WINTER PRECIPITATION TYPE FORECASTING AT NWS LA CROSSE

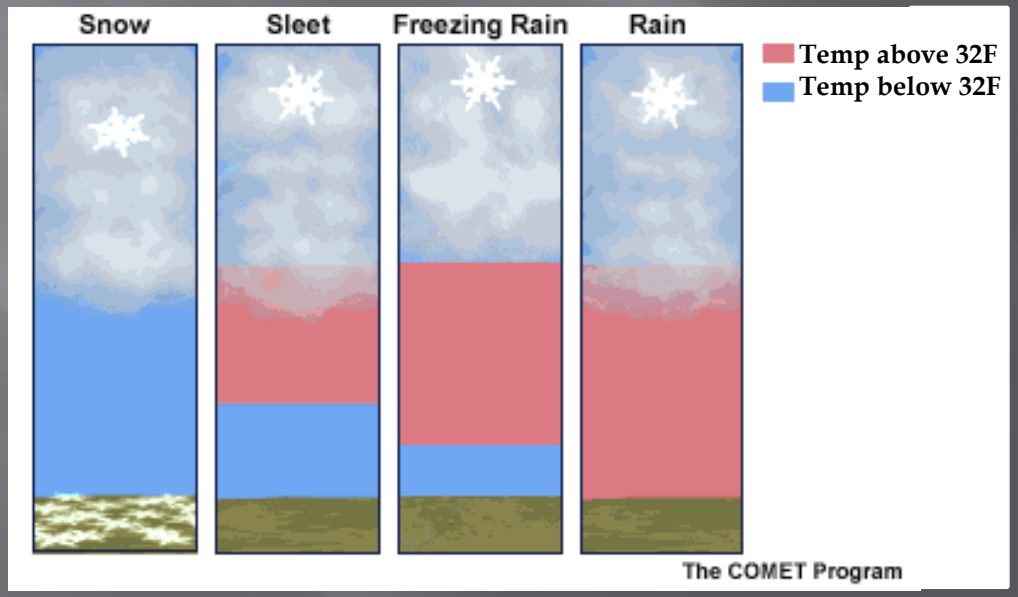
Dan Baumgardt and Andy Just

Precipitation Type Basics

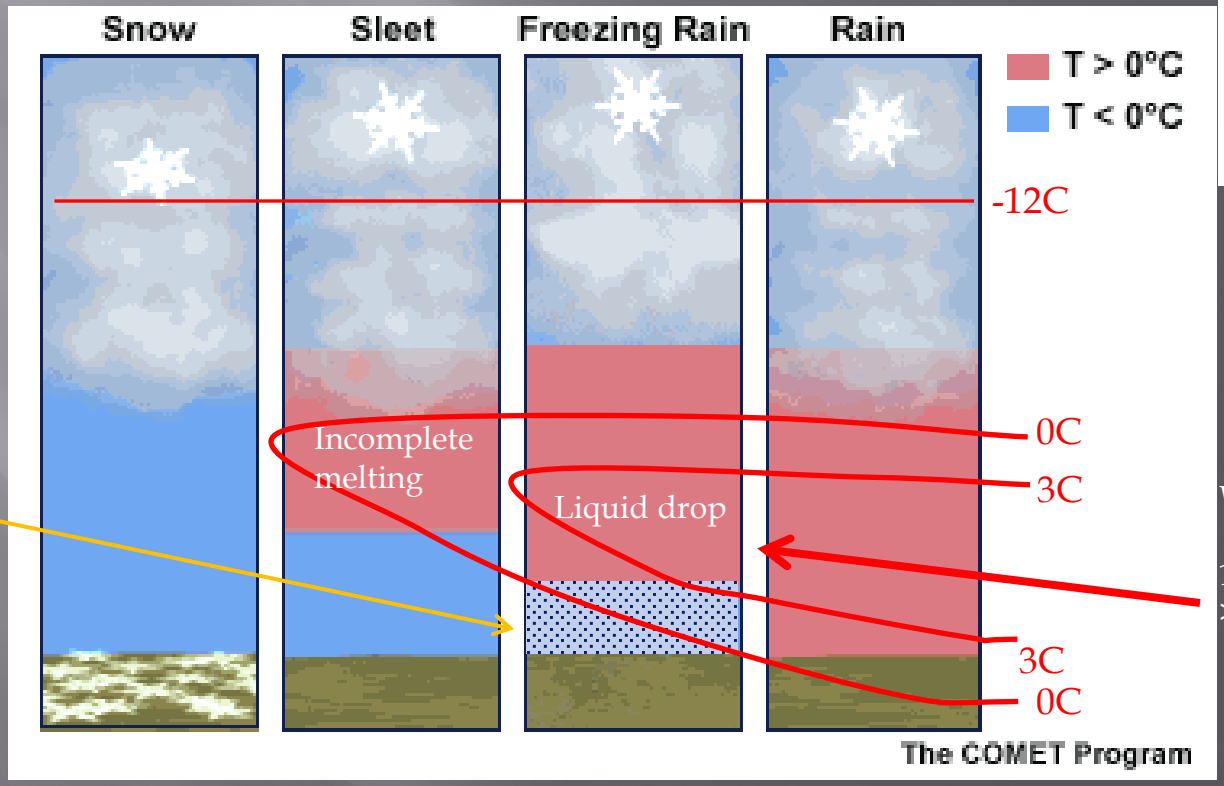
- Layers of below- and above-freezing temperatures.
- Precipitation particles change phases on their fall.

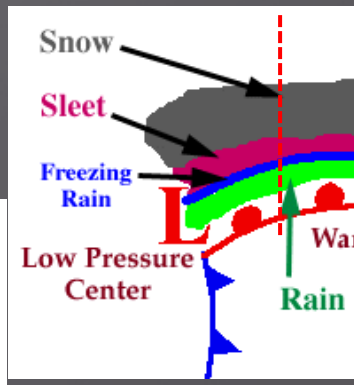
15,000ft

5,000ft



Precipitation Type Basics





Refreeze to sleet?

How cold and deep is this layer?
< -6C and
> 2500 ft?

Warm Layer MaxT:

1-3C: Incomplete melt
> 3C: Melt to liquid

Eau Claire

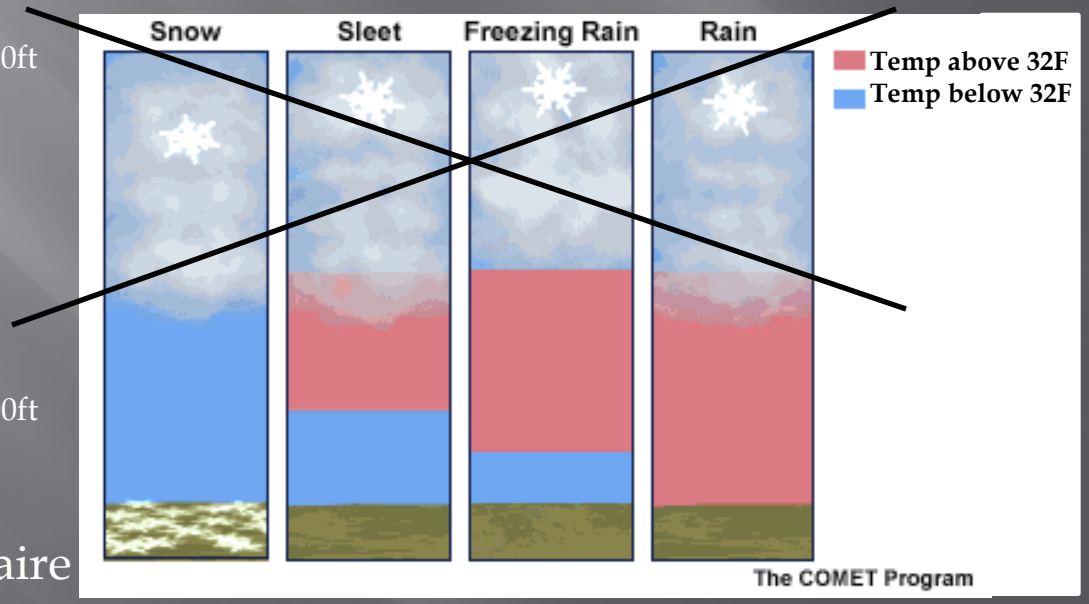
Dubuque

Precipitation Type Basics

- If in-cloud temperatures aren't cold enough, supercooled liquid drops dominate the cloud.
- Cloud temperatures warmer than -10 to -12C.

15,000ft

5,000ft



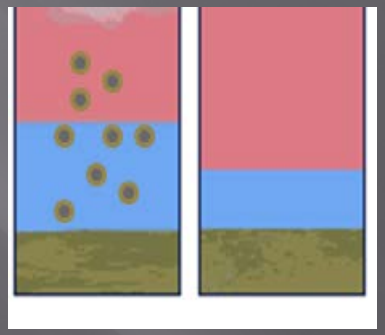
Eau Claire

Dubuque

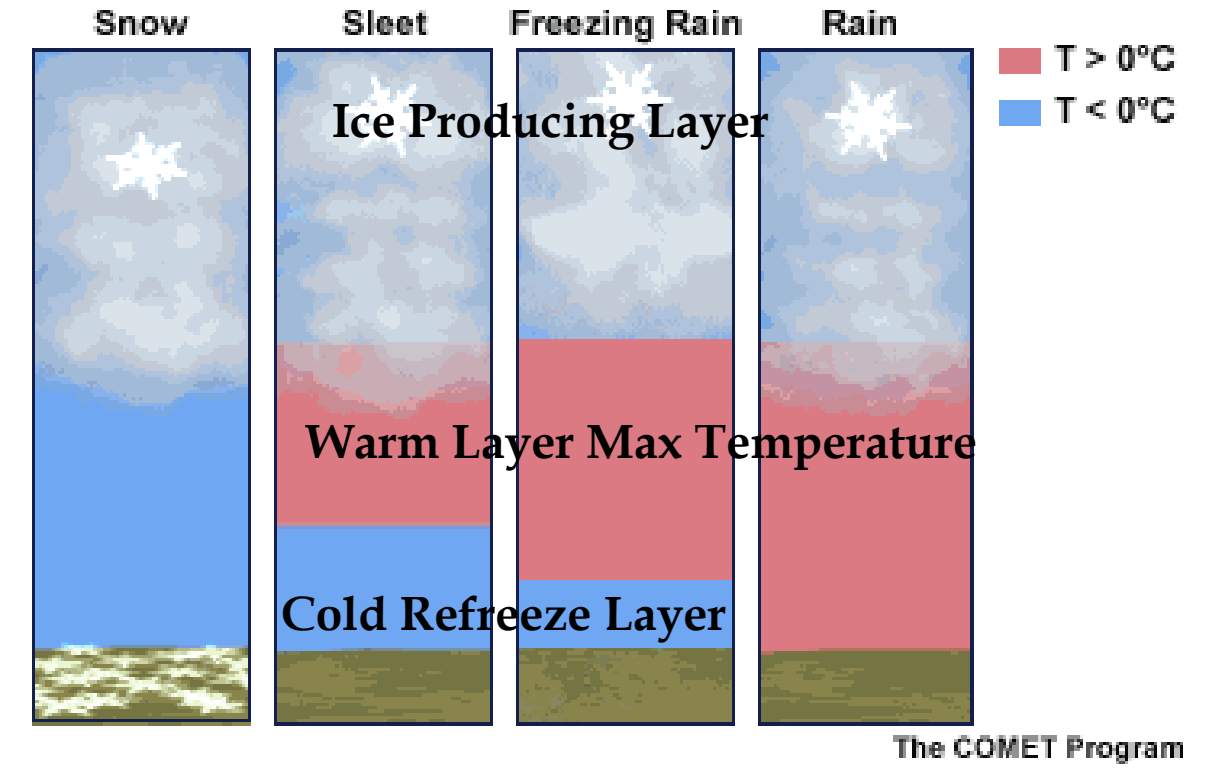
Precipitation Type Basics

- Freezing drizzle or rain
- Cloud temperatures just aren't cold enough to produce ice.

5,000ft



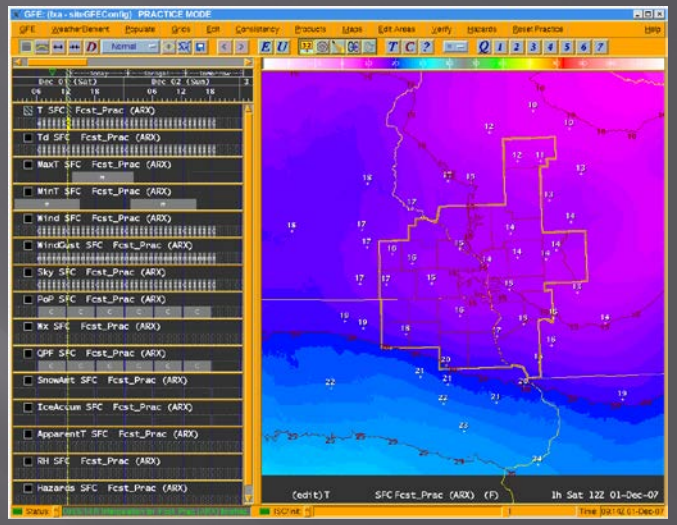
Precipitation Type Basics



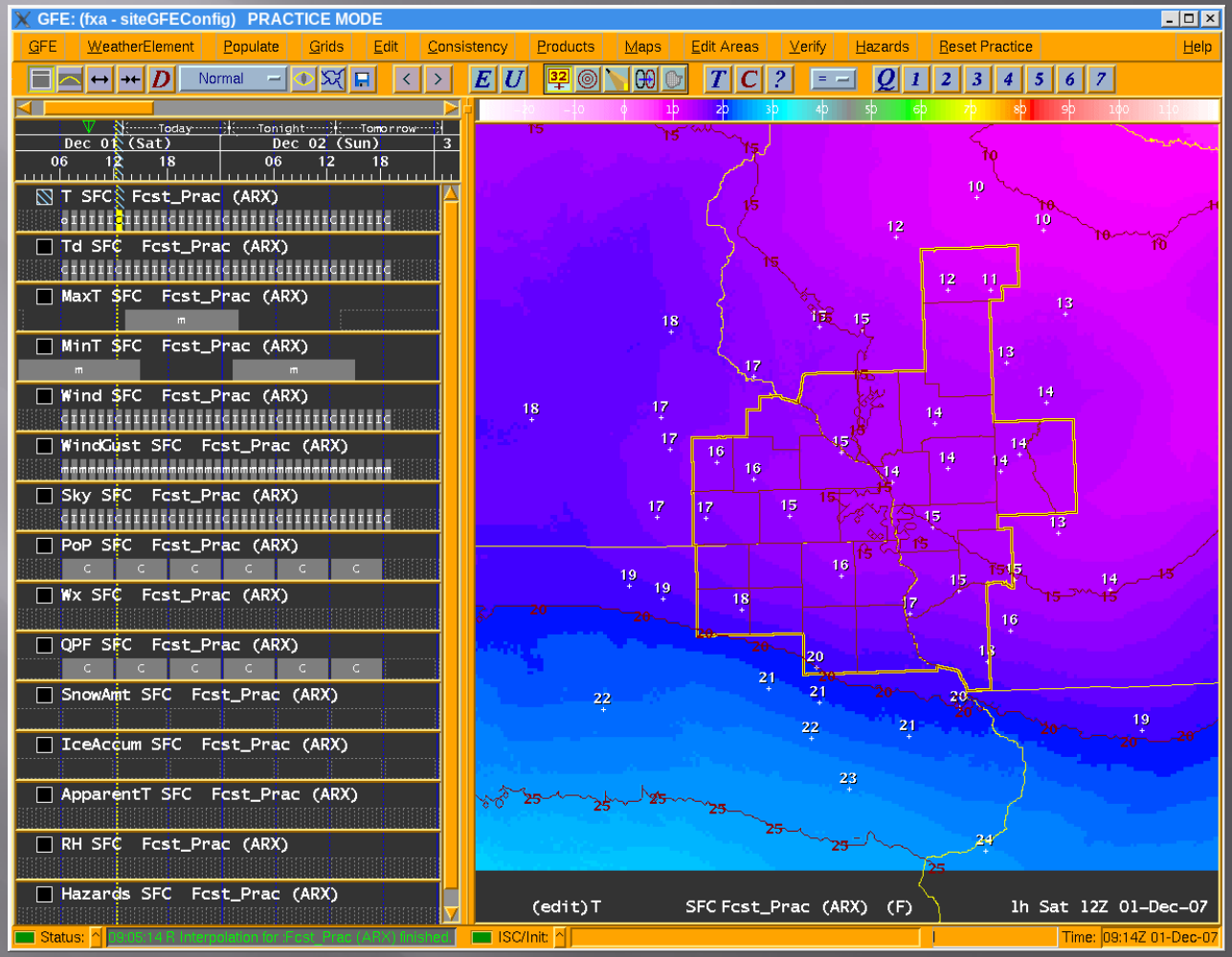
Example: December 1 2007

How We Put This Storm Into a Forecast

- Graphically: GFE (Graphical Forecast Editor)
- We can incorporate 1 or more computer models, along with our own forecasting tools and expertise
- Automated programs create text-based forecasts off our graphics

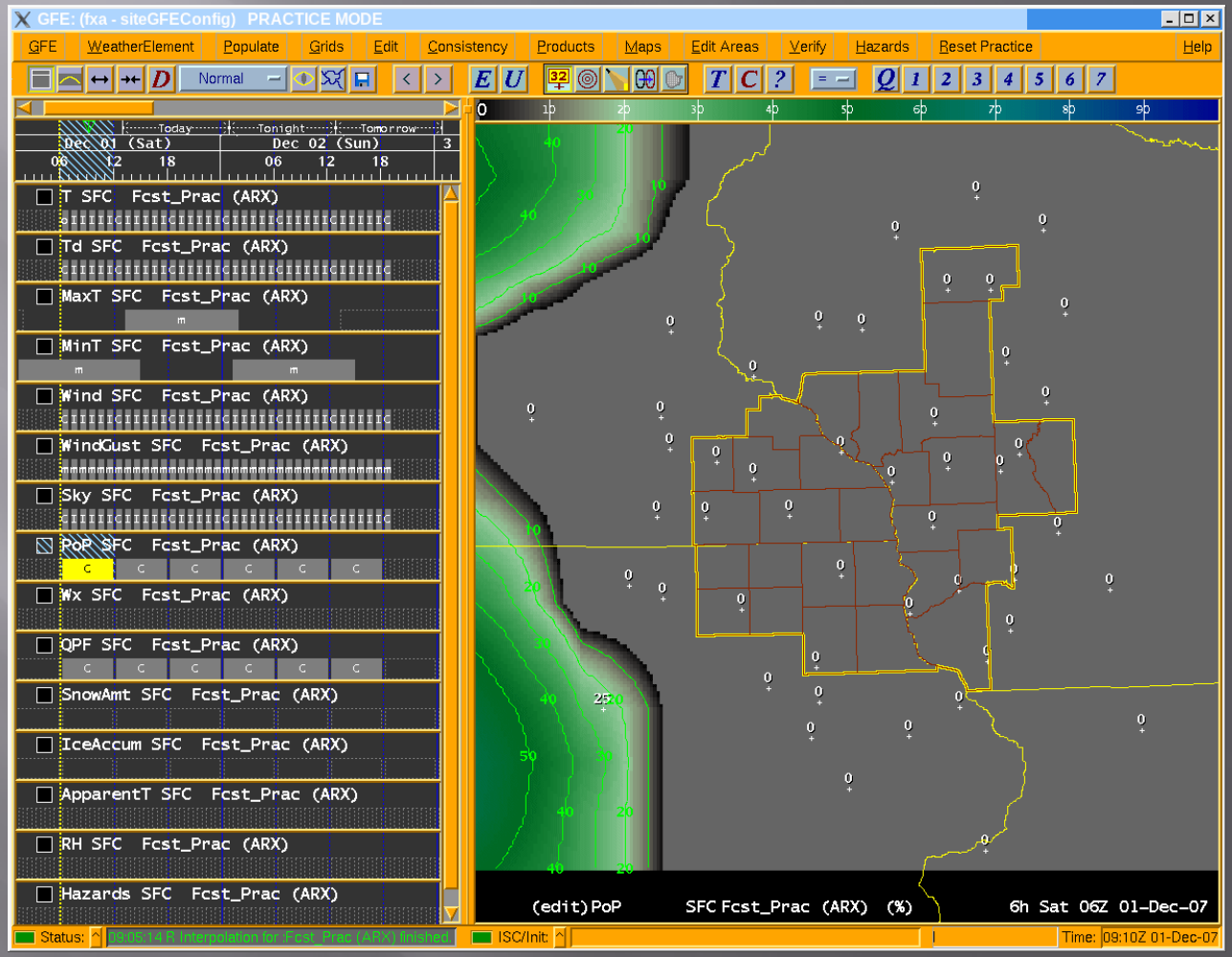


GFE : Hourly Temperatures



Dec 1 2007

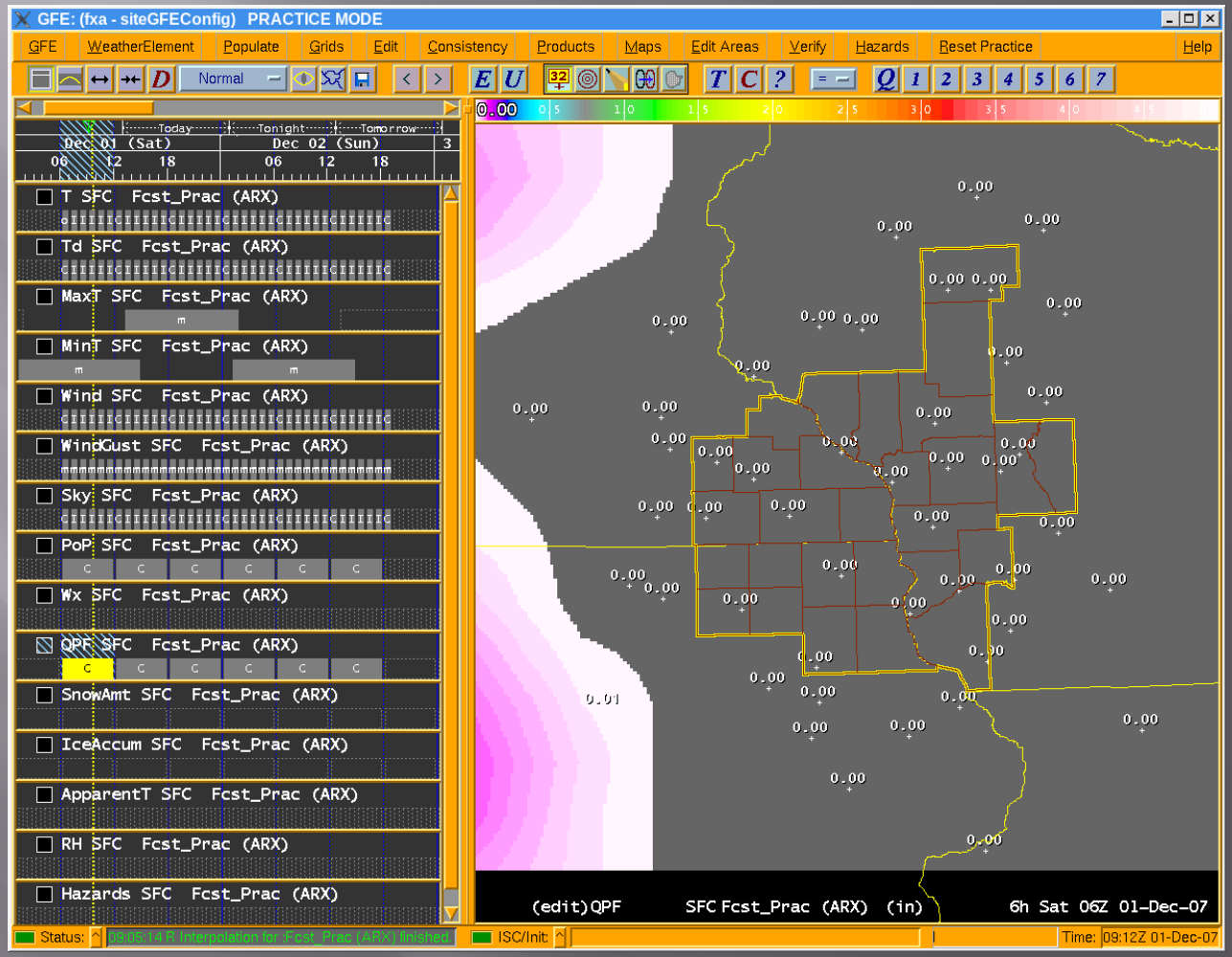
GFE : Probability of Precipitation (PoP)



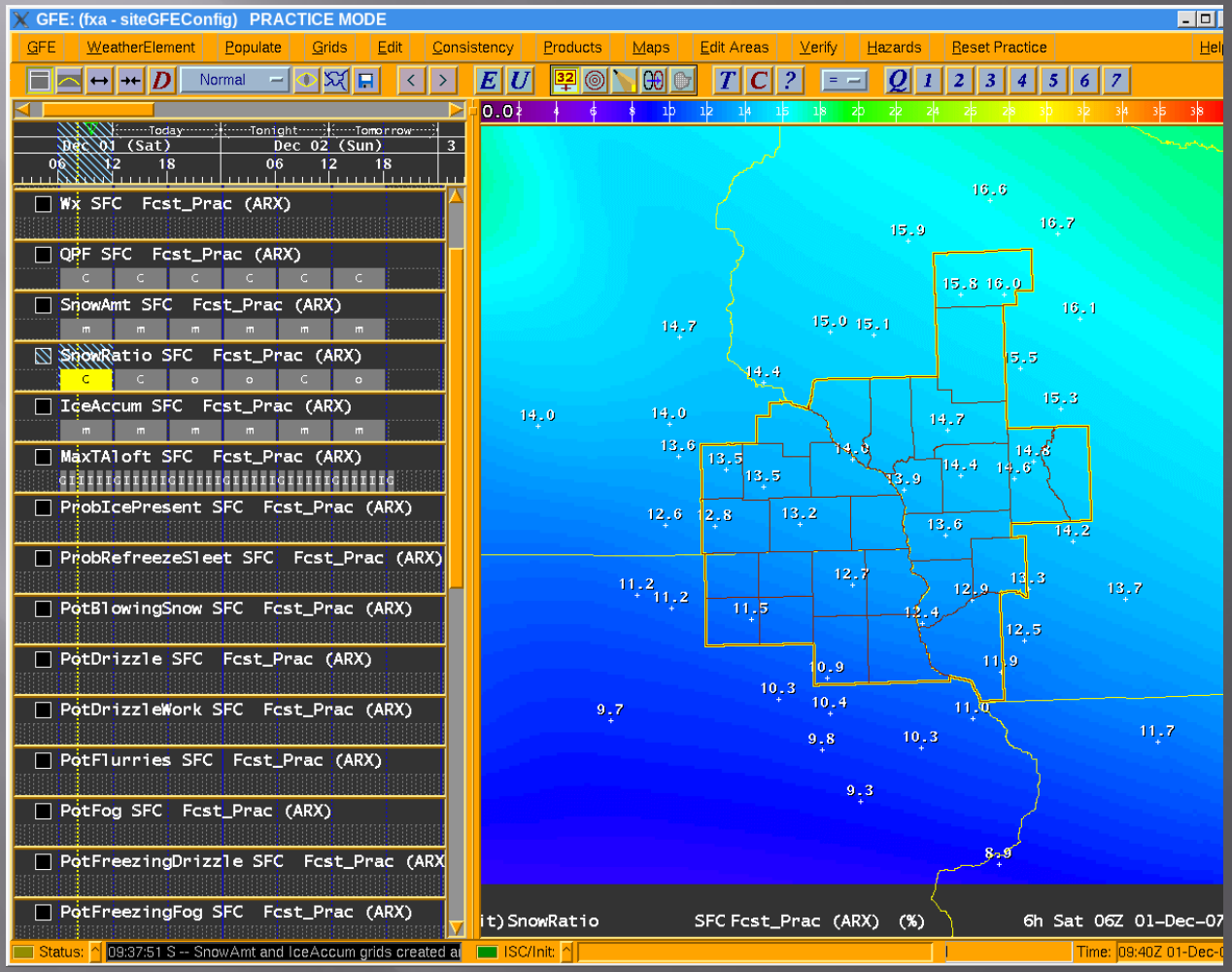
GFE : Quantitative Precipitation Forecast (QPF)

Liquid Equivalent Precipitation

i.e. if you melt the precipitation that falls into water



GFE : Snow to Water Ratio (how wet/dry the snow is)



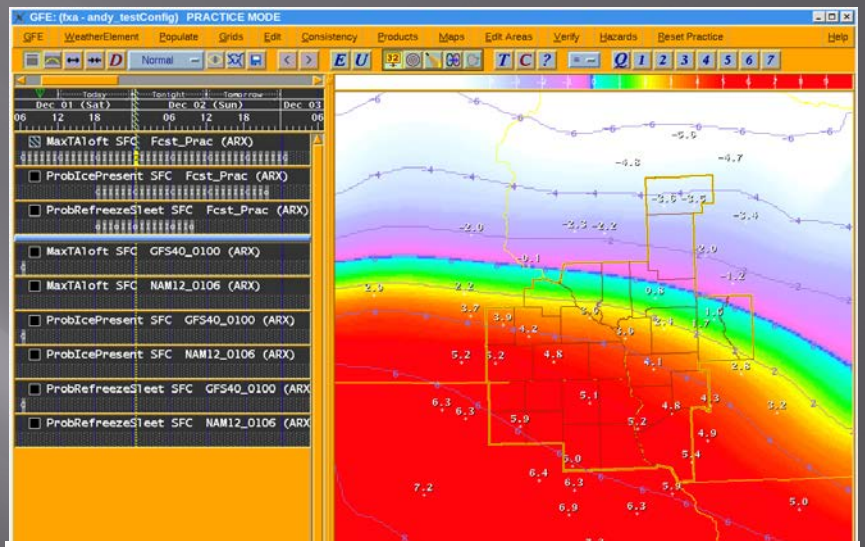
Dry: >20:1 Wet: ~10:1 (e.g., 1″ liquid=10″ snow)

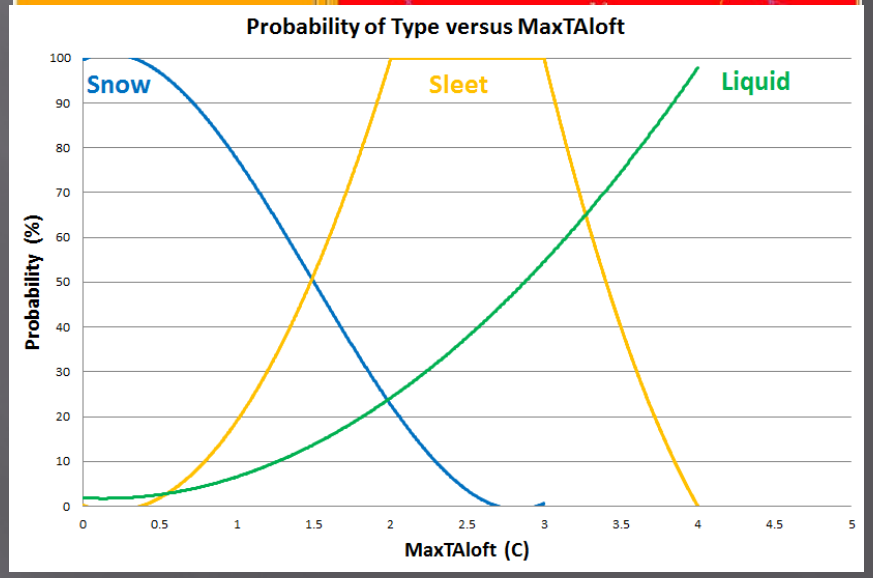
Producing the Types of Weather

- This event includes a warm layer above the surface, a loss of ice in the clouds, and a cold layer near the surface which allows for refreezing
- We create 3 other grids, which are a proxy top-down method:
  - Warm air layer temperature (MaxTAloft)
  - Surface cold layer temperature (ProbRefreezeSleet)
  - Probability of ice in the cloud (ProbIcePresent)
- Tools then create probability of precipitation types

MaxTAloft

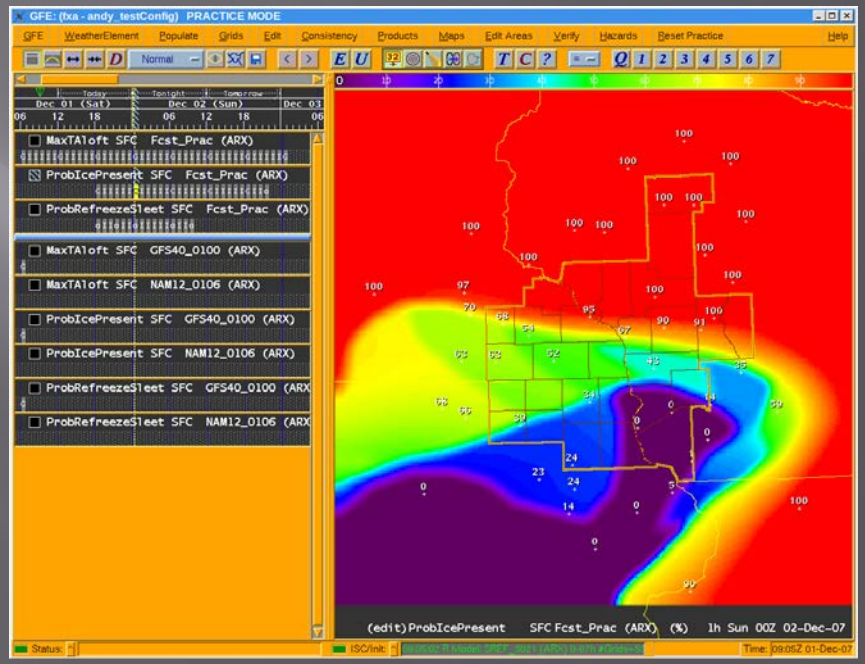
- The warmest temperature throughout the troposphere
- Available for the GFS, NAM and RAP models
- Proxy of p-type:
  - Snow: <= 0C
  - Sleet: 1-3C
  - Rain: >= 4C





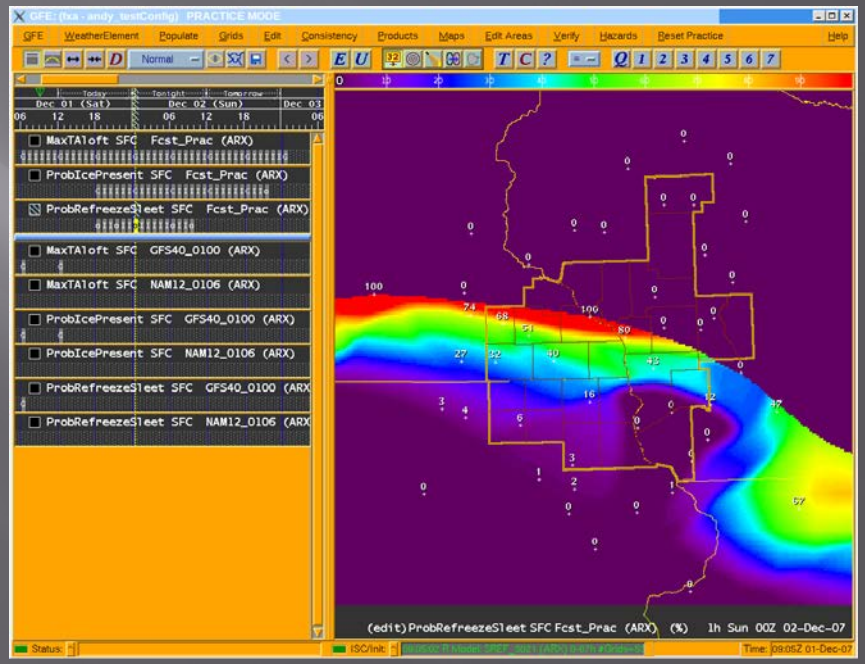
ProbIcePresent

- Describes confidence about the presence of ice crystals in the clouds
- Available for the GFS, NAM and RAP models
- As ProbIcePresent decreases to 0:
  - Rain increases
  - Sleet decreases
  - Snow decreases

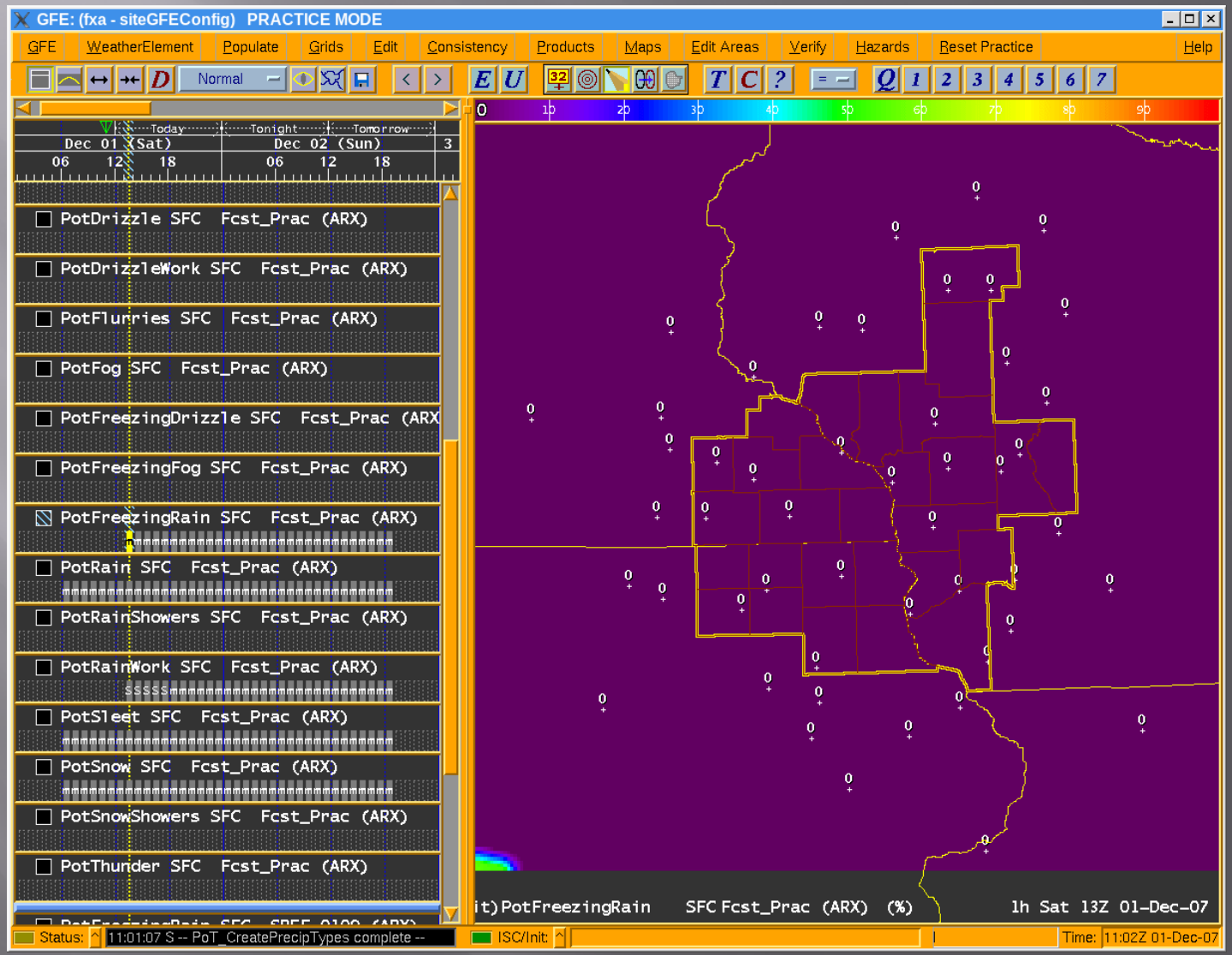


ProbRefreezeSleet

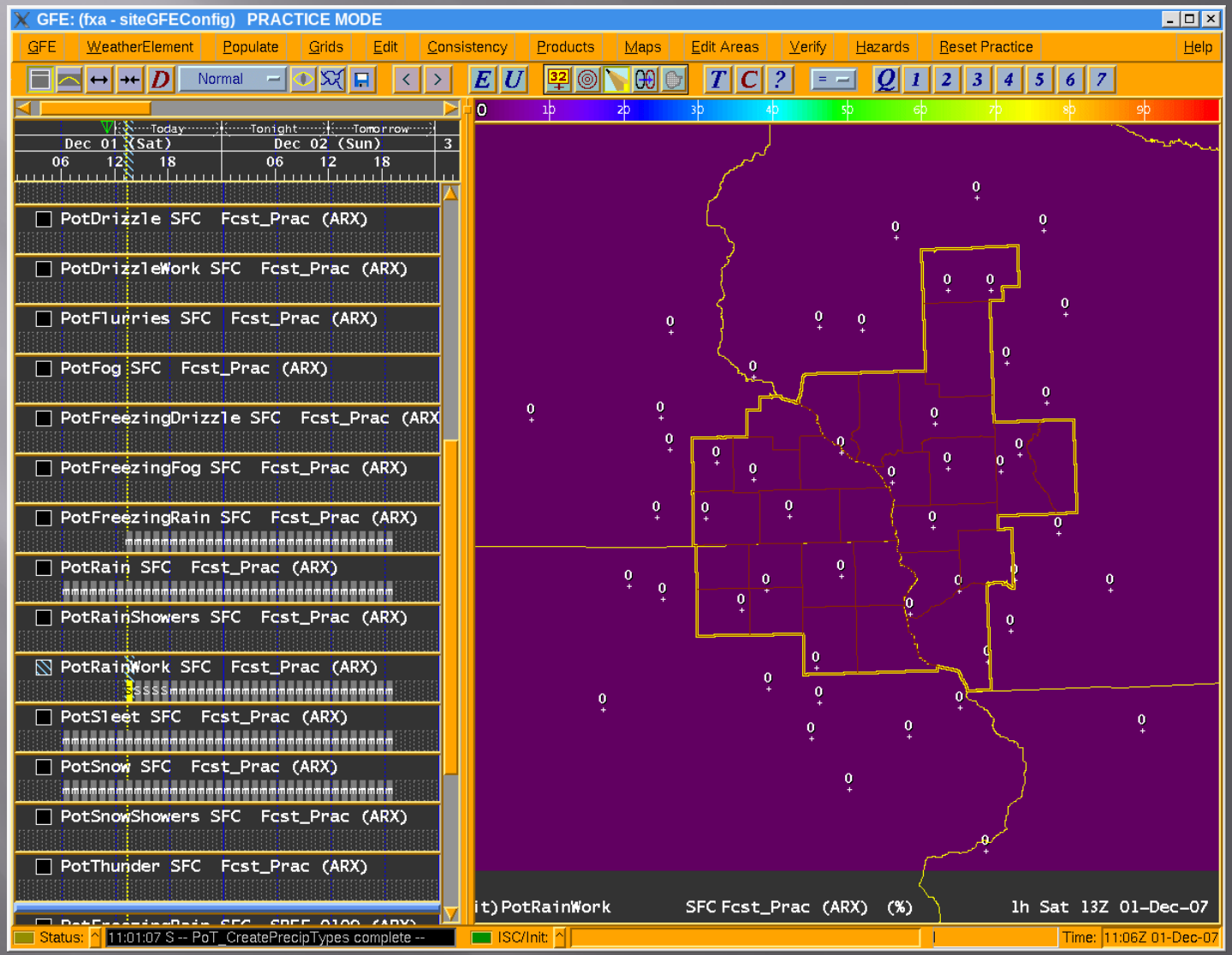
- If there is a deep and cold enough layer at the surface, rain can change to sleet
- Available for the GFS, NAM and RAP
- As ProbRefreezeSleet increases to 100:
  - Rain decreases
  - Sleet increases
  - Snow stays the same



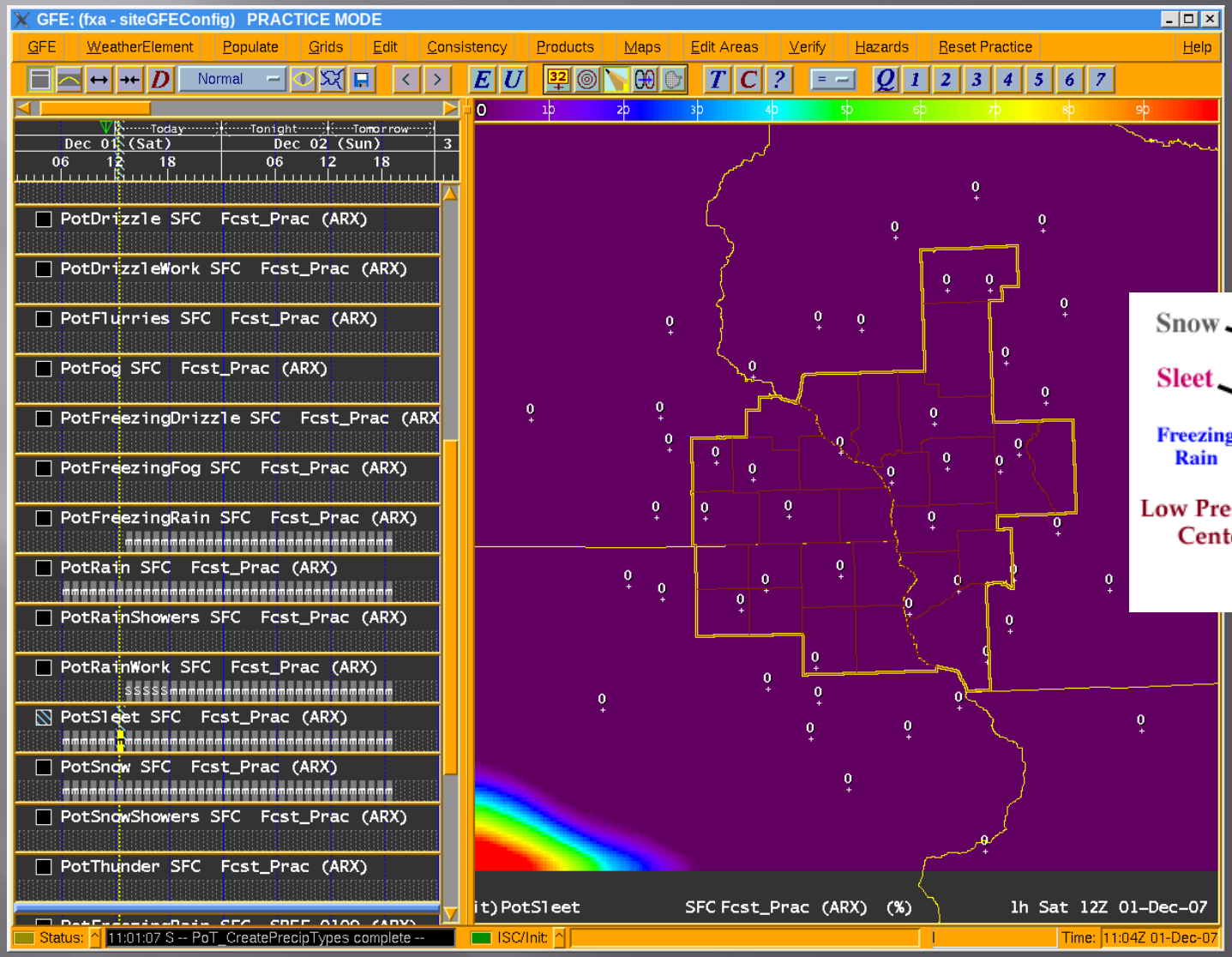
Freezing Rain Probabilities



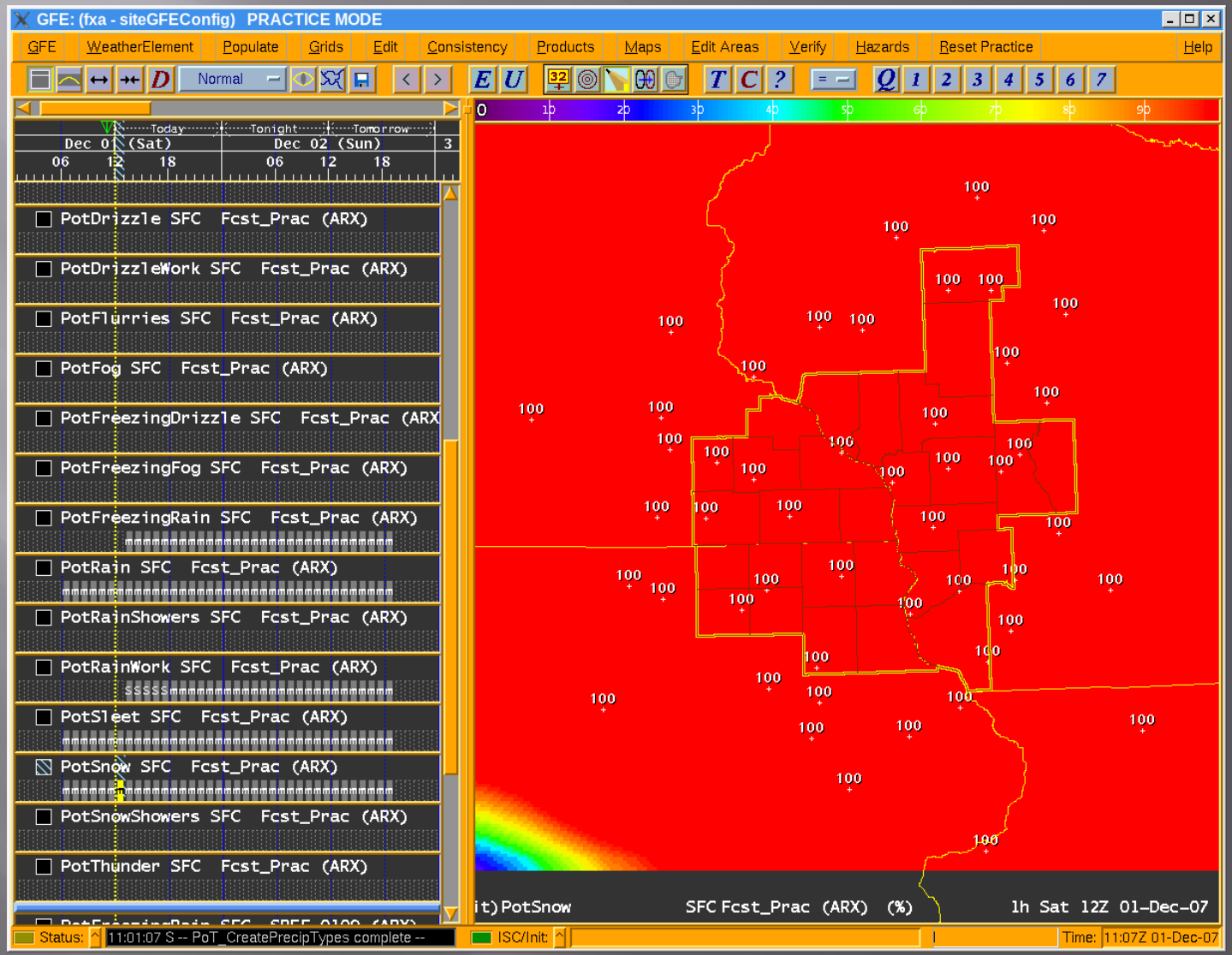
Rain Probabilities



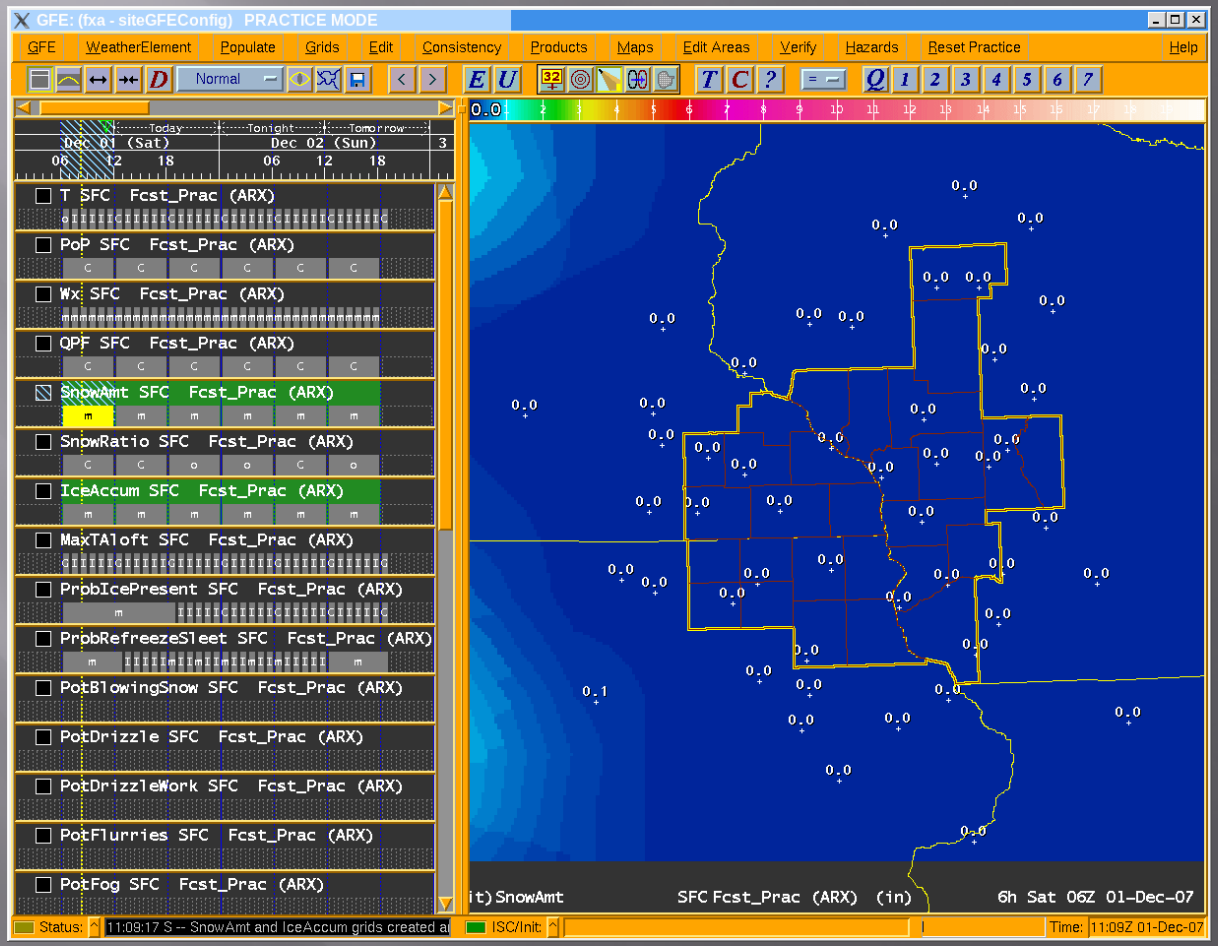
Sleet Probabilities



Snow Probabilities

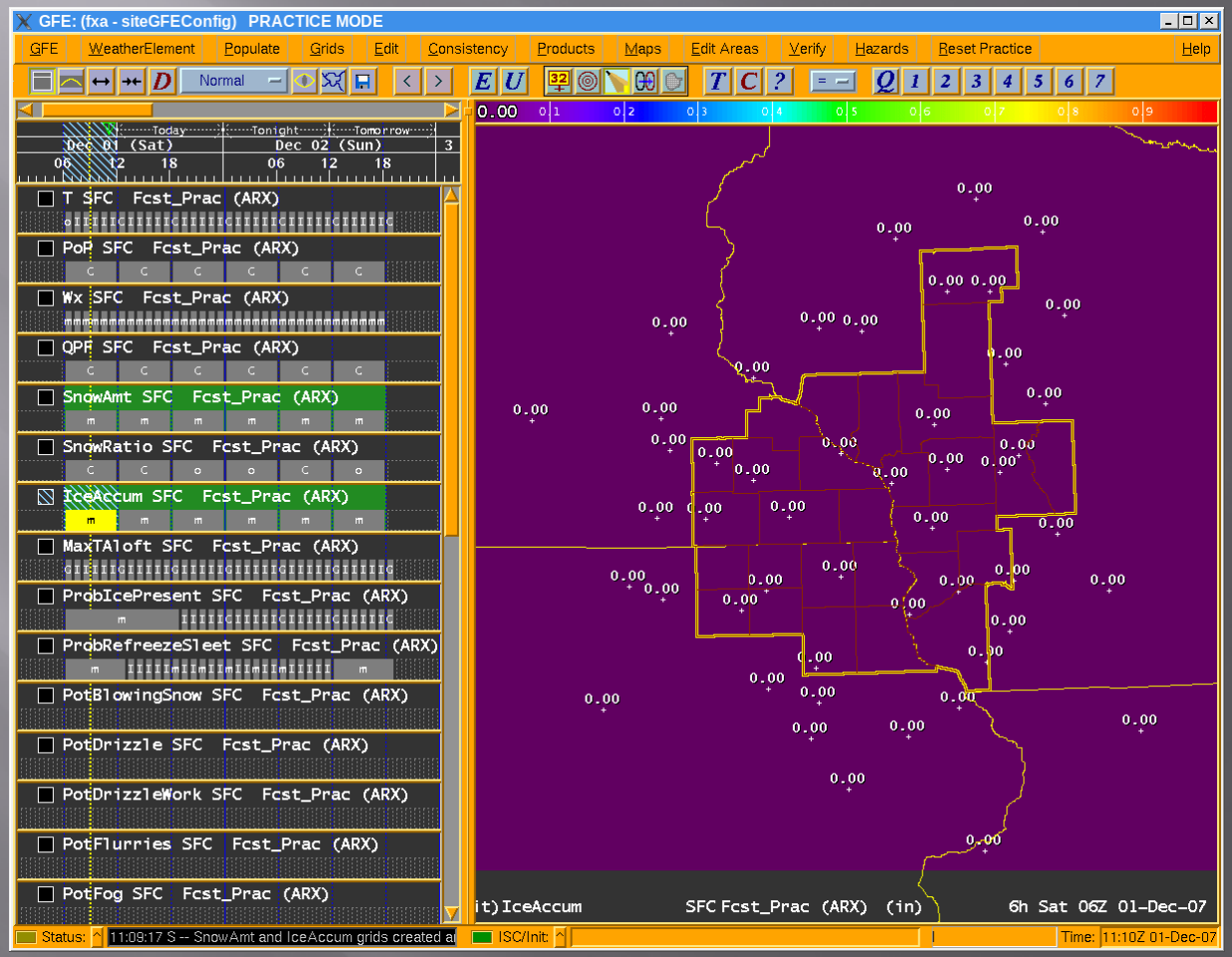


Snow Amount Forecast



Computed in 6 hour time periods

Ice Accumulation Forecast



Computed in 6 hour time periods

Probability of Precipitation Type Forecasts

- Experimental
- Accessible via the Winter Monitor page of our website
- Allows you to see our <u>confidence of each type of precipitation</u>, given that precipitation occurs
- Averaged across each county in our forecast area
- **Updated every hour**

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UPPER MISS. RIVER VALLEY EXPERIMENTAL PROBABILITIES OF PRECIPITATION TYPE
NATIONAL WEATHER SERVICE LA CROSSE WI
308 AM CST SAT DEC 1 2007

WIZ041-011015-
LA CROSSE-
INCLUDING THE CITIES OF...LA CROSSE
308 AM CST SAT DEC 1 2007

DATE        SAT 12/01/07     \      SUN 12/02/07     \      MON 12/03/07
CST      12 3A 6A 9A 12 3P 6P 9P 12 3A 6A 9A 12 3P 6P 9P 12 3A 6A 9A 12 3P 6P 9P

 POP6HR    |  0  |  87 | 100 |  89 |  79 |  29 |  0  |  0  |  0  |  0  |  0  |  0
 QPF6HR    |  0  | 0.17| 0.72| 0.30| 0.08|  0  |  0  |  0  |  0  |  0  |  0  |  0
 SNOW6HR   | 0.0 |  2  |  6  |  T  | 0.0 | 0.0 |  MM |  MM |     |     |     |
 ICE6HR    |  0  |  0  | 0.03| 0.26| 0.07|  0  |  0  |  0  |  0  |  0  |  0  |  0

IF PRECIPITATION OCCURS.. PROBABILITY THAT PRECIPITATION WILL FALL AS:
 RAIN      0  0  0  0  0  0  0  0  +  +  0  0  0  0  0  0  0  0  0  0  0  0  0  0
 SNOW      +  +  +  +  +  +  25 0  0  0  0 32 80 0  0  0  0  0  0  0  0  0  0  0
 SLEET     0  0  0  0  0  39 + 12 0  0  0  6  0  0  0  0  0  0  0  0  0  0  0  0
 FRZ RAIN  0  0  0  0  0  27 +  +  +  +  + 86 65 0  0  0  0  0  0  0  0  0  0  0

PERCENT COVERAGE OF: (OUT OF 100)
 THUNDER   0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
 FOG       0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
&&

POP6HR.......6-HOUR PROBABILITY OF MEASURABLE PRECIPITATION (0.01 INCH OR MORE)
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ICE6HR.......6-HOUR MOST PROBABLE ICE ACCUMULATION (INCHES)

NOTE: + IS 100 PERCENT PROBABILITY
```

Location (counties, cities)

Prob of Precipitation Type Forecast Dec 1, 2007

1. Date and Time in 3 hour increments
2. Most probable amounts of liquid, freezing and frozen precipitation for 6 hour periods
3. Probability of each precipitation type
4. Percent coverage that fog and/or thunder will occur

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 SNOW6HR   | 0.0 |  2  |  6  |  T  | 0.0 | 0.0 |  MM |  MM |     |     |     |
 ICE6HR    |  0  |  0  | 0.03| 0.26| 0.07|  0  |  0  |  0  |  0  |  0  |  0  |  0

IF PRECIPITATION OCCURS.. PROBABILITY THAT PRECIPITATION WILL FALL AS:
 RAIN      0  0  0  0  0  0  0  0  +  +  0  0  0  0  0  0  0  0  0  0  0  0  0  0
 SNOW      +  +  +  +  +  +  25 0  0  0  0 32 80 0  0  0  0  0  0  0  0  0  0  0
 SLEET     0  0  0  0  0  39 + 12 0  0  0  6  0  0  0  0  0  0  0  0  0  0  0  0
 FRZ RAIN  0  0  0  0  0  27 +  +  +  +  + 86 65 0  0  0  0  0  0  0  0  0  0  0

PERCENT COVERAGE OF: (OUT OF 100)
 THUNDER   0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
 FOG       0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
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ICE6HR.......6-HOUR MOST PROBABLE ICE ACCUMULATION (INCHES)

NOTE: + IS 100 PERCENT PROBABILITY
```
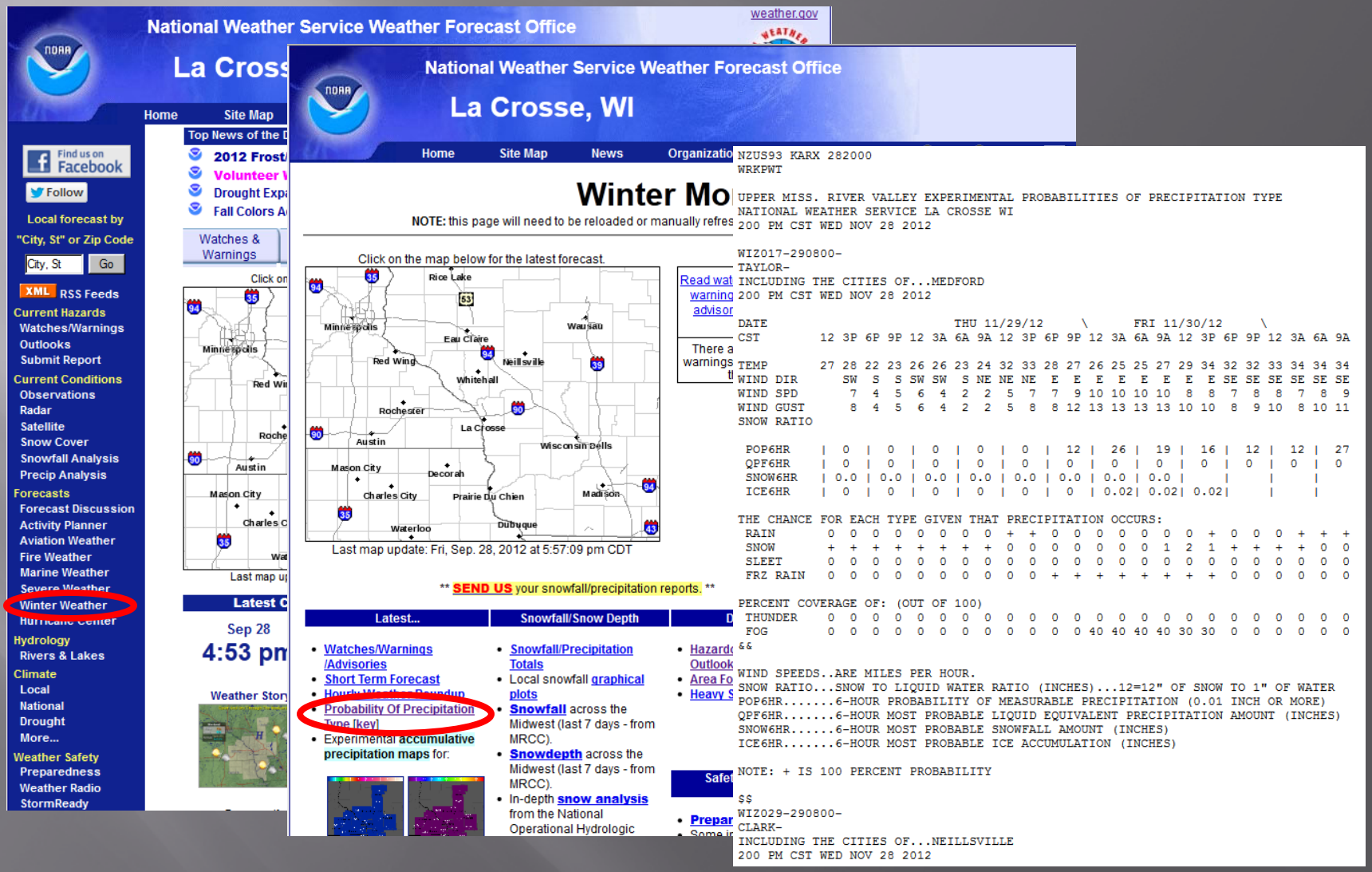

Location (counties, cities)

To Find It


National Weather Service Weather Forecast Office
weather.gov
La Cross
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Volunteer W
Drought Expa
Fall Colors A
Watches & Warnings
Find us on Facebook
Follow
Local forecast by
"City, St" or Zip Code
City, St
Go
XML RSS Feeds
Current Hazards
Watches/Warnings
Outlooks
Submit Report
Current Conditions
Observations
Radar
Satellite
Snow Cover
Snowfall Analysis
Precip Analysis
Forecasts
Forecast Discussion
Activity Planner
Aviation Weather
Fire Weather
Marine Weather
Severe Weather
Winter Weather
Hurricane Center
Hydrology
Rivers & Lakes
Climate
Local
National
Drought
More...
Weather Safety
Preparedness
Weather Radio
StormReady
Click on
Minneapolis
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Sep 28
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Weather Story
National Weather Service Weather Forecast Office
La Crosse, WI
Home
Site Map
News
Organizatio
Winter Mo
NOTE: this page will need to be reloaded or manually refres
Click on the map below for the latest forecast.
Rice Lake
Minneapolis
Eau Claire
Wausau
Red Wing
Neillsville
Whitehall
Rochester
La Crosse
Austin
Wisconsin Dells
Mason City
Decorah
Charles City
Prairie Du Chien
Madison
Waterloo
Dubuque
Last map update: Fri, Sep. 28, 2012 at 5:57:09 pm CDT
Read wat
warning
advisor
There a
warnings
** SEND US your snowfall/precipitation reports. **
Latest...
Snowfall/Snow Depth
Watches/Warnings /Advisories
Short Term Forecast
Probability Of Precipitation Type [key]
Experimental accumulative precipitation maps for:
Snowfall/Precipitation Totals
Local snowfall graphical plots
Snowfall across the Midwest (last 7 days - from MRCC).
Snowdepth across the Midwest (last 7 days - from MRCC).
In-depth snow analysis from the National Operational Hydrologic
Hazardo Outlook
Area Fo
Heavy S
Safet
Prepar
NZUS93 KARX 282000
WRKPWT
UPPER MISS. RIVER VALLEY EXPERIMENTAL PROBABILITIES OF PRECIPITATION TYPE
NATIONAL WEATHER SERVICE LA CROSSE WI
200 PM CST WED NOV 28 2012
WIZ017-290800-
TAYLOR-
INCLUDING THE CITIES OF...MEDFORD
200 PM CST WED NOV 28 2012
DATE THU 11/29/12 \ FRI 11/30/12 \
CST 12 3P 6P 9P 12 3A 6A 9A 12 3P 6P 9P 12 3A 6A 9A 12 3P 6P 9P 12 3A 6A 9A
TEMP 27 28 22 23 26 26 23 24 32 33 28 27 26 25 25 27 29 34 32 32 33 34 34 34
WIND DIR SW S S SW SW S NE NE NE E E E E E E E SE SE SE SE SE SE
WIND SPD 7 4 5 6 4 2 2 5 7 7 9 10 10 10 10 8 8 7 8 8 7 8 9
WIND GUST 8 4 5 6 4 2 2 5 8 8 12 13 13 13 13 10 10 8 9 10 8 10 11
SNOW RATIO
POP6HR | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 26 | 19 | 16 | 12 | 12 | 27
QPF6HR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0
SNOW6HR | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | | |
ICE6HR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.02| 0.02| 0.02| | |
THE CHANCE FOR EACH TYPE GIVEN THAT PRECIPITATION OCCURS:
RAIN 0 0 0 0 0 0 0 0 + + 0 0 0 0 0 0 0 + 0 0 0 + + +
SNOW + + + + + + + + 0 0 0 0 0 0 0 1 2 1 + + + + 0 0
SLEET 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
FRZ RAIN 0 0 0 0 0 0 0 0 0 0 + + + + + + + + 0 0 0 0 0 0
PERCENT COVERAGE OF: (OUT OF 100)
THUNDER 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
FOG 0 0 0 0 0 0 0 0 0 0 0 0 40 40 40 40 30 30 0 0 0 0 0 0
&&
WIND SPEEDS..ARE MILES PER HOUR.
SNOW RATIO...SNOW TO LIQUID WATER RATIO (INCHES)...12=12" OF SNOW TO 1" OF WATER
POP6HR.....6-HOUR PROBABILITY OF MEASURABLE PRECIPITATION (0.01 INCH OR MORE)
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$$
WIZ029-290800-
CLARK-
INCLUDING THE CITIES OF...NEILLSVILLE
200 PM CST WED NOV 28 2012

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