

## Tri-Agency Forecast Discussion for September 16, 2010

Created 1600 UTC September 16, 2010

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### **Summary:**

For the first time since 1998, 3 hurricanes are simultaneously present in the Atlantic basin, Karl, Igor, and Julia. Two PGI systems also have the potential to develop within the next week. The focus today rests squarely on Karl, and a possibly unprecedented effort is underway to document the storm. 3 NASA aircraft, 2 NOAA aircraft, and a pair of Air Force C-130s will all be observing Karl today. Karl is in a very favorable environment, and the potential for RI is high. Even if Karl does not actually rapidly intensify, further strengthening is very likely. Karl is expected to take a general westerly track, with a slight northward turn a possibility shortly before landfall. However, landfall is expected by 20-21 UTC tomorrow. Igor has undergone a second eyewall replacement cycle, and after briefly weakening overnight, has regained some of its strength today. The track forecasts continue to bring it very close to Bermuda by the end of the weekend. Julia has finally begun to weaken after undergoing a surprise RI yesterday. Julia is expected to accelerate to the NW for the next two days, and will likely catch up to Igor allowing for vortex interaction. Finally, the two PGI systems are not well organized at this time, but will be monitored closely for future development.

### **Forecast for 1600 UTC 9/16/2010:**

### **Synoptic Overview:**

The tropics are busy today, and 3 simultaneous hurricanes are present in the Atlantic basin for the first time since 1998 (**S2**). Hurricane Karl is located at 19.7N/92.8W and has maximum sustained winds of 65kts. Meanwhile, Hurricane Igor is located at 20.5N/56.8W and has sustained winds of 125kts, and Hurricane Julia is at 22.4N/38.5W, with max sustained winds of 90kts. There are also 2 PGI systems, PGI-45L at 8.6N/20.4W and newly named PGI-46L located at 9.8N/38.7W. Both of these systems are unorganized at the moment, but have the potential to develop over the next week. The other primary feature of note in the Atlantic is a mid latitude cold low which has emerged from the eastern US coast (**S1**). This low is acting to weaken the subtropical ridge, allowing Igor to progress northward to some extent. However aside from the 5 tropical systems being tracked and the ITCZ, there are no other active systems in the Atlantic currently producing convection (**S3**). Water Vapor imagery indicates the continued presence of dry air ahead of Igor and Julia, however there is no indication it is getting into the core of Igor. However dry air is wrapping into and around Julia as indicated in both WV and TPW (**S4 and S6**). However, the environment around Karl is very moist.

Looking at the low level vorticity, well defined maxes are associated with Karl, Igor, and Julia. Julia's vorticity has decreased somewhat from yesterday while Karl's signature has become more pronounced. There are also vorticity maxes associated with both PGI-45 and PGI-46, however these are not particularly well defined or strong at this time (C4). At upper levels, a mid latitude ridge is evident over the southeast US, while a trough is moving off of the northeast US into the Atlantic (C1). The upper level cold low that has persisted off of Spain for several days remains in place as well (C5). Some upper level cyclonic turning is still evident with Igor, however it is less evident today. However, Igor continues to showcase impressive outflow nonetheless. The Spanish low is related to fairly high shear, as is the mid latitude trough in the western Atlantic. However shear is fairly low elsewhere, except where it is influenced by outflow from Igor or Karl (C2).

### **Features of Interest:**

#### **PGI-44L...Karl:**

As of 1500UTC, Hurricane Karl was located at 19.7N, 92.8W. Maximum estimated winds are 65kts, and the central pressure has dropped to 983mb. Karl was recently upgraded to a hurricane, despite only recently emerging from the Yucatan Peninsula. Karl appeared to maintain its structure with only minimal interference from land, and an eye-like feature was visible in microwave imagery almost immediately after reaching the Bay of Campeche (K1). The environment around Karl is extremely conducive for development as it has been for the past few days. Wind shear is low (C2), SSTs are high (J1), and should it develop enough to take advantage of it, Ocean Heat Content is also fairly high (K2). Furthermore, there is an abundance of moisture available to the system. The only apparent negative influence on Karl is its proximity to land.

With an environment so conducive for development, Karl is anticipated to intensify, perhaps rapidly. In fact, as of 1500UTC, the pressure was dropping at a rate close to 2mb per hour, and wind speeds were quickly increasing. Whether rapid intensification is underway or not, further strengthening is anticipated. Microwave imagery of Karl indicates a storm structure similar to that of Igor and Julia before they underwent RI, further indicating the possibility of RI.

Karl's final intensity will depend heavily on its track. The storm is currently moving nearly due west, however many models are predicting a slight northward turn (K3). However, given the lack of strong large scale northward steering over the system, this track seems unlikely (K4). If the system gains enough strength, some beta advection could allow it to turn, however no other factors seem to be in place to allow it to turn northward. The current NHC forecast calls for a somewhat northward turn, allowing the system to remain over water until 0000UTC tomorrow, however given its current movement, a southern track and landfall closer to 2000-2200UTC seems likely. This

may prevent Karl from reaching its full intensity potential, and limit flight operations beyond today. The track forecast for Karl, adjusting the NHC forecast south to account for current movement, is:

Initial	16/1200Z	19.7 N 92.8 W	
12 hr	17/0000Z	19.8 N 93.9 W	
24 hr	17/1200Z	19.9 N 95.5 W	
33 hr	17/2100Z	20.1 N 96.7 W	Landfall
36 hr	18/0000Z	20.1 N 97.0 W	Inland

**PGI-41L...Igor:**

Hurricane Igor is located presently at 20.5°N, 56.8°W, moving WNW at 6 kt and appears to have completed an eyewall replacement cycle overnight. Maximum sustained winds are estimated at 125 kt. The system is traversing the western periphery of the subtropical ridge, to the south of a weak upper level trough off the northeastern seaboard, which is not deep enough to fully recurve the storm towards the northeast (**C1**). SSMIS at 91 GHz depicts a well-established eye with a slight convective void on its southwestern periphery (**I1**). Dry air is wrapping around the south and west of Igor at low levels but TPW remains favorable for the system (**S4**). Igor is forecast to move into a region of slightly lower shear in the short term before seeing values rise towards unfavorable levels over the weekend (**C2**). Thermodynamic factors also appear favorable with SSTs around 29°C (**J1**) and OHC remaining a positive influence through 48 hours (**K2**).

Models remain in relatively good agreement that Igor will track northwestward for the next 72 hours (**I2**) with only the ECMWF bringing the storm slightly to the east (**I3**). The GFS has Igor beginning to gain an eastward component on Monday, as the system is caught up in a shortwave trough exiting the Northeast U.S. (**I4**). Intensity forecasts, with the exception some NOGAPS variants, have Igor plateauing today before finally weakening for good in the next 12-24 hours (**I5**). SHIPS dramatically reduces OHC and increases wind shear after 48 hours. The SHIPS probabilistic forecast for secondary eyewall formation at 74% over the next 36 hours and 89% over the next 48 hours, and another eyewall replacement cycle could result in some fluctuation in intensity before the inevitable decline begins.

Officially the NHC forecast for Igor is:

Initial	16/0900Z	20.5 N 56.8 W	125 kt
12 hr	16/1800Z	21.1 N 57.8 W	125 kt
24 hr	17/0600Z	22.0 N 59.4 W	125 kt
36 hr	17/1800Z	23.2 N 61.1 W	120 kt
48 hr	18/0600Z	24.7 N 62.7 W	120 kt
72 hr	19/0600Z	28.0 N 65.0 W	110 kt
96 hr	20/0600Z	32.5 N 64.5 W	95 kt

120 hr

21/0600Z

37.5 N 59.0 W

80 kt

**PGI-43L...Julia:**

As of 1200UTC, Julia was centered at 22.4N/38.5W. The central pressure of Julia has increased overnight from 953 mb at 2100 UTC to 970 mb at 1200UTC. Estimated maximum winds have decreased according, from 110kts to 90kts. A combination of dry air, high shear, and low SSTs (**S6, C2, J1**) have weakened Julia, and convection is no longer present in the SE quadrant of the storm, leaving an open eye (**J2**).

There is a good consensus in the early models for Julia to move NW for 48 hrs, followed by recurvature (**J3**). Julia's recurvature will likely be impacted by Igor, and some degree of a Fujiwhara interaction cannot be ruled out. Whether they show signs of rotation about one another or not, the systems will interact to some degree and the ECMWF, NOGAPS, and GFS all show the low pressure centers of Julia merging with Igor beyond 120 hrs. The ECMWF also indicates the 850 mb vorticity maximums of the two systems will combine past 120 hrs, while NOGAPS shows the storms as separate maxima. Intensity forecasts at 1200 UTC generally show a trend of weakening in the storm until eventual dissipation or merging with Igor, however the rate of that decline is highly variable (**J4**). Given the unfavorable environment surrounding Julia, weakening is likely to be fairly rapid, and the OFCI forecast seems reasonable.

**PGI-45L:**

PGI-45L has moved westward to 8.6° N and 20.4° W, bringing the pouch center over the Atlantic. While the low level vorticity maximum was displaced northwest of the pouch location yesterday, today an elongated maximum is present very close to the center (**45A**). Strongest convection remains confined to the northwestern part of PGI-45L, though one overshooting top was noted by CIMSS near the pouch center. The peak number of overshooting tops have diminished, and a distinct diurnal cycle in the number of these tops is continuing to occur (**45B**). CIMSS has evaluated shear of 20 kt affecting the south and east regions of the system, with the shear to the south nearly reaching the pouch center.

The 0000 UTC ECMWF today continues to develop PGI-45L, and the system appears to become at least a tropical storm within 144 hours. The ECMWF moves it westward in the short term with a gradual turn northward through 5 days (45C). This disagrees with the 0000 UTC GFS solution which develops a closed low, but nothing more. The GFS also turns the system northward, but the turn is later and much more sharp. While the ECMWF track would bring the system through an environment conducive for development, the GFS track environment is somewhat hostile, accounting for the difference in storm development. While the chances of development will depend heavily on exact track, the potential for genesis within the next 5-7 days continues to exist.

## **PGI-46L:**

PGI-46L has been analyzed as a vorticity maxima in the ITCZ. This particular vortex is being pulled north out of the ITCZ by the environment around Hurricane Julia. At 1300 UTC, the pouch was analyzed at 9.8N, 38.7W (**46A**). An ASCAT pass this morning indicated 10-15 kt winds oriented around a low level circulation (**46B**). Over the next 24 hours, the center of circulation should continue to move north, and then the predominant easterly flow that returns to the region should push the storm steadily to the west.

The global models agree to some extent on a track position for the first 48 hours, but the development of the system is highly variable. The GFS (non-pouch tracking) follows this vortex north for the first 36 hours, and then loses it until 60 hours, but then the circulation reappears as a low level center in the model and undergoes genesis near Barbados at 132 hours (**46C**). The ECMWF is not nearly as aggressive, and does not develop the system after it sees it in 48 hours. It merely persists the area as a wave-like feature. The NOGAPS and UKMET are even less aggressive with the forecast for PGI-46L. If the model forecasts have a proper handle on how fast the vortex could propagate westward, it should be near Barbados late Tuesday.

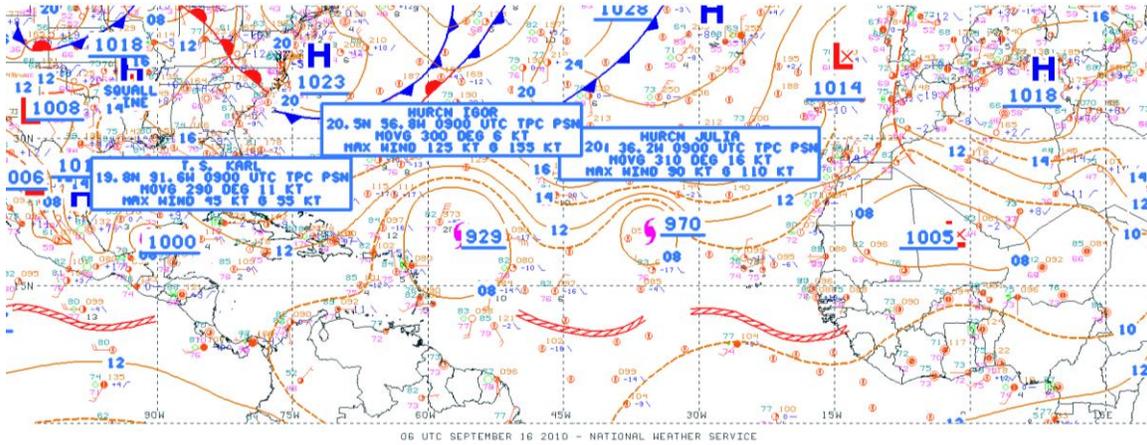
## **SAL:**

The current water vapor imagery shows some dry air to the north of PGI-45L. The area extends from the coast of Africa westward through the Cape Verde islands and over much of the eastern Atlantic. There is also substantial dry air wrapping around Julia at this time (**S6**). The CIMSS 0600 UTC Dry Air analysis shows a large area of dry air over the eastern Atlantic, in addition to the dry air around Julia (**D1**). The GEOS-5 model analysis agrees with TERRA AOT (**S5**), and shows a large area of dust mass over much of western Africa and the eastern Atlantic at 700-hPa (**D2**). Concentrations of dust mass decrease near Julia at 700-hPa, but increase off of the coast of Africa. The GEOS-5 24 hour forecast shows the potential for this dust to continue to push further westward into the Atlantic, with some potentially wrapping around the circulation of Julia (**D3**).

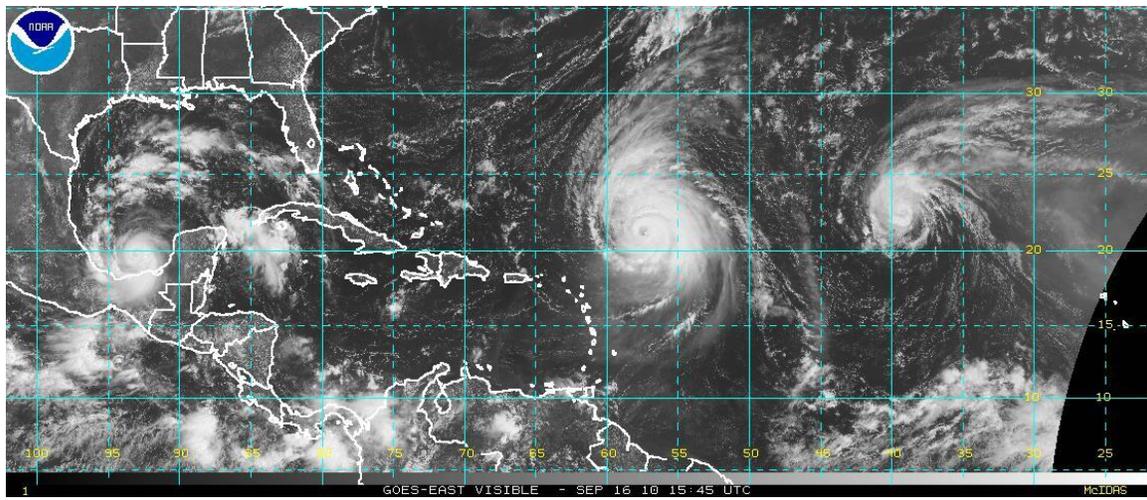
*Forecasters: Zelinsky, Harnos, English, Maliawco, Wood, Leary, Kofron, Stovern*

## **Images used in discussion:**

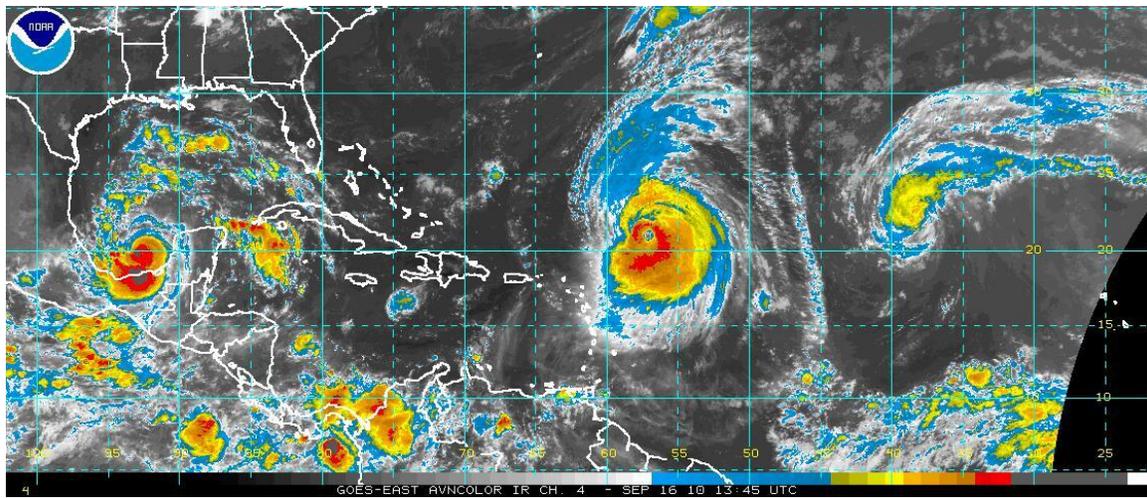
S1



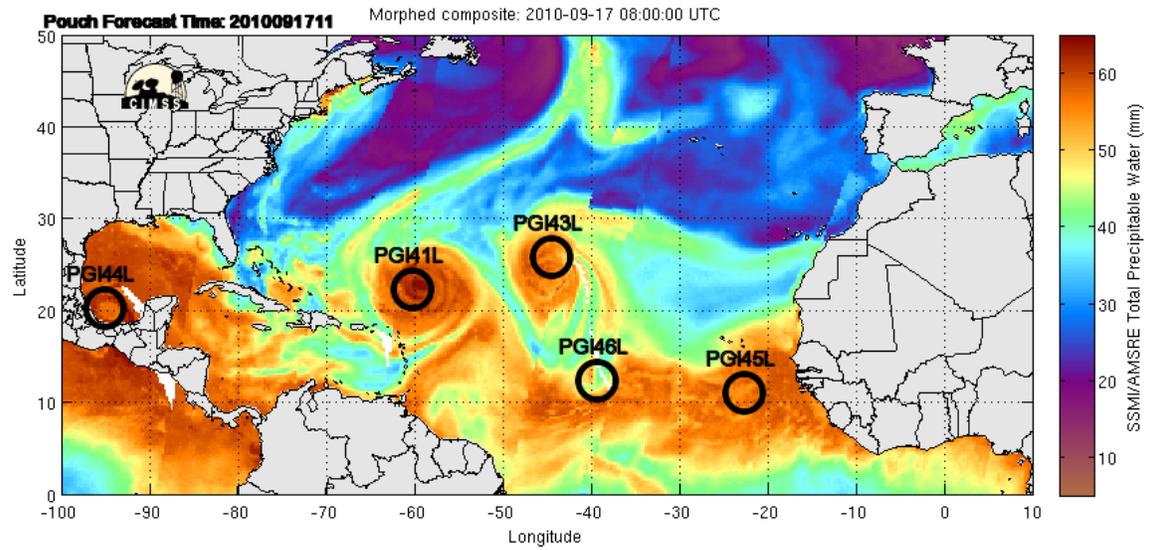
S2 GOES Visible



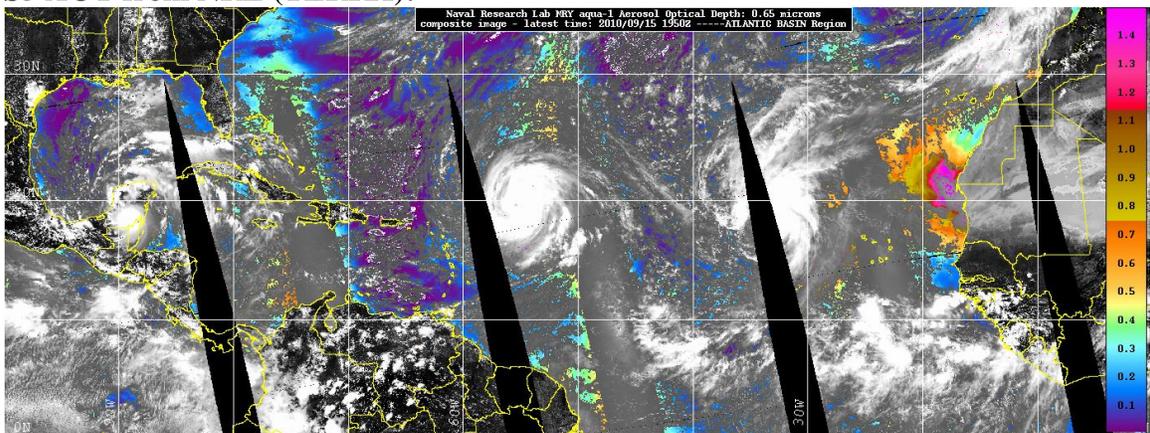
S3- GOES IR



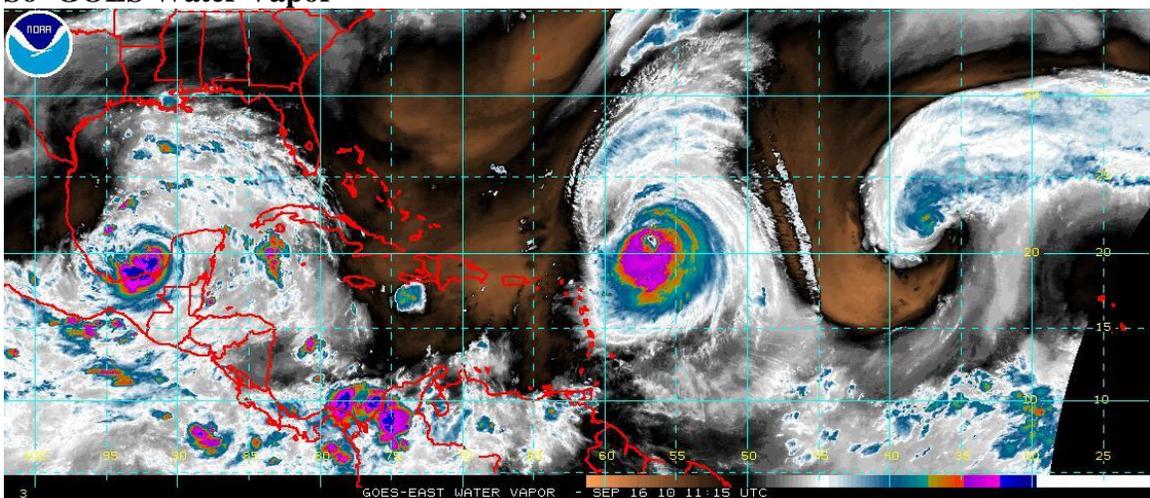
### S4- CIMSS TPW with Pouch Positions



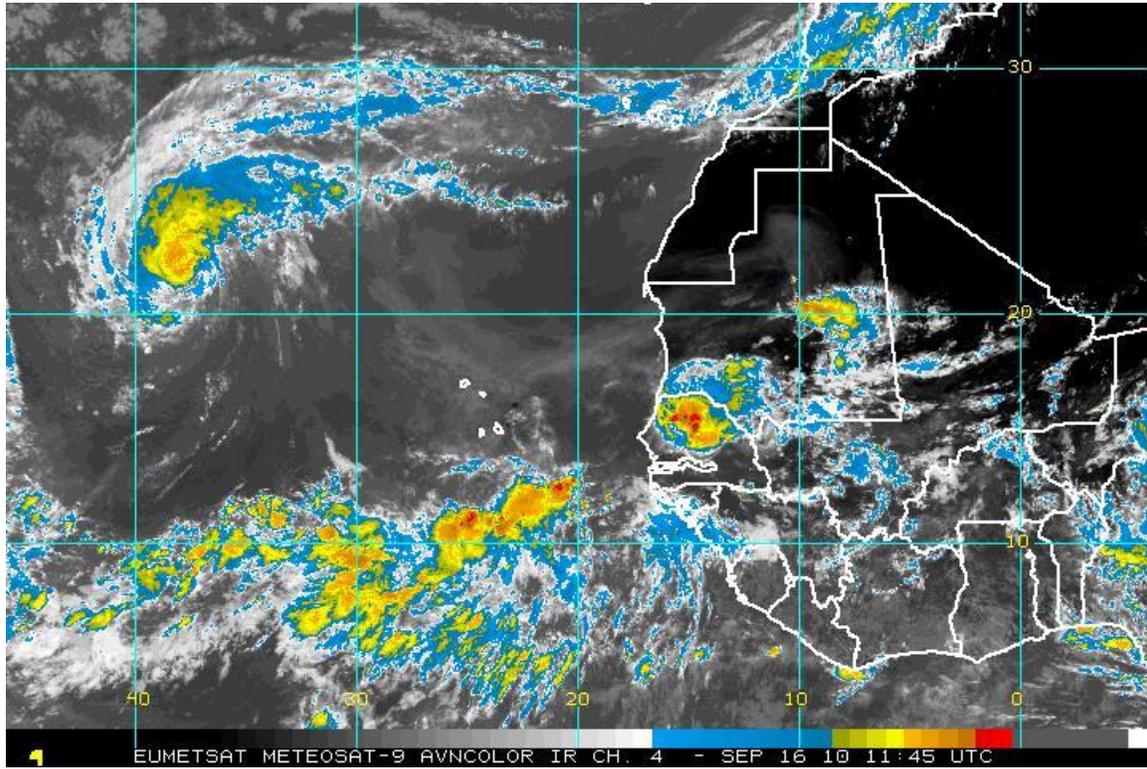
### S5 AOT from NRL (TERRA):



### S6- GOES Water Vapor

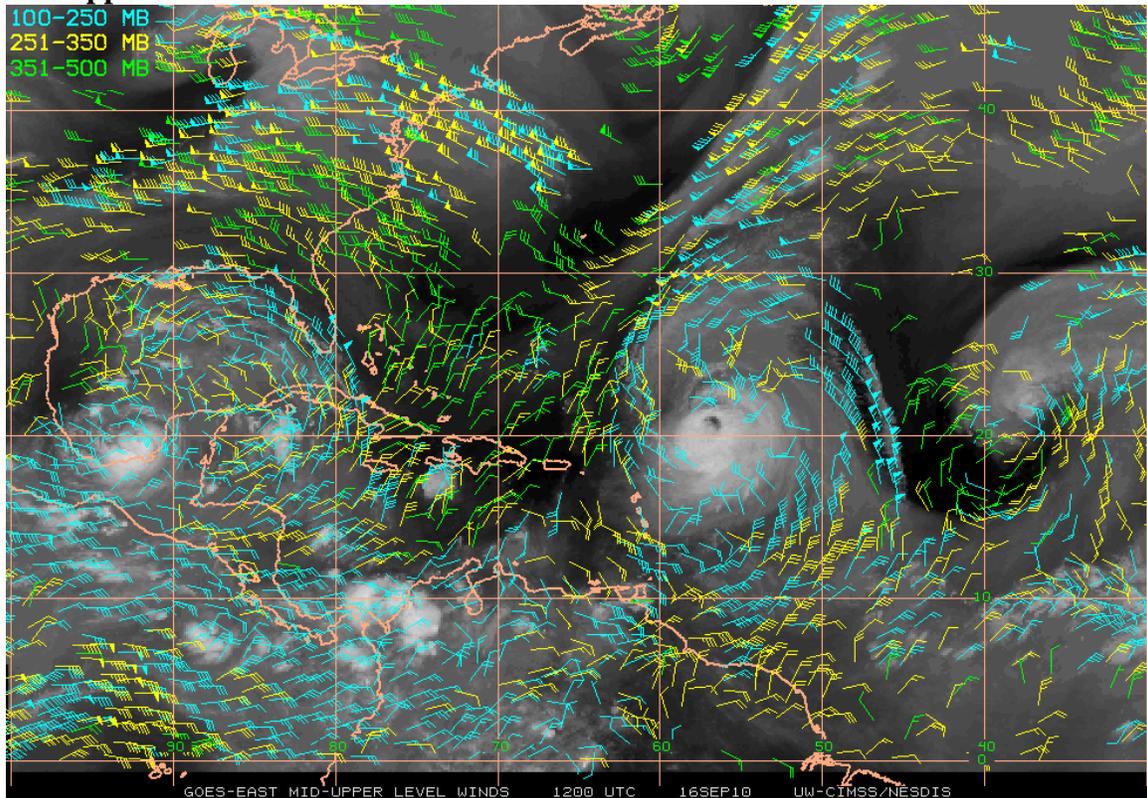


## S7 METEOSAT IR

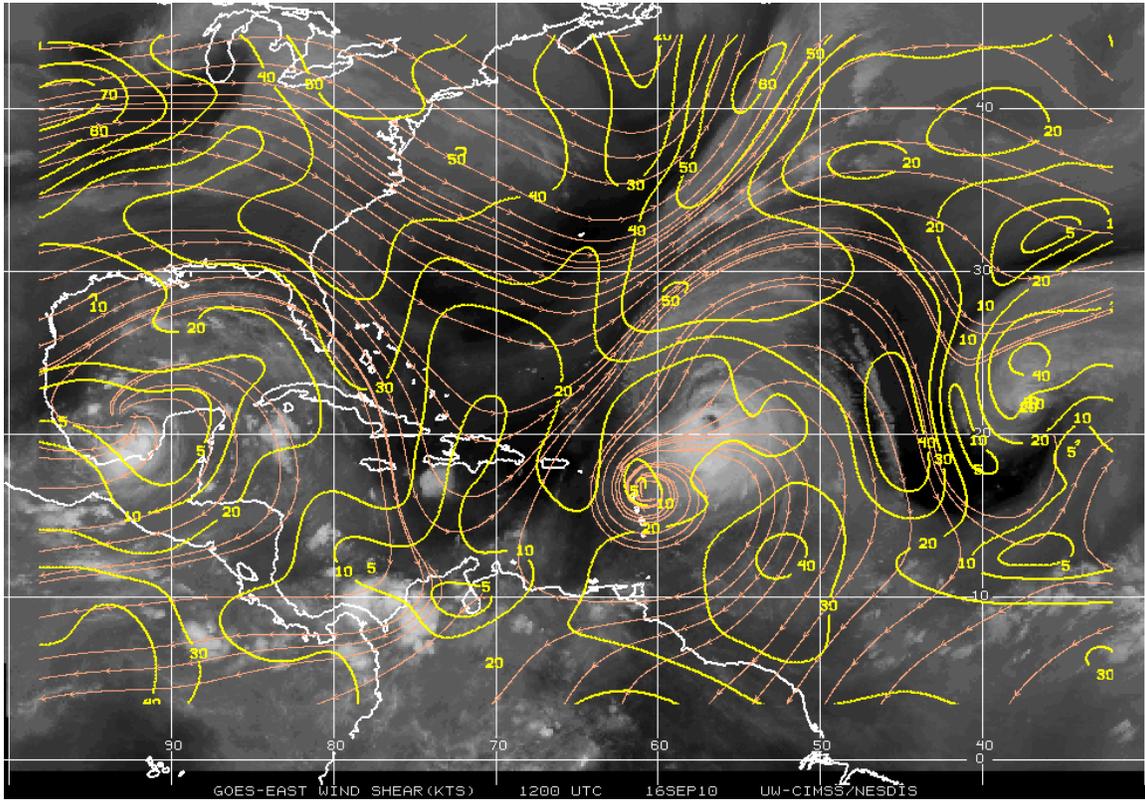


## CIMSS Analyses:

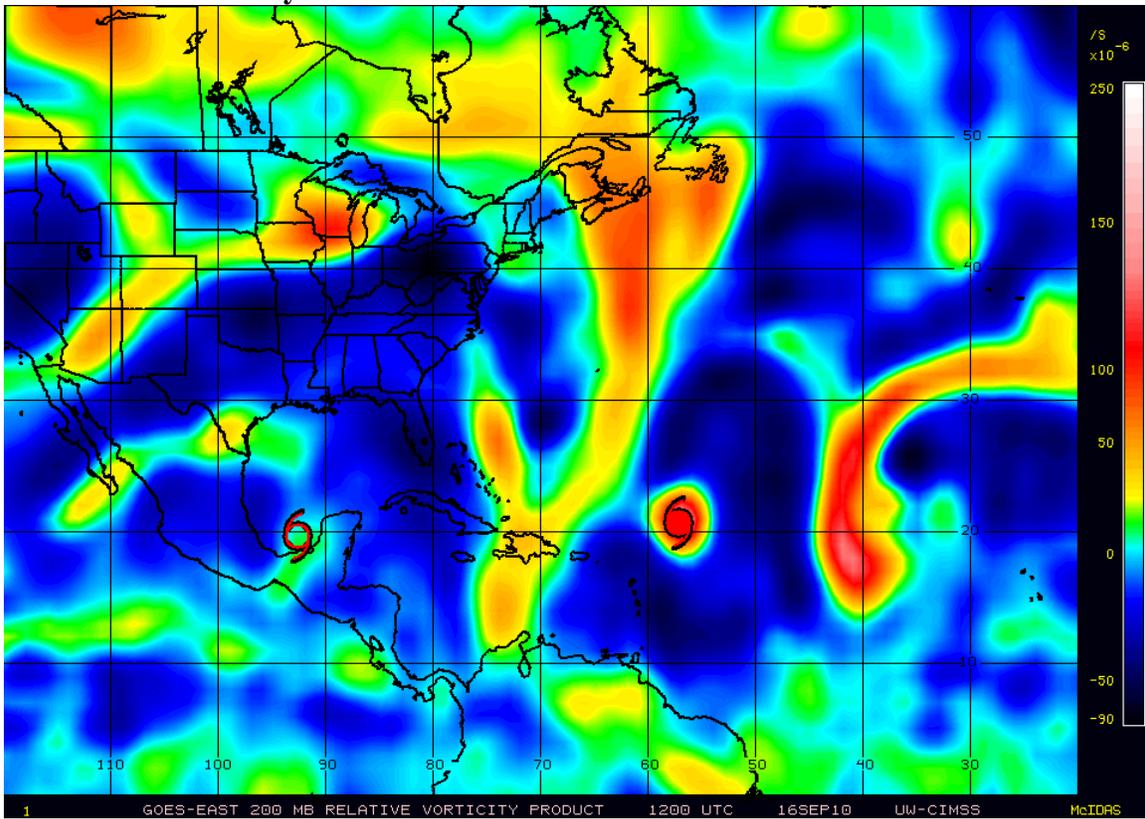
### C1- Upper Level Winds



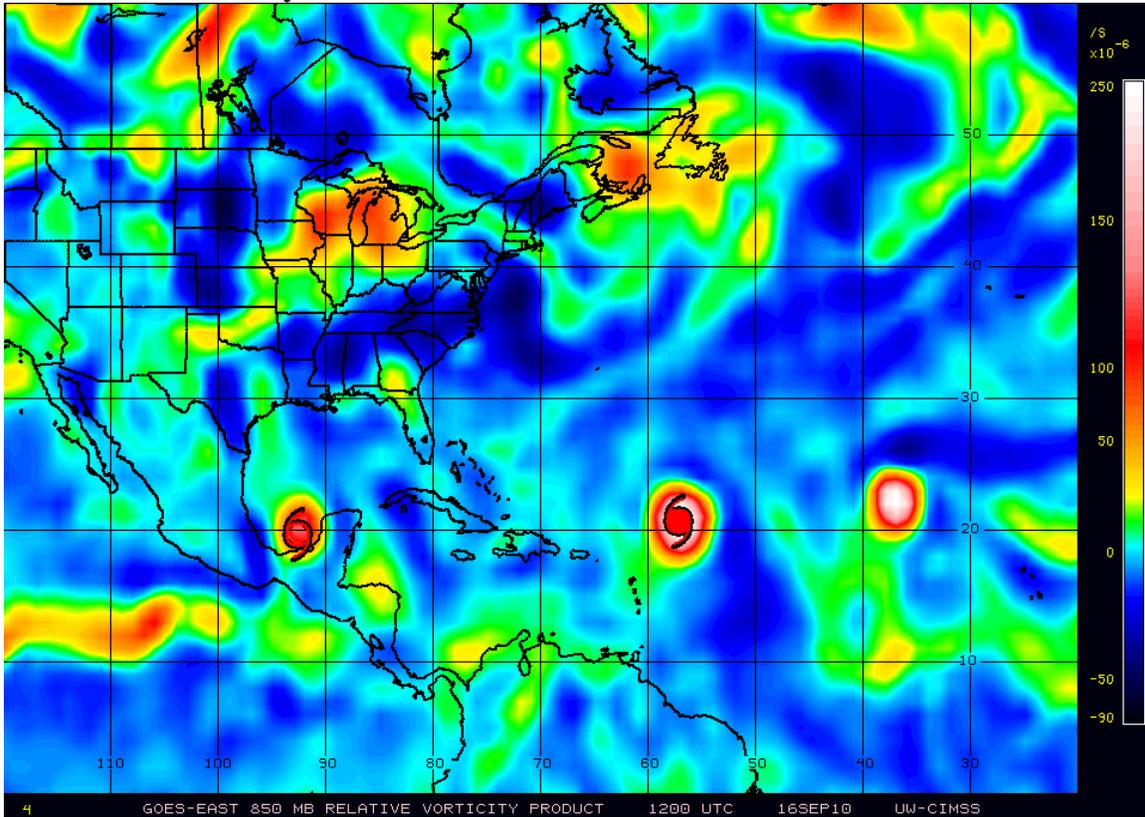
### C2- Wind Shear



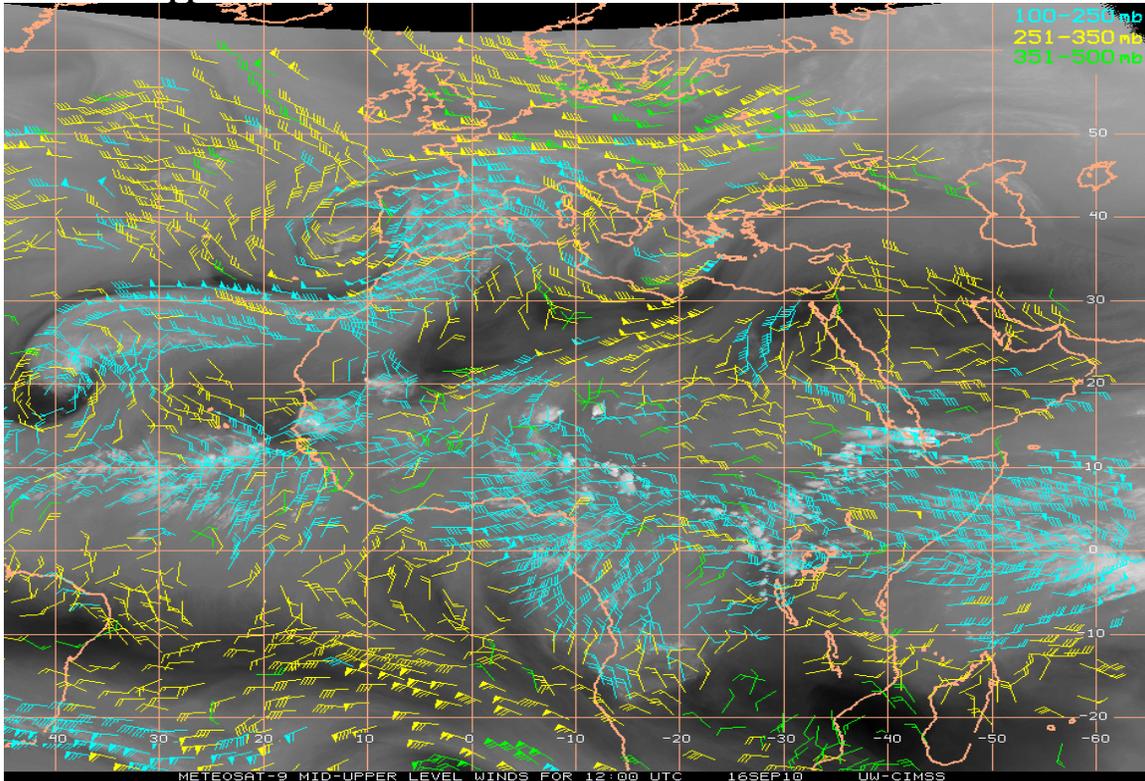
### C3- 200 hPa Vorticity



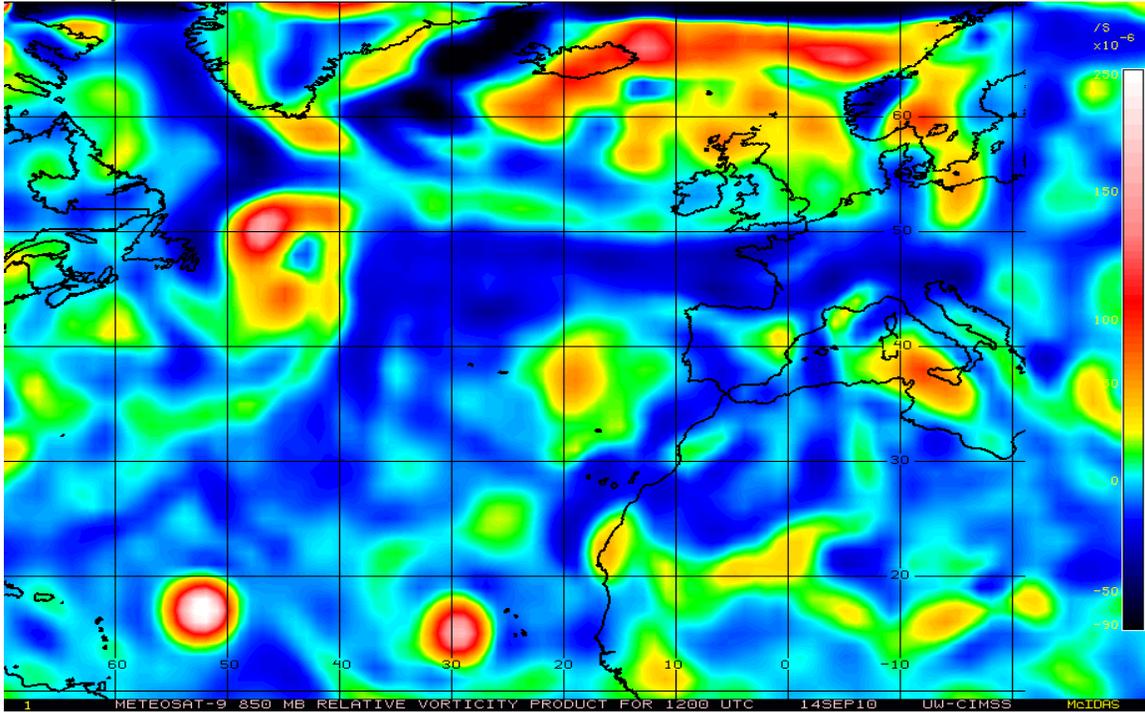
### C4- 850 hPa Vorticity



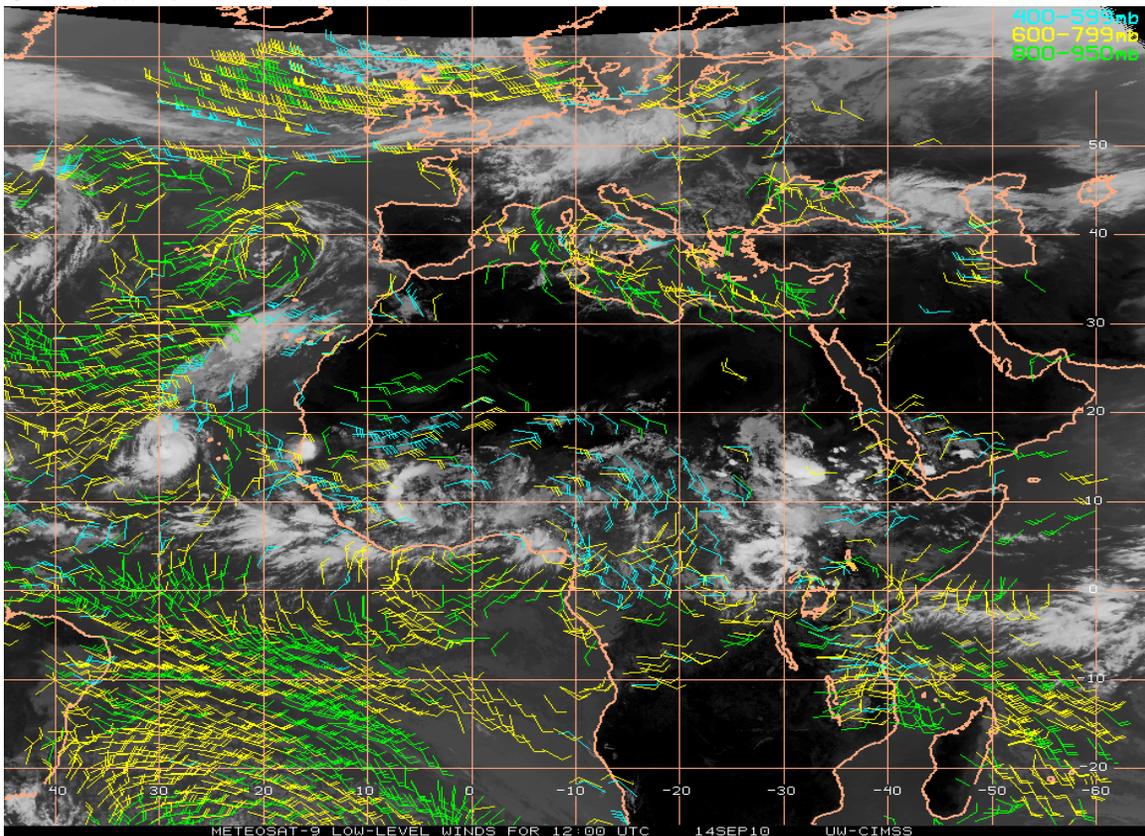
### C5 Africa Upper Level Winds:



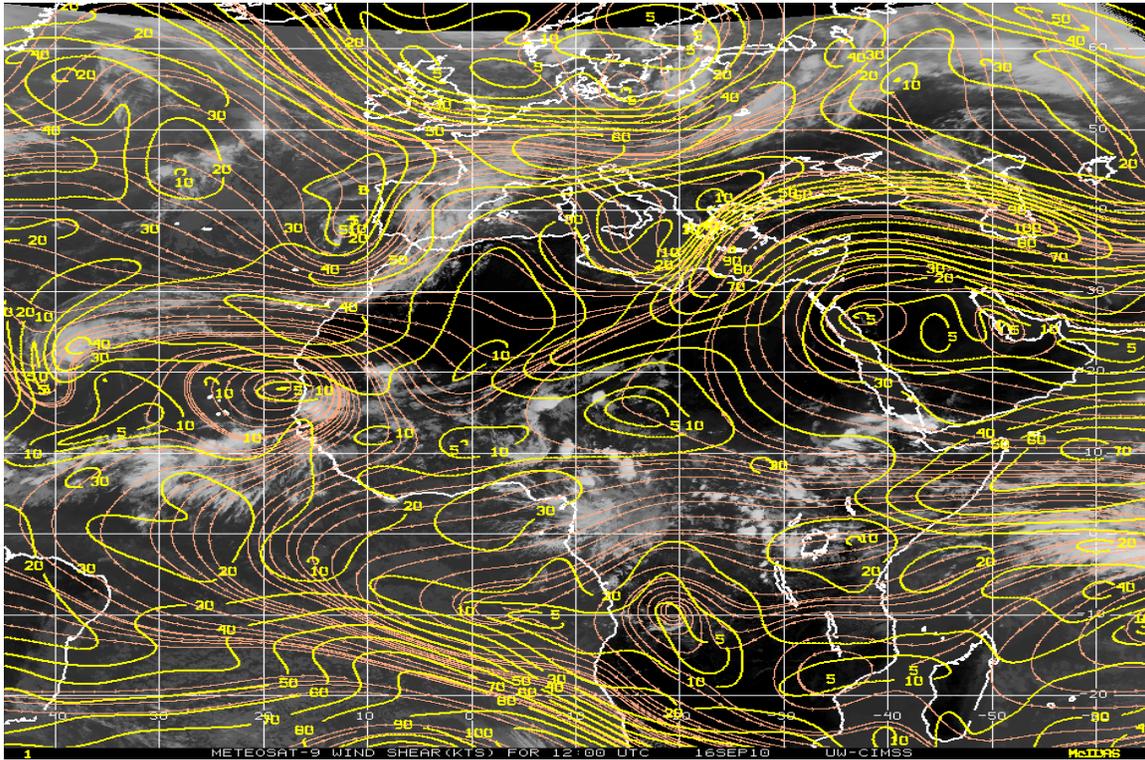
### C6 Africa Lower Level Vorticity



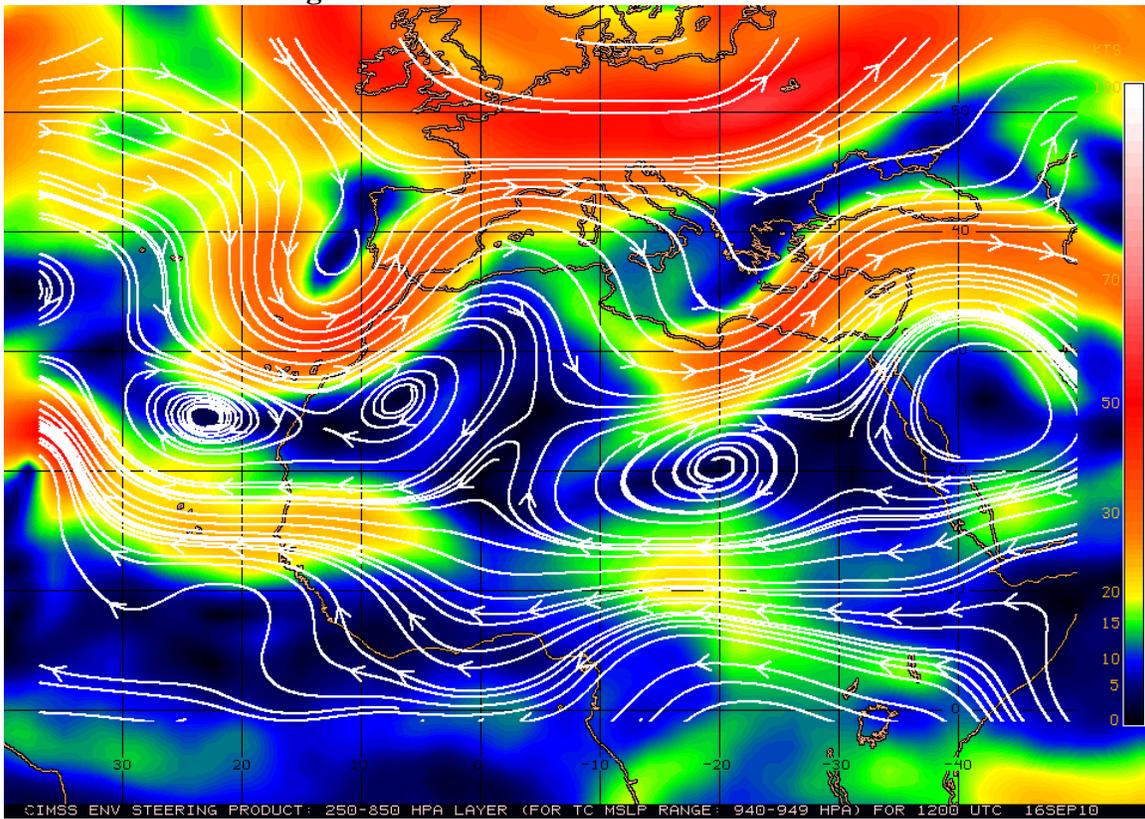
### C7 Africa Lower Level Winds



**C8 Africa Wind Shear**



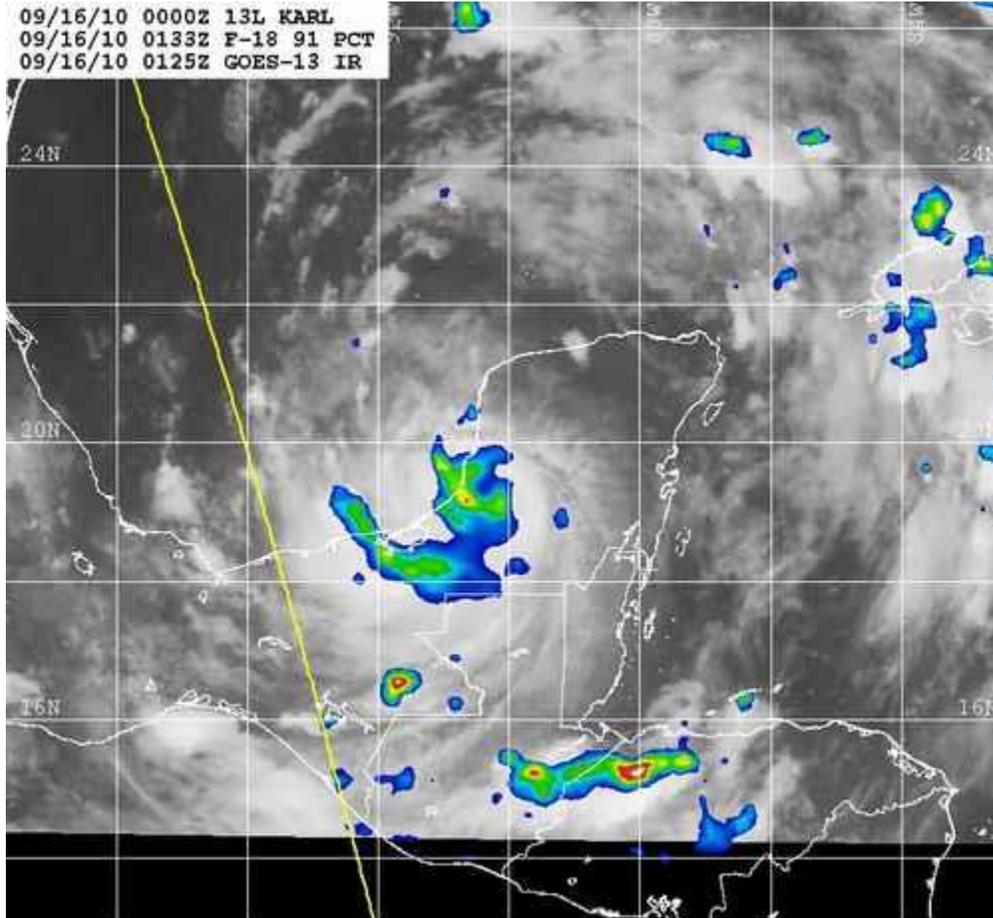
**C9 850-200mb Steering Flow over Africa**



**Karl:**

# K1-SSMIS 85GHz Microwave

09/16/10 0000Z 13L KARL  
09/16/10 0133Z F-18 91 PCT  
09/16/10 0125Z GOES-13 IR

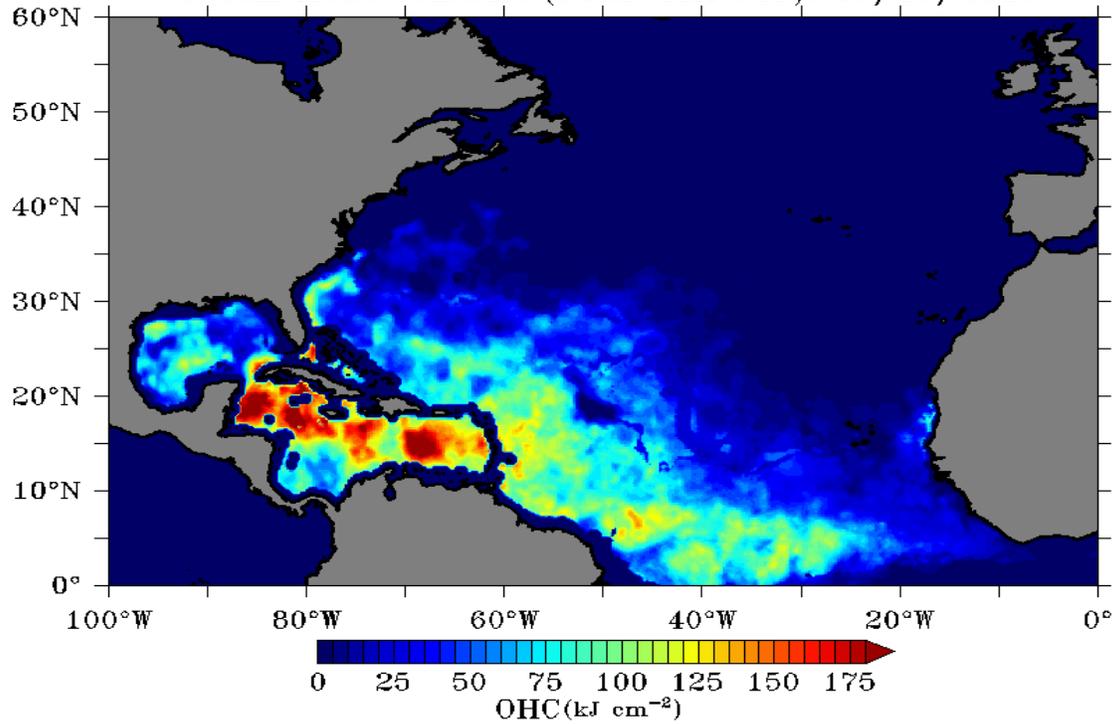


Naval Research Lab [www.nrlmry.navy.mil/sat\\_products.html](http://www.nrlmry.navy.mil/sat_products.html)  
<-- 91 GHz PCT (Kelvin) -->



K2

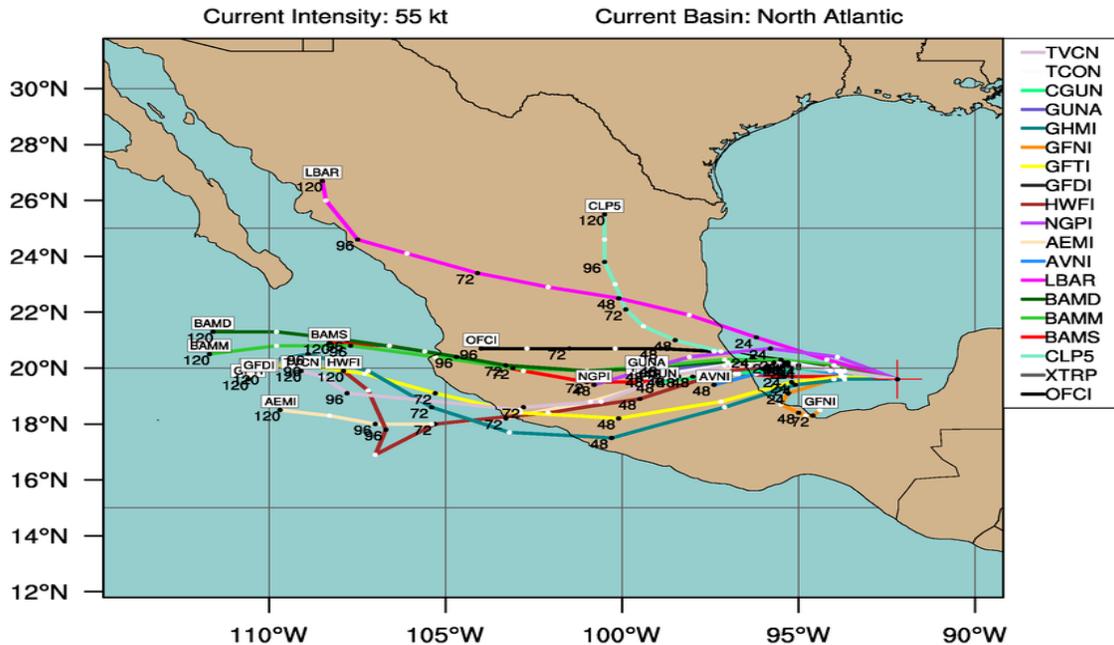
Ocean Heat Content (SSM/I-TMI SST): 09/16/2010



K3

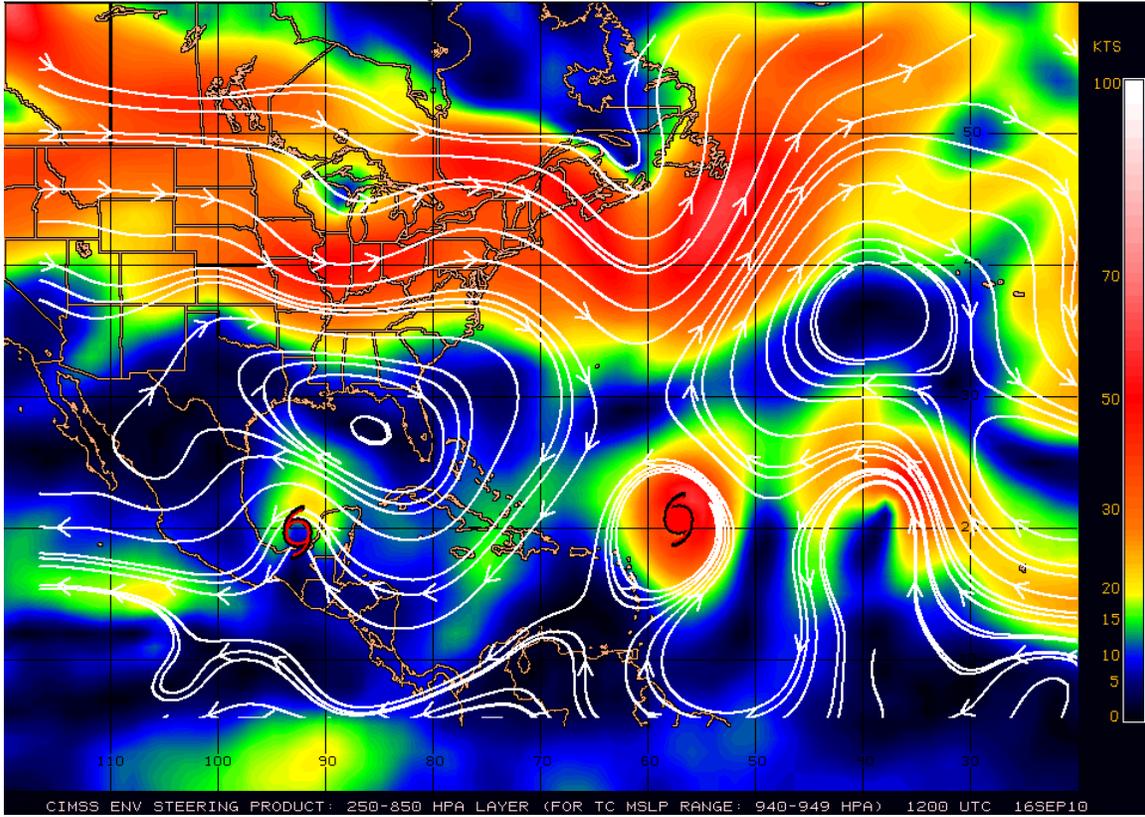
## TROPICAL STORM KARL (AL13)

Early-cycle track guidance valid 1200 UTC, 16 September 2010



This plot does not display official storm information. Use for information purposes only.  
DO NOT USE FOR LIFE AND DEATH DECISIONS!

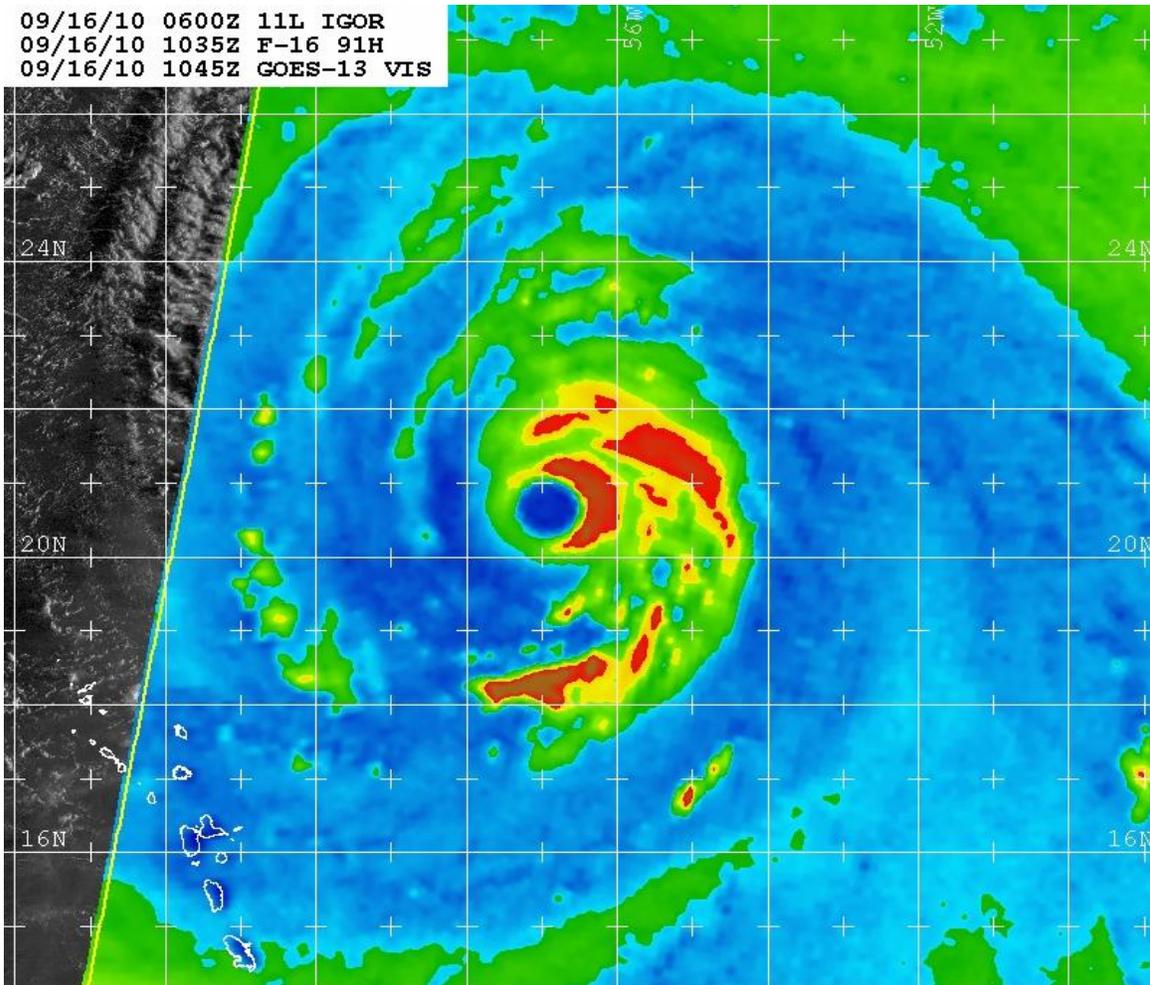
**K4 CIMSS 850-200mb mean layer wind**



**Igor:**

## I1-SSMIS 91 GHz Microwave

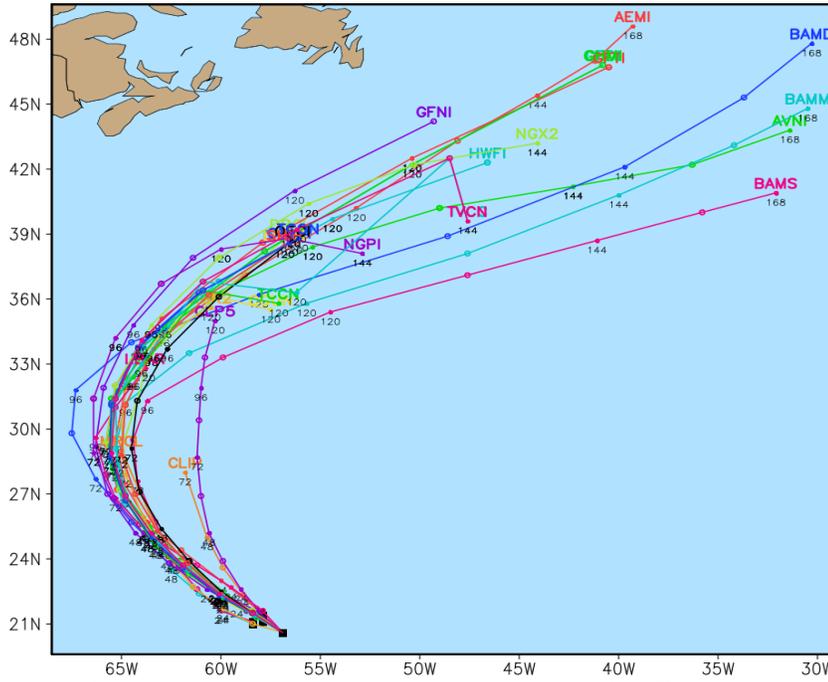
09/16/10 0600Z 11L IGOR  
09/16/10 1035Z F-16 91H  
09/16/10 1045Z GOES-13 VIS



Naval Research Lab [www.nrlmry.navy.mil/sat\\_products.html](http://www.nrlmry.navy.mil/sat_products.html)  
<-- 91H Brightness Temp (Kelvin) -->



Atlantic HURRICANE IGOR Model Tracks  
Valid Time: 1200 UTC 16 September 2010



MODELS  
DISPLAYED

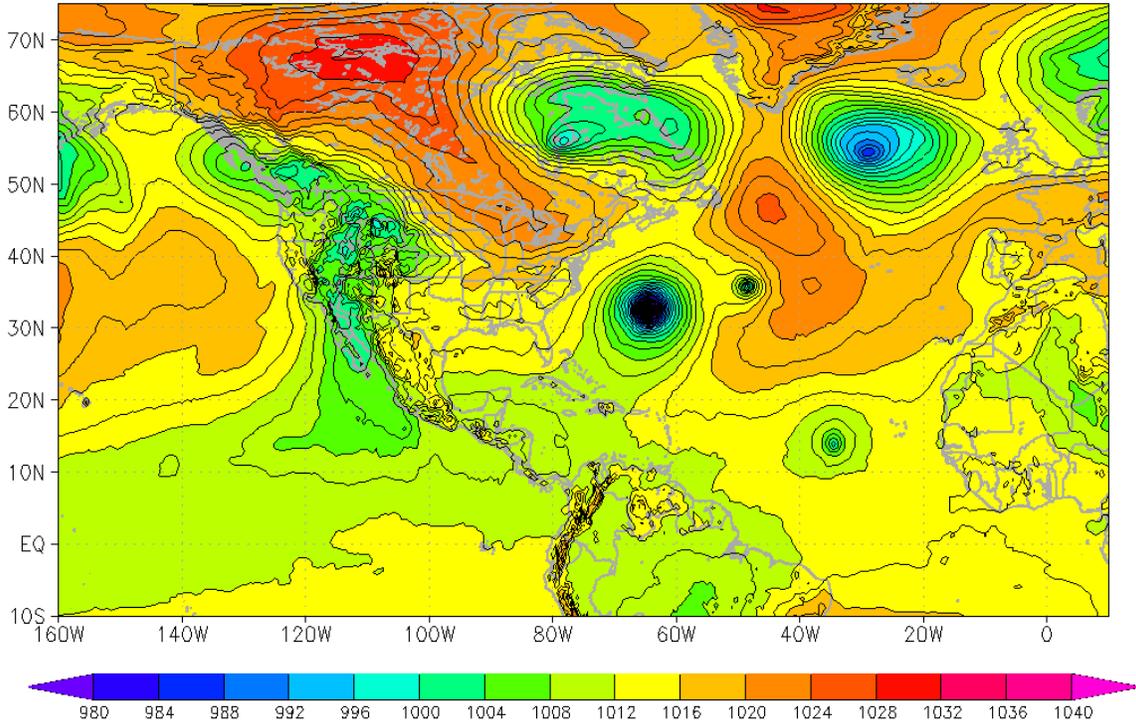
- AEMI
- AVNI
- BAMD
- BMM
- BAMS
- CGUN
- CLIP
- CLP5
- DRCL
- DSHP
- EGR2
- GFDI
- GFNI
- GFTI
- GHMI
- GUNA
- HWFI
- LBAR
- LGEM
- MRCL
- NGPI
- NGX2
- OFCI
- SHIP
- TCCN
- TCON
- TVCC
- TVCN

Tropical Cyclone Model Plots  
<http://mcg.mei.fsu.edu/~acevans/models/>  
Redistribution of these images is prohibited.

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.

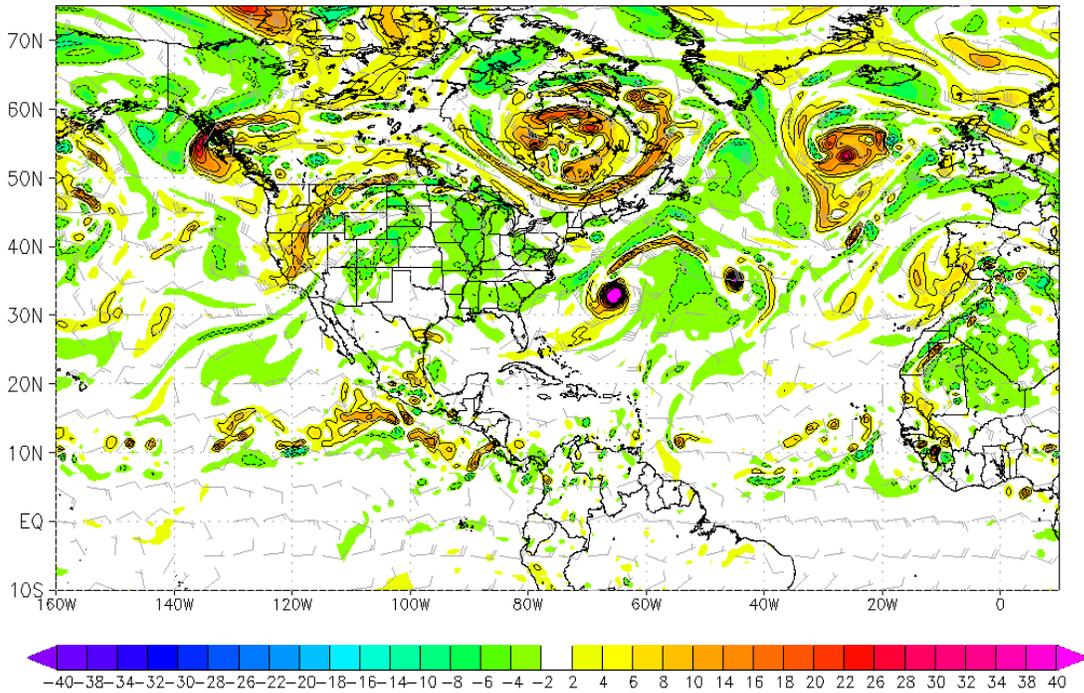
**I3**

00Z16SEP2010 ecmwf-oper MSLP (mb) T=96 h



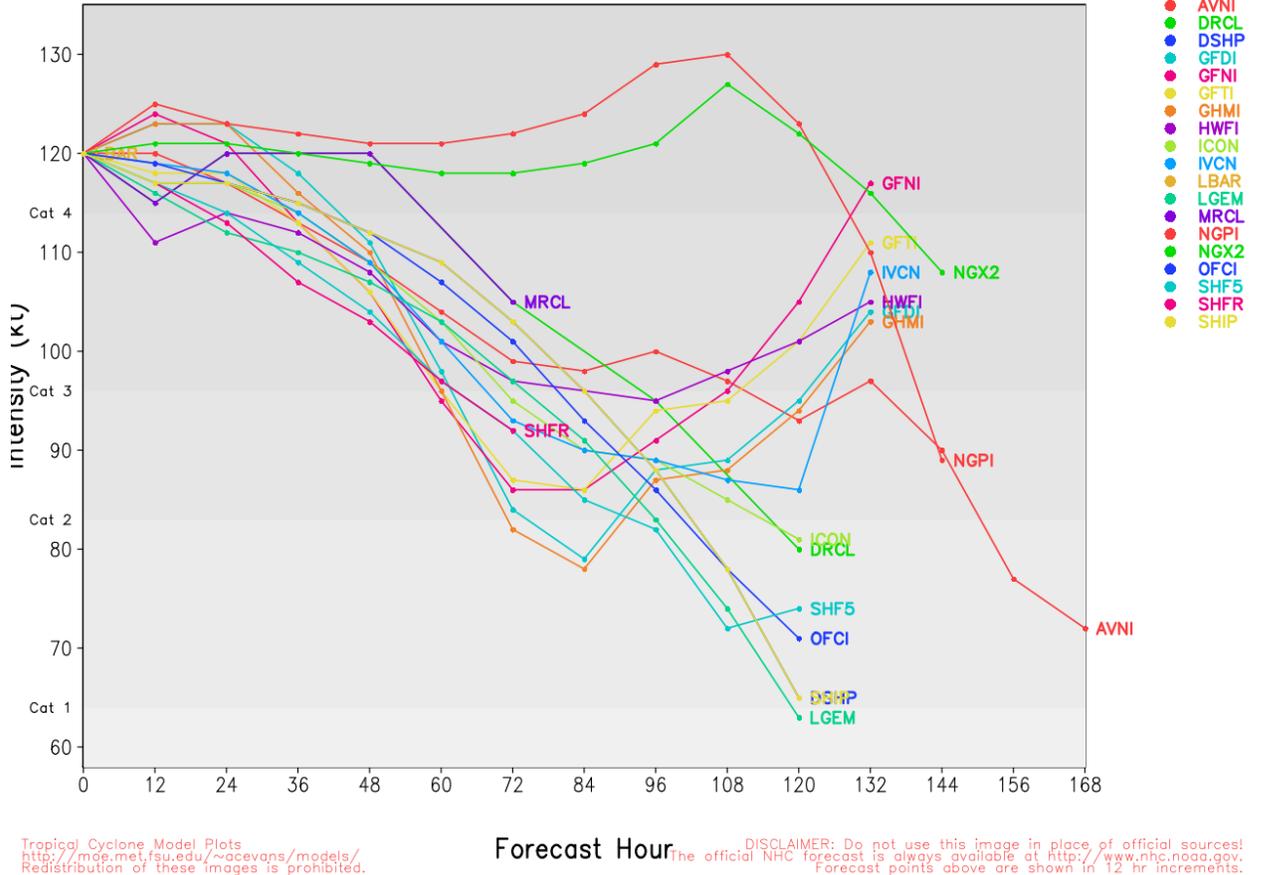
**I4**

06Z16SEP2010 gfs  
500mb vorticity ( $10^{-5}\text{s}^{-1}$ ) T=96 h  
Shading every 2 units; Contouring every 4 units



I5

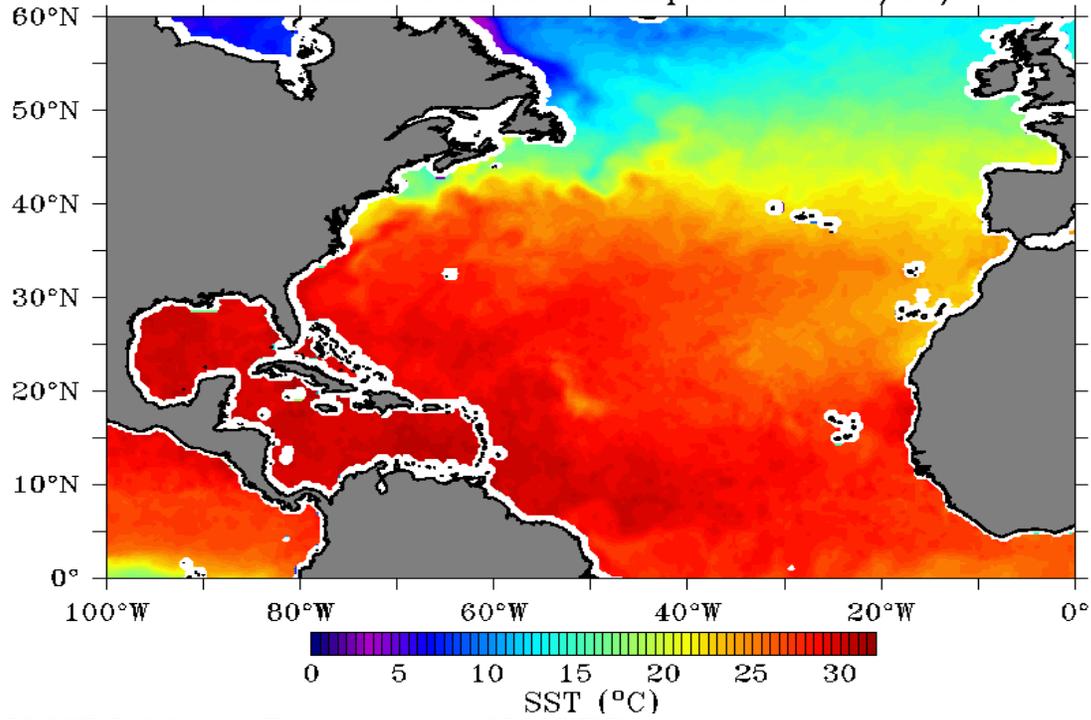
### Atlantic HURRICANE IGOR Model Intensities Valid Time: 1200 UTC 16 September 2010



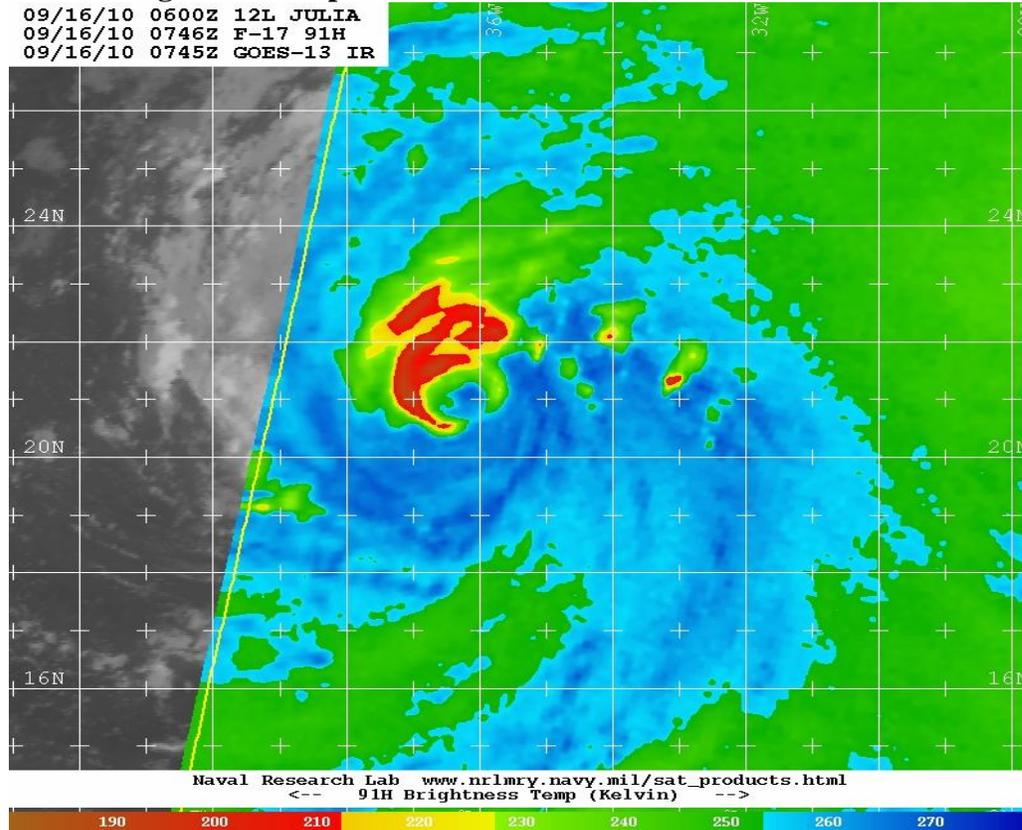
**Julia:**

J1

SSMI-TMI Sea Surface Temperature: 09/16/2010

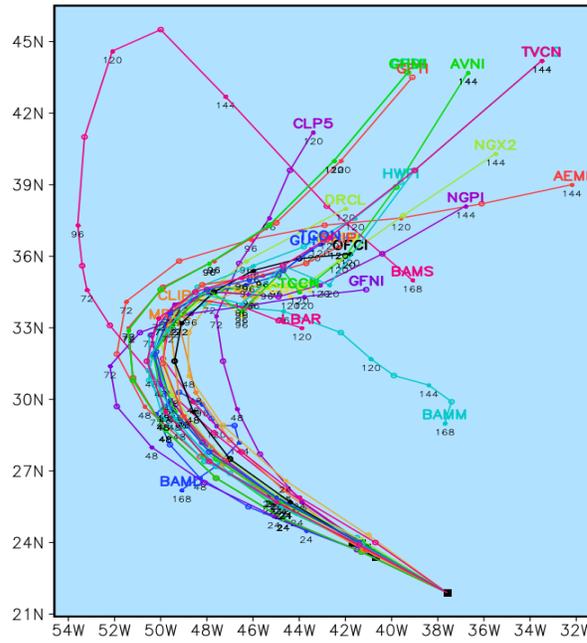


J2 91H Brightness Temperature at 0746 UTC



J3

Atlantic HURRICANE JULIA Model Tracks  
Valid Time: 1200 UTC 16 September 2010

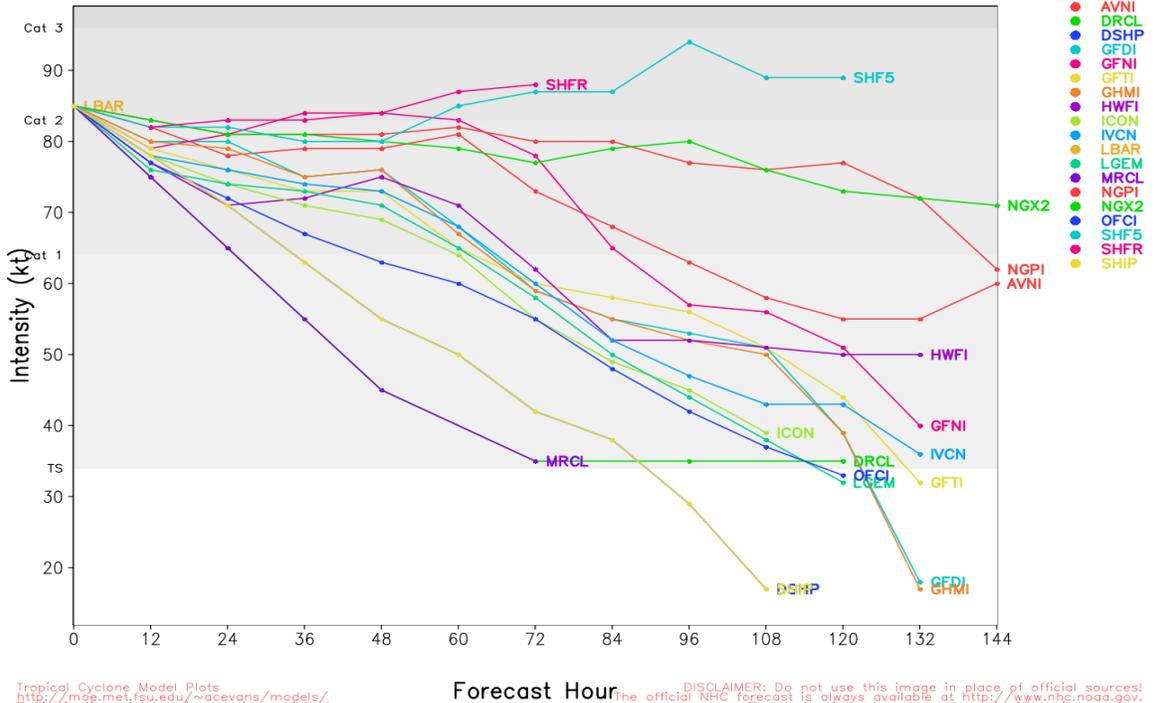


Tropical Cyclone Model Plots  
<http://moe.met.fsu.edu/~acevans/models/>  
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Forecast points above are shown in 12 hr increments. Initial points denoted by black squares.

J4

Atlantic HURRICANE JULIA Model Intensities  
Valid Time: 1200 UTC 16 September 2010

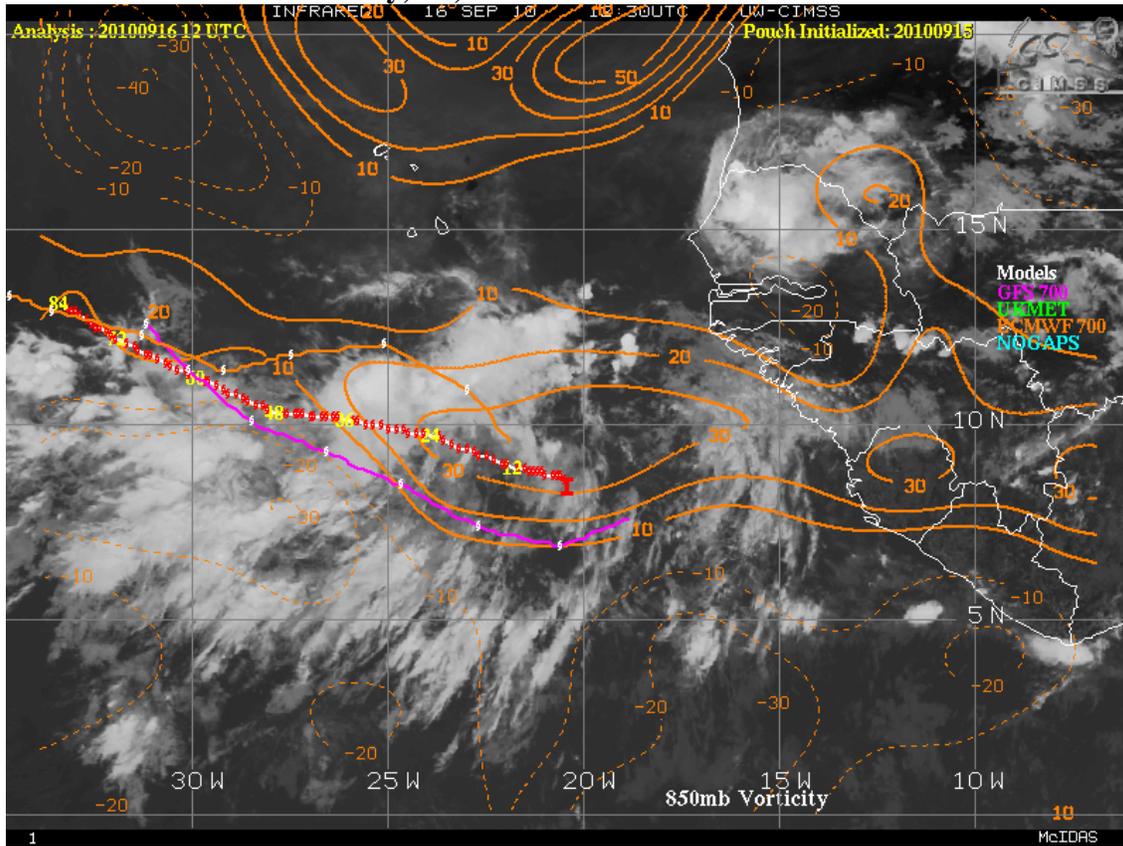


Tropical Cyclone Model Plots  
<http://moe.met.fsu.edu/~acevans/models/>  
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Forecast points above are shown in 12 hr increments.

**PGI-45L:**

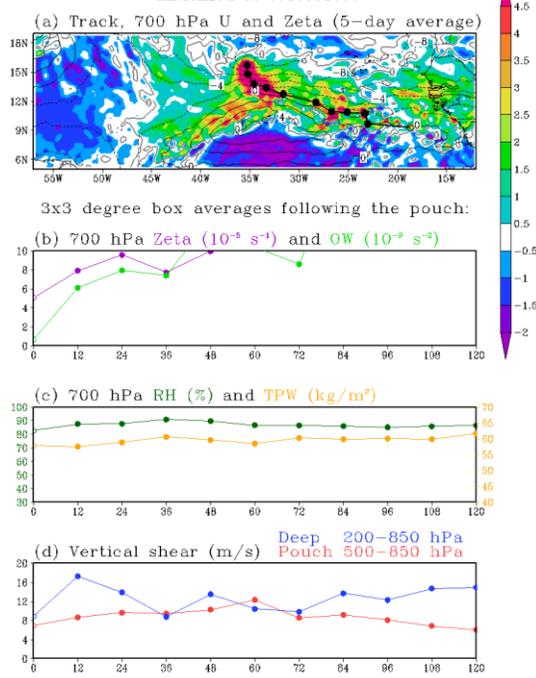
**45A-CIMSS 850 mb vorticity, IR, and Model Tracks**



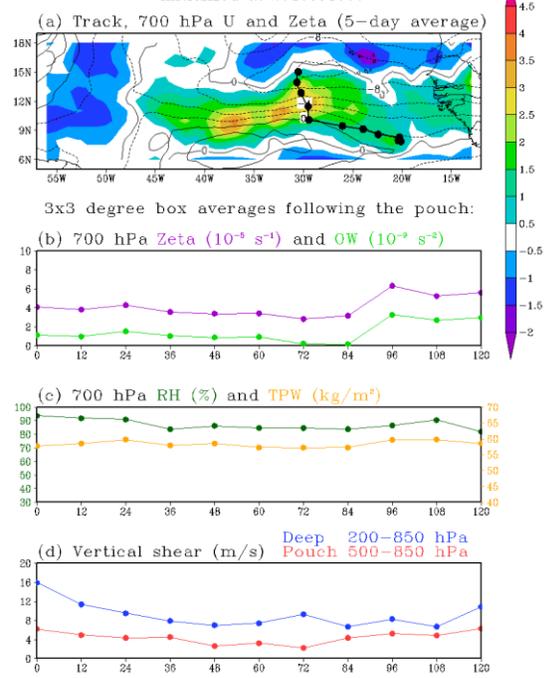


## 44C- ECMWF and GFS Pouch Tracking

PGI45L: 5-Day Forecast Based on ECMWF  
 Initialized at 2010091600

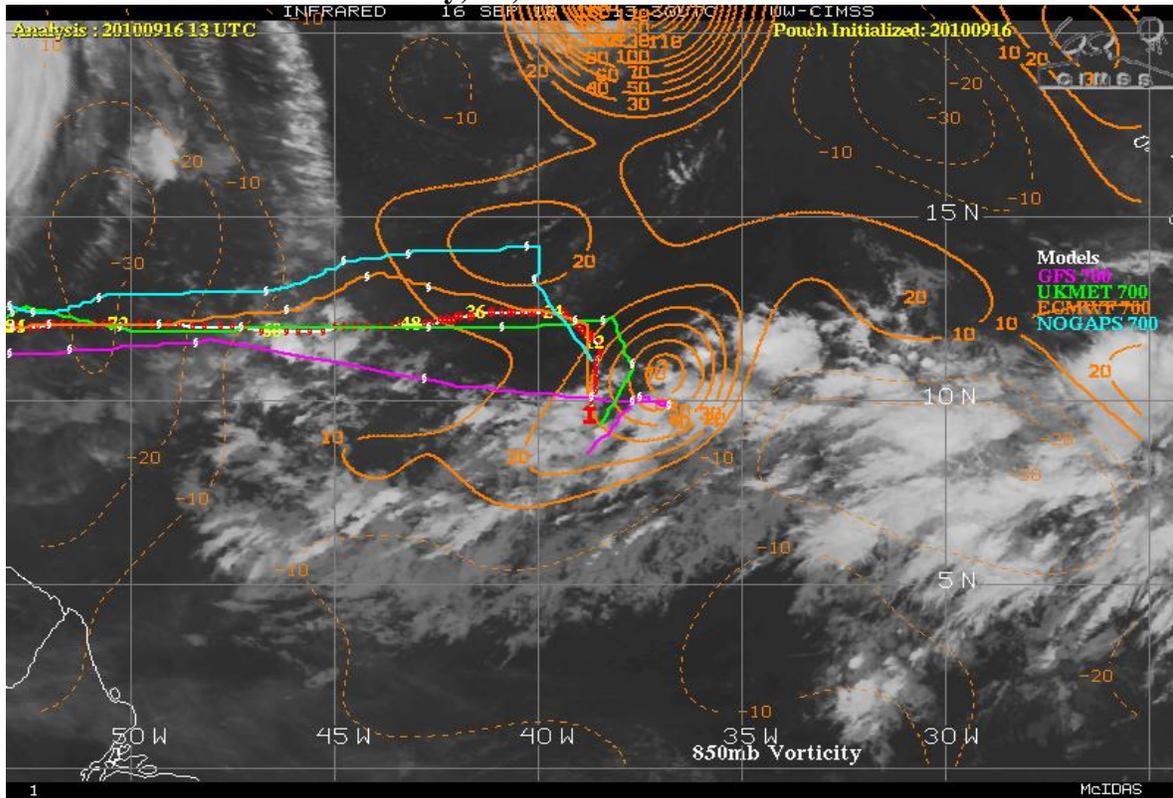


PGI45L: 5-Day Forecast Based on GFS  
 Initialized at 2010091600

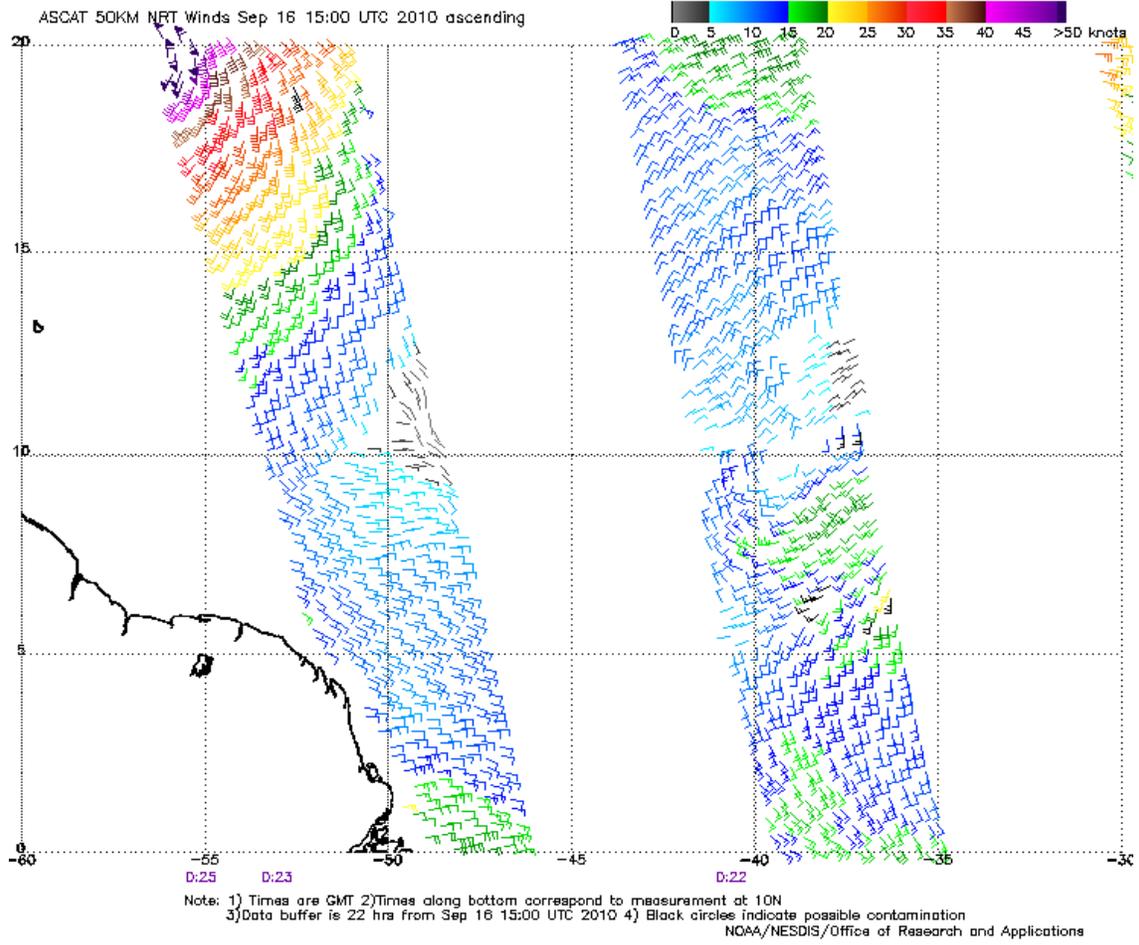


## PGI-46L:

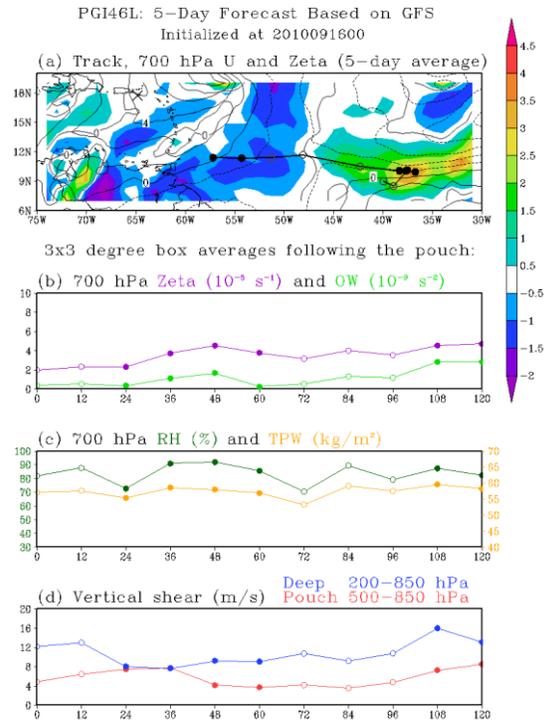
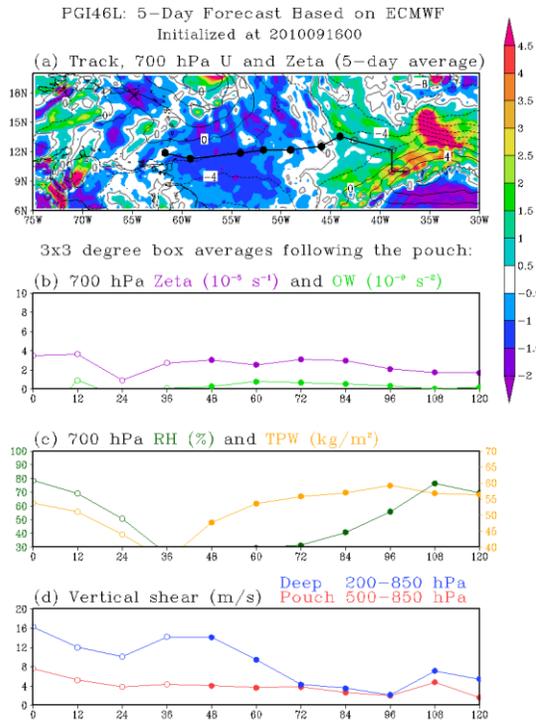
# 46A- CIMSS Low Level Vorticity, IR, and Model Pouch Tracks



## 44B-0000UTC ASCAT Winds

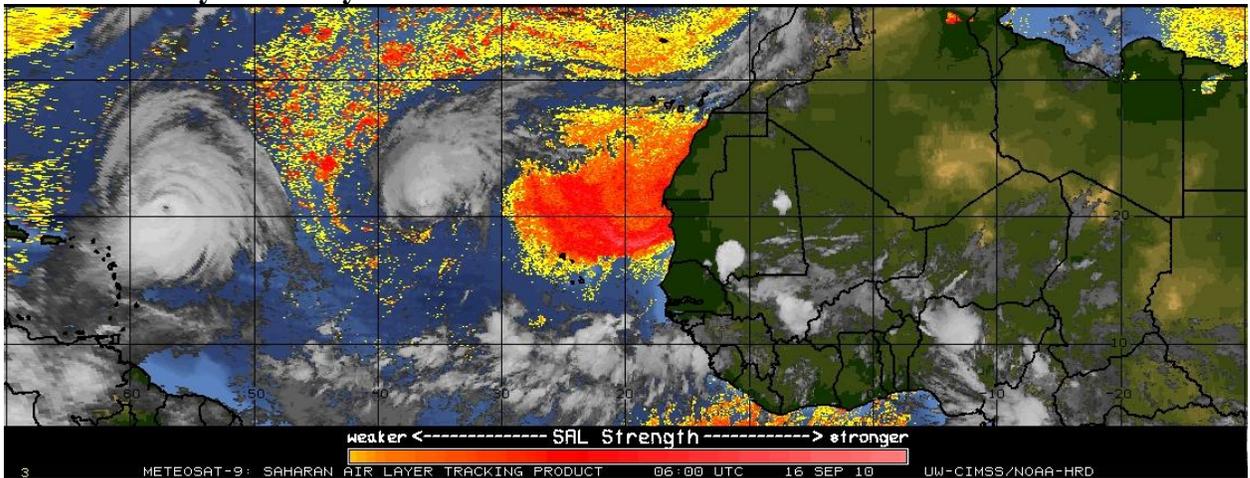


## 44C- ECMWF and GFS Pouch Tracking



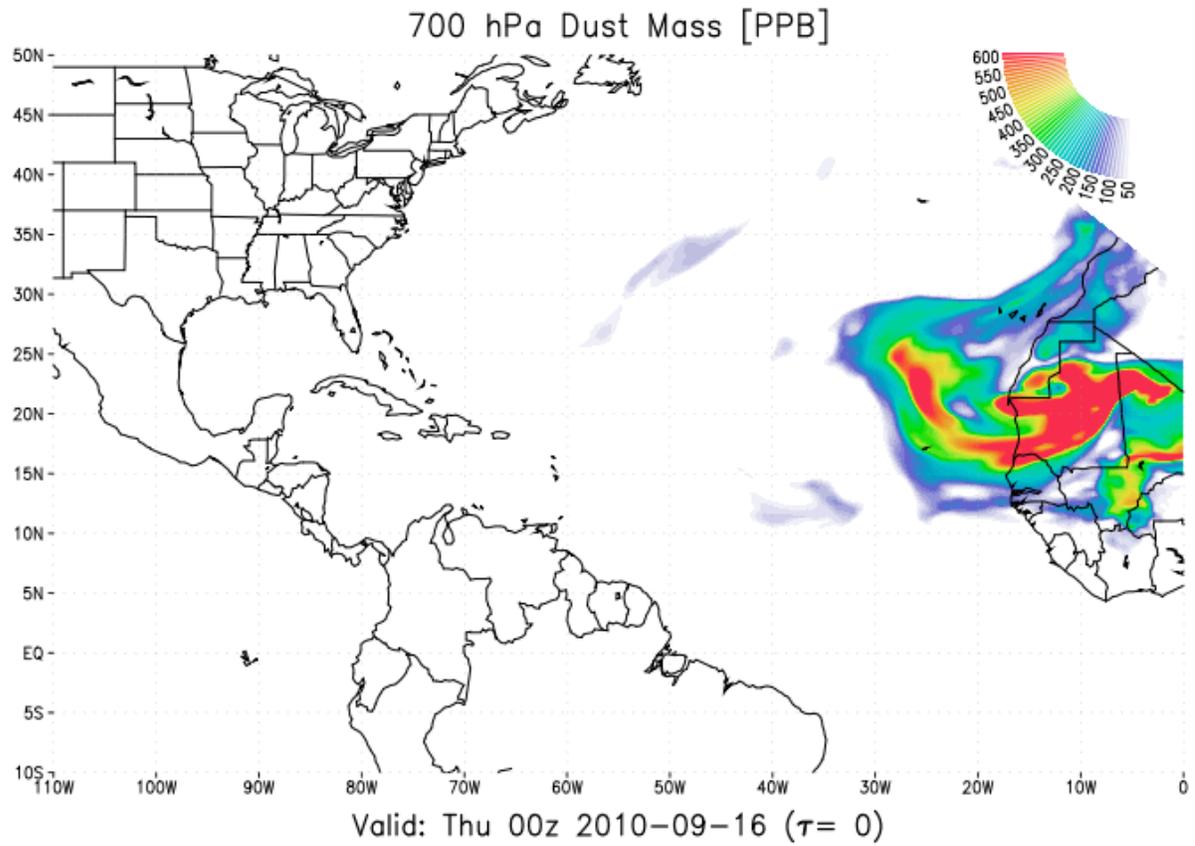
**SAL:**

**D1-CIMSS Dry Air Analysis**



## D2- 700hPa GEOS-5 000UTC Analysis

NASA/GSFC Global Modeling and Assimilation Office - GEOS-5 Forecast Initialized on 00z 2010-09-16



# D3-850hPa GEOS-5 24-hr forecast

NASA/GSFC Global Modeling and Assimilation Office - GEOS-5 Forecast Initialized on 00z 2010-09-16

