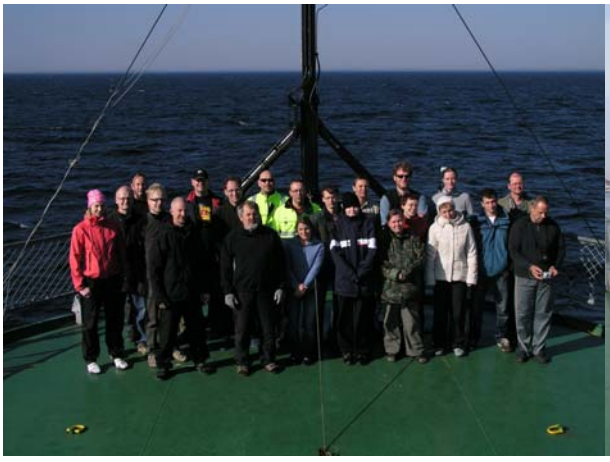
INFLOW Interim Report No. 1

INFLOW CRUISE REPORT:

SEDU 2009

The RV Aranda 22nd April – 29th April 2009



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BONUS INFLOW

Title **INFLOW Cruise Report** **SEDU 2009, the RV Aranda 22.-29.4.2009**	INFLOW Interim Report No. **1**		
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VSEGEI = A. P. Karpinsky Russian Geological Research Institute, St. Petersburg, Russia
IOW = Leibniz Institute for Baltic Sea Research Warnemünde, Germany

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Contents

Appendices:

1. SEDU 2009 Participants (22.-29.4.209)

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EMI = Estonian Marine Institute, Estonia
GEUS = Geological Survey of Denmark and Greenland
GTK = Geological Survey of Finland, Espoo, Finland
IOW = Leibniz Institute for Baltic Sea Research Warnemünde, Germany
SYKE = Marine Research Centre of the Finnish Environment Institute, Finland
VSEGEI= A.P Karpinsky Russian Geological Research Institute, St. Petersburg, Russia

2. Introduction

BONUS INFLOW project partners from GTK/Finland, Department of Geology/University of Helsinki/Finland, VSEGEI/Russia, Szczecin University/Poland, IOW/Germany and Lund University/Sweden participated in research vessel Aranda (Figure 1) SEDU 2009 "Sediment EDUcation" –cruise to the Baltic Sea 22.-29.4.2009. Altogether 31 scientists and students, 17 of them from INFLOW –project, participated in the cruise.

The main purposes of the SEDU 2009 -cruise were to collect surface sediment samples and long sediment cores, as well as echo-sounding data, for BONUS INFLOW project purposes. In addition to that main emphasis was to organize sediment related hands-on-activities and education onboard (Floating University field course), covering the INFLOW topics (e.g. sediment proxies, dating approaches, modelling). Other activities included bio-optical measurements of seawater, sampling for bacteria and viruses in seawater, spring bloom plankton sampling and collecting sediment material for BONUS Baltic Gas project.

The SEDU 2009 cruise was organized by Finnish Environment Institute (SYKE) and co-chiefed by Dr. Harri Kankaanpää.

Figure 1. Researh vessel Aranda. Photo: Aarno Kotilainen, GTK.

3. Study area

Study area of the SEDU 2009 Cruise was the Gulf of Finland, the northern Baltic Proper, the Gotland Deep, the Åland Sea, the Bothnian Sea, and the Archipelago Sea (Figure 2).

The Leg 1 of the SEDU 2009 Cruise (from Helsinki to Mariehamn) was carried out from 22nd April to 25th April 2009. The Leg 2 of the SEDU 2009 Cruise (from Mariehamn to Helsinki) was carried out from 26th April to 29th April 2009.

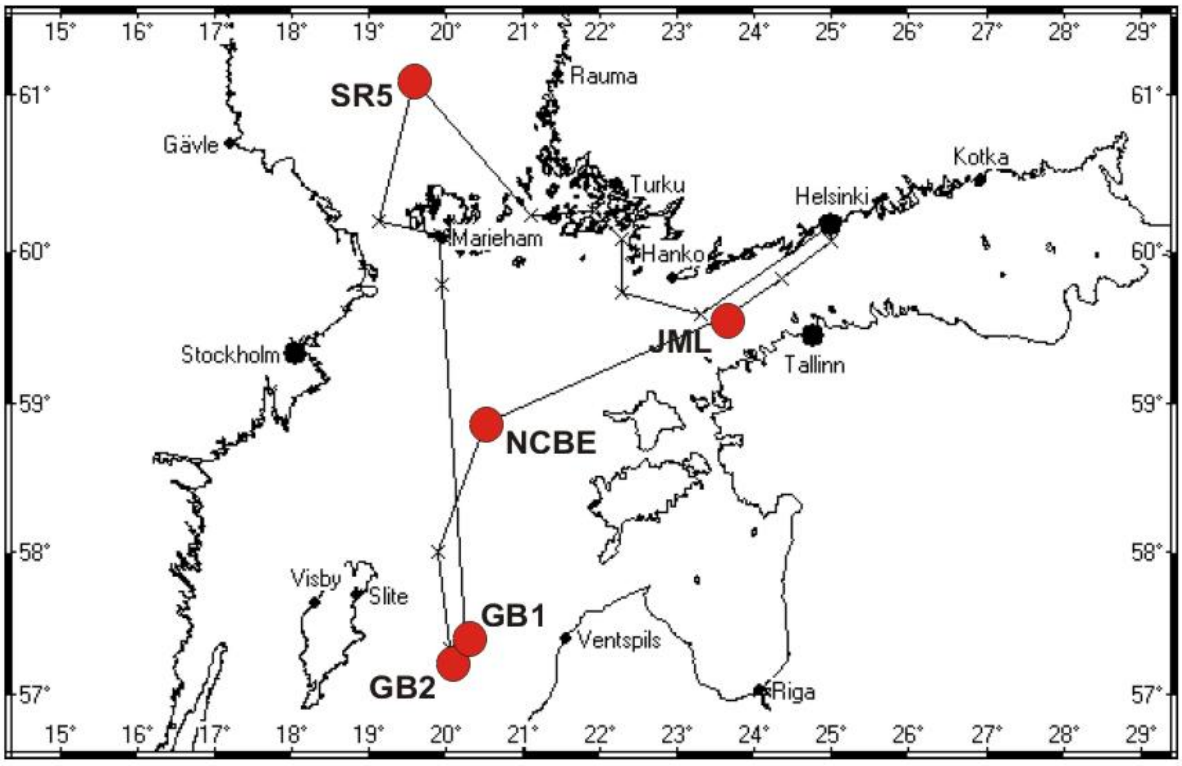

Figure 2. Route of the RV Aranda during the SEDU 2009 cruise. The key-sites for INFLOW studies (Sites JML, NCBE, GB1, GB2 and SR5) in the northern Baltic Sea are indicated by red dots.

4. Methods of study and sampling

4.1. Positioning

The vessel as well as its survey systems in use were continuously positioned using the DGPS (Differential Global Positioning System) with ± 2 m accuracy.

4.2. Echo-sounding

The acoustic survey during the SEDU 09 –cruise were performed using 12 kHz echo-sounder. The acoustic data was recorded and stored digitally by using a MD DSS sonar system©.

4.3. Sediment sampling methods

4.3.1. GEMAX –corer

Surface sediment samples from soft bottoms were recovered using a GEMAX twin barrelled gravity corer (Figure 3) with an inner diameter of 90 mm of the core liner.

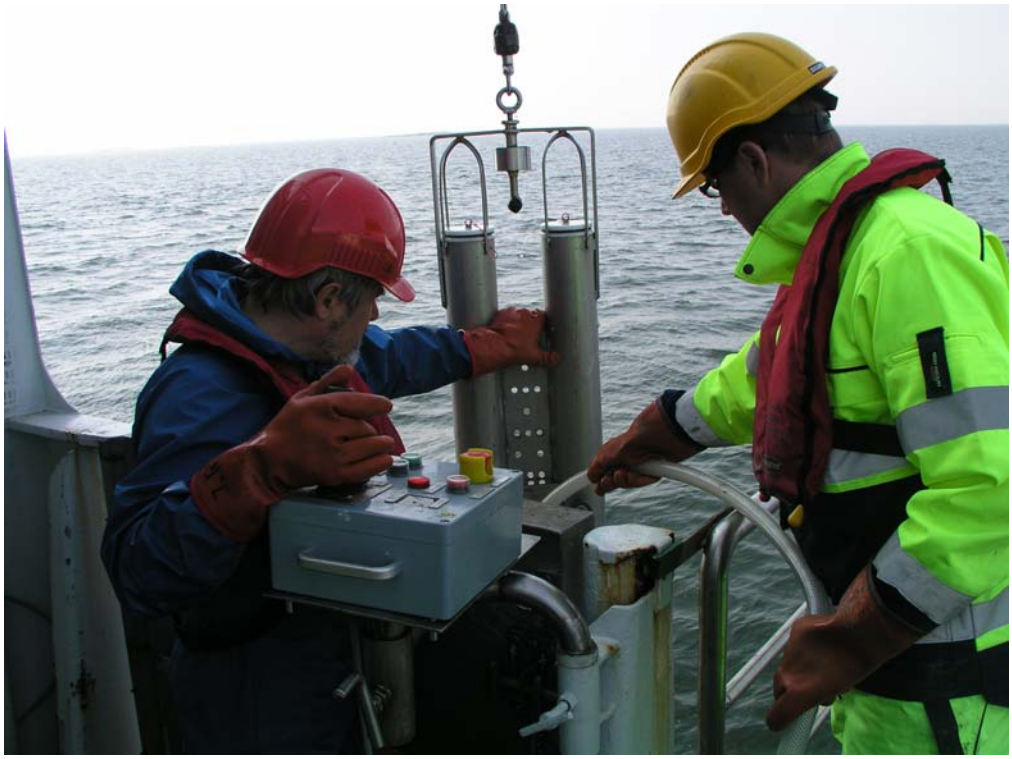

Figure 3. GEMAX -corer in use onboard RV Aranda. Photo: Aarno Kotilainen, GTK.

©MD DSS Multi-Mode Sonar System for Sub-Bottom Profiling, Meridata Finland Ltd

4.3.2. Multicorer (MUC)

Surface sediment samples from soft bottoms were recovered also using IOW's multicorer (Figure 4) that has 4 cores/ core liner.

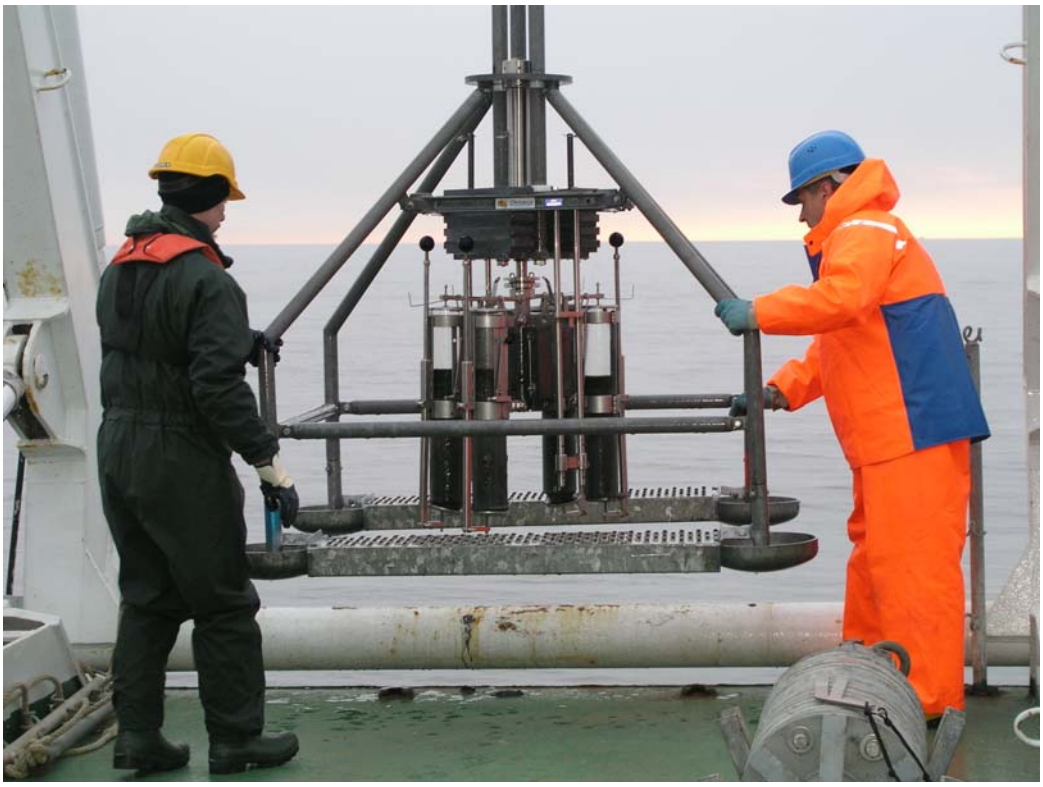

Figure 4. Multicorer in use onboard RV Aranda. Photo: Aarno Kotilainen, GTK.

4.3.3. Gravity corer

Long sediments cores were recovered using IOW's 9 meters long Gravity corer (Figure 5). The first sediment core at every site was normally taken with plastic (inner) foil in order to check the type of sediment. Next sediment cores were recovered with liner.

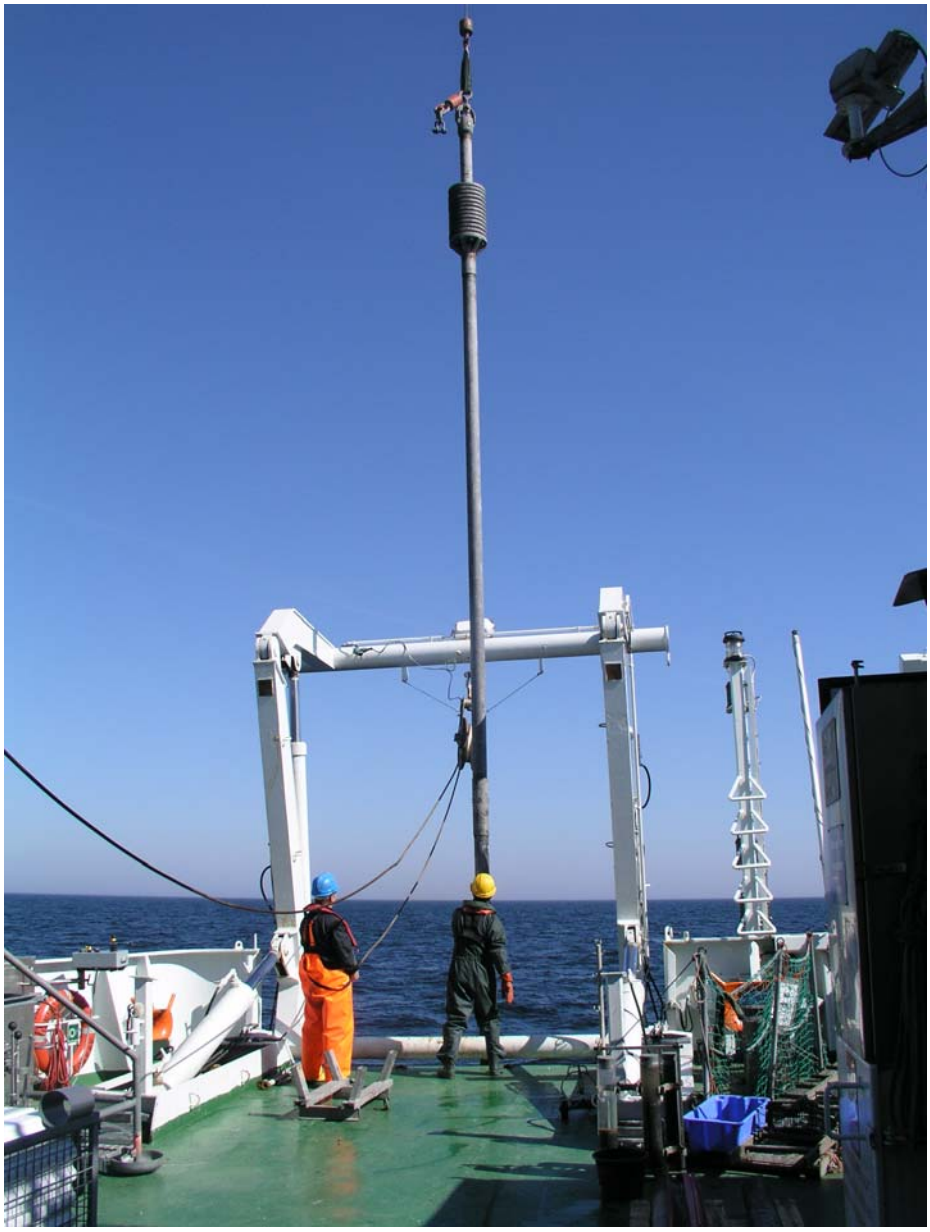

Figure 5. IOW's 9 m long gravity corer in use onboard RV Aranda. Photo: Aarno Kotilainen, GTK.

4.3.4. Mini ice finger (MIF)

To recover sediment samples for high-resolution studies of fluffy (i.e. very soft) surface sediments (taken using GEMAX corer) we did employ Mini ice finger (MIF) –method (suom. Minijääsormi – näytteenotin). MIF –method has been developed in University of Turku, Department of Geology (Saarinen et al. 2005). Inner core/liner of MIF was 310 mm long, a 1 mm thick, rectangular, hollow aluminium bar with inner diameter of 13 mm. Before sampling the lowermost end of aluminium bar

will be blocked e.g. with tape or wedge. MIF will then be pressed slowly into the sediment (that is in GEMAX core liner). Since MIF is in the sediment, it will be filled gingerly with dry ice (solid carbon dioxide, −78.5 °C). As dry ice evaporates more dry ice will be added into MIF gradually. MIF will be kept in sediment around 20-30 minutes, until enough sediment around MIF is frozen. Then the MIF will be removed (pull out) from sediment core carefully and surface of the frozen sediment will be trimmed (using e.g. knife) (Figure 6). The frozen sediment will be wrapped/packed, labelled and stored in freezer. It is possible to remove MIF (aluminium bar) from the frozen sediment before packing e.g. pouring hot water carefully into MIF and pulling it out. Instruments used in MIF sampling are shown in Figure 7.

Figure 6. Frozen surface sediment sample taken using mini ice finger. Photo: Aarno Kotilainen, GTK.

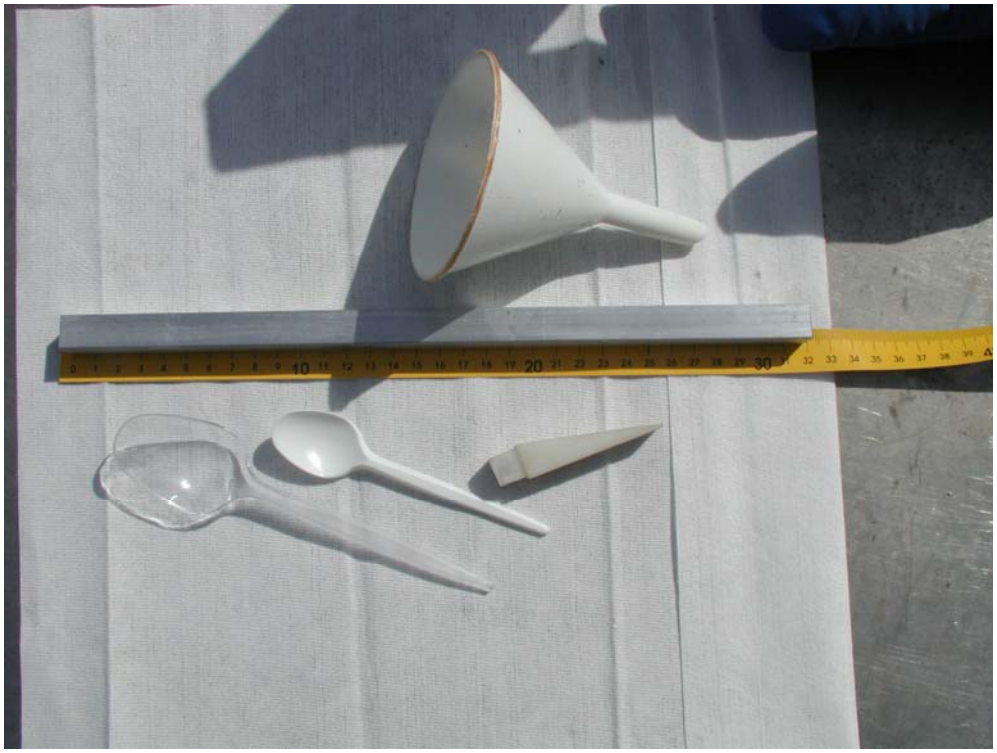

Figure 7. Instruments used in mini ice finger (MIF) sampling. Photo: Aarno Kotilainen, GTK.

4.4. Sediment descriptions

All recovered sediment cores were photographed and documented onboard. Sedimentological descriptions of GEMAX cores were made both through the plastic core liner and from the splitted and trimmed sediment surfaces. After coring one of the two GEMAX cores obtained was usually split vertically for description and the other one was used for sub-sampling. Standard GTK description forms were used.

A long sediment cores were cut into 100 cm sections and labelled. Then whole-core sections were split into two halves, archive and work halves. The work halves were described visually (e.g. sedimentary structures, sedimentary disturbances, colour) and photographed (Figure 8). Then work halves were run through magnetic susceptibility (MS) device, and stored in the cold store.

Figure 8. Sedimentologist on duty in laboratory onboard the RV Aranda. Photo: Aarno Kotilainen, GTK.

4.5. Magnetic susceptibility (MS)

Immediately after splitting of sediment cores (GEMAX and gravity) their surfaces were trimmed and covered with thin plastic film (©Elmukelmu). The magnetic susceptibility (MS) was then measured at 0.5 cm intervals using a Bartington Instruments Ltd MS2E1 surface scanning sensor coupled to a TAMISCAN-TS1 automatic logging conveyor (Figure 9), which was interfaced to a PC.

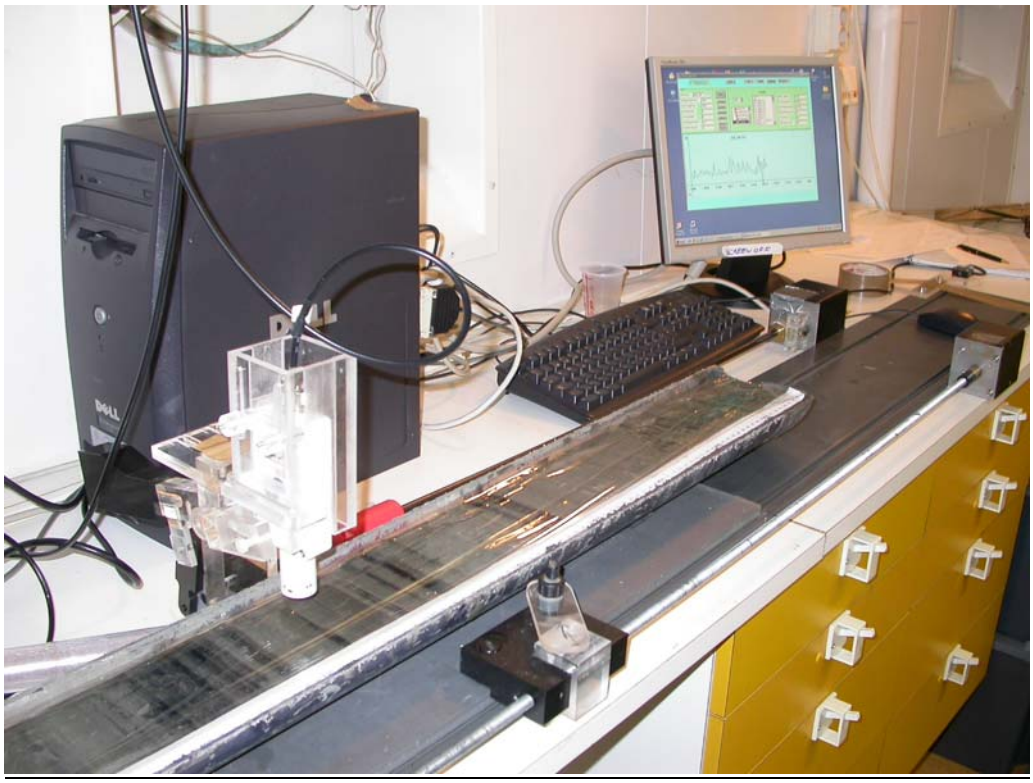

Figure 9. A Bartington Instruments Ltd MS2E1 surface scanning sensor coupled to a TAMISCAN-TS1 automatic logging conveyor. Photo: Ian Snowball.

4.6. Subsampling

All surface sediment cores (GEMAX cores) and selected long sediment cores were subsampled onboard Aranda during the cruise. The surface sediment cores were sliced normally into 0.5 or 1 cm thick subsamples onboard and packed in plastic bags and boxes. Subsamples of long sediment cores were taken from selected intervals for various analysis including microfossil (e.g. diatoms), geochemical, sediment structure and palaeomagnetic studies.

The oriented sub-samples for paleomagnetic and mineral magnetic studies were taken from the cut and trimmed sediment core sections using annotated polystyrene sample boxes (size of 2 x 2 x 2 cm). The plastic cubes (with a small hole drilled in the base for bleeding air during insertion into the sediment) were pressed into the sediment parallel to the trimmed sediment surface and one side of the cube oriented parallel to the long axis of the core (Figure 10).

Figure 10. Palaeomagnetic sub-sampling party onboard RV Aranda.

Continuous subsamples for the primary and biogenic sedimentary structure studies (for X-ray radiographs) were collected using plastic (electrical installation) liners 50cm x 5 cm x 1 cm in cross section. Plastic liners were pushed into trimmed core sections, cut out with a steel string and sealed. Plastic liners were taken from both surface sediment and long sediment cores. All sub-samples were kept refrigerated onboard (or frozen if needed).

5. Survey and sediment data

5.1. Survey data

Altogether over 950 nautical miles (1700 km) of echo-sounding data was collected during the SEDU 2009 –cruise Leg 1 (Figure 2 and Appendix 1). All data is stored in DVD –disks. Echo-sounding

data was collected also from stations (Table 1). Collected acoustic data was of good quality due to favourable weather conditions. An example of echo-sounding data is shown in figure 11.

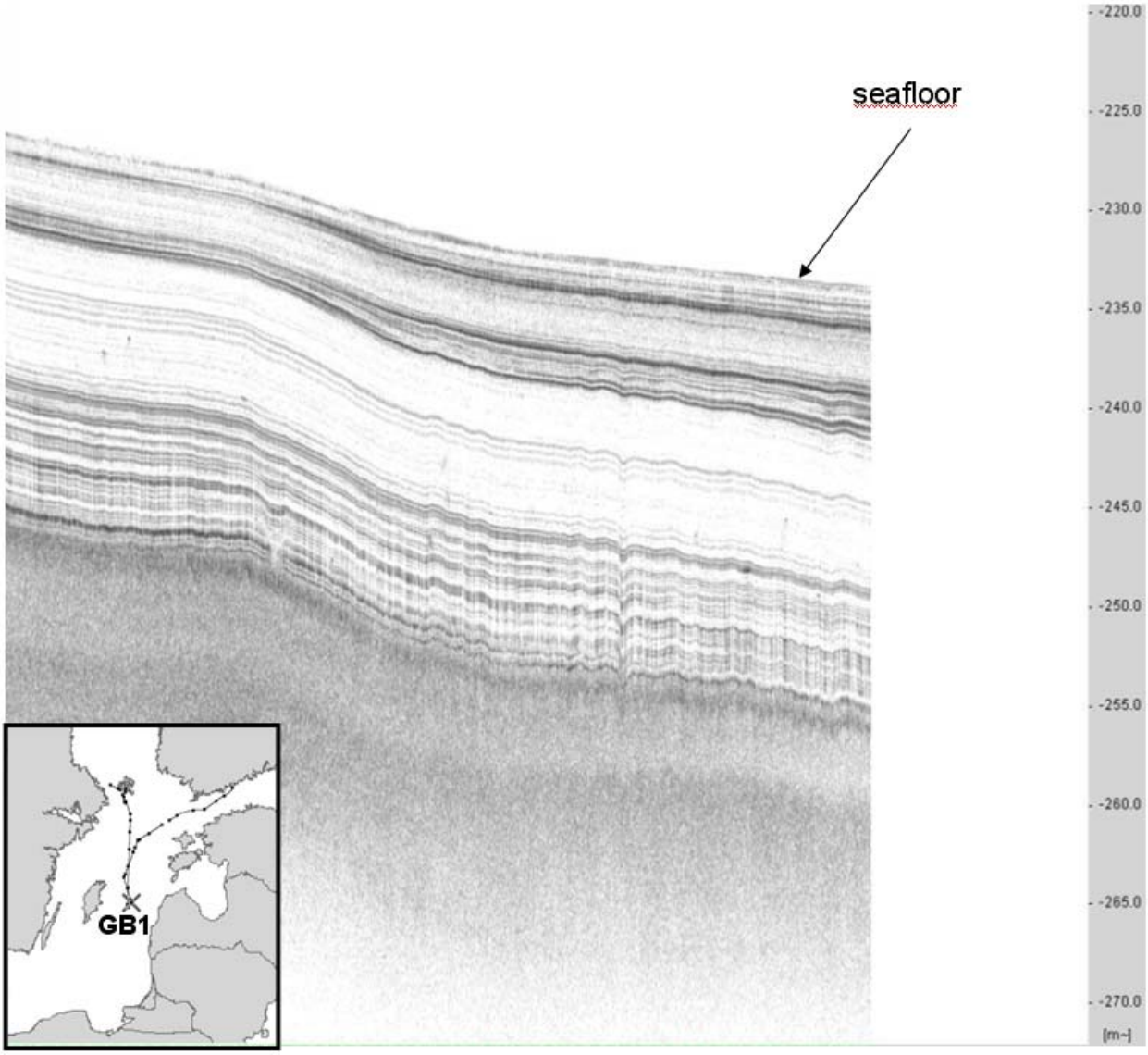

Figure 11. 12 kHz Echo-sounding profile from site GB1. Vertical scale in meters is shown in the figure too on the right-hand side).

5.2. Sediment cores

A total of 11 Sites were sampled during the SEDU 2009 cruise (Table 1). Surface sediment samples from Sites JML, NCB_IN, GB1, GB2, F69, Åland Deep (ÅD), SR5, SMA, AIRISTO2 and AS2

were recovered using a GEMAX corer. Multicorer (MUC) samples were collected from Sites JML, NCB_IN, GB1, GB2, F69, Åland Deep (ÅD), SR5, AIRISTO2 and AS2. In addition surface sediment samples were collected from Site Åland Deep (ÅD) and LL11.

Long sediment cores were recovered from 8 Sites; JML, NCB_IN, GB1, GB2, F69, Åland Deep (ÅD), SR5 and SMA). A total of 78 meters of sediment were collected. The longest sediment core recovered was 861 cm long (SMA Site).

5.3. Mini ice finger samples

Mini ice finger samples were collected from GEMAX surface sediment cores that were recovered from INFLOW key-sites JML, NCB_IN, GB1, GB2 and SR5.

5.4. Magnetic susceptibility data

Magnetic susceptibility (MS) was measured from all GEMAX surface sediment cores MGGN-2009-1 – MGGN-2009-10. MS was measured onboard also from all (8) long sediment cores.

6. Education – "Floating University"

INFLOW -project partners organized together with SYKE scientist an educational program during the SEDU 2009 Cruise. Educational program included lectures, student presentations, hand-on activities in sediment studies (e.g. sediment description, various sub-sampling) as well as planning survey grids and executing echo-sounding profiling. For more detailed information see Floating University Report by Daria Ryabchuk and Mia Kotilainen (2009).

Table 1. Sediment samples recovered from main stations during SEDU 09 cruise.

Site	Core ID number	Corer type	Lat (N) Lon (E)	Core length (cm)	Depth (m)	Time (Finnish Summer Time)
JML	370510-2	MUC	59°34.908 23°37.572		80	22.4.2009 19:56
JML	370510-3/ (MGGN-2009-1)	GEMAX	59°34.908 23°37.572		80	22.4.2009 20:05
JML	370510-4	GC (foil)	59°34.908 23°37.572		80	22.4.2009 21:20
JML	370510-5	GC (liner)	59°34.907 23°37.572	557	80	22.4.2009 21:56
JML	370510-6*	GC (liner)	59°34.949 23°37.909	553	80	22.4.2009 22:58
NCB_IN	370520-2	MUC	58°53.660 20°34.427		182	23.4.2009 10:41
NCB_IN	370520-3 (MGGN-2009-2)	GEMAX-1	58°53.660 20°34.427		182	23.4.2009 10:50
NCB_IN	370520-4	GEMAX-2	58°53.662 20°34.428		182	23.4.2009 11:08
NCB_IN	370520-5	GC-1 (foil)	58°53.657 20°34.419		182	23.4.2009 12:23
NCB_IN	370520-6	GC-2 (liner)	58°53.657 20°34.419	476	182	23.4.2009 13:03
NCB_IN	370520-7	GC-3 (liner)	58°53.657 20°34.419		182	23.4.2009 13:43
GB1	370530-2	MUC	57°23.123 20°15.489		230	24.4.2009 09:55
GB1	370530-3 (MGGN-2009-3)	GEMAX	57°23.123 20°15.490		230	24.4.2009 10:10
GB1	370530-4	GC-1 (foil)	57°23.123 20°15.490		230	24.4.2009 10:50
GB1	370530-5	GC-2 (liner)	57°23.123 20°15.489	498	230	24.4.2009 11:16
GB2	370540-2	MUC	57°17.025 20°07.269		243	24.4.2009 13:25
GB2	370540-3 (MGGN-2009-4)	GEMAX	57°17.025 20°07.269		243	24.4.2009 13:33
GB2	370540-4	GC-1 (foil)	57°17.025 20°07.271		243	24.4.2009 14:00
GB2	370540-5	GC-2 (liner)	57°17.011 20°07.246	745	243	24.4.2009 15:04
GB2	370540-6	GC-3 (liner)	57°17.011 20°07.248		243	24.4.2009 15:50
F69	370550-2	MUC	59°47.000 19°55.801		200	25.4.2009 10:49
F69	370550-3 (MGGN-2009-5)	GEMAX	59°47.000 19°55.800		200	25.4.2009 10:57
F69	370550-4	GC-1 (foil)	59°46.998 19°55.796		200	25.4.2009 12:29
F69	370550-5*	GC-2 (liner)	59°46.996 19°55.784		200	25.4.2009 13:22

MUC = multicorer, GEMAX = GEMAX corer for surface sediment sampling, GC = gravity corer
* sediment core for the BONUS Baltic Gas -project

(Table 1 continues).

Site	Core ID number	Corer type	Lat (N) Lon (E)	Core length (cm)	Depth (m)	Time (Finnish Summer Time)
ÅD	370560-2	MUC	60°11.653 19°07.213		264	25.4.2009 10:08
ÅD	370560-3 (MGGN-2009-6)	GEMAX	60°11.653 19°07.214		264	25.4.2009 10:13
ÅD	370560-4	GC-1 (foil)	60°11.652 19°07.213		264	25.4.2009 10:45
ÅD	370560-5	GC-2 (liner)	60°11.650 19°07.211	788	264	25.4.2009 11:23
ÅD	370560-6	VV	60°11.650 19°07.211		264	25.4.2009 12:22
SR5	370570-2	MUC	61°05.115 19°34.703		125	26.4.2009 18:24
SR5	370570-3 (MGGN-2009-7)	GEMAX	61°05.115 19°34.703		125	26.4.2009 18:35
SR5	370570-4	GC-1 (foil)	61°05.115 19°34.703		125	26.4.2009 18:50
SR5	370570-5	GC-2 (liner)	61°05.115 19°34.703	608	125	26.4.2009 19:43
SMA_sed	MGGN-2009-8	GEMAX	60°13.729 21°04.214		28	27.4.2009 11:00
SMA_gra	MGGC-2009-1	GC-1 (foil)	60°13.674 21°06.556		28.5	27.4.2009 12:29
SMA_gra	MGGC-2009-2	GC-2 (liner)	60°13.671 21°06.564	861	28.5	27.4.2009 14:06
AIRISTO2	370580-2 (MGGN-2009-9)	GEMAX	60°20.790 22°05.207		60	27.4.2009 20:16
AIRISTO2	370580-3	MUC	60°20.789 22°05.207		60	27.4.2009 20:36
AS2	370590-2	MUC	60°04.881 22°15.879		47	28.4.2009 10:36
AS2	370590-3 (MGGN-2009-10)	GEMAX	60°04.880 22°15.882		47	28.4.2009 10:44
LL11		Water sample (bottle)	59°35.010 23°17.809		67	28.4.2009 21:48
LL11		VV	59°35.010 23°17.809		67	28.4.2009 21:59

ÅD = Åland Deep
MUC = multicorer, GEMAX = GEMAX corer for surface sediment sampling, GC = gravity corer, VV = vanVeen sampler
* sediment core for the BONUS Baltic Gas -project

7. Conclusions

INFLOW –project partners from Geological Survey of Finland, University of Helsinki/Department of Geology, VSEGEI/Russia, Szczezin University/Poland, IOW/Germany and Lund University/Sweden participated in RV Aranda SEDU 09 -cruise to the Gulf of Finland, the northern Central Basin, Gotland Deep, Åland Sea, the Bothnian Sea and the Archipelago Sea 22.-29.4.2009.

Altogether over 1700 km of 12 kHz echo-sounding data was collected during the SEDU 2009 – cruise. Collected acoustic data was of high quality due to good weather conditions.

Long sediment cores were recovered from 8 Sites (JML, NCB, GB1, GB2, F69, Åland Deep, SR5 and SMA) using IOW's 9 m long gravity corer. A total of 78 meters of sediment were collected. Surface sediment samples were collected from 10 sites using GEMAX- and IOW's Multicorer.

Sediment cores were described and photographed digitally onboard, and magnetic susceptibility was measured from every core. Sediment cores were sub-sampled onboard for e.g. micropaleontological, geochemical, trace fossil and dating (including palaeomagnetic, AMS C14 and OSL) analysis.

INFLOW -project partners participated also in planning and executing the educational program of SEDU 2009 Cruise (see Report by D. Ryabchuk & M. Kotilainen 2009). Educational program included lectures, student presentations, hand-on activities in sediment studies (e.g. sediment description, various sub-sampling) as well as planning survey grids and executing echo-sounding profiling.

INFLOW project co-operated also with other BONUS Programme projects providing Baltic Gas scientists onboard long sediment cores from 2 Sites for gas/methane studies. SEDU 2009 Cruise collected echo-sounding data also for FINMARINET Life+ project from EEZ of the Gulf of Finland.

We can summarize that BONUS INFLOW project RV Aranda cruise (SEDU 2009) was a great success. All the objectives proposed for this cruise were fulfilled.

8. Acknowledgements

INFLOW scientists thank the staff and other scientists onboard the RV Aranda during SEDU 2009 for their very valuable help during echo-sounding survey, coring and subsampling. Special thanks to Dr. Harri Kankaanpää for the possibility to participate on the cruise. In addition we would like to thank the staff for taking good care of us.

9. References

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Echo-sounding survey index table during RV Aranda SEDU 2009 cruise

R/V Aranda echo-sounder 12 kHz
MD DSS
WGS-84 UTM zone 34

			WGS-84	WGS-84	WGS-84	WGS-84		
date	**time (Finnish)**	**file**	**lat** beginn.	**lon** beginn.	**lat** end	**lon** end	**from …to…**	**note**
22.4.2009	13:44	94221044	60 04.128	24 58.781			39a - JML	ev. 2 -12
	15:15	94221215	59 53.13	24 34.177			39a - JML	ev. 13- (wreck after ev. 17, not visible in profile)
	16:33	94221333	59 46.028	24 10.137	59 34.918	23 38.438	39a - JML	ev. 24 - 37 (gas in many places)
	22:27	94221927	59 34.892	23 37.566	59 34.949	23 37.913	JML - JML gas	ev. 38 - 40
	22:47	94221947	59 34.949	23 37.909			Asema JML gas	ev. 41
	23:18	94220017	59 34.950	23 37.902			JML gas - NCBE	ev. 42 - 51
23.4.2009	0:46	94222146	59 34.529	23 05.934			JML gas - NCBE	ev. 52 - 64
	2:51	94222351	59 27.595	22 20.840			JML gas - NCBE	ev. 65 - 79 at the end nice gas horizon
	5:01	94230201	59 14.147	21 38.407			JML gas - NCBE	ev. 80 - 92
	6:56	94230356	59 02.350	21 01.428			JML gas - NCBE	ev. 93 - 104
	8:34	94230534	58 52.565	20 30.916	58 52.400	20 30.499	NCBE - NCBE	ev. 105 - 107
	10:03	94230703	58 52.504	20 30.802	58 53.662	20 34.409	NCBE - NCBin	ev. 108 - 111
	12:22	94230703	58 53.657	20 34.419			NCBin	ev. 112 - 113
	13:53	94231053	58 53.661	20 34.424			NCBin - F80	ev. 114 - 123
	15:04	94231204	58 41.960	20 23.150			to F80	ev. 124 - 128, 400 ms
	15:39	94231239	58 35.633	20 18.662			to F80	ev. 129 - 140, 300 ms
	17:28	94231428	58 15.890	20 04.822			to F80	ev. 141-147
	18:31	94231531	58 03.885	19 56.467	57 59.996	19 53.809	to F80	ev. 148 -152 (4 miles to F80)
	19:07	94231607	58 00.500	19 53.800			F80	ev. 153
	20:17	94231717	57 59.846	19 53.880			to GB1	ev. 153 -162
	20:41	94231841	57 44.141	20 03.104			to GB1	ev. 163 - 173
	23:14	94232014	57 27.070	20 13.850			to GB1	ev. 174 - 177
	23:38	94232038	57 24.512	20 16.084			to GB1	ev. 178 - 181
	0:24	94232124	57 21.301	20 14.906			to GB1	ev. 183 - 187
	1:12	94232212	57 24.555	20 13.076			to GB1	ev. 188 - 193
	1:56	94232256	57 21.685	20 14.286			to GB1	ev. 195 - 199
	2:39	94232339	57 24.585	20.15.491			to GB1	ev. 201 - 204
	3:15	94240019	57 21.730	20 16.690			to GB1	ev. 206 - 209
	4:10	94240111	57 23.982	20 17.806			to GB1	ev. 213 - 216
	4:55	94240155	57 23.380	20 12.471	57 23.433	20 18.205	to GB1	ev. 217 - 221
	5:36	94240236	57 22.764	20 17.837	57 22.781	20 12.168	to GB1	ev. 223 - 226
	6:25	94240324	57 22.132	20 12.420	57 23.128	20 16.129	to GB1	ev. 228 - 235
	7:27	94240427	57 23.128	20 16.129	57 23.123	20 15.489	GB1	ev. 236 - 238
	11:41	94240841	57 23.123	20 15.489			Station GB1	ev. 239 - 240
	11:51	94240851	57 23.123	20 15.489			to GB2	ev. 241-246
	14:15	94241116	57 17.025	20 07.271	57 17.011	20 07.245	around station	
	14:59	94241159	57 17.011	20 07.246			station GB2	ev. 247 - 250
	16:13	94241315	57 17.027	20 07.030			GB2 to BY15	ev. 251 - 253

Echo-sounding survey index table during RV Aranda SEDU 2009 cruise

R/V Aranda echo-sounder 12 kHz
MD DSS
WGS-84 UTM zone 34

			WGS-84	WGS-84	WGS-84	WGS-84		
date	**time (Finnish)**	**file**	**lat** beginn.	**lon** beginn.	**lat** end	**lon** end	**from …to…**	**note**
	16:36	94241336	57 17.000	20 04.800			station BY15	ev. 254
	18:59	94241559	57 16.230	20 04.647	57 16.220	20 03.203	around BY 15	ev. 255-256
	19:22	94241622	57 15.815	20 04.189			around BY 15	ev. 258 - 259
	19:46	94241646	57 16.915	20 04.623			around BY 15	ev. 261 - 263
	20:23	94241723	57 20.305	20 03.440			to F 69	ev. 266-279
	22:25	94241925	57 44.963	20 04.511			to F69	ev.280 - 308 ef.length to 300 ms
25.4.2009	3:00	94250000	58 39.272	20 07.000			to F69	ev. 309 - 322
	5:05	94250205	59 04.184	20 08.168			to F69	ev. 323 - 332
	6:32	94250332	59 21.372	20 08.978			to F69	ev. 333 - 338
	7:17	94250417	59 30.098	20 08.990	59 47.007	19 55.814	to F69	ev. 339 - 350
	12:27	94250927	59 46.998	19 55.797			station F69	ev. 351 - 352
	14:06	94251106	59 47.016	19 55.783			grid line1	ev. 353 - 355 to N
	14:27	94251127	59 48.436	19 54.526			grid line2	ev. 356 - 359 to N
	15:03	94251203	59 45.706	19 52.815			grid line 3	ev. 360 - 363
	15:29	94251229	59 48.318	19 52.434			to Grill!	ev. 364 - 367
	16:06	94251306	59 53.494	19 50.062			to Grill!	ev. 368 - ef.lenth 400 ms, +200 m depths
	17:43	94251443	60 00.848	19 53.520			to Grill!	ev. 373 - 378
26.4.2009	5:23	94260223	60 03.76	19 54.67			Mariehamn -->	ev. 379 -
			60 03.127	19 40.867			to Åland Deep	ev. 386 -
	6:15	94260315	60 03.770	19 38.329			to Åland Deep	ev. 390 -
	6:20	94260320	60 04.275	19 36.362			to Åland Deep	ev. 392 -
	6:32	94260332	60 05.316	19 32.240			to Åland Deep	ev. 400 - 407
	7:40	94260440	60 10.488	19 11.792			to Åland Deep	ev. 408 - 411
	11:25	94260825	60 11.650	19 07.211			station Åland Deep	ev. 412
	12:00	94260900	60 11.650	19 07.211			to SR5	ev. 414 - 424
	13:39	94261039	60 29.039	19 04.071			to SR5	ev. 425 - 440
	16:01	94261301	60 54.350	19 25.779			to SR5	ev. 441 - 453
	17:38	94261438	61 05.137	19 35.246	61 05.102	19 34.691	to SR5	ev. 454 - 456
	20:10	94261710	61 05.106	19 34.607			GRID alkum	ev. 457 - 459
	20:23	94261723	61 05.530	19 33.562			LINJA 1	ev. 460 - 462
	20:38	94261738	61 04.692	19 35.794			MUTKA	ev. 463 - 466
	20:59	94261759	61 04.783	19 34.250			LINJA 2	ev. 467 - 468
	21:08	94261808	61 05.550	19 35.385			to SMA	ev. 469 - 475
	21:59	94261859	61 01.384	19 50.712			to SMA	ev. 476 - 484
	23:19	94262019	60 55.305	20 14.334			to SMA	ev. 485 - 487
	23:32	94262032	60 55.120	20 17.690			to SMA	ev. 488 - 503 ef.lenth 200 ms, 490, 493, 514-515, 519, 524
	1:59	94262258	60 43.293	20 57.240	60 14.860	21 06.277	to SMA	ev. 504 - 525
27.4.2009	7:05	94270405	60 14.863	21 06.284			SMAGRID L1	ev. 527 - 536

Echo-sounding survey index table during RV Aranda SEDU 2009 cruise

R/V Aranda echo-sounder 12 kHz
MD DSS
WGS-84 UTM zone 34

			WGS-84	WGS-84	WGS-84	WGS-84		
date	**time (Finnish)**	**file**	**lat** beginn.	**lon** beginn.	**lat** end	**lon** end	**from …to…**	**note**
	8:05	94270505	60 14.202	21 04.112			SMAGRID L2	ev. 537 - 541
	11:40	94270840	60 13.844	21 04.652	60 13.674	21 06.556	to SMA GRA	ev. 542 - 547
	12:30	94270930	60 13.674	21 06.556			MGGC-2009-1	ev. 548 -
	14:11	94271110	60 13.671	21 06.564			MGGC-2009-2	ev. 559 - 560
	14:17	94271117	60 13.671	21 06.562			SMA GRA to Aivisto	
	15:39	94271239	60 11.979	21 31.638	60 13.907	21 51.168	to SMB	ev. 569 - Airisto 1
	17:12	94271411	60 13.916	21 51.170				Airisto 1 -
	18:07	94271507	60 19.033	22 03.392			SMB grid line	ev. 584 - 589
27.4.2009	19:38	94271638	60 20.479	22 04.568			to point SMB	ev. 590 - 595
	20:53	94271753	60 19.894	22 04.102			to AS2	ev. 596 - 604
	22:11	94271911	60 07.500	22 09.897			to AS2	ev. 605 - 614
	23:32	94272032	60 05.410	22 14.402			to AS2	ev. 615 - 619
	0:03	94272103	60 03.742	22 17.116			to AS2	ev. 620 - 623
	0:33	94272133	60 05.354	22 15.120			to AS2	ev. 624 - 628
	1:04	94272204	60 03.974	22 17.806			to AS2	ev. 629 - 631
	1:24	94272224	60 04.943	22 16.799			to AS2	ev. 632 - 635
	1:52	94272252	60 04.256	22 16.107			to AS2	ev. 636 - 638
	2:08	94272310	60 04.495	22 17.675			to AS2	ev. 639 - 642
	2:30	94272333	60 03.969	22 15.600	60 04.424	22 16.991	to AS2	ev. 643 - 644
	11:30	94280810	60 04.896	22 15.786			to Öro gas	ev.695 - 700
	11:59	94280859	59 57.866	22 19.730			to Öro gas	ev. 701 - 710
	13:37	94281037	59 42.516	22 17.202			to Öro gas	ev. 711 - 715
	14:11	94281111	59 39.376	22 15.984			Örogrid 1.line	ev. 716 - 719
	14:45	94281145	59 27.232	22 16.548			Örogrid 2.line	ev. 720 - 723 (2 ja 3 line sama file)
	15:14	94281145	59 39.275	22 17.154			Örogrid 3.line	ev. 724 - 728
	15:45	94281244	59 37.121	22 17.813			Örogrid 4.line	ev. 729 - 731
	16:18	94281318	59 38.825	22 15.489			Örogrid 5.line	ev. 732 - 734
	16:40	94281340	59 38.549	22 18.669			Örogrid 6.line	ev. 735 - 737
	17:02	94281402	59 38.256	22 15.548	59 38.264	22 17.812	Örogrid 7.line	ev.738 - 740
	17:16	94281416	59 38.226	22 18.223			Öro-LL1	ev. 741 - 750
	18:46	94281546	59 35.472	22 15.453			Öro-LL1	ev. 751 - 759
	19:58	94281658	59 31.880	22 14.072			Öro-LL1	ev. 760 - 769
	21:54	94281854	59 35.010	22 17.809			Asema LL11	ev. 770
	22:17	94281917	59 35.010	22 17.809			to Helsinki	ev. 772 - 779
	23:20	94282020	59 35.675	23 12.683			to Helsinki	ev. 780 - 786
	0:10	94282110	59 36.075	23 22.101			to Helsinki	ev. 787 - 793
	1:04	94282203	59 37.609	23 32.396			to Helsinki	ev. 794 - 801
	2:06	94282306	59 36.433	23 21.799			to Helsinki	ev. 802 - 807

Echo-sounding survey index table during RV Aranda SEDU 2009 cruise

R/V Aranda echo-sounder 12 kHz								
MD DSS								
WGS-84 UTM zone 34								
			WGS-84	WGS-84	WGS-84	WGS-84		
date	**time (Finnish)**	**file**	**lat** beginn.	**lon** beginn.	**lat** end	**lon** end	**from …to…**	**note**
	2:54	94282354	59 36.046	23 12.540			to Helsinki	ev. 808 - 812
	3:31	94290030	59 36.747	23 22.049			to Helsinki	ev. 813 - 817
	4:07	94290106	59 38.190	23 32.417			to Helsinki	ev. 818 - 824
	5:01	94290201	59 43.434	23 49.547			to Helsinki	ev. 825 - 832
	6:10	94290308	59 48.688	24 12.713			to Helsinki	ev. 833 - 840
	7:14	94290414	59 53.840	24 35.872			to Helsinki	ev. 841 - 851

This report is a product of the ”INFLOW” project.

INFLOW (Holocene saline water inflow changes into the Baltic Sea, ecosystem responses and future scenarios) –project studies ongoing and past changes in both surface and deep water conditions and their timing by means of multi - proxy studies combined with state-of-the-art modelling approaches. INFLOW uses sediment proxy data on a transect from the marine Skagerrak to the freshwater dominated northern Baltic Sea. The validated ecosystem models can provide simulated data for extreme natural climatic conditions over the past thousands of years (e.g. Medieval Warm Period, Little Ice Age). Proxy reconstructions will be compared to results from model simulations. These evaluated models will be used to provide predictions of the Baltic Sea ecosystem state at the end of the 21st century for selected IPCC climate change scenarios. Those scenarios of the future development of the Baltic Sea can form the scientific basis for political strategies adapting to future climate change.

INFLOW (2009-2011) is one of the BONUS research programme (http://www.bonusportal.org/) projects and it is funded by national funding agencies (e.g. Academy of Finland) and the EU Commission. Geologian tutkimuskeskus (GTK) coordinates the INFLOW project that has 9 partners in 7 countries of the Baltic Sea Region: Leibniz Institute for Baltic Sea Research Warnemünde (IOW), Germany; Geological Survey of Denmark and Greenland (GEUS), Denmark; Lund University, Sweden; Swedish Meteorological and Hydrological Institute, Sweden; University of Szczecin, Poland; Unifob AS, Bjerknes Centre for Climate Research, Norway; A.P Karpinsky Russian Geological Research Institute (VSEGEI), Russia; Department of Geology, University of Helsinki, Finland.

The INFLOW Report Series included following reports on 30th of June 2009:

INFLOW Interim Report No. 1 “INFLOW Cruise Report, SEDU 2009, the RV Aranda 22.-29.4.2009”.

INFLOW Interim Report No. 2 “Floating University Report, the RV Aranda 22.-29.4.2009”.

For more information on INFLOW –project see (http://projects.gtk.fi/inflow/index.html).