

Flight AF 447 Rio de Janeiro-Paris



- Weather
- Technical Data
- Human Factors





AF 447

Flight Rio de Janeiro to Paris

- Take off 31th May 2009 at 22:29
- Passengers on bord : 216
- 3 Crew members cockpit
- 9 Cabin crew
- Last contact control center Atlantico at 01:33



Cockpit Crew

- Captain:
 - Age 58, 3 years A 330
 - 10.988 flight hours, South-America route 16 X
- Copilot (SFO)
 - Age 37, 7 years A 330
 - 6547 flight hours, South-America route 39 X
- 2. Copilot
 - Age 32, 6 month A 330
 - 2936 flight hours, South-America route 5 X



Airbus A330-302

- Length : 58,37m
- Wing span: 60,3m



- Height: 17,8m
- Total flight hours: 18.870
- flights: 2644
- Max take off weight 233t
- Take off weight in Rio: 232,75t

Original flight plan

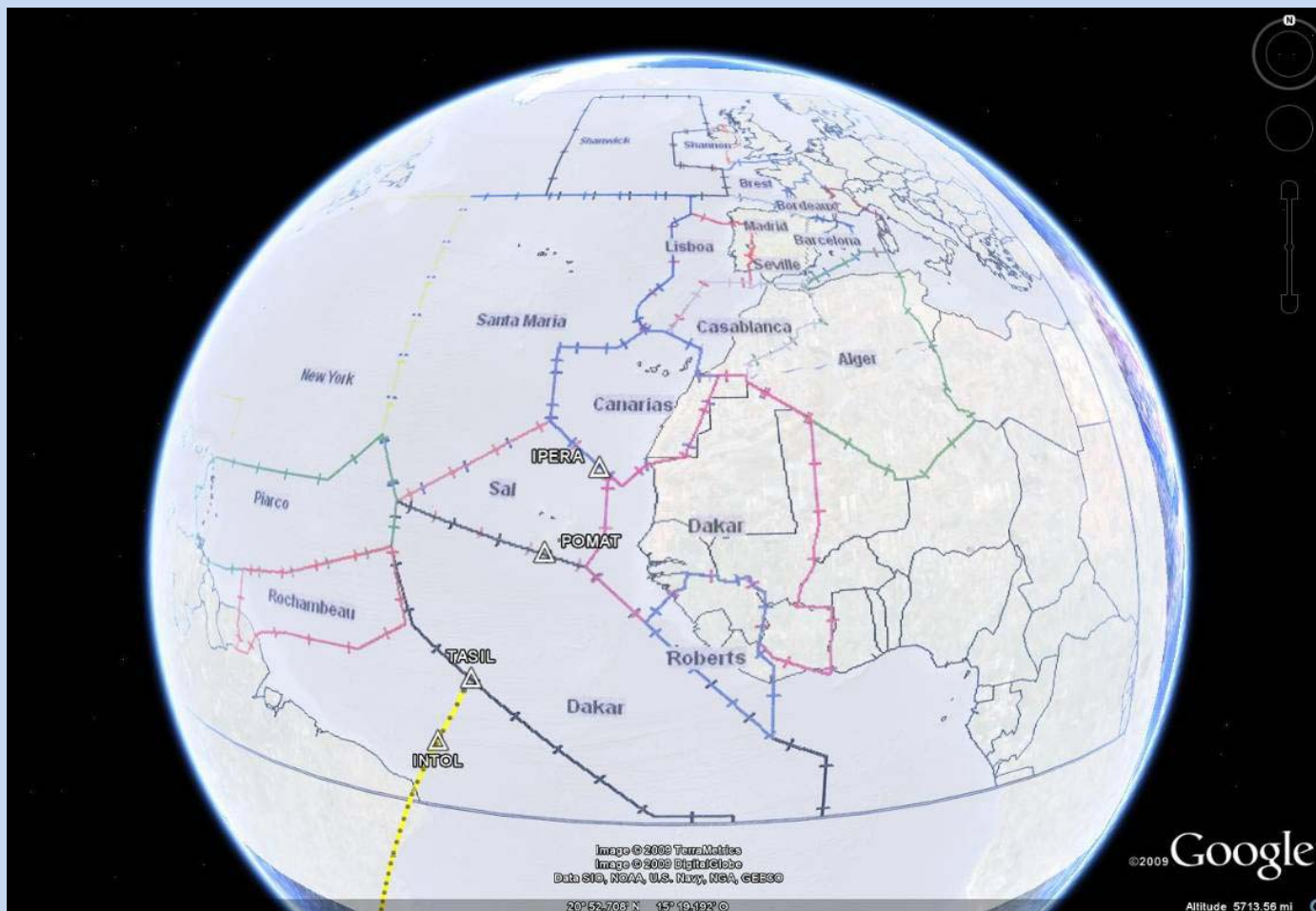
! (FPL-AFR447-IS
-A332/H-SGIJPRWY/SD
-SBGL2200
-N0481F350 DCT AWAKE UZ10 FLIRT/M082F350 UZ10 NTL UN873
INTOL/M082F350 UN873 SALPU/M082F370 UN873 ORARO/M082F370 UN873
ISOKA/N0471F370 UN873 LIMAL/N0466F390 UN873 SAMAR/N0468F380 UN873
BARDK/N0465F400 DCT PORTA UN873 MOKOR UN741 NTS/N0484F280 UN741 KEPER
UT182 ROMLO/N0483F270
-LFP61034 LFPO
-EET/SBBS0028 SBRE0050 SBA00302 G0000349 GVSC0512 GCCC0606 LIMALO643
GMMM0731 LPPC0816 LECM0851 LFRR0930 LFFF1004 RIF/ZMR UN976 DGO UL176
SSN UP181 ENSAC SOLSO DIRAX LFBD REG/FGZCP SEL/CPHQ DAT/SV DOF/090531
SRC/RQP ORGN/SBGLYOYX)

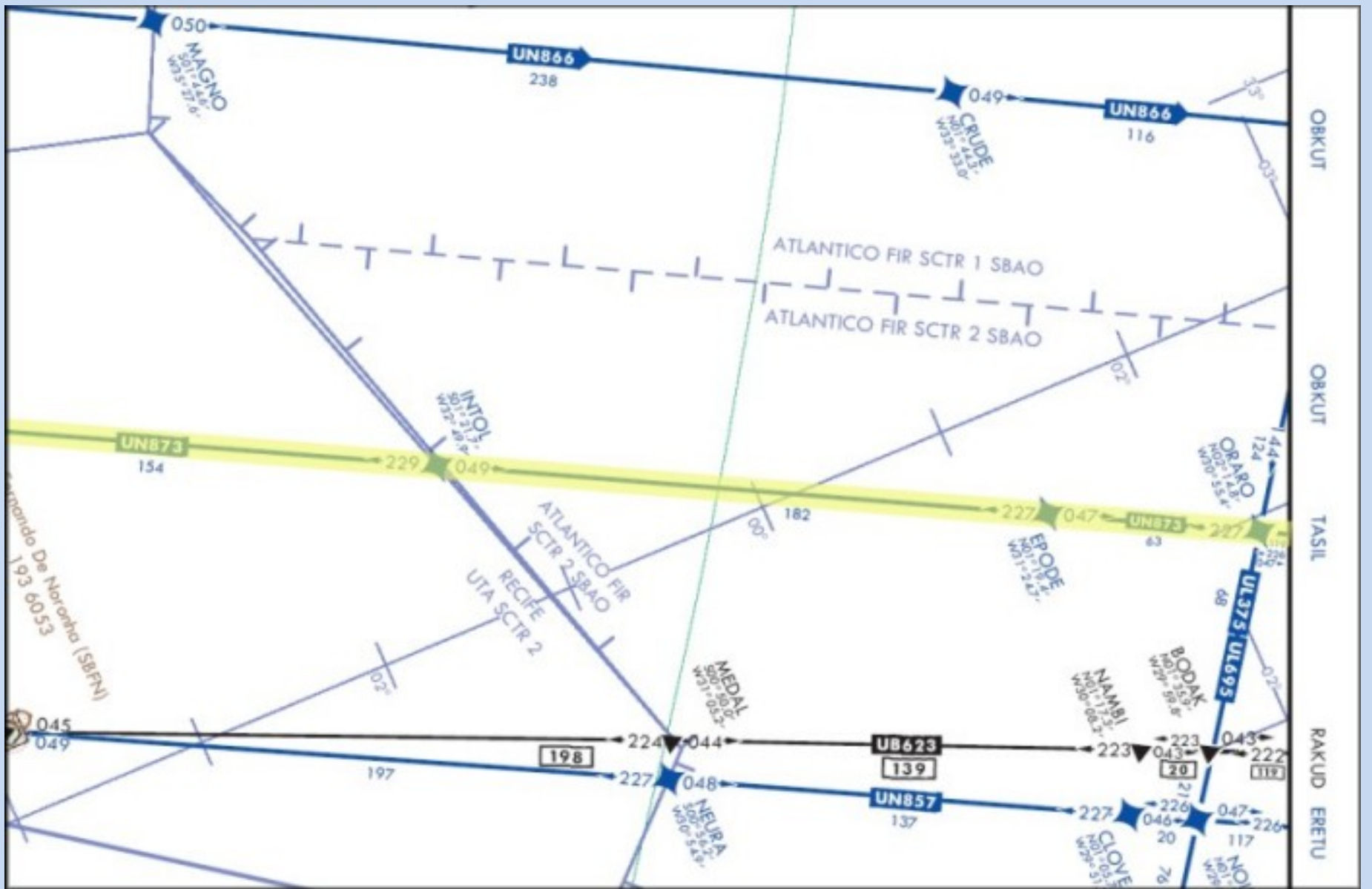
Communication

- Rio de Janeiro Tower
- Curitiba ATC 22:45:26 Uhr
- Brasilia ATC 22:55:41 Uhr
- Recife ATC 23:19:27 Uhr
- Atlanico ATC 01:33:25 Uhr

- Last message „passed Intol “ 01:35:15
- between 01:35:53 and 01:36:14 →
3 attempts to reach the plane →
no answer

Flight route







02:10:00 - Last known position (2° 58.800'N 30° 35.400'O)

TASIL

ORARO

02:00:00

01:50:00

SALPU

01:40:00

01:35:43 - Last radio contact

INTOL

01:30:00

01:20:00

01:10:00

Fernando de Noronha

01:00:00

NATAL

00:50:00

Paraíba

00:39:00

Recife

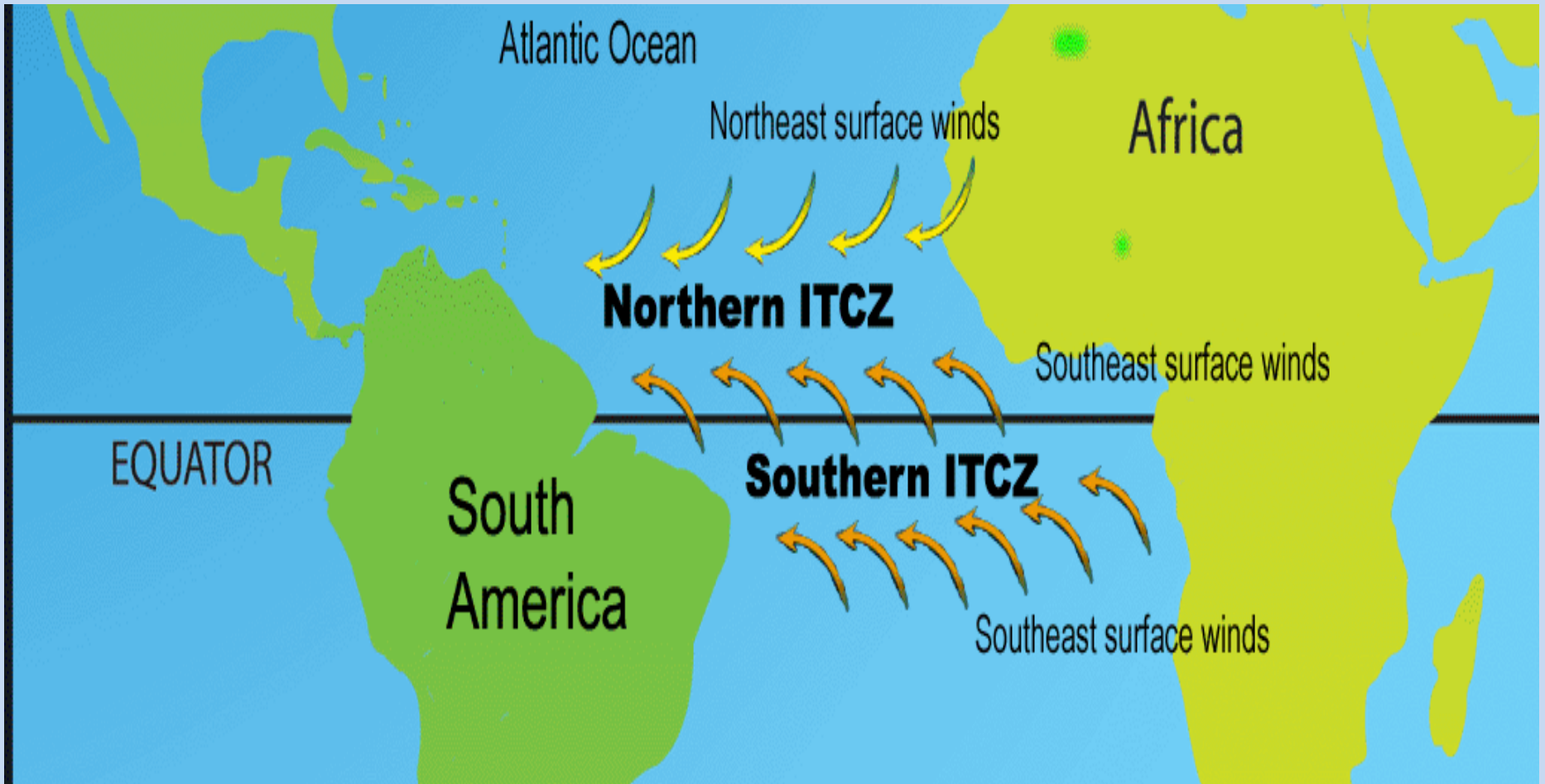
00:29:00

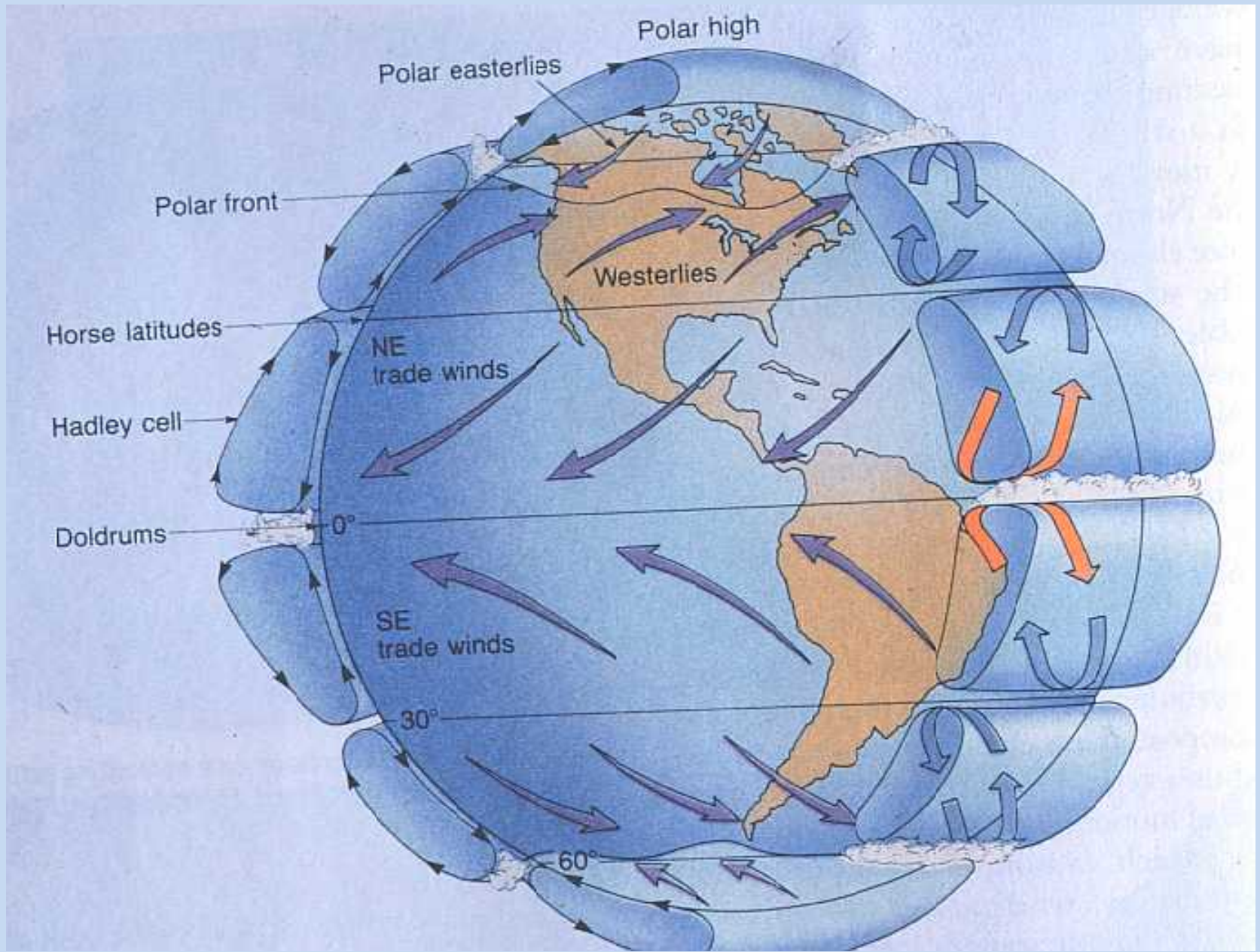
© 2009 MapLink/Tele Atlas
© 2009 Europa Technologies
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2009 Google
2° 39.138' S 33° 26.479' O

©2009 Google

Altitude 1174.35 mi

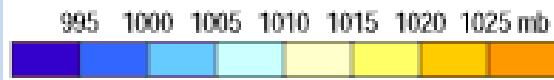
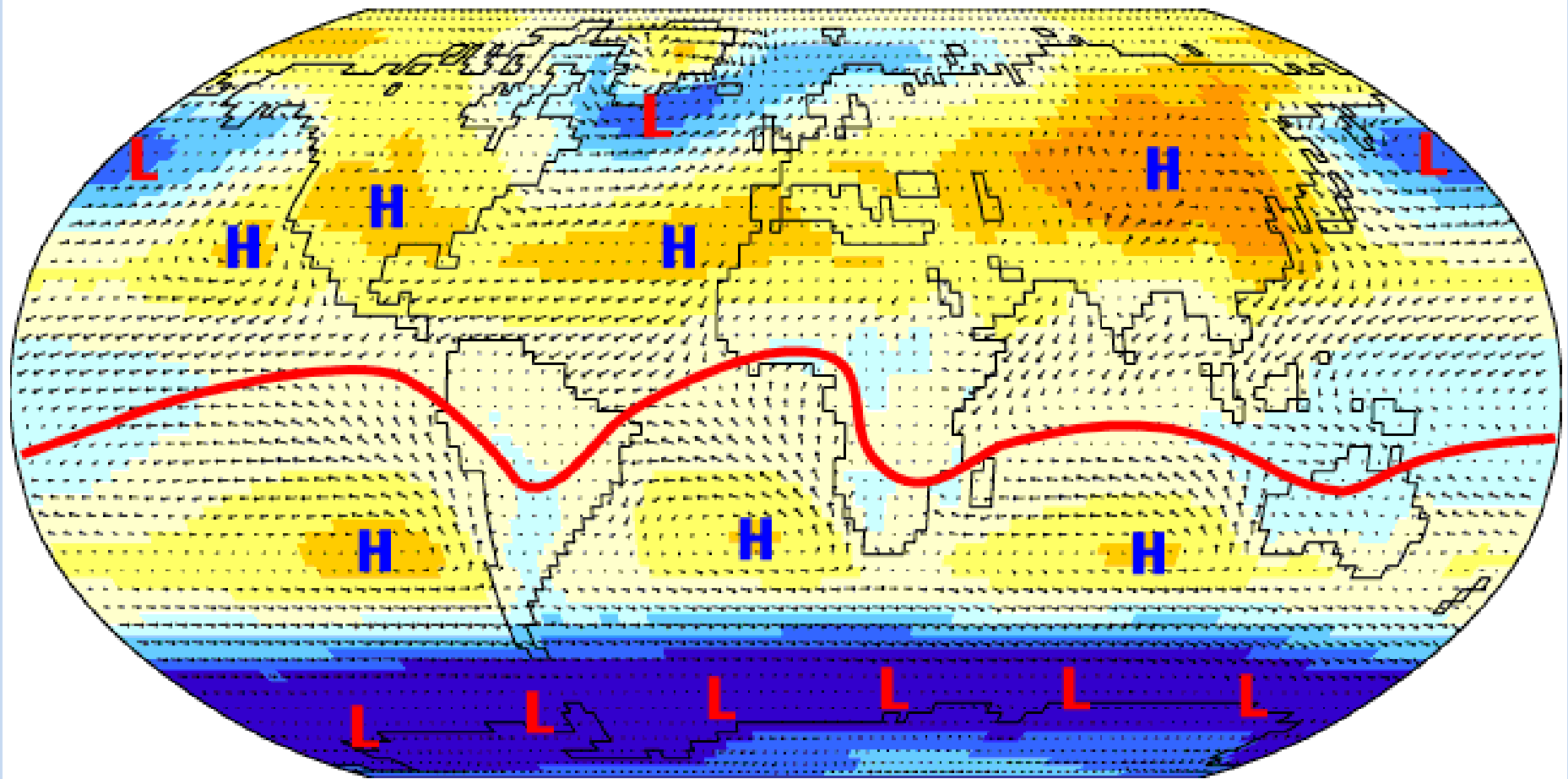
Intertropical Convergence Zone





Sea-Level Pressure and Surface Winds

Jan



Data: NCEP/NCAR Reanalysis Project, 1959-1997 Climatologies





Photo Copyright Daems Guy



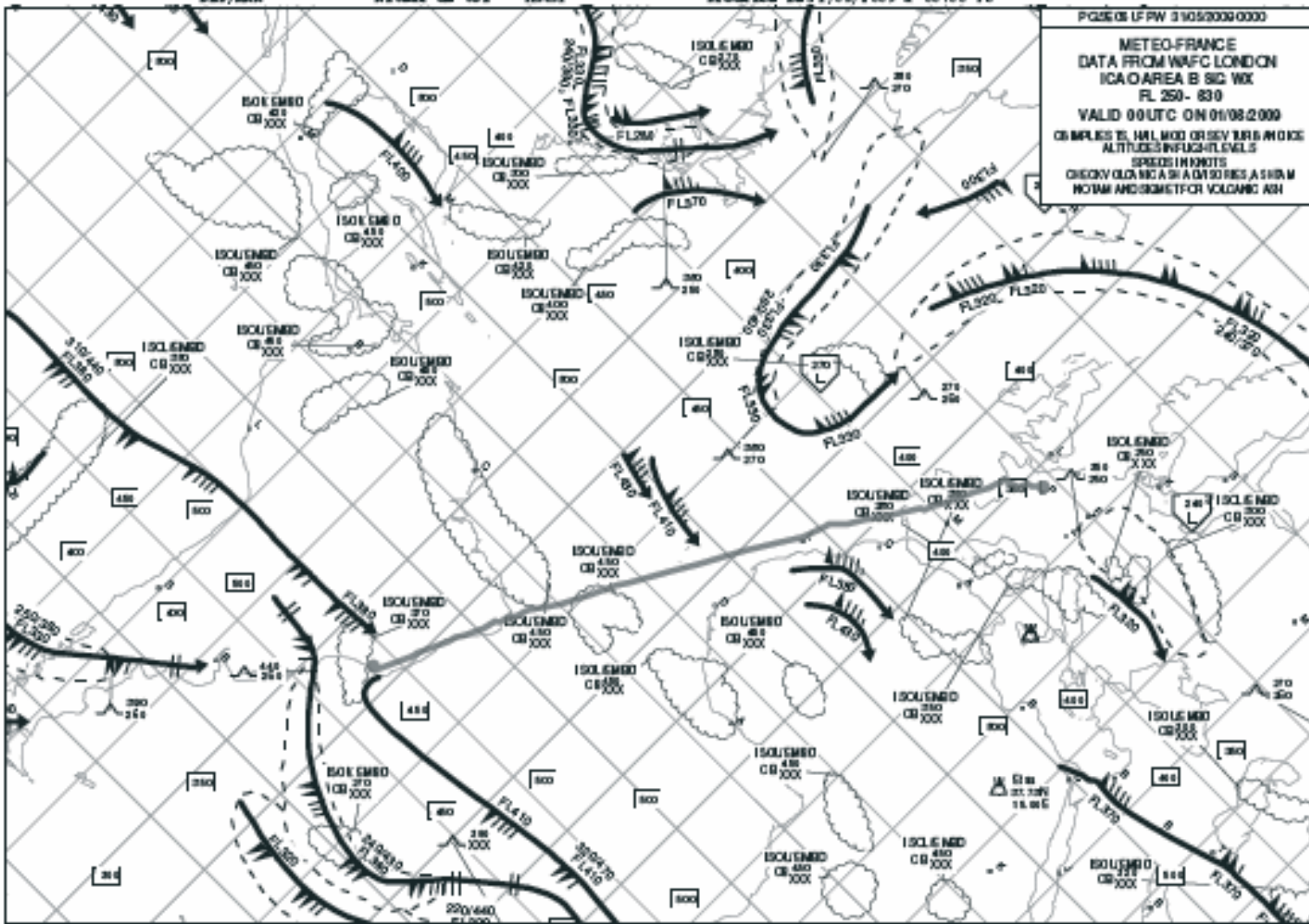
Weather chart FL 250-630, 01/06/09, valid 00UTC -

Eole

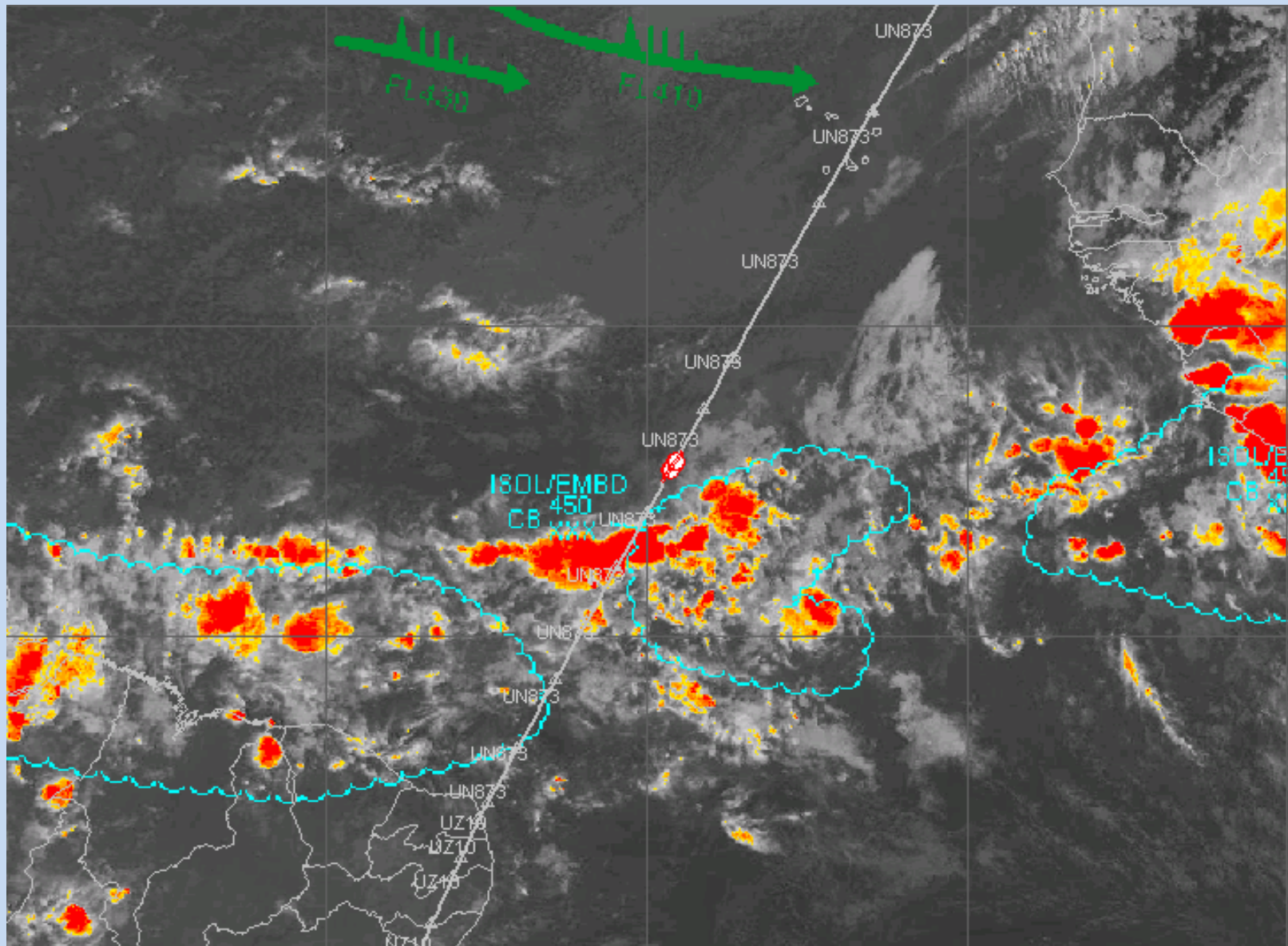
Vol AF 447 Type information TEMPE FAX
 IC/Plan 5493/0101 Domaines METEOROLOGIE SUD
 DEP/ARE Niveau de vol TEMPE

Valable le 01/06/2009 à 00:00 TU
 Prochaine le 11/06/2009 à 00:00 TU

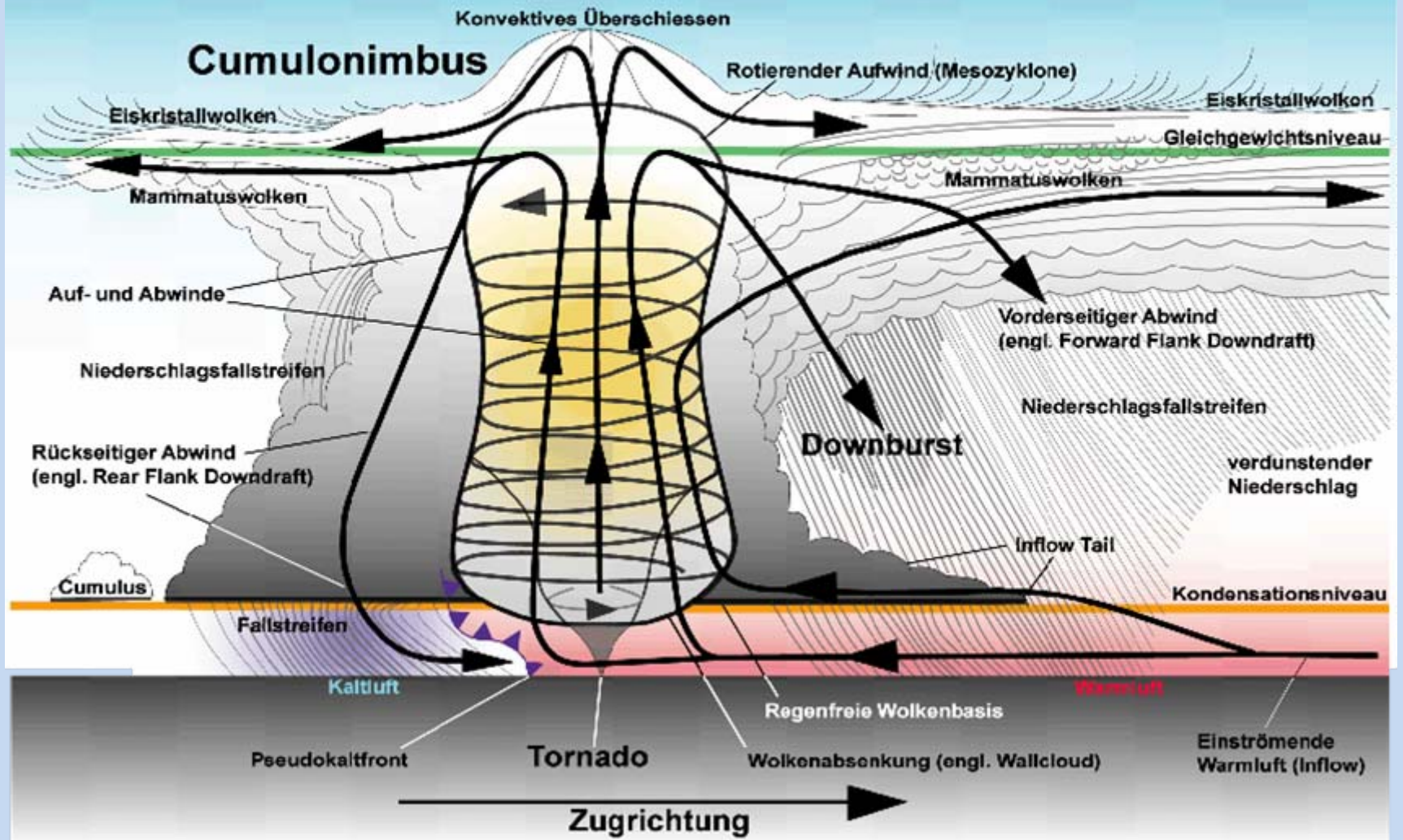
PGSECE LFPW 310520090000
 METEO-FRANCE
 DATA FROM WAFC LONDON
 ICAO AREA B SIG WX
 FL 250 - 630
 VALID 00UTC ON 01/06/2009
 COMPLETS ET AMPLIÉS GRISÉS SUR MOINS
 ALTITUDES EN FL 250-630
 ÉCHÉLONNÉS EN METRES
 DÉSIGNÉ EN A SUR LES ÉCHÉLONS A 500 M
 NORME AND SIGMET FOR VOLCANIC ASH

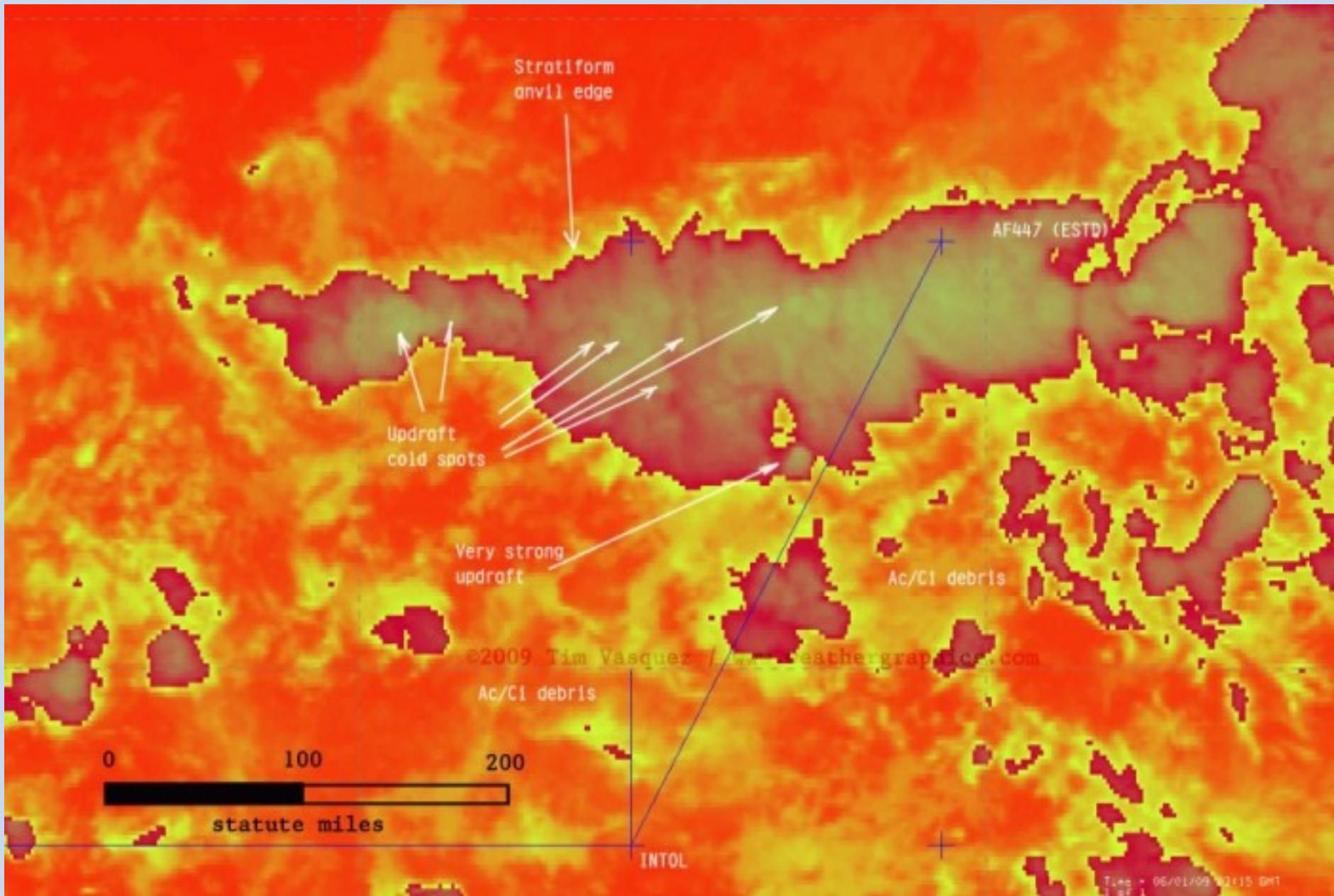


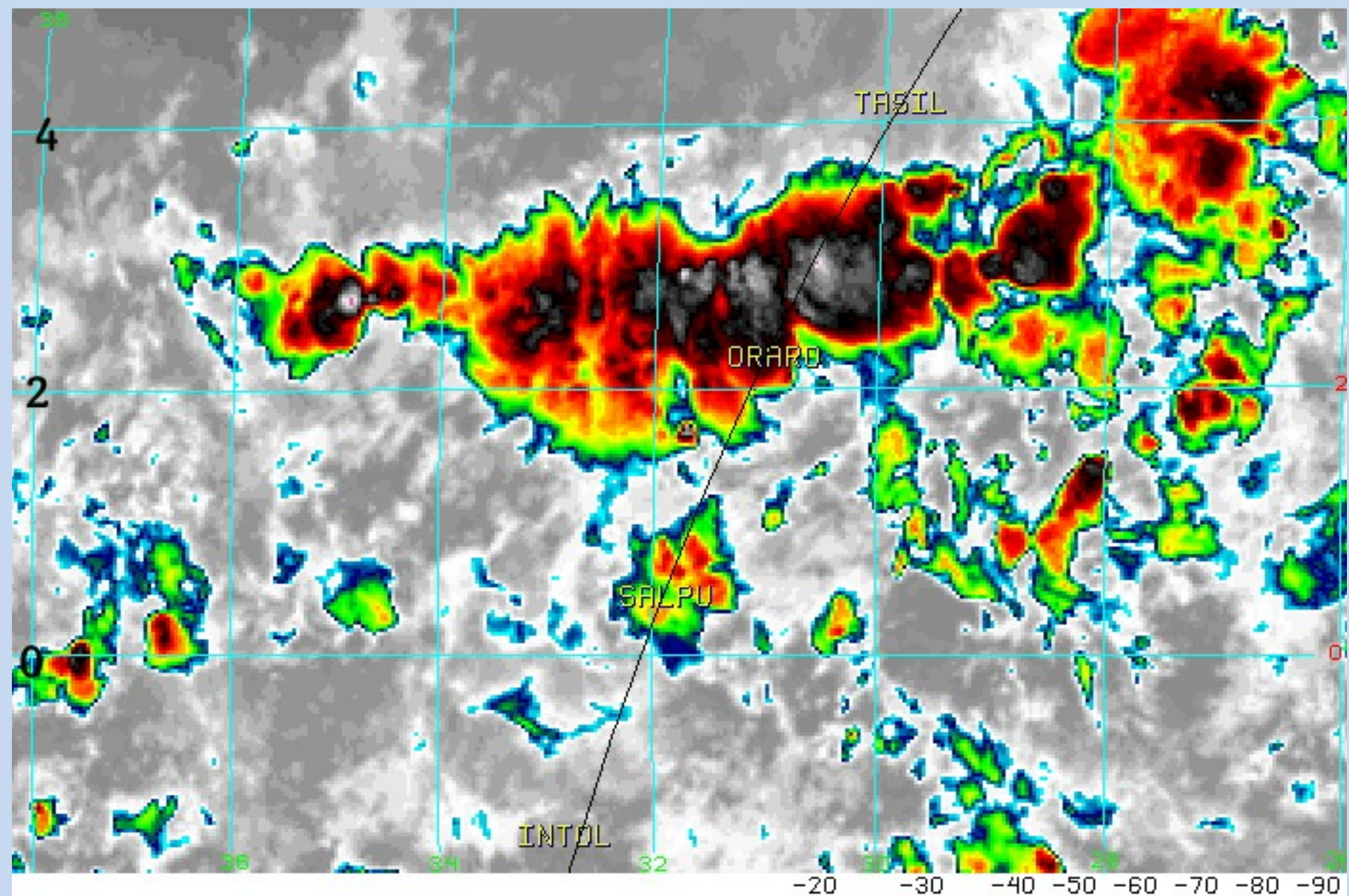
Actual weather situation 01.06. 01:00 Uhr



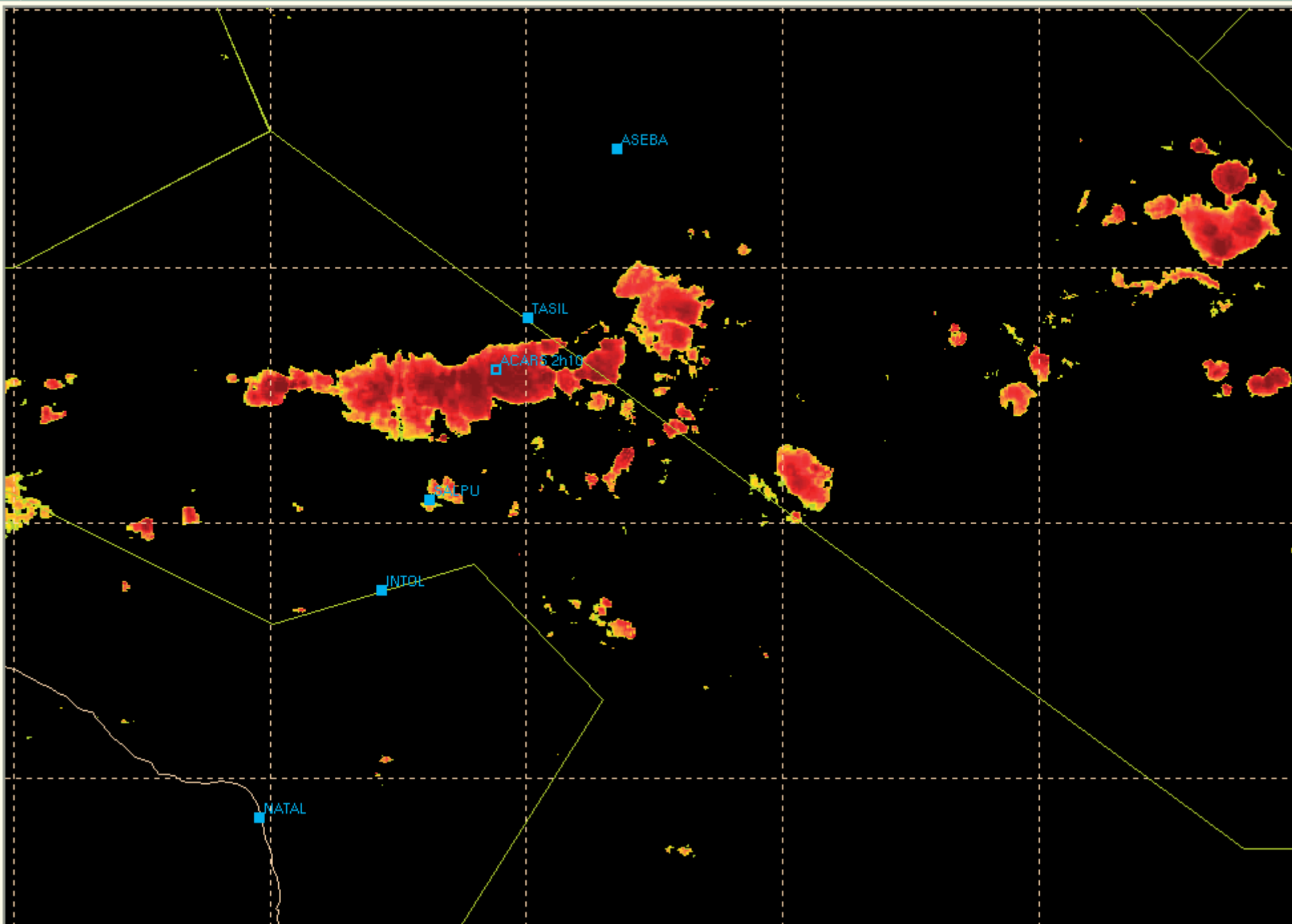
Superzelle von Süden her betrachtet

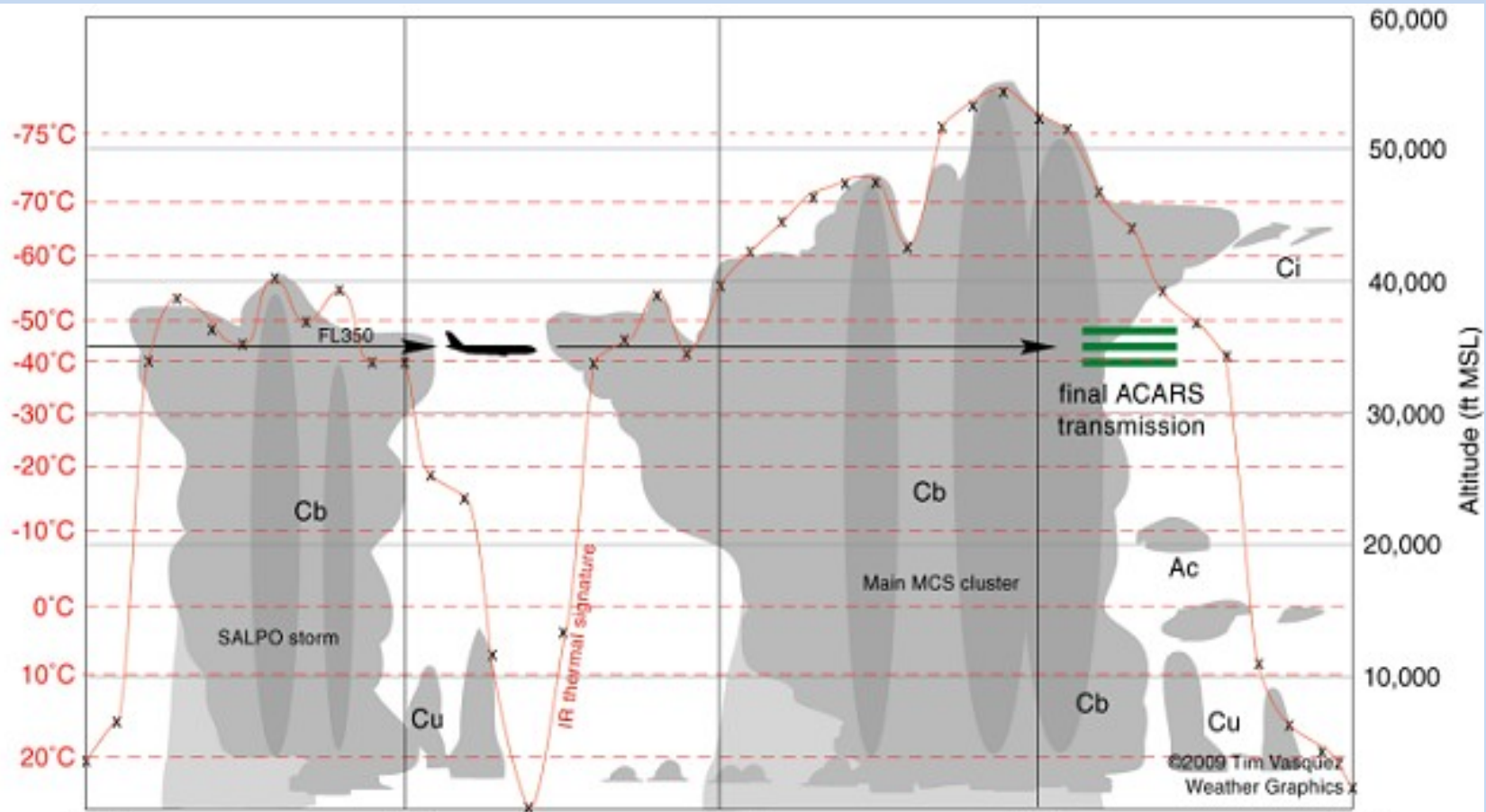






METEOSAT-9 - IR 10.8 (CHANNEL 09) - 02:00 UTC 01 JUNE 2009 - CIMSS



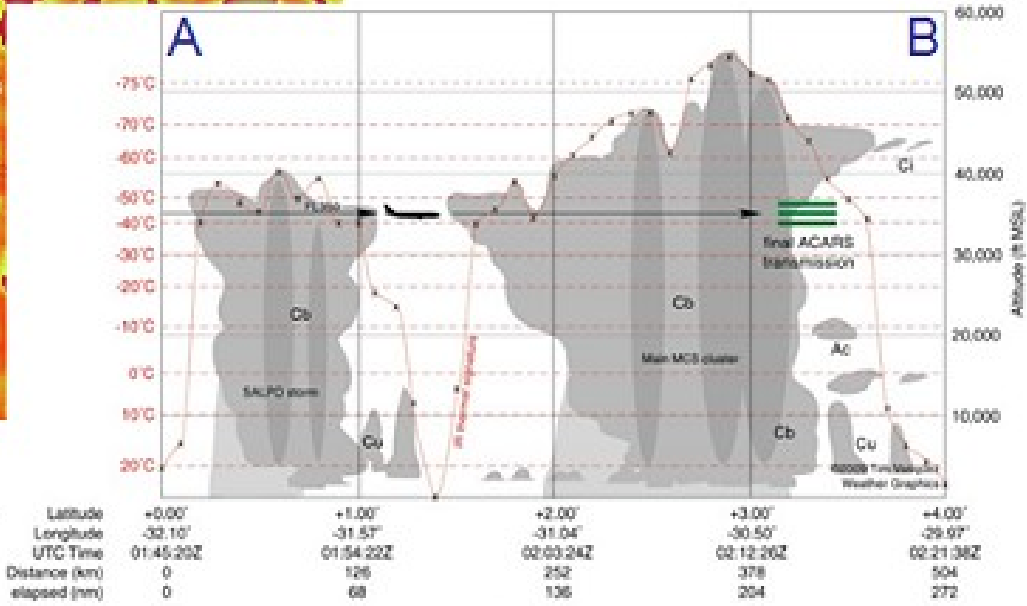
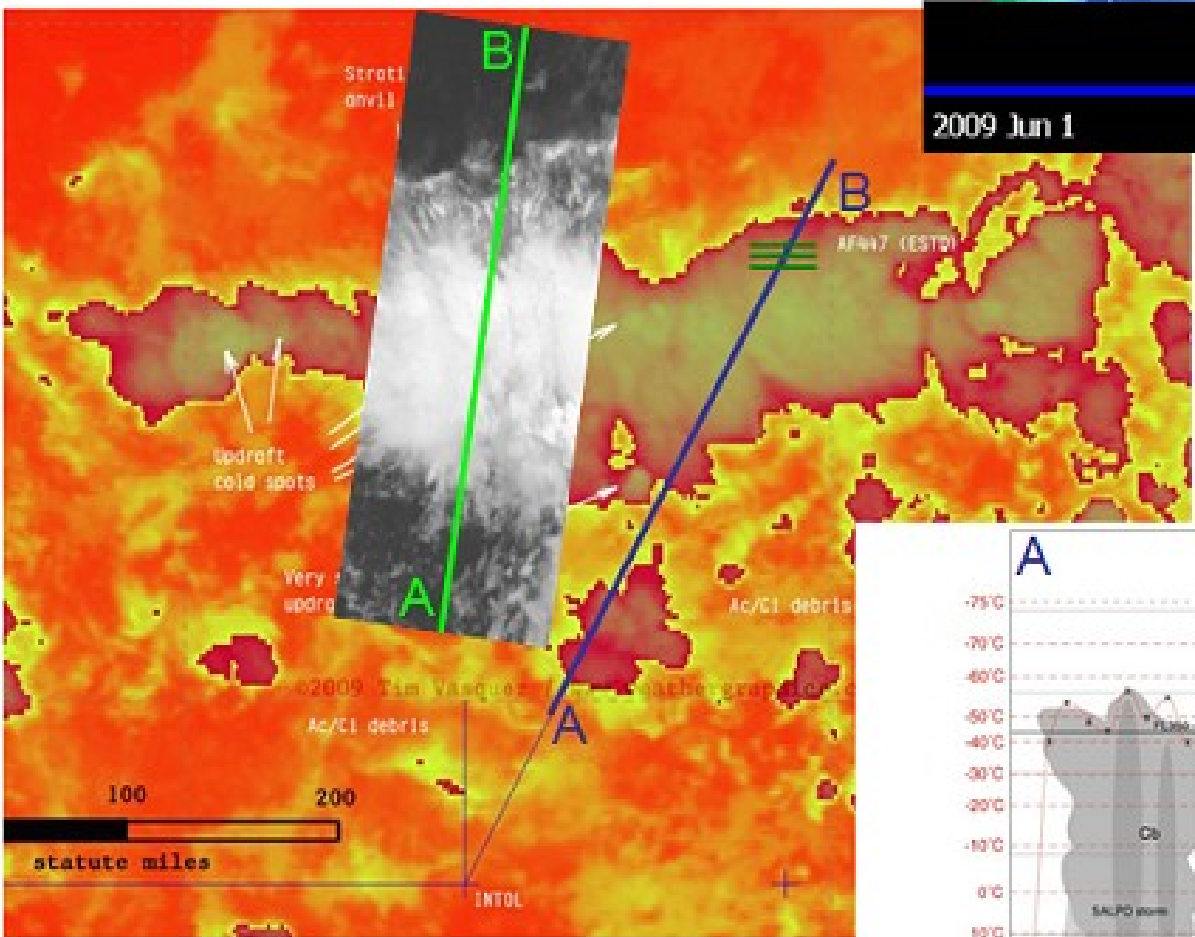
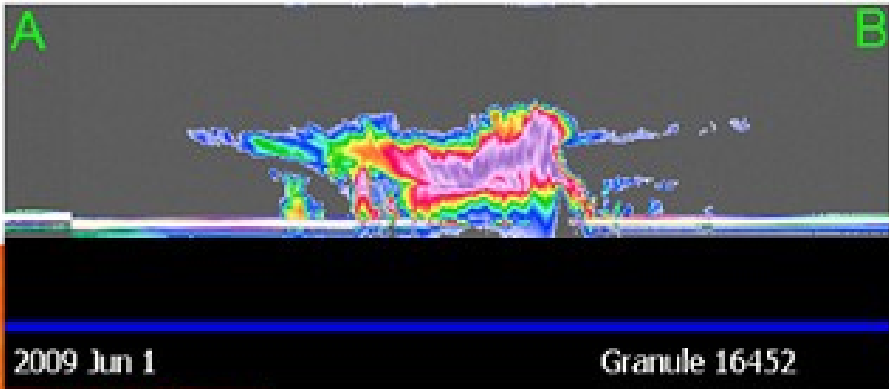


Latitude	+0.00°	+1.00°	+2.00°	+3.00°	+4.00°
Longitude	-32.10°	-31.57°	-31.04°	-30.50°	-29.97°
UTC Time	01:45:20Z	01:54:22Z	02:03:24Z	02:12:26Z	02:21:38Z
Distance (km)	0	126	252	378	504
elapsed (nm)	0	68	136	204	272

Projected flight path
 blended with infrared satellite analysis
AIR FRANCE FLIGHT 447

©2009 Tim Vasquez
 Weather Graphics

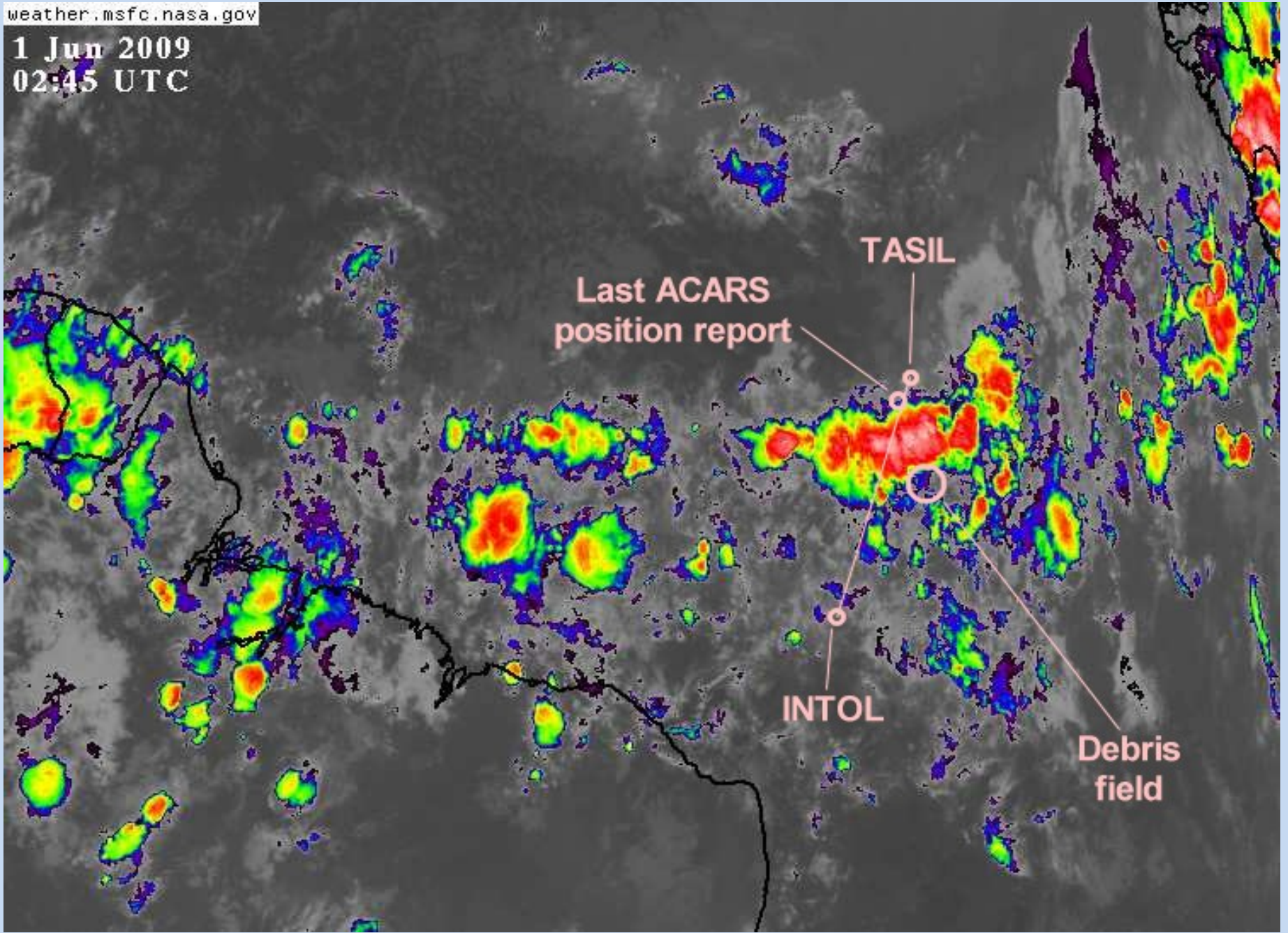
CloudSat DPC →



©2009 Tim Vasquez →

Projected flight path
blended with infrared satellite analysis
AIR FRANCE FLIGHT 447

1 Jun 2009
02:45 UTC



Other airplanes flying within the same airspace

1. Lufthansa LH 507, Boeing 747-400, Sao Paulo-Frankfurt, 20 min. ahead AF 447, FL 350 , moderate turbulence, diversion 10 NM west



2. Iberia IB 6024, Airbus A 340, Rio de Janeiro-Madrid, 12 min after AF 447, FL 370, severe turbulence, diversion 30NM east



3. Air France AF 459, Airbus A330-203, Sao-Paulo-Paris, 37min after AF 447, severe turbulence, FL 350 auf 370, diversion 80NM east



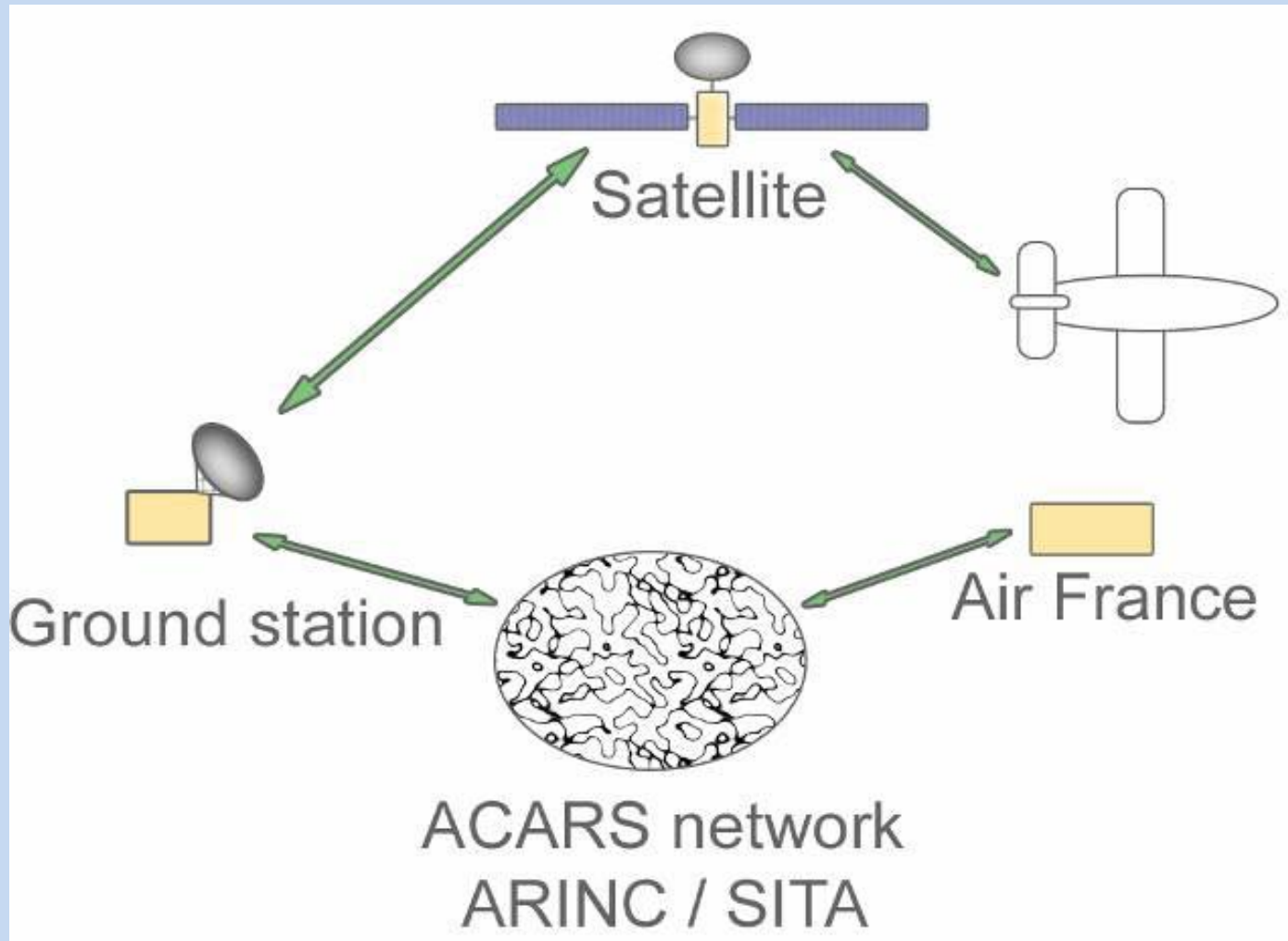
4. TAM Lineas Aereas JJ 8098, A330, Sao-Paulo-Paris 40min after AF 447, FL 370, severe turbulence, emergency descent, flight route 120 NM east



Classifikation of turbulence

- Light turbulence** - briefly causes slight, erratic changes in altitude and/or attitude.
- Light chop** - slight, rapid and somewhat rhythmic bumpiness without noticeable changes in altitude or attitude.
- Moderate turbulence**
 - similar to light turbulence, but greater intensity. Changes in altitude/attitude occur. Aircraft remains in control at all times. Variations in indicated air speed.
- Moderate chop** - similar to light chop, but greater intensity. Rapid bumps or jolts without obvious changes in altitude or attitude.
- Severe turbulence** - large, abrupt changes in altitude/attitude. Large variation in indicated airspeed. Aircraft may be temporarily out of control.
- Extreme turbulence** - aircraft is violently tossed about and is impossible to control. May cause structural damage.

ACARS – Aircraft Communication And Reporting System



Original Acars messages

A I R F R A N C E A C A R S

Liste Des Evenements ACARS

29 / 256

MATERIEL : AV FGZCP REG

DATES du: 12050

??OT ENT : ATA/PH:

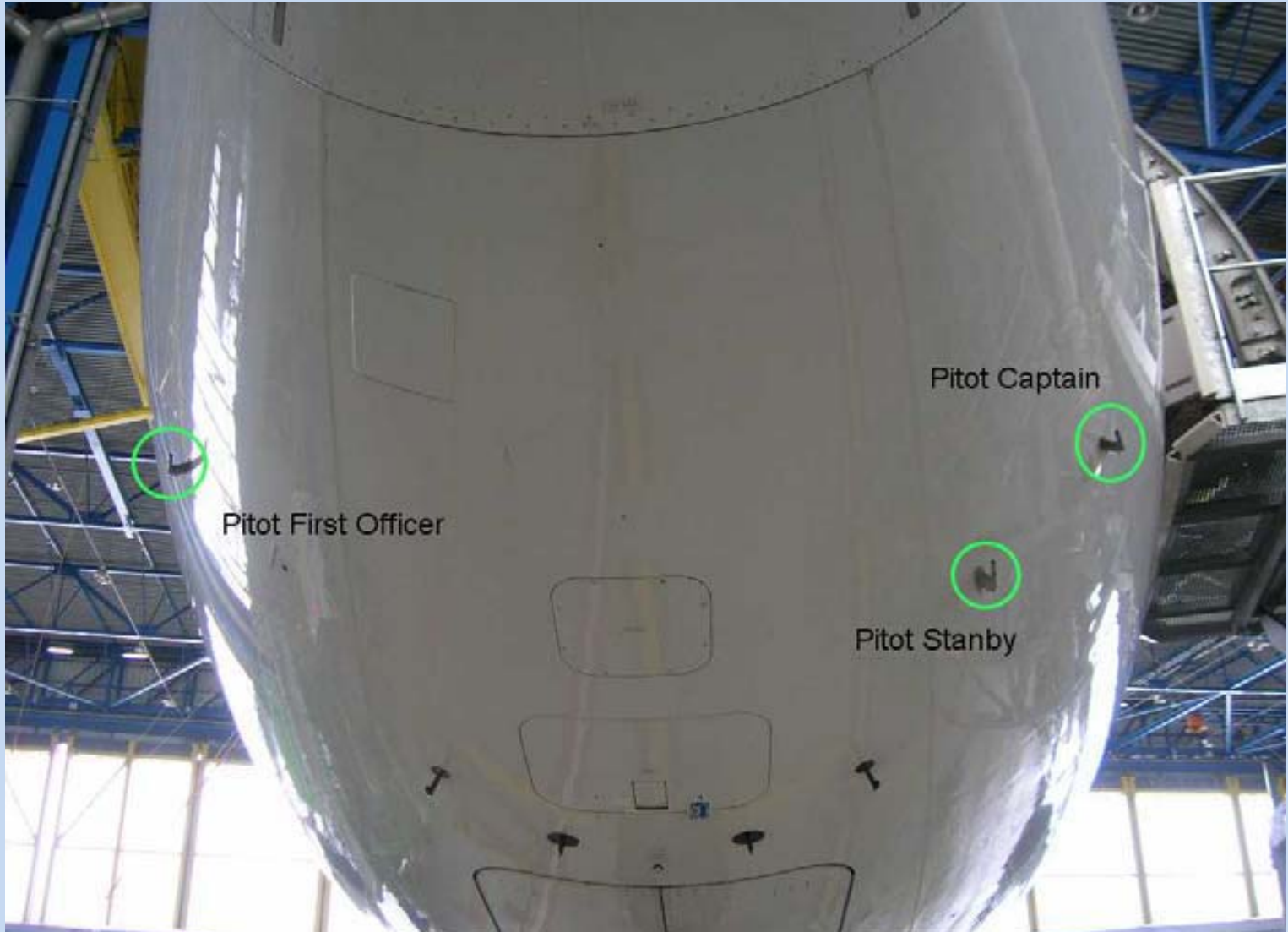
(TA: A330)

ATA/PH	Typ	Sel	Libelle succinct du message	Date
21 31/06	WRN	WN0906010214	213100206ADVISORY	09-06
22 03/06	FLR	FR0906010213	22833406AFS 1,,,,,,FMGKCL(1C	09-06
34 10/06	WRN	WN0906010214	341036006MAINTENANCE STATUS	09-06
27 90/06	WRN	WN0906010213	279004006F/ CTL SEC 1 FAULT	09-06
27 90/06	WRN	WN0906010213	279002506F/CTL PRIM 1 FAULT	09-06
34 12/06	FLR	FR0906010211	34123406IR2 1,EFCSLX,IR1,IR3,	09-06
34 12/06	FLR	FR0906010211	34120006ISIS 1,,,,,,ISIS(22FN	09-06
34 10/06	WRN	WN0906010212	341040006NAV ADR DISAGREE	09-06
34 12/06	WRN	WN0906010211	341201106FLAG ON F/O PFD	09-06
34 12/06	WRN	WN0906010211	341200106FLAG ON CAPT PFD	09-06
27 93/06	FLR	FR0906010210	27933406EFCSL X2,EFCSLX,,,,,FC	09-06
34 11/06	FLR	FR0906010210	34111506EFCSL 1,EFCSL,AFS,,,,,P	09-06
27 90/06	WRN	WN0906010210	279045006MAINTENANCE STATUS	09-06
27 90/06	WRN	WN0906010210	279045506MAINTENANCE STATUS	09-06

PF2/3=Fin PF4/5=Pag. avion PF6/7/8/9=Pagination X=consult. PF.

Time of reception	Message
2:10:10	- .1/WRN/WN0906010210 221002006AUTO FLT AP OFF
2:10:16	- .1/WRN/WN0906010210 226201006AUTO FLT REAC W/S DET FAULT
2:10:23	- .1/WRN/WN0906010210 279100506F/CTL ALTN LAW
2:10:29	- .1/WRN/WN0906010210 228300206FLAG ON CAPT PFD SPD LIMIT
2:10:41	- .1/WRN/WN0906010210 228301206FLAG ON F/O PFD SPD LIMIT
2:10:47	- .1/WRN/WN0906010210 223002506AUTO FLT A/THR OFF
2:10:54	- .1/WRN/WN0906010210 344300506NAV TCAS FAULT
2:11:00	- .1/WRN/WN0906010210 228300106FLAG ON CAPT PFD FD
2:11:15	- .1/WRN/WN0906010210 228301106FLAG ON F/O PFD FD
2:11:21	- .1/WRN/WN0906010210 272302006F/CTL RUD TRV LIM FAULT
2:11:27	- .1/WRN/WN0906010210 279045506MAINTENANCE STATUS EFCS 2
2:11:42	- .1/WRN/WN0906010210 279045006MAINTENANCE STATUS EFCS 1
2:11:49	- .1/FLR/FR0906010210 34111506EFCS2 1,EFCS1,AFS,,,,,PROBE-PITOT 1X2 / 2X3 / 1X3 (9DA),HARD
2:11:55	- .1/FLR/FR0906010210 27933406EFCS1 X2,EFCS2X,,,,,FCPC2 (2CE2) /WRG:ADIRU1 BUS ADR1-2 TO FCPC2,HARD
2:12:10	- .1/WRN/WN0906010211 341200106FLAG ON CAPT PFD FPV
2:12:16	- .1/WRN/WN0906010211 341201106FLAG ON F/O PFD FPV
2:12:51	- .1/WRN/WN0906010212 341040006NAV ADR DISAGREE
2:13:08	- .1/FLR/FR0906010211 34220006ISIS 1,,,,,,ISIS(22FN-10FC) SPEED OR MACH FUNCTION,HARD
2:13:14	- .1/FLR/FR0906010211 34123406IR2 1,EFCS1X,IR1,IR3,,,,,ADIRU2 (1FP2),HARD
2:13:45	- .1/WRN/WN0906010213 279002506F/CTL PRIM 1 FAULT
2:13:51	- .1/WRN/WN0906010213 279004006F/CTL SEC 1 FAULT
2:14:14	- .1/WRN/WN0906010214 341036006MAINTENANCE STATUS ADR 2
2:14:20	- .1/FLR/FR0906010213 22833406AFS 1,,,,,,FMGEC1(1CA1),INTERMITTENT
2:14:26	- .1/WRN/WN0906010214 213100206ADVISORY CABIN VERTICAL SPEED

Pitot tubes



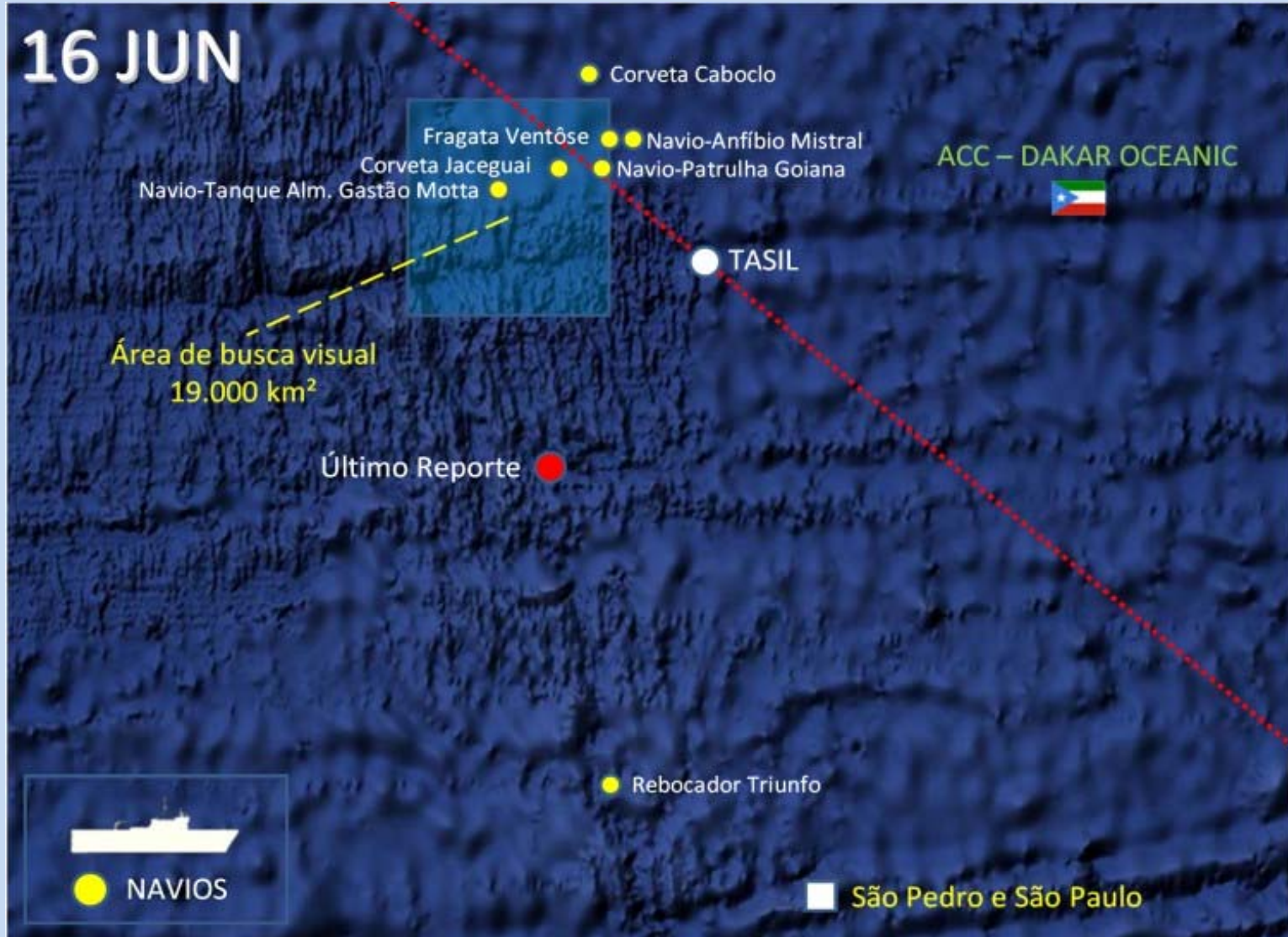
Pitot tube



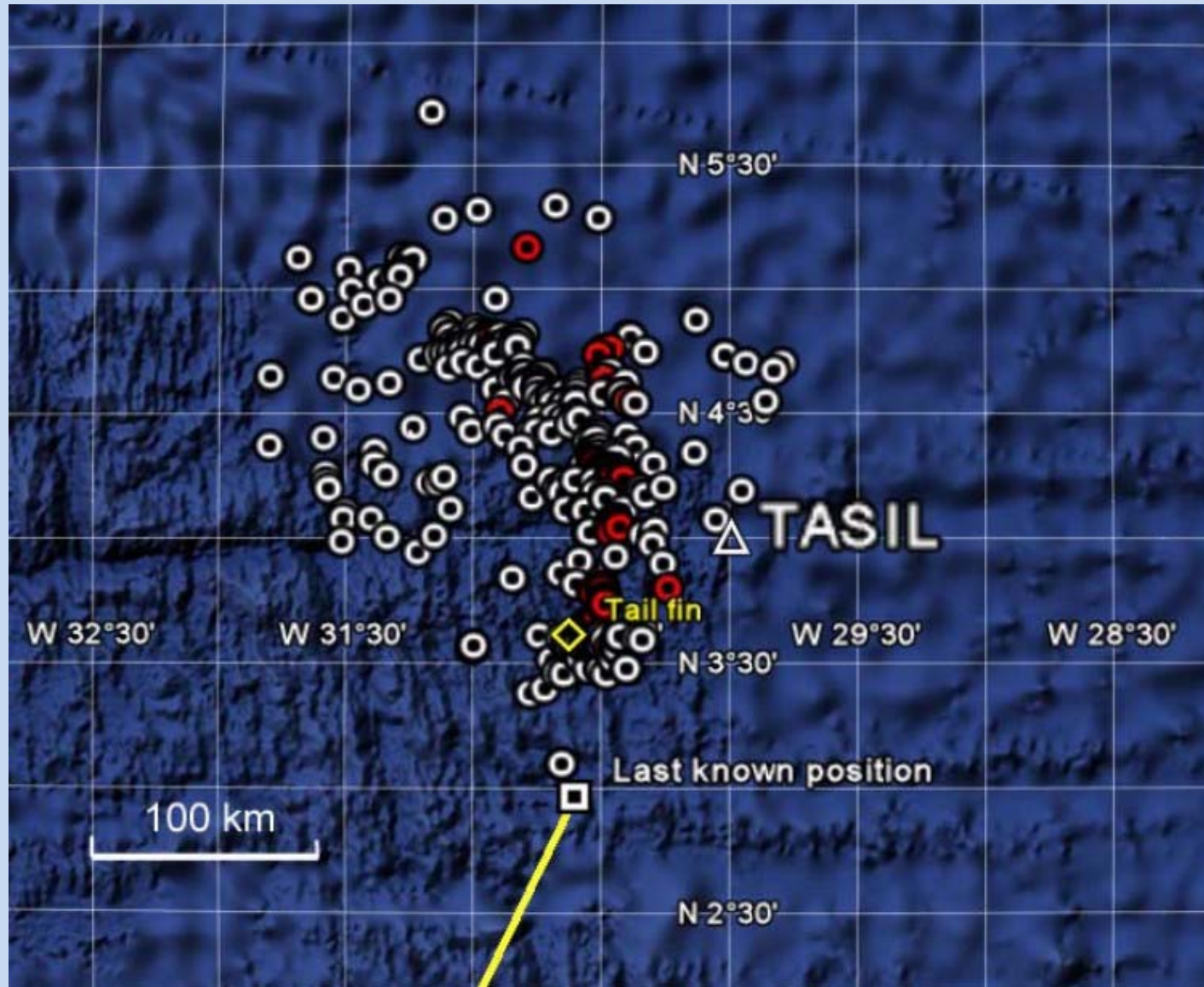
Air traffic control areas



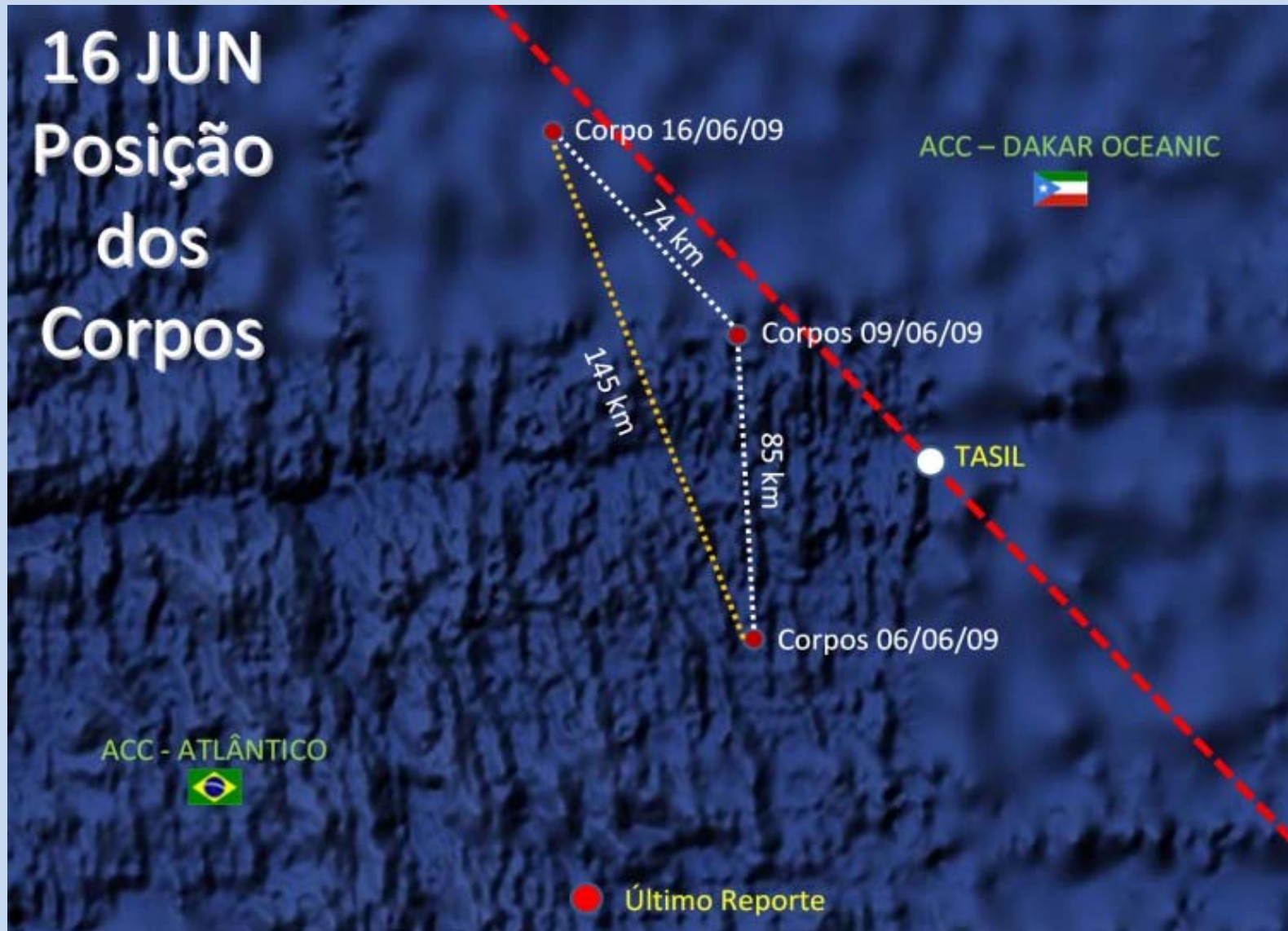
Ships involved

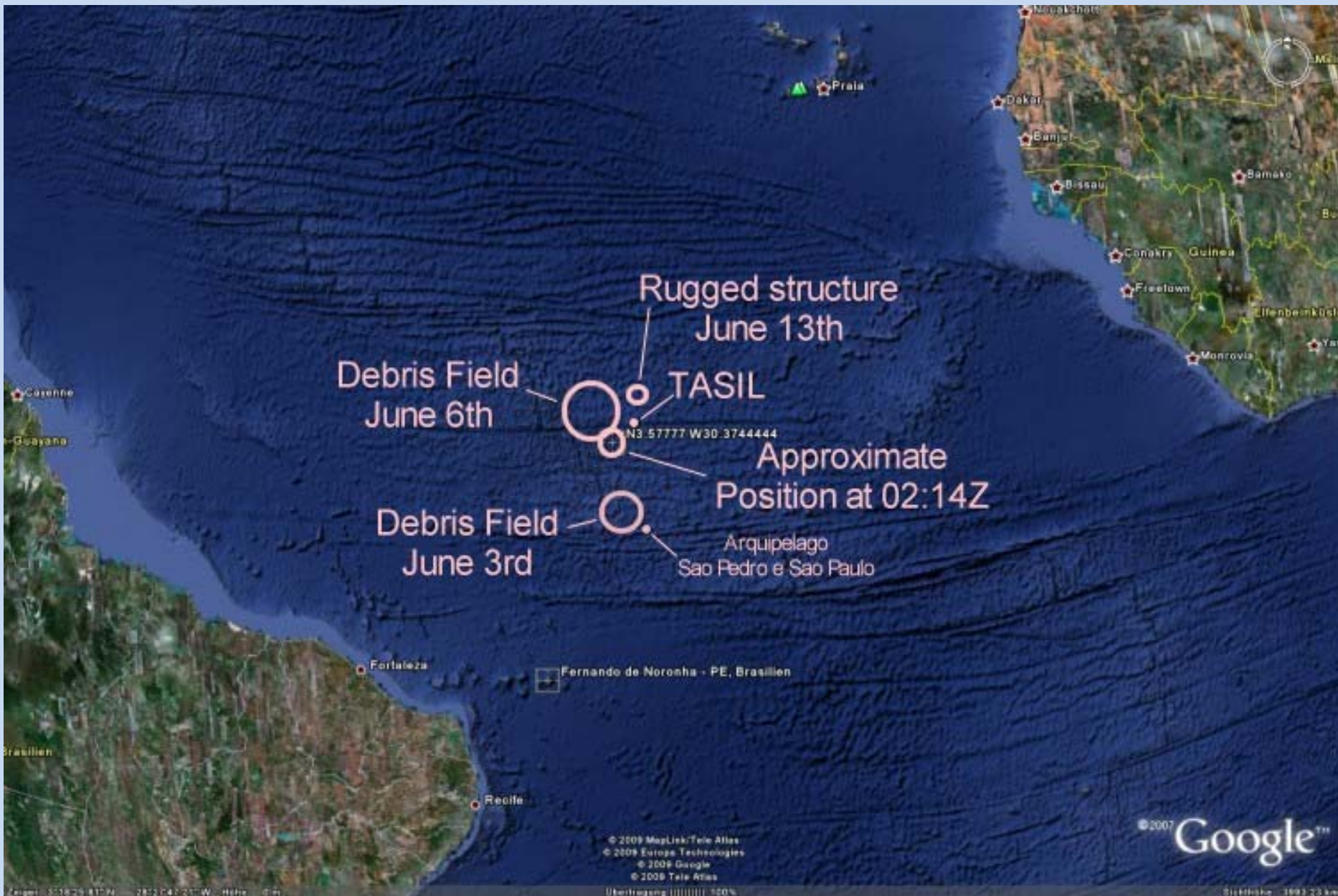


Location of wreckage found



Location of victims found

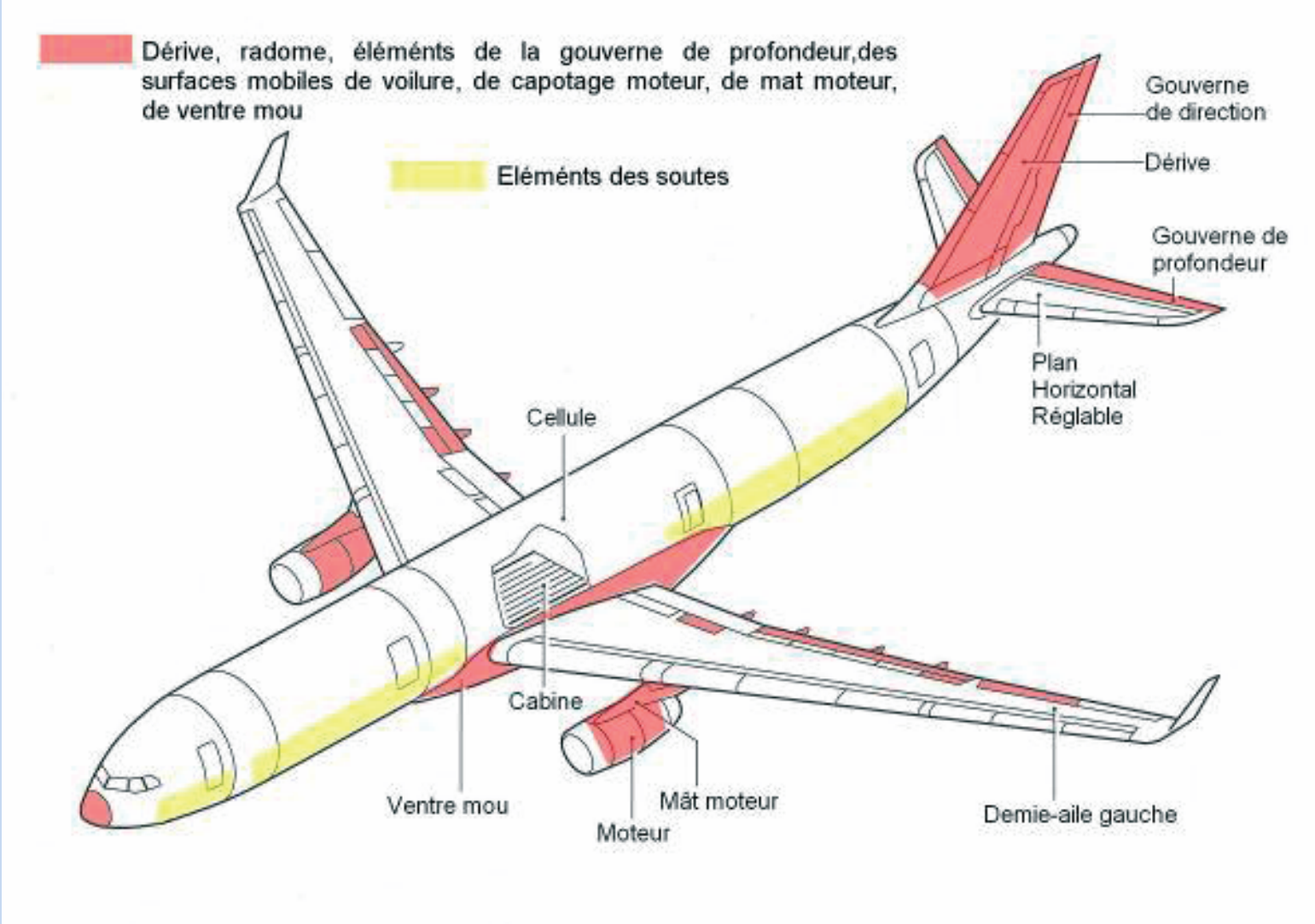




Vertical stabilizer



Distribution of wreckage parts found



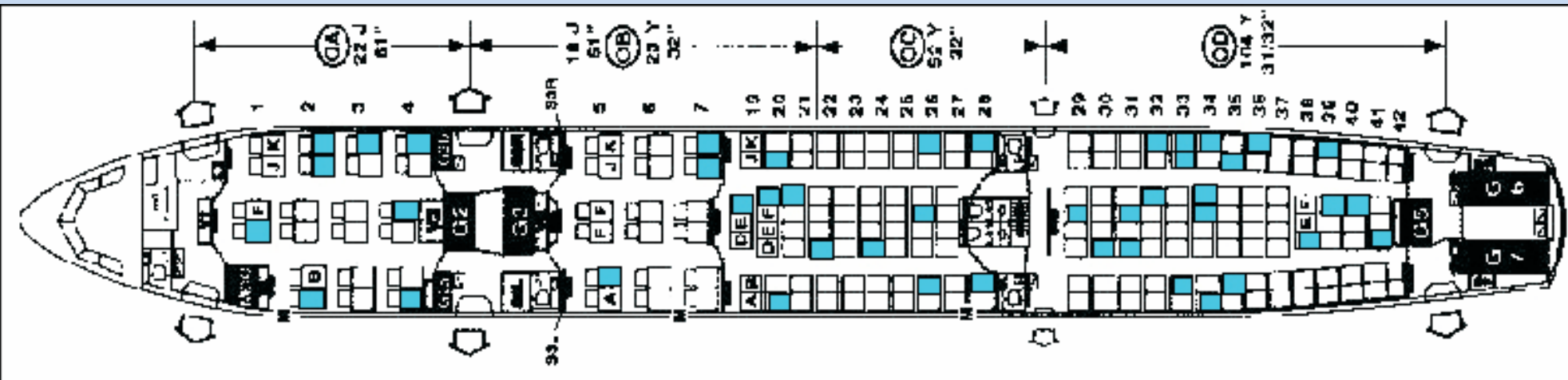
The lifejackets that were found
were all in their packaging



Passenger oxygen container recovered closed:
the deformations on the cover and box match



Seating positions of the passengers whose bodies were recovered





Parts of the overhead baggage lockers
 Parts of the walls, galley and cloakrooms
 Parts of Crew Rest Module

Galley, signs of extreme vertical acceleration



Parts of Crew Rest Compartment



Recovery of vertical fin



Vertical fin



Vertical fin American Airlines



Wreckage parts



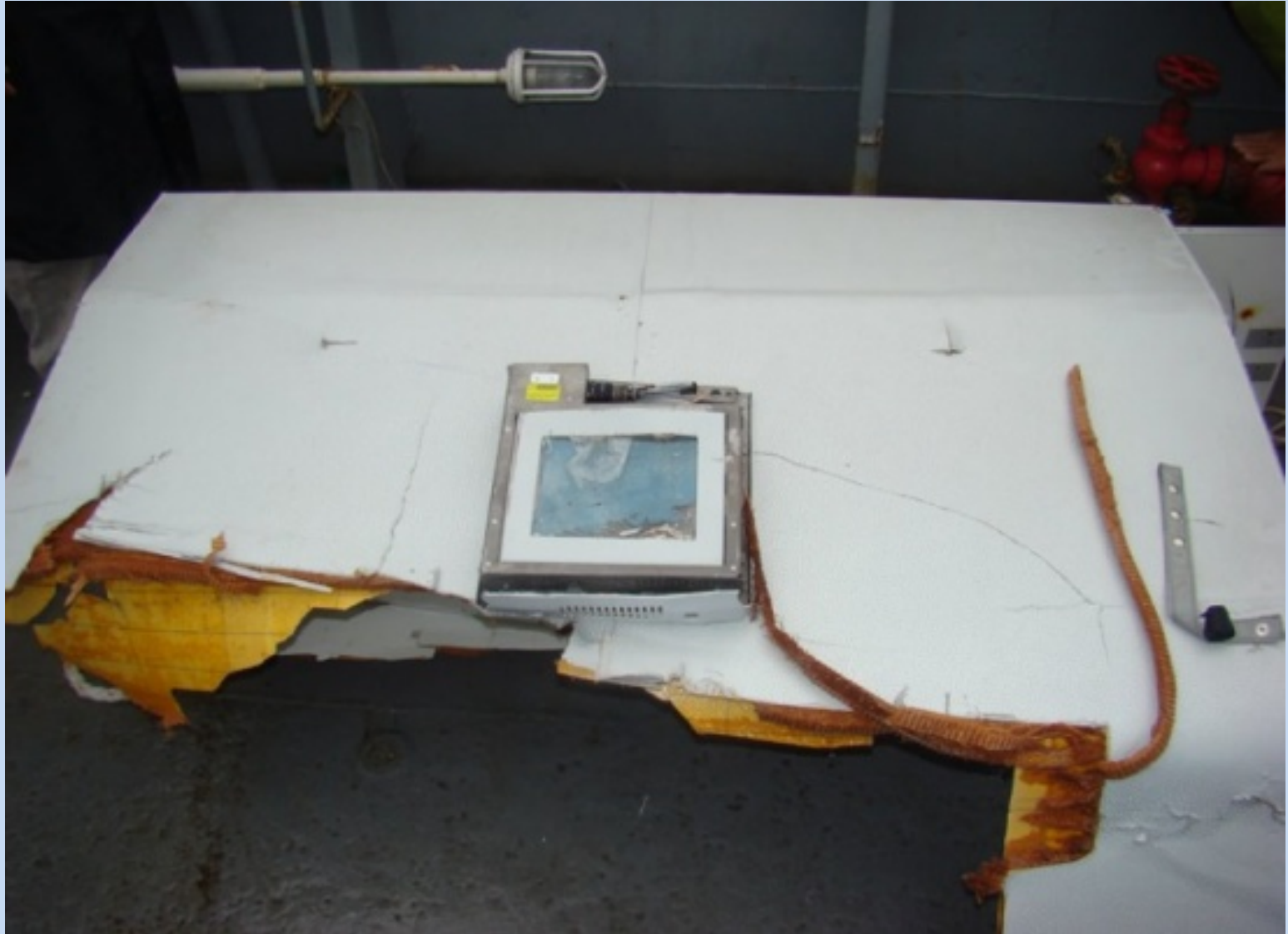
Flight attendants seats



Part of a galley



Monitor





- **1.12.4 Summary**
- The cabin crew's seatbelts that were found (three out of eleven) were not in use at the moment of impact.
- The containers recovered closed showed that the passenger oxygen masks had not been released. There had been no cabin depressurisation.



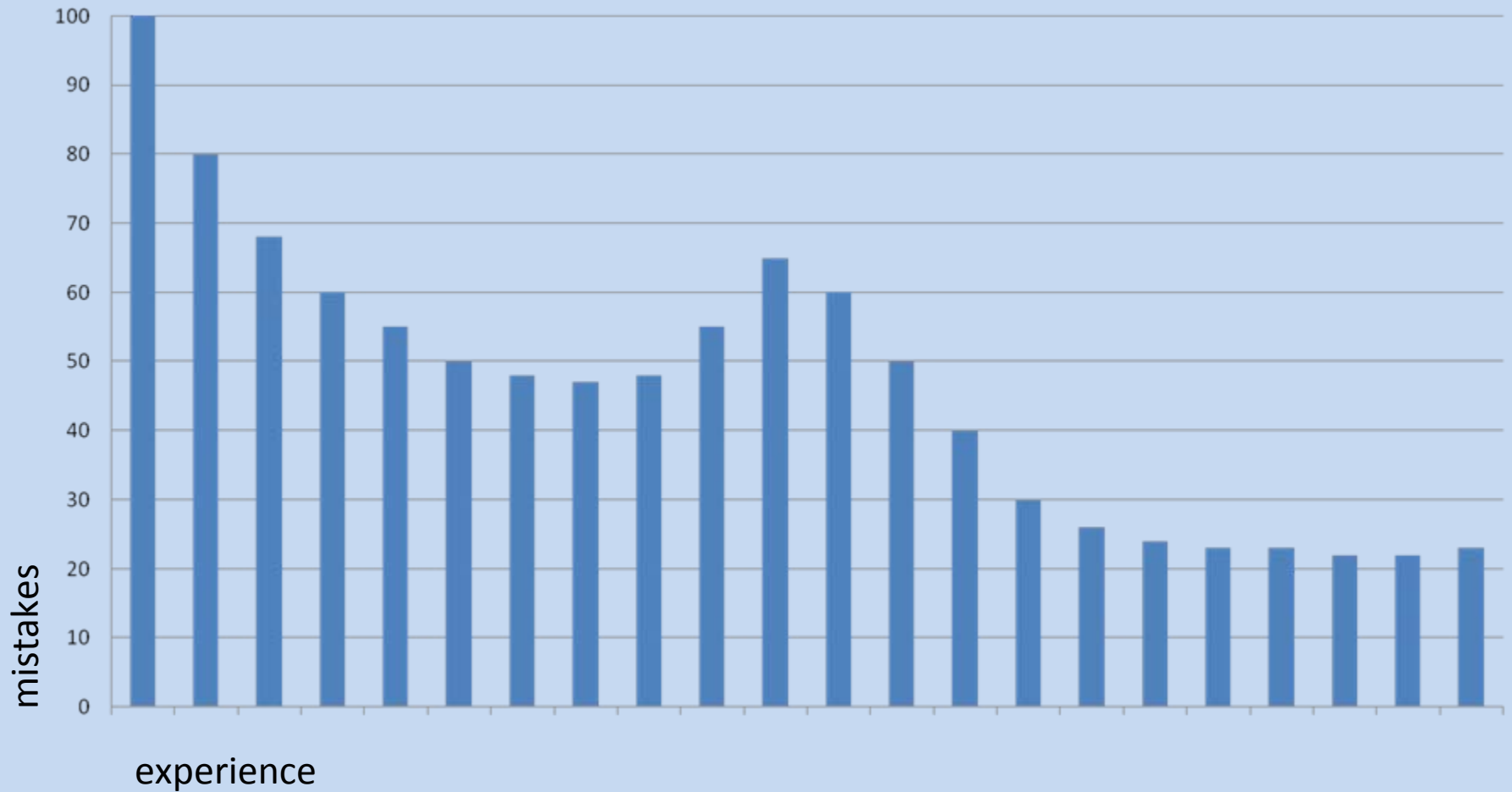
Human Factors

- Overconfidence
- Complacency
- Communication
- Alertness
- Situational Awareness



„Overconfidence“

Mistakes in relation to experience



Additional causes discussed

- Failure of weather radar(ice, thunderstorm)
- Radar image shaded
- Lightning
- Broken cockpit window
- Terrorist attack
- Meteorite impact
- Medical reasons



Thank you for your attention!

Questions ?

