

# METviewer

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METplus Tutorial  
Jul 31 – August 2, 2019  
Monterey, CA

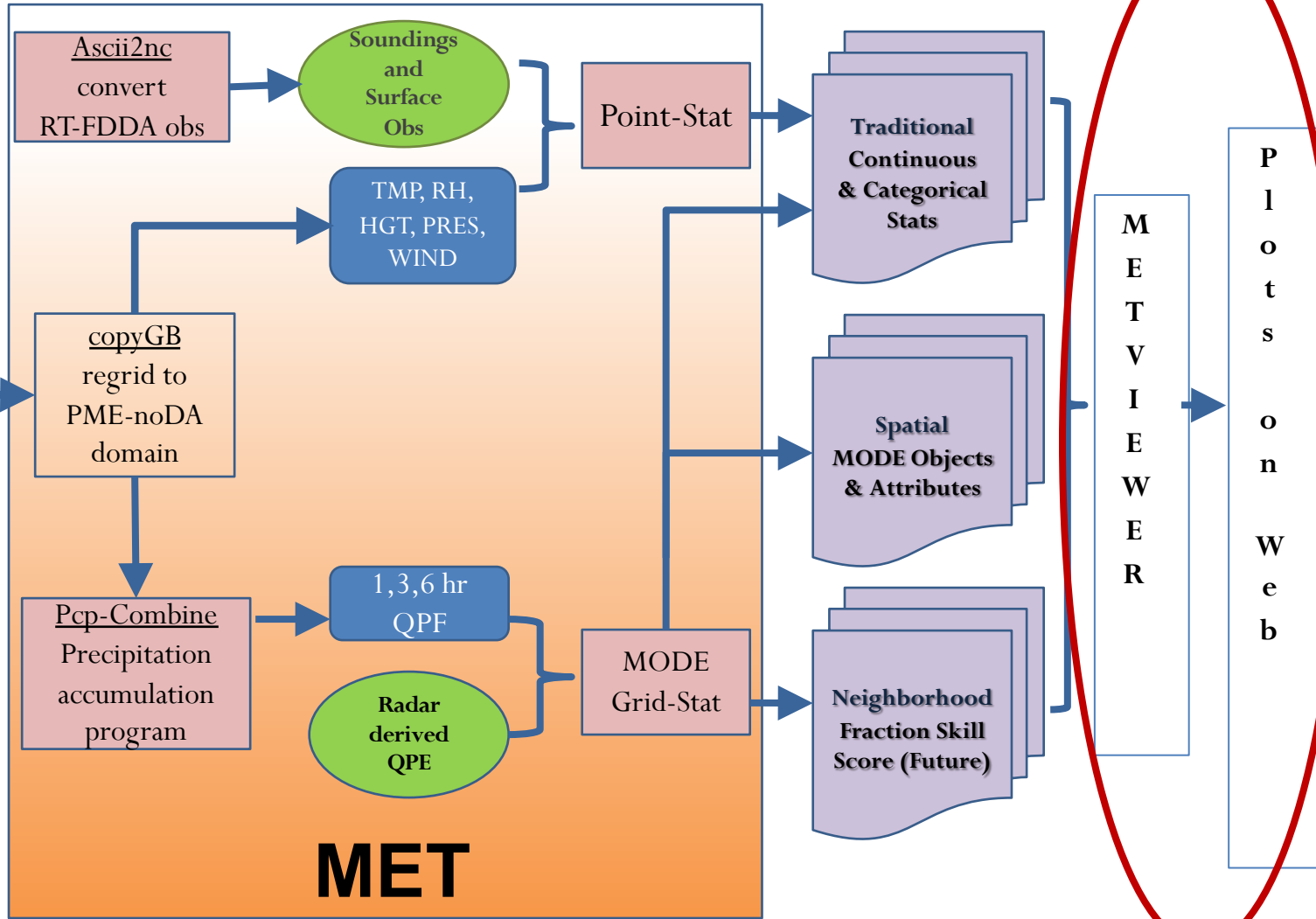
# Example Design of a Verification System

**MODELS**  
d02 – 7.2  
km; d03  
– 2.4 km

withDA-D02  
withDA-D03  
noDA-D01  
noDA-D02  
version2.2-D01  
GFS (0.25 deg)

Cycles:00z, 06z,  
12z, 18z

Verification stats:  
State Variables  
Precipitation

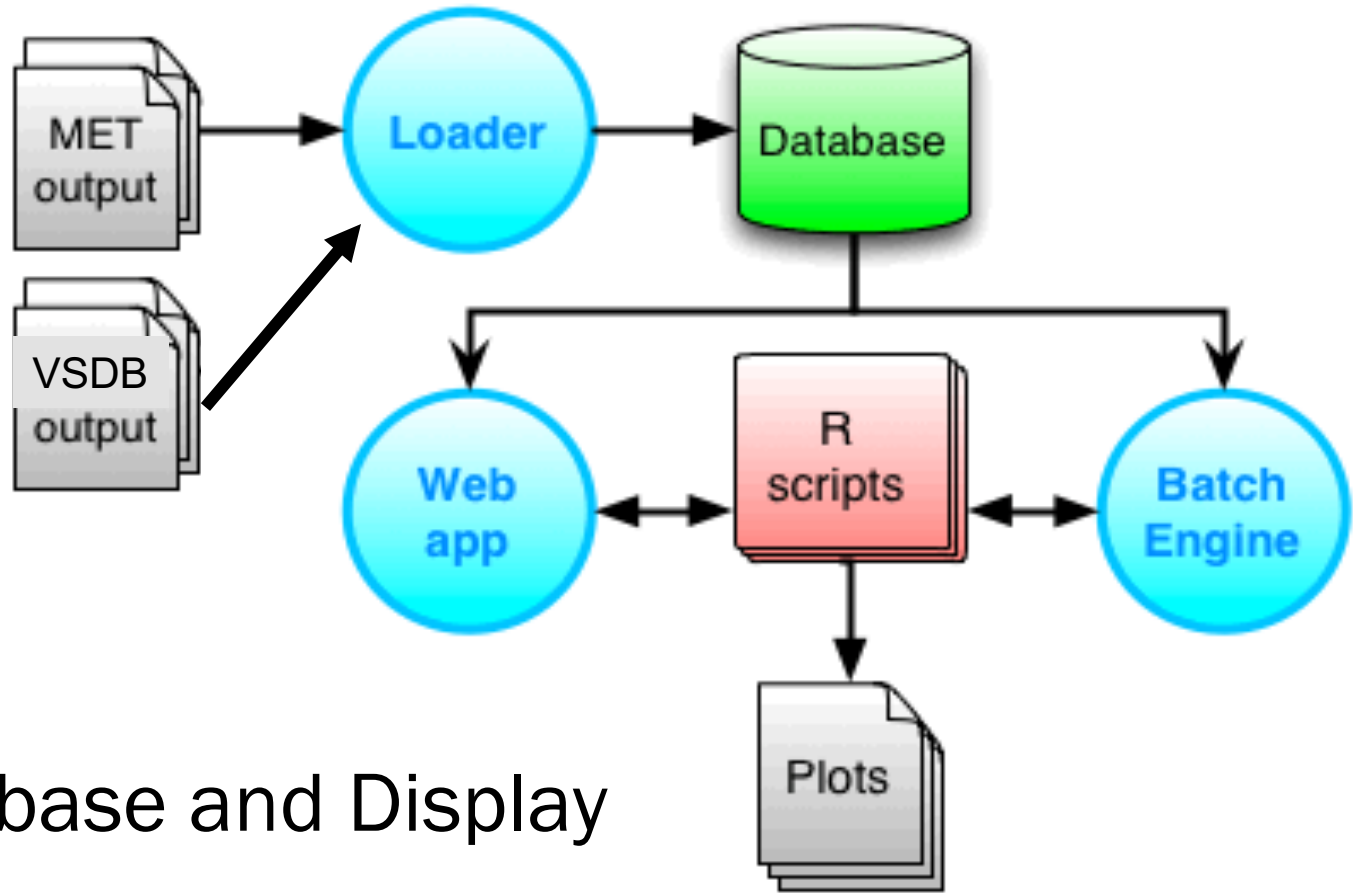


Model

Obs

MET  
Tools

# METviewer Components

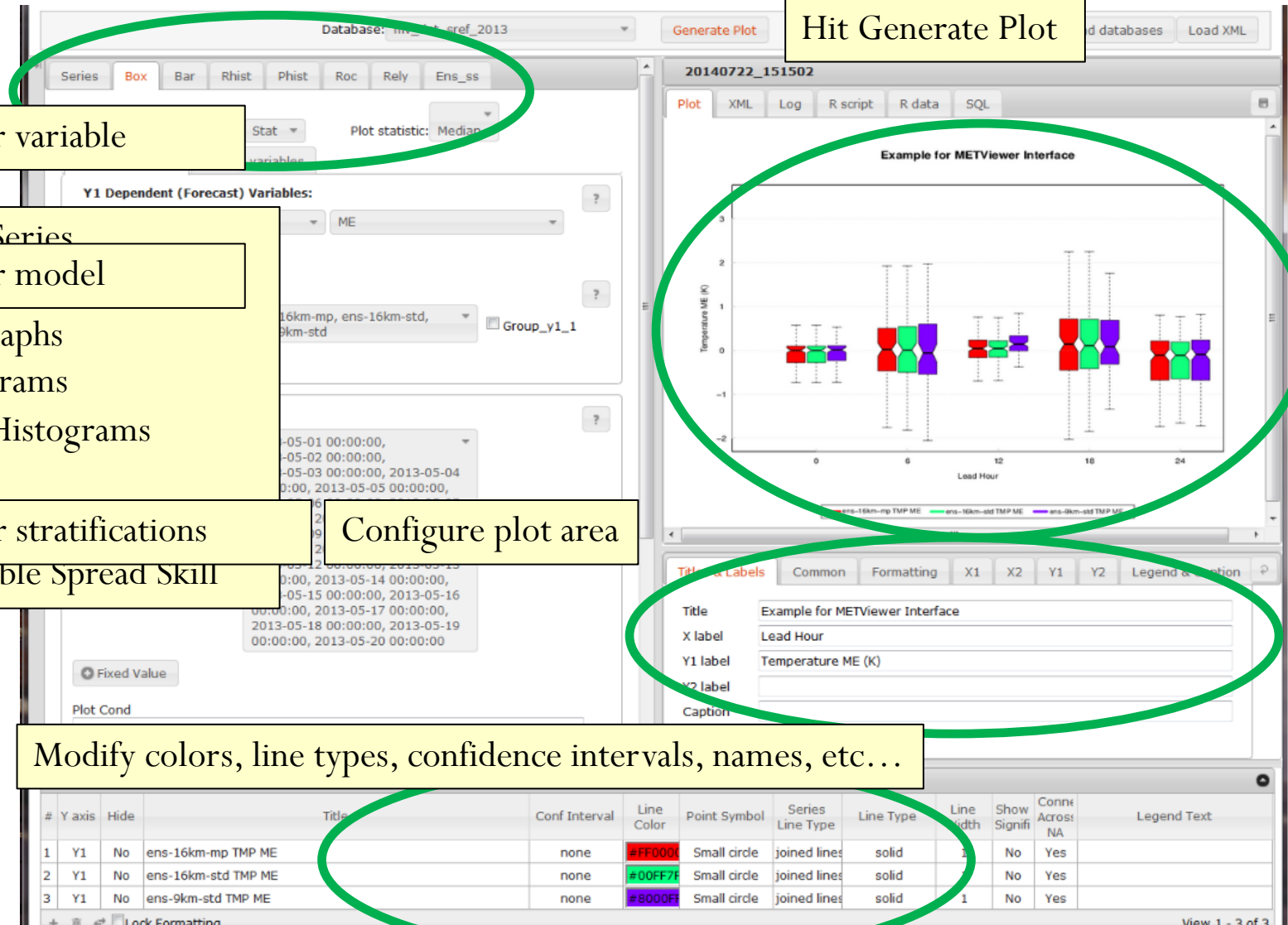


Database and Display

# METviewer

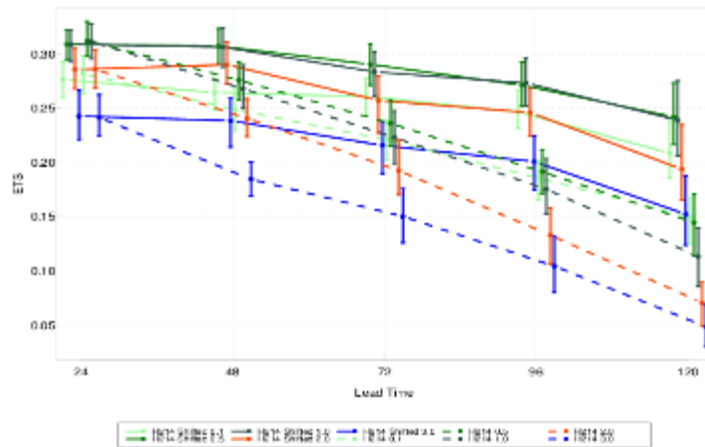
<http://www.dtcenter.org/met/metviewer/metviewer1.jsp>

Many plot options

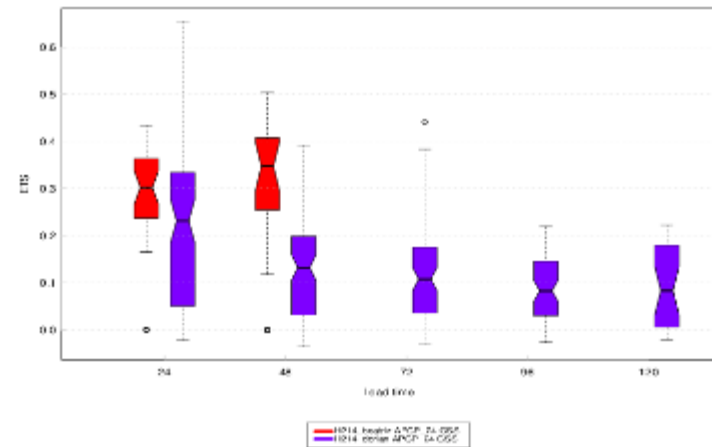


# Examples of plots you can make

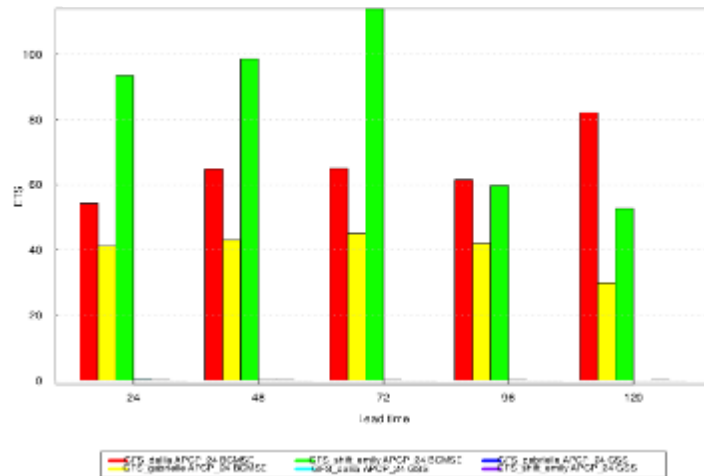
## Time Series



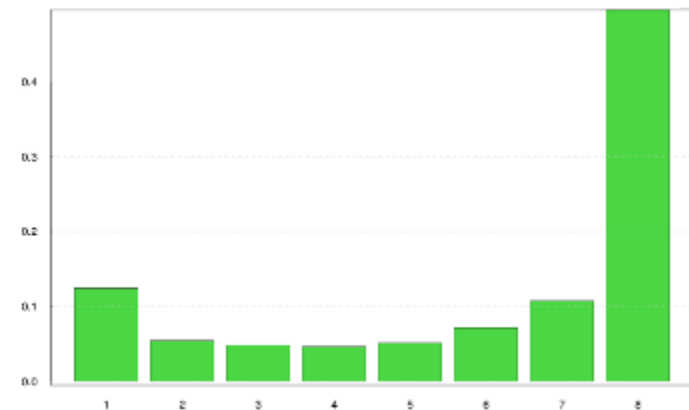
## Box Plots



## Bar Plots



## Histograms



# DTC's METviewer Instance

- <http://www.dtcenter.org/met/metviewer.jsp>
- Always Select :
  1. Database
  2. Plot Type
  3. Variable (Y1 Dependent variable)
  4. What the lines are (Y1 Series variable)
  5. Any stratifications like forecast levels and verification masking regions (FCST\_LV, VX\_MASK)
  6. X-axis (Independent variable)
  7. Aggregation Statistics: CTC (FHO) or SL1L2
  8. Whether you want to Mean or Median plotted

# METviewer

Click on down arrow to pick database

1 Database: mv\_det\_sref\_2013 Generate Plot Reload databases Load XML

Series **Box** Bar Rhist Phist Roc Rely Ens\_ss

Plot Data: Stat Plot statistic: Median

Y1 Axis variables Y2 Axis variables

**Y1 Dependent (Forecast) Variables:**

TMP ME

Variable

**Y1 Series Variables:**

MODEL ens-16km-mp, ens-16km-std, ens-9km-std Group\_y1\_1

Series Variable

**Fixed Values:**

2013-05-01 00:00:00, 2013-05-02 00:00:00, 2013-05-03 00:00:00, 2013-05-04 00:00:00, 2013-05-05 00:00:00, 2013-05-06 00:00:00, 2013-05-07 00:00:00, 2013-05-08 00:00:00, 2013-05-09 00:00:00, 2013-05-10 00:00:00, 2013-05-11 00:00:00, 2013-05-12 00:00:00, 2013-05-13 00:00:00, 2013-05-14 00:00:00, 2013-05-15 00:00:00, 2013-05-16 00:00:00, 2013-05-17 00:00:00, 2013-05-18 00:00:00, 2013-05-19 00:00:00, 2013-05-20 00:00:00

FCST\_INIT\_BEG

Fixed Value

Plot Cond

**20140722\_151502**

Plot XML Log R script R data SQL

**Example for METViewer Interface**

Temperature ME (K)

Lead Hour

ens-16km-mp TMP ME ens-16km-std TMP ME ens-9km-std TMP ME

**Titles & Labels** Common Formatting X1 X2 Y1 Y2 Legend & Caption

Title Example for METViewer Interface

X label Lead Hour

Y1 label Temperature ME (K)

Y2 label

Caption

**Series Formatting**

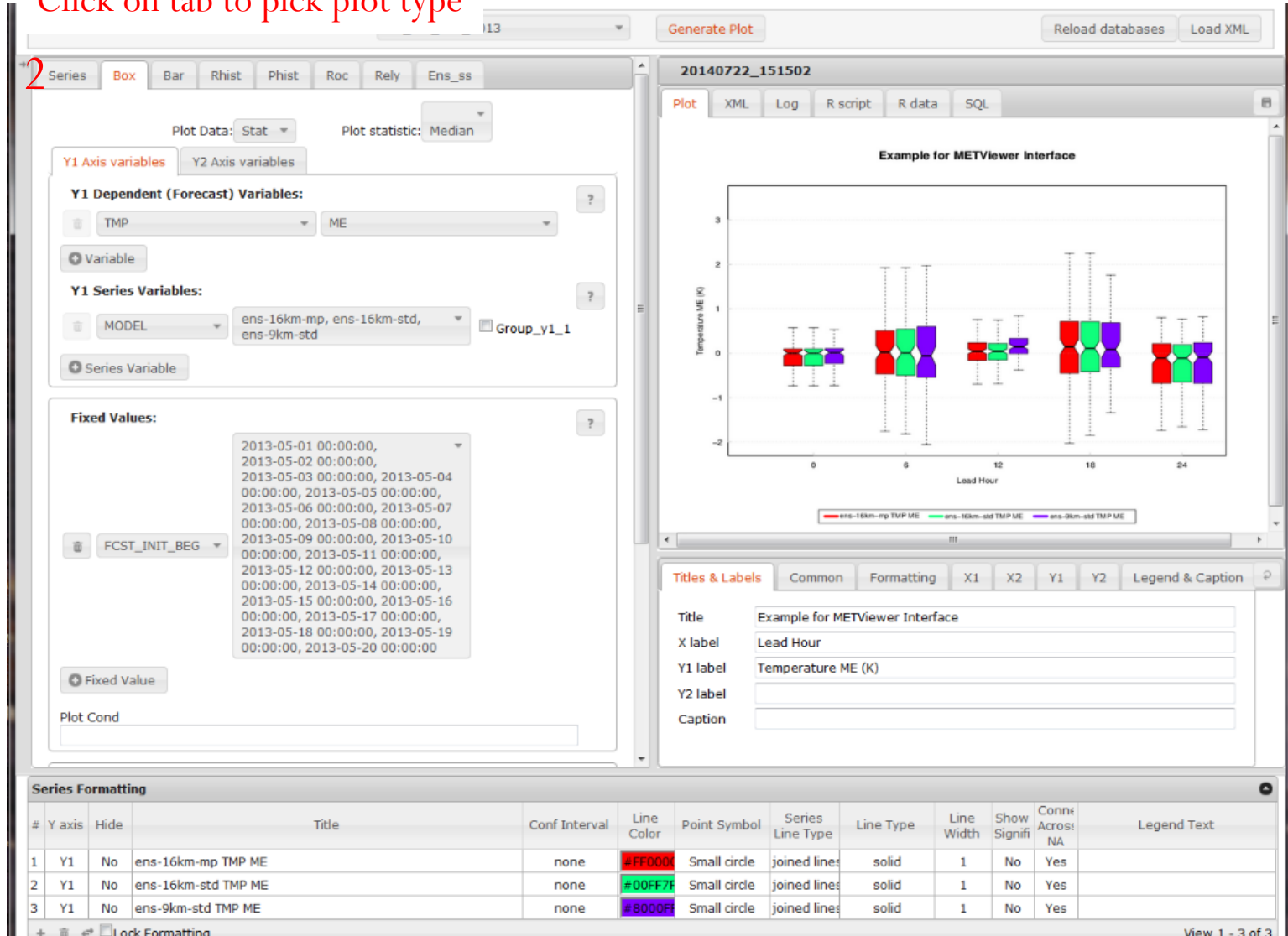
#	Y axis	Hide	Title	Conf Interval	Line Color	Point Symbol	Series Line Type	Line Type	Line Width	Show Signifi	Conn Across	Legend Text
1	Y1	No	ens-16km-mp TMP ME	none	#FF0000	Small circle	joined lines	solid	1	No	Yes	
2	Y1	No	ens-16km-std TMP ME	none	#00FF7F	Small circle	joined lines	solid	1	No	Yes	
3	Y1	No	ens-9km-std TMP ME	none	#8000FF	Small circle	joined lines	solid	1	No	Yes	

Lock Formatting

View 1 of 3

# METviewer

Click on tab to pick plot type





# METviewer

Database: mv\_det\_sref\_2013 Generate Plot Reload databases Load XML

Series **Box** Bar Rhist Phist Roc Rely Ens\_ss

Click on down arrow to pick variable

3

**Y1 Dependent (Forecast) Variables:**

TMP ME

Variable

**Y1 Series Variables:**

MODEL ens-16km-mp, ens-16km-std, ens-9km-std Group\_y1\_1

Series Variable

**Fixed Values:**

2013-05-01 00:00:00, 2013-05-02 00:00:00, 2013-05-03 00:00:00, 2013-05-04 00:00:00, 2013-05-05 00:00:00, 2013-05-06 00:00:00, 2013-05-07 00:00:00, 2013-05-08 00:00:00, 2013-05-09 00:00:00, 2013-05-10 00:00:00, 2013-05-11 00:00:00, 2013-05-12 00:00:00, 2013-05-13 00:00:00, 2013-05-14 00:00:00, 2013-05-15 00:00:00, 2013-05-16 00:00:00, 2013-05-17 00:00:00, 2013-05-18 00:00:00, 2013-05-19 00:00:00, 2013-05-20 00:00:00

FCST\_INIT\_BEG

Fixed Value

Plot Cond

**20140722\_151502**

Plot XML Log R script R data SQL

**Example for METViewer Interface**

Temperature ME (K)

Lead Hour

ens-16km-mp TMP ME ens-16km-std TMP ME ens-9km-std TMP ME

**Titles & Labels** Common Formatting X1 X2 Y1 Y2 Legend & Caption

Title Example for METViewer Interface

X label Lead Hour

Y1 label Temperature ME (K)

Y2 label

Caption

**Series Formatting**

#	Y axis	Hide	Title	Conf Interval	Line Color	Point Symbol	Series Line Type	Line Type	Line Width	Show Signifi	Conn Across NA	Legend Text
1	Y1	No	ens-16km-mp TMP ME	none	#FF0000	Small circle	joined lines	solid	1	No	Yes	
2	Y1	No	ens-16km-std TMP ME	none	#00FF7F	Small circle	joined lines	solid	1	No	Yes	
3	Y1	No	ens-9km-std TMP ME	none	#8000FF	Small circle	joined lines	solid	1	No	Yes	

Lock Formatting

View 1 of 3

# METviewer

Database: mv\_det\_sref\_2013 Generate Plot Reload databases Load XML

Series **Box** Bar Rhist Phist Roc Rely Ens\_ss

Plot Data: Stat Plot statistic: Median

Y1 Axis variables Y2 Axis variables

Variable

**4** Y1 Series Variables:

MODEL ens-16km-mp, ens-16km-std, ens-9km-std Group\_y1\_1

Series Variable

Fixed Values:

2013-05-01 00:00:00, 2013-05-02 00:00:00, 2013-05-03 00:00:00, 2013-05-04 00:00:00, 2013-05-05 00:00:00, 2013-05-06 00:00:00, 2013-05-07 00:00:00, 2013-05-08 00:00:00, 2013-05-09 00:00:00, 2013-05-10 00:00:00, 2013-05-11 00:00:00, 2013-05-12 00:00:00, 2013-05-13 00:00:00, 2013-05-14 00:00:00, 2013-05-15 00:00:00, 2013-05-16 00:00:00, 2013-05-17 00:00:00, 2013-05-18 00:00:00, 2013-05-19 00:00:00, 2013-05-20 00:00:00

FCST\_INIT\_BEG

Fixed Value

Plot Cond

**20140722\_151502**

Plot XML Log R script R data SQL

Example for METViewer Interface

Titles & Labels

Common Formatting X1 X2 Y1 Y2 Legend & Caption

Title Example for METViewer Interface

X label Lead Hour

Y1 label Temperature ME (K)

Y2 label

Caption

**Series Formatting**

#	Y axis	Hide	Title	Conf Interval	Line Color	Point Symbol	Series Line Type	Line Type	Line Width	Show Signifi	Conn Across NA	Legend Text
1	Y1	No	ens-16km-mp TMP ME	none	#FF0000	Small circle	joined lines	solid	1	No	Yes	
2	Y1	No	ens-16km-std TMP ME	none	#00FF7F	Small circle	joined lines	solid	1	No	Yes	
3	Y1	No	ens-9km-std TMP ME	none	#8000FF	Small circle	joined lines	solid	1	No	Yes	

Lock Formatting

View 1 of 3

# METviewer

Database: mv\_det\_sref\_2013 Generate Plot Reload databases Load XML

Series: **Box** Bar Rhist Phist Roc Rely Ens\_ss

Plot Data: Stat Plot statistic: Median

Y1 Axis variables Y2 Axis variables

Y1 Dependent (Forecast) Variables:

TMP ME

Variable

Fixed Values:

2013-05-01 00:00:00,  
2013-05-02 00:00:00,  
2013-05-03 00:00:00, 2013-05-04  
00:00:00, 2013-05-05 00:00:00,  
2013-05-06 00:00:00, 2013-05-07  
00:00:00, 2013-05-08 00:00:00,  
2013-05-09 00:00:00, 2013-05-10  
00:00:00, 2013-05-11 00:00:00,  
2013-05-12 00:00:00, 2013-05-13  
00:00:00, 2013-05-14 00:00:00,  
2013-05-15 00:00:00, 2013-05-16  
00:00:00, 2013-05-17 00:00:00,  
2013-05-18 00:00:00, 2013-05-19  
00:00:00, 2013-05-20 00:00:00

FCST\_INIT\_BEG

Fixed Value

Plot Cond

20140722\_151502

Plot XML Log R script R data SQL

Example for METViewer Interface

Lead Hour

ens-16km-mp TMP ME ens-16km-std TMP ME ens-9km-std TMP ME

Titles & Labels

Common Formatting X1 X2 Y1 Y2 Legend & Caption

Title: Example for METViewer Interface

X label: Lead Hour

Y1 label: Temperature ME (K)

Y2 label:

Caption:

Series Formatting

#	Y axis	Hide	Title	Conf Interval	Line Color	Point Symbol	Series Line Type	Line Type	Line Width	Show Signifi	Conn Across	Legend Text
1	Y1	No	ens-16km-mp TMP ME	none	#FF0000	Small circle	joined lines	solid	1	No	Yes	
2	Y1	No	ens-16km-std TMP ME	none	#00FF7F	Small circle	joined lines	solid	1	No	Yes	
3	Y1	No	ens-9km-std TMP ME	none	#8000FF	Small circle	joined lines	solid	1	No	Yes	

Lock Formatting

View 1 of 3

Fixed Values – you stratifications. For example, thresholds for categorical, init times, date range based on valid time or initialization time

5

# METviewer

*Scrolled down to see remainder of page*

Database: mv\_afvar\_gsi\_control Generate Plot Reload databases Load XML

**Y1 Series Variables:**

MODEL Select value Group\_y1\_1

**Fixed Values:**

FCST\_LEAD Select value

**Independent Variables:**

FCST\_LEAD Select value

**Statistics:**

Summary Aggregation statistics

☐ Contingency table count (CTC)

☐ Scalar partial sums (SL1L2)

☒ None

Plot statistic: Median

**Titles & Labels** Common Formatting X1 X2 Y1 Y2 Legend & Caption

Title test title

X label test x\_label

Y1 label test y\_label

Y2 label

Caption

**Series Formatting**

#	Y axis	Hide	Title	Conf Interval	Line Color	Point Symbol	Series Line Type	Line Type	Line Width	Show Significa	Connect Across NA	Legend Text
+ Add Difference Curve - Remove Difference Curve Apply defaults Lock Formatting												
No records to view												

# METviewer

*Scrolled down to see remainder of page*

IF VSDB files

Pick SL1L2 if plotting continuous statistics (RMSE, MAE etc...)

Pick FHO if plotting categorical statistics (ETS, TSS, Freq. Bias etc...)

Summary – calculated Mean statistics like Perl page does

Aggregate statistics – accumulates SL1L2 lines or FHO counts (actually

Contingency Table Counts – CTC) and then calculates the statistic

Bootstrapping available on the Aggregate Statistics Page

7

Database: mv\_afvar\_gsi\_control Generate Plot Reload databases Load XML

IF VSDB files

Pick SL1L2 if plotting continuous statistics (RMSE, MAE etc...)

Pick FHO if plotting categorical statistics (ETS, TSS, Freq. Bias etc...)

Summary – calculated Mean statistics like Perl page does

Aggregate statistics – accumulates SL1L2 lines or FHO counts (actually

Contingency Table Counts – CTC) and then calculates the statistic

Bootstrapping available on the Aggregate Statistics Page

**Statistics:**

Summary Aggregation statistics

☐ Contingency table count (CTC)

☐ Scalar partial sums (SL1L2)

☒ None

Plot statistic: Median

**Titles & Labels** Common Formatting X1 X2 Y1 Y2 Legend & Caption

Title

X label

Y1 label

Y2 label

Caption

**Series Formatting**

#	Y axis	Hide	Title	Conf Interval	Line Color	Point Symbol	Series Line Type	Line Type	Line Width	Show Significa	Connect Across NA	Legend Text
+ Add Difference Curve - Remove Difference Curve Apply defaults Lock Formatting												
No records to view												

# METviewer

*Scrolled down to see remainder of page*

Database: mv\_afvar\_gsi\_control Generate Plot Reload databases Load XML

**Y1 Series Variables:**

MODEL Select value Group\_y1\_1

**Fixed Values:**

FCST\_LEAD Select value

**Independent Variables:**

FCST\_LEAD Select value

**Plot statistic:** Median

**Series Formatting**

#	Y axis	Hide	Title	Conf Interval	Line Color	Point Symbol	Series Line Type	Line Type	Line Width	Show Significa	Connect Across NA	Legend Text
+ Add Difference Curve - Remove Difference Curve Apply defaults Lock Formatting												
No records to view												

# METviewer

Database: mv\_det\_sref\_2013 Generate Plot Hit Generate Plot Load XML

Series: **Box** Bar Rhist Phist Roc Rely Ens\_ss

Plot Data: Stat Plot statistic: Median

Y1 Axis variables Y2 Axis variables

Y1 Dependent (Forecast) Variables:

TMP ME

Variable

Y1 Series Variables:

MODEL ens-16km-mp, ens-16km-std, ens-9km-std Group\_y1\_1

Series Variable

Fixed Values:

2013-05-01 00:00:00, 2013-05-02 00:00:00, 2013-05-03 00:00:00, 2013-05-04 00:00:00, 2013-05-05 00:00:00, 2013-05-06 00:00:00, 2013-05-07 00:00:00, 2013-05-08 00:00:00, 2013-05-09 00:00:00, 2013-05-10 00:00:00, 2013-05-11 00:00:00, 2013-05-12 00:00:00, 2013-05-13 00:00:00, 2013-05-14 00:00:00, 2013-05-15 00:00:00, 2013-05-16 00:00:00, 2013-05-17 00:00:00, 2013-05-18 00:00:00, 2013-05-19 00:00:00, 2013-05-20 00:00:00

FCST\_INIT\_BEG

Fixed Value

Plot Cond

20140722\_151502

Plot XML Log R script R data SQL

Example for METViewer Interface

Temperature ME (K)

Lead Hour

0 6 12 18 24

Configure plot area

Hit Generate Plot

Example for METViewer Interface

Lead Hour

Temperature ME (K)

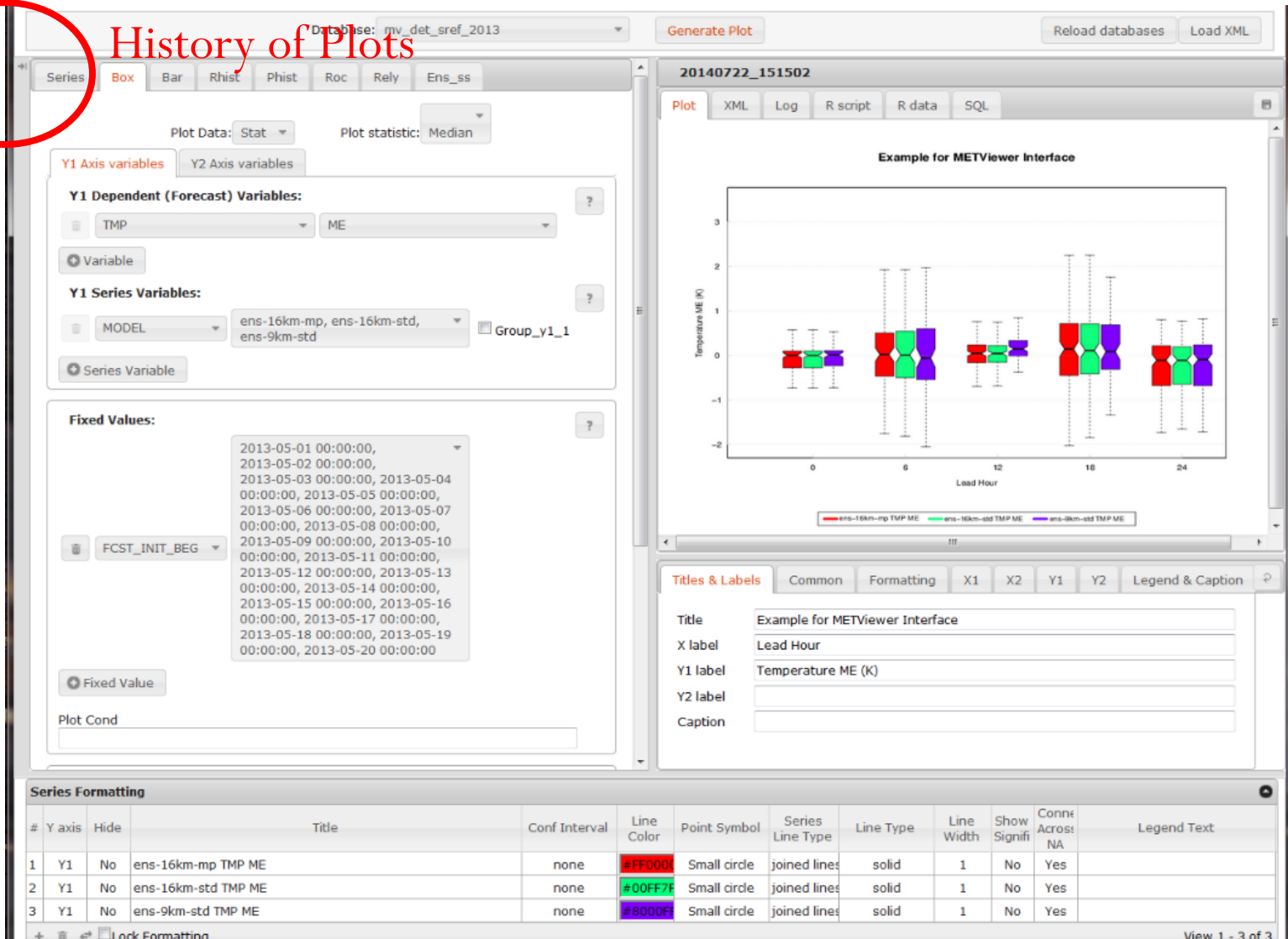
Modify colors, line types, confidence intervals, names, etc...

#	Y axis	Hide	Title	Conf Interval	Line Color	Point Symbol	Series Line Type	Line Type	Line Width	Show Signifi	Conn Across	Legend Text
1	Y1	No	ens-16km-mp TMP ME	none	#FF0000	Small circle	joined lines	solid	2	No	Yes	
2	Y1	No	ens-16km-std TMP ME	none	#00FF7F	Small circle	joined lines	solid	2	No	Yes	
3	Y1	No	ens-9km-std TMP ME	none	#8000FF	Small circle	joined lines	solid	1	No	Yes	

View 1 - 3 of 3

# METviewer

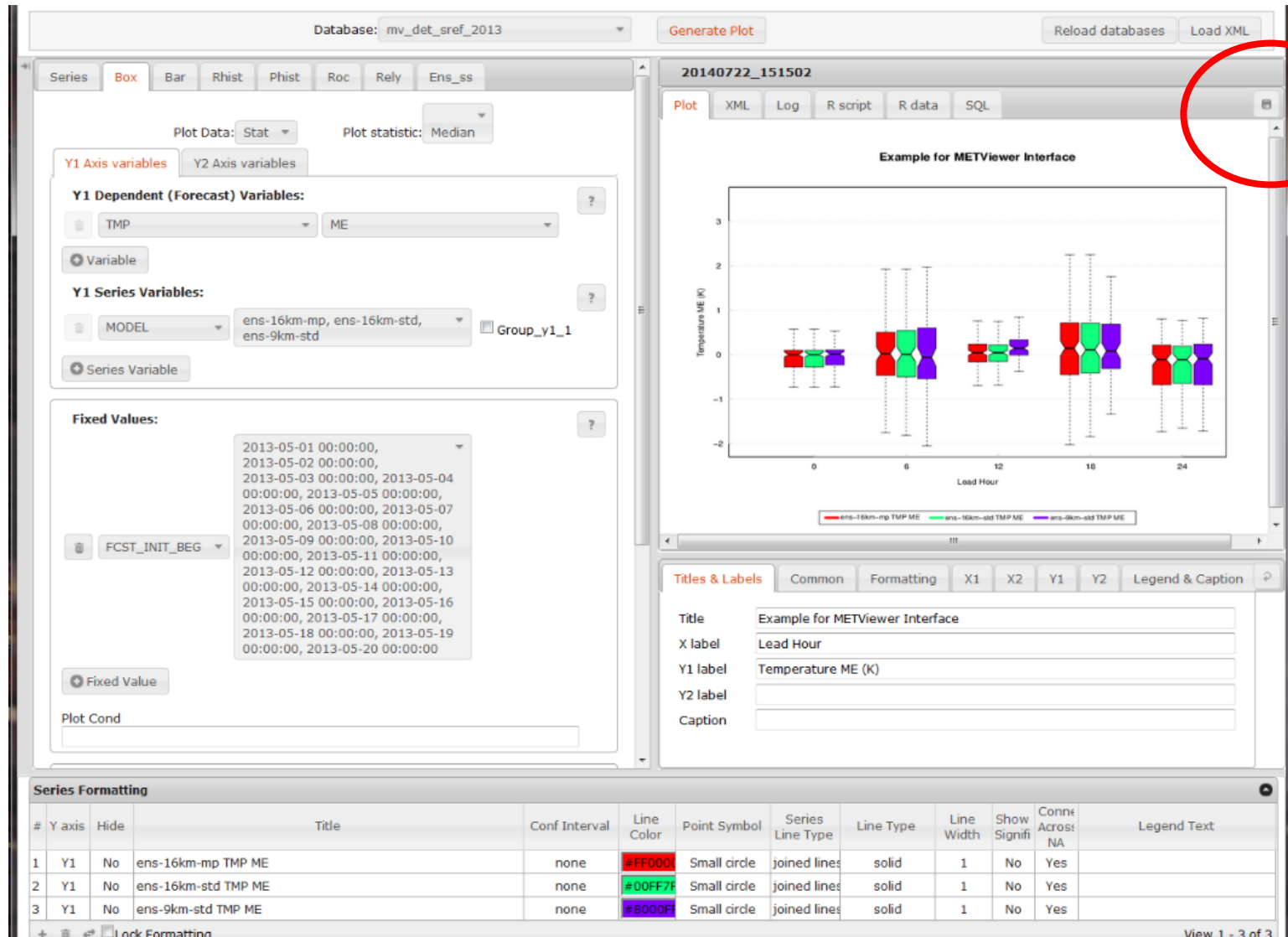
## History of Plots





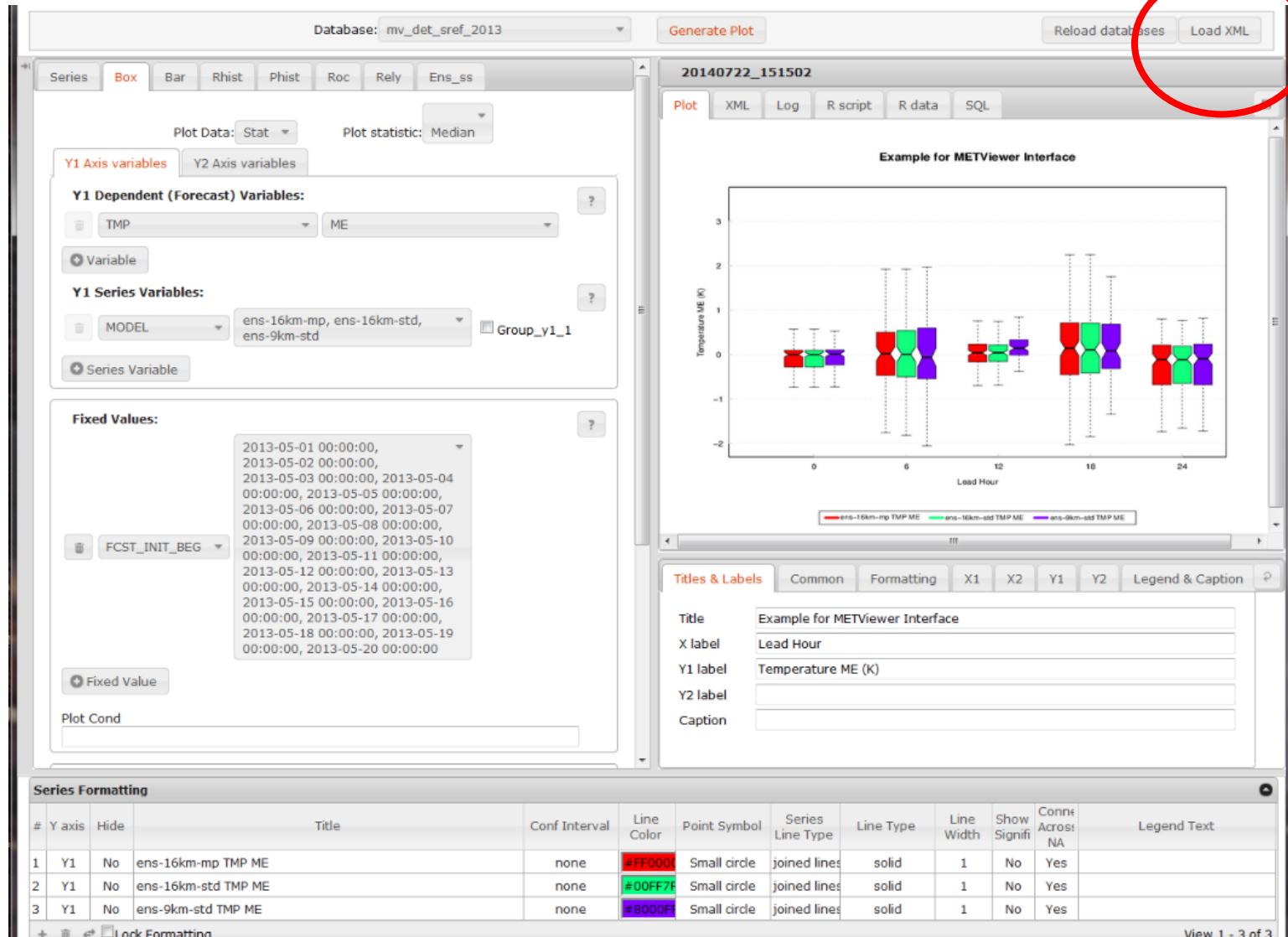
# METviewer

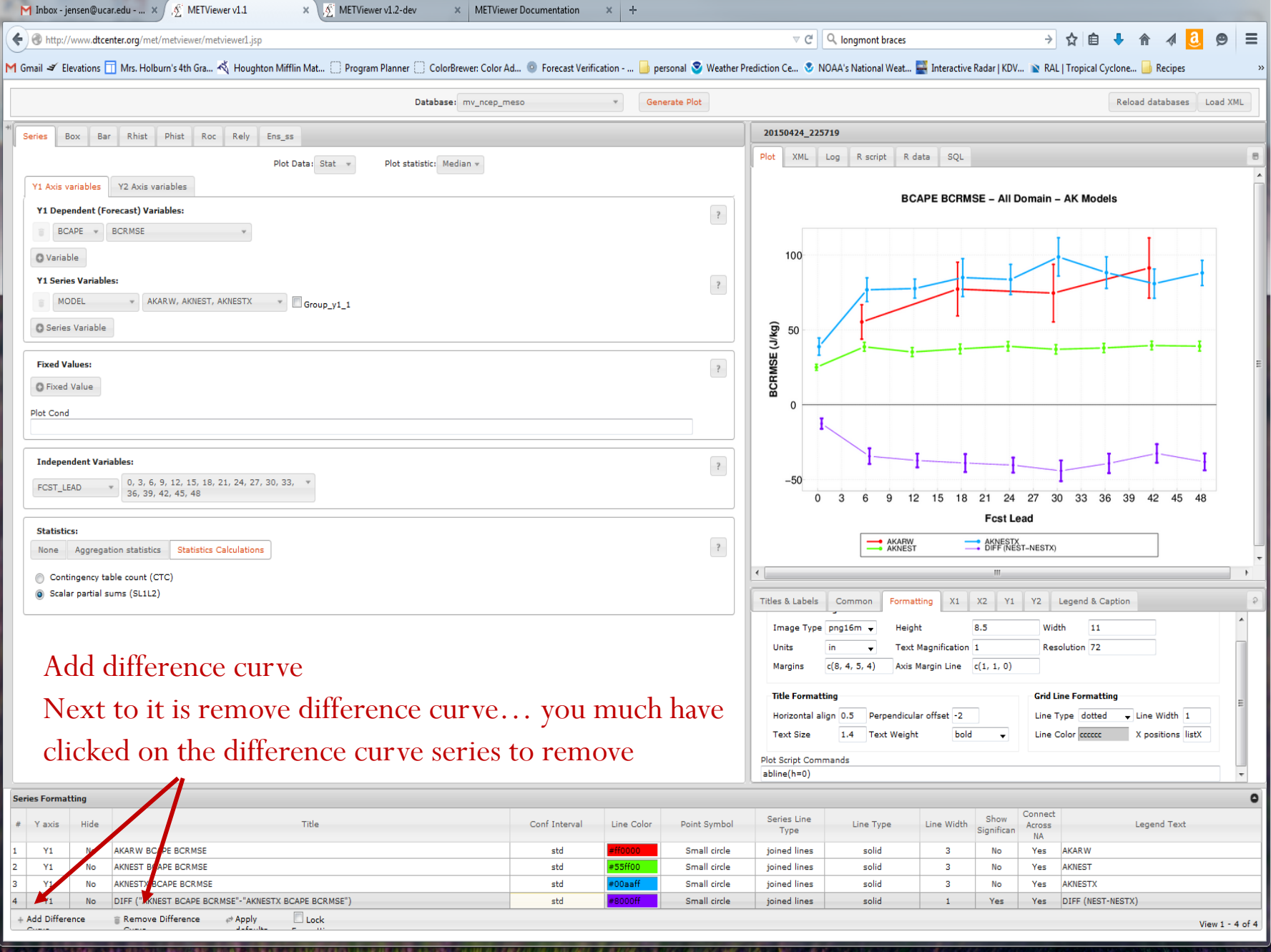
Save Plots, Save XML,  
Save Data based on which  
tab is selected

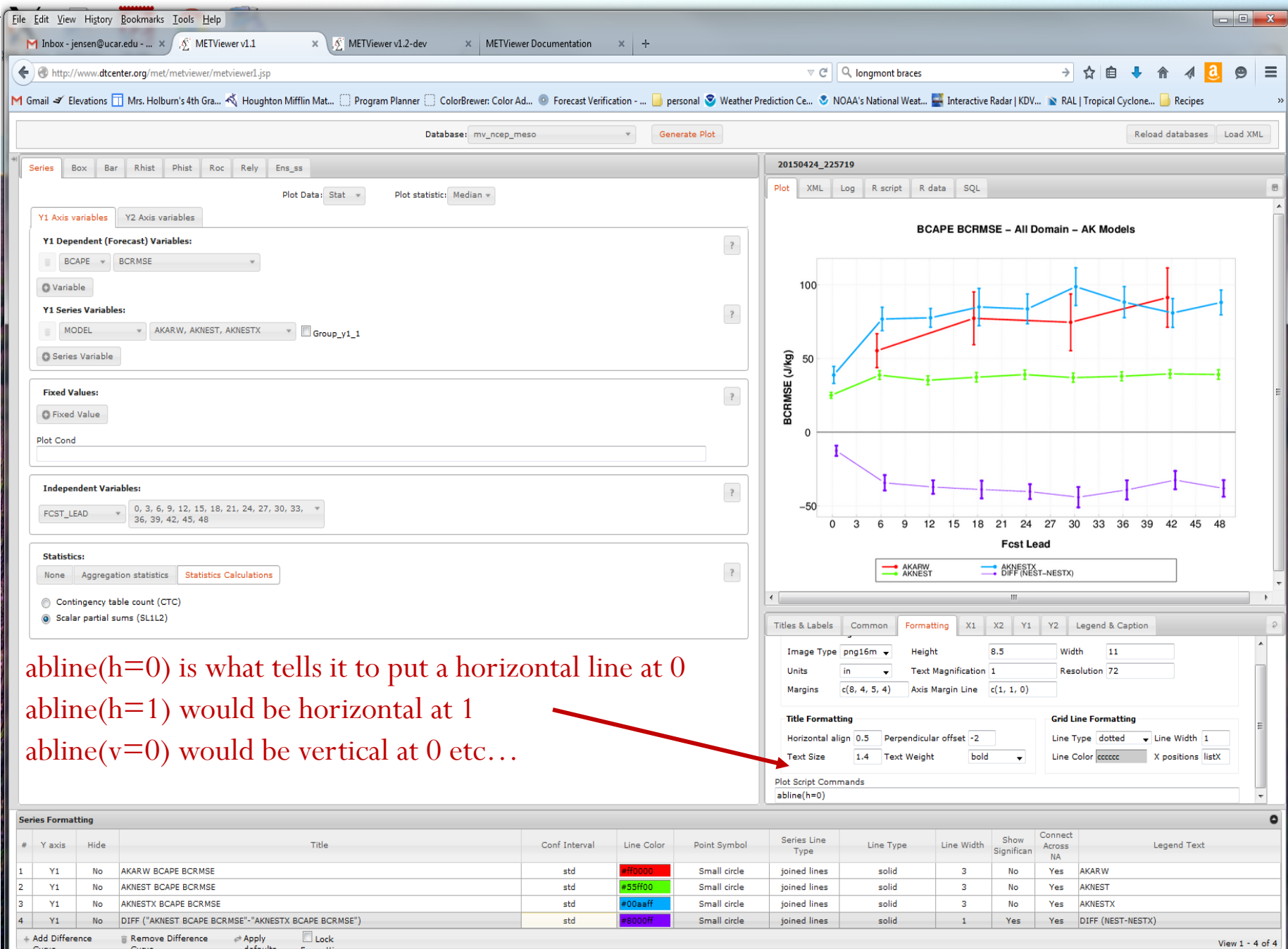


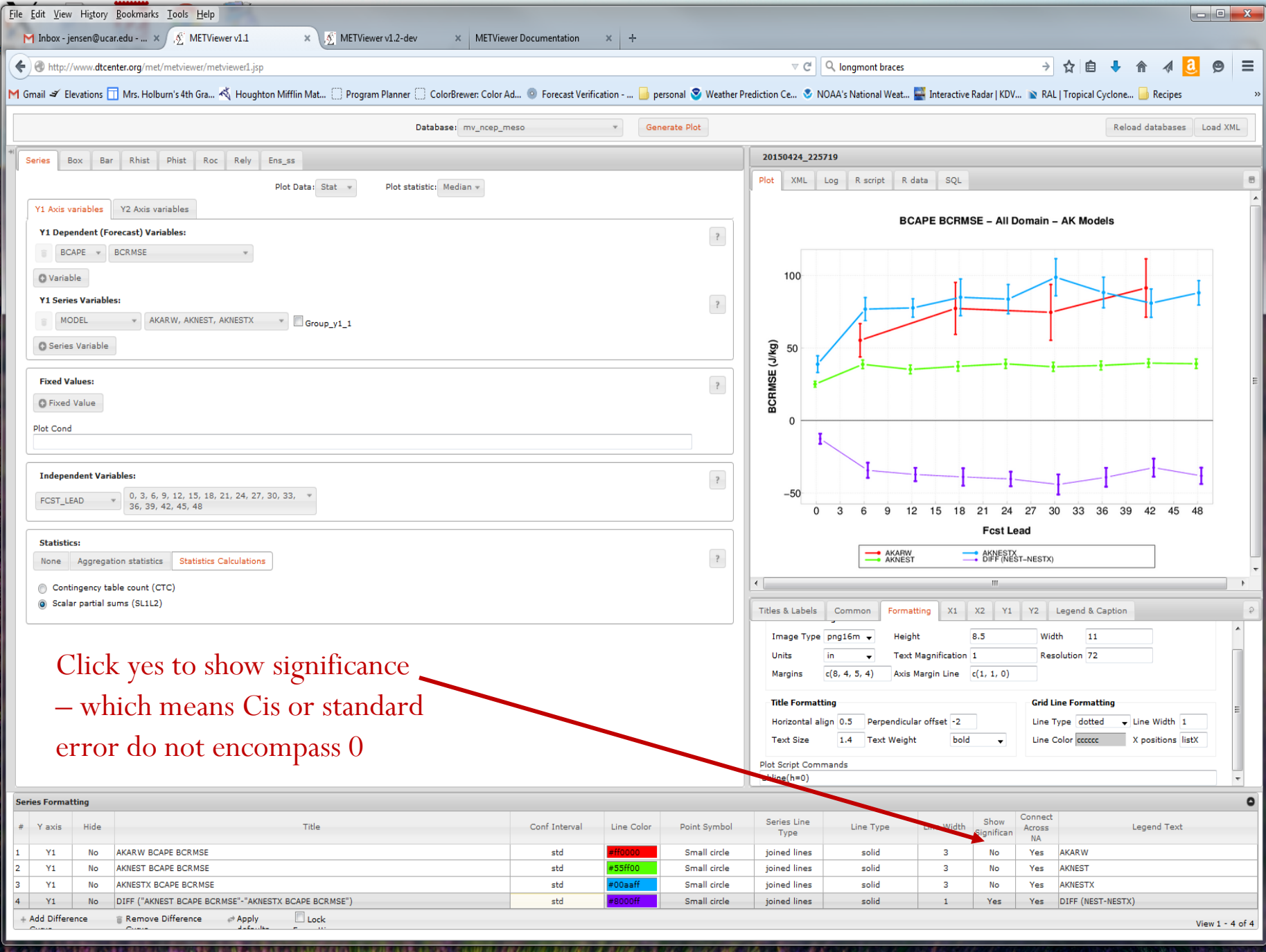
# METviewer

Upload XML scripts  
from your system







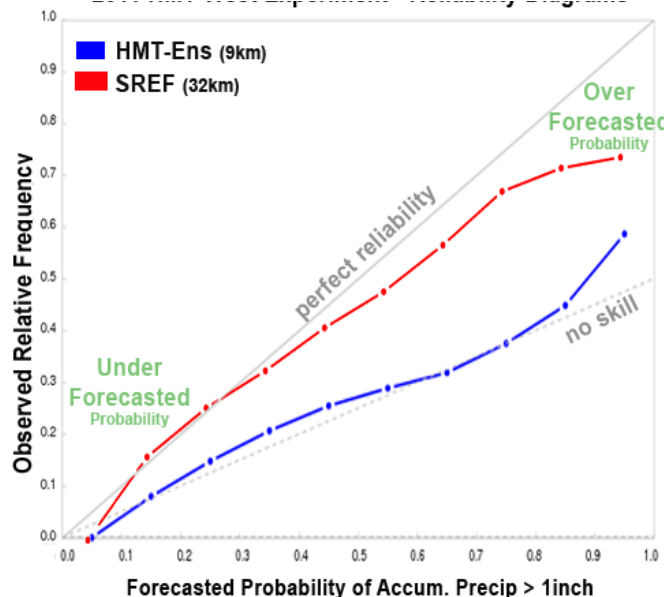


# MET Probability Output (line-types)

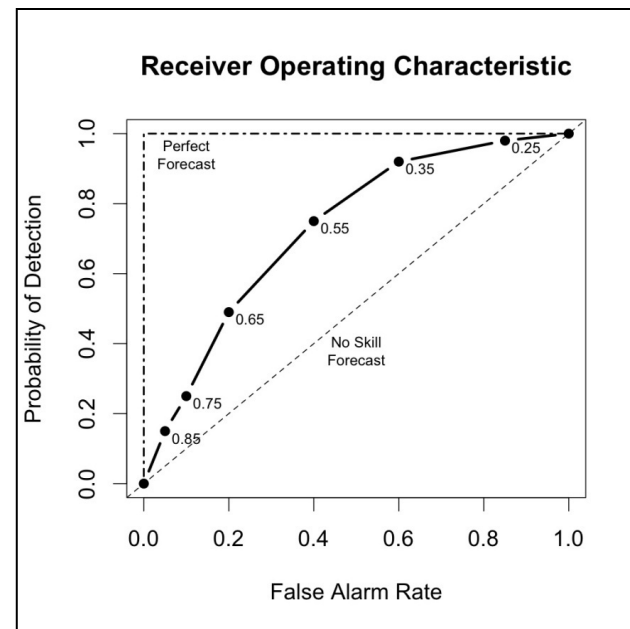
- Output written to MET .stat file and, if desired, to individual text files:
  - PCT – Probability Contingency Table Counts
  - PSTD – Probability Contingency Table Scores
    - Brier Score, Reliability, Resolution, Uncertainty, Area Under ROC
  - PJC – Joint/Continuous Statistics of Probabilistic Variables
    - Calibration, Refinement, Likelihood, Base Rate, Reliability points
  - PRC – ROC Curve Points for Probabilistic Variables
  - ECLV – Economic Cost Loss Value

**We will  
use these  
data for  
the  
Verification  
Exercise**

PJC



PRC



# Let's plot Brier Score and Decomposition

**METviewer 2.11** **mv\_clue\_2018\_uswrp** **Generate Plot**

Series Box Bar Roc Rely Ens\_ss Perf Taylor

Plot Data

Y1 Axis variables Y2 Axis variables

**Y1 Dependent (Forecast) Variables:**

APCP\_01 Select ratio stat Select attribute stat

+ Variable

**Y1 Series Variables:**

FCST\_LEAD Select value ☐ Group\_y1\_1

+ Series Variable

**Fixed Values:**

+ Fixed Value

☐ Event Equalizer

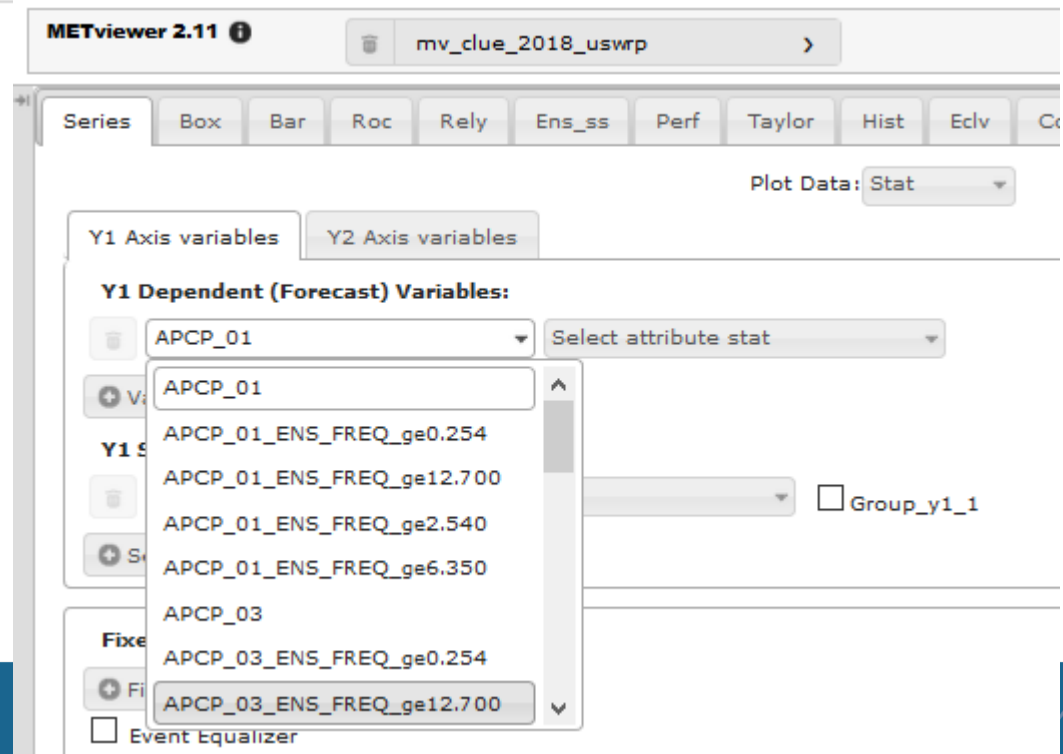
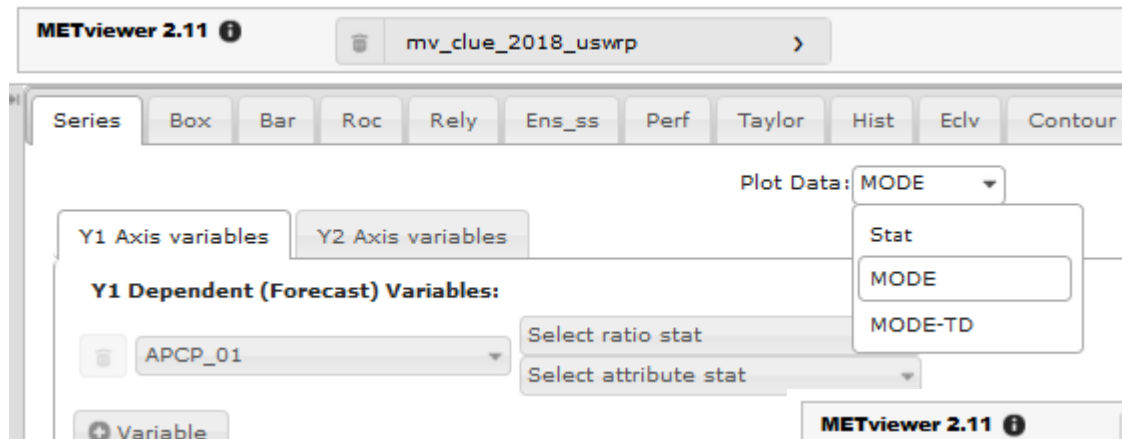
Plot Cond

**Independent Variable:**

Data Assimilation >  
GMTB >  
Hurricanes >  
NOAA ESRL >  
NOAA NCEP >  
RAL Projects >  
**Regional Ensemble**  
Testing >  
Verification >  
NO GROUP >

☐ mv\_caf\_2018test  
☐ mv\_caf\_epic\_test  
☐ mv\_caf\_test  
☐ mv\_clue\_2016\_update  
☐ mv\_clue\_2017\_update  
☐ mv\_clue\_2018\_fv3  
☒ mv\_clue\_2018\_uswrp  
☐ mv\_clue\_2018\_uswrp\_test  
☐ mv\_hrrr\_exp1x8\_soil  
☐ mv\_hrrr\_fy2017

# Let's plot Brier Score and Decomposition





# Let's plot Brier Score and Decomposition

The image displays two screenshots of the METviewer 2.11 web interface, showing the process of selecting variables for a plot. Both screenshots are for the dataset 'mv\_clue\_2018\_uswrp'.

**Top Screenshot:** The 'Series' tab is selected. A dropdown menu is open for 'Y1 Axis variables', showing a list of variables with checkboxes. The 'Check all' button is checked. The variable 'PSTD\_BRIER' is selected (checked).

**Bottom Screenshot:** The 'Series' tab is selected. A dropdown menu is open for 'Y1 Axis variables', showing a list of variables with checkboxes. The 'Check all' button is checked. The variables 'PSTD\_RELIABILITY', 'PSTD\_RESOLUTION', and 'PSTD\_UNCERTAINTY' are selected (checked).

Both screenshots show the 'Y1 Dependent (Forecast) Variable' as 'APCP\_03\_ENS\_FREQ\_ge' and the 'Y1 Series Variables' as 'MODEL'.

# Let's plot Brier Score and Decomposition

**METviewer 2.11** mv\_clue\_2018\_uswrp

Series: Box Bar Roc Rely Ens\_ss Perf Taylor Hist Eclv Contour

Plot Data: Stat

Y1 Axis variables Y2 Axis variables

**Y1 Dependent (Forecast) Variables:**

APCP\_03\_ENS\_FREQ\_ge12.700

PSTD\_BRIER,  
PSTD\_RELIABILITY,  
PSTD\_RESOLUTION,  
PSTD\_UNCERTAINTY

+ Variable

**Y1 Series Variables:**

MODEL multip\_ens\_prob\_hwt ☐ Group\_y1\_1

+ Series Variable

**Fixed Values:**

+ Fixed Value

☐ Event Equalizer

Plot Cond

**Independent Variable:**

FCST\_LEAD Select value ☐ Finalize

☒ Check all ☒ Uncheck all

☒ multip\_ens\_prob\_hwt

☐ singlp\_ens\_prob\_hwt

☐ stoch\_ens\_prob\_hwt

# Let's plot Brier Score and Decomposition

Series Box Bar Roc Rely Ens\_ss Perf Taylor Hist Eclv Contour

Plot Data: Stat

Y1 Axis variables Y2 Axis variables

**Y1 Dependent (Forecast) Variables:**

APCP\_03\_ENS\_FREQ\_ge12.700

PSTD\_BRIER,  
PSTD\_RELIABILITY,  
PSTD\_RESOLUTION,  
PSTD\_UNCERTAINTY

+ Variable

**Y1 Series Variables:**

MODEL multip\_ens\_prob\_hut

+ Series Variable

**Fixed Values:**

VX\_MASK CONUS

+ Fixed Value

☐ Event Equalizer

Plot Cond

**Independent Variable:**

✓ Check all ✗ Uncheck all

☒ CONUS

☐ EAST

☐ WEST

# Let's plot Brier Score and Decomposition

**Fixed Values:**

☐ Equalize

☐ Event Equalizer

Plot Cond

**Independent Variable:**

**Statistics:**

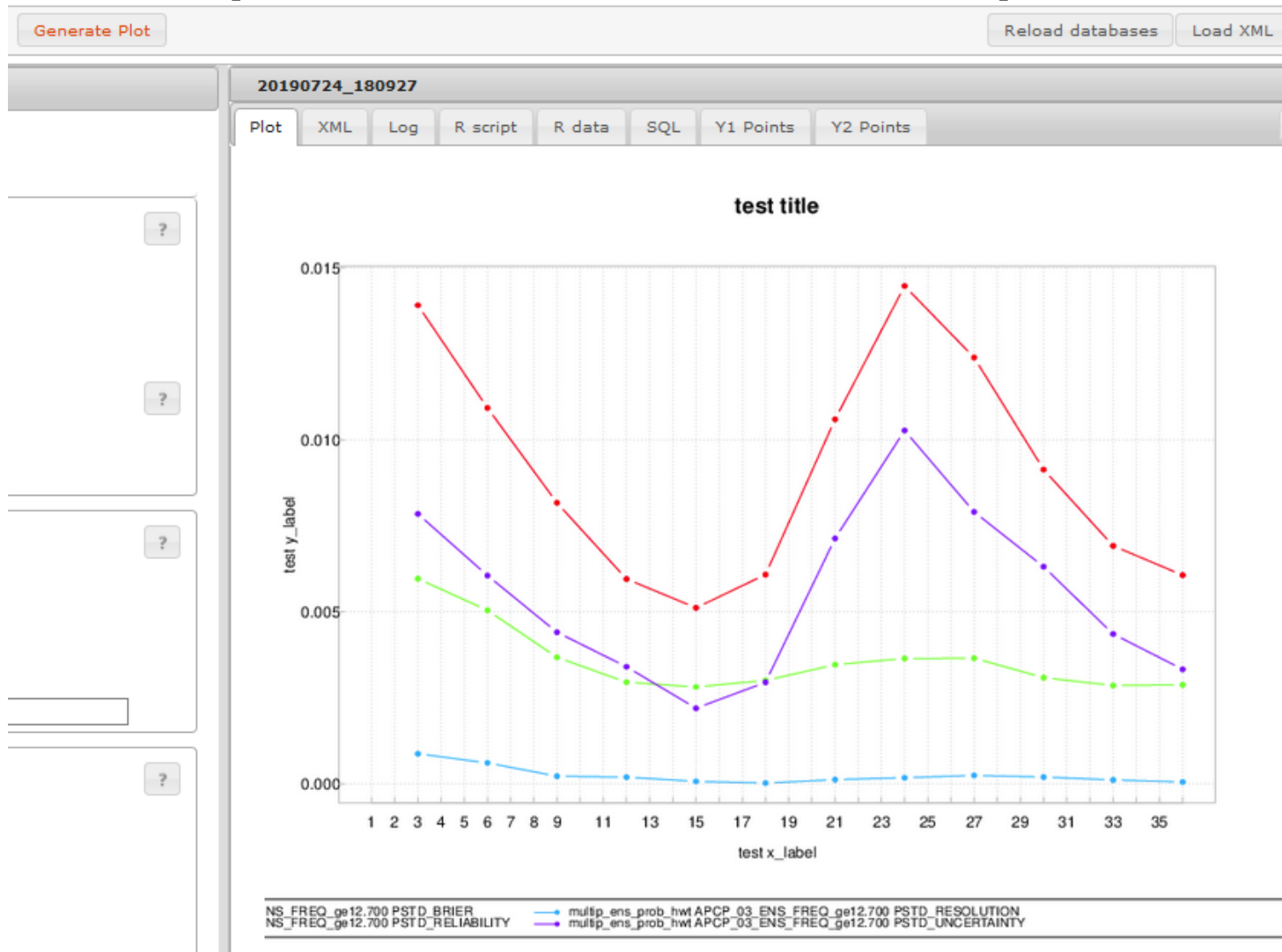
☒ Summary ☐ Aggregation statistics

☒ Check all ☒ Uncheck all

<input checked="" type="checkbox"/>	10000	Label: 1	Plot val: <input type="text"/>
<input checked="" type="checkbox"/>	20000	Label: 2	Plot val: <input type="text"/>
<input checked="" type="checkbox"/>	30000	Label: 3	Plot val: <input type="text"/>
<input checked="" type="checkbox"/>	40000	Label: 4	Plot val: <input type="text"/>
<input checked="" type="checkbox"/>	50000	Label: 5	Plot val: <input type="text"/>
<input checked="" type="checkbox"/>	60000	Label: 6	Plot val: <input type="text"/>
<input checked="" type="checkbox"/>	70000	Label: 7	Plot val: <input type="text"/>
<input checked="" type="checkbox"/>	80000	Label: 8	Plot val: <input type="text"/>
<input checked="" type="checkbox"/>	90000	Label: 9	Plot val: <input type="text"/>
<input checked="" type="checkbox"/>	100000	Label: 10	Plot val: <input type="text"/>
<input checked="" type="checkbox"/>	110000	Label: 11	Plot val: <input type="text"/>
<input checked="" type="checkbox"/>	120000	Label: 12	Plot val: <input type="text"/>

Statistic: Median

# Let's plot Brier Score and Decomposition



# Let's plot Brier Score and Decomposition

Titles & Labels

Common

Formatting

X1

X2

Y1

Y2

Legend & Caption

Job title

Keep Revisions ☐

Plot title

Brier Score Example

X label

Lead Time

Y1 label

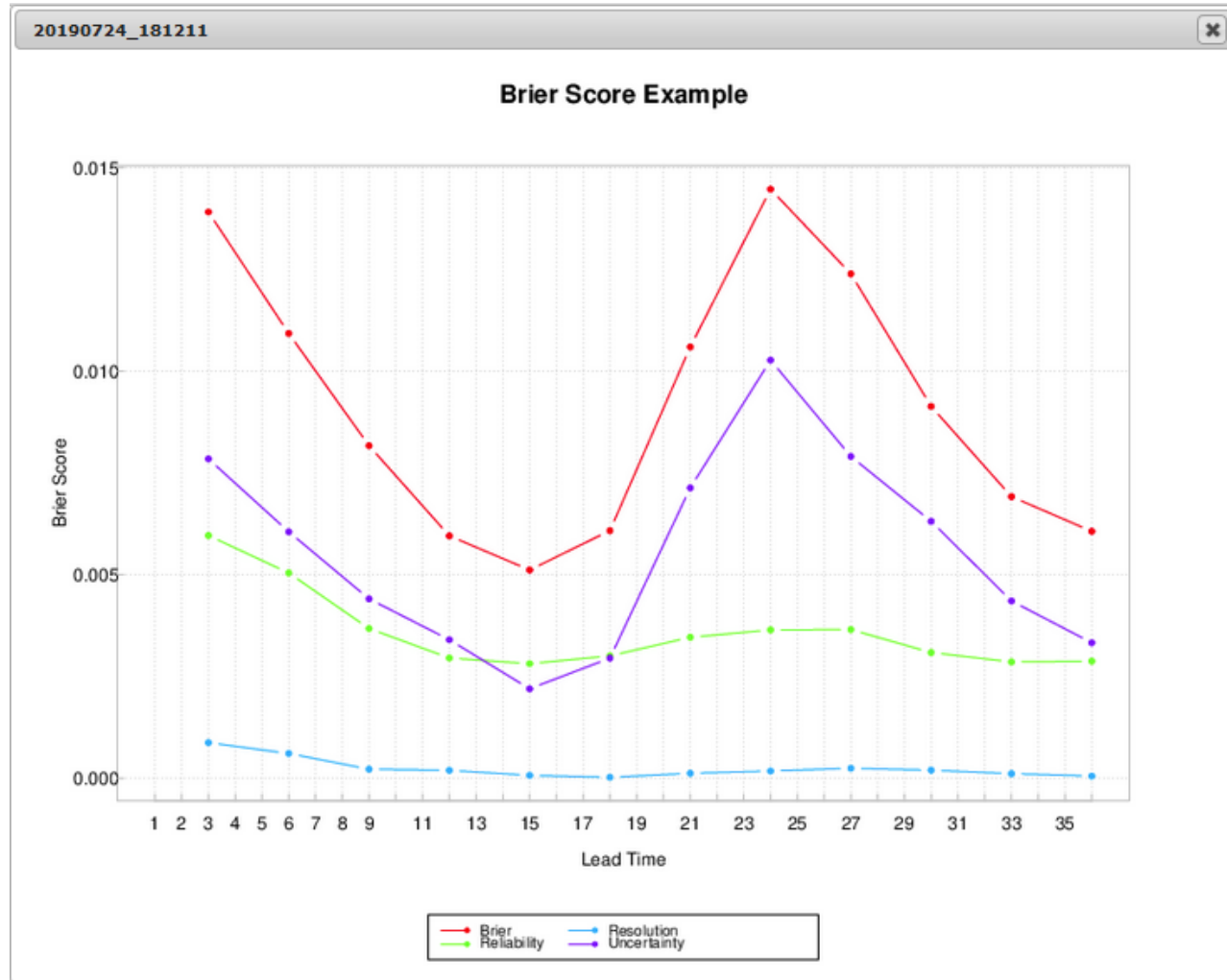
Brier Score

Y2 label

Caption

Plot Symbol	Series Line Type	Line Type	Line Width	Show Significance	Connect Across NA	Legend Text
all circle	joined lines	solid	1	No	Yes	Brier
all circle	joined lines	solid	1	No	Yes	Reliability
all circle	joined lines	solid	1	No	Yes	Resolution
all circle	joined lines	solid	1	No	Yes	Uncertainty

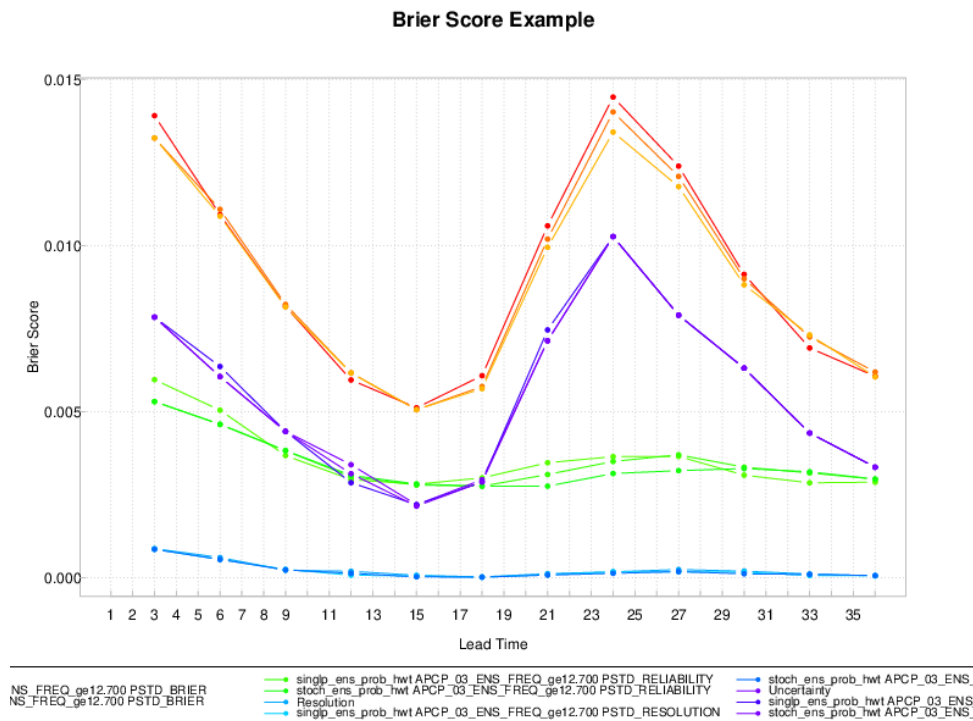
# Let's plot Brier Score and Decomposition



us?

# Can we compare several models?

Add the two other models





# East vs. West?

Select only Brier Score (Delete All the select Brier Score)

Remove two models

Add Y1 Series Variable and select

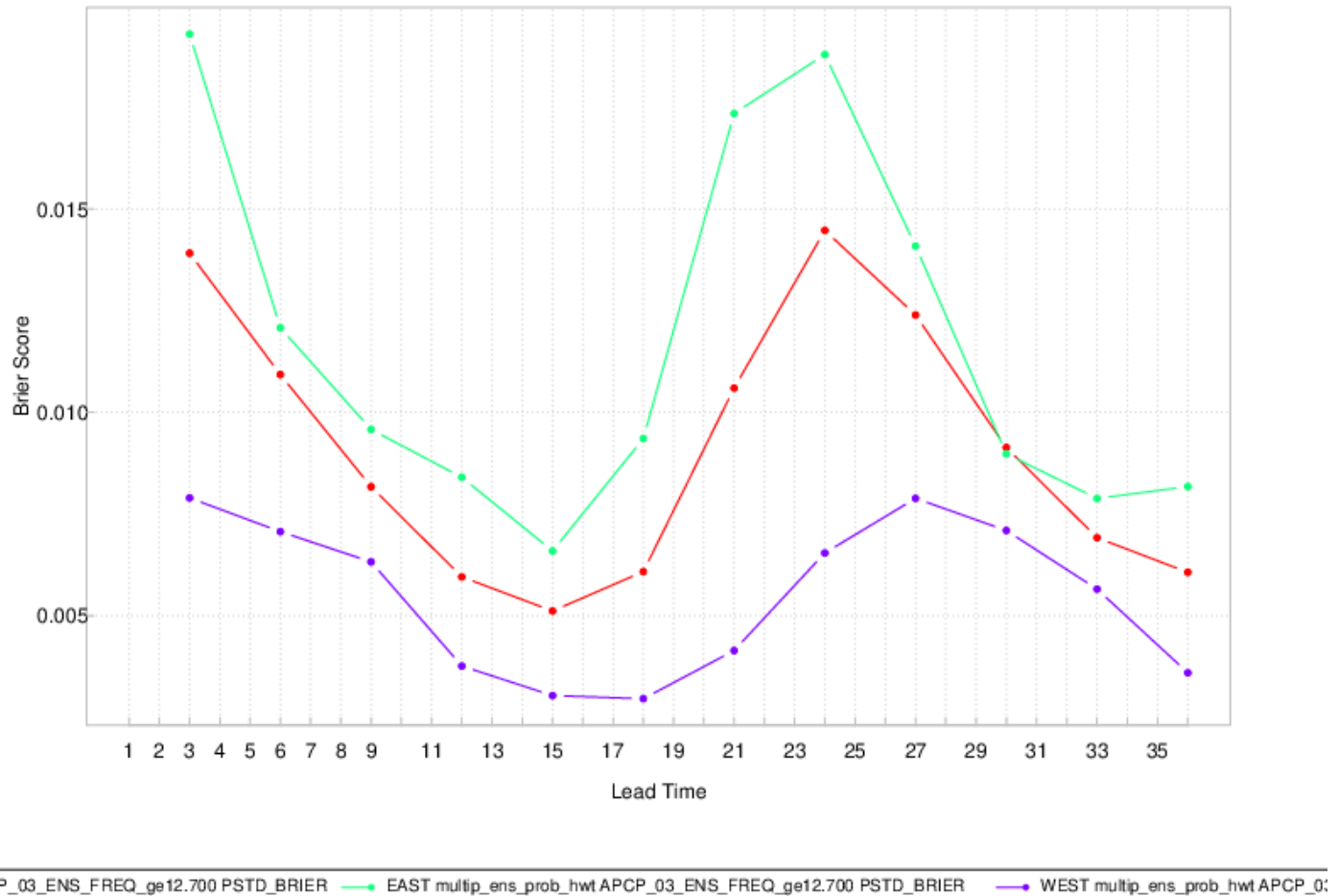
VX\_Mask -> CON

Remove Fixed

Value entry

## Explore a little

Brier Score Example

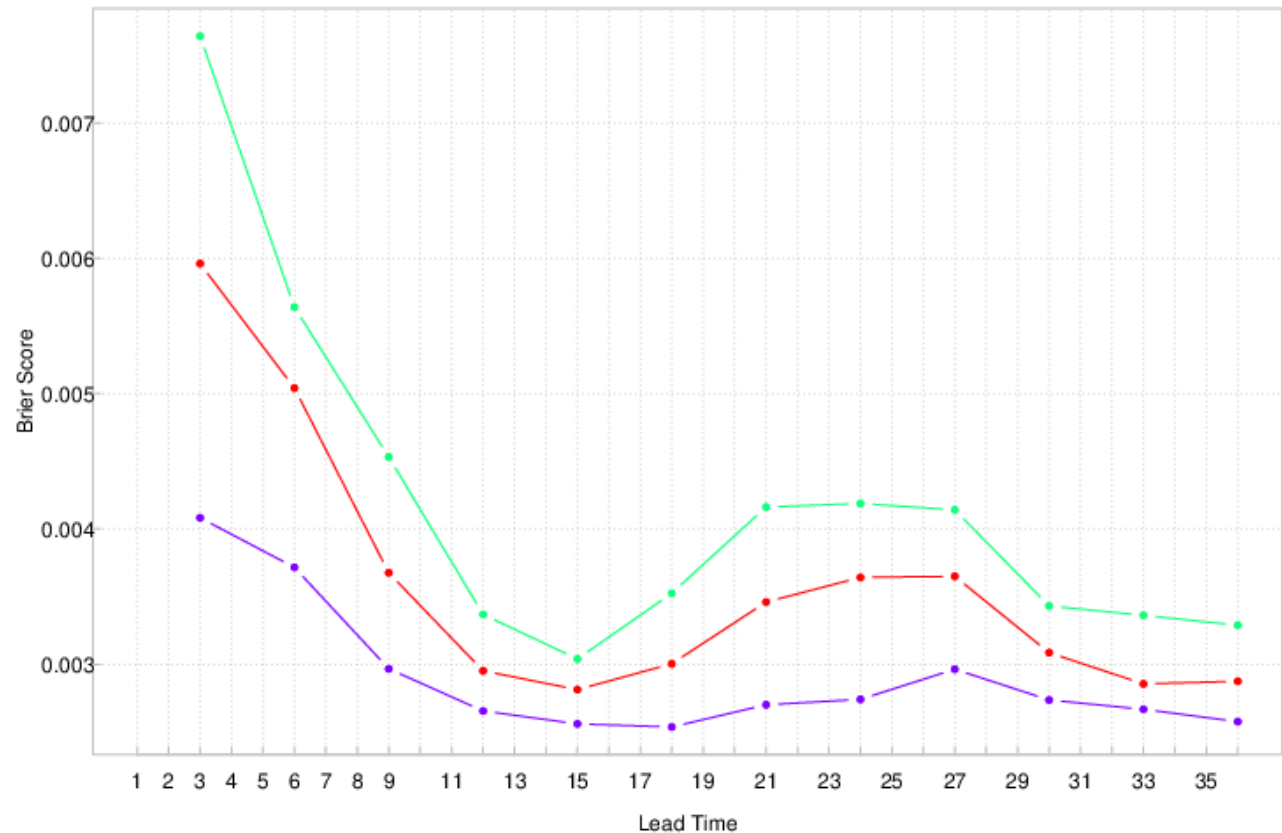


# Explore a little

## Do scores change if stratified East vs. West?

Select only Reliabil

Brier Score Example

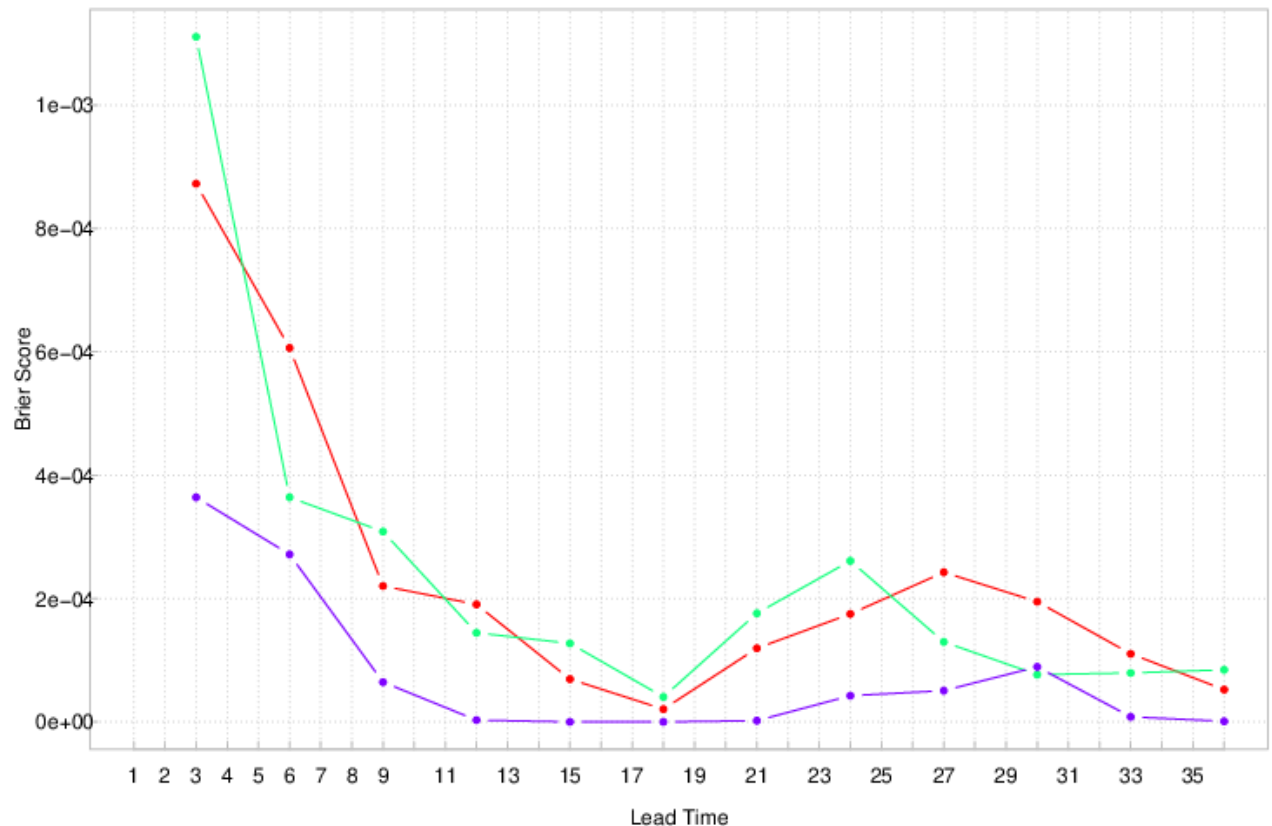


# Explore a little

Do score  
East vs.

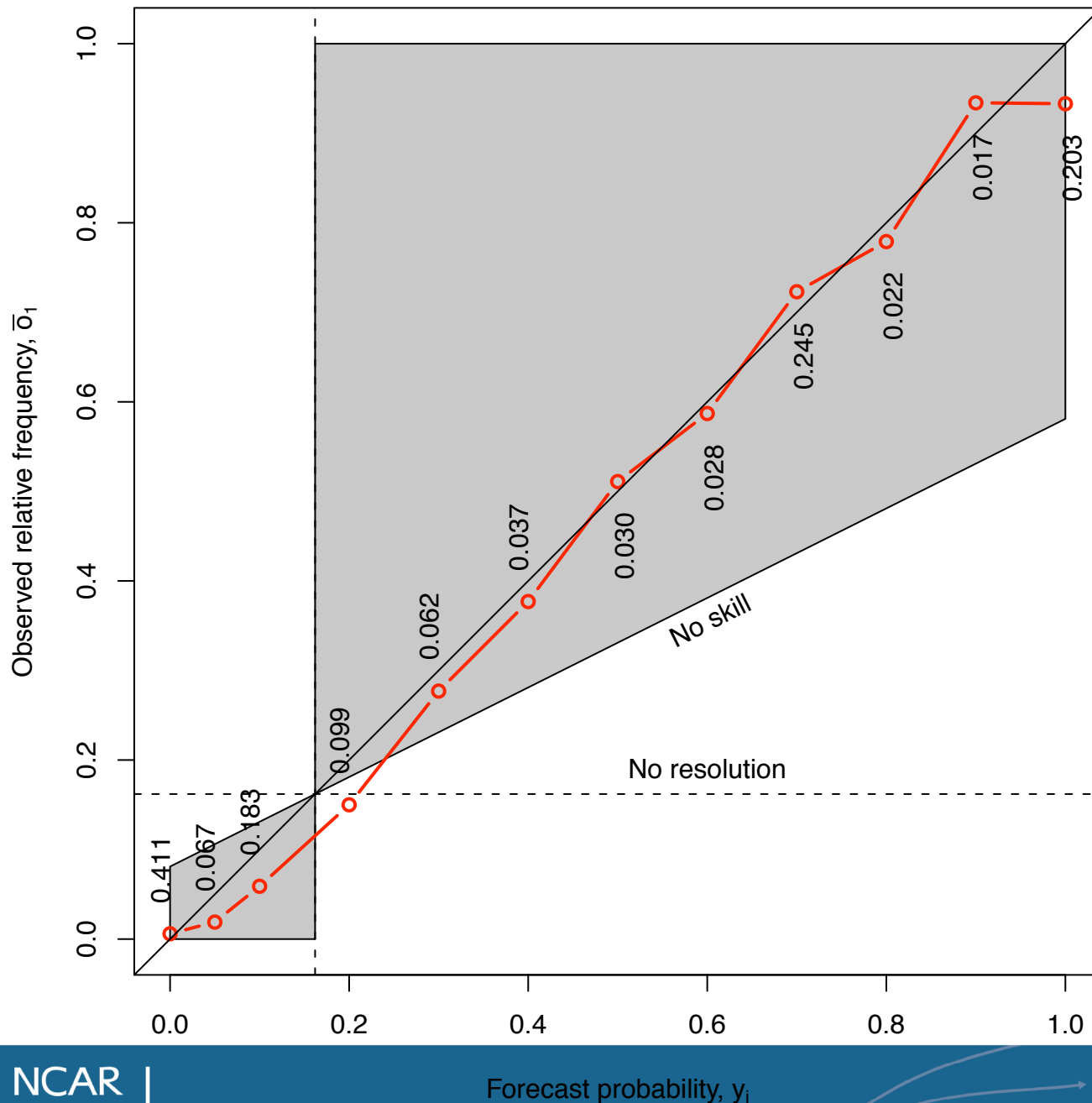
Select only Resoluti

Brier Score Example



# Reliability (Attribute) diagram

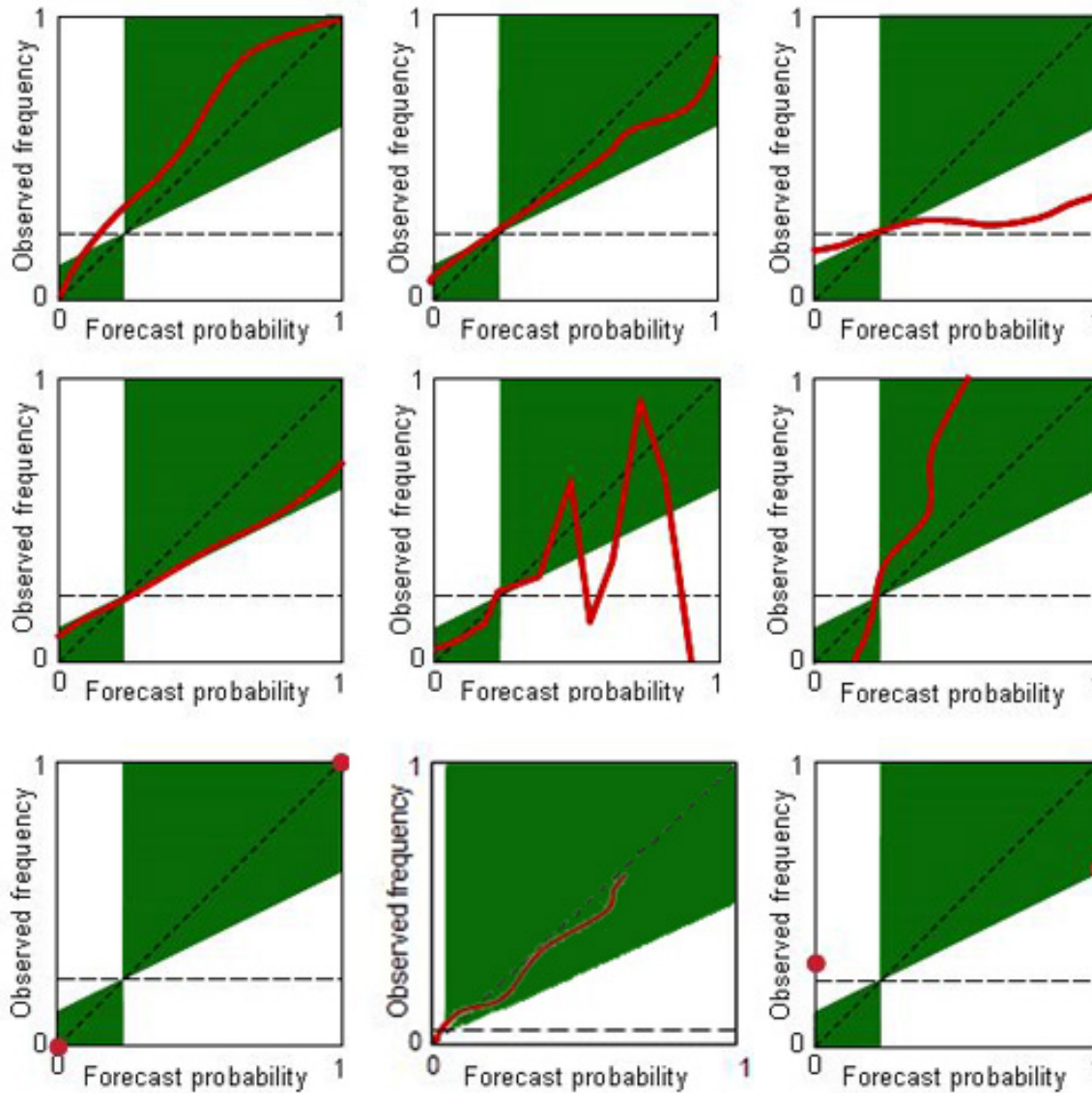
- Analogous to the scatter plot- same intuition holds.
- Data must be binned!
- Hides how much data is represented by each
- Expresses conditional probabilities.
- Confidence intervals can illustrate the problems with small sample sizes.



**Reliability diagram** plots observed frequency of event vs probability forecasted for event;

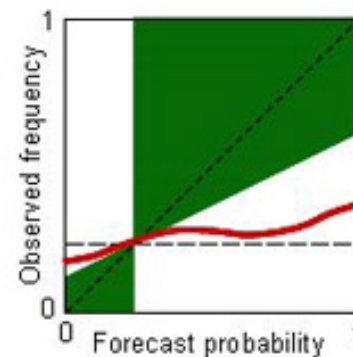
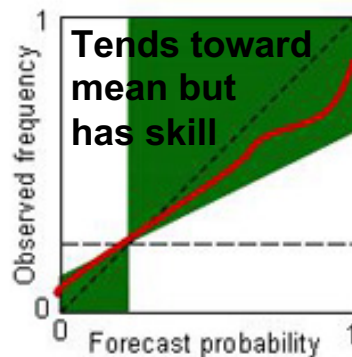
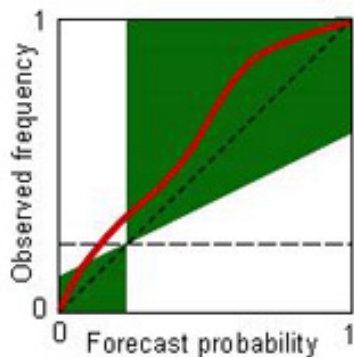
**Attribute diagram** adds lines to show how connected line (reliability) relates to Resolution and skill

# Reliability Diagram Exercise



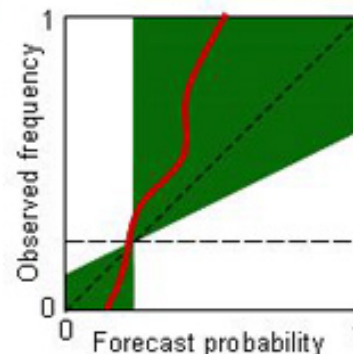
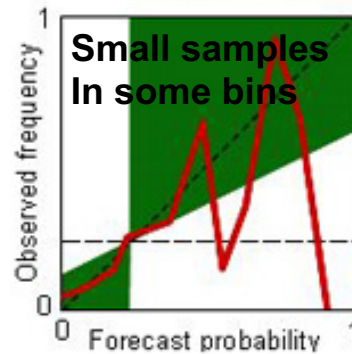
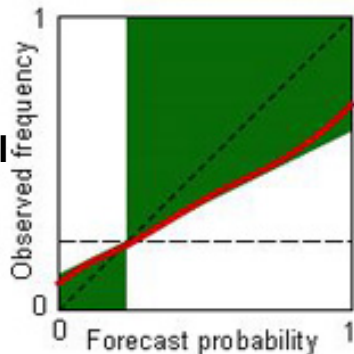
# Reliability Diagram Exercise

Probabilities  
underforecast



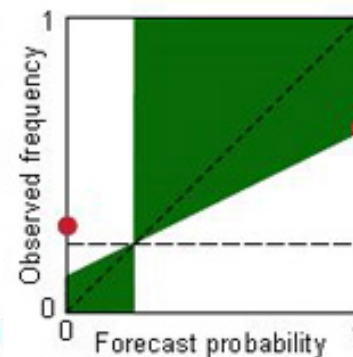
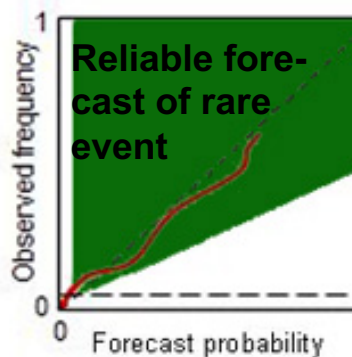
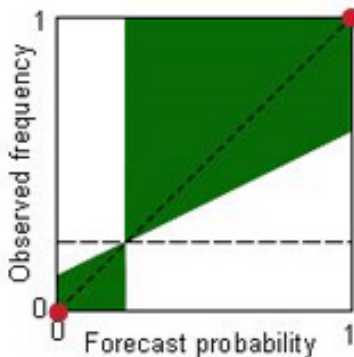
No resolution

Essentially  
no skill



Over-  
resolved  
forecast

Perfect  
forecast



Typical  
categorical  
forecast

# Select Rely Tab

**METviewer 2.11** mv\_clue\_2018\_uswrp > Generate Plot

**History**

All Success

20190724\_182439  
20190724\_182421  
20190724\_182404  
20190724\_182202  
20190724\_182138  
20190724\_181447  
20190724\_181211  
20190724\_180927  
20190724\_164409  
20190724\_142634  
20190724\_142558  
20190724\_142443  
20190724\_142313  
20190724\_142257  
20190724\_142144  
20190724\_142132  
20190724\_142024

**Series** Box Bar Roc **Rely** Ens\_ss Perf Taylor Hist Eclv Contour

**Series Variables:**

Series Variable

**Specialized Plot Fixed Values:**

FCST\_VAR Select value ☐ Equalize

Fixed Value

☐ Event Equalizer

Plot Cond

**Reliability Event Histogram**

Yes No ☒ Add skill line ☒ Add reference line

**Summary Curve**

Select options

**Aggregation options**

1 Bootstrapping replications  Bootstrapping seed

perc Confidence Interval method ☐ Cache aggregation statistics



# Select Model, Fcst Var and Region

The image displays three screenshots of a software interface, illustrating the steps to select a model, forecast variable, and region. Red arrows indicate the sequence of actions.

**Top Screenshot:** The 'Series Variables' dropdown menu is open, showing a list of variables. The 'multip\_ens\_prob\_hwt' variable is selected. The 'Specialized Plot Fixed Values' section shows the 'FCST\_VAR' dropdown menu open, with 'APCP\_03\_ENS\_FREQ\_ge12.700' selected. The 'Event Equalizer Plot Cond' checkbox is checked.

**Middle Screenshot:** The 'Series Variables' dropdown menu is open, showing a list of variables. The 'multip\_ens\_hwt' variable is selected. The 'Specialized Plot Fixed Values' section shows the 'FCST\_VAR' dropdown menu open, with 'APCP\_03\_ENS\_FREQ\_ge12.700' selected. The 'Event Equalizer Plot Cond' checkbox is checked.

**Bottom Screenshot:** The 'Series Variables' dropdown menu is open, showing a list of variables. The 'multip\_ens\_hwt' variable is selected. The 'Specialized Plot Fixed Values' section shows the 'FCST\_VAR' dropdown menu open, with 'APCP\_03\_ENS\_FREQ\_ge12.700' selected. The 'Event Equalizer Plot Cond' checkbox is checked. The 'Region' dropdown menu is open, showing a list of regions. The 'CONUS' region is selected.

# Generate Plot

Titles & Labels

Common

Form

Job title

Plot title

Reliability Diagram

X label

Forecast Probability

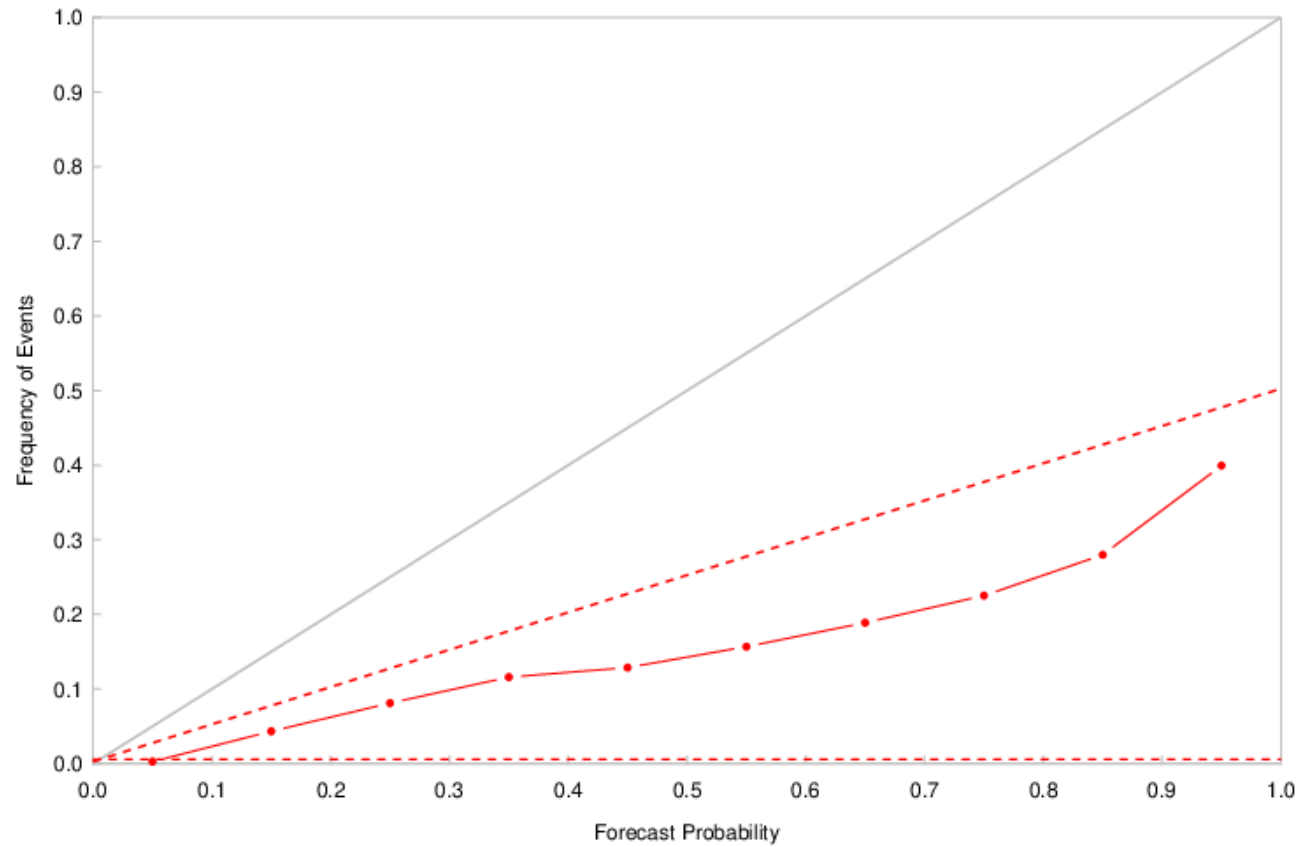
Y1 label

Frequency of Events

Y2 label

Caption

Reliability Diagram



—•— multip\_ens\_prob\_hwt Reliability Curve

Does the reliability change with different ensemble compositions (multip, singlep, stocachastic)?

Add the other two modes\_ens\_prob\_hwt to the MODEL list

Does the reliability change with different thresholds?

Change to a different thresholds to the FCST\_VAR drop-down

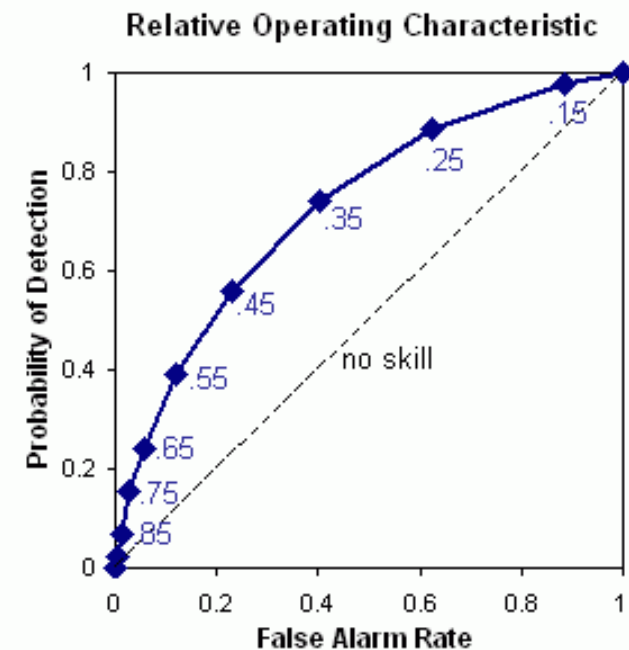
Does reliability change with different regions?

Move VX\_MASTK to Series Variables and Add East, West

# Explore a little

# Interpretation of ROC

- Close to upper left corner – *good resolution*
- Close to diagonal – *little skill*
- **Area under curve** ("ROC area") is a useful summary measure of forecast skill
- **Perfect:** ROC area = 1
- **No skill:** ROC area = 0.5
- ROC skill score ROCS =  $2(\text{ROC area} - 0.5)$
- *Not sensitive to bias.*



- ROC is **conditioned on the observations** (i.e., given that Y occurred, what was the corresponding forecast?)
- Reliability and ROC diagrams are good companions

# Select ROC Tab

Series Box Bar **Roc** Rely Ens\_ss Perf Taylor Hist Ecl

**Series Variables:**

+ Series Variable

**Specialized Plot Fixed Values:**

FCST\_VAR Select value ☐ Equalize

+ Fixed Value

☐ Event Equalizer Plot Cond

Series: Select MODEL and add VX\_MASK  
Fixed Values: Select Threshold

Series Box Bar **Roc** Rely Ens\_ss Perf Taylor Hist Eclv Contc

**Series Variables:**

MODEL multip\_ens\_prob\_hwt

VX\_MASK CONUS

+ Series Variable

**Specialized Plot Fixed Values:**

FCST\_VAR APCP\_03\_ENS\_FREQ\_ge12.700 ☐ Equalize

+ Fixed Value

☐ Event Equalizer Plot Cond

**ROC Calculations**

ROC

# Generate Plot

Titles & Labels

Common

Form

Job title

Plot title

Reliability Diagram

X label

Forecast Probability

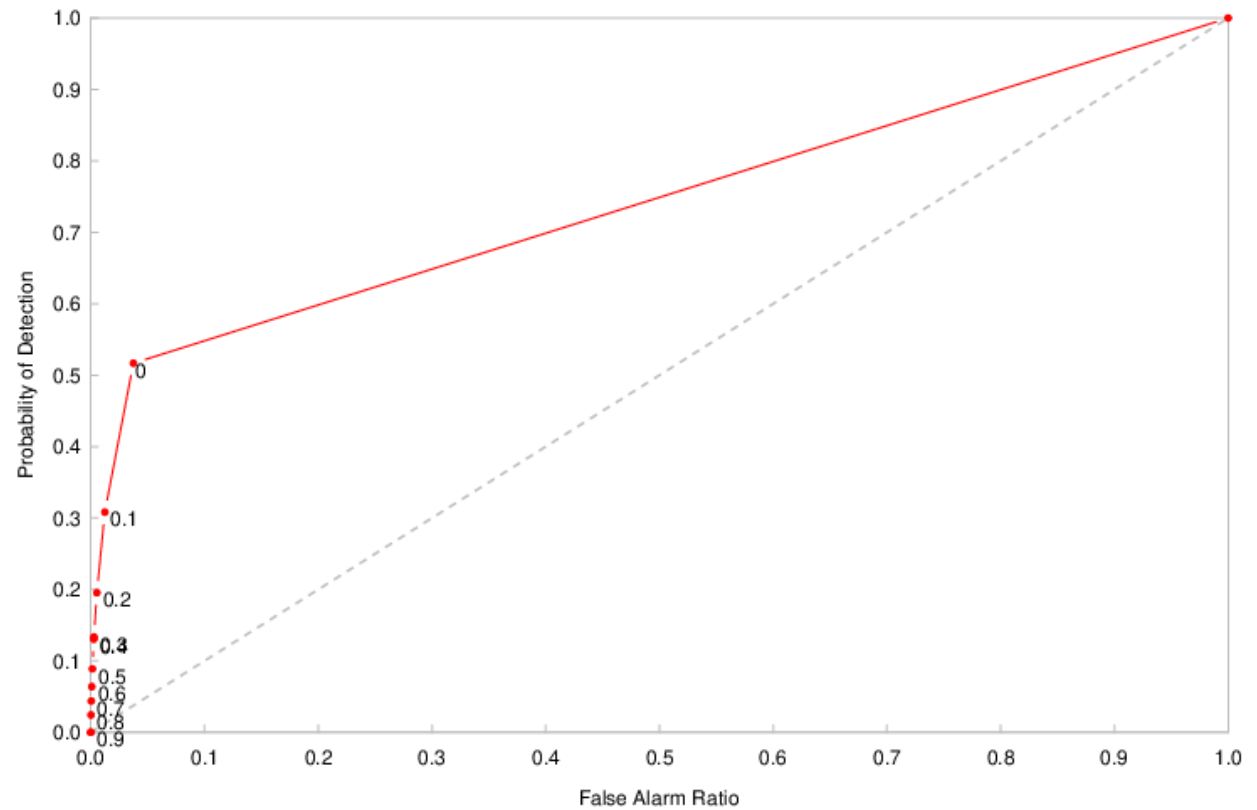
Y1 label

Frequency of Events

Y2 label

Caption

ROC Diagram



—•— multip\_ens\_prob\_hwt CONUS ROC Curve

# Explore a little

Does the ROC change with different ensemble compositions (multip, singlep, stocachastic)?

Add the other two modes `_ens_prob_hwt` to the MODEL list

Does the ROC change with different thresholds?

Change to a different thresholds to the FCST\_VAR drop-down

Does ROC change with different regions?

Move VX\_MASTK to Series Variables and Add East, West

What else?

# Rank Histograms

SeriesBoxBarRocRelyEns\_ssPerfTaylorHistEclvContour

Plot Data: Stat

Series Variables:

Series Variable

Specialized Plot Fixed Values:

FCST\_VARSelect value

Fixed Value

☐ Event Equalizer

Plot Cond

Line type

RhistPhistRelp

SeriesBoxBarRocRelyEns\_ssPerfTaylorHistEclv

Plot Data: Stat

Series Variables:

MODELmultip\_ens\_hwt

Series Variable

Specialized Plot Fixed Values:

FCST\_VAR

Fixed Value

☐ Event Equalizer

Plot Cond

Line type

RhistPhistRelp

Check allUncheck all

☐ core07\_hwt

☐ core08\_hwt

☒ multip\_ens\_hwt

☐ multip\_ens\_mean\_hwt

☐ multip\_ens\_prob\_hwt

☐ single-phys01\_hwt

☐ Equalize



# Add VX\_MASK to Series; Select FCST\_VAR

Plot Data: Stat

## Series Variables:

MODEL multip\_ens\_hwt

VX\_MASK CONUS

Series Variable

Series Box Bar Roc Rely Ens\_ss Perf Taylor Hist Eclv

## Specialized Plot Fixed Values:

FCST\_VAR Select value

Fixed Value

Event Equalizer  
Plot Cond

Plot Data: Stat

## Series Variables:

MODEL multip\_ens\_hwt,  
multip\_ens\_mean\_hwt,  
multip\_ens\_prob\_hwt

Series Variable

## Specialized Plot Fixed Values:

FCST\_VAR APCP\_03

Fixed Value

Event Equalizer  
Plot Cond

Check all Uncheck all

APCP\_01\_ENS\_FREQ\_ge12.700

APCP\_01\_ENS\_FREQ\_ge2.540

APCP\_01\_ENS\_FREQ\_ge6.350

APCP\_03

APCP\_03\_ENS\_FREQ\_ge0.254

APCP\_03

## Line type

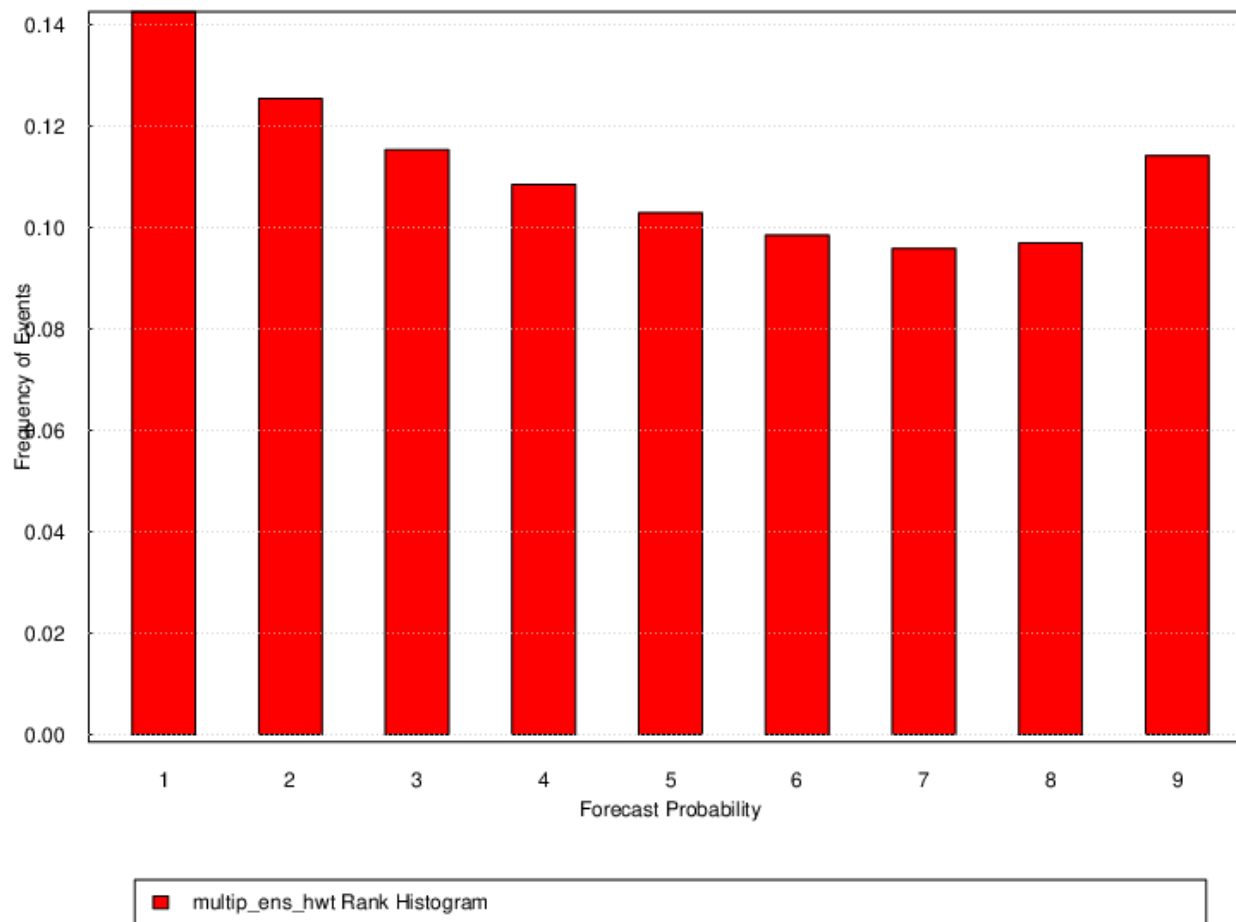
Rhist Phist Relp

## Histogram type

Normalized Raw counts

# Plot Rank Histogram

Reliability Diagram



# Explore a little

Does the rank histogram change with different ensemble compositions (multip, singlep, stocachastic)?

Add the other two modes `_ens_prob_hwt` to the MODEL list

Does the rank histogram change with different thresholds?

Change to a different thresholds to the FCST\_VAR drop-down

Does rank histogram change with different regions?

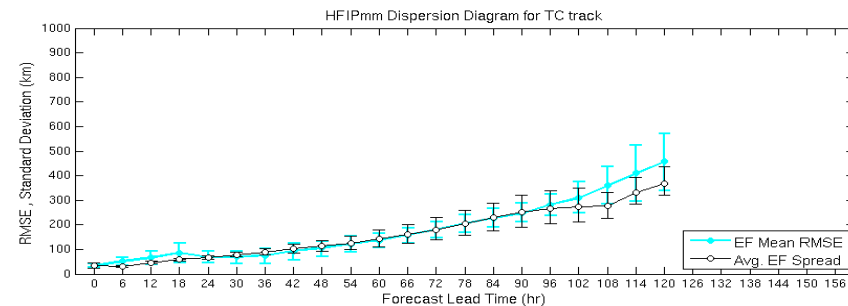
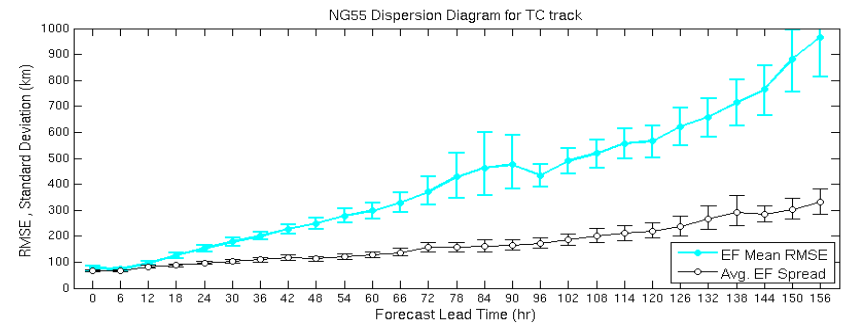
Move `VX_MASK` to Series Variables and Add East, West

What else?

# Evaluating ensembles

- Select Series Tab
- Y1 Dependent is APCP\_03 -> SSVAR\_RMSE, SSVAR\_Spread
- Add Y1 Dependent VX\_MASK -> CONUS
- Y1 Series Var MODEL -> multip\_ens\_hwt
- FCST\_LEAD -> Select all leads
- Statistics
- Aggregation (see below)

## Spread-skill



### Independent Variable:

FCST\_LEAD

10000, 20000, 30000, 40000, 50000,  
60000, 70000, 80000, 90000, 100000,  
110000, 120000, 130000, 140000, 150000,  
160000, 170000, 180000, 190000, 200000,  
210000, 220000, 230000, 240000, 250000,  
260000, 270000, 280000, 290000, 300000,  
310000, 320000, 330000, 340000, 350000,  
360000

☐ Equa

### Statistics:

☐ Summary ☒ Aggregation statistics ☐ Revision statistics

Spread/Skill Variance (SSVAR)

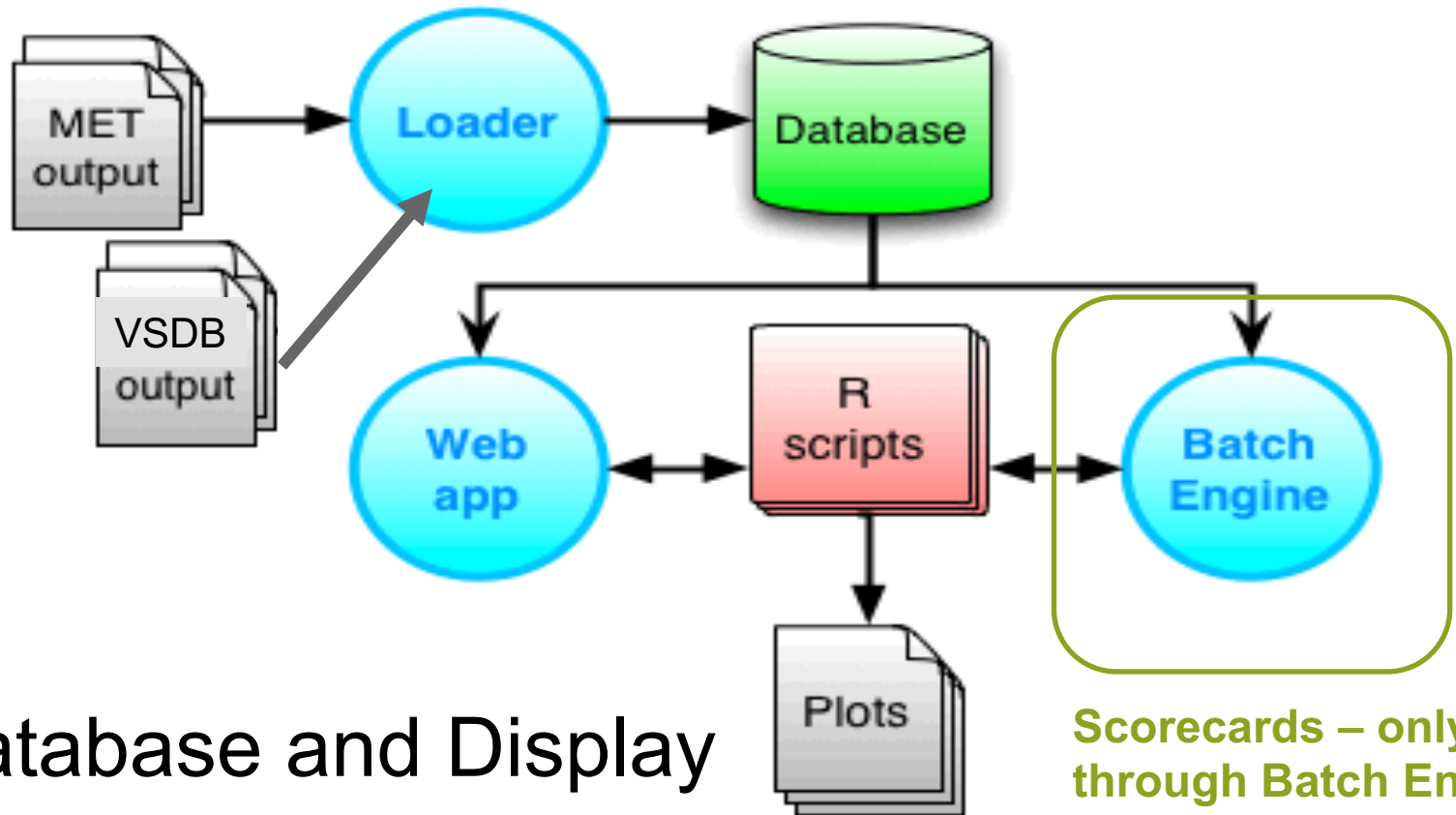
Bool

Bool

perc  Con

☐ Cact

# Scorecards



Database and Display

# MET+ Scorecard

Specify the Statistic

Specify the aggregations

Specify the regions

Specify the Field

Specify whether you have symbol, values or diffs

METViewer Scorecard  
for PR4RN\_1405 and GFS2016

2014-05-20 00:00:00 - 2014-07-30 00:00:00

			N.American							N.Hemisphere							S.Hemisphere							Tropics						
			Day 1	Day 3	Day 5	Day 6	Day 8	Day 10	Day 1	Day 3	Day 5	Day 6	Day 8	Day 10	Day 1	Day 3	Day 5	Day 6	Day 8	Day 10	Day 1	Day 3	Day 5	Day 6	Day 8	Day 10				
Anom Corr	Heights	P250	▲				▲		▲				▲									▼		▲						
		P500	▲																			▼		▲						
		P700							▼													▼		▲						
		P1000							▼						▼							▼		▲						
Anom Corr	Vector Wind	P250																			▼									
		P500							▼						▼						▼	▼								
		P850							▼			▲									▼	▼								
Anom Corr	Temp	P250					▲														▼		▲	▲	▲	▲				
		P500					▲					▲			▼						▼									
		P850			▲	▲	▲		▲	▲			▲								▼	▼								
Anom Corr	MSLP	MSL						▼						▼						▼	▼									
RMSE	Heights	P10	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲				
		P20	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	▲	▲	▲	▲				
		P50	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▼	▲	▲	▲	▲				
		P100	▲	▲	▲				▲						▲	▲	▲						▲	▲	▲	▲				
		P200	▲							▼	▼					▲							▲	▲	▲	▲				
		P500	▲							▼	▼											▼	▲	▲	▲					
		P700	▲						▼													▼		▲						
		P850	▲						▼							▼						▼								
		P1000	▲						▼							▼						▼								

# METViewer CAM Scorecard

for GFDLfv3 and NSSLfv3

2018-04-30 00:00:00 - 2018-05-22 00:00:00

		Daily Domain	CONUS
		Daily	
CSI	NBR 50	>=0.02	▲
		>=0.05	▲
		>=0.10	▲
		>=0.15	▲
		>=0.30	■
		>=0.45	■
		>=0.60	■
	NBR 75	>=0.02	▲
		>=0.05	▲
		>=0.10	▲
		>=0.15	▲
		>=0.30	■
		>=0.45	■
		>=0.60	■
	NBR 100	>=0.02	▲
		>=0.05	▲
		>=0.10	▲
		>=0.15	▲
		>=0.30	▲
		>=0.45	■
		>=0.60	■
	NBR 125	>=0.02	▲
		>=0.05	▲
		>=0.10	▲
		>=0.15	▲
		>=0.30	▲
		>=0.45	■
		>=0.60	■

Surrogate Severe

Prob

UH  
exceeding

# METViewer CAM Scorecard

for NSSLfv3 and HRRR

2018-04-30 00:00:00 - 2018-05-22 00:00:00

		Daily Domain	CONUS
		Daily	
CSI	NBR 50	>=0.02	▼
		>=0.05	▼
		>=0.10	▼
		>=0.15	▼
		>=0.30	▼
		>=0.45	▼
		>=0.60	■
	NBR 75	>=0.02	▼
		>=0.05	▼
		>=0.10	▼
		>=0.15	▼
		>=0.30	▼
		>=0.45	▼
		>=0.60	■
	NBR 100	>=0.02	▼
		>=0.05	▼
		>=0.10	▼
		>=0.15	▼
		>=0.30	▼
		>=0.45	▼
		>=0.60	■
	NBR 125	>=0.02	▼
		>=0.05	▼
		>=0.10	▼
		>=0.15	▼
		>=0.30	■
		>=0.45	■
		>=0.60	■

Daily &  
CONUS  
Domains

# METViewer CAM Scorecard

for HREFv2 and HRRR

2018-04-30 00:00:00 - 2018-05-22 00:00:00

		Daily Domain	CONUS
		Daily	
CSI	NBR 50	>=0.02	■
		>=0.05	■
		>=0.10	■
		>=0.15	■
		>=0.30	■
		>=0.45	■
		>=0.60	■
	NBR 75	>=0.02	■
		>=0.05	■
		>=0.10	■
		>=0.15	■
		>=0.30	■
		>=0.45	■
		>=0.60	▲
	NBR 100	>=0.02	■
		>=0.05	■
		>=0.10	■
		>=0.15	▲
		>=0.30	■
		>=0.45	■
		>=0.60	■
	NBR 125	>=0.02	■
		>=0.05	▲
		>=0.10	▲
		>=0.15	▲
		>=0.30	■
		>=0.45	■
		>=0.60	▲

▲	GFDLfv3 is better than NSSLfv3 at the 99.9% significance level
▲	GFDLfv3 is better than NSSLfv3 at the 99% significance level
■	GFDLfv3 is better than NSSLfv3 at the 95% significance level
■	No statistically significant difference between GFDLfv3 and NSSLfv3
■	GFDLfv3 is worse than NSSLfv3 at the 95% significance level
▼	GFDLfv3 is worse than NSSLfv3 at the 99% significance level
▼	GFDLfv3 is worse than NSSLfv3 at the 99.9% significance level
■	Not statistically relevant

▲	NSSLfv3 is better than HRRR at the 99.9% significance level
▲	NSSLfv3 is better than HRRR at the 99% significance level
■	NSSLfv3 is better than HRRR at the 95% significance level
■	No statistically significant difference between NSSLfv3 and HRRR
■	NSSLfv3 is worse than HRRR at the 95% significance level
▼	NSSLfv3 is worse than HRRR at the 99% significance level
▼	NSSLfv3 is worse than HRRR at the 99.9% significance level
■	Not statistically relevant

▲	HREFv2 is better than HRRR at the 99.9% significance level
▲	HREFv2 is better than HRRR at the 99% significance level
■	HREFv2 is better than HRRR at the 95% significance level
■	No statistically significant difference between HREFv2 and HRRR
■	HREFv2 is worse than HRRR at the 95% significance level
▼	HREFv2 is worse than HRRR at the 99% significance level
▼	HREFv2 is worse than HRRR at the 99.9% significance level
■	Not statistically relevant

# METViewer CAM Scorecard for HREFv2 and HRRRE

2018-04-30 00:00:00 - 2018-06-01 00:00:00

		Daily Domain	CONUS
		Daily	
		>=0.02	▼
		>=0.05	
		>=0.10	
	75%	>=0.15	
		>=0.30	
		>=0.45	
		>=0.60	
		>=0.02	
		>=0.05	
		>=0.10	
	80%	>=0.15	
		>=0.30	
		>=0.45	
		>=0.60	
		>=0.02	
		>=0.05	▲
		>=0.10	
	85%	>=0.15	
		>=0.30	▲
		>=0.45	▲
		>=0.60	
		>=0.02	
		>=0.05	▲
		>=0.10	▲
	90%	>=0.15	
		>=0.30	▲
		>=0.45	▲
		>=0.60	
		>=0.02	▲
		>=0.05	▲
		>=0.10	▲
	95%	>=0.15	▲
		>=0.30	▲
		>=0.45	
		>=0.60	

▲	HREFv2 is better than HRRRE at the 99% significance level
■	HREFv2 is better than HRRRE at the 95% significance level
■	No statistically significant difference between HREFv2 and HRRRE
■	HREFv2 is worse than HRRRE at the 95% significance level
▼	HREFv2 is worse than HRRRE at the 99% significance level
■	Not statistically relevant

# METViewer CAM Scorecard for HREFv2 and HRRRE

2018-04-30 00:00:00 - 2018-05-22 00:00:00

		Daily Domain	CONUS
		Daily	
		>=0.02	
		>=0.05	
		>=0.10	
	NBR 50	>=0.15	
		>=0.30	
		>=0.45	
		>=0.60	
		>=0.02	
		>=0.05	
		>=0.10	
	NBR 75	>=0.15	
		>=0.30	
		>=0.45	
		>=0.60	▲
	CSI	>=0.02	
		>=0.05	
		>=0.10	
	NBR 100	>=0.15	▲
		>=0.30	▲
		>=0.45	
		>=0.60	
		>=0.02	▲
		>=0.05	▲
		>=0.10	▲
	NBR 125	>=0.15	▲
		>=0.30	
		>=0.45	
		>=0.60	▲

▲	HREFv2 is better than HRRRE at the 99.9% significance level
▲	HREFv2 is better than HRRRE at the 99% significance level
■	HREFv2 is better than HRRRE at the 95% significance level
■	No statistically significant difference between HREFv2 and HRRRE
■	HREFv2 is worse than HRRRE at the 95% significance level
▼	HREFv2 is worse than HRRRE at the 99% significance level
▼	HREFv2 is worse than HRRRE at the 99.9% significance level
■	Not statistically relevant

To eliminate biases  
Percentile Thresholding  
applied

Specific Threshold

Threshold used is  
associated with  
Percentiles (75,  
80, 85, 90, 95)  
computed from  
climatology