Storm-scale radar sampling strategies during VORTEX2

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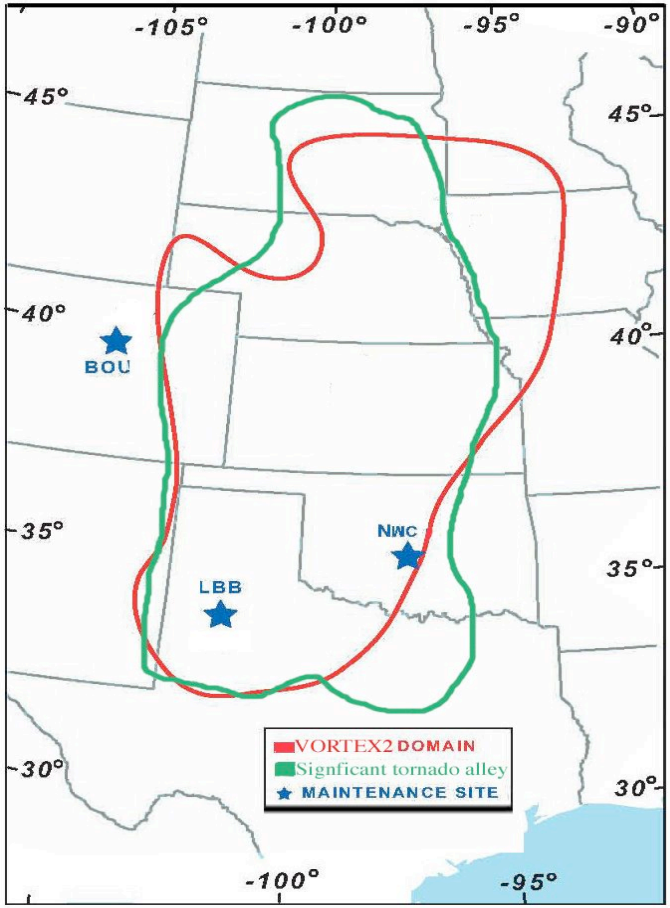
VORTEX2: Verification of the Origin of Rotation in Tornadoes EXperiment



V2 GOALS:

(i)Tornadogenesis:

- role of downdrafts
- sensitivity to microphysics and thermodynamics
- role gust fronts
- modes of significant tornado development.

(ii)Near-ground wind field in tornadoes:

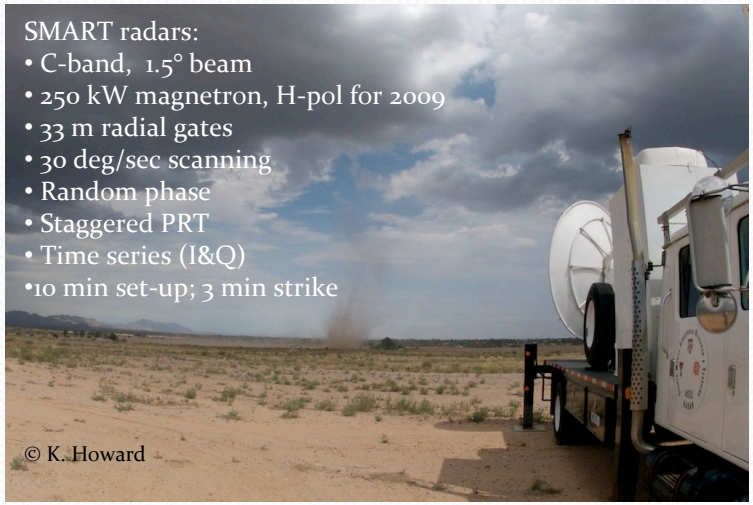
- tornado characteristics,
- angular momentum budgets;
- relationships between damage and wind speed, acceleration, and duration.

(iii)Relationships between tornadic storms and their environments

(iv)Storm-scale data assimilation and numerical weather prediction

VORTEX2: Storm-scale Radar Instrumentation

OU-NSSL Radar Component



C-bands

coordinated with mesocyclone-scale obs

every 3 min, covering 500 m to 15+ km

hybrid (random phase/staggered PRT)

deployed ~20 km from hook

baselines between 30-40 km nominally

CIRPAS more free-ranging

OU- CIRPAS Radar Component

Slow Storm Deployment Strategy

Determine target area based on morning forecast

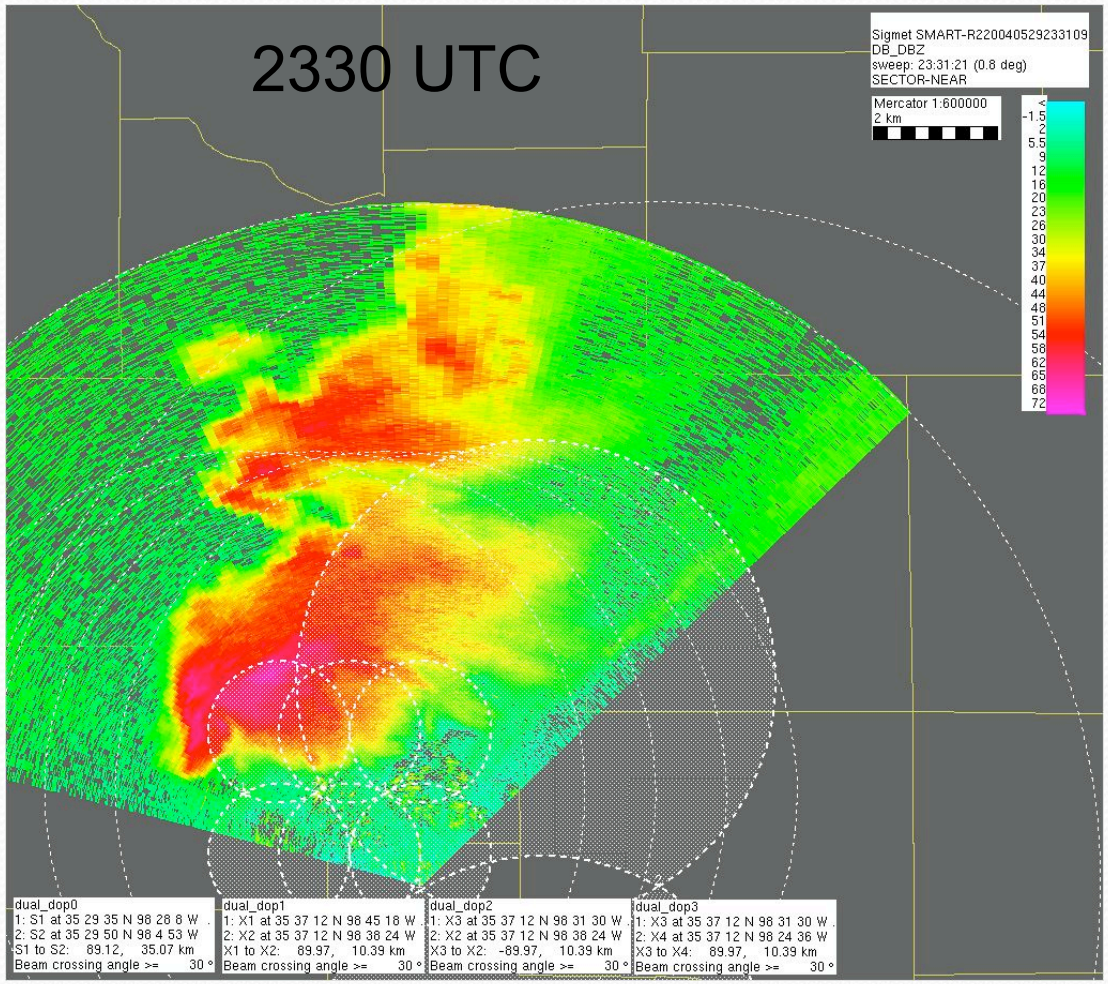
Send scouts (one for each C-band and NXP) to find suitable spots for C-bands/NXP; C-band PIs are in scouts initially; sites will be relayed to VOC and Radar Coordinator

If not working boundary, then ~60-90 minutes before storm reaches area, PIs and Radar Coordinator finalize site selection; send C-bands to selected sites; PIs join radars; students continue scouting

Check with Radar Coordinator/VOC before starting setup; adjust as necessary; collect clutter data for location qc

Start operations; strike to avoid hail if necessary; terminate as storm leaves dual-Doppler lobes; if really slow (< 10m/s) shift radars; otherwise, find new target or terminate ops for the day

Slow Storm Deployment Example

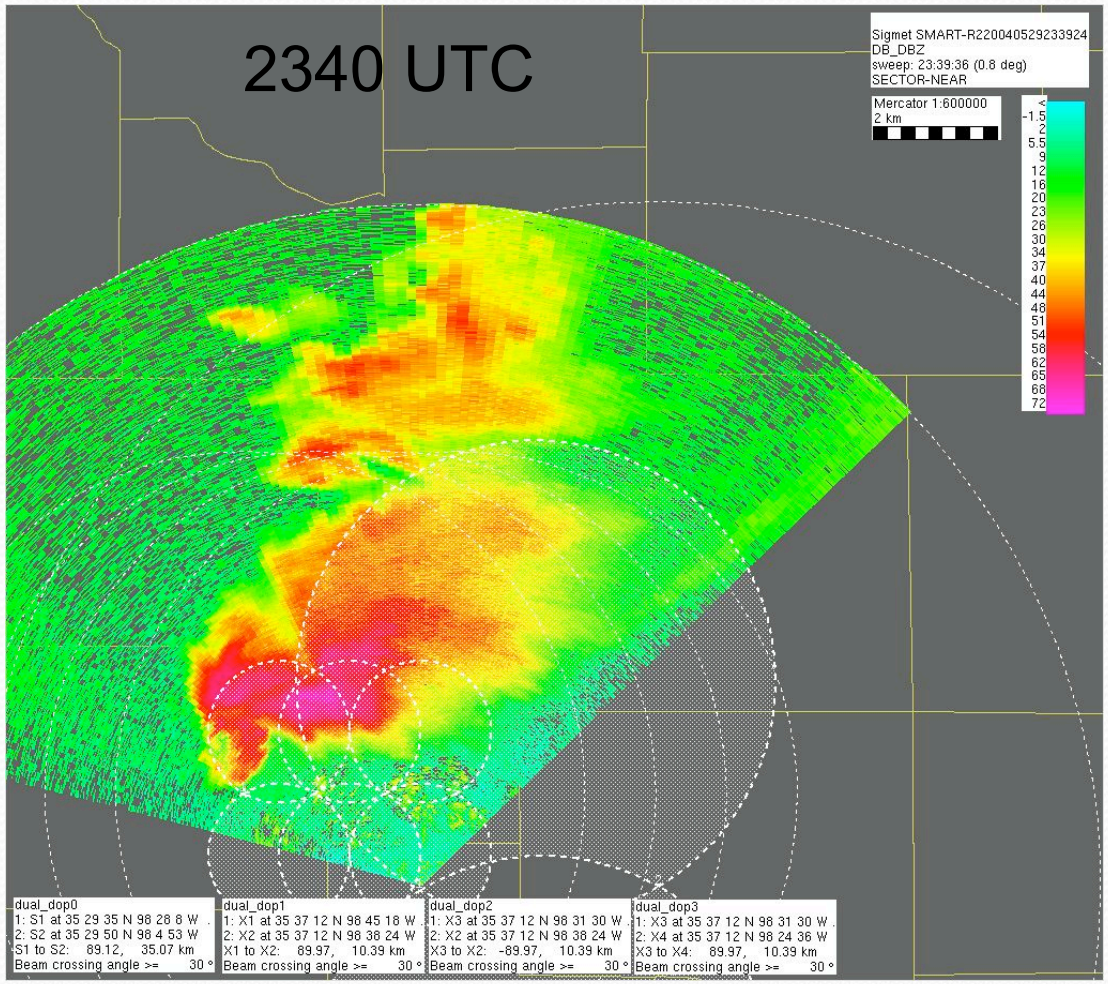


C-bands 35 km apart
X-bands 10 km apart
(D6, D7, UMX, NXP)

W-band, Ka-Band, RapidDoW, and CIRPAS are free-ranging

C-bands collect 120° sector scans with ~18-24 tilts (sector-far, near, here) every 2.5 to 3 min; if no 88D, then work in a surveillance scan

Slow Storm Deployment Example



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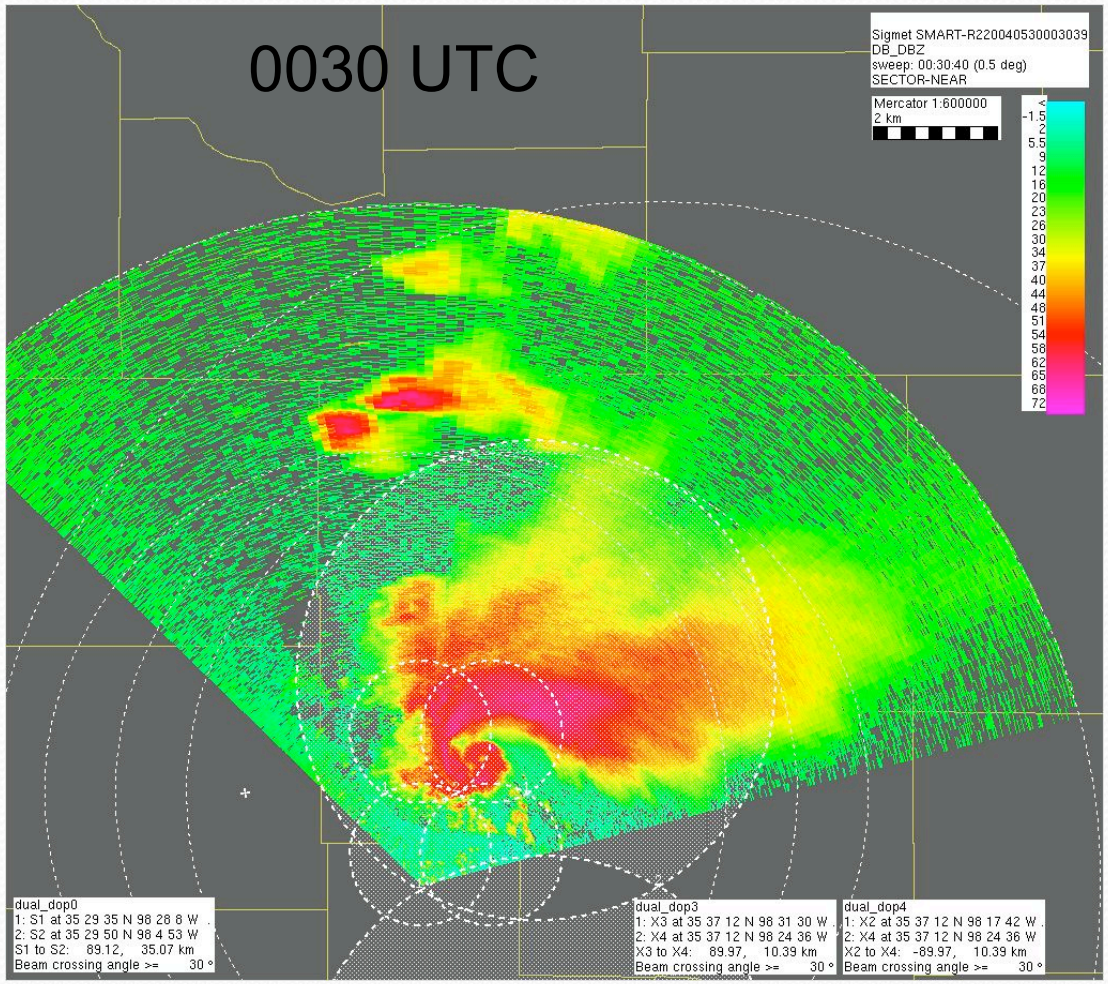


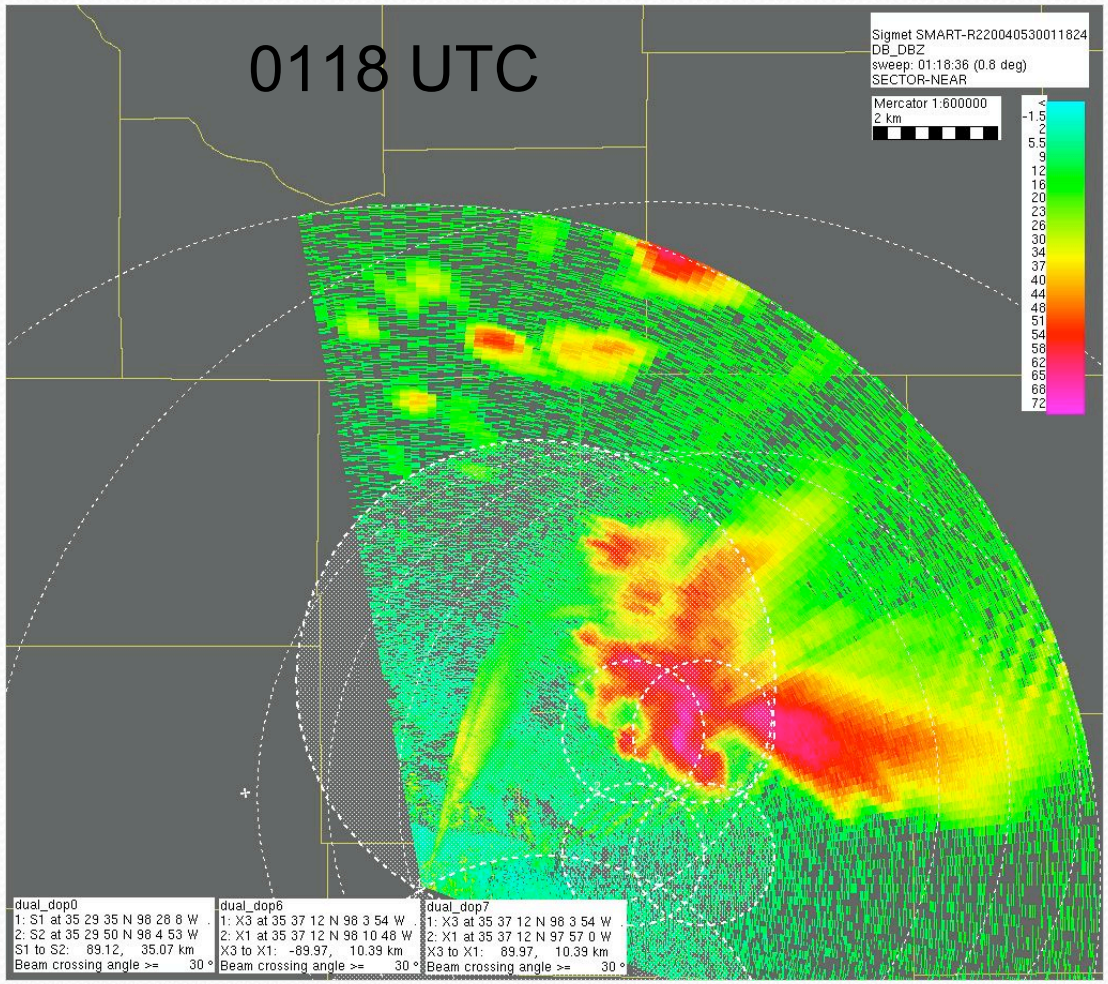
C-bands 35 km apart

At some point, the western X-band moves east and establishes a new lobe to the east

W-band, Ka-Band, RapidDoW, and CIRPAS are free-ranging

C-band continue operations

Slow Storm Deployment Example



Decision point for western C-band; PIs discuss with Radar Coordinator; if storm motion < 10m/s then shift network

Shift minimizes time without storm-scale dual-Doppler; use CIRPAS to maintain continuous storm-scale observations while C-bands move

X-bands continued moving east

Fast Storm Deployment Strategy

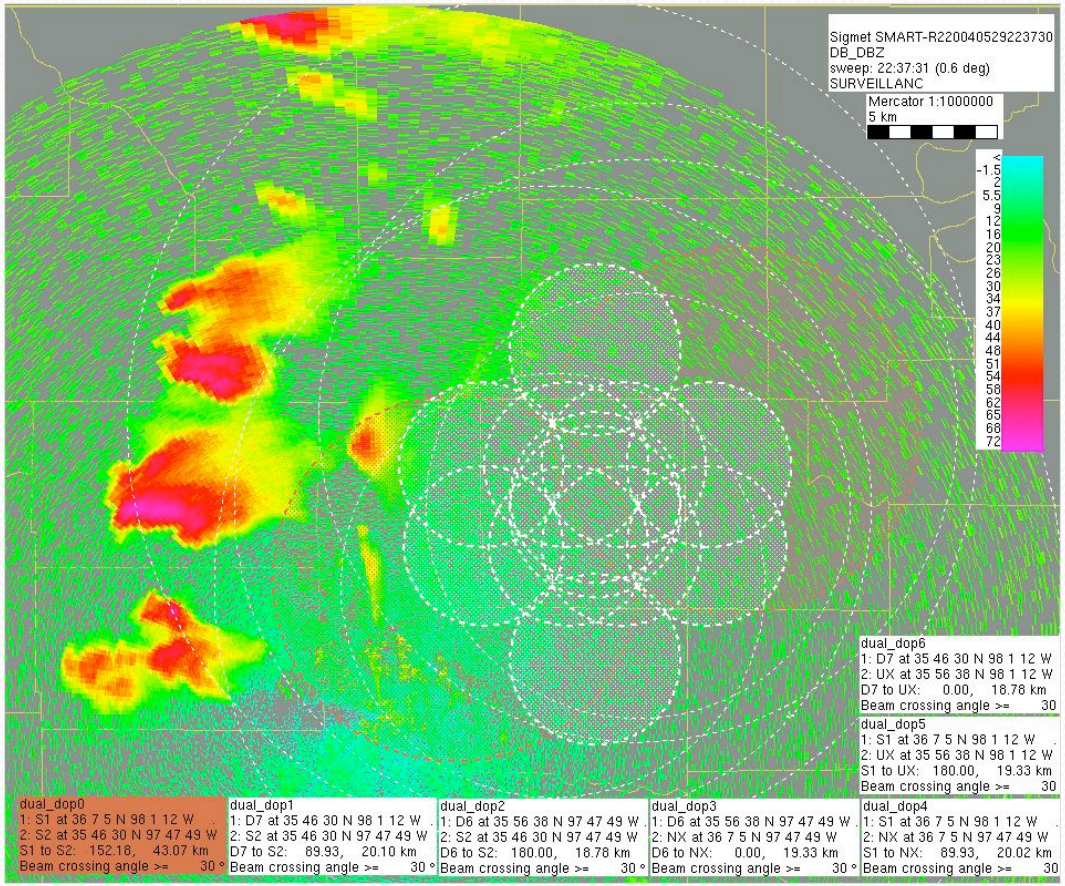
Determine target area based on morning forecast

Send scouts to find suitable spots for C-bands/NXP; set-up a grid with X-bands to mitigate uncertainty in time and location forecast; scouts search for nearby safe havens from hail

Send C-bands to selected sites, conduct surveillance until storm approaches; either conduct default 360° scanning or let Radar Coordinator try to optimize radar pairings [C-bands may take on mesocyclone or tornado scale scanning as appropriate]

Strike to avoid hail if necessary; terminate as storm leaves network; find new target or terminate ops for the day

Fast Storm Deployment Example



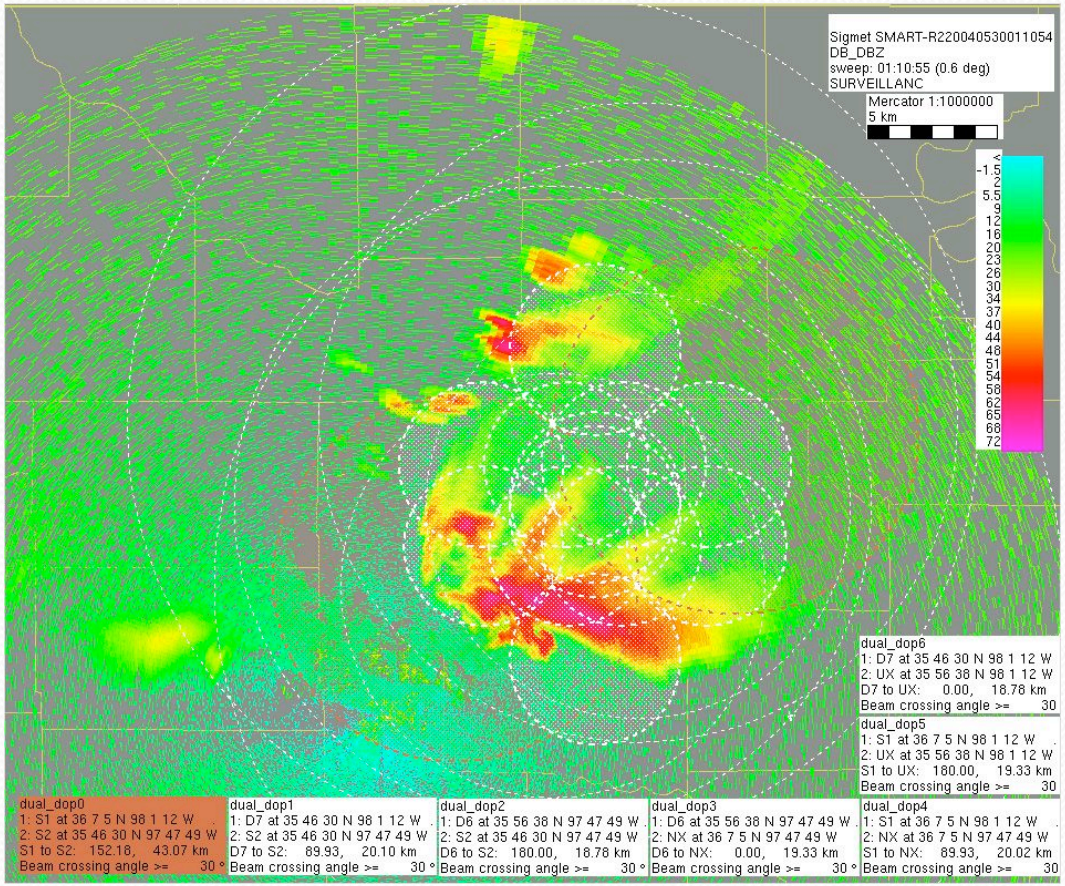
Grid of radars provide ~ 100km X 120 km dual-Doppler area with over-determined sampling

Each radar spaced ~ 20 km apart along two lines, lines also spaced 20 km apart

From N to S, the first line has SR1, UMX, D6; second line has NXP, D7, SR2; C-bands form 43 km baseline

CIRPAS, W-band, Ka-band and RapidDoW are free ranging

Fast Storm Deployment Example



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Additional Comments from "Contributors"?