Tropical Areas of Interest Discussion: Created 1800 UTC July 22, 2010

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**Summary:** A late-day organization of convection and vorticity began yesterday and continued overnight with PGI-17L/AL97 such that this morning the chances for formation were upgraded by the NHC to 100%, resulting in the 1500 UTC classification of the system as Atlantic Tropical Depression #3 (TD3). This system now has a defined center of circulation clearly visible by satellite and has improved organization of convection today. The upper level cold low to the NW of TD3 has moved westward more quickly than TD3, resulting in TD3`s more favorable environmental conditions. Less wind shear, overcoming mid-level dry air intrusion yesterday, and slightly improving upper level divergence over the system have aided development thus far. Flight investigations by multiple agencies are underway and expected to continue for at least the next two days. Another system, stemming from the northern extent of PGI-16L/AL98, has formed a broad center of circulation early this morning and has a medium chance for development (NHC), though it will move inland on the central Mexican Gulf coast within the next 24 hours. No flight investigations are expected with that system.

**Nowcast: 1800 UTC July 22, 2010**

Three tropical waves in the Atlantic continue to be monitored by the GRIP, IFEX, and PREDICT teams. These include PGI-16L/AL98, PGI-17L/AL97/TD3, and the tropical wave with a formerly associated pouch PGI-18L. (see 1a) AL98 is located in the SW Gulf of Mexico near 20N, 96W. TD3 is located at 22N, 75W. PGI-18L is no longer being tracked on the Montgomery website and there has not been persistent deep convection, however the position of this wave is between 20N, 47W and 2N, 43W and satellite imagery indicates broad cyclonic flow (see 1b). Operations have focused on TD3 for the past several days, and it was upgraded by the National Hurricane Center (NHC) from an Invest to a Tropical Depression at 1500 UTC today after satellite imagery began to indicate a closed circulation had developed. Tropical Storm warnings have been issued for the FL Keys and south Florida coasts on both the Gulf and Atlantic sides. (see 1c) Ft Lauderdale is currently under a tropical storm watch.

The system continues to be under the influence of a strong upper tropospheric cold low which is helping to maintain a strong shear gradient near the center of TD3. 1500 UTC CIMSS analysis shows shear greater than 20 kts within a few degrees NW of the storm center. However, to the east of the storm and over the center, shear is only 5-10kts. (see 2) Thus, convection is limited to the eastern side of the low and west side convection is currently inhibited by dry air at mid levels, high shear and land influences. Upper level divergence is also only marginally favorable; however some good outflow is observable over the eastern half of the storm (see 3) and banding features can also be seen. SSTs and atmospheric moisture content over the storm center remain conducive for development, however Ocean Heat Content is not particularly high, and, as previously mentioned, dry air at mid levels is present to the west of the center of circulation (see 4, 5, 6). Compared to yesterday, the low level vorticity is far more concentrated, and well stacked vertically. As long as the low level center does not move ahead of the convection, it appears that there is a good chance for development into a tropical storm in the short term. Flight operations including all 3 NASA aircraft as well as NOAA aircraft are planned over the next 3 days for this system.
The NHC has also issued an Invest classification on PGI-16L, now AL98, and there is a 50% probability of development within the next 48 hours. The 0600 UTC Ocean Prediction Center places a 1010 hPa low in AL98’s location, and widespread deep convection is occurring around the low. Wind shear is low in this region and SSTs are sufficiently high to support genesis. However, the low is very near land, and should reach the coast of Mexico within the next 24 hours, limiting its chances for development. Elsewhere in the Atlantic, a pair of 1027 hPa subtropical highs is dominating the flow resulting in largely easterly surface winds from Africa through the Gulf of Mexico. A tropical wave which separated from TD3 is being analyzed in the Caribbean at 15N, 80W however no convection is currently associated with this system.

**Forecast: 1800 UTC July 22, 2010**

**TD3:** The primary forecast concern is TD3 which is centered at 22N, 75W moving WNW at 13 kts. Overnight it began to show signs of development and a closed circulation formed. However, several factors are still hindering the development of TD3. This includes mid level dry air to the west of the storm, terrain influences from Cuba, and persistent shear to the west. The cold low is moving faster than the depression, and has moved south and west away from TD3, effectively decreasing the shear immediately over the center of the depression, and changing the direction of the shear from SW to S. The cold low is forecasted to move SW, and as it does so the shear is expected to eventually turn to the SE over TD3, as indicated by the SHIPS text forecast (see 7). While the shear is not expected to be particularly favorable for development, it also is not expected to be extremely unfavorable either. Another consideration of the cold low is that as it moves farther ahead of the depression, the downstream ridging supporting convection near Hispaniola may set up over TD3, creating a more favorable upper level environment.

The model track guidance for TD3 has a fairly good consensus (see 8). Almost all of the 1200 UTC model forecasts bring TD3 between Cuba and the Keys, with the northern most tracks bringing the center over the Keys. Within 36 hours, the system will have emerged into the Gulf, continuing a steady NW heading. Most models then forecast a gradual northward turn, resulting in an eventual landfall along the Louisiana or Northern Texas coasts within 72-96 hours. The National Hurricane Center is predicting a track near the center of the model spread with a landfall in about 84 hours at the Louisiana-Texas border. This track seems reasonable, and should not deviate substantially.

The model intensity forecast spread continues to be split between the statistical-dynamical models, which continue to strengthen the system into a moderate tropical storm before it makes landfall, while the dynamical models show little to no strengthening, and in fact suggest the system will gradually weaken (see 9). Due to the system’s updated classification to a depression, the DSHIPS/LGEM developmental data is now applicable and more stock can be placed in those forecasts. The NHC official forecast lies in the middle of the model spread with very slight strengthening over the next several days before landfall as a 45kt tropical storm, while SHIPS and LGEM suggest a landfall intensity closer to 55kts. Pouch tracking analysis utilizing the GFS and NOGAPS 0000 UTC model forecasts show initially high O-W and Zeta values that quickly decrease, however both level off around the nominal threshold for development, suggesting that further development remains a possibility (see 10). While substantial
strengthening is not anticipated, it seems likely that the system will intensify into a weak tropical storm within the next 24-48 hours.

Links to resources used in discussion:

1a: Montgomery site analysis [http://www.met.nps.edu/~mtmontgo/storms2010.html]

1b: Updated 1200 UTC TPC analysis [http://www.nhc.noaa.gov/tafb/ATSA_12Z.gif]

1c: NHC forecast/warnings graphic [http://www.nhc.noaa.gov/refresh/graphics_at3+shtml/145913.shtml?radii#contents]

2: CIMSS shear product [http://cimss.ssec.wisc.edu/tropic2/real-time/windmain.php?&basin=atlantic&sat=wg8&prod=shr&zoom=&time=]

3: Visible satellite of TD3: [http://www.ssd.noaa.gov/goes/flt/t1/vis-l.jpg]

4/5: [http://isotherm.rsmas.miami.edu/heat/webmini/mini.php]


8/9: 12Z model track and intensity guidance from Clark Evans’ site: [http://moe.met.fsu.edu/~acevans/models/]

10: GFS forecast for pouch tracking (only 00Z available): [http://www.met.nps.edu/~mtmontgo/storms2010/PGI17L/2010072200/gfs/PGI17L.track-gfs.2010072200.gif]

Static Images used in discussion:
1a) 0000 UTC Surface analysis plus Montgomery analysis
1b) Updated 1200 UTC TPC analysis
Surface Wind Field of Tropical Depression Three
Sustained Winds as of 1100 AM EDT Thu Jul 22, 2010  Advisory Number 1

No Sustained Winds of Tropical Storm Force (39 mph) or Greater

Watches:
- Hurricane Watch
- Tropical Storm Watch

Warnings:
- Hurricane Warning
- Tropical Storm Warning

Sustained Winds:
- Hurricane Force
- Tropical Storm Force

Position:
- Center as of 1100 AM EDT
- Past Track

1c) 1500 UTC CIMSS Shear product
3) 1200 UTC visible image

4) SST analysis

SSMI–TMI Sea Surface Temperature: 07/22/2010
5) Ocean Heat Content analysis

Ocean Heat Content (SSMI-TMI SST): 07/22/2010

6) Water Vapor Imagery 1200 UTC
7) SHIPS Forecast July 22

Atlantic TROPICAL DEPRESSION THREE Model Tracks
Valid Time: 1200 UTC 22 July 2010
PGI17L: 5-Day Forecast Based on gfs
Initialized at 2010072200

(a) Track of the Pouch, 700 hPa U and Zeta (5-day average)

(b) 700 hPa Zeta (10^-5 s^-1) - 3x3 deg. box average following the pouch

(c) 700 hPa O\(\lambda\) (10^-5 s^-1) - 3x3 deg. box average following the pouch

(d) 700 hPa RH (%) - 3x3 deg. box average following the pouch

(e) Pouch & Deep Vertical Shear (m/s) - 3x3 deg. box as above