Mission Summary
Hurricane Georges
Landfall
9809028I Aircraft: 43RF

Scientific Crew:		**Aircraft Crew:**	
Chief Scientist	Peter Dodge	Cockpit:	LCDR Brian Taggart
Doppler Scientist	Mike Black		CAPT Dave Tennesen
Cloud Physics			Steve Wade, Butch Moore
Dropsonde Scientist	James Franklin	Navigator:	LCDR Steve Kozak
Workstation/AXBT:	Mike Black/ Peter Dodge	Flight Director:	Jack Parrish
Observer/WARDS	James McFadden	Engineers:	Terry Lynch, Jeff Smith,
SRA	Ed Walsh, Wayne Wright		Chris Hornbrook
		Radio:	Damon Sans Souci

Mission Briefing:

At 3 am EDT, 28 September 1998, we briefed the AOC flight crew for a Tropical Cyclone Windfields at Landfall research flight in Hurricane Earl, which at that time was forecast to make landfall between Mobile, Alabama, and New Orleans, Louisiana. The goal of the flight was to collect flight-level, radar and GPS dropsonde data to capture the structure of the windfield in a landfalling hurricane. We were especially interested in the onshore flow because of the possibile storm surge in Lake Ponchatrain and Mobile Bay. Ed Walsh and Wayne Wright were there to collect Scanning Radar Altimeter (SRA) data to map out the wave heights and storm surge. Our plan was to pass along the Gulf Coast, followed by a figure 4 through the storm, all at 7,000' altitude. Then we would climb to 14 000', if necessary, and fly radials between Mobile and New Orleans WSR-88D radars. There was also an option to fly along the principal rainband east of the center, similar to the pattern we flew in Hurricane Earl a few weeks before.

Several University groups sent surface observing systems to catch Georges' landfall; their locations near Slidell and Gulfport are shown in Figure 1. The University Of Oklahoma sent two mobile Doppler radars (DOWs), an instrumented 10m tower, and two portable observing systems mounted on cars. Clemson University and Texas Tech University erected instrumented towers, and the University of Alabama/Huntsville deployed a profiler. Flight patterns for this flight (and the previous flight, NOAA 42) were desgined to overfly these sites if possible and to drop GPS sondes nearby.

Mission Synopsis:

We left MacDill Air Force Base at 0907 UTC, and reached our mission altitude of 7000' by 1005. Figure 1 shows most of our flight track, and Figure 2 shows the surface data from most of our GPS sondes. The core of Hurricane Georges was mainly stratiform, so we maintained our altitude at 7 000' until we finished our pattern at 1712 and climbed out to return home. The experiment is conveniently described in three parts:

a. Initial coastal survey and figure 4, 1005-1326 UTC:

After dropping two sondes near buoys 42036 and 42039, the aircraft descended to 7,000' and headed for C-Man station CSBF1 (Figure 3a), where we dropped another sonde. We then turned NW and then W, to map the winds and waves east of the center, deviating slightly to avoid the nastier cells in a strong rainband between Panama City and Fort Walton Beach (the rainband was right over the Eglin AirForce 88D at this time). At 1028 we were ~110 nmi from the center and Ed Walsh reported 10-15' wave heights. After the 5th sonde drop at 1032, the aircraft turned to move closer along the coast on our first pass through the center. Sondes were deployed near C-Man station DPIA1, in the east eyewall, in the center at 1057, and then in the west eyewall and along the coast, finishing with our 10th sonde in the center of Lake Ponchatrain. During this initaial pass the radar was in F/AST mode. We turned and headed back east to fly a figure 4 pattern in continuous mode, so that we could construct an EVTD analysis and send a horizontal windfield image back to TPC. But two errors rendered the second pass through the storm unsuitable for EVTD: the radar operator forgot to swich out of F/AST until we were in the center and the workstation operator (me!) had forgotten to start the radar capture. It had been a long week, and fatigue was starting to play tricks on us. But no problem, we just added

another east-west leg, which ended at 1326 over Lake Ponchatrain. One image of the EVTD winds at 1 km was transmitted back to TPC. During the figure 4 several GPS sondes were dropped in Georges to define the eyewall winds. Sondes 7, 11-13 and 18 were dropped near the Gulfport-Biloxi area where the surface teams were deployed. We also flew over that region three times in this part of the flight.

b. Second coastal pass and WSR-88D triangle, 1326-1632:

From Lake Ponchatrain we flew south to the GDIL1 C-Man station to drop sonde #20 (Figure 3b), followed by a drop at BURL1. This was the first time we got out of the rain and clouds and could see the Gulf of Mexico and bayous.Then we turned northeast and flew towards KEVX, releasing a sonde at buoy 42040 on the way. At 1427 we turned at the coast, dropped another sonde and headed back along the coast. We followed the coast line more closely, to measure the wave heights close to the shore. We passed through the center for the 5th time at 1504 and then followed the coast to Lake Borgne where we turned south east, heading for 42040. From 42040 we flew North up into Mobile Bay, where we dropped the 25th GPS sonde. We had intended to repeat the KMOB-KLIX-42040 triangle, but time was running short so Mike suggested we pass through the center, turn and go back to the center again. Then we would turn in tthe center to head southeast towards the inflow region of the main rainband, which was now just east of Mobile Bay. By doing this we were able to release sondes 26 and 27 quite near the shore on each side of the center to get a pair of onshore and offshore soundings in higher winds.

c. rainband module, 1632-1712:

The strong rainband was shaped similarly to the line-echo wave pattern seen occasionally in midwestern squall lines, and the only weakness in the high reflectivity was at the kink. After dropping a sonde in the inflow region, we flew up the outside edge until we reached to the weak spot, dropped sonde # 30 as we crossed the band and continued along the inside edge until we were about 25 km inland, above Fairhope, Alabama. We turned south and stayed on the inside edge of the band. At 1704 there was a great view of the the disturbed ocean as we came off the coast. A sonde was lauched there, (# 31), and probably landed on the beach. Our last sonde was dropped in the band at 1707. After we crossed back through the rainband at 1712 the pattern was finished and we climbed out to return home.

NOAA 43 landed at MacDill at 1823 UTC.

Evaluation:

The flight went very well. The sondes, Doppler radar and SRA data provide good coverage of a destructive hurricane. GPS sonde data and F/AST Doppler radar data were collected near every one of the deployed profilers, instrumented towers and DOW radars, so there will be a lot of joint effoert required to analyze all of the data collected.

Acknowledgements:

The AOC crew were great. Jack Parrish and the flight crew agreed to every change in the flight patterns that we requested, and Dave Tennesen and Brian Taggart moved us through some bumpy flying with a minimum of surprises. Terry Lynch kept the radar running, and Jeff Smith and Chris Hornbrook managed to keep with our evolving plans for GPS sonde drops.

Mike Black acted as co-LPS on this mission; he called most of the sonde drops, and also helped design the patterns. James Franklin processed and transmitted the GPS sonde data. Frank Marks and Pete Black helped plan the flight . Mark Powell and Jerry Straka (University of Oklahoma) coordinated the mobile teams' deployment on the ground.

Problems:

There was a brief problem with the ASDL system at the beginning of the flight. The radar system was down from 1002 to 1014 UTC, and the tail radar froze from 1106 to 1115.

Tables:

Table 1. Centers determined by AOC Flight Director and Navigator

Time	Lat	Lon	Comments
1057	30° 21′	88° 55′	962 mb, from GPS Sonde
1134	30° 20.5′	88° 56′	
1222	30° 20′	88° 59′	
1311	30° 21′	88° 57′	
1504	30° 24′′	88° 58′	
1606	30° 28′	88° 57′	967 mb, est from flight level
1628	30° 29′	88° 57′	

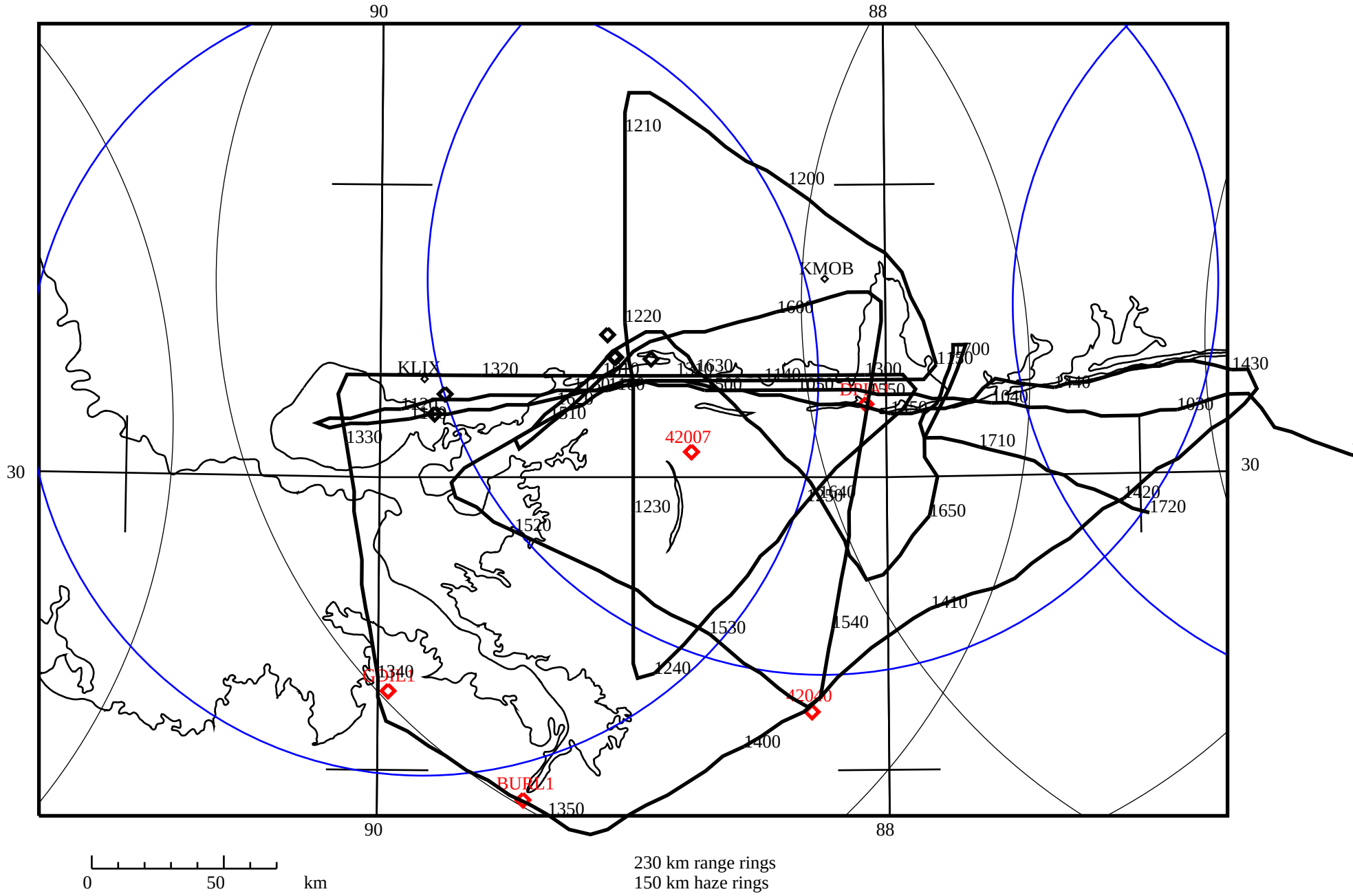
Table 2. GPS Sondes

#	Serial #	Time	Lat	Lon	Comments from message
2	974510071	093800	28.540	-084.690	MBL WND 16529 OVER BUOY 42036=
3	973720050	095600	28.880	-086.000	MBL WND 17044=
4	981750069	100900	29.770	-085.410	MBL WND 15538=
5	983310208	103200	30.250	-087.010	MBL WND 16567=
6	981830038	104600	30.340	-088.110	MBL WND 16569=
7	983310202	105300	30.350	-088.600	MBL WND 16575 EYEWALL 090=
9	974010013	110100	30.240	-089.170	MBL WND 33072 EYEWALL 270=
10	982010018	111500	30.150	-090.210	MBL WND 32045=
11	974530093	113300	30.330	-088.930	EYE=
12	974510011	113700	30.380	-088.670	MBL WND 16068 EYEWALL 090 LST WND 014= (Mud!)
13	982430075	113800	30.380	-088.560	MBL WND 16567 EYEWALL 090=
15	982640254	122600	30.080	-088.960	MBL WND 26562 EYEWALL 180=
16	981810001	124100	29.410	-088.800	MBL WND 24558=
17	981750021	125800	30.400	-087.960	MBL WND 16561=
18	981830011	130800	30.390	-088.770	LST WND 091 MBL WND 16061 EYEWALL 090=
19	981820084	132600	30.320	-090.090	MBL WND 33047=
20	981810014	134100	29.200	-089.950	MBL WND 27048=
21	981750024	134800	28.900	-089.410	MBL WND 26048=
22	982720419	140300	29.230	-088.290	MBL WND 22052=
23	983410129	142900	30.390	-086.600	MBL WND 16546=
24	983410136	152300	29.690	-089.110	MBL WND 26063=
25	983310209	155300	30.600	-088.010	MBL WND 16054=
26	983340083	162200	30.350	-089.120	MBL WND 31046=
27	983310051	163200	30.310	-088.620	EYEWALL 135 MBL WND 21068=
28	983410123	164500	29.720	-088.090	MBL WND 21556 RAINBAND=
29	983410046	164800	29.790	-087.920	MBL WND 19559 RAINBAND=
30	983410135	165200	30.080	-087.820	MBL WND 19545 RAINBAND=
31	983410134	170500	30.230	-087.850	RAINBAND= (Mud!)
32	983410127	170700	30.170	-087.790	MBL WND 19061 RAINBAND=

Note: Sondes 1, 8, and 14 had no data.

Figures:

1. NOAA 43RF flight track. (on thor in /users/peter/georges_stuff.d/ inner_pattern_map.draw, *.ps}
2. Surface plot of GPS Sonde drops (/users/peter/georges_stuff.d/synmap1050.ps)
3. Flight track maps for each module (/users/peter/georges_stuff.d/3_panel_fig.draw, *.ps)
4. Lower Fuselage radar image (thor /hrd/dat/georges/g28_11.gif)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90
88
30
KLIX
KMOB
42007
BPTA2
GDHL1
BURL1
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1200
1220
1600
1700
1750
1430
1320
1330
1710
1650
1720
1520
1230
1530
1540
1410
1240
1400
1350
1340
1420
1030
1040
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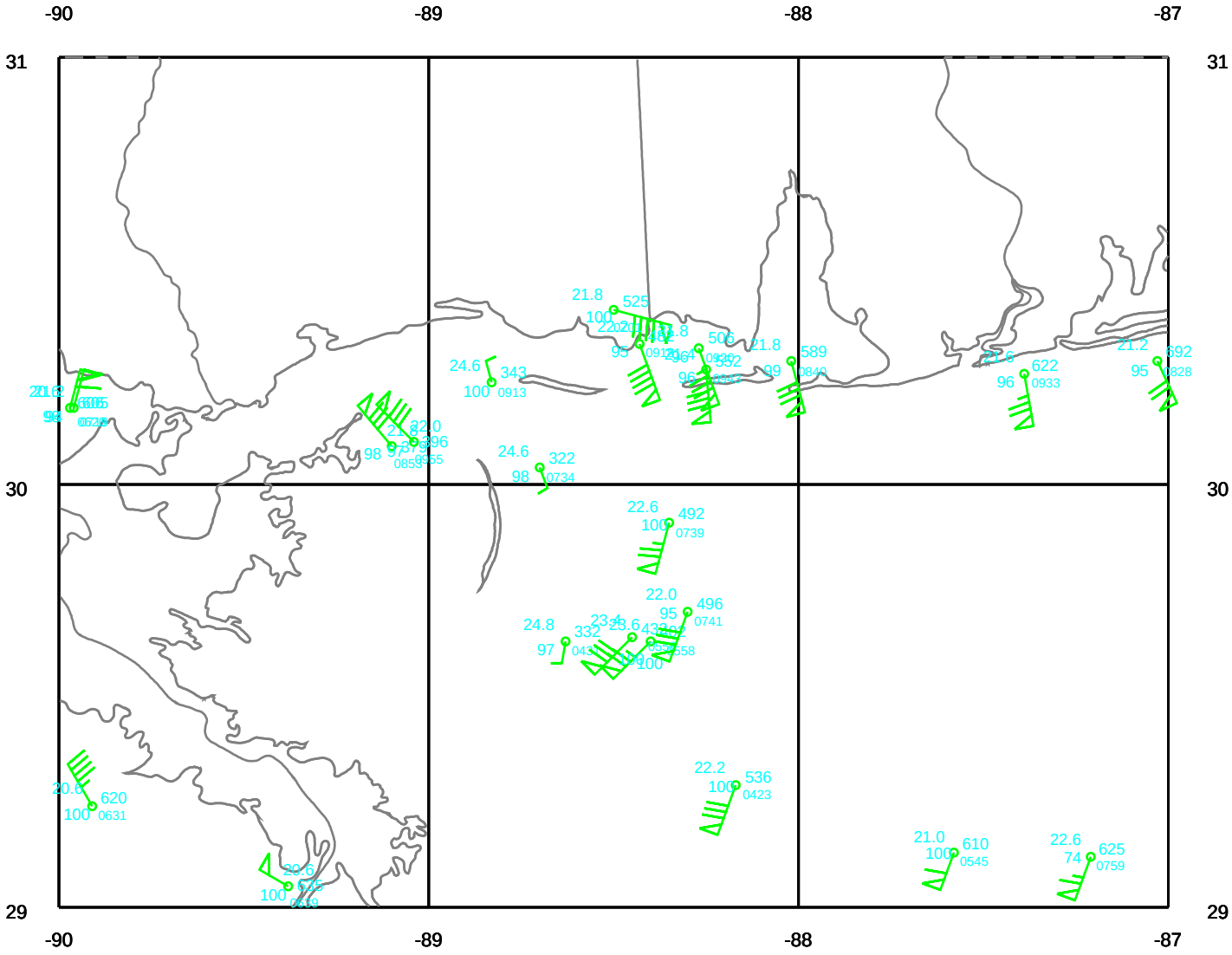
1510
1550
0
50
km
230 km range rings
150 km haze rings



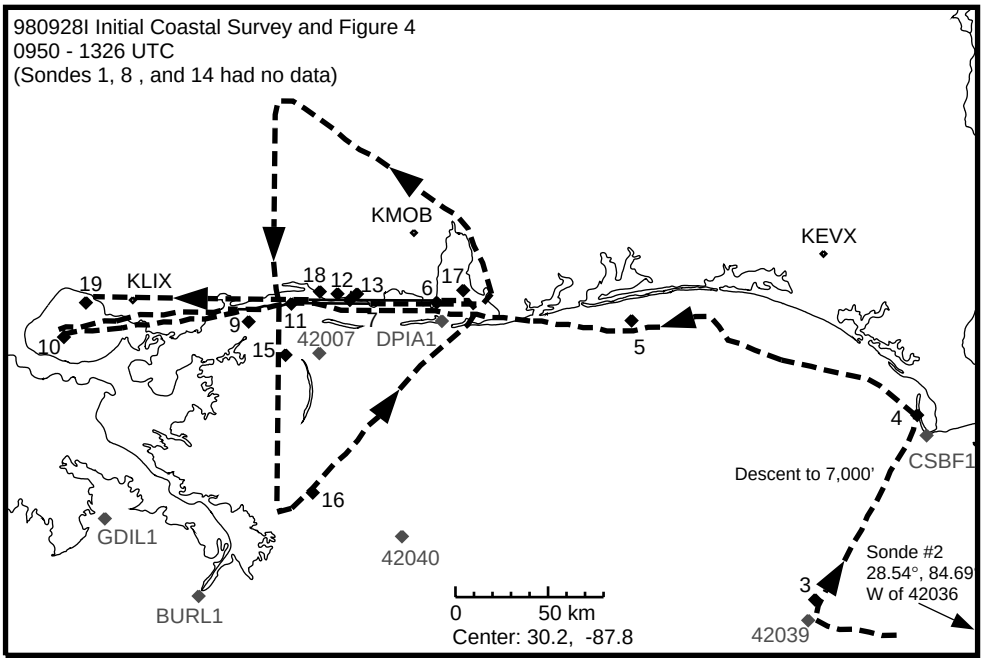
GEORGES

925 mb

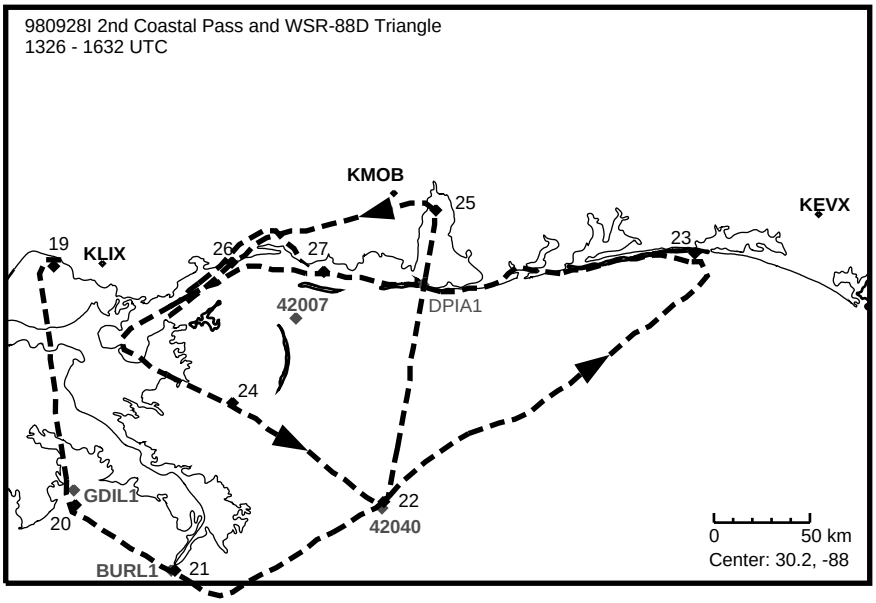
Date: 980928
Time: 00-12 UTC

EARTH RELATIVE

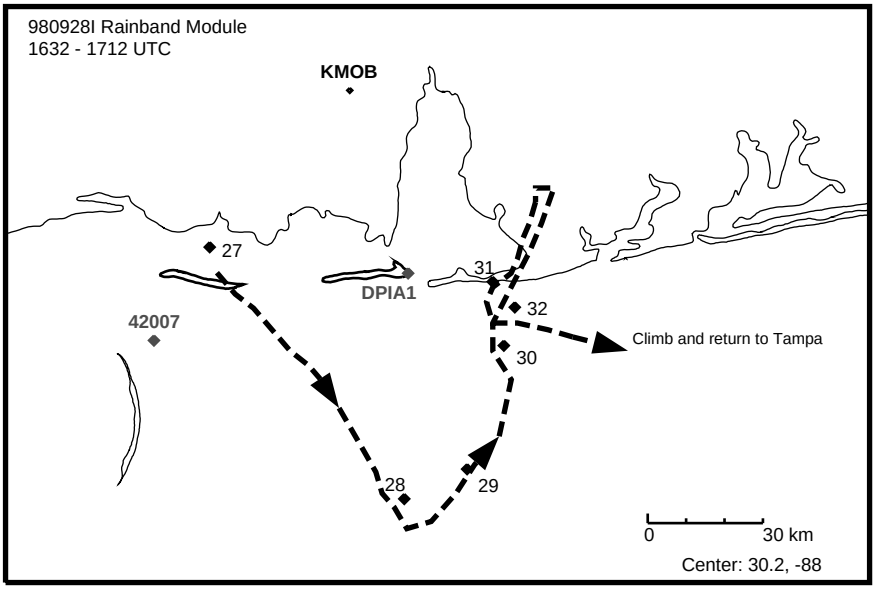
NOAA/ERL/HURRICANE RESEARCH DIVISION



a.

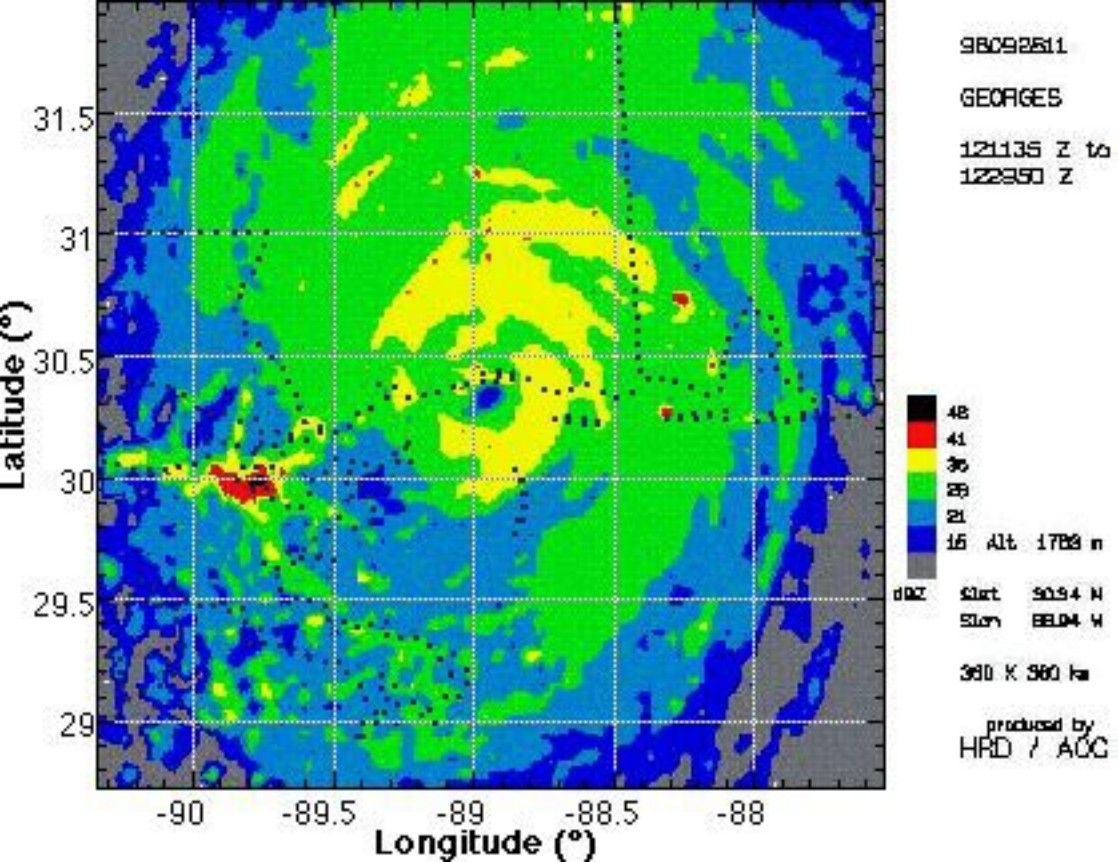


b.



c.

Figure 3.NOAA 43 Track (dashed) and GPS Sonde Splash Locations (black diamonds) on 28 September 1998


98092611
GEORGES
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122350 Z
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31
30.5
30
29.5
29
Latitude (°)
-90
-89.5
-89
-88.5
-88
Longitude (°)
46
41
36
26
21
16 Alt 1788 m
dBZ
Slat 9034 N
Slon 8804 W
360 K 360 ka
produced by
HRD / AOC