Update on Model Evaluation Tools (MET+) Aerosol Verification

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NCAR/RAL and DTC

8 June 2018

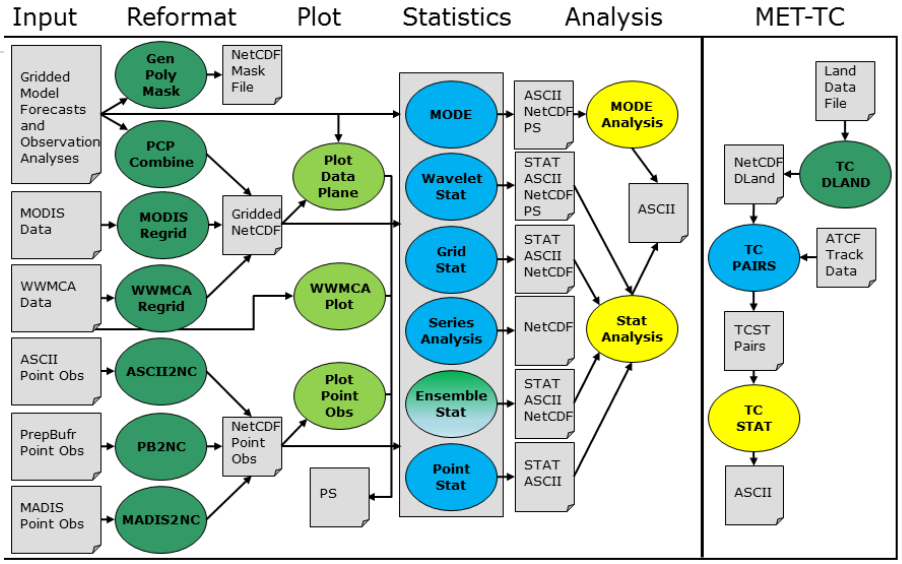
ICAP 10th Working Group Meeting

Met Office, Exeter UK

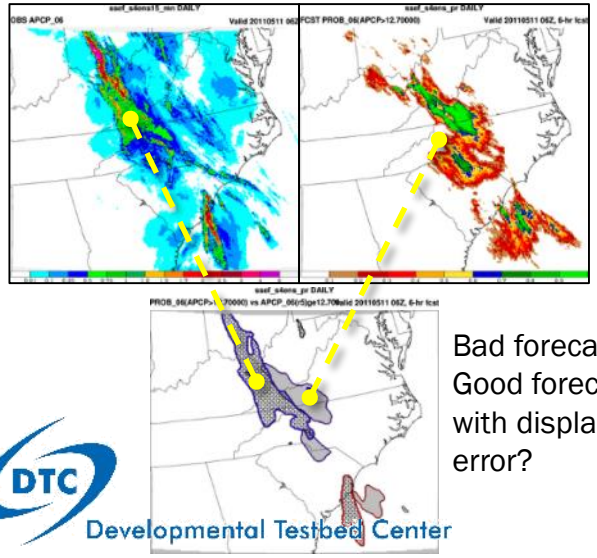
MET
Model Evaluation Tools

A verification toolkit designed for flexible yet systematic evaluation (supported to the community via the DTC)

- **Over 85 traditional statistics** using both point and gridded datasets
- Support for deterministic and ensemble prediction
- 15 interpolation methods
- Able to read in GRIB1, GRIB2 and CF-compliant NetCDF4
- Automated regridding
- Online and In-person tutorials
- Very responsive helpdesk

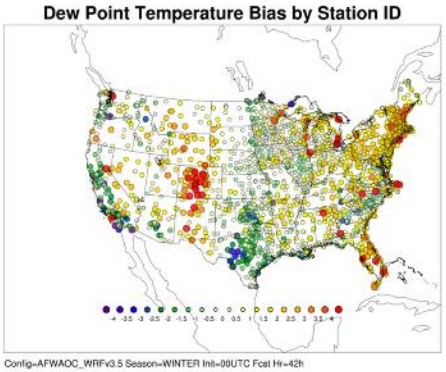


Object Based and Spatial Methods

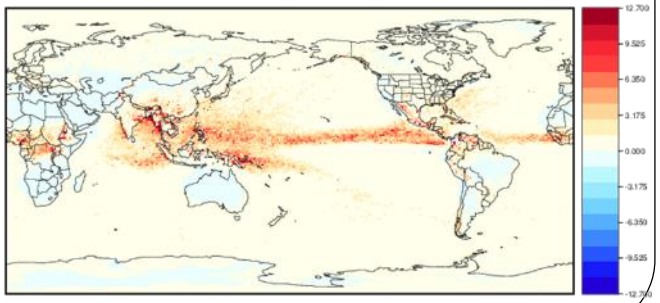


Bad forecast or Good forecast with displacement error?

Geographical Representation of Errors



90th Percentile of difference between two models



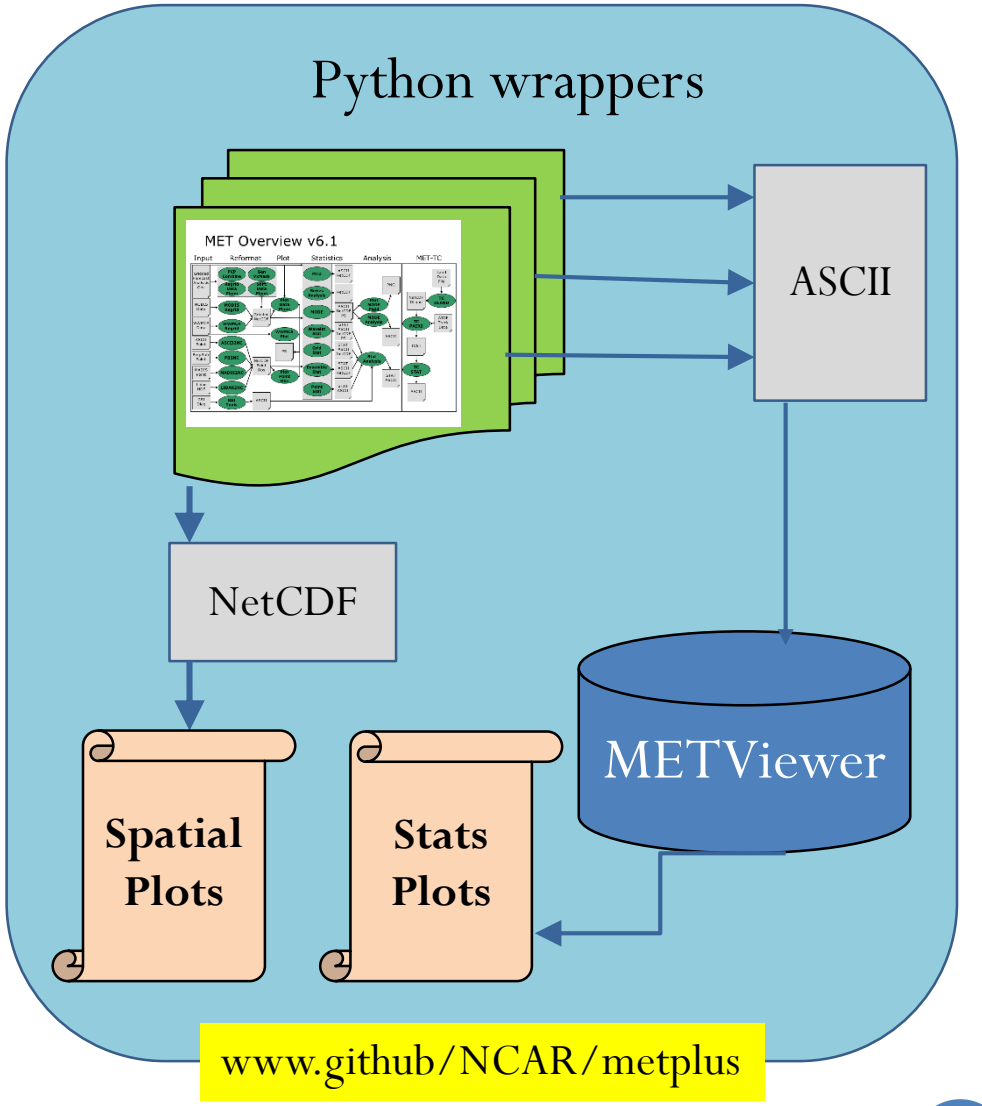
DTC Developmental Testbed Center

What is MET+

Python wrappers around:

- MET (core)
- METViewer (core)
- Plotting
  - METViewer User Interface
  - METViewer Batch Engine
  - Python plotting scripts
- Communication between MET & python algorithms*

***Near Term:** After Global - CAM, Ensembles and Aerosols/Air Qual*
***Longer Term:** Earth System "Components"*



MET(+) Use-Case Example

AERONET 1-min AOD Data

ASCII 2NC

AERONET AOD 6-hr mean, max, stdev, range

MODE

MODE-TD

Wavelet Stat

Grid Stat

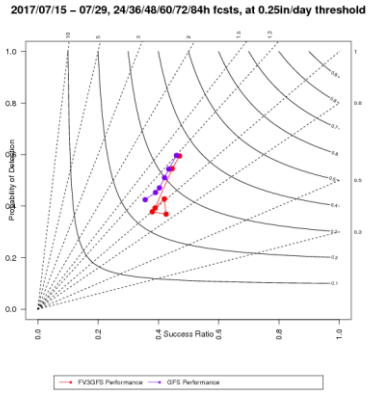
Series Analysis

Ensemble Stat

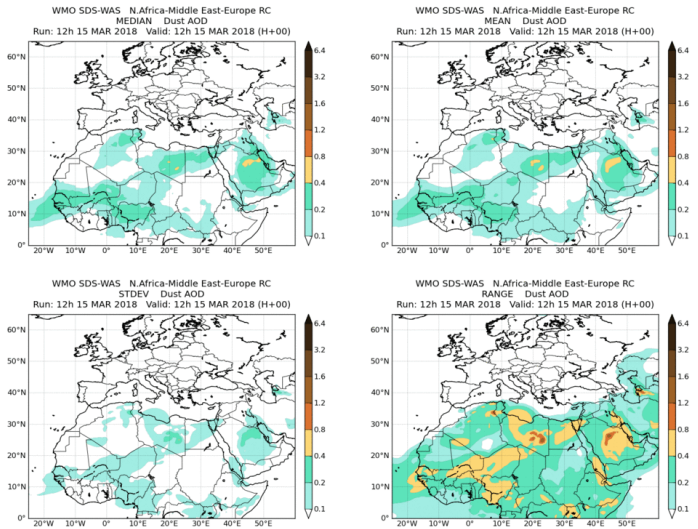
Point Stat

METViewer Database and Display

Multiple runs over time



WMO SDS-WAS Forecasts



Use-case includes

- MET+ .conf file
- MET config files
- Python scripts to:
  - Call Ascii2NC
  - Call Point-Stat
  - Load METViewer
  - Make statistics plot
  - Make plot of fields

MET+ Aerosol and Atmospheric Composition Capability

Expected capability by Jun/Jul 2018 time frame

General Formats

- Grib1 and 2
- NetCDF - cf-Compliant with projection information in it - current capability

Obs File Format Support

- MODIS
- Calipso - L2 - 5km data cloud and aerosol products
- Aeronet v2 *(NOTE: header changes in v3 will be addressed in next release)*
- Surfrad Irradiance
- MADIS mesonet observations
- Any other data in MET specified 11-column ASCII format

MET+ Aerosol and Atmospheric Composition Capability

Work in progress - Satellite

- GOES-16 aerosol optical depth (AOD), smoke and dust concentration (column average of 0-5000 m and 0-100m), smoke and dust mask
  - Static grid definition file
  - Dense data that needs to be thinned
- VIIRS AOD (BUFR) format
  - Dense data that needs to be thinned

Work in progress – Surface

- AERONET AOD - current capability is for Version 2
  - Header changed significantly with Version 3 as well as number of fields
- SURFRAD AOD –
- Other Fields in NCEP BUFR
  - Aeronet AOD, PM2.5/10, Ozone, others

MET+ Aerosol and Atmospheric Composition Capability

Additional capability that we are working on and that's pertinent:

- Thinning (super-obbing) and gridding satellite swath data (specify if min, max, median, or a quantile and interpolation method used for gridding)
- Compute time summaries such as mean, max, median, quantiles over a user-specified time window (e.g. max O3 concentration in 24hrs)
- Hooks into the MET data-plane libraries to allow python packages to read data and pass it into MET tools.
  - As of June 1: C++ MET code can extract data array from python script
  - By end of June: A template to pass data through X-Array utility

MET+ Aerosol and Atmospheric Composition Capability

What's still needed:

- Expanded support for HDF-5 (discussing how to fund development - or maybe python will be the solution)
- Users to help us set up MET+ examples (use-cases) with the right MET configurations to provide to the community
- Let us know what else is missing so we can plan for it

Contact: Tara Jensen – jensen@ucar.edu

MET Download:
http://www.dtcenter.org/met/users/downloads/index.php

MET Helpdesk ***met_help@ucar.edu***

http://www.dtcenter.org/met/users/support/met_help.php

DTC Visitor Program

Accepting proposals related to all areas of DTC work including Verification

https://dtcenter.org/visitors/opportunity/

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