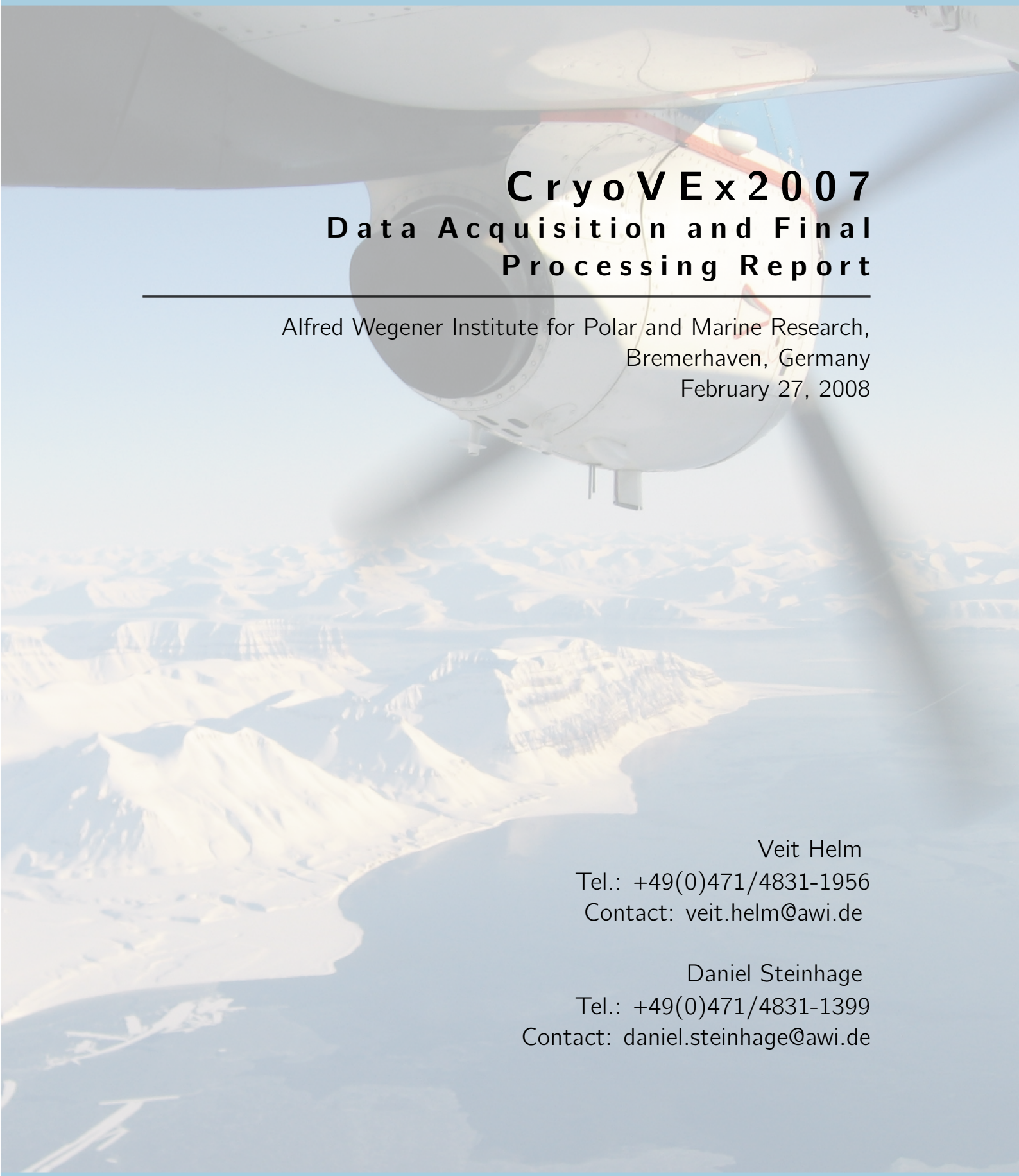


CryoVEx2007
Data Acquisition and Final Processing Report

Alfred Wegener Institute for Polar and Marine Research,
Bremerhaven, Germany
February 27, 2008

Veit Helm
Tel.: +49(0)471/4831-1956
Contact: veit.helm@awi.de

Daniel Steinhage
Tel.: +49(0)471/4831-1399
Contact: daniel.steinhage@awi.de

Contents

1. Introduction

Following the successful 2004, 2005 and 2006 campaigns, this document is the data aquisition report of the CryoVEx2007 campaign taking place in Svalbard during the period April 15 to April 25 in 2007. The airborne part of the campaign was successfully carried out by the Alfred Wegener Institute (AWI) using a chartered DLR Dornier-228 aircraft (D-CODE).

The CryoSat validation activities undertaken during 2004, 2005 and 2006 involved simultaneous radar altimetry and laser data acquisition over land ice and sea ice sites in the Arctic. Ground-based land ice measurement activities were carried out to characterize surface and subsurface snow and ice conditions.

The spring 2007 campaign repeated many of the airborne and ground measurements undertaken in the last campaigns. Ground measurements took place at the Austfonna site and were carried out by scientist of the Norwegian Polar Institute and the Scott Polar Institute.

The key objectives next to the repeat measurements of the CryoSat validation lines were the test of the upgraded ASIRAS-LAM mode and interferometric studies using the ASIRAS-HAM mode (LAM - Low altitude Mode; HAM - High Altitude Mode).

In general the airborne activities were succesful and the objectives were met. All planed survey lines were measured and some additional data could be collected (e.g. ENVI-Sat track and AWI-sea ice line).

This report outlines the field operations and the data collected by AWI during the CryoVEx2007 campaign. In addition a few examples of preliminary processed data are shown and some results of the ASIRAS upgrade test will be highlighted.

2. Summary of the Aircraft operations

After successful installation and certification of the ASIRAS and laser scanner system in the Dornier-228 aircraft, the system was tested in Bremerhaven on April 5 2007. During this flight different setups of the upgraded ASIRAS instrument were successfully tested by technicians of RST. A detailed overview of the test procedure is given in figure 2.1. After a quick data analysis through ESA and RST engineers the campaign was approved and the system was ready for operation for the Svalbard campaign. In Svalbard a similar second test flight were carried out, an overview is given in figure 2.2.
Table 2.1 gives an overview of the flight activity in chronological order and below a short day-to-day description is found.

Day	Date	Activity
1	2007-04-05	Bremerhaven test flight, runway and corner reflector passes
2	2007-04-13	Ferry: Germany ⇒ Longyearbyen
3	2007-04-14	Ferry: Germany ⇒ Longyearbyen
4	2007-04-15	Briefing
5	2007-04-16	Kongsvegen test flight, runway and corner reflector passes, hangar calibration flights
6	2007-04-17	Lonyearbyen runway and corner reflector passes
7	2007-04-18	Austfonna, LAM flight on site, runway pass
8	2007-04-19	Kongsvegen test flights
9	2007-04-20	Austfonna LAM flight on site, runway passes, hangar calibration flights
10	2007-04-21	Austfonna, LAM flight on site + ENVI-Sat track + combination with EM-System test
11	2007-04-22	Day off
12	2007-04-23	Ferry: Longyearbyen ⇒ Germany
13	2007-04-24	Ferry: Longyearbyen ⇒ Germany

Table 2.1.: Overview of flight activity

Date	Activity
April 05:	Installation of system in Aircraft Do-228. First test flight over North Sea and around Bremerhaven Airport to check different ASIRAS modes. Additional to this program some corner reflector passes could be carried out.
April 13-14:	Transfer of aircraft and installed system from Bremerhaven to Longyearbyen.
April 15:	Briefing
April 16:	First test flights were used for completing the ASIRAS test procedure and training of the AWI scientist in operation and backup of the system. The test flight were carried out over open water, sea ice, the Kongsvegen glacier and around the airport of Longyearbyen. Additional to this program some corner reflector passes and some laser scanner calibration flights of the hangar building could be carried out.
April 17:	Due to bad weather over Austfonna performing of test flights close to Lonyearbyen inclusiv runway and corner reflector passes.
April 18:	The first main site overflight were carried out. Both CryoSat tracks (0472, 0797) and all (six) corner reflectors were hit during the over pass. Runway over passes at the end of the day.
April 19:	A low pressure system around the Austfonna ice cap didn't allow flight activity around the validation sites. Instead a repeat of the Kongsvegen glacier over pass in 2500 m above ground were carried out using the HAM.
April 20:	Failing gyro of the aircraft system caused a delay of several hours. The problem could be fixed with the help of Airlift - Longyearbyen cargo. During the afternoon flight both ground validation lines (NV and SV) could be covered. Due to low clouds only ASIRAS data was gathered. Hit of the corner refelector near the ground camp. Runway and hangar overflights at the end of the day.
April 21:	First flight: Repeating of the lines from April 20. Simultaneous ASIRAS and laser scanner data were obtained. Due to IGI problems no corner reflector hit.

continued

Date	Activity
April 21:	Second flight: Hit of ground camp corner reflector, however low clouds and therefore no laser scanner data. Additional both the ENVI-Sat track and the AWI sea ice line was covered. The latter one in combination with AWI EM-system test.
April 22:	Day off, due to bad weather. Backup and first processing.
April 23-24:	Transfer flight from Lonyearbyen to Bremerhaven

Label (see notes below)	Approximate aircraft altitude (m)	Surface type A-Any O-Open water C-Corner reflector G- On-Ground Measure	Margin (Minutes)	Acquisition Time (Minutes)	Total time (Minutes)	Volume (Gb/Min)	Description
CA2H2500_01	0	G	0	0.5	0.5	0.0672	Pre flight CAL-2 HAM test calibration
CA2L2500_01	0	G	0	0.5	0.5	0.9216	Pre flight CAL-2 LAM test calibration
LAMO2500_01	400	C	7	1	8	1.8432	Use for check on pulse to pulse phase. Include flight over Bremerhaven docks (TBC) where cranes may be present and can provide pseudo corner reflector like responses.
LAMA2000_01	400	C	7	1	8	0.36864	Use for check on pulse to pulse phase. Include flight over Bremerhaven docks (TBC) where cranes may be present and can provide pseudo corner reflector like responses.
LAMA2500_02	400	C	7	1	8	0.4608	Use for check on pulse to pulse phase. Include flight over Bremerhaven docks (TBC) where cranes may be present and can provide pseudo corner reflector like responses.
LAMA3000_01	600	C	7	1	8	0.55296	Use for check on pulse to pulse phase. Include flight over Bremerhaven docks (TBC) where cranes may be present and can provide pseudo corner reflector like responses.
LAMA2000_02	600	C	7	1	8	0.36864	Use for check on pulse to pulse phase. Include flight over Bremerhaven docks (TBC) where cranes may be present and can provide pseudo corner reflector like responses.
LAMO2500_02	600	C	7	1	8	1.8432	Use for check on pulse to pulse phase. Include flight over Bremerhaven docks (TBC) where cranes may be present and can provide pseudo corner reflector like responses.
LAMO2500_03	800	C	7	1	8	1.8432	Use for check on pulse to pulse phase. Include flight over Bremerhaven docks (TBC) where cranes may be present and can provide pseudo corner reflector like responses.
LAMA3000_02	800	C	7	1	8	0.55296	Use for check on pulse to pulse phase. Include flight over Bremerhaven docks (TBC) where cranes may be present and can provide pseudo corner reflector like responses.
LAMA2500_03	800	C	7	1	8	0.4608	Use for check on pulse to pulse phase. Include flight over Bremerhaven docks (TBC) where cranes may be present and can provide pseudo corner reflector like responses.
LAMA2000_03	800	C	2	1	3	0.36864	Use for check on pulse to pulse phase. Include flight over Bremerhaven docks (TBC) where cranes may be present and can provide pseudo corner reflector like responses.
CA2H2500_02	Any	A	2	0.5	2.5	0.0672	In flight CAL-2 test during manoeuver
CA2L2500_02	Any	A	2	0.5	2.5	0.9216	In flight CAL-2 test during manoeuver
LAMO2500_03	700	OW	7	2	9	3.6864	SNR test with manual stepping of AGC
LAMO2500_04	700	OW	5	2	7	3.6864	SNR test with manual stepping of AGC
LAMA2500_04	700	OW	5	5	10	2.304	SNR test with manual stepping of AGC
LAMA2500_05	600 +/- 50 m	OW	5	2	7	0.9216	Sensitivity of reduced range window
HAMO4000_01	1100	OW	5	5	10	1.0752	SNR test with manual stepping of AGC
HAMO4000_02	1100	C	7	1	8	0.21504	On-ground end of test HAM calibration
CA2H2500_03	0	G	0	0.5	0.5	0.0672	On-ground end of test HAM calibration
CA2L2500_03	0	G	0	0.5	0.5	0.9216	On-ground end of test LAM calibration
		Total	103	29	131	22.52928	Gb

Notes

Label (XXXMPPPP) : (XXX - Mode, M - O [original configuration] or A[LAM-A], PPP - PRF [Hz])

CA2L2500	Cal-2 Impulse response for LAM
CA2H2500	Cal-2 Impulse response for HAM
HAMO4000	High Altitude Mode 4000Hz - original configuration
LAMO2500	Low altitude mode (2500 Hz PRF) original LAM
LAMA2000	LOW ALTITUDE MODE A (2000 KHZ PRF)
LAMA2500	LOW ALTITUDE MODE A (2500 KHZ PRF)
LAMA3000	LOW ALTITUDE MODE A (3000 KHZ PRF)

Figure 2.1.: Pre-CryoVEx2007 Bremerhaven Test Plan (5th April 2007).

Waypoint	Label	Label (see notes below)	Approximate aircraft altitude above surface (m)	Surface type A-Any OW-Open water IS - Ice Sheet C-Corner reflector G- On-Ground Measure	Margin (Minutes)	Acquisition Time (Minutes)	Total time (Minutes)	Volume (Gb/Min)	Description
N/A	C1	CA2L2500_01	0	G	0	0.1	0.1	0.18432	Pre flight CAL-2 LAM test calibration
N/A	C2	CA2H2500_01	0	G	0	0.1	0.1	0.01344	Pre flight CAL-2 LAM test calibration
N/A	C3	CA2S2500_01	0	G	0	0.1	0.1	0.06	Pre flight CAL-2 LAM-A test calibration
A0-A1	L1	LAMO2500_01	?-700	OW	2	3	5	5.5296	Open water acquisition - conditions to be notes
A1-A2	L2	LAMA2000_01	700	OW	2	5	7	1.8432	Open water acquisition - conditions to be noted. Manual tracking and profile change
A2-A3	L1	LAMO2500_02	700-1000	IS	2	2	4	3.6864	
A2-A3	H1	HAMO4000_01	1000-2000	IS	2	2	4	0.73728	Manual tracking and profile change test in HAM
A3-A14	H1	HAMO4000_02	2000	IS	1	15	16	8.2944	Auto-tracking in HAM
A14	C1	CA2H2500_02	Any	IS	1	0.1	1.1	0.18432	In flight CAL-2 HAM test calibration
A14	C2	CA2L2500_02	Any	IS	1	0.1	1.1	0.01344	In flight CAL-2 LAM test calibration
A14	C3	CA2S2500_02	Any	IS	1	0.1	1.1	0.06	In flight CAL-2 LAM-A test calibration
A14-A3	L1	LAMO2500_02	700	IS	1	15	16	27.648	Use of LAM over topography
A3	C1	CA2H2500_03	Any	IS	0.5	0.1	0.6	0.18432	In flight CAL-2 HAM test calibration
A3	C2	CA2L2500_03	Any	IS	0.5	0.1	0.6	0.01344	In flight CAL-2 LAM test calibration
A3	C3	CA2S2500_03	Any	IS	0.5	0.1	0.6	0.06	In flight CAL-2 LAM-A test calibration
A3-A14	L3	LAMA2500_02	500	IS	1	5	6	1.8432	Manual tracking test
A14-A15	L1	LAMO2500_03	500-1000	OW	1	3	4	5.5296	Manual tracking and profile change test
A14-A15	H1	HAMO4000_03	1000-2500	OW	1	3	4	5.5296	HAM auto tracking
A15-A16	H1	HAMO4000_04	2500	OW	1	15	16	8.2944	Coherence/phase difference at high altitude
A16	C1	CA2H2500_04	Any	OW	0.5	0.1	0.6	0.04608	In flight CAL-2 HAM test calibration
A16	C2	CA2L2500_04	Any	OW	0.5	0.1	0.6	0.18432	In flight CAL-2 LAM test calibration
A16	C3	CA2S2500_04	Any	OW	0.5	0.1	0.6	0.01344	In flight CAL-2 LAM-A test calibration
A16-A14	L2	LAMA2000_02	700	OW	1	5	6	1.8432	Low PRF test + manual tracking
A16-A14	L3	LAMA2500_03	700	OW	1	5	6	2.304	Medium PRF test + manual tracking
A16-A14	L4	LAMA3000_01	700	OW	1	5	6	2.7648	High PRF test + manual tracking
A14-A2	L3	LAMA2500_05	500	IS	1	5	6	2.304	Manual trackin in LAM-A over topography
A2-A1	L1	LAMO2500_04	500	OW	1	5	6	9.216	Open water acquisition - conditions to be noted. Manual tracking and profile change
N/A	C1	CA2H2500_05	0	G	0	5	10	9.216	Post flight CAL-2 HAM test calibration
N/A	C2	CA2L2500_05	0	G	0	0.5	2.5	0.0672	Post flight CAL-2 LAM test calibration
N/A	C3	CA2S2500_05	0	G	0	0.5	2.5	0.3	Post flight CAL-2 LAM-A test calibration
				Total	25	100.2	134	97.968	Gb

Figure 2.2.: CryoVEx2007 Svalbrad test plan (16th April 2007).

2.1. Instrument installation

The D-CODE was equiped with the ASIRAS instrument, a laser scanner, a single beam laser, two 1 Hz Trimble GPS receivers, one 20 Hz Novatel GPS receiver, a video camera and an INS platform. Their positions within the aircraft reference frame is given in Table 2.3 and figure 2.3 sketches the instrument installation in the aircraft. The measurements were carried out in the hangar in Bremerhaven during the installation of the system by engineers of Optimare.

Instrument	dx (m)	dy (m)	dz (m)
GPS-rear	0	0	0
GPS-front	+4.912	-0.244	-0.095
Novatel receiver	-0.020	-0.399	+0.000
ASIRAS center	-0.115	-0.412	+1.824
ASIRAS Panel 1	-0.115	-0.792	+1.824
ASIRAS Panel 2	-0.115	-0.032	+1.824
Laser scanner	+1.138	-0.241	+1.380
Single Beam Laser	+0.982	-0.241	+1.690
Video camera	+4.722	+0.010	+1.620

Table 2.3.: Instrument installation in the D-CODE reference frame. Origin of the system is the GPS-rear antenna. All instruments where measured to its phase center within an accuracy of ± 5 cm. Offset definition: x positive to the front, y positive to the right wing and z positive down.

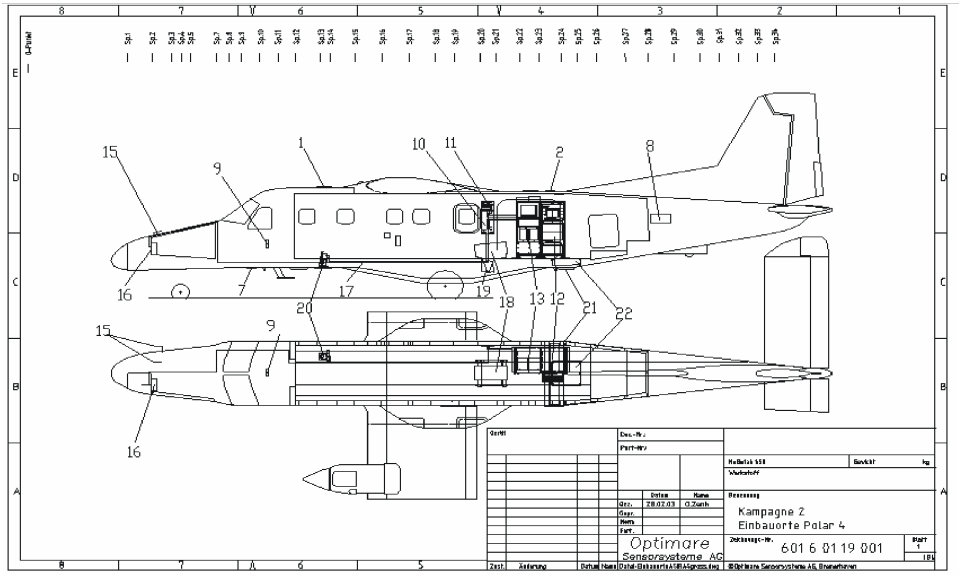


Figure 2.3.: Sketch of D-CODE aircraft showing positions of measuring devices
1+2 GPS antenna (Trimble receiver)
7 Radar altimeter
8 INS
9 GNS-X
10 Power distribution module
11 Data distribution module
12 Rack I
13 Rack II
15 Basis meteorology sensors
16 BMET I/O module
17 Fiber optic
18 RIEGL laser scanner - LMSQ-280
19 RIEGL LD90 laser altimeter
20 Sony video camera
21 RST ASIRAS antenna
22 Antenna cable slot

3. Recorded and processed Data

3.1. GPS

Kinematic GPS is the key positioning method of the aircraft. GPS dual-frequency phase data were logged at 1 Hz using one to two ground base receivers at one or more reference sites, and three aircraft receivers. The ground base stations were installed in Longyearbyen and close to the base camp on the Austfonna ice cap. Both the time server of the airborne system and the ASIRAS instrument were triggered by the PPS-pulse of one of the Trimble receivers. Data were logged in the receivers durig flights and downloaded upon landing on laptop PC's. All data were recovered and a preliminary kinematic GPS processing was performed after downloading (see Table 3.1).

Date	Filename	Start time (Seconds of day)	Stop time (Seconds of day)	Filesize (MB)
2007-04-05	GPS_F_01_20070405T113351_134207	41631	49327	0.2
2007-04-05	GPS_R_01_20070405T113350_134154	41630	49314	0.2
2007-04-16	GPS_F_01_20070416T105718_140310	39438	50590	0.7
2007-04-16	GPS_R_01_20070416T105705_140307	39425	50587	0.7
2007-04-17	GPS_F_01_20070417T135017_151847	49817	55127	0.3
2007-04-17	GPS_R_01_20070417T135120_151846	49880	55126	0.3
2007-04-18	GPS_F_01_20070418T152947_185447	55787	68087	0.7
2007-04-18	GPS_R_01_20070418T153050_185445	55850	68085	0.7
2007-04-19	GPS_F_01_20070419T134617_155116	49577	57076	0.4
2007-04-19	GPS_R_01_20070419T134651_155106	49611	57066	0.4
2007-04-20	GPS_F_01_20070420T140121_172704	50481	62824	0.7
2007-04-20	GPS_R_01_20070420T140250_172641	50570	62801	0.7
2007-04-21	GPS_F_01_20070421T091618_122118	33378	44478	0.6
2007-04-21	GPS_R_01_20070421T091718_122112	33438	44472	0.6
2007-04-21	GPS_F_01_20070421T142019_170920	51619	61760	0.6
2007-04-21	GPS_R_01_20070421T142149_170913	51709	61753	0.6

Table 3.1.: Preliminary processed GPS files in ESA binary format.

3.2. INS

A Honeywell inertial navigation system was used throughout the surveys to record inertially integrated position, velocity and attitude information. Data were logged on the Medusa-P data base and downloaded after each flight. Data from all flights have been stored and transfered to the ESA binary format (see Table 3.2).

Date	Filename	Start time (Seconds of day)	Stop time (Seconds of day)	Filesize (MB)
2007-04-05	INS_20070405T080944_134038	29384	49238	75
2007-04-16	INS_20070416T102045_140427	37245	50685	86
2007-04-17	INS_20070417T135939_151854	50379	55134	41
2007-04-18	INS_20070418T153425_185350	56065	68030	103
2007-04-19	INS_20070419T134914_154744	49754	56864	61
2007-04-20	INS_20070420T081213_172613	29533	62773	286
2007-04-21	INS_20070421T092625_121923	33985	44363	89
2007-04-21	INS_20070421T121925_170427	44365	61467	147

Table 3.2.: INS files in ESA binary format.

3.3. Laser scanner

A Riegl laser scanner (LMS-Q280) was used to measure the range between the aircraft and the snow or ice surface. The laser scanner data were logged in binary format on the Medusa-P data base and downloaded after each flight. The files are time tagged by the GPS PPS signal. A seperate ascii file including these time tags where produced during flight. Each time a PPS reaches the instrument an internal time counter is set to zero. During post processing both the data file and the time file are combined, giving GPS (UTC-time) based range information. Table 3.3 show the preliminary processed laser scanner files of the campaign. The nominal data-logging rate is 80 scans/second; each scan consists of 113 single laser shots. At approx. 700 m above ground this corresponds to a 500 m wide swath, with a point spacing of 4.4 m across and 0.8 m along track. During flight a real time quality control showed rather frequently a missing scan line (approx. 1 out of 80 scans), however this has only minor affect to the data quality.

3.4. ASIRAS

The ASIRAS system was run as tested during the test flight on April 5, 2007. The system was timed using a 1 PPS signal and an ASCII datation string from the GPS-Trimble receiver.

Extensive tests and data backup of the upgraded system were performed during the first test flights. Additional to the normal operation of the system in LAM or HAM mode the new LAMA was used. Before take off and after landing as well as during attitude maneuvers

Date	Filename	Start time (Seconds of day)	Stop time (Seconds of day)	Filesize (MB)
2007-04-05	ALS_L1B_20070405T131050_133320	47450	48800	486
2007-04-16	ALS_L1B_20070416T105706_140308	39426	50588	4007
2007-04-17	ALS_L1B_20070417T140154_151847	50514	55127	1666
2007-04-18	ALS_L1B_20070418T153839_185321	56319	68001	4236
2007-04-19	ALS_L1B_20070419T135919_154744	50359	56864	2361
2007-04-20	ALS_L1B_20070420T141100_142151	51060	51711	238
2007-04-20	ALS_L1B_20070420T145735_153027	53855	55827	717
2007-04-20	ALS_L1B_20070420T154316_160128	56596	57688	398
2007-04-20	ALS_L1B_20070420T164519_172032	60319	62432	771
2007-04-21	ALS_L1B_20070421T093503_093957	34503	34797	109
2007-04-21	ALS_L1B_20070421T101027_111713	36627	40633	1465
2007-04-21	ALS_L1B_20070421T111741_114120	40661	42080	520
2007-04-21	ALS_L1B_20070421T154612_155851	56772	57531	279
2007-04-21	ALS_L1B_20070421T155917_160156	57557	57716	59
2007-04-21	ALS_L1B_20070421T160236_162342	57756	59022	407

Table 3.3.: Preliminary processed laser scanner files

the calibration mode (CAL2) was carried out. Calibration files and log files were transfered from the data PC's to the harddisk for backup after flights. The data were then stored on magnetic tapes and on hard disks.

ASIRAS data of the CryoSat validation lines were obtained in the LAM mode at 60 MHz. Data were aquired continously over the main sites. A great number of small files were acquired in different modes and altitudes, due to testing purposes. In Table 3.4 all ASIRAS log files are listed, together with the start and stop acquisition time and some additional information. The validation profiles are highlighted in red.

Logfile	Operation mode	Initial frequency [MHz]	approx. Altitude [m]	Surface type (see notes below)	Start time (UTC)	Start time (Sec. day)	Stop time (UTC)	Stop time (Sec. day)	Aquis. time [s]	Remark
A070405_00	LAMO2500	60	480	A	12:05:19	43519	12:08:22	443702	182.535	
A070405_01	LAMO2500	60	480	A	12:09:43	43783	12:10:52	43852	68.565	
A070405_02	LAMA2500	60	480	A	12:12:58	43978	12:15:27	44127	148.748	
A070405_03	LAMA2500	60	480	A	12:16:24	44184	12:19:07	44347	162.524	
A070405_04	LAMO2500	40	480	A	12:20:14	44414	12:21:42	44502	87.909	
A070405_05	LAMO2500	40	480	A	12:22:08	44528	12:23:17	44597	68.676	
A070405_06	LAMA2500	40	480	A	12:24:45	44685	12:27:42	44862	176.58	
A070405_07	LAMA2500	40	480	A	12:28:20	44900	12:29:11	44951	50.536	
A070405_08	HAMO4000	/	1208	A	12:34:19	45259	12:35:33	45333	73.658	
A070405_09	HAMO4000	/	1208	A	12:36:07	45367	12:38:52	45532	164.652	
A070405_10	LAMA2000	95	480	A	12:40:53	45653	12:45:14	45914	260.865	
A070405_11	LAMO2500	80	480	A	13:02:25	46945	13:03:20	47000	54.646	
A070405_12	LAMO2500	40	480	RW, CR	13:11:06	47466	13:11:31	47491	24.923	
A070405_13	LAMA2000	25	480	RW, CR	13:12:35	47555	13:16:39	47799	243.491	
A070405_14	LAMA2000	30	480	A	13:16:47	47807	13:16:49	47809	1.566	
A070405_15	LAMA2500	30	480	CR	13:26:54	48414	13:27:54	48474	59.580	
A070405_16	LAMA3000	30	480	CR	13:30:41	48641	13:31:42	48702	60.624	
A070416_00	LAMO2500	60	720	A	11:26:10	41170	11:28:12	41292	121.5	
A070416_01	LAMA2000	55	720	OW, SI	11:29:48	41388	11:33:36	41616	227.714	
A070416_02	LAMA2500	55	720	OW	11:34:05	41645	11:36:02	41762	116.495	
A070416_03	LAMO2500	60	480	IS	11:38:31	41911	11:40:16	42016	104.525	
A070416_04	HAME4000	/	1208	IS	11:42:56	42176	11:45:49	42349	172.675	tracking failed
A070416_05	HAMO4000	/	1648	IS	11:47:47	42467	11:52:04	42724	256.483	
A070416_06	LAMO2500	60	720	IS	11:59:59	43199	12:08:12	43692	492.479	

continued

Logfile	Operation mode	Initial frequency [MHz]	approx. Altitude [m]	Surface type	Start time (UTC)	Start time (Sec. day)	Stop time (UTC)	Stop time (Sec. day)	Aquis. time [s]	Remark
A070416_07	LAMA2500	40	480	IS, OW	12:13:36	44016	12:22:52	44572	555.444	
A070416_08	LAMA3000	40	480	OW, IE	12:26:34	44794	12:42:50	45770	975.455	
A070416_09	LAMA3000	55	480		12:44:41	45881	12:45:03	45903	21.528	
A070416_10	LAMA3000	55	480	OW	12:46:00	45960	12:47:13	46033	72.487	
A070416_11	LAMO2500	40	480		12:48:43	46123	12:50:49	46249	125.66	
A070416_12	LAMA2000	40	480		12:51:32	46292	12:52:28	46348	55.5	
A070416_13	LAMO2500	40	480		12:54:24	46464	12:55:36	46536	71.51	
A070416_14	LAMO2500	40	480		12:56:34	46594	12:57:24	46644	49.844	
A070416_15	LAMO2500	60	480		12:57:32	46652	12:58:31	46711	58.505	
A070416_16	LAMO2500	80	480		12:58:38	46718	12:59:12	46752	33.479	
A070416_17	HAMO4000	/	1120		13:06:00	47160	13:10:55	47455	294.513	
A070416_18	HAMO4000	/	1120		13:11:01	47461	13:11:14	47474	12.562	
A070416_19	HAMO4000	/	2336		13:12:11	47531	13:18:22	47902	370.465	
A070416_20	LAMO2500	40	480	RW 500	13:27:57	48477	13:29:22	48562	84.903	
A070416_21	LAMO2500	40	480	HG	13:31:54	48714	13:32:31	48751	36.469	
A070416_22	LAMO2500	40	480	HG	13:34:07	48847	13:34:49	48889	41.484	
A070416_23	LAMO2500	20	480	HG	13:37:08	49028	13:37:51	49071	42.474	
A070416_24	LAMO2500	20	480	HG	13:39:23	49163	13:39:53	49193	29.523	
A070416_25	LAMO2500	20	480	RW 500	13:42:33	49353	13:43:45	49425	71.815	
A070416_26	LAMO2500	20	480	CR 300	13:45:33	49533	13:46:50	49610	76.74	
A070416_27	LAMO2500	20	480	CR 300	13:53:09	49989	13:54:39	50079	89.92	
A070416_28	LAMO2500	20	480	CR 300	13:56:28	50188	13:57:24	50244	55.503	
A070417_00	LAMO2500	40	480	OW	14:16:45	51405	14:17:45	51465	59.537	
A070417_01	LAMO2500	40	480	CR 500	14:25:06	51906	14:26:52	52012	105.93	

continued

Logfile	Operation mode	Initial frequency [MHz]	approx. Altitude [m]	Surface type	Start time (UTC)	Start time (Sec. day)	Stop time (UTC)	Stop time (Sec. day)	Aquis. time [s]	Remark
A070417_02	LAMO2500	40	480	CR 500	14:37:49	52669	14:38:58	52738	68.492	
A070417_03	LAMO2500	60	720	CR 700	14:48:56	53336	14:50:47	53447	110.5	
A070417_04	LAMA2500	40	480	CR 500	14:57:01	53821	14:58:56	53936	114.524	
A070417_05	LAMA2500	25	480	RW 300	15:07:40	54460	15:10:20	54620	159.52	
A070418_00	HAMO4000	/	2648	SI	16:25:47	59147	16:31:29	59489		N_pulses (logfile), rec. error
A070418_01	LAMO2500	60	720	IS-0472, CR	16:36:56	59816	16:55:39	60939	1122.68	
A070418_02	LAMO2500	60	720	IS-0797, CR, IE	17:00:00	61200	17:22:06	62526	1.325.455	
A070418_03	LAMO2500	60	720		17:25:51	62751	17:28:18	62898	146.785	
A070418_04	LAMO2500	60	720	IS-0797, CR	17:28:30	62910	17:33:15	63195	284.508	
A070418_05	LAMO2500	60	720	IS-0472, CR	17:38:42	63522	17:46:26	63986	463.51	
A070418_06	HAMO4000	/	1176	OW, SI	17:49:27	64167	17:50:26	64226	58.623	
A070418_07	HAMO4000	/	1176	OW, SI	17:52:28	64348	18:03:15	64995	646.875	
A070418_08	LAMO2500	40	480	RW 500	18:44:49	67489	18:46:12	67572	82.489	
A070418_09	LAMO2500	20	480	RW 300	18:47:43	67663	18:48:54	67734	70.685	
A070419_00	HAMO4000	/	1120	IS, OW	14:56:32	53792	15:00:12	54012	219.511	
A070419_01	HAMO4000	/	1632	IS, OW	15:00:53	54053	15:11:54	54714	660.712	
A070419_02	HAMO4000	/	1696	IS, OW	15:15:24	54924	15:30:43	55843	918.727	
A070420_00	HAMO4000	/	1208	OW, IE, IS	14:57:05	53825	14:58:20	53900	74.674	
A070420_01	LAMO2500	60	720	IS-SV, CR	15:08:55	54535	15:30:01	55801	1.265.909	
A070420_02	LAMO2500	60	720	test	15:43:27	56607	15:43:49	56629	21.478	

continued

Logfile	Operation mode	Initial frequency [MHz]	approx. Altitude [m]	Surface type	Start time (UTC)	Start time (Sec. day)	Stop time (UTC)	Stop time (Sec. day)	Aquis. time [s]	Remark
A070420_03	LAMO2500	80	720	IS-NV	15:44:06	56646	15:46:30	56790	143.513	
A070420_04	LAMO2500	60	720	IS-NV, CR	15:46:34	56794	16:00:31	57631	836.886	
A070420_05	HAMO4000	/	1184	SI, OW	16:10:52	58252	16:12:24	58344	91.468	
A070420_06	HAMO4000	/	1184	SI, OW	16:14:43	58483	16:15:21	58521	37.892	
A070420_07	HAMO4000	/	1184	SI, OW	16:17:36	58656	16:23:22	59002	345.611	rec. error
A070420_08	LAMO2500	40	720	RW 500	16:54:53	60863	16:58:12	61092	198.838	
A070420_09	LAMO2500	20	720	RW 300	17:00:39	61239	17:03:00	61380	140.477	
A070420_10	LAMO2500	20	720	RW 300	17:04:55	61495	17:06:35	61595	99.769	
A070420_11	LAMO2500	20	720	RW 300	17:08:31	61711	17:10:08	61808	96.502	
A070421_00	HAMO4000	/	1208	SI, OW	10:02:16	36136	10:07:13	36433	296.865	
A070421_01	LAMO2500	60	720	IS-SV, CR, IE	10:19:30	37170	10:43:29	38609	1.438.742	
A070421_02	LAMO2500	60	720	SI	10:45:41	38741	10:48:09	38889	147.936	
A070421_03	LAMO2500	60	720	IS-NV, CR	11:00:09	39609	11:17:00	40620	1.010.768	
A070421_04	LAMO2500	40	720	SI-Fjord	11:23:20	41000				N_pulses (logfile), rec. error
A070421_05	LAMO2500	40	480	SI-Fjord, Lance, OW	11:32:23	41543	11:38:11	41891	347.661	
A070421_06	LAMO2500	60	720	IS-ENVI, IE	15:07:31	54451	15:15:16	54916	464.521	
A070421_07	LAMO2500	60	720		15:18:08	55088	15:21:10	55270	181.756	
A070421_08	LAMO2500	60	720	IS-ENVI	15:24:07	55447	15:36:54	56214		N_pulses (logfile)
A070421_09	LAMO2500	60	720		15:41:41	56501	15:42:38	56558	56.503	
A070421_10	LAMO2500	60	720	IS-NV, CR	15:46:54	56814	15:53:29	57209	394.476	

continued

Logfile	Operation mode	Initial frequency [MHz]	approx. Altitude [m]	Surface type	Start time (UTC)	Start time (Sec. day)	Stop time (UTC)	Stop time (Sec. day)	Aquis. time [s]	Remark
A070421_11	LAMO2500	40	720	SI-Fjord, Lance, OW	16:03:51	57831	16:15:32	58532	700.665	
A070421_12	LAMO2500	40	720	SI-Fjord, Lance	16:18:59	58739	16:23:18	58998	258.641	

Table 3.4.: Recorded ASIRAS log files. CryoSat validation lines are highlighted in red. Abbreviations for operation mode and surface types:
A-Any
OW-Open water
IS-Ice Sheet
IE-Ice egde
SI-Sea Ice
CR-Corner reflector
RW-runway
HG-Hangar.
HAMO4000 High Altitude Mode 4000Hz - original configuration
LAMO2500 Low altitude mode (2500 Hz PRF) original LAM
LAMA2000 LOW ALTITUDE MODE A (2000 KHZ PRF)
LAMA2500 LOW ALTITUDE MODE A (2500 KHZ PRF)
LAMA3000 LOW ALTITUDE MODE A (3000 KHZ PRF)

3.5. Auxiliary data

During the survey flights operator logs were recorded. These logs has been stored as seperate files together with the data files and can be found in the Appendix B.

A downward looking SONY-video camera was installed and operated during the flights. Video tapes of 90 min storage time were recorded and will be archived at AWI. The start time of each new tape were noted by the Operator in the logs.

In addition to the laser scanner a single beam laser altimeter (LD90), operating at 4 Hz, was mounted and run during the survey flights. The data was stored on the Medusa-P data base and a backup was carried out after flight. Table 3.5 lists the prelimary processed geolocated LD90 files.

Date	Filename	Start time (Seconds of day)	Stop time (Seconds of day)	Filesize (MB)
2007-04-05	LD90_L1B_20070405T115332_133245	42812	48765	0.4
2007-04-16	LD90_L1B_20070416T105706_135752	39426	50272	1.0
2007-04-17	LD90_L1B_20070417T141030_151040	51030	54640	0.4
2007-04-18	LD90_L1B_20070418T163443_184910	59683	67750	0.6
2007-04-19	LD90_L1B_20070419T145455_154041	53695	56441	0.2
2007-04-20	LD90_L1B_20070420T150203_171904	54123	62343	0.3
2007-04-21	LD90_L1B_20070421T100926_114102	36566	42062	0.7
2007-04-21	LD90_L1B_20070421T114113_162347	42073	59027	0.4

Table 3.5.: Preliminary processed single beam laser altimeter files.

3.6. Total amount of recorded and processed data

The whole data set of the CryoVEx2007 campaign and its pre-campaign has been stored and secured at the AWI data storage system. An overview of the total amount of the raw and processed data are given in the Tables 3.6 and 3.7.

Data type	Data amount
GPS - processed	1.0 MB
INS - processed	170.8 MB
LD90 - processed	0.4 MB
ALS - processed	1.9 GB
ASIRAS - processed	56.9 MB
ASIRAS - raw	23.8 GB

Table 3.6.: Summary of collected data for the ASIRAS_07_01 Bremerhaven test campaign.

Data type	Data amount
GPS - processed	8.4 MB
INS - processed	842.6 MB
LD90 - processed	3.5 MB
ALS - processed	13.8 GB
ASIRAS - processed	1.1 GB
ASIRAS - raw	446.0 GB

Table 3.7.: Summary of collected data for the ASIRAS_07_02 Bremerhaven test campaign.

4. Data analysis

4.1. Corner reflector analysis

Seven corner reflectors where placed on the CryoSat validation lines by the ground team. Preliminary hand held GPS positions of the corner reflector locations where reported to the airborne team for flight preparation (see Table 4.1 and figure 4.1). One additional corner reflector was placed close to the runway of Longyearbyen to fullfill ESA's test flight program. As it is shown in Table 4.2 all corner reflectors but one where hit. The data quality over the corner reflectors has been checked after the survey flight with the 'ASIRASviewer3.5' software from RST. One Example from the viewer is shown in figure 4.2. Here the corner reflector shows up as a parabola of strong amplitude. By analyzing the corner responses it could be shown that the ASIRAS pulse to pulse phase shift problem (see CryoVEx2006 report) is solved. The comparison between a CryoVEx2006 and a CryoVEx2007 corner reflector analysis highlightes this progress (figures 4.3 and 4.4).

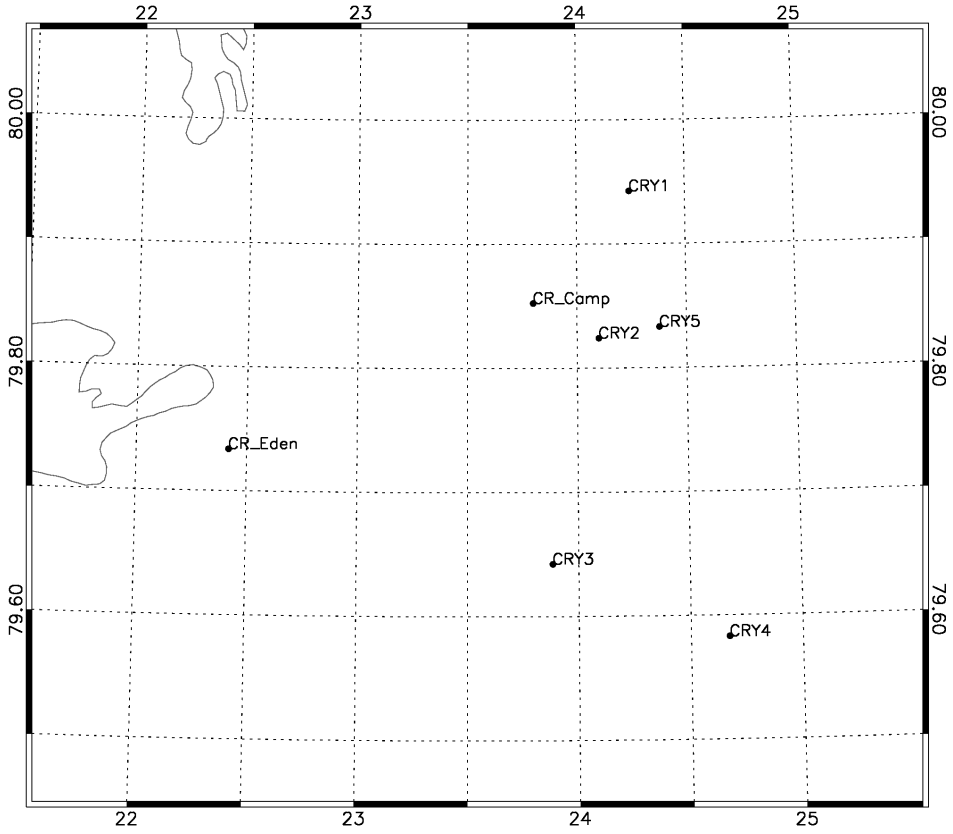


Figure 4.1.: Overview of the corner reflector positions on the Austfonna Icecap.

Corner Reflector	Latitude	Longitude	Altitude	Height above ground [m]
CR Brhv	53.5013375	8.5757514	46.17	1.15
CR Airport	78.2448382	15.5093248	53.66	1.55
CR CRY1	79.9426041	24.2432943	686.28	1.54
CR CRY2	79.8241805	24.0990740	813.07	1.61
CR CRY3	79.6422064	23.8835351	640.39	1.83
CR CRY4	79.5829149	24.6718286	470.37	1.83
CR CRY5	79.8330504	24.3766933	819.71	1.55
CR Camp	79.8524701	23.7995709	802.15	1.68
CR Eton	79.7335480	22.4175309	368.32	1.75

Table 4.1.: Corner reflector positions.

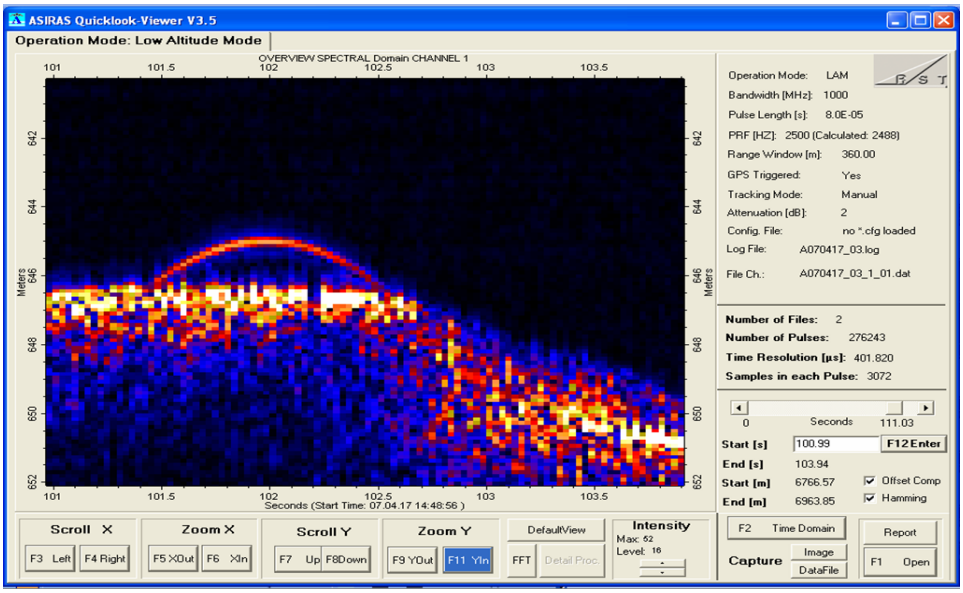


Figure 4.2.: Example of a corner reflector response displayed by the RST-'ASIRASviewer'.

CR	Profile	Offset-track distance [m]	DGPS Time [h:m:s]	Seconds from the beginning of the file [s]	ASIRAS Hit
CR Brhv	A070405_12	42.3	13:11:16.54 47476.54	11	No
CR Brhv	A070405_13	2.0	13:16:24.60 47784.6	230	No
CR Brhv	A070405_15	2.7	13:27:49.65 48469.65	56	No
CR Brhv	A070405_16	12.7	13:31:38.85 48698.85	58	No
CR Airport	A070416_26	20.8	13:46:21.42 49581.42	49	No
CR Airport	A070416_27	21.4	13:54:21.64 50061.64	73	No
CR Airport	A070416_28	26.5	13:57:06.50 50226.5	39	No
CR Airport	A070417_01	5.8	14:26:40.03 52000.13	95	Ok
CR Airport	A070417_02	8.4	14:38:48.22 52728.22	60	Ok - poor
CR Airport	A070417_03	11.3	14:50:37.52 53437.52	102	Ok
CR Airport	A070417_04	15.4	14:58:45.34 53925.34	105	No
CR Airport	A070417_05	135.4	15:09:31.27 54771.27	112	No
CR CRY1	A070418_01	6.1	16:53:21.49 60801.49	986	Yes - poor
CR CRY1	A070418_02	4.2	17:03:21.52 61401.52	201.5	Yes - poor
CR CRY2	A070418_01	6.0	16:50:09.16 60609.16	793.5	Yes
CR CRY3	A070418_01	7.5	16:45:02.12 60302.12	486.5	Yes
CR CRY3	A070418_05	314.3	17:41:39.15 63699.15	178	No
CR CRY4	A070418_02	11.0	17:14:09.38 62049.38	850	Yes
CR CRY4	A070418_04	10.5	17:32:24.92 63144.92	235	Yes
CR CRY5	A070418_02	7.4	17:06:39.07 61599.07	389	Yes - poor

continued

CR	Profile	Offset-track distance [m]	DGPS Time [h:m:s]	Seconds from the beginning of the file [s]	ASIRAS Hit
CR CRY5	A070421_01	3.6	10:30:18.45 37818.45	649	Yes - poor
CR Camp	A070420_04	8.3	15:54:48.31 57288.31	495	Yes
CR Camp	A070421_03	196.6	11:12:22.23 40342.24	734	No
CR Camp	A070421_10	15.20	15:51:52.69 57112.69	300	No
CR Eton	A070420_01	21.1	15:10:21.65 54621.65	87	No

Table 4.2.: Corner reflector analysis.

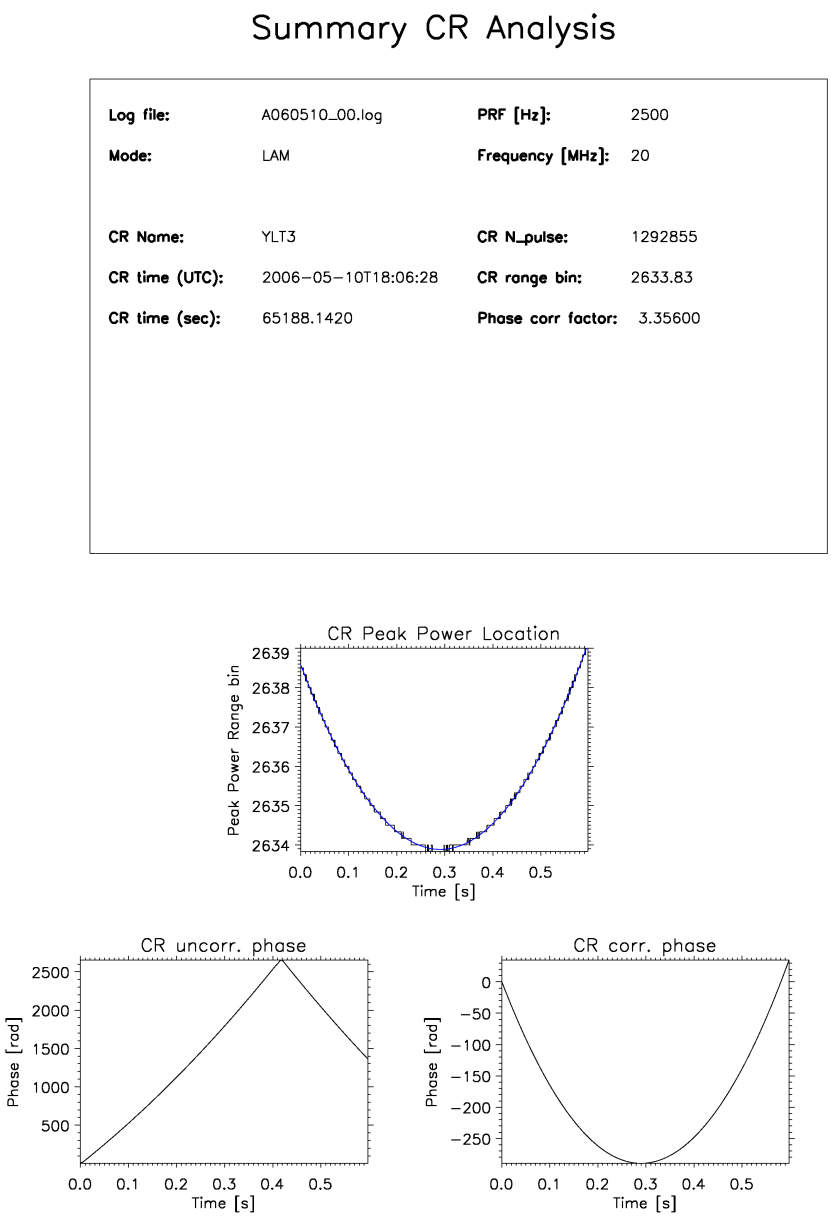


Figure 4.3.: Example of the corner reflector analysis from 2006 data. The phase correction value of 3.356 indicates that a correction has to be applied during processing.

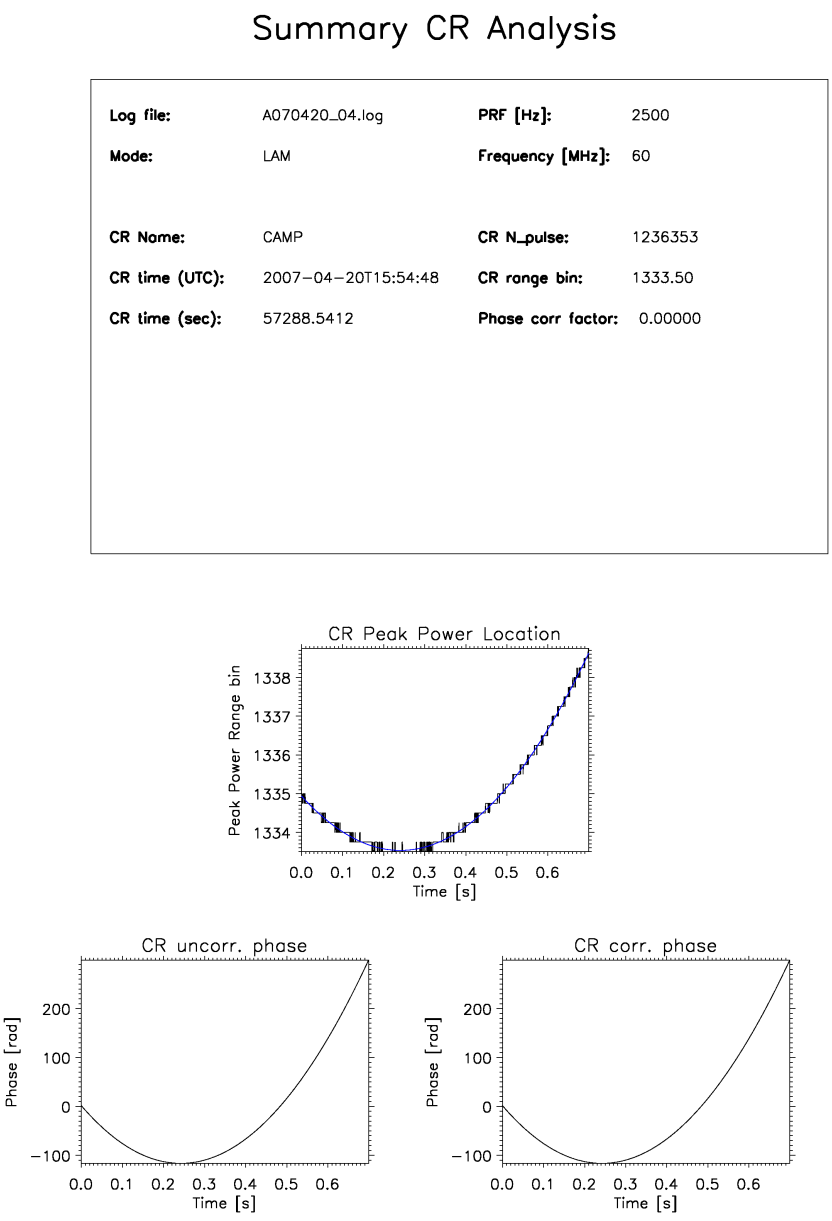


Figure 4.4.: Example of the corner reflector analysis from 2007 data. The phase correction value of 0.0 indicates that no correction has to be applied during processing.

4.2. Laser scanner analysis

A couple of hangar overflights in different altitudes have been applied during the campaign. The hangar cross calibration flights were used to determine the laser scanner squinting angles. We applied the same procedure as described in *Helm et al.* (2006). Additional to the cross calibration of two different overflights the precise positions of the hangar building edges (measured with DGPS) were used in the analysis. Tables 4.3 and 4.4 list the GPS positions of the hangar building edges and the result of the cross calibration analysis, respectivly. Figure 4.6 show the comparison of the uncorrected and corrected differentiell ALS-DEM's. Included in the figures are the GPS measured hangar edges, given in table 4.3.

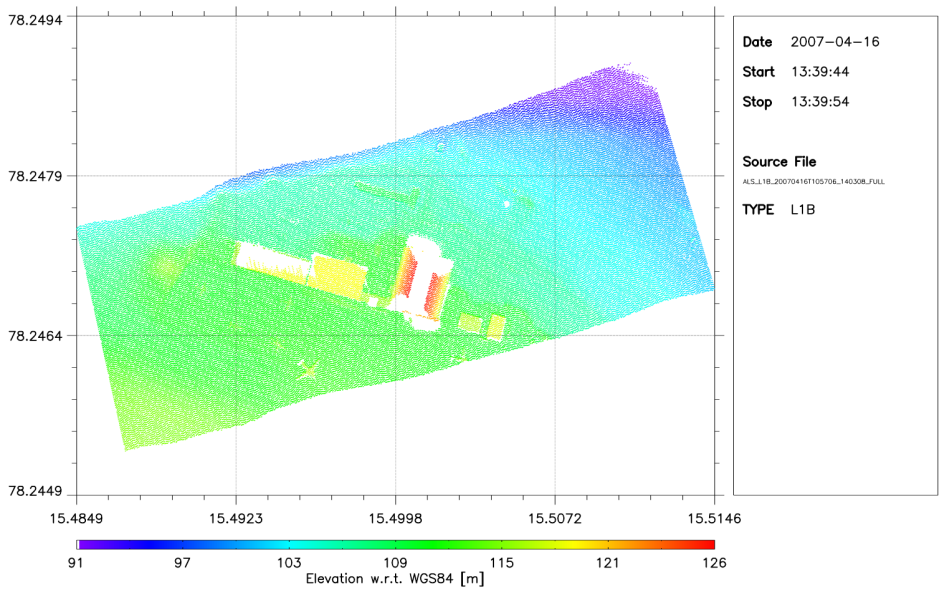


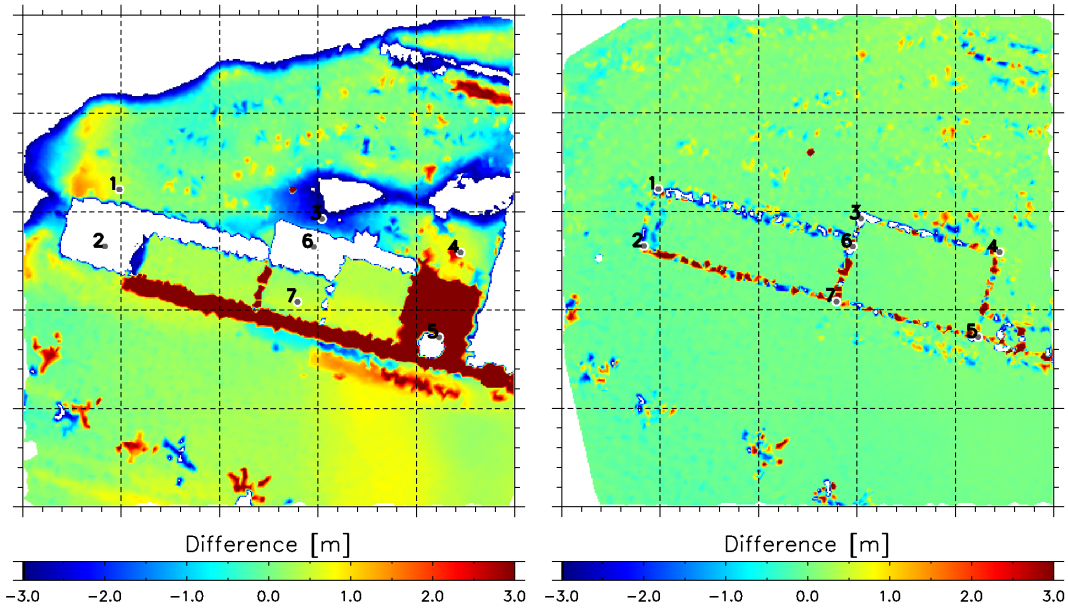
Figure 4.5.: Laser scanner cross calibration flight over the hangar building in Longyearbyen. Edges of the hangar building are used to determine the laser scanner squinting angle.

Hangar edges	Latitude [°]	Longitude [°]	Altitude [m]
Edge 1	78.2468395644	15.4889160189	63.90
Edge 2	78.2470495199	15.4892156698	63.52
Edge 3	78.2468686784	15.4924200512	63.77
Edge 4	78.2466629288	15.4921348606	63.22
Edge 5	78.2466527898	15.4922114591	63.95
Edge 6	78.2469577518	15.4925953444	64.12
Edge 7	78.2468237517	15.4950553226	64.00
Edge 8	78.2465226302	15.4946620328	63.94
Edge 9	78.2468566068	15.4886740623	60.82
Edge 10	78.2470635584	15.4889611718	60.37

Table 4.3.: Positions of the edges of the hangar building.

ϑ [°]	ς [°]	ξ [°]
0.0	-2.025	0.0

Table 4.4.: Results of laser scanner squint angle analysis.



(a) uncorrected (b) corrected

Figure 4.6.: Results of ALS squint angle analysis. Shown are the differentiell ALS-DEM's of two cross flights over the Longyearbyen hangar buildings. The correction in b) was done by reprocessing the data with the squint angles given in Table 4.4. The numbers corresponding to the GPS measured building edges given in table 4.3.

4.3. Runway passes

Laser scanner runway overflights are used in comparison with simultaneously acquired ASIRAS data to determine the static offset (cable length, etc.) of the ASIRAS system. This offset should be considered in further data analysis. Table 4.5 lists all runway overflights and the analysis results. Figure 4.7 shows an example of the laser scanner true color image of the runway in Longyearbyen overflown at the 16th of April 2007.

ASIRAS file	Start time	Stop time	Time shift [s]	Offset [m]	Stddev [m]	ALS quality	ASIRAS quality
A070405_12	13:11:15 47475	13:11:24 47484	-0.43	2.82	0.03	good	ok
A070416_20	13:28:38 48518	13:39:14 48554	-0.38	2.75	0.04	good	good
A070416_25	13:42:59 49379	13:43:39 49419	-0.32	2.75	0.05	good	ok
A070417_05	15:09:28 54568	15:10:09 54609	0.00	2.78	0.04	good	ok,roll
A070418_08	18:45:27 67527	18:45:59 67559	0.00	2.76	0.10	good	poor, roll
A070418_09	18:48:11 67691	18:49:30 67730	-0.17	2.78	0.02	good	good
A070420_08	16:57:17 61037	16:58:03 61045	-0.51	2.69	0.03	good	ok,roll
A070420_09	17:01:04 61264	17:01:43 61303	0.00	2.81	0.04	good	ok, roll
A070420_10	17:05:41 61541	17:06:23 61583	-0.18	2.78	0.03	good	ok, roll
A070420_11	17:09:18 61758	17:10:00 61800	-0.10	2.75	0.08	good	poor, roll
Average				2.77	0.04		

Table 4.5.: Analysis of ASIRAS and ALS data simultaneously acquired over the runway.

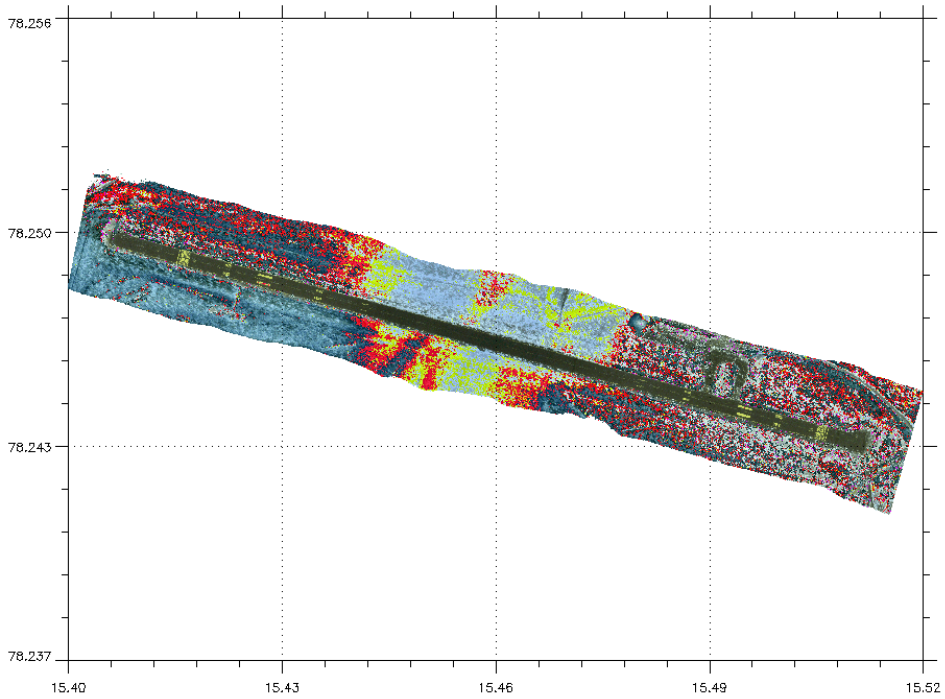
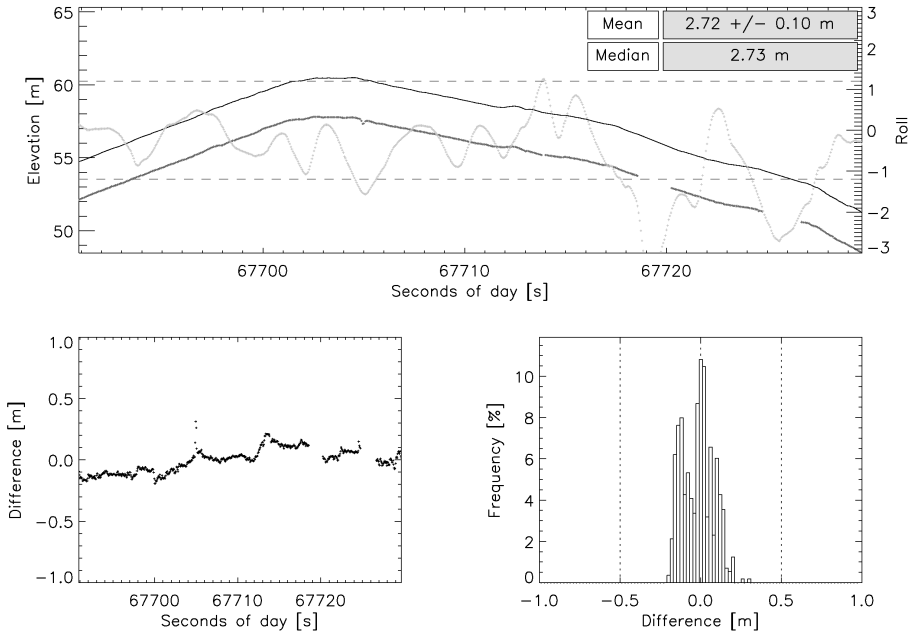


Figure 4.7.: True color image of laser scanner runway overflight in Longyearbyen.

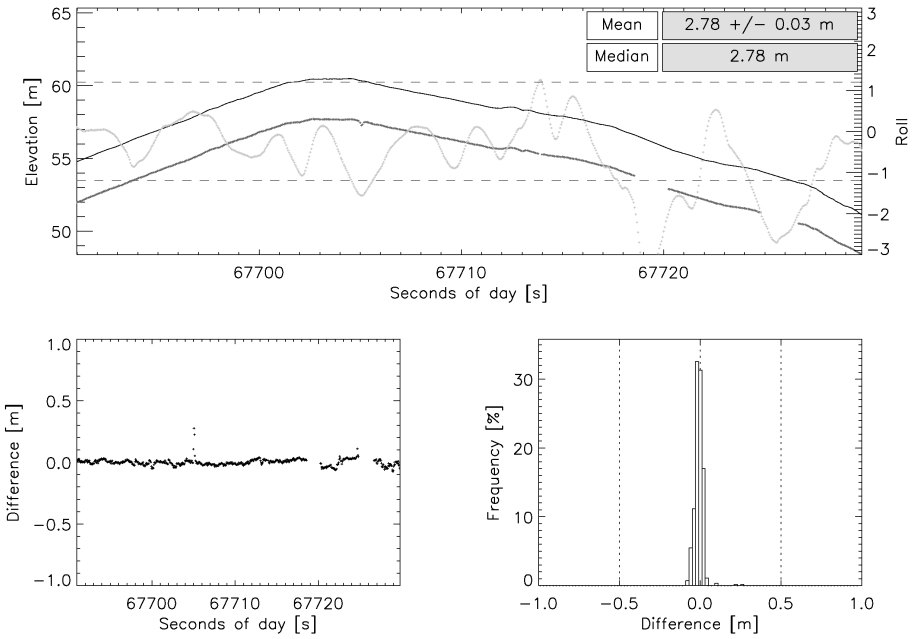
4.4. Datation analysis

As it was shown in former campaign reports, *Helm et al.* (2006); *Stenseng et al.* (2007) an ASIRAS datation issue exists in some of the ASIRAS profiles. Its origin is still unkown, however two different test procedure where developed to investigate these datation issues. The first test uses a comparison of the ASIRAS surface elevation with the laser scanner elevation model in small sections of the profiles. Details of the procedure are described in *Helm et al.* (2006). An example is given in figure 4.9, where we compared the ASIRAS and ALS elevation models of the runway in Longyearbyen. the black lines in the upper panels show the ALS elevation, whereas the dark gray line shows the ASIRAS elevation. The light gray line shows the roll, which is close to zero for this section. Data with roll angles larger than $\pm 1.2^{\circ}$ were not used in the comparison, due to artefacts explained in *Helm et al.* (2006). The lower left panels of figure 4.9 (a) and (b) show the variation of the difference around the median value. Statistics of this variation is shown in the histogram. It can be seen that both standard deviation and histogram of figure 4.9 (b) shows an clear improvement compared to figure 4.9 (a). For most of the profiles this test was applied and the results are listed in table C.1. After the determination of the time shifts the data was re-processed including the datation correction.

In the second test procedure ASIRAS corner reflector crossings were used. This method enables a direct comparison of raw ASIRAS data and GPS, without third party ALS data. Therefore it can be used to check the ASIRAS-ALS analysis results. An example of the test is shown in figure 4.9. Here the CR response shown as hyperbola and a simulated CR hyperbola (orange line) are compared. The simulation includes instrument positions within the aircraft reference frame, DGPS, INS data and the measured corner reflector position on



(a) ASIRAS profile shifted by 0.0 s



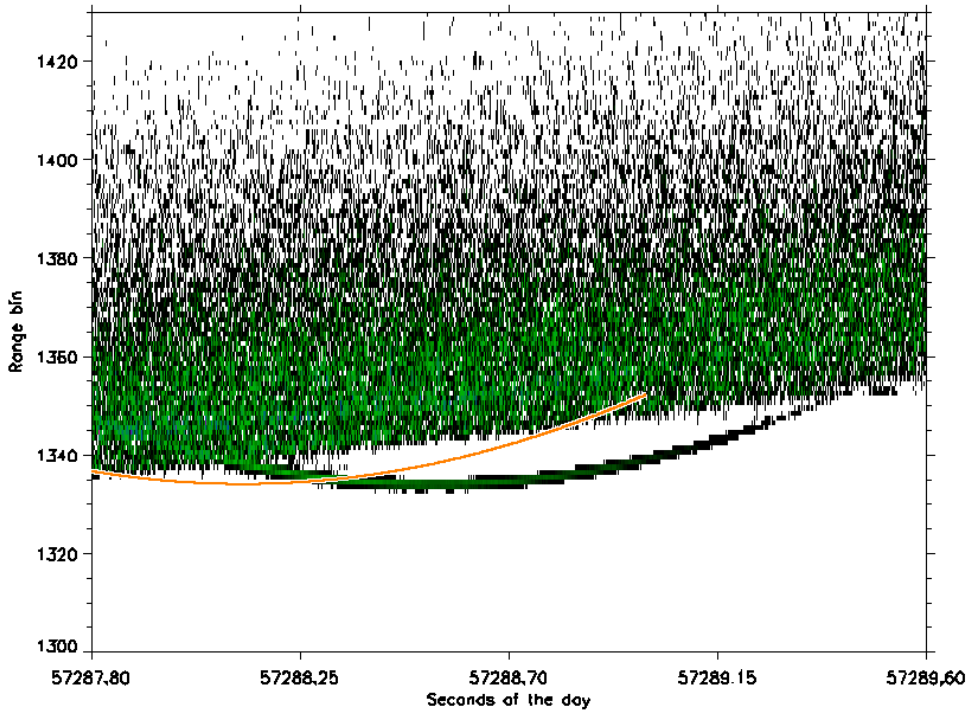
(b) ASIRAS profile shifted by -0.17 s

Figure 4.8.: Comparison between ASIRAS elevation of profile A070418_09 and ALS elevation model.

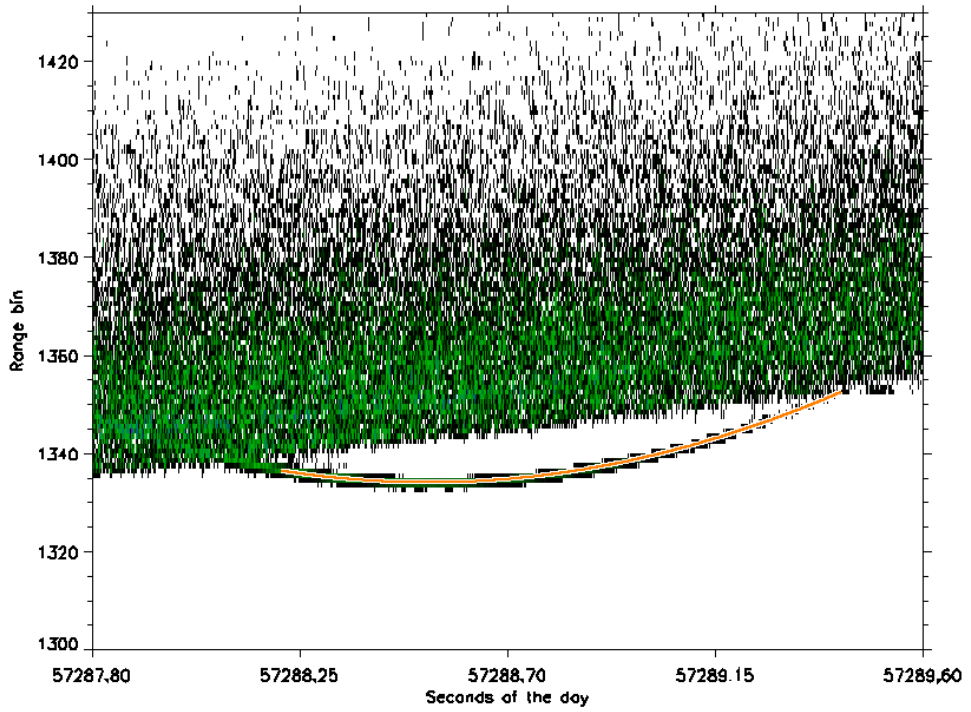
CR	Profile	Offset-track distance [m]	DGPS Time [h:m:s]	Time shift [s]	ALS time shift [s]
CR Airport	A070417_01	5.8	14:26:40.13 52000.13	-0.43	-0.42
CR Airport	A070417_02	8.4	14:38:48.22 52728.22	0.03	0.00
CR Airport	A070417_03	11.8	14:50:37.44 53437.44	0.00	0.00
CR CRY2	A070418_01	6.0	16:50:09.16 60609.16	-0.18	-0.16
CR CRY3	A070418_01	7.5	16:45:02.12 60302.12	-0.18	-0.16
CR CRY4	A070418_02	11.0	17:14:09.38 62049.38	0.04	0.00
CR CRY4	A070418_04	10.5	17:32:24.92 63144.92	0.00	0.00
CR Camp	A070420_04	8.3	15:54:48.31 57288.31	-0.41	-0.39

Table 4.6.: Comparison of datation procedures. The column time shift was determined directly from ASIRAS raw data by fitting the simulated hyperbola to the raw data and column ALS time shift by using ASIRAS ALS comparisons.

ground. The time shift was determined by a least square algorithm to fit simulated hyperbola to the raw data. In table 4.6 the results of both procedures are compared. It can be seen that they show very similar results. Small deviations are connected to unprecise DGPS solutions of the croner reflector ground positions, since the accuracy of hand held GPS is within +/- 5 to 10 m. Positioning errors of 10 m can explain deviations of up to 0.1 s (average ground speed: 65 m/s). The results clearly proof that an datation error in the ASIRAS data exists and that it is not artificially produced within the data processing chain.



(a) simulated hyperbola shifted by 0.0 s



(b) simulated hyperbola shifted by -0.43 s

Figure 4.9.: ASIRAS corner reflector datation test. The orange hyperbola is the simulated response using GPS, INS and the instrument positions within the aircaft reference frame.

5. Conclusion

The airborne part of the CryoVEx2007 campaign has successfully been carried out by AWI and the gathered data sets are now stored and secured at AWI and partly at ESA. A total of 20 h were flown with the DLR D-CODE where laser scanner data and ASIRAS radar data were gathered on the main CryoSat validation sites and additional over the Kongsvegen glacier, the sea ice of the Walfjorden and along an ENVI-Sat track. The Analysis of the time lag corrected data sets show good results. All processed data sets have been delivered to ESA to be used for further data analysis.

The data collected during CryoVEx 2007 will be important for understanding CryoSat-2 radar signals, and the processed data presents many opportunities for additional scientific investigations, such as e.g. the direct mapping of snow thickness by the combination of laser and radar, a detailed understanding on snow and firn penetration of the CryoSat2 signal etc. A number of overflights of corner reflectors on the Austfonna icecap will aid this resarch, as well as serving the calibration of ASIRAS.

A number of independent in-situ data on accumulation rate and surface roughness were collected during CryoVEx 2007 on the Austfonna icecap by Norwegian and British scientists. The comparison of these data sets with ASIRAS is outside the scope of this document and will be presented in other scientific papers.

A. File Formats

The format description for the core products is taken from *Cullen* (2006) and the users should refer to this document for detailed information. The definition of the data types used in the binary files can be found in table A.1.

Type	Description	Size (bytes)
uc	Unsigned character	1
sc	Signed character	1
us	Unsigned short integer	2
ss	Signed short integer	2
ul	Unsigned long integer	4
sl	Signed long integer	4
ull	Unsigned long long integer	8
sll	Signed long long integer	8
d	Double precision floating	8
f	Single precision floating	4
[n]	Array length n	

Table A.1.: Definition of format parameter types

A.1. ASIRAS L1B

Processed ASIRAS L1B data is delivered in binary, big endian format as described by *Cullen* (2006) and tables **??**.
The L1B product consists of two elements.

1. An ASCII header consisting of a main product header (MPH), a specific product header (SPH) and the data set descriptors (DSDs).

2. A binary, big endian measurement data set (MDS)

Field	Description	Units	Bytes	Type
	Product Identification Info			
1	PRODUCT=	keyword	8	
	quotation mark (")		1	uc
	Product File Name It is left justified with trailer blanks		62	
	quotation mark (")		1	uc
	newline character	terminator	1	
2	PROC_STAGE=	keyword	11	11*uc
	Processing stage code: N = Near-Real Time T = Test O = OFF Line (Systematic) R = Reprocessing L = Long Term Archive		1	
	newline character	terminator	1	
3	REF_DOC=	keyword	8	8*uc
	quotation mark (")		1	uc
	Reference DFCB Document describing the product		23	23*uc
	quotation mark (")		1	uc
	newline character	terminator	1	
4	Spare (blank characters)		40	40*uc
	newline character	terminator	1	uc
	Data Processing Information			
5	ACQUISITION_STATION=	keyword	20	20*uc
	quotation mark (")		1	uc
	Acquisition Station ID Filled by blanks		20	Kiruna
	quotation mark (")		1	uc
	newline character	terminator	1	
6	PROC_CENTER=	keyword	12	12*uc
	quotation mark (")		1	uc
	Processing Center ID code		6	PDS
	quotation mark (")		1	uc

continued

Field	Description	Units	Bytes	Type
	newline character	terminator	1	
7	PROC_TIME=	keyword	10	10*uc
	quotation mark (")		1	uc
	Processing Time (Product Generation Time)	UTC	27	dd-MMM-yyyy hh:mm:ss.uuuuuu
	quotation mark (")		1	uc
	newline character	terminator	1	
8	SOFTWARE_VER=	keyword	13	13*uc
	quotation mark (")		1	uc
	Processor name, up to 8 characters, and software version number followed by trailer blanks if any. If not used set to blanks		14	14*uc Proc.Name/VV.rr
	quotation mark (")		1	uc
	newline character	terminator	1	
9	Spare (blank characters)		40	40*uc
	newline character	terminator	1	uc
Information on Time of Data				
10	SENSING_START=	keyword	14	14*uc
	quotation mark (")		1	uc
	UTC start time of data sensing. This is the UTC start time of the Input Level 0 Product. If not used set to 27 blanks	UTC	27	dd-MMM-yyyy hh:mm:ss.uuuuuu
	quotation mark (")		1	uc
	newline character	terminator	1	
11	SENSING_STOP=	keyword	13	13*uc
	quotation mark (")		1	uc
	UTC stop time of data sensing. This is the UTC stop time of the Input Level 0 Product. If not used set to 27 blanks	UTC	27	dd-MMM-yyyy hh:mm:ss.uuuuuu
	quotation mark (")		1	uc
	newline character	terminator	1	
12	Spare (blank characters)		40	40*uc
	newline character	terminator	1	uc
Orbit Information				
13	PHASE=	keyword	6	6*uc
	Phase Code: phase letter (A, B, :.) If not used set to X		1	
	newline character	terminator	1	uc
14	CYCLE=	keyword	6	6*uc
	Cycle number.		4	%+04d

continued

Field	Description	Units	Bytes	Type
	If not used set to +000			
	newline character	terminator	1	uc
15	REL_ORBIT=	keyword	10	10*uc
	Relative Orbit Number at sensing start time. If not used set to +00000		6	%+06d
	newline character	terminator	1	uc
16	ABS_ORBIT=	keyword	10	10*uc
	Absolute Orbit Number at sensing start time. If not used set to +00000		6	%+06d
	newline character	terminator	1	uc
17	STATE_VECTOR_TIME=	keyword	18	18*uc
	quotation mark (")		1	uc
	UTC state vector time It is filled properly in case of usage of FOS Predicted Orbit information otherwise it shall be set to 27 blanks	UTC	27	dd-MMM-yyyy hh:mm:ss.uuuuuu
	quotation mark (")		1	uc
	newline character	terminator	1	
18	DELTA_UT1=	keyword	10	10*uc
	Universal Time Correction: DUT1 = UT1 UTC Not used for ASIRAS. It shall be set to +.000000	s	8	%+08.6f
	<s>	units	3	3*uc
	newline character	terminator	1	
19	X_POSITION=	keyword	11	11*uc
	X position in Earth Fixed Reference. If not used set to +0000000.000	m	12	%+012.3f
	<m>	units	3	3*uc
	newline character	terminator	1	
20	Y_POSITION=	keyword	11	11*uc
	Y position in Earth Fixed Reference. If not used set to +0000000.000	m	12	%+012.3f
	<m>	units	3	3*uc
	newline character	terminator	1	
21	Z_POSITION=	keyword	11	11*uc
	Z position in Earth Fixed Reference. If not used set to +0000000.000	m	12	%+012.3f
	<m>	units	3	3*uc
	newline character	terminator	1	
22	X_VELOCITY=	keyword	11	11*uc
	X velocity in Earth Fixed Reference. If not used set to +0000.000000	m/s	12	%+012.6f

continued

Field	Description	Units	Bytes	Type
	<m/s>	units	5	5*uc
	newline character	terminator	1	
23	Y_VELOCITY=	keyword	11	11*uc
	Y velocity in Earth Fixed Reference. If not used set to +0000.000000	m/s	12	%+012.6f
	<m/s>	units	5	5*uc
	newline character	terminator	1	
24	Z_VELOCITY=	keyword	11	11*uc
	Z velocity in Earth Fixed Reference. If not used set to +0000.000000	m/s	12	%+012.6f
	<m/s>	units	5	5*uc
	newline character	terminator	1	
25	VECTOR_SOURCE=	keyword	14	14*uc
	quotation mark (")		1	uc
	Source of Orbit State Vector Record FP = FOS predicted DN = DORIS Level 0 navigator DP = DORIS precise orbit FR = FOS Restituted DI = DORIS Preliminary		2	2*uc
	quotation mark (")		1	uc
	newline character	terminator	1	
26	Spare (blank characters)		40	40*uc
	newline character	terminator	1	uc
SBT to UTC conversion Information				
27	UTC_SBT_TIME=	keyword	13	13*uc
	quotation mark (")		1	uc
	Not used and set to 27 blanks		27	
	quotation mark (")		1	uc
	newline character	terminator	1	uc
28	SAT_BINARY_TIME=	keyword	16	16*uc
	Satellite Binary Time Not used for Cryosat and it shall be set to zeros		11	0
	newline character	terminator	1	uc
29	CLOCK_STEP =	keyword	11	11*uc
	Clock Step Not used for Cryosat and it shall be set to zeros		11	0
	<ps>	units	4	4*uc
	newline character	terminator	1	uc
30	Spare (blank characters)		32	32*uc
	newline character	terminator	1	uc
Leap Second Information				
continued				

Field	Description	Units	Bytes	Type
31	LEAP_UTC=	keyword	9	9*uc
	quotation mark (")		1	uc
	UTC Time of the occurrence of the leap second. If a leap second occurred in the product window the field is set by a devoted function in the CFI EXPLORER_ORBIT library (see [EXPL_ORB-SUM] for details), otherwise it is set to 27 blanks. It corresponds to the time after the Leap Second occurrence (i.e. midnight of the day after the leap second)		27	dd-MMM-yyyy hh:mm:ss.uuuuuu
	quotation mark (")		1	uc
	newline character	terminator	1	uc
32	LEAP_SIGN=	keyword	10	10*uc
	Leap second sign If a leap second occurred in the product window the field is set to the expected value by a devoted function in the CFI EXPLORER_ORBIT library (see [EXPL_ORB-SUM] for details), otherwise it is set to +000.	S	4	%+04d
	newline character	terminator	1	uc
33	LEAP_ERR=	keyword	9	9*uc
	Leap second error flag. This field is always set to 0 considering that CRYOSAT products have true UTC times		1	uc
	newline character	terminator	1	uc
34	Spare (blank characters)		40	40*uc
	newline character	terminator	1	uc
Product Confidence Data Information				
35	PRODUCT_ERR=	keyword	12	12*uc
	Product Error Flag set to 1 if errors have been reported in the product		1	uc
	newline character	terminator	1	uc
Product Size Information				
36	TOT_SIZE=	keyword	9	9*uc
	Total size of the product	bytes	21	%+021d
	<bytes>	units	7	7*uc
	newline character	terminator	1	Uc
37	SPH_SIZE=	keyword	9	9*uc
	Length of the SPH	bytes	11	%+011d

continued

Field	Description	Units	Bytes	Type
	<bytes>	units	7	7*uc
	newline character	terminator	1	Uc
38	NUM_DSD=	keyword	8	8*uc
	Number of Data Set Descriptors, including spares and all other types of DSDs		11	%+011d
	newline character	terminator	1	Uc
39	DSD_SIZE=	keyword	9	9*uc
	Length of each DSD	bytes	11	%+011d
	<bytes>	units	7	7*uc
	newline character	terminator	1	Uc
40	NUM_DATA_SETS=	keyword	14	14*uc
	Number of attached Data Sets (note that not all the DSDs have a DS attached)		11	%+011d
	newline character	terminator	1	Uc
41	CRC=	keyword	4	4*uc
	Cyclic Redundancy Code computed as overall value of all records of the Measurement Data Set. If not computed it shall be set to -00001		6	%+06d
	newline character	terminator	1	Uc
42	Spare (blank characters)		29	29*uc
	newline character	terminator	1	uc
TOTAL				**1247**

Table A.2.: ESA defined ASIRAS main product header (MPH) format.

Field	Description	Units	Bytes	Type
Product description and identification				
1	SPH_DESCRIPTOR=	keyword	15	15*uc
	quotation mark (")		1	uc
	ASCII string describing the product ASI_SAR_1B SPECIFIC HEADER		28	28*uc
	quotation mark (")		1	uc
	newline character	terminator	1	uc
Product Time information				
2	START_RECORD_TAI_TIME=	keyword	22	22*uc
	quotation mark (")		1	uc
	TAI of the first record in the Main MDS of this product	TAI	27	dd-MMM-yyyy hh :mm :ss.uuuuuu
	quotation mark (")		1	uc
	newline character	terminator	1	uc
3	STOP_RECORD_TAI_TIME=	keyword	21	21*uc
	quotation mark (")		1	uc
	TAI of the last record in in the Main MDS of this product	TAI	27	dd-MMM-yyyy hh :mm :ss.uuuuuu
	quotation mark (")		1	uc
	newline character	terminator	1	uc
Product Orbit Information				
4	ABS_ORBIT_START=	Keyword	16	16*uc
	Absolute Orbit Number at Product Start Time		6	%06d
	Newline character	terminator	1	uc
5	REL_TIME_ASC_NODE_START=	Keyword	24	24*uc
	Relative time since crossing ascending node time relative to start time of data sensing	s	11	%011.6f
	<s>	units	3	3*uc
	Newline character	terminator	1	Uc
6	ABS_ORBIT_STOP=	Keyword	15	15*uc
	Absolute Orbit Number at Product Stop Time		6	%06d
	Newline character	terminator	1	uc
7	REL_TIME_ASC_NODE_STOP=	Keyword	23	23*uc
	Relative time since crossing ascending node time relative to stop time of data sensing	s	11	%011.6f
	<s>	units	3	3*uc
	Newline character	terminator	1	uc
8	EQUATOR_CROSS_TIME_UTC=	Keyword	23	23*uc
	Quotation mark(")		1	uc

continued

Field	Description	Units	Bytes	Type
	Time of Equator crossing at the ascending node of the sensing start time	UTC	27	dd-MMM-yyyy hh:mm:ss.uuuuuu
	Quotation mark (")		1	uc
	Newline character	terminator	1	uc
9	EQUATOR_CROSS_LONG=	Keyword	19	19*uc
	Longitude of Equator Crossing at the ascending node of the sensing start time (positive East, 0 = Greenwich) referred to WGS84	s	11	%+011d
	<10-6degE>	units	10	10*uc
	Newline character	terminator	1	uc
10	ASCENDING_FLAG= Orbit Orientation at the sensing start time A= Ascending D= Descending	Keyword	15 1	15*uc uc
	Newline character	terminator	1	uc
Product Location Information				
11	START_LAT=	keyword	10	10*uc
	WGS84 latitude of the first record in the Main MDS (positive north)	[10-6 deg]	11	%+011d
	<10-6degN>	units	10	10*uc
	newline character	terminator	1	uc
12	START_LONG=	keyword	11	11*uc
	WGS84 longitude of the first record in the Main MDS (positive East, 0 = Greenwich)	[10-6 deg]	11	%+011d
	<10-6degE>	units	10	10*uc
	newline character	terminator	1	uc
13	STOP_LAT=	keyword	9	9*uc
	WGS84 latitude of the last record in the Main MDS (positive north)	[10-6 deg]	11	%+011d
	<10-6degN>	units	10	10*uc
	newline character	terminator	1	uc
14	STOP_LONG=	keyword	10	10*uc
	WGS84 longitude of the last record in the Main MDS (positive East, 0 = Greenwich)	[10-6 deg]	11	%+011d
	<10-6degE>	units	10	10*uc
	newline character	terminator	1	uc
15	Spare (blank characters)	ascii	50	50*uc
	newline character	terminator	1	uc
Level 0 Quality information				
16	L0_PROC_FLAG=	keyword	13	13*uc

continued

Field	Description	Units	Bytes	Type
	Processing errors significance flag (1 or 0). 1 if the percentage of SIRAL packets free of processing errors is less than the acceptable threshold		1	uc
	newline character	terminator	1	uc
17	L0_PROCESSING_QUALITY=	keyword	22	22*uc
	Percentage of quality checks successfully passed during the SP processing (max allowed +10000)	[10-2 %]	6	%+06d
	<10-2%>	units	7	7*uc
	newline character	terminator	1	uc
18	L0_PROC_THRESH=	keyword	15	15*uc
	Minimum acceptable percentage of quality threshold that must be passed during SP processing (max allowed +10000)	[10-2 %]	6	%+06d
	<10-2%>	units	7	7*uc
	newline character	terminator	1	uc
19	L0_GAPS_FLAG=	keyword	13	13*uc
	Gaps significance flag (1 or 0). 1 if gaps (either caused by extraction or alignment failures) were detected during the SP processing		1	uc
	newline character	terminator	1	uc
20	L0_GAPS_NUM=	keyword	12	12*uc
	Number of gaps detected during the SP processing (no gaps indicated as +0000000)		8	%+08d
	newline character	terminator	1	uc
21	Spare (blank characters)	ascii	50	50*uc
	newline character	terminator	1	uc
ASIRAS Instrument Configuration				
22	ASI_OP_MODE=	keyword	12	12*uc
	quotation mark (")		1	uc
	ASIRAS Operative Mode: HAM LAM (strings shorter than 10 are filled in with blanks $)		10	10*uc
	quotation mark (")		1	uc
	Newline character	terminator	1	uc
23	ASI_CONFIGURATION=	keyword	18	17*uc
	quotation mark (")		1	uc
	SIRAL Configuration:		7	7*uc

continued

Field	Description	Units	Bytes	Type
	RX_1 RX_2 BOTH UNKNOWN (strings shorter than 7 are filled in with blanks)			
	quotation mark (")		1	uc
	Newline character	terminator	1	uc
Surface Statistics				
24	OPEN_OCEAN_PERCENT=	Keyword	19	19*uc
	Percentage of records detected on open ocean or semi-enclosed seas	[10-2%]	6	%+06d
	<10-2%>	Units	7	7*uc
	Newline character	Terminator	1	uc
25	CLOSE_SEA_PERCENT=	Keyword	18	18*uc
	Percentage of records detected on closed seas or inland lakes	[10-2%]	6	%+06d
	<10-2%>	Units	7	7*uc
	Newline character	Terminator	1	uc
26	CONTINENT_ICE_PERCENT=	Keyword	22	22*uc
	Percentage of records detected on continental ice	[10-2%]	6	%+06d
	<10-2%>	Units	7	7*uc
	Newline character	Terminator	1	uc
27	LAND_PERCENT	Keyword	13	13*uc
	Percentage of records detected on land	[10-2%]	6	%+06d
	Percentage of records detected on land	[10-2%]	6	%+06d
	<10-2%>	Units	7	7*uc
	Newline character	Terminator	1	uc
28	Spare (blank characters)	ascii	50	50*uc
	Newline character	Terminator	1	uc
Level 1 Processing information				
29	L1B_PROD_STATUS=	keyword	16	16*uc
	Complete/Incomplete Product Completion Flag (0 or 1). 1 if the Product as a duration shorter than the input Level 0		1	uc
	newline character	terminator	1	uc
30	L1B_PROC_FLAG=	keyword	14	14*uc
	Processing errors significance flag (1 or 0).		1	uc

continued

Field	Description	Units	Bytes	Type
	1 if the percentage of DSR free of processing errors is less than the acceptable threshold			
	newline character	terminator	1	uc
31	L1B_PROCESSING_QUALITY=	keyword	23	23*uc
	Percentage of quality checks successfully passed during Level 1B processing (max allowed +10000)	[10-2 %]	6	%+06d
	<10-2%>	units	7	7*uc
	newline character	terminator	1	uc
32	L1B_PROC_THRESH=	keyword	16	16*uc
	Minimum acceptable percentage of quality threshold that must be passed during Level 1B processing (max allowed +10000)	[10-2 %]	6	%+06d
	<10-2%>	units	7	7*uc
	newline character	terminator	1	uc
33	Spare (blank characters)	ascii	50	50*uc
	newline character	terminator	1	uc
TOTAL				**1112**
DSD Section				

Table A.3.: ESA defined ASIRAS specific product header (MPH) format.

Field	Description	Units	Bytes	Type
DSD				
1	DS_NAME=	keyword	8	8*uc
	quotation mark (")		1	uc
	Name describing the Data Set		28	28*uc
	quotation mark (")		1	uc
	newline character	terminator	1	uc
2	DS_TYPE=	keyword	8	8*uc
	Type of Data Set. It can be: M = Measurement R = Reference		1	uc
	newline character	terminator	1	uc
External product reference				
3	FILENAME=	keyword	9	9*uc
	quotation mark (")		1	uc
	Name of the Reference File. Used if DS_TYPE is set to R. It is left justified with trailer blanks. The file name includes the extensio If not used it is set to 62 blanks.		62	62*uc
	quotation mark (")		1	uc
	newline character	terminator	1	uc
Position and size of DS				
4	DS_OFFSET=	keyword	10	10*uc
	Length in bytes of MPH + SPH (including DSDs) + DS size of previous Data Set (if any).	Byte	21	%+021d
	<bytes>	units	7	7*uc
	newline character	terminator	1	uc
5	DS_SIZE=	keyword	8	8*uc
	Length in bytes of the attached Data Set Used if DS_TYPE is set to M If not used set to 0	byte	21	%+021d
	<bytes>	units	7	7*uc
	newline character	terminator	1	uc
Number and length of DSRs				
6	NUM_DSR=	keyword	8	8*uc
	Number of Data Set Records		11	%+011d
	newline character	terminator	1	uc
7	DSR_SIZE=	keyword	9	9*uc
	Length in bytes of the Data Set Record If not used set to +0 If variable set to -1	byte	11	%+011d

continued

Field	Description	Units	Bytes	Type
	<bytes>	units	7	7*uc
	newline character	terminator	1	uc
8	Spare	ascii	32	32*uc
	newline character	terminator	1	uc
TOTAL				**280**

Table A.4.: ESA defined ASIRAS data set descriptors (DSD) format.

The MDS can be further diveded into five parts as described below.

1. Time and orbit group (20 blocks per record).
2. Measurement group (20 blocks per record).
3. Corrections Group (one block per record - zeroed for ASIRAS)
4. Average waveform group (one block per record - zeroed for ASIRAS)
5. Waveform group (20 blocks per record)

Identifier	Description	Units	Type	Size (Byte)
Time & Orbit Group Repeated 20 times				**Sub Total=84*20**
1	Days	TAI	sl	4
2	Seconds		ul	4
3	Microseconds		ul	4
4	Spare		sl	4
5	Spare		us	2
6	Spare		us	2
7	Instrument Config		ul	4
8	Burst Counter		ul	4
9	Geodetic latitude of ASIRAS centre of baseline	10^{-7} Deg	sl	4
10	Longitude of ASIRAS centre of baseline	10^{-7} Deg	sl	4
11	WGS-84 ellipsoidal altitude of ASIRAS baseline centre	10^{-3} m	sl	4
12	Altitude rate determined from DGPS	10^{-6} m/s	sl	4
13	Velocity [x,y,z], described in ITRF derived from ROC of DGPS locations	10^{-3} m/s	sl	3*4
14	Real antenna beam direction vector [x,y,z] defined in CPRF	10^{-6} m	sl	3*4
15	Interferometer baseline [x,y,z]	10^{-6} m	sl	3*4
16	Measurement Confident data		ul	4
Measurement Group Repeated 20 times				**Sub Total=94*20**
17	Window delay	10^{-12} s	sll	8
continued				

Identifier	Description	Units	Type	Size (Byte)
18	Spare		sl	4
19	OCOG width (USE WITH CAUTION)	Range bins*100	sl	4
20	OCOG or threshold re-tracker range (USE WITH CAUTION)	10^{-3} m	sl	4
21	Surface elevation derived from field 20 (USE WITH CAUTION)	10^{-3} m	sl	4
22	AGC Channel 1	dB/100	sl	4
23	AGC Channel 2	dB/100	sl	4
24	Total fixed gain Ch1	dB/100	sl	4
25	Total fixed gain Ch2	dB/100	sl	4
26	Transmit Power	10^{-6} Watts	sl	4
27	Doppler range correction	10^{-3} m	sl	4
28	Instrument range correction Ch 1	10^{-3} m	sl	4
29	Instrument range correction Ch 2	10^{-3} m	sl	4
30	Spare		sl	4
31	Spare		sl	4
32	Internal phase correction	10^{-6} rad	sl	4
33	External phase correction	10^{-6} rad	sl	4
34	Noise power	dB/100	sl	4
35	Roll w.r.t NAR	10^{-3} Deg	ss	2
36	Pitch w.r.t NAR	10^{-3} Deg	ss	2
37	Yaw w.r.t NAR	10^{-3} Deg	ss	2
38	Spare	N/A	ss	2
39	Heading w.r.t local north	10^{-3} Deg	sl	4
40	Standard deviation of roll during stack integration	10^{-4} Deg	us	2
41	Standard deviation of pitch during stack integration	10^{-4} Deg	us	2
42	Standard deviation of yaw during stack integration	10^{-4} Deg	us	2
Corrections Group (once per record)				**Sub Total=64**
Empty for ASIRAS				
43	Spare		uc	64*1
Average pulse-width ltd. waveform group (once per record)				**Sub Total=556**
Empty for ASIRAS				
44	Spare		uc	556*1
Multilooked Waveform Group (repeated 20 times)				**Sub Total=2160*20**
45	Multi-looked Power Echo.	Counts (0-65535)	us	256*2
46	Linear scale factor, A		sl	4
47	Power of 2 scale factor,B		sl	4
48	Number of multilooked echoes		us	2

continued

Identifier	Description	Units	Type	Size (Byte)
49	Flags		us	2
50	Beam behaviour parameters[50]		us	50*2
51	Coherence echo	10^{-3}	us	256*2
52	Phase difference echo	10^{-6} rad	sl	256*4
Total				**47380**

Table A.5.: ESA defined ASIRAS HAM measurement data set (MSD) format.

Identifier	Description	Units	Type	Size (Byte)
Time & Orbit Group Repeated 20 times				**Sub Total=84*20**
1	Days	TAI	sl	4
2	Seconds		ul	4
3	Microseconds		ul	4
4	Spare		sl	4
5	Spare		us	2
6	Spare		us	2
7	Instrument Config		ul	4
8	Burst Counter		ul	4
9	Geodetic latitude of ASIRAS centre of baseline	10^{-7} Deg	sl	4
10	Longitude of ASIRAS centre of baseline	10^{-7}	sl	4
11	WGS-84 ellipsoidal altitude of ASIRAS baseline centre	10^{-3} m	sl	4
12	Altitude rate determined from DGPS	10^{-6} m/s	sl	4
13	Velocity [x,y,z], described in ITRF derived from ROC of DGPS locations	10^{-3} m/s	sl	3*4
14	Real antenna beam direction vector [x,y,z] defined in CPRF	10^{-6} m	sl	3*4
15	Interferometer baseline [x,y,z]	10^{-6} m	sl	3*4
16	Measurement Confident data		ul	4
Measurements Group Repeated 20 times				**Sub Total=94*20**
17	Window delay	10^{-12} s	sll	8
18	Spare		sl	4
19	OCOG width (USE WITH CAUTION)	Range bins*100	sl	4
20	OCOG or threshold re-tracker range (USE WITH CAUTION)	10^{-3} m	sl	4
21	Surface elevation derived from field 20 (USE WITH CAUTION)	10^{-3} m	sl	4
22	AGC Channel 1	dB/100	sl	4
23	AGC Channel 2	dB/100	sl	4

continued

Identifier	Description	Units	Type	Size (Byte)
24	Total fixed gain Ch1	dB/100	sl	4
25	Total fixed gain Ch2	dB/100	sl	4
26	Transmit Power	10^{-6} Watts	sl	4
27	Doppler range correction	10^{-3} m	sl	4
28	Instrument range correction Ch 1	10^{-3} m	sl	4
29	Instrument range correction Ch 2	10^{-3} m	sl	4
30	Spare		sl	4
31	Spare		sl	4
32	Internal phase correction	10^{-6} rad	sl	4
33	External phase correction	10^{-6} rad	sl	4
34	Noise power	dB/100	sl	4
35	Roll w.r.t NAR	10^{-3} Deg	ss	2
36	Pitch w.r.t NAR	10^{-3} Deg	ss	2
37	Yaw w.r.t NAR	10^{-3} Deg	ss	2
38	Spare	N/A	ss	2
39	Heading w.r.t local north	10^{-3} Deg	sl	4
40	Standard deviation of roll during stack integration	10^{-4} Deg	us	Ta2
41	Standard deviation of pitch during stack integration	10^{-4} Deg	us	2
42	Standard deviation of yaw during stack integration	10^{-4} Deg	us	2
Corrections Group (once per record)				**Sub Total=64**
Empty for ASIRAS				
43	Spare		uc	64*1
Average pulse-width ltd. waveform group (once per record)				**Sub Total=8236**
Empty for ASIRAS				
44	Spare		uc	8236*1
Multilooked Waveform Group (repeated 20 times)				**Sub Total=8304*20**
45	Multi-looked Power Echo.	Counts (0-65535)	us	4096*2
46	Linear scale factor, A		sl	4
47	Power of 2 scale factor,B		sl	4
48	Number of multilooked echoes		us	2
49	Flags		us	2
50	Beam behaviour parameters[50]		us	50*2
Total				**177940**

Table A.6.: ESA defined ASIRAS LAM measurement data set (MSD) format.

Identifier	Description	Units	Type	Size (Byte)
Time & Orbit Group Repeated 20 times				**Sub Total=84*20**

continued

Identifier	Description	Units	Type	Size (Byte)
1	Days	TAI	sl	4
2	Seconds		ul	4
3	Microseconds		ul	4
4	Spare		sl	4
5	Spare		us	2
6	Spare		us	2
7	Instrument Config		ul	4
8	Burst Counter		ul	4
9	Geodetic latitude of ASIRAS centre of baseline	10^{-7} Deg	sl	4
10	Longitude of ASIRAS centre of baseline	10^{-7}	sl	4
11	WGS-84 ellipsoidal altitude of ASIRAS baseline centre	10^{-3} m	sl	4
12	Altitude rate determined from DGPS	10^{-6} m/s	sl	4
13	Velocity [x,y,z], described in ITRF derived from ROC of DGPS locations	10^{-3} m/s	sl	3*4
14	Real antenna beam direction vector [x,y,z] defined in CPRF	10^{-6} m	sl	3*4
15	Interferometer baseline [x,y,z]	10^{-6} m	sl	3*4
16	Measurement Confident data		ul	4
Measurements Group Repeated 20 times				**Sub Total=94*20**
17	Window delay	10^{-12} s	sll	8
18	Spare		sl	4
19	OCOG width (USE WITH CAUTION)	Range bins*100	sl	4
20	OCOG or threshold re-tracker range (USE WITH CAUTION)	10^{-3} m	sl	4
21	Surface elevation derived from field 20 (USE WITH CAUTION)	10^{-3} m	sl	4
22	AGC Channel 1	dB/100	sl	4
23	AGC Channel 2	dB/100	sl	4
24	Total fixed gain Ch1	dB/100	sl	4
25	Total fixed gain Ch2	dB/100	sl	4
26	Transmit Power	10^{-6} Watts	sl	4
27	Doppler range correction	10^{-3} m	sl	4
28	Instrument range correction Ch 1	10^{-3} m	sl	4
29	Instrument range correction Ch 2	10^{-3} m	sl	4
30	Spare		sl	4
31	Spare		sl	4
32	Internal phase correction	10^{-6} rad	sl	4
33	External phase correction	10^{-6} rad	sl	4
34	Noise power	dB/100	sl	4

continued

Identifier	Description	Units	Type	Size (Byte)
35	Roll w.r.t NAR	10^{-3} Deg	ss	2
36	Pitch w.r.t NAR	10^{-3} Deg	ss	2
37	Yaw w.r.t NAR	10^{-3} Deg	ss	2
38	Spare	N/A	ss	2
39	Heading w.r.t local north	10^{-3} Deg	sl	4
40	Standard deviation of roll during stack integration	10^{-4} Deg	us	Ta2
41	Standard deviation of pitch during stack integration	10^{-4} Deg	us	2
42	Standard deviation of yaw during stack integration	10^{-4} Deg	us	2
Corrections Group (once per record)				**Sub Total=64**
Empty for ASIRAS				
43	Spare		uc	64*1
Average pulse-width ltd. waveform group (once per record)				**Sub Total=2092**
Empty for ASIRAS				
44	Spare		uc	2092*1
Multilooked Waveform Group (repeated 20 times)				**Sub Total=2160*20**
45	Multi-looked Power Echo.	Counts (0-65535)	us	1024*2
46	Linear scale factor, A		sl	4
47	Power of 2 scale factor,B		sl	4
48	Number of multilooked echoes		us	2
49	Flags		us	2
50	Beam behaviour parameters[50]		us	50*2
Total				**48916**

Table A.7.: ESA defined ASIRAS LAMA measurement data set (MSD) format.

A.2. GPS

Processed DGPS data is delivered in binary, big endian format with each record formated as described by *Cullen* (2006) and A.8.

Identifier	Description	Unit	Type	Size (Bytes)
1	Days (MJD)	UTC	sl	4
2	Seconds	s	ul	4
3	Microseconds	ms	ul	4
4	Latitude (WGS-84)	10^{-7} Deg	sl	4
5	Longitude (WGS-84)	10^{-7} Deg	sl	4
6	Geodetic ellipsoidal height	m	d	8
7	Spare_7	N/A	d	8
8	Spare_8	N/A	d	8
9	Spare_9	N/A	d	8
10	Spare_10	N/A	d	8
			Total	72

Table A.8.: ESA defined DGPS binary big endian format
(For example MJD 2306 is the date for 25th of April 2006)

A.3. INS

Processed DGPS data is delivered in binary, big endian format with each record formated as described by *Cullen* (2006) and A.9.

Identifier	Description	Unit	Type	Size (Bytes)
1	Days (MJD)	UTC	sl	4
2	Seconds	s	sl	4
3	Microseconds	ms	sl	4
4	Latitude (WGS-84)	Deg	d	8
5	Longitude (WGS-84)	Deg	d	8
6	Ground speed	kts	d	8
7	True Track	Deg	d	8
8	True Heading	Deg	d	8
9	Wind Speed	kts	d	8
10	Wind Direction	Deg	d	8
11	Magnetic Heading	Deg	d	8
12	Pitch	Deg	d	8
13	Roll	Deg	d	8
14	Pitch Rate	Deg/s	d	8
15	Roll Rate	Deg/s	d	8
16	Yaw Rate	Deg/s	d	8
17	Body longitudinal acceleration	g	d	8
18	Body lateral acceleration	g	d	8
19	Body normal acceleration	g	d	8
20	Vertical acceleration	g	d	8
21	Vertical inertial velocity	ft/min	d	8
22	N-S Velocity	kts	d	8
23	E-W Velocity	kts	d	8
			Total	172

Table A.9.: ESA defined INS binary big endian format
(For example MJD 2306 is the date for 25th of April 2006)

A.4. Laserscanner

Processed laserscaner data is delivered in binary, big endian format with each record formated as described by *Cullen* (2006) and A.10.

Field	Description	Unit	Size (Bytes)	Type
	HEADER			
1	Header size		1	uc
2	Number of scan lines (N_{SL})		4	ul
3	Number of data points per line (N_{PL})		1	uc
4	Bytes per line (B_L)		2	us
5	Bytes sec line		8	ull
6	Year of acquistion (UTC)	YYYY	2	us
7	Month of acquistion (UTC)	MM	1	uc
8	Day of acquistion (UTC)	DD	1	uc
9	Acquistion start time (UTC)	Seconds of day	4	ul
10	Acquistion stop time (UTC)	Seconds of day	4	ul
11	Device name (LMS-Q280)			
12	Line time stamp	Seconds of day	$4 * N_{SL}$	ul
	DATA		$Total = B_L * N_{SL}$	
	DATA LINE		B_L	
13	Time	Seconds of day	$8 * N_{PL}$	d
14	Latitude	Deg	$8 * N_{PL}$	d
15	Longitude	Deg	$8 * N_{PL}$	d
16	Surface elevation	m	$8 * N_{PL}$	d

Table A.10.: AWI defined ALS_L1B binary big endian format. (Total file size $= 36 + 4N_{SL} + N_{SL}B_L = 36 + 4N_{SL} + 32N_{PL}$)

B. Airborne Log with GPS track plot

B.1. CryoVEx2007 - April 5th

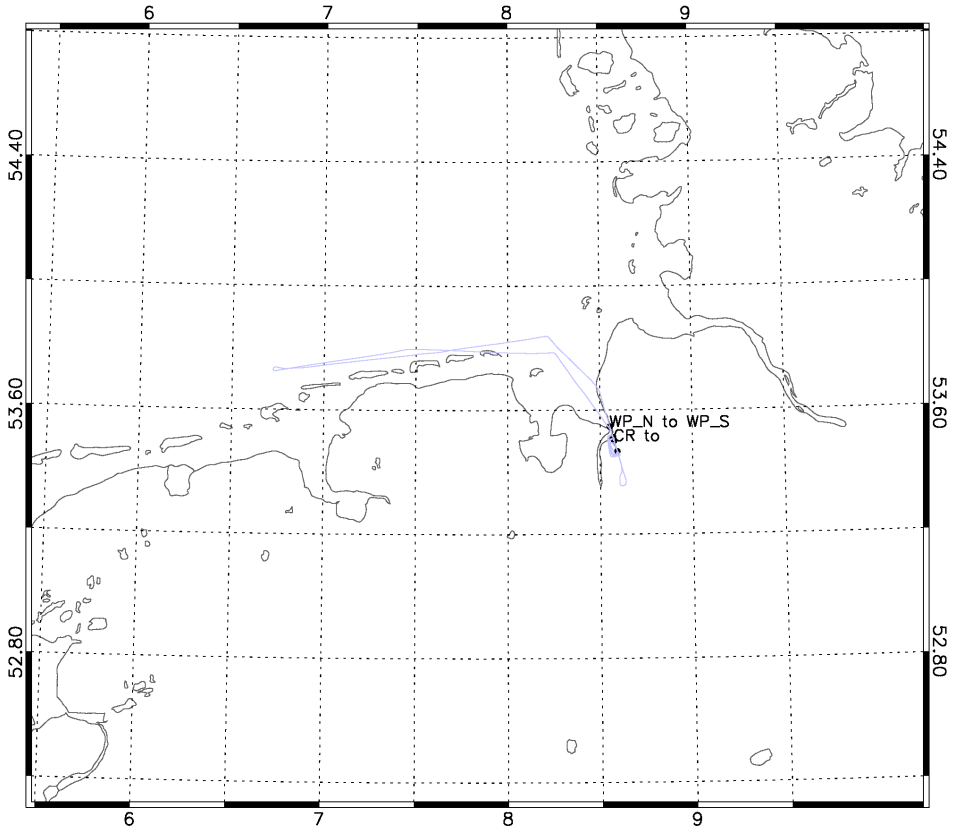


Figure B.1.: Overview of flight activity on 5th april 2007. Blue line shows GPS track, black lines are showing the planned profiles.

Event	Time (UTC)	Description
1	11:43:08	ready (lat=53:30.1580N lon=008:34.3933E alt=+0042)
2	11:50:54	schwelle (lat=53:30.1248N lon=008:34.5231E alt=+0042)
3	11:51:07	go (lat=53:30.1680N lon=008:34.5017E alt=+0042)
4	11:51:23	take off (lat=53:30.9790N lon=008:34.0942E alt=+0148)
5	11:54:46	open rollerdoor (lat=53:35.7433N lon=008:29.1581E alt=+1272)
6	11:58:12	camera recording on (lat=53:41.1604N lon=008:22.4554E alt=+1251)

continued

Event	Time (UTC)	Description
7	12:02:00	turn (lat=53:47.1250N lon=008:15.0761E alt=+1244)
8	12:05:33	asiras start file 0 lamo2500 (lat=53:47.1304N lon=008:00.9370E alt=+0782)
9	12:08:00	passing wangerrooge (lat=53:47.2680N lon=007:54.4020E alt=+0777)
10	12:08:20	asiras stop (lat=53:47.3019N lon=007:53.4551E alt=+0776)
11	12:09:46	asiras start file 1 lamo2500 (lat=53:47.4705N lon=007:47.5515E alt=+0777)
12	12:10:50	asiras stop (lat=53:47.5295N lon=007:45.5431E alt=+0780)
13	12:12:56	asiras start file 2 lama2500-01 (lat=53:47.7055N lon=007:38.0649E alt=+0781)
14	12:13:41	turbulences (lat=53:47.7469N lon=007:36.2439E alt=+0782)
15	12:15:34	asiras stop (lat=53:47.8291N lon=007:30.1197E alt=+0784)
16	12:16:25	asiras start file 3 lama2500-02 (lat=53:47.7967N lon=007:26.9140E alt=+0782)
17	12:19:05	asiras stop (lat=53:46.8010N lon=007:18.2790E alt=+0485)
18	12:20:15	asiras start file 4 lamo2500-03 (lat=53:46.4185N lon=007:14.3044E alt=+0486)
19	12:21:41	asiras stop (lat=53:46.0037N lon=007:09.8044E alt=+0487)
20	12:22:06	asiras start file 5 lamo2500-04 (lat=53:45.8228N lon=007:07.7768E alt=+0488)
21	12:23:01	asiras stop (lat=53:45.5031N lon=007:04.2151E alt=+0486)
22	12:23:01	asiras start file 6 lama2500-03 (lat=53:44.9815N lon=006:58.8325E alt=+0488)
23	12:27:43	asiras stop (lat=53:44.0991N lon=006:50.1080E alt=+0489)
24	12:29:01	asiras start file 7 lama2500-04 (lat=53:43.6152N lon=006:45.5243E alt=+0490)
25	12:29:26	asiras stop (lat=53:43.5093N lon=006:44.5726E alt=+0490)
26	12:29:46	fl 4000 ft (lat=53:43.5703N lon=006:43.4591E alt=+0518)
27	12:31:34	no comment (lat=53:43.9730N lon=006:49.1223E alt=+1091)
28	12:33:26	steady on alt (lat=53:44.3808N lon=006:56.8532E alt=+1265)
29	12:34:31	asiras start file 8 hamo4000-01 (lat=53:44.7986N lon=007:01.7860E alt=+1262)
30	12:35:32	asiras stop (lat=53:45.0521N lon=007:05.1443E alt=+1261)
31	12:36:05	asiras start file 9 hamo4000-02 (lat=53:45.2116N lon=007:07.4407E alt=+1261)
32	12:39:16	asiras stop (lat=53:46.0492N lon=007:19.2623E alt=+1259)
33	12:40:55	descend (lat=53:46.4675N lon=007:25.7252E alt=+1258)
34	12:41:47	asiras start file 10 lama2000-01 (lat=53:46.7313N lon=007:29.2830E alt=+1192)
35	12:45:12	asiras stop (lat=53:47.7742N lon=007:42.3735E alt=+0787)
36	12:46:09	veit operator (lat=53:48.1351N lon=007:46.7128E alt=+0786)
37	12:52:36	turn to bhv climbing 3500ft (lat=53:50.2702N lon=008:13.1118E alt=+0785)

continued

Event	Time (UTC)	Description
38	13:01:16	corner reflektor (lat=53:31.8369N lon=008:33.6589E alt=+1112)
39	13:03:21	asiras start file 11 lamo2500 and asiras stop (lat=53:26.3377N lon=008:36.3590E alt=+1115)
40	13:05:28	descend (lat=53:21.9480N lon=008:38.3190E alt=+1067)
41a	13:11:06	asiras start file 12 lamo2500
41	13:11:16	corner (lat=53:30.4616N lon=008:34.3688E alt=+0414)
41b	13:11:31	asiras stop
42	13:15:10	asiras start file 13 lama2000 (lat=53:28.4015N lon=008:35.3931E alt=+0343)
43	13:16:24	corner (lat=53:30.3204N lon=008:34.4451E alt=+0340)
44	13:16:35	asiras stop (lat=53:30.9832N lon=008:33.3875E alt=+0342)
44a	13:16:48	asiras start file 14 lama2000 and asiras stop
45	13:26:47	asiras start file 15 lama2500 (lat=53:28.6849N lon=008:35.2345E alt=+0358)
46	13:27:45	corner (lat=53:30.1937N lon=008:34.4916E alt=+0358)
47	13:27:55	asiras stop (lat=53:30.3743N lon=008:34.0789E alt=+0298)
48	13:29:07	no comment (lat=53:28.1153N lon=008:33.4440E alt=+0356)
49	13:30:43	asiras start file 16 lama3000 (lat=53:28.9064N lon=008:35.1379E alt=+0352)
50	13:31:35	asiras stop (lat=53:30.1408N lon=008:34.5340E alt=+0348)
51	13:32:02	asiras off (lat=53:30.4337N lon=008:33.5874E alt=+0271)
52	13:32:35	rollerdoor closed (lat=53:29.2218N lon=008:33.0589E alt=+0317)
53	13:34:22	prepare vor landing (lat=53:28.5954N lon=008:35.2906E alt=+0231)
54	13:36:09	touch down (lat=53:30.5971N lon=008:34.2911E alt=+0039)

Table B.1.: Event log of April 5

B.2. CryoVEx2007 - April 16th

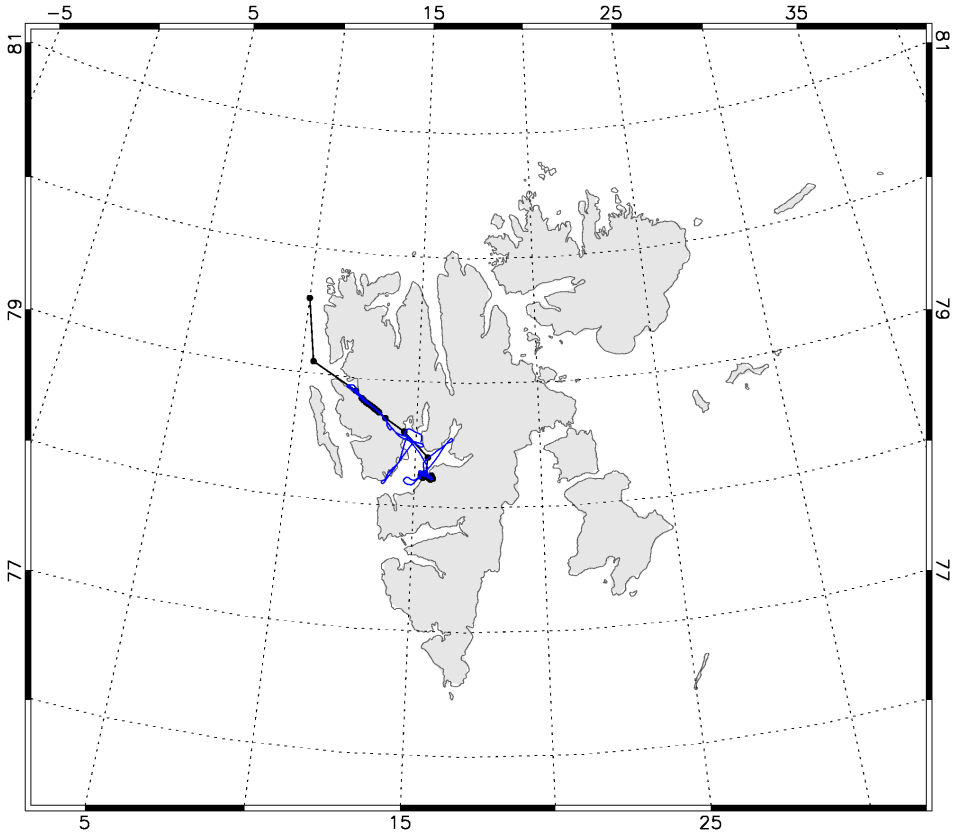


Figure B.2.: Overview of flight activity on 16th april 2007. Blue line shows GPS track, black lines are showing the planned profiles.

Event	Time (UTC)	Description
2	10:40:59	video on (lat=78:14.7955N lon=015:27.4516E alt=+0058)
3	10:41:46	on runway (lat=78:14.8655N lon=015:26.1928E alt=+0055)
4	10:44:02	take off (lat=78:14.7984N lon=015:27.3328E alt=+0126)
5	10:44:34	asiras on - problems with network several reboots(lat=78:14.5696N lon=015:31.2678E alt=+0295)
6	10:47:41	open rollerdoor (lat=78:15.9807N lon=015:12.1362E alt=+1396)
7	10:50:59	laserscanner reboot (lat=78:20.6210N lon=014:45.3378E alt=+0679)
8	10:53:45	laserscann online (lat=78:26.0099N lon=014:51.5768E alt=+0682)
9	10:58:43	trimble internal gpsdatastorage on (lat=78:35.2224N lon=015:07.2272E alt=+0685)
10	11:22:00	asiras signal ok now (lat=78:14.5739N lon=013:54.9529E alt=+0680)
11	11:24:18	asiras oparational (calibration files 06,07,08) (lat=78:10.6050N lon=013:43.5358E alt=+0681)

continued

Event	Time (UTC)	Description
12	11:26:09	asiras file 00 (LAMO2500) (lat=78:13.2780N lon=013:55.7878E alt=+0680)
13	11:27:41	land (lat=78:15.6742N lon=014:03.4875E alt=+0681)
14	11:28:07	asiras end (lat=78:16.5058N lon=014:06.2175E alt=+0680)
15	11:29:46	asiras file 01 (LAMA2000) open water, pan cake ice (lat=78:19.3892N lon=014:15.2299E alt=+0679)
16	11:31:39	land (lat=78:22.4677N lon=014:24.4534E alt=+0681)
17	11:33:36	asiras stop (lat=78:25.8631N lon=014:35.6893E alt=+0682)
18	11:34:04	asiras file 02 lama2500 (lat=78:27.1010N lon=014:39.7713E alt=+0680)
19	11:34:30	open water - waves approx. 0.5 m (lat=78:27.5298N lon=014:41.1532E alt=+0680)
20	11:36:01	asiras stop (lat=78:30.0253N lon=014:49.8745E alt=+0682)
21	11:36:09	turn (lat=78:30.1448N lon=014:50.2439E alt=+0681)
22	11:37:15	Asiras calibration (09) (lat=78:32.1946N lon=014:45.8913E alt=+0682)
23	11:37:19	Asiras cal (10, 11) (lat=78:32.2716N lon=014:45.5297E alt=+0682)
24	11:38:29	asiras start profil 03 lamo2500 (lat=78:33.8048N lon=014:33.5040E alt=+0709)
25	11:40:15	asiras stop (lat=78:34.6693N lon=014:16.7220E alt=+0826)
26	11:42:57	asiras start file 04 HAMO4000 manuell tracking - steep ascending - tracking failed(lat=78:38.2355N lon=013:55.0945E alt=+1639)
27	11:45:46	asiras stop (lat=78:42.8298N lon=013:36.3163E alt=+2610)
28	11:47:45	asioras start file 05 - HAMO4000 auto tracking - 1600m above ground (lat=78:45.7023N lon=013:19.3745E alt=+2258)
29	11:52:04	asiras stop (lat=78:50.7610N lon=012:44.8464E alt=+2159)
30	11:52:55	asiras calibration lama 2500 file 12(lat=78:51.9277N lon=012:37.8868E alt=+2035)
31	11:53:04	asiras calibration lamo2500 file13 (lat=78:52.2450N lon=012:35.7228E alt=+1983)
32	11:53:41	asiras sarin cal file 14(lat=78:52.9277N lon=012:31.7902E alt=+1856)
33	11:58:19	video tape on (lat=78:54.8825N lon=012:13.4635E alt=+0802)
34	12:00:00	asiras start file 06 lamo2500 700m asl (lat=78:53.0410N lon=012:29.2408E alt=+0747)
35	12:08:08	a3 (lat=78:41.9260N lon=013:39.8486E alt=+1280)
36	12:08:11	asiras stop (lat=78:41.6197N lon=013:41.6100E alt=+1278)
37	12:08:36	asiras calibration lamo2500 file 15 (lat=78:40.9112N lon=013:45.0522E alt=+1246)
38	12:08:55	asiras calibration lama2500 file 16 (lat=78:40.4796N lon=013:46.0597E alt=+1227)
39	12:09:28	asiras sarin cal file 17 (lat=78:39.2598N lon=013:46.3020E alt=+1175)

continued

Event	Time (UTC)	Description
40	12:13:35	asiras start file 07 lama2500 (lat=78:40.5387N lon=013:44.8113E alt=+1034)
41	12:14:46	a3 - rough surface on glacier(lat=78:42.2680N lon=013:36.7401E alt=+1106)
42	12:22:37	open water (lat=78:52.6282N lon=012:27.2522E alt=+0536)
43	12:22:51	asiras stop (lat=78:52.9614N lon=012:25.0538E alt=+0541)
44	12:23:31	asiras calibration lamo2500 file 18 (lat=78:53.8366N lon=012:18.9364E alt=+0538)
45	12:23:42	asiras calibration lama2500 file 19 (lat=78:54.0850N lon=012:17.2591E alt=+0554)
46	12:24:11	asiras sarin cal file 20 (lat=78:54.7052N lon=012:13.3692E alt=+0566)
47	12:26:35	asiras start file 08 lama3000 open water (lat=78:55.0536N lon=012:06.6526E alt=+0527)
48	12:29:11	ice edge then crevaced surface (lat=78:52.0632N lon=012:29.2260E alt=+0552)
49	12:42:48	asiras stop (lat=78:33.2211N lon=014:22.8494E alt=+0528)
50	12:45:05	asiras start and stop file 09 lama3000 (lat=78:31.3589N lon=014:46.0425E alt=+0694)
51	12:45:59	asiras start file 10 lama3000 - open water (lat=78:29.8500N lon=014:53.3512E alt=+0697)
52	12:47:11	asiras stop (lat=78:28.0980N lon=015:00.7091E alt=+0697)
53	12:48:41	asiras start file 11 lamo2500 (lat=78:25.2019N lon=015:12.5194E alt=+0538)
54	12:50:48	asiras stop (lat=78:21.7308N lon=015:23.2648E alt=+0535)
55	12:51:31	asiras start file 12 lama2000(lat=78:20.1527N lon=015:28.1261E alt=+0552)
56	12:52:28	asiras stop (lat=78:18.4688N lon=015:29.7626E alt=+0543)
57	12:54:22	asiras start file 13 lamo2500 (lat=78:18.6729N lon=015:21.2301E alt=+0537)
58	12:55:35	asiras stop (lat=78:20.4476N lon=015:19.5670E alt=+0533)
59	12:55:46	turn (lat=78:20.7956N lon=015:19.4674E alt=+0538)
60	12:56:33	asiras start file 14 lamo2500 (lat=78:22.3102N lon=015:23.9538E alt=+0528)
61	12:57:23	asiras stop (lat=78:23.2911N lon=015:28.6731E alt=+0655)
62	12:57:31	asiras start file 15 (lat=78:23.5236N lon=015:29.8862E alt=+0697)
63	12:58:30	asiras stop (lat=78:24.7619N lon=015:36.5242E alt=+0904)
64	12:58:36	asiras start file 16 (lat=78:24.9909N lon=015:37.7952E alt=+0944)
65	12:59:11	asiras stop (lat=78:25.7304N lon=015:42.1739E alt=+1049)
66	13:05:55	asiras start file 17 - sarin (lat=78:32.0305N lon=016:17.9220E alt=+1139)
67	13:10:54	asiras stop (lat=78:23.1386N lon=015:48.7416E alt=+2335)
68	13:12:10	asiras file 18 start stop and start file 19 - sarin 2500m asl. (lat=78:20.8380N lon=015:40.3131E alt=+2333)

continued

Event	Time (UTC)	Description
69	13:18:23	asiras stop (lat=78:11.4874N lon=014:58.7903E alt=+2333)
70	13:24:06	video tape3 (lat=78:13.2476N lon=015:03.1654E alt=+1370)
71	13:27:56	asiras start file 20 - lamo2500 (lat=78:15.1942N lon=015:20.0341E alt=+0521)
72	13:28:37	runway start (lat=78:14.9083N lon=015:25.5310E alt=+0526)
73	13:29:17	runway end (lat=78:14.5523N lon=015:31.7803E alt=+0538)
74	13:29:26	asiras stop (lat=78:14.5079N lon=015:32.5429E alt=+0543)
75	13:29:55	asiras calibration file 21 lamo2500 (lat=78:15.3100N lon=015:35.6795E alt=+0501)
76	13:30:32	asiras calibration file 22 lama2500 (lat=78:16.3866N lon=015:30.8010E alt=+0535)
77	13:31:01	asiras sarin cal file 23 (lat=78:16.9540N lon=015:29.5502E alt=+0536)
78	13:31:52	asiras start file 21 - lamo2500 (500m) (lat=78:15.5683N lon=015:27.7905E alt=+0537)
79	13:32:25	hangar (lat=78:14.6512N lon=015:30.0684E alt=+0551)
80	13:32:32	asiras stop (lat=78:14.4361N lon=015:30.7133E alt=+0559)
81	13:34:06	asiras start file 22 - lamo2500 (500m)(lat=78:15.0275N lon=015:35.0075E alt=+0515)
82	13:34:41	hangar (lat=78:14.7596N lon=015:29.2415E alt=+0538)
83	13:34:47	asiras stop (lat=78:14.7064N lon=015:28.2239E alt=+0538)
84	13:37:09	asiras start file 23 lamo2500 (300m) (lat=78:15.5647N lon=015:26.0989E alt=+0313)
85	13:37:46	hangar (lat=78:14.7152N lon=015:29.9050E alt=+0318)
86	13:37:52	asiras stop (lat=78:14.6387N lon=015:30.2371E alt=+0323)
87	13:39:21	asiras start file 24 lamo2500 (300m) (lat=78:15.0010N lon=015:32.9850E alt=+0324)
88	13:39:49	hangar (lat=78:14.7670N lon=015:28.9556E alt=+0344)
89	13:39:57	asiras stop (lat=78:14.7184N lon=015:27.7698E alt=+0351)
90	13:42:33	asiras start file 25 - lamo2500 (300m)(lat=78:15.1170N lon=015:21.8057E alt=+0329)
91	13:43:03	runway start (lat=78:14.8572N lon=015:26.5898E alt=+0321)
92	13:43:40	runway end (lat=78:14.5651N lon=015:31.8319E alt=+0333)
93	13:43:47	asiras stop (lat=78:14.4907N lon=015:33.2036E alt=+0341)
94	13:45:32	asiras start file 26 lamo2500 (CR 300m) (lat=78:14.3213N lon=015:37.8348E alt=+0359)
95	13:46:50	asiras stop (lat=78:14.9284N lon=015:24.9412E alt=+0322)
96	13:53:08	asiras start file 27 lamo2500 (CR 300m) (lat=78:15.1969N lon=015:20.1254E alt=+0381)
97	13:54:38	asiras stop (lat=78:14.5224N lon=015:33.9522E alt=+0338)
98	13:56:26	asiras start file 28 lamo2500 (CR 300m) (lat=78:14.3990N lon=015:36.5218E alt=+0342)
99	13:57:22	asiras stop (lat=78:14.8259N lon=015:26.7130E alt=+0348)
100	13:57:38	asiras calibration (files 24, 25, 26) (lat=78:15.0510N lon=015:24.1629E alt=+0350)

continued

Event	Time (UTC)	Description
101	13:58:03	rollerdoor closed (lat=78:15.9416N lon=015:22.2713E alt=+0352)
102	13:59:28	video off (lat=78:16.3893N lon=015:13.8937E alt=+0330)
103	14:01:23	landing (lat=78:14.8101N lon=015:27.1780E alt=+0061)

Table B.2.: Event log of April 16.

B.3. CryoVEx2007 - April 17th

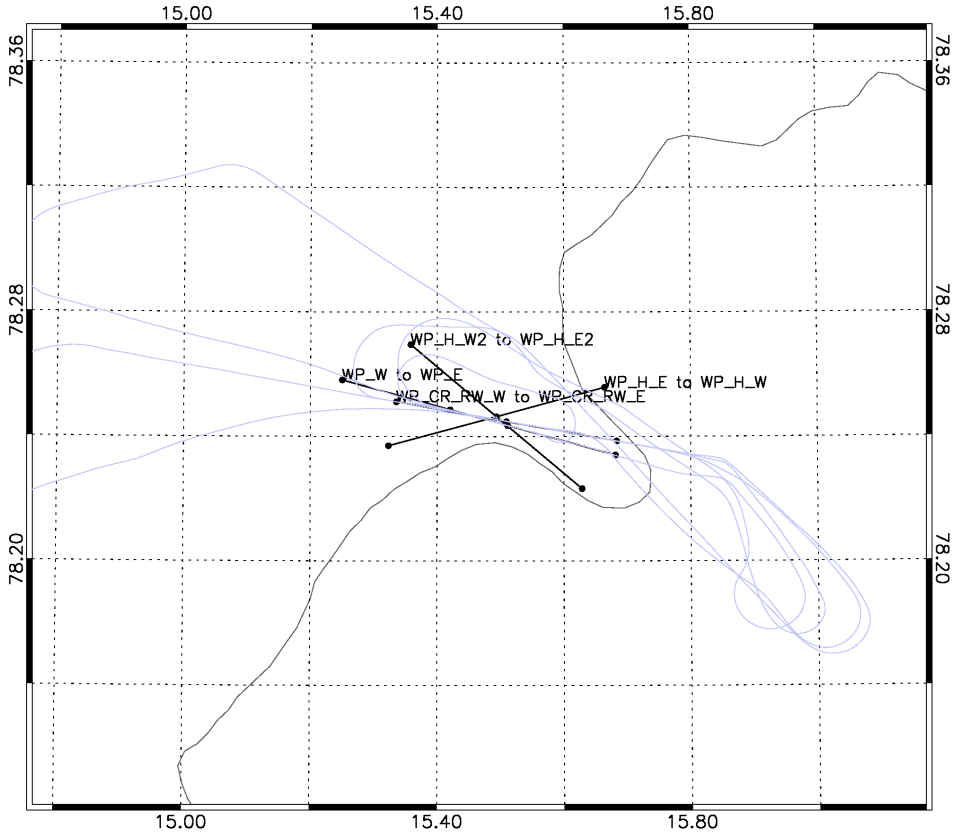


Figure B.3.: Overview of flight activity on 17th april 2007. Blue line shows GPS track, black lines are showing the planned profiles.

Event	Time (UTC)	Description
0	13:48:00	asiras calibration on ground no HPA (file 00, 01, 02)
1	14:02:45	ready for start (lat=78:14.7739N lon=015:29.3819E alt=+0062)
2	14:08:33	take off (lat=78:14.8068N lon=015:27.2688E alt=+0166)
3	14:10:59	video on (lat=78:16.8246N lon=014:51.9103E alt=+0539)
4	14:10:59	asiras calibration file 03 - lamo2500 (lat=78:17.9760N lon=014:44.1176E alt=+0513)
5	14:10:59	asiras calibration file 04 - lama2500 (lat=78:18.5571N lon=014:45.6846E alt=+0522)
6	14:10:59	asiras calibration file 05 - sarin (lat=78:18.7552N lon=014:47.2676E alt=+0505)
7	14:16:46	asiras start file 00 lamo2500 (lat=78:18.0937N lon=015:16.9517E alt=+0500)
8	14:17:44	asiras stop (lat=78:17.0601N lon=015:24.8504E alt=+0505)

continued

Event	Time (UTC)	Description
9	14:25:06	asiras start file 01 lamo2500 (lat=78:14.2036N lon=015:43.8544E alt=+0490)
10	14:26:37	corner (lat=78:14.7129N lon=015:30.1120E alt=+0492)
11	14:26:59	asiras stop (lat=78:14.8248N lon=015:26.9384E alt=+0507)
12	14:28:54	asiras calibration file 06 lam2500 (lat=78:16.5397N lon=015:21.8743E alt=+0501)
13	14:29:13	asiras calibration file 07 lama2500 (lat=78:16.5180N lon=015:24.5832E alt=+0506)
14	14:29:31	asiras sarincal file08 (lat=78:16.4974N lon=015:28.5175E alt=+0512)
15	14:37:44	asiras start file02 lamo2500 (lat=78:14.3928N lon=015:38.9117E alt=+0500)
16	14:38:45	corner (lat=78:14.7115N lon=015:30.1225E alt=+0507)
17	14:38:57	asiras file stop (lat=78:14.7980N lon=015:27.1149E alt=+0511)
18	14:40:41	asiras calibration file 09 lamo2500 (lat=78:14.8396N lon=015:10.9649E alt=+0651)
19	14:40:53	asiras calibration file 10 lama2500 (lat=78:14.7501N lon=015:08.2672E alt=+0648)
20	14:41:08	no Comment (lat=78:14.7362N lon=015:07.9331E alt=+0647)
21	14:41:16	asiras sarincal file 11 (lat=78:14.6155N lon=015:05.4578E alt=+0647)
22	14:48:47	asiras start file 03 lamo2500 (lat=78:15.3283N lon=015:12.9652E alt=+0691)
23	14:50:36	corner (lat=78:14.6364N lon=015:32.1269E alt=+0700)
24	14:50:49	asiras stop (lat=78:14.5757N lon=015:33.9679E alt=+0695)
25	14:57:02	asiras start file 04 lama2500 (lat=78:14.1202N lon=015:45.8786E alt=+0499)
26	14:58:44	corner (lat=78:14.7214N lon=015:29.8678E alt=+0498)
27	14:59:01	asiras stop (lat=78:14.8174N lon=015:27.2341E alt=+0496)
28	15:07:41	asiras start file 05 lama2500 (lat=78:13.7650N lon=015:45.6334E alt=+0334)
29	15:09:31	rw start (lat=78:14.6663N lon=015:29.6258E alt=+0356)
30	15:10:09	rw ende (lat=78:14.9819N lon=015:23.5363E alt=+0341)
31	15:10:19	asiras stop (lat=78:15.0265N lon=015:22.2513E alt=+0339)
32	15:10:33	video off (lat=78:15.3644N lon=015:20.3444E alt=+0353)
33	15:11:22	roller door close (lat=78:15.7451N lon=015:26.5314E alt=+0380)
34	15:13:49	touch down (lat=78:14.7294N lon=015:28.6346E alt=+0063)
35	15:17:57	asiras calibration file 12 lamo2500 on ground no HPA (lat=78:14.8036N lon=015:29.2501E alt=+0058)
36	15:18:07	asiras calibration file 13 lama2500 no HPA(lat=78:14.7979N lon=015:29.2418E alt=+0059)
37	15:18:24	asiras sarincal file 14 no HPA (lat=78:14.7978N lon=015:29.2431E alt=+0059)

continued

Event	Time (UTC)	Description

Table B.3.: Event log of April 17.

B.4. CryoVEx2007 - April 18th

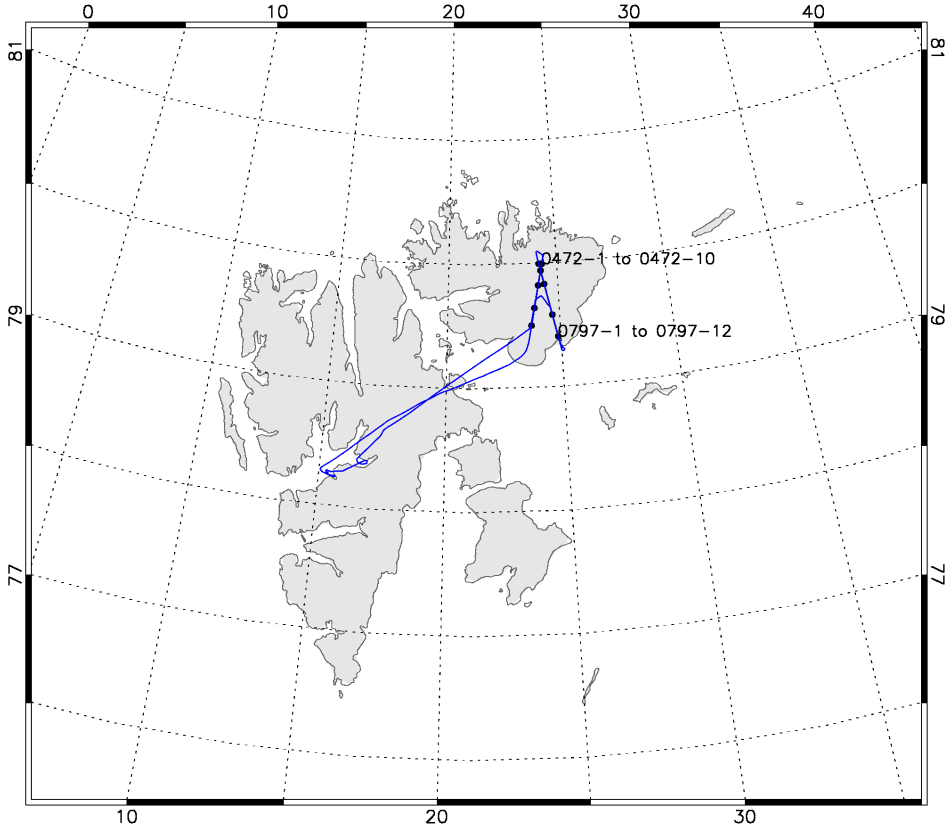


Figure B.4.: Overview of flight activity on 18th april 2007. Blue line shows GPS track, black lines are showing the planned profiles.

Event	Time (UTC)	Description
1	15:38:44	system running (lat=78:14.7955N lon=015:29.2439E alt=+0057)
2	15:50:23	asiras calibration file 00 lamo2500 - on ground no HPA (lat=78:14.7832N lon=015:29.3472E alt=+0060)
3	15:50:48	asiras calibration file 01 lama2500 - on ground no HPA (lat=78:14.7833N lon=015:29.3472E alt=+0060)
4	15:51:00	asiras sarincal file 02 - on ground no HPA (lat=78:14.7833N lon=015:29.3471E alt=+0059)
5	15:56:26	take off (lat=78:14.8699N lon=015:26.2185E alt=+0207)
6	16:25:46	asiras start file 00 - sarin auto track (2670m sea ice) (lat=79:04.4596N lon=021:09.6016E alt=+2677)
7	16:31:34	asiras stop, network error (lat=79:11.9530N lon=022:44.6294E alt=+2124)
8	16:33:16	asiras reboot (lat=79:14.3056N lon=023:05.3646E alt=+1672)
9	16:34:04	open rollerdoor (lat=79:15.6842N lon=023:14.5151E alt=+1425)

continued

Event	Time (UTC)	Description
10	16:36:56	asiras start file 01 - lamo2500 (lat=79:21.5948N lon=023:33.2246E alt=+0959)
11	16:41:04	no comment (lat=79:30.2791N lon=023:43.4818E alt=+1181)
12	16:50:11	corner (lat=79:49.6986N lon=024:06.2207E alt=+1497)
13	16:53:22	corner (lat=79:56.7211N lon=024:14.7906E alt=+1375)
14	16:54:51	corner (lat=79:59.9914N lon=024:18.8724E alt=+1308)
15	16:55:38	asiras stop (lat=80:01.6520N lon=024:20.9223E alt=+1277)
16	16:56:19	asiras calibration file 03 lamo2500 (lat=80:03.4997N lon=024:22.7156E alt=+1281)
17	16:56:41	asiras calibration file 04 lama2000 (lat=80:04.0421N lon=024:22.2404E alt=+1277)
18	16:57:03	asiras calibration file 05 lama2500 (lat=80:04.4963N lon=024:19.2375E alt=+1284)
19	16:57:17	asiras calibration file 06 lama3000(lat=80:04.8566N lon=024:16.6480E alt=+1285)
20	16:58:56	asiras sarincal file 07 (lat=80:04.9170N lon=024:05.1433E alt=+1286)
21	17:00:00	asiras start file 02 lamo2500 (700m) (lat=80:02.5847N lon=024:07.1231E alt=+1115)
22	17:03:19	corner (lat=79:56.4720N lon=024:14.7235E alt=+1386)
23	17:06:38	corner (lat=79:49.8211N lon=024:22.8358E alt=+1516)
24	17:14:07	corner (lat=79:34.9209N lon=024:40.4113E alt=+1164)
25	17:19:32	profil end (lat=79:23.9847N lon=024:52.7665E alt=+0878)
26	17:21:09	ice edge (lat=79:20.9068N lon=024:56.2085E alt=+0711)
27	17:22:04	asiras stop(lat=79:18.9897N lon=024:58.3720E alt=+0577)
28	17:23:08	asiras calibration file 08 lamo2500 (lat=79:17.7891N lon=025:07.1096E alt=+0571)
29	17:23:36	asiras calibration file 09 lama2000 (lat=79:18.3081N lon=025:06.5519E alt=+0578)
30	17:23:50	asiras calibration file 10 lama2500 (lat=79:18.6646N lon=025:04.6170E alt=+0590)
31	17:24:07	asiras calibration file 11 lama3000 (lat=79:19.0109N lon=025:02.8328E alt=+0630)
32	17:24:56	no comment (lat=79:20.4647N lon=024:58.0366E alt=+0759)
33	17:25:55	asiras start file 03 lamo2500 (lat=79:22.7008N lon=024:55.0541E alt=+0729)
34	17:27:11	profile start (lat=79:24.8852N lon=024:51.7497E alt=+0905)
35	17:28:16	asiras stop (lat=79:26.9417N lon=024:49.4571E alt=+0950)
36	17:28:44	asiras start file 04 (lat=79:27.8016N lon=024:48.5074E alt=+0984)
37	17:32:29	corner (lat=79:35.3319N lon=024:39.9352E alt=+1178)
38	17:33:15	asiras stop (lat=79:36.8247N lon=024:38.0584E alt=+1181)
39	17:35:09	asiras sarincal file 12 (lat=79:40.5967N lon=024:27.6120E alt=+1272)
40	17:35:43	asiras calibration file 13 lamo2500 (lat=79:41.4037N lon=024:24.8619E alt=+1318)

continued

Event	Time (UTC)	Description
41	17:38:42	asiras start file 05 lamo2500 (lat=79:43.0078N lon=024:00.5088E alt=+1376)
42	17:41:41	corner (lat=79:38.3002N lon=023:51.7466E alt=+1336)
43	17:46:21	profil ende (lat=79:29.5273N lon=023:40.8183E alt=+1175)
44	17:46:30	asiras stop - recording error at the end of profile (lat=79:28.4517N lon=023:36.1993E alt=+1179)
45	17:48:00	closed rollerdoor (lat=79:27.4195N lon=023:27.4891E alt=+1180)
46	17:48:44	video recording stop (lat=79:26.5354N lon=023:20.4937E alt=+1178)
47	17:52:26	asiras start and stop file 06 and start file 07 sarin (open water, little sea ice)(lat=79:22.0815N lon=022:44.0482E alt=+1174)
48	18:03:11	asiras stop (lat=79:08.3643N lon=020:52.9001E alt=+1178)
49	18:04:16	asiras calibration file 14 lamo2500 (lat=79:06.9413N lon=020:42.1264E alt=+1178)
50	18:04:45	asiras calibration file 15 lama2000 (lat=79:06.2415N lon=020:36.9583E alt=+1177)
51	18:05:16	asiras calibration file 16 lama2500 (lat=79:05.5533N lon=020:31.9600E alt=+1179)
52	18:05:51	asiras calibration file 17 lama3000 (lat=79:04.6231N lon=020:25.2345E alt=+1178)
53	18:06:21	asiras sarincal file 18 (lat=79:04.1013N lon=020:21.4085E alt=+1178)
54	18:42:16	open rollerdoor (lat=78:16.7350N lon=015:33.8079E alt=+0573)
55	18:44:32	video rec (lat=78:15.7041N lon=015:18.0522E alt=+0549)
56	18:45:01	asiras start file 08 lamo2500 (500m) (lat=78:15.0650N lon=015:22.9556E alt=+0549)
57	18:45:24	runway (lat=78:14.9086N lon=015:25.7825E alt=+0540)
58	18:46:01	runway (lat=78:14.6309N lon=015:31.6460E alt=+0511)
59	18:46:17	asiras stop (lat=78:14.7026N lon=015:33.3859E alt=+0443)
60	18:47:43	asiras start file 09 lamo2500 (300m) (lat=78:14.4245N lon=015:34.0702E alt=+0358)
61	18:48:07	runway start (lat=78:14.6467N lon=015:30.1104E alt=+0336)
62	18:48:47	runway ernde (lat=78:15.0263N lon=015:23.4951E alt=+0322)
63	18:49:00	asiras stop (lat=78:15.1940N lon=015:22.6561E alt=+0325)
64	18:49:54	rollerdoor close (lat=78:15.4378N lon=015:19.4970E alt=+0222)
65	18:51:06	landing (lat=78:14.7936N lon=015:27.4833E alt=+0065)
66	18:51:48	video off (lat=78:14.7059N lon=015:29.0585E alt=+0067)

Table B.4.: Event log of April 18.

B.5. CryoVEx2007 - April 19th

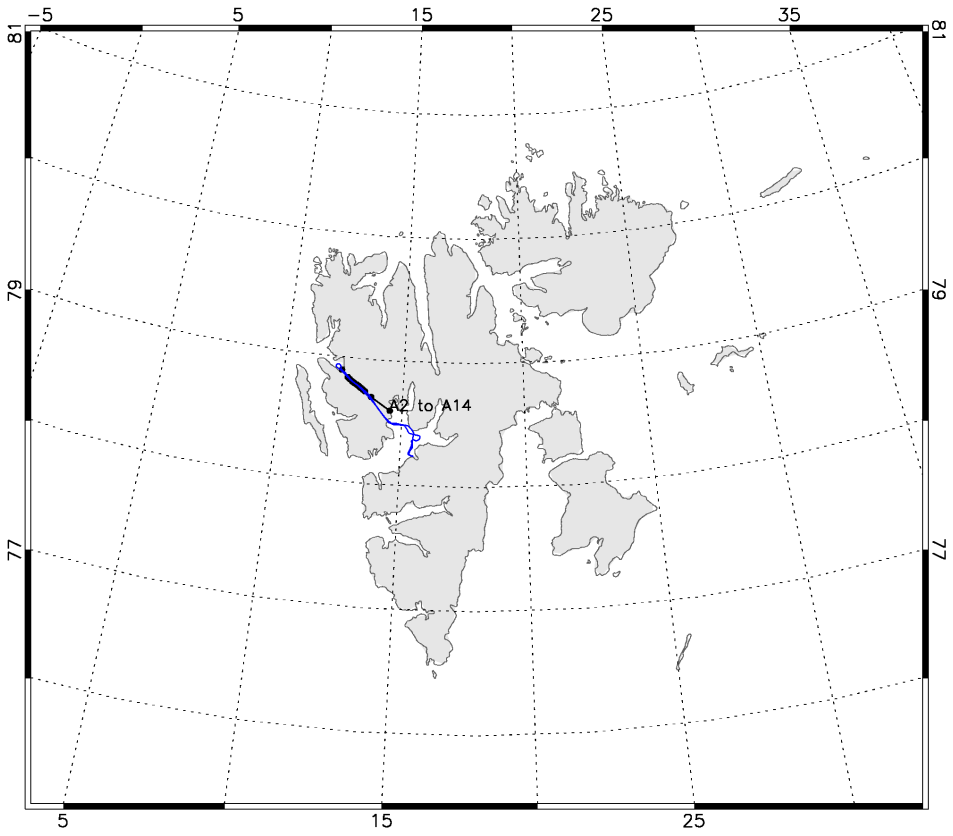


Figure B.5.: Overview of flight activity on 19th april 2007. Blue line shows GPS track, black lines are showing the planned profiles.

Event	Time (UTC)	Description
1	14:00:30	asiras calibration file 00 lamo2500 - on ground, no HPA(lat=78:14.7389N lon=015:29.6069E alt=+0057)
2	14:00:46	asiras calibration file 01 lama2500 - on ground, no HPA (lat=78:14.7389N lon=015:29.6069E alt=+0057)
3	14:01:02	asiras sarincal file 02 - on ground, no HPA (lat=78:14.7389N lon=015:29.6070E alt=+0057)
4	14:45:03	take off (lat=78:14.7377N lon=015:28.4574E alt=+0106)
5	14:48:24	no comment (lat=78:21.2496N lon=015:28.0538E alt=+1074)
6	14:48:30	rec video on (lat=78:22.0415N lon=015:28.3888E alt=+1116)
7	14:50:51	asiras calibration file 03 lamo2500(lat=78:27.4100N lon=015:25.5602E alt=+1036)
8	14:51:05	asiras calibration file 04 lama2500 (lat=78:27.7371N lon=015:23.9985E alt=+1048)
9	14:51:20	asiras sarincal file 05 (lat=78:28.0988N lon=015:22.2628E alt=+1058)

continued

Event	Time (UTC)	Description
10	14:54:40	open rollerdoor (lat=78:30.0241N lon=014:48.4412E alt=+1062)
11	14:56:32	asiras start file 00 sarin (lat=78:30.1883N lon=014:30.0584E alt=+1135)
12	14:57:30	clouds (lat=78:31.6476N lon=014:22.7674E alt=+1424)
13	15:00:14	asiras stop (lat=78:35.9528N lon=014:04.0867E alt=+1892)
14	15:01:11	asiras start file 01 sarin autotracking (lat=78:37.6002N lon=013:57.0383E alt=+2079)
15	15:11:51	asiras stop (lat=78:53.4466N lon=012:27.3401E alt=+2155)
16	15:15:24	asiras start file 02 sarin (lat=78:54.2528N lon=012:17.1245E alt=+2403)
17	15:15:50	a14 (lat=78:53.8306N lon=012:20.4167E alt=+2403)
18	15:23:51	a3 (lat=78:41.9849N lon=013:35.7408E alt=+2817)
19	15:30:12	open water (lat=78:30.7602N lon=014:30.4166E alt=+2392)
20	15:30:42	asiras stop file 02 (lat=78:29.6907N lon=014:37.5648E alt=+2409)
21	15:40:06	asiras switch off (lat=78:19.5876N lon=015:26.4829E alt=+0396)
22	15:40:17	closing roller door (lat=78:19.0803N lon=015:25.6209E alt=+0402)
23	15:43:21	landing (lat=78:14.8389N lon=015:26.6715E alt=+0065)
24	15:43:51	video off (lat=78:14.6922N lon=015:29.2965E alt=+0068)
25	15:47:33	parking position (lat=78:14.7950N lon=015:29.2569E alt=+0061)

Table B.5.: Event log of April 19.

B.6. CryoVEx2007 - April 20th

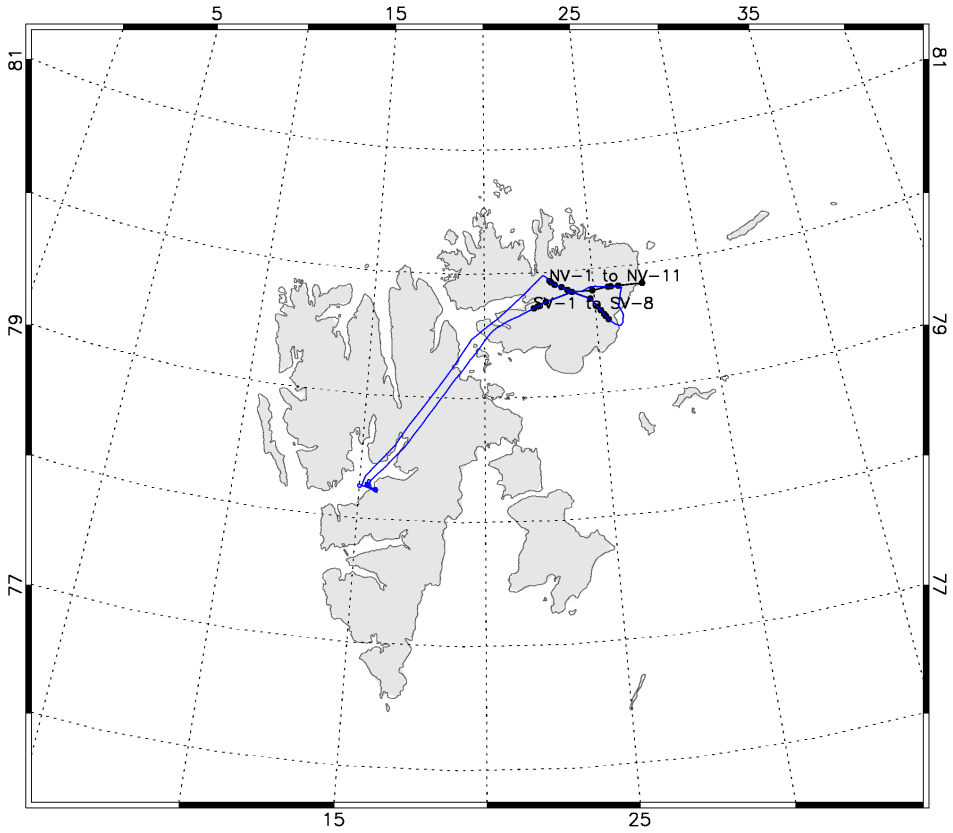


Figure B.6.: Overview of flight activity on 20th april 2007. Blue line shows GPS track, black lines are showing the planned profiles.

Event	Time (UTC)	Description
0	7:52:44	asiras calibration file 00 lamo2500 - on ground, no HPA
0	7:53:07	asiras calibration file 01 lama2500 - on ground, no HPA
0	7:53:18	asiras sarincal file 02 - on ground, no HPA Problems with Gyro of aircraft - Flight operation stoped
1	14:11:16	asiras calibration file 03 lamo2500 - acknowledge byte error (lat=78:14.7703N lon=015:29.3477E alt=+0058)
2	14:11:16	asiras calibration file 04 lama2500 - acknowledge byte error (lat=78:14.7715N lon=015:29.3505E alt=+0058)
3	14:15:05	asiras rebooted (lat=78:14.7715N lon=015:29.3506E alt=+0057)
4	14:17:59	asiras calibration file 05 lamo2500, no HPA (lat=78:14.7718N lon=015:29.3524E alt=+0065)
5	14:18:25	asiras calibration file 06 lama2500, no HPA (lat=78:14.7718N lon=015:29.3524E alt=+0065)
6	14:18:49	asiras sarincal file 07, no HPA (lat=78:14.7718N lon=015:29.3524E alt=+0064)

continued

Event	Time (UTC)	Description
7	14:26:36	take off (lat=78:14.7198N lon=015:28.8216E alt=+0072)
8	14:55:00	asiras calibration file 08 lamo2500 (lat=79:23.1691N lon=019:41.7231E alt=+2750)
9	14:55:13	asiras calibration file 09 lama2500 (lat=79:23.6536N lon=019:43.7186E alt=+2751)
10	14:55:27	asiras sarincal file 10 (lat=79:24.3191N lon=019:46.4189E alt=+2751)
11	14:57:01	asiras start file 00 sarin - iceedge (lat=79:28.3460N lon=020:01.8588E alt=+2752)
12	14:58:29	asiras stop test file 00 (lat=79:32.2531N lon=020:19.6733E alt=+2675)
13	15:02:10	open roller door (lat=79:36.9677N lon=020:59.2791E alt=+1869)
14	15:07:13	flaps 1 (lat=79:41.4135N lon=021:53.6976E alt=+0971)
15	15:08:55	asiras start file 01 lamo2500 (lat=79:42.8813N lon=022:11.9037E alt=+0939)
16	15:09:36	sv1 (lat=79:43.3681N lon=022:17.6215E alt=+1005)
17	15:10:44	corner (lat=79:44.4354N lon=022:30.1889E alt=+1078)
18	15:12:54	turn (lat=79:46.5111N lon=022:56.1199E alt=+1258)
19	15:16:42	clouds (lat=79:48.8547N lon=023:37.6270E alt=+1485)
20	15:18:03	sv3 (lat=79:49.8571N lon=023:53.5162E alt=+1557)
21	15:22:38	turn (IGI wrong way point) (lat=79:51.5076N lon=024:47.8806E alt=+1477)
22	15:23:27	sv4 (lat=79:51.7952N lon=024:57.9768E alt=+1436)
23	15:27:25	sv5 (lat=79:50.6399N lon=025:43.1958E alt=+1377)
24	15:29:45	sv7 (lat=79:50.5037N lon=026:09.8806E alt=+1301)
25	15:30:06	asiras stop (lat=79:50.4647N lon=026:14.0002E alt=+1273)
26	15:30:13	als stop (lat=79:50.3624N lon=026:15.2783E alt=+1265)
27	15:33:33	asiras calibration file 11 lamo2500 (lat=79:44.5244N lon=026:07.9137E alt=+1271)
28	15:33:51	asiras calibration file 12 lama2500 (lat=79:44.0542N lon=026:07.3596E alt=+1271)
29	15:34:01	asiras sarincal file 13 (lat=79:43.6652N lon=026:06.8909E alt=+1272)
30	15:43:19	als run on and asiras file 02 start and stop lamo2500(lat=79:34.1586N lon=025:39.0417E alt=+1257)
31	15:44:05	asiras start file 03 lamo2500 (lat=79:35.5800N lon=025:31.9910E alt=+1256)
32	15:45:31	nv9 (lat=79:38.2872N lon=025:21.1586E alt=+1315)
33	15:46:29	asiras stop (lat=79:40.3128N lon=025:13.2365E alt=+1336)
34	15:46:39	asiras start file 04 lamo2500 (lat=79:40.7122N lon=025:11.3612E alt=+1348)
35	15:49:36	nv6 (lat=79:46.1049N lon=024:48.2013E alt=+1433)
36	15:54:04	nv05 (lat=79:50.3321N lon=023:55.9992E alt=+1492)
37	15:54:42	corner (lat=79:51.1034N lon=023:48.3997E alt=+1487)

continued

Event	Time (UTC)	Description
38	15:56:18	nv4 (lat=79:52.7075N lon=023:31.8026E alt=+1441)
39	15:56:47	no clouds (lat=79:53.1572N lon=023:25.6517E alt=+1423)
40	15:58:05	nv3 (lat=79:54.1708N lon=023:11.6503E alt=+1340)
41	15:59:18	nv1 (lat=79:56.1543N lon=022:59.9262E alt=+1191)
42	15:59:54	roiugh surface (lat=79:57.4414N lon=022:53.7642E alt=+0968)
43	16:00:31	asiras stop (lat=79:58.2975N lon=022:47.9810E alt=+0940)
44	16:00:51	rollerdoor closed (lat=79:58.6890N lon=022:43.2625E alt=+0911)
45	16:01:58	als off (lat=79:57.3571N lon=022:34.0952E alt=+0923)
46	16:02:05	asiras calibration file 14 lamo2500 (lat=79:57.1635N lon=022:32.9351E alt=+0926)
47	16:02:28	asiras calibration file 15 lama2500 (lat=79:56.5767N lon=022:29.3253E alt=+0928)
48	16:02:54	asiras sarincal file 16 (lat=79:55.9028N lon=022:25.0970E alt=+0927)
49	16:10:50	asiras start file 05 sarin (lat=79:43.1748N lon=021:04.7898E alt=+1260)
50	16:12:24	asiras stop (lat=79:40.6401N lon=020:48.9314E alt=+1583)
51	16:14:49	asiras start file 06 sarin (lat=79:36.6014N lon=020:21.1363E alt=+2545)
52	16:15:30	asirasa stop (lat=79:35.8538N lon=020:15.4897E alt=+2718)
53	16:17:35	asiras start file 07 sarin (lat=79:32.3213N lon=019:50.8057E alt=+2779)
54	16:23:21	asiras stop recording error profile over sea ice (lat=79:19.4283N lon=018:52.9911E alt=+2775)
55	16:45:15	ld90 als on (lat=78:31.2958N lon=015:57.6408E alt=+1730)
56	16:51:03	open rollerdoor (lat=78:19.1693N lon=015:10.5000E alt=+0809)
57	16:54:47	flaps 1 (lat=78:16.1726N lon=015:02.8256E alt=+0508)
58	16:55:04	asiras start file 08 lamo2500 (500m) (lat=78:15.9164N lon=015:06.1557E alt=+0522)
59	16:57:18	rwy (lat=78:14.9312N lon=015:25.1315E alt=+0519)
60	16:58:06	rwy over (lat=78:14.5585N lon=015:32.4705E alt=+0517)
61	16:58:12	asiras stop (lat=78:14.5432N lon=015:34.2731E alt=+0474)
62	17:00:38	asiras start file 09 lamo2500 (300m) (lat=78:14.4223N lon=015:33.9240E alt=+0323)
63	17:01:05	ryw (lat=78:14.6785N lon=015:29.4685E alt=+0322)
64	17:01:44	rwy (lat=78:14.9761N lon=015:24.0502E alt=+0323)
65	17:03:01	asiras stop (lat=78:17.1561N lon=015:18.6750E alt=+0374)
66	17:04:59	asiras start file 10 lamo2500 (300m) (lat=78:15.2243N lon=015:19.8269E alt=+0331)
67	17:05:40	rwy (lat=78:14.9362N lon=015:25.0396E alt=+0335)
68	17:06:27	rwy (lat=78:14.5139N lon=015:31.9809E alt=+0335)
69	17:06:35	asiras stop (lat=78:15.0798N lon=015:39.6343E alt=+0336)
70	17:08:28	asiras start file 11 lamo2500 (300m)(lat=78:14.1945N lon=015:38.0864E alt=+0335)

continued

Event	Time (UTC)	Description
71	17:09:21	rwy (lat=78:14.6465N lon=015:30.1317E alt=+0332)
72	17:10:02	rwy (lat=78:14.9736N lon=015:24.1021E alt=+0335)
73	17:10:11	asiras stop (lat=78:15.0941N lon=015:21.8655E alt=+0334)
74	17:15:00	hangar (lat=78:14.6859N lon=015:29.8468E alt=+0335)
75	17:15:50	asiras calibration file 17 lamo2500 (lat=78:13.5902N lon=015:36.4537E alt=+0335)
76	17:16:10	asiras calibration file 18 lama2500 (lat=78:13.2860N lon=015:40.0372E alt=+0350)
77	17:16:25	asiras sarincal file 19 (lat=78:13.3871N lon=015:40.8371E alt=+0342)
78	17:18:42	hangar (lat=78:14.7819N lon=015:29.1677E alt=+0353)
79	17:19:01	close rollerdoor (lat=78:14.7176N lon=015:25.7443E alt=+0370)
80	17:20:09	camera off (lat=78:17.0722N lon=015:21.1686E alt=+0410)
81	17:20:42	als off (lat=78:17.1479N lon=015:17.3385E alt=+0367)
82	17:22:36	landing (lat=78:14.8295N lon=015:26.7565E alt=+0060)

Table B.6.: Event log of April 20.

B.7. CryoVEx2007 - April 21

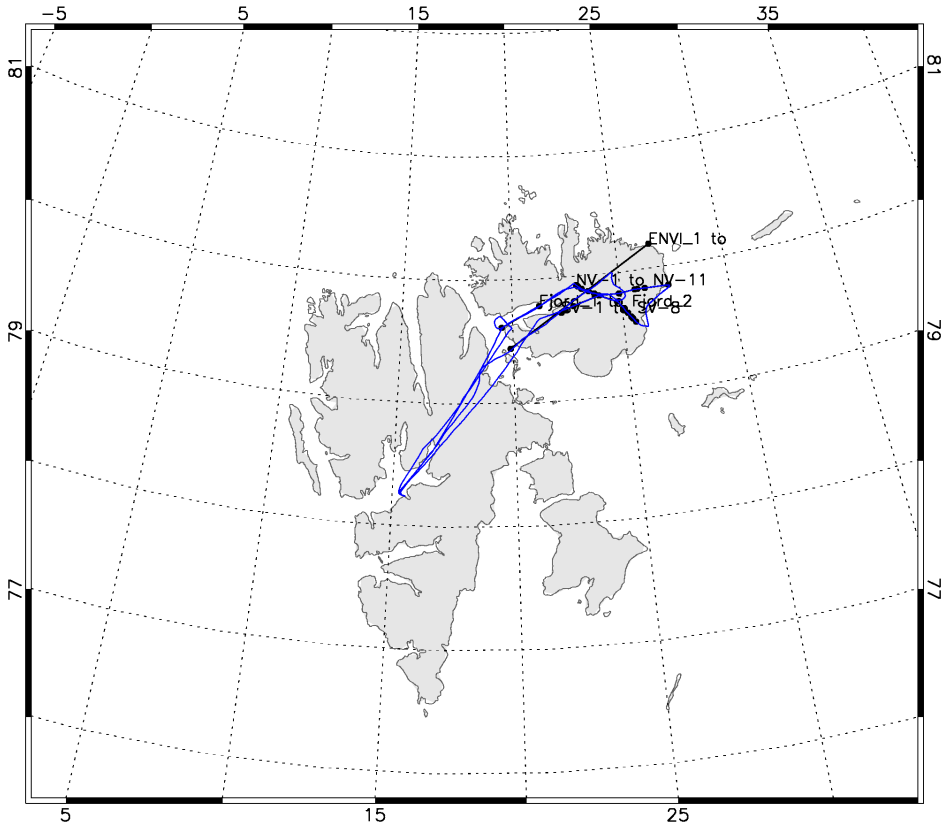


Figure B.7.: Overview of flight activity on 21th april 2007. Blue line shows GPS track, black lines are showing the planned profiles.

B.7.1. Flight 1

Event	Time (UTC)	Description
1	9:27:35	asiras calibration file 00 lamo2500 - serial error(lat=78:14.7692N lon=015:29.3994E alt=+0062)
2	9:36:01	take off (lat=78:14.7444N lon=015:28.3878E alt=+0087)
3	9:49:54	asiras calibration file 01 lamo2500 (lat=78:44.8374N lon=017:15.0363E alt=+2774)
4	9:50:09	asiras calibration file 02 lamo2500 (lat=78:45.4871N lon=017:17.5069E alt=+2774)
5	9:50:23	asiras calibration file 03 lama2500 (lat=78:46.1707N lon=017:20.2278E alt=+2774)
6	9:51:27	asiras sarincal file 04 (lat=78:48.6284N lon=017:31.1876E alt=+2773)

continued

Event	Time (UTC)	Description
7	9:53:44	asiras sarincal file 05 (lat=78:54.0186N lon=017:56.0584E alt=+2775) Acknowledge byte are missing - ASIRAS 3x rebooted, Laptop problems to shut up and reboot
8	9:59:50	asiras calibration file 06 lamo2500 (lat=79:08.7018N lon=019:01.7940E alt=+2774)
9	10:00:26	asiras calibration file 07 lama2500 (lat=79:10.1886N lon=019:07.8740E alt=+2770)
10	10:00:55	asiras sarincal file 08 (lat=79:11.0973N lon=019:11.4570E alt=+2769)
11	10:02:23	asiras start file 00 sarin - manuell tracking (lat=79:14.7105N lon=019:26.5549E alt=+2769)
12	10:04:13	video rec start (lat=79:19.0525N lon=019:44.4936E alt=+2776)
13	10:07:12	asiras stop (lat=79:26.0190N lon=020:12.8813E alt=+2775)
14	10:08:06	openrollerdoor (lat=79:30.1944N lon=020:27.5902E alt=+2580)
15	10:19:30	asiras start file 01 (lat=79:43.9830N lon=022:14.2147E alt=+1026)
16	10:21:30	corner (lat=79:45.3123N lon=022:37.0022E alt=+1138)
17	10:21:34	sv1 (lat=79:45.3570N lon=022:37.7239E alt=+1144)
18	10:22:26	sv2 (lat=79:45.9477N lon=022:48.0760E alt=+1193)
19	10:29:08	sv3 (lat=79:49.9576N lon=024:07.8807E alt=+1501)
20	10:35:00	end of line igi problems (lat=79:50.6010N lon=025:22.8477E alt=+1425)
21	10:36:33	sv5 (lat=79:51.0537N lon=025:42.2168E alt=+1368)
22	10:36:42	dense sastrugies (lat=79:51.0180N lon=025:45.1708E alt=+1357)
23	10:36:51	igi problems garmin as backup flightmanager (lat=79:50.9908N lon=025:47.2777E alt=+1350)
24	10:37:03	sv6 (lat=79:50.9843N lon=025:48.3431E alt=+1345)
25	10:38:35	sv7 (lat=79:51.0377N lon=026:08.5360E alt=+1241)
26	10:43:14	ice edge (lat=79:50.8815N lon=027:10.1569E alt=+0746)
27	10:43:20	sv8 (lat=79:50.8784N lon=027:11.6431E alt=+0726)
28	10:43:28	asiras stop (lat=79:50.8418N lon=027:13.7862E alt=+0726)
29	10:45:40	asiras start file 02 lam02500 - sea ice(lat=79:48.6345N lon=027:02.4339E alt=+0742)
30	10:48:11	asiras stop (lat=79:46.2350N lon=026:40.3923E alt=+0750)
31	10:59:54	ice edge (25m)(lat=79:34.1988N lon=025:39.2063E alt=+0919)
32	11:00:08	asiras start file 03 lam02500 (700m) (lat=79:34.5559N lon=025:37.2684E alt=+0918)
33	11:01:04	n11 (lat=79:36.0484N lon=025:29.9911E alt=+0954)
34	11:01:36	nv10 (lat=79:36.9979N lon=025:26.1813E alt=+1013)
35	11:03:00	homogenous sastrugis (lat=79:39.6714N lon=025:15.1810E alt=+1209)
36	11:04:41	nv7 (lat=79:42.6894N lon=025:03.9543E alt=+1348)
37	11:07:10	igi and garmin differences (lat=79:46.6914N lon=024:42.4846E alt=+1471)

continued

Event	Time (UTC)	Description
38	11:07:22	garmin used as backup flight manager (lat=79:46.7623N lon=024:41.2864E alt=+1474)
39	11:12:23	corner (lat=79:51.2714N lon=023:47.1828E alt=+1484)
40	11:13:59	nv4 (lat=79:52.9065N lon=023:29.7486E alt=+1440)
41	11:15:18	nv3 (lat=79:53.9189N lon=023:14.4423E alt=+1354)
42	11:16:21	nv2 (lat=79:55.3710N lon=023:03.5130E alt=+1231)
43	11:16:49	nv1 (lat=79:56.1242N lon=022:59.2634E alt=+1104)
44	11:16:57	asiras stop(lat=79:56.3666N lon=022:58.0607E alt=+1069)
45	11:17:56	als run off and on (lat=79:56.0594N lon=022:46.6841E alt=+1070)
46	11:24:01	asiras start file 04 lamo2500 (lat=79:50.2729N lon=021:49.1050E alt=+0696)
47	11:25:27	sea ice (lat=79:48.8287N lon=021:34.4938E alt=+0484)
48	11:26:17	fjord1 (lat=79:47.9948N lon=021:26.5638E alt=+0523)
49	11:27:35	system down no power - asiras stop (lat=79:46.6099N lon=021:13.1064E alt=+0525)
50	11:32:22	asiras start file 05 lam02500 (lat=79:42.1374N lon=020:23.2527E alt=+0508)
51	11:36:18	Lance (Ice breaker) travers profile crossing (lat=79:38.5674N lon=019:44.2780E alt=+0525)
52	11:37:22	open water (lat=79:37.4633N lon=019:36.0555E alt=+0507)
53	11:38:00	fjord2 (lat=79:36.6673N lon=019:31.3332E alt=+0501)
54	11:38:09	asiras stop (lat=79:36.4098N lon=019:30.1284E alt=+0506)
55	11:39:22	video rec (lat=79:34.5548N lon=019:24.2609E alt=+0514)
56	11:39:49	asiras calibration file 09 lamo2500 (lat=79:33.5647N lon=019:21.3418E alt=+0507)
57	11:40:15	asiras calibration file 10 lama2500 (lat=79:33.0330N lon=019:19.7469E alt=+0584)
58	11:41:04	close roller door (lat=79:31.7409N lon=019:15.9374E alt=+0902)
59	11:42:03	asiras sarincal file 11 (lat=79:29.6499N lon=019:10.9824E alt=+1384)
60	12:16:42	touch down (lat=78:14.6974N lon=015:29.1988E alt=+0065)

Table B.7.: Event log of April 21 - flight 1.

B.7.2. Flight 2

Event	Time (UTC)	Description
1	14:31:33	asiras calibration file 12 lamo2500 - on ground, no HPA (lat=78:14.7685N lon=015:29.4147E alt=+0060)
2	14:31:48	asiras calibration file 13 lama2500 - on ground, no HPA (lat=78:14.7685N lon=015:29.4146E alt=+0060)
3	14:32:04	asiras sarincal file p14 - on ground, no HPA (lat=78:14.7685N lon=015:29.4145E alt=+0060)
4	14:39:40	take off (lat=78:14.8101N lon=015:27.0633E alt=+0164)
5	15:05:30	open roller door (lat=79:19.6865N lon=018:52.5898E alt=+1455)
6	15:05:50	als run on (lat=79:20.1395N lon=018:56.6713E alt=+1326)
7	15:07:33	asiras start file 06 lamo2500 (lat=79:22.4333N lon=019:16.8236E alt=+0761)
8	15:09:53	envi4 (lat=79:24.4230N lon=019:39.7611E alt=+0780)
9	15:09:58	video on (lat=79:24.5143N lon=019:40.6559E alt=+0782)
10	15:11:39	envi3 (lat=79:26.7302N lon=019:57.9263E alt=+0779)
11	15:12:18	ice edge (lat=79:27.7310N lon=020:04.2819E alt=+0774)
12	15:15:23	asiras stop (lat=79:32.3924N lon=020:35.2447E alt=+1259)
13	15:16:38	walenfjorden (lat=79:34.7787N lon=020:59.6836E alt=+0992)
14	15:18:08	asiras start file 07 lamo2500 (lat=79:35.6893N lon=021:08.2327E alt=+0939)
15	15:21:10	asiras stop (lat=79:39.4205N lon=021:39.6140E alt=+1306)
16	15:24:06	asiras start file 08 lamo2500 (lat=79:43.7731N lon=022:12.8985E alt=+0998)
17	15:28:02	few clouds (lat=79:49.1450N lon=022:53.6048E alt=+1284)
18	15:28:31	clouds (lat=79:49.6938N lon=022:58.6245E alt=+1326)
19	15:29:59	als no data due to clouds (lat=79:51.4363N lon=023:17.2584E alt=+1406)
20	15:36:42	envi2 (lat=80:00.1931N lon=024:37.0434E alt=+1284)
21	15:36:55	asiras stop (lat=80:00.3044N lon=024:38.0152E alt=+1282)
22	15:37:36	asiras calibration file 15 lamo2500 (lat=79:59.5369N lon=024:42.5289E alt=+1289)
23	15:37:55	asiras calibration file 16 lama2500 (lat=79:59.0763N lon=024:41.9160E alt=+1289)
24	15:38:15	asiras sarincal file 17 (lat=79:58.4860N lon=024:40.8706E alt=+1281)
25	15:39:28	als run off (lat=79:56.5495N lon=024:40.9643E alt=+1404)
26	15:41:40	asiras start file 09 lamo2500 (lat=79:53.1132N lon=024:54.3860E alt=+1480)
27	15:42:39	asiras stop (lat=79:51.7773N lon=025:03.0342E alt=+1476)
28	15:46:00	als run on (lat=79:46.5704N lon=024:58.3945E alt=+1476)
29	15:46:57	asiras start file 10 lamo2500 (lat=79:47.1726N lon=024:46.3014E alt=+1474)
30	15:50:48	nv5 (lat=79:50.6470N lon=024:01.8298E alt=+1485)

continued

Event	Time (UTC)	Description
31	15:51:59	corner (lat=79:51.2293N lon=023:45.7003E alt=+1496)
32	15:53:24	direct to fjord1 (lat=79:52.5812N lon=023:25.2204E alt=+1448)
33	15:53:42	asiras stop (lat=79:52.7373N lon=023:23.2306E alt=+1434)
34	15:55:02	no clouds (lat=79:54.2399N lon=023:04.9659E alt=+1253)
35	15:58:59	als off and on (lat=79:53.0543N lon=022:12.7818E alt=+0718)
36	16:01:07	clouds (lat=79:51.0263N lon=021:52.0798E alt=+0845)
37	16:02:00	als stop (lat=79:49.9288N lon=021:42.7104E alt=+0860)
38	16:02:24	als on (lat=79:49.5316N lon=021:39.1019E alt=+0846)
39	16:03:48	asiras start file 11 lamo2500 (500m) (lat=79:47.8532N lon=021:23.7062E alt=+0516)
40	16:05:18	fjord1 (lat=79:46.5836N lon=021:10.2236E alt=+0496)
41	16:13:32	scooter line from field team near Lance (lat=79:38.5697N lon=019:45.3985E alt=+0514)
42	16:14:46	open water (lat=79:37.4625N lon=019:34.8324E alt=+0491)
43	16:15:21	fjord2 (lat=79:36.9532N lon=019:29.6413E alt=+0495)
44	16:15:32	asiras stop (lat=79:36.7273N lon=019:27.3407E alt=+0495)
45	16:18:56	asiras start file 12 (lat=79:42.3437N lon=019:22.4216E alt=+0501)
46	16:21:45	lance (lat=79:39.1392N lon=019:44.4551E alt=+0499)
47	16:23:17	asiras stop (lat=79:37.1481N lon=019:56.1704E alt=+0532)
48	16:23:47	als off (lat=79:36.5387N lon=019:57.0609E alt=+0643)
49	16:23:59	roller door closed (lat=79:36.0254N lon=019:54.6540E alt=+0748)
50	16:24:56	asiras calibration file 18 lamo2500 (lat=79:34.6515N lon=019:46.9135E alt=+1120)
51	16:25:19	asiras calibration file 19 lamo2500 (lat=79:34.0012N lon=019:44.3891E alt=+1264)
52	16:25:46	asiras sarincal file 20 (lat=79:33.3099N lon=019:41.7128E alt=+1411)
53	16:36:15	video off (lat=79:11.8435N lon=018:21.6136E alt=+2832)
54	17:01:16	touch down (lat=78:14.7131N lon=015:28.9359E alt=+0065)

Table B.8.: Event log of April 21 - flight 2.

C. ASIRAS processing table

Profil	Label	L1	L1B	GPS	INS	QUALITY	TSHIFT (s)	REMARK
A070405_00	LAMO2500	X	X	X	X		0.00	
A070405_01	LAMO2500	X	X	X	X		0.00	
A070405_02	LAMA2500	X	X	X	X		0.00	
A070405_03	LAMA2500	X	X	X	X		0.00	
A070405_04	LAMO2500	X	X	X	X		0.00	
A070405_05	LAMO2500	X	X	X	X		0.00	
A070405_06	LAMA2500	X	X	X	X		0.00	
A070405_07	LAMA2500	X	X	X	X		0.00	
A070405_08	HAMO4000	X	X	X	X		0.00	
A070405_09	HAMO4000	X	X	X	X		0.00	
A070405_10	LAMA2000	X	X	X	X		0.00	
A070405_11	LAMO2500	X	X	X	X		0.00	
A070405_12	LAMO2500	X	X	X	X		-0.42	
A070405_13	LAMA2000	X	X	X	X		0.00	
A070405_14	LAMA2000	X	X	X	X		0.00	
A070405_15	LAMA2500	X	X	X	X		0.00	
A070405_16	LAMA3000	X	X	X	X		-0.13	
A070416_00	LAMO2500	X	X	X	X		0.00	
A070416_01	LAMA2000	X	X	X	X		0.00	
A070416_02	LAMA2500	X	X	X	X		0.00	
A070416_03	LAMO2500	X	X	X	X		0.00	
A070416_04	HAME4000	/	/	X	X		0.00	HAME
A070416_05	HAMO4000	X	X	X	X		0.00	
A070416_06	LAMO2500	X	X	X	X		0.00	
A070416_07	LAMA2500	X	X	X	X		0.00	
A070416_08	LAMA3000	X	X	X	X		0.00	
A070416_09	LAMA3000	X	X	X	X		0.00	

continued

Profil	Label	L1	L1B	GPS	INS	QUALITY	TSHIFT (s)	REMARK
A070416_10	LAMA3000	X	X	X	X		-0.15	
A070416_11	LAMO2500	X	X	X	X		0.00	
A070416_12	LAMA2000	X	X	X	X		0.00	
A070416_13	LAMO2500	X	X	X	X		0.00	
A070416_14	LAMO2500	X	X	X	X		-0.32	
A070416_15	LAMO2500	X	X	X	X		0.00	
A070416_16	LAMO2500	X	X	X	X		0.00	
A070416_17	HAMO4000	X	X	X	X		0.00	
A070416_18	HAMO4000	X	X	X	X		0.00	
A070416_19	HAMO4000	X	X	X	X		0.00	
A070416_20	LAMO2500	X	X	X	X		-0.38	
A070416_21	LAMO2500	X	X	X	X		0.00	
A070416_22	LAMO2500	X	X	X	X		0.00	
A070416_23	LAMO2500	X	X	X	X		0.00	
A070416_24	LAMO2500	X	X	X	X		0.00	
A070416_25	LAMO2500	X	X	X	X		-0.32	
A070416_26	LAMO2500	X	X	X	X		-0.27	
A070416_27	LAMO2500	X	X	X	X		-0.40	
A070416_28	LAMO2500	X	X	X	X		0.00	
A070417_00	LAMO2500	X	X	X	X		0.00	
A070417_01	LAMO2500	X	X	X	X		-0.42	
A070417_02	LAMO2500	X	X	X	X		0.00	
A070417_03	LAMO2500	X	X	X	X		0.00	
A070417_04	LAMA2500	X	X	X	X		0.00	
A070417_05	LAMA2500	X	X	X	X		0.00	
A070418_00	HAMO4000	/	/	X	X			SIGBUS
A070418_01	LAMO2500	X	X	X	X		-0.16	

continued

Profil	Label	L1	L1B	GPS	INS	QUALITY	TSHIFT (s)	REMARK
A070418_02	LAMO2500	X	X	X	X		0.00	
A070418_03	LAMO2500	X	X	X	X		-0.26	
A070418_04	LAMO2500	X	X	X	X		0.00	
A070418_05	LAMO2500	X	X	X	X		0.00	
A070418_06	HAMO4000	X	X	X	X		0.00	
A070418_07	HAMO4000	X	X	X	X		0.00	
A070418_08	LAMO2500	X	X	X	X		0.00	
A070418_09	LAMO2500	X	X	X	X		-0.17	
A070419_00	HAMO4000	X	X	X	X		0.00	
A070419_01	HAMO4000	X	X	X	X		0.00	
A070419_02	HAMO4000	X	X	X	X		0.00	
A070420_00	HAMO4000	X	X	X	X		0.00	
A070420_01	LAMO2500	X	X	X	X		0.00	
A070420_02	LAMO2500	X	X	X	X		0.00	
A070420_03	LAMO2500	X	X	X	X		0.00	
A070420_04	LAMO2500	X	X	X	X		-0.39	
A070420_05	HAMO4000	X	X	X	X		0.00	
A070420_06	HAMO4000	X	X	X	X		0.00	
A070420_07	HAMO4000	X	X	X	X		0.00	
A070420_08	LAMO2500	X	X	X	X		-0.51	
A070420_09	LAMO2500	X	X	X	X		0.00	
A070420_10	LAMO2500	X	X	X	X		-0.15	
A070420_11	LAMO2500	X	X	X	X		-0.10	
A070421_00	HAMO4000	X	X	X	X		0.00	
A070421_01	LAMO2500	X	X	X	X		-0.24	
A070421_02	LAMO2500	X	X	X	X		-0.50	
A070421_03	LAMO2500	X	X	X	X		-0.26	

continued

Profil	Label	L1	L1B	GPS	INS	QUALITY	TSHIFT (s)	REMARK
A070421_04	LAMO2500	/	/	X	X		0.00	SIGBUS
A070421_05	LAMO2500	X	X	X	X		-0.14	
A070421_06	LAMO2500	X	X	X	X		0.00	
A070421_07	LAMO2500	X	X	X	X		0.00	
A070421_08	LAMO2500	/	/	X	X		0.00	SIGBUS
A070421_09	LAMO2500	X	X	X	X		0.00	
A070421_10	LAMO2500	X	X	X	X		0.00	
A070421_11	LAMO2500	X	X	X	X		-0.10	
A070421_12	LAMO2500	X	X	X	X		-0.09	

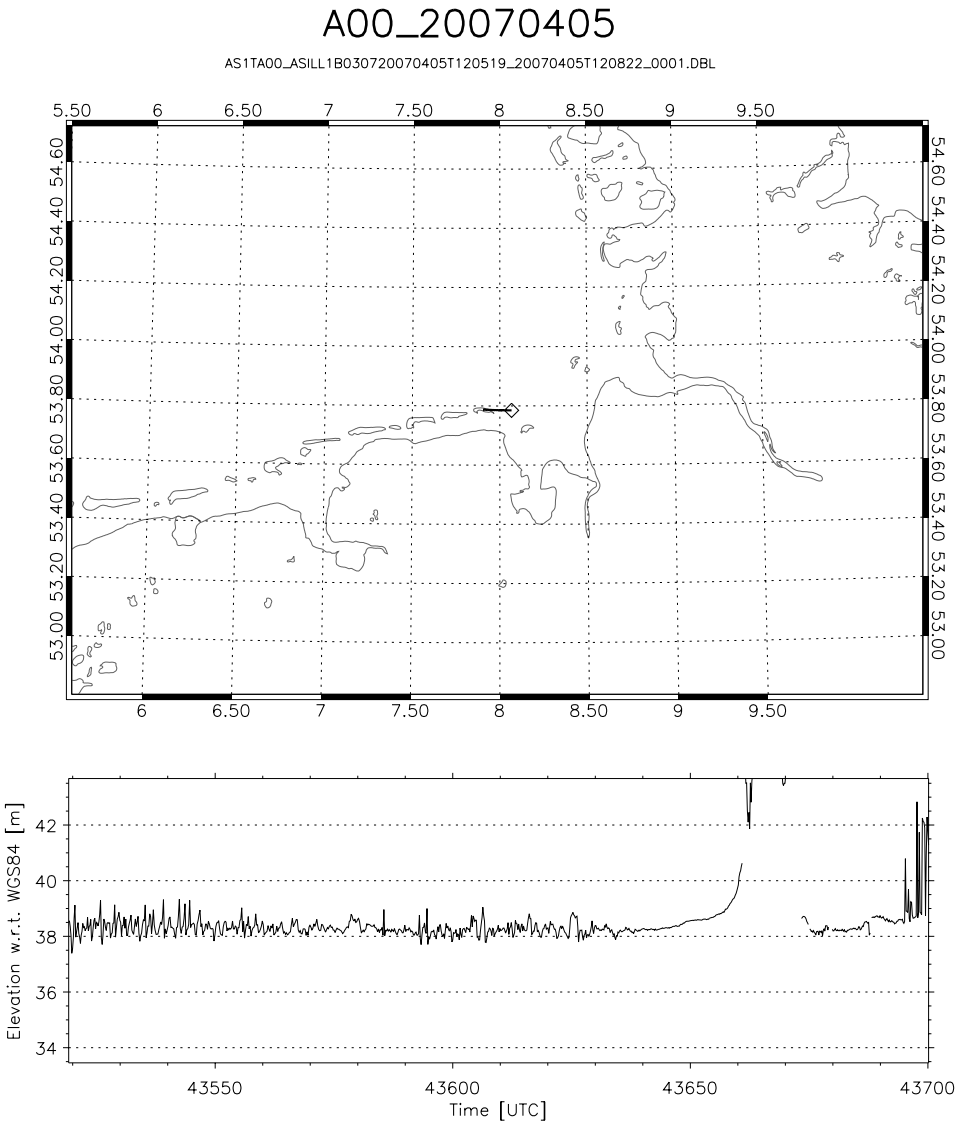
Table C.1.: ASIRAS processing. All profiles where processed with new processor version ASIRAS_03_07. Abbreviations for Label:
HAMO4000 High Altitude Mode 4000Hz - original configuration
LAMO2500 Low altitude mode (2500 Hz PRF) original LAM
LAMA2000 LOW ALTITUDE MODE A (2000 KHZ PRF)
LAMA2500 LOW ALTITUDE MODE A (2500 KHZ PRF)
LAMA3000 LOW ALTITUDE MODE A (3000 KHZ PRF)

D. Processed ASIRAS profiles

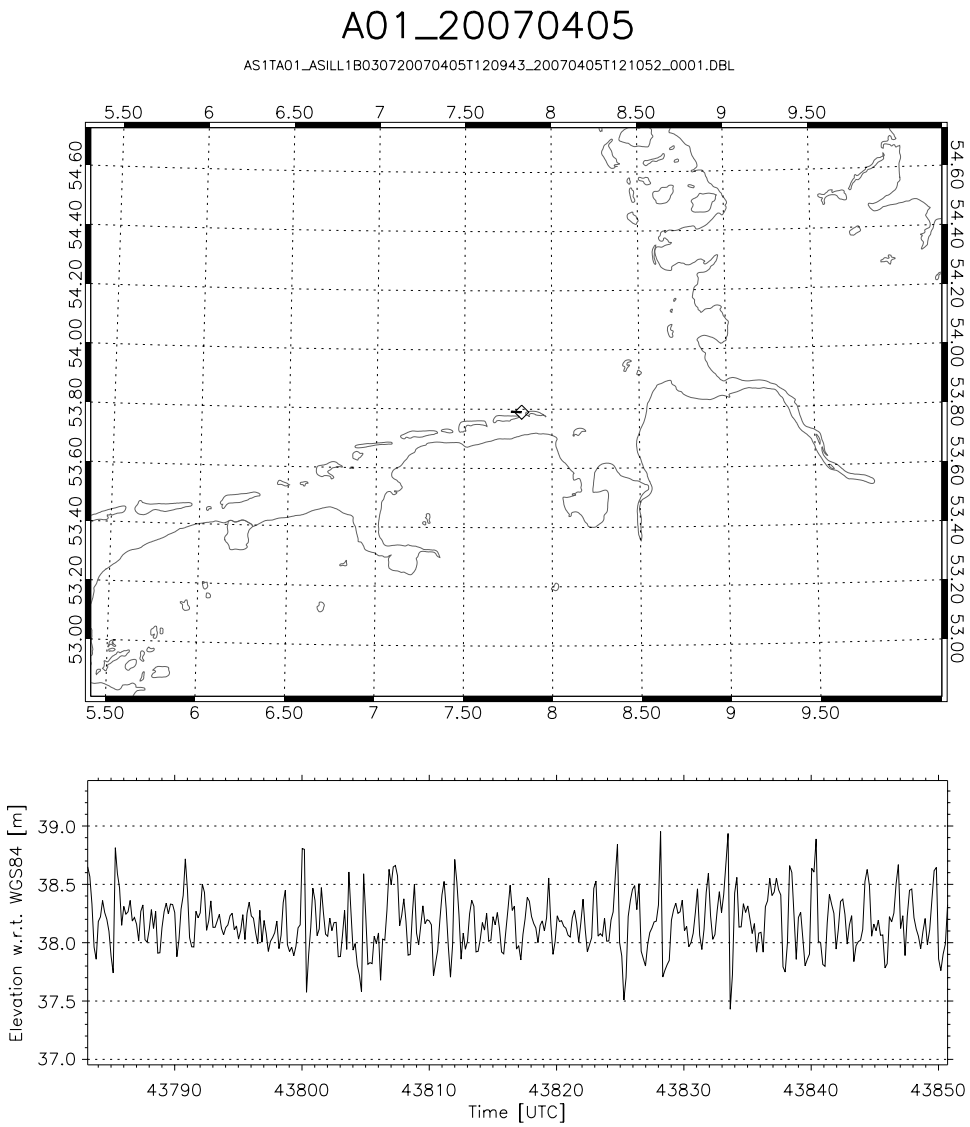
The following plots are showing all processed ASIRAS profiles. Each profile plot consist of four parts:

1. Header composed of daily profile number and date and a subheader including the filename.
2. Geographical plot showing the profile location (diamond indicates the starting point of the profile)
3. Rough indication of surface elevation as determined by the AWI TSRA-retracker plotted versus time in seconds of day.
4. Info box including date, start and stop times in hour, minute, second and in square brackets second of day, acquisition mode, etc.

It should be emphasized that the original surface elevation determined by the ESA OCOG retracker gave very bad or no elevation estimates. Therefore the TSRA retracking results are plotted.



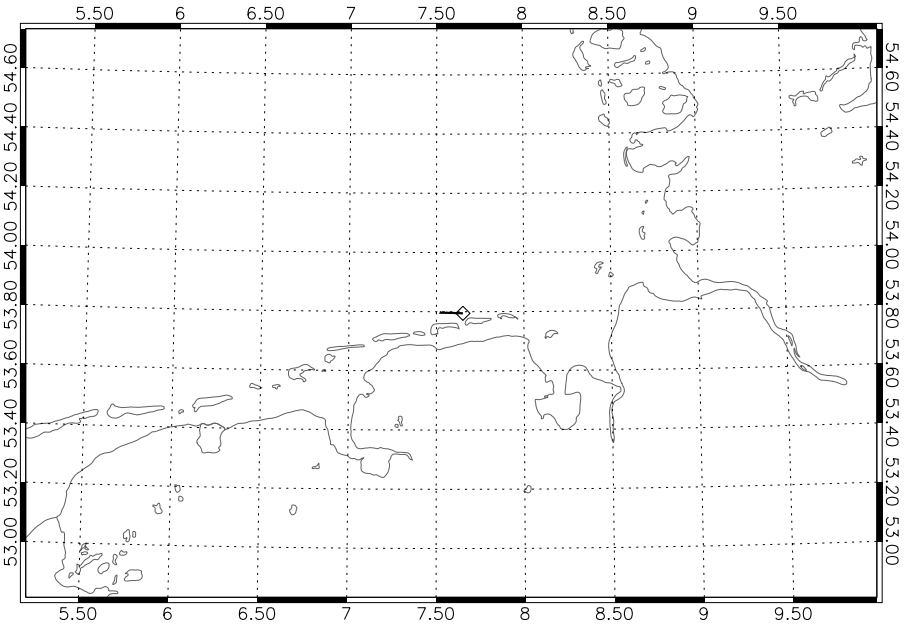
Date	2007-04-05	**Instrument Mode**	Low Altitude
Start Time	12:05:19 (43519)	**Aircraft**	AWI/DLR D-CODE
Stop Time	12:08:20 (43700)	**Retracker**	TSRA
Distance	10.737 km	**INS Resolution**	50 Hz
Duration	00 h 03 m 01 s	**Processor Version**	3.07

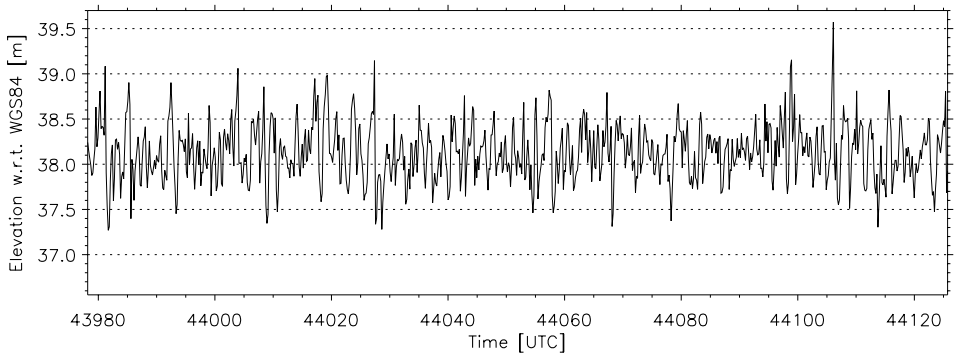


Date	2007−04−05	**Instrument Mode**	Low Altitude
Start Time	12:09:43 (43783)	**Aircraft**	AWI/DLR D−CODE
Stop Time	12:10:50 (43850)	**Retracker**	TSRA
Distance	4.068 km	**INS Resolution**	50 Hz
Duration	00 h 01 m 08 s	**Processor Version**	3.07

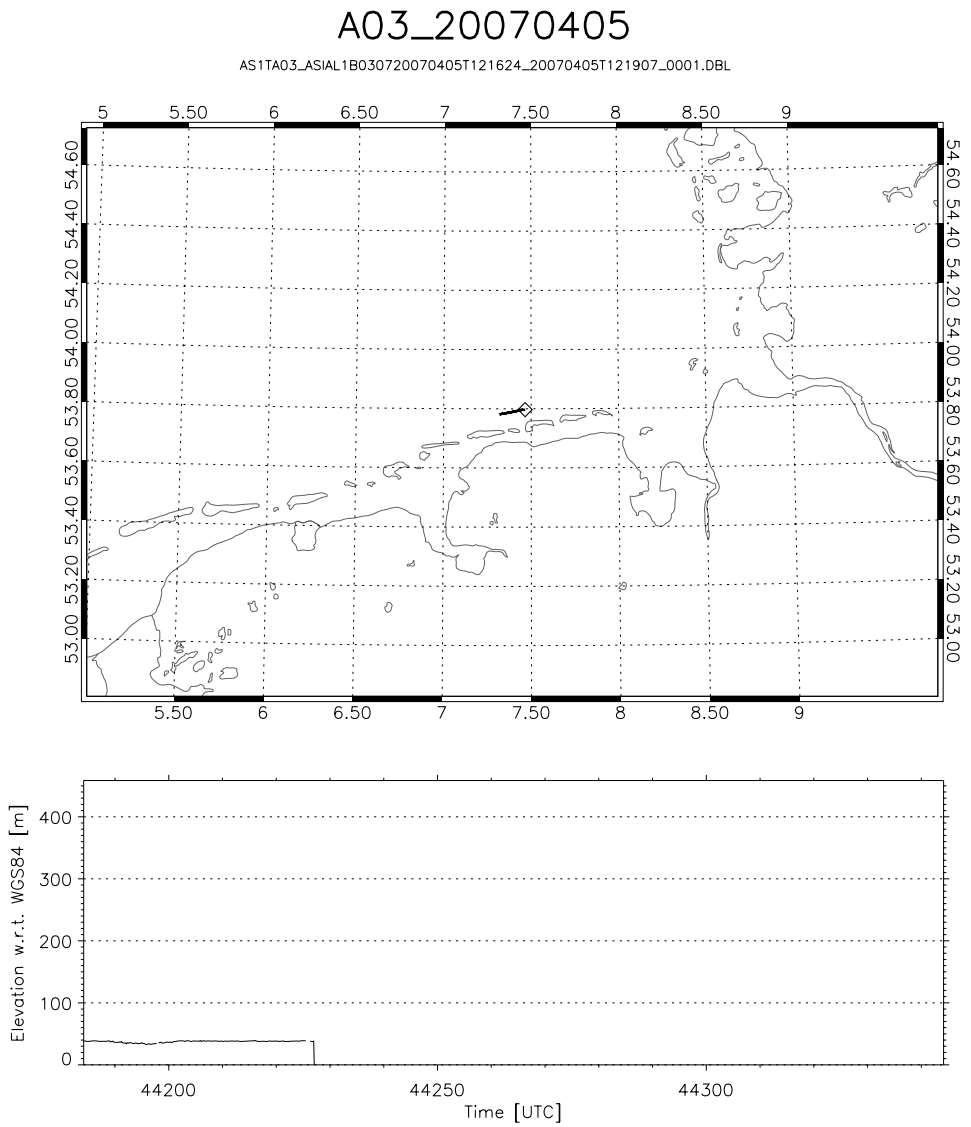
A02_20070405

AS1TA02_ASIAL1B030720070405T121258_20070405T121527_0001.DBL





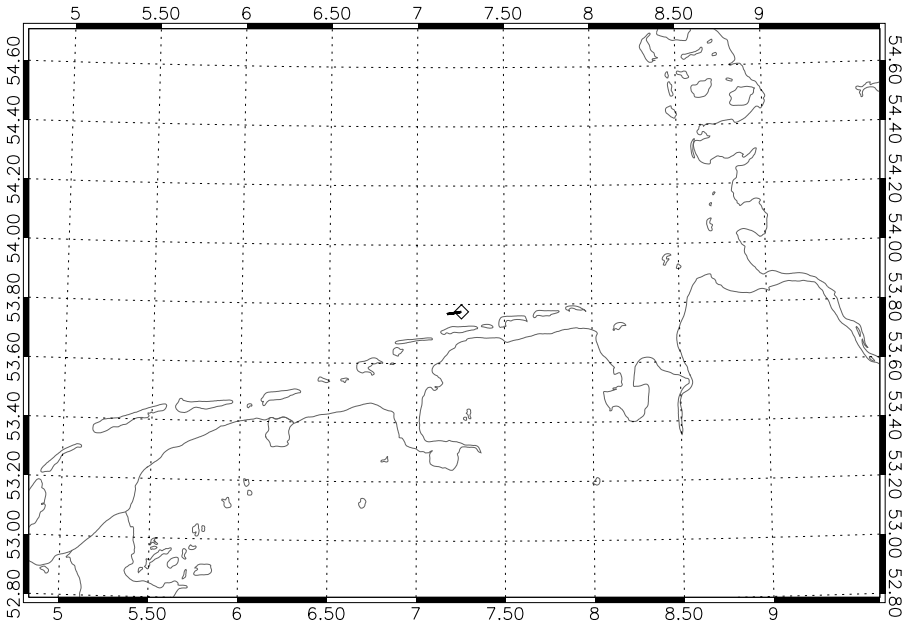
Date	2007−04−05	**Instrument Mode**	Adv. Low Altitude
Start Time	12:12:58 (43978)	**Aircraft**	AWI/DLR D−CODE
Stop Time	12:15:25 (44125)	**Retracker**	TSRA
Distance	8.719 km	**INS Resolution**	50 Hz
Duration	00 h 02 m 28 s	**Processor Version**	3.07

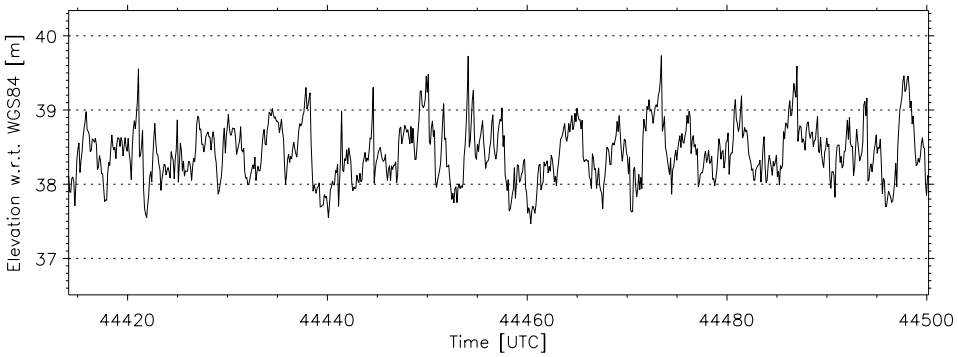


Date	2007-04-05	**Instrument Mode**	Adv. Low Altitude
Start Time	12:16:24 (44184)	**Aircraft**	AWI/DLR D-CODE
Stop Time	12:19:04 (44344)	**Retracker**	TSRA
Distance	9.806 km	**INS Resolution**	50 Hz
Duration	00 h 02 m 40 s	**Processor Version**	3.07

A04_20070405

AS1TA04_ASILL1B030720070405T122014_20070405T122142_0001.DBL

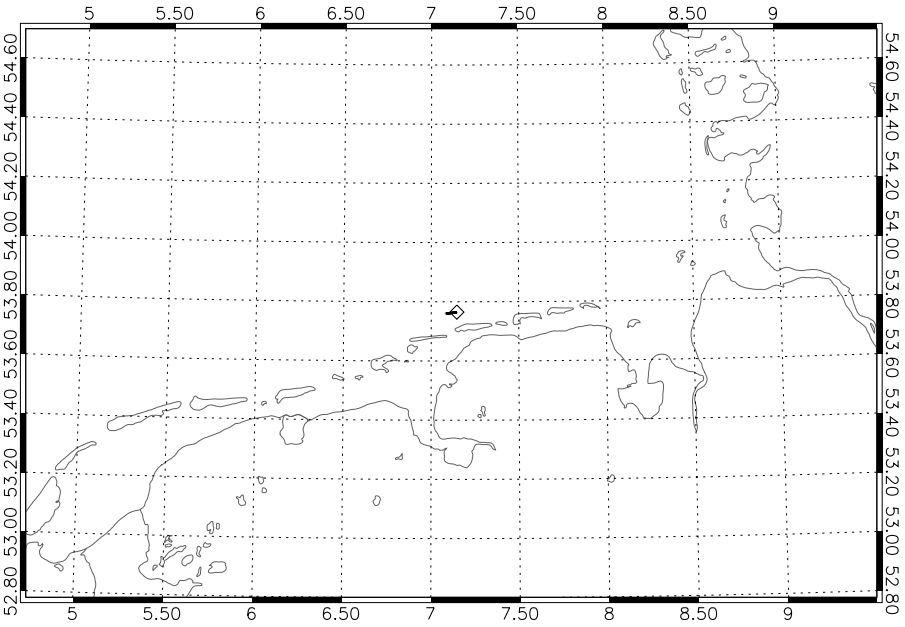


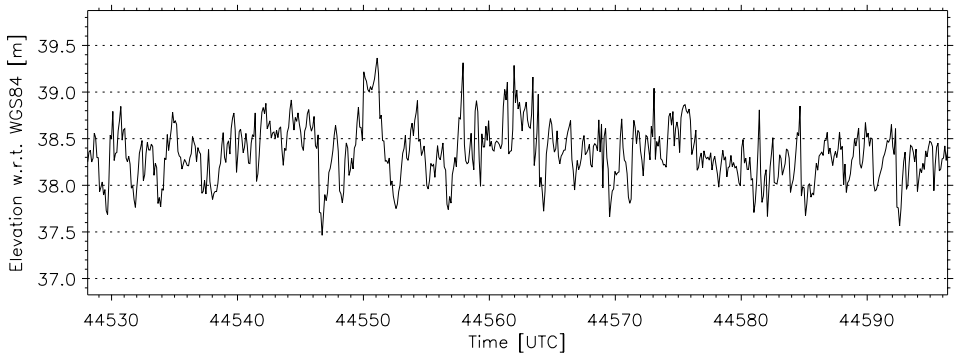


Date	2007-04-05	**Instrument Mode**	Low Altitude
Start Time	12:20:14 (44414)	**Aircraft**	AWI/DLR D-CODE
Stop Time	12:21:40 (44500)	**Retracker**	TSRA
Distance	5.438 km	**INS Resolution**	50 Hz
Duration	00 h 01 m 26 s	**Processor Version**	3.07

A05_20070405

AS1TA05_ASILL1B030720070405T122208_20070405T122317_0001.DBL

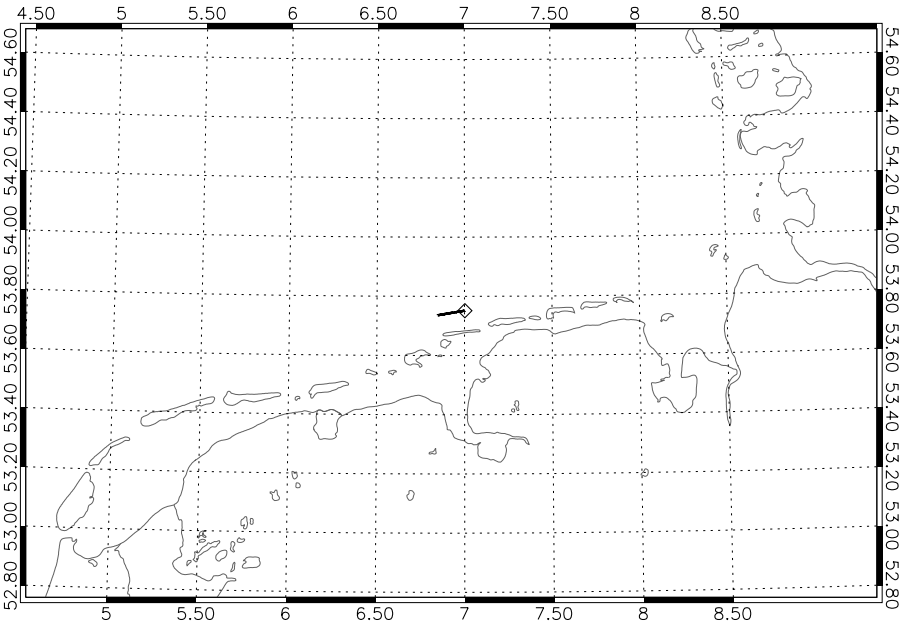


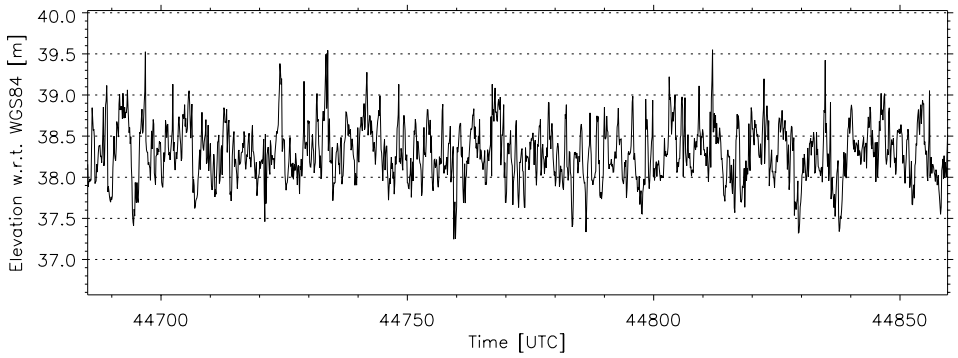


Date	2007−04−05	**Instrument Mode**	Low Altitude
Start Time	12:22:08 (44528)	**Aircraft**	AWI/DLR D−CODE
Stop Time	12:23:16 (44596)	**Retracker**	TSRA
Distance	4.227 km	**INS Resolution**	50 Hz
Duration	00 h 01 m 08 s	**Processor Version**	3.07

A06_20070405

AS1TA06_ASIAL1B030720070405T122445_20070405T122742_0001.DBL

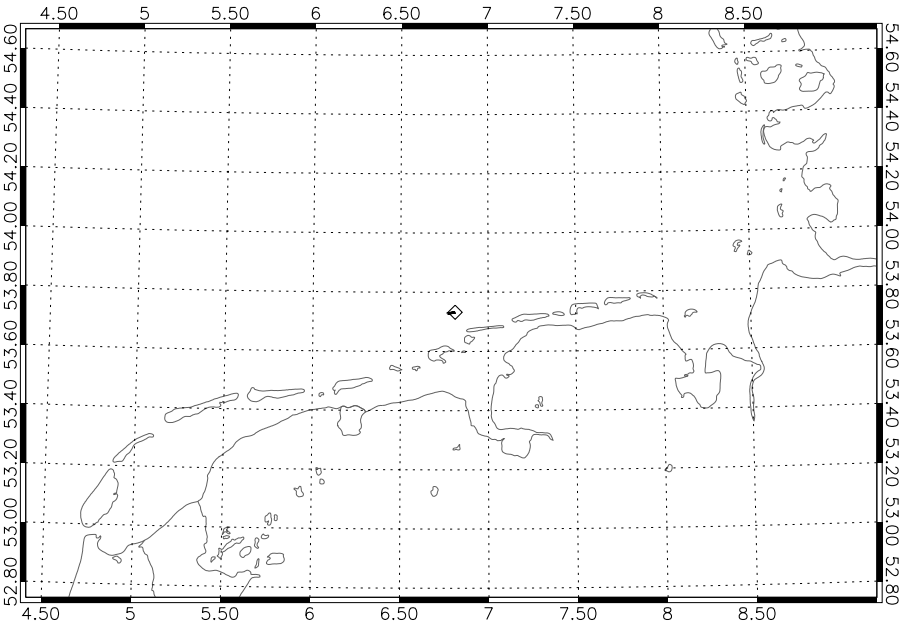


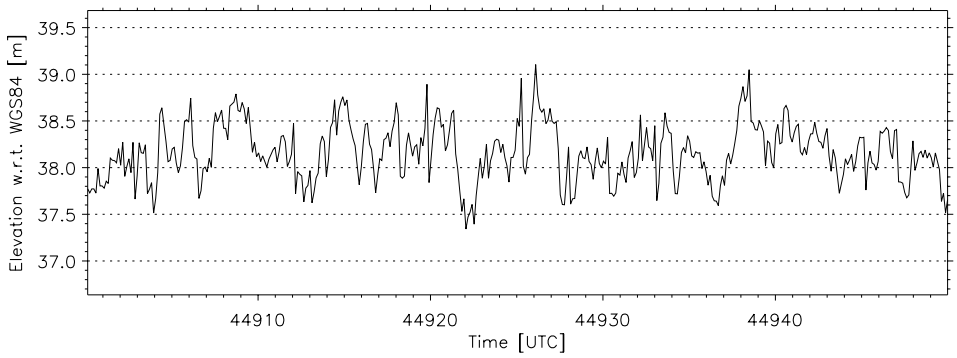


Date	2007-04-05	**Instrument Mode**	Adv. Low Altitude
Start Time	12:24:45 (44685)	**Aircraft**	AWI/DLR D-CODE
Stop Time	12:27:39 (44859)	**Retracker**	TSRA
Distance	10.351 km	**INS Resolution**	50 Hz
Duration	00 h 02 m 55 s	**Processor Version**	3.07

A07_20070405

AS1TA07_ASIAL1B030720070405T122820_20070405T122911_0001.DBL

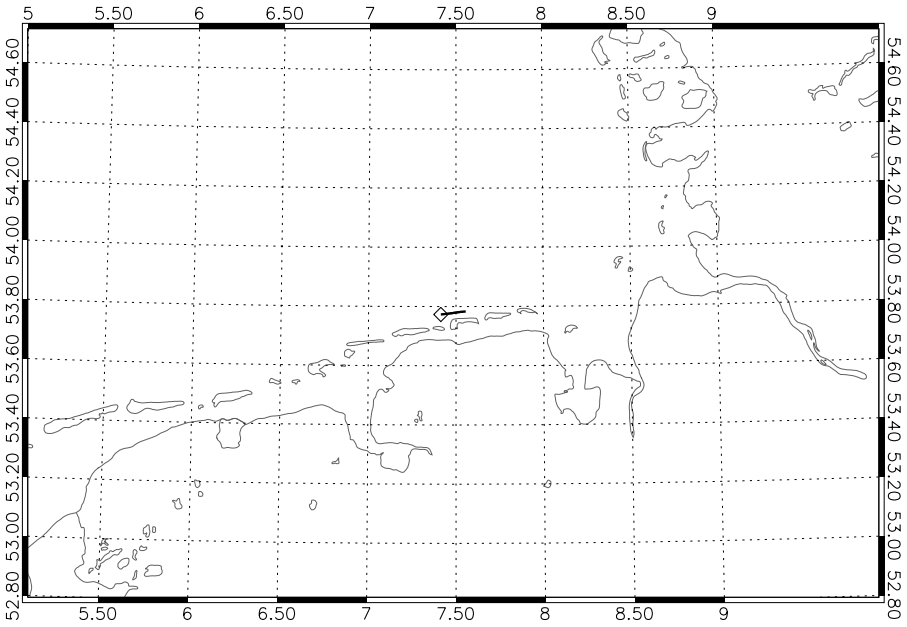


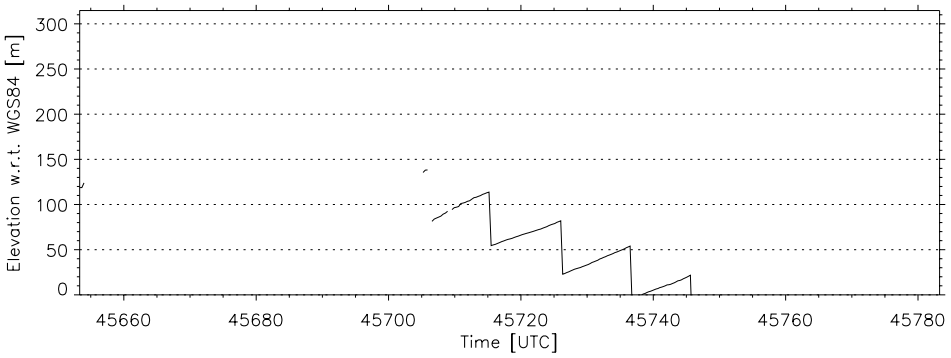


Date	2007−04−05	**Instrument Mode**	Adv. Low Altitude
Start Time	12:28:20 (44900)	**Aircraft**	AWI/DLR D−CODE
Stop Time	12:29:09 (44949)	**Retracker**	TSRA
Distance	2.925 km	**INS Resolution**	50 Hz
Duration	00 h 00 m 50 s	**Processor Version**	3.07

A10_20070405

AS1TA10_ASIAL1B0307200704O5T124053_20070405T124514_0001.DBL

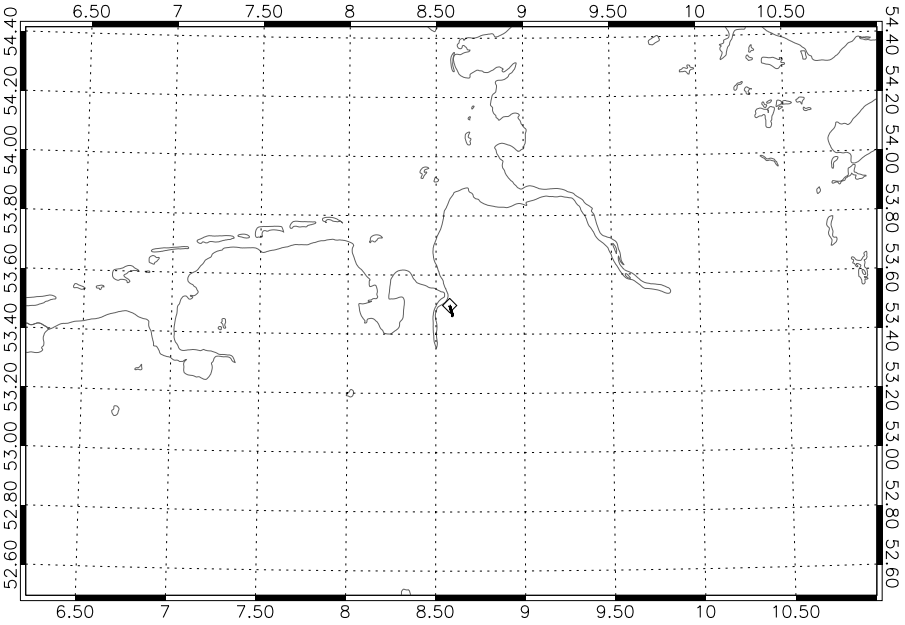


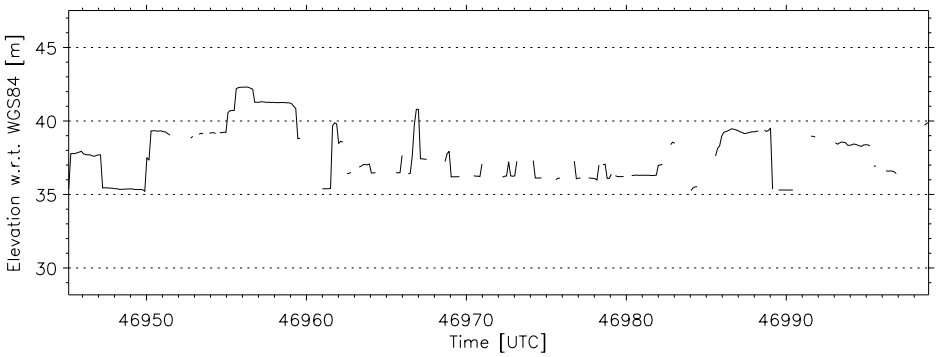


Date	2007-04-05	**Instrument Mode**	Adv. Low Altitude
Start Time	12:40:53 (45653)	**Aircraft**	AWI/DLR D-CODE
Stop Time	12:43:03 (45783)	**Retracker**	TSRA
Distance	9.406 km	**INS Resolution**	50 Hz
Duration	00 h 02 m 10 s	**Processor Version**	3.07

A11_20070405

AS1TA11_ASILL1B030720070405T130225_20070405T130320_0001.DBL

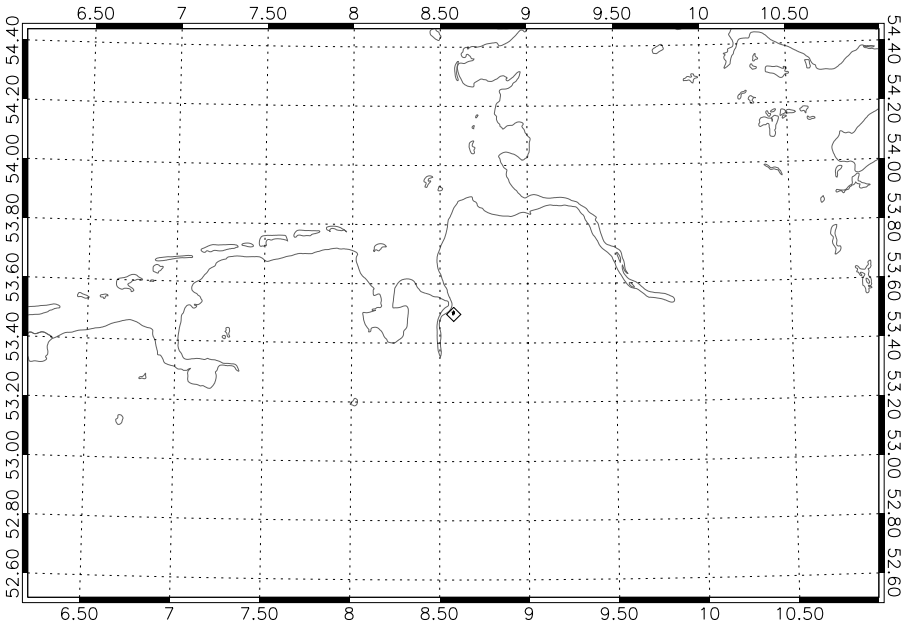


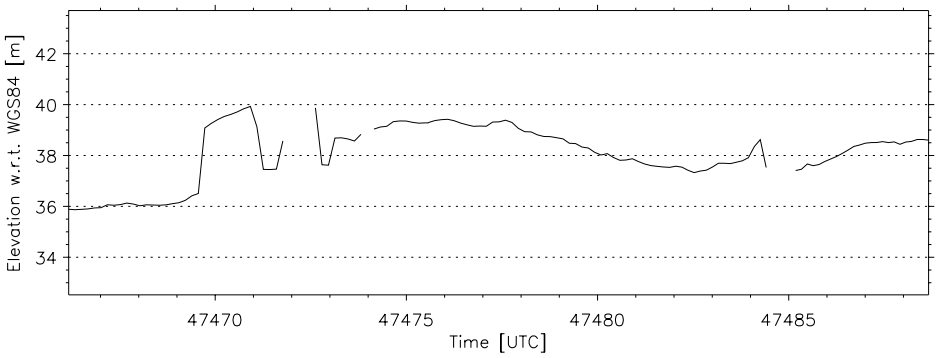


Date	2007-04-05	**Instrument Mode**	Low Altitude
Start Time	13:02:25 (46945)	**Aircraft**	AWI/DLR D-CODE
Stop Time	13:03:18 (46998)	**Retracker**	TSRA
Distance	4.304 km	**INS Resolution**	50 Hz
Duration	00 h 00 m 54 s	**Processor Version**	3.07

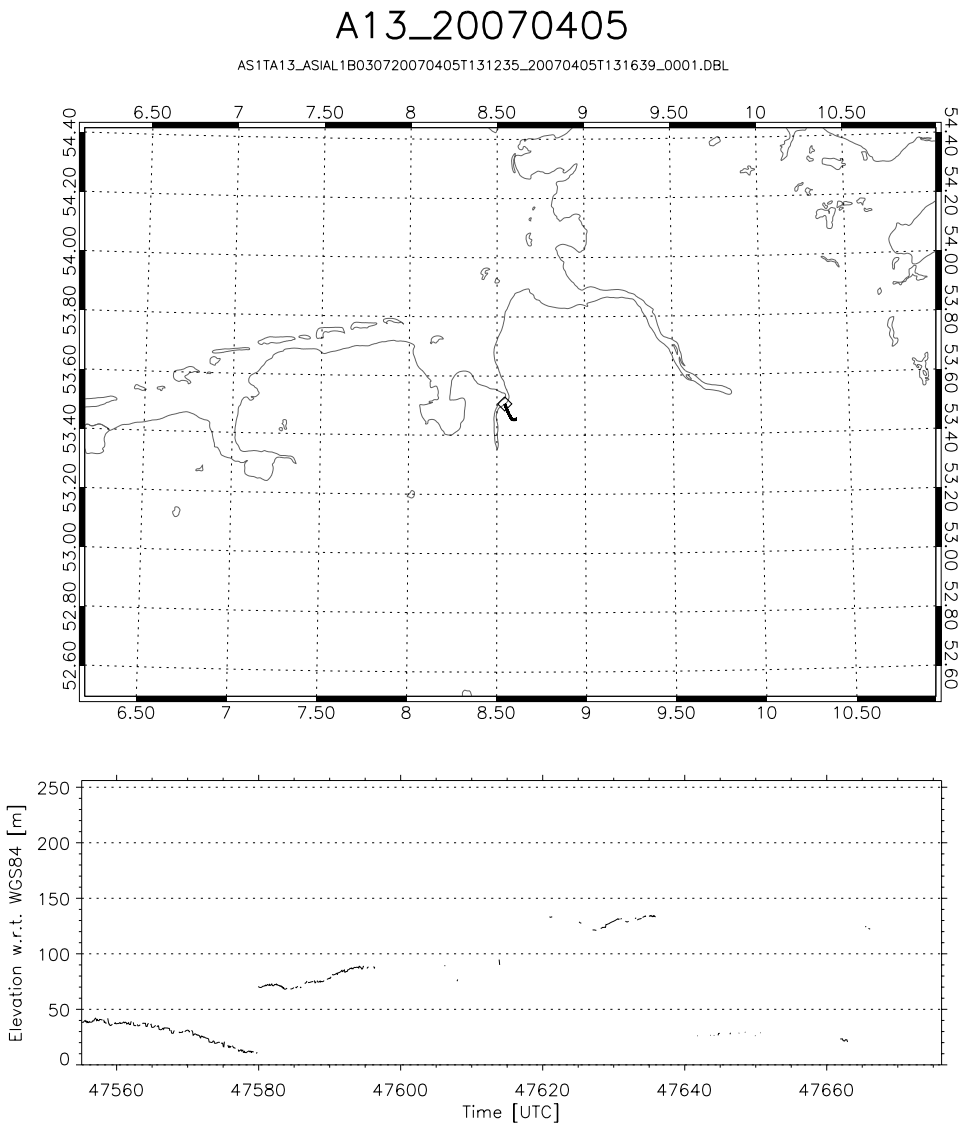
A12_20070405

AS1TA12_ASILL1B030720070405T131106_20070405T131131_0001.DBL

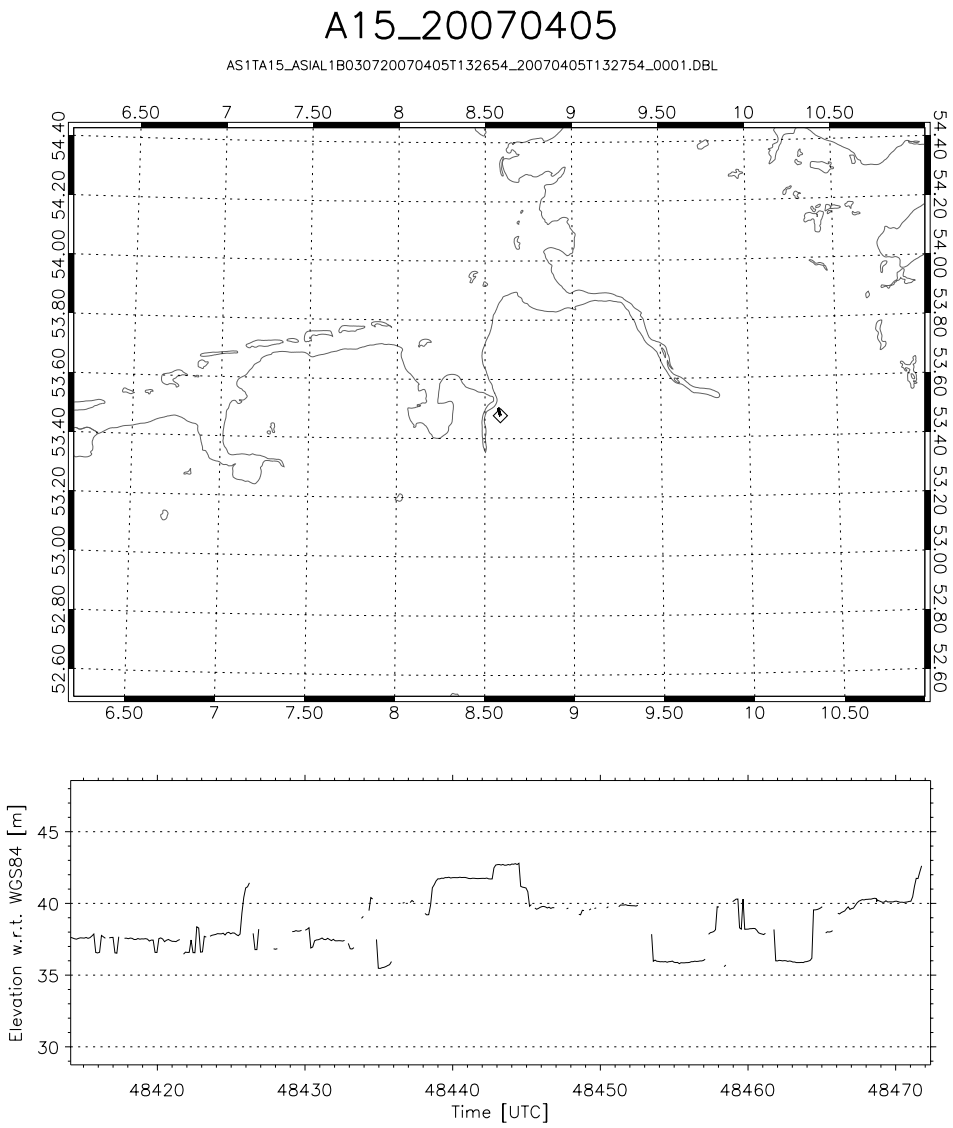




Date	2007-04-05	**Instrument Mode**	Low Altitude
Start Time	13:11:06 (47466)	**Aircraft**	AWI/DLR D-CODE
Stop Time	13:11:28 (47488)	**Retracker**	TSRA
Distance	1.127 km	**INS Resolution**	50 Hz
Duration	00 h 00 m 22 s	**Processor Version**	3.07



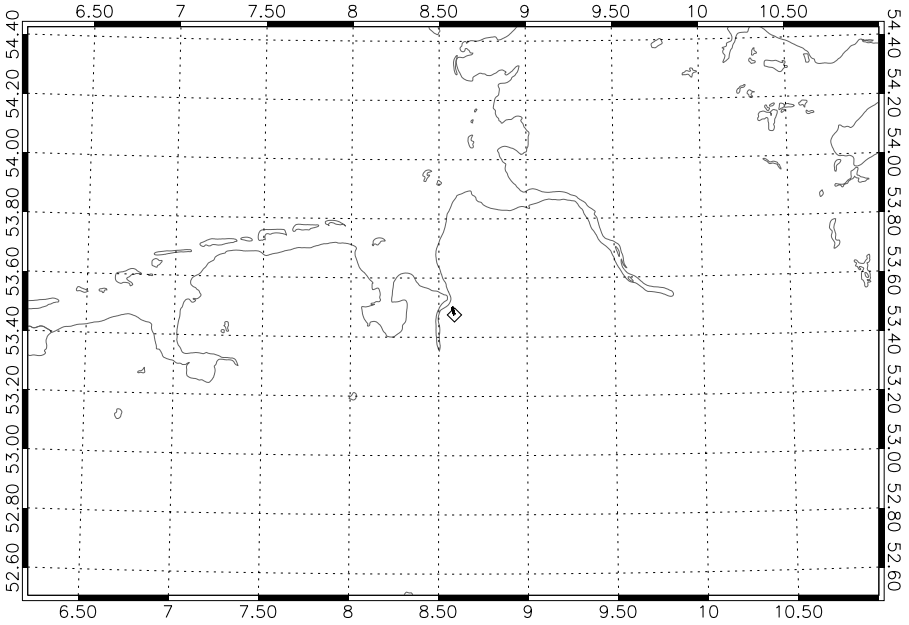
Date	2007-04-05	**Instrument Mode**	Adv. Low Altitude
Start Time	13:12:35 (47555)	**Aircraft**	AWI/DLR D-CODE
Stop Time	13:14:36 (47676)	**Retracker**	TSRA
Distance	8.489 km	**INS Resolution**	50 Hz
Duration	00 h 02 m 01 s	**Processor Version**	3.07

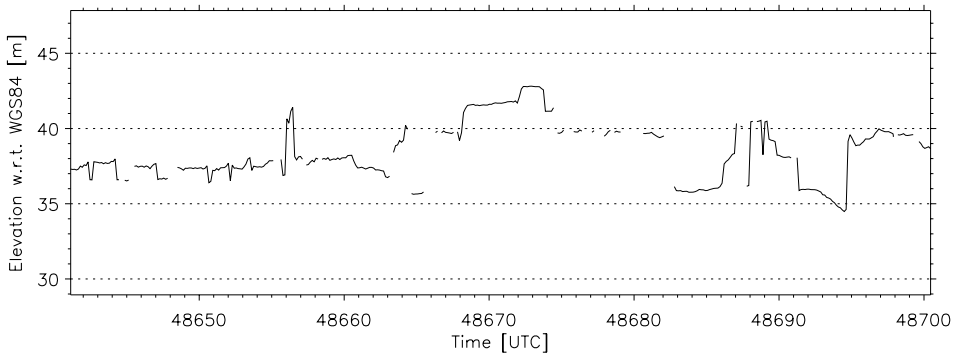


Date	2007-04-05	**Instrument Mode**	Adv. Low Altitude
Start Time	13:26:54 (48414)	**Aircraft**	AWI/DLR D-CODE
Stop Time	13:27:52 (48472)	**Retracker**	TSRA
Distance	2.925 km	**INS Resolution**	50 Hz
Duration	00 h 00 m 58 s	**Processor Version**	3.07

A16_20070405

AS1TA16_ASIAL1B030720070405T133041_20070405T133142_0001.DBL

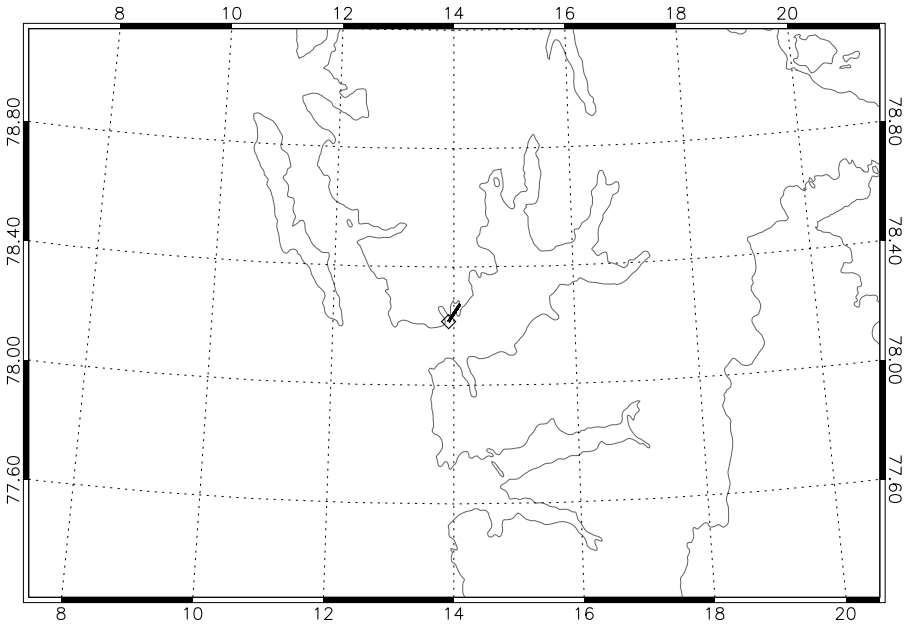


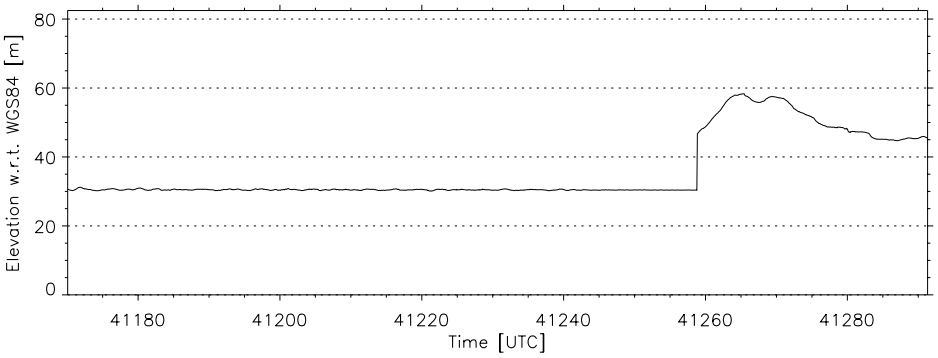


Date	2007-04-05	**Instrument Mode**	Adv. Low Altitude
Start Time	13:30:41 (48641)	**Aircraft**	AWI/DLR D-CODE
Stop Time	13:31:40 (48700)	**Retracker**	TSRA
Distance	3.083 km	**INS Resolution**	50 Hz
Duration	00 h 00 m 59 s	**Processor Version**	3.07

A00_20070416

AS1TA00_ASILL1B030820070416T112610_20070416T112812_0005.DBL

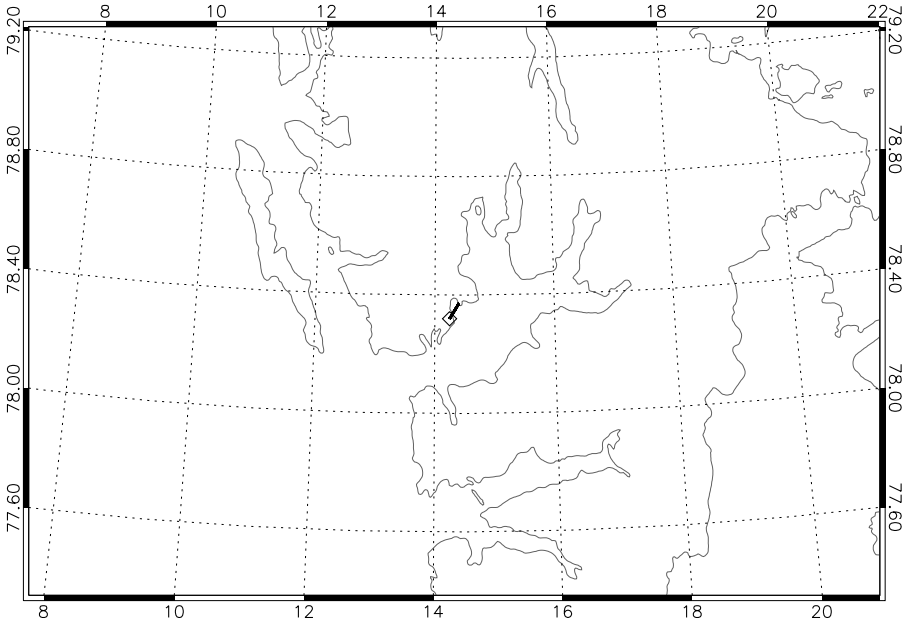


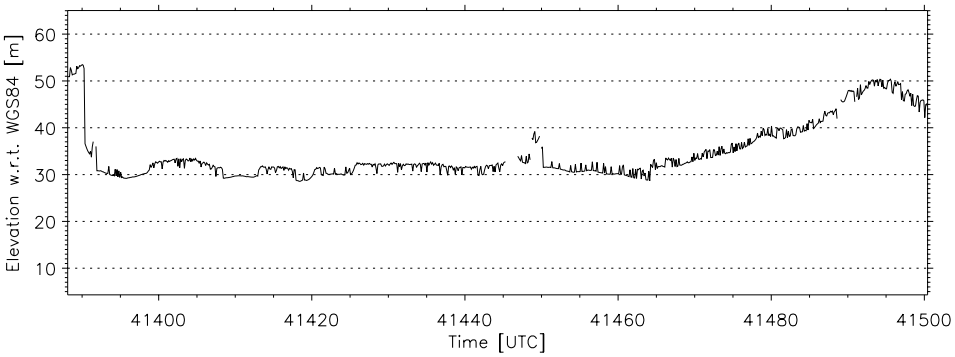


Date	2007−04−16	**Instrument Mode**	Low Altitude
Start Time	11:26:10 (41170)	**Aircraft**	AWI/DLR D−CODE
Stop Time	11:28:11 (41291)	**Retracker**	TSRA
Distance	7.757 km	**INS Resolution**	50 Hz
Duration	00 h 02 m 01 s	**Processor Version**	3.08

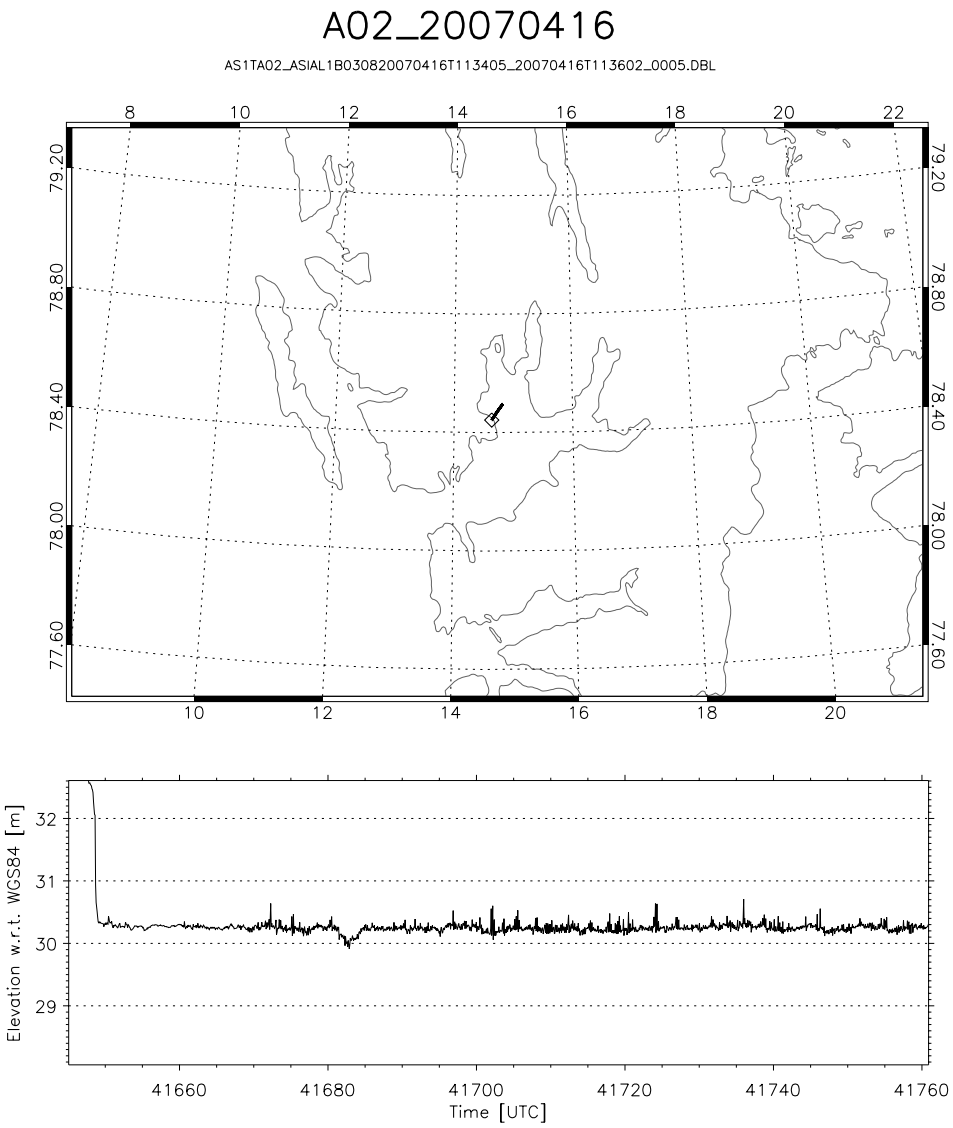
A01_20070416

AS1TA01_ASIAL1B030820070416T112948_20070416T113336_0005.DBL

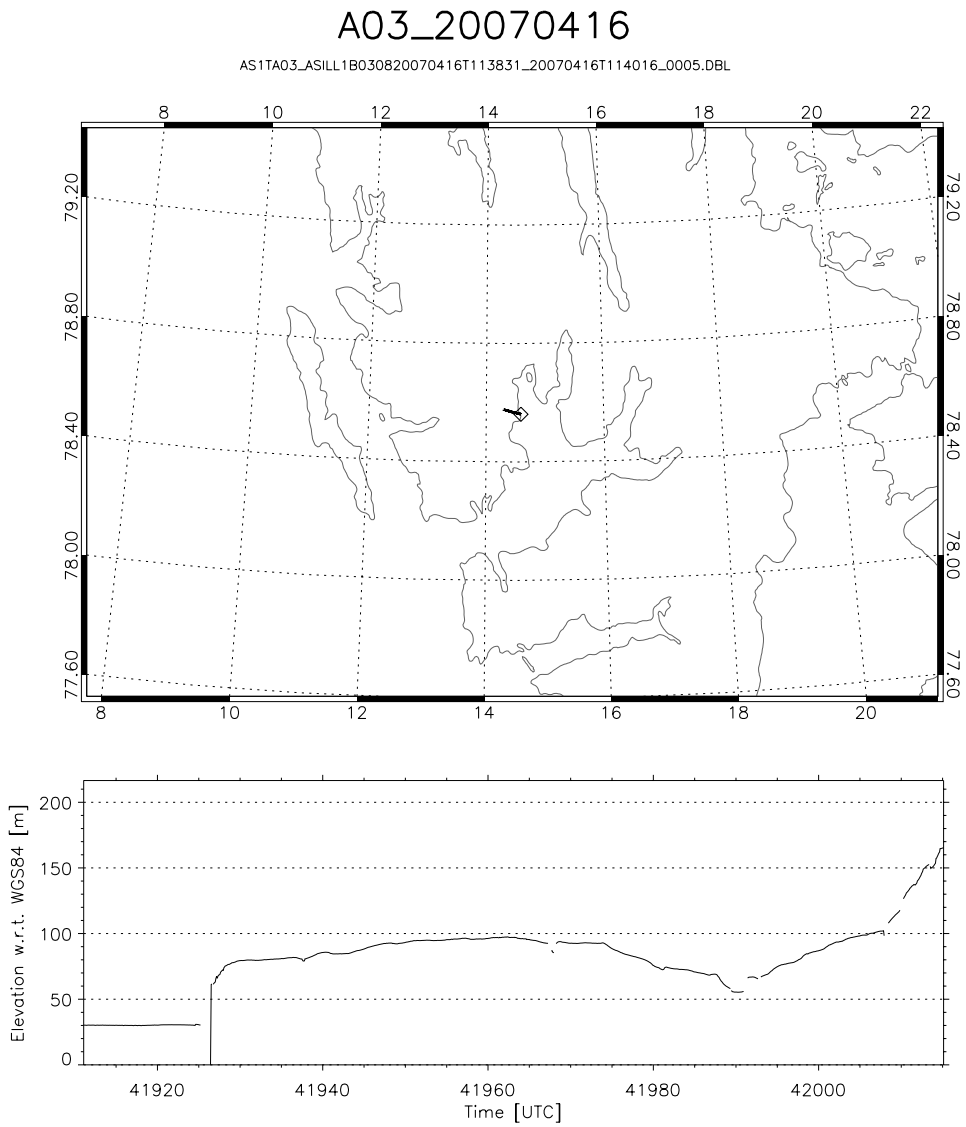




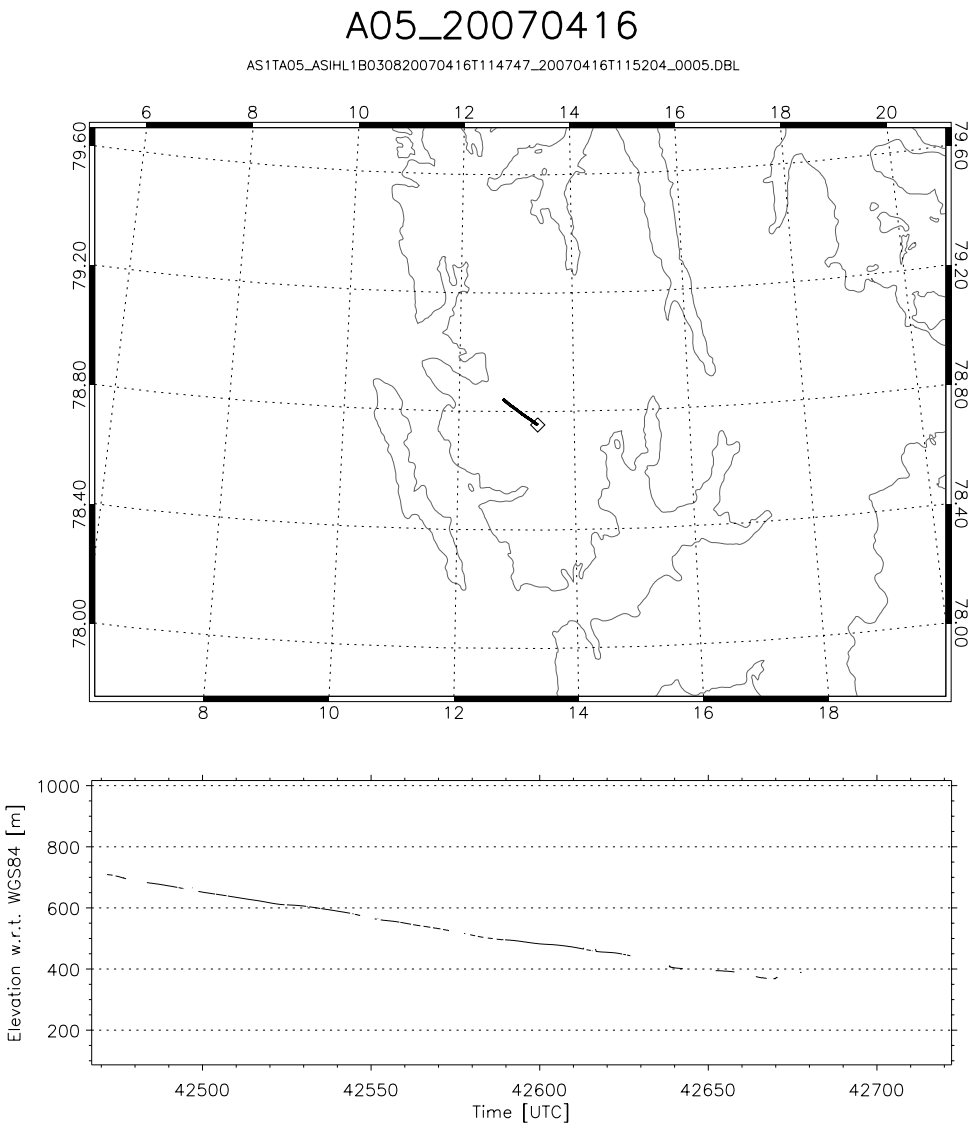
Date	2007-04-16	**Instrument Mode**	Adv. Low Altitude
Start Time	11:29:48 (41388)	**Aircraft**	AWI/DLR D-CODE
Stop Time	11:31:40 (41500)	**Retracker**	TSRA
Distance	6.812 km	**INS Resolution**	50 Hz
Duration	00 h 01 m 52 s	**Processor Version**	3.08



Date	2007−04−16	**Instrument Mode**	Adv. Low Altitude
Start Time	11:34:05 (41645)	**Aircraft**	AWI/DLR D−CODE
Stop Time	11:36:00 (41760)	**Retracker**	TSRA
Distance	7.392 km	**INS Resolution**	50 Hz
Duration	00 h 01 m 56 s	**Processor Version**	3.08



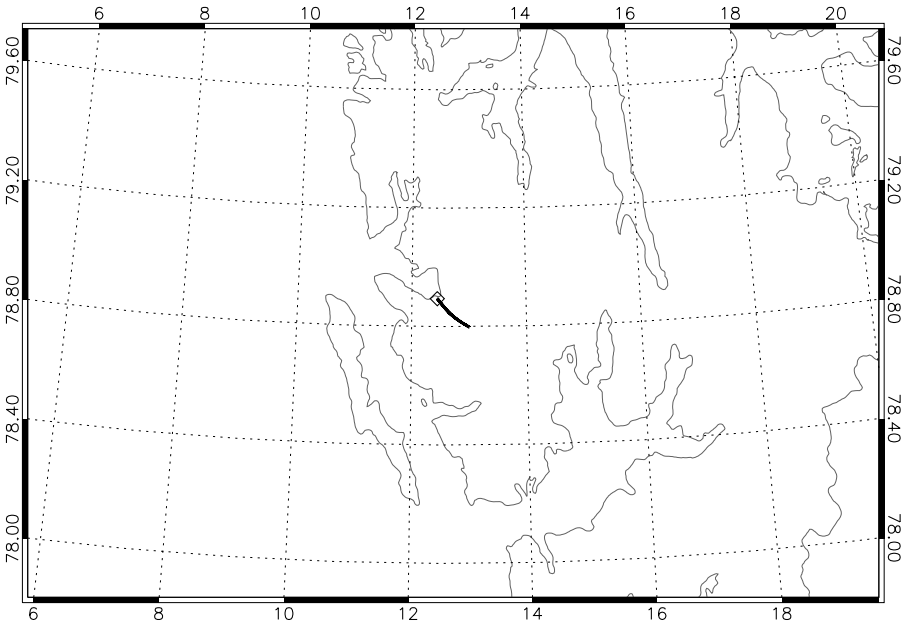
Date	2007−04−16	**Instrument Mode**	Low Altitude
Start Time	11:38:31 (41911)	**Aircraft**	AWI/DLR D−CODE
Stop Time	11:40:15 (42015)	**Retracker**	TSRA
Distance	6.723 km	**INS Resolution**	50 Hz
Duration	00 h 01 m 44 s	**Processor Version**	3.08

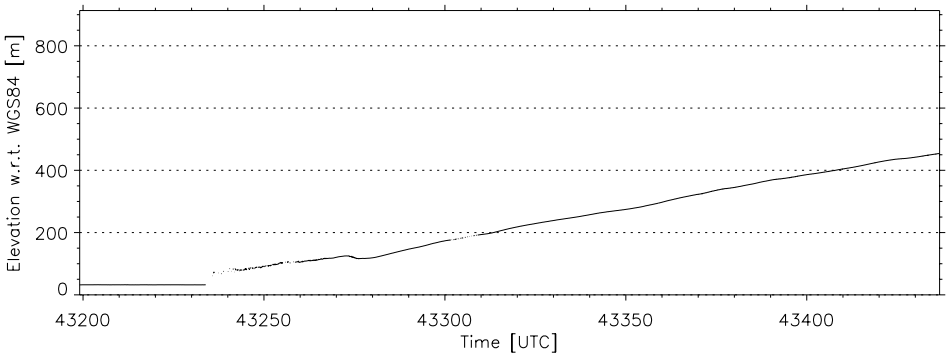


Date	2007−04−16	**Instrument Mode**	High Altitude
Start Time	11:47:47 (42467)	**Aircraft**	AWI/DLR D−CODE
Stop Time	11:52:02 (42722)	**Retracker**	TSRA
Distance	16.344 km	**INS Resolution**	50 Hz
Duration	00 h 04 m 15 s	**Processor Version**	3.08

A06_20070416

AS1TA06_ASILL1B030820070416T115959_20070416T120812_0005.DBL

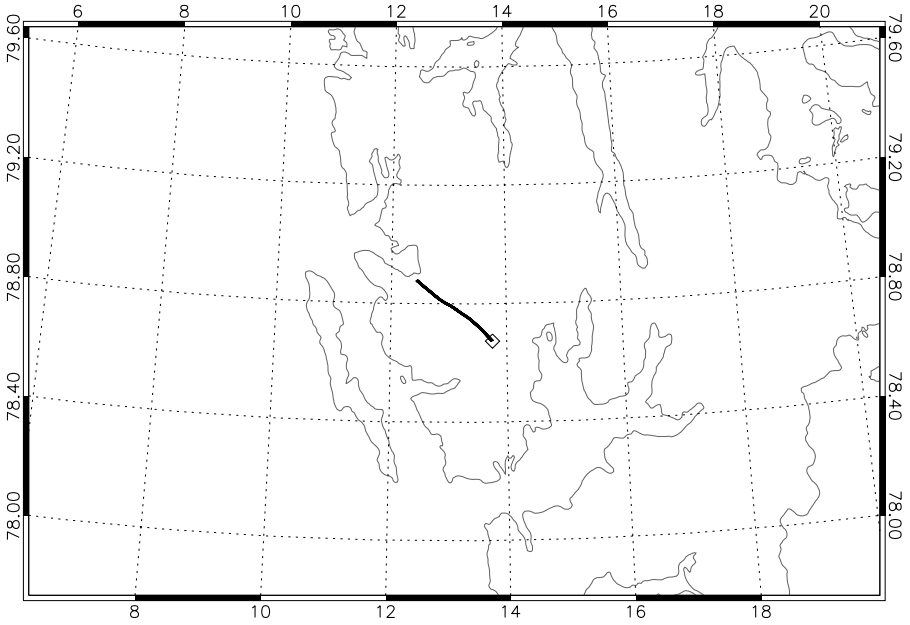


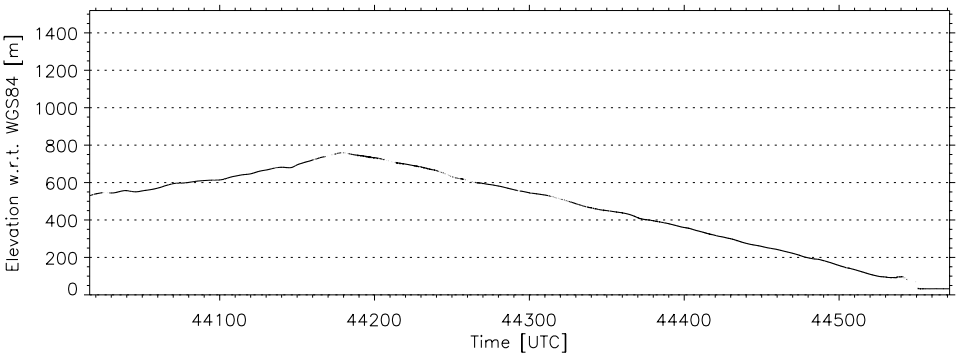


Date	2007-04-16	**Instrument Mode**	Low Altitude
Start Time	11:59:59 (43199)	**Aircraft**	AWI/DLR D-CODE
Stop Time	12:03:56 (43436)	**Retracker**	TSRA
Distance	16.264 km	**INS Resolution**	50 Hz
Duration	00 h 03 m 58 s	**Processor Version**	3.08

A07_20070416

AS1TA07_ASIAL1B030820070416T121336_20070416T122252_0005.DBL

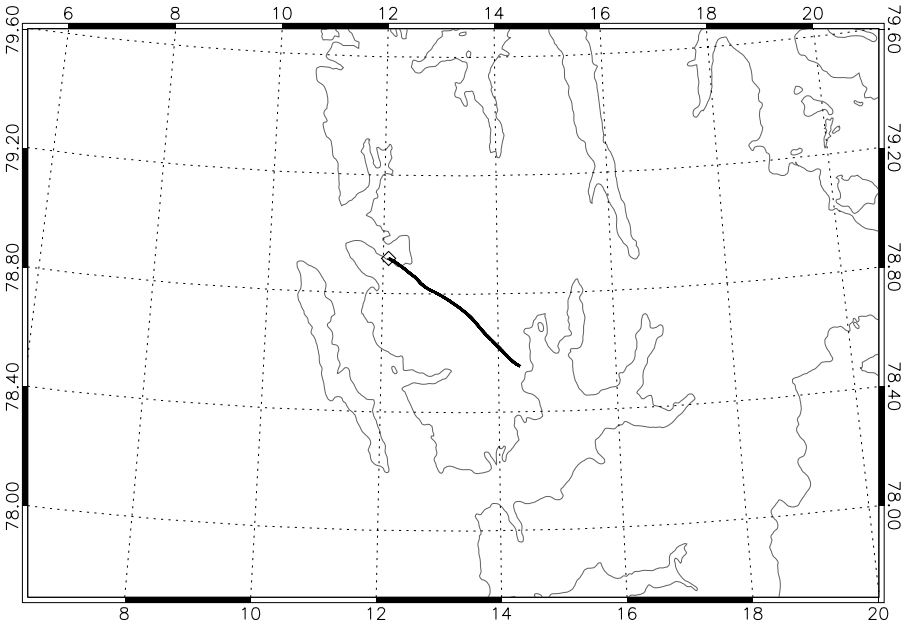


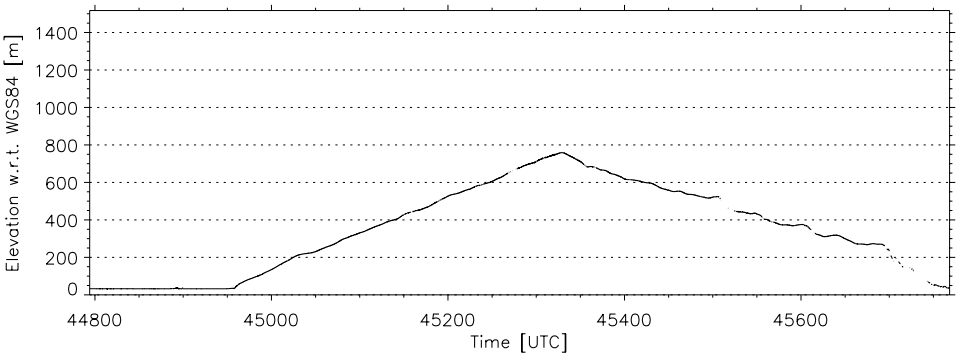


Date	2007−04−16	**Instrument Mode**	Adv. Low Altitude
Start Time	12:13:36 (44016)	**Aircraft**	AWI/DLR D−CODE
Stop Time	12:22:51 (44571)	**Retracker**	TSRA
Distance	36.644 km	**INS Resolution**	50 Hz
Duration	00 h 09 m 15 s	**Processor Version**	3.08

A08_20070416

AS1TA08_ASIAL1B030820070416T122634_20070416T124250_0005.DBL

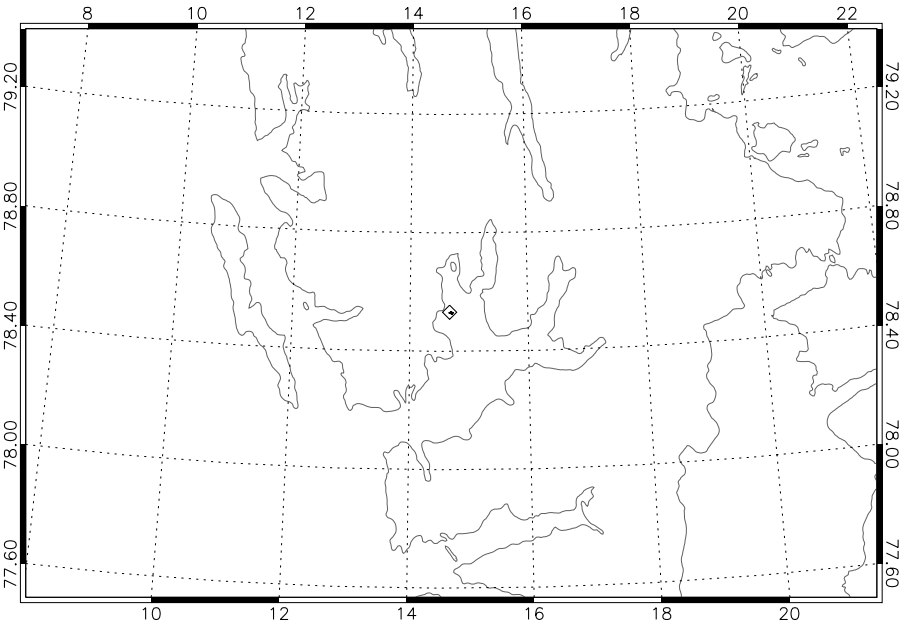


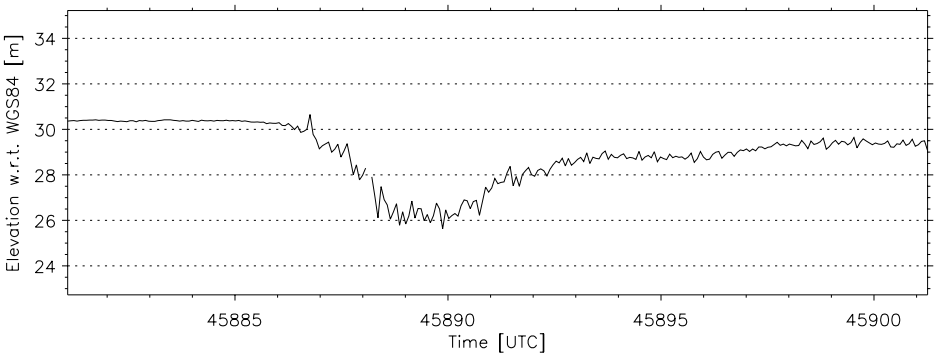


Date	2007−04−16	**Instrument Mode**	Adv. Low Altitude
Start Time	12:26:34 (44794)	**Aircraft**	AWI/DLR D−CODE
Stop Time	12:42:48 (45768)	**Retracker**	TSRA
Distance	64.349 km	**INS Resolution**	50 Hz
Duration	00 h 16 m 14 s	**Processor Version**	3.08

A09_20070416

AS1TA09_ASIAL1B030820070416T124441_20070416T124503_0005.DBL

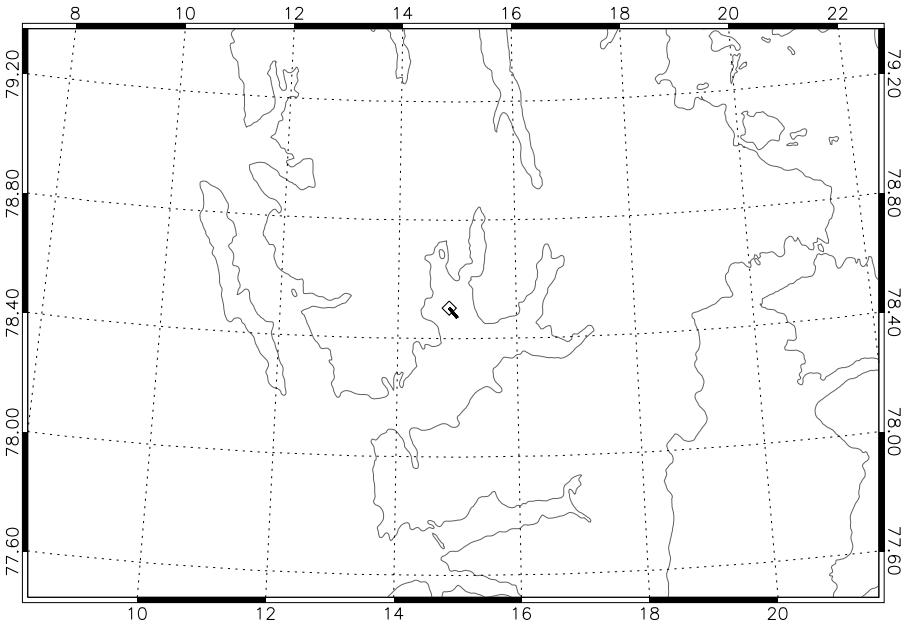


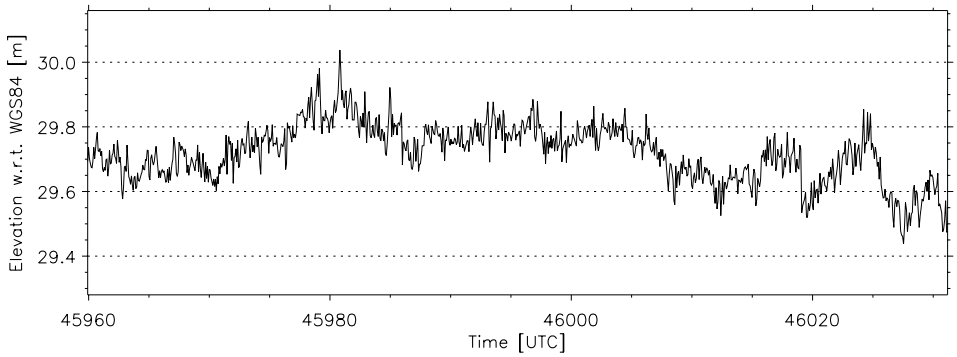


Date	2007−04−16	**Instrument Mode**	Adv. Low Altitude
Start Time	12:44:41 (45881)	**Aircraft**	AWI/DLR D−CODE
Stop Time	12:45:01 (45901)	**Retracker**	TSRA
Distance	1.378 km	**INS Resolution**	50 Hz
Duration	00 h 00 m 20 s	**Processor Version**	3.08

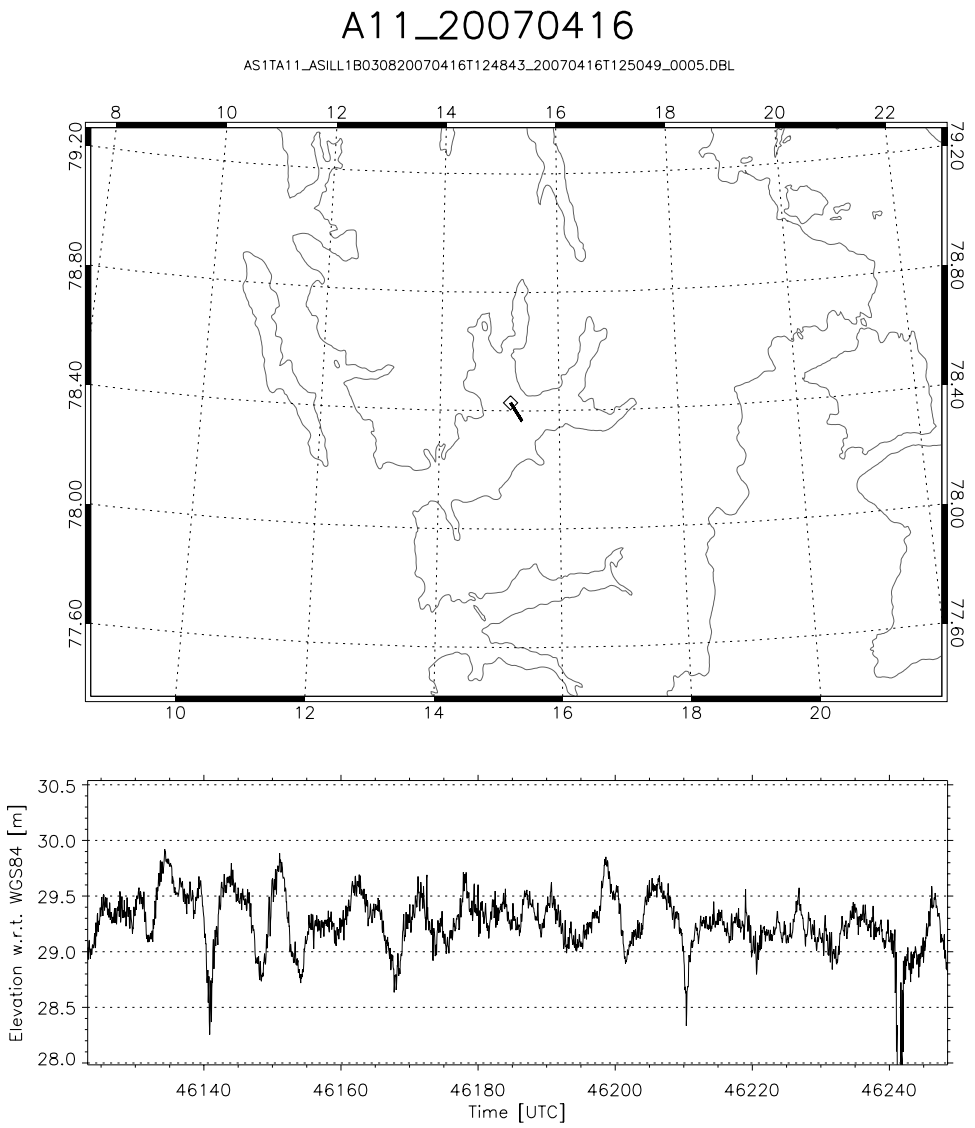
A10_20070416

AS1TA10_ASIAL1B030820070416T124600_20070416T124713_0005.DBL





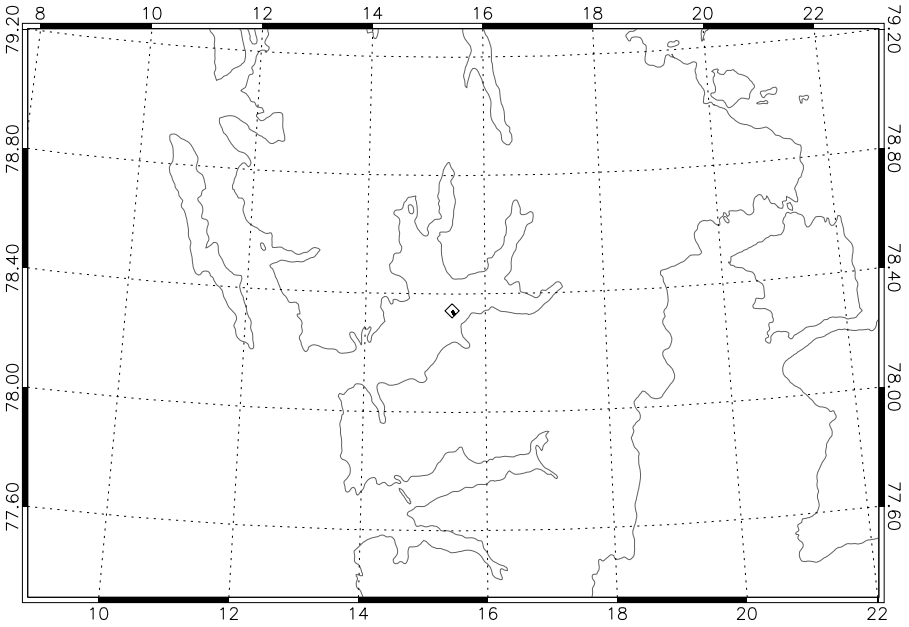
Date	2007−04−16	**Instrument Mode**	Adv. Low Altitude
Start Time	12:45:59 (45959)	**Aircraft**	AWI/DLR D−CODE
Stop Time	12:47:11 (46031)	**Retracker**	TSRA
Distance	4.750 km	**INS Resolution**	50 Hz
Duration	00 h 01 m 11 s	**Processor Version**	3.08

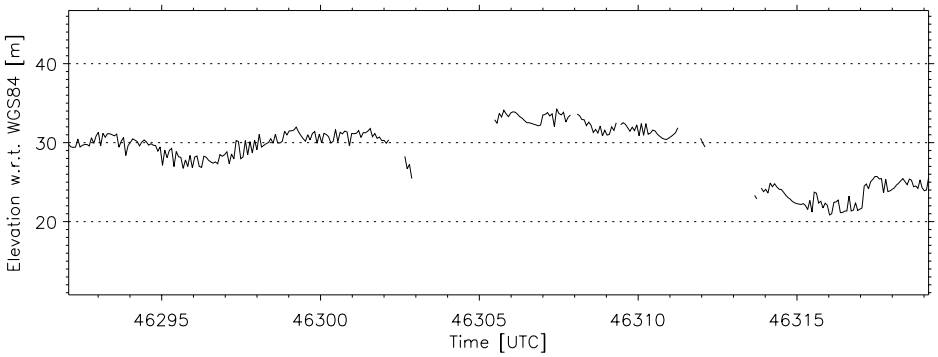


Date	2007-04-16	**Instrument Mode**	Low Altitude
Start Time	12:48:43 (46123)	**Aircraft**	AWI/DLR D-CODE
Stop Time	12:50:48 (46248)	**Retracker**	TSRA
Distance	8.098 km	**INS Resolution**	50 Hz
Duration	00 h 02 m 05 s	**Processor Version**	3.08

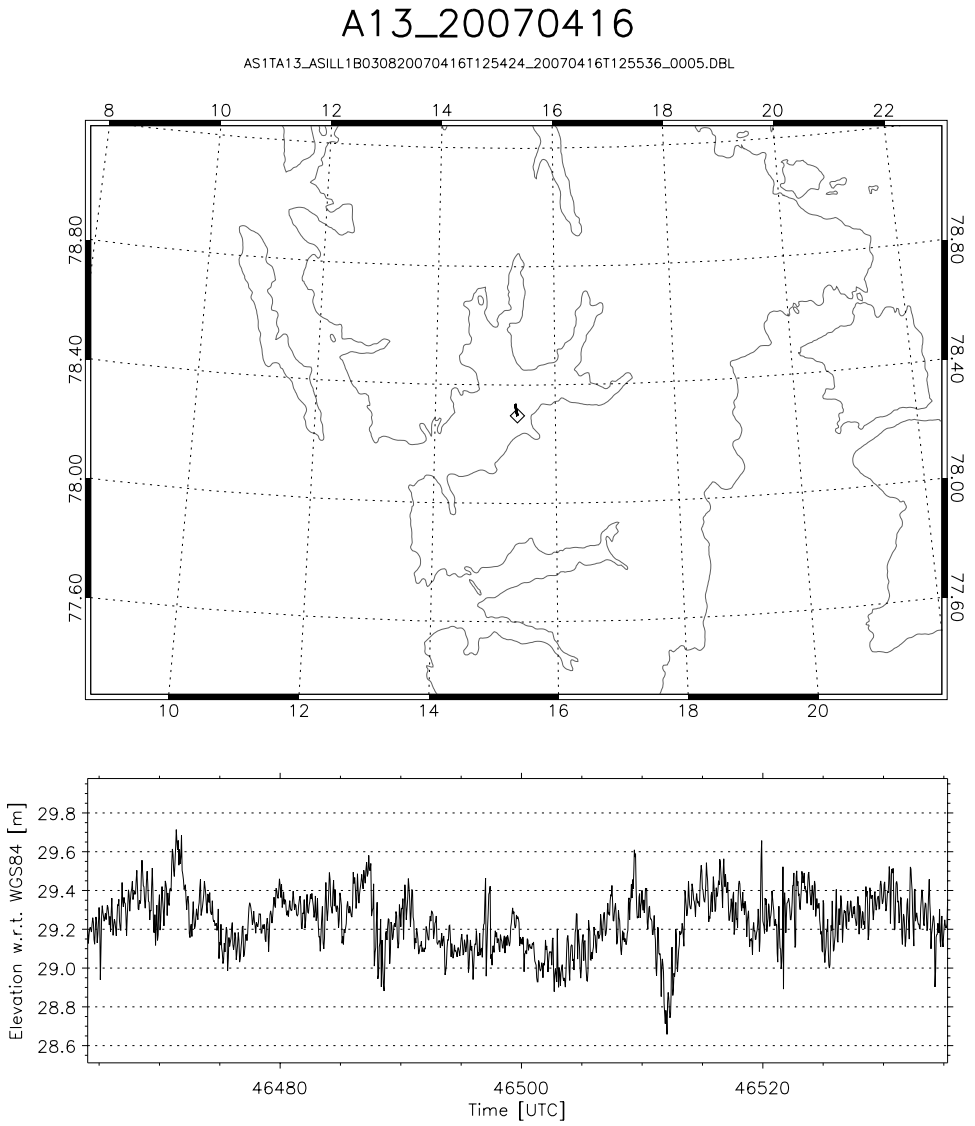
A12_20070416

AS1TA12_ASIAL1B030820070416T125132_20070416T125228_0005.DBL

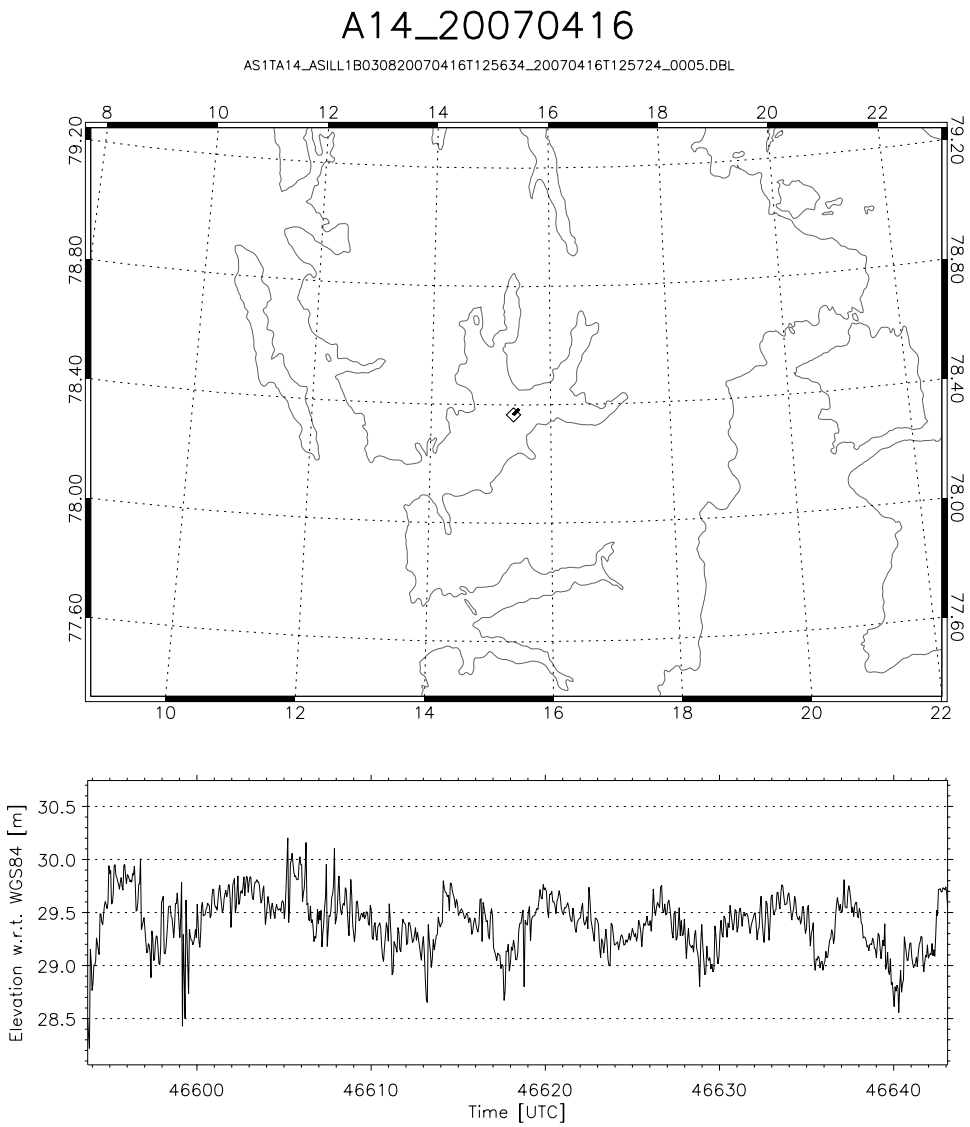




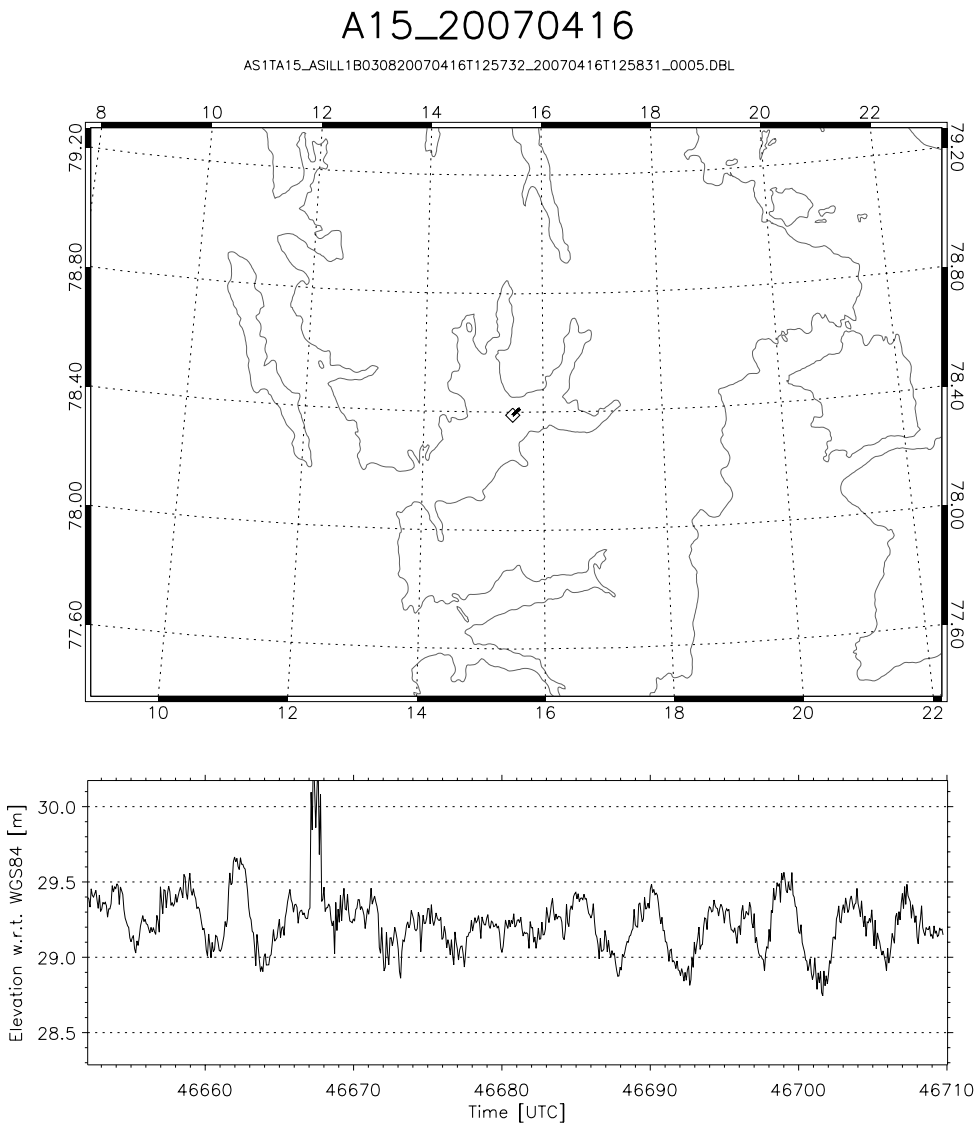
Date	2007−04−16	**Instrument Mode**	Adv. Low Altitude
Start Time	12:51:32 (46292)	**Aircraft**	AWI/DLR D−CODE
Stop Time	12:51:59 (46319)	**Retracker**	TSRA
Distance	1.832 km	**INS Resolution**	50 Hz
Duration	00 h 00 m 27 s	**Processor Version**	3.08



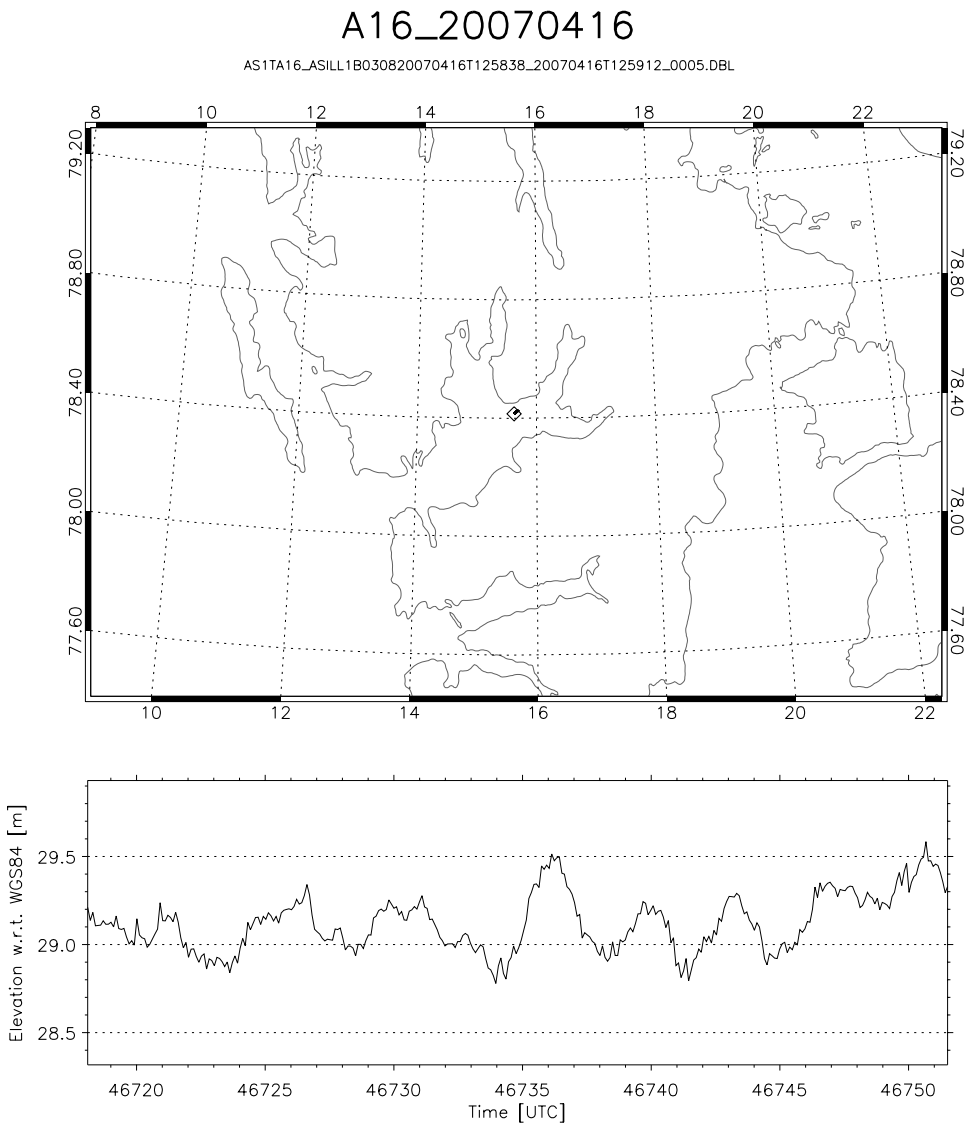
Date	2007−04−16	**Instrument Mode**	Low Altitude
Start Time	12:54:24 (46464)	**Aircraft**	AWI/DLR D−CODE
Stop Time	12:55:35 (46535)	**Retracker**	TSRA
Distance	4.478 km	**INS Resolution**	50 Hz
Duration	00 h 01 m 11 s	**Processor Version**	3.08



Date	2007−04−16	**Instrument Mode**	Low Altitude
Start Time	12:56:33 (46593)	**Aircraft**	AWI/DLR D−CODE
Stop Time	12:57:23 (46643)	**Retracker**	TSRA
Distance	3.007 km	**INS Resolution**	50 Hz
Duration	00 h 00 m 49 s	**Processor Version**	3.08



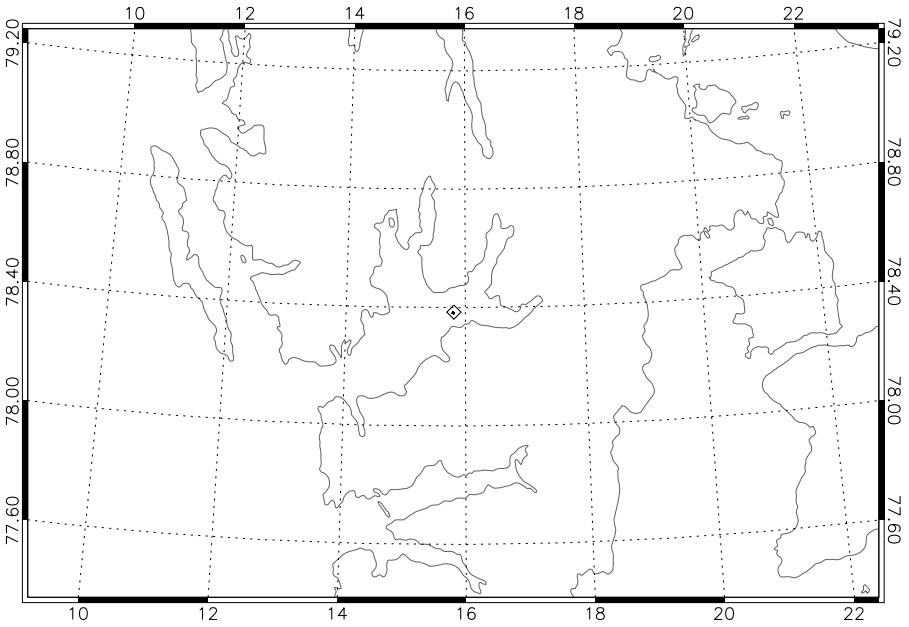
Date	2007−04−16	**Instrument Mode**	Low Altitude
Start Time	12:57:32 (46652)	**Aircraft**	AWI/DLR D−CODE
Stop Time	12:58:30 (46710)	**Retracker**	TSRA
Distance	3.619 km	**INS Resolution**	50 Hz
Duration	00 h 00 m 58 s	**Processor Version**	3.08

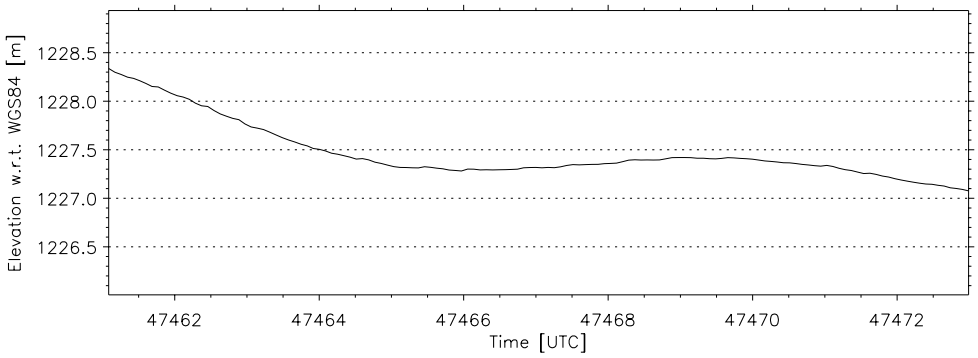


Date	2007−04−16	**Instrument Mode**	Low Altitude
Start Time	12:58:38 (46718)	**Aircraft**	AWI/DLR D−CODE
Stop Time	12:59:11 (46751)	**Retracker**	TSRA
Distance	2.149 km	**INS Resolution**	50 Hz
Duration	00 h 00 m 33 s	**Processor Version**	3.08

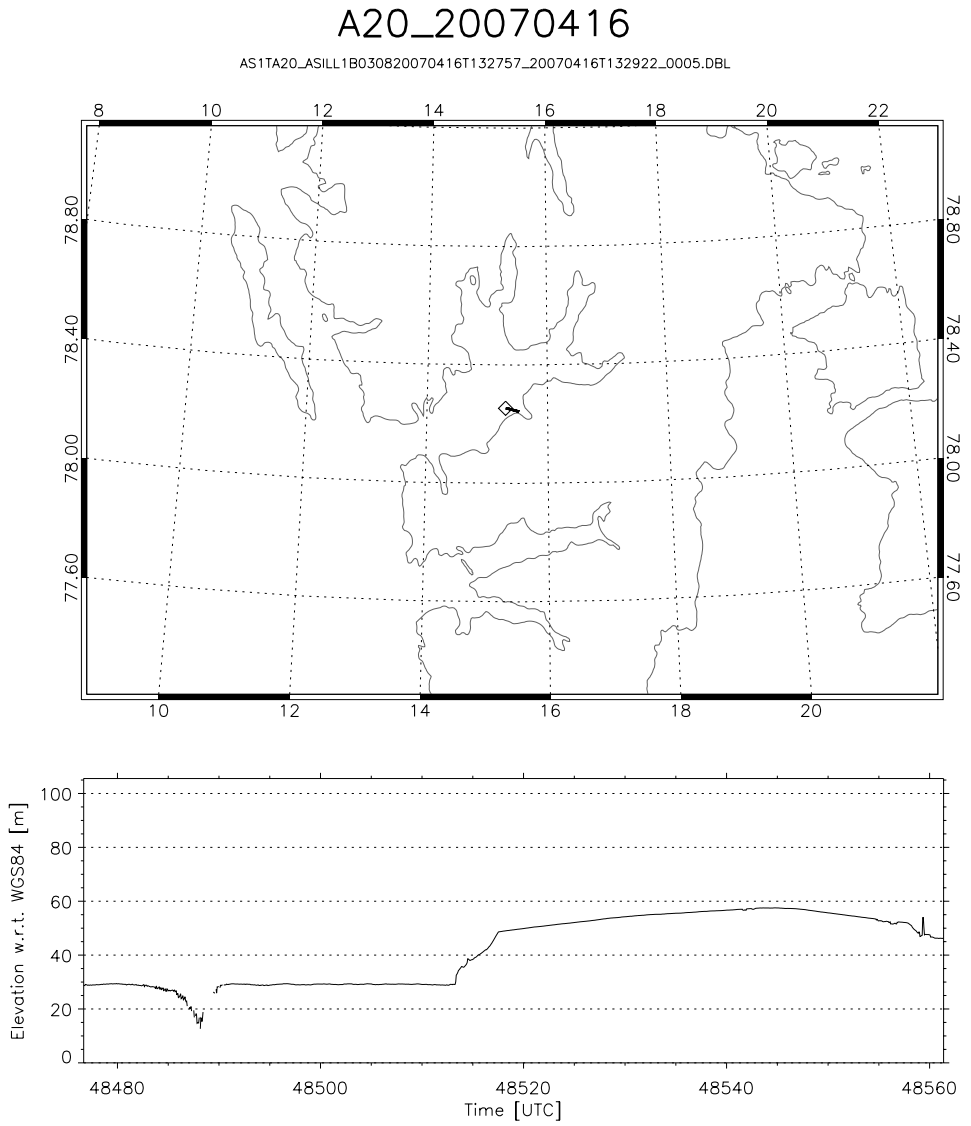
A18_20070416

AS1TA18_ASIHL1B030820070416T131101_20070416T131114_0005.DBL

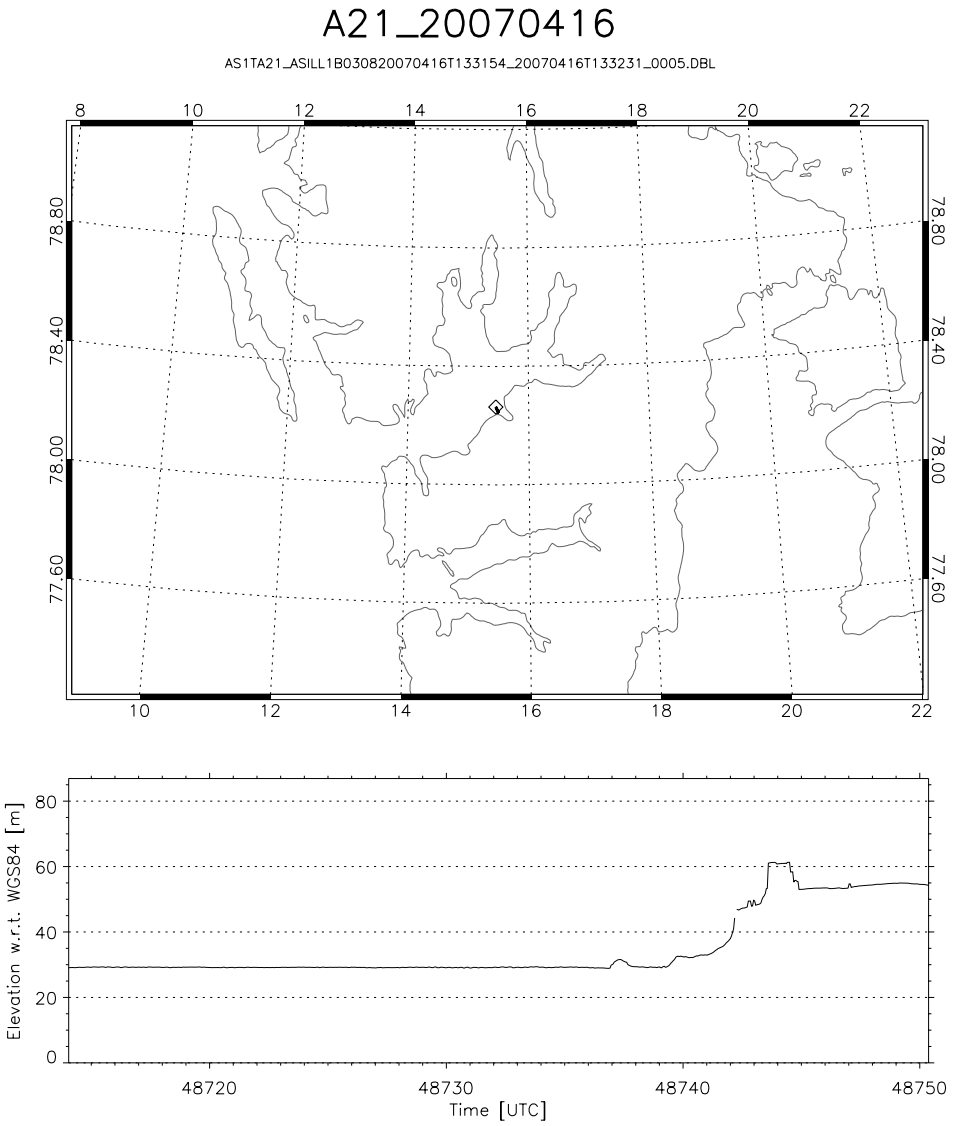




Date	2007−04−16	**Instrument Mode**	High Altitude
Start Time	13:11:01 (47461)	**Aircraft**	AWI/DLR D−CODE
Stop Time	13:11:12 (47472)	**Retracker**	
Distance	0.797 km	**INS Resolution**	50 Hz
Duration	00 h 00 m 12 s	**Processor Version**	3.08



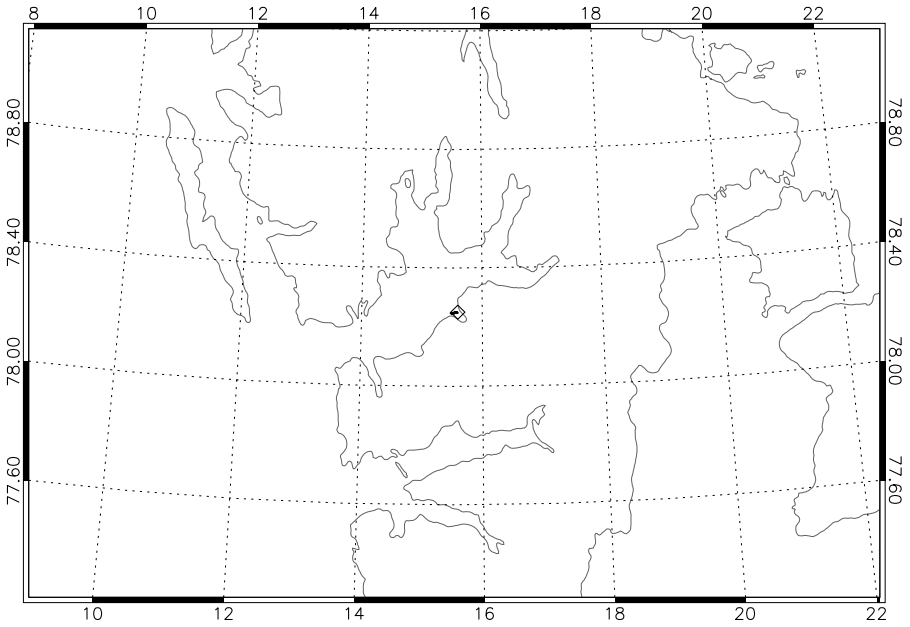
Date	2007−04−16	**Instrument Mode**	Low Altitude
Start Time	13:27:56 (48476)	**Aircraft**	AWI/DLR D−CODE
Stop Time	13:29:21 (48561)	**Retracker**	TSRA
Distance	5.194 km	**INS Resolution**	50 Hz
Duration	00 h 01 m 25 s	**Processor Version**	3.08

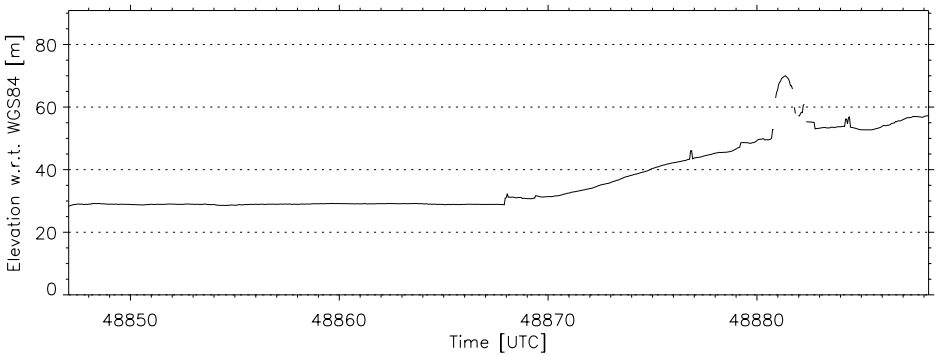


Date	2007−04−16	**Instrument Mode**	Low Altitude
Start Time	13:31:54 (48714)	**Aircraft**	AWI/DLR D−CODE
Stop Time	13:32:30 (48750)	**Retracker**	TSRA
Distance	2.466 km	**INS Resolution**	50 Hz
Duration	00 h 00 m 36 s	**Processor Version**	3.08

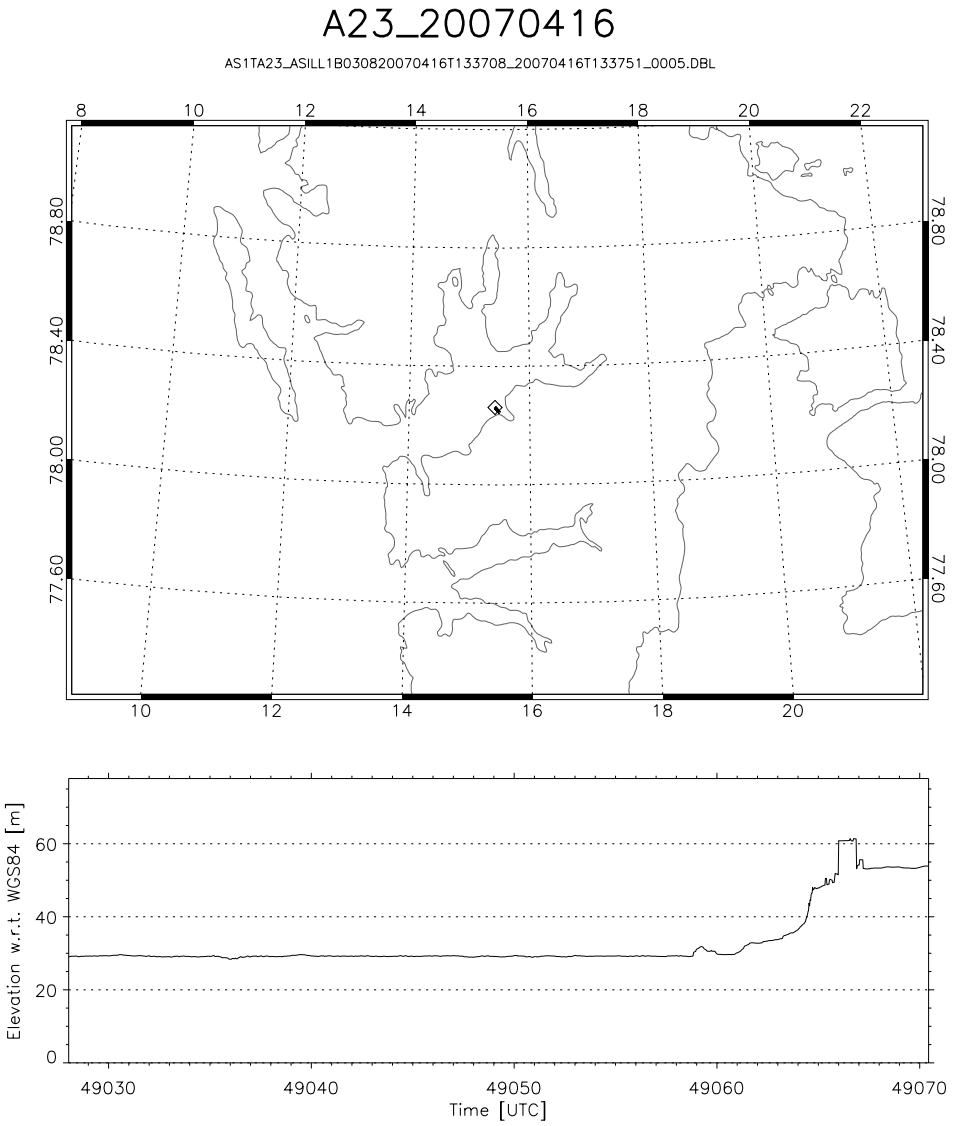
A22_20070416

AS1TA22_ASILL1B030820070416T133407_20070416T133449_0005.DBL

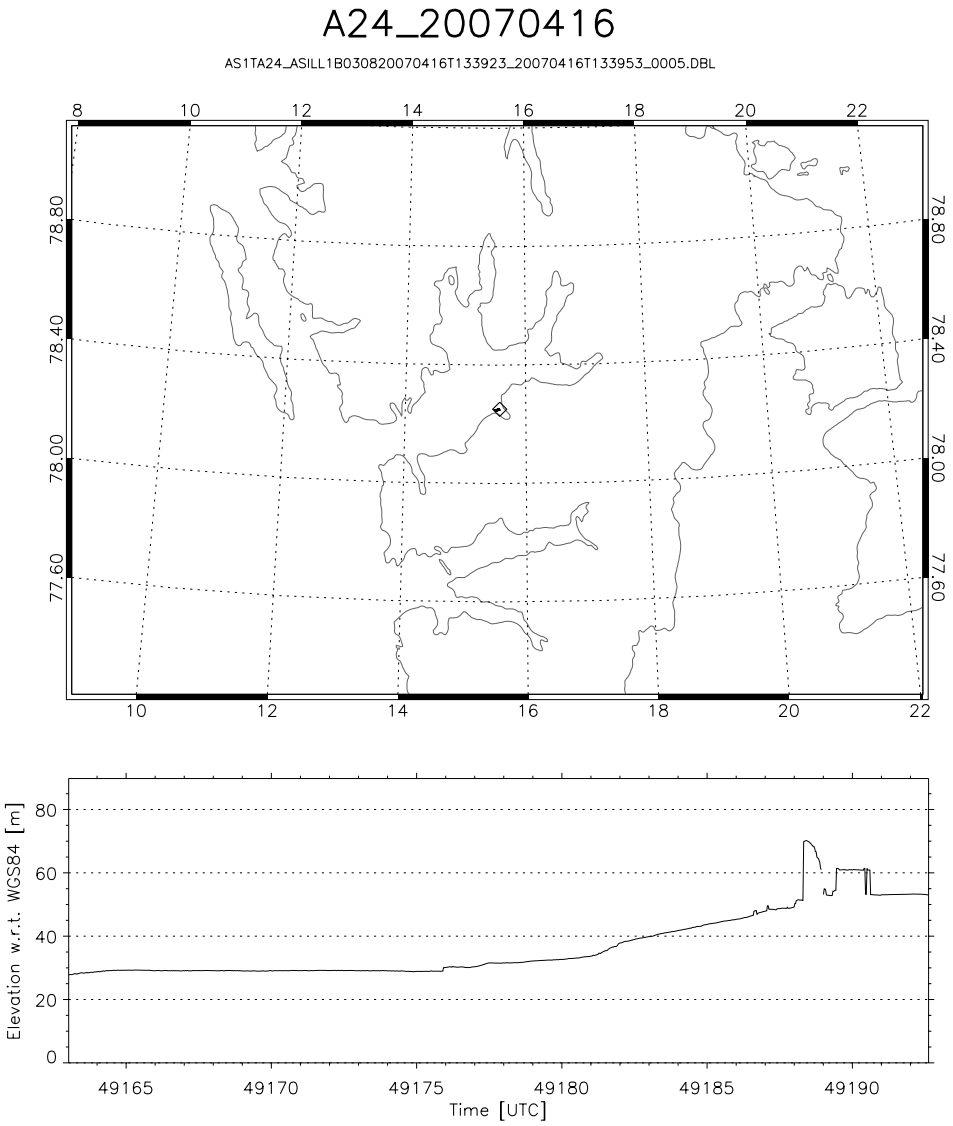




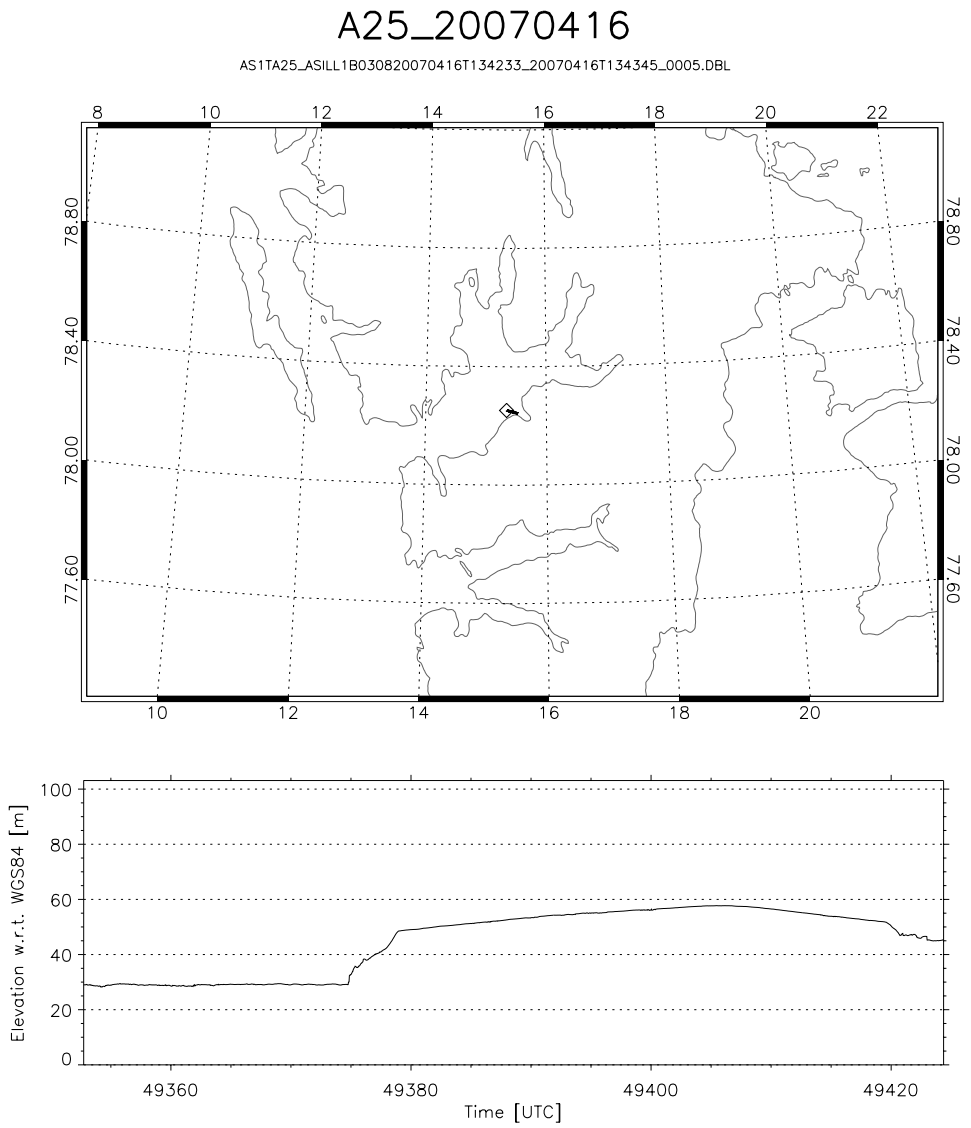
Date	2007-04-16	**Instrument Mode**	Low Altitude
Start Time	13:34:07 (48847)	**Aircraft**	AWI/DLR D-CODE
Stop Time	13:34:48 (48888)	**Retracker**	TSRA
Distance	2.718 km	**INS Resolution**	50 Hz
Duration	00 h 00 m 41 s	**Processor Version**	3.08



Date	2007−04−16	**Instrument Mode**	Low Altitude
Start Time	13:37:08 (49028)	**Aircraft**	AWI/DLR D−CODE
Stop Time	13:37:50 (49070)	**Retracker**	TSRA
Distance	2.545 km	**INS Resolution**	50 Hz
Duration	00 h 00 m 42 s	**Processor Version**	3.08



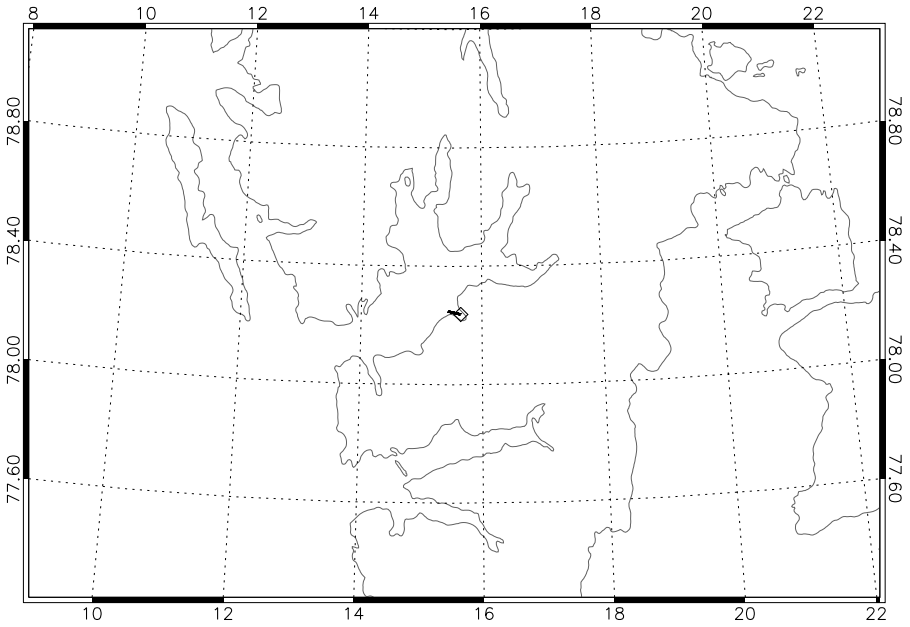
Date	2007−04−16	**Instrument Mode**	Low Altitude
Start Time	13:39:23 (49163)	**Aircraft**	AWI/DLR D−CODE
Stop Time	13:39:52 (49192)	**Retracker**	TSRA
Distance	1.887 km	**INS Resolution**	50 Hz
Duration	00 h 00 m 30 s	**Processor Version**	3.08

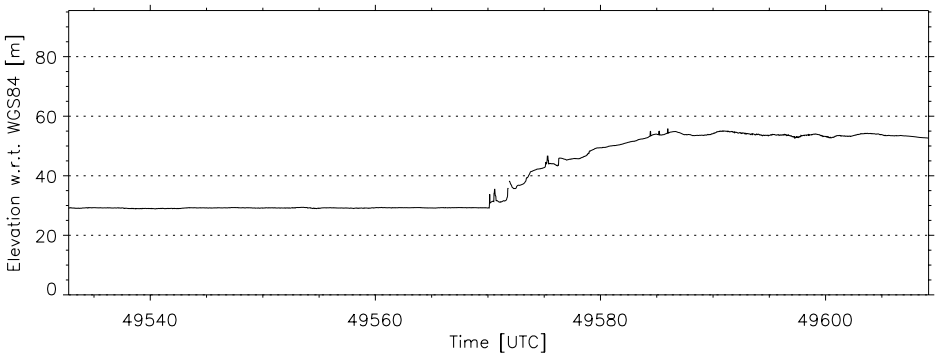


Date	2007−04−16	**Instrument Mode**	Low Altitude
Start Time	13:42:32 (49352)	**Aircraft**	AWI/DLR D−CODE
Stop Time	13:43:44 (49424)	**Retracker**	TSRA
Distance	4.409 km	**INS Resolution**	50 Hz
Duration	00 h 01 m 12 s	**Processor Version**	3.08

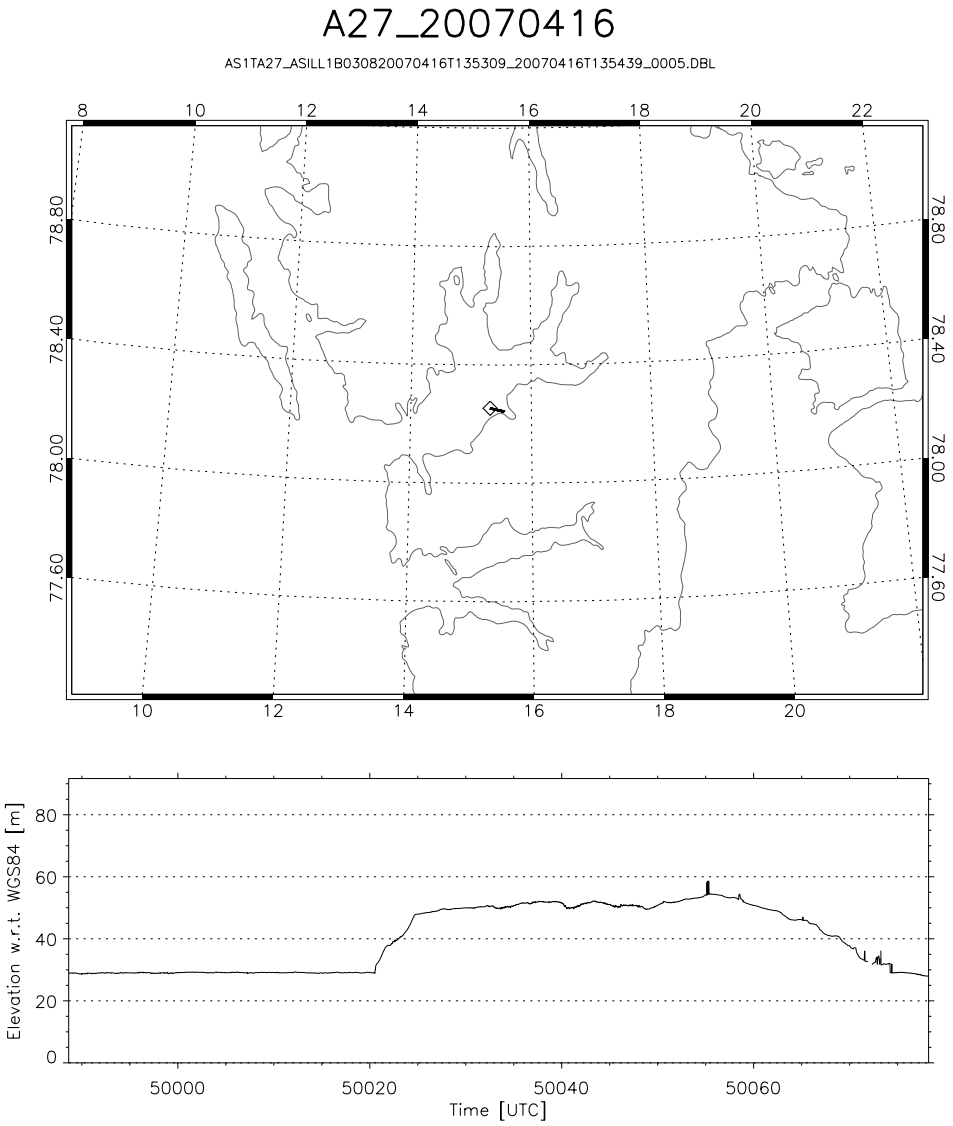
A26_20070416

AS1TA26_ASILL1B030820070416T134533_20070416T134650_0005.DBL





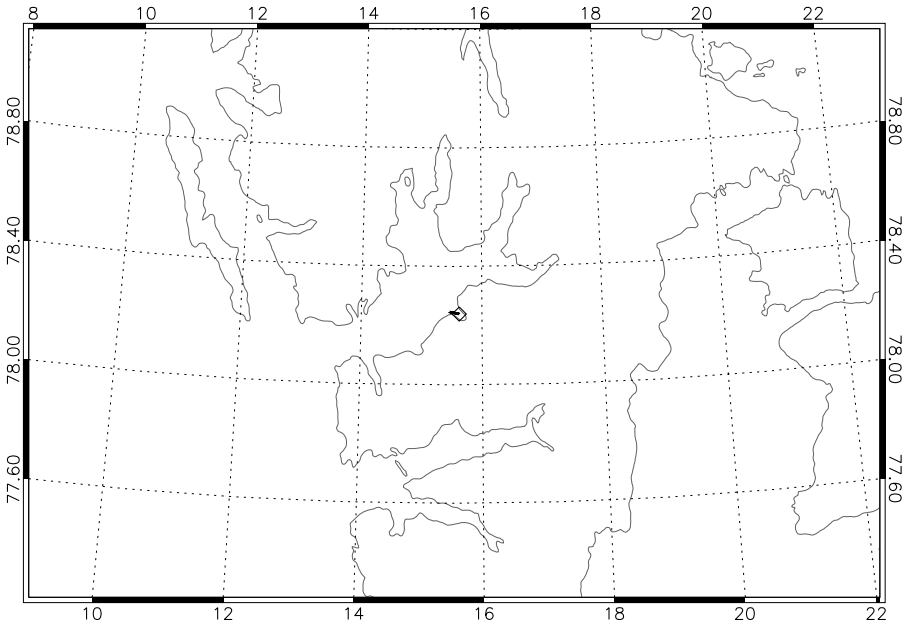
Date	2007−04−16	**Instrument Mode**	Low Altitude
Start Time	13:45:32 (49532)	**Aircraft**	AWI/DLR D−CODE
Stop Time	13:46:49 (49609)	**Retracker**	TSRA
Distance	4.990 km	**INS Resolution**	50 Hz
Duration	00 h 01 m 16 s	**Processor Version**	3.08

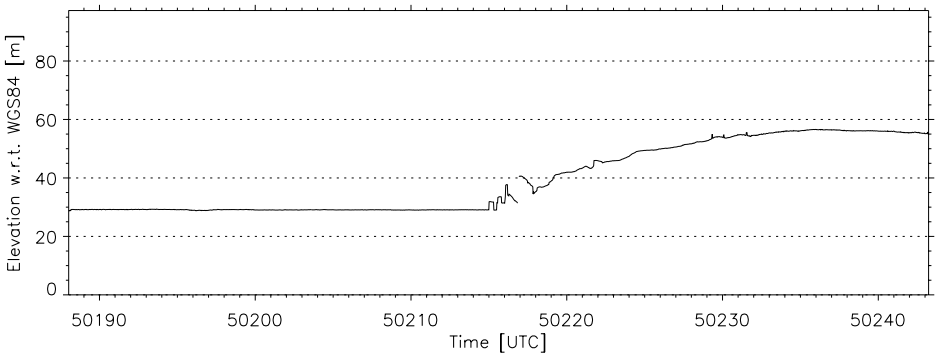


Date	2007−04−16	**Instrument Mode**	Low Altitude
Start Time	13:53:08 (49988)	**Aircraft**	AWI/DLR D−CODE
Stop Time	13:54:38 (50078)	**Retracker**	TSRA
Distance	5.527 km	**INS Resolution**	50 Hz
Duration	00 h 01 m 30 s	**Processor Version**	3.08

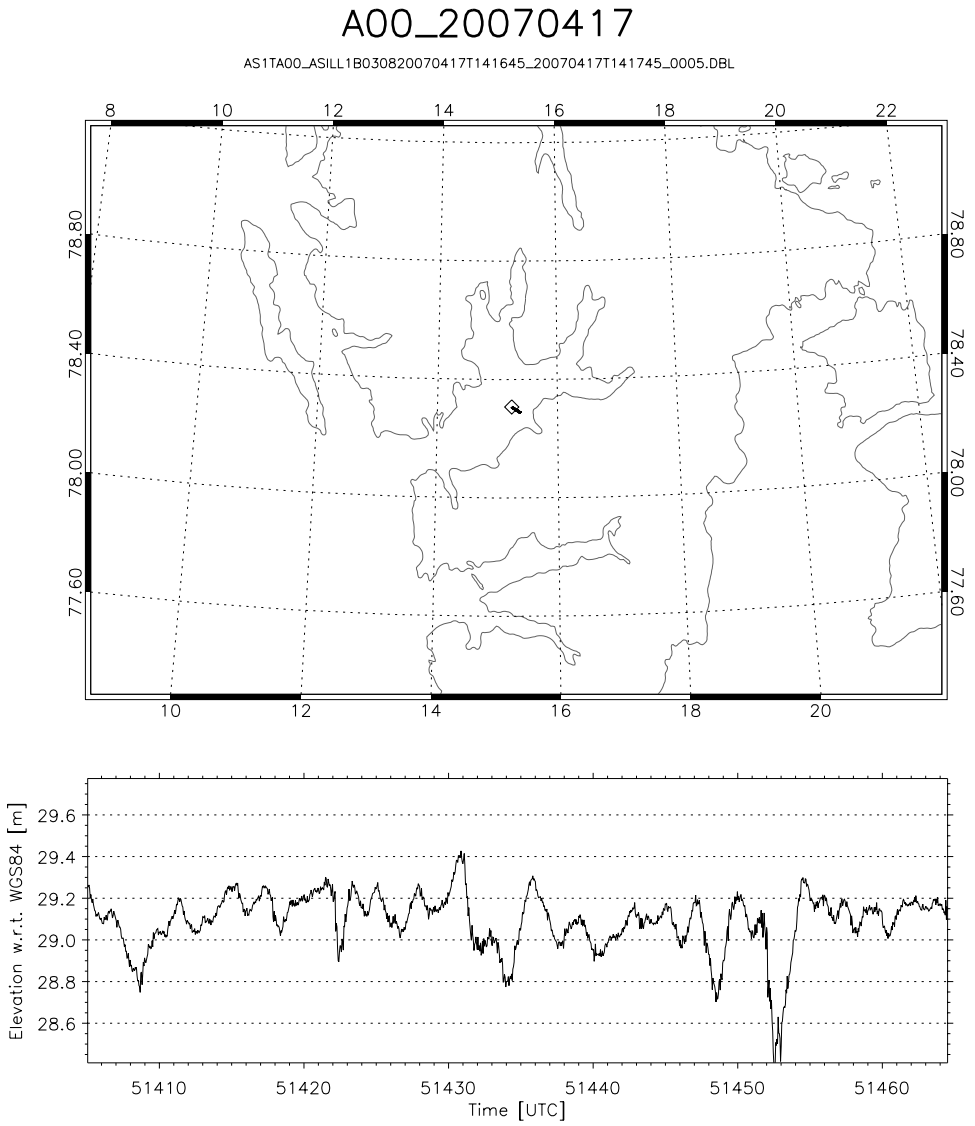
A28_20070416

AS1TA28_ASILL1B0308200704 16T135628_20070416T135724_0005.DBL





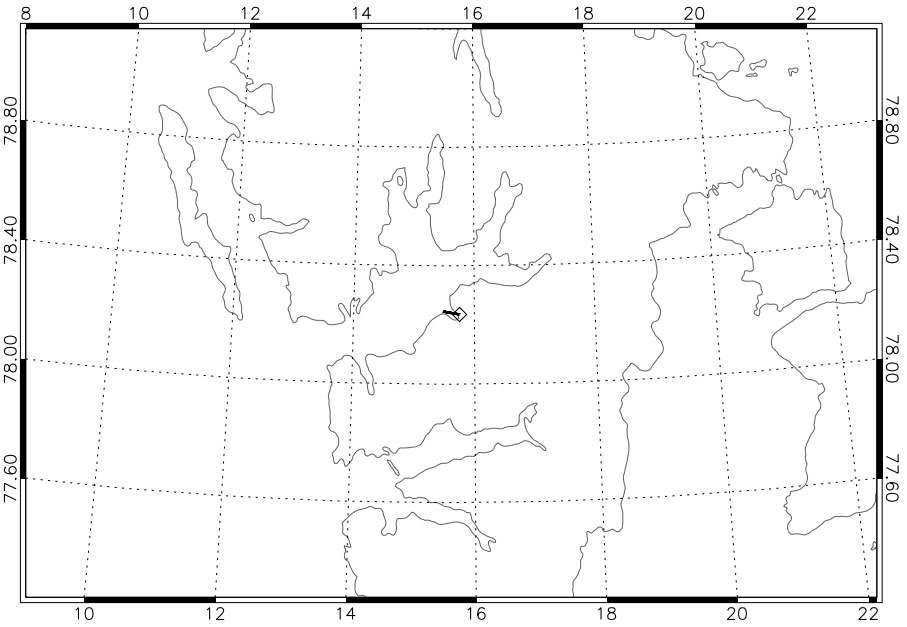
Date	2007−04−16	**Instrument Mode**	Low Altitude
Start Time	13:56:28 (50188)	**Aircraft**	AWI/DLR D−CODE
Stop Time	13:57:23 (50243)	**Retracker**	TSRA
Distance	3.812 km	**INS Resolution**	50 Hz
Duration	00 h 00 m 55 s	**Processor Version**	3.08

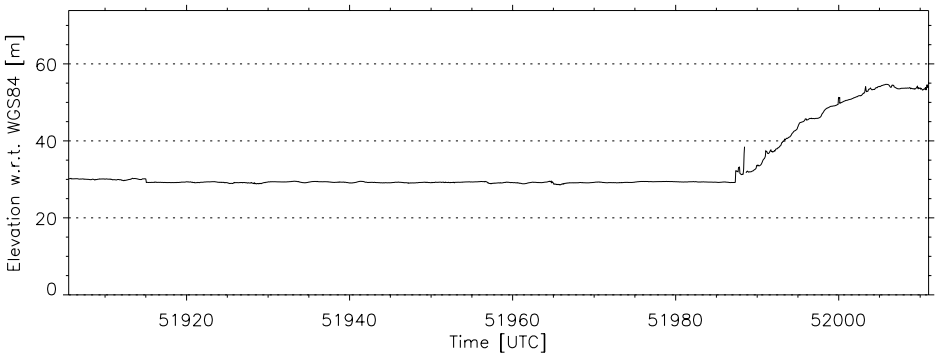


Date	2007−04−17	**Instrument Mode**	Low Altitude
Start Time	14:16:45 (51405)	**Aircraft**	AWI/DLR D−CODE
Stop Time	14:17:44 (51464)	**Retracker**	TSRA
Distance	4.093 km	**INS Resolution**	50 Hz
Duration	00 h 00 m 59 s	**Processor Version**	3.08

A01_20070417

AS1TA01_ASILL1B030820070417T142506_20070417T142652_0005.DBL

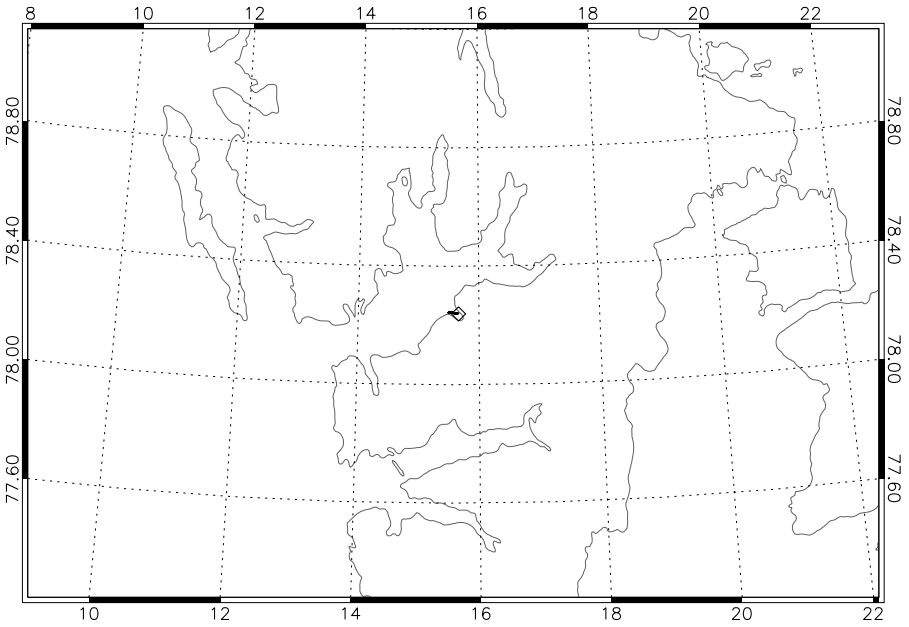


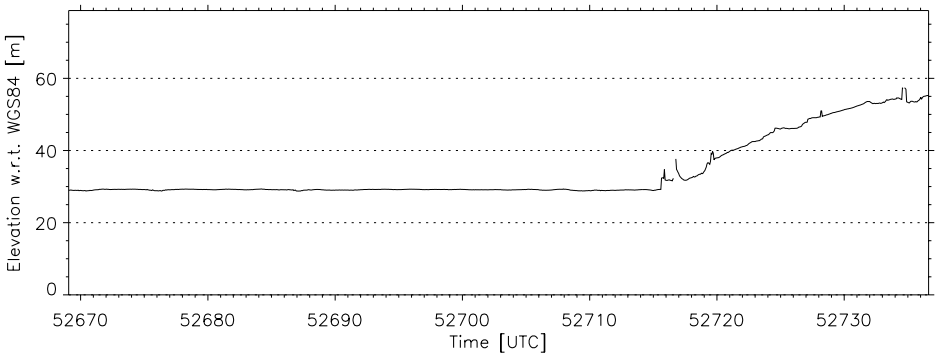


Date	2007−04−17	**Instrument Mode**	Low Altitude
Start Time	14:25:05 (51905)	**Aircraft**	AWI/DLR D−CODE
Stop Time	14:26:51 (52011)	**Retracker**	TSRA
Distance	6.325 km	**INS Resolution**	50 Hz
Duration	00 h 01 m 45 s	**Processor Version**	3.08

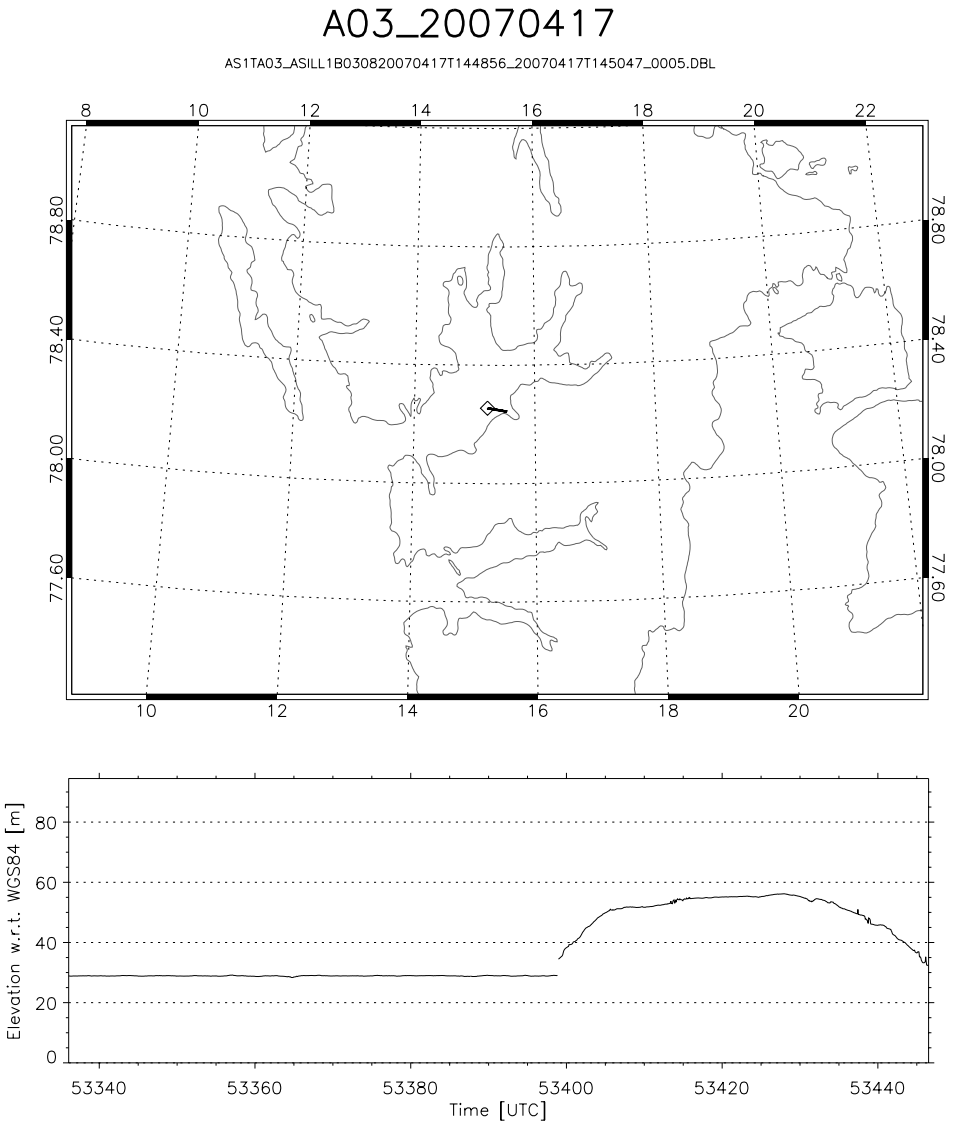
A02_20070417

AS1TA02_ASILL1B030820070417T143749_20070417T143858_0005.DBL





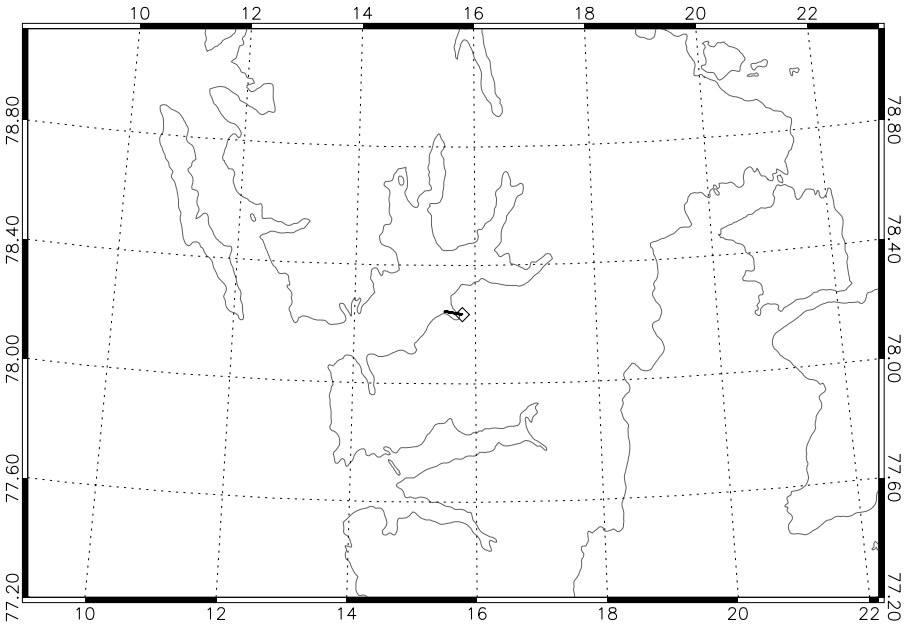
Date	2007-04-17	**Instrument Mode**	Low Altitude
Start Time	14:37:49 (52669)	**Aircraft**	AWI/DLR D-CODE
Stop Time	14:38:56 (52736)	**Retracker**	TSRA
Distance	3.998 km	**INS Resolution**	50 Hz
Duration	00 h 01 m 08 s	**Processor Version**	3.08

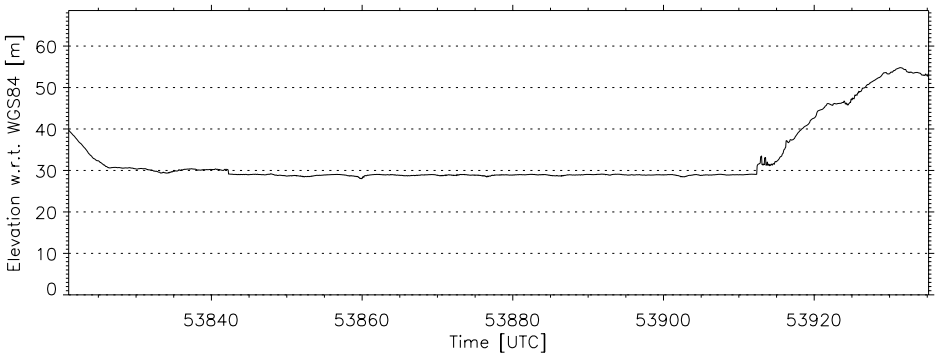


Date	2007−04−17	**Instrument Mode**	Low Altitude
Start Time	14:48:56 (53336)	**Aircraft**	AWI/DLR D−CODE
Stop Time	14:50:46 (53446)	**Retracker**	TSRA
Distance	7.442 km	**INS Resolution**	50 Hz
Duration	00 h 01 m 50 s	**Processor Version**	3.08

A04_20070417

AS1TA04_ASIAL1B030820070417T145701_20070417T145856_0005.DBL

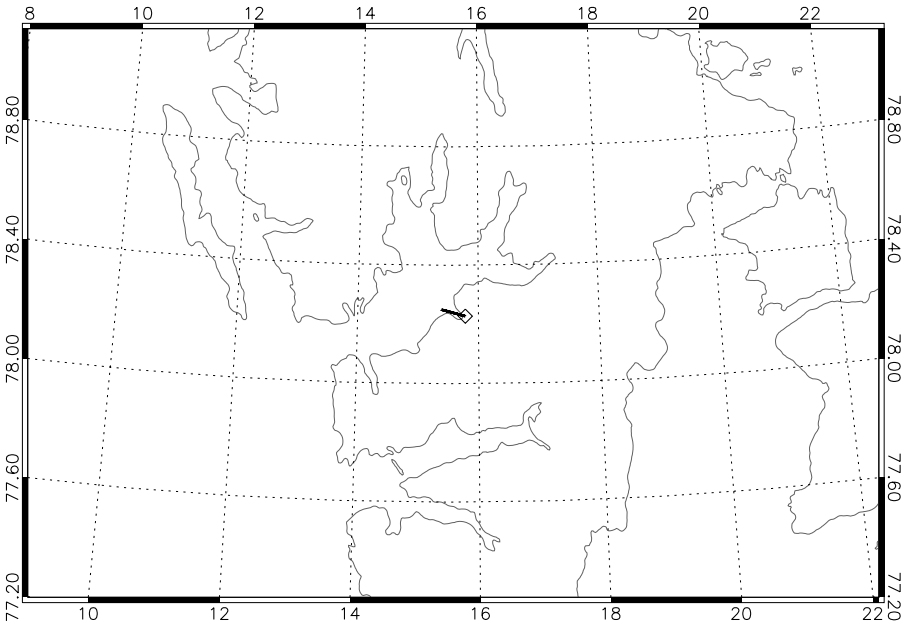


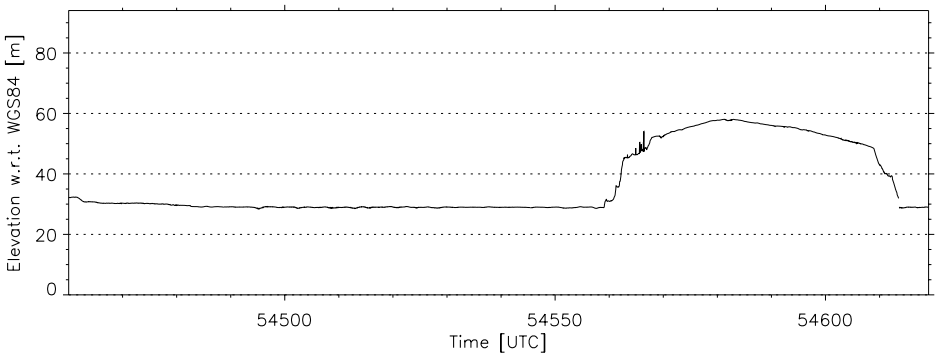


Date	2007−04−17	**Instrument Mode**	Adv. Low Altitude
Start Time	14:57:01 (53821)	**Aircraft**	AWI/DLR D−CODE
Stop Time	14:58:55 (53935)	**Retracker**	TSRA
Distance	6.920 km	**INS Resolution**	50 Hz
Duration	00 h 01 m 54 s	**Processor Version**	3.08

A05_20070417

AS1TA05_ASIAL1B030820070417T150740_20070417T151020_0005.DBL

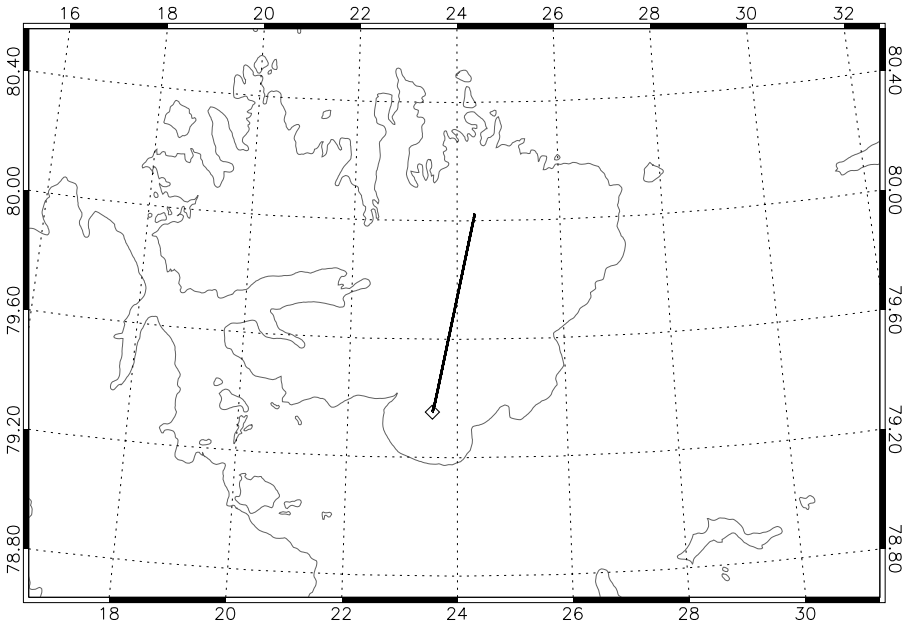


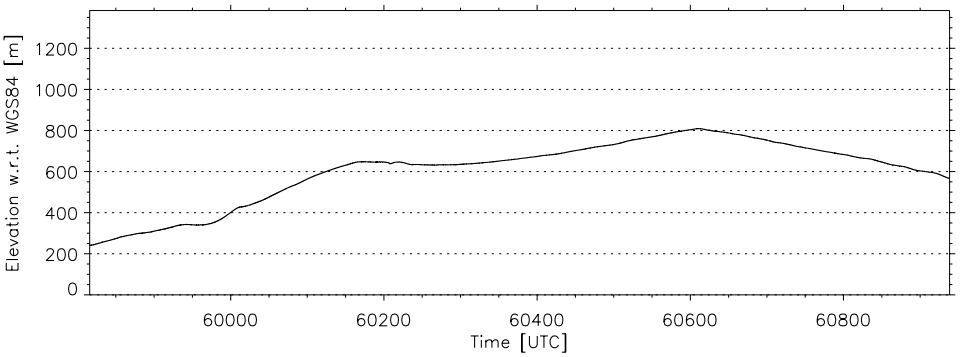


Date	2007−04−17	**Instrument Mode**	Adv. Low Altitude
Start Time	15:07:40 (54460)	**Aircraft**	AWI/DLR D−CODE
Stop Time	15:10:19 (54619)	**Retracker**	TSRA
Distance	9.358 km	**INS Resolution**	50 Hz
Duration	00 h 02 m 39 s	**Processor Version**	3.08

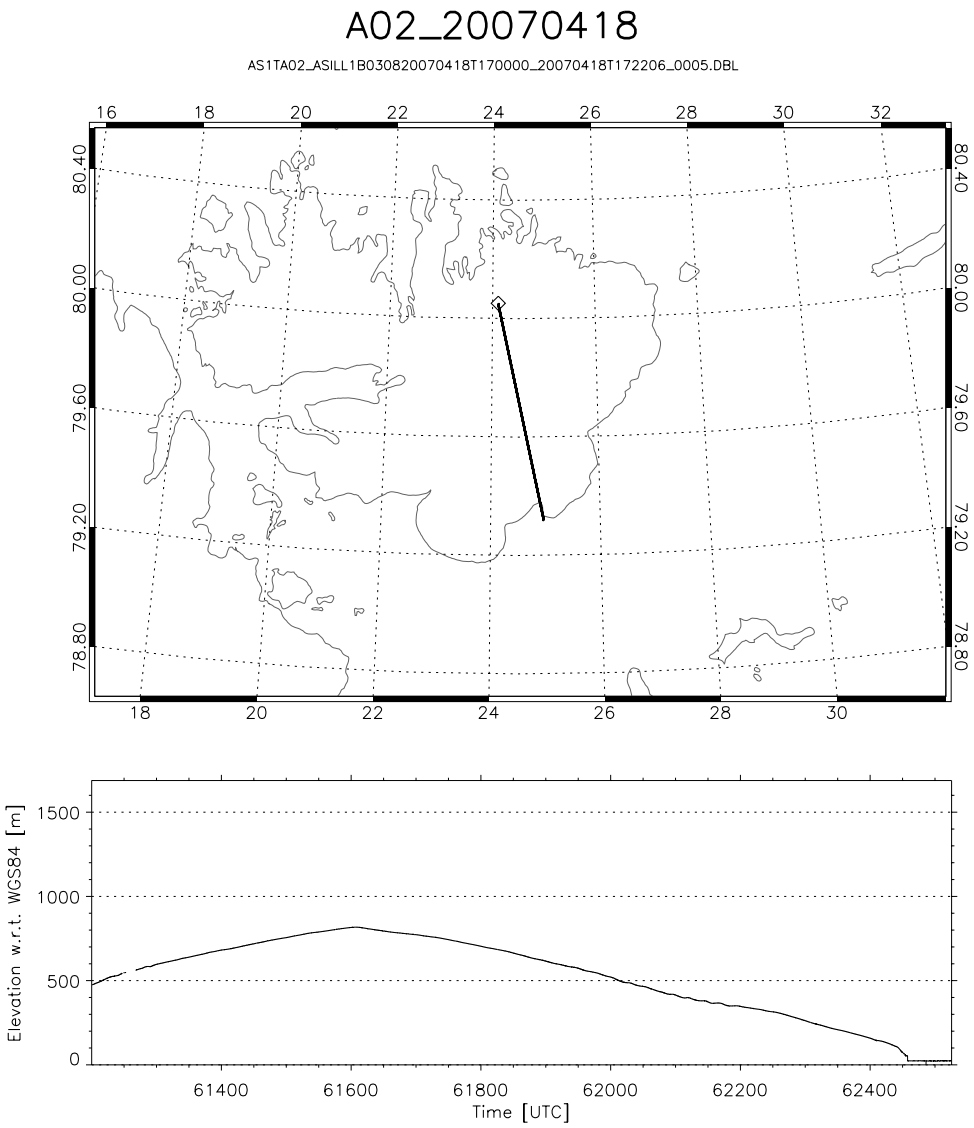
A01_20070418

AS1TA01_ASILL1B030820070418T163656_20070418T165539_0005.DBL

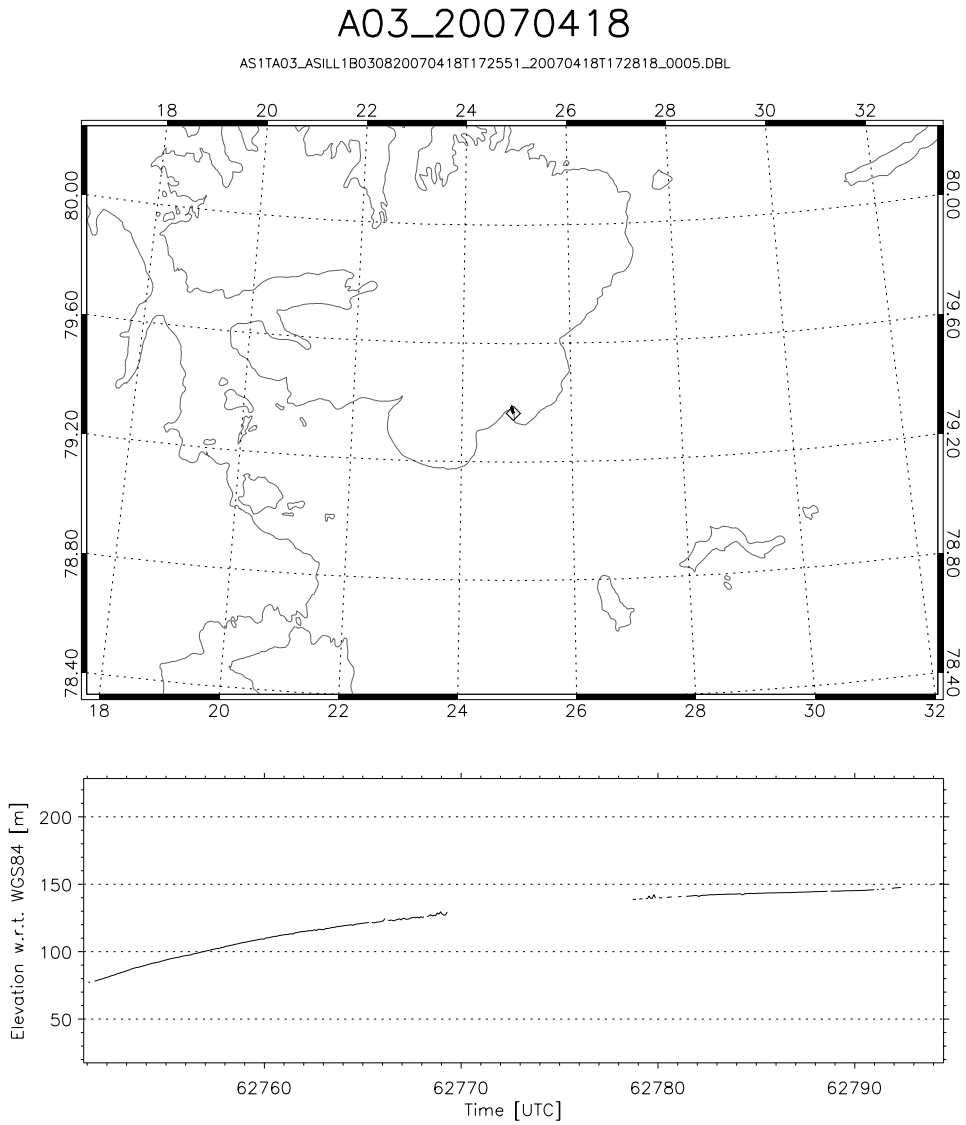




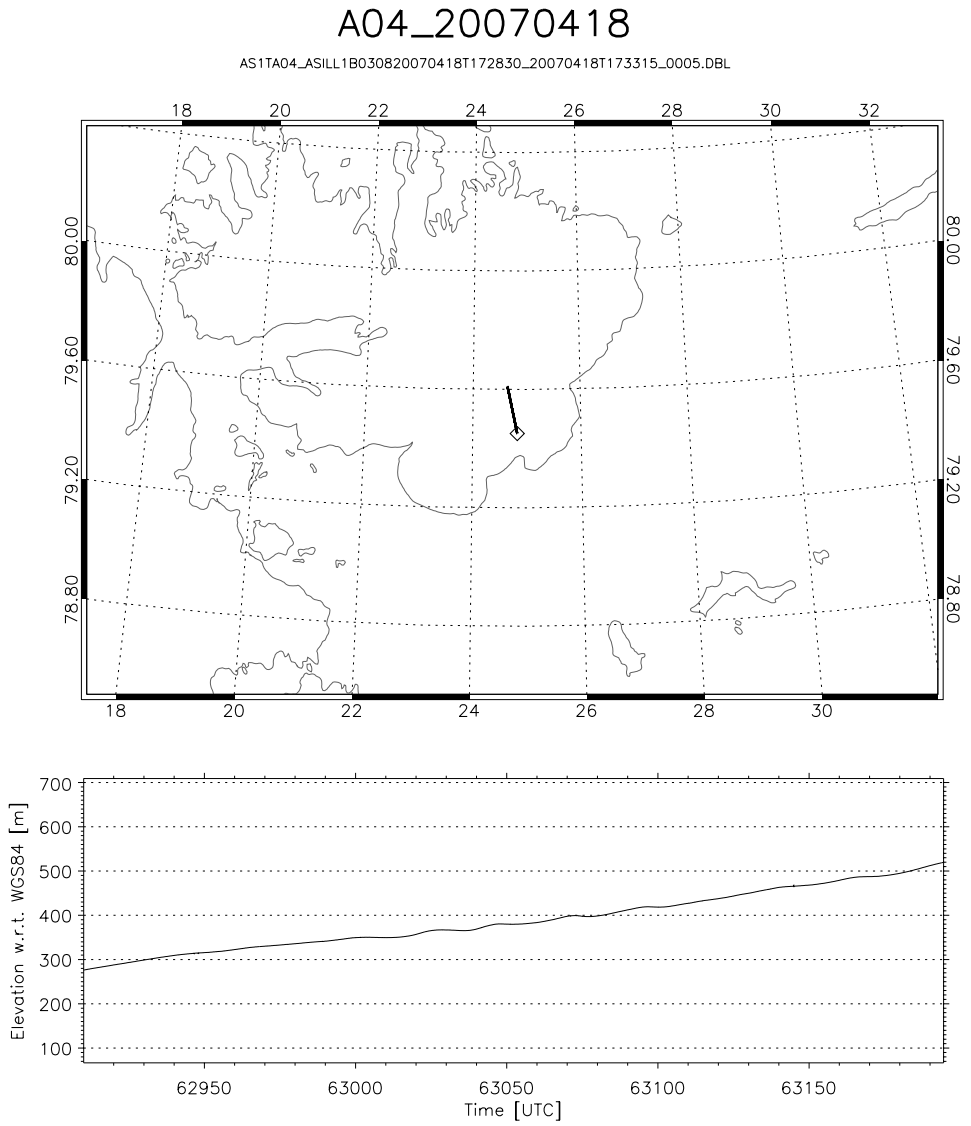
Date	2007-04-18	**Instrument Mode**	Low Altitude
Start Time	16:36:55 (59815)	**Aircraft**	AWI/DLR D-CODE
Stop Time	16:55:38 (60938)	**Retracker**	TSRA
Distance	76.204 km	**INS Resolution**	50 Hz
Duration	00 h 18 m 43 s	**Processor Version**	3.08



Date	2007−04−18	**Instrument Mode**	Low Altitude
Start Time	17:00:00 (61200)	**Aircraft**	AWI/DLR D−CODE
Stop Time	17:22:05 (62525)	**Retracker**	TSRA
Distance	83.381 km	**INS Resolution**	50 Hz
Duration	00 h 22 m 05 s	**Processor Version**	3.08



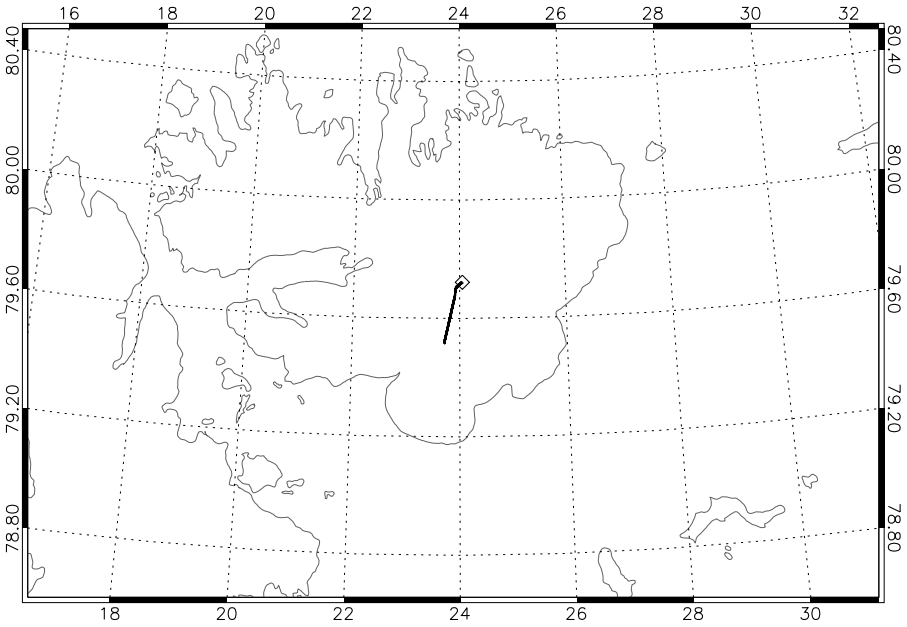
Date	2007−04−18	**Instrument Mode**	Low Altitude
Start Time	17:25:50 (62750)	**Aircraft**	AWI/DLR D−CODE
Stop Time	17:26:34 (62794)	**Retracker**	TSRA
Distance	2.684 km	**INS Resolution**	50 Hz
Duration	00 h 00 m 44 s	**Processor Version**	3.08

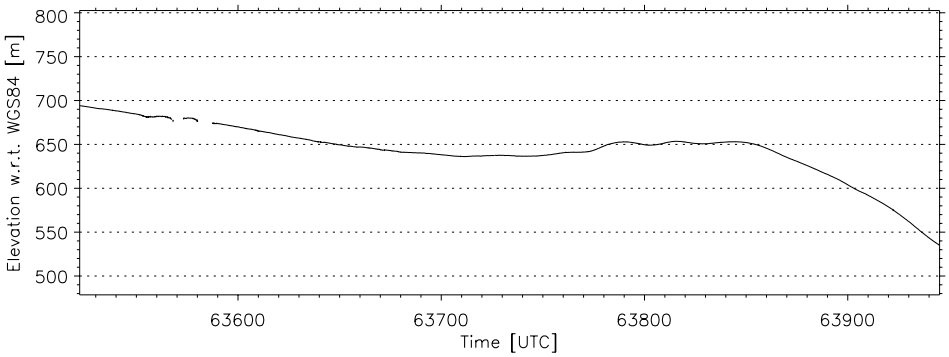


Date	2007−04−18	**Instrument Mode**	Low Altitude
Start Time	17:28:30 (62910)	**Aircraft**	AWI/DLR D−CODE
Stop Time	17:33:14 (63194)	**Retracker**	TSRA
Distance	18.083 km	**INS Resolution**	50 Hz
Duration	00 h 04 m 44 s	**Processor Version**	3.08

A05_20070418

AS1TA05_ASILL1B030820070418T173842_20070418T174626_0005.DBL

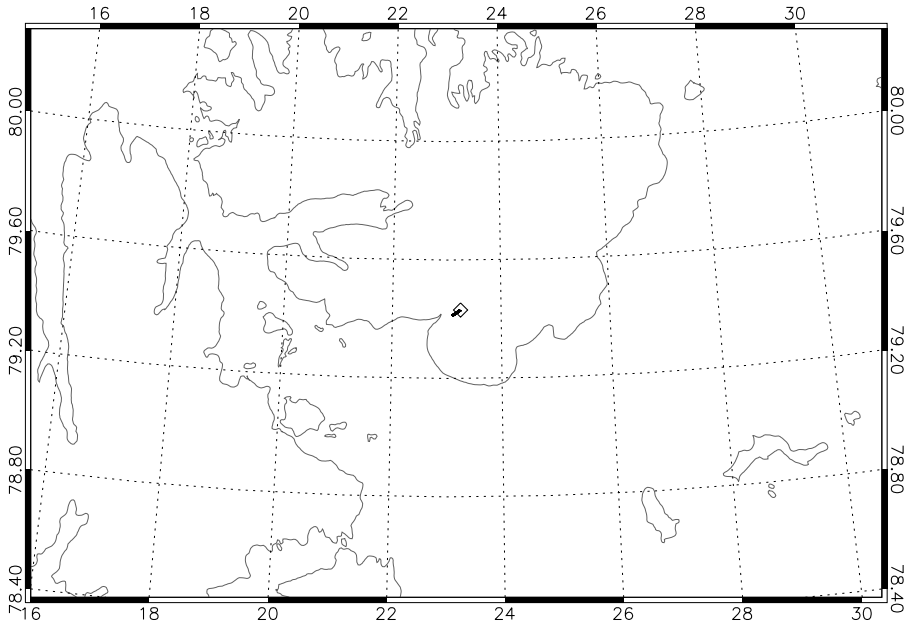


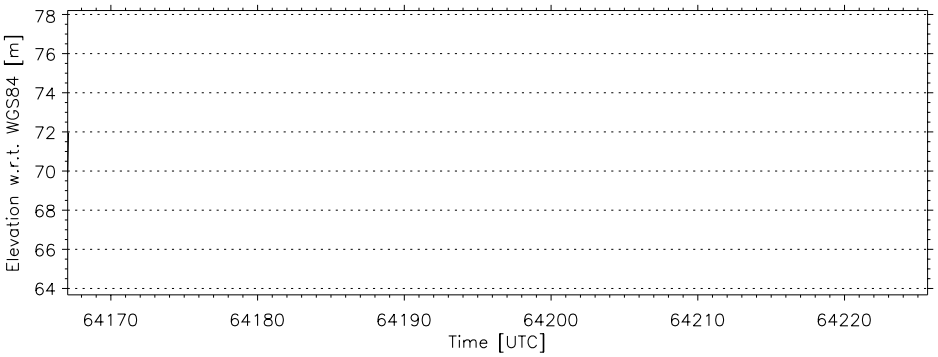


Date	2007−04−18	**Instrument Mode**	Low Altitude
Start Time	17:38:42 (63522)	**Aircraft**	AWI/DLR D−CODE
Stop Time	17:45:45 (63945)	**Retracker**	TSRA
Distance	24.614 km	**INS Resolution**	50 Hz
Duration	00 h 07 m 03 s	**Processor Version**	3.08

A06_20070418

AS1TA06_ASIHL1B030820070418T174927_20070418T175026_0005.DBL

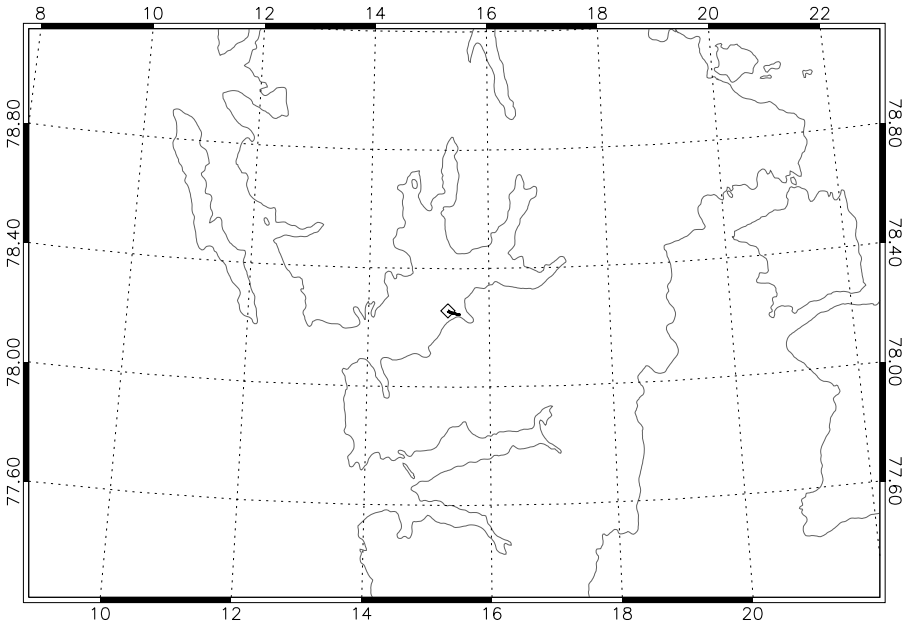


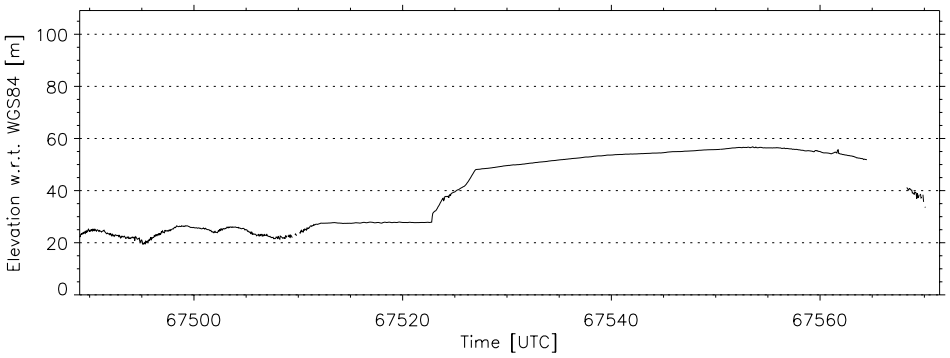


Date	2007−04−18	**Instrument Mode**	High Altitude
Start Time	17:49:27 (64167)	**Aircraft**	AWI/DLR D−CODE
Stop Time	17:50:25 (64225)	**Retracker**	TSRA
Distance	4.012 km	**INS Resolution**	50 Hz
Duration	00 h 00 m 59 s	**Processor Version**	3.08

A08_20070418

AS1TA08_ASILL1B030820070418T184449_20070418T184612_0005.DBL

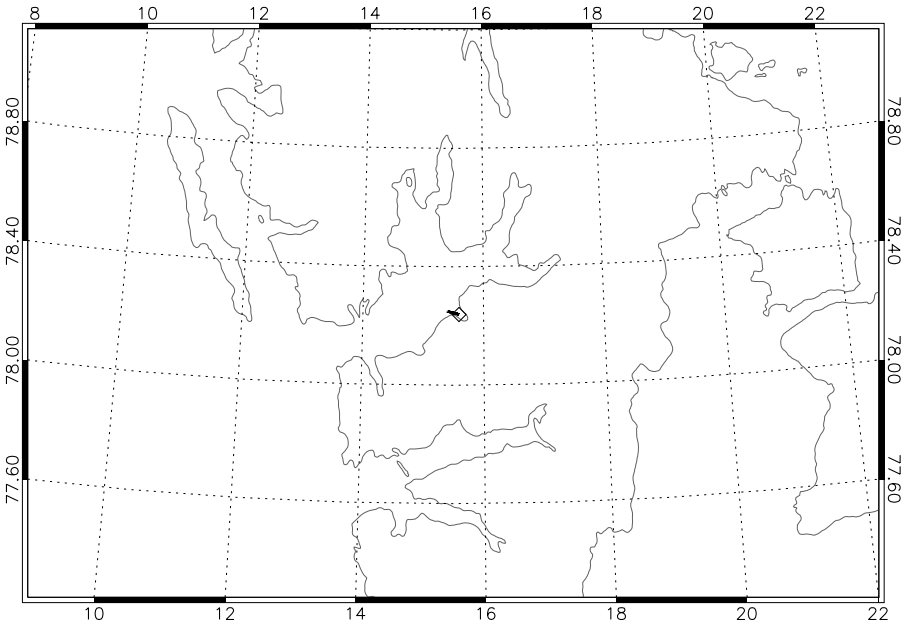


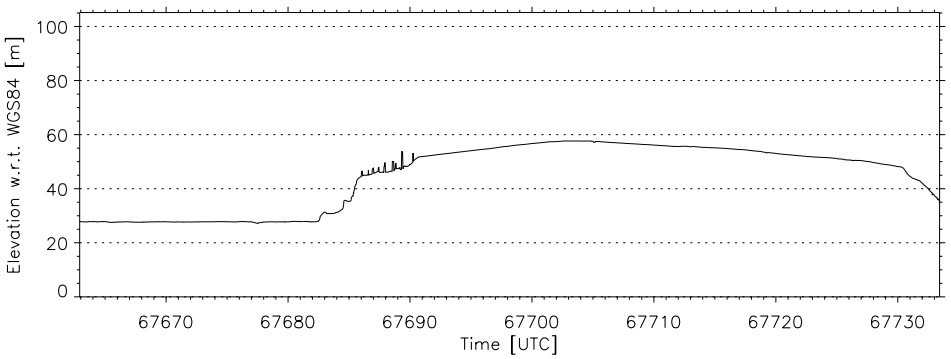


Date	2007-04-18	**Instrument Mode**	Low Altitude
Start Time	18:44:49 (67489)	**Aircraft**	AWI/DLR D-CODE
Stop Time	18:46:11 (67571)	**Retracker**	TSRA
Distance	5.086 km	**INS Resolution**	50 Hz
Duration	00 h 01 m 22 s	**Processor Version**	3.08

A09_20070418

AS1TA09_ASILL1B030820070418T184743_20070418T184854_0005.DBL

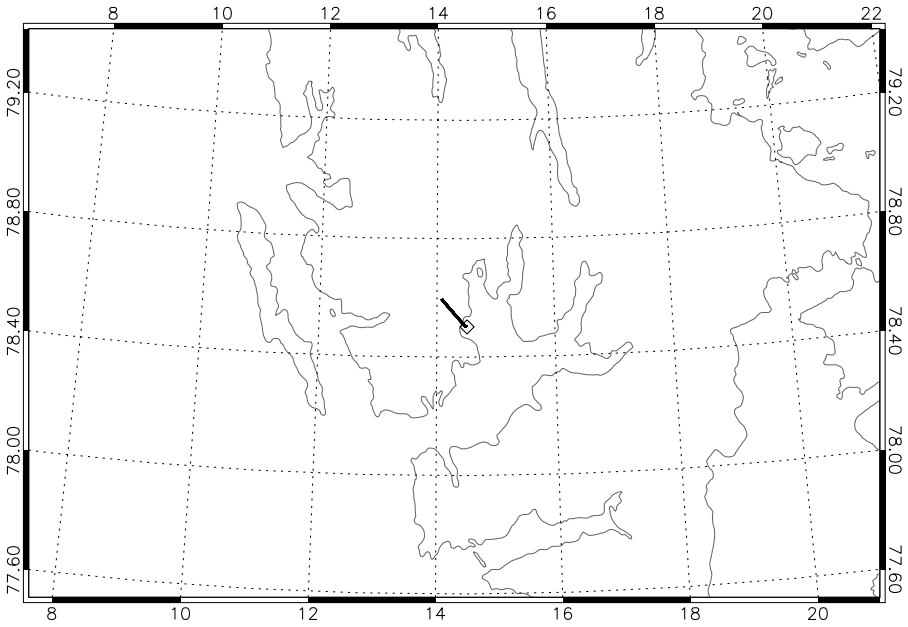


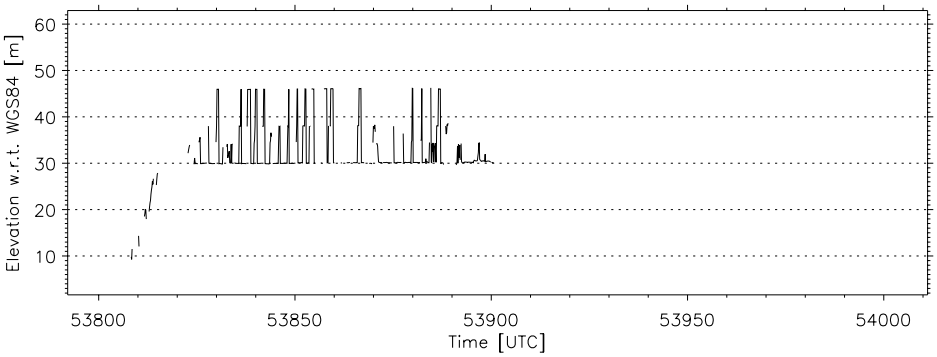


Date	2007-04-18	**Instrument Mode**	Low Altitude
Start Time	18:47:42 (67662)	**Aircraft**	AWI/DLR D-CODE
Stop Time	18:48:53 (67733)	**Retracker**	TSRA
Distance	4.455 km	**INS Resolution**	50 Hz
Duration	00 h 01 m 11 s	**Processor Version**	3.08

A00_20070419

AS1TA00_ASIHL1B030820070419T145632_20070419T150012_0005.DBL

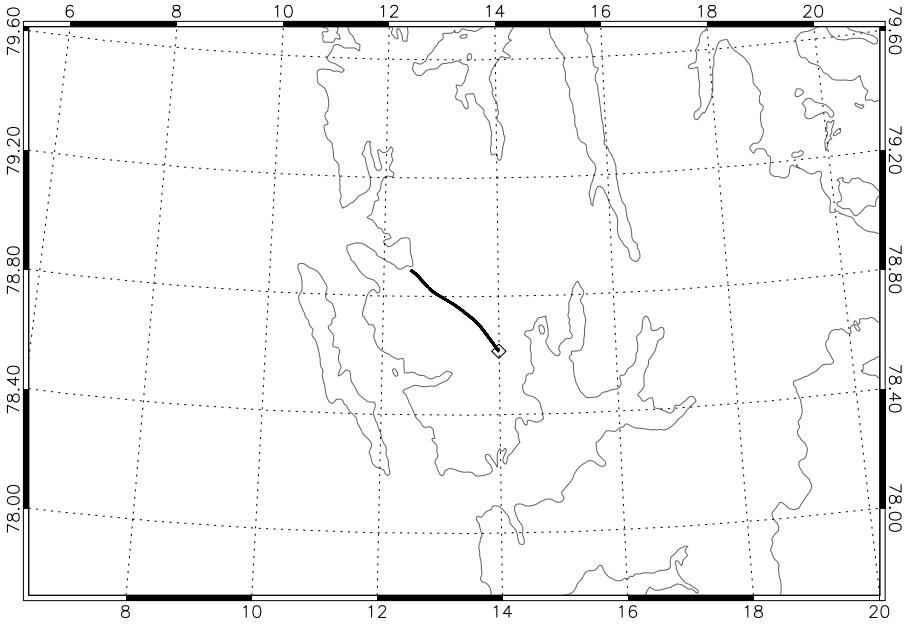


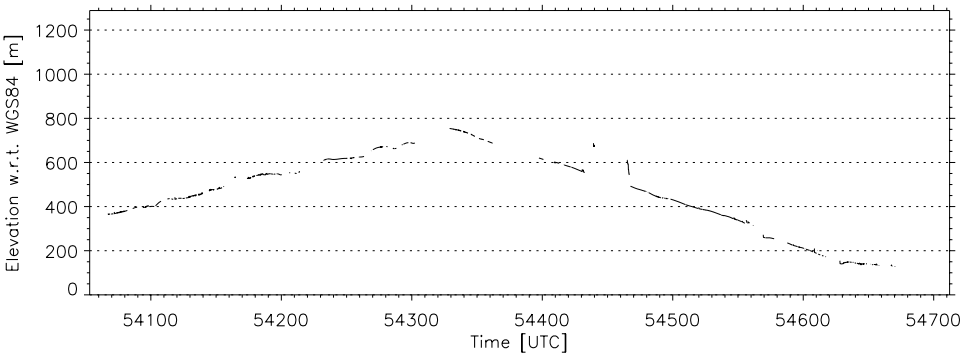


Date	2007−04−19	**Instrument Mode**	High Altitude
Start Time	14:56:32 (53792)	**Aircraft**	AWI/DLR D−CODE
Stop Time	15:00:11 (54011)	**Retracker**	TSRA
Distance	14.254 km	**INS Resolution**	50 Hz
Duration	00 h 03 m 39 s	**Processor Version**	3.08

A01_20070419

AS1TA01_ASIHL1B0308200704 19T150053_20070419T151154_0005.DBL

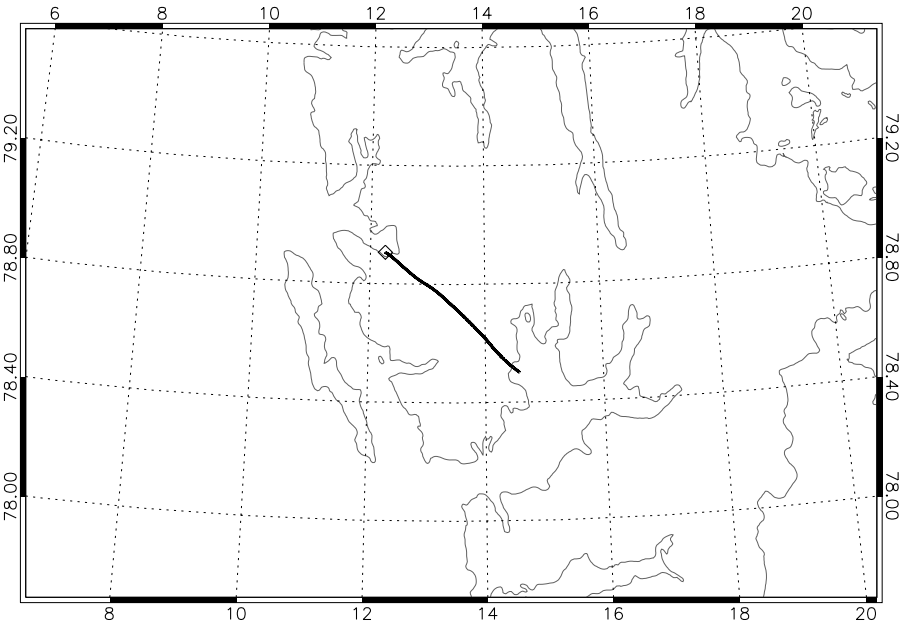


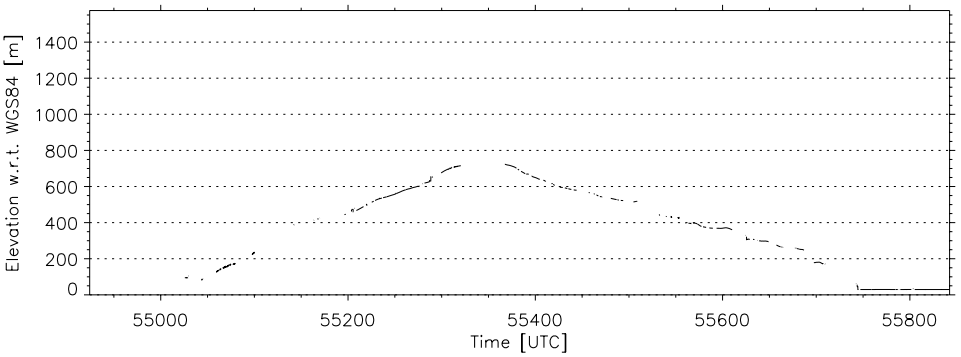


Date	2007-04-19	**Instrument Mode**	High Altitude
Start Time	15:00:53 (54053)	**Aircraft**	AWI/DLR D-CODE
Stop Time	15:11:52 (54712)	**Retracker**	TSRA
Distance	NaN km	**INS Resolution**	50 Hz
Duration	00 h 10 m 59 s	**Processor Version**	3.08

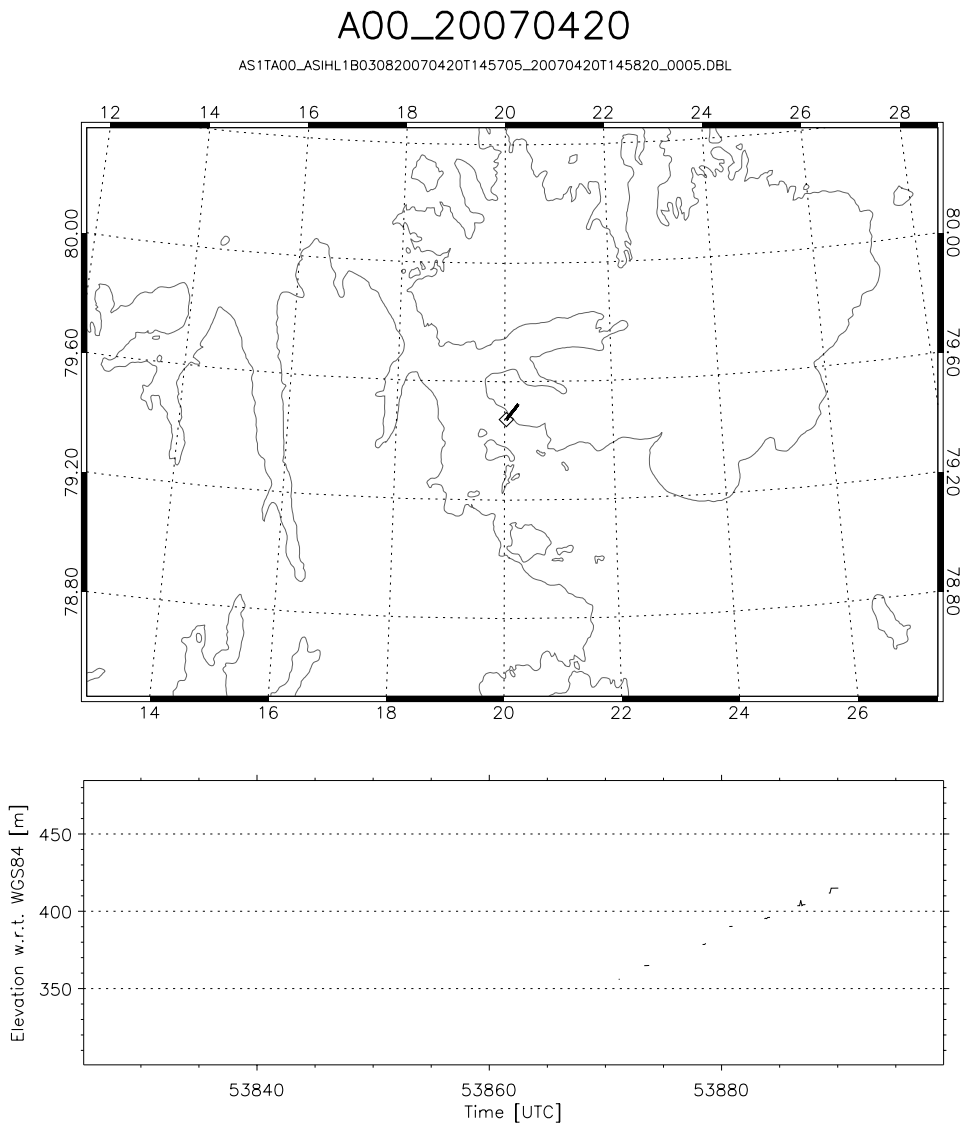
A02_20070419

AS1TA02_ASIHL1B0308200704191151524_20070419T153043_0005.DBL





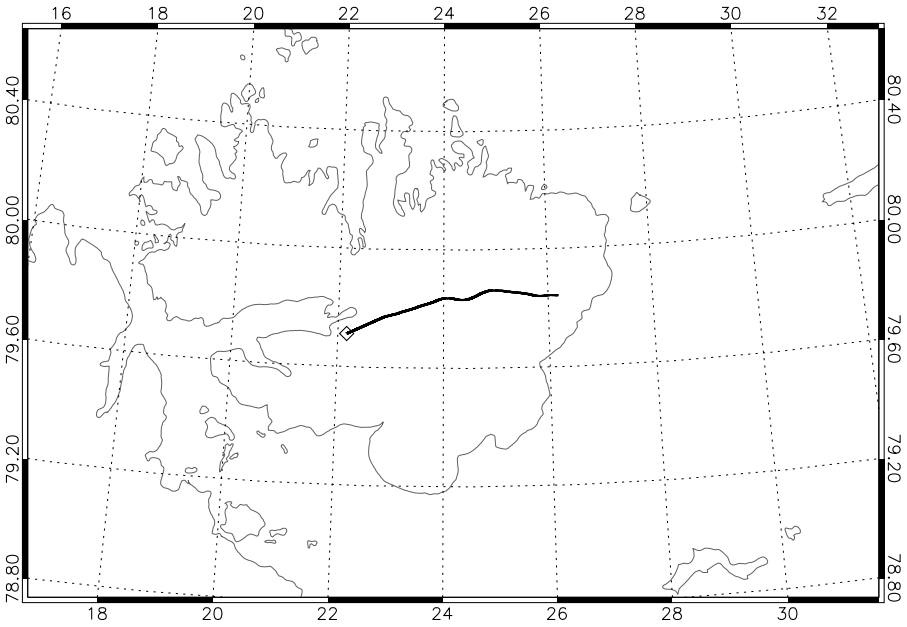
Date	2007-04-19	**Instrument Mode**	High Altitude
Start Time	15:15:24 (54924)	**Aircraft**	AWI/DLR D-CODE
Stop Time	15:30:42 (55842)	**Retracker**	TSRA
Distance	67.861 km	**INS Resolution**	50 Hz
Duration	00 h 15 m 18 s	**Processor Version**	3.08

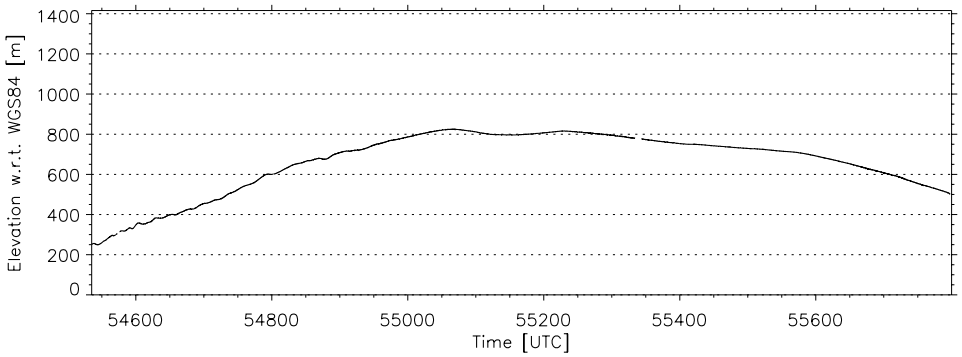


Date	2007−04−20	**Instrument Mode**	High Altitude
Start Time	14:57:05 (53825)	**Aircraft**	AWI/DLR D−CODE
Stop Time	14:58:19 (53899)	**Retracker**	TSRA
Distance	7.265 km	**INS Resolution**	50 Hz
Duration	00 h 01 m 14 s	**Processor Version**	3.08

A01_20070420

AS1TA01_ASILL1B030820070420T150855_20070420T153001_0005.DBL

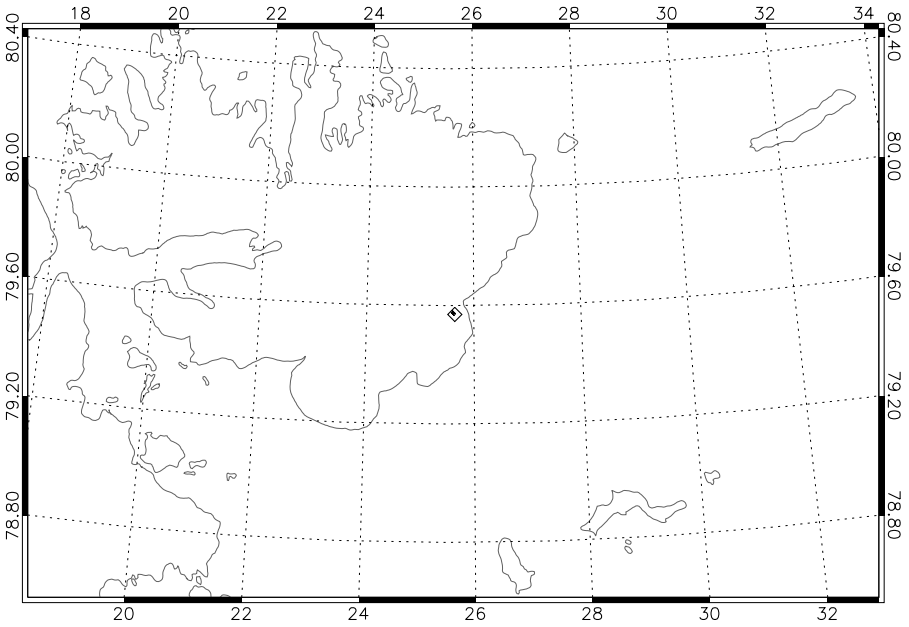


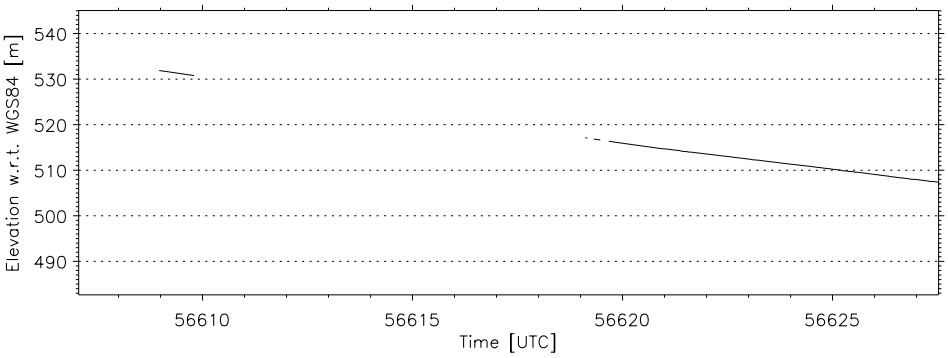


Date	2007-04-20	**Instrument Mode**	Low Altitude
Start Time	15:08:55 (54535)	**Aircraft**	AWI/DLR D-CODE
Stop Time	15:29:59 (55799)	**Retracker**	TSRA
Distance	82.895 km	**INS Resolution**	50 Hz
Duration	00 h 21 m 05 s	**Processor Version**	3.08

A02_20070420

AS1TA02_ASILL1B030820070420T154327_20070420T154349_0005.DBL

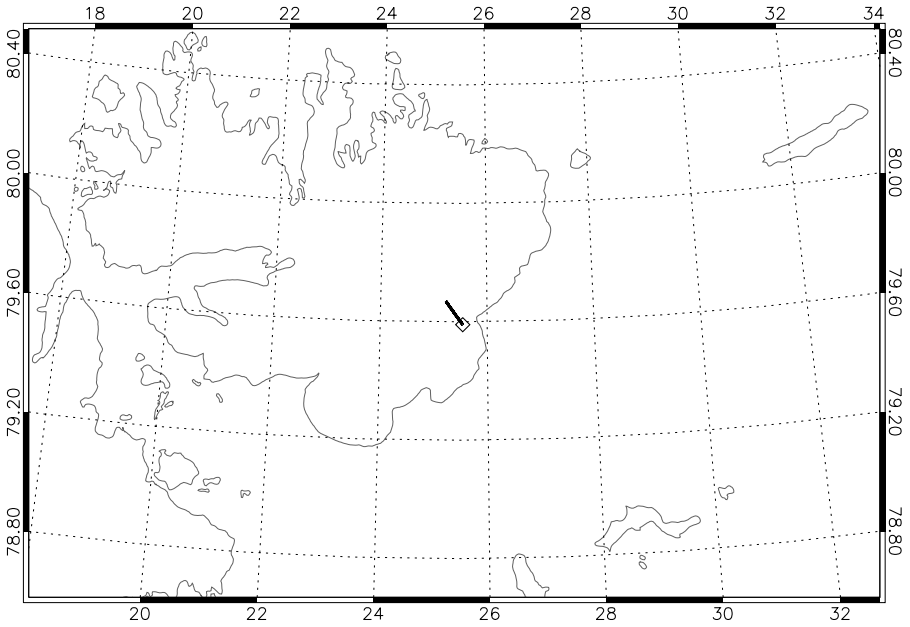


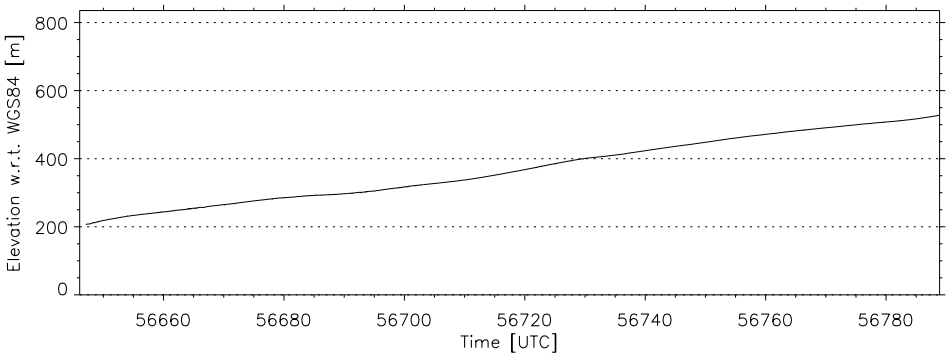


Date	2007-04-20	**Instrument Mode**	Low Altitude
Start Time	15:43:27 (56607)	**Aircraft**	AWI/DLR D-CODE
Stop Time	15:43:47 (56627)	**Retracker**	
Distance	1.582 km	**INS Resolution**	50 Hz
Duration	00 h 00 m 20 s	**Processor Version**	3.08

A03_20070420

AS1TA03_ASILL1B030820070420T154406_20070420T154630_0005.DBL

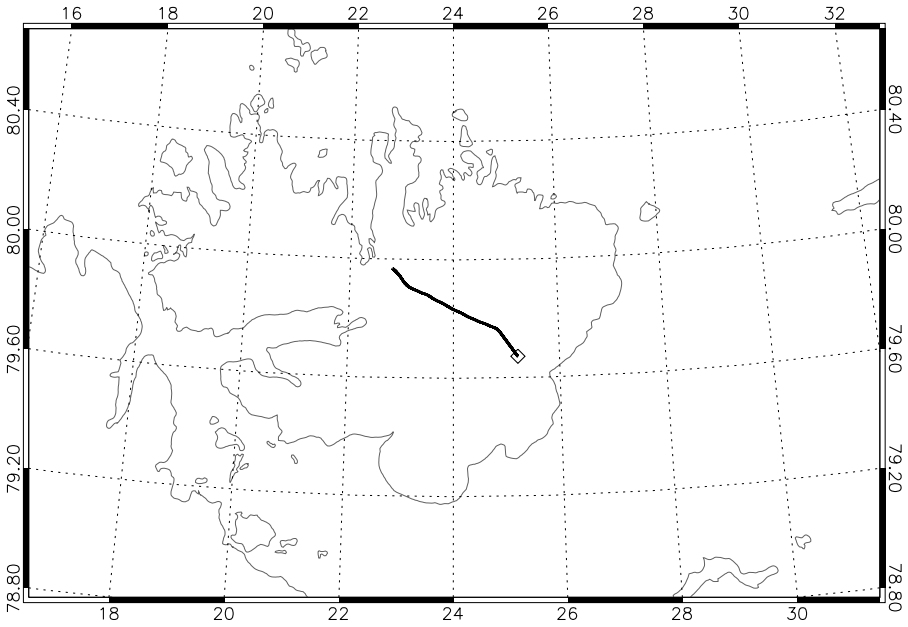


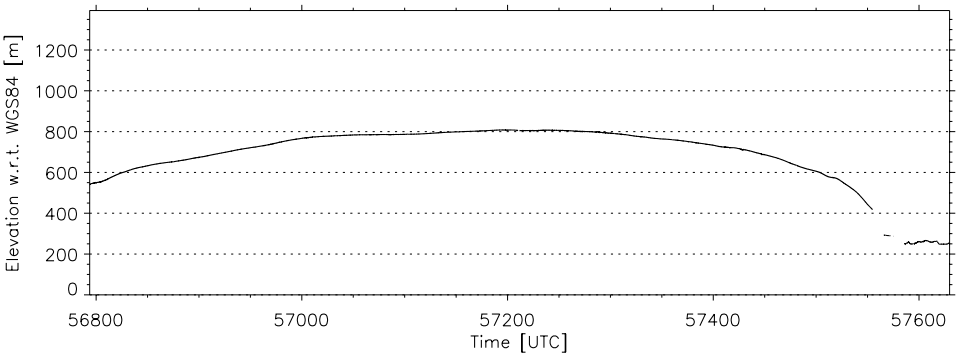


Date	2007-04-20	**Instrument Mode**	Low Altitude
Start Time	15:44:06 (56646)	**Aircraft**	AWI/DLR D-CODE
Stop Time	15:46:28 (56788)	**Retracker**	TSRA
Distance	10.849 km	**INS Resolution**	50 Hz
Duration	00 h 02 m 23 s	**Processor Version**	3.08

A04_20070420

AS1TA04_ASILL1B030820070420T154634_20070420T160031_0005.DBL

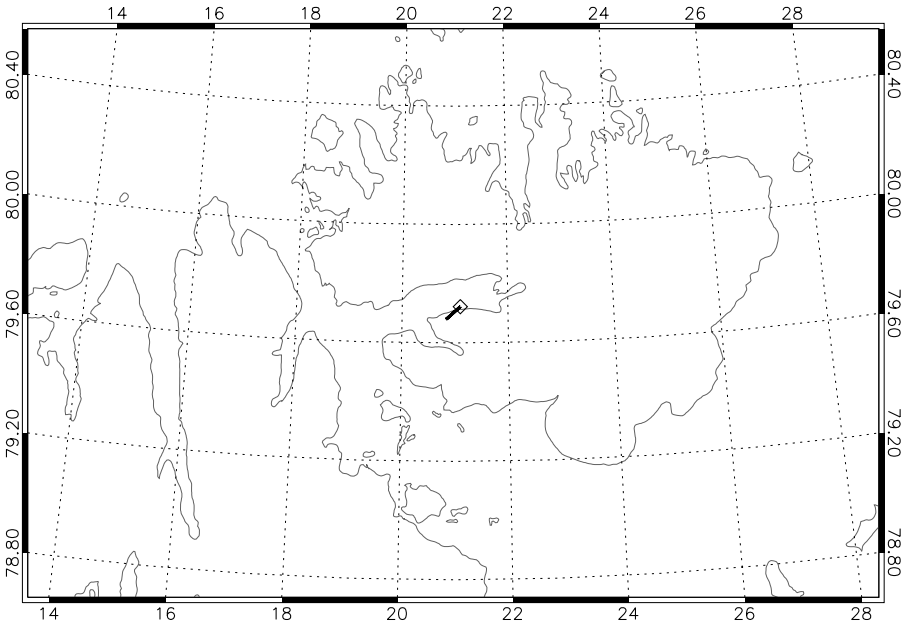


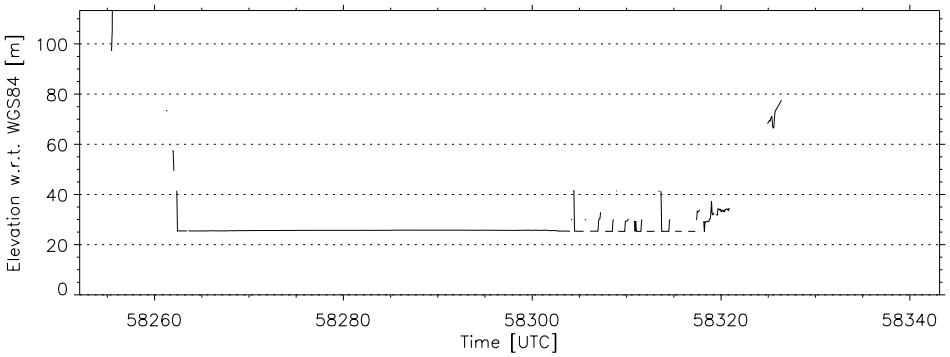


Date	2007−04−20	**Instrument Mode**	Low Altitude
Start Time	15:46:33 (56793)	**Aircraft**	AWI/DLR D−CODE
Stop Time	16:00:29 (57629)	**Retracker**	TSRA
Distance	59.055 km	**INS Resolution**	50 Hz
Duration	00 h 13 m 56 s	**Processor Version**	3.08

A05_20070420

AS1TA05_ASIHL1B0308200704 20T161052_20070420T161224_0005.DBL

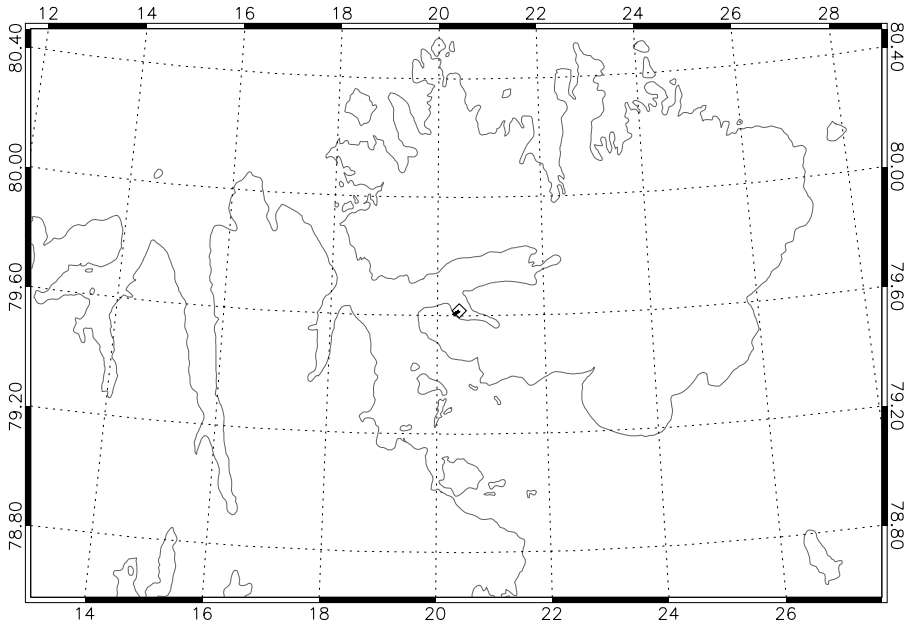


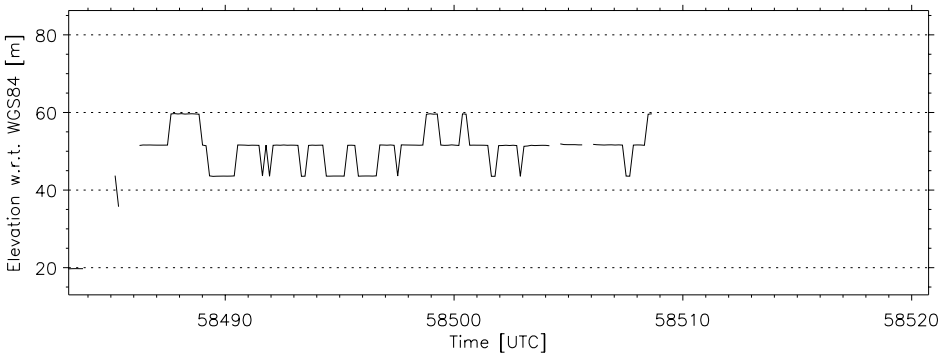


Date	2007-04-20	**Instrument Mode**	High Altitude
Start Time	16:10:52 (58252)	**Aircraft**	AWI/DLR D-CODE
Stop Time	16:12:23 (58343)	**Retracker**	TSRA
Distance	7.116 km	**INS Resolution**	50 Hz
Duration	00 h 01 m 31 s	**Processor Version**	3.08

A06_20070420

AS1TA06_ASIHL1B0308200704 20T161443_20070420T161521_0005.DBL

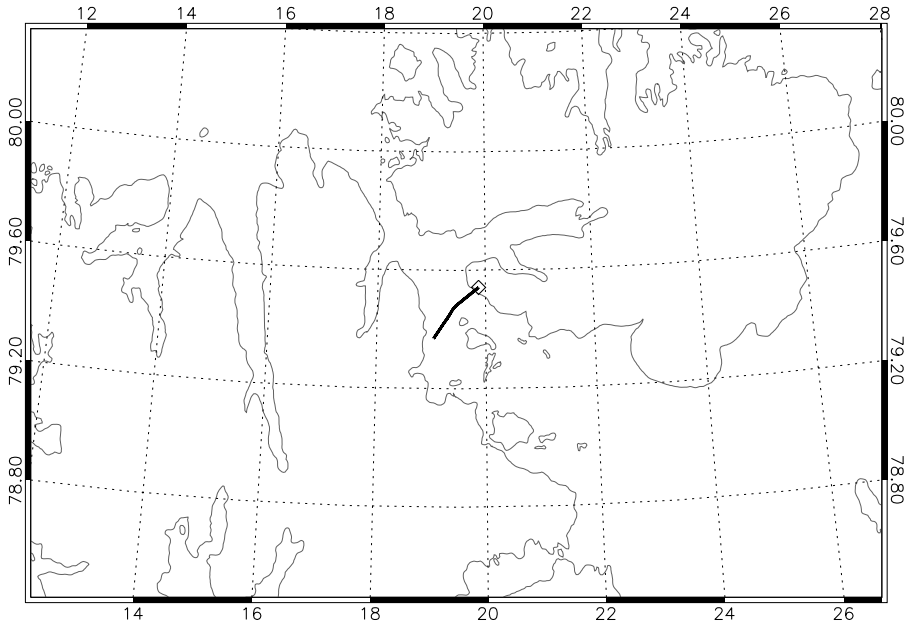


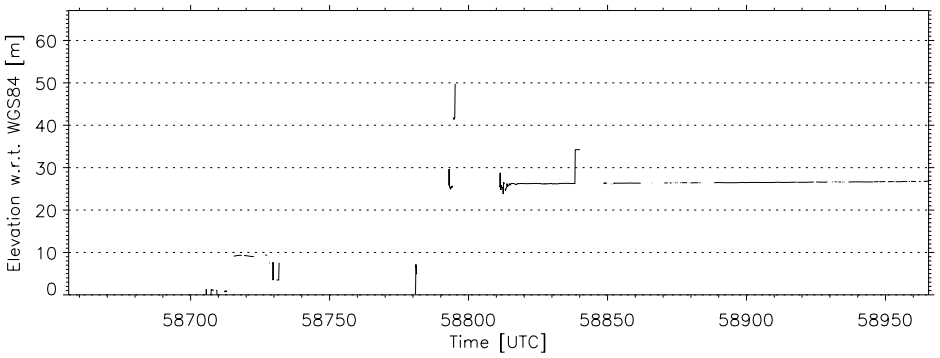


Date	2007−04−20	**Instrument Mode**	High Altitude
Start Time	16:14:43 (58483)	**Aircraft**	AWI/DLR D−CODE
Stop Time	16:15:20 (58520)	**Retracker**	
Distance	2.762 km	**INS Resolution**	50 Hz
Duration	00 h 00 m 38 s	**Processor Version**	3.08

A07_20070420

AS1TA07_ASIHL1B0308200704 20T161736_20070420T162322_0005.DBL

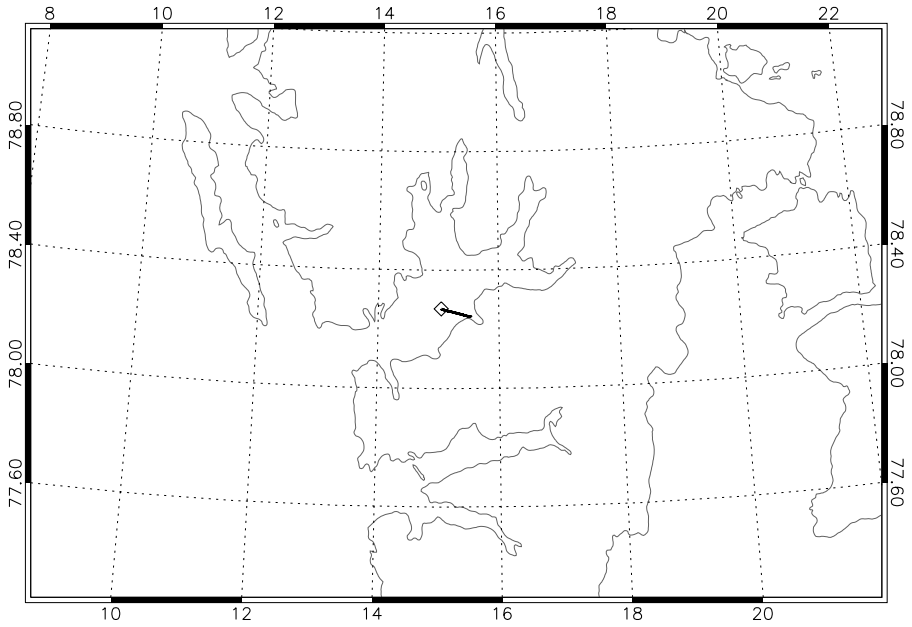


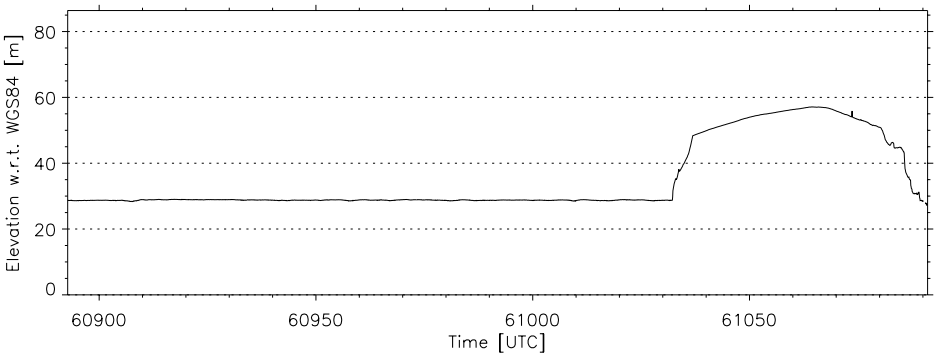


Date	2007−04−20	**Instrument Mode**	High Altitude
Start Time	16:17:36 (58656)	**Aircraft**	AWI/DLR D−CODE
Stop Time	16:22:45 (58965)	**Retracker**	TSRA
Distance	25.764 km	**INS Resolution**	50 Hz
Duration	00 h 05 m 09 s	**Processor Version**	3.08

A08_20070420

AS1TA08_ASILL1B030820070420T165453_20070420T165812_0005.DBL

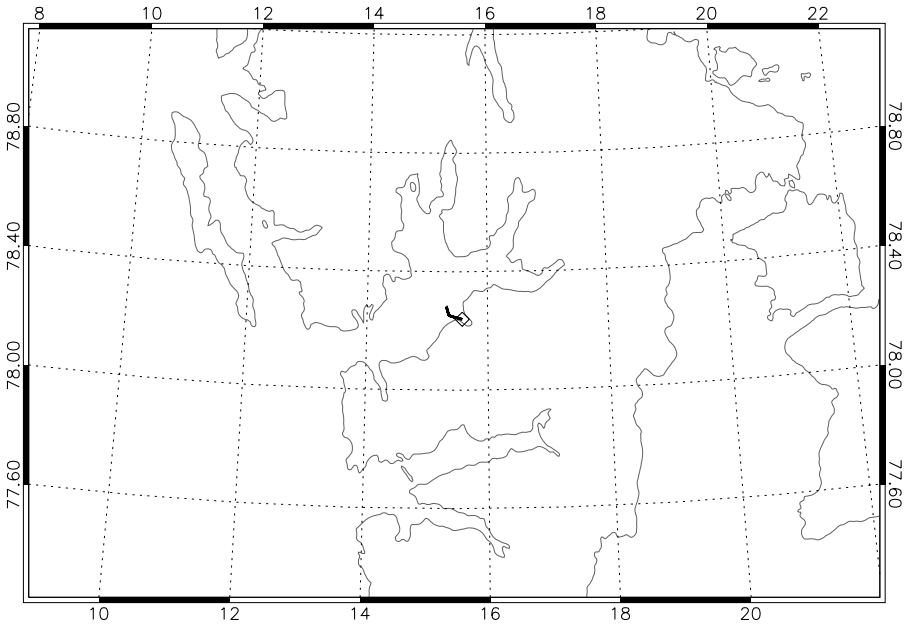


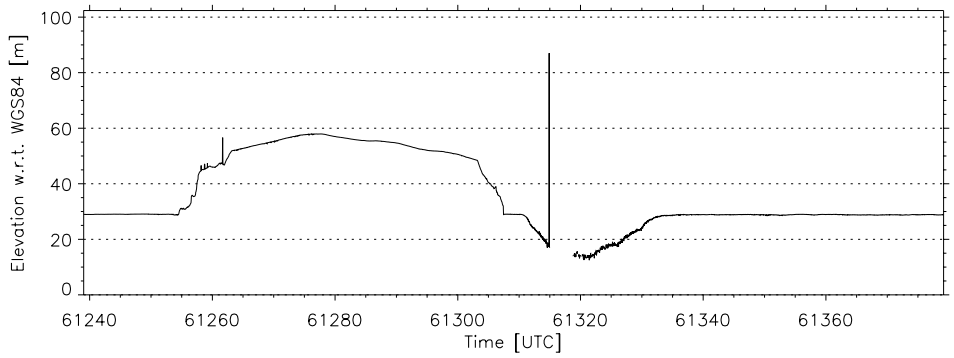


Date	2007-04-20	**Instrument Mode**	Low Altitude
Start Time	16:54:52 (60892)	**Aircraft**	AWI/DLR D-CODE
Stop Time	16:58:11 (61091)	**Retracker**	TSRA
Distance	11.726 km	**INS Resolution**	50 Hz
Duration	00 h 03 m 18 s	**Processor Version**	3.08

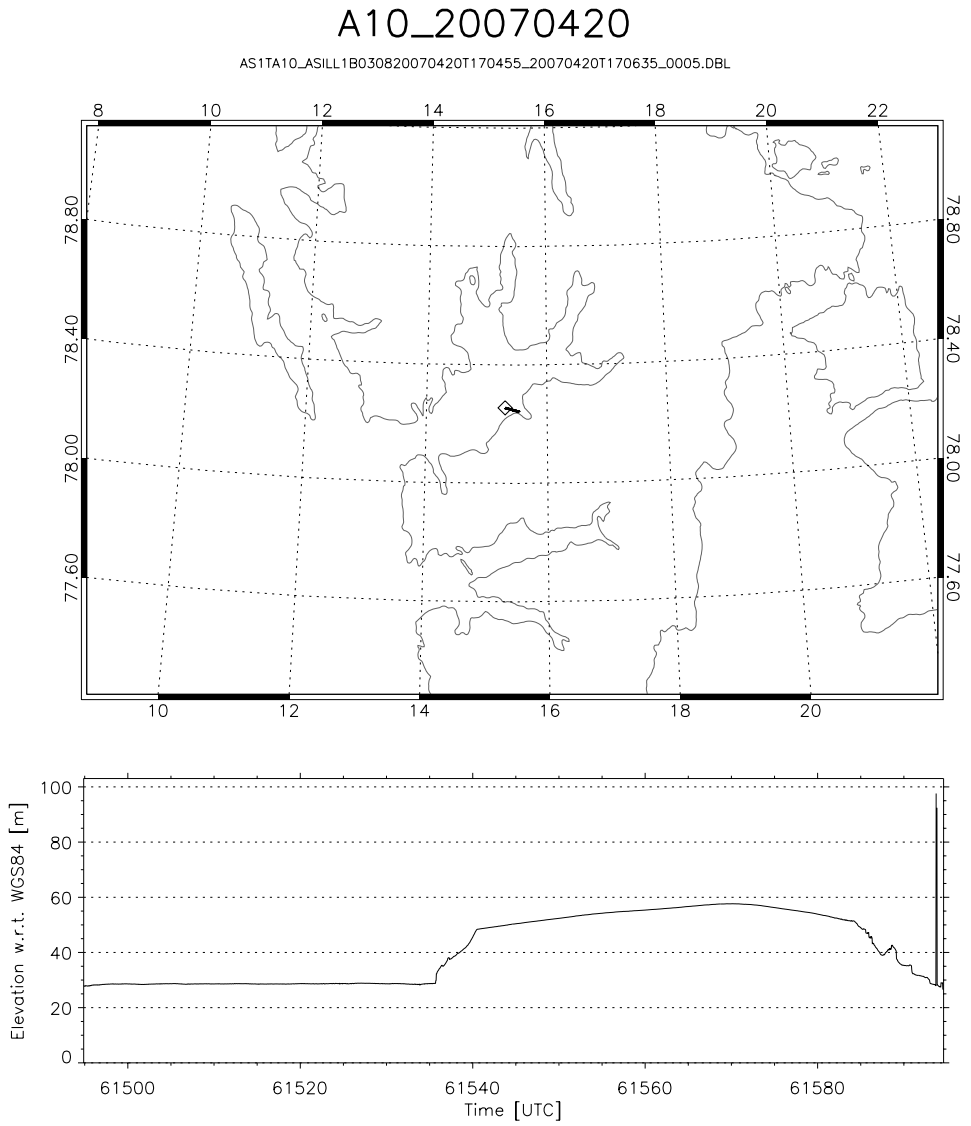
A09_20070420

AS1TA09_ASILL1B030820070420T170039_20070420T170300_0005.DBL





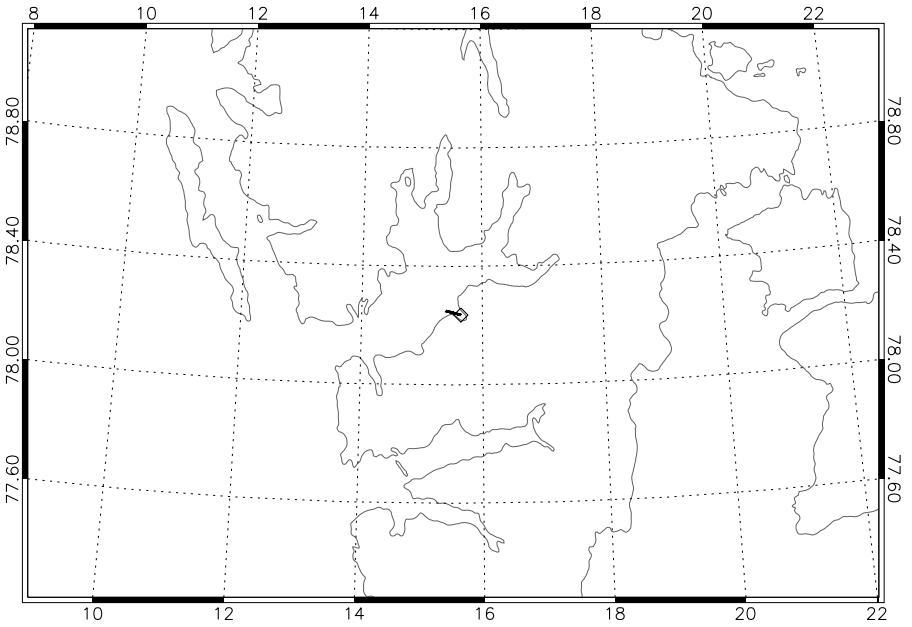
Date	2007-04-20	**Instrument Mode**	Low Altitude
Start Time	17:00:39 (61239)	**Aircraft**	AWI/DLR D-CODE
Stop Time	17:02:59 (61379)	**Retracker**	TSRA
Distance	8.540 km	**INS Resolution**	50 Hz
Duration	00 h 02 m 20 s	**Processor Version**	3.08

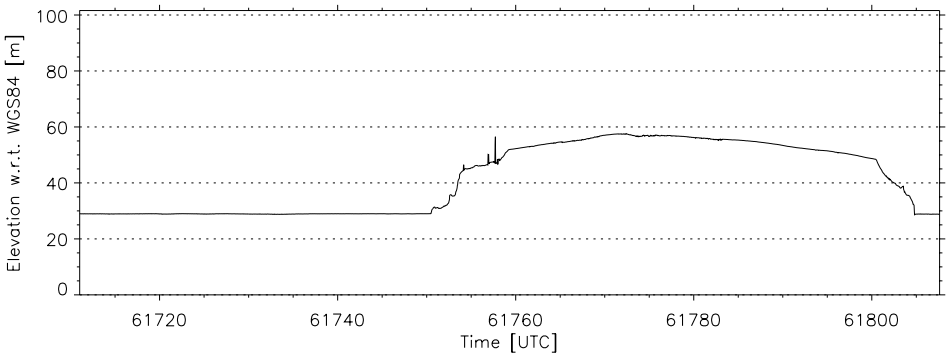


Date	2007−04−20	**Instrument Mode**	Low Altitude
Start Time	17:04:54 (61494)	**Aircraft**	AWI/DLR D−CODE
Stop Time	17:06:34 (61594)	**Retracker**	TSRA
Distance	5.617 km	**INS Resolution**	50 Hz
Duration	00 h 01 m 40 s	**Processor Version**	3.08

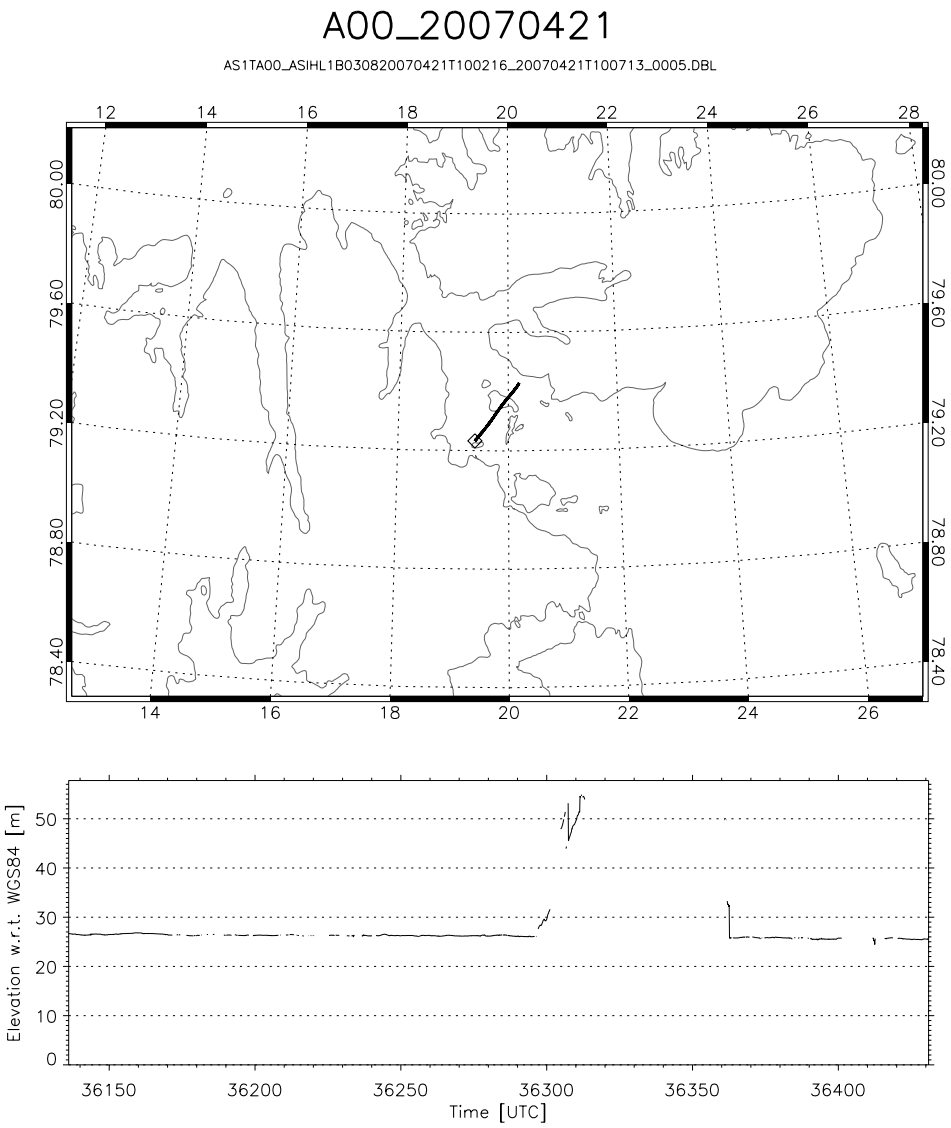
A11_20070420

AS1TA11_ASILL1B030820070420T170831_20070420T171008_0005.DBL





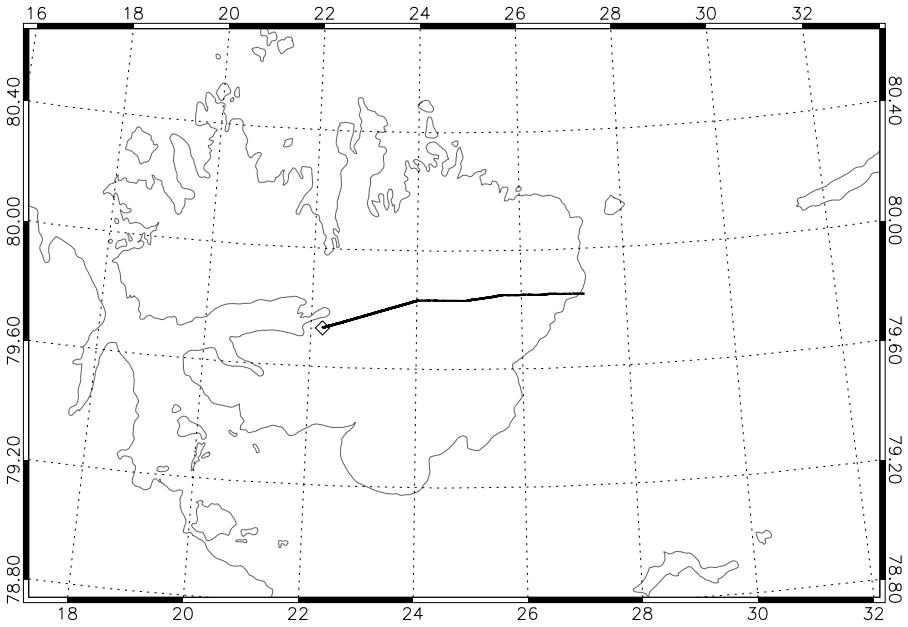
Date	2007-04-20	**Instrument Mode**	Low Altitude
Start Time	17:08:31 (61711)	**Aircraft**	AWI/DLR D-CODE
Stop Time	17:10:07 (61807)	**Retracker**	TSRA
Distance	5.890 km	**INS Resolution**	50 Hz
Duration	00 h 01 m 37 s	**Processor Version**	3.08

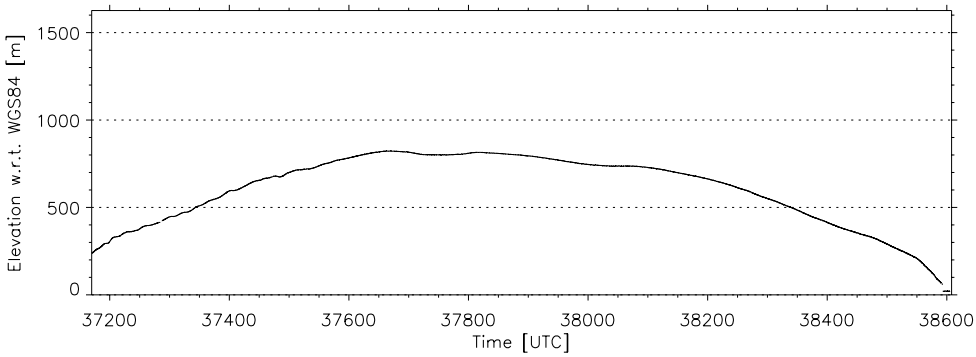


Date	2007−04−21	**Instrument Mode**	High Altitude
Start Time	10:02:16 (36136)	**Aircraft**	AWI/DLR D−CODE
Stop Time	10:07:10 (36430)	**Retracker**	TSRA
Distance	27.443 km	**INS Resolution**	50 Hz
Duration	00 h 04 m 55 s	**Processor Version**	3.08

A01_20070421

AS1TA01_ASILL1B0308200704 21T101930_20070421T104329_0005.DBL

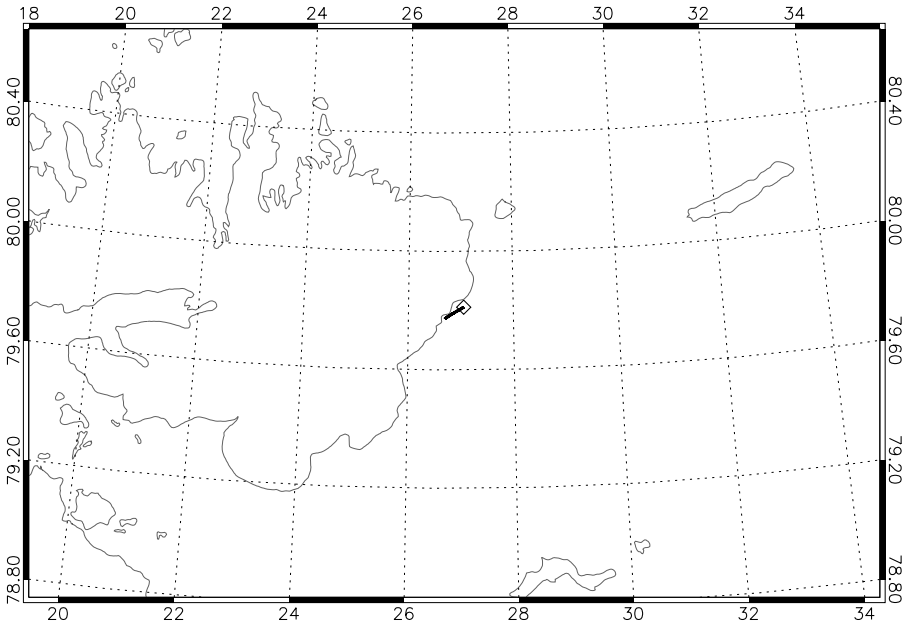


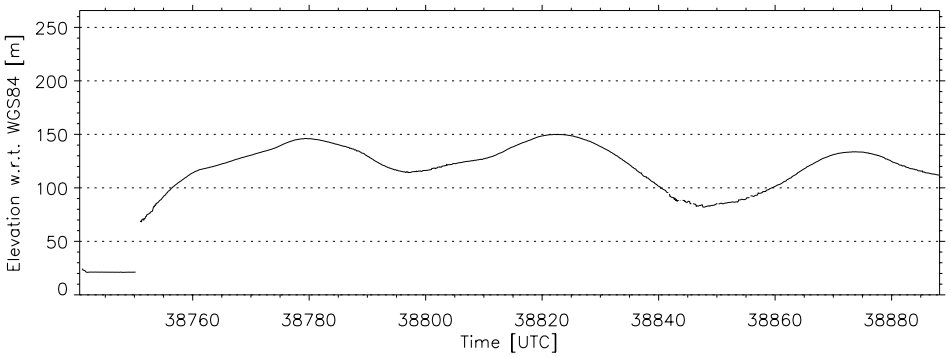


Date	2007-04-21	**Instrument Mode**	Low Altitude
Start Time	10:19:29 (37169)	**Aircraft**	AWI/DLR D-CODE
Stop Time	10:43:27 (38607)	**Retracker**	TSRA
Distance	100.143 km	**INS Resolution**	50 Hz
Duration	00 h 23 m 58 s	**Processor Version**	3.08

A02_20070421

AS1TA02_ASILL1B0308200704 21T104541_20070421T104809_0005.DBL

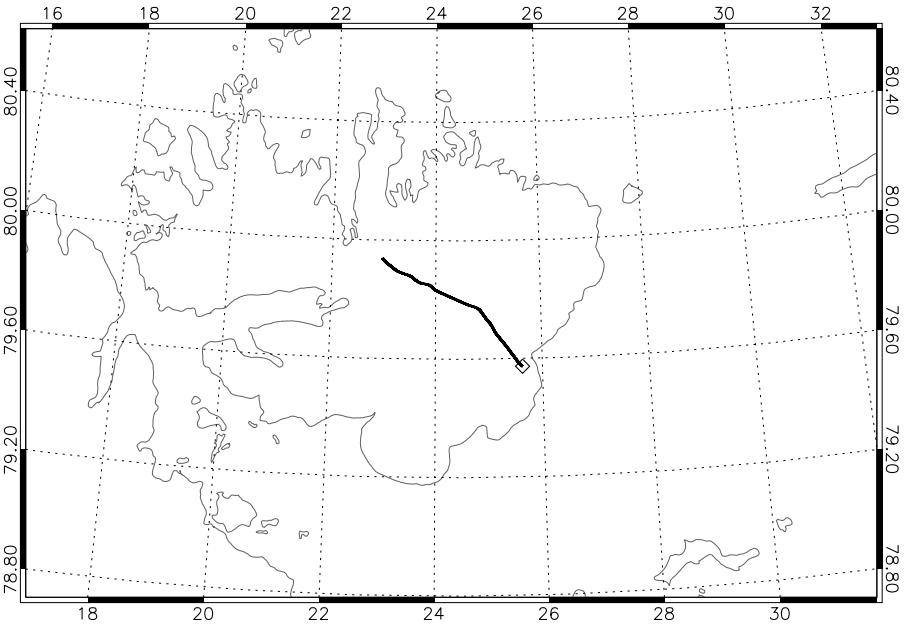


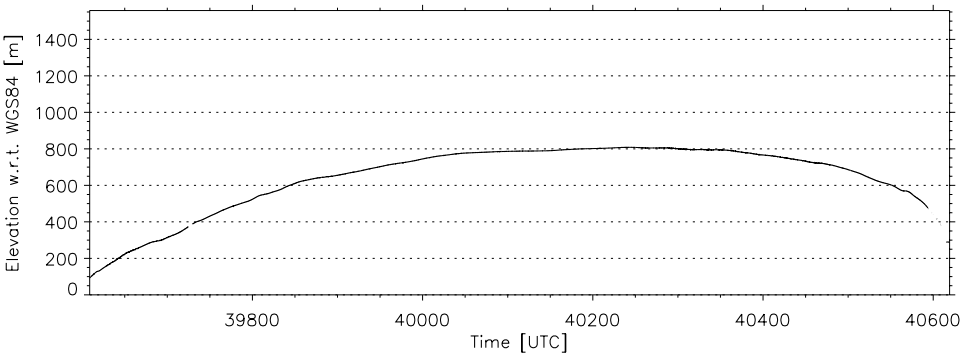


Date	2007-04-21	**Instrument Mode**	Low Altitude
Start Time	10:45:40 (38740)	**Aircraft**	AWI/DLR D-CODE
Stop Time	10:48:08 (38888)	**Retracker**	TSRA
Distance	8.289 km	**INS Resolution**	50 Hz
Duration	00 h 02 m 28 s	**Processor Version**	3.08

A03_20070421

AS1TA03_ASILL1B0308200704 21T110009_20070421T111700_0005.DBL

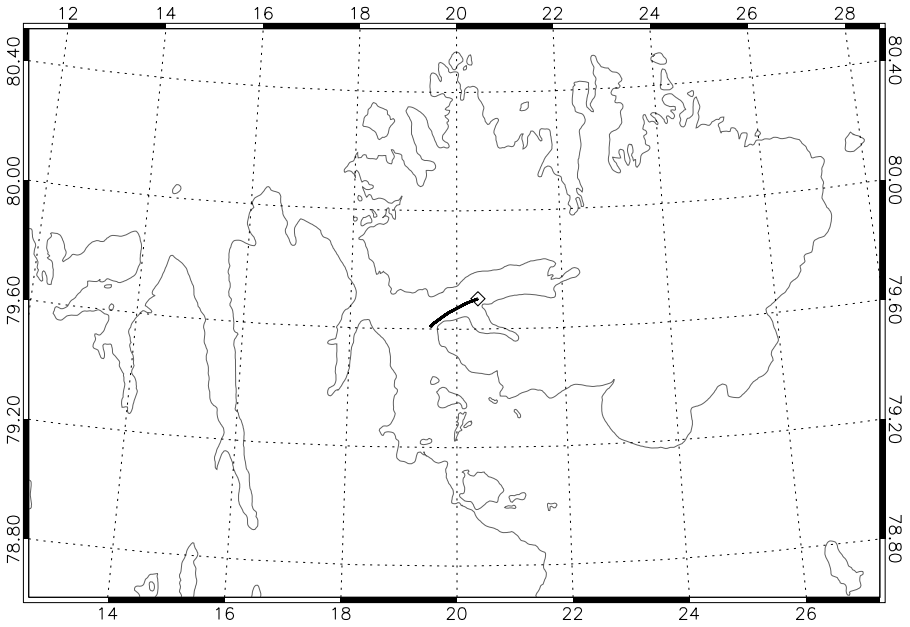


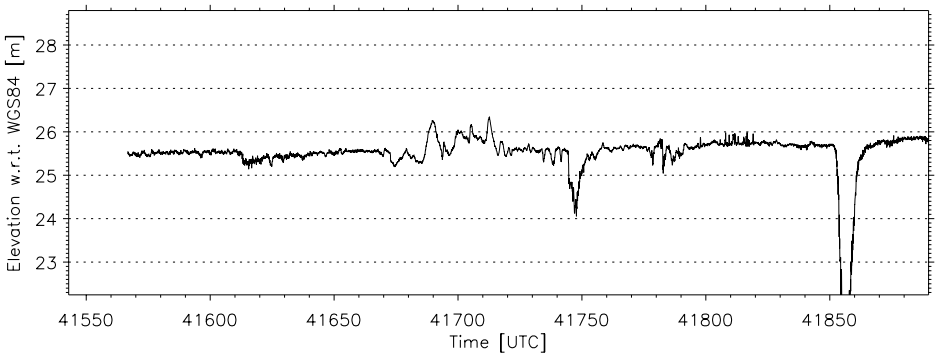


Date	2007-04-21	**Instrument Mode**	Low Altitude
Start Time	11:00:08 (39608)	**Aircraft**	AWI/DLR D-CODE
Stop Time	11:16:59 (40619)	**Retracker**	TSRA
Distance	68.636 km	**INS Resolution**	50 Hz
Duration	00 h 16 m 50 s	**Processor Version**	3.08

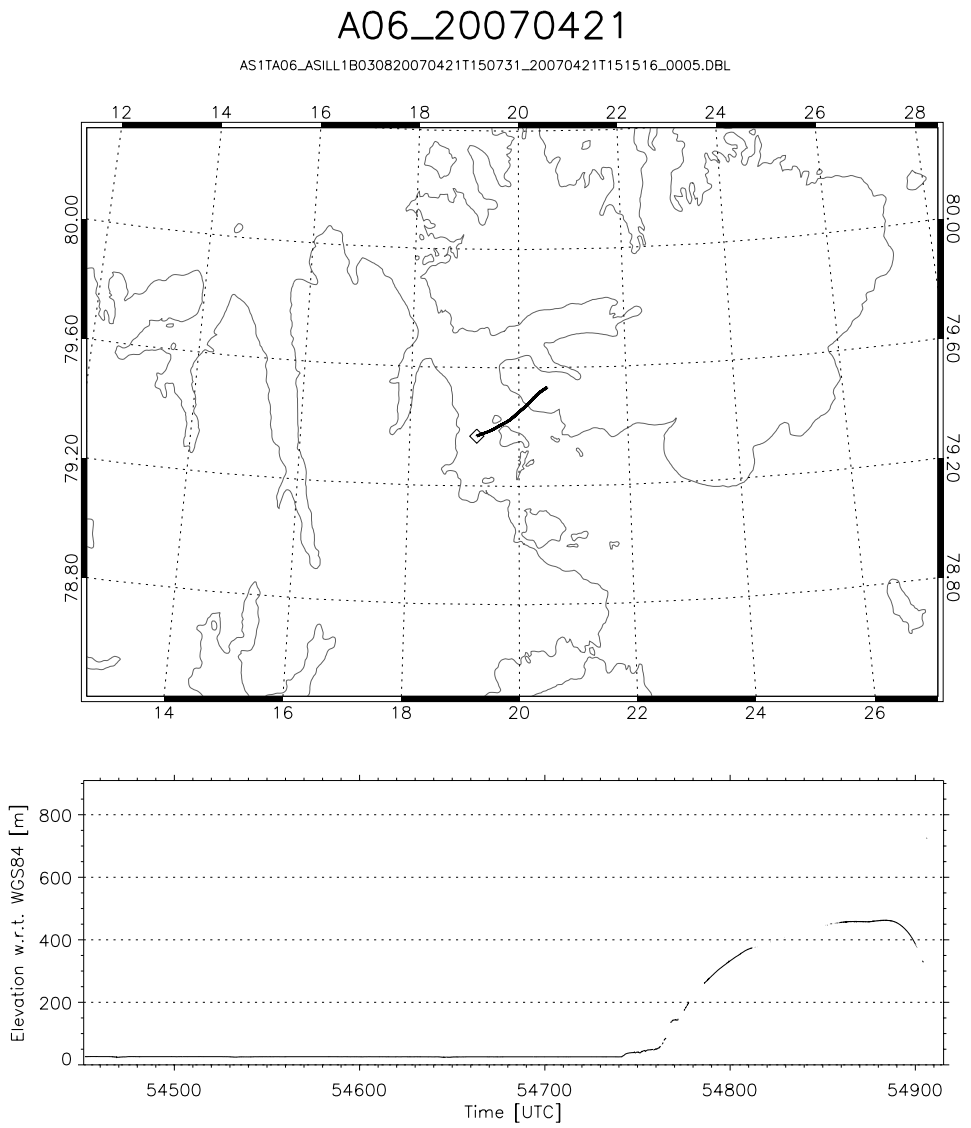
A05_20070421

AS1TA05_ASILL1B0308200704 21T113223_20070421T113811_0005.DBL

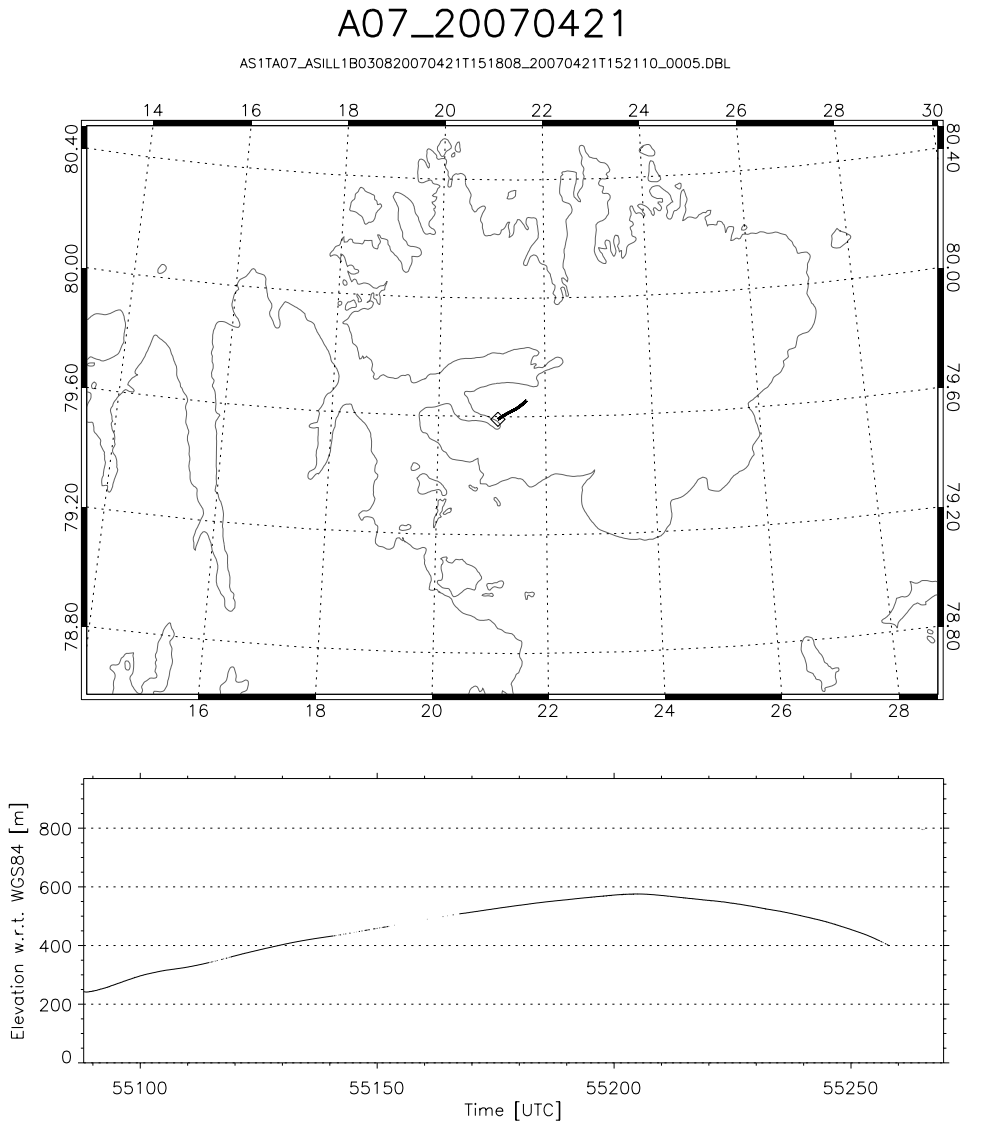




Date	2007−04−21	**Instrument Mode**	Low Altitude
Start Time	11:32:22 (41542)	**Aircraft**	AWI/DLR D−CODE
Stop Time	11:38:09 (41889)	**Retracker**	TSRA
Distance	20.941 km	**INS Resolution**	50 Hz
Duration	00 h 05 m 47 s	**Processor Version**	3.08



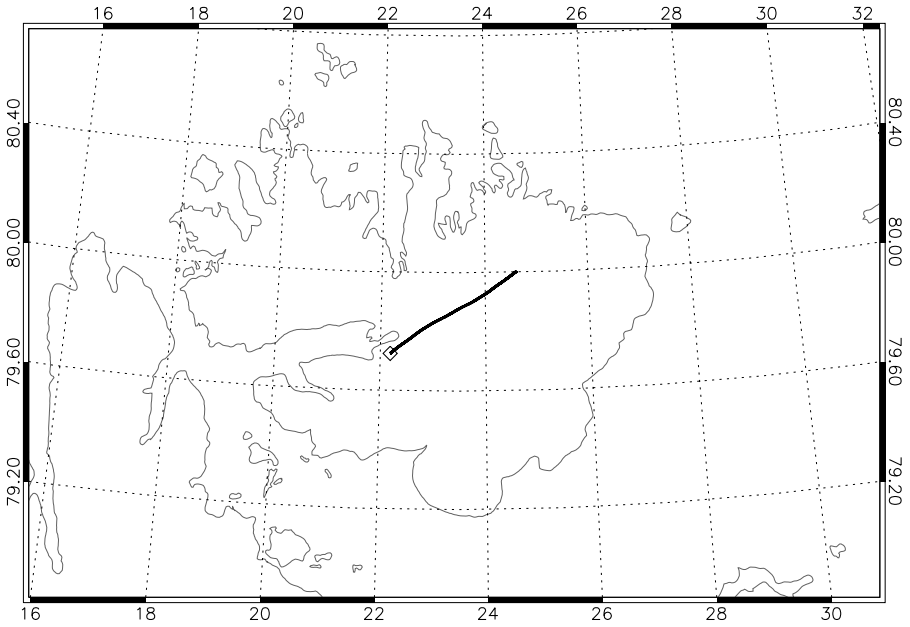
Date	2007−04−21	**Instrument Mode**	Low Altitude
Start Time	15:07:31 (54451)	**Aircraft**	AWI/DLR D−CODE
Stop Time	15:15:15 (54915)	**Retracker**	TSRA
Distance	32.558 km	**INS Resolution**	50 Hz
Duration	00 h 07 m 44 s	**Processor Version**	3.08

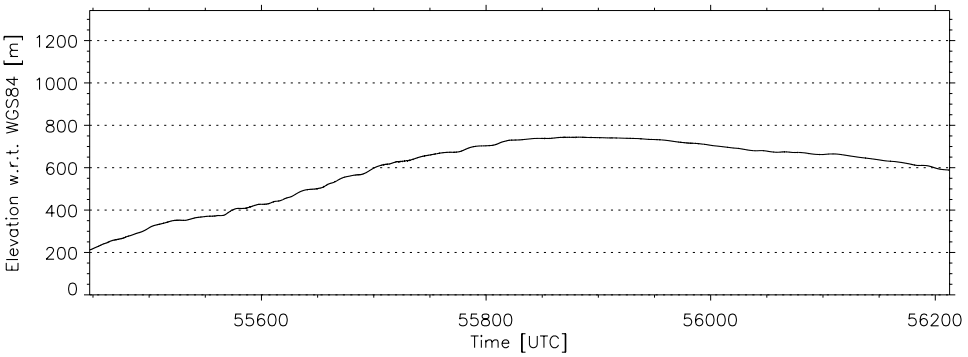


Date	2007−04−21	**Instrument Mode**	Low Altitude
Start Time	15:18:08 (55088)	**Aircraft**	AWI/DLR D−CODE
Stop Time	15:21:09 (55269)	**Retracker**	TSRA
Distance	12.903 km	**INS Resolution**	50 Hz
Duration	00 h 03 m 01 s	**Processor Version**	3.08

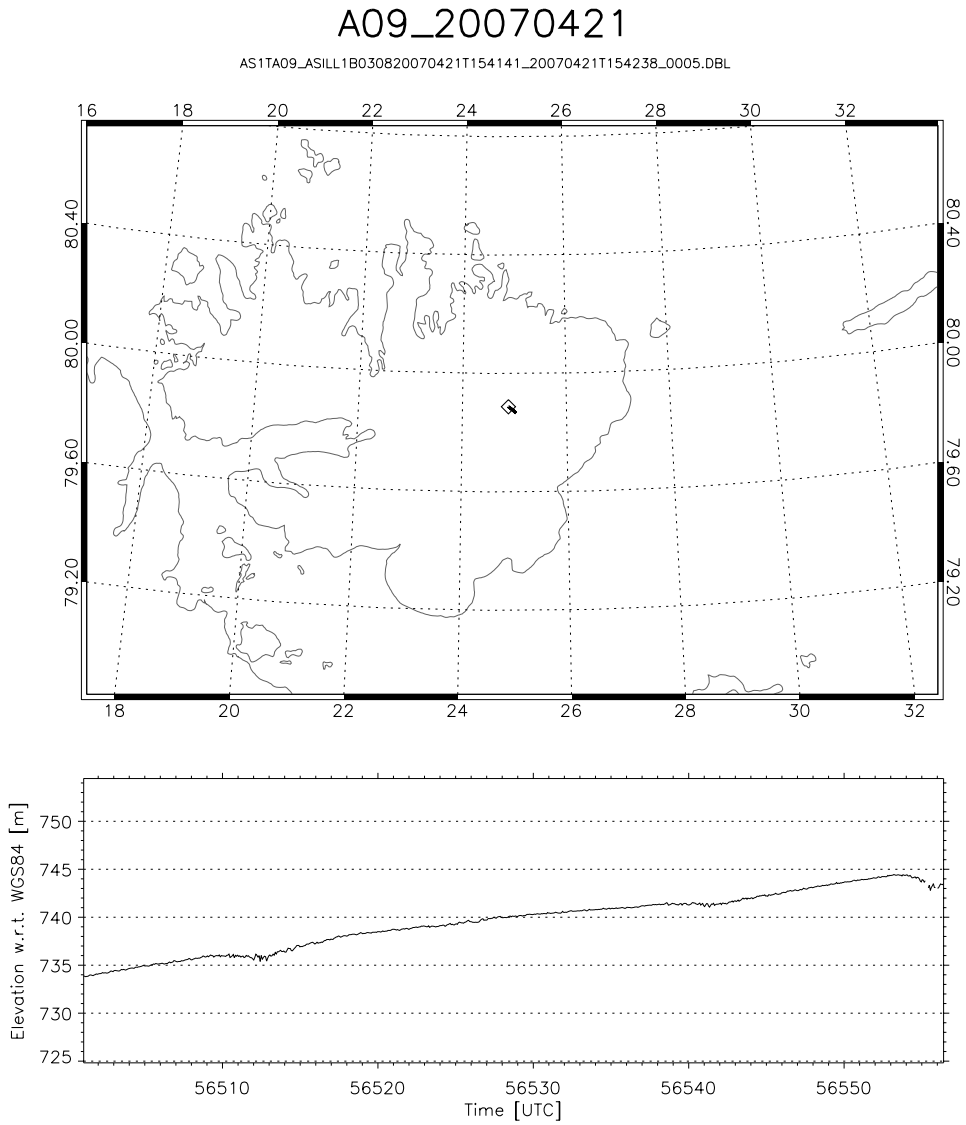
A08_20070421

AS1TA08_ASILL1B0308200704 21T152407_20070421T153654_0005.DBL





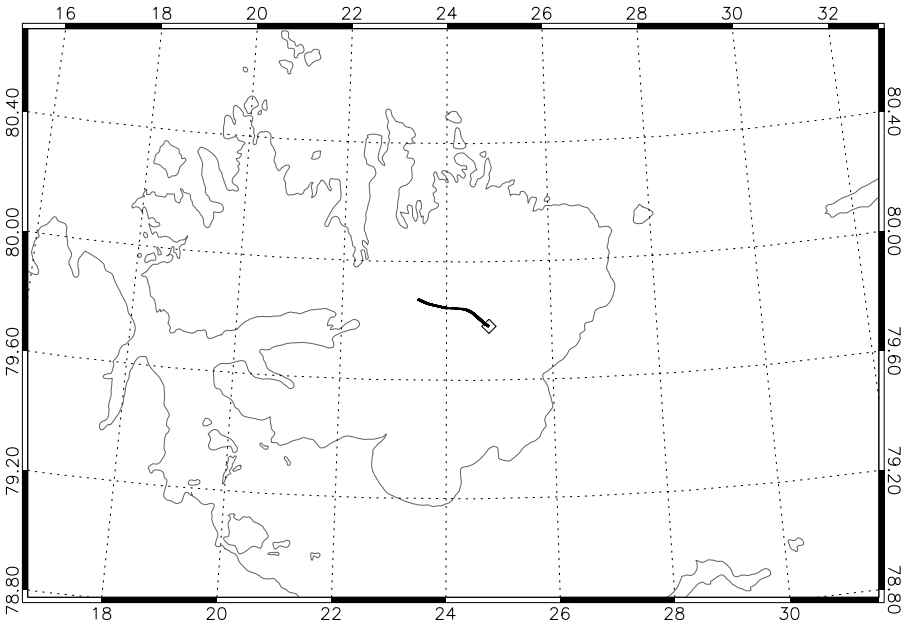
Date	2007-04-21	**Instrument Mode**	Low Altitude
Start Time	15:24:07 (55447)	**Aircraft**	AWI/DLR D-CODE
Stop Time	15:36:52 (56212)	**Retracker**	TSRA
Distance	56.819 km	**INS Resolution**	50 Hz
Duration	00 h 12 m 46 s	**Processor Version**	3.08

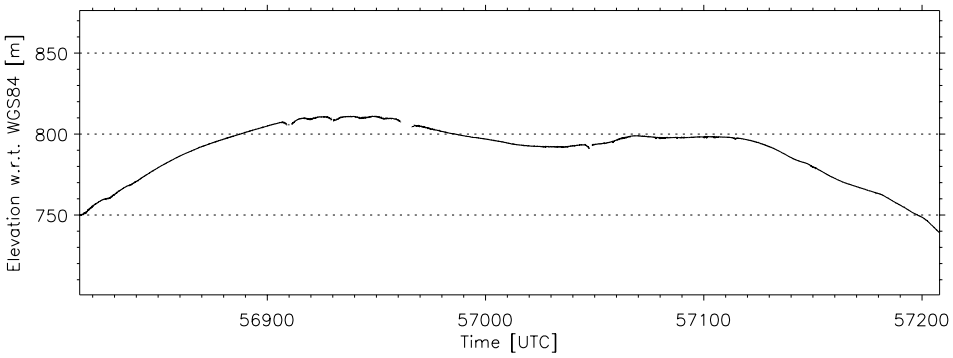


Date	2007−04−21	**Instrument Mode**	Low Altitude
Start Time	15:41:41 (56501)	**Aircraft**	AWI/DLR D−CODE
Stop Time	15:42:36 (56556)	**Retracker**	TSRA
Distance	3.771 km	**INS Resolution**	50 Hz
Duration	00 h 00 m 55 s	**Processor Version**	3.08

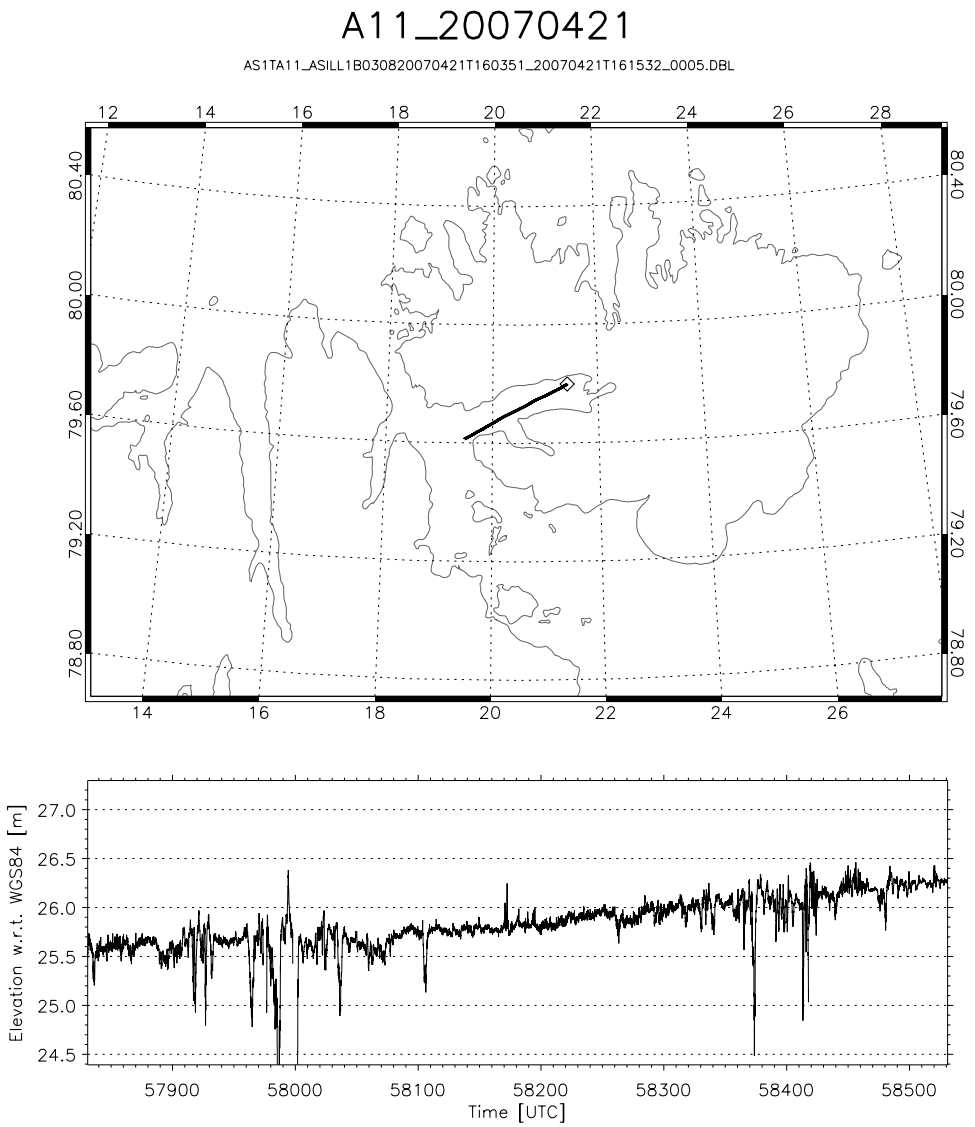
A10_20070421

AS1TA10_ASILL1B0308200704 21T154654_20070421T155329_0005.DBL

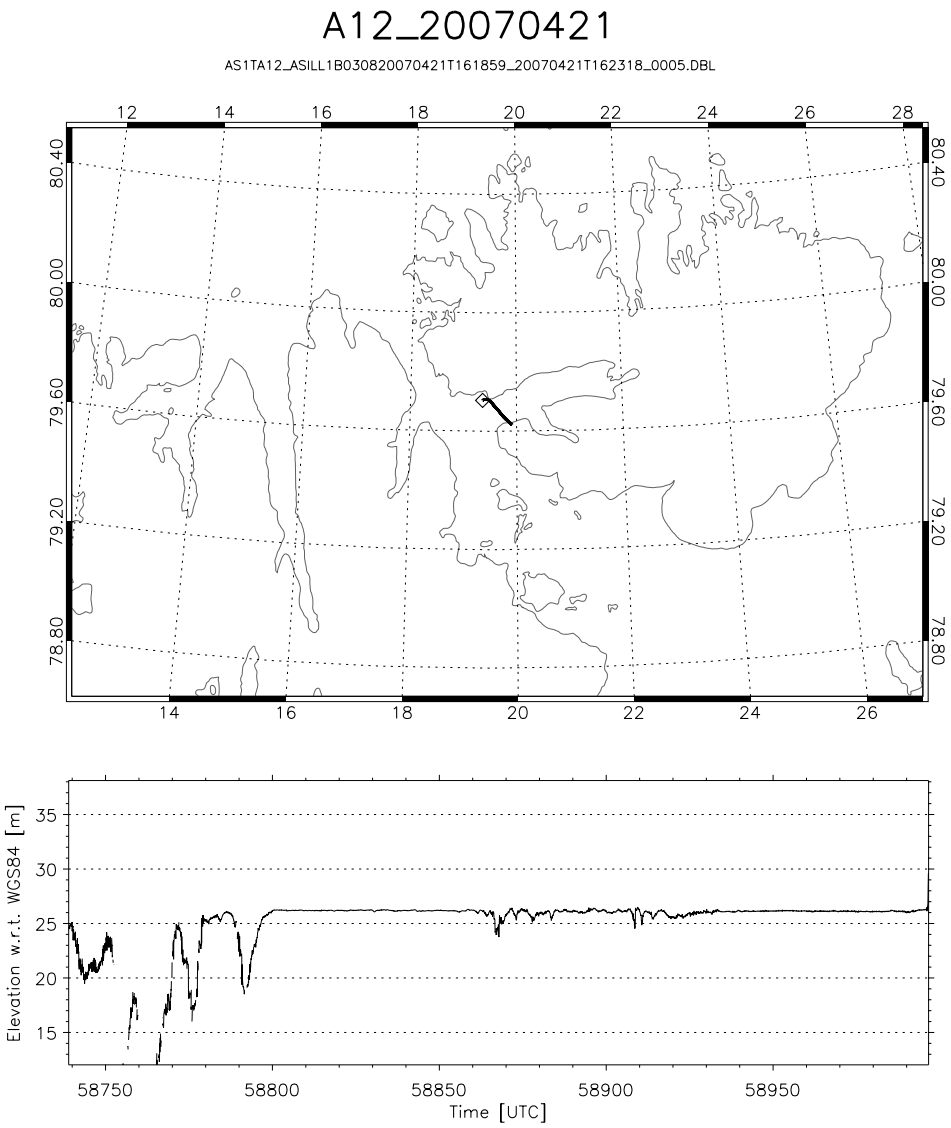




Date	2007-04-21	**Instrument Mode**	Low Altitude
Start Time	15:46:54 (56814)	**Aircraft**	AWI/DLR D-CODE
Stop Time	15:53:28 (57208)	**Retracker**	TSRA
Distance	29.377 km	**INS Resolution**	50 Hz
Duration	00 h 06 m 34 s	**Processor Version**	3.08



Date	2007−04−21	**Instrument Mode**	Low Altitude
Start Time	16:03:50 (57830)	**Aircraft**	AWI/DLR D−CODE
Stop Time	16:15:31 (58531)	**Retracker**	TSRA
Distance	43.824 km	**INS Resolution**	50 Hz
Duration	00 h 11 m 40 s	**Processor Version**	3.08



Date	2007−04−21	**Instrument Mode**	Low Altitude
Start Time	16:18:58 (58738)	**Aircraft**	AWI/DLR D−CODE
Stop Time	16:23:16 (58996)	**Retracker**	TSRA
Distance	15.191 km	**INS Resolution**	50 Hz
Duration	00 h 04 m 18 s	**Processor Version**	3.08

List of Figures

List of Tables

Bibliography

Cullen, R., Asiras - product description, *Tech. Rep. 2.5*, ESA, 2006.

Helm, V., S. Hendricks, S. Goebell, W. Rack, C. Haas, U. Nixdorf, and T. Boebel, Cryovex 2004 and 2005 (bob) data aquisition and final report, *Tech. Rep. 1.0*, Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany, 2006.

Stenseng, L., S. Hvidegaard, H. Skourup, R. Forsberg, C. Anderson, S. Hanson, R. Cullen, and V. Helm, Airborne lidar and radar measurements in and around greenland - cryovex 2006, *Tech. rep.*, Danish National Space Center, 2007.