

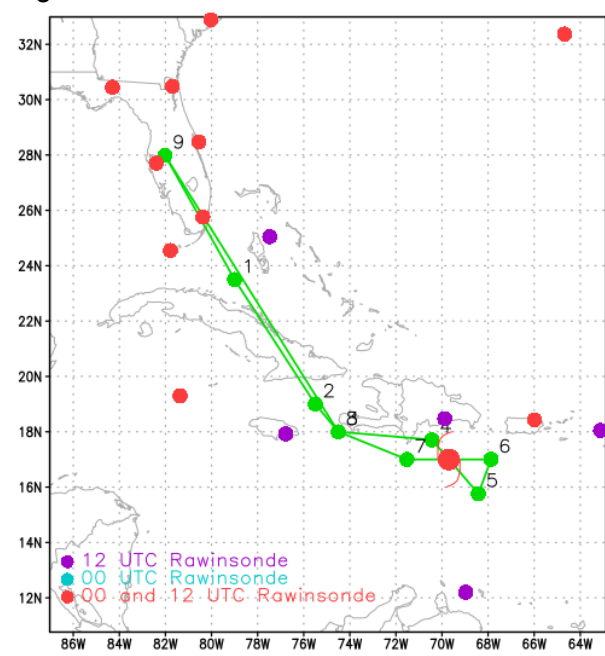
**NOAA / AOML / Hurricane Research Division  
2021 Hurricane Field Program  
Advancing the Prediction of Hurricanes Experiment (APHEX)**

**FLIGHT LOG -- 20210816H1**

MISSION PLAN			
FLIGHT ID	20210816H1	STORM	AL07 / GRACE
MISSION ID	0507A	TAIL NUMBER	NOAA42
TASKING	EMC	PLANNED PATTERN	Fig. 4
MISSION SUMMARY			
TAKEOFF [UTC]	0753Z	LANDING [UTC]	1527Z
TAKEOFF LOCATION	Lakeland	LANDING LOCATION	Lakeland
FLIGHT TIME	7.6	BLOCK TIME	
TOTAL REAL-TIME RADAR ANALYSES (Transmitted)	2	TOTAL DROPSONDES (Good/Transmitted)	14 (12/12)
OCEAN EXPENDABLES (Type)	None	sUAS (Type)	None
APHEX EXPERIMENTS / MODULES	Genesis experiment: PREFORM		
HRD CREW MANIFEST			
LPS ONBOARD	Aberson	LPS GROUND	Holbach
TDR ONBOARD	Aberson	TDR GROUND	Fischer, Reasor
ASPEN ONBOARD	Aberson	ASPEN GROUND	None
NESDIS SCIENTISTS	None		
GUESTS (Affiliation)	None		
AOC CREW MANIFEST			
PILOTS	Abitbol, Shaw, Stateler		
NAVIGATOR	Utama, B. Richards		
FLIGHT ENGINEERS	Sanchez, Stokes		
FLIGHT DIRECTOR	Hathaway, Lundry		
DATA TECHNICIAN	T. Richards		
AVAPS	Warnecke		

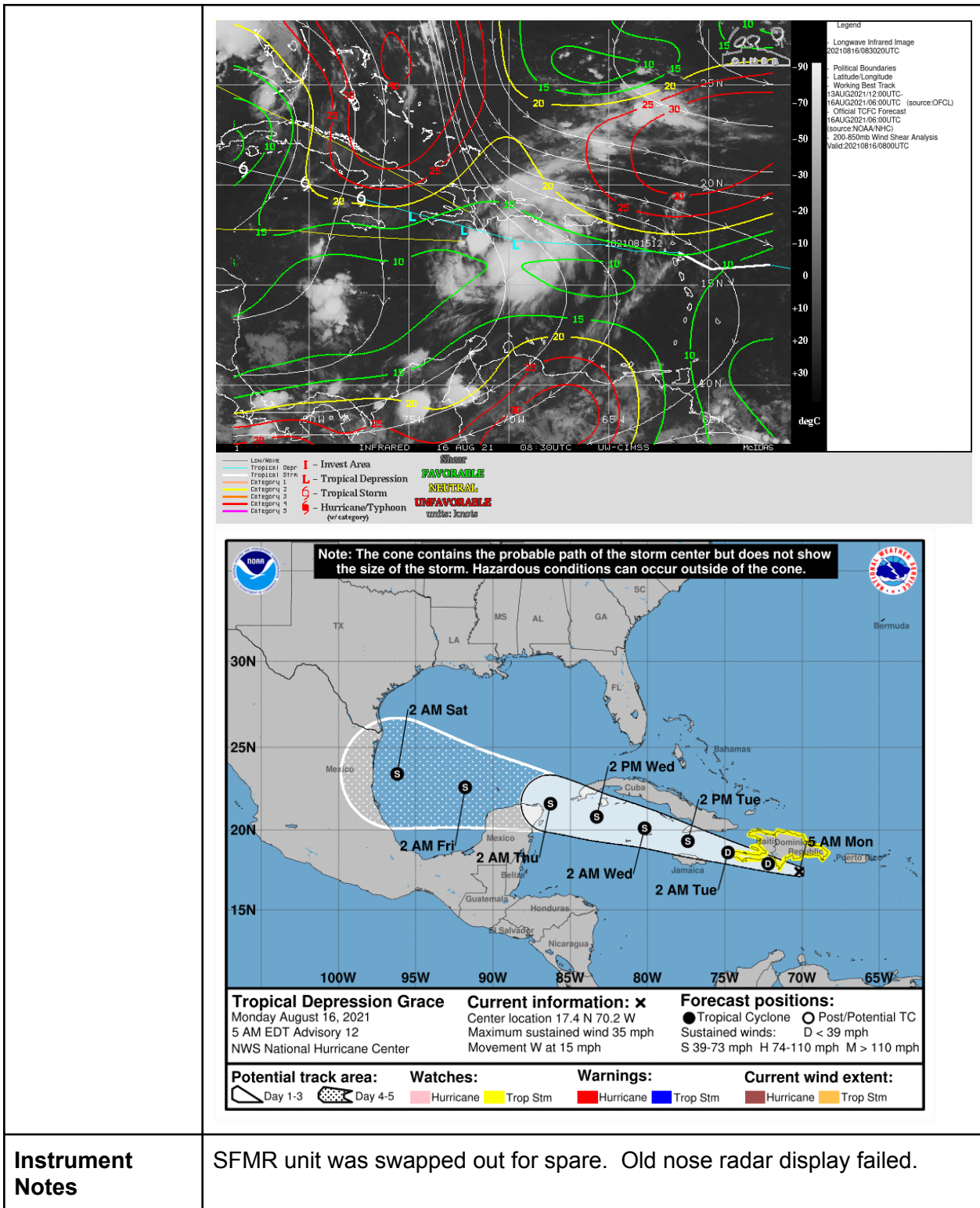
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PRE-FLIGHT	
<b>Flight Plan</b>	<p>Flight altitude 10 kft</p>  <p>Flight track was modified at pre-flight to obtain a little better coverage given the proximity of Grace to Hispaniola. Plan is to come in from the west, going out 135. North to the coast, inbound to the center, out 225, then home.</p>
<b>Expendable Distribution</b>	<p>Dropsondes during the ferry to the storm, endpoints, midpoints, and center of each pass.</p>
<b>Preflight Weather Briefing</b>	<p>Grace remains a 30 kt Tropical Depression moving west at 13 kt at 9Z. Minimum sea-level pressure estimated at 1010 mb. Center located at 17.4N 70.2W. NHC discussion noted an "ASCAT-B overpass showed that the circulation is elongated from the NE-SW". UW-CIMSS analyzed shear around Grace is about 10-15 kt. Forecasted track keeps Grace on the southern side of Hispaniola and continuing WNW as the ridge to the north remains strong.</p>

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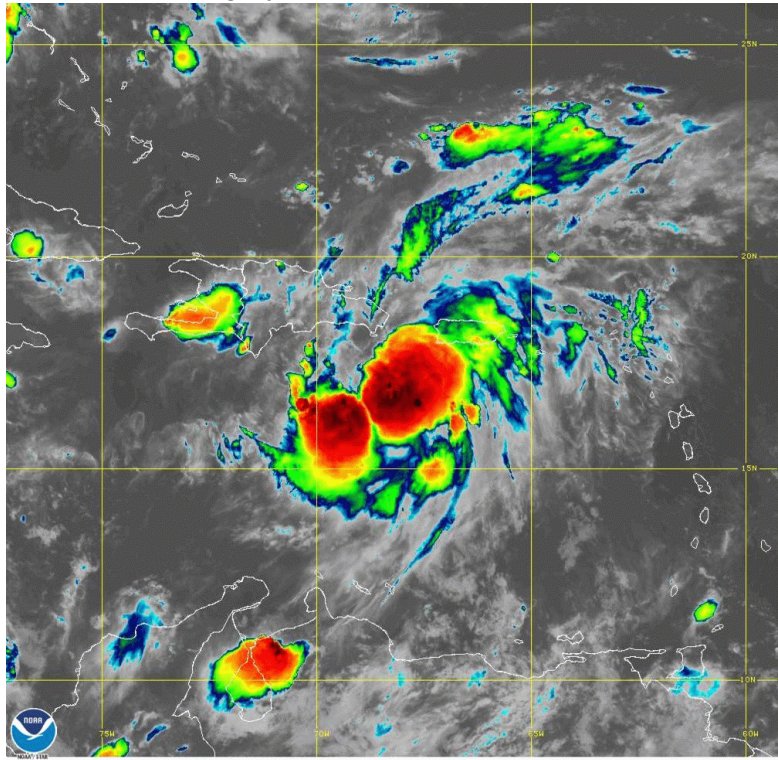


**Instrument Notes**

SFMR unit was swapped out for spare. Old nose radar display failed.

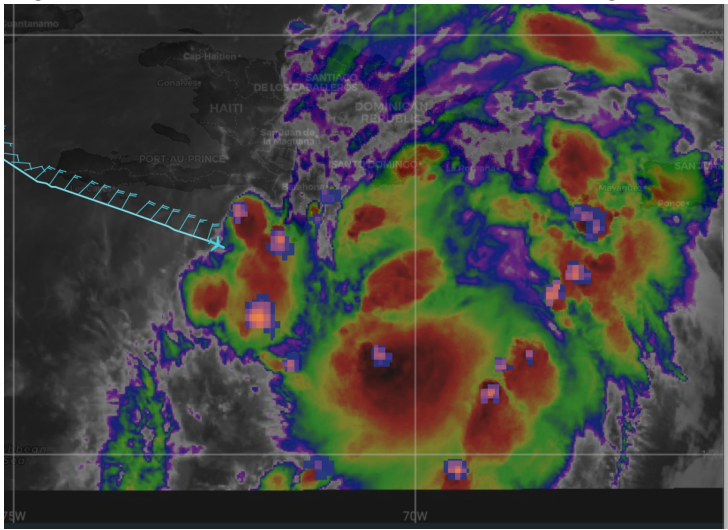
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IN-FLIGHT	
Time [UTC]	Event
0753	Takeoff
0859	Drop #1 (pt 1, ferry between FL and Cuba): 23.87N 78.37W
0957	Drop #2 (pt 2, ferry S of Cuba): 19.14N 75.51W
1013	Drop #3 (pt 3, ferry tip of Haiti): 18.19N 74.44W
1015	GOES-16 IR Imagery  <p style="font-size: small; text-align: center;">16 Aug 2021 01:10Z NOAA/NESDIS/STAR GOES-East Band 13 TD Grace</p>
1028	Beginning descent to IP
1032	Nice cells showing up on MMR. GOES-16 GLM indicates lightning present

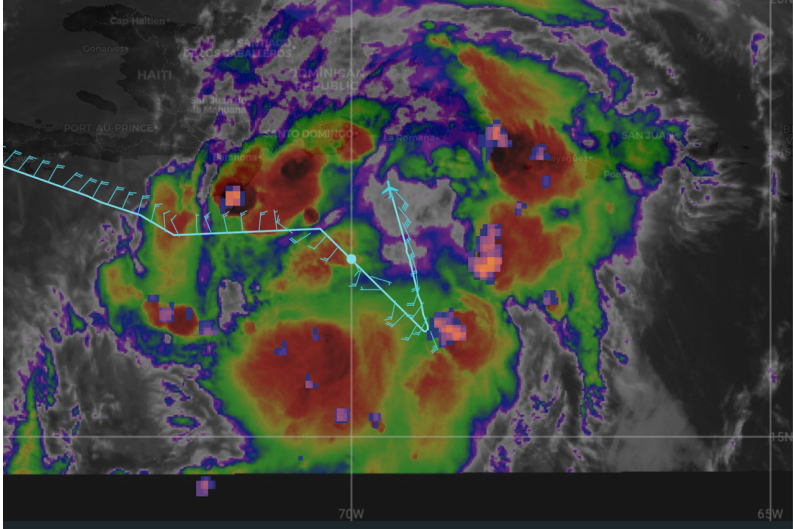
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	and crew confirmed. Starting leg 1 a little further south to avoid needing to turn in pattern to avoid the cell just south of Haiti.
1036	Flight track with GOES-16 IR and GLM showing the cells mentioned above. 
1041	IP, tracking inbound at 86°
1041	Drop #4 (IP, pt 4): 17.32N 72.13W
1051	Sim noted that the MMR was indicating the possible center well to their left. Plan is to continue straight and steady for this leg and if winds show the center is further north they will adjust to that position for the second pass. Sim estimates the MMR-based center to be around 17.65N 70.65W.
1055	Drop #5 (midpoint IP-center): 17.36N 71.15W Lost telemetry just after release
1058	Drop #6 (midpoint backup sonde): 17.37N 70.91W lost telemetry after release. Sim noted that both of these sondes had similar serial numbers and were likely manufactured on the same day
1100	Estimated center from FL winds is 17.63N 70.73W
1103	Drop #7 (center): 17.39N 70.50W quasi-center sonde 1009.7 mb surface 19 kt wind
1105	Turning southeast. Sim noted lots of curved bands now on radar.
1117	Drop #8 (midpoint center-pt 5): 16.78N 69.72W

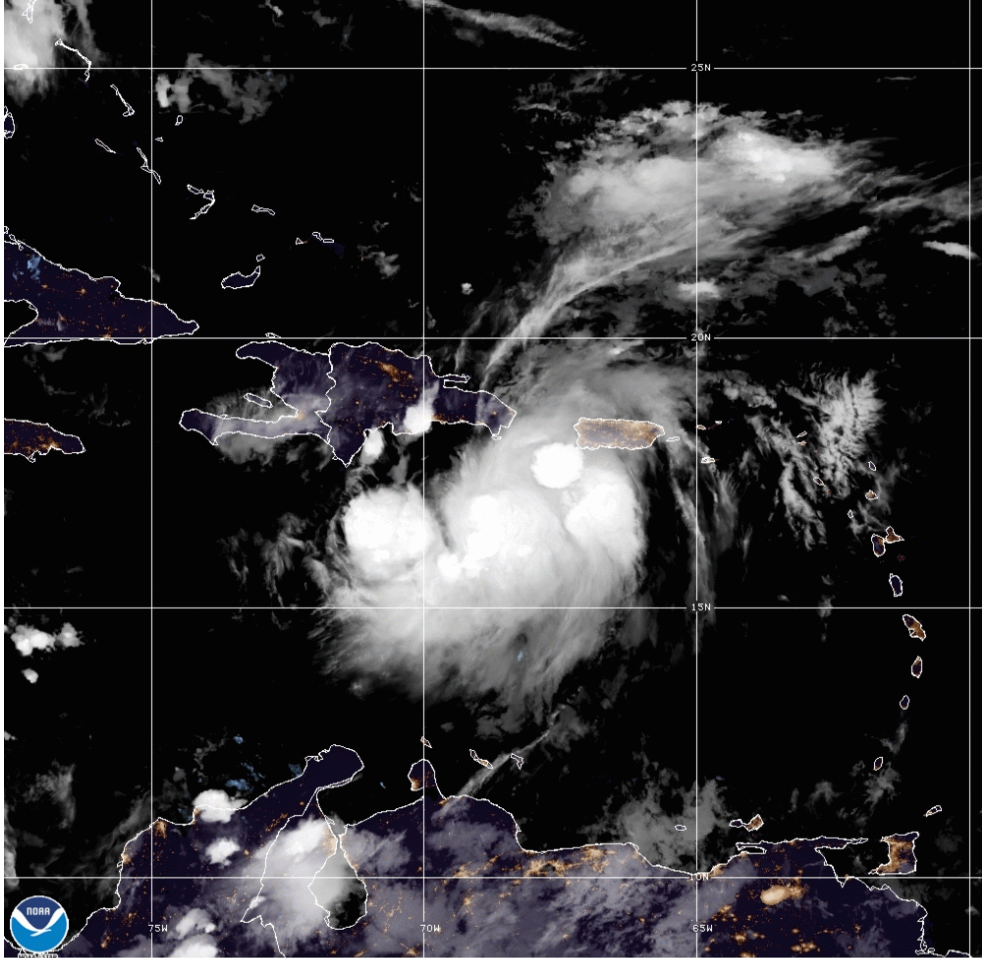
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1128	Drop #9 (pt 5): 16.24N 69.16W
1129	Turning N to pt 6
1142	Troubleshooting TDR jobfile download.
1150	Restarting TDR workstation to see if that resolves the issue
1151	Flight track after first leg and partial downwind 
1156	Drop #10 (pt 6): 18.23N 69.65W
1156	Turning inbound at pt 6
1200	GOES-16 true color imagery

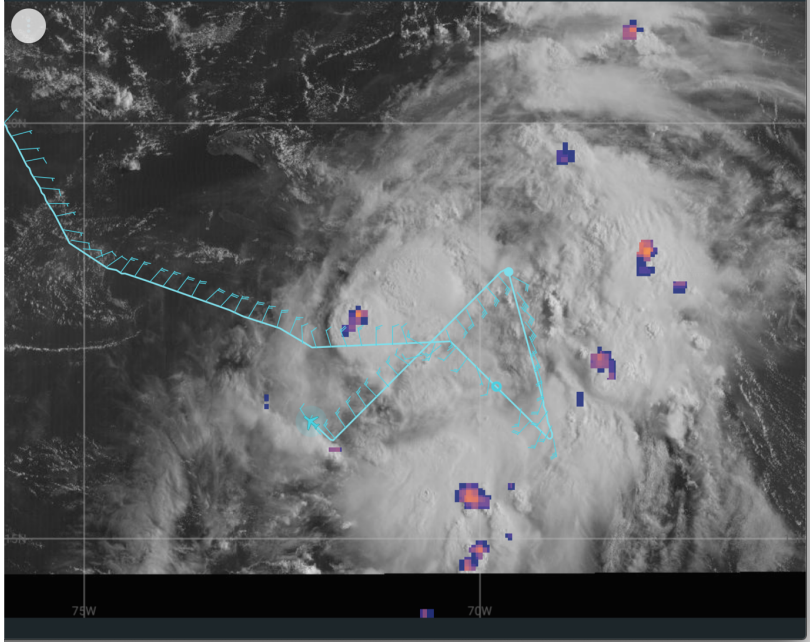
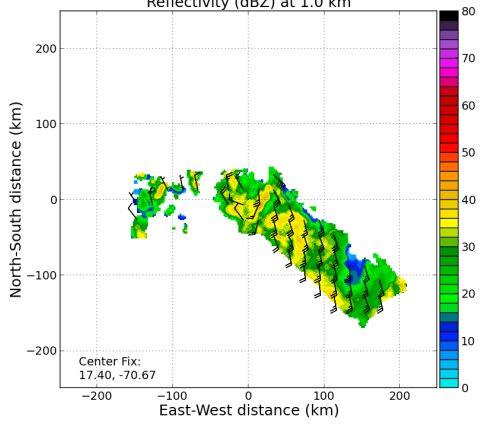
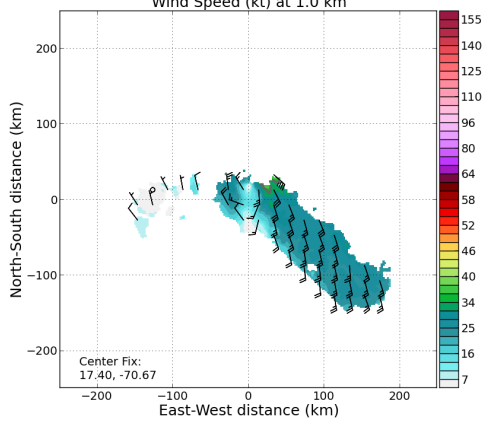
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	 <p style="text-align: center;">16 Aug 2021 03:30Z NOAA/NESDIS/STAR GOES-East GEOCOLOR</p>
1206	Drop #11 (midpoint pt 6-center): 17.82N 70.17W
1216	Drop #12 (center): 17.34N 70.67W Sim noted a square of convection, like a square eyewall, and they were riding it upwind. He thought the center would be to their right, but the wind went down to 6 kt, so they released a sonde.
1227	Drop #13 (midpoint center-pt 7): 16.80N 71.22W
1238	Turning for home. Sim notes a nice cell near the end point and curved band.
1239	Drop #14 (pt 7): 16.21N 71.84W
1243	Final flight track on MTS

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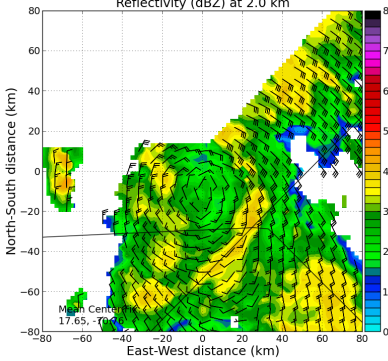
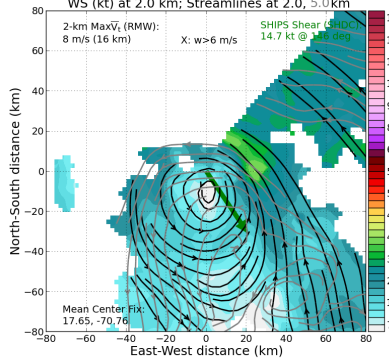
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<p>1244</p>	<p>Todd rebooted the satcom and that fixed the error with the TDR job processing!</p>
<p>1301</p>	<p>First TDR analysis shows much better defined low-level circulation than previous flights by N43</p> <div style="display: flex; justify-content: space-around;"> <div> <p style="text-align: center;">210816H1 (GRACE) 104221 to 112901 UTC Reflectivity (dBZ) at 1.0 km</p>  </div> <div> <p style="text-align: center;">210816H1 (GRACE) 104221 to 112901 UTC Wind Speed (kt) at 1.0 km</p>  </div> </div>
<p>1332</p>	<p>Final TDR composite zoom graphic depicting coherent low level circulation, but competing circulations at 5 km.</p>



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	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>210816H1 (GRACE) 104221 to 125634 UTC Reflectivity (dBZ) at 2.0 km</p>  <p>Mean Center: 17.65, -70.76</p> </div> <div style="text-align: center;"> <p>210816H1 (GRACE) 104221 to 125634 UTC WS (kt) at 2.0 km; Streamlines at 2.0, 5.0 km</p>  <p>2-km MaxV<sub>i</sub> (RMW): 8 m/s (16 km) SHIPS Shear (SHDC): 14.7 kt @ 17.65, -70.76</p> <p>Mean Center: 17.65, -70.76</p> </div> </div>
1527	Landed at KLAL

POST-FLIGHT	
<b>Mission Summary</b>	<p>The mission was executed successfully and showed that Grace has become better organized overnight with a much tighter and coherent low-level circulation. The mid-level circulation is not very well defined with two competing circulations apparent in the TDR composite analysis from this mission. It appears that genesis is occurring more from the bottom-up rather than top-down. If it is able to maintain the convective initiation that has been present overnight, it may be able to continue strengthening throughout the day.</p> <p>The minimum central pressure has fallen to 1007 mb, but as of the 15Z NHC advisory, they have maintained max sustained winds of 30 kt, keeping Grace a TD. TDR 0.5 km winds show a small region of TS force winds on the NE side of the circulation. The SFMR was reporting 40 kt winds for a large portion of the flight; however, these winds seemed a little high compared to other data sources and the SFMR struggles with weaker winds as it is not as sensitive on the low end.</p>

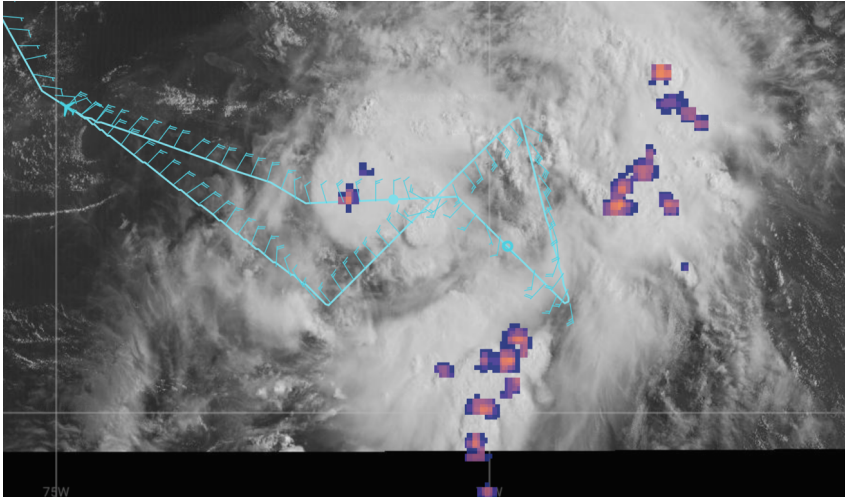
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	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>210816H1 (GRACE) 104221 to 125634 UTC Wind Speed (kt) at 0.5 km</p> </div> <div style="text-align: center;"> <p>210816H1 (GRACE) 104221 to 125634 UTC Wind Speed (kt) at 3.5 km (~flight level)</p> </div> </div> <p style="text-align: center;"><b>Wind Speed and Rain Rate (NOAA 20210816H1)</b></p> <p style="text-align: center;"><b>Extrapolated Surface Pressure (mb) and Geopotential Altitude (m)</b></p> <p>The modification to the figure-4 pattern that was made during pre-flight worked well and led to really good TDR coverage. Other than the change to the pattern, no deviations occurred during the flight.</p> <p>Dropsondes on the ferry depicted some dry air still present ahead of Grace and may be partially wrapping into the south and east sides of the storm. In total, 14 sondes were released (all charged to NWS). 2 sondes failed to attain telemetry after launch and were not transmitted.</p>
<b>Actual Standard</b>	Modified Figure-4 at 10 kft.

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<b>Pattern Flown</b>	
<b>APHEX Experiments / Modules Flown</b>	While operationally tasked, this mission can contribute a useful dataset for the Genesis experiment: PREFORM.
<b>Plain Language Summary</b>	<ul style="list-style-type: none"> <li>● Grace's surface circulation was much better defined during this flight.</li> <li>● TDR data showed that the circulation was organizing from the bottom upwards.</li> <li>● Dry air is present ahead of the storm.</li> <li>● This will be a useful case for studying TC genesis.</li> </ul>
<b>Instrument Notes</b>	<p>Sondes: 6 had post-splash data, 2 had late launch detects, 2 were partial fast falls, and 2 lost telemetry</p> <p>SFMR: wind speeds seemed a bit high (5-10 kt), but hard to judge accuracy in a weak system</p> <p>TDR: issue with satcom that caused jobfile to not download. After satcom reboot analyses ran smoothly</p>
<b>Final Mission Track</b>	

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