



# 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

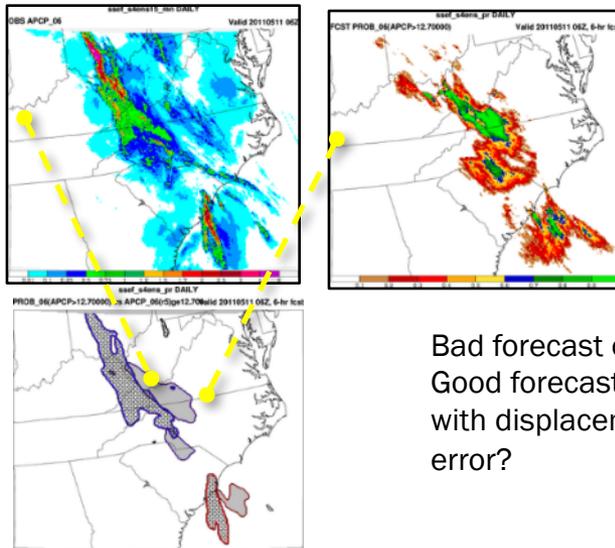
## ESRL

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

**Scientists:** Jeff Hamilton

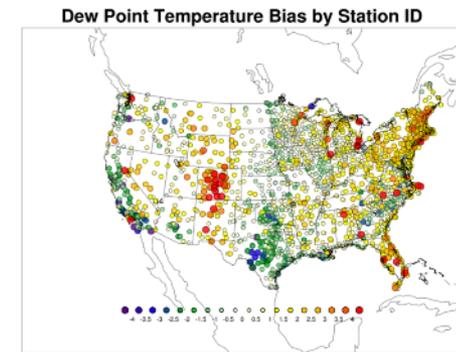
- **Over 70 traditional statistics** using both point and gridded datasets
- Multiple interpolation methods
- Computation of confidence intervals
- Able to read in GRIB1, GRIB2 and CF-compliant NetCDF
- Applied to many spatial and temporal scales
- 3200+ users, both US (30%) and internationally (70%)

### Object Based and Spatial Methods

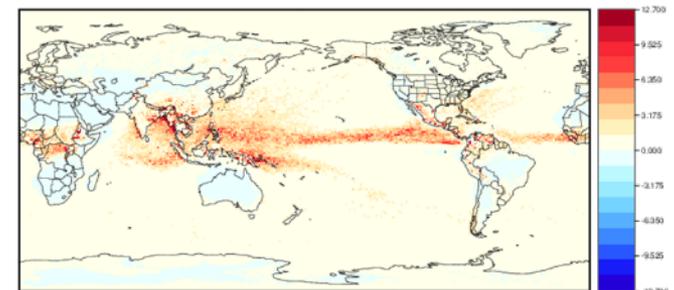


Bad forecast or  
Good forecast  
with displacement  
error?

### Geographical Representation of Errors

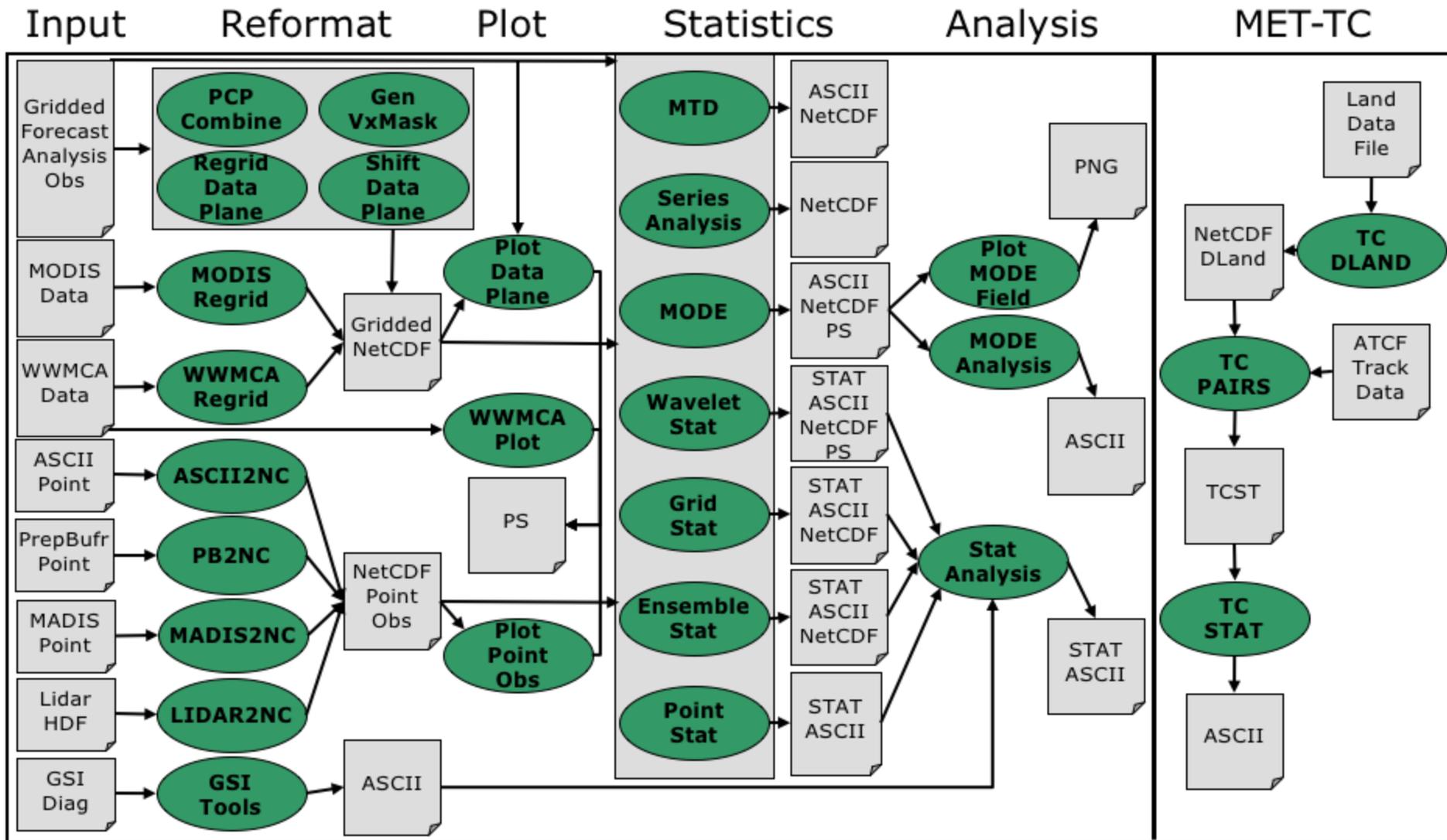


Config=AFWAOC\_WRFv3.5 Season=WINTER Init=00UTC Fcst Hr=42h



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

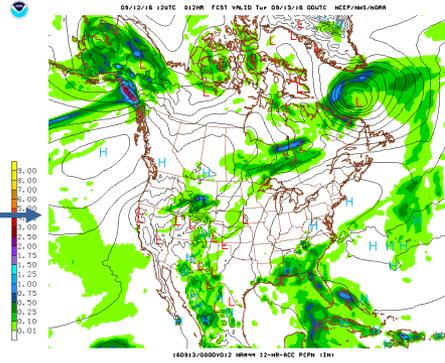
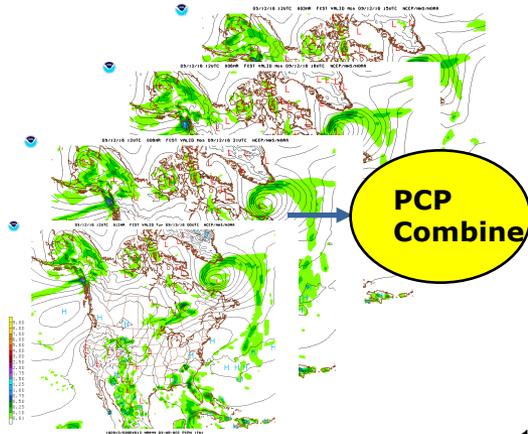
# MET Overview v6.1



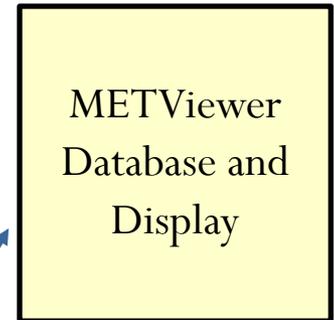
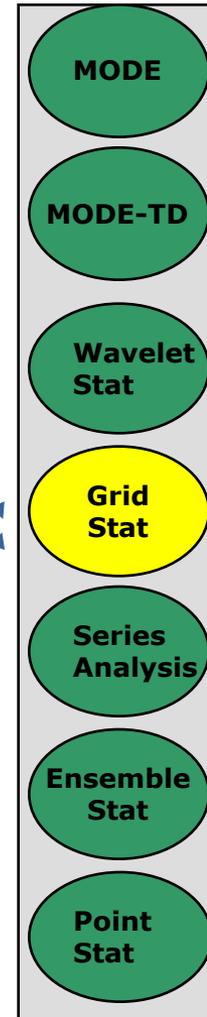
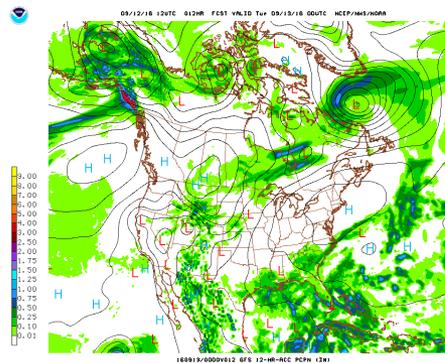
# Example: Accumulated precipitation

3-h accumulation QPE

12-h accumulation QPE

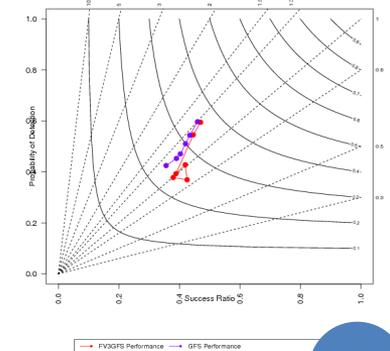


12-h accumulation QPF



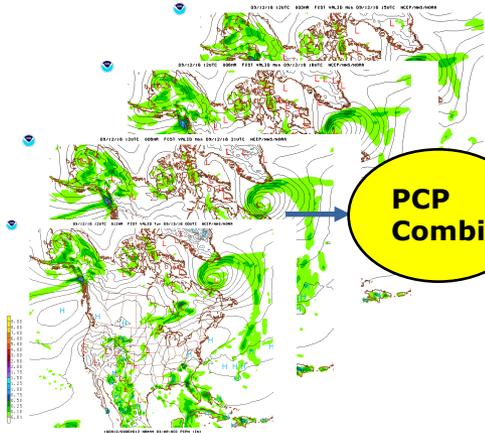
Multiple runs over time

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



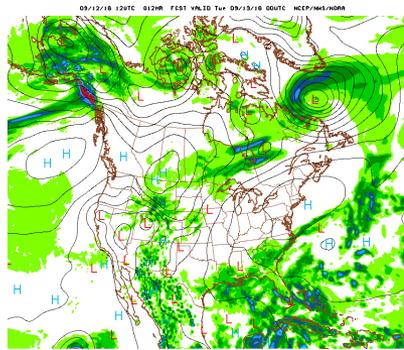
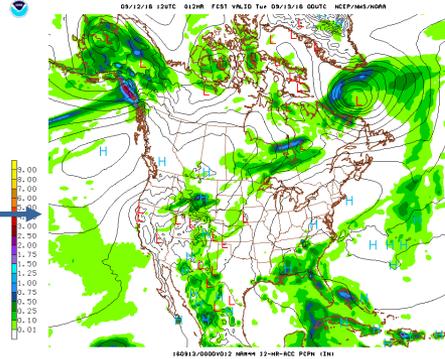
# Example: Accumulated precipitation

3-h accumulation QPE

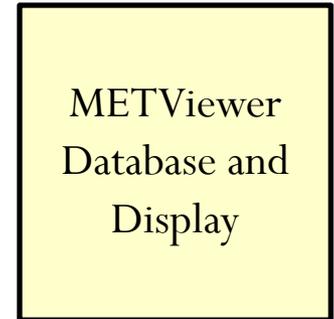
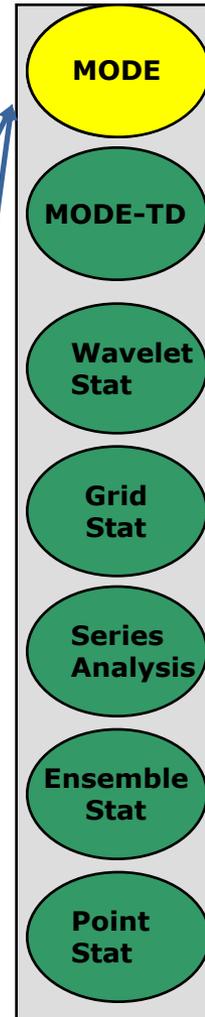


**PCP  
Combine**

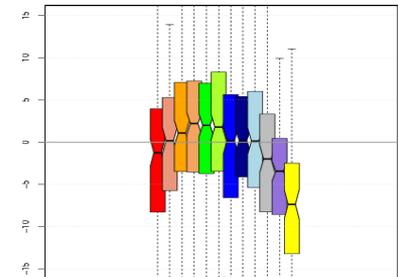
12-h accumulation QPE



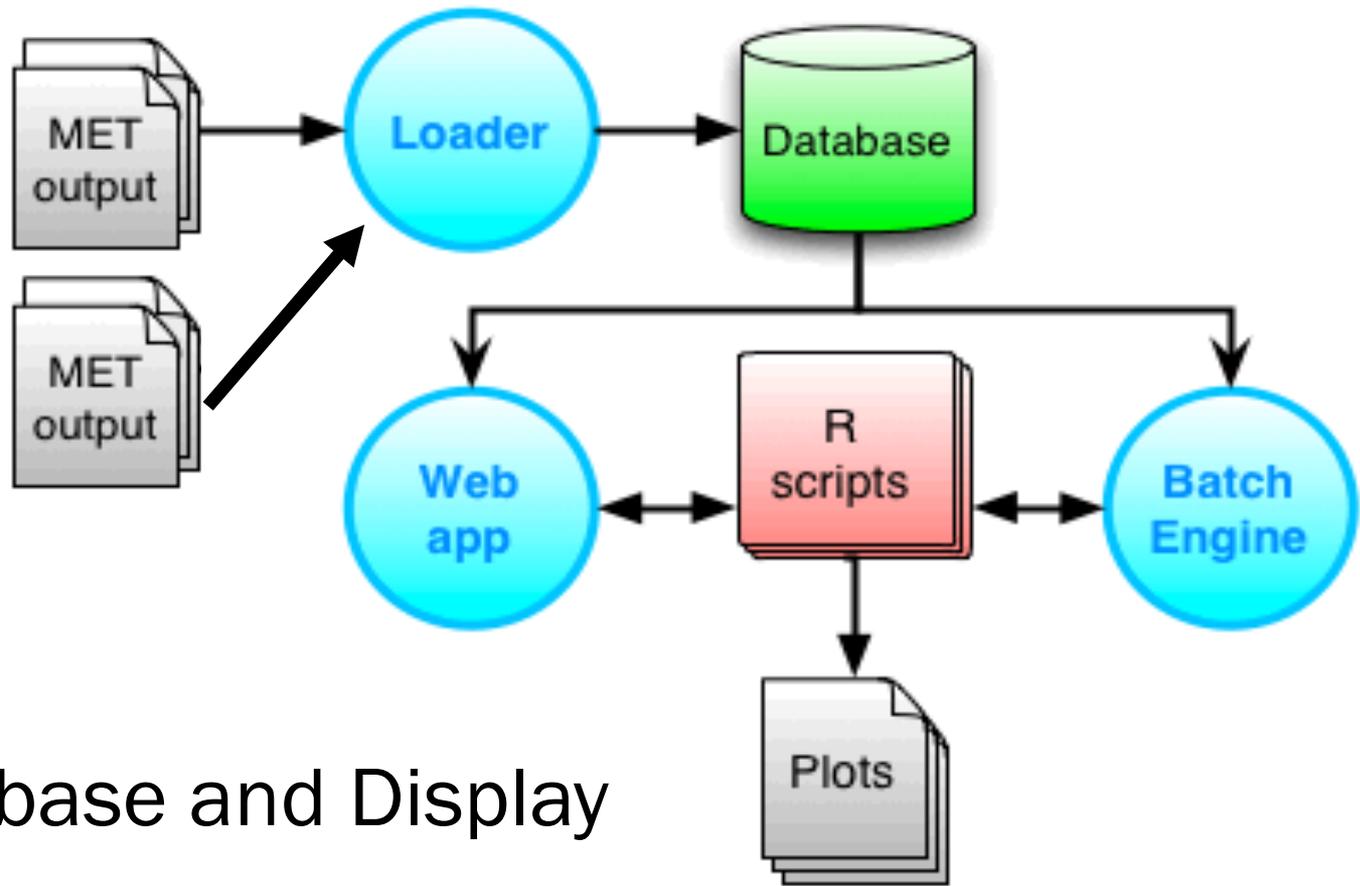
12-h accumulation QPF



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...

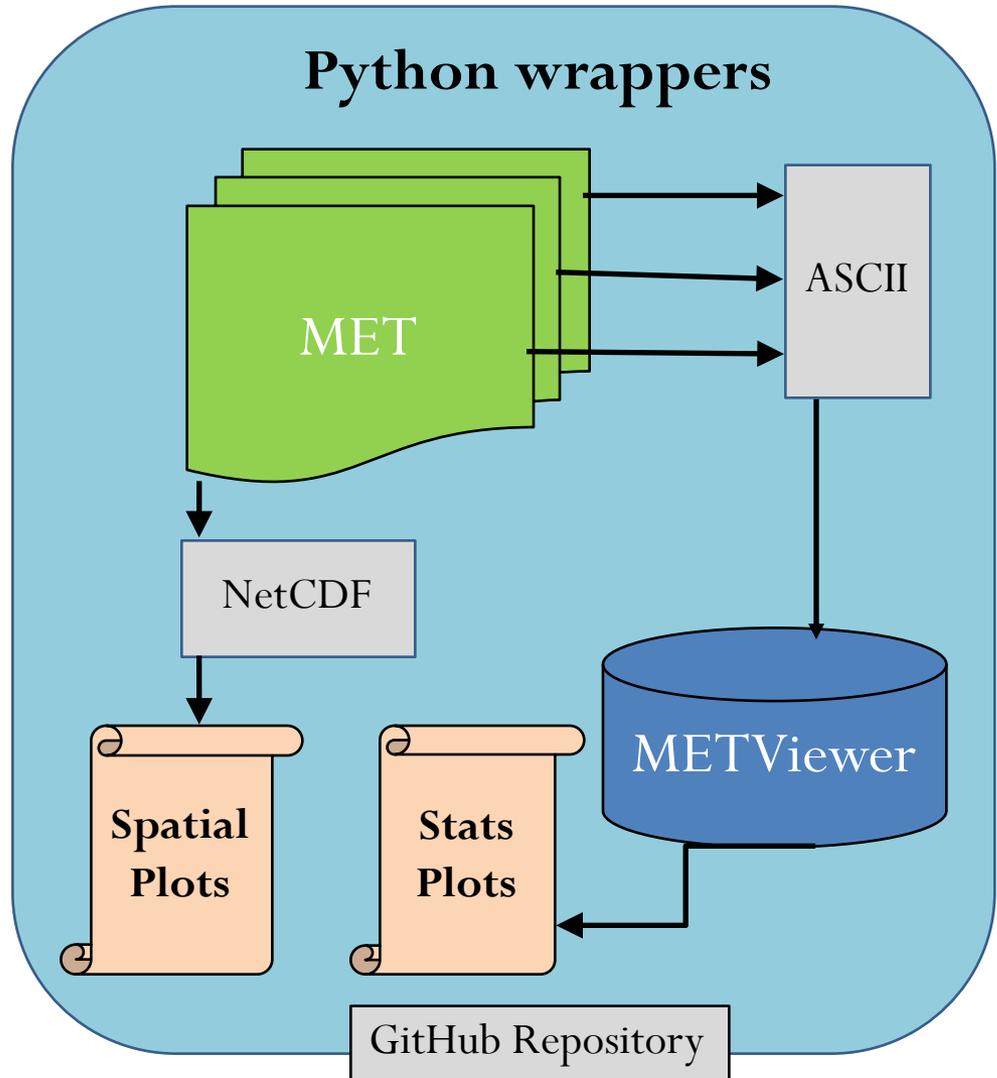
Hit Generate Plot

#	Y axis	Hide	Title	Conf Interval	Line Color	Point Symbol	Series Line Type	Line Type	Line Width	Show Signifi	Connec 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	

# 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/>



ABOUT

TESTING & EVALUATION

COMMUNITY CODES

VISITOR PROGRAM

EVENTS

## MET USERS PAGE

Home

Terms of Use

Overview

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Documentation

User Support ▶

Related Links

## 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***

### 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*** 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>