

Application for Consent to conduct
Marine Scientific Research

Date: 15.08.2018 – 03.09.2018

1. General Information

1.1 Cruise name and/or number: POS527

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:	Prof. Dr. Eric Achterberg
Country:	Germany
Affiliation:	GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel
Address:	Wischhofstraße 1-3, 24148 Kiel, Germany
Telephone:	00494316001290
Fax:	0049431600131290
Email:	eachterberg@geomar.de
Website (for CV and photo):	http://www.geomar.de/en/mitarbeiter/fb2/ch/eachterberg/

1.4 Entity(ies)/Participant(s) from coastal State involved in the planning of the project:	
Name:	Prof. Douglas P. Connelly
Affiliation:	NERC National Oceanography Centre
Address:	Southampton SO14 3ZH, Great Britain
Telephone:	0044 2380 596546
Fax:	
Email:	douglas.connelly@noc.ac.uk
Website (for CV and photo):	http://www.noc.ac.uk/about-us/staff/dpc

2. Description of Project

2.1 Nature and objectives of the project:
<p>The proposed research cruise is related to a European Union Horizon2020 project which commenced in March 2016: "Strategies for Environmental Monitoring of Marine Carbon Capture and Storage" STEMM-CCS (http://www.stemm-ccs.eu/) 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 CO₂ leakage, prior to offshore CO₂ 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 also needed for comparison with data obtained during artificial CO₂-release experiments, which will be conducted in 2018 in the same area. (3) Undertake benthic ecology baseline measurements, to compare against conditions with</p>

perturbations from artificial CO₂ release experiments. (4) Test novel chemical sensors for measuring benthic and pelagic carbon fluxes (i.e. by using lab-on-chip technology, optodes, eddy co-variance techniques for O₂ and pH).

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:

- de Beer, D.**, Haeckel, M., Neumann, J., Wegener, G., Inagaki, F., and Boetius, A. (2013) Saturated CO₂ inhibits microbial processes in CO₂-vented deep-sea sediments. *Biogeosciences* **10**: 5639-5649.
- Berg, P., Roey, H., Janssen, F., Meyer, V., Jørgensen, B.B., Huettel, M., and **de Beer, D.** (2003) Oxygen uptake by aquatic sediments measured with a novel non-invasive eddy correlation technique. *Mar Ecol Prog Ser* 261: 75-83
- Clarke, J.S., **Achterberg, E.P.**, Rerolle, V.M.C., Kaed Bey, S.A., Floquet, C.F.A., Mowlem, M.C. (2015). Characterisation and deployment of an immobilised pH sensor spot towards surface ocean pH measurements. *Analytica Chimica Acta*, 897, 69-80.
- Clarke, J.S., **Achterberg, E.P.**, Connelly, D.P., Schuster, U., Mowlem, M. (2016). Developments in marine pCO₂ measurement technology; towards sustained in situ observations. *Trends in Analytical Chemistry*, in press.
- Legiret, F.E., **Achterberg, E.P.**, Connelly, D.P., Woodward, E.M., Mowlem, M. (2013). High performance microfluidic analyser for phosphate monitoring in the marine environment. *Talanta*, 116, 382-387.
- Linke, P., **Haeckel, M.**, Schneider von Deimling, J., Vielstädte, L., Schmidt, M., Karstens, J., Berndt, C., Herreillers, 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. (2014) Fluxes of CO₂ 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.
- Long, M.H., Berg, P., **de Beer, D.**, and Ziemann, J.C. (2012) In Situ Coral Reef Oxygen Metabolism: an Eddy Correlation Study. *PLoS ONE*: e58581.
- Meyer, S., Guilini, K., Neumann, J., Ramette, A., Wenzhöfer, F., **de Beer, D.**, Weber, M., Lott, C., Vanreusel, A. and Boetius, A. (2013) Impact of high CO₂ on marine benthic life at natural CO₂ leakage sites (Panarea & Okinawa) In: International Workshop on Leakage effects from natural analogues, 13.05.2013, Bergen, Norway.
- Rérolle, V.M., Floquet, C.F., Harris, A.J., Mowlem, M.C., Bellerby, R.R. and **Achterberg, E.P.** (2013) Development of a colorimetric microfluidic pH sensor for autonomous seawater measurements. *Analytica Chimica Acta* 786, 124-131.
- 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.
- Vielstädte, L., Sommer, S., Schmidt, M., Linke, P., **Haeckel, M.** (2012) Gas release experiment In: RV Celtic Explorer EUROFLEETS cruise report CE12010 - ECO2@NorthSea : 20.07. – 06.08.2012, Bremerhaven - Hamburg, ed. by Linke, P.. GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel, 28-32.

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](#).

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

Work permission is requested for long-term and short-term lander operations, water sampling and surface sediment sampling.

<i>Longitude</i>	<i>Latitude</i>	<i>ID</i>
-0.992	57.653	1
0.365	57.653	2
0.365	58.361	3
-0.992	58.361	4

The coordinates of the overall area 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.

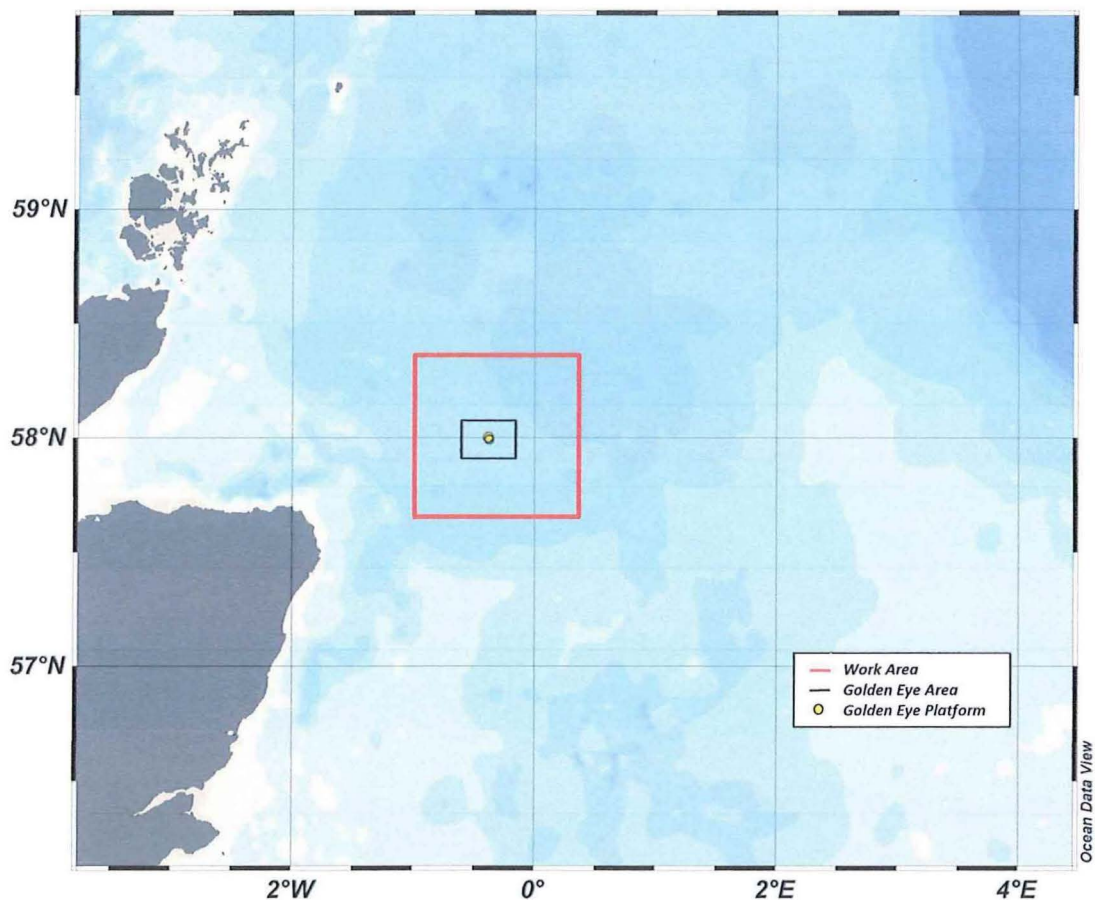


Fig. 1: Proposed work areas (British and German EEZ; > 12 nautical miles offshore).

4. Methods and means to be used

4.1 Particulars of vessel:	
Name:	POSEIDON
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):	Telephone: 00870761651773 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:

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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):
Water column sampling	CTD	Seabird 9plus	no
Near bottom water column	Multifunctional sensor suite	SeapHOx, Lab on Chip, optodes,lander	no
Sediment & water sampling	Flux measurements	Biogeochemical observatory landers	no
Surface sediment sampling	Benthic faunal sampling	Grab	no
Sediment sampling	Drilling	Gravity corer (6 m)	no
Sediment sampling	Drilling	Push core (0.3 m)	no
Sediment sampling	Drilling	Multi corer (0.8 m)	no
Currents	ADCP	RDI 300kHz, lander	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:

none

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):

A seafloor lander equipped with a suite of sensors to monitor temperature, conductivity, pressure, current speed and direction, hydroacoustic, pH, pCO₂, O₂ and nutrients will be recovered by acoustic command on arrival. Following servicing, the lander will be re-deployed at approximately the same position (57° 59.698' N, 00° 22.391' W) at a depth of 115 m. An eddy covariance/gradient flux lander will be deployed in approximately 100 m water depth in the vicinity of Golden Eye platform. The system is installed on a small frame (less than 1.5 m) that will be deployed several times (6-8 times) for periods no longer than 2.5 hours. The mooring will be recovered either by acoustic means or through a surface buoy.

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 16 th August 2018 Departure 1 st September 2018
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:
The cruise is planned to start and end at Kiel harbour

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 14 th August 2018 in Kiel, Germany Disembarkation 3 rd September 2018 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 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 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

GEOMAR
Helmholtz-Zentrum
für Ozeanforschung Kiel

Signature: 
Forschungsschiffe
Wischhofstraße 1-3
24148 Kiel

Contact information of the focal point:

Name: Dr. Klas Lackschewitz
Country: Germany
Affiliation: GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel
Address: Wischhofstraße 1-3, 24148 Kiel
Telephone: +49 (0)4316002132
Telefax: +49 (0)4316002680
E-Mail: klackschewitz@geomar.de