Weather Guidance from the Rapid Update Cycle

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- RUC/MAPS web page

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RUC Purpose

• Provide high-frequency operational NWS mesoscale analyses and short-range numerical forecasts for users including:
  – aviation
  – severe weather forecasting
  – general public forecasting
  – other transportation
  – agriculture
NCEP model hierarchy – RUC (1h frequency) → Eta (6h) → Global (12h)
RUC jet-level wind error – forecasts valid at 0000 UTC 27 Jan 98 – 250 hPa

Purpose of RUC
Improved forecasts using high-frequency updates initialized with recent data (NASA TAP wind study)
Uses of the RUC

- Explicit Use of Short-Range Forecasts
- Monitoring Current Conditions with Hourly Analyses
- Evaluating Trends of Longer-Range Models

Some places where the RUC is used

- Aviation Weather Center - airmets, sigmets
- Storm Prediction Center - severe weather watches
- FAA – CWSUs, WARP, air traffic management (CTAS), ITWS..
- National Weather Service Forecast Offices
- Airline Forecasting Offices
- NASA Space Flight Centers
- Private vendors
- Other AWRP PDTs – icing, turbulence, AGFS/ADDS/RTVS, convective weather, winter weather
# Hourly Data for 40 km RUC

<table>
<thead>
<tr>
<th>Data Type</th>
<th>~Number</th>
<th>Freq.</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rawinsonde (inc. special obs)</td>
<td>80</td>
<td>/12h</td>
<td>NCEP and FSL</td>
</tr>
<tr>
<td>NOAA wind profilers (405 MHz)</td>
<td>31</td>
<td>/ 1h</td>
<td>NCEP and FSL</td>
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<tr>
<td>- 405 MHz</td>
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<tr>
<td>Boundary layer profilers</td>
<td>15</td>
<td>/ 1h</td>
<td>FSL only</td>
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<tr>
<td>RASS (NOAA and PBL)</td>
<td>15</td>
<td>/ 1h</td>
<td>FSL only</td>
</tr>
<tr>
<td>VAD winds (WSR-88D radars)</td>
<td>110-130</td>
<td>/ 3h</td>
<td>NCEP &amp; FSL*</td>
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<tr>
<td>Aircraft (ACARS)(V,temp)</td>
<td>800-3200</td>
<td>/ 1h</td>
<td>NCEP and FSL</td>
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<tr>
<td>Surface - land (V, $p_{sfc}$,T,$T_d$)</td>
<td>1500-1700</td>
<td>/ 1h</td>
<td>NCEP and FSL</td>
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<tr>
<td>Buoy</td>
<td>80-130</td>
<td>/ 1h</td>
<td>NCEP and FSL</td>
</tr>
<tr>
<td>GOES precipitable water</td>
<td>1000-2500</td>
<td>/ 1h</td>
<td>NCEP and FSL</td>
</tr>
<tr>
<td>GOES high-density cloud drift winds</td>
<td>1000-2500</td>
<td>/ 3h</td>
<td>NCEP and FSL</td>
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<tr>
<td>Recon dropwinsonde</td>
<td>a few</td>
<td>/ variable</td>
<td>NCEP only</td>
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</table>
Examples of RUC convective weather parameters
Accurate surface wind fields from RUC
20km vs. 40km topography

20km RUC/MAPS

40km RUC/MAPS
Contour interval for precipitation
– 2 mm (0.08 inches) / 3h

3 May 1999 OKC tornado case
Improved convection forecasts from new RUC model at 20km
The Future of the RUC

• 20 km 1 hr version on IBM SP
  – Late summer 2000
  – Cloud/hydrometeor analysis using satellite combined with explicit cloud fcsts in RUC
• Later, assimilation of new data sets: radar, sfc cloud obs, sat radiances, hourly precipitation analyses, WSR-88D radial winds, lightning, GPS precipitable water
• Improved physical parameterizations, including cloud microphysics (freezing drizzle), surface and turbulence physics
• Higher resolution versions
  – 13-15 km/60 level - 2001

Key areas of upcoming improvement
Precipitation – stable and convective
Cloud analysis – cloud fields
Surface/orographic effects – resolution, land-use
Wind/temp/RH fcsts
The Rapid Update Cycle (RUC) is an operational atmospheric prediction system comprising primarily of a numerical forecast model and an analysis system to initialize that model. MAPS is the research counterpart to the RUC. The RUC has been developed to serve users needing short-range weather forecasts, including those in the US aviation community.

**40-km MAPS forecasts**

National and regional (NW, SW, N Central, S Central, Great Lakes, NE, SE). Forecasts out to 36 h updated every 6 h and forecasts out to 12 h every 3 h.

**40-km RUC2 forecasts**

National and regional (NW, SW, N Central, S Central, Great Lakes, NE, SE). Forecasts out to 12 h updated every 3 h. Jan 2000 - Backup RUC from FSL continues to run -- products available via index on left. Differences between RUC backup and normal NCEP RUC.

Information on RUC/MAPS diagnosed variables - How are they calculated?

NWS State Forecast Discussions (SFDs) using RUC 1 text file for each day
Experiments on GOES cloud-top pressure assimilation

The RAP Branch focuses on the development of

- **Mesoscale Analysis and Prediction System (MAPS)**, a regional data assimilation and weather forecast system, and the
- **Rapid Update Cycle (RUC)**, the operational version of MAPS running at the National