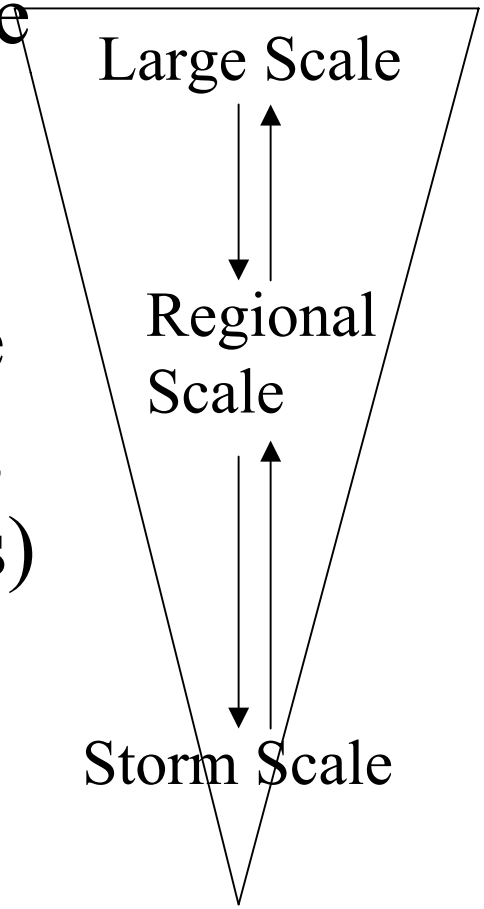
CAPS Mission Statement

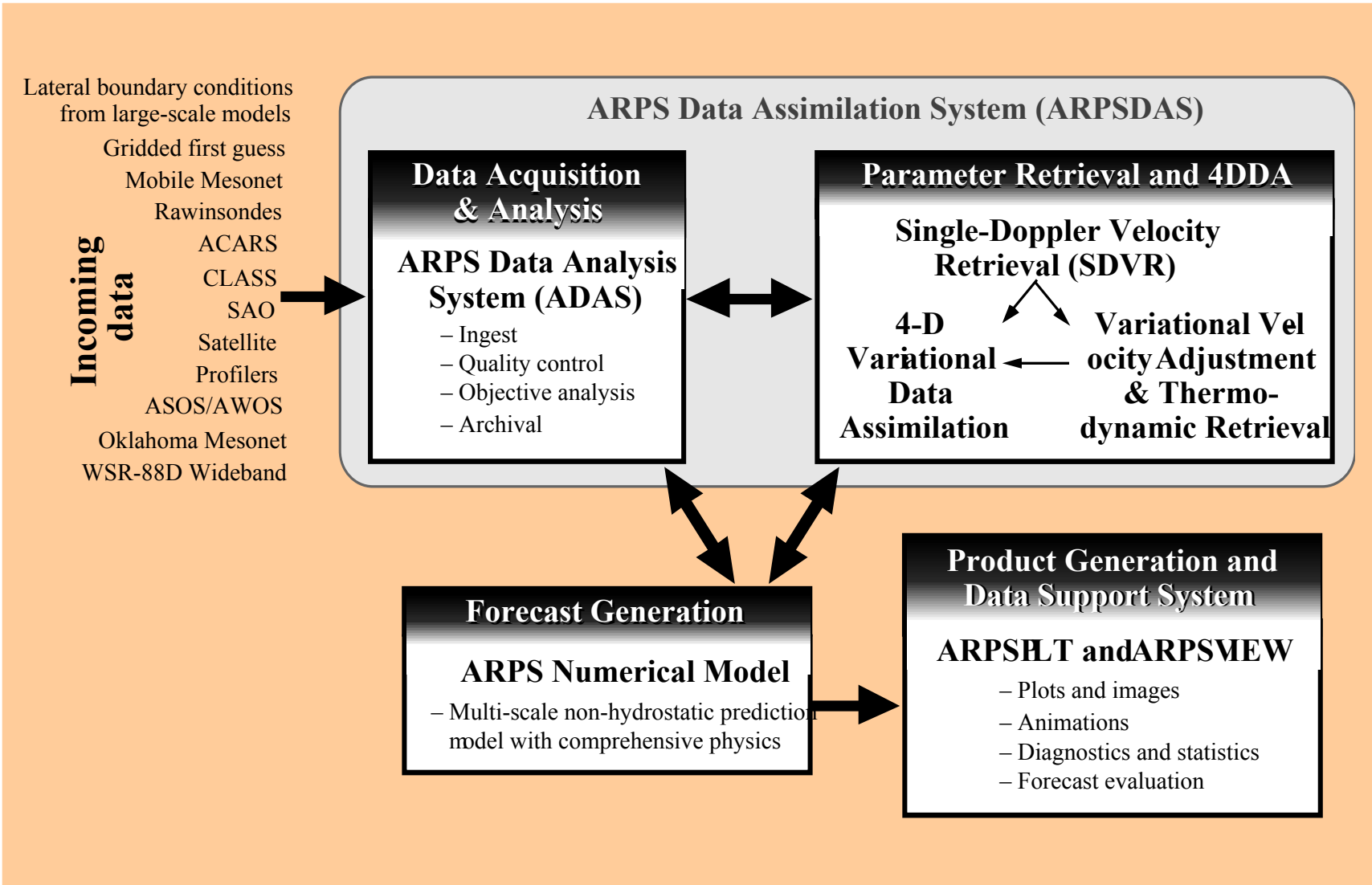
- The Center for Analysis and Prediction of Storms (CAPS) was established at the University of Oklahoma in 1989 as one of the first 11 National Science Foundation Science and Technology Center. Its mission was, and remains the development of techniques for the computer-based prediction of high-impact local weather, such as individual spring and winter storms, with the NEXRAD (WSR-88D) Doppler radar serving as a key data source.

Forecast Funnel

- Large Scale - provide synoptic flow patterns and boundary conditions to the regional scale flow.
- Regional Forecast - provide improved resolution for predicting regional scale events (large thunderstorm complexes, squall lines, heavy precipitation events)
- Storm Scale - predict individual thunderstorm and groups of thunderstorms as well as initiation of convection.



ARPS System


Lateral boundary conditions from large-scale models
Gridded first guess
Mobile Mesonet
Rawinsondes
ACARS
CLASS
SAO
Satellite
Profilers
ASOS/AWOS
Oklahoma Mesonet
WSR-88D Wideband
Incoming data
ARPS Data Assimilation System (ARPSDAS)
Data Acquisition & Analysis
ARPS Data Analysis System (ADAS)
– Ingest
– Quality control
– Objective analysis
– Archival
Parameter Retrieval and 4DDA
Single-Doppler Velocity Retrieval (SDVR)
4-D Variational Data Assimilation
Variational Velocity Adjustment & Thermo-dynamic Retrieval
Forecast Generation
ARPS Numerical Model
– Multi-scale non-hydrostatic prediction model with comprehensive physics
Product Generation and Data Support System
ARPSPLT and ARPSVIEW
– Plots and images
– Animations
– Diagnostics and statistics
– Forecast evaluation

Current ARPS Forecast Configuration

- ARPS is applied every day at 48, 32, 20 km at horizontal resolutions for research purposes (verification and testing new algorithms) see: http://www.caps.ou.edu/wx

CAPS/wx

Home
Main Menu

Forecasts: SREF
Analyses: SREF

Current Weather
SPlains · OKmeso · TLX · FDR

Verification Archive

Archive
View all products for today

Select Forecast:

SREF: 12 Sep 7 am (12Z) +2h
11 Sep 7 pm (12th/00Z) +36h · 11 Sep 7 am (12Z) +0h

Daily Forecast Archive · Thu 12 Sep 2002

Previous Day (wx) · Next Day (wx)
ARPS Forecasts · Weather Products

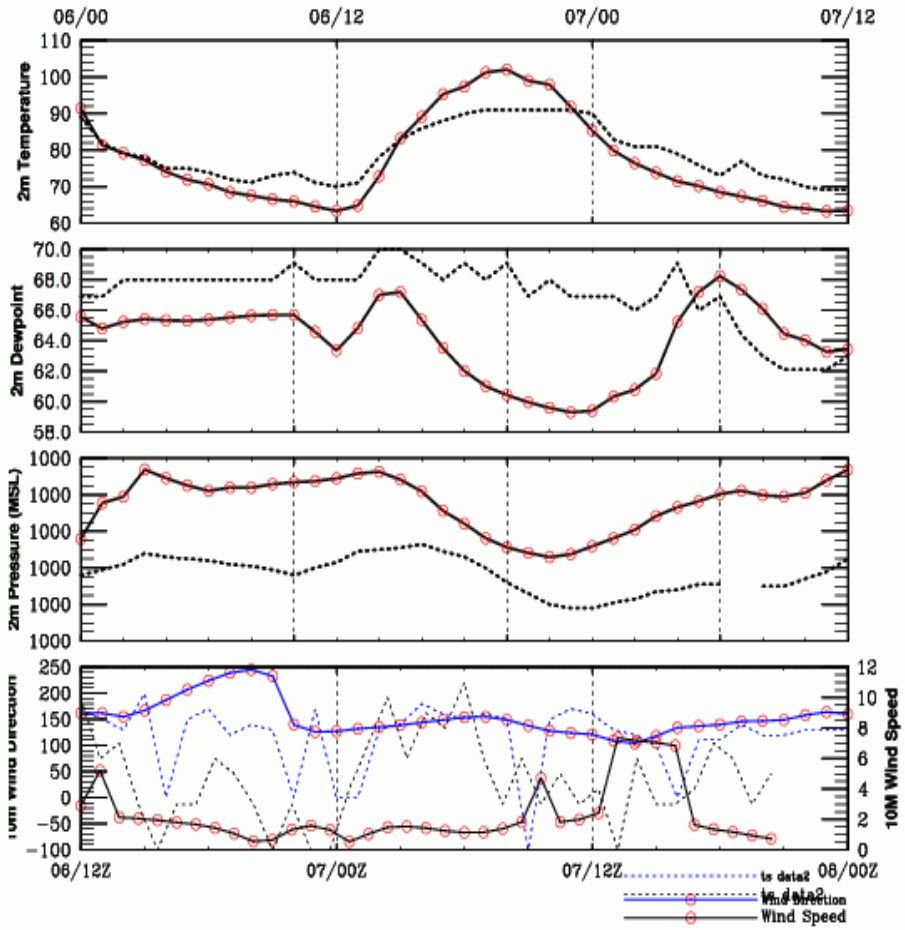
ARPS Forecasts & Analyses for Thu 12 Sep 2002																								
	00Z	01Z	02Z	03Z	04Z	05Z	06Z	07Z	08Z	09Z	10Z	11Z	12Z	13Z	14Z	15Z	16Z	17Z	18Z	19Z	20Z	21Z	22Z	23Z	13/00Z
SREF Anl	Anl	Anl	Anl	Anl	Anl	Anl	Anl	Anl	Anl	Anl	Anl	Anl	Anl	Anl	Anl	Anl	Anl	Anl	Anl						
SREF Fcst init 12Z/09	+60																								
SREF Fcst init 00Z/10	+48	+49	+50	+51	+52	+53	+54	+55	+56	+57															
SREF Fcst init 00Z/11	+24	+25	+26	+27	+28	+29	+30	+31	+32	+33	+34	+35	+36	+37	+38	+39	+40	+41	+42	+43	+44	+45	+46	+47	+48
SREF Fcst init 00Z	Init	+01	+02	+03	+04	+05	+06	+07	+08	+09	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19	+20	+21	+22	+23	+24
SREF Fcst init 12Z													Init	+01	+02										
	00Z	01Z	02Z	03Z	04Z	05Z	06Z	07Z	08Z	09Z	10Z	11Z	12Z	13Z	14Z	15Z	16Z	17Z	18Z	19Z	20Z	21Z	22Z	23Z	13/00Z

Verification of ARPS Forecasts

- ARPS is verified daily to determine the accuracy of the current formulation and to test new forecast components and analyses
- Example: hourly verification of surface quantities at Oklahoma City, (temperature, dew point, pressure and wind speed and direction) for the 36 hr Southern plains region (15km resolution) forecast initiated 00UTC September 6, 2002
- Dashed lines represent observations and solid lines the model prediction

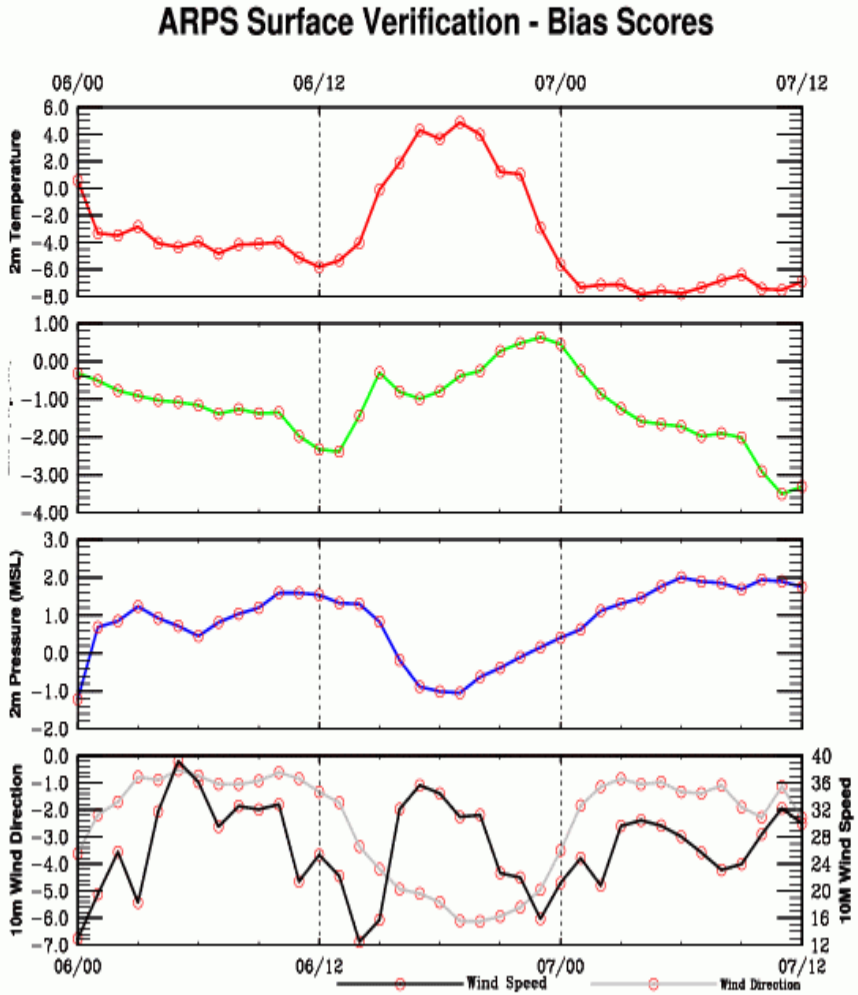
FCST-SPTH3OUS at 00Z on 09 / 06 / 2002

Verification for OKC_verif_ts.png

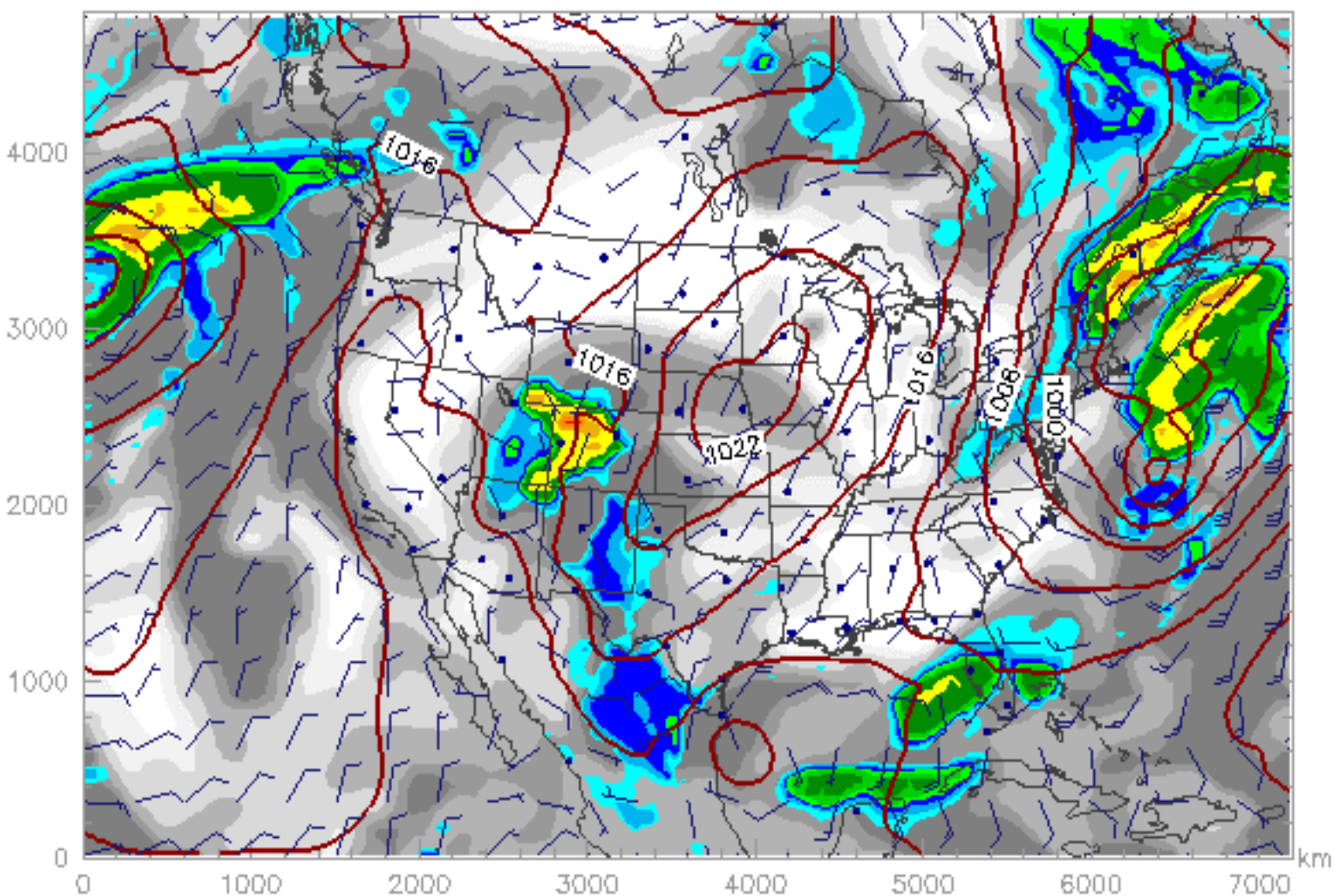


FCST-SPTH3OUS at 00Z on 09 / 06 / 2002

Verification for bias.png



16 hr forecast valid Wed, 11 Sep 2002, 11 am CDT (16Z)
Radar, Clouds, MSL Pressure



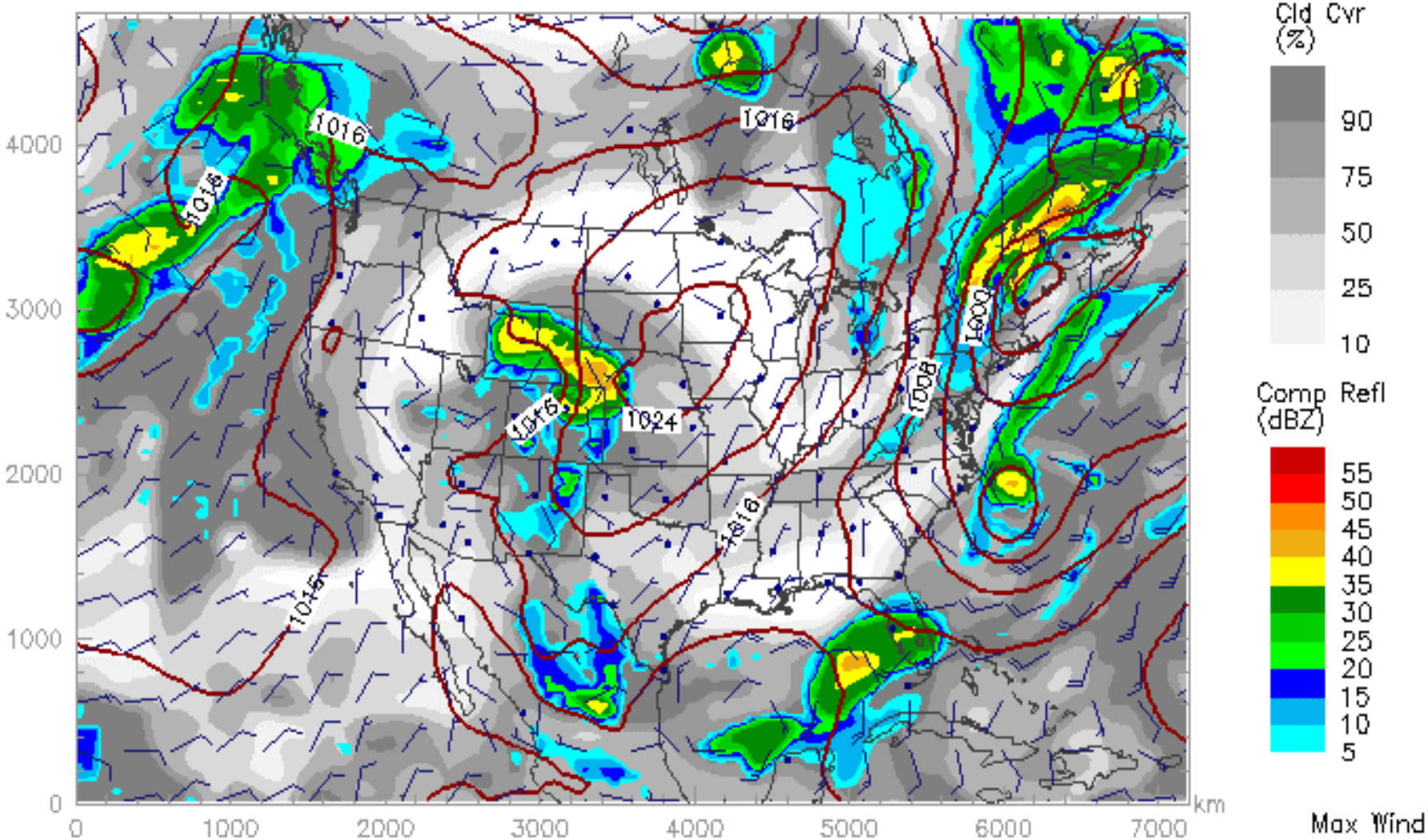
Cld Cvr (%)
90
75
50
25
10

Comp Refl (dBZ)
55
50
45
40
35
30
25
20
15
10
5

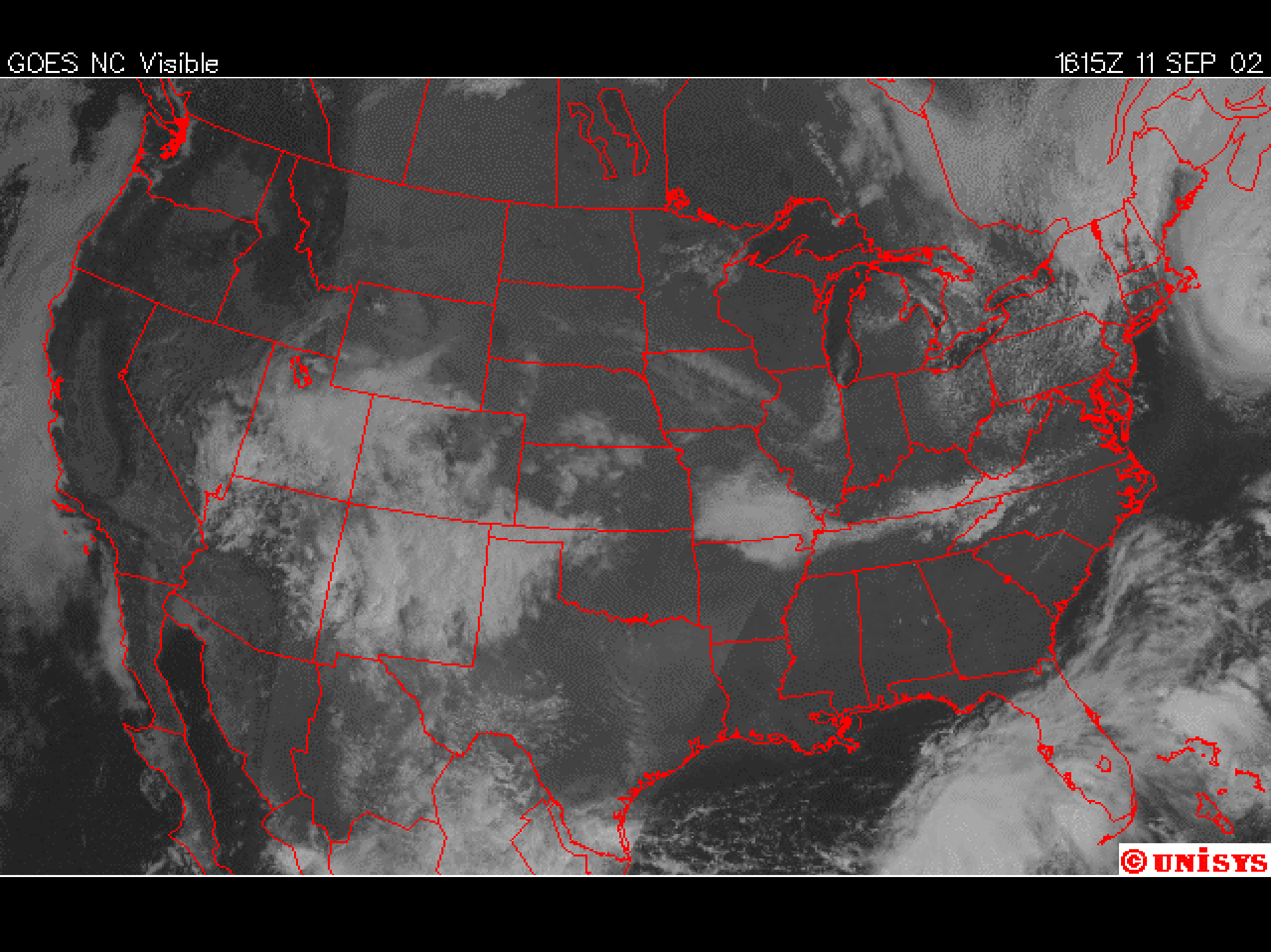
Max Wind
30.83 kts

Total Cloud Cover, filled, Min=0, Max=100 %
Composite Reflectivity, filled, Min=0, Max=52.26, Intrvl=5 dBZ
Sea-Level Pressure, contour, Min=991, Max=1023, Intrvl=4 mb

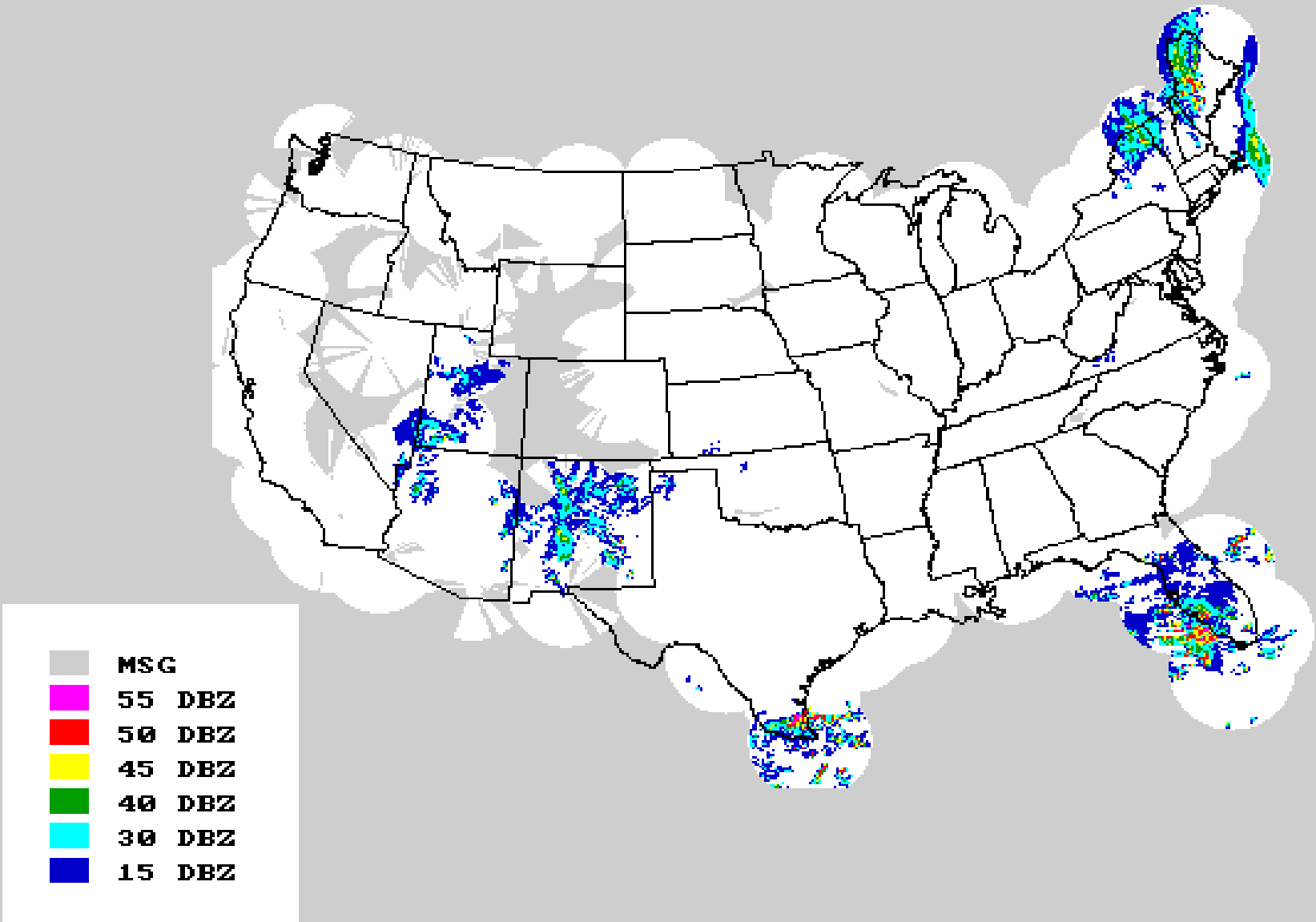
40 hr forecast valid Wed, 11 Sep 2002, 11 am CDT (16Z)
Radar, Clouds, MSL Pressure



Total Cloud Cover, filled, Min=0, Max=100 %
Composite Reflectivity, filled, Min=0, Max=51.82, Intrvl=5 dBZ
Sea-Level Pressure, contour, Min=990, Max=1025, Intrvl=4 mb


GOES NC Visible
1615Z 11 SEP 02
©UNISYS

RADAR REFLECTIVITY FROM RADAR CODED MESSAGES
METEOROLOGICAL DEVELOPMENT LABORATORY
NATIONAL WEATHER SERVICE
AP/CLUTTER EDITING APPLIED
SEP 11, 2002 16:45 UTC



Future ARPS Forecast Configuration using OSCER

- Contribute to the NCEP Short Range Ensemble Forecast project (SREF)
- Conduct daily forecasts for verification of ARPS and new soil physics package
- Research in Data Assimilation (radar data retrieval)
- Weather Research and Forecast (WRF) model simulations (Ensembles)
- Perform high resolution nested forecasts for severe weather

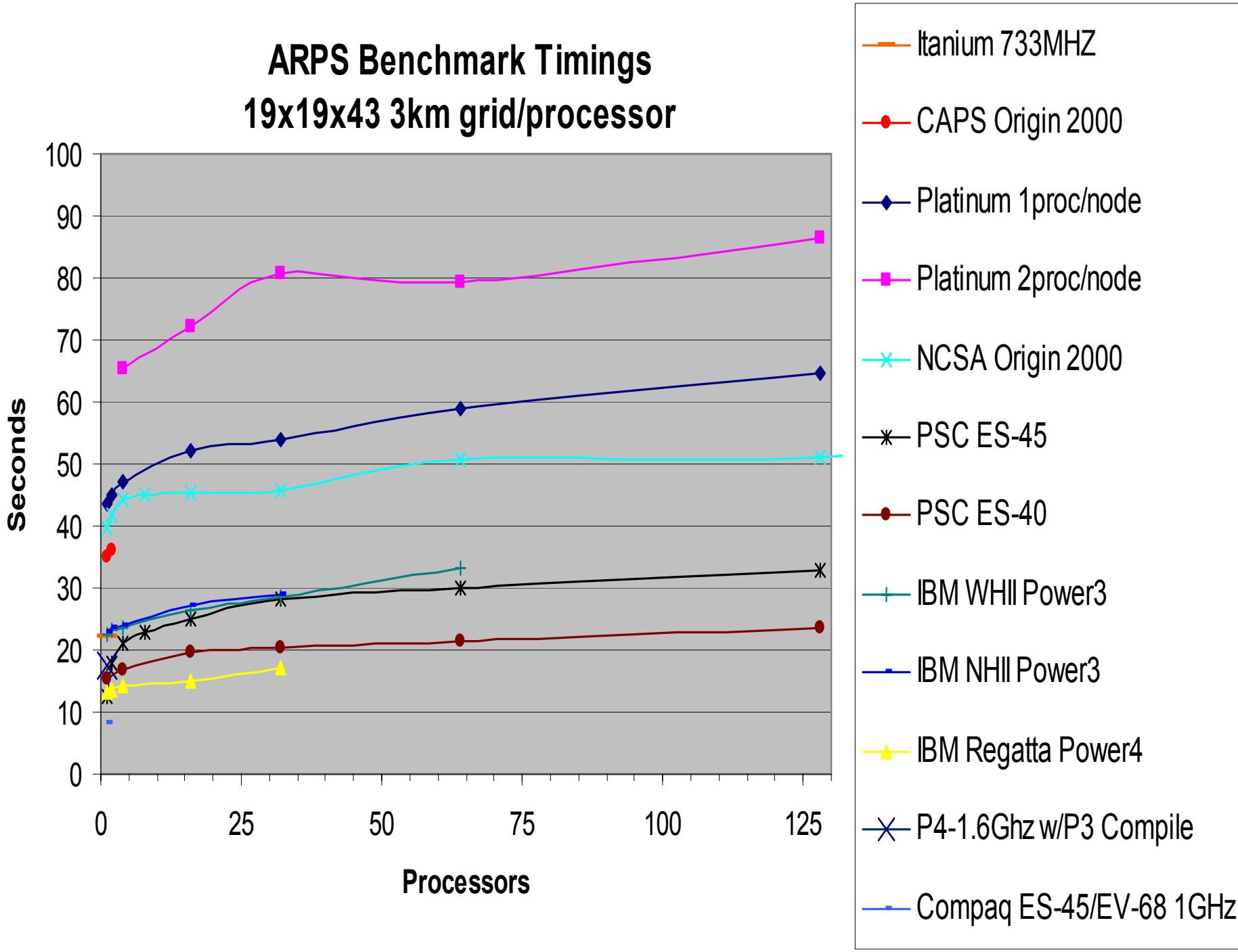
Proposed ARPS Forecast Configuration using OSCER

	AM												Local Time												PM
Forecast Grid	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
Conus 00Z (daily)																					---30---				
Conus 12Z (daily)							---30---																		
Conus 09Z SREF Ensembles-10 (daily)	240																								
Conus 21Z SREF Ensembles-10 (daily)					240																				
Regional-1 00Z (daily)																								-100-	
Regional-1 12Z (daily)									-100-																
Severe Wx-1 15Z (daily)											-256-														

Chart represents the number of processors required for each forecast and the length of the entry represents the wall time required by each forecast group. Table built by D. Weber (12/28/01).

OSCER Supercomputer Benchmarks

- ARPS was used to benchmark various computer systems during the OSCER supercomputer selection process.
- The benchmarks include single processor performance as well as parallel performance using the MPI paradigm.
- Note: a line with zero slope represents a perfect parallel machine (network and I/O) and lower numbers represent better performance.


ARPS Benchmark Timings
19x19x43 3km grid/processor
Seconds
Processors
0
10
20
30
40
50
60
70
80
90
100
0
25
50
75
100
125
Itanium 733MHZ
CAPS Origin 2000
Platinum 1proc/node
Platinum 2proc/node
NCSA Origin 2000
PSC ES-45
PSC ES-40
IBM WHII Power3
IBM NHII Power3
IBM Regatta Power4
P4-1.6Ghz w/P3 Compile
Compaq ES-45/EV-68 1GHz

OSCER Supercomputer Symposium

September 12, 2002

Kelvin Droegemeier, Dan Weber, Ming Xue,
Keith Brewster, Kevin Thomas, Jerry Brotzge,
Eric Kemp, Jason Levit,Yunheng Wang

The Center for Analysis and Prediction of Storms