

METViewer

What is METViewer

The METViewer

- A highly-configurable software package designed to help MET users visualize MET output easily.
- Runs on the web on **apache tomcat** and relies on a **database** for data and the **R language** for plots

- Available to anyone online:

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

*Note: The link is a public test version and hence is limited to a single database

<http://lark.fsl.noaa.gov:8080/metviewer/metviewer.jsp> **GSD**

(Restricted to fsl.noaa.gov users)

METViewer

- Fully customizable and very powerful but has a learning curve

- Can produce fully customizable:
 - Series plots with confidence intervals
 - Box plots
 - X-Y scatter plots
 - Histograms

The screenshot displays the METViewer v0.5.2 web interface. At the top, there is a 'Plot XML Upload' section with a 'Browse...' button and an 'Upload' button. Below this, the 'Database:' dropdown is set to 'mv_hmt_2011', 'Plot Data:' is set to 'Stat', and 'Template:' is set to 'series_plot'. The interface is divided into two main sections: 'Y1 Axis' and 'Y2 Axis'. The 'Y1 Axis' section includes a 'Dependent Variables (help)' dropdown, a 'Forecast Variable:' dropdown set to 'P-06', and a 'Series Variables (help)' section with a 'Database Field:' dropdown set to 'MODEL' and a 'Values »' button. A list of variables is visible, including 'arw-fer-gep1-d02', 'arw-fer-gep5-d01', 'arw-fer-gep5-d02', and 'w-sch-gep2-d01'. The 'Y2 Axis' section also has a 'Dependent Variables (help)' dropdown and an 'Add a Dependent y2 Variable' button. At the bottom, there is a 'Series Variables (help)' section with an 'Add a Series y2 Value' button.

METViewer Usage

METViewer Usage

MET Viewer is designed to be configured in a downward direction. This means that the user should set the desired settings in order, gradually moving downward

Database: mv_hmt_2011

Plot Data: Stat

Template: series_plot

- The top three settings (shown above) allow the user to select a database and type for the plot.

METViewer Usage

- The next section is where the variable, statistic of interest, and models of interest are selected

Y1 Axis

Dependent Variables [\(help\)](#)

Forecast Variable:

APCP_06

Stats >>

E90
ESTDEV
FAR
FBAR
FBIAS

[Add a Dependent y1 Variable](#)

Series Variables [\(help\)](#)

Database Field:

MODEL

Values >>

arw-tom-gep7-d02
gfs-d01
gfs-d02
hmt-ens-d01
hmt-ens-d02

[Add a Series y1 Value](#)

METViewer Usage

- The Y2 axis can be used to plot a Base Rate.

Y2 Axis

Dependent Variables [\(help\)](#)

Forecast Variable:

APCP_06

Stats >>

ACC
BASER
BCMSE
BCRMSE
CSI

☐ Remove Dependent Variable

☐ Add a Dependent y2 Variable

Series Variables [\(help\)](#)

Database Field:

MODEL

Values >>

arw-tom-gep7-d01
arw-tom-gep7-d02
gfs-d01
gfs-d02
hmt-ens-d01

☐ Remove Field

☐ Add a Series y2 Value

METViewer Usage

- The fixed variables section is what usually confuses new users and can take quite some time to master
- It controls the constraints for the plot (what period of data is used, what thresholds to include, interpolation method, as well as domains)
- The screenshot on the next slide shows a typical Fixed Variables setting

Note: The order of fixed variables is NOT important.

METViewer Usage

Fixed Values [\(help\)](#)

Database Field: FCST_VALID_BEG Values »

2010-12-06 12:00:00
2010-12-06 18:00:00
2010-12-07 00:00:00
2010-12-07 06:00:00
2010-12-07 12:00:00

☐ Remove Field

Database Field: OBTYP E Values »

MC_PCP

☐ Remove Field

Database Field: VX_MASK Values »

CNRFC_d01
LAND_d01
LAND_d02
NEST_d01

☐ Remove Field

Database Field: INTERP_MTHD Values »

NBRHD
UW_MEAN

☐ Remove Field

Database Field: INTERP_PNTS Values »

1

☐ Remove Field

Database Field: FCST_THRESH Values »

NA
>=2.540,>=6.350,>=12.700,>=25.400,>=50.800
>=2.540
>=6.350
>=12.700

☐ Remove Field

☐ Add a Fixed Value

METViewer Usage

- This is where the x-axis is configured
- In the example, we are using forecast lead hours as our x-axis

Independent Variable [\(help\)](#)

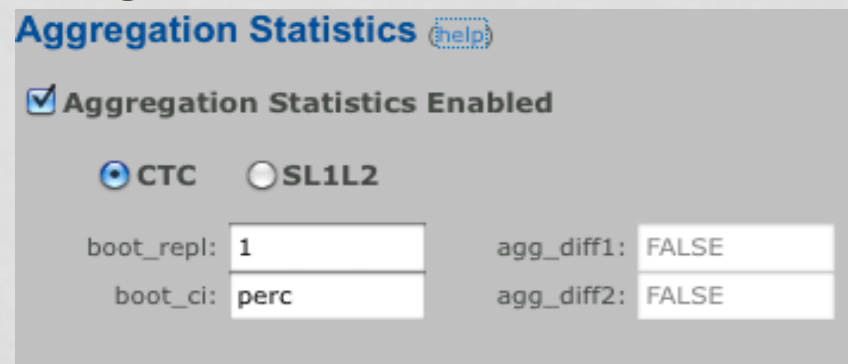
Database Field:

<input checked="" type="checkbox"/>	60000	label: 6	plot val: <input type="text"/>
<input checked="" type="checkbox"/>	90000	label: 9	plot val: <input type="text"/>
<input checked="" type="checkbox"/>	120000	label: 12	plot val: <input type="text"/>
<input checked="" type="checkbox"/>	150000	label: 15	plot val: <input type="text"/>
<input checked="" type="checkbox"/>	180000	label: 18	plot val: <input type="text"/>
<input checked="" type="checkbox"/>	210000	label: 21	plot val: <input type="text"/>
<input checked="" type="checkbox"/>	240000	label: 24	plot val: <input type="text"/>
<input checked="" type="checkbox"/>	270000	label: 27	plot val: <input type="text"/>
<input checked="" type="checkbox"/>	300000	label: 30	plot val: <input type="text"/>
<input checked="" type="checkbox"/>	330000	label: 33	plot val: <input type="text"/>
<input checked="" type="checkbox"/>	360000	label: 36	plot val: <input type="text"/>
<input checked="" type="checkbox"/>	390000	label: 39	plot val: <input type="text"/>
<input checked="" type="checkbox"/>	420000	label: 42	plot val: <input type="text"/>
<input checked="" type="checkbox"/>	450000	label: 45	plot val: <input type="text"/>
<input checked="" type="checkbox"/>	480000	label: 48	plot val: <input type="text"/>
<input checked="" type="checkbox"/>	510000	label: 51	plot val: <input type="text"/>
<input checked="" type="checkbox"/>	540000	label: 54	plot val: <input type="text"/>
<input checked="" type="checkbox"/>	570000	label: 57	plot val: <input type="text"/>
<input checked="" type="checkbox"/>	600000	label: 60	plot val: <input type="text"/>
<input checked="" type="checkbox"/>	630000	label: 63	plot val: <input type="text"/>
<input checked="" type="checkbox"/>	660000	label: 66	plot val: <input type="text"/>
<input checked="" type="checkbox"/>	690000	label: 69	plot val: <input type="text"/>
<input checked="" type="checkbox"/>	720000	label: 72	plot val: <input type="text"/>
<input checked="" type="checkbox"/>	750000	label: 75	plot val: <input type="text"/>

☐ Check all ☐ Uncheck all

METViewer Usage

- The options in this section, named Aggregate Statistics depend on the type of graph and statistic
- It is essential this section is configured correctly or the graph will either error or produce results which baffle the user. *Click the “help” button on the section if confused about any setting*



The screenshot shows the 'Aggregation Statistics' configuration panel. At the top, the title 'Aggregation Statistics' is followed by a '(help)' button. Below this, a checkbox labeled 'Aggregation Statistics Enabled' is checked. Underneath, there are two radio buttons: 'CTC' (which is selected) and 'SL1L2'. Below the radio buttons, there are four input fields arranged in two rows. The first row contains 'boot_repl:' with the value '1' and 'agg_diff1:' with the value 'FALSE'. The second row contains 'boot_ci:' with the value 'perc' and 'agg_diff2:' with the value 'FALSE'.

Aggregation Statistics (help)

☒ Aggregation Statistics Enabled

☒ CTC ☐ SL1L2

boot_repl: 1 agg_diff1: FALSE

boot_ci: perc agg_diff2: FALSE

METViewer Usage

- This setting does exactly what it says. It calculates the plot statistics from CTCs or partial sums.
- Commonly, it is left disabled as in our example.

Statistics Calculations [\(help\)](#)

☐ **Statistics Calculation Enabled**

METViewer Usage

- This is where the main plot labels are entered

Plot Titles & Labels

title:	False Alarm Ratio for Entire 2011 Exercise Period
x_label:	Lead Hour
y1_label:	False Alarm Ratio (FAR)
y2_label:	Base Rate
caption:	Domain D01, Threshold $\geq 2.540\text{mm}$

METViewer Usage

- This is where a whole lot of stylistic changes can be applied to the graph.
- Two important settings here are the “Event Equalizer” and the “Box Plot Show Notches”. (hidden by default)

Plot Formatting [\(help\)](#)

Event Equalizer ☐ false

event_equal

Event Equalizer Multi ☐ false

event_equal_m

Vertical Levels Plot ☐ false

vert_plot

Reverse X Values ☐ false

x_reverse

Y1 Series Difference Curve ☐ false

plot1_diff

Y2 Series Difference Curve ☐ false

plot2_diff

Display Number of Stats ☐ false

num_stats

Y1 Stagger Points ☐ false

indy1_stag

Y2 Stagger Points ☐ false

indy2_stag

Plot Grid ☒ true

grid_on

Synch Y1 and Y2 Ranges ☐ false

sync_axes

Print Y1 Series Values ☐ false

dump_points1

Print Y2 Series Values ☐ false

dump_points2

Y1 Axis Log Scale ☐ false

log_y1

Y2 Axis Log Scale ☐ false

log_y2

► Show Formatting Controls

METViewer Usage

- This section is reserved for line labels and formatting.

Series Formatting [\(help\)](#) **Defaults** **# Series: 3** ☐ Lock Formatting

▼ Hide Formatting Controls

gfs-d01 APCP_06 FAR
Y1 Series
☐ Hide

Conf Interval Type plot_ci none
Line Color color Red
Point Symbol pch 20
Series Line Type type b

Line Type lty 1
Line Width lwd 3
Connect Across NA Values con_series 1
Legend Text legend GFS-D01

hmt-ens-d01 APCP_06 FAR
Y1 Series
☐ Hide

Conf Interval Type plot_ci none
Line Color color Blue
Point Symbol pch 20
Series Line Type type b

Line Type lty 1
Line Width lwd 3
Connect Across NA Values con_series 1
Legend Text legend HMT-Ens-D01

gfs-d01 APCP_06 BASER
Y2 Series
☐ Hide

Conf Interval Type plot_ci none
Line Color color #8000FFFF
Point Symbol pch 20
Series Line Type type h

Line Type lty 1
Line Width lwd 20
Connect Across NA Values con_series 1
Legend Text legend Base Rate

Note: If names are changed on one line, all lines require a name to be put defined in "Legend Text".

METViewer Usage

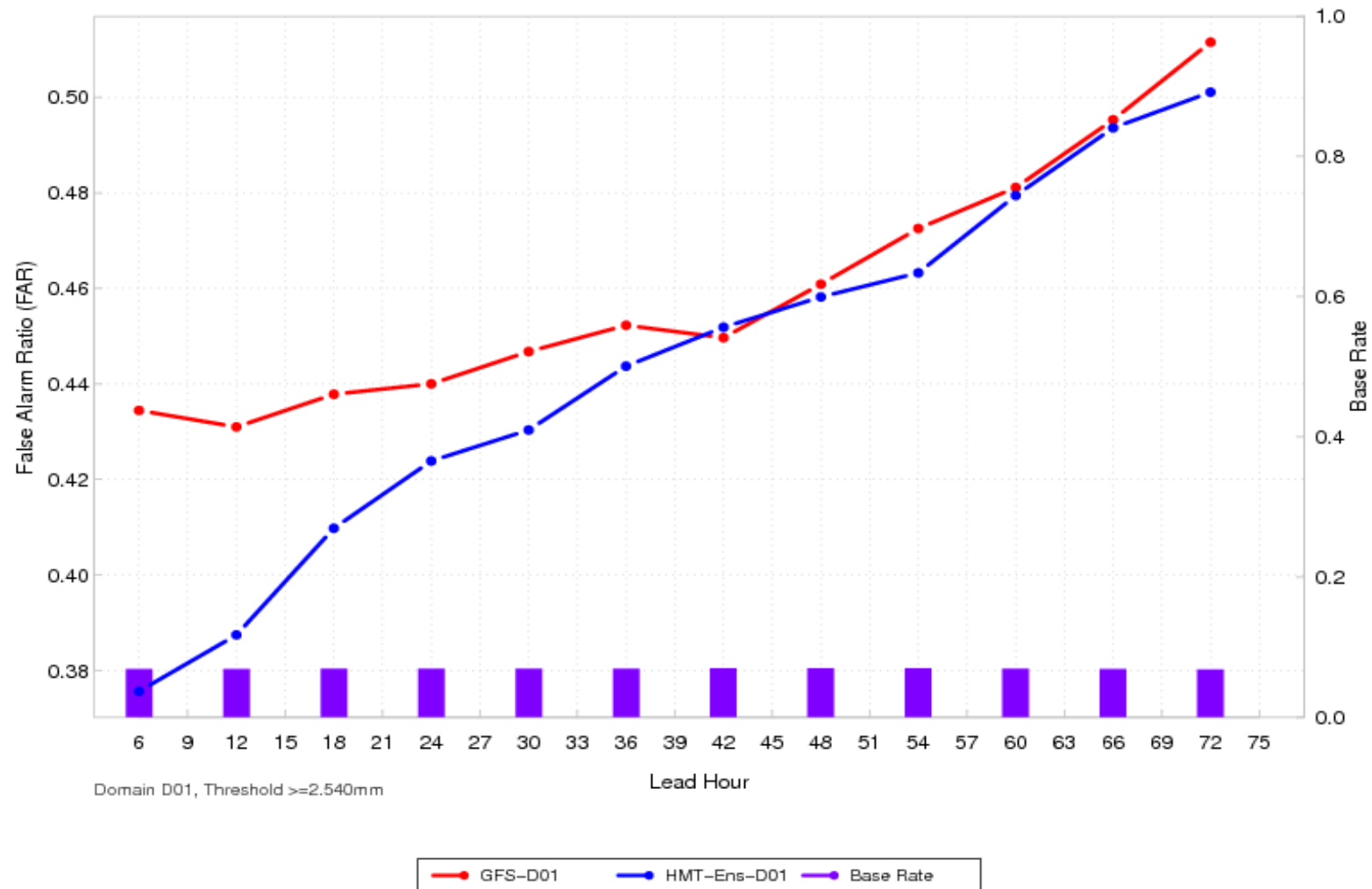
- This last section allows users to specify a custom scale
- Scales must be in R language format:
For example, if a scale of 0 to 2 is desired, the expression put into y1_lim: would be "c(0,2)". You cannot change the x-scale as you have already defined that further up in the graph settings (see the Independent Variable section)

Axis Bounds [\(help\)](#)

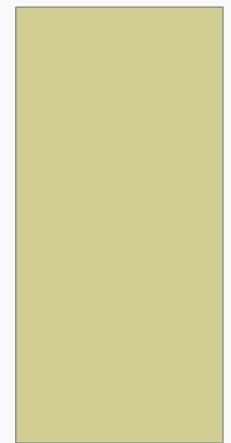
y1_lim: y1_buf: y2_lim: y2_buf:

Result

False Alarm Ratio for Entire 2011 Exercise Period



Importing Data To METViewer



What is METViewer

The METViewer tool

- Reads MET verification statistics output from a database
- Creates plots using the R statistical package
- Includes a web application that can be accessed from a web browser to create a single plot
 - Specification for each plot is built using a series of controls and then serialized into XML
 - For each plot, METViewer generates a SQL query, an R script to create the plot, a flat file containing the data that will be plotted and the plot itself

Available to anyone online:

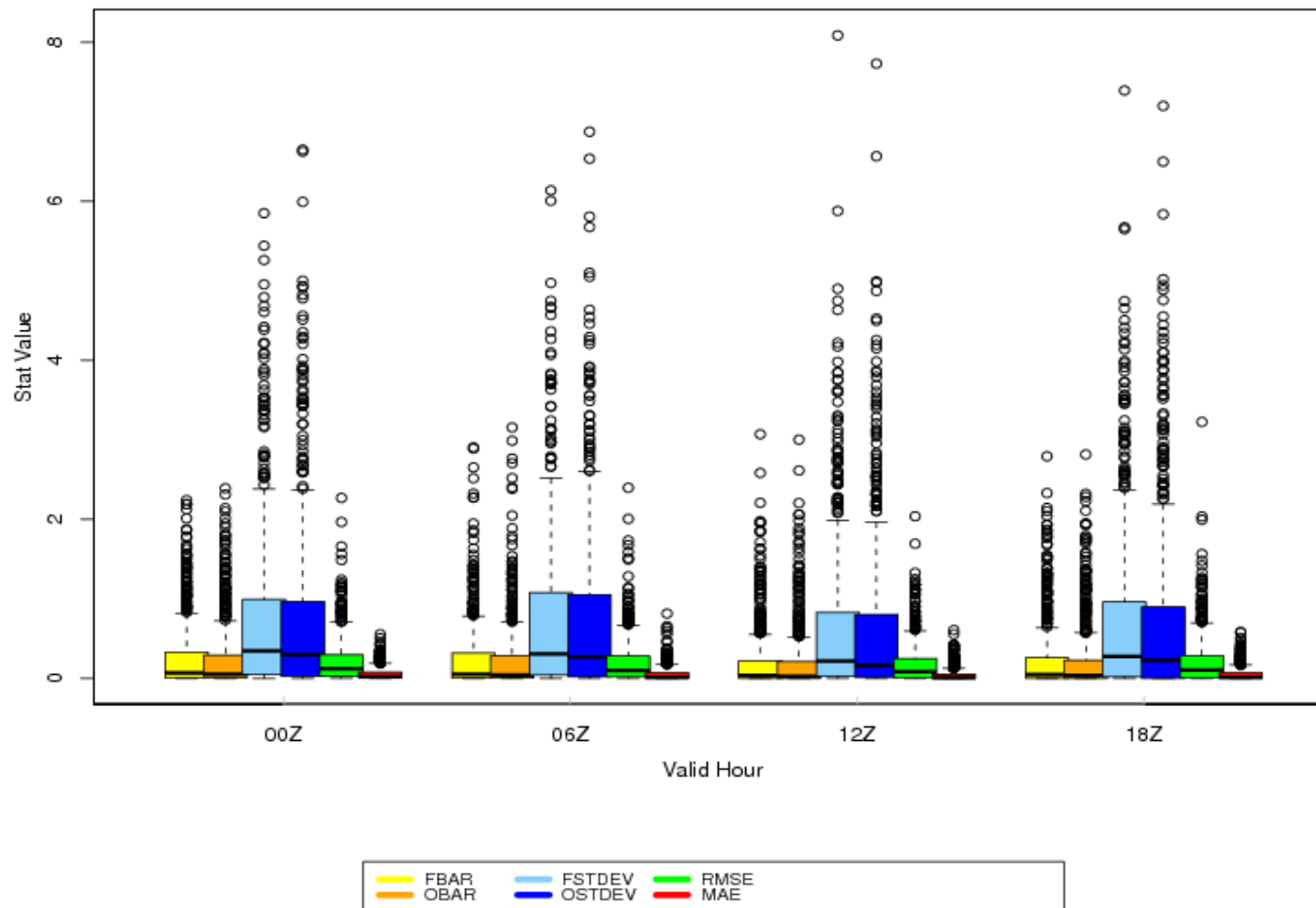
http://www.dtcenter.org/met/metviewer/metviewer.jsp?db=hmt_2010 **DTC**

- Note: the link is a public test version and hence is limited to a single database

OR <http://lark.fsl.noaa.gov:8080/metviewer/metviewer.jsp> **GSD**

Result

CCPA vs StageIV for APCP_06
Season: Spring Region: HMT_West_d01



Aggregated by diurnal cycle valid times; Comparison of one gridded dataset with another gridded dataset (StageIV and 'improved' StageIV)

MET Viewer Importing Data

How do you import data into the MET Viewer?

- Create verification statistics (.stat files) using MET
- Organize verif stat data files in a tree-like dir structure which emulates a database structure, where
 - Top level directories reference domains, ensemble membs
 - Mid level directories reference dates
 - Low level directories reference hourly content

- E.g.

```
dwr_domains/ewp2_d01/2011051116V_01h/grid_stat/grid_stat_d01_F000_01h__000000L_20110511_160000V.stat  
dwr_domains/ewp2_d01/2011051116V_01h/grid_stat/grid_stat_d01_F001_01h__010000L_20110511_170000V.stat  
dwr_domains/ewp2_d01/2011051116V_01h/grid_stat/grid_stat_d01_F002_01h__020000L_20110511_180000V.stat  
dwr_domains/ewp2_d01/2011051116V_01h/grid_stat/grid_stat_d01_F003_01h__030000L_20110511_190000V.stat  
dwr_domains/ewp2_d01/2011051116V_01h/grid_stat/grid_stat_d01_F004_01h__040000L_20110511_200000V.stat
```

MET Viewer Importing Data

How do you import data into the MET Viewer?

- Create an XML script with instructions that closely match the dirs containing the data files
- Load the data files into mySQL using **myload**, a MET Viewer script, which reads the XML file

- E.g.

```
<connection>
  <host>lark</host>
  <database>mv_hmt_ed_2011</database>
<folder_tmpl>/exchange/tmp/HMT/West/2011/dwr_domains/{model}/{fcst_valid}/{output_type}</folder_tmpl>
  <date_list name="folder_dates_01h">
    <start>2011051116V_01h</start>
    <format>yyyyMMddHH'V_01h'</format>
  </date_list>
<field name="model">
  <val>ewp2_d01</val>
  <val>ewp3_d01</val>
```

MET Viewer Importing Data

Directory structure, content and Xml (again)

dwr_domains/ewp2_d01/2011051116V_01h/grid_stat/grid_stat_d01_F000_01h__000000L_20110511_160000V.stat
dwr_domains/ewp2_d01/2011051116V_01h/grid_stat/grid_stat_d01_F001_01h__010000L_20110511_170000V.stat
dwr_domains/ewp2_d01/2011051116V_01h/grid_stat/grid_stat_d01_F002_01h__020000L_20110511_180000V.stat
dwr_domains/ewp2_d01/2011051116V_01h/grid_stat/grid_stat_d01_F003_01h__030000L_20110511_190000V.stat
dwr_domains/ewp2_d01/2011051116V_01h/grid_stat/grid_stat_d01_F004_01h__040000L_20110511_200000V.stat

<connection>

<host>lark</host>

<database>mv_hmt_ed_2011</database>

<folder_tmpl>/exchange/tmp/HMT/West/2011/dwr_domains/{model}/{fcst_valid}/{output_type}/</folder_tmpl>

<date_list name="folder_dates_01h">

<start>2011051116V_01h</start>

<format>yyyyMMddHH'V_01h'</format>

</date_list>

<field name="model">

<val>ewp2_d01</val>

<val>ewp3_d01</val>



Directory & content



Xml

MET Viewer System

The process of populating the MET Viewer (CON'T)

- VM (virtual machine) called 'lark' created, has all the software tools needed
 - apache – to host metviewer on as website as server
 - mySQL – database
 - R – plotting software
 - metviewer – suite of tools (scripts) to populate a database and extract data according to requests, etc
- No need to log onto lark **unless** importing data for MET Viewer

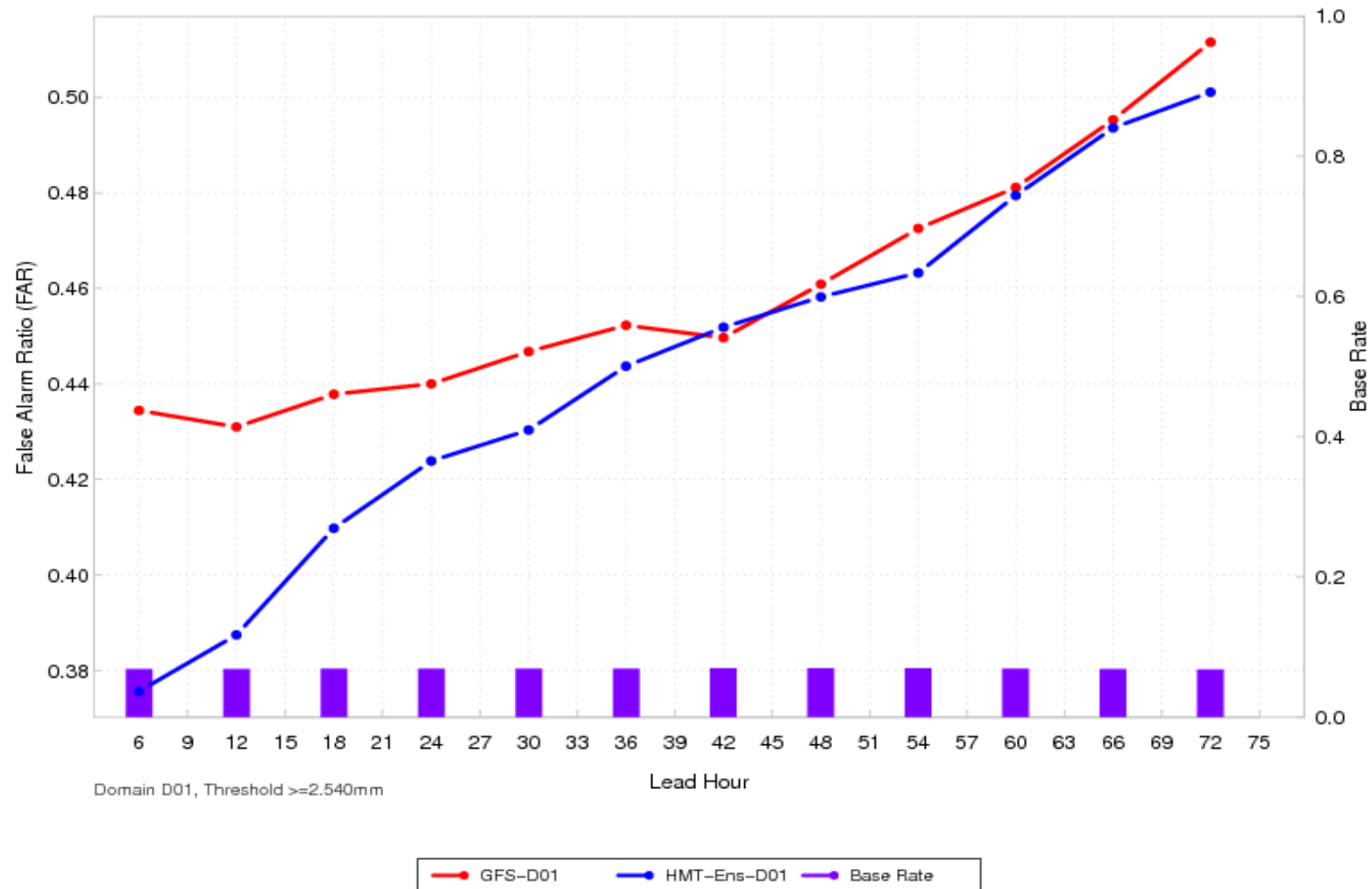
MET Viewer Importing Data

The process of populating the MET Viewer (CON'T)

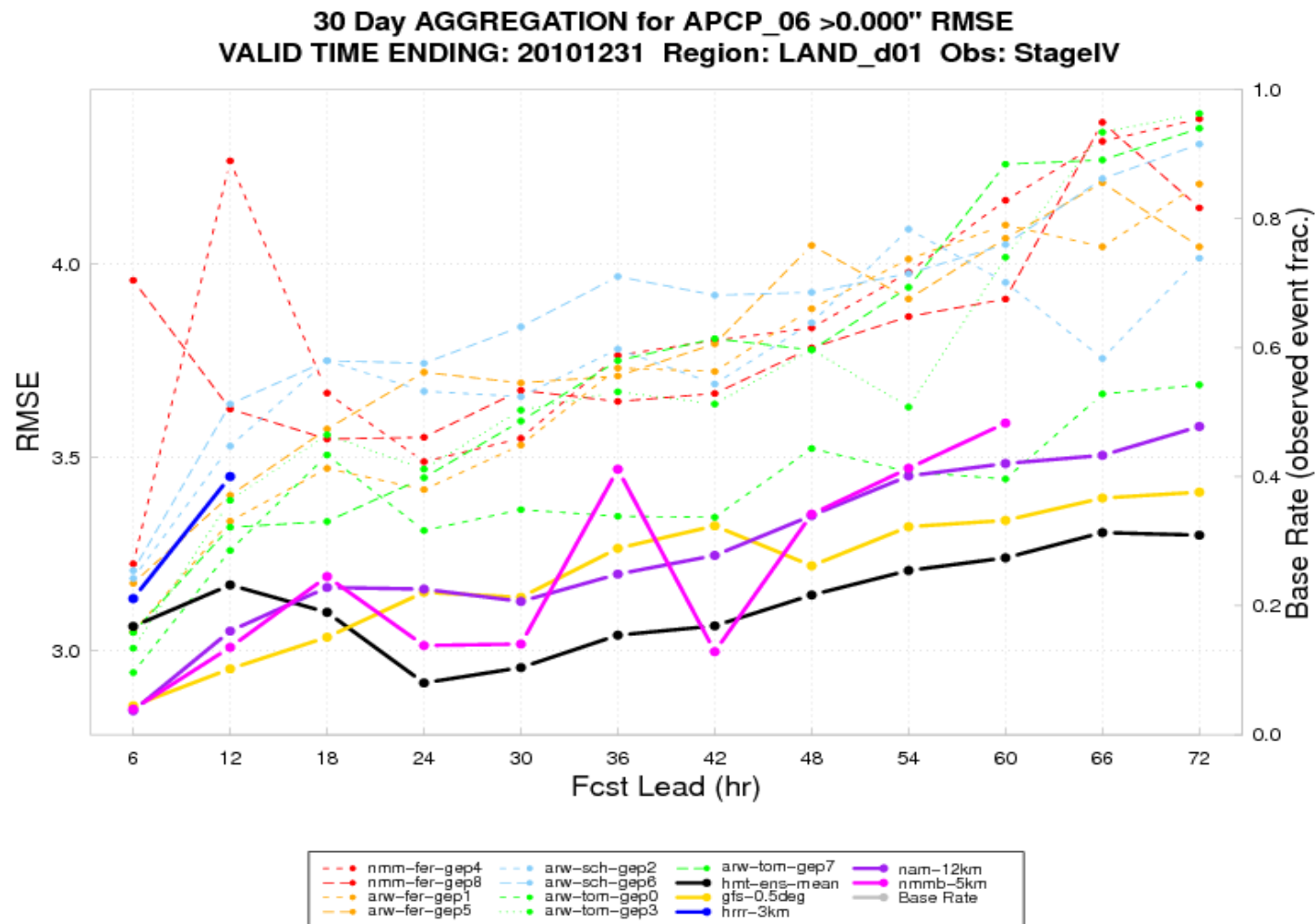
- With verification task, e.g. '**HMT_2012**':
 1. Create mysql database '**mv_hmt_2012**' (where mv= metviewer)
 2. Grant all permissions on '**mv_hmt_2012**' via mysql
 3. Load db tables
`mysql -u [user] mv_hmt_2012 < mv_mysql.sql`
 4. Load verification data into db
`bin/mv_load.sh [load_hmt_2012.xml] >& log/load_[date].log`
 5. Edit java servlet file to include '**mv_hmt_2012**'
`/usr/local/metviewer/webapp/metviewer/WEB-INF/classes/mvservlet.properties`
 6. Rebuild web application – ant
 7. Re-deploy application to webserver
 8. Change permissions for global execute and write access, as R will be run by the end-user (need to write and execute scripts)

Result

False Alarm Ratio for Entire 2011 Exercise Period



Result



30-day aggregations, with multiple models and ensemble members, plotted over lead times