

# **NOAA-ESRL/GSD/AMB\* participation in MPEX**

**David Dowell and John Brown**

## **Objectives of AMB participation**

- **Provide opportunity to establish impact of MPEX special obs in the context of near future (~2-5y) operational NWP capabilities, using the coupled RAP-HRRR assimilation / forecasts**
- **(as time permits) Devise and test procedures for effective assimilation of MPEX special obs**

**\*Assimilation and Modeling Branch (AMB) RAP-HRRR team: Stan Benjamin (AMB Chief), Curtis Alexander, John Brown, David Dowell, Patrick Hofmann, Ming Hu, Eric James, Haidao Lin, Joe Olson, Tanya Smirnova, Tracy Smith, Ed Szoke, Xue Wei, Steve Weygandt**

# Proposed Participation in MPEX

**Real-time field quality control for dropsonde data**

**volunteers: David Dowell and John Brown**

**Parallel RAP and HRRR analyses and forecasts with dropsonde DA**

**identical to real-time ESRL-RAP and HRRR except with**

**addition of dropsonde data-assimilation in RAP**

**images on MPEX field catalog (and NOAA RAP-HRRR web page)**

**gridded model output in MPEX data archive**

**Post-field-phase analysis**

**assessment of influences of dropsonde data on HRRR forecasts**

**assistance for PI's who use RAP / HRRR output**

# **Existing RAP-HRRR coupled cycling setup at GSD**



# RUC to Rapid Refresh transition

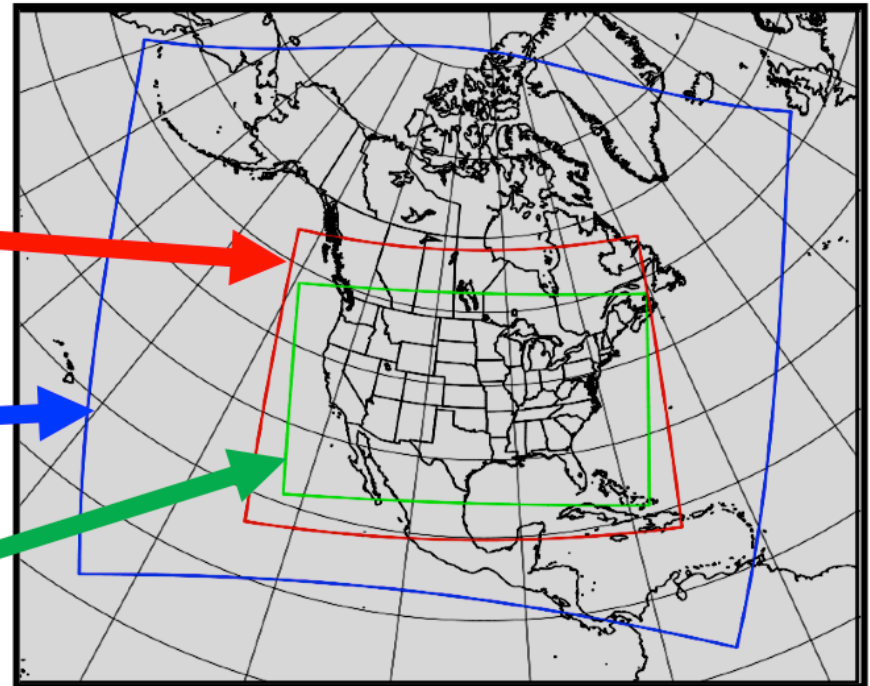
- CONUS domain →
- RUC Model →
- RUC 3dvar →
- RUC post →
- North American domain
- WRF-ARW Model
- GSI – Gridpoint Statistical Interpolation
- Unipost

Hourly updated models

13km RUC

13km Rapid Refresh

3km HRRR



# **RUC** → **RAP** / **HRRR** configuration

## Community-based advanced model and analysis

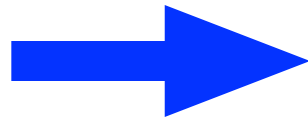
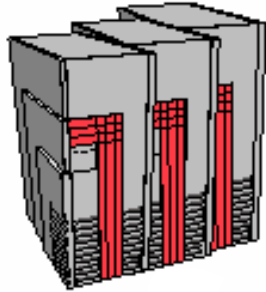
- **WRF-ARW**: advanced numerics, non-hydrostatic
- **GSI**: advanced satellite data assimilation

Model	Run at:	Domain	Grid Points	Grid Spacing	Vertical Levels	Pressure Top	Boundary Conditions	Initialized
<b>RUC</b>	<b>GSD</b>	<b>CONUS</b>	451 x 337	13-km	50	Sigma/ Isentropic	NAM	Hourly (cycle)
<b>RAP</b>	<b>NCO GSD</b>	North America	758 x 567	13 km	50	10 mb	GFS	Hourly (Part. cycle)
<b>HRRR</b>	<b>GSD</b>	<b>CONUS</b>	1799 x 1059	3 km	50	20 mb	RAP	Hourly - RAP (no-cycle)

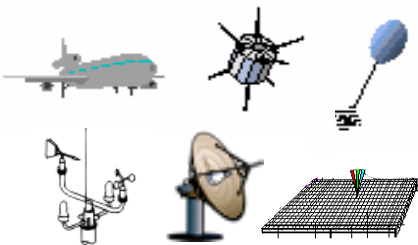
Model	Assimilation	Cloud Analysis	Radar DFI	Radiation	Microphysics	Cum Param	PBL	LSM
<b>RUC</b>	<b>RUC-3DVAR</b>	Yes	Yes	RRTM / Dudhia	Thompson (2003)	Grell-Devenyi	Burk – Thompson	RUC 2003
<b>RAP</b>	<b>GSI-3DVAR</b>	Yes	Yes	RRTM/ Goddard	Thompson	G3 + Shallow	MYJ	RUC 2010
<b>HRRR</b>	None: RAP I.C	No	No	RRTM/ Dudhia	Thompson	None	MYJ	RUC 2010

# RAP: Data assimilation engine for HRRR

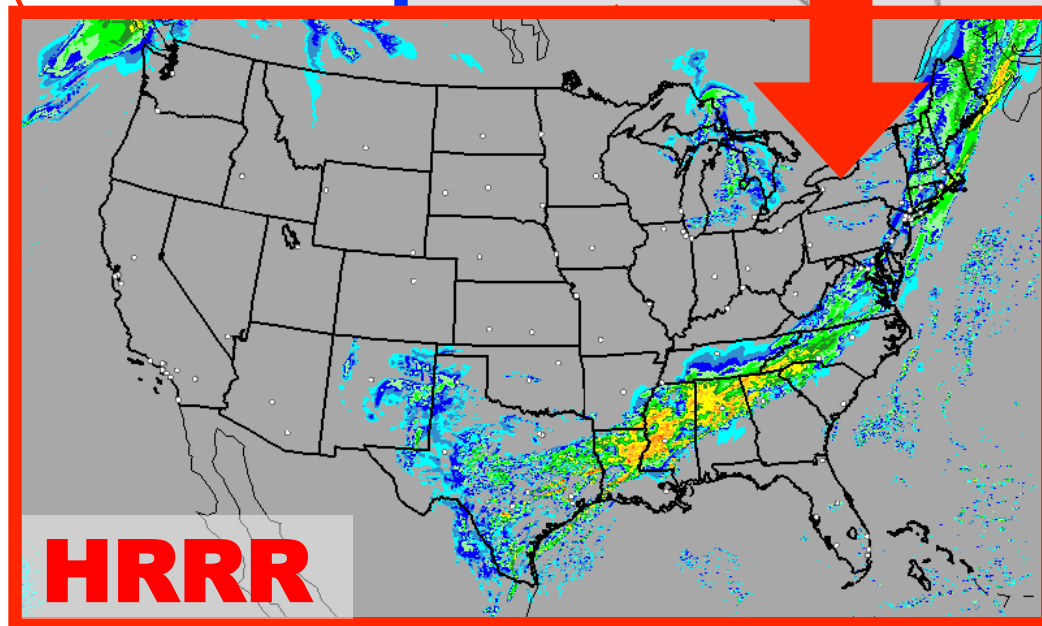
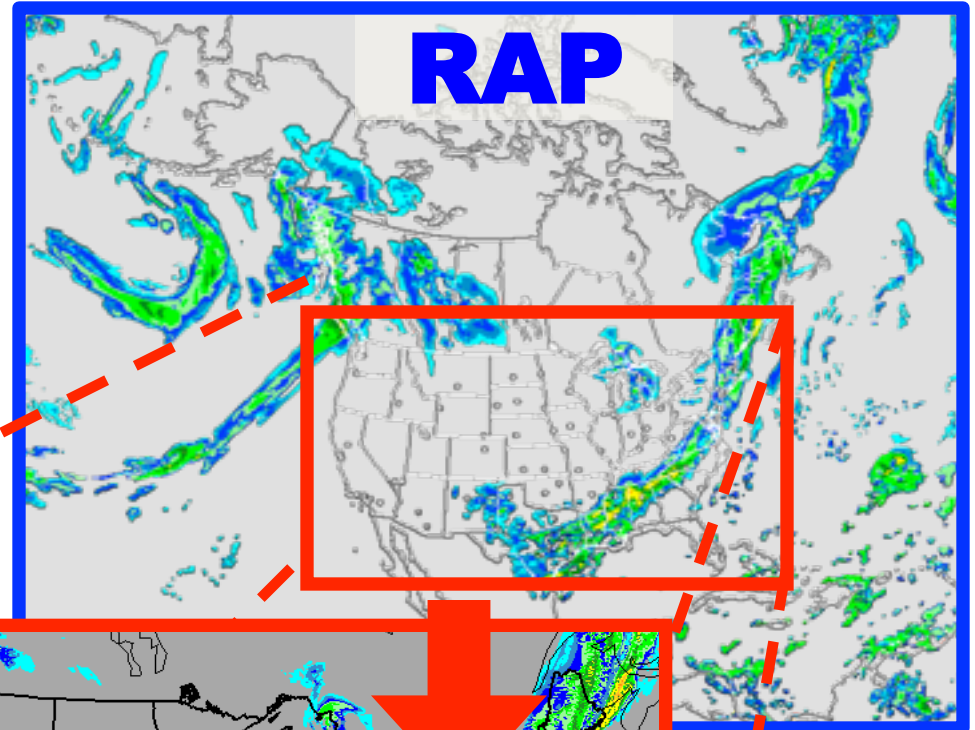
*Hourly cycling model*



Data  
Assimilation  
cycle



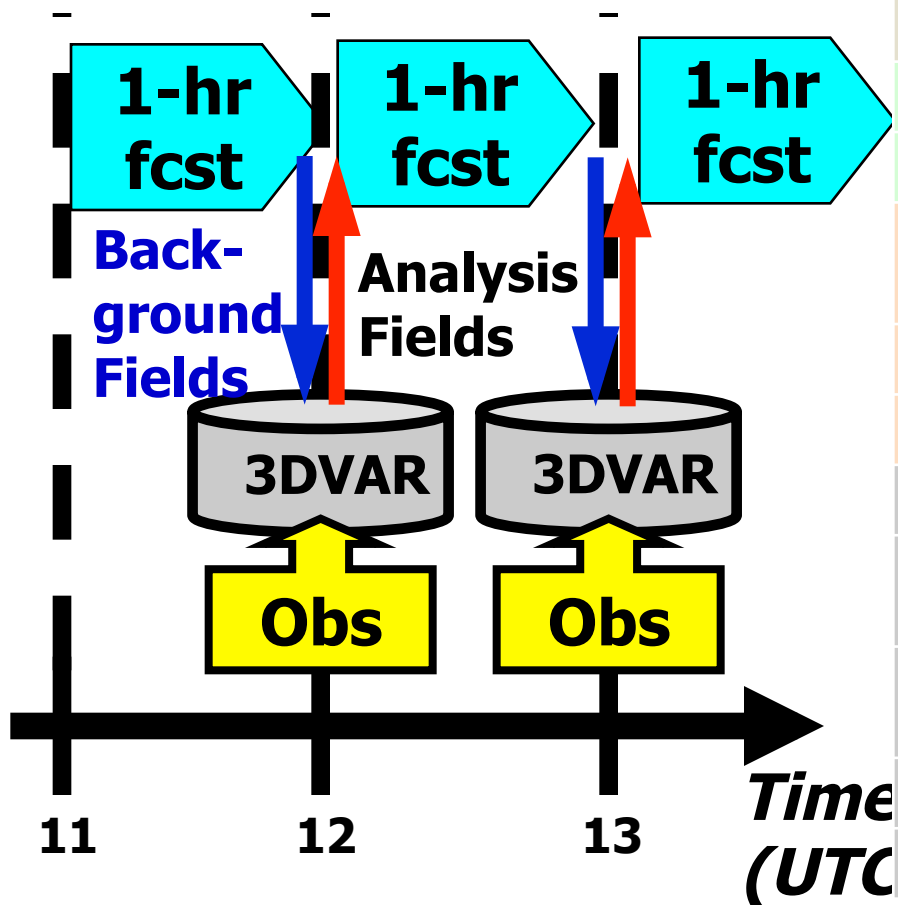
Observations



# Rapid Refresh Hourly Update Cycle

Partial cycle atmospheric fields –  
introduce GFS information 2x/day

Fully cycle all land-sfc fields



Hourly Observations	RAP 2012 N. Amer
Rawinsonde (T,V,RH)	120
Profiler – NOAA Network (V)	21
Profiler – 915 MHz (V, Tv)	25
Radar – VAD (V)	125
Radar reflectivity - CONUS	2km
Lightning (proxy reflectivity)	NLDN, GLD360
Aircraft (V,T)	2-15K
Aircraft - WVSS (RH)	0-800
Surface/METAR (T,Td,V,ps,cloud, vis, wx)	2200- 2500
Buoys/ships (V, ps)	200-400
Mesonet (T, Td, V, ps)	flagged
GOES AMVs (V)	2000- 4000
AMSU/HIRS/MHS radiances	Used
GOES cloud-top pressure/temp	13km
GPS – Precipitable water	
WindSat scatterometer	2-10K

# **Planned Summer 2013 RAP – HRRR Redundant Configuration**

**Greater reliability of HRRR for FAA,  
renewable-energy users**

**To run on NOAA linux clusters  
Jet and Zeus**



# Preparation For MPEX

Testing dropsonde data assimilation in Rapid Refresh (internal task)  
OSSE's with synthetic dropsonde data; early 2013

Testing dropsonde data feed (help needed)

aircraft



GTS (Global Telecommunications System)



GSI (Gridpoint Statistical Interpolation)

how and when to test?

Preparing archive for RAP and HRRR output (help needed)  
output from both standard and parallel model versions  
images and gridded data

Training for real-time field dropsonde-data qc with aspen (help needed)  
at NCAR, during month before field phase?  
improved qc by David and John if they are provided good coffee

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