Institut für Meereskunde an der Universität Kiel

Forschungsbereich Ozeanzirkulation und Klima

Physikalische Ozeanographie II

Dr W Zenk

16 August 2002

Cruise Summary Report

Ship: **FS POSEIDON** cruise no. 293, leg 1

Dates: **7 – 15 August 2002**

Port Calls: **Galway / Ireland** and **Reykjavik / Iceland**

Institute: *Institut für Meereskunde an der Universität Kiel*

Number of Scientists: 7

Chief Scientist: Dr rer nat Walter Zenk

Principal Project: ***Sonderforschungsbereich*** SFB 460/ Special research initiative ***Thermohaline Circulation Variability in the North Atlantic***

Prime support: *Deutsche Forschungsgemeinschaft,* Bonn

Additional funds: European Commission, Brussels

Research areas: North Atlantic: Iceland Basin

Scientific Team from Institut für Meereskunde an der Univers

	Name	Function
1	Zenk, Walter, Dr.	Chief Scientis
2	König, Jochen	Student
3	Lankhorst, Matthias	Student
4	Macrander, Andreas	PhD student
5	Niehus, Gerd	TA
6	Nielsen, Martina	TA
7	Pinck, Andreas	Dipl.-Ing.

1 Research Program

SFB 460 subproject A3 proposed the revisit of the Iceland Basin to continue measurements of the water mass variability in the subpolar gyre in the eastern basins of the North Atlantic. Research subjects are Labrador Sea Water penetrating from the west and Overflow Water entering from the northeast. Labrador Sea Water is generated annually by wintertime convection. Part of this water mass is advected eastward underneath the North Atlantic Current and over the Mid-Atlantic Ridge in the region of the Charlie Gibbs Fracture Zone at ~ 53°N. Its further penetration into the eastern basin is strongly influenced by mixing with Mediterranean Water, Subpolar Mode Water, and Overflow Water. Through these processes the low salinity tongue of Labrador Sea Water looses its prime characteristic properties while progressing northward into the Iceland Basin.
Water mass transformation processes also change the original properties of Iceland Scotland Overflow Water penetrating the Iceland Basin from the Norwegian Sea along the way southward. Then this partially mixed overflow water leaves the Iceland Basin for the Irminger Basin through gaps in the Reykjanes Ridge. Other diluted fractions follow the Mid-Atlantic Ridge as a deep western boundary current towards the Azores.
We aimed to make quantitative observations of transport fluctuations of the mentioned water masses. Such estimates are most relevant for the dynamics of the larger scale circulation of North Atlantic Deep Water. Modified Overflow Water, occasionally also called Gibbs Fracture Zone Water, is a main constituent of North Atlantic Deep Water. After leaving the subpolar gyre this water mass follows the continental slope of the Americas finally reaching the Antarctic Circumpolar Current. North Atlantic Deep Water is an integral limb of the global circulation and thus has a major impact on the global climate.
Spreading paths of Labrador Sea and Overflow Waters in the Iceland Basin are subject to strong pulsations and shifts. The variability of the Iceland Scotland Overflow Water tongue was recorded since August 2000 by four in-line current meter moorings orthogonal to the Reykjanes Ridge. Additional variations will be captured by eddy-resolving accoustically tracked RAFOS floats. Further drifter launches support the ARGO project. The international ARGO Information Center manages a sustained network of freely drifting ocean observing platforms. Their data are an essential part of future "ocean weather forecast". Our contribution to ARGO is funded under GYROSCOPE by the European Commission in Brussels.

2 Narrative of the Cruise

POSEIDON left Galway on 7 August 2002 at 1545. A delay in delivery of luggage of the scientific party had no impact on the schedule because the local tides would not have allowed any earlier departure from this interesting habour and city. The day before a small group from the POSEIDON took the opportunity to visit the Martin Ryan Marine Science Institute of the National University of Ireland and discussed with Dr Martin White areas of common interests in the North Atlantic. The ship headed towards the mouth of Rockall Trough where we reached the first station (no. 635) on 8 August (see Fig 1). Until midnight POSEIDON conduced its test station without any difficulties. Samples for later thorium analysis were taken and two floats were seeded. For details see Table 1.
Following the first station we sailed for the next 26 hours on a northwesterly course towards the western flank of Hatton Bank. Here we approached the inner Iceland Basin, our main working area. For the next five days PESEIDON conducted a CTD section with 27 nm spacing, yielding a highly resolved hydrographic survey along the array line of four current meter mooring called "I", "S", "O", "W". The latter had been deployed by POSEIDON as well two years before.

Table 1: List of RAFOS and APEX Float Launches

Sta. No.	IfM No.	Date 2002	Time Z	Latitude North	Longitude West	Argos (Dec)	Mission (month)	S/N
RAFOS float launches ↓								
635	307	08/08/02	23:45	54°30.22	16° 10.71	12612	14	76
646	308	12/08/02	02:20	60° 55.66	22° 05.89	6843	14	13
649	309	12/08/02	16:00	61° 36.81	22° 47.64	12613	14	75
APEX float ↓								
635		08/08/02	23:55	54° 30.22	16°10.71	6845	<60	658
638		10/08/02	13:37	58° 53.65	20°08.91	6842	<60	653
646		12/08/02	02:25	60°55.66	22°05.89	6844	<60	654

Abbreviations:
↓ deployment
↑ recovery

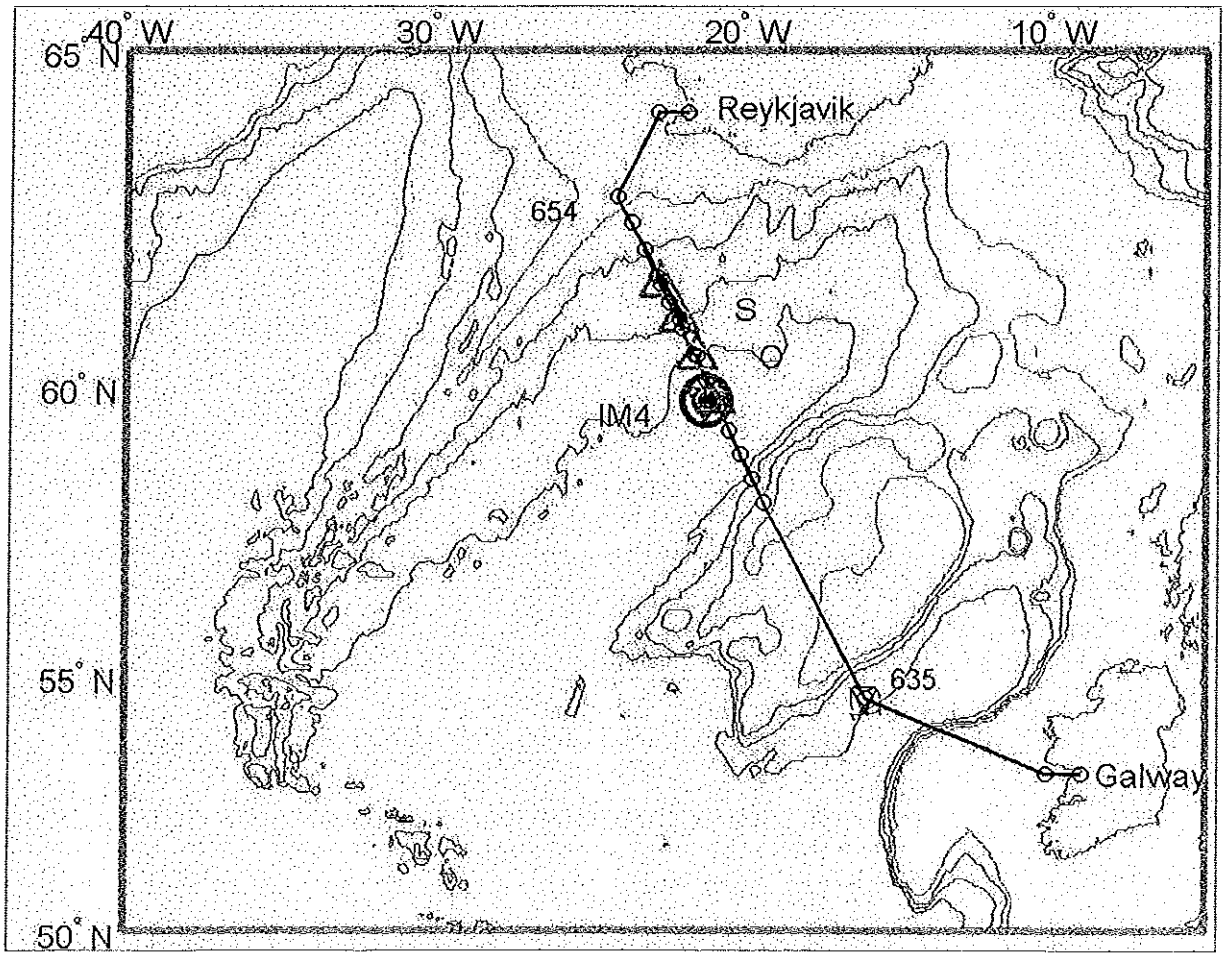

Figure 1: Track chart of POSEIDON cruise 293, leg 1, Galway to Reykjavik, 7-15 August 2002. Contour interval between isobath is 500 m between 1000 m and 2500 m. Letters denote moorings, numbers stand for station numbers.

□ APEX
▽ RAFOS

On 11 August POSEIDON launch a mooring with a RAFOS generator (Sta 642). Moorings "S" and "O" were recovered successfully, while those of mooring "I" and "W" failed to release. For details see Table 2. Until 12 August the remaining floats were deployed along the hydrographic section (see cruise chart).
With Sta. 654 on the flank of the Reykjanes Ridge POSEIDON finished the scientific programme on 14 August and headed towards Reykjavik. In the afternoon we reached the port at 1700 LT.

3 Acknowledgements

The chief scientist and his team would like to thank cordially Kapitän H Bruns and his crew for the excellent co-operation on board. We realize that the cruise had fallen in a critical situation for the entire crew. We further appreciate the logistic support from the Icelandic Marine research Institute in Reykjavik. Financial support came from the *Deutsche Forschungsgemeinschaft* (SFB 460), Bonn, and from the European Commission (GYROSCOPE), Brussels.

Table 1: Mooring Activities

Ship	Sta No.	Int. No.	IfM No.	Date	Latitude North	Longitude West	Depth (m)	Instr. Type	Remarks incl. Nominal instr. depth
Current meter moorings									
Pos 261	192	W	V 420-01	08. July ↓ 2000	59° 46.80'	020° 56.65'	2818	CB, Argos	Argos 9244
								RCM 8	No. 12005@1520m
								RCM 8	No. 2317 @2020m
Pos 293/1	**643**	**W**	**V 420-01**	**11. Aug. 2002**	Recovery failed			MC	No. 206 @2020m
								RCM 8	No. 10660@2420m
								MC	No. 1285 @2420m
								RCM 8	No. 9832 @2660m
								RCM 8	No. 12051@2768m
Pos 261		O	V 419-01	09. July ↓ 2000	60° 30.50'	021 36.05	2526	CB, Argos	Argos 3535
								RCM 8	No. 9726 @1480m
								RCM 8	No. 11576 @1975m
Pos 293/1	**644** 195	**O**	**V 419-01**	**11. Aug. ↑ 2002**				MC	No. 1286 @1975m
								RCM 8	No. 10500 @2170m
								MC	No. 1287 @2170m
								RCM 8	No. 10502 @2365m
								RCM 8	No. 9821 @2475m
Pos 293/1	199	S	V418-01	10. July ↓ 2000	61° 04.15	022° 11.45	1969	CB, Argos	Argos 15173
								RCM 8	No. 10658@1245m
								RCM 8	No. 11441@1645m
								MC	No. 1288@1645m
Pos 293/1	**647**	**S**	**V 418-01**	**12. Aug. ↑ 2002**				RCM 8	No. 10659@1860m
								MC	No. 1284@1860m
								RCM 8	No. 9812@1910m
Pos 261	201	I	V 417-01	10. Jul.00↓	61° 36.90'	022° 47.75	1805	CB, Argos	Argos 7848
								RCM 8	No.10078@1305m
Pos 293/1	**643**	**I**	**V 417-01**	**12. Aug. 2002**	Recovery failed			RCM 8	No. 131@1705m
								RCM 8	No. 9834@1755
Sound Source Mooring									
Pos 293/1	**642**	**IM4**	**V432**	**11. Aug. ↓ 2002**	59° 45.71 ?	-21° 18.87 ?	2844	Argos	Argos 615 SoSo68, transmission: 02:00Z

Abbreviations

RCM 8	Aanderaa Current meter RCM 8
MC	Microcat
CB	Short Wave Transmitter
Argos	Watch Dog
↓	deployment
↑	recovery

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Ship	Sta No.	Int. No.	IfM No.	Date	Latitude North	Longitude West	Depth (m)	Instr. Type	Remarks incl. Nominal instr. depth
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								RCM 8	No. 9832 @2660m
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Pos 261		O	V 419-01	09. July ↓ 2000	60° 30.50'	021 36.05	2526	CB, Argos	Argos 3535
								RCM 8	No. 9726 @1480m
								RCM 8	No. 11576 @1975m
Pos 293/1	**644** 195	**O**	**V 419-01**	**11. Aug. ↑ 2002**				MC	No. 1286 @1975m
								RCM 8	No. 10500 @2170m
								MC	No. 1287 @2170m
								RCM 8	No. 10502 @2365m
								RCM 8	No. 9821 @2475m
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								RCM 8	No. 9834@1755
Sound Source Mooring									
Pos 293/1	**642**	**IM4**	**V432**	**11. Aug. ↓ 2002**	59° 45.71 ?	-21° 18.87 ?	2844	Argos	Argos 615 SoSo68, transmission: 02:00Z

Abbreviations

RCM 8	Aanderaa Current meter RCM 8
MC	Microcat
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Argos	Watch Dog
↓	deployment
↑	recovery

Appendix: POSEIDON Cruise 293, leg 1

Station List and Sample Log

Status: 15-Aug-2002

Date Year 2002 MM DD	Time UTC hhmm	St	C	Latitude North DD MM.MM	Longitude East DD MM.MM	Water depth m	Instr. depth m	Inst. type	Samples / remarks
08 07	1445	-9	-9	54 10.00	09 00.00	-9	-9	-9	Sail from Galway
-9 -9	-9	-9	-9	53 10.00	10 10.00	-9	-9	5	Start vmADCP
08 08	2159	635	001	54 30.08	16 10.48	2369	2374	2	SBE2, Thorium
08 08	2345	635	-9	54 30.22	16 10.71	2369	1500	3	RAFOS float 307
08 08	2355	635	-9	54 30.22	16 10.71	2369	1500	4	APEX float 658
08 10	0210	636	002	58 04.87	19 23.83	1365	1354	2	SBE2, lADCP 876
08 10	0626	637	003	58 29.33	19 46.32	1868	1863	2	SBE2, lADCP 876
08 10	1109	638	004	58 53.73	20 08.92	2872	2872	2	SBE2, lADCP 876, Thorium
08 10	1253	638	-9	58 53.73	20 08.92	2872	1095	-9	releaser test Nr.373
08 10	1337	638	-9	58 53.65	20 08.91	2872	1500	4	APEX float 653
08 10	1643	639	005	59 17.98	20 31.69	2833	2830	2	SBE2, lADCP 876
08 10	2134	640	006	59 42.46	20 55.18	2840	2841	2	SBE2, lADCP 876
08 11	0228	641	007	60 06.91	21 18.61	2744	2745	2	SBE2, lADCP 876, Thorium
08 11	0823	642	-9	59 46.34	21 18.56	2844	1300	1	deployment V432/IM4
08 11	1200	643	-9	59 46.70	20 57.10	2818	1440	1	recover V420/W failed
08 11	1906	644	-9	60 30.54	21 36.09	2526	1400	1	recovery V419/O
08 11	1944	645	008	60 30.51	21 36.08	2527	2527	2	SBE2, lADCP 876
08 12	0034	646	009	60 55.63	22 06.39	2130	2129	2	SBE2, lADCP 876, Thorium
08 12	0220	646	-9	60 55.66	22 05.89	2130	1500	3	RAFOS float 308
08 12	0225	646	-9	60 55.66	22 05.89	2130	1500	4	APEX float 654
08 12	0836	647	-9	61 03.97	22 11.51	1966	1165	1	recovery V418/S
08 12	1104	648	010	61 19.85	22 30.94	1875	1869	2	SBE2, lADCP 876
08 12	1450	649	-9	61 36.81	22 47.64	1805	1235	1	recover V417/I failed
08 12	1600	649	-9	61 36.48	22 48.27	1805	1500	3	RAFOS float 309
08 12	1700	650	011	61 44.38	22 55.35	1744	1727	2	SBE2, lADCP 876
08 12	2107	651	012	61 08.51	23 20.54	1484	1481	2	SBE2, lADCP 876
08 13	0800	652	013	61 03.09	22 00.04	2025	2024	2	SBE2, lADCP 876, MC calibr. station
08 13	2107	653	014	61 33.05	23 45.76	1304	1305	2	SBE2, lADCP 876
08 14	0103	654	015	62 56.24	24 12.86	601	603	2	SBE2, lADCP 876
08 14	-9	-9	-9	64 08.00	22 54.00	-9	-9	-9	Way point
08 14	1700	-9	-9	64 08.00	21 21.56	-9	-9	-9	port call Reykjavik

List of abbreviations:

St : Station no.
C : CTD cast no., monotonically increasing during the cruise;
Wd : Sounding @ 1500 m/s
Instr : Instrument symbol:
Mooring : 1
CTD : 2, SBE 2 10x12 1 bottle rosette, lowered ADCP (Acoustic Doppler Current Profiler)
RAFOS float: 3
APEX float: 4
VmADCP : 5
dummy: : -9