MET+ Overview

MET+ Unified Package

- Python wrappers around MET and METViewer:
- Simple to set-up and run
- Automated plotting of 2D fields and statistics

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



What is currently wrapped with Python?





What	does wrapped by Python mean?						
At https	://github	o.com/NCAR/MET	olus/				
	A NCAR / METplus	S Private	O Unwatch → 10 ★ Star 2	😵 Fork 4			
	<> Code () Issue	es 32 🕅 Pull requests 0 🔲 Projects 0	💷 Wiki 🔟 Insights				
	Python scripting infrastructure for MET tools.						
	© 590 com	mits 🖗 4 branches	🗞 7 releases 🎎 6 contribut	ors			
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METplus/parm/use_cases/feature_relative/examples/series_by _lead_all_fhrs.conf

series_by_lead_all_fhrs.conf

[config] PROCESS_LIST = TcPairs, ExtractTiles, SeriesByLead

Series analysis config file used by MET SERIES_ANALYSIS_BY_LEAD_CONFIG_FILE = {PARM_BASE}/met_config/SeriesAnalysisConfig_by_lead

Variables and levels of interest VAR LIST = TMP/P850, HGT/P500

Statistics of interest (Must always have include TOTAL) STAT_LIST = TOTAL, FBAR, OBAR, ME

#TC-STAT filtering options used to extract tiles EXTRACT_TILES_FILTER_OPTS = -basin ML

The init time begin and end times, increment, and last init hour.

INIT_TIME_FMT = %Y%m%d INIT_BEG = 20141214 INIT_END = 20141216 INIT_INC = 21600

At https://github.com/NCAR/METplus/

31 32 cat thresh = [NA]; 33 cnt_thresh = [NA]; 34 cnt logic = UNION: In Configs: Series Analysis Config 37 11 Environmen 38 // Forecast and observation fields to be verified 39 11 t variables 40 fcst = { passed in 41 42 field = [from 43 £ name "\${NAME}"; Constants 45 level = ["\${LEVEL}"]; 46 3 File 47 48 49 obs = fcst; 51 52 53 54 11 // Climatology mean data

METplus/parm/use_cases/feature_relative/examples/series_by _lead_all_fhrs.conf

series_by_lead_all_fhrs.conf

```
[config]
```

PROCESS_LIST = TcPairs, ExtractTiles, SeriesByLead

Series analysis config file used by MET SERIES_ANALYSIS_BY_LEAD_CONFIG_FILE = {PARM_BASE}/met_config/SeriesAnalysisConfig_by_lead

```
# Variables and levels of interest
VAR_LIST = TMP/P850, HGT/P500
```

```
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STAT_LIST = TOTAL, FBAR, OBAR, ME
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```
#TC-STAT filtering options used to extract tiles
EXTRACT_TILES_FILTER_OPTS = -basin ML
```

```
# The init time begin and end times, increment, and last init hour.
INIT_TIME_FMT = %Y%m%d
INIT_BEG = 20141214
INIT_END = 20141216
INIT_INC = 21600
```

MET+ Beta - Prerequisites

- Python 2.7 ** When we started this was specified by NCO
- R version 3.25 ** Only if you are using plot_tcmpr.R tool
- nco (netCDF operators)
- MET version 6.0 or later installed
 ** Tool is designed to sit on-top of MET and should be version insensitive after METv6.0
- Basic familiarity with MET

MET+ Beta Installations

- Theia
- /scratch4/BMC/dtc/Tara.Jensen/METplus
- . WCOSS
- Gyre: /global/noscrub/Julie.Prestopnik/METplus
- Surge:

/gpfs/hps3/emc/global/noscrub/Julie.Prestopnik/M ETplus

Getting Started

Instructions for grabbing release:

https://github.com/NCAR/ME Tplus

Instructions for downloading:

Click on the green download button on right side

Instructions for cloning:

- git clone <u>https://github.com/NCAR/M</u> <u>ETplus</u>
- You should now have a METplus directory

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NCAR / METplus	s 32 🕅 Pul	requests 0 📳 Projects 0 📟 Wil	🕑 Unwa	atch • 10 🖈 Star 2 🖞 Fork 4
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METplus Repository README File {#METplus_README}

Welcome to the documentation for the Model Evaluation Tools Plus (METplus).

This is the METplus repository Top level README.md

Basic DOCUMENTATION - getting started

ALL Documentation specific to this repository can be found in the doc/ directory.

The ORIGINAL setup text documentation in a markdown file is found here

- doc/README_install.md --- installation, configuration, running
- doc/README_terms_of_use.md --- legal Terms Of Use

METplus is a Python scripting infrastructure around the MET verification tools (and eventually METViewer, a tool used for plotting MET output verification statistics).

Grabbing the Release



Grabbing the Release

NCAR / METplus		O Unwatch 10	★ Star 3	¥ Fork
Code (1) Issues 32	1 Pull requests 0 Projects 0 E Wiki III Insights			
Releases Tags			Draft a I	new releas
Latest release [©] METplus_beta - ○ 1aa1573	METplus Beta bikegeek released this 20 hours ago · 2 commits to master since to METplus_beta Change name from Alpha-produtil to Beta-METplus. Downloads	this release		Edit
	Tinstructions_METplus_Beta.pdf			164 KE
	T sample_data.tar.gz			479 ME
	Source code (zip)			
	Source code (tor az)			

Recommended Procedure - User <u>https://github.com/NCAR/METplus/wiki/GitHub-Repo-</u> <u>Information</u>

GitHub Repository

For Users

Downloading a release from the GitHub web-page:

- Click on the link 'Releases' link below the solid blue line near the top of the main NCAR/METplus web page and save the sample data, source code, and instructions.
- 2. Copy the source code (either .zip or .tar.gz) to your desired location.
- 3. Uncompress the source code:

unzip <file.zip>

or tar xvfz <file.tar.gz>

- 4. Copy the sample_data.tar.gz to the METplus/ directory
- 5. Uncompress the sample_data.tar.gz: tar xvfz sample_data.tar.gz

Recommended Procedure - Developer

https://github.com/NCAR/METplus/wiki/GitHub-Repo-Information

For Developers

- Fork a copy of the NCAR/METplus code into your own GitHub repo, then clone from your GitHub repo to your local machine and make any changes.
- 2. When you want to save your work in progress, you can check into your GitHub repo.
- When everything is working satisfactorily, you can do a pull request to the NCAR/METplus repo.

Diagram outlining GitHub process for developers: https://github.com/NCAR/METplus/blob/master/doc/wiki_contents/diagrams/GitHub_process.png

Existing MET Builds

https://dtcenter.org/met/users/downloads/existing_met_builds/M ETv6.1_existing_met_builds.php

Home

Terms of Use

Overview

Download **>**

Documentation

User Support▶

Related Links

METV6.1 EXISTING MET BUILDS

METv6.1 Existing MET Builds

- NCAR RAL machines
 - MET BUILD: /usr/local/met-6.1
 PATCH DATE: No known issues

NCAR machine cheyenne

- PATCH DATE: NONE MODULES:
 - module use /glade/p/ral/jnt/MET/MET_releases/cheyenne /modulefiles
 - module load met/6.1

NOAA machine theia

- PATCH DATE: NONE MODULES:
 - module use /contrib/modulefiles
 - module load met/6 1

EVENTS

2018 Hurricane WRF Tutorial 01.23.2018 to 01.25.2018 Location: College Park, MD

ANNOUNCEMENTS

MET Version 6.1 Release 12.04.2017

Release v3.9a of the HWRF system 10.16.2017

MET NEWS

MET Online Tutorial New for METv6.1 on 2017.12.04

METv6.0 Running within a Docker container New for Mac and Windows 10 users who wish to skip building and installing METv6.0

Setting up profile - Theia

```
Theia - .cshrc
set loadmemetplus='yes'
if ( $loadmemetplus == 'yes' ) then
  module use /contrib/modulefiles
  module load met
  module load nco
  module load wgrib2
  module load R
  set METPLUS PATH=/scratch4/BMC/dtc/Tara.Jensen/METplus
  set MET PATH=/contrib/met/6.1
  setenv JLOGFILE ${METPLUS PATH}/logs/metplus jlogfile
  setenv PYTHONPATH
${METPLUS PATH}/ush:${METPLUS PATH}/parm
  setenv PATH ${PATH}:${METPLUS PATH}/ush:.
endif
```

Setting up profile - Gyre

WCOSS - /u/user/.bashrc

set loadmetplus='yes'

```
if [ $loadmetplus=='yes' ]; then
```

echo "Loading METplus environment"

module use /global/noscrub/Julie.Prestopnik/modulefiles

module load met/6.1

module load nco

```
module load grib_util/v1.0.3
```

module use /usrx/local/dev/modulefiles

module load python

```
export METPLUS_DEMO="/global/noscrub/Julie.Prestopnik/"
```

```
export MET_DEMO="/global/noscrub/Julie.Prestopnik/met/6.1"
```

```
export JLOGFILE="${METPLUS_DEMO}/METplus/logs/metplus_jlogfile"
export
```

```
PYTHONPATH="${METPLUS_DEMO}/METplus/ush:${METPLUS_DEMO
}/METplus/parm"
```

export PATH="\${PATH}:\${METPLUS_DEMO}/METplus/ush:."

fi

Setting up profile - Surge

set loadmetplus='yes'

if [\$loadmetplus=='yes']; then

```
echo "Loading METplus environment"
```

```
module use /gpfs/hps3/emc/global/noscrub/Julie.Prestopnik/modulefiles module load met/6.1
```

module load grib util/1.0.3

module use /usrx/local/dev/modulefiles

module load python

module load nco-gnu-sandybridge/4.4.4

export METPLUS_DEMO="/gpfs/hps3/emc/global/noscrub/Julie.Prestopnik/"

export MET_DEMO="/gpfs/hps3/emc/global/noscrub/Julie.Prestopnik/met/6.1" export JLOGFILE="\${METPLUS_DEMO}/METplus/logs/metplus_jlogfile"

export

PYTHONPATH="\${METPLUS_DEMO}/METplus/ush:\${METPLUS_DEMO}/MET plus/parm"

export PATH="\${PATH}:\${METPLUS_DEMO}/METplus/ush:."

fi

Directory Structure

- doc/ Doxygen documentation
- internal_tests/ developer tests
- parm/ where configs live
- README.md general README
- sorc/ executables
- ush/ python scripts

METplus/doc

/scratch4/BMC/dtc/Tara.Jensen/METplus/doc\$ ls confguide.dox NCEP_Coding_Standards.pdf run.dox install.dox overview.dox wiki_contents install-main.dox README_install.md wiki_contents.dox mainpage.dox README_terms_of_use.md wiki_contents_imagefiles.dox metplus-conf.dox rocoto.dox

METplus/internal_tests

/scratch4/BMC/dtc/Tara.Jensen/METplus/internal_tests\$ ls
test_extract_tiles_unittest.py test_series_by_init.py
test_original_run_tc_pairs.py test_tc_pairs_wrapper.py
test_run_tc_pairs.py test_util_unittest.py

METplus/parm

/scratch4/BMC/dtc/Tara.Jensen/METplus/parm\$ ls */*

met_config/GridStatConfig_MEAN
met_config/GridStatConfig_PROB
met_config/MODEConfig_PROB
met_config/MODEConfig_test
met_config/SeriesAnalysisConfig_by_init
met_config/SeriesAnalysisConfig_by_lead

met_config/TCPairsETCConfig
metplus_config/metplus_data.conf
metplus_config/metplus_runtime.conf
metplus_config/metplus_system.conf
metplus_config/README

met_config/mask: CONUS_HRRRTLE.nc EAST_HRRRTLE.nc HRRRTLE_GRID.grb2 WEST_HRRRTLE.nc

use_cases/feature_relative: examples feature_relative.conf README

use_cases/qpf: examples qpf.conf README

use_cases/track_and_intensity: examples track_and_intensity.conf

METplus/sorc

/scratch4/BMC/dtc/Tara.Jensen/METplus/sorc\$ ls doc Makefile

METplus/ush

/scratch4/BMC/dtc/Tara.Jensen/METplus/ush\$ ls

command_builder.py command_builder.pyc confdoc.py config_launcher.py config_launcher.pyc config_metplus.py config_metplus.pyc externals extract_tiles_wrapper.py extract_tiles_wrapper.pyc extra_tropical_cyclone_plotter.py gempak_to_cf_wrapper.pyc grid_stat_wrapper.pyc

master_met_plus.py met_util.py met_util.pyc mode_wrapper.py pcp_combine_wrapper.py pcp_combine_wrapper.pyc produtil README_produtil.md regrid_data_plane_wrapper.pyc regrid_data_plane_wrapper.pyc run_example_uswrp.py series_by_init_wrapper.pyc series_by_init_wrapper.pyc series_by_lead_wrapper.pyc

string_template_substitution.py string_template_substitution.pyc task_info.py task_info.pyc tcmpr_plotter_wrapper.py tc_pairs_wrapper.py tc_pairs_wrapper.pyc tc_stat_wrapper.py tc_stat_wrapper.pyc usage_wrapper.pyc usage_wrapper.pyc usage_wrapper.pyc

Key to running METplus – parm dir

- Met_config
 - . All MET configuration files with Environment Variables should reside here
- Metplus_config
 - . Three basic files that can be set by a system administrator for all to use
- Use_cases
 - feature_relative
 - . Three ways of running feature_relative software
 - qpf
 - One example of grib to grib comparison and lots of GEMPAK examples
 - . track_and_intensity
 - One example of computing track and intensity scores using plot_tcmpr.R script
- . {user}_system.conf.{system_name}
 - Allows user to over-ride base system setting and write data into a given directory

Suggestions on how to set up parm dir

- Met_config
 - All MET configuration files with Environment Variables should reside here
- Metplus_config
 - Common install for BRANCH includes paths to commonly used data
- Use_cases
 - Common install for FUNCTIONAL GROUP includes paths for tests your conducting
- . {user}_system.conf.{system_name}
 - Place your variances from use-cases in here, including pointing to your output directory, or pointing to a different config you are trying, etc...

Key to running METplus- parm dir

- Met_config
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Three Use Cases

- Track and Intensity
 - Using MET-TC to pair up ATCF track files
 - plot_tcmpr.R to compute track and intensity errors and plot
- . Feature Relative
 - . Use MET-TC to pair up ATCF track files
 - Extract 30deg by 30deg tiles from GFS Forecast and Analysis files for comparison
 - Use Series-Analysis to compute statistics for the stack of tiles over CONUS
 - Use Plot-Data-Plane to generate quick look plots
- QPF
 - Use Pcp-Combine to accumulate 1-hr QPE into 3-hr accumulation
 - Use Grid-Stat to compute Categorical statistics

Phase I – Left to be done

- TINISH
- Moving MET code-base from SVN to GitHub
- Additional scripting to emulate base Global verification
- Scripting to push data to METViewer server, load data and make basic batch plots
- Install and test on Theia and WCOSS
- Python scripting to emulate base Global Vx plots

Where to get help

- GitHub Instructions at Release link
 - <u>https://github.com/NCAR/METplus/rele</u> <u>ases</u>
 - Click on
 - Instructions_METplus_Beta.pdf
- . Contact met_help@ucar.edu

Supplementary Slides

MET+ Coding Standards

- NCEP Coding Standards
- NCO WCOSS Implementation Standards for directory structure and script naming conventions (http://www.nco.ncep.noaa.gov/idsb/implementation_ standards/)
- pep8 for code style
- Doxygen and Python docstrings for documentation