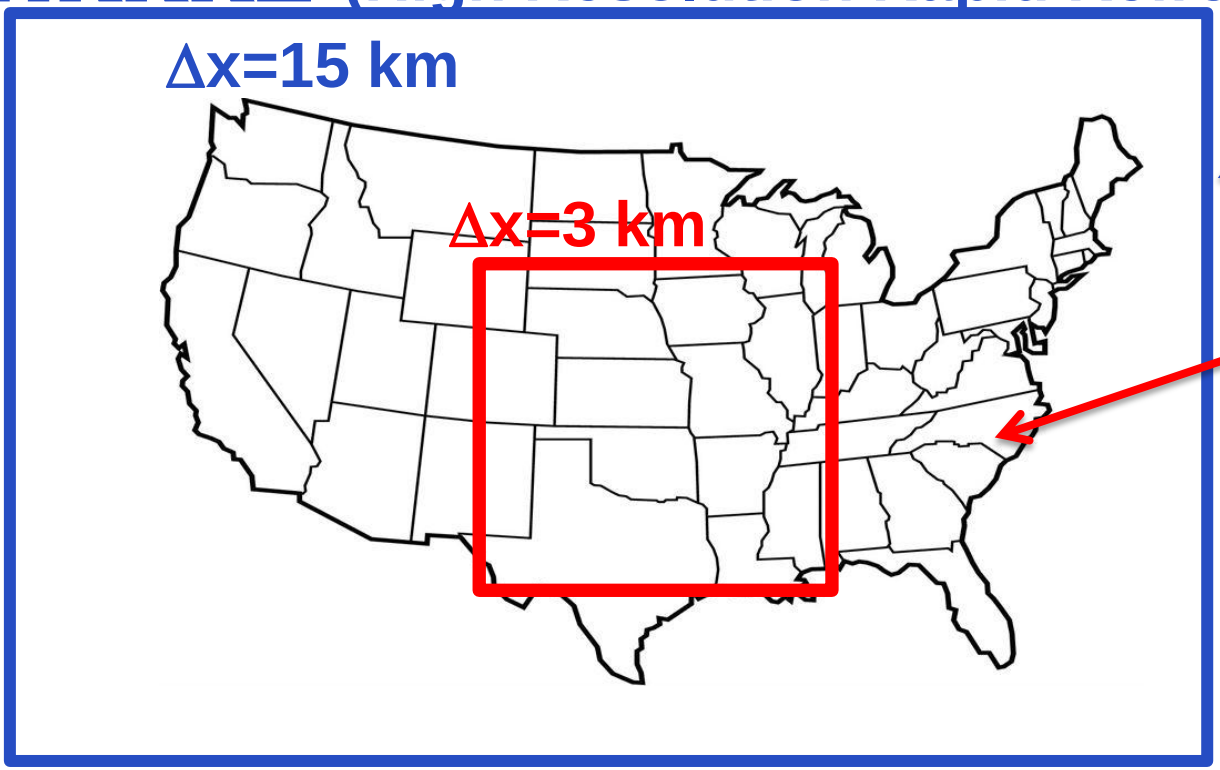
HRRRE (High Resolution Rapid Refresh Ensemble

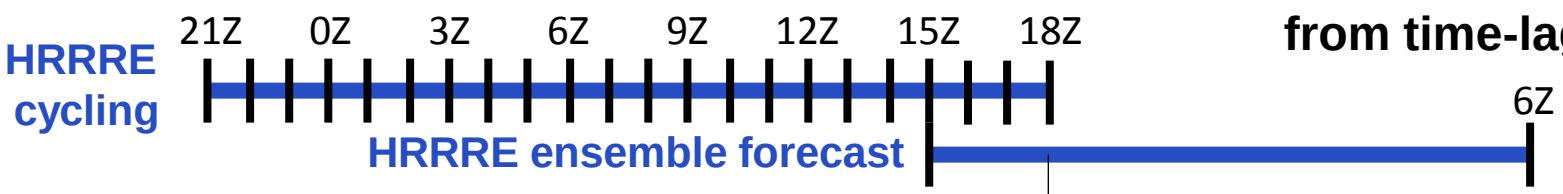


BC from GFS

soil from RAP; initial atmos. mean from GFS or RAP; atmos. perts. from GFS ensemble*

HRRR-Time Lagged Ensemble (HRRR-TLE)

GSD also producing ensemble guidance from time-lagged HRRR forecasts using spatial and temporal filtering



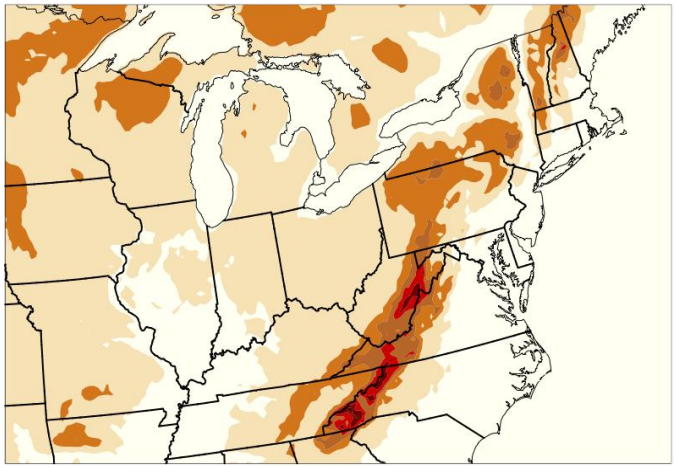
Prototype regional ensemble prediction system

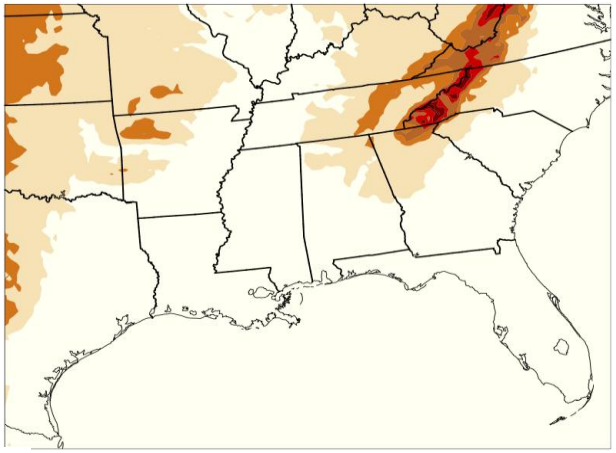
- hourly-updated storm-scale ensemble runs
- Selection of different fixed 3-km domains (1 shown)
- Hourly ensemble assimilation from 21z (20+ members)
- Initiate ensemble forecasts at different times (9 members)

HRRRE configuration

Model Version	WRF-ARW v3.6+
Grid Points	415 325 50 / 650 550 50
Grid Spacing	15 km / 3 km
EnKF Cycling	20-40 mem w/ **GSI-EnKF every 1 h**
Observations	**conventional obs only:** T, q_v, u, v, and p from rawinsonde, aircraft, surface (land and marine), profiler
Radiation LW/SW	RRTMG/RRTMG
Microphysics	Thompson (aerosol aware)
Cumulus Param.	GF + shallow / none
PBL	MYNN
LSM	RUC (Smirnova)

HRRRE 3-km domains





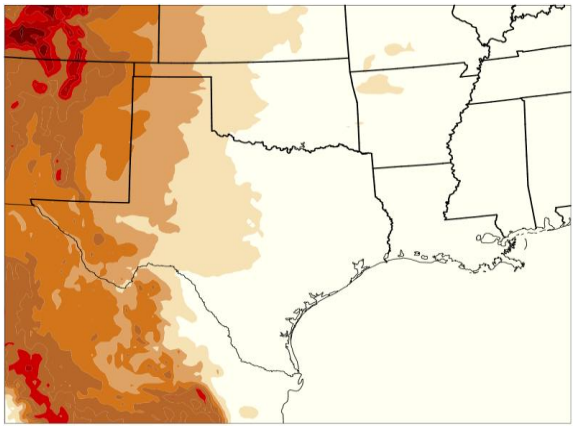
HRRRE Model Fields - Experimental

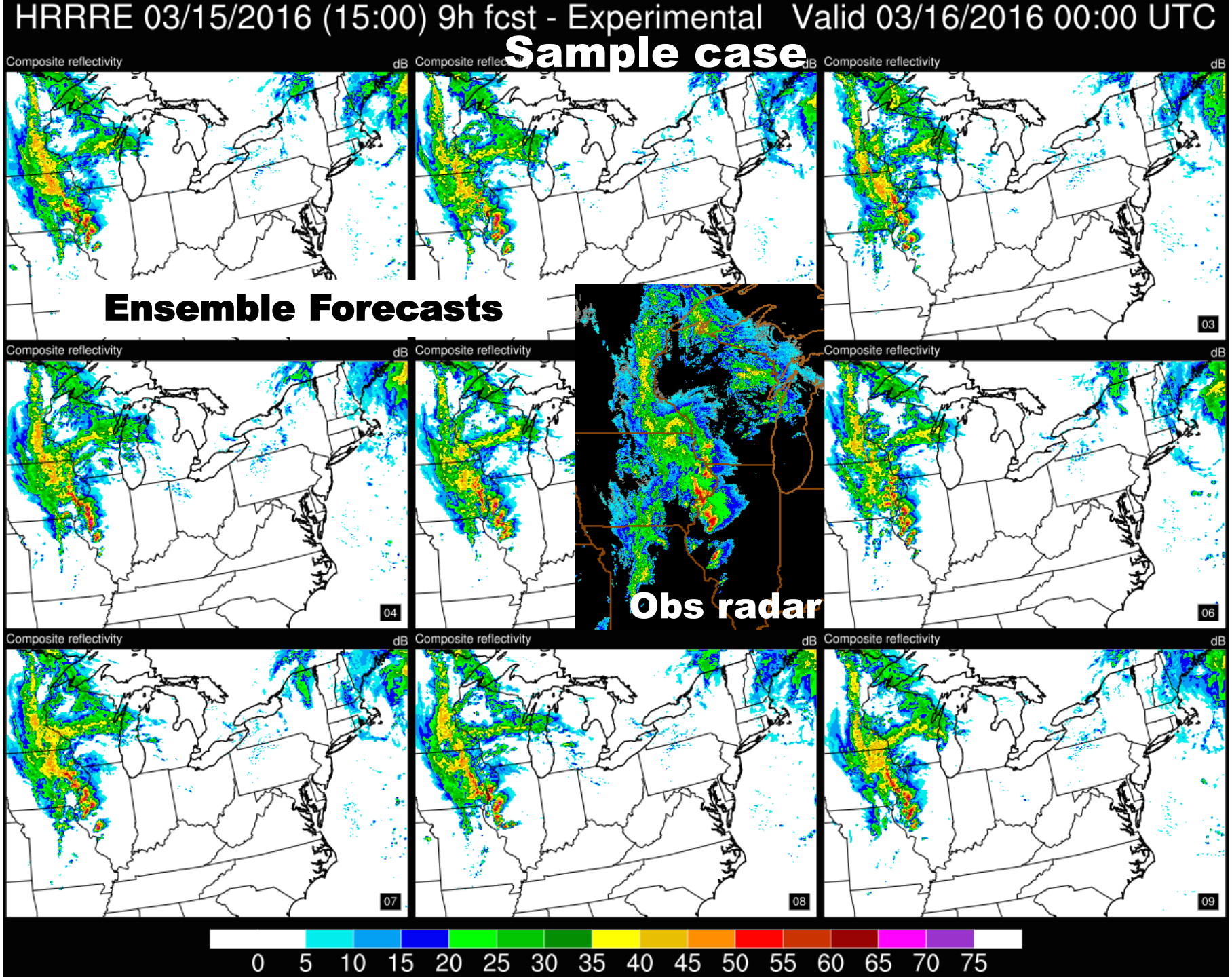
Model: HRRRE (Experimental) Area: Full Date: 01 Apr 2016 - 03Z

Model: HRRRE (Experimental) Domain: Full Date: 01 Apr 2016 - 03Z

Web graphics selection

			Valid Time																													
			Fri 03	Fri 04	Fri 05	Fri 06	Fri 07	Fri 08	Fri 09	Fri 10	Fri 11	Fri 12	Fri 13	Fri 14	Fri 15	Fri 16	Fri 17	Fri 18	Fri 19	Fri 20	Fri 21	Fri 22	Fri 23	Sat 00	Sat 01	Sat 02	Sat 03	Sat 04	Sat 05	Sat 06
	All times	Loop	Forecast																													
			00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
all fields			00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
composite reflectivity	✓	✓	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
composite reflectivity 9-panel	✓	✓	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
updraft helicity	✓	✓		01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			
updraft helicity 9-panel	✓	✓		01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24			




HRRRE 03/15/2016 (15:00) 9h fcst - Experimental Valid 03/16/2016 00:00 UTC
Sample case
Ensemble Forecasts
Obs radar
Composite reflectivity
dB
03
04
06
07
08
09
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

HRRR, HRRRE, HRRR-TLE and RAP Resources

HRRR
http://rapidrefresh.noaa.gov/HRRR/

High-Resolution Rapid Refresh Ensemble (HRRRE)
http://rapidrefresh.noaa.gov/HRRRE/

HRRR Time-Lagged Ensemble (HRRR-TLE)
http://rapidrefresh.noaa.gov/hrrrtle/

Benjamin et al. 2016, A North American Hourly Assimilation and Model Forecast Cycle: The Rapid Refresh. *Monthly Weather Review*, **144**, in press.