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Cruise Report
POSEIDON 294

Reykjavik - Tórshavn – Tórshavn -Kiel
06. 09. – 14.09. – 22.09. – 01.10.2002
Technical Report 1-02

On citing this report in a bibliography, the reference should be followed by the words *unpublished manuscript.*

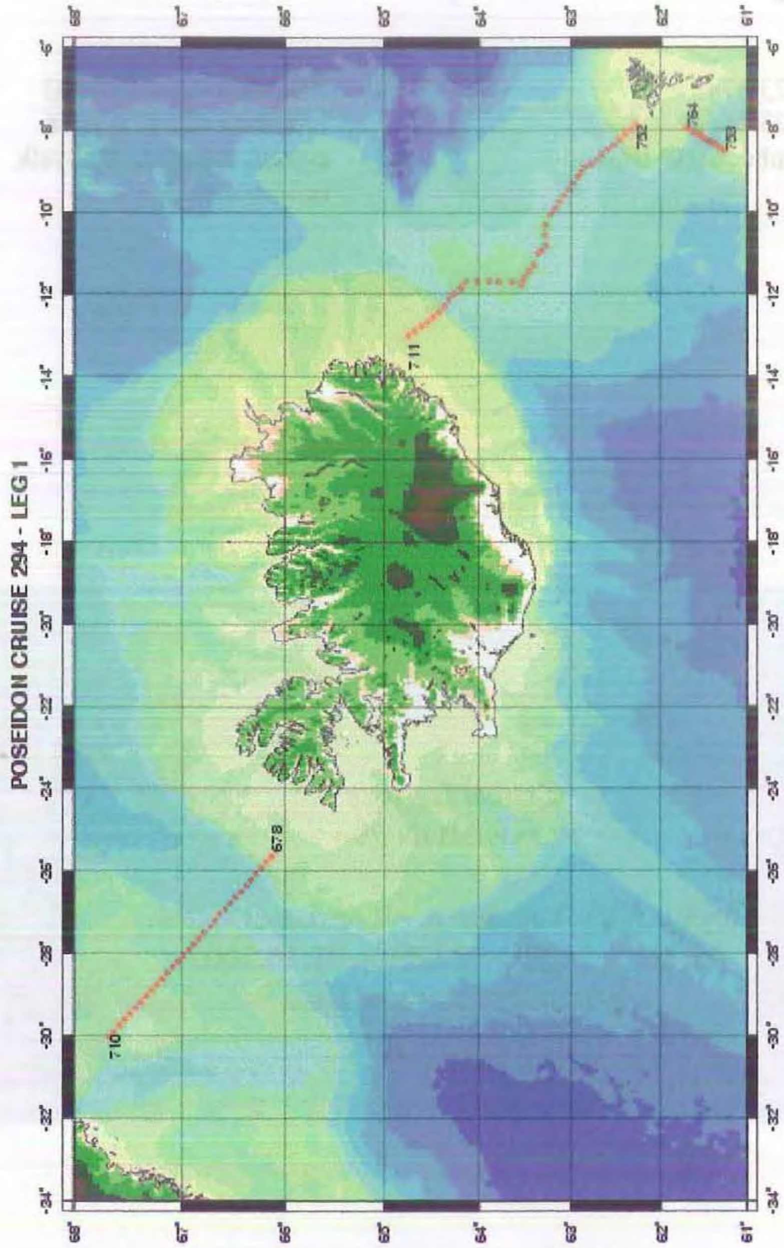

Figure 1a: Overview over the measurements carried out during Leg 1 of POSEIDON cruise 294. Red dots indicate CTD/LADCP stations.

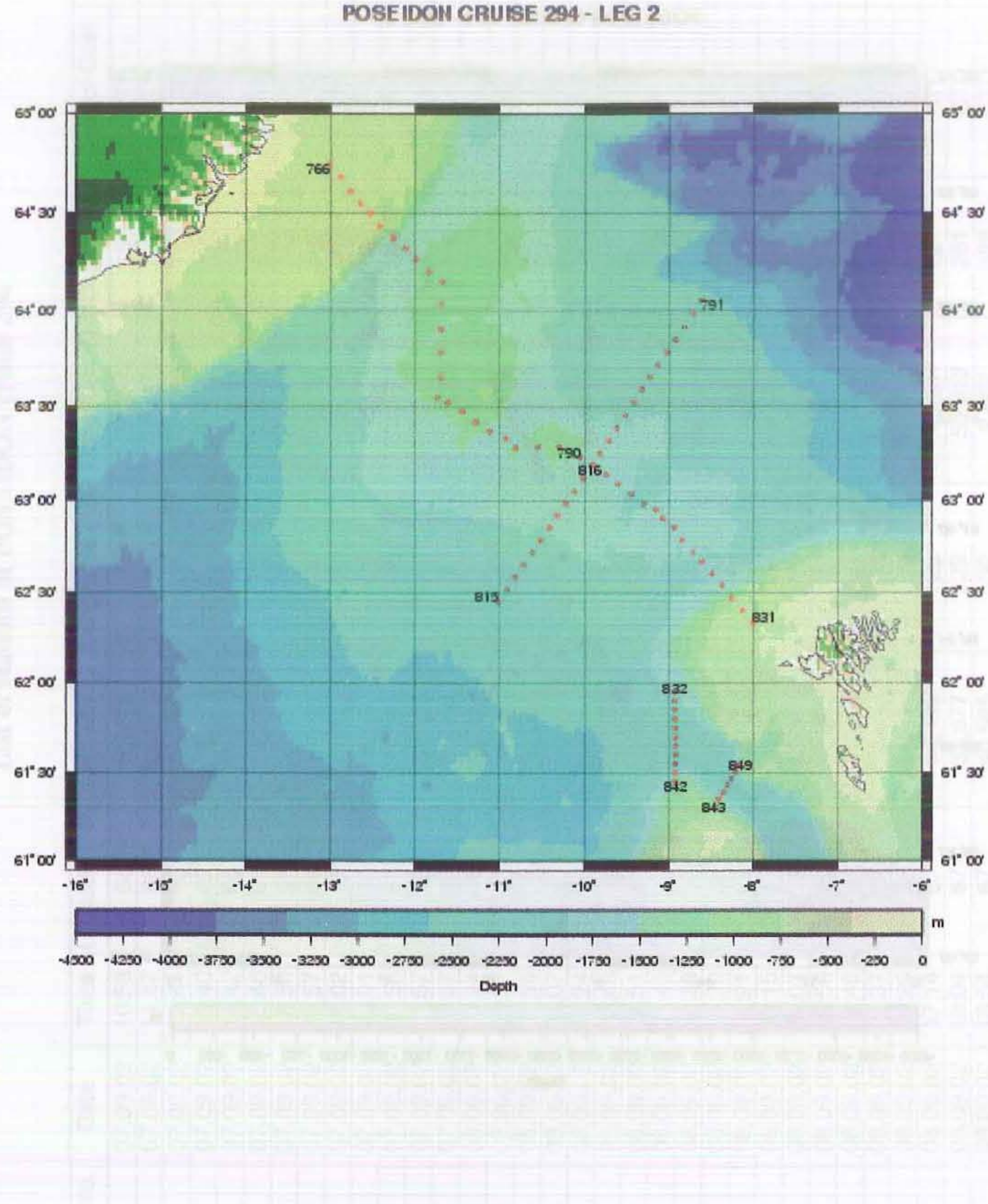

Figure 1b: Overview over the measurements carried out during Leg 2 of POSEIDON cruise 294. Red dots indicate CTD/LADCP stations.

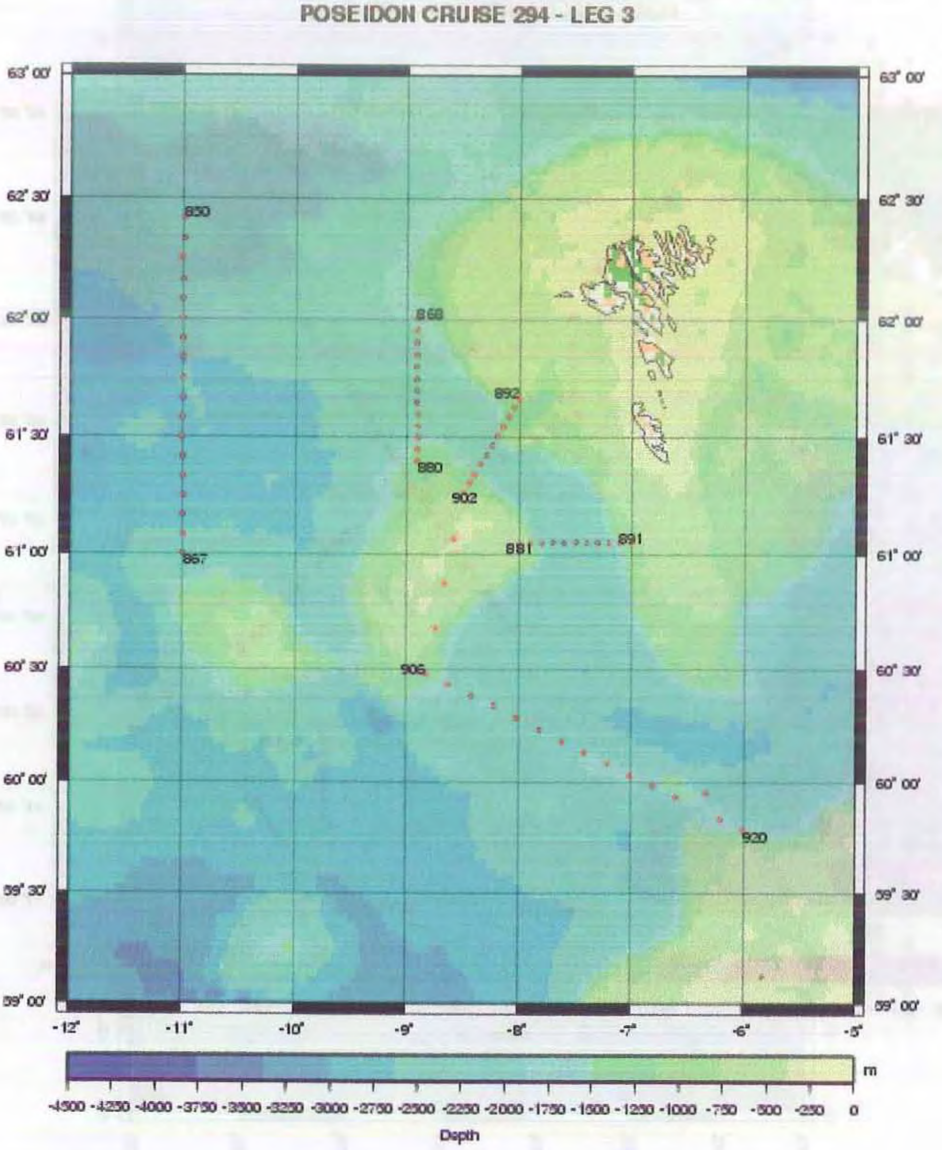

Figure 1c: Overview over the measurements carried out during Leg 3 of POSEIDON cruise 294. Red dots indicate CTD/LADCP stations.

List of stations of POSEIDON cruise 294

Station No.	Date	Time	Latitude (°N)	Latitude (')	Longitude (°W)	Longitude (')	Depth (m)	Type of Cast	Leg	Comments
678	07.09.02	10:58	66	5,2416	25	29,8572	168	CTD	1	DS
679	07.09.02	11:47	66	8,01234	25	38,4378	173	CTD	1	DS
680	07.09.02	12:41	66	10,998	25	46,758	170	CTD	1	DS
681	07.09.02	13:40	66	14,106	25	55,542	382	CTD	1	DS
682	07.09.02	14:42	66	17,124	26	4,17	541	CTD	1	DS
683	07.09.02	15:46	66	19,956	26	13,098	617	CTD	1	DS
684	07.09.02	16:50	66	22,624	26	21,852	645	CTD	1	DS
685	07.09.02	17:57	66	25,73	26	30,15	601	CTD	1	DS
686	07.09.02	19:02	66	29,02	26	38,44	521	CTD	1	DS
687	07.09.02	20:01	66	32,14	26	46,67	519	CTD	1	DS
688	07.09.02	20:58	66	35,184	26	54,972	496	CTD	1	DS
689	07.09.02	21:57	66	38,076	27	3,288	448	CTD	1	DS
690	07.09.02	23:07	66	40,968	27	11,874	409	CTD	1	DS
691	08.09.02	00:24	66	43,434	27	20,754	377	CTD	1	DS
692	08.09.02	01:37	66	46,986	27	29,784	356	CTD	1	DS
693	08.09.02	02:54	66	50,028	27	38,364	363	CTD	1	DS
694	08.09.02	04:07	66	52,964	27	46,897	371	CTD	1	DS
695	08.09.02	05:24	66	56,049	27	55,008	383	CTD	1	DS
696	08.09.02	06:43	66	59,156	28	3,541	361	CTD	1	DS
697	08.09.02	07:51	67	2,002	28	11,605	352	CTD	1	DS
698	08.09.02	08:43	67	5,0742	28	19,992	349	CTD	1	DS
699	08.09.02	09:38	67	7,9446	28	28,6734	337	CTD	1	DS
700	08.09.02	10:29	67	11,049	28	37,28	294	CTD	1	DS
701	08.09.02	11:21	67	13,923	28	45,598	261	CTD	1	DS
702	08.09.02	12:15	67	16,998	28	54,24	281	CTD	1	DS
703	08.09.02	13:07	67	19,938	29	2,808	246	CTD	1	DS
704	08.09.02	13:59	67	22,956	29	11,274	219	CTD	1	DS
705	08.09.02	14:48	67	25,848	29	20,04	223	CTD	1	DS
706	08.09.02	15:37	67	28,914	29	28,59	207	CTD	1	DS
707	08.09.02	16:26	67	31,701	29	37,03	213	CTD	1	DS
708	08.09.02	17:14	67	34,899	29	45,51	227	CTD	1	DS
709	08.09.02	18:04	67	37,877	29	54,312	261	CTD	1	DS
710	08.09.02	18:54	67	40,525	30	2,607	328	CTD	1	DS
711	11.09.02	01:19	64	45,027	12	59,892	155	CTD/LADCP	1	IFR

Station No.	Date	Time	Latitude (°N)	Latitude (')	Longitude (°W)	Longitude (')	Depth (m)	Type of Cast	Leg	Comments
712	11.09.02	02:44	64	41,0976	12	52,8366	198	CTD/LADCP	1	IFR
713	11.09.02	03:51	64	36,6204	12	45,8658	184	CTD/LADCP	1	IFR
714	11.09.02	04:50	64	32,874	12	39,411	160	CTD/LADCP	1	IFR
715	11.09.02	05:44	64	29,759	12	32,505	179	CTD/LADCP	1	IFR
716	11.09.02	06:45	64	26,108	12	26,071	201	CTD/LADCP	1	IFR
717	11.02.09	08:06	64	22,26	12	16,399	446	CTD/LADCP	1	IFR
718	11.09.02	09:26	64	19,2	12	6,88	435	CTD/LADCP	1	IFR
719	11.09.02	10:42	64	16,167	11	58,796	416	CTD/LADCP	1	IFR
720	11.09.02	12:04	64	12,087	11	50,228	374	CTD/LADCP	1	IFR
721	11.09.02	13:16	64	8,89	11	41,443	311	CTD/LADCP	1	IFR
722	11.09.02	14:33	64	1,861	11	41,106	338	CTD/LADCP	1	IFR
723	11.09.02	15:57	63	53,884	11	41,178	347	CTD/LADCP	1	IFR
724	11.09.02	17:10	63	47,996	11	41,55	356	CTD/LADCP	1	IFR
725	11.09.02	18:33	63	39,075	11	41,652	393	CTD/LADCP	1	IFR
726	11.09.02	20:12	63	33,29	11	44,13	398	CTD/LADCP	1	IFR
727	11.09.02	21:17	63	31,159	11	35,926	371	CTD/LADCP	1	IFR
728	11.09.02	22:29	63	27,981	11	25,838	347	CTD/LADCP	1	IFR
729	11.09.02	23:33	63	24,849	11	16,63	338	CTD/LADCP	1	IFR
730	12.09.02	00:35	63	22,0944	11	0,4488	429	CTD/LADCP	1	IFR
731	12.09.02	01:41	63	19,9854	10	56,0802	430	CTD/LADCP	1	IFR
732	12.09.02	02:41	63	16,956	10	48,264	416	CTD/LADCP	1	IFR
733	12.09.02	03:53	63	17,0334	10	33,1782	412	CTD/LADCP	1	IFR
734	12.09.02	05:07	63	16,971	10	18,991	348	CTD/LADCP	1	IFR
735	12.09.02	06:34	63	13,795	10	3,507	447	CTD/LADCP	1	IFR
736	12.09.02	07:52	63	10,725	9	54,903	482	CTD/LADCP	1	IFR
737	12.09.02	09:04	63	7,9908	9	45,5388	489	CTD/LADCP	1	IFR
738	12.09.02	10:17	63	4,959	9	35,9496	505	CTD/LADCP	1	IFR
739	12.09.02	11:39	63	1,9236	9	27,0156	508	CTD/LADCP	1	IFR
740	12.09.02	12:47	62	59,1402	9	17,9538	506	CTD/LADCP	1	IFR
741	12.09.02	13:59	62	55,9524	9	8,7822	420	CTD/LADCP	1	IFR
742	12.09.02	14:56	62	54,189	9	2,9016	410	CTD/LADCP	1	IFR
743	12.09.02	16:02	62	51,282	8	55,749	425	CTD/LADCP	1	IFR
744	12.09.02	17:18	62	47,01	8	50,213	432	CTD/LADCP	1	IFR
745	12.09.02	18:29	62	43,091	8	43,485	503	CTD/LADCP	1	IFR
746	12.09.02	19:42	62	39,954	8	36,141	497	CTD/LADCP	1	IFR

Station No.	Date	Time	Latitude (°N)	Latitude (')	Longitude (°W)	Longitude (')	Depth (m)	Type of Cast	Leg	Comments
747	12.09.02	20:47	62	35,9124	8	29,2386	496	CTD/LADCP	1	IFR
748	12.09.02	21:55	62	32,0406	8	22,3416	459	CTD/LADCP	1	IFR
749	12.09.02	23:02	62	28,0524	8	14,706	207	CTD/LADCP	1	IFR
750	13.09.02	00:05	62	24,213	8	7,4994	133	CTD/LADCP	1	IFR
751	13.09.02	01:05	62	20,1414	7	59,979	109	CTD/LADCP	1	IFR
752	13.09.02	01:51	62	16,9248	7	52,8504	99	CTD/LADCP	1	IFR
753	13.09.02	08:30	61	16,0398	8	30,1242	211	CTD/LADCP	1	iFBC
754	13.09.02	09:28	61	18,1854	8	27,5034	336	CTD/LADCP	1	iFBC
755	13.09.02	10:27	61	20,8482	8	24,1752	411	CTD/LADCP	1	iFBC
756	13.09.02	11:14	61	23,2344	8	20,8932	666	CTD/LADCP	1	iFBC
757	13.09.02	12:39	61	25,5048	8	18,3636	823	CTD/LADCP	1	iFbC
758	13.09.02	13:59	61	28,3332	8	15,1728	621	CTD/LADCP	1	iFBC
759	13.09.02	14:51	61	30,468	8	12,003	353	CTD/LADCP	1	iFBC
760	13.09.02	15:42	61	32,6562	8	9,1152	273	CTD/LADCP	1	iFBC
761	13.09.02	16:41	61	35,004	8	6,206	305	CTD/LADCP	1	iFBC
762	13.09.02	17:43	61	37,49	8	3,103	262	CTD/LADCP	1	iFBC
763	13.09.02	18:39	61	39,743	8	0,312	213	CTD/LADCP	1	iFBC
764	13.09.02	19:40	61	42,584	7	57,173	168	CTD/LADCP	1	iFBC
765	16.06.02	12:40	64	22.61	12	15.14	452	Mooring	2	
766	16.06.02	20:26	64	44,900	13	0,310	151	CTD/LADCP	2	IFR
767	16.06.02	21:32	64	40,925	12	53,023	197	CTD/LADCP	2	IFR
768	16.06.02	22:33	64	36,721	12	46,111	184	CTD/LADCP	2	IFR
769	16.06.02	23:43	64	32,970	12	38,890	162	CTD/LADCP	2	IFR
770	17.09.02	00:33	64	29,940	12	32,090	179	CTD/LADCP	2	IFR
771	17.09.02	01:24	64	26,100	12	25,180	202	CTD/LADCP	2	IFR
772	17.09.02	02:48	64	22,050	12	15,510	449	CTD/LADCP	2	IFR
773	17.09.02	03:59	64	19,239	12	6,663	436	CTD/LADCP	2	IFR
774	17.09.02	05:08	64	16,048	11	59,092	422	CTD/LADCP	2	IFR
775	17.09.02	06:16	64	11,907	11	49,946	374	CTD/LADCP	2	IFR
776	17.09.02	07:19	64	8,958	11	40,638	313	CTD/LADCP	2	IFR
777	17.09.02	08:47	64	1,944	11	41,190	339	CTD/LADCP	2	IFR
778	17.09.02	10:07	63	53,903	11	41,079	345	CTD/LADCP	2	IFR
779	17.09.02	11:25	63	46,960	11	41,610	356	CTD/LADCP	2	IFR
780	17.09.02	12:46	63	39,040	11	41,420	392	CTD/LADCP	2	IFR
781	17.09.02	13:59	63	32,960	11	44,230	399	CTD/LADCP	2	IFR

Station No.	Date	Time	Latitude (°N)	Latitude (')	Longitude (°W)	Longitude (')	Depth (m)	Type of Cast	Leg	Comments
782	17.09.02	15:04	63	31,238	11	36,734	378	CTD/LADCP	2	IFR
783	17.09.02	16:18	63	28,359	11	26,365	345	CTD/LADCP	2	IFR
784	17.09.02	17:26	63	25,050	11	16,960	329	CTD/LADCP	2	IFR
785	17.09.02	18:41	63	21,983	11	7,019	427	CTD/LADCP	2	IFR
786	17.09.02	19:47	63	19,856	10	55,405	429	CTD/LADCP	2	IFR
787	17.09.02	20:40	63	16,865	10	48,677	421	CTD/LADCP	2	IFR
788	17.09.02	21:41	63	16,966	10	33,082	409	CTD/LADCP	2	IFR
789	17.09.02	23:01	63	16,980	10	17,900	340	CTD/LADCP	2	IFR
790	18.09.02	00:06	63	13,832	10	3,017	461	CTD/LADCP	2	IFR
791	18.09.02	07:08	64	2,968	8	36,530	1037	CTD/LADCP	2	cIFR
792	18.09.02	08:45	63	59,008	8	42,903	909	CTD/LADCP	2	cIFR
793	18.09.02	10:07	63	54,809	8	48,527	822	CTD/LADCP	2	cIFR
794	18.09.02	11:06	63	50,806	8	55,063	765	CTD/LADCP	2	cIFR
795	18.09.02	12:22	63	46,870	9	1,259	715	CTD/LADCP	2	cIFR
796	18.09.02	13:33	63	42,963	9	7,524	670	CTD/LADCP	2	cIFR
797	18.09.02	14:47	63	38,975	9	13,297	635	CTD/LADCP	2	cIFR
798	18.09.02	16:01	63	35,110	9	18,88	604	CTD/LADCP	2	cIFR
799	18.09.02	17:13	63	31,166	9	24,608	572	CTD/LADCP	2	cIFR
800	18.09.02	18:29	63	27,209	9	30,692	542	CTD/LADCP	2	cIFR
801	18.09.02	19:41	63	23,056	9	36,848	502	CTD/LADCP	2	cIFR
802	18.09.02	20:48	63	19,065	9	42,611	485	CTD/LADCP	2	cIFR
803	18.09.02	21:56	63	15,154	9	48,903	488	CTD/LADCP	2	cIFR
804	18.09.02	23:03	63	11,130	9	54,832	482	CTD/LADCP	2	cIFR
805	19.09.02	00:17	63	6,881	10	0,882	477	CTD/LADCP	2	cIFR
806	19.09.02	01:22	63	2,850	10	7,121	470	CTD/LADCP	2	cIFR
807	19.09.02	02:24	62	59,048	10	13,03	470	CTD/LADCP	2	cIFR
808	19.09.02	03:30	62	55,061	10	19,03	476	CTD/LADCP	2	cIFR
809	19.09.02	04:36	62	51,097	10	24,971	492	CTD/LADCP	2	cIFR
810	19.09.02	05:47	62	47,166	10	31,012	515	CTD/LADCP	2	cIFR
811	19.09.02	07:01	62	43,022	10	36,963	556	CTD/LADCP	2	cIFR
812	19.09.02	08:27	62	38,996	10	42,902	589	CTD/LADCP	2	cIFR
813	19.09.02	09:37	62	35,089	10	48,887	623	CTD/LADCP	2	cIFR
814	19.09.02	10:50	62	30,915	10	55,037	666	CTD/LADCP	2	cIFR
815	19.09.02	12:21	62	26,865	11	1,114	750	CTD/LADCP	2	cIFR
816	19.09.02	18:50	63	11,266	9	53,443	482	CTD/LADCP	2	IFR

Station No.	Date	Time	Latitude (°N)	Latitude (')	Longitude (°W)	Longitude (')	Depth (m)	Type of Cast	Leg	Comments
817	19.09.02	20:03	63	8,148	9	44,199	491	CTD/LADCP	2	IFR
818	19.09.02	21:10	63	5,059	9	35,995	503	CTD/LADCP	2	IFR
819	19.09.02	22:14	63	1,881	9	26,47	510	CTD/LADCP	2	IFR
820	19.09.02	23:23	62	58,643	9	17,362	505	CTD/LADCP	2	IFR
821	20.09.02	00:23	62	56,998	9	8,734	421	CTD/LADCP	2	IFR
822	20.09.02	01:11	62	54,049	9	3,642	408	CTD/LADCP	2	IFR
823	20.09.02	02:11	62	51,146	8	55,757	426	CTD/LADCP	2	IFR
824	20.09.02	03:17	62	47,164	8	50,179	481	CTD/LADCP	2	IFR
825	20.09.02	04:27	62	43,048	8	42,544	494	CTD/LADCP	2	IFR
826	20.09.02	05:28	62	40,057	8	36,247	498	CTD/LADCP	2	IFR
827	20.09.02	06:40	62	36,158	8	29,108	493	CTD/LADCP	2	IFR
828	20.09.02	08:08	62	32,298	8	21,889	467	CTD/LADCP	2	IFR
829	20.09.02	09:17	62	28,108	8	14,99	214	CTD/LADCP	2	IFR
830	20.09.02	10:16	62	24,05	8	7,338	134	CTD/LADCP	2	IFR
831	20.09.02	11:11	62	19,882	8	0,05	107	CTD/LADCP	2	IFR
832	20.09.02	15:40	61	56,989	8	55,347	454	CTD/LADCP	2	exFBC
833	20.09.02	16:49	61	53,993	8	55,354	506	CTD/LADCP	2	exFBC
834	20.09.02	17:56	61	51,246	8	55,430	554	CTD/LADCP	2	exFBC
835	20.09.02	19:07	61	48,135	8	55,016	639	CTD/LADCP	2	exFBC
836	20.09.02	20:20	61	45,000	8	55,074	748	CTD/LADCP	2	exFBC
837	20.09.02	21:33	61	41,906	8	54,809	875	CTD/LADCP	2	exFBC
838	20.09.02	22:48	61	39,027	8	54,732	859	CTD/LADCP	2	exFBC
839	20.09.02	00:05	61	36,024	8	54,496	822	CTD/LADCP	2	exFBC
840	21.09.02	01:18	61	33,000	8	55,080	663	CTD/LADCP	2	exFBC
841	21.09.02	02:21	61	30,043	8	54,990	494	CTD/LADCP	2	exFBC
842	21.09.02	03:21	61	27,065	8	54,944	416	CTD/LADCP	2	exFBC
843	21.09.02	05:37	61	18,499	8	27,038	337	CTD/LADCP	2	iFBC
844	21.09.02	06:32	61	20,919	8	24,218	419	CTD/LADCP	2	iFBC
845	21.09.02	07:28	61	23,246	8	20,683	678	CTD/LADCP	2	iFBC
846	21.09.02	08:30	61	25,750	8	17,899	806	CTD/LADCP	2	iFBC
847	21.09.02	09:34	61	27,970	8	15,059	640	CTD/LADCP	2	iFBC
848	21.09.02	07:40	61	30,384	8	12,000	350	CTD/LADCP	2	iFBC
849	21.09.02	11:27	61	32,765	8	9,107	277	CTD/LADCP	2	IFBC
850	23.09.02	10:17	62	25,184	10	59,640	772	CTD/LADCP	3	cIFR
851	23.09.02	11:40	62	20,000	10	59,180	856	CTD/LADCP	3	cIFR

Station No.	Date	Time	Latitude (°N)	Latitude (')	Longitude (°W)	Longitude (')	Depth (m)	Type of Cast	Leg	Comments
852	23.09.02	13:00	62	15,177	11	0,531	927	CTD/LADCP	3	clFR
853	23.09.02	14:29	62	9,870	10	59,940	997	CTD/LADCP	3	clFR
854	23.09.02	15:52	62	4,926	11	0,276	1018	CTD/LADCP	3	clFR
855	23.09.02	17:13	62	0,178	11	0,223	1025	CTD/LADCP	3	clFR
856	23.09.02	18:40	61	55,000	11	0,000	1044	CTD/LADCP	3	clFR
857	23.09.02	20:23	61	50,257	10	59,748	1103	CTD/LADCP	3	clFR
858	23.09.02	21:57	61	45,102	10	59,675	1209	CTD/LADCP	3	clFR
859	23.09.02	23:29	61	40,020	11	0,130	1242	CTD/LADCP	3	clFR
860	24.09.02	01:06	61	35,054	11	0,369	1278	CTD/LADCP	3	clFR
861	24.09.02	02:44	61	30,054	11	0,540	1374	CTD/LADCP	3	clFR
862	24.09.02	04:21	61	25,000	11	0,000	1214	CTD/LADCP	3	clFR
863	24.09.02	06:02	61	20,000	10	59,900	1240	CTD	3	clFR
864	24.09.02	07:40	61	15,070	10	59,570	1196	CTD	3	clFR
865	24.09.02	09:07	61	10,100	11	0,000	1223	CTD	3	clFR
866	24.09.02	10:38	61	5,107	10	59,606	1127	CTD	3	clFR
867	24.09.02	11:59	61	0,058	11	0,065	727	CTD	3	clFR
868	24.09.02	21:08	62	0,167	8	55,016	438	CTD/LADCP	3	exFBC
869	24.09.02	22:12	61	57,100	8	54,800	456	CTD/LADCP	3	exFBC
870	24.09.02	23:11	61	54,111	8	54,984	509	CTD/LADCP	3	exFBC
871	25.09.02	00:13	61	51,013	8	55,149	556	CTD/LADCP	3	exFBC
872	25.09.02	01:14	61	47,960	8	55,210	651	CTD/LADCP	3	exFBC
873	25.09.02	02:17	61	44,905	8	55,168	757	CTD/LADCP	3	exFBC
874	25.09.02	03:26	61	41,943	8	55,079	867	CTD/LADCP	3	exFBC
875	25.09.02	04:57	61	39,000	8	55,000	861	CTD/LADCP	3	exFBC
876	25.09.02	06:19	61	36,030	8	54,684	822	CTD/LADCP	3	exFBC
877	25.09.02	07:30	61	33,011	8	54,506	653	CTD/LADCP	3	exFBC
878	25.09.02	08:45	61	30,080	8	54,607	500	CTD/LADCP	3	exFBC
879	25.09.02	09:48	61	27,000	8	54,800	415	CTD/LADCP	3	exFBC
880	25.09.02	10:45	61	23,970	8	54,880	355	CTD/LADCP	3	exFBC
881	25.09.02	14:31	61	2,923	7	59,971	164	CTD/LADCP	3	enFBC
882	25.09.02	15:16	61	2,955	7	54,166	319	CTD/LADCP	3	enFBC
883	25.09.02	16:38	61	2,907	7	48,067	790	CTD/LADCP	3	enFBC
884	25.09.02	17:01	61	3,177	7	41,994	930	CTD/LADCP	3	enFBC
885	25.09.02	19:04	61	3,140	7	36,100	900	CTD/LADCP	3	enFBC
886	25.09.02	19:20	61	3,200	7	29,800	866	CTD/LADCP	3	enFBC
887	25.09.02	21:25	61	3,084	7	23,790	835	CTD/LADCP	3	enFBC
888	25.09.02	22:36	61	3,100	7	17,800	745	CTD/LADCP	3	enFBC

Station No.	Date	Time	Latitude (°N)	Latitude (')	Longitude (°W)	Longitude (')	Depth (m)	Type of Cast	Leg	Comments
889	25.09.02	23:34	61	3,077	7	11,935	534	CTD/LADCP	3	enFBC
890	26.09.02	00:27	61	3,087	7	5,792	275	CTD/LADCP	3	enFBC
891	26.09.02	01:16	61	3,064	6	59,961	236	CTD/LADCP	3	enFBC
892	26.09.02	07:00	61	40,000	8	0,500	182	CTD/LADCP	3	iFBC
893	26.09.02	07:47	61	37,700	8	3,000	258	CTD/LADCP	3	iFBC
894	26.09.02	08:38	61	35,315	8	5,964	305	CTD/LADCP	3	iFBC
895	26.09.02	09:32	61	32,853	8	9,077	271	CTD/LADCP	3	iFBC
896	26.09.02	10:26	61	30,461	8	11,991	342	CTD/LADCP	3	iFBC
897	26.09.02	11:24	61	28,085	8	14,669	626	CTD/LADCP	3	iFBC
898	26.09.02	12:35	61	25,642	8	17,957	811	CTD/LADCP	3	iFBC
899	26.09.02	13:51	61	23,261	8	20,947	667	CTD/LADCP	3	iFBC
900	26.09.02	14:53	61	20,767	8	24,203	405	CTD/LADCP	3	iFBC
901	26.09.02	15:15	61	18,441	8	26,938	336	CTD/LADCP	3	iFBC
902	26.09.02	16:39	61	16,049	8	29,896	212	CTD/LADCP	3	iFBC
903	26.09.02	18:20	61	4,163	8	35,053	97	CTD	3	FB
904	26.09.02	19:56	60	52,531	8	40,056	133	CTD	3	FB
905	26.09.02	21:34	60	40,768	8	44,928	193	CTD	3	FB
906	26.09.02	23:15	60	28,926	8	50,056	265	CTD/LADCP	3	WTR
907	27.09.02	00:20	60	25,963	8	37,981	455	CTD/LADCP	3	WTR
908	27.09.02	01:37	60	23,070	8	25,599	565	CTD/LADCP	3	WTR
909	27.09.02	02:58	60	20,420	8	13,585	542	CTD/LADCP	3	WTR
910	27.09.02	04:25	60	17,168	8	1,448	547	CTD/LADCP	3	WTR
911	27.09.02	05:49	60	13,973	7	49,062	607	CTD/LADCP	3	WTR
912	27.09.02	07:08	60	10,922	7	36,868	564	CTD/LADCP	3	WTR
913	27.09.02	08:19	60	8,000	7	24,900	523	CTD/LADCP	3	WTR
914	27.09.02	09:30	60	5,010	7	12,770	507	CTD/LADCP	3	WTR
915	27.09.02	10:41	60	1,900	7	0,500	468	CTD/LADCP	3	WTR
916	27.09.02	11:49	59	59,104	6	48,209	450	CTD/LADCP	3	WTR
917	27.09.02	13:04	59	56,090	6	35,848	333	CTD/LADCP	3	WTR
918	27.09.02	14:24	59	57,098	6	19,715	572	CTD/LADCP	3	WTR
919	27.09.02	15:49	59	50,046	6	12,194	467	CTD/LADCP	3	WTR
920	27.09.02	17:05	59	47,008	6	0,159	355	CTD/LADCP	3	WTR

DK = Denmark Strait Section, IFR = Along Island Faroe Ridge Section, cIFR = Across Island Faroe Ridge Section, enFBC = Faroe-Bank Channel Entry Section, iFBC = Inner Faroe- Bank Channel Section, exFBC = Faroe-Bank Channel Exit Section, FB = Stations on the Faroe - Bank, WTR = Wyville – Thomson Ridge Section

1. Aims of the cruise

RV POSEIDON cruise 294, leg 1 - 3 were carried out by the Institut für Meereskunde of the University of Hamburg. Researchers and students from the Institut für Umweltphysik of the University of Bremen and from the Niels Bohr Institutet for Astronomi, Fysik og Geofysik of the University of Copenhagen also participated.

The cruise had several objectives:

- to educate undergraduate students in the handling of oceanographic instrumentation and in the collection and analysis of field data,
- to map the cold overflow to the North Atlantic and the warm inflow to the Nordic Seas over the ridge system between Greenland, Iceland and the Faroe Islands, through the Faroe-Bank Channel, and across the Wyville Thomson Ridge and to study its variability and
- to recover several temperature-pressure recorders in the overflow path.

The planning and preparation of the cruise involved the participating students and was carried out during seminars at the participating universities. Following a review of the recent literature, an analysis of historical data and the experiences made during the previous student cruises the observational programme was designed. Hydrographic stations were occupied along several sections crossing the in- and overflow. The University of Hamburg financed the experiment.

The result from these preparations are summarised on a WEB site and can be found under www.gfy.ku.dk/~dq, together with some preliminary results from the cruise itself.

2. Narrative

Leg 1

Friday, 6. September 2002

Reykjavik, sunny, NE 4-5 Bft., 12° C.
After arrival of the scientific crew onboard, the equipment was installed and secured. In the afternoon we received instructions on emergency procedures. RV POSEIDON left Reykjavik harbour at 19:50 sailing towards Denmark Strait.

Saturday, 7. September 2002

Noon position: 66°08' N 25°39'W, sunny, SW 6 Bft, 8°C
After steaming the whole night we arrived at the first CTD station at 10:30 a.m. Problems with hard- and software forced us to start the measurements without bottles on the rosette sampler and without the LADCP. On the way to the station the measurement positions for the next 36 hours along the section from the northwest Icelandic shelf towards the coast of Greenland across the Denmark Strait were planned. The night was really dark when we made the first radar contact with icebergs crossing our way.

Sunday, 8. September 2002

Noon position: 67°17' N 28°54'W, foggy, SW 3-4 Bft, 4°C
Work with the CTD was continued. Water temperatures at the surface dropped to less than 3° C and because of fog there was low visibility, between ½ and 1 NM. The section

comprising 33 stations was completed 20 miles off the coast of Greenland. From here we steamed towards our next section on the Iceland-Faroe-Ridge just east of Iceland.

Monday, 9. September 2002

Noon position: 67°08' N 23°30'W, foggy, E 2-3 Bft, 7°C
We are still on our way to the eastern Iceland-Faroe-Ridge. While steaming, we started on processing of the CTD-data from the Denmark Strait section and the students prepared and heard talks about the Acoustic Doppler Current Profilers (ADCP). In the morning we saw a very big, wonderful blue iceberg and some dolphins. In the afternoon came two whales and a large school of dolphins. After dinner the students learned from one of the very friendly sailors how to do sailor's knots. Then they met again to discuss the processed CTD data. From the technical side we managed to get the rosette water sampler and the lADCP going, both of which will be used on the Iceland-Faroe section.

Tuesday, 10. September 2002

Noon position: 66°33' N 14°15'W, sunny, SE 4 Bft, 7°C
We are still on passage to the Iceland-Faroe-Ridge. During the night the string of tourist attractions of the previous day was prolonged by an impressive aurora borealis that only later faded away in the fog. During the day we continued working with data processing and interpretation that were discussed during several meetings. The students were also given instructions on how to operate the lowered ADCP, and how to handle the rosette water sampler. In the afternoon they were guided through the engine room by one of the engineers, followed by a brief course in basic navigation techniques given by the mate. After dinner they had another knot-seminar. Then two of them gave a seminar on the principles of the CTD operation.

Wednesday, 11. September 2002

Noon position: 64°12' N 11°50'W, sunny, S 3-4 Bft, 10°C
The first station on the Iceland-Faroe-Ridge about 12 miles off the coast of Iceland was reached at 1 a.m. The measurements now include the collection of 3 water samples and of a current profile with the lADCP. Problems occur with the ship's ADCP, because both, software and the gyro-compass failed to work properly. Data processing for the Denmark Strait section was completed and the results discussed and documented. The distribution of temperature and salinity along the present section looks rather different to the one seen a year ago during the Kommandor Jack cruise, in as such there was much less overflow water found in the western deep trench off Iceland.

Thursday, 12. September 2002

Noon position: 63°02' N 09°27'W, foggy, S 4 Bft, 11°C
Work along the Iceland-Faroe Ridge continues, showing a thick patch of cold overflow water about half way between the islands. In parallel we continued data analysis of the Denmark Strait section and the students started writing their scientific report for the Web page, explaining what we observed and how we see these observations in the light of earlier studies. The procedures for the CTD data processing were streamlined and documented to be used by the students of the cruise's second and third legs.

Friday, 13. September 2002

Noon position: 61°24' N 08°22'W, sunny, E 1 Bft, 13°C
The Iceland-Faroe-Ridge section was completed after 44 stations at about 3 a.m. A thick layer of cold overflow water had been observed over the central part of the ridge. It

appeared to be associated with a large cyclonic eddy that reached to the surface and split the Atlantic inflow into two branches. After steaming onto the Faroe-Bank, a final section on this leg was covered across the Faroe-Bank-Channel, before work commenced at 8 p.m. The final seminar later smoothly turned into a farewell party, were the impressions from the cruise were discussed and plans for the future made.

Saturday, 14. September 2002

Torshavn, foggy, E 1 Bft, 12°C
RV POSEIDON arrived in Torshavn on the Faroe Islands at 6:15 a:m: and the first leg of cruise POS294 ended. The students left for the airport at 8:30 a.m. but one of the flights to Copenhagen had bee cancelled due to the fog. The Danish group had to stay one more night on the islands. Likewise some of the students from the second leg did not land, but after a seven hour stay in the aircraft landed back in Copenhagen.

Leg 2

Sunday, 15. September 2002

Noon position: Torshavn, foggy, WNW 4 Bft, 12°C
The rest of the scientific crew arrived on the ship at 1 p:m. and POSEIDON sailed at 1:45 p.m. towards the western part of the Iceland-Faroe-Ridge to repeat the CTD section of the previous leg and to recover several moorings layed with SV KOMMANOR JACK in July 2001. The new students received safety instructions and during a first seminar in the evening the scientific objectives of the cruise were discussed.

Monday, 16. September 2002

Noon position: 61°24' N 08°22'W, cloudy, WSW 5 Bft, 9°C
During the morning the students received an introduction into the different instruments and learned how to operate the CTD and lADCP. After morning coffee a fire drill was carried out and the life boats were tested. At 13:40 we started to dredge for the westernmost temperature/pressure recorder mooring, but failed to retrieve the instrument. Due to difficulties with the positioning of the mooring we decided to forgo searching for the remaining moorings. In parallel the students received a course in basic navigation, held by the second mate. We continued to steam towards the Icelandic continental shelf and the CTD section started with the first station around 9 p.m. During the night we worked our way towards the east, repeating the CTD stations from the first leg over the top of the Iceland-Faroe Ridge.

Tuesday, 17. September 2002

Noon position: 63°48 N 11°41 W, partly cloudy, SW 2 Bft, 9° C
During the whole day we were still collecting data with the CTD and the LADCP on the Iceland-Faroe-Ridge. The early morning shift saw a beautiful sunrise - all cameras producing tacky postcards. At 15:00 we had a meeting distributing the work that has to be done for the report. In the evening the sailors taught the students some sailor's knots.

Wednesday, 18. September 2002

Noon position: 63°51 N 8°52 W, overcast, E 3-4 Bft, 7° C

The western part of the CTD/lADCP section was completed at 2 a.m. and POSEIDON steamed northward to the start of a section from the Norwegian to the Icelandic Basin, crossing the Iceland Faroe Ridge. Normal station work started again after breakfast, some groups were busy in the computer laboratory doing data analysis. The first meeting for the day was held at 10:45 a.m. during which updates on data and measurements were discussed. In the afternoon the students had a tour to the vessel's main engine room, where the officer in charge explained how the engine works. For most it was really an exciting experience. Later in the evening, the last meeting for the day was held. During this period, updates on measurements and data that have been obtained so far were discussed and compared with those of the previous leg last week.

Thursday, 19. September 2002

Noon position: 62° 31' N 10° 55' W, cloudy, NW 4Bft, 9° C
In the morning we finished the CTD and LADCP measurements on the Iceland-Faroe-Ridge cross-section, the last station on this cross-section took place at 1 p.m. Afterwards we steamed to the next station, continuing with the last part of our Iceland-Faroe-Ridge section from 8 p.m. onwards. In the afternoon we took group photos on deck and we had a meeting to report the progress in our different tasks.

Friday, 20. September 2002

Noon position: 62° 20' N 8° W, cloudy
Work continued on the along ridge section which was completed early evening. Poseidon then steamed towards the Faroe Bank Channel to occupy two sections, one across the channel's exist, and one across the narrowest region. Besides their normal watch duties the students were busy preparing figures and texts for their reports, which were discussed during several meetings and seminars during the day.

Saturday, 21. September 2002

Noon position: 61° 33' N 8° 9' W, partly cloudy
The Faroe Bank Channel sections were completed at 1 p.m., and the vessel set course towards Tórshavn. During the afternoon laboratories were cleaned and the final touches put on the reports. R.V. POSEIDON arrived in Torshavn on the Faroe Islands at 6:30 p.m. and the second leg of cruise P294 ended.

Leg 3

Sunday, 22. September 2002

Torshavn, sunny, E 1 Bft, 12°C
The scientific party of the second leg left the ship after breakfast and took the bus to the airport. The new scientific crew arrived and Poseidon left the harbour in Torshavn at 8 p.m., steaming for the first section of the 3rd leg.

Monday, 23. September 2002

Noon position: 62°06' N 11°00' W, cloudy SW 5 Bft SW, waves 2-2.5 m
We steamed all night and arrived at the first station at 62°25' N 11°00' W during the morning. This was the first station on a section going due south - a continuation of a section from Leg 2. During the first station we were all introduced to the equipment and procedures. The weather is so far gentle and only one suffers from seasickness. All

instruments are working well although we had a total power failure - for 5 min during the afternoon.
Tuesday, 24. September 2002

Noon position: 61°06' N, 11°00' W, partly cloudy, W 2Bf, Waves 0 - 0.5m
In the morning we continued with our first section giving some of the deepest stations on the cruise - with each station taking about 90 min. At about noon we finished this section along the 11° W longitude and set a northeasterly course towards the beginning of the next section. In the afternoon we held our first scientific meeting to plan the data-analyses, which can be performed after the first section. At about 9 p.m. we reached the first station of our second section: a north-south section on the 8° 55 W longitude.

Wednesday, 25 September 2002

Noon position: 61°24' N, 8°55' W, overcast, W 5/6 Bft., waves 3-4 m, Relative Humidity: 72%.
Late in the morning we finished the second section of this leg (stations 869 to 880) steaming from north to south parallel to the first section, but closer to the Faroe Islands (at longitude 8° W). We have already processed the CTD data of the first two sections, making contour plots of density, salinity, temperature, geostrophic velocities and concentrations of some water masses from the zone (particularly NSDW and NSAIW), as well as the TS diagrams. We have discussed these results in our second scientific meeting. So far our results coincide with the known fact that each one of these water masses crosses from the Nordic Seas to the North Atlantic at different sides of the Faroe Islands.

Thursday 26. September 2002

Noon position: 61°29 N, 8°14 W, overcast, W 4 Bft., waves 1-1.5m, 12 C, Relative Humidity: 78%.
At about 01:30 this morning we finished the third section of this leg (stations 881 to 891) steaming from west to east taking our last station at a position south of the Faroe Islands (7°W 61°03N). We have processed the CTD data of this section as well as the LADCP data of the last two sections. The ship steamed northwest, parallel to the Faroe Islands for about 5 hrs to station 892 to begin the forth section (stations 892 to 902). The measurements were started at 7:00 and ended at 17:00. We continued the measurements with a number of shallow stations across the Faroe Bank.

Friday 27. September 2002

Noon position: 60°20 N, 7°01 W, overcast, WSW 6 Bft., waves 3-4 m
During the night we encountered quite strong currents at stations 909 and 910 near 60° 17' N - 8° 0' 1W and 60° 20' N - 8° 20' W as we used more than 640 m of wire to reach a depth of 547 m. This afternoon we are nearly done with the fifth and last section of the cruise along the Wyville Thomson Ridge. Due to some fishing vessels in the area of station 918 we may had to deviate northward from our planned cruise track. We completed this final section around 1800 utc and hereafter started our streaming towards the North Sea and Kiel.

Saturday 28. September 2002

Noon position: 59° 06 N, 0° 29' W, overcast, SSW 5 Bft., 13° C, waves 2-2.5 m

The Poseidon is steaming to Kiel, making good progress due to the fine weather. This morning the students gathered in the lab to continue the processing of the data. One group started working hard to complete the salinity analyses for the last two boxes of water samples. A second group proccessed the last LACDP data and final contour plots of all the sections of the cruise. The third group did the packing of the equipments used on the cruise. About 6.20 p.m. local time, we had a meeting and again all the groups were asigned to tomorrows duties.

Sunday 29. September 2002

Noon position: 57° 41 N, partly cloudy, W 5, sea 2-2.5 m, 15 °C
Work on data evaluation and interpretation continued.

Monday 30. September 2002

Noon position: 55° 43 N, 10° 47 E, partly cloudy, SW 5, sea 1 m, 14.5 °C
RV Poseidon arrived in Kiel and went alongside her berth at the Institute für Meereskunde at 10 p.m., and a successfull cruise with interested and motivated students ended. In total they had run 242 CTD stations, covering the ridge from the Greenland to the Scotish Shelf.

3. Cruise participants

Leg 1, 06.- 14. September 2002

Dagmar Hainbucher	Chief Scientist	IfM
Detlef Quadfasel	Scientist	NBIAFoG
Stiig Wilkenskjeld	Student	NBIAFoG
Cevat Alkan	Student	IfM
Brian Broe	Student	NBIAFoG
Roberto Fausto	Student	NBIAFoG
Mirjam Gleßmer	Student	IfM
Claudia Majer	Student	IfM
Martin Vogt	Student	IfM

Leg 2, 14.- 22. September 2002

Dagmar Hainbucher	Chief Scientist	IfM
Detlef Quadfasel	Scientist	NBIAFoG
Christian Mertens	Scientist	IUP
Samuel Acquah	Student	IUP
Manfred Brath	Student	IfM
Nathalie Marie-Hélène Courcoux	Student	IUP
Sara Herbertz	Student	IfM
Lotte Laugesen	Student	NBIAFoG
Stephan Sedlacek	Student	IfM
Christoph M. Schultzs	Student	IfM

Leg 3, 22. September - 01. October 2002

Christian Mertens	Chief Scientist	IUP
Philip Kruse Jakobsen	Scientist	NBIAFoG
Berit Rabe	Student	IfM
LeonardKofitse Amekudzi	Student	IUP
Peter Langen	Student	NBIAFoG
Jesper Nissen	Student	NBIAFoG
Ismael Diego Nuñez Riboni	Student	IUP
Francis Kofi Tetteh	Student	IUP

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4. Technical information

CTD/Rosette

Altogether 242 full depth standard hydrographic stations were occupied during the cruise, employing a SeaBird SBE911plus CTD-O2 sonde and a RDI lADCP, attached to a SeaBird carousel 24 bottle water sampler. Profiles were run to within 10-15 m of the bottom. At all stations water samples were taken from three depth levels (10 m depth, mid-depth and 10 m above the bottom). The water samples were analysed onboard for salinity, using a Guildline Autosal salinometer. One of the water bottles was also equipped with protected and unprotected reversing thermometers, providing temperature and pressure check values for the CTD sensors.

5. Preliminary results

The results presented here were compiled by the students during the course of the cruise and can, in a slightly different form, also be seen on their WEB page www.qfy.ku.dk/~dq. The data used for producing these results are not calibrated.

Leg 1:

Water mass exchange through Denmark Strait

Three main water masses pass through Denmark Strait: at the eastern side of the Strait the Irminger Current carries warm and saline Atlantic Water northward, cold and low salinity Polar Water flows southward in the East Greenland Current, in the central and western side and near the bottom dense overflow waters from the Nordic Seas and the Arctic Ocean pass through the Strait. This overflow water sinks into the deep Irminger Basin to depths between 2000m and 4000m and contributes to the Great Conveyor Belt circulation of the World Ocean.

At the beginning of leg 1 of POSEIDON cruise 294, CTD measurements were taken along a section crossing Denmark Strait just north of the sill. Starting in the east, 33 stations were occupied from the Icelandic shelf across the deep trench onto the Greenland Shelf. The nominal station spacing was 5 nautical miles (fig.1a).

The three principle water masses can be distinguished in this hydrographic section. In the upper layers the temperature distribution (fig. 2a) clearly shows the front separating the Atlantic from the Polar Water, which is located over the continental slope of Iceland in the very eastern part of the Strait. Compared to historical observations, this is a very eastern location. Finally the overflow waters, in contrast, are better seen in the salinity (fig. 2b) and potential density distributions (fig. 2c), with values above 34.9 and 27.9 kg/m3, respectively.

In the upper 200 m of the water column both temperatures and salinities are highly variable and characterised by intrusions between high and low salinity waters. This is indicative for high stirring and mixing activity that may be caused by the presence of meso-scale eddies throughout the Strait. Such eddies can be seen in the density distribution, by undolation of the pycnocline with length scales of several tens of kilometres. A possible origin of these eddies are instabilities of the frontal zone.

Figure 2d shows the temperature-salinity distribution of the Denmark Strait section.. Given in boxes are the water mass definitions by Hansen and Øserhus (2001, Progress in Oceanography) and Saunders (2001, WOCE book). Modified North Atlantic water (MNAW) has a temperature of 7.0-8.5 °C and a salinity between 35.1-35.3. Polar Water is characterised by temperatures of about. -1 °C down to the freezing point and salinities lower than 34.5. The Denmark Strait overflow water (DSOW) is identified by temperatures between -1 and 2 °C and salinities of 34.7-35.0. The black dots in the TS diagram refer to data collected in the upper 80 m of the water column and show the effect of summer heating, in particular over the Greenland shelf. Not considering this layer that is influenced by local air-sea fluxes, the remaining water parcels can all be explained as a mixture between the three basic water masses.

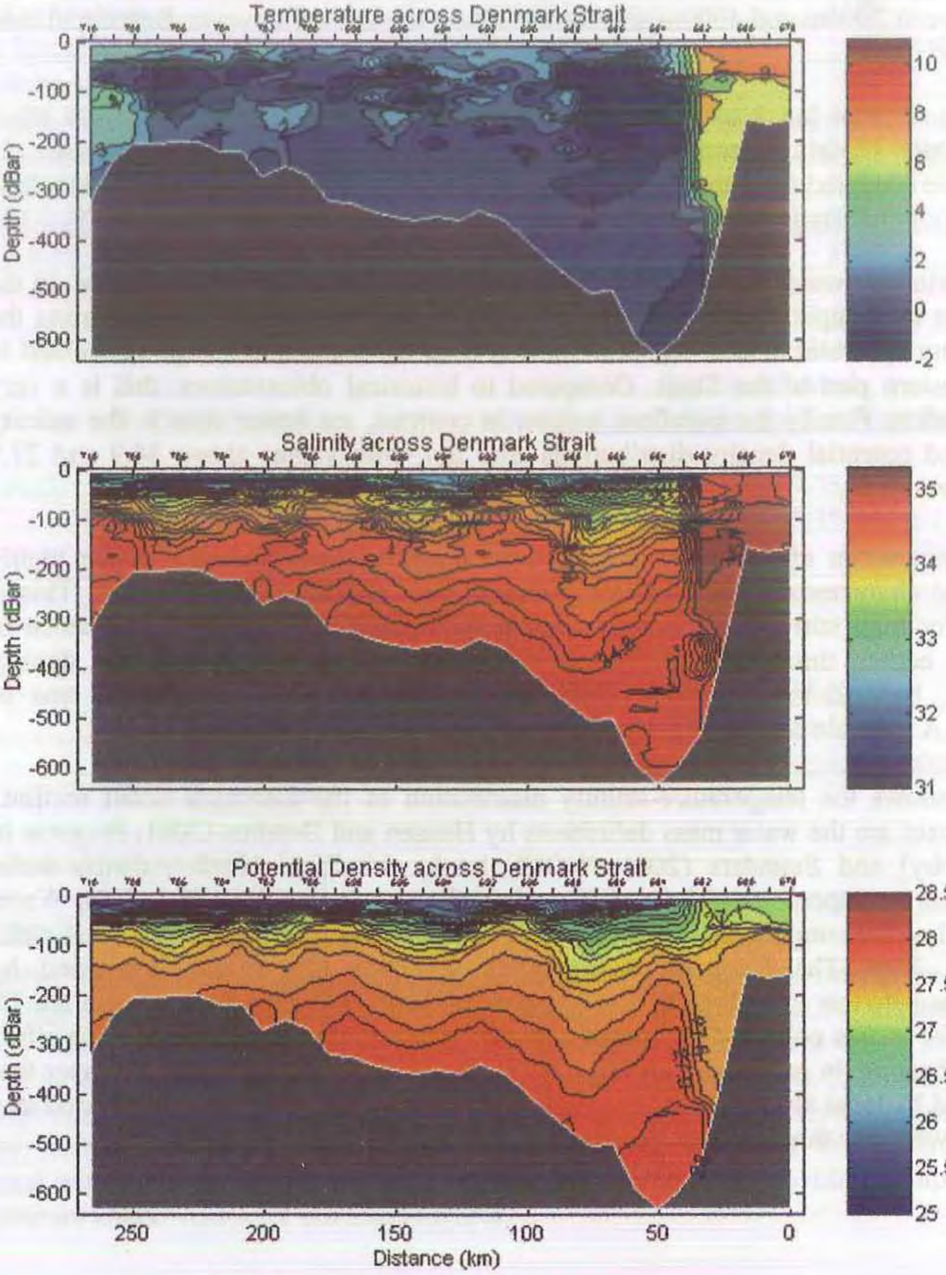

Figure 2: a) Temperature distribution of the Denmark Strait section during leg 1.
b) Salinity distribution of the Denmark Strait section during leg 1.
c) Density distribution of the Denmark Strait section during leg 1.

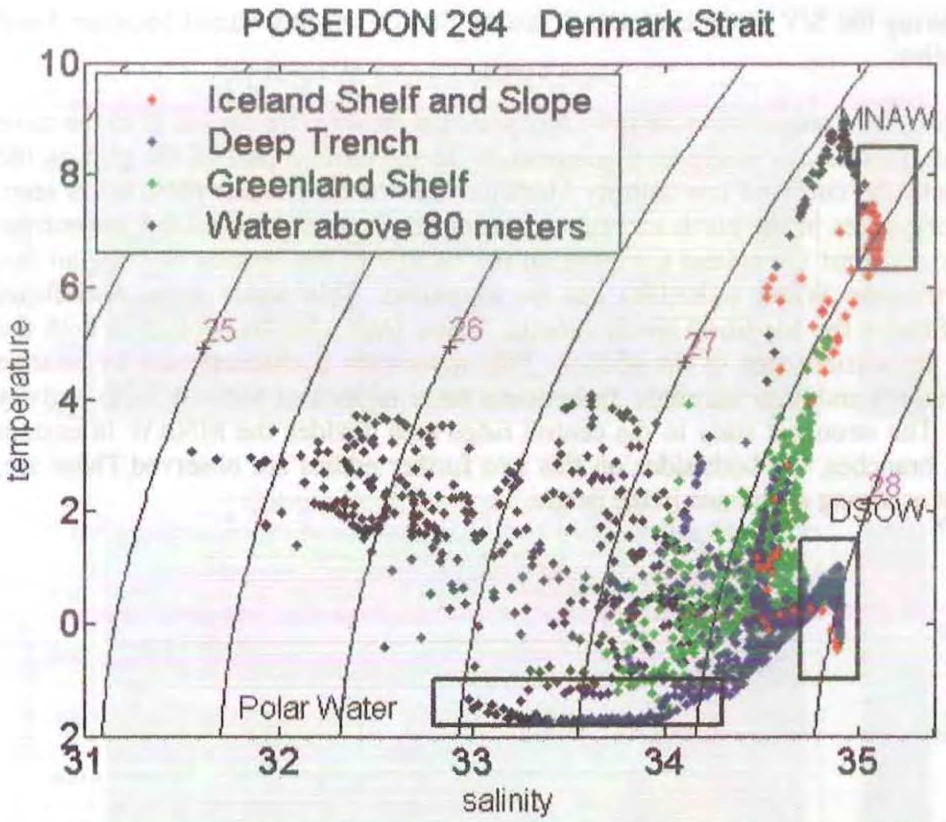

Figure 2d: TS-diagram of the Denmark strait section (stations 678-710) during leg 1

Some conclusions:

- The water in Denmark Strait consists of three basic water masses and mixtures between them.
- During the POSEIDON cruise in September 2002 the front between Polar- and Atlantic waters was located very much to the east.
- There is evidence for strong eddy activity in Denmark Strait.
- Summer heating substantially modifies the near surface water, in particular over the Greenland Shelf.

Water masses on the Iceland Faroe Ridge

The Iceland-Faroe Ridge is much shallower than Denmark Strait and the Faroe Bank Channel and it is common opinion that the cold overflows are sporadic and associated with the passage of eddies rather than steady as in the deep passages. The main water masses exchanged over the ridge are: East Icelandic Water at the Icelandic shelf and slope, Atlantic Water over the whole width of the ridge and near the bottom dense Overflow Waters through the various up to 450 m deep trenches in the ridge.

42 CTD profiles were taken along a section along the top of the Iceland Faroe Ridge from the Icelandic to the Faroes shelfs. Station positions were the same as those occupied in

July 2001 during the S/V Kommandor Jack cruise. Station spacing varied between 3 and 8 nautical miles.

In the distribution of temperature, salinity and potential density (figure 3 a, b, c) the three different watermasses can easily be distinguished. In the eastern part of the plot on the Icelandic shelf, the cold and low salinity Modified East Iceland Water (MEIW) is seen. This water originates in the north and flows southward. It consists of mixed water from the Irminger and East Greenland Currents. In the middle of the section Norwegian Sea Arctic Intermediate Water (NSAIW) can be identified. This water mass also flows southward. Finally the Modified North Atlantic Water (MNAW) was found in both the eastern and the western part of the section. This watermass is characterised by relative high temperatures and high salinities. In between these regions of MNAW eddy activity is observed. The strongest eddy in the centrel ridge area devides the MNAW in eastern and western branches. On both sides on this two further eddies are observed.These are, however, not as strong as the one in the centre.

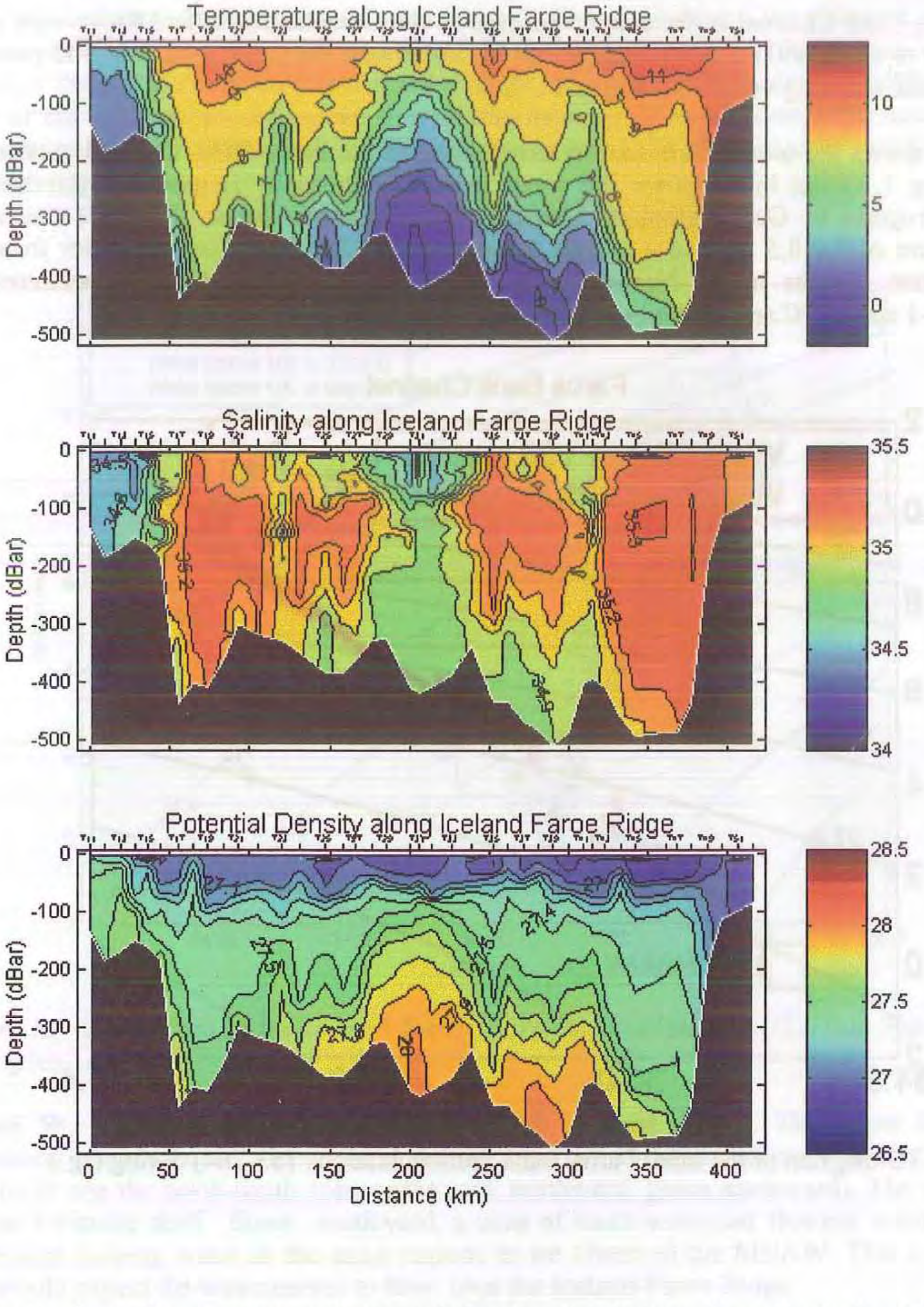

Figure 3a, b, c: Temperature, salinity and density distribution along the Iceland Faroe Ridge during leg 1.

Deep outflow through the Faroe Bank Channel

The Faroe Bank Channel is the deepest passage in the Greenland Scotland Ridge with a sill depth of about 860 m. On average 1.9 Sv of water with temperatures below 3°C pass over the sill, reaching velocities of up to 1.3 m/s.

Figure 4 shows the temperature-salinity distribution of the Faroe Bank Channel section during leg 1. Given in boxes are the water mass definitions by Hansen and Øserhus (2001, Progress in Oceanography). Modified North Atlantic water (MNAW) has a temperature of 7.0-8.5 °C and a salinity between 35.0-35.3. The overflow water from intermediate depths in the Norwegian Sea (NSAIW) is identified by temperatures between -1 and 0.5°C and salinities around 34.85-34.92.

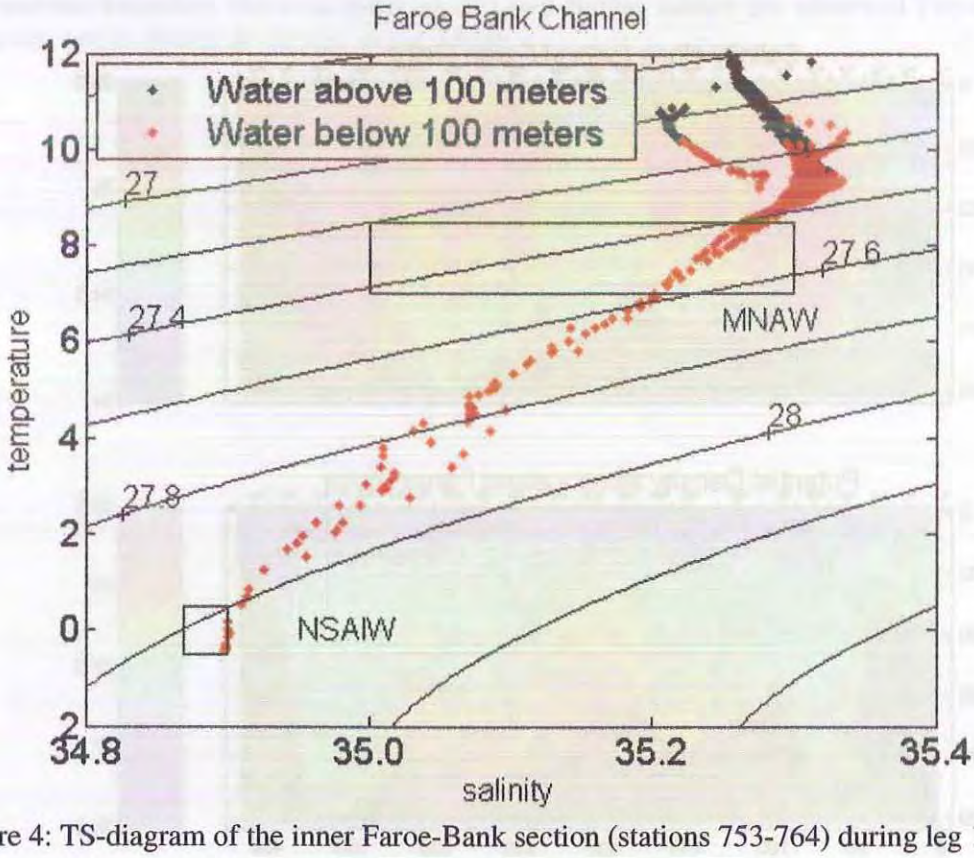

Figure 4: TS-diagram of the inner Faroe-Bank section (stations 753-764) during leg 1

Leg 2

Water masses on the Iceland Faroe Ridge

Figure 5a shows the temperature-salinity distribution of the Iceland Faroe Ridge section. Given in boxes are the water mass definitions by Hansen and Øserhus (2001, Progress in Oceanography). Modified North Atlantic water (MNAW) has a temperature of 7.0-8.5 °C and a salinity between 35.0-35.3. Modified East Icelandic Water is characterised by temperatures below 4° and salinities lower than 34.8. The overflow water from intermediate depths in the Norwegian Sea (NSAIW) is identified by temperatures between -1 and 0.5°C and salinities around 34.85.

The properties of EIW and MEIW are not totally clear defined, but TS diagrams of the measurements have been plotted in order to get a clearer picture of the different water masses. After building these TS diagrams and avoiding to consider the surface water (because there are too much interactions with the atmosphere) it is clearly visible that most of the data points correspond to a mixing between three different water masses . Two end points of the triangle are clearly defined as being the MNAW and the NSAIW, the third one, which is located around 2°C and 34.673 PSU, seems to be EIW.

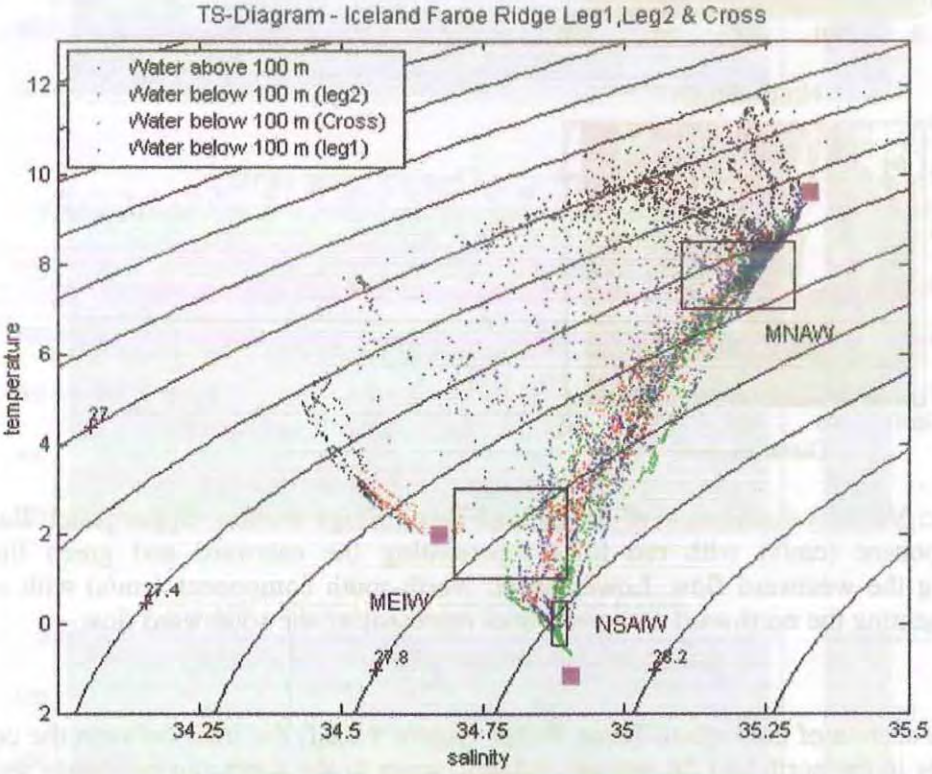

Figure 5a: TS-diagram of the Iceland Faroe Ridge sections (stations 711-752, 766-831) during leg 1and 2.

Figure 5b,c show the velocity measured by the lowered ADCP. The upper figure represents the east-west component of the velocity (red: eastward, green: westward) and the lower one the north-south component (red: northward, green southward). The water on the Icelandic shelf flows southward, a core of south-westward flowing water and northward flowing water in the same regions as we observed the MNAW. This is how one would expect the watermasses to flow over the Iceland-Faroe-Ridge.

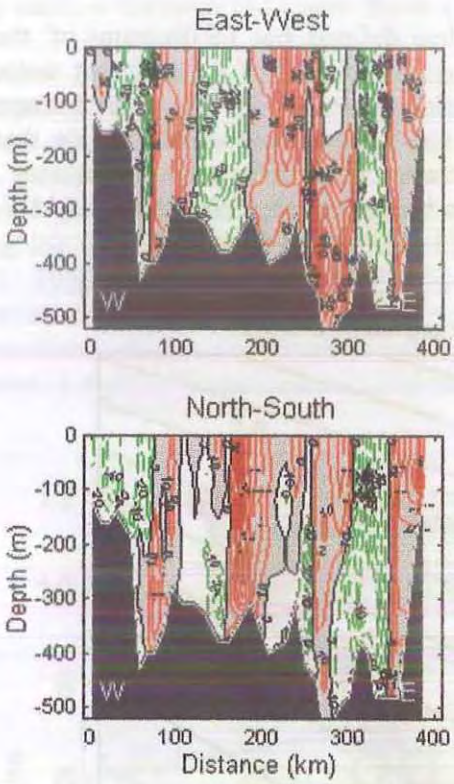

Figure 5b,c: Velocity distribution of the Iceland Faroe Ridge section. Upper panel: East-west component (cm/s) with red lines representing the eastward and green lines representing the westward flow. Lower panel: North-south component (cm/s) with red lines representing the northward and green lines representing the southward flow.

In the cross section of the Iceland-Faroe Ridge (figure 5 d,e,f) the front between the cold Arctic water in the north and the warmer Atlantic water in the south can be clearly seen. At this high latitude and just regarding relatively large scale motions the coriolis parameter is strong enough to affect the current which is geostrophic. Since the pressure gradient is towards the north the upper light water will flow north-eastward (figure 5 g,h).

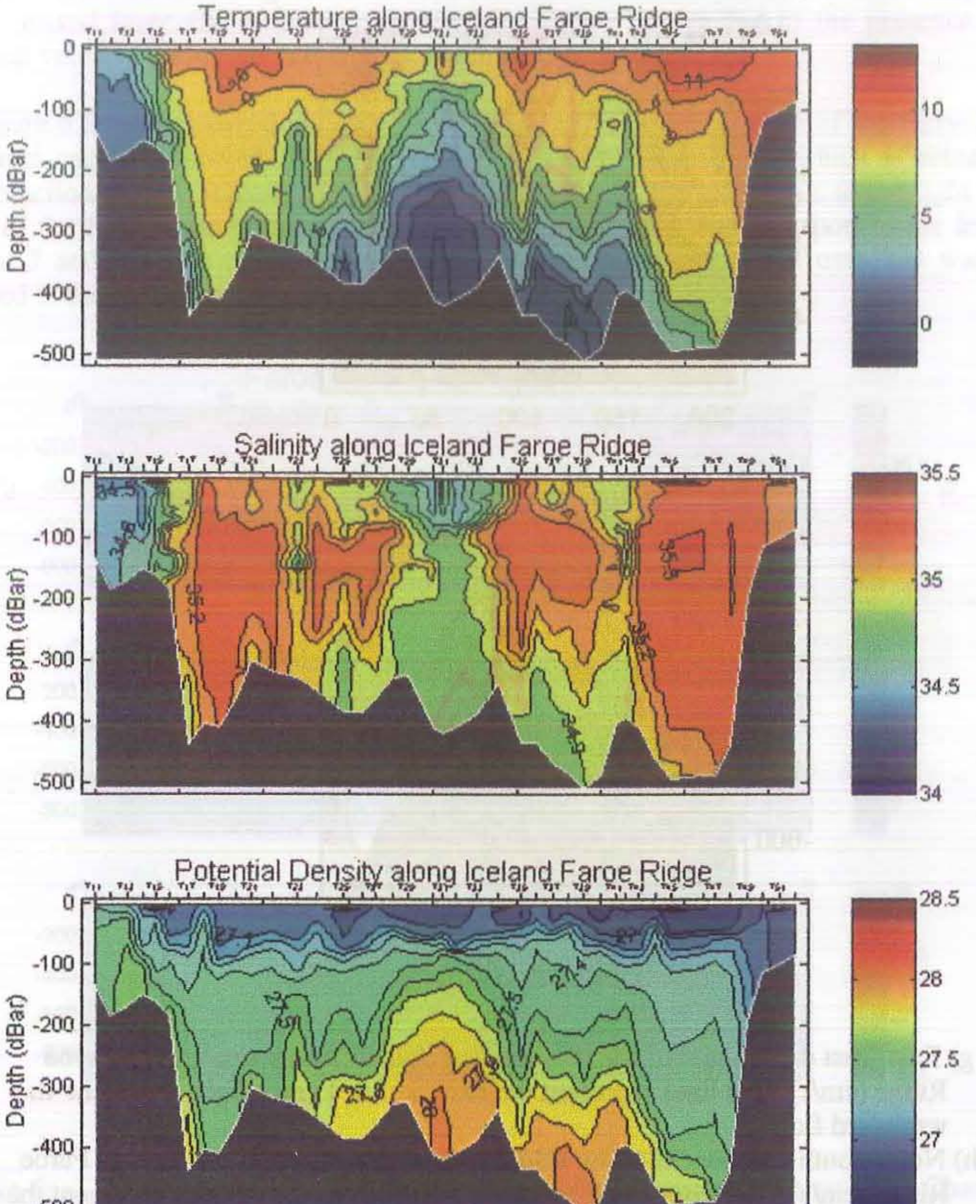

Figure 5: d) Temperature distribution across the Iceland Faroe Ridge during leg 2.
e) Salinity distribution across the Iceland Faroe Ridge during leg 2.
f) Density distribution across the Iceland Faroe Ridge during leg 2.

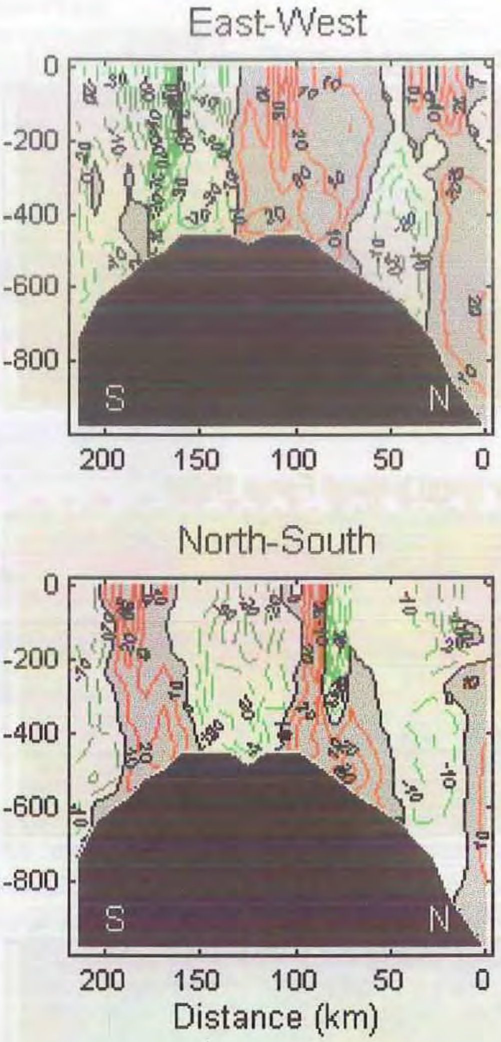

Figure 5: g) East-west component of the velocity distribution across the Iceland Faroe Ridge (cm/s). Red lines represent the eastward and green lines represent the westward flow.
h) North-south component of the velocity distribution across the Icelnad Faroe Ridge (cm/s). Red lines represent the northward and green lines represent the southward flow.

Leg 3:

General section description of the waters found in the area surrounding the Faroe-Bank Channel

Generally four different layers can be observed (figure 6, 7, 8). In the top 50 meters a homogeneous and low saline layer is observed. This mixed layer is caused by wind stress at the surface creating a vertical velocity shear and therefore induces turbulent mixing. The low salinity is due to the fact that the layer is diluted by freshwater from precipitation. Underneath we find a layer of warm and saline Atlantic water flowing into the Nordic Seas. Going from west towards east this layer becomes more saline as it approaches the Continental Slope Current. At the bottom a layer of dense, fresh and cold water is found, with a distinctive gradient in the temperature, salinity and density. This is the overflow water flowing out of the Nordic Seas. In addition several stations display a well mixed layer above the bottom (bottom Ekman layer) due to the presence of a vertical velocity shear (no velocity at the sea floor).

In figure 6 the dense overflow water as a bottom layer at the entrance of the Faroe Bank Channel can be observed. The isopycnals seem almost horizontal which is actually a combination of two forces. The Coriolis force displaces the isopycnals to the right hand side of the flow while bottom friction induces a bottom Ekman transport to the left. In figure 7 and figure 8 the Coriolis force becomes dominant and the overflow water is pushed to the north-eastern side of the channel.

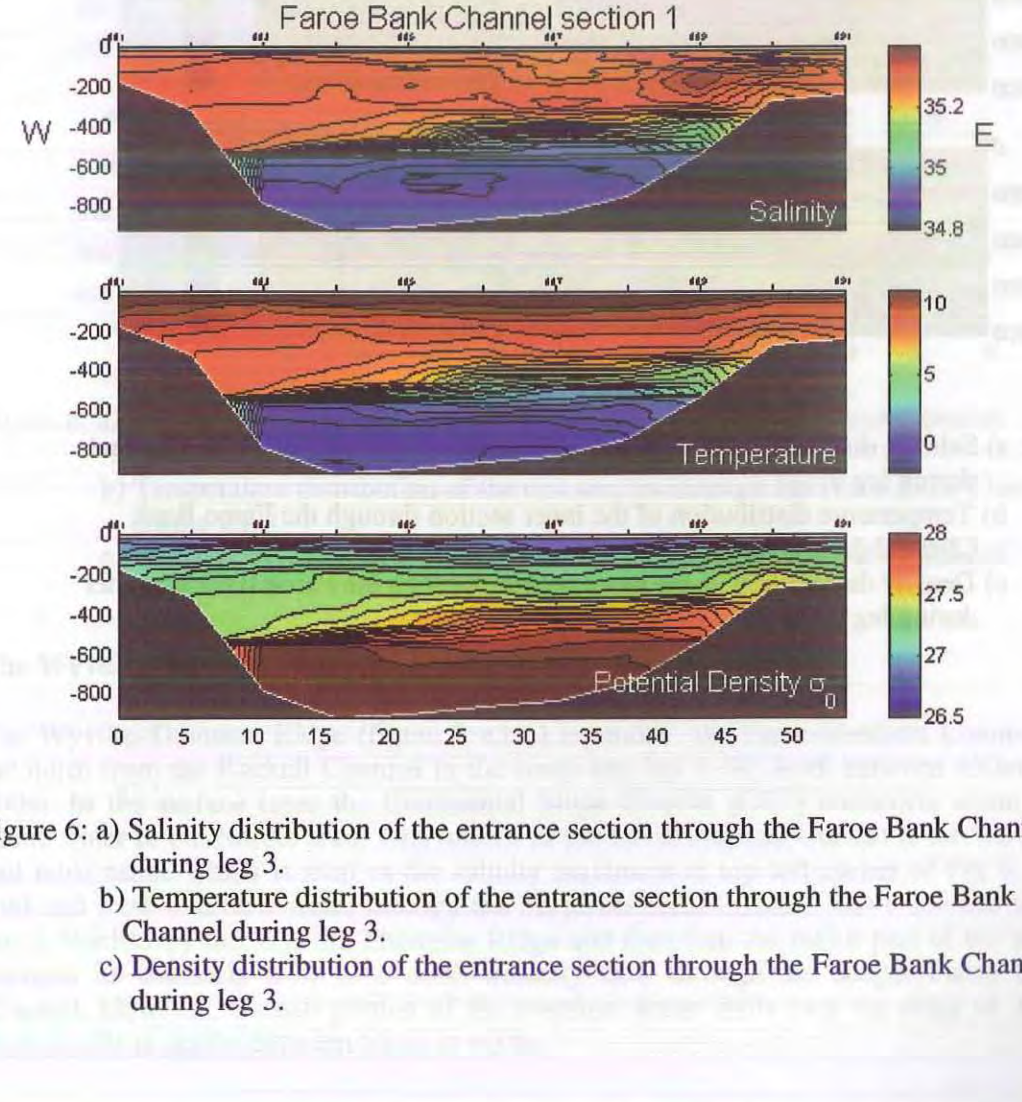

Figure 6: a) Salinity distribution of the entrance section through the Faroe Bank Channel during leg 3.
b) Temperature distribution of the entrance section through the Faroe Bank Channel during leg 3.
c) Density distribution of the entrance section through the Faroe Bank Channel during leg 3.

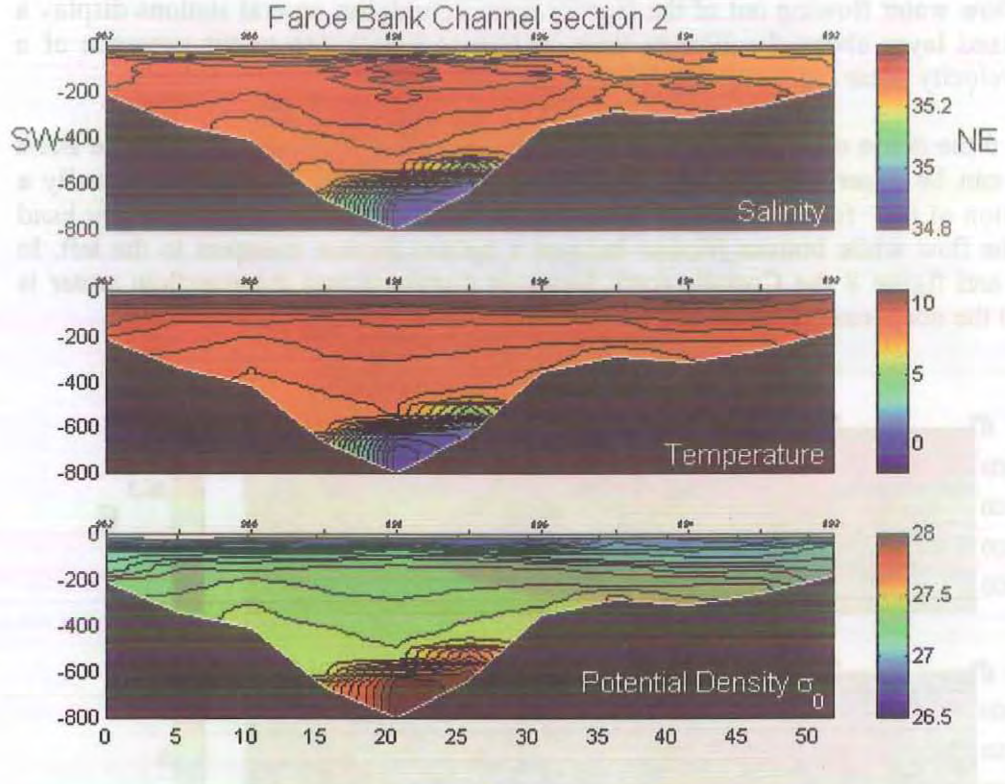

Figure 7: a) Salinity distribution of the inner section through the Faroe Bank Channel during leg 3.

b) Temperature distribution of the inner section through the Faroe Bank Channel during leg 3.

c) Density distribution of the inner section through the Faroe Bank Channel during leg 3.

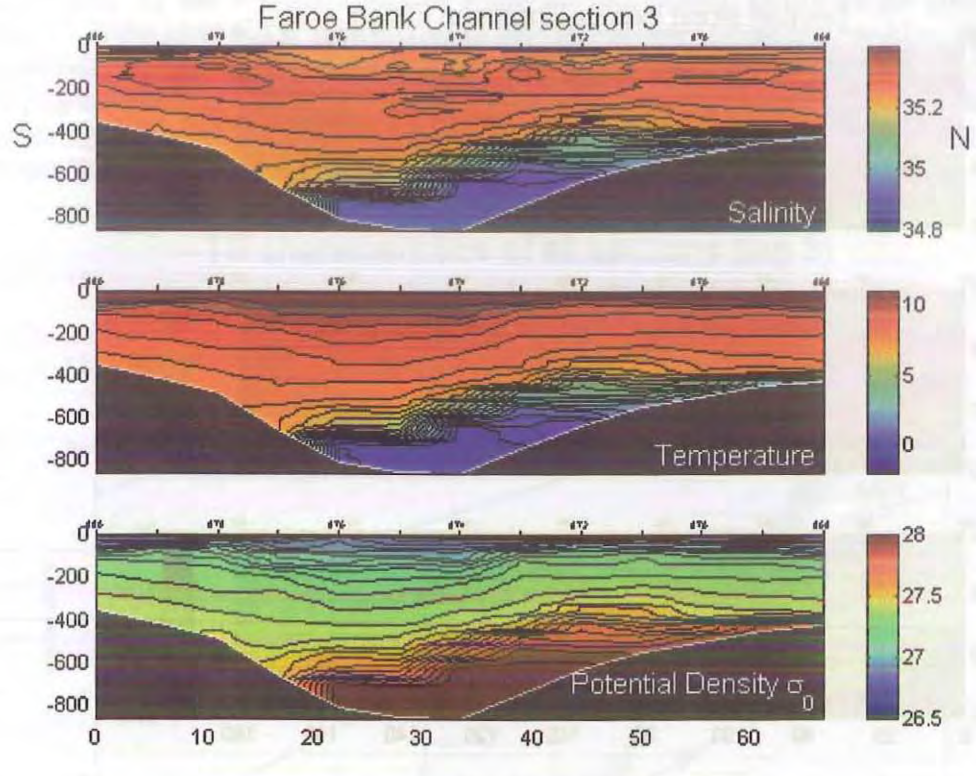

Figure 8: a) Salinity distribution of the exit section through the Faroe Bank Channel during leg 3.

b) Temperature distribution of the exit section through the Faroe Bank Channel during leg 3.

c) Density distribution of the exit section through the Faroe Bank Channel during leg 3.

The Wyville-Thomson Ridge

The Wyville-Thomson Ridge (figure 9 a,b,c) separates the Faroe-Shetland Channel in the north from the Rockall Channel in the south and has a sill depth between 450m and 600m. In the surface layer the Continental Slope Current (CSC) transports warm and saline water to the Nordic seas. This branch of the North Atlantic Current is the warmest and most saline which is seen as the salinity maximum at top left corner of Fig 9. The cold and fresh overflow water through the Faroe-Shetland Channel flows towards south but is blocked by the Wyville-Thomson Ridge and therefore the major part of the water changes its southerly flow to a north-westerly flow through the deeper Faroe Bank Channel. However, a small portion of the overflow water spills over the ridge at three distinct sills at depths between 550m to 600m.

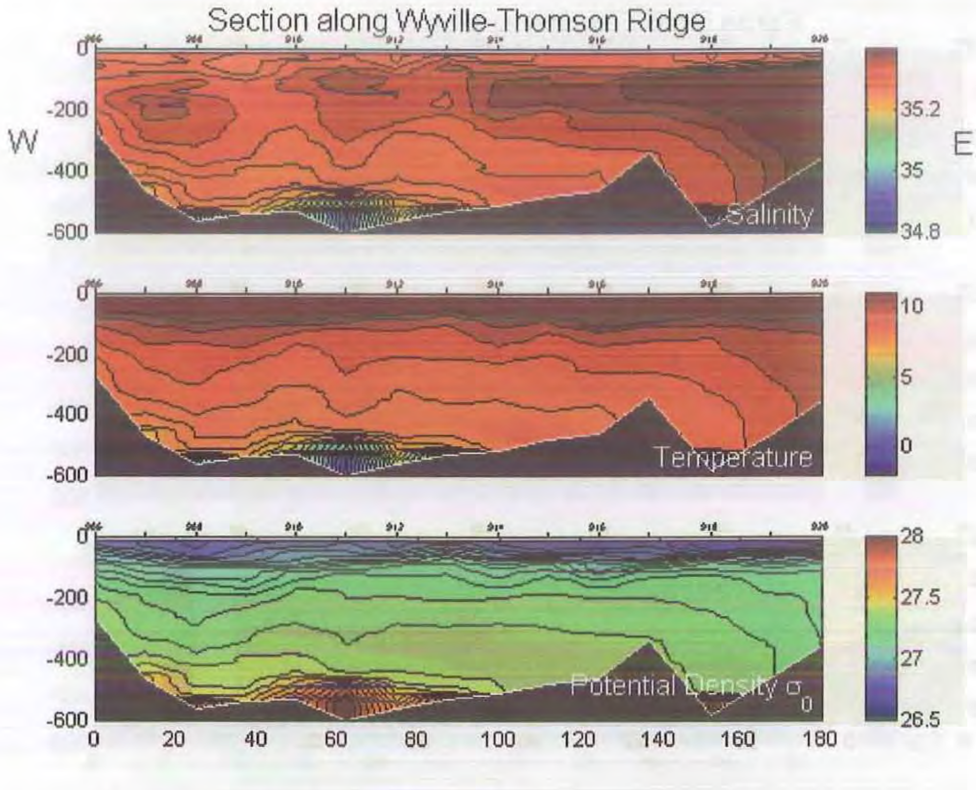

Figure 9: a) Salinity distribution of the Wyville-Thomson Ridge during leg 3.
b) Temperature distribution of the Wyville-Thomson Ridge during leg 3.
c) Density distribution of the Wyville-Thomson Ridge during leg 3.

General TS-characteristics of the leg 3 sections

In general, the characteristics of the measured water masses can be described as a mixing between warm and salty water masses such as North Atlantic Water (NAW) and Modified North Atlantic Water (MNAW) and cold and fresh water masses as Modified East Icelandic Water (MEIW), Norwegian Sea Arctic Intermediate Water (NSAIW) and Norwegian Sea Deep Water (NSDW). There are, however, a number of differences between the sections - some of which will be discussed here.

In the Iceland-Faroe Ridge (IFR) section, shown by the black dots in Figure 10, a distinct mixing line from MNAW to MEIW is observed but stops at around 4°C. Water on this line mixes with that on the mixing line between MNAW and NSAIW also present in this section. To explain this feature we look closer at a special case: Station 860, located 200 km south of the IFR. This displays a characteristic salinity maximum about 50 m above the bottom. This maximum coincides with the interface between water on the NSAIW/MNAW mixing line and the overlaying water placed on the MEIW/MNAW mixing line. We believe that the rather large vertical extent of the mixing, i.e., 50-100m, is made possible by the combination of a low stratification and a velocity shear. In fact, a profile of the Richardson number for this station shows a minimum (0.2) at this depth. The velocity shear for the IFR section has been plotted in Fig. 10. In the detailed TS-diagram (Fig. 11) the black dots show the special S-shape resulting from the interfacial mixing between water on two different mixing lines.

Characteristic for the Wyville-Thomson Ridge (WTR) section, shown by the green dots in Fig. 10, is the clear NAW imprint due to the Continental Slope Current. Also, the only trace of pure NSDW observed in our sections was found over the WTR. We suspect that the topographical steering exerted by the ridge is able to deflect the isopycnals far enough upwards for pure NSDW to spill over. As this section is also the one closest to the exit from the Nordic Seas, it has the lowest degree of entrainment.

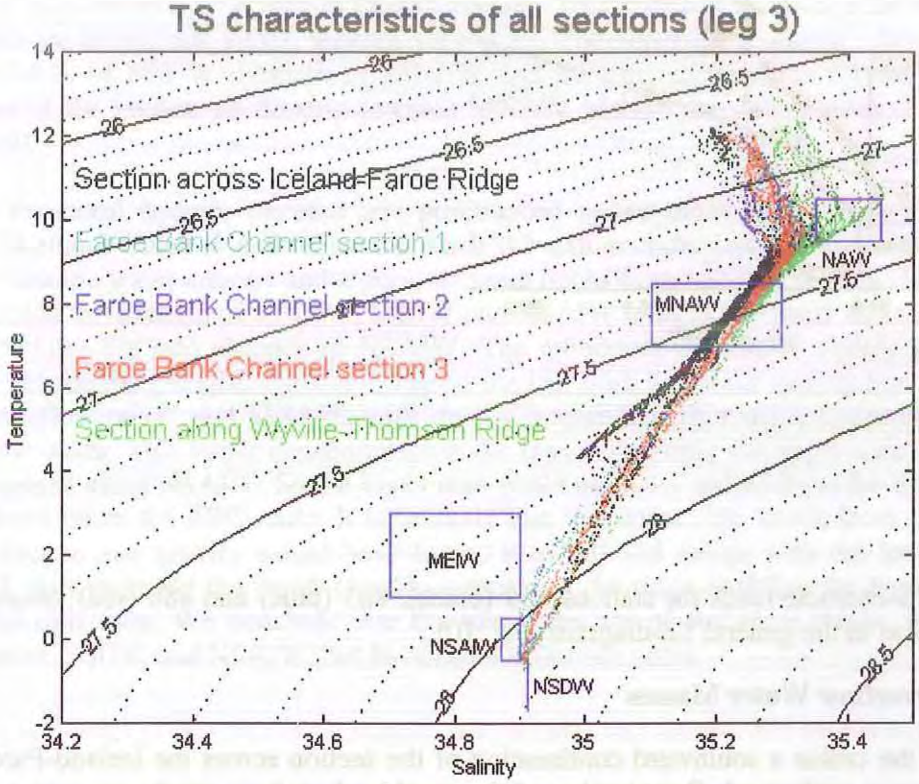

Figure 10: TS-characteristics of all sections of leg 3. Source water masses are marked with blue boxes and their ranges are taken from Hansen and Østerhus (2000): North Atlantic Water (NAW) (35.35--35.45,9.5--10.5 C), Modified North Atlantic Water (MNAW) (35.10--35.30,7.0--8.5 C) , Modified East Icelandic Water (MEIW) (34.70--34.90,1.0--3.0 C) , Norwegian Sea Arctic Intermediate Water (NSAIW) (34.87--34.90, -0.5--+0.5 C) , Norwegian Sea Deep Water (NSDW) (34.91,<-0.5 C) . The five sections are marked in different colours.

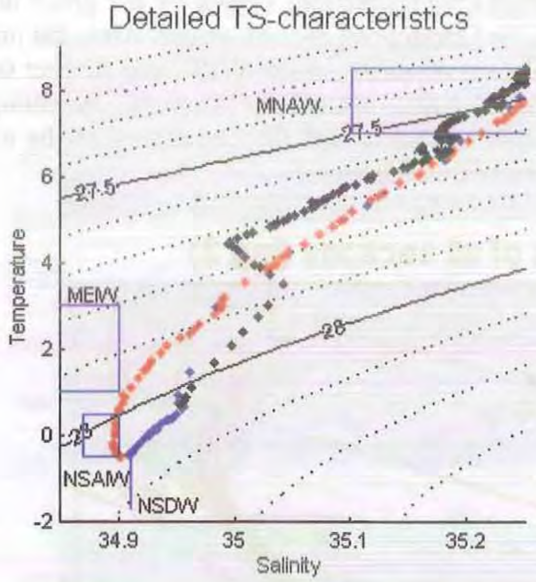

Figure 11: TS-characteristics for stations 869 (black), 883 (blue) and 886 (red). Source water masses as in the general TS-diagram (Fig. 10).

The Deep Overflow Water Masses

On leg 3 of the cruise a southward continuation of the section across the Iceland-Faroe Ridge (IFR) was performed. Examination of the combined section reveals two cores of cold and fresh overflow water on the southern side of the ridge. The interesting question is: whether these cores are the same water mass spilling over the ridge or if they are different in origin. In order to address this problem water mass analyses were made and an example is shown in Fig. 12. We assume a mixing of the three water masses Norwegian Sea Deep Water (NSDW), Modified East Icelandic Water (MEIW) and Modified North Atlantic Water (MNAW). The percentages of NSDW are shown both for the IFR-section (of leg 3) and the exit Faroe Bank Channel (FBC) section. It is seen that the concentration of NSDW is higher in the lower core on the IFR than in the upper one. The concentration in the FBC core is higher than both of these and we found that the concentration increased even further when moving upstream (entrance and inner Faroe-Bank Channel section are not shown).

Replacing NSDW with NSAIW (Norwegian Sea Arctic Intermediate Water) in the analysis (not shown) we found that the lower core on the IFR and the FBC-core fall outside the triangle and are thus not represented by the decomposition. This seems indicative of the cores being strictly NSDW with NSAIW completely absent, a somewhat counterintuitive observation: Heavy NSDW flowing alone through the FBC without the lighter NSAIW, which is known to overflow along much the same paths as NSDW (Hansen and Østerhus, 2000). This motivates a closer look at the TS-diagram for the cores. It turns out that the TS-characteristics of the entrance FBC-section can be interpreted in terms of a three layer system with NSDW overlain by NSAIW and an Atlantic water mass - either MNAW or NAW - on top.

The red dots in Fig. 11 show a station in the eastern part of exit FBC section. First, a line is seen from the Atlantic water towards NSAIW - this is the mixing across the MNAW/NSAIW-interface. Secondly, a vertical part is seen within the range of NSAIW. This may be the imprint of the original cooling of this water mass during its production. Finally, the line turns towards the NSDW (colder and saltier) and thus represents mixing across the lower interface. This three-layer structure, however, only holds in the eastern part of the section. As can be seen from the density plot (Fig 9) the western part is strongly influenced by the bottom Ekman current: This transport at the bottom displaces upwards the isopycnals which become very close. The structure is almost two layered and consists of NSDW overlain by MNAW and the blue mixing line for the western stations of the section go directly towards MNAW without the detour around NSAIW (Fig. 10).

These structural features become less pronounced as we move downstream from the Faroe-Shetland Channel and when we reach the exit section, just mixing between the North Atlantic water masses and a point between NSAIW and NSDW is seen. This point lies outside the triangle of MNAW, MEIW and NSAIW used in the water mass analysis. This explains the odd absence of NSAIW: The admixture of NSDW simply pulls the points outside the triangle. The two cores on the IFR both lie on the mixing line between our "overflow point" and MNAW, with the lower core having a larger concentration of overflow water. This larger concentration is the reason that only the upper core could be decomposed using NSAIW. So the lower core could not have spilled from the upper, and must have taken the FBC-route. It is unlikely that the upper core stems from the FBC, since friction and gravity would have forced it to fall and merge with the lower core. Instead, it is probably the result of eddy activity on the ridge enabling the heavy water mass to spill over. We conclude that the two cores are of the same origin, namely a mixture of NSDW and NSAIW, but have taken different routes.

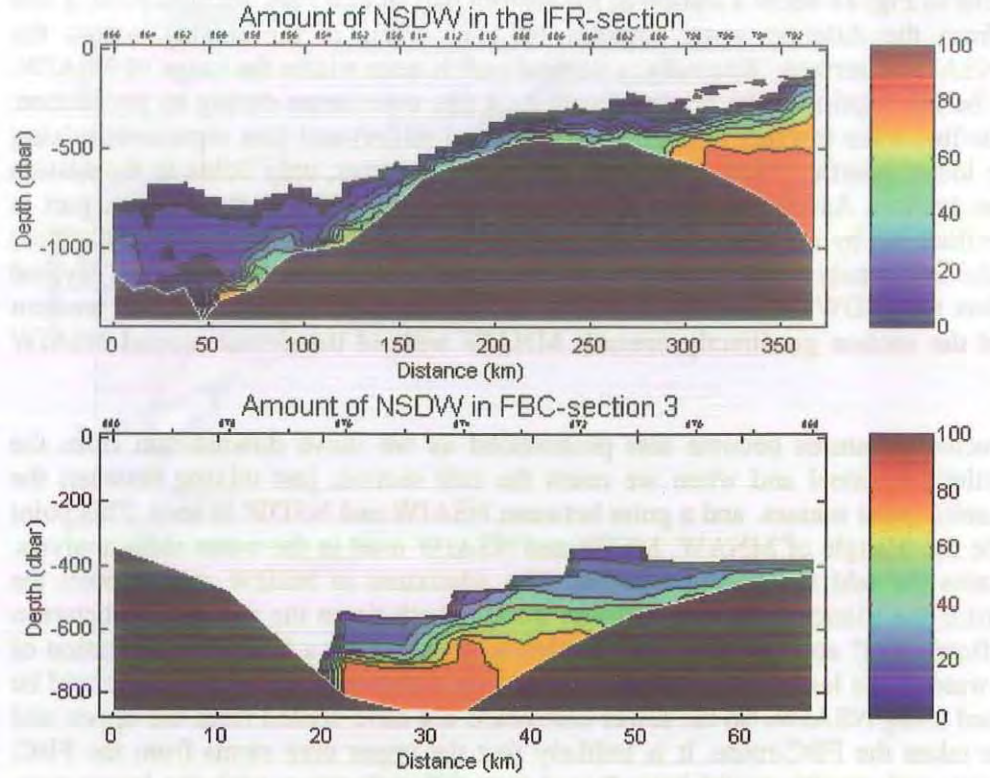

Figure 12: Water mass composition. Shown is the amount of Norwegian Sea Deep Water (NSDW) in percent when the water is assumed a mixture of NSDW, Modified East Icelandic Water and Modified North Atlantic Water. The two sections are the Iceland-Faroe Ridge section (of leg 3) and the exit Faroe Bank Channel section. White areas denote regions where the points fall outside the triangle spanned by the three water masses.

6. Acknowledgements

We like to thank captain Heinrich Bruns and his crew of RV POSEIDON for their support of the measurement programme and for the patience with the students, most of whom had been on a research vessel for the first time in their career. Special thanks go to the deck crew who always kept friendly and cooperatively although many of them got their dismissal due to economical problems of the shipping company. Anyhow, the crew gave extra lessons for the students in how to make knots and navigation.

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