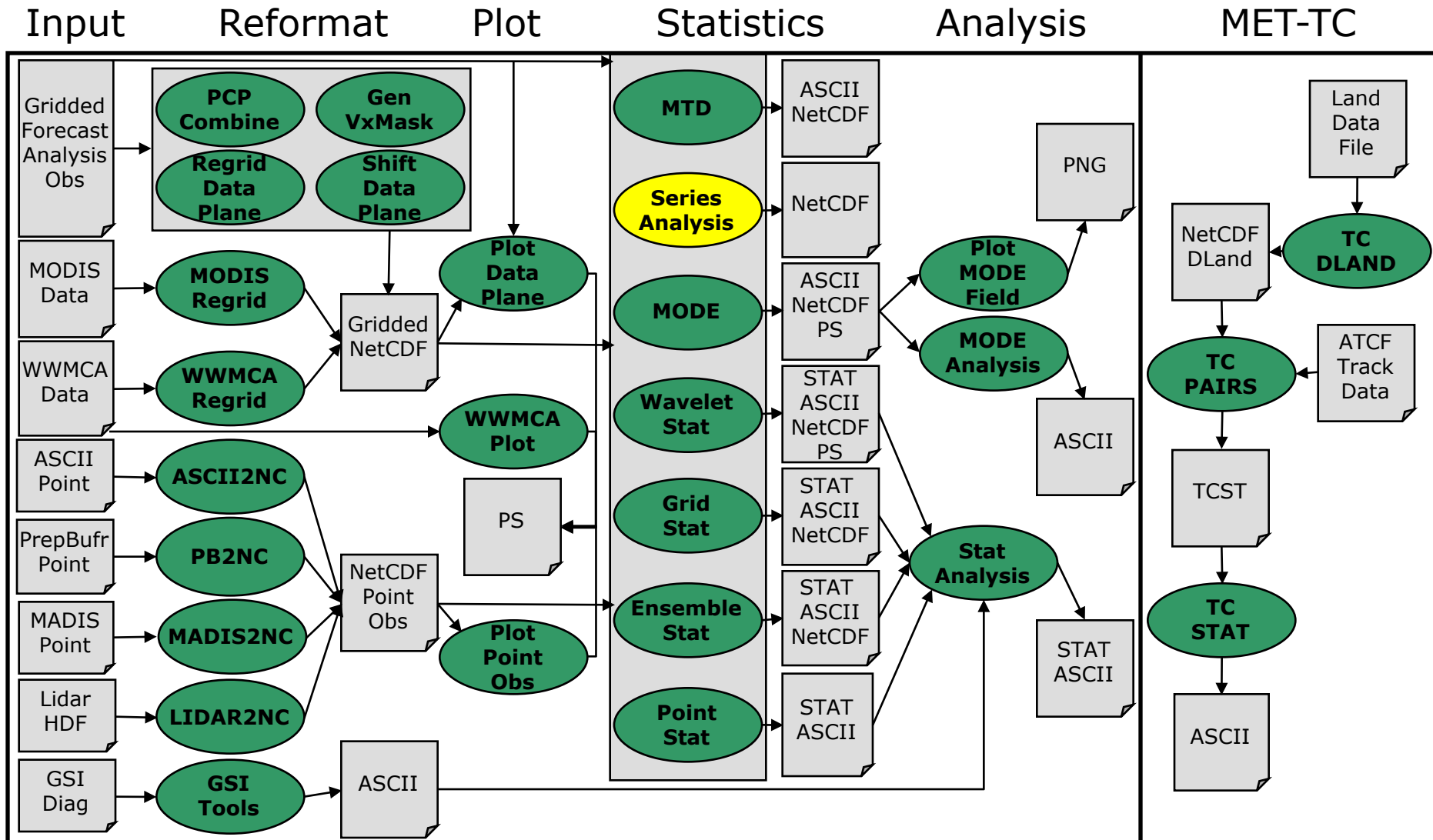# Series-Analysis Tool

Series-Analysis Tool

Series-Analysis: Overview

- Grid-to-grid comparisons on common grid.

- Grid-Stat and Point-Stat:

  - Compute statistics aggregated over many grid points for a single point in time.

- Series-Analysis Tool:

  - Compute statistics aggregated through time for each point in the grid.

Series-Analysis: Input/Output

- Input Files
  - Gridded forecast and observation files
    - GRIB1 output of Unified Post-Processor (or other)
    - GRIB2 from NCEP (or other)
    - NetCDF from PCP-Combine, p_interp, or CF-compliant
  - ASCII configuration file
- Output File
  - NetCDF file containing one or more statistics computed for each grid point.

Series-Analysis: Define Series

- Define series as:

  - Same field from multiple files.

  - Different fields from the same file.

  - Example: 24hr NAM fcst of 3hr APCP vs StageII
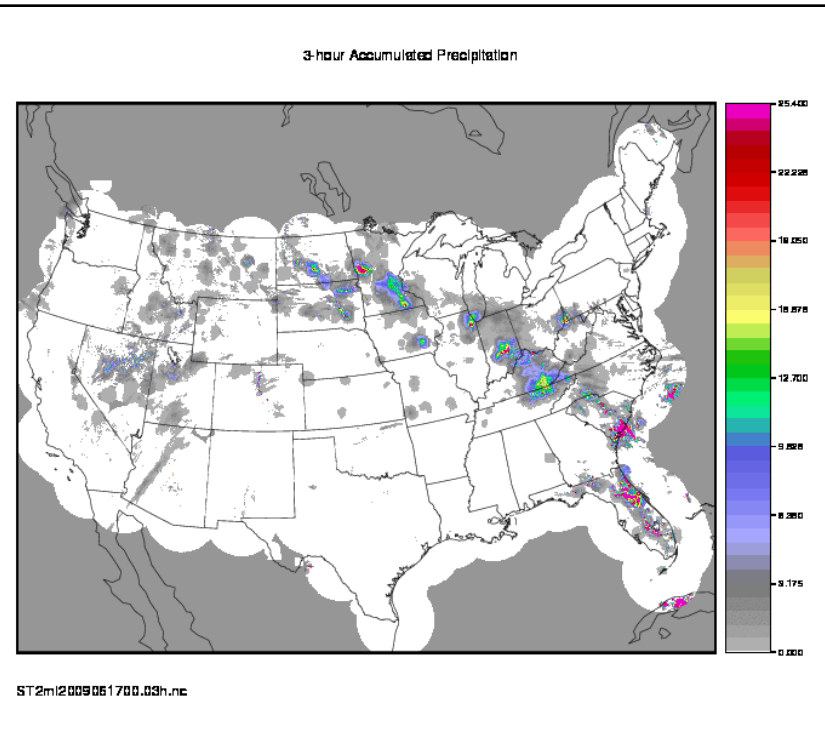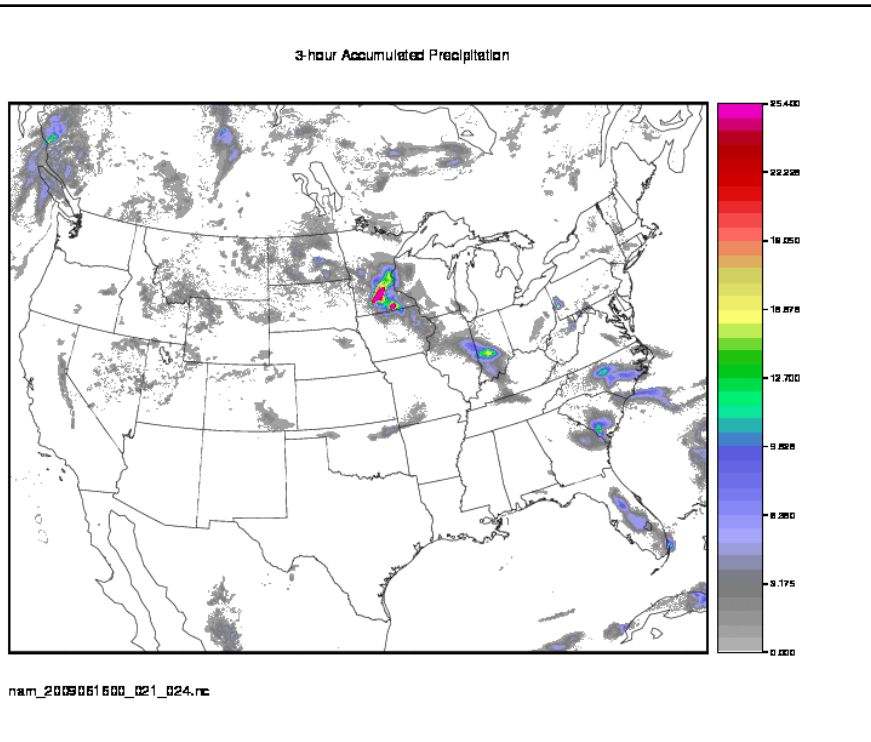
Series-Analysis: Usage

Usage: series_analysis

-fcst file_1 ... file_n

-obs file_1 ... file_n

[-both file_1 ... file_n]

[-paired]

-out file

-config file

[-log file]

[-v level]

[-compress level]

-fcst	Gridded forecast files or ASCII file list
-obs	Gridded observation files or ASCII file list
-both	Set –fcst and –obs to the same list of files (i.e. Grid-Stat NetCDF pairs)
-paired	Input –fcst and –obs files are paired
-out	Output NetCDF file name
-config	ASCII configuration file
-log	Output directory to be used
-v	Level of logging

Series-Analysis: Configuration

- Precipitation accumulated over 3 hours.
  - NetCDF fcst and obs
- Threshold precip at 0.01" and 0.10".

- Do not restrict the analysis area in any way.

- Process 100,000 grid points in each pass.
- Require 75% of matched pairs in series to be valid.

- Compute contingency table statistics listed.

```
fcst = {
 cat_thresh = [ >0.254, >2.540 ];
 field = [
  {
   name  = "APCP_03";
   level = [ "(*,*)" ];
  }
 ];
};
obs = fcst;
```

```
mask = {
  grid = "";
  poly = "";
};
```

```
block_size = 100000;
vld_thresh = 0.75;
```

```
output_stats = {
    fho    = [];
    ctc    = [];
    cts    = [
     "TOTAL",
     "BASER",
     "GSS",
     "FBIAS",
     "HK",
     "HSS"
    ];
    mctc   = [];
    mcts   = [];
    cnt    = [];
    sl1l2  = [];
    sal1l2 = [];
    pct    = [];
    pstd   = [];
    pjc    = [];
    prc    = [];
};
```

Series-Analysis: Run

- met-8.0/bin/series_analysis \

  -fcst nam_24hr_fcst_summer \

  -obs st2_00Z_vld_summer \

  -config SeriesAnalysisConfig \

  -out series_nam_st2_24hr_fcst_summer.nc -v 2

```
DEBUG 1: Reading ASCII file list: nam_24hr_fcst_summer
DEBUG 1: Reading ASCII file list: st2_00Z_vld_summer
DEBUG 1: Default Config File: met-5.0/share/met/data/config/SeriesAnalysisConfig_default
DEBUG 1: User Config File: SeriesAnalysisConfig
DEBUG 1: Length of configuration "fcst.field" = 1
DEBUG 1: Length of configuration "obs.field"  = 1
DEBUG 1: Length of forecast file list       = 92
DEBUG 1: Length of observation file list     = 92
DEBUG 1: Series defined by the forecast file list of length 92.
DEBUG 2: Computing statistics using a block size of 100000, requiring 10 passes through the 1121 x 881 grid.
DEBUG 2: Processing data pass number 1 of 10 for grid points 1 to 100000.
DEBUG 2: Processing series entry 1 of 92: APCP_03(*,*) versus APCP_03(*,*)
DEBUG 2: Found data for APCP_03(*,*) in NAM_4km_03h/2009061600/nam_2009061600_021_024.nc
DEBUG 2: Found data for APCP_03(*,*) in ST2_4km_03h/ST2ml2009061700.03h.nc
DEBUG 2: Processing data pass number 2 of 10 for grid points 100001 to 200000.
DEBUG 2: Processing data pass number 3 of 10 for grid points 200001 to 300000.
DEBUG 2: Processing data pass number 4 of 10 for grid points 300001 to 400000.
DEBUG 2: Processing data pass number 5 of 10 for grid points 400001 to 500000.
DEBUG 2: Processing data pass number 6 of 10 for grid points 500001 to 600000.
DEBUG 2: Processing data pass number 7 of 10 for grid points 600001 to 700000.
DEBUG 2: Processing data pass number 8 of 10 for grid points 700001 to 800000.
DEBUG 2: Processing data pass number 9 of 10 for grid points 800001 to 900000.
DEBUG 2: Processing data pass number 10 of 10 for grid points 900001 to 987601.
DEBUG 1: Output file: out/series_nam_st2_24hr_fcst_summer.nc
```
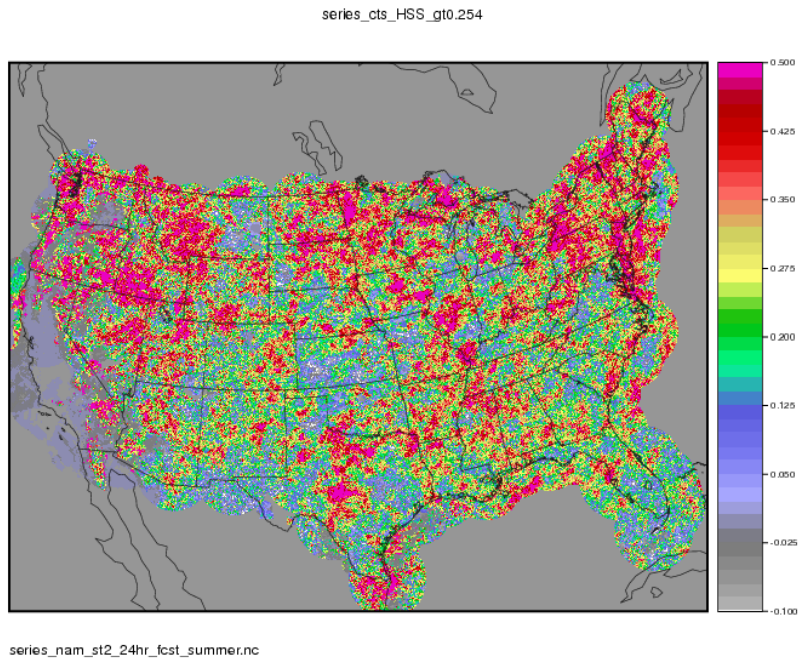
Run time approx
30 minutes

Series-Analysis: ncdump

```
netcdf series_nam_st2_24hr_fcst_summer {
dimensions:
        lat = 881 ;
        lon = 1121 ;
variables:
        int n_series ;
                n_series:long_name = "length of series" ;
        float series_cts_TOTAL_gt0.254(lat, lon) ;
                series_cts_TOTAL_gt0.254:_FillValue = -9999.f ;
                series_cts_TOTAL_gt0.254:name = "TOTAL" ;
                series_cts_TOTAL_gt0.254:long_name = "Total number of matched pairs" ;
                series_cts_TOTAL_gt0.254:fcst_thresh = ">0.254" ;
                series_cts_TOTAL_gt0.254:obs_thresh = ">0.254" ;
        float series_cts_BASER_gt0.254(lat, lon)
                series_cts_BASER_gt0.254:_FillValue = -9999.f ;
                series_cts_BASER_gt0.254:name = "BASER" ;
                series_cts_BASER_gt0.254:long_name = "Base rate" ;
                series_cts_BASER_gt0.254:fcst_thresh = ">0.254" ;
                series_cts_BASER_gt0.254:obs_thresh = ">0.254" ;
        float series_cts_GSS_gt0.254(lat, lon) ;
                series_cts_GSS_gt0.254:_FillValue = -9999.f ;
                series_cts_GSS_gt0.254:name = "GSS" ;
                series_cts_GSS_gt0.254:long_name = "Gilbert Skill Score" ;
                series_cts_GSS_gt0.254:fcst_thresh = ">0.254" ;
                series_cts_GSS_gt0.254:obs_thresh = ">0.254" ;
        float series_cts_FBIAS_gt0.254(lat, lon) ;
                series_cts_FBIAS_gt0.254:_FillValue = -9999.f ;
                series_cts_FBIAS_gt0.254:name = "FBIAS" ;
                series_cts_FBIAS_gt0.254:long_name = "Frequency bias" ;
                series_cts_FBIAS_gt0.254:fcst_thresh = ">0.254" ;
                series_cts_FBIAS_gt0.254:obs_thresh = ">0.254" ;
        float series_cts_HK_gt0.254(lat, lon) ;
                series_cts_HK_gt0.254:_FillValue = -9999.f ;
                series_cts_HK_gt0.254:name = "HK" ;
                series_cts_HK_gt0.254:long_name = "Hanssen-Kuipers discriminant" ;
                series_cts_HK_gt0.254:fcst_thresh = ">0.254" ;
                series_cts_HK_gt0.254:obs_thresh = ">0.254" ;
```
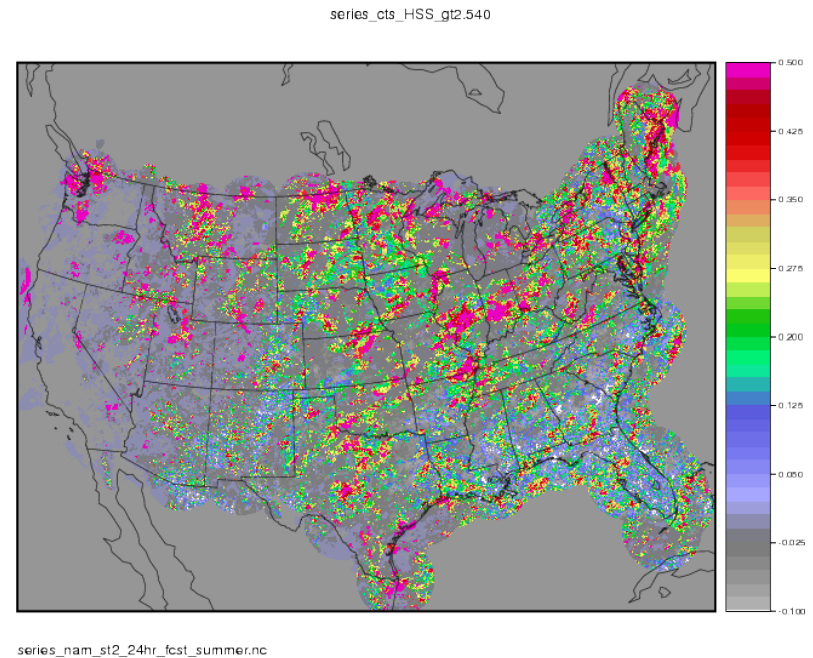
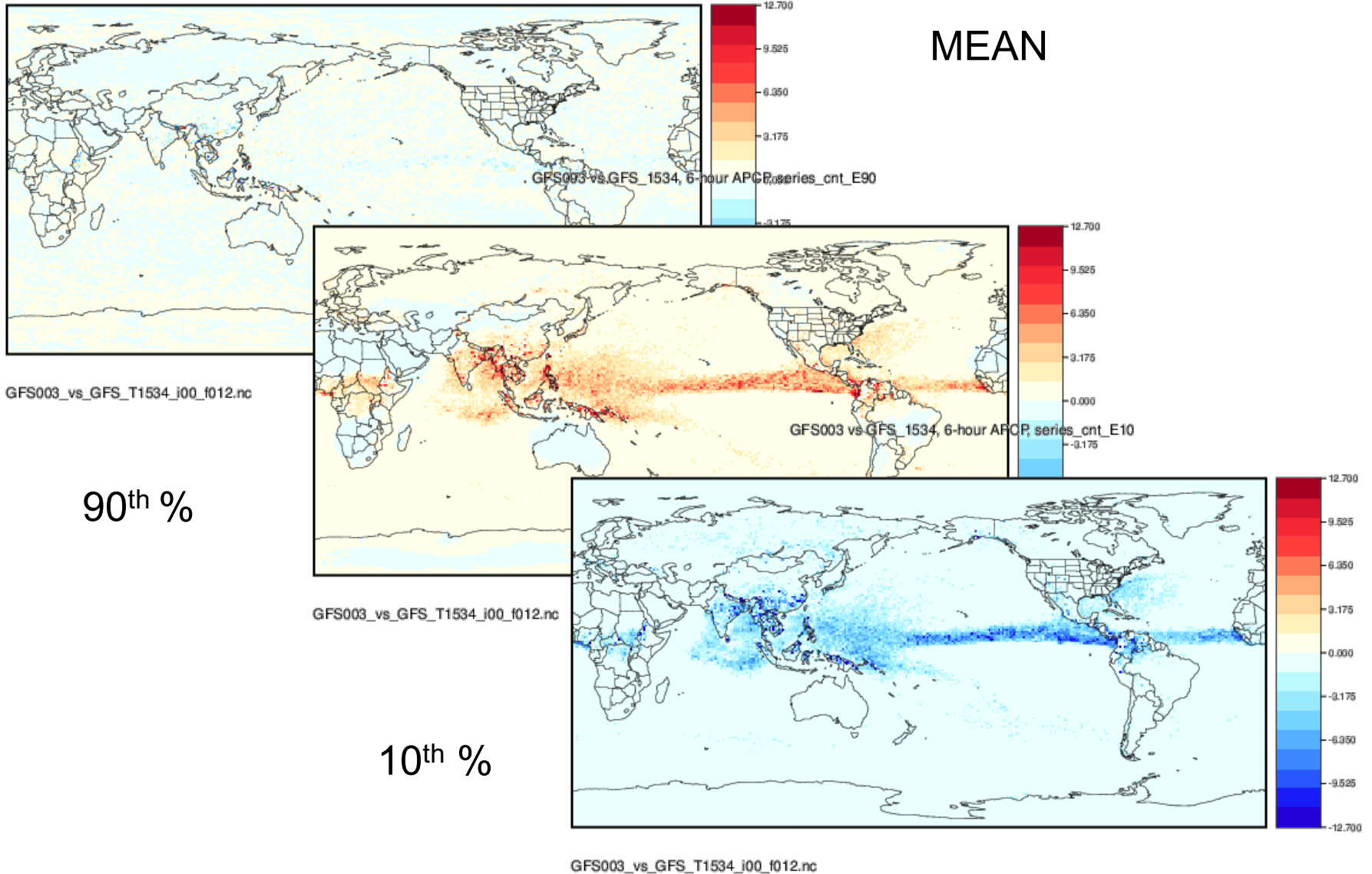# Series-Analysis: Statistics

3hr APCP > 0.254 mm
(0.01 in)

3hr APCP > 2.54 mm
(0.1 in)

series_cts_HSS_gt0.254

series_nam_st2_24hr_fcst_summer.nc

series_cts_HSS_gt2.540

series_nam_st2_24hr_fcst_summer.nc

MET Series Analysis

6 hour accumulated precipitation - Bias

MEAN

90th %

10th %

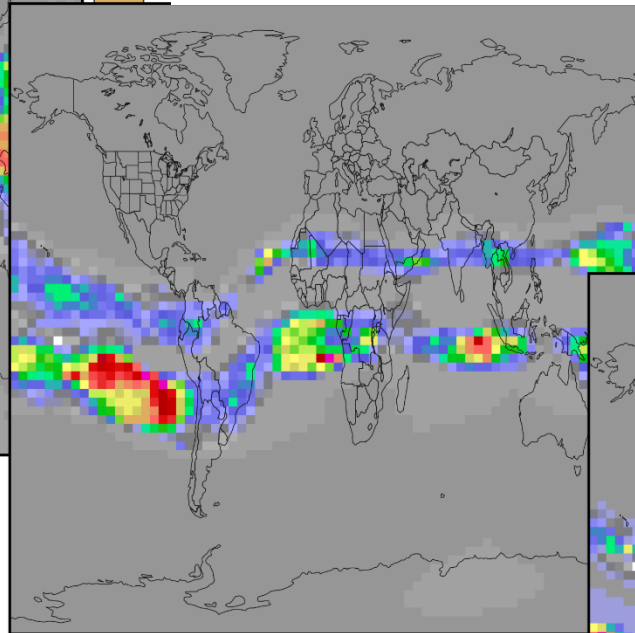GFS003_vs_GFS_T1534_i00_f012.nc

GFS003_vs_GFS_T1534_i00_f012.nc

GFS003_vs_GFS_T1534_i00_f012.nc

GFS003 vs GFS_1534, 6-hour APCP, series_cnt_E90

GFS003 vs GFS_1534, 6-hour APCP, series_cnt_E10

MET Tool: Series Analysis

Gilbert Skill Score >=25

**Evaluation of Ionosphere Total
Electron Count (TEC) prediction**

Gilbert Skill Score >=35 TEC units

Gilbert Skill Score >=45
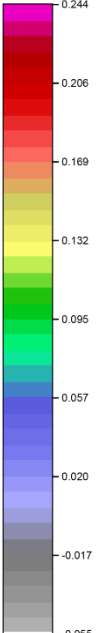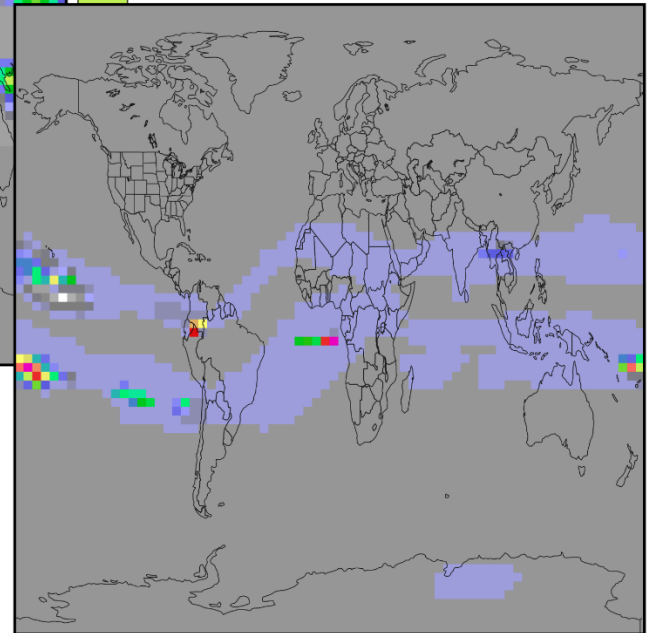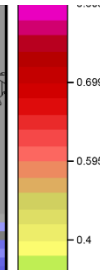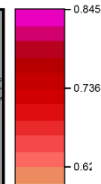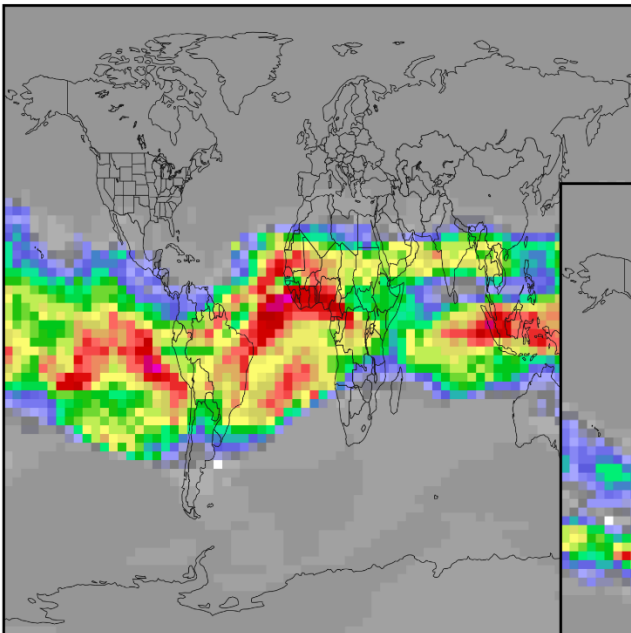
series_analysis_WAM_GloTEC_stats.nc

series_analysis_WAM_GloTEC_stats.nc

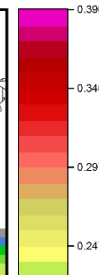series_analysis_WAM_GloTEC_stats.nc
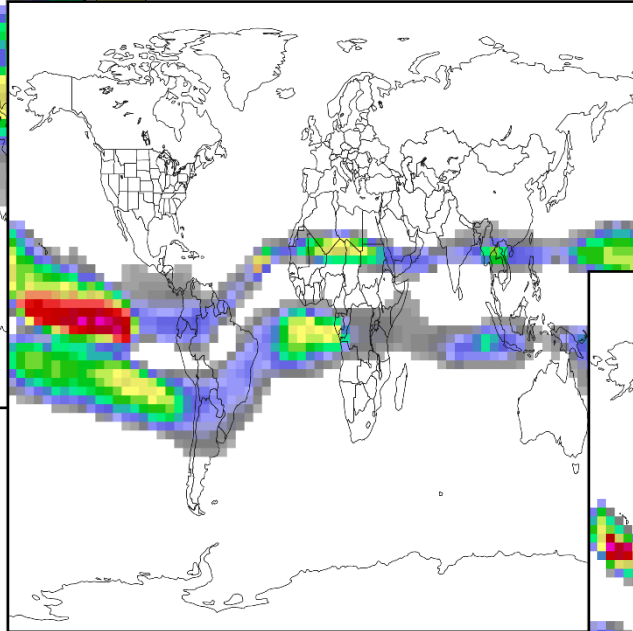
Gilbert Skill Score:

Measures the fraction of observed and/or forecast events
that were correctly predicted, adjusted for hits associated
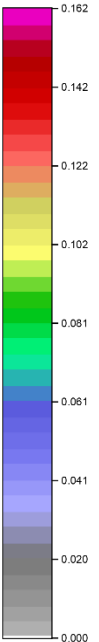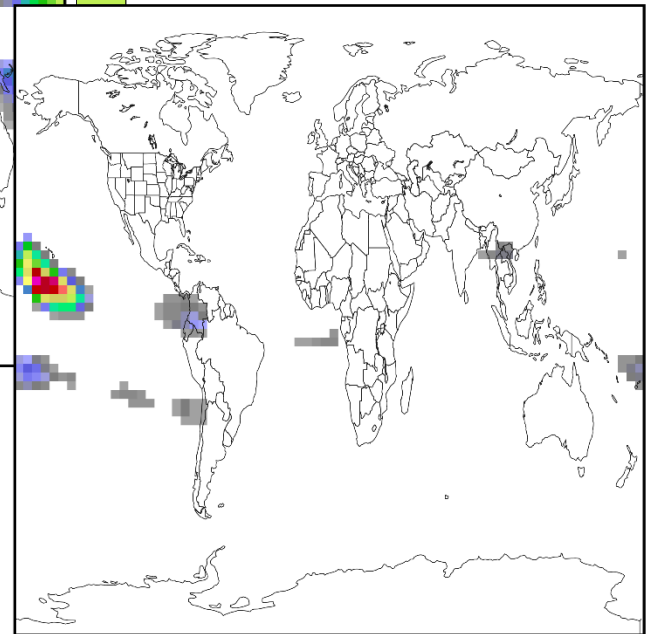with random chance

MET Tool: Series Analysis

Base Rate >=25

series_analysis_WAM_GloTEC_stats.nc

Base Rate >=35

series_analysis_WAM_GloTEC_stats.nc
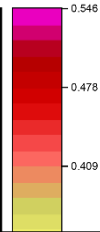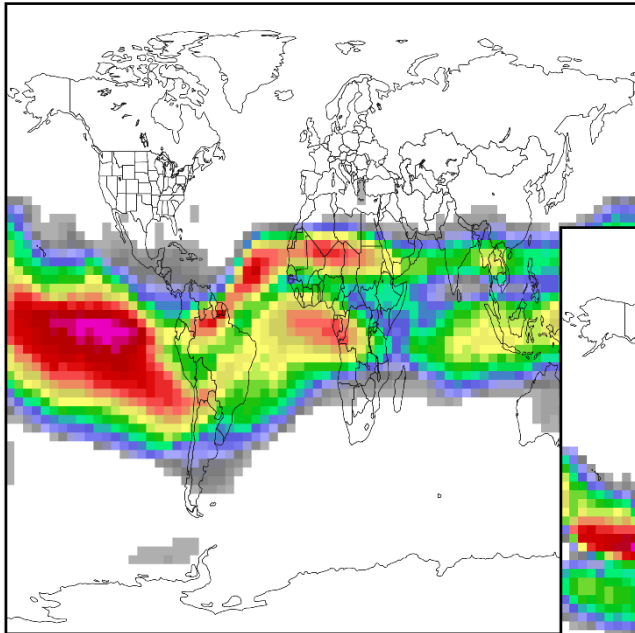
Base Rate >=45

series_analysis_WAM_GloTEC_stats.nc

Base Rate:

Frequency of observations exceeding the given threshold