

NOTIFICATION OF PROPOSED RESEARCH CRUISE

GENERAL ORGANISATION
PART A

01. Name of research ship : **BELGICA** Cruise N° : **2007/12**
02. Dates of cruise : From **09 May** to **26 May 2007**
03. Operation authority **Belgian Navy under contract for Belgian Ministry of Science Policy
Management Unit of the North Sea Mathematical Model
"M.U.M.M.",
3° & 23° Linierregimentplein, 8400 Oostende
Telephone 32(0)59 70 01 31, Facsimile 32(0)59 70 49 35
Email : bmmost@mumm.ac.be**
04. Owner **Belgian state represented by Minister for Science Policy**
05. Particulars of ship
- | | |
|-----------------|------------------------------------|
| Name | Belgica |
| Nationality | Belgian |
| Overall length | 51 meters |
| Maximum draught | 4,5 meters |
| Net tonnage | 232 NRT |
| Propulsion | Diesel |
| Call sign | ORQQ |
| Telephone | INMARSAT 00870 76 218 73 27 |
| Facsimile | INMARSAT 00870 32 052 18 12 |
| E-mail | belgica@mumm.ac.be |
06. Crew
- | | |
|----------------|--------------------------|
| Name of master | L. GOUSSAERT, KVK |
| Number of crew | 15 |
07. Scientific personnel
- Name and address of scientist in charge
- Prof. Lei Chou
Université Libre de Bruxelles
Laboratoire d'Océanographie Chimique et Géochimique des
Eaux
Campus Plaine – CP 208
Boulevard du Triomphe
B-1050 Bruxelles, BELGIUM
Tel : +32-2-650 52 37, Fax : +32-2-650 5228, e-mail :
lei.chou@ulb.ac.be**
- Number of scientists : **15**
(a nominal roll of all personnel other than nationals of the applicant (flag) state is required)
08. Geographical area in which ship will operate (with reference in latitude and longitude).
**French, UK and Irish continental Shelf and slope
Between 46°N – 51°N, 2°W – 12°W**
09. Brief description of purpose of cruise
**The PEACE project takes place in the framework of the program "Science for a sustainable development" theme Climate and atmosphere' 1st call, of the Belgian Federal Science Policy Office.
The overall objective of the PEACE project is to evaluate the role in climate regulation of calcification, primary production and export processes during coccolithophorid blooms. We will use a transdisciplinary approach that combines process-oriented field investigations with laboratory experiments and modelling tools.**
10. Port of Call. Dates. Reasons.
- | | | |
|------------------|--------------------------------|--|
| Zeebrugge | 09/05 | Start of campaign 12a |
| Cork | 17/05 (pm) – 20/05 (pm) | Relaxation of crew and scientists |
| Cork | 20/05 (am) | Start of campaign 12b |
| Brest | 26/05 (pm) | End of campaign, disembarkation of scientists |
11. Any special logistic requirements at ports of call (other than water, fuel provisions, etc.)
N.A.

NOTIFICATION OF PROPOSED RESEARCH CRUISE

DETAIL PART B

01. Name of research ship : **BELGICA** Cruise N° : **2007/12**
02. Dates of cruise : from **09 May** to **28 May 2007**

03. Purpose of research and general methods.
(If the research work is being taken on behalf of a research institution of a third state, it is the responsibility of that state to obtain prior permission; it is essential that written confirmation that this has been done is obtained and quoted in this application)

The overall objective of the PEACE project is to evaluate the role in climate regulation of calcification, primary production and export processes during coccolithophorid blooms. We will use a transdisciplinary approach that combines process-oriented field investigations with laboratory experiments and modelling tools. Specific objectives are

- 1) to study the net ecosystem dynamics during coccolithophorid blooms,**
- 2) to unravel the link between the bacterial community, grazing, TEP dynamics, carbon export and DMS cycling during coccolithophorid blooms,**
- 3) to assess the effects of ocean acidification on coccolithophorid metabolism and TEP production, and**
- 4) to model coccolithophorid dynamics and their impact on ocean dissolved inorganic carbon (DIC) chemistry.**

(Project Internet Site: <http://www.co2.ulg.ac.be/peace/>)

04. Attach chart(s) showing (on an appropriate scale) the geographical area of the intended work, positions of intended stations, tracks of survey lines, positions of moored / seabed equipment.

See chart in annex

05. Types of samples required, e.g. Geological / Water / Plankton / Fish / Radioactivity / Isotope
water ; sediment ; suspended matter ; plankton

and methods by which samples will be obtained (including dredging/coring/drilling).

Niskin & Go-FLO bottles, in situ measurements (SCTD, ...); Van Veen grab, Reineck corer, multicorer B&C, NIOZ box corer; non-toxic sea water circuit and on board centrifuge; in-situ pumps, plankton net; underway measurements

06. Details of moored equipment : **N.A.**

Dates		Description	Latitude	Longitude
Laying	Recovery			

07. Explosives : **N.A.**

- | | |
|--|-----------------------------|
| (a) Type and Trade Name | (b) chemical content |
| (c) Depth of trade class and stowage | (d) Size |
| (e) Depth of detonation | (f) Frequency of detonation |
| (g) Position in longitude and latitude | (h) Dates of detonation |

08. Details and reference of

(a) any relevant previous/future cruises

CCCC BELGICA 2002/11 : 22.04.2002 - 11.05.2002

CCCC BELGICA 2003/12 : 28.04.2003 - 16.05.2003

CCCC BELGICA 2004/13 : 01.06.2004 - 17.08.2004

BELGICA 2006/11 : 28.05.2006 - 10.05.2006

(b) any previous published research data relating to the proposed cruise (attach separate sheet if necessary)

See Annex 1

09. Names and addresses of scientist of the coastal state in whose waters the proposed cruise takes place with whom previous contact has been made.

Prof. Patrick Buat-Ménard, University de Bordeaux I Département de Géologie et d'Océanographie, Av. des Facultés, F-33405 Talence Cédex, France

Prof. Peter Liss, University of East Anglia, School of Environmental Sciences Norwich NR4 7TJ UK

Dr. Daniel Cossa, IFREMER, DEL/PC, BP 21105, F-44311 NANTES Cedex 03, France

10. State :

(a) whether visits to the ship in port by scientists of the coastal state concerned will be acceptable

YES

(b) whether it will be acceptable to carry on board an observer from the coastal state for any part of the cruise and dates and ports of embarkation / disembarkation

YES, cfr. part A § 10

(c) when research data from intended cruise is likely to be made available to the coastal state and if so by what means. (If the final report is likely to be delayed beyond 12 months, interim progress reports are required.

- Cruise report available within 2 months by request to the chief scientist
- see 8b above

NOTIFICATION OF PROPOSED RESEARCH CRUISE

**SCIENTIFIC EQUIPMENT
PART C**

COASTAL STATE :

UNITED KINGDOM

Complete the following table - separate page for each coastal state

Indicate "Yes or No"

LIST SCIENTIFIC WORK BY FUNCTION	Water column including sediment sampling of the seabed	Fisheries research within fishing limits	Research concerning the natural resources of the continental shelf or its physical characteristics	Distance from coast		
				WITHIN 12 NMS	BETWEEN 12-200 NMS	(CONTINENTAL SHELF WORK ONLY) BEYOND 200 NM BUT WITHIN THE CONTINENTAL MARGIN
e.g. Magnetometry : Gravity Diving : Seismics: Bathymetry seabed sampling Trawling Echo sounding : Water sampling U/W TV : Moored instruments: towed instruments:						
Niskin and Go Flo bottles	Yes	No	No	Yes	Yes	Yes
In situ measurements (CTD-system, ... and optical properties)	Yes	No	No	Yes	Yes	Yes
In-situ pumping of water at various depths	Yes	No	No	Yes	Yes	Yes
Plankton net	Yes	No	No	Yes	Yes	Yes
Van Veen grab	Yes	No	No	Yes	Yes	Yes
Reineck corer	Yes	No	No	Yes	Yes	Yes
Multicorer B & C	Yes	No	No	Yes	Yes	Yes
NIOZ box corer	Yes	No	No	Yes	Yes	Yes
vessel's non toxic sea water intake and on board centrifuge	Yes	No	No	Yes	Yes	Yes
continuous measurements	Yes	No	No	Yes	Yes	Yes
Spectroradiometer Trios	Yes	No	No	Yes	Yes	No
Secchi disk	Yes	No	No	Yes	Yes	No

NOTIFICATION OF PROPOSED RESEARCH CRUISE

SCIENTIFIC EQUIPMENT
PART C

COASTAL STATE:

FRANCE

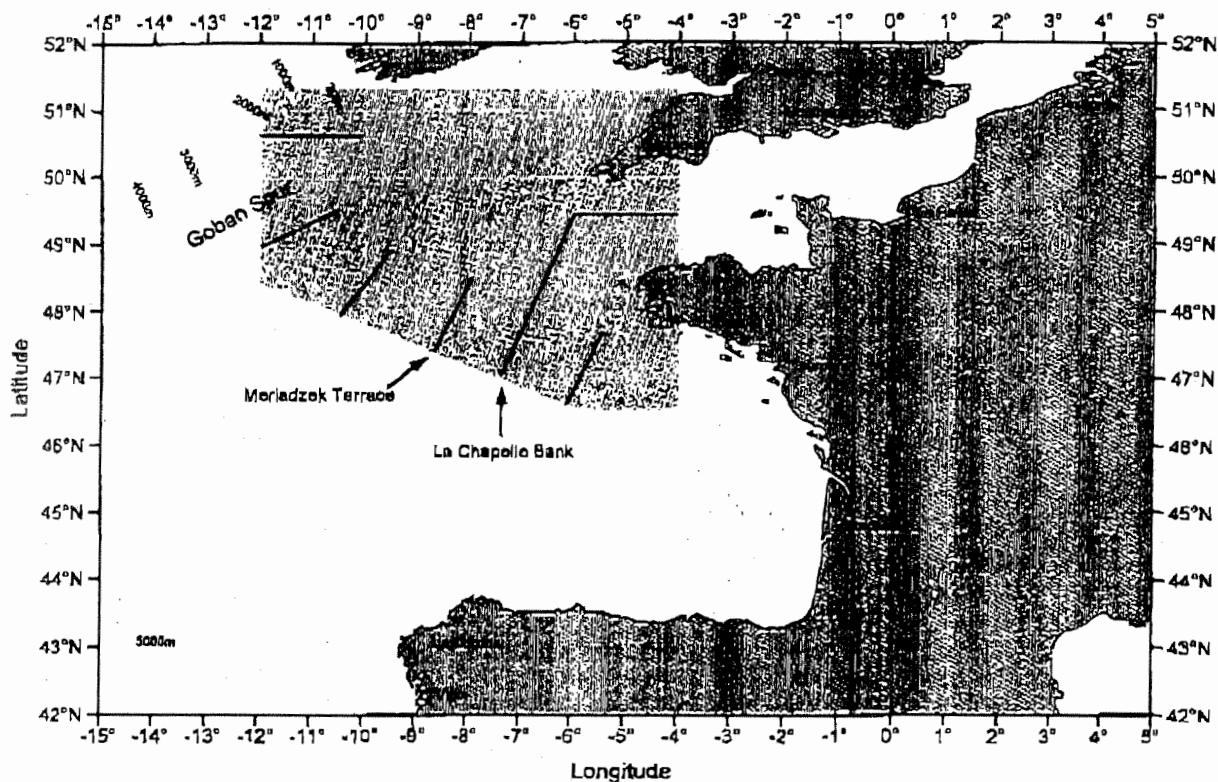
Complete the following table - separate page for each coastal state

Indicate "Yes or No"

LIST SCIENTIFIC WORK BY FUNCTION	Distance from coast					
	Water column including sediment sampling of the seabed	Fisheries research within fishing limits	Research concerning the natural resources of the continental shelf or its physical characteristics	WITHIN 12 NMS	BETWEEN 12-200 NMS	(CONTINENTAL SHELF WORK ONLY) BEYOND 200 NM BUT WITHIN THE CONTINENTAL MARGIN
e.g. Magnetometry : Gravity Diving : Seismics: Bathymetry seabed sampling Trawling Echo sounding : Water sampling UW TV : Moored instruments: towed instruments:						
Niskin and Go Flo bottles	Yes	No	No	Yes	Yes	Yes
in situ measurements with SCTD-system	Yes	No	No	Yes	Yes	Yes
In-situ pumping of water at various depths	Yes	No	No	Yes	Yes	Yes
Plankton net	Yes	No	No	Yes	Yes	Yes
Van Veen grab	Yes	No	No	Yes	Yes	Yes
Reineck corer	Yes	No	No	Yes	Yes	Yes
Multicorer B & C	Yes	No	No	Yes	Yes	Yes
NIOZ box corer	Yes	No	No	Yes	Yes	Yes
vessel's non toxic sea water intake and on board centrifuge	Yes	No	No	Yes	Yes	Yes
continuous measurements	Yes	No	No	Yes	Yes	Yes
Spectroradiometer Trios	Yes	No	No	Yes	Yes	No
Secchi disk	Yes	No	No	Yes	Yes	No

Belgica campaign 07/12 chart

The provisional transects are indicated by the blue lines. The exact positions of the stations along each transect will be determined later depending on the remote sensing data received before and during the cruise.



Belgica campaign 06/12 ; Annex 1

Publications (in alphabetical order) :

- Borges A.V. (2005) Do we have enough pieces of the jigsaw to integrate CO₂ fluxes in the Coastal Ocean ? *Estuaries*, 28(1):3-27
- Borges A.V., B. Delille & M. Frankignoulle (2005) Budgeting sinks and sources of CO₂ in the coastal ocean: Diversity of ecosystems counts, *Geophysical Research Letters*, 32, L14601, doi:10.1029/2005GL023053
- Borges A.V. & M. Frankignoulle (2003) Distribution of surface carbon dioxide and air-sea exchange in the English Channel and adjacent areas. *Journal of Geophysical Research*, 108(C5): doi: 10.1029/2000JC000571
- Delille B., J. Harlay, I. Zondervan, S. Jacquet, L. Chou, R. Wollast, R.G.J. Bellerby, M. Frankignoulle, A.V. Borges, U. Riebesell & J.-P. Gattuso (2005) Response of primary production and calcification to changes of pCO₂ during experimental blooms of the coccolithophorid *Emiliania huxleyi*, *Global Biogeochemical Cycles*, 19, GB2023, doi:10.1029/2004GB002318
- Engel A., B. Delille, S. Jacquet, U. Riebesell, E. Rochelle-Newall, A. Terbrüggen & I. Zondervan (2004) TEP and DOC production by *Emiliania huxleyi* exposed to different CO₂ concentrations: A mesocosm experiment, *Aquatic Microbial Ecology*, 34(1):93-104
- Engel A., I. Zondervan, K. Aerts, L. Beaufort, A. Benthien, L. Chou, B. Delille, J.-P. Gattuso, J. Harlay, C. Heemann, L. Hoffmann, S. Jacquet, J. Nejstgaard, M.-D. Pizay, E. Rochelle-Newall, U. Schneider, A. Terbrüggen A. & U. Riebesell (2005) Testing the direct effect of CO₂ concentration on a bloom of the coccolithophorid *Emiliania huxleyi* in mesocosm experiments, *Limnology and Oceanography*, 50(2): 493-507
- Frankignoulle M. & A.V. Borges (2001) European continental shelf as a significant sink for atmospheric carbon dioxide. *Global Biogeochemical Cycles*, 15(3): 569-576
- Gehlen, M., F. C. Bassinot, L. Chou, and D. McCorkle. (2005a). Reassessing the dissolution of marine carbonates: I. Solubility. *Deep Sea Research Part I: Oceanographic Research Papers* 52(8):1445-1460.
- Gehlen, M., F. C. Bassinot, L. Chou, and D. McCorkle. (2005b). Reassessing the dissolution of marine carbonates: II. Reaction kinetics. *Deep Sea Research Part I* 52(8):1461-1476.
- Rochelle-Newall E., B. Delille, M. Frankignoulle, J.-P. Gattuso, S. Jacquet, U. Riebesell, A. Terbrüggen & I. Zondervan (2004) Chromophoric dissolved organic matter in experimental mesocosms maintained under different pCO₂ levels. *Marine Ecology Progress Series*, 272:25-31
- Scandra A., J. Harlay, D. Lefèvre, R. Lemée, P. Rimmelin, M. Denis and J.-P. Gattuso (2003) Response of the coccolithophorid *Emiliania huxleyi* to elevated pCO₂ under nitrate limitation. *Marine Ecology Progress Series*, 261, 111-122.
- Wollast, R. and L. Chou (1998) Distribution and fluxes of calcium carbonate along the continental margin in the Gulf of Biscay. *Aquatic Geochemistry* 4:369-393.
- Wollast, R. and L. Chou (2001) The carbon cycle at the ocean margin in the northern Gulf of Biscay. *Deep-Sea Research Part II* 48(14-15):3265-3293.

Abstracts submitted for presentations during international conferences (in alphabetical order) :

- Aerts K., R.H.M. Godoi, J. Harlay, L. Chou and R. Van Grieken. Characterization of marine CaCO₃ particles in the context of Global Change. Poster, OCEANS: Ocean Biogeochemistry and Ecosystems Analysis. IGBP & SCOR International Open Science Conference. 7-10 January 2003, Paris, France.
- Aerts K., R.H.M. Godoi, R. Van Grieken, Characterization of surface layers on individual marine CaCO₃ particles, using "variable energy" electron probe microanalysis. Poster. VLIZ Young Scientist Day, Brugge, Belgium, 13 March 2002.
- Benthien A., U. Riebesell, E. Anja, I. Zondervan, J. Heffer, B. Delille, J. Harlay & S. Jacquet. Alkenone carbon isotopes during a bloom of *Emiliania huxleyi*: Effects of CO₂ concentration and production, 8th International Conference on Paleoceanography, 5-10 September 2004, Biarritz, France.
- Benthien A., I. Zondervan, U. Riebesell, A. Engel, J. Heffer, B. Delille, J. Harlay & S. Jacquet. Alkenone carbon isotopes during a bloom of *Emiliania huxleyi*: Effects of CO₂ concentration and production. Poster. EGS-AGU-EUG Joint Assembly, Nice, 6-11 April 2003.
- Chou L., J. Harlay, N. Roevros, R. Wollast, B. Delille, K. Aerts, P.-E. Lapernat, T. Smyth & S. Schmidt. Coupling of the primary production and calcification during a field experiment in the Northeastern Atlantic, EGS-AGU-EUG Joint Assembly, Nice, 6-11 April 2003.
- Delille B., J. Harlay, L. Chou, J.-P. Gattuso, S. Jacquet, U. Riebesell, R. Wollast, I. Zondervan & M. Frankignoulle. Calcification and organic production of coccolithophorids *Emiliania huxleyi* under different atmospheric pCO₂ in a mesocosm experiment. Poster. OCEANS: Ocean Biogeochemistry and Ecosystems Analysis. IGBP & SCOR International Open Science Conference, 7-10 January 2003, Paris, France.
- Delille B., J. Harlay, I. Zondervan, L. Chou, R. Wollast, A.V. Borges, M. Frankignoulle, U. Riebesell & J.-P. Gattuso. Delayed and reduced coccolithophorid calcification under elevated pCO₂. Poster.

The Ocean in a High CO₂ World, An International Science Symposium, UNESCO, 10-12 May 2004, Paris, France.

- Delille B., J. Harlay, I. Zondervan, S. Jacquet, L. Chou, R. Wollast, A.V. Borges, M. Frankignoulle, U. Riebesell & J.-P. Gattuso. Organic and inorganic production of coccolithophorids *Emiliana huxleyi* under different atmospheric pCO₂ during a mesocosm experiment, EGS-AGU-EUG, Nice, France, 6-11 April 2003.
- Denis M., A. Sciandra, J. Harlay, D. Lefèvre, R. Lemée, P. Rimmelin, J.-P. Gattuso. Impact of elevated pCO₂ on optical properties of the Coccolithophorid *Emiliana huxleyi* grown under nitrate limitation. EGS-AGU-EUG Joint Assembly, Nice, 6-11 April 2003.
- Engel A., C. Heemann, M. Schartau, U. Schneider, S. Thoms, B. Delille, S. Jacquet, U. Riebesell, & I. Zondervan. Transparent Exopolymer Particles (TEP) production by marine phytoplankton in response to increasing CO₂: laboratory and field mesocosm experiments, EGS-AGU-EUG Joint Assembly, Nice, 6-11 April 2003.
- Harlay J., L. Chou, V. Dedonder, R. Wollast, B. Delille, K. Aerts. Assessment of the importance of the carbonate pump in surface waters of the Bay of Biscay. Poster. OCEANS: Ocean Biogeochemistry and Ecosystems Analysis, IGBP & SCOR International Open Science Conference, 7-10 January 2003, Paris, France.
- Harlay J., L. Chou, N. Roevros, R. Wollast, B. Delille, K. Aerts & P.-E. Lapernat. Quantification of the Carbonate Pump: Case study of an *Emiliana huxleyi* bloom in the Bay of Biscay. Poster. EGS-AGU-EUG Joint Assembly, Nice, 6-11 April 2003.
- Harlay J., L. Chou, N. Roevros, R. Wollast, B. Delille, K. Aerts & P.-E. Lapernat. On the coupling of primary production and calcification at the continental margin. Poster. VLIZ Young Scientist Day, Brugge, Belgium, 5 March 2004.
- Harlay J., C. van der Zee, L.-S. Schiettecatte, R. H. Godoi, K. Aerts, P.-E. Lapernat, N. Roevros, L. Rebreaun, S. Groom & L. Chou. Biogeochemical study of a coccolithophore bloom at the continental margin in the Northeast Atlantic, ASLO 2005 Summer Meeting, 14-24 June 2005, Santiago de Compostela, Spain.
- Harlay J., C. van der Zee, L.-S. Schiettecatte, N. Roevros, L. Rebreaun, P.-E. Lapernat, A.V. Borges & L. Chou. Dissolved Inorganic Carbon dynamics in the northern Bay of Biscay during a Coccolithophore bloom. Poster. XXXVII International Liège Colloquium on Ocean Dynamics, Gas Transfer At Water Surfaces, 2-6 May 2005, Liège, Belgium.
- Huonnic P., V. Martin-Jézéquel, Y. Rincé, B. Delille & U. Riebesell. Impact of the pCO₂ level on microalgae. Comparison of past, present and future situations during mesocosms experiments. IIspecies diversity of diatoms. SOLAS open science conference, Halifax, Canada, 13-16 October 2004.
- Martin-Jézéquel V., P. Huonnic, B. Delille & U. Riebesell. Impact of the pCO₂ level on microalgae. Comparison of past, present and future situations during mesocosms experiments. Iphytoplanktonic development. SOLAS open science conference, Halifax, Canada, 13-16 October 2004.
- Riebesell U., M. Allgaier, V. Avgoustidi, R. Bellerby, V. Carbonnell, L. Chou, B. Delille, J. Egge, A. Engel, H.-P. Grossart, P. Huonnic, S. Jansen, T. Johannessen, I. Joint, S. Kringstad, T. Lovdal, V. Martin-Jezequel, C. Moros, M. Mühling, P.D. Nightingale, U. Passow, B. Rost, K. Schulz, I. Skjelvan, A. Terbrüggen & S. Trimborn. Pelagic Ecosystems in a High CO₂ Ocean: the Mesocosm Approach, SOLAS open science conference, Halifax, Canada, 13-16 October 2004.
- Riebesell U., R. Bellerby, V. Carbonnell, L. Chou, B. Delille, A. Engel, U. Passow, K. Schulz & S. Trimborn. CO₂ fertilization enhances carbon over-consumption during a phytoplankton bloom. SOLAS open science conference, Halifax, Canada, 13-16 October 2004.
- Rochelle-Newall E., B. Delille, J.-P. Gattuso, S. Jaquet, A. Terbrüggen, U. Riebesell & I. Zondervan. Phytoplankton, bacteria and viruses: sources of CDOM in experimental mesocosms maintained under different pCO₂ levels, EGS-AGU-EUG Joint Assembly, Nice, 6-11 April 2003.
- Sciandra A., J. Harlay, D. Lefèvre, R. Lemée, P. Rimmelin, M. Denis, J.-P. Gattuso. Response of the Coccolithophorid *Emiliana huxleyi* to elevated pCO₂ under nitrate limitation, EGS-AGU-EUG Joint Assembly, Nice, 6-11 April 2003.
- Zondervan I., K. Aerts, R. Bellerby, L. Beaufort, A. Benthien, L. Chou, B. Delille, A. Engel, J.-P. Gattuso, J. Harlay, C. Heemann, L. Hoffmann, S. Jacquet, J. Nejstgaard, M.-D. Pizay, U. Riebesell, E. Rochelle-Newall, U. Schneider & A. Terbrueggen. Biological responses to CO₂-related changes in seawater carbonate chemistry during a bloom of *Emiliana huxleyi*. EGS-AGU-EUG Joint Assembly, Nice, 6-11 April 2003.

Abstracts to be submitted (in alphabetical order)

- De Bodt C., Q. d'Hoop, J. Harlay and L. Chou (2006) Calcification and transparent exopolymer particles (TEP) production in batch cultures of *Emiliana huxleyi* exposed to different pCO₂. Abstract to be submitted to SOLAS Open Science Meeting, Xiamen, China, 6-9 March 2007.
- Harlay J., C. Koch, J.R. Young, N. Roevros, A.V. Borges, L.-S. Schiettecatte, C. Van de Zee, L. Rebreaun, R. Godoi & L. Chou (2006) Coccolithophorid calcium carbonate dissolution in surface waters. Abstract to be submitted to SOLAS Open Science Meeting, Xiamen, China, 6-9 March 2007.

Annex A
Campaigns 07/12-14T2

INTERNATIONAL AFFAIRS/SURVEY/BNS BELGICA/UK EZ-TTW/08 MAY- 23 JUN 2007

1.
 - a. Participating naval unit: bns belgica a 962
 - b. Ship characteristics : length 51m , width 10m ; draught 4.6m /displacement 1200 t / masthead 28.6 m /
2. Waters to be passed : UK EZ and territorial waters (ttw)
3. Waters:
 - a. entrance in UK EZ/TTW : 08 may pm near Dover Strait (rejoin TSS- transit to La Chapelle bank),
 - b. 10 - 26 may 2007: working within the working area (46° - 51° N / 002° - 012°W)
 - c. 20 - 23 jun 2007: Transit through Bay of Biscay, from Finisterre, towards Ushant, Channel.
4. Anchorage and passage in UK TTW requested in case of adverse weather conditions or technical problems
5. Visit to harbour : Nihil
6. Commanding officer : CDR Lieven Goussaert, 26 jun 2006
7. Crew :
 - a. total 30
 - b. officers: 2
 - c. cpo : 4
 - d. rating : 9
 - e. civilian scientists : 15
8. Reason for stay in ttw: Transit - monitoring/sampling water and bottom— deepwater sampling
9. Communications requirements
 - a. 1.frequencies: 2461 - 4158 - 8239 - 8330 kHz
 - b. 1.transmission mode: f1b
 - a. 2.frequencies: 2072 - 4113 - 8752 kHz
 - b. 2.transmission mode: j3e
 - c. eff.output : 400 watt
 - d.int call sign : orgq (oscar romeo golf quebec)
10. n.a.