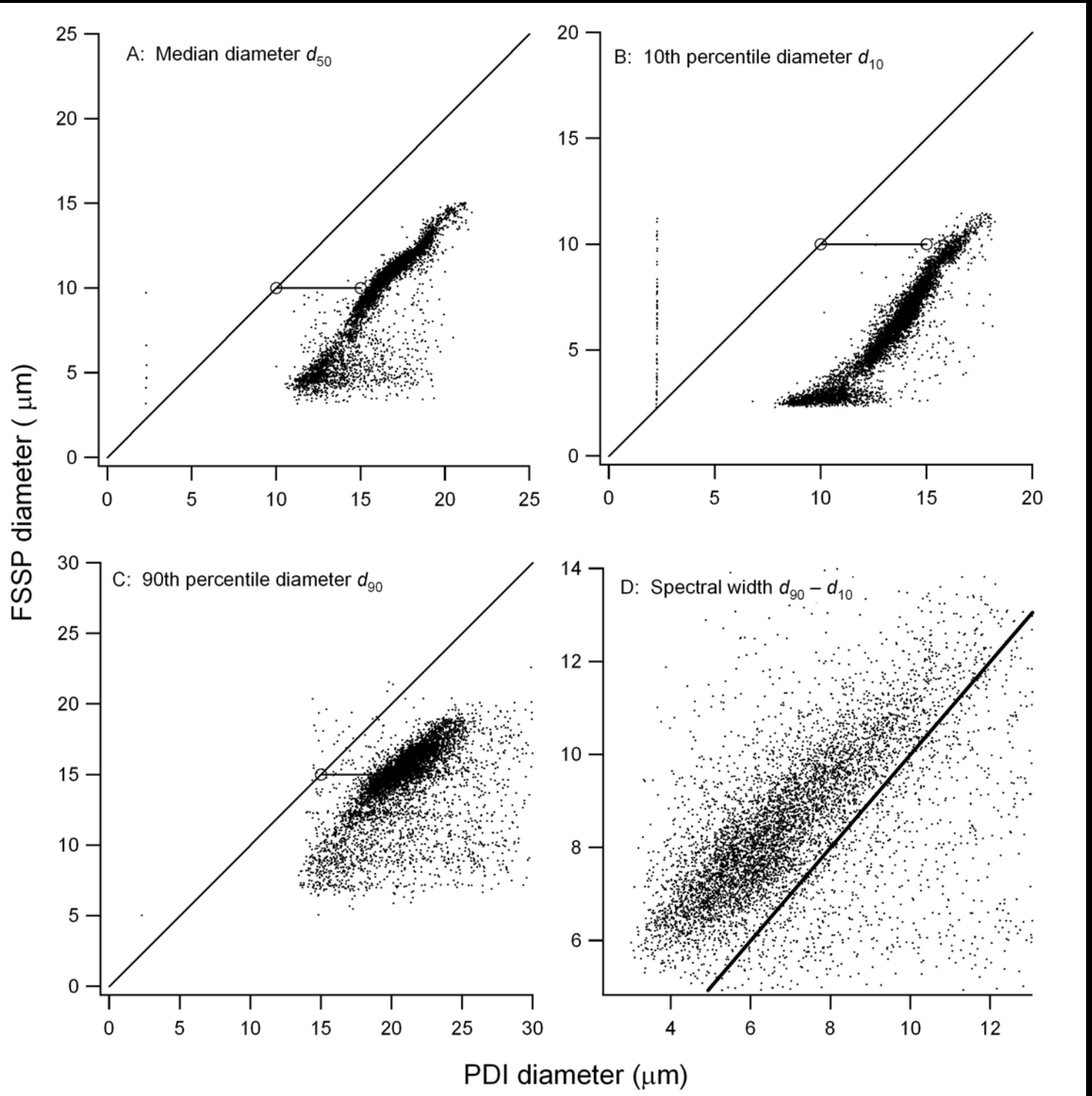

A: Median diameter d_{50}
B: 10th percentile diameter d_{10}
C: 90th percentile diameter d_{90}
D: Spectral width $d_{90} - d_{10}$
FSSP diameter (μm)
PDI diameter (μm)

Figure 10

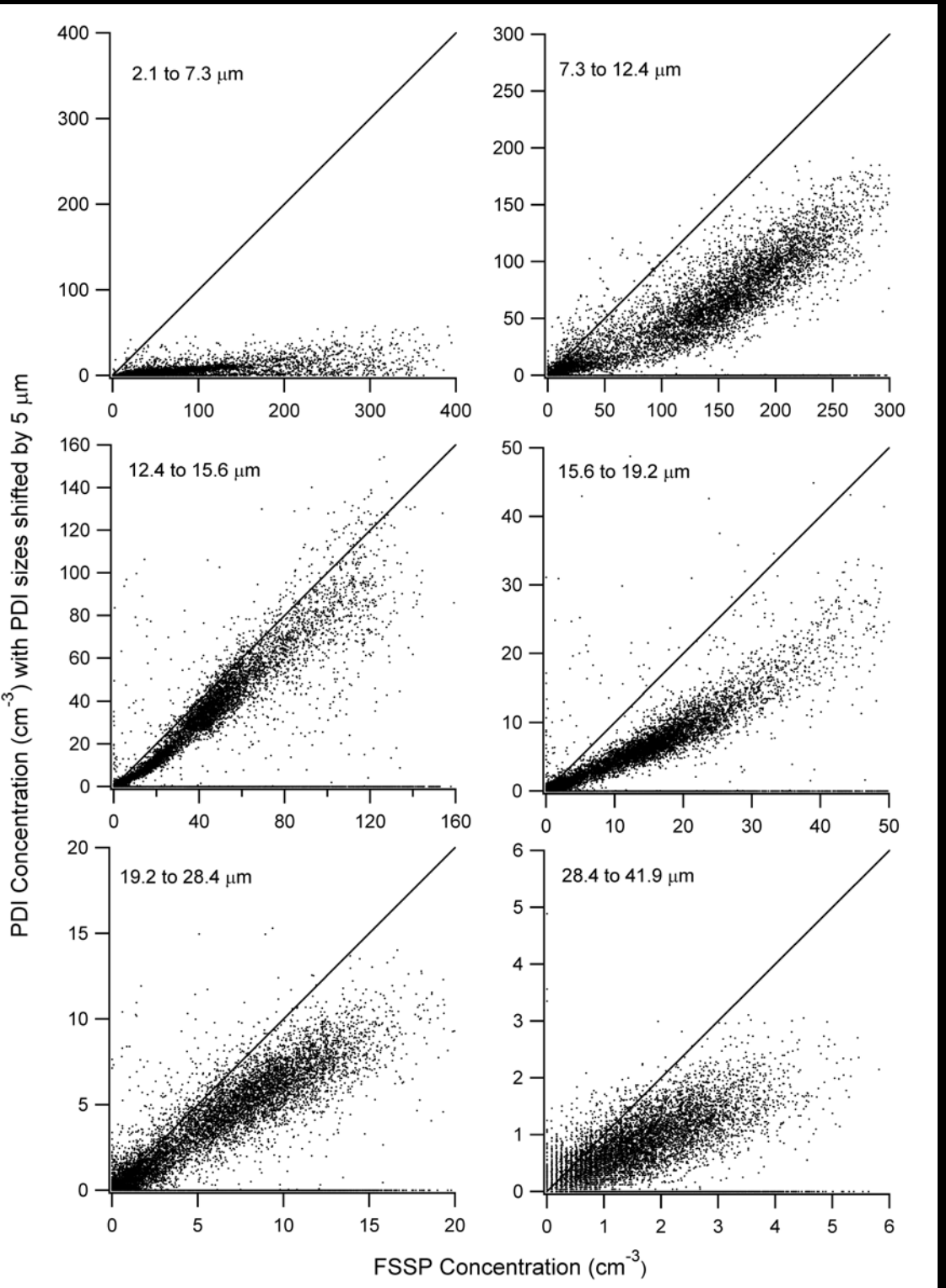

2.1 to 7.3 μm
7.3 to 12.4 μm
12.4 to 15.6 μm
15.6 to 19.2 μm
19.2 to 28.4 μm
28.4 to 41.9 μm
PDI Concentration (cm-3) with PDI sizes shifted by 5 μm
FSSP Concentration (cm-3)

Figure 11

UC Santa Cruz Processing Plans

Finish data processing

- Process all days @ 1 Hz
- Generate 5 Hz or 10 Hz data set (depends on sampling statistics)
- Data quality control

UC Santa Cruz Analysis Questions

Conditional sampling of cloud properties (microphysical, thermodynamic, dynamic) to address:

- How do cloud microphysical properties change with entrainment?
- What determines the formation and organization of drizzle?
- Is there a relationship between drizzle and entrainment? (e.g. Bretherton idea of sedimentation/entrainment feedback)
- Day time vs night time differences in entrainment, drizzle and cloud microphysics?

UC Santa Cruz Analysis Plans

Conditional sampling of cloud properties (microphysical, thermodynamic, dynamic)

- mixing θ_e
- buoyancy θ_v
- mixing turbulence $(T')^2$, $(\mathrm{LWC}')^2$
- turbulence $(w')^2$

} Differences?

- large-scale vertical structure: low-pass filtered w
- shear $d\mathbf{v}/dz$?

If any of these overlaps with interests of others, we're more than happy to collaborate!

UC Santa Cruz Analysis Plans

Conditional sampling of cloud properties (microphysical, thermodynamic, dynamic)

- adiabatic ratio LWC/LWC_{adiab}
- drizzle liquid water LWC > 40 µm
- mean drop volume d_v
- ?enstrophy?
- ?Richardson number Ri?

UC Santa Cruz Analysis Plans

- Sampling relative to cloud top
  - 5 m altitude intervals relative to cloud top
  - interest in generating a common cloud top & EIL for each sawtooth leg?

UCSC modeling “plans”

Primarily in collaboration with others. We welcome all collaborators.

- 1-D model? (UCSC? Wood?)
- Work with LES models? (Shouping Wang, others?)
- Work with LEM model? (Krueger, Kerstein)