

FL Governors' Hurricane Conference

A photograph of a propeller airplane flying over a vast, white, cloud-covered landscape under a blue sky with wispy clouds. The airplane's propeller is visible in the foreground on the right side, and the ground below is a dense, white, textured expanse of clouds or snow.

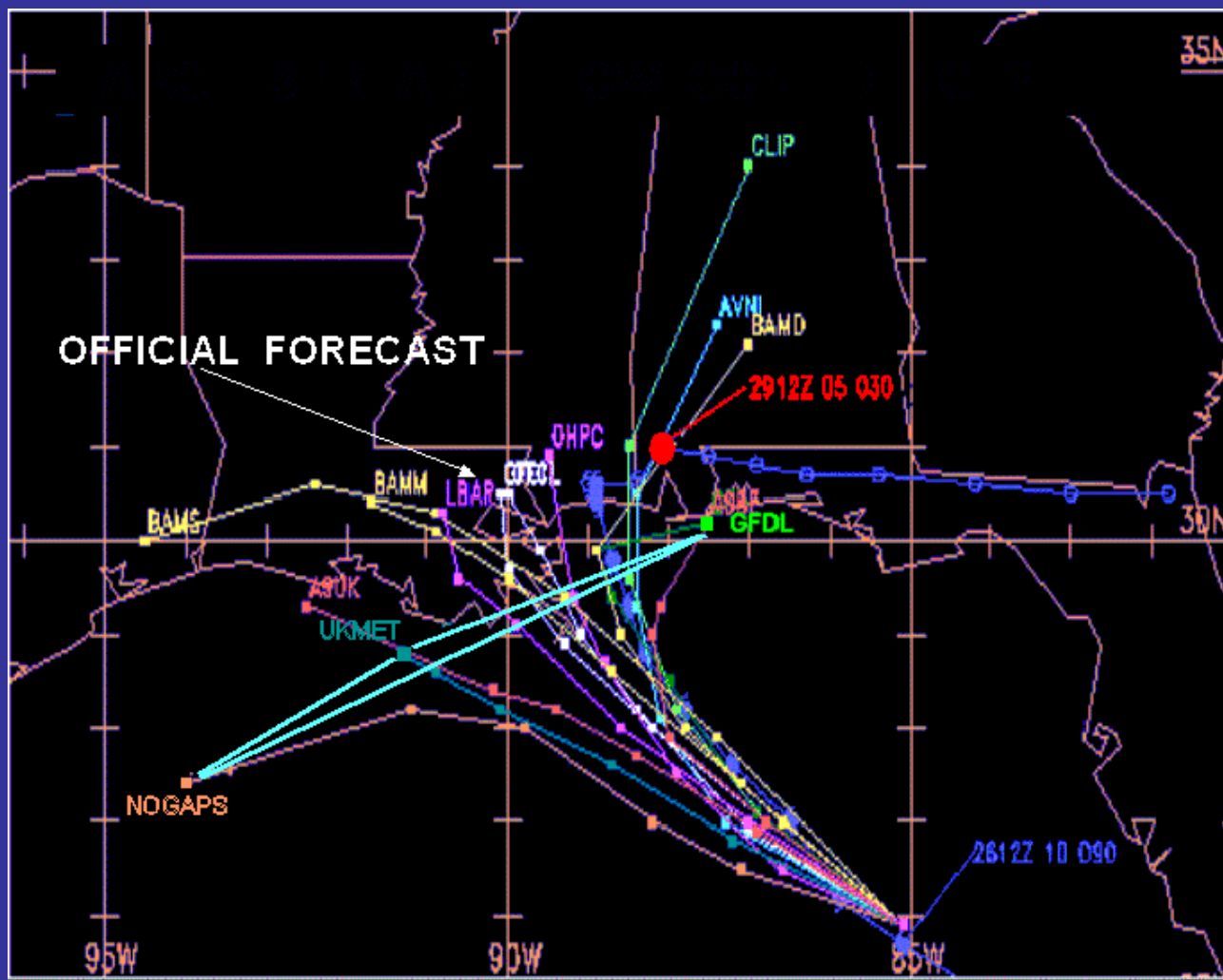
**Lt Col Jon Talbot
Chief Meteorologist
53d Weather Reconnaissance Squadron**



- Why do we fly into Tropical Cyclones
- Where do we do this
- How does the data flow
- What aircraft do this
- What do the data messages look like and how to interpret them
- Sensor limitations









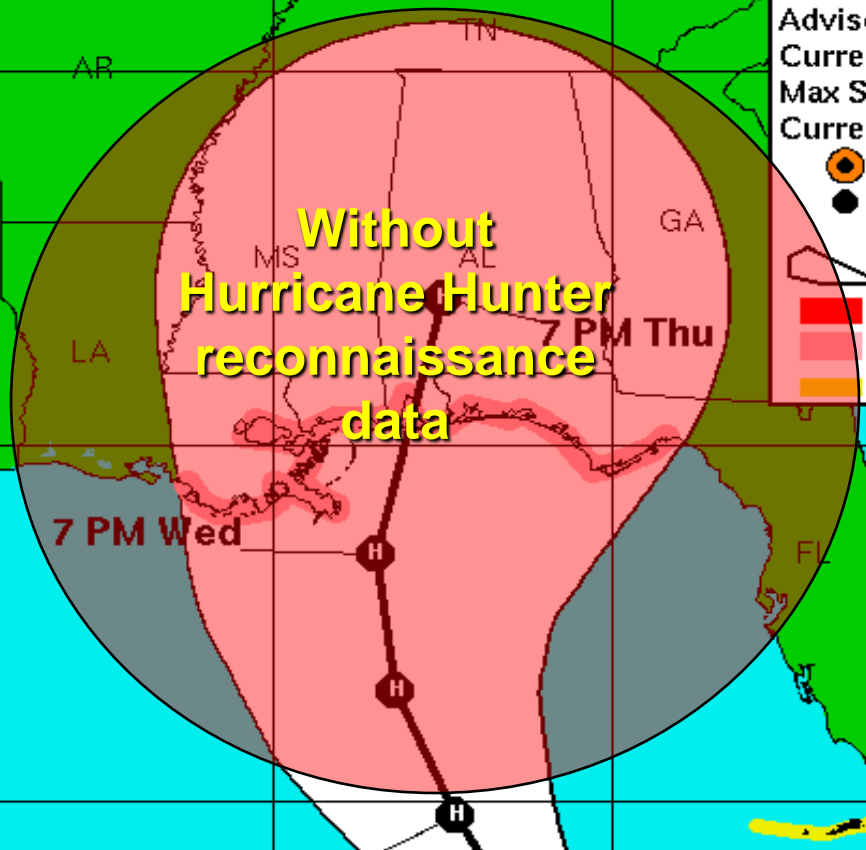
Why do we do this? Initialize!



The suite of forecast models

Hurricane Ivan
September 13, 2004
10 PM CDT Monday
 NWS TPC/National Hurricane Center
 Advisory 47
 Current Center Location 22.0 N 85.4 W
 Max Sustained Wind 160 mph
 Current Movement NW at 9 mph

-  Current Center Location
-  Forecast Center Positions
- H Sustained wind > 73 mph
-  Potential Day 1-3 Track Area
-  Hurricane Warning
-  Hurricane Watch
-  Tropical Storm Watch



Without
Hurricane Hunter
reconnaissance
data

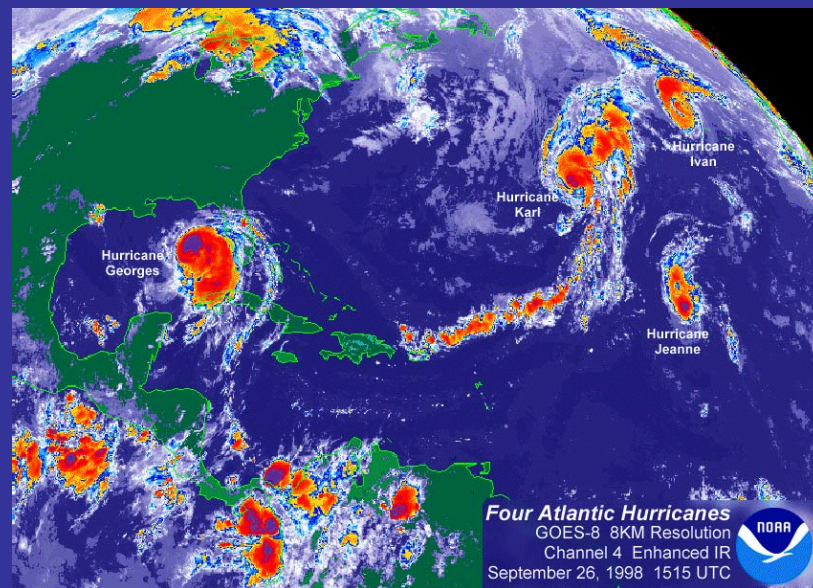
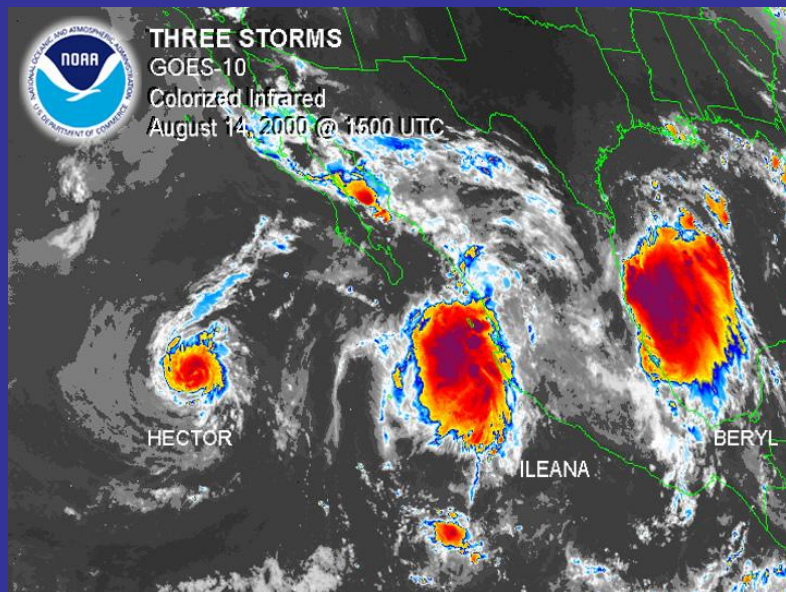
Data collected enables National Hurricane Center to increase the accuracy of forecasts by 25%, which at One Million dollars per mile, saves millions of dollars for every storm !





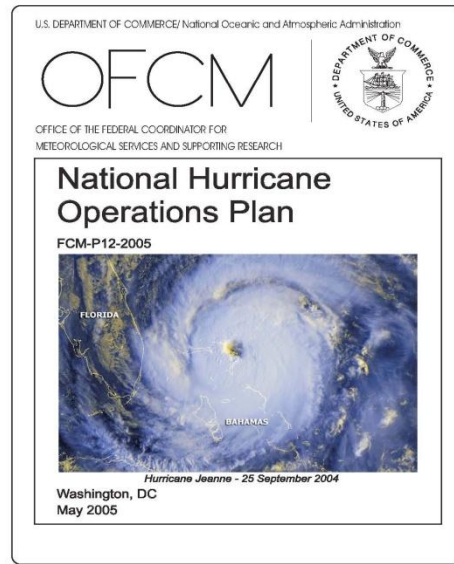
Area of Responsibility

Mid-Atlantic (55W) – Int'l Dateline





Operations



The National Hurricane Operations Plan (NHOP) is an agreement between DoC and DoD regarding weather reconnaissance operations



Operations and data flow

**National Hurricane Center
(NHC) Miami, FL**



**Chief, Aerial
Reconnaissance
Coordination, All
Hurricanes (CARCAH)**



We are tasked 48 hours in advance by the National Hurricane Center via CARCAH, which is located at NHC



WC-130 J AIRCRAFT





WC-130 J



Heads Up Display



Eye of ERNESTO



SFMR

10 yrs of development and collaboration between NOAA's Hurricane Research Division, NOAA's Aircraft Operations Center, private companies and universities

Provides surface wind speeds on the ocean surface every 1 sec

Data proven to greatly enhance tropical cyclone warnings and near term forecasting prior to landfall
Operations began 2007
Hurricane Season





PERSONNEL

5 person crew



10 Full Time crews
(Civil Service and Reserve positions combined)
10 Traditional Reserve crews

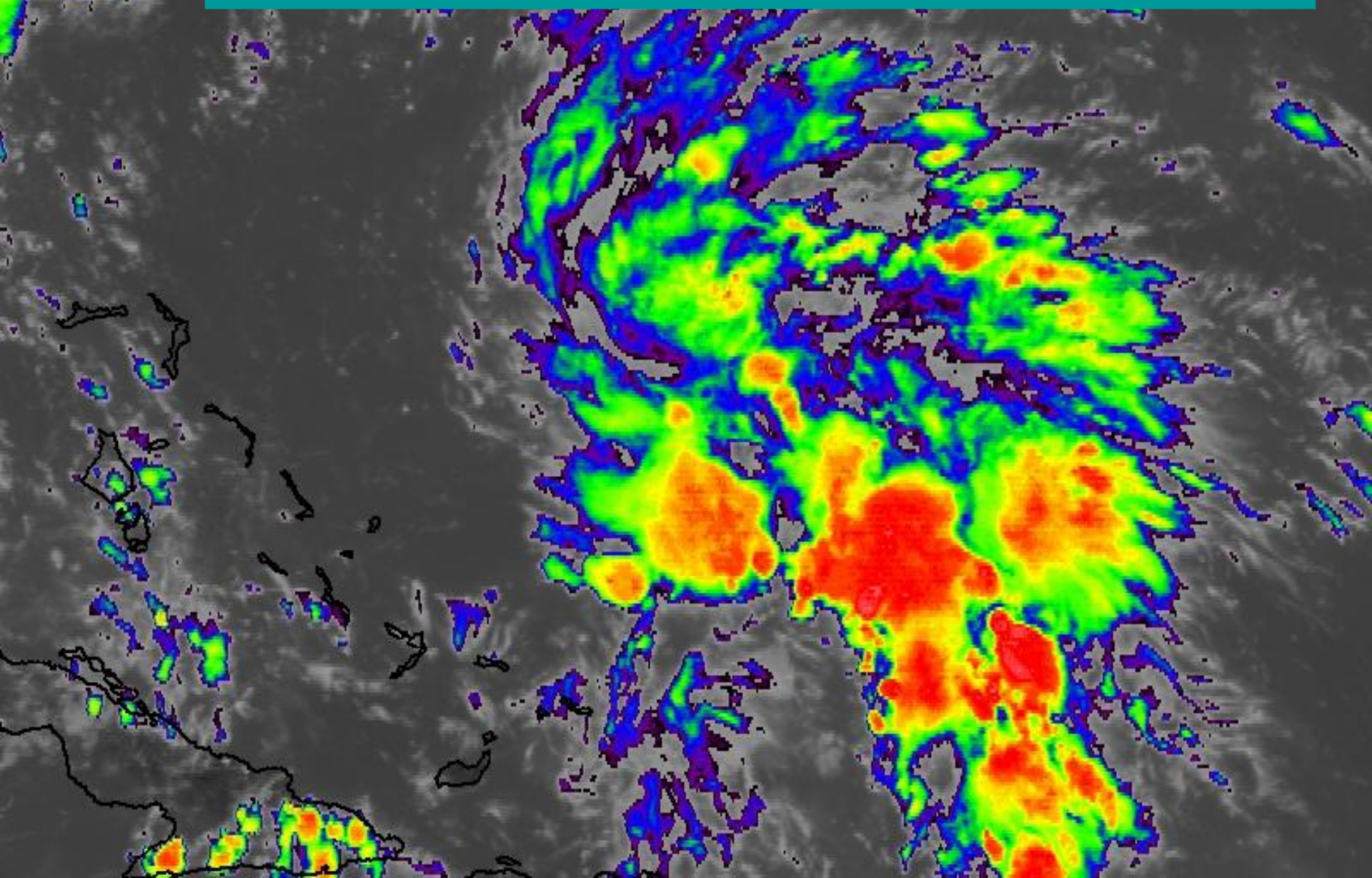


NOAA Aircraft



29 Jul 2004
17:15 UTC

Is there a complete counterclockwise circulation of winds?





Low Level Mission: Birth of a Storm



“Are the winds blowing in a counter-clockwise circle yet?”



After Our Third Invest on Some Tropical Trash:

... THE INTENSITY FORECAST IS FOR LITTLE CHANGE TO THE 30 KNOT MAX ONE-MIN WINDS

Yawn...





36 HRS LATER:

LENNY IS STRENGTHENING RATHER QUICKLY THIS MORNING. REPORTS FROM AN AIR FORCE RESERVE HURRICANE HUNTER INDICATE THE CENTRAL PRESSURE HAS DROPPED TO 971 MB...WITH MAX 850 MB WINDS OF 100 KT...AND SATELLITE INTENSITY ESTIMATES ARE ALL 77 KT.



We're on-scene to catch sudden changes



What does the data look like?



- Vortex Msg
- High-Density
- Dropsonde



- #1 position
- #2 SLP

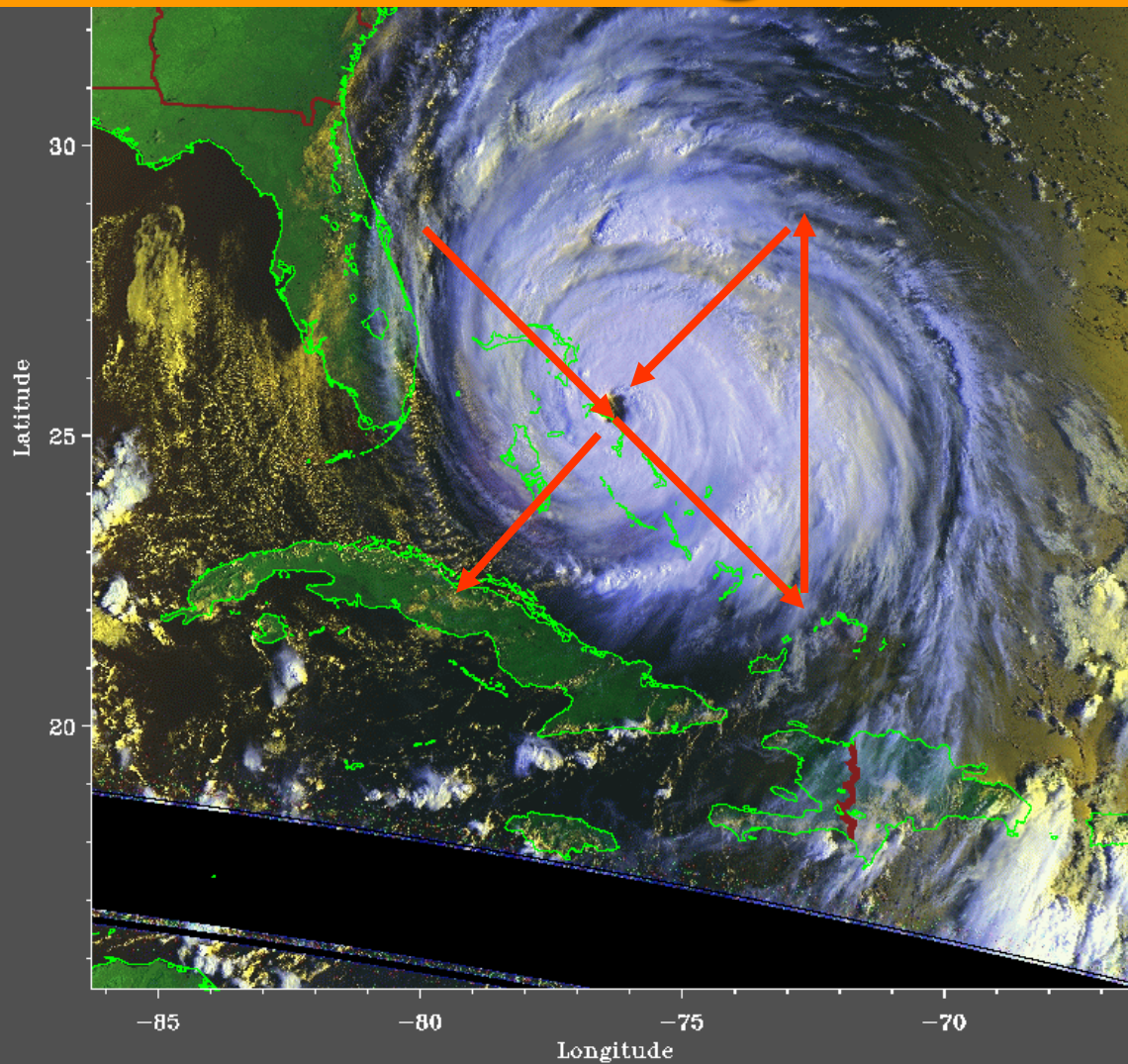
“Duty ... Honor ... Data...”



Hurricane Floyd



Hurricane Flight Pattern



AVHRR 3 Channel Color Composite
NOAA-15 AVHRR 1999 Sep 14 12:45 UT
Daytime: R=C1 G=C2 B=-C4



HIGH DENSITY DATA in DEAN

AF304 1104A DEAN

HDOB 18 20070820

012430 1734N 07755W 6961 02923 9990 +064 +999 151111 117 091 027 01

012500 1733N 07757W 6965 02886 9990 +068 +999 154121 124 099 039 01

012530 1733N 07759W 6940 02878 9990 +078 +999 162110 121 117 026 05

012600 1733N 07801W 6991 02779 9990 +091 +999 153103 105 119 004 05

012630 1732N 07803W 6975 02764 9586 +130 +130 153111 112 121 003 00

012700 1732N 07804W 6969 02735 9533 +139 +139 156115 117 108 002 00

012730 1732N 07806W 6969 02685 9492 +129 +129 157116 117 098 000 00

012800 1732N 07808W 6972 02627 9428 +134 +134 155117 119 089 005 00

012830 1731N 07810W 6969 02574 9382 +124 +124 154104 112 087 006 00

012900 1731N 07812W 6954 02549 9304 +153 +153 144061 073 070 003 00

012930 1730N 07814W 6969 02515 9284 +159 +159 147037 046 051 004 00

013000 1729N 07815W 6966 02508 9276 +155 +155 157021 026 034 003 00

013030 1728N 07817W 6968 02503 9273 +154 +154 173012 015 026 004 03

013100 1728N 07819W 6965 02506 9274 +155 +155 234005 007 017 002 03

013130 1727N 07820W 6964 02512 9281 +154 +154 300015 021 022 004 03

013200 1725N 07821W 6967 02523 9291 +155 +155 308029 033 036 004 03

013230 1724N 07823W 6966 02543 9311 +155 +155 314042 045 041 003 03

013300 1723N 07824W 6970 02566 9990 +118 +999 313069 087 106 031 05

013330 1721N 07824W 6992 02604 9990 +093 +999 305101 103 105 039 05



VORTEX DATA MESSAGE



URNT12 KNHC 200148

VORTEX DATA MESSAGE AL042007

A. 20/01:31:00Z

Date and time of flight level center Fix

B. 17 deg 28 min N

Latitude

078 deg 18 min W

Longitude

C. 700 mb 2466 m

Height at standard Level

D. 121 kt

Max inbound sfc wind (SFMR)

E. 073 deg 16 nm

Where the max sfc wind occurred (radial /distance from center)

F. 160 deg 125 kt

Max flight level wind observed on inbound leg

G. 075 deg 021 nm

Where max flight level wind occurred

H. 926 mb

Surface pressure (measured by dropsonde or extrapolated)

I. 7 C/ 3049 m

Max flight level temp outside central core (low bias in heavy rain)

J. 16 C/ 3044 m

Max flight level temperature in center (if more than 5nm away from fix, remark)

K. 16 C/ NA

Dew point as same point as max flight level temp

L. CLOSED

Eye character

M. C16

Eye Diameter

N. 12345/7

Fix discriminators (penetration, radar,winds,pressure, temp)

O. 0.02 / 2 nm

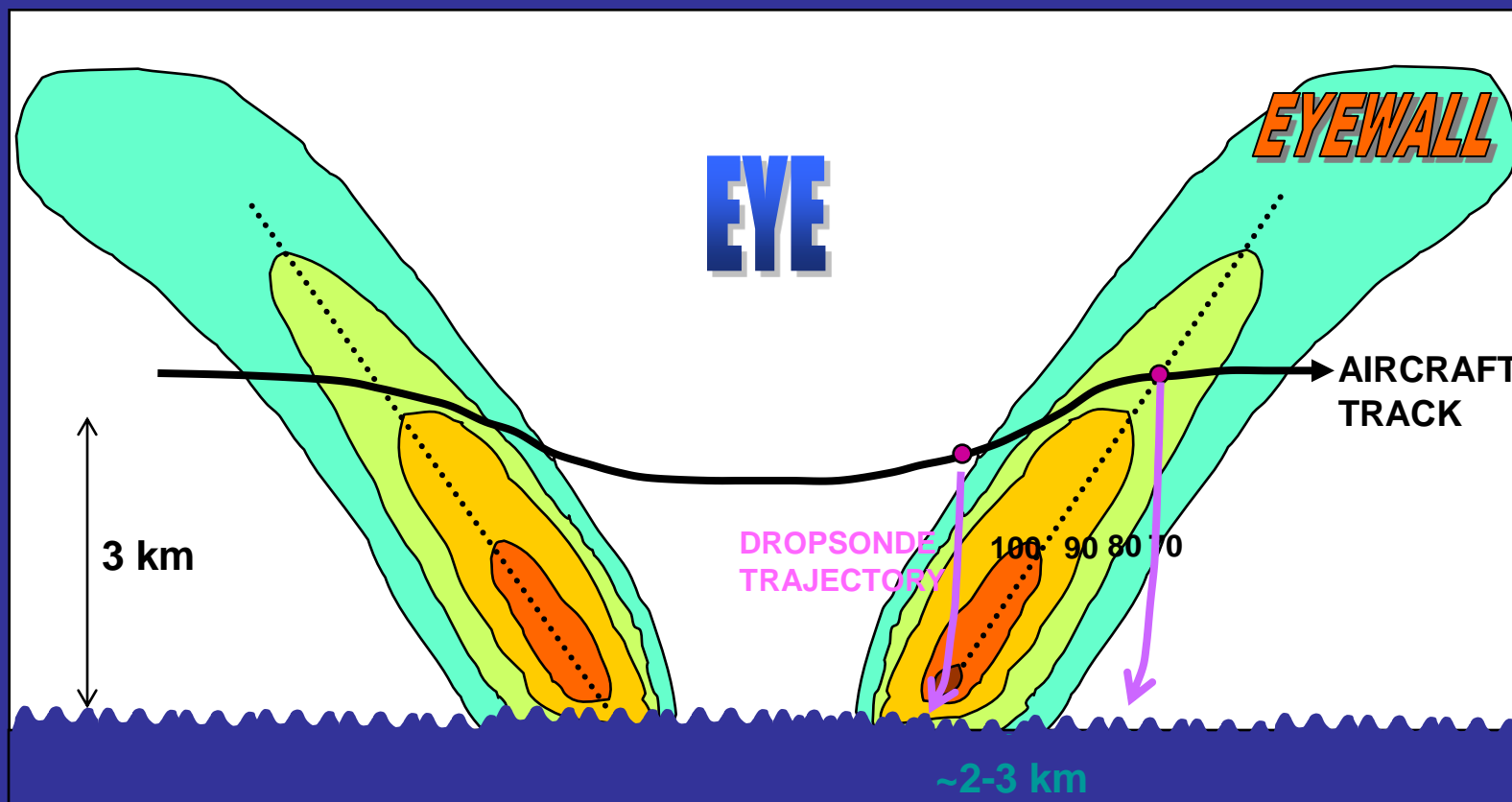
Nav/Meteorological accuracy

P. AF304 1104A DEAN OB 05

MAX FL WIND 125 KT E QUAD 01:25:00 Z Max flight level wind observed on latest pass through any portion of storm



Capturing the Max Winds





VERTICAL PROFILE in DEAN

UZNT13 KNHC 200139

XXAA 70017 99175 70781 04478 99945 26205 11117 00/// // // //

92191 24604 11618 85934 22425 13622 70609 13800 15619 88999 77999

31313 09608 80127

61616 AF304 1104A DEAN OB 07

62626 EYEWALL 090 SPL 1761N07820W 0131 MBL WND 12121 AEV 00000 DLM WND

14119 944708 WL150 11623 082 =

XXBB 70018 99175 70781 04478 00945 26205 11850 22425 22778 20045

33725 16236 44707 15407 55697 13000

21212 00945 11117 11937 11126 22924 11617 33917 12124 44907 12620

55885 13127 66850 13622 77697 15618

31313 09608 80127

61616 AF304 1104A DEAN OB 07

62626 EYEWALL 090 SPL 1761N07820W 0131 MBL WND 12121 AEV 00000 DLM WND

14119 944708 WL150 11623 082 =

•



VERTICAL PROFILE in DEAN

UZNT13 KNHC 200141

XXAA 70027 99175 70783 04478 99**926** 27001 **15018** 00/// // ///

92014 26801 15017 85764 23401 19019 70450 16200 23507 88999 77999

31313 09608 80131

61616 AF304 1104A DEAN OB 08

62626 EYE SPL 1747N07831W 0134 **MBL WND 16520** AEV 00000

DLM WND 19015 926719 WL150 15518 075 =

XXBB 70028 99175 70783 04478 00926 27001 11850 23401 22723 17812

33705 17200 44697 15400

21212 00926 15018 11900 17018 22888 17023 33850 19019 44794 21514

55738 21511 66697 24007

31313 09608 80131

61616 AF304 1104A DEAN OB 08

62626 EYE SPL 1747N07831W 0134 MBL WND 16520 AEV 00000 DLM WND

19

015 926719 WL150 15518 075 =

•Eye drop on first pass – 926mb at surface, but with 18kts of wind.



Sensor limitations

- **Temperature**

- Develops a low bias in very heavy rain of 2-3dec C

- **SFMR surface wind data**

- Transient spikes occur in low wind speeds when entering heavy rain

- **Dropwindsonde**

- Occasional sensor wetting in heavy rain
- Doesn't always go straight down, especially eyewall drops
- Surface winds reported may not be representative of the surface winds at the location of the drop. Need to look at splash location



....Weather Buoys....





TOP TEN COSTLIEST HURRICANES

(\$ billions, as of January, 2006)

Estimated insured losses (2004 dollars)

Year/ Rank/ Hurricane Billions of Dollars (1)

1	2005 Katrina	80+ (1300+ deaths)
2	1992 Andrew	35
3	2005 Wilma	14.4 (35 deaths)
4	2004 Ivan	14.2 (92 deaths)
5	2004 Charley	14.2 (10 deaths)
6	1989 Hugo	9.7
7	2005 Rita	9.4 (6 deaths)
8	2004 Frances	8.8 (7 deaths)
9	1972 Agnes	8.6
10	1965 Betsy	8.5

Source: Insurance Information Institute/Insurance Services Office, Inc.

Estimates, Expressed in 2004 dollars.



8 Most Intense Storms on Record

• Hurricane	Year	Pressure (MB)
• WILMA	2005	882
• GILBERT	1988	888
• Labor Day	1935	892
• ALLEN	1980	895
• RITA	2005	898
• KATRINA	2005	902
• CAMILLE	1969	905
• IVAN	2004	910

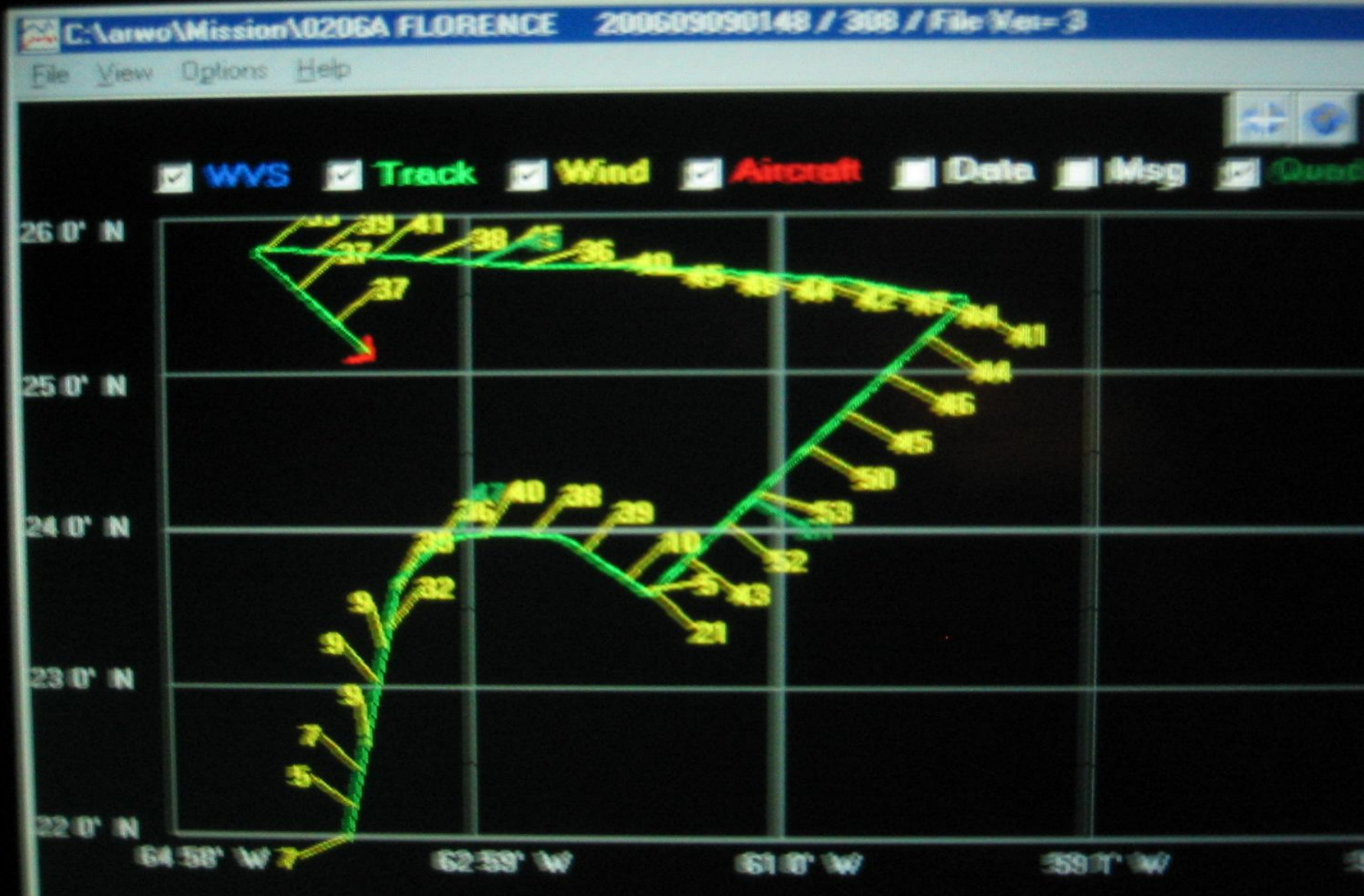


ERNESTO 8/31/06



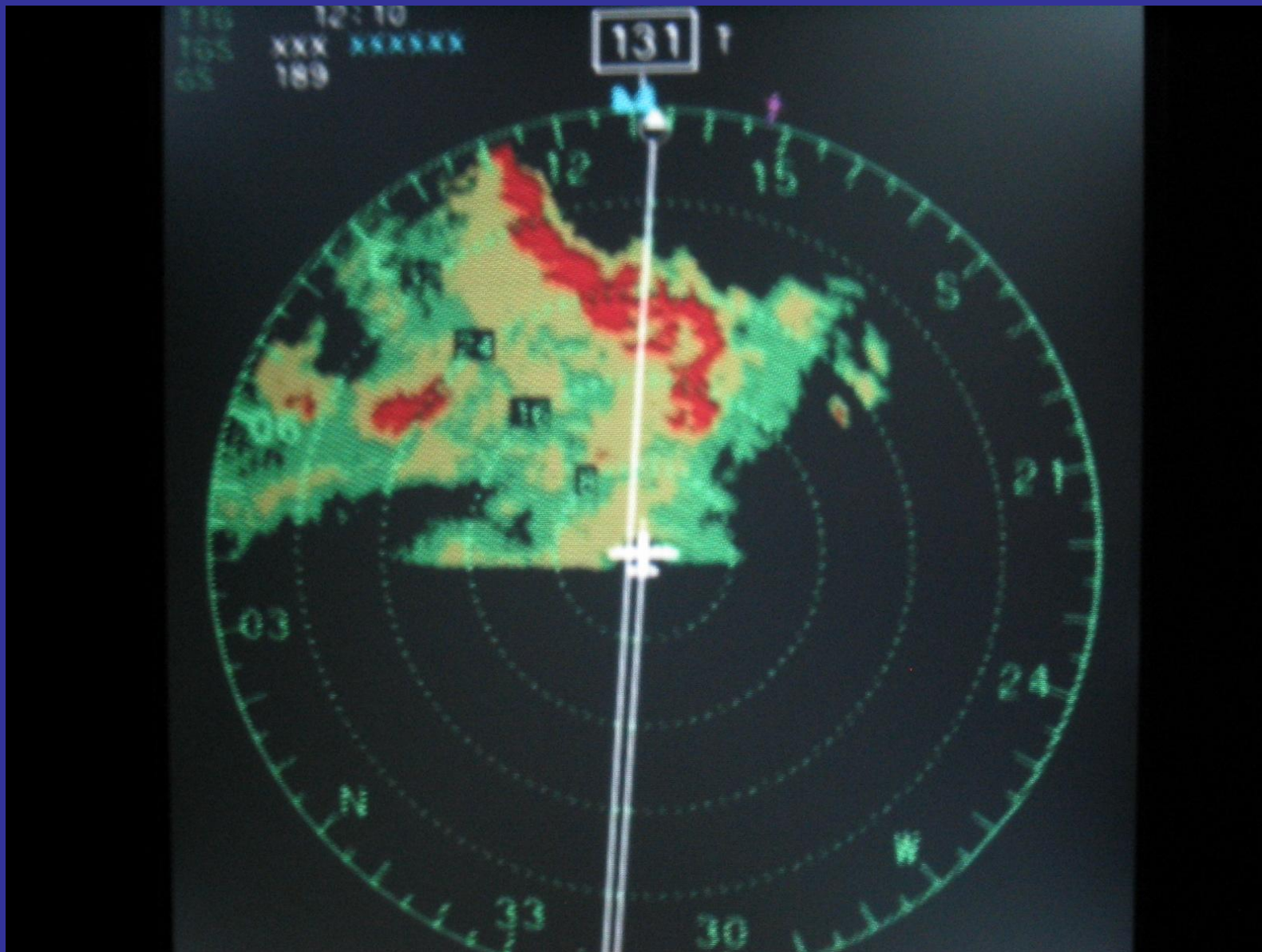


FLORENCE 9/9/06



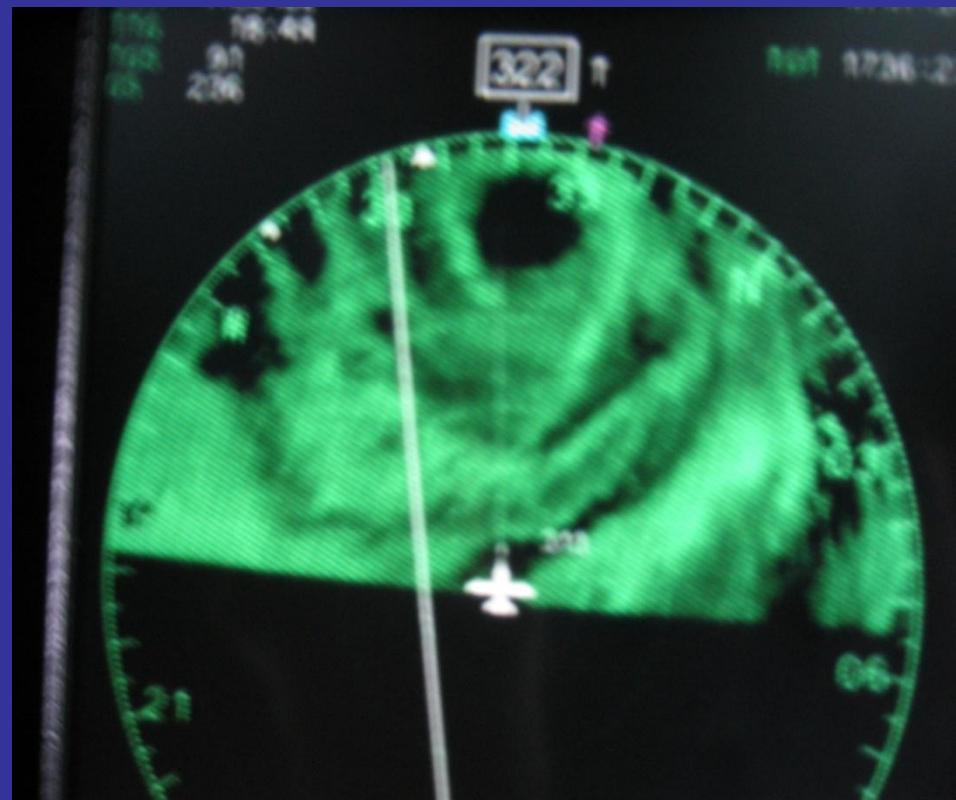
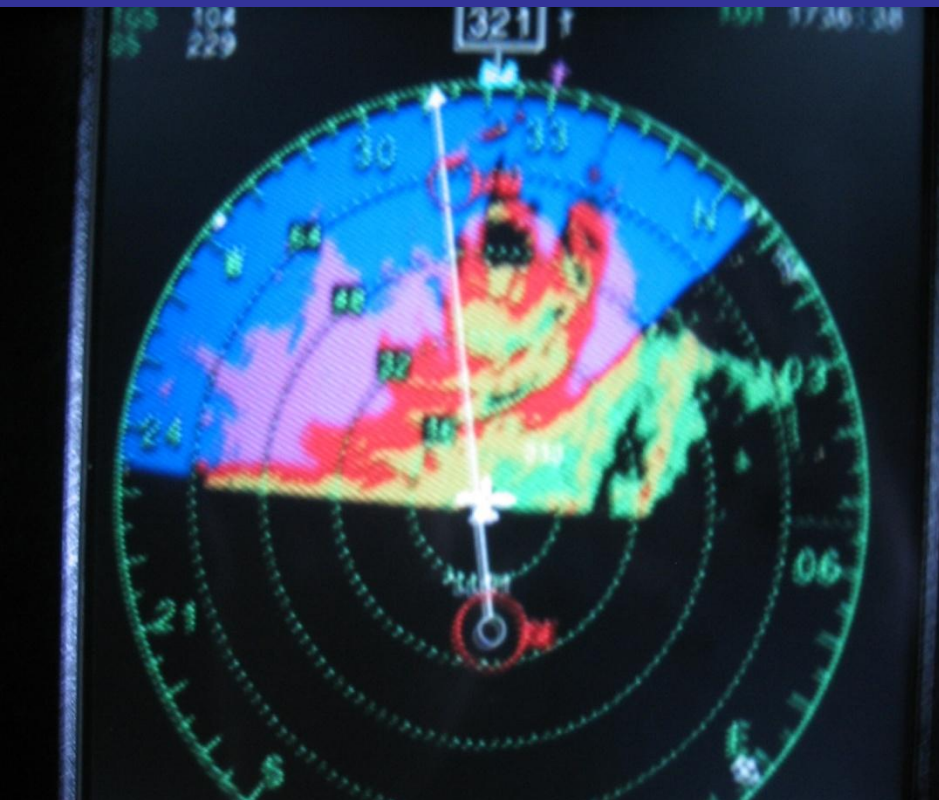


FLORENCE cont.



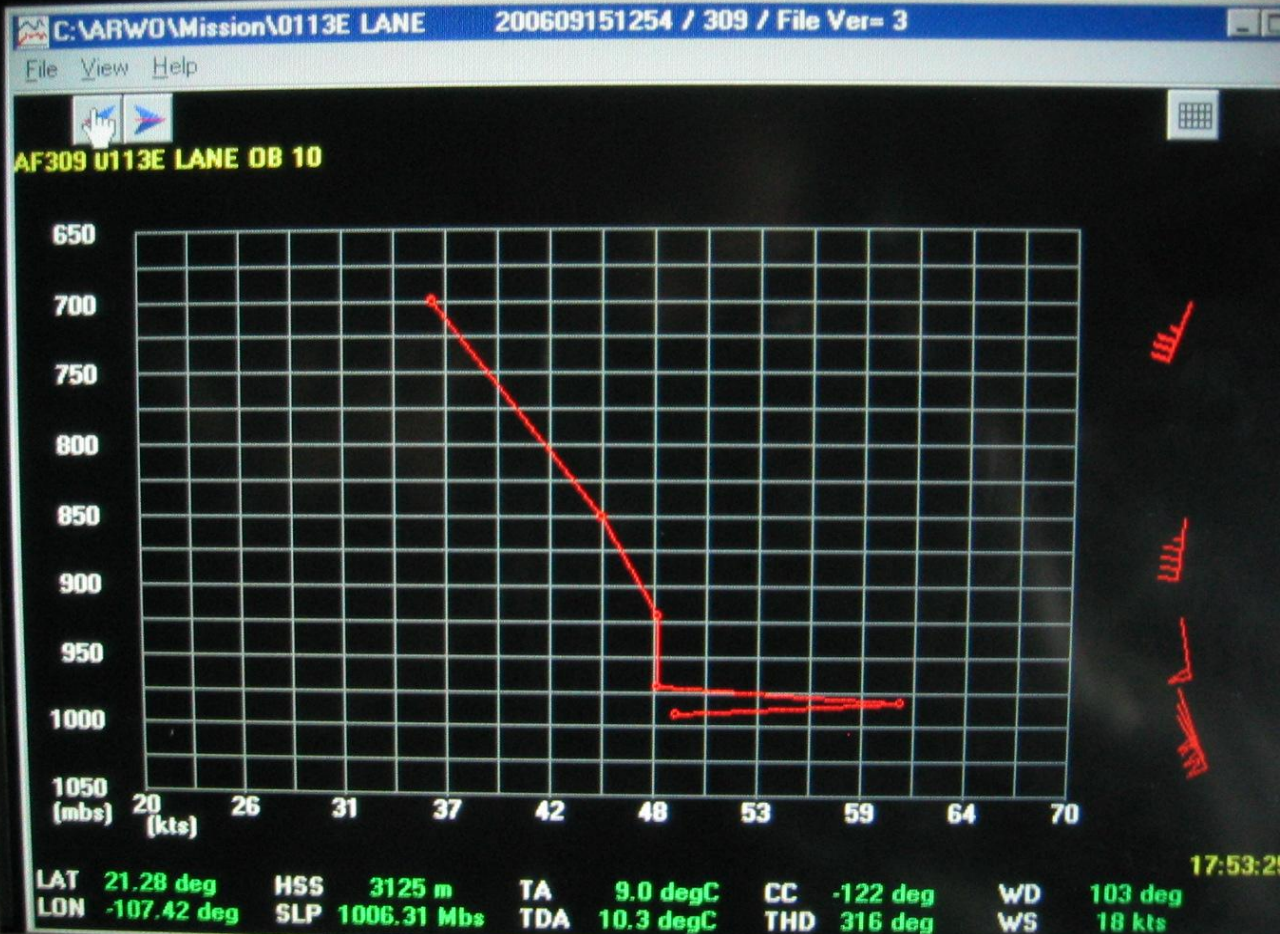


LANE (E. Pacific) 9/15/06



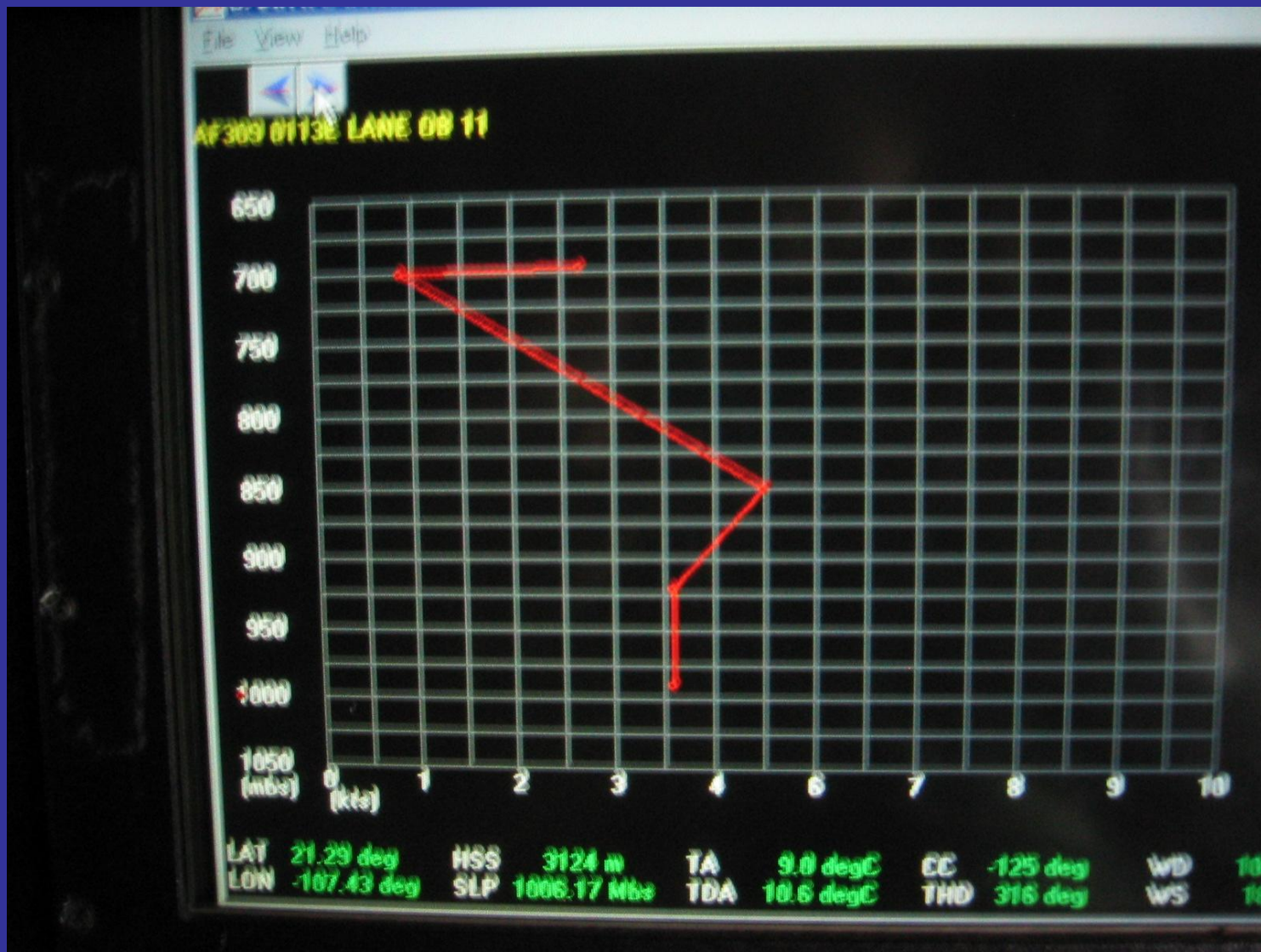


LANE Max Wind Drop





LANE Eye Drop





Lots of Media interest



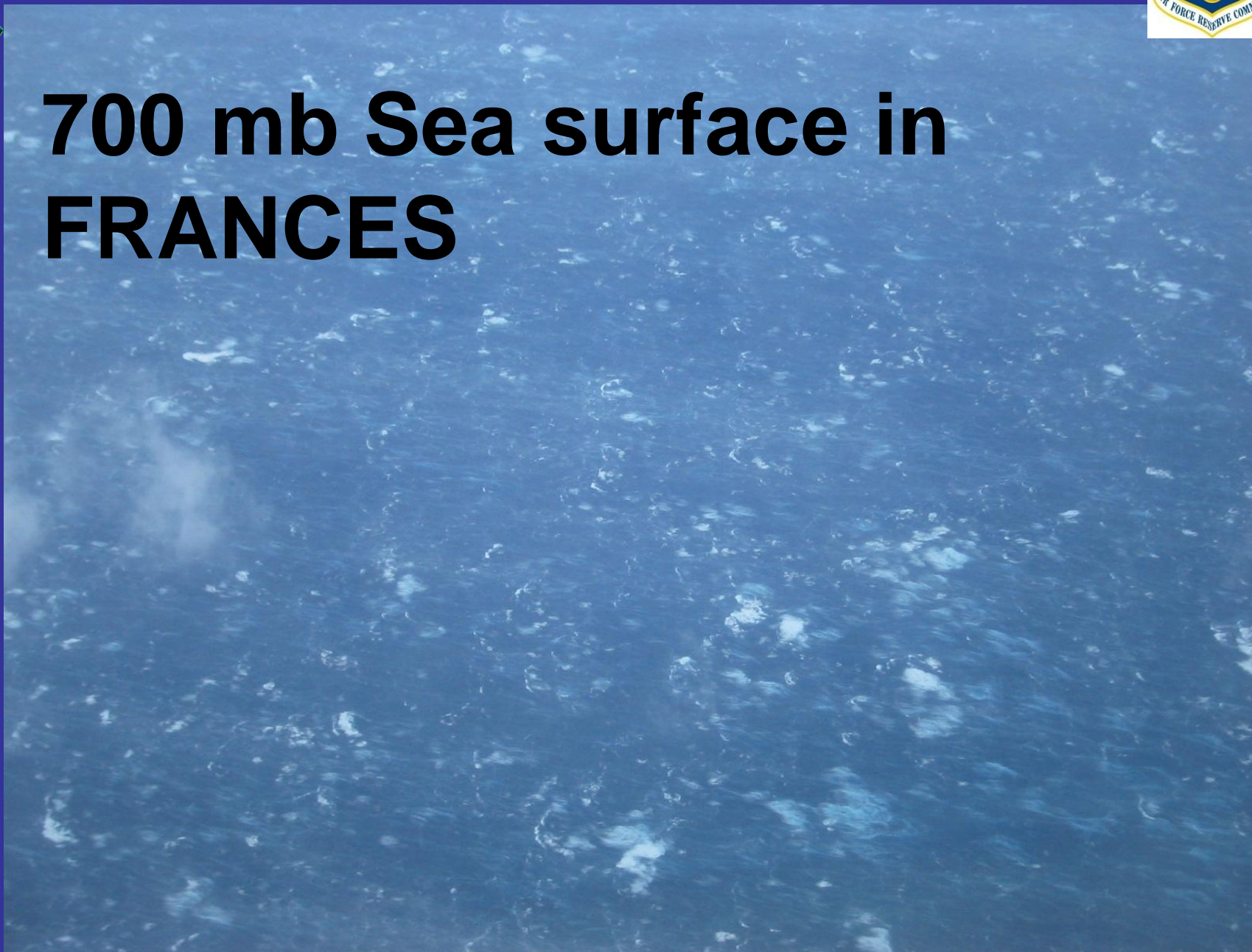


Eye of Frances on 9/4/04





700 mb Sea surface in FRANCES





2005 Season

<u>Flying Time (hrs)</u>	<u>Atlantic</u>	<u>Pacific</u>	
• 53WRS	1329.4	10.9	
• Deployment Time	146.7	0	
• TOTAL	1476.1	10.9	(62 Days airborne)
• <u>Requirements Accomplished (Fixes, Surv/Invests)</u>			
• 53WRS	245	1	
• <u>Missions Flown</u>			
• 53WRS	138	1	



Lajes, AB, Azores



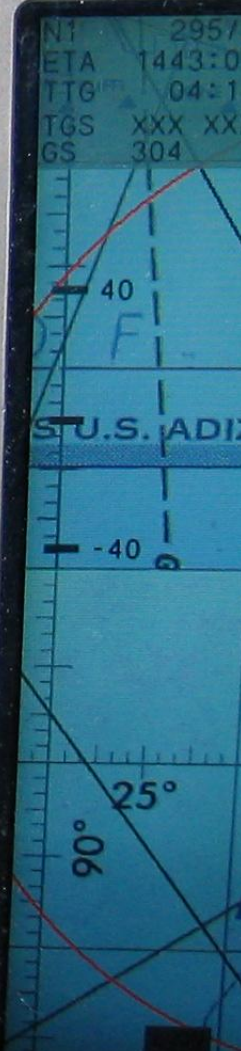


KATRINA Cat 5

- UZNT13 KNHC 281436
XXAA 78147 99261 70879 08167 99919 26800 // // // 00 // // // //
// // //
92 // // // // 85688 22001 10671 70371 14800 13621 88999
77999
31313 09608 81421
- 21212 00919 // // // 11913 06657 22908 06161 33905 06657
44900 07158 55895 07665 66887 07661 77884 08179 88882
08181 99880 08680 11877 09168 22871 08673 33868 08685
44866 10734 55853 10174 66842 11167 77822 11684
88803 12155 99793 12167 11777 13117 22769 13114 33697
13620
- 234kts????????

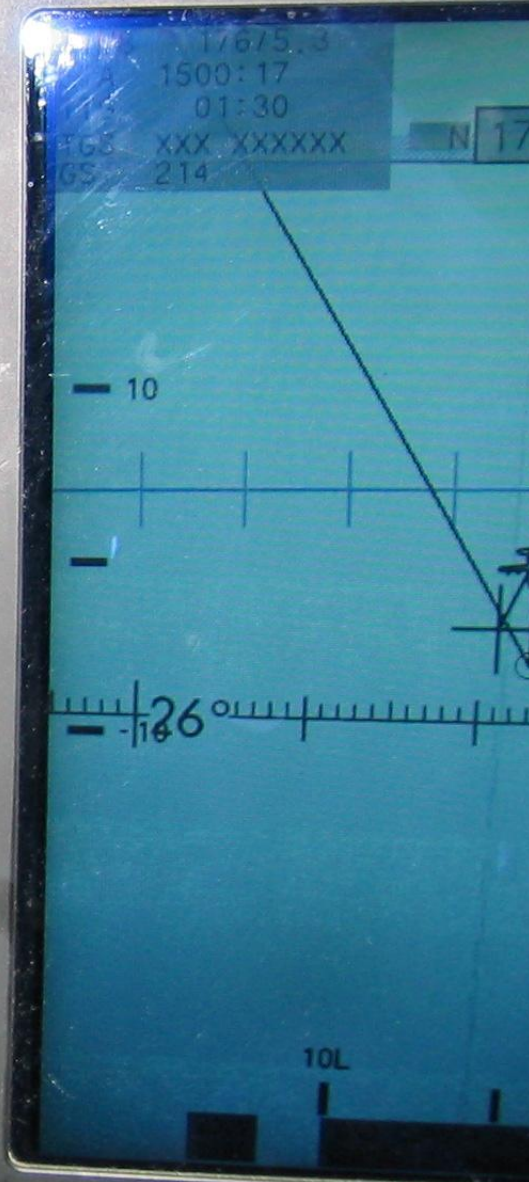


3350681 1 8952
MFP 0340023
MAYCE 9135





1150084 1 1052
137 0510053
DATE: 0105





Cat 5 RITA 21/2313z





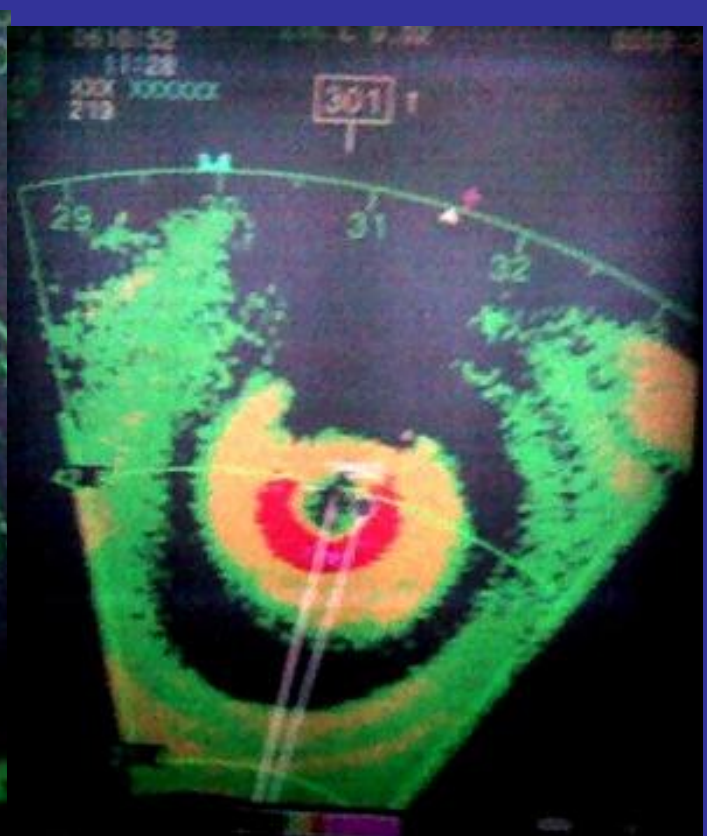
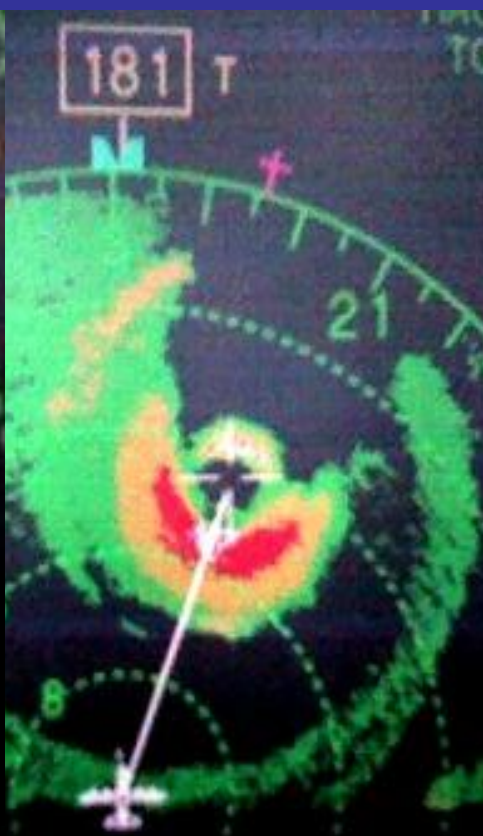
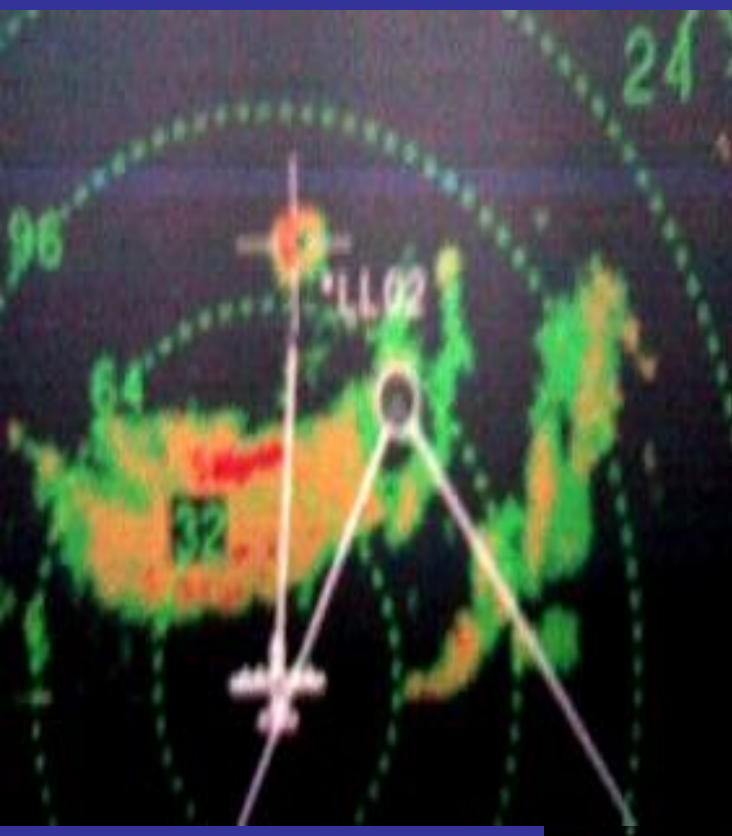
WILMA

HURRICANE WILMA DISCUSSION NUMBER 16
CORRECTED NWS TPC/NATIONAL HURRICANE CENTER
5 AM EDT WED OCT 19 2005
...TO USE THE PROPER WORD...RELAYED...

IN ADDITION TO THE SPECTACULAR CLOUD PATTERN OBSERVED ON SATELLITE ...AN AIR FORCE RECONNAISSANCE PLANE MEASURED 168 KNOTS AT 700 MB AND ESTIMATED A MINIMUM PRESSURE OF 884 MB EXTRAPOLATED FROM 700MB. **UNOFFICIALLY...THE METEOROLOGIST ON BOARD THE PLANE RELAYED AN EXTRAPOLATED 881 MB PRESSURE** AND MEASURED 884 MB WITH A DROPSONDE. THIS IS ALL IN ASSOCIATION WITH A **VERY SMALL EYE THAT HAS BEEN OSCILLATING BETWEEN 2 AND 4 N MI DURING EYE PENETRATIONS.**

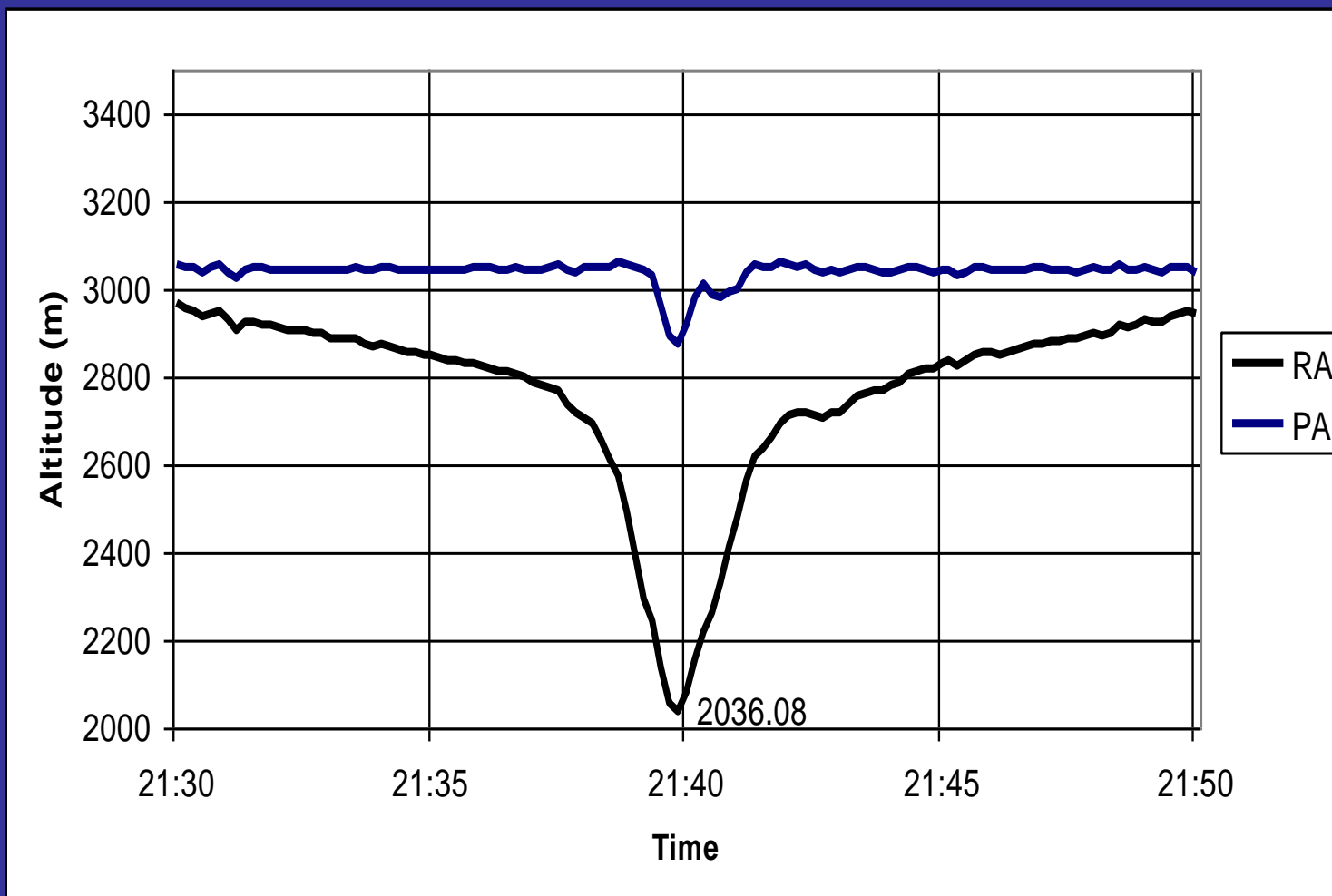


WILMA's PINHOLE EYE



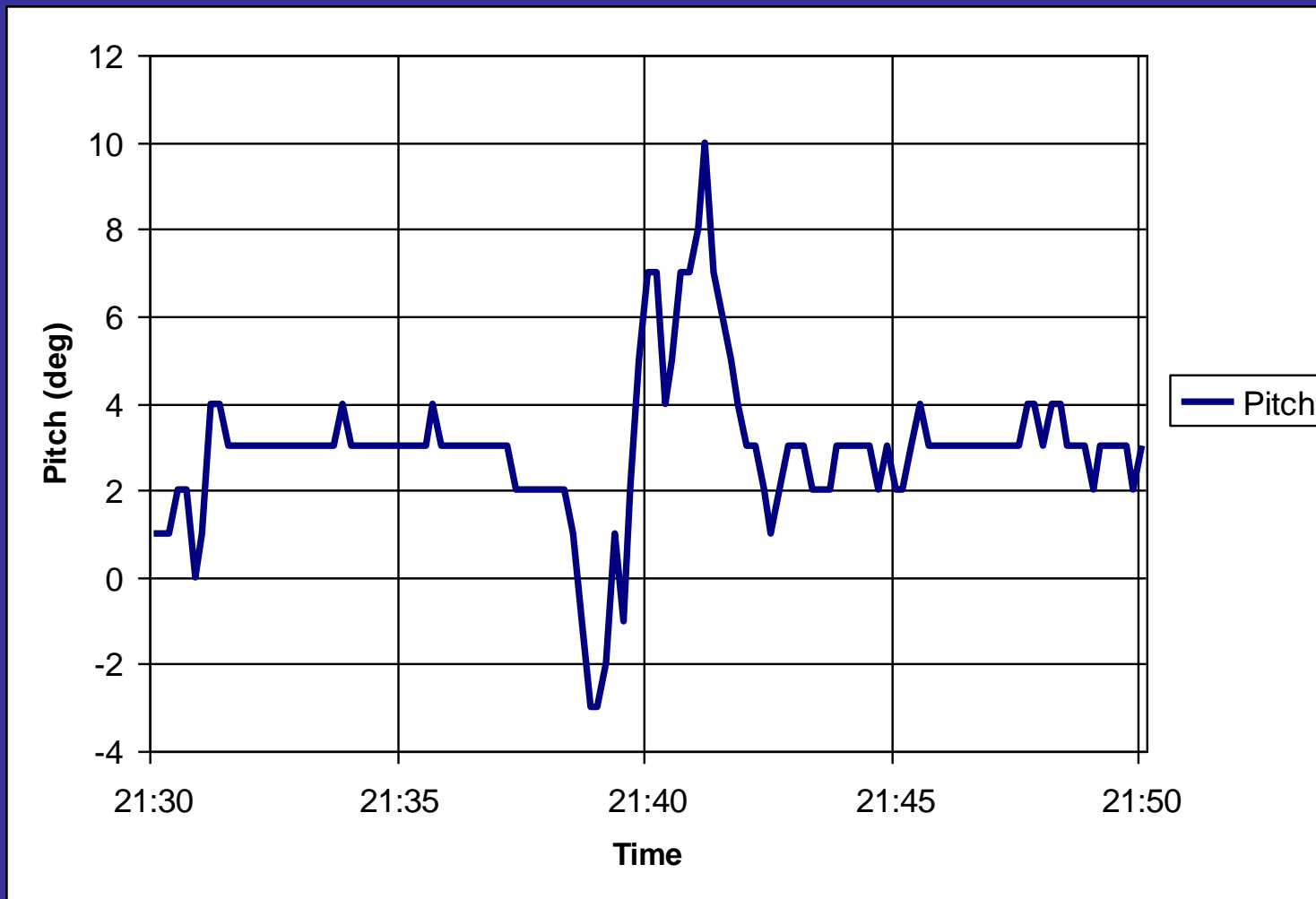


Wilma's wild ride





Pitch and Catch





Public Affairs





Media Info

- Lots of good info: www.403wg.afrc.af.mil
- Soon to be tips on public website
- Phone: 228-377-2056 (Public Affairs)
- Requests taken at beginning of year
- Must contact PA office
- If opportunity for media flight arises, PA prioritizes the pool based on coverage, proximity to storm, travel time, etc
- Max allowed is 6 people or 3 media outlets, typically less
- Media responsible for own transportaton
- May end up at a different location
- Lastly, check your life insurance (Just in case of another Wilma)

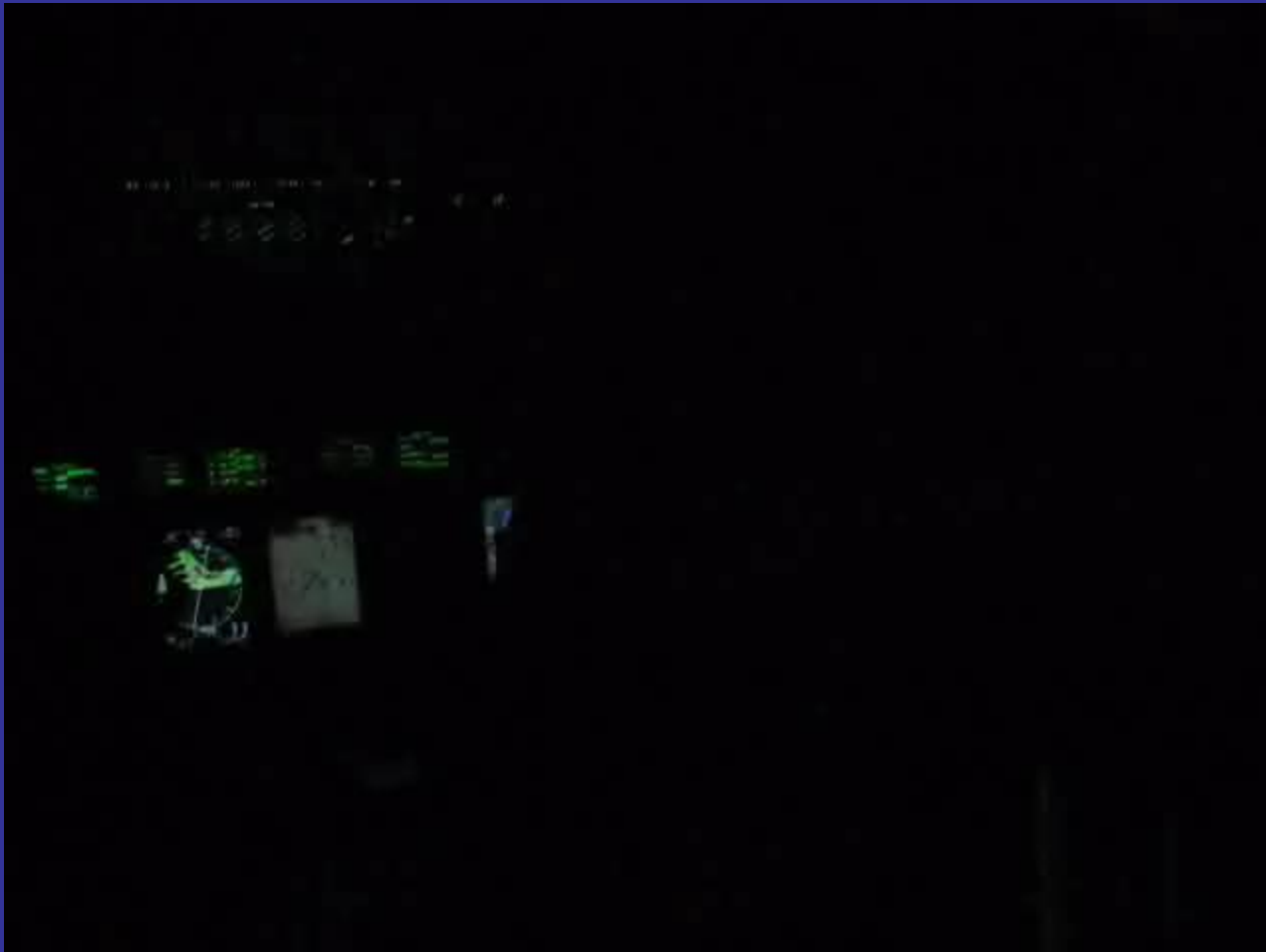


<http://www.HurricaneHunters.com>



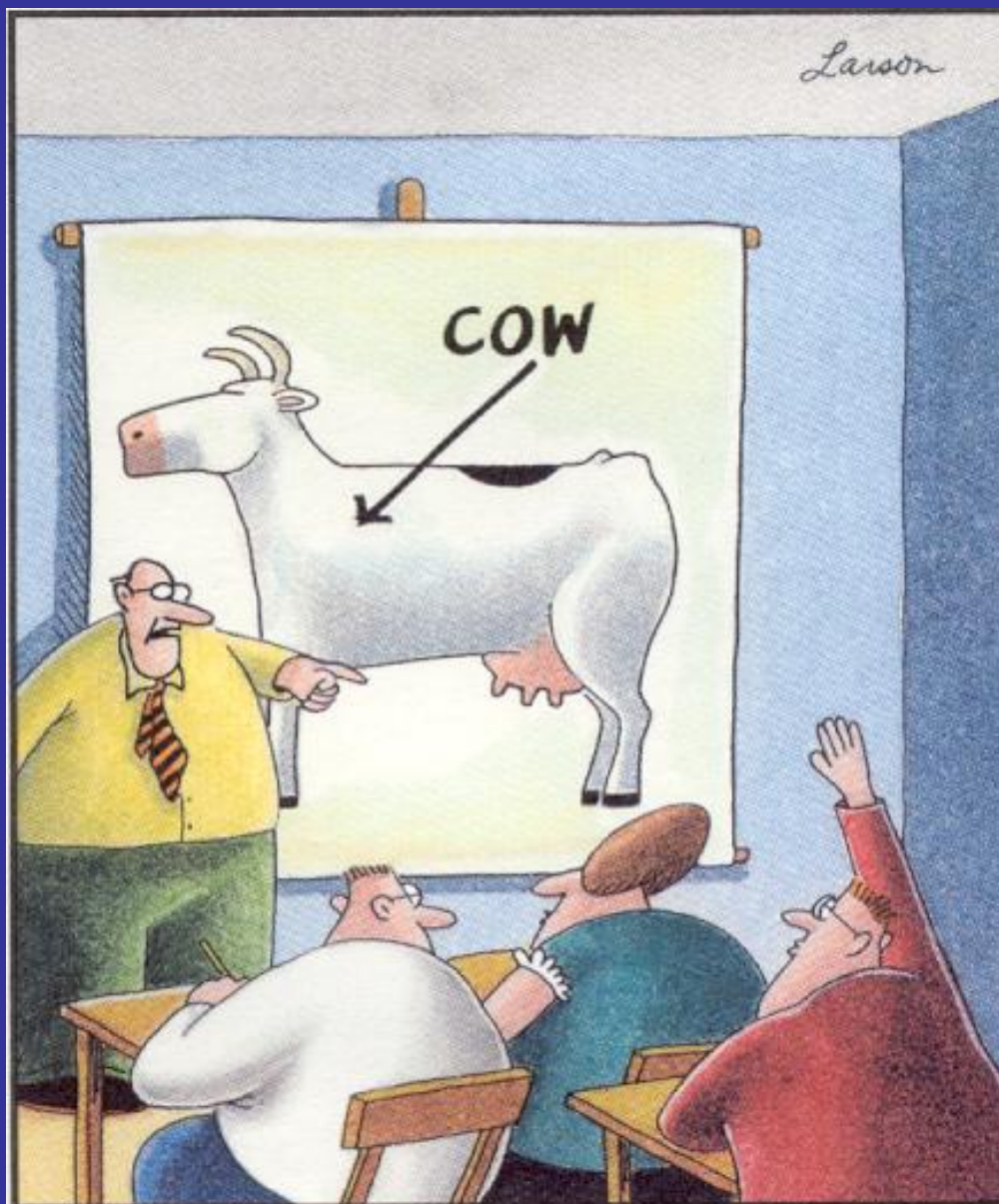


Hurricane Felix





Questions and Comments?



"Yes ... I believe there's a question in the back."