NASA Hurricane Field Programs

- TCSP (2005)
- NAMMA (2006)
- GRIP (PREDICT/IFEX) (2010)
- HS3 (2012-2014)

Zipser Hurricane Research Group

- Ed Zipser (Professor)
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Synthesize in-situ (primarily dropsondes), flight-level, and satellite observations to identify the kinematic, thermodynamic, and convective evolutions during genesis and rapid intensification.

P1: Datasets for well-sampled genesis and nondeveloping cases since 2005:

- **Dropsonde Dataset** :
  667 pregenesis, 245 nondev, 1537 postgenesis
- **Satellite Dataset: IR, PMW** (TMI, AMSR-E, SSMI and SSMIS), **3B42**

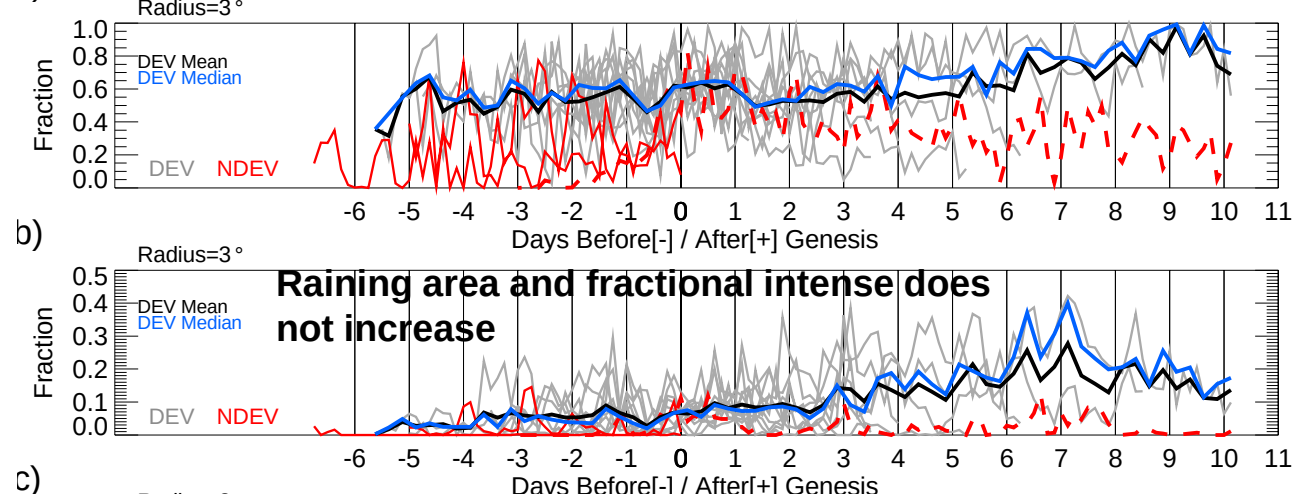
P2: Analysis of rapid intensification of Hurricane Earl and Karl (2010)

- For Earl: **WWLLN**, PMW overpasses, **NOAA P3 TDR**, model analysis
- For Karl: **HAMSR** and hopefully **HIRAD** and **HIWRAP**

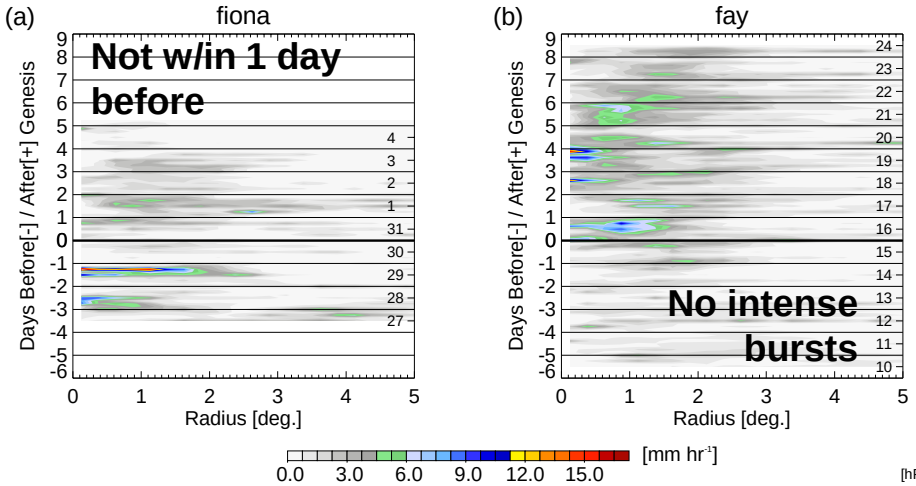
P3: Satellite Datasets for Developing ATL, EPAC, CPAC, WPAC, IO Disturbances 1998-2012, Nondeveloping 2004-2012 (EPAC, ATL, CPAC)

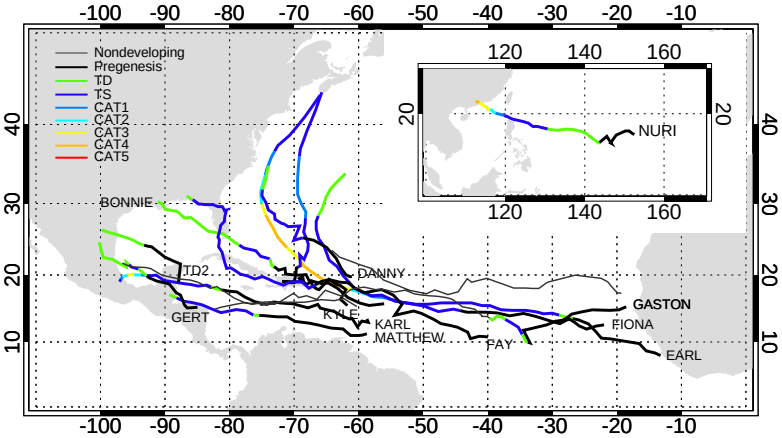
- 35027 **PMW** overpasses, 78% full data coverage within 1 deg., 48% within 3 deg.
- 6117 nondeveloping, 6457 pregenesis, 22453 postgenesis

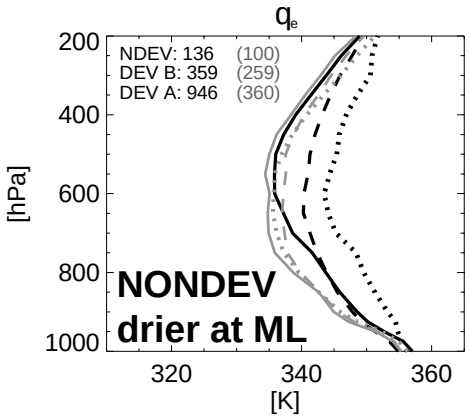
P1 Results

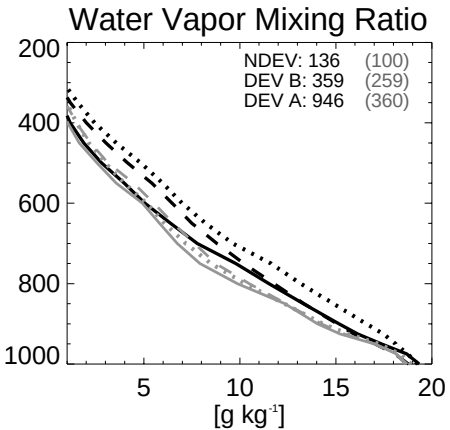

Radius=3°
Fraction
DEV Mean
DEV Median
DEV
NDEV
Days Before[-] / After[+] Genesis
b)
Radius=3°
Raining area and fractional intense does not increase
c)

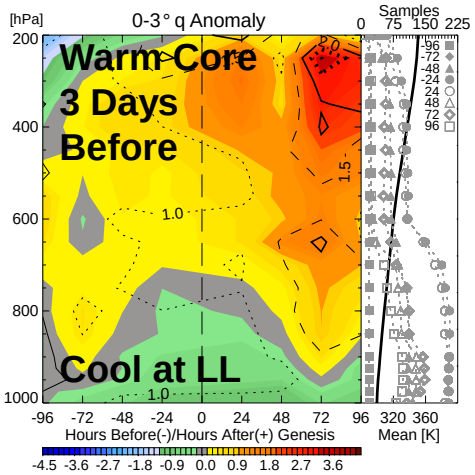
GRIP
Genesis and Rapid Intensification Processes
August - September 2010
NASA Hurricane Science Research Team

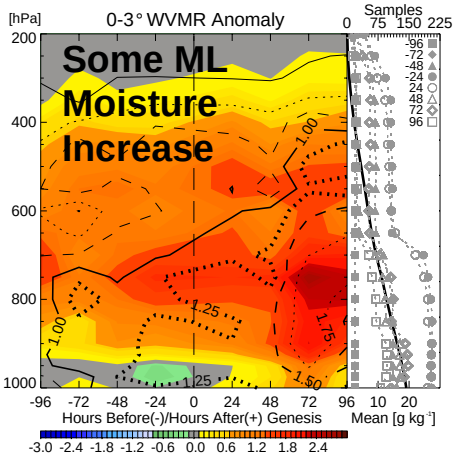

(a)
fiona
Not w/in 1 day before
(b)
fay
No intense bursts
Days Before[-] / After[+] Genesis
Radius [deg.]
[mm hr⁻¹]


Nondeveloping
Pregenesis
TD
TS
CAT1
CAT2
CAT3
CAT4
CAT5
BONNIE
TD2
GERT
DANNY
KATE
KARL
MATTHEW
FAY
GASTON
FIONA
EARL
NURI


qe
NDEV: 136 (100)
DEV B: 359 (259)
DEV A: 946 (360)
NONDEV drier at ML
[hPa]
[K]

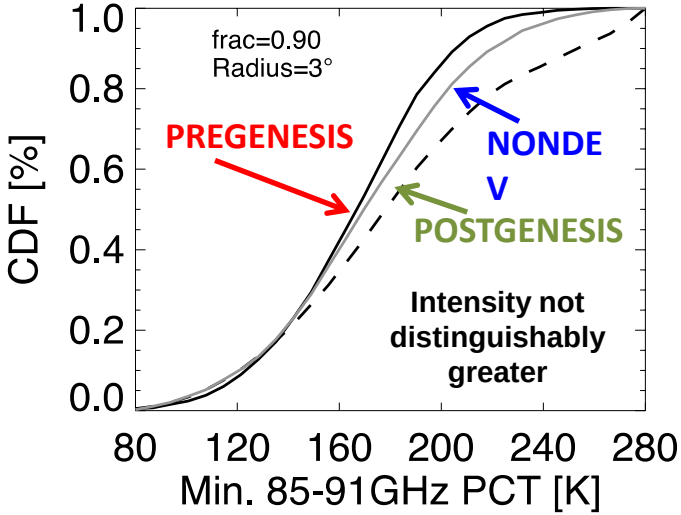

Water Vapor Mixing Ratio
NDEV: 136 (100)
DEV B: 359 (259)
DEV A: 946 (360)
[g kg⁻¹]


0-3° q Anomaly
Samples
Warm Core 3 Days Before
Cool at LL
Hours Before(-)/Hours After(+) Genesis
Mean [K]

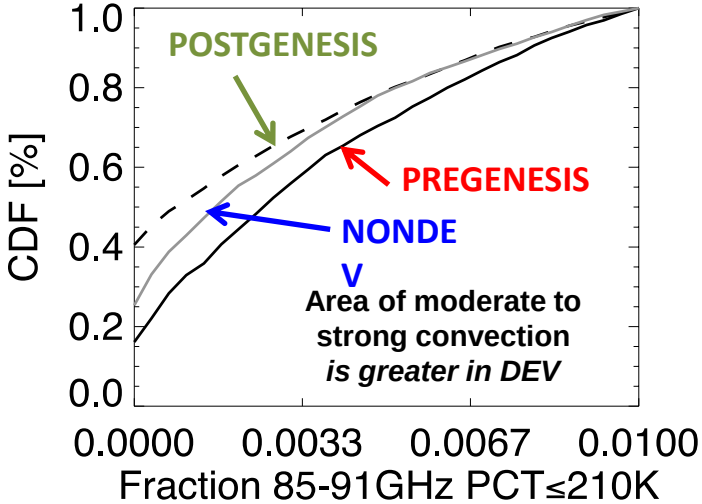

0-3° WVMR Anomaly
Samples
Some ML Moisture Increase
Hours Before(-)/Hours After(+) Genesis
Mean [g kg⁻¹]

Genesis Convective Properties

CONVECTIVE INTENSITY



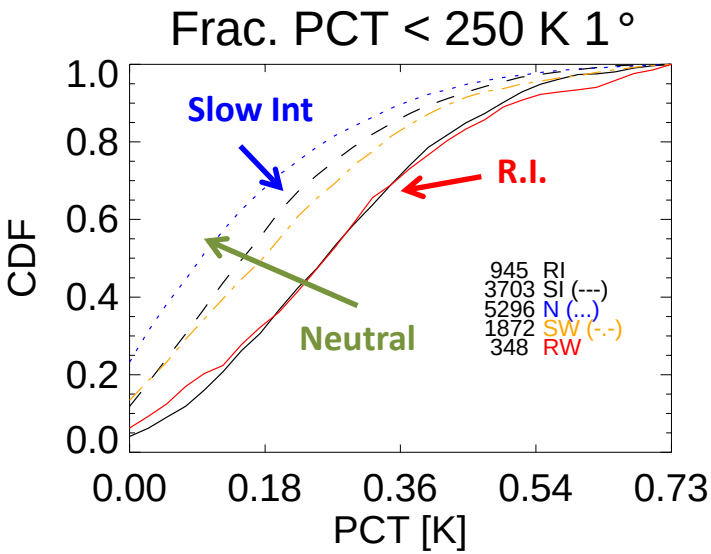
AREA OF STRONG CONVECTION



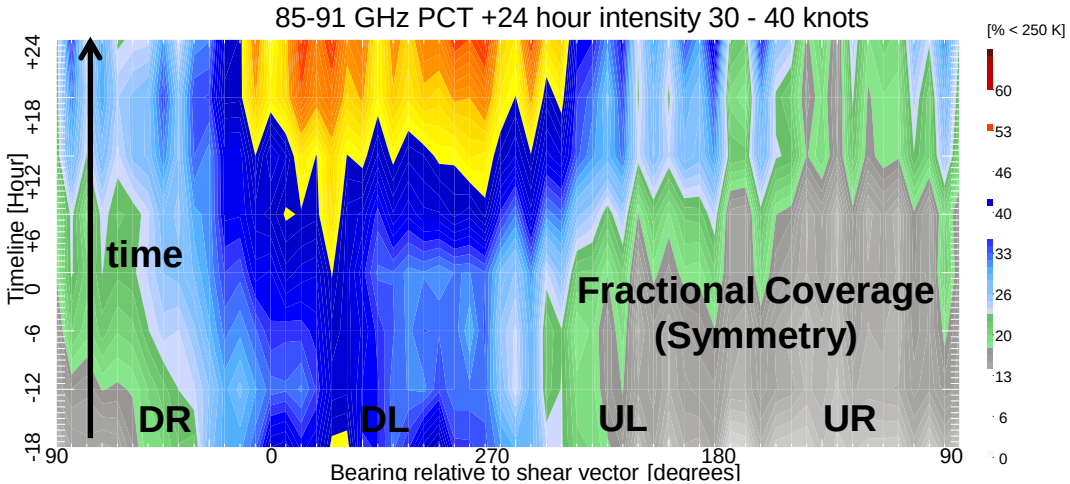
P3 Ongoing Work: 1998-2012 PMW TC Database

TC Intensification Convective Properties

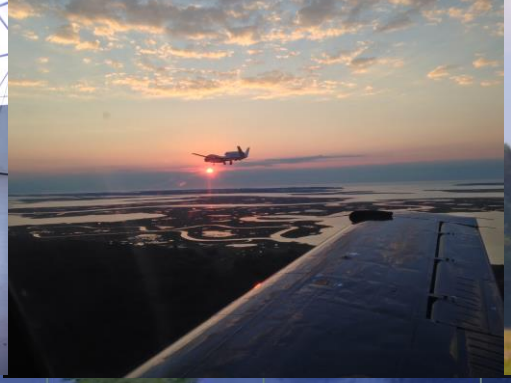
AREA OF STRONG CONVECTION



Area of convection *is more important to intensification*



Increase in symmetry is most important to R.I., but which leads which?



2014 AV-6 Flights

Dropsonde, CPL, S-HIS

HIWRAP & HIRAD,
Drops on WB-57

Cristobal E.T.

TS Cristobal

TS Dolly

Edouard

Invest 90/SAL

MDR Transect

North Atlantic Ocean

Gulf of Mexico

Cuba

Dominican Rep

Puerto Rico

Guatemala

Honduras

Nicaragua

Costa Rica

Panama

Caribbean Sea

Venezuela

The Gambia

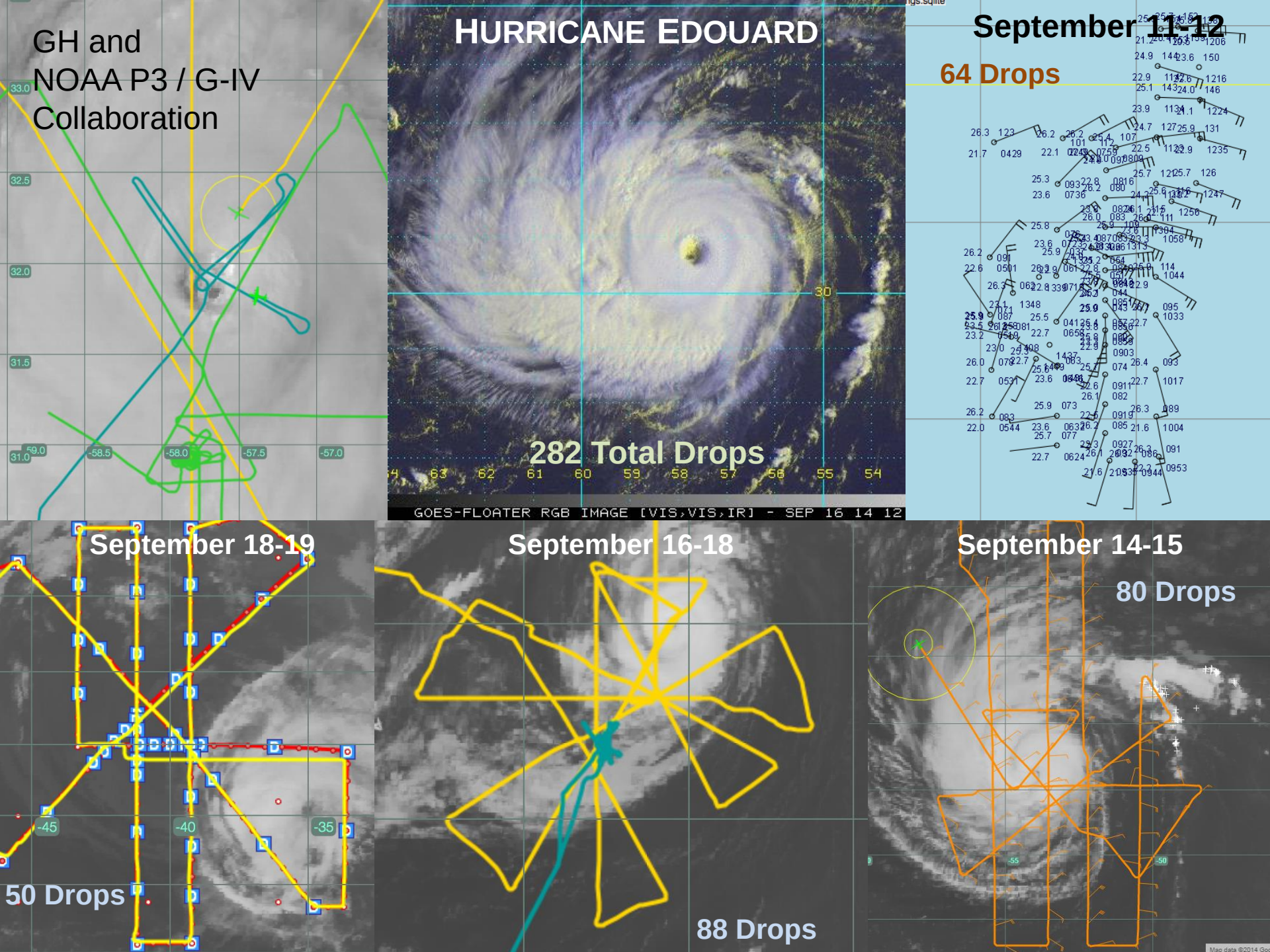
Guinea-Bissau

40

30

20

10


GH and
NOAA P3 / G-IV
Collaboration
HURRICANE EDOUARD
282 Total Drops
GOES-FLOATER RGB IMAGE [VIS,VIS,IR] - SEP 16 14 12
September 11-12
64 Drops
September 18-19
50 Drops
September 16-18
88 Drops
September 14-15
80 Drops

NASA G-V Field Programs

- MC3E (2011)
- IPHEX (2014)

Zipser GV Research Group

- Ed Zipser (Professor)
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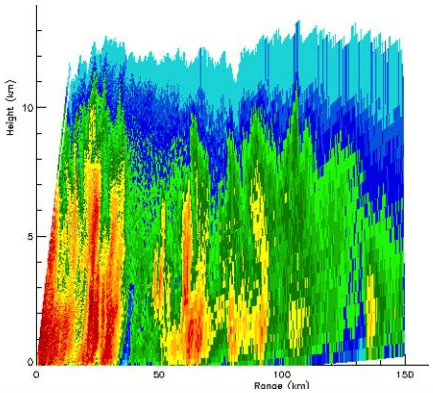
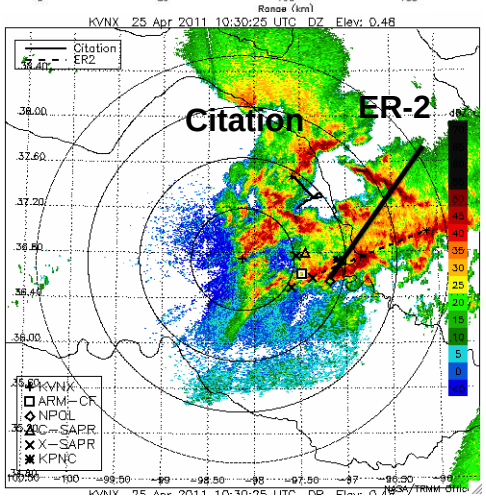
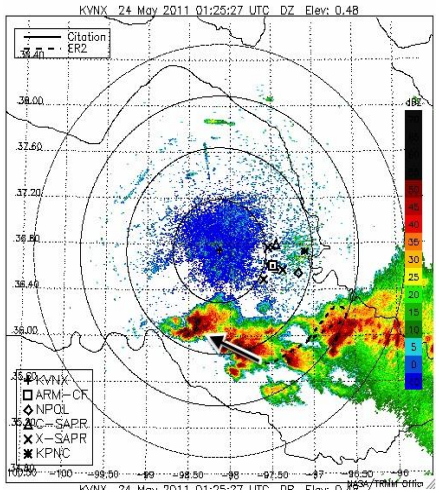
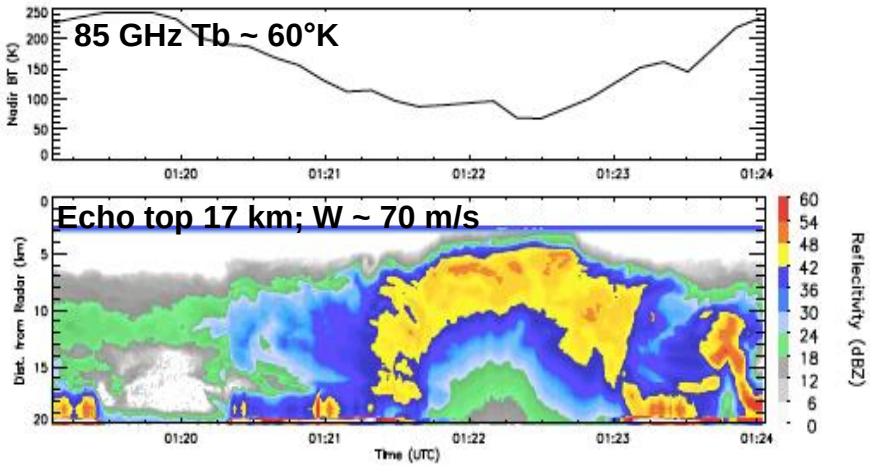
- Nick Bassil (Postdoc)
- Sarah Bang (PhD)
- McKenna Stanford (Masters)
- Ali Gingrey (Masters)

Moderate-strong convection very close to all CF radars for 3 hours on April 25. N-POL section here; at same time the ER-2 does long pass over line of convective cells



P1: Evaluation of model microphysical parameterizations and model representation of convection at multiple scales using collection of ground-, aircraft-, and satellite-based data

P2: Sensitivity of microwave brightness temperatures to microphysical representation; model comparison with observed T_B

May 23 example of ER-2 overpass of powerful storm (arrow)