



# MET+ Tutorial



# Goals

- Overview of MET and METViewer for new users
- Update current users on changes for METv6.1 and latest METViewer upgrades
- Highlight current MET users interesting research
- Introduce MET+

# MET+ Team

## NCAR

**Engineers:** John Halley Gotway, Julie Prestopnik, Randy Bullock, Tatiana Burek, Minna Win, Howard Soh, George McCabe

**Statisticians:** Tressa Fowler, Barb Brown, Eric Gilleland

**Scientists:** Tara Jensen, Kathryn Newman, Jamie Wolff, Michelle Harrold, Tina Kalb, Dan Adriaansen

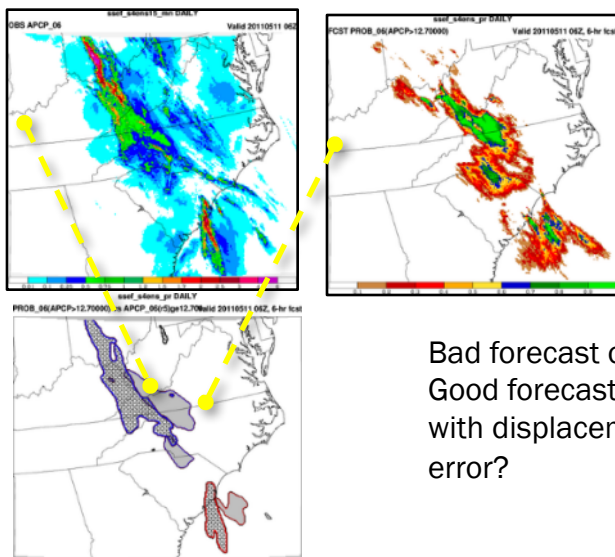
## ESRL

**Engineers:** Bonny Strong, Jim Frimmel, Kirk Holub, Randy Pierce, Molly Smith

**Scientists:** Jeff Hamilton

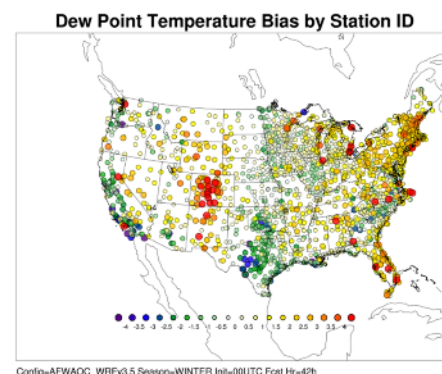
- **Over 70 traditional statistics** using both point and gridded datasets
- Multiple interpolation methods
- Computation of confidence intervals
- Able to read in GRIB1, GRIB2 and CF-compliant NetCDF
- Applied to many spatial and temporal scales
- 3200+ users, both US (30%) and internationally (70%)

### Object Based and Spatial Methods

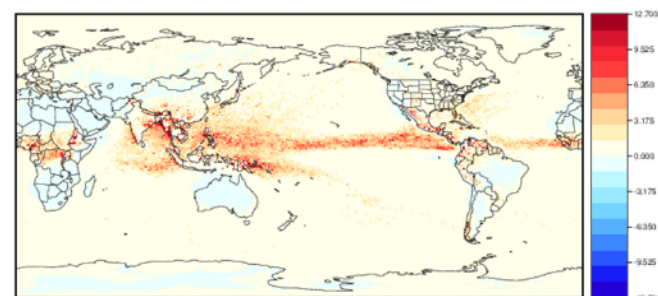


Bad forecast or  
Good forecast  
with displacement  
error?

### Geographical Representation of Errors



Config=AFWAOC\_WRFv3.5 Season=WINTER Init=00UTC Fcst Hr=42h



90<sup>th</sup> Percentile of difference between two models

# MET Overview v6.1

## Input

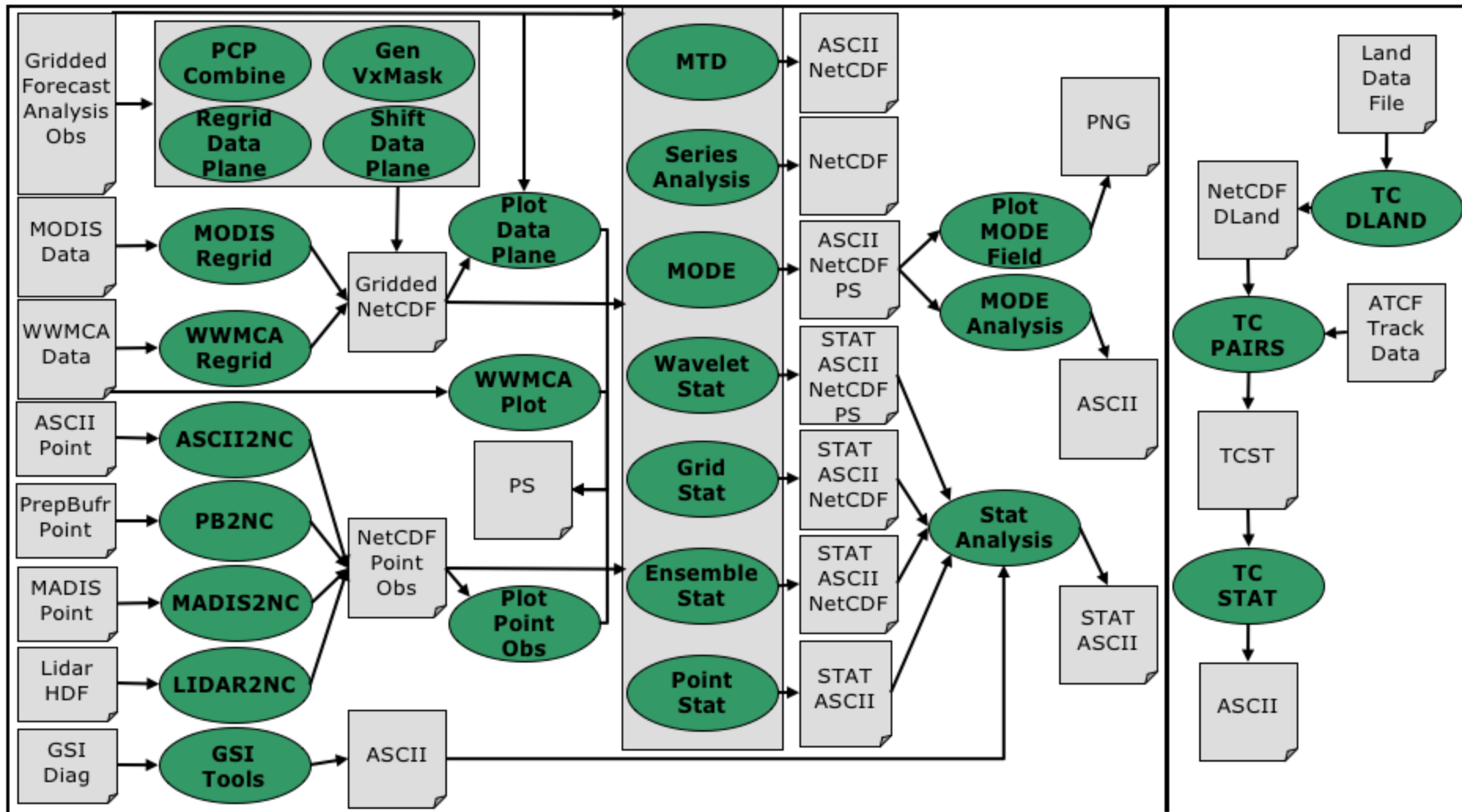
## Reformat

## Plot

## Statistics

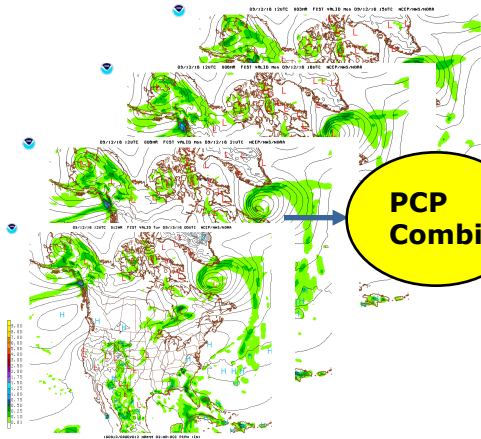
## Analysis

## MET-TC

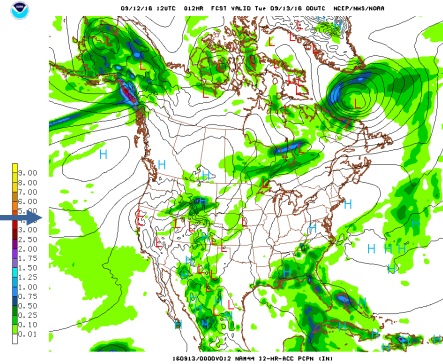


# Example: Accumulated precipitation

3-h accumulation QPE

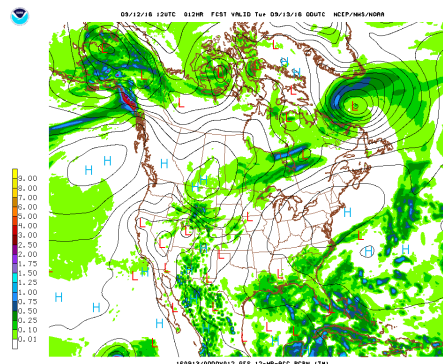


12-h accumulation QPE



PCP  
Combine

12-h accumulation QPF



MODE

MODE-TD

Wavelet  
Stat

Grid  
Stat

Series  
Analysis

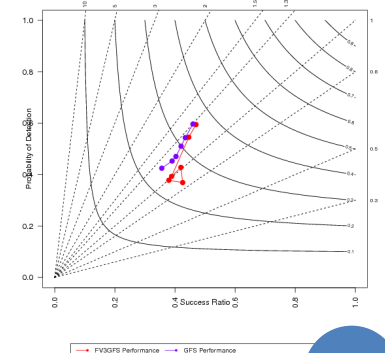
Ensemble  
Stat

Point  
Stat

METViewer  
Database and  
Display

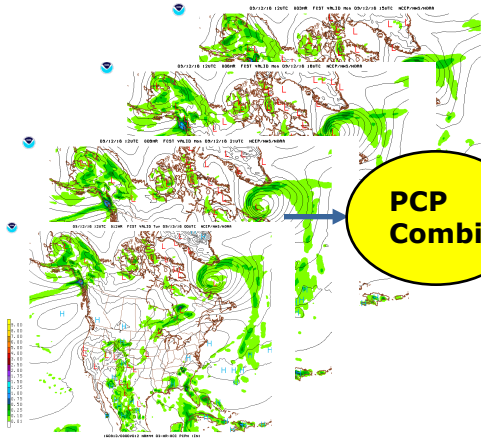
Multiple  
runs over  
time

2017/07/15 - 07/29, 24/36/48/60/72/84h fcsts, at 0.25in/day threshold



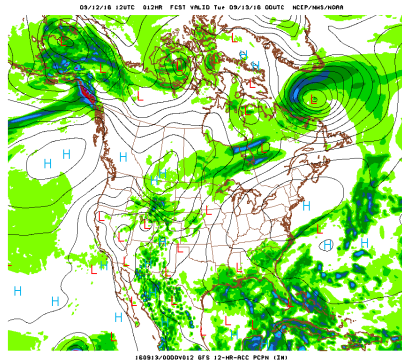
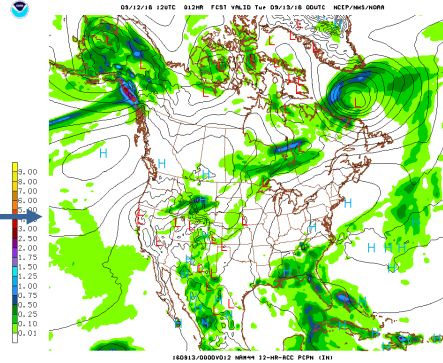
# Example: Accumulated precipitation

3-h accumulation QPE



**PCP  
Combine**

12-h accumulation QPE



12-h accumulation QPF

**MODE**

**MODE-TD**

**Wavelet  
Stat**

**Grid  
Stat**

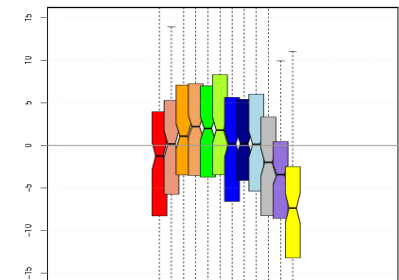
**Series  
Analysis**

**Ensemble  
Stat**

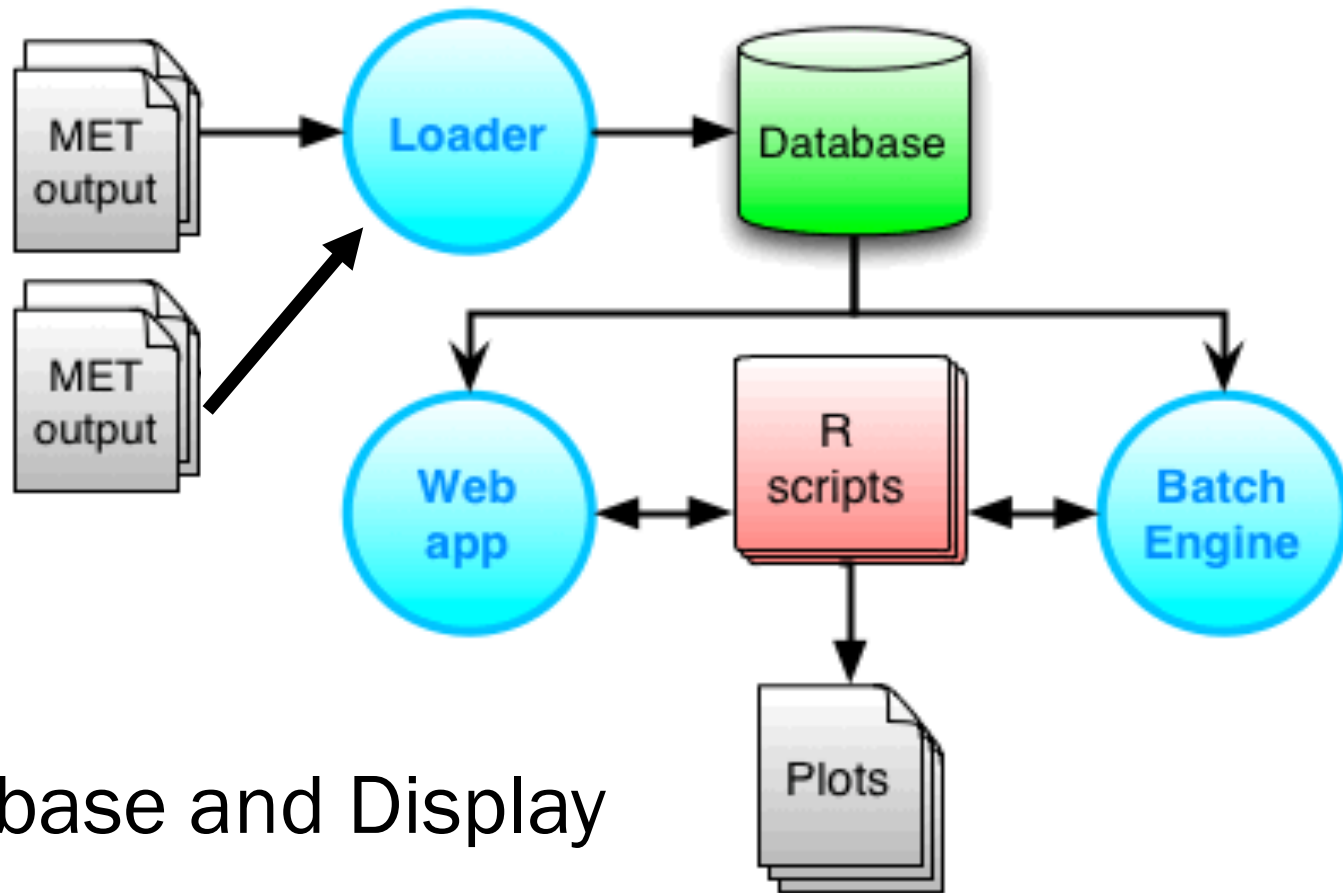
**Point  
Stat**

METViewer  
Database and  
Display

Multiple  
runs over  
time



# METViewer Components

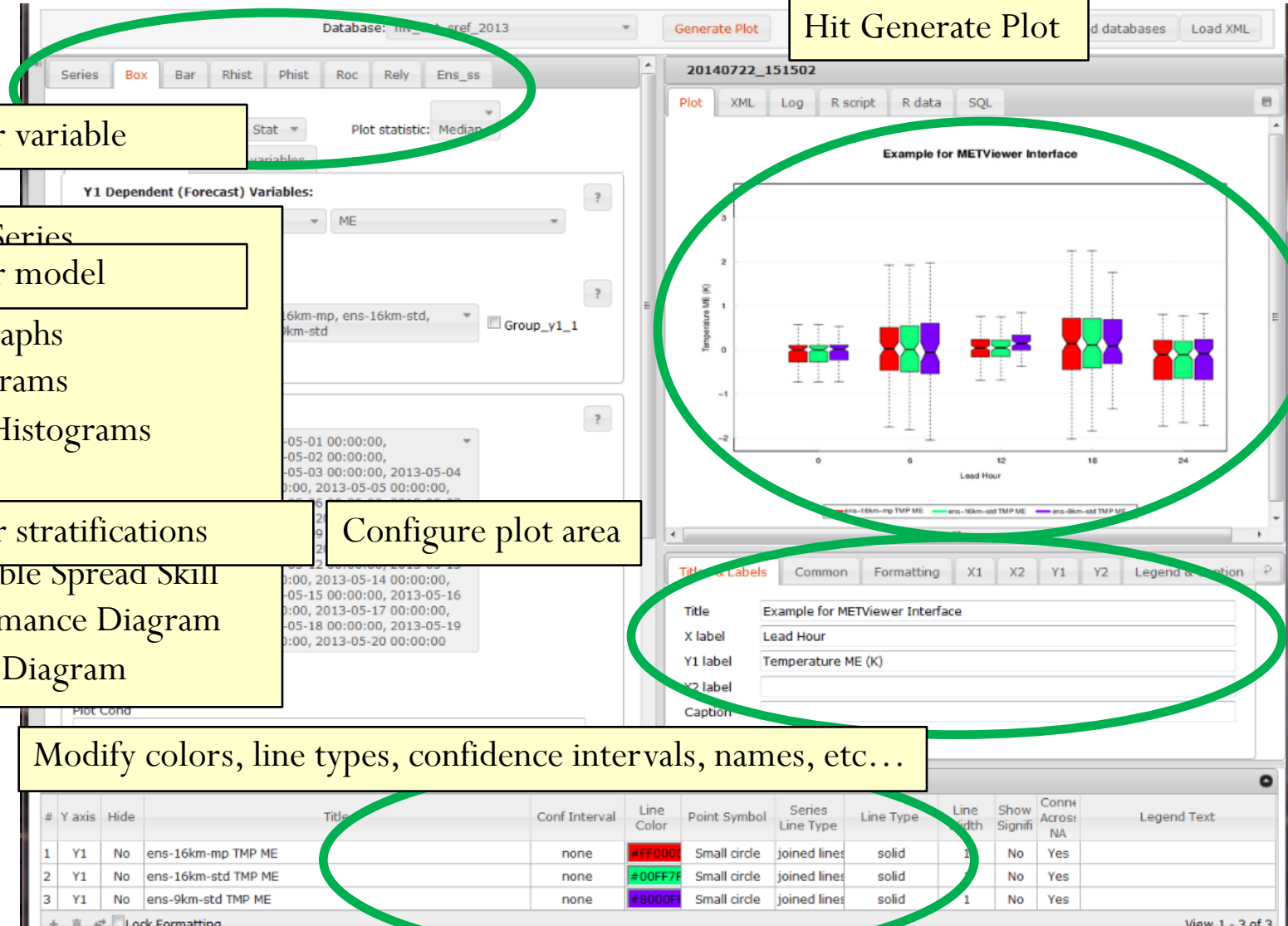


Database and Display



# METViewer

Many plot options



Pick your variable

Time Series

Pick your model

Bar Graphs

Histograms

Rank Histograms

ROC

Pick your stratifications

Ensemble Spread Skill

Performance Diagram

Taylor Diagram

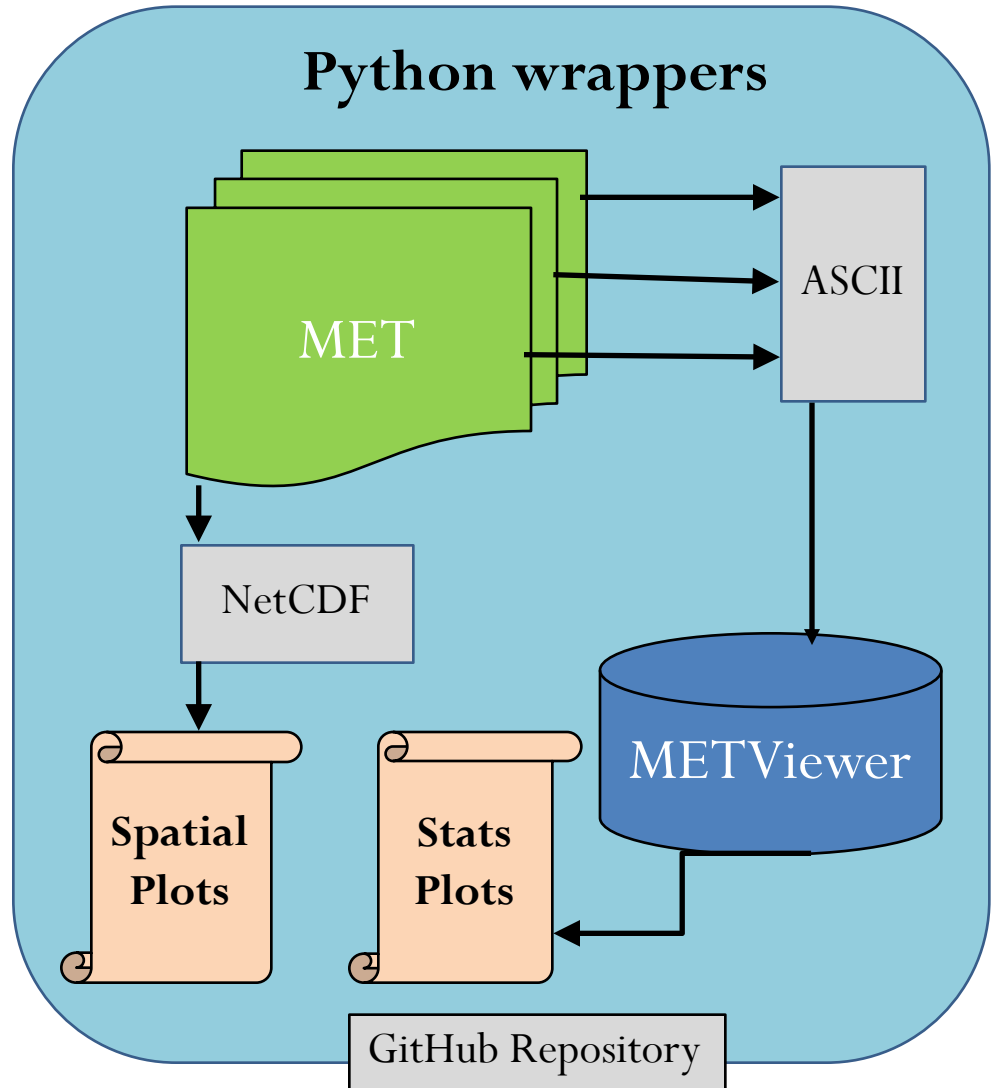
Configure plot area

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

# MET+ Unified Package

- Python wrappers around MET and METViewer:
- Simple to set-up and run
- Automated plotting of 2D fields and statistics
- Communication between MET & python algorithms (Cython)

**Initial system - Global deterministic with plans to generalize across scales when possible to quickly spin-up Ensembles, High Resolution & Global Components**



# Schedule

Wed - Jan 31	
09:00	Welcome and Intro
09:20	Basic VX Concepts
09:50	Contingency Tables
<b>10:30</b>	<b>Break</b>
10:45	Continuous Stats
11:30	Statistical Significance (Box plots, CIs, Pairwise Diff)
<b>12:00</b>	<b>Lunch</b>
01:00	MET Download and use-cases
01:30	Data Types and pre-processing
02:00	Point-Stat
<b>02:30</b>	<b>Break</b>
02:45	Practical Session - Pre-processing and Point Stat

# Schedule

## Thurs – Feb 1

08:00	Stat-Analysis
08:30	Masking and Interpolation
09:15	Grid-Stat and Regridding
<b>10:00</b>	<b>Break</b>
10:15	Practical Session - Grid-Stat and Stat-Analysis
<b>12:00</b>	<b>Lunch</b>
01:00	Series-Analysis
01:25	Ensembles and Probability
02:10	Ensemble-Stat
<b>02:30</b>	<b>Break</b>
02:45	Practical Session - Series-Analysis; Ensembles and Probabilities

# Schedule

Fri – Feb 2	
08:00	MODE and MODE-TD
08:45	MODE Customization and Output
09:30	MET-TC
<b>10:10</b>	<b>Break</b>
10:20	Practical - MODE, MTD and MET-TC
<b>12:00</b>	<b>Lunch</b>
01:00	METViewer
01:20	Containers
01:45	MET+ python wrappers
02:30	Wrap-up
<b>02:35</b>	<b>Break</b>
02:50	Practical - METViewer and MET+

# Where to get help

<https://dtcenter.org/met/users/>



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[VISITOR PROGRAM](#)

[EVENTS](#)

## MET USERS PAGE

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### MET-HELP

MET-Help is an email assistance service to provide support for registered MET users. Questions regarding MET and its use should be directed to:  
***[met\\_help@ucar.edu](mailto:met_help@ucar.edu)***

#### MET Resources

If you have a question regarding MET, please first check to see if your question is answered in the:

- [MET Documentation](#)
- List of [Known Issues](#)
- [FAQs](#) section
- [MET-Help Email Archive](#)
- Search online for ***Met\_help*** followed by the topic.

#### How To Contact MET-Help

If you would like to contact ***[met\\_help@ucar.edu](mailto:met_help@ucar.edu)*** but are not yet registered,

### EVENTS

[AMS 2018 NWP using Docker Containers](#)  
01.06.2018 to 01.06.2018  
Location: AMS Annual Meeting in Austin, TX

[2018 Hurricane WRF Tutorial](#)  
01.23.2018 to 01.25.2018  
Location: College Park, MD

### ANNOUNCEMENTS

[Release v3.9a of the HWRF system](#)  
10.16.2017

[MET Version 6.0 Release](#)  
04.03.2017

events

# Resources



MET User's Guide:

<https://dtcenter.org/met/users/docs/overview.php>

Verification Methods FAQ:

<http://www.cawcr.gov.au/projects/verification/>

Verification Discussion  
Group:

Subscribe at

<http://mail.rap.ucar.edu/mailman/listinfo/vx-discuss>