Flight report

Research Flight 10 (RF10)
ATR-2024-0801a
SAFIRE flight as240032
Sal (SID-SID), 13:55 - 17:32 UTC

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1 Objectives

- Earth Care CavlVal, coordination with KingAir (CELLO) and HALO (PERCUSSION)
- Cloud and oceanic boundary layer sampling with remote sensing and in-situ instrumentation.

2 Cal/Val activity

Earthcare

3 Crew

SAFIRE	Name	Lab
Pilot (CDB)	G Seurat	SAFIRE
Pilot (OPL)	JF Bourdinot	SAFIRE
Mechanics	T André	SAFIRE
Expé Principal	G Vergez	SAFIRE
Expé	T. Jiang	SAFIRE
SCIENTISTS		
PI seat	L Jaffeux	LAERO
LNG seat	K Huet	LATMOS
aWALI seat	H Cassan	LAERO
Microphys seat 1	P Coutris	LAMP
Microphys seat 2	T Latchimy	LAMP
RASTA seat	J Delanoe	LATMOS
BASTA seat	K Huet	SAFIRE

4 Synoptic situation

The flight happened in a dry period with integrated daily precipitable water values between 30 and 40 mm (see Figure 1). The wind was blowing from the North East over the Cap Verde islands with limited vertical wind sheer between 720 and 900 hPa levels. Clouds were rare in the area as can be seen in Figure 2 and precipitations were not observed either.

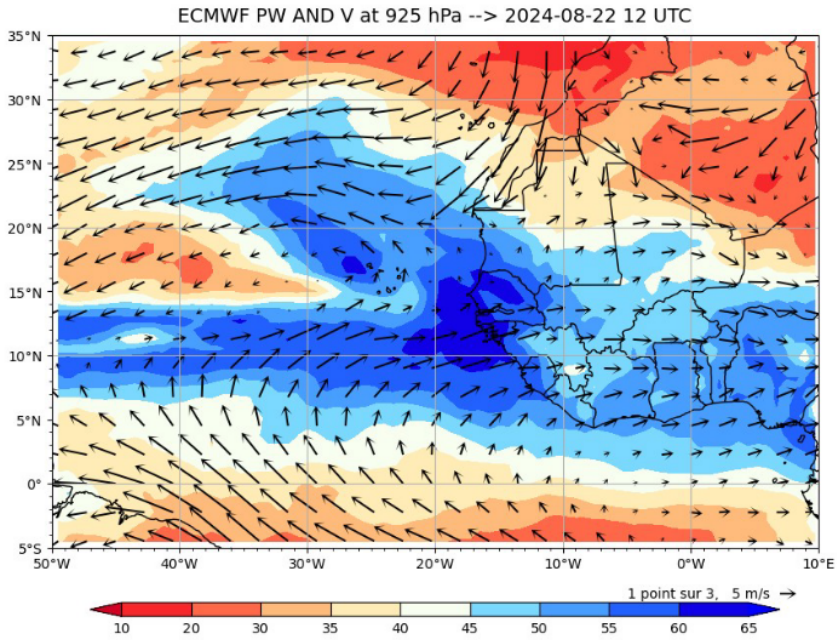

Figure 1: ECMWF PW forecast.

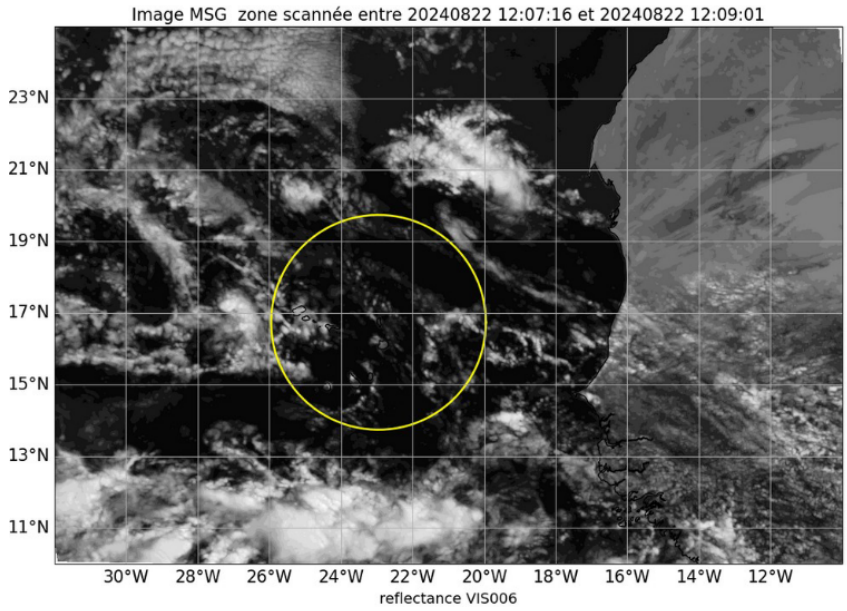

Figure 2: MSG image taken on 25/08/2024 at 15:08 UTC, during RF10.

5 Flight elements

Due to the aimed cooperation with HALO and King Air research aircraft, the meeting point with EarthCare was placed south of Praia (see Figure 3). After WP1, the first leg was performed at altitude 500 ft finishing at WP 2 where the ATR climbed up to FL220. During the next leg, towards WP 3, EC meeting point was reached at 15:41, as planned. The leg was then slightly prolonged by 3 minutes to maximize sampling time of clouds, from above with remote sensing instruments, and in-situ during the next leg. A VAD was performed, before descending to cloud base level at 2400 ft. A shorter leg was flown, turning before WP4 and staying at cloud level up to WP5. Finally, the return was done partly at 500 ft and at the surface (200 ft).

The flight was segmented using an optimization function that evaluates the stabilization of the plane, which is a necessary conditions for proper wind speed retrieval. 5 minutes segments were thereby constructed (as shown in Figure **??**) with associated scores. Better stabilization translates into lower score.

RF10 elements	Time (UTC)	Flight Level (FL)	Position	Notes
Takeoff	13:55		SID-SID	
L1-L2	13:55 - 14:11	0 → 2000 ft → 500 ft	SID → WP0	Transit to WP0
L1-L2	14:11 - 14:56	500 ft	WP0 → EC1	Subcloud leg
A1	14:56 - 15:31	500 ft → FL210	near EC1	Hippodrome ascent with sounding
H1-H2	15:32 - 15:52	FL210	EC1 → near EC2	max altitude leg with EC meeting point at 15:41
VAD	15:52 - 15:57	FL210	near EC2	Calibration maneuver
D1	15:57 - 16:17	FL210 → 2500 ft	near EC2 → EC2bis	Hippodrome descent with sounding
B1	16:20 - 16:34	2500 - 2300 ft	EC2bis → WP2bis	Cloud base leg
B2	16:37 - 16:56	2300 ft	WP2bis → WP3	Cloud base leg
L3	16:59 - 17:09	500 ft	WP3 → WP3bis	Subcloud leg
S1	17:09 - 17:23	300 ft	WP3bis → WP3ter	Surface leg
Landing	17:32		SID	

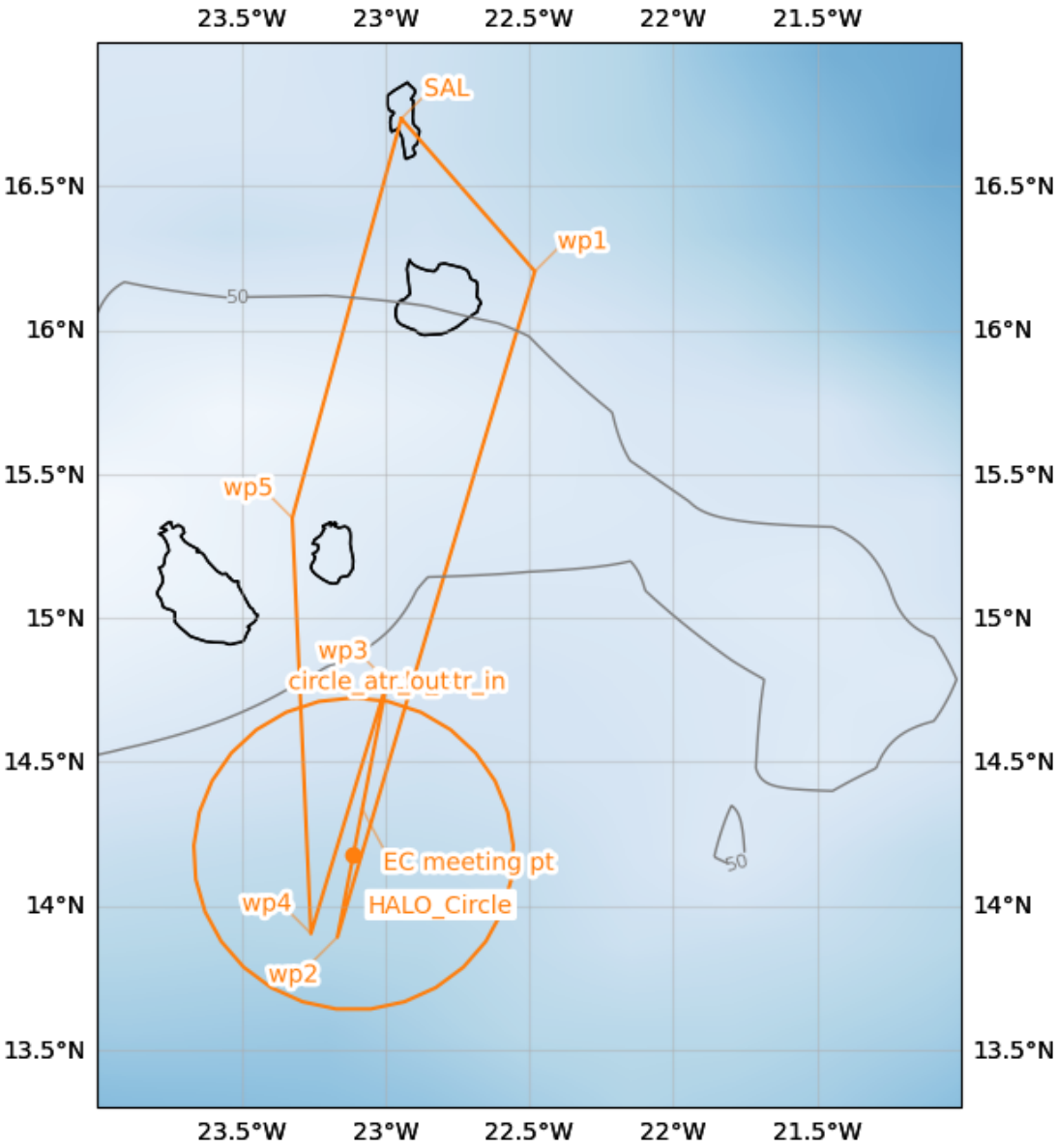

Figure 3: Initially planned Lat-Lon Path of the ATR for RF10.

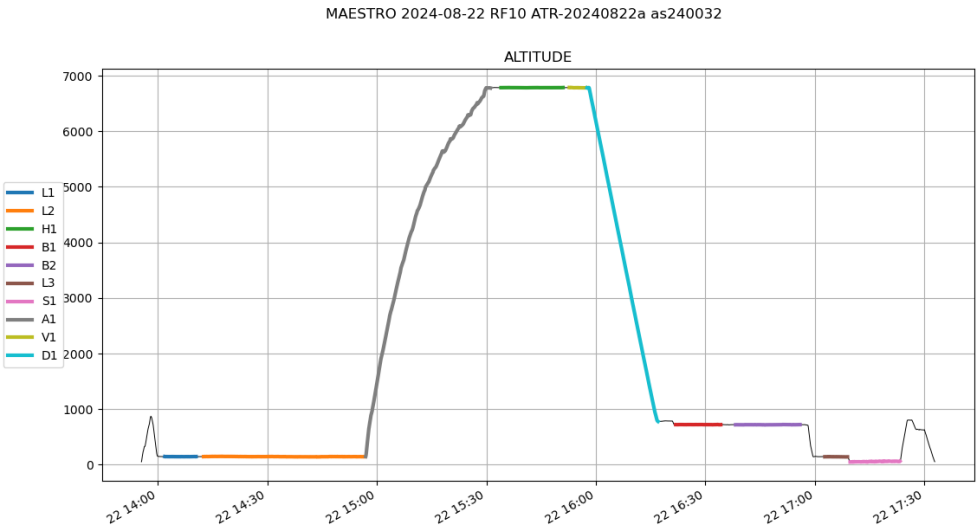

Figure 4: Flight segmentation as described in the table

6 Quicklooks and Comments

The quicklook data from the embarked vertically pointing W band radar is shown in Figure 5. It shows clearly that the first leg was entirely cloud free. During the ascent and descent high cirrus clouds were detected. The high leg where Earth Care was met was also cloud free. A few clouds and precipitation falling from cloud with tops near 2000 m were then sampled in two subsequent legs performed at 800 m.

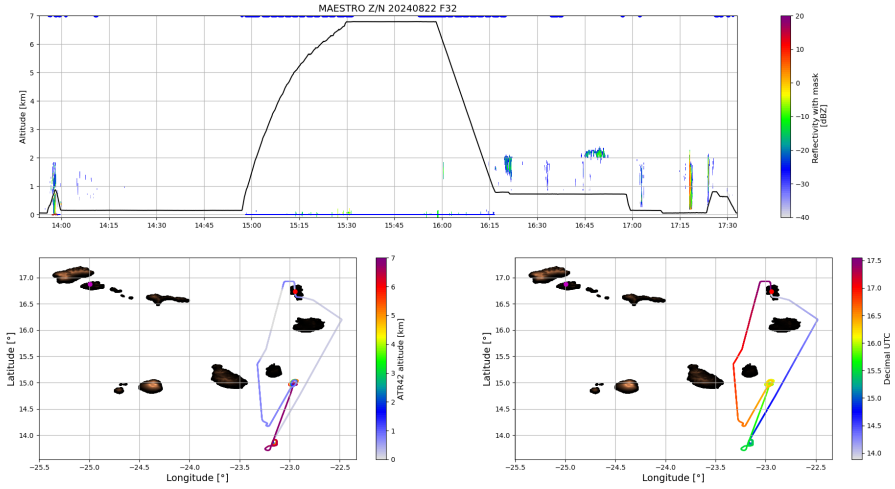

Figure 5: RASTA quicklook for RF10.

7 Instrument status

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	-
	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	OK	-
	ray_ir_up_1	Upwelling longwave radiation (no attitude correction)	LWU	OK	-
	ray_tb_ce332_c1_1	Brightness temperature channel1 (8.7μm) ce332 radiometer	TB_C1	OK	-
	ray_tb_ce332_c2_1	Brightness temperature channel2 (10.6μm) ce332 radiometer	TB_C2	OK	-
	ray_tb_ce332_c3_1	Brightness temperature channel3 (12μm) ce332 radiometer	TB_C3	OK	-
	ray_lum_ce332_c1_1	Radiance, channel1 (8.7μm) from ce332 radiometer	RAD_C1	OK	-
	ray_lum_ce332_c2_1	Radiance channel2 (10.6μm) from ce332 radiometer	RAD_C2	OK	-
	ray_lum_ce332_c3_1	Radiance channel3 (12μm) 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	noisy signal
	alt_ralt_15_m_1	Height	HEIGHT	OK	ok, under 19200 ft
	att_aoa_radom_deg_1	Angle of Attack	AOA_RAD	OK	-
	att_aos_radom_deg_1	Angle of Sideslip	AOS_RAD	OK	-

DATA	SAFIRE_name	DESCRIPTION	PARAMETER	STATUS	COMMENT
	ven_wind_v_vp_imu_1	Upward Wind	WW	OK	probably 0,2 m/s 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	refrence
	tpr_ts_rtd_1	Air Static Temperature, deiced sensor	TEMP2	OK	-
	tpr_tt_rt_1	Total Temperature, non-deiced sensor	TTEMP1	OK	reference
	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	PB	too many strong 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	slow
	hum_humr_1011_rs_1	Water Vapor Mixing ratio from 1011C	MR1	PB	too many strong oscillations
	hum_humr_wvs_rs_1	Water Vapor Mixing ratio WVSSII	MR2	OK	reference
	hum_humr_srtd_aero_1	Water Vapor Mixing ratio from humaero enviscope	MR3	OK	slow
	hum_huabs_rt_1011_1	Abolute Humidity from 1011C	HABS1	PB	too many strong oscillations
	hum_huabs_wvs_rs_1	Abolute Humidity from WVSSII	HABS2	OK	reference
	hum_huabs_srtd_aero_1	Abolute Humidity from enviscope	HABS3	OK	slow
	hum_hurel_rt_1011_rs_1	Relative Humidity from 1011C	RH1	PB	too many strong oscillations
	hum_hurel_wvs_rs_1	Relative Humidity from WVSSII	RH2	OK	reference
	hum_hurel_stat_rt_aero_1	Relative Humidity from enviscope	RH3	OK	slow
	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	-
	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	-

DATA	SAFIRE_name	DESCRIPTION	PARAMETER	STATUS	COMMENT
	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	measures ok in low altitude, not in hight altitude (> 4400 m)
	mic_somcount_SPP300_1	SPP300 total particles count	SPP300_TCOUNT	PB	measures ok in low altitude, not in hight altitude (> 4400 m)
	mic_tabconc_SPP300_1	SPP300 particles concentration bin[1]...bin[30]	SPP300_CONC	PB	measures ok in low altitude, not in hight altitude (> 4400 m)
	mic_totalconc_SPP300_1	SPP300 Total particles concentration	SPP300_TCONC	PB	measures ok in low altitude, not in hight altitude (> 4400 m)
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	-
	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	
	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	