Tropical GRIP Forecast Discussion for September 3, 2010

Created 1600 UTC September 3, 2010

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Summary: The GRIP domain is full of activity, but not necessarily of potential targets for a viable genesis study. The DC-8 finished its last flight of Earl yesterday and Earl is expected to continue an extratropical transition down from its Cat 1 status to a cold core system. Still, its wind and wave damage potential remains high for the New England and Nova Scotia areas. Tropical Storm Fiona is in bad shape and is weakening quickly. Ex-Gaston underwent weakening yesterday and became a remnant low, however it continues to have potential for re-formation. The models are attempting to redevelop in it 12 hours, but coordination with other agencies and distance from the target requiring a second suitcase flight are preventing GRIP from making another suitcase deployment to St Croix to fly this storm. The WB57 is grounded for plane repairs, the Global Hawk will not fly for the next few days, and tomorrow is a Hard Down day for the DC-8, and no flight is planned for Sunday either. The Atlantic is not looking like there will be many targets to fly besides Gaston (maybe eventually), so operations could be quiet for a little while.

Forecast for 1600 UTC 9/03/2010:

Synoptic Overview:

At the surface, **(S1)** the subtropical ridge is in place with a general easterly flow across the Atlantic. Two subtropical highs are split in the Atlantic approximately at 30 N. The general orientation of the westward high pressure (1022 hPa) protrudes south into the Caribbean, while the eastward high pressure (1021 hPa) maintains composure along the westward coast of Africa. Hurricane Earl/PGI34 is located along the northwestern periphery of the westward high pressure. Fiona/PGI36 (ex-Fiona as of 1200 UTC) is trailing behind hurricane Earl becoming less organized (**S2, S3**). Gaston/PGI38 has degenerated into a remnant low in the mid Atlantic. PGI39L is moving slowly off the western coast of Africa (**S7**), continuing the wave train recently propagating westward. The eastern Pacific has a vorticity center associated with deep convection. All global models concur that this system will likely travel across Mexico and into the western Gulf of Mexico. Unfortunately, this system is not in range for the DC-8 but could possibly be a target for the Global Hawk.

Upper levels **(C1, C3)** reveal an elongate trough, centered at 20 N/60 W, slowly propagating west-southwest over the past 24hours. Shear **(C2)** is high in the northeast and southwest quadrants of the elongated trough. The western Gulf of Mexico also contains an upper level trough propagating slowly westward and at times seeming stationary. An upper level, middle latitude trough over the Great Lakes continues to influence the propagation of hurricane Earl. Additionally, Earl's outflow continues to merge with the middle latitude westerlies while influencing the shear environment over Fiona. Shear is low over Gaston and moderate over PGI39.

Total precipitable water **(S4)** is high in the Gulf of Mexico as well as the Caribbean. Low total precipitable water values indicate very dry air between 60 W and Gaston. Dry, aerosol laden air continues to stream off Africa, extending to near 10 N over the central Atlantic (**S5**). This dry air is likely influencing the development of Gaston and PGI39. Water vapor imagery **(S6)** also suggests areas of dry air to the north and west of Gaston.

Features of Interest:

Hurricane Earl:

Hurricane Earl has weakened over the last 24 hours and is a category 2 as of the 8AM EDT advisory, with a minimum central pressure of 955 hPa, and maximum sustained winds of 105 mph. Earl has made the turn, and is currently on a heading of 20 degrees (NNE) at 16 kt. During yesterday afternoon's DC-8 flight, the inner eyewall weakened considerably and was nearly nonexistent by the last DC-8 center pass. The eyewall exhibited strong asymmetric structure, with the strongest part being in the northern half. It appeared to have a SW-NE tilt with height as well, with the low-level center locations being consistently southwest of the IR satellite warm spot. Lightning was occasionally observed in the NE quadrant after being nearly nonexistent during Wednesday's flight. These observations were consistent with an increase in southwesterly wind shear which shifted most of the convection to the downshear and downshear left regions.

Yesterday's weakening trend has continued this morning based on current satellite imagery. Earl's convection in the inner core has utterly evaporated over the past few hours, as shown by IR imagery (**E1**) as well as TMI (**E2**) and SSMI (**E3**) microwave imagery. This is likely due to a combination of factors: moderate southwesterly wind shear between 10-20 kts (**C1**), decreasing sea surface temperatures as Earl heads NNE (**E4**), and dry air in the inner core either/both by shear-induced subsidence or entrainment from the environment. Rainbands are still impacting the Outer Banks of NC, as well as the VA and Delmarva coasts. Station HCGN7 on Hatteras Island, NC reported a maximum wind gust of 68 kts at 5am EDT. Cape Henry, VA as of 9:12am is reporting sustained winds of 35 kts with gusts to 42 kts.

Earl is projected to accelerate towards the NE, and may impact Nova Scotia a little over 24 hours (**E5**). Afterwards, Earl should complete extratropical transition. Intensity guidance is unanimous in continuing the weakening trend for the foreseeable future. SHIPS weakens this to a minimal hurricane (65 kts) in about 24 hours, just as it makes a final approach towards Nova Scotia. We send Earl our thanks for turning away from the East Coast while providing us with phenomenal data over much of its life span.

NHC Forecast positions: INITIAL: 03/0900Z 35.3N 74.0W 90 KT
12HR VT 03/1800Z 31.7N 75.3W 85 KT
24HR VT 04/0600Z 34.8N 74.6W 75 KT
36HR VT 04/1800Z 38.1N 72.6W 55 KT
48HR VT 05/0600Z 41.6N 69.2W 45 KT...POST-TROP/EXTRATROP
72HR VT 06/0600Z….DISSIPATED

GFS Forecast positions (06z run):
03/1200 36N,74W
04/0000 39N,71W
04/1200 44N,66W
05/0000 49N,61W

Tropical Storm Fiona:
As of 8am EDT, Tropical Storm Fiona was located at 28.5N/66.7W with maximum sustained winds of 50 mph. Fiona continues to move north at 13 mph with a minimum central pressure of 1010mb. Satellite imagery **(F1)** shows that shear has displaced Fiona's convection to the southern area of circulation. Fiona has distanced itself from Earl and despite Earl's wake, is among warm SST's (>29°C) **(F2)** with shear values near 17 knots **(C2).** SHIPS forecast a slight decrease in shear values over the next 24 hours. However, shear values remain unfavorable for development and Fiona is expected to weaken over the next 24 hours despite warm SST's. Fiona is expected to take on a northeastward track **(F3)** passing over Bermuda with winds forecasted around 45 knots.

Remnant Low/ Ex-Gaston:
(Formerly) Tropical Storm Gaston degenerated into a remnant low yesterday afternoon. This was quite a deviation from the forecast thinking over the past few days, which called for gradual strengthening to a hurricane by the end of the forecast period. Convection diminished greatly yesterday and was a large factor in why the storm was downgraded. It appears that this was due to some dry air interaction on the western side of the storm. There is also an upper level trough to the northwest of the system, but it is expected to move west and not be a factor beyond 36 hours. Convection this morning can best be described as disorganized pulses (**G1**). Visible satellite imagery still shows cyclonic flow associated with ex-Gaston. With the exception of the aforementioned factors, environmental variables remain favorable. SSTs are sufficiently warm (> 28C) (**G2**), wind shear is relatively low (~10 kts) (**G4**), and TPW in the pouch is ~55-60 mm of water (**G3**). GEOS-5 suggests that the dust interaction with Gaston will decrease in 48 hours.

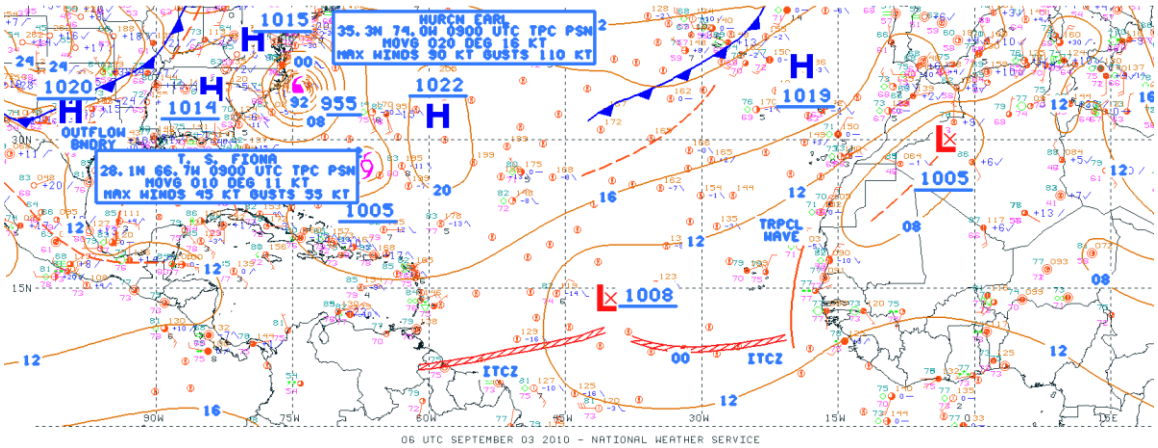
The big question from an operations perspective is whether or not ex-Gaston regenerates into a tropical cyclone. As previously mentioned, most environmental conditions are favorable for development, and the only hindrance (the dry air interaction) is expected to diminish in about 48 hours. So, it is hard to argue that regeneration at some point during the forecast period will not happen. SHIPS intensifies ex-Gaston to a tropical storm in 24 hours and a hurricane by 72 hours. The rest of the intensity guidance that is available depicts a steady strengthening with tropical storm status regained by 36 hours (**G5/6**). It is worth noting that the ECMWF is the exception to the rule, and does not regenerate the storm at all. Track guidance indicates a general westward motion through the next 5 days as ex-Gaston remains on the southern side of the subtropical ridge (**G5/6**). It appears as though ex-Gaston will regain tropical storm status before Monday, which is the earliest that GRIP would be able to fly the system.

PGI-39L/PGI-40L:
The situation for PGI-39L and PGI-40L has become somewhat more complex today. PGI-39L remains fairly unorganized on satellite (**S7**). There is some deep convection in the vicinity of the wave which is split into a northern and southern component. PGI-40L remains over Africa, and is even less organized (**39A/B**). There is very little agreement among the models. The ECMWF only tracks PGI-39L, and moves it almost directly north, along a track similar to previous forecasts for PGI-40L. However, the GFS indicates a continued westerly track for PGI-39L, while a separate PGI-40L moves NNW (**39C/D**). The 06Z GFS 850mb vorticity forecast does indicate that PGI-39L could split into a northern and southern component. Other models are split between these two solutions (**GFS**). The UKMET and NOGAPS agree with the ECMWF, while the CMC agrees with the GFS (**39E**). Based on METEOSAT imagery, which suggests that there are still 2 distinct waves (**S7**), as well as the fact that the GFS has handled wave propagation well recently, the GFS forecast seems to be the most reasonable one at this point. Assuming at least part of the wave propagates to the east, it will be moving into a marginal environment. Shear is high over PGI-39L (**39F**), however this is influenced in part by the fact that shear analysis of pouches does not remove the vortex, so winds ahead of the wave have almost no easterly component, resulting in high analyzed shear. SSTs over the pouch location are not high now, around 26C, however they are higher to the west, and the wave should reach waters near 28C within the next 48 hours (**39G**). Between the marginal environment and the fact that even the GFS doesn't suggest any substantial strengthening within the next 5 days, development of this wave seems very unlikely in the near future. The forecasted positions are: 04/0100UTC 12.5N/22.5W; 04/1300UTC 12.5N/24W; 05/0100UTC 12N/25.5W; 05/1300UTC 12N/27W; 06/0100UTC 12N/30W.

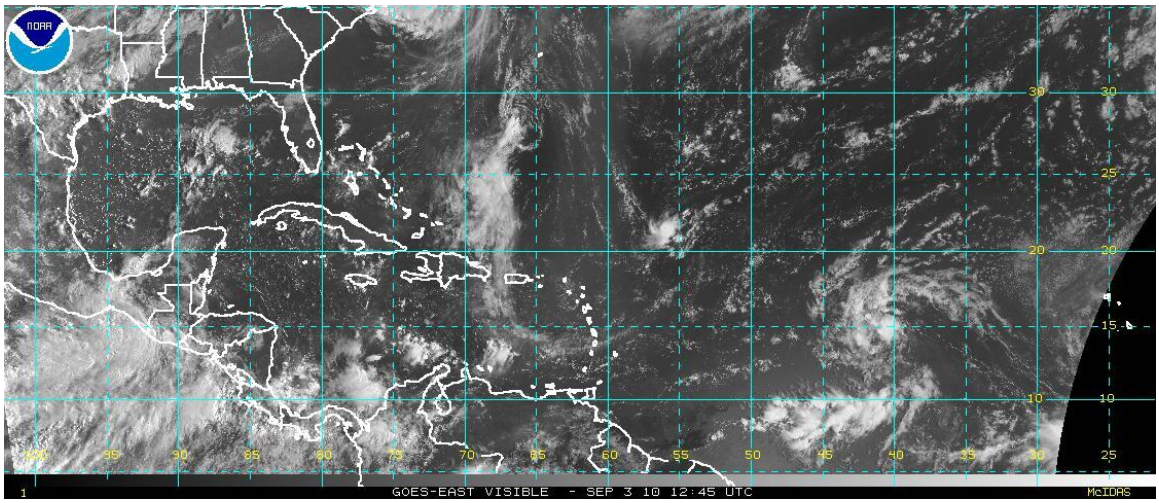
Dust/SAL Discussion:
The Saharan Dust that moved off of Africa a few days ago continues to progress westward. Terra Aerosol Optical Depth indicates that dry air is located over a large part of the Northern tropics of the Eastern Atlantic from 45W to the African Coast (**S5**). CIMSS SAL analysis suggests that there is still dry air to the North and West of PGI-38L/ex-Gaston, as well as North and West of PGI-39L (**D1**). TPW is also very low ahead of ex-Gaston (**S4**). The 6Z GOES-5 analysis also indicates some dust behind Fiona in the eastern Caribbean, however it is not interacting with Fiona at this time. The GOES-5 forecast indicates that Dust will continue to move to the west, and wrap into both ex-Gaston and PGI-39L (**D2**). The GOES-5 forecast also indicates that another Dust Outbreak will occur in 5 days after PGI39L and PGI-40L move further into the Atlantic or dissipate.

Images used in discussion:

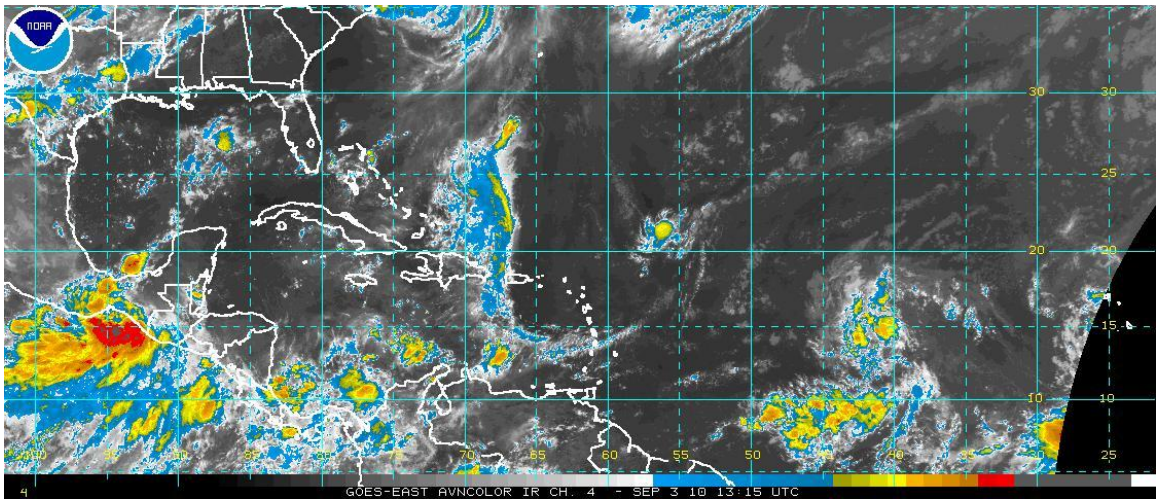
S1



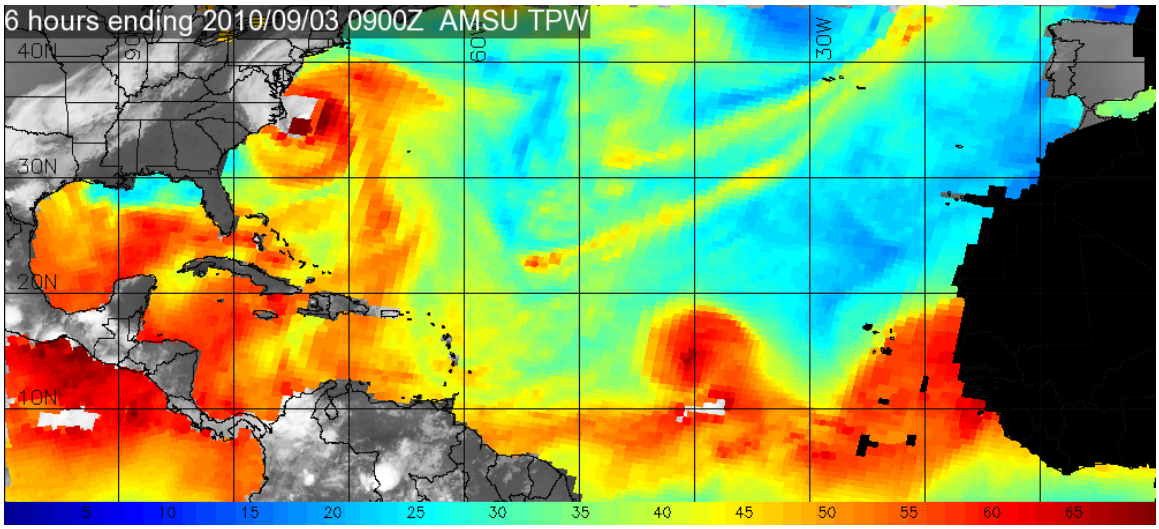
S2



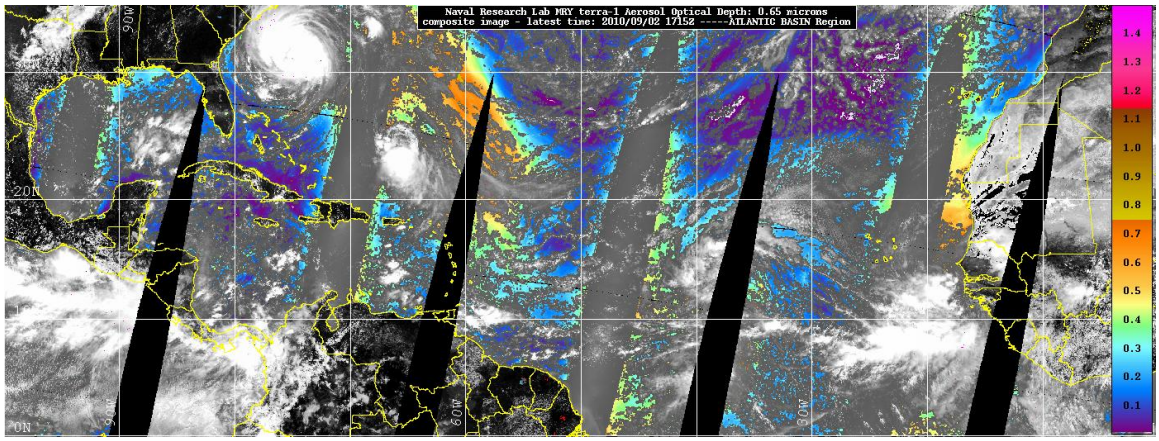
S3



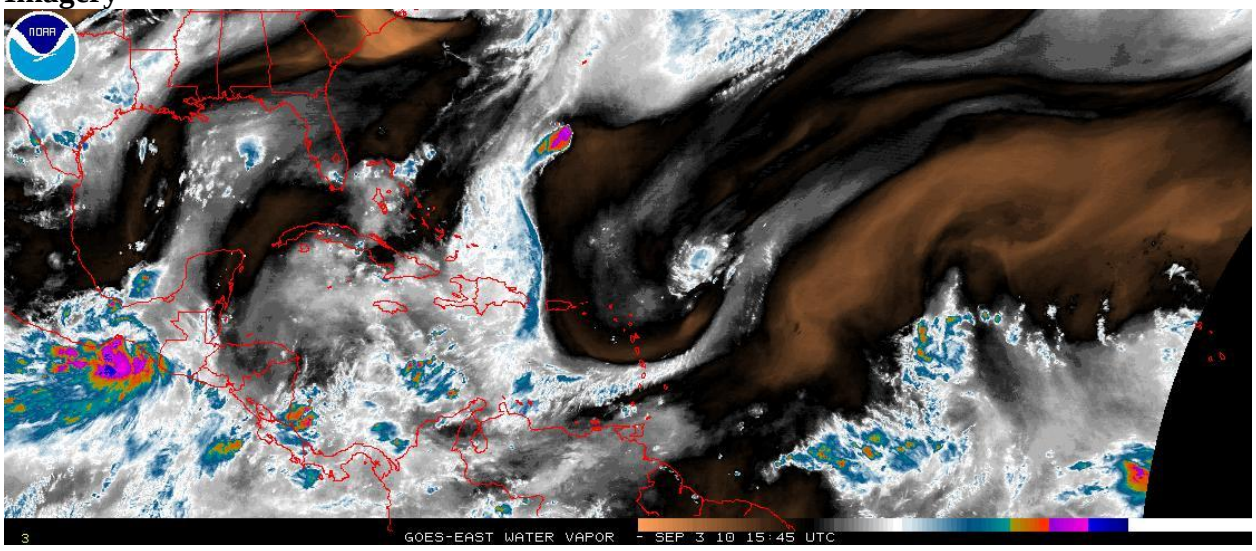
S4



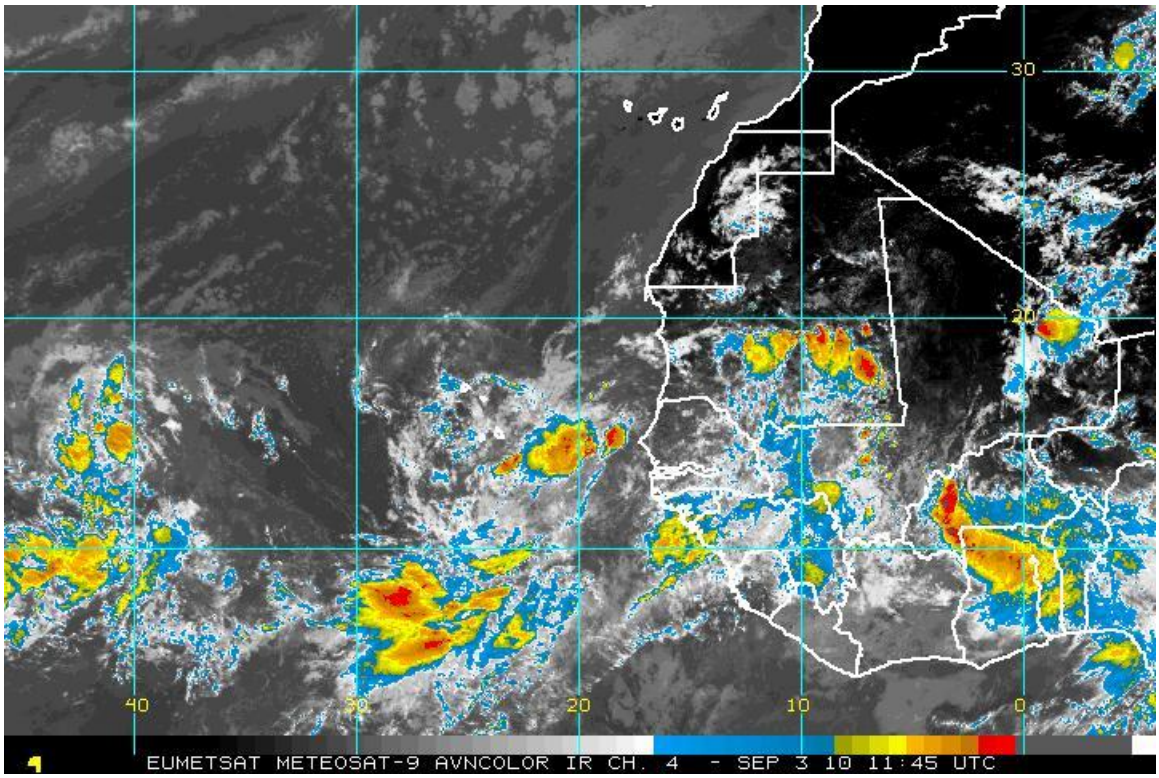
S5 AOD from NRL



S6 Water Vapor Imagery

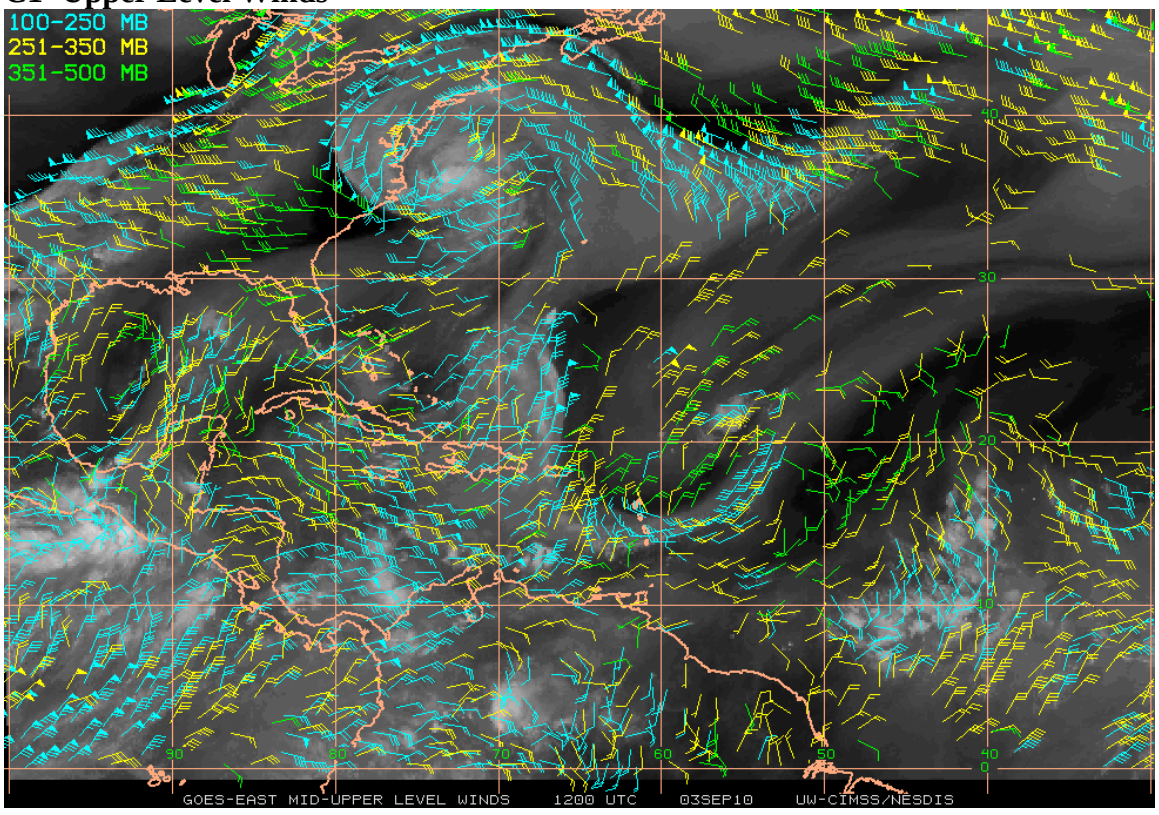


S7

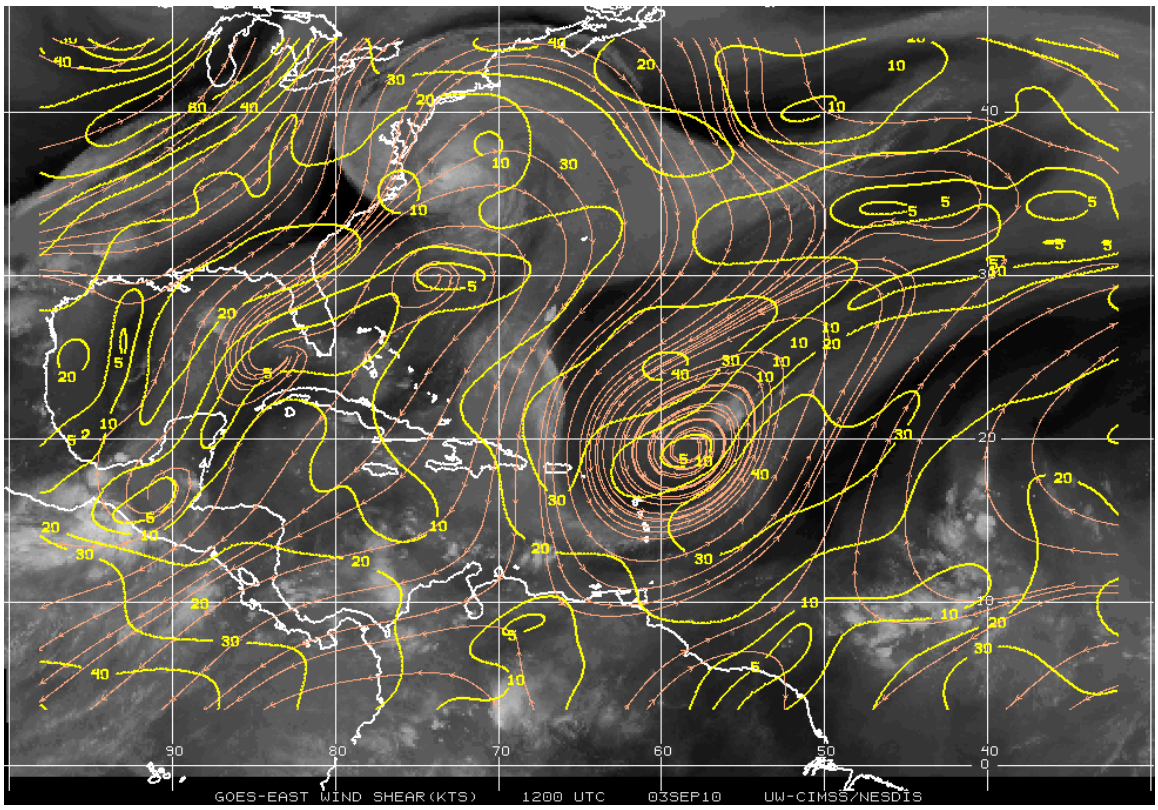


CIMSS Analyses:

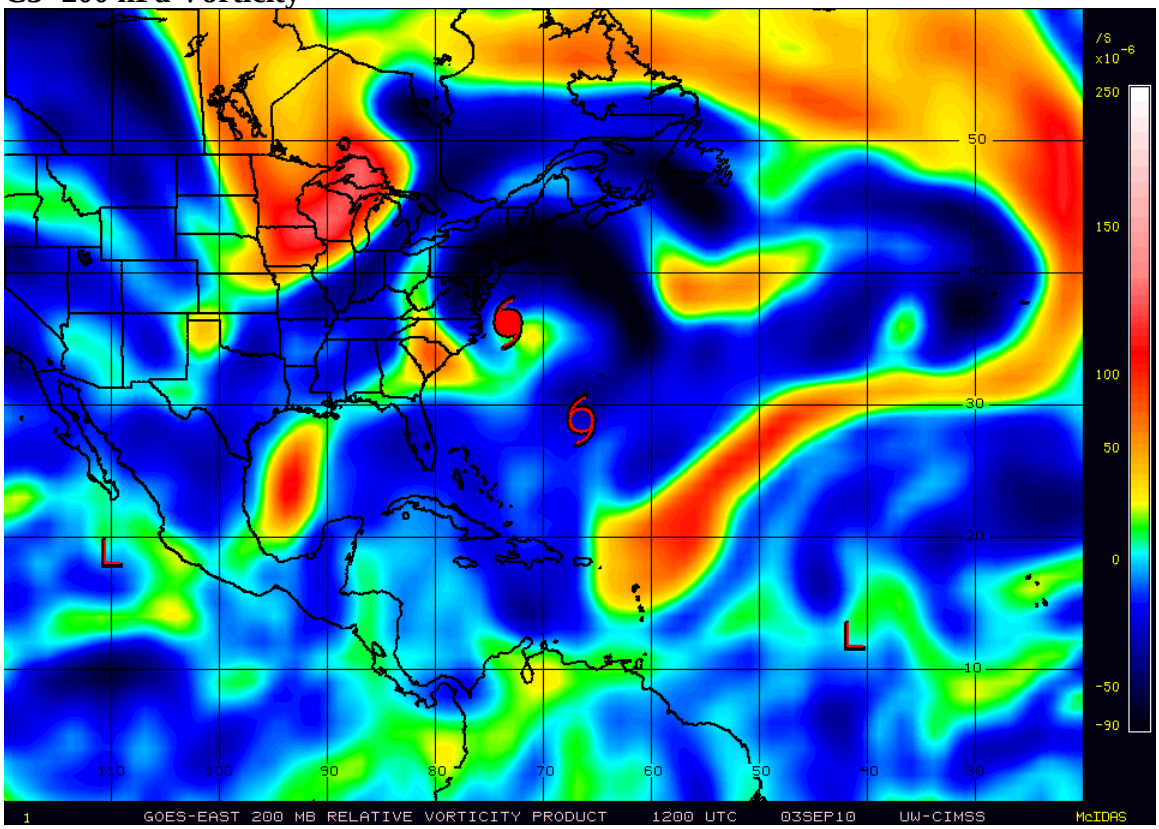
C1- Upper Level Winds



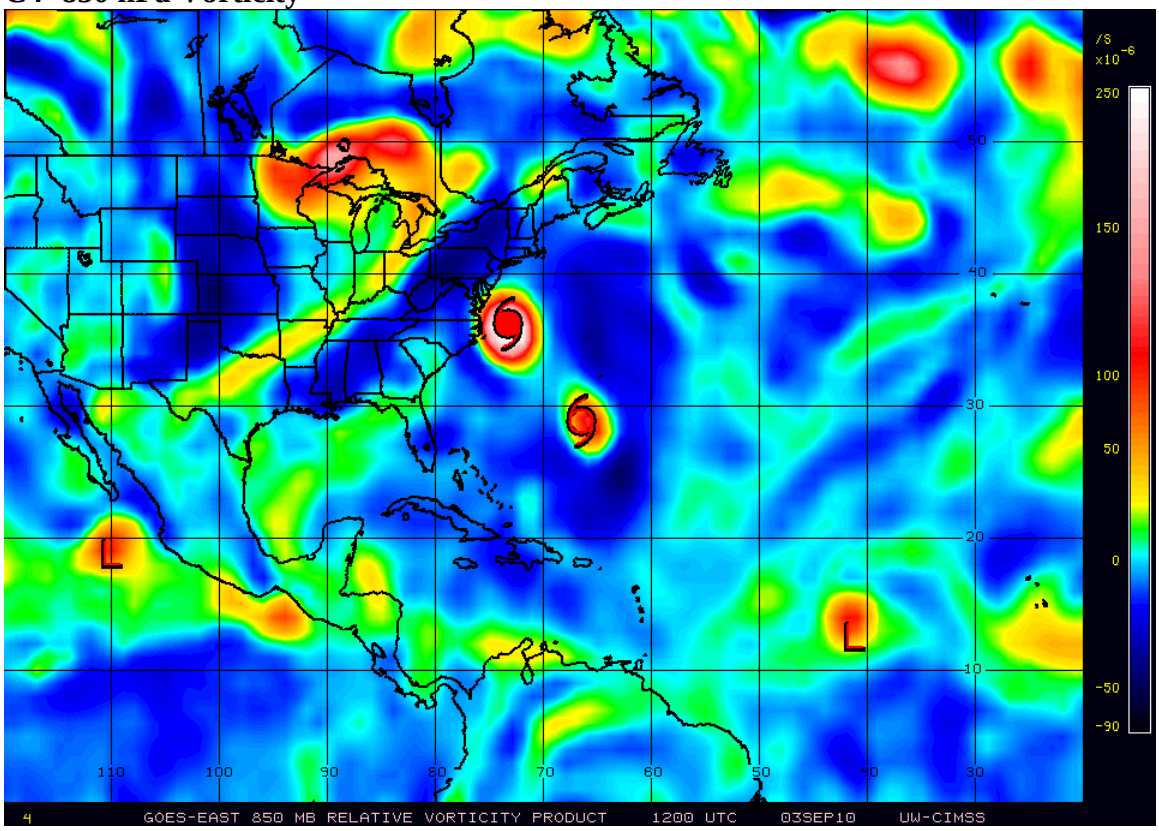
C2- Wind Shear



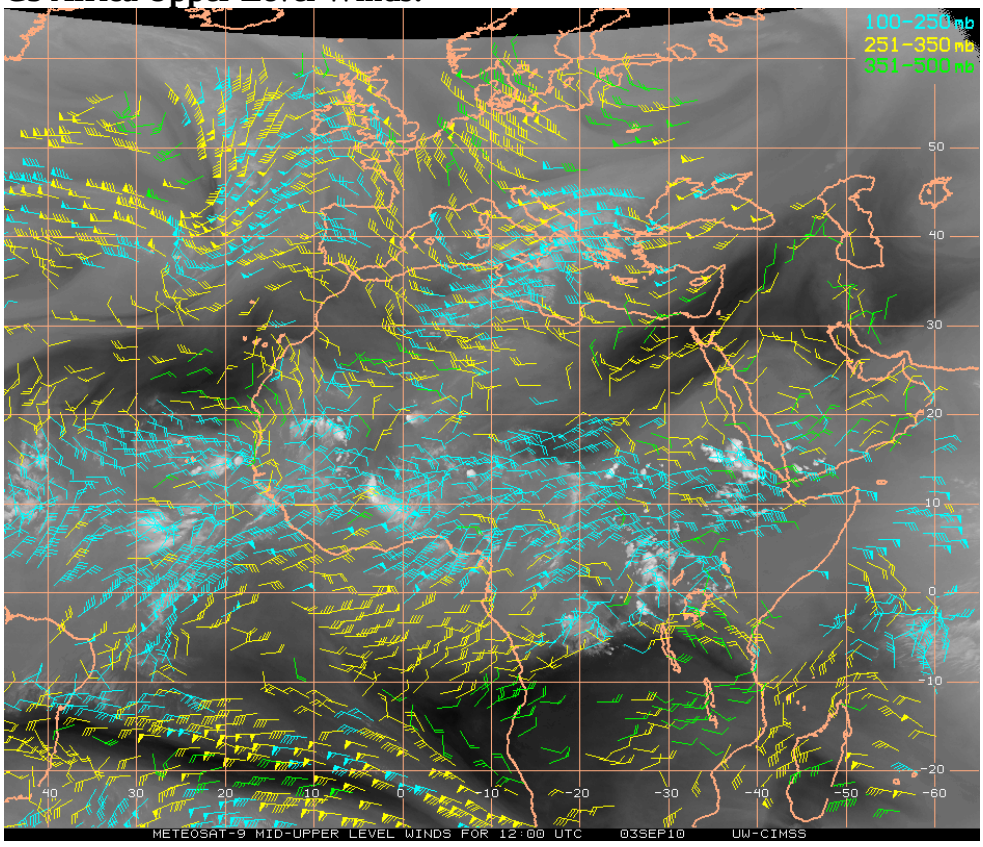
C3- 200 hPa Vorticity



C4- 850 hPa Vorticity

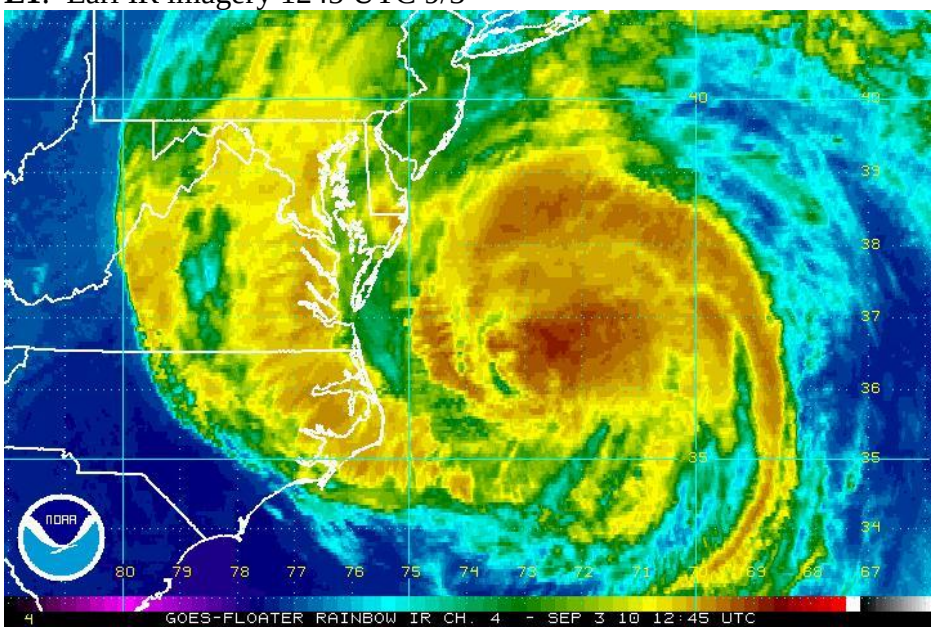


C5 Africa Upper Level Winds:

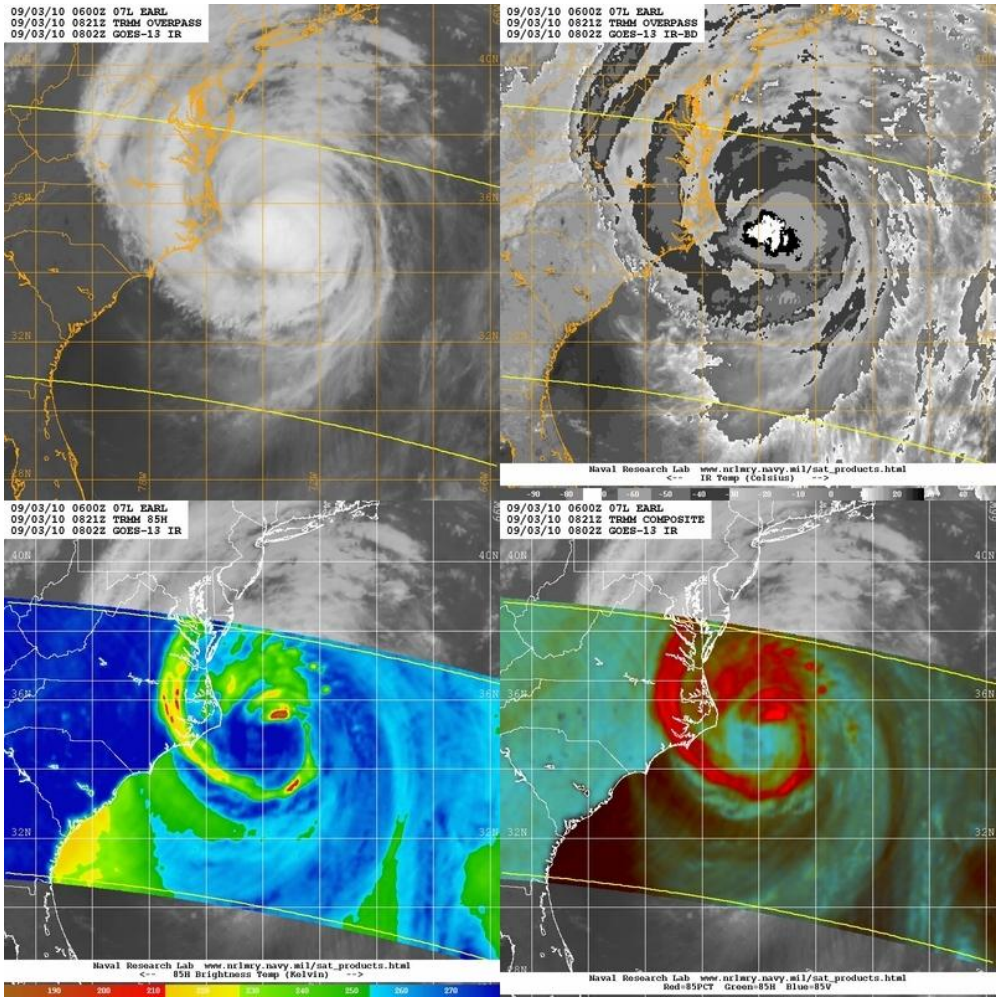


Hurricane Earl

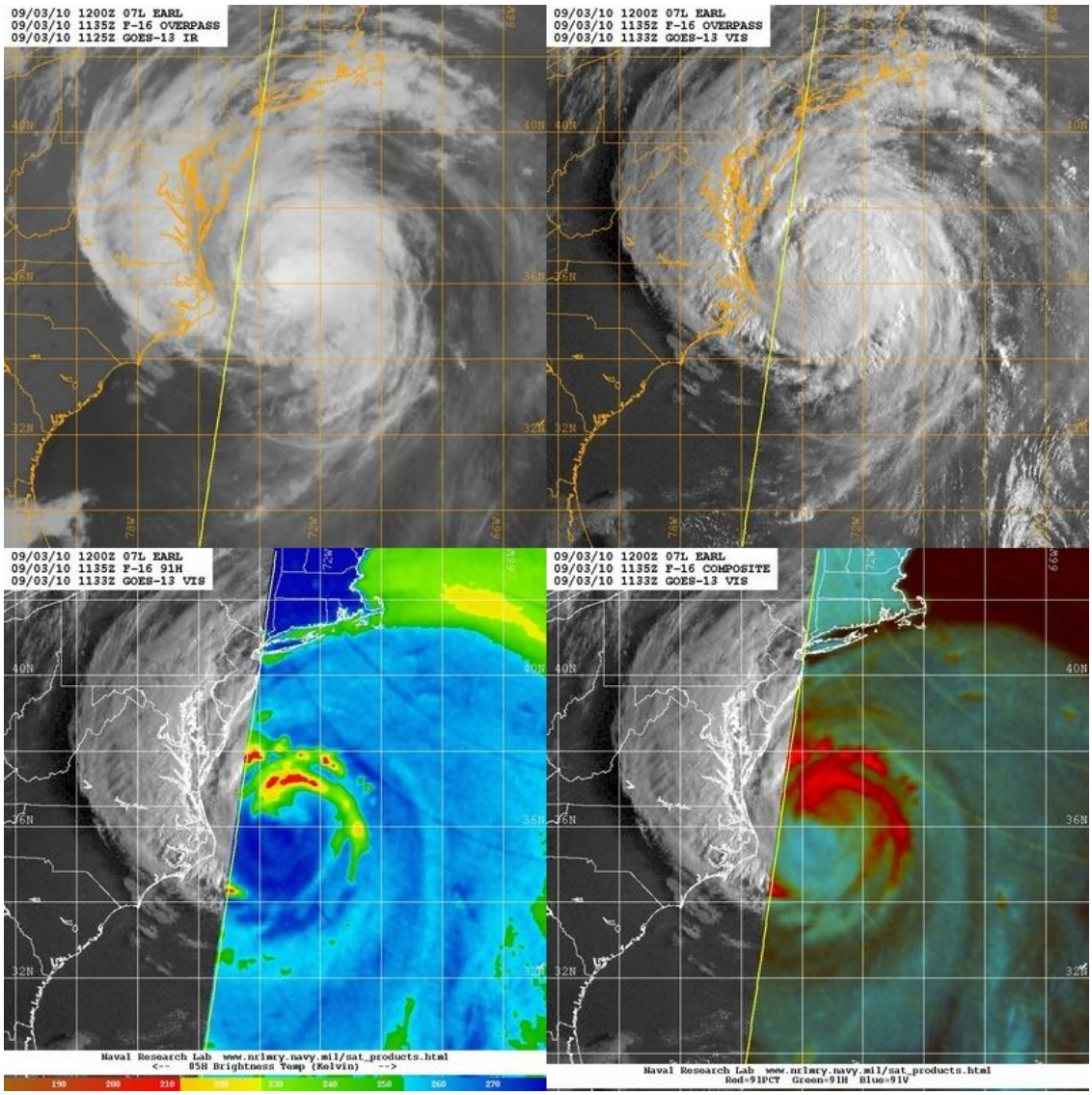
E1: Earl IR imagery 1245 UTC 9/3



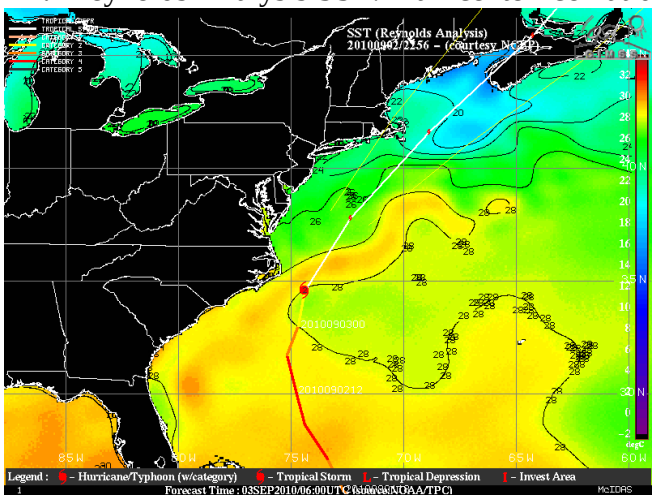
E2: TMI 0821 UTC 9/3



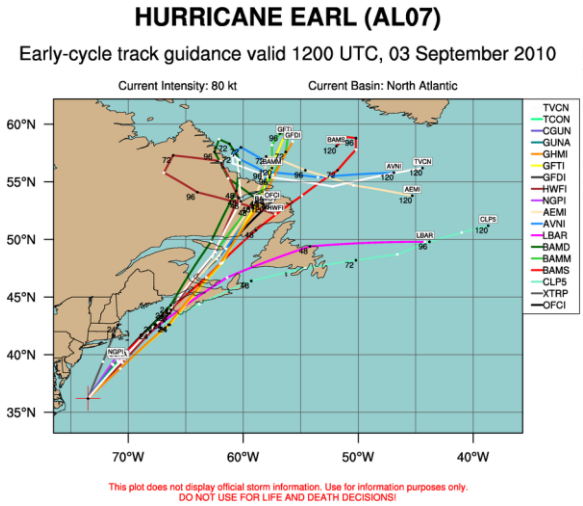
E3: SSMI 1135 UTC 9/3

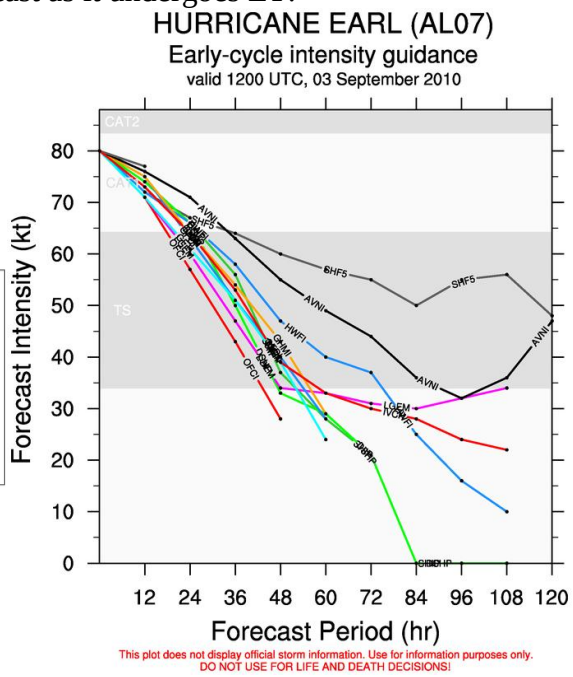


E4: Reynolds Analysis SST. Earl center icon at 0300 UTC 9/3.

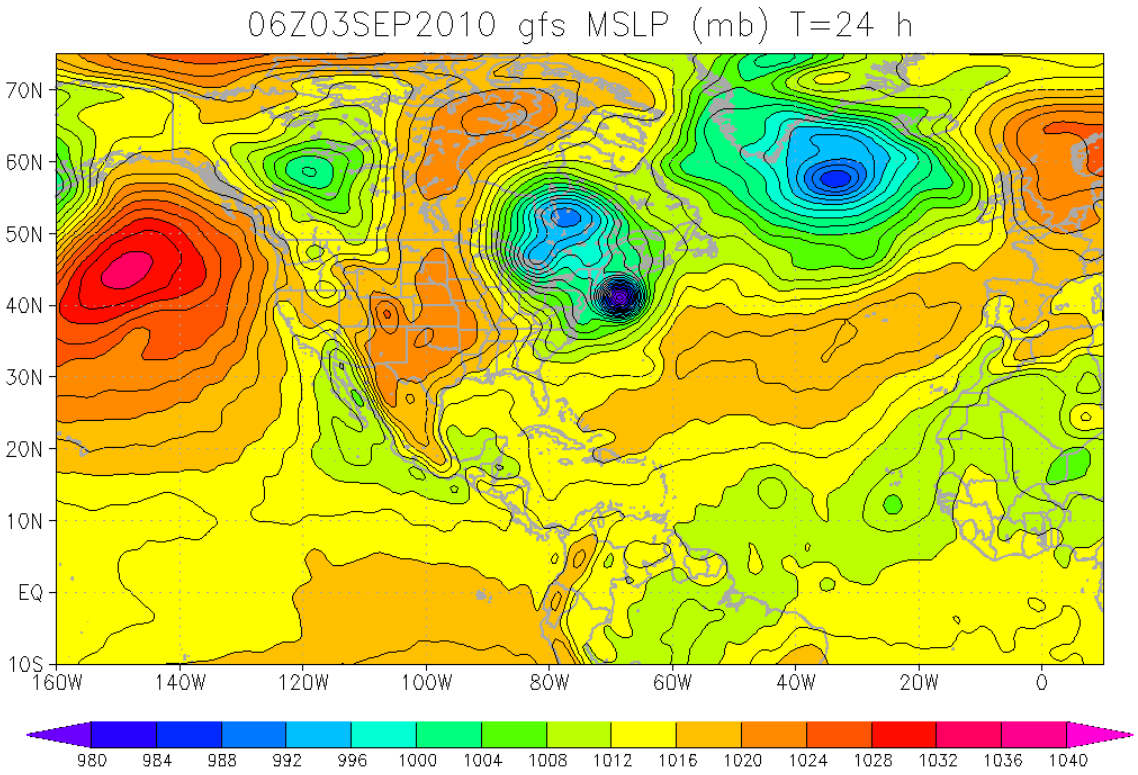


E5- Hurricane Earl Track and Intensity forecast as it undergoes ET:



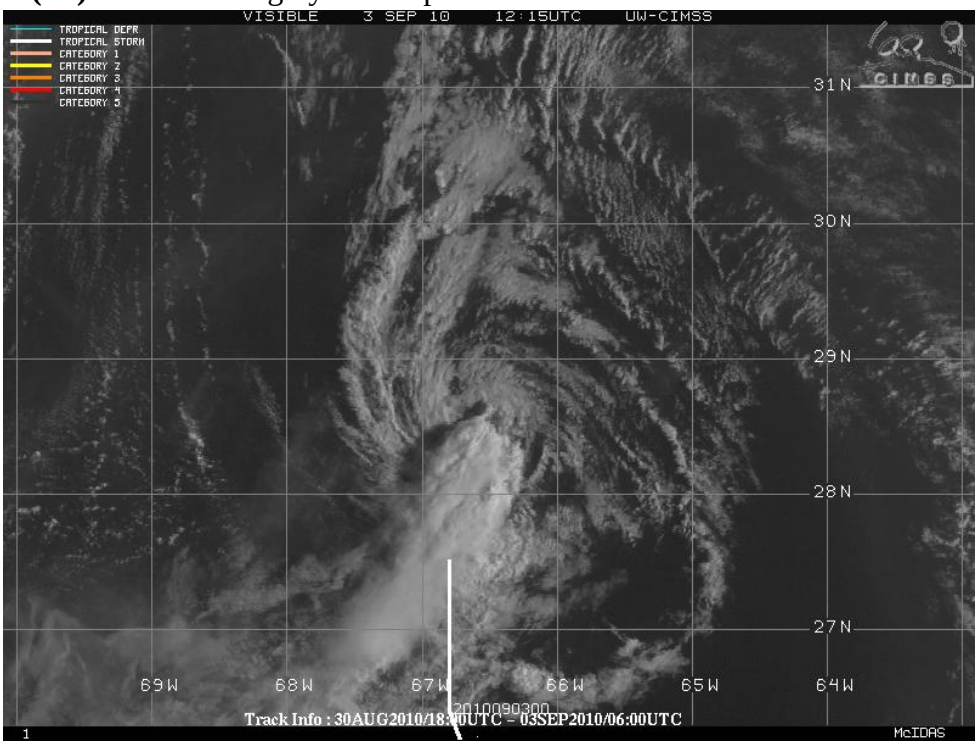


<u>GFS</u> at 24 hours from 0600 UTC Sept 03 initialization:

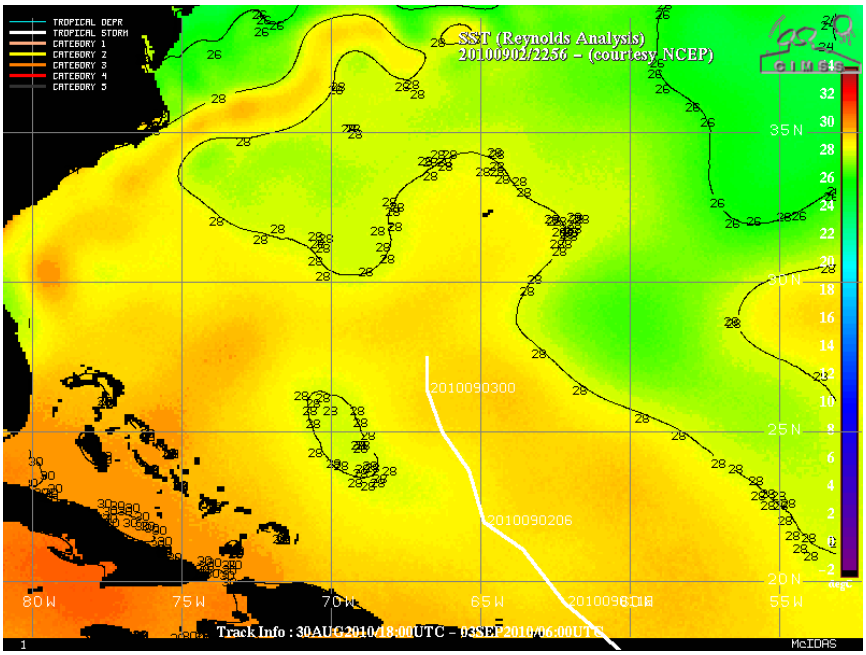


Tropical Storm Fiona:

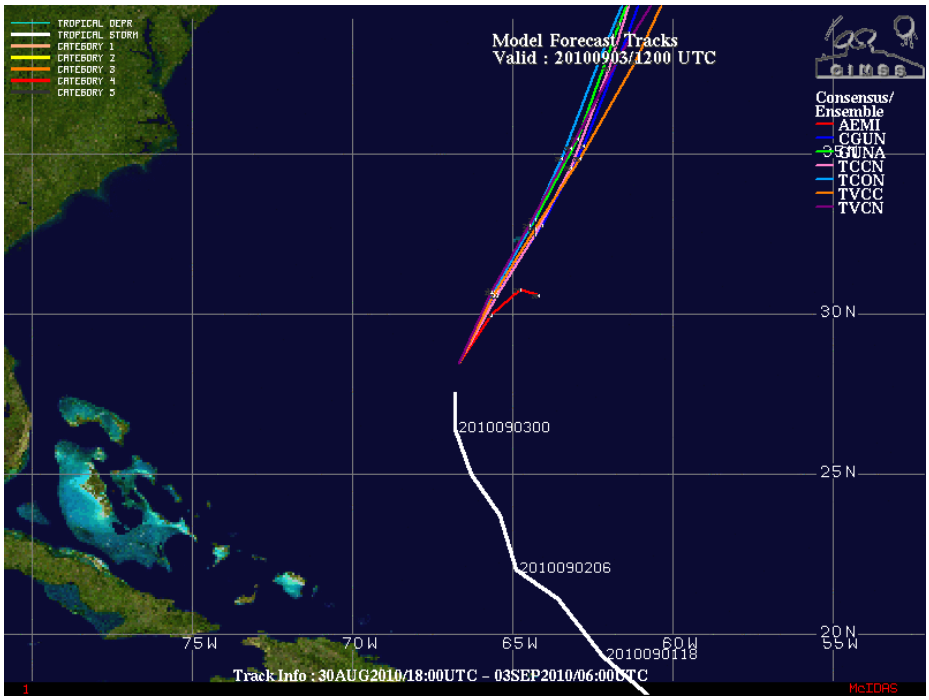
(F1): Satellite imagery for Tropical Storm Fiona at 06 Z



(F2): Sea Surface Temperatures for Tropical Storm Fiona

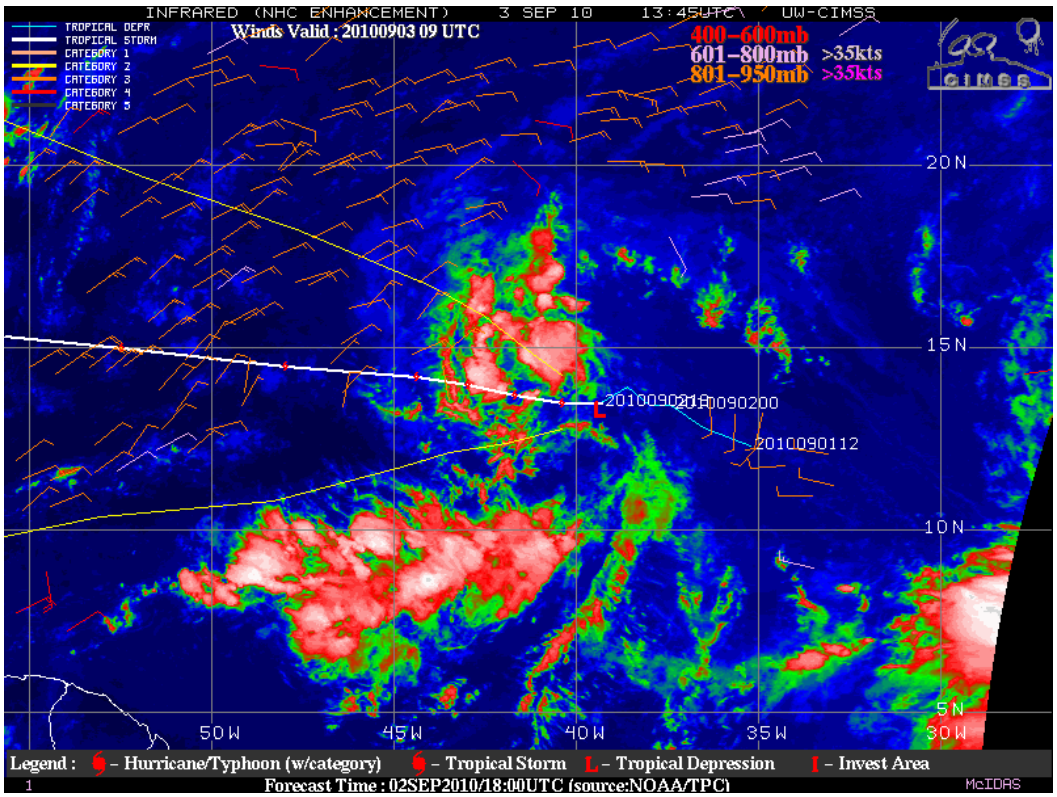


(F3): Forecasted track position and intensity for Tropical Storm Fiona

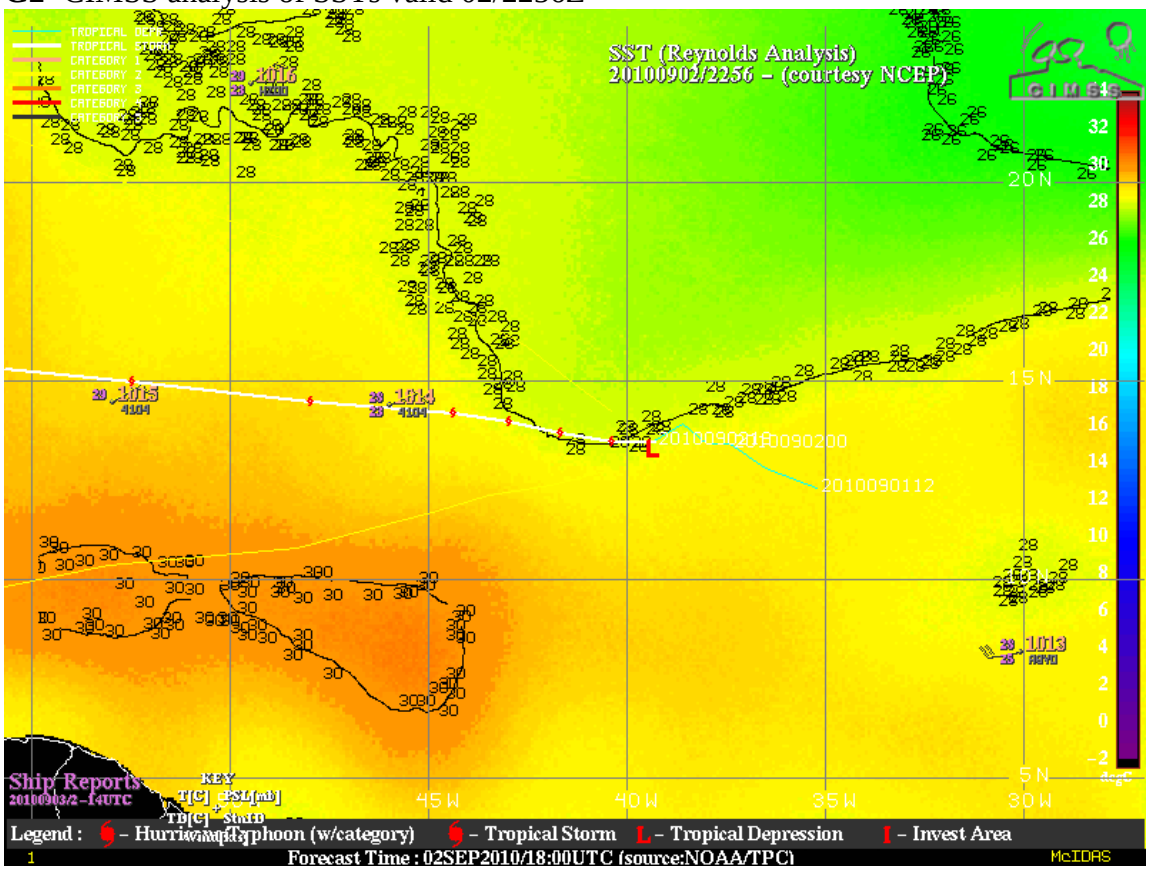


Gaston/PGI-38L:

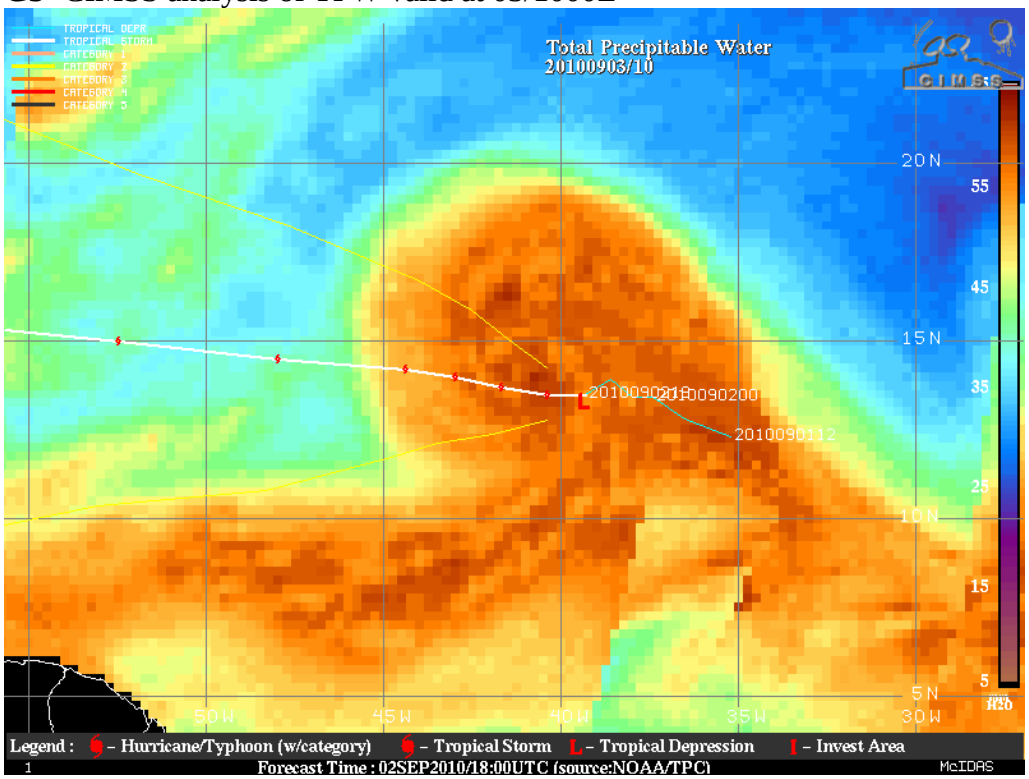
G1- CIMSS analysis of IR imagery valid 03/1345Z with satellite derived lower level winds valid 03/0900Z



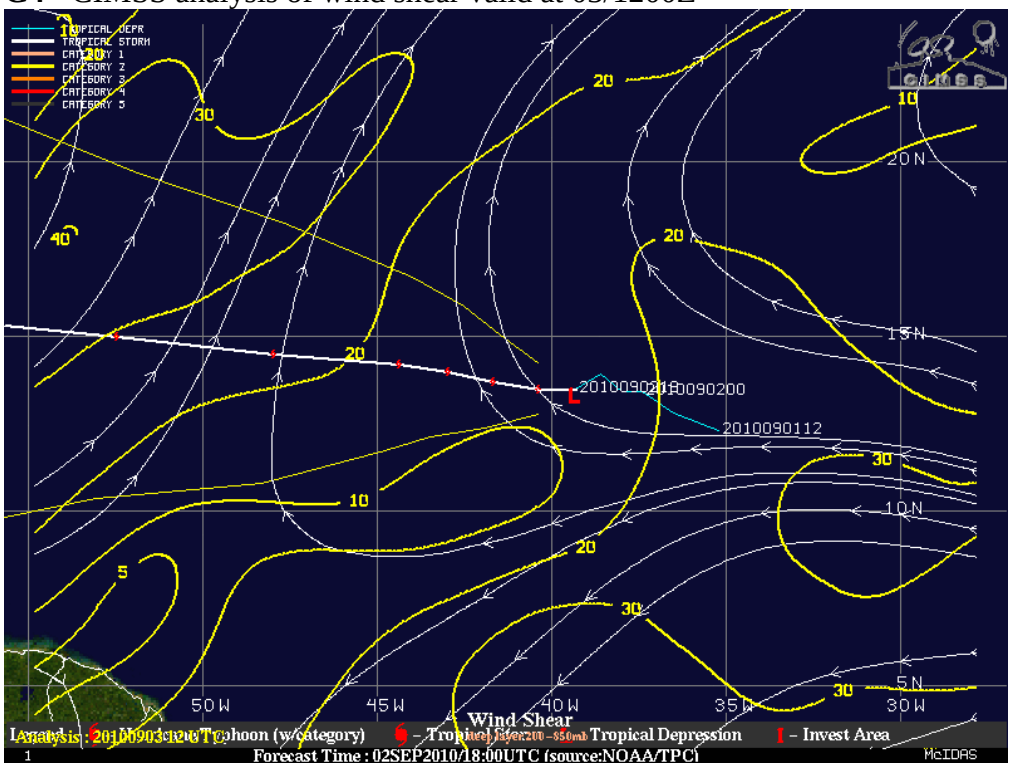
G2- CIMSS analysis of SSTs valid 02/2256Z



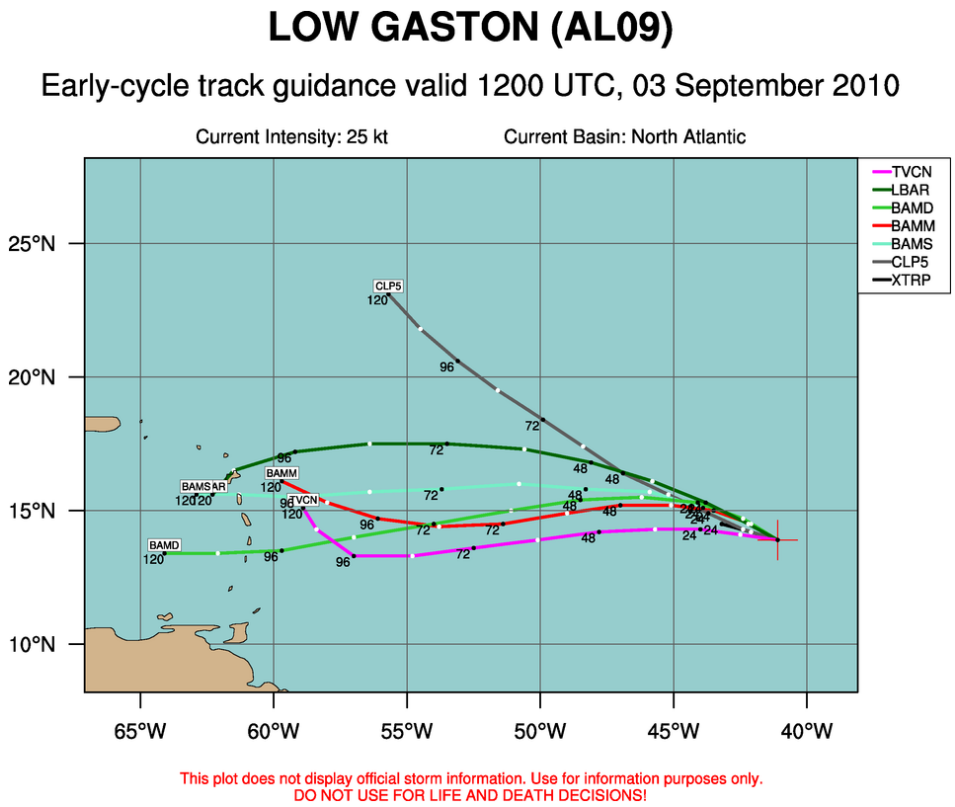
G3- CIMSS analysis of TPW valid at 03/1000Z



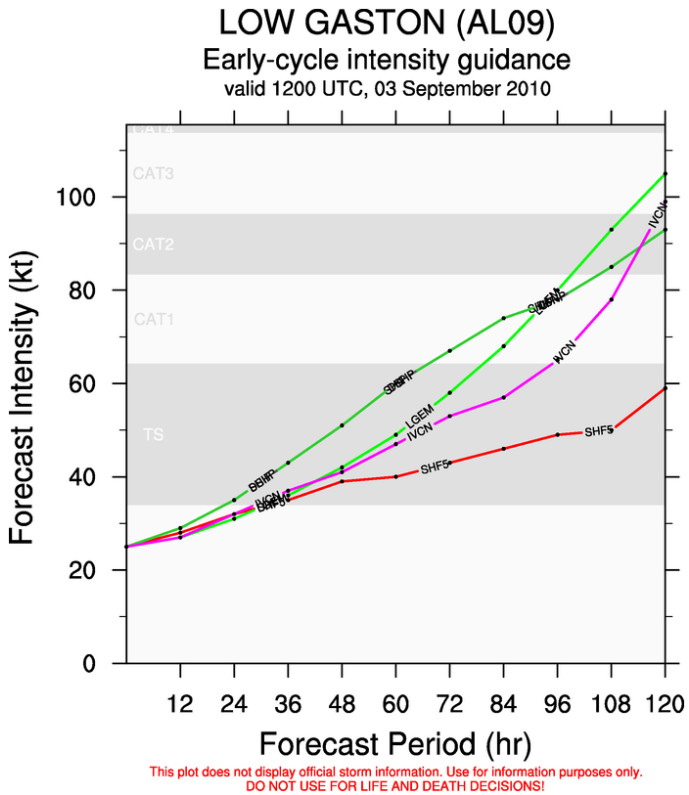
G4- CIMSS analysis of wind shear valid at 03/1200Z



G5-

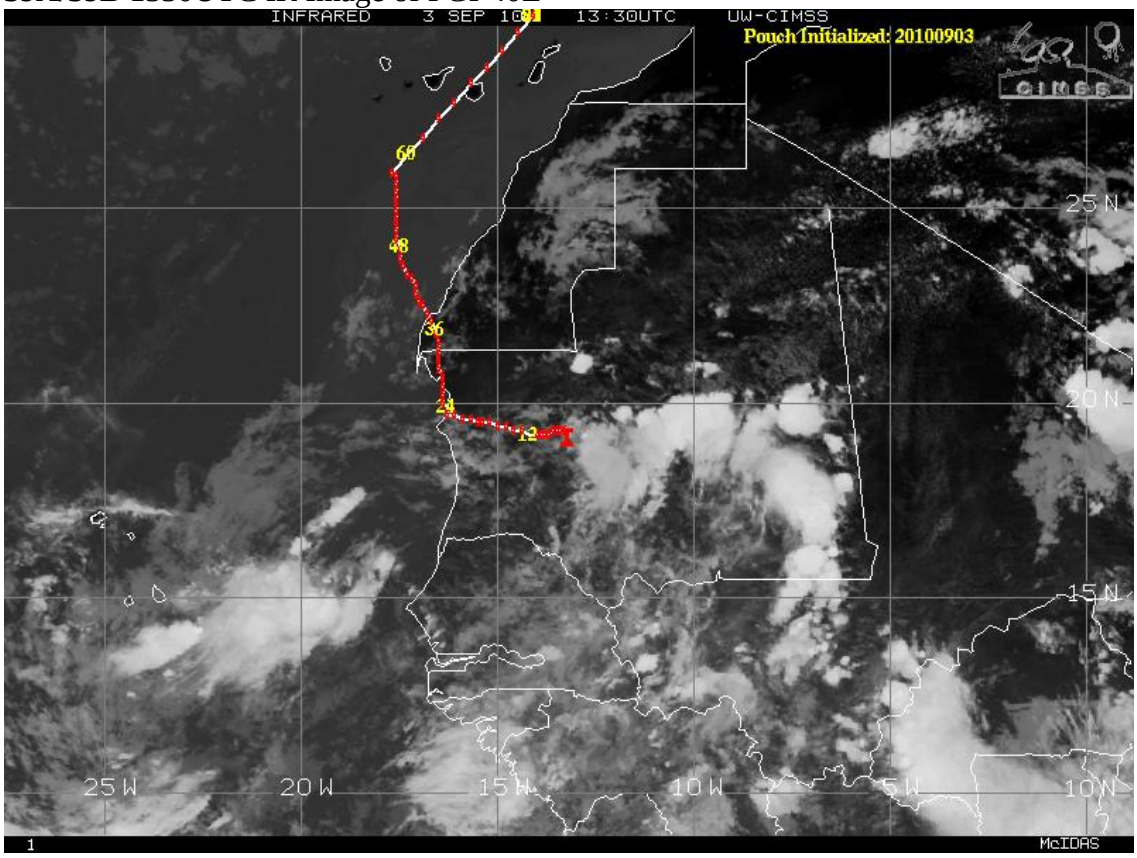


G6-

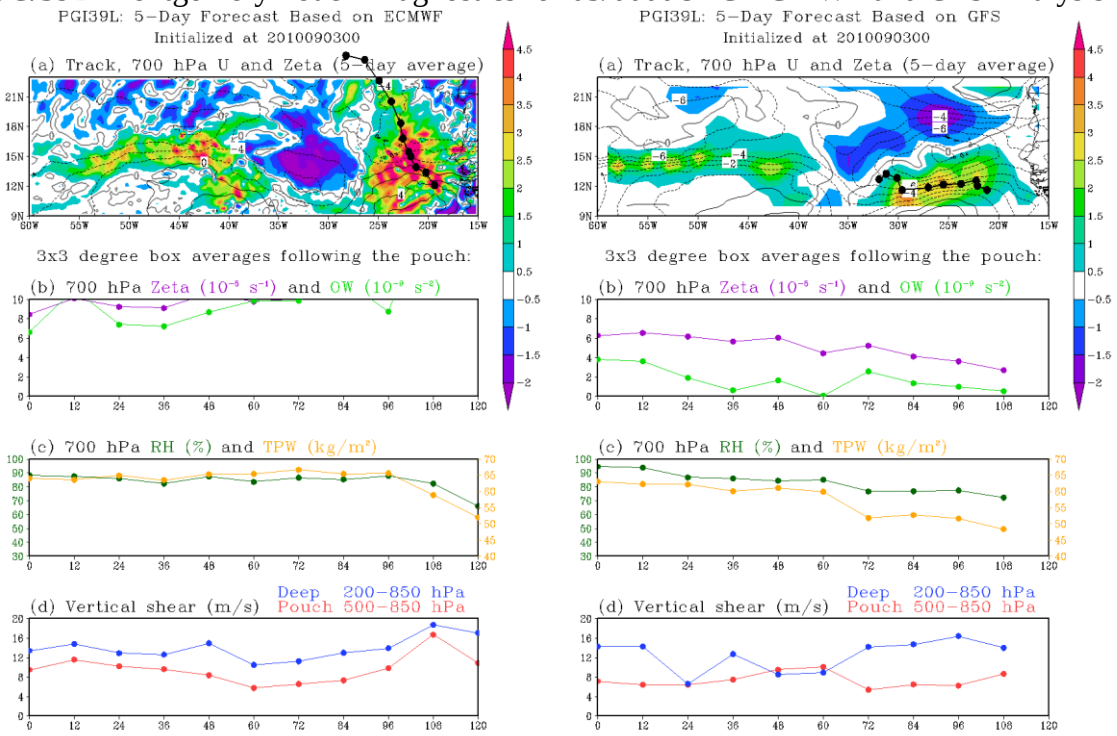


PGI-39L:

39A/39B 1330UTC IR Image of PGI-40L

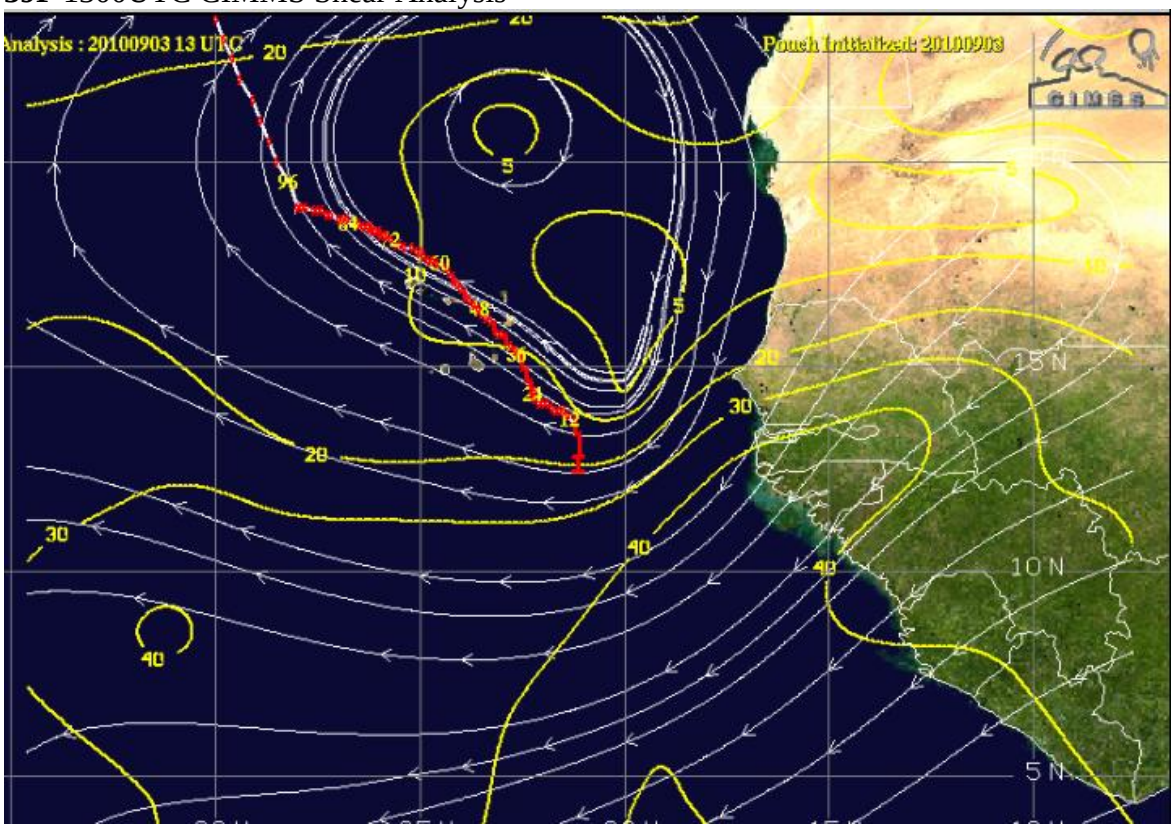


39C/39D Montgomery Pouch Diagnostics for 03/0000UTC ECMWF and GFS Analysis

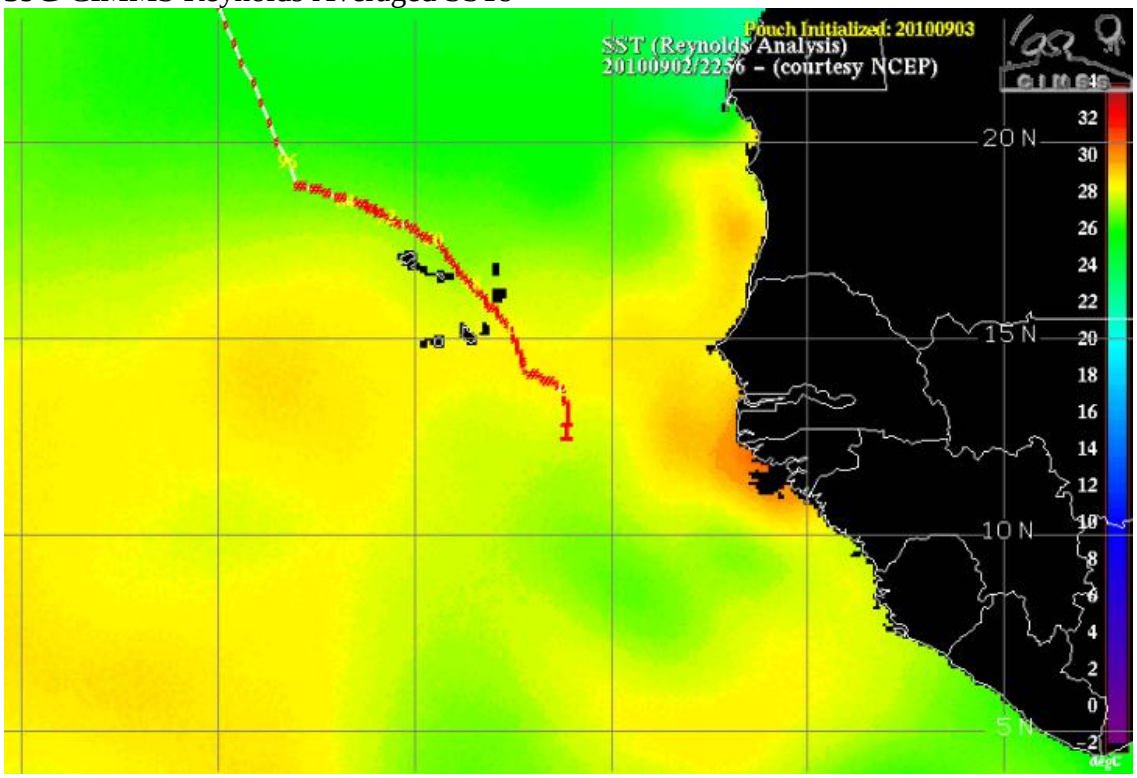


39E- Model tracks for PGI-39L

39F 1300UTC CIMMS Shear Analysis

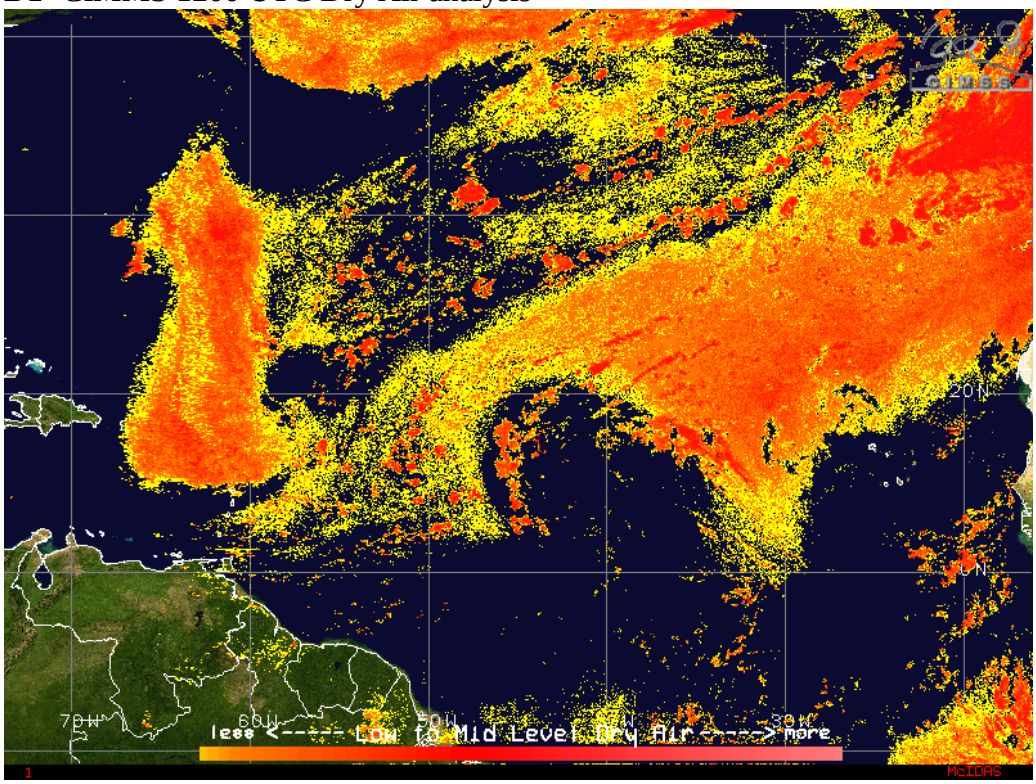


39G CIMMS Reynolds Averaged SSTs



Dust

D1- CIMMS 1200 UTC Dry Air analysis



D2- 0600UTC GOES-5 27-hr forecast