Tropical Areas of Interest Discussion for August 23, 2010

Created 1600 UTC August 23, 2010

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Summary:
Today is another no fly day for the GRIP field program in FLL. Today's potential mission was scrubbed due to the lack of organized convection in the Gulf of Mexico. The models have been inconsistent in their solutions over the past few days, so it is unclear whether anything will actually develop here. There is still the potential for a flight into the Gulf later this week if the current convection and associated elongated area of 850mb vorticity shows signs of organization. Therefore, the DC-8 is on alert for a 14Z takeoff on Tuesday. If it occurs, the flight would coincide with an A-Train overpass. PGI-30L has been discontinued today in the pouch tracking after a final investigative flight into the system by PREDICT occurred this morning. Also of interest is TS Danielle/PGI-31L, which has become much better organized since this time yesterday. Steady strengthening is expected to continue for the next 36-48 hours. Danielle should also continue its track to the WNW for the next 48 hours, at which time its motion should shift to the NW. This forecast track makes it unlikely that Danielle will be in range of the GRIP aircraft, and is not a flight target for IFEX at this time either. In addition, all agencies are monitoring PGI-34L, which has just emerged off the coast of Africa, and is expected to gradually strengthen in the coming days, and take a similar to track to Danielle.

Forecast for 1600 UTC 8/23/2010:

Synoptic Overview:
The tri-agency domain has several interesting features to discuss today (**1D**). Please see the tri-agency track diagram for targets (**17**). The upper level winds (**2C**) over the Gulf, Atlantic and Caribbean indicate the presence of two upper level lows; one over Texas and one well north of the Windward Islands. These are acting to suppress convection nearby (**2D**) and are also dominating the steering flow (**4**). Strong upper level westerlies and northerlies are coming off of the US associated with the front approaching the Gulf of Mexico. The Atlantic is dominated by the Subtropical Ridge, which is forecast to weaken over the next few days and allow the northward progression of Danielle/PGI-31L (**1D**). At 1200 UTC Danielle was located near 15N, 39.5W, based on visible satellite imagery. Convection with this system has improved dramatically since yesterday with an upper level anticyclone orienting itself directly above the system. Danielle continues to strengthen with each official advisory and is currently forecast to become a hurricane in the next few hours.

In the Eastern Atlantic and over West Africa a very classic pattern is establishing itself (**2E**). The ITF is draped over 20N curving up to 25N over Africa with southerlies at low levels over Africa south of that. A cool monsoon surge with good low-level diffluent flow (evident in low-level negative vorticity seen) is over SW Africa and this is suppressing convection in between 34L and the next AEW. This is seen well in IR imagery and the ITCZ vorticity strip (**2E**, **10**). The northern vortex off the coast of Senegal extends back to the northeast and is becoming stretched

and deformed over time. There is a good low-level vorticity structure with this wave, and it has two vorticity centers that are coupled (**10**). The northern component is dry and baroclinic and the southern component is the convective part, and these two are forecast to interact and the southern vortex will overwhelm the influence of the northern component as the system moves further off the West African coast. TPW shows the huge surge of dry air in high amplitude wave pattern setting up in the East Atlantic (**2G**). There is a major SAL outbreak associated with this with very impressive AOT values. This air is being pulled southward by PGI-34L and the dust will begin to wrap around the system at low-mid levels in the next couple of days (**16**). Overall, it appears that West Africa is really beginning to set up in a classic monsoonal flow pattern to the south with a well-established baroclinic zone to the north and large amplitude waves emerging with classic northern and southern components to them.

Features of Interest:

Frontal Analysis:
The NOAA 0900 UTC surface analysis indicates a very weak cold front stretching across mid Georgia, mid Alabama, mid Mississippi and into S. Arkansas (**1A, B**). Temperature and pressure gradients across the frontal boundary are minimal. From a larger perspective the GFS prognosis shows an amplifying ridge over the central United States causing the low pressure system in the N.E. US to dig further into the S.E. region. An elongated cyclonic PV anomaly from this trough is producing an area of convection in the N.E. GOM off the coast of FL (seen in Figure **1C**). Sea surface pressure anomalies are on the order of 2 hPa. The mean flow at upper levels is from the north-northeast. 850 hPa vorticity is present but there is no indication of upper level cyclonic motion (**2A, B**). This feature is an extension of the trough and shows no immediate sign of independent circulation. While IR imagery (**3**) indicates moderate convection, the cloud structure is not well developed and organization does not appear likely over the next 12-24 hrs. A surface high in place over the West-central GOM could play a factor in facilitating cyclonic motion in the central GOM out 48 hrs. The ECMWF model produces a vorticity maximum on Tuesday with a northward progression (**3**).

TS Danielle/PGI-31L:
At 1500 UTC Aug 23, 2010 the NHC analyzed TS Danielle/PGI-31L at 15.1N/39.4W. Satellite imagery depicts a better organized storm than this time yesterday (**2F**). Yesterday, most of the convection was removed from the low level circulation as the system was contending with some vertical wind shear. This morning, however, the shear seems to have decreased a bit and the center is now on the northern side of the storm, under the deep convection, which showed an impressive burst recently (**2F**). There is also some decent outflow on the western side of the system as indicated by visible satellite imagery, which was weaker this morning and improved throughout the afternoon. An AIRS sounding indicates that there is some very dry air to the NW of the system, but current water vapor animations suggest that the dry air is not being wrapped into Danielle for now. Also, TPW in the immediate vicinity of Danielle is high, except to its NW (**6)**. As a result of these things, Danielle has been steadily strengthening for the past 18 hours and at 23/15Z, NHC reported the intensity to be 55kt.

Although Danielle tracked NW for much of the day yesterday, a WNW motion appears to be resuming as Danielle moves around the southwestern side of the subtropical ridge (**8**). However, the ridge is forecast to weaken in about 48 hours. Therefore, the guidance is in good agreement

that the storm will continue to the WNW (~290 degrees) at 13-16 knots for the next 48 hours (**8**). Beyond that, a turn to the NW should occur (~310 degrees) and continue through 120 hours.

Danielle is currently over sufficiently warm SSTs (~28C), and the official track brings it over water in the 27-28C range throughout the forecast (**5**). Additionally, vertical wind shear is forecast to remain low (< 10 kts) over the next 36 hours. The intensity guidance is in general agreement that strengthening should continue over the next 48 hours (**7**). The degree to which it strengthens is the ultimate question though, with the models ranging between a moderate tropical storm and a moderate category 2 hurricane. None of the guidance has Danielle attaining major hurricane status within the 120 hour forecast period, which could be due to the fact that shear is forecast to increase from 72 to 120 hours. Our forecast calls for Danielle to track WNW with a continued intensification over the next 48 hours. (**2:05PM EDT Update: Danielle is now a Cat 1 Hurricane.**)

PGI30L:
The pouch associated with PGI-30L was terminated this morning at 1300 UTC. The current center location was 22N 60W as of 1144 UTC on 23 August 2010 (PREDICT pouch synopsis). Limited convection in the eastern half of the pouch (**9C**) is not favored to strengthen again as the remnants head into a drier environment, which is the main driver for dissipation, and slightly higher shear than in its current environment. Dry air has wrapped around the back of the anticyclone (**9A**) and upper-level divergence is virtually non-existent (**9C**). Any vorticity present is small in area and displaced to the NE of the former Invest location (**9B**).

All models show complete dissipation of ex-PGI-30L after 12 hours from the 00Z model runs with GFS low-level vorticity (925 hPa) at approx. 1×10^{-5} s^{-1} and non-existent Okubo-Weiss values. The UKMET had any remnants of ex-PGI-30L moving slightly more NW than GFS as deep layer tropical easterlies direct former PGI-30L as well as PGI-33L and PGI-34L. RH decreased marginally as the pouch transitioned into drier, low TPW environment, and lower pouch and deep level vertical shear were forecast by UKMET model. Latest model runs from ECMWF forecasted the former pouch to move directly west to 64W but also had complete dissipation after 12 hours. (No NOGAPS today.)

PGI34L:
As indicated by the CIMSS 8/23 0800 UTC vorticity analysis, the southern, or convective, vortex of PGI-34L has begun to separate from the enhanced vorticity in the ITCZ vorticity strip **(10)**. At 8/23 0000 UTC a pouch was analyzed at 10N/15W. A second vortex along the baroclinic zone has also begun to move off of Africa and is beginning to become elongated about a SW to NE axis. Convection is enhanced to the NW of the southern vortex associated with a large convective burst which began at 8/23 0800 UTC (**2E**). Associated with the intense northern vortex along the baroclinic zone, strong northeasterly flow has resulted in a large outbreak of warm, dry, and dusty Saharan air into the East Atlantic (**10**).
Over the next 48 hours, the northern vortex will become increasingly elongated transitioning into a remnant front and will weaken. This weakening of the northern vortex and associated weakening baroclinicity is consistent with the movement of the wave over the East Atlantic. The Saharan air north of the northern vortex is forecast to wrap around PGI-34L in the global models.

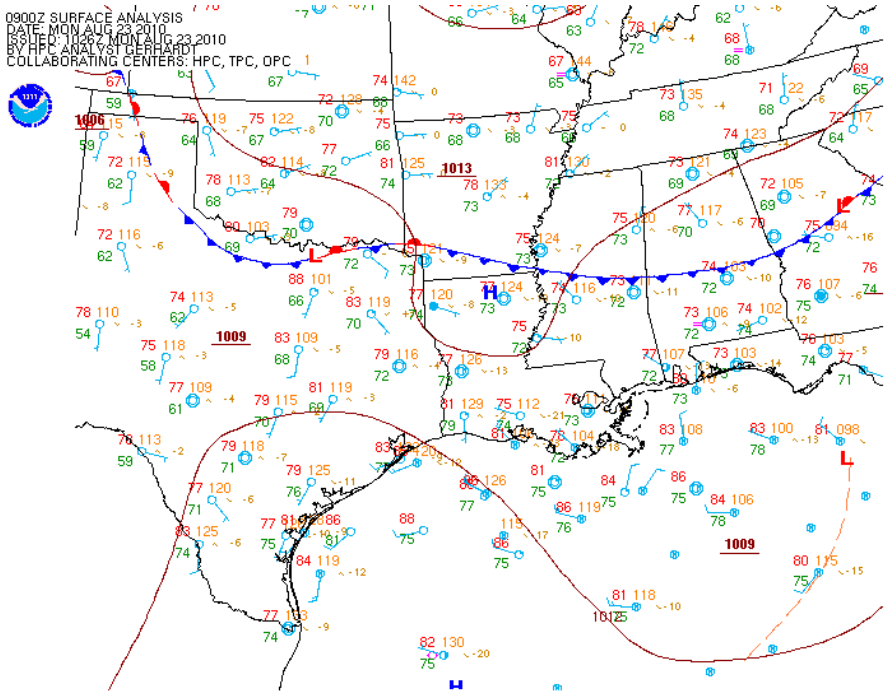
However, all the global model guidance suggests that a small pouch of high relative humidity will remain within the co-moving mid-level cyclone, which will become increasingly closed at lower levels as the southern convective vortex intensifies (**11**). The 0000 UTC ECMWF and 0000 UTC – 1200 UTC runs of the GFS all maintain a fairly intense disturbance through the next 120 hrs with some of the solutions indicating that it could approach tropical depression strength near the end of this period. PGI-34L is forecast to take a northwestward track over the next 120 hrs, however some uncertainty exists in the forecasted latitude at which this could occur, with most guidance suggesting a position between 20-25N and 40-45W by 8/23 0000 UTC.

DUST/SAL Discussion:

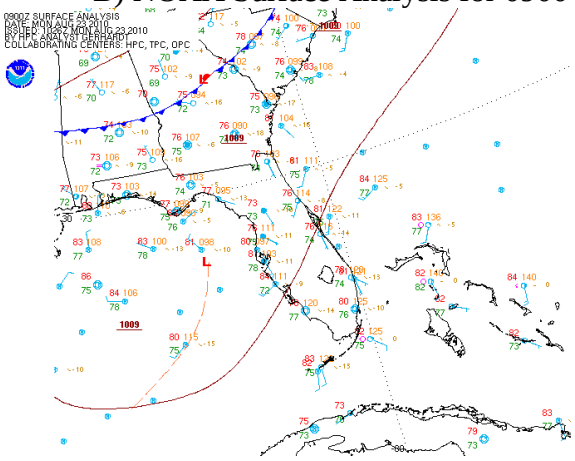
There are 2 major dust features in the Atlantic basin today. The first is dry dusty air wrapping around the western edge of TS Danielle with the leading edge located near 55W between 15N and 22N. The second is a new SAL outbreak leading PGI-34L as it moves off the African coast. In addition, dry air is located ahead of ex-PGI-30L at 65W between 20N and 26N. This area west of ex-30 is evident in AMSU TPW composites, but is not dust-laden and is also not expected to have an impact on TC formation. (See Mimic TPW composite valid 1200 UTC on 8/23, **2G & 12**) The dust in the central Atlantic ahead of TS Danielle had origins as a minor SAL outbreak which moved off of Africa on 8/20. As Danielle has moved north, the cyclonic circulation has caused the dusty air to dive south to nearly 10N. (See Google Earth figure with MODIS and GOES IR overlays, **15**) AMSU total precipitable water and AIRS soundings suggest that this area is dry at low-levels and extremely dry at mid-levels (**2G**). (See AIRS sounding for 48W/16N at 0530 UTC, **14**) The new SAL outbreak is currently at its peak, with AOT values from MODIS measuring over 1.0 along the African coast from Senegal to the Canary Islands. As with the dust to the west of Danielle, the closed cyclonic circulation in this region is contributing to dust being advected far to the south. (See Aqua AOT composite ending at 0000 UTC on 8/23, **15**) The layer which exists to the west of PGI-34L is currently dry, but not nearly as dry at upper levels as the air west of Danielle. Of note in the AIRS sounding nearby is the impressive nocturnal marine layer inversion. (See AIRS sounding from 23W/20N at 0351 UTC, **13**) GEOS-5 suggests that dust will eventually wrap completely around the TC which forms from PGI-34L by 96 hours. (See GEOS-5 forecast for dust AOT valid on 8/27 at 0000 UTC, **16**) The dry air within the future environment of PGI-34L should have major impact on its forecasted development, and may make a very good case for study of SAL interaction in TC genesis.

Static Images used in discussion:

1) A) NOAA Surface Analysis for 0900 UTC 23 August

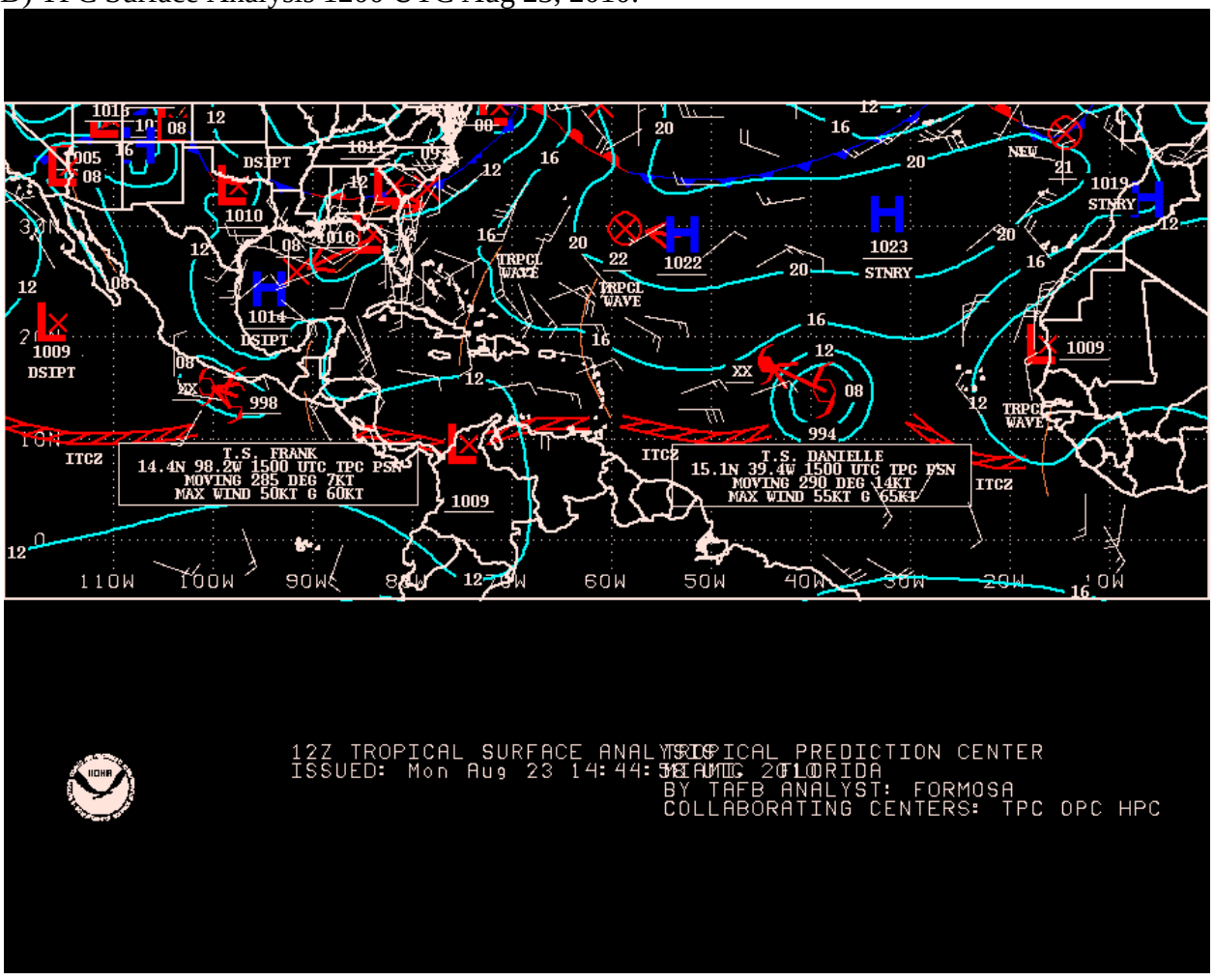


B) NOAA Surface Analysis for 0900 UTC 23 August

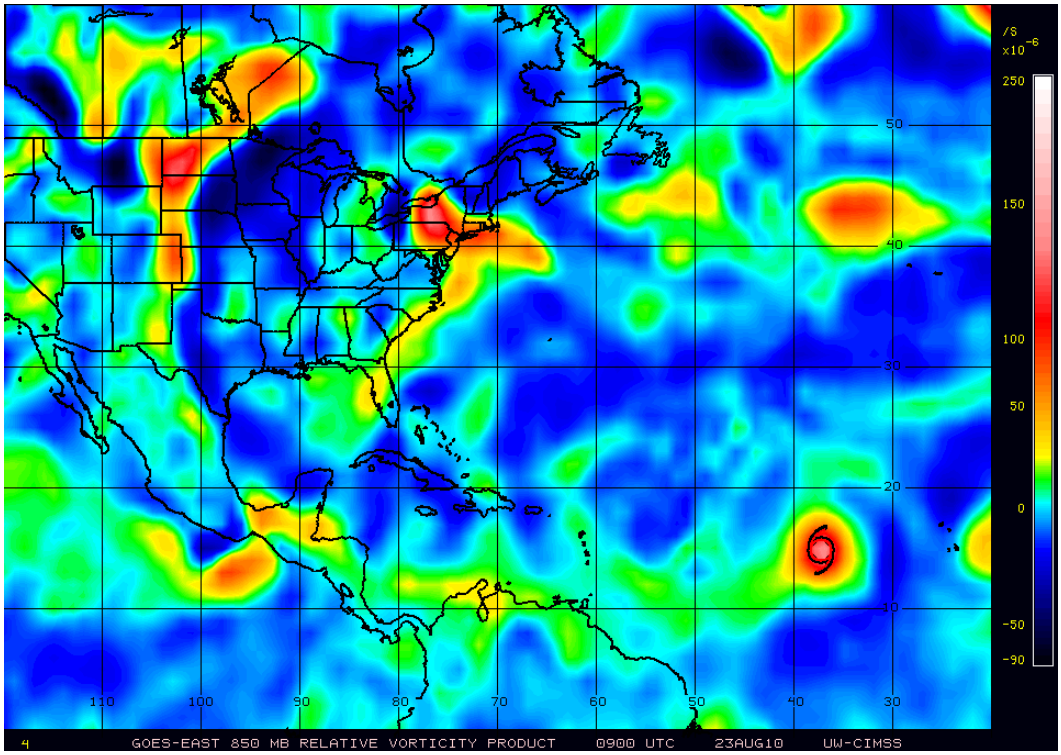


C) NCEP Surface analysis at 0900 UTC 23 August

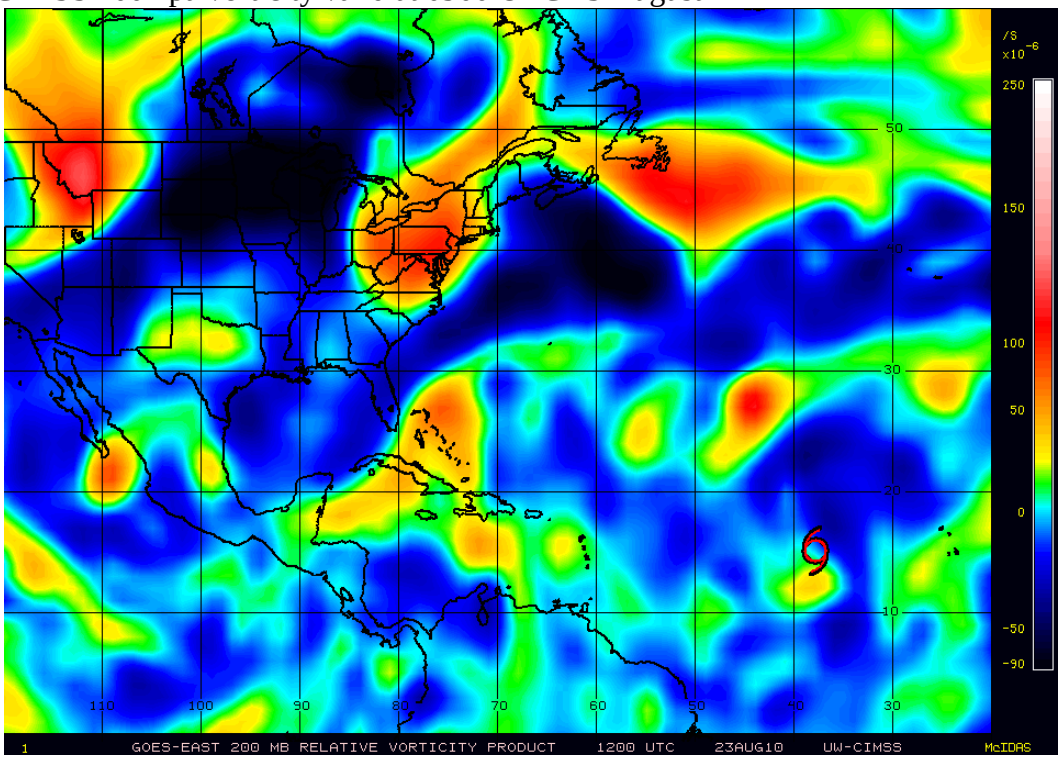
D) TPC Surface Analysis 1200 UTC Aug 23, 2010:



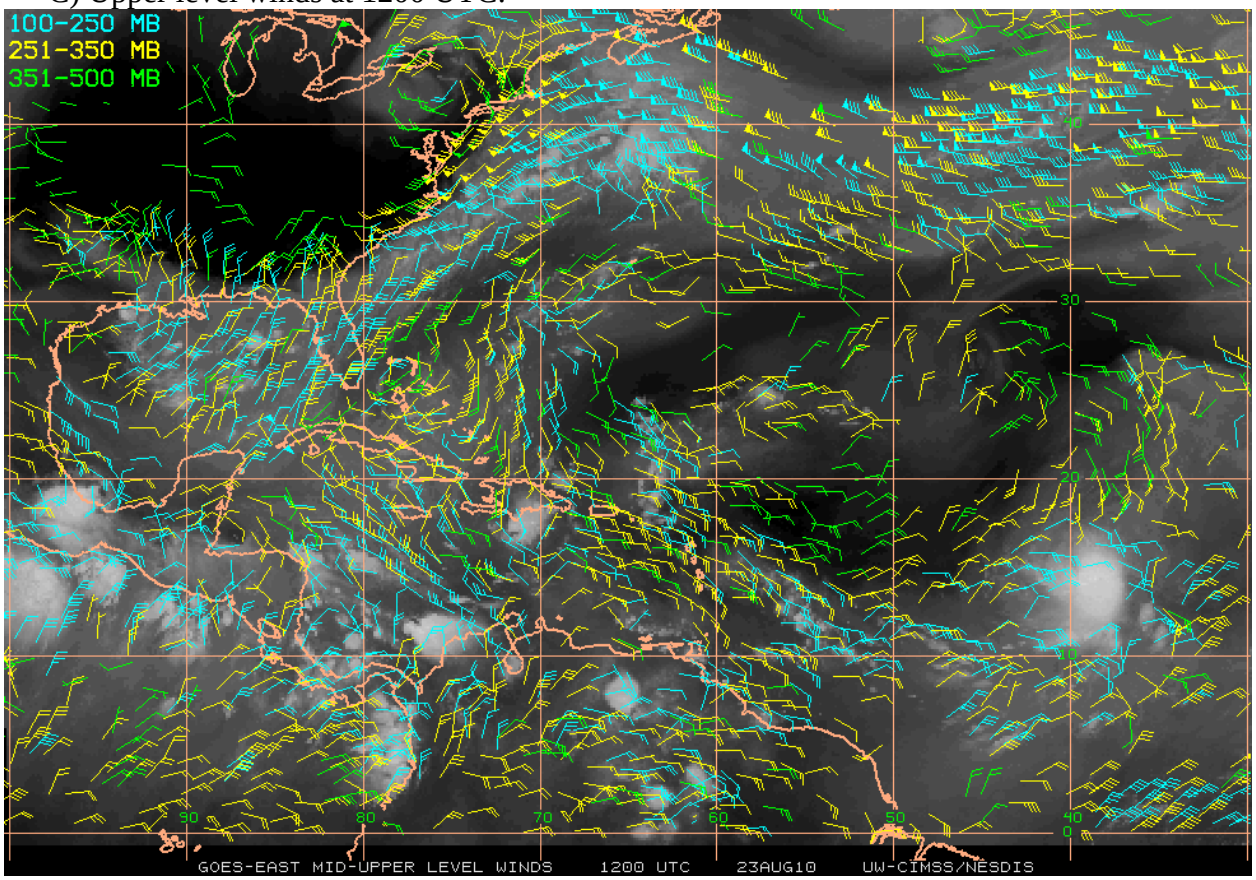
2) A) CIMSS 850 hpa vorticity valid at 0900 UTC 23 August



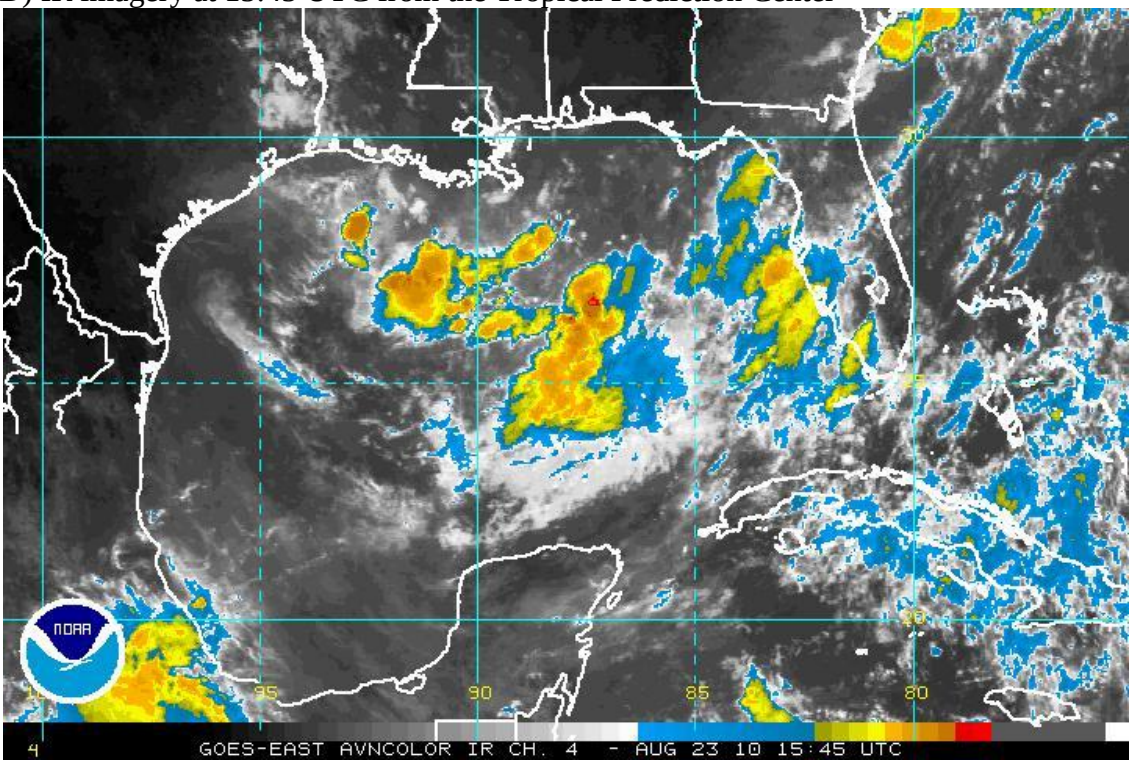
B) CIMSS 200 hpa vorticity valid at 0900 UTC 23 August



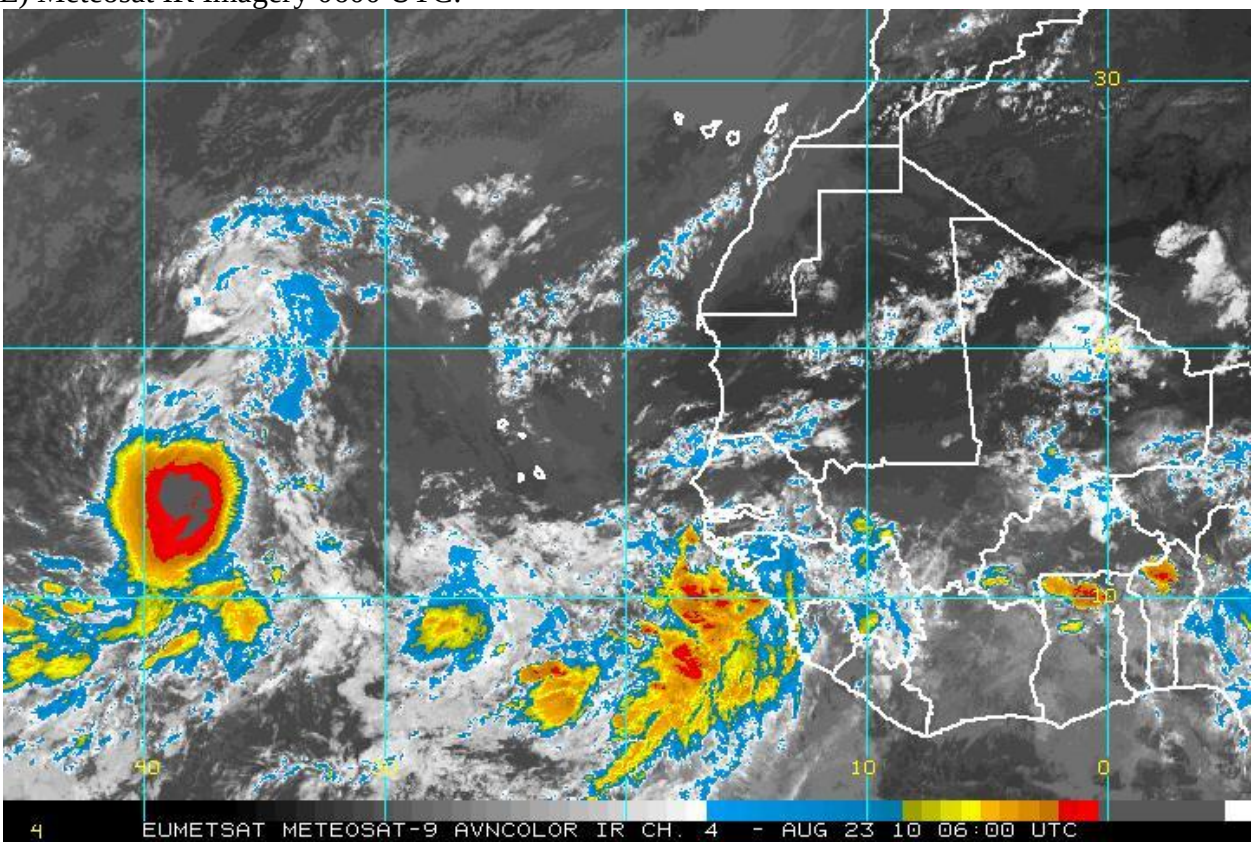
C) Upper level winds at 1200 UTC:



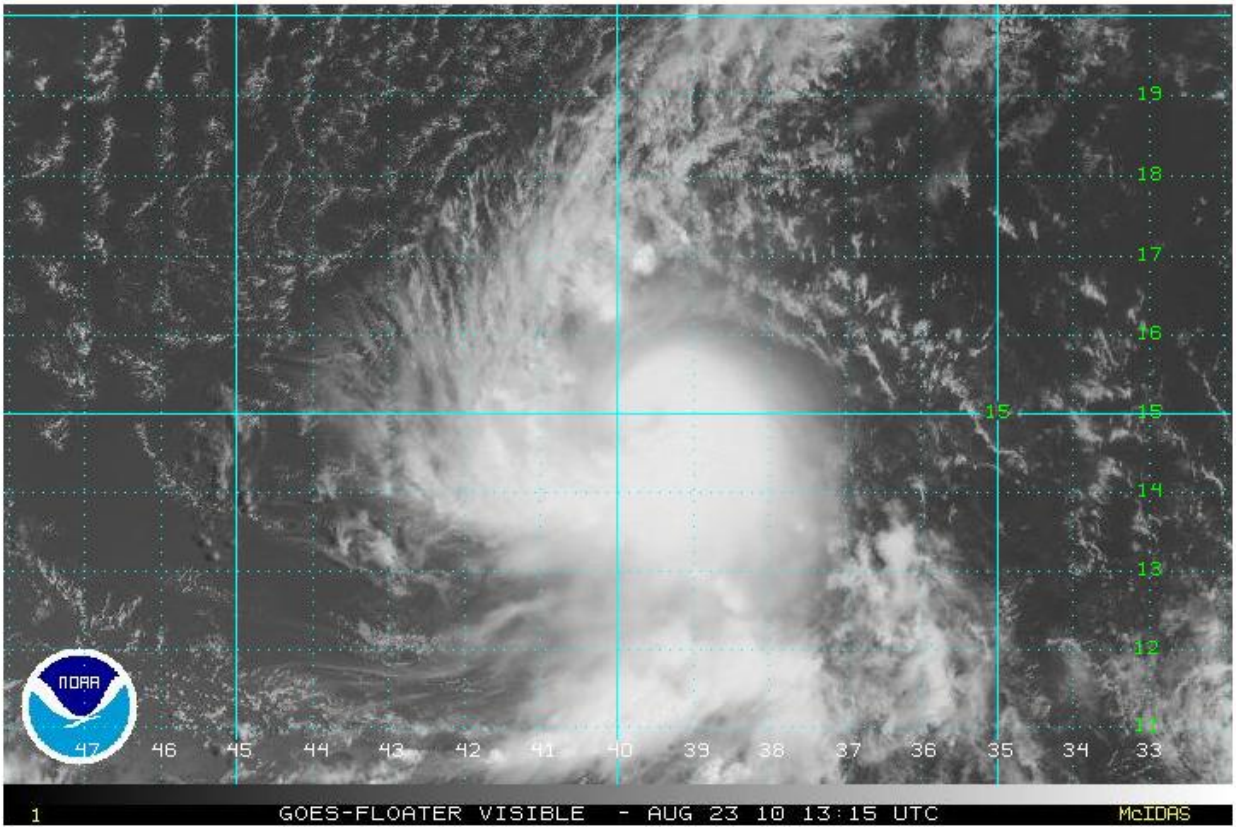
D) IR imagery at 15:45 UTC from the Tropical Prediction Center



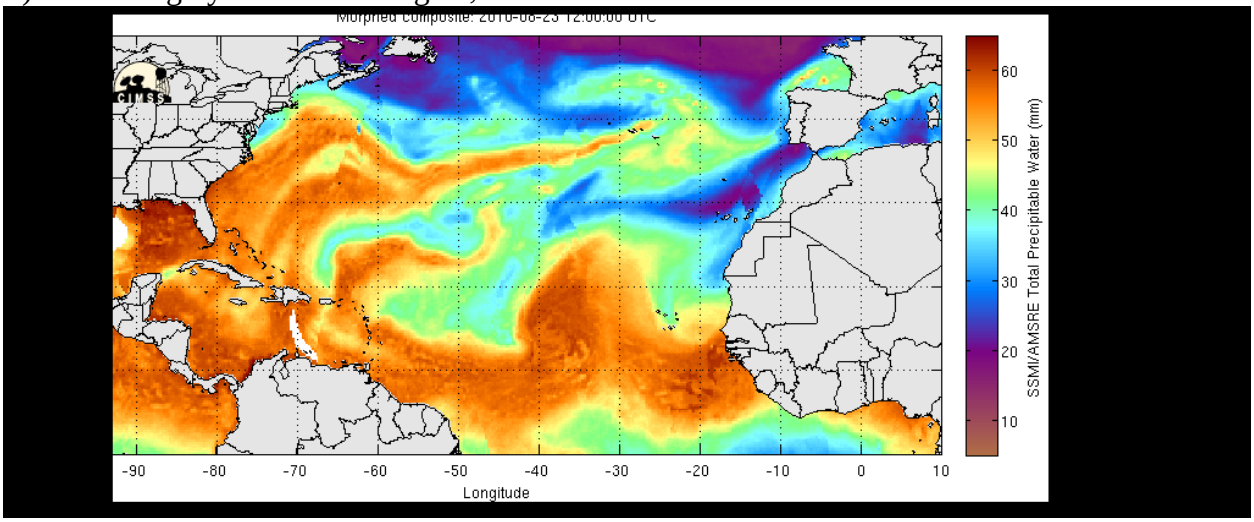
E) Meteosat IR Imagery 0600 UTC:



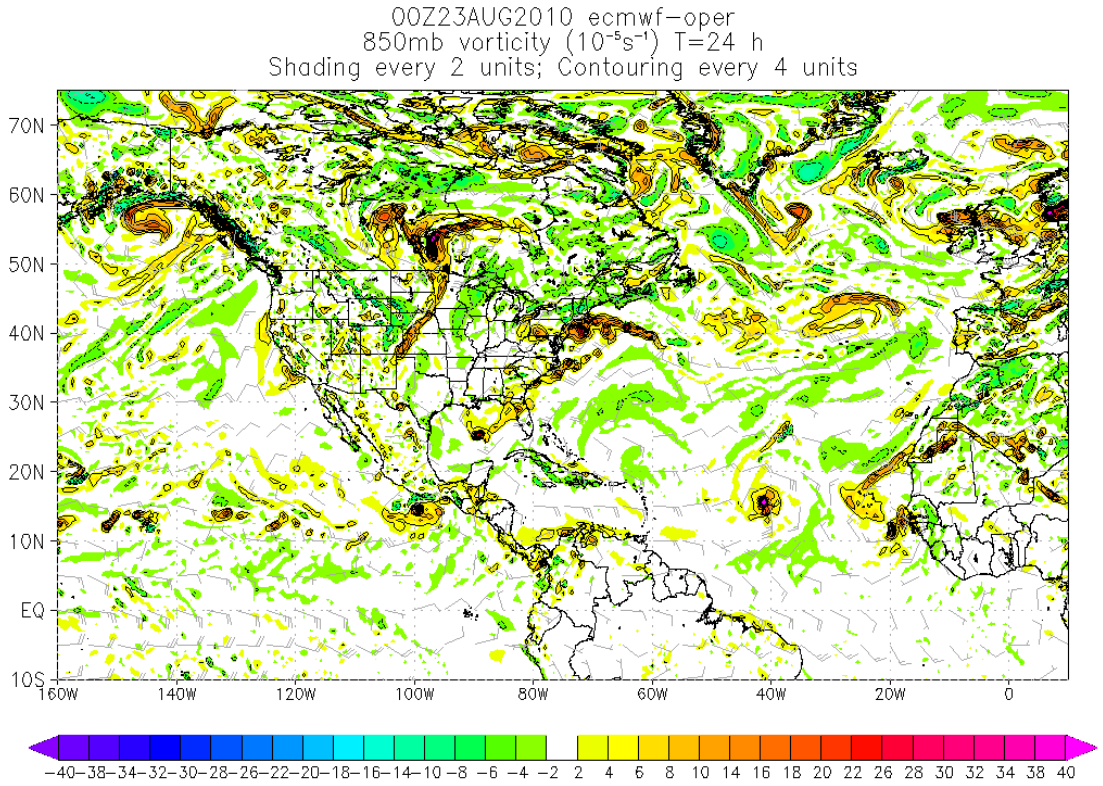
F) Danielle Visible Image:



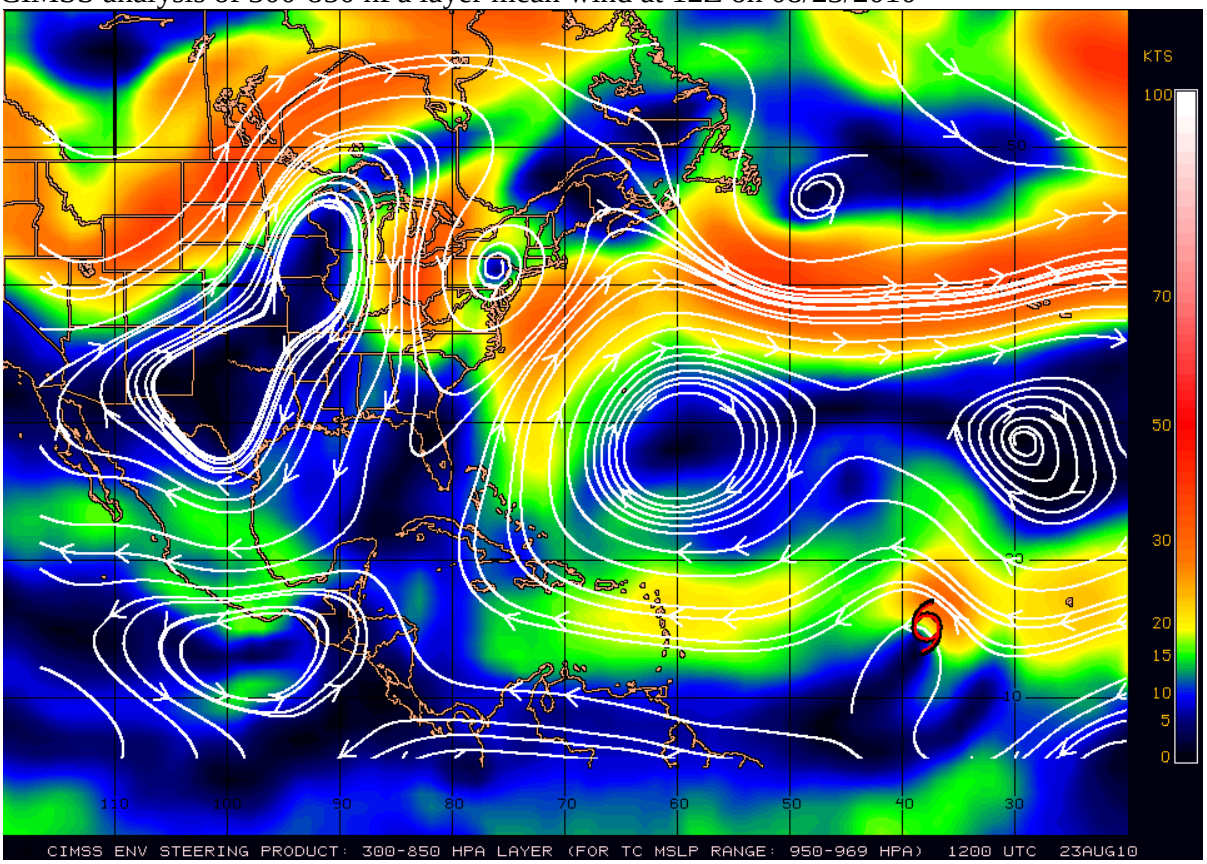
G) TPW Imagery 1200 UTC Aug 23, 2010:



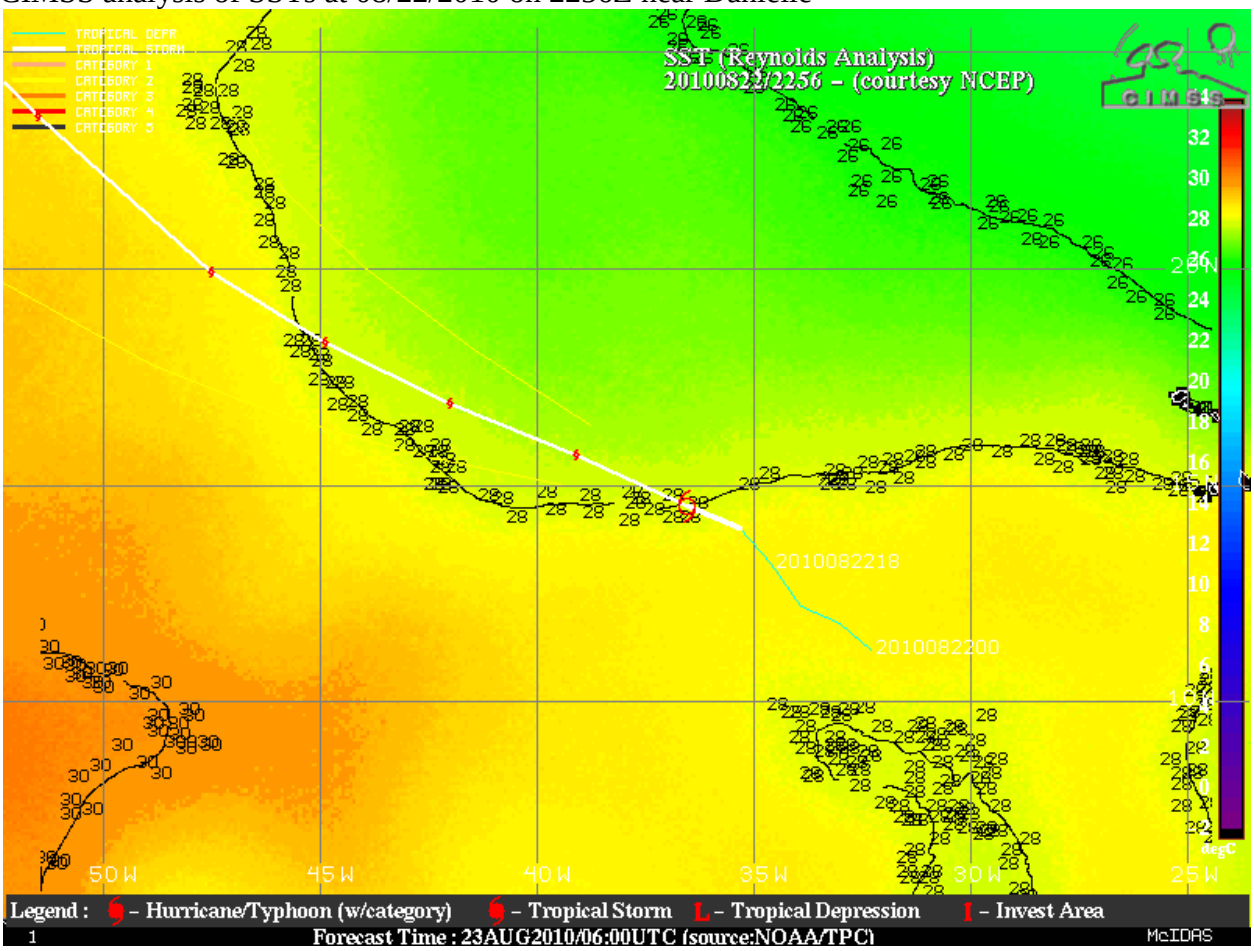
3) ECMWF 850 hpa vorticity forecast initialized at 0000 UTC 23 August, for 24hrs out.



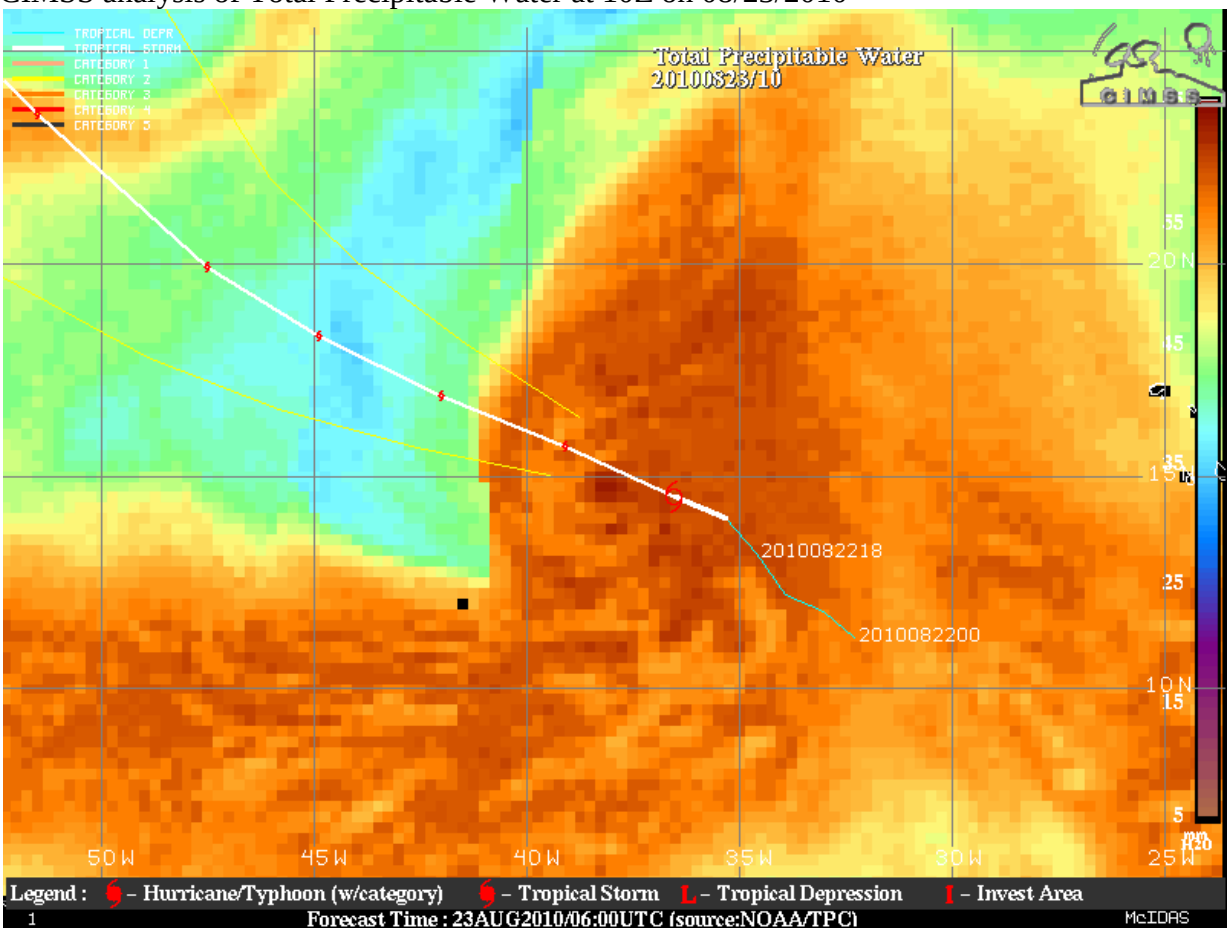
4) CIMSS analysis of 300-850 hPa layer mean wind at 12Z on 08/23/2010



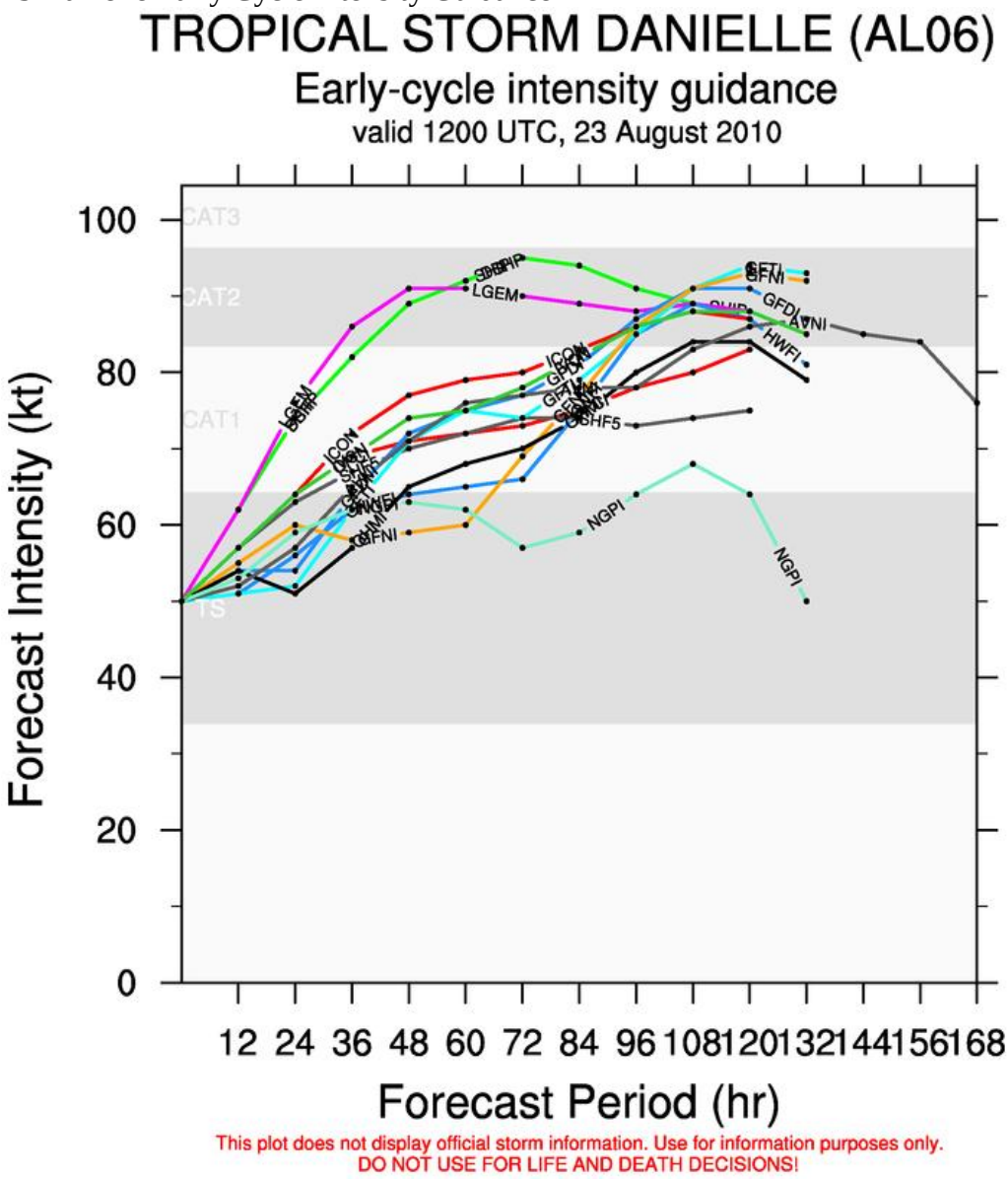
5) CIMSS analysis of SSTs at 08/22/2010 on 2256Z near Danielle



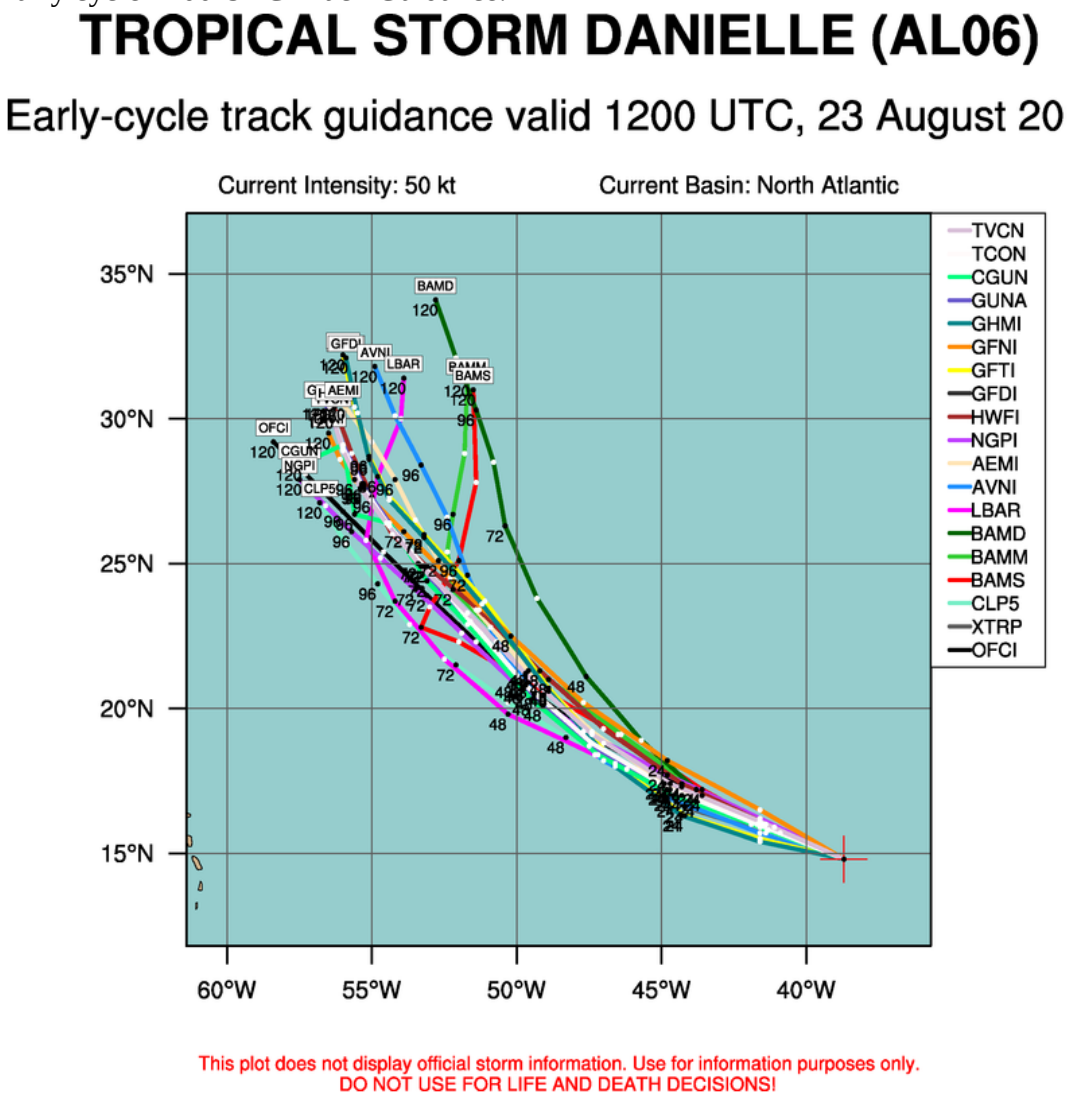
6) CIMSS analysis of Total Precipitable Water at 10Z on 08/23/2010



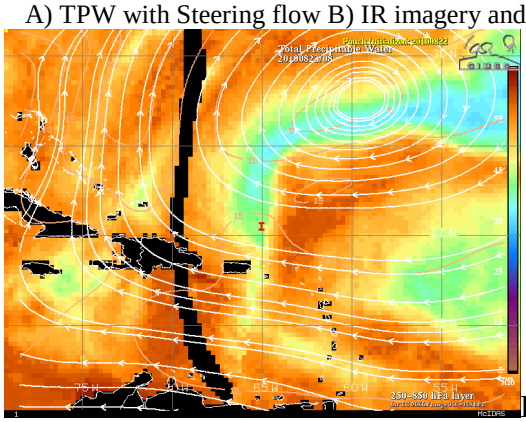
7) TS Danielle Early Cycle Intensity Guidance

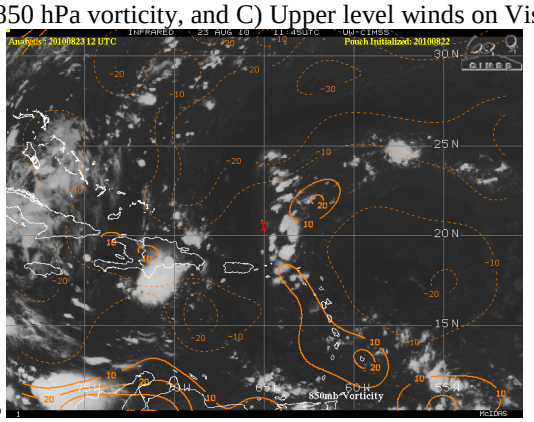


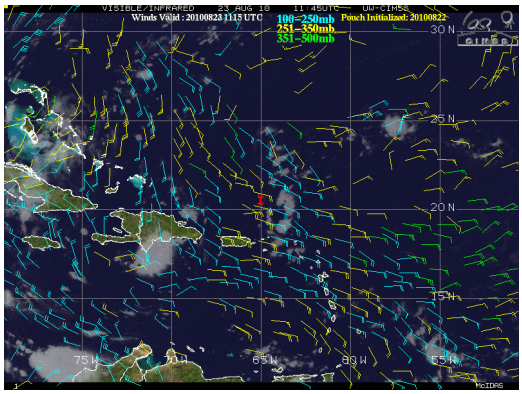
8) Early cycle 1200 UTC Track Guidance:



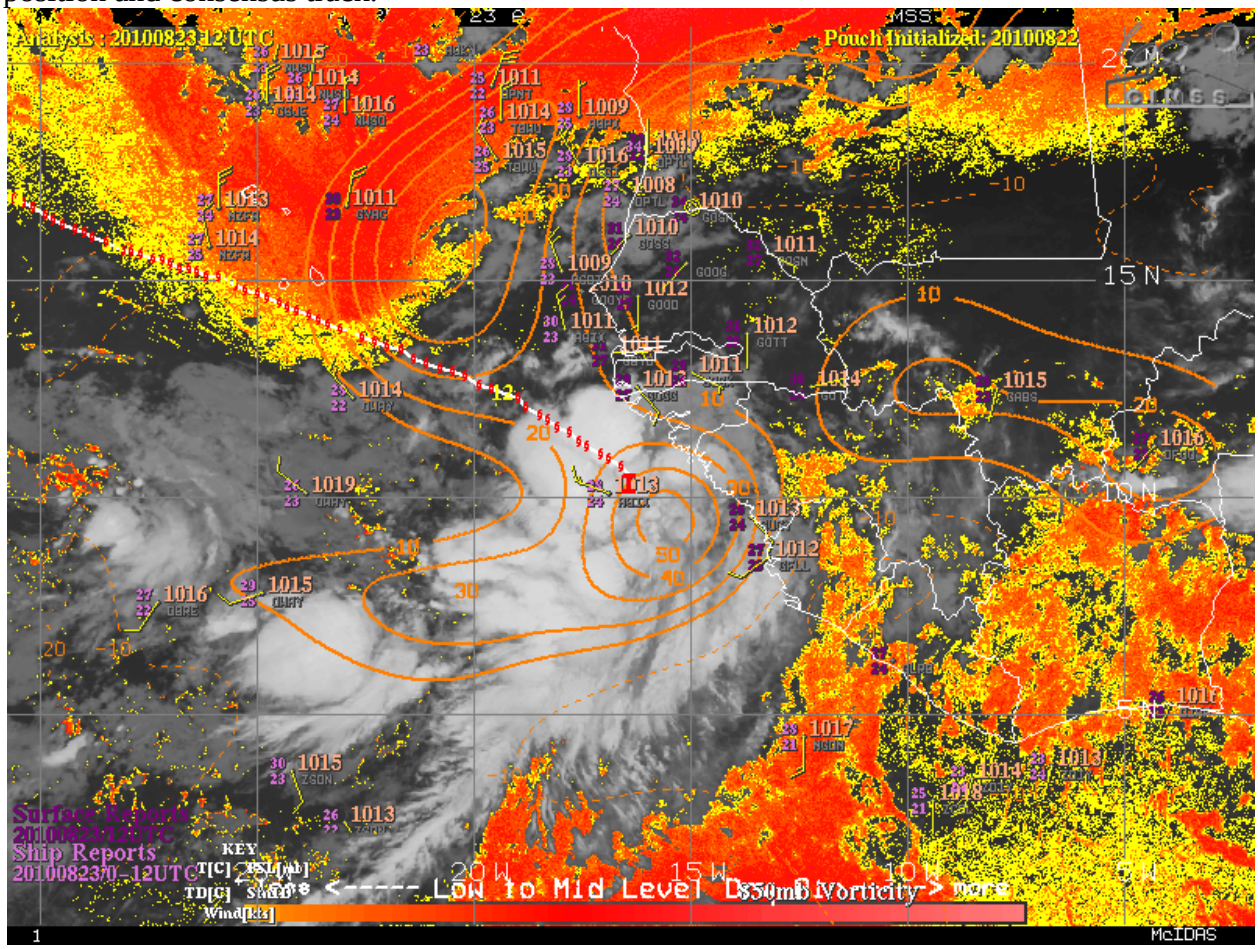
9) A) TPW with Steering flow B) IR imagery and 850 hPa vorticity, and C) Upper level winds on Visible Image

A 

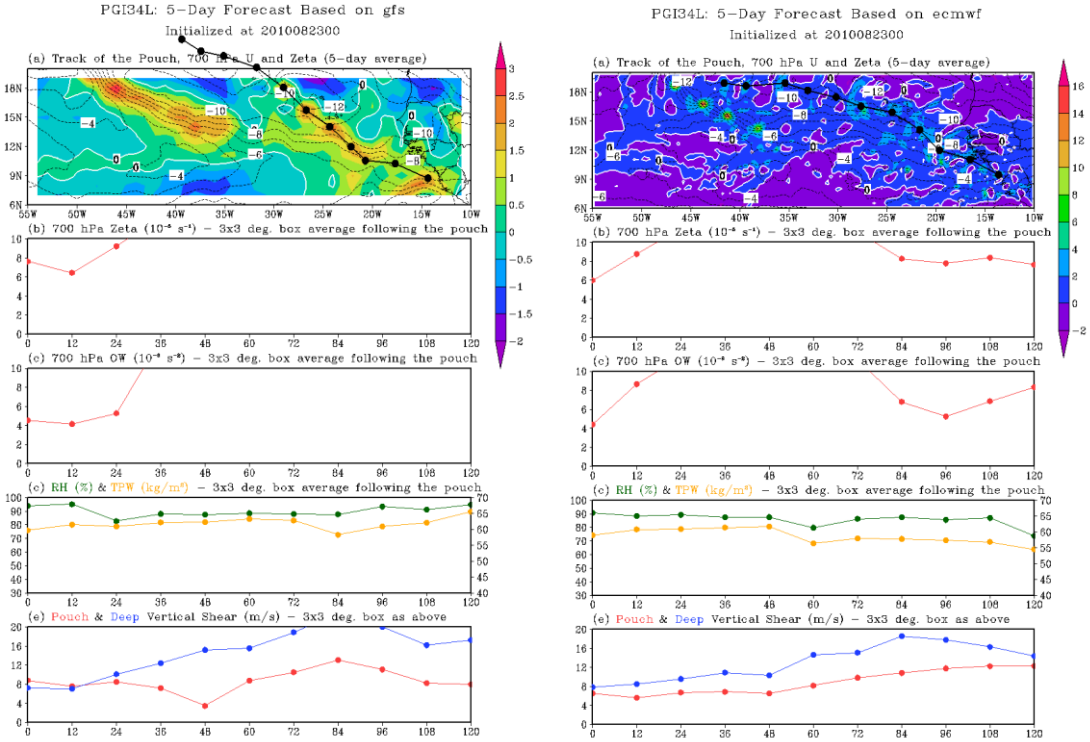
B 

C 

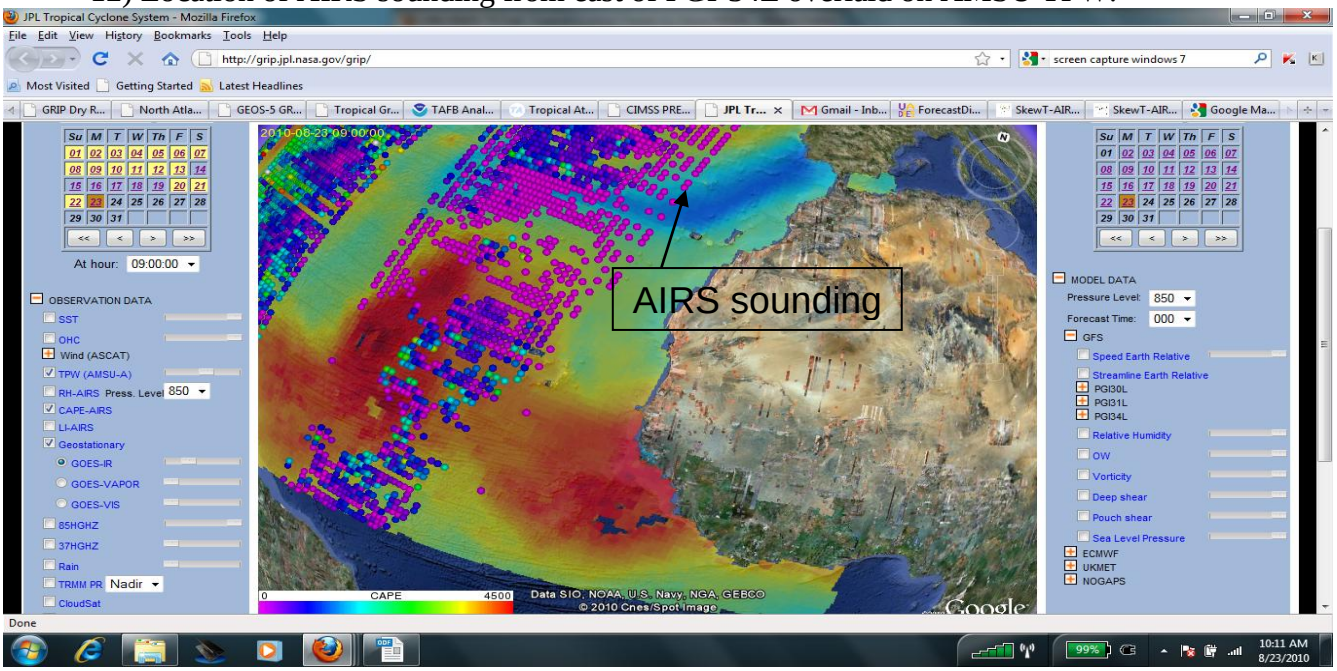
10) PGI-34L 850 hPa vorticity and IR at 0800 UTC along with the 8/23 0000 UTC pouch position and consensus track.

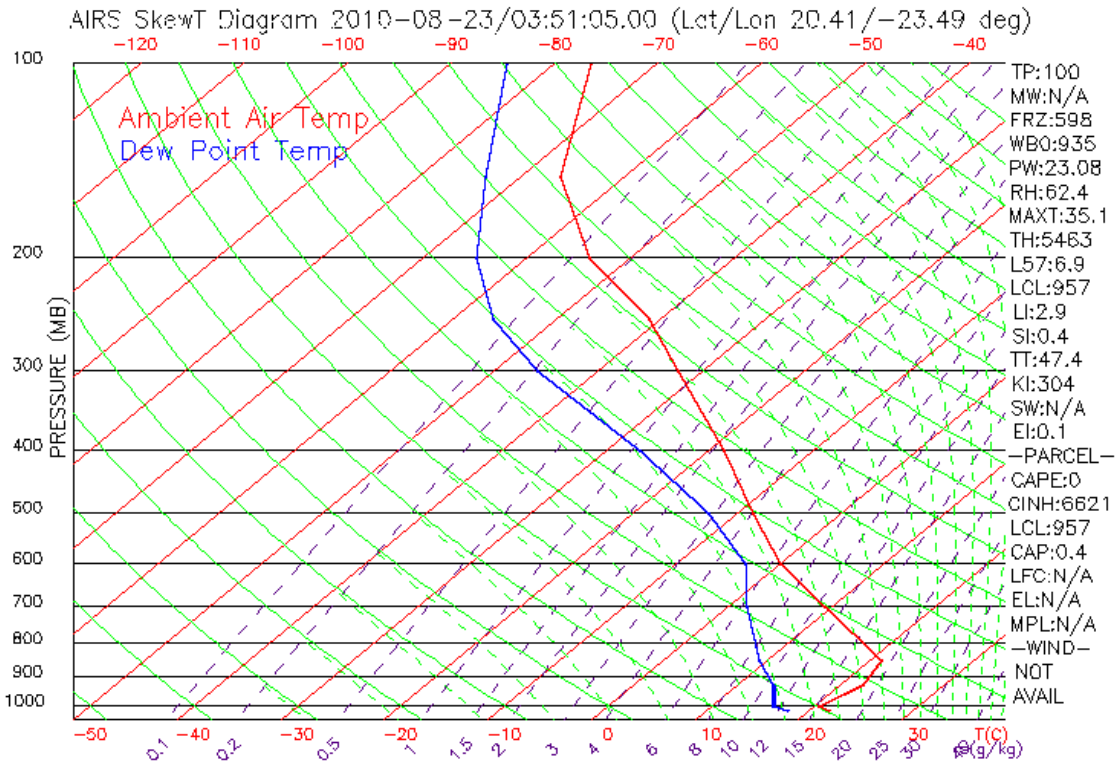


11) The PGI-34L 8/23 0000 UTC GFS and ECMWF pouch track forecasts:

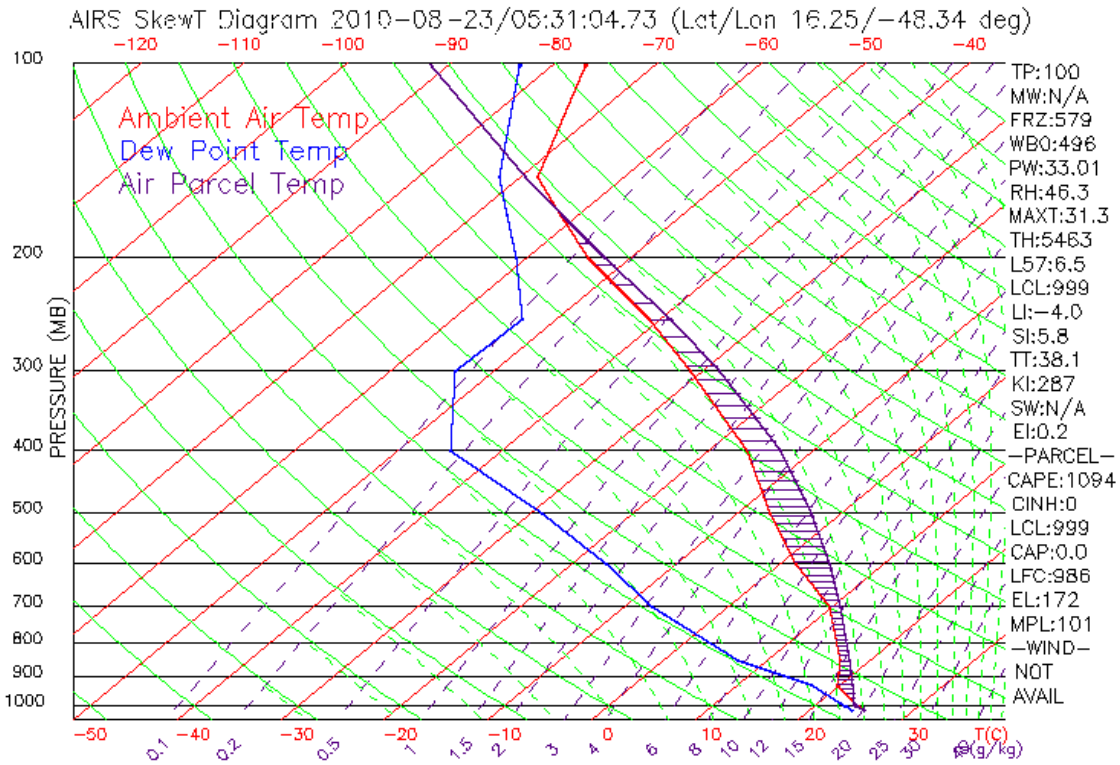


12) Location of AIRS sounding from east of PGI-34L overlaid on AMSU TPW.

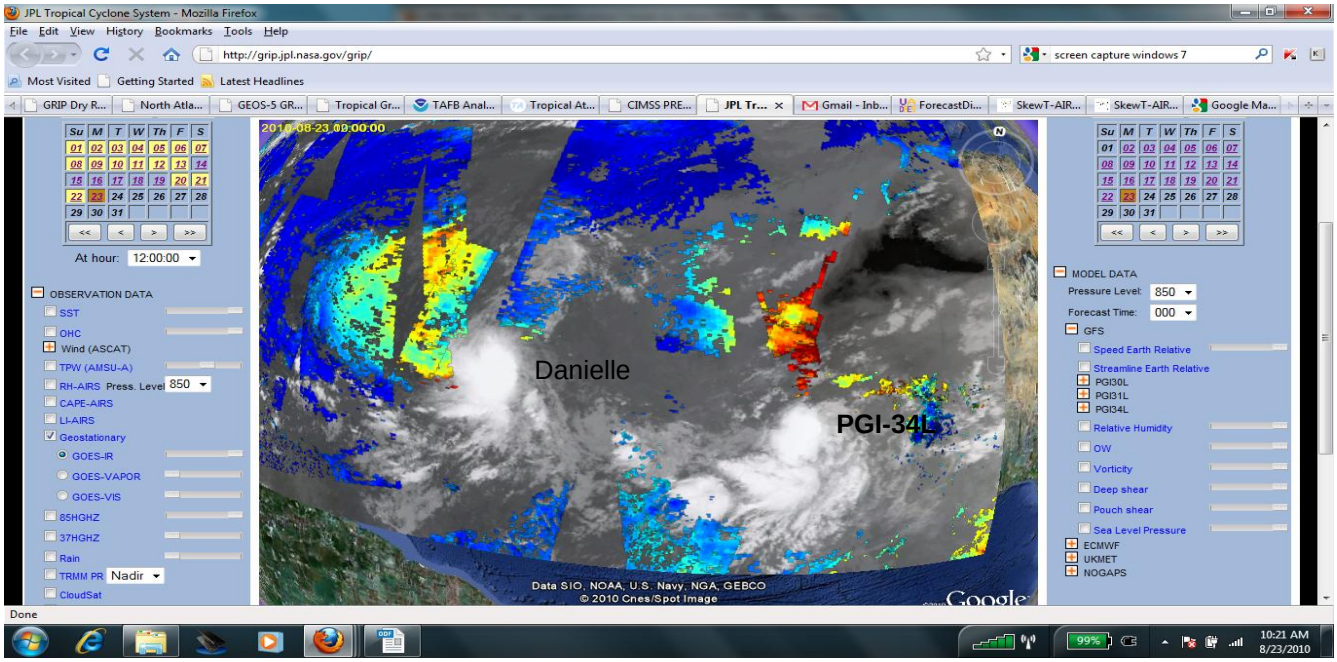


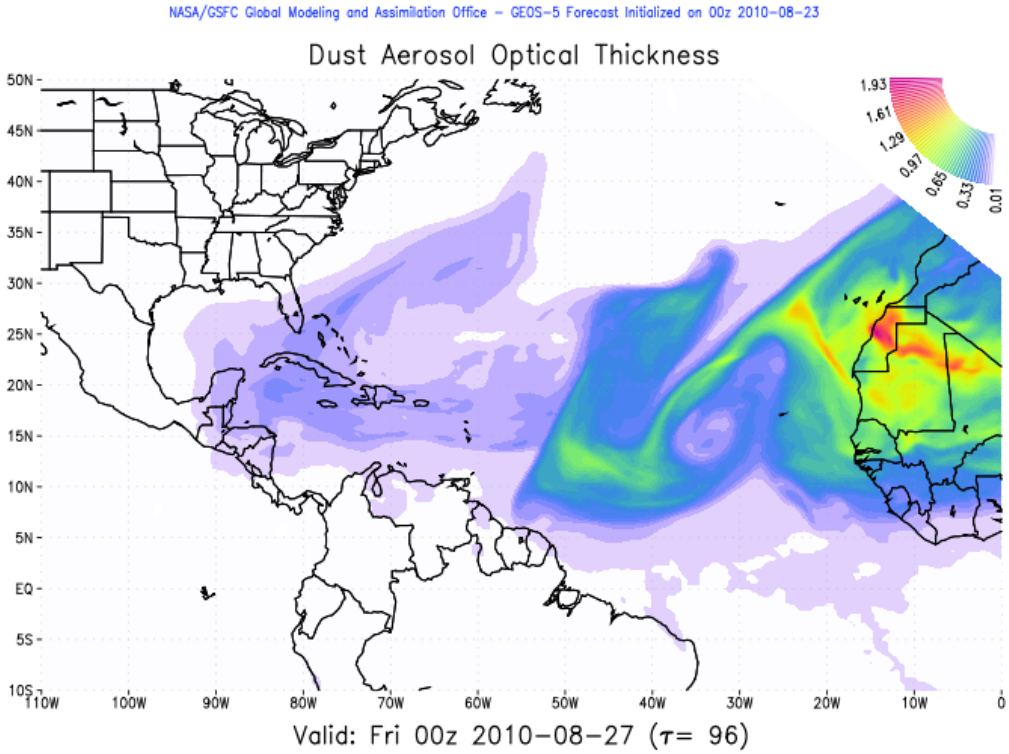


13) AIRS Skew-T from 23W/20N from new SAL outbreak.



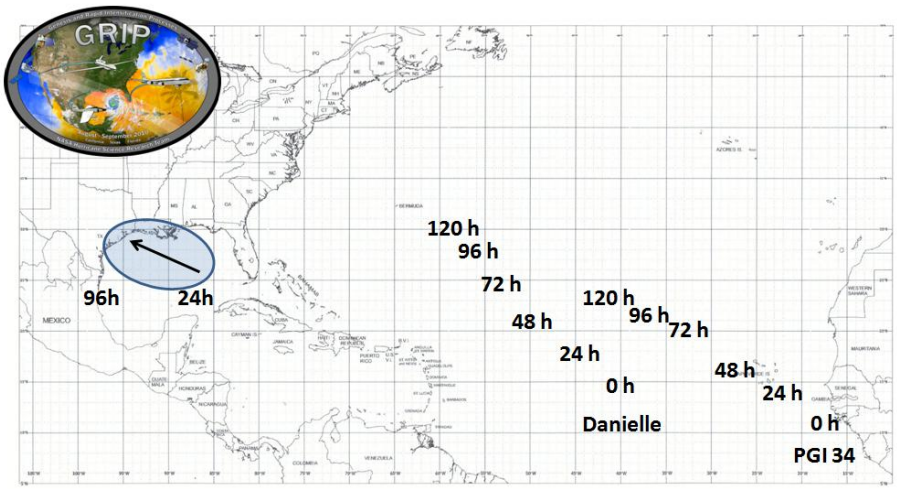
14) AIRS Skew-T from 48W/16N east of Danielle
15) Image of dust outbreaks near Danielle and PGI-34L. MODIS AOT from both Aqua and Terra shown, with GOES IR





16) GEOS-5 dust AOT forecast initialized on 8/23 at 0000 UTC, valid at 8/27 0000 UTC

17) Tri-agency targets track forecast:



Systems of Interest

All times relative to 8/23 1200 UTC

TC Danielle
Gulf Development
PGI34L