NOTIFICATION OF PROPOSED RESEARCH CRUISE

PART A: GENERAL

1. NAME OF RESEARCH SHIP: FS ALKOR — CRUISE NO.: AL412

2. DATES OF CRUISE: From: 22 March 2013 — To: 08 April 2013

3. OPERATING AUTHORITY: GEOMAR
Helmholtz-Zentrum für Ozeanforschung Kiel
Wischhofstraße 1-3
D-24148 KIEL

TELEPHONE: 0431- 600 2132

TELEFAX: 0431- 600 2680

E-MAIL: klackschewitz@geomar.de

4. OWNER (if different from no. 3)

5. PARTICULARS OF SHIP:

Name:	**ALKOR**
Nationality:	German
Overall length: (in metres)	55,20 metres
Maximum draught: (in metres)	3,95 metres
BRT:	1000
GT:	1322
NT:	396
Propulsion e.g. diesel/steam:	Diesel Electric
Call sign:	DBND
Registration port and number (if registered fishing vessel)	
IMO no.	8905880
MMSI no.	211216570
Telephone	INMARSAT 00870764549982
Telefax	INMARSAT 00870764549984
E-Mail	bruecke@alkor.briese-research.de

6. CREW

Name of master: Jan Lass

Number of crew: 11

7. SCIENTIFIC PERSONNEL: 12

Name and address of scientist in charge: Dr. Peter Linke, GEOMAR Helmholtz Centre for Ocean Research Kiel, Wischhofstr. 1-3, 24148 Kiel, Germany

Tel/telex/fax no.: +49-431-600-2115 / +49-431-600-2928
No. of scientists: 12

8. GEOGRAPHICAL AREA IN WHICH SHIP WILL OPERATE (with reference to latitude and longitude)
General working area: Central North Sea; 59°N, Eastern-limit: 3°E, Southern-limit: 57.5°N, Western-limit: 0°; for details (see attached map).

9. BRIEF DESCRIPTION OF PURPOSE OF CRUISE

The proposed research cruise will be an integral part of the field activities within the EU project ECO2. ECO2 brings together the leading experts of three large scientific communities in Europe: ocean acidification, CCS, and natural seepage, but ECO2 also involves colleagues from the legal, economic, and social sciences. On the cruise we wish to revisit the Sleipner CO_2 storage site operated by Statoil

and the blowout crater (22/4b) in the UK sector of the North Sea, which will be explored as a reference site. We intend to quantify fluxes of key chemical parameters and potentially toxic metals and study the mechanisms determining the migration of CO_2, CH_4, and formation waters through the sedimentary overburden by a variety of novel monitoring techniques. Included in the study are investigations of seawater chemistry together with the near-field dispersion processes as key input parameters for our environmental studies and numerical model simulations. We will also carry out the assessment of the distribution of sensitive megafauna and will use fingerprinting of microbial community diversity as a key indicator of environmental impacts.

Primary objectives at Sleipner are:

(1) to determine whether shallow gas and fluid seepage has increased or old pathways have been reactivated,
(2) to search for formation water displaced by the injected CO_2 plume that might be seeping out.

10. DATES AND NAMES OF INTENDED PORTS OF CALL

none

11. ANY SPECIAL REQUIREMENTS AT PORTS OF CALL

none

NOTIFICATION OF PROPOSED RESEARCH CRUISE

1. PART B: DETAILS

1. NAME OF RESEARCH SHIP — ALKOR
   CRUISE NO. — AL412

2. DATES OF CRUISE — From: 22 March 2013 — To 08 April 2013

3. a) PURPOSE OF RESEARCH

On cruise AL412 we wish to investigate the Sleipner CO_2 storage site operated by Statoil and the blowout crater (22/4b) in the UK sector of the North Sea (Fig. 1). We intend to quantify fluxes of key chemical parameters and potentially toxic metals and study the mechanisms determining the migration of CO_2, CH_4, and formation waters through the sedimentary overburden by a variety of novel monitoring techniques. Included in the study are investigations of seawater chemistry together with the near-field dispersion processes as key input parameters for our environmental studies and numerical model simulations. We will also carry out the assessment of the distribution of sensitive megafauna and will use fingerprinting of microbial community diversity as a key indicator of environmental impacts.

b) GENERAL OPERATIONAL METHODS (including full description of any fish gear, trawl type, mesh size, etc.)

The water column and seafloor in the vicinity of gas plumes at active pockmarks, gassy sediments, abandoned wells and fractures in the sediment will be monitored with multi beam echo-sounding and a remotely operated vehicle (ROV), respectively. Surficial sediment samples will be taken with multiple corer, grabs and vibro corer in the vicinity of pockmarks. Water samples will be obtained from Rosette water sampler profiles. A bottom lander (BIGO) will be deployed at the bottom (only during the cruise) to quantify gas fluxes from sediment into the water column (and atmosphere). **No** fishing gear will be used.

4. ATTACH CHART showing (on an appropriate scale) the geographical area of intended work, positions of intended stations, tracks of survey lines, positions of moored/seabed equipment, areas to be fished.

Focus of our activities in the Norwegian EEZ will be abandoned well locations at Sleipner (15/9-11, 15/9-16, and 16/7-2; Chadwick et al. 2004) and fractures in the north of the subsurface CO2 storage complex.
Mean central position of Sleipner: 58°22.60'N, 01°56.85'E.
Coordinates of the old wells (Sleipner, N):
15/9-11: 58°24.012'N / 1°53.604'E
15/9-16: 58°22.128'N / 1°52.623'E
16/7-02: 58°28.401'N / 2°01.952'E
Work permission is requested for the area:
58°40'N / 1°40'E and 58°40'N / 2°20'E
58°10'N / 1°40'E and 58°10'N / 2°20'E

The blowout site (22/4b) in the EEZ of the UK is considered as a reference area (mean decimal position: 57°55.30`N., 01° 37.85´E). Work permission is requested for the area:
57°57'N / 1°34'E and 57°57'N / 1°42'E
57°54'N / 1°34'E and 57°54'N / 1°42'E

Further details are presented on the map (see below). Intended working areas are marked in red.

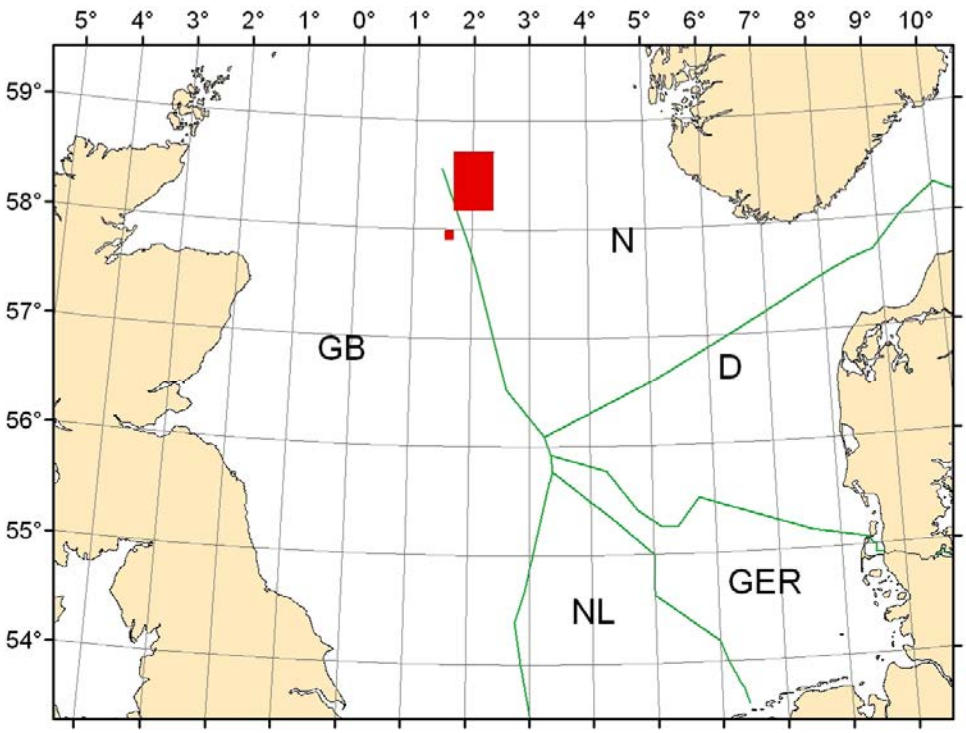

Chart of working areas. EEZ borders of European countries are plotted as green lines.

5. a) TYPES OF SAMPLES REQUIRED (e.g., geological/water/plankton/fish/radionuclide)
Water/gas, surface sediments

b) METHODS OF OBTAINING SAMPLES (e.g., dredging/coring/drilling/fishing, etc. When using fishing gear, indicate fish stocks being worked, quantity of each species required, and quantity of fish to be retained on board).
CTD/ Rosette water sampler (water, dissolved gases), pumping system
Remotely Operated Vehicle (ROV),
Multiple Corer (<0.5m sediment cores)
Vibro Corer (<3m sediment cores)
Grab (<0.5m sediment)
BIGO Lander (water, dissolved gases, <0.2m sediment)

6. DETAILS OF MOORED EQUIPMENT No moorings

Dates Laying	Recovery	Description	Depth	Latitude	Longitude

7. ANY HAZARDOUS MATERIALS (chemicals/explosives/gases/radioactives, etc.)
(Use separate sheet if necessary) None

a) Type and trade name

b) Chemical content (and formula)

c) IMO IMDG code (reference and UN no.)

d) Quantity and method of storage on board

e) If explosives give dates of detonation
- Method of detonation
- Position of detonation
- Position of detonation
- Frequency of detonation

- Depth of detonation
- Size of explosive charge in kg.

8. DETAIL AND REFERENCE OF

a) Any relevant previous/future cruises

The Sleipner storage site has been investigated by many cruises within the ECO2 project (e.g. RV G.O.SARS, RSS JAMES COOK cruise JC077) and both working areas have been intensively studied by our institution during previous research cruises with the German RV ALKOR (AL259, 267, 290, 374) and the Irish RV CELTIC EXPLORER (CE0913, CE12010).

b) Any previously published research data relating to the proposed cruise

Chadwick, RA, P Zweigel, U Gregersen, GA Kirby, S Holloway, PN Johannessen (2004) Geological reservoir characterization of a CO2 storgae site: The Utsira Sand, Sleipner, northern North Sea. Energy 29: 1371-1381.

Hovland M (1992) Pockmarks and gas-charged sediments in the eastern Skagerrak. Continental Shelf Res., 12: 1111-1119.

Judd A, Hovland M (2007) Seabed Fluid Flow – The Impact on Geology, Biology, and the Marine Environment. Cambridge University Press, Cambridge, UK, 475 pages.

Linke, P, Schmidt, M, and CE0913 cruise participants (2010). RV Celtic Explorer Fahrtbericht / Cruise Report CE0913 – Fluid and gas seepage in the North Sea, IFM-GEOMAR report No. 36, pp. 82.

Linke, P and AL374 cruise participants (2011) Cruise Report AL374, IFM-GEOMAR Report 51, Kiel, 55 pages.

Linke, P, ed (2012) RV Celtic Explorer EUROFLEETS Cruise Report CE12010 – ECO2@NorthSea: 20.07.-06.08.2012, Bremerhaven – Hamburg, GEOMAR Report N. Ser. 004. GEOMAR, Kiel, Germany, 60 pp.

Niemann H, Elvert M, Hovland M, Orcutt B, Judd A, Suck I, Gutt J, Joye S, Damm E, Finster K, Boetius A, (2005). Methane emission and consumption at a North Sea gas seep (Tommeliten area). Biogeosciences, 2, 335–351.

McGinnis, DF, M Schmidt, S Themann, TS DelSontro, L Rovelli, P.Linke (2010), Natural carbon dioxide seeps in the Southern German North Sea, Journal of Geophysical Research, 116, C03013, doi:10.1029/2010JC006557.

Rise L et al (1999) Sea-bed pockmarks related to fluid migration from Mesozoic bedrock strata in the Skagerrak offshore of Norway. Marine and Petroleum Geology 16: 619-631.

Schneider von Deimling, J., Brockhoff, J., Greinert, J. (2007) Flare imaging with multibeam sonar systems: data processing for seep bubble detection Geochemistry, Geophysics, Geosystems, 8 (6). Q06004. DOI 10.1029/2007GC001577.

Schneider v Deimling J, Greinert J, Chapman NR, Rabbel W, Linke P (2010) Acoustic imaging of natural gas seepage in the North Sea: Sensing bubbles under control of variable currents. Limnology and Oceanography: Methods 8: 155-171.

9. NAMES AND ADDRESSES OF SCIENTISTS OF THE COASTAL STATE(S) IN WHOSE WATERS THE PROPOSED CRUISE TAKES PLACE WITH WHOM PREVIOUS CONTACT HAS BEEN MADE

Dr. Stefan Buenz, Univ. Tromsø, Naturfagbygget, Naturf 1317, Tromsø, Norway
Prof. Dr. Rolf-Birger Pedersen, Univ. Bergen, Realfagbygget, Allegt. 41, Bergen, Norway
Dr. Alan Judd, Wilderspool House, High Mickley, Stocksfield, Northumberland, NE43 7LU, UK
Dr. Dave Long, British Geological Survey, Murchisons House, West Mains Road, Edinburgh EH9 3LA, UK

10. STATE

a) Whether visits to the ship in port by scientists of the coastal state concerned will be acceptable (Yes/No)

Yes

b) Participation of an observer from the coastal state for any part of the cruise together with the dates and the ports for embarkation and disembarkation

yes, 22.03.2013 Kiel / 08.04.2013 Kiel, onboard working applicability has to be discussed

c) When research data from the intended cruise are likely to be made available to the coastal state and by what means

2013: cruise summary report
2013-2014: cruise report, scientific literature, images on request

PART C. SCIENTIFIC EQUIPMENT

Complete the following table using a separate page for each coastal state

Coastal state: UK

Port of call: none

Dates: 22. March – 08 April 2013

Indicate "YES" or "NO"

				DISTANCE FROM COAST		
List scientific work by function e.g.	Water column including sediment sampling of the seabed	Fisheries research within fishing limits	Research concerning the natural resources of the conti-nental shelf or its physical characteris-tics	Within 4 nm	Between 4-12 nm	Between 12-200 nm
Magnetometry	No	No	Yes	No	No	No
Gravity	No	No	Yes	No	No	No
Diving	No	No	Yes	No	No	No
Seismics	No	No	Yes	No	No	No
Seabed sampling	Yes	No	Yes	No	No	Yes
Bathymetry	Yes	No	Yes	No	No	Yes
Trawling	No	No	Yes	No	No	No
Echo sounding	Yes	No	Yes	No	No	Yes
Water sampling	Yes	No	Yes	No	No	Yes
U/W TV	Yes	No	Yes	No	No	Yes
Moored instr.	No	No	Yes	No	No	No
Towed instr.	Yes	No	Yes	No	No	Yes

GEOMAR
Helmholtz-Zentrum
für Ozeanforschung Kiel
Forschungsschiffe
Wischhofstraße 1-3
24148 Kiel

(On behalf of the Principal Scientist)

Dated 22.11.2012

NB IF ANY DETAILS ARE MATERIALLY CHANGED REGARDING DATES/AREA OF OPERATION AFTER THIS FORM HAS BEEN SUBMITTED, THE COASTAL STATE AUTHORITIES MUST BE NOTIFIED IMMEDIATELY