Comparison of Eulerian bin and Lagrangian particle-based schemes in simulations of Pi Chamber dynamics and microphysics

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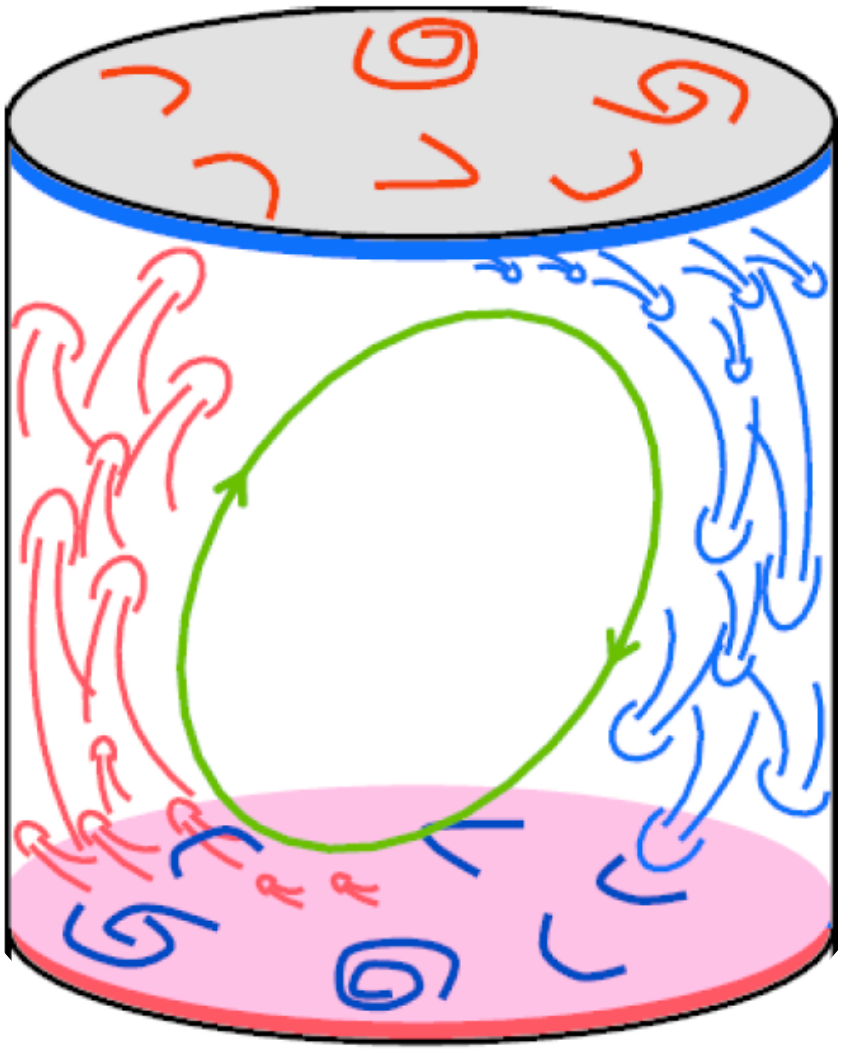
Cloud inside the Pi chamber, laboratory apparatus at Michigan Tech, forms because of the mixing between air parcels originating at chamber bottom and top water-saturated boundaries



cold and water-saturated

warm and water-saturated

Moist Rayleigh-Bénard convection in the Pi chamber:
thermal plumes, large-scale circulation, and boundary layers…

http://phy.sites.mtu.edu/cloudchamber/

Pi chamber dynamic simulations, condensation only:

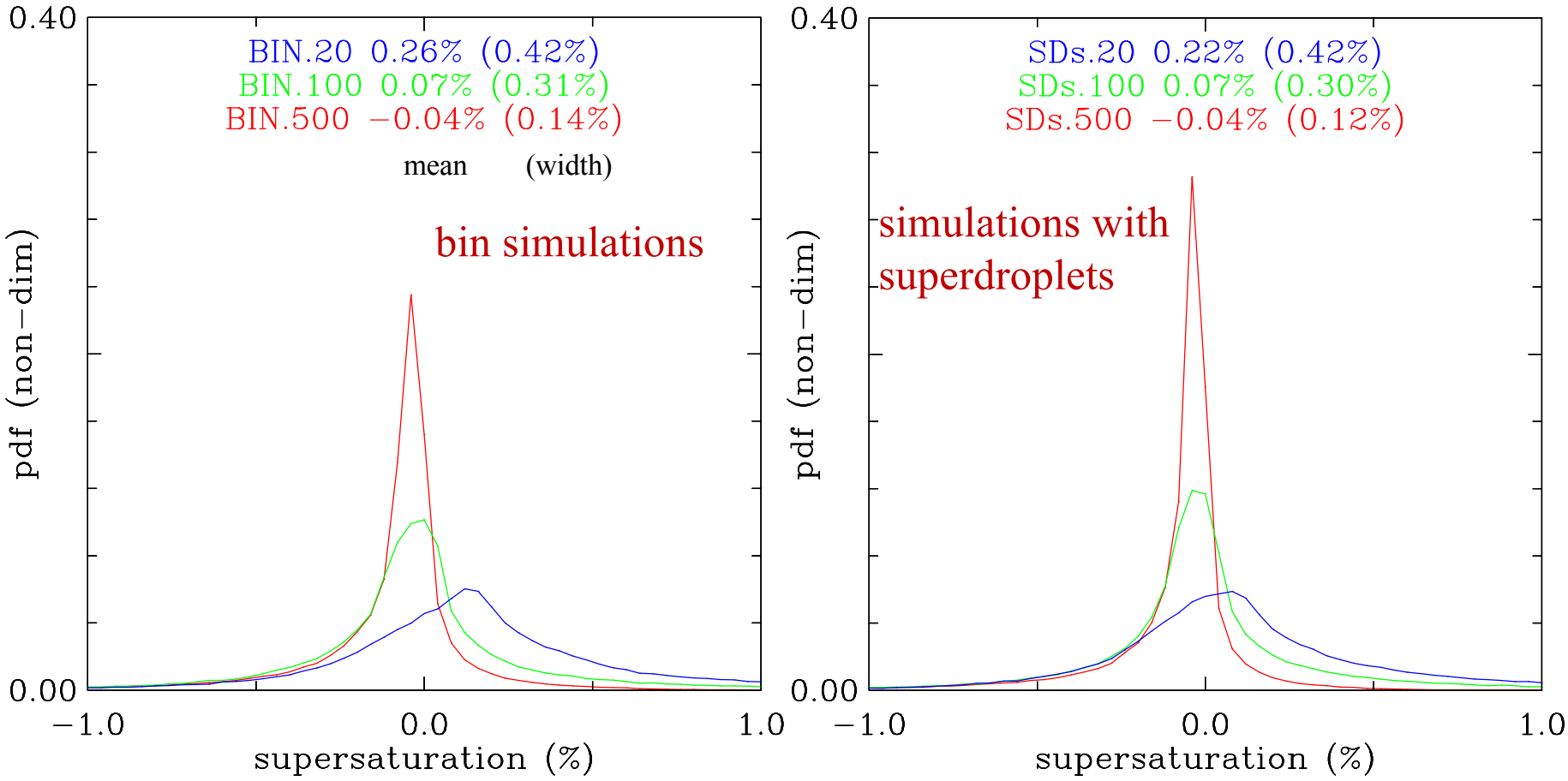
- Bin microphysics with 20, 100, 500 CCN per cc
  BIN.20, BIN.100, BIN.500
  40 bins with 0.5 μm bin width

- Superdroplets with 20, 100, 500 CCN per cc
  SDs.20, SDs.100, SDs.500
  40 super-droplets per grid box

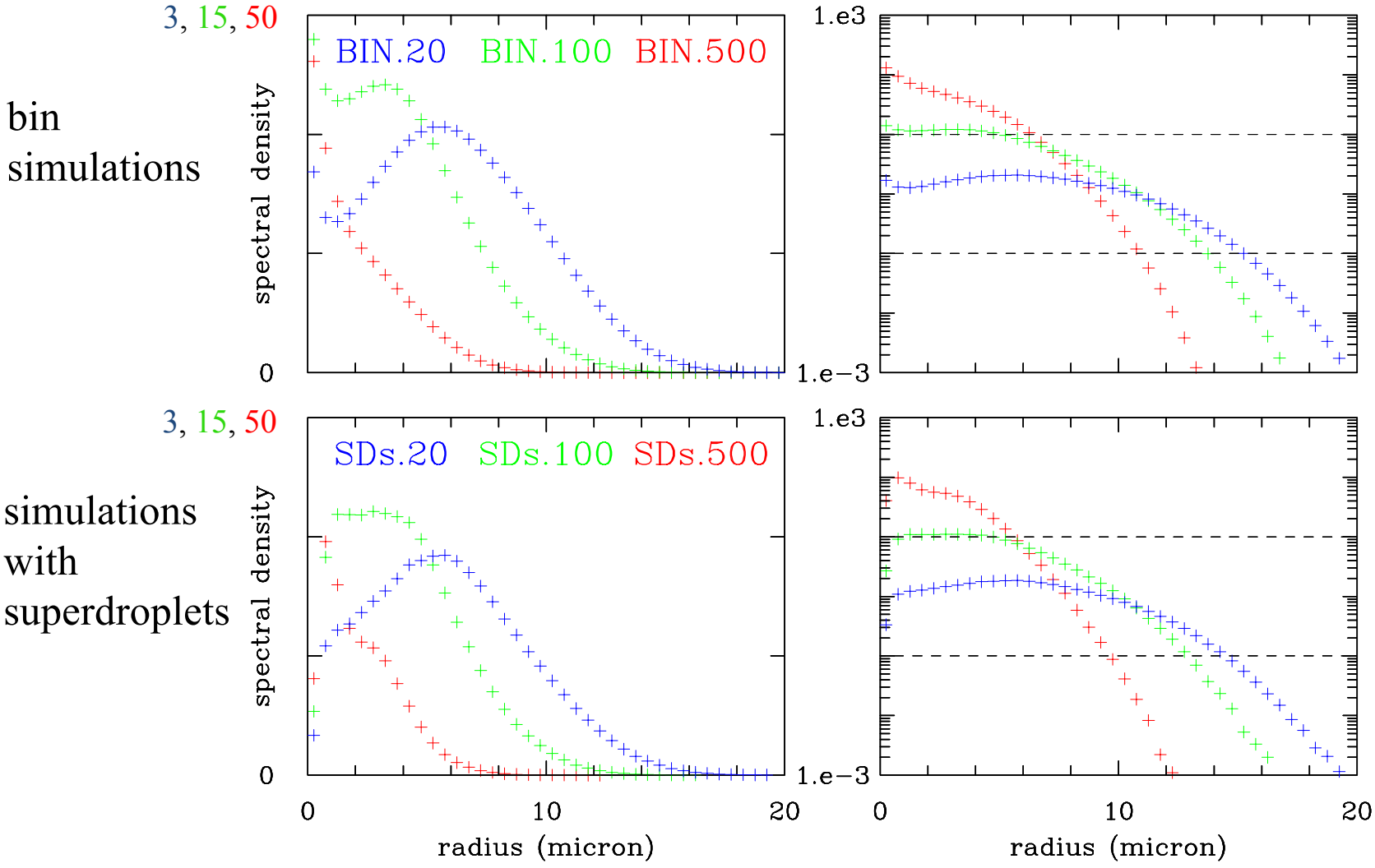
CCN: 50 nm NaCl particles in different concentrations: 20, 100, and 500 per cc

CCN activation supersaturation and radius:
$S_{act} \sim 0.1\%$, $R_{act} \sim 0.7$ μm

Pdfs of the supersaturation inside simulated chamber show a good agreement.



Droplet spectra averaged over the volume away from boundaries show a very good agreement.



linear vertical scale

logarithmic vertical scale