Tri-Agency Forecast Discussion for August 24, 2010

Created 1600 UTC August 24, 2010

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Summary:
The DC-8 is flying today to examine an elongated region of convection in the Gulf of Mexico coincident with a low-level trough which has been deepening over the past 48 hr. The flight is currently sampling convection using a "lawnmower pattern" to examine locations of possible development of a low-level cyclone. In addition, a circular maneuver will be performed for microphysical research. This flight has also been designed to coincide with a TRMM and AQUA overpass. Convection has become increasingly organized along a line coincident with a strip of high moisture south of a dry air mass associated with subsidence within a developing ridge over the Central US. Also of interest in the central Atlantic is Hurricane Danielle/PGI-31L which began an impressive bout of intensification beginning 8/22 2100 UTC and continuing through 8/24 0000 UTC. Later, increased shear associated with an upper-level low to the NW possibly interacting with dry air to the NW led to a substantial deterioration of the central dense overcast between 8/24 0000 UTC and 8/24 1200 UTC. The intensity of Danielle is forecast to intensify slowly or remain steady over the following 120 hrs. However, this may be negated by an unfavorable interaction with dry air and shear from the upper-level low over the next 72 hrs. A NW track is projected for Danielle over the next 120 hrs before recurvature commences as Danielle is picked up by a trough currently over the North Central US forecast to move into the Atlantic by 120 hrs. Farther east, many of the models are suggesting that a rapid development similar to that experienced by Danielle could soon initiate and continue for the next 72 hrs. PGI-34L is approaching tropical depression strength and is forecast to maintain a WNW heading over the next 120 hrs. Considerable uncertainty exists in the forecast latitude of PGI-34L beyond 120 hrs with some guidance suggesting recurvature and others placing farther south and within better range of the Barbados. This would be of particular interest to IFEX operations. See the summary figure for expected tracks of weather systems of interest (**17**). PREDICT will not be flying for the next 2 days, IFEX has a likely upcoming ferry flight of the G-IV and P3's to Barbados on Friday, and GRIP's Global Hawk and DC-8 are not flying tomorrow either.

Forecast for 1600 UTC 8/24/2010:

Synoptic Overview:

At upper-levels a cyclonic wave break is occurring in an intense upper-tropospheric trough over the north-central US and southern Canada **(1a)**. This is helping to build an intense ridge over the central US with strong subsidence indicated by the low moisture in the water vapor channel. Near the Texas coast a small anticyclone is present slightly separate from the large scale ridge **(1a)**. Along the east coast an extratropical low is beginning to merge with, and elongate, the upper-level cutoff low currently over Cuba. Another cutoff upper-level low was located at 25N/47.5W just to the north of Hurricane Danielle.

At lower-levels, a trough extends from the central Gulf of Mexico northeastward to a cyclone SE of New England as shown in the CIMSS 850 hPa vorticity analysis **(2a)**. This low-level trough is associated with enhanced TPW **(3)**. Near the Gulf coast a remnant stationary front which was once associated with this cyclone has stalled. South of Louisiana there is some hint that the western end of the low-level trough has begun to break off. A region of convection near 28N/93W can be seen north of the main line of convection, which extends along the main strip of low-level vorticity in the CIMSS analysis **(2b)**. In the East Atlantic, PGI-34L is indicated by a low-level vorticity maximum near 24W/12N. The strip of vorticity over West Africa at 23N is the elongated/deformed remnants of a northern vortex once associated with PGI-34L **(2a)**.

In the 1800 UTC TPW analysis several notable regions of dry air are apparent **(3)**. A small extension of dry air is wrapping around the remnants of PGI-30L at 25N/70W. To the west of Hurricane Danielle a wedge of dry air is beginning to wrap around the high TPW on the southern flank of the storm. Another wedge of dry air is also present north of PGI-34L/96L.

Features of Interest:

Possible GOM Development

The low-mid level trough in the Gulf remains mostly stationary as its parent trough moves to the NE along the eastern US coast **(2a)**. Convective initiation is primarily occurring along the boundary between the moist air to south and a dry, subsiding air mass moving into the Gulf of Mexico from the north **(4)**. Atmospheric sounding profiles from coastal Louisiana and Mississppi **(as well as dropsondes from the current flight)** confirm the presence of a very dry air mass aloft with strong subsdence.

Shear over the northeast Gulf of Mexico was around 30 kts at 8/24 1800 UTC associated with the cutoff upper-level low currently elongated from the Central Caribbean northeastward toward the Bahamas **(5)**. Shear is decreasing over the western Gulf of Mexico associated with the progression of the ridge eastward **(5)**. The decreasing shear over the western Gulf of Mexico may aid the development and maintenance of the low-level vorticity maxima currently located south of Louisiana **(2a)**.

The development of this tail-end vortex on the western edge of the low-level trough was well forecast by the last several runs of both the GFS and ECWMF. The eastern portion of the low-level trough is forecast to lift northeastward over the next 48 hrs while the vortex south of Louisiana is forecast to be steered westward by the ridge reaching Texas around 96 hrs. A weak pouch was able to be tracked in the 8/24 0000 UTC forecasts of both the GFS and ECMWF **(6)**. Vorticity in both runs remains fairly low before the disturbance makes landfall along the Texas coast. Although development into a tropical depression remains unlikely, close attention will be paid to the system for continuity and a possible future intensification of the vortex depicted at 850 hPa in the CIMSS analysis. In addition, satellite imagery should be monitored to determine if any low-level cyclonic motion becomes coincident with the vortex in the CIMSS analysis, because such satellite detection is currently ambiguous.

Hurricane Danielle/PGI-31L:

Fairly rapid development from a pre-depression to a Hurricane occurred between 1800 UTC 8/22 and 8/24 0000 UTC, but subsequent substantial erosion of the central dense overcast of Danielle occurred between 0600 and 1500 UTC today. The deep convection near the core shifted in position from a partial eye eroded on the southwest side to entirely downshear between 0434 UTC and 1433 UTC as indicated by 85 GHz microwave imagery **(8)**. This displacement of deep convection to the southwest of the low-level center was also apparent in the visible satellite imagery **(9)**. Shear increased from approximately 5 to 15 knots, and between 0000 and 1200 UTC the shear was from the northwest. It was associated with both a southwestward shift of the upper-level anticyclone and possibly also with an interaction with an upper-level low to the northwest of the storm. Also during this period, a slot of dry air could be seen wrapping around the southern flank of the region of high TPW associated with Danielle **(3)**. The relative roles and possible interaction between the dry air and shear is not completely understood.

There is quite a bit of uncertainty regarding the future intensity of Danielle. On the one hand, deep convection has begun to move back over the center of the low-level circulation as of 1800 UTC Aug 24. In addition, most model guidance suggests a slow intensification **(9)**. However, on the other hand, over the next 60 hrs Danielle will continue to interact with, and become closer to, the upper-level low. Model guidance suggests that Danielle will eventually destroy/deform the upper-level PV maxima associated with the upper-level low after 72 hrs. Finally, it is uncertain to what degree Danielle will be able to mix out the dry air that entered the northwest sector of the storm. Model guidance is in fairly good agreement regarding the track of Danielle. A northwest track is forecast up to approximately 120 hrs, beyond which the direction of movement will shift to the north as Danielle interacts with an upper-level trough.

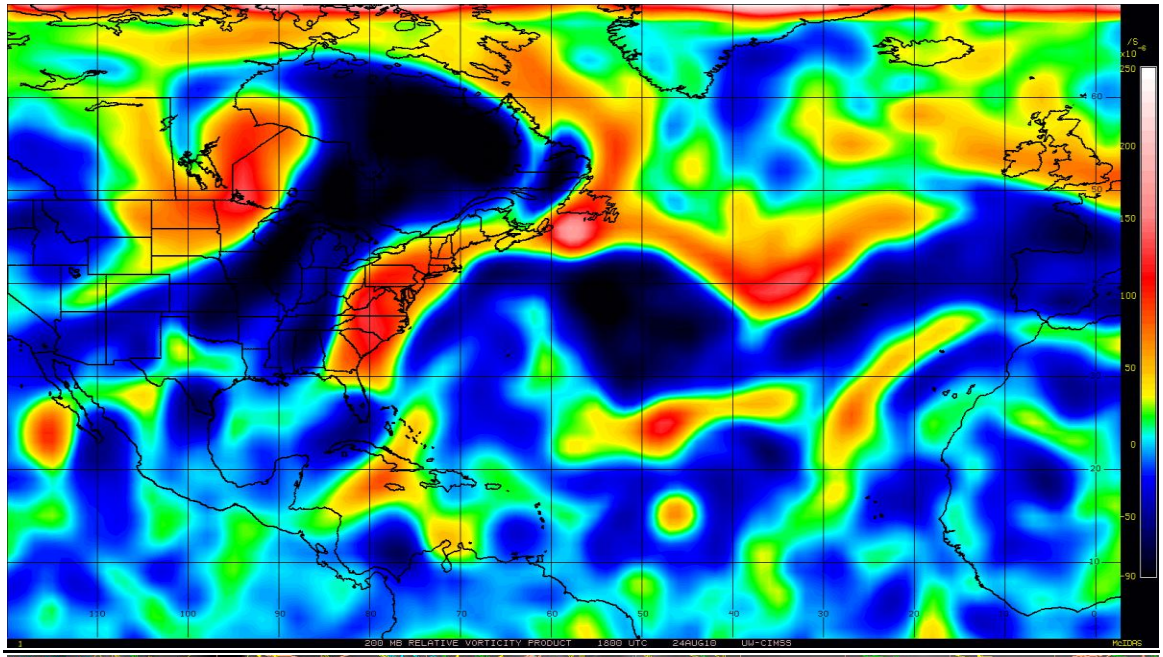
AL96/PGI34L:

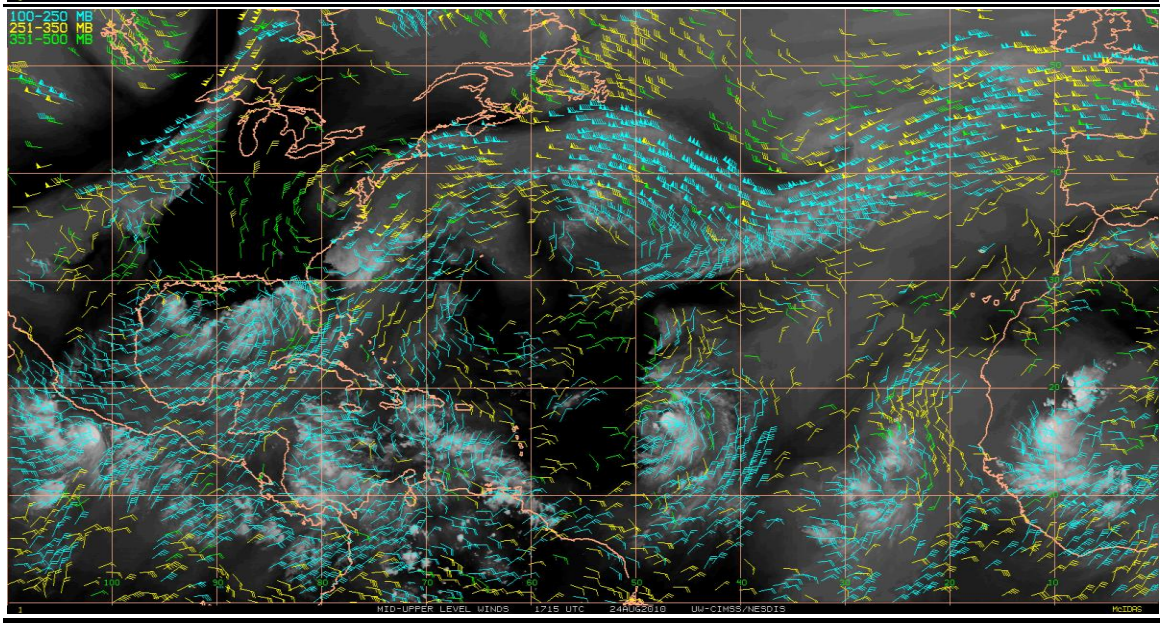
Convection associated with AL96/PGI-34L has increased overnight and there are two distinct convective areas near the pouch, with the local maximum of 850 hPa vorticity lying in between. There is broad cyclonic flow indicated by satellite-derived low-level winds, but it is hard to determine if there is indeed a low level center. There are no conventional or satellite-derived wind observations near the convective bursts, and visible satellite imagery does not show a definite center. Nevertheless, it is entirely possible that a low level center will develop later today or tonight, and a tropical depression will form. The 8/24 1000 UTC CIMSS analysis shows that dry air is continuing to impede on the system, especially on the north and west sides **(10)**. The pouch analysis of relative vorticity illustrates a continued presence of a southward baroclinic tilt with height of PGI-34L between the baroclinic northern vortex and convective southern vortex **(11)**. The presence of a closed co-moving mid-level circulation was well forecast by the GFS going back 48 hrs. Despite the sloping dry air which becomes closer to the pouch at mid-levels **(12),** the pouch appears to be maintaining a region of high relative humidity with favorable convective activity. The GEOS-5 model suggests that dry/dusty air will wrap around AL96/PGI-34L, but that the pouch itself will close off and prevent the dry air from infiltrating the center of circulation.

The models are in good agreement that the system will continue to track to the WNW throughout the 120-hour forecast period as it moves along the south side of a high pressure ridge. Considerable uncertainty exists beyond this period, and the 1200 UTC GFS is suggesting a more southward track passing by 22N near 60W, while most other guidance suggests a recurvature following Danielle's track.

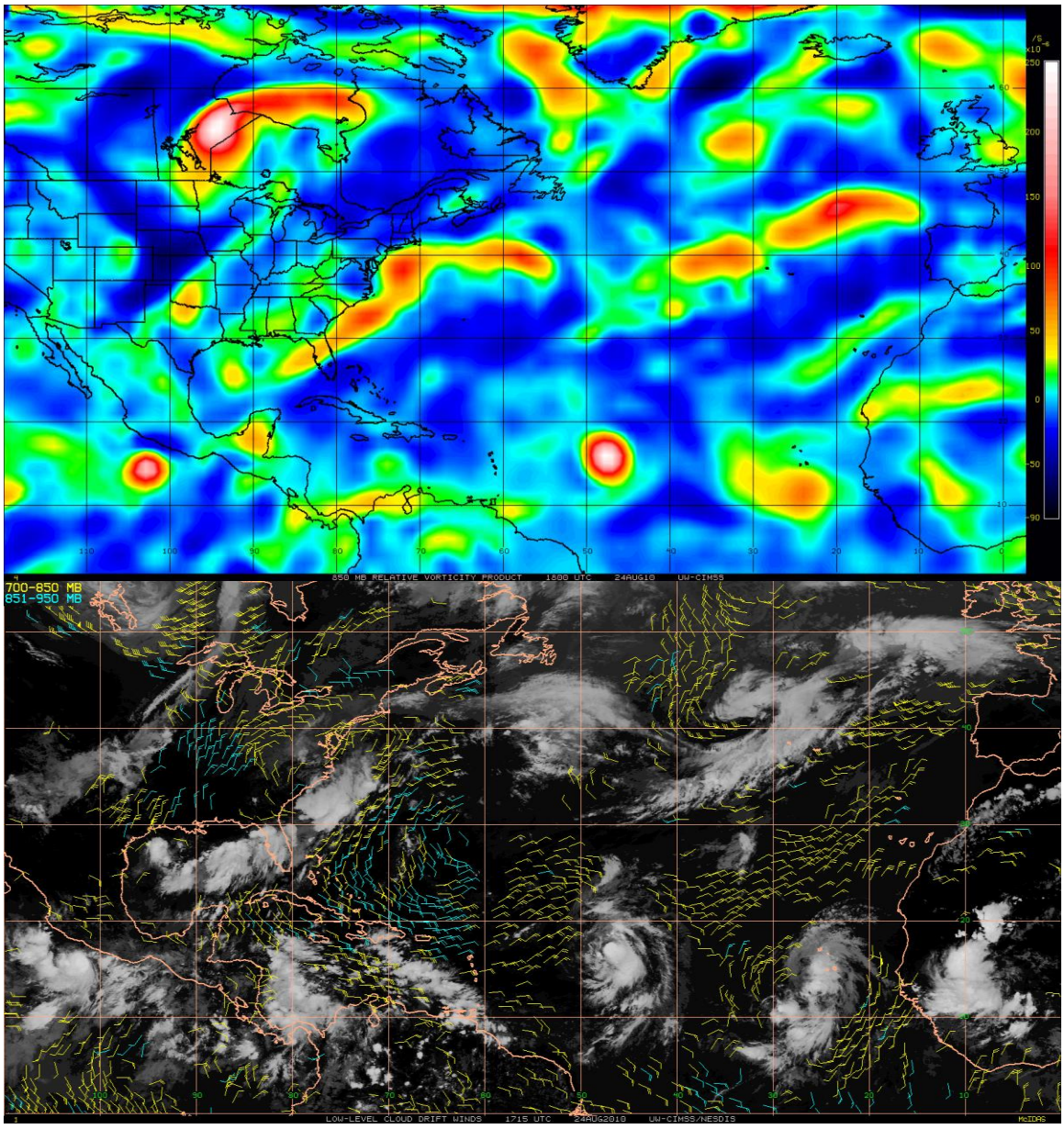
The storm is forecast to move over SSTs of 27-28C and encounter low vertical wind shear (< 10 kt) over the next 36 hours. No upper-level lows are forecast to interact with the system for the next 120 hours, suggesting a favorable upper-level anticyclone will be able to develop over the storm center. The only potential inhibiting factor would be dry air if it is able to wrap into the center of the storm. But, as mentioned, the GEOS-5 model suggests that the pouch will be closed off and the dry air will remain on the periphery of the system. Most of the intensity guidance has this system quickly becoming a tropical storm soon **(13)**.

Images used in discussion:

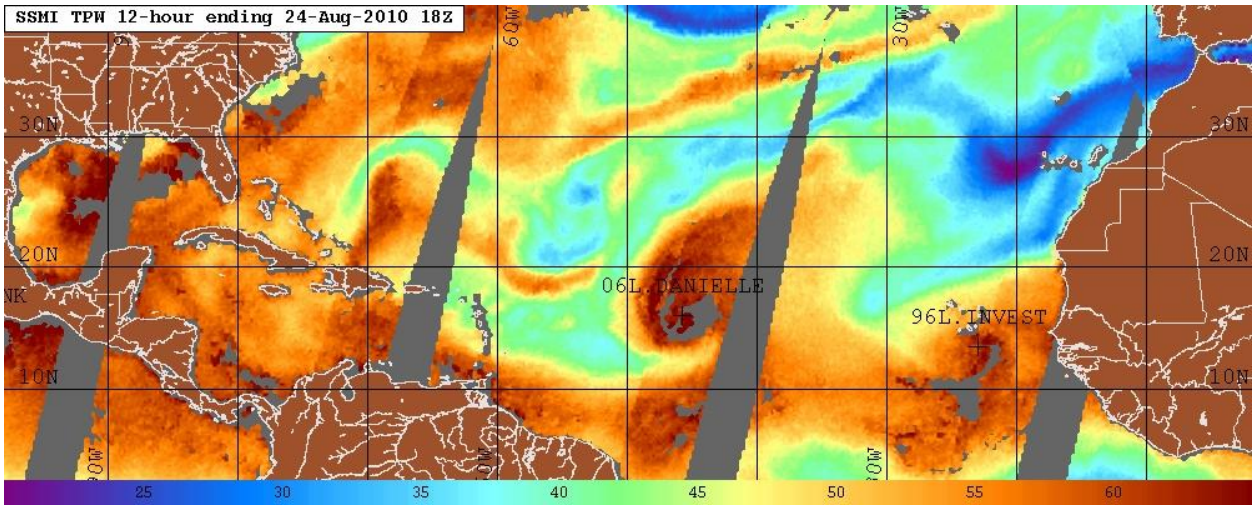




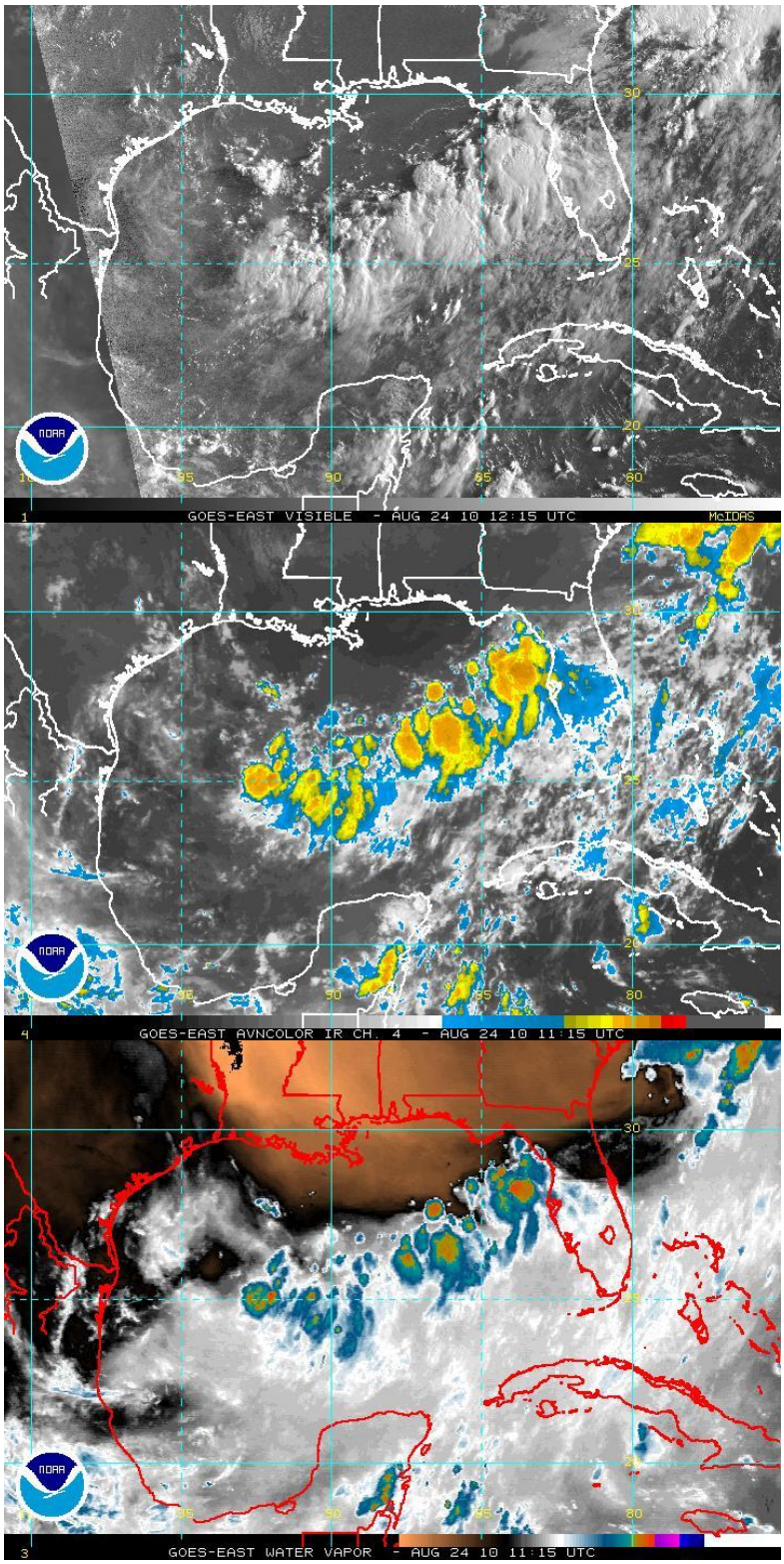
1) (a) CIMSS analyzed 200 hPa vorticity (b) CIMSS satellite-derived upper-level winds and water vapor at 8/24 1715 UTC and 1800 UTC, respectively.



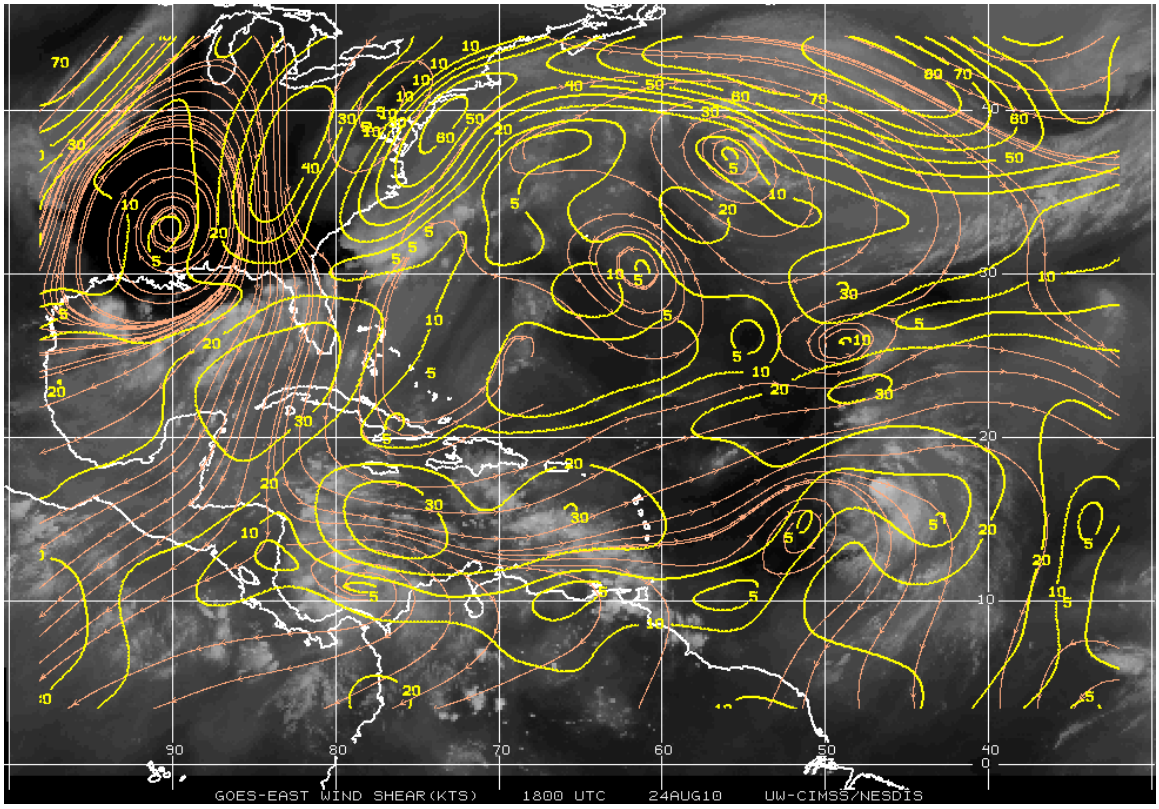
2) (a) CIMSS analyzed 850 hPa vorticity (b) CIMSS satellite derived lower-level winds and IR at 8/24 1715 UTC and 1800 UTC, respectively.



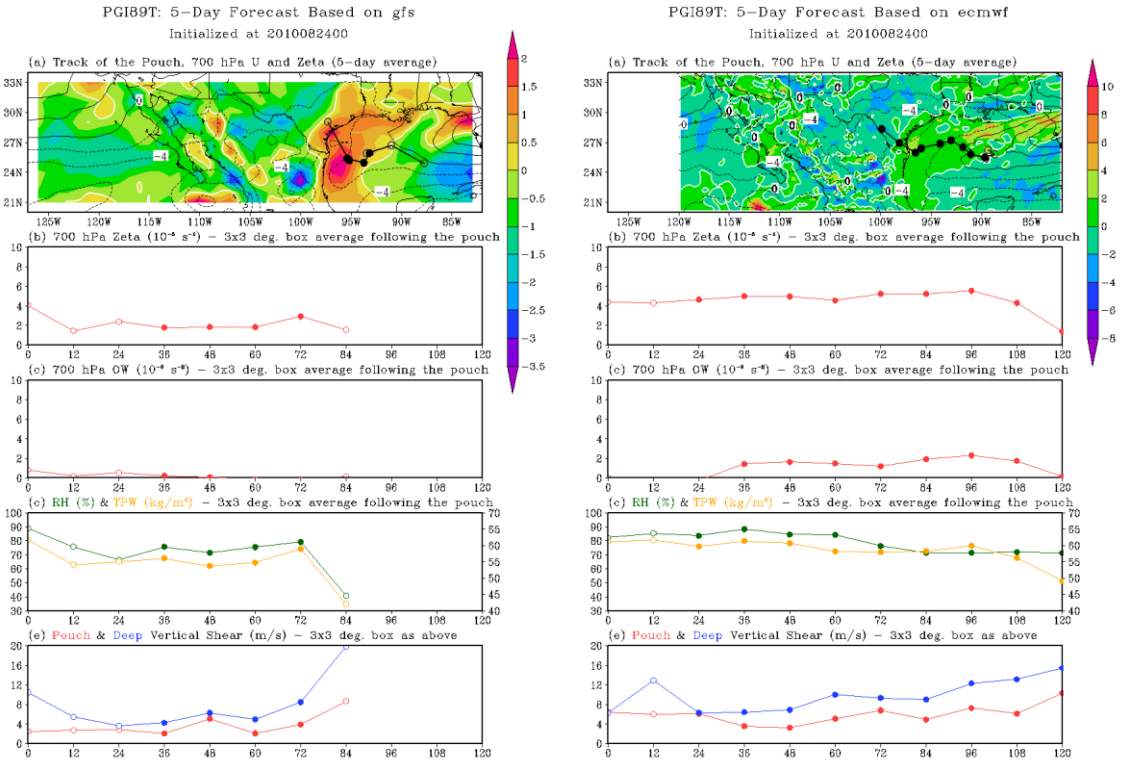
3.) SSMI TPW 12-hr composite at 8/24 1800 UTC.



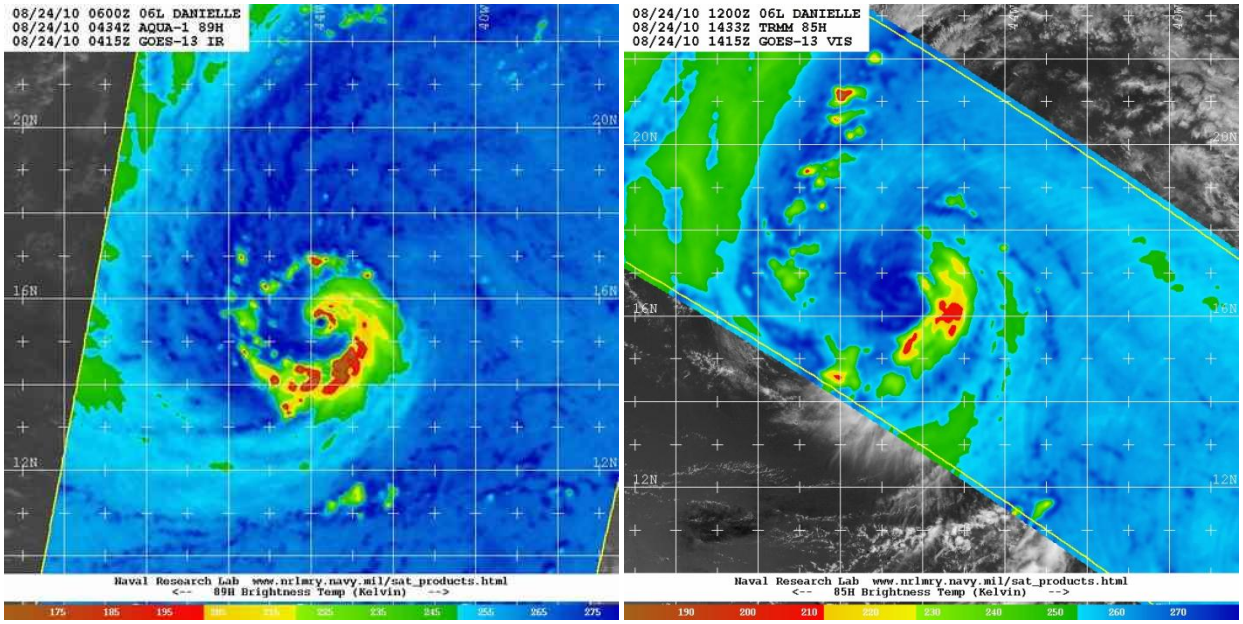
4) Visible, IR, and Water Vapor channel satellite images valid at 1800 UTC Aug 24 over the Gulf of Mexico.



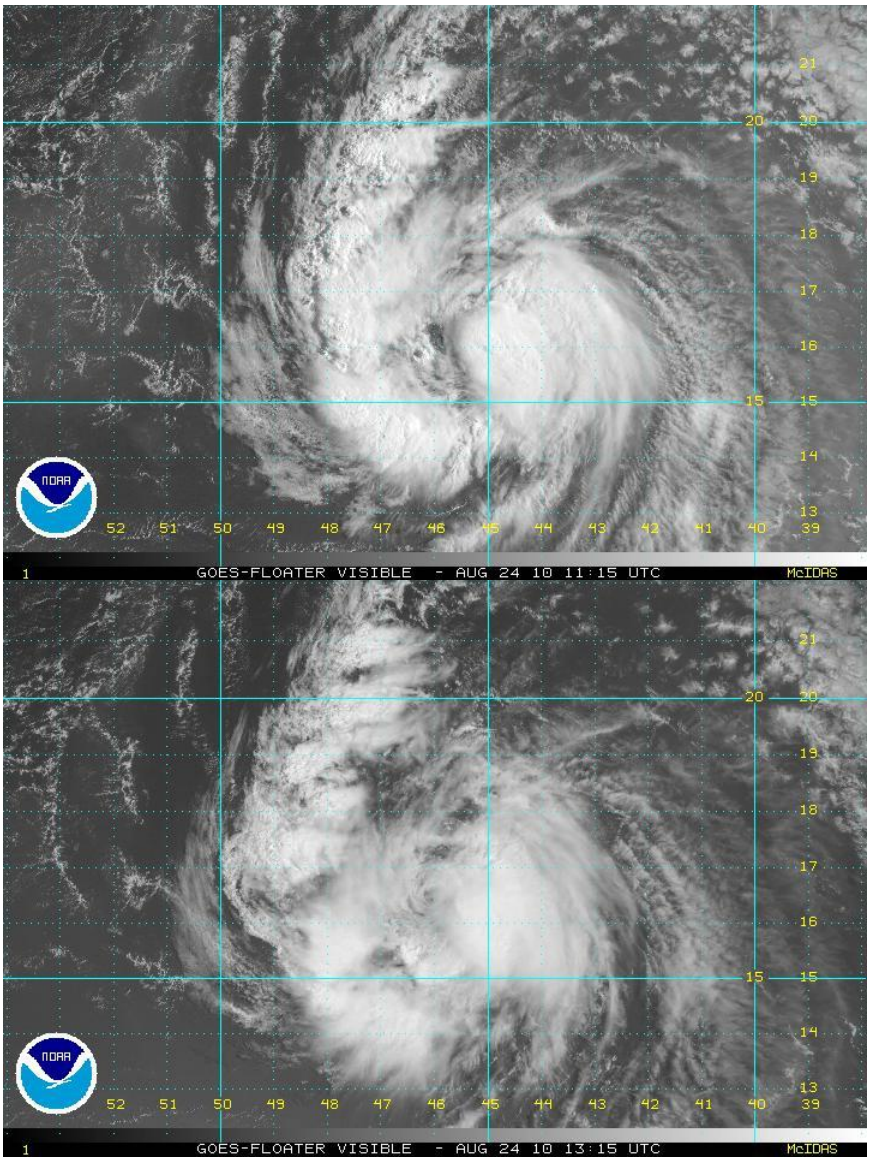
5) Deep shear (kts) and water vapor valid at 8/24 1800 UTC Aug 24, 2010.



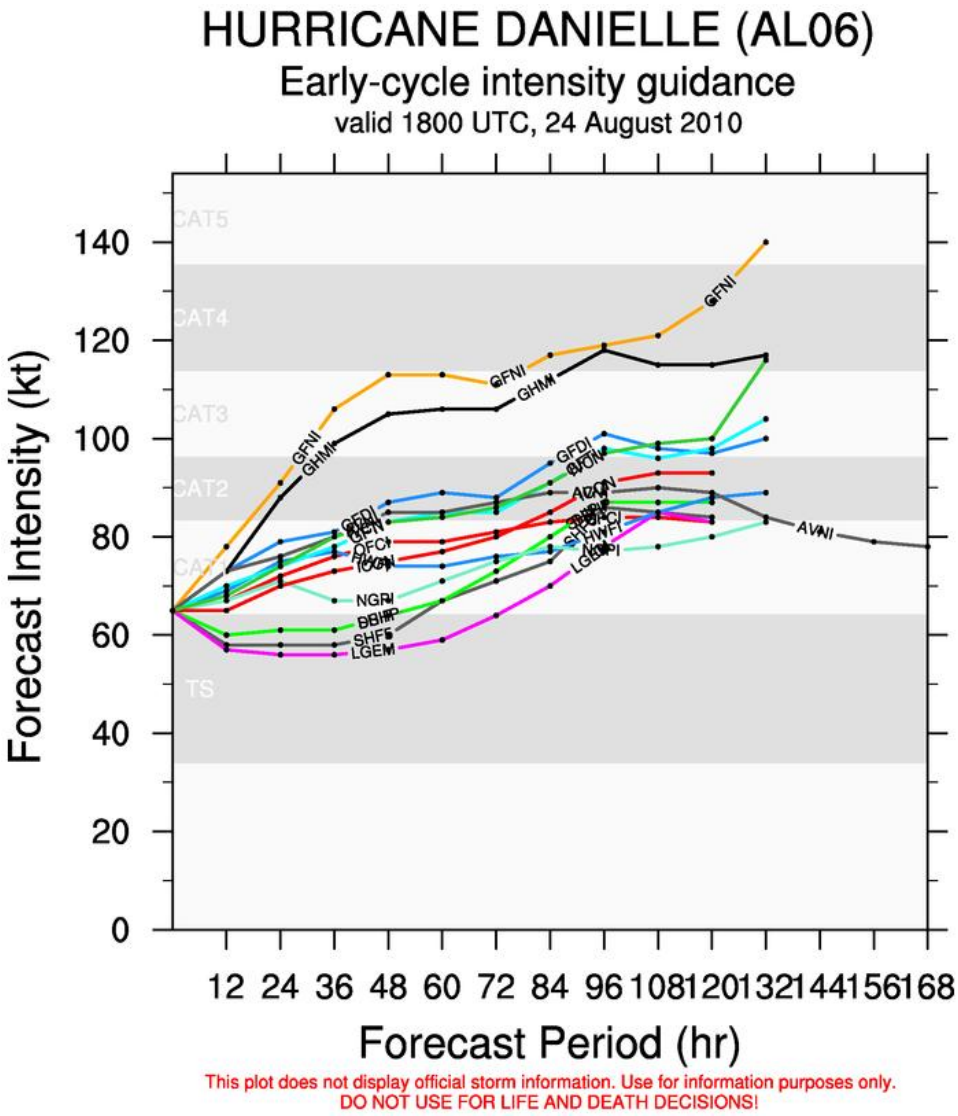
6) Pouch analysis valid at 8/24 0000 UTC from (left) the GFS and (right) the ECMWF.



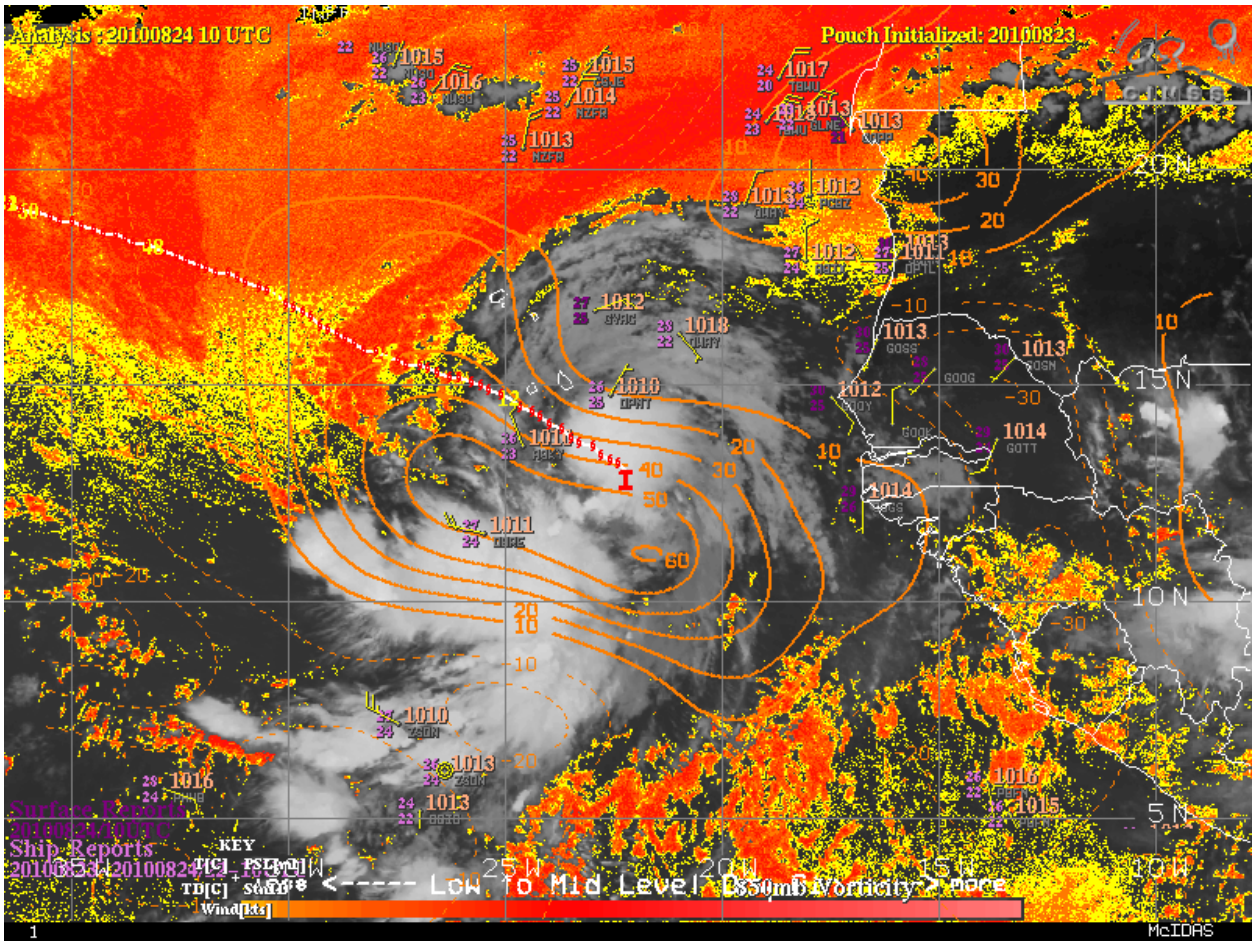
7) Evolution of 85 gHz imagery between 0434 UTC and 1433 UTC Aug 24.



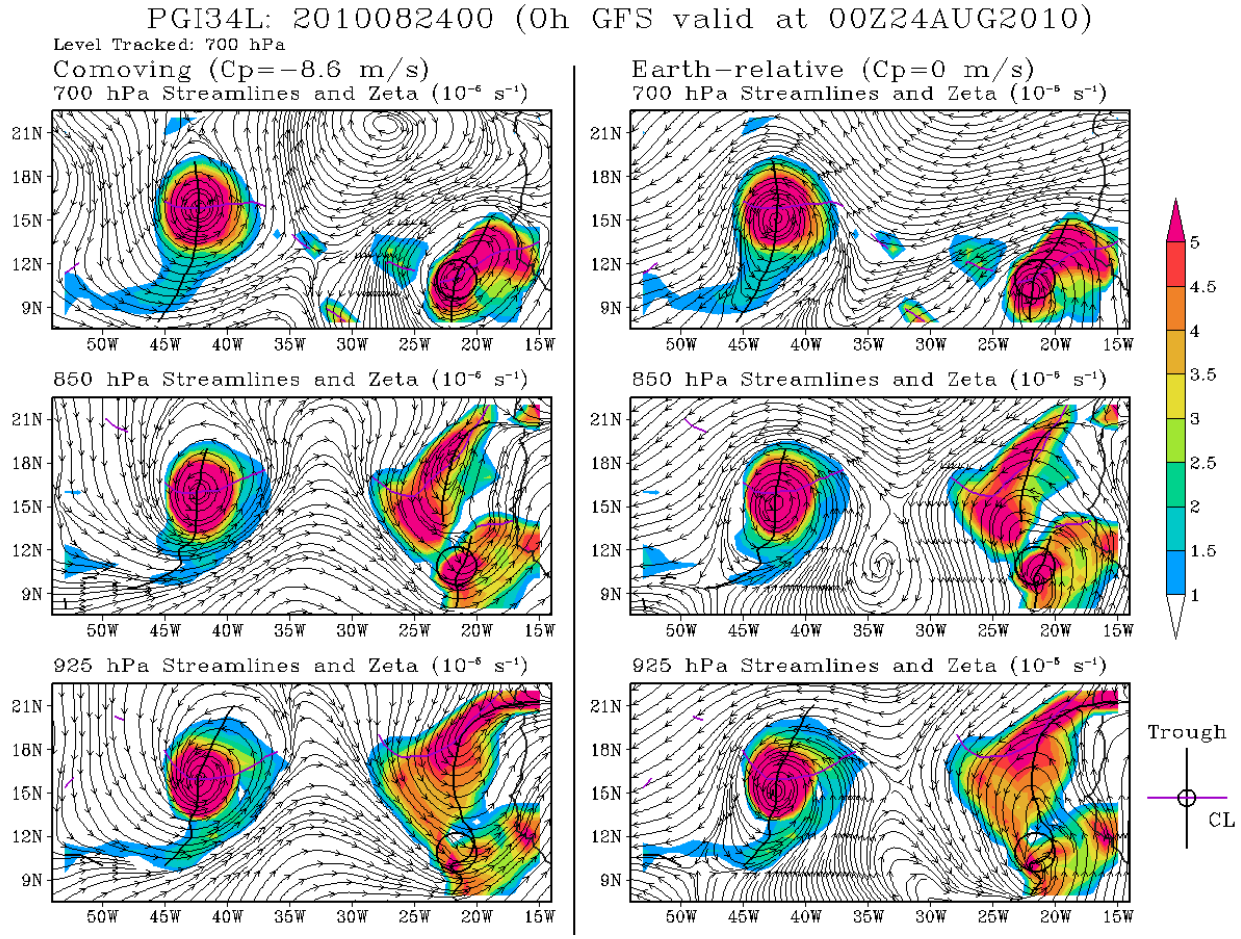
8) Evolution of visible satellite imagery between 1115 and 1315 UTC Aug 24 over Danielle.



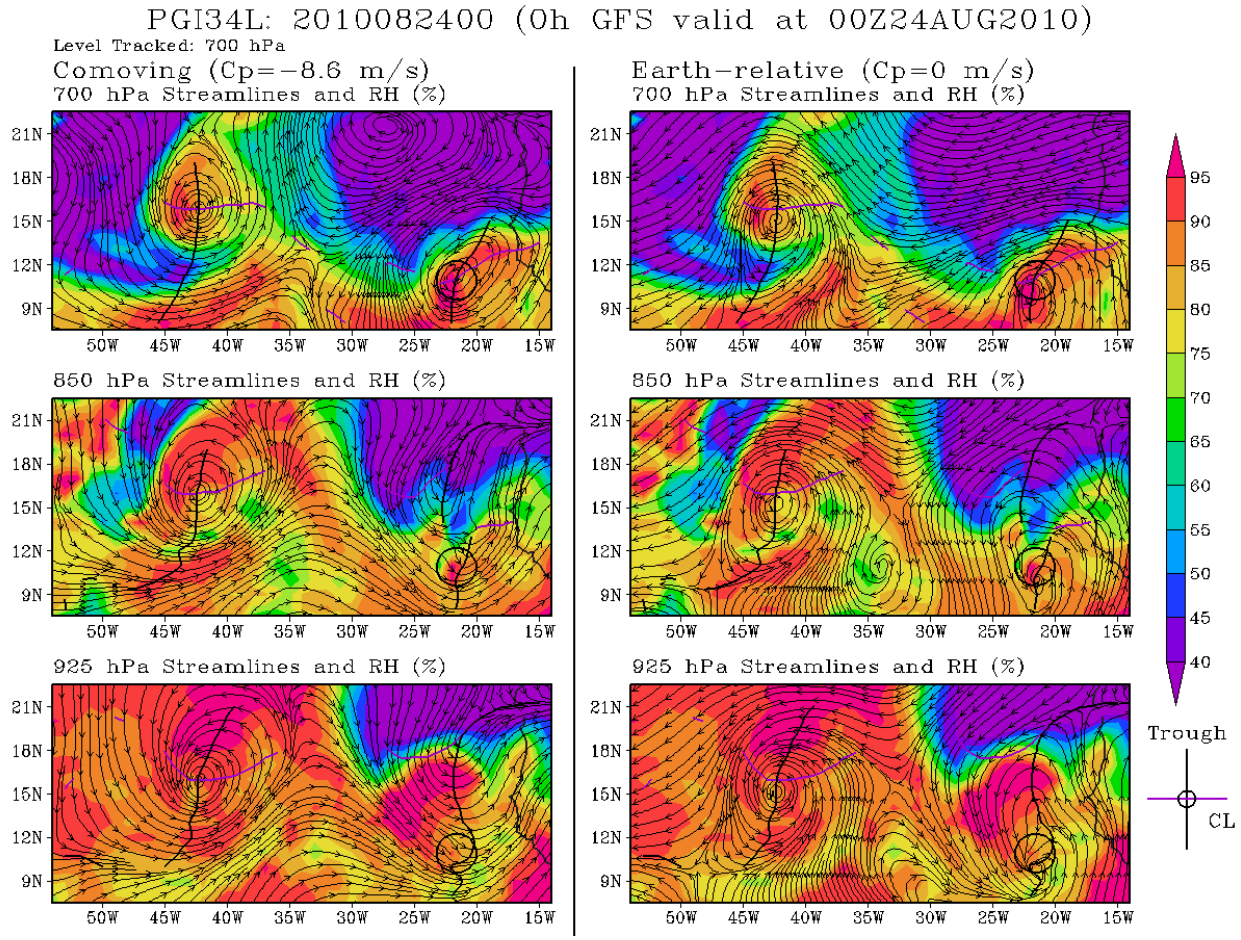
9) Early track guidance of the intensity of Hurricane Danielle initialized at 8/24 1800 UTC.



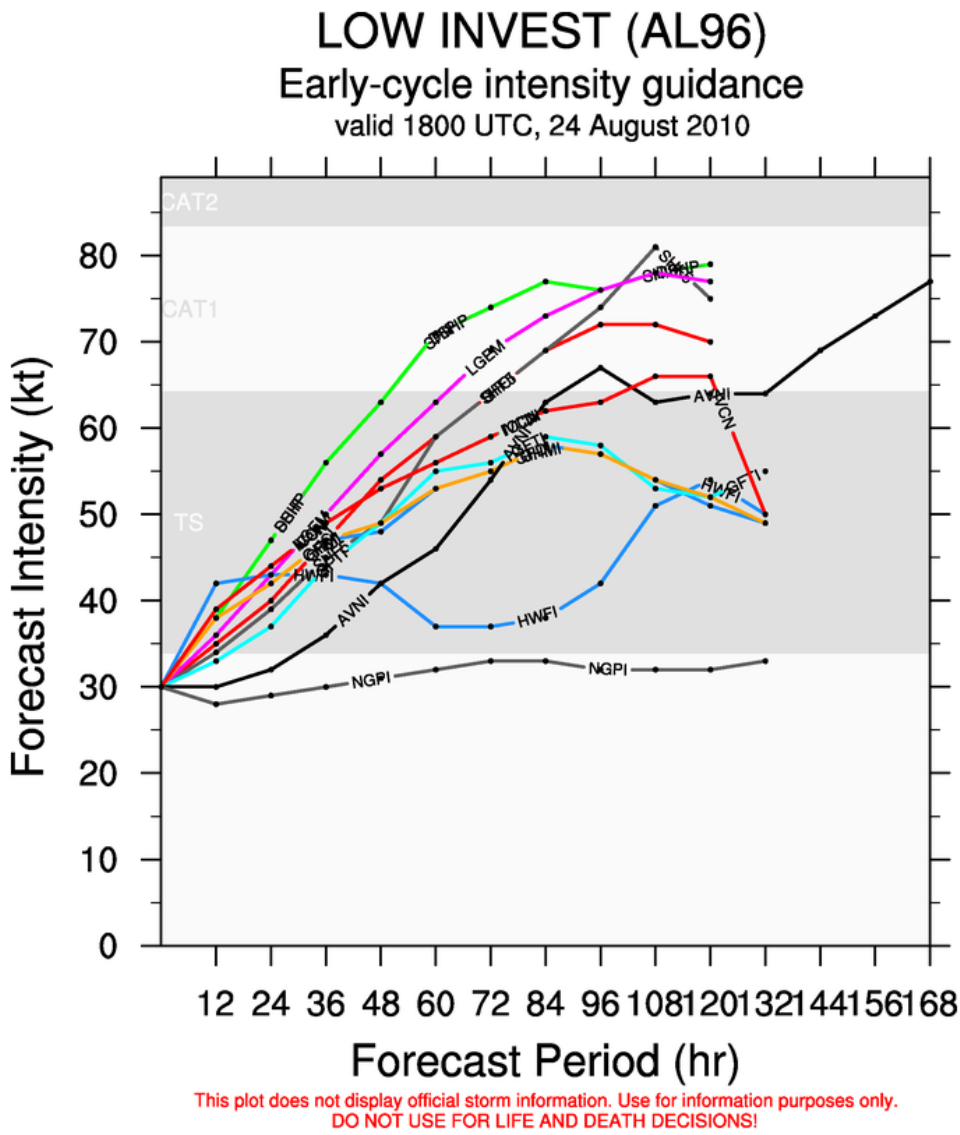
10) 1000 UTC IR, dry air (shaded), and 850 hPa vorticity (contours).



12) Pouch analysis of AL96/PGI34L relative vorticity from the 8/24 0000 UTC GFS.



12) Pouch analysis of AL96/PGI34L relative humidity from the 8/24 0000 UTC GFS.



13) Early track guidance of the intensity of AL96/PGI-34L initialized at 8/24 1800 UTC.