Flight report
Research Flight 6 (RF06)
ATR-2024-0816a
SAFIRE flight as240028
Sal (SID-SID), 10:35 - 14:17 UTC

PI: **Marie Lothon**

16 August 2024

1 Objectives

- After AEW front passage
- SE axis across PW gradient

2 Cal/Val activity

No

3 Crew

SAFIRE	Name	Lab
Pilot (CDB)	Guillaume Seurat	SAFIRE
Pilot (OPL)	Jean-François Bourdinot	SAFIRE
Mechanics	Thierry André	SAFIRE
Expé Principal	Greg Ehses	SAFIRE
Expé	Clément Bezier	SAFIRE
SCIENTISTS		
PI seat	Marie Lothon	LAERO
LNG seat	Sophie Bounissou	SAFIRE
aWALI seat	Jérémy Lagarrigue	LSCE
Microphys seat 1	Pierre Coutris	LAMP
Microphys seat 2	Antoine Baudoux	LAMP
RASTA seat	Julien Delanoë	LATMOS
BASTA seat	Emmeline François	LATMOS

4 Synoptic situation

Area was influenced by an AEW during the night before, with significant rain at SAL. Contrary to what was predicted, it was not active anymore in the area during the flight. Clouds were more to the West and Northwest.
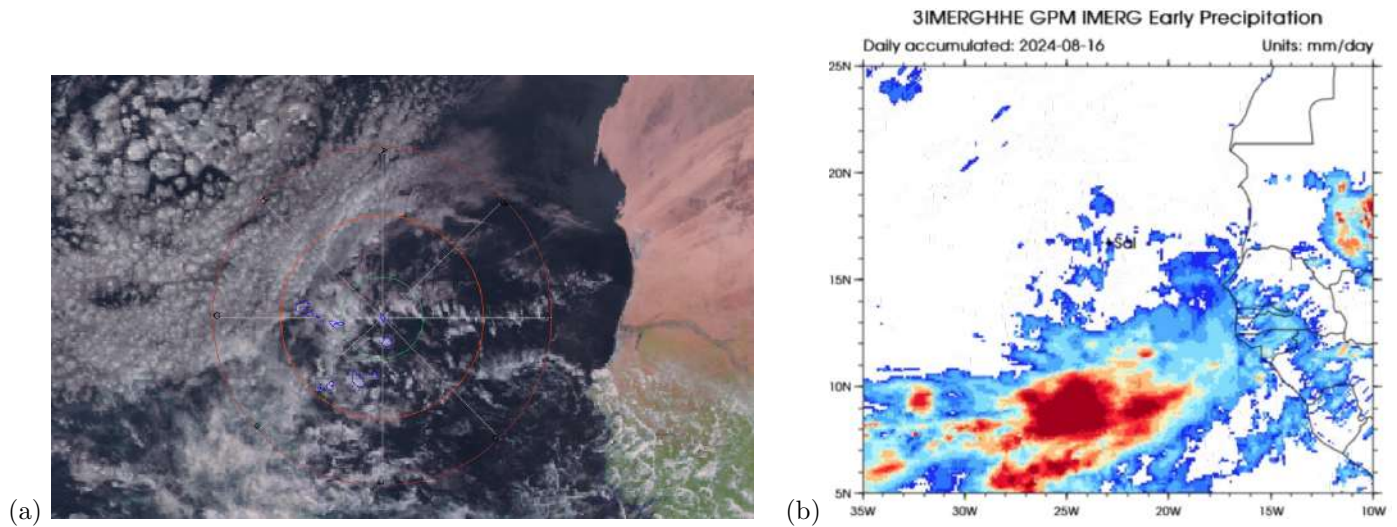

Figure 1: (a) MSG imagery (RGB) on Aug 16 2024, 13:00 UTC, (b) Cumulated rain
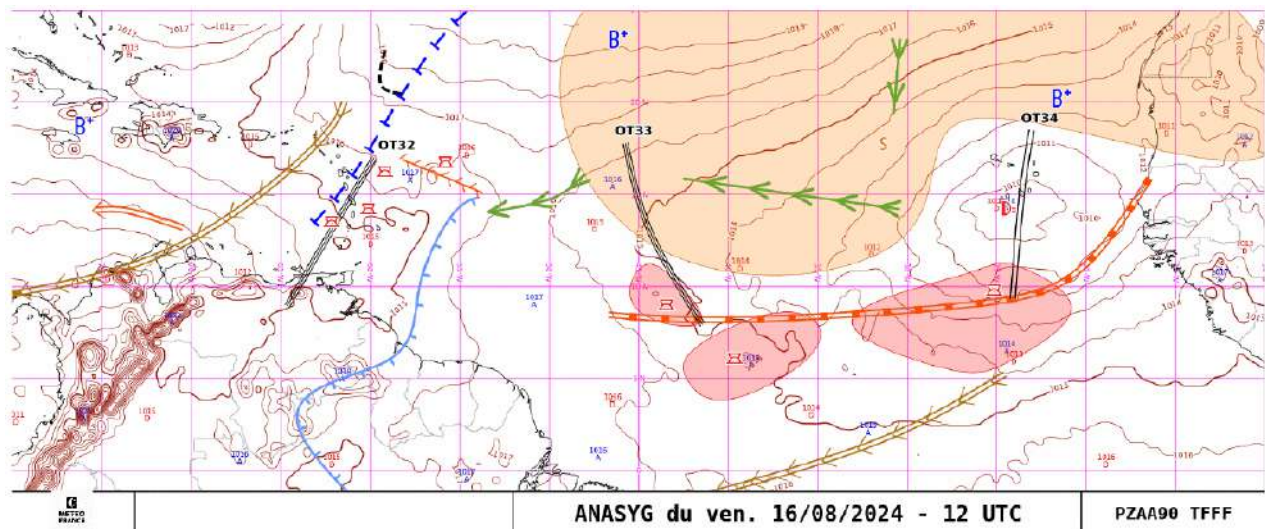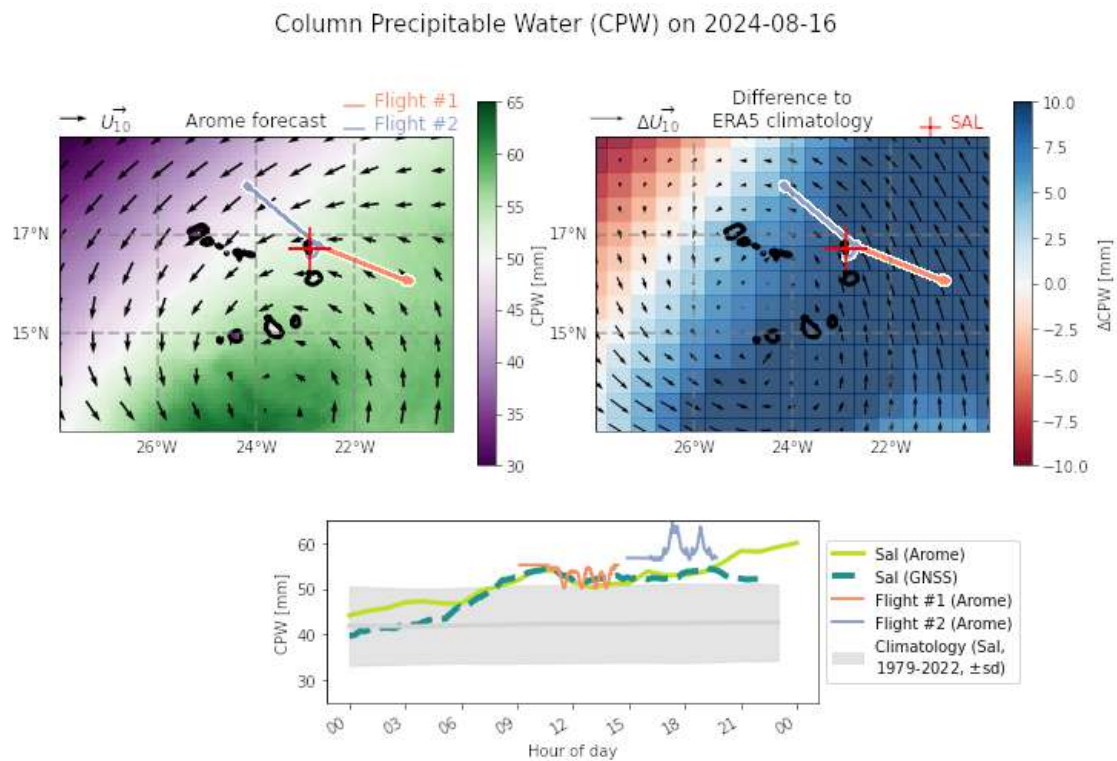

Figure 2: MISVA schematic analysis.

Figure 3: 24h average of Column of Precipitable Water, from ECMWF analysis and GNSS.
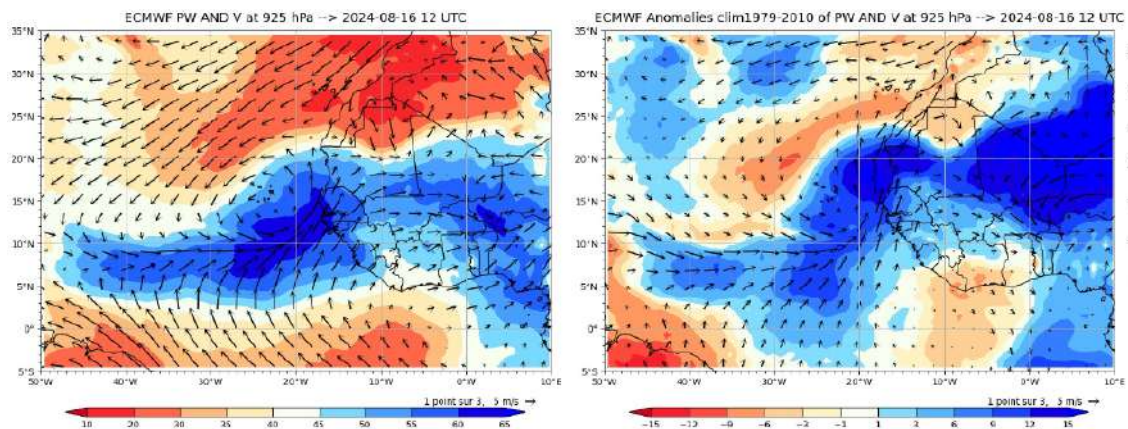

Figure 4: Precipitable water, and PW anomaly from ECMWF
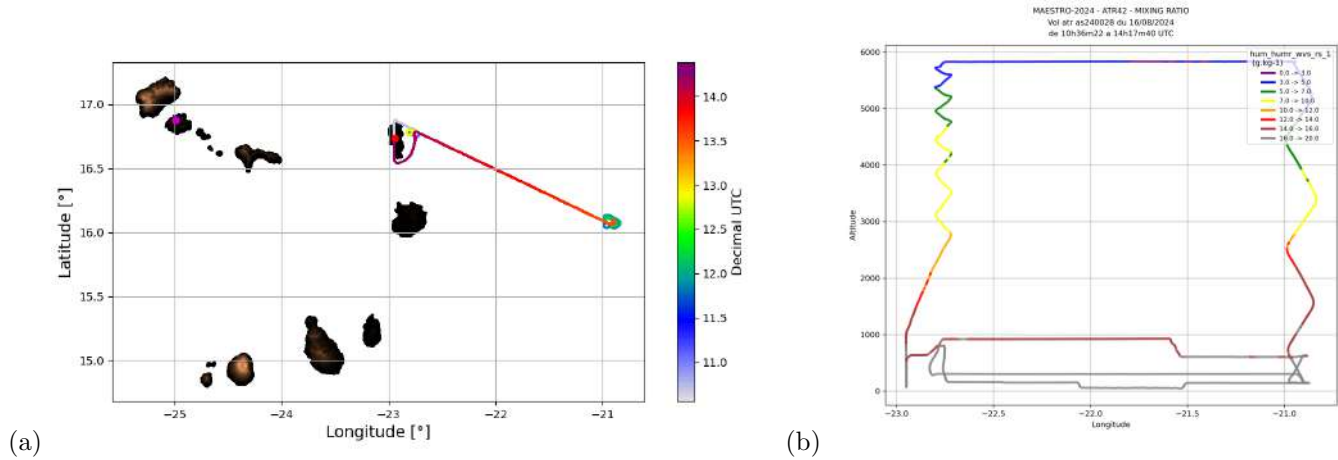
5 Flight elements

Description of the legs

(a)

(b)

Figure 5: (a) Projected trajectory and altitude (color). (b) EW vertical cross section of water vapour mixing ratio

RF02 elements	Time (UTC)	Flight Level (FL)	Position	Notes
Takeoff	10:35		SID-SID	
A	10:35 - 11:08	$0 \rightarrow$ FL180	SAL $\rightarrow WP1$	Ascent from Sal to WP1
H1	11:09 - 11:46	FL180	WP1 $\rightarrow WP2$	High level leg toward ESE
V	11:46 - 11:51	FL180	near WP2	VAD
D	11:49 - $\sim 12:15$	FL180 $\rightarrow 500ft$	WP2	
B1	$\sim 12:16-\sim 12:30$	2000 ft	WP2 $\rightarrow WP1$	'Cloud base leg'
B2	$\sim 12:30-\sim 12:48$	3000 ft	WP2 $\rightarrow WP1$	'Cloud base leg'
L1	12:51 - 13:29	1000 ft	WP1 $\rightarrow WP2$	BL leg
L2	13:33 - 13:43	500 ft	WP2 $\rightarrow WP1$	BL leg
L3	13:44 - 13:54	200 ft	WP2 $\rightarrow WP1$	BL leg
L4	55:33 - 14:07	500 ft	WP2 $\rightarrow WP1$	BL leg
Landing	14:17		SID-SID	

6 Quicklooks and Comments

During the first ascent from airport, first cloud base was around 500 m. It was overlaid by a stratocumulus layer, topped at 1500 m with dry air. Inversions were observed at the top of the SC, and several smaller were found at 3400 m and 3600 m. A moister layer was found above. In the other side, another Sc layer was observed, topped at 2500 m with a base at 1600 m. The stratus below had its base at 1100 m. Clouds were thus mostly present at start and end of the segment, with 1 to 3 layers then. Thin rain with SC. In between, we had clear area. In the boundary layer, water vapour mixing ratio was around 19 g kg^{-1}, with easterly or ESE wind weak around 5 m s^{-1}.
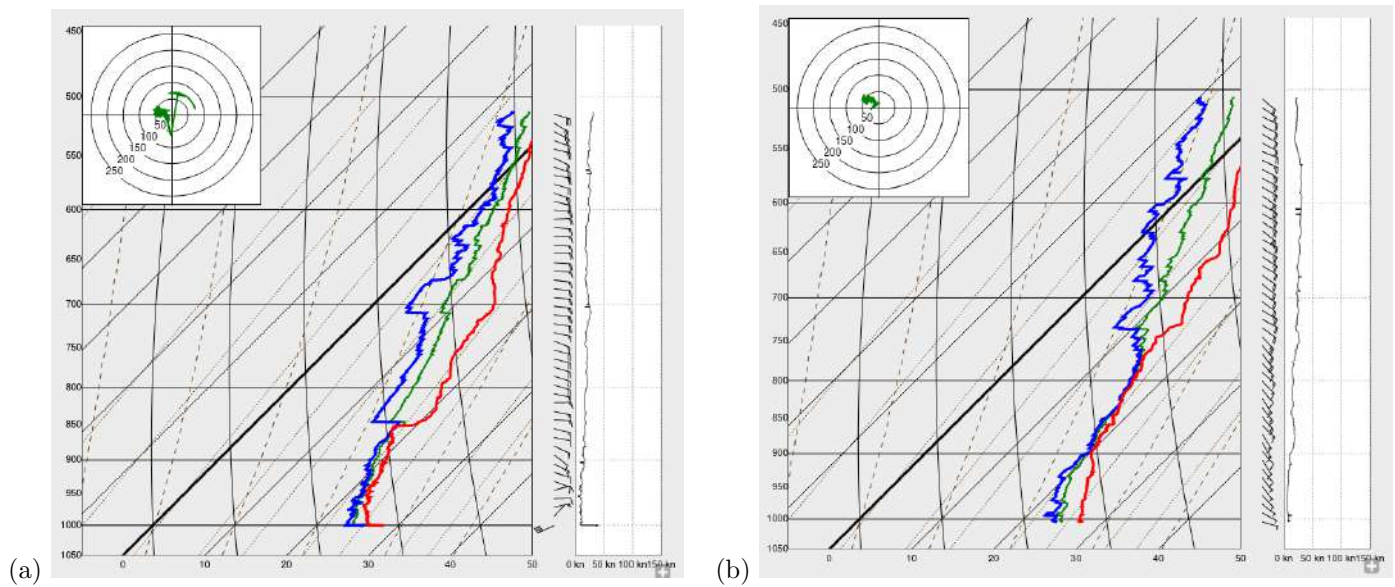
Figure 6: Skew-T diagrams and wind profiles during (a) ascent from airport to WP1, and (b) descent at WP2.

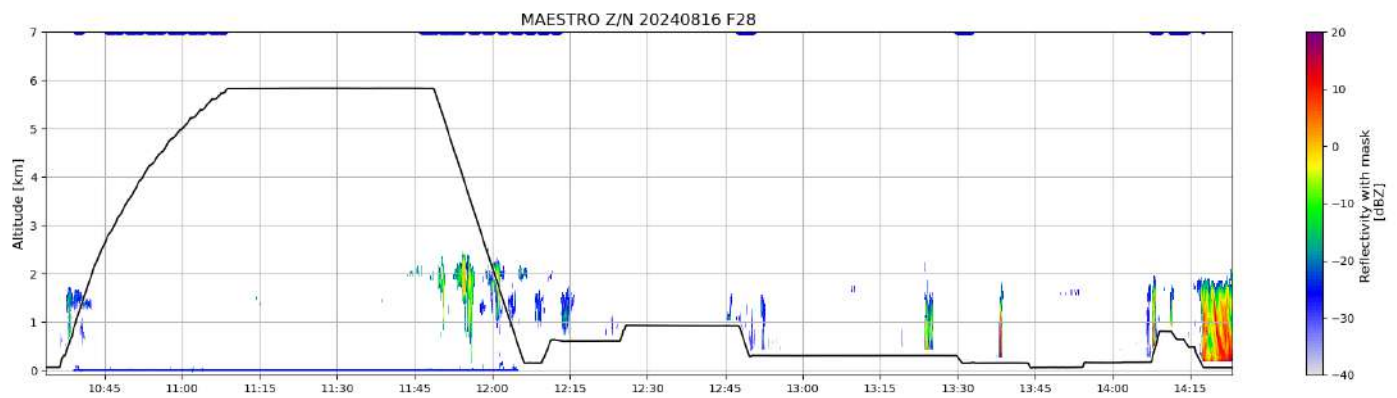Figure 7: RASTA observations along the entire flight.

7   Instrument status

No data from the top pyrgeometer (downward IR radiation). Unexplained. All other instruments worked well.

DATA	SAFIRE_name	DESCRIPTION	PARAMETER	STATUS	COMMENT
NAV	pos_lat_imu_1	Latitude from AIRINS	LATITUDE	OK	
	pos_lon_imu_1	Longitude from AIRINS	LONGITUDE	OK	
	alt_alt_imu_1	Altitude from AIRINS	ALTITUDE	OK	
	nav_track_imu_1	Course	COURSE	OK	
	att_thead_imu_1	True Heading	THEAD	OK	
	att_roll_imu_1	Platform Roll angle	ROLL	OK	
	att_pitch_imu_1	Platform Pitch angle	PITCH	OK	
	vit_v_n_imu_1	Platform North speed	VN	OK	
	vit_v_e_imu_1	Platform Eastward speed	VE	OK	
	vit_v_w_imu_1	Vertical speed	VV	OK	

DATA	SAFIRE_name	DESCRIPTION	PARAMETER	STATUS	COMMENT
	vit_v_gs_imu_1	Ground speed	GS	OK	
RAD	ray_rg_down_1	Downwelling Shortwave radiation clear dome (no attitude correction)	SWD	OK	
	ray_rg_down_crsensor_1	Downwelling Shortwave radiation clear dome- Attitude correction for pitch/roll $<\pm 3°$	SWDC	OK	reference
	ray_pir_down_1	Downwelling Shortwave radiation red dome (no attitude correction)	SWD_RED	OK	
	ray_pir_down_crsensor_1	Downwelling shortwave radiation red dome-Attitude correction for pitch/roll $<\pm 3°$	SWDC_RED	OK	reference
	ray_rg_up_1	Upwelling Shortwave radiation clear dome (no attitude correction)	SWU	OK	
	ray_pir_up_1	Upwelling shortwave radiation red dome (no attitude correction)	SWU_RED	OK	
	ray_ir_down_1	Downwelling longwave radiation (no attitude correction)	LWD	NOK	Erroneous data
	ray_ir_up_1	Upwelling longwave radiation (no attitude correction)	LWU	OK	
	ray_tb_ce332_c1_1	Brightness temperature channel1 ($8.7\mu m$) ce332 radiometer	TB_C1	OK	
	ray_tb_ce332_c2_1	Brightness temperature channel2 ($10.6\mu m$) ce332 radiometer	TB_C2	OK	
	ray_tb_ce332_c3_1	Brightness temperature channel3 ($12\mu m$) ce332 radiometer	TB_C3	OK	
	ray_lum_ce332_c1_1	Radiance, channel1 ($8.7\mu m$) from ce332 radiometer	RAD_C1	OK	
	ray_lum_ce332_c2_1	Radiance channel2 ($10.6\mu m$) from ce332 radiometer	RAD_C2	OK	
	ray_lum_ce332_c3_1	Radiance channel3 ($12\mu m$) from ce332 radiometer	RAD_C3	OK	
TDYN	pre_ps_av1_1	Static pressure corrected for flow distorsion	PRES	OK	
	vit_v_dp2_crs_1	Dynamic pressure corrected for flow distorsion	DYNP	OK	
	vit_v_p_av1_1	True Air Speed	TAS1	OK	reference
	vit_v_tas_adc_1	True Air Speed	TAS2	OK	
	alt_ralt_15_m_1	Height	HEIGHT	OK	
	att_aoa_radom_deg_1	Angle of Attack	AOA_RAD	OK	
	att_aos_radom_deg_1	Angle of Sideslip	AOS_RAD	OK	
	ven_wind_v_vp_imu_1	Upward Wind	WW	OK	ok +0,2 offset
	ven_wind_FF_vp_imu_1	Horizontal Wind Speed	WS	OK	reference
	ven_wind_DD_vp_imu_1	Horizontal Wind Direction	WD	OK	reference
	ven_wind_FF_simp_1	Horizontal Wind Speed WITHOUT Radome angles, with non-deiced Air Static Temperature	WS_RAW	OK	
	ven_wind_DD_simp_1	Horizontal Wind Direction WITHOUT Radome angles, with non-deiced Air Static Temperature	WD_RAW	OK	
	tpr_ts_rt_1	Air Static Temperature, non-deiced sensor	TEMP1	OK	reference
	tpr_ts_rtd_1	Air Static Temperature, deiced sensor	TEMP2	OK	
	tpr_tt_rt_1	Total Temperature, non-deiced sensor	TTEMP1	OK	reference

DATA	SAFIRE_name	DESCRIPTION	PARAMETER	STATUS	COMMENT
	tpr_tt_rtd_1	Total Temperature, deiced sensor	TTEMP2	OK	
	tpr_tp_rt_1	Potential Temperature	THETA	OK	
	hum_hutd_1011_sync_1	Dew Point Temperature 1011C	DP1	OK	oscillations
	hum_hutd_wvs_rs_1	Dew Point Temperature from WVSSII	DP2	OK	reference
	hum_hutd_rtd_aero_1	Dew Point Temperature from humaero enviscope	DP3	OK	
	hum_humr_1011_rs_1	Water Vapor Mixing ratio from 1011C	MR1	OK	oscillations
	hum_humr_wvs_rs_1	Water Vapor Mixing ratio WVS-SII	MR2	OK	reference
	hum_humr_srtd_aero_1	Water Vapor Mixing ratio from humaero enviscope	MR3	OK	
	hum_huabs_rt_1011_1	Abolute Humidity from 1011C	HABS1	OK	oscillations
	hum_huabs_wvs_rs_1	Abolute Humidity from WVSSII	HABS2	OK	reference
	hum_huabs_srtd_aero_1	Abolute Humidity from enviscope	HABS3	OK	
	hum_hurel_rt_1011_rs_1	Relative Humidity from 1011C	RH1	OK	saturation
	hum_hurel_wvs_rs_1	Relative Humidity from WVSSII	RH2	OK	reference
	hum_hurel_stat_rt_aero_1	Relative Humidity from enviscope	RH3	OK	
	ctl_CTL_P_CABINE_1	Cabin Pressure	P_CABIN	OK	
	ctl_CTL_T_CABINE_1	Cabin Temperature	T_CABIN	OK	
LWC	lwc_lwc300_rebase005_1	LWC calculation according to DMT PADS Hotwire LWC	LWC2	OK	
FW	hum_humolfra_fw_crh_100	Mole fraction of water vapour in air measured by FastWave	FW_MOLFRA	OK	1 incoherente value
	hum_humr_fw_100	Water Vapor Mixing ratio from FastWave	MR6	OK	
	pre_pb_fw_100	Air Pressure measured by FastWave	FW_P	OK	
	tpr_tt_fw_100	Temperature measured by FastWave	FW_T	OK	
OZONE	chm_cc_o3_2b_ppb_RS_cal_%10	O3 2493DB OzoneMonitor mixing ratio	O3_MONITOR2	OK	
	chm_cc_o3_2b_ppb_anlg_%10	O3 2493DB OzoneMonitor concentration analogical	O3_MONITOR2_ANALOG	OK	
	ctl_CTL_CELL_T_2B_RS_cal_%10	O3 2493DB OzoneMonitor cell temperature	TCELL_MONITOR2	OK	
	ctl_CTL_CELL_P_2B_RS_cal_%10	O3 2493DB OzoneMonitor cell presure	PCELL_MONITOR2	OK	
	ctl_CTL_VOLFR_2B_RS_cal_%10	O3 2493DB OzoneMonitor volumetric flow rate	VOLFLRATE_MONITOR2	OK	
SPP300	mic_tabcount_SPP300_1	SPP300 particles count bin[1]...bin[30]	SPP300_COUNT	PB	only in low altitude
	mic_somcount_SPP300_1	SPP300 total particles count	SPP300_TCOUNT	PB	only in low altitude
	mic_tabconc_SPP300_1	SPP300 particles concentration bin[1]...bin[30]	SPP300_CONC	PB	only in low altitude
	mic_totalconc_SPP300_1	SPP300 Total particles concentration	SPP300_TCONC	PB	only in low altitude
UHSAS	mic_tabcount_uhsas_sync_1	UHSAS particles count	UHSAS_COUNT	OK	
	mic_somcount_uhsas_sync_1	UHSAS total particles counts	UHSAS_TCOUNT	OK	
	mic_tabconc_second_uhsas_sync_1	UHSAS Particles concentration	UHSAS_CONC	OK	
	mic_totalconc_uhsas_sync_1	UHSAS total particles concentration	UHSAS_TCONC	OK	

DATA	SAFIRE_name	DESCRIPTION	PARAMETER	STATUS	COMMENT
	ctl_sample_flow_uhsas_sync_1	UHSAS sample flow	UHSAS_FLOW	OK	
	ctl_sheath_flow_uhsas_sync_1	UHSAS sheath flow	UHSAS_SHEATH	OK	
REMOTE	RASTA	Cloud radar (Up and down)	Z, V, Doppler spectrum	OK	
	BASTA	Cloud radar (sidewards)	Z, V, Doppler spectrum	OK	OK
	LNG	Lidar (Up or Down)	Backscatter(355nm/532/1064) – HSRand Doppler 355nm	OK	
	aWALI	Raman Lidar (sidewards)	Backscatter and inelastic(RH/Temp)	OK	
MICRO	CVI		TWC	OK	
	HSI			OK	
	2DS		Images and Spectrum	OK	
	HVPS	Hydrometeors imagery	Images	OK	
	FCDP	Droplets (2?m - 50?m)	Spectrum	OK	
	NP-2			OK	