

Application for Consent to conduct  
Marine Scientific Research

Date: 26.09.2017 – 27.10.2017

1. General Information

1.1 Cruise name and/or number: POS 518
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1.2 Sponsoring Institution(s):	
Name:	GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel
Address:	Wischhofstraße 1-3, 24148 Kiel
Name of Director:	Prof. Dr. Peter M. Herzig

1.3 Scientist in charge of the Project:	
Name:	Dr. Linke, Peter
Country:	Germany
Affiliation:	GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel
Address:	Wischhofstraße 1-3, 24148 Kiel, Germany
Telephone:	+49 431 600-2115
Fax:	+49 431 600-1601
Email:	plinke@geomar.de
Website (for CV and photo):	<a href="http://www.geomar.de/en/mitarbeiter/fb2/mg/plinke/">http://www.geomar.de/en/mitarbeiter/fb2/mg/plinke/</a>

1.4 Entity(ies)/Participant(s) from coastal State involved in the planning of the project:	
Name:	Prof. Connelly, Douglas P.
Affiliation:	NERC National Oceanography Centre
Address:	Southampton SO14 3ZH, Great Britain
Telephone:	+44 (0)2380 596546
Fax:	
Email:	douglas.connelly@noc.ac.uk
Website (for CV and photo):	<a href="http://www.noc.ac.uk/about-us/staff/dpc">http://www.noc.ac.uk/about-us/staff/dpc</a>

2. Description of Project

2.1 Nature and objectives of the project:
<p>The proposed research cruise (Leg 1 and 2) is related to a recently (March 2016) started EU project: "Strategies for Environmental Monitoring of Marine Carbon Capture and Storage" STEMM-CCS (<a href="http://www.stemm-ccs.eu/">http://www.stemm-ccs.eu/</a>), coordinated by Prof. Connelly, NERC/NOCS.</p> <p>Contributions to the main aims of STEMM-CCS supported by this cruise are:</p> <p>(1) Pre-define and measure sensitive and robustly measurable environmental background variables, which are also indicative for subsea CO<sub>2</sub> leakage, prior to offshore CO<sub>2</sub> storage operations. (2) Provide water column measurements of trace gases, nutrients, and carbonate chemistry variables to assess baseline conditions in the study region. Collect geochemical porewater data to provide a quantitative, process-based interpretation of porewater and benthic fluxes by state-of-the-art numerical model, collected under natural (baseline) conditions. The baseline data is</p>

also needed for comparison with data obtained during artificial CO<sub>2</sub>-release experiments, which will be conducted in 2018 in the same area. (3) Test of newly designed benthic chambers, novel chemical sensors, and hydroacoustic detection systems for measuring benthic and pelagic carbon fluxes (i.e. by using lab-on-the-chip technology, optodes, membrane inlet mass spectrometry, 3D-visual bubble imaging, and (multibeam)echosounder quantification.

2.2 If designated as part of a larger scale project, then provide the name of the project and the Organisation responsible for coordinating the project:

STEMM-CCS (NERC/NOCS)

2.3 Relevant previous or future research projects:

ECO2, SDNS, COMET, MOSES

2.4 Previous publications relating to the project:

- Linke, P., Schmidt, M.,** Rohleder, M., Al-Barakati, A. and Al-Farawati, R. (2015) Novel online digital video and high-speed data broadcasting via standard coaxial cable onboard marine operating vessels. *Marine Technology Society Journal*, 49 (1), 7-18.
- Linke, P., Haeckel, M.,** Schneider von Deimling, J., Vielstädte, L., **Schmidt, M.,** Karstens, J., Berndt, C., Herreilers, H., Lichtschlag, A., James, R., Connelly, D., Baumberger, T., Pedersen, R. B., Denny, A. R., Rapp, H. T., Thorseth, I. H., Molari, M., de Beer, D., Rehder, G., Kedzior, S., Beaubien, S., de Vittor, C. (2014a) Fluxes of CO<sub>2</sub> from natural seep sites and Sleipner storage site . ECO2 Deliverable, D2.2 . ECO2 Project Office, Kiel, Germany, 43 pp. DOI 10.3289/ECO2\_D2.2.
- Rovelli, L.,** Dengler, M., **Schmidt, M., Sommer, S., Linke, P.,** McGinnis, D. (2016) Thermocline mixing and vertical oxygen fluxes in the stratified central North Sea. *Biogeosciences* 13, 1609-1620. DOI:10.5194/bg-13-1609-2016.
- Schmidt, M., Linke, P., Sommer, S.,** Esser, D., Cherednichenko, S. (2015) *Natural CO<sub>2</sub> seeps offshore Panarea – A test site for subsea CO<sub>2</sub> leak detection technology.* *Marine Technology Society Journal* 49 (1), 19-30.
- Schneider von Deimling, J., Greinert, J., Chapman, N.R., Rabbel, W., **Linke, P.** (2010) Acoustic imaging of natural gas seepage in the North Sea: Sensing bubbles controlled by variable currents. *Limnol. Oceanogr. Methods* 8 (5), 155-171. doi:10.4319/lom.2010.8.155
- Schneider von Deimling, J., **Linke, P., Schmidt, M.** und Rehder, G. (2015) Ongoing methane discharge at well site 22/4b (North Sea) and discovery of a spiral vortex bubble plume motion *Marine and Petroleum Geology* 68, 718-730. DOI:10.1016/j.marpetgeo.2015.07.026.
- Schneider von Deimling, J., Rehder, G., Greinert, J. , McGinnis, D.F. Boetius, A., **P. Linke** (2011) Quantification of seep-related methane gas emissions at Tommeliten, North Sea. *Cont. Shelf Res.* 31 (7), 867–878.
- Sommer, S., Schmidt, M., Linke, P.** (2015) Continuous inline tracking of dissolved methane plume at a blowout site in the Northern North Sea UK – water column stratification impedes immediate methane release into the atmosphere. *Marine and Petroleum Geology* 68, 766-775. DOI 10.1016/j.marpetgeo.2015.08.020
- Sommer S.,** Türk M., Kriwanek S., Pfannkuche O. (2008) Gas exchange system for extended in situ benthic chamber respiration and flux measurements under controlled oxygen conditions. *Limnol Oceanogr.: Methods.* 6, 23-33.
- Veloso, M., Greinert, J., Mienert, J., De Batist, M. (2015) A new methodology for quantifying bubble flow rates in deep water using splitbeam echosounders. Examples from the Arctic offshore NW-Svalbard: Quantifying bubble flow rates in deep water. *Limnol. Oceanogr. Methods* 13, 267–287. doi:10.1002/lom3.10024.

Vielstädte, L., Karstens, J., **Haeckel, M., Schmidt, M., Linke, P.**, Reimann, S., Liebetrau, V., McGinnis, D.F., **Wallmann, K.** (2015). Quantification of methane emissions at abandoned gas wells in the Central North Sea. *Marine and Petroleum Geology* 68, 848-860.

### 3. Geographical Areas

3.1 Indicate geographical areas in which the project is to be conducted (with reference in latitude and longitude in decimal degrees, including coordinates of cruise/track/way points/sampling stations). Please provide coordinates in a separate excel spreadsheet.

**Overall work area (WGS84, decimal degree):**

Work permission for ship-borne hydro-acoustic devices (single beam echosounder and multibeam swath echosounder) is requested within these frame coordinates.

<b>Longitude</b>	<b>Latitude</b>
8.087937	53.930563
6.799855	54.158231
5.015386	55.010551
3.373581	55.775688
-0.466308	57.098788
-1.244	57.209
-1.011	58.517
-0.793459	58.53571
1.31111	58.558178
1.960539	57.913681
2.607839	56.599447
3.242612	56.083087
3.348343	55.925555
4.237408	55.777518
4.739812	55.419349
5.139273	55.255681
7.308142	54.193578

**Coordinates of single targets (ED50, decimal degree):**

Work permission is requested for single targets (abandoned wells) within an operational radius of one nautical mile for hydroacoustic investigations, ROV operations, water sampling, surface sediment sampling, video imaging, short-term lander operations (10 – 36 hours).

<b>Longitude</b>	<b>Latitude</b>	<b>ID</b>
0.00389496	57.80264269	21/06-2
0.73268740	57.80098721	21/09-3
1.63228390	57.92183999	22/4b
1.44096615	57.94562699	22/03a-2
1.09586574	56.99217899	29/01c-9z
2.16671749	56.99971874	30/01a-7
2.16629453	57.00576759	23/26a-11
0.97106276	58.28530239	15/25b-1

<b>Longitude</b>	<b>Latitude</b>	<b>ID</b>
0.6188288	58.37469638	15/19c-11
0.96653105	58.48211571	15/20-1
0.59653987	57.9608646	21/03-2
0.65019606	57.9885479	21/04b-5
2.0512848	56.95565613	30/01f-8

<b>Longitude</b>	<b>Latitude</b>	<b>ID</b>
6.9666	54.1666	Figge Mare

**Coordinates of Golden Eye near- and far-field area (WGS84, decimal degree)**

Work permission is requested for hydroacoustic investigations, Lander operations (10 – 36 hours), water sampling, surface sediment sampling, video imaging.

<b>Longitude</b>	<b>Latitude</b>	<b>ID</b>
-0.967	57.653	1
0.273	57.653	2
0.2	58.35	3
-1.045	58.35	4

The coordinates of the overall area, of single targets and of the Golden Eye near- and far-field area are provided also in a separate Excel spreadsheet.

3.2 Attach chart(s) at an appropriate scale (1 page, high-resolution) showing the geographical Areas of the intended work and, as far as practicable, the location and depth of sampling Stations, the tracks of survey lines, and the locations of installations and equipment.

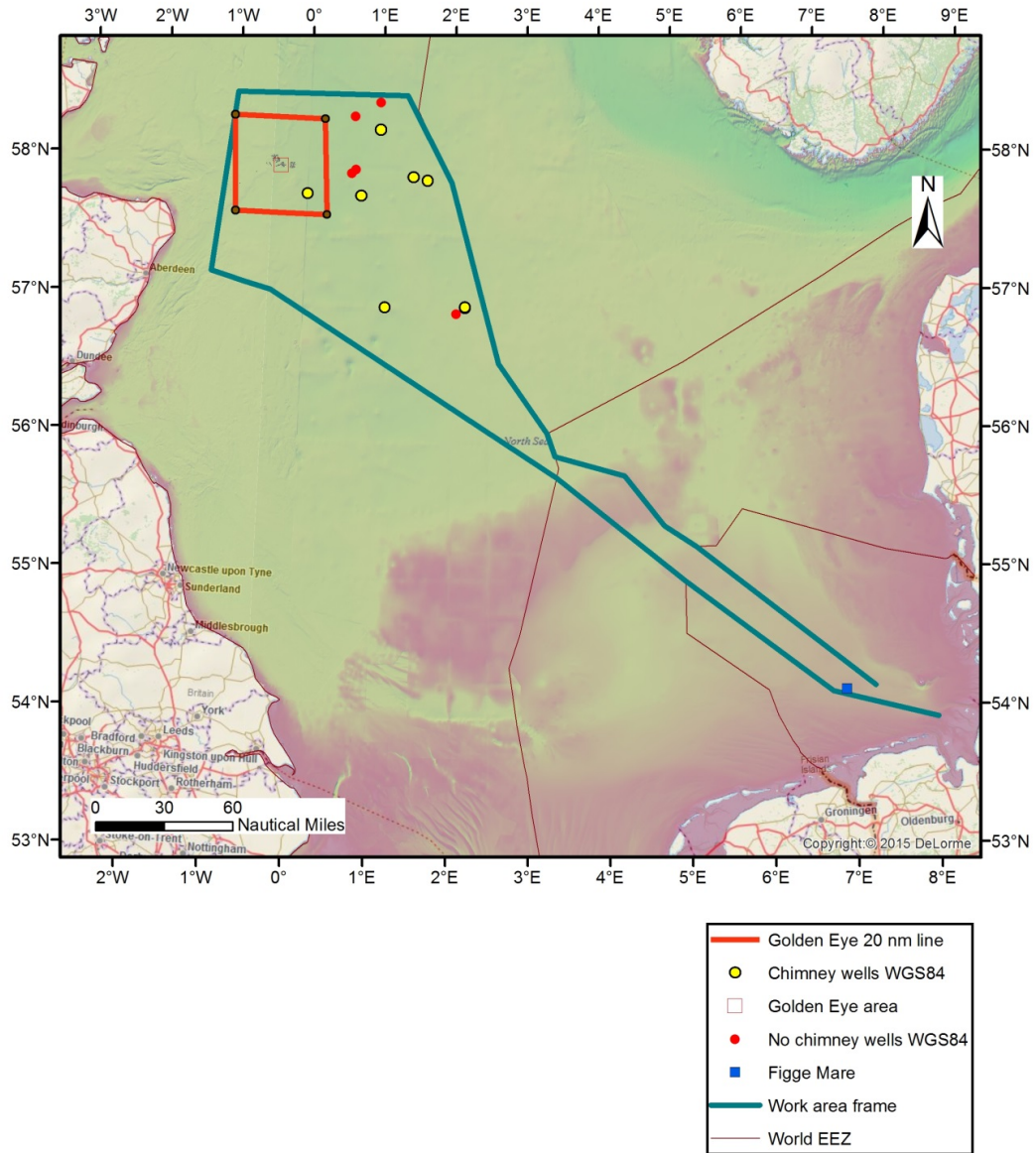


Fig. 1: Proposed work areas (British and German EEZ; > 12 nautical miles offshore).

#### 4. Methods and means to be used

##### 4.1 Particulars of vessel:

Name:	<b>POSEIDON</b>
Type/Class:	RV
Nationality (Flag State):	German
Identification Number (IMO/Lloyds No.):	7427518
Owner:	Ministerium für Wissenschaft und Wirtschaft des Landes Schleswig-Holstein vertreten durch das GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel Wischhofstraße 1-3 24148 Kiel

Operator:	GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel Wischhofstraße 1-3 24148 Kiel
Overall length (meters):	60,80 m
Maximum draught:	04,90 m
Displacement/Gross Tonnage:	1105 BRZ
Propulsion:	Diesel Electric
Cruising & maximum speed:	9 kn, max.10 kn
Call sign:	DBKV
INMARSAT number and method and capability of communication (including emergency frequencies):	<b>Telephone: 00870761651773</b> Telefax: 00870600273636 Mobile GSM: 0049 1716070932
Name of Master:	Matthias Günther
Number of Crew:	15
Number of Scientists on board:	11

4.2 Particulars of Aircraft:	
Name:	
Make/Model:	
Nationality (flag State):	
Website for diagram & Specifications:	
Owner:	
Operator:	
Overall Length (meters):	
Propulsion:	
Cruising & Maximum speed:	
Registration No.:	
Call Sign:	
Method and capability of communication (including emergency frequencies):	
Name of Pilot:	
Number of crew:	
Number of scientists on board:	
Details of sensor packages:	
Other relevant information:	

4.3 Particulars of Autonomous Underwater Vehicle (AUV):	
Name:	
Manufacturer and make/model:	
Nationality (Flag State):	
Website for diagram & Specifications:	
Owner:	
Operator:	
Overall length (meters):	
Displacement/Gross tonnage:	
Cruising & Maximum speed:	
Range/Endurance:	
Method and capability of communication (including emergency frequencies):	
Details of sensor packages:	
Other relevant information:	

4.4 other craft in the project, including its use:	
Work class ROV Phoca with cable connection to the mother ship	

4.5 Particulars of methods, full description of scientific instruments to be used (for fishing gear specify type and dimension) and location			
Types of samples and Measurements:	Methods to be used:	Instruments to be used:	To be carried out within 12nm (yes or no):
Air chemistry	Cavity ring down mass spectrometry	Picarro	no
Hydroacoustics	Multibeam	ELAC SB3050	no
Hydroacoustics	Single beam	EK80	no
Water column sampling	Video pump-CTD, Total alkalinity	Seabird 9plus	no
Video Survey	Video seabed survey	ROV	no
Currents	ADCP	RDI 300kHz, lander	no
Sediment & water sampling	Flux measurements	Biogeochemical observatory landers	no
Sediment sampling	Surface sampling by ROV	Push core (0.3 m)	no
Sediment sampling		Multi corer (0.8 m)	no
Sediment sampling		Gravity corer (6 m)	no

4.6 Indicate nature and quantity of substances to be released into the marine environment:

none

4.7 Indicate whether drilling will be carried out. If yes, please specify:

Only surface coring up to 6 m below the seafloor

4.8 Indicate whether explosives will be used. If yes, please specify type and trade name, Chemical content, depth of trade class and stowage, size, depth of detonation, frequency of Detonation, and position in latitude and longitude:

no

## 5. Installations and Equipment

Details of installations and equipment (including dates of laying, servicing, method and Anticipated timeframe for recover, as far as possible exact locations and depth, and Measurements):

During Leg 1 an upward looking ADCP mooring will be deployed in approximately 100 m water depth by the ROV in the vicinity of the abandoned wells. The mooring is less than 1 m tall and equipped with a sonar beacon. No rope or surface buoy is attached to the mooring. Approximate time of deployment is 5 days with subsequent recovery by the ROV.

## 6. Dates

6.1 Expected dates of first entry into and final departure from the research area by the research vessel and/or other platforms:

First entry 28 September 2017  
Departure 25<sup>th</sup> October 2017

6.2 Indicate if multiple entries are expected:

Depending on the weather multiple entries may be necessary within the above given period

7. Port Calls

7.1 Dates and Names of intended ports of call:
An intermediate port call is planned from 22 <sup>nd</sup> to 26 <sup>th</sup> September in Bremerhaven/Germany

7.2 Any special logistical requirements at ports of call:
No

7.3 Name/Address/Telephone of shipping agent (if available):
GEOMAR Dr. Klas Lackschewitz Telefon: 0431 600-2132 Telefax: 0431 600-2680 klackschewitz@geomar.de

8. Participation of the representative of the coastal State

8.1 Modalities of the participation of the representative of the coastal State in the research Project:
Coordination of the STEMM-CCS project

8.2 Proposed dates and ports for embarkation/disembarkation:
Embarkation 25 <sup>th</sup> September 2017 in Bremerhaven/Germany Disembarkation 27 <sup>th</sup> October 2017 in Kiel/Germany

9. Access to Data, Samples and Research Results

9.1 Expected dates of submission to coastal State of preliminary report, which should include The expected dates of submission of the data and research results:
No preliminary report is expected to be written. However, if required, we could supply such a report 3 months after the cruise

9.2 Anticipated dates of submission to the coastal State of the final report:
6 months after the cruise a full cruise report will be supplied

9.3 Proposed means for access by coastal State to data (including format) and samples:
Data will be available via DVD 3 months after the cruise and shipped over

9.4 Proposed means to provide coastal State with assessment of data, samples and Research results:
Data and results will be accessible through the research staff members of the cruise

9.5 Proposed means to provide assistance in assessment or interpretation of data, samples and research results:
Assistance in assessment or interpretation of data will be possible via the staff members of the cruise

9.6 Proposed means of making results internationally available:
The cruise report and scientific data will be published



10. Other permits Submitted

10.1 Indicate other types of coastal state permits anticipated for this research (received or pending):

none

11. List of Supporting Documentation

11.1 List of attachments, such as additional forms required by the coastal State, etc.:

List of coordinates in a separate excel spreadsheet

Signature:



Dr. Klas S. Lackschewitz  
GEOMAR  
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Contact information of the focal point:

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