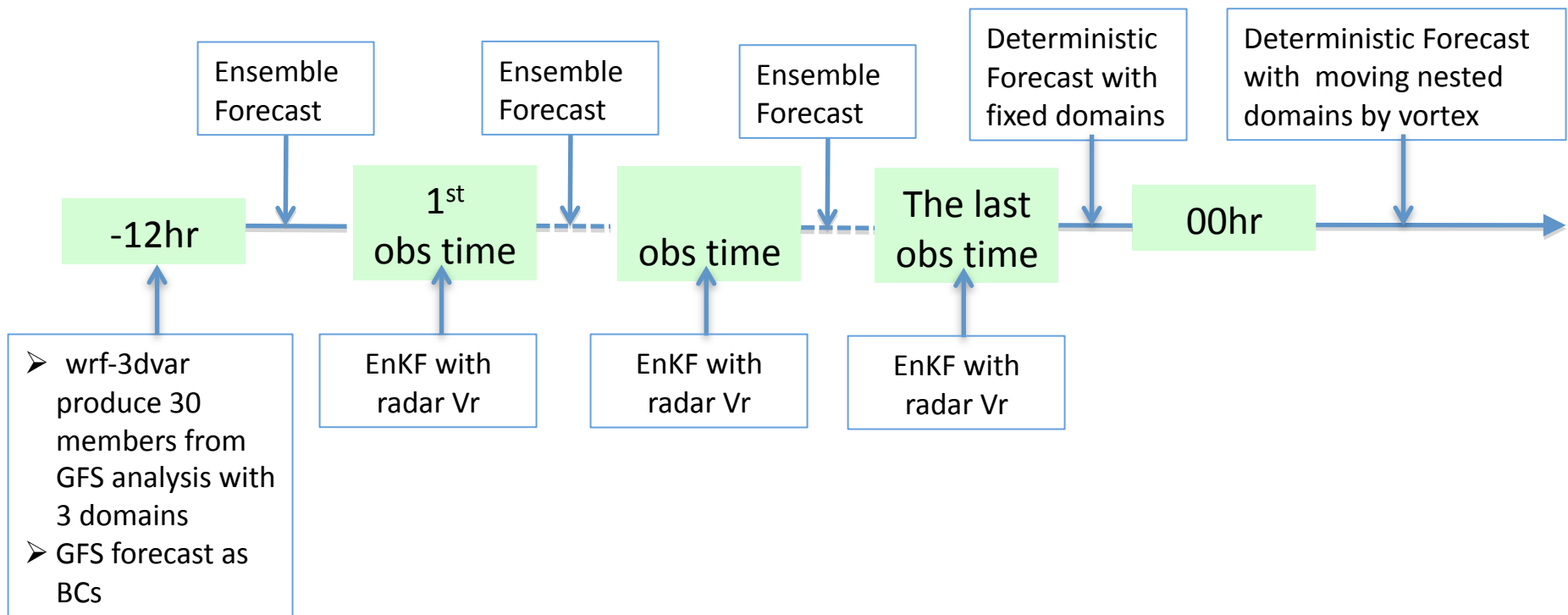


PSU/TAMU HRH TEST REPORT
Impact of Resolution with ARW-EnKF

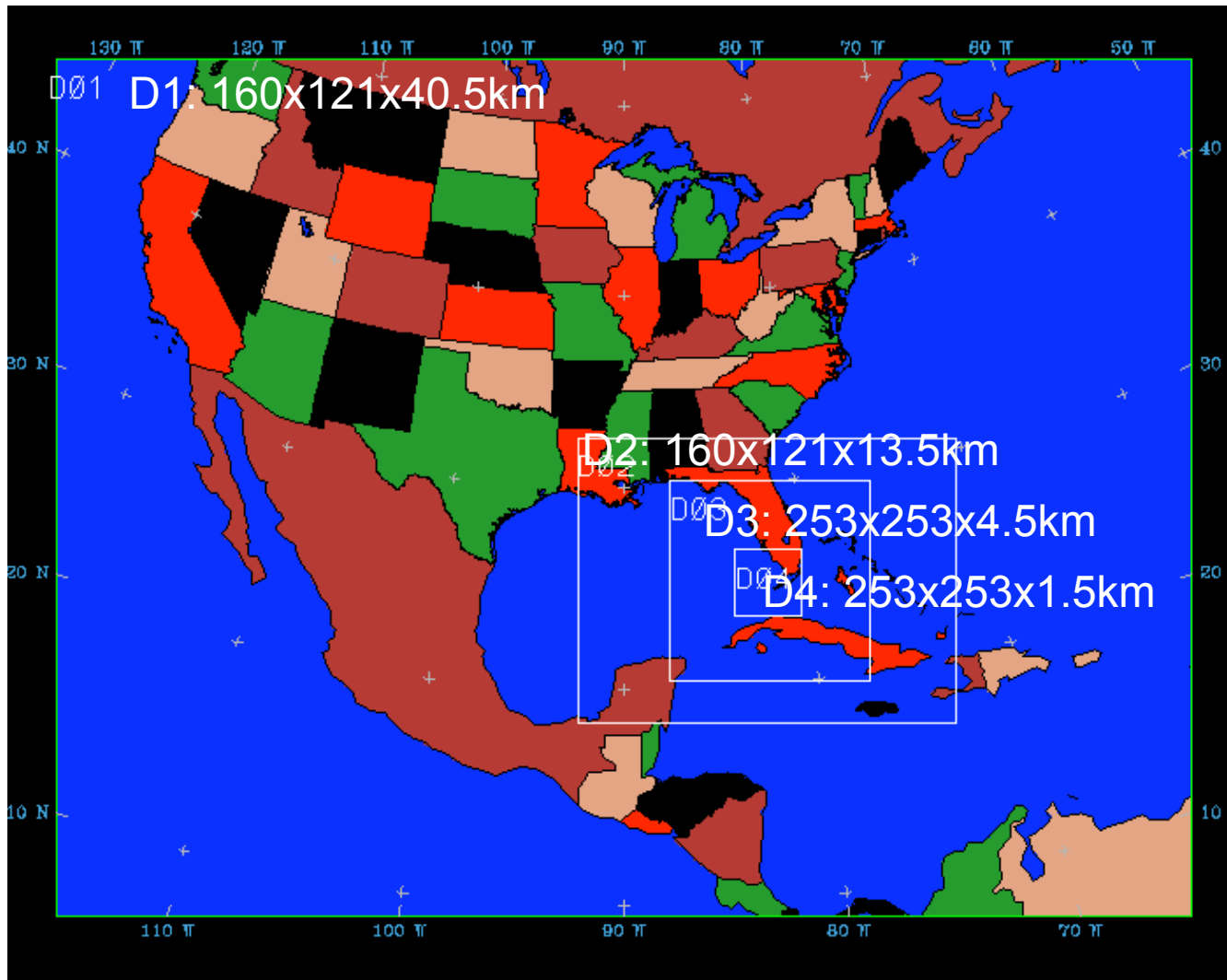
Fuqing Zhang
Penn State University

Yonghui Weng, John Gamache and Frank Marks

Experiment design for Ensemble based Data Assimilation with Radar Vr



Model Configurations



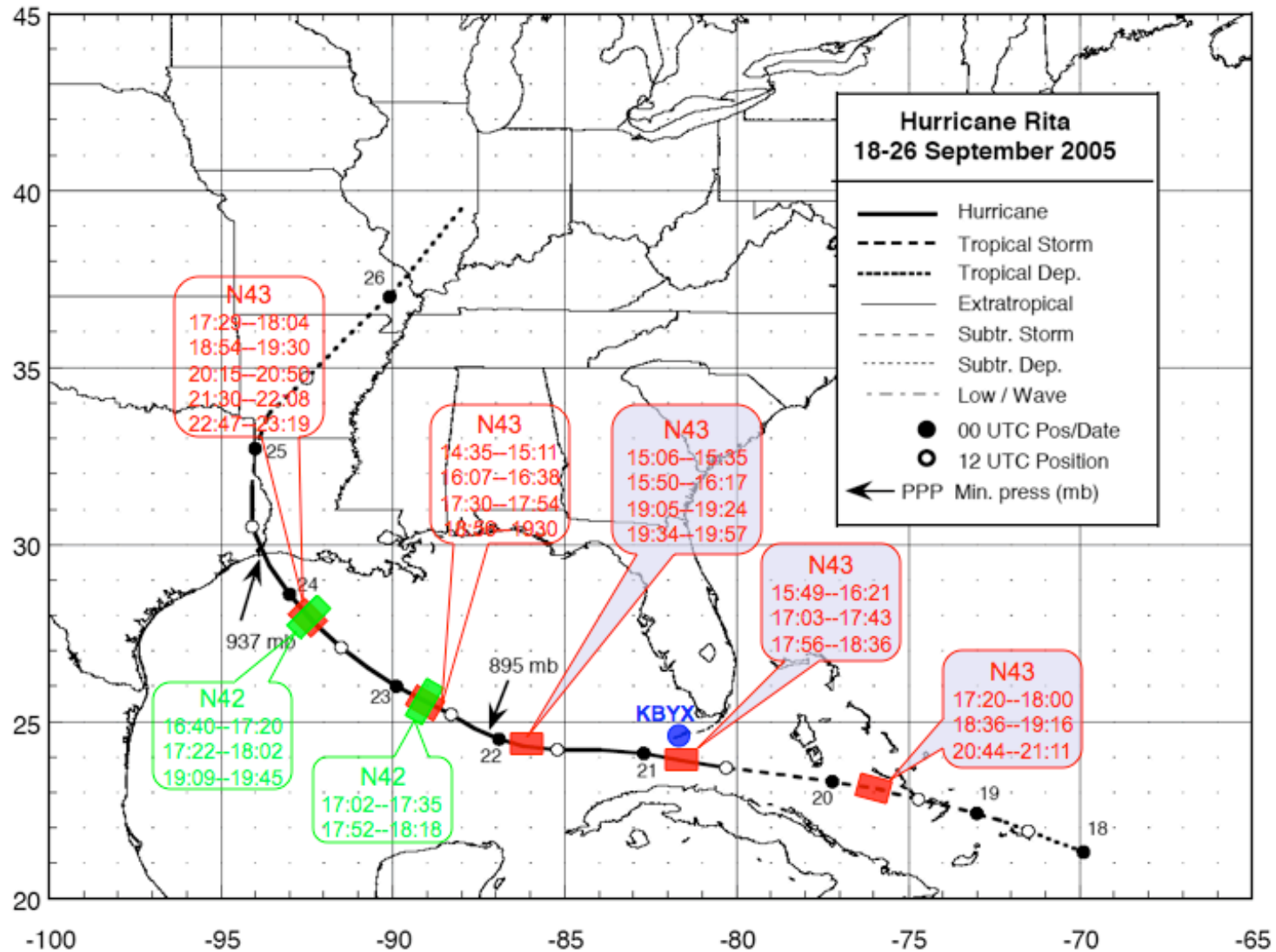
- 35 vertical levels;
- WSM 6-class microphysics;
- YSU PBL;
- Grell-Devenyi CPS

- 30-member ensemble;
- Gaspari&Cohn 99' covariance localization with varying RoI

- IC & BC: GFS using 3DVAR background uncertainty

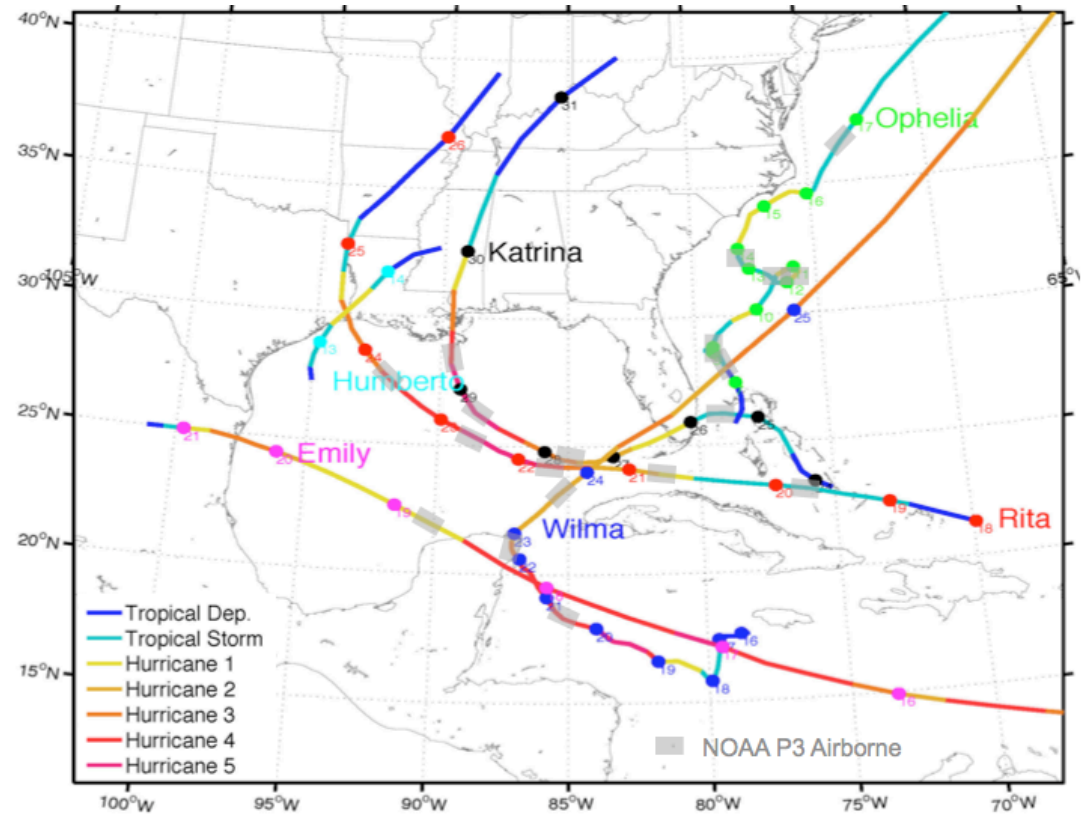
Hurricane Rita (2005)

Best track and NOAA P3 airborne



Test Cases

- The Hurricane Research Division (HRD) collects NOAA P3 aircraft radar data sets and process them on most tropical cyclones since 1994.
- NexRAD data can be useful for near-shore tropical storms.

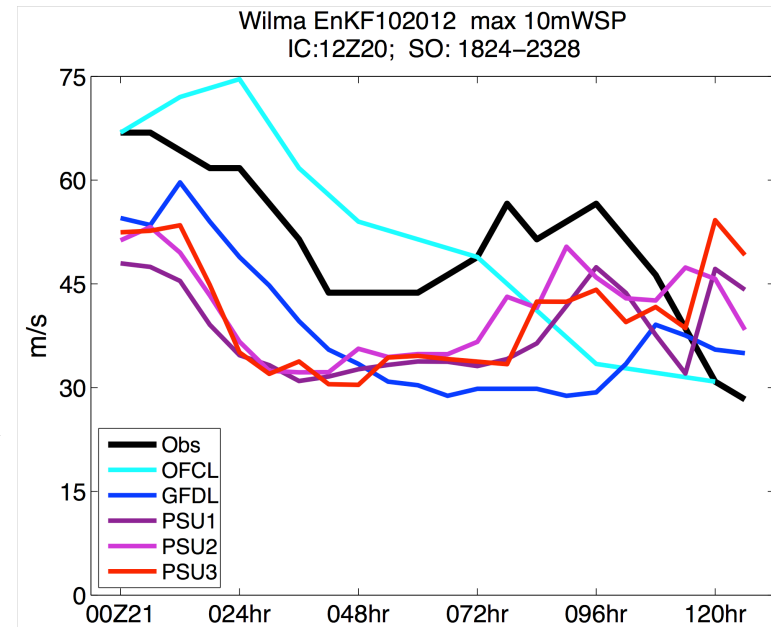
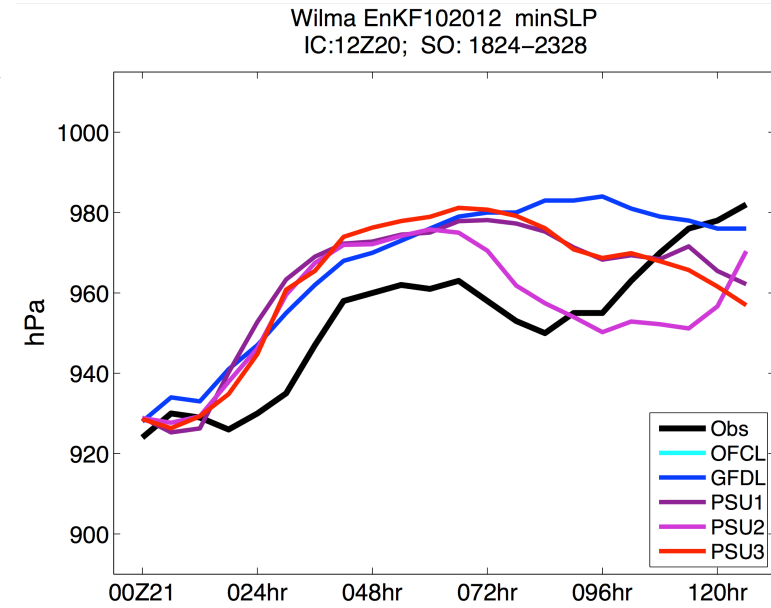
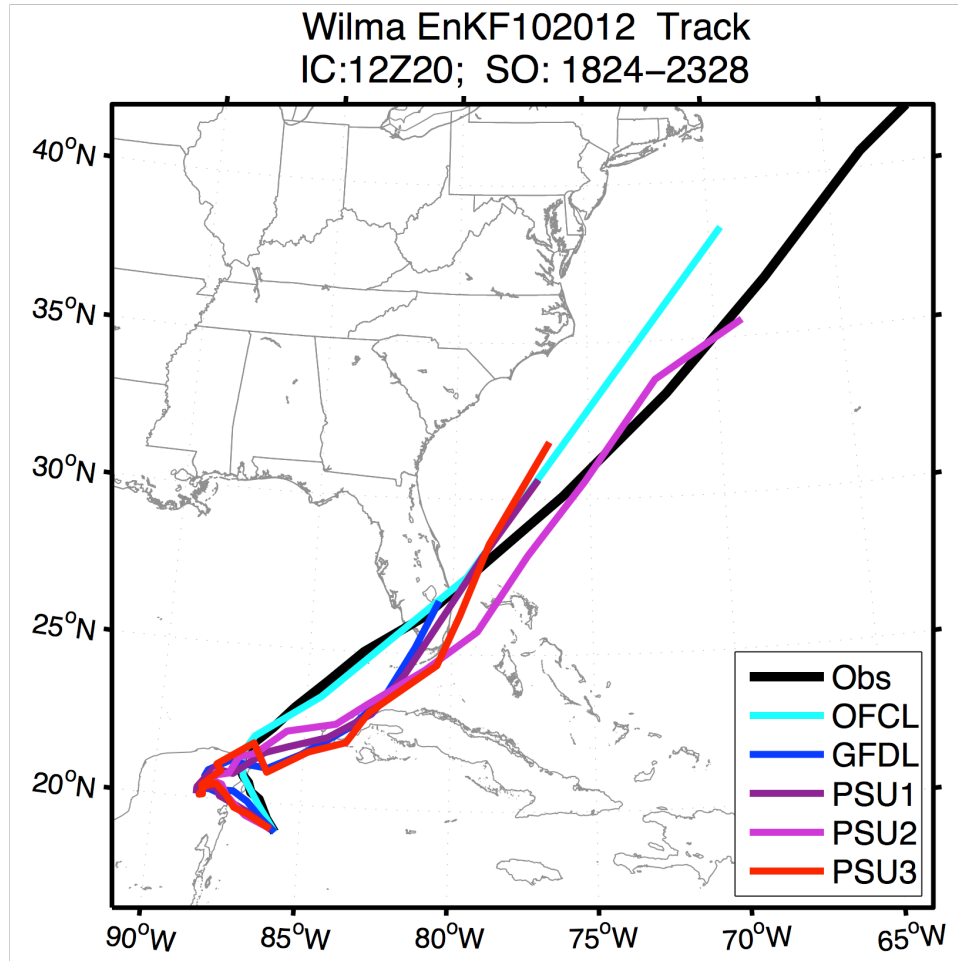


Noaa P3 airborne radar observations for hurricane

Test Cases

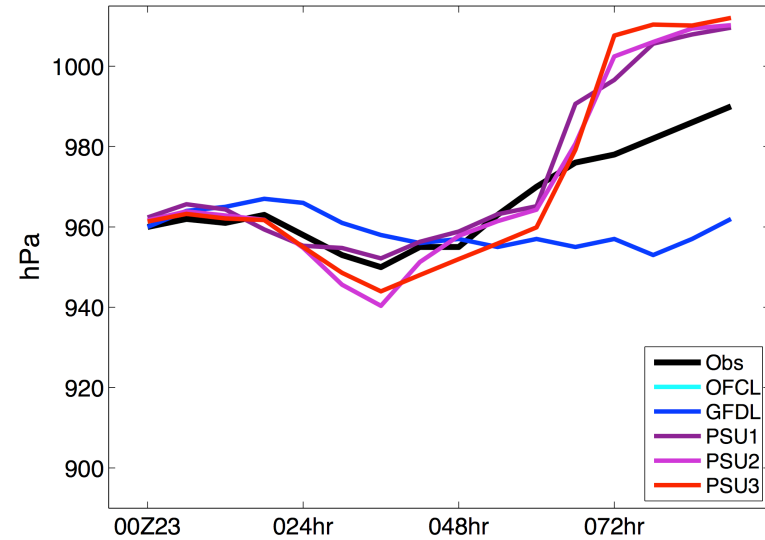
Storm	Initial Time	Obs.	Free Forecast	Evaluation Time	Hours w/ track	Hours as TC
Wilma	10/16/2005 -- 10/25/2005					
	12Z/20	N42	23Z/20	00Z/21	126	114
	12Z/22	N42	22Z/22	00Z/23	90	66
Rita	9/18/2005 -- 9/24/2005					
	12Z/19	N43	21Z/19	00Z/20	126	126
	12Z/20	N43	18Z/20	00Z/21	126	120
	12Z/21	N43	20Z/21	00Z/22	102	96
Katrina	8/24/2005 -- 8/29/2005					
	12Z/25	N43	20:30Z/25	00Z/26	126	114
	12Z/27	N43	20Z/27	00Z/28	78	66
Humberto	9/12/2007 -- 9/13/2007					
	00Z/12	NexRAD	18Z/12	00Z/13	36	24
Emily	7/11/2005 -- 7/20/2005					
	12Z/18	N43	20:30Z/18	00Z/19	60	60
Ophelia	9/6/2005 -- 9/16/2005					
	12Z/07	N42	19Z/07	00Z/08	126	126

Case 1: Wilma 2005102100

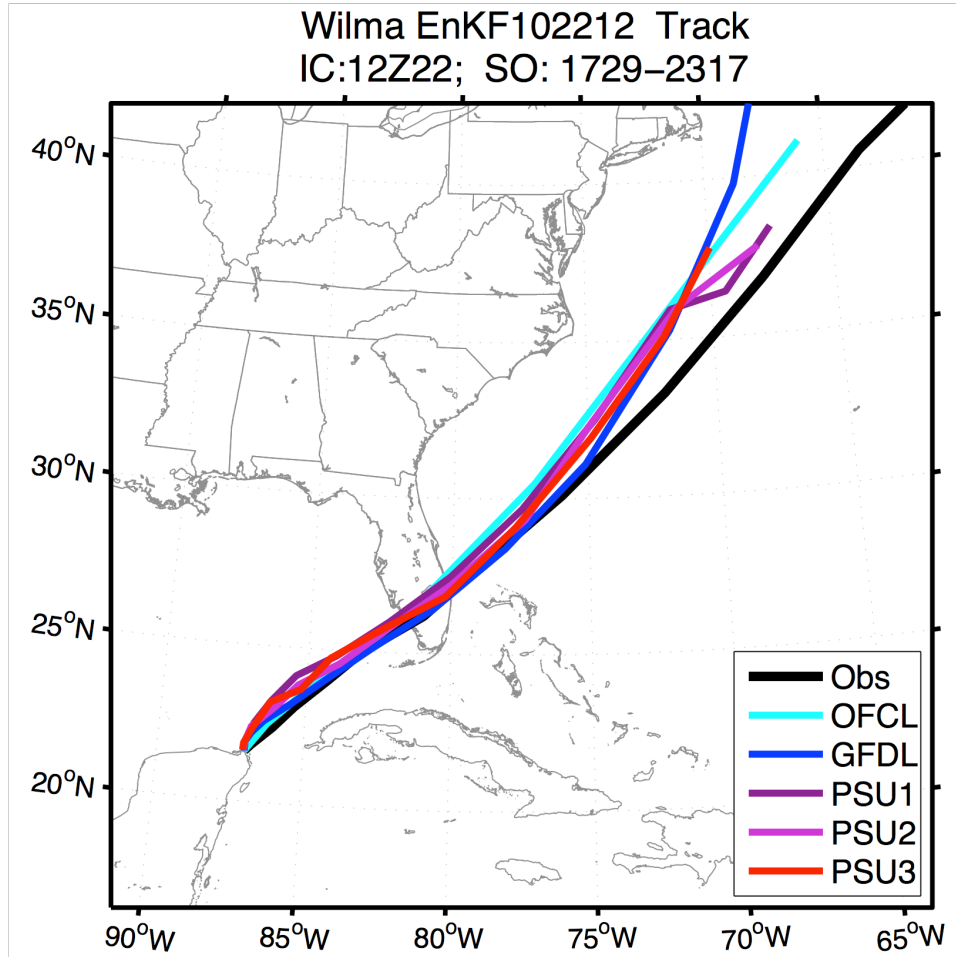
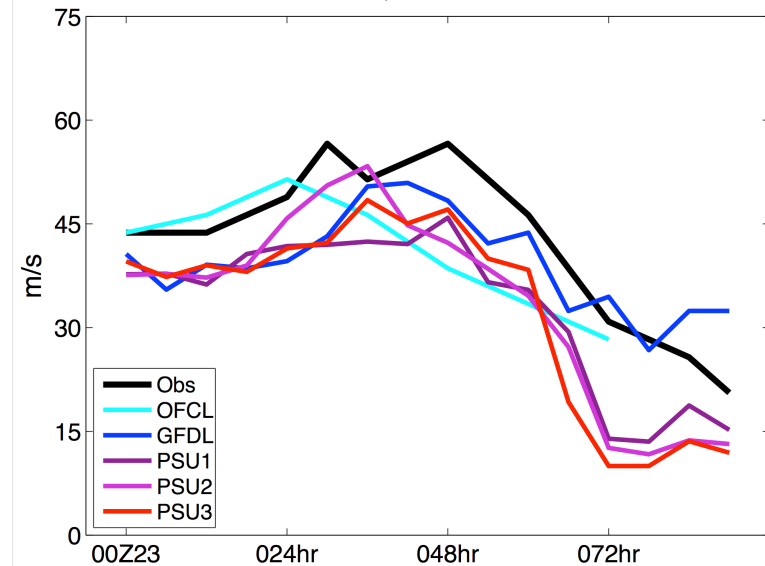


Case 2: Wilma 2005102300

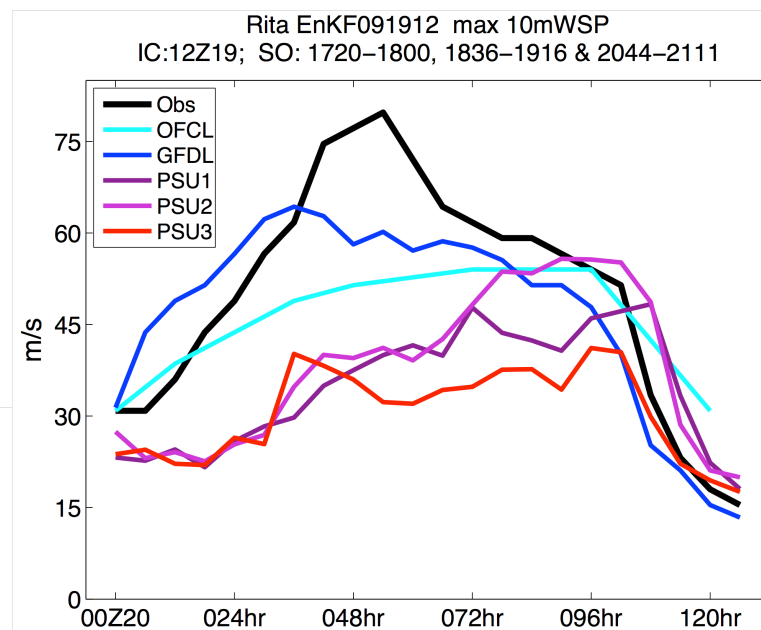
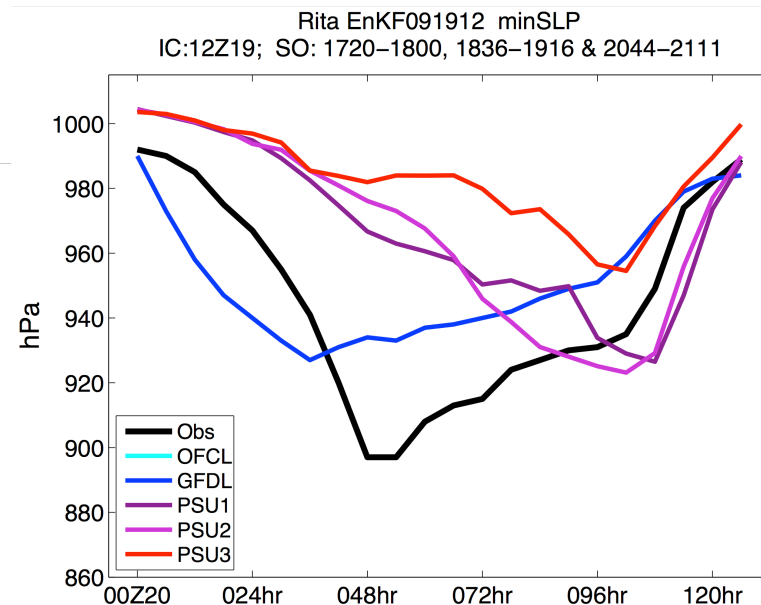
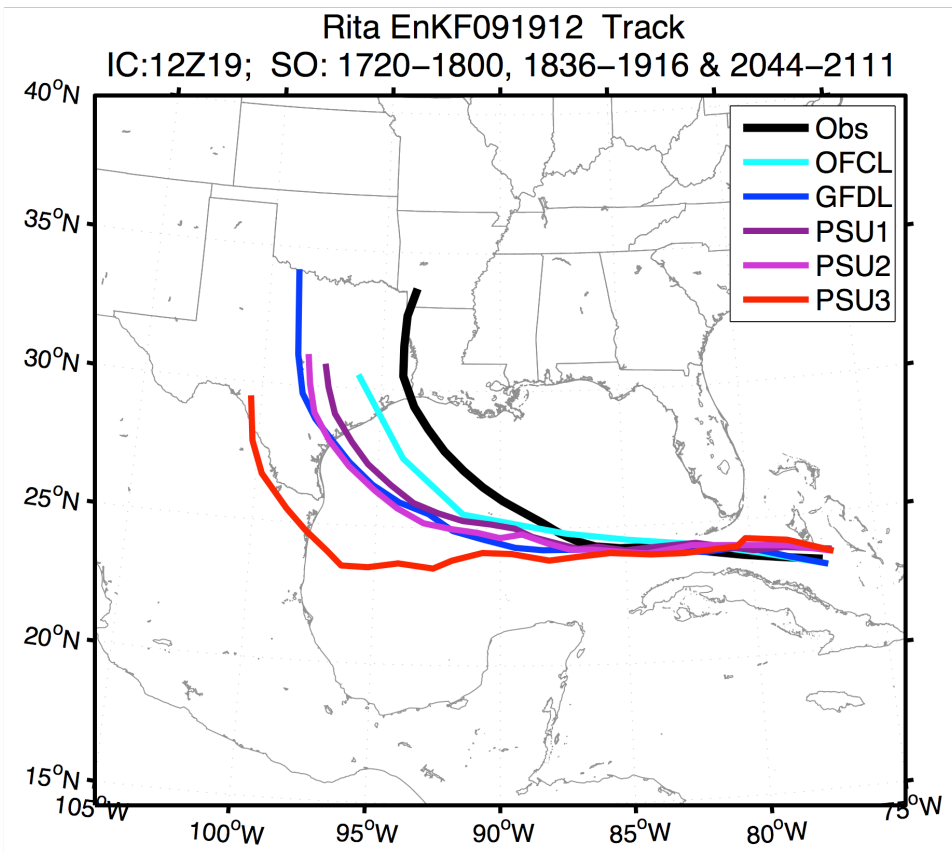
Wilma EnKF102212 minSLP
IC:12Z22; SO: 1729-2317



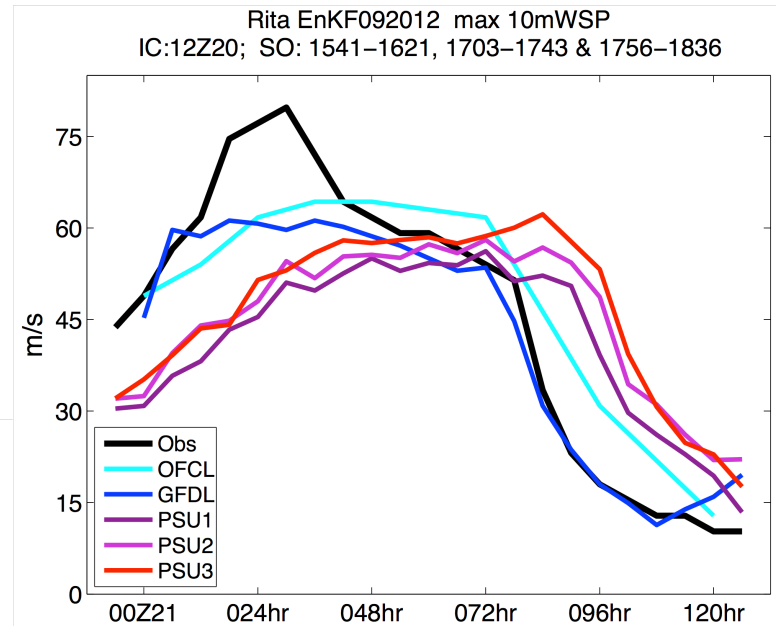
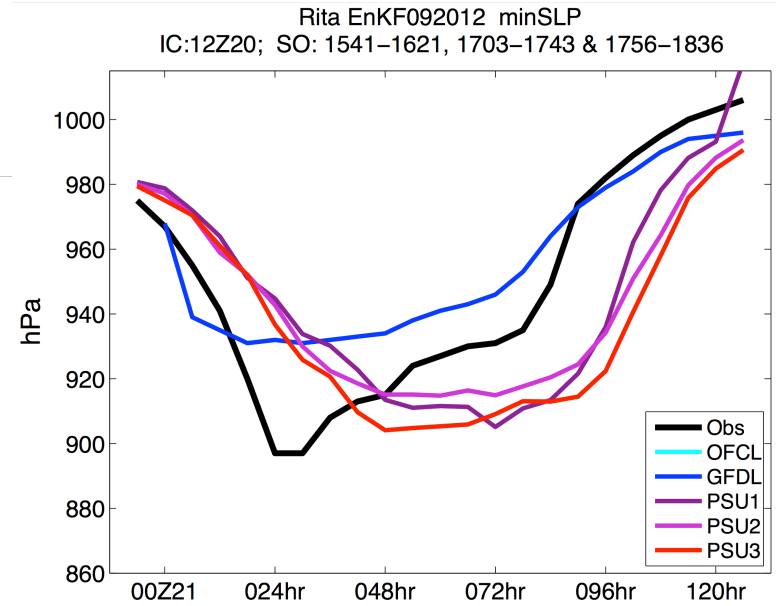
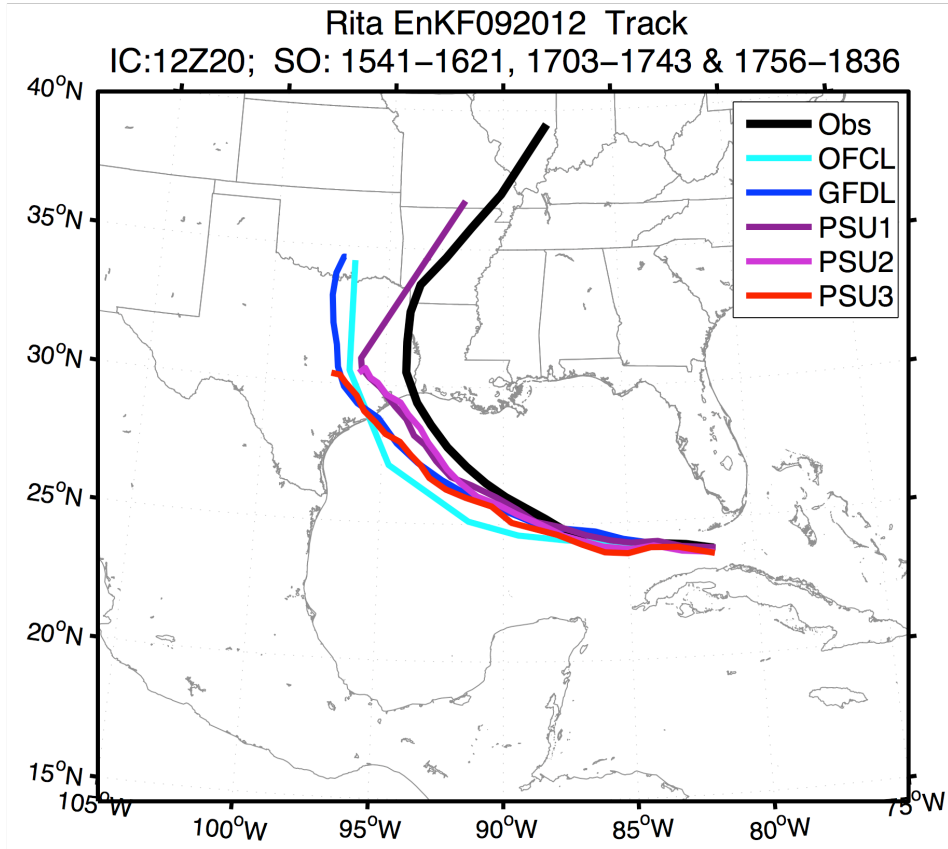
Wilma EnKF102212 max 10mWSP
IC:12Z22; SO: 1729-2317



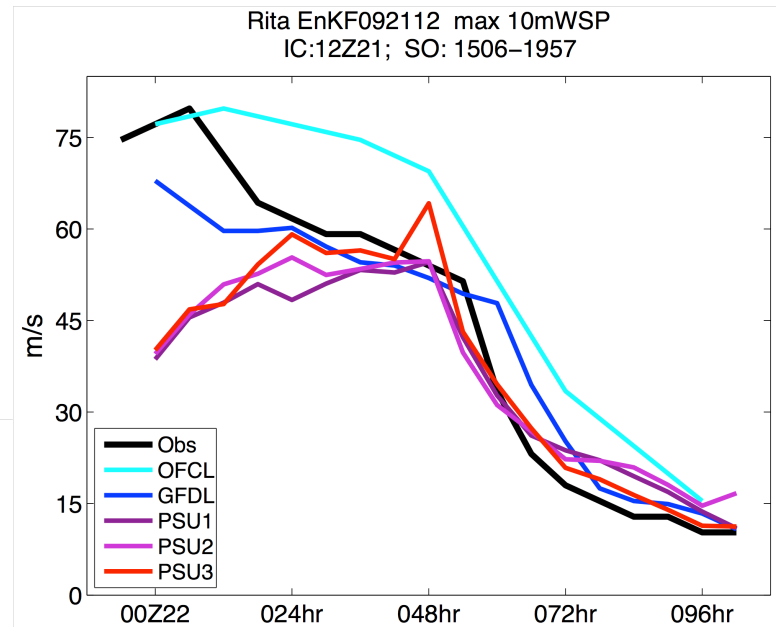
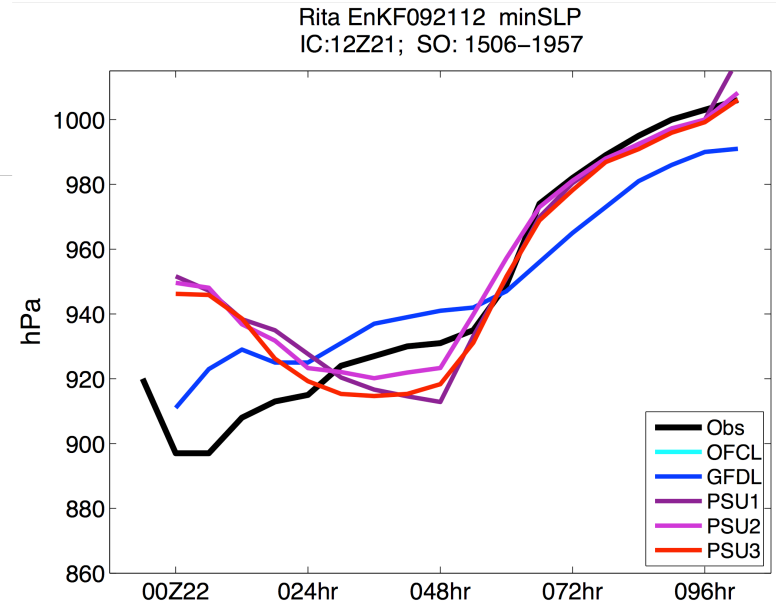
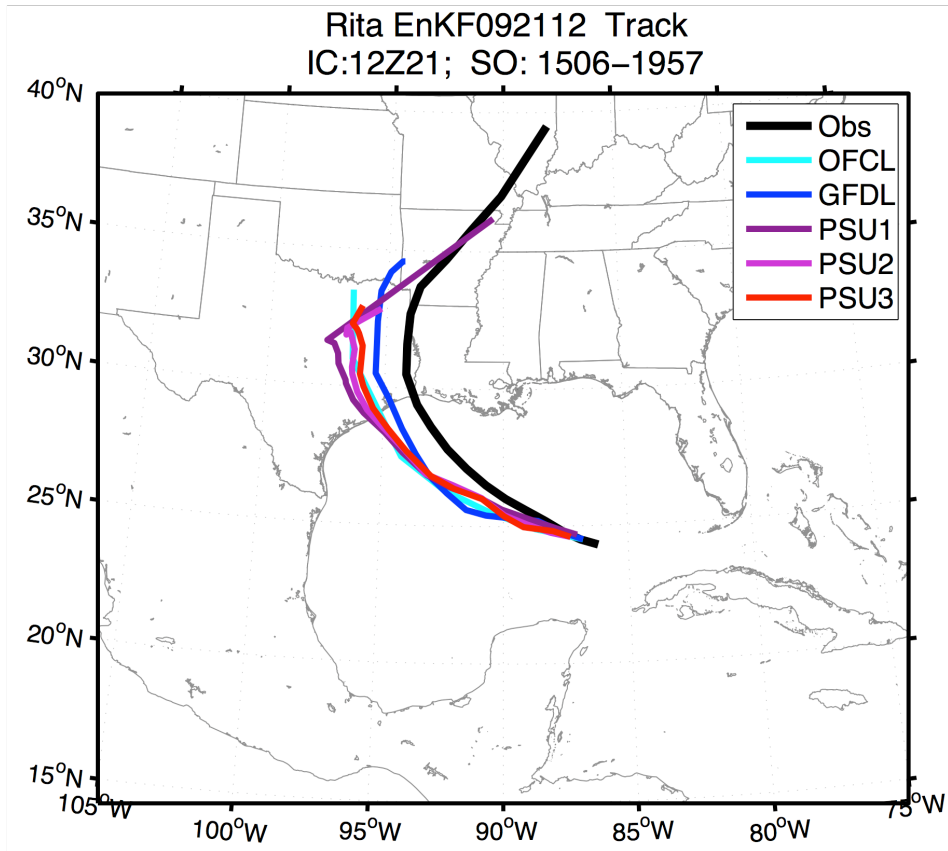
Case 3: Rita 2005092000



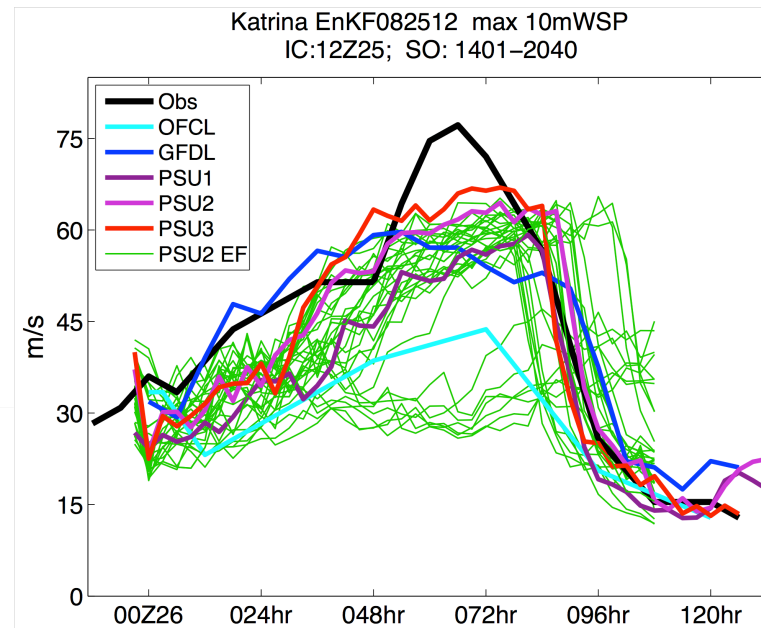
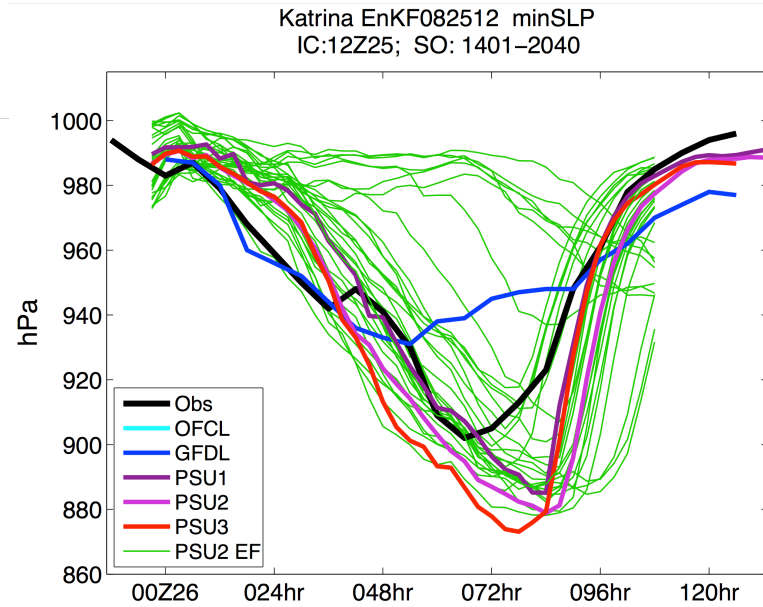
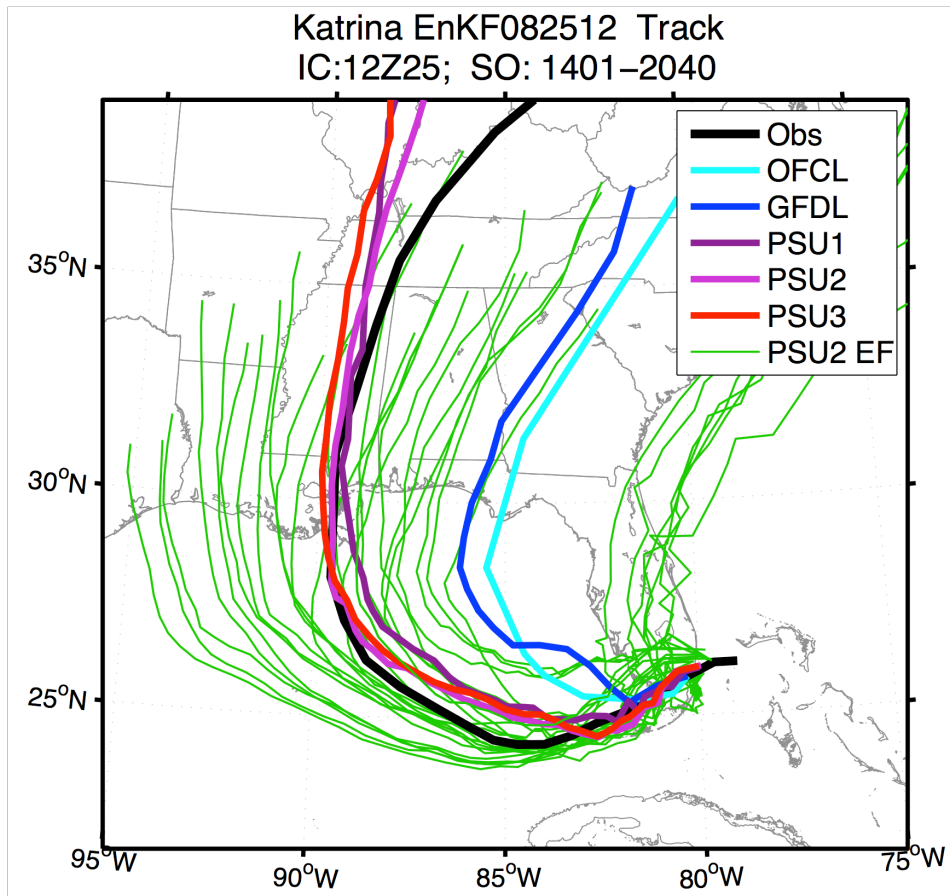
Case 4: Rita 2005092100



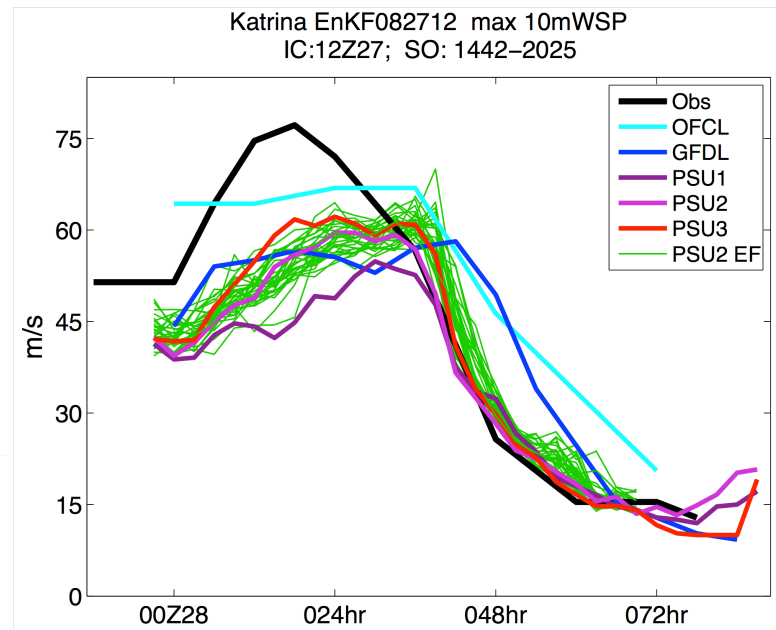
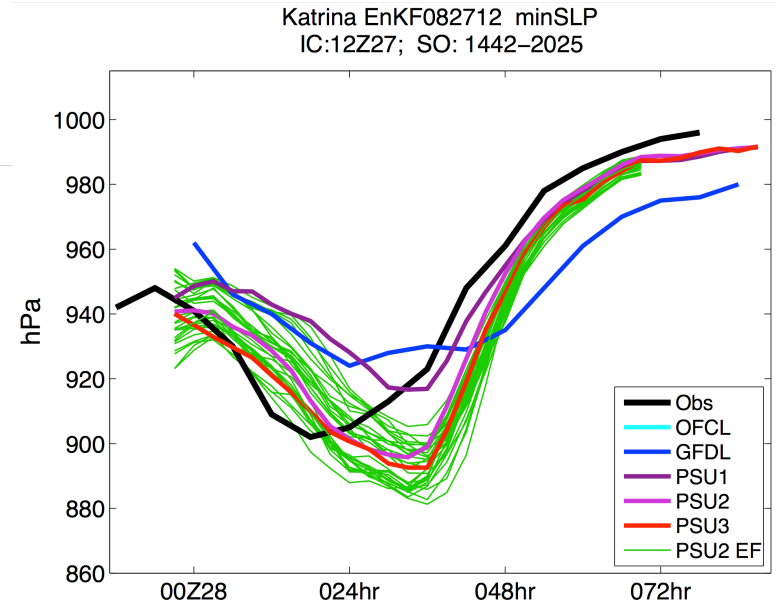
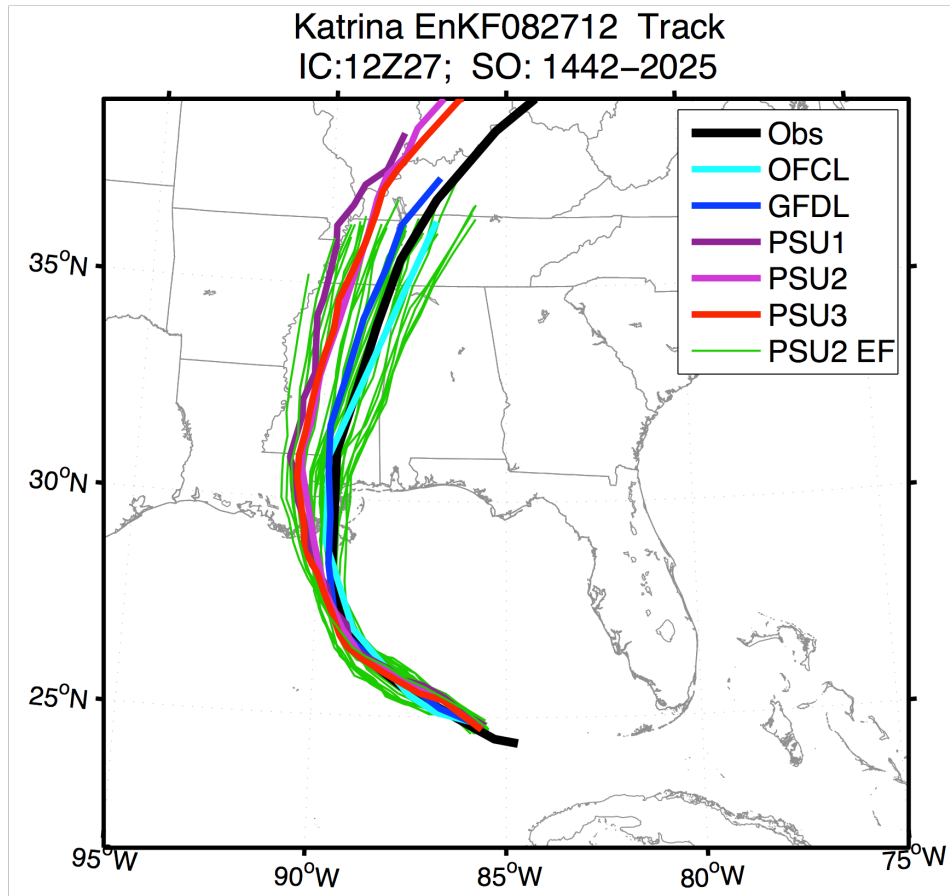
Case 5: Rita 2005092200



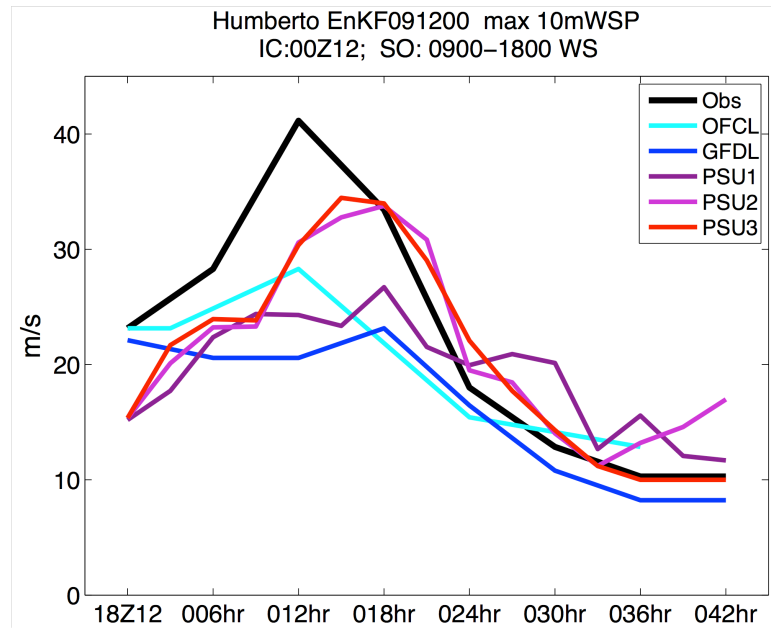
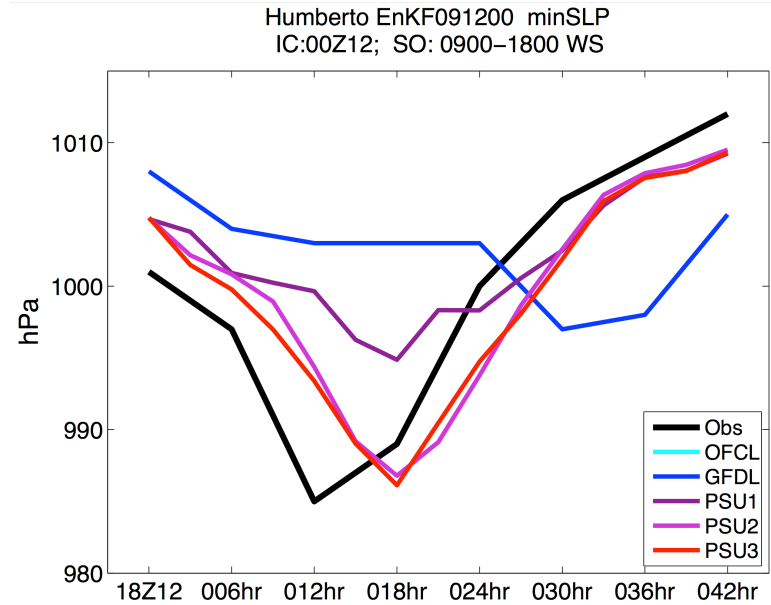
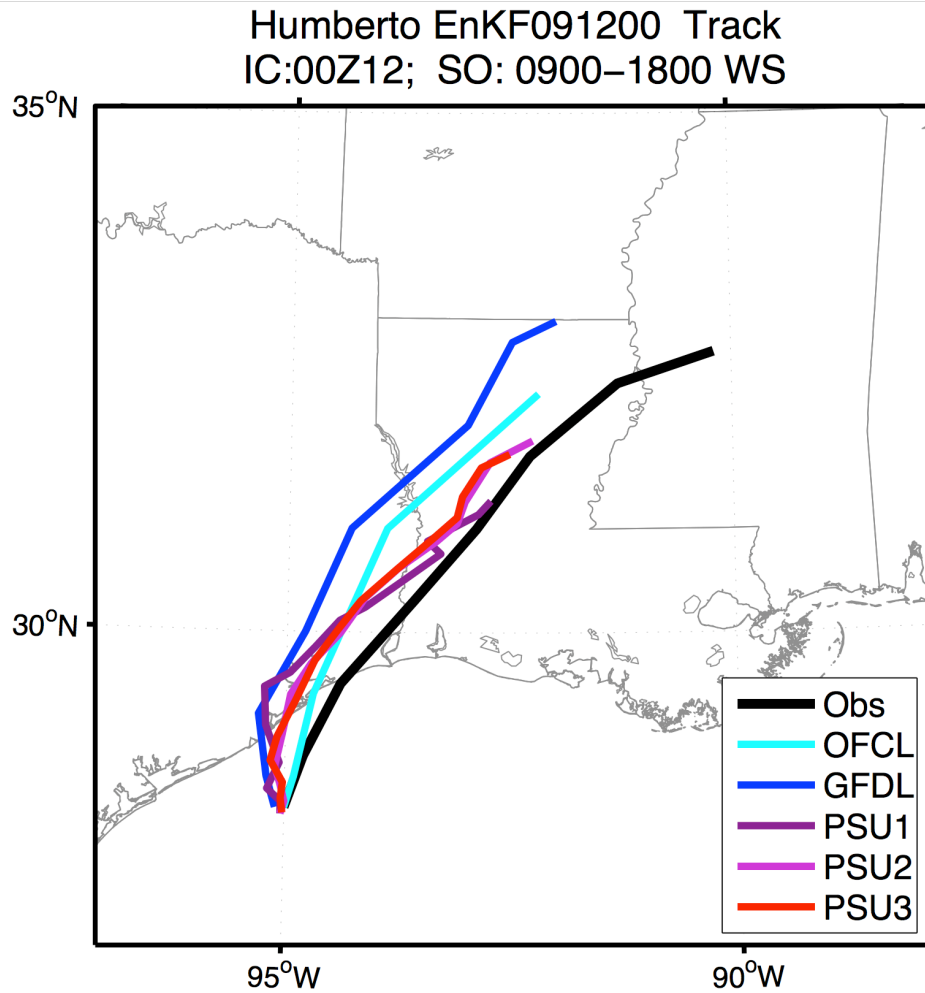
Case 6: Katrina 2005082600



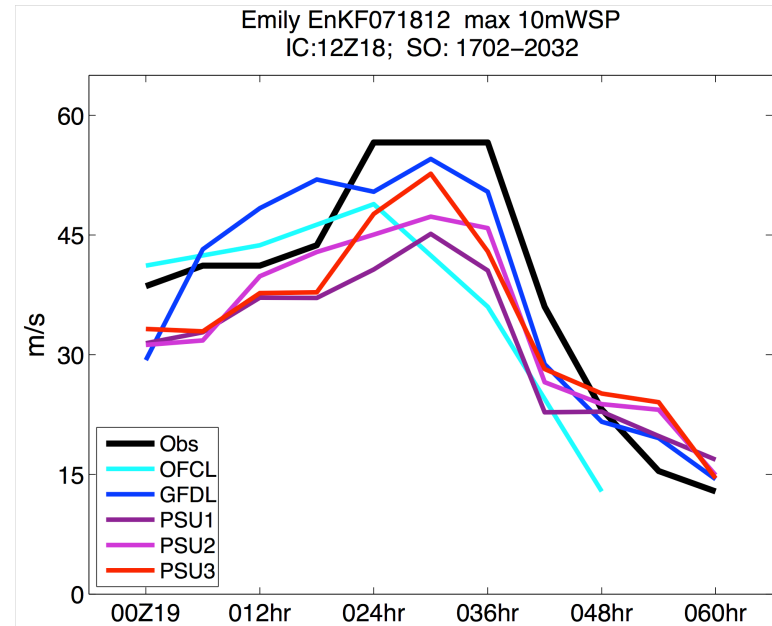
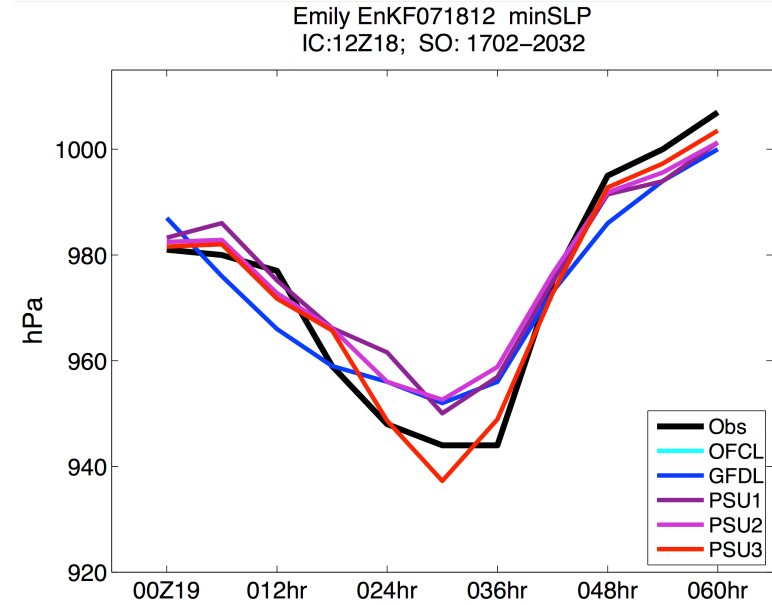
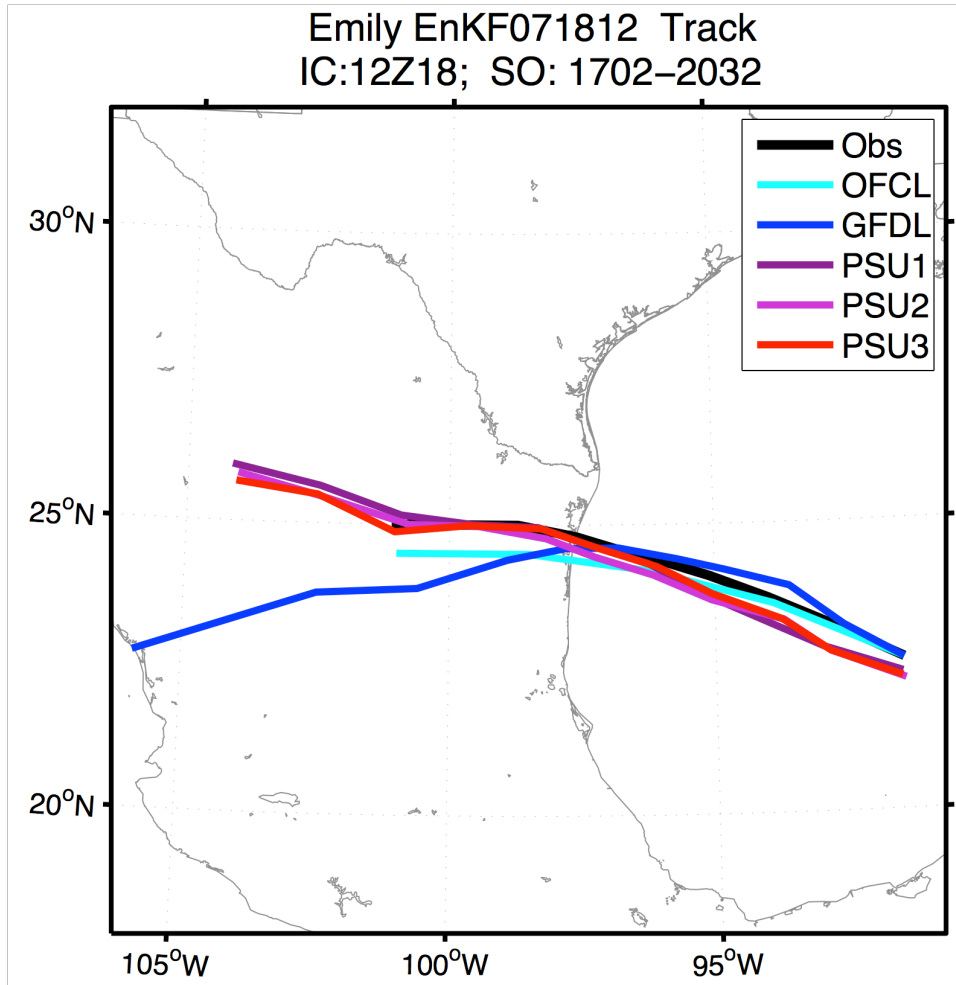
Case 7: Katrina 2005082800



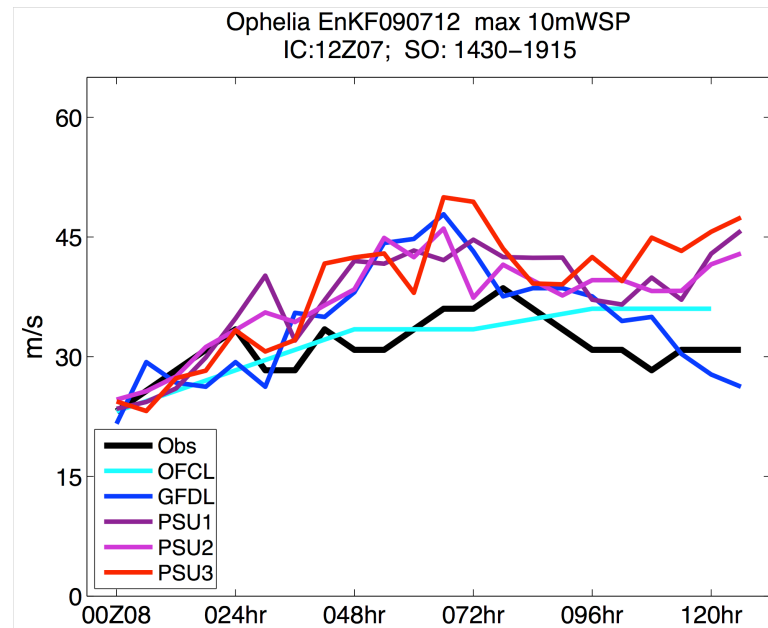
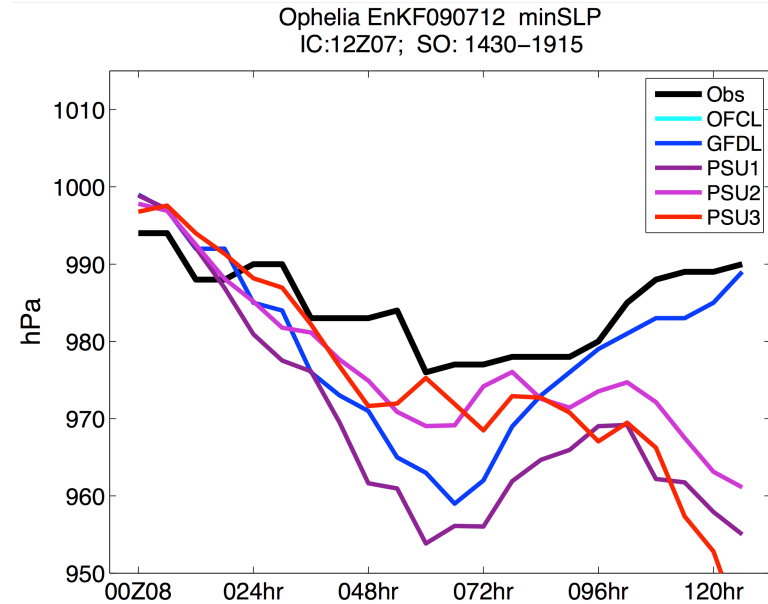
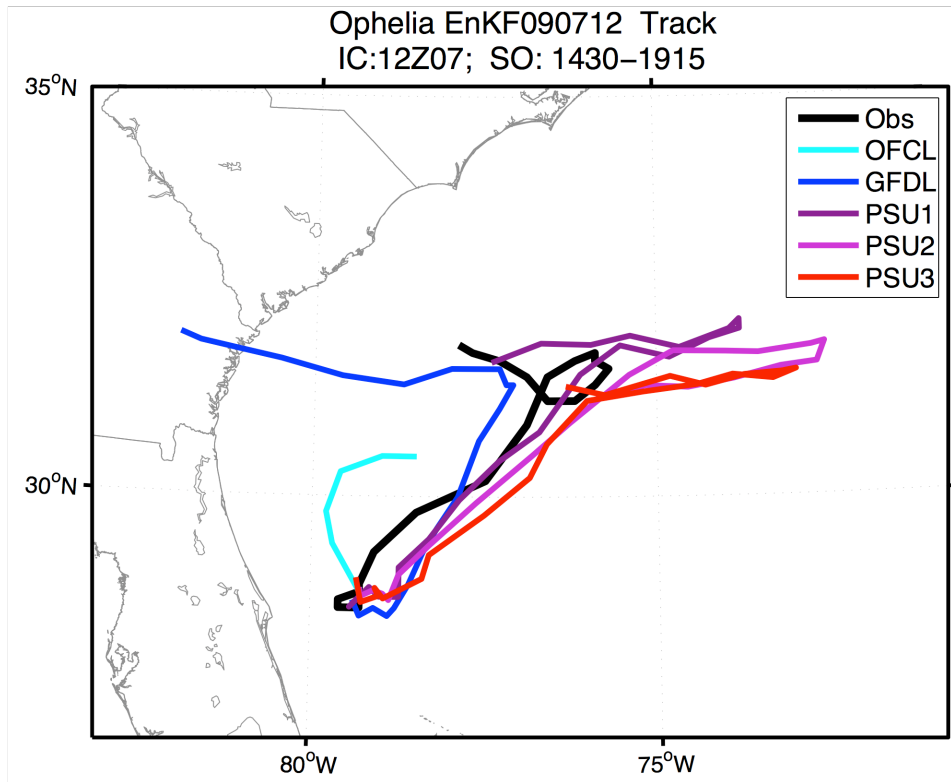
Case 8: Humberto 2007091218



Case 9: Emily 2005071900

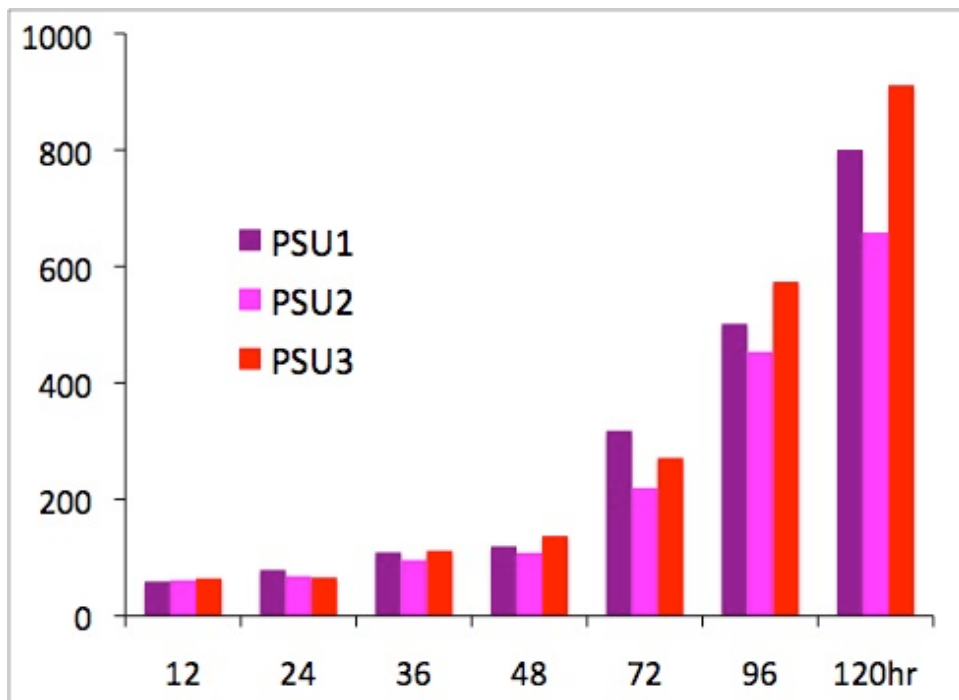


Case 10: Ophelia 20050090800

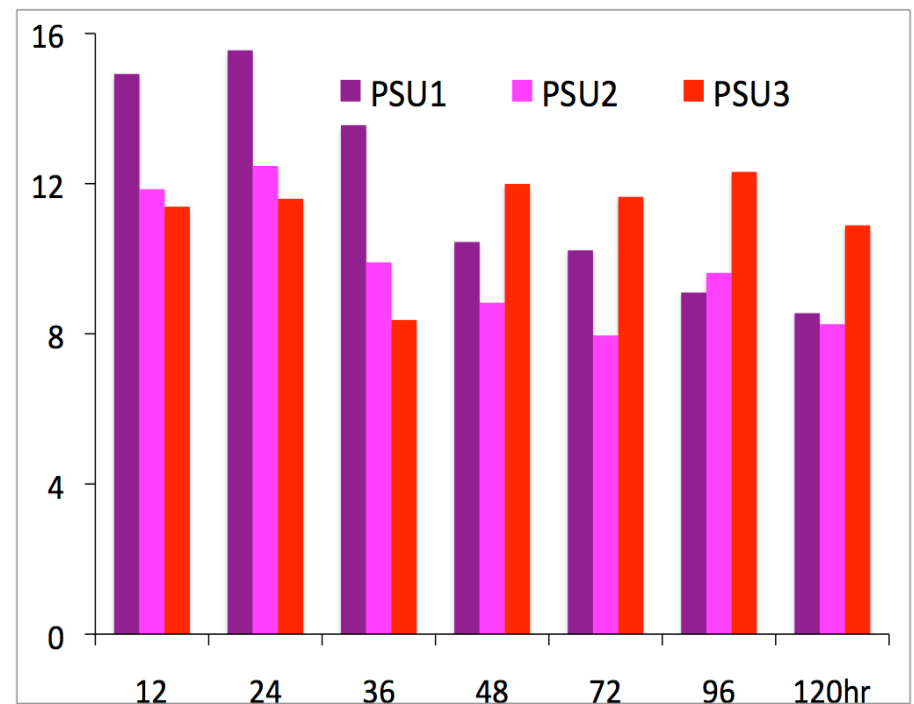


Summary of HRH ARW-EnKF Tests

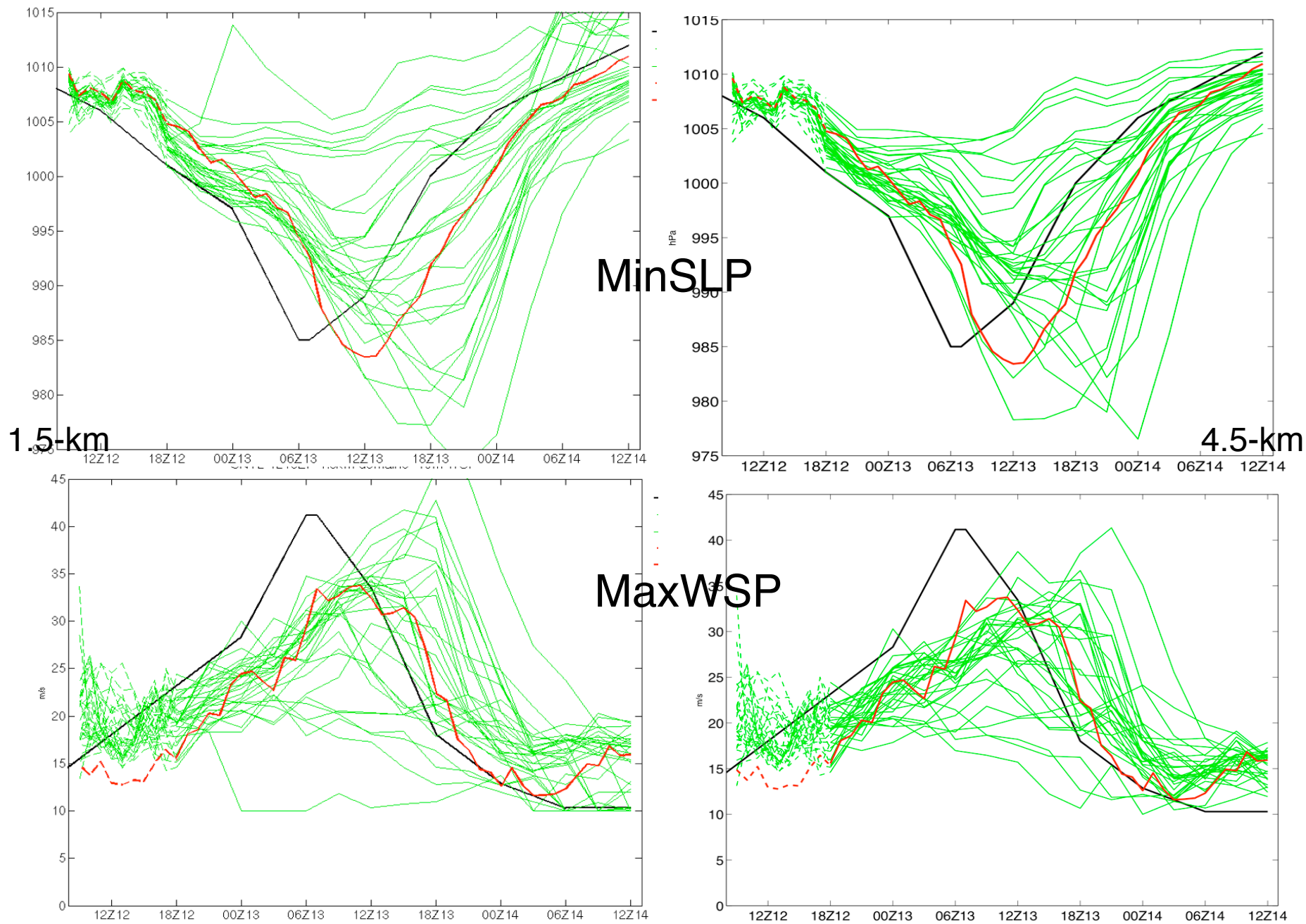
Mean Track Error (km)



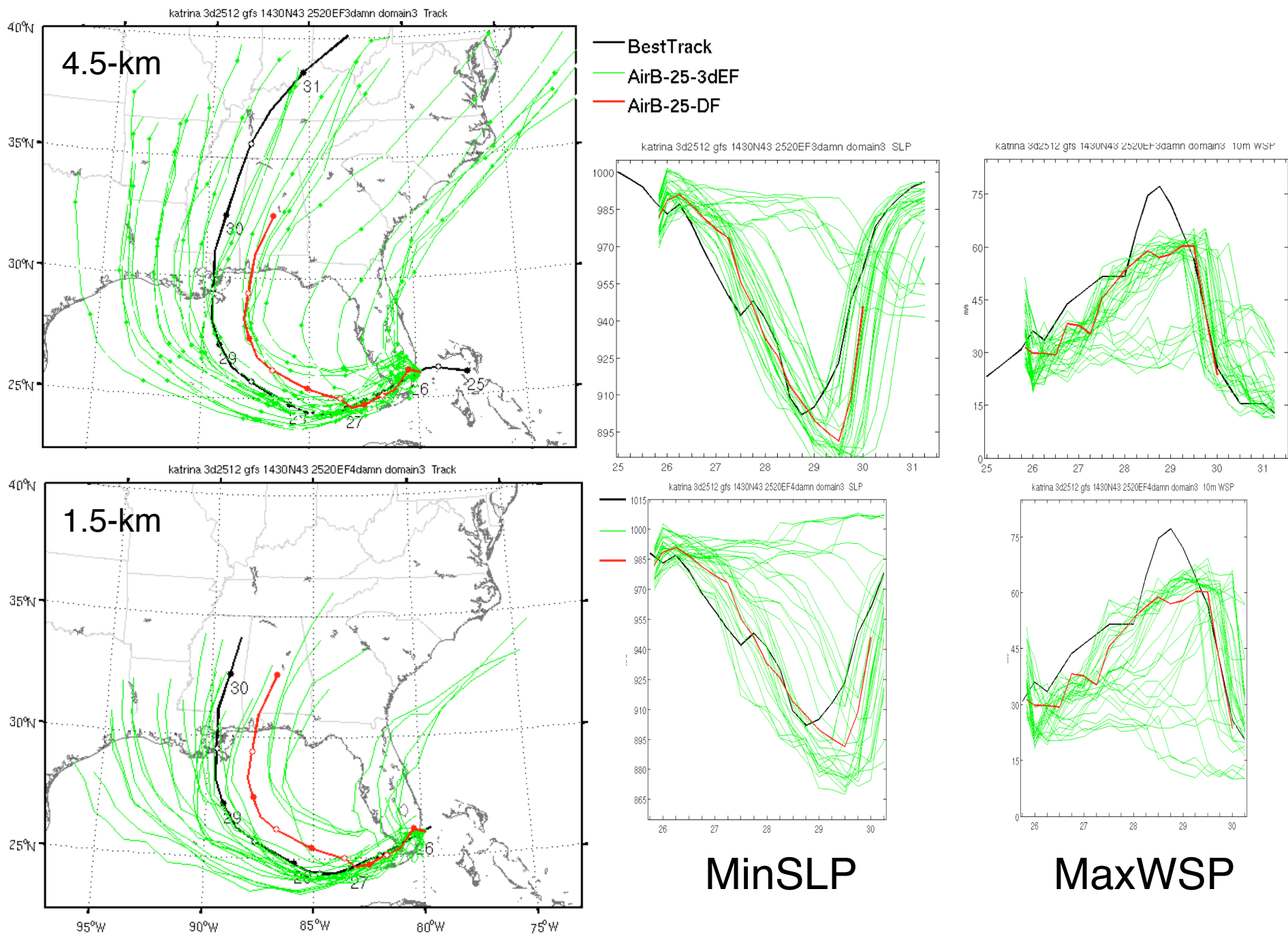
Mean Maximum Wind Speed Error (m/s)



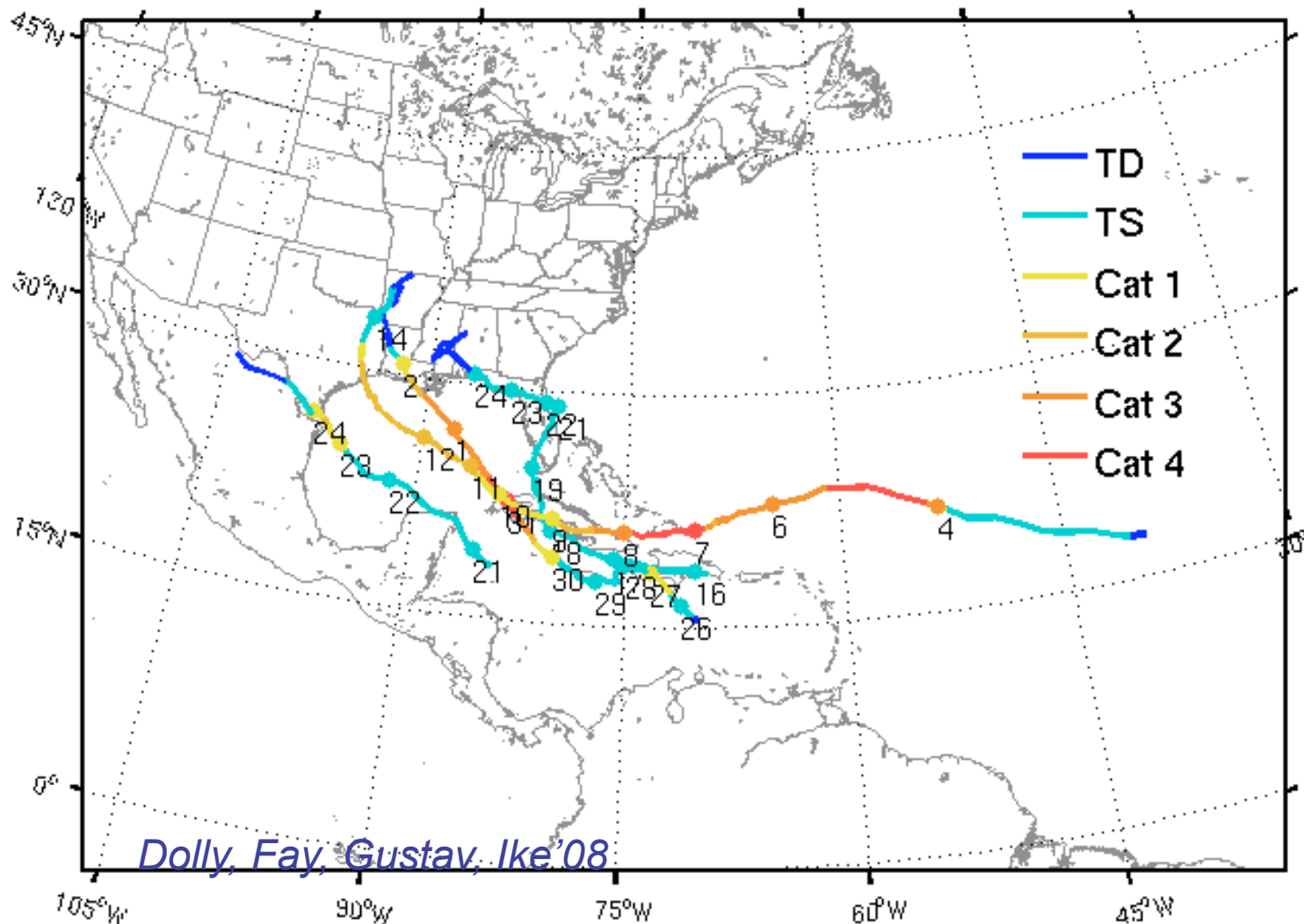
Predictability: 1.5-km (left) vs. 4.5-km (right) 42h ensembles



4.5-km (top, 126h) vs. 1.5-km (bottom, 102h) ensemble fcsts

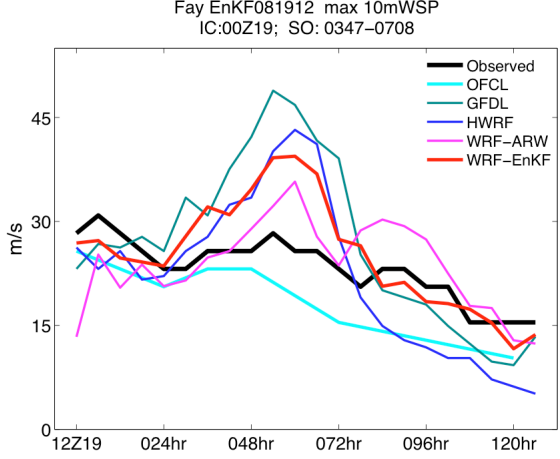
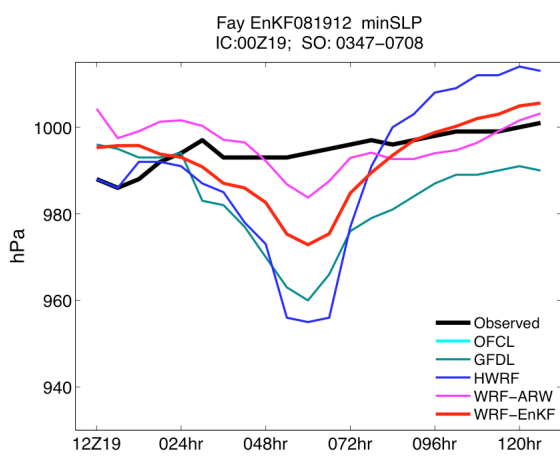
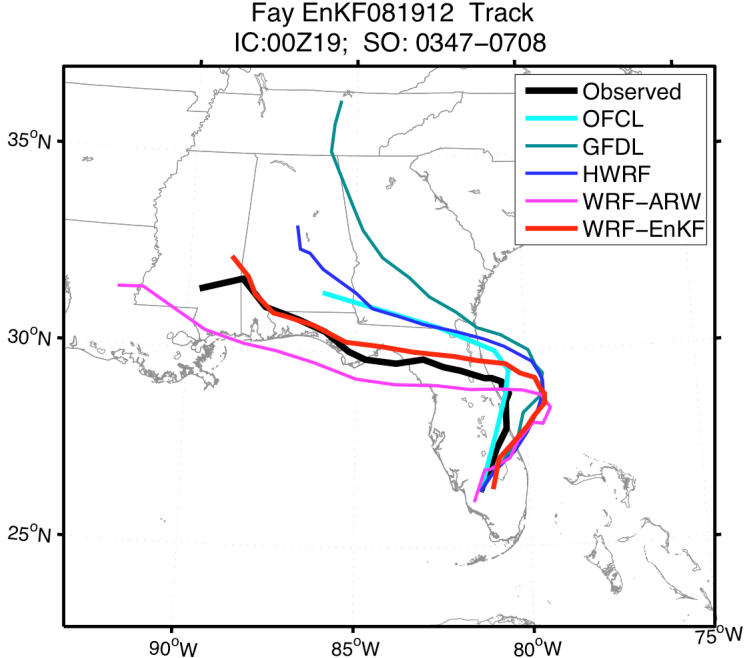


TOWARDS REALTIME ASSIMILATION OF DOPPLER RADAR OBSERVATIONS FOR CLOUD-RESOLVING HURRICANE PREDICTION

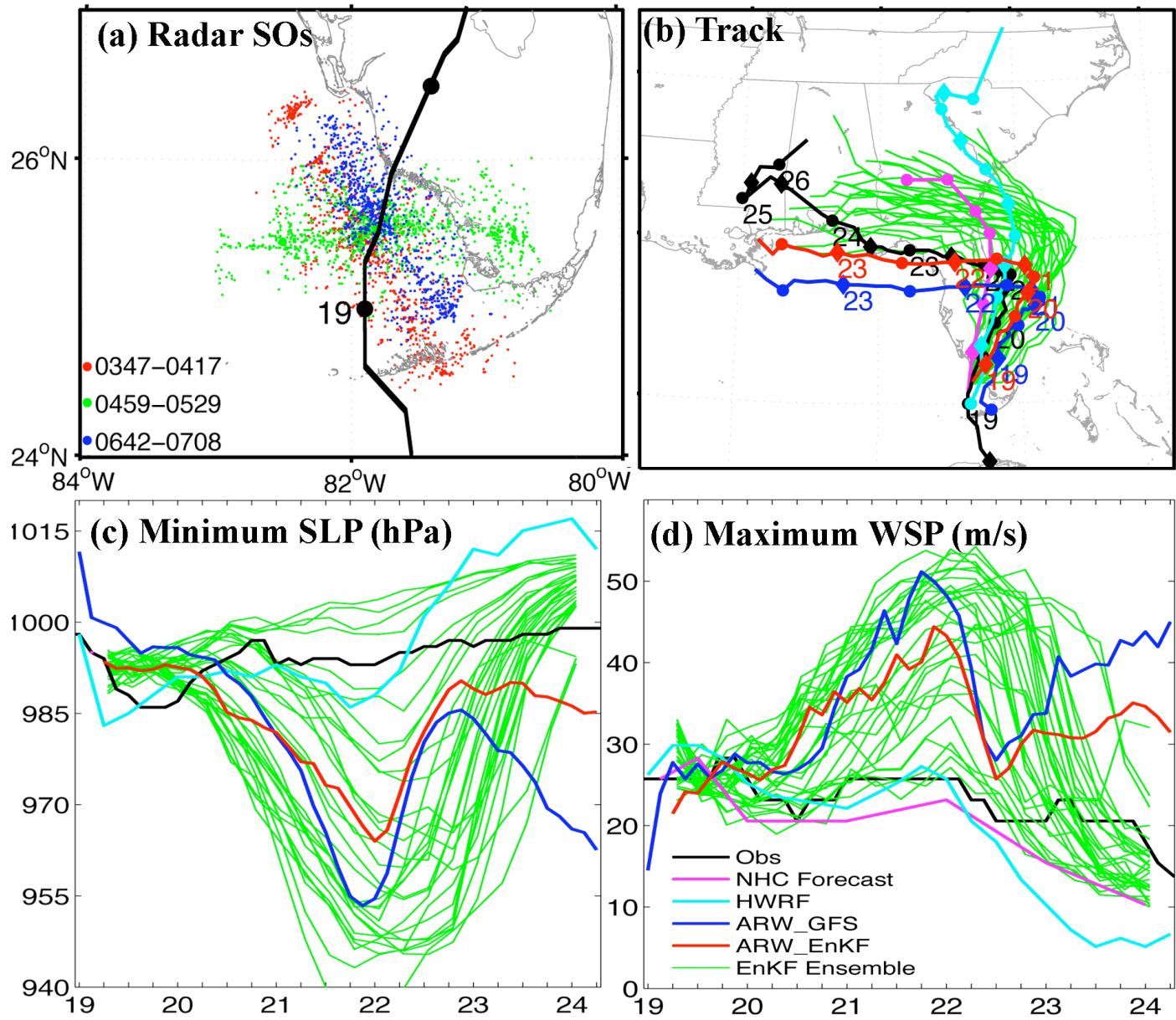


Thanks to John Gamache, our Vr superobbing procedure is now implemented on P3 in realtime

Realttime Test 1: Fay 2008081912

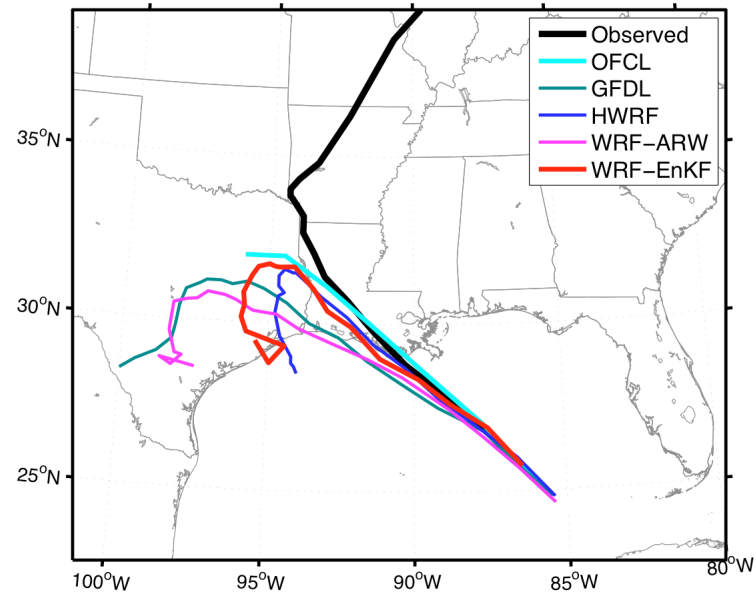


Realttime Test 1: Fay 2008081912

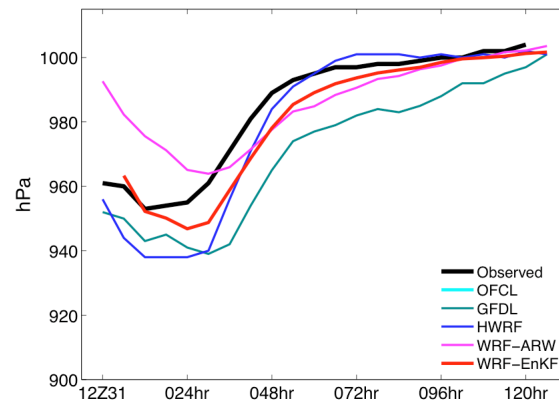


Realttime Test 2: Gustav 2008083112

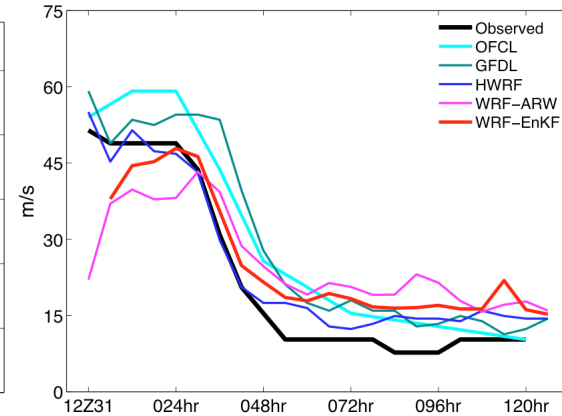
Gustav EnKF083112 Track
IC:00Z31; SO: 0926-1400



Gustav EnKF083112 minSLP
IC:00Z31; SO: 0926-1400

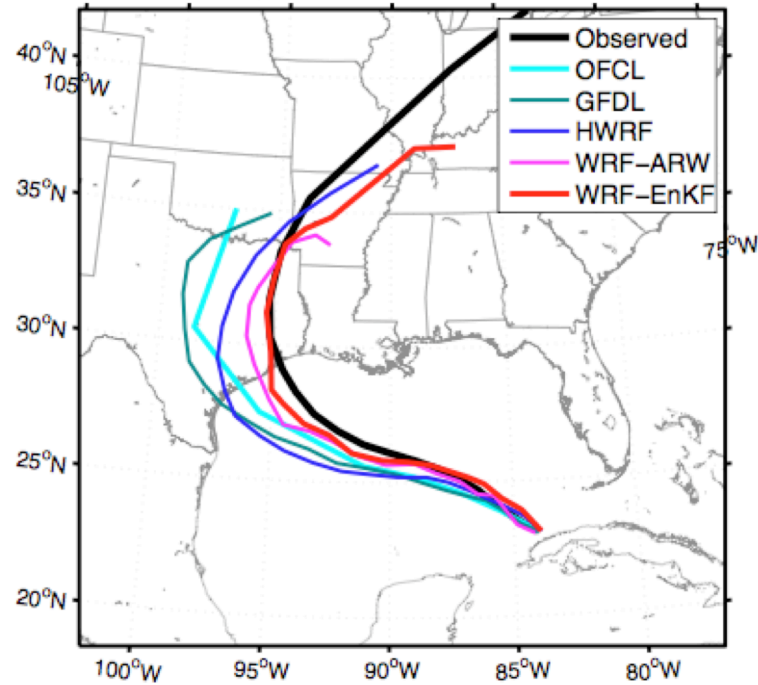


Gustav EnKF083112 max 10mWSP
IC:00Z31; SO: 0926-1400

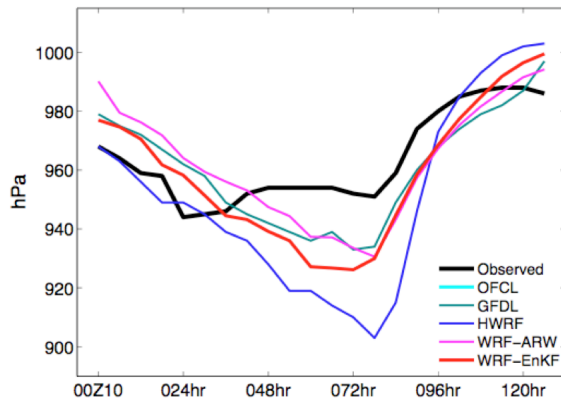


Realtime Test 3: Ike 2008091000

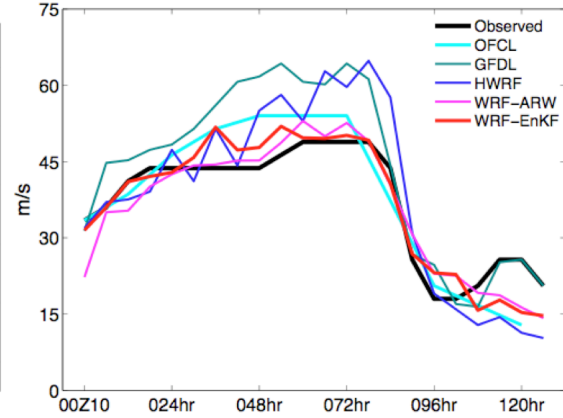
Ike EnKF091000 Track
IC:12Z09; SO: 2125-2227 & 2302-2341



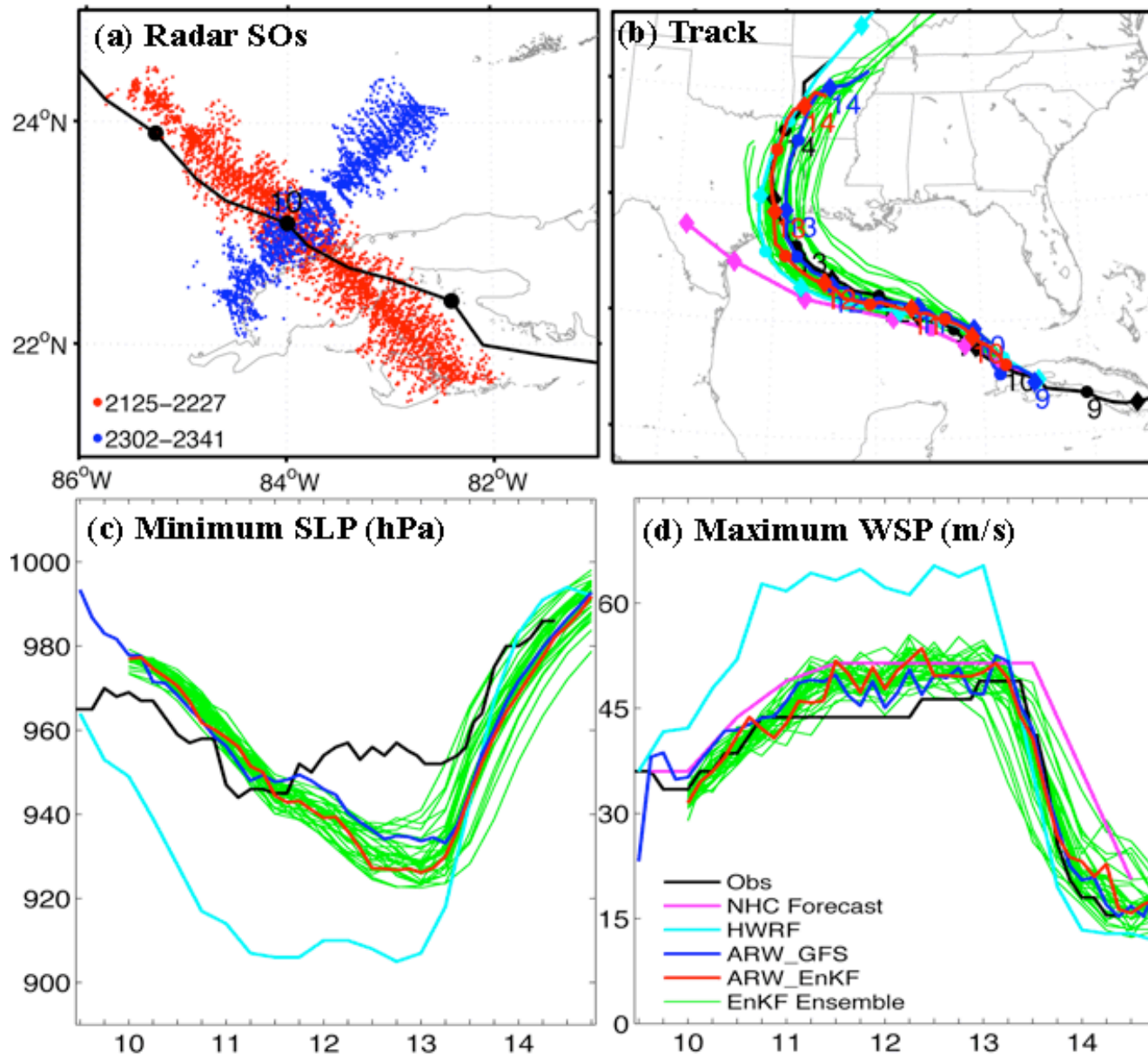
Ike EnKF091000 minSLP
IC:12Z09; SO: 2125-2227 & 2302-2341



Ike EnKF091000 max 10mWSP
IC:12Z09; SO: 2125-2227 & 2302-2341



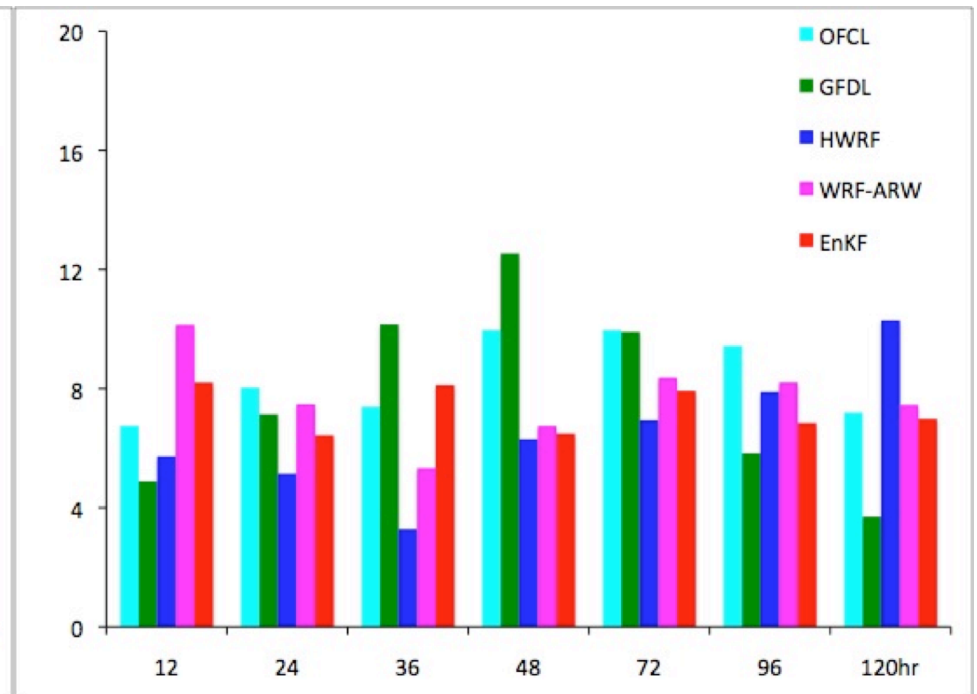
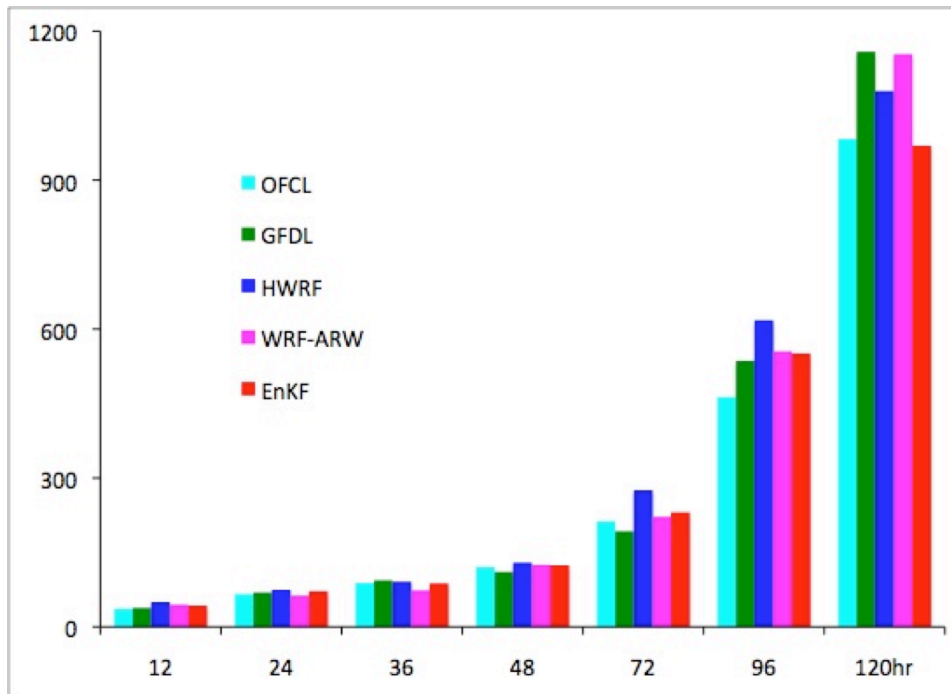
Realtime Test 3: Ike 2008091000



Summary of Realtime ARW-EnKF Tests

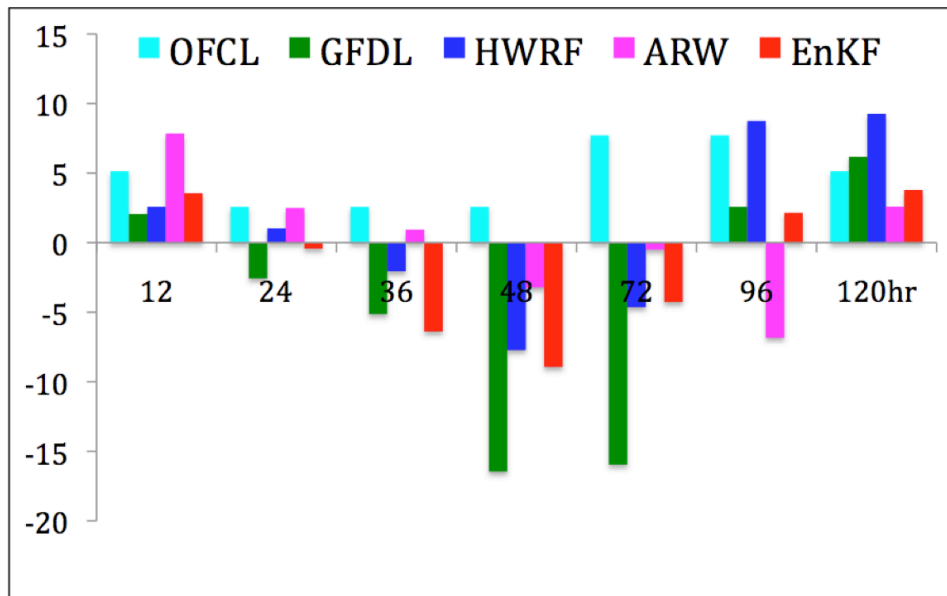
Mean Track Error (km)

Mean Maximum Wind Speed Error (m/s)

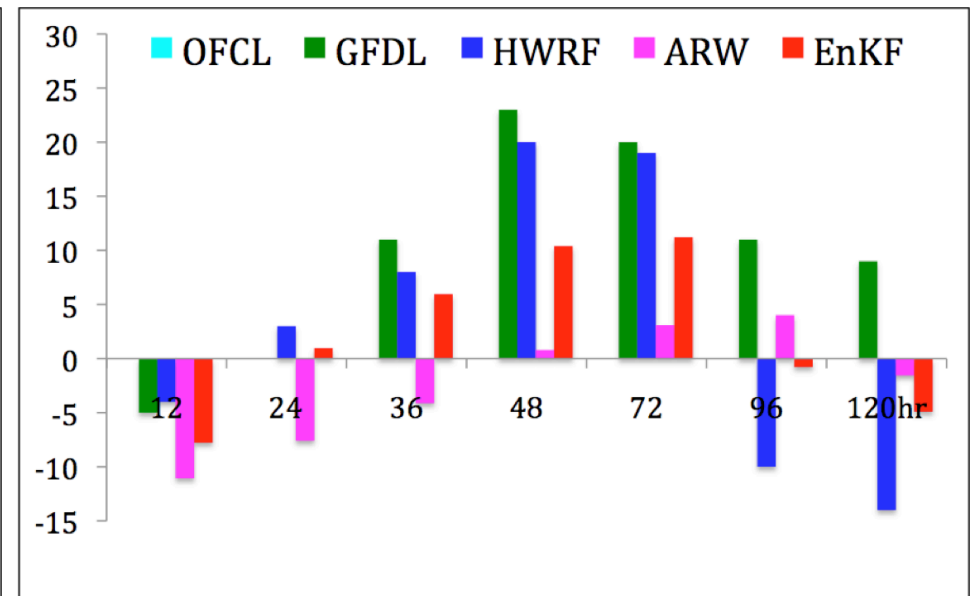


Summary of Realtime ARW-EnKF Tests

Mean bias for MinSLP (mb)



Mean Maximum Wind Speed bias (m/s)



Summary of HRH ARW-EnKF Tests (Emily 1, Katrina 2, Rita 3)

Mean Track Error (km)

Mean Maximum Wind Speed Error (m/s)

