

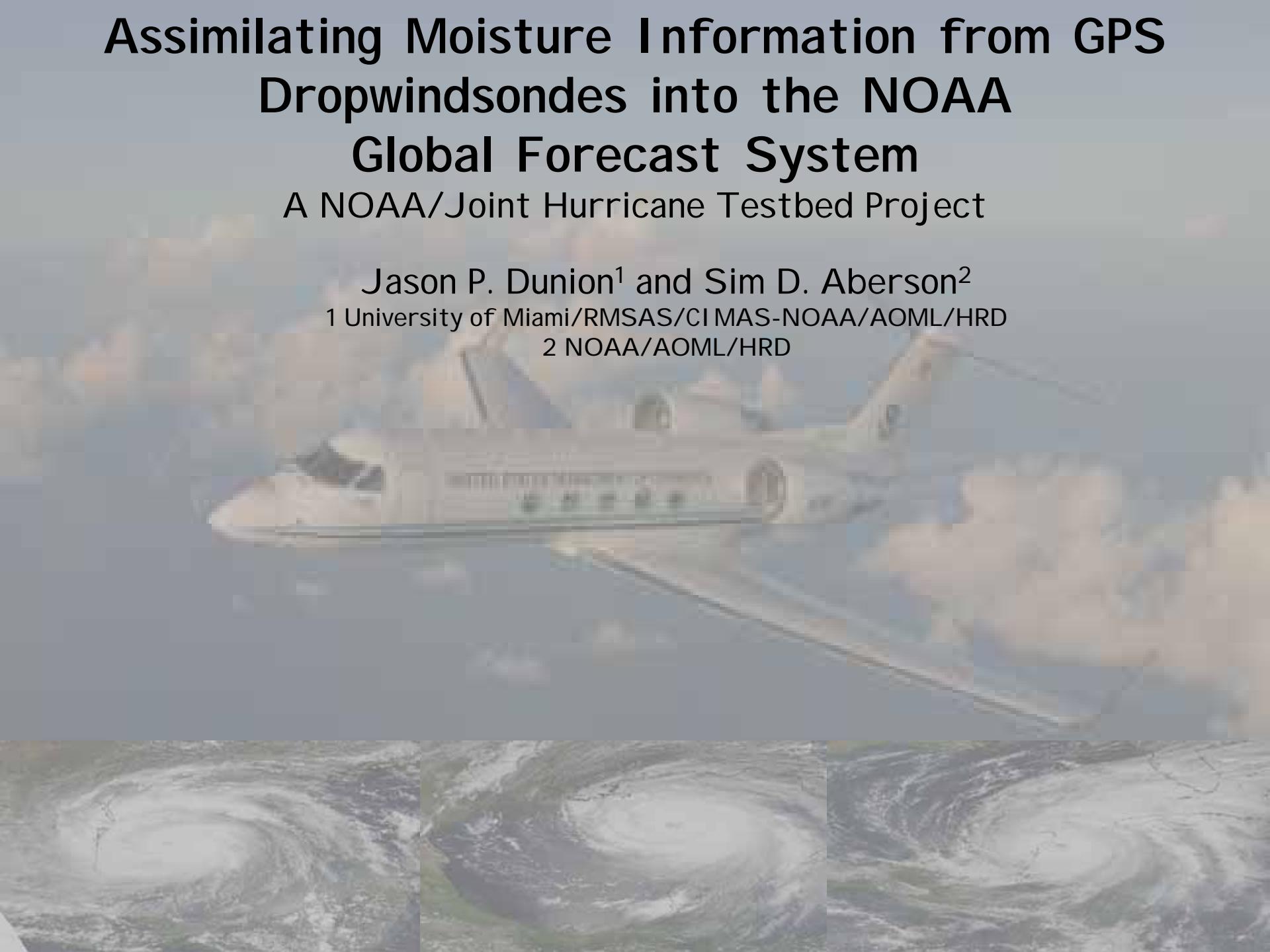
# Assimilating Moisture Information from GPS Dropwindsondes into the NOAA Global Forecast System

A NOAA/Joint Hurricane Testbed Project

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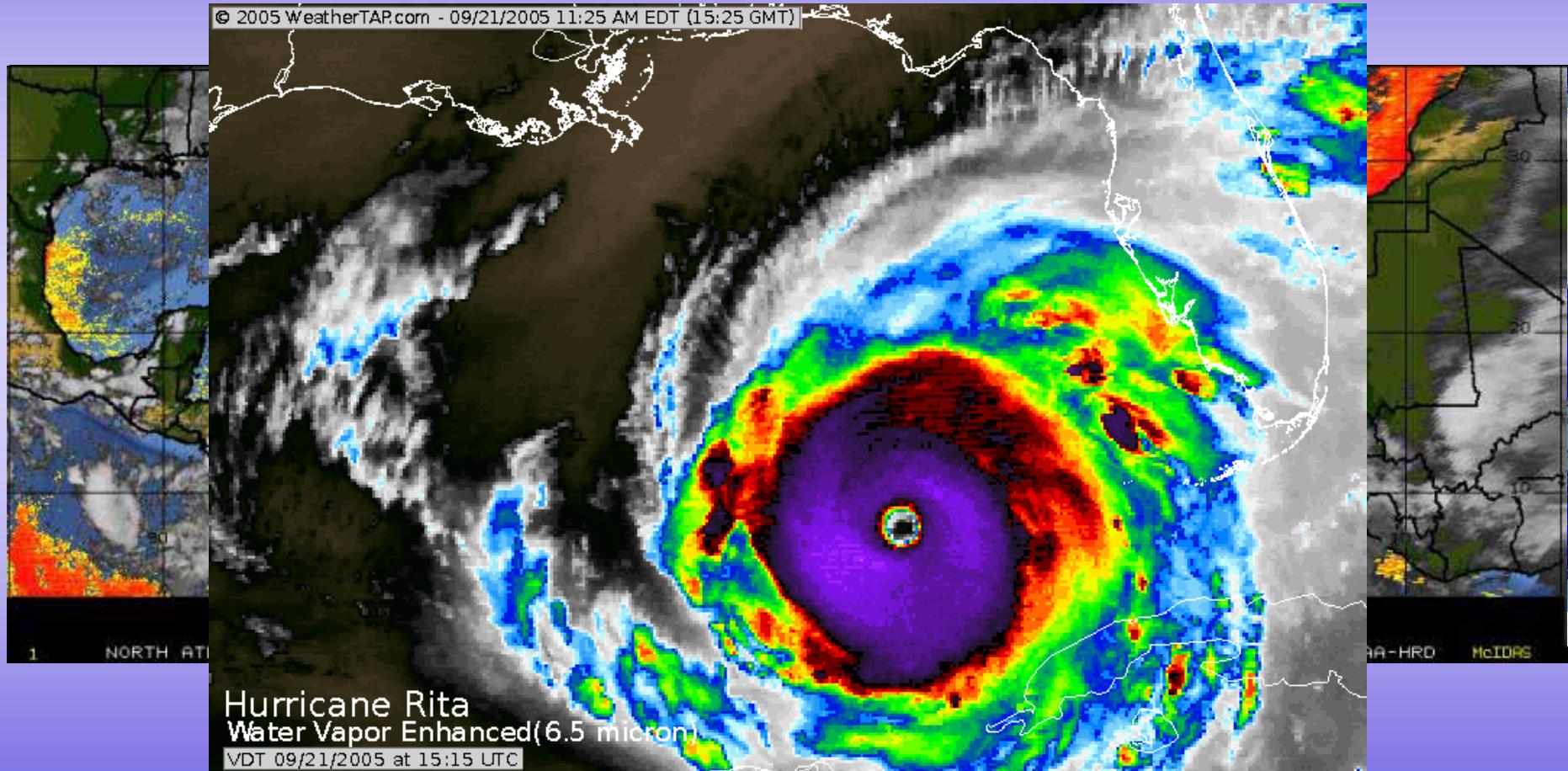
1 University of Miami/RMSAS/CIMAS-NOAA/AOML/HRD

2 NOAA/AOML/HRD



# Motivation

Assessing atmospheric moisture and predicting its affect on TC intensity...no easy task.



The NOAA GFS model does not currently assimilate humidity information from GPS dropsondes

# Project Objectives

## Year 1:

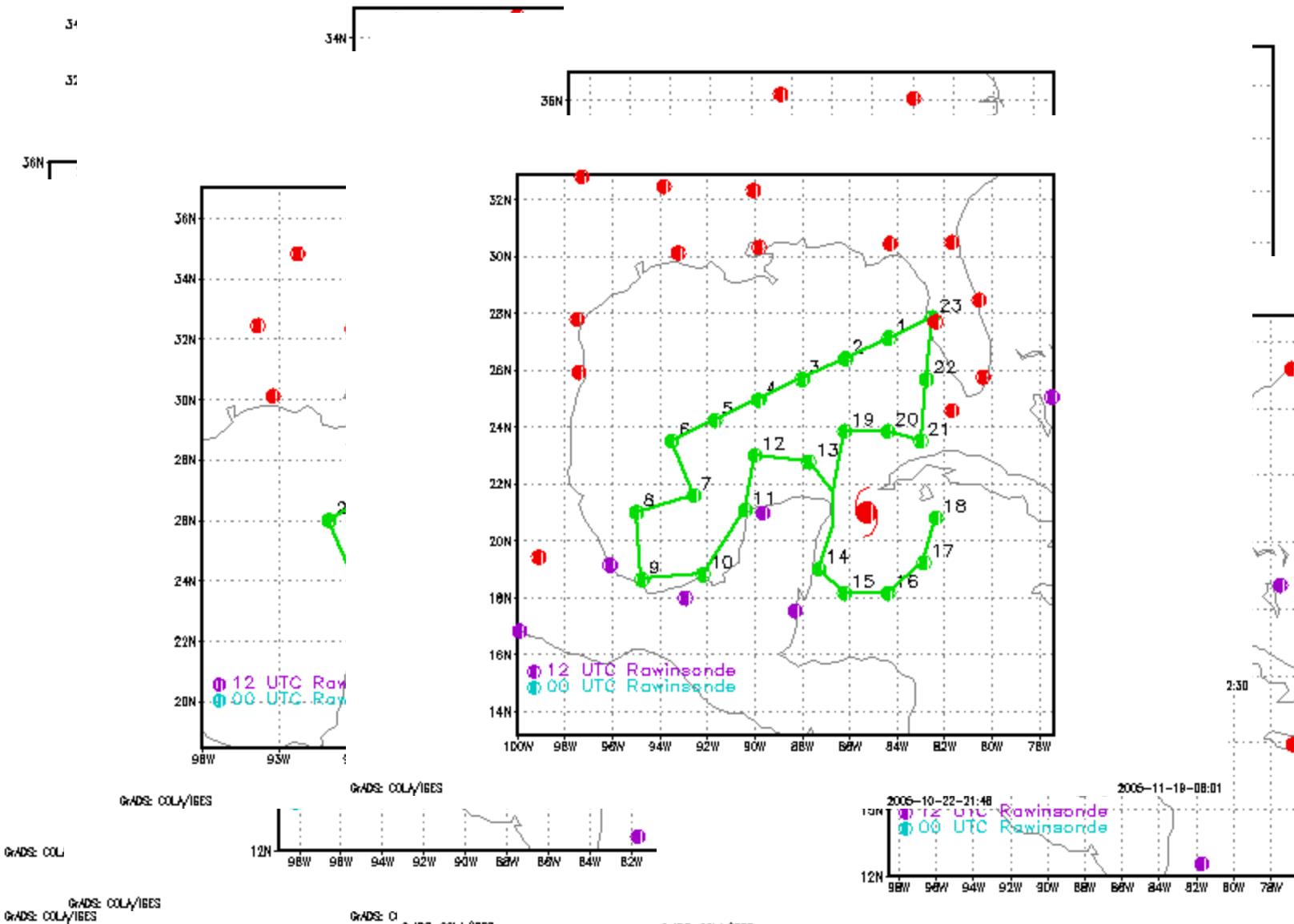
- Perform parallel runs of the GFS model that assimilate dropsonde moisture information from NOAA G-I V missions
- Begin assessing the impact of this data on GFS forecasts of TC track and intensity

## Year 2:

- Perform detailed assessments of the impact of GPS dropsonde humidity data on GFS TC forecasts of track & intensity
- Assess how effectively the GFS is able to represent dry layers such as the Saharan Air Layer
- Assess the feasibility of performing targeted observations of humidity to improve GFS forecasts

# 2005 Atlantic Hurricane Season

G-IV Missions: 10 TCs, 50 missions\*\*



\*\*Note to self...pick an El Nino year next time\*\*

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# Project Methodology

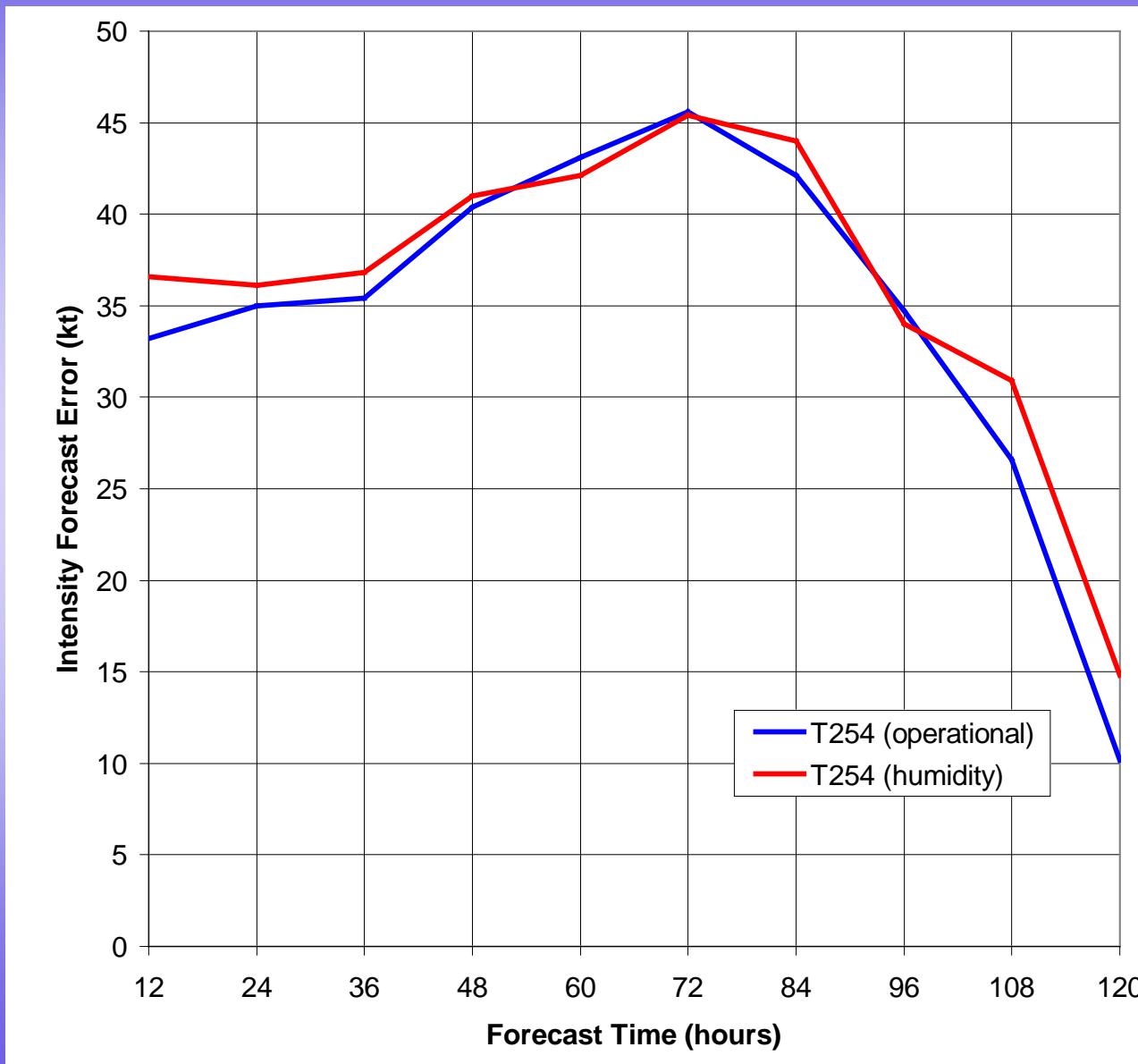
- In order to be assimilated into the GFS, GPS dropsondes must be transmitted in real - time from the aircraft
- Run GFS parallel runs at lower resolution (T254) for Year 1 assessments
- Compare T254 parallel runs with T254 operational runs for “apples to apples” comparisons

# Project Challenges

- “Old dog new trick” syndrome: teaching a satellite guy how to run a global model
- Setting up the code at NCEP to run the parallel GPS dropsonde humidity runs (never been done)
- GFS parallel run forecast failures
  - recently corrected bug in the radiation code: dry profiles...>...can generate bad profile temperatures...>...model bombs
  - some runs still failing (e.g. Cindy and Dennis)

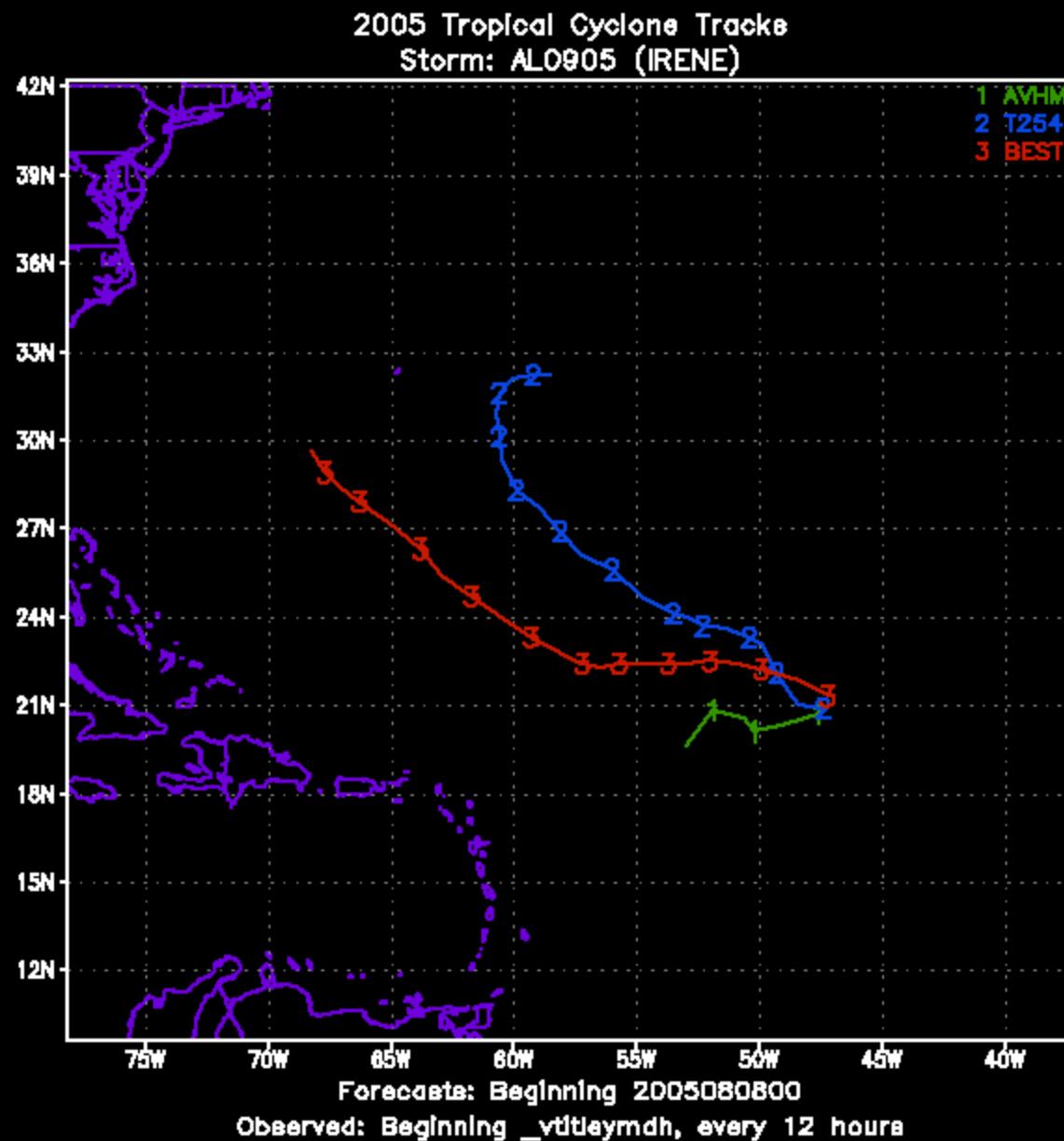
# Current Storm Catalogue

Arlene; Emily; Irene; Katrina (12 NOAA G-I V missions)

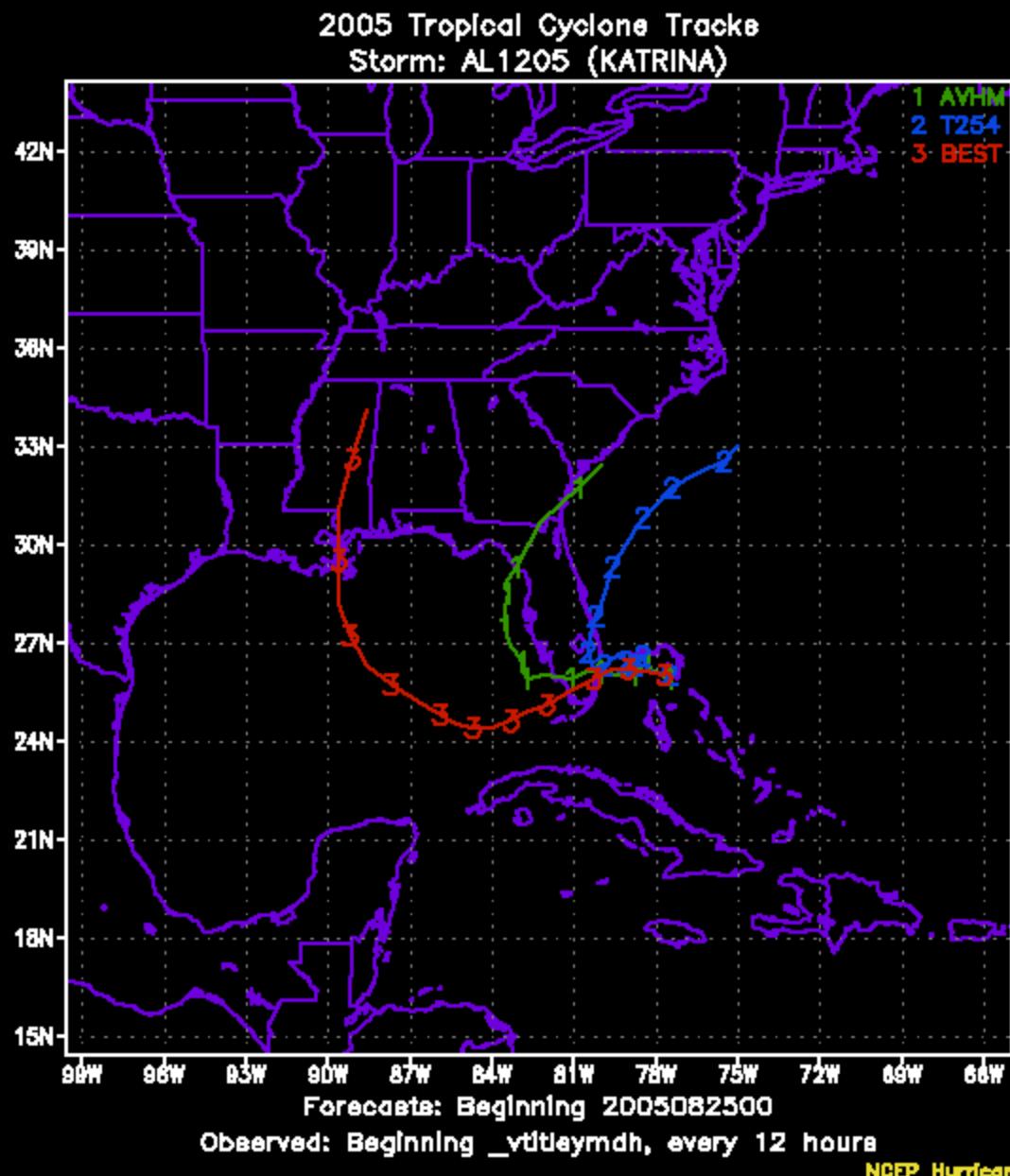


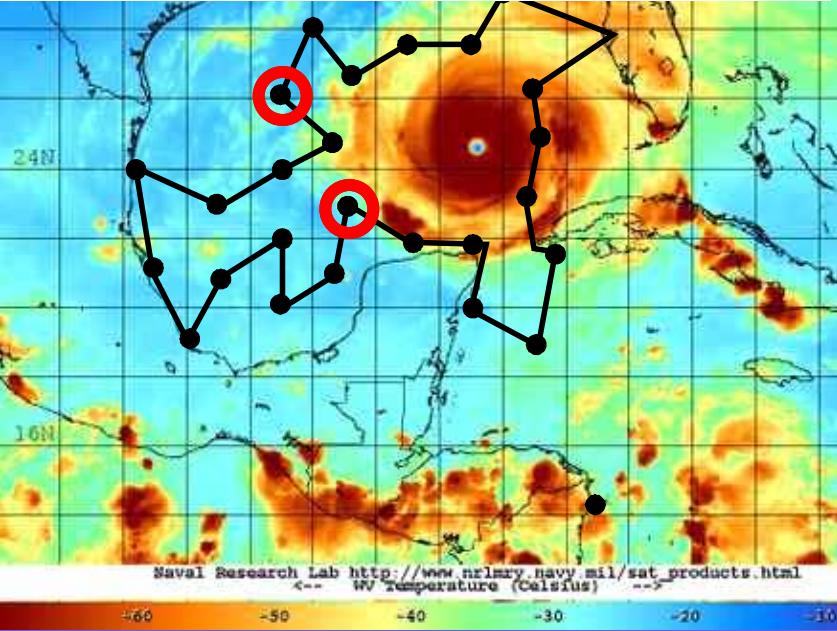
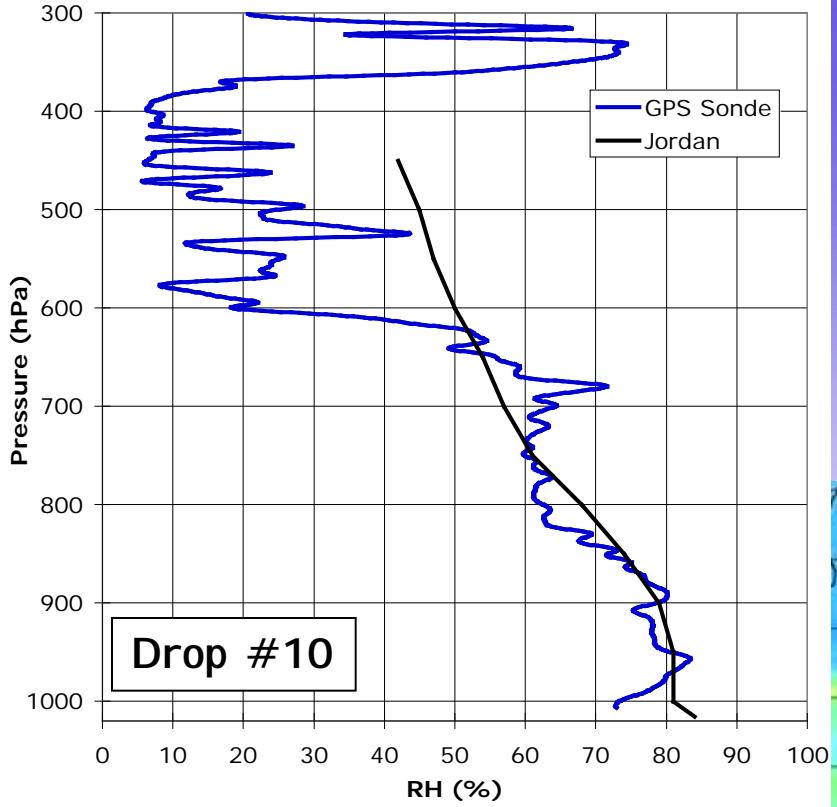
# of cases 26 25 24 21 19 16 14 11 8 4

# Irene (08-09 September 2005)



# Katrina (25-27 August 2005)

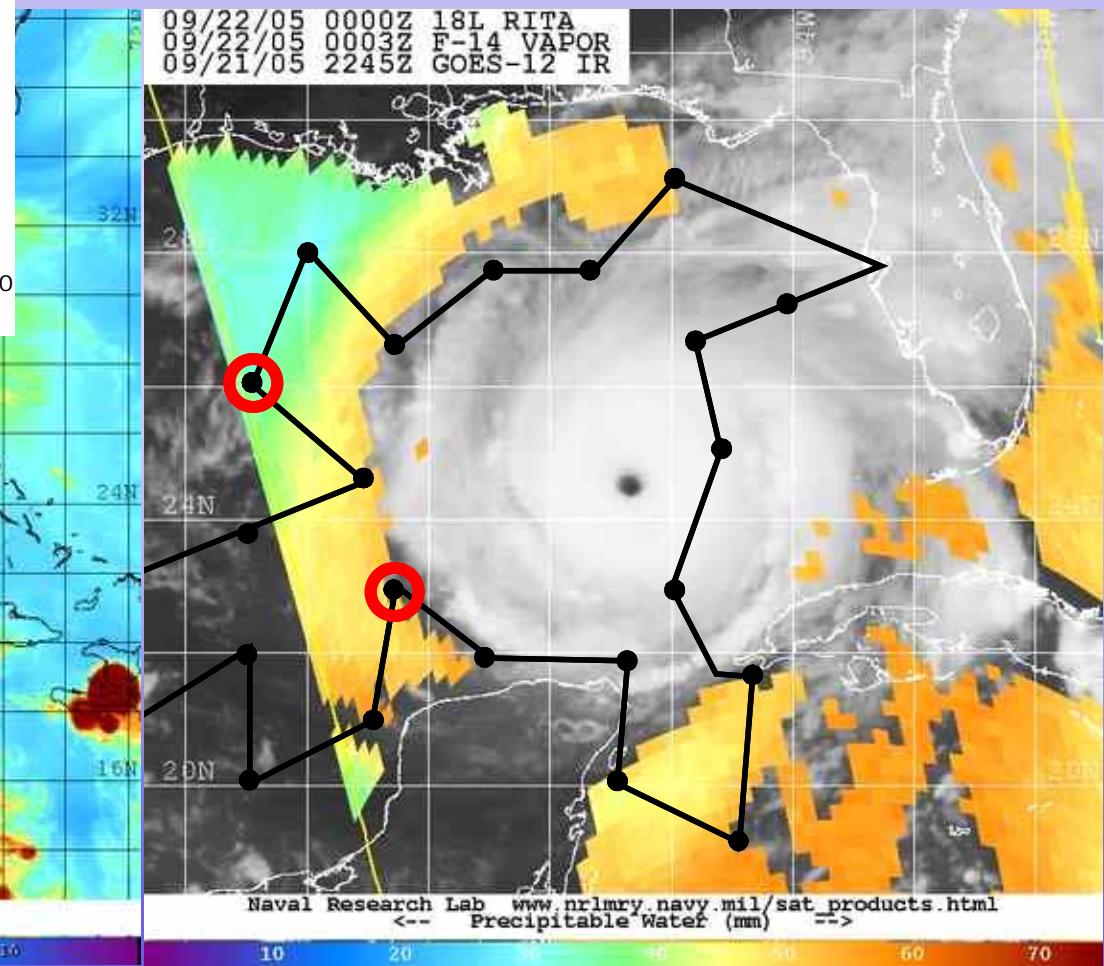




# Hurricane Rita

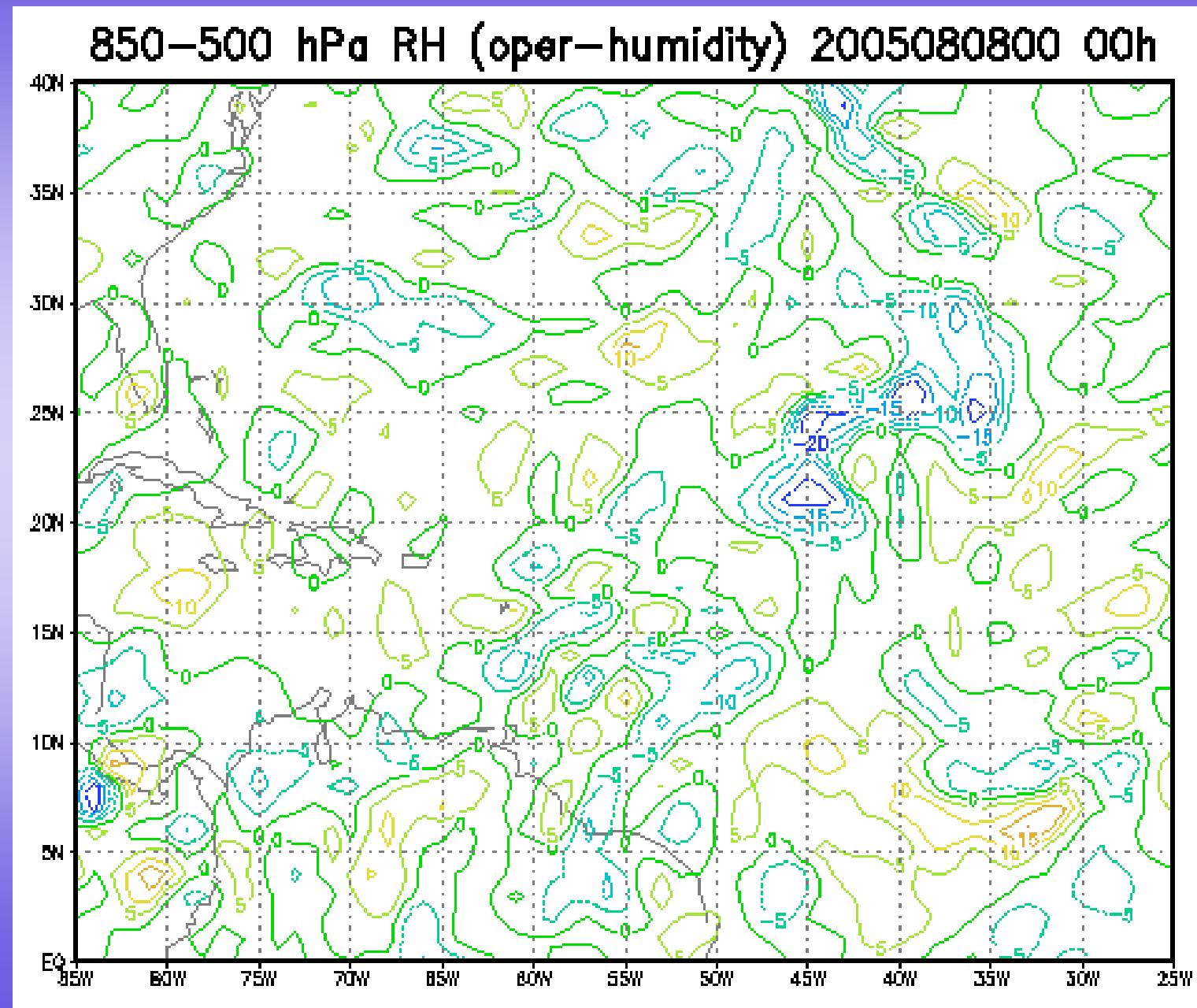
## 22 Sept 2005 00 UTC

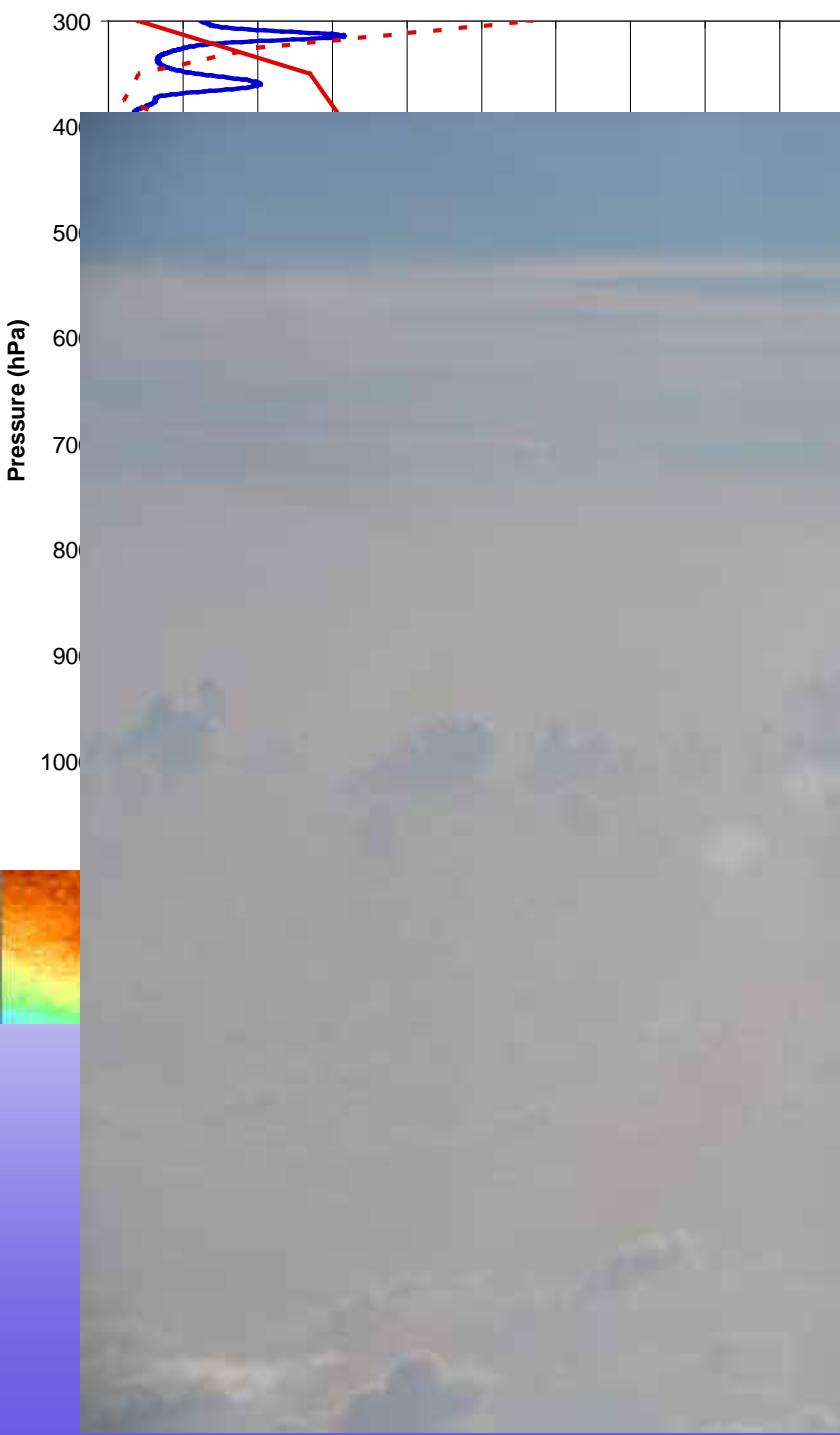
### G-IV Mission 050921n



# Impact of GPS Sonde Moisture on the GFS

## TS Irene 08 Aug 2005 0000 UTC





Experiment (SALEX)



# Summary of Findings

- Humidity information from G-IV GPS dropsondes can significantly affect the T254 GFS (EMC was smart no to just throw the switch)
- Early results: the GPS dropsonde humidity data doesn't have a strong negative OR positive impact on GFS forecasts of track/intensity
  - For some individual cases (e.g. Irene and Katrina), the GPS dropsonde humidity information had a significant impact on the GFS track forecast
  - The GFS analysis of humidity appears to be significantly affected by the GPS dropsonde humidity. This difference appears to grow with successive forecast times.

# Future Work

- Continue running the remaining 2005 cases
- Test the impact of the GFS operational vs GPS dropsonde humidity fields on SHIPS (GFDL?) intensity forecasts
- Assess whether targeted observing strategies can optimize GPS dropsonde humidity impacts on the GFS