METplus Feature Relative Overview

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Background

Feature relative use case:

- Cyclone Adeck and Bdeck data as input
  - Supports Automated Tropical Cyclone Forecast (ATCF) formatted data
  - Supports extra tropical cyclone format provided by Stony Brook University (SBU)
- Generates pairs of track data (regridded to a common grid) and performs extracting of nxn degree subgrids and any additional filtering
- Performs a series analysis by init time or lead (fcst) time
- Generates plots for visualization

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Tools

MET Tools involved:

1. **Tc-Pairs** is run to match a tropical cyclone (TC) forecast with a second reference TC dataset (most commonly the Best Track analysis).

2. **Tc-Stat** tool is run in summary mode to determine the average lat/lon location and perform any additional **filtering** on the output from tc_pairs. For more information on tc_stat filtering refer to Chapter 20 of the MET User's Guide for more details.

3. **Regrid-Data-Plane** tool is used to regrid matched pairs from the tc-pairs output to a common grid.

4. **Series-Analysis** is called to perform the series analysis

5. **Plot-Data-Plane** to generate the plots

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Wrappers

METplus wrappers and how they correspond to the MET tools:

1. **TcPairsWrapper** corresponds to **MET Tc-Pairs.**

2. **TcStatWrapper** corresponds to **MET Tc-Stat**

3. **ExtractTilesWrapper** *calls* **MET Regrid-Data-Plane** and provides additional support for filtering and extracting the *n*x*n* degree tiles that are centered on the lat/lons of the analysis and forecast files generated from running the tc_pairs wrapper.

4. **SeriesByInitWrapper and SeriesByLeadWrapper** correspond to **MET** S**eries-Analysis** and **calls MET Plot-Data-Plane** to generate plots

- provides the flexibility of performing a series analysis based on initialization time or lead (forecast) time.
- In addition, the series_by_lead_wrapper can create a series analysis over all lead hours or by groupings of lead hours.
- Grouping by lead hours is useful for analyzing storm tracks by days (e.g. a series over Day1 (0-23hr), Day 2 (24-47hr), Day3 (48-71hr) etc.)

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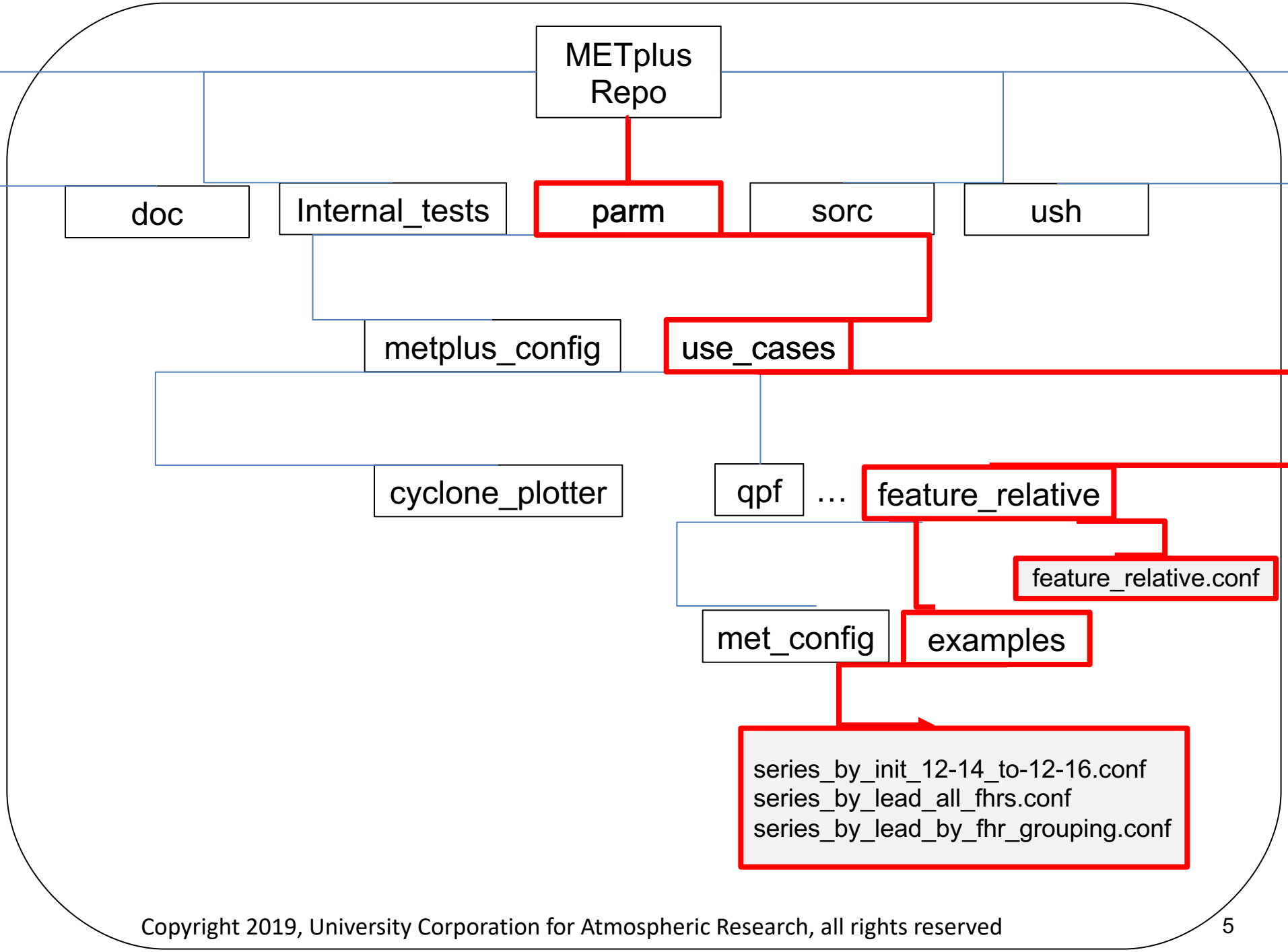

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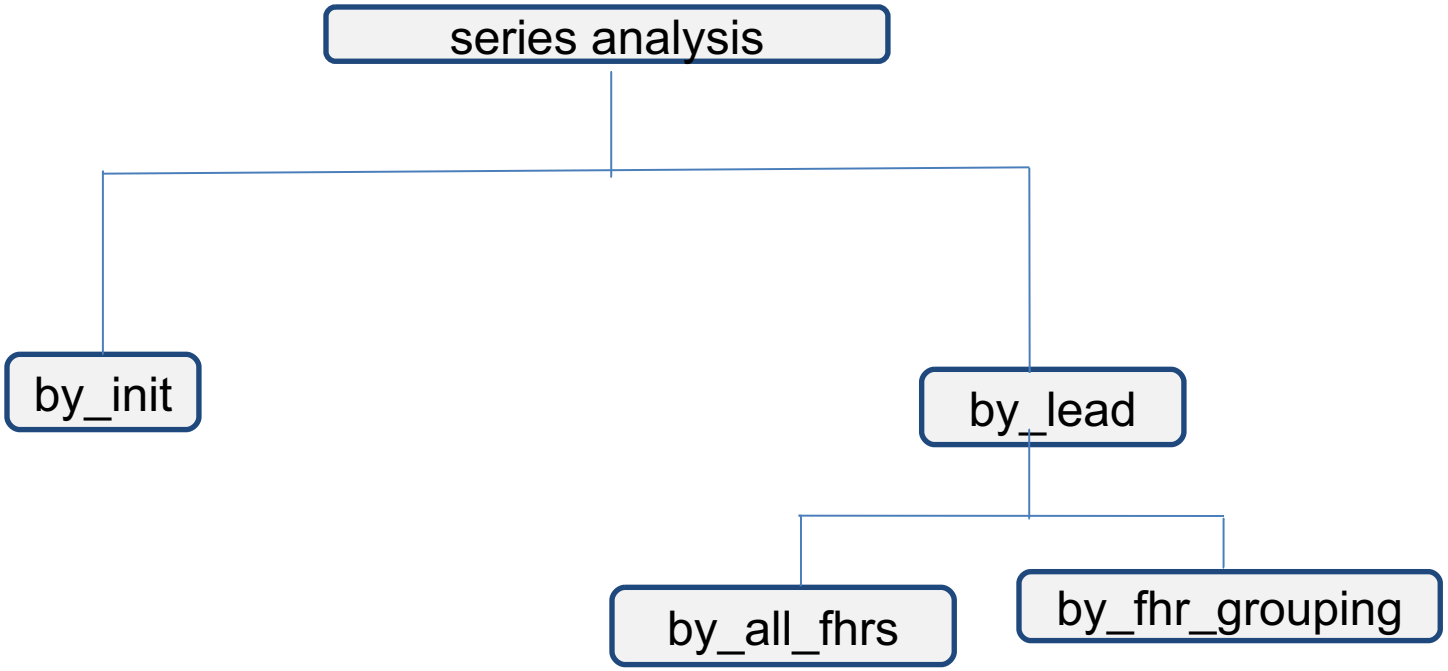
Configuring METplus for Use Case

Overview of Series Analysis portion of the Feature Relative Use Case



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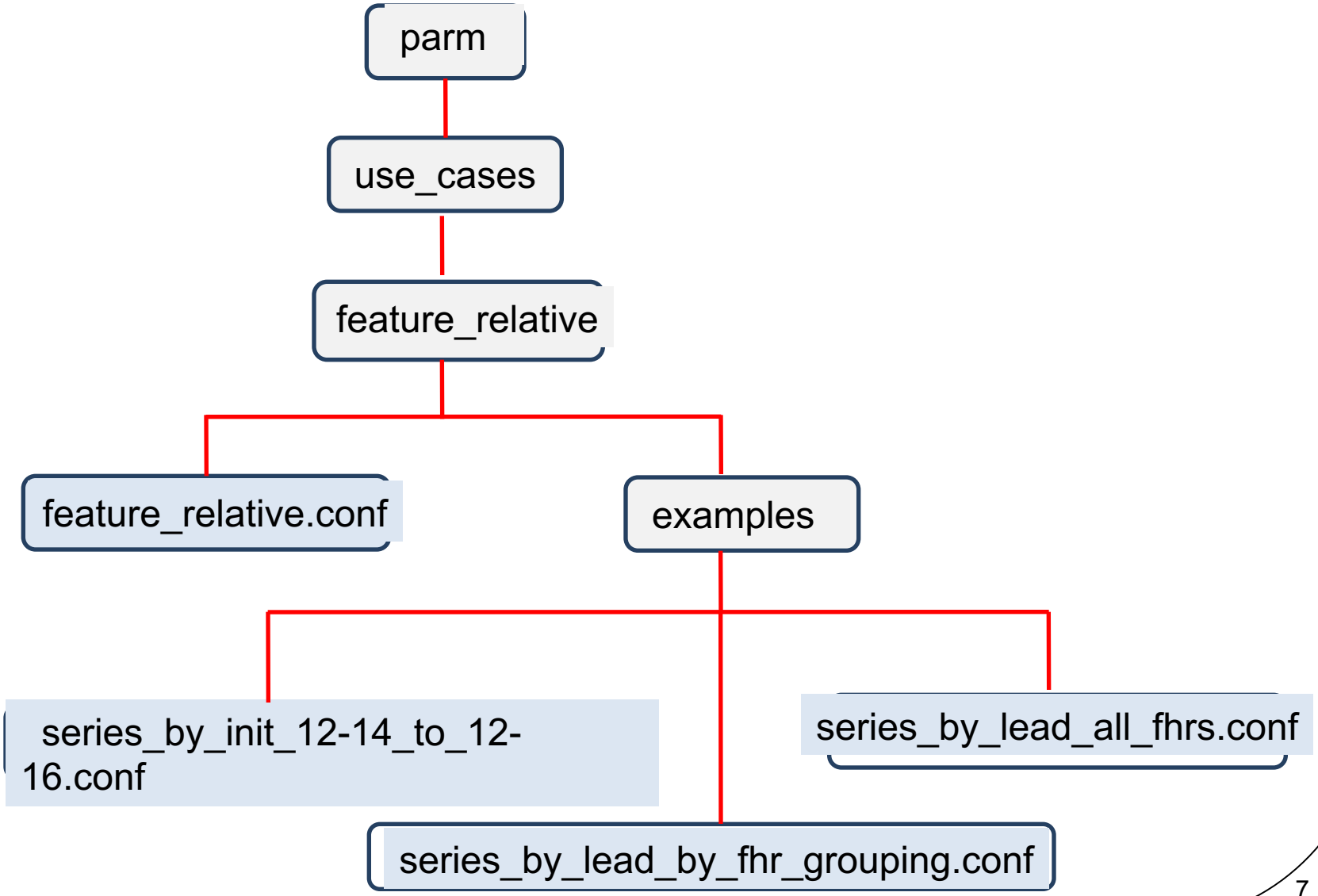
Configuring METplus for Use Case

There are currently four examples in the feature relative use case:



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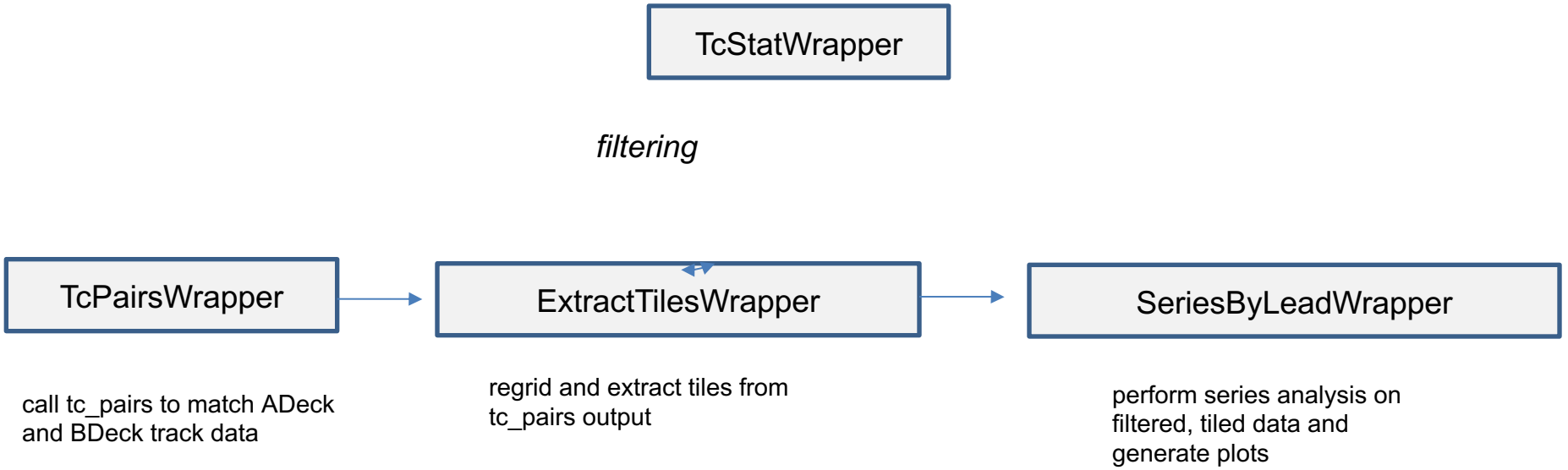
Configuring METplus for Use Case

Common “Work flow” in all feature relative examples:



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Configuring METplus for Use Case

1. Create your own custom config file and open in editor
2. View (in GitHub) or open (in editor):
   parm/use_cases/feature_relative/feature_relative.conf

3. Find any *</path/to>* in the feature_relative.conf
   a. Replicate the section header e.g. [dir], [config], etc. in your custom conf file. **The Glossary in the User Documentation is your friend*

   b. Define any variables in your custom config file wherever there are *</path/to>'s* in the feature_relative.conf file **See next slide*

   c. Save your changes in your custom conf file

   d. Your custom conf file will now work for all the examples in the use_cases/feature_relative and use_cases/feature_relative/examples directories

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Configuring METplus for Use Case

Example of variables that you should define in your custom config file

under the [dir] section

MODEL_DATA_DIR
TC_PAIRS_ADECK_INPUT_DIR
TC_PAIRS_BDECK_INPUT_DIR
…

for tc-pairs

Over rides what is in the parm/use_cases/feature_relative/feature_relative.conf
and the OUTPUT_BASE in the conf files in parm/use_cases/feature_relative/examples

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Configuring METplus for Use Case for your own data

Variables that you should define in your custom config file to define your data file format (subdirectory and name where date and other useful information is found).

```
[dir]
TC_PAIRS_ADECK_INPUT_DIR = /d1/METplus_TC/adeck
TC_PAIRS_BDECK_INPUT_DIR = /d1/METplus_TC/bdeck

[filename_templates]

# forecast file with format: atcfunix.gfs.2018010118.dat
TC_PAIRS_ADECK_INPUT_TEMPLATE =
atcfunix.gfs.{date?fmt=%Y%m%d%h}.dat

# reference track file like: /d1/METplus_TC/bdeck/bml2012017.dat
TC_PAIRS_BDECK_INPUT_TEMPLATE =
b{region?fmt=%s}{cyclone?fmt=%s}{date?fmt=%Y}.dat
```

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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 the “default” use case with METplus

```
master_metplus.py –c parm/use_cases/feature_relative/feature_relative.conf \
-c /path_to_your/custom_conf_file.conf
```

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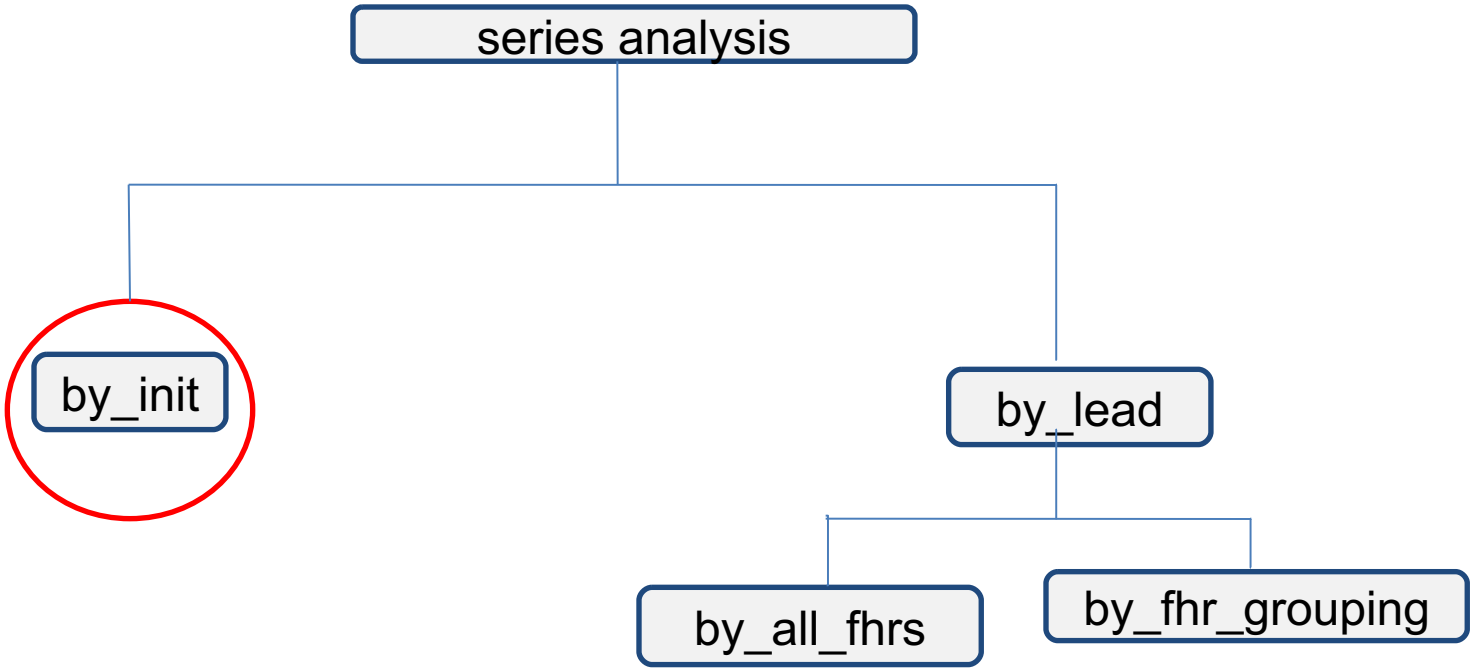
Configuring METplus for Use Case

Overview of Series Analysis portion of the Feature Relative Use Case



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Configuring METplus for Use Case

Snippet of config file requesting series by init

*these variables are located under the [config] family/section header

```
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 = 20141215
INIT_INCREMENT =  21600
#21600 ;; The increment in seconds in integer format
```

additional filtering on matched pairs

init begin and end times specifying time window of interest

THESE VARIABLES HAVE BEEN REMOVED

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Running the use case with METplus

Example 1. Series analysis by initialization time

```
master_metplus.py –c parm/use_cases/feature_relative/feature_relative.conf \
-c /path_to_your/custom_conf_file.conf
```

Example 2. Series analysis by initialization with modified time

```
master_metplus.py –c parm/use_cases/feature_relative/feature_relative.conf \
-c parm/use_cases/feature_relative/examples/series_by_init_12-14_to_12-16.conf \
-c /path_to_your/custom_conf_file.conf
```

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Post-run overview: logging

```
DEBUG 1: Creating postscript file: /d1/jfrimel/pytmp_dev2.0/series_by_init_12-
14_to_12-
16/series_analysis_init/20141215_00/ML1201192014/series_TMP_Z2_OBAR.ps
09/26 18:48:09.007 metplus.SeriesByInit (command_runner.py:155)
INFO: RUNNING: /usr/bin/convert -rotate 90 -background white -flatten
/d1/jfrimel/pytmp_dev2.0/series_by_init_12-14_to_12-
16/series_analysis_init/20141215_00/ML1201192014/series_TMP_Z2_OBAR.ps
/d1/jfrimel/pytmp_dev2.0/series_by_init_12-14_to_12-
16/series_analysis_init/20141215_00/ML1201192014/series_TMP_Z2_OBAR.png
09/26 18:48:09.008 metplus.SeriesByInit (command_runner.py:156)
DEBUG: RUNNING exe('/usr/bin/convert')['-rotate','90','-background','white','-
flatten','/d1/jfrimel/pytmp_dev2.0/series_by_init_12-14_to_12-
16/series_analysis_init/20141215_00/ML1201192014/series_TMP_Z2_OBAR.ps','/d1/jf
rimel/pytmp_dev2.0/series_by_init_12-14_to_12-
16/series_analysis_init/20141215_00/ML1201192014/series_TMP_Z2_OBAR.png']
09/26 18:48:09.412 metplus.SeriesByInit (series_by_init_wrapper.py:218) INFO:
INFO|Finished series analysis by init time
```

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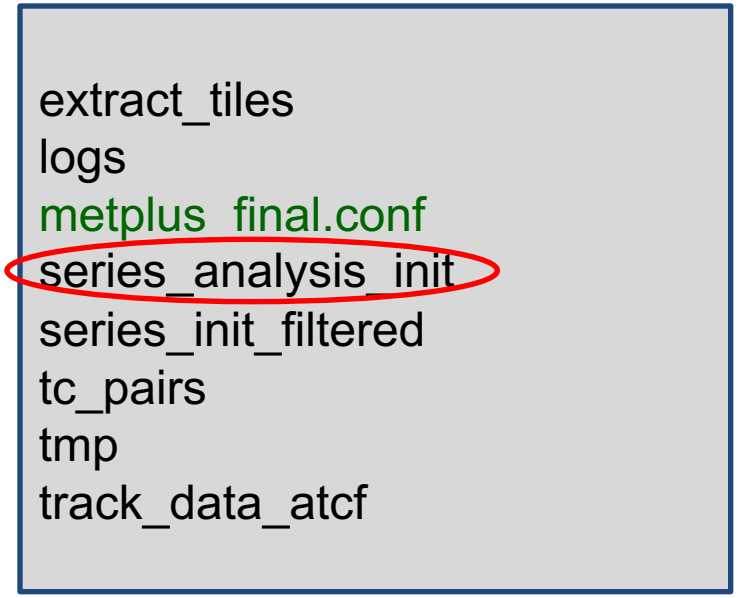
Post-run overview: output

Output for **series analysis by init**…

Directories created:



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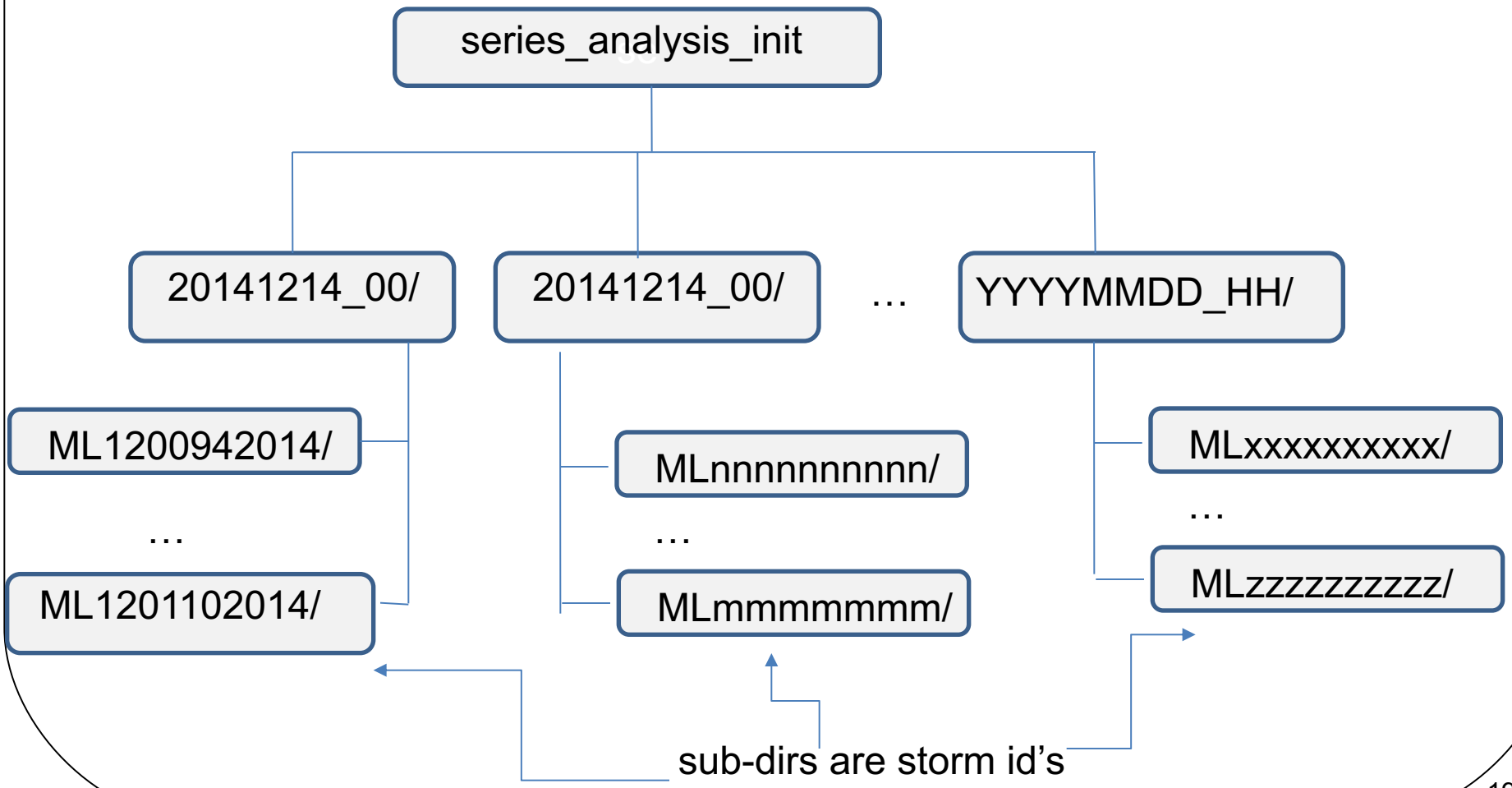
Post-run overview: output

Overview of series_analysis_init directory:



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Post-run overview: output

…each stormID sub-directory has the static series analysis plots (.ps and .png) based on the specified field, level, and statistic

e.g. series_TMP_Z2_FBAR.png

for ML1200942014/:

6292 Sep 29 18:02 ANLY_ASCII_FILES_ML1200942014
6292 Sep 29 18:02 FCST_ASCII_FILES_ML1200942014
56188 Sep 29 18:02 series_HGT_P500.nc
9607 Sep 29 18:02 series_HGT_P500_FBAR.png
4804 Sep 29 18:02 series_HGT_P500_FBAR.ps
9624 Sep 29 18:02 series_HGT_P500_OBAR.png
4799 Sep 29 18:02 series_HGT_P500_OBAR.ps
8143 Sep 29 18:02 series_HGT_P500_TOTAL.png
3963 Sep 29 18:02 series_HGT_P500_TOTAL.ps
56188 Sep 29 18:02 series_PRMSL_Z0.nc
...

56186 Sep 29 18:02 series_TMP_Z2.nc
9606 Sep 29 18:02 series_TMP_Z2_FBAR.png
4822 Sep 29 18:02 series_TMP_Z2_FBAR.ps
9620 Sep 29 18:02 series_TMP_Z2_OBAR.png
4817 Sep 29 18:02 series_TMP_Z2_OBAR.ps
8120 Sep 29 18:02 series_TMP_Z2_TOTAL.png
3981 Sep 29 18:02 series_TMP_Z2_TOTAL.ps

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Post-run overview: output

***Special note**:

In the *series_analysis_init /<YYYYMMDD_HH>/<stormID>* sub-directory, there are two ASCII (text files):

ANLY_ASCII_FILES_IN_<*STORMID*>

FCST_ASCII_FILES _IN_<*STORMID*>

e.g.
ANLY_ASCII_FILES_ML1200942014
FCST_ASCII_FILES_ML1200942014

- These are useful for troubleshooting.
- They summarize the files that are included in the series analysis

e.g. for the /d1/jfrimel/pytmp_dev2.0/series_by_init_12-14_to_12-16/:

series_init_filtered/20141214_00/ML1200972014/ANLY_TILE_F000_gfs_4_20141214_0000_000.nc
series_init_filtered/20141214_00/ML1200972014/ANLY_TILE_F000_gfs_4_20141214_0000_000.nc
series_init_filtered/20141214_00/ML1200972014/ANLY_TILE_F006_gfs_4_20141214_0000_006.nc
series_init_filtered/20141214_00/ML1200972014/ANLY_TILE_F012_gfs_4_20141214_0000_012.nc
series_init_filtered/20141214_00/ML1200972014/ANLY_TILE_F018_gfs_4_20141214_0000_018.nc

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And now for something completely different, the **series analysis by lead for all fhrs**….

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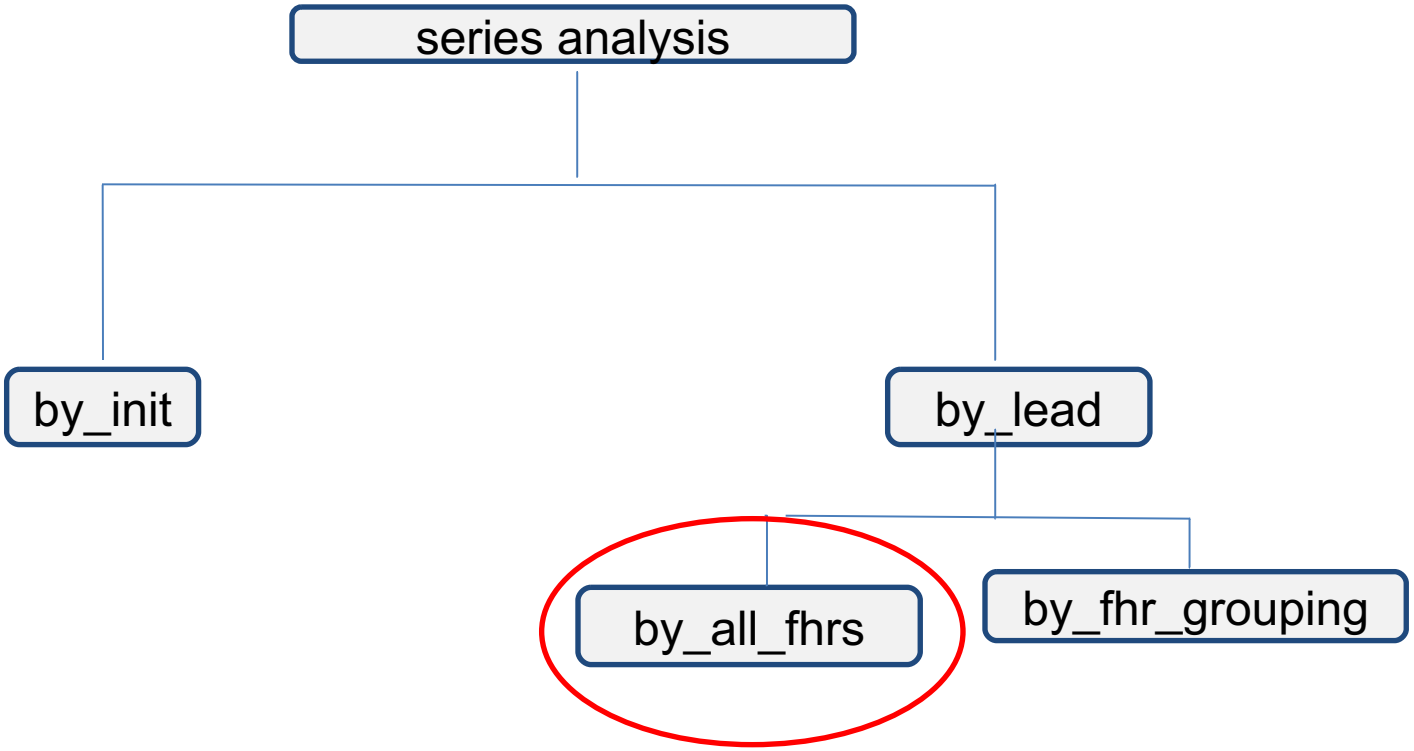
Configuring METplus for Use Case

Overview of Series Analysis portion of the Feature Relative Use Case



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Configuring METplus for Use Case

Snippet of config file requesting all fhrs, under [config]:

```
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 = 20141215
#INIT_INCREMENT =  86400
INIT_INCREMENT =  21600
#21600 ;; The increment in seconds in integer format
INIT_HOUR_END = 18 ;; Should be a string in HH or HHH format
```

additional filtering on matched pairs

specifies the time window of interest

```
SERIES_BY_LEAD_GROUP_FCSTS = False

# used if not grouping by forecast
LEAD_SEQ = begin_end_incr(0,96,6)
```

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Running the use case with METplus

Example 3. Series analysis by lead time all fhrs

```
master_metplus.py  \
-c parm/use_cases/feature_relative/feature_relative.conf \
-c parm/use_cases/feature_relative/examples/series_by_lead_all_fhrs.conf \
-c /path_to_your/custom_conf_file.conf
```

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Post-run overview: output

Output for **series analysis by lead (all fhrs)…**

Directories created :

```
 224 Sep 29 18:02 extract_tiles
  96 Sep 29 18:02 logs
4791 Sep 29 18:02 metplus_final.conf
 384 Sep 29 18:02 series_analysis_lead
 288 Sep 29 18:02 series_lead_filtered
  96 Sep 29 18:02 tc_pairs
  64 Sep 29 18:02 tmp
  96 Sep 29 18:02 track_data_atcf
```

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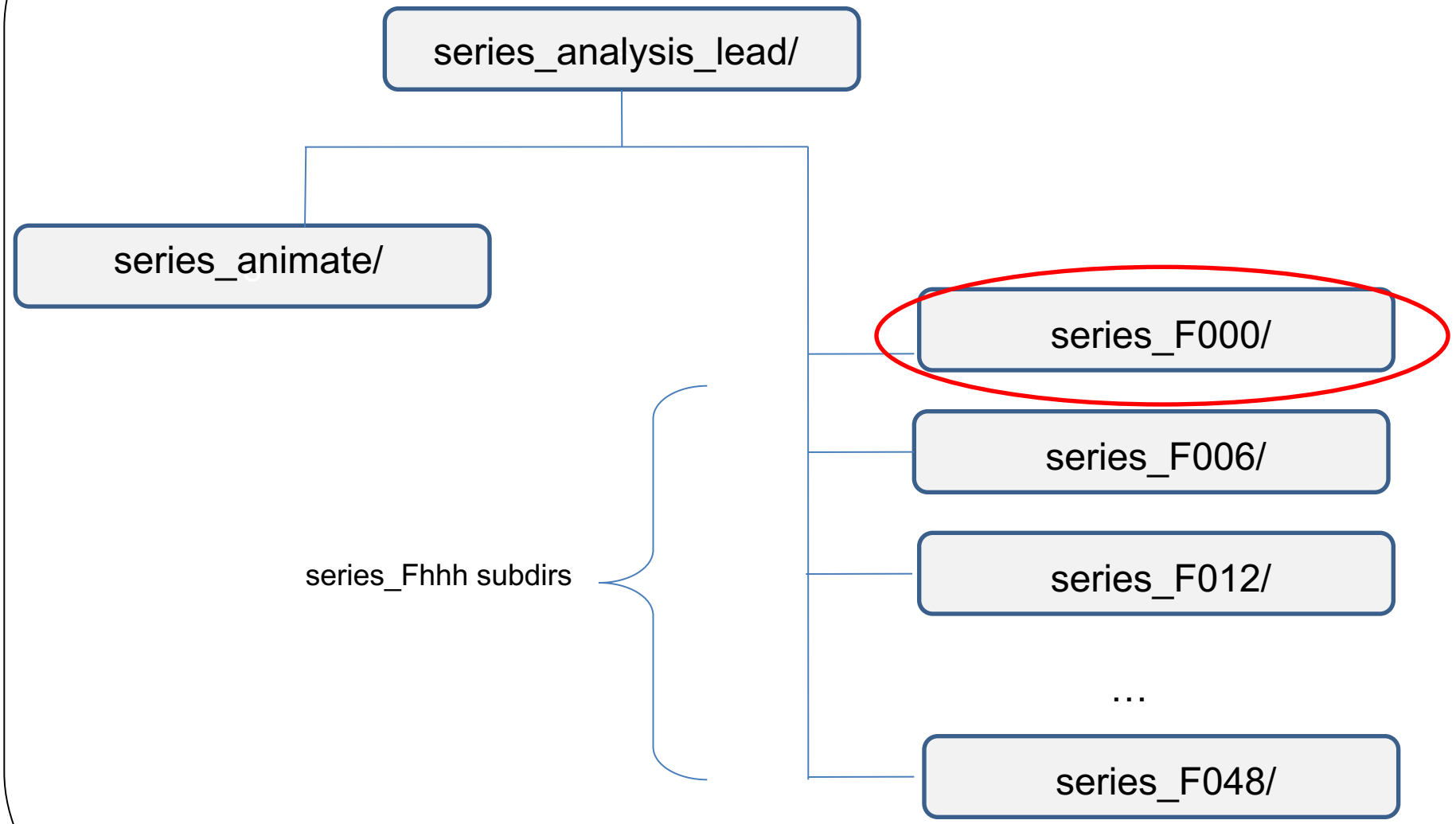
Post-run overview: output



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Post-run overview: output

in the series_F*hhh* directories are the ASCII (text) files and static plots, based on the specified field, level, and statistic

e.g. series_TMP_Z2_FBAR.png:

```
   7579 Sep 29 18:02 ANLY_FILES_F000
   7579 Sep 29 18:02 FCST_FILES_F000
  56180 Sep 29 18:02 series_F000_HGT_P500.nc
   9169 Sep 29 18:02 series_F000_HGT_P500_FBAR.png
   4801 Sep 29 18:02 series_F000_HGT_P500_FBAR.ps
   9109 Sep 29 18:02 series_F000_HGT_P500_OBAR.png
   4779 Sep 29 18:02 series_F000_HGT_P500_OBAR.ps
   8248 Sep 29 18:02 series_F000_HGT_P500_TOTAL.png
   3945 Sep 29 18:02 series_F000_HGT_P500_TOTAL.ps
  56180 Sep 29 18:02 series_F000_PRMSL_Z0.nc
   9596 Sep 29 18:02 series_F000_PRMSL_Z0_FBAR.png
   5016 Sep 29 18:02 series_F000_PRMSL_Z0_FBAR.ps
   9538 Sep 29 18:02 series_F000_PRMSL_Z0_OBAR.png
   4982 Sep 29 18:02 series_F000_PRMSL_Z0_OBAR.ps
   8345 Sep 29 18:02 series_F000_PRMSL_Z0_TOTAL.png
   3945 Sep 29 18:02 series_F000_PRMSL_Z0_TOTAL.ps
  56178 Sep 29 18:02 series_F000_TMP_Z2.nc
   9398 Sep 29 18:02 series_F000_TMP_Z2_FBAR.png
   5088 Sep 29 18:02 series_F000_TMP_Z2_FBAR.ps
   9422 Sep 29 18:02 series_F000_TMP_Z2_OBAR.png
   5123 Sep 29 18:02 series_F000_TMP_Z2_OBAR.ps
   8260 Sep 29 18:02 series_F000_TMP_Z2_TOTAL.png
   3961 Sep 29 18:02 series_F000_TMP_Z2_TOTAL.ps
```

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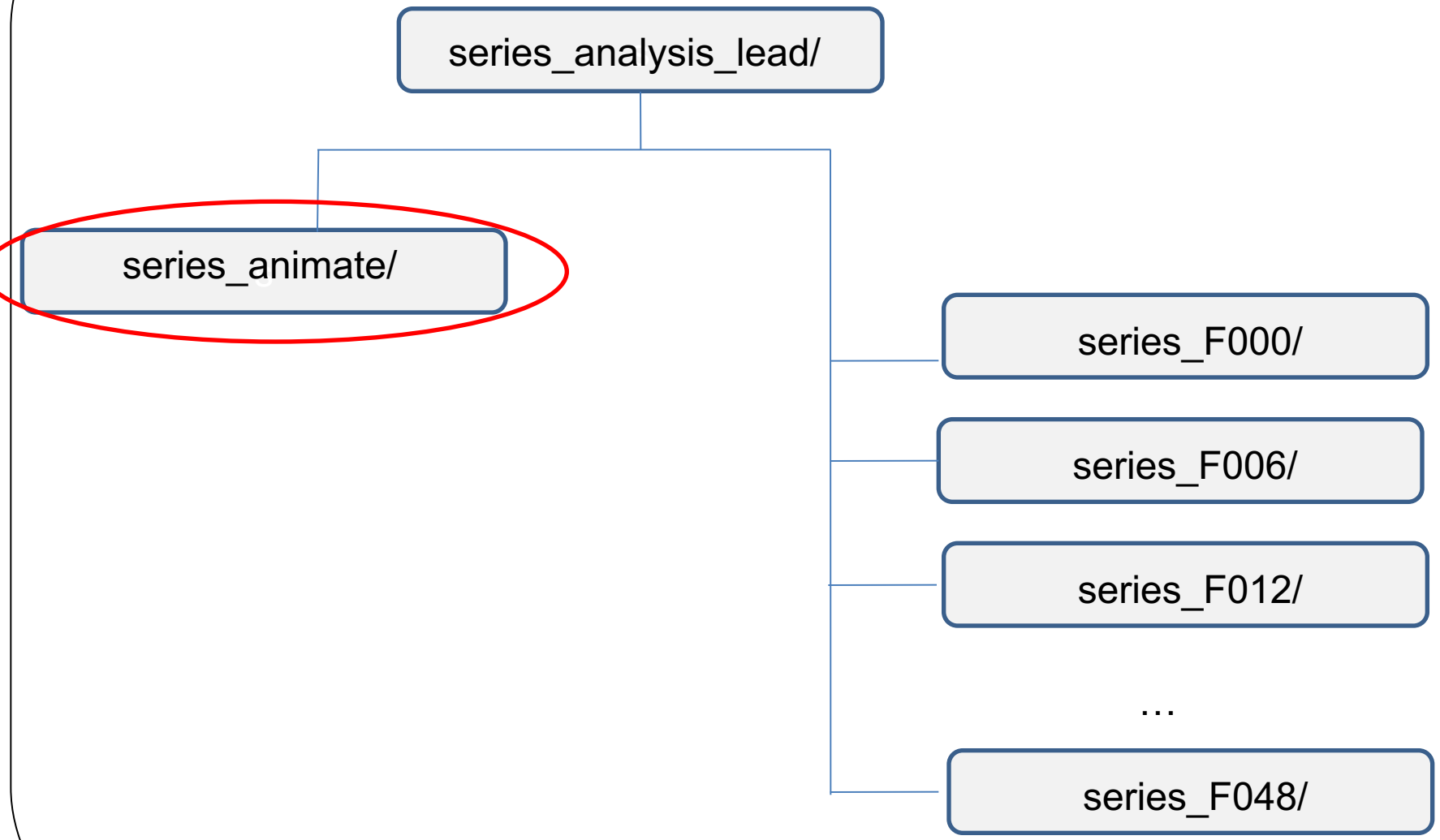
Post-run overview: output



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Post-run overview: output

…and in the series_animate directory, the animated GIF files, labelled by the level, height and statistics that were set in the use case config file

e.g. series_animate_TMP_Z2_OBAR.gif

```
212017 Sep 29 18:02 series_animate_HGT_P500_FBAR.gif
199965 Sep 29 18:02 series_animate_HGT_P500_OBAR.gif
112760 Sep 29 18:02 series_animate_HGT_P500_TOTAL.gif
218058 Sep 29 18:02 series_animate_PRMSL_Z0_FBAR.gif
214865 Sep 29 18:02 series_animate_PRMSL_Z0_OBAR.gif
113333 Sep 29 18:02 series_animate_PRMSL_Z0_TOTAL.gif
204497 Sep 29 18:02 series_animate_TMP_Z2_FBAR.gif
205774 Sep 29 18:02 series_animate_TMP_Z2_OBAR.gif
111570 Sep 29 18:02 series_animate_TMP_Z2_TOTAL.gif
```

* File sizes included in the file listing to provide a reference to the expected file sizes of the output files (based on the amount of requested data).

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And finally, **series analysis by lead**, where we are **grouping by fhrs**…

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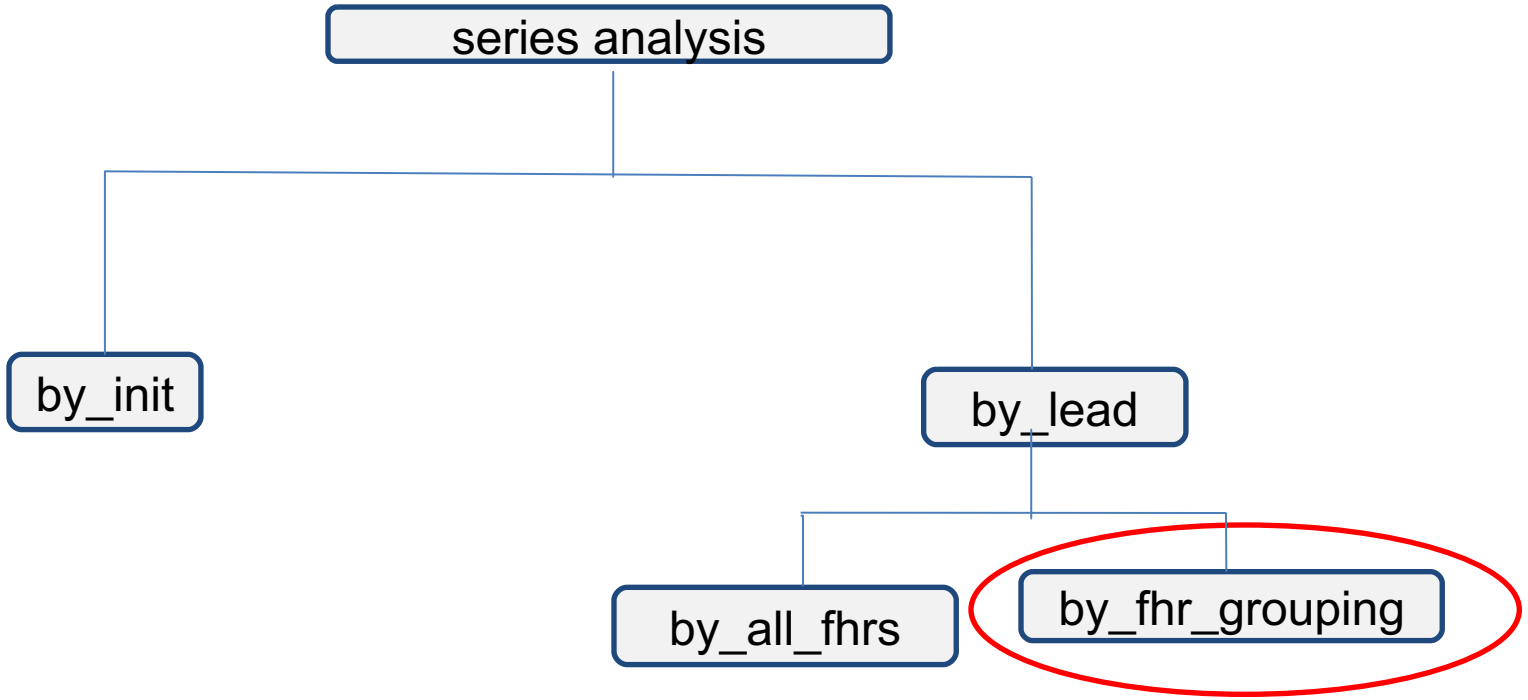
Configuring METplus for Use Case

Overview of Series Analysis portion of the Feature Relative Use Case



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Configuring METplus for Use Case

Snippet of config file requesting series by lead by fhr groupings

* these are under the [config] family

```
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 = 20141215
#INIT_INCREMENT =  86400
INIT_INCREMENT =  21600
#21600 ;; The increment in seconds in integer format
INIT_HOUR_END = 18 ;; Should be a string in HH or HHH format

SERIES_BY_LEAD_GROUP_FCSTS = True

# used if grouping by forecast
LEAD_SEQ_1 = begin_end_incr(0,18,6)
LEAD_SEQ_1_LABEL = Day1
LEAD_SEQ_2 = begin_end_incr(24,42,6)
LEAD_SEQ_2_LABEL = Day2
LEAD_SEQ_2 = begin_end_incr(48,66,6)
LEAD_SEQ_3_LABEL = Day3
```

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Running the use case with METplus

Example 4. Series analysis by lead, by fhr grouping

```
master_metplus.py \
-c parm/use_cases/feature_relative/feature_relative.conf \
-c parm/use_cases/feature_relative/examples/series_by_lead_by_fhr_grouping.conf \
-c /path_to_your/custom_conf_file.conf
```

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Post-run overview: output

series_analysis_lead (fhr grouping) directories has output directories:

```
  224 Sep 29 18:02 extract_tiles
   96 Sep 29 18:02 logs
 4854 Sep 29 18:02 metplus_final.conf
  224 Sep 29 18:02 series_analysis_lead
  288 Sep 29 18:02 series_lead_filtered
   96 Sep 29 18:02 tc_pairs
   64 Sep 29 18:02 tmp
   96 Sep 29 18:02 track_data_atcf
```

*Directory listing is file size, month, day, time, file/dir name. The file sizes are included in file listing to illustrate the size of files expected for the requested amount of data.

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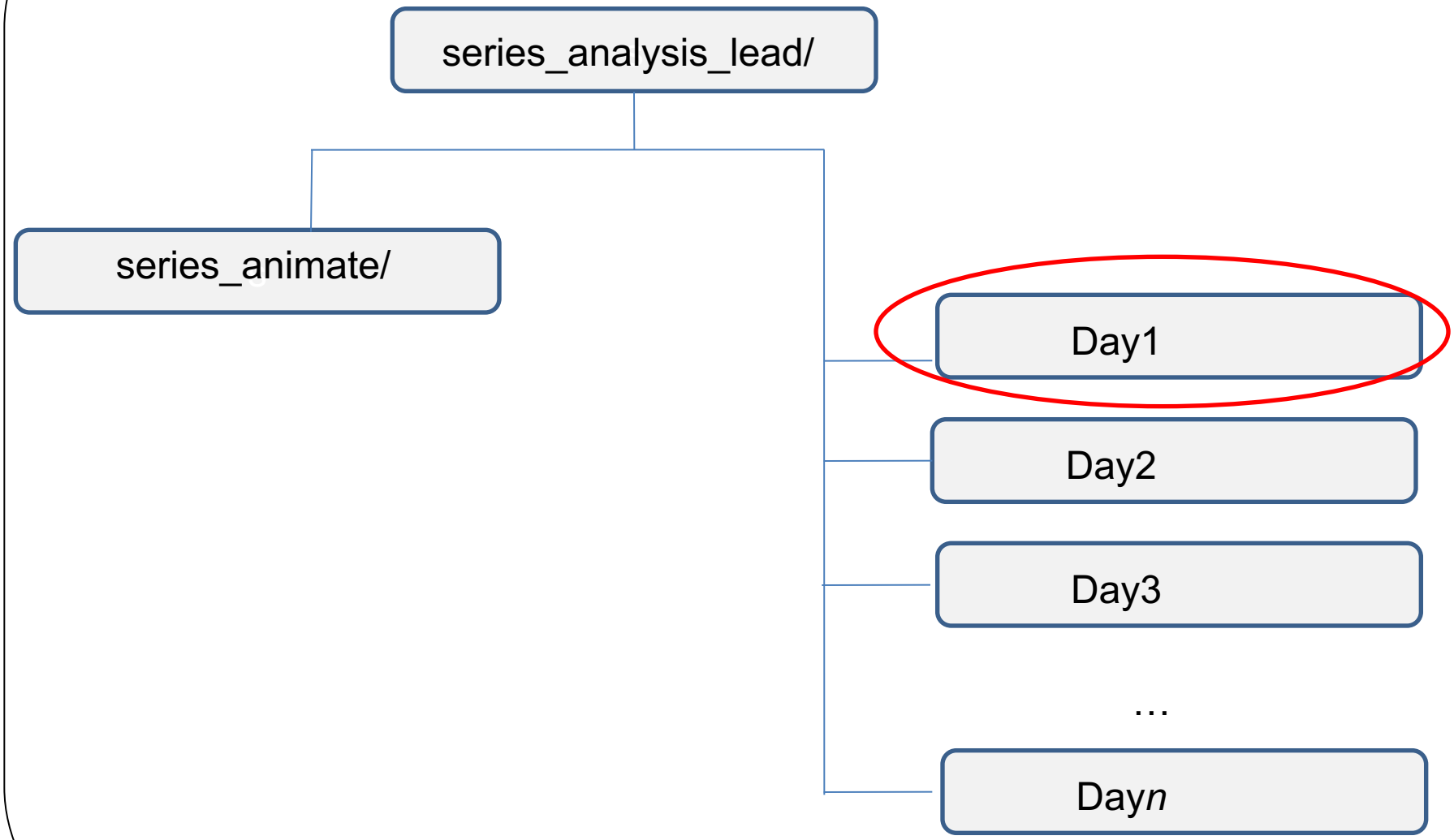
Post-run overview: output



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Post-run overview: output

each Day*n** directory contains the static plots, based on the variable, level, and statistic set in the use case config file

e.g. series_F000_to_F018_HGT_P500_OBAR.png

```
79500 Sep 29 18:02 ANLY_FILES_F000_to_F018
79500 Sep 29 18:02 FCST_FILES_F000_to_F018
56188 Sep 29 18:02 series_F000_to_F018_HGT_P500.nc
 9986 Sep 29 18:02 series_F000_to_F018_HGT_P500_FBAR.png
 5050 Sep 29 18:02 series_F000_to_F018_HGT_P500_FBAR.ps
10015 Sep 29 18:02 series_F000_to_F018_HGT_P500_OBAR.png
 5062 Sep 29 18:02 series_F000_to_F018_HGT_P500_OBAR.ps
 8818 Sep 29 18:02 series_F000_to_F018_HGT_P500_TOTAL.png
 4016 Sep 29 18:02 series_F000_to_F018_HGT_P500_TOTAL.ps

… etc.
```

**This can be any label you chose, this is set in the use case config file parm/use_cases/feature_relative/examples/series_by_lead_by_fhr_grouping.conf*
File sizes included in the file listing to indicate the size of files expected for the requested amount of data.

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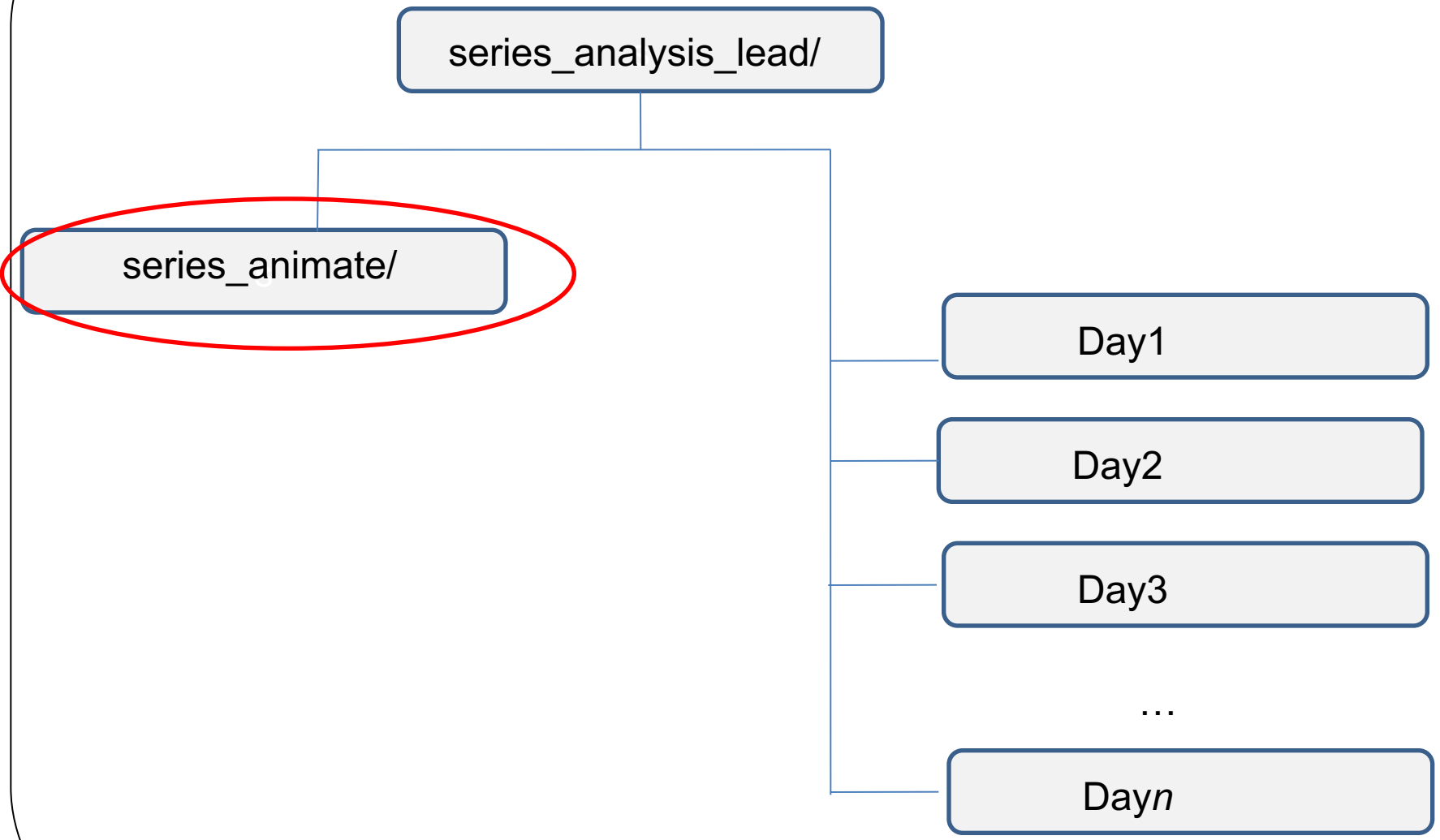
Post-run overview: output



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Post-run overview: output

the series_animate directory has the animated GIF files:

```
111876 Sep 29 18:02 series_animate_HGT_P500_FBAR.gif
109147 Sep 29 18:02 series_animate_HGT_P500_OBAR.gif
 52654 Sep 29 18:02 series_animate_HGT_P500_TOTAL.gif
101680 Sep 29 18:02 series_animate_PRMSL_Z0_FBAR.gif
100967 Sep 29 18:02 series_animate_PRMSL_Z0_OBAR.gif
 52895 Sep 29 18:02 series_animate_PRMSL_Z0_TOTAL.gif
113336 Sep 29 18:02 series_animate_TMP_Z2_FBAR.gif
116398 Sep 29 18:02 series_animate_TMP_Z2_OBAR.gif
 52191 Sep 29 18:02 series_animate_TMP_Z2_TOTAL.gif
```

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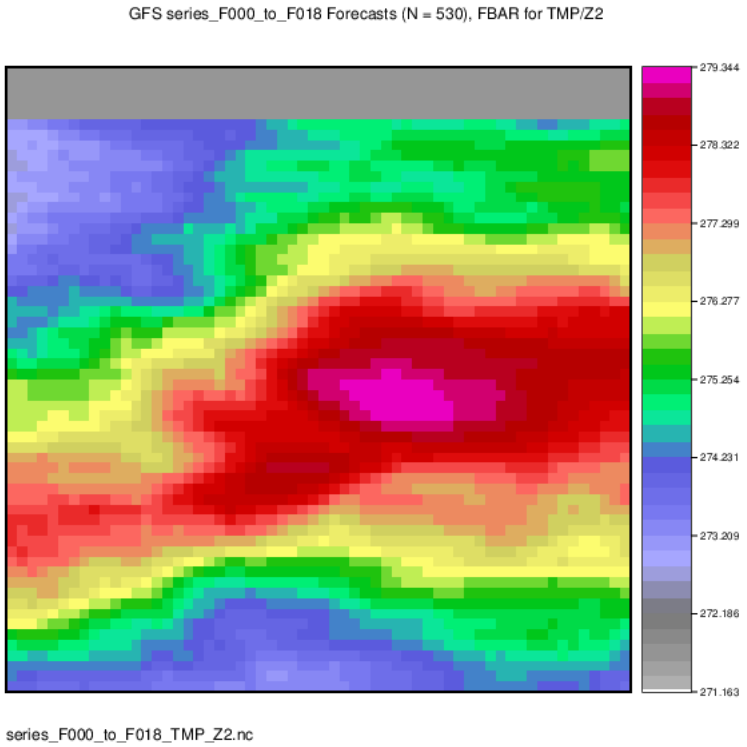
Post-run overview: output

series_F000_to_F018_TMP_Z2_FBAR.png



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Questions

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