

PSU AHW-EnKF 2013 System

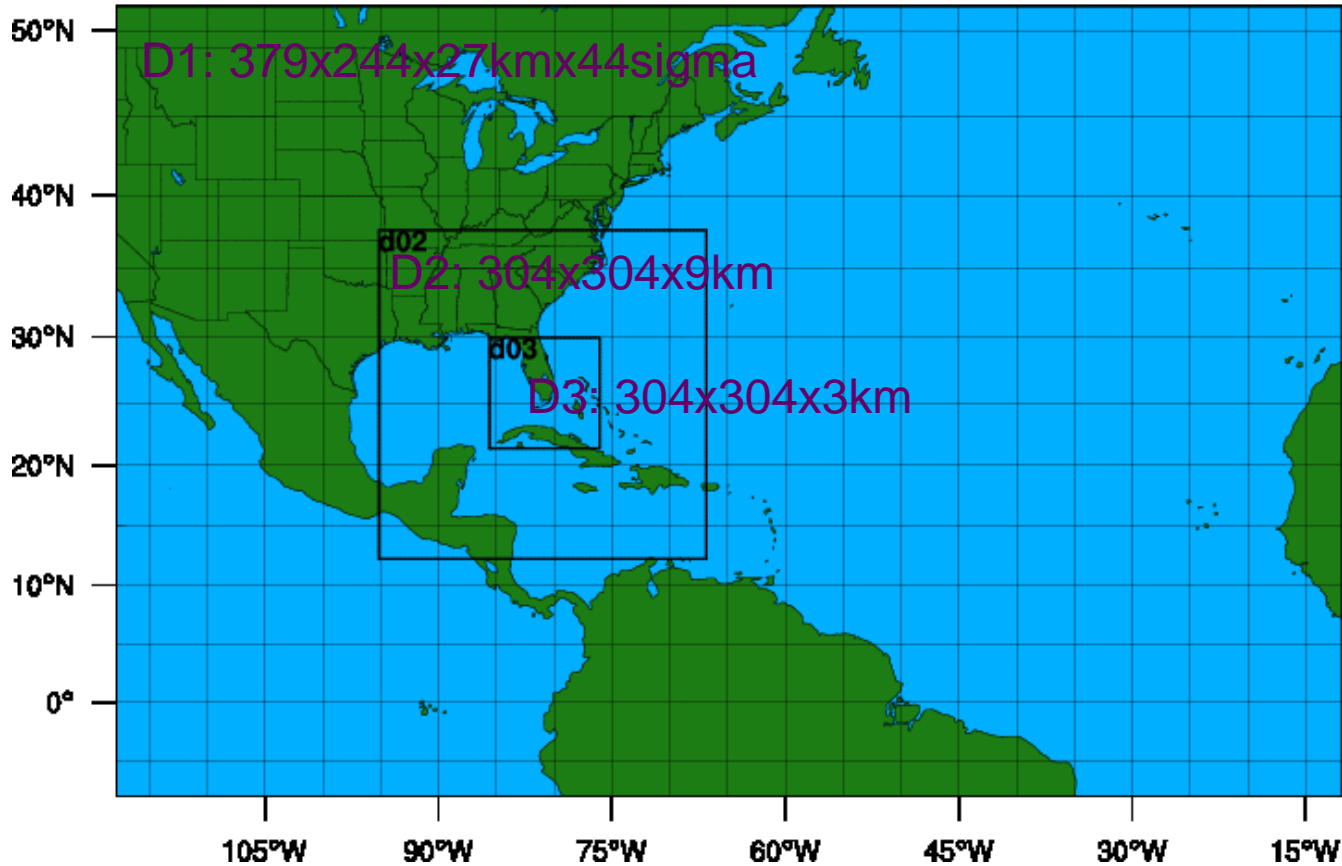
Group Meeting

July 19, 2013

History of PSU Real-time System

- 2006: Parallel WRF-EnKF
- 2006: Ground-base radar (NexRAD & SMART);
- 2007: Hurricane with NexRAD
- 2008: Airborne TDR;
- 2008: real-time test for TDR;
- 2009: real-time for TDR;
- 2010: HFIP Stream 2 for TDR cases;
- 2011-2012: HFIP Stream 1.5 for TDR cases;
- 2013-: Stream 1.5 for all obs. by cycling every 3h.

PSU 2013 System Configurations



ATCF IDs:

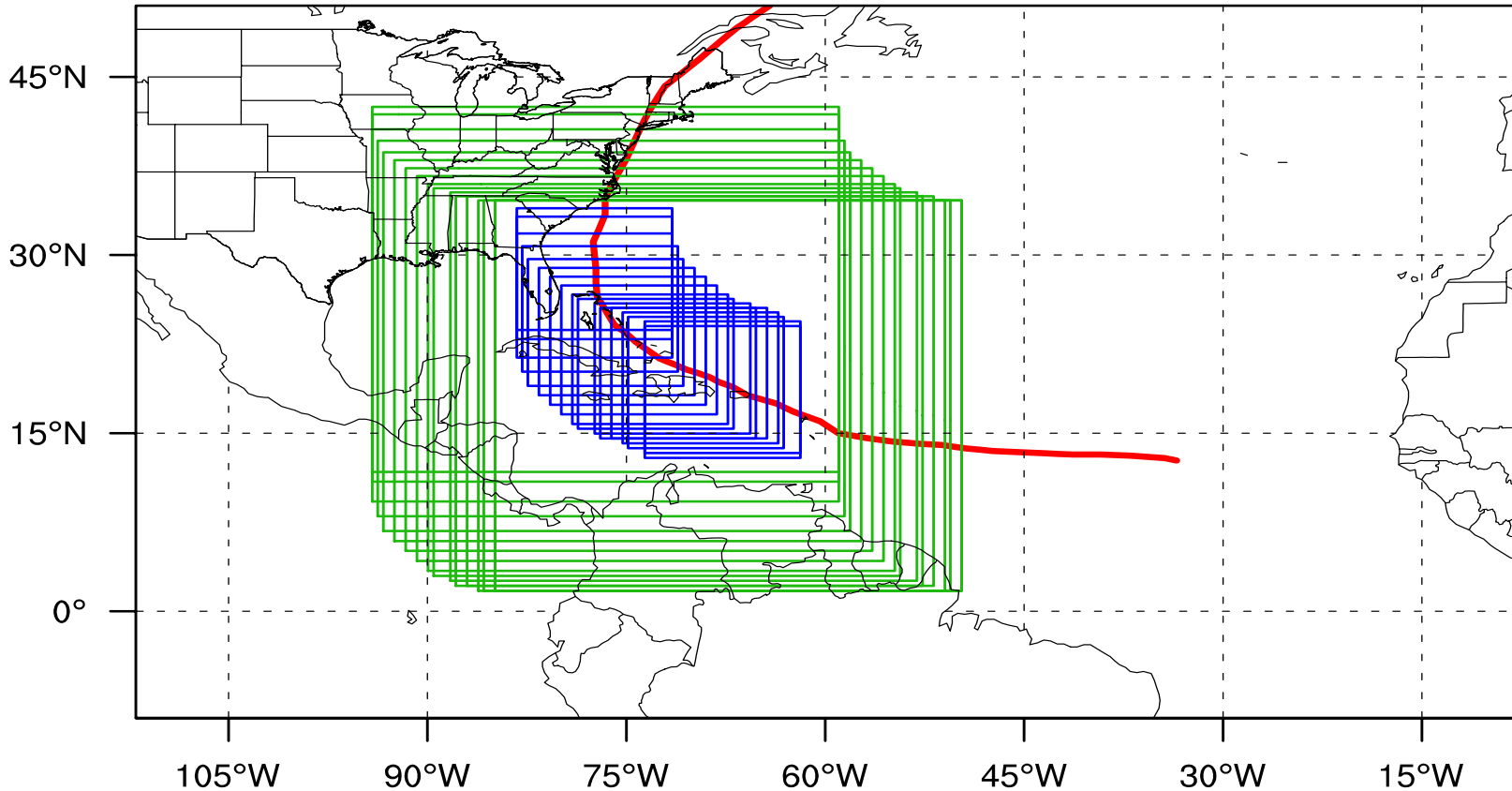
APSU: stream 1.5, ARW 3-km deterministic forecast;

PS01-10: stream 2.0, ARW 3-km ensemble forecasts.

ARW	V3.4.1
Cumulus	Grell-Devenyi ensemble (27 km domain only)
Microphysics	WSM 6-class graupel
PBL	YSU
Surface Layer	Monin-Obukov
Land Surface	thermal diffusion
Radiation	Rrtm / Dudhia
Air-sea flux	Green and Zhang
Ocean	1-D
<ul style="list-style-type: none"> • 60-member ensemble • Gaspari & Cohn 99' covariance localization with varying Rol • IC & BC: GFS using 3DVAR background uncertainty • Hourly assimilation with TDR over all 3 domains 	

Cycling Strategy

Irene2011 Track and EnKF domains



An example of movable domains following tc vitals.

Retrospective Runs

Year	Storm	APCT	APRC	APAR
2008	04-Dolly	072012-072418	072012-072418	072012-072300
	06-Fay	081400-082400	081400-082400	081400-081906
	07-GUSTAV	082512-090200	082512-090200	082918-090118
	09-Ike	090200-091312	090512-091312	090918-091218
	11-Kyle	092300-092812	092318-092812	092318-092718
	17-Paloma	110600-111000	110600-111000	110706-110900
2009	02-Ana	081200-081700	081612-081700	081618-081700
	03-Bill	081600-082312	081812-082312	081818-082012
	05-Danny	082612-082900	082612-082900	082612-082812
2010	01-Alex	062512-070112	062512-070112	062900
	07-Earl	082600-090400	082712-090400	082900-090400
	13-Karl	091412-091800	091412-091800	091300-091700
	19-Richard	102012-102600	102012-102600	102306-102312
	21-Tomas	102912-110806	102912-110806	110400-110700
2011	09-Irene	082000-082900	082012-082900	082400-082712
	13-Lee	090200-090612	090200-090612	090200
	16-Ophelia	092100-100218	092312-092900	092418
	18-Rina	102212-102818	102312-102800	102600-102718
2012	09-Isaac	082000-083018	082112-082906	082300-082900
	12-Leslie	083000-091100	090712-090812	090712-090812
	14-Nadine	091000- 100318	091118- 100318 (GH dropsondes)	
	17-Rafael	101300-101718	101300-101718	101600-101700
	18-Sandy	102100-103018	102212-102918	102600-102900
Total	23	758	636	240

Experiment design:

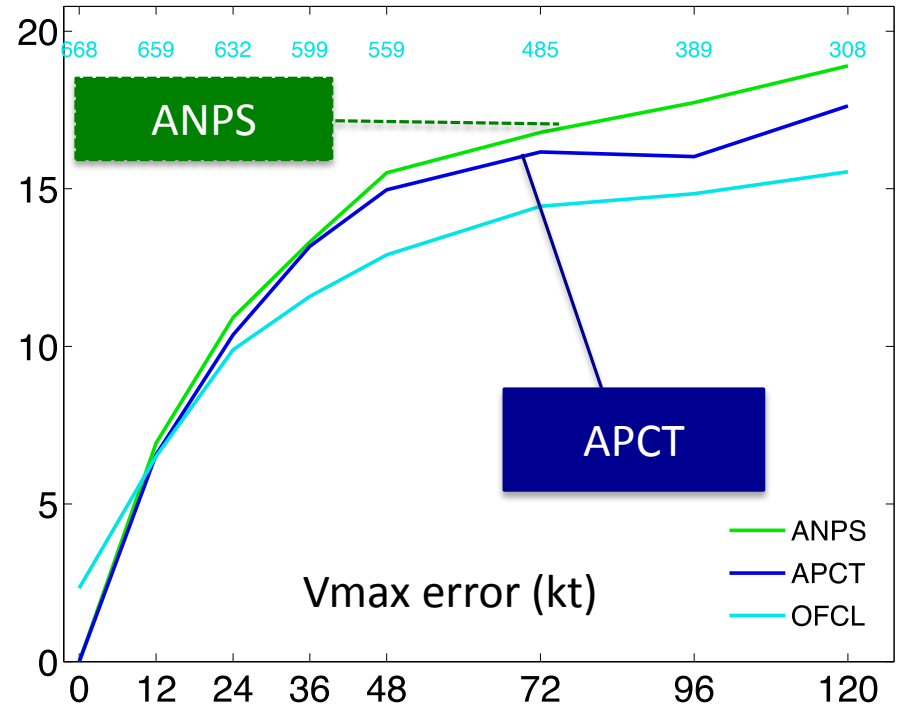
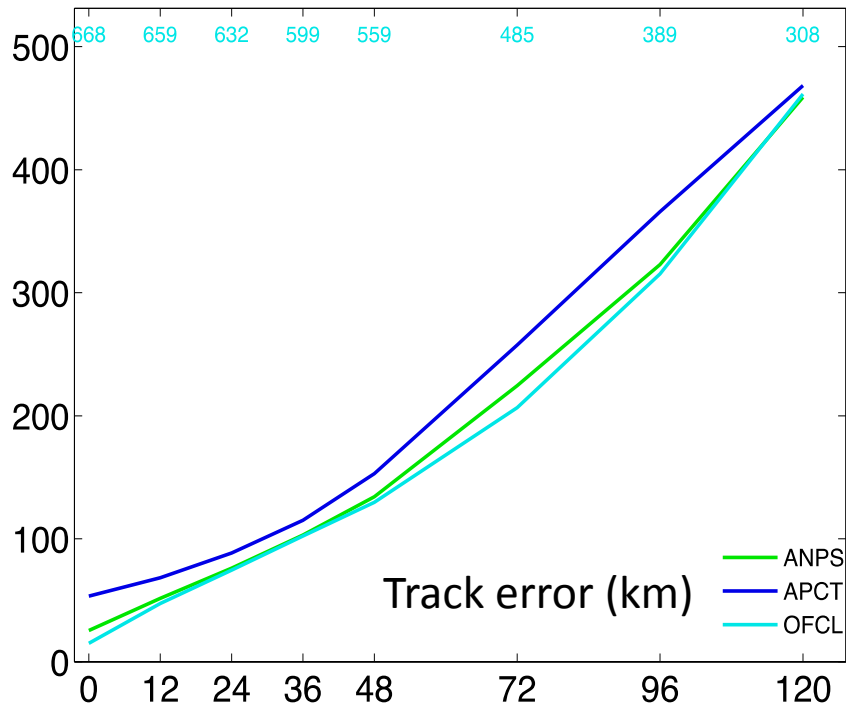
ANPS: Control, WRF initialized with operational GFS without PSU-EnKF assimilation;

APCT: Cycling WRF-EnKF with conventional obs. DA;

APRC: APCT + ReCon (FL + drops) data;

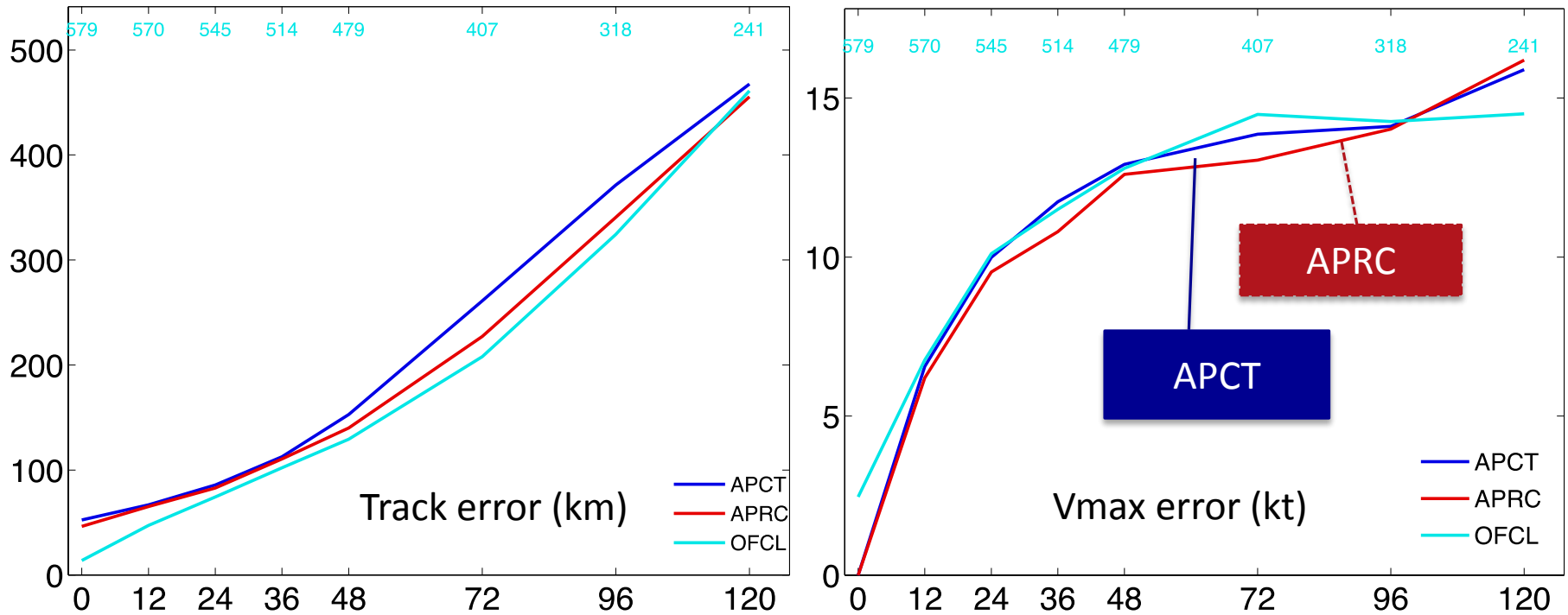
APAR: APCT + All Recon (Doppler + FL + drops) data.

DA Tiger Team: APCT vs. ANPS errors for 2008-2012



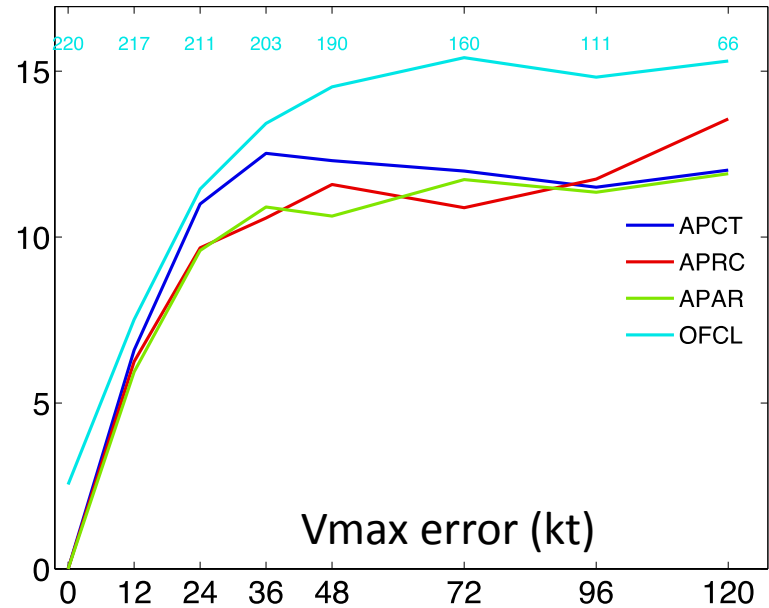
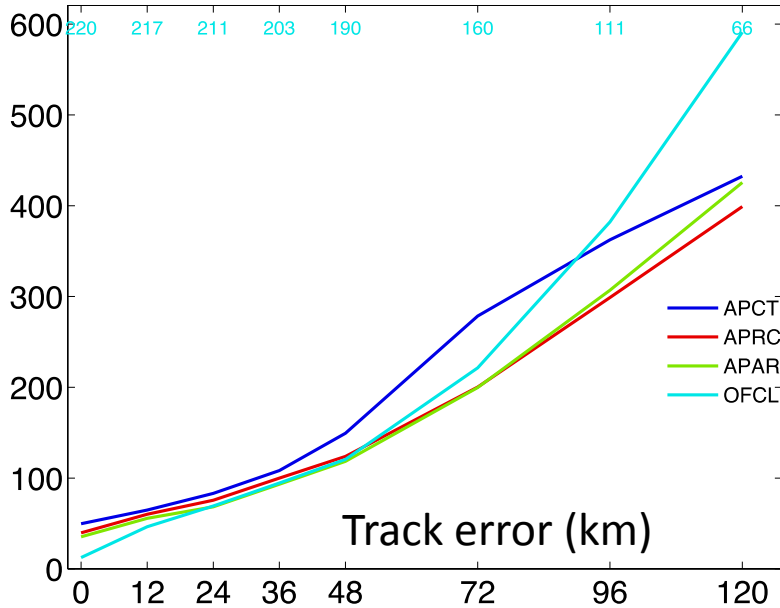
- PSU cycling ARW-EnKF system assimilating non-radiance GTS obs only performs comparable to ANPS initialized from GFS

DA Tiger Team: APRC vs. APCT errors for 2008-2012



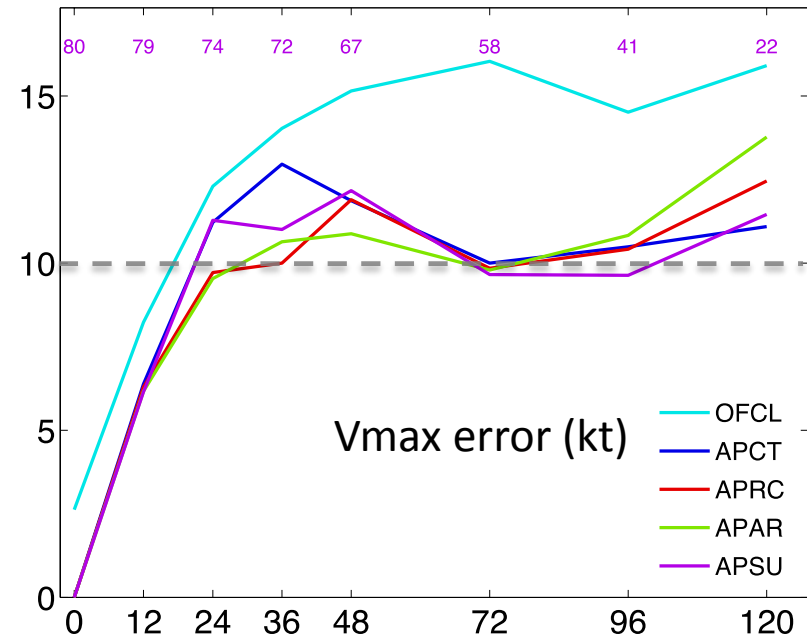
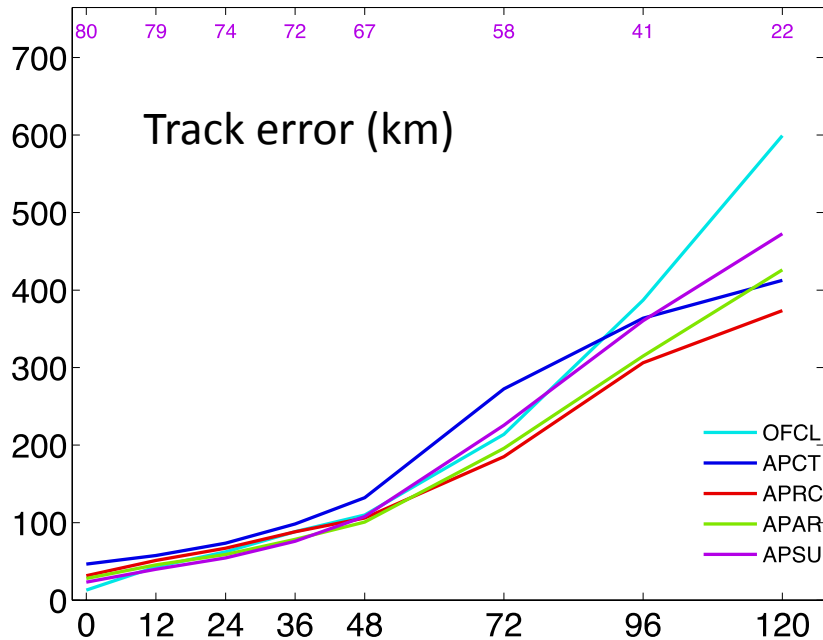
- Assimilation of additional recon flight-level plus dropsondes improves both track and intensity forecasts

DA Tiger Team: APRC, APCT & APAR errors for 2008-2012



- Somewhat surprisingly, addition of TDR does not further improve beyond FL+drops

DA Tiger Team: APAR vs. APSU (2012 system) errors for 2008-2012

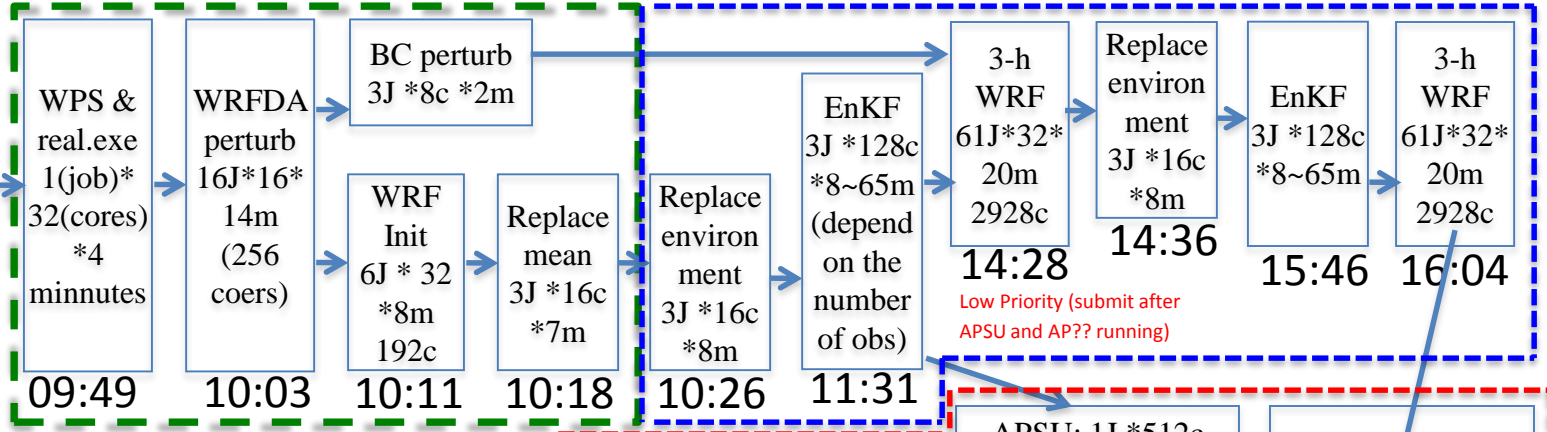


- For all the TDR cases, no significant performance difference between experiments
- More tests needed

PSU 2013 System Workflow

**4 epochs:
00,06,12,
18Z
@+3:45h**

e.g. for 06Z,
Starts @
09:45

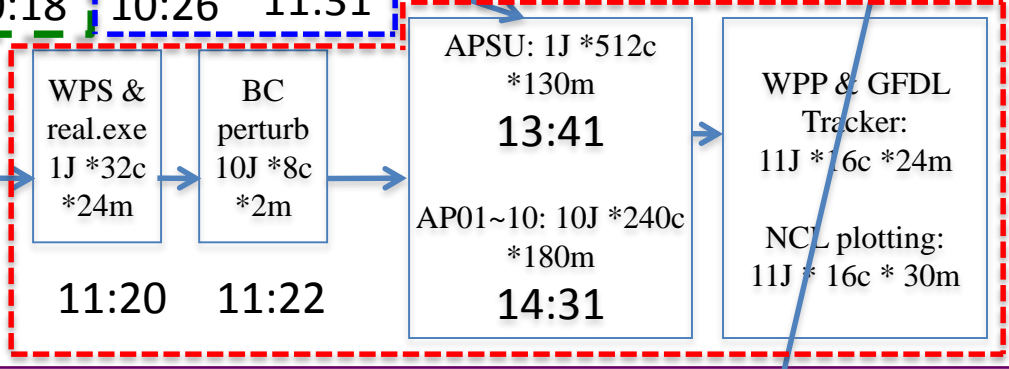


Initial: arwenkf_step1_icbcs.sh

Assimilation: arwenkf_step2_anacycle.sh

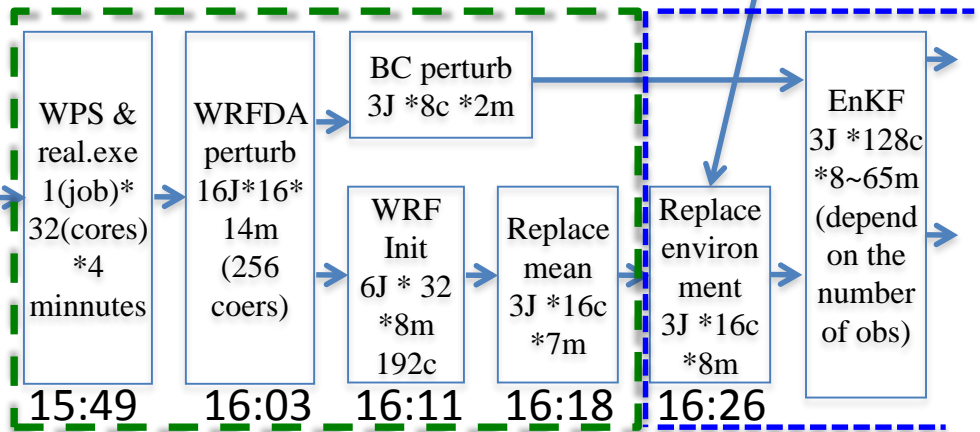
Forecast: arwenkf_step3_forecast.sh

10:55



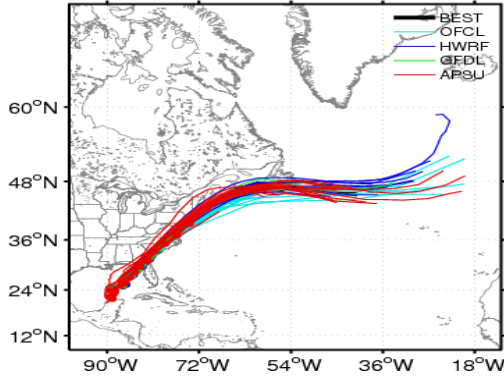
**12Z,
Starts @
15:45**

/lfs2/projects/hfip-
psu/yweng/D2013/APSU_Shell/r
un_APSU.sh

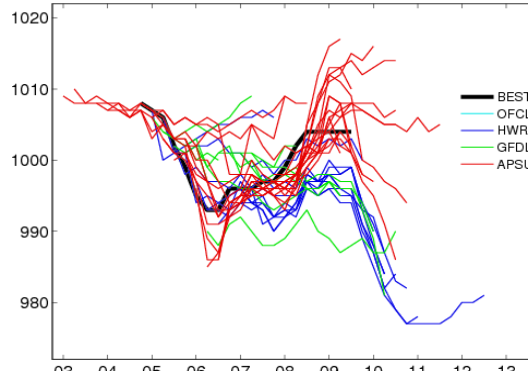


Atlantic storm Andrea in 2013

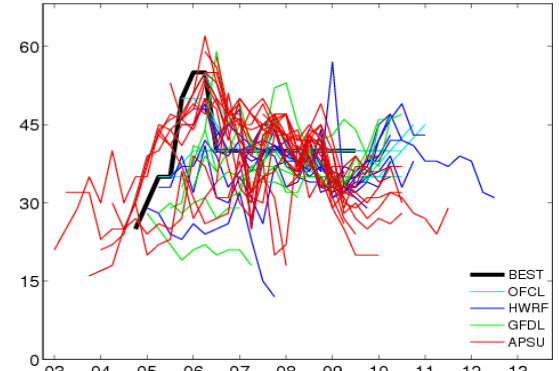
2013al01 Andrea APSU Track



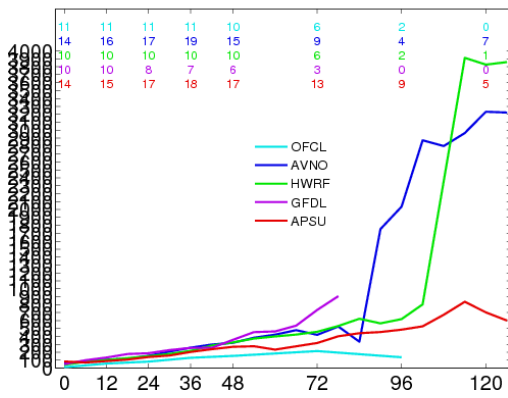
2013al01 Andrea APSU Pmin



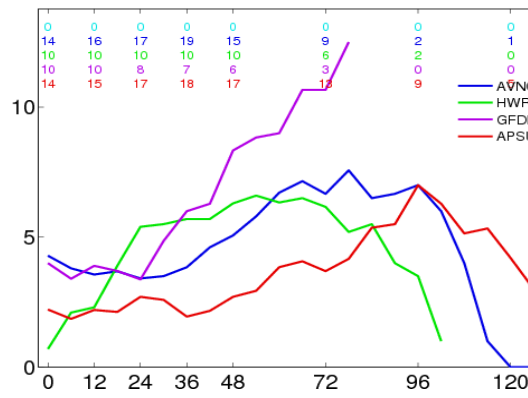
2013al01 Andrea APSU Vmax



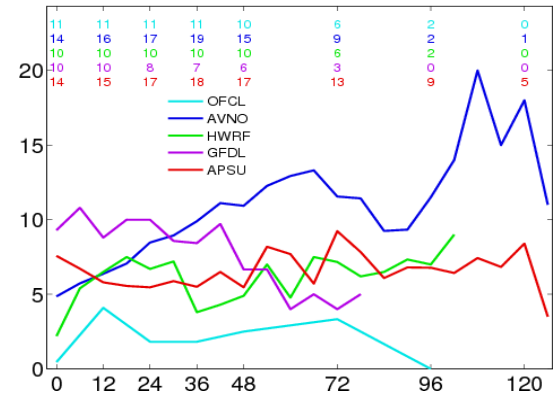
Homo Abs Error of position (km) for 2013al01-APSU-OFCL



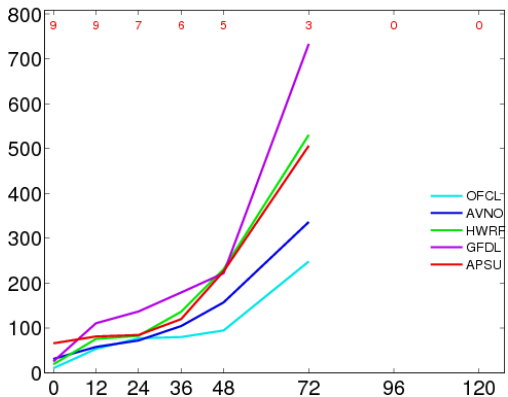
Homo Abs Error of minSLP (hPa) for 2013al01-APSU-OFCL



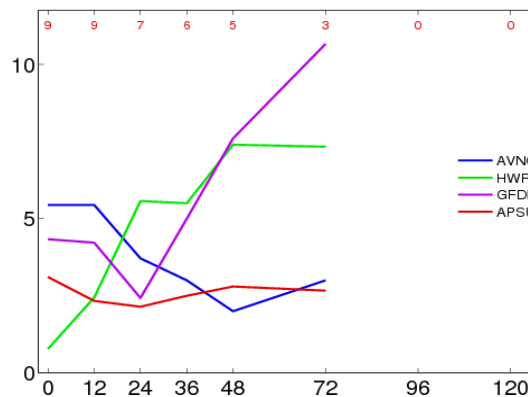
Homo Abs Error of maxWSP (kts) for 2013al01-APSU-OFCL



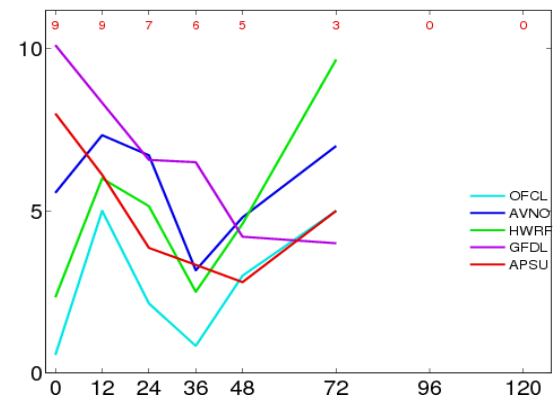
Homo Abs Error of position (km) for 2013al01-APSU-OFCL



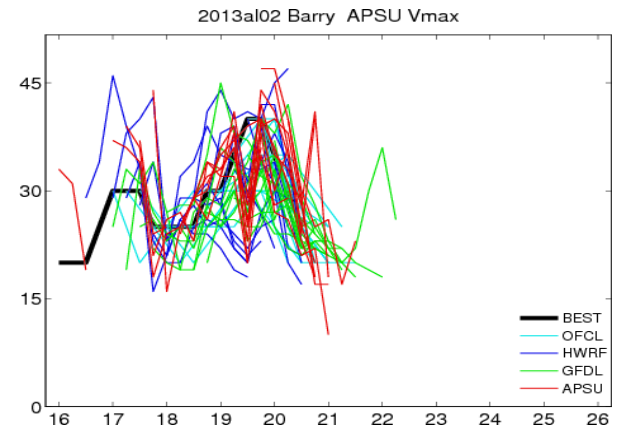
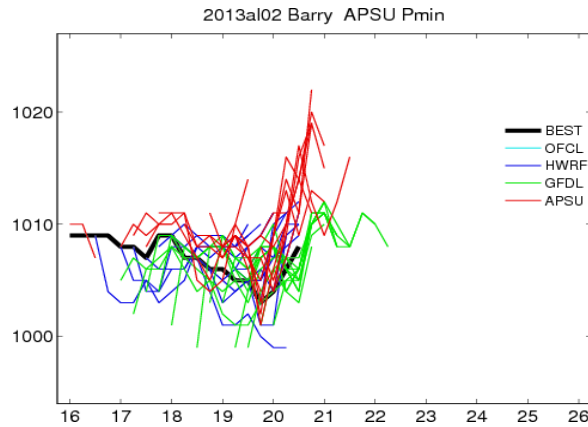
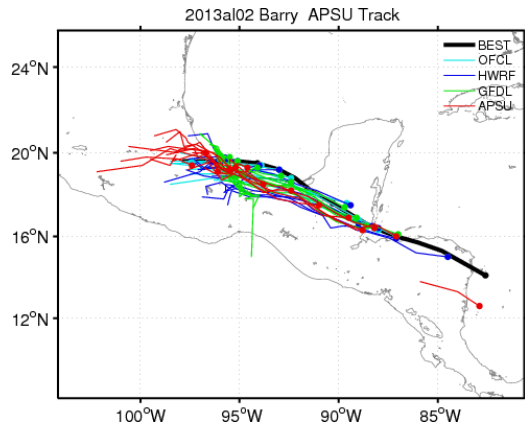
Homo Abs Error of minSLP (hPa) for 2013al01-APSU-OFCL



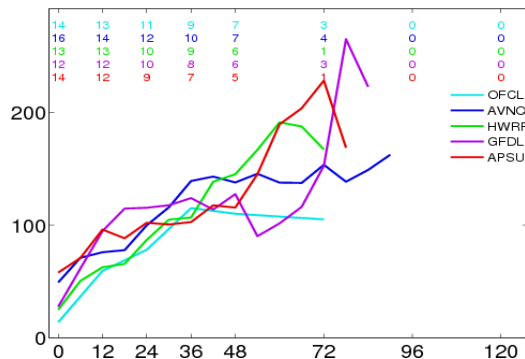
Homo Abs Error of maxWSP (kts) for 2013al01-APSU-OFCL



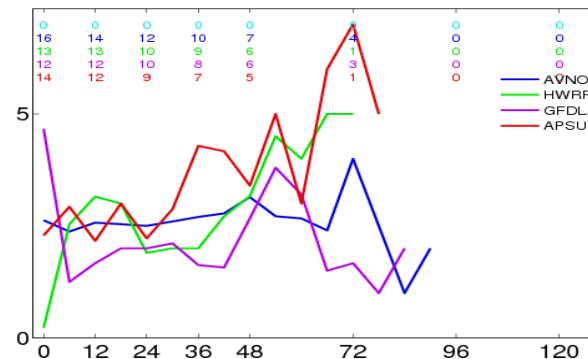
Atlantic storm Barry in 2013



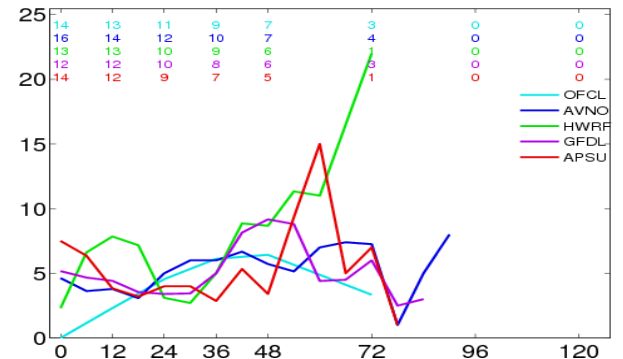
Homo Abs Error of position (km) for 2013aI02-APSU-OFCL



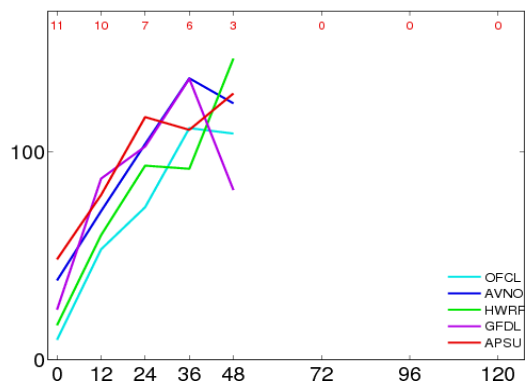
Homo Abs Error of minSLP (hPa) for 2013aI02-APSU-OFCL



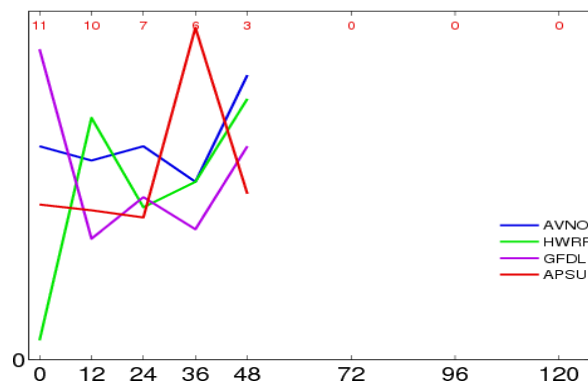
Homo Abs Error of maxWSP (kts) for 2013aI02-APSU-OFCL



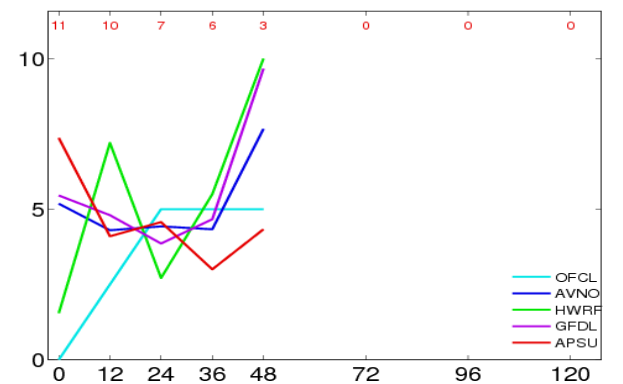
Homo Abs Error of position (km) for 2013aI02-APSU-OFCL



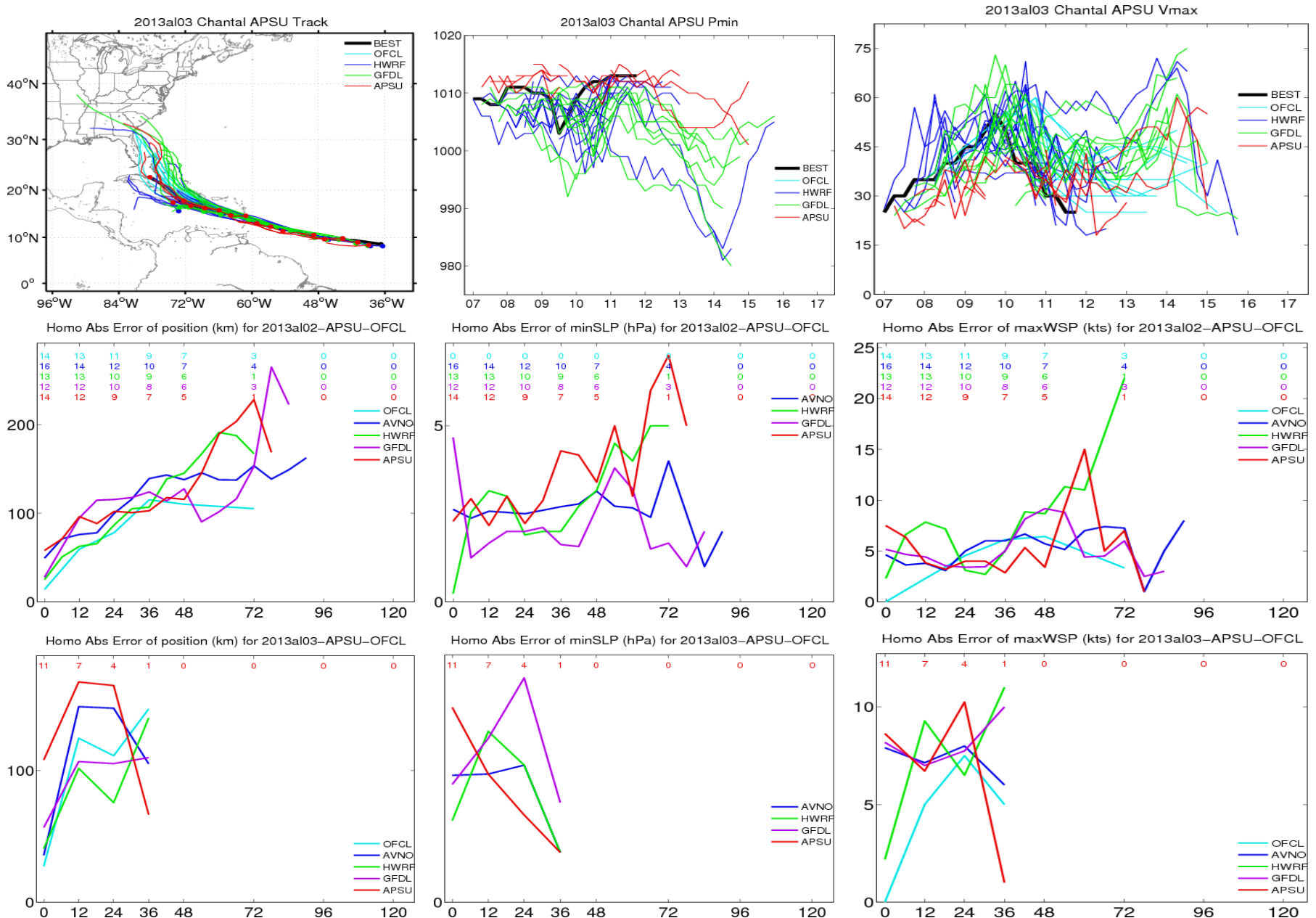
Homo Abs Error of minSLP (hPa) for 2013aI02-APSU-OFCL



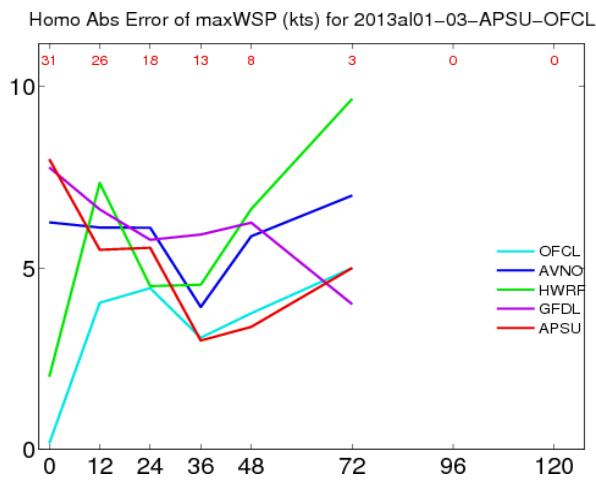
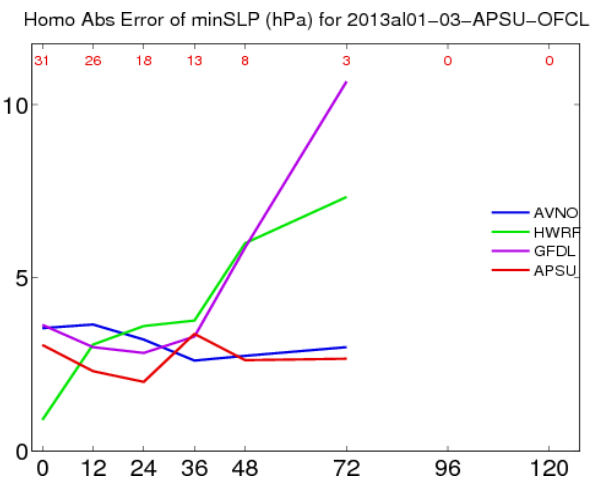
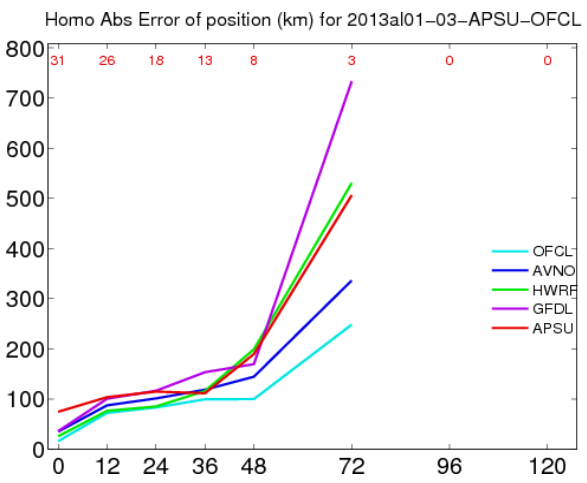
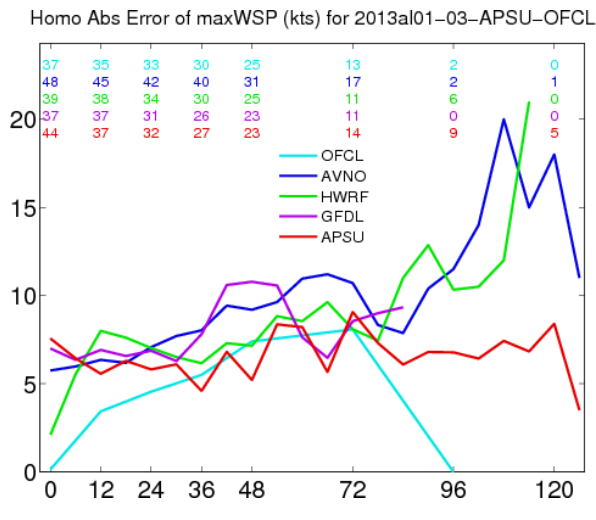
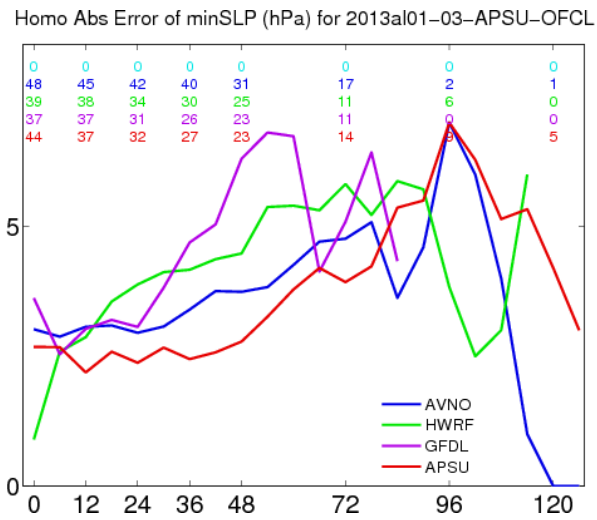
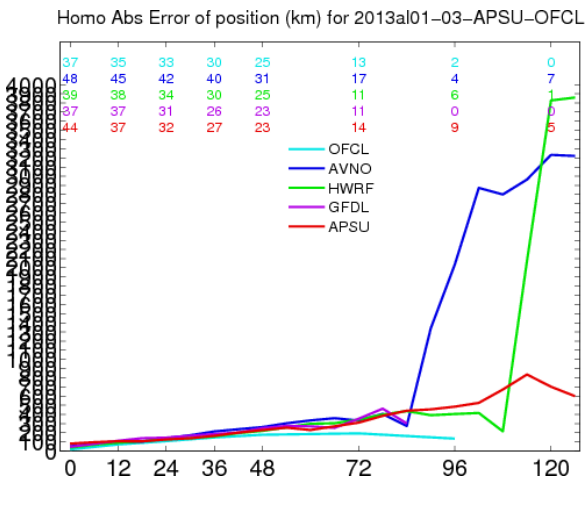
Homo Abs Error of maxWSP (kts) for 2013aI02-APSU-OFCL



Atlantic storm Chantal in 2013



First 3 Atlantic storms in 2013



PSU 2013 System Product Distribution

- Tire1: ATCF a-deck file to NHC;
- Tier2: 2-D Grib fields to TCMT;
- Website: <http://hfip.psu.edu/>
 - The website is “perfect”: I sent the whole group including some ex-members an Email at June 25 to ask for comments and suggestions, but I only got responds from Ben and Fuqing.