Surface In Situ Microphysical Measurements

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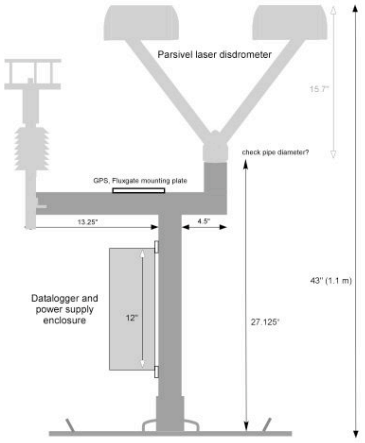
Instrumentation

4 laser disdrometers (fixed)
2 vehicle mounted @ 2 m AGL
2 unmanned deployable @ 1.1 m AGL
size range 0.3-25 mm
sensor area 54 cm^2 (Horiz.)
sample freq. 30-60 s
mean velocity per size bin 0.2-21 m s^{-1}

2 2DP video particle probes (mobile)
mounted on 2 separate vehicles
30 km/hr flow needed across sensor
size range 0.2-6.4 mm
particle data avg over 30-60 s
~ 3 m AGL (Vert.)



Limitations

- 2DP probes
  - small sensor area – need large instrument relative wind speeds for reasonable sample volumes (30 km/hr)
- Laser disdrometers
  - About half the sensor area of video disdrometers
  - Quality affected by wind speed, orientation relative to wind direction, turbulence, splashing from nearby surfaces, 'margin fallers' and vibration
  - Unknown hail exposure survival (larger than golfball)
- Optimal sampling is in conjunction with polarimetric radar coverage:
  - Radar and disdrometer samples are not co-located and have different time-space resolution

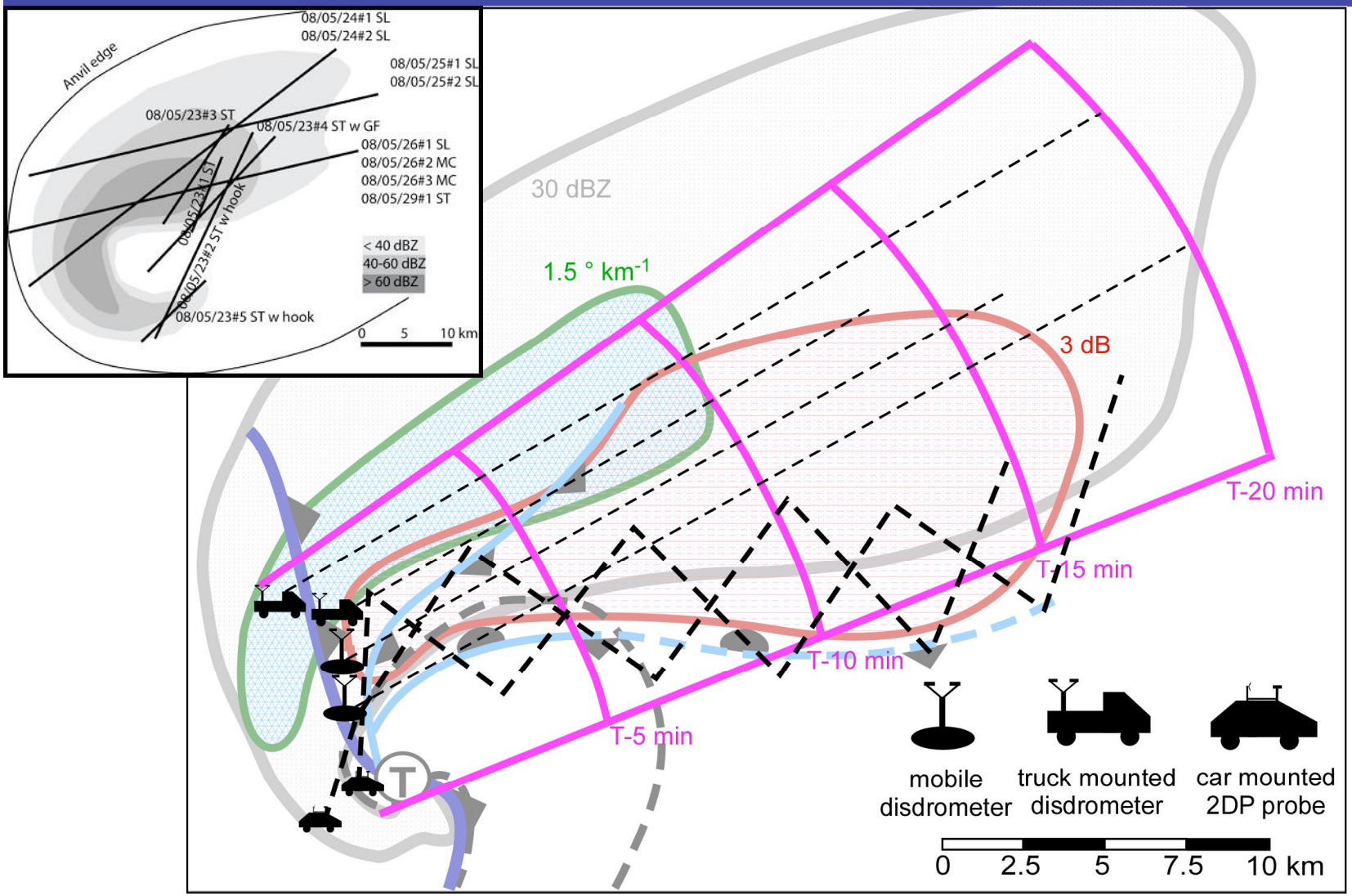
Science Objectives

- Particle size distributions
  - Physical process measurements
    - (e.g. evaporation rate within hook appendage precipitation, drag, centrifuging)
  - Microphysical parameterizations
    - Intra and inter storm DSD shape variability
  - Understanding multi-scale interactions between microphysical and kinematic processes and their relevance for tornadogenesis
- Water content
  - Buoyancy calculations
  - *Radar attenuation, polarimetric measurement ground truth (with caveats)

Deployment strategies

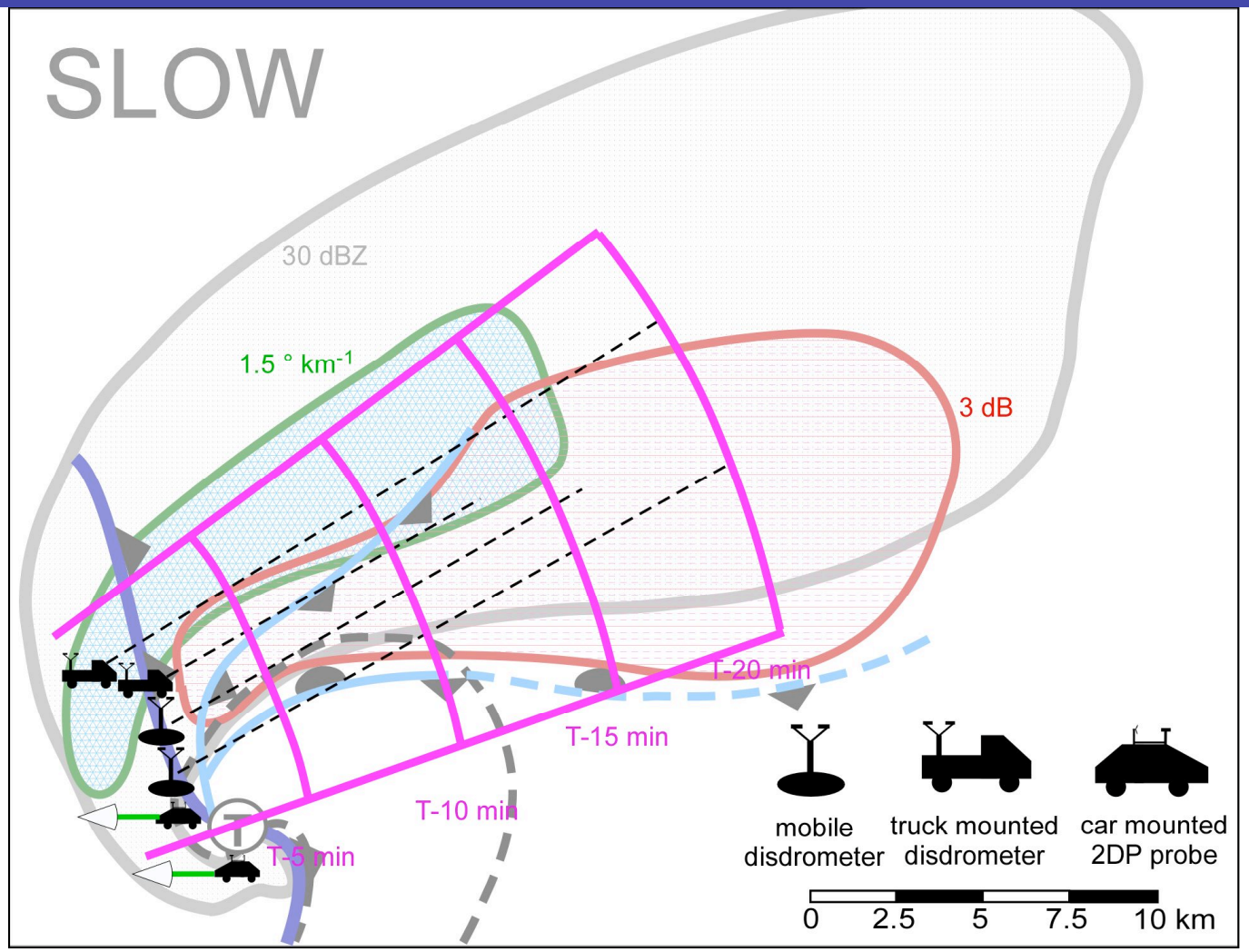
- Coordinated with polarimetric radar measurement windows for more complete microphysical mapping
- Prefer to embed within Sticknet array and mobile mesonets when practical to supplement buoyancy measurements

Fast Moving Storm



Focus ~ centerline to right flank – 2DP exits south along hook axis

Slow Moving Storm



Concentration toward right rear, 2DP probes focus on E-W transects through hook (data collection while westbound)

Information needs

- (1) Status, location and scanning sector of polarimetric radars
- (2) Feedback on locations of significant circulations (radar) and large hail (mobile mesonet, Sticknet deployment crews?)
- (3) Locations of high density Sticknet deployments (embed when practical)