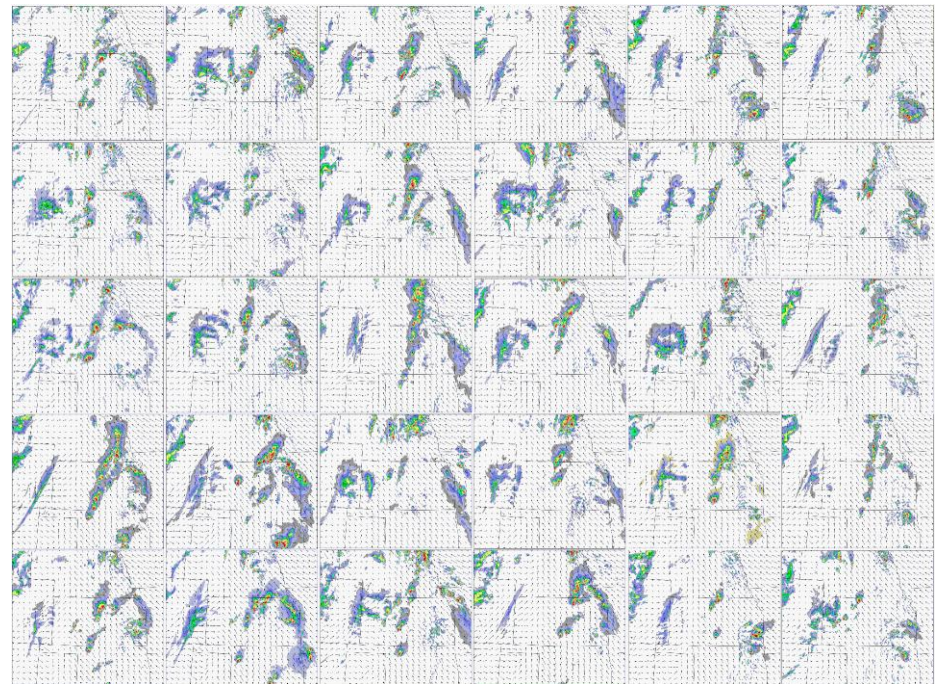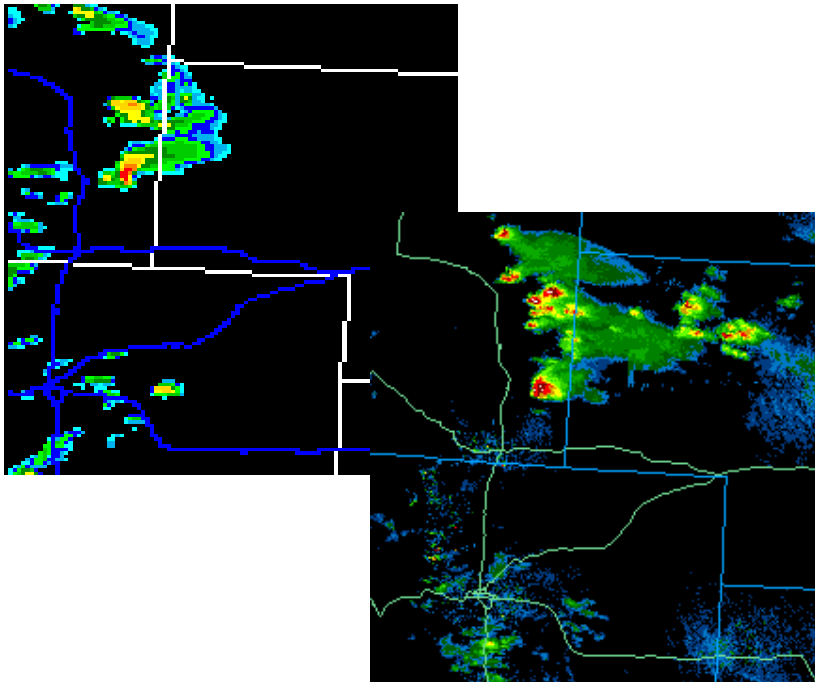# VORTEX2 Research Plans: Retrospective Demonstration of Storm-Scale Data Assimilation and Prediction

Glen Romine and David Dowell
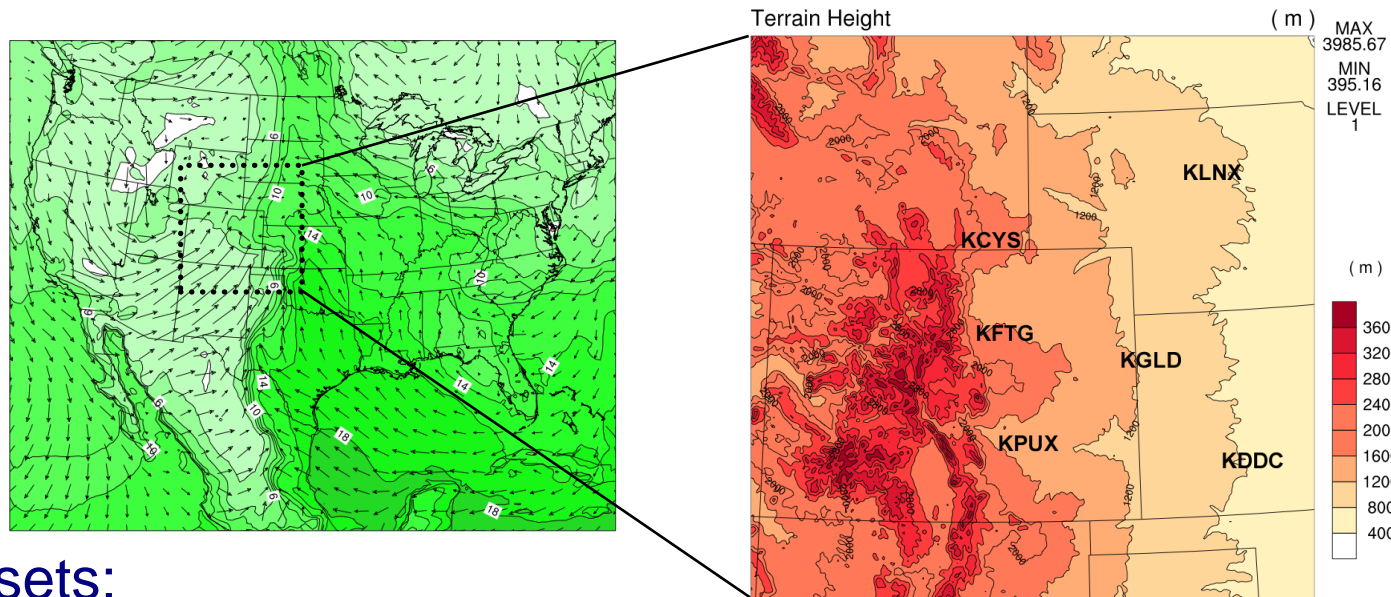VORTEX2 Workshop, 11 Nov 2009

Research Plans and Objectives

## Ensemble-based data assimilation and prediction

- Test drive for Data Assimilation Research Testbed (DART) system
- Mesoscale DA on CONUS domain
- Storm-scale DA on Front Range - High Plains domain
  - Most interesting part of VORTEX2 domain in 2009, particularly 4-17 June
  - Complex terrain a focus of Short Term Explicit Prediction program
- High-resolution (sub-storm-scale) DA eventually
- Probabilistic analyses and forecasts from 50-member ensembles

Terrain Height (m)

MAX 3985.67
MIN 395.16
LEVEL 1

(m)

3600
3200
2800
2400
2000
1600
1200
800
400

KLNX, KCYS, KFTG, KGLD, KPUX, KDDC

Datasets:

- Standard "mesoscale" observations: radiosonde, surface, aircraft, etc.
- WSR-88D velocity and reflectivity: KFTG, KCYS, KPUX, KDDC, KGLD, KLNX

Chugwater and Denver Tornado Alleys in 2009

June 5

June 7

June 9

June 10

June 14

June 15
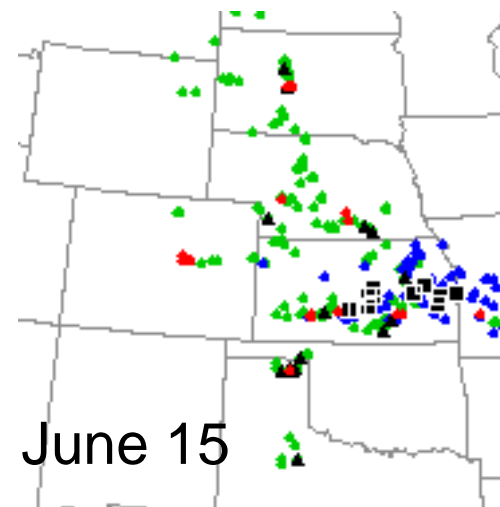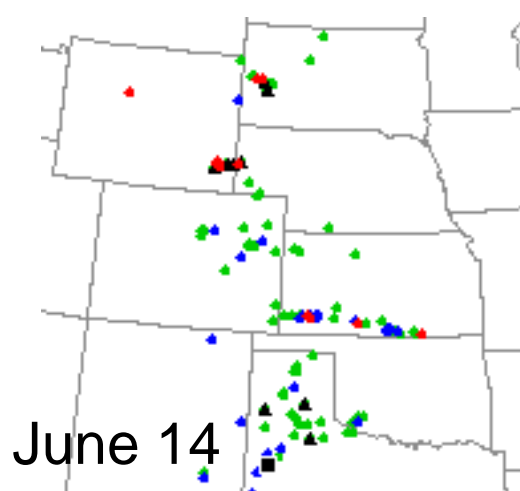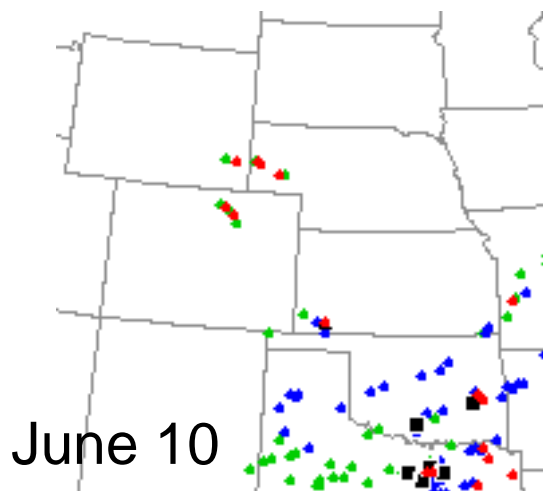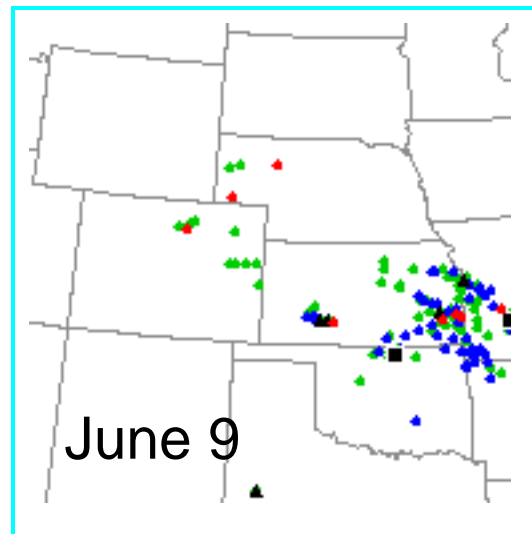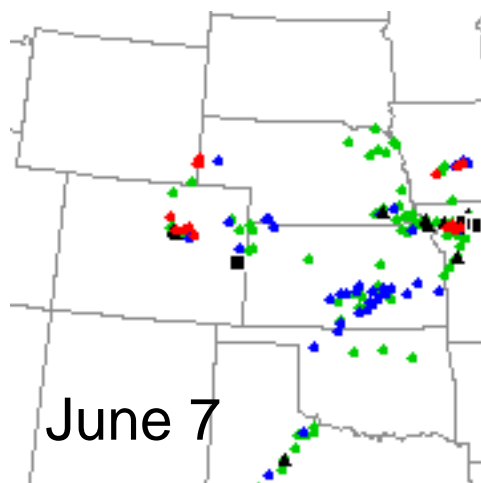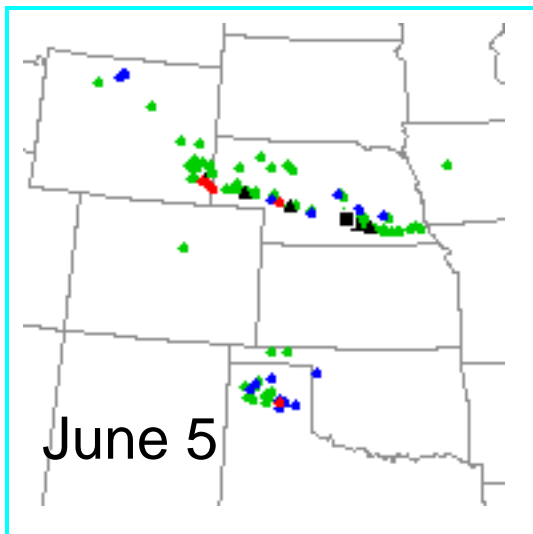
TORNADO REPORTS..
WIND REPORTS/HI......
HAIL REPORTS/LG.....
TOTAL REPORTS.......

NOAA

National Weather Service
Storm Prediction Center   Norman, Oklahoma

■ High Wind Report (65KT +)
▲ Large Hail Report (2" dia. +)

Opportunities for Collaboration

Working group on ensemble-based storm-scale data assimilation and forecasting related to VORTEX2?

Workshop to evaluate storm-scale analyses and predictions

- 4-17 June 2009 high plains results evaluated second half of 2010
- Real-time forecasts (CAPS, HRRR, NSSL, NCAR) baseline for comparison
- Boulder and/or Norman
- Participation by VORTEX2 PIs invited

Mesoscale and storm-scale WRF model analyses

- Other VORTEX2 research projects could potentially benefit from using these analyses for diagnosis and/or initializing simulations.
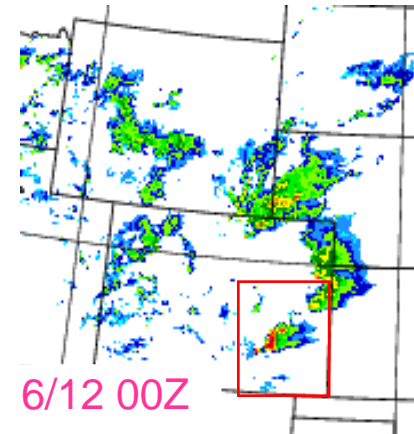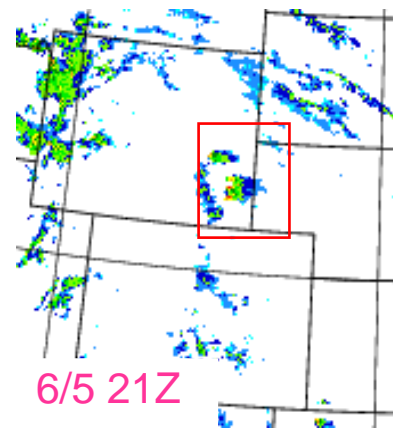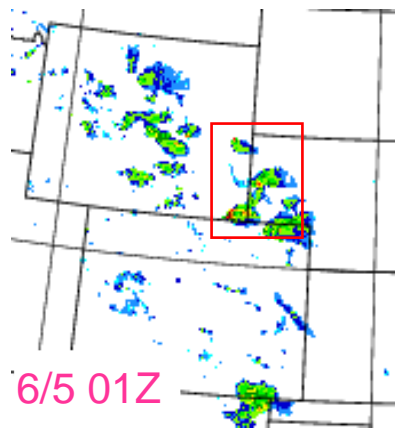
Priority Days:

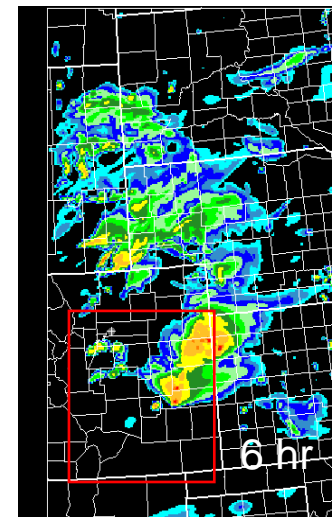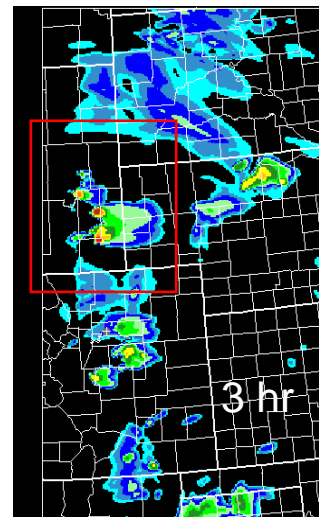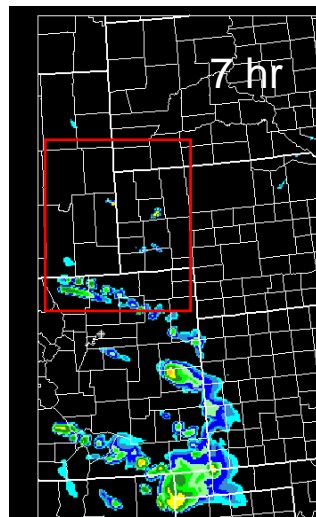Overlapped V2 data collection within focus window for STEP project:

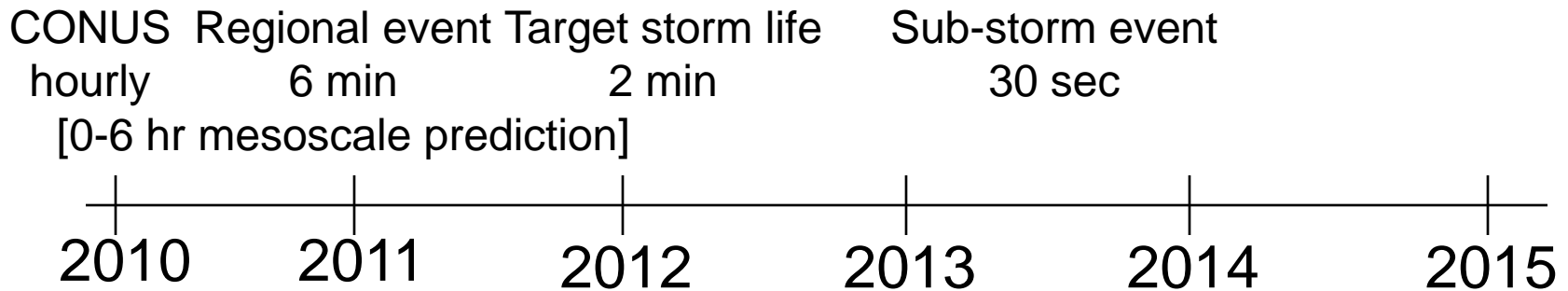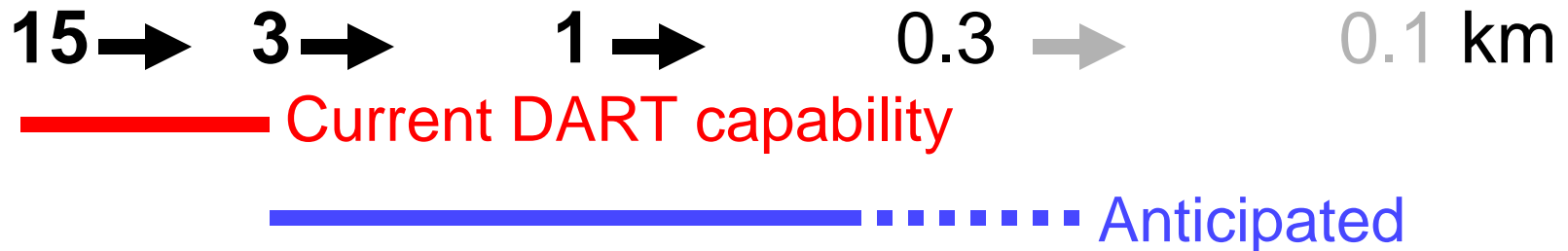**6/4**, **6/5**, 6/6, 6/9, 6/10, **6/11**, 6/13

Bold – best overlap events

Composite Radar

6/5 01Z

6/5 21Z

6/12 00Z

HRRR Sim. Radar

7 hr

3 hr

6 hr

Data Needs: slow progression from CONUS toward sub-storm scale resolution analysis

15 ➡ **3** ➡ **1** ➡ 0.3 ➡ 0.1 km

━━━━━━ Current DART capability

━━━━━━━━━━ ▪▪▪▪▪▪ Anticipated

CONUS   Regional event Target storm life   Sub-storm event
hourly   6 min   2 min   30 sec
  [0-6 hr mesoscale prediction]

|————|————|————|————|————|————|
2010   2011   2012   2013   2014   2015

⭕ Standard obs

⭕ V2 surv. radar, soundings, surface

⭕ Microphysics, rapid scan