

Introduction to Use Cases Grid to Grid Verification

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Set Up Personal Environment

- Creating directories for data
- Obtaining data
- Configuring METplus for you and your environment
- Running METplus

Creating Directories for Data

- Ensure you have enough disk space
- Create separate directories for input and output
 - Input data may be shared or owned by someone else
 - Don't want to accidentally wipe out input data when erasing output data to rerun

Obtaining Data - From GitHub

- Sample data tarballs available on METplus GitHub webpage under Releases
- <https://github.com/NCAR/METplus/releases>

METplus-2.0.4

 georgemccabe released this a minute ago

▼ Assets 9

-  [METplus_Users_Guide.pdf](#)
-  [sample_data-cyclone_track_feature.tgz](#)
-  [sample_data-ensemble.tgz](#)
-  [sample_data-grid_to_grid.tgz](#)
-  [sample_data-grid_to_obs.tgz](#)
-  [sample_data-mode.tgz](#)
-  [sample_data-qpf.tgz](#)
-  [Source code \(zip\)](#)
-  [Source code \(tar.gz\)](#)

Obtaining Data - Organization

- Tarballs are organized by use case corresponding to parm directory in GitHub repository

```
[mccabe@eyewall:~/METplus/parm/use_cases$ ls  
cyclone_plotter  feature_relative  grid_to_obs  hwt    qpf  
ensemble        grid_to_grid      hmt          mode   track_and_intensity
```

- sample_data-grid_to_grid.tgz ->
parm/use_cases/grid_to_grid/examples

```
mccabe@eyewall:~/METplus/parm/use_cases/grid_to_grid/examples$ ls  
anom.conf  anom_height.conf  precip.conf  precip_continuous.conf  sfc.conf
```

Obtaining Data - Downloading

- Download tarball by clicking on the link
- Or use wget from the command line
- https://github.com/NCAR/METplus/releases/download vX.Y/sample_data-grid_to_grid.tgz
- Untar data into input data directory
 - cp sample_data-grid_to_grid.tgz </path/to>/input/
 - cd </path/to>/input
 - tar xzf sample_data-grid_to_grid.tgz

Configuring METplus Environment

- Override configurations from default METplus install to:
 - Match the system you are using
 - Where MET is installed
 - EXE paths (wgrib2, cut, tr, rm, etc.)
 - Set up personal data area
 - Where to read input data
 - Where to write output data

Configuring METplus

Best Practices

1) Copy parm directory to user location

- Users may work with a shared installation of METplus wrappers
 - Scripts are shared by all users
 - Changes to the parm (configuration) directory would affect all users – on installation, system settings should be set (location of MET version to use)
 - May not have permission to edit parm directory in shared location
- May want some settings to be static over all runs

2) Create user specific configuration files

- Used to override configuration settings for a given run
- Contains only the settings overridden from default in one place
- Preserves user settings when moving to new version of scripts

Configuring METplus

Best Practices (continued)

- Review the configuration files and look for variables with a value containing the phrase “/path/to”
- These variables will need to be set. You can either:
 - Change them directly in the base configuration files
 - Copy them into a new file and modify the values (remember to use correct headers)

```
[dir]
# This is a comment.
# Use comments to help you remember important things.

TMP_DIR = /path/to
OUTPUT_BASE = /path/to
INPUT_BASE = /path/to
MET_INSTALL_DIR = /path/to
```

Configuring METplus

What to Override?

```
[dir]
INPUT_BASE = /home/mccabe/data/input
OUTPUT_BASE = /home/mccabe/data/output-g2g
MET_INSTALL_DIR = /usr/local/met-8.0
TMP_DIR = /tmp

[config]

[exe]
WGRIB2 = /usr/local/bin/wgrib2
CUT = cut
TR = tr
RM = rm
NCAP2 = /usr/local/nco/bin/ncap2
CONVERT = convert
NCUMP = ncdump
EGREP = egrep
```

Configuring METplus

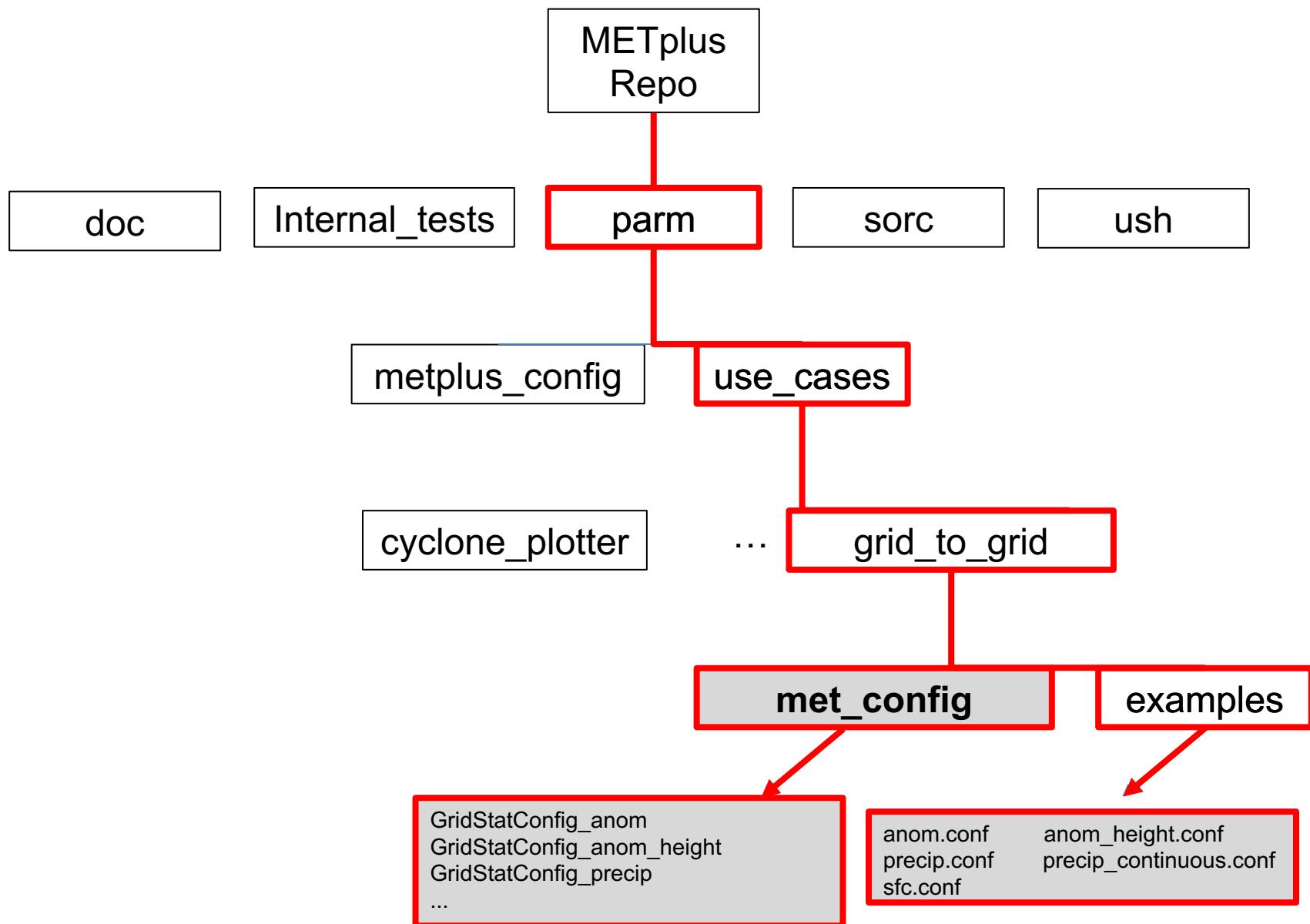
Use Case Configuration Files

- Each use case directory

(i.e. `parm/use_cases/grid_to_grid`)

has two directories:

- **met_config** - MET configuration files read by MET applications
- **examples** - METplus configuration files that are read by METplus



Configuring METplus Grid-to-Grid Use Case

- Both forecast and observation files must be gridded
- Data used by this example:
 - Operational GFS analysis and forecast files (pressure levels)
 - Verification masking regions
- examples/anom.conf (METplus config file)
- met_config/GridStatConfig_anom (MET config file)

METplus Configuration Files

anom.conf: Time Information

[config]

```
# time looping - options are INIT, VALID, RETRO, and REALTIME  
LOOP_BY = VALID
```

NEW IN v2.2

```
# Format of VALID_BEG and VALID_END
```

```
VALID_TIME_FMT = %Y%m%d%H
```

```
# Start time for METplus run
```

```
VALID_BEG = 2017061300
```

```
# End time for METplus run
```

```
VALID_END = 2017061306
```

```
# Increment between METplus runs in
```

```
VALID_INCREMENT = 6H
```

```
# list of forecast leads to process
```

```
LEAD_SEQ = 24, 48
```

VALID: 2017-06-13_00
LEAD = 24

VALID: 2017-06-13_00
LEAD = 48

VALID: 2017-06-13_06
LEAD = 24

VALID: 2017-06-13_06
LEAD = 48

METplus Configuration Files

anom.conf: Field Information

```
# List of applications to run
PROCESS_LIST = GridStat

# list of variables to compare
FCST_VAR1_NAME = TMP
FCST_VAR1_LEVELS = P850, P500, P250

FCST_VAR2_NAME = UGRD
FCST_VAR2_LEVELS = P850, P500, P250

FCST_VAR3_NAME = VGRD
FCST_VAR3_LEVELS = P850, P500, P250

FCST_VAR4_NAME = PRMSL
FCST_VAR4_LEVELS = Z0
```

NOT IN CONFIG FILE,
BUT INFERRRED

```
OBS_VAR1_NAME = TMP
OBS_VAR1_LEVELS = P850, P500, P250

OBS_VAR2_NAME = UGRD
OBS_VAR2_LEVELS = P850, P500, P250

OBS_VAR3_NAME = VGRD
OBS_VAR3_LEVELS = P850, P500, P250

OBS_VAR4_NAME = PRMSL
OBS_VAR4_LEVELS = Z0
```

METplus Configuration Files

anom.conf: Data Information

```
[config]
  MODEL = GFS
  OBTYPE = ANLYS

# location of grid_stat MET config file
GRID_STAT_CONFIG = {CONFIG_DIR}/GridStatConfig_anom

[dir]
# location of configuration files used by MET applications
CONFIG_DIR={PARM_BASE}/use_cases/grid_to_grid/met_config

# input and output data directories
FCST_GRID_STAT_INPUT_DIR = {INPUT_BASE}/grid_to_grid/gfs/fcst
OBS_GRID_STAT_INPUT_DIR = {INPUT_BASE}/grid_to_grid/gfs/obs
  GRID_STAT_OUTPUT_DIR = {OUTPUT_BASE}/uswrp/met_out/{MODEL}/anom

[filename_templates]
# format of filenames
# GFS
FCST_GRID_STAT_INPUT_TEMPLATE = pgbf{lead?fmt=%3H}.gfs.{init?fmt=%Y%m%d%H}

# ANLYS
OBS_GRID_STAT_INPUT_TEMPLATE = pgbanl.gfs.{valid?fmt=%Y%m%d%H}
```

METplus Configuration Files

Filename Templates

TEMPLATE:

`pgbf{lead?fmt=%3H}.gfs.{init?fmt=%Y%m%d%H}`

(options are init, valid, lead, level, cycle, offset, date, region, cyclone, misc)

VALID TIME: 2017-06-13 06Z

FORECAST LEAD: 24 (hours)

INITIALIZATION TIME: VALID - LEAD

2017-06-13_06Z - 24 hours = 2017-06-12_06Z

FILENAME: pgbf024.gfs.2017061206

METplus Configuration Files

Filename Templates

TEMPLATE:

pgbanl.gfs.{valid?fmt=%Y%m%d%H}

VALID TIME: 2017-06-13 06Z

FILENAME: pgbanl.gfs.2017061306

MET Configuration Files

GridStatConfig_anom

Uses environment variables set by METplus

```
//  
// Output model name to be written  
//  
model = "${MODEL}";  
  
//  
// Output observation type to be written  
//  
obtype = "${OBTYPE}";  
  
//  
// Forecast and observation fields to be verified  
//  
fcst = {  
    field = [ ${FCST_FIELD} ];  
};  
  
obs = {  
    field = [ ${OBS_FIELD} ];  
};
```

Running METplus Setup

Add METplus/ush to PATH to run
master_metplus.py from any directory

csh:

```
setenv PATH </path/to>/METplus/ush:$PATH
```

bash:

```
export PATH=</path/to>/METplus/ush:$PATH
```

Running METplus anom.conf Use Case

master_metplus.py

USE CASE CONFIG FILE

-c ~/METplus/parm/use_cases/grid_to_grid/
examples/anom.conf

-C

USER CONFIG FILE

/d1/mccabe/system.conf.mccabe.eyewall

Running METplus

Environment Variables set by wrappers

MODEL=GFS

FCST_FIELD=

```
{ name="TMP"; level="P850"; },
{ name="TMP"; level="P500"; },
{ name="TMP"; level="P250"; },
{ name="UGRD"; level="P850"; },
{ name="UGRD"; level="P500"; },
{ name="UGRD"; level="P250"; },
{ name="VGRD"; level="P850"; },
{ name="VGRD"; level="P500"; },
{ name="VGRD"; level="P250"; },
{ name="PRMSL"; level="Z0"; }
```

```
# List of applications to run
PROCESS_LIST = GridStat

# list of variables to compare
FCST_VAR1_NAME = TMP
FCST_VAR1_LEVELS = P850, P500, P250

FCST_VAR2_NAME = UGRD
FCST_VAR2_LEVELS = P850, P500, P250

FCST_VAR3_NAME = VGRD
FCST_VAR3_LEVELS = P850, P500, P250

FCST_VAR4_NAME = PRMSL
FCST_VAR4_LEVELS = Z0
```

Running METplus

Environment Variables set by wrappers

OBTYPE=ANLYS

OBS_FIELD=

```
{ name="TMP"; level="P850"; },
{ name="TMP"; level="P500"; },
{ name="TMP"; level="P250"; },
{ name="UGRD"; level="P850"; },
{ name="UGRD"; level="P500"; },
{ name="UGRD"; level="P250"; },
{ name="VGRD"; level="P850"; },
{ name="VGRD"; level="P500"; },
{ name="VGRD"; level="P250"; },
{ name="PRMSL"; level="Z0"; }
```

MET Configuration Files

GridStatConfig_anom

Uses environment variables set by METplus

```
//  
// Output model name to be written  
//  
model = "${MODEL}";  
  
//  
// Output observation type to be written  
//  
obtype = "${OBTTYPE}";  
  
//  
// Forecast and observation fields to be verified  
//  
fcst = {  
    field = [ ${FCST_FIELD} ];  
};  
  
obs = {  
    field = [ ${OBS_FIELD} ];  
};
```

```
//  
// Output model name to be written  
//  
model = "GFS";  
  
//  
// Output observation type to be written  
//  
obtype = "ANLYS";  
  
//  
// Forecast and observation fields to be verified  
//  
fcst = {  
    field = [  
        { name="TMP"; level="P850"; },  
        { name="TMP"; level="P500"; },  
        { name="TMP"; level="P250"; },  
        { name="UGRD"; level="P850"; },  
        { name="UGRD"; level="P500"; },  
        { name="UGRD"; level="P250"; },  
        { name="VGRD"; level="P850"; },  
        { name="VGRD"; level="P500"; },  
        { name="VGRD"; level="P250"; },  
        { name="PRMSL"; level="Z0"; }  
    ];  
};  
  
obs = {  
    field = [  
        { name="TMP"; level="P850"; },  
        { name="TMP"; level="P500"; },  
        { name="TMP"; level="P250"; },  
        { name="UGRD"; level="P850"; },  
        { name="UGRD"; level="P500"; },  
        { name="UGRD"; level="P250"; },  
        { name="VGRD"; level="P850"; },  
        { name="VGRD"; level="P500"; },  
        { name="VGRD"; level="P250"; },  
        { name="PRMSL"; level="Z0"; }  
    ];  
};
```

MET Configuration Files

GridStatConfig_anom - Climatology

MET_VALID_HHMM is hour and minute of valid time.

Future version will set climatology file using dir and template config

```
//////////  
//  
// Climatology data  
//  
climo_mean = fcst;  
climo_mean = {  
    file_name = [ "${INPUT_BASE}/grid_to_grid/nwprod/fix/cmean_1d.1959${MET_VALID_HHMM}" ];  
  
    regrid = {  
        method      = BILIN;  
        width       = 2;  
        vld_thresh = 0.5;  
        shape       = SQUARE;  
    }  
  
    time_interp_method = NEAREST;  
    match_day          = TRUE;  
    time_step          = 21600;  
}
```

Running METplus

Call grid_stat with environment set

- VALID = 2017061300, LEAD = 24

{MET_INSTALL_DIR}/bin/grid_stat

{FCST_GRID_STAT_INPUT_DIR}/pgbf024.gfs.2017061200

{OBS_GRID_STAT_INPUT_DIR}/pgbanl.gfs.2017061300

{CONFIG_DIR}/GridStatConfig_anom

-outdir {GRID_STAT_OUTPUT_DIR}/201706130000/grid_stat

^

(defined by {GRID_STAT_OUTPUT_TEMPLATE})

Running METplus

Call grid_stat with environment set

- VALID = 2017061300, LEAD = 48

{MET_INSTALL_DIR}/bin/grid_stat

{FCST_GRID_STAT_INPUT_DIR}/pgbf048.gfs.2017061100

{OBS_GRID_STAT_INPUT_DIR}/pgbanl.gfs.2017061300

{CONFIG_DIR}/GridStatConfig_anom

-outdir {GRID_STAT_OUTPUT_DIR}/201706130000/grid_stat

Running METplus

Call grid_stat with environment set

- VALID = 2017061306, LEAD = 24

{MET_INSTALL_DIR}/bin/grid_stat

{FCST_GRID_STAT_INPUT_DIR}/pgbf024.gfs.2017061206

{OBS_GRID_STAT_INPUT_DIR}/pgbanl.gfs.2017061306

{CONFIG_DIR}/GridStatConfig_anom

-outdir {GRID_STAT_OUTPUT_DIR}/201706130600/grid_stat

Running METplus

Call grid_stat with environment set

- VALID = 2017061306, LEAD = 48

{MET_INSTALL_DIR}/bin/grid_stat

{FCST_GRID_STAT_INPUT_DIR}/pgbf048.gfs.2017061106

{OBS_GRID_STAT_INPUT_DIR}/pgbanl.gfs.2017061306

{CONFIG_DIR}/GridStatConfig_anom

-outdir {GRID_STAT_OUTPUT_DIR}/201706130600/grid_stat

Running METplus

Reviewing Output and Logs

```
GRID_STAT_OUTPUT_DIR =  
{OUTPUT_BASE}/uswrf/met_out/GFS/anom
```

```
output_prefix      = "${MODEL}_vs_${OBTYPE}";
```

```
{GRID_STAT_OUTPUT_DIR}/201706130000/grid_stat
```

- grid_stat_GFS_vs_ANLYS_240000L_20170613_000000V.stat
- grid_stat_GFS_vs_ANLYS_480000L_20170613_000000V.stat

```
{GRID_STAT_OUTPUT_DIR}/201706130600/grid_stat
```

- grid_stat_GFS_vs_ANLYS_240000L_20170613_060000V.stat
- grid_stat_GFS_vs_ANLYS_480000L_20170613_060000V.stat

Running METplus

Reviewing Output and Logs

{OUTPUT_BASE}/
metplus_final.conf

```
[config]
CLOCK_TIME = 20190110220708
LOOP_METHOD = times
PROCESS_LIST = GridStat
INIT_TIME_FMT = %Y%m%d
INIT_BEG = 20141214
INIT_END = 20141216
INIT_INCREMENT = 21600
METPLUS_CONF = {OUTPUT_BASE}/metplus_final.conf
LOG_METPLUS = /home/mccabe/data/output-g2g/logs/master_metplus.log.20190110
LOG_TIMESTAMP_TEMPLATE = %Y%m%d
LOG_TIMESTAMP_USE_DATETIME = no
LOG_MET_OUTPUT_TO_METPLUS = yes
LOG_MET_VERBOSE = 2
LOG_LEVEL = DEBUG
LOOP_BY_INIT = false
VALID_TIME_FMT = %Y%m%d%H
VALID_BEG = 2017061300
VALID_END = 2017061306
VALID_INCREMENT = 21600
LEAD_SEQ = 24, 48
FCST_VAR1_NAME = TMP
FCST_VAR1_LEVELS = P850, P500, P250
FCST_VAR2_NAME = UGRD
FCST_VAR2_LEVELS = P850, P500, P250
FCST_VAR3_NAME = VGRD
FCST_VAR3_LEVELS = P850, P500, P250
FCST_VAR4_NAME = PRMSL
FCST_VAR4_LEVELS = Z0
MODEL_TYPE = GFS
OB_TYPE = ANLYS
GRID_STAT_CONFIG = {CONFIG_DIR}/GridStatConfig_anom
FCST_IS_PROB = false
LOG_TIMESTAMP = 20190110

[dir]
PARM_BASE = {METPLUS_BASE}/parm
OUTPUT_BASE = /home/mccabe/data/output-g2g
STAGING_DIR = {OUTPUT_BASE}/stage
MET_INSTALL_DIR = /usr/local/met-8.0
MET_BASE = {MET_INSTALL_DIR}/share/met
LOG_DIR = {OUTPUT_BASE}/logs
TMP_DIR = /tmp
PROJ_DIR = /path/to
INPUT_BASE = /home/mccabe/data/input
MODEL_DATA_DIR = {PROJ_DIR}/model_data
CONFIG_DIR = {PARM_BASE}/use_cases/grid_to_grid/met_config
FCST_GRID_STAT_INPUT_DIR = {INPUT_BASE}/grid_to_grid/gfs/fcst
OBS_GRID_STAT_INPUT_DIR = {INPUT_BASE}/grid_to_grid/gfs/obs
GRID_STAT_OUT_DIR = {OUTPUT_BASE}/uswrf/met_out/{MODEL_TYPE}/anom
METPLUS_BASE = /d1/mccabe/METplus.develop
----- metplus_final.conf Top L33 (Conf[Unix])
```

METplus Output Lines

```
01/16 22:43:04.322 metplus.GridStat (master_metplus.py:150) INFO: ****
01/16 22:43:04.322 metplus.GridStat (master_metplus.py:151) INFO: * RUNNING METplus
01/16 22:43:04.322 metplus.GridStat (master_metplus.py:155) INFO: * at valid time: 201706130000
01/16 22:43:04.322 metplus.GridStat (master_metplus.py:156) INFO: ****
01/16 22:43:04.327 metplus.GridStat (compare_gridded_wrapper.py:338) DEBUG: ENVIRONMENT FOR NEXT COMMAND:
01/16 22:43:04.327 metplus.GridStat (command_builder.py:156) DEBUG: MODEL=GFS
01/16 22:43:04.327 metplus.GridStat (command_builder.py:156) DEBUG: FCST_VAR=PRMSL
01/16 22:43:04.327 metplus.GridStat (command_builder.py:156) DEBUG: OBS_VAR=PRMSL
01/16 22:43:04.327 metplus.GridStat (command_builder.py:156) DEBUG: LEVEL=Z0
01/16 22:43:04.327 metplus.GridStat (command_builder.py:156) DEBUG: OBTYPE=ANLYS
01/16 22:43:04.327 metplus.GridStat (command_builder.py:156) DEBUG: CONFIG_DIR=/d1/mccabe/METplus.develop/parm/use_cases/grid_to_grid/met_config
01/16 22:43:04.327 metplus.GridStat (command_builder.py:156) DEBUG: FCST_FIELD=[{ name="TMP"; level="P850"; },{ name="TMP"; level="P500"; },{ name="TMP"; level="P250"; },{ name="UGRD"; level="P850"; },{ name="UGRD"; level="P500"; },{ name="UGRD"; level="P250"; },{ name="VGRD"; level="P850"; },{ name="VGRD"; level="P500"; },{ name="VGRD"; level="P250"; },{ name="PRMSL"; level="Z0"; }]
01/16 22:43:04.327 metplus.GridStat (command_builder.py:156) DEBUG: OBS_FIELD=[{ name="TMP"; level="P850"; },{ name="TMP"; level="P500"; },{ name="TMP"; level="P250"; },{ name="UGRD"; level="P850"; },{ name="UGRD"; level="P500"; },{ name="UGRD"; level="P250"; },{ name="VGRD"; level="P850"; },{ name="VGRD"; level="P500"; },{ name="VGRD"; level="P250"; },{ name="PRMSL"; level="Z0"; }]
01/16 22:43:04.327 metplus.GridStat (command_builder.py:156) DEBUG: INPUT_BASE=/home/mccabe/data/input
01/16 22:43:04.328 metplus.GridStat (command_builder.py:156) DEBUG: MET_VALID_HHMM=0613
01/16 22:43:04.328 metplus.GridStat (command_builder.py:156) DEBUG: FCST_TIME=024
01/16 22:43:04.328 metplus.GridStat (compare_gridded_wrapper.py:342) DEBUG: COPYABLE ENVIRONMENT FOR NEXT COMMAND:
01/16 22:43:04.328 metplus.GridStat (command_builder.py:151) DEBUG: export MODEL="GFS"; export FCST_VAR="PRMSL"; export OBS_VAR="PRMSL"; export LEVEL="Z0"; export OBTYPE="ANLYS"; export CONFIG_DIR="/d1/mccabe/METplus.develop/parm/use_cases/grid_to_grid/met_config"; export FCST_FIELD=[{"name": "TMP", "level": "P850"}, {"name": "TMP", "level": "P500"}, {"name": "TMP", "level": "P250"}, {"name": "UGRD", "level": "P850"}, {"name": "UGRD", "level": "P500"}, {"name": "UGRD", "level": "P250"}, {"name": "VGRD", "level": "P850"}, {"name": "VGRD", "level": "P500"}, {"name": "VGRD", "level": "P250"}, {"name": "PRMSL", "level": "Z0"}]; export OBS_FIELD=[{"name": "TMP", "level": "P850"}, {"name": "TMP", "level": "P500"}, {"name": "TMP", "level": "P250"}, {"name": "UGRD", "level": "P850"}, {"name": "UGRD", "level": "P500"}, {"name": "UGRD", "level": "P250"}, {"name": "VGRD", "level": "P850"}, {"name": "VGRD", "level": "P500"}, {"name": "VGRD", "level": "P250"}, {"name": "PRMSL", "level": "Z0"}]; export INPUT_BASE="/home/mccabe/data/input"; export MET_VALID_HHMM="0613"; export FCST_TIME="024";
01/16 22:43:04.328 metplus.GridStat (command_runner.py:222) DEBUG: LOG_MET_OUTPUT_TO_METPLUS log file is True
01/16 22:43:04.329 metplus.GridStat (command_runner.py:119) INFO: app_name is: grid_stat, output sent to: /home/mccabe/data/output-g2g/logs/master_metplus.log.20190116
01/16 22:43:04.347 metplus.GridStat (command_runner.py:155) INFO: RUNNING: /usr/local/met-8.0/bin/grid_stat /home/mccabe/data/input/grid_to_grid/gfs/fcst/pgbf024.gfs.2017061200 /home/mccabe/data/input/grid_to_grid/gfs/obs/pgbanl.gfs.2017061300 /d1/mccabe/METplus.develop/parm/use_cases/grid_to_grid/met_config/GridStatConfig_anom -outdir /home/mccabe/data/output-g2g/uswrf/met_out/GFS/anom/201706130000/grid_stat >> /home/mccabe/data/output-g2g/logs/master_metplus.log.20190116 2>&1
DEBUG 1: Default Config File: /usr/local/met-8.0/share/met/config/GridStatConfig_default
DEBUG 1: User Config File: /d1/mccabe/METplus.develop/parm/use_cases/grid_to_grid/met_config/GridStatConfig_anom
```

MET Output Lines

Running METplus

Live Demo

- You can try it yourself!
- Questions?