

# **Tropical Cyclone – Dropsonde Research and Operations Product Suite (TC-DROPS)**

## **Update on Dataset Development and Architecture**

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# TROPICAL CYCLONE - DROPSONDE RESEARCH AND OPERATIONS PRODUCT SUITE (TC-DROPS)

## WHAT IS IT?

**Level-2 product suite that accumulates dropsonde data from all (recent; i.e., 1996) TC flights to facilitate advanced real-time analysis and historical compositing**

## RESEARCH MODE:

- **Combine dropsondes from all aircraft into a single, searchable storm dataset file**
- **More easily facilitates dropsonde composite studies**
- **Differentiate observations by metrics, ex., intensity, intensity change, vertical wind shear, and storm/shear/motion-relative location**

## OPERATIONAL/NEAR-REAL TIME MODE:

- **Can be run after each flight**
- **Visualize dropsonde observations at a higher level than ASPEN**
- **Dropsonde pattern planning purposes (where did we miss? interesting features that we should sample again?)**



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## **ARCHITECTURE: Research Mode**

### ***Data Directory:***

Drops are organized by year and storm, differentiated into folders by flight id  
...specify non-NOAA and USAF-recon aircraft and programs....

20160829I1, 20100914N1  
20100901\_grip\_dc8  
20080924\_tcs08\_c130  
20160901\_shout\_gh

### ***TC-DROPS Directory:***

Ex. /TC-DROPS/research/2016/al\_matthew2016/...

/...al\_matthew2016\_height\_dropsonde\_dataset.nc  
/...al\_matthew2016\_pressure\_dropsonde\_dataset.nc  
/...al\_matthew2016\_track.nc  
/...al\_matthew2016\_ships.nc  
/Figures  
/satellite  
/aircraft

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## ARCHITECTURE: Research Mode

### ***Contents:***

- [1996-2016] NOAA (P-3 and G-IV)
- [1997-2016] AFRC (*recon*)
- [2015-2016] SHOUT (Global Hawk)
- [2015] TCI (WB-57)
- [2012-2014] HS3 (Global Hawk)
- [2010] GRIP (DC-8)
- [2010] *PREDICT* (*G-V*)
- [2010] ITOP (C-130, Dotstar Astra)
- [2008] TCS-08 (NRL P-3, C-130, Dotstar Astra, DLR Falcon)
- [2006] NAMMA (DC-8)
- [2005] *RAINEX* (*NRL P-3*)
- [2001] CAMEX-4 (DC-8, ER-2)
- [1998] CAMEX-3 (DC-8)

**Note: while pre-genesis drops can be added, analysis is tied to availability of best track**



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## ***What does it offer?***

- Dropsonde data are located with respect to the interpolated TC center (currently best track...coming soon, 2-min track)
- Hour of drop before/after genesis
- Interpolated to the same pressure and height levels
- SHIPS vertical wind shear
- Shear and motion relative azimuths
- Corresponding best track intensity (vmax, mslp)
- Additional kinematic and thermodynamic variables (storm relative u & v,  $\theta$ ,  $\theta_E$ ,  $\theta_V$ ,  $Z_{PBL}$ )
- SST
- 6-, 12-, 18-, 24-h intensity change

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## **ARCHITECTURE: Operational / Near real-time Mode**

- Same dataset architecture as the research mode  
...required inputs:
  - aircraft flight-level
  - NASA IMERG rain rate (early, 4-hr latency)  
(30-min, 0.10°, IR-PMW merged)
- Produces similar accumulated dropsonde netcdf files, as well as a suite of figures  
ex., shear/motion-relative quadrant composite vertical profiles and skew-t's for each flight/storm, storm/shear/motion-relative plan view of RH, theta-e, theta at multiple levels,  $Z_{PBL}$ , precipitation distributions
- Update the dataset files, and storm composite profiles after every flight