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

A NOAA/Joint Hurricane Testbed Project

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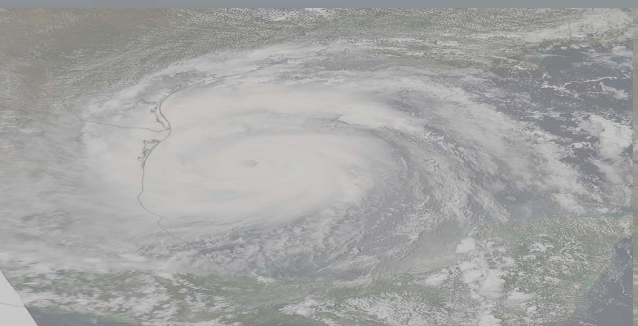
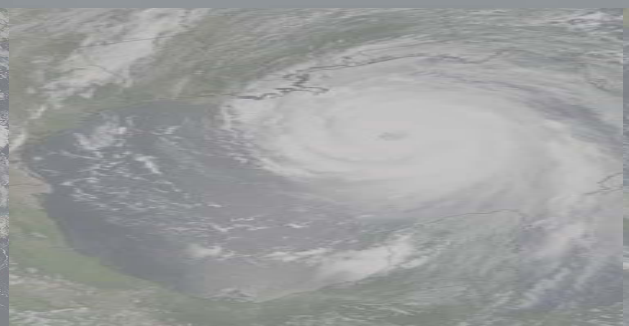
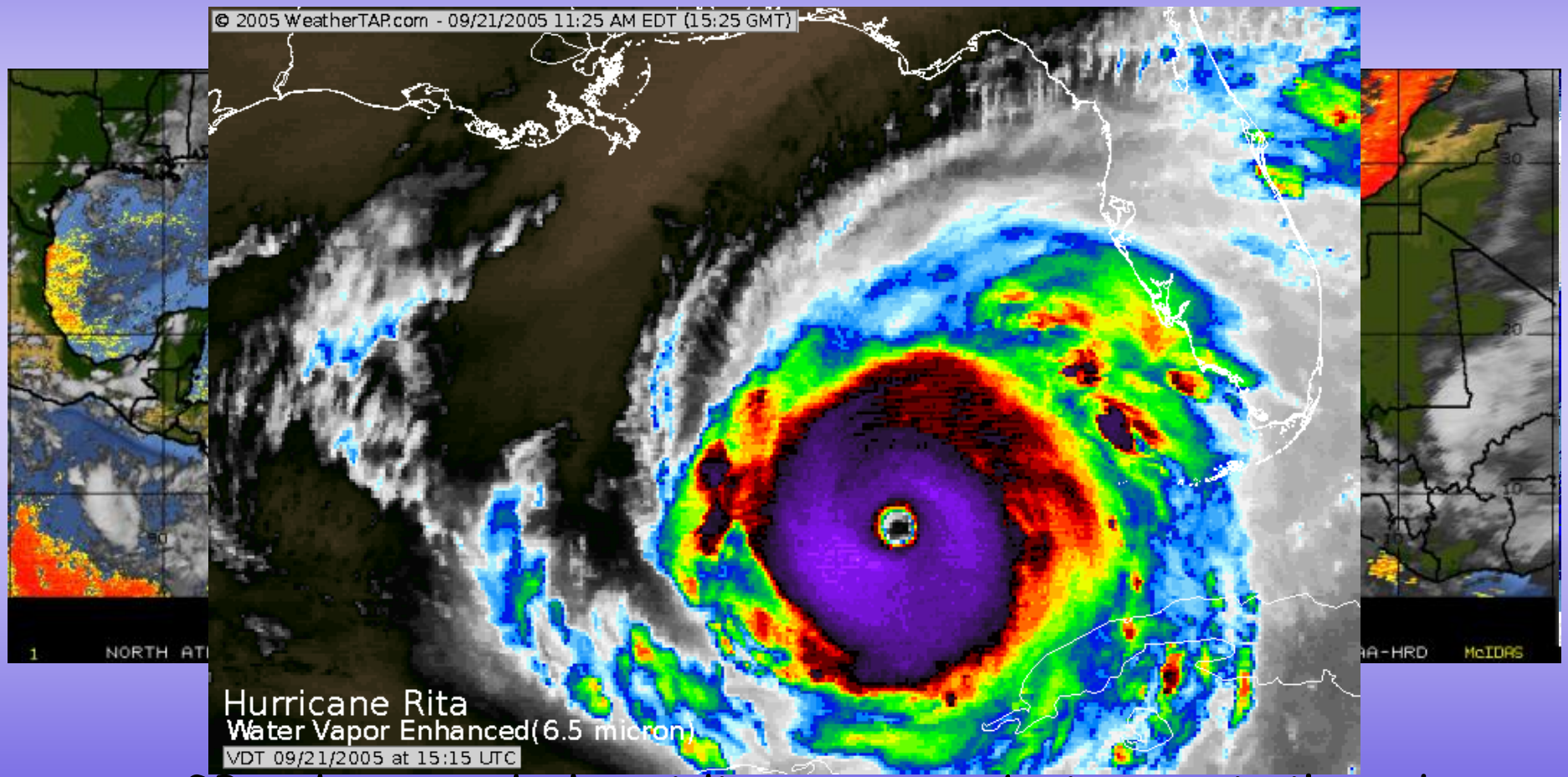




Motivation

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



…GPS dropsonde humidity was not being assimilated into the GFS model

Project Objectives

"995. DATACARDS - IBM Jobs GFS_PREP, GDAS_PREP. (Keyser, NP22). This program PREPOBS_PREPDATA prepares observational data for subsequent quality control programs and for subsequent analysis in all forecast networks, using data card switches in the input parm cards to control processing based on the forecast network. The input parm cards for the GFS and GDAS networks, prepobs_prepdata.gfs.parm and prepobs_prepdata.gdas.parm, respectively, are being modified to no longer flag Gulf Stream dropwindsonde moisture data. These data, on all levels, will now be assimilated by the Global SSI analysis. USAF dropwindsonde moisture will continue to be flagged and not assimilated in all networks, as will Gulf Stream dropwindsonde moisture in the NAM, NDAS and RUC networks."

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

Project Challenges

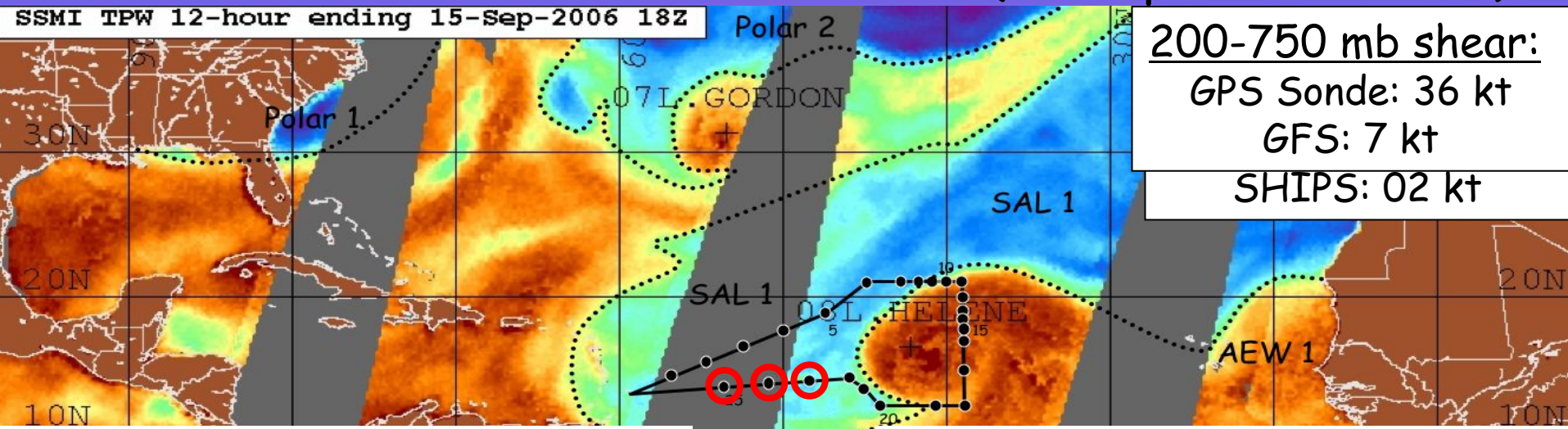
- "Old dog new trick" syndrome: teaching a satellite guy how to run a global model

- Issues with the conversion to "haze" at NCEP:
  - -HPSS and mirroring with other computer systems was not available for more than a month after "haze" was installed. These data are necessary for the parallel runs.
  - -The GFS was not avai
  above difficulties wer
  - -The NCEP cyclone tra
  installed on "haze" wit
  - -The parallel cycle nov
  soon.

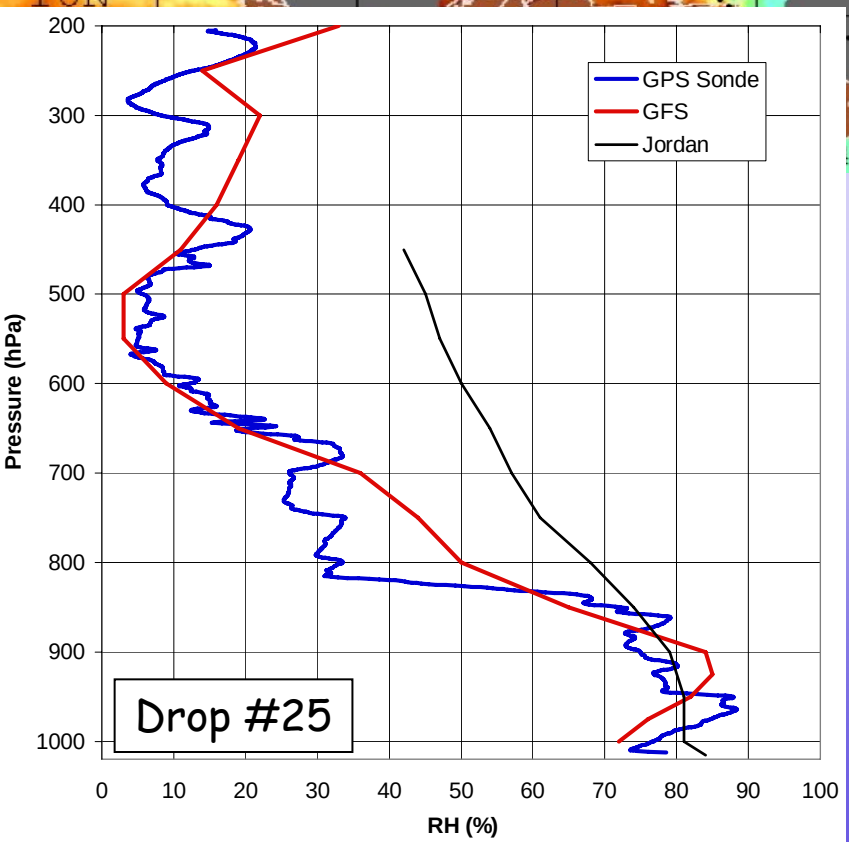
- Harsh working conditions

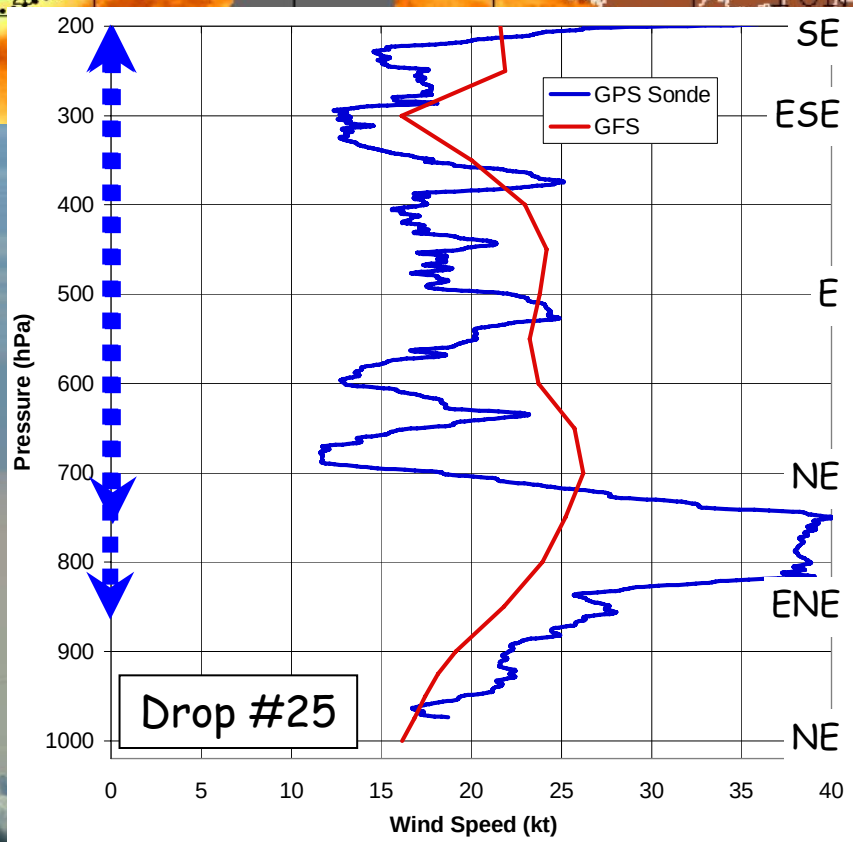

Barbados

G-IV SALEX Mission 060915n (15 September 2006)



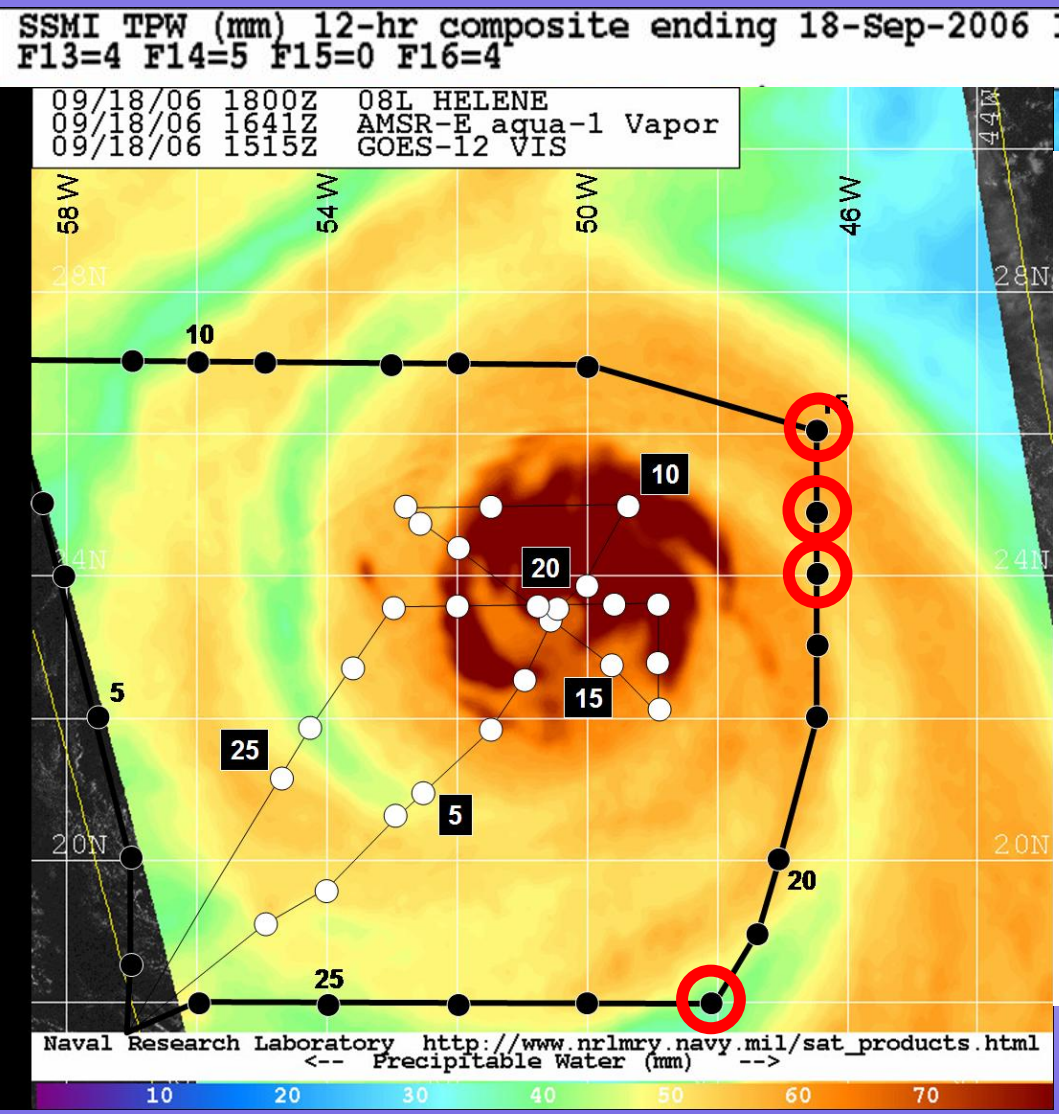
200-750 mb shear:
GPS Sonde: 36 kt
GFS: 7 kt
SHIPS: 02 kt

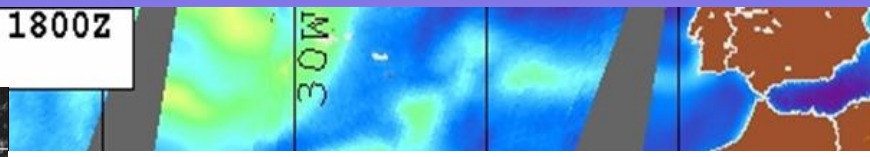


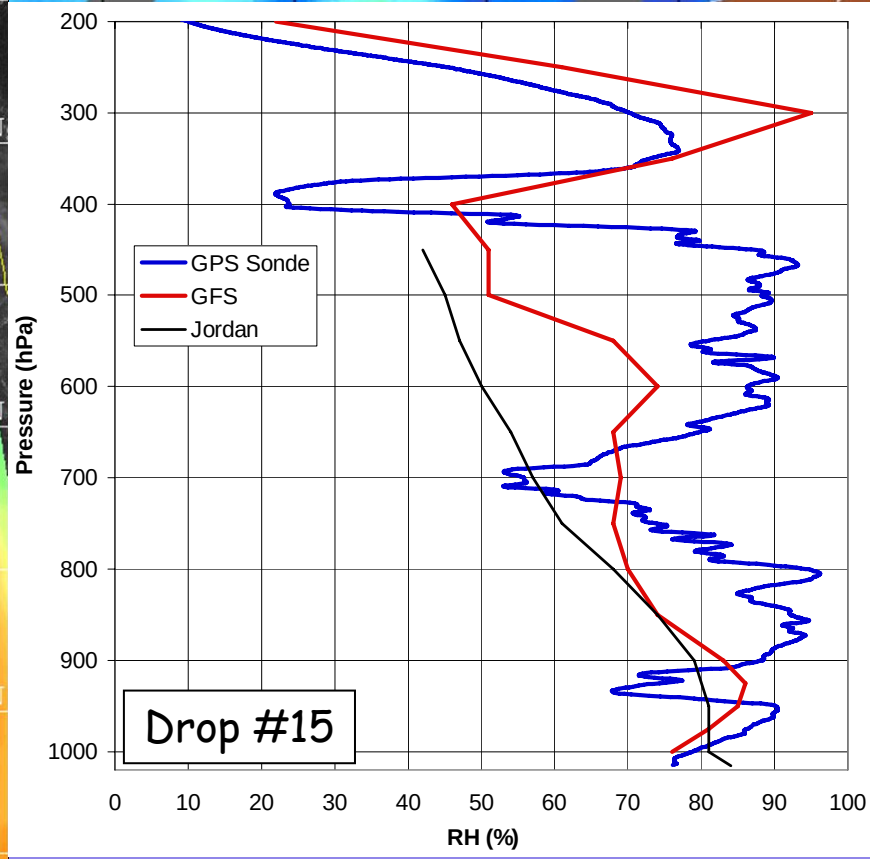


P-3/G-IV SALEX Mission 060918n

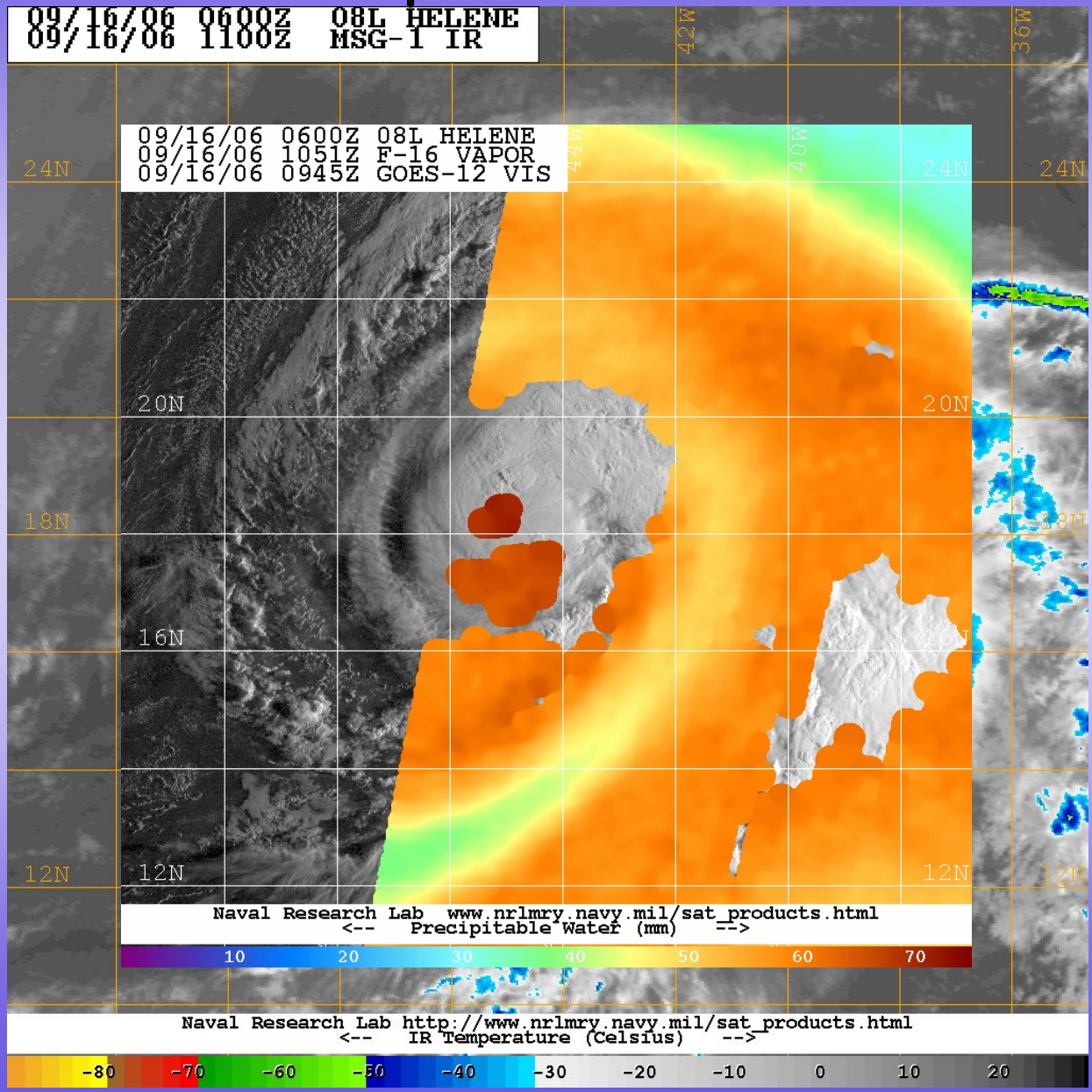
18 September 2006





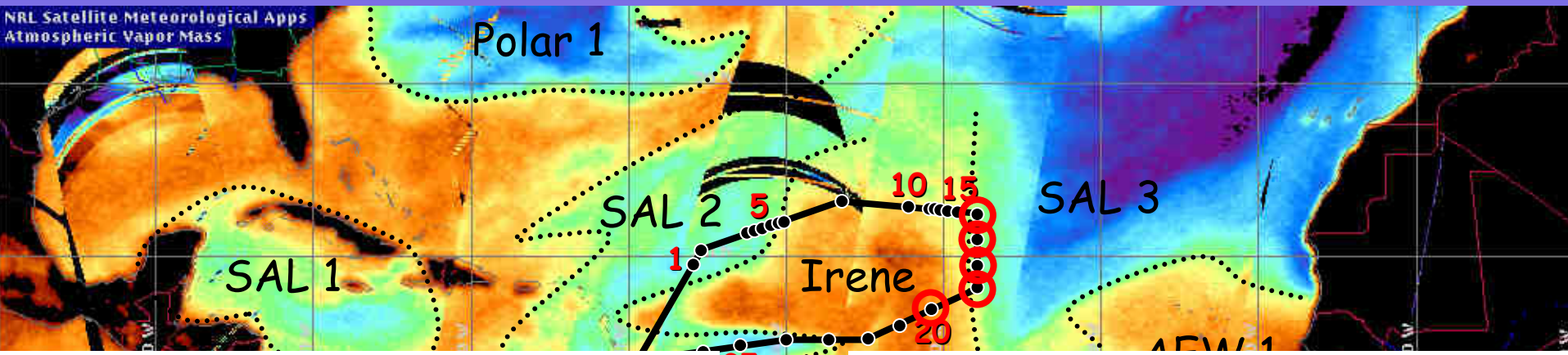


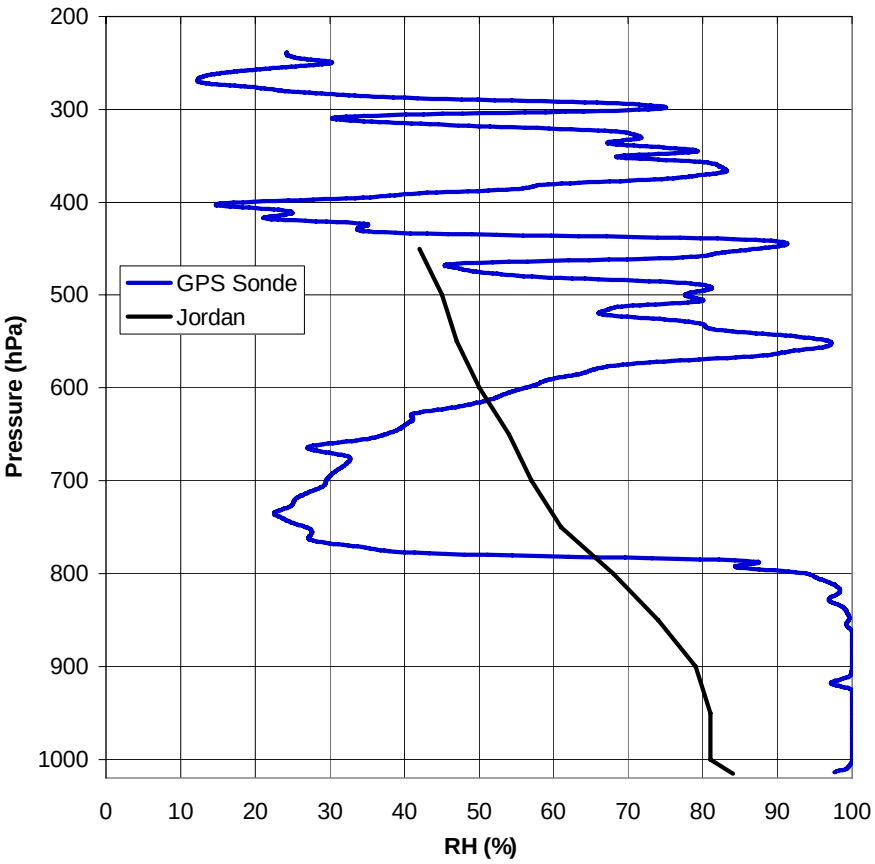
Hurricane Helene
16 September 2006

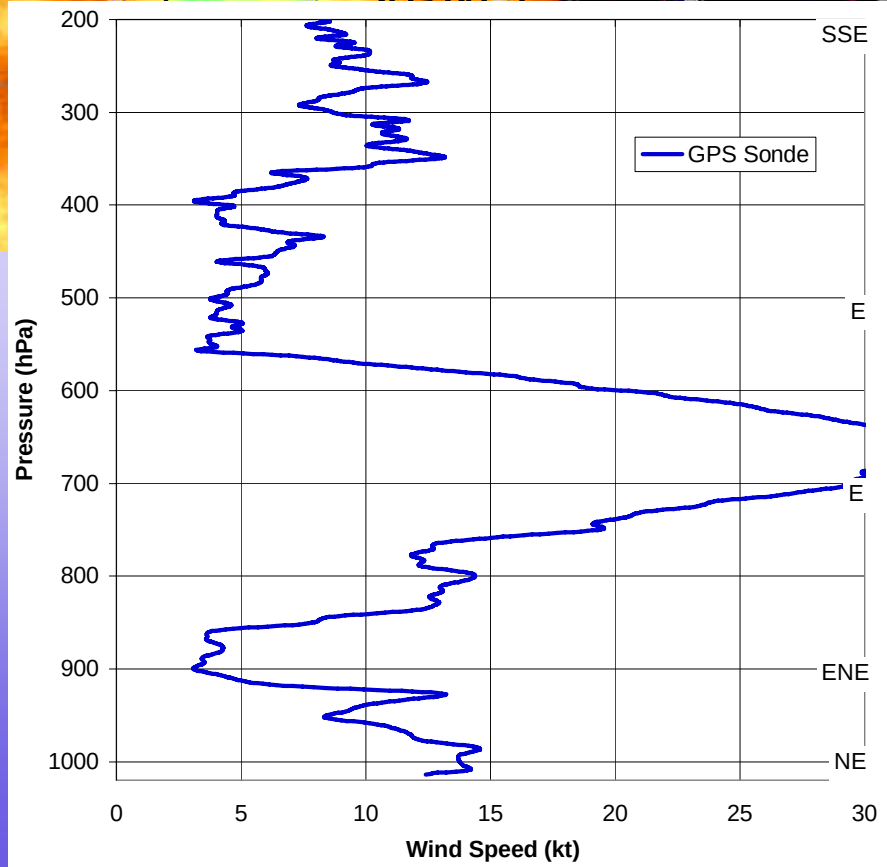


Saharan Air Layer Experiment (SALEX)

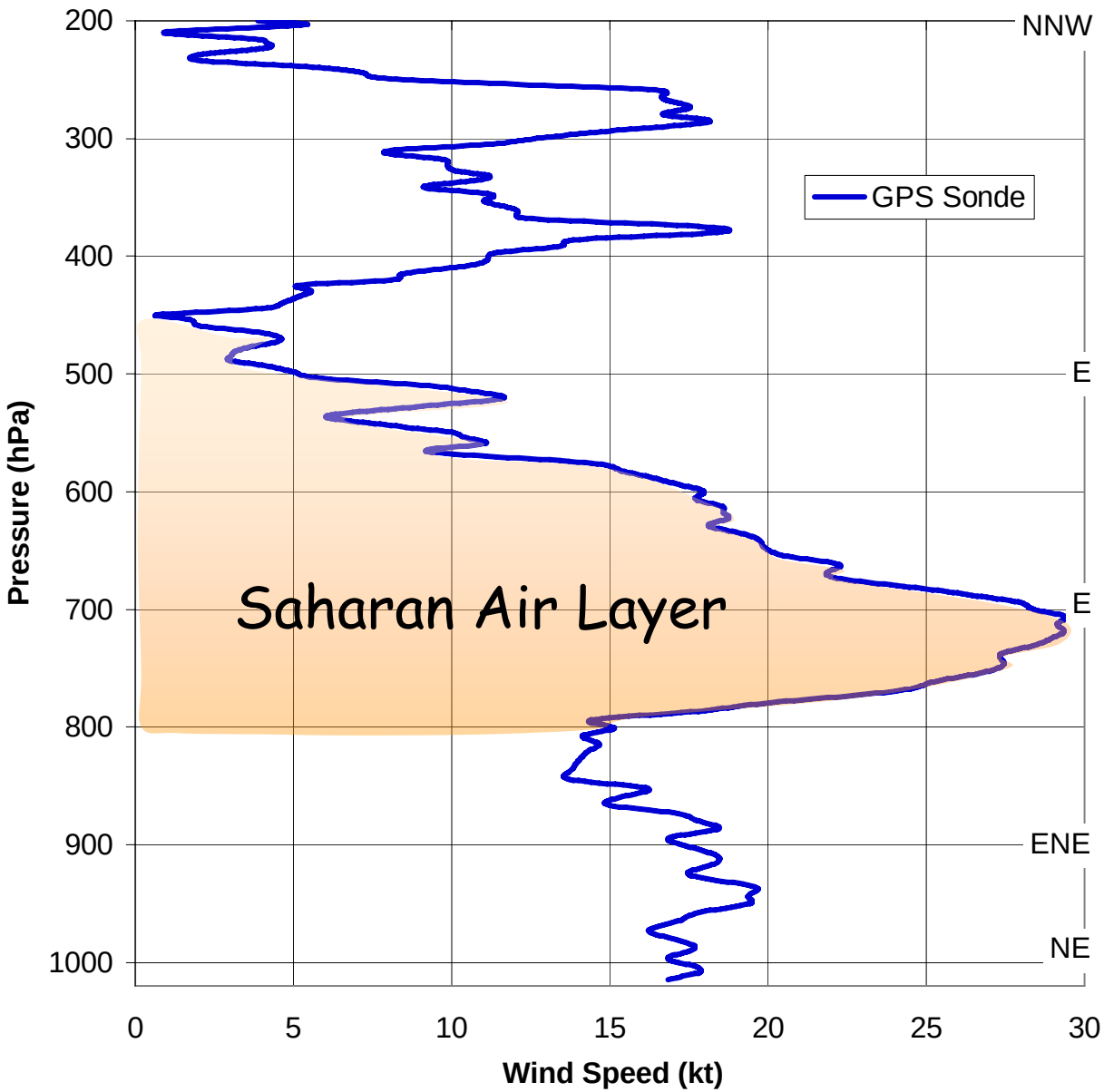
G-IV Mission 050807n





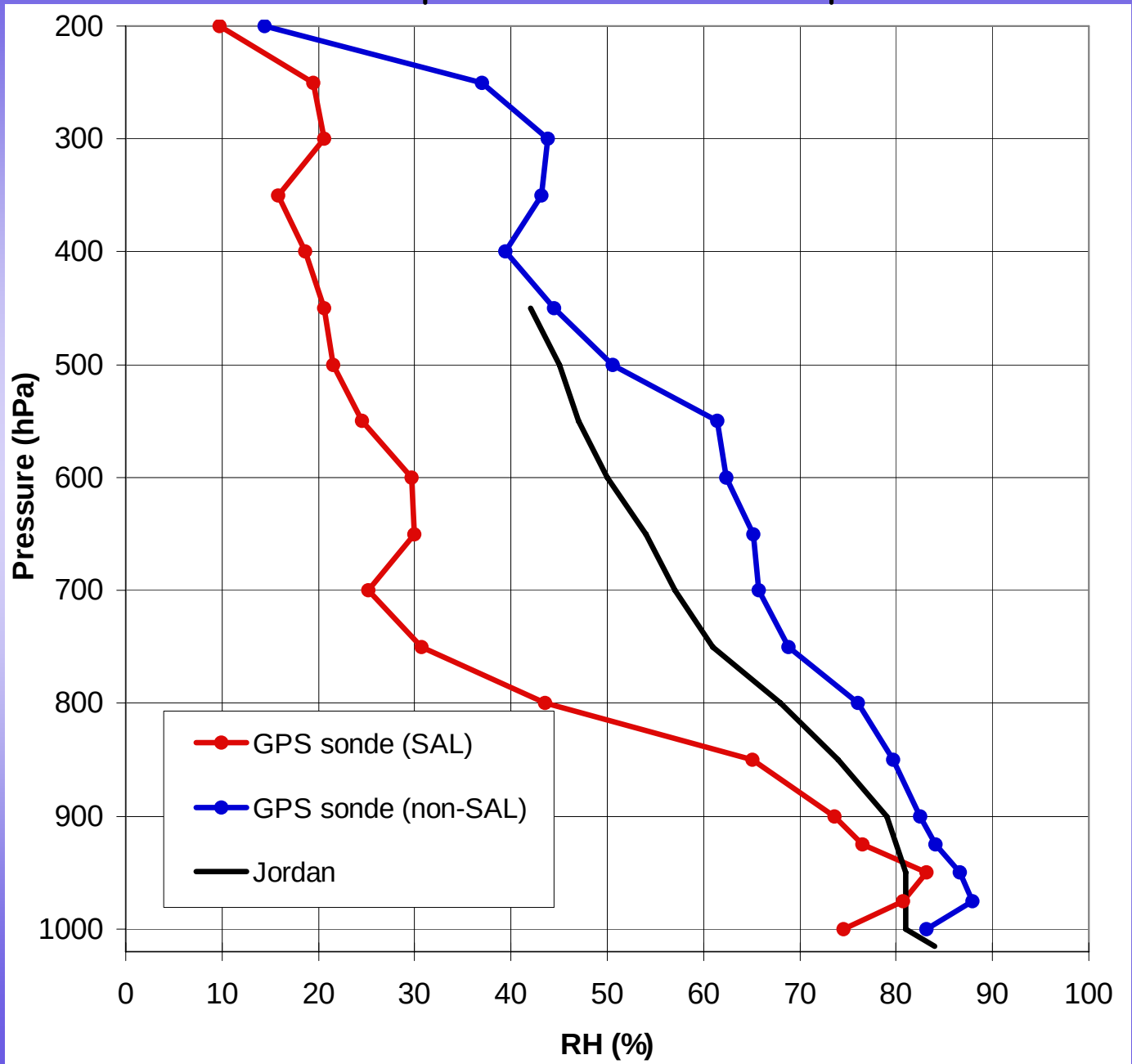


Getting Dry Air in to the TC Circulation



GFS Analyses vs GPS Dropsondes (2006 SALEX)

SAL drops: 79; non-SAL drops 27



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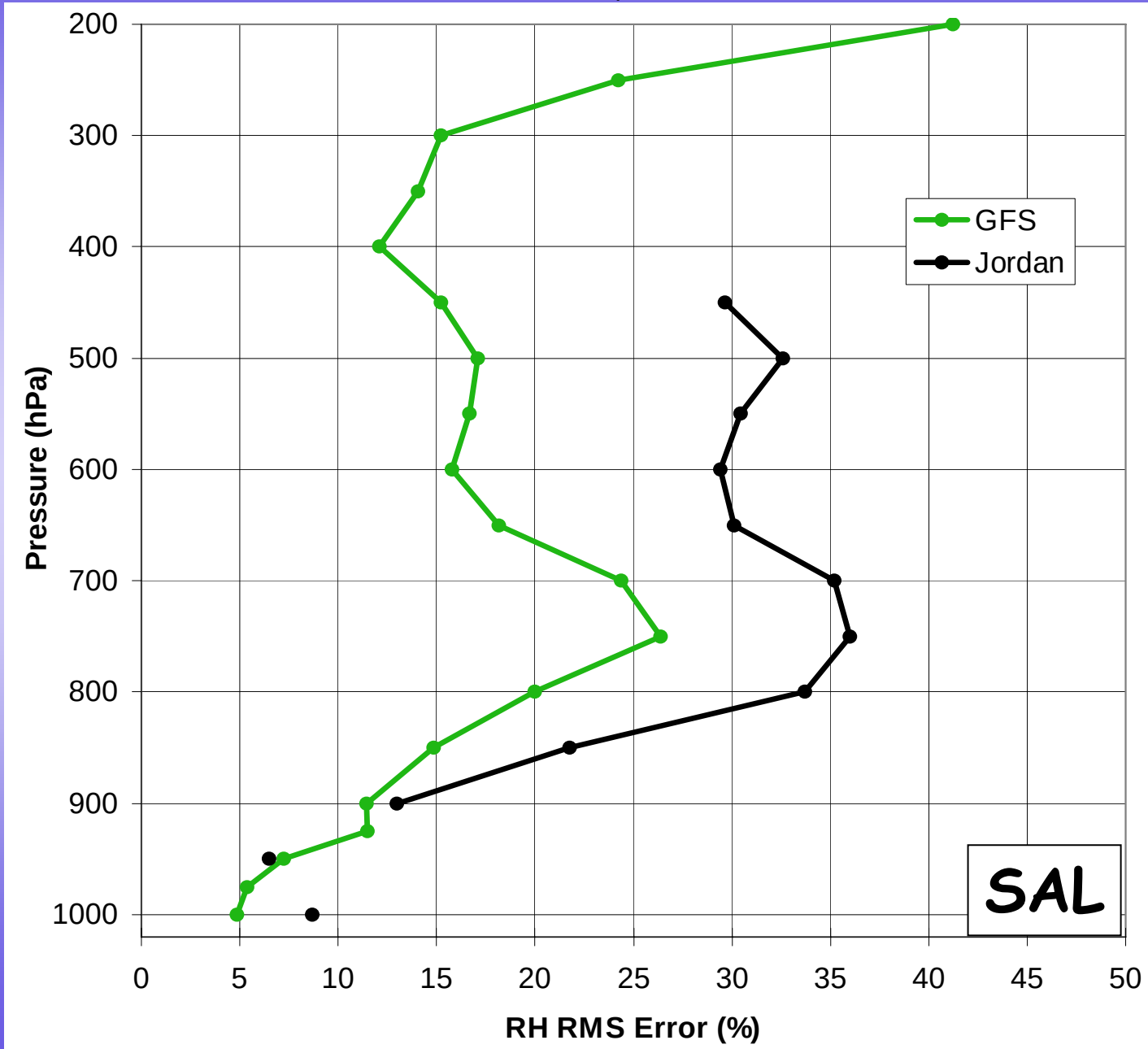
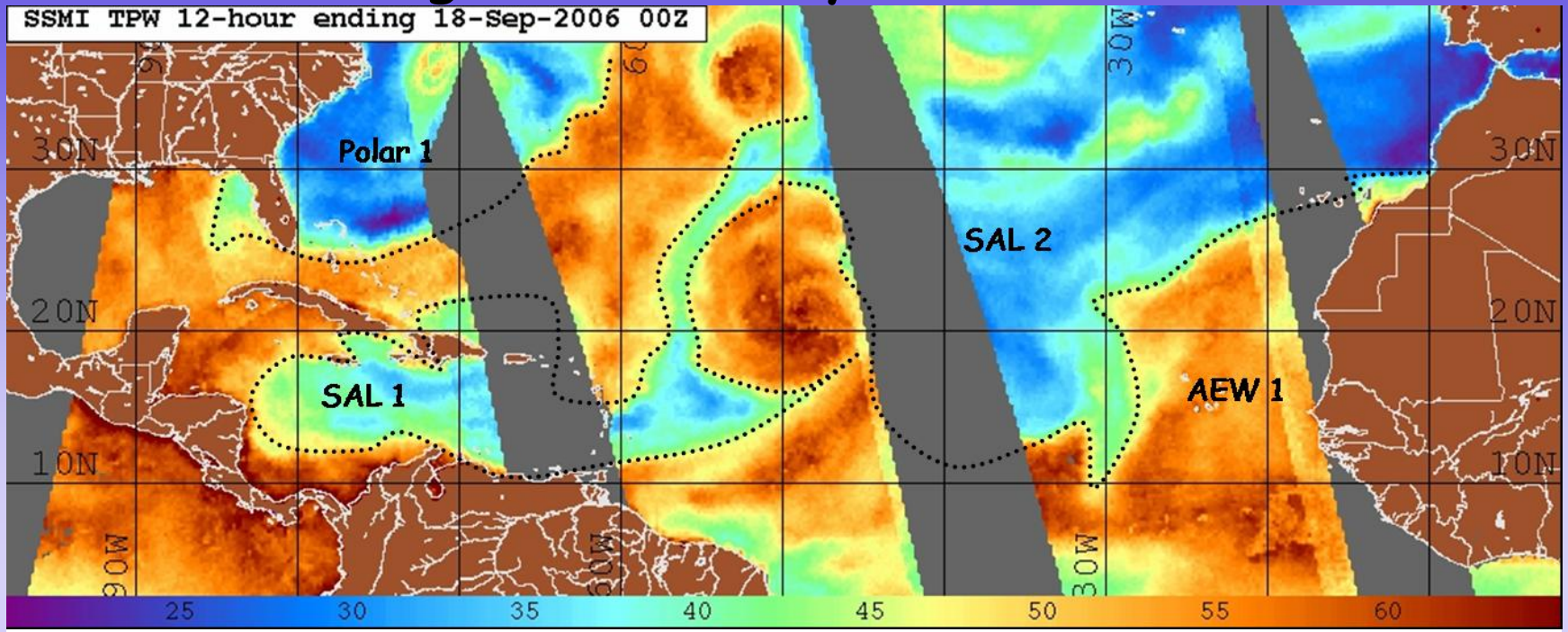
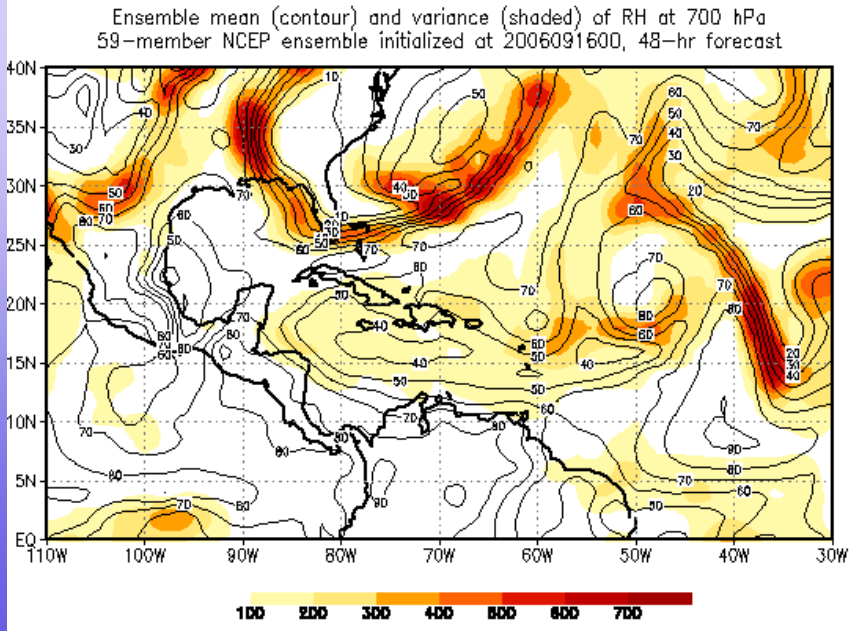
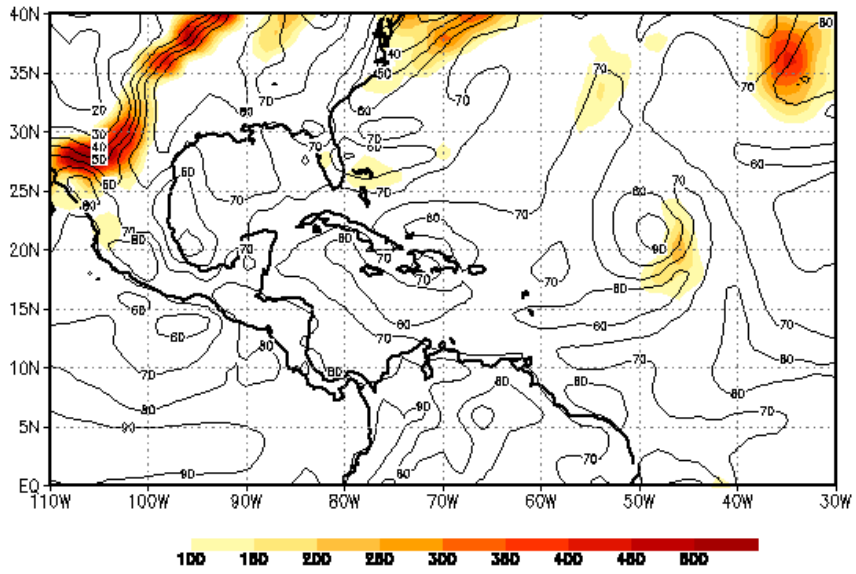


Targeted Humidity Observations







Summary of Findings

- As of August 2006, G-IV GPS dropsonde humidity data is being assimilated into the GFS model (not from P-3s or C-130s)

- GFS analysis fields appear to overestimate the SAL's mid-level moisture and underestimate its mid-level easterly jet

- Targeting humidity observations (GPS dropsondes) shows promise

Future Work

- Continue parallel runs (w/o GPS sondes) for 2006 G-IV TC cases

- Continue assessing targeted observing strategies for optimizing GPS dropsonde humidity impacts on the GFS

- Assess feasibility of operationally assimilating humidity data from the NOAA P-3s and AF C-130s GPS dropsondes

- Begin similar moisture studies with higher resolution models (e.g. HWRF; GFDL)