

Tri-Agency Forecast Discussion for August 26, 2010

Created 1600 UTC August 26, 2010

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Summary: The Tri-Agency domain is finally getting very active after a long waiting period. The potential flight targets for the agencies include Atlantic Tropical Storm Earl (PGI-34L) and PGI-36L in the AEW behind Earl, as well as Hurricane Frank in the East Pacific. Hurricane Danielle perhaps rapidly re-intensified in the last 12 hours, but unfortunately, it is not a target for investigation by any agency due to distance and/or lifecycle stage. However, the track forecast for Earl and PGI-36L should make these of particular interest to GRIP, IFEX, and PREDICT. With all agencies about to begin deploying from the East Caribbean islands, ferry flights are being planned for IFEX and GRIP. Interestingly, there has been a shift in the forecast track for Earl such that it could potentially come closer to St Croix in the Monday to Tuesday time frame than shown in previous model runs. Over the next two days, the track of Earl will undoubtedly play a role in the flight decisions by the agencies. Meanwhile, the Global Hawk will fly a weakening Frank on Saturday, and by 1600 UTC when it should reach the system, it will likely be a 55-60kt Tropical Storm somewhere close to 21N/114W, following this morning's official NHC track.

Forecast for 1600 UTC 8/26/2010:

Synoptic Overview:

There are several interesting features today in the western portion of the tri-agency domain. At upper levels, there is an anticyclone over much of the Gulf of Mexico, and there are lows located over the northern Caribbean near eastern Cuba, and there is also a trough at upper levels in the eastern Caribbean Sea (**1**). At low-mid levels, there is a tropical wave extending south from Cuba along 81W, a trough over the Gulf of Mexico extending from south TX to LA, and at the southern extent of this trough there is a 1010 hPa low with an elongated vorticity maxima at 850 hPa (**3a**).

In the Atlantic, Hurricane Danielle is on a WNW heading (**3a, 8b**), with a translation speed of 13 kts. Danielle's minimum central pressure is 970 hPa with 90 kt winds gusting to 110 kts. Danielle is currently in a region of 10-20 kt south-southwesterly shear (**8b**).

At the lower-levels, there are a few areas of interest in the eastern Atlantic as well (**3a**). The subtropical ridge is in place and its influence extends from the west coast of Africa to about 75W. Hurricane Danielle and Tropical Storm Earl are currently being steered to the west as it traverses the south side of the ridge. A 999 hPa surface low was analyzed near 35N/40W, and it will help to break down the subtropical ridge and allow Hurricane Danielle to curve to the NW. Elsewhere, PGI-36L is located just off the coast of Africa and several MCSs can be seen over Africa (**5**). A broad area of diffluence is present over the convection associated with PGI-36L.

Also at upper-levels, a low was analyzed at 35N/40W, co-located with the aforementioned surface low (1). This feature is now interacting with Hurricane Danielle. Broad anti-cyclonic flow was noted over Tropical Storm Earl. CIMSS analysis indicates that a large wedge of dry air was located to the NW of Earl, and a narrow band of this dry air may have been wrapping into the center of Earl earlier this morning (16).

Additionally, the East Pacific is becoming more interesting as Hurricane Frank is a potential flight target for the Global Hawk (1), and there is a suggestion by several models (ECMWF, GFS, GFDL, HWRF) that there could be another TC forming south of Mexico in the 4-5 day range. The location of Frank and the expected formation area for another TC are both in areas of high SSTs in the East Pacific (11), however this is about to change for Frank as it makes a northwestward to north turn over the next 48-72 hours (12). Hurricane Frank is currently located at 17.4N/109.3W moving WNW at 10 kt with maximum sustained winds of 75 kt. Frank is located in a region of relatively low wind shear and there is good low-level vorticity associated with the center of Frank (10). The organization of the center of circulation is not as good however, and AMSR-E data from a pass last night indicated this as well. As Frank makes its northward turn, it will begin to weaken quickly. By the time the Global Hawk flies into Frank, it should be about 1600 UTC Saturday, and Frank's expected position should be close to 21N, 114W with an intensity of approximately 55-60 kts, as a Tropical Storm (12).

Features of Interest:

PGI-37L:

The elongated trough located offshore the eastern coast of US appears to extended further southwestward to Estadio Tamaulipas, Mexico, but became a little bit weaker than yesterday in terms of 850-hPa relative vorticity (2). The convective systems associated with the weak low-level circulation/PGI-37 and upper-level anticyclonic circulation are present over the western GOM (4). The vertical wind shear to the north of the low-level circulation is 5 knots stronger than yesterday and there is dry air behind the cold front over the GOM, which could inhibit the convective activity in the extreme northwestern Gulf offshore of both Texas and Louisiana (6). According to the track forecast for PGI-37L from UKMET, NOGAPS, and GFS, PGI-37L will make landfall over the Mexico in the next 48 h, while ECMWF suggests that PGI-37L will still circle around over the northwestern GOM (7). Since 850-hPa maximum vorticity and the pouch location of PGI-37 are currently very close to land, and there appears to be no trend of increasing intensity from most of the global models, the potential genesis is very low (<5%).

Hurricane Danielle/PGI-31L: Hurricane Danielle is an impressive looking Category 2 hurricane today (8a) due to its recovery from unfavorable interactions yesterday with dry air and moderate shear. Danielle is currently located at 24.4N, 56.9W, moving on a NW heading at 13 kts (3a). The system has a minimum central pressure of 970 hPa and a maximum sustained wind speed of 90 kts with gusts to 110 kts. Danielle still remains in a low-moderate south-southwesterly shear at 10-20 kts (8b), but is fending off the dry air well (15, 16). Danielle will continue to head NW over the next 48 hours where the model consensus is that it will make a northward turn, followed by another turn to the NE at 72 hours (from 1200 UTC Aug 26) (8c). The hurricane's intensity over the last 12 hours has been increasing at such an impressive rate that it appears almost as though rapid intensification is occurring; and it may not be over yet. Danielle is now displaying an eye on visible satellite imagery (8a) that is well defined, and some

models are forecasting Danielle to become a Category 3 hurricane in 36-48 hours (8d), after which it will gradually begin to weaken as its track takes it north over less favorable SSTs and it is swept off to the NE.

Hurricane Earl/PGI-34L:

TS Earl does not appear to be much better organized this morning according to satellite imagery (5). The center of the storm is at roughly 14.9N/37.1W (3a), located on the east side of a north-to-south elongated area of convection, and is somewhat exposed. Water vapor imagery and CIMSS analysis TPW (15) suggest that there is a broad area of dry air to the NW of Earl, with a narrow band of dry air wrapping around the southern and eastern side of the system (16), which is contributing to the lack of convection on the east side of the center.

Earl has been moving just north of due west for the past 24 hours at 12-14 kts. A WNW motion at 13-16 kts is expected to continue through the next 72-84 hours as the storm passes along the southern side of the subtropical ridge (14). Beyond this timeframe, the subtropical ridge will be considerably weaker, and Earl should turn more to the NW and slow down a bit (~10-12kts) as it rounds the western side of the ridge. The track guidance is in relative good agreement, with the dynamical models tightly clustered through 96 hours. If this track holds, it will put Earl within range of the DC-8 from roughly 29/00Z to 31/12Z (14).

There is current a very steep shear gradient to the NW of Earl, with CIMSS analysis showing some 40 kts of shear close by. The SHIPS model, which is based on the official interpolated forecast track shows that Earl will pass to the south of this gradient and encounter relatively weak shear (<10 kts) through 60 hours. Beyond that time, increased shear is expected, which is about the time the DC-8 will be in range. The intensity guidance at 26/06Z was extremely widespread, ranging from a minimal tropical storm to a strong category 2 hurricane during the expected flight times. The models do agree on a strengthening trend, but the extent of the strengthening is the big unknown at this time. The 26/12Z intensity guidance is a bit more tightly clustered on a steady rate of intensification through 120 hours, except for the GFS which weakens the storm slightly after 84 hours (14). Our intensity forecast calls for a category 1 hurricane by 60 hours (beginning of DC-8 range), and a category 2 storm at 120 hours (end of DC-8 range).

Dust and Dry Air in the Atlantic Basin

The presence of the Saharan Air Layer in the Atlantic Basin will have different impacts on Hurricane Danielle and TS Earl (16, 17).

The current track that Hurricane Danielle is on will continue into an environment with limited, if any, chance of further entrainment of dry air. Danielle is in a high TPW region and will continue to be so as it continues to track NW (15). The lack of continued dry air entrainment into Danielle overnight is one of the reasons that Danielle was able to overcome the weakening it experienced yesterday, thus aiding its intensification into a Category 2 again by 0000 UTC 26 August 2010.

Elsewhere, TS Earl is developing in the Atlantic on the heels of a SAL outbreak that exited the west coast of Africa, and it is predicted to steadily intensify over the next 5 days. As opposed to Hurricane Danielle, TS Earl has entrained dry air from the SAL airmass as indicated by

relatively high AOT values (17). The continued further intensification of Earl is dependent upon the absence of entrainment of dry air out of the SAL ahead of it (17, 18).

PGI-36L:

PGI-36L, located near 18W/10N (according to satellite imagery) (5), indicates nice organization overnight after a series of MCS events over west Africa over the past couple of days. The multiple cloud clusters (perhaps MCVs?) appear to be converging towards a mid- or low-level center (5). The tropical wave is emerging off the coast of Africa (surface analysis) (3a), while the 850hPa relative vorticity maximum is centrally located near 16W/12N as of 1200UTC (2). The cloud track wind analysis indicates upper-level easterlies of up to 55kt, although there is some evidence of some anticyclonic curvature above the main convective region (1, 13). The deep layer wind shear (850-200hPa) is 20-30kt. Despite the seemingly unfavorable shear in the environment, the convection was able to consolidate near the low-level vorticity maximum.

The following is the 0600UTC initialization GFS forecast track for the 850hPa vorticity maximum:

26/1800UTC: 20W/10N; 27/0000UTC: 21W/10N; 27/0600UTC: 21W/10N; 27/1200UTC: 22W/11N; 27/1800UTC: 24W/11N; 28/0000UTC: 26W/11N; 28/0600UTC: 28W/11N; 28/1200UTC: 30W/11N; 28/1800UTC: 32W/12N; 29/0000UTC: 34W/12N; 29/0600UTC: 35W/14N; 29/1200UTC: 38W/15N; 29/1800UTC: 40W/15N; 30/0000UTC: 42W/16N; 30/0600UTC: 44W/16N; 30/1200UTC: 46W/17N; 30/1800UTC: 49W/17N; 31/0000UTC: 49W/18N; 31/0600UTC: 51W/19N; 31/1200UTC: 52W/21N; 31/1800UTC: 53W/22N; 01/0000UTC: 54W/26N; 01/0600UTC: 54W/28N; 01/1200UTC: 55W/30N; 01/1800UTC: 55W/31N; 02/0000UTC: 55W/32N; 02/0600UTC: 54W/33N

The GFS shows no intensification but a fairly strong 850hPa vorticity maximum. While the disturbance remains fairly distant initially, it moves rapidly westward becoming engulfed in the flow of Earl as it approaches 50W around 0000UTC 31 August. Following that, it is stretched in the southerly flow on the east side of Earl and is accelerated northward towards the mid-latitudes. The 1200UTC 30 August forecast for the 850hPa relative vorticity is in (9). PGI-36L is only at 46W and in the process of getting caught up in Earl.

The ECMWF 0000UTC initialization for the MSLP:

27/0000UTC: 20W/15N; 28/0000UTC: 24W/15N; 29/0000UTC: 33W/15N; 30/0000UTC: 40W/16N; 31/0000UTC: 48W/17N; 01/0000UTC: 53W/19N.

The NOGAPS has a weak surface low that drags way behind Earl and farther to the south, 6 days from now, only at 48W/14N. Overall, the NOGAPS and ECMWF are not as aggressive as the GFS for the interactions with Earl, but the disturbance is weak and the models are still a day away from the potential peak interaction with Earl.

The consensus pouch forecast is as follows (13): initial: 17.2W/12.2N; 27/0100UTC: 20.0W/12.4N; 27/1300UTC: 22.8W/12.4N; 28/0100UTC: 25.8W/12.7N; 28/1300UTC: 29.4W/13.1N; 29/0100UTC: 32.4W/13.2N; 29/1300UTC: 36.6W/13.6N; 30/0100UTC: 40.4W/14.1N; 30/1300UTC: 43.9/14.6N.

Hurricane Frank

As of 1500 UTC August 26, 2010, Hurricane Frank was located at 17.4N/109.3W with winds of 85 mph. The storm is moving towards the west at 12 mph **(10)**. Frank is currently located in a moist environment with relatively warm SSTs (27-28°C) **(11)**. In terms of intensity, most of the models weaken Frank slightly over the next 12-24 hours. At this time, no model indicates Frank will intensify beyond a category 1 hurricane **(12)**.

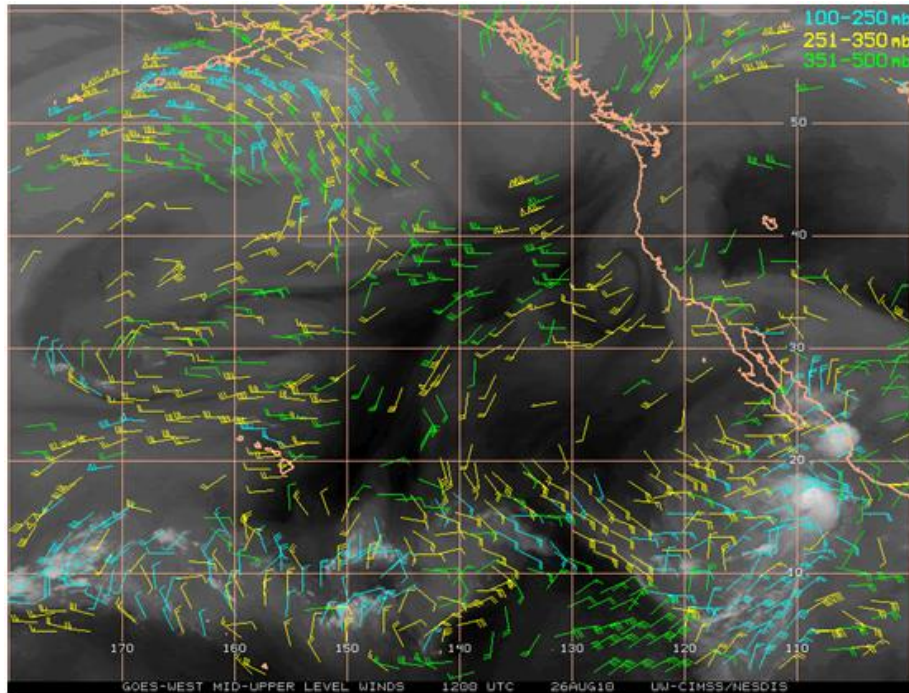
Over the next 24 hours, Frank will maintain its current WNW track **(12)**. The models indicate a trough with an axis currently located around 135W will dig deeper over the next 48-72 hours as it approaches the U.S. Pacific coast. As a result, Frank is expected to slow down and begin curving towards the northwest and then the north in the 48-72 hour timeframe. During this period, the storm will move into SSTs < 26°C and thus begin to weaken **(11)**. There is good model agreement that Frank will only be a tropical storm by Saturday and gradually continue weakening into a tropical depression/remnant low by Tuesday **(12)**. The consensus of model runs indicates that Frank will stall to the W off the southern tip of the Baja Peninsula at approximately 120 hours.

The consensus forecast track for Frank is as follows:

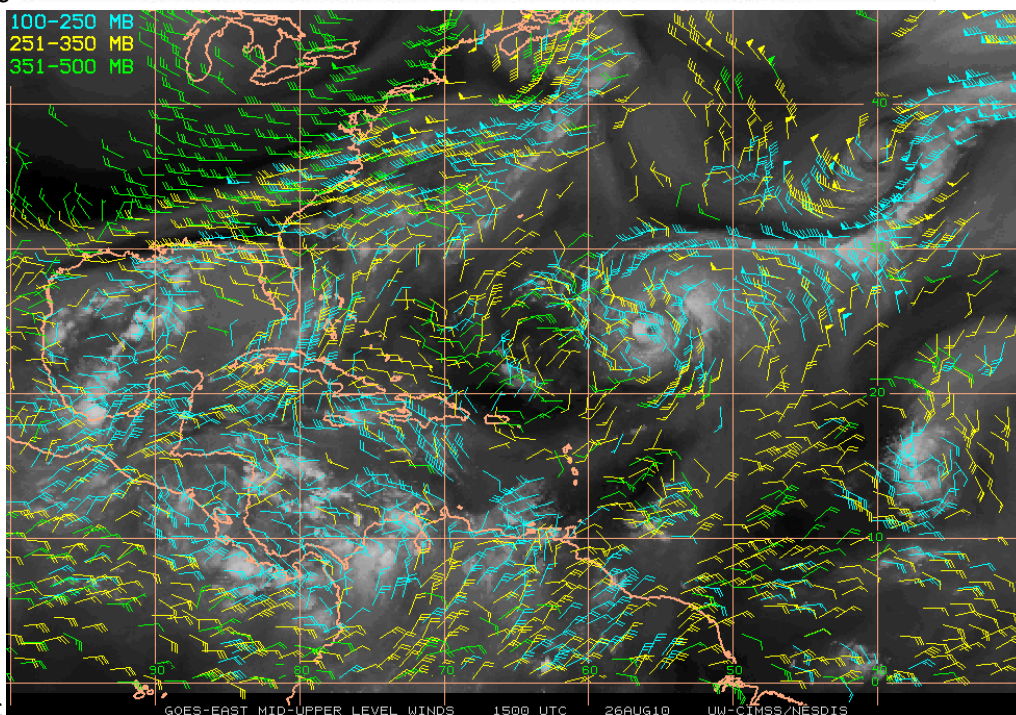
27/0000UTC: 17.8N/110.8W; 27/1200UTC: 18.2N/112.2W; 28/0000UTC: 18.9N/113.3W;
28/1200UTC: 19.6N/113.9W; 29/1200UTC: 21.0N/114.0W; 30/1200UTC: 22.0N/114.0W;
31/1200UTC: 23.0N/114.0W

Images used in discussion:

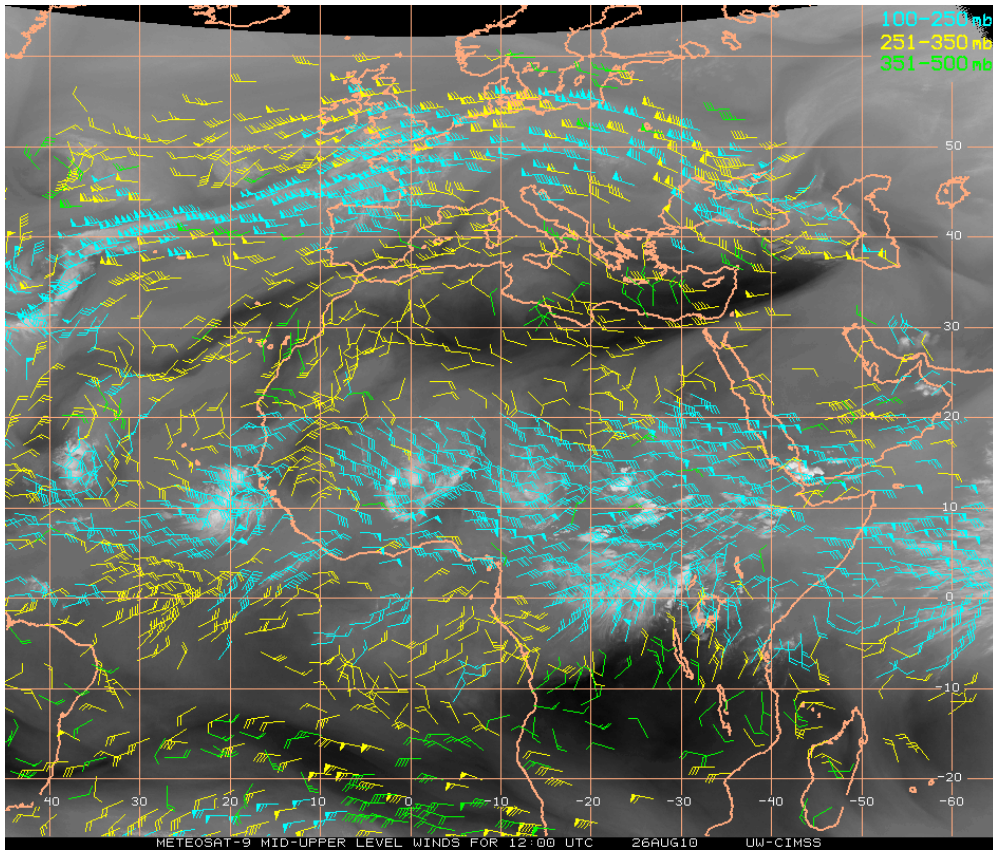
1) CIMSS satellite-derived upper-level winds and water vapor, both at 8/25 1200 UTC for the



East Pac

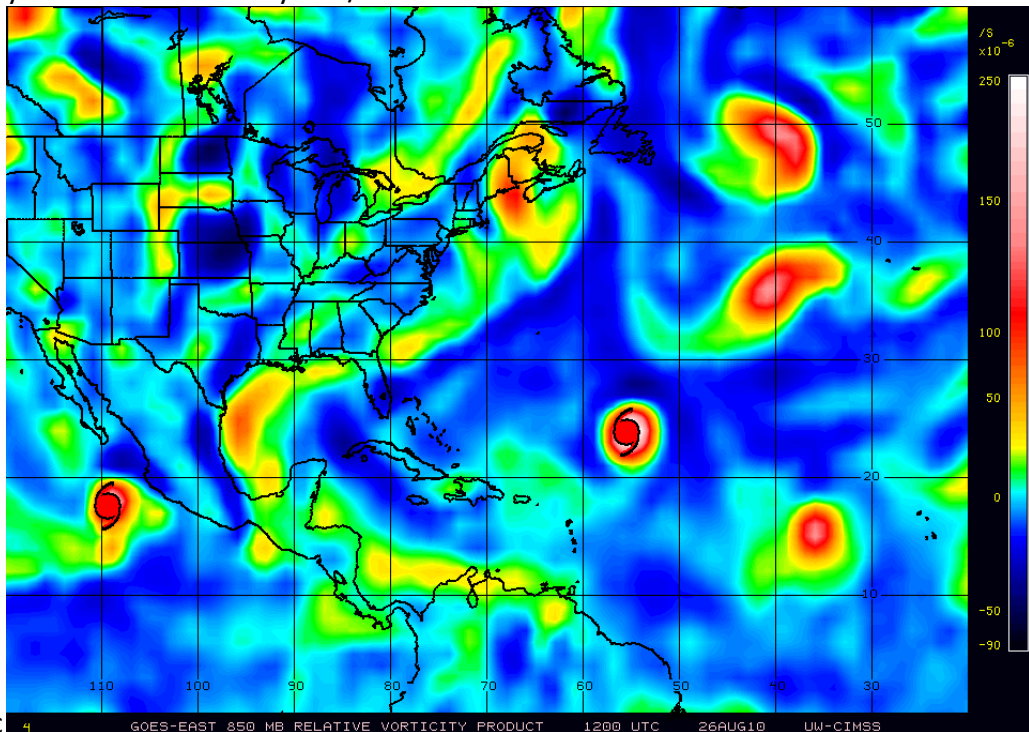


Atlantic

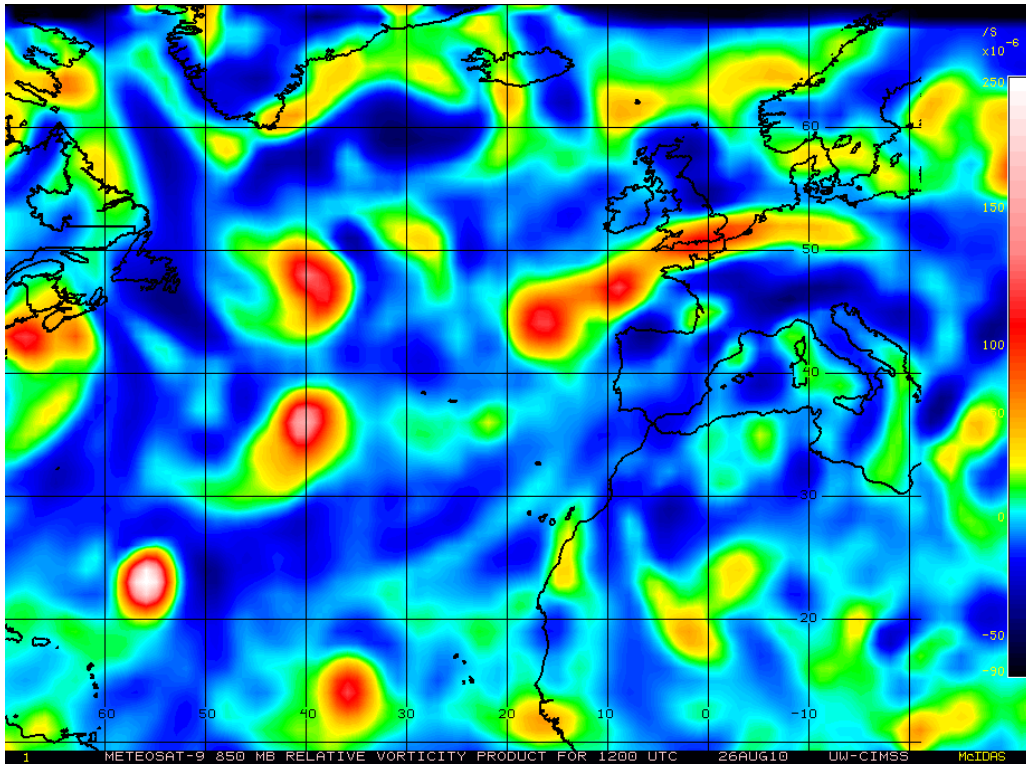


Africa

2) CIMSS analyzed 850 hPa vorticity at 8/26 1200 UTC for the

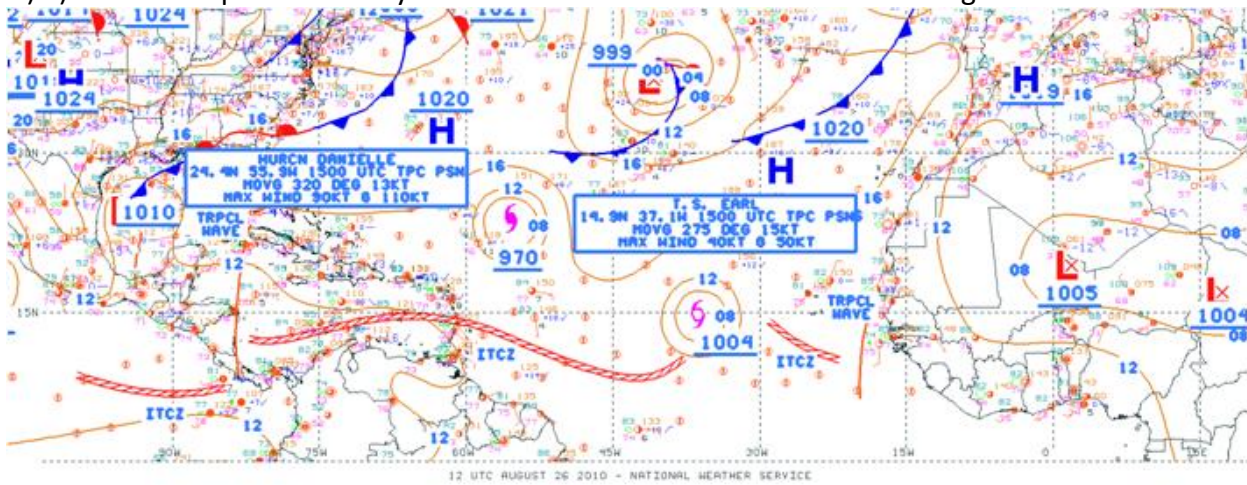


EPac/Atlantic

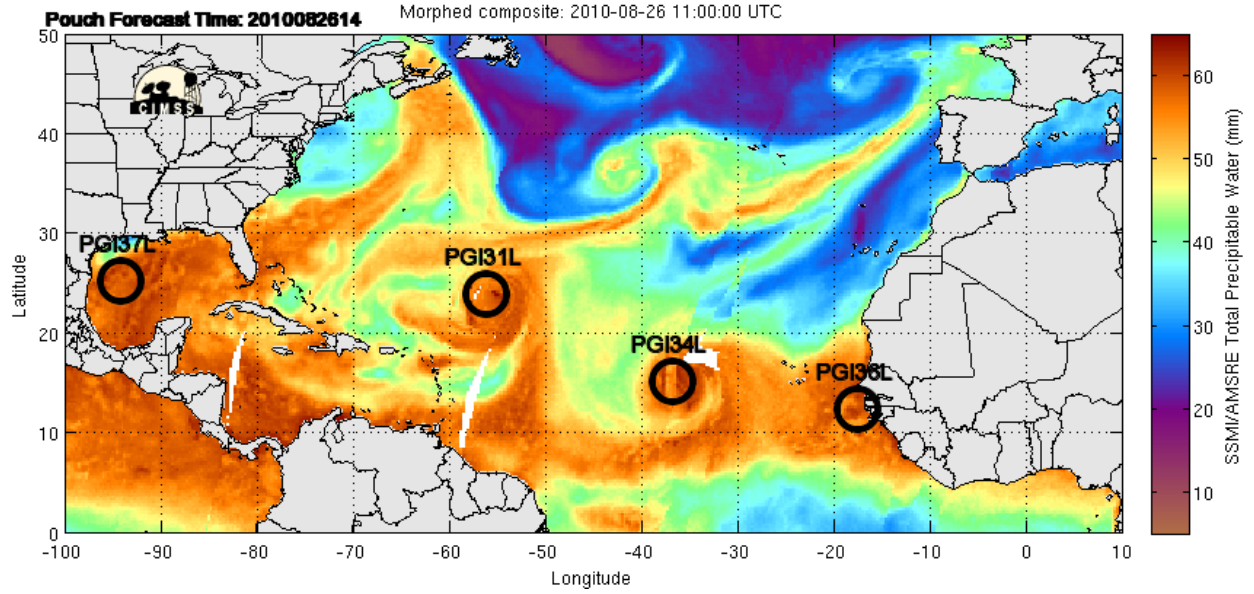


Africa

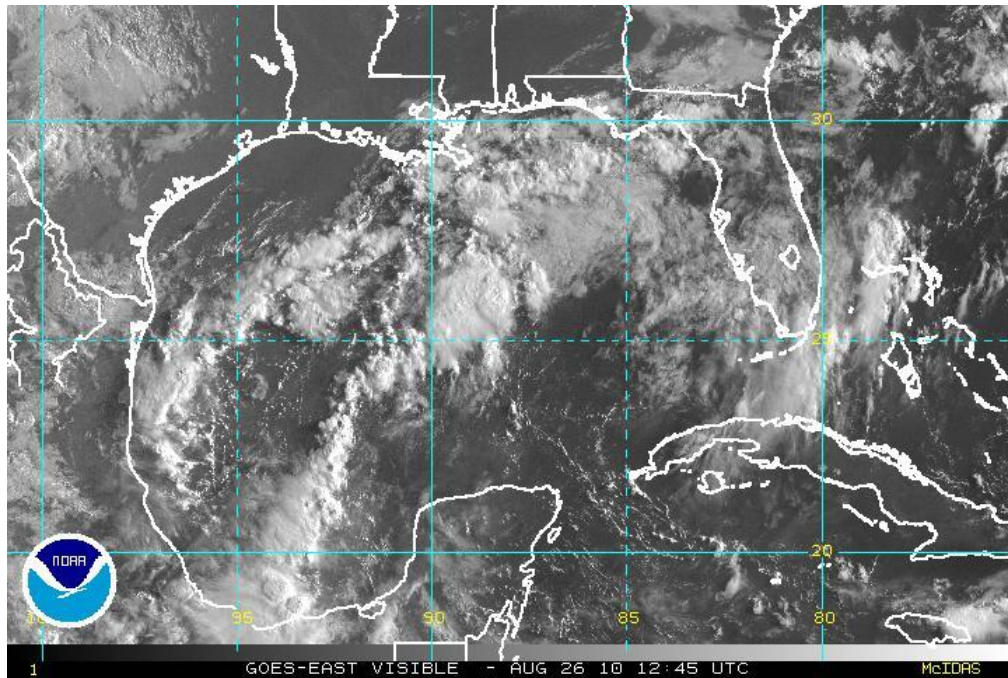
3.) a) Surface map of current systems in the Atlantic Basin at 1200 UTC Aug 26

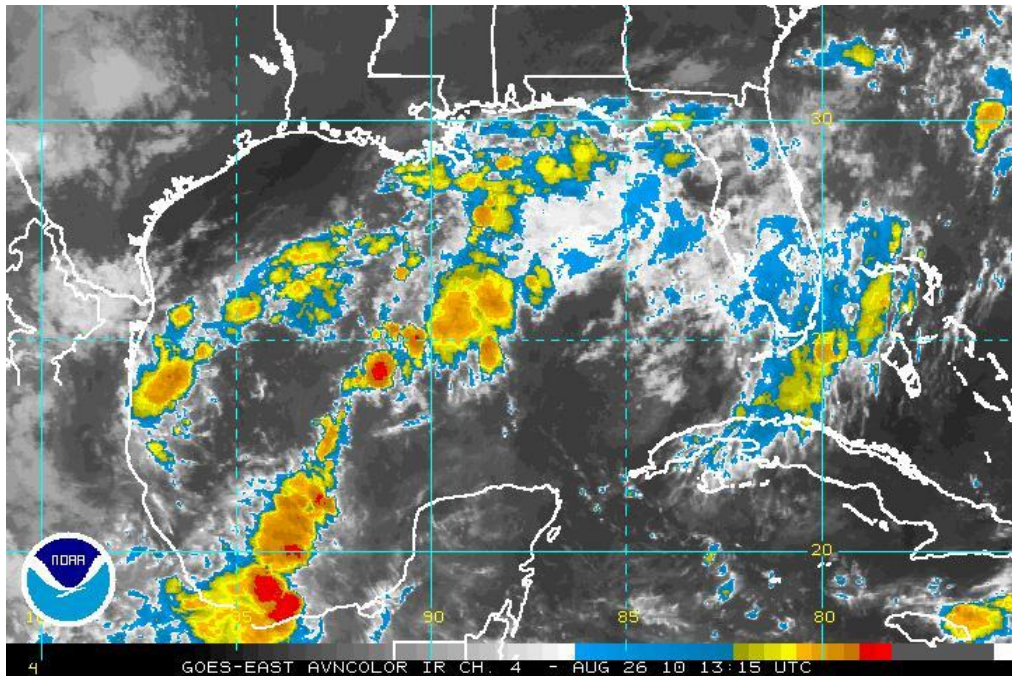


b) Pouch locations at 0000 UTC Aug 26 on TPW map at 1100 UTC

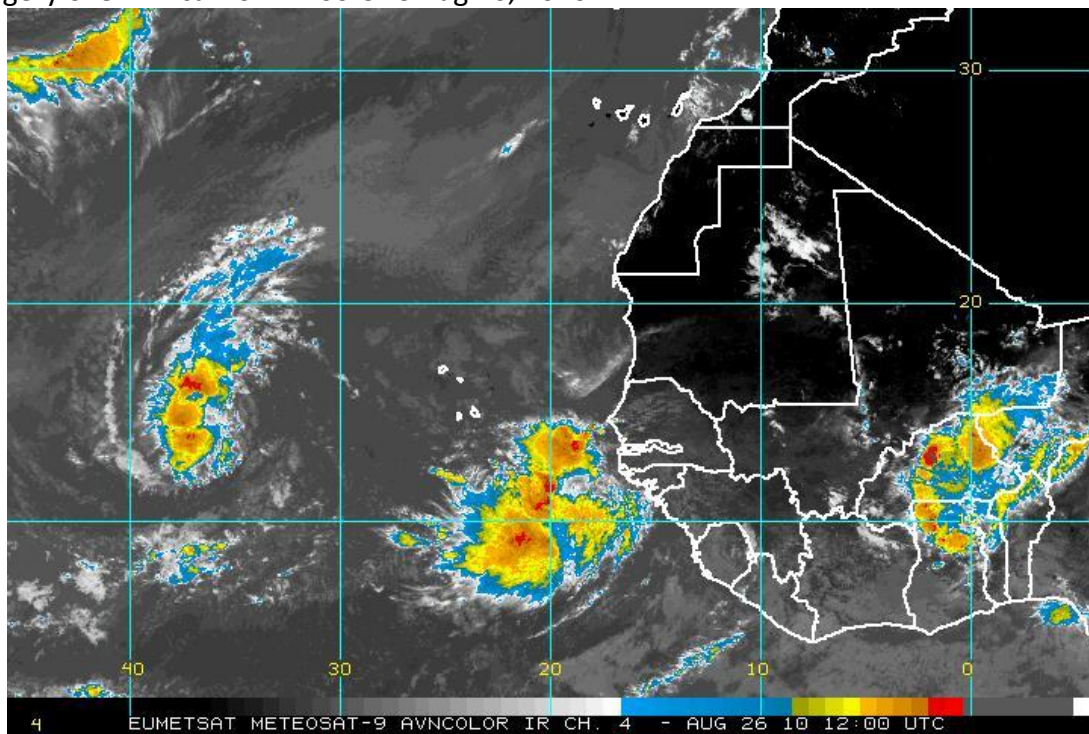


4) GOM Visible and IR satellite images valid at 12:45 and 13:15 UTC, respectively, Aug 26:

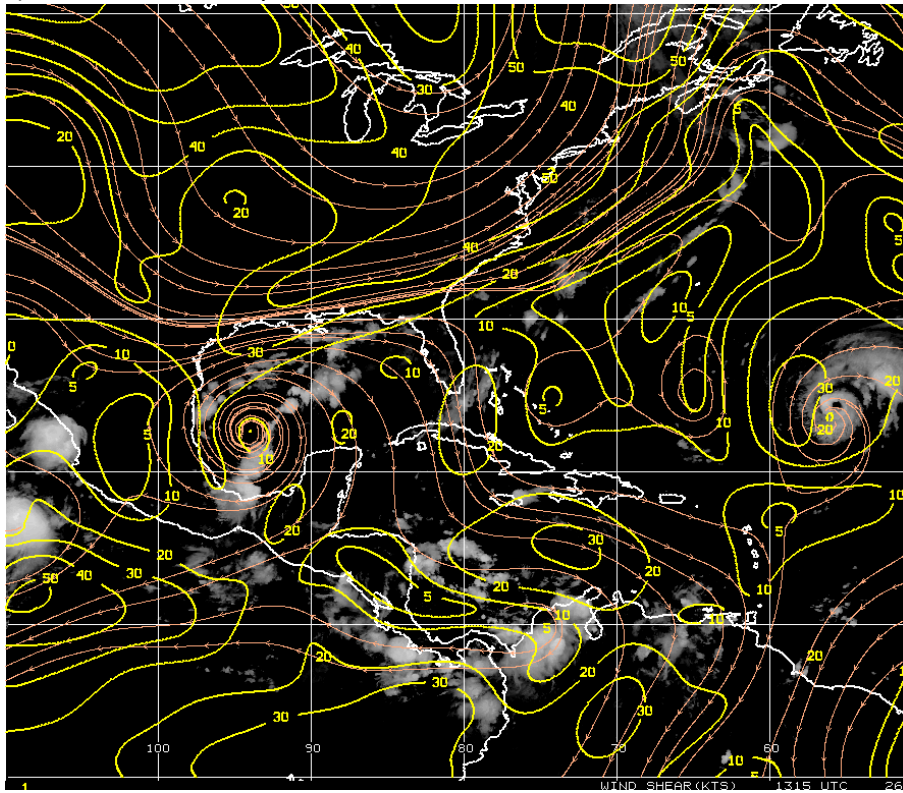




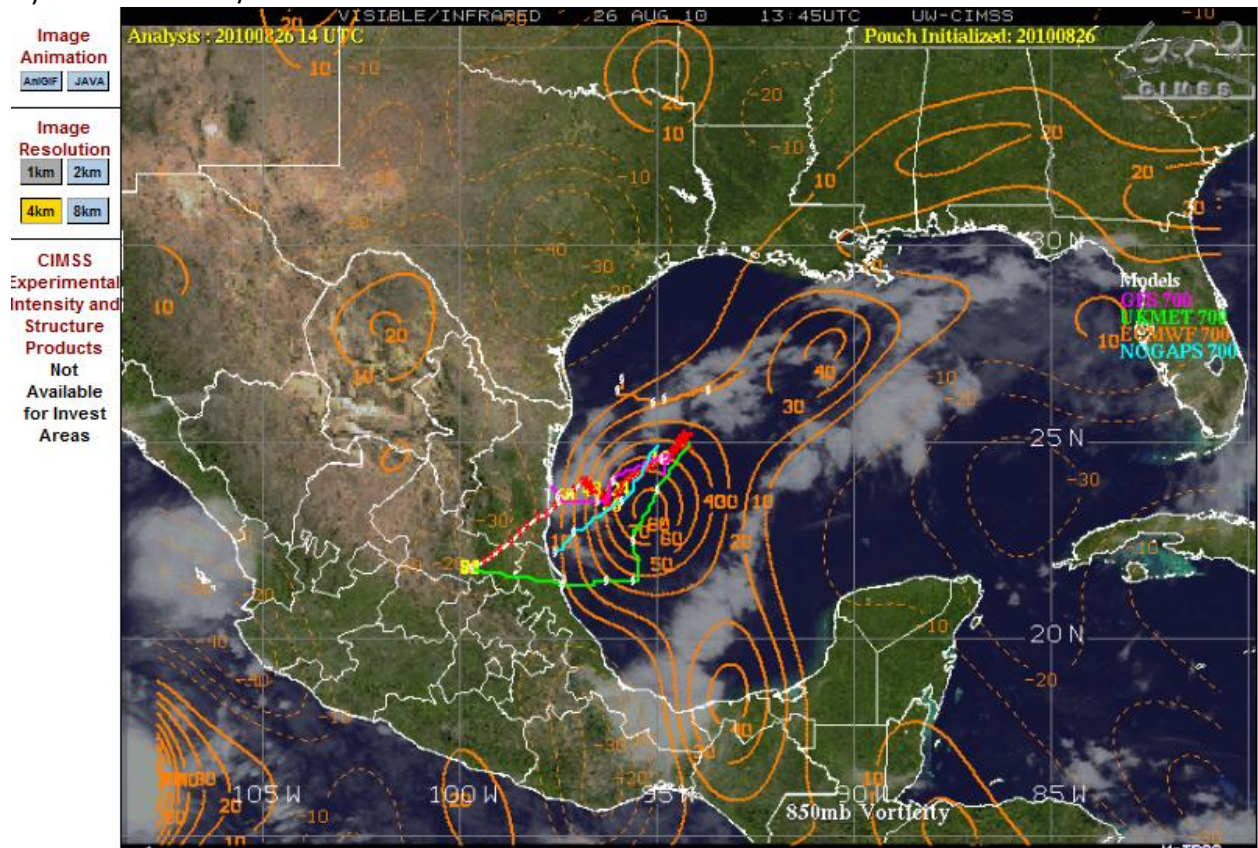
5) IR Imagery over Africa from 1200 UTC Aug 26, 2010



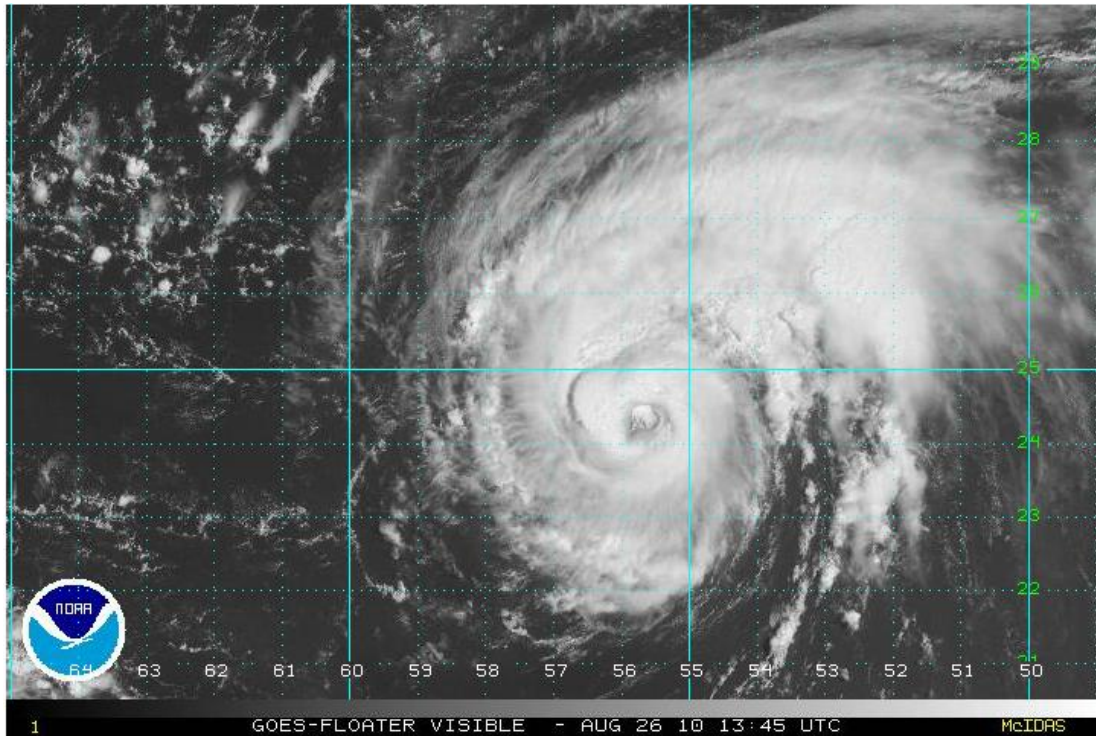
6) Gulf/Atlantic Deep Vertical Shear



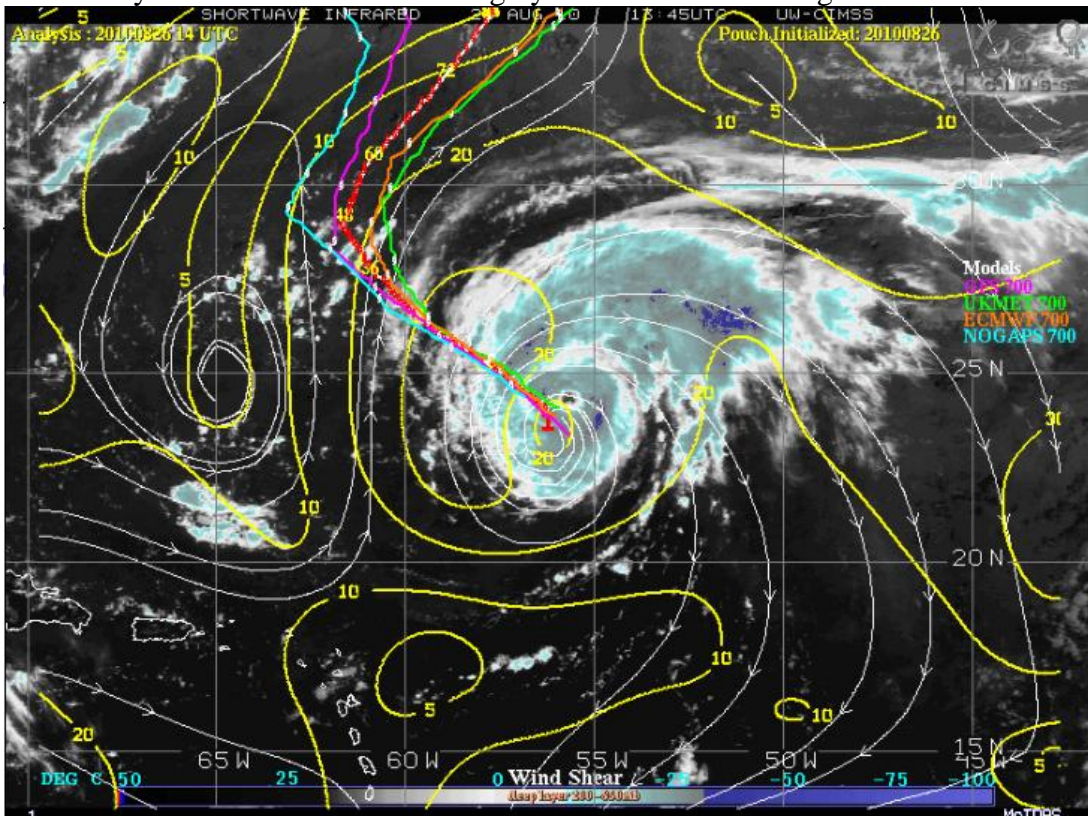
7) PGI-37L model/consensus tracks



8) a) Hurricane Danielle Visible Imagery at 13:45 UTC Aug 26, 2010



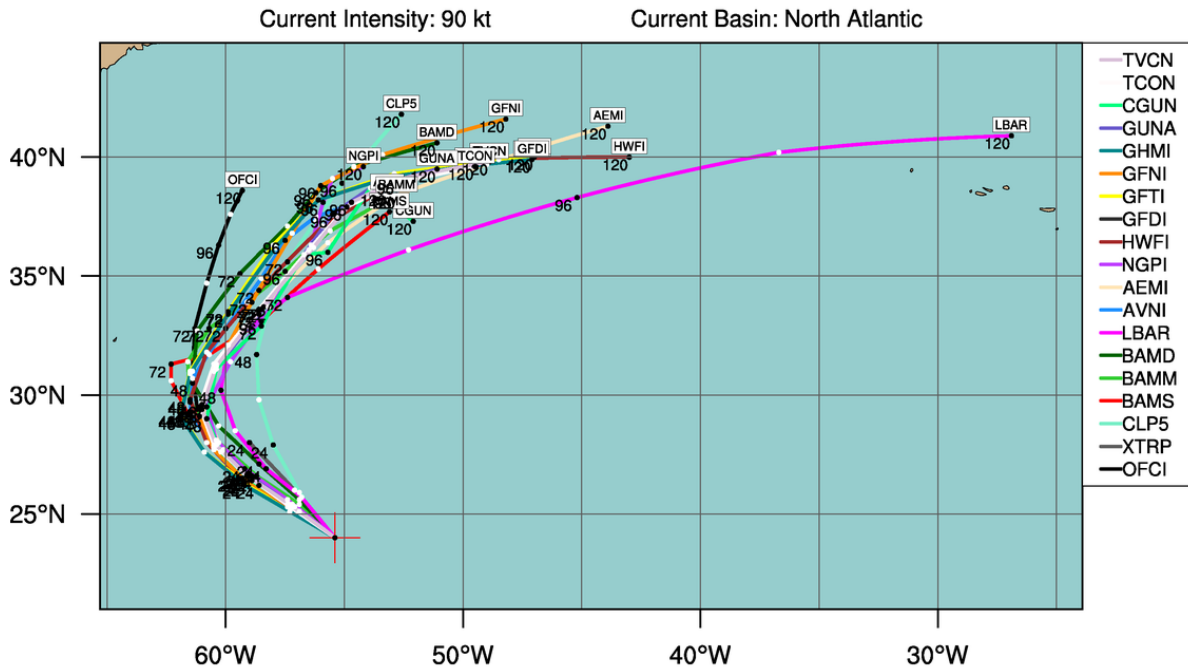
b) Hurricane Danielle Pouch 0000 UTC initialized model forecast tracks and CIMSS Wind Shear analysis overlain on SW IR Imagery from 13:45 UTC Aug 26



c) Hurricane Danielle Track Guidance from 1200 UTC initializations Aug 26, 2010

HURRICANE DANIELLE (AL06)

Early-cycle track guidance valid 1200 UTC, 26 August 2010



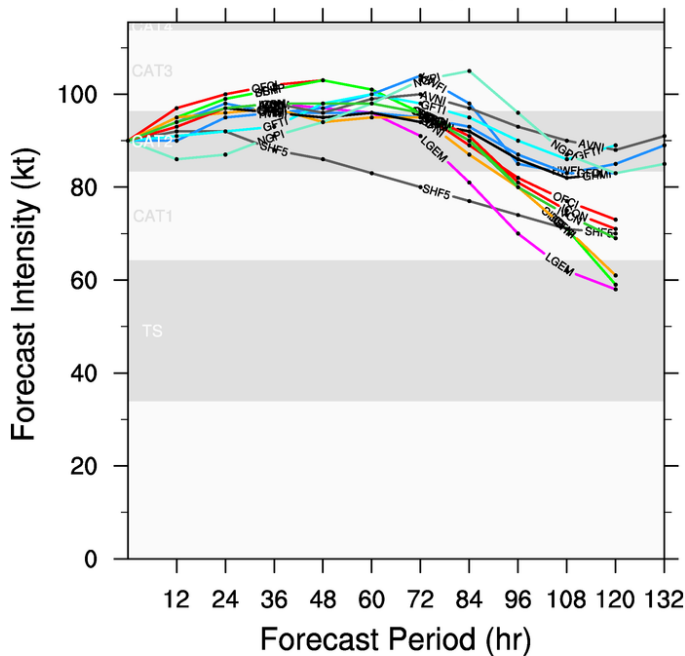
This plot does not display official storm information. Use for information purposes only.
DO NOT USE FOR LIFE AND DEATH DECISIONS!

d) Hurricane Danielle Intensity Guidance from 1200 UTC initializations Aug 26, 2010

HURRICANE DANIELLE (AL06)

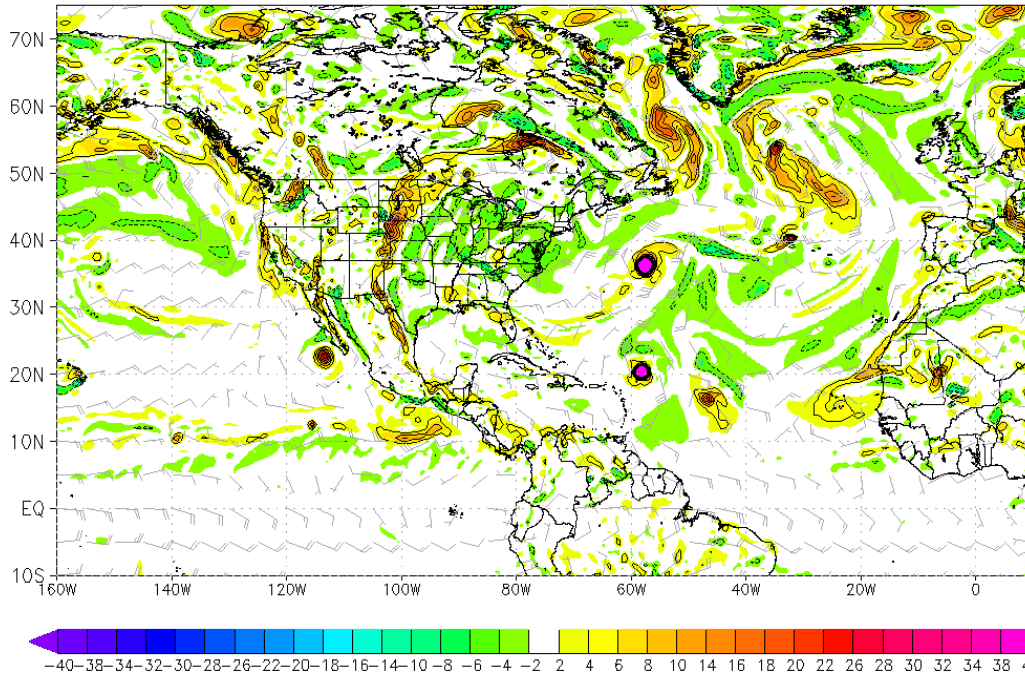
Early-cycle intensity guidance

valid 1200 UTC, 26 August 2010



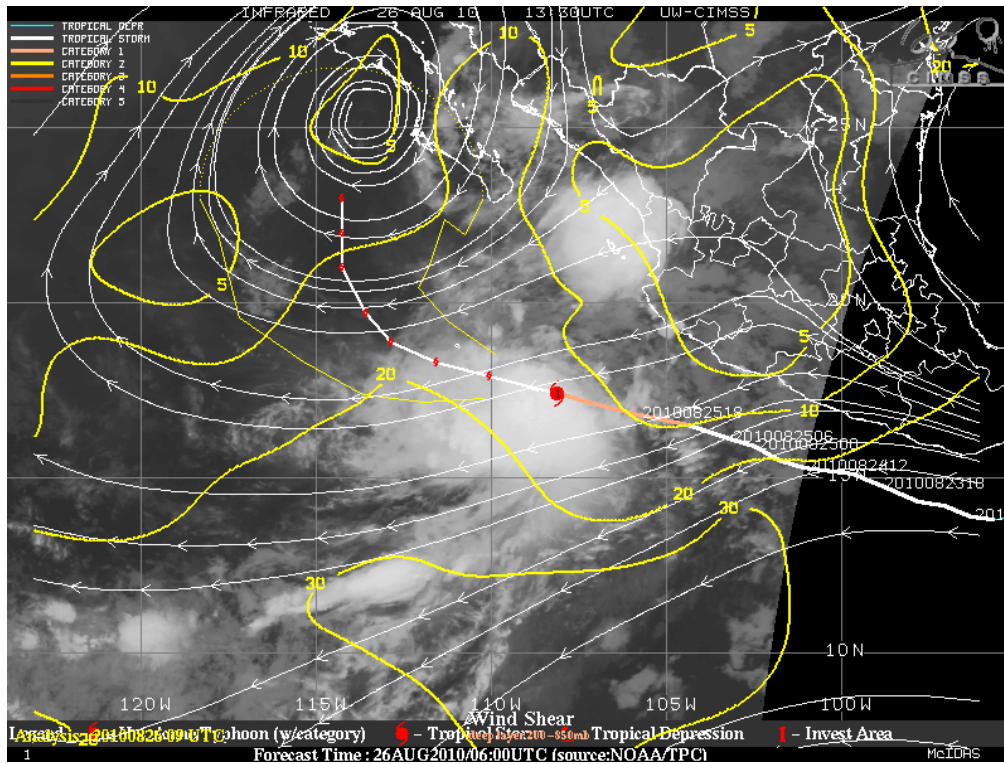
This plot does not display official storm information. Use for information purposes only.
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06Z26AUG2010 gfs
 850mb vorticity ($10^{-5}s^{-1}$) T=102 h
 Shading every 2 units; Contouring every 4 units

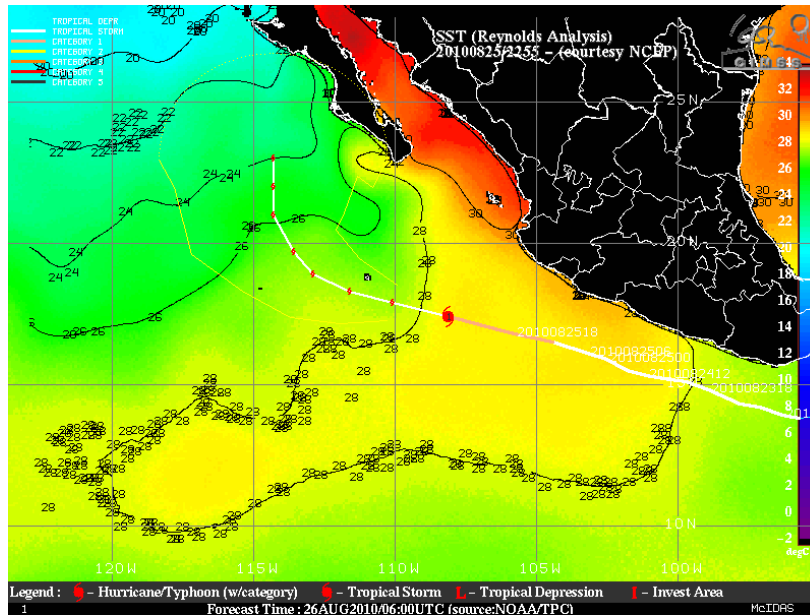


9)
 0600UTC
 GFS
 forecast
 valid at
 1200UTC
 on 30
 August
 2010

10) Wind shear and IR satellite image of Hurricane Frank



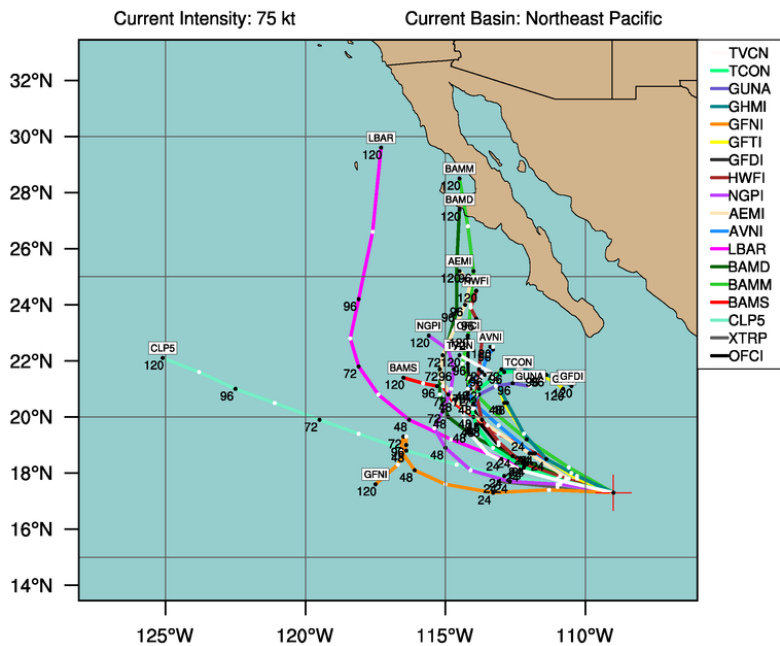
11) SST image and forecast track of Hurricane Frank



12) Hurricane Frank 1200 UTC Aug 26 model guidance for track and intensity

HURRICANE FRANK (EP09)

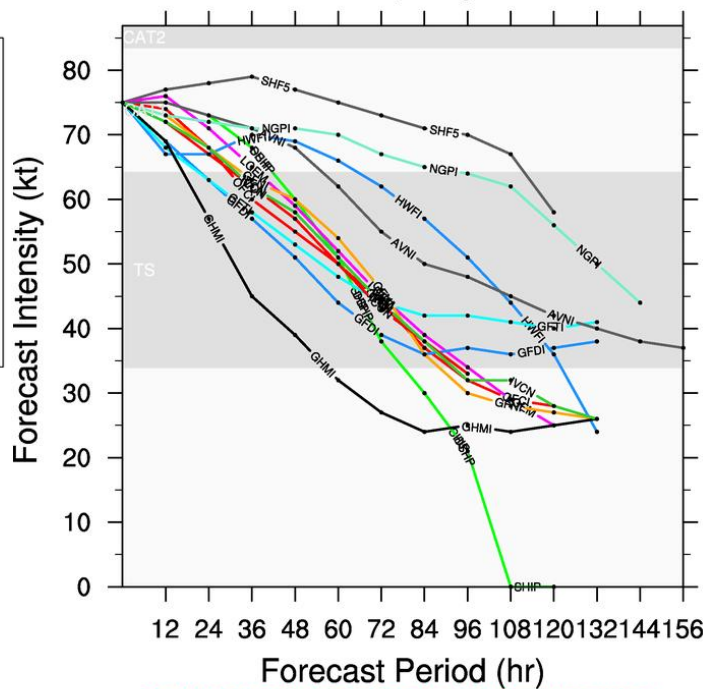
Early-cycle track guidance valid 1200 UTC, 26 August 2010



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

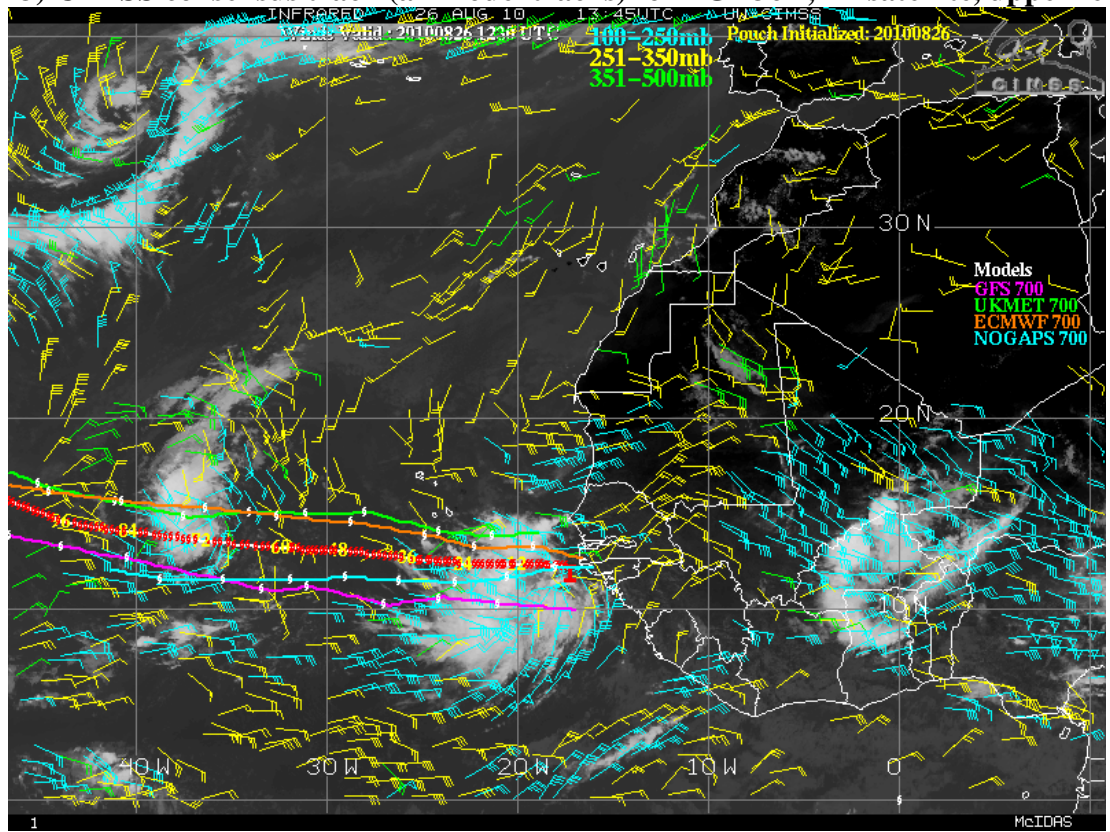
HURRICANE FRANK (EP09)

Early-cycle intensity guidance valid 1200 UTC, 26 August 2010



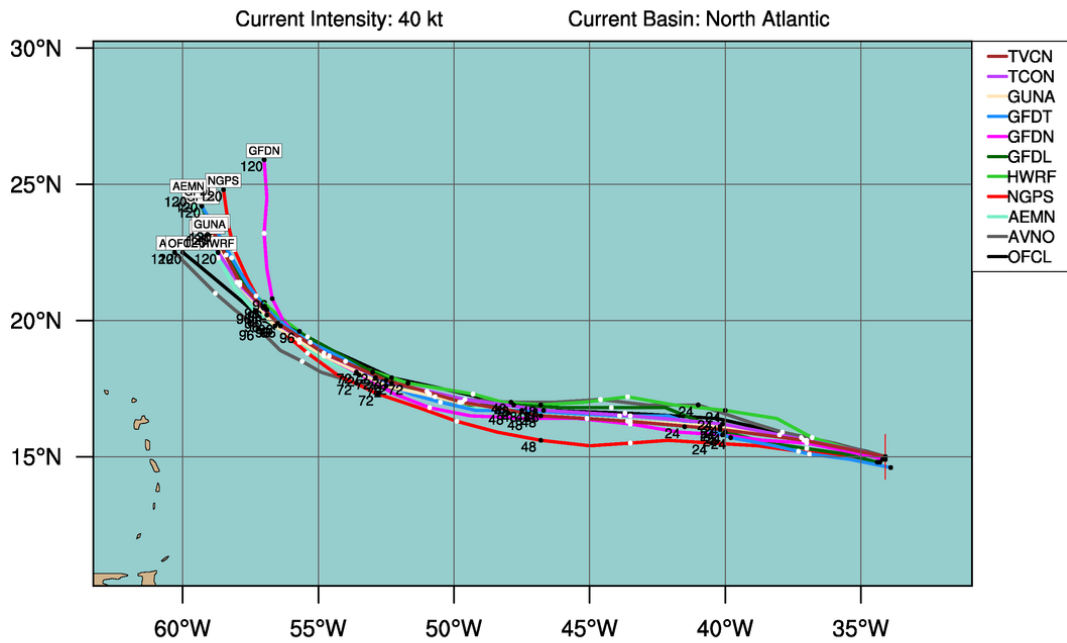
This plot does not display official storm information. Use for information purposes only. DO NOT USE FOR LIFE AND DEATH DECISIONS!

13) CIMSS consensus track (all model tracks) for PGI-36L; IR satellite, upper-level winds



14) Tropical Storm Earl forecast guidance from 0600 UTC Aug 26 for track and intensity
TROPICAL STORM EARL (AL07)

Late-cycle track guidance valid 0600 UTC, 26 August 2010

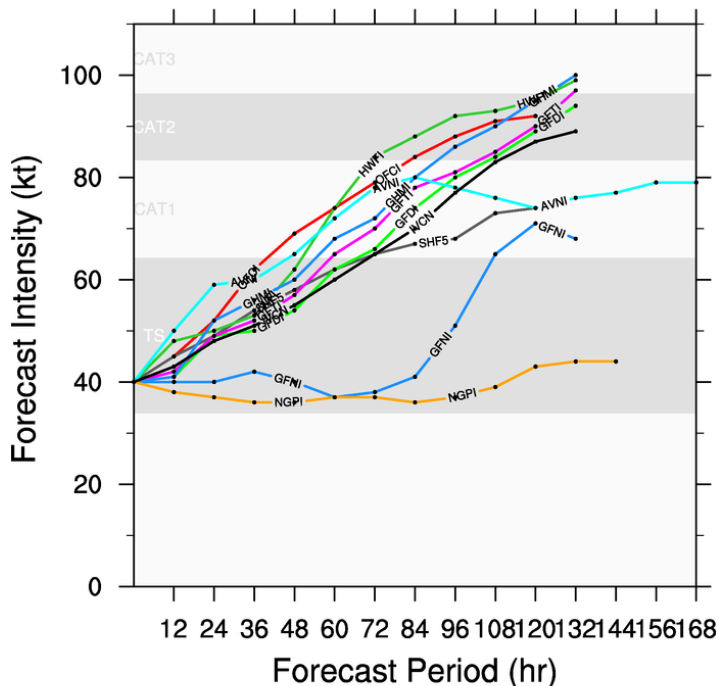


This plot does not display official storm information. Use for information purposes only.
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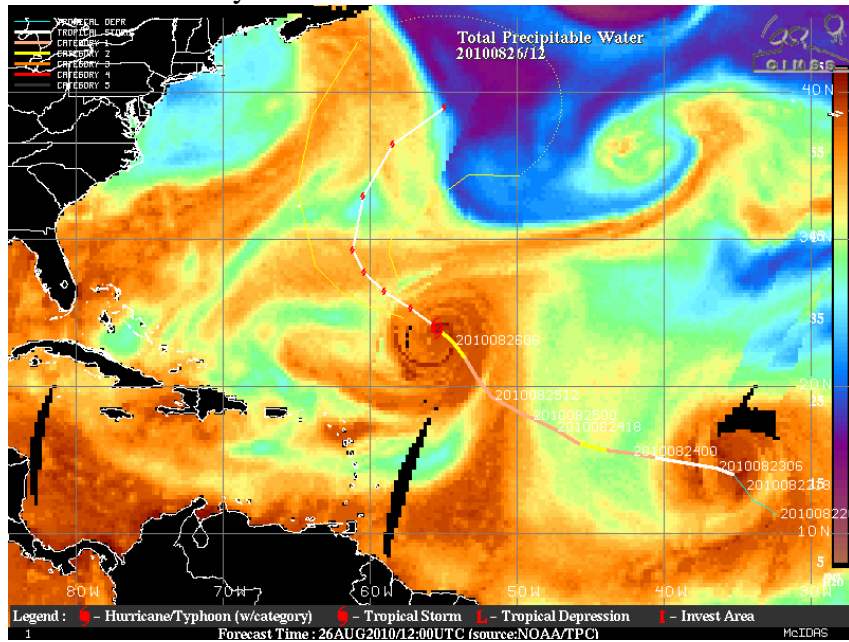
TROPICAL STORM EARL (AL07)

Early-cycle intensity guidance

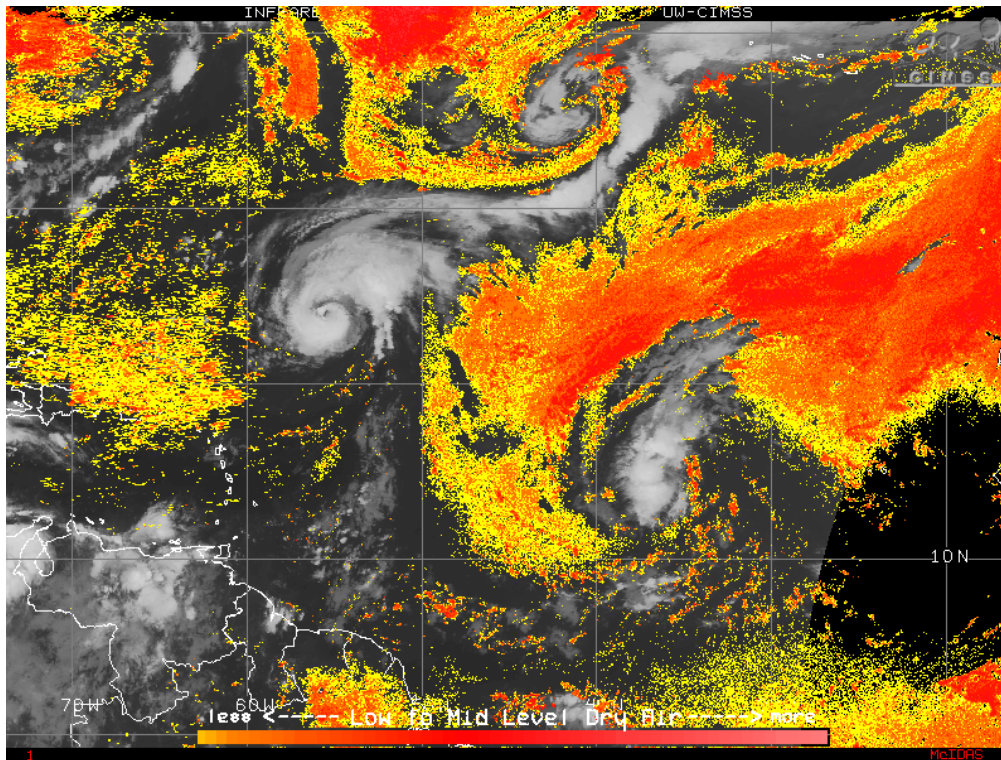
valid 1200 UTC, 26 August 2010



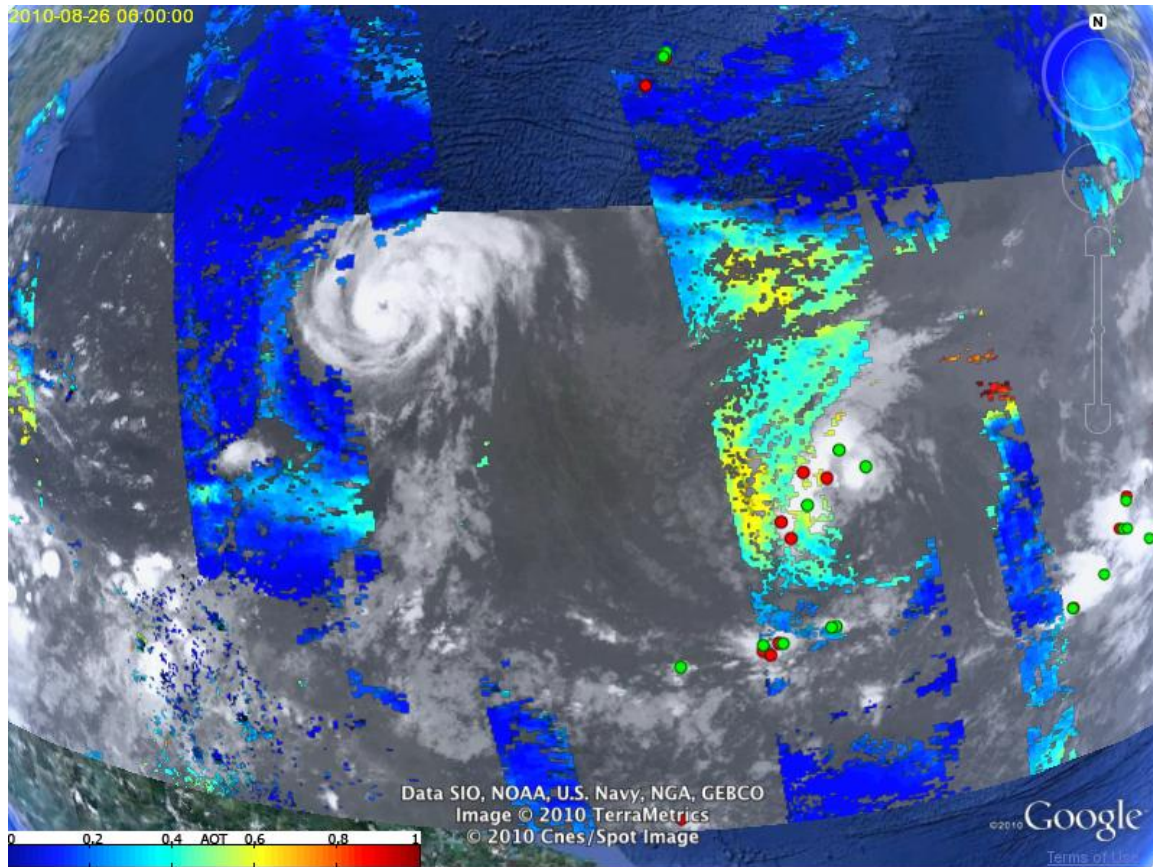
15) CIMSS analysis of low to mid level dry air and water vapor imagery at 1730 UTC on 8/26/10 Danielle and Earl shown in TPW imagery from 1200 UTC Aug 26, 2010 with the forecast and history track of Danielle.



16) Infrared and SAL/Low to Mid-level Dry Air satellite products for Hurricane Danielle and TS Earl.



17) Infrared satellite imagery of Hurricane Danielle and Tropical Storm Earl and Aerosol Optical Thickness (from <http://grip.jpl.nasa.gov>).



18) TPW satellite imagery and AIRS swaths. The arrow points to the location for an AIRS SkewT Diagram that shows dry air and low CAPE in the SAL ahead of TS Earl.

