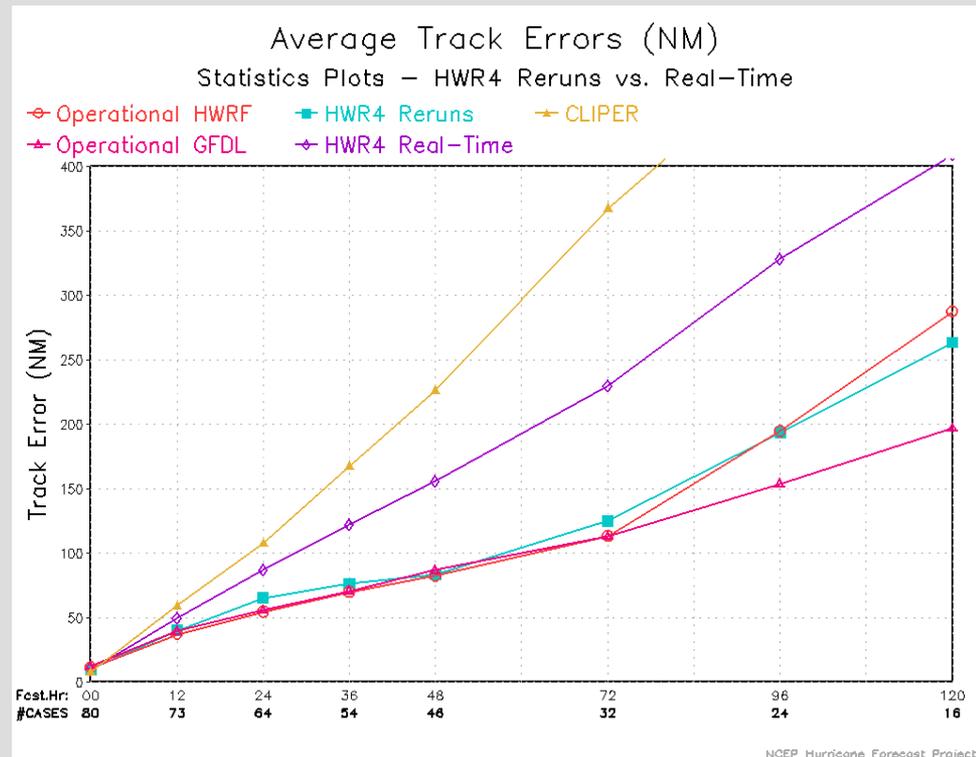


EMC 2009 High-Resolution Real-Time Parallel HWR4 and Plans for 2010

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Monday, May 10 2010

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HWR4 Model Configuration

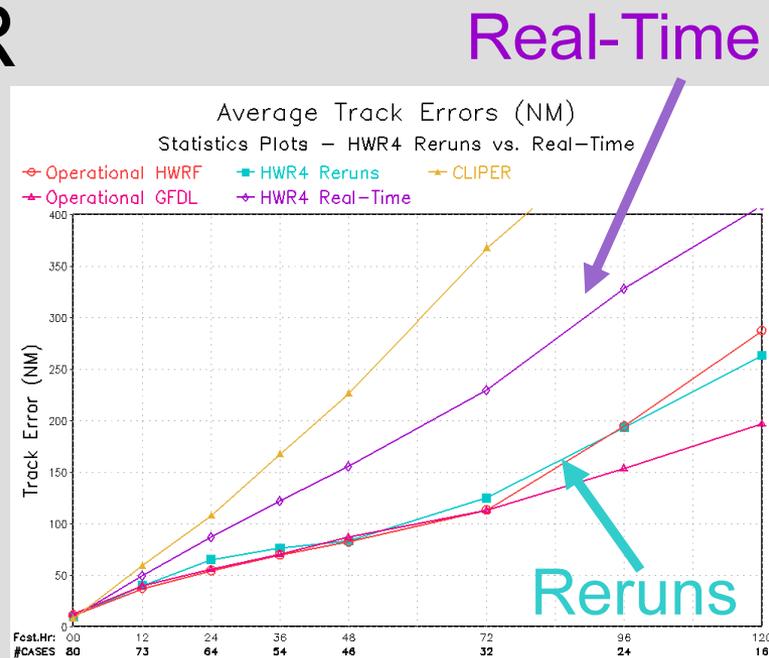
- 2009 operational HWRF at twice operational resolution.
- 2009 Operational HWRF physics
- GFS init, boundary cond.
- Full HWRF initialization
- 6 hour cycling
- Princeton Ocean Model ~0.25° res. (same as operational HWRF)
- NOAA Vapor cluster

75x75°
13.5 km res

6x6°
4.5km

The HWR4 Adventure

- Real-Time: hardware, system admin probs
- Nearly every aspect of model broke
- Fault-tolerant code, but recovery mechanisms hurt the forecast
- RERAN IN DECEMBER
 - Fixed technical problems
 - Disabled gravity wave drag (on by accident)
- RESULT: rerun track skill competitive with HWRF

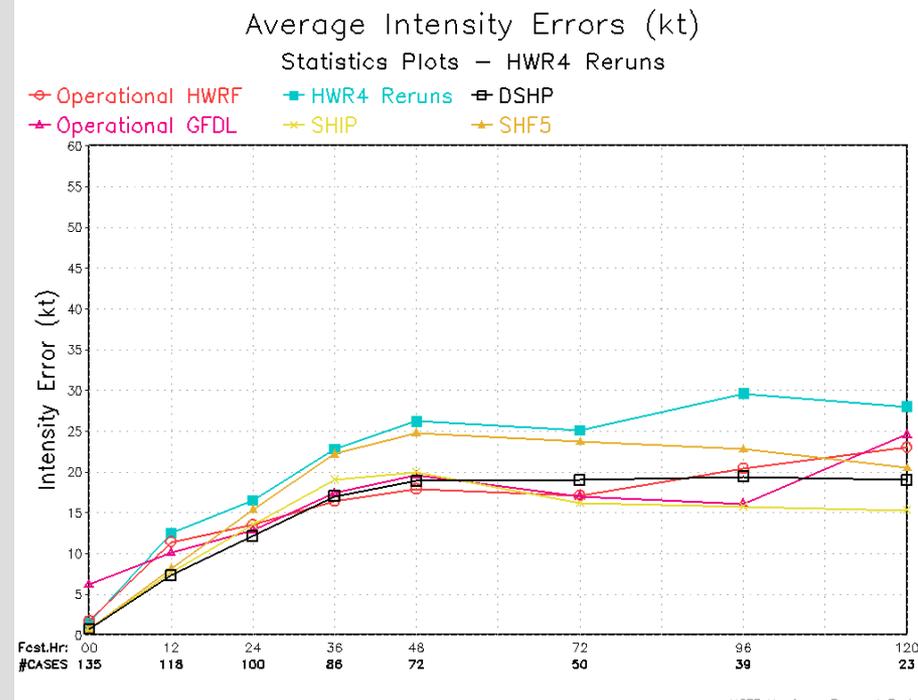
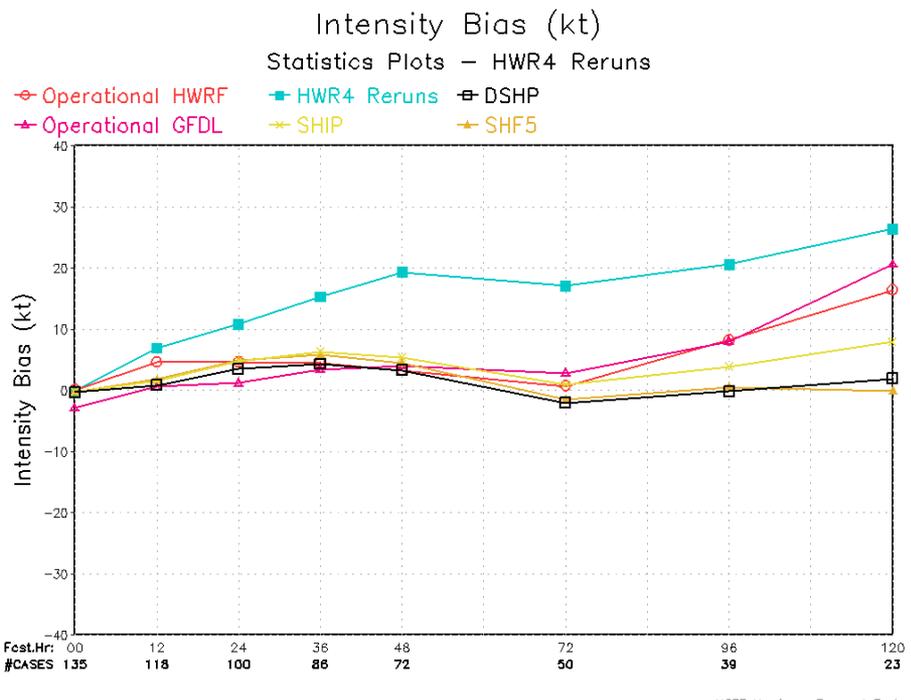


Real-Time: Lessons Learned

- High-Res HWRF is too slow
 - Initialization: 3-4 hours
 - 12hr forecast: ~30 minutes
 - Init + 126 hour forecast: 10-12 hours
 - For 6hr cycling, 12hr forecast needed in 7hrs
 - Operational model MUST finish in 115 min
- Reason: serial init, MPI scaling issues
 - HWRF initialization is serial
 - HWRF is purely MPI (no threads), and
 - IBM's MPI scales poorly on IBM's 16-processor Power6 machines
 - Threading helps GFS model's runtime, but HWRF cannot use threading yet

Rerun Results

- HWR4 Reruns: 137 cases (Ana through Ida)
 - 20kt intensity bias after 36 hours
 - Intensity error 5-10kt higher than HWRF.

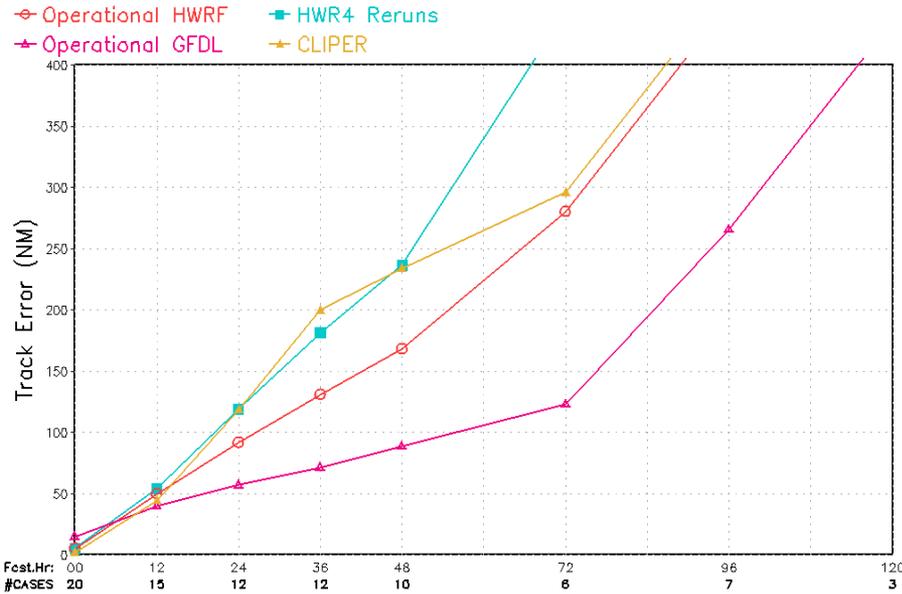


HWR4 Results

- Track error okay except for Ana.
- HWRF, GFDL also did poorly for Ana

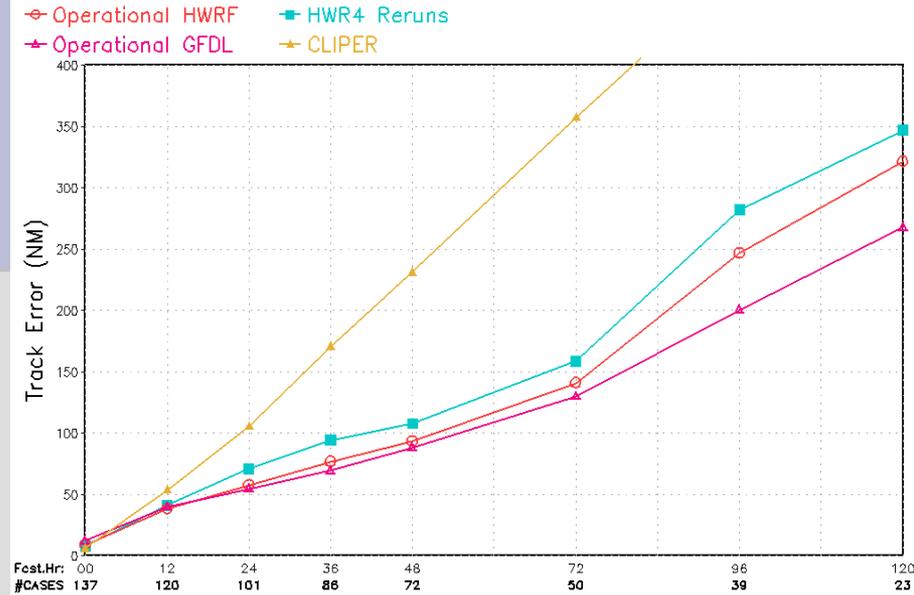
Forecast Errors (NM) For ANA 02L 2009

Statistics Plots - HWR4 Reruns



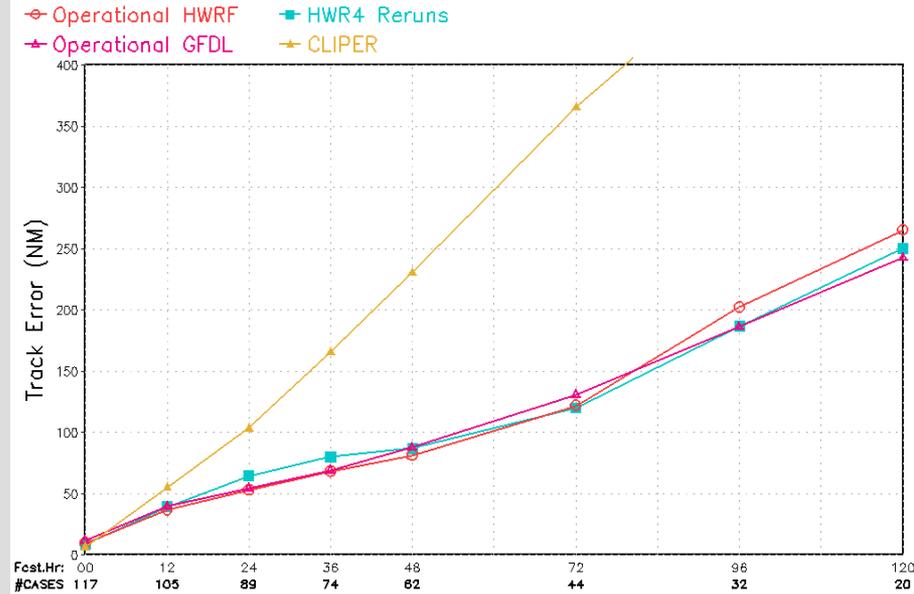
Average Track Errors (NM)

Statistics Plots - HWR4 Reruns



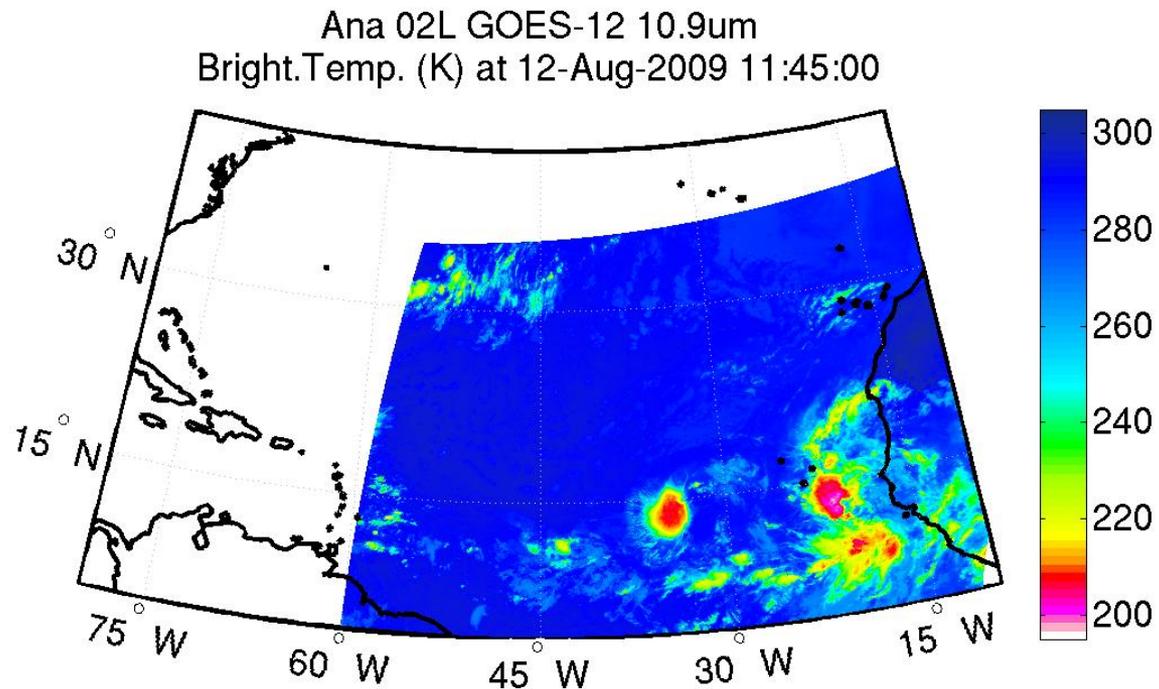
Average Track Errors (NM)

Statistics Plots - HWR4 Reruns without Ana



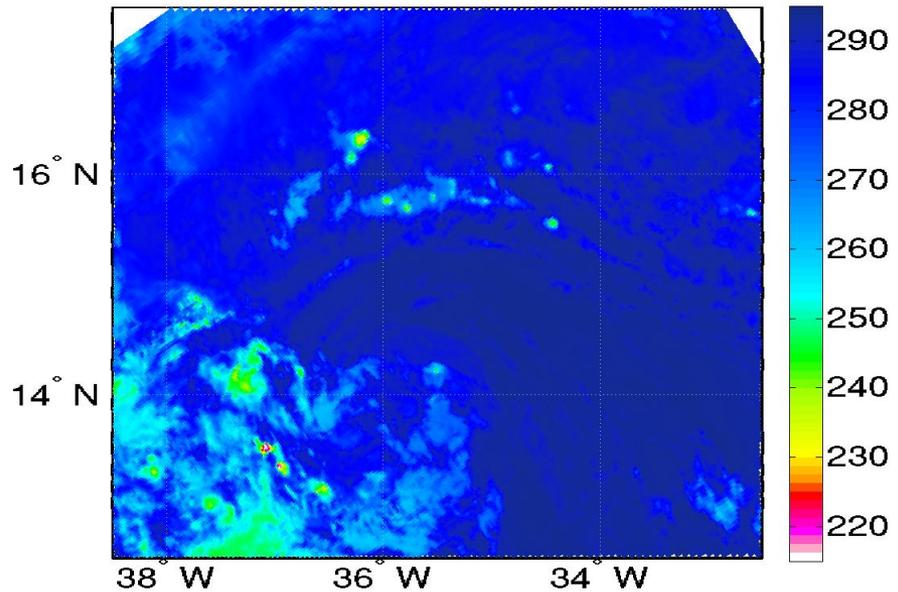
2009 Ana

The Untrackable Storm

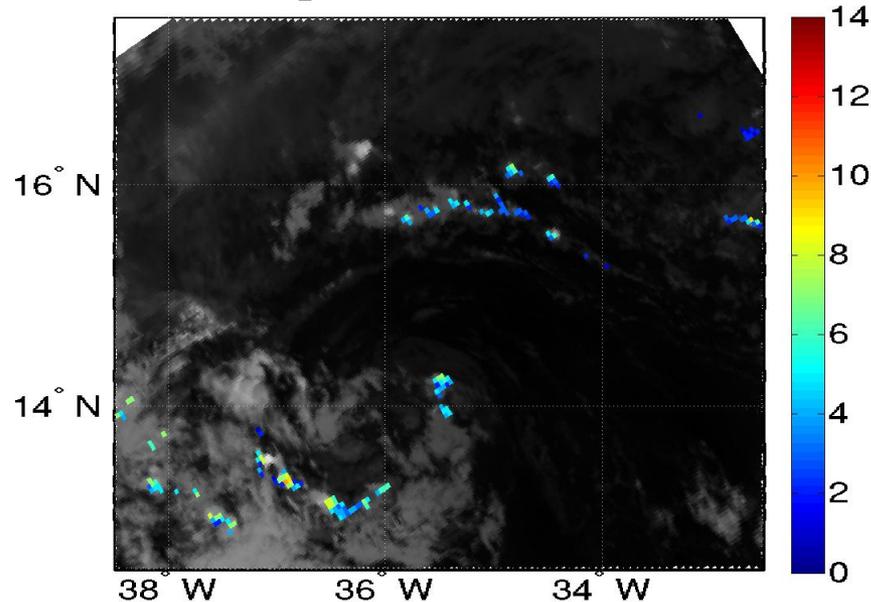


**Slide Removed
To Fit Under 3MB Limit**

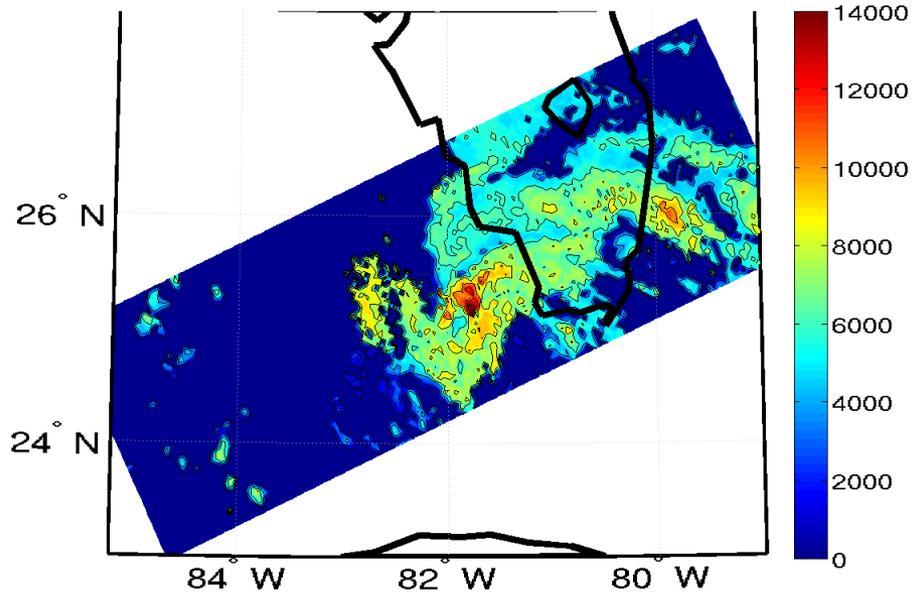
TRMM 10.8um Brightness Temp. (K)
August 13, 2009 03:49:05



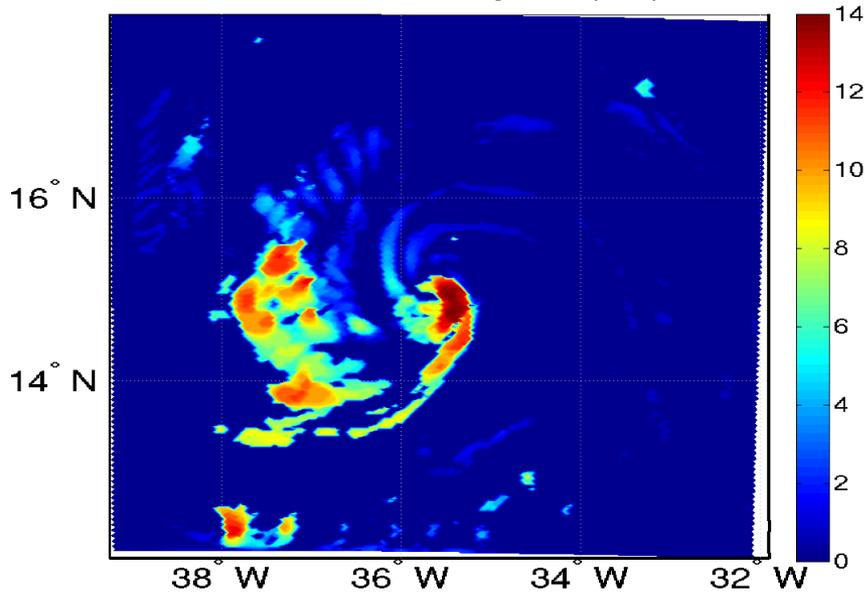
TRMM 10.8um Br.Temp. & 18dbZ Alt (km)
August 13, 2009 03:49



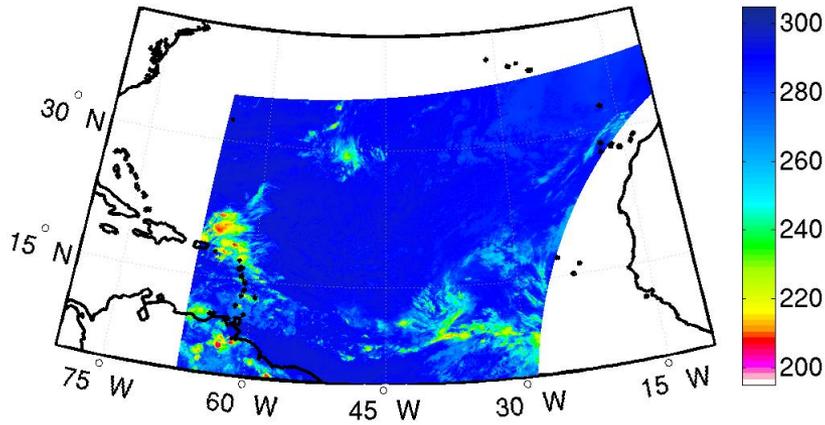
TRMM Storm Top Height (18dbZ alt.)
Fay 06L August 18, 2008, 22:18:18 UTC



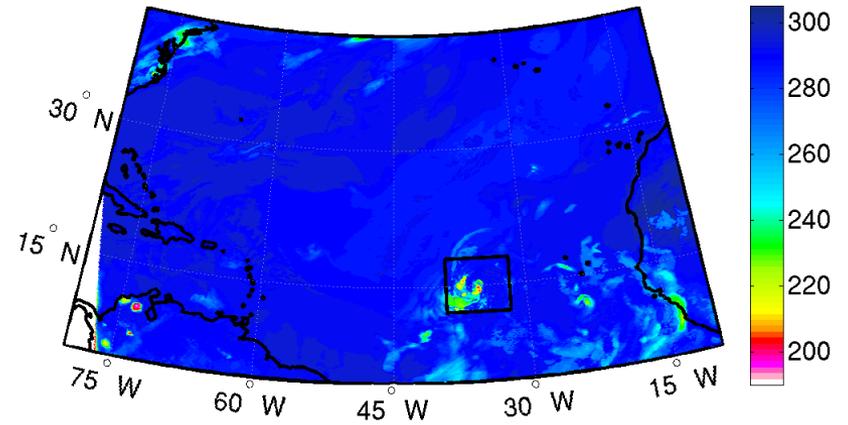
Ana 02L HWR4 2009081212
18dbZ Reflectivity Alt. (km)



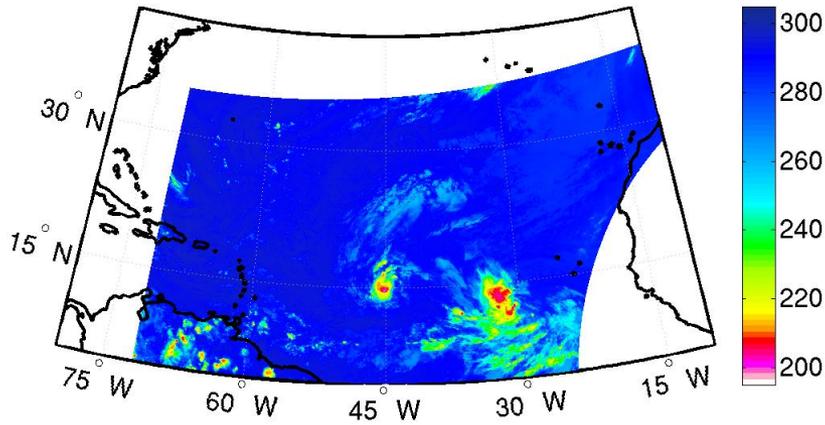
Ana 02L GOES-12 10.9um
Bright.Temp. (K) at 13-Aug-2009 01:15:00



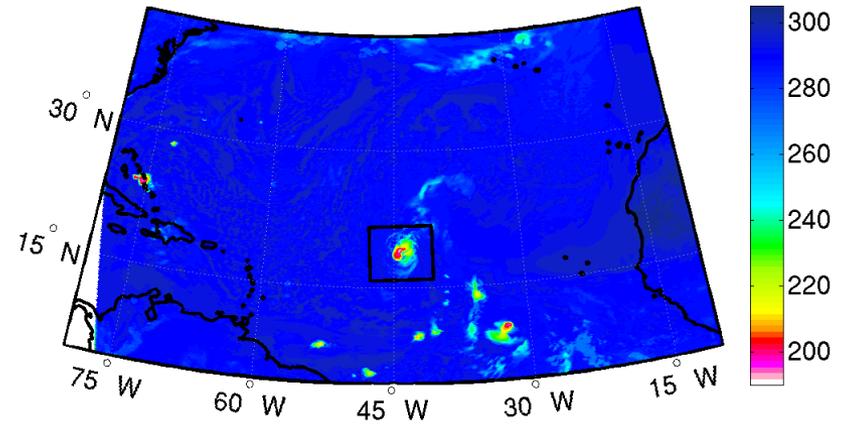
Ana02L 2009081212 Sim.GOES-12 10.8um
Bright.Temp. (K) at 2009-08-13 03:00:00



Ana 02L GOES-12 10.9um
Bright.Temp. (K) at 14-Aug-2009 23:45:00



Ana02L 2009081212 Sim.GOES-12 10.8um
Bright.Temp. (K) at 2009-08-15 00:00:00



2009 Ana

The Untrackable Storm

- Convection
 - Bill dies off, so no bill interaction
 - Outer domain convection too weak
 - Inner domain overactive
- Nest Motion Algorithm
 - Ana still has multiple vortices,
 - Model follows wrong one
 - Gridpoint with lowest MSLP
- HWRF-X (AOML/HRD) Nest Motion Alg.
 - Follows centroid of multiple vortices
 - Might this have helped?

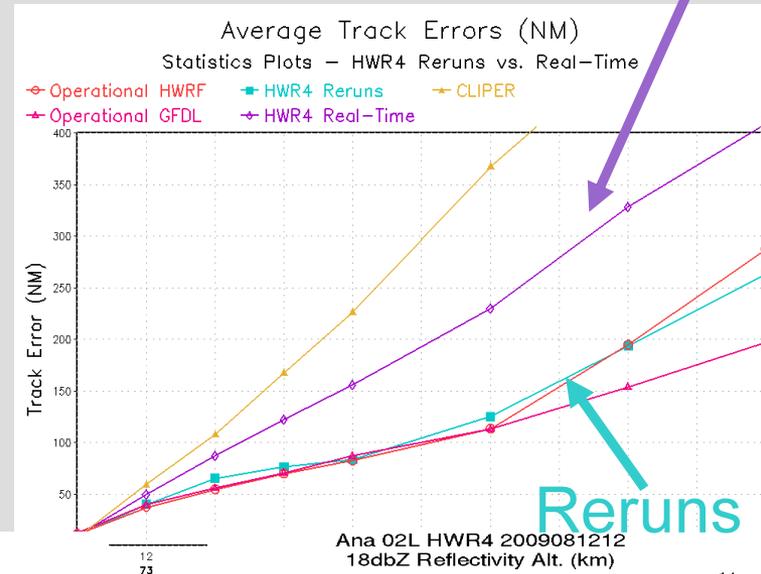
2010 Plans: "H93P"

- 2010 HWRF run at triple operational res.
 - Atmos Domains: 9km, 3km res
 - Ocean: POM at 0.25°
 - HWRF community model code base
- Physics & Tuning
 - HWRF radiation does not support 3km
 - Tuning help from HRD (makers HWRF-X)
 - Maybe HWRF-X nest motion algorithm
- Different cluster: nJet
 - MPI implementation scales better
 - Much larger than NOAA Vapor cluster

Questions?

- P2.91 Sam Trahan
 - HWRF, HWR4 cloud top vs. observations
- P2.125 Janna O'Connor
 - 2010 Operational HWRF Graphics

Real-Time



Reruns

