METplus

# METplus Update

Tara Jensen on behalf of the METplus team

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NCAR/RAL

and

Developmental Testbed Center (DTC)

HAFS Coordination Meeting – 28 April 2021

DTC Developmental Testbed Center

NCAR

# Release update

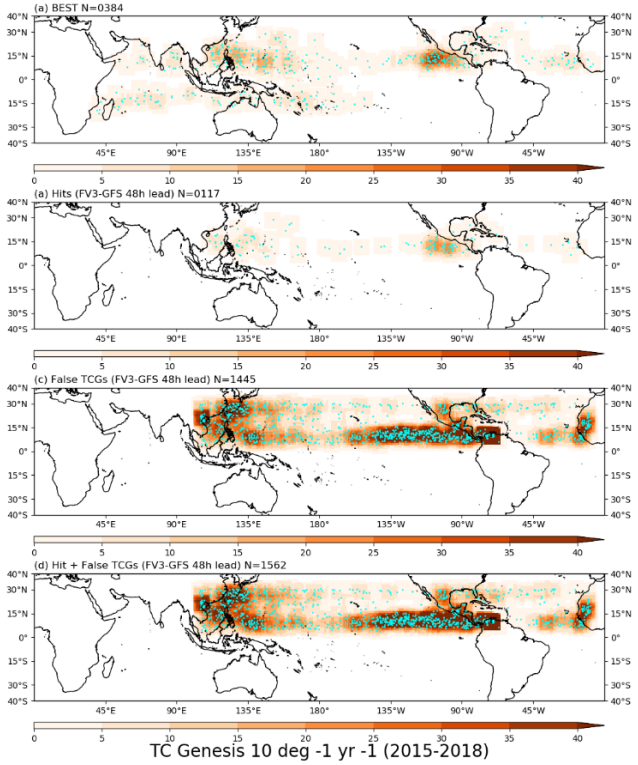
- Early May: METplus v4.0.0 with MET v10.0.0, METviewer 4.0.0 and METexpress 4.0.0 with METcalcpy 1.0.0, METplotpy 1.0.0, METdatadb 1.0.0 utilities

- Using TDR and Dropsondes to evaluate models
- Improved TC-Genesis use-cases
- Hovmoller and Tropical Wave Phase Diagrams
- Interface in METcalcpy to read MET output to replicate METviewer/METexpress capabililty using flat files on HPCs (rather than a database)

# New Capabilities

# One Tools Many Apps: TC-Genesis

- *Collaboration with Dan Halperin, Embry-Riddle Aeronautical University*
- Compare forecast of TC-Genesis to actual BEST track and CARQ genesis events
- Writes contingency table counts and statistics; netCDF files of genesis events




*Li et al., 2016*

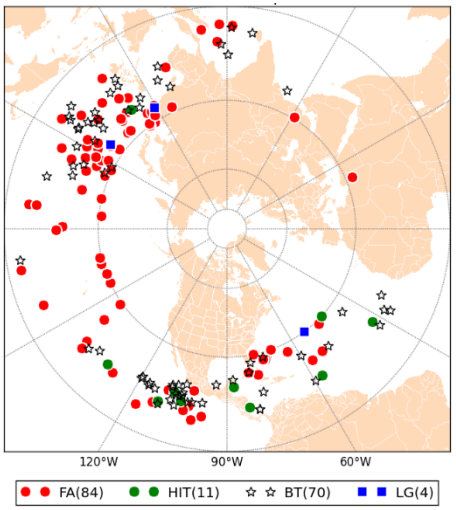
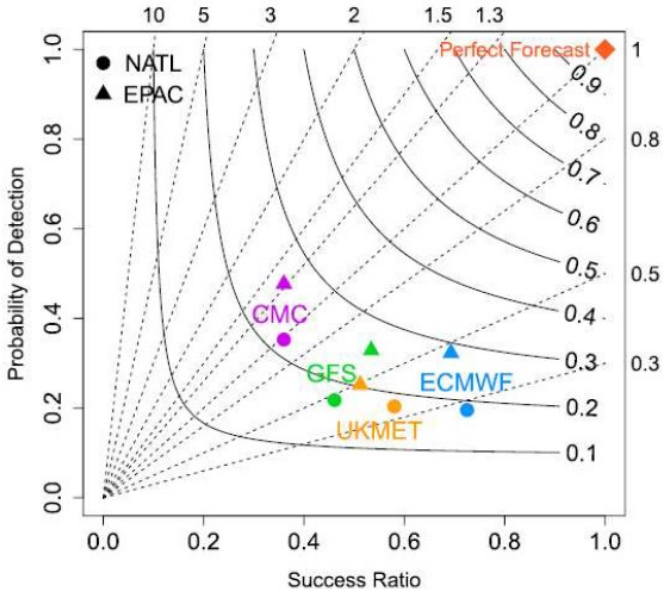
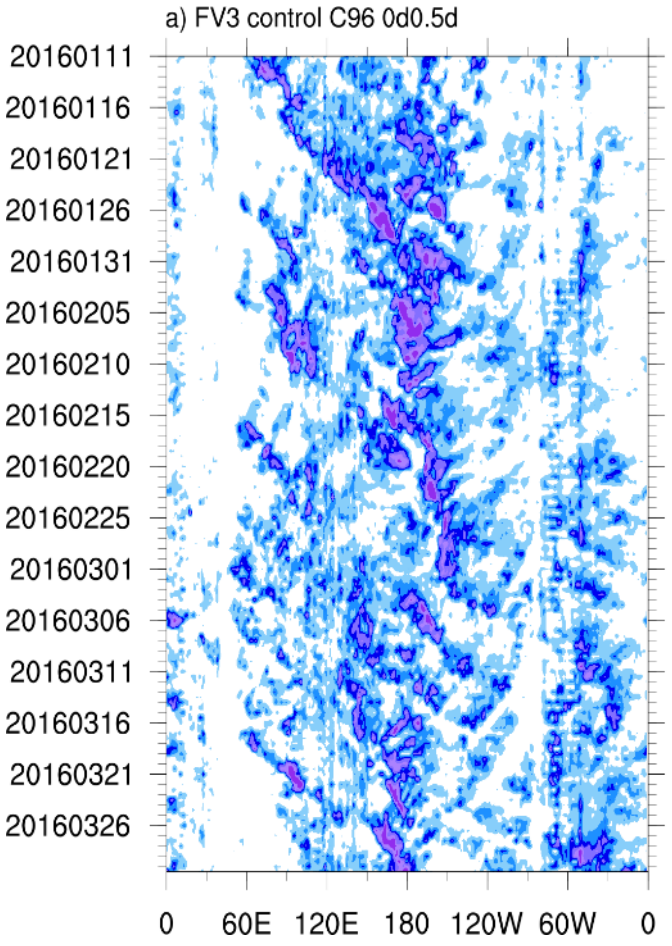


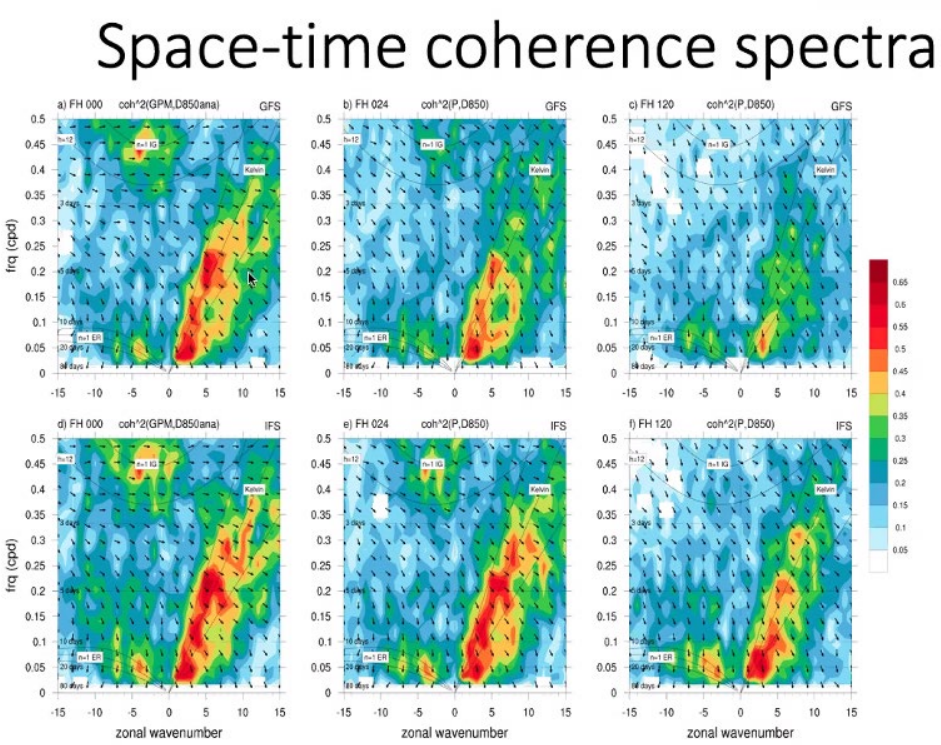

Figure: Tropical cyclogenesis verification for the NH for 2016. Symbols represent the Best Track (black), hits (green), late Genesis (blue) and false alarms (red).

*Halperin et al., 2017*

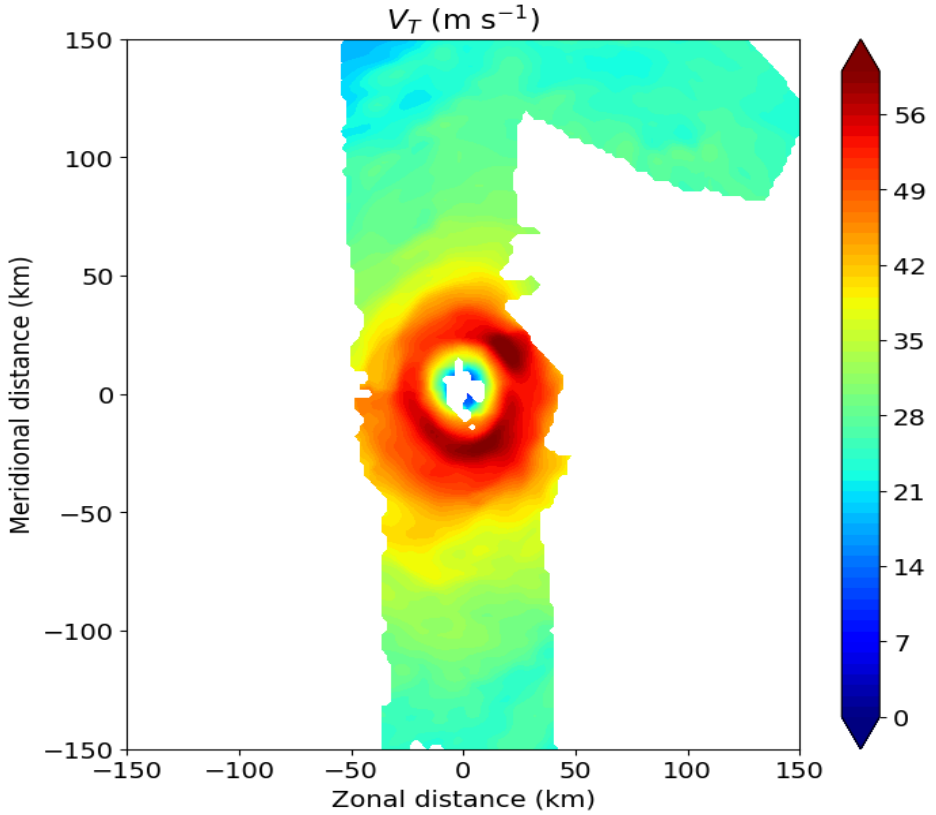


# Hovmoeller and Phase Diagrams



# TDR and Dropsondes for Evaluating TCs Using of Python Embedding



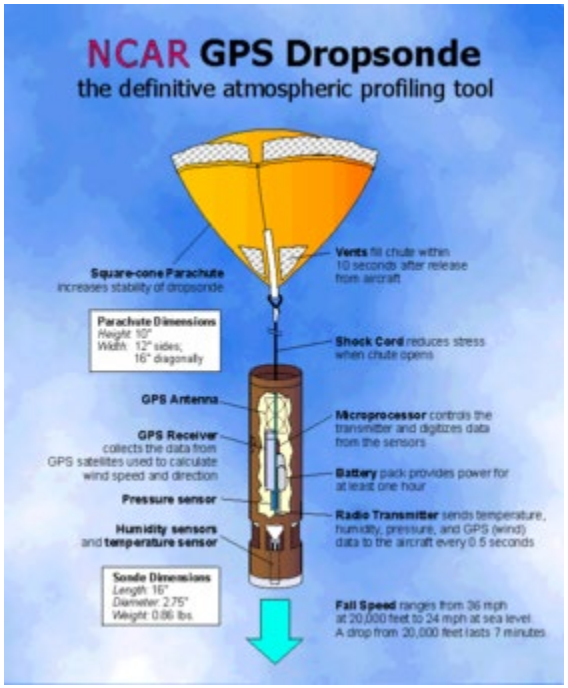
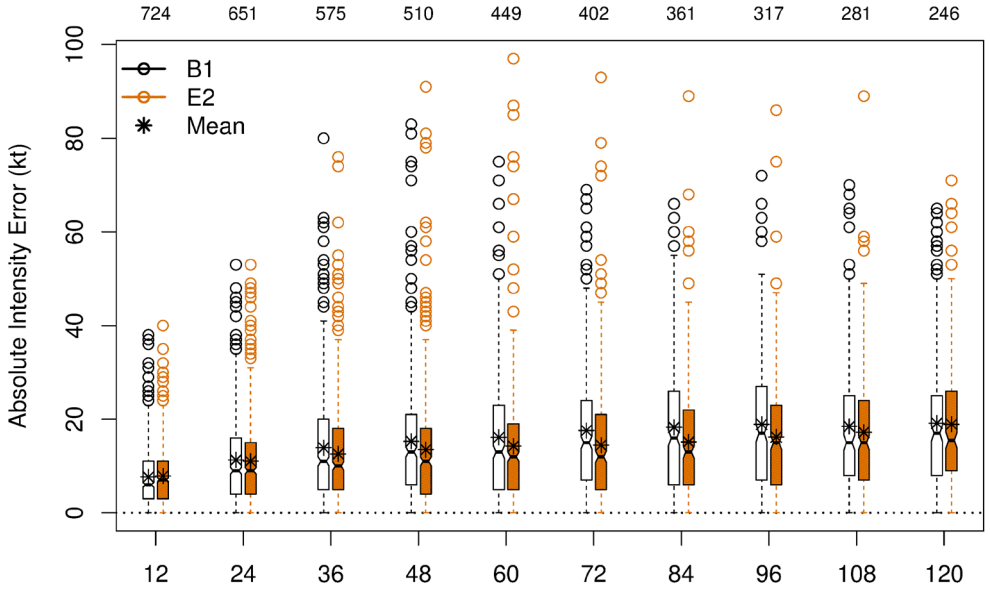




Image courtesy of Michael S. Fischer, Robert F. Rogers, Paul D. Reasor at NOAA/AOML/HRD

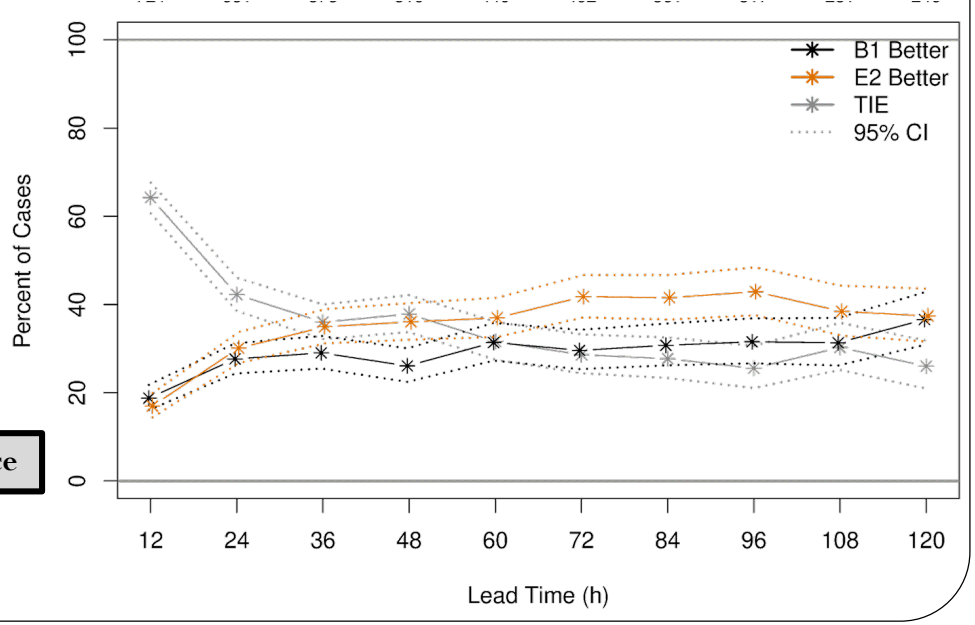
# Upcoming Capability

# TC Graphics



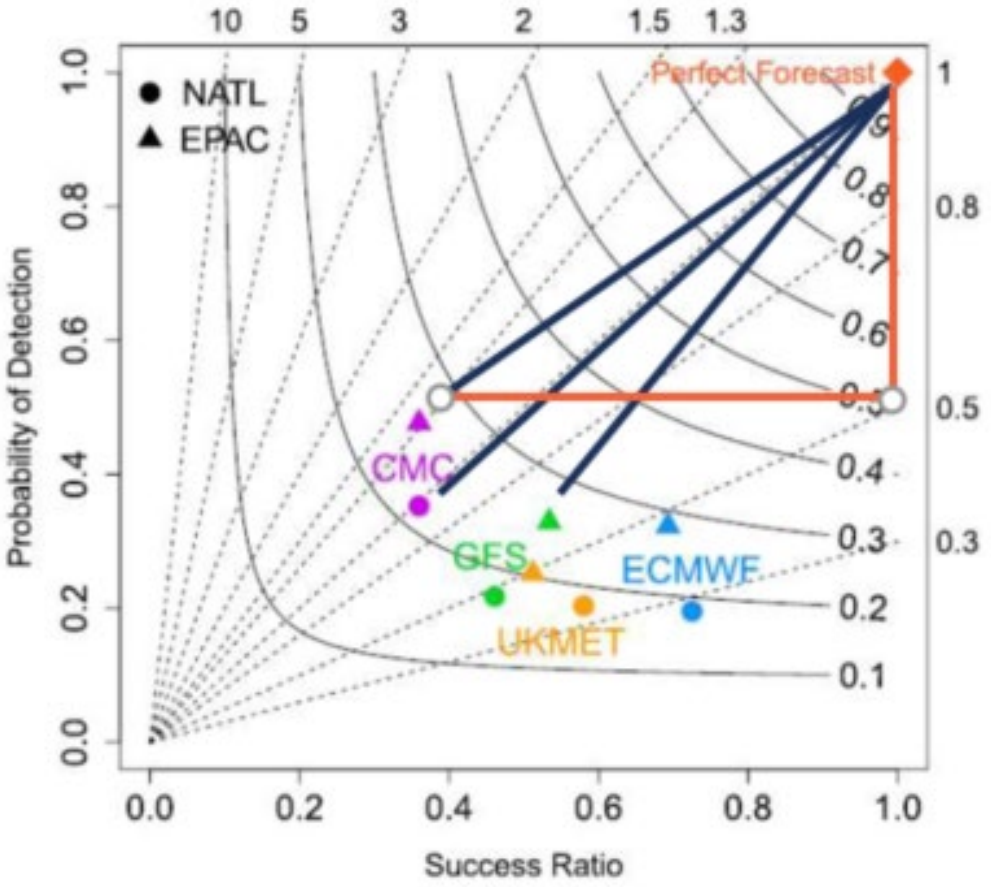

**Plot_TCMPR - R-statistics script Being transitioned to Python**

**Intensity Error Box Plots**




**Frequency of Superior Performance**

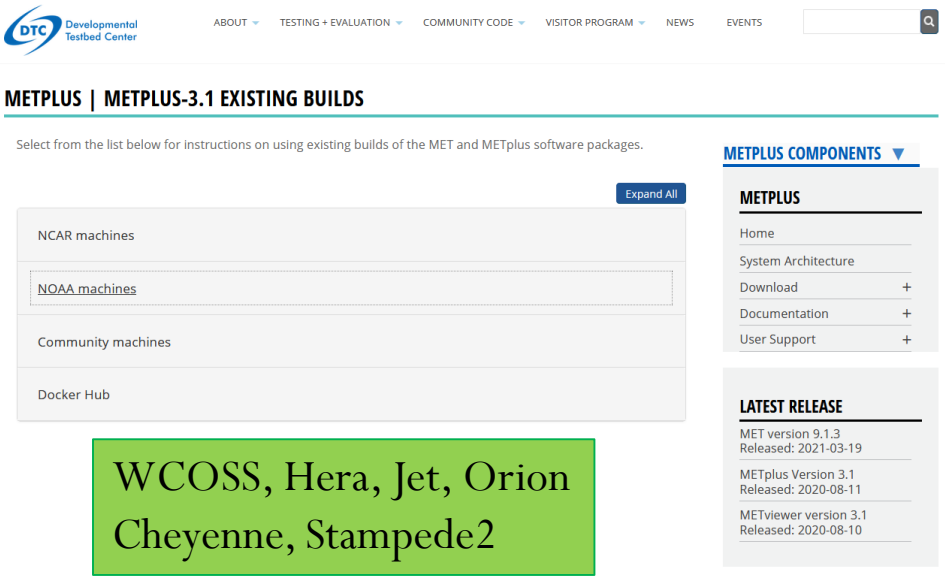
# Measure of goodness for Perf. Diagram




See AMS presentation in 2 weeks

# How to integrate this into HAFS workflow?

- METplus can use environment variables
- Has been integrated into other workflows:
  - Rocoto – GFS Workflow
  - Rocoto – DTC Testing
  - Rose – Met Office
  - EC Flow – it will need to be now that METplus 3.1 is on the operational side of WCOSS
- HPC Stack – working on this
- AWS Machine Image for use with Prototypes on AWS
  - Cristiana Stan – beta tester
  - Looking for others
- https://dtcenter.org/community-code/metplus/metplus-3-1-existing-builds

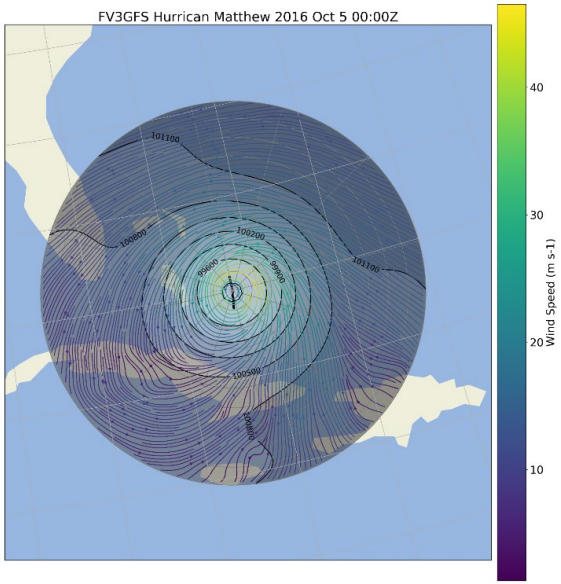


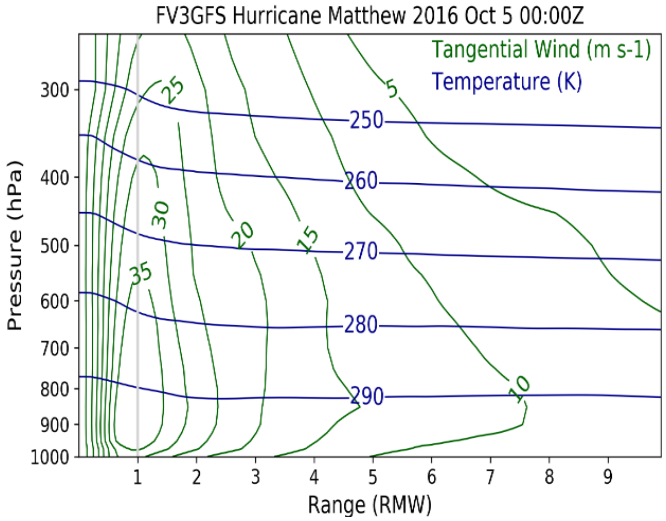

WCOSS, Hera, Jet, Orion
Cheyenne, Stampede2

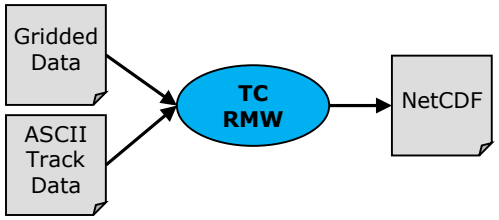
# Existing Capabilities

# TC-RMW

- *Collaboration with NCAR/DTC and NOAA/HRD*
- Tropical Cyclone Radius of Maximum Winds (**TC-RMW**) tool
  - Implements methodology of the Hurricane Research Division, **HRD DIA-Post** tool
  - Reads ATCF track data and corresponding gridded model fields
  - For each track point, select storm center and compute an azimuthal average over multiple heights and radii.
  - Writes NetCDF output file
  - Configurable options:
    - Model fields and vertical levels
    - Radius in km or as a function of RMW



# Evaluating TC Precipitation

There were questions about if METplus could help with evaluating precipitation on a moving nest.
Three capabilities that may be helpful:

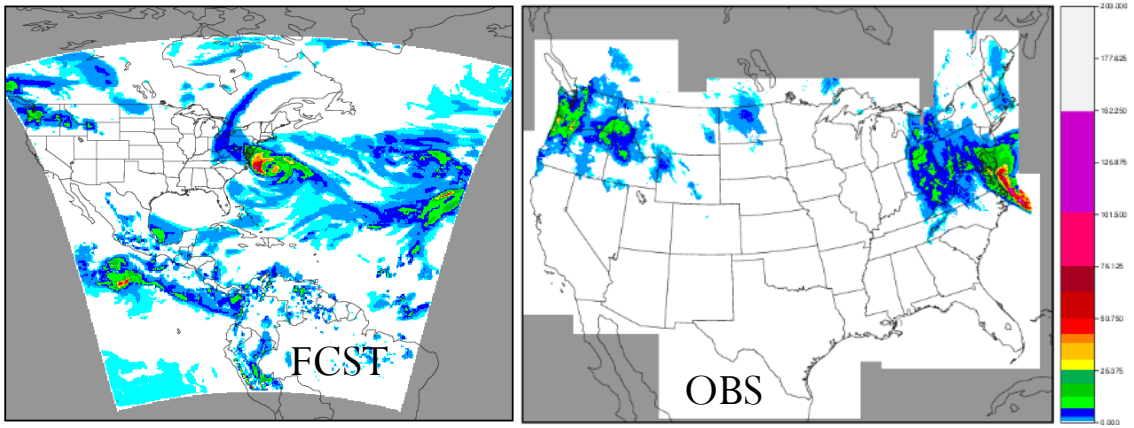
Automated Regridding in core MET tools
- Can regrid analysis to nest projection

Feature Relative use-cases
- Remove the displacement errors
- Compute additional diagnostic fields using Python Embedding

PCP-Combine
- Can be used to compute Sum, Different, Min, Max, Mean, Standard Deviation of two or more fields
- Python Embedding can also be used with this tool to potentially convert from Precipitation Rate to amount and then summed using this tool

# Regrid_Data_Plane & Automated Regridding

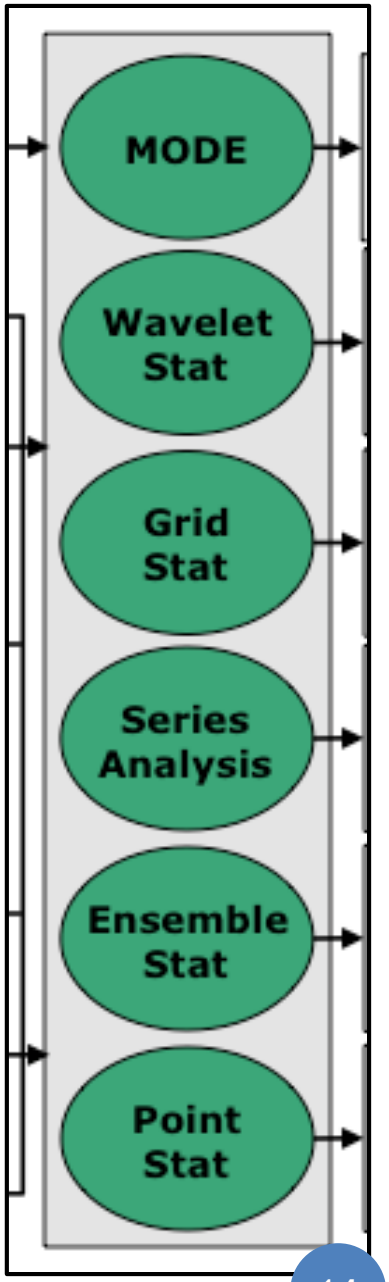
**Config File:** grid to verify on: FCST, OBS, or USER DEFINED




**Impact #1 – Decreased complexity & storage requirements**
Old method: Regrid outside MET
Regrid to FCST or OBS - requires at least 1 more file
Regrid to USER DEFINED - requires 2 more files

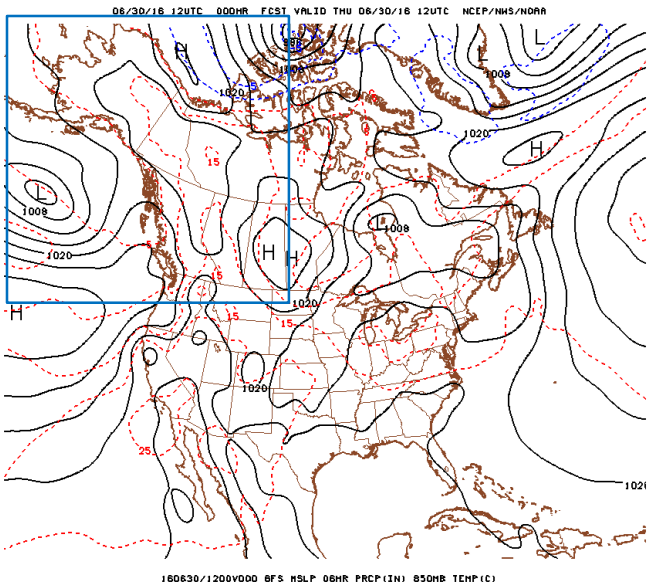
Automated regridding could save **0.5 to 7.5 GB per operational cycle** Equates to **60 GB – 1 TB per month** of storage

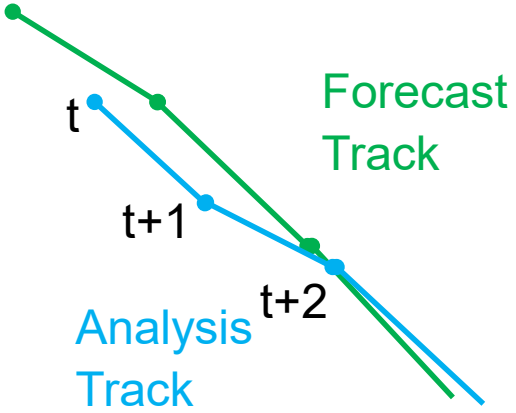
**Impact #2 – Less complexity for using climatologies**
Climatologies may not be on same grid as forecasts. See Impact #1



# Depiction of Cyclone Relative Evaluation

Area of Interest

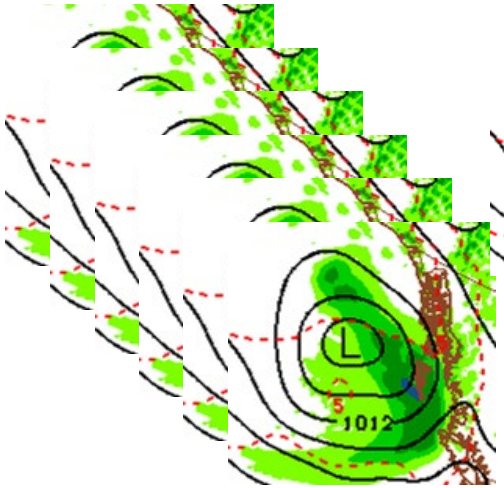


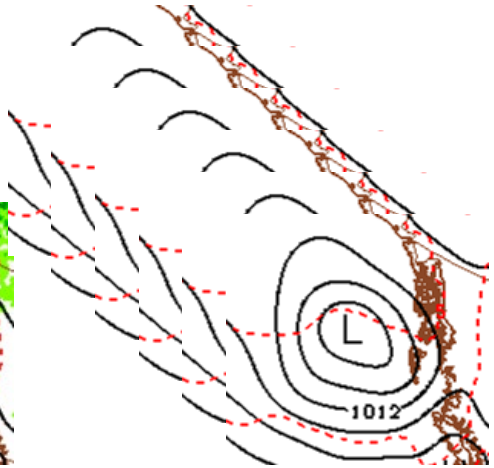

Methodology

- Run a tracker on forecast and analysis field
- Use METplus to extract a tile centered on each lat/lon pair of track
- Use MET Series-Analysis to compute statistics for paired fields within tile irrespective of displacement

Forecast



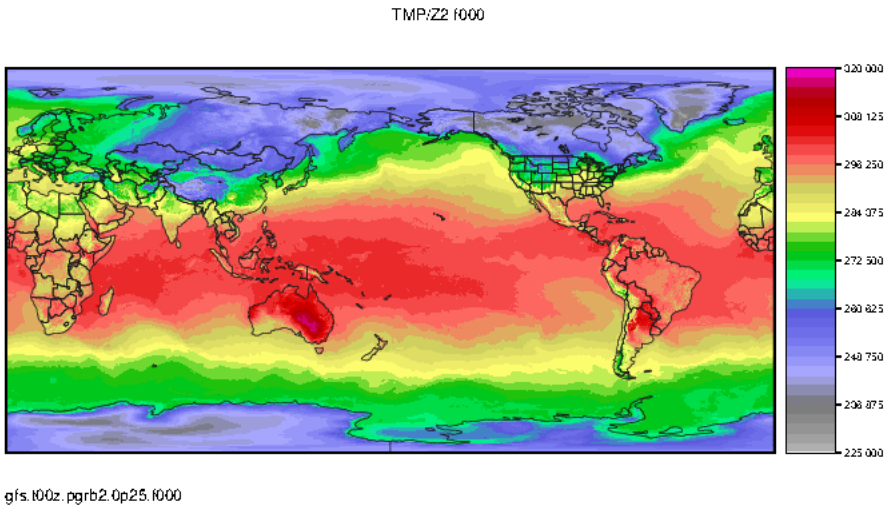

Analysis



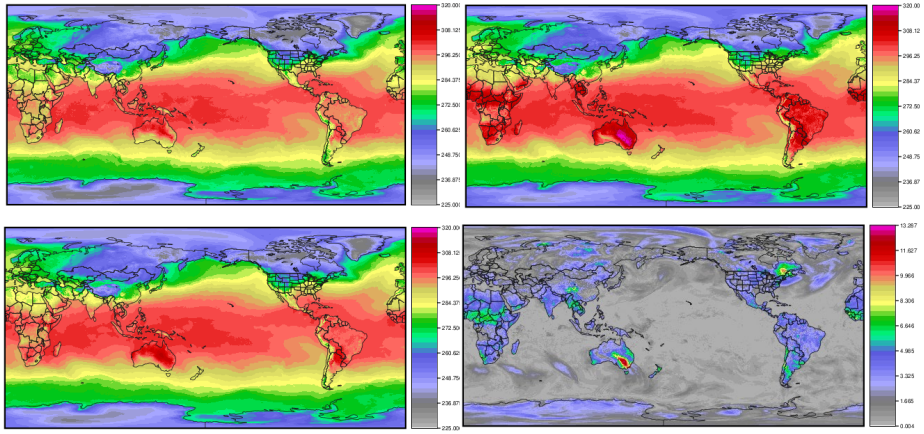
# PCP-Combine –derive option

- **PCP-Combine** originally designed to sum, add, or subtract precipitation accumulation intervals. Add option to **derive** (sum, min, max, range, mean, stdev, vld_count) statistics from a list of input fields.

```
pcp_combine -derive min,max,mean,stdev \
 gfs.t00z.pgrb2.0p25.f000 gfs.t00z.pgrb2.0p25.f006 \
 gfs.t00z.pgrb2.0p25.f012 gfs.t00z.pgrb2.0p25.f018 \
 gfs.t00z.pgrb2.0p25.f024 \
 -field 'name="TMP"; level="Z2";' derive_TMP_Z2.nc
```




**min** **max**



**mean** **stdev**

May be useful when verifying daily temperature extremes.