



**NOAA P-3 N43RF
Hurricane Research
H. LILI LANDFALL
IN LOUISIANA**



Flight ID: I021003

<u>Sensor or system</u>	<u>Number or Name</u>
INE	1
Accelerometer	1
Temperature Probe	1
Dew Point Probe	3 (Buck Research)
Altitude (for vertical wind)	Radar Altitude (RA-159)
Static Pressure	Rosemount Fuselage
Dynamic Pressure	Rosemount Fuselage
Time Source	Micro 99
Constants File	CO3022.CON

Notes:

There were several time/data gaps:

180111Z - 180200Z, 180231Z - 180240Z, and 180251Z - 180510Z.

The radar altimeter 159, RA159, had several occurrences of spikes during the following time frames: 1453Z - 1456Z, 1530Z - 1533Z, 1536Z - 1538Z, 1604Z - 1607Z, 1822Z - 1827Z, 1929Z - 1935Z, 1935Z - 1941Z, 1941Z - 1944Z, and 1951Z - 1953Z. These spikes were removed and patched over using the RA232 (radar altimeter 232) and pressure altitude as references.

There were several occurrences during the flight where dewpoint temperature exceeded ambient temperature from heavy precipitation events.

The King liquid water probe was not operating for the entire mission.

All other instruments worked optimally during the flight.

The aircraft INE positions were re navigated with respect to GPS.

SPECIAL NOTE!!! Locations 80, 81 and 82 of record five on the standard tape contain vertical ground, vertical air and vertical speeds, respectively, computed using Dave Jorgensen's vertical wind algorithm.
It is recommended that these values be used for vertical wind analysis.

	Takeoff	Landing
Aircraft Static Pressure	1015.8 mb	1013.0mb
Corrected Tower Pressure	1015.4 mb	1013.7 mb
Flight Director:	A. Barry Damiano	(813) 828-3310 ext. 3073

Flt ID: FO21003	From: KMCF	To: KMCF
Flt No.: 03-02	Blk In: 2030Z	ATA: 2021Z
ETD: 1300Z	Blk Out: 1252Z	ATD: 1302Z
ETE:	Blk Time: 7:38 (7.6)	Flt Time: 7:19 (7.3)
Sponsor Org: HRD	Program: HURRICANE RESEARCH	Purpose: H. LILI LANDFALL

AOC Personnel

AC: TENNESEN ✓	Sys Eng: SMITH ✓
CP: HALVERSON / KENDL ✓	Data Sys: XXXXXXXXXX
Nav: ADLER ✓	Radar:
FE: CURRY / FLOYD ✓	GPS/BT: TONG ✓
Avionics: SANS SOUCI ✓	Cld Phys:
FD: DAMIANO ✓	MITCHELL ✓

Participating Scientists/Visitors/AOC

Name (Last, First)	Activity on Aircraft	Affiliation
BLACK, P. ✓	PI	HRD
BLACK, M. ✓	ASST. PI	↓
GAMACHE, ✓	RADAR	
ABERSON, S. ✓	HAPS	
WALSH, E. ✓	SAR	NASA
HAZARD, J. ✓	CBLAST	SCRIPPS
CAPPELLA, C. ✓	MEDIA	USA TODAY
HASLETT, ✓	OBS	MACILL
WHELESS, K. ✓	OBS	AOC

Proposed/Actual Mission/Remarks (Recco, Fixes, Storm, PENET, NHOP #)

T₂₆

NO KLLW

1516Z,
 2952,
 9219,
 EXT 966

1807Z
 3030,
 9227,
 OVER LAND
 @ 14K

0944Z
 28°45'
 91°56' 960m

AF 0832Z
 28°32'
 91°49'

335/15 at 9Z
 28.7 91.7

TEAL 25 @ 14Z-15Z

1203Z
 2913 96Z
 9206

KNOW NE QUAD OVR LAND
 TEAL 71

U.S. Dept. of Commerce/NOAA/Aircraft Operations Center

AGCWF2

Flt ID: *1021003*Time Off: *1302Z*Time On: *2021Z*

A/C (Take Off)

Wx Stn (Take Off)

A/C (Land)

Wx Stn (Land)

Pressure

*1015.8**30.00 / 1015.4**4012.1013.0**29.95 / 1013.7*

Number

Data Disposition/Date/Quality

Slow/Fast Flt Lvl Tapes

3

Radar Tapes

1

Cloud Physics Tapes

Video Tapes

1

AXBT

1

AXCP

AXCTD

Dropsondes

*20**20 messages sent*

Video

Forward

Left Side

Right Side

Down

Remarks

Time On

Time Off

Rate

Remarks

U.S. Dept. of Commerce/NOAA/Aircraft Operations Center

Form 4-1550

[illegible]

20505

INS PERFORMANCE		INS 1	INS 2
BEGIN ALIGN TIME		1000	1000
ALIGN STATUS (0-5)		0	0
END NAV TIME		2021	2021
START NAV TIME		1245	1245
DELTA T		7+36	7+36

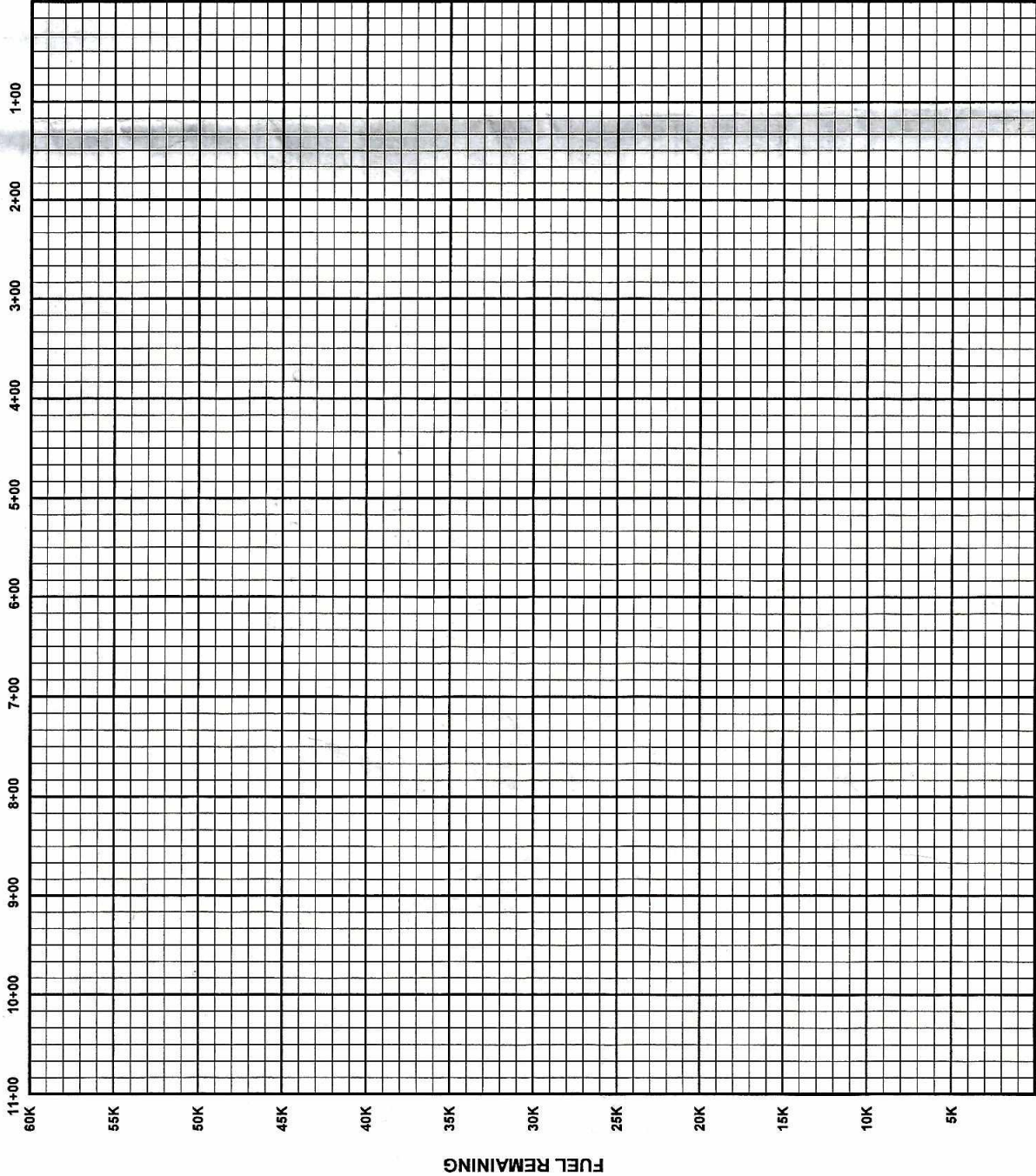
TERMINAL ERRORS		
	INS 1	INS 2
DELTA LAT	-2	-1.0
DELTA LON	+2	+1
RCS	1	3
RADIAL ERROR	0	1.

[illegible][illegible]

2951.8
09218.6
15:15:42Z

RANGE CONTROL GRAPH

TIME REMAINING



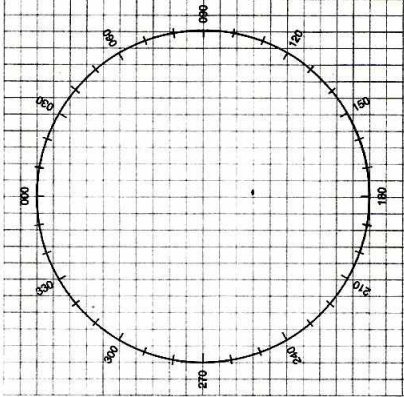
ENROUTE FUEL	
ENROUTE TIME	
ENROUTE FUEL (5K/5K/45K RULE)	
RESERVE AT DESTINATION	
REQUIRED RAMP	
ACTUAL RAMP FUEL	

TACTICAL (OFFSTA TO DESTINATION)	
DISTANCE (OFFSTA TO DEST)	
ENROUTE TIME (OFFSTA TO DEST)	
BURN RATE (LBS/HR)	4500 5500
ENROUTE FUEL REQUIRED	
RESERVE AT DESTINATION	
FUEL AT OFFSTA	

POINT OF SAFE RETURN	
ETP DISTANCE (TO DEPARTURE)	
ENROUTE TIME (TO DEPARTURE)	
BURN RATE (LBS/HR)	4500 5500
FUEL REQUIRED	
RESERVE AT DEPARTURE	
PSR FUEL	

CEX - TRUE BEARING METHOD				CEX SIGHT	
COMPASS TYPE	INS1	INS2	WET	GMT	
MCH (READING)				GHA	
- MTH (SEXTANT)				CORR	
CE				GHA	
- VAR				LONG +W -E	
DEV				EXACT LHA	
				LAT	
				BODY	
				DEC	
				HC/D	
				CORR	
				HC	
				Z	
				ZN	

CEX - ERB METHOD			
COMPASS TYPE	INS1	INS2	WET
MERB (DIAL 000)			
+ ZN			
= MTH			
MCH (READING)			
CE			
- VAR			
= DEV			



WIND FACTOR		
WINDSPEED	HEADWIND	TAILWIND
10	1.03	.97
20	1.06	.94
30	1.10	.92
40	1.14	.89
50	1.18	.87
60	1.22	.85

DISTANCE REMAINING

ETP = 5(TOTAL DISTANCE x OUTBOUND WIND FACTOR)

PRESS ALT		200		250		300		350	
10,000	1.0	.99	1.0	.98	1.0	.97	.99	.97	.99
20,000	.99	.98	.98	.97	.97	.96	.95	.94	.97
30,000	.97	.96	.96	.95	.94	.93	.92	.91	.94
40,000	.96	.94	.94	.92	.91	.90	.89	.88	.90

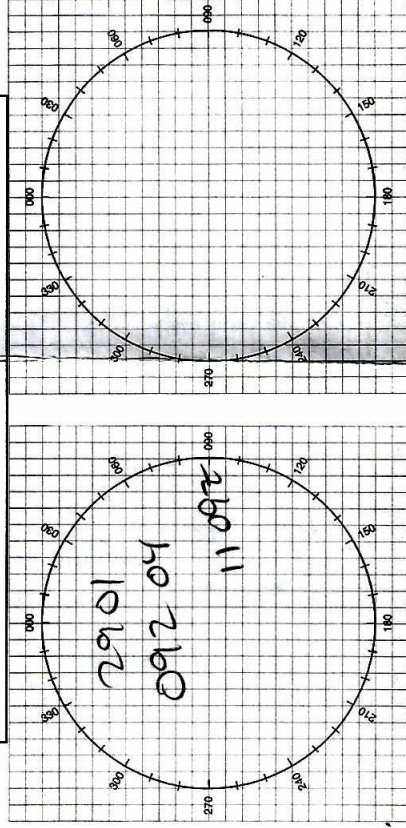
TRUE AIRSPEED CROSS-CHECK						
TIME	IAS	PRESS ALT	"F" FACTOR	EAS	OAT	ITAS

CLEARANCES

FRQ	ALT	HDG	OTHER
			R 080° 71600 3532g
			110° 2170°
			R 270°
			75K
			76K
			710 280°
			912
			BAL 1500-7K
			45K 720° → 1600

MISSION LOG

PAGE OF



POSITION REPORT

1. POSITION
 2. TIME
 3. ALTITUDE
 4. NEXT POSITION
 5. ETA
 6. NEXT POSITION

EMERGENCY MESSAGE

TRANSMIT THE FOLLOWING MESSAGE TO ANY AGENCY ON THE AIR-GROUND FREQUENCY IN USE. IF UNABLE TO ESTABLISH COMMS, ATTEMPT CONTACT ON ANY OF THE FOLLOWING EMERGENCY FREQUENCIES:

UHF/VOICE	VHF/VOICE	MF/VOICE	HF/CW	MF/CW
243.0	121.5	2182 KHZ	8364 KHZ	500 KHZ

MAYDAY, MAYDAY, MAYDAY
THIS IS NOAA NOAA NOAA

- POSITION _____ N/S _____
E/W AT _____ Z _____

- HEADING _____ TRUE/MAG _____
- AT _____ KTS TRUE/INDICATED _____

- AT _____ KTS TRUE/INDICATED
- FLIGHT LEVEL OR ALTITUDE _____

- FLIGHT LEVEL OR ALTITUDE _____
- WE ARE A P-3 AIRCRAFT WITH _____

- WE ARE A P-3 AIRCRAFT WITH
- NATURE OF EMERGENCY
- ASSISTANCE REQUIRED

- ASSISTANCE DESIRED
- PII QT INTENTIONS

- PILOT INTENTIONS
- WE HAVE ENDURANCE REMAINING

[illegible]

Flight ID: D021003

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U.S. Dept. of Commerce/NOAA Aircraft Operations Center

Form 413-50

Time	Lat	Long	Trk	Hdg	Wind Dir	Wind Spd	T _a	T _s	Press. Alt.	Geo. Alt.	Slc Press.	Press. Slc	Dyn. Press.	Remarks
171240														start 2000 ft leg into wind
172135														end 2000 ft leg into wind
172415														start 600 ft crosswind leg
173100														end leg
173245														start 600 ft leg
174000														end 600 ft leg
180000	3000	9217	350	341	251	41	6.1	1.5	4444	4504	98.1	581.7	7611	IN CLD
180700	3030	9227												
1812														turned south after 20 nm W of center
182700	2941	9150	123	133	230	45	4.3	2.3	4453	4593	992.1	580.8	88.9	IN CLD
192500	2818	8653	104	109	165	21	.4	-14.2	4664	4937	1011.5	585.0	98.1	ABV CLD

Mission Summary
Hurricane Lili
Landfall/CBLAST
021003I Aircraft: 43RF

Scientific Crew:

Chief Scientist	Peter Black
Doppler Scientist	John Gamache
Dropsonde Scientist	Sim Aberson
Workstation:	Mike Black
Laser altimeter	Joel Hazard
Observer:	Chris Cappella
SRA	Ed Walsh

Aircraft Crew:

Cockpit:	CAPT Dave Tennesen, LCDR H Halverson, CDR Phil Kenul
Navigator:	LCDR John Adler
Flight Director:	Barry Damiano
Engineer:	Jeff Smith,
Data Tech	Ray Tong
Electronics::	Damon Sans Souci

Mission Briefing:

After HAIRSIN and Ocean Winds flights in Hurricane Lili, HRD planned for a flight during Lili's landfall on the Louisiana coast. Mobile observing teams from Texas Tech University (TTU), Clemson, and University of Florida were heading for the Louisiana coast to deploy the SMART-R radar and several wind towers. They were joined late in the evening of 2 October by two portable Doppler radars from U of Oklahoma, DOW-2 and DOW-3. The HIRT team from North Carolina also drove an instrumented vehicle to the region south of New Iberia, Louisiana. We designed a flight plan that would include overflights of as many of these sites as possible, including GPS sonde drops just offshore of them. The flight was planned to be ~8 h, to allow another 2h for CBLAST stepped descents in strong winds, sampling onshore and offshore flow, continuing the CBLAST flight pattern tests.

Mission Synopsis:

NOAA 43 left MacDill Air Force Base at 1302 UTC, and descended to 6,000' at the IP ~ 200 km SSE of New Orleans at 1420. For the next two hours, the plane sampled the storm environment just along the coast, dropping 20 GPS sondes along the coast and near the wind towers, especially the WEMITE tower on West Cote Blanche Island. Figure 1 shows the complete flight track, with sonde launch locations and portable observing sites. Figure 2a is an LF image from NOAA 43's initial pass through the center of Lili.

The CBLAST module began at 1623 when the aircraft descended to 900'. The plane flew an upwind and downwind pass at this altitude and then the aircraft descended to 600' for another leg. At 1702 the plane turned and ascended to 2000' for a crosswind leg. Because of the numerous oil rigs with heights 200' to 300' the aircraft could not go below 600'. The crosswind legs were completed at 1740. The aircraft climbed to 14,000' and then made one south to north pass through the center over land (Figure 2b), turning west towards Lake Charles and then turning SE to head back to base. NOAA 43 landed at MacDill later that day.

Evaluation:

This is probably the most complete data set collected in a landfalling hurricane (with the exception of the LCH radar data). Hurricane Lili has weakened considerably over night, yet some of the TTU towers measured hurricane-force winds. The wind towers measured winds in various exposures and environments and these data will be valuable for wind engineering studies. Preliminary examination of the Tail Doppler data show them to be free of noise problems.

The flight crew also further practised flying low-altitude patterns for the CBLAST experiment. One important finding was the difficulty of flying these patterns near the Gulf Coast, because of the oil rigs.

Acknowledgements:

Barry Damiano, John Adler, and the flight crew flew a complicated pattern with their usual dedication and attention to detail. Jeff Smith kept the radar running, and Ray Tong and Damon Sans Souci managed to

keep with our evolving plans for GPS sonde drops.

Problems:

The aircraft radar system was down from 1534 to 1543 UTC. The Lake Charles WSR-88D was only able to archive 4 volume scans during the entire episode, 2 at 0533 and 2 at 0900 UTC, 3 October. Several GPS sondes had no winds, but the wind data maybe be recovered by post-processing at AOC.

Tables:

Table 1. Some Centers

Time	Lat	Lon	
0900	27° 42'	91° 42'	NHC Official
1500	29° 50'	92° 16'	Air Force radar center
1516	29° 52'	92° 18'	NOAA 43
1806	30° 31'	92° 27'	NOAA 43

Table 2. GPS Sondes

#	id	time	location (launch)
1	014335072	142338	28.55° 89.00°
2	014415035	142852	28.60° 89.38°
3	014335070	143414	28.64° 89.77°
4	014335076	143904	28.71° 90.13°
5	014335036	144408	28.83° 90.50°
6	014335074	144905	28.95° 90.86°
7	014335073	145404	29.08° 91.21°
8	014515063	145905	29.22° 91.55°
9	014515062	150046	29.26° 91.67°
10	014515060	150525	29.45° 91.96°
11	014515058	150837	29.67° 92.10°
12	014515056	153159	29.00° 92.33°
13	014335095	153458	29.15° 92.13°
14	014515065	153803	29.31° 91.92°
15	014335025	154136	29.49° 91.67°
16	014335078	154404	29.62° 91.74° no winds
17	014515061	154548	29.67° 91.87° no winds
18	014335049	155818	29.64° 91.76°
19	014515010	155938	29.68° 91.86° no winds
20	014515121	160407	29.56° 92.05°

Several of these sondes had late launch detects and late winds.

Table 3. AXBT

Launch (UTC)	Lat	Lon	SST (°C)
1434	28° 39'	89° 31'	

Table 4. Locations of mobile instruments deployed during the landfall

Latitude	Longitude	Location
30° 12' 27.72"	91° 59' 23.64"	SMART-R Lafayette Regional Airport
30° 02'	91° 54'	DOW3 Acadiana Airport (New Iberia)
30° 42.5'	92° 06.5'	DOW2 St Landry Parish Airport (Opelousas)
30° 05.08'	91° 00.37'	Clemson/U Fla near Cane Air Field
29° 54.84'	91° 45.56'	" New Iberia
30° 22.07'	91° 05.53'	" S of Baton Rouge
30° 12.88'	92° 02.68'	" Cajun Field, Lafayette
29° 55' 06.3"	92° 14' 50'	TTU tower at Old Harrington Landing Field
29° 55' 07"	92° 14' 45.9"	TTU tower 2 " " (near Cow Island)
29° 45' 4.62"	91° 43' 30.36"	TTU Wemite # 2, W. Cote Blanche Island (30' salt dome)
30° 01' 48.96"	91° 52' 40.74"	TTU tower Acadiana Airport
29° 42' 32"	91° 20' 40.2"	TTU 3m tower at Williams Memorial Airport
29° 42' 48.5"	91° 20' 9.8"	TTU 3m Tower 2 at " " (near Patterson)
31° 10' 40"	92° 24' 38"	LAIS Dean Lee (E of Woodworth, LA)
30° 14' 28"	92° 20' 51"	LAIS Rice (E of Crowley, LA)
29° 57' 54"	91° 42' 54"	LAIS Iberia (NW of Jeanerette, LA)
29° 59' 08"	91° 04' 45"	LAIS Paincourtville (W of Paincourtville, LA)
29° 26' 28.2"	92° 03' 40.8"	CSI-3
29° 10'	90° 35'	CSI-11
29° 03.2'	90° 32'	CSI-5
28° 52'	90° 29'	CSI-6

Some locations were supplied by the teams, others were read off of aeronautical chart CH-24.

TTU - Texas Tech University Wind Engineering

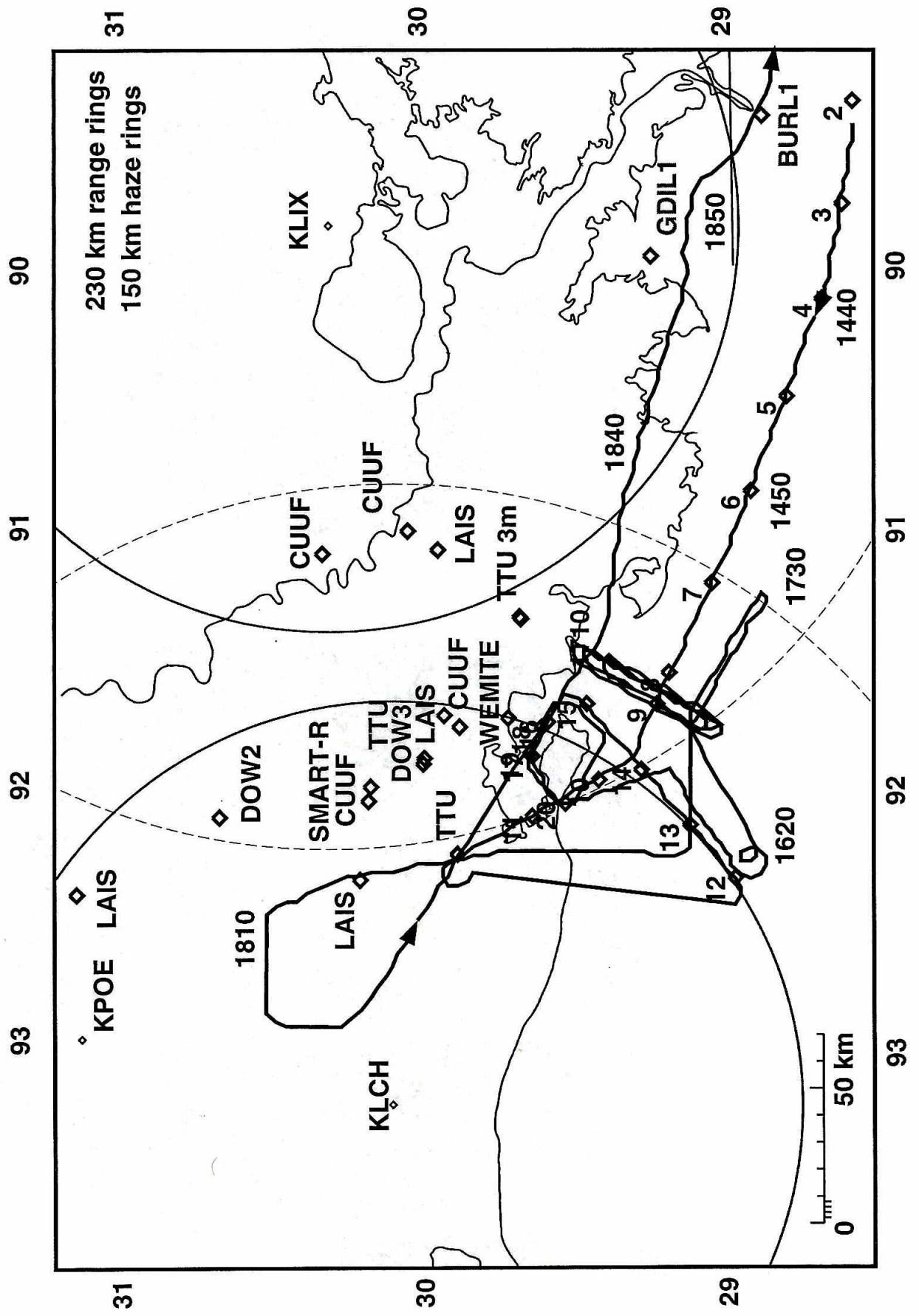
LAIS: Louisiana Agroclimatic Information System

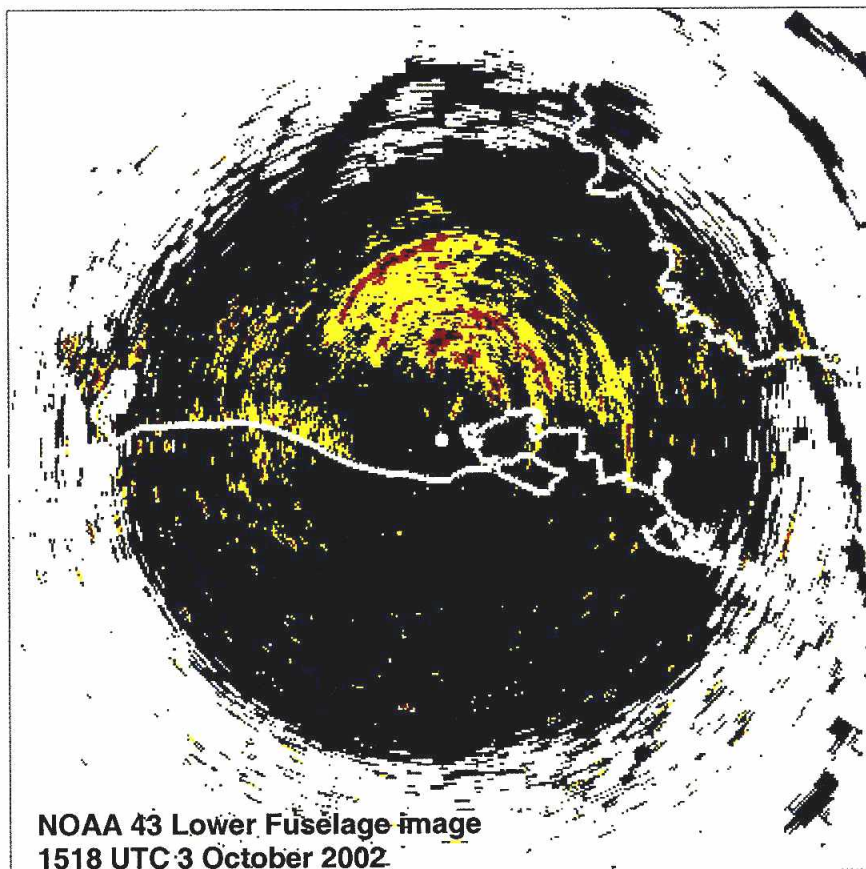
CIS: WAVCIS-LSU Coastal Studies Institute

Figures:

1. NOAA 43RF flight track. (lili_landfall_map.ps) The map shows the flight track and the location of the portable surface stations.

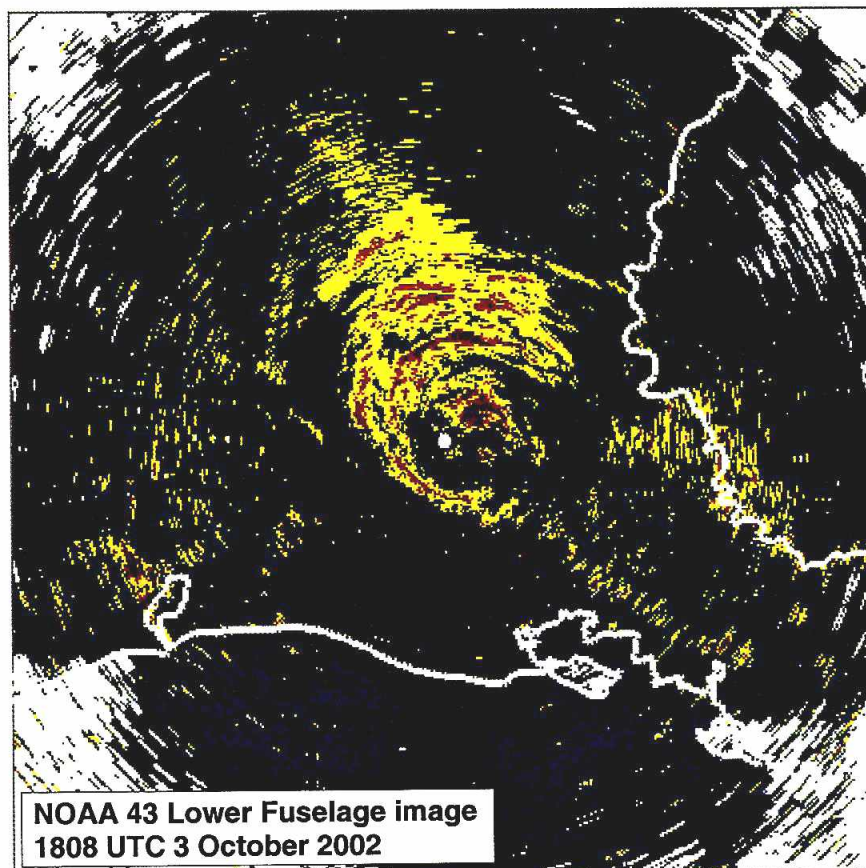
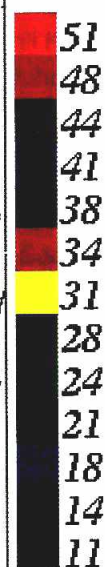
2 Lower Fuselage radar images (lili_1003_lf_images.ps) These two images are single-sweep PII's from NOAA 43 lower-fuselage radar at 1518 and 1808 UTC, 3 October 2002, when the aircraft was near the eye. Note that at 1518 the aircraft was at 6,000' while at 1808 the aircraft was flying at 14,000'. When the aircraft is higher the ground clutter extends further out.





NOAA 43 Lower Fuselage image
1518 UTC 3 October 2002

Oct. 3, 2002
15:18:25 UTC
El .0 deg
400 x 400 km
LFS43P3
LILI



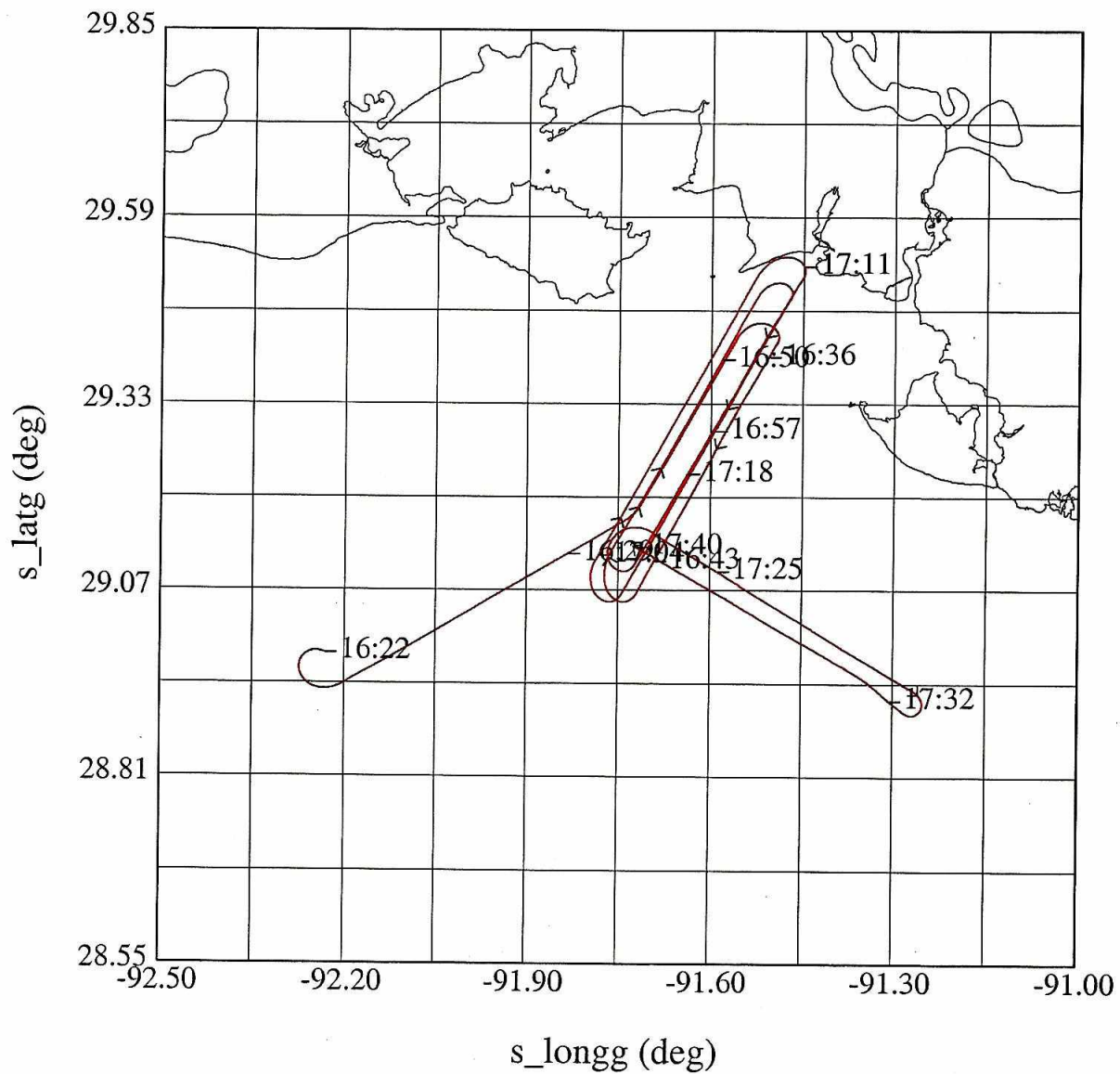
NOAA 43 Lower Fuselage image
1808 UTC 3 October 2002

Oct. 3, 2002
18:08:14 UTC
El .0 deg
400 x 400 km
LFS43P3
LILI



HUR02 H. Lili Landfall

021003Is_P, 16:22:00-17:40:00



	mean	sigma	min	max
— s_latg (deg), 1 s/sec	29.20	0.17	28.89	29.54
— s_longg (deg), 1 s/sec	-91.64	0.19	-92.27	-91.25

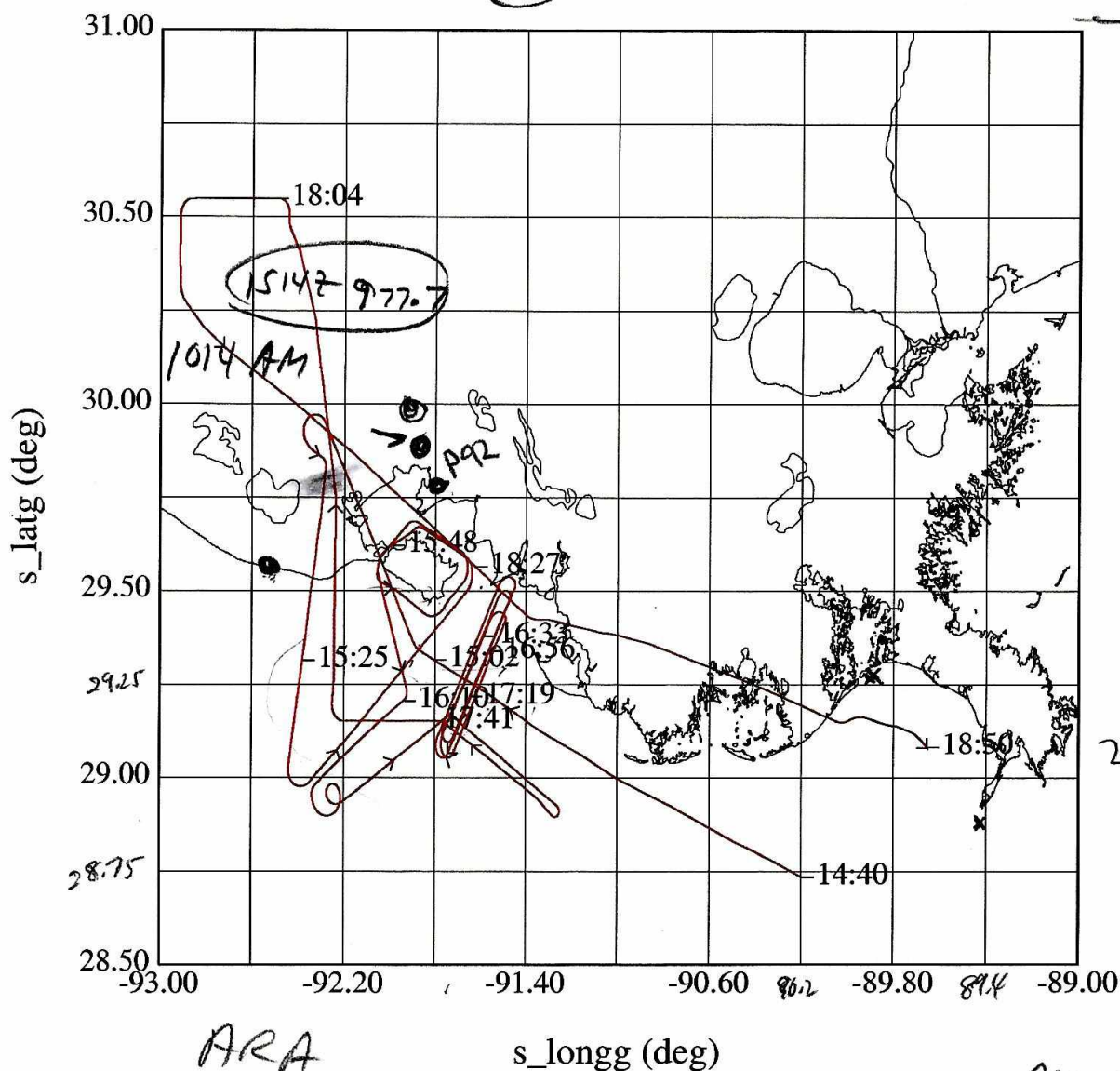
H. LILI LANDFALL IN LOUISIANA

021003Is_P, 14:40:00-18:50:00

LC14 993.9

~~HA1141 AM~~
16412LFT 1123 AM
983.1 16232

(16 AM) 10 AM 2 PM 18



OFFICE PROGRAMS

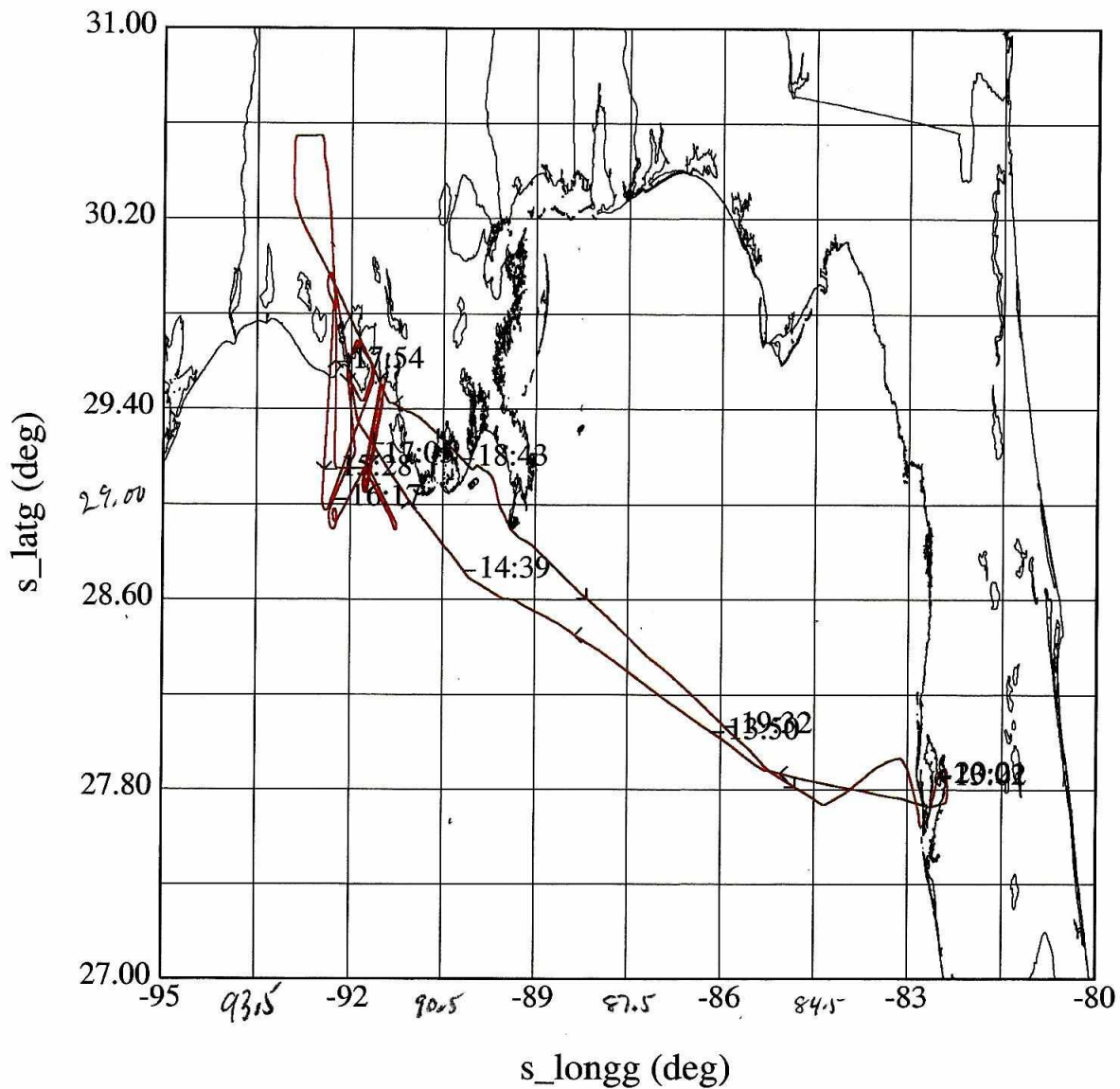
OBSERVATION

SAURS Ryp

	mean	sigma	min	max
— s_latg (deg), 1 s/sec	29.38	0.37	28.73	30.55
— s_longg (deg), 1 s/sec	-91.75	0.60	-92.92	-89.65

H. LILI LANDFALL IN LOUISIANA

021003Is_P, 13:02:00-20:21:00

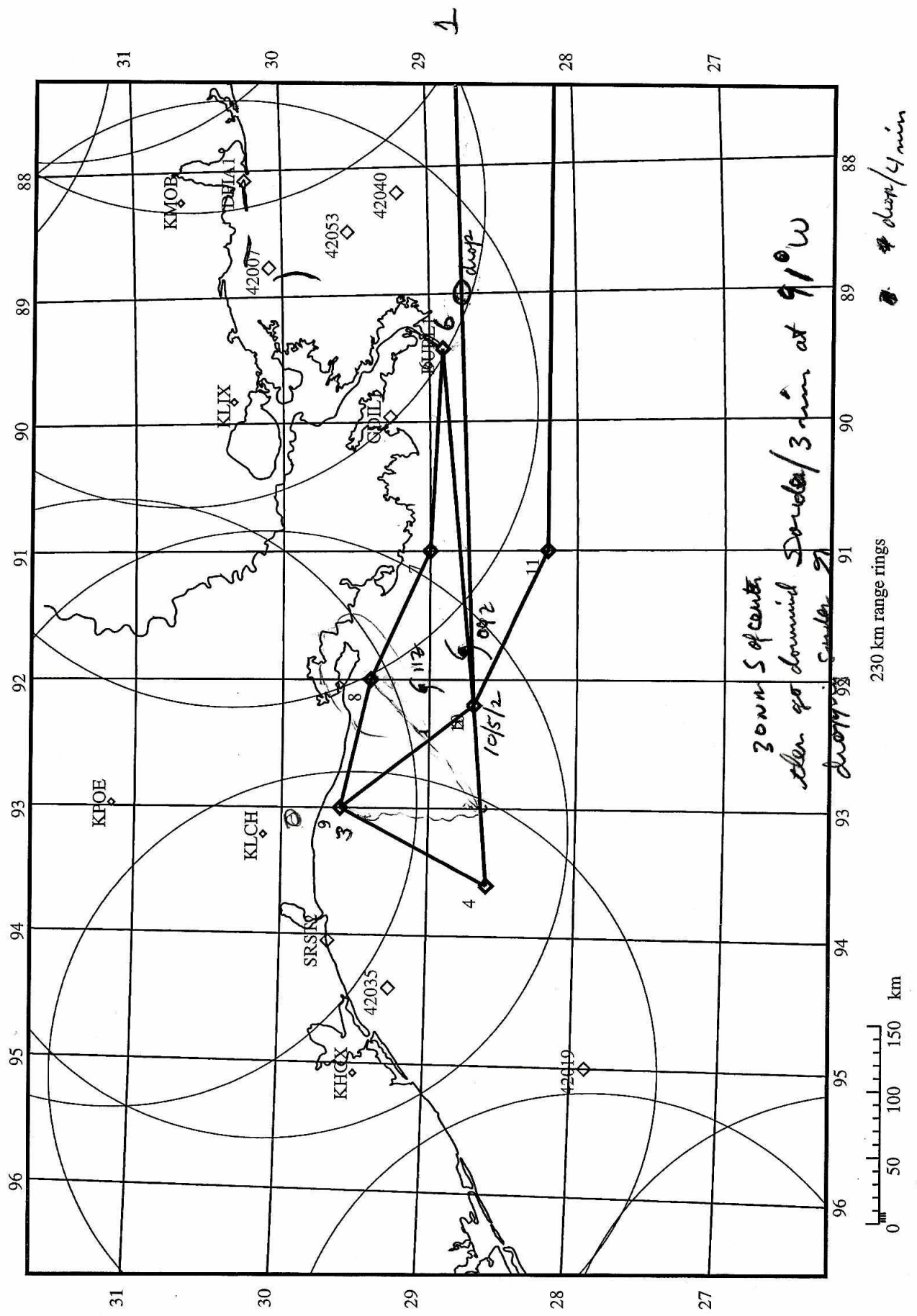


	mean	sigma	min	max
— s_latg (deg), 1 s/sec	28.85	0.72	27.65	30.55
— s_longg (deg), 1 s/sec	-89.25	3.30	-92.92	-82.37

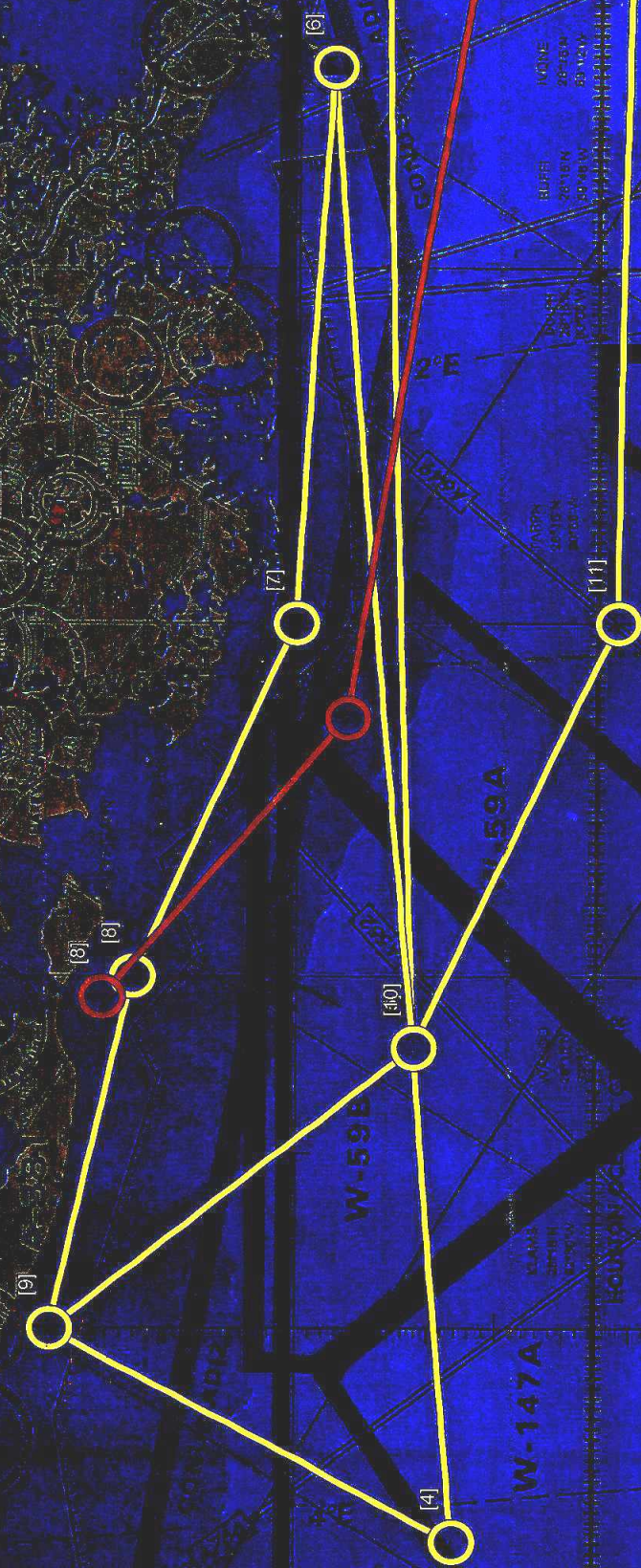
2950
9216

2913 962
9206 12032

Center Lat: 29.00 Lon: -92.00



NOAA Hurricane Hunters
GADRG JNC 1:2 M - Equal Arc Projection



Printed Oct 03 2002 11:52

NOAA Hurricane Hunters

P4

