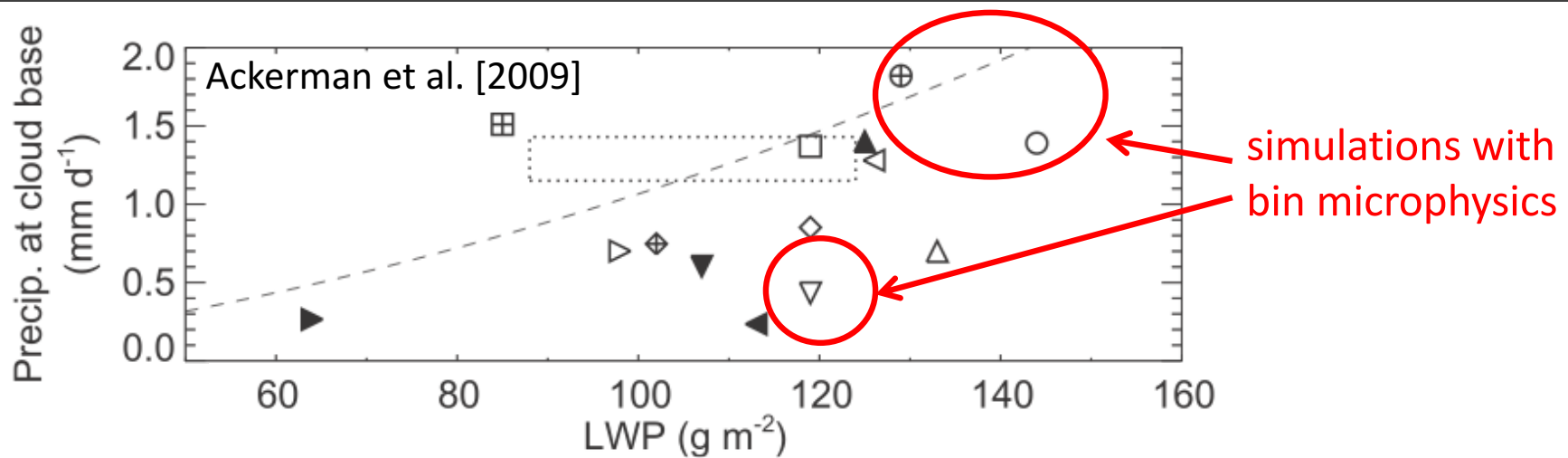# Using LES with bin microphysics and cloud Doppler radar spectra to advance understanding of drizzle:
A first study and next steps

J. Remillard[1], A. M. Fridlind[2]*, A. S. Ackerman[2], G. Tselioudis[2], P. Kollias[1,3], D. Mechem[4], H. Chandler[4], E. Luke[3], R. Wood[5], M. Witte[6], and P. Chuang[6], and J. K. Ayers[7]

[1]Stony Brook University, Stony Brook, NY
[2]NASA Goddard Institute for Space Studies, New York, NY
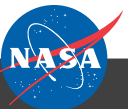[3]Brookhaven National Laboratory, Brookhaven, NY
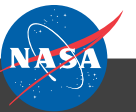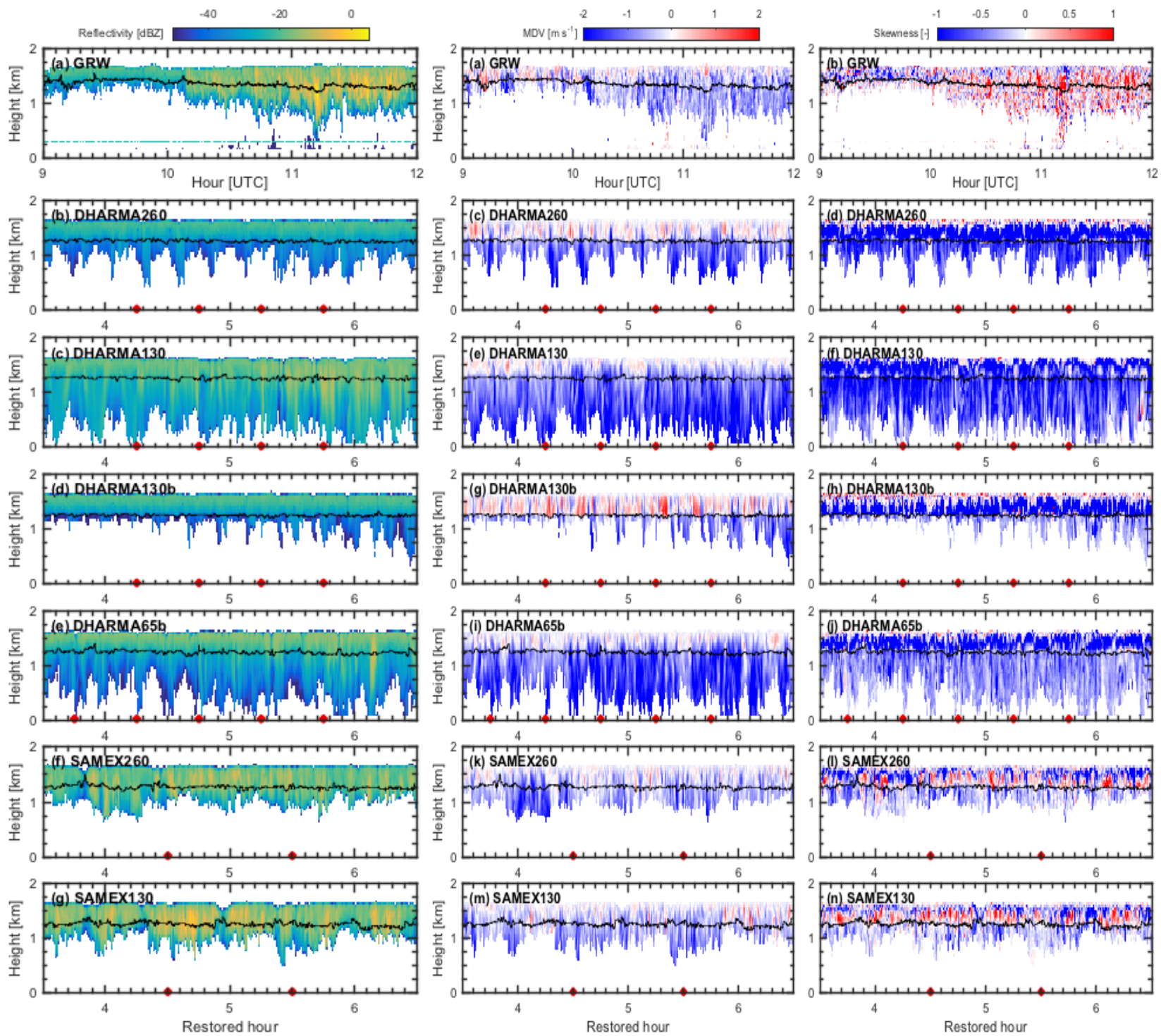[4]University of Kansas, Lawrence, KS
[5]University of Washington, Seattle, WA
[6]University of California, Santa Cruz, CA
[7]SSAI, NASA Langley Research Center, Langley, VA

Simulators Breakout • DOE ASR PI Meeting • 16 March 2017 • Fridlind / NASA GISS
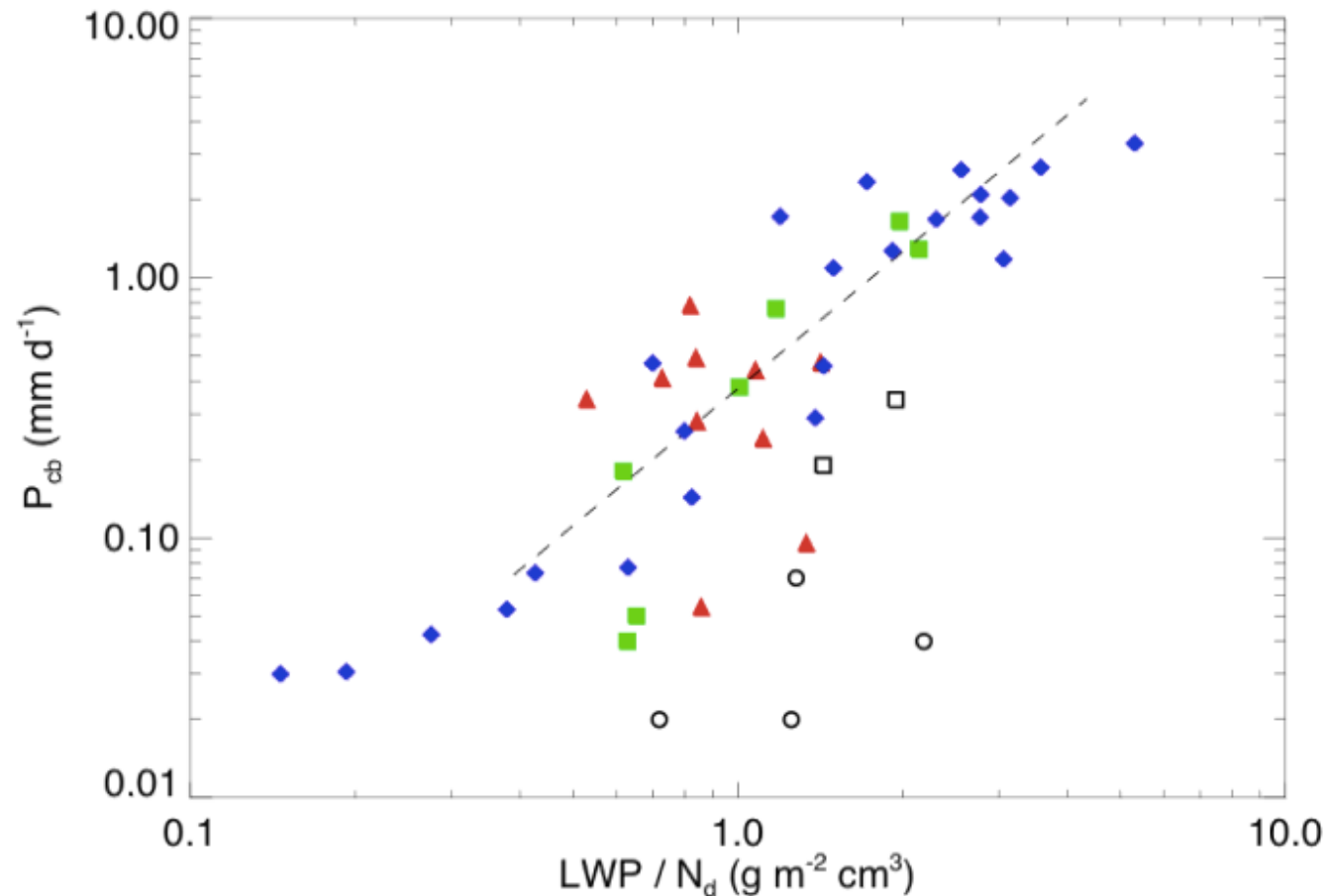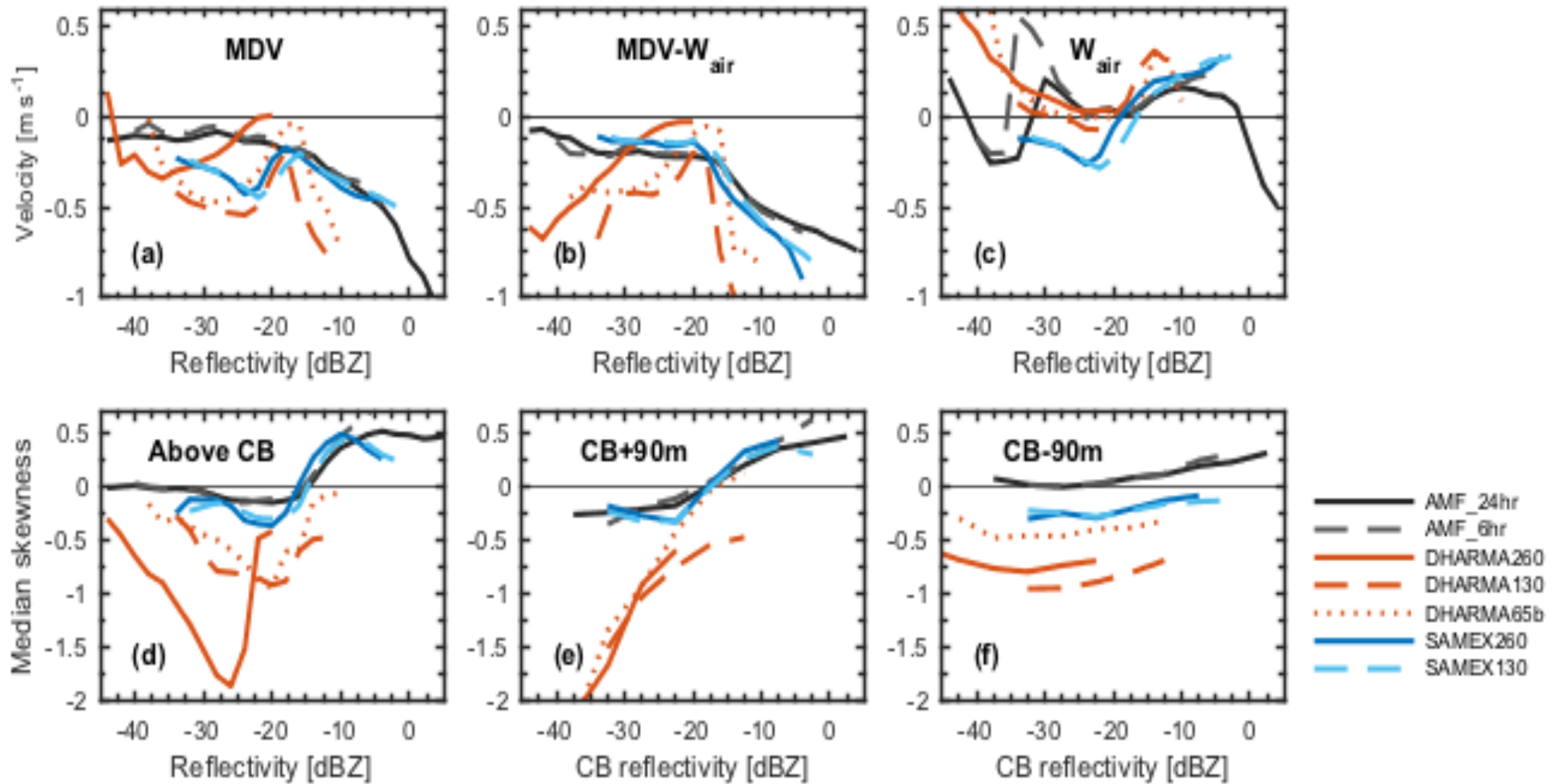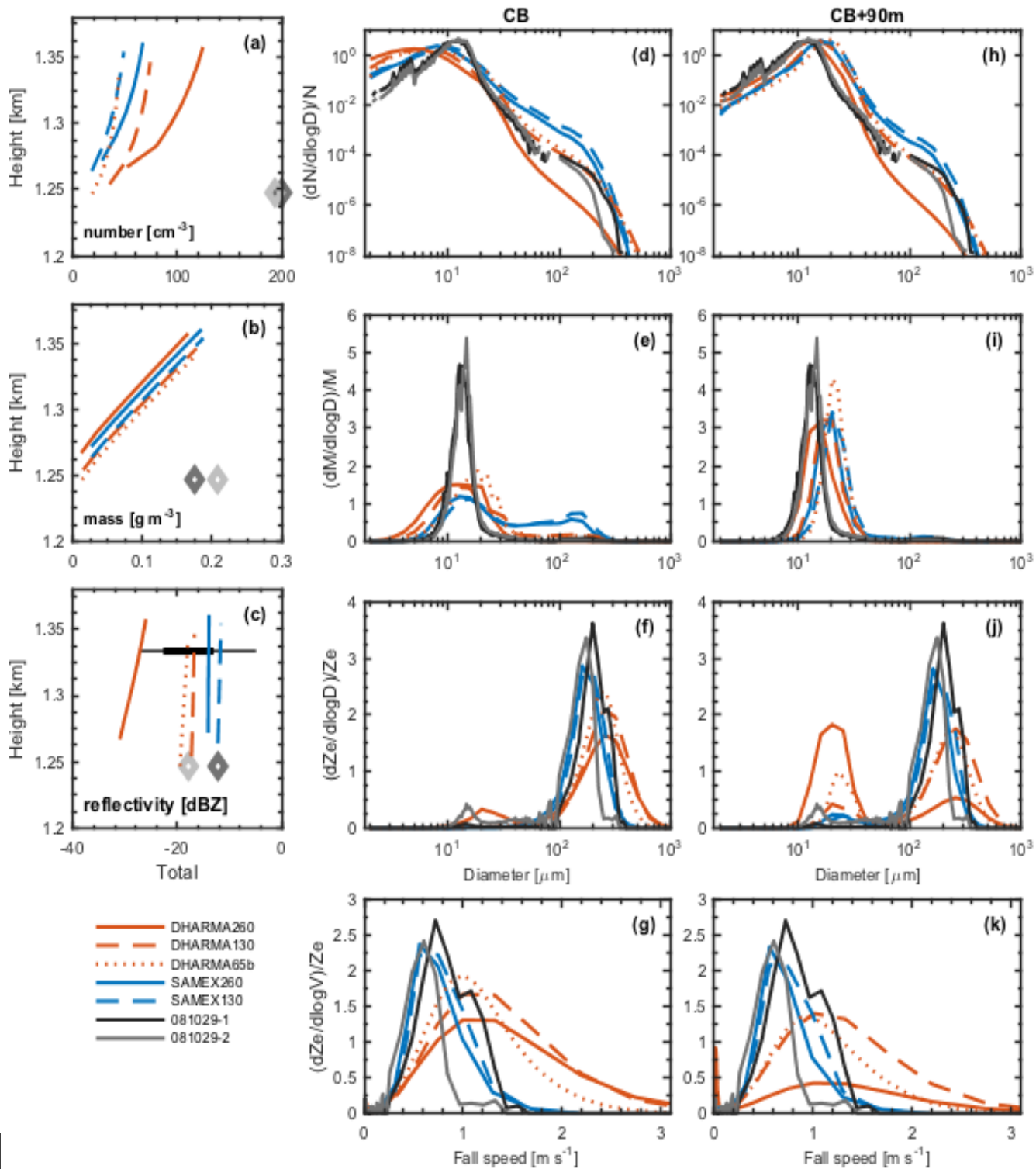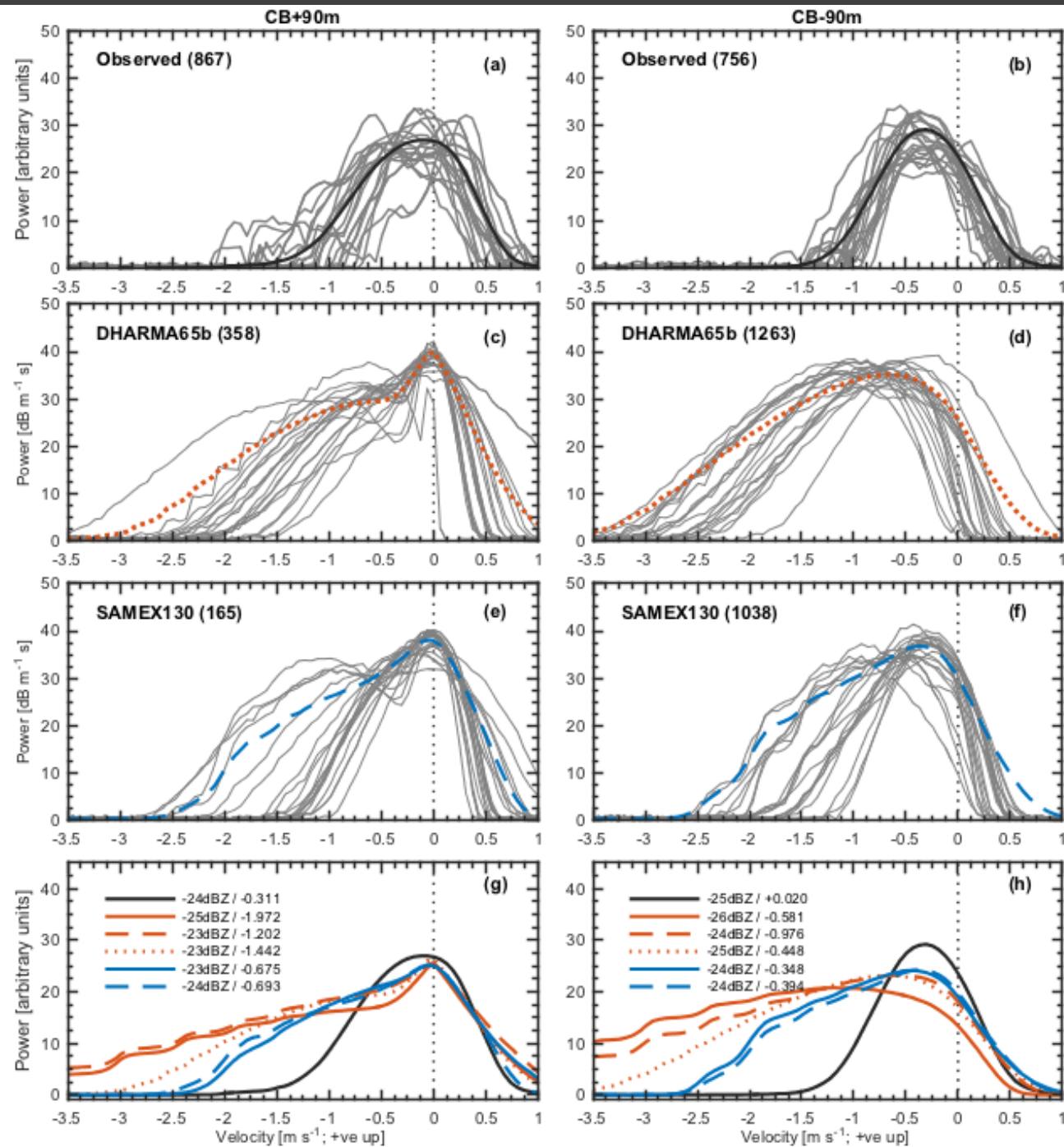
Context

Figure 5: Cloud base precipitation rate (P_{cb}) as a function of liquid water path (LWP) divided by cloud droplet number concentration (N_d) as simulated in this study by DHARMA (open circles; see Table 2) and SAMEX (open squares), fit to observations by Comstock et al. (2004, their Eqn. 17; dashed line), derived from observations by VanZanten et al. (2005) and Stevens et al. (2003) (green symbols) and Wood (2005; single layer cases, red symbols), and simulated using DHARMA by Ackerman et al. (2004; blue symbols).

Even MDV(Z) not so simple

CB

CB+90m

DHARMA260
DHARMA130
DHARMA65b
SAMEX260
SAMEX130
081029-1
081029-2

Fridlind / NASA GISS

Individual spectra

Summary and next steps

- constraining simulated drizzle using radar Doppler spectra
  - best constraint of drizzle PSDs to date for DHARMA
    - simulated drizzle missing prominent shoulder feature at circa 200 µm
    - likely fix is less diffusive collision-coalescence scheme
  - this works!

- future work
  - fix DHARMA numerics (post-doc hired)
  - study embryo formation process
  - convince ourselves that we understand drizzle processes
  - refine ModelE parameterizations accordingly