

Tropical GRIP Forecast Discussion for September 15, 2010

Created 1600 UTC September 15, 2010

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Summary: While PREDICT, IFEX, and GRIP are all currently having a no fly day for various reasons, some agencies are gearing up for flights tomorrow into Tropical Storm Karl when it enters the Gulf of Mexico in the Bay of Campeche. Tomorrow should be an historic day for TC investigation flights because so many aircraft from so many different agencies will be in this system; the Global Hawk, the WB-57, the DC-8, the G-IV, the NOAA P3s, the C130Js. The PREDICT team has studied this storm for the last several days, and it has undergone genesis and moved out of their flight range now, so they will not be flying this system any longer. Tropical Storm Karl underwent a very fast intensification prior to landfall this morning, and even formed an eye-like feature that was evident in both the Belize radar reflectivity and SSMIS 85GHz microwave imagery. While the track of this system has continued to defy the global models since yesterday afternoon, it is currently on a westward heading and has yet to make the northwestward turn that so many models predict it will. The system is also forecast to slow its forward progression, so there is still some degree of uncertainty as to where the storm will actually be centered for tomorrow's flights.

Forecast for 1600 UTC 9/15/2010:

Synoptic Overview:

The Atlantic Basin continues to be very active today (**S1, S4**). Tri-agency targets include the intensifying Tropical Storm Karl, category 4 Hurricane Igor, category 4 Hurricane Julia which rapidly intensified, and PGI-45L which the models are now predicting will undergo genesis in the coming days. The overall environment for these various storms has been mostly conducive.

At upper levels in the western portion of the basin, the ridge over the northern Gulf coast has elongated and retreated north due to the expanding upper level outflow from TS Karl entering the southern Gulf of Mexico (**C1**). Nevertheless, an anticyclonic turn at upper levels over Cuba extends down to easterlies over the western Caribbean and Mexico. There is also clear evidence of a westerly jet aloft to the North of Igor extending behind the midlatitude trough pushing east through the central Atlantic. Upper level cyclonic flow continues to accompany Igor, while the environment near Julia is more anticyclonic aloft (**C1, C3**).

At lower levels, troughiness in the Caribbean is accompanied by scattered convection behind Karl and over Cuba (**S2, S3**). Dry air persists in the East Caribbean and ahead of Igor (**S4**). Julia has begun to encounter drier air (**S4**) and wind shear in the environment behind Igor (**C2**), but appears to be well formed such that at this time the

hurricane is overcoming the influence for the most part. Another dry air/SAL outbreak has emerged from Africa with very high AOT values over the last day (**S5**), but points west of Africa remain moist south of Senegal (**S4, S7**).

Wind shear over most of the Gulf of Mexico and Caribbean Sea continues to be low to moderate, and shear values increase over the Bahamas and NE of Igor (**C2**). Shear to the south of the ridge in the central Atlantic is high, and this also resides in the region to the north and west of Julia. Over West Africa, wind shear values are low to moderate in the vicinity of PGI-45L (**C8**).

At low levels over the East Atlantic and West Africa, winds indicate the continual presence of a low off the west coast of Spain, and monsoonal flow over southern portions of West Africa (**C7**). Above that surface low is a ridge at upper levels with a large extent that dominates the flow over the East Atlantic off the African coast (**C5**), advecting the dry air outbreak at mid- to upper levels (**C9**). Water vapor imagery confirms the presence of upper level dry air moving over West Africa and exiting the coast.

Features of Interest:

PGI-44L / Tropical Storm Karl

Tropical Storm Karl formed yesterday between 1800 and 2100UTC. As of the 1800 UTC NHC advisory, Karl is located at 18.8N/88.7W. The central pressure is 994 hPa and maximum sustained winds are 50 kts. Karl strengthened fairly quickly yesterday, and organized into a fairly symmetric storm over the 18 hours it had preceding landfall (**K1**). In fact, radar imagery from Belize indicated the rapid development of an eyelike feature and a southern eyewall in the hours just prior to landfall (**K2**). A microwave image taken 15 minutes prior to landfall also indicates the presence of eye and eyewall features (**K3**). While it is unknown what the true intensity of Karl was at landfall, it was rapidly becoming better organized.

The rapid development of Karl is unsurprising given the very favorable environment around the system. Wind shear is low, moisture is high, and SSTs in the Caribbean and Bay of Campeche are high (**K4**). The primary inhibiting factor to its intensity will be the time it spends crossing the Yucatan Peninsula. The NHC forecast calls for Karl to remain over land for approximately 18 hours. However, radar observations have indicated that Karl is taking a track slightly farther south, which will increase the time spent over land. The track is still fairly uncertain, and the models are not yet converging on a consensus solution, probably due to the inability to properly represent the impact of land on the track (**K5**). Karl could turn slightly northward as a mid latitude high moves eastward, weakening the easterlies in the Gulf and Northern Caribbean. This should also cause Karl's forward motion to decrease. Karl's intensity after it emerges from the Yucatan is difficult to predict, however guidance suggests it will maintain tropical storm strength (**K6**). If it maintains its structure, Karl could quickly intensify after emerging into the Bay of Campeche. Rapid Intensification remains a distinct possibility. Even if Karl's structure is somewhat disrupted, at least some reorganization and intensification is likely given the favorable environment.

Forecast points for Karl

12Z Wednesday 18.5N/87.6W

00Z Thursday 19.3N/89.7W

12Z Thursday	20.0N/91.9W
00Z Friday	20.5N/93.9W
12Z Friday	21.0N/95.5W
00Z Saturday	21.0N/96.9W
12Z Saturday	20.6N/98.1W

Igor:

In the past 24 hours, Hurricane Igor completed an eyewall replacement cycle and saw an intensification that brought the storm near category 5 strength over night (minimum central pressure 925 hPa, maximum sustained winds 125 kt). Igor then saw a slight weakening in the morning hours (central pressure 935 hPa, sustained winds 115 kt), but the storm remains as a very intense category 4 cyclone with a generally well defined eye and large circulation (**I1**). Water vapor imagery (**I2**) shows some of the dry air intrusion on the northwest and north sides of the storm, which has caused some eyewall degradation. However, the environmental conditions appear to remain favorable for the maintenance of category 4 intensity with wind shear values remaining low, and SSTs and ocean heat content remaining high (**I3**). The motion of Hurricane Igor remains relatively persistent at 9 kt to the west-northwest.

The short-term forecasts for Hurricane Igor have generally been good, but Igor has shown a slight trend to move to the west of the model guidance tracks. Although NHC claims that the model guidance tracks this morning have shifted to the east, it appears that the model guidance tracks (**I4**) remain about the same as the tracks for the past 24 hours, and keep Igor moving on a general west-northwest track. Also, the spread in the track forecasts is greater than in the past few days. It is interesting to note that Hurricane Julia has also trended along the westward portion of the model guidance track forecasts, which suggests that the ridge over the eastern Atlantic is actually stronger than initially thought to be, and the general increase in the spread may indicate some uncertainty in the ridge strength and some uncertainty in the future interaction between Hurricanes Igor and Julia. While there is no reason to believe that Hurricane Igor will not follow the NHC official track forecast, which is somewhere near the center of the model tracks, it would not be surprising if Igor does in fact track slightly west of the official track, as it has the past several days. The point of recurvature after roughly 4 or 5 days will become important for future flight plans and for the warnings that will need to be issued for Bermuda. A westward track would favor possible flight observation planning, but it would also likely have a stronger impact on Bermuda.

As mentioned above, the wind shear, SSTs and ocean heat content remain favorable for the maintenance of a category 4 hurricane, and the forecast is for these conditions to remain favorable for at least the next 60 hours (**I3**). The model guidance intensity forecasts (**I5**) show the decrease in intensity in the short-term associated with some inner-core fluctuations, but reflect the favorable conditions with a general increase in intensity between 12 and 36 hours. However, as with the track forecasts, there is a much greater spread in the model guidance intensity forecasts. After 36 hours, many of the models show a gradual and constant decrease in the intensity as Hurricane Igor begins to recurve. There is general model consensus that Igor will be category 3 by 48 hours, but there is large uncertainty as to how fast Igor will degrade down to category 2

strength, which coincides with the time at which the model guidance forecast tracks begin to deviate from each other.

Julia:

Overnight Julia quickly intensified from a category 1 hurricane to a category 4 major hurricane. At 2100 UTC yesterday Julia had maximum sustained winds of 75 kts and an estimated central pressure of 982 mb, at 0300 UTC today the system was a category 2 with winds of 90 kts and an estimated central pressure of 974 hPa, by 0530 UTC 955 hPa Julia had 110 kt winds, classifying it as a category 3 major hurricane, and finally as of 0900 UTC, the storm became a category 4 hurricane dipping to a minimum central pressure of 950 mb with maximum sustained winds of 115 kts and gusts up to 140 kts. Julia's course has changed to the NW (305) moving at 9 kts. During the rapid intensification stages, the eye of Julia was captured by a fortuitous pass of Cloudsat, and the reflectivity (**J2**) shows the eye clearly, with very impressive eyewall features including cloudtops that extend to even above 15km.

At 1415 UTC the system is centered at 17.9N/32.4W with an eye of 10 nm in diameter, which can be seen in the infrared imagery (**J1**), and is continuing on the NW track with high shear of 40-50 kts over the northern half of the storm (**C2**). Julia is moving along the southern boundary of the subtropical high and being steered on a more westward track now than before. There seems to be a good model forecast consensus for Julia's track (**J3**). NOGAPS shows Julia continuing on a NW track for the next 24 hrs, then heading WNW along the bottom of the subtropical ridge before continuing NW around the high to 84 hrs, and finally breaking down the ridge and moving northward through the Atlantic Basin and re-curving to the NE around 96 hrs. ECMWF has Julia moving predominately to the NW to 72 hrs, then changing to a NNW heading from 72-96 hrs, and finally re-curving to the NE out to 144 hrs. The GFS has similar movement of the 700 mb vorticity maximum, but moving along a more ENE course after 96 hrs. There is a split in the model forecasted intensity for Julia (**J3**), but overall, the trend should be for Julia to weaken gradually over the next several days as it moves over less favorable SSTs and into an environment of increasing wind shear.

PGI-45L:

PGI-45L has moved west-northwest to 8.4° N and 14.6° W as of 1200 UTC today and is now largely over the Atlantic. Low-level vorticity is still displaced from the center of the pouch, as the maximum value is found to the northwest near active areas of convection (**45A**). Overall convection appears to have increased from this time yesterday, and the peak number of overshooting tops doubled as the western part of the system emerged over water (**45B**). The pouch is expected to continue moving west-northwest over the next few days, though the GFS moves it less far west than the ECMWF by 5 days out (**45C**). The NOGAPS model still brings the system farther northward than the other two, and confidence in that track is again low. The 0600 UTC GFS and 0000 ECMWF runs both develop this system into a tropical cyclone before 120 hours, with a closed low appearing in each by 72 hours. The environment along the

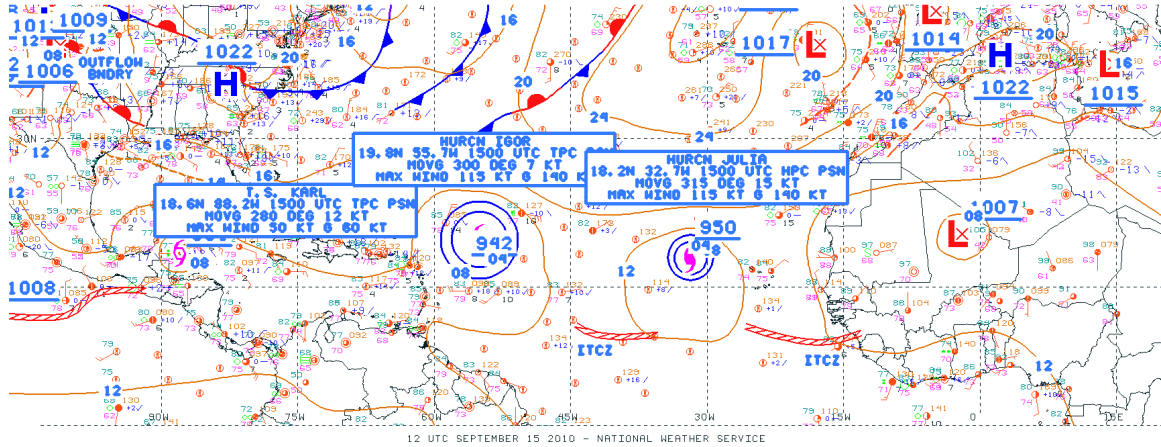
predicted track remains somewhat conducive for development, and there is a strong possibility for tropical cyclogenesis to occur within the next week.

Forecasters: English, Zelinsky, Kofron, Wood, Leary

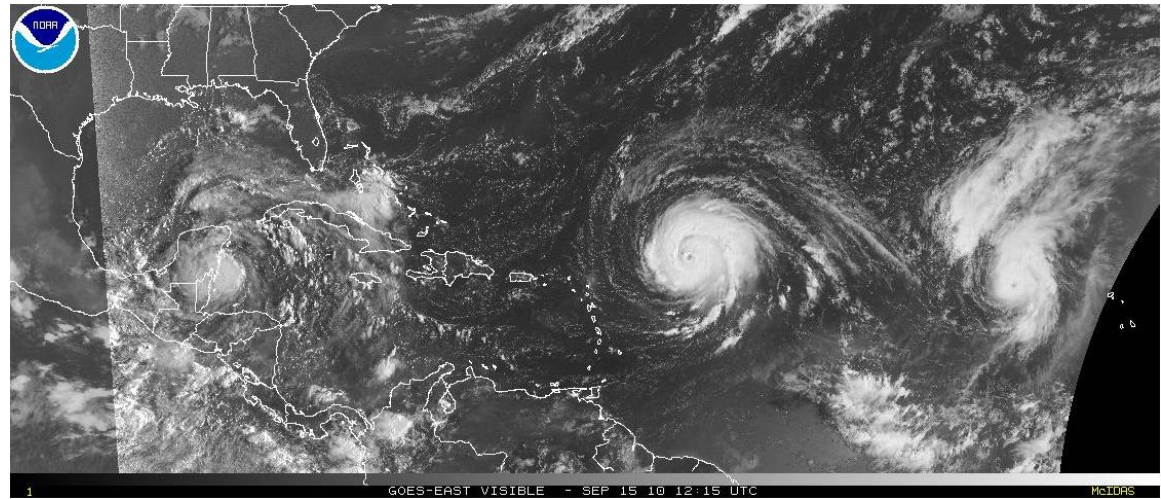
Images used in discussion:

Synoptic Overview Images

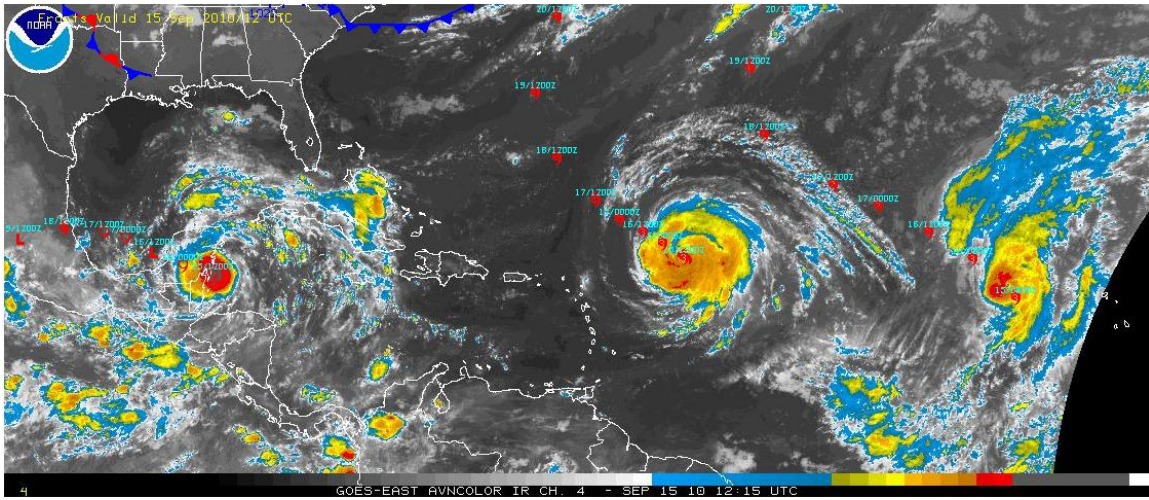
S1



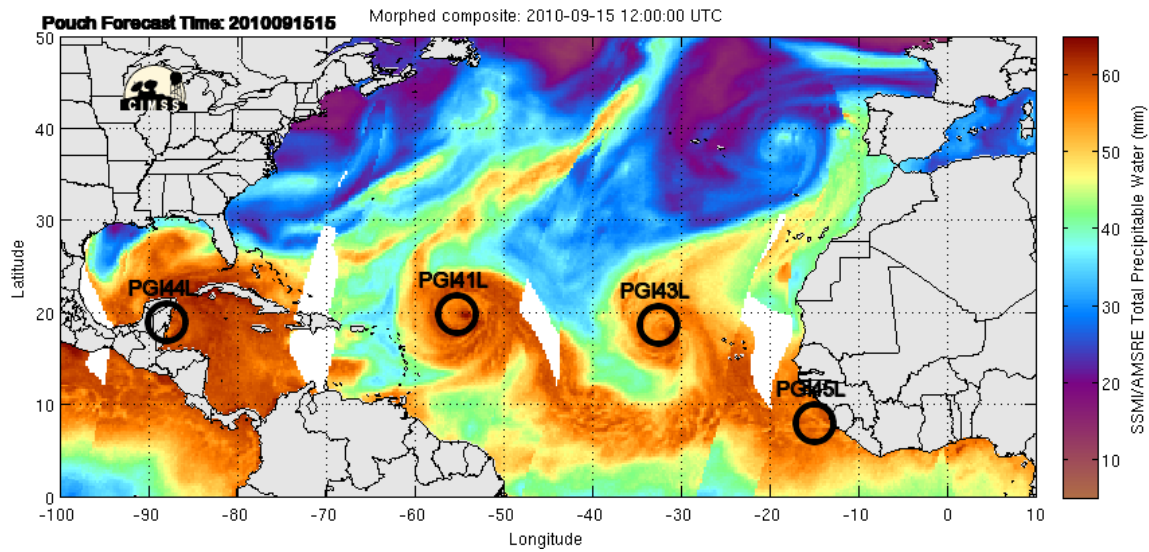
S2 GOES Visible



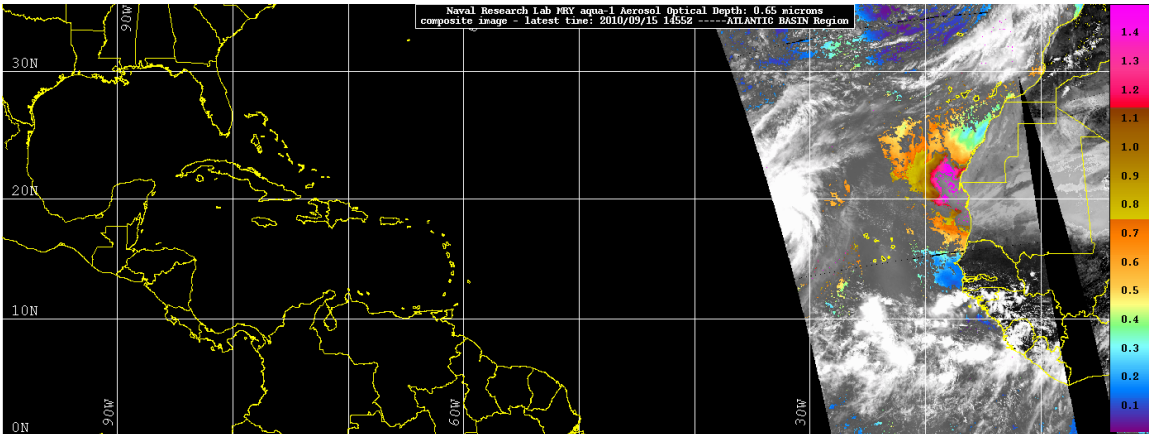
S3- GOES IR



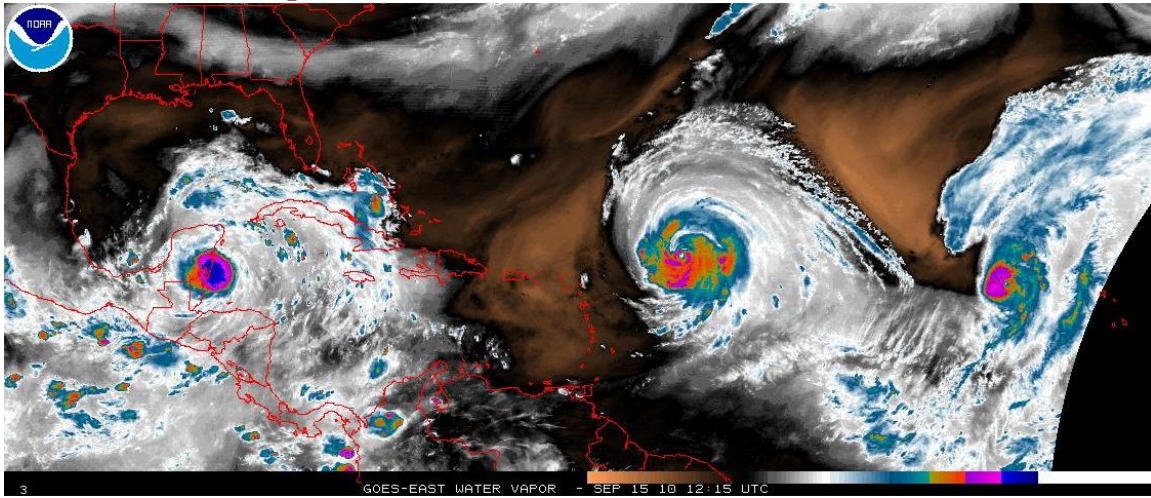
S4- CIMSS TPW with Pouch Positions



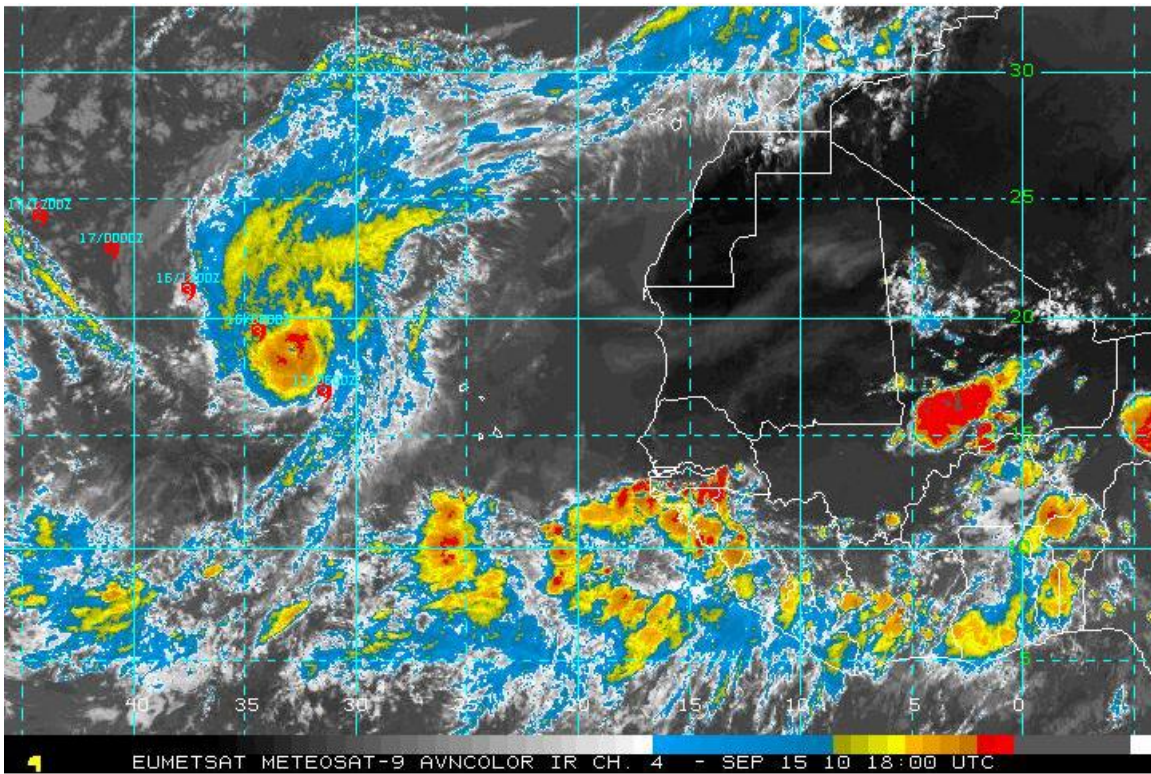
S5 AOT from NRL:



S6- GOES Water Vapor

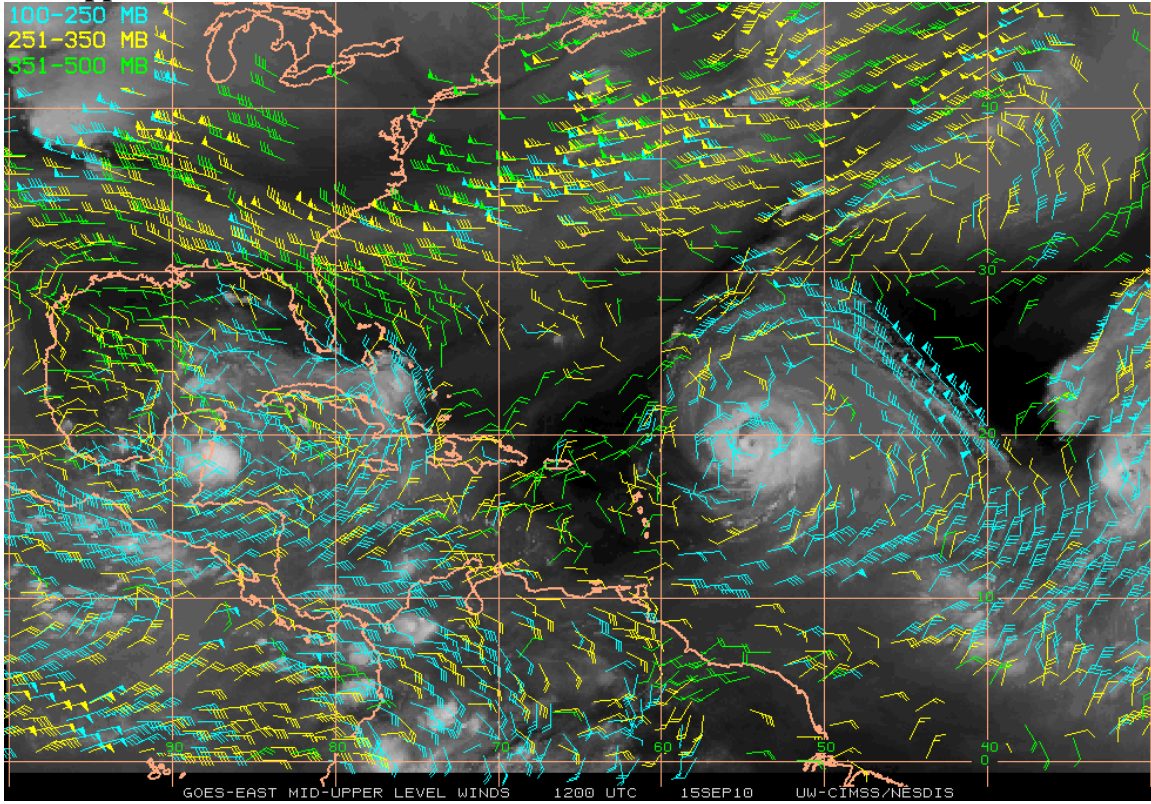


S7 METEOSAT IR

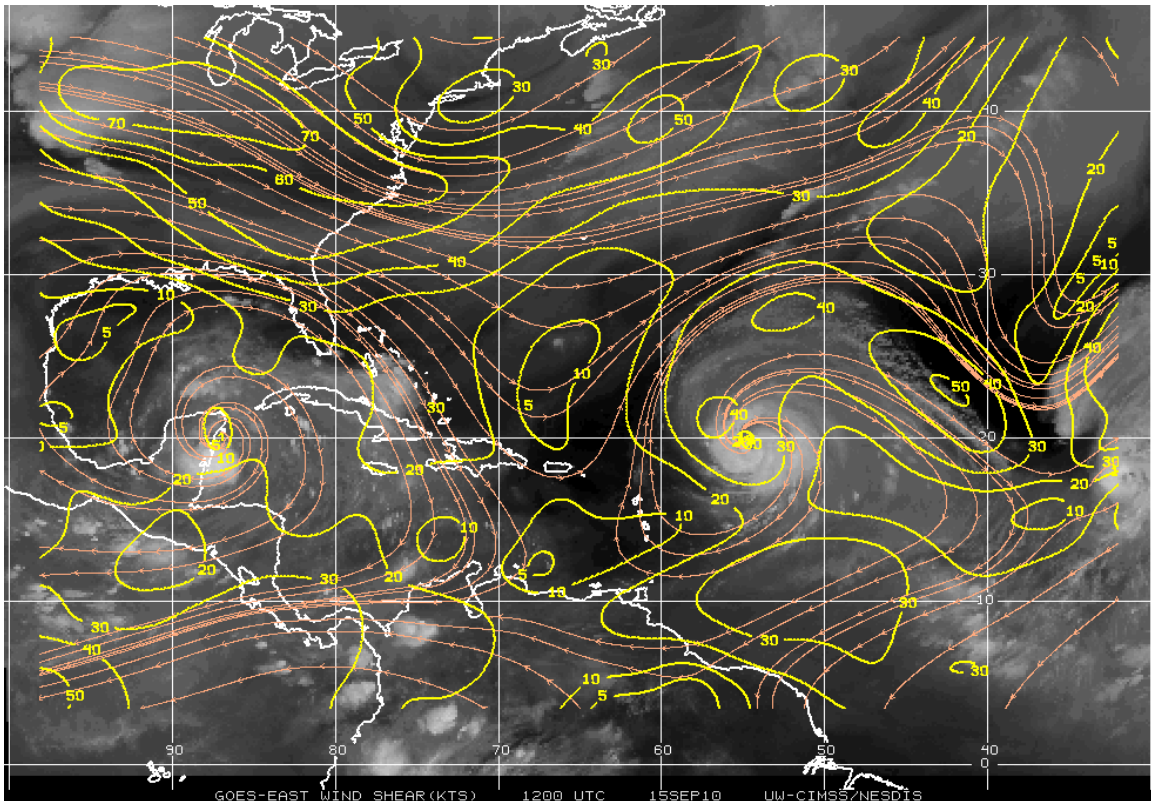


CIMSS Analyses:

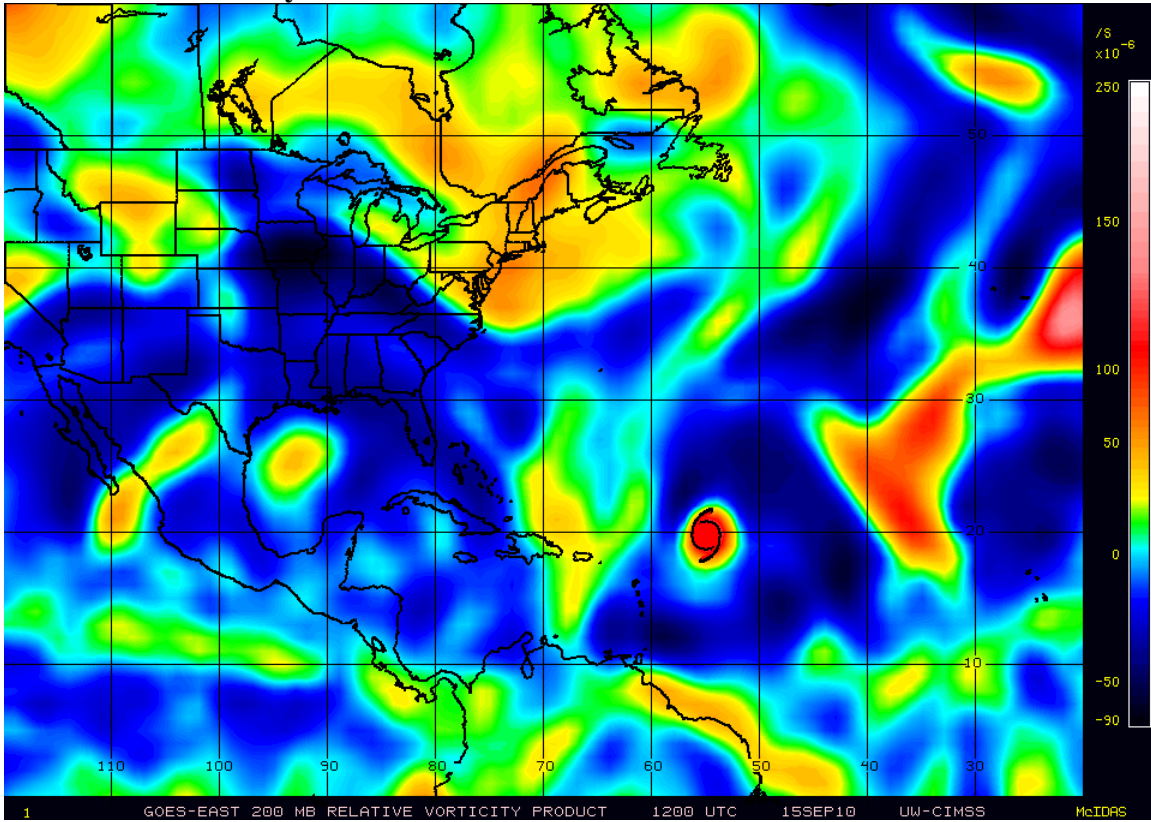
C1- Upper Level Winds



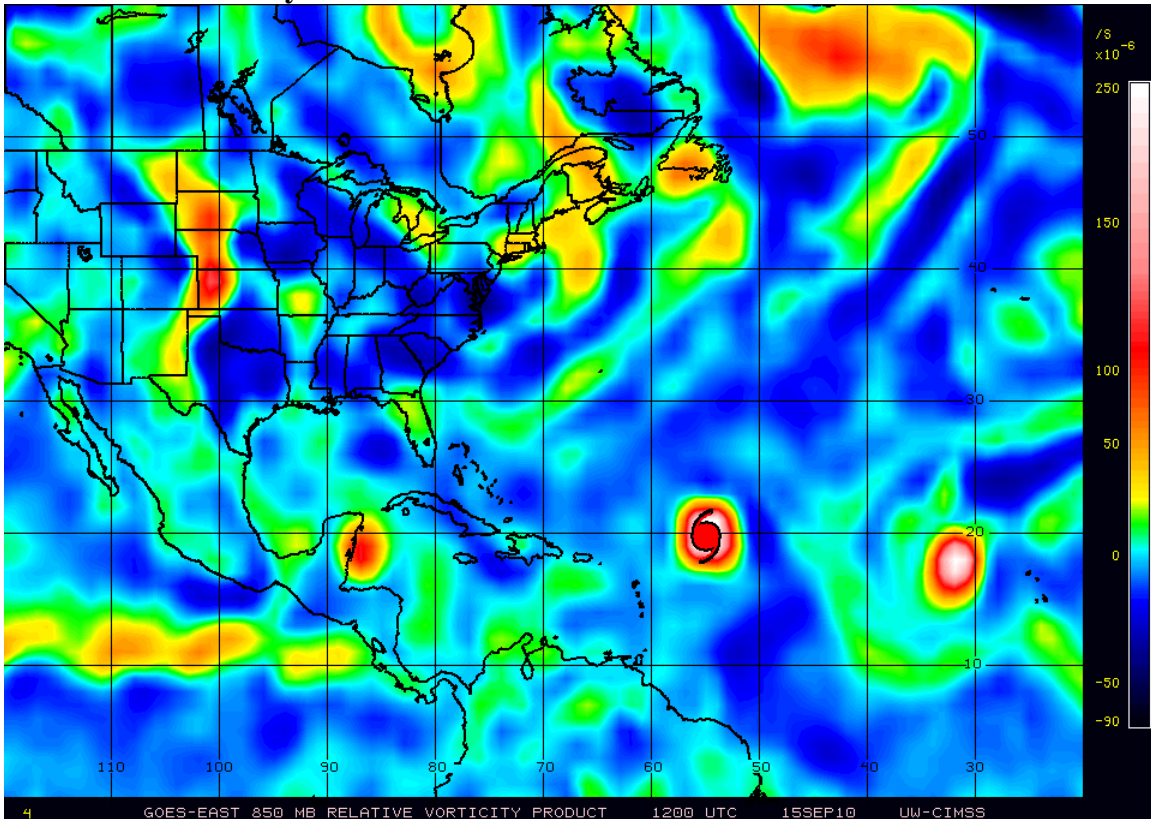
C2- Wind Shear



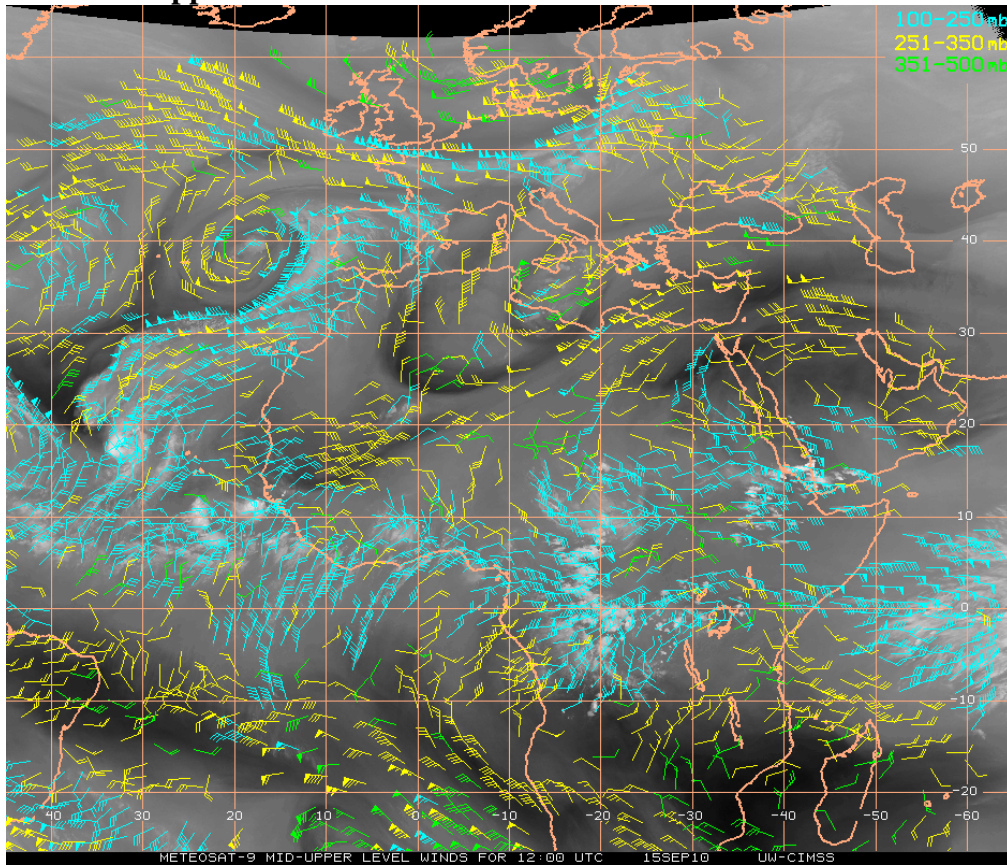
C3- 200 hPa Vorticity



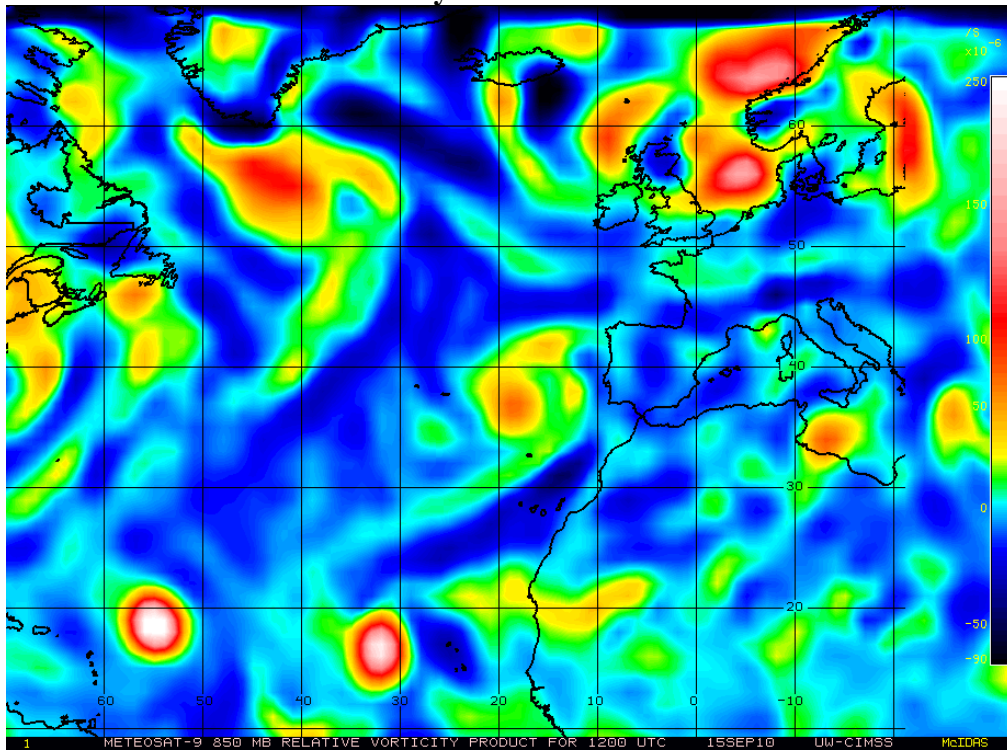
C4- 850 hPa Vorticity



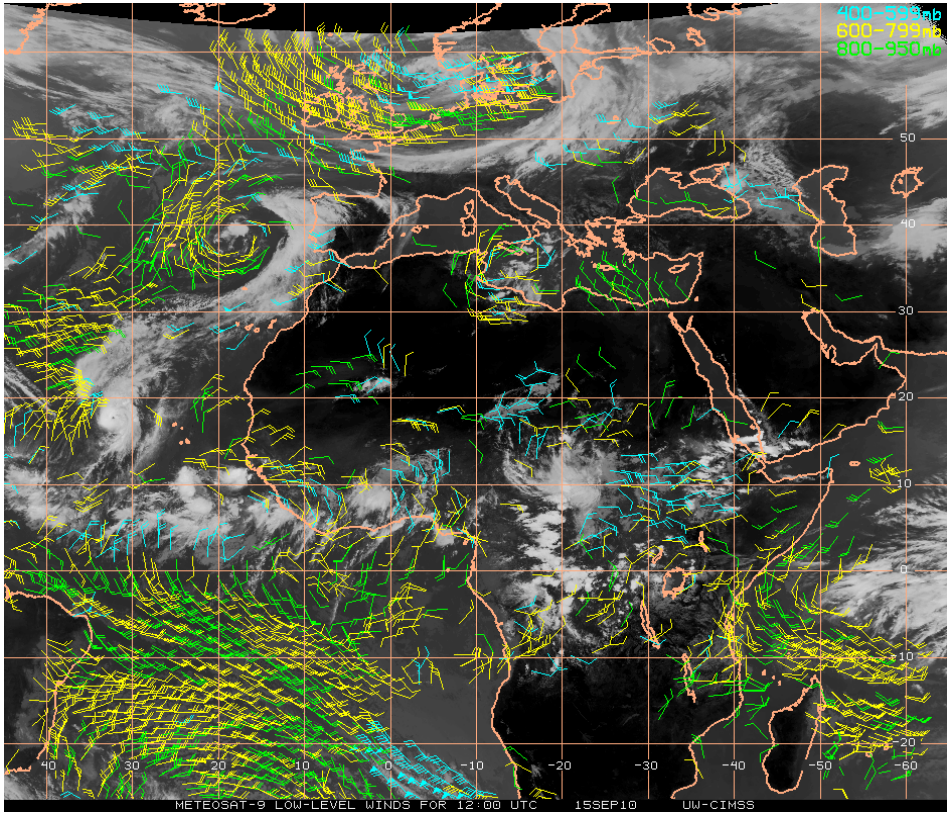
C5 Africa Upper Level Winds:



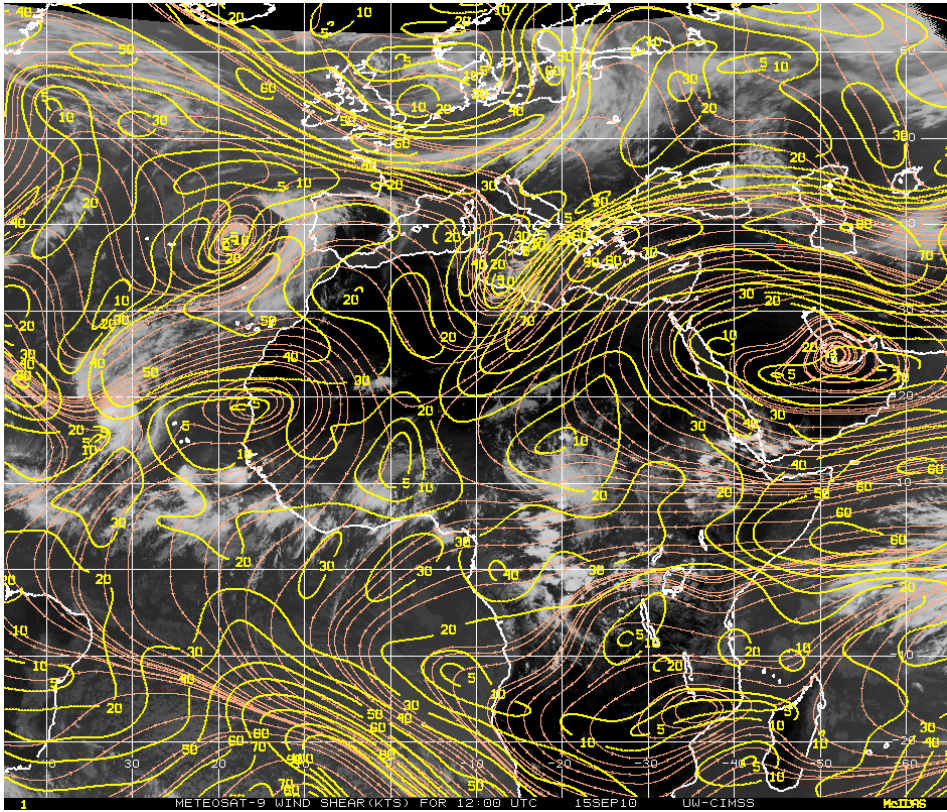
C6 Africa Lower Level Vorticity



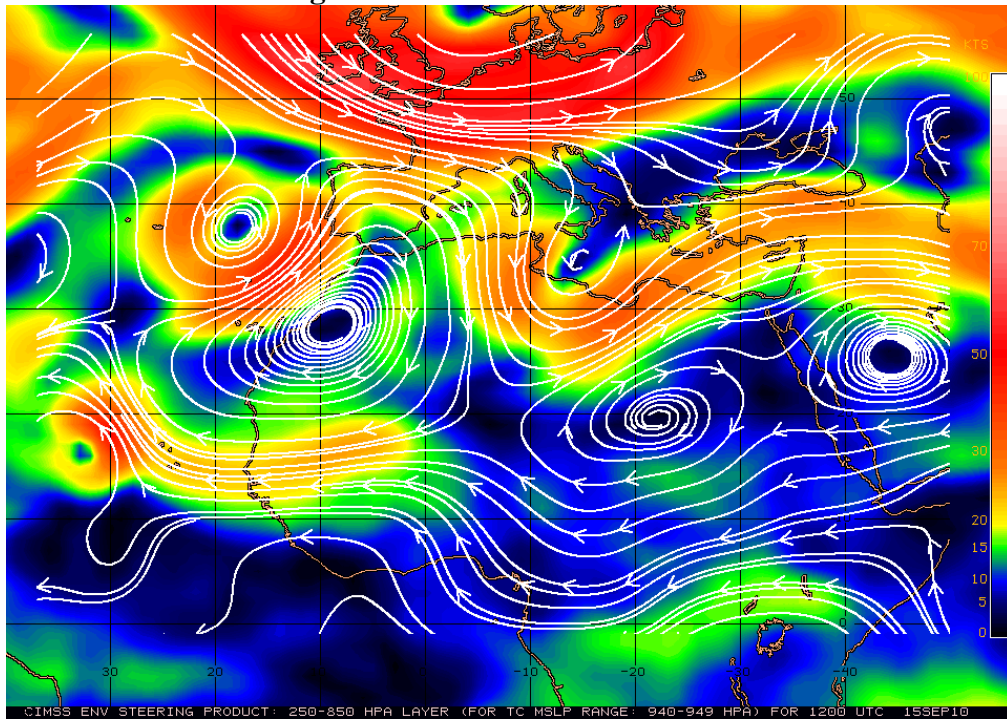
C7 Africa Lower Level Winds



C8 Africa Wind Shear



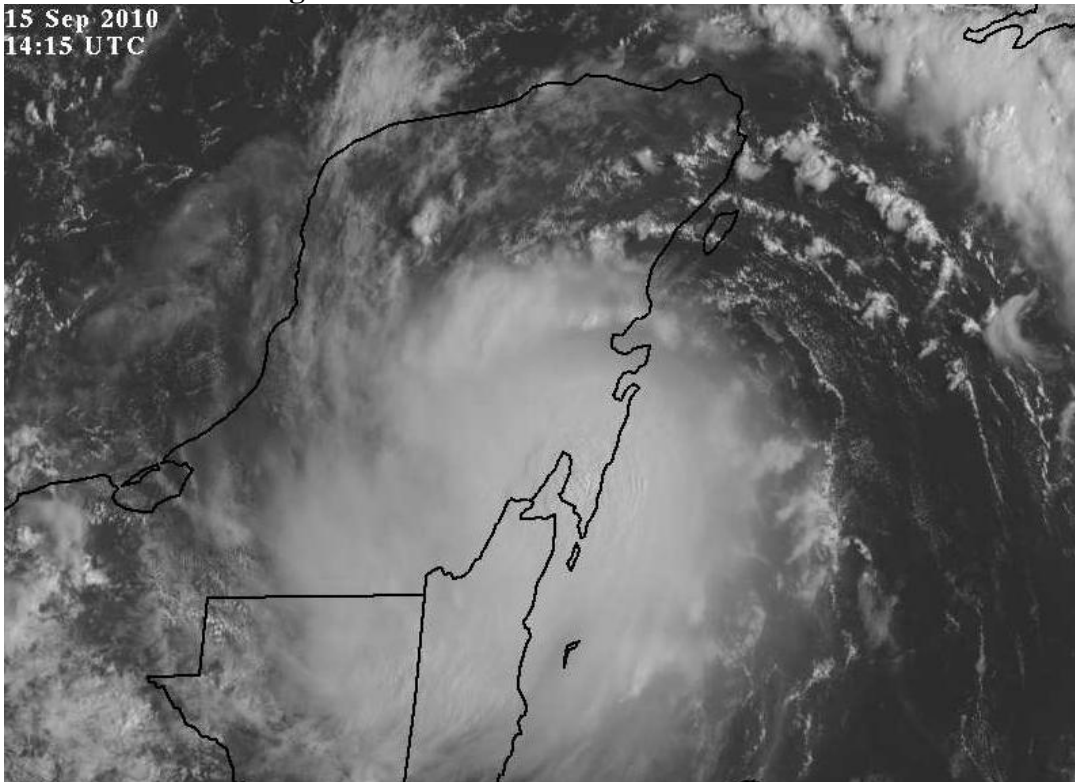
C9 850-200mb Steering Flow over Africa



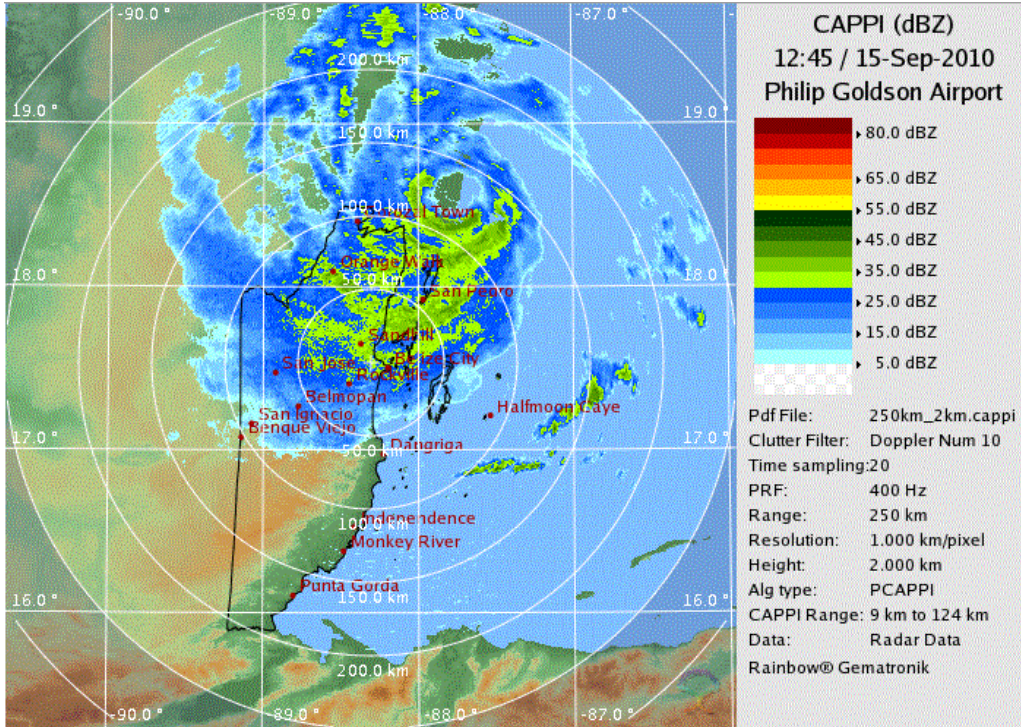
Features of Interest Images

Tropical Storm Karl K1- 1km Visible Image

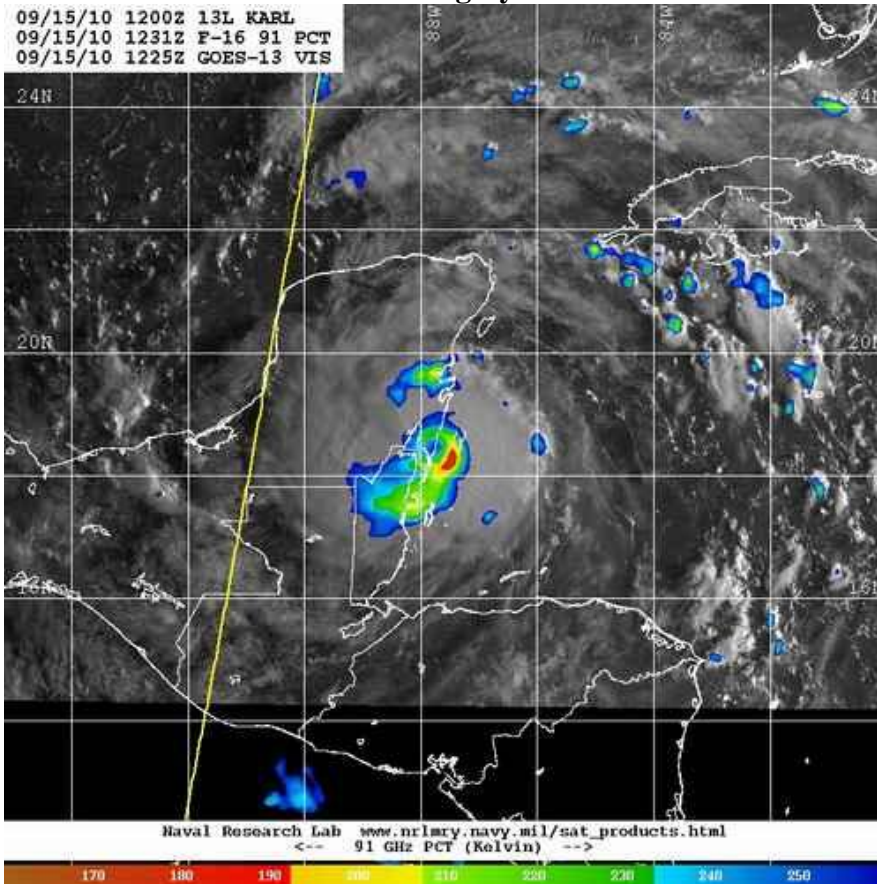
15 Sep 2010
14:15 UTC



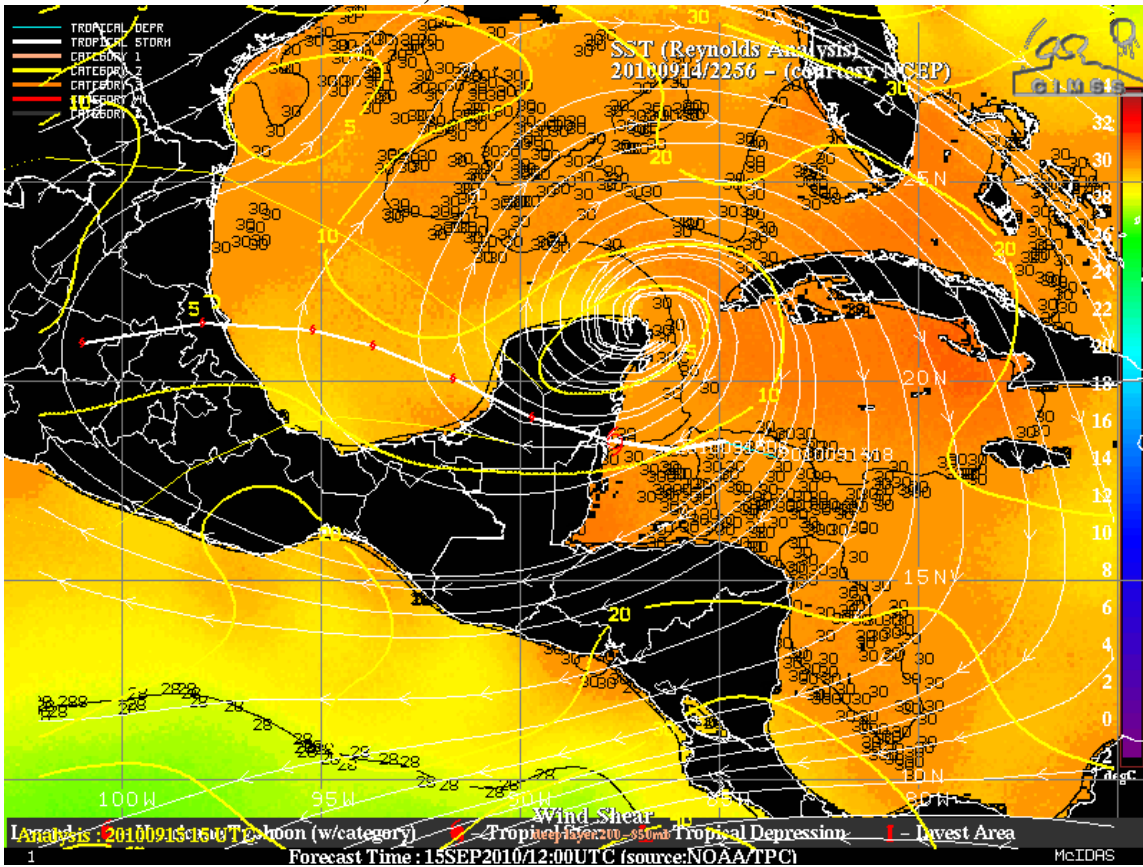
K2- Radar



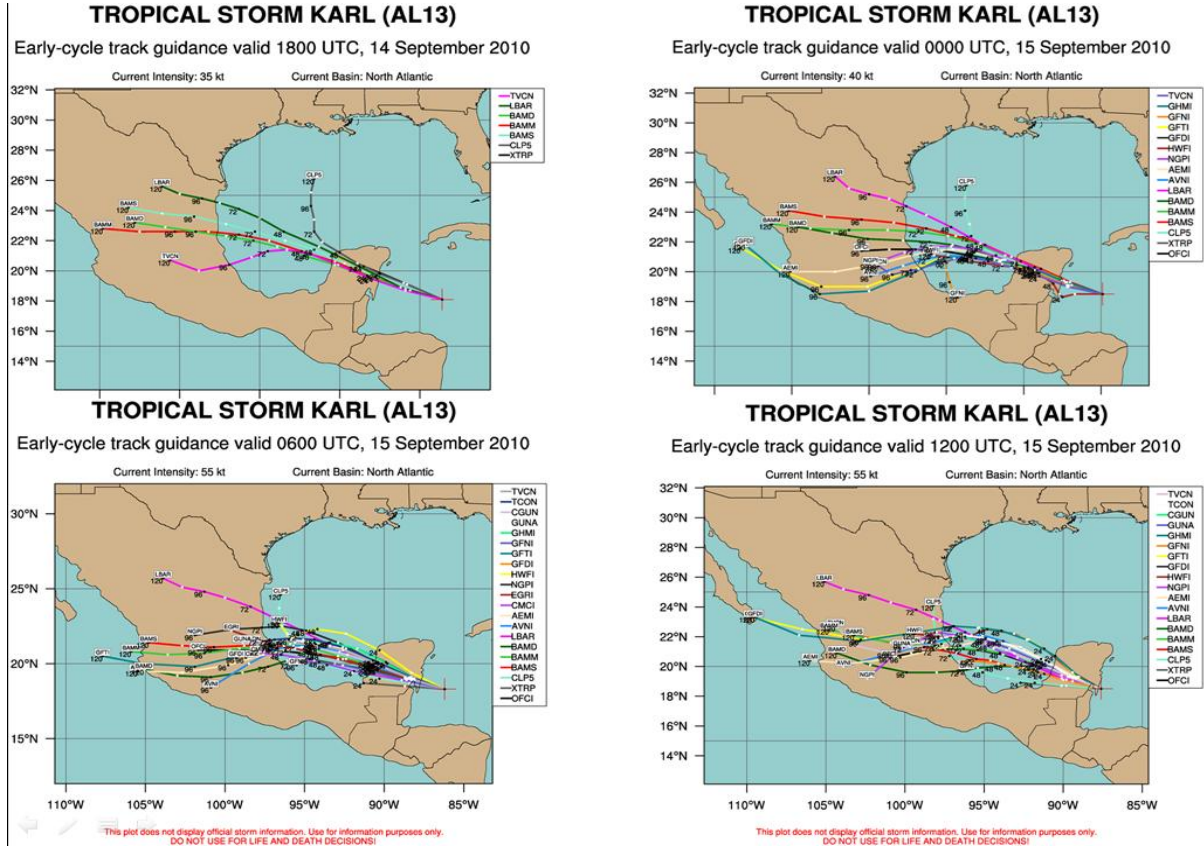
K3- SSMIS PCT Microwave Imagery



K4- CIMSS- 850-200mb Shear, SSTs and NHC forecast track

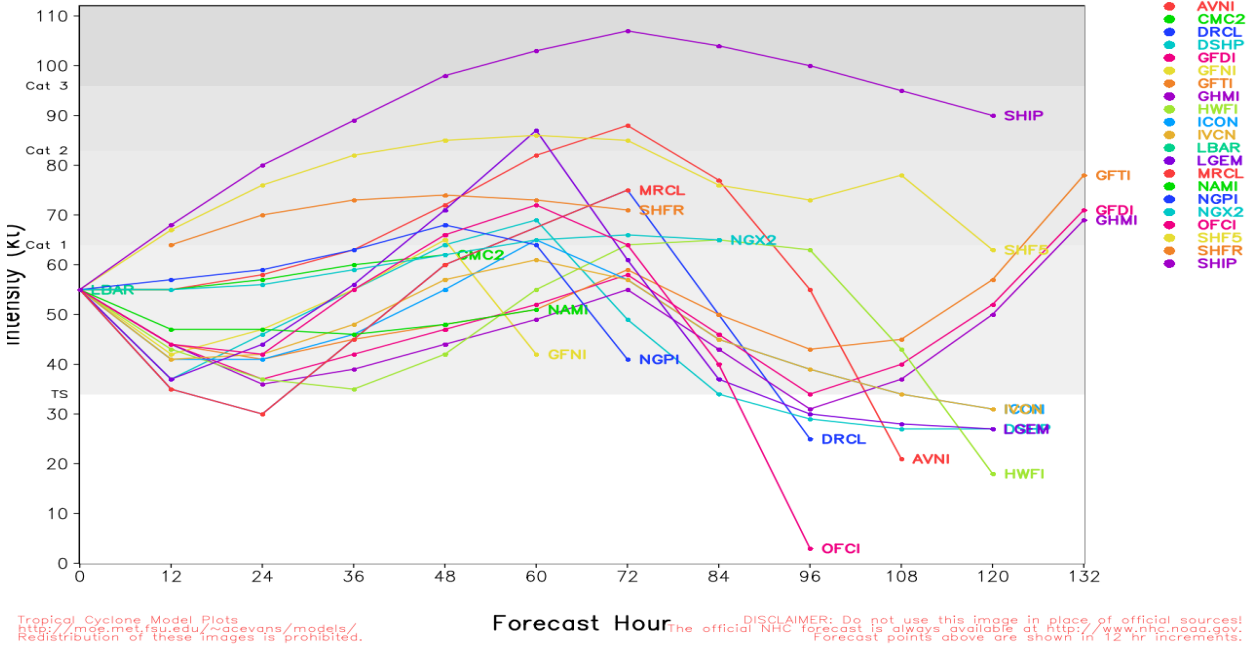


K5 – Last 4 early cycle track forecasts for Karl



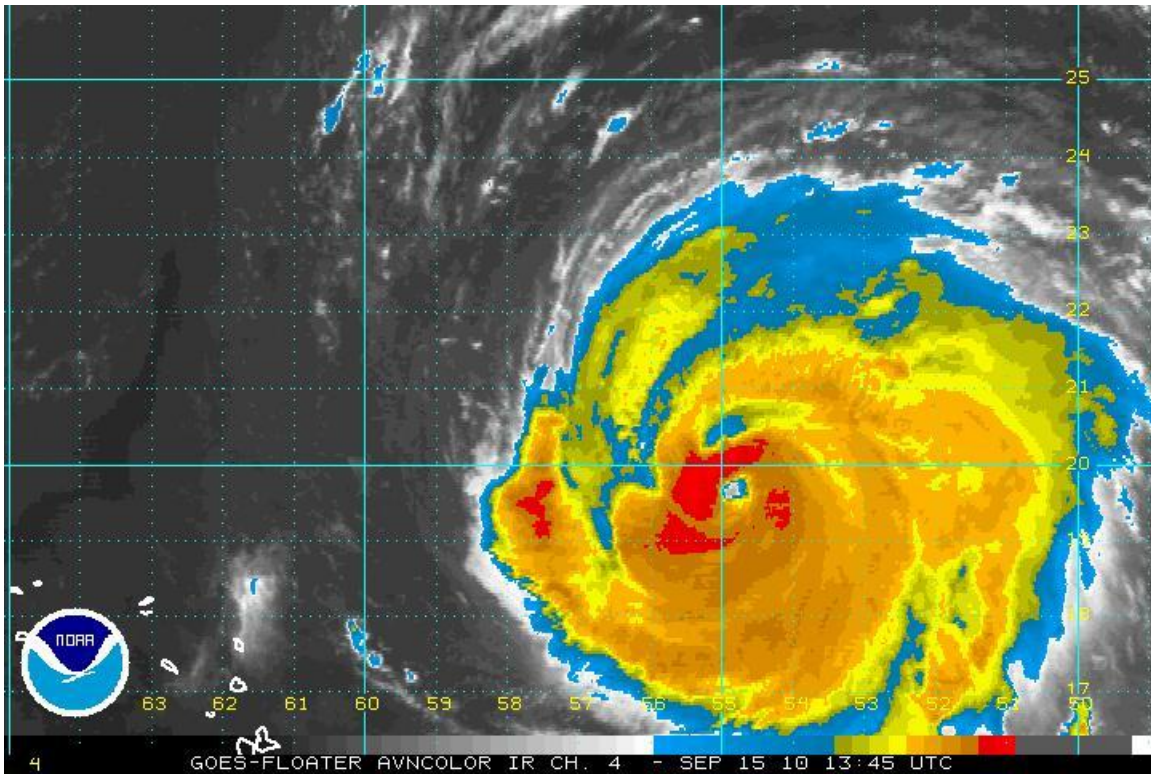
K6

Atlantic TROPICAL STORM KARL Model Intensities Valid Time: 1200 UTC 15 September 2010

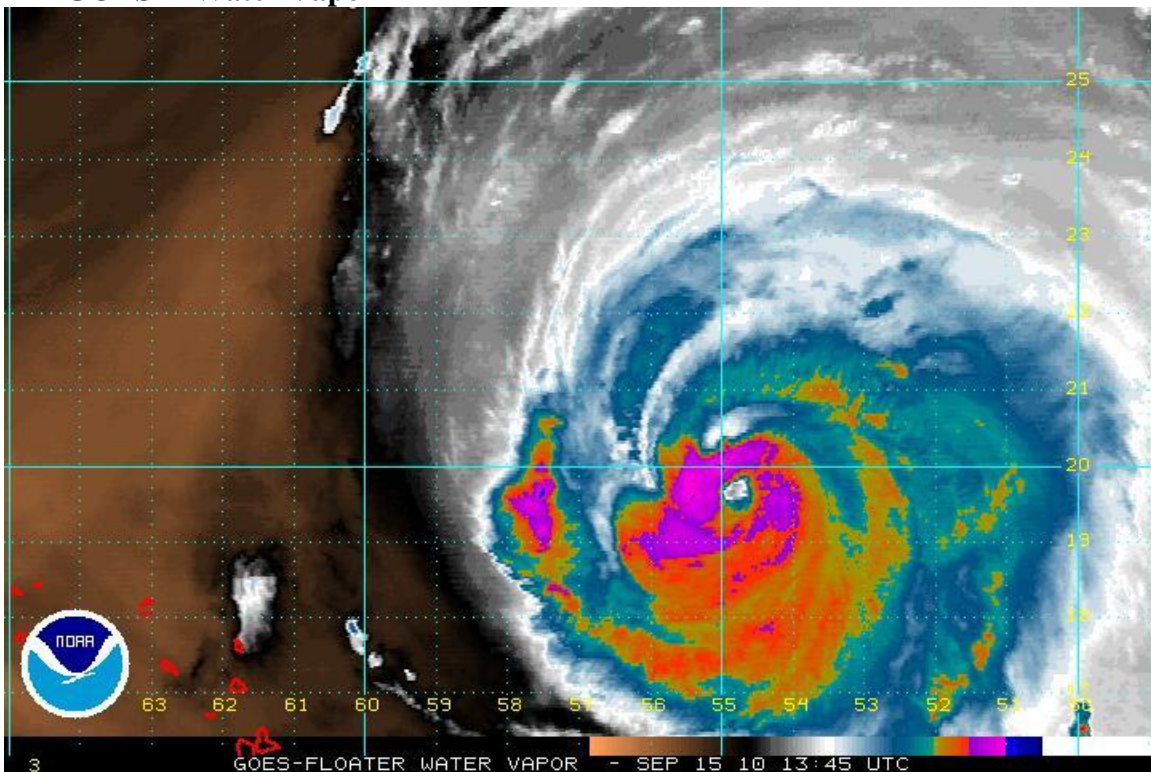


Tropical Cyclone Model Plots
<http://mof.mel.fsu.edu/~macevans/models/>
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**PGI-41L...Igor:
I1 – GOES-E IR**



I2 – GOES-E Water Vapor



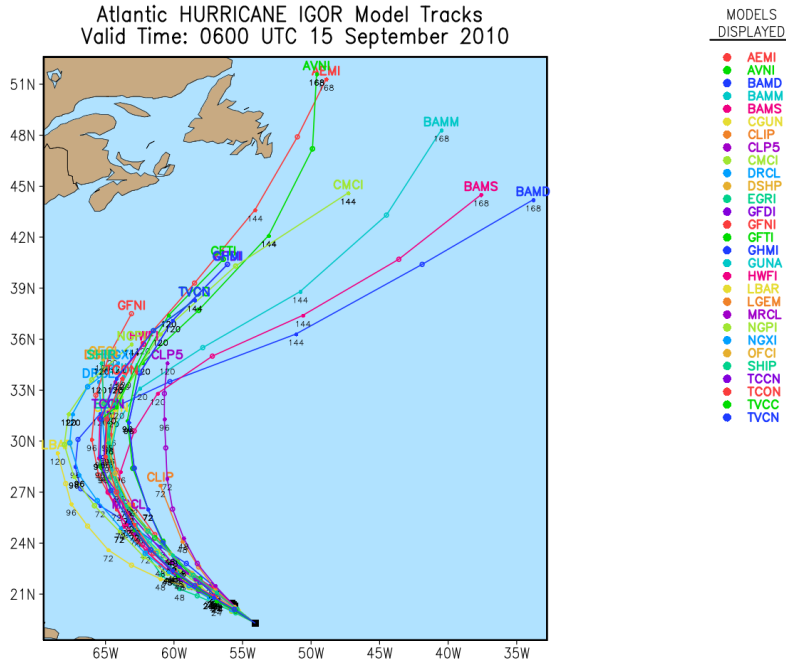
I3

	* ATLANTIC SHIPS INTENSITY FORECAST *												
	* GOES DATA AVAILABLE *												
	* OHC DATA AVAILABLE *												
	* IGOR AL112010 09/15/10 12 UTC *												
TIME (HR)	0	6	12	18	24	36	48	60	72	84	96	108	120
V (KT) NO LAND	115	112	115	119	120	126	122	118	112	105	99	94	82
V (KT) LAND	115	112	115	119	120	126	122	118	112	105	99	94	82
V (KT) LGE mod	115	110	108	108	109	112	113	111	105	99	93	87	78
SHEAR (KT)	5	5	4	3	2	6	5	5	12	21	19	27	27
SHEAR ADJ (KT)	-3	-4	-2	3	3	3	3	2	-2	0	1	10	7
SHEAR DIR	122	190	185	176	138	216	268	179	191	188	200	205	195
SST (C)	29.0	29.1	29.1	29.1	29.1	29.1	29.2	29.1	28.7	28.5	28.5	28.2	27.6
POT. INT. (KT)	151	153	152	152	152	153	155	153	147	144	144	140	132
ADJ. POT. INT.	138	141	139	138	139	140	141	138	130	126	125	120	113
200 MB T (C)	-50.8	-50.4	-50.1	-49.8	-49.1	-49.3	-48.1	-47.6	-47.5	-46.9	-46.4	-44.9	-45.5
TH_E DEV (C)	12	12	13	12	11	12	11	11	10	10	9	8	6
700-500 MB RH	58	56	53	49	51	51	49	51	57	55	55	49	44
GFS VTEC (KT)	43	41	45	46	42	48	47	49	49	45	46	49	49
850 MB ENV VOR	91	102	118	119	137	158	167	170	166	172	176	168	206
200 MB DIV	22	-11	9	69	92	39	25	12	24	63	96	87	70
LAND (KM)	1175	1103	1035	980	929	822	754	792	922	1101	1170	1091	946
LAT (DEG N)	19.6	20.1	20.5	20.9	21.3	22.2	23.4	24.8	26.5	28.3	30.4	32.6	35.0
LONG (DEG W)	54.6	55.4	56.1	56.8	57.4	59.0	60.9	62.4	63.6	64.4	64.9	64.6	63.7
STM SPEED (KT)	7	8	8	7	8	10	10	10	10	10	10	12	13
HEAT CONTENT	69	76	77	68	67	63	62	53	30	19	22	26	22

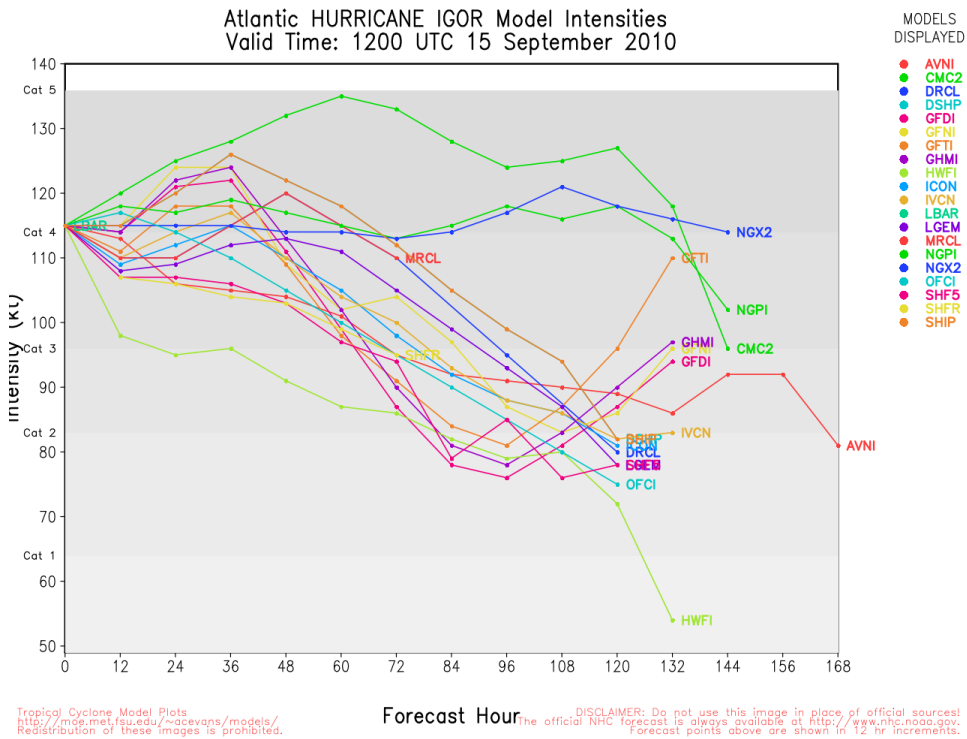
FORECAST TRACK FROM OFCI INITIAL HEADING/SPEED (DEG/KT): 300/ 7 CX,CY: -5/ 4
 T-12 MAX WIND: 135 PRESSURE OF STEERING LEVEL (MB): 566 (MEAN=624)
 GOES IR BRIGHTNESS TEMP. STD DEV. 50-200 KM RAD: 12.4 (MEAN=14.5)
 % GOES IR PIXELS WITH T < -20 C 50-200 KM RAD: 98.0 (MEAN=65.0)

I4

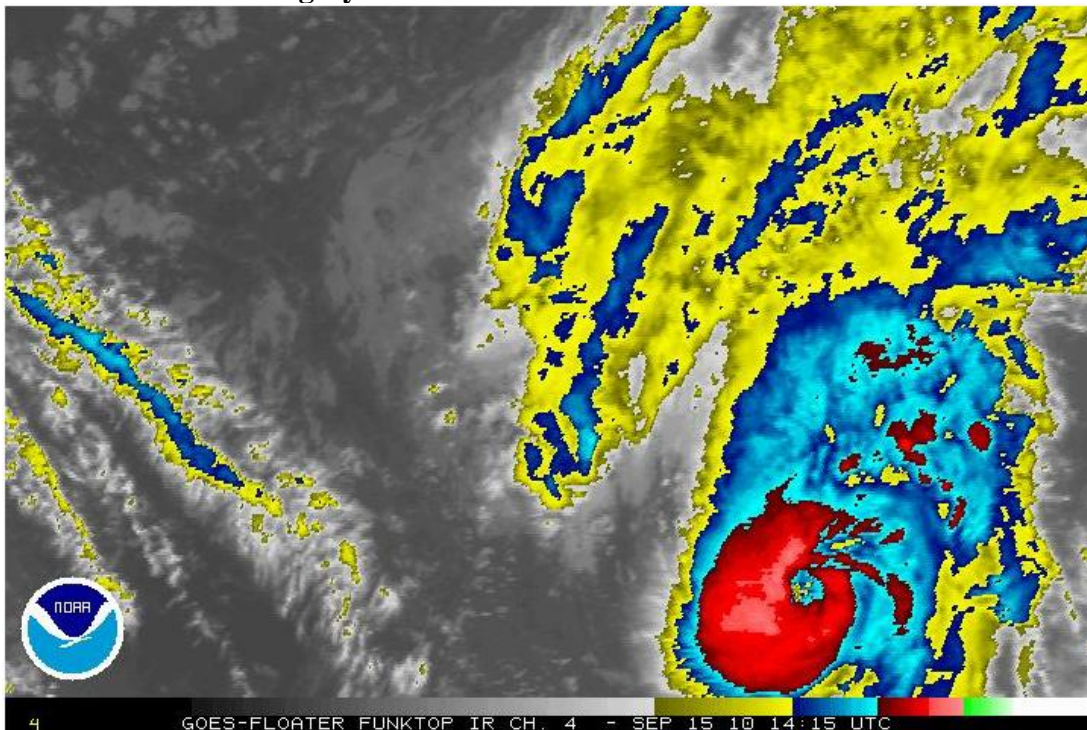
Atlantic HURRICANE IGOR Model Tracks
 Valid Time: 0600 UTC 15 September 2010



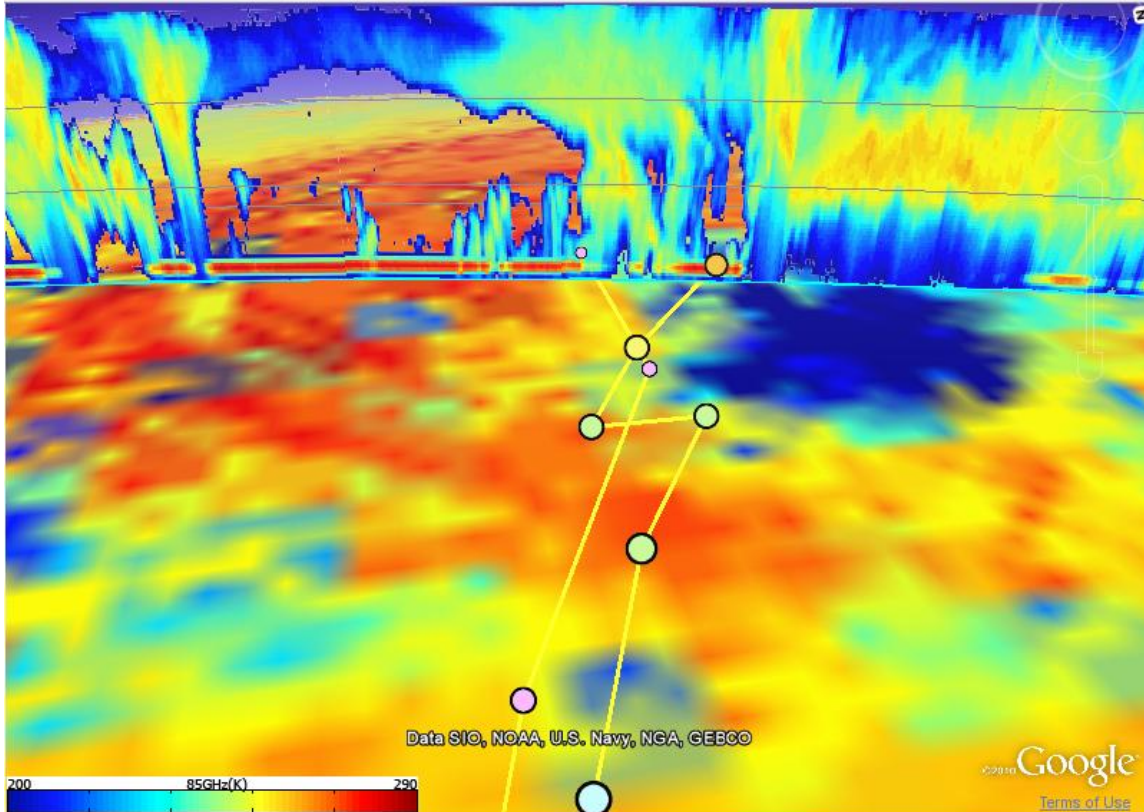
I5



**PGI-43L...Julia:
J1: 1415 UTC IR Imagery**

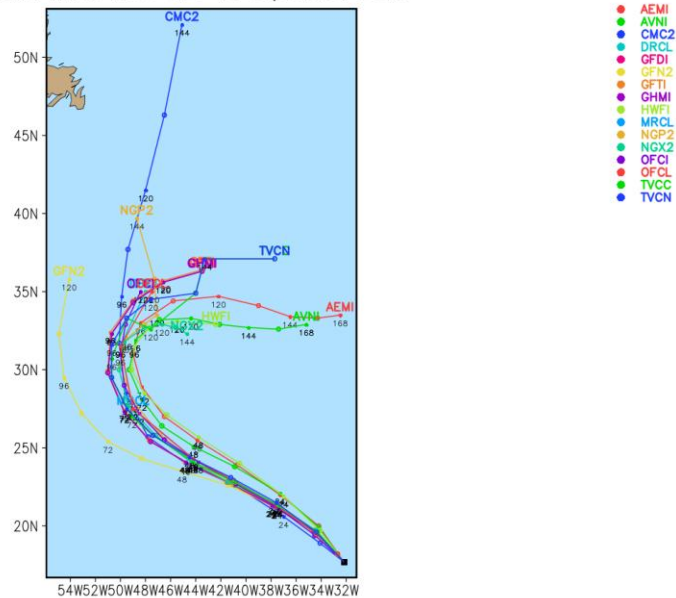


J2: Vertical slice through Julia during rapid intensification by Cloud Sat showing reflectivity values, plotted over 85Ghz temperatures and the track of Julia, showing the slice caught the eye and the eyewall features. The cloud tops were higher than even 15km! Image courtesy of the JPL GRIP Support Portal.



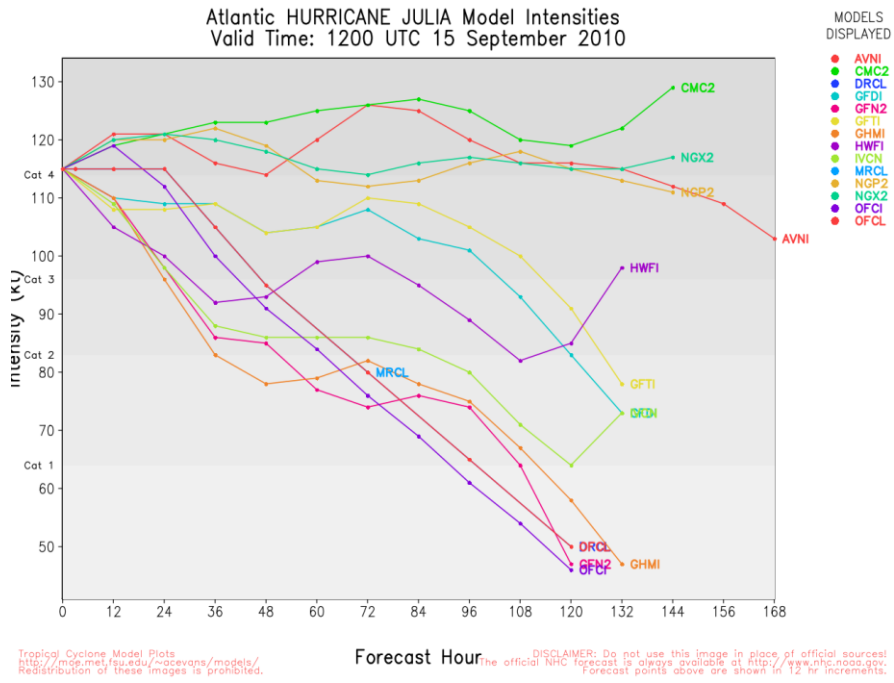
J3: Julia 1200 UTC forecast track and intensity

Atlantic HURRICANE JULIA Model Tracks
Valid Time: 1200 UTC 15 September 2010

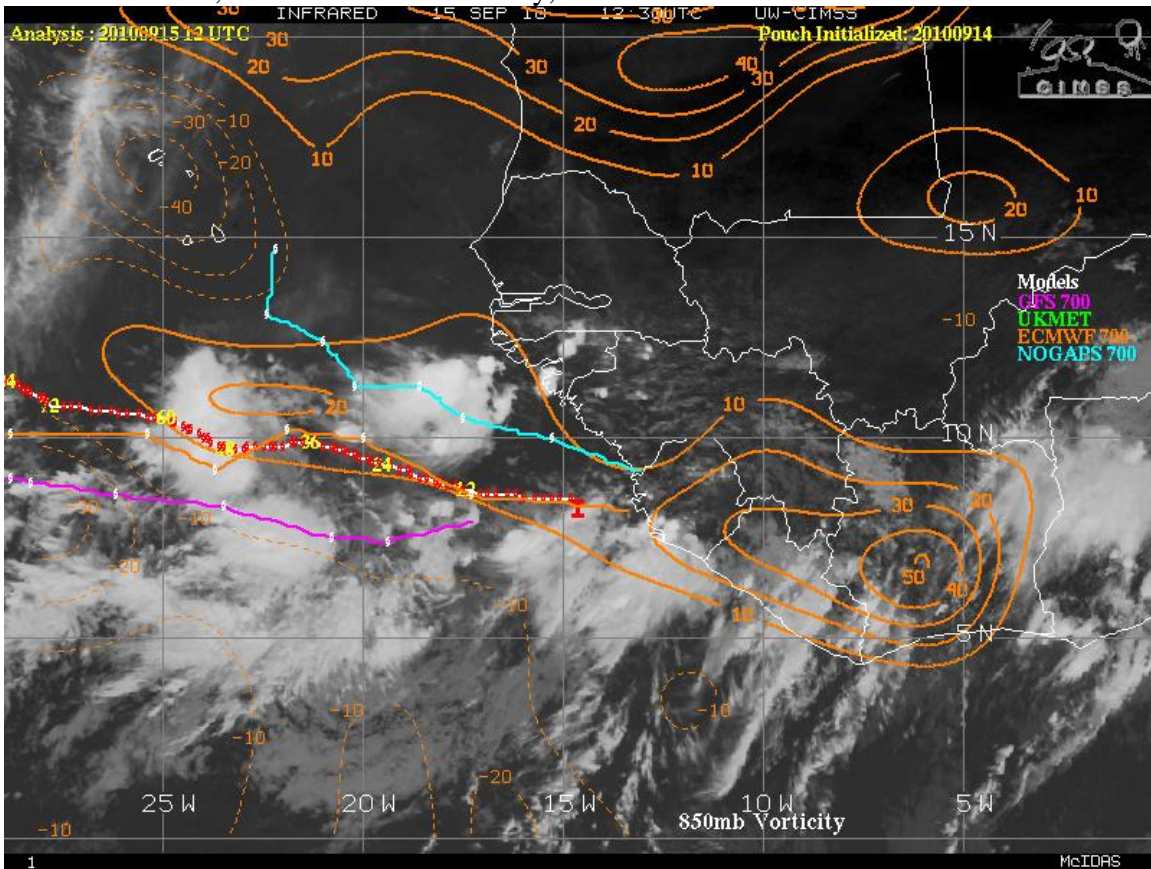


Tropical Cyclone Model Plots
<http://mdl.met.fsu.edu/~acevans/models/>
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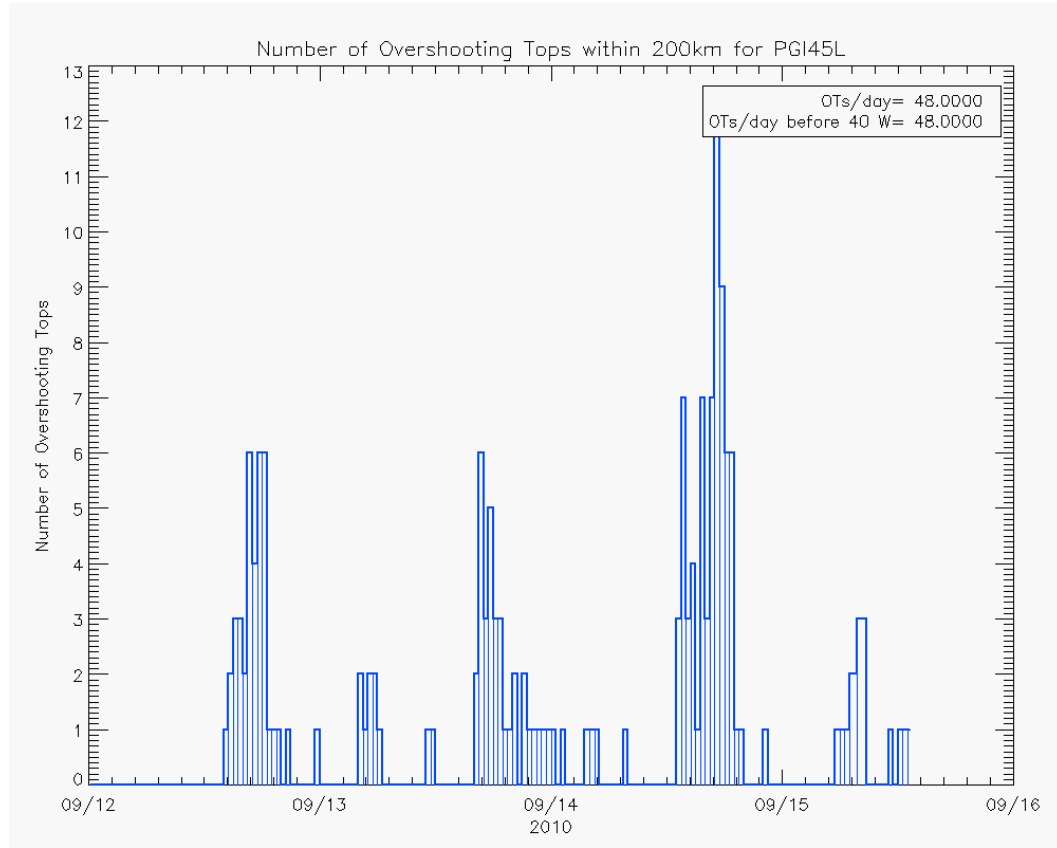
DISCLAIMER: Do not use this image in place of official sources!
The official NHC forecast is always available at <http://www.nhc.noaa.gov>.
Forecast points above are shown in 12 hr increments. Initial points denoted by black squares.



PGI-45L: 45A – GOES IR, CIMSS 850 mb vorticity, and model tracks

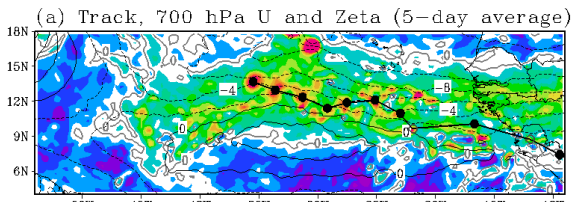


45B

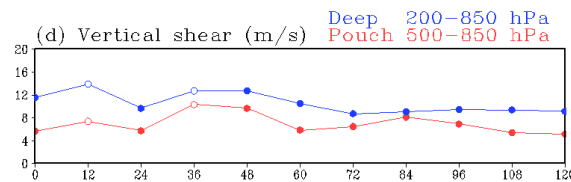
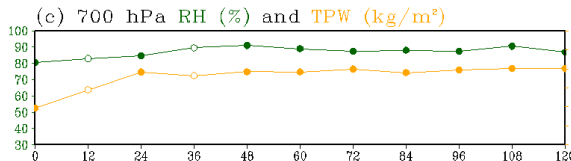
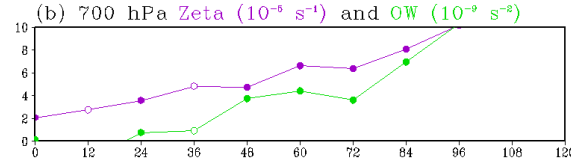


45C – ECMWF and GFS pouch tracking

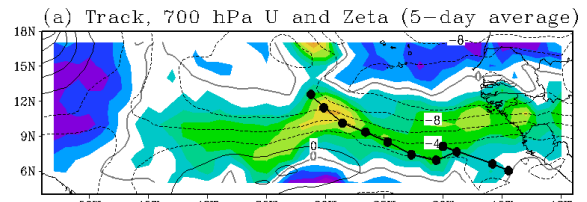
PGI45L: 5-Day Forecast Based on ECMWF
Initialized at 2010091500



3x3 degree box averages following the pouch:



PGI45L: 5-Day Forecast Based on GFS
Initialized at 2010091500



3x3 degree box averages following the pouch:

