

19990803H1-LPS

Mission Summary
990803H Aircraft 42RF
Early-Season: Tropical Cyclone Air-Sea Interaction
Gulf Loop Current/Eddy Flight

Scientific Crew (42RF)

Lead Scientist	P. Black
AXBT Scientists	J. Cione, E. Uhlhorn
AXCP/AXCTD Scientist	D. Jacob
Observer	P. Davies

Mission Briefing:

This flight was the AXBT version of the early-season, air-sea interaction experiment designed to map the boundaries of the Gulf Loop Current and associated warm anticyclonic eddies as well as obtain an initial estimate of the heat content anomalies associated with these features. The experiment is designed to determine the effect of heat content in anomalous warm eddies in the Gulf of Mexico on hurricane intensity change. A secondary objective was to test the aircraft receiver system with three expendable probe types: AXBT (measures temperature vs. depth), AXCP (measures temperature and current vector vs. depth) and AXCTD (measures temperature and conductivity (salinity) vs. depth from which density is calculated).

With the help of blended TOPEX and ERS2 satellite altimeter maps from the University of Colorado (CCAR), and feature boundaries based on drift buoy and rig ADCP measurements used to initialize the CU-POM Gulf of Mexico ocean model, a flight pattern was designed to map the main Loop Current region and two anticyclonic warm eddies in the process of breaking off from the Loop Current. A feature to the northeast of the Loop Current had separated the week before, and named Eddy Haskell. A second feature to the northwest of the Loop Current proved to be stronger and deeper than Eddy Haskell, but not yet completely separated. The complex structure deduced from the satellite altimeter data was confirmed in its essential pattern by the AXBT survey, but somewhat different in detail.

Mission Synopsis

The flight departed MacDill AFB at 1315 UTC and landed there at 2245 UTC, a duration of 9.5 hours. The flight pattern consisted of a single line through the NE eddy feature (Eddy Haskell), a 'butterfly' pattern (3-legged) centered on the NW eddy feature and a modified 'Fig 4' centered on the main Loop Current feature. The first two legs through Eddy Haskell and NW to SE through the main Loop Current feature was flown at 10K ft (3 km/700 mb), while the rest of the flight was flown at 5 kft (1.5 km/850 mb).

A total of 46 AXBTs were deployed, 19 CAD-launched externally and 25 internally via the free-fall chute. Clean signals were observed to 350 m on 43 of 46 AXBTs, a failure rate of less than 7%. Two AXCPs and two AXCTDs were also launched to test the receiver systems. One AXCTD failed due to erroneous receiver assignment. The others were partially successful with strong initial signals, but rapid weakening of signals occurred after 400m depth due to poor signal strength, and no data was obtained below 500 m.

A double-lobbed eddy pattern was diagnosed by the AXBTs similar to the TOPEX/ERS2 blended analysis. The analysis of 20°C and 15°C isotherm depth showed a weak warm eddy (Haskell) to the northeast of the Loop Current and a stronger eddy northwest of the Loop Current. At 150 m, there was approximately a 10°C temperature difference between the standard Gulf water (Gulf Common

Water) and the Loop Current/warm eddy water. The maximum depth of the 20°C isotherm was 310m in the Loop Current, 260m in the northwestern eddy and 200m in Eddy Haskell.

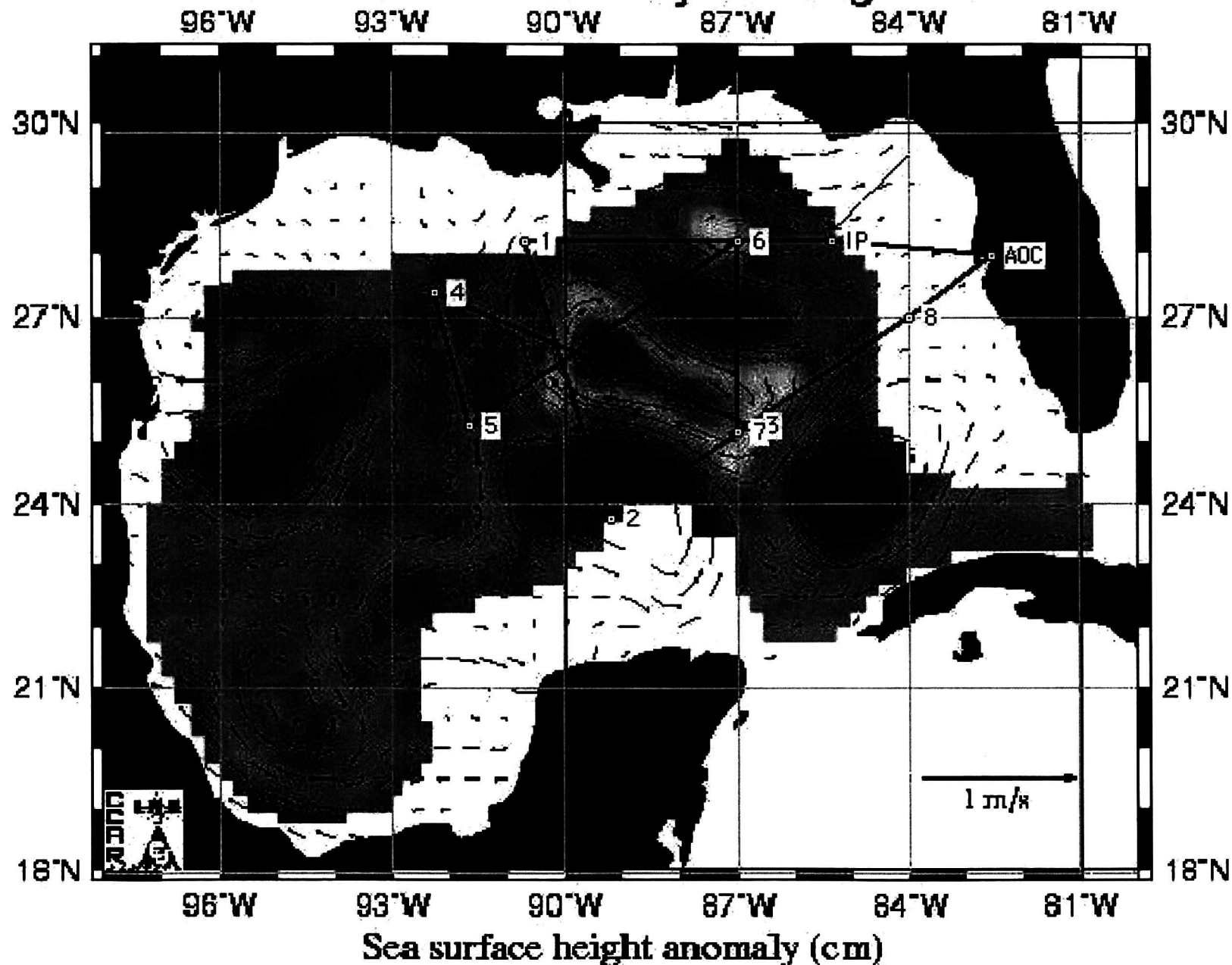
Problems:

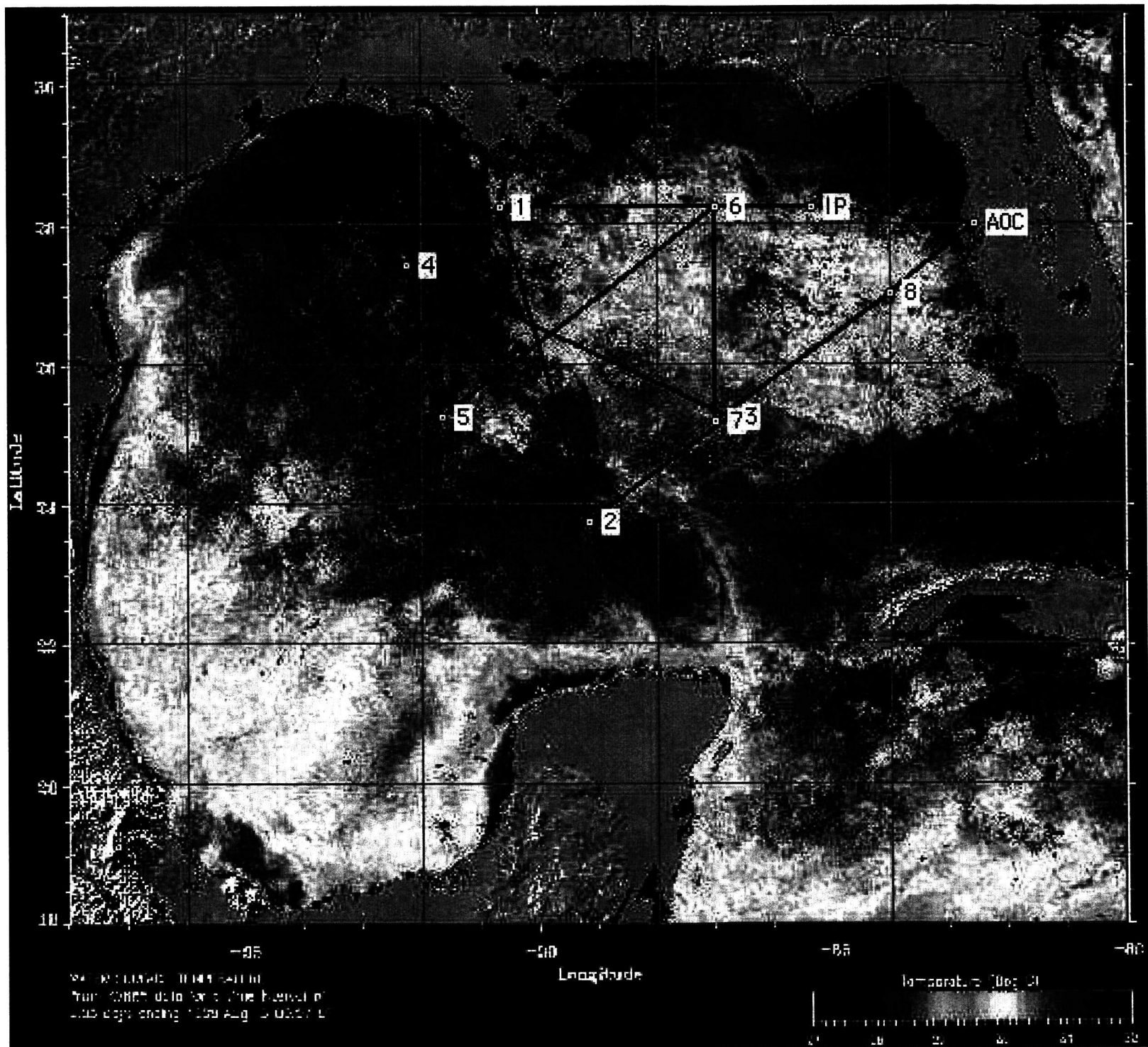
This flight followed AXBT/AXCP/AXCTD system continuity checks on the ground and a test drop of two AXBTs during the aircraft system calibration flight on 31 July (flight 990731H). Digital audio recording of the data failed on 990731H. A defective antenna cable (one of two) was found and the flight (990803H) was conducted with only one working antenna.

One cause of the weak AXCP and AXCTD signals was found to be due to a 7 dB signal strength loss in the antenna cable and to the lack of a necessary pre-amp to boost signal strength, a problem which was fixed along with the bad antenna cable the next day. This preamp was in line for the AXBT signals, hence the excellent data return.

P. Black

TOPEX/ERS-2 Analysis Aug 1 1999





On-Board Lead Project Scientist Check List

Date 8/3/99 Aircraft 42RF Flight ID 99080314

A. Participants:

HRD		AOC	
Function	Participant	Function	Participant
Lead Project Scientist	<u>P. Black</u>	Flight Director	<u>S. Cysyk</u>
Cloud Physics		Pilots	<u>D. Tennison / R. Phillipsburne</u>
Radar	<u>E. Uhlhorn</u>	Navigator	<u>D. Rathbun</u>
Workstation		Systems Engineer	<u>B. J. Roles</u>
Photographer/Observer	<u>P. Davies</u>	Data Technician	<u>S. McMillan</u>
Omegasonde		Electronics Technician	<u>R. MacNamara (drops)</u>
AXBT/AXCP/Guest	<u>J. CIONE / D. JACOB</u>	Other	

Wheels up

Take-Off: 1332Z Location: MACDELL

Landing: 2246Z Location: MACDELL

Number of Eye Penetrations: _____

9h 15m

B. Past and Forecast Storm Locations:

Date/Time	Latitude	Longitude	MSLP	Maximum Wind

C. Mission Briefing:

Air-sea eddy AXBT flight - Survey ocean
eddy features in Gulf of Mexico
test AXCP/AXCTD data systems

E.2 Lead Project Scientist (On-Board)

E.2.1 Preflight

- ___ 1. Participate in general mission briefing.
- ___ 2. Determine specific mission and flight requirements for assigned aircraft.
- ___ 3. Determine from CARCAH or field program director whether aircraft has operational fix responsibility and discuss with AOC flight director/meteorologist and CARCAH unless briefed otherwise by field program director.
- ___ 4. Contact HRD members of crew to:
 - a. Assure availability for mission.
 - b. Arrange ground transportation schedule when deployed.
 - c. Determine equipment status.
- ___ 5. Meet with AOC flight crew at least 90 minutes before takeoff, provide copies of flight requirements, and provide a formal briefing for the flight director, navigator, and pilots.
- ___ 6. Report status of aircraft, systems, necessary on-board supplies and crews to appropriate HRD operations center (MGOC in Miami or FGOC at remote recovery location).

E.2.2 In-Flight

- ___ 1. Confirm from AOC flight director that satellite data link is operative (Information).
- ___ 2. Confirm camera mode of operation.
- ___ 3. Confirm data recording rate.
- ___ 4. Complete Form E-2.

E.2.3 Postflight

- ___ 1. Debrief scientific crew.
- ___ 2. Report landing time, aircraft, crew, and mission status along with supplies (tapes, etc.) remaining aboard the aircraft to the appropriate HRD operations center (MGOC or FGOC).
- ___ 3. Gather completed forms for mission and turn in at the appropriate operations center. [Note: all data removed from the aircraft by HRD personnel should be cleared with the AOC flight director.]
- ___ 4. Obtain a copy of the 10-s flight listing from the AOC flight director. Turn in with completed forms.
- ___ 5. Determine next mission status, if any, and brief crews as necessary.
- ___ 6. Notify the appropriate operations center (FGOC or MGOC) as to where you can be contacted and arrange for any further coordination required.
- ___ 7. Prepare written mission summary.

D. Equipment Status (Up, Down, Not Available, Not Used)

Equipment	Pre-Flight	In-Flight	Post-Flight
Aircraft	✓	✓	✓
Radar/LF	✓	✓	✓
Radar/TA (Doppler)	—	—	—
Cloud Physics	—	—	—
Data System	✓	down for 5 min	✓
GPS Omegasondes	✓	✓	✓
AXBT/AXCP	✓/✓	✓/✓	✓/✓
Workstation	—		
Videography	down only		

REMARKS:

One of two AXBT antennas inop. Probable cable problem.

AXCP/AXCTD data systems OK

E. (I) Proposed Flight Pattern (sketch or designate by number)

E. (II) Actual Flight Pattern

Lead Project Scientist Event Log

Date _____ Flight 990803H LPS P. BLACK

Time	Event	Position	Comments
141700	IP	2813 8523	over all edge w ≈ 10m/s
141845	BT 1 18	2814 8530	CH12
2148	SST 30.0		MLD 142247 = 38m
2246	20C		D20 = 90
2351	15C		D15 = 182
142510	BT 2 30.0	2815 8600	
			MLD
			D20
			D15
143332	BT 3	2815 8641	CH12
3556	29.6		MLD 36m
3714	20C		D20 113m
3900	15C		D15 = 270m, ^{mk12} 285m
144135	BT 4	2816 8720	CH16
4400	29.5		MLD = 34m
4422	MLD		drop quit early below MLD ~45m
4440			
145105	BT 5	2816 8806	
5328	30.0		MLD =
5510	20C		158m
5628	15C		277m

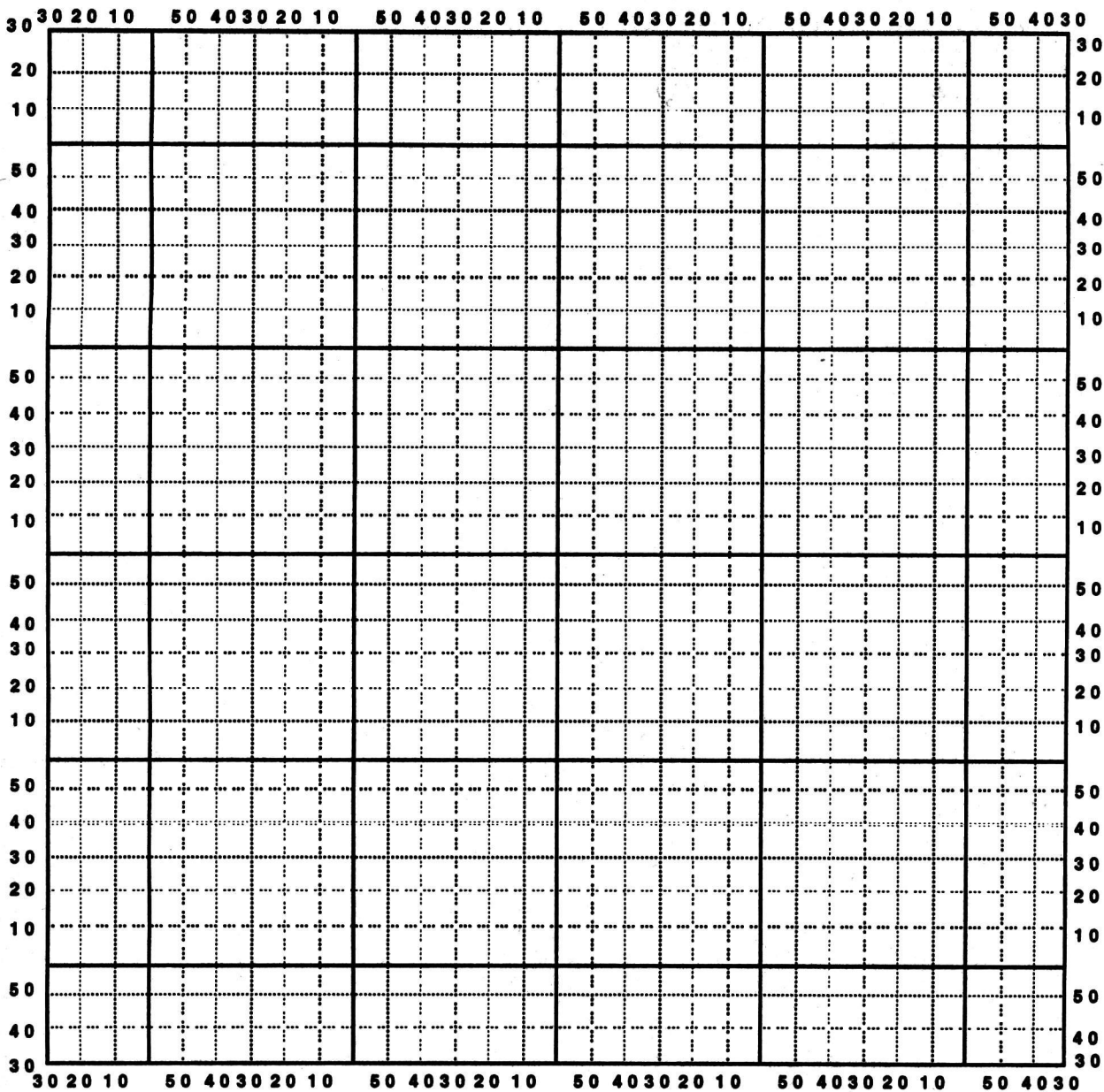
10's
120
155 1800
15
300

1.5
22
30

Hurricane Recco Plotting Chart

True at 25° Latitude, in Degrees and Minutes

Date _____ Flight ID _____ LPS _____



Note : Label full degrees according to location of the flight area.

Lead Project Scientist Event Log

Date _____ Flight 990803H LPS P. BLACK

wt 10

Time	Event	Position	Comments
150212	BT 6	2815 8901	
0438	30.1		
0600	20C		recvr #3 hung in down log drop-out of recvr #2
0700	15C		
151839	BT 7	2814 9022	3 rigs nearby CH12
152100	30.6		MLD = 20m
2200	20C		in mud D20 = 65m
	15C		
152923	BT 8	2739 9014	MLD = 21m
3453	29.3		data on recvr 3 only
3345	20C		recvr #2 NG
3503	15C		
153530	BT 9	2714 9005	
3748	29.9		MLD = 62m in eddy
4032	20C		
4200	15C		
154303	BT 10	2644 8954	
4532	SST 29.8		
4750	20C		D20 = 190
4928	15C		

3

Lead Project Scientist Event Log

Date _____

Flight 99080314

LPS P. BLACK

Time	Event	Position	Comments
155009	BT11	2415 8944	NG
	SST		
	20C		
	15C		
155630	BT12	2548 8935	GPS drop also
5815	SST 29.6		over buoy 42001
5841	20C		MCD = 8m DIS = 37m
5939	15C		DIS = 127 in cold eddy now
160432	BT13	2515 8924	
0700	SST 30.3		
0736	20C		
0825	15C		
162350	BT14	pt 2 2400 8856	
2633	29.8		
2702	20C		
2820	15C		
163211	BT15	2420 8824	
3440	SST 28.5		
3518	20C		
3636	15C		

Lead Project Scientist Event Log

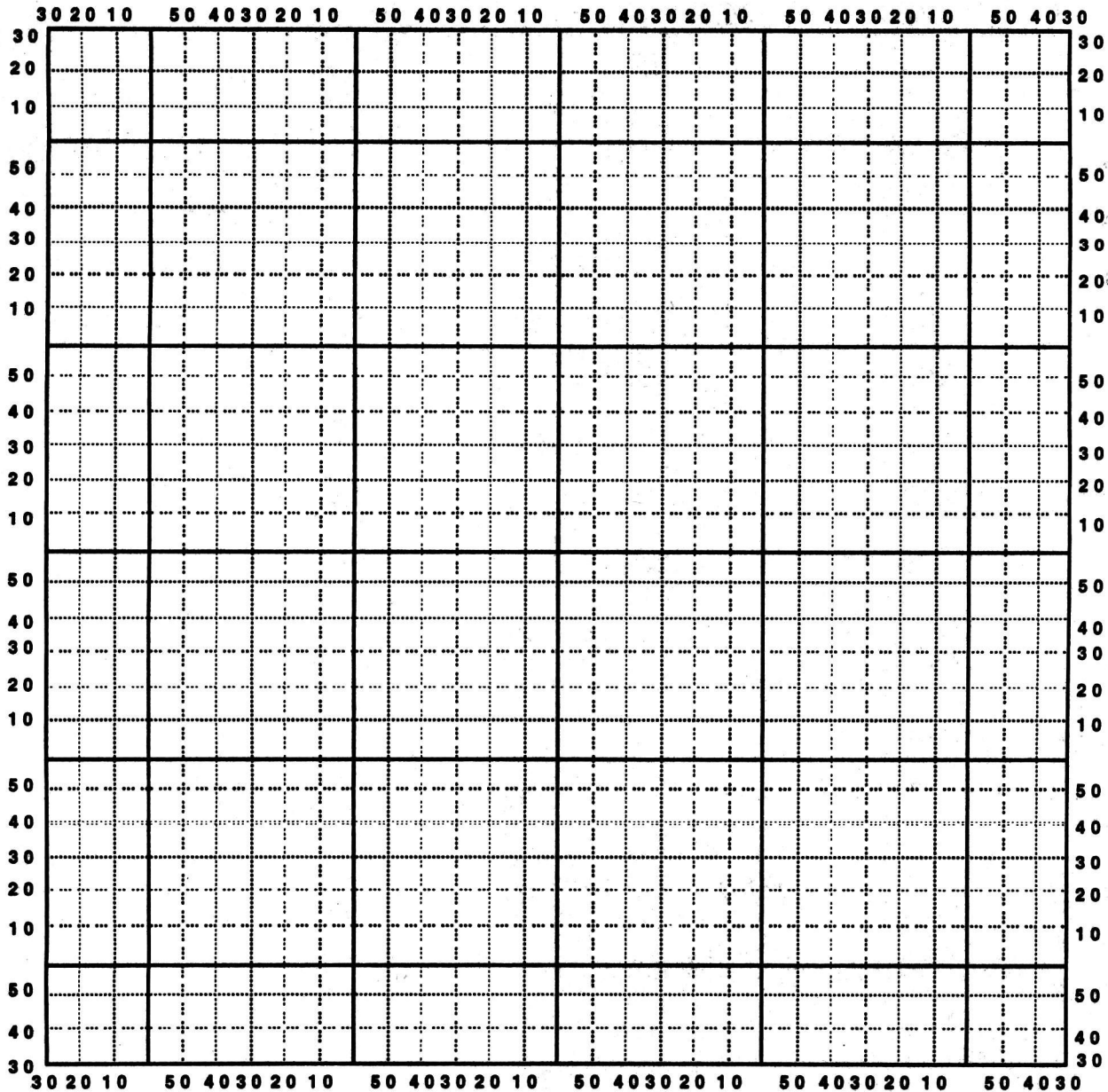
Date _____ Flight 990803A LPS P. Black

Time	Event	Position	Comments
163749	BT16	2432 8800	
4035	SST 29.5		only record 41 good 2 record the N/C
4156	20C		
4332	15C		
164551	BT17	2450 8728	
4818	SST 29.7		
5116	20C		D20 = 250m
5225	15C		
165608	BT18 pt 13	2514 8647	
165650	BT18	2515 8649	
165706		2516 8650	start descent
5915	SST 29.9		
170200			lvl 5200ft
0244	20C		D20-321
	15C		
170637	BT19	2530 8729	last CO2 launch
0820	SST = 29.7		
1128	20C		
171245			depressurize, mount launch tube

Hurricane Recco Plotting Chart

True at 25° Latitude, in Degrees and Minutes

Date _____ Flight ID _____ LPS _____



Note : Label full degrees according to location of the flight area.

5

Lead Project Scientist Event Log

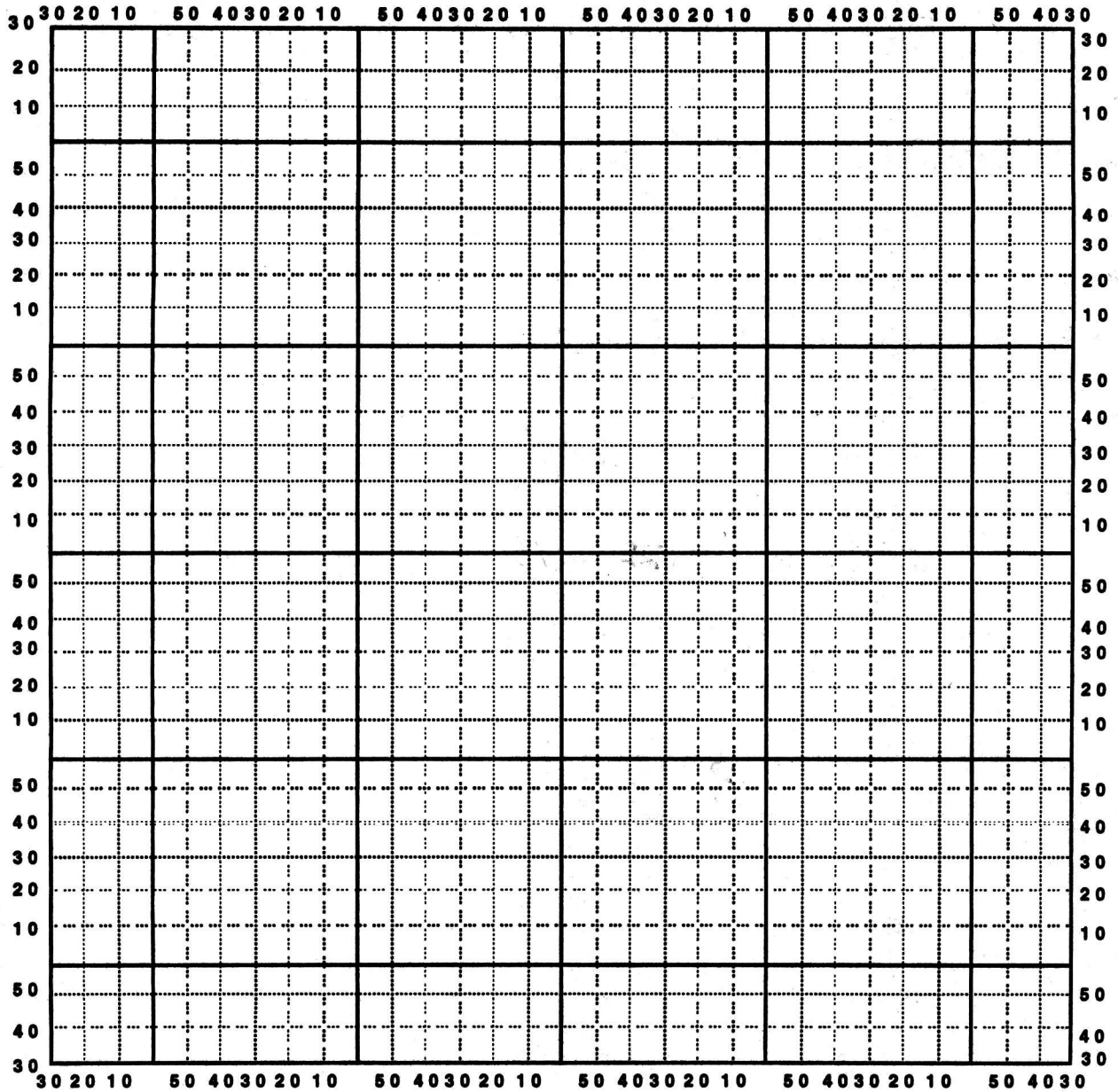
Date _____ Flight 990803H LFS P Black

Time	Event	Position	Comments
171752	BT20	2548 8812	
1921	29.9		
2245	20c		
172420	CP1	2558 8836	FAS 191 kt OK great signal on M/K10
173047	BT21	2609 8900	
3234	SST 29.5		
3504	20c		
3602	15c		
174125	BT21(1)22	2613 8947	
4252	29.2		
4349	20c		
4457	15c		
175336	BT22	2645 9025	
5444	29.0		
	20c		probe hung at 26c @ 175520
175730			data syst hung
180315	CP2	2700 9100	CH12
180930	data npt up		
	C15		D15 ~ 300m

Hurricane Recco Plotting Chart

True at 25° Latitude, in Degrees and Minutes

Date _____ Flight ID _____ LPS _____



Note : Label full degrees according to location of the flight area.

6

Lead Project Scientist Event Log

Date _____ Flight 990803H LPS P. BLACK

Time	Event	Position	Comments
181029	turn (4)	2709 9130	
181139	BT 24	2705 9131	
1327	SST 29.6		
1452	20C		
1610	20 15C		
182425	BT 24 25	2613 9123	
	SST		
	20C		D20 = 60
	15C		
183635	CTD 1	2532 9112	NG - used AOC receiver got quieting on M112, dist no signal
183637	BT 26		
183820	29.9		
3902	20C		D20 = 80m
	15C		D15 = 210
184350	BT 27	2552 9047	
4524	SST 30.0		
4556	20C		
4651	15C		
185342	BT 28	2616 9015	
5516	SST 30.2		
	20C		
5655	15C		

(7)

Lead Project Scientist Event Log

Date _____

Flight 990803H

LPS R. BLACK

Time	Event	Position	Comments
190040	CTD2	2633 8953	8953
	C20		D20 = 300m
191118	BT 29	2658 8916	
1300	30, 3		
	20 C		D20 = 172m
	15 C		D15 = 300m
192125	BT 30	2723 8870	
2310	SST 30.0		
2521	20 C		
2630	15 C		
193500	pt (6)	2755 8752	
193542	BT 31	2754 8752 49	
3724	SST 30.0		
3950	20 C		
	15 C		
1944	pt (6')		
194433	BT 32	2737 8716	
4534	29.0		
4720	20 C		
	15 C		

Lead Project Scientist Event Log

Date _____ Flight 990803H LPS P. BLACK

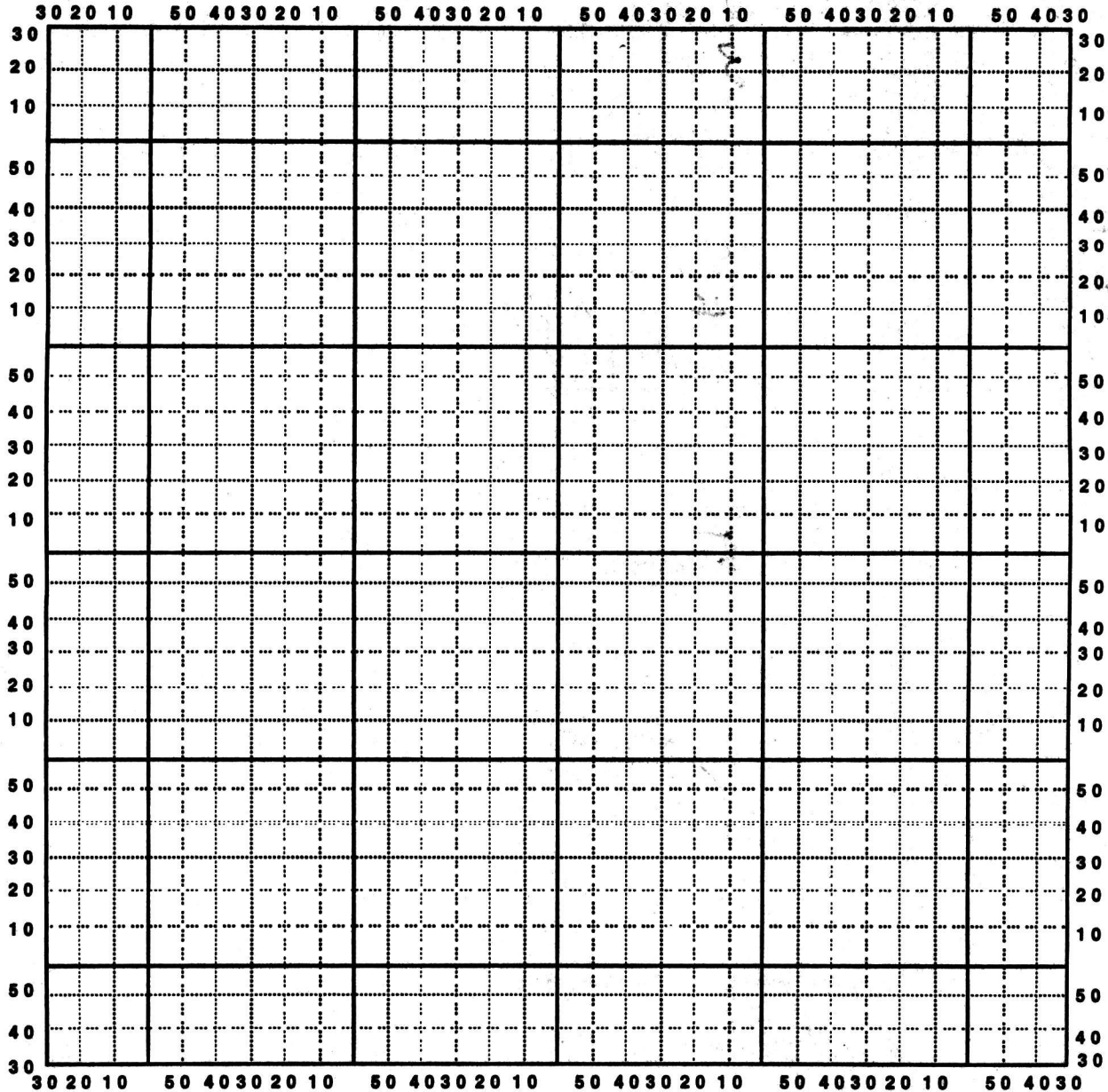
Time	Event	Position	Comments
195210	BT32	2705 8712	
195749	BT32	2705 8710	
5927	30.1		
0850	20C		
	15C		
200759	BT34	2629 8708	
0942	SST 30.1		
1125	20C		
1250	15C		
201506	BT34	2600 8705	
1637	30.3		
	20C		
2030	15C		
203640	BT36	2428 8656	
3808	SST 29.9		
4104	20C		
	15C		
204900	BT37	2343 8647	
5020	SST 29.6		
	20C		
	15C		

pt 2

Hurricane Recco Plotting Chart

True at 25° Latitude, in Degrees and Minutes

Date _____ Flight ID _____ LPS _____



Note : Label full degrees according to location of the flight area.

9

Lead Project Scientist Event Log

Date _____

Flight 990803H

LPS P Black

Time	Event	Position	Comments
210200	BT38	2408 8605	
0234	29.5		
0520	20c		
0645	15c		
211100	BT39		convecting line along Loop Cur. back to ESTZ
211510	BT39	2435 8518	very hazy
1642	29.9		
1900	20c		
1940	15c		
212351	BT40	2453 8548	
2542	29.8		
2826	20c		
	15c		
213530	BT41	2516 8627	
3700	30.0		
4000	20c		
	15c		
214119	BT42	2536 8617	
4312	30.0		
4552	20c		

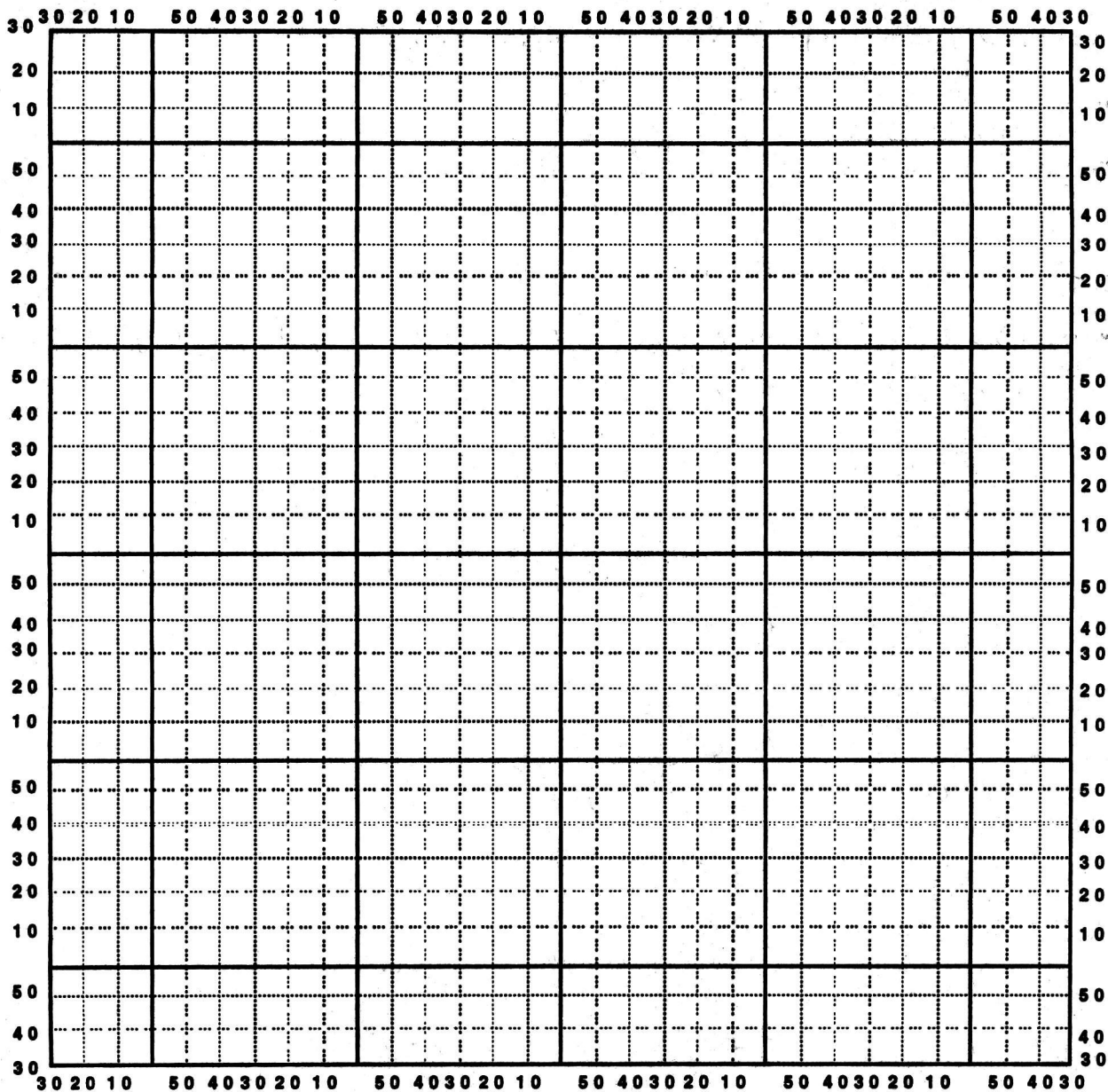
pt8

pt9

Hurricane Recco Plotting Chart

True at 25° Latitude, in Degrees and Minutes

Date _____ Flight ID _____ LPS _____



Note : Label full degrees according to location of the flight area.

Lead Project Scientist Event Log

Date _____

Flight 99080314

LPS P. BLACK

Time	Event	Position	Comments
214928	BT43	2556 8549	
5105	30.0		SST only - failed at 10m
215233	BT43'	2602 8538	
	30.0		SST only - failed at 5m
220156	BT44	2623 8505	
0340	29.7		
0436	20c		
0551	15c		
221800	BT45	2700 8402	
2010	30.1		
2054	20c		
2120			in the mud

1.5
to
60

