**NOTIFICATION OF PROPOSED RESEARCH CRUISE****PART A: GENERAL ORGANISATION**

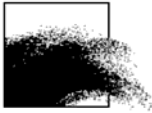
1. Name of research ship **BELGICA** Cruise N° **2011/24**
2. Dates of cruise From **12 September** to **15 September 2011**
3. Operating Authority **Belgian Navy under contract for Belgian Ministry of Science Policy Management Unit of the North Sea Mathematical Model "M.U.M.M.", 3° & 23° Linierregimentsplein, 8400 Oostende
Tel, 32(0)59 70 01 31, Facsimile 32(0)59 70 49 35
Email : bmmmost@mumm.ac.be**
4. Owner **Belgian state represented by Minister for Science Policy**
5. Particulars of ship

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

Name of master	DE MAESSCHALK Luc, KVK
N° of Crew	15
7. Scientific Personnel

Name and address of scientist in charge :	Griet Neukermans/Kevin Ruddick Remote Sensing and Ecosystem Modelling Team (REMSEM) Management Unit of the North Sea Mathematical Models (MUMM/BMM) Royal Belgian Institute for Natural Sciences (RBINS/KBIN) Gulledelle 100, 1200 Brussels, BELGIUM Tel: +32 2 7732134 Fax: +32 2 7706972 Email : griet.neukermans@mumm.ac.be/k.ruddick@mumm.ac.be Website : http://www.mumm.ac.be/BELCOLOUR
N° of scientists	15

(A nominal roll of all personnel other than nationals of the applicant (flag) state is required)
Astoreca Rosa (CL)
8. Geographical area in which ship will operate (with reference in latitude and longitude).
**Belgian, Dutch (including Scheldt Estuary) and UK Continental Shelves
Box with corners at N 51°00', E 0°30' and N 52°00', E 4°00'**



9. Brief description of purpose of cruise

Main purpose:

The cruise will collect data for the BELCOLOUR-2 research project – see part B.3 for information on the general objectives of these projects.

For the BELCOLOUR-2 project, data will be collected during the cruise for optical properties and for suspended particulate matter (concentration, algal/non-algal and organic/inorganic components, photosynthetic parameters) and parameters related to the marine carbon cycle (partial pressure of CO₂, etc.) for use in the calibration and validation of optical remote sensing algorithms and for the validation of satellite data products (especially MERIS and MODIS).

Purpose b : only in Belgian waters

Study of the sand dynamics on a small scale to study the risk of mine burial

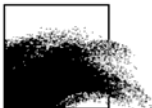
Detection and classification of mines using high resolution SAS images

10. Port of Call. Dates. Reasons.

Zeebrugge	12/09/2011	Departure homeport : start of research cruise 2011/24
Zeebrugge	15/09/2011	Arrival homeport : end of research cruise 2011/24

11. Any special logistic requirements at ports of call (other than water, fuel provisions, etc.)

N.A.



NOTIFICATION OF PROPOSED RESEARCH CRUISE

PART B: DETAIL

1. Name of research ship **BELGICA** Cruise N° **2011/24**
2. Date of cruise From **12 September** To **15 September 2011**
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 purpose of the **BELCOLOUR-2** project is to improve the quality of existing optical remote sensing products for marine, coastal and inland waters and development of new products (e.g. pCO₂ and primary production) for key applications such as aquaculture and air-sea CO₂ flux quantification. This is carried out in the of the research programme for earth observation "STEREO II" (Support to The Exploitation and Research in Earth Observation) of the Belgian Science Policy (Belspo). Measurements are made of both optical properties and the desired satellite data products (such as chlorophyll a concentration) in order to provide calibration and validation data for retrieval algorithms.

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 Annex 1 : Chart

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

water (phytoplankton, suspended particulate matter)

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

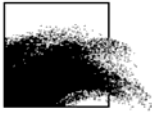
Water samples by Niskin bottle (5&10l) for biogeochemical analysis (HPLC, Suspended matter, optical properties), In situ measurements of physical properties of water (SCTD), In situ optical measurements (LISST 100C, AC9, BB9, etc.), YSI oxygen probe, Secchi disk.

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

Dates		Description	Latitude	Longitude
Laying	Recovery			

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

Belgica cruise 2002/07, 2002/09, 2002, 2002/14, 2003/06, 2003/16, 2003/19 and 2003/22, 2004/10b, 2004/16, 2005/08, 2005/16, 2005/19, 2006/08, 2006/19, 2007/10, 2007/14, 2007/20, 2008/10, 2008/13b, 2008/17, 2008/20, 2008/21, 2009/12, 2009/14c, 2009/15, 2009/24, 2010/10, 2010/18 and 2010/23. See www.mumm.ac.be for reports.

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

BELCOLOUR-2 : See Annex 2 and www.mumm.ac.be/BELCOLOUR/Publications

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.

NETHERLANDS

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

UNITED KINGDOM

Dr Rodney Forster, The Centre for Environment Fisheries and Aquaculture Science, Lowestoft Laboratory, Pakefield Road, Lowestoft, Suffolk NR33 0HT, United Kingdom

Email : rodney.forster@cefas.co.uk, Tel: 44 (0) 1502 562244, Fax 44 (0) 1502 513865

10. State :

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

YES

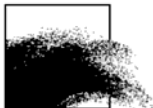
(b) Whether it will be acceptable to carry on board an observer from the coastal state for any part of the cruise and dates and ports of embarkation / disembarkation.

**Yes, Zeebrugge (advance notice of one month required to guarantee cabin space)
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)**

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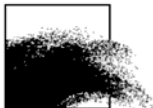


PART C: SCIENTIFIC EQUIPMENT

COASTAL STATE : **THE NETHERLANDS**

INDICATE "YES" OR "NO"

<u>LIST SCIENTIFIC WORK BY FUNCTION</u>				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 :	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			
Water sampling by Niskin bottles (5l & 10l)	YES	NO	YES	YES	YES	NO
In situ measurements (SCTD and optical)	YES	NO	YES	YES	YES	NO
Non toxic seawater intake	YES	NO	YES	YES	YES	NO
Secchi disk	YES	NO	YES	YES	YES	NO
YSI Oxygen Probe	YES	NO	YES	YES	YES	NO

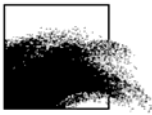


PART C: SCIENTIFIC EQUIPMENT

COASTAL STATE : **UNITED KINGDOM**

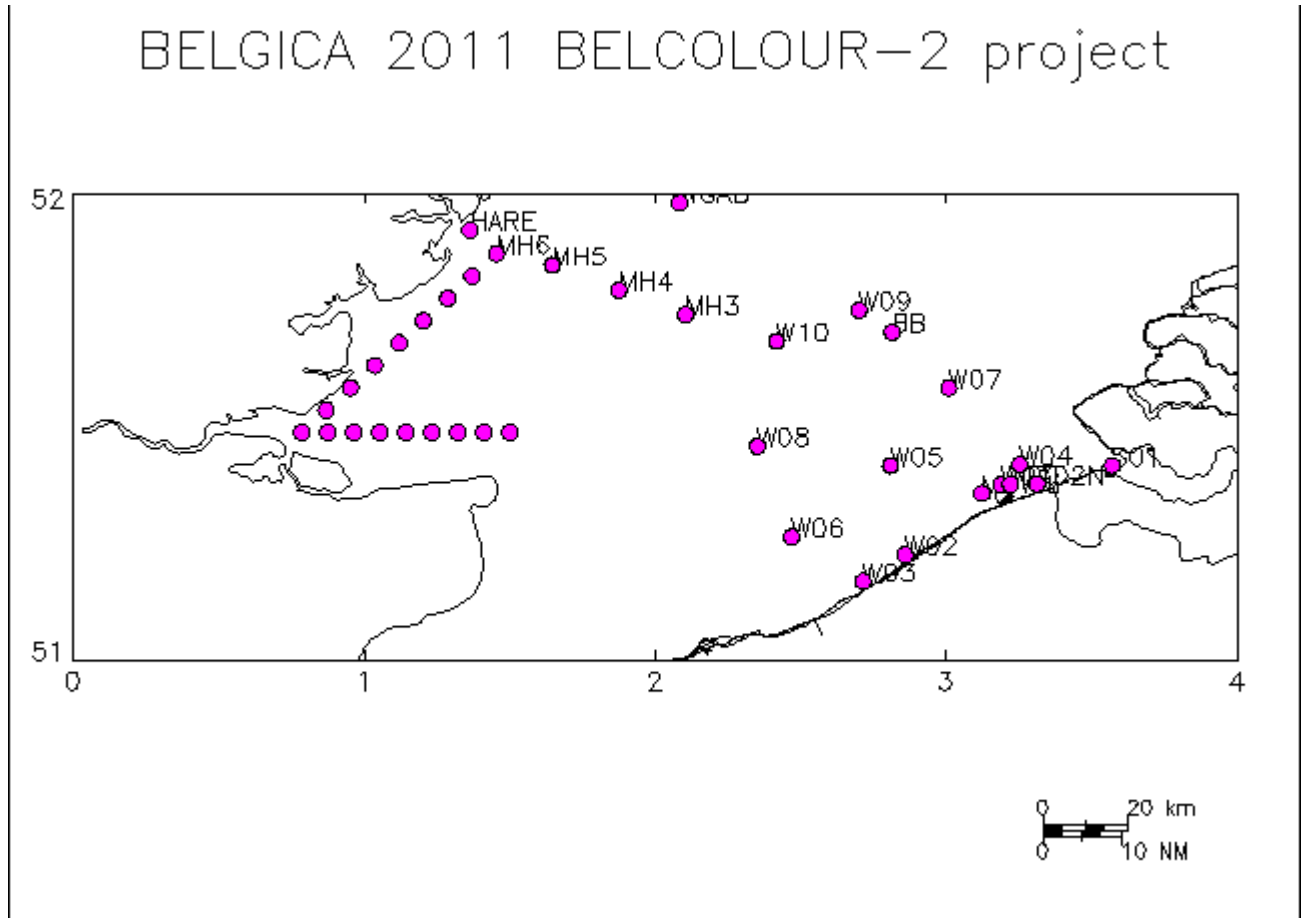
INDICATE "YES" OR "NO"

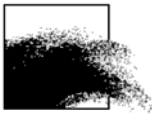
<u>LIST SCIENTIFIC WORK BY FUNCTION</u>				<u>DISTANCE FROM COAST</u>		
				<u>WITHIN 12 NMS</u>	<u>BETWEEN 12-200 NMS</u>	<u>CONTINENTAL SHELF WORK ONLY) BEYOND 200 NM BUT WITHIN THE CONTINENTAL MARGIN</u>
eg. MAGNETOMETRY : GRAVITY DIVING : SEISMICS: BATHYMETRY SEABED SAMPLING TRAWLING ECHO SOUNDING : WATER SAMPLING U/W T.V. : MOORED INSTRUMENTS: TOWED INSTRUMENTS :	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			
Water sampling by Niskin bottles (5l & 10l)	YES	NO	YES	YES	YES	NO
In situ measurements (SCTD and optical)	YES	NO	YES	YES	YES	NO
Non toxic seawater intake	YES	NO	YES	YES	YES	NO
Secchi disk	YES	NO	YES	YES	YES	NO
YSI Oxygen Probe	YES	NO	YES	YES	YES	NO



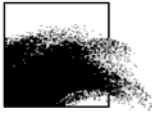
Annex 1: Chart

The chart below shows the complete study area, giving typical station locations as measured in previous cruises.



**Annex 2: BELCOLOUR (Publications & Reports)**

- Astoreca, R., V. Rousseau, K. Ruddick, B. Van Mol, J.-Y. Parent, and C. Lancelot. 2005. Optical properties of algal blooms in an eutrophicated coastal area and its relevance to remote sensing. In R. J. Frouin, M. Babin and S. Sathyendranath [eds.], SPIE international conference 5885 on Remote sensing of the coastal oceanic environment. SPIE.
- Astoreca, R., K. Ruddick, B. V. Mol, V. Rousseau, J.-Y. Parent, and C. Lancelot. 2006. Variability of the inherent and apparent optical properties in a highly turbid coastal area: impact for the calibration of remote sensing algorithms. EARSel eProceedings 5: 1-17.
- De Cauwer, V., K. Ruddick, Y. Park, B. Nechad, and M. Kyramarios. 2004. Optical remote sensing in support of eutrophication monitoring in the Southern North Sea. EARSel eProceedings 3: 208-221.
- Fettweis, M., B. Nechad, and D. Van Den Eynde. 2007. An estimate of the suspended particulate matter (SPM) transport in the southern North Sea using SeaWiFS images, in situ measurements and numerical model results. Continental Shelf Research 27: 1568-1583.
- 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: 5189-5192.
- Gons, H. J., M. Rijkeboer, and K. G. Ruddick. 2002. A chlorophyll-retrieval algorithm for satellite imagery (Medium Resolution Imaging Spectrometer) of inland and coastal waters. Journal of Plankton Research 24: 947-951.
- Gons, H. J., M. Rijkeboer, and K. G. Ruddick. 2005. Effect of a waveband shift on chlorophyll retrieval from MERIS imagery of inland and coastal waters. Journal of Plankton Research 27: 125-127.
- Nechad, B., V. De Cauwer, Y. Park, and K. Ruddick. 2003. Suspended Particulate Matter (SPM) mapping from MERIS imagery. Calibration of a regional algorithm for the Belgian coastal waters. MERIS user workshop, 10-13th November 2003. European Space Agency.
- Nechad, B., D. Van Den Eynde, M. Fettweis, and F. Francken. 2004. Suspended particulate matter mapping from multitemporal SeaWiFS imagery over the Southern North Sea - SEBAB project, p. 357-367. In P. C. Smits and L. Bruzzone [eds.], Second International Workshop on the Analysis of multi-temporal remote sensing images (Multitemp 2003). Series in Remote Sensing. World Scientific Publishing.
- Ovidio, F., and K. Ruddick. 2000. Ocean Color Spectrum (contribution), p. 18-19. Backscatter.
- Ovidio, F., K. Ruddick, A. Vasilkov, and V. Burenkov. 2001. Optical remote sensing of Belgian coastal waters, p. 95-102. Space Scientific Research in Belgium. Volume III Part 2: Earth Sciences. Federal Office for Scientific, Technical and Cultural Affairs.
- Park, Y., V. De Cauwer, B. Nechad, and K. Ruddick. 2003. Validation of MERIS water products for Belgian coastal waters: 2002-2003. MERIS and AATSR Calibration and Geophysical Validation workshop, 20-24th October 2003. European Space Agency.
- Park, Y., and K. Ruddick. 2005. Model of remote-sensing reflectance including bidirectional effects for case 1 and case 2 waters. Applied Optics 44: 1236-1249.
- Park, Y., and K. Ruddick. 2007. Detecting algae blooms in European waters. ENVISAT symposium. European Space Agency.
- Park, Y., B. Van Mol, and K. Ruddick. 2006. Validation of MERIS water products for Belgian coastal waters: 2002-2005. In D. Danesy [ed.], Second Working Meeting on MERIS and AATSR Calibration and Geophysical Validation (MAVT-2006). ESA.
- Peters, S. W. M., M. Eleveld, R. Pasterkamp, H. Van Der Woerd, M. Devolder, S. Jans, Y. Park, K. Ruddick, T. Block, C. Brockmann, R. Doerffer, H. Krasemann, R. Röttgers, W. Schönfeld, P. V. Jorgensen, G. Tilstone, V. Martinez-Vicente, G. Moore, K. Sorensen, J. Hokedal, T. M. Johnsen, E. R. Lomsland, and E. Aas. 2005. Atlas of chlorophyll-a concentration for the North Sea based on MERIS imagery of 2003. Vrije Universiteit, Amsterdam.
- Ruddick, K., V. D. Cauwer, and B. V. Mol. 2005. Use of the near infrared similarity spectrum for the quality control of remote sensing data. In R. J. Frouin, M. Babin and S. Sathyendranath [eds.], SPIE international conference 5885 on Remote sensing of the coastal oceanic environment. SPIE.
- Ruddick, K., V. De Cauwer, Y. Park, G. Becu, J.-P. De Blauwe, E. D. Vreker, P.-Y. Deschamps, M. Knockaert, B. Nechad, A. Pollentier, P. Roose, D. Saudemont, and D. V. Tuyckom. 2002b. Preliminary validation of MERIS water products for Belgian coastal waters. Envisat Validation workshop, 9-13th December 2002. European Space Agency.
- Ruddick, K., G. Lacroix, Y. Park, V. Rousseau, V. De Cauwer, and S. Sterckx. 2007. Overview of Ocean Colour: theoretical background, sensors and applicability for the detection and monitoring of harmful algae



- blooms (capabilities and limitations). Real-time coastal observing systems for ecosystem dynamics and harmful algal blooms. UNESCO Monographs on Oceanographic Methodology Series. UNESCO publishing.
- Ruddick, K., F. Ovidio, D. V. D. Eynde, and A. Vasilkov. 1998a. The distribution and dynamics of suspended particulate matter in Belgian coastal waters derived from AVHRR imagery, p. 626-629. Ninth Conference on Satellite Meteorology and Oceanography. American Meteorological Society.
- Ruddick, K., Y. Park, and B. Nechad. 2003b. MERIS imagery of Belgian coastal waters: mapping of Suspended Particulate Matter and Chlorophyll-a. MERIS user workshop, 10-13th November 2003. European Space Agency.
- Ruddick, K. G., V. De Cauwer, Y. Park, and G. Moore. 2006. Seaborne measurements of near infrared water-leaving reflectance - the similarity spectrum for turbid waters. *Limnol. and Oceanogr.* 51: 1167-1179.
- 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* 40: 3575-3585.
- Ruddick, K. G., F. Ovidio, and M. Rijkeboer. 2000c. Atmospheric correction of SeaWiFS imagery for turbid coastal and inland waters. *Applied Optics* 39: 897-912.
- Ruddick, K. G., F. Ovidio, A. Vasilkov, C. Lancelot, V. Rousseau, and M. Rijkeboer. 1999. Optical remote sensing in support of eutrophication monitoring in Belgian waters, p. 445-452. In G. J. A. Nieuwenhuis, R. A. Vaughan and M. Molenaar [eds.], 18th EARSEL symposium on Operational remote sensing for sustainable development. A.A. Balkema, Rotterdam.
- Van Den Eynde, D., B. Nechad, M. Fettweis, and F. Francken. 2003. SPM dynamics in the Southern North Sea derived from SeaWiFS imagery, in-situ measurements and numerical modelling. INTERCOH-2003.
- Van Mol, B., Y. Park, K. Ruddick, and B. Nechad. 2004. Mapping of chlorophyll and suspended particulate matter from CHRIS imagery of the Oostende core site. 2nd ESA/CHRIS Proba workshop. European Space Agency.
- Van Mol, B., and K. Ruddick. 2004. The Compact High Resolution Imaging Spectrometer (CHRIS): the future of hyperspectral satellite sensors. Imagery of Oostende coastal and inland waters. Airborne Imaging Spectroscopy workshop.
- Van Mol, B., and K. Ruddick. 2005. Total suspended matter maps from CHRIS imagery of a small inland water body in Oostende (Belgium). 3rd ESA/CHRIS Proba workshop. European Space Agency.
- Vasilkov, A. P., V. I. Burenkov, and K. G. Ruddick. 1997. Variability of the spectral reflectance and transparency of river plume waters caused by hydrodynamic processes, p. 97-106. Proceedings of the 4th Intl. Conf. on Rem. Sens. for Mar. and Coastal Env.
- Vasilkov, A. P., V. I. Burenkov, and K. G. Ruddick. 1999. The spectral reflectance and transparency of river plume waters. *International Journal of Remote Sensing* 20: 2497-2508.