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.

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-IV 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**
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-IV missions)
Irene (08-09 September 2005)
Katrina (25-27 August 2005)
Hurricane Rita
22 Sept 2005 00 UTC
G-IV Mission 050921n

GPS Sonde
Jordan

Drop #21
Impact of GPS Sonde Moisture on the GFS
TS Irene 08 Aug 2005 0000 UTC
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