

NOTIFICATION OF PROPOSED RESEARCH CRUISE

GENERAL  
ORGANISATION  
PART A

1. Name of research ship **BELGICA** Cruise N° **2007/10**
2. Dates of cruise From **23 April** to **27 April 2007**
3. Operating 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° Linieregimentsplein, 8400 Oostende  
Tel, 32(0)59 70 01 31, Facsimile 32(0)59 70 49 35  
Email : [bmmost@mumm.ac.be](mailto:bmmost@mumm.ac.be)**
4. Owner **Belgian state represented by Minister for Science Policy**
5. Particulars of ship

Name	<b>Belgica</b>
Nationality	<b>Belgian</b>
Overall length	<b>51 meters</b>
Maximum draught	<b>4,5 meters</b>
Nett tonnage	<b>232 NRT</b>
Propulsion	<b>Diesel</b>
Call Sign	<b>ORGQ</b>
Telephone	<b>INMARSAT 00870 76 218 73 27</b>
Facsimile	<b>INMARSAT 00870 32 052 18 12</b>
Email	<b>belgica@mumm.ac.be</b>
6. Crew

Name of master	<b>L. GOUSSAERT, KVK</b>
N° of Crew	<b>15</b>
7. Scientific Personnel

Name and address of scientist in charge :	<b>Barbara Van Mol Belgian Royal Institute of Natural Sciences Management Unit of the North Sea Mathematical Models "M.U.M.M." Gulledelle 100 B-1200 Brussels Telephone : 02773 21 34 ; facsimile : 02770 69 72; email : <a href="mailto:B.Vanmol@mumm.ac.be">B.Vanmol@mumm.ac.be</a></b>
N° of scientists	<b>15</b>

(A nominal roll of all personnel other than nationals of the applicant (flag) state is required)  
**JoungJe Park (Korea) | Dr. Kevin Ruddick (UK) | Dr. Alberto Borges (Portugal) | David Doxaran (France)**
8. Geographical area in which ship will operate (with reference in latitude and longitude).  
**Belgian, French, Dutch and UK Continental Shelves  
Box with corners at N 50°30', E 1°00 and N 52°00, E 3°30'**

## 9. Brief description of purpose of cruise

Purpose a) (main purpose)

"BELMER" : MERIS water product validation in Belgian waters ; project in the frame of "PROgramme for the Development of scientific Experiments" (PRODEX) of the European Space Agency (ESA)

"BELCOLOUR-2" : Improvement of the quality of existing optical remote sensing products for marine, coastal and inland waters and development of new products (e.g. pCO<sub>2</sub> and primary production) for key applications such as aquaculture and air-sea CO<sub>2</sub> flux quantification ; project in the frame of the research programme for earth observation "STEREO II" (Support to The Exploitation and Research in Earth Observation) of the Belgian Science Policy (Belspo).

Purpose b) (only in Belgian waters)

Research program in the framework of a PhD investigation. Study of the development of a genetic model of the geological Quaternary evolution of the Belgium Continental Shelf

## 10. Port of Call. Dates, Reasons.

Zeebrugge	23/04 – 27/04	Departure-Arrival (Start and End of research cruise)
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## 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

1. Name of research ship **BELGICA** Cruise N° **2007/10**
2. Date of cruise From **23 April** To **27 April 2007**
3. 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 objectives of the BELMER project are:

- to validate the MERIS water products for Belgian coastal waters and neighbouring French, UK and Dutch waters
- to provide a quantitative statement of product accuracy and recommendations for improvements in the scientific algorithms, where appropriate.

In particular the problems reported by the MERIS validation and user communities of turbid water atmospheric correction, case 2 water chlorophyll retrieval, adjacency effects (straylight), moderate sunglint, spatio-temporal variability of specific inherent optical properties and bottom reflectance will be addressed.

The general objective of the BELCOLOUR-2 project is to improve the quality of existing optical remote sensing products for marine, coastal and inland waters based on new knowledge and to develop new products (including primary production and partial pressure of CO<sub>2</sub>) for key applications such as aquaculture and air-sea CO<sub>2</sub> fluxes.

The theoretical basis for solving key problems in optical remote sensing will be improved with the specific scientific objectives to:

- Improve the quality and the quality control of existing EO products for total suspended matter, chlorophyll a and diffuse attenuation.
- Develop and validate algorithms for detection and correction of adjacency effects and for detection/correction/mapping of bottom effects
- Improve and validate algorithms for atmospheric correction, particularly aspects concerning turbid waters, moderate sun glint and absorbing aerosols.
- Develop new algorithms for phytoplankton-related parameters including phytoplankton taxonomic groups and determine their range of applicability (detection limits, limitations on feasibility related to optical water type).
- Develop new products (such as PAR attenuation and partial pressure of CO<sub>2</sub>) for use with ecosystem and carbon cycle models in an integrated assessment of primary production and air-sea CO<sub>2</sub> fluxes.
- Provide the basic research to support the design of new sensors.

In addition to these scientific objectives, BELCOLOUR-2 has the exploitation objectives to:

- Facilitate use of products for marine, coastal and inland water applications by consulting and supporting key user groups and by tailoring products according to feedback,
- Contribute to the international science community by disseminating research results, organising workshops and training scientists.

Purpose b) : See part A § 9

4. 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

5. Types of samples required, e.g. Geological / Water / Plankton / Fish / Radioactivity / Isotope ....

water

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

**Niskin bottle, In situ measurements (SCTD, Secchi disk...),  
spectroradiometric measurements (above water)**

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

Dates Laying	Recovery	Description	Latitude	Longitude
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7. Explosives : **N.A.**

(a) Type and Trade Name	(b) chemical content
(c) Dept of trade class and stowage	(d) Size
(e) Depth of detonation	(f) Frequency of detonation
(g) Dates of detonation	

8. Details and reference of

- a) Any relevant previous/future cruises

**Project BELCOLOUR : Belgica cruise 2002/07, 2002/09, 2002, 2002/14, 2003/06, 2003/18, 2003/19 and 2003/22, 2004/10b, 2004/16, 2006/08, 2005/16, 2005/19, 2006/08, 2006/19**

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

See Annex 1

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

**BELCOLOUR-2 (NL)**

Dr Steef Peters, Instituut voor Milieuvraagstukken, Vrije Universiteit Amsterdam, De Boelelaan 1115, 1081 HV, Amsterdam, Netherlands  
Tel: ++31 20 444 9555, Fax: +31 20 444 9553, Email: [Steef.Peters@ivm.vu.nl](mailto:Steef.Peters@ivm.vu.nl)

**BELCOLOUR-2 - (FR)**

Dr Hubert Loisel, Laboratoire ELICO, UMR -CNRS/ULCO 8013, Maison de la Recherche en Environnement Naturel, 32 Avenue Foch, 62930 Wimereux, France  
email: [loisel@mren2.univ-littoral.fr](mailto:loisel@mren2.univ-littoral.fr) Tél : 03 20 33 61 89 ; Fax : 03 21 99 84 01

Dr David Doxaran, Marine Optics and Remote Sensing Lab, Laboratoire d'Océanographie de Villefranche, B.P. 8, Quai de la Darse, 06238 Villefranche-sur-Mer, CEDEX, France  
email: [david.doxaran@obs-vlfr.fr](mailto:david.doxaran@obs-vlfr.fr) Tél : +33 (0)4 93 76 37 18; Fax : +33 (0)4 93 76 38 73,

**BELCOLOUR-2 - (UK)**

Dr. Gavin Tilstone, Remote Sensing Group, Plymouth Marine Laboratory, Prospect Place, West Hoe, PLYMOUTH PL1 3DH, UK, Tel : +44 1752 633 406; facsimile +44 1752 633 101; email : [gtil@pml.ac.uk](mailto:gtil@pml.ac.uk)

10. State :

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

**YES**

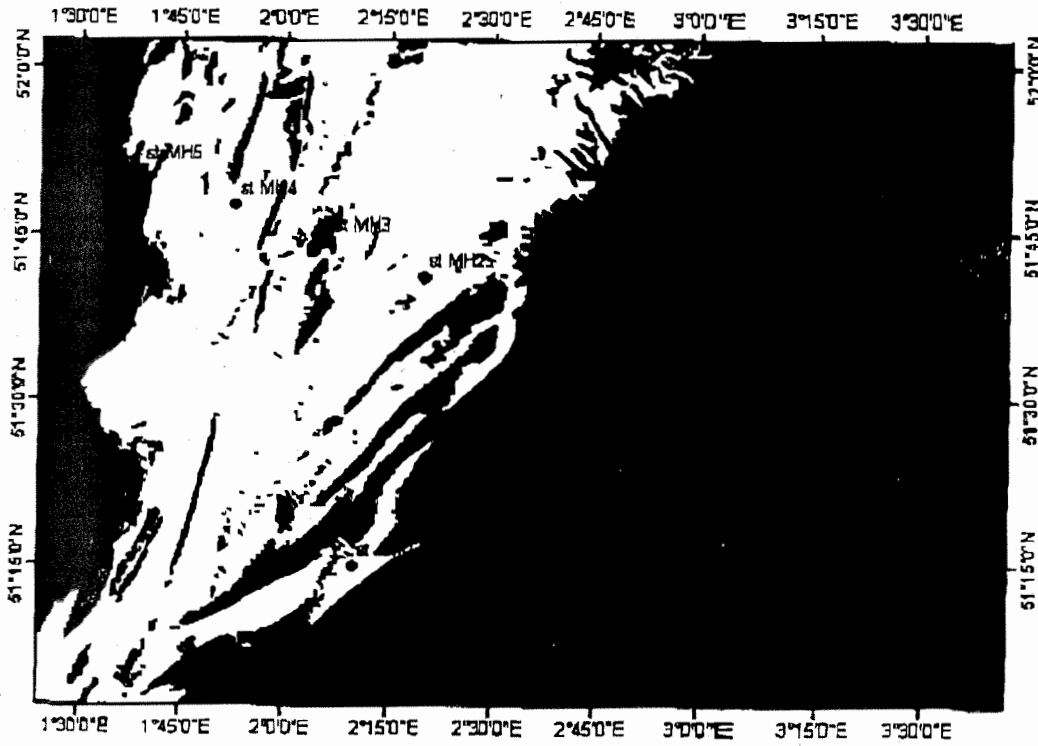
(b) Whether it will be acceptable to carry on board an observer from the coastal state for any part of the cruise and dates and ports of embarkation / disembarkation.

**Yes, Zeebrugge 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 (on request)**

Chart - Belgica 2007/10



**PART C : SCIENTIFIC EQUIPMENT**

**COASTAL STATE : THE NETHERLANDS**

**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
eg. MAGNETOMETRY : GRAVITY DIVING : SEISMICS: BATHYMETRY SEABED SAMPLING TRAWLING ECHO SOUNDING : WATER SAMPLING U/W T.V. : MOORED INSTRUMENTS: TOWED INSTRUMENTS :						
Niskin water bottles	YES	NO	YES	YES	YES	NO
in situ measurements (SCTD, .. and optical properties)	YES	NO	YES	YES	YES	NO
spectroradiometer Trios	YES	NO	NO	YES	YES	NO
Sacchi disk	YES	NO	NO	YES	YES	NO

## PART C : SCIENTIFIC EQUIPMENT

COASTAL STATE : FRANCE

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
eg. MAGNETOMETRY : GRAVITY DIVING : SEISMICS: BATHYMETRY SEABED SAMPLING TRAWLING ECHO SOUNDING : WATER SAMPLING UW T.V. : MOORED INSTRUMENTS : TOWED INSTRUMENTS :						
Niskin water bottles	YES	NO	YES	YES	YES	NO
in situ measurements (SCTD, .. and optical properties)	YES	NO	YES	YES	YES	NO
spectroradiometer Trios	YES	NO	NO	YES	YES	NO
Secchi disk	YES	NO	NO	YES	YES	NO



**PART C : SCIENTIFIC EQUIPMENT**

**COASTAL STATE : UNITED KINGDOM**

**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
eg. MAGNETOMETRY : GRAVITY DIVING : SEISMICS: BATHYMETRY SEABED SAMPLING TRAWLING ECHO SOUNDING : WATER SAMPLING U/W T.V. : MOORED INSTRUMENTS: TOWED INSTRUMENTS :						
Niskin water bottles	YES	NO	YES	YES	YES	NO
in situ measurements (SCTD, .. and optical properties)	YES	NO	YES	YES	YES	NO
spectroradiometer Trios	YES	NO	NO	YES	YES	NO
Secchi disk	YES	NO	NO	YES	YES	NO

## Annex 1. Publications

Astoreca R., V. Rousseau, C. Lancelot. Specific phytoplankton absorption variability and implication for chlorophyll a retrieval in Belgian waters (Southern North Sea). MERIS validation team 2006 proceedings, ESA Special Publication SP-615.

Astoreca, R., V. Rousseau, K. Ruddick, B. Van Mol, J.Y. Parent and C. Lancelot. Optical Properties of algal blooms in an eutrophicated coastal area and its relevance to Remote Sensing. Proceedings of the SPIE International Symposium on "Optics and Photonics: Remote sensing of the coastal oceanic environment" held in San Diego, USA, 31st July – 1st August 2005

Astoreca R, K Ruddick, V Rousseau, B Van Mol, J-Y Parent & C Lancelot Variability of the inherent and apparent optical properties in a highly turbid coastal area: Impact on the calibration of remote sensing algorithms. EARSel eProceedings, 5(1): 1-17, 2006

De Cauwer, V., K. Ruddick, Y. Park, B. Nechad, and M. Kyramarios, Optical remote sensing in support of eutrophication monitoring in the Southern North Sea. EARSel eProceedings, 2004. 3(2): p. 208-221.

Gons, H.J., M. Rijkeboer, and K.G. Ruddick, A chlorophyll-retrieval algorithm for satellite imagery (Medium Resolution Imaging Spectrometer) of inland and coastal waters. Journal of Plankton Research, 2002. 24(9): p. 947-951.

Gons, H.J., M. Rijkeboer, and K.G. Ruddick, Effect of a waveband shift on Chlorophyll retrieval from MERIS imagery of inland and coastal waters. Journal of Plankton Research, 2004. 26(11)

Gons, H.J., M. Rijkeboer, S. Bagheri and K.G. Ruddick, 2000. Optical teledetection of chlorophyll-a in estuarine and coastal waters. Environmental Science and Technology, 34(24): 5189-5192.

Kempeneers, P., S. Sterckx, W. Debruyne, S. De Backer, P. Scheunders, Y. Park and K. Ruddick Retrieval of oceanic constituents from ocean color using simulated annealing. Proceedings of the 25th International Geoscience and Remote Sensing Symposium (IGARSS) held in Seoul, 25-29. July, 2005

Nechad, B., D. Van Den Eynde, M. Fettweis, and F. Francken. Suspended particulate matter mapping from multitemporal SeaWiFS imagery over the Southern North Sea - SEBAB project. in Second International Workshop on the Analysis of multi-temporal remote sensing images (Multitemp 2003), 2003. JRC, Ispra: World Scientific Publishing.

Nechad, B., V. De Cauwer, Y. Park, and K. Ruddick. Suspended Particulate Matter (SPM) mapping from MERIS imagery. Calibration of a regional algorithm for the Belgian coastal waters. in MERIS user workshop, 10-13th November 2003. 2003. Frascati: European Space Agency.

Ovidio, F. and K.G. Ruddick, 2000. Ocean Color Spectrum (contribution), Backscatter, pp. 18-19.

Park Y, B. Van Mol and K. Ruddick. Validation of MERIS Water products for Belgian coastal waters: 2002-2005. MERIS validation team 2006 proceedings, ESA Special Publication SP-615.

Park, Y. and K. Ruddick, A model of remote-sensing reflectance including bidirectional effects for case 2 waters. Applied Optics, Vol.44, n°7, 1 March 2005

Park, Y., V. De Cauwer, B. Nechad, and K. Ruddick. Validation of MERIS water products for Belgian coastal waters: 2002-2003. in MERIS and AATSR Calibration and Geophysical Validation workshop, 20-24th October 2003. 2003. Frascati: European Space Agency.

Ruddick K., V. De Cauwer, Y. Park and G. Moore. Seaborne measurements of near infrared water-leaving reflectance – the similarity spectrum for turbid waters. In *Limnology and Oceanography*. *Limnology and Oceanography*. 51: p.1167-1179, March 2006.

Ruddick, K., V. De Cauwer and B. Van Mol Use of the near infrared similarity reflectance spectrum for the quality control of remote sensing data Proceedings of the SPIE International Symposium on "Optics and Photonics: Remote sensing of the coastal oceanic environment" held in San Diego, USA, 31st July – 1st August 2005

Ruddick, K., V. De Cauwer, Y. Park, and G. Moore. Seaborne measurements of near infrared water-leaving reflectance: The similarity spectrum for turbid waters. *Limnology and Oceanography*. 51: p.1167-1179, March 2006.

Ruddick, K., G. Lacroix, Y. Park, V. Rousseau, V. De Cauwer, W. Debruyn, and S. Sterckx. Overview of Ocean Colour: theoretical background, sensors and applicability for the detection and monitoring of harmful algae blooms (capabilities and limitations). Submitted to the Proceedings of the HABWATCH Workshop. in HABWATCH Workshop. 2003. Villefranche-sur-mer.

Ruddick, K., V. De Cauwer, Y. Park, G. Beu, J.-P. De Blauwe, E.D. Vreker, P.-Y. Deschamps, M. Knockaert, B. Nechad, A. Pollentier, P. Roose, D. Saudermont, and D.v. Tuyckom. Preliminary validation of MERIS water products for Belgian coastal waters. in Envisat Validation workshop, 9-13th December 2002. 2002. Frascati: European Space Agency.

Ruddick, K., Y. Park, and B. Nechad. MERIS imagery of Belgian coastal waters: mapping of Suspended Particulate Matter and Chlorophyll-a. in MERIS user workshop, 10-13th November 2003. 2003. Frascati: European Space Agency.

Ruddick, K.G, F. Ovidio, A.P. Vasilkov, C. Lancelot, and V. Rousseau, 1999. Optical remote sensing in support of eutrophication monitoring in Belgian waters. In "Operational remote sensing for sustainable development", edited by Vaughan and Molenaar, Balkema, Rotterdam, p445-452.

Ruddick, K.G, F. Ovidio, D. Van Den Eynde and A.P. Vasilkov, 1998. The distribution and dynamics of suspended particulate matter in Belgian Coastal waters derived from AVHRR imagery. In "Proceedings of the 9th Conf. On Satellite Meteorology & Oceanography", 25-29 May 1998, Paris, vol. II, p. 626-629.

Ruddick, K.G., F. Ovidio and M. Rijkeboer, 2000. Atmospheric correction of SeaWiFS imagery for turbid coastal and inland waters. *Applied Optics*, Vol. 39, No. 6, pp. 897-912.

Ruddick, K.G., G. Lacroix, Y. Park, V. Rousseau, V. De Cauwer, W. Debruyn and S. Sterckx (2003). Overview of Ocean Colour: theoretical background, sensors and applicability for the detection and monitoring of harmful algae blooms (capabilities and limitations). Submitted to UNESCO monograph of Harmful Algae Blooms.

Ruddick, K.G., H.J. Gons, M. Rijkeboer and G. Tilstone, 2001. Optical remote sensing of chlorophyll-a in case 2 waters using an adaptive two-band algorithm with optimal error properties. *Applied Optics*. Vol. 40, no. 21 (in press).

Ruddick, K.G., H.J. Gons, M. Rijkeboer, and G. Tilstone, 2000. Chlorophyll-a retrieval in case 2 waters using an adaptive two-band algorithm (CRAT) with hyperspectral data, Published in CDROM proceedings of Ocean Optics XV. Office of Naval Research, Monaco, 5pp.

Van Den Eynde, D., B. Nechad, M. Fettweis, and F. Francken. SPM dynamics in the Southern North Sea derived from SeaWiFS imagery, in-situ measurements and numerical modelling. in INTERCOH-2003. 2003.

Van Mol, B. and K. Ruddick. The Compact High Resolution Imaging Spectrometer (CHRIS): the future of hyperspectral satellite sensors. Imagery of Oostende coastal and inland waters. in Airborne Imaging Spectroscopy workshop. 2004. Brugge.

Van Mol, B., Y. Park, K. Ruddick, and B. Nechad. Mapping of chlorophyll and suspended particulate matter from CHRIS imagery of the Oostende core site. in 2nd ESA/CHRIS Proba workshop. 2004: European Space Agency.

Vasilkov, A.P., 1997. A retrieval of coastal water constituent concentrations by least-square inversion of a radiance model. In "Proceedings of the 4th International Conference on Remote Sensing for Marine and Coastal Environments (Environmental Research Institute of Michigan)", Vol. II, p107-116.

Vasilkov, A.P., V.I. Burenkov, and K.G. Ruddick, 1999. The spectral reflectance and transparency of river plume waters. Int. J. Remote Sensing, Vol. 20, No. 13, pp. 2497-2508.