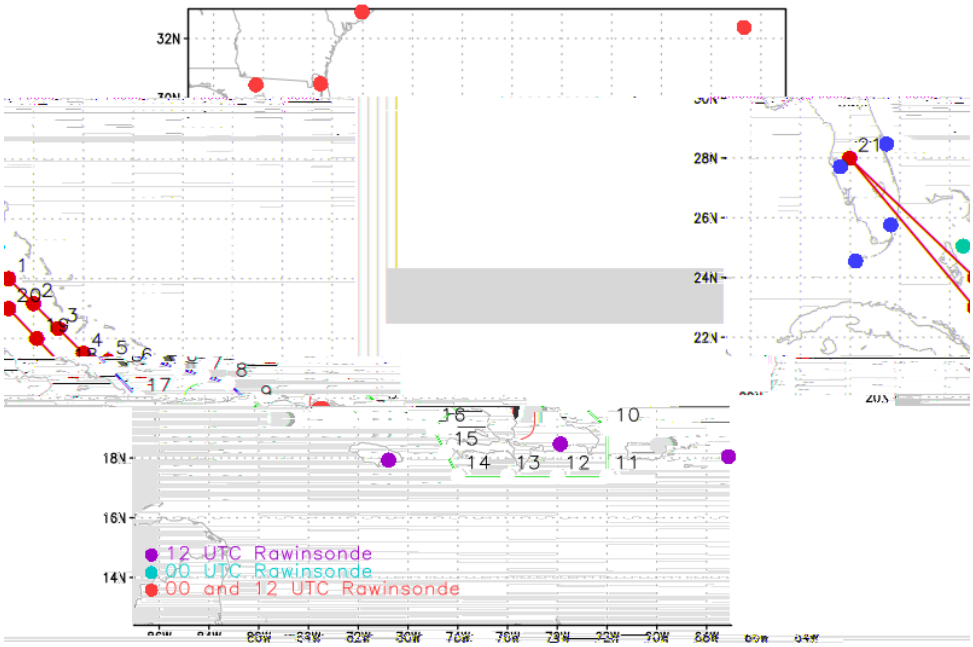
NOAA / AOML / Hurricane Research Division
2021 Hurricane Field Program
Advancing the Prediction of Hurricanes Experiment (APHEX)

FLIGHT LOG -- 20210811H1

MISSION PLAN			
FLIGHT ID	20210811H1	**STORM**	AL06 / FRED
MISSION ID	0406A	**TAIL NUMBER**	NOAA42
TASKING	EMC	**PLANNED PATTERN**	Survey
MISSION SUMMARY			
TAKEOFF [UTC]	1946	**LANDING [UTC]**	0314
TAKEOFF LOCATION	Lakeland	**LANDING LOCATION**	Lakeland
FLIGHT TIME	7.5	**BLOCK TIME**	7.9
TOTAL REAL-TIME RADAR ANALYSES (Transmitted)	2 (2)	**TOTAL DROPSONDES (Good/Transmitted)**	22 (21/21)
OCEAN EXPENDABLES (Type)	None	**sUAS (Type)**	None
APHEX EXPERIMENTS / MODULES	Early Stage Experiment: AIPEX		
HRD CREW MANIFEST			
LPS ONBOARD	Zawislak	**LPS GROUND**	Rogers
TDR ONBOARD	Zawislak	**TDR GROUND**	Alvey, Gamache
ASPEN ONBOARD	Sellwood	**ASPEN GROUND**	None
NESDIS SCIENTISTS	None		
GUESTS (Affiliation)	None		
AOC CREW MANIFEST			
PILOTS	Mitchell, Rannenberg, Copare		
NAVIGATOR	Urato		
FLIGHT ENGINEERS	Darby, Wysinger		
FLIGHT DIRECTOR	Carpenter		
DATA TECHNICIAN	Mascaro		
AVAPS	Underwood		

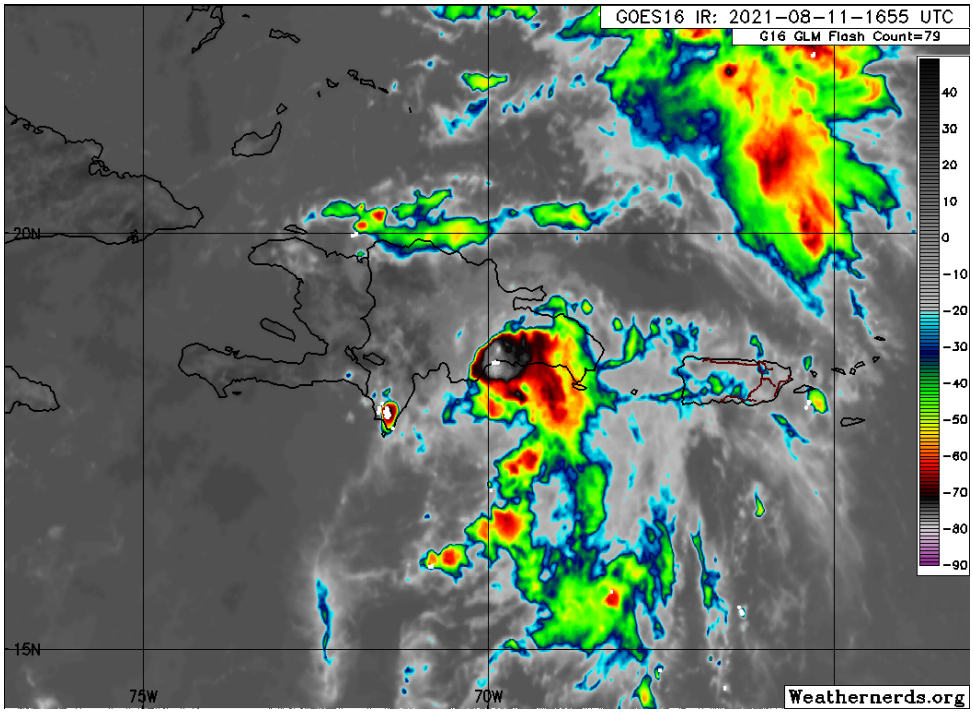
NOAA / AOML / Hurricane Research Division
2021 Hurricane Field Program
Advancing the Prediction of Hurricanes Experiment (APHEX)

FLIGHT LOG -- 20210811H1

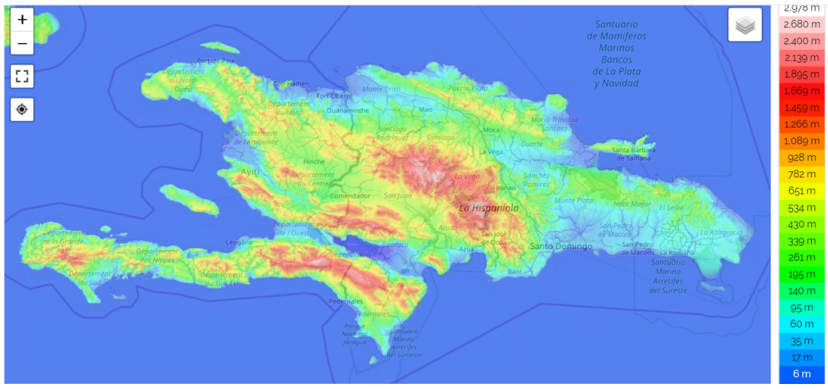
PRE-FLIGHT	
Flight Plan	 Fly an EMC-tasked survey mission around TS Fred, which is currently inland over southeast Hispaniola. Storm remains rather disorganized, with a displaced circulation between the low-level center (LLC) along the south coast of the Dominican Republic and a region of convection to the southeast earlier in the day. Today's mission will be important for documenting the environment, including the humidity in advance of the storm. The P-3 will fly as high as possible (likely around 20,000 ft) during the ferry down and along the north coast of Hispaniola. As the plane gets south of the island it will likely have to descend to 10,000 ft due to precipitation.
Expendable Distribution	Dropsondes will be released at all numbered points indicated in the diagram. There is the potential for some supplemental drops to be released in support of the ONR/TCRI project, but this is unlikely.

NOAA / AOML / Hurricane Research Division
2021 Hurricane Field Program
Advancing the Prediction of Hurricanes Experiment (APHEX)

FLIGHT LOG -- 20210811H1

Preflight Weather Briefing	Over the past few hours, convection has developed over and to the north of the LLC as it's traveled along the south coast.  This convective flare-up may have been related to terrain and topographic interactions with the mountainous region of Hispaniola.

FLIGHT LOG -- 20210811H1

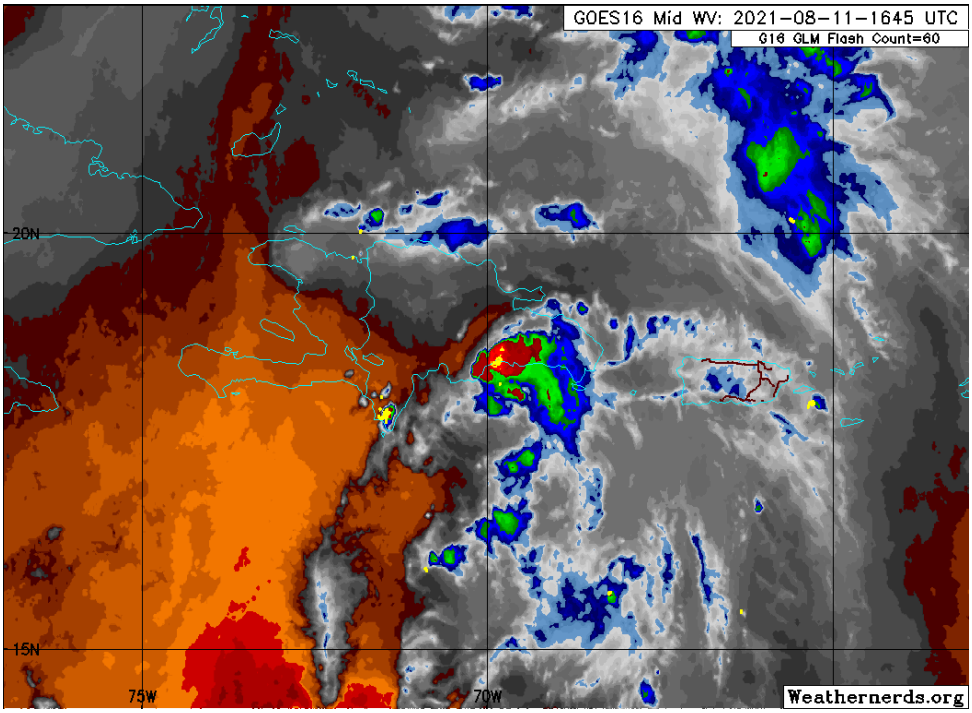


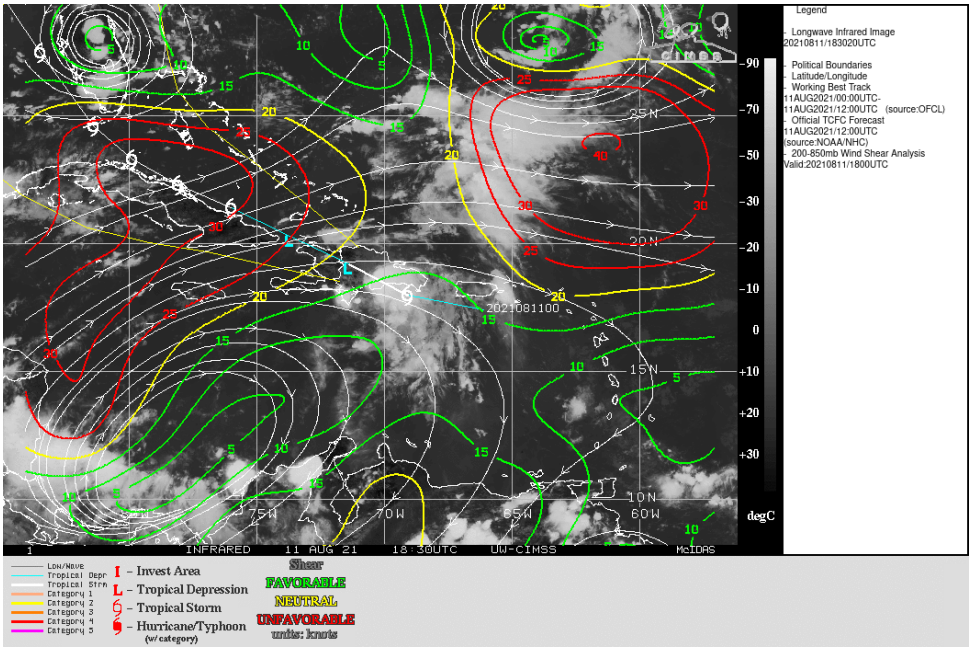
Regardless, this indicates a tightening of the circulation and possible alignment. Whether that alignment persists as the storm gets further into the high terrain remains to be seen.

The other big uncertainty is where the LLC emerges from Hispaniola, what kind of structure it has upon emergence, and what the environment looks like moving forward in time. The forecasts generally keep Fred along the north coast of Cuba before turning slightly rightward as it approaches south Florida/Keys. There is dry air to the north and west of the system which has been providing a fairly hostile environment for the convection (prior to Hispaniola interaction), as has some shear.

NOAA / AOML / Hurricane Research Division
2021 Hurricane Field Program
Advancing the Prediction of Hurricanes Experiment (APHEX)

FLIGHT LOG -- 20210811H1





Models seem to be suggesting the potential for a weakening of the shear

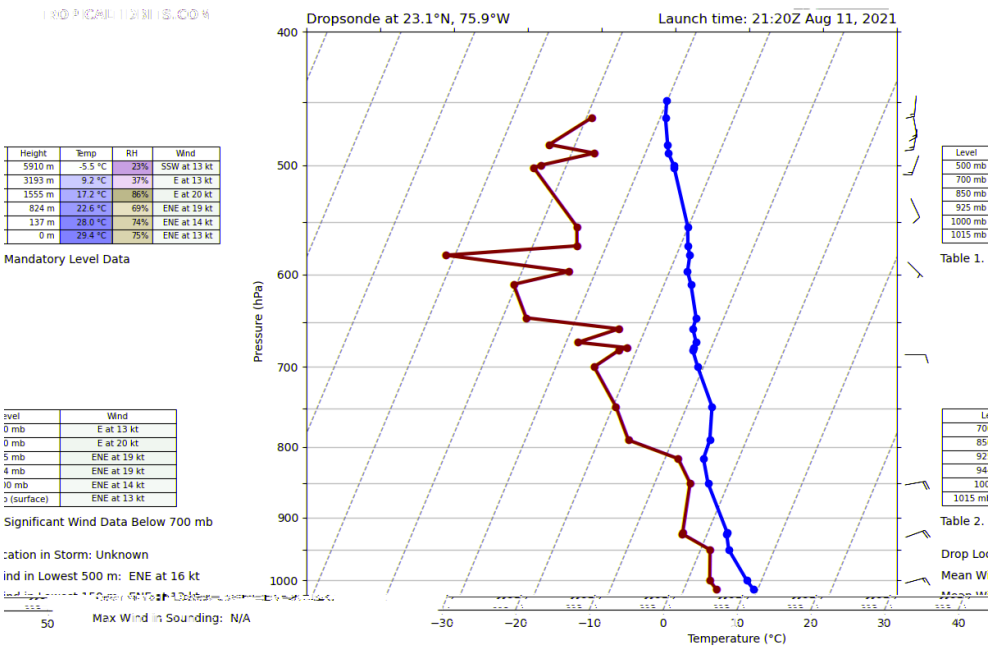
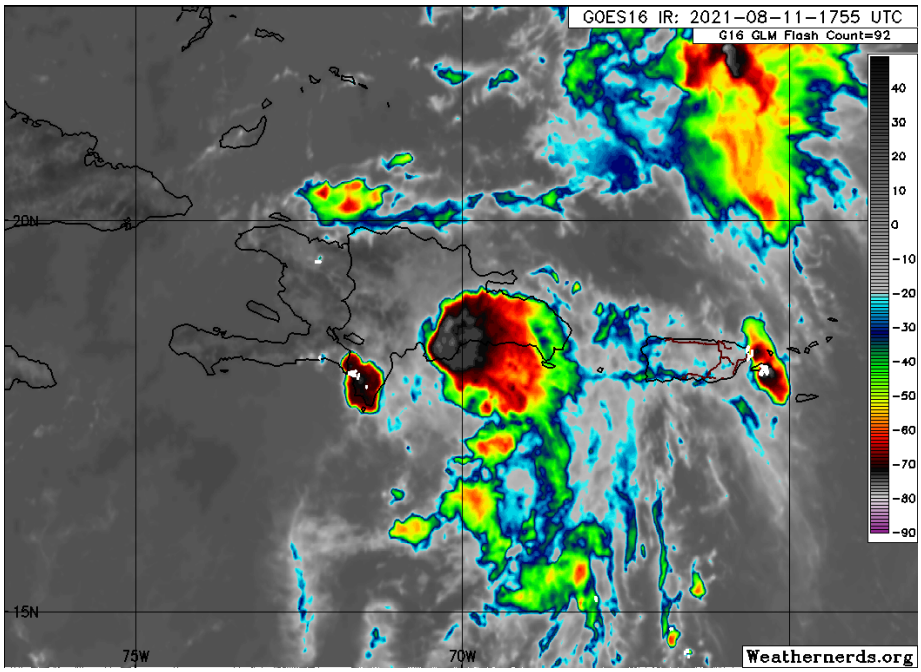
FLIGHT LOG -- 20210811H1

	as Fred approaches Florida, though, and intensification is possible over the warm waters of the Florida Straits. On the other hand, if the circulation is substantially disrupted over Hispaniola, it will have a hard time reorganizing over water, and/or it could track along the spine of Cuba. It's the complex interactions among a weak, disorganized system, complicated environment of shear and dry air, and terrain/topographic interactions that make this an exceedingly challenging forecast.
Instrument Notes	Tail Doppler Radar (TDR) is working fine. There are some issues with the automated transmission of TDR status for situational awareness, but otherwise the instrument is working fine.

IN-FLIGHT	
Time [UTC]	**Event**
1946	Takeoff from Lakeland, FL
2015	Working on some issues with the real-time transmission of TDR status. Does not affect the operation of the TDR, but does impact the ability to monitor the status of the radar from the ground. That just means that the airborne science crew will have to monitor the status closely.
2106	Sonde 1 released, from 21.1 kft
2108	Sonde 2, backup drop for sonde 1. Dry air ahead of the system is evident.

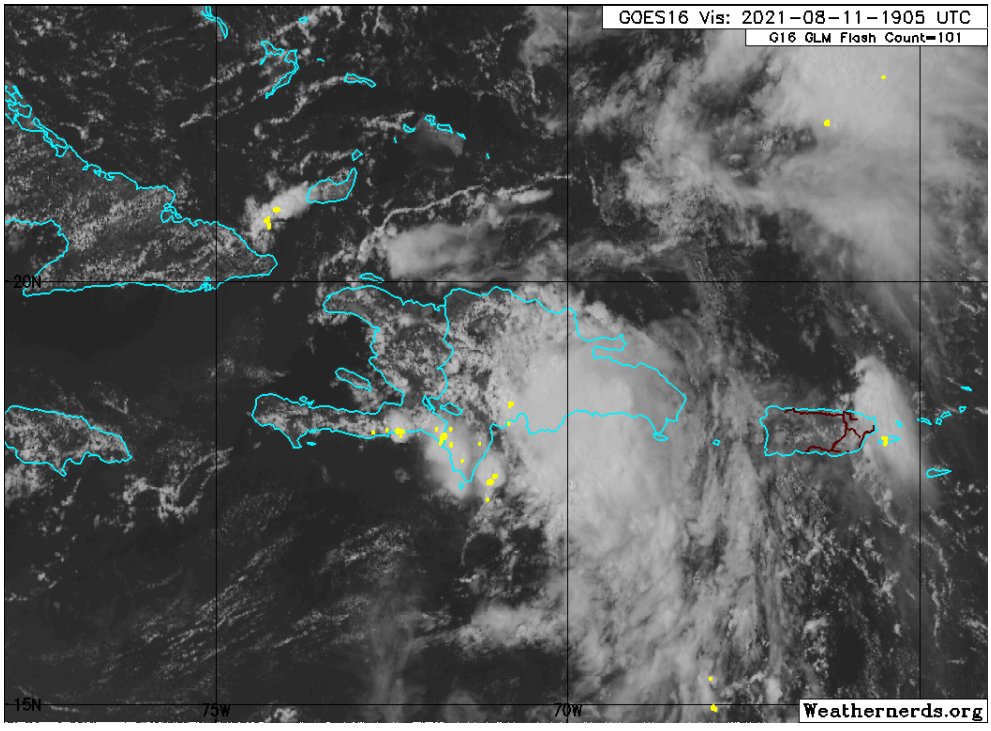
NOAA / AOML / Hurricane Research Division
2021 Hurricane Field Program
Advancing the Prediction of Hurricanes Experiment (APHEX)

FLIGHT LOG -- 20210811H1

	
2119	IR presentation becoming more ragged. Cellular convection looks tied to topographic peaks. Stratiform precipitation displaced to the southeast; i.e., downshear 

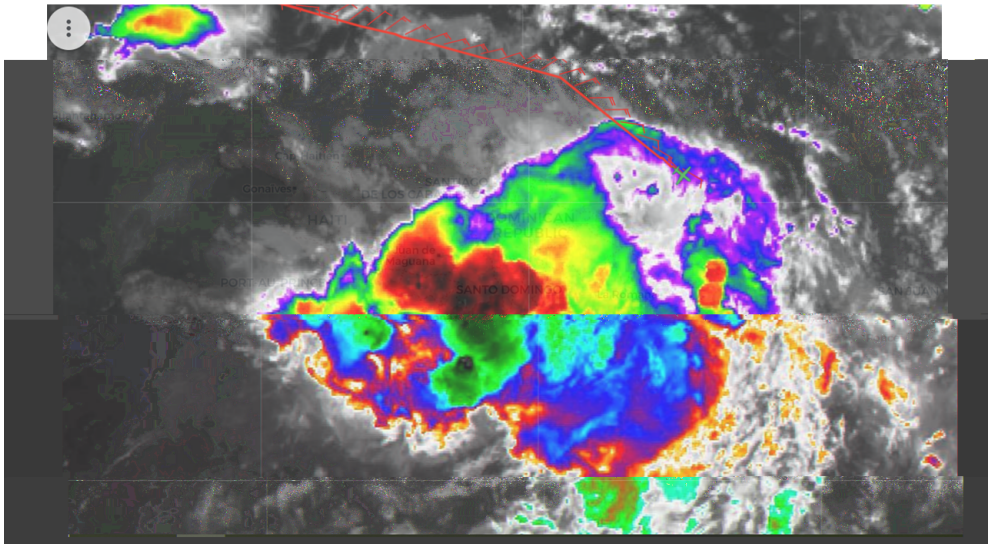
NOAA / AOML / Hurricane Research Division
2021 Hurricane Field Program
Advancing the Prediction of Hurricanes Experiment (APHEX)

FLIGHT LOG -- 20210811H1

2120	Sondes 3 and 4 released at point 2. Backup needed for sonde 3 because of no launch detect.
2133	Sonde 5 at point 3
2148	Sonde 6 at point 4
2201	Sonde 7 at point 5
2211	Sonde 8 at point 6
2222	Sonde 9 at point 7
2228	North of island now, no deep convection, just congestus
2233	Sonde 10 at point 8
2238	Last visible as sun sets shows convection continuing to flare associated with presumed location of LLC, but also likely related to topographic interactions. Lightning associated with convective elements too, in southwest part of island and probably west of LLC 

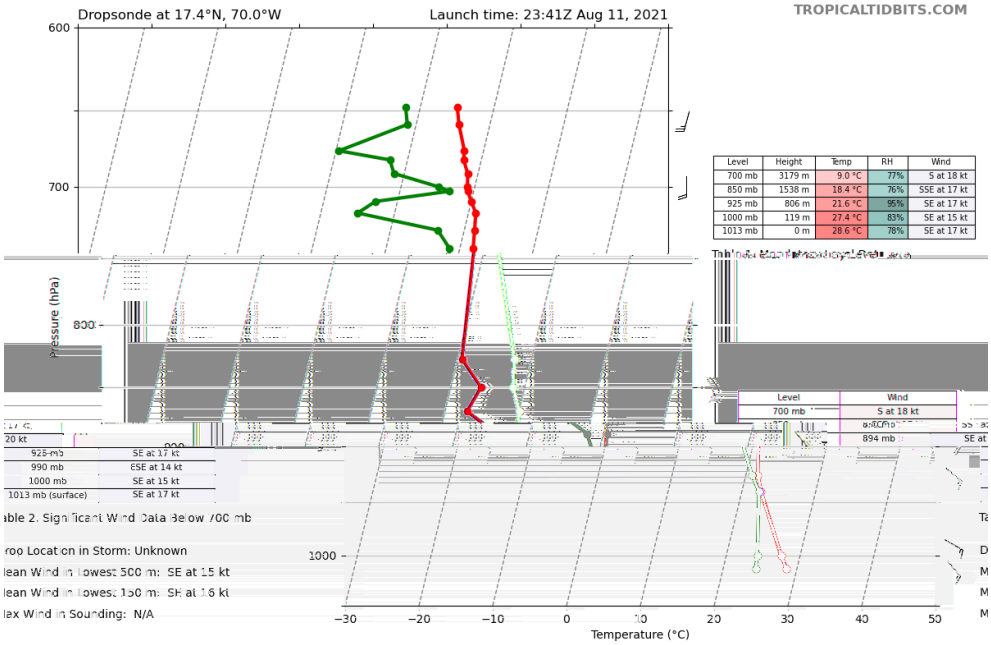
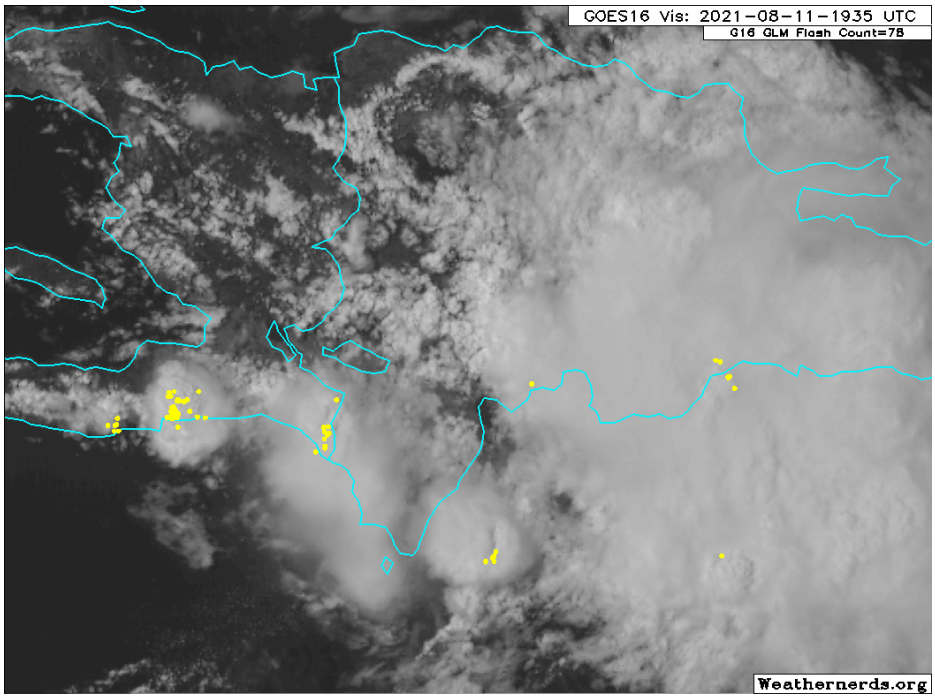
NOAA / AOML / Hurricane Research Division
2021 Hurricane Field Program
Advancing the Prediction of Hurricanes Experiment (APHEX)

FLIGHT LOG -- 20210811H1

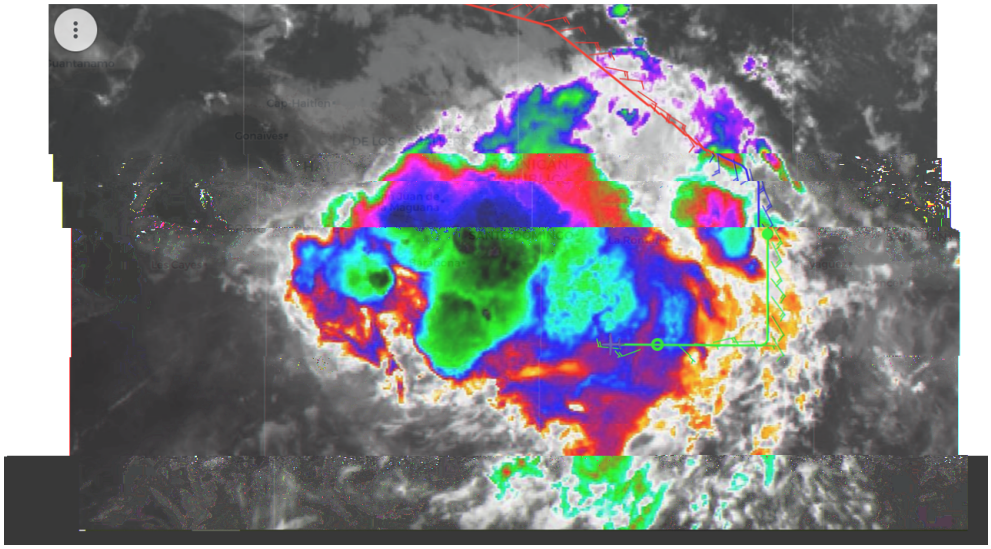
2245	Begin first leg of TDR analysis. Cloudiness has been steadily increasing. Overcast below flight level, some weak echo here. 
2247	Sonde 11 at point 9
2257	Climbed to 23.2 kft to get above stratus deck
2302	Sonde 12 at point 10. More moist environment south of the island here.

NOAA / AOML / Hurricane Research Division
2021 Hurricane Field Program
Advancing the Prediction of Hurricanes Experiment (APHEX)

FLIGHT LOG -- 20210811H1

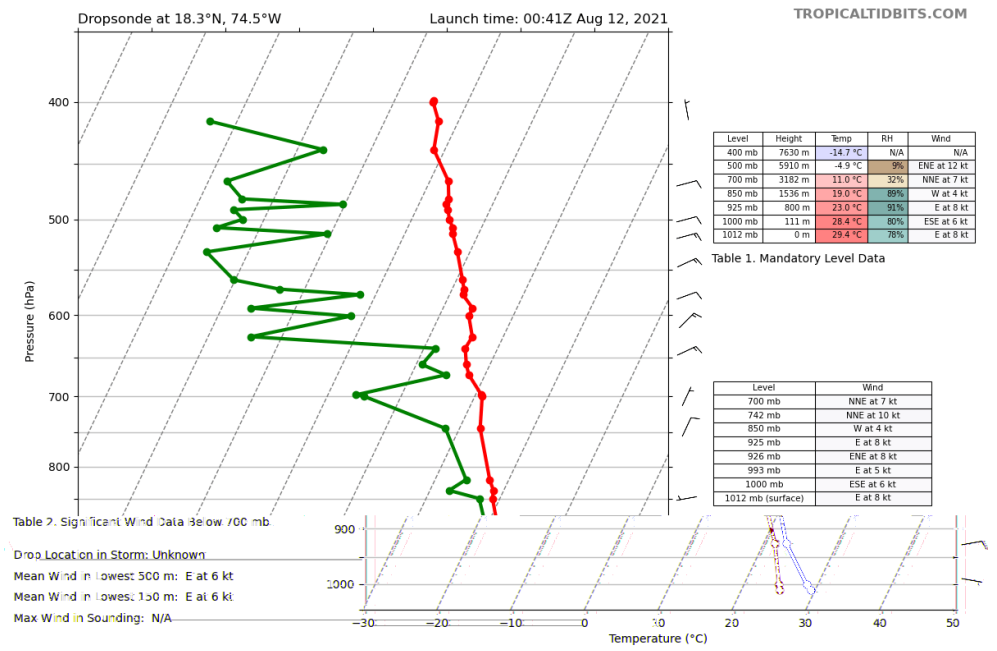
	
2305	Center is hard to spot, but zoomed in visible image suggests a LLC could be near the northern coast of Hispaniola and the Haiti/DR border 

FLIGHT LOG -- 20210811H1

	If that is the case, then deep convection and likely midlevel center is displaced pretty substantially to the southeast of the LLC
2318	Sonde 13 at point 11
2332	Descending to 10kft now that flying in darkness
2335	End radar leg 1
2335	Begin radar leg 2
2338	Traveling west off the south coast of Hispaniola now. Encountering stratiform precipitation about 25-30 n mi to the north. 
2341	Sonde 14 at point 12.
2358	8PM NHC intermediate advisory came out, downgraded to a tropical depression. But the estimated center does look to be pretty close to that LLC identified in zoomed in visible image from 2305 UTC.
0000	Aircraft mostly in heavy stratiform, but some echo tops up to 15 km to the north
0008	Sonde 15 at point 13. Moving into dryer air again to the southwest of the island.

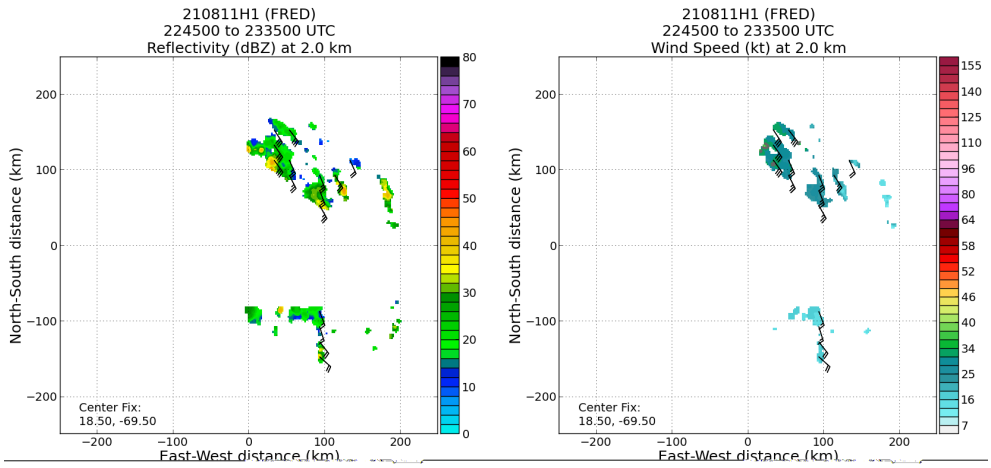
NOAA / AOML / Hurricane Research Division
2021 Hurricane Field Program
Advancing the Prediction of Hurricanes Experiment (APHEX)

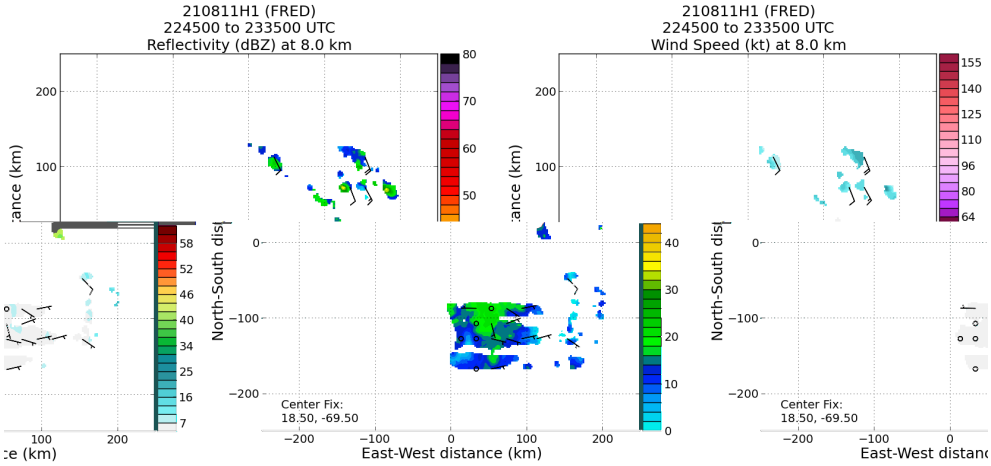
FLIGHT LOG -- 20210811H1

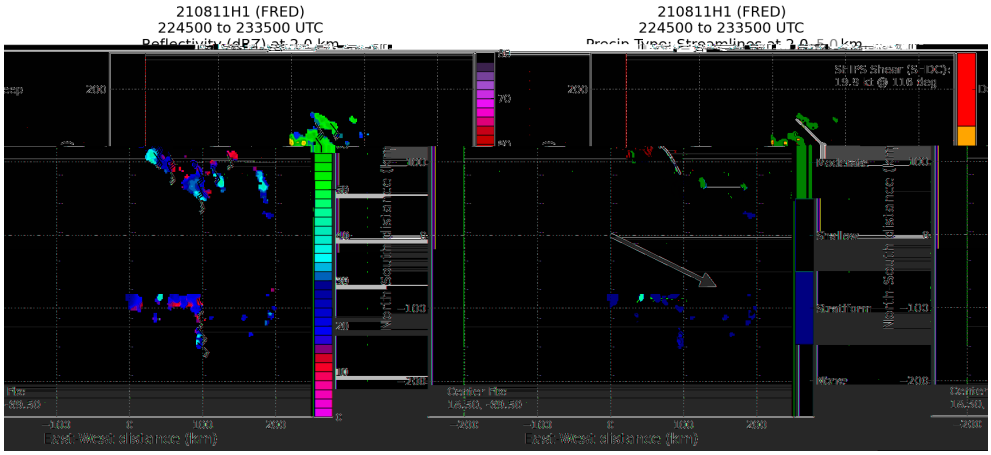
	
0014	Out of precipitation, climbing now
0026	Leveled off at 22 kft
0032	Sonde 16 at point 14
0033	Analyses from the first radar leg are in. Coverage is quite limited. There is a suggestion of a very weak-flow region at 8 km altitude in the southeast part of the domain, and straight southeast flow at 2 km altitude. That weak-flow region has suggestions of midlevel convergence downshear. This is where there was moderate convection and stratiform precipitation indicated. Again, though, coverage is spotty at best.

NOAA / AOML / Hurricane Research Division
2021 Hurricane Field Program
Advancing the Prediction of Hurricanes Experiment (APHEX)

FLIGHT LOG -- 20210811H1

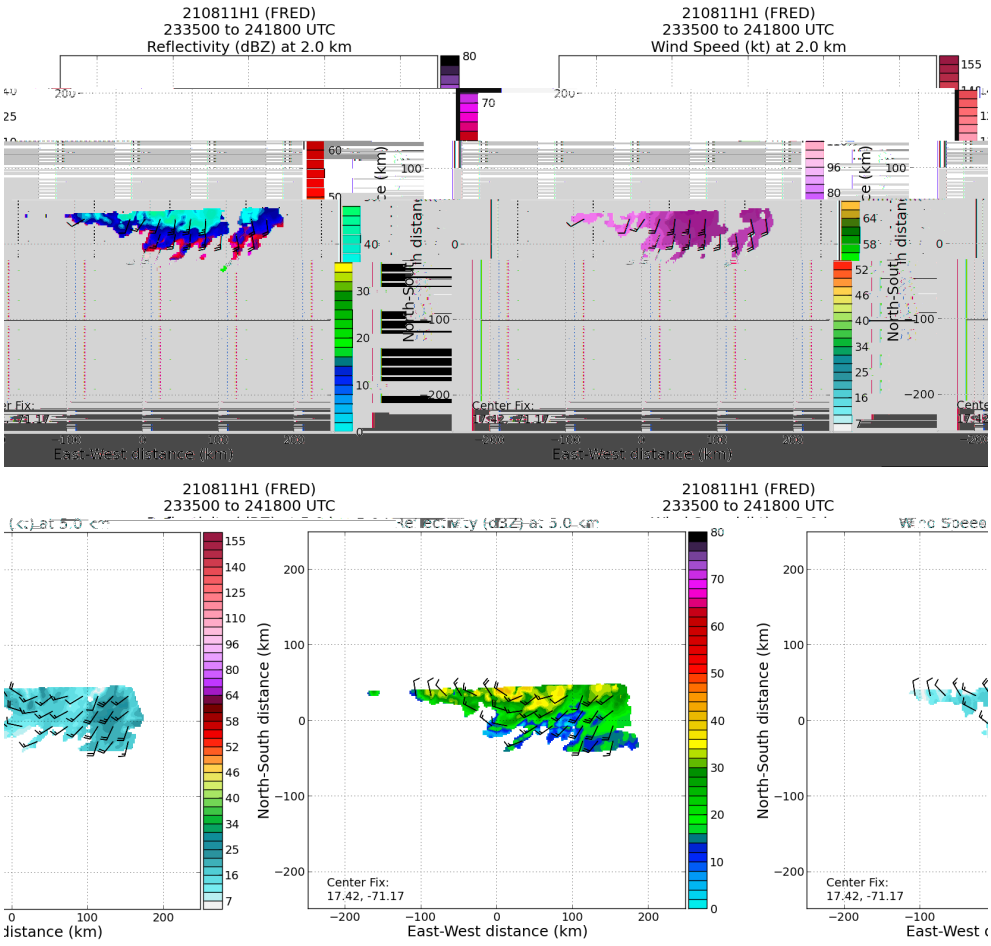






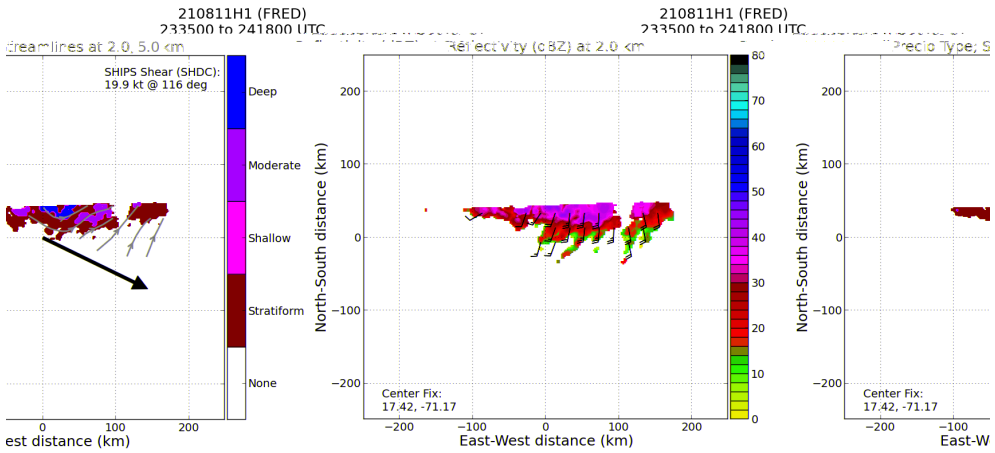
NOAA / AOML / Hurricane Research Division
2021 Hurricane Field Program
Advancing the Prediction of Hurricanes Experiment (APHEX)

FLIGHT LOG -- 20210811H1

0041	Climbing to 26 kft
0041	Sonde 17 at point 15
0053	Sonde 18 at point 16
0107	Sonde 19 and point 17
0108	Analysis from the second pass, from east to west along the southern coast of Hispaniola. Better coverage on this leg. Solid southerly flow at 2 km altitude, and clear curvature in the flow at 5 km to the north of the flight track. This curvature is coincident with a region of deep convection. 

NOAA / AOML / Hurricane Research Division
2021 Hurricane Field Program
Advancing the Prediction of Hurricanes Experiment (APHEX)

FLIGHT LOG -- 20210811H1

	
0125	Sonde 20 at point 18
0141	Sonde 21 at point 19
0157	Sonde 22 at point 20

POST-FLIGHT	
Mission Summary	Mission to investigate the structure of TS Fred and its environment was completed successfully. The mission was challenging because the storm was located over Hispaniola the entire time. With limited scatterers over much of the system and the displacement from the circulation center, there was limited coverage from the TDR. However, some structures were able to be inferred, including a possible formation of a midlevel center (at 8 km) from the first radar pass, and a pretty clear region of cyclonic curvature co-located with deep convection at 5 km altitude from the second pass. This all suggests a fairly diffuse midlevel circulation with possible multiple circulations. The actual LLC was not clearly detected by the radar. Satellite imagery suggested that the LLC was displaced substantially to the northwest of the convective mass where the aforementioned midlevel centers were seen. Such an orientation is consistent with the northwesterly shear that's been impacting the system for the past 24-36 h. Visible animations suggested that the LLC may have become decoupled from the midlevel center(s) and associated convection. It remains to be seen what will happen to the LLC as it emerges off the northern coast.

FLIGHT LOG -- 20210811H1

	Dropsondes showed the dry air ahead of Fred, to the north and west of the system. Relative humidity values of 10-35% were seen above 700 hPa in these regions. If these humidity conditions persist, it will make it hard for convection to persist and redevelop the low-level circulation. The presence of shear will make that even harder. The pattern was flown as drawn, with no deviations. The aircraft flew at altitudes as high as 22-23 kft in precipitation-free regions. This will help greatly for the dropsonde profiles. A total of 22 sondes were dropped, 21 were transmitted. Two tail Doppler radar analyses were completed and transmitted. No merger of analyses was created because of the disorganized nature of the system and the uncertain center locations. No ocean drops. All sondes were charged to NWS.
Actual Standard Pattern Flown	No standard pattern, but a survey circumnavigation of Hispaniola
APHEX Experiments / Modules Flown	Data collection could support research for the *Early Stage Experiment: AIPEX*
Plain Language Summary	● P-3 mission sampled the structure of a weak tropical storm Fred that was dealing with a hostile environment (wind shear and dry air) while also encountering steep mountains as it made landfall in Hispaniola ● High-level dropsondes from the P-3 documented the distribution of the dry air in the environment ahead of Fred, while the tail Doppler radar provided information on the complicated structure of the wind field of Fred's inner core ● This information proved helpful to NHC in assessing the weakening of Fred while also helping EMC in setting the initial structure of Fred and its environment for its model runs
Instrument Notes	Instruments worked well. Two dropsondes failed.

NOAA / AOML / Hurricane Research Division
2021 Hurricane Field Program
Advancing the Prediction of Hurricanes Experiment (APHEX)

FLIGHT LOG -- 20210811H1

Final Mission Track