

Stat Analysis Tool

- Filtering
- Summarizing
- Aggregating

of Grid-Stat, Point-Stat,
& Wavelet-Stat output

Presenter: Tara Jensen

What can Stat Analysis do for you?

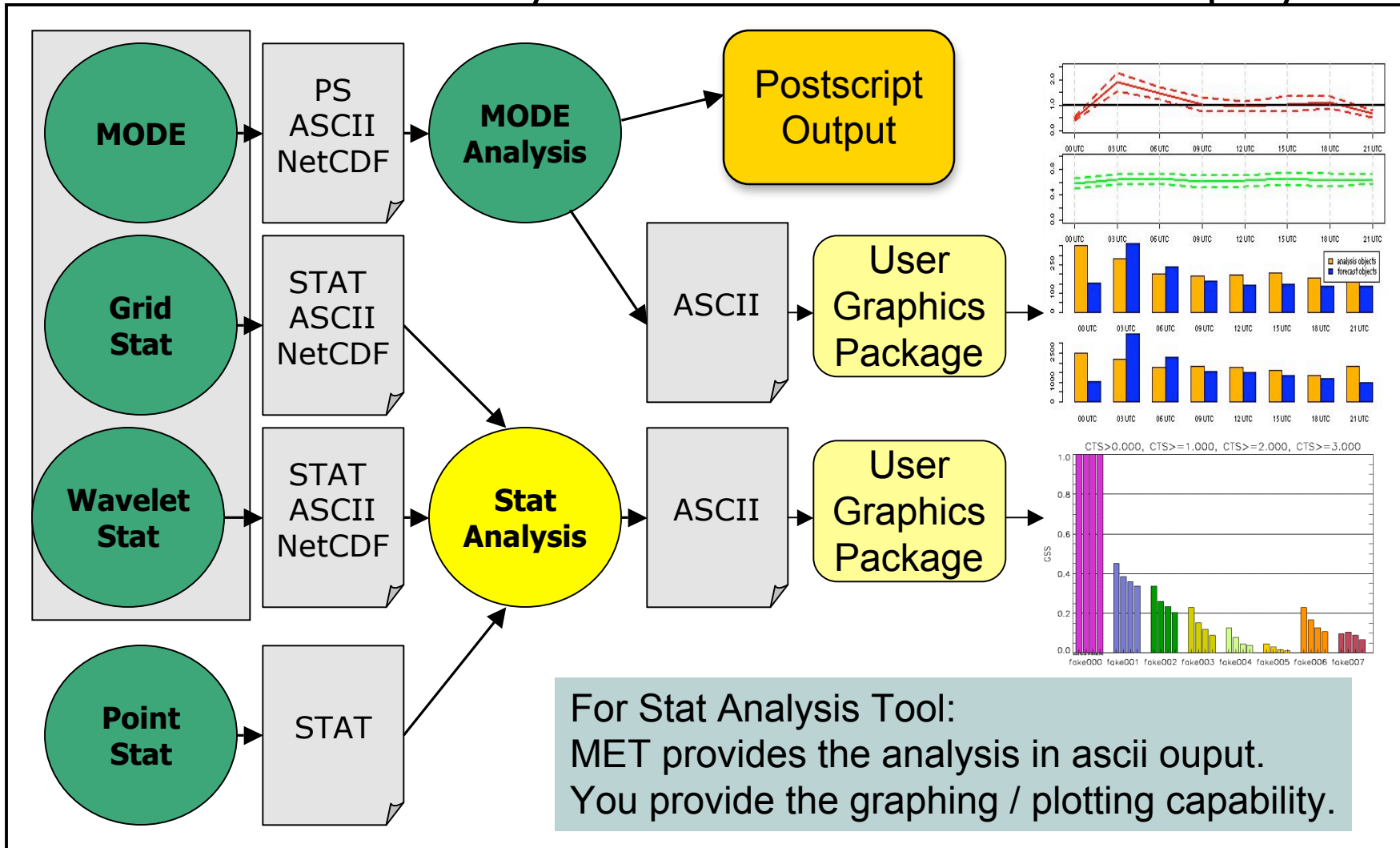
- ✓ **Q:** If I wanted the overall statistics for all the gridded observations compared to the forecasts for hours 0 through 24 together, can MET do this?
A: Yes – using Stat Analysis Tool on Grid-Stat output
- ✓ **Q:** Can I compute long-term statistics at individual sites (eg, mean absolute error or RMS error for daily forecasts for a month).?
A: Yes – using Stat Analysis Tool on Point-Stat output
- ✓ **Q:** Can I aggregate my contingency table statistics over multiple runs?
A: Yes – using Stat Analysis Tool on any output
- ✓ **Q:** Can I aggregate statistics for a large number (N) of individual stations in one simultaneous run?
A: Yes – but it would be cumbersome, you would have to configure Stat Analysis Tool to run (N) number of jobs.

Stat Analysis Tool

Statistics

Analysis

User Defined Display



Stat Analysis Jobs

- **Filtering**
 - **stat_job_filter** - filters out lines from one or more stat files based on user-specified filtering options.
- **Summarizing**
 - **stat_job_summary** - produces summary information from a single column of data including:
mean, standard deviation, min, max, and the 10th, 25th, 50th, 75th, and 90th percentiles.
- **Customized tool for AFWA**
 - **stat_job_go_index** - computes the GO Index, a performance Statric used primarily by the United States Air Force.

Stat Analysis Jobs

- **Aggregation**

- **stat_job_aggr** - aggregates stat data across multiple time steps or masking regions; sums contingency table data or partial sums across multiple lines of data.
- **stat_job_aggr_cts** - aggregates contingency table to produce aggregated contingency table statistics.
- **stat_job_aggr_cnt** - computes as many continuous statistics from aggregated partial sums as possible.
- **stat_job_aggr_mpr** - aggregates the matched pair output of Point-Stat and recomputes the requested stat line type.

Stat Analysis Tool: Usage

Usage: stat_analysis

-lookin path

[-out filename]

[-v level]

-config config_file

**or -job command line
options with associated
arguments**

[stat_job_filter]

[stat_job_summary]

[stat_job_aggr]

[stat_job_cts]

[stat_job_aggr_cnt]

[stat_job_aggr_mpr]

[stat_job_go_index]

| | |
|--------------------------|---|
| -lookin | Path to *.stat files – this can be a directory or a single file name (Use one or more times) |
| -out | Output name for ASCII file |
| -v | Level of logging |
| -config | StatAnalysisConfig file |
| stat_job_filter | See previous 2 slides |
| stat_job_summary | See previous 2 slides |
| stat_job_aggr | See previous 2 slides |
| stat_job_cts | See previous 2 slides |
| stat_job_aggr_cnt | See previous 2 slides |
| stat_job_aggr_mpr | See previous 2 slides |
| stat_job_go_index | See previous 2 slides |

Stat Analysis Tool: Configuration

- 22 configurable parameters – only set a few:
 - Apply NAM G212 mask
 - `vx_mask[] = ["G212"];`
 - Using only the Temperature variable
 - `var[] = ["TMP"];`
 - Filter on CTC lines that have been thresholded `var[]>278`
 - `line_type[] = ["CTC"];`
 - `fcst_thresh[] = [">278"];`
 - Dump the filtered stat data to a file
AND sum contingency table count (CTC) lines of data
for pressure levels between 850 and 750
 - `joblist[] = ["-job stat_job_filter -dump_row \
out/filter_job.stat", \
"-job stat_job_aggr -dump_row out/aggr_ctc_job.stat \
-level P850-750"];`

Stat Analysis Tool: Run `stat_job_aggr`

"-job stat_job_aggr -dump_row out/aggr_ctc_job.stat -level P850-750"

Point Stat Output (i.e. `point_stat_out.stat`)

```
V2.0      WRF      ... ADPUPA G212 ... TMP
P850-750 ... >278.00 CTC
401      192      11      24      174
UW_MEAN  1
```



| OBS | | | | |
|------------------|---|-----|-----|-----|
| F C S T | | Y | N | |
| | Y | 192 | 11 | 203 |
| | N | 24 | 174 | 198 |
| | | 216 | 185 | 401 |

```
V2.0      WRF      ... ADPSFC G212 ... TMP
P850-750 ... >278.00 CTC
167      25      23      0      119
UW_MEAN  1
```



| OBS | | | | |
|------------------|---|----|-----|-----|
| F C S T | | Y | N | |
| | Y | 25 | 23 | 48 |
| | N | 0 | 119 | 119 |
| | | 25 | 142 | 167 |

(NOTE: header modified to show only pertinent info)

Stat Analysis Tool: Run `stat_job_aggr`

Stat Analysis Output (i.e. `stat_analysis.out`)

```
FILTER:  -job stat_job_filter
        -vx_mask G212 -line_type CTC
        -fcst_thresh >278.000 -var TMP
        -dump_row out/filter_job.stat
```

```
JOB_LIST: -job stat_job_aggr
          -vx_mask G212 -line_type CTC
          -fcst_thresh >278.000 -var TMP
          -level P850-750 -dump_row
            out/aggr_ctc_job.stat
```

| COL_NAME: | TOTAL | |
|-------------|-------------|-------|
| FY_OY | FY_ON | |
| FN_OY | FN_ON | |
| INTERP_MTHD | INTERP_PNTS | |
| CTC: | 568 | 217 |
| 34 | 24 | 293 |
| -9999 | | -9999 |

| OBS | | | | |
|------------------|---|-----|-----|-----|
| F C S T | | Y | N | |
| | Y | 217 | 34 | 251 |
| | N | 24 | 293 | 317 |
| | | 241 | 327 | 568 |

Stat Analysis Tool: Run stat_job_summary

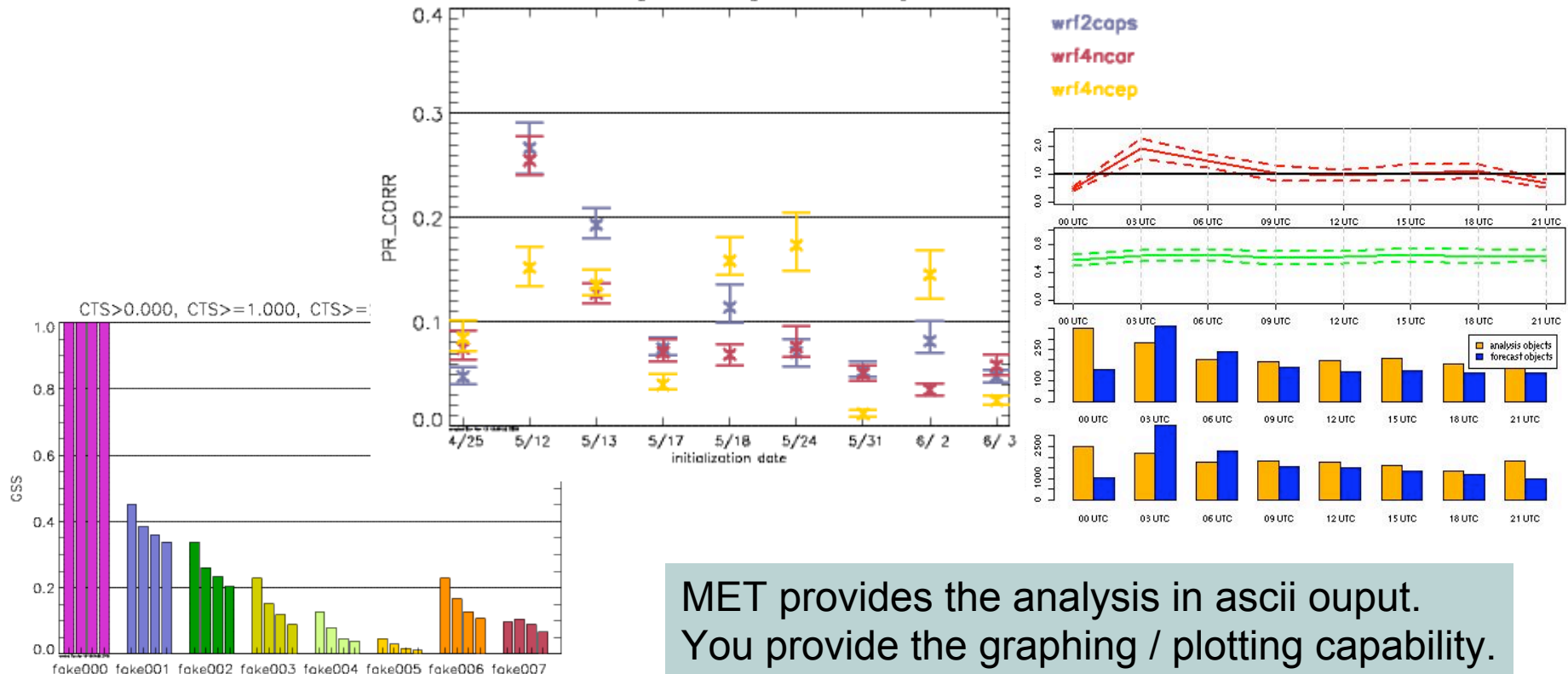
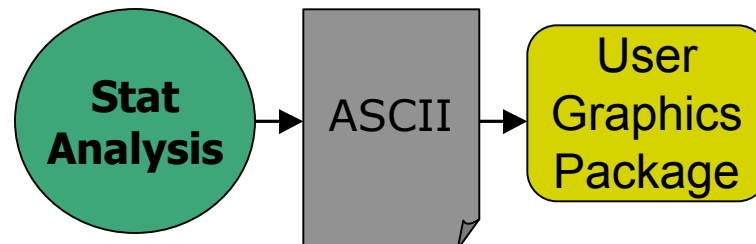
```
"-job stat_job_summary -line_type CNT -alpha 0.050 -var TMP \
-dump_row ../out/job_summary_RMSE.stat -column RMSE"
```

(stat_analysis.out cont.)

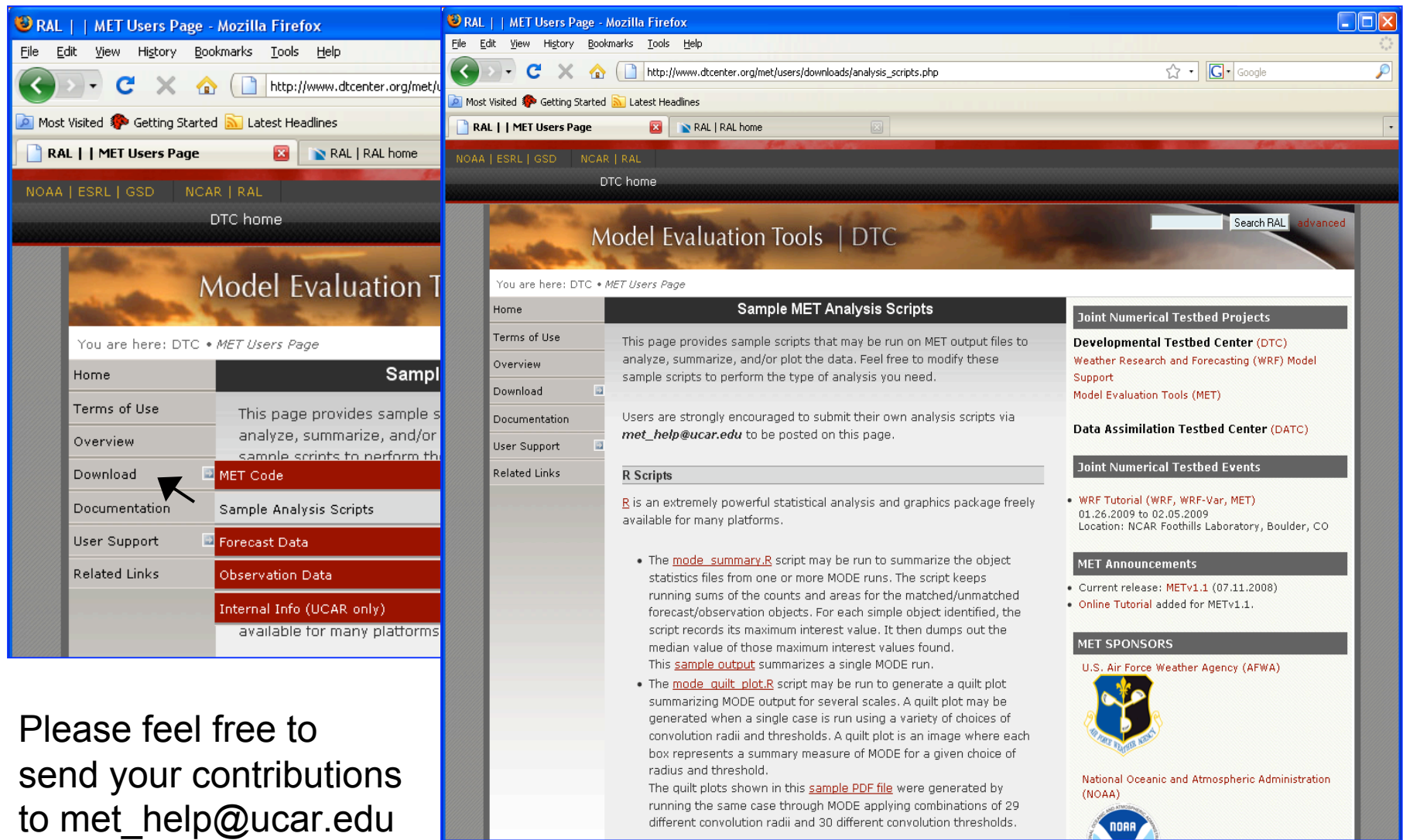
| Column Number | Description |
|---------------|--|
| 1 | Summary (job type) |
| 2 | Total |
| 3-7 | Mean* <i>Includes normal and bootstrap upper and lower confidence limits</i> |
| 8-10 | Standard deviation** <i>Includes bootstrap upper and lower confidence limits</i> |
| 11 | Minimum value |
| 12 | 10 th percentile |
| 13 | 25 th percentile |
| 14 | Median (50 th percentile) |
| 15 | 75 th percentile |
| 16 | 90 th percentile |
| 17 | Maximum value |

```
JOB_LIST: -job
stat_job_summary -line_type
CNT ...
COL_NAME: TOTAL MEAN
MEAN_NCL MEAN_NCU MEAN_BCL
MEAN_BCU STDEV STDEV_BCL
STDEV_BCU MIN P10
P25 P50 P75
P90 MAX
SUMMARY: 4 1.98438
1.33219 2.63656 1.58837
2.29289 0.40986 0.04574
0.55950 1.41291 1.59671
1.87241 2.07130 2.18328
2.18328 2.30251
```

Use your favorite plotting software



User Contributed Plotting Scripts



The image displays two screenshots of the MET Users Page in Mozilla Firefox. The left screenshot shows the 'Download' menu with an arrow pointing to 'MET Code'. The right screenshot shows the 'Sample MET Analysis Scripts' page with a list of scripts and their descriptions.

Model Evaluation Tools | DTC

You are here: DTC • MET Users Page

Sample MET Analysis Scripts

This page provides sample scripts that may be run on MET output files to analyze, summarize, and/or plot the data. Feel free to modify these sample scripts to perform the type of analysis you need.

Users are strongly encouraged to submit their own analysis scripts via met_help@ucar.edu to be posted on this page.

R Scripts

R is an extremely powerful statistical analysis and graphics package freely available for many platforms.

- The [mode_summary.R](#) script may be run to summarize the object statistics files from one or more MODE runs. The script keeps running sums of the counts and areas for the matched/unmatched forecast/observation objects. For each simple object identified, the script records its maximum interest value. It then dumps out the median value of those maximum interest values found. This [sample output](#) summarizes a single MODE run.
- The [mode_quilt_plot.R](#) script may be run to generate a quilt plot summarizing MODE output for several scales. A quilt plot may be generated when a single case is run using a variety of choices of convolution radii and thresholds. A quilt plot is an image where each box represents a summary measure of MODE for a given choice of radius and threshold. The quilt plots shown in this [sample PDF file](#) were generated by running the same case through MODE applying combinations of 29 different convolution radii and 30 different convolution thresholds.

Joint Numerical Testbed Projects

Developmental Testbed Center (DTC)
Weather Research and Forecasting (WRF) Model Support
Model Evaluation Tools (MET)

Data Assimilation Testbed Center (DATC)

Joint Numerical Testbed Events

- WRF Tutorial (WRF, WRF-Var, MET)
01.26.2009 to 02.05.2009
Location: NCAR Foothills Laboratory, Boulder, CO

MET Announcements

- Current release: **METv1.1** (07.11.2008)
- Online Tutorial** added for METv1.1.

MET SPONSORS

U.S. Air Force Weather Agency (AFWA)

National Oceanic and Atmospheric Administration (NOAA)

Please feel free to
send your contributions
to met_help@ucar.edu

Thanks - Any Questions?

Now you know how to:

Filter it.
Aggregate it.
and
Plot it...



Next up is:
Analyzing it.
and
Customizing it.

