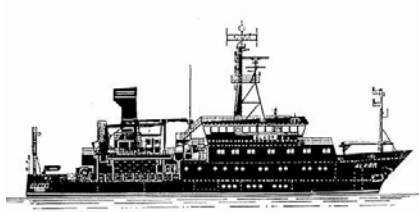


Cruise Report



ALKOR cruise AL328 (08.10. – 29.10.2008) Kiel - Kiel

Fluid- and gas seepage in the Southern German North Sea (SGNS)

Objectives

The aim of the project is to detect sites of active fluid and gas seepage in the Southern German North Sea, to decipher and map possible migration pathways in the Pleistocene and Holocene sediments, to quantify gas fluxes in the water column and analyse their chemical composition.

It can be expected that gas discharge is not diffused but connected with the near surface (Pleistocene/Holocene) sediment architecture. The chemical and isotopic composition of the discharged gases and fluids in regard to nitrogen, methane, higher hydrocarbons (C_2-C_5), hydrogen, noble gases and other geochemical tracers will provide information about the origin and quality of deeper petroleum and hydrocarbon reservoirs. For example the ratio of CH_4 to N_2 in the discharged gases and fluids can be used to qualify the grade of the hydrocarbon reservoir and the exploitation potential.

Methods

Along conspicuous structures in the deeps seismics a high-resolution mapping of the sediment distribution pattern and sampling of morpho-dynamic structures will be conducted, which will serve as a survey of the Holocene shelf architecture and the stratigraphic identification of the sampled horizons. For the spatial extrapolation of elevated methane and nitrogen occurrences the nitrogen concentrations will be mapped in the benthic boundary layer close to sites of gas and fluid discharge. For this investigation continuous measurements of nitrogen and methane by a towed in situ mass spectrometer are beside conventional methods in the focus of the project. The chemical and isotopic composition of fluids and gases during their transfer from deeper reservoirs until the point of discharge at the seafloor can be modified by biogeochemical processes. To identify and quantify these effects sediments cores have to be obtained. In a later phase of the project a benthic observatories will be deployed to record the variability of the gas fluxes and the important environmental control parameters (currents, tides) during in situ time series measurements. Additionally, existing gas analyses obtained from deeper wells will be used for comparison and calibration of the measurements in the water column.

List of Participants

1	Dr. Peter Linke	IFM-GEOMAR	Chief scientist
2	PD Dr. Mark Schmidt	IFM-GEOMAR	Water chemistry
3	Dr. Klaus Schwarzer	IFG, Universität Kiel	Seismics, Bathymetry
4	Sören Themann	IFG, Universität Kiel	Seismics, Bathymetry
5	Andreas Jacobsen	IFG, Universität Kiel	Vibrocorer
6	Dr. Daniel McGinnis	IFM-GEOMAR	CTD, ADCP
7	Lorenzo Ravelli	IFM-GEOMAR	CTD, ADCP
8	Thorsten Schott	Oktopus	Video technician
9	Markus Faulhaber	IFM-GEOMAR	Gas chromatography
10	Dr. Anja Reitz	IFM-GEOMAR	Pore water chemistry
11	Anke Bleyer	IFM-GEOMAR	Pore water chemistry
12	Jakob Wanke	IFM-GEOMAR	Pore water chemistry

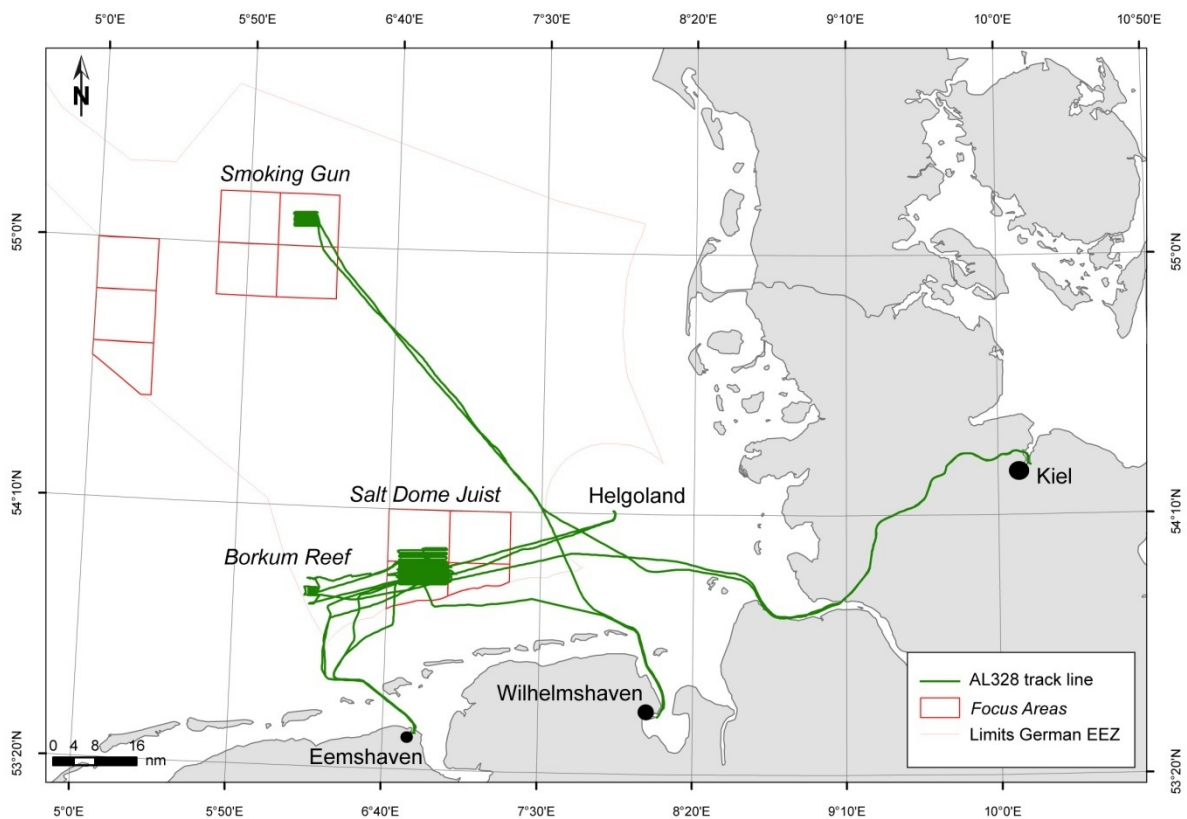


Fig. 1: AL328 cruise track and working areas in the Southern German North Sea.

List of instruments deployed during AL328

- CTD mit 12 x 10 L Niskin Rosette
- Acoustic Doppler Current Profiler (ADCP)
- Ocean Floor Observation System (OFOS)
- Parametric sediment echosounder (SES)
- Sidescan Sonar with Subbottom Profiler (C3D)
- Vibrocorer (VC)
- Van Veen Sediment Grab

Cruise narrative

08.10.08 0830h: (Local time) Leaving IFM-GEOMAR, Seefischmarkt, 1030h entering Kiel Holtenau locks, passage through Kiel Canal with first scientific crew meeting and project meeting with Wintershall partners (Dr. Peter Eisenach and Bert Clever). 1900h: Entering Brunsbüttel locks. 1930h: Leaving locks and transit to first station at the L1-2 drill site north of Borkum.

09.10.08 0630h: Arrival in the working area Borkum Reef (L1-2 drill site). 08:00 First deployment of the C3D Side scan sonar until 1230h. Deployment of the vibro corer during slack water but no core recovery due to connector failure. Continuation of the C3D survey followed by a CTD-cast east of the working area. After repair of the connector 2 successful vibro corer stations with 0.5 and 2.5 m sediment recovery were performed. 1900h: Transit into the next working area "Saltdome Juist". 2200h: Start of a dense C3D survey with 70 anticipated profiles covering an area with an uplifted salt dome in the east and a shallow basin to the west.

10.10.08 Continuation of the C3D survey at Bft. 6.

11.10.08 Continuation of the C3D survey at Bft. 6-7.

12.10.08 Interrupting C3D survey as weather permitted other station work. After picking the positions with flares in the side scan sonar record we deployed the CTD with 3 casts and water sampling. Subsequent vibro corer stations were performed at slack water (high tide), followed by an OFOS transect. At low tide another vibro corer gained a core. This station was followed by 3 CTD casts with water sampling. Continuation of the C3D survey.

13.10.08 2 CTD-casts and an OFOS survey from the north to the south of the eastern part of the working area. The vibro corer station had to be aborted due to strong tidal currents. The instrument was damaged, but could be repaired during the night. Continuation of the C3D survey.

14.10.08 Due to the weather forecast for Wednesday the planned GasQuant deployment had to be postponed. Station work during the day included vibro coring and an OFOS survey. On this survey covering sites discovered during the side scan survey during the preceding night vast gas bubble discharge from the sediment was evident. The OFOS survey was followed by 2 CTD casts on transects with water bottles triggered in the bottom water approx. 50m apart from another. One vibro corer was taken in this area, the other as a stratigraphic reference. Continuation of the C3D survey.

15.10.08 CTD-casts with bottom-near sampling in the morning and evening. Inbetween ground-truthing of side scan sonar data by sediment sampling. Due to the bad weather conditions only SES surveys could be performed.

16.10.08 Continuation of the SES survey and transit to Eemshaven with storm gusts. 1800h: Arrival at Eemshaven.

17.10.08 1200h: Leaving Eemshaven after staff exchange and receiving spare parts. Heading for the working area "Saltdome Juist" to complete station work. 1700h: Continuation of ground-truthing of side scan sonar data by sediment sampling and continuation of the C3D survey.

18.10.08 The planned station work with vibro corer and GasQuant had to be cancelled due to the bad weather conditions and predictions. The ADCP was mounted in the moon pool of the vessel to detect gas bubbles in the acoustic back scatter of the instrument. A towed CTD/Rosette deployment was performed which turned out to be very difficult. A subsequent deployment with OFOS had to be terminated due to the strong swell and deteriorating weather conditions. The grid of sediment samples for ground truthing of the side scan sonar data was finalized. A SES survey was conducted perpendicular to the previous profiles line of the side scan sonar. 2200h: Heading for the working area at the L1-2 drill site north of Borkum Island.

19.10.08 0800h: A grid of 12 grab stations was performed for sediment surface exploration. Due to the deteriorating weather conditions and the bad weather forecast we sailed to Helgoland and arrived at 1900h.

20.10.08 Due to the bad weather conditions the decision was made that we stay in harbor. The vessel had to move into the inner harbor area.

21.10.08 As the weather forecast predicted some time windows with reduced wind speeds we left the harbor at 1900h at Bft. 6 heading towards the working area Saltdome Juist to see whether we are able to finalize the side scan survey of the area together with ship-borne ADCP measurements to search for gas flares. Upon arrival weather conditions were worse than predicted and we had to stay waiting during the night.

22.10.08 In the morning we conducted a CTD water sampling profile followed by 3 grab sampling stations in the area where we had seen gas bubble discharge in the OFOS before. 12:35h Continuation of C3D-survey with ADCP.

23.10.08 2 CTD water sampling profiles were conducted in areas where flares had been recorded in the ADCP. All water samples showed reduced pH and one sample taken in the flare contained very high CO₂ values. Due to the deteriorating weather conditions and the bad weather forecast we had to leave for Eemshaven. Arrival at 1900h.

24.10.08 1200h: Leaving Eemshaven and heading back for the western part of the working area "Saltdome Juist" as weather forecast prediction a time window with reduced wind speeds. A CTD water sampling program was performed at the flare site. During the night the C3D-profiles were extended to the north.

25.10.08 0500h: C3D-profiles had to be terminated due to a technical problem. A CTD cast was performed followed by vibro corer sampling. The next coring station had to be abandoned due to upcoming strong winds. Station work was finalized by a CTD cast at the flare position in the western part of the working area. Steaming towards Wilhelmshaven. Arrival at 1900h.

26.10.08 1700h: Leaving Wilhelmshaven in an effort to reach the working area "Smoking gun" in the central part of the North Sea. Wind is still strong (Bft. 7) and the prevailing wind directions created waves with more than 4 m height.

27.10.08 1600h: Arriving in the working area "Smoking gun" with strong winds (Bft. 7) and high swell disabling station work with towed equipment. A grid of profiles with the ship-borne ADCP and echo sounder was started to look for gas flares in the water column.

28.10.08 Continuation of the profiles until 1030h. Due to the improving weather conditions (Bft. 4-5) a CTD profile was conducted and water was sampled in the area where a plume had been detected in the ADCP record. The grid of profiles was completed and a last CTD cast was performed with winds peaking up again. Station work ended at 1830h and the transit to Brunsbüttel was started due to the bad weather forecast.

29.10.08 0930h: Arrival at the Brunsbüttel locks and transit through the Canal with disassembling and packing of the seagoing instruments and laboratory equipment. 1900h: Arrival at the Seefischmarkt in Kiel and end of the cruise.

Station list ALKOR 328

Times in UTC (Local time = summer time - 2h), change to winter time on 26.10.08 (LT -1h)

Station	Gear	No.	Area	Date	Start	Coordinates		Depth	at depth	Coordinates		Depth	End stat.	Coordinates		Depth
No.				2008	Time	Lat. °N	Long. °E	(m)	Time	Lat. °N	Long. °E	(m)	Time	Lat. °N	Long. °E	(m)
955	C3D/SES	1	Borkum reef	09.10.	07:18	53°53.126	06°16.496	30					10:15	53°53.569	06°14.642	30
956	VC	1	Borkum reef	09.10.	10:47	53°52.834	06°16.342	30	10:51	53°52.833	06°16.329	30	11:01	53°52.83	06°16.36	
957	C3D/SES	2	Borkum reef	09.10.	11:24	53°53.611	06°16.465	30					14:32	53°54.18	06°16.91	30
958	CTD/Ros	1	Borkum reef	09.10.	14:58	53°54.028	06°17.791	30		53°54.031	06°17.790		15:29	53°54.030	06°17.784	
959	VC	2	Borkum reef	09.10.	16:11	53°52.838	06°16.358	31					16:31	53°52.84	06°16.37	
960	VC	3	Borkum reef	09.10.	16:57	53°52.839	06°14.744	31	17:01	53°52.841	06°14.758	31	17:17	53°52.833	06°14.593	31
961	C3D/SES	3	Salt dome Juist	09.10.	19:59	53°59.889	06°43.962	28								
962/1	CTD/Ros	2/1	Salt dome Juist	12.10.	07:24	53°59.772	06°55.669	30,2		53°59.764	06°55.668	30,2	07:38	53°59.762	06°55.68	31,5
962/2	CTD/Ros	2/2	Salt dome Juist	12.10.	07:39	53°59.766	06°55.700	31,5		53°59.766	06°55.728	31,5	07:47	53°59.762	06°55.74	31,5
962/3	CTD/Ros	2/3	Salt dome Juist	12.10.	07:47	53°59.761	06°55.754	31,4		53°59.753	06°55.608	31,4	08:00	53°59.750	06°55.790	31,4
963/1	VC	4/1	Salt dome Juist	12.10.	08:19	53°59.770	06°55.675	30	08:32	53°59.782	06°55.635	30	08:41	53°59.798	06°55.643	30
963/2	VC	4/2	Salt dome Juist	12.10.	09:09	53°59.772	06°55.608	30	09:11	53°59.772	06°55.615	30	09:20	53°59.776	06°55.653	30
964/1	OFOS	1/1	Salt dome Juist	12.10.	10:25	53°59.820	06°59.344	28					11:45	53°59.841	06°58.121	28
964/2	OFOS	1/2	Salt dome Juist	12.10.	12:42	53°59.806	06°58.210	28	12:48				14:09	53°59.809	06°56.345	28
965/1	VC	5/1	Salt dome Juist	12.10.	14:32	53°59.759	06°55.751	28	14:37	53°59.753	06°55.746	28				
965/2	VC	5/2	Salt dome Juist	12.10.	14:49	53°59.733	06°55.728	28	14:52	53°59.733	06°55.730	28	15:03	53°59.709	06°55.782	29
966/1	CTD/Ros	3/1	Salt dome Juist	12.10.	15:40	53°55.754	06°55.753	28		53°59.755	06°55.896	28		53°59.755	06°55.943	28
966/2	CTD/Ros	3/2	Salt dome Juist	12.10.	15:49	53°59.754	06°55.973	28,4		53°59.755	06°56.119	28,4	15:57	53°59.752	06°56.162	28,4
966/3	CTD/Ros	3/3	Salt dome Juist	12.10.	15:58	53°59.753	06°56.196	28,9	16:01	53°59.749	06°56.376	29	16:05	53°59.749	06°56.383	29
967	C3D/SES	4	Salt dome Juist	12.10	17:24	53°58.290	06°44.950	28					06:20	53°58.254	06°59.028	28
968	CTD/Ros	4	Salt dome Juist	13.10.	07:25	53°59.807	06°57.911	30,1					07:57	54°00.022	06°59.003	30
969	OFOS	2	Salt dome Juist	13.10.	09:39	54°00.080	06°58.130	30,4	09:42	54°00.040	06°58.170	30,4	13:35	53°57.780	06°58.120	26,6
970	CTD/Ros	5	Salt dome Juist	13.10.	14:14	53°59.909	06°57.786	28,5					14:57	54°00.175	06°57.644	28
971	VC	6	Salt dome Juist	13.10.	15:56	53°59.873	06°52.419	28,4	16:06	53°59.874	06°52.451	28,5	16:10	53°59.875	06°52.504	28,8
972	C3D/SES	5	Salt dome Juist	13.10.	17:12	53°58.160	06°58.680	30					07:47	53°57.790	06°59.160	30
973/1	VC	7/1	Salt dome Juist	14.10.	09:24	53°58.250	06°55.004	29	09:29	53°58..249	06°55.007	29	09:32	53°58.248	06°55.012	29
973/2	VC	7/2	Salt dome Juist	14.10.	09:55	53°58.260	06°55.017	29,4	09:58	53°58.269	06°55.046	29,5	10:06	53°58.280	06°55.050	29,5
974	VC	8	Salt dome Juist	14.10.	10:33	53°58.101	06°52.394	28,8	10:37	53°58.094	06°52.386	28,6	10:44	53°58.104	06°52.367	28,6
975	OFOS	3	Salt dome Juist	14.10.	11:40	53°57.881	06°58.303	28	11:47	53°57.906	06°58.303	28	12:46	53°57.698	06°57.324	28

Station	Gear	No.	Area	Date	Start	Coordinates		Depth	at depth	Coordinates		Depth	End stat.	Coordinates		Depth
No.				2008	Time	Lat. °N	Long. °E	(m)	Time	Lat. °N	Long. °E	(m)	Time	Lat. °N	Long. °E	(m)
1008	CTD/Ros	10	Salt dome Juist	18,10	07:51	53°58.084	06°58.325	27					08:08	53°57.792	06°58.472	27
1009	OFOS	4	Salt dome Juist	18,10	09:52	53°58.010	06°58.330	27,5					09:18	53°57.766	06°58.671	27,5
1010	SG	24	Salt dome Juist	18,10	10:11	53°57.616	06°52.045	28	10:12	58°57.618	06°52.047	28	10:14	53°57.627	06°52.045	28
1011	SG	25	Salt dome Juist	18,10	10:34	53°57.576	06°49.731	28,3	10:35	58°57.570	06°49.738	28,3	10:37	53°57.566	06°49.752	28,3
1012	SG	26	Salt dome Juist	18,10	10:52	53°58.621	06°48.730	28,6	10:53	53°58.619	06°48.734	28,6	10:54	53°58.619	06°48.747	28,6
1013	SG	27	Salt dome Juist	18,10	11:14	53°58.573	06°46.447	28,8	11:15	53°58.573	06°46.445	28,8	11:17	53°58.573	06°46.447	28,8
1014	SG	28	Salt dome Juist	18,10	11:45	53°56.431	06°44.759	28,5	11:46	53°56.428	06°44.765	28,5	11:48	53°56.428	06°44.777	28,5
1015	SG	29	Salt dome Juist	18,10	12:01	53°56.473	06°46.649	28	12:02	53°56.461	06°46.638	28	12:04	53°56.432	06°46.716	28
1016	SG	30	Salt dome Juist	18,10	12:18	53°56.485	06°48.843	27	12:21	53°56.496	06°48.855	27	12:25	53°56.490	06°48.850	27
1017	SG	31	Salt dome Juist	18,10	12:35	53°56.491	06°50.518	26	12:35	53°56.491	06°50.515	26	12:37	53°56.503	06°50.595	27
1018	SG	32	Salt dome Juist	18,10	12:53	53°56.560	06°53.377	27	12:56	53°56.540	06°53.378	28	12:58	53°56.531	06°53.371	27
1019	SES	2	Salt dome Juist	18,10	13:30	53°56.592	06°54.920	27					19:36	54°00.370	06°44.077	30
1020	SG	33	Borkum reef	19.10.	06:13	53°56.067	06°14.747	28	06:14	53°56.069	06°14.762	28	06:15	53°56.060	06°14.805	28
121	SG	34	Borkum reef	19.10.	06:40	53°56.058	06°16.382	28	06:41	53°56.054	06°16.384	28	06:42	53°56.050	06°16.381	28
1022	SG	35	Borkum reef	19.10.	07:12	53°54.455	06°17.971	28,5	07:14	53°54.450	06°17.971	28,5	07:15	53°54.441	06°18.007	28,5
1023	SG	36	Borkum reef	19.10.	07:38	53°54.458	06°16.363	30	07:39	53°54.460	06°16.364	30	07:41	53°54.469	06°16.348	30
1024	SG	37	Borkum reef	19.10.	07:57	53°54.453	06°14.747	30	07:58	53°54.456	06°14.762	30	07:59	53°54.446	06°14.800	30
1025	SG	38	Borkum reef	19.10.	08:20	53°54.452	06°13.119	31,5	08:21	53°54.453	06°13.128	31,5	08:22	53°54.454	06°13.129	31,5
1026	SG	39	Borkum reef	19.10.	08:48	53°52.836	06°13.112	30,5	08:50	53°52.835	06°13.112	30,5	08:51	53°52.846	06°13.138	30,5
1027	SG	40	Borkum reef	19.10.	09:13	53°52.835	06°14.743	32	09:14	53°52.836	06°14.746	32	09:15	53°52.8	06°14.7	
1028	SG	41	Borkum reef	19.10.	10:06	53°52.822	06°16.402	31,7	10:07	53°52.816	06°16.410	31,7	10:08	53°52.823	06°16.419	31,7
1029	SG	42	Borkum reef	19.10.	10:23	53°52.810	06°18.067	31	10:23	53°52.807	06°18.059	31	10:24	53°52.	06°18.	31
1030	SG	43	Borkum reef	19.10.	10:58	53°51.249	06°16.371	30	10:59	53°51.247	06°16.369	30	11:00	53°51.247	06°16.378	30
1031	SG	44	Borkum reef	19.10.	11:15	53°51.224	06°14.832	29	11:16	53°51.218	06°14.841	29	11:17	53°51.215	06°14.843	29
1032	CTD/Ros	11	Salt dome Juist	22.10.	07:38	53°57.523	06°58.674	27,3					08:08	53°58.020	06°58.292	27,5
1033	SG	45	Salt dome Juist	22.10.	08:51	53°57.996	06°58.298	28	08:53	53°58.001	06°58.299	27,5	08:54	53°58.007	06°58.334	27,5
1034	SG	46	Salt dome Juist	22.10.	09:27	53°57.951	06°58.305	28	09:28	53°57.963	06°58.304	28	09:28	53°57.	06°	
1035	SG	47	Salt dome Juist	22.10.	10:13	53°57.925	06°58.251	27,5	10:14	53°57.924	06°58.254	27,5	10:15	53°57.937	06°58.253	27,5
1036	C3D/ADCP	8	Salt dome Juist	22.10.	10:35	53°57.16	06°59.54	26,9	10:40	53°57.03	06°59.09	25,7	06:11	53°56.52	06°49.50	25,5
1037	CTD/Ros	12	Salt dome Juist	23.10.	07:07	53°57.6	06°58.453	27,3					07:33	53°58.139	06°58.247	27,5
1038	ADCP	1	Salt dome Juist	23.10.	08:42	53°56.199	06°46.026	25,6					10:10	53°55.084	06°39.077	26
1039/1	CTD/Ros	13	Salt dome Juist	23.10.	08:57	53°56.351	06°45.295	25,5					09:03	53°56.267	06°45.28	25,5

Station	Gear	No.	Area	Date	Start	Coordinates		Depth	at depth	Coordinates		Depth	End stat.	Coordinates		Depth
No.				2008	Time	Lat. °N	Long. °E	(m)	Time	Lat. °N	Long. °E	(m)	Time	Lat. °N	Long. °E	(m)
1039/2	CTD/Ros	13	Salt dome Juist	23.10.	09:14	53°56.188	06°45.355	25,6					09:42	53°56.408	06°45.173	25,6
1040	CTD/Ros	14	Salt dome Juist	24.10.	15:40	53°56.237	06°45.735	27					16:21	53°56.219	06°45.229	27
1041	C3D/ADCP	9	Salt dome Juist	24.10.	17:14	54°00.338	06°44.601	30					02:56	54°02.742	06°58.295	33
1042	CTD/Ros	15	Salt dome Juist	25.10.	06:03	53°57.762	06°57.432	28,4					06:22	53°57.874	06°57.965	28
1043	VC	11	Salt dome Juist	25.10.	07:00	53°57.911	06°58.303	28..5	07:05	53°57.923	06°58.321	28,5	07:14	53°57.958	06°58.296	29
1044	CTD/Ros	16	Salt dome Juist	25.10.	08:51	53°56.321	06°45.378	26,8					09:48	53°56.531	06°45.264	27
1045	ADCP	2	Smoking gun	27.10.	14:47	55°05.771	06°12.000	47					09:22	55°05.91	06°12.51	46,1
1046	CTD/Ros	17	Smoking gun	28.10.	10:00	55°03.842	06°13.073	46					10:40	55°04.319	06°13.073	45
1047	ADCP	3	Smoking gun	28.10.	10:43	55°04.38	06°13.06	47,1					16:04	55°06.56	06°11.90	46,1
1048	CTD/Ros	18	Smoking gun	28.10.	16:30	55°06.330	06°10.728	47,5					17:31	55°06.404	06°09.695	46,4

CRUISE SUMMARY REPORT

FOR COLLATING CENTRE USE

Centre: **DOD** Ref. No.:
 Is data exchange restricted Yes In part No

SHIP enter the full name and international radio call sign of the ship from which the data were collected, and indicate the type of ship, for example, research ship; ship of opportunity, naval survey vessel; etc.

Name: **ALKOR**Call Sign: **DBND**Type of ship: **Research vessel**CRUISE NO. / NAME **AL328 / SDNS**

enter the unique number, name or acronym assigned to the cruise (or cruise leg, if appropriate).

 CRUISE PERIOD start **08/10/2008** to **29/10/2008** end
 (set sail) day/ month/ year day/ month/ year (return to port)
PORT OF DEPARTURE (enter name and country) **Kiel, Germany**PORT OF RETURN (enter name and country) **Kiel, Germany**

RESPONSIBLE LABORATORY enter name and address of the laboratory responsible for coordinating the scientific planning of the cruise

Name: **Leibniz-Institute of Marine Sciences at Kiel University (IFM-GEOMAR)**Address: **Wischhofstr. 1-3, 24148 Kiel**Country: **Germany**

CHIEF SCIENTIST(S) enter name and laboratory of the person(s) in charge of the scientific work (chief of mission) during the cruise.

Dr. Peter Linke, IFM-GEOMAR

OBJECTIVES AND BRIEF NARRATIVE OF CRUISE enter sufficient information about the purpose and nature of the cruise so as to provide the context in which the report data were collected.

The aim of the project is to detect sites of active fluid and gas seepage in the Southern German North Sea, to decipher and map possible migration pathways in the Pleistocene and Holocene sediments, to quantify gas fluxes in the water column and analyse their chemical composition. From seismic investigations it was expected that gas discharge is not diffuse but connected to the near surface (Pleistocene/Holocene). The chemical and isotopic composition of the discharged gases and fluids in regard to trace gases (e.g. CH₄, light HC, CO₂), nutrients (PO₄, NH₄), and other geochemical tracers (e.g. pH, Cl, PAH) were measured. They can provide information about the origin and quality of deep and shallow fluid/gas forming processes. Geochemical samples, hydro/sediment acoustic data, and sedimentological samples recovered during the AL328 cruise will be analyzed and correlated to local sediment stratigraphy, and hydrography. Results will be discussed concerning their ability in qualifying the CO₂/N₂-risk of exploration of hydrocarbon reservoirs.

PROJECT (IF APPLICABLE) if the cruise is designated as part of a larger scale cooperative project (or expedition), then enter the name of the project, and of organisation responsible for co-ordinating the project.

Project name: **Fluid and gas seepage in the Southern German North Sea**Coordinating body: **IFM-GEOMAR**

<p>TRACK CHART: You are strongly encouraged to submit, with the completed report, an annotated track chart illustrating the route followed and the points where measurements were taken.</p>	<p>Insert a tick(✓) in this box if a track chart is supplied</p>
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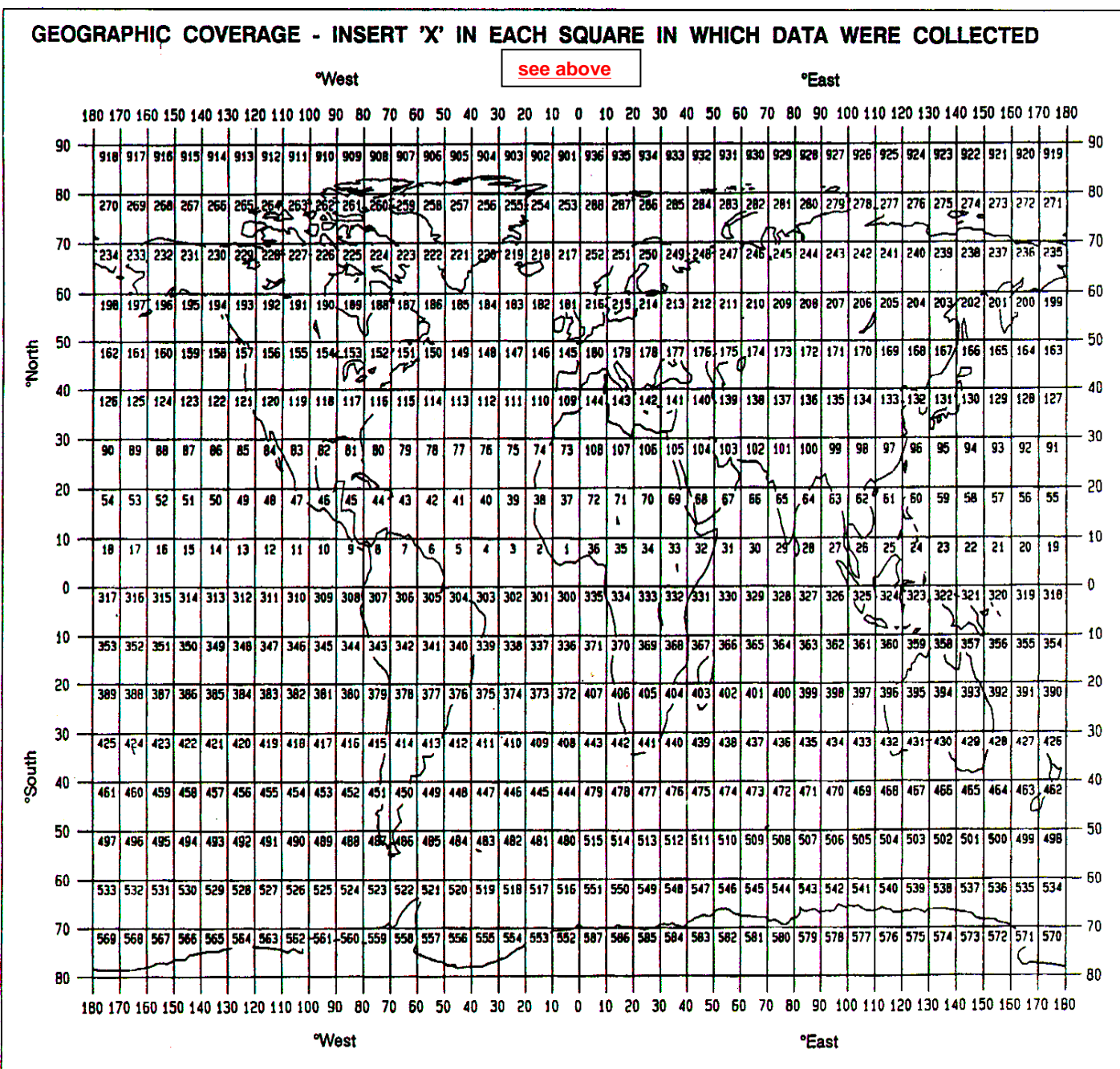
GENERAL OCEAN AREA(S): Enter the names of the oceans and/or seas in which data were collected during the cruise – please use commonly recognised names (see, for example, International Hydrographic Bureau Special Publication No. 23, 'Limits of Oceans and Seas').

North Sea

SPECIFIC AREAS: If the cruise activities were concentrated in a specific area(s) of an ocean or sea, then enter a description of the area(s). Such descriptions may include references to local geographic areas, to sea floor features, or to geographic coordinates.

Please insert here the number of each square in which data were collected from the below given chart

Southern German North Sea (216)



THANK YOU FOR YOUR COOPERATION
 Please send your completed report without delay to the collating centre indicated on the cover page