

ATR-0131 (31 January 2020)
Flight #7 and #8 – as200007 and as200008
Marie Lothon, Cyrille Flamant
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1. Objective

The objective of this flight is to characterize the cloud and boundary layer properties within the HALO circle, focusing on the cloud base level and the subcloud-layer. In the afternoon, the ATR was in the air at the same time as the TO and the P3.

2. Crew

Flight A (15 – 19 UTC):

Marie Lothon (Mission PI), Christophe Caudoux (RASTA and BASTA), Christophe Le Gac (RASTA and BASTA, Engineer), Alexandre Baron (Lidar), Alfons Schwarzenboeck (Microphysics), Caroline Muller (Picarro), Michel Cluzeau (SAFIRE Engineer), Tetyana Jiang (SAFIRE Engineer), Dominique Duchanoy (Pilot), Guillaume Seurat (Pilot)

Flight-level support on ground: Raphaela Vogel, Nicolas Rochetin, Jessica Vial

Flight B (20 – 24 UTC):

Cyrille Flamant (Mission PI), Julien Delanoë (RASTA and BASTA), Carol Subrath-Ali (visitor CIMH), Patrick Chazette (Lidar), Alfons Schwarzenboeck (Microphysics), Pierre Coutris (Microphysique), Hubert Bellec (SAFIRE Engineer), Gilles Vergez (SAFIRE Engineer), Dominique Duchanoy (Pilot), Guillaume Seurat (Pilot)

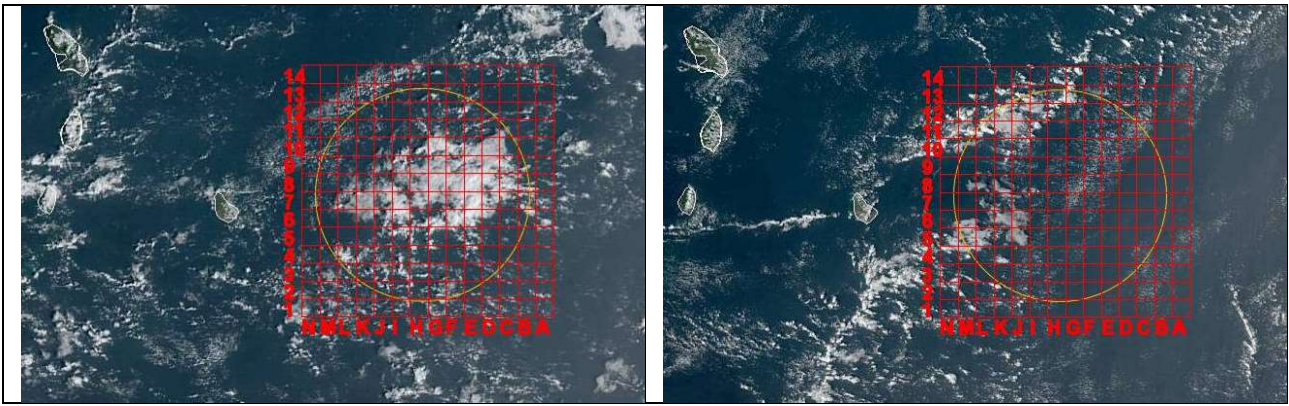
Flight-level support on ground: Jessica Vial, Raphaela Vogel, Nicolas Rochetin, Caroline Müller

3. Synoptic Situation

Flower within the circle during the whole first flight, deactivating progressively. Several associated cold pools, and pumping clouds near their fronts. Lines of convection at the border of cold pools, activating later as the flower dissipates. Before getting to Entry Point, we overflew an extended decked stratus cloud. Same on the way back home. Dust layer up to 2500m.

During the first flight, the ATR was flying on the western side of the Flower, above cold pools. The flower remained approximately at the center of the HALO circle during this first flight, though slowly advected by the easterly winds. Its associated cold pools seemed to propagate only on its western side (where the ATR flew; no visible cold pools to the east of the flower). ATR sampled two patches of clouds located at the edge of cold pools in northern and western part of the rectangle. Small and sparse cumulus clouds in between. Fuzzy mixed layer. Small visibility. Cloud base height (CBH) 100m higher in the southern part of the rectangle compared to the north. On the L-shaped subcloud leg, the ATR flew below the anvil cloud of the flower, which looked like a thick altostratus with wide horizontal extent.

During the second flight, the ATR flew in the remains of the flower, and sampled mostly shallow cumulus, except on several occasions when a towering convective cloud (seen with BASTA) was sampled in the NE part of the flight track. The cloud base height (CBH) was found to be higher to the south (by less than 100 m) and flight level was adjusted during the first 2 rectangles to remain just above CBH. Such an adjustment was not necessary during the last rectangle (after dark). The flight was also quite hazy, with dust being monitored with the lidar throughout the flight (up to 2100 m AMSL in Barbados, up 1800 m AMSL upon reaching the HALO circle), based on depolarization measurements. After dark, deposition of a mix of dust and water deposited on all aircraft windows, limiting the range of the lidar during the last rectangle.



Target area superimposed on GOES satellite picture at 12:30 UTC and 20:00 UTC.
Image credit from Phil Rosenberg (Leeds).

3. Flight Elements

R: Rectangular (race track) pattern starting at Entry Point, starting with the northward heading leg to the west; L: L-shape pattern round trip (one leg along wind, one crosswind); EP: Entry Point race track (13.25N, 58.41W)

Flight #7:	(°N, °W)	Flight Level (FL)	Time (UTC)	Notes
Takeoff	GAIA		14 :58	
Ferry	To EP	FL80	15 :09-15:19	about 2.5 km.
R1		FL22	15 :28-16 :16	cloud base (600 m)
R2		FL22	16:16-17 :04	cloud base (600 m)
½ R3 Southern		FL22	17 :04-17 :30	cloud base (700 m)
L1		FL15	17:33-17:56	top subcl layer (400 m)
L2		FL13	18:00-18:21	mid subcl layer (200 m)
Ferry back	From EP	FL100	18:28-18:42	Upper level leg (3000m)
Landing	GAIA		18:48	

Flight #8:	(°N, °W)	Flight Level (FL)	Time (UTC)	Notes
Takeoff	GAIA		19:49	
Ferry	To EP	FL80	19:57-20 :10	about 2.5 km.
R1		2000 ft	20:14-21:03	cloud base (ft) 2000→1710→2000
R2		2000 ft	21:03-21:51	cloud base (ft) 2000→1800→2000
R3		2000 ft	21:51-22:39	cloud base
L1		1500 ft	22:43-23:06	top subcl layer
L2		1000 ft	23:11-23:32	mid subcl layer
Ferry back	From EP	FL100	23:39-23:50	Upper level leg (stable for 10 min)

Flight #8:	(°N, °W)	Flight Level (FL)	Time (UTC)	Notes
Landing	GAIA		00:01	

A detailed report of the start time and ending time of all legs is accessible on EUREC4A AERIS website (EUREC4A Operational Center, <https://observations.ipsl.fr/aeris/eurec4a/#/>)

4. Instrument Status

Radars: RASTA nadir did not work.
BASTA worked fine.

Lidar: Worked fine.

Picarro: Worked fine.

Microphysics: CDP-2, 2DS and FCDP worked well.

Base:

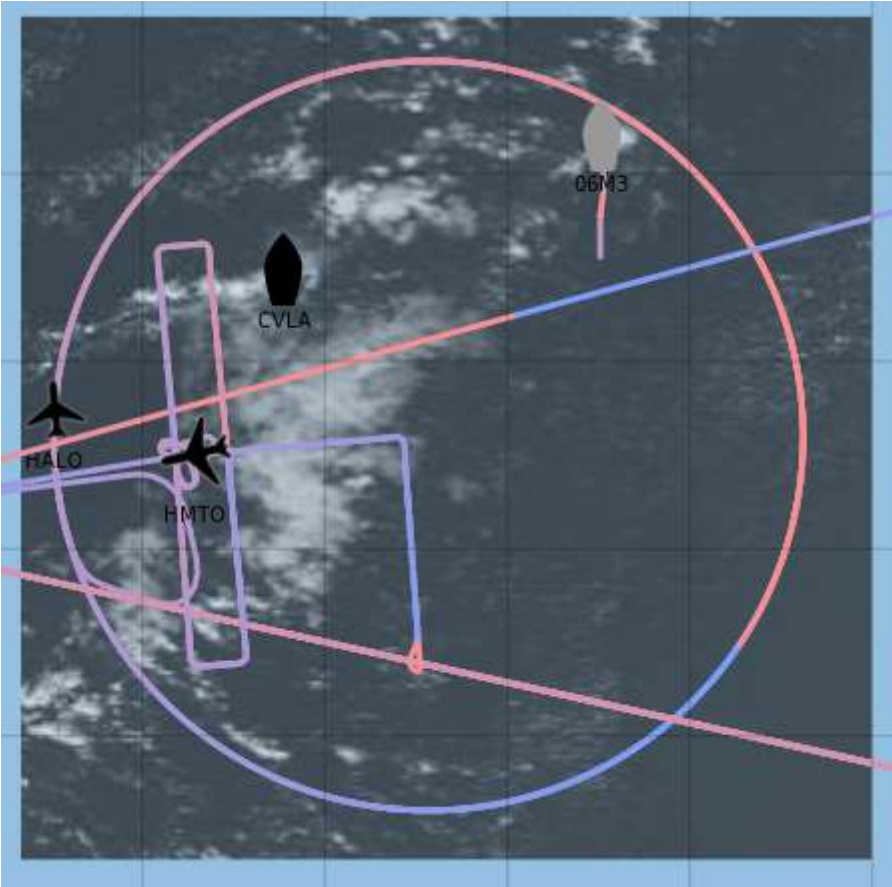
INS degraded to 50Hz instead of 100Hz normally.

Fast water vapour: KH20 OK.

No vertical wind measurements.

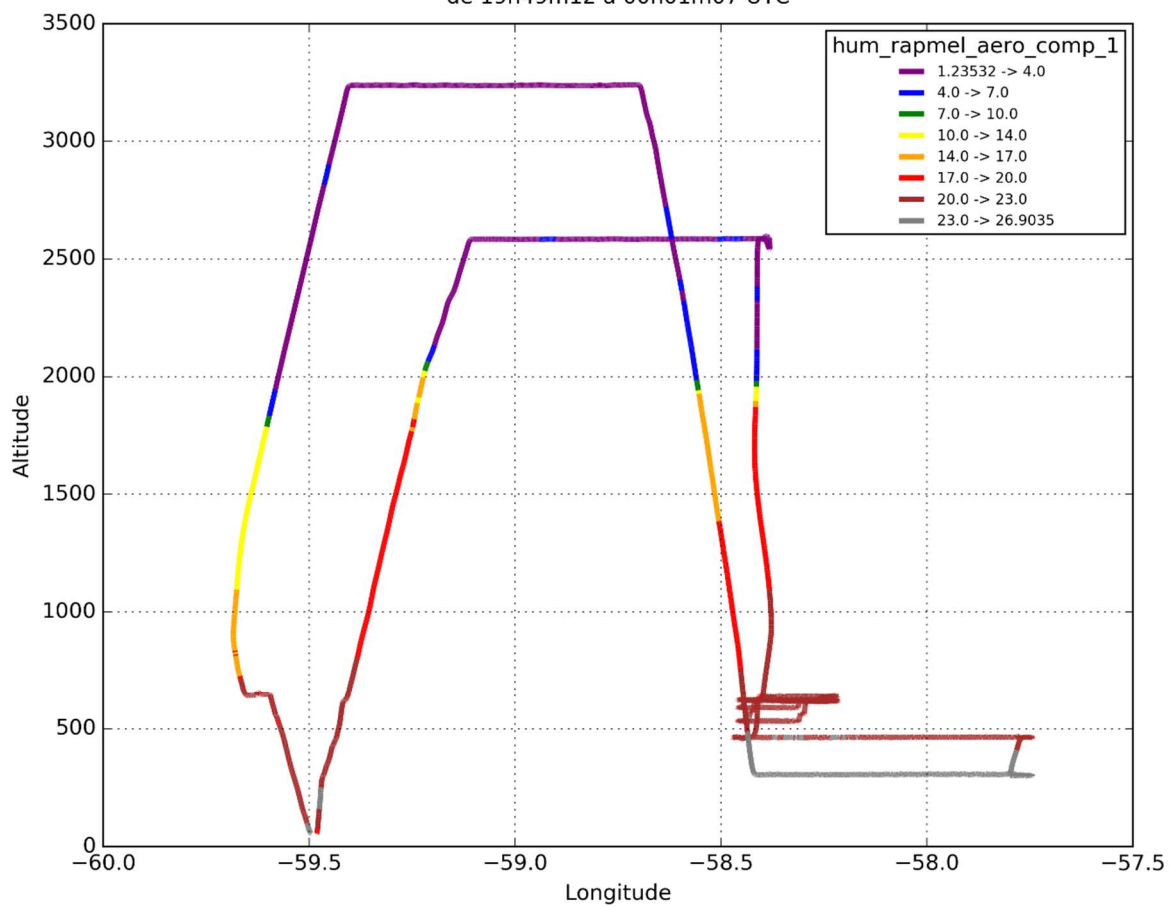
PVM, LWC-300, Aerosol, microphysics: OK except Nevzorov (LWC).

4. Figures

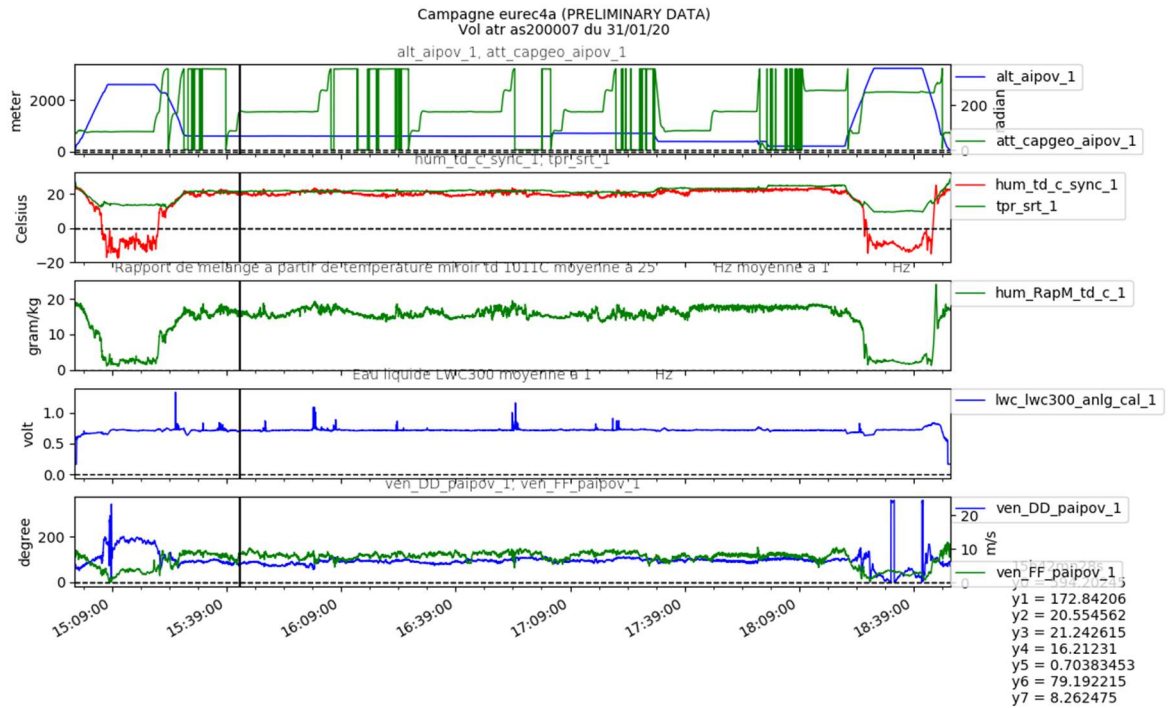


Trajectory at the end of first flight

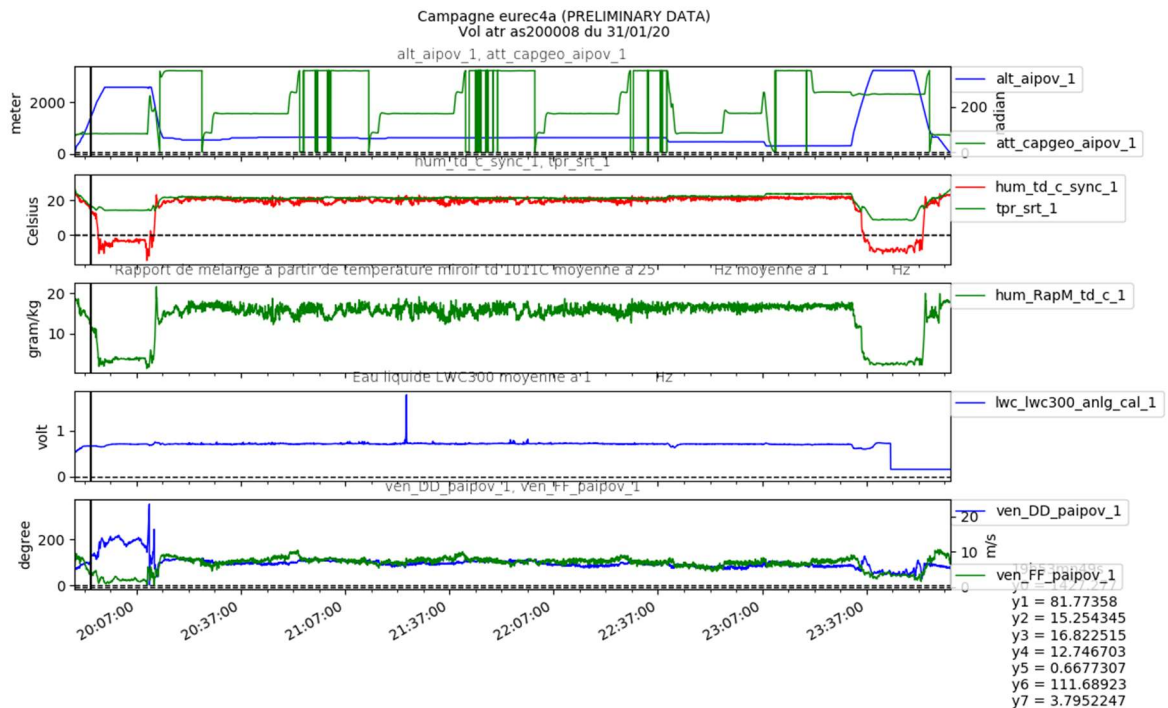
Campagne EUREC4A
Vol atr as200008 du 31/01/2020
de 19h49m12 a 00h01m07 UTC



Vertical projection with superimposed water vapour mixing ratio during second flight

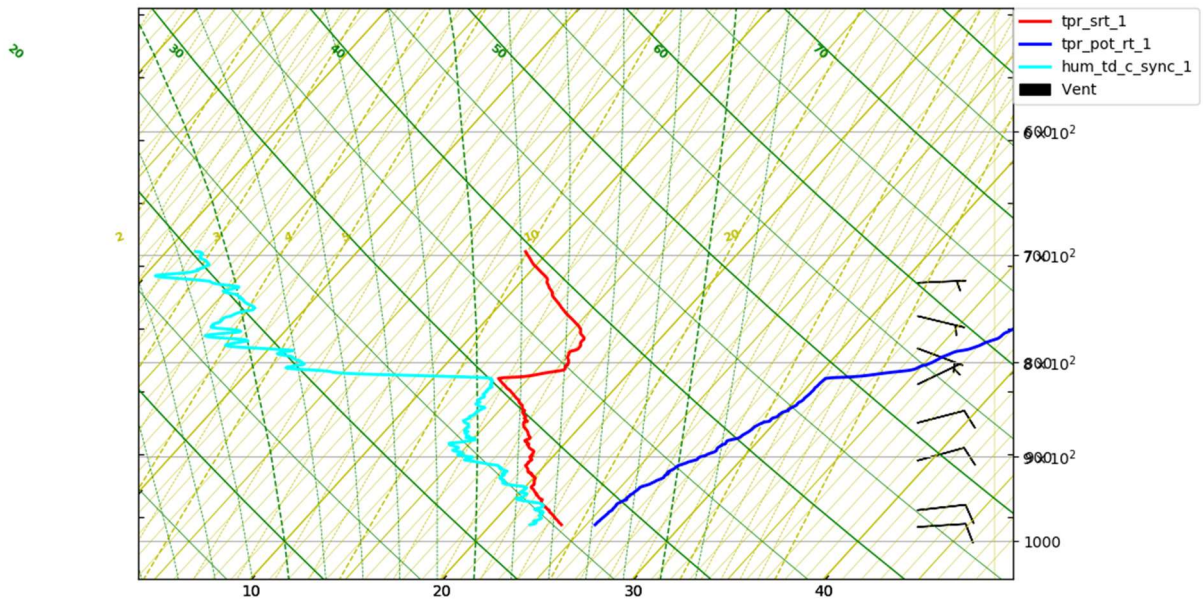


Time series during first flight of (1) altitude and heading, (2) Dew point temperature and temperature, (3) water vapour mixing ratio, (4) liquid water content (uncalibrated), (4) horizontal wind. Caution: those are preliminary unvalidated data.



Time series during second flight of (1) altitude and heading, (2) Dew point temperature and temperature, (3) water vapour mixing ratio, (4) liquid water content (uncalibrated), (4) horizontal wind. Caution: those are preliminary unvalidated data.

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Skew-T diagramme during alinear ascent of second flight from the L pattern to the ferry leg back