REVAMP:

D5: Validation field measurements and algorithm calibration phase.

2nd 6- months management report – 1st Year Report

Covering period 1-9-2002 to 1-2-2003

Includes Sections: 1,2,3,4

Version 0.1

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Report Number: Revamp deliverable 5: 2nd 6 months management report; 1st year report

March 2003

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1. Executive publishable summary, related to the first year of REVAMP

REVAMP: REGIONAL VALIDATION OF MERIS CHLOROPHYLL PRODUCTS IN NORTH SEA COASTAL WATERS

Knowledge of phytoplankton dynamics and distributions in North Sea coastal waters is vital to ensure a scientific basis for coherent management of the coastal environment and the human activities which impact on or benefit from it. The EC-funded project REVAMP aims to support the monitoring of the eutrophication status of the North Sea and the effects of nutrient reduction by measuring and validating a key bio-geo-physical parameter (Chlorophyll concentration) using ENVISAT/MERIS satellite observations.

REVAMP activities in the first year have been:

1) Collect all relevant historical optical observations and concentration data
2) Parameterise and calibrate selected candidate algorithms for CHL retrieval from MERIS observations
3) Collect optical observations and concentration data in spring and summer 2002 for the further calibration of algorithms and the validation of MERIS water leaving refelctance observations
4) Start the work on the REVAMP MERIS processor
5) Do various propomotion activities (flyer and website, conference visits etc).
6) Make a first assessment of user requirements for MERIS CHL products.

A main REVAMP-work-package 1 task is to collect and analyse historical North Sea data on concentrations and optical properties of optical active constituents of the North Sea. Based on needs and possibilities in the REVAMP consortium is was decided to expand the already available MUMM ORACLE database to incorporate all REVAMP historic and year 2002 and 2003 field measurements. The ORACLE database on North Sea (optical and concentrations) observations is accessible to all REVAMP partners through the internet.Guidelines for data management, data and metadata structures were defined The data-input to the database-system is achieved by a two-step procedure. In the first step data are transformed from the former storing place/database into a common spreadsheet form (defined by data user requirements and by the structure and content of available historic datasets). From the filled out spreadsheet the data are loaded into the database system.'Historic-data' input was delivered by six partners: DMI, GKSS, IVM, MUMM, NIVA, and PML (data from COASTlOOC, COLORS, MULTICOLOR and other institute-managed campaigns). Altogether, data from 18 data-sets were collected. These 18 data-sets are kept as a reference and lookup in addition to deliverable 16: 'Historic csi-dataset'

'Historical data' so far compiled and loaded into REVAMP's database follow quality consistency checks and a formal checking on data integrity. In total for 15 single parameters 30.000 values are compiled, of those were 11 types of spectra: totally 3.300 spectra.

A methodology was defined to use a climatology of water depth and –salinity to subdivide meaningful regions in the North Sea. The idea is that water depth will provide information on areas with higher TSM concentrations (through resuspension), while water salinity will indicate the location of areas with higher/lower CDOM concentration. Both may influence the outcome of CHL algorithms and should be accounted for by regional algorithms.

The objective of WP2 is to select, calibrate and validate the best algorithm to retrieve regional CHL concentrations from MERIS observations. In the first year the main activities have been 1): to complete the definition of regional algorithm requirements in terms of output parameters (precise definition of CHL, possible higher-level products, quality indicators and flags), target accuracy and water types, 2) to start the selection and calibration of the most promising currently available CHL algorithms and 3) to start the the establishment of evaluation criteria for the candidate algorithms in preparation for algorithm evaluation

During the course of the first REVAMP project year the following progress in work package 2 has been made:

- The required output parameters and necessary input parameters of the REVAMP CHL algorithm have been defined
- A number of CHL algorithms suitable for coastal waters have been identified as candidates for the REVAMP CHL algorithm and are being regionally calibrated

The next steps will be:

- The proposed CHL algorithms will be evaluated at an algorithm inter comparison workshop using agreed tests
- On the basis of the results of this workshop the CHL algorithm to be used within REVAMP will be selected. As an outcome of the discussion/analysis on regional variability of background concentrations of e.g. CDOM and TSM and optical properties, a subdivision of the North Sea in regions may arise with several algorithms to be applied to specific regions.
- Once selected the REVAMP CHL algorithm will be improved where possible and validated using REVAMP data which has not been used yet in the algorithm development/calibration.

In principle the historic data, simulated datasets and year 2002 data sets will be used for algorithm calibration while year 2003 data will be used mainly for validation of CJL products and algorithm parameterisations.

In work package 3, current ESA MERIS and NASA SeaWiFS protocols were scrutinised. The resulting protocols document (also based on dedicated lab experiments) covers instrument descriptions, parameter definitions, instrument calibrations and data quality assurance, methodologies, data processing, measurement limitations and related references of the principal inherent and apparent optical property measurements (IOP & AOP) for MERIS validation. Discrepancies in methods adopted by all REVAMP partners were tested during the Instrument Inter-calibration Workshop in June 2002. The results were used to select the most appropriate method for use in Case 2 waters. During this workshop also all optical instruments were calibrated using NIST-traceable lamps. A specific intercalibration experiment was designed and executed for backscatter-meters. In the first year REVAMP has generated a large data set with over 800 AOP and 1430 IOP measurements, which is a strong platform for the testing and development of Chlorophyll (CHL) algorithms for Case 2 waters. Due to the late launch of ENVISAT and a summer with very little cloud free days, and the necessity to wait for a final version of the MERIS level-2 processor (due in March 2003), it was planned that the majority of the fieldwork should be undertaken in 2003. CSI data collected by all partners in 2002 was submitted to the REVAMP database and into the region specific datasets.

WP4 entails the construction of the REVAMP MERIS processor. The foundation for the REVAMP processor was laid with the development of the MERIS and AATSR Toolbox, BEAM. BEAM provides a software development framework for individual processors for MERIS data. The design of this framework was mainly driven by the requirements for the REVAMP processor.The processor runs either with a request file (XML), or through an interactive interface. Requests can include simple processing calls for one REVAMP product, but can also large batch jobs, which is an important feature for the later production of the Atlas. The ENVISAT format is complex. A generic product reader was designed to encapsulate all structural information about the details of the MERIS product into a data file. This also prevents major software changes in case the ESA-MERIS format is changed. After the first project year there already exists a first version of the REVAMP processor, which has been developed such that proposed REVAMP algorithms can be implemented independently of already exisiting software for testing. A dedicated REVAMP Processor Definition Meeting was held on 30./31. 1. 2003 at Brockmann Consults in Geesthacht to define the input and output formats.

During the REVAMP workshop in December 2002, it was decided to use the salinity – depth relationship for the identification of the region. Algorithms shall be invoked with region specific calibration coefficients. The second version of the REVAMP processor will support this regionalisation.

Peer Reviewed Articles:

Authors	**Date**	**Title**	**Journal**	**Reference**
Tilstone, G. H., Moore, G. F., Sørensen, K., Doerffer, R., Røttgers, R., Ruddick, K. G., Pasterkamp, R., Jørgensen P.V.	2003	Protocols for the validation of MERIS products in Case 2 waters.	European Space Agency publications (Book / Manual)	Submitted
Tilstone G.H., Blondeau D., Martinez-Vicente V., Moore G.F.	2003	A comparison of protocols for the determination of absorption coefficients for coloured dissolved organic material and phytoplankton: Implications for MERIS data validation.	Applied Optics	In prep.

Non refereed literature:

Authors / Editors	Date	Title	Event	Reference	Type[1]
Tilstone G.H., Martinez-Vicente V, Rottgers R., Sorensen K., Hokedal J.	2003	An inter-comparison of coloured dissolved organic material and phytoplankton absorption coefficients: implications for meris data validation.	ENVISAT validation workshop	Proceedings of the ENVISAT validation workshop, 9 – 13 Dec 2002, ESRIN, Frascati, Italy. European Space Agency.	Proceedings & Oral presentation
Jorgensen P.V., Tilstone G.H., Hokedal J, Schoenfeld W.	2003	Inter-comparison of spectral backscattering coefficients measured in-situ using several Hydroscat instruments – Results from PlymCal-2 and REVAMP cruises.	ENVISAT validation workshop	Proceedings of the ENVISAT validation workshop, 9 – 13 Dec 2002, ESRIN, Frascati, Italy. European Space Agency	Proceedings
Ruddick et al.	2003	Preliminary validation of MERIS water products for Belgian Coastal waters.	ENVISAT validation workshop	Proceedings of the ENVISAT validation workshop, 9 – 13 Dec 2002, ESRIN, Frascati, Italy. European Space Agency	Proceedings
Tilstone, G. H., Moore, G. F., Sørensen, K., Doerffer, R., Røttgers, R., Ruddick, K. G., Pasterkamp, R., Jørgensen P.V.	2002	Protocols for the validation of MERIS products in Case 2 waters.	Deliverable on Contract EVG1 – CT – 2001 – 00049	Report to the European Commission.	Report
Pasterkamp,R., S.W.M.Peters and H.van der Woerd	2002	MERIS validation of geophysical ocean colour products: preliminary results for the Netherlands.	ENVISAT validation workshop	Proceedings of the ENVISAT validation workshop, 9 – 13 Dec 2002, ESRIN, Frascati, Italy. European Space Agency	Proceedings

[1] Type: Abstract, Newsletter, Oral Presentation, Paper, Poster, Proceedings, Report, Thesis

Kevin Ruddick, Eyvind Aas, Tom Block, Roland Doerffer, Siegrid Jans, Peter Jorgensen, Hajo Kraseman, Marnix Laanen, Gerald Moore, Reinold Pasterkamp, Steef Peters, Kai Sorensen and Hans van der Woerd	2002	REVAMP Regional algorithm requirements	Deliverable on Contract EVG1 – CT – 2001 – 00049	Report number: REVAMP/1/KR/200207/ EN/1, MUMM, Brussels, Belgium	Report
Jørgensen, P.V., Tilstone, G. , Høkedal, J. & Schönfeld, W.	2002	Intercomparison of spectral backscattering coefficients measured in-situ using several Hydroscat instruments – Results from PlymCal-2 and REVAMP cruises.	ENVISAT validation workshop	Proceedings of the ENVISAT validation workshop, 9 – 13 Dec 2002, ESRIN, Frascati, Italy. European Space Agency	Proceedings
Jørgensen, P. V. & Højerslev, N. K.	2002	Modeling of key bio-optical parameters including spectral backscattering and absorption coefficients using in-situ measurements of spectral up- and downwelling irradiances and backscattering coefficient.	*Ocean Optics XVI*	*Proceedings of theOcean Optics XVI, November 18-22, Santa Fe, New Mexico*	Conference paper + poster presentation
H.J. van der Woerd, M.A. Eleveld, and S.W.M. Peters	2002	User requirements for REVAMP chlorophyll products: Phase 1 – Initial requirements inventory	Deliverable on Contract EVG1 – CT – 2001 – 00049	IVM, Amsterdam	Report

Peters, S.W.M., R.Pasterkamp and H.J.van der Woerd . *Mexico, USA, pp: 9.*	2002	A sensitivity analysis of analytical inversion methods to derive chlorophyll from MERIS spectra in Case-II waters.	*Ocean Optics XVI*	*Proceedings of theOcean Optics XVI, November 18-22, Santa Fe, New Mexico*	Conference paper + poster presentation