

Dust Outflow and Deposition to the Ocean:

DODO

F.A.A.M BAe-146 Aircraft Flight Summary

DODO(1) 2nd February – 17th February 2006

Dakar, Senegal



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Introduction to DODO

Dust Outflow and Deposition to the Ocean (DODO) is a NERC funded campaign within the SOLAS (Surface Ocean Lower Atmosphere System). Saharan dust deposition provides a major source of nutrients to the subtropical Atlantic Ocean. Dust outflow is sporadic and depends on source, transport and the microphysical properties of the dust itself, being sensitive to size, mixing state and source. Dust outbreaks from the Saharan region over the Atlantic are frequent, with intense outbreaks having a periodicity of 5-10 days and sometimes reaching as far as the Americas. The outbreaks impact on atmospheric composition, dynamics and provide a significant local and regional climate forcing. Dust provides iron input to the ocean which allows nitrogen fixation supplying nutrients to surface phytoplankton in the otherwise nutrient starved regions of the subtropical gyres. Thus the amount and location of dust deposition impacts biological productivity and subsequently the global carbon cycle – of fundamental importance to the climate system.

The dust flux to the North Atlantic is not well constrained. To achieve a reliable and quantitative estimate it is necessary to understand the mechanisms controlling dust deposition throughout the year. Iron content also depends on dust source, therefore it is important to be able to characterise the source of the airborne dust. The transport of the dust, and therefore the deposition to the ocean, depends on the size distribution and vertical profile of the dust close to the sources and the wet and dry deposition processes. The soluble iron appears preferentially in the fine mode of aerosol, although there is to date no consistent picture of the role of aerosol in iron processing.

DODO takes advantage of planned campaigns DABEX and AMMA, to characterise these important microphysical and chemical properties of dust, in order to inform and develop regional predictive modelling of dust deposition.

The overarching aims of DODO are to:

1. Deliver case study based predictions of dust deposition to the northern hemisphere Atlantic Ocean constrained by in-situ aircraft measurements.
2. Describe how chemical and physical changes in the dust affect its transport over the ocean, and are themselves affected by the transport.
3. Assess the size distributed iron loading in the dust, and characterise the chemical form of the iron.
4. Fingerprint dust sources using single particle characterisation and assess their main composition, including iron content.
5. Assess the climatological representivity of the case studies and therefore predict the seasonal footprint of dust deposition and its associated iron to the North Atlantic.
6. Assess the radiative impact of the dust over the Atlantic ocean and its effect on sea surface temperatures.

To this end, two aircraft campaigns based in Dakar are planned:

DODO1: 3rd-17th February 2006

DODO2: 21st-29th August 2006

DODO1 has co-incident ship based measurements of deposition and single particle composition from POSEIDON courtesy of another SOLAS proposal (Southampton, PI Eric Achterberg).

This summary document outlines the flights in DODO1. Early flights are of shared interest to DABEX (Dust and Biomass Burning Experiment – Met Office – PI Jim Haywood).

Table 1 Summary of Flights during DODO

DODO1 Summary Document

Flight No	Date	Take off time (UTC)	Land time (UTC)	Flight time (hrs,mins)	Region	Sortie Objectives
B167 (DODO/DABEX)	02/02/06	075245	095604	2, 03	Niamey	High level calibration flights for radiometers
B168	03/02/06	074628 130042	112445 170016	7, 38	Niamey – Bamako – Dakar	Scientific transit
B169	07/02/06	112228	141834	2, 56	Over ocean south of Dakar	Instrument shake-down
B170	11/02/06	095447	145335	4, 59	Over ocean south of Dakar	In situ sampling of biomass and dust aerosol
B171	13/02/06	084911	130656	4, 18	North of Nouadhibou, over ocean	Major dust break forecast over ocean to very north of operating region
B172	13/02/06	152503	170452	1, 40	Nouadhibou-Dakar	Transit back (limited science due to loss of ground power prior to flight)
B173	14/02/06	094953	143615	4, 46	Coastal region Dakar – Nouakchott	In situ sampling near local dust source
B174	15/02/06	094400	141354	4, 48	Over Sea north and south of Dakar	In situ sampling of dust advected over ocean
B175	16/02/06	085143	141538	5, 24	Land regions in Northern Mauritania	In situ and radiation measurements in moderate dust loadings over land
P001	17/02/06			6, 51	Dakar-Casablanca-Cranfield	Transit

BAE-146 Measurements Summary

Table 2

Type of measurement	Instrument	Size range, wavelengths etc	Comment
Aerosol microphysics	PMS PCASP SID-1 TSI CPC3025	0.05 -1 μ m 1-20 μ m	No data yet for B173-
Aerosol optical properties	TSI nephelometer TSI Wet nephelometer Radiance Research PSAP	$\lambda = 0.45, 0.55, 0.7 \mu\text{m}$ $\lambda=0.568 \mu\text{m}$	Growth data. Wet nephelometer under development and testing. Working from flights X onwards
Aerosol chemical composition	Filters Aerodyne AMS VACC (University of Leeds)	Particle sizes 50-500nm Temp range 50-300°C PCASP 0.05-1.5 μ m	Inorganics (elements and water-soluble fraction) Carbon (EC and OC) Volatile and semi-volatile aerosols Water and volatile material
Radiative fluxes	BBRs (upper and lower)	Clear dome: $\lambda=0.3-3\mu\text{m}$ Read dome: $\lambda=0.7-3\mu\text{m}$	
Spectral radiances	SWS ARIES SHIMS	303.4nm to 1706.5nm	Resolution: 3.2nm up to 948.7nm, 6.3nm thereafter Intermittent performance on some flights
Trace gas chemistry	Ozone CO NO _x SO ₂ PAN (Leeds) WAS (Leeds)		Bags/tubes and bottles
Thermodynamics	AVAPS		Temp, pressure, winds, GPS. B168 onwards

DODO1 Summary Document

		02/02/2006	03/02/2006	04/02/2006	05/02/2006	06/02/2006	07/02/2006	08/02/2006	09/02/2006	10/02/2006	11/02/2006	12/02/2006	13/02/2006	14/02/2006	15/02/2006	16/02/2006
		B167	B168	B169	B170	B171/B172	B173	B174								
Niamey 13.31N 2.07E	Terra	1042	1125	1156G	1131	1144G	1131	1131L	1131	1131	1214G	1119G	1220G	1170L	1150G	
	distance	453	439	379	267	60	267	764	60	267	874	515	555	914	234	
	MODIS	y	y	y	y	y	y	y	y	y	y	y	y	y	y	
	MOPITT MISR															
Aqua	time	1343	15427G	1402	1433G	1445	1402	1414G	1445	1433G	1420G	1420G	1503L	1408G	1452	1356GL
	distance	801	45	688	136	453	688	366	453	136	199	199	952	516	628	836
	MODIS	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y
	AIRS AMSR	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y
Envisat	time	946	1055	1101	1035	1137G	1106	1132G	1106	1035	1143G	1112	1041	1149G	1118	1046
	distance	295	506	480	1030	633	210	480	210	1030	789	49	874	941	1114	719
Djouougou 9.76N 1.6E	Terra	1043	1155	1238g	1131L	1143	1226G	1208G	1226G	1131L	1214G	1226G	1202g	1409L	1149	1232G
	distance	491	302	823	945	623	507	823	507	945	192	141	141	1072	451	677
	MODIS	y	y	y	y	y	y	y	y	y	y	y	y	y	y	y
	MOPITT MISR															
Aqua	time	1342	1428g	1458g	1434G	1446G	1528L	1416L	1528L	1434G	1516	1422g	1504	1409L	1452G	
	distance	676	612	202	440	124	1012	928	1012	440	690	756	369	1072	56	
	MODIS	y	y	y	y	y	y	y	y	y	y	y	y	y	y	
	AIRS AMSR	y	y	y	y	y	y	y	y	y	y	y	y	y	y	
Envisat	time	947	1100	1208G	1214G	1137g	1106	1203G	1106	1214G	1143G	1112	1041	1148G	1117	1046
	distance	264	1131	1208G	1214G	1137g	1107	1203G	1107	1214G	1143G	1113	874	1148G	1118	719

Satellite overpasses during DODO1
L=low Terra/Aqua peak elevation
G=glint probability >5.0 (of interest over ocean regions only)
g=glint probability >1.0 (but <= 5.0) (ocean only)

B167Flight Number: B167Date: 2nd February 2006Sortie Objectives: DABEX high level calibration flight for radiometers. (Ellie Highwood)Operating area: Over land to north of Niamey.Weather: Clear skies. No cirrus. Considerable haze. Light windsFlight Patterns:

Take off from Niamey at ~0750Z. Carried out a missed approach manouvere over Niamey airfield. Profile ascent, broken once at FL100, to FL200. Dust observed in lowest 3000ft with considerable fine structure. A very clear blue slot at around 4500ft was clear to all directions. On top of this, a deep biomass layer (CO strongly and positively correlated with nephelometer scattering persisted to around FL115. Another clear slot and then a very thin biomass layer between FL130 and FL145. Above FL150 we entered free tropospheric air with CO₂ and scattering reaching background values and O₃ increasing.

A box pattern consisting of into, across, down and across sun runs was performed at FL200. SHIMS and 1 module of SWS were recorded. SWS was stepped through 70 degrees from maximum possible tilt. SZA ~ 60°. During cross sun runs the SWS was pointed at zenith. All these were completely free of Ci. The final leg of the box pattern was extended to allow swapping of SHIMS and SWS modules on to the rack. Initaly no signal was observed on the 2nd (near IR) module of SWS, but after 2 tries it was observed to be present but very small. A series of 4 orbits at bank angle 60° were performed (two left hand turns followed by two right hand turns).

A broken profile from FL200 (broken once at FL120) was performed and landed at Niamey at ~1005Z

Summary:

A very successful flight in cloud free skies, ideal for radiometer, SWS and SHIMS r calibrations. Two good vertical profiles of scattering and chemistry in addition.

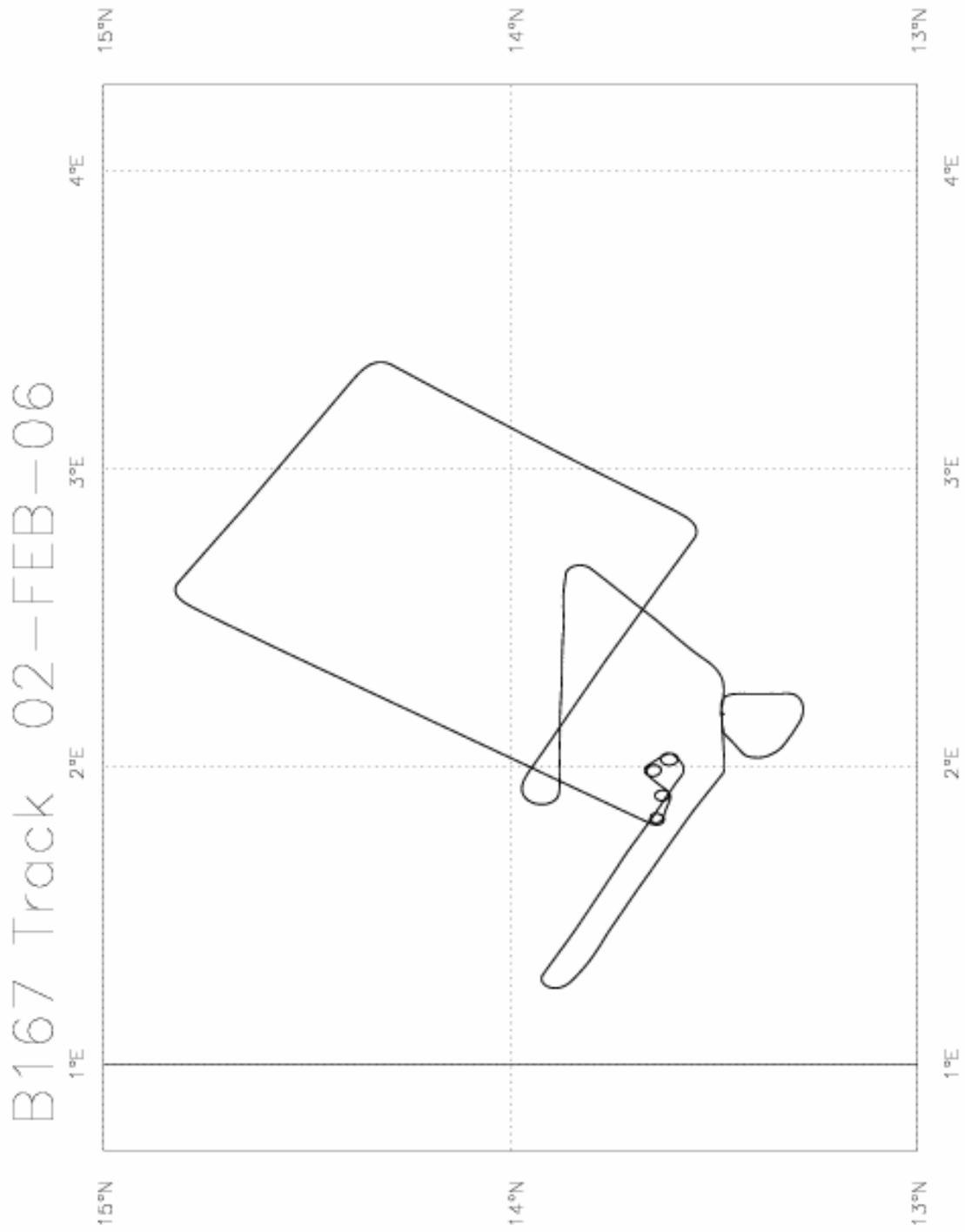
Problems:

Upper pyrogreometer had problems at high altitude.

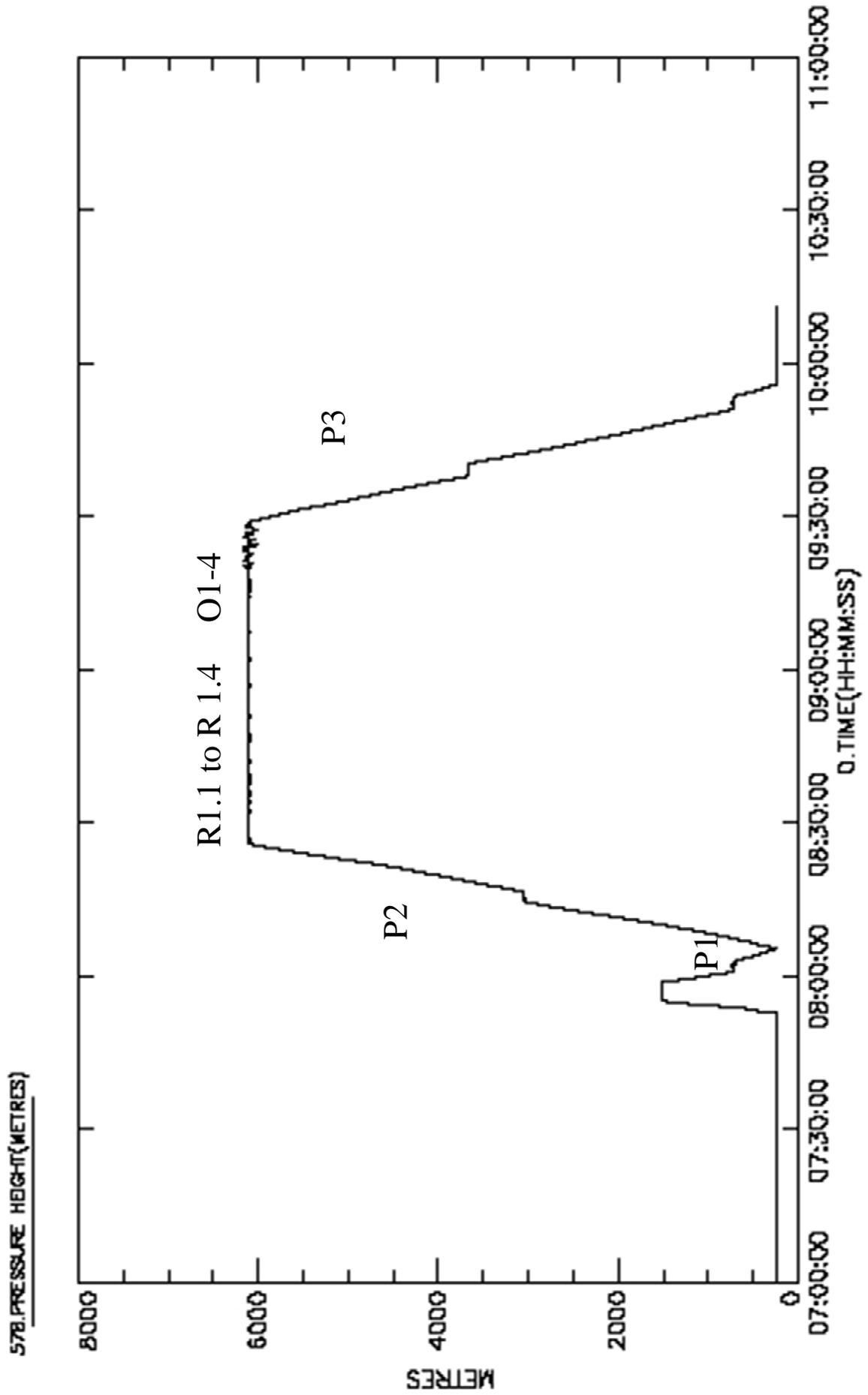
Start Time	End Time	Event	Height (s)	Hdg	Comments
072416		INU	0.79 kft	315	to nav
072511		GPS	0.79 kft	315	13' 28.65N 2' 10.53E
072611		cgps	0.79 kft	315	b167cgps.log
073425		video	0.79 kft	315	#1 dfc #2 ffc
075245		T/O	0.77 kft	85	Niamey
075850	080522	Profile 1	5.0 - 0.85 kft	299	50' (P1 interrupted during manouvre)
080523	082602	Profile 2	0.85 - 20.0 kft	82	50'
081452		P2 interrupt	10.0 kft	44	

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081638		P2 resume	10.0 kft	277	
082858	083856	Run 1.1	20.0 kft	118	into sun
082927		heiman n cal 14	20.0 kft	120	
084019	085020	Run 1.2	20.0 kft	34	cross sun
084043		heiman n cal 10	20.0 kft	31	
084056		nev	20.0 kft	31	zero
085148	090149	Run 1.3	20.0 kft	303	down sun
090309	091511	Run 1.4	20.0 kft	217	cross sun extended 2
					mins for sws
091543		!	20.0 kft	214	further ext for sws
091751		!	20.0 kft	214	extended R1.4 ends
091948	092107	Orbit 1	20.0 kft	174	170M turn to port
092200	092317	Orbit 2	20.2 - 20.0 kft	77	070M turn to port
092408	092522	Orbit 3	20.2 - 19.9 kft	89	120M turn to stbd
092615	092731	Orbit 4	20.1 - 19.8 kft	198	190M turn to stbd
092859	095108	Profile 3	20.0 - 2.4 kft	296	
093804		P3 interrup t	12.0 kft	296	
094020		P3 resume	12.0 kft	127	
095604		Land	0.76 kft	87	Niamey
100333		INU	0.78 kft	316	13' 29.51N 2' 09.45E
100440		GPS	0.77 kft	316	13' 28.65N 2' 10.53E



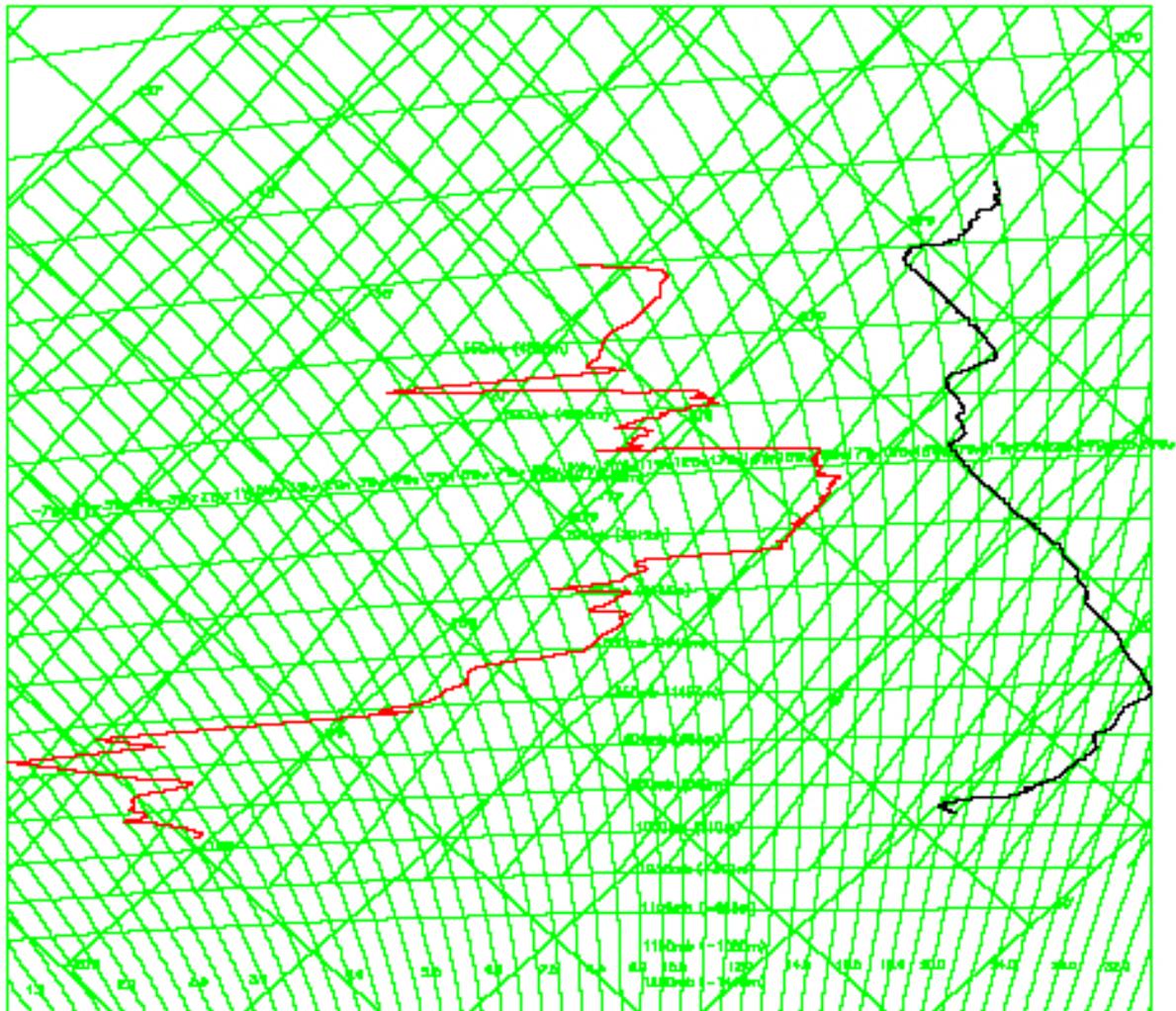
B167 02-FEB-06 05:48:39-10:11:18



B167 02-FEB-06 P2 08:05:23-08:26:02

520.DERIVED TRUE TEMP(DEG K)

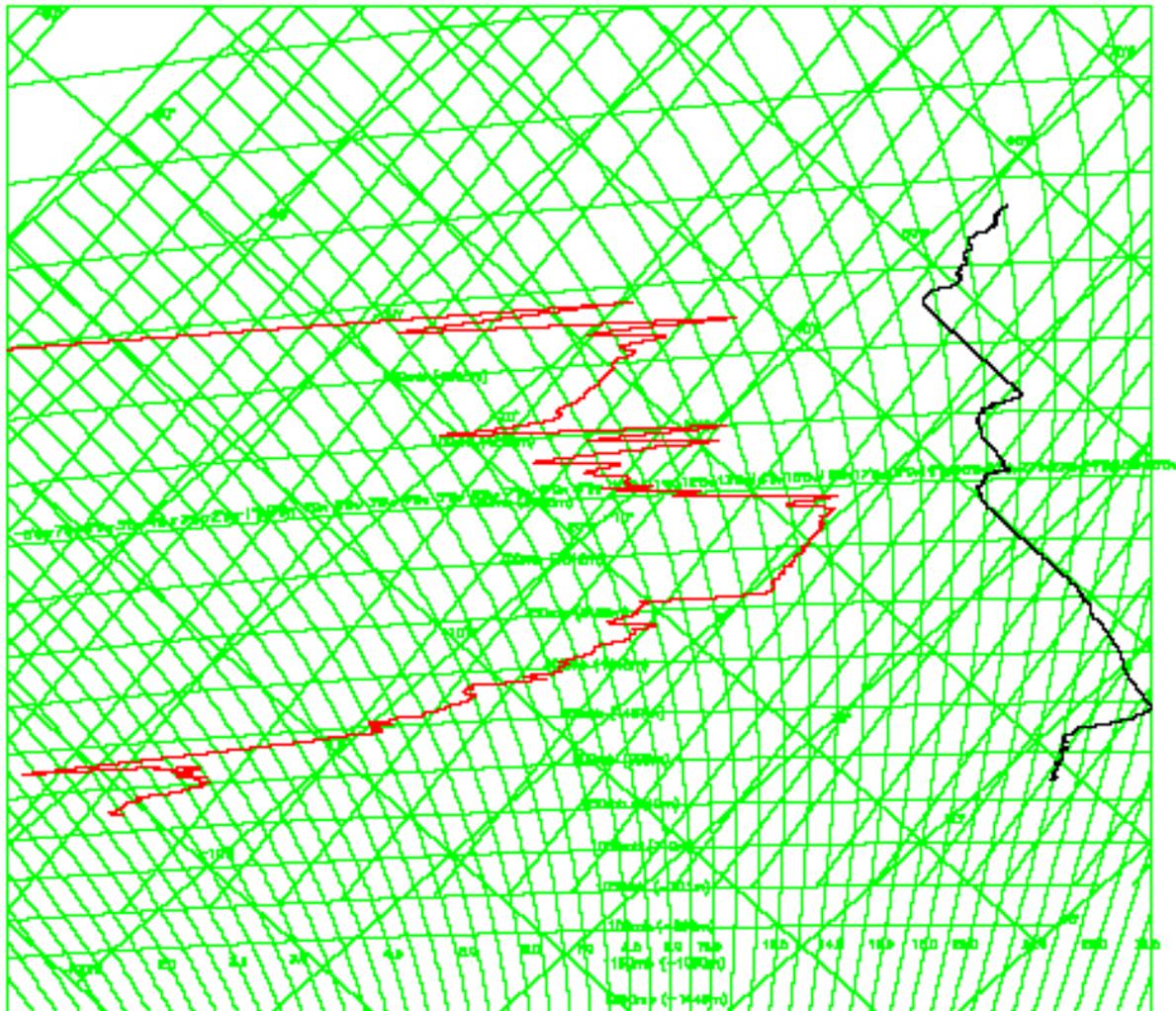
528.DEW POINT(DEG K)



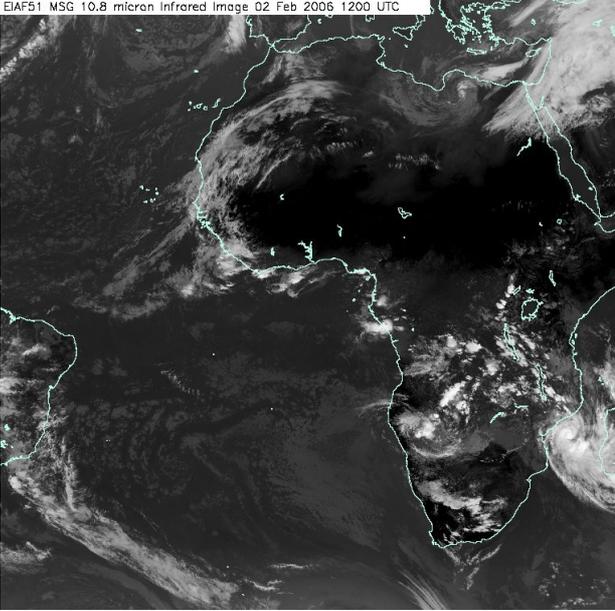
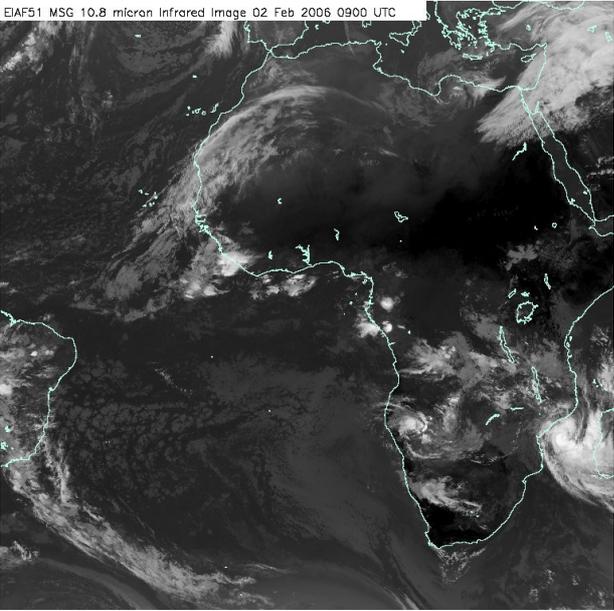
B167 02-FEB-06 P3 09:28:59-09:51:08

520.DERIVED TRUE TEMP(DEG K)

528.DEW POINT(DEG K)



DODO1 Summary Document



B168

Sortie Debrief

Flight Number: B168a

Sortie Objectives: Transit flight from Niamey to Bamako.

Operating area: Between Niamey and Bamako. Three dropsondes launched.

Weather: Variable amounts of cloud throughout the morning, which means that the radiation measurements will be difficult to disentangle.

Flight Patterns: Take off from Niamey was followed by a profile ascent from the ground to FL180. A thin layer of dust with peak scattering values of $300 \times 10^{-6} \text{m}^{-1}$ was present at low level. Biomass burning aerosol was present between FL50 and FL120, but the scattering was not that large with a peak of around $50 \times 10^{-6} \text{m}^{-1}$. SWS was set to nadir to look at the surface because the cloud amount was too large. A SLR at FL70 was performed for 15mins in the BB layer before a profile ascent was performed to FL150 to launch a dropsonde. The aerosol had thinned significantly upon return to FL80 so a slow (500ft/minute) sawtooth was performed 4500ft - FL150 - 5000ft. A second sonde was launched at FL150. A second sawtooth was performed from 5000ft - FL100 - 5000ft - FL180 - 500ft AGL. A third sonde was dropped at FL180. The environment was very clean. Little sign of the forecasted dust in the lee of the Hoggar mountains. At 500ft AGL a 12 minute soft ride was performed including a brief off-track pass through a biomass burning fire. A profile was made then to FL180, a SLR was performed at FL110, before landing at Bamako.

Summary: Not much in the way of dust aerosol present and plenty of cirrus throughout the flight will make analysis of the radiation work difficult. SWS was nadir viewing throughout the flight, so could be used to provide e.g. NDVI.

Jim Haywood.

Sortie Debrief

Flight Number: B168b

Date: 3rd February 2006

Sortie Objectives: Science transit Bamako to Dakar. First look at aerosol over the ocean.

Operating area: Land regions to the North of Bamako to Dakar line. Over ocean between Nautchokk and Dakar.

Weather: Clear skies. Some cirrus, and some mid-level cloud. Considerable haze at high level. Light winds. No dust.

Flight Patterns:

Take off from Bamako after refuelling. An interrupted profile ascent to FL180 was carried out to establish location of aerosol layer. The biomass layer of the morning flight was deep and had multiple structures between around 7000 ft and FL150. A straight and level run at FL100 was performed at the top of the biomass layer. Towards the north the signal became weaker at this level and we descended to FL080 to look for bottom of layer. This was followed by a profile ascent to FL180 when a sonde was dropped in the region of Gao. A profile descent to FL100 was made to allow more in-situ sampling of the aerosol layer. Cirrus was present in increasing amounts, with some mid cloud to the east. The aerosol layers became thinner and elevated further north, and a deep sawtooth profile was performed between FL100 and FL180. Sonde 2 was launched close to

DODO1 Summary Document

the Northern most point, after a turn to the south and just after passing the coast line. CuNb were visible to the east just shooting through the top of the biomass layer which was clearly visible. SWS was looking down at the surface during the passage over the coast line.

A deep profile descent over the ocean reached 170ft above the ocean. A 10 min low level run at 170ft was performed south towards Dakar. An aerosol layer was present below around 2000ft, with the remainder of some elevated biomass above. Several ship steaming through the area. Sea state calm, a few white ripples. A further 10 minute run was performed at 1500ft in the middle of the lowest layer. Some Ci towards Dakar, so turned west to perform one set of 2 orbits at 1000ft at 60 bank angle (SZA around 55). A further set of orbits were obtained at 4000ft at the top of the lowest aerosol layer. Subsequently we ascended to approach Dakar and to land. Clearly defined brown haze extending from Dakar peninsula west over ocean, thinning as moving away from coast..

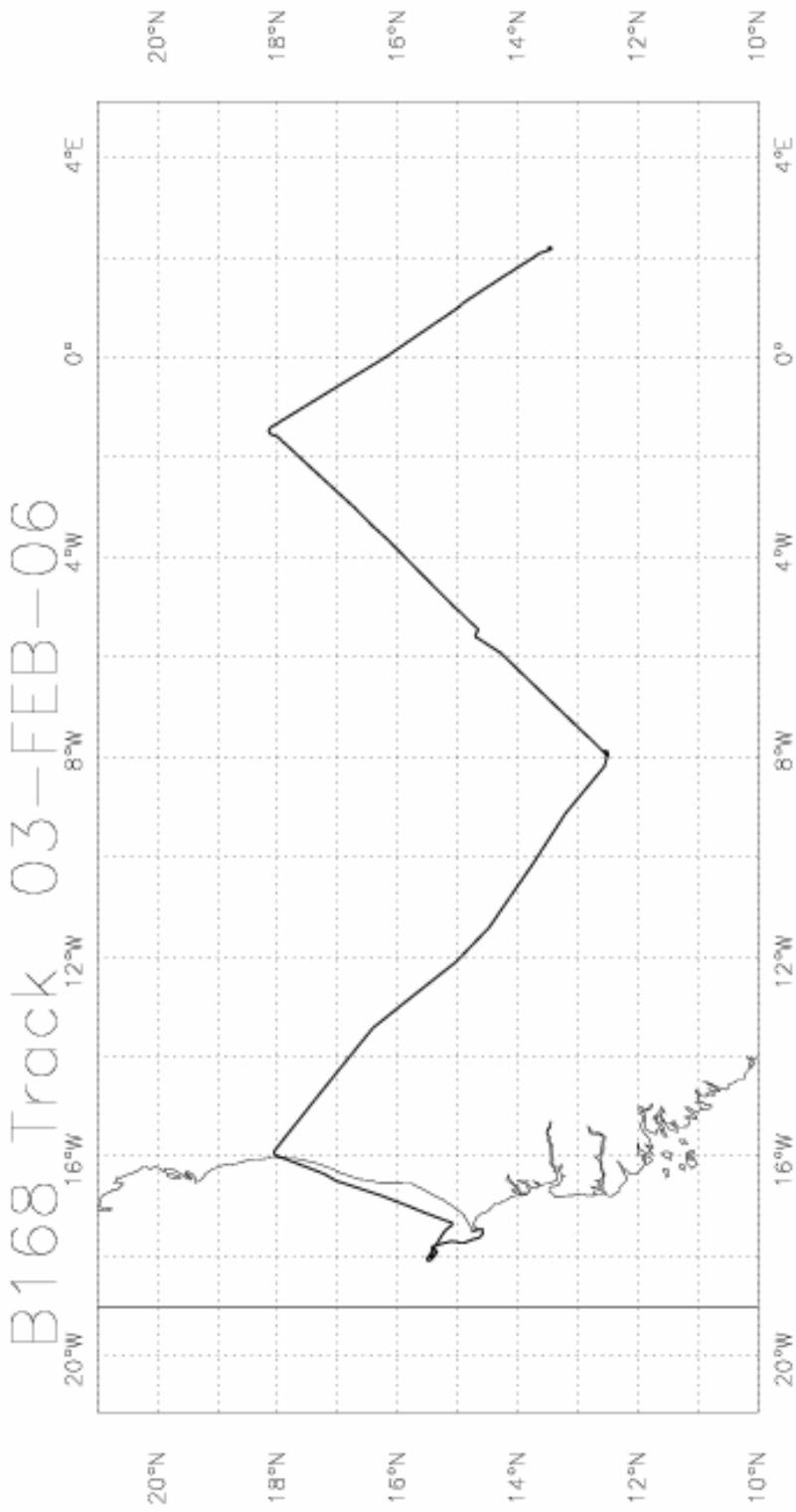
Summary:

Good opportunistic radiative measurements and profiles of aerosol in marine environment. Some interesting surface characterisation over the coastal region. In situ biomass samples from early runs, and first marine samples from 1500ft run.

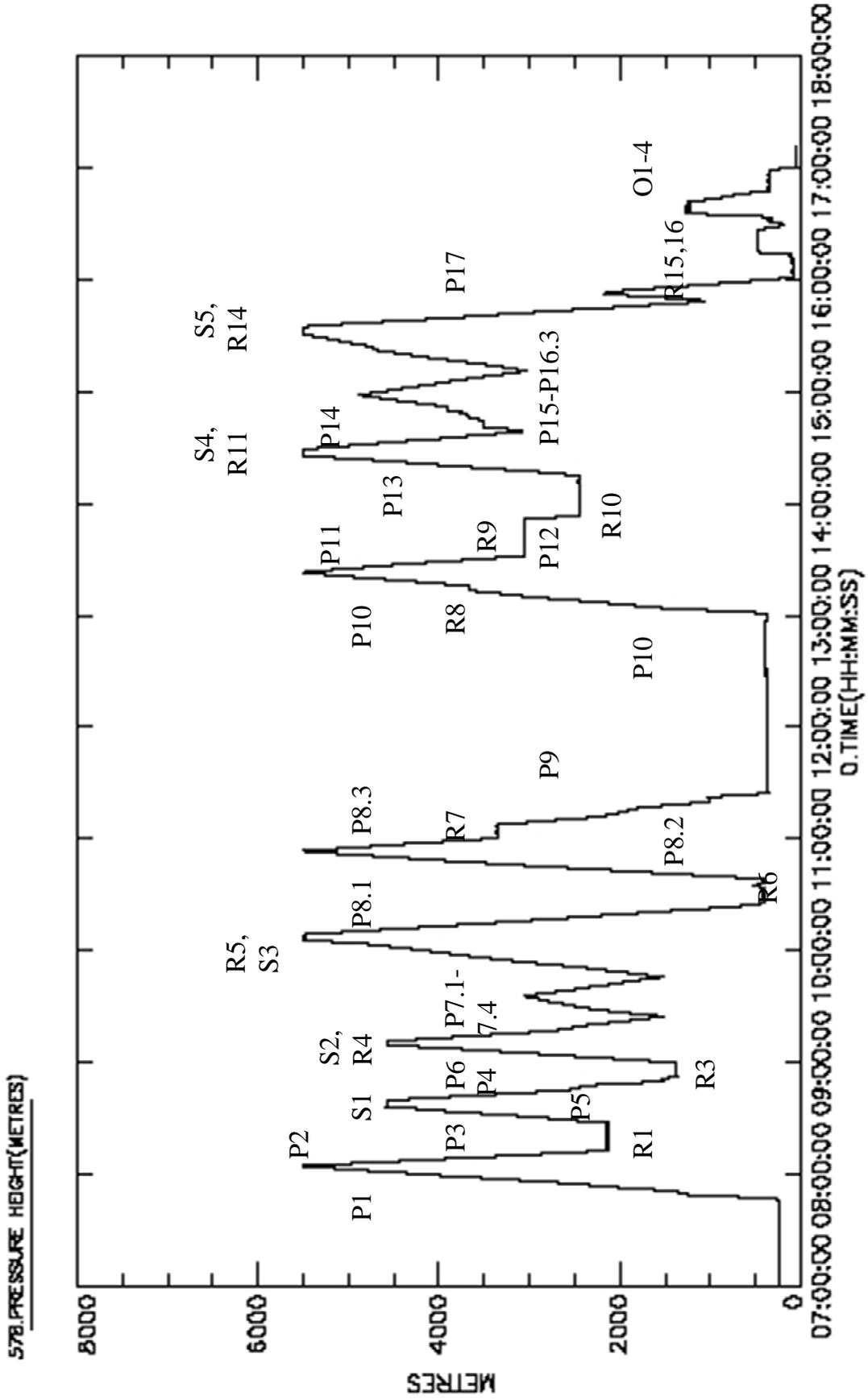
Start Time	End Time	Event	Height (s)	Hdg	Comments
63631		Startup		316	13'28.65N 2'10.53E
72855		INU		316	Set To Navigate
074628		T/O	1.5 kft	197	Niamey
074838		Videos	3.4 kft	348	Start FFC & DFC
074628	080429	Profile 1	4.1 - 18.0 kft	339	1000fpm
074924		ASPs	4.2 kft	336	Open
080429	081256	Profile 2	18.0 - 7.1 kft	320	1000fpm
081256	082735	Run 1	7.1 - 7.0 kft	318	
082735	083612	Profile 3	7.0 - 15.0 kft	319	
083647		Sonde	15.0 kft	319	Launch #01
083939	084603	Profile 4	15.0 - 8.0 kft	319	
084603	084729	Run 2	8.0 kft	322	
084730	085002	Profile 5	8.0 - 5.1 kft	322	
085002	085943	Run 3	5.1 - 4.5 kft	325	
085133		Event	5.0 kft	325	Change level
085224		Event	4.5 kft	326	Now Level
085944	090938	Profile 6	4.5 - 15.0 kft	324	
090939	091109	Run 4	15.0 kft	320	500fpm
091001		Sonde	15.0 kft	320	Launch 02
091109	091520	Profile 7.1	15.0 - 10.8 kft	320	500fpm, turning
091530	092442	Profile 7.1	10.6 - 5.0 kft	299	500fpm<FL90
092103		Videos	7.2 kft	230	Change tapes
092443	093529	Profile 7.2	5.0 - 10.0 kft	226	500fpm<FL90, 1000fpm – FL90
093530	094553	Profile 7.3	10.0 - 5.0 kft	232	1000fpm - FL90
094553	100549	Profile 7.4	5.0 - 18.0 kft	226	150-158 @500fpm
100623		Sonde	18.0 kft	233	Launch #03
100549	100830	Run 5	18.0 kft	232	
100831	102535	Profile 8.1	18.0 - 1.3 kft	232	500'agl
102536	103828	Run 6	1.3 - 1.4 kft	228	500'agl Q1014
103255		Event	1.4 kft	267	Turning to fire
103526		Event	1.6 kft	248	Return to track

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103828	105327	Profile 8.2	1.4 - 18.0 kft	214	Q1014, 1000fpm-FL70
105327	110032	Profile 8.3	18.0 - 11.0 kft	230	1000fpm-FL70
105859		Videos	12.5 kft	230	Change tapes
110032	110722	Run 7	11.0 kft	229	
110722	112035	Profile 9	11.0 - 3.3 kft	228	
112203		ASPs	3.4 kft	216	Close
112208	112445	Profile 9	3.3 - 1.2 kft	216	End
112445		Land	1.2 kft	56	Bamako
113027		Position		148	12'32.45N, 7'56.68W
124747		INU		148	To Navigate
130042		T/O	1.5 kft	57	Bamako
130042	130317	Profile 10	1.7 - 4.6 kft	73	
130231		ASPs	3.3 kft	213	Open
130326	131314	Profile 10	4.7 - 12.0 kft	280	
131333	131510	Run 8	12.0 kft	304	
131510	132241	Profile 10	12.0 - 18.0 kft	304	
132241	133159	Profile 11	18.0 - 10.0 kft	299	
133159	135116	Run 9	10.0 - 10.1 kft	297	
135117	135319	Profile 12	10.1 - 8.1 kft	298	
135320	141412	Run 10	8.1 - 8.0 kft	299	
135404		Videos	8.0 kft	298	Change tapes
141412	142534	Profile 13	8.0 - 18.0 kft	319	
142535	142835	Run 11	18.0 kft	310	
142610		Sonde	18.0 kft	310	Launch #04
142836	143824	Profile 14	18.0 - 10.1 kft	310	
143824	144101	Profile 15	10.1 - 11.5 kft	315	
144102	144410	Run 12	11.5 kft	302	
144410	144544	Profile 13	11.5 - 12.0 kft	302	
144544	144744	Run 13	12.0 - 12.1 kft	301	Creep up
144756	144901	Run 13	12.2 - 12.4 kft	302	Climb to FL128
144907	145141	Run 13	12.4 - 12.8 kft	302	Lvl@145009
145141	145759	Profile 16.1	12.8 - 16.0 kft	300	500fpm
145800	151051	Profile 16.2	16.0 - 10.0 kft	298	500fpm, P16.1
151051	152214	Profile 16.3	10.0 - 15.5 kft	302	
152350	153030	Profile 16.3	15.5 - 18.0 kft	210	
152451		Videos	15.9 kft	207	Change Tapes
153031	153432	Run 14	18.0 kft	210	
153128		Sonde	18.0 kft	210	Launch #05
153433	154825	Profile 17	18.0 - 3.5 kft	211	1000fpm
155729	160151	Profile 17	3.3 - 0.27 kft	202	ATC Inrupt min=170'
160151	161150	Run 15	0.27 - 0.32 kft	206	
161435	162550	Run 16	1.5 - 1.6 kft	319	1500'
163047	163141	Orbit 1	1.0 - 1.1 kft	282	60 left, start @270
163224	163319	Orbit 2	1.1 kft	197	60 left, start @210
163544	163644	Orbit 3	4.2 - 4.1 kft	91	60 left, start @090
163715	163811	Orbit 4	4.1 kft	20	60 left, start @040
164123		ASPs	4.0 kft	158	Closed
170016		Land	0.20 kft	352	Dakar
171010		Shutdown	0.20 kft	358	14'44.45N,17'29.33W



B168 03-FEB-06 05:32:34-17:11:43

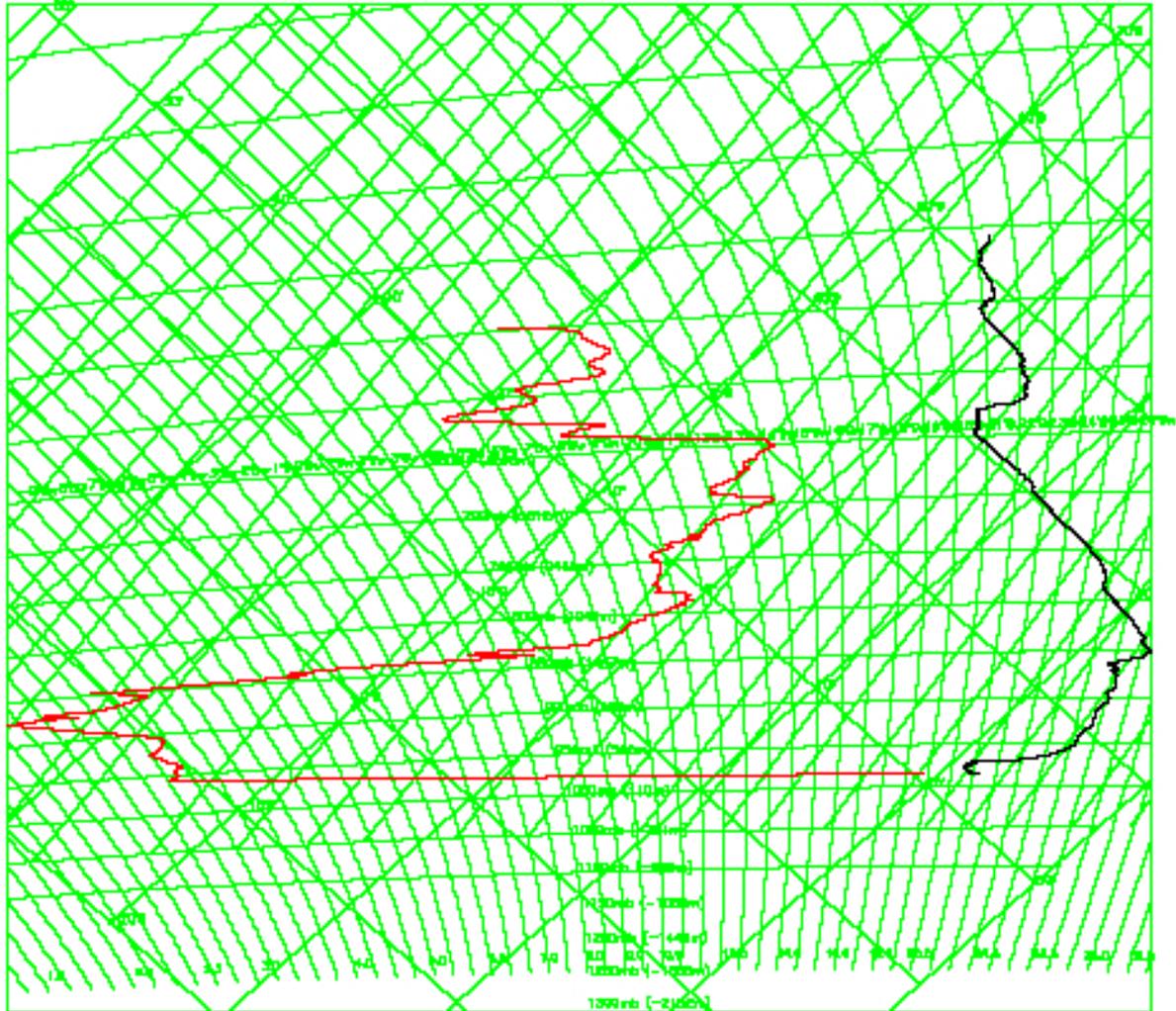


P1

B168 03-FEB-06 07:46:28-08:04:29

520.DERIVED TRUE TEMP(DEG K)

528.DEW POINT(DEG K)

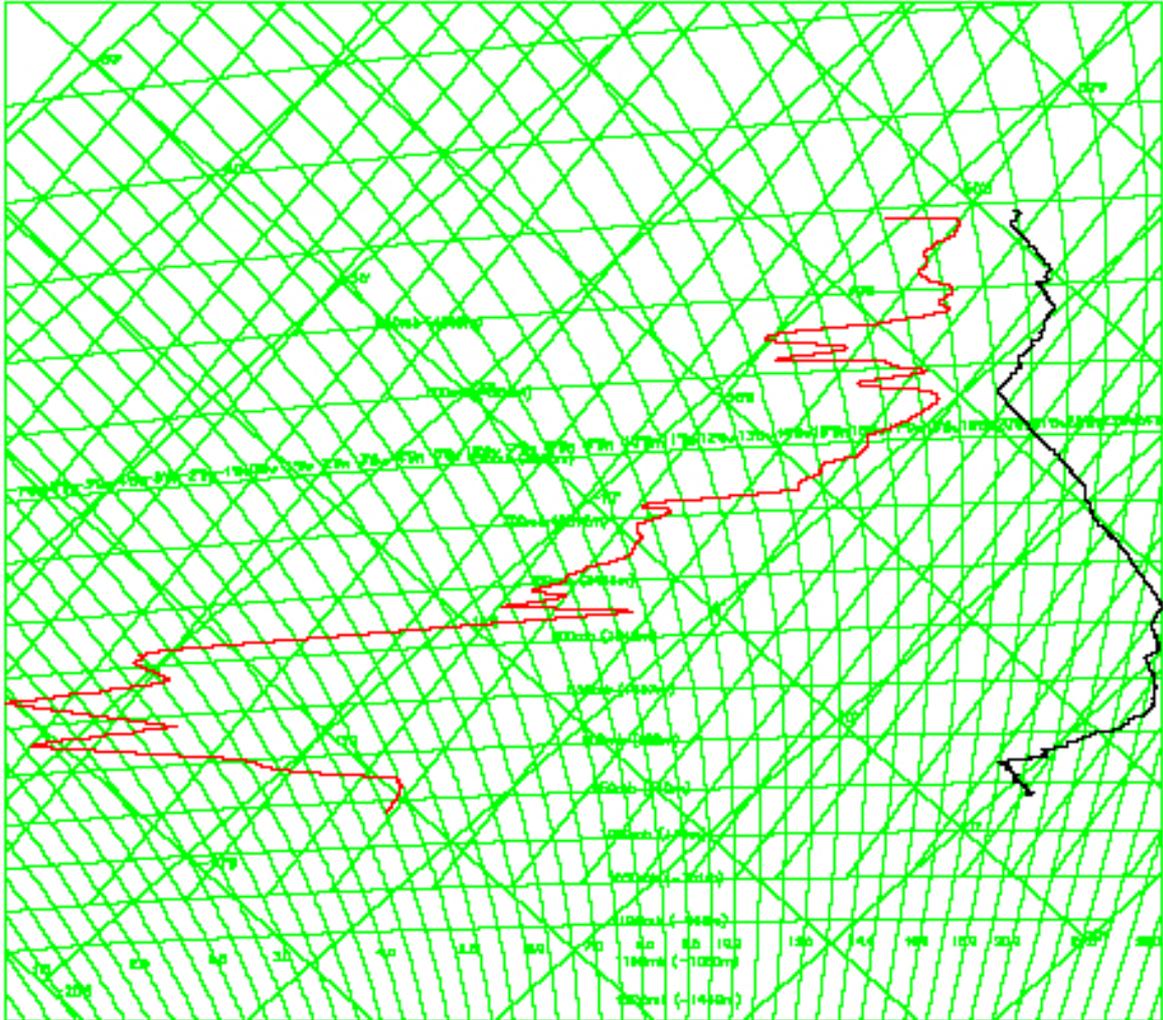


P8.2

B168 03-FEB-06 10:38:28-10:53:27

520.DKICED TRUE TEMP(DEG K)

520.DEW POINT(DEG K)

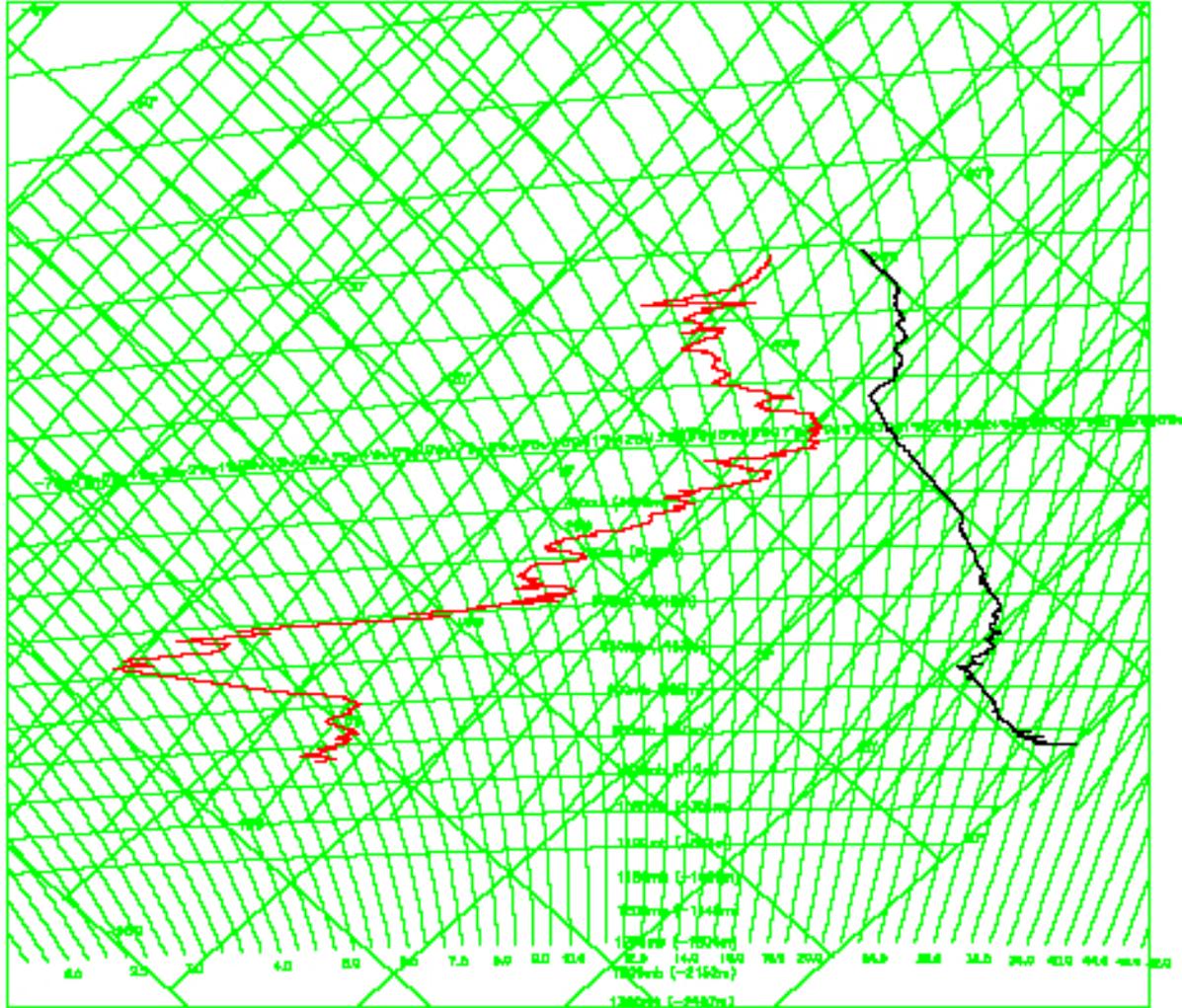


P10

B168 03-FEB-06 13:00:42-13:22:41

520.DEKED TRUE TEMP(DEG K)

520.DEW POINT(DEG K)

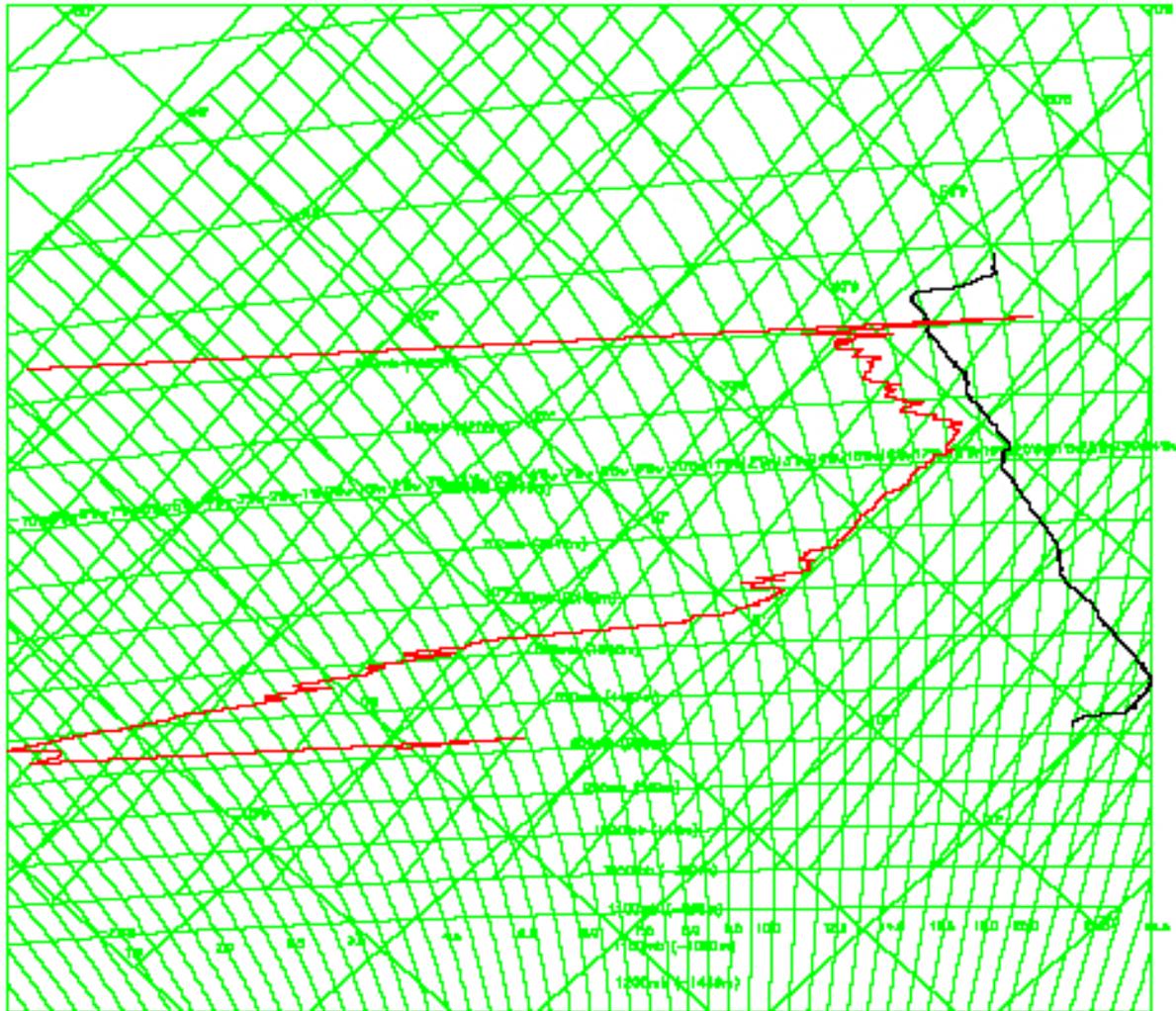


P17

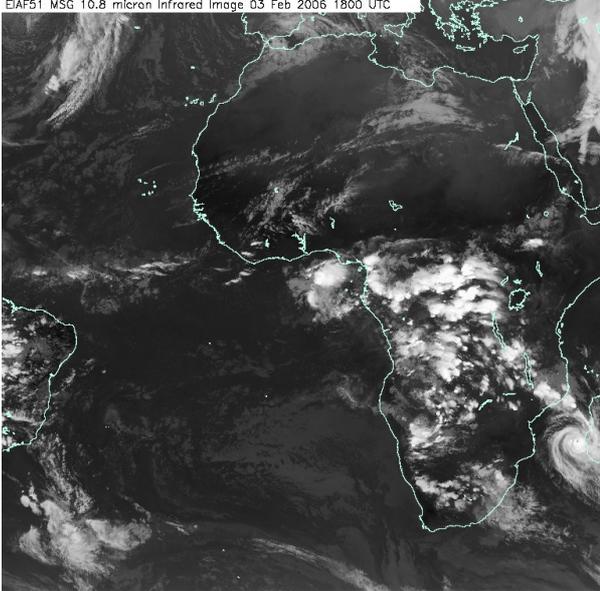
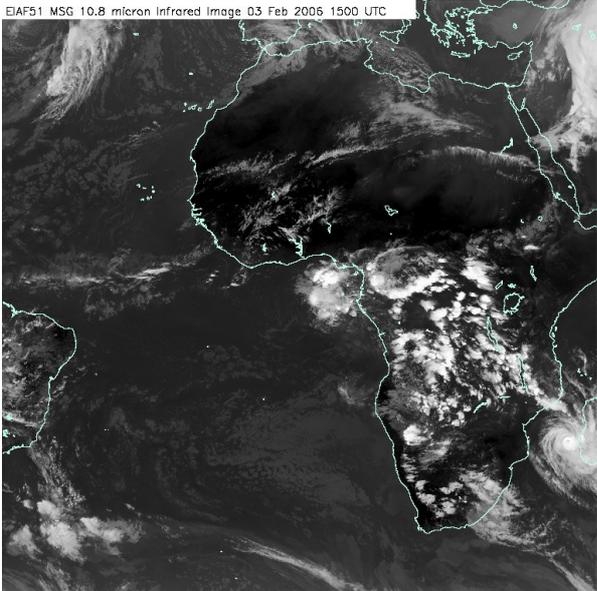
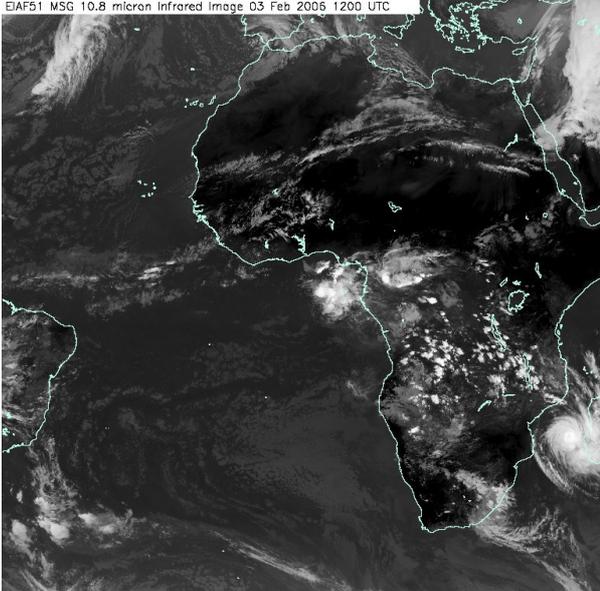
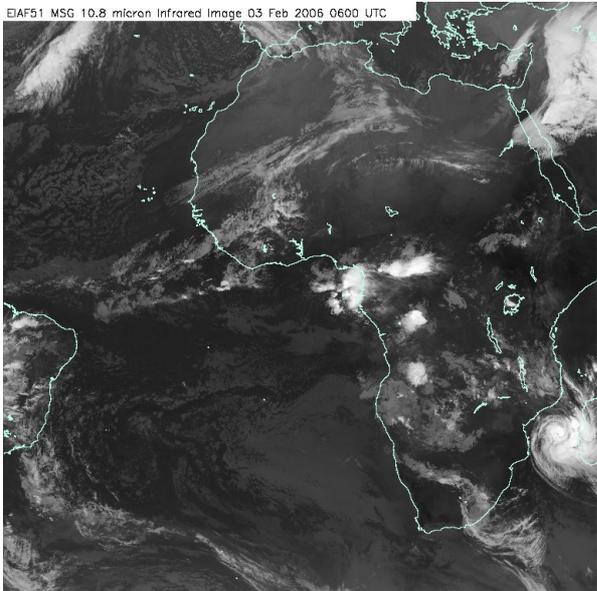
B168 03-FEB-06 15:34:33-15:48:25

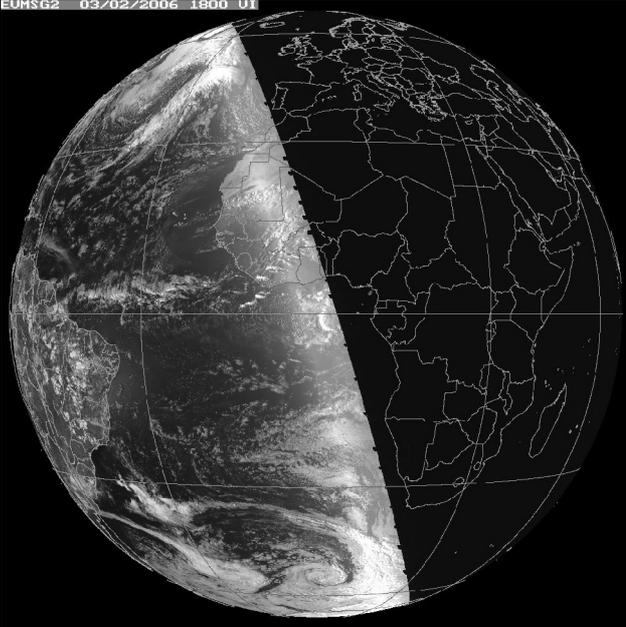
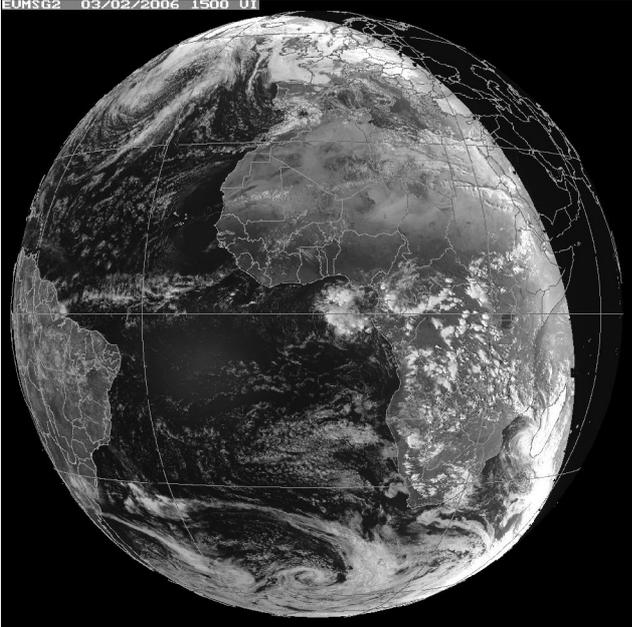
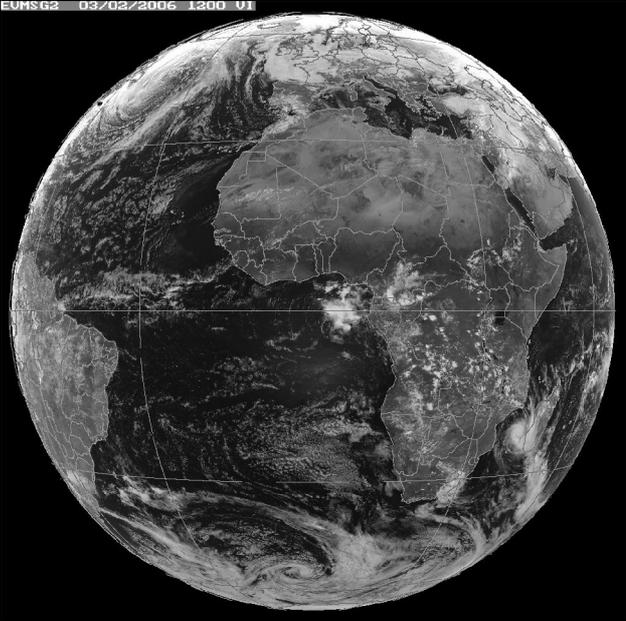
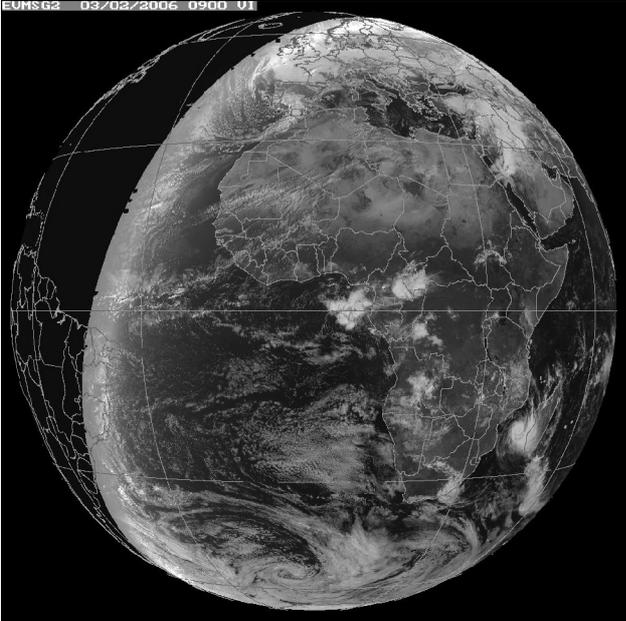
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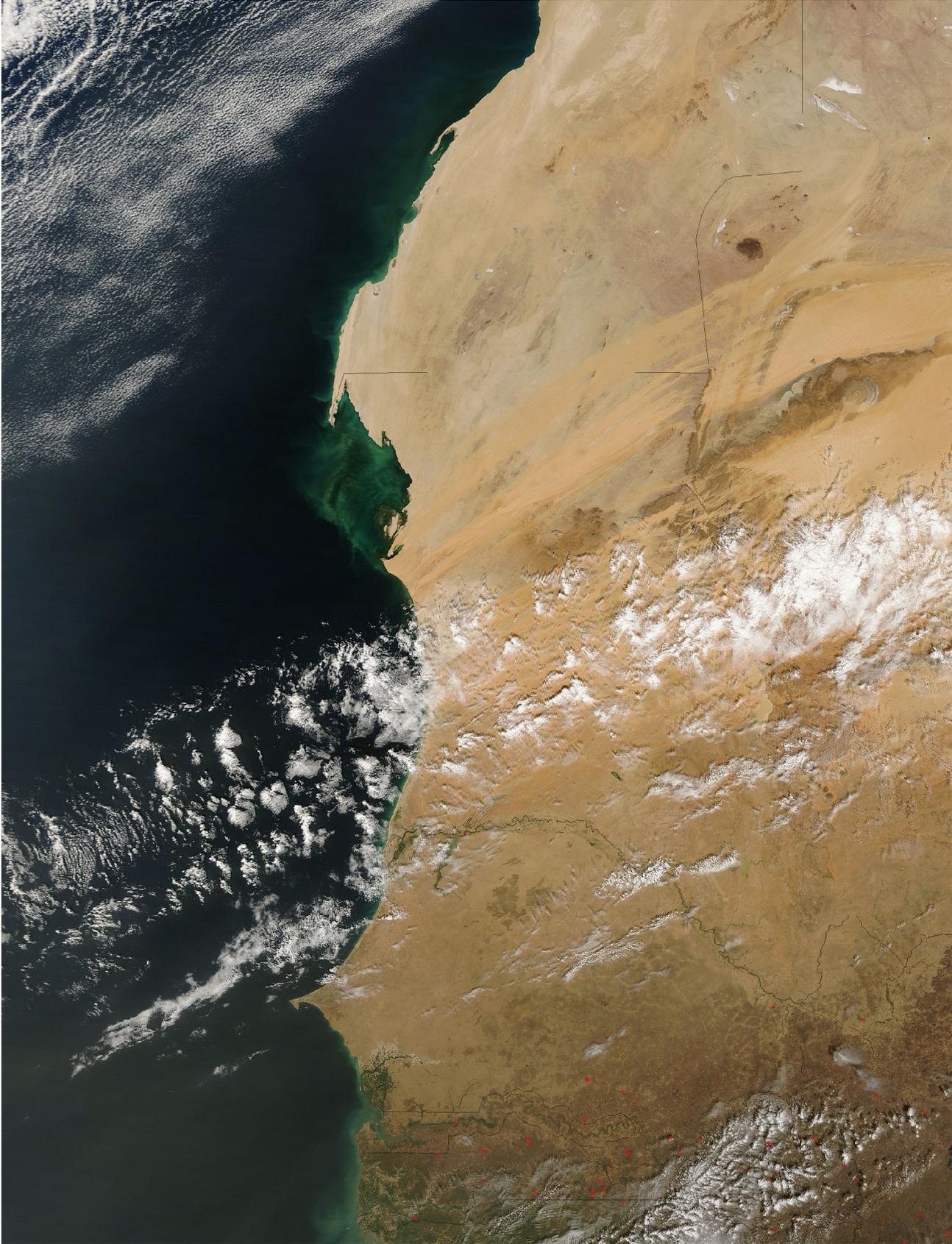
520.DEW POINT(DEG K)



DODO1 Summary Document



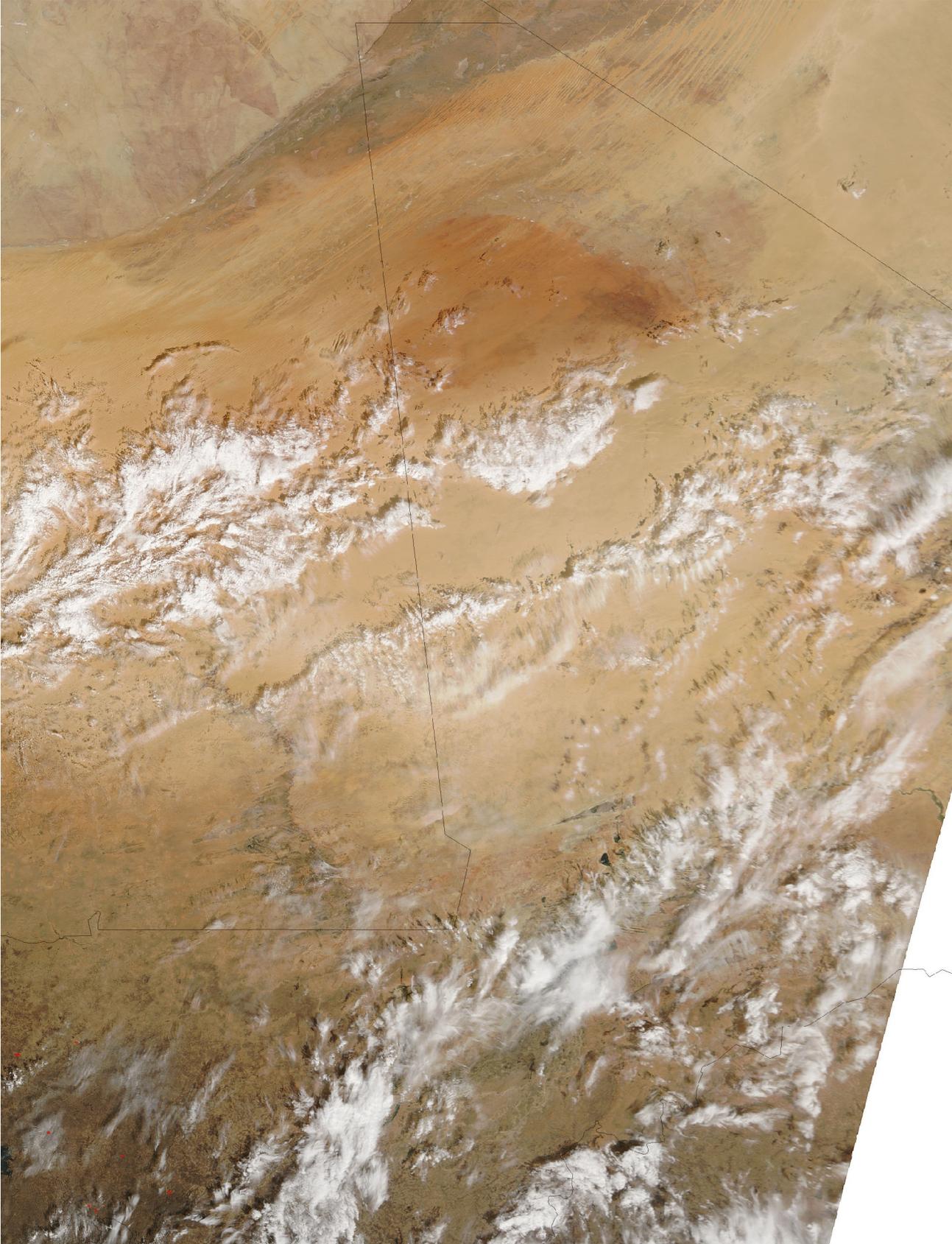




TERRA 500m



AQUA 500m



TERRA 500m



AQUA 500m

B169

Flight Number: B169

Date: 7th February 2006

Sortie Objectives: Shake-down flight and in-situ sampling of aged biomass aerosol.

Operating area: Over ocean areas south of Dakar, off the Guinea coast. Immediately south and west of the point Limel.

Weather: Extensive cirrus in region of Dakar (7/8 at take-off), and some mid-level cloud. Haze to south (biomass?). Local pollution near Dakar. Clearer skies towards southern most points of track.

Flight Patterns:

After take-off from Dakar, a profile climb to FL180 revealed some low level dust or local pollution within the first 200ft, an elevated pollution layer between around FL075 and FL110 and a further thin elevated layer FL120 to FL160. Free tropospheric air was encountered above FL160.

A profile descent was carried out to FL080, within the biomass layer. A SLR at FL080 due south to Limel revealed some biomass aerosol with scattering $100 \times 10^{-6} \text{ m}^{-1}$. Different size distribution to previous flights from Niamey. Hypothesise purer aged biomass with no dust mixed in. At Limel a raster pattern consisting of 15 min SLRs at FL080, followed by a relocation 5 minutes west at the same level was performed. High concentrations of biomass continued to be seen south of Limel, but with a change in size distribution to look more like previous Niamey based flights. Ci clearing to south. 3 legs of the raster pattern were performed, oriented North-South. Some aerosol was visible at low level beneath the flight towards the southern end of the run. At the southern end of the last leg, and after the relocation 5 mins west, a long northerly track was performed back towards Dakar. A sawtooth profile was performed twice between FL040 and FL120. The aerosol layer was certainly above 4000ft, but continued above FL120. The low layers cleared as going further north. A descent to 2000ft on a track towards Dakar was followed by an SLR at 2000ft for 15 minutes heading North to shortly north of Dakar. This could be a good clean base-line for filters. A number of ships were seen, and an attempt at a NEON manouver was made. Towards the very end of the SLR, scattering increased in a local pollution plume visible to the eye from Dakar. At the end of the SLR an ascent was made to FL050 for recovery to Dakar.

Summary:

An effective shakedown flight. In situ sampling of aged biomass plumes to the south.

Problems

ARIES problematic, software conflict? No function for most of flight.

SHIMS both modules dropping in and out but stable for last 90 minutes of flight.

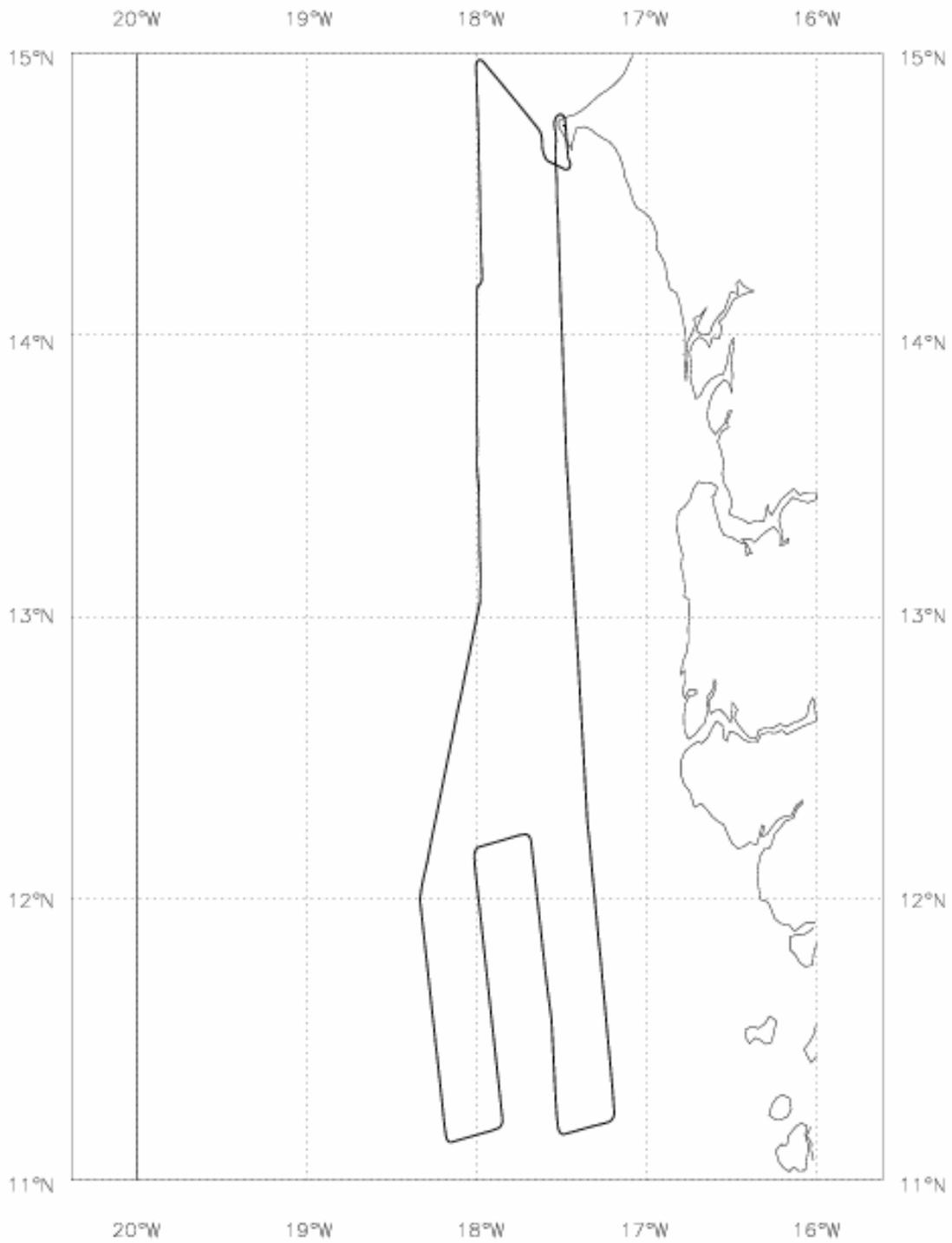
AMS suffered interference from CCN operator part way through flight.

Start Time	End Time	Event	Height (s)	Hdg	Comments
105558		Bee removal starts	0.11 kft	334	
110531		engines start	0.11 kft	334	
110622		inu to nav	0.11 kft	334	
110846		power transfer	0.11 kft	334	
111107		taxy	0.11 kft	334	

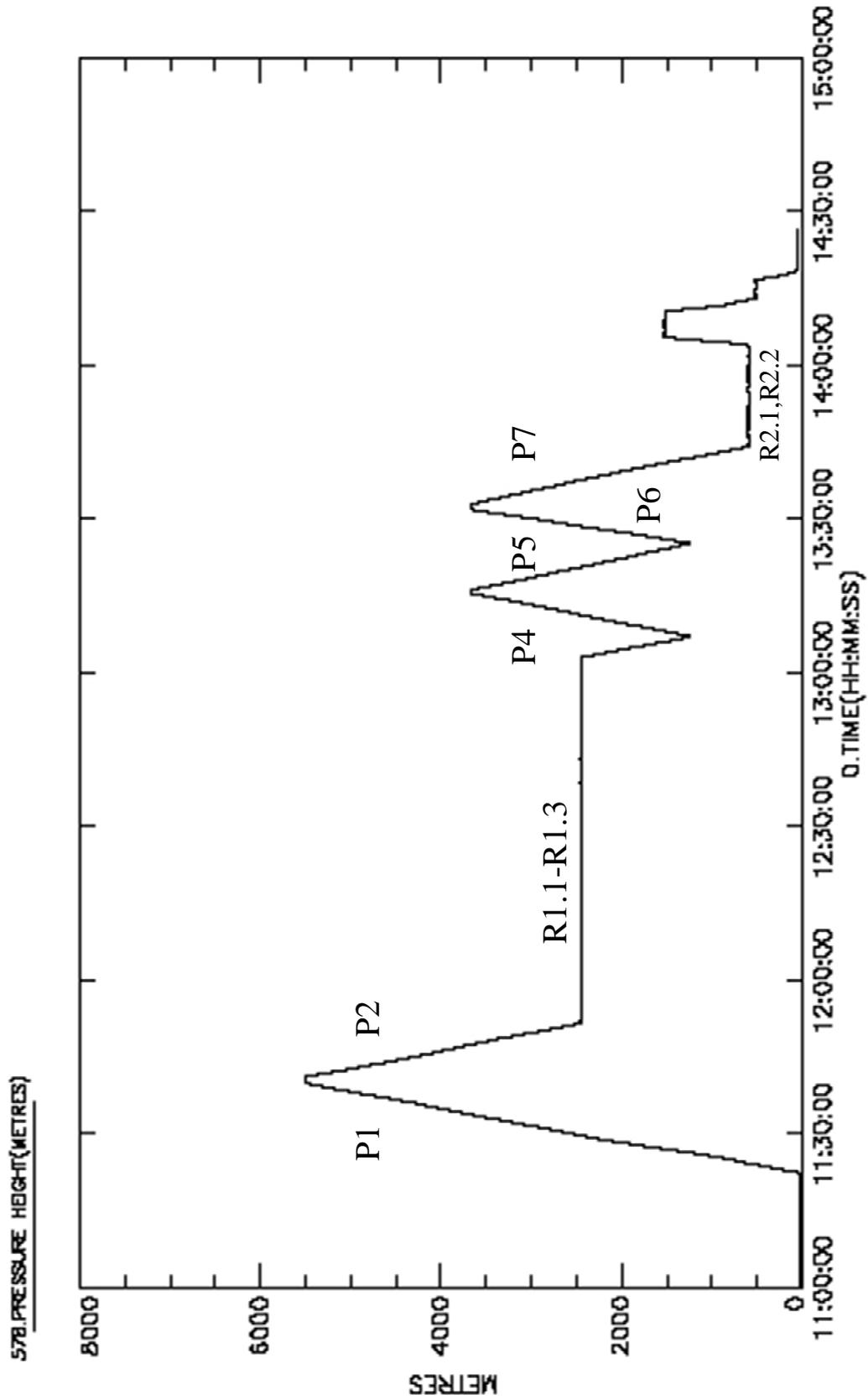
DODO1 Summary Document

111948		asp open	0.12 kft	171	
112228		T/O	0.10 kft	353	from dakar
112228	113959	Profile 1	0.10 kft	353	
114104	115140	Profile 2	18.0 - 8.1 kft	176	
115140		Run 1.1	8.1 kft	176	
120146		Run 1.1	8.0 kft	170	Limel checked
120958		Run 1.1	8.0 kft	170	bbr shtr open 12:06
121632		Run 1.1	8.0 kft	171	end time
122216	123736	Run 1.2	8.1 - 8.0 kft	350	
124311	125702	Run 1.3	8.0 kft	175	
130245	130710	Profile 3	8.1 - 4.1 kft	350	
130711	131532	Profile 4	4.1 - 12.0 kft	351	
131602	132511	Profile 5	12.0 - 4.1 kft	13	
132511	133150	Profile 6	4.1 - 11.9 kft	19	
133255	134420	Profile 7	12.0 - 1.9 kft	0	
134420	135004	Run 2.1	2.0 kft	1	
135337	140319	Run 2.2	2.0 kft	1	
141834		Land	0.17 kft	354	at Dakar
142327		asp closed	0.19 kft	332	
142509		standstill	0.19 kft	332	14'44.56N, 17'29.30W

B169 Track 07-FEB-06



B169 07-FEB-06 07:53:38-14:26:37

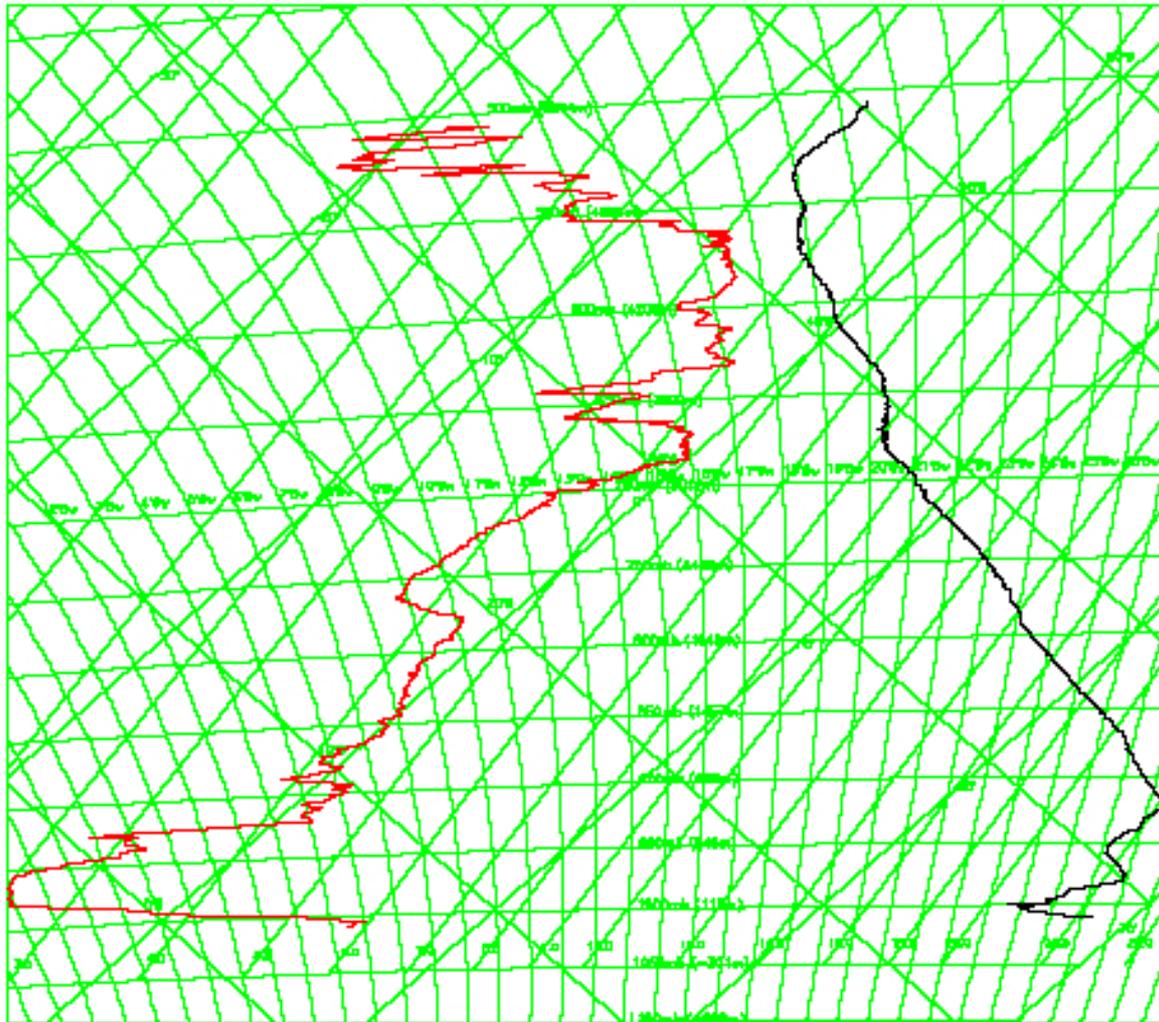


P1

B169 07-FEB-06 11:22:28-11:39:59

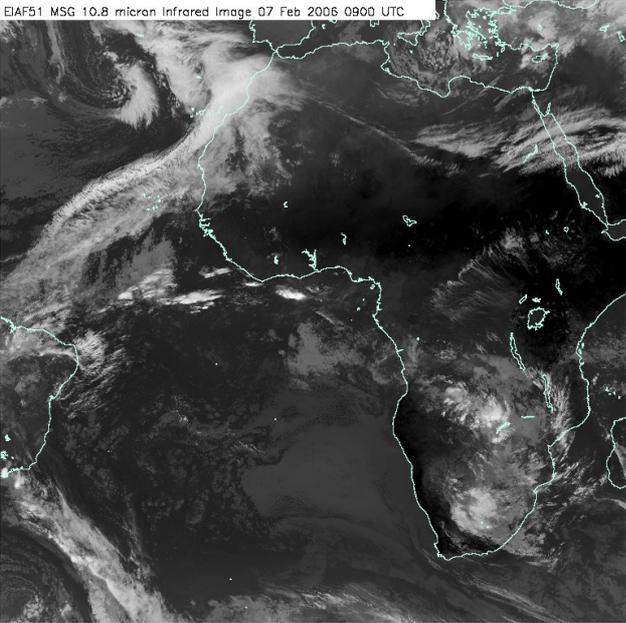
520.DKICED TRUE TEMP(DEG K)

528.DEW POINT(DEG K)

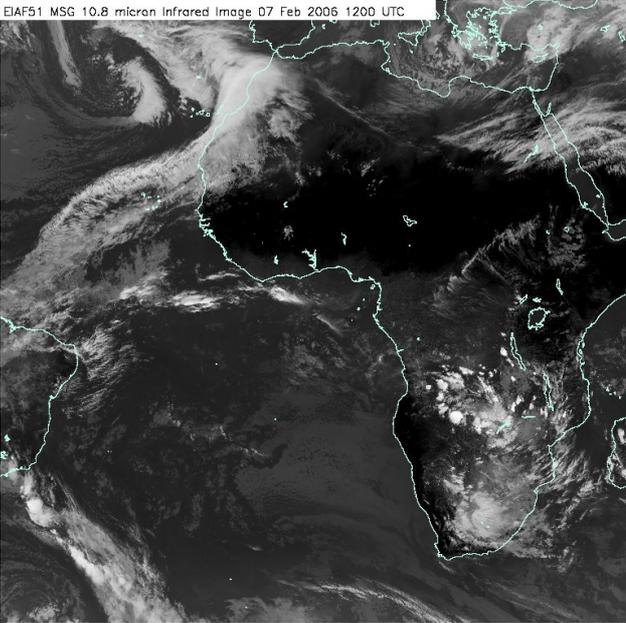


DODO1 Summary Document

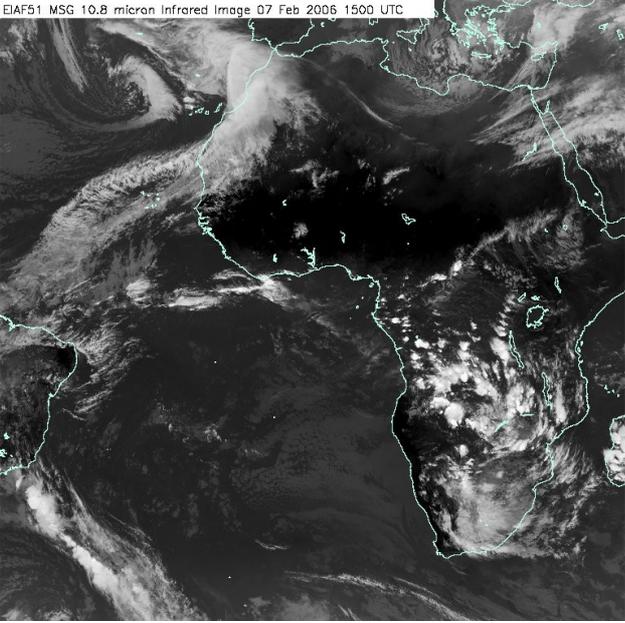
EJAF51 MSG 10.8 micron Infrared Image 07 Feb 2006 0900 UTC

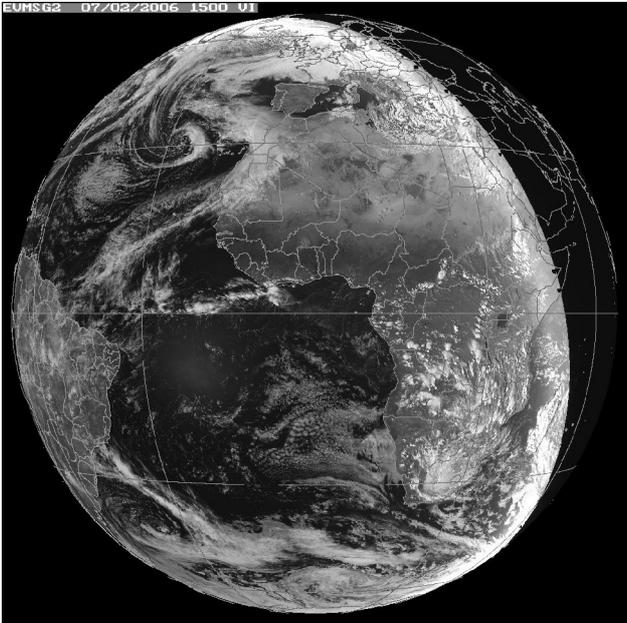
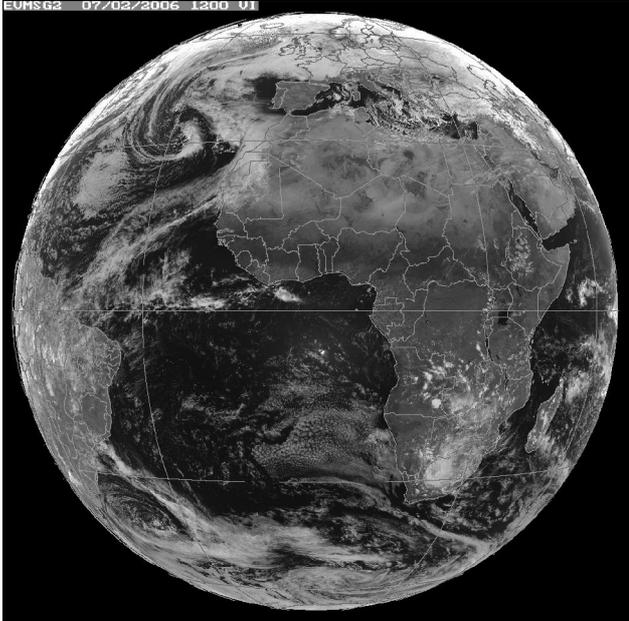
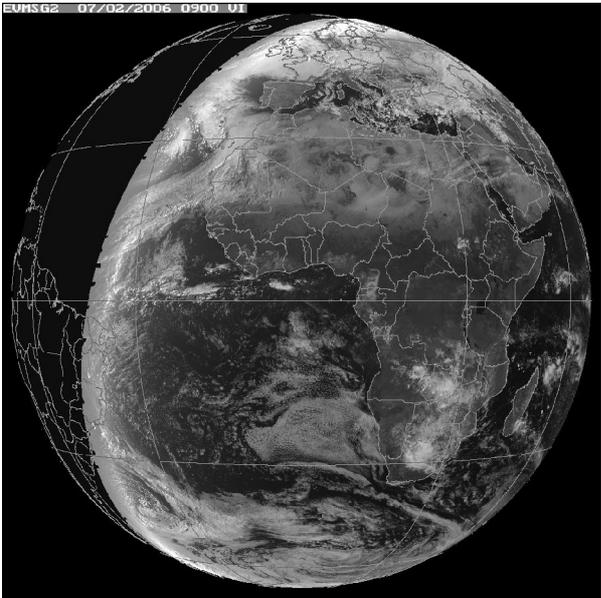


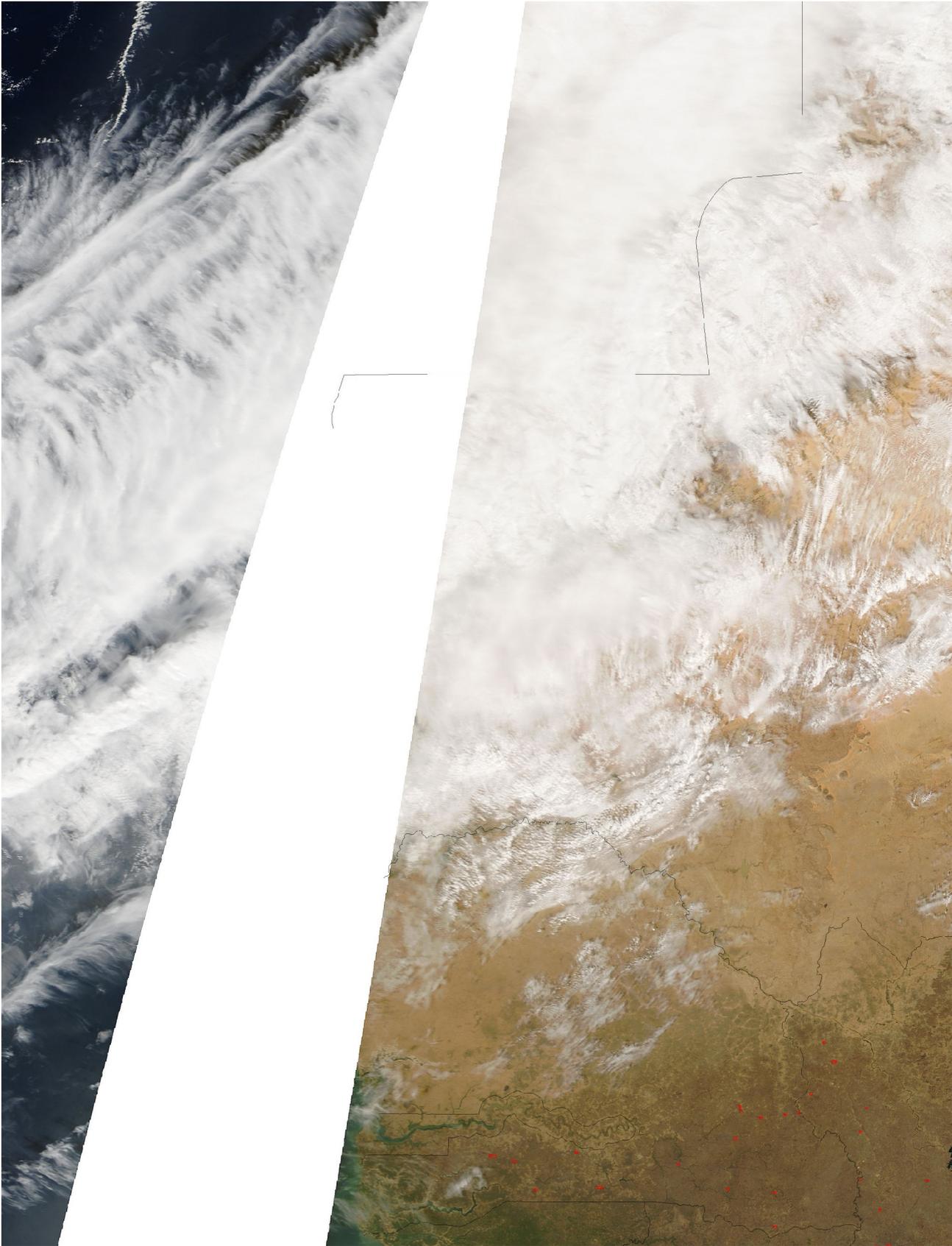
EJAF51 MSG 10.8 micron Infrared Image 07 Feb 2006 1200 UTC



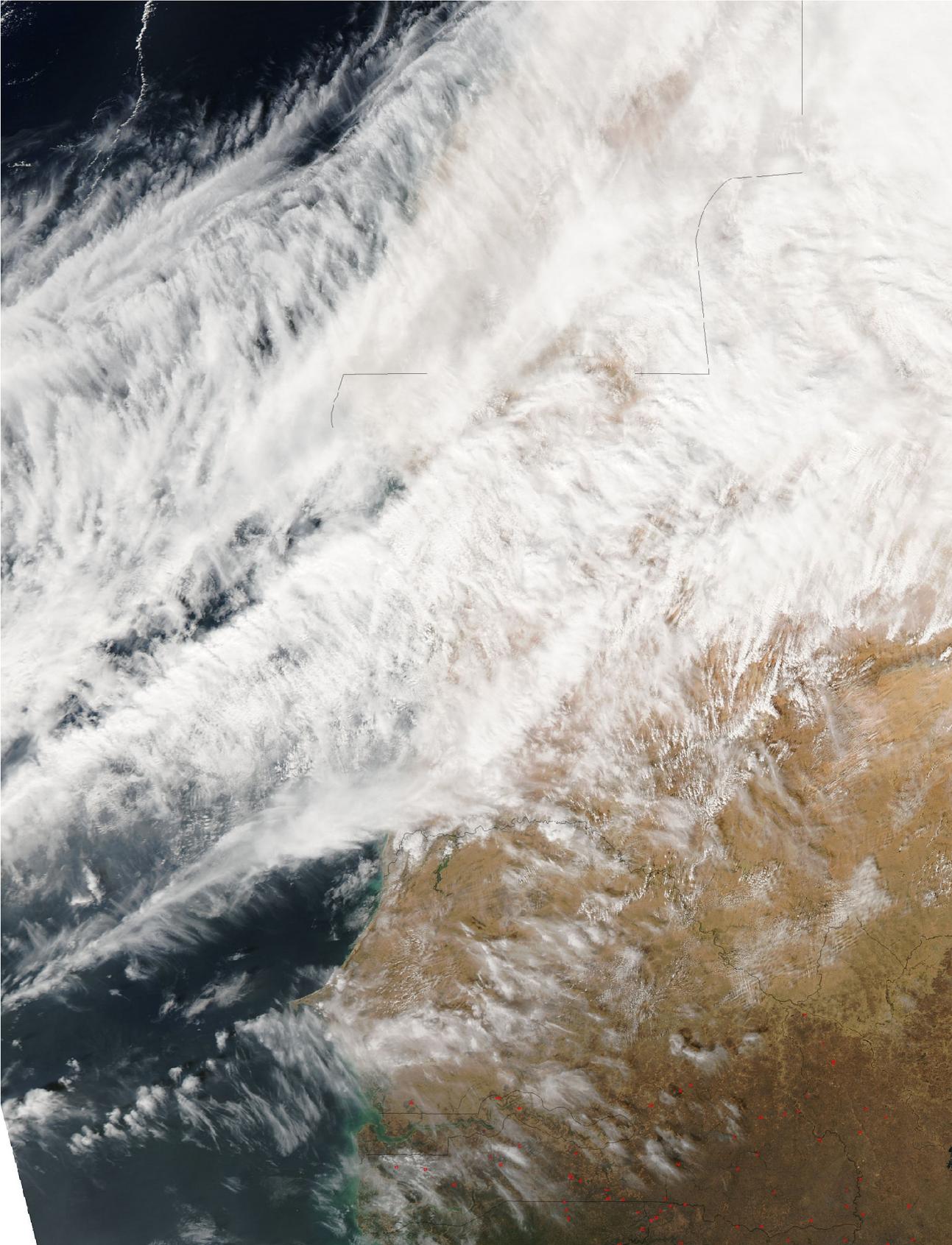
EJAF51 MSG 10.8 micron Infrared Image 07 Feb 2006 1500 UTC







TERRA 500m

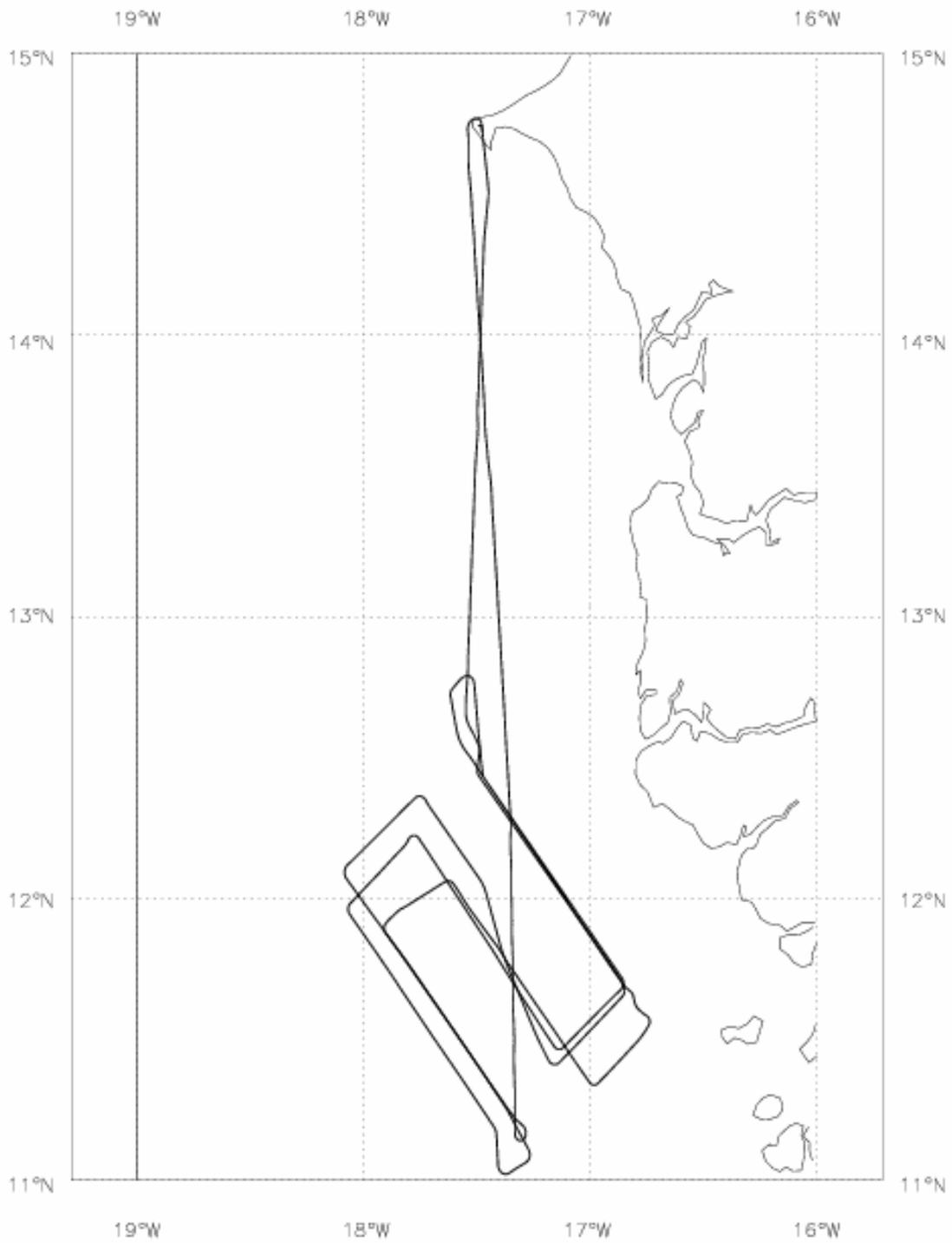


AQUA 500m

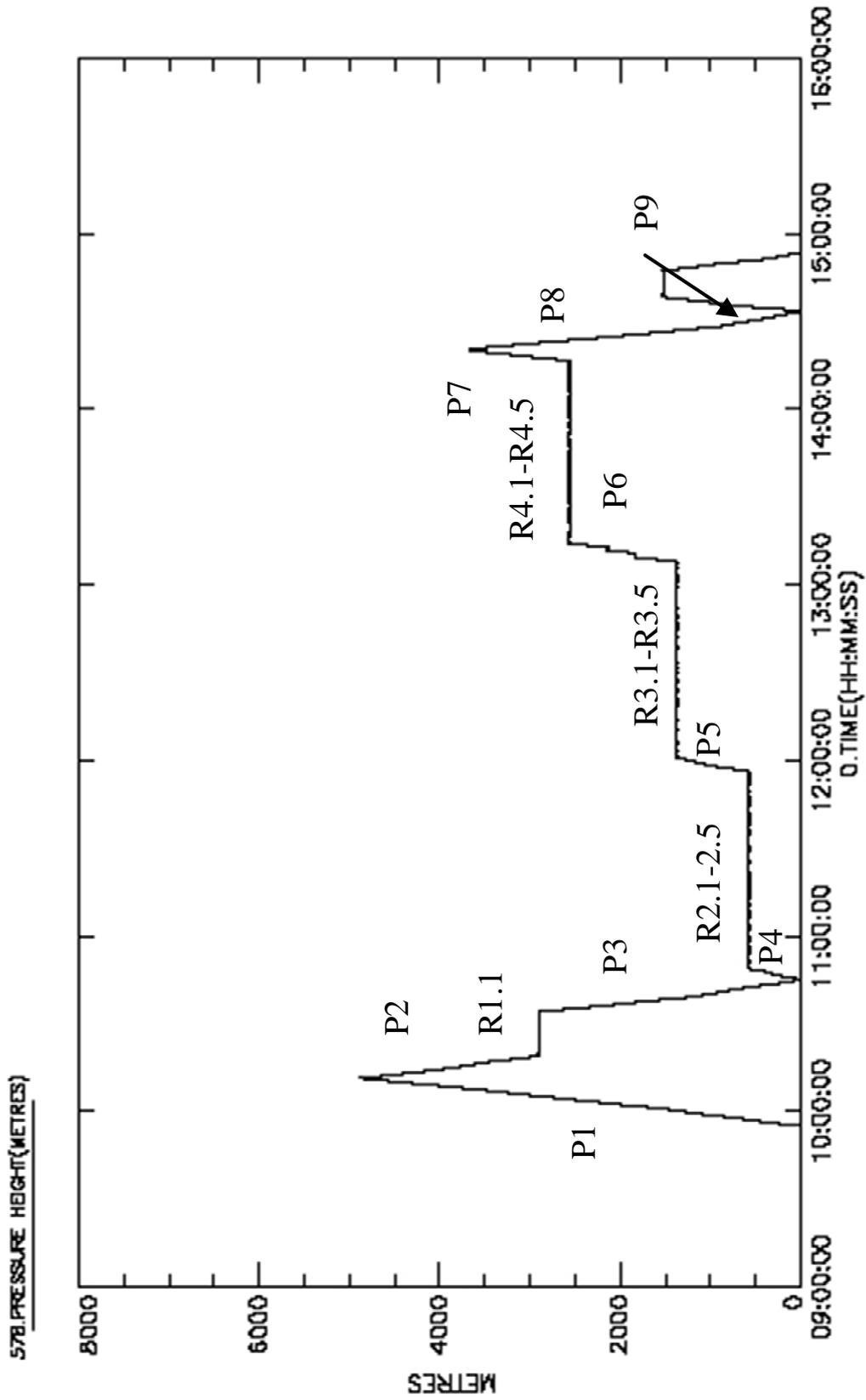
B170

Start Time	End Time	Event	Height (s)	Hdg	Comments
094139		INU to navigate	-.03 kft	334	
094541		taxy start	-.03 kft	334	
094706		asp open	-.03 kft	106	
095447		T/O	-.03 kft	353	from Dakar, P1 start
095447	101121	Profile 1	-.03 - 16.0 kft	335	
101122	101859	Profile 2	16.0 - 9.5 kft	180	
101900	103400	Run 1.1	9.5 kft	178	
102522		bbr open	9.5 kft	178	
103401	104504	Profile 3	9.5 - -.02 kft	182	
103919		rate of descent chan	3.8 kft	180	
104504	104848	Profile 4	-.02 - 1.9 kft	175	qnh 1018
105334	110837	Run 2.1	1.9 kft	312	bbrs exposed at start
110942	111426	Run 2.2	1.9 kft	49	
111506	113006	Run 2.3	1.9 kft	136	tapes changed 11:29
113105	113602	Run 2.4	1.9 kft	44	
113720	115530	Run 2.5	1.9 kft	308	strange sea/water layer observed at 11:39
115608	120056	Profile 5	1.9 - 4.5 kft	352	
120834	122339	Run 3.1	4.5 kft	144	
122434	122935	Run 3.2	4.5 kft	231	
123027	124506	Run 3.3	4.5 kft	320	
124629	125129	Run 3.4	4.5 kft	225	
125226	130720	Run 3.5	4.5 kft	142	tapes change 1 03:02
130759	131419	Profile 6	4.5 - 8.4 kft	174	
130928		Profile 6	6.0 kft	174	interrupt
131045		Profile 6	6.0 kft	64	resume
131149		Profile 6	7.0 kft	66	interrupt
131251		Profile 6	7.0 kft	327	resume
131419	133035	Run 4.1	8.4 kft	325	
133137	133637	Run 4.2	8.4 kft	52	
133748	135248	Run 4.3	8.4 kft	143	
135352	135852	Run 4.4	8.4 kft	50	
135946	141448	Run 4.5	8.4 kft	324	
141639	142020	Profile 7	8.4 - 12.0 kft	330	
142039	143328	Profile 8	12.0 - -.01 kft	359	
142909		Profile 8	2.5 kft	2	rate of descent changed at 3kft
					e at 3kft
143328	143824	Profile 9	-.01 - 5.0 kft	5	
145335		Land	0.01 kft	355	at Dakar
145934		standstill	0.02 kft	329	14'44.56N, 17' 29.30W

B170 Track 11-FEB-06



B170 11-FEB-06 07:41:11-15:02:40

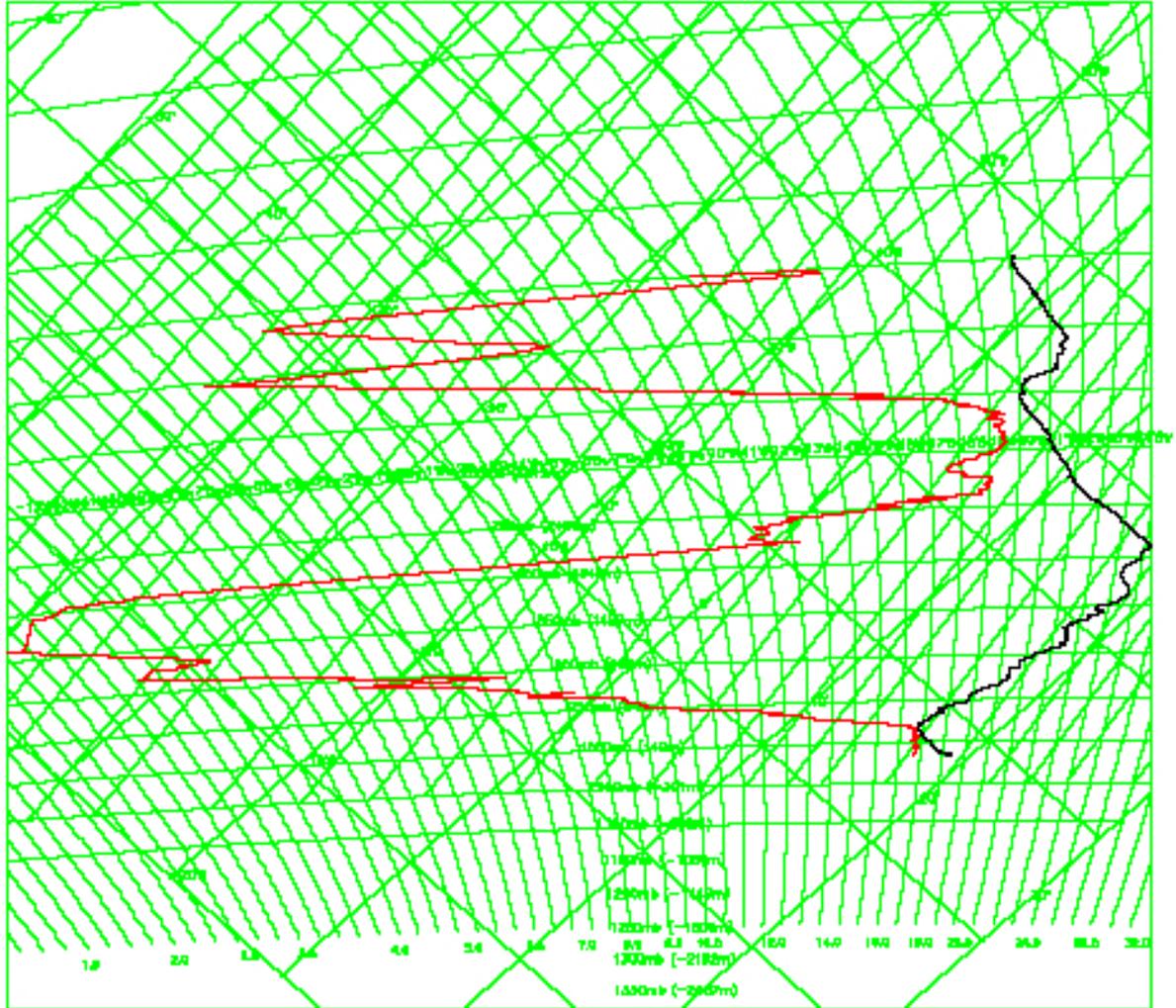


P1

B170 11-FEB-06 09:54:47-10:11:21

520.DEGCED TRUE TEMP(DEG K)

520.DEW POINT(DEG K)

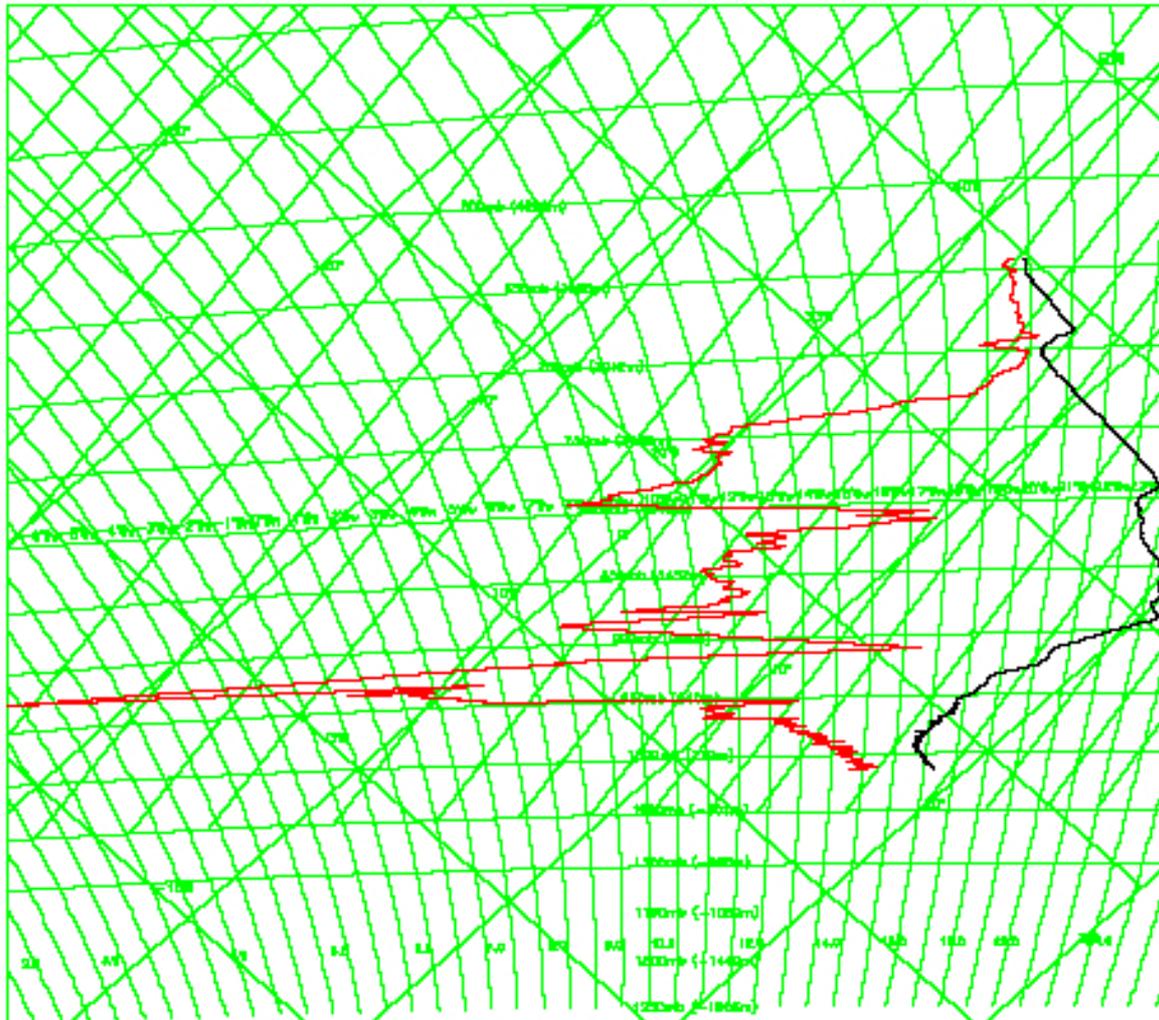


P8

B170 11-FEB-06 14:20:39-14:33:28

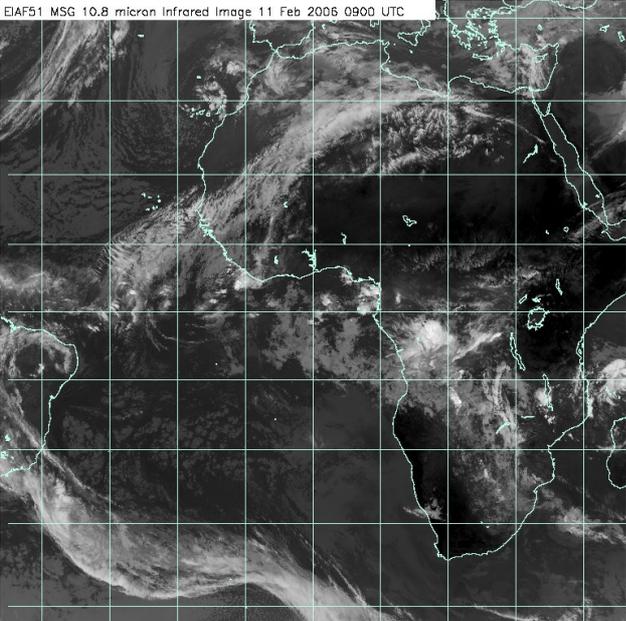
520.DEGCED TRUE TEMP(DEG K)

520.DEW POINT(DEG K)

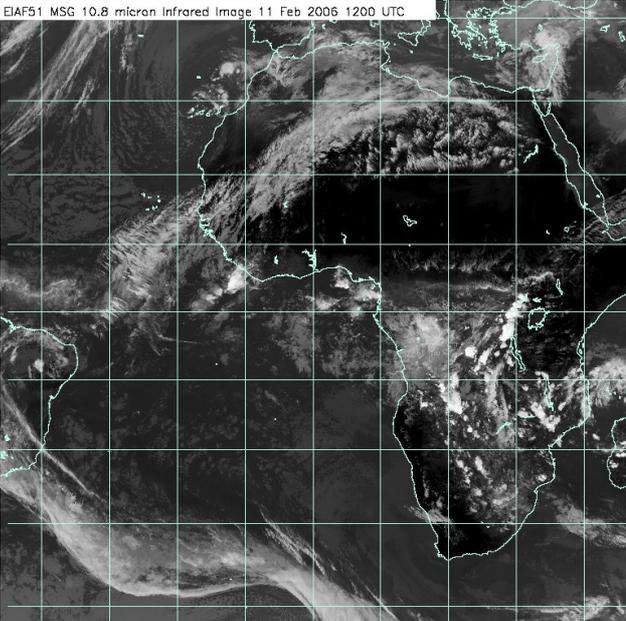


DODO1 Summary Document

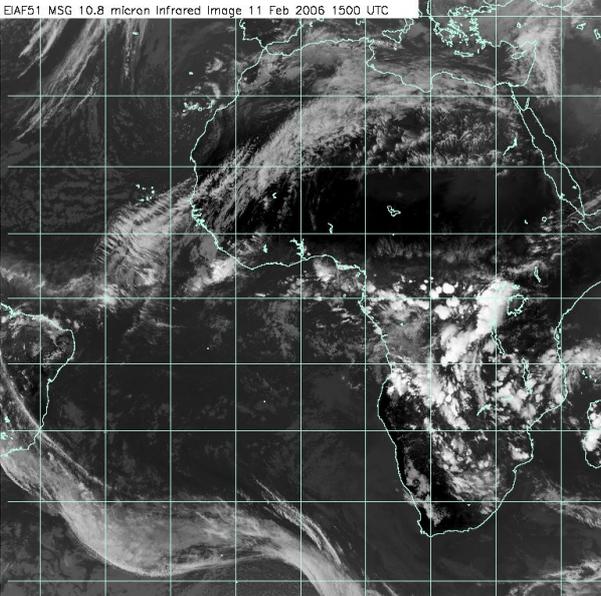
EIAF51 MSG 10.8 micron Infrared Image 11 Feb 2006 0900 UTC

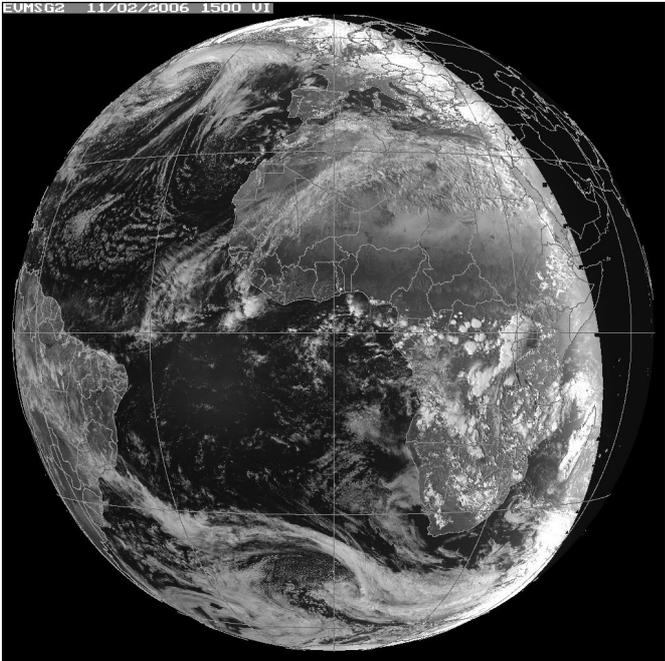
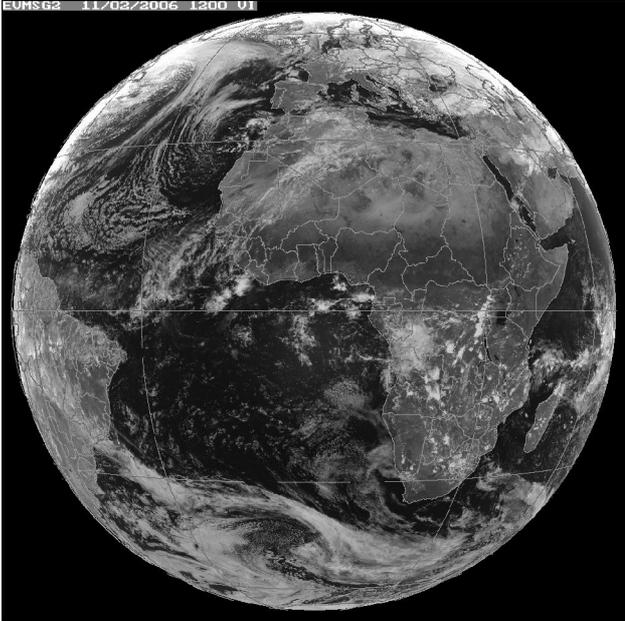
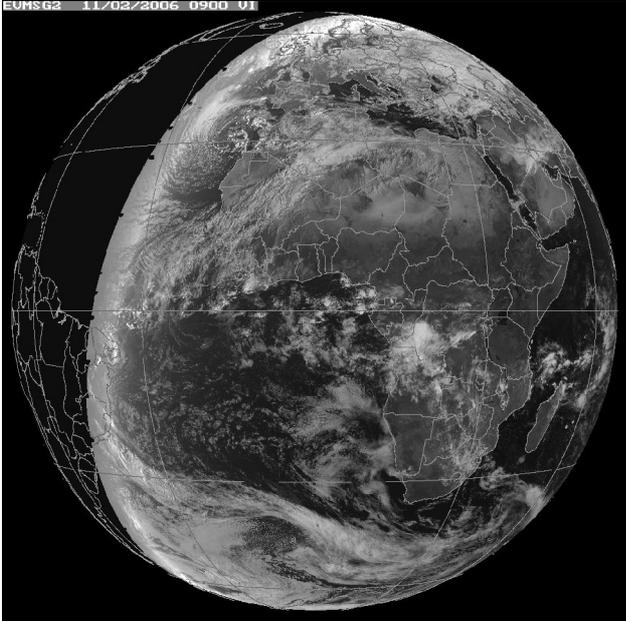


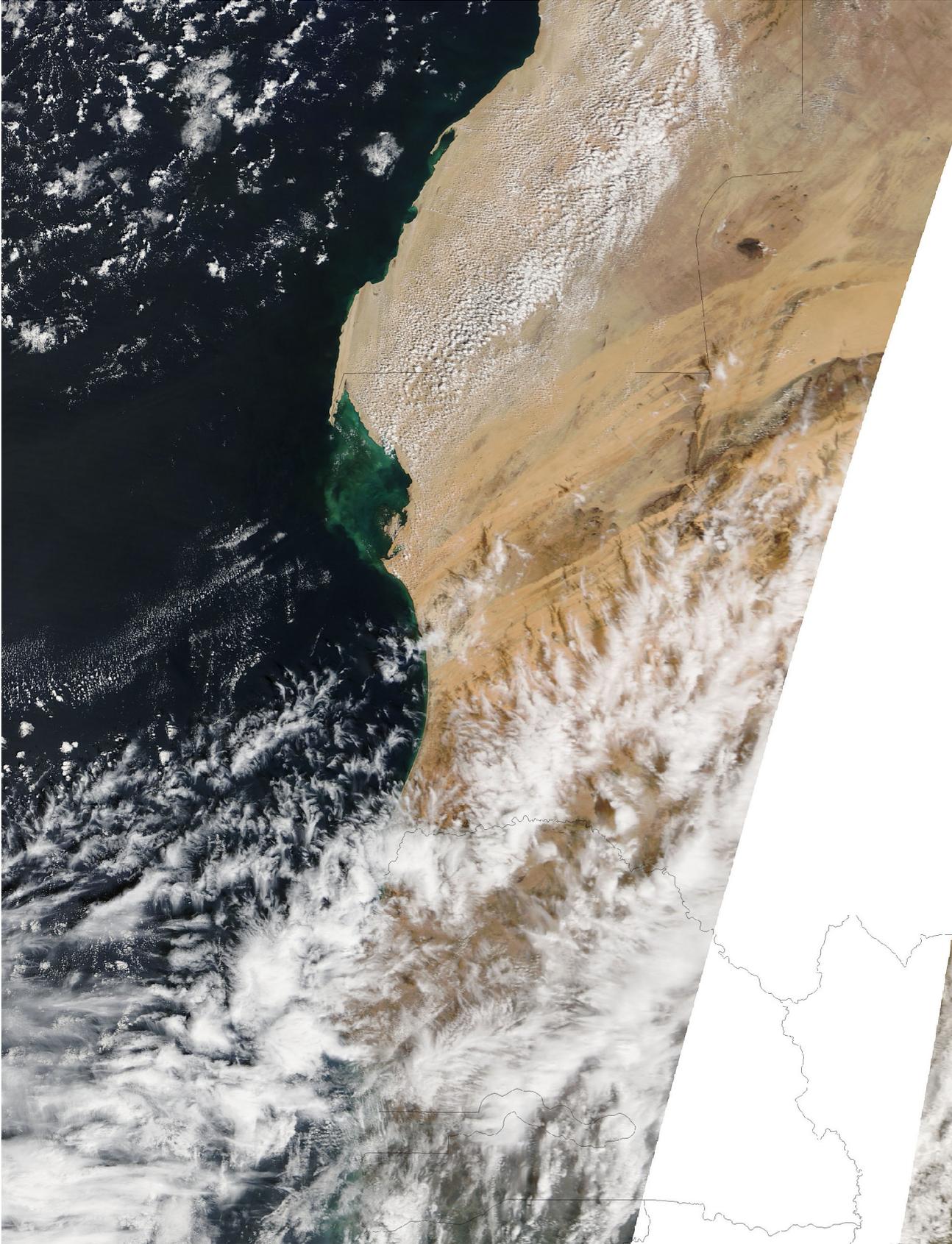
EIAF51 MSG 10.8 micron Infrared Image 11 Feb 2006 1200 UTC



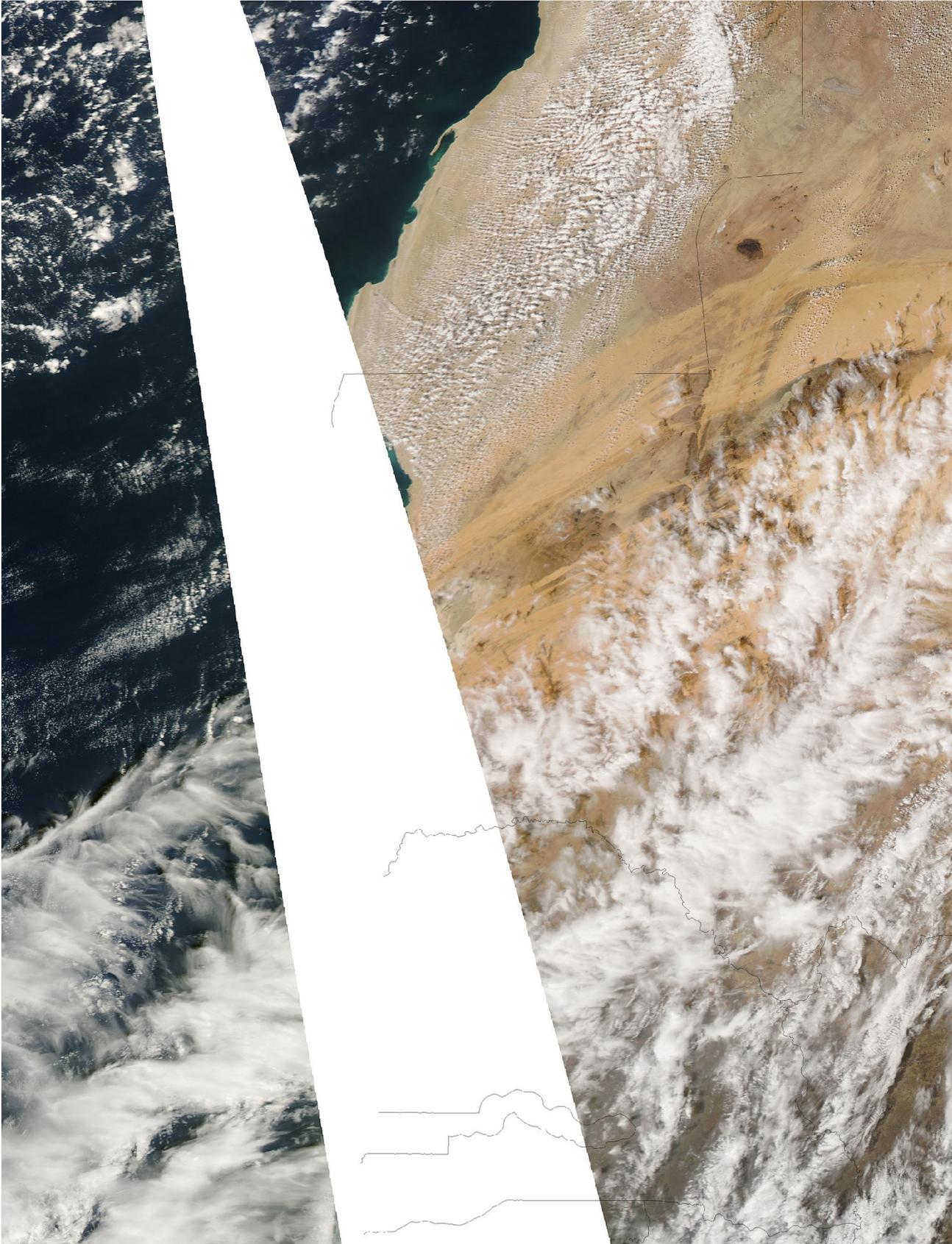
EIAF51 MSG 10.8 micron Infrared Image 11 Feb 2006 1500 UTC



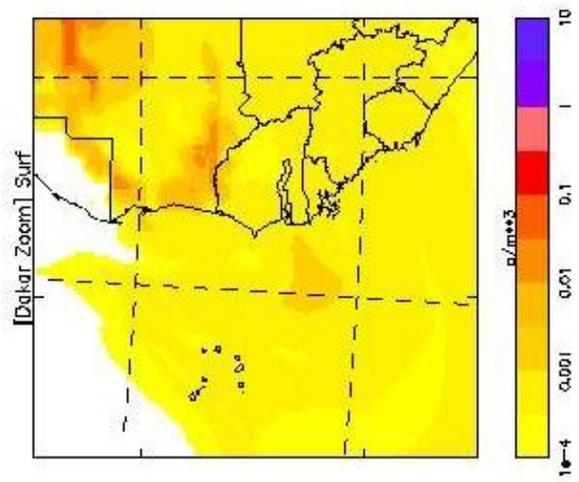
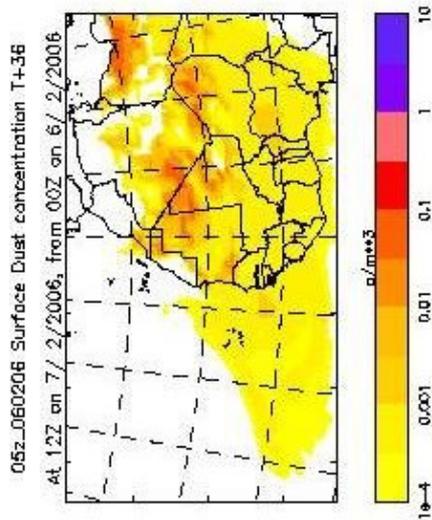
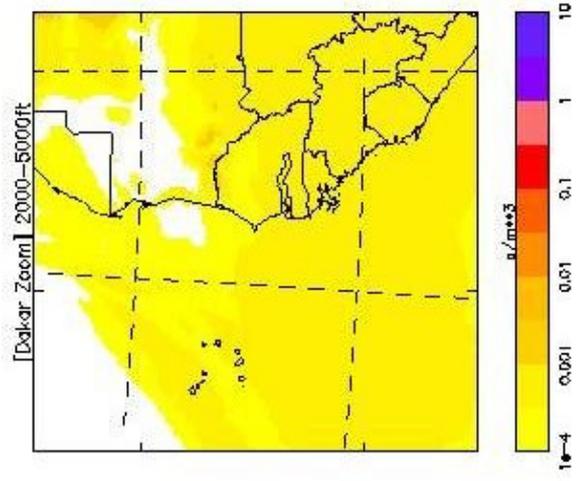
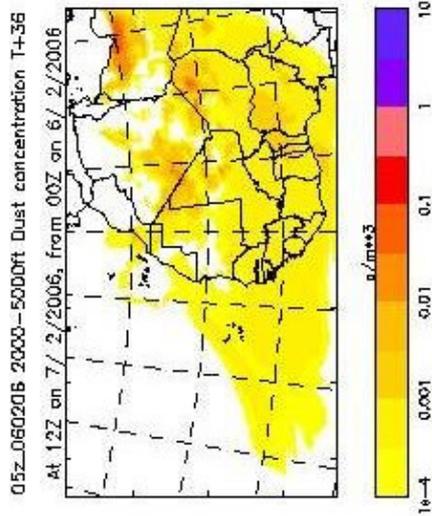
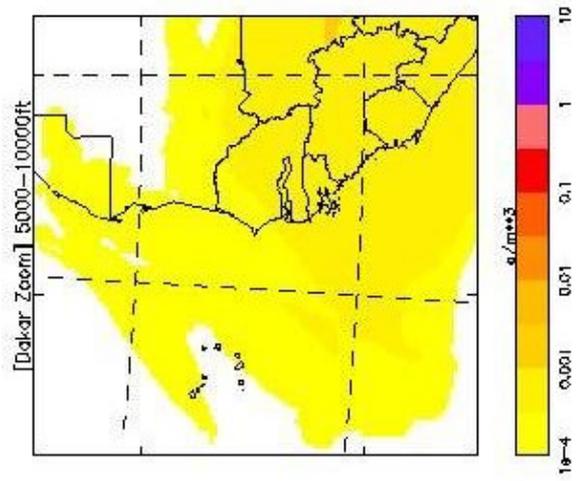
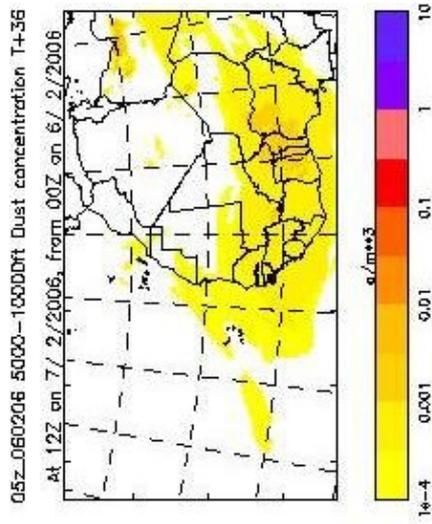




TERRA 500m



AQUA 500m

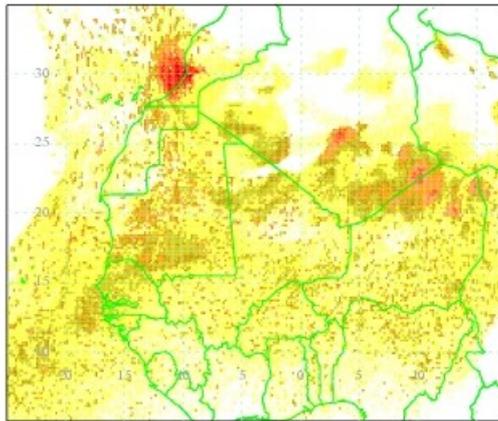


NAME version 814

Sahara forecast

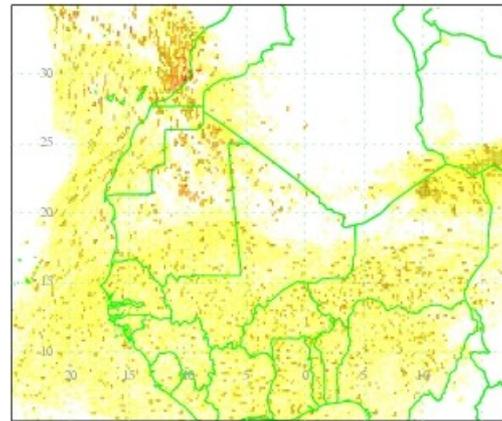
Valid at 1200UTC 07/02/2006

From 2000 – 5000 ft agl Air concentration



Maximum value = 1.10×10^{-1} g/m³
1.00e-07 1.00e-05 1.00e-03 1.00e-01 1.00e+01

From 5000 – 10000 ft agl Air concentration



Maximum value = 2.60×10^{-2} g/m³
1.00e-07 1.00e-05 1.00e-03 1.00e-01 1.00e+01

Start of release: 0000UTC 14/01/2006
End of release: 0000UTC_07/01/1957
Release rate: multiple sources
Release location: multiple sources
Release heights : ***** to 0m agl

Pollutant: PM10_MINERAL
Met data: Mesoscale
Run time: 0654UTC 06/02/2006

Met Office (GMR) Crown copyright

B171

Flight B171 13th February 2006

Mission Scientist's Debrief (Hugh Coe)

Summary of the weather conditions:

Large area of well developed cumulus streets to the north of Dakar stretching to 25 N, aligned with the BL wind blowing from 40 N. Overhead, clear skies for much of the time. It was cloudless to the east over the Mauritanian Coast and inshore waters with a little cirrus coverage. The cumulus cover appeared to diminish through the afternoon.

Scientific Aims:

The flight aimed to locate and sample a dust storm, which was predicted by the CAM and NAME models to be advecting dust from northern Mauritania and Western Sahara westwards over the eastern Atlantic in the operating region to the north of Dakar.

Points defined:

Dakar airfield (13°29'N, 2°10'E). 700ft elevation;

GUNET 19° 35' 42N 19° 44' 6W;

Point A 22°00'N, 20°,00'W,

Point B (24°00'N, 20°00'W),

Nouadibou (20° 55' 59N 17° 1' 48W)

Summary of the flight:

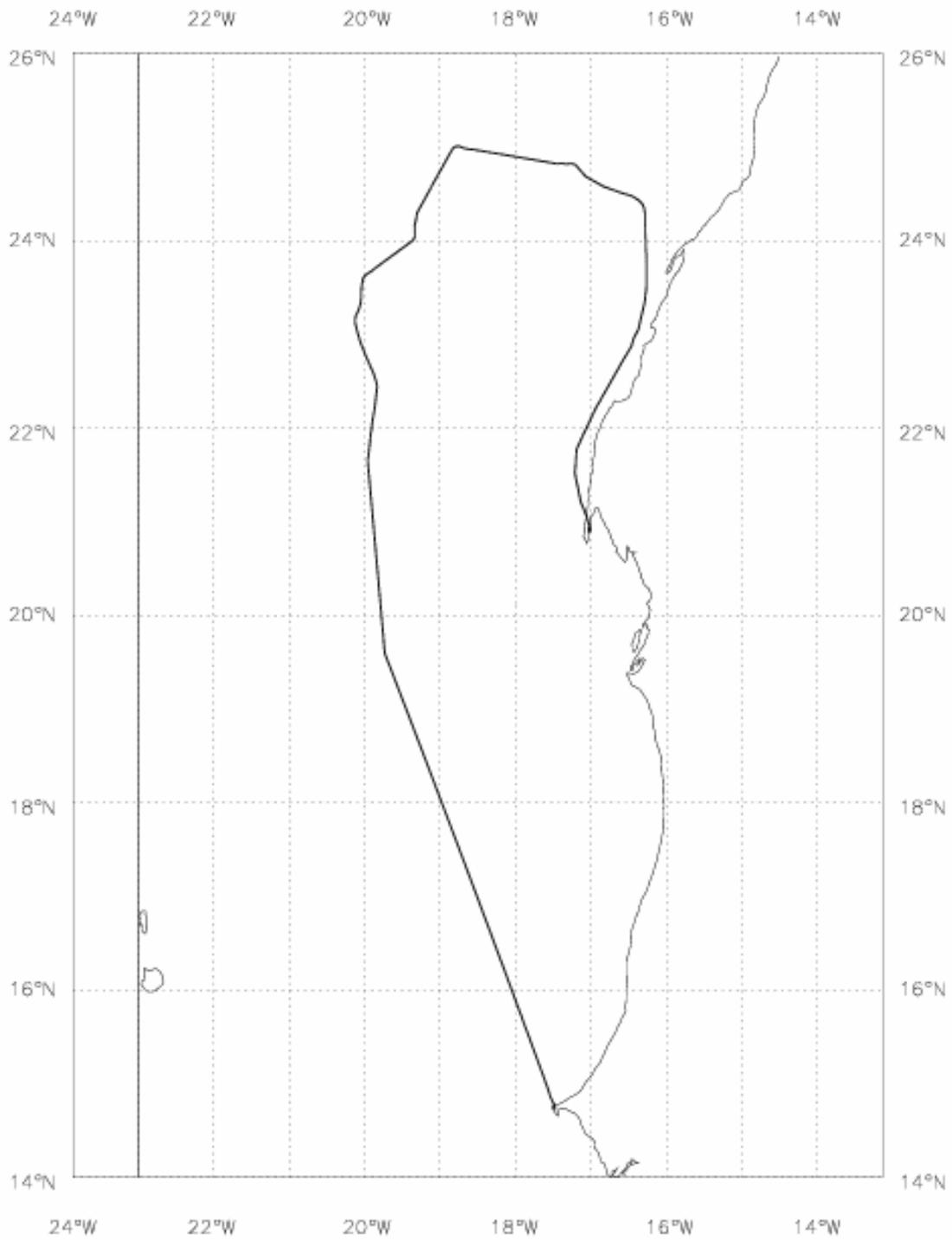
The forecast predicted the dust to be situated a considerable distance to the north of Dakar and so after an initial profile to FL240 a transit at range spend was carried out before conducting a profile descent to point A. A sonde was released north of GUNET, immediately before descent into point A. Considerable cumulus cloud (6/8), a significant fraction of which was developing congestus. The aerosol in this region was very low in concentration and marine in nature. Some clear air slots to the north were identified and these were targeted. Heading to the NNW to find a clear slot, a short profile determined that there was little dust but as the model prediction was for low level outflow sampling at 1000' under the cloud layer was carried out. Close to point B there were a few scattered and light showers. A northerly run was continued to the 25°N limit of operation and then survey work to the east was continued to establish if the dust was further to the east. Cloud was prevalent for the first half of this easterly leg though dissipated to towards the coast. Some evidence of a low concentration sulphate layer in the marine boundary layer was seen but no evidence of dust. A profile established the complete absence of dust and the aircraft continued at 5000' towards Dakhla, before heading southwards, parallel to the coast to Nouadibou. The only evidence of dust was observed on descent into Nouadibou with scattering coefficients around 100 Mm⁻¹ and evidence of large particle scattering. To the west there was visible evidence of a pollution layer at the top of the marine boundary layer.

Start Time	End Time	Event	Height (s)	Hdg	Comments
083548		inu to nav	0.02 kft	338	
083609		engine start	0.02 kft	338	
083854		power change	0.02 kft	338	
084048		taxy start	0.02 kft	338	
084222		asp open	0.02 kft	105	
084258		start tapes	0.02 kft	105	
084911		T/O	0.02 kft	353	from dakar

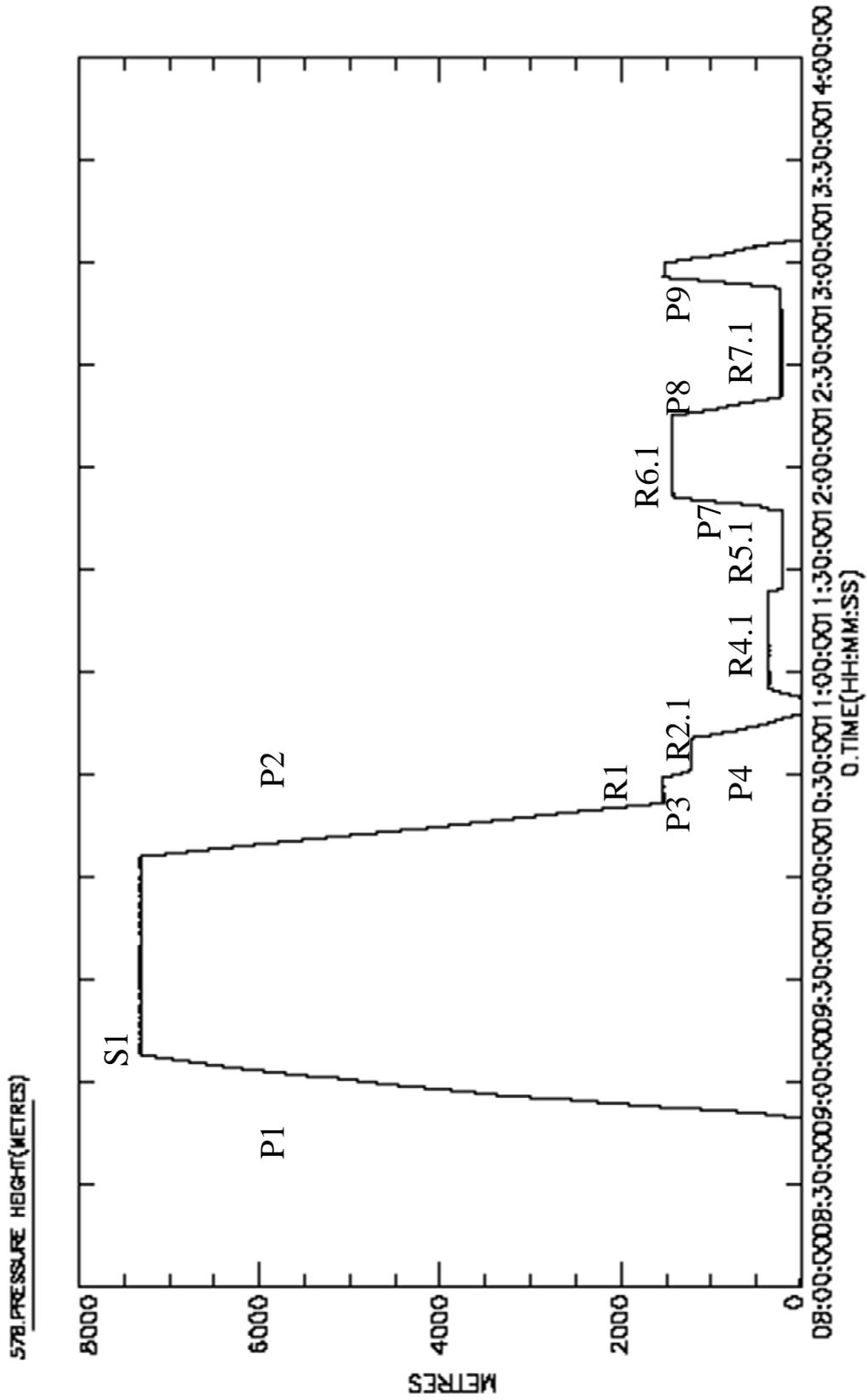
DODO1 Summary Document

085146	zero nevzorov	3.2 kft	343
084911	090804 Profile 1	13.4 - 24.0 kft	334
092944	bbrs exposed	24.0 kft	329
094803	sonde 1	24.0 kft	329 launch
100547	102146 Profile 2	24.0 - 5.2 kft	346
101557	tapes change	11.7 kft	2
102146	102855 Run 1	5.2 - 5.0 kft	11
102906	103108 Profile 3	5.0 - 4.0 kft	12 500ft/min
103108	104037 Run 2.1	4.0 kft	346 500ft/min
103319	bbrs exposed	4.0 kft	340
104042	104823 Profile 4	4.0 - -.20 kft	350 500ft/min at 3000 ft
104834	105205 Run 3.1	-.15 - -.16 kft	10
105212	105502 Profile 5	-.16 - 1.2 kft	57
105502	112323 Run 4.1	1.2 kft	55
110945	heimann cal	1.2 kft	13 qnh = 1025mb
112323	112416 Profile 6	1.2 - 0.72 kft	33
112417	114658 Run 5.1	0.72 - 0.71 kft	33
114708	115122 Profile 7	0.71 - 4.7 kft	94
114913	tapes change	2.2 kft	82
115135	121450 Run 6.1	4.7 kft	90
121458	122036 Profile 8	4.7 - 0.74 kft	174
122037	125219 Run 7.1	0.74 - 0.76 kft	175 qnh 1022 @1246
125229	125548 Profile 9	0.77 - 5.0 kft	180
125928	asp closed	5.0 kft	154
130656	Land	-.13 kft	16 at Nouadhibou
131209	standstill	-.11 kft	40 20'55.75N, 17'02.00W

B171 Track 13-FEB-06



B171 13-FEB-06 06:34:03-13:14:02

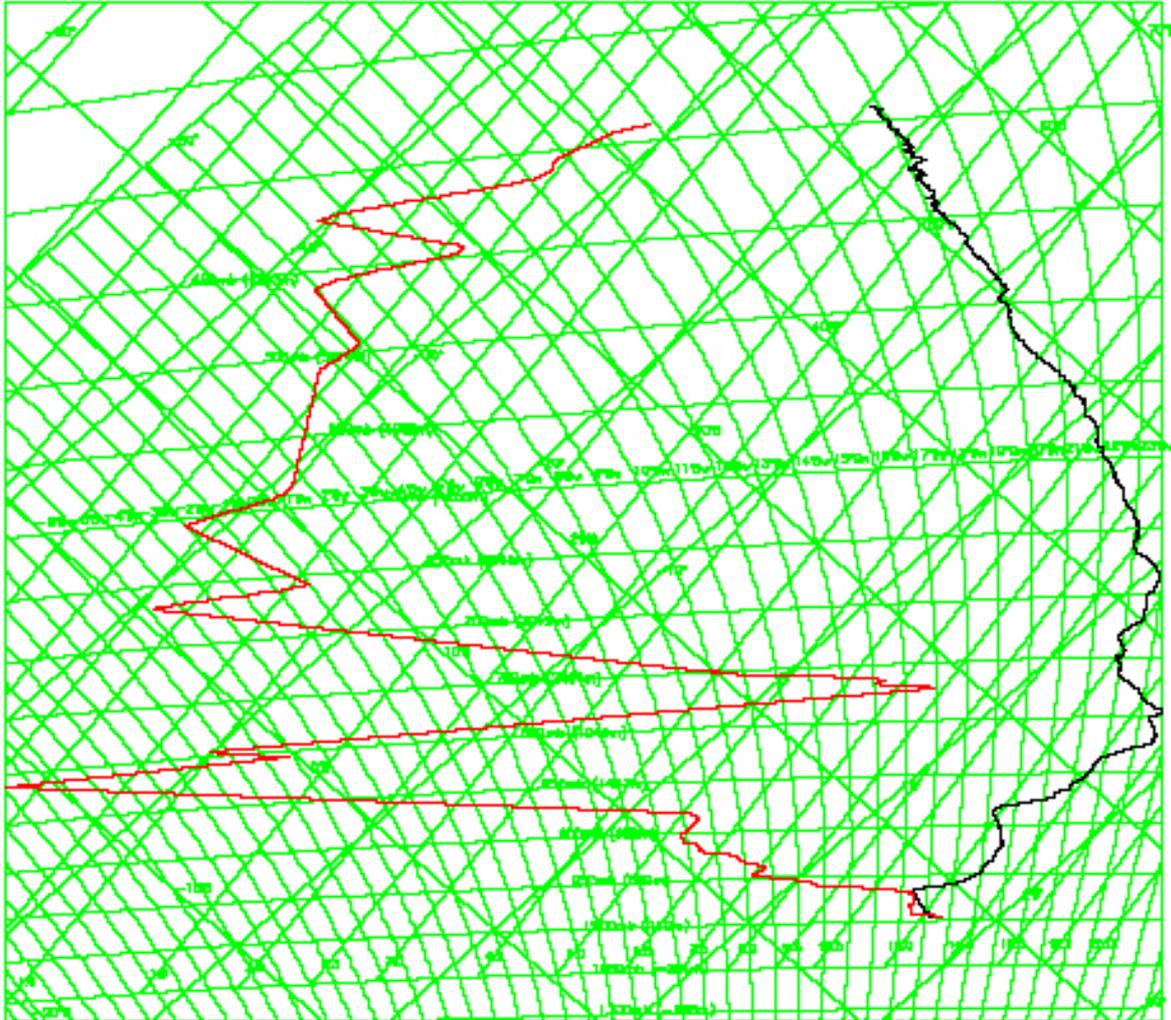


P1

B171 13-FEB-06 08:49:41-09:08:04

520.DEICED TRUE TEMP(DEG K)

528.DEW POINT(DEG K)

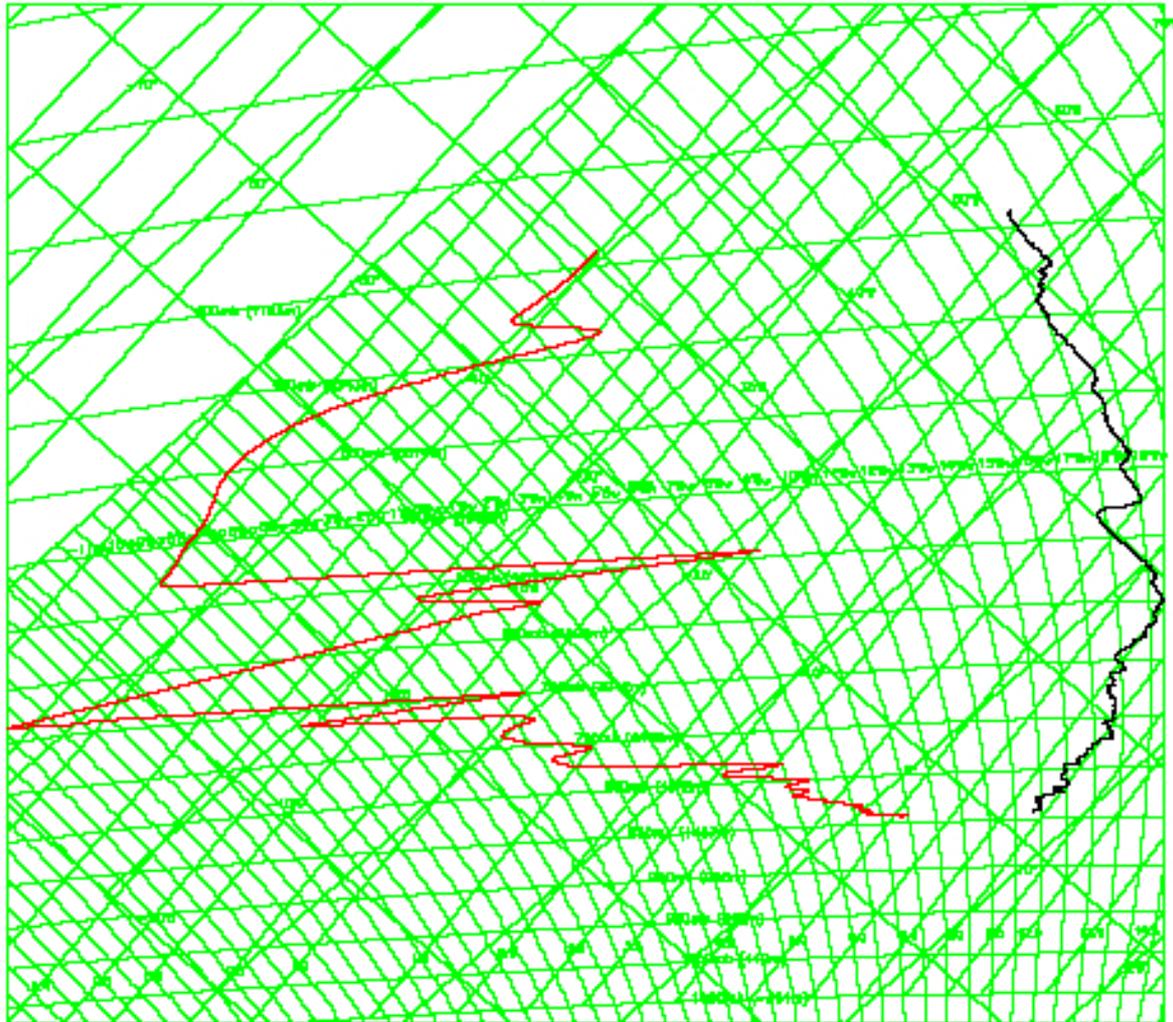


P2

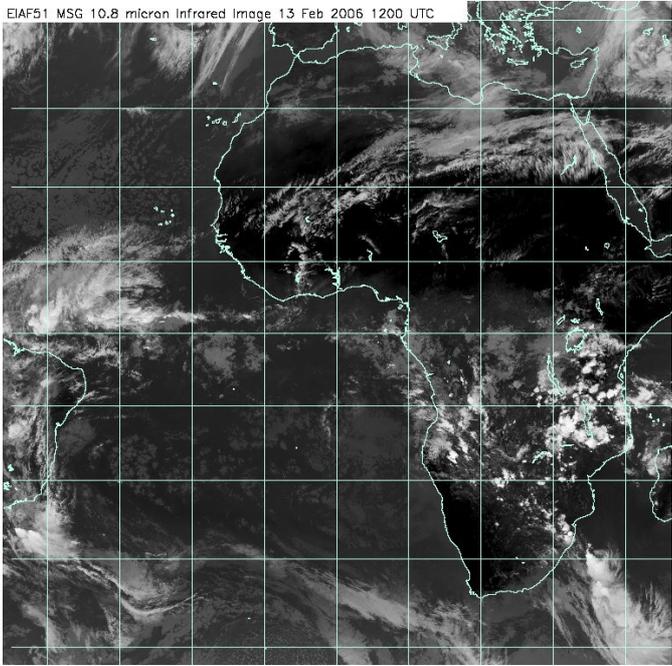
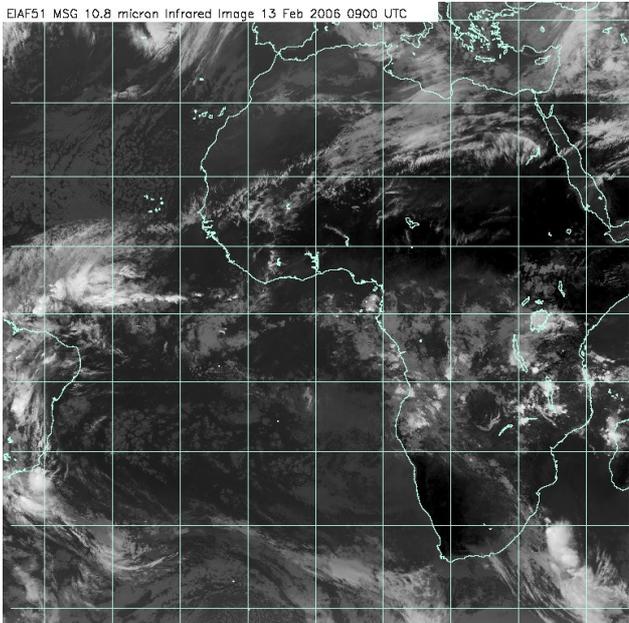
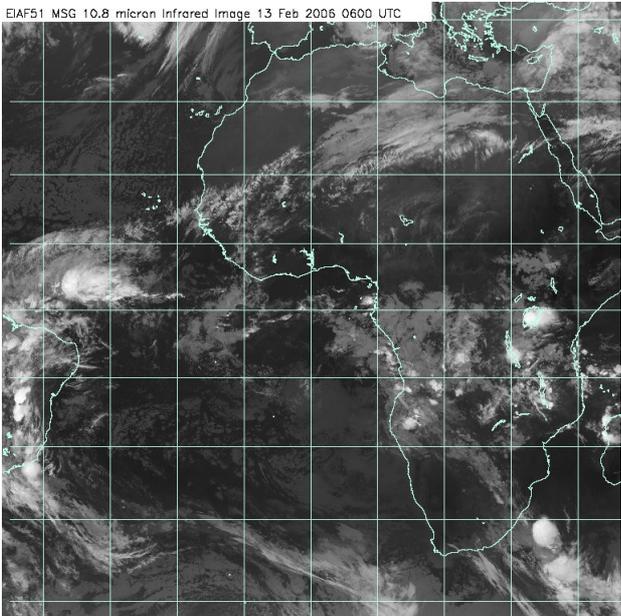
B171 13-FEB-06 10:05:47-10:21:46

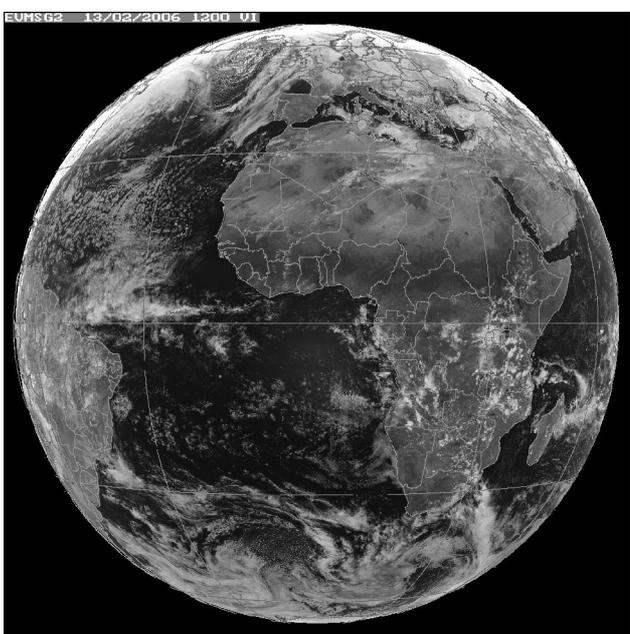
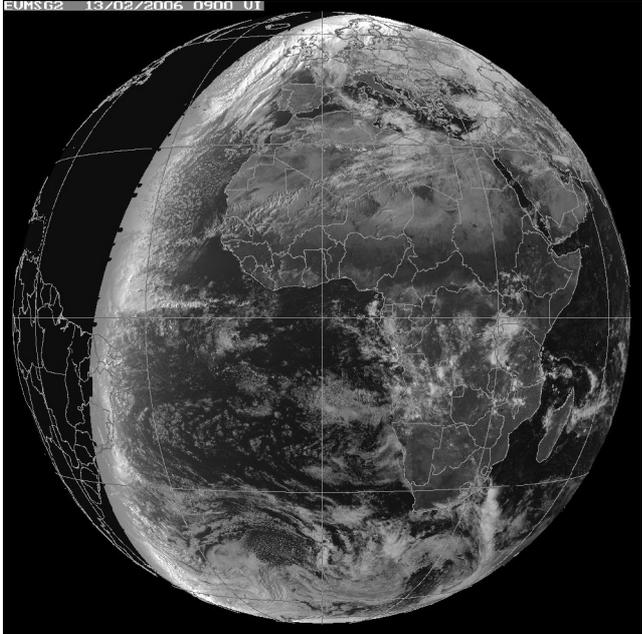
520.DEICED TRUE TEMP(DEG K)

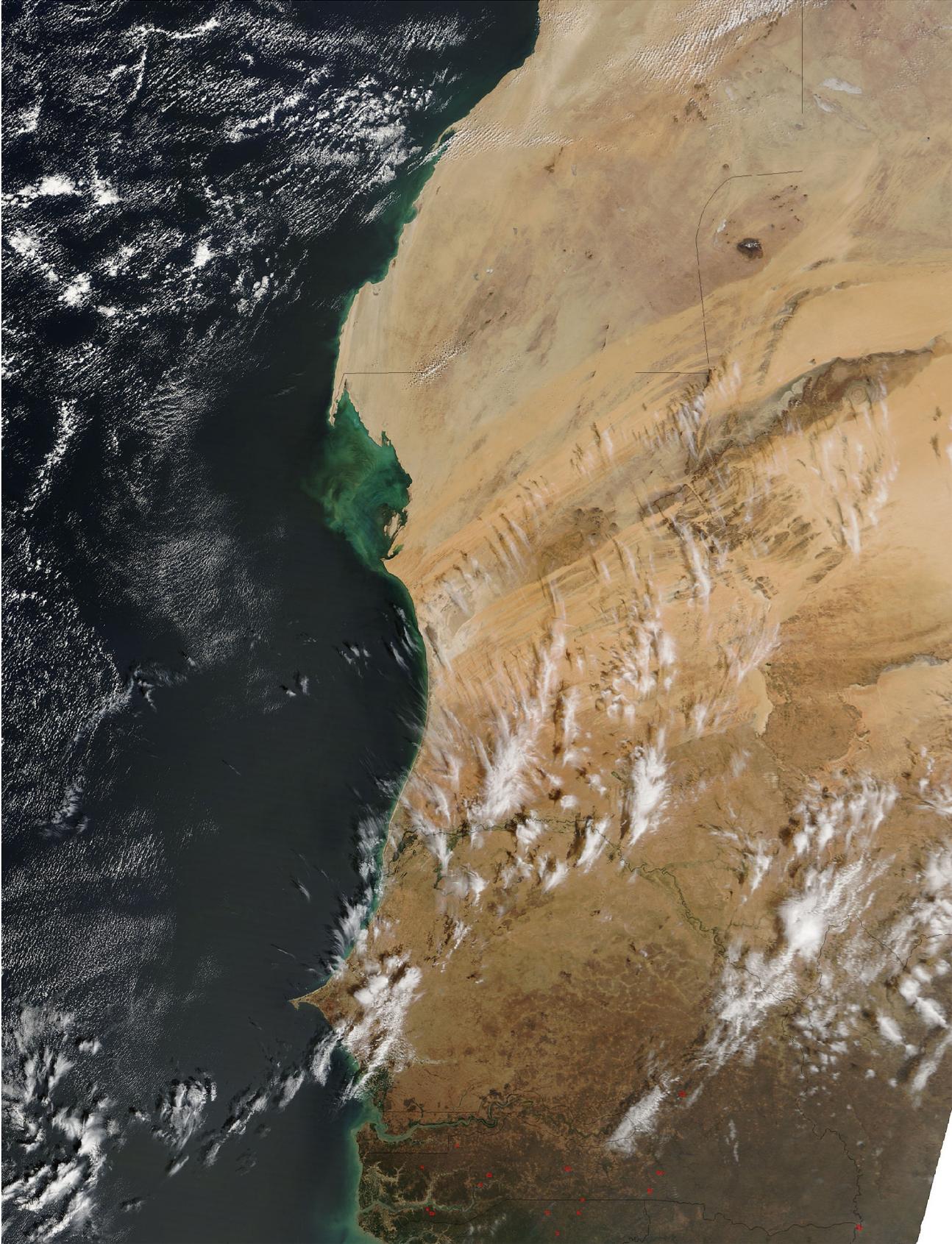
528.DEW POINT(DEG K)



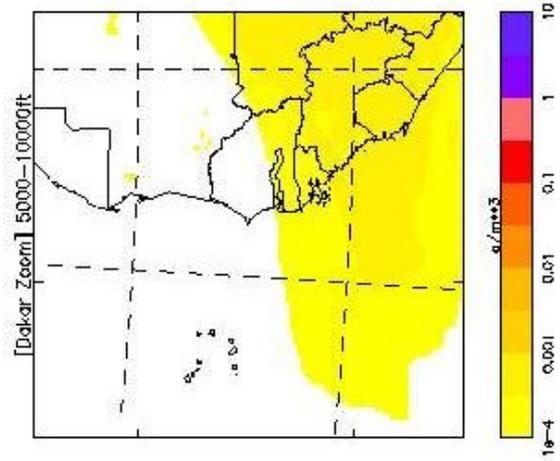
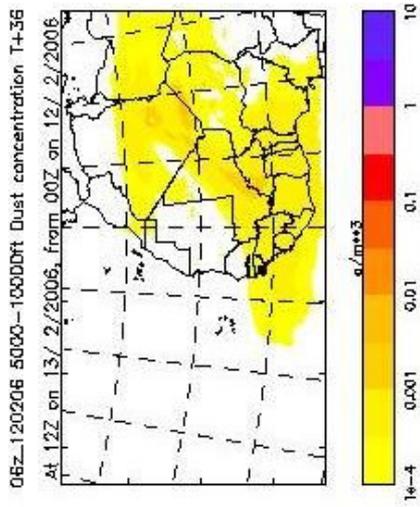
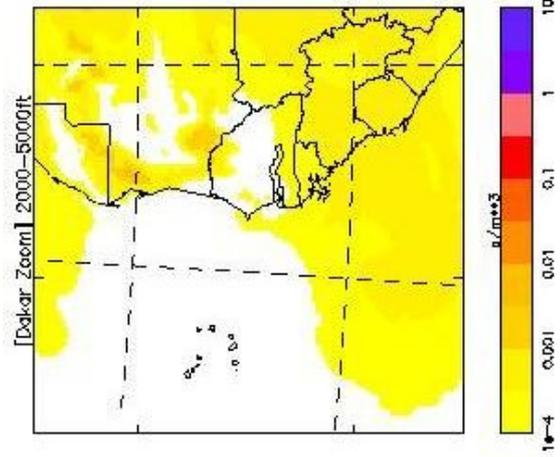
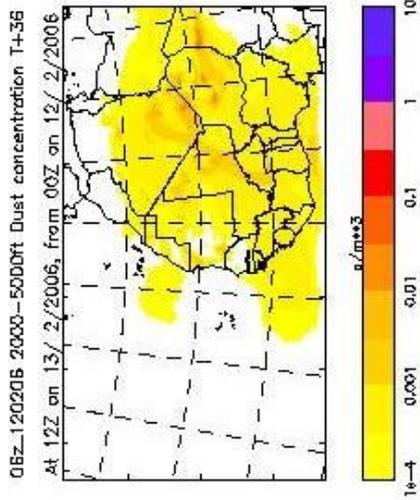
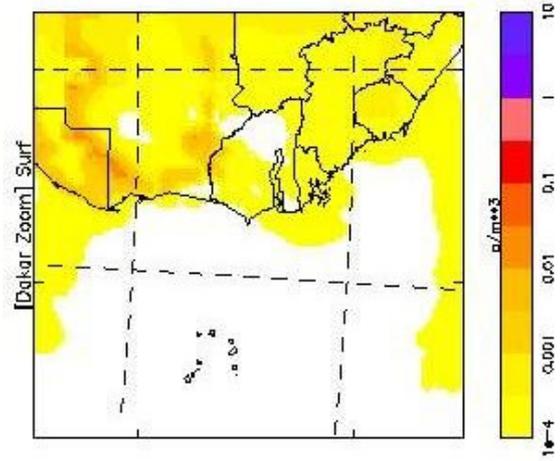
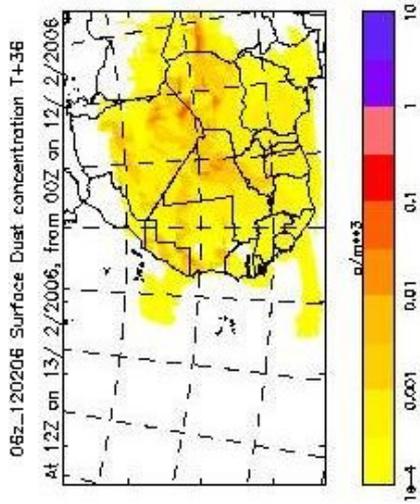
DODO1 Summary Document







TERRA 500m

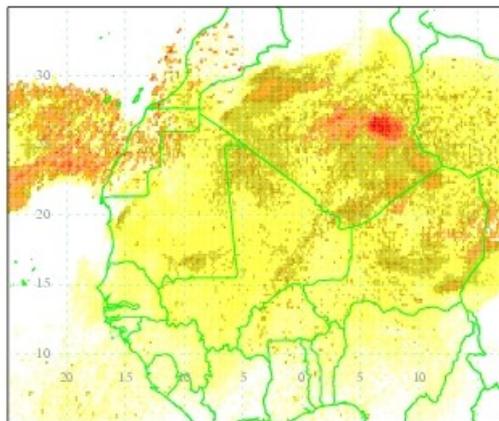


NAME version 814

Sahara forecast

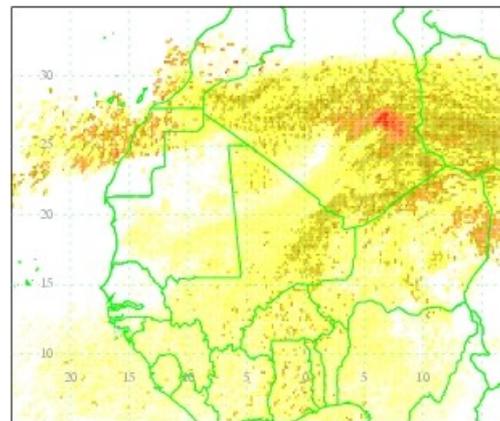
Valid at 1200UTC 13/02/2006

From 2000 – 5000 ft agl Air concentration



Maximum value = $4.89\text{e-}02$ g/m³
1.00e-07 1.00e-05 1.00e-03 1.00e-01 1.00e+01

From 5000 – 10000 ft agl Air concentration



Maximum value = $2.25\text{e-}02$ g/m³
1.00e-07 1.00e-05 1.00e-03 1.00e-01 1.00e+01

Start of release: 0000UTC 14/01/2006
End of release: 0000UTC_07/01/1957
Release rate: multiple sources
Release location: multiple sources
Release heights : ***** to 0m agl

Pollutant: PM10_MINERAL
Met data: Mesoscale
Run time: 0912UTC 12/02/2006

Met Office (GMR) Crown copyright

B172

Flight B172 13th February 2006

Mission Scientist's Debrief Sheet (Hugh Coe)

Summary of the weather conditions:

Local dust present in the area of Nouadibou but clear, cloudless skies to the south en route to Dakar.

Scientific Aims;

The flight aimed to locate and sample a dust storm, which was predicted by the CAM and NAME models to be advecting dust from northern Mauritania and Western Sahara westwards over the eastern Atlantic in the operating region to the north of Dakar en return route from Nouadibou to Dakar.

Points defined:

Dakar airfield (13°29'N, 2°10'E), Nouadibou (20° 55' 59N 17° 1' 48W)

Summary of the flight:

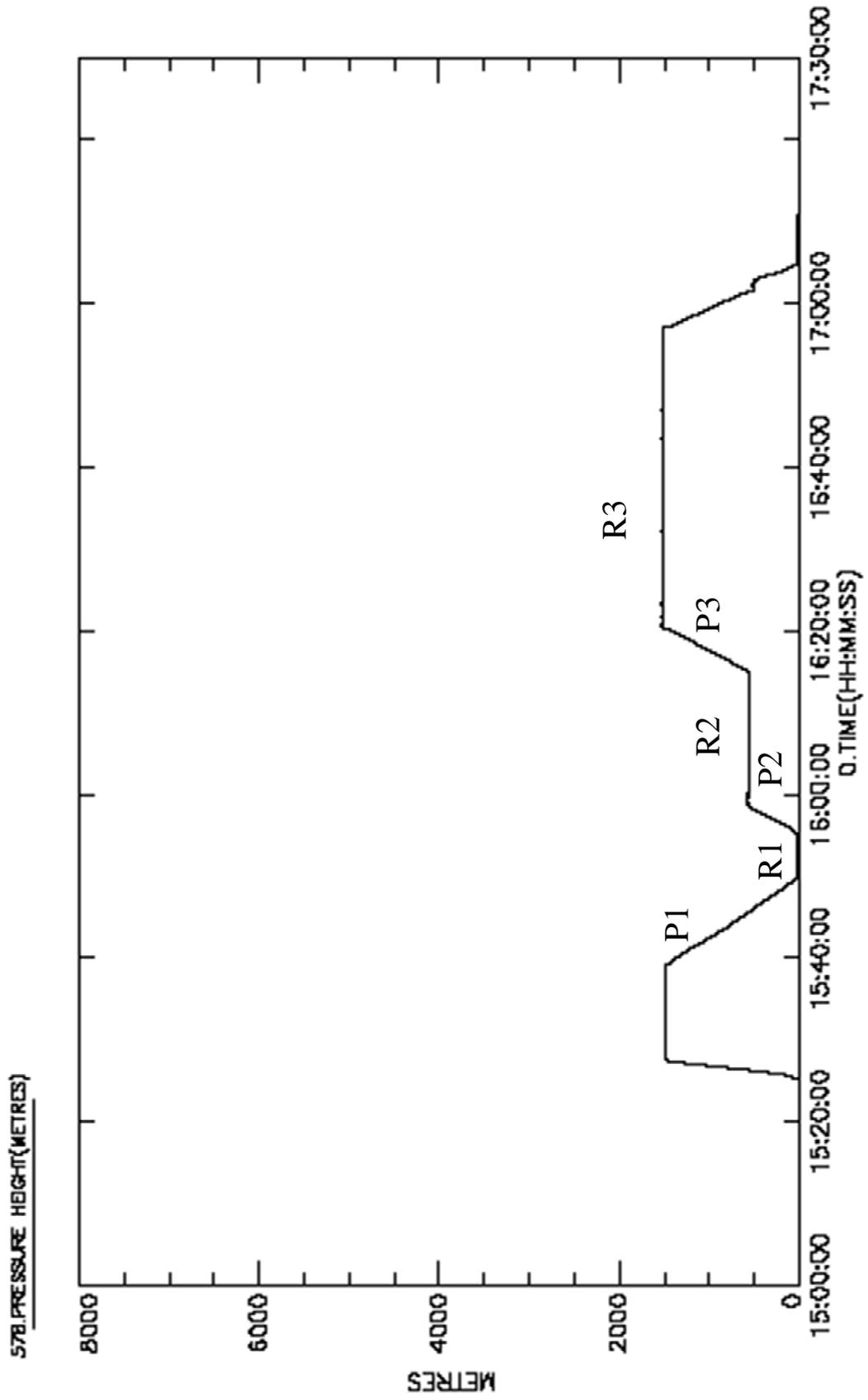
Due to the absence of a ground power unit at Nouadibou science power was lost and only a skeleton instrument fit was enabled for the short transit from Nouadibou to Dakar. Local dust increased significantly during the refuel (>250 Mm-1) but after profiling out of the airfield southward this had not advected away to the south of the region. Visibility was greater than 50 nautical miles for the transit with no evidence of transported dust. There were some signs of an elevated biomass layer at around 6000' over land to the east but no evidence of a perturbed oceanic background. The biomass layer extended as far south as Dakar.

Start Time	End Time	Event	Height (s)	Hdg	Comments
152155		taxy	-.07 kft	359	
152503		T/O	-.09 kft	359	from Nouadhibou
153849	154959	Profile 1	4.9 - 0.05 kft	359	500 ft/min
154959	155504	Run 1	0.05 kft	359	500 ft/min
155504	155834	Profile 2	0.05 - 1.9 kft	359	
155834	161452	Run 2	1.9 kft	359	
161452	162027	Profile 3	1.9 - 5.0 kft	359	
162027	165703	Run 3	5.0 - 4.9 kft	359	
170452		Land	0.10 kft	359	
170950		standstill	0.10 kft	359	14'44.56N, 17'28.30W

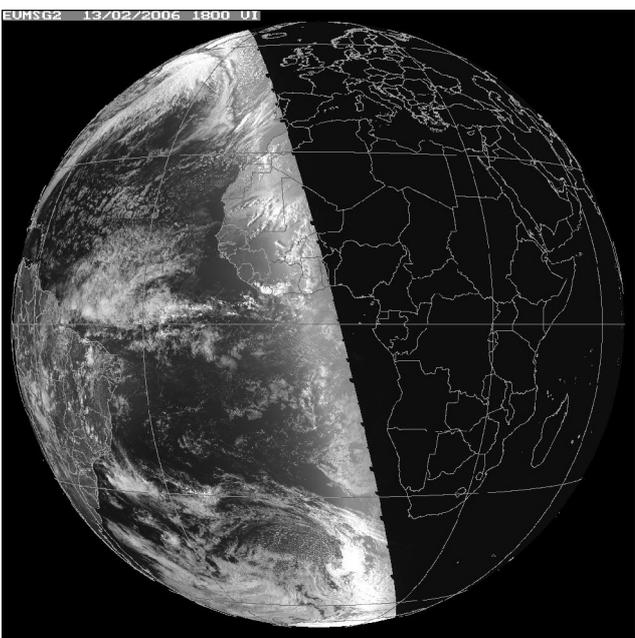
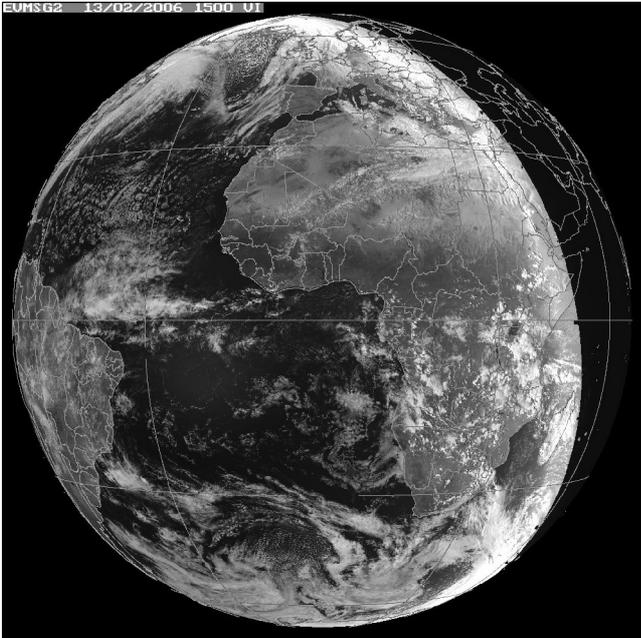
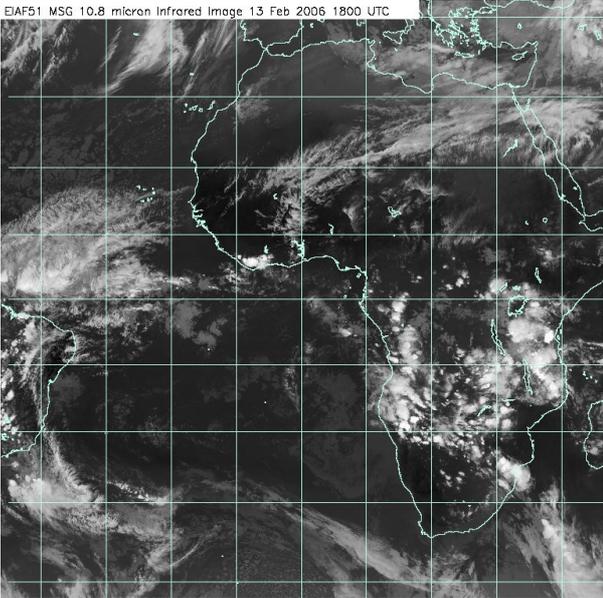
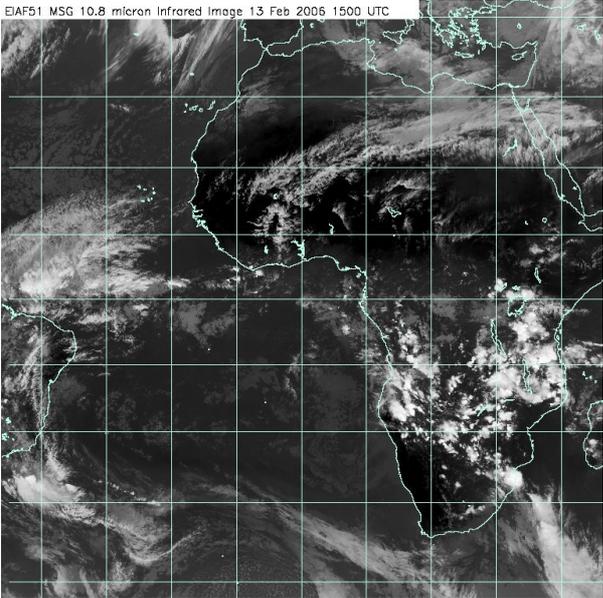
B172 Track 13-FEB-06

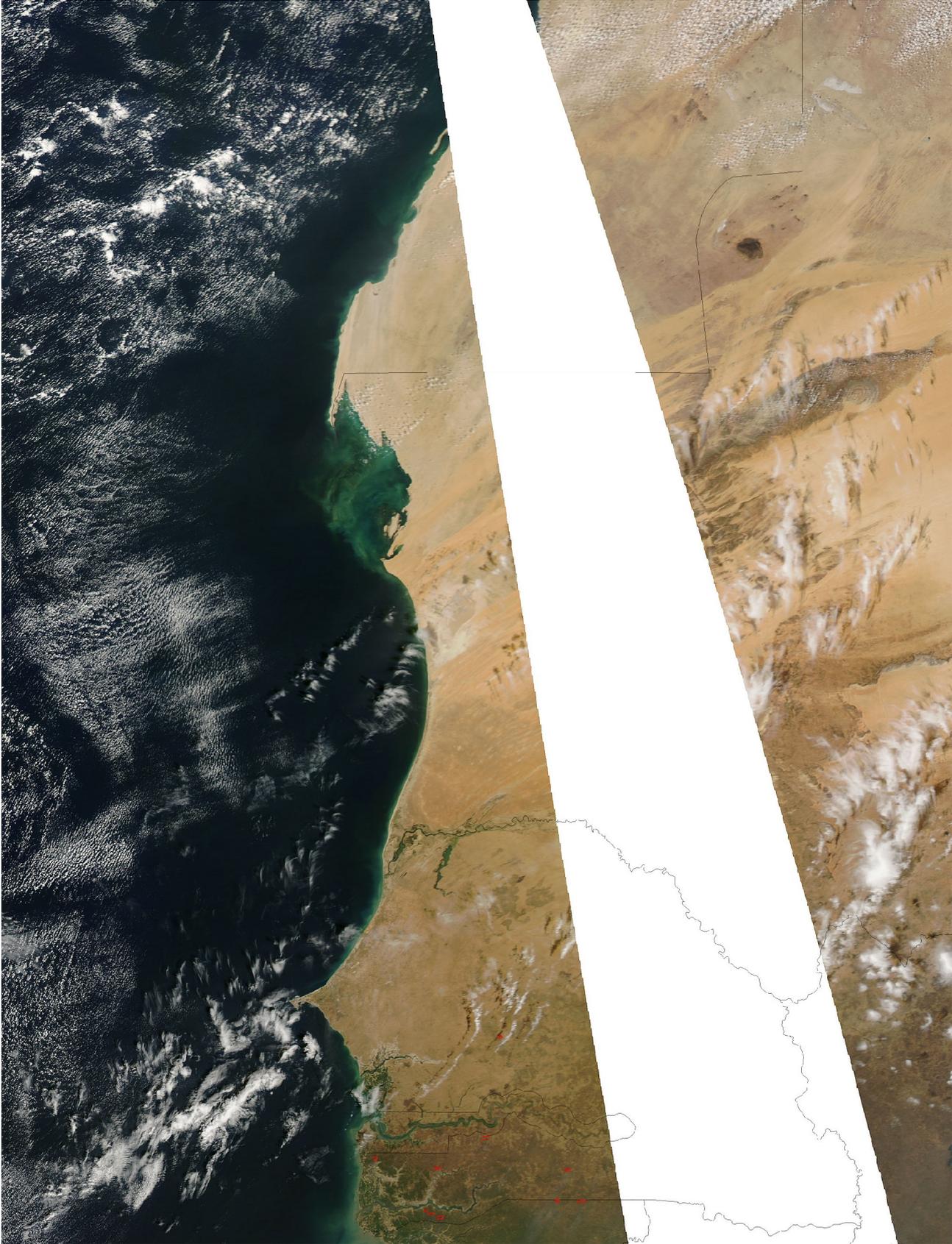


B172 13-FEB-06 15:16:28-17:10:44



DODO1 Summary Document



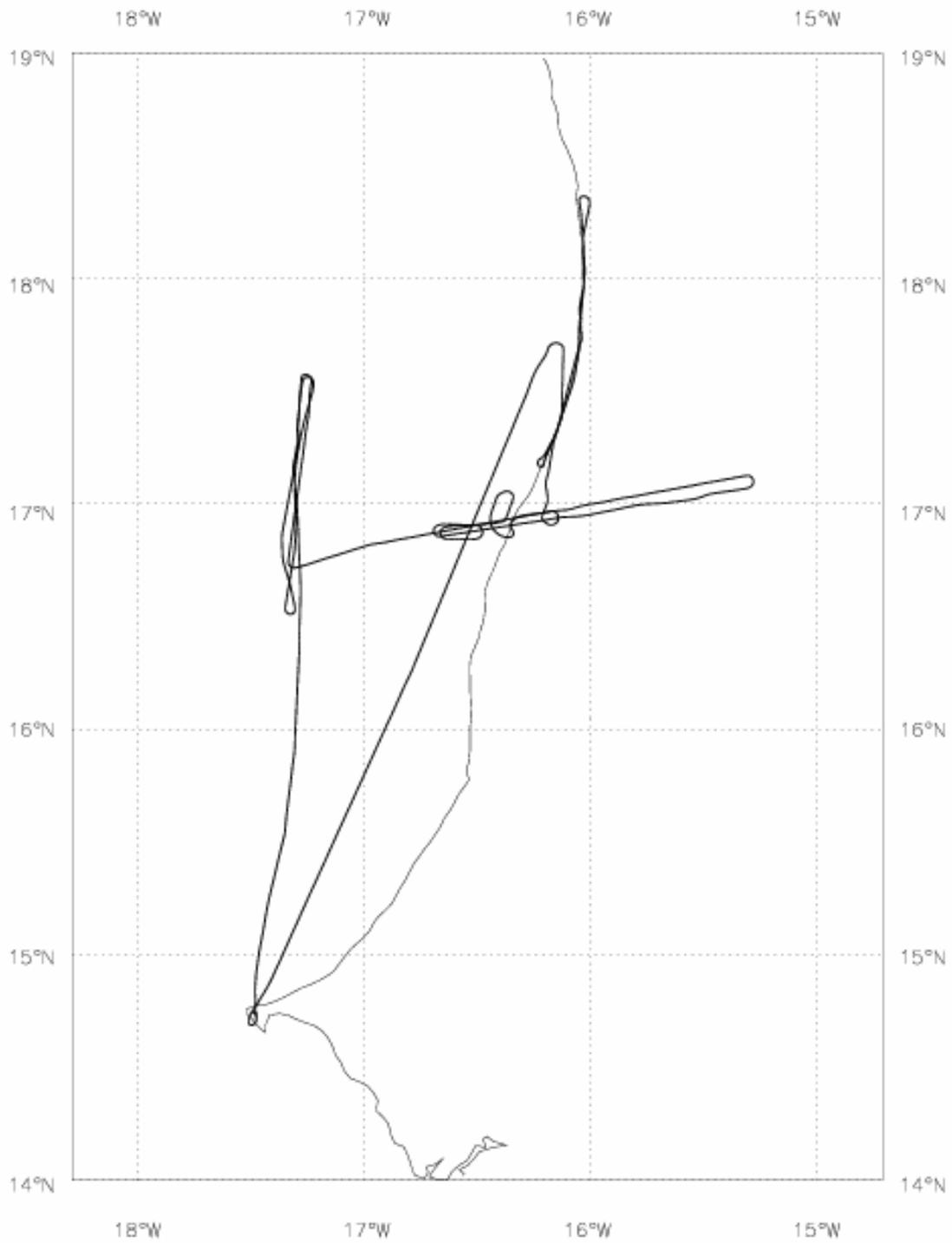


AQUA 500m

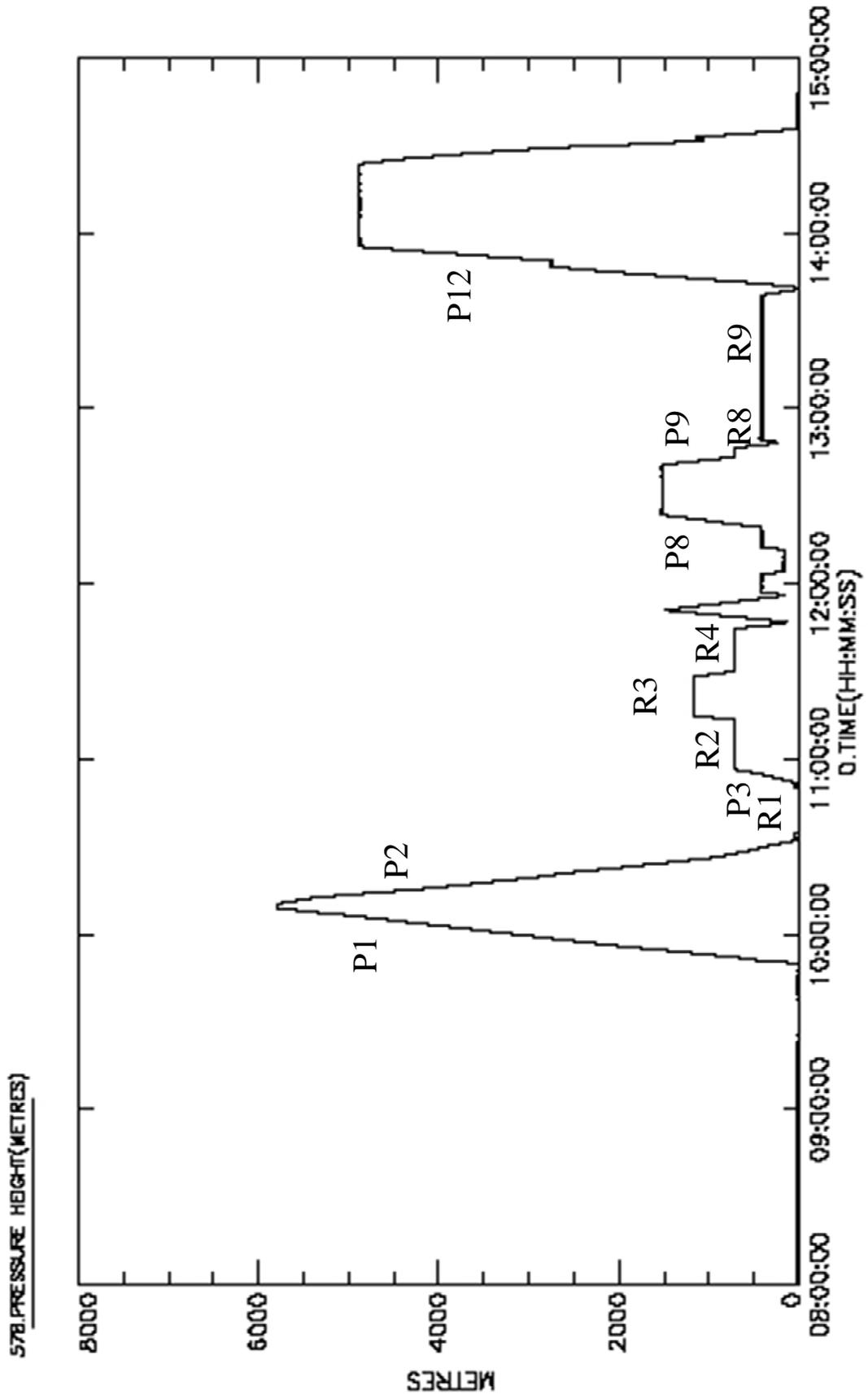
B173

Start Time	End Time	Event	Height (s)	Hdg	Comments
093630		taxy	0.03 kft	154	
093754		ASP	0.04 kft	105	From Dakar
094953		T/O	0.01 kft	353	From Dakar
094953	100857	Profile 1	0.93 - 19.0 kft	9	1000ft/min
095500		Tapes started	5.6 kft	8	
100908		sonde 1	19.0 kft	355	
101014	103251	Profile 2	19.0 - 50ft	355	
101306		qnh 1010	16.9 kft	356	
102631		descent change	3.0 kft	13	500 ft/min
103449	104950	Run 1	100 ft	191	
105131	105633	Profile 3	100 ft - 2.5 kft	354	
105621	111125	Run2	2.5 kft	4	
111308	111452	Profile 4	2.5 - 4.0 kft	184	
111452	112456	Run 3	4000 kft	184	
112753	113009	Profile 5	4.0 - 2.5 kft	67	@1000ft/min
113009	114353	Run 4	2.5 kft	67	
113113		changed tapes	2.5 kft	67	
113543		UFC changed to DFC	2.5 kft	73	
113745		ship track	2.5 kft	73	2500 ft
114427	114650	Profile 6.1	2.4 kft - 500ft	74	1000ft/min reduce to 500ft @ 1000ft
114650	115057	Profile 6.2	500ft - 5.0 kft	79	1000ft min-1 reduce to 500ft @ 1000ft
115057	115606	Profile 6.3	5.0 - 500ft	76	
115606	115709	Profile 6.4	0.5 - 1.5 kft	74	
120119	120602	Run 5	1.5kft	75	1500ft @ 120119
120309	120429	Profile 7	0.55 - 0.58 kft	262	
120429	121142	Run 6	500ft	266	
121236	121854	Run 6.2	1.5 kft	263	
121910	122333	Profile 8	1.5 - 5.0 kft	264	
124037	124330	Profile 9	5.0 - 2.5 kft	197	
124555	124625	Run 7	2.4 - 2.0 kft	66	
124625	124821	Profile 10	1.7 - 0.83 kft	80	
124835			0.84 kft	93	repositioning
125106	131808	Run 8	1.5 kft	17	
130433		tapes changed	1.3 kft	14	
132011	133713	Run 9	1.5 kft 189		
132351		Event	1.3 kft	173	16N57.64 16W 12.63 lots of aerosol
133858	134103	Profile 11	1.2 - 50 ft	6	
134251	134837	Profile 12	1.9 - 9.0 kft	21	started at minima
135019	135525	Profile 12	9.0 - 16.0 kft	202	
135532		sonde 2	16.0 kft	208	
135834		Event	16.0 kft	208	End of science
142402		asp	15.7 kft	209	asp closed
143615		Land	0.08 kft	352	14:36:15
144622		final position gps	0.08 kft	337	14'44.56N 17'29.30W

B173 Track 14-FEB-06



B173 14-FEB-06 07:56:03-14:48:08

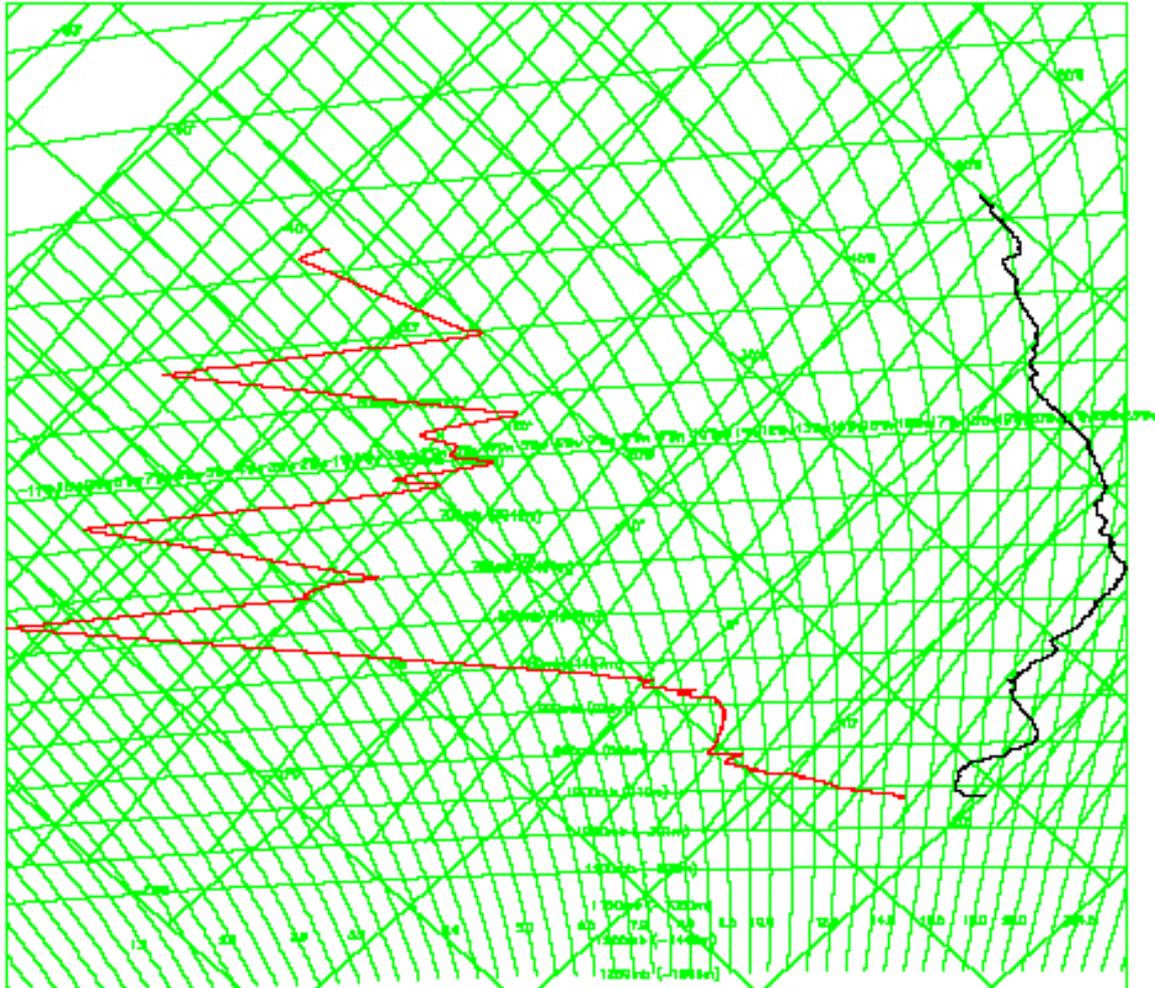


P1

B173 14-FEB-06 09:49:53-10:08:57

520.DKICED TRUE TEMP(DEG K)

528.DEW POINT(DEG K)

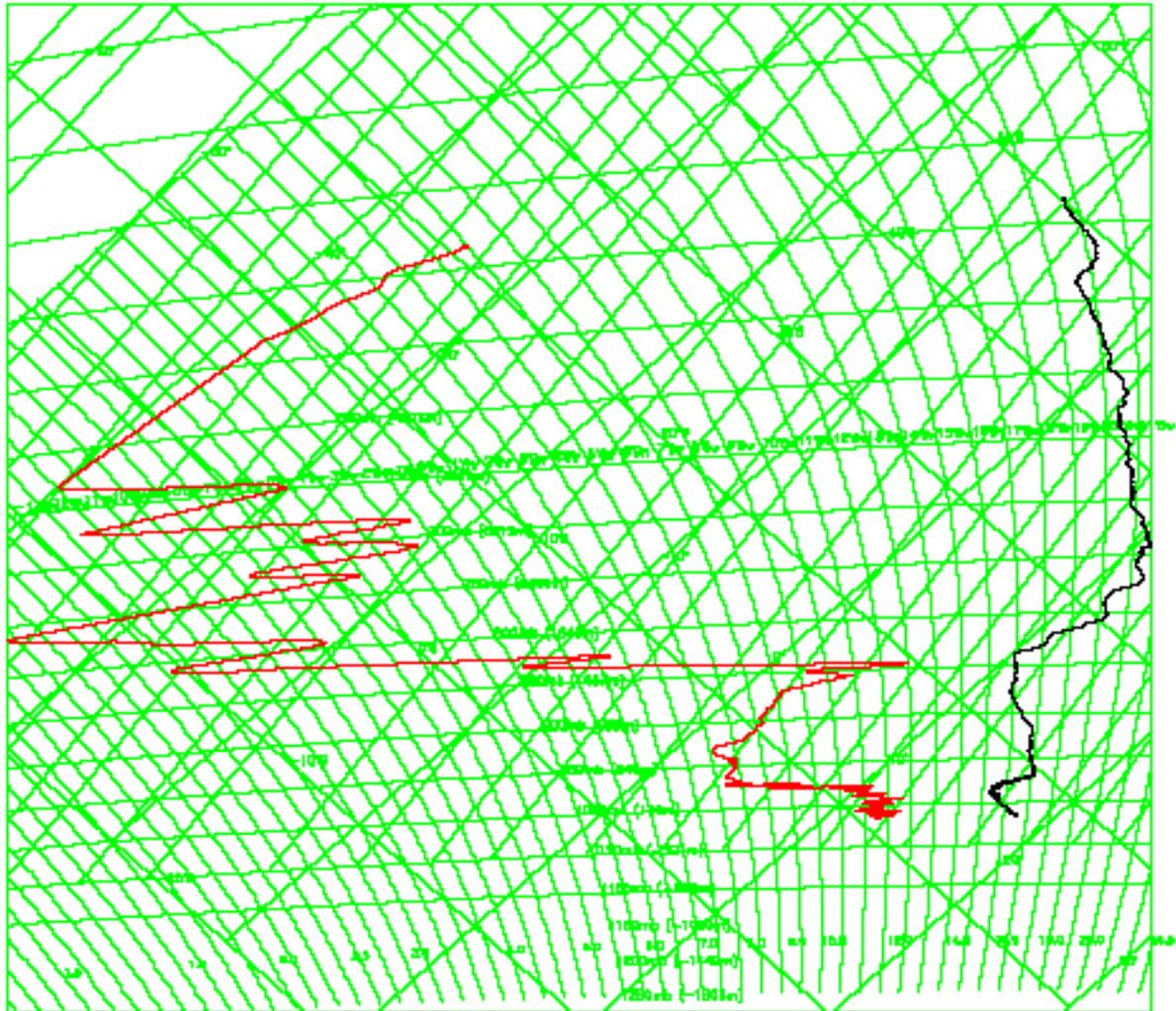


P2

B173 14-FEB-06 10:10:14-10:32:51

520.DKICED TRUE TEMP(DEG K)

528.DEW POINT(DEG K)

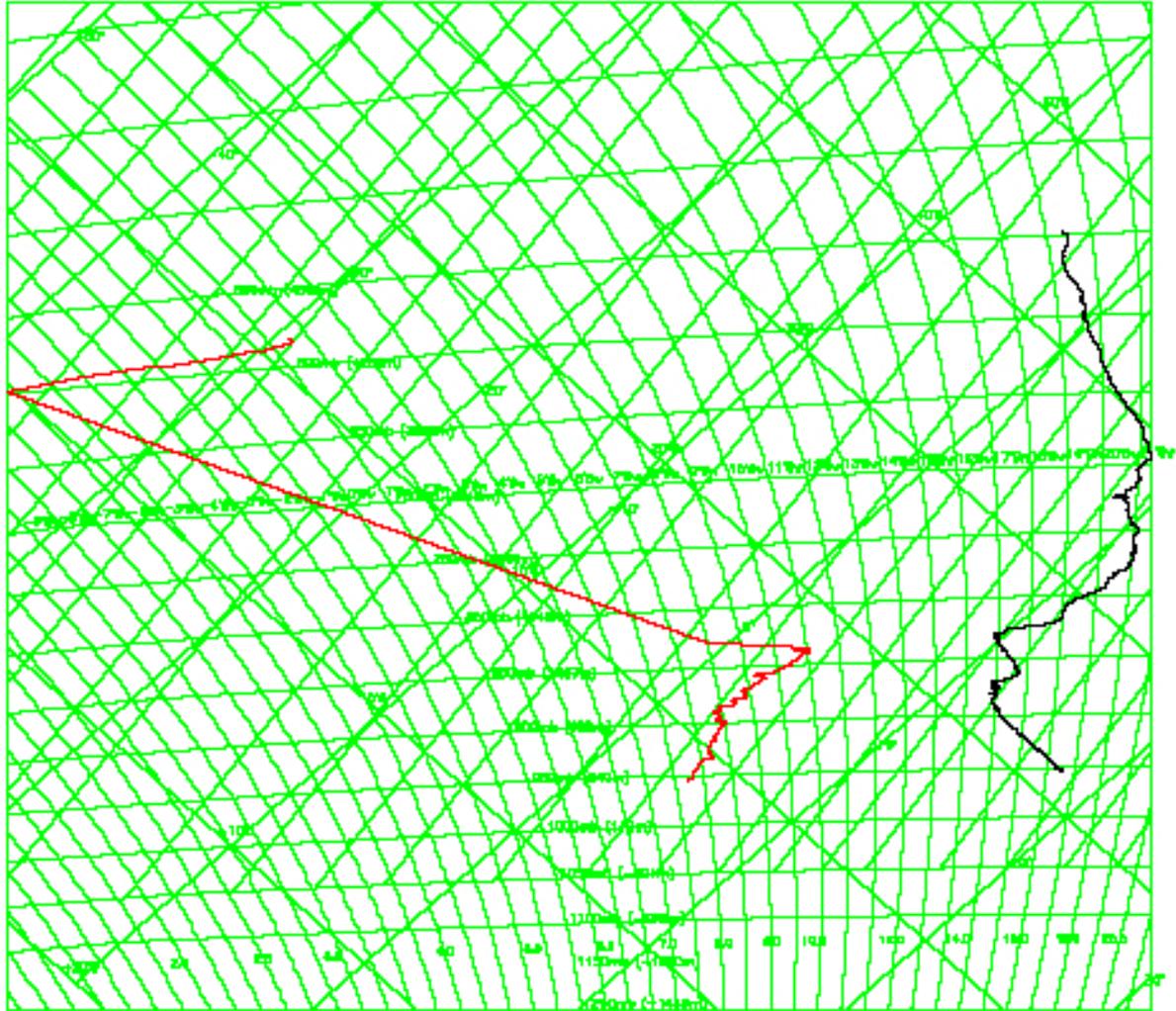


P12

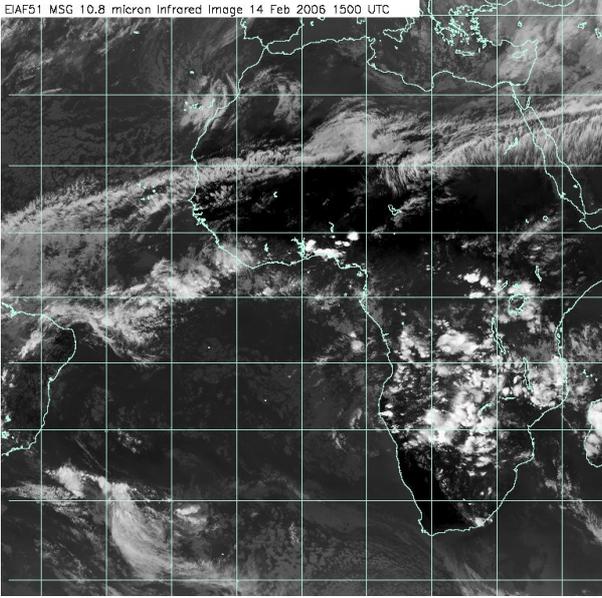
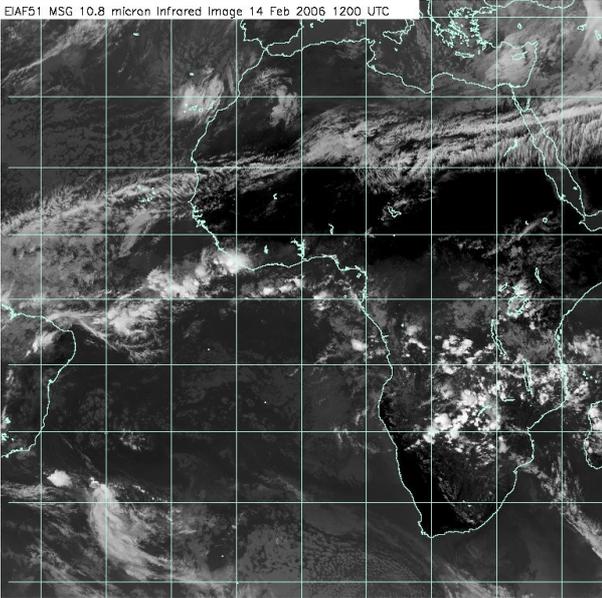
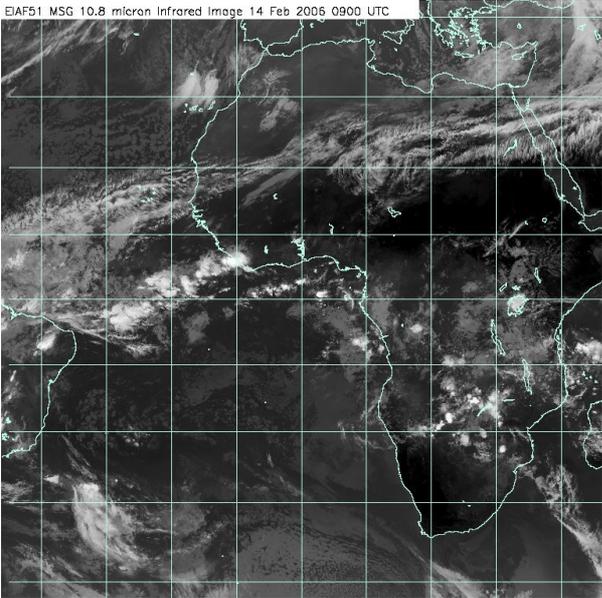
B173 14-FEB-06 13:42:51-13:55:25

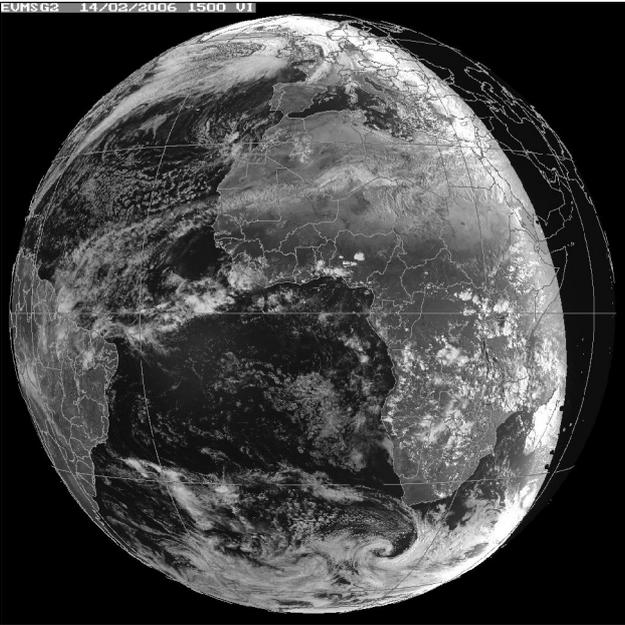
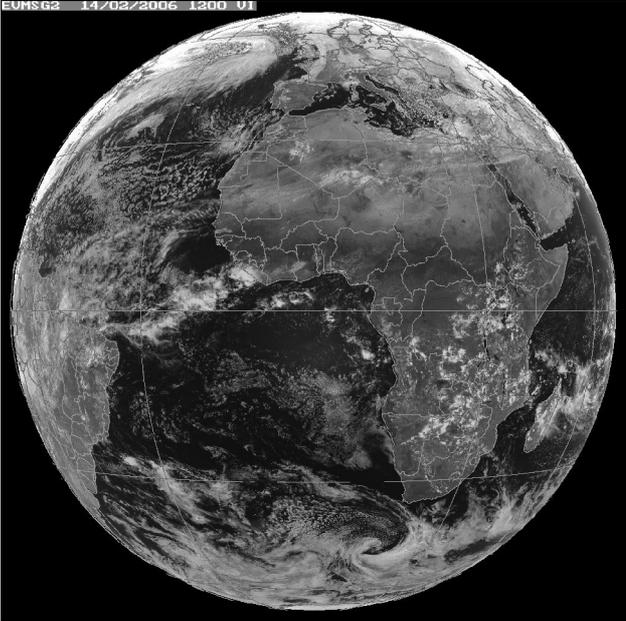
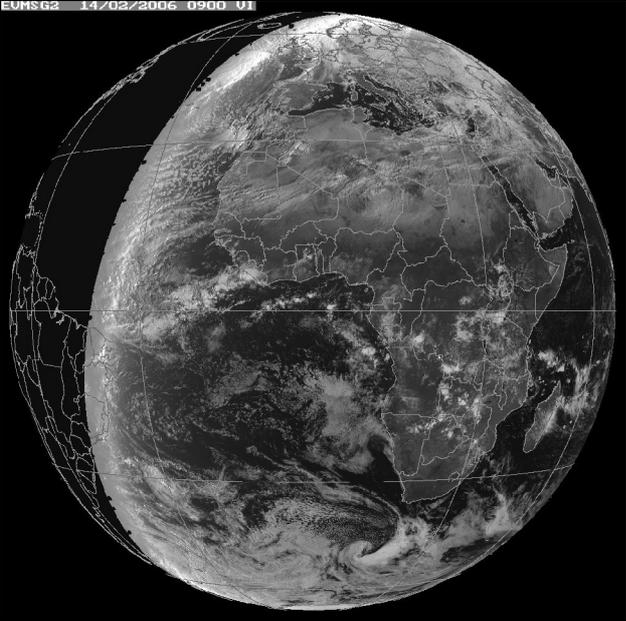
520.DERIVED TRUE TEMP(DEG K)

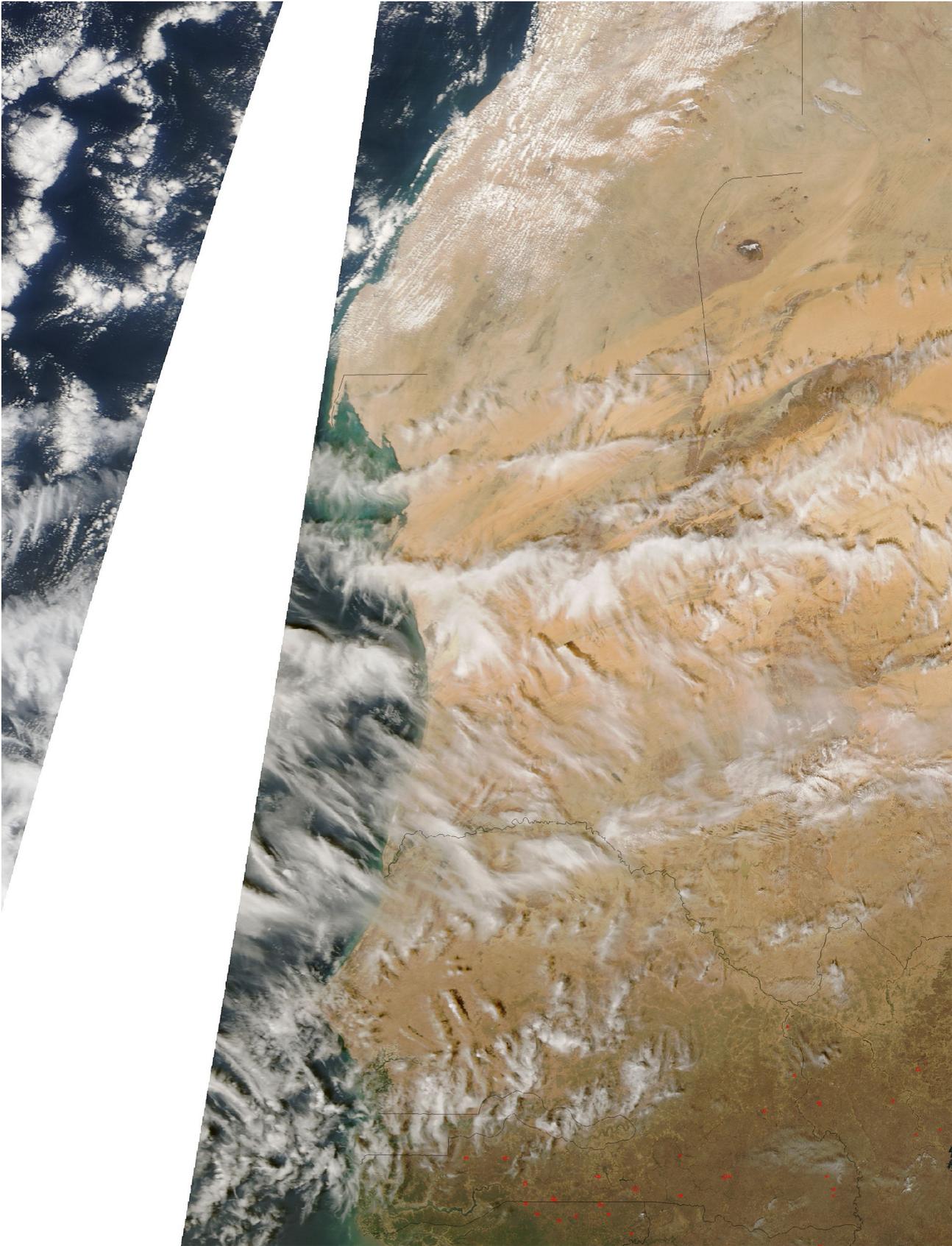
528.DEW POINT(DEG K)



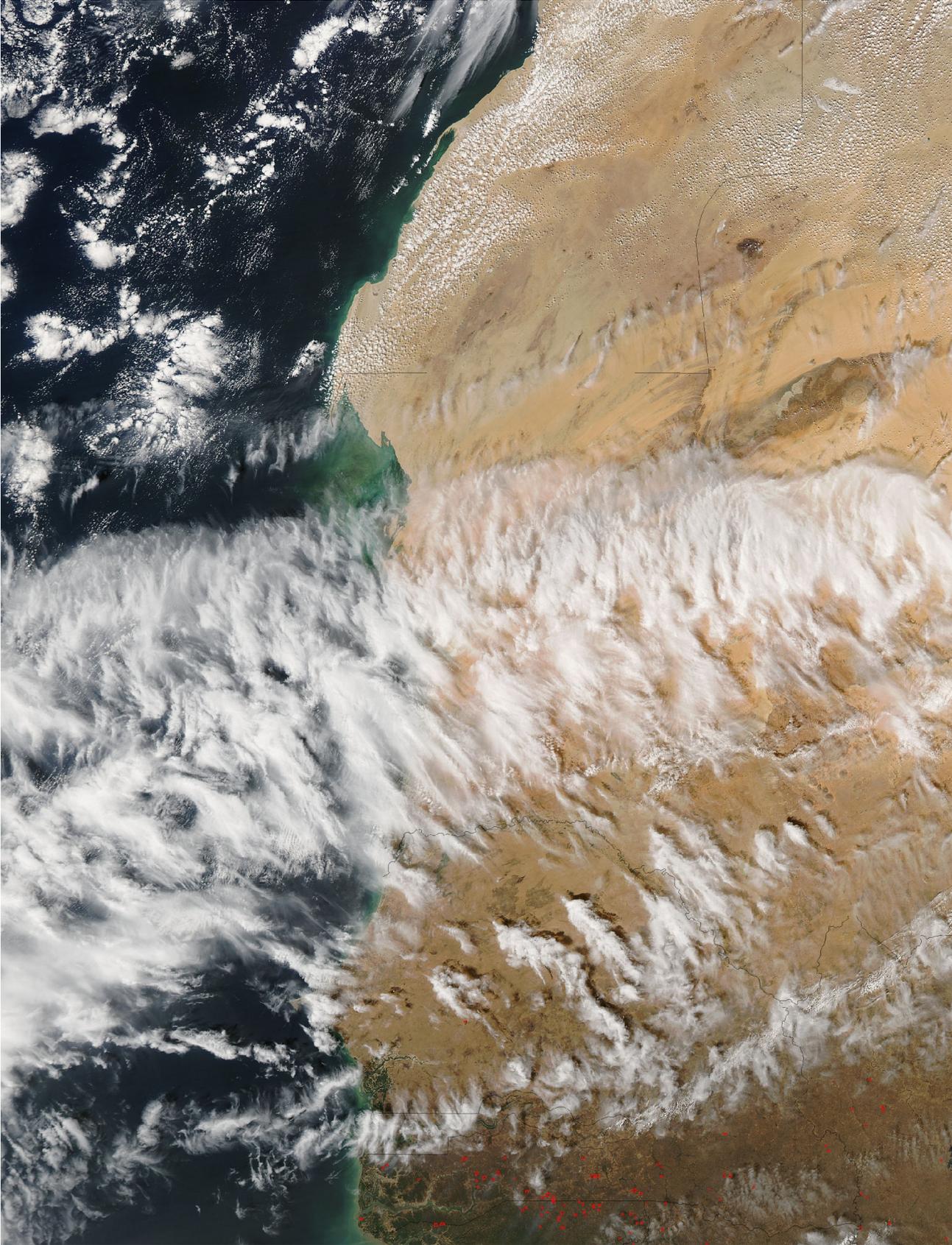
DODO1 Summary Document



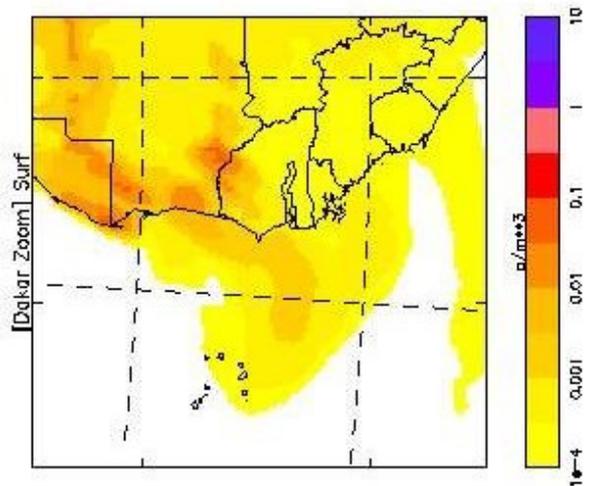
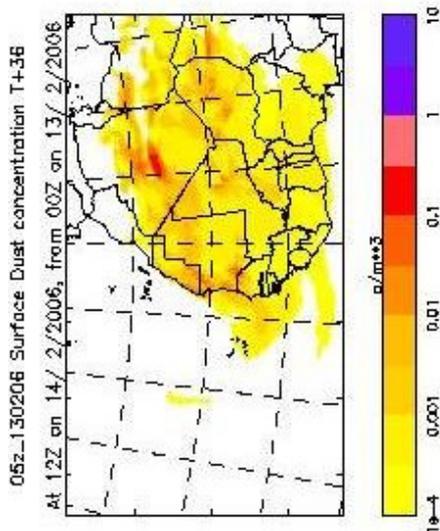
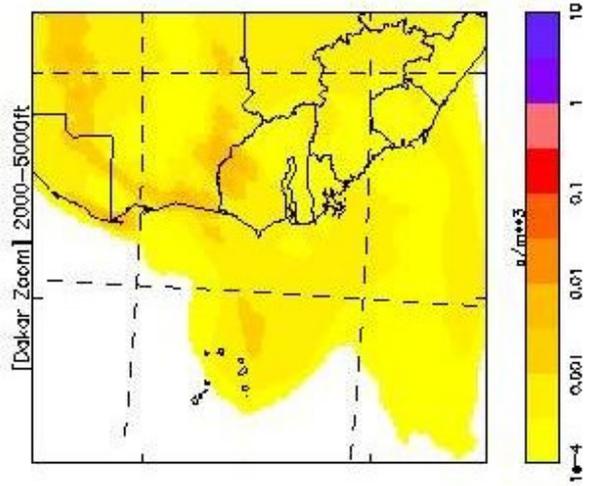
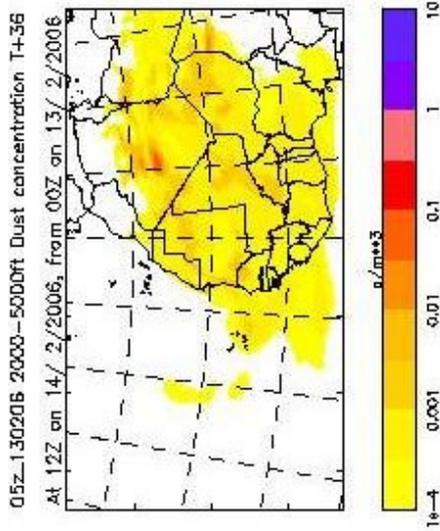
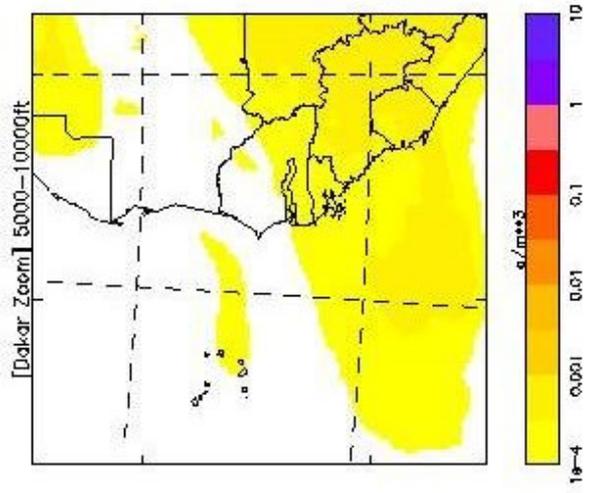
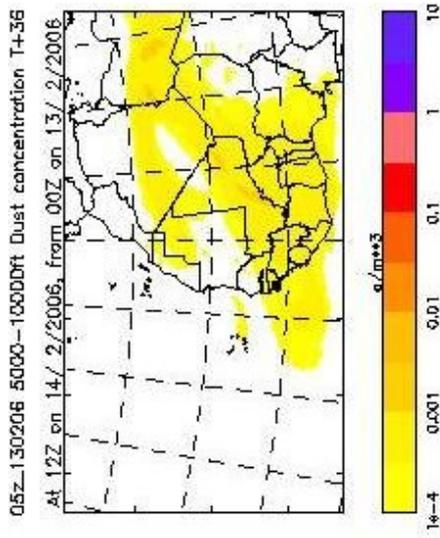




TERRA 500m



AQUA 500m

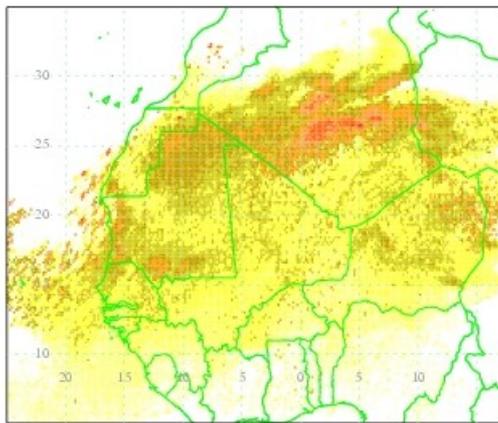


NAME version 814

Sahara forecast

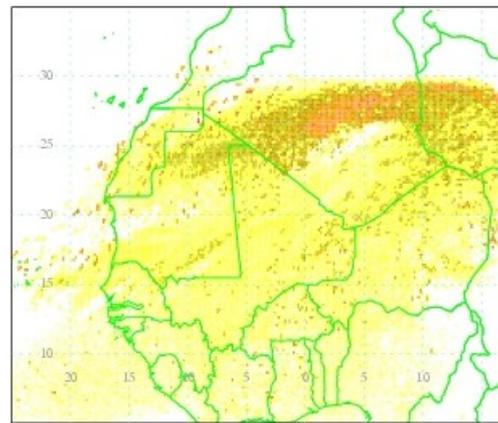
Valid at 1200UTC 14/02/2006

From 2000 – 5000 ft agl Air concentration



Maximum value = 2.05e-02 g/m3
1.00e-07 1.00e-05 1.00e-03 1.00e-01 1.00e+01

From 5000 – 10000 ft agl Air concentration



Maximum value = 2.32e-02 g/m3
1.00e-07 1.00e-05 1.00e-03 1.00e-01 1.00e+01

Start of release: 0000UTC 14/01/2006
End of release: 0000UTC_07/01/1957
Release rate: multiple sources
Release location: multiple sources
Release heights : ***** to 0m agl

Pollutant: PM10_MINERAL
Met data: Mesoscale
Run time: 0913UTC 13/02/2006

Met Office (GMR) Crown copyright

B174

Mission Scientist's De-brief sheet (S.R. Osborne)

Flight B174

15th February 2006

Weather conditions:

Surface flow from NNE, advection of dust plume off the coast to the SSW. Still cirrus to the north of Dakar and medium level cloud over Dakar itself. Similar cloud to the south of Dakar, but some clear slots and more of these forecast during the day.

Summary of the flight:

A very successful flight DODO was conducted to sample the dust plume over the ocean that was first sampled nearer the sources in B173 i.e. after 24 hrs of further ageing. Taken together B173 and B174 will provide an excellent case study of dust short-scale evolution over the ocean and hence help satisfy three(?) of DODO's aims.

After take-off, an initial failed attempt was made to hunt for dust near the surface sources to the north of Dakar (like in B173). However, we found winds had died down from yesterday and visibility had increased to 6-10 km. Only light loadings of dust were found as we got as far as 18°N, 16°W before turning south. A 15 min SLR was made going south at 4500ft within light dust conditions (CCN, filters) before climbing to FL220 and zooming south at high speed to locate the B173 dust plume based on the B173 winds.

A profile descent was made into the new area from FL220 to 50ft. Multiple biomass burning aerosol layers were identified with tops at FL125. A peak in the PCASP concentration of 2600/cc was found at ~3600ft. A low-level layer of dust was successfully found below 2300ft down to the surface. A clear slot was at ~2600ft. A run was made roughly across-plume at 500ft. PCASP concs were ~400/cc. The PCASP size distribution showed less large particles than in B173 presumably due to sedimentation. A reciprocal run was made at 100ft still within the dust but low enough to enable radiation measurements to be made (some cirrus above though- use the upward facing camera to help). Wind speeds were less than 10 m/sec with little white-capping. The majority of aerosol at this height was thought to be dust. Green scatter coeffs were $\sim 300 \times 10^{-6} \text{ m}^{-1}$. A good plume structure was identified during both these runs so that a series of zig-zags was made at 100ft on headings of ~050° and ~290° working "upstream". The plume was transected during each of these four runs. Cloud conditions improved during this low level work and some decent radiation measurements should be possible. A short period (~6 min) was made with ARIES and SWS looking in the nadir at 100ft; otherwise all views were true zenith. CO levels were slightly higher in the dust layer compared to the clear slot just above it. A final profile was carried out from 100ft to FL130 where multiple (at least three) biomass burning aerosol layers were seen with both instruments and the naked eye.

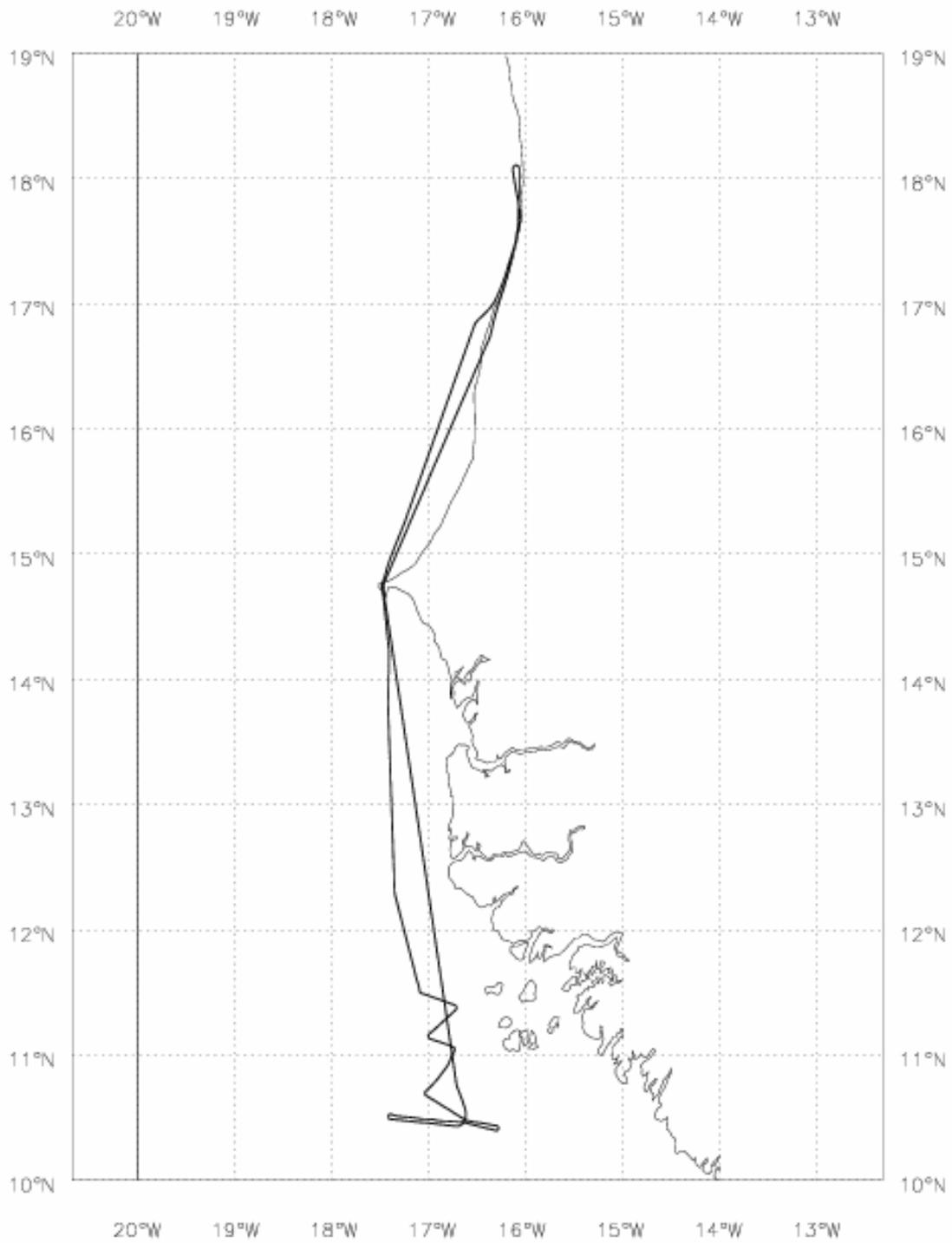
Sonde drops:

- (1) 100156 z on hdg 021 to the north of Dakar (top of P1 at FL130)
- (2) 121328 z on hdg 172 profiling into the operating area (during P6 at FL144)
- (3) 135736 z on hdg 353 profiling out of the operating area (top of P8 at FL130)

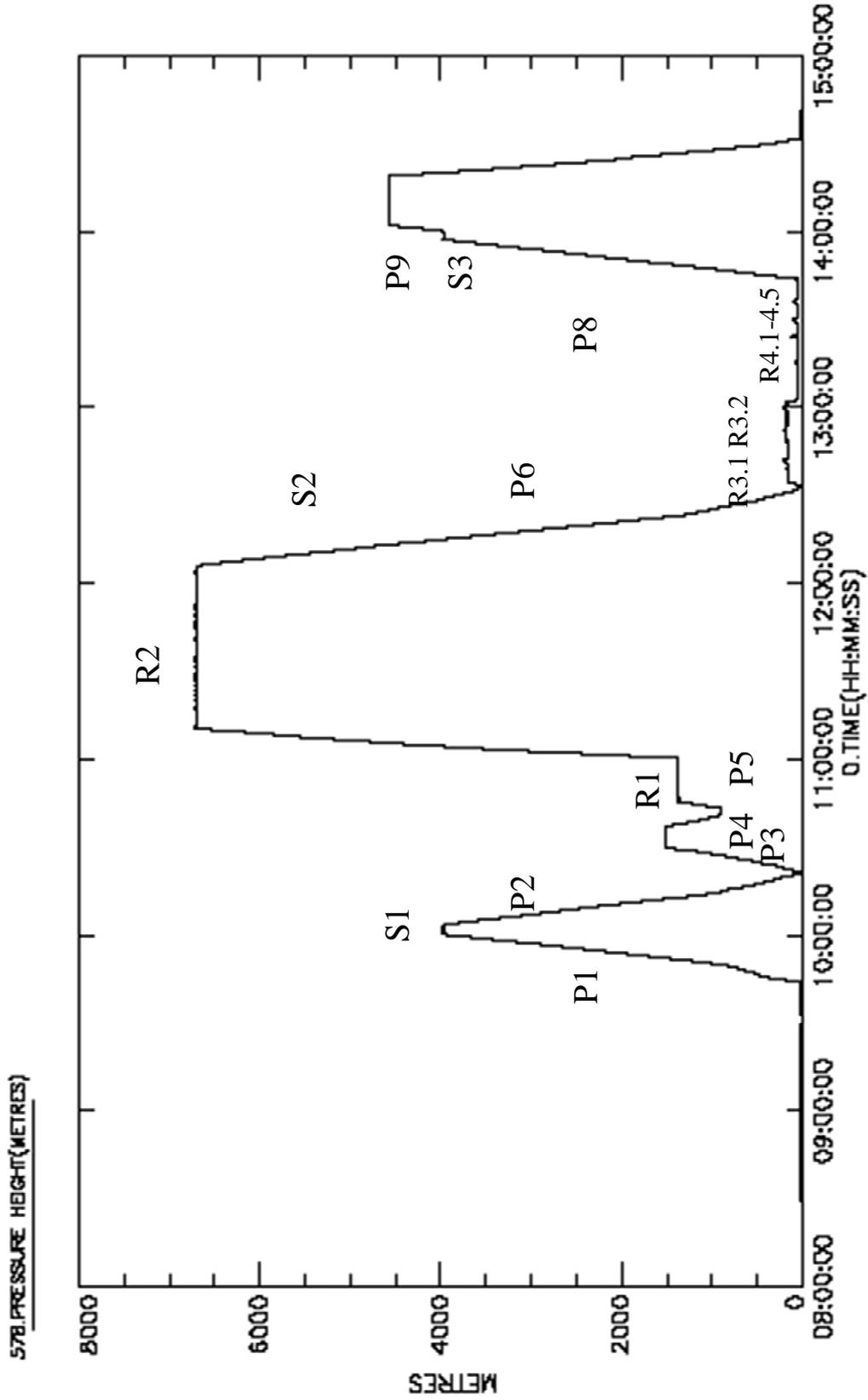
DODO1 Summary Document

Start Time	End Time	Event	Height (s)	Hdg	Comments
093058		inu to nav	0.04 kft	343	
093104		engine start	0.04 kft	343	
093319		power change	0.04 kft	343	
093509		tapes start	0.04 kft	343	
093518		taxy start	0.04 kft	343	
093653		asp open	0.05 kft	106	
094400		T/O	0.03 kft	353	P1 true start
094417	100011	Profile 1	0.23 - 13.0 kft	354	
094923		nevzorov zero	2.7 kft	27	
095023		Profile 1	3.3 kft	27	1000ft/min roc
100157		sonde 1	13.0 kft	21	launch
100324	102118	Profile 2	13.0 - -.01 kft	21	
102118	102945	Profile 3	-.01 - 4.9 kft	47	
103704	104102	Profile 4	5.0 - 3.0 kft	5	
103841		Profile 4	4.0 kft	3	rod 500ft/min
104303	104532	Profile 5	3.0 - 4.5 kft	163	
104533	110016	Run 1	4.5 kft	164	
111038	120553	Run 2	22.0 kft	216	
120554	123323	Profile 6	22.0 - 0.07 kft	177	qnh 1013
121329		sonde 2	14.7 kft	172	launch
123323	123425	Profile 7	0.07 - 0.50 kft	279	qnh 1013
123425	124011	Run 3.1	0.50 - 0.53 kft	277	
124225	130004	Run 3.2	0.55 - 0.62 kft	93	
130241	131459	Run 4.1	0.17 - 0.16 kft	282	
131612	132339	Run 4.2	0.15 - 0.20 kft	47	
132457	132906	Run 4.3	0.14 - 0.25 kft	291	
133032	133536	Run 4.4	0.17 - 0.18 kft	52	
133653	134305	Run 4.5	0.18 kft	290	
134347	135718	Profile 8	0.16 - 13.0 kft	345	
135734		sonde 3	13.0 kft	353	launch
135954	140213	Profile 9	13.0 - 15.0 kft	352	
143154		Land	0.08 kft	354	at Dakar
143927		standstill	0.10 kft	335	14'44.60N. 17'29.45W

B174 Track 15-FEB-06



B174 15-FEB-06 08:29:36-14:41:17

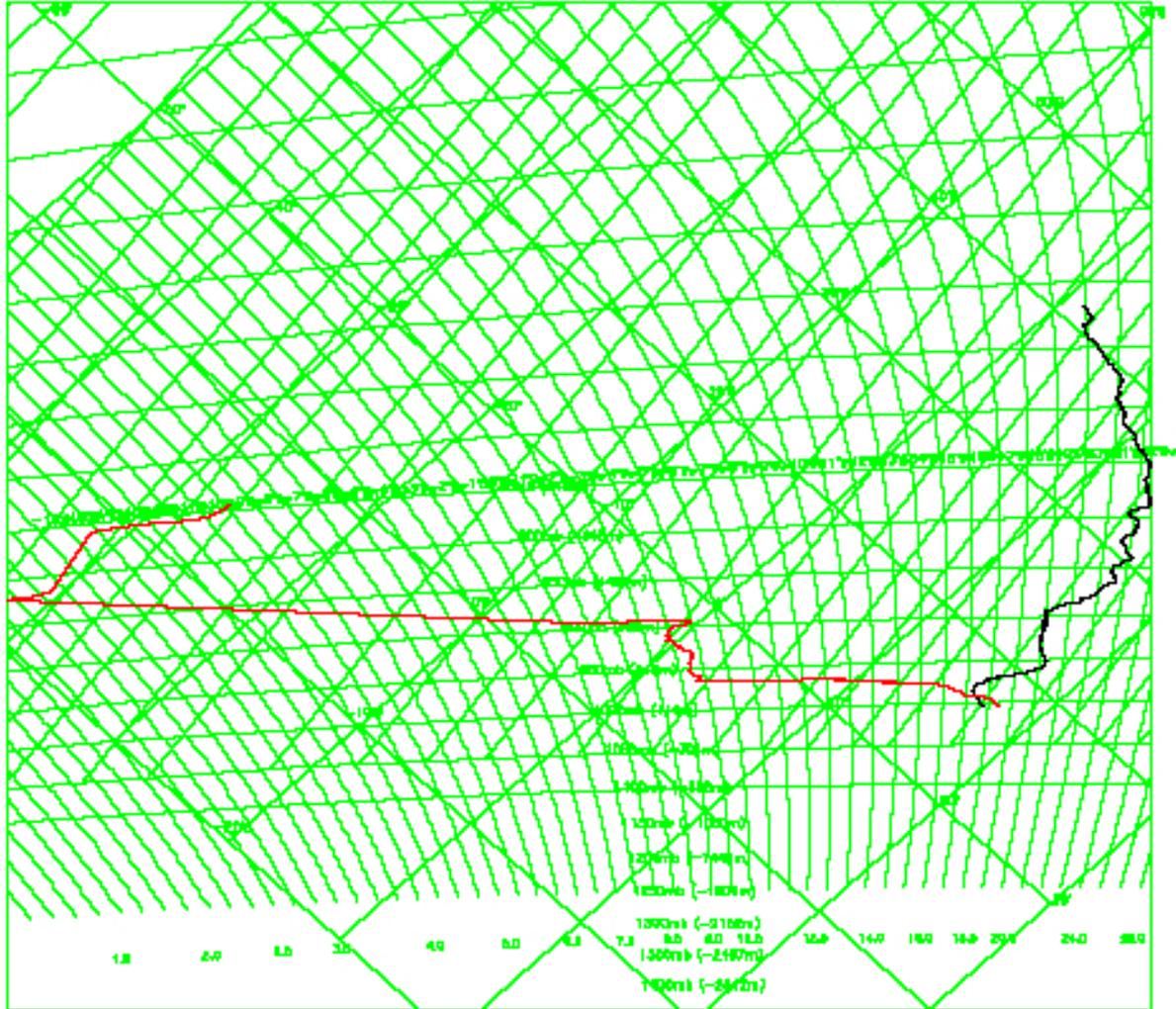


P1

B174 15-FEB-06 09:44:17-10:00:11

520.DEGCED TRUE TEMP(DEG K)

528.DEW POINT(DEG K)

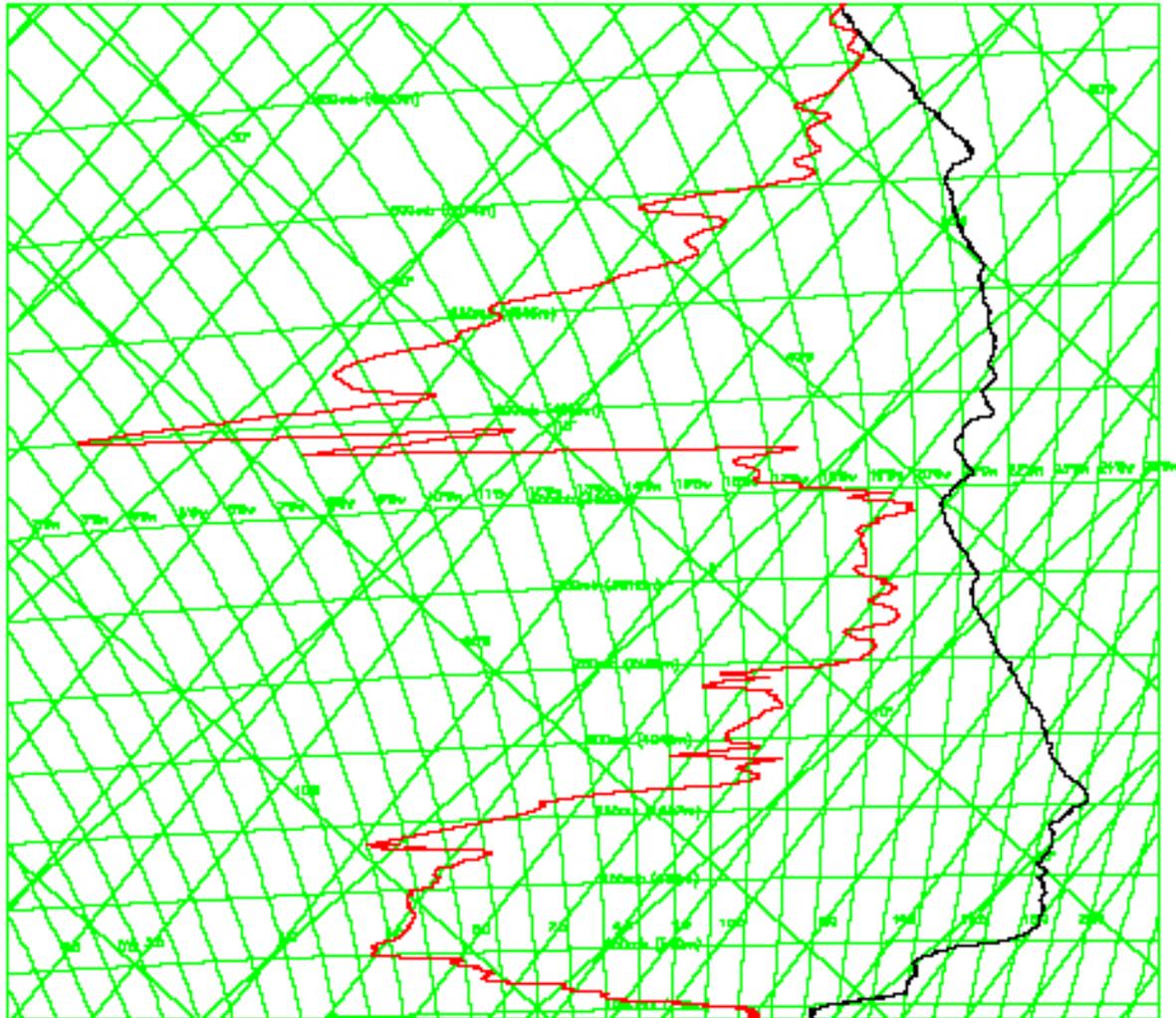


P6

B174 15-FEB-06 12:05:54-12:33:23

520.DKICED TRUE TEMP(DEG K)

528.DEW POINT(DEG K)

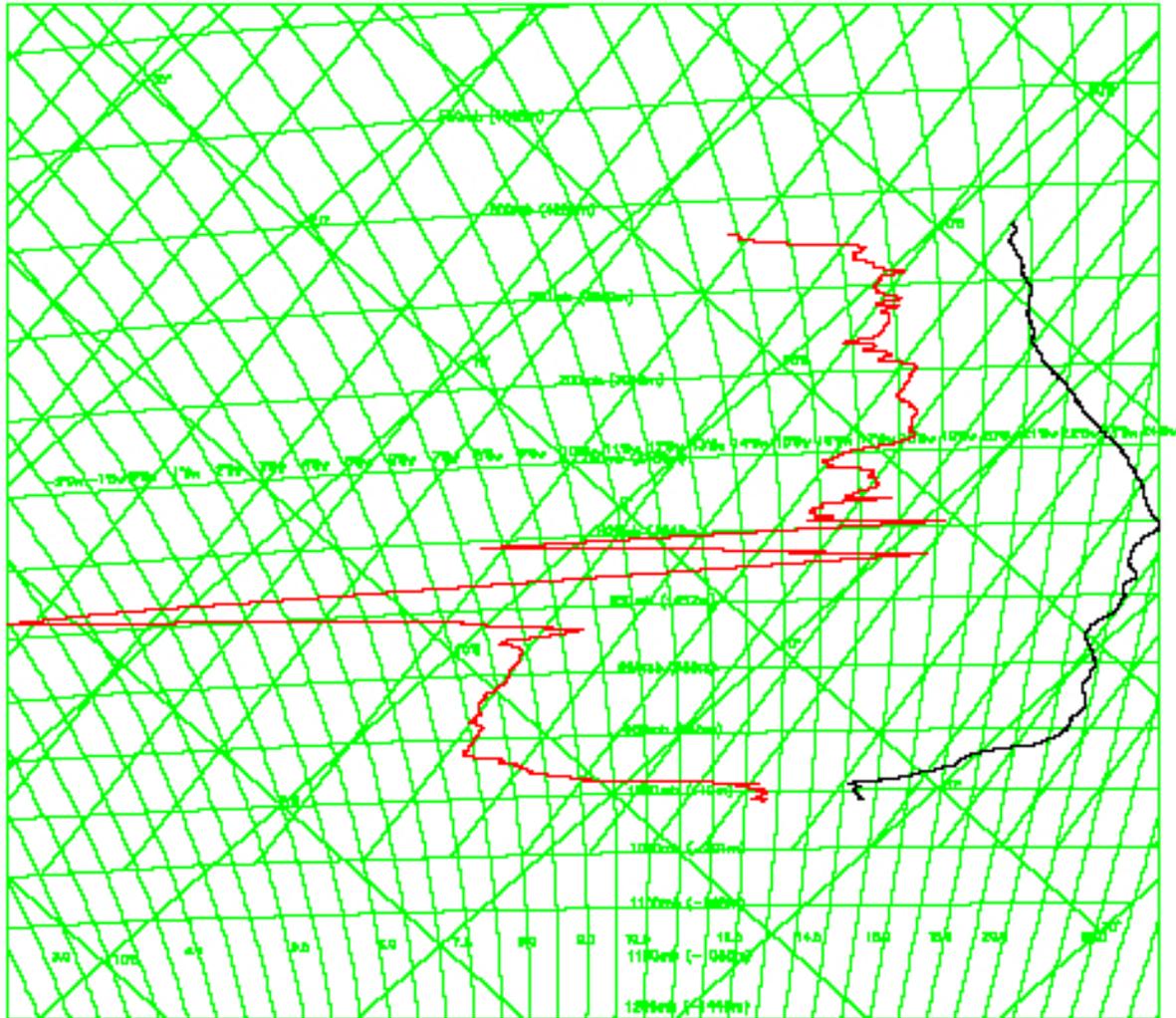


P8

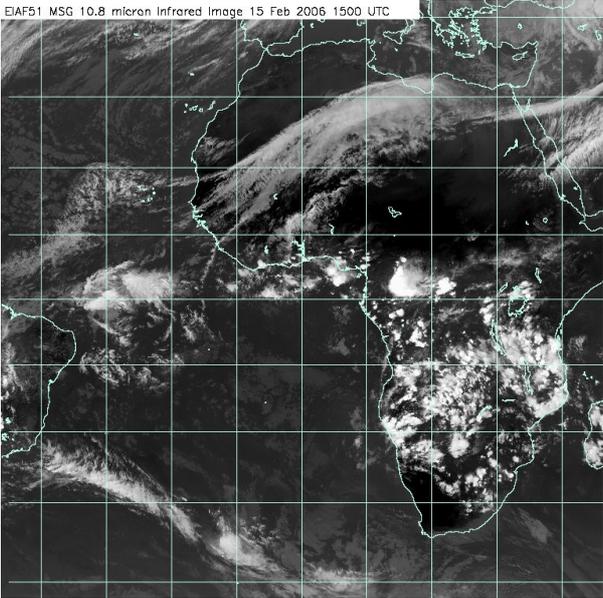
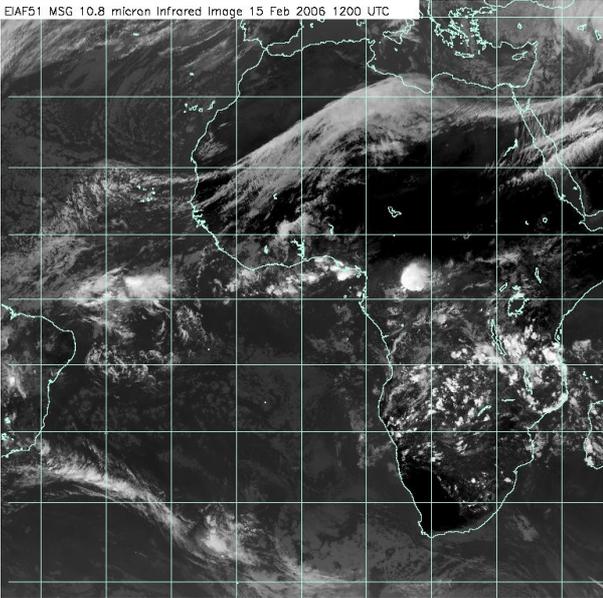
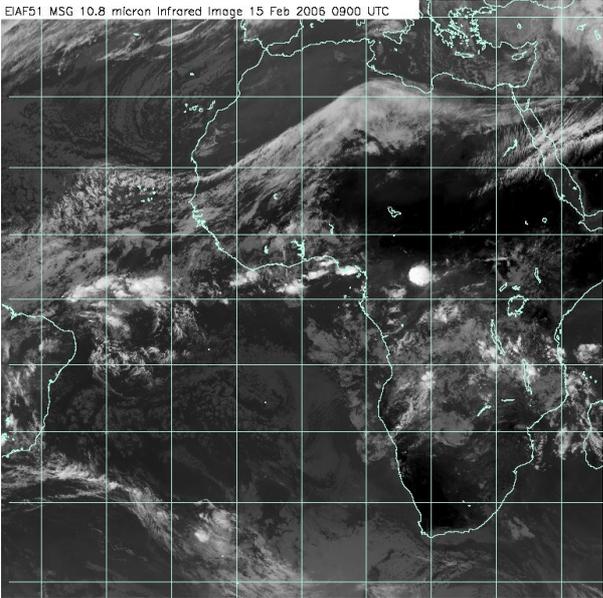
B174 15-FEB-06 13:43:47-13:57:18

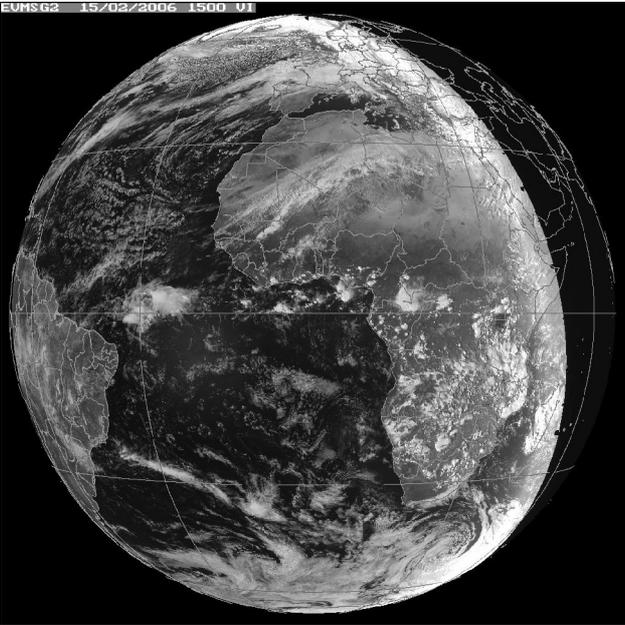
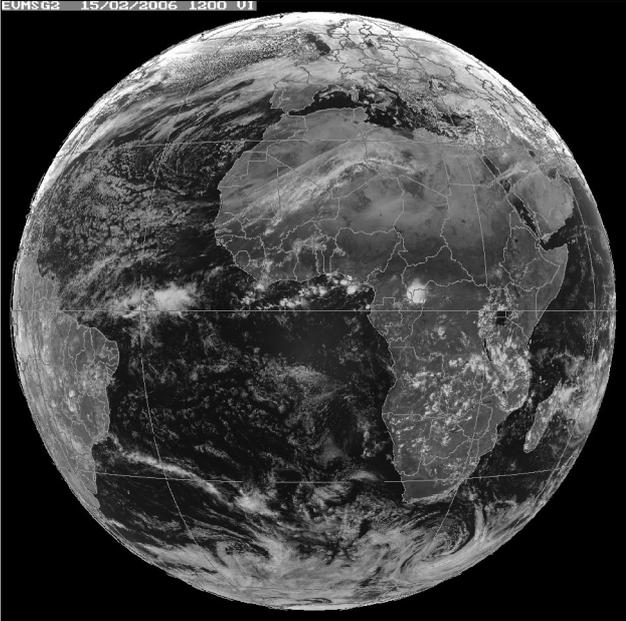
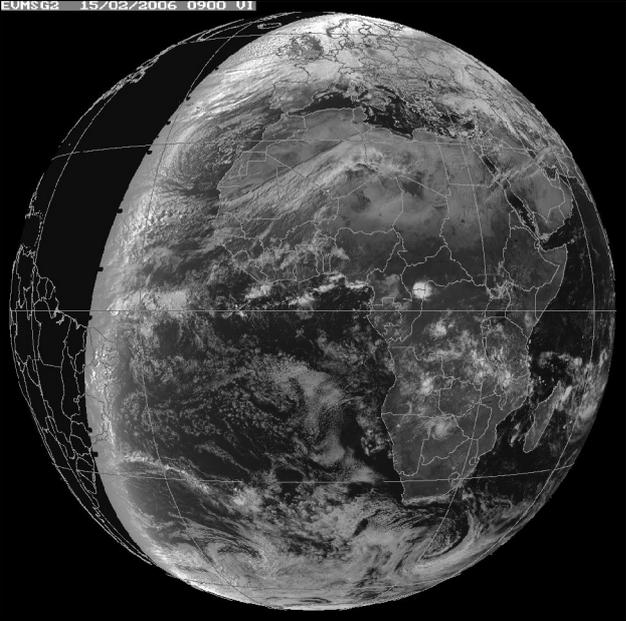
520.DKICED TRUE TEMP(DEG K)

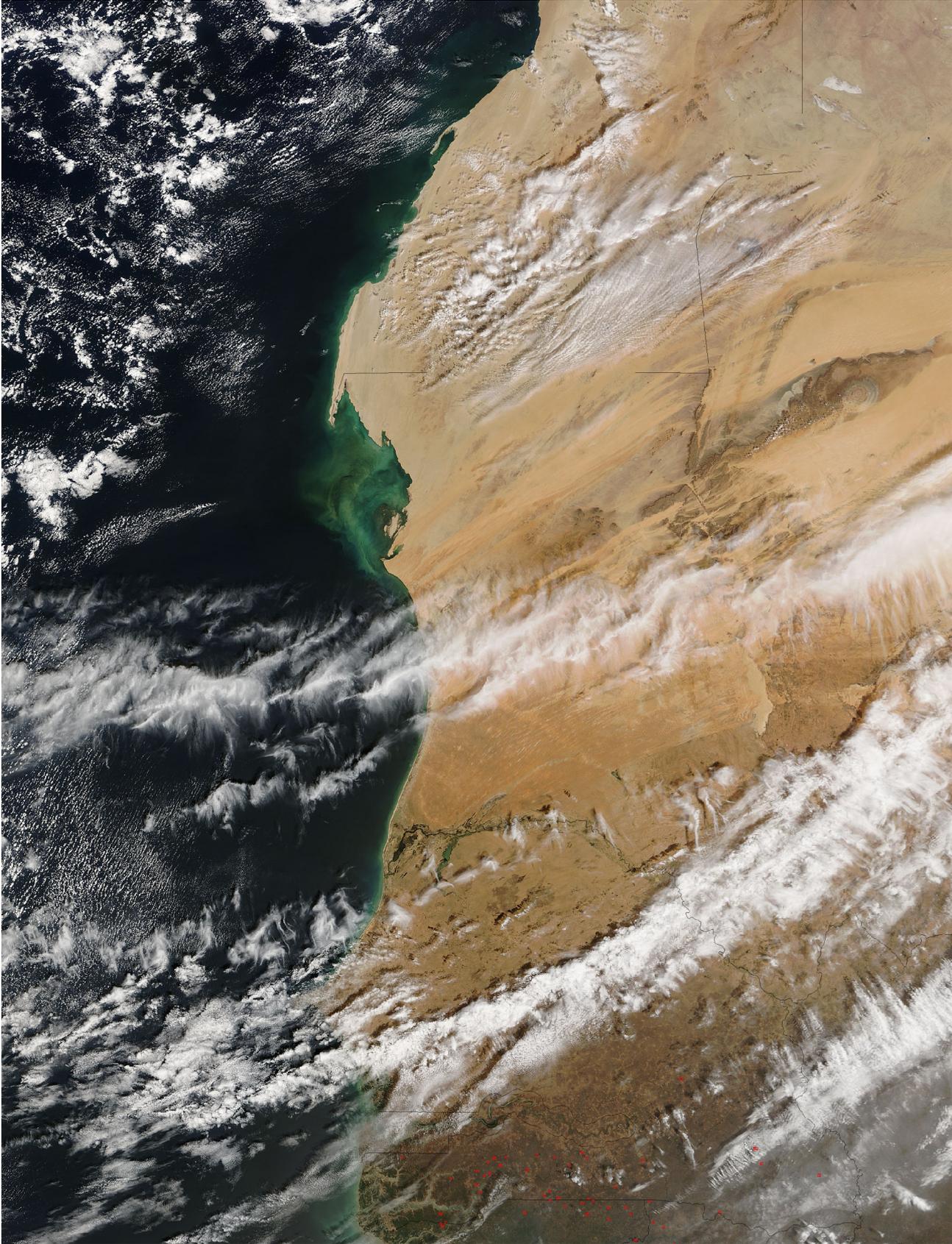
528.DEW POINT(DEG K)



DODO1 Summary Document





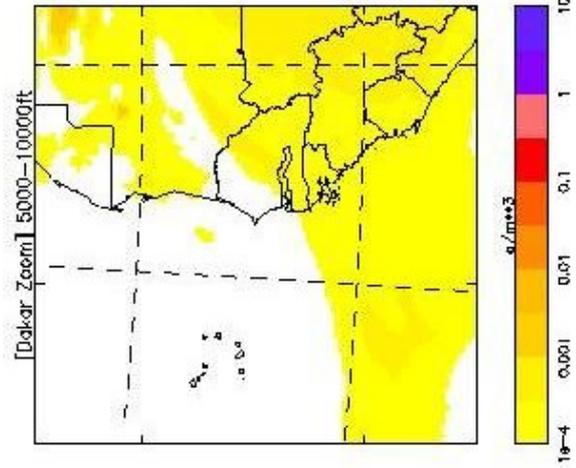
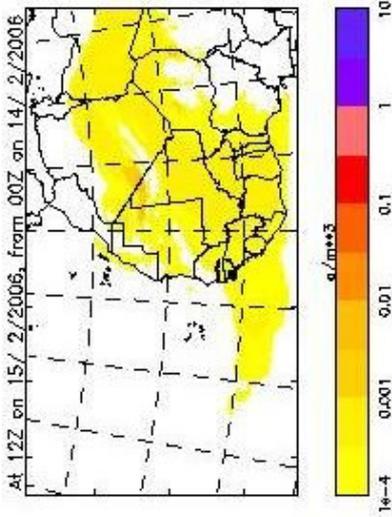


TERRA 500m

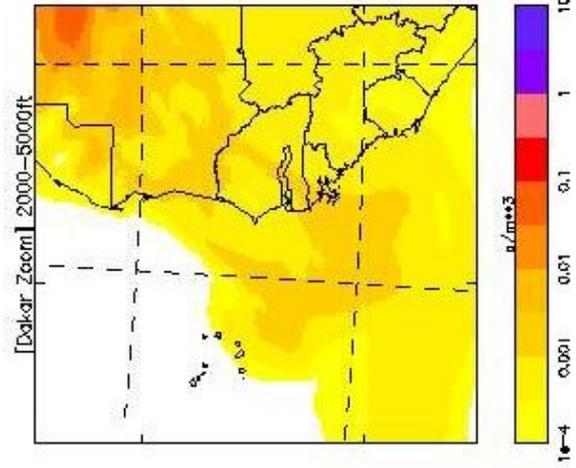
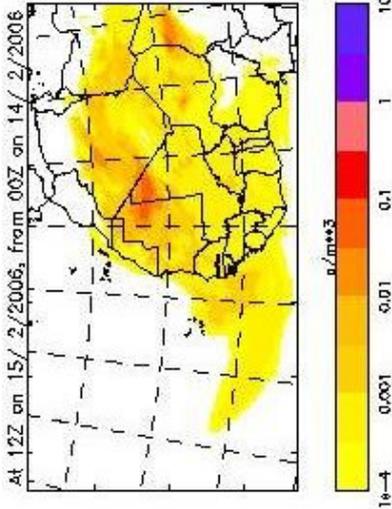


AQUA 500m

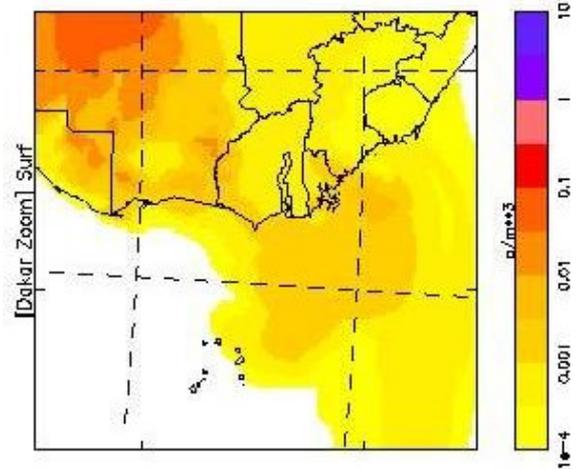
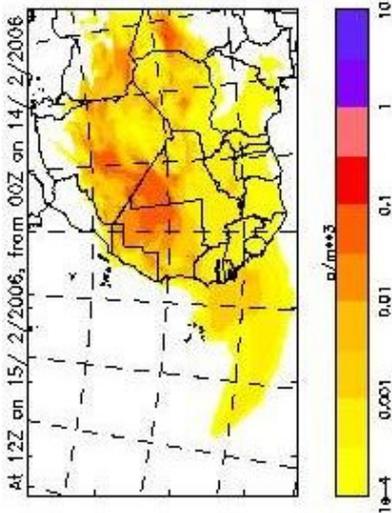
05z-140206 5000-10000ft Dust concentration T+36



05z-140206 2000-5000ft Dust concentration T+36



05z-140206 Surface Dust concentration T+36



B175Flight Number: B175Date: 16th February 2006Sortie Objectives: In-situ sampling of Saharan dust over the land. Validation (or not) of CAMM large dust storm. Radiative effect of dust over land.Operating area: Land areas north of Dakar and in northern Mauritania towards Western Sahara.Weather: Mostly clear skies.Flight Patterns:

Following take off from Dakar, a profile ascent over the ocean to the north revealed small scattering particles in the lowest 1000ft followed by a peak of larger particles at 2500ft. Clean air above FL050. High level transit to point Idini where a descent to FL500ft was performed. It was increasingly dusty below whilst moving north. Dust layer below FL095, with most dust below 3000ft. Some scattered Ci on horizon and more extensive to the east. PCASP showed a broad spectrum of particle sizes. Scattering approached $200 \times 10^{-6} \text{ m}^{-1}$. Optical depth around 0.3. A SLR at 500ft was performed heading north towards the Western Sahara border. Surface below alternated between sand dunes and rock striations. Some larger rocky outcrops. Scattered camels and Bedouin camps. Since the concentrations were still below that expected from the CAMM model output, and the model predicted an elevated layer, a profile was performed to FL150. Suggestion of larger particles at elevated level around FL050. Considerable Cu to west and north of region.

Given maximum range of the aircraft, a turn was made onto a reciprocal heading, and an SLR performed at FL150 to bring above typical sand surface rather than rocky region. A sonde was dropped. A set of 2 60 degree orbits were performed. These were too far away from the sun, so a further set of 2 orbits at 45 degrees bank were performed above sand dunes. A further SLR at FL150 was performed on a reciprocal heading with radiometers pointing down.

At the end of the run, we descended to FL050, turned and performed one SLR at this altitude. At the end of the run, we turned and descended along a reciprocal heading to 500ft. A set of 2 orbits at SZA+10 degrees, and a set of 2 orbits at SZA were performed at around 1000ft under the previous high level orbits. Two reciprocal SLRs at 500ft were performed, one with SWS and ARIES up to examine the radiative effect, and one down to characterise the surface. A final profile ascent towards Indini was performed showing a deep dust layer to 5000ft, a sharp fall off with a shoulder at 8500ft and falling off completely above FL100. Transit performed at FL220 back to Dakar.

Summary:

An excellent radiation flight. Although dust loading in North of Mauritania was moderate, clear skies meant radiation work and orbits were completed. Some good in-situ sampling work. Dust forecast loads too heavy, and extent of outflow too large.

Problems

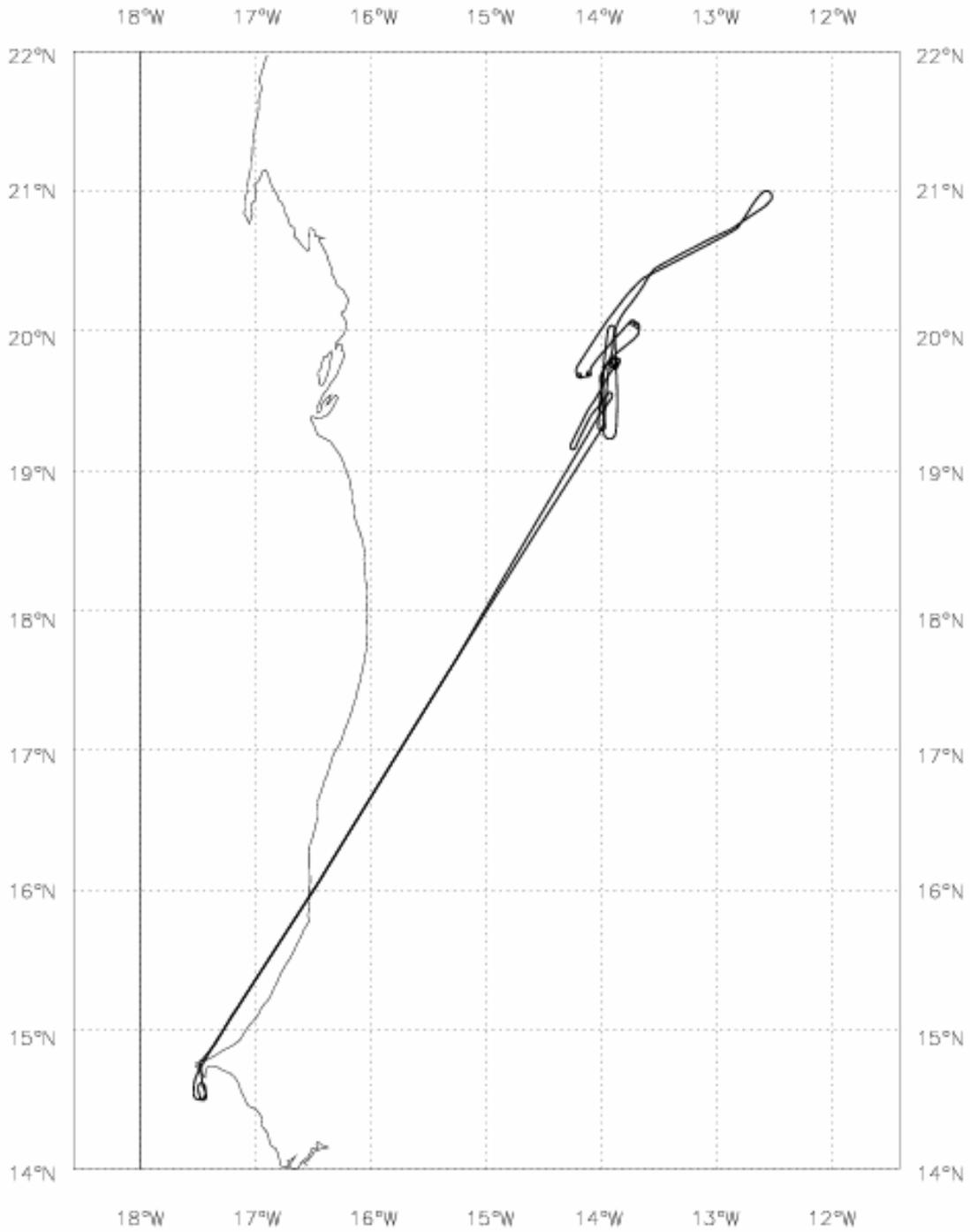
ARIES operator ill during flight.

Start Time	End Time	Event	Height (s)	Hdg	Comments
083151		engine start	0.05 kft	7	
083228		inu to nav	0.05 kft	7	
083456		power change	0.05 kft	7	
083703		taxy start	0.05 kft	7	

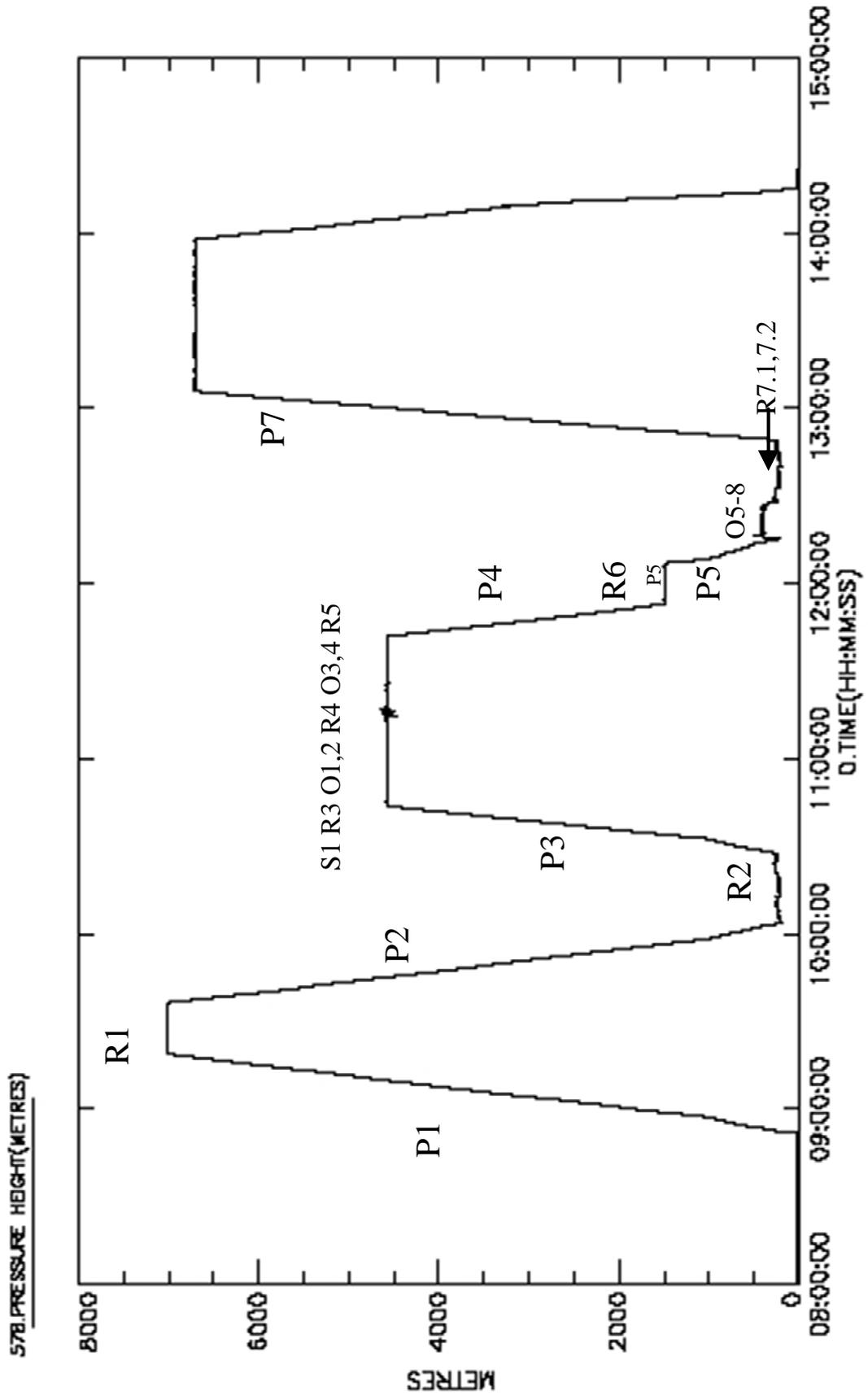
DODO1 Summary Document

083854		asp open	0.05 kft	286	
085143		T/O	0.04 kft	353	
085143	091856	Profile 1	1.2 - 23.0 kft	42	
091856	093611	Run 1	23.0 kft	27	
093611	100347	Profile 2	23.0 - 0.67 kft	28	
093807		nevz zero	21.3 kft	30	
100347	102801	Run 2	0.67 - 1.0 kft	30	qnh estimate 1018
102801	104347	Profile 3	1.0 - 15.0 kft	63	qnh estimate 1018
104553	111231	Run 3	15.0 kft	227	
105524		tapes change	15.0 kft	249	
105957		sonde 1	15.0 kft	249	launch
111340	111445	Orbit 1	15.0 - 14.7 kft	113	
111546	111650	Orbit 2	15.1 kft	11	
111809	112324	Run 4	15.0 kft	35	
112351	112520	Orbit 3	15.0 - 15.1 kft	83	
112604	112731	Orbit 4	15.0 kft	158	
112928	113928	Run 5	15.0 kft	237	
114138	115259	Profile 4	15.0 - 4.9 kft	2	
115442	120441	Run 6	4.9 kft	190	
120648	121516	Profile 5	4.9 - 0.73 kft	351	
121753	121909	Orbit 5	1.3 kft	280	
121946	122100	Orbit 6	1.3 kft	356	
122150	122328	Orbit 7	1.3 kft	55	
122428	122620	Orbit 8	1.3 kft	119	
122705	122807	Profile 6	1.3 - 0.78 kft	220	
122807	123809	Run 7.1	0.77 - 0.72 kft	217	
123936	124738	Run 7.2	0.77 - 0.83 kft	26	
124857	130604	Profile 7	0.79 - 22.0 kft	214	
141538		Land	0.07 kft	356	at Dakar
142112		standstill	0.08 kft	335	14'44.61N, 17'29.45W

B175 Track 16-FEB-06



B175 16-FEB-06 07:28:40-14:21:40

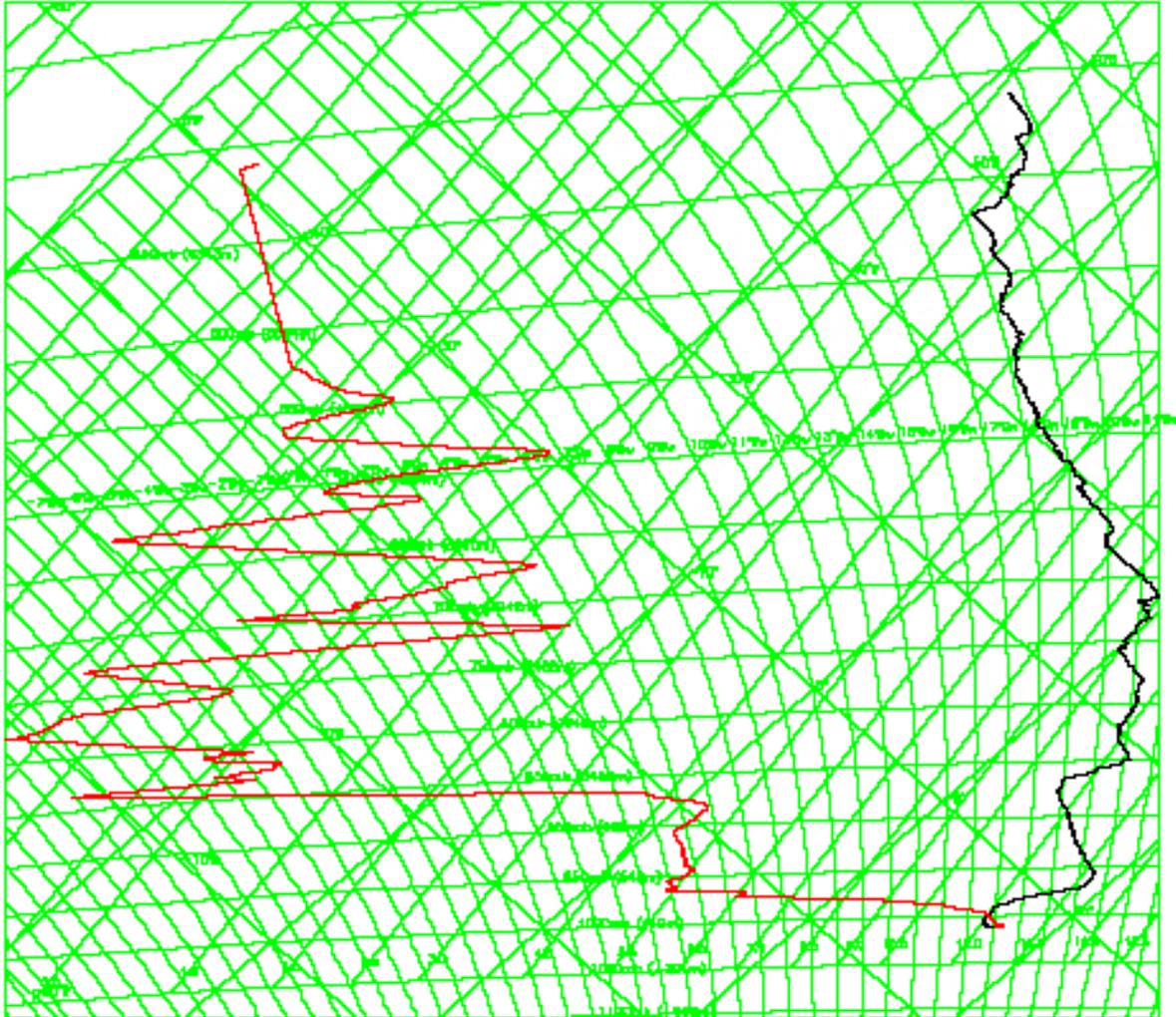


P1

B175 16-FEB-06 08:51:43-09:18:56

520.DERIVED TRUE TEMP(DEG K)

528.DEW POINT(DEG K)

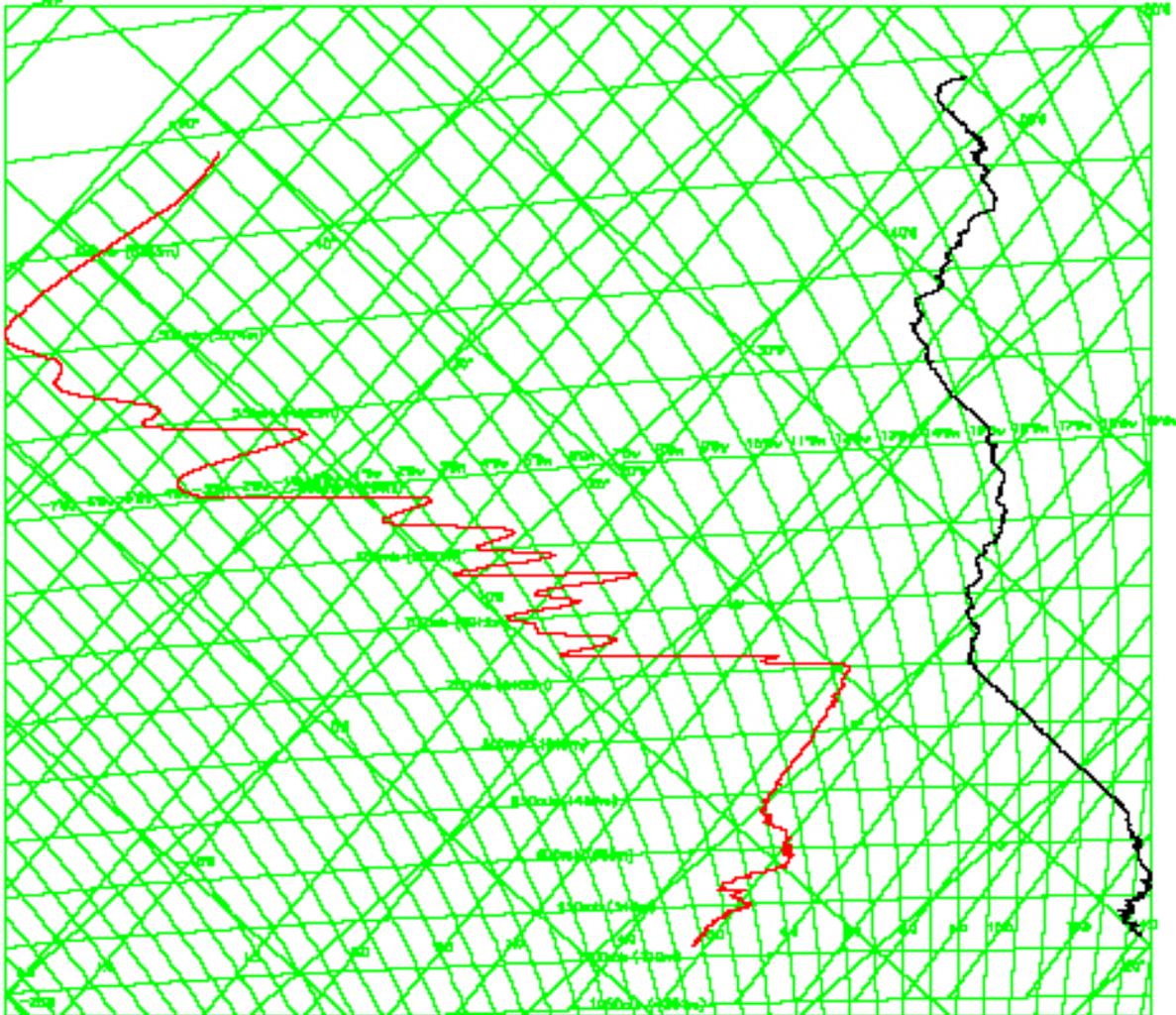


P2

B175 16-FEB-06 09:36:11-10:03:47

520.DKICED TRUE TEMP(DEG K)

528.DEW POINT(DEG K)

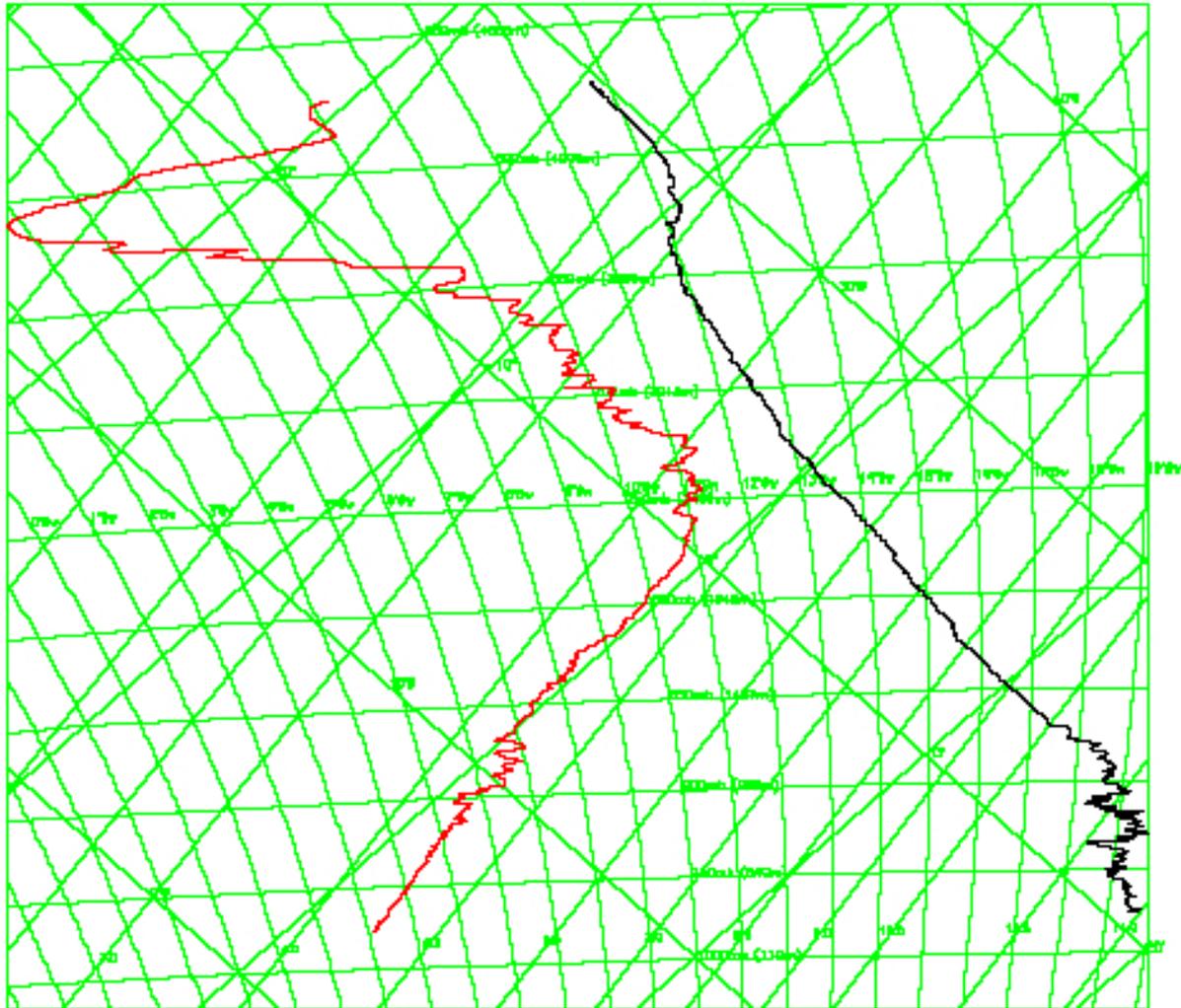


P3

B175 16-FEB-06 10:28:01-10:43:47

520.DEGEED TRUE TEMP(DEG K)

528.DEW POINT(DEG K)

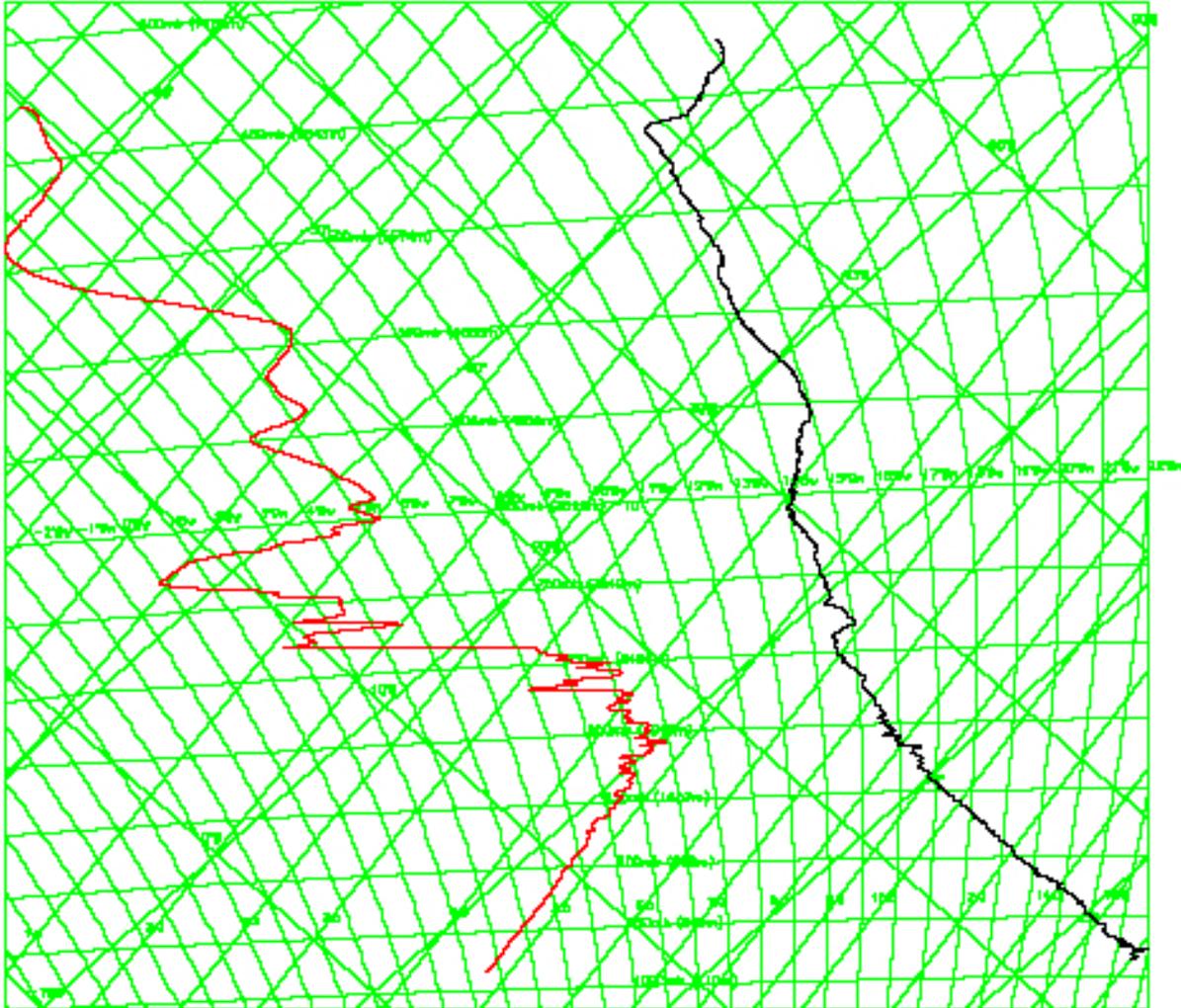


P7

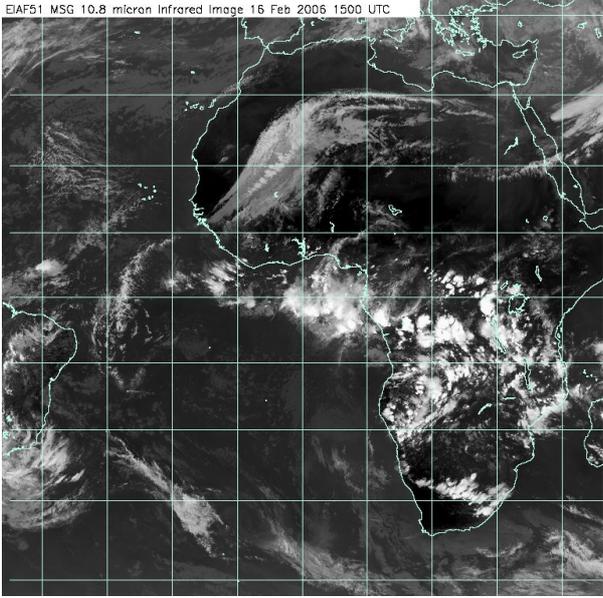
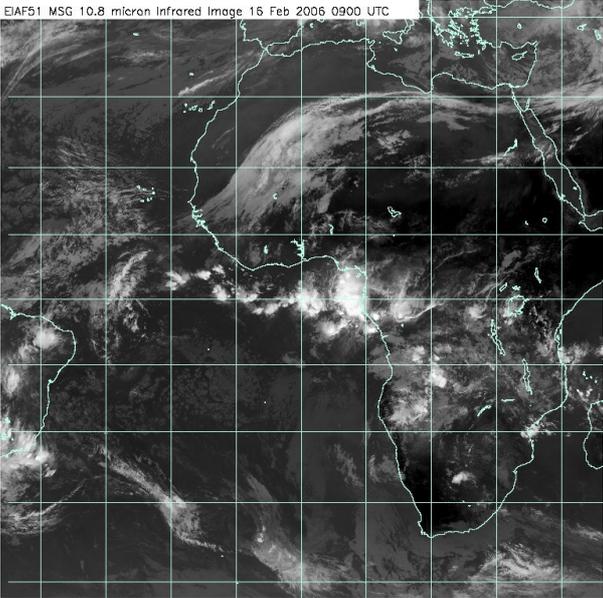
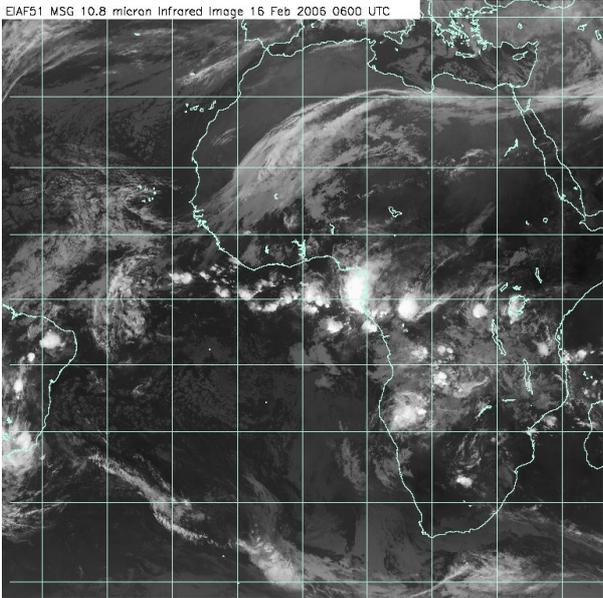
B175 16-FEB-06 12:48:57-13:06:04

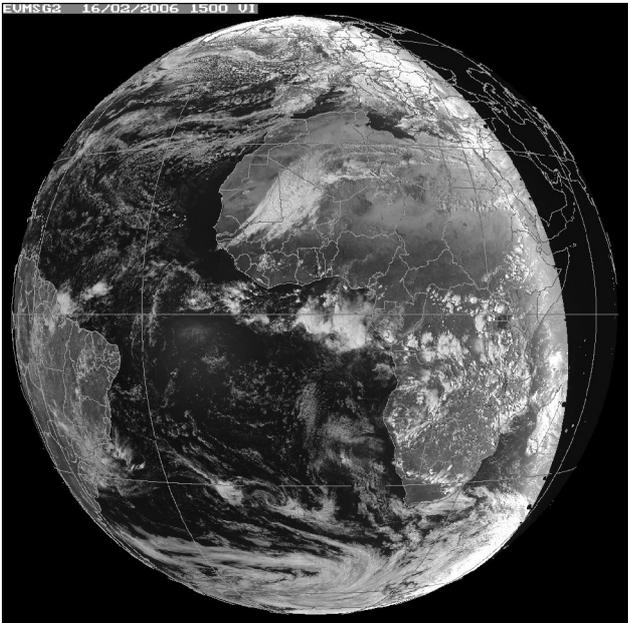
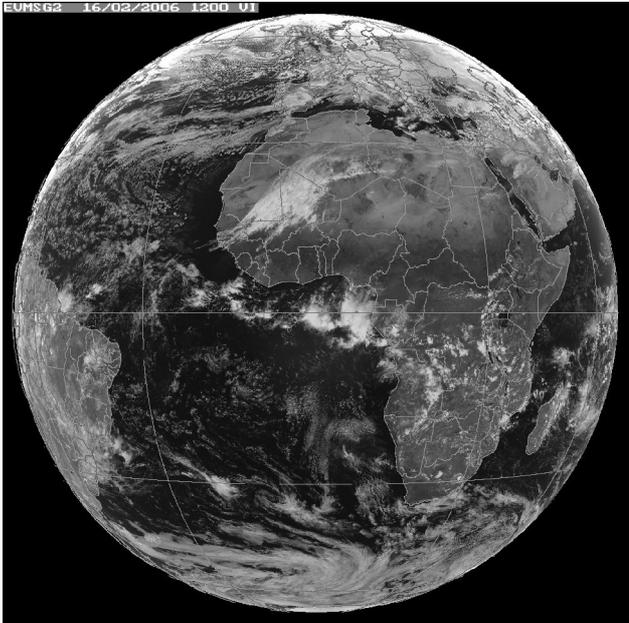
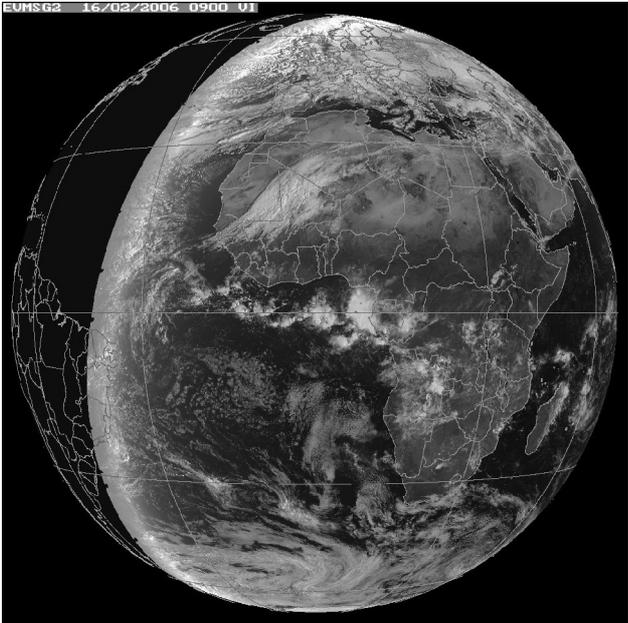
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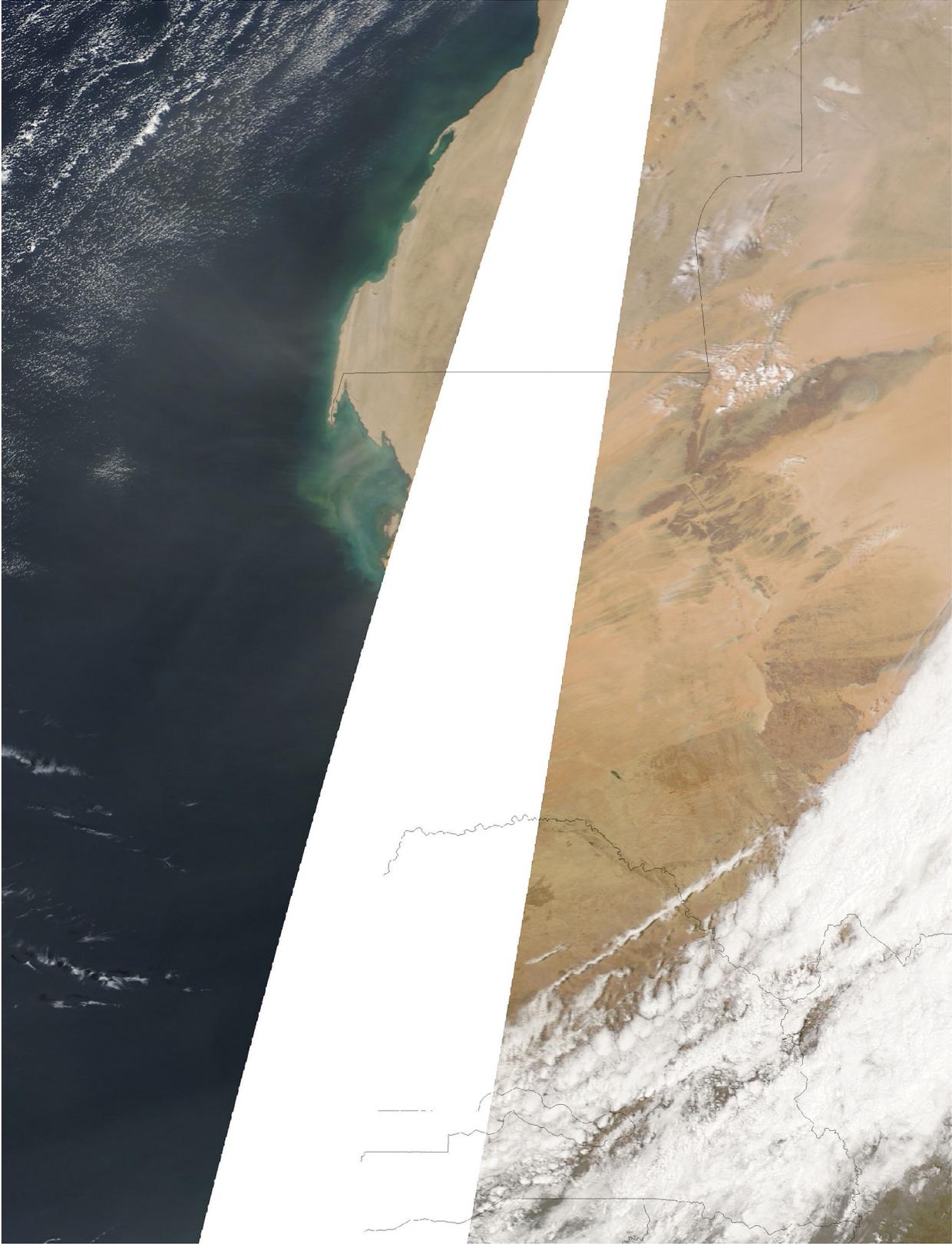
528.DEW POINT(DEG K)



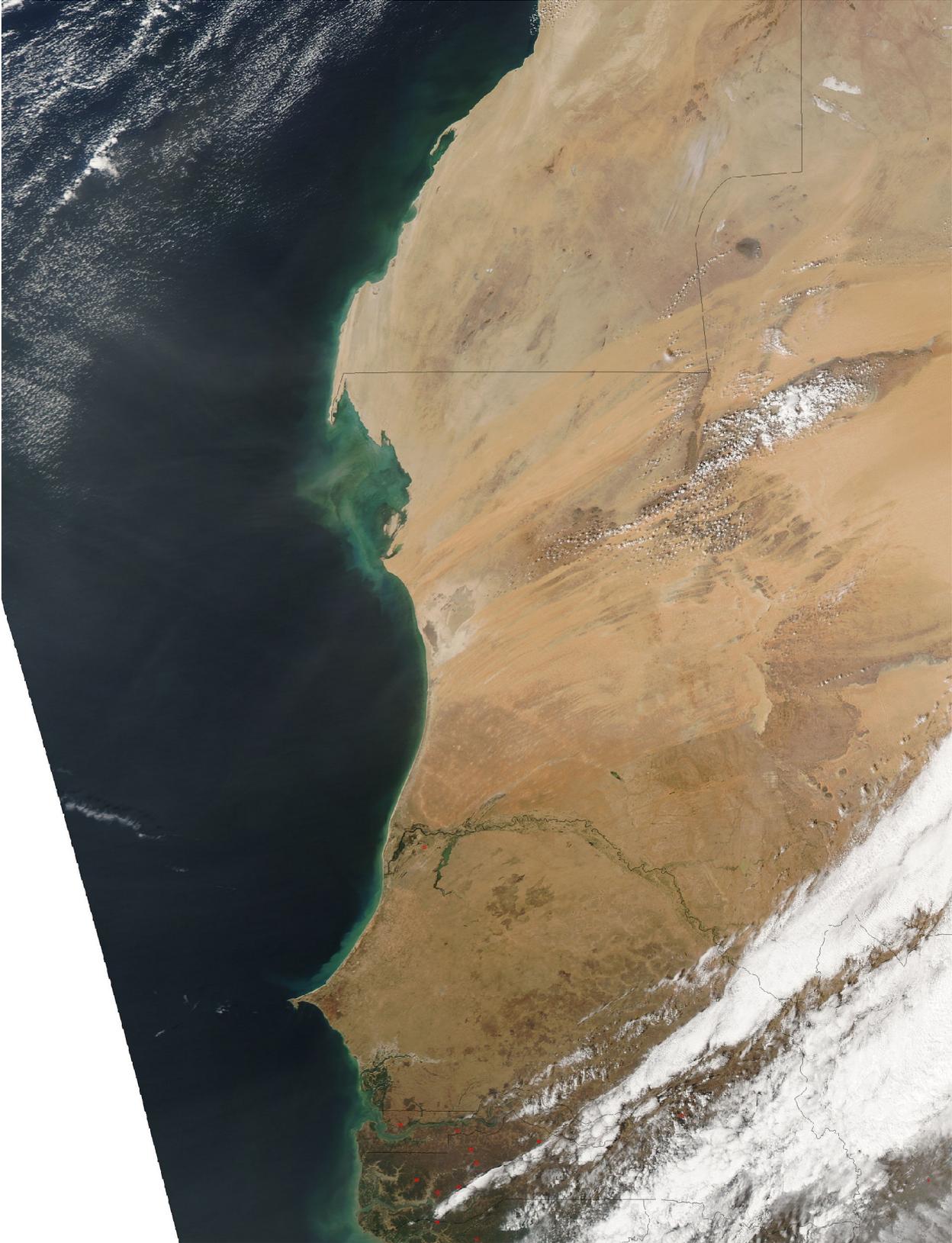
DODO1 Summary Document







TERRA 500m



AQUA 500m

