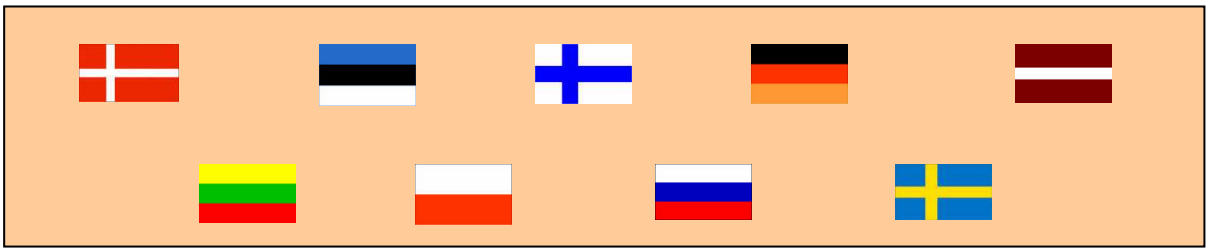
PAPA

The Visiting Scientists Programme

Jüri Elken

EVR1-CT-2002-20012
www. boos.org/papa/papa.html



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Visiting Scientist Programme

The PAPA projects Capacity Building Work package was designed to:

- develop the basic technical and scientific expertise for all partners required to participate in the BOOS by performing the VISITOR SCIENTIST SCHEME allowing visits of scientists/technicians and representatives of end-users to the specialized ocean observing, modelling and forecasting sites with significant advanced experience;

- to increase instrumentation and data management capacity to the same level in all participating countries based on the results from evaluation of the present Baltic operational observing system (results from WP2), to establish by upgrading of existing observational capacities high-level automation of observations at coastal stations (sea level, SST, optional other parameters) and build up data transfer and management capacities to make the data operationally available Baltic-wide.

In this report the Visiting Scientist Programme will be described.

Visitor scientist scheme

Procedures

A specific budget has been allocated to support the visits of the fellows from CMR, MSI, IMWM, IOPAS, LHMA, MIG, NWAHEM, UL in order to conduct the specific training projects to the operational oceanography centers of significant experience. Receiving organizations DMI, BSH, FIMR, FEI, IOW, RDANH, SMHI have been each allocated a specific manpower to ensure preparation of didactic materials, arranging the visit logistics and training the visitors. MSI as responsible for the visitor scheme was obliged to transfer necessary travel funds (train/bus/ship tickets, accommodation, daily allowances) to the sending organizations following the decisions of the Capacity Building Board (CBB).

For the training fellowships, CBB elaborated an application procedure. The Guidelines are given in Appendix 1 and the procedures for application and conducting the training visits are visualized in Figure 1. The training offers from the "Receiving Organizations" were summarized in the item 2 of the Guidelines, as agreed prior to the call.

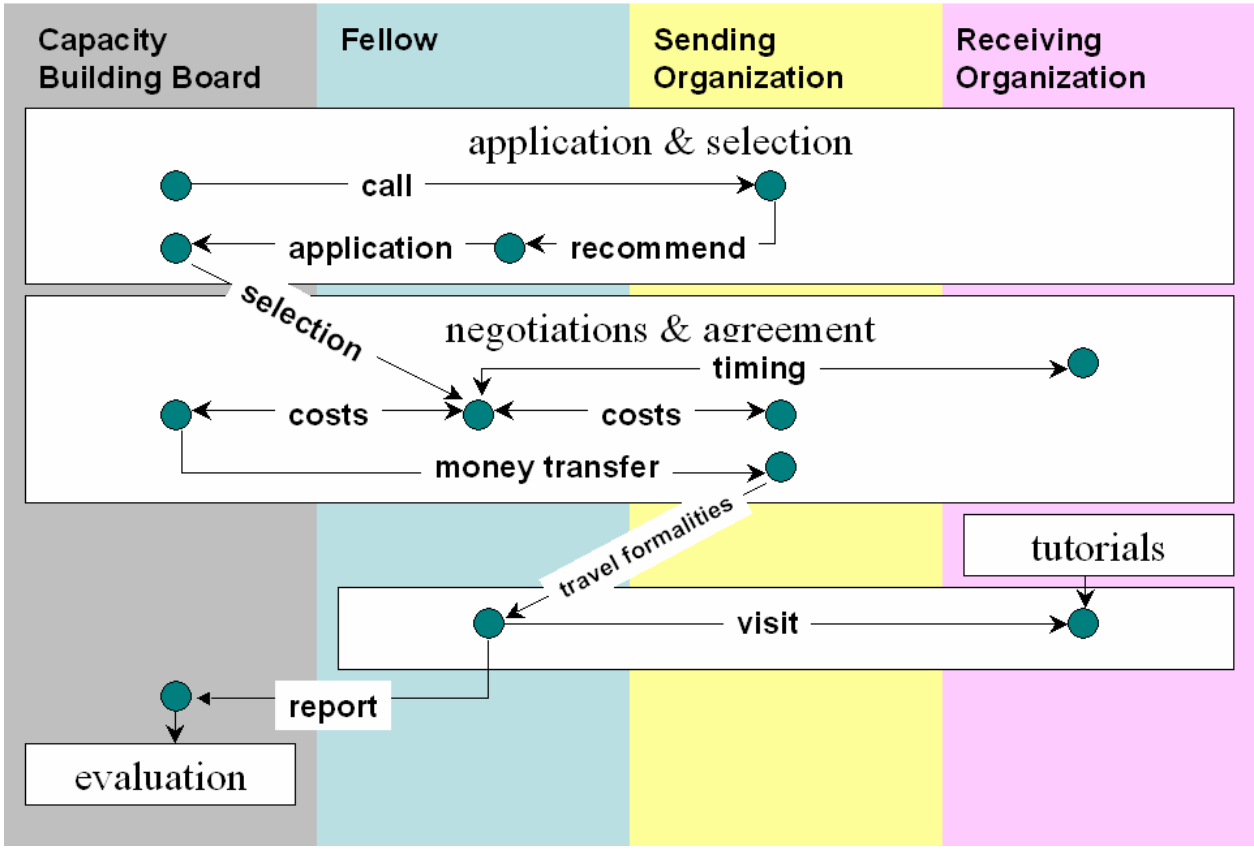

Figure 1. A schematic of procedures for conducting the training visits within the CBB Visitor Scientist Scheme.

The focus of the fellowship had to be on the themes:
1.1. Technical know-how for the deployment, running, calibration and maintenance of an operational coastal observing system.
1.2. Transmission and management of operational data/meta-data, access to data (including that from satellites) and merging different operational datasets (including data needed by the models).
1.3. Numerical modelling and data assimilation.
1.4. Data products and reporting, including analysis and transformation into added-value products.

Within the Guidelines approved, four entities had to act jointly to conduct the training projects as seen in Figure 1. The procedure was based on the very active role of applying fellow as it is common to the purely scientific fellowships. At the same time, the competition was limited to the PAPA partners.

The Call for Applications has been announced to the responsible contact persons of the Sending Organizations who forwarded the information to the potential fellows. When submitting the applications, the fellows had to provide also a recommendation letter from their employer organizations, to ensure that the obtained experience is important to the organization and it has a potential to be implemented in the Sending Organization everyday work.

As the next step, CBB made careful evaluation of the applications by the criteria announced by the guidelines:

- agreement of the training project description to the PAPA objectives and fellowship themes;
- benefit to the sending organization;
- sufficient background in the area of transfer of expertise;
- be already involved in her/his institution in similar or related activities;
- be fluent in the English language.

Successful fellows had to negotiate with the Receiving Organizations, its own organization and CBB on the content, terms and formalities of the training visit. As a formal step to ensure transfer of travel funds and receiving the training reports, binding agreements between the Sending Organization and the Marine Systems Institute (as responsible for organizing the fellowships) were signed for each of the training project. The agreement template can be found in Appendix 2.

Progress

Following CBB decisions on its meeting 26 May 2003, all the 12 planned training visits decided on the basis of the first call were completed in the 2 first years. In total, 190 visit days have been completed.

CBB also planned some visitor fund reserve to be used later to ensure implementation of the instrumentation upgrade. After calculating the actual costs of the visit agreements, CBB decided in November 2004 to announce additional training visit call with conditions: earmarked call for 1 Estonian visitor and 1 Russian visitor, open call for 2 visitors from all other PAPA partners.

Additional call for 4 training projects was announced 6 December 2004. CBB received 4 applications by the deadline of 7 January 2005. Three applications were approved by CBB during electronic meeting on 21 January 2005. One application was considered not relevant to the PAPA objectives and it was rejected. One additional application was submitted to CBB on 19 July 2005. By electronic communication, the application was approved by CBB on 25 August 2005.

Evaluation

All the planned activities were completed. In the first stage, 12 training projects were completed. Additional visits were planned and conducted based on unused funds left after the first call, which resulted in total 15 training visits with total length of 232 days. A summary table of the training visits is given in Appendix 3. The individual training reports are given in Appendix 4.

By the subject focuses, the training projects covered quite equally the three main fields:

modelling technologies	4	training projects
observation technologies	6	training projects
data management and reporting	5	training projects

One of the purposes of the capacity building in the basin-wide operational oceanography network, involving 9 bordering countries, was to achieve a balanced distribution of the tasks and the workload between the project partners. This had to take into account the different historically formed background in the old and new EU member states and Russia. While the old EU member states with long traditions of market economy were designed to be as “Receiving Organizations” of the training fellows, the organizations from the former “socialist” countries were designed to be those sending their fellows for training.

The country- and organization-wise summary of the PAPA training projects is given in Table 1. Within the free application procedure among the partners, where decisions were made based on the quality criteria as described above, the balance between the countries and organizations was well achieved. The lower “sending” numbers for Estonia are explained by their success in training using other funds (national governmental and enterprise funds, EC, Nordic Council of Ministers etc). Therefore, involvement of dedicated training funds from PAPA was not that necessary for the purpose of the project. Higher interest of training fellows to visit the Finnish and German institutions, reflects also the extensive marine science infrastructure available at those organizations.

Table 1. Country- and organization-wise summary of the PAPA training projects

Sending Organization			**Receiving Organization**		
Country	Organization	No. of visits	Country	Organization	No. of visits
Latvia		**5**	**Finland**		**5.5**
	UL	3		FIMR	3.0
	LHMA	2		SYKE	2.5
Poland		**5**	**Germany**		**5.0**
	IOPAN	2		IOW	2.5
	IMWM	3		BSH	2.5
	MIG	0	**Sweden**		**2.5**
Lithuania		**2**		SMHI	2.5
	CMR	2	**Denmark**		**2.0**
Estonia		**1**		DMI	1.5
	MSI	1		RDANH	0.5
Russia		**2**			
	NWAHEM	2			

Although the individual reports (all seen in Appendix 4) are written in different level of details, they clearly show the value of the conducted training visits. Training fellows have obtained experience that was not yet strong in their home organizations. The experience plus obtained personal contacts provide a solid basement for the development of operational oceanography at the fellow's home institutions.

The visitor scheme has been successful, allowing on-site training of 15 persons. The obtained experience is going to be used in the everyday operational work of the sending organizations.

Appendix 1

Fellowship opportunities
within the

VISITOR SCIENTIST SCHEME

Guidelines and Application Forms

EU project PAPA is aimed at integration and further development of the present operational ocean monitoring, data management and modelling activities within the Baltic Sea. As part of the project, the Work-Package 4 "Capacity Building" will sponsor visits of scientists/technicians and representatives of end-users to the specialized ocean observing, modelling and forecasting sites with significant advanced experience. The aim is to transfer expertise within the network, involving on an equal opportunity basis state-of-the-art experience in all the Baltic countries. The visits will have the form of a fellowship (internship). The activities will consist of hands-on sessions and participation in the day-to-day activities of the center through the assignment of jobs. Successful candidates for this fellowship will be invited to spend from two weeks to two months in the receiving centers. The guidelines provided below outline the scope of the Visitor Scientist Scheme and the application and selection procedures for the fellows within the PAPA community.

1. PAPA objectives and fellowship themes

The goal is to **build the basin-wide network** for ocean monitoring and forecasting, linking all the Baltic countries, broadening and strengthening the existing network of national institutions already established by PAPA partners; **identify the gaps** in the monitoring systems in the region and in the capability to measure, model and forecast the ecosystem, taking stock of current RTD projects and of the EuroGOOS and BOOS activities; **build capacities** for expertise in the setting up and running of observing platforms, in managing data, in modelling and forecasting the ecosystem; **design an effective observing and forecasting system**, inter-comparing experiences and standardizing practices, towards the co-ordinated upgrading of the observing and forecasting capabilities in all Baltic countries; **raise awareness** on the benefits of ocean forecasting at local, regional and global scales, involving stakeholders and disseminate PAPA results and products.

The focus of the fellowship will be on the themes:
1.1. Technical know-how for the deployment, running, calibration and maintenance of an operational coastal observing system.
1.2. Transmission and management of operational data/meta-data, access to data (including that from satellites) and merging different operational datasets (including data needed by the models).
1.3. Numerical modelling and data assimilation.
1.4. Data products and reporting, including analysis and transformation into added-value products.

The visiting scheme also provides know-how support for increase of instrumentation and data management capacity.

2. Receiving organizations & training offers

Successful candidates will have the fellowship at one of the PAPA partners listed below.

Receiving organization	Acronym	Web page	training offers
Danish Meteorological Institute	DMI	www.dmi.dk	operational modelling, dissemination of results
The Federal Maritime and Hydrographic Agency	BSH	www.bsh.de	operational modelling, field work, data management
Finnish Institute of Marine Research	FIMR	www.fimr.fi	waves, ice, field work, ships of opportunity
Finnish Environmental Institute	SYKE	www.ymparisto.fi/syke	ecological modelling, remote sensing
Baltic Sea Research Institute Warnemünde	IOW	www.io-warnemuende.de	field work, automated stations, equipment engineering, data management
Royal Danish Administration of Navigation and Hydrography	RDANH	www.frv.dk	T/S measurements, data management, modelling
Swedish Meteorological and Hydrological Institute	SMHI	www.smhi.se	operational modelling, field work, data management

The receiving organizations will provide tutorship by experienced personnel to the visiting fellow. This will include preparation of didactic materials, enabling access to computing/documentation facilities, providing general guidance and reporting on the performance of the visiting scientist/technician. The receiving organizations can allocate the expenses of 2 person-months to the PAPA project to cover the costs of preparing and hosting the visit.

PAPA will provide the fellows financial support, covering daily allowances, housing and travel to and from the receiving organization.

3. Eligible fellowship candidates

Fellowship candidates have to write an application (Annex 1) and ask a reference letter (Annex 2) from one of the PAPA partners (sending organizations) listed below.

Sending organization	Acronym	Web page	Country
Centre of Marine Research	CMR	www.omnitel.net/juriniai_tyrimai	Lithuania
Marine Systems Institute	MSI	www.msi.ttu.ee	Estonia
Institute of Meteorology and Water Management	IMWM	www.otkz.pol.pl	Poland
Institute of Oceanology	IOPAS	www.iopan.gda.pl	Poland
Latvian Hydrometeorological Agency	LHMA	www.meteo.lv	Latvia
Maritime Institute of Gdansk	MIG	wwwzoo.im.gda.pl	Poland
North-West Regional Administration for Hydrometeorology and Environmental Monitoring	NWAHEM		Russia
University of Latvia	UL	www.lu.lv	Latvia

Fellowship candidates are selected by the follow the criteria:

3.1. agreement of the training project description to the PAPA objectives and fellowship themes 1.1-1.4;
3.2. benefit to the sending organization;
3.3. sufficient background in the area of transfer of expertise;
3.4. be already involved in her/his institution in similar or related activities;
3.5. be fluent in the English language.

4. Selection and management procedures

PAPA Visitor Scientist Scheme is managed by the Capacity Building Board (CBB) composed as listed below.

Name	Affiliation	e-mail
Jüri Elken	MSI, WP4 coordinator	elken@phys.sea.ee
Erik Buch	DMI	ebu@dmi.dk
Kai Soetje	BSH	kai.soetje@bsh.de
Kimmo Kahma	FIMR	kimmo@fimr.fi
Maria Gästgifvars	SYKE	maria.gastgifvars@ymparisto.fi
Siegfried Krüger	IOW	siegfried.krueger@io-warnemuende.de
Charlotte W. Havsteen	RDANH	cwc@fomfrv.dk
Bertil Håkansson	SMHI	bertil.hakansson@smhi.se

CBB will rank the received applications based on the criteria 3.1-3.5. If necessary, advise from the sending organization is asked to rank more than one candidate from one organization. Knowledge and language check may be done by incidental phone calls by CBB members to the candidates.

Since the applicants may give several alternatives of receiving organizations to perform a specific training project, CBB decisions on the hosting will also take into account optimal share of duties between the receiving organizations.

Within the budgetary limitations, CBB will fix the list of selected fellows together with receiving organizations. Some additional fellowship candidates may be fixed also on the "waiting list".

Following the selection, the fellows will negotiate with the receiving organizations on the timing of visit and on the conditions of travel and housing. After successful negotiation the fellowship is carried out.

By the end of the fellowship, both the receiving organization and the fellow will provide a report to CCB.

5. Fellowship application schedule

Each application consists of three parts:

5.1. Application (Annex 1)
5.2. Reference letter from sending organization (Annex 2)
5.3. Curriculum Vitae

The applications have to be e-mailed latest **25 April 2003** to Jüri Elken, WP4 coordinator (elken@phys.sea.ee). When sending filled electronic application forms, use write-protected Word document or conversion to PDF. Outside CBB the application documents are kept confidential.

CBB plans to make evaluation meeting on **26 May 2003**. Applicants will receive notice on the decisions and further instructions within two weeks after the CBB meeting.

Annex 1

APPLICATION FORM

Fellowships within PAPA Visitor Scientist Scheme

Personal data

Applicant's name	
Position / Title	
Agency / Institution	
e-mail	
phone	

Fellowship theme and proposed receiving organization

Fellowship theme (use themes 1.1-1.4)	
Specific training project name	
Receiving organization, alternative 1	
Receiving organization, alternative 2	
Receiving organization, alternative 3	
Proposed duration of the fellowship	
Proposed start and end dates of fellowship	

Proposed fellowship training project (not more than 2 pages, type below the sub-titles)

1. Project name
2. Description of the specific topic worldwide
3. Status of the specific topic in the sending organization
4. Prospect of development of the specific topic in the sending organization
5. Expected training support from the receiving organization
6. Plan for implementation of obtained experience

Annex 2

REFERENCE LETTER

Fellowships within PAPA Visitor Scientist Scheme

Reference name	
Position / Title	
Agency / Institution	
e-mail	
phone	

Applicant's name	

How long have you known the applicant?	
Is your knowledge based on personal/professional relationship or both? Please describe briefly.	
Please comment on the applicant's motivation and ability to complete the program.	
Will this candidate be willing to share his/her experiences to enhance the capabilities of the sending organization?	
Please rate the applicant's professional qualifications relative to other professionals in the same field.	

Appendix 2

Template for the training agreement between partners

Fellowship Agreement
within Contract No EVR1-CT-2002-20012 PAPA

PAPA-WP4 Agreement No:

Date:

Principal contractors of the PAPA project,

Marine Systems Institute at Tallinn Technical University,
represented by its legal/authorized representative Jüri Elken, Director

and

organization name ("the Sending Organization"),
represented by its legal/authorized representative **name, position**

have agreed,

based on the Contract No EVR1-CT-2002-20012 PAPA, its Annex I – Description of work + list of participants, Annex II – General conditions

and

based on the decision of the WP4 Capacity Building Board from the meeting in 26 May 2003 regarding the fellowships within the Visitor Scientist Scheme

on the following.

1. Marine Systems Institute at Tallinn Technical University, mandated by the PAPA Project Coordinator and the Capacity Building Board, will transfer from the dedicated Visitor Scientist Scheme funds, obtained as part of the Contract No EVR1-CT-2002-20012 PAPA, a fixed sum **sum** Euro as a travel grant to the Sending Organization to support the training project "**training project name as applied**" by **name of fellow** to be conducted during **total number of supported days** days in the **name of the receiving organization** as PAPA partner in a period from **start date** up to **end date**. The financial transaction based on the Article 17.4 of Annex II is done in 20 days after the signing of this agreement.

2. The Sending Organization will ensure that the above travel grant received will be used to support the above training project to be conducted by **name of fellow**. The travel formalities related to the fellowship will be arranged according to the national regulations. All the accounting and reporting of actual travel costs is a responsibility of the Sending Organization.

3. The Sending Organization will ensure that the fellow **name of fellow** will present by **date in 3 months after the visit** to the Marine Systems Institute representing the Capacity Building Board a report containing:
    - Short description of performed activities;
    - Short description of the results/experience of the visit;
    - Comprehensive implementation plan of the results/experience in the Sending Organization.

4. The agreement may be amended by written agreement signed by both partners.

5. In case of inability to fulfill the items 2 and 3 of the agreement, the Sending Organization will immediately inform the Marine Systems Institute.

6. In case of disputation on the fulfillment of the present agreement, the conditions set up in the Contract No EVR1-CT-2002-20012 PAPA will apply and decisions are made by the project coordinator Danish Meteorological Institute by the advise from the Capacity Building Board.

7. The agreement is done at two identical copies.

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SWIFT: EEUHEE2X
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SEB
Stockholm
SWIFT: ESSE SE SS

name
position
name of sending organization

address of organization
country
phone: **number**
fax: **number**
e-mail:

Bank Information

Beneficiary:
name of sending organization
address of organization
country
Beneficiary Bank:
bank name and address
town
Beneficiary Bank Account:
number
SWIFT: **code**
Correspondent Bank:
bank name and address
town
SWIFT: **code**

Appendix 3

Summary table of visits conducted by the Visitor Scientist Scheme

Name	Sending organization	Receiving organization	Training Project Title	No. of Days
Andra Ikauniece	Institute of Aquatic Ecology, University of Latvia	Finnish Institute of Marine Research (FIMR)	Methods, equipment, sampling and data flow using the ships-of opportunity as the tools for rapid marine monitoring.	14
Irina Olenina	Center of Marine Research, Lithuania	Finnish Environment Institute (SYKE)	Special course on the remote sensing of water quality.	7
Elena Chichkova	Regional Center for Hydrometeorology and Environmental Monitoring, Russia	Swedish Meteorological and Hydrological Institute (SMHI); Finnish Environmental Institute (SYKE)	The satellite information assimilation and merging of different operational datasets in the monitoring systems.	21
Igor Fyodorov	Latvian Hydrometeorological Agency	Institute for Baltic Sea Research (IOW); The Federal Maritime and Hydrographic Agency (BSH)	New data processing and management technologies implementation in the LHMA operational oceanographic practices	14
Victor Kuchinscis	Latvian Hydrometeorological Agency	Institute for Baltic Research (IOW); The Federal Maritime and Hydrographic Agency (BSH)	Advanced observation technology and data control study for application into operational practice at the LHMA coastal observing system	14
Edgars Januševskis	Institute of Aquatic Ecology, University of Latvia	Bundesamt fuer Seeschiffahrt und Hydrographie (BSH), Hamburg, Germany	Management of Marine Monitoring data (hydrological, chemical, biological): standardization of operational databases, report generation, access to data.	14
Bogusz Piliczewski	Institute of Meteorology and Water Management, Maritime Branch in Gdynia	Royal Danish Administration of Navigation and Hydrography (RDANH); Danish Meteorological Institute (DMI)	Polish operational oceanographic service	21
Piotr Wieczorek	Institute of Oceanology, Polish Academy of Sciences, Sopot	Baltic Sea Research Institute, Warnemünde (IOW)	Deep velocity profiling using lowered Acoustic Doppler Profilers (LADCP) and moored ADCP	14
Inga Dailidiene	Center of Marine Research, Lithuania	Swedish Meteorological and Hydrological Institute (SMHI)	Management of operational data and forecast	10
Bärbel Müller-Karulis	Institute of Aquatic Ecology, University of Latvia	Finnish Institute of Marine Research (FIMR)	Ecological modelling - sensitivity analysis and parameter estimation of ecological models	21

Name	Sending organisation	Receiving organisation	Training Project Title	No. of Days
Ove Pärn	Marine Systems Institute at Tallinn Technical University	Finnish Institute of Marine Research (FIMR)	Use of models within ice service	21
Magdalena Kaminska	Institute of Meteorology and Water Management, Maritime Branch in Gdynia	Institute for Baltic Research (IOW); The Federal Maritime and Hydrographic Agency (BSH)	Development of procedures of marine physical oceanographic field measurements: preparation, field work and data management.	19
Robert Osinski	Institute of Oceanology, Polish Academy of Sciences, Sopot	Swedish Meteorological and Hydrological Institute (SMHI)	Numerical modeling and data assimilation by coupled ice-ocean model	14
Alexej Seliverstov	Regional Center for Hydrometeorology and Environmental Monitoring, Russia	Danish Meteorological Institute (DMI)	Forming complex system of the data management and transformation results into end-user products for Regional Service with use observing and forecasting system, analysis and operational database, numerical modelling	14
Katarzyna Czosnyka	Institute of Meteorology and Water Management, Maritime Branch in Gdynia	Finnish Environment Institute (SYKE)	Basic knowledge and abilities of water modelling and water models application	14

Appendix 4

Reports from the PAPA-WP4 Fellowship Agreements Within Contract No EVR1-CT-2002-20012 PAPA.

Training project:
Methods, equipment, sampling and data flow using the ships-of-opportunity as the tools for rapid marine monitoring

Visitor: Anda Ikauniece anda@monit.lu.lv
Sending organization: Institute of Aquatic Ecology, University of Latvia
Hosting organization: Finnish Institute of Marine Research
Visit period: From 15. August 2003 to 29. August 2003

PAPA-WP4 Agreement No: 1
Date: 22 July 2003

Report on fellowship within PAPA Visitor scientist scheme "Methods, equipment, sampling and data flow using the ships-of-opportunity as the tools for rapid marine monitoring"

Performed activities

- Acquaintance with automatic plankton sampling devices on board of research vessel "Aranda" – U-tow and automatic plankton sampler, their construction and operation;
- Acquaintance with the unattended sampling systems on board of commercial ships – ferries Finnpartner and Silja Opera, the structure of the systems, operation and their maintenance;
- Detailed literature studies concerning automatic sampling systems – SAHFOS reports, Alg@line reports;
- Acquaintance with the preparation of information for the Baltic Sea News Portal, charts of measured parameters, maps of algal distribution;
- Acquaintance with the preparation of national press release, data treatment and use for the explanation and forecasting of possible algal blooms;
- Acquaintance with the use of Alg@line data in EU-HABILE, for annual assessments and HELCOM assessments.

Experiences and results

- Complete idea of complexity level of automatic sampling systems, especially on commercial vessels – not so sophisticated as it seems;
- Realization of time input needed on the ship – frequency of sampling, schedule of system maintenance and intercalibration, most frequent operation problems, mandatory negotiations with the crew;

- Realization of time input needed in the lab and for data treatment – analysis of phytoplankton, chlorophyll and nutrient samples, calibration of chlorophyll data, search of outliers, recalculation and interpolation procedures;
- Realization of time input needed for public relations and most common problems related;
- Participation in the update of the Baltic Sea News Portal – preparation of the charts and algal maps and insertion in web page;
- Assistance in small maintenance works of the automatic sampling system;
- Inventory of possible ferry lines for automatic measurements in Latvia – two potential candidates and transects – LatLines from Riga to Lübeck; Scandlines from Ventspils to Nynashamn;
- Proposition to cooperate in analysis of samples from Silja Opera on the route Helsinki – Riga.

Implementation plan of the experiences and results in the Institute of Aquatic Ecology

Activity	Planned time scale
A presentation of obtained experiences and ideas	September 2003, fulfilled
Approval from administration of the institute to cooperate in analysis of samples from Silja Opera	Beginning of October, 2003, fulfilled
Allocation of time and manpower resources for analysis of samples from Silja Opera	October 2003, fulfilled
Measurements of nutrient and chlorophyll *a* concentrations, semiquantitative analysis of phytoplankton in the samples from Silja Opera, sending of the results to Baltic Sea News Portal	Starting December 2003*
Sending of reports on algal composition from high-frequency station in the southern Gulf of Riga	Continously
The choice of the most appropriate transects for unattended monitoring, negotiations with shipping companies, adjustment of institute's data base to accumulate the data of automatic measurements, allocation of necessary resources	Starting 2004-2005**
Use of automatic sampling system on the chosen routes in the Baltic Sea, sending of data to Baltic Sea News Portal	Starting 2004-2005**
Use of obtained data in various assessments of marine environment (national, HELCOM)	Starting 2005**

* - the analysis of samples from Silja Opera depends how quickly the permission to get to the ship in Riga will be obtained. It is not possible to get it in Riga if the company itself does not inform the local agent who issues the permission.
** - the fulfillment of the activity depends on decisions made by Baltic Sea Regional Project (GEF/ICES/HELCOM) – will the IAE be granted with the sampling system.

24 November, 2003

Training project:
Special Course on Remote Sensing of Water Quality

Visitor: Irina Olenina olirina@delfi.lt
Sending organization: Center of Marine Research, Lithuania
Hosting organization: Finnish Environment Institute
Visit period: From 01. September 2003 to 04. September 2003

PAPA-WP4 Agreement No: 2
Date: 24 July 2003

Participation in the "Special Course on Remote Sensing of Water Quality" according to the Fellowships within PAPA Visitor Scientist Scheme

REPORT

According to Fellowships within PAPA Visitor Scientist Scheme and Agreement between PAPA CBB and the Centre of Marine Research of 17 June 2003, I have participated in the "Special Course on Remote Sensing of Water Quality". The course was organized by the Laboratory of Space Technology of Helsinki University of Technology (HUT/LST) and the Finnish Environment Institute (SYKE) on September 1-4, 2003. The course lecturers were: Dr. Herbert Siegel (Baltic Sea Research Institute, Rostock-Warnemünde, Germany) and Dr. Hans van der Woerd (Institute for Environmental Studies, Free University, the Netherlands).

The course presented the basic and advanced concepts and techniques of the optical remote sensing of water bodies. Specifically, it concentrated on the mapping of water quality related variables in the Baltic Sea.

The topics included:

- Theory of the optical remote sensing of water bodies (including inherent optical properties, forward modeling and relation of reflectance to absorption and scattering)
- Inverse modeling and spectral signatures
- Satellite observations and airborne scanners (including validation of ocean colour products, e.g. for Envisat MERIS)
- Ocean colour and optical properties of the Baltic Sea, the North Sea and lakes
- Applications in the Baltic Sea, the North Sea and lakes (including investigations on coastal discharge, contribution of remote sensing to environmental studies and to the operative monitoring of water quality related characteristics)

Additionally, the course included practical exercises and presentations of the participants. During these exercises I learned to work with Biopti-model and ENVI-based study on the Vecht area computer programs. Also, I have participated in the final course discussion on "The Baltic Sea Water quality monitoring after 30 years". My topic of the discussion was "Potential application of the Remote Sensing data in biological monitoring of the Baltic Sea".

The program of the course is given in the Annex 1.

Application of the gained experience in the Centre of Marine Research.

I hope that the knowledge I have obtained during the courses will help to organize monitoring in the Lithuanian coastal waters on a more modern level. Environmental problems of the Lithuanian coastal waters are quite common for the rest of the Baltic Sea: the ongoing eutrofication remains the most important issue. Increase in concentration of nutrients results in growth of phytoplankton biomass, frequent algae blooms, and subsequent physical, chemical, and biological changes in an aquatic ecosystem. Therefore, the national marine environmental monitoring system is largely oriented to control the causes and consequences of eutrophication. The application of the remote sensing data will help to use satellite images in our monitoring works for verifying water quality. It will allow to increase the spatial scale and raise the frequency of observations required to assess algae bloom location, extent, and movements. These tools can be used for observing and investigating harmful algae blooms (HAB) events. Using the remote sensing data will also help to develop and support systems of information providing on temporal and spatial water temperature changes in the Lithuanian coastal waters and predict algae blooms possibility, intensity and extensity.

Klaipėda, 25 November 2003

Annex 1

Monday September 1

9.00-10.00 Introduction
J. Pulliainen
Introduction to the lectures
Aim and set up of the course
Introduction of the participants

10.00-12.00 Basics
Herbert

- Ocean colour - General introduction
- Basic quantities
  The main processes
  Contributions of different water constituents
- Reflectance model overview
- Overview on Ocean colour sensors

13.00-15.30 Introduction to forward and inverse modelling Hans

- Relating R(0-) to absorption and scattering
- Summary of methods (analytical, neural networks, etc.)
- The band-ratio approach

- Introduction to Biopti-model

15.30-17.00 Student presentation and discussion Herbert and Hans

Optional: Exercise Biopti-model or WASI-model

Tuesday September 2

9.00-12.00 Validation and protocols in the Baltic Herbert

- Validation
  - Validation of MERIS (MODIS, SeaWiFS)
  - Measurement requirements
  - The determination of concentrations (protocols)
  - The derivation of Inherent Optical Properties
- Optical properties of the Baltic
- Overview on the application of satellite data in the Baltic

13.00-15.30 Remote sensing of inland waters Hans

- The derivation of R(0-) from PR650 measurements
- Optical water types
- Case studies of inland waters
- The CDOM problem

15.30-17.00 Student presentation and discussion Herbert and Hans

- Optional: ENVI-based study on the Vecht area (demonstration or hands-on)

Wednesday September 3

9.00-12.00 Total suspended matter in the North Sea Hans

- The role of suspended matter
- Atmospheric correction
- The Western Scheldt Estuary study
- SeaWiFS processing
- The North Sea atlas of suspended matter

13.00-15.30 Coastal discharge studies in the Pomeranian Bight Herbert

- Introduction to the area
- Multi-sensor application combined with dynamical modelling and *in situ* data
- Special satellite derived features compared with *in situ* data
- Distribution pattern for the main wind directions
- Wind analysis
- Main transport directions
- Oder flood investigation

15.30-17.00 Participant presentation and discussion Herbert and Hans

Thursday September 4

9.00-12.00 Chlorophyll monitoring in Lake Ijssel Hans

- Introduction to the system

- CSI data and algal species detection
- Algorithm development and Matrix inversion
- Water-quality products from airborne data
- Chlorophyll detection with SeaWiFS
- Comparison with in-situ data
- The data-model connection

13.00-14.30 Contribution to the monitoring of the Baltic Herbert

- German Monitoring Programme of the IOW
- Coastal Monitoring Programme
- Physical and biological aspects
- Combination with model simulations

14.30-16.00 Final discussion and student presentation Herbert and Hans

Training project:
The satellite information assimilation and merging of different operational datasets in the monitoring systems

Visitor: Elena Chichkova Lena@meteo.nw.ru
Sending organization: Regional Center for Hydrometeorology and Environmental Monitoring, St – Petersburg, Russia
Hosting organization: Swedish Meteorological and Hydrological Institute and Finnish Environmental Institute
Visit period: From 25. October 2003 to 14. November 2003

PAPA-WP4 Agreement No: 3
Date: 25 August 2003

Report about fellowship training
" The satellite information assimilation and merging of different operational datasets in the monitoring systems"

Short description of performed activities.

Visit was held in the period from 25th October to 14th November :
from 27th Oct. to 03ed Nov. – Swedish Meteorological and Hydrological Institute (SMHI) in Goteborg;
from 04th Nov. to 05th Nov. – SMHI in Norrkoping;
from 06th Nov. to 14th Nov. – Finnish Environmental Institute (SYKE) in Helsinki.

The following knowledge and acquaintances have been presented by experts in SMHI:

1. SMHI`s organization structure and interrelation between other departments;
2. research base for Baltic Sea observation operations (field work, costal dataset, data from buoys);
3. operational modeling (Baltic Alge Watch System);
4. monitoring programs for Baltic Sea (with satellite data);
5. operation of the meteorological and marine forecasting services.

The following knowledge and acquaintances have been presented by experts in SYKE:

1. monitoring Gulf of Finland with help satellite data from NOAA, Terra, LANSAT;
2. SYKE`s Baltic Sea monitoring and research by the program for Protection of the Baltic Sea (ITO);
3. snow cover estimation using hydrological model;

Visits at the Laboratory of Space Technology (Helsinki University of Technology) and at the Finnish Meteorological Institute were organized.

Short description of the results/experience of the visit.

1. rich experience has been got by application of different operational datasets for Baltic Sea monitoring and forecasting confirmed didactic materials;
2. recommendations to use method for retrieval of upper sea layer temperature (SST) with help satellite data (NOAA) has been got;
3. present scientific articles and information according to training project topic have been copied;
4. approach of Algae Bloom interpretation demonstrated both SMHI and SYKE has convinced to refuse from investigation this phenomenon at least only satellite method. Now NWAHEM hasn't got sufficient database for similar research;
5. a few problems of NWAHEM processing (satellite information AVHRR from NOAA) system "Varjag" have been discussed and solved.

Comprehensive implementation plan of the results/experience in the Sending Organization.

1) sea surface temperature algorithm making more precise on the basis of recommendations of SMHI and SYKE specialists will be put into practice through the processing (satellite information AVHRR from NOAA) system "Varjag". It will be able to upgrade the properties of sea monitoring with help satellite data made in NWAHEM.
2) taking into account fellowship training experience, scientific research of Informatic Technology and Satellite Data Processing Department of NWAHEM will have been corrected following:

- to design automatic cloud identification as alternative of real interactive cloud identification in the system "Varjag";
- to refuse from Algae Bloom interpretation without sufficient observing database;
- to upgrade a few processing procedures in the system "Varjag" using a new ideas from scientific articles (having a gap in these since 1992 year)

3) content and accessibility of satellite information processing results will be transformed for more effective employment by management of operational data for all services of NWAHEM and for external organizations.

Training project:
New data processing and management technologies implementation into the LHMA operational oceanographic practices

Visitor: Igor Fyodorov Igor.Fyodorov@meteo.lv
Sending organization: Latvian Hydrometeorological Agency
Hosting organization: Institute for Baltic Research and
The Federal Maritame and Hydrographic Agency
Visit period: From ……. to ……. 2003

PAPA-WP4 Agreement No: 4
Date: 25 August 2003

1. Short description of performed activities and experience of the visit

First of all I want to thank the PAPA project for this great opportunity to visit such great people doing really good things.

My first visit was to IOW to meet MARNET people. Warnemuende is very beautiful place. Thomas Badewien met me and showed me my apartments. Because I've spent about 30 hours to get from Riga to Warnemuende, I was very tired to go sightseeing, so I went to bed immediately. Next morning I met Wolfgang Roeder who told me about the stations they operate, what data they receive, and Peter Wlost who showed me the actual data they receive, program which converts the received data to the format they need and so on. During that week I have met a lot of very good people. I have seen a lot of instruments and equipment for measuring different parameters and process the data to the IOW. Siegfried Krueger showed me calibration laboratory they have because it is very significant to have reliable data. IOW operate three stations in the Baltic Sea. The different parameters are measured and transferred though the METEOSAT satellite to the DWD service in form of telegram and then via TCP/IP protocol to the BSH institute and then via FTP protocol to the IOW. Fred Heiden is working on the database system. I was very impressed with job he is doing with other people. Of course sometimes it is not very good to keep the data in pure file forms. What Fred is doing now is very good thing, because there is a possibility to get access to the database for internal use. Fred is using Delphi to write this system of programs. System is based on MySQL database, which is not so expensive (for example at the moment of writing this report it costs about 200 euros per version for commercial use). To put the data from the stations first of all it is necessary to arrange the data, this function as I wrote above, is done by a Peter's program. This program arranges the data using special algorithms and makes the new data file. I want to describe the way the program works. There are some directories for different purposes. One directory is used if it is needed to put the new data to the database, these data are converted to the MySQL database. Another directory is used if it is needed to replace the existing data in the database. With Fred's program it is possible to get all the data from the database for different stations and different parameters, it is also possible to convert the data in ASCII form, in EXCEL tables, it is also possible to make graphical diagram for all the parameters. This system is written the way that it is possible to validate the data putting the appropriate flags. This system is very useful for presenting the data in graphical form to the Internet.

Of course I would like to have this set of programs in our institute. May be if it would be possible to have this set of programs in all the participating institutions of PAPA project which do not have the database driven applications under some kind of getting the license for this program or buying some money to IOW for implementation of this system. Because in my opinion it is very reliable and well done application.

Also I have spent some days in Hamburg in BSH where I have met Kai Soetje and Anna Gyldenfeldt and other people. BSH operates four stations in North Sea and two station "in the way" to Baltic Sea. There is very big database system in BSH.

2. Implementation plan of the results/experience in the LHMA's practice

For this moment we have only coastal stations on the Baltic Sea coast. We have GSM connection with our stations, so we can get the data every moment we need, but the main server making the connection every hour (of course we can configure the server to communicate with stations as needed) with the stations. The data can be converted using different scripts and batch files to the appropriate form. Data are stored in files. At this stage we are working to put our data to our FTP-box so the data can be used for other PAPA project members.

So the algorithm of sending our data to FTP-box will be the following:
After the data is received via GSM connection from the appropriate station the data converts to the appropriate form, after that the data is to be send to our FTP-box using FTP server program.

My aim of work is to make the MySQL driven database for the data of our coastal stations. I have chosen MySQL database, because it is cheap, it is flexible and reliable. It is easy to present the data to the end customer via Internet network.

Of course I would like to have Fred Heiden's program under some kind of licensing program or buying the rights to use this program on our side, to build up the database driven system.

In accordance to the PAPA-Info implementation plan:

November 1st is a deadline we should put Daugavgriva station's hourly water level data to our FTP-box in form of text file on automatic basis.

Further we will permanently test our partners' FTP-box connections to know the problems, to report about them.

The responsible for PAPA-Info work package is MIG (Gdansk). The MIG should prepare special platform for operational interagency data exchange. The first version of this platform should be installed at all partners' sites in the first half of the 2005-year. We should test the system for three-month period to inform our opinion and proposals to develop the final version of the system. The MIG should prepare the final design of the system by the September 2005.

Riga, October 3, 2003

Training project:
Advanced observation technology and data control study for application into operational practice at the LHMA coastal observing system

Visitor: Victor Kuchinscis viktors.kucinskis@meteo.lv
Sending organization: Latvian Hydrometeorological Agency
Hosting organization: Institute for Baltic Research and
The Federal Maritime and Hydrographic Agency
Visit period: From 22. September 2003 to 02. October 2003

PAPA-WP4 Agreement No: 5
Date: 29 August 2003

Visitor report

1. Short description of the performed activities

From 22 of September till 26 of September I was visiting BSH (The Federal Maritime and Hydrographic Agency) in Gamburg.

From 26 of September till 29 of September I was taking part in "Marnet" cruise by the ship " Professor Albrecht Penck " on service of 2 sea automatic stations in Baltic sea: " Arkona Basin " and " Darss Sill ".

From 29 of September till 2 of October I was taking part in PAPA (Programe for a Baltic net work Access and upgrade an oPerational observing and forecasting system in the region) expert meeting for WP2 (NOW) and WP3 (OBS) in Warnemuende (IOW and BSH Rostock).

2. Short description of the results/experience of the visit

In BSH institute of Gamburg I was familiarized with experience of German colleagues in:

- The order and system of supervisions
- Technical tools for the deployment, running, calibration and maintenance of an operational observing system
- The used equipment and procedures for measurements
- The new methods for monitoring and data collection

I was seeing the program decisions for supervisions and forecasts what are going from sea and coastal stations. The ways for supervisions through special software, calculations and constructions for forecasting models, the control for the going data and appropriate data processing.
In technical part I was familiarized with the methods of the equipment installation and their subsequent maintenance. I was seeing how these tools are calibrating for measurements accuracy.

During "Marnet" cruise I saw how measurements are conducted and I carried out together with the Polish colleague trial measurements.

During PAPA meeting I was taking part in discussion of tasks and ways of their solutions. And during meeting I was getting the contacts from “Messen Nord” company that is producing the devices of measurements for automatic coastal stations.

3. Comprehensive implementation plan of the results/experience in the Sending Organization.

Our organization is preparing to expand and improve supervisions over the coastal sea stations. And our task is to modernize and automate the control of supervisions for the acting data. In the near future we are planning to optimize of existing LHMA coastal network, which allow creating cost effective way with new equipment installation on the network, improvement of data collection and exchange.

LHMA has strategy to design scientifically and cost effective observing and forecasting system to improve the quality of operational monitoring and data management within the Baltic Sea.
The LHMA tasks are:

- Optimizing the existing observation network
- Introducing new observation technologies
- Designing of cost-effective operational coastal monitoring systems
- Establishment an efficient data exchange

This trip helped me to upgrade the technical and scientific skills with the experience of the data control and program processing for effective observing and forecasting system.

Our organization further will aspire to improve equipment, the quality and accuracy of measurements and modernize the control of supervisions. LHMA will be responsible to upgrade to real-time data transmission from selected observation stations.

I think that my task “Advanced observation technology and data control study for application into operational practice at the LHMA coastal observing system” is executed.

Training project:
Management of Marine Monitoring data (hydrologycal, chemical, biological): standartization of operational databases, report generation, access to data

Visitor: Edgars Januševskis edgars@monit.lu.lv
Sending organization: Institute of Aquatic Ecology, University of Latvia
Hosting organization: Bundesamt fuer Seeschiffahrt und Hydrographie, Hamburg, Germany
Visit period: From ……. to …….. 2003

PAPA-WP4 Agreement No: 6
Date: 06 October 2003

Report not available

Training project:
Polish operational oceanographic service

Visitor: Bogusz Piliczewski Bogusz.Piliczewski@imgw.pl
Sending organization: Institute of Meteorology and Water Management Maritime Branch in Gdynia
Hosting organization: Royal Danish Administration of Navigation and Hydrography and Danish Meteorological Institute
Visit period: From 25. October 2003 to 15. November 2003

PAPA-WP4 Agreement No: 7
Date: 16 October 2003

Description of results and experiences gained during the visit

1. Hosting organisations: Royal Danish Administration of Navigation and Hydrography (RDANH) and Danish Meteorological Institute (DMI).

2. Place and period of the visit: Denmark, Copenhagen, 25th October – 15th November 2003.

3. Goals of visit: realisation of the training project " Polish operational oceanographic service", gaining experience in management of the operational data, organising databases (Oracle or MySQL if possible), training on operating hydrodynamical models for the Baltic Sea (implementation, running, assimilation of data), an exchange of experience in the dissemination of results.

4. Activities performed during the visit

4.1 Visit at RDANH

2003-10-27

1) Meeting with the staff of the Department of Oceanography
I presented goals of my visit at RDANH, listed tasks for which I am responsible at IMGW and expressed subjects in which I am interested in. The plan of the visit was prepared.
2) Meeting with Arne Nielsen (head of the Unit of Oceanography)
I informed Arne Nielsen, that the Director of IMGW Maritime Branch aims to sign the HIROMB Co-operation agreement.
3) Meeting with Henrik Nojgaard (hng@fomfrv.dk) and **Lars Melsted Thomsen** (lmt@fomfrv.dk)
Henrik Nojgaard presented operational oceanographic products of the Danish Royal Navy. I got information that they take part in the project within the frame of SACLANT (Undersea Research Centre), which aim is to investigate possibilities of accessing the internet from the sea. TV satellites (VISAT) can be an alternative to satellite telephone communication.
4) Meeting with Palle Bo Nielsen
The meeting was about RDANH coastal stations and tides.

2003-10-28
5) Meeting with Bjorne
Bjorne described his experiences gained during implementation of GETM model. The source code written in Fortran 90 is available at:
http://www.bolding-burchard.com/getm.html
The model is based on GOTM (http://www.gotm.net). Non-commercial version of the Intel fortran compiler is available from http://www.intel.com. Model is forced with the data from Hirlam meteorological forecasts (DMI) and river outflow model forecasts (SMHI). The model will cover the North and Baltic Seas with 1 km resolution. The most commonly used data format at RDANH is NetCDF http://www.unidata.ucar.edu/packages/netcdf. Several applications for processing and visualisation of this format are freely available (e.g. NCO - http://nco.sourceforge.net, ncview). For running the model a linux cluster based on Beowulf (http://www.beowulf.org), Rocks (http://rocks.npaci.edu) and MPICH is used.
6) Meeting with Peter Gylling Jorgensen (Peg@fomfrv.dk)
Peter presented a forecast service for the eastern part of the North Sea, Danish straits and southern Baltic: http://www.frv.dk/dcoo/. Currently they generate maps using Matlab scripts, but he works on implementation of GMT software (http://gmt.soest.hawaii.edu), which will replace the old system. GMT is capable to work with NetCDF. He developed software for processing data from GRIB format (HIROMB, HIRLAM) to NetCDF. They think about making it available for other users of the GRIB format.

2003-10-29
7) Meeting with Johan Mattsson (jma@fomfrv.dk)
Johan presented SeaTrackWeb service, which is available at:
http://pro.smhi.se/seatrack/
Cecilia Ambjorn is responsible for this service at SMHI (Cecilia.Ambjorn@smhi.se).
8) Meeting with Carsten Hansen
Carsten works with wave models. Currently they use a commercial MIKE21 and WAVEWATCH III, available at:
http://polar.wwb.noaa.gov/waves/wavewatch/wavewatch.html
The Wavewatch III is based on WAM and written in fortran 90.
Forcing is taken from HIRLAM. I have received the bathymetry data of the Baltic Sea with resolution of 1 km, which had been prepared by Carsten.

2003-10-30
9) Meeting with Niels Holt (nho@fomfrv.dk)
Niels described a structure of the oceanographic database and technologies used in the internet service presenting observations and forecasts in the Danish part of the North and Baltic Seas.
10) Meeting with Peter Gylling Jorgensen
We discussed the details of using GMT software.

2003-10-31
11) Meeting with Henrik Holm (hfh@fomfrv.dk) and **Finn Milvertz** (fcl@fomfrv.dk)
They showed measuring instruments (e.g. ultrasonic level instruments) and communication methods (GSM modems, wireless LAN) used at coastal stations.

2003-11-03
12) Meeting with Jens Jensen (jkj@fomfrv.dk)
We discussed the Oracle database issues: collecting of the data, calculation of derived data, quality control, dissemination of data to services, plotting graphical diagrams (GnuPlot). The database is divided to three parts: production, testing and development databases.
13) Meeting with Karsten Holm (kho@fomfrv.dk)
Karsten presented tools for building the graphical interface and administration of the Oracle database (Oracle Designer, PLSQL, Internet Applications Server).

2003-11-04
14) Meeting with Claus Solvsteen (cls@fomfrv.dk)
Claus gave me a copy of report „Comparison between in situ temperature measurements and NOAA/AVHRR based SSTs from O&SI SAF Version 2", which was prepared within the frame of SST group at BOOS. A good SST product is available at:
ftp://ftp.ifremer.fr/ifremer/cersat/SAFOSI/Products/NARSST/
More information about the product is available at:
http://projects.met.no/~saf/p/sst/SST_12HL/
http://www.meteorologie.eu.org/safo/
http://www.meteorologie.eu.org/safo/gb_html_sst/regional/regsst_manual.pdf
Data is in HDF-EOS (HDF-4) format. Every day four images from two NOAA satellites are available. The resolution of the images is app. 2 km. The software for processing the data is available for Unix/Linux platforms. He uses Matlab for processing the data.

2003-11-05
15) Meeting of Department
At the meeting I summarised experiences gained during my visit.

4.2 Visit at DMI

2003-11-06
16) Meeting of the Department of Operational Oceanography
I presented my expectations regarding the visit at DMI. Meeting dates with Bjorne Siwertsen, Ove Kjaer and Jacob Hoyer were set.
17) Meeting with Erik Buch (ebu@dmi.dk)
Erik presented main tasks realised at DMI and at his department. DMI uses the commercial

MIKE-21 (DHI) product for making storm surge forecasts, WAM for wave modelling (4 times a day), BSH Cmod model, which is very similar to HIROMB, for hydrodynamic and oil drift forecasts. The department participates in the following international projects: PAPA, ODON (optimising positions of measurement points for assimilation of data in models), MERSEA 1 and 2 (within GMES – global and regional oceanographic modelling), MOEN (ocean climate), ECOGREEN (Greenland waters ecosystem).

2003-11-07

18) Meeting with Nikolai Kliem (nk@dmi.dk)

One of the main goals of my visit at DMI was to begin co-operation with Nikolai Kliem in hydrodynamic modelling. Before the visit he offered co-operation in POM model, which I am going to implement in my own Department.

2003-11-10

19) Meeting with Jacob Woge Nielsen (jw.@dmi.dk)

Jacob described the main assumptions of the Cmod model. Forcing: river outflow is downloaded from BSH (Rhein, Elbe, Odra, Weser and Ems, contact person: Stefan Dick); other rivers are taken from SMHI river outflow model (43 rivers, contact person: Lennart Funquist); meteorological forcing from HIRLAM (atmospheric pressure, wind, air temperature, humidity, cloud cover) decoded using GRIB Decoder. Open boundaries: tides, storm surges from Northern Atlantic model, water temperature and salinity from climatic monthly means.

20) Meeting with Jacob Hoyer (jlh@dmi.dk)

The meeting was about possibilities of obtaining SST from NOAA satellite images. Jacob uses readh4sst software. In order to read these HDF files it is necessary to install HDF v.4.1 (http://hdf.ncsa.uiuc.edu/obtain.html) and HDF-EOS 2.4 (http://hdfeos.gsfc.nasa.gov) libraries. Jacob uses IDL for data processing.

2003-11-11

21) Co-operation with Nikolai Kliem

A simple version of POM model was run.

2003-11-12

22) Meeting with Bjorne Sivertsen

I was acquainted with DMI internet services and tools to build them. DMI similarly as IMGW is preparing a new version of internet service, temporarily available at: http://nywww.dmi.dk/index/danmark.htm

The internet page of Department of Operational Oceanography is available at:
http://ocean.dmi.dk

For working with Xwindows they use Exceed, for visualisation their own Java software, Metview (http://www.ecmwf.int) and Metgraf.

23) Meeting with Ove Kjaer (okj@dmi.dk)

We discussed issues of using MySQL.

24) Co-operation with Nikolai Kliem

Continuation of work on POM. We chose an area Gulf of Gdansk as a test case and prepared bathymetry for it.

2003-11-13

25) Co-operation with Nikolai Kliem

Continuation of work on POM. We were trying to run the model for the test case. The main parameters were discussed.

2003-11-14

26) Meeting of the Department of Operational Oceanography

The main goals of Mersea project were presented.

27) Meeting with Jun She (js@dmi.dk)

Jun She was interested in the IMGW monitoring measurements, which are carried out in the Baltic Sea.

4. Main results and experiences of the visit

During my visit at RDANH and DMI I gained a lot of information on operational oceanography, particularly on:

- software for processing and visualisation of the data (GMT, GNU Plot, Java scripts);
- data formats (NetCDF, GRIB, HDF);
- oceanographic modelling (Wavewatch III, GETM, POM, Cmod);
- RDANH database structure and Oracle tools;
- availability of SST data from NOAA satellite products;
- communication and data transfer (GSM modems, satellite communication – VISAT, Wireless LAN).

The software used at RDANH and DMI is based on Linux platform. Danish colleagues try to use open software as widely as possible (Linux, GMT, GETM, WaveWatch III, MySQL, etc.).

Training project:
Deep velocity profiling using lowered Acoustic Doppler Profilers (LADCP) and moored ADCP

Visitor: Piotr Wieczorek wpeter@iopan.gda.pl
Sending organization: Institute of Oceanology, Polish Academy of Sciences, Sopot
Hosting organization: Baltic Sea Research Institute, Warnemuende
Visit period: From 15. September 2003 to 02. October 2003

PAPA-WP4 Agreement No: 8
Date: 17 October 2003

Reports from visit in Baltic Sea Research Institute in Warnemuende, under PAPA Capacity Building from 15.09 2003 to 02.10.2003

Training Project: Deep velocity profiling using Lowered Acoustic Doppler Profilers (LADCP) and moored ADCP.

During stay in IOW I have participated in lot of meetings and consultation on following subjects:

1. Equipment and firmware settings for LADCP and VM ADCP;
2. LADCP data processing;
3. QA procedures and sensors calibration;
4. Construction of measuring buoys;
5. Data transmission from buoy to Data Center;
6. Database and IT technology.

I have participated in the technical service cruise of r.v. "Professor Albrecht Penck" to Monitoring Stations (Arkona Sea and Darss Sill). We made comparative CTD measurements as well as deployed the ADCP for training.

Results/experience
I have had possibilities to gain and complement the experience in several fields:

1. Technical solutions for using rosette as a LADCP carrier;
2. Construction and configuration of buoys, monitoring stations and problems with their service;
3. Data Quality procedures;
4. Configuration of ADCP with special discussion of importance of WV coefficient in device setting;
5. Vessel Mounted Broad Band ADCP data acquisition;
6. Procedures of ADCP and LADCP data handling.

Comprehensive implementation plan of results/experience in the IO PAS

1. Modification of our SBE 32 as LADCP carrier.
2. Preparation laboratory and equipment, implementation new procedures to QA of CTD data.
3. Testing different WV coefficients for VM BB ADCP to improve data quality.
4. Preparation cage for moored ADCP using IOPAS and IOW experiences.

All experiences will be helpful during our investigation of the Baltic Sea and other research cruises. At the end I would like to express my warm thanks to IOW and Mr. Siegfried
Krueger for their effort, help and hospitality.

Training project:
Management of operational data and forecast

Visitor: Inga Dalidienė inga.dailidiene@delfi.lt
Sending organization: Centre of Marine Research, Lithuania
Hosting organization: Swedish Meteorological and Hydrological Institute
Visit period: From 27. October 2003 to 06. November 2003

PAPA-WP4 Agreement No: 9
Date: 23 October 2003

Participation in the "Management of operational data and forecast" training according to the Fellowships within PAPA Visitor Scientist Scheme

REPORT

Short description of performed activities

According to Fellowships within PAPA Visitor Scientist Scheme and Agreement between PAPA CBB and the Centre of Marine Research of 17 June 2003, I have the training "Management of operational data and forecast" in the Swedish Meteorological and Hydrological Institute (SMHI). Visit was held in the period from 27th October to 6th November. Experts in SMHI have presented the following knowledge and acquaintances:

- SMHI organisation structure and interrelation between other departments
- Research base for Baltic Sea observation
- Operational modelling
- Monitoring programmes for Baltic Sea
- Operation of the meteorological and marine forecasting services
- Seatrack Web marine forecast system

Short description of the results/experience of the visit

The structure of the entire institute was presented at the Swedish Institute of Hydrology and Meteorology (SMHI) in Gothenburg. The work carried out in various departments: Meteorological, Marine biology, Oceanography, Marine forecasts, Operative modelling was presented as well as researches, reports, equipment, quality of measurements. Specialists from the departments mentioned above made introductory reports, answered the questions and shared their experience.

The system of the reception were introduced during the course:

- of synoptic information and formation of forecasts,
- the database of marine biology and its processing,
- the system of monitoring observation,
- the system of the Baltic algae observation,

- marine researches,
- means of maintaining the guarantee of the quality in a chemical laboratory.
- A seminar about the spread of biota in the Kattegat was delivered.

In SMHI Norrkoping at the Department of the Marine forecast, a possibility of the usage of the Seatrack Web programme for the observation of the drift of oil and other pollutants was introduced and real-time data, satellite information, usage of models for making forecasts was introduced.

At the Department of the Marine Research consultations about the installation and possibilities to use a marine buoy were given, the problems which were confronted during the cold period, when the sea is covered with ice were analyzed, equipment which were in the laboratory were examined.

The programme and equipment used to process water level recorder stripes which reads data from the stripes as well as check the quality of those data, management and processing of data base was introduced.

Comprehensive implementation plan of the results/experience in the Sending Organization

Information obtained during practical sessions, advice, practical knowledge in the future may be used to improve operational marine information data quality, storage and processing. We have obtained during the course will help to organize operational marine observations in the Lithuania coastal waters on a more modern level. We hope that in the future while operating the marine equipment and buoy which will belong to the Center of Marine Research it would be possible to get useful advice and send there our specialists to intern.

Klaipėda, 16 January 2004

Training project:
Ecological modelling – sensitivity analysis and parameter estimation of ecological models

Visitor: Bärbel Müller-Karulis baerbel@latnet.lv
Sending organization: Institute of Aquatic Ecology, University of Latvia
Hosting organization: Finnish Institute of Marine Research
Visit period: From …. …… 2003 to …….. 2003

PAPA-WP4 Agreement No: 10
Date: 07 November 2003

REPORT

Fellowships within PAPA Visitor Scientist Scheme

Personal data

Applicant's name	Bärbel Müller-Karulis
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Agency / Institution	Institute of Aquatic Ecology, University of Latvia
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Phone	+ 371 7 610 850

Fellowship theme and proposed receiving organization

Fellowship theme (use themes 1.1-1.4)	1.3, Numerical modelling and data assimilation
Specific training project name	Ecological modelling – sensitivity analysis and parameter estimation of ecological models
Receiving organization	FIMR (Kimmo Kahma, Tapani Stipa)

Performed activities
Goal of my stay at FIMR was to learn data assimilation techniques for estimating parameters in ecosystem models. Working closely together with Dr. Tapani Stipa, I acquired the theoretical background of data assimilation methods. We then constructed a simple nutrient – phytoplankton model and estimated its parameters using the adjoint method. We also conducted an error analysis of the model parameters, based on the Hessian matrix of the model penalty function. Prof. Harri Kuosa provided a dataset from a laboratory study of the Baltic Sea phytoplankton spring bloom, with which model and parameter estimation was further tested. We plan to continue the cooperation with a scientific publication.

Results/experience of the visit

Theoretical background of parameter estimation
I acquired the mathematical background for using a Langrangian functional to incorporate model-data differences into parameter estimation and learned, how the adjoint equations for a system of forward model equations are derived. Further, I understood how the gradient of the penalty function with respect to model parameters can be calculated from the Euler-Lagrange equations and how this gradient can be used in an iterative parameter estimation scheme.

Adjoint model formulation for a phytoplankton-nutrient model
Phytoplankton growth and nutrient assimilation form the basis of marine ecological models. During my stay at FIMR we constructed the adjoint equations to a typical phytoplankton - nutrient model. The adjoint equations can also be applied to situations with more than one phytoplankton group or several, potentially limiting nutrients.

Implementation in numerical routines
Both forward and adjoint equations were integrated, using numerical routines programmed using MS Excel/Visual Basic. The penalty function gradients derived from the adjoint model were tested against gradients based on estimating the penalty function gradient from the forward model. We succeeded in generating an error-free adjoint model formulation for our phytoplankton - nutrient model. It became clear that errors in the adjoint model are difficult to detect. Comparing penalty function gradient estimates between forward and adjoint model provides a method to test the adjoint model formulation for errors.

Parameter estimation
Parameter estimation for the phytoplankton – nutrient model was tested, using "test data" generated by the forward model. Recovery of the parameters underlying the artificial dataset was tried for phytoplankton maximum growth rate, mortality, and nutrient half saturation constant. Parameter estimation was also tested with a laboratory dataset provided by Harri Kuosa.

Error analysis
The covariance of the estimated model parameters is related to the inverse of the Hessian matrix of the model penalty function with respect to the model parameters. We constructed the Hessian matrix for the phytoplankton - nutrient model based on the penalty function gradients calculated from the adjoint model. It became clear, that the errors in the model parameters increase in the order mortality < maximum growth rate < nutrient half saturation constant. Errors in the nutrient half saturation constant become especially large if growth occurs under strongly limiting conditions during the entire dataset. This means that a numerical error analysis of model parameter estimates can help to improve the design of experimental setups.

Implementation plan of the results of the visit
The work that has been started with this fellowship allows for improved error estimates for the inversions of laboratory studies and monitoring results, and is therefore an essential ingredient in future ecosystem modelling activities within the PAPA region. In particular, gaps in existing knowledge as well as areas of improvement for ecosystem models can be identified more robustly than before, hence providing a feedback to both long-term monitoring plans as well as scientific process studies. Better assimilation methods for operational ecosystem models can be developed.

Tapani Stipa, Harri Kuosa and I plan to continue the cooperation started during my capacity building stay and publish a scientific paper on the adjoint inversion of a phytoplankton – nutrient model for a diatom dominated spring bloom.

In my home institutions, both in the Institute of Aquatic Ecology and in the Laboratory for mathematical modelling of environmental and technological processes of the University of Latvia, I am involved in constructing and calibrating ecosystem models. Experiences from the capacity building visit will help me to improve the parameter estimation for these models. The acquired error

analysis techniques will be important for reviewing the model structure for ill determined parameters. Estimated parameter variances will form a basis for model sensitivity analysis. In the medium term I plan to use the ecosystem model of the Gulf of Riga I currently work with for policy scenario analysis. The knowledge gained during the capacity building stay will be very valuable for error and sensitivity analysis.

Acknowledgements
I would like to thank my hosts at FIMR, especially Dr. Tapani Stipa, for patient teaching, critical questions, discussions, and interest for this work, and the PAPA network for the financial support.

Training project:
Use of models within ice service

Visitor: Ove Pärn Ove ove@sea.ee
Sending organization: TUT Marine Systems Institute
Hosting organization: Finnish Institute of Marine Research
Visit period: From … 2004 to …. 2004

1) Short description of performed activities

   a) Took part in the seminar „Sea Ice Modelling, with Application to the Baltic Sea"
   b) Introduction to Finnish ice service and discussion about it.
   c) Introduction of software the Grid Analysis and Display System and database NCEP/NCAR.
   d) Forecast model data analysis: ice drift, deformations and compare those to ice charts and satellite images.

2) Short description of results

The operative sea ice dynamical model driven by HRLAM wind forcing predicts the ice conditions to the future 48h. The forecasts during March and April 2004 for the Gulf of Finland were analysed. Main interest was concentrated to the period when the changes of ice conditions were remarkable.
In general the model simulations are in good agreement with the ice charts for Gulf of Finland, some inaccuracy becomes obvious for Gulf of Bothnia and Riga. There came out some problems with initial data.

3) Comprehensive implementation plan of the results/experience in the sending organization.

Co-operation plan with J. Haapala arose during my practice in FIMR. We have purposed to investigate the sea ice on the Gulf of Finland. At first we write an article from model results what I analysed in FIMR.

Training project:
Development of procedures of marine physical oceanographic field measurements: preparation, field work and data management

Visitor: Magdalena Kamińska magdalena.kaminska@imgw.pl
Sending organization: Institute of Meteorology and Water Management. Maritime Branch in Gdynia
Hosting organization: Bundesamt fuer Seeschifffahrt und Hydrographie, Hamburg and Institute fuer Ostseeforschung Warnemuende
Visit period: From 30. August 2004 to 17. September 2004

PAPA-WP4 Agreement No: 11
Date: 16 August 2004

PAPA CBB Report
Workpackage 4 – Capacity Building
Visit scientist scheme

Fellowship:	Development of procedures of marine physical oceanographic field measurements: preparation, field work and data management.
Hosting organizations:	BSH Hamburg (Bundesamt fuer Seeschifffahrt und Hydrographie) IOW (Institute fuer Ostseeforschung Warnemuende)
Training time:	30 August – 17 September 2004

In a frame of training programme following items were subject of fellowship.

Methods of vertical profile of temperature and salinity measurements were compared. At IMWM Maritime Branch vertical profile of temperature and salinity is made using Neil Brown CTD sounder attached to rosette sampling system of General Oceanics (GO). At BSH CTD sounder SeaBird attached to rosette sampling system of GO is used. Except of pressure, temperature and conductivity sensors (IMWM sounder is equipped in these sensors only) they are equipped with oxygen sensor and altimeter. At IOW sounder is equipped with optical sensors: chlorophyll "a" fluorescence, blue algae, turbidity, and photosynthetic radioactivity sensor.

An integral part of SeaBird CTD is a pump which control speed of water during measurements. It caused that accuracy of measurement is not dependent on speed of lowering of CTD.

At BSH and IMWG ordinary 12 places GO rosette is used. The difference in rosette sampling system between IMGW and BSH is releasing of bathometers. An original GO system has an electric engine which allow to release single bathometer, modified GO rosette used at BSH is equipped with magnetic SeaBird releaser which allow to release from 1 to all simultaneously. A CTD is mounted below bathometers at BSH and IMWM as well. At IOW is used special designed by HydroBios 16 places rosette with magnetic SeaBird releaser. A CTD is mounted instead of 1 bottle.

The new experience is connected to towed CTDs. One is used within DELPHIN programme (at BSH). I was informed on procedures of fitting data to the real geographical position and depth. An important thing for data is salinity spikes correction during crossing a thermocline.

Another type of towed CTD is used at IOW. They are planned to connect it (Seafish) to the tubing system to receive high spatial resolution of nutrients.

A very important thing is data quality control and removing of "wrong data", i.e. spikes, out of range, upward sounding (it happens with high sea state and buoyancy). SeaBird sounder is deliver with software which includes all of listed above correction procedures. During bathometer releasing all measured parameters are recorded in a separate file including simply statistics: maximum, minimum, mean, standard deviation.

Another significant difference in rosette sampling system between IOW and IMWM is bathometer type. IOW uses free flow bathometers which are better for the Baltic Sea monitoring than ordinary GO bathometer. Because of bigger inlet and outlet diameter a water inflow is easier and it can be cached less disturbed water body.

A cruise to autonomous measurement stations (buoys) onboard r/v Professor Albrecht Penck was completely new experience. There isn't any autonomous buoy at present at IMGW. IMWM set self recording stations a few times in a past but there wasn't any real – time data transmission. Data were recorded inside instrument and were read after sensors / equipment were picked up.

Goals of the cruise were buoy's sensors maintenance, installation of new bottom mounted ADCP at Arkona Basin, new programme installation, exchange cards for GSM transmission (new operator to lower transmission costs), and of course comparison measurements. For comparison measurements between equipment installed at the buoys and present values measured by ship equipment I personally took and preserved samples to determine oxygen (Winkler method) and took salinity samples during a cruise. Oxygen determination and salinity measurements were done by IOW staff. Comparison results were ready before a cruise ended. All measurements, comparison measurements (tables and graphics as well) were ready to analyze differences between ship and buoy measurement and prepared to set new correction coefficients.

I participated in Ships of Opportunity service at BSH in Hamburg. Ship goes along a regular route on the North Sea and Northern Atlantic. Vertical profile of temperature is done every 1.5 hour between 40 N and 53 N (according to a responsibility of BSH). It was important experience because we were invited to cooperation on the Baltic sea within BSRP SOOP project. IMWM application was accepted by BSRP and we are preparing to equipment installation onboard a ferry.

Chemical parameters analyses are almost the same at all three institutions (BSH, IOW and IMWM). The core parameters are nutrient. At IMGW they are determined manually but at IOW and BSH autoanalyser is used to determine NO_2, NO_3, PO_4, SiO_2, total N, total P. A sample must be filtered before analyses in autoanalyser. NH_4 is determined manually because of high contamination from an air during sample filtration. Radioactive isotopes of CS-137 and Sr-90 are determined using the same analytical methods. Harmful substances, POP and heavy metals, in biota (fish, mollusk) and stratified bottom sediment, are determined using the same analytical methods and the same equipment. Determination of heavy metals in sea water is done at BSH laboratory in Sueldorff only.

I have discussed on oceanographic database. At IOW it exists since 2 years, first plans and vision were made in early 90'ties. A database in a present form started to be created in 1991. It is a relative database, data stored in a database are available for authorized users via internet. At a database are stored results of measurements and metadata as well. Data are checked before entering into database and no flagging is used. Some of metadata are: platform type (ship, buoy), sensor type (sonde, thermometer, salinometer), measurements method, country, chief scientist. Measured parameters are: measurements value, unit, parameter code. Into a database are introduced combined physical and chemical (nutrient concentration) data. Meteorological data are part of station information. For a users from IOW data are available via internet depending on authorization. Data can be search in three ways: square regions, geographical regions and by project name. Database at Maritime Branch was built in 70'ies (DOS version), in May 2001 it was exchanged by a new Windows version. It is organized similarly to IOW's database, but meteorology is a separate database. In comparison to IOW it is not build yet a module for biological data at IMWM (except chlorophyll "a") concentration. Phytoplankton and zooplankton analysis data are stored according to HELCOM requirements – biological data reporting format.

In connection with database is reporting of metadata to HELCOM, ICES and other end users. IMWM sends ROSCOP reports of monitoring cruises to ICES and CSR online reports of all cruises to SeaSearch. During a stay in BSH I have talked on DOD (Deutsche Ozeanographische Database). In this database are stored data from all institutions involved in marine measurements from all Germany. There isn't such organized oceanographic database in Poland at present. Every institution involved in marine measurements and investigations is storing data in its own database. In connection with planned activity within SOOP I have discussed about SOOP report delivered to CSR (for example: frequency) too.

Current measurements are made using ADCP RDInstrument, the same type of equipment is using at Maritime Branch (vessel mounted). Except this at IOW is used towed ADCP – it is mounted at catamaran very close to the sea surface. It enable current measurements closer to a sea surface. Measurement methods and some technical information were discussed. We were talked about lowering ADCP, but we concluded together that the Baltic Sea is too shallow water to use this method for current measurements.

Training project:
Numerical modeling and data assimilation by coupled ice-ocean model

Visitor: Robert Osinski roberto@water.iopan.gda.pl
Sending organization: Institute of Oceanology Polish Academy of Sciences
Hosting organization: Swedish Meteorological and Hydrological Institute
Visit period: From …. …… 2005 to …….. 2005

PAPA-WP4 Agreement No: 12
Date: 02 March 2005

1. **Short description of performed activities.**

During my two weeks stay at Swedish Meteorological and Hydrological Institute (SMHI), Rossby Centre I focused at the RCO and HIROMB models. Modeling details and possible results for both regions Baltic Sea and Arctic Ocean were discussed with Markus Maier, Ralf Doscher and Lars Axell. I have learnt about the data for initial and forcing fields utilized by both models. Some analysis about the last Baltic Sea inflow event comparing results from the model with data collected by IOPAS were done.
I have discussed advantages and disadvantages of using assimilations techniques for the operational ocean models. I have learnt about the implementation of the classical Method of Successive Corrections in the HIROMB model.
I have taken part in two seminars:

a) Implementation of Flux Corrected Transport (FCT) advection scheme. Important especially when introducing biogeochemical model.
b) CDO - Climate Data Operators. CDO is a collection of command line Operators to manipulate and analyze Climate Data files. Supported file formats are GRIB, netCDF, SERVICE and EXTRA. There are more than 200 operators available.

2. **Short description of the results/experience of the visit.**

a) Practical knowledge about implementation of FCT.
b) Using CDO as a environment for data analysis especially very large net CDF or GRIB format files.
c) Using the data assimilation technique Method of Successive Corrections.
d) Experience in RCO model results analysis.

3. **Comprehensive implementation plan of the results/experience in Sending Organization.**

a) Implementation some models options in our model as I have practiced at SMHI.
b) As a long term task doing some data assimilation using data from IOPAS in the south Baltic region.

Prepare an article including results regarding the 2003 inflow event in model with FCT, CD and in data using CTD and VM-ADCP collected by IOPAS.

Training project:
Basic knowledge and abilities of water modelling and water models application

Visitor: Katarzyna Czosnyka
Sending organization: Institute of Meteorology and Water Management Maritime Branch in Gdynia
Hosting organization: Finnish Environment Institute
Visit period: From 25. September 2005 to 08. October 2005

PAPA-WP4 Agreement No: 13
Date: 15 September 2005

I. Outline

1. Basics and main characteristics of models
    a. state variables, initialization field, boundary conditions, forcing
    b. Lagrange, Euler
2. Review of existing models
    a. 0D, 1D, 2D, 3D-models
    b. differences between water quality and ecological and biogeochemical models
    c. possibilities for implementation of biological modules
    d. exercises with models: HAMBOX model, EIA model
3. Set up of COHERENS model, visualization of test simulations
4. Advanced modeling of coupled ocean-biological models
    a. necessary tools for advanced modeling
    b. set up of COHERENS model
    c. visualization of test simulations of COHERENS
5. Short introduction to catchment area model (Model INCA – *Integrated Nitrogen in Catchments*)
6. Acquainted with the Seatrack Web – an on-line drift forecasting system for emergency purposes.

II. Training program details

"Numerical model: One or more mathematical expressions that approximate the behavior of a system such as the Earth-atmosphere system."

(http://www.ametsoc.org/amsedu/WES/glossary.html)

In order to represent the processes in nature I learned that the environment, which I want to investigate, has to be subdivided into several compartments so called state variables or prognostic variables. According to that, the aquatic ecosystem is generally subdivided into several compartments comprising primary producers, consumers, decomposers, nutrients and dead organic

material. Depending on the question which needs to be answered the models distinguish substantially from each other.

The main subject of my interest was an ecological model. I have acquainted with two ecological modules coupled to 3D-physical models, which were COHERENS and EIA model (that is used in SYKE). These models run under different operational systems, Windows and Linux. Besides differences in model structure (e.g. physical model, number of state variables) the data format of the model input and output are different in these models and also the visualization tools.

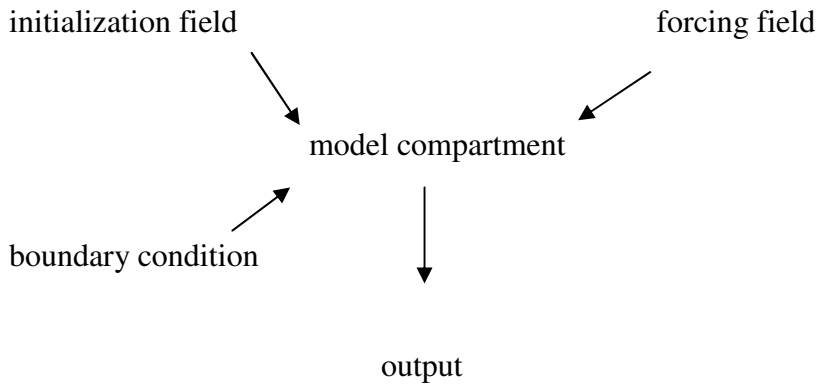
Ecological models are important mathematical tools, for example often used when it is needed to assess the status of the water environment. Ecological models simulate the processes of a specific ecosystem.

In order to start working with each kind of models, there is a need to make assumptions and define:

initialization fields: which are input to the model only at the beginning of the model process (t=0); the initialization field must be known for every state variables we are going to computed,

forcing field: that are the forces from which drive the variables (from outside); for biological variables these are for example: atmospheric deposition (nutrients), agriculture leaching (nutrients), river runoff (nutrients + phytoplankton), physical dynamics (velocities, temp. solar radiation (Photosynthetic Active Radiation), it depends on the particular situation of the modeling area),

boundary condition: Boundary conditions are necessary to define possible fluxes at the boundaries of the model

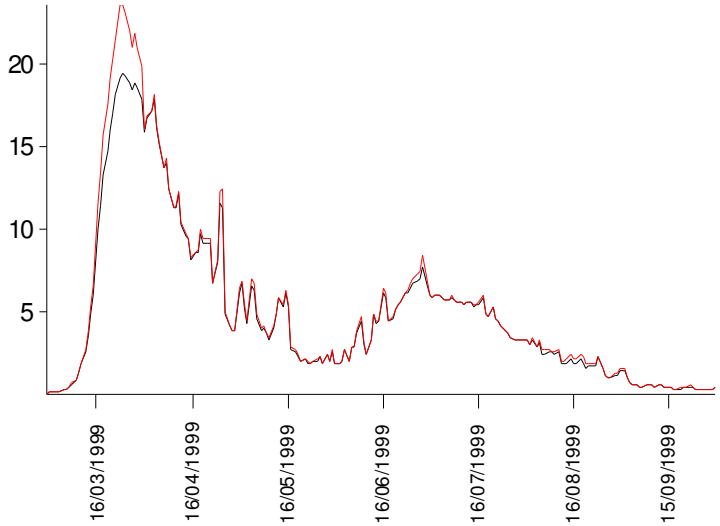


Initialization field, parameters, forcing field and boundary conditions depend on the model dimensions. Depending on the application or the task, initialization fields and boundary conditions have to be adapted. For example, for a realistic 3-dimensional Baltic Sea model, 3-dimensional nutrient initialization fields are required.

The important part of my learning was exercises related to calculation of state variables – nutrients and phytoplankton and also how to take into account loads from rivers. These exercises were also

related to biological topics, such as Redfield ratio, sources and sinks of phytoplankton, PAR (PhotosyntheticActiveRadiation) calculation.

I approached my education by working with ecological models, such as SYKE-EIA and COHERENS.
Following exercise with the SYKE-EIA model has been carried out:
For a regional model application in the Bothnian Bay the nutrient river loading of the river Lapuanjoki has been reduced by 50% according to the guidelines of the Water Framework Directive. The model has been run from March 1999 to October 1999.
Model output has been analyzed with the GUI (Graphic User Interface).



Phytoplankton concentration (mg WW/l) in Bothnian Bay

Model results show a significant decrease of phytoplankton concentrations when the river loading has been decreased by 50%. The phytoplankton is, however, only affected in the beginning of spring.

III. Results of the visit

During the training period in SYKE, the possibilities of ecological model setting up in IMGW have been discussed with Dr Inga Hense. Two main options were selected:

- write our own biological module adapted to HIROMB
- take into account cooperation within Neumann Baltic Sea ecosystem model

There are exist also other possibilities refer to ecological model implementation in IMGW. The choice will be depended on later discussion with scientists in IMGW engage in modelling and our needs and expectations.

IV. Acknowledgment

I would like to thank Inga Hense and Maria Gastgifvars for all clear explanation, discussion, direction, and familiar atmosphere. It was a great pleasure to visit SYKE.

Training project:
Forming complex system of the data management and transformation results into end-user products for Regional Service with use observing and forecasting system, analysis and operational database, numerical modelling

Visitor: Alexej Seliverstov salex@meteo.nw.ru
Sending organization: Regional Center for Hydrometeorology and Environmental Monitoring, St – Petersburg, Russia
Hosting organization: Danish Meteorological Institute
Visit period: From 17 October 2005 to 30 October 2005

PAPA-WP4 Agreement No: 14
Date: 18 October 2005

Fellow	Alexey Seliverstov
Training Project	Forming complex system of the data management and transformation results into end-user products for Regional Service with use observing and forecasting system, analysis and operational database, numerical modelling
Hosting organization	Danish Meteorological Institute
CBB member in the hosting organization	Erik Buch

At present, departments of the Regional Center use different system of the hydrometeorological data management with different kind of the output forms, formats, map formats, often non-standard formats without complex data integration.

Project - propose development and introduction complex system data management and making standard output forms of reports, maps and other types information in the different direction of the activities of the St.Petersburg Regional Center, including data management for Baltic Sea and Finnish gulf. The system propose realization all the forms of the data management into Regional information Center, take part the informational and computing resources of the St.Petersburg Regional Center and other regional departments and organizations of the Federal Service Roshydromet, take part informational and computing resources of the members PAPA project.

Result – getting end-user products in the standard special reports, maps, and other special message for send to standard communication channels (fax, automated fax-service, radio, mail, broadcasts, web-service, ftp-service) at the short time.

Technological and functional features of the organization of system of gathering and processing of the hydrometeorological information from process of measurement of data before reception of a target product under the following plan:

1. The Infrastructure of maintenance access to the allocated meteorological databases.

2. The Organization of various reliable delivery services.

3. Maintenance of global politics of the safety operated by partners and integration of these global politics in their existing infrastructure of safety.

4. The Organization of uniform representation of the information.

5. Standardization of search mechanisms of a data access.

6. Standardization of mechanisms of distribution of data.

7. Standardization of Mechanisms of formation of data.

8. The Allocated services of data processing.

9. Questions of formation and representation on the basis of the complex technical information of the data allowing in the accessible form to inform a society about forthcoming events and allowing to react to these events.

10. Tools of the analysis of consequences, for an estimation of influence of event on a society and its infrastructure.

11. Used Geographical Information Systems (GIS) to analytical models which allow to appreciate influence of event. Target Ecological information

12. The Organization of interaction from mass-media and other organizations, private persons. Forms and ways of representation and transfer of the information.

The Plan training consists:

Introduction DMI organization. Structure and Main direct activities.

MySQL database system

Data processing with MySQL database system. Informational and search system. Use system for water level system control for Baltic Sea (examples).

Warning and crisis management system.

Structure and organization its management system.

Remote sensing.

System of the satellite observation. Use satellite information for different services of DMI departments (common forecaster, shipping routes, marine forecast, etc.)

Shipping navigation route forecast.

The main activities. Introduction forecast navigation system. Use its system for work of shipping forecast department for shipping rote in around the World. The ship forecaster service Atlantic region, Pacific region, Indian region from DMI over ship company or direct connect with ships. Forecaster have all navigation information from ship on the your workstation and have possible operative correction route.

Service of the airport Copenhagen from DMI.

This uniform system for its airport and for all airport of Denmark. DMI have forecast group for airport services and all information for pilot prepare in forecast department DMI.

Local database system.

Structure of database system. System of access to European database. Use of recourses EU computing and dabases.(HIRLAM model) Use BUFR code for delivery information. What center receive information from.

Sea ice forecast system (for GreenLand).

This service use only for GreenLan AREA. Input information received from: Satellite information NOAA and mainly RADERS-Satellite from CANADA. Receive Station have place Greenland and One Station on DENMARK. Additional information: standard meteorology information station of observation, vessels information from its area, RADERS satellite send high resolution image 100 m per px. Ice Sea group use MODIS information additional. All data write archive. Database commonly for DMI. Ice-chart information sent to consumers over e-mail, presentation in the internet web-sight for common use, send over fax. The main period of activities – august only for all Greenland, but all year south coastal of Greenland. All group ice service placed in DMI, but in Greenland have operative group for helicopters observation of the coastal. Ice Sea Activities around Denmark coastal – very small and not every year. It depends from season. This group not make forecast. Its group have analyze of ice information and pure output consultation for current conditions. All this information has free access from Internet. All receiving satellite information may be representative kind: visual, infrared, and nave soft for color image different surfaces (comment: the color continental not equal color water ice.).

ClimaDB The new climate database to be installed at DMI

StatDB The new station management system which has been defined, and will be installed at DMI in 2004 by an external contractor ObsDB A new observations database at DMI which does not yet exist. It will be defined by the computer department and should ideally be installed at the same time as the new climate database ClimaDB.

INGRES The current climate database at DMI. This contains currently both observation data, climate data and station information (the latter is commonly called “the station catalogue”).

GIS Geographical Information Systems (e.g. ArcView, Map-info) GRID data DMI has a system of climate data in a system of grid-squares covering Denmark (not Faroe Islands or Greenland). This is called climate grid Denmark. The GRID system has several spatial resolutions 10, 20 and 40 km, and it is filled with values by using advanced interpolation techniques and weighting of data from the individual observation stations. CaveMet Computer Aided VErification of METeorological data. A program developed for quality control of data from individual stations before these data are used in the GRID system. Country-wise Data values which represent Denmark as a whole, calculated on the basis of monthly values from several selected stations.

Introduction

The current document describes the demands and requirements for a new climatological database at DMI - ClimaDB. The current INGRES database was installed in 1992 and the last upgrade was done in 1997/1998. DMI has decided to install a more modern and up-to-date system. This has several reasons. First of all, most of the stations in DMI’s observation network have been modernized over the last years with new automatic measurement stations that create large volumes of data, which are not currently archived in an optimal manner. Secondly, a number of the current functionalities and applications existing within INGRES needs a great deal of manual input, which could be avoided by being performed more effectively within an up-to-date system running on current state of the art software and hardware. Thirdly, it has long been a strong desire from the current database users to have a better user-interface with the database and to include quality control procedures and labeling. Fourthly, the INGRES hardware and software are getting increasingly difficult to maintain and support. Currently, INGRES holds both raw observation data and derived climatic data. This is not an ideal setup, so DMI wants to separate these into the actual observations stored in an observations database (ObsDB) and derived data stored in a climate database (ClimaDB).

Therefore, the table structure in ClimaDB should not be equivalent to the one in INGRES because of the exclusion of raw observation data. Further, the ObsDB, which is not part of this ITT, should be designed to accommodate an increased data-input both from national and international data-sources. The issue of defining a new database for the climate data has been discussed for a number of years, and it is generally accepted that DMI should hereby re-think the entire database-system. Currently, also a number of smaller databases and archives are run, so many data are stored multiple times, and the overall dataflow is not easily mapped. In addition, a new Station Management System (StatDB) will be acquired and installed in 2004, so this part of INGRES will no longer be needed in ClimaDB. In INGRES, this part was called "the station catalogue". The ClimaDB should still contain enough station information to identify the data series, and be dynamically synchronized with StatDB. Therefore, in this requirement document it is assumed that the new ObsDB exist and that the StatDB is up and running. These two are both prerequisites of the current ClimaDB definition. See Figure 1 with an overview. On the other hand, it is not possible to create a new ObsDB without defining the ClimaDB and the relations between the two. So the purpose here has been to define the requirements for the design of the new ClimaDB while making appropriate assumptions on the ObsDB and StatDB**.** The StatDB will be installed in 2004 by an external contractor under the responsibility of the Observation department. The creation of the ObsDB is the responsibility of the computer department and will be done in parallel to the creation of the ClimaDB. This ITT concerns the creation of the ClimaDB, including delivery of hardware, software, and documentation of the system, plus maintenance-support during the first two years of operation.

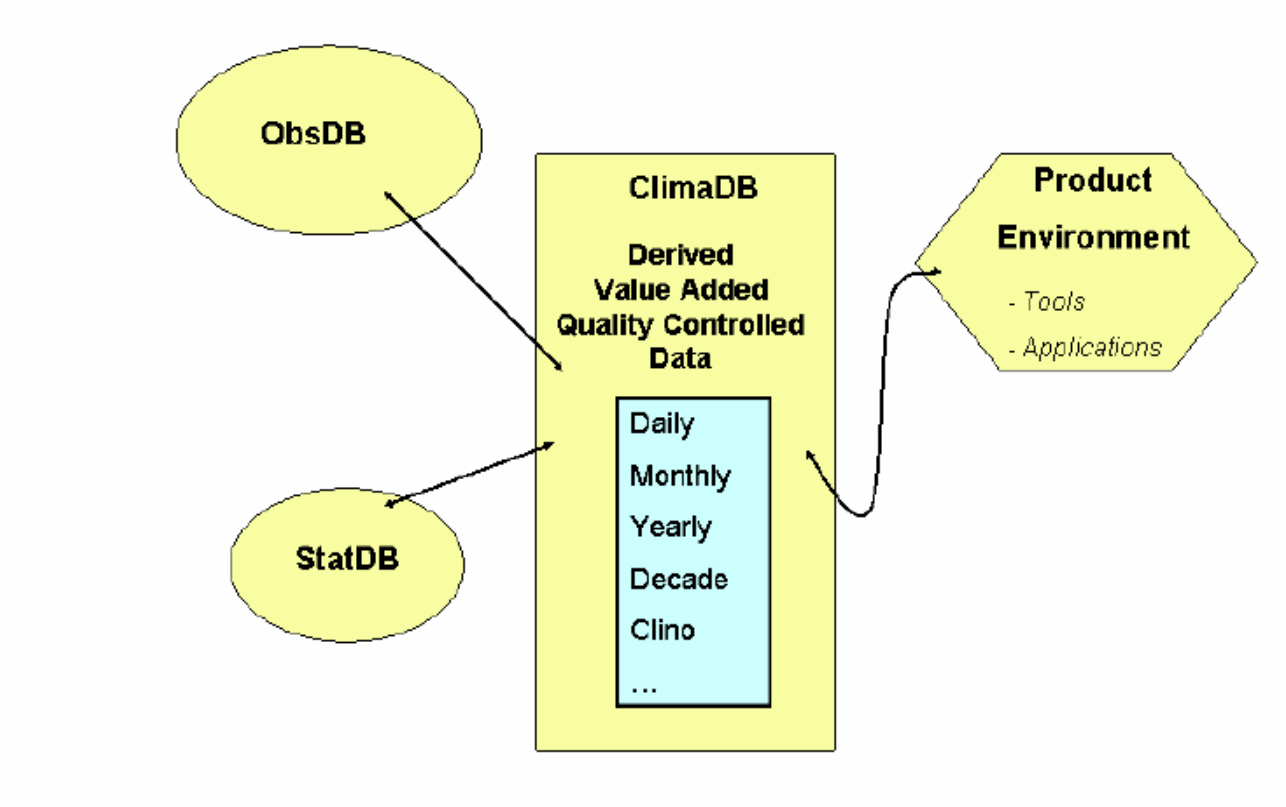


Figure 1: New environment surrounding the ClimaDB

General Description

In general, the ClimaDB should consist of ***quality controlled***, ***value-added/derived*** data. These could be both regular station data and GRID data (see list of abbreviations page 2), with some quality information

labeling. GRID data are currently produced for a number of key climate parameters such as temperature and precipitation. This is a system of grid-cells covering all of Denmark in three spatial resolutions (10 x 10 km, 20 x 20 km and 40 x 40 km), but not the Faroe Islands or Greenland. Daily data for each grid-cell are calculated from all available station data by a complicated interpolation scheme. From these also monthly and yearly values can be derived. The GRID data should be regarded just as important as the normal station data as they will likely play an increasing role for DMI's future climate products.

The Product Environment shown in Figure 1 is a natural part of the database setup, and involves the tools and applications used to derive many types of climate data products in order to satisfy both internal and external customers. These products require appropriate links also to the ObsDB and the StatDB. In Table 1 in appendix 9, a list of station types at DMI is provided.

Requirement: Relations between ObsDB and ClimaDB

The ObsDB provides the basis for all the data in ClimaDB. Since ObsDB has not yet been designed we expect that:

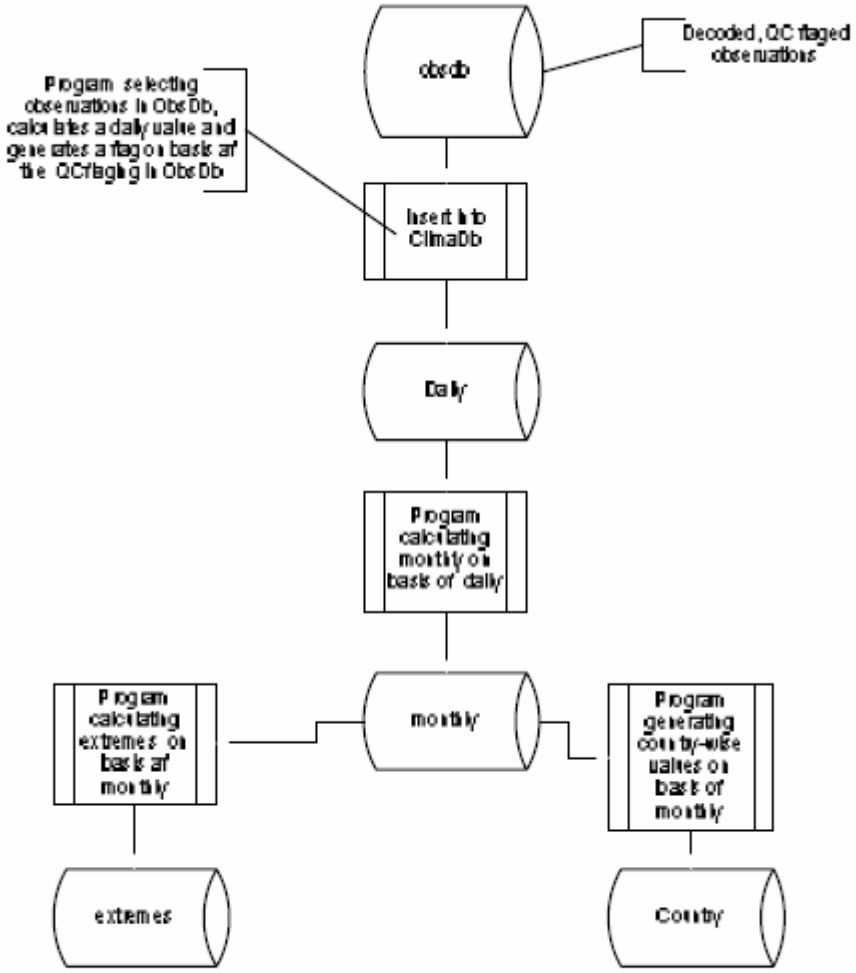
- Data are available in decoded form.
- Format and unit of each parameter in ObsDB is stored in one table in ObsDB. This is necessary for calculation of daily values.

If or when values in ObsDB are inserted, changed or deleted, this information must be transferred to ClimaDB, and new calculations initiated accordingly. Log-files could be used for this purpose. For instance hourly log-files could be written and a program created to look for these, and transfer the relevant information to ClimaDB. Afterwards, the particular log-files can be deleted or marked as *read*. Some observation values have an influence on several element numbers in the daily tables. For instance one particular precipitation observation has an influence on daily values with element numbers 601, 604, 605, 606, 607, 608 and more. Others may not have an impact on the derived daily values.

The handling of which changes should initiate which re-calculations could be managed by a separate table in ClimaDB:

Observation parameter	**Element numbers for re-calculation**
ttt	101, 111, 112, 114
rrr	601, 604, 605, 606, 607, 608… etc.
….	….

Figure 2 depicts the general flow of data from the ObsDB to the ClimaDB, and the creation of the value-added products daily, monthly, extremes and country-wise values. These products will be described later.



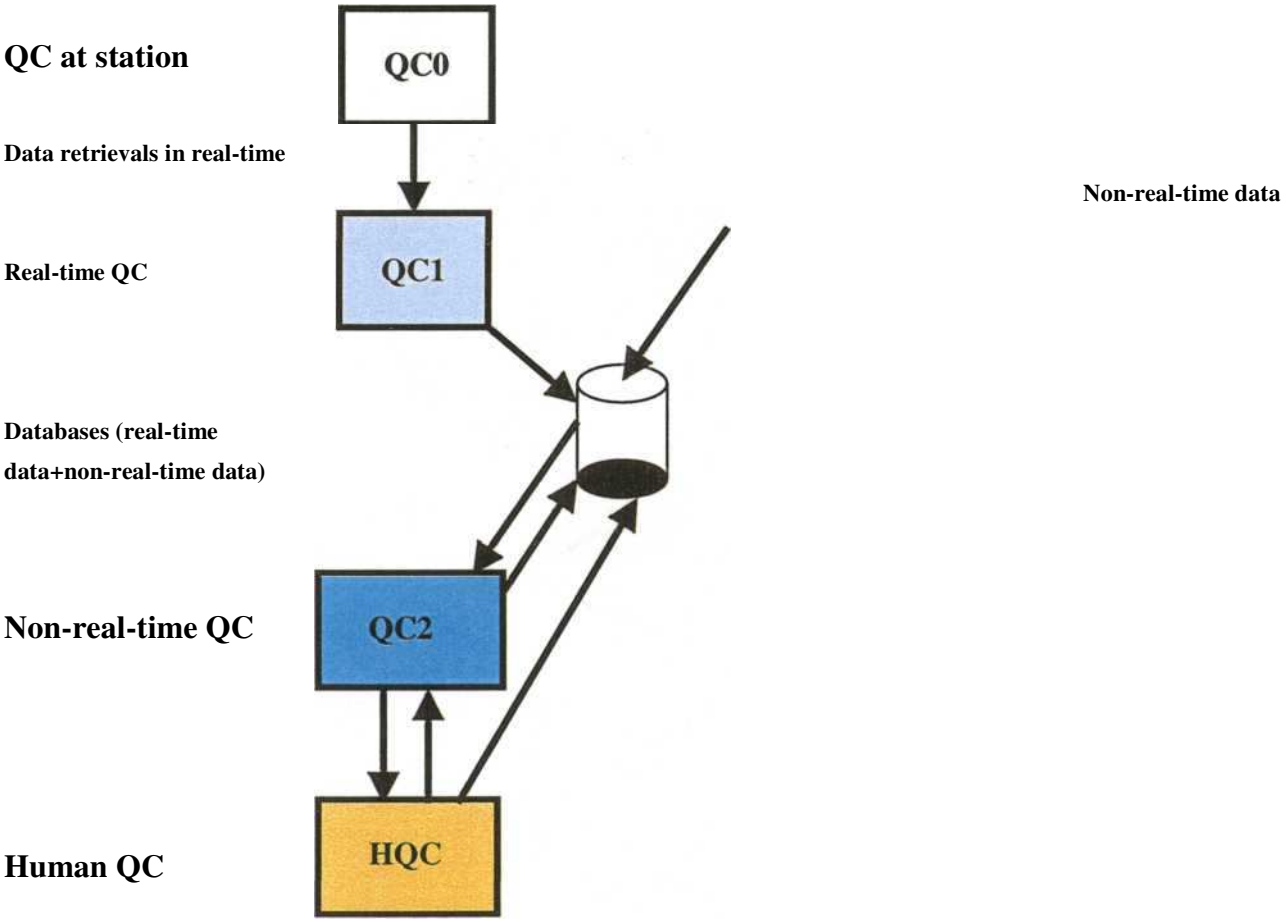
Quality Control of Meteorological Observations

- analysing data by using self diagnostic methods in the equipment to monitor actual
- conditions
- analysing data from one station, either instantly or temporally
- analysing data from several stations (spatially), either instantly or temporally

There are different demands for time of data delivery to the end-users; some want data in real time while others can accept some delay. Consequently, there will be a different need for the level of the preceding quality control and inspection of suspicious data, and it can be split up into two phases:

- real-time quality control (QC1): All checking is done continuously for one station at a time,e.g. step and consistency checks, or comparing with numerical models
- non real-time quality control (QC2): Ann expansion of QC1 including spatial and temporal checks with multiple stations.

During quality control, suspicious values or certain errors may have been identified. Flagging information should be assigned to each data element in order to indicate the level of data quality. Some erroneous and suspicious values must be inspected manually to avoid exclusion of extreme weather phenomena. Data corrections are mostly done manually, but some automatic methods or model output can sometimes be used. Improving HQC methods will be the main task for further co-operation in Nordklim.



General overview

Various symbols and names are used to indicate the quality control level (QCO, QC1, QC2, HQC, where HQC can be divided up into HQO, HQ1 and HQ2) and the checking types (e.g. range/limit, step, consistency, spatial and homogeneity checks). Naming guidelines of meteorological parameters and checking algorithms are defined in order to make it possible to specify any checking algorithm and parameter name.

Definitions of data types

Real-time data

Real-time data are observations retrieved by automatic data processing (ADP) methods from the site in real time, or almost in real time, and transmitted to a collecting centre

instantaneously and delivered to users. For instance, synoptic messages and AWS data are considered real-time data. It is difficult to define an exact time limit for an acceptable delay in the receipt of data from the stations. A straightforward definition could be that real-time data are observations that may have been subjected to automatic quality control, but are received early enough to be used by real-time data users, e.g. forecasters. Warning systems data should be received as quickly as possible while other end-users do not need data as fast.

Non real-time data

According to the previous definition of real-time data, non real-time data are observations that are received later than for example 10 minutes after the observation time. Typically, this is data from automatic or hybrid stations delayed due to interruptions in data transmission, or data from manual stations, for example manual precipitation stations that send the observations by mail.

Metadata

Metadata are various kinds of information about meteorological stations such as: general station information (e.g. geographical co-ordinates, addresses, personnel), station history, sensor history (e.g. calibration, repairs), description of station environment (vegetation, terrain, exposure, etc.), kind of equipment, state of station, service information and plans, sensor statistics (e.g. frequency and kind of error), station statistics, station climate, software versions, and references to documentation.

Definitions of quality control levels

QCO - quality control at station site

QCO is performed at the station site by correction programs that are developed by the met office or
the manufacturer. On-site quality control procedures include:

- site evaluation
- installation of instruments
- installation of data collection and transmission systems (hardware and software)
- quality control methods
- self-diagnostic systems
- instrument service
- personnel training

QCO may include quality flagging. Some automatic stations produce error reports attached to the messages they send. QCO may be fully automatic or involve human resources, i.e. the observer. A fundamental statement is that "data quality starts at the site".

Types of quality control methods that can be implemented on-site are range, step and consistency checking.

QCl - Real-time on-line quality control

QCl is automatic checking of real-time data performed on-line on a station-by-station basis. Because observations from neighbouring sites are not necessarily available in real-time it

is not possible to use interpolation methods. Furthermore, observations arrive at the NMS's in random order, which makes the use of data from neighbouring sites impractical in the real-time window.

Methods for checking data values at the QCl level are mainly based on the following methods:

- range and limit checks based on statistical limits
- step checks for control of parameter value changes
- internal consistency checking
- checking missing values and syntax control
- checking methods comparing observed and expected values, the latter derived from numerical forecast models, e.g. HIRLAM

At this quality control level, preliminary flagging for values, that are suspicious or certainly in error, can be included in order to prevent the use of totally erroneous data and warn the users.

QC2 - non-real-time quality control

QC2 is automatic data checking after real time. This definition implies that observations from neighbouring sites are normally available during quality control. This enables spatial analyses of data through a variety of checking methods, for example interpolation methods. Tests from QCl can be applied at the QC2 level. More exact statistics can be applied in this part of the quality control, for example by using interpolation methods such as Kriging or HIRLAM analyses, special products, mesoscale analyses that may use parameter fields of prognosis models, radar and satellite data.

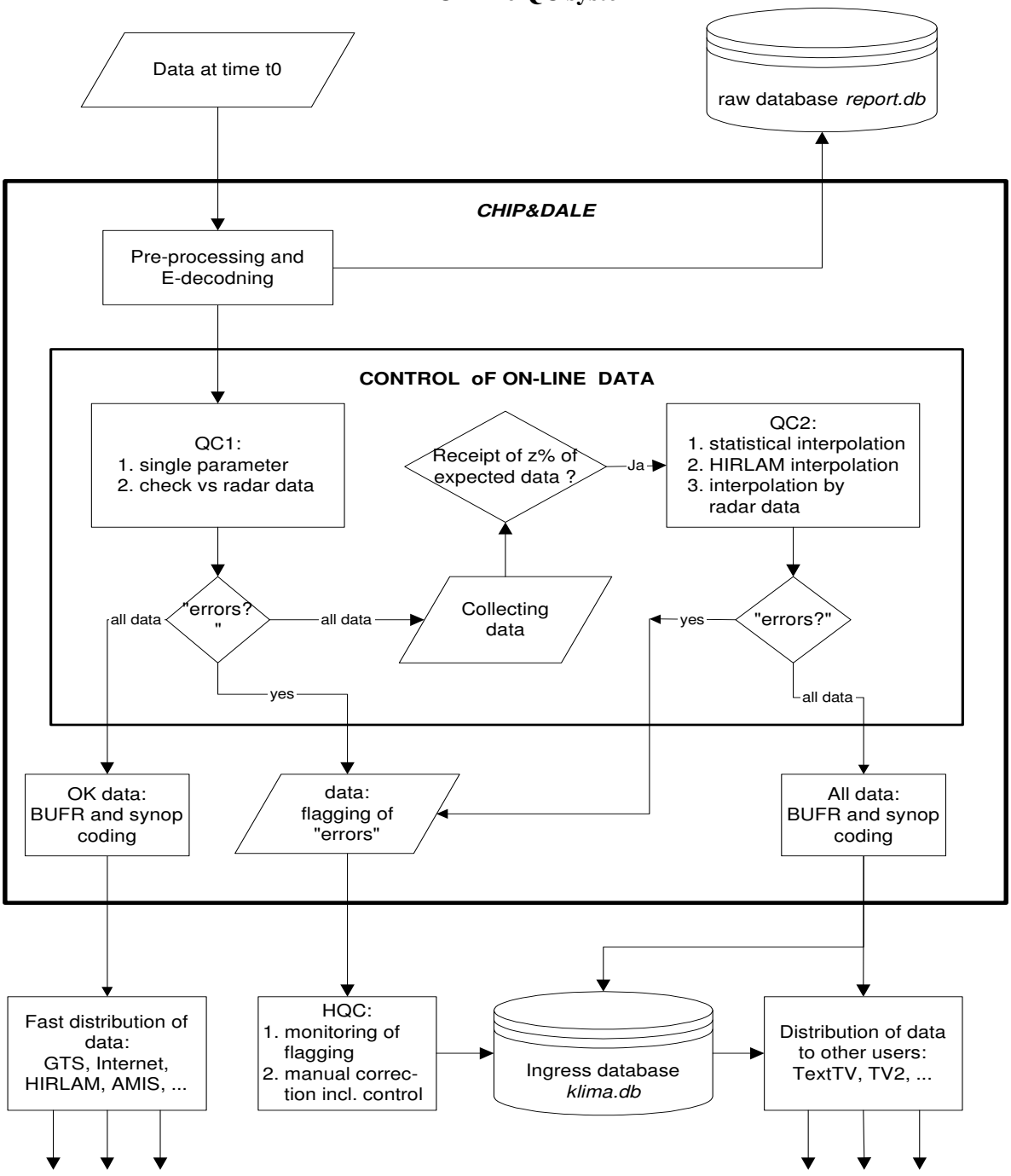
Comprehensive quality data flagging should be included in this phase as much as possible. Correction methods could be included in QC2. Missing data will be detected, and it is possible to calculate or interpolate values to compensate for missing data.

HQC - human quality control

Manual quality control can be done on all levels. HQO is done at station level. HQ1 includes manual inspection of errors and suspicious values that have been identified at the QCl level, while HQ2 includes inspection of values found at the QC2 level. HQC can include inspection at any level.

After quality control at a certain level, databases may include some unresolved errors in observation data. HQC is the final phase in quality the control procedure. The purpose of manual inspection is to examine only erroneous or suspicious values, and a comprehensive flagging will allow the map representation of erroneous, suspicious and modified values. A manual control system can be used to modify and accept values and these modifications in turn will affect the flagging. HQC can be done in many different ways; for instance, it could be based on various paper formats, error lists and possibly graphical fields, and on the other hand it could be based on a GIS system for interpretation of flagging and data values by maps and tables. Visualisation of data is very important, e.g. sums, graphical presentations of data, observations of neighbouring stations etc. Currently, GIS tools are only slightly used. From the HQC phase it should be possible to return to the previous quality control phase in order to check and trace modifications.

On-line QC system



The Organization of interaction from mass-media and other organizations, private persons.

Forms and ways of representation and transfer of the information.

PR-group DMI.

Look site DMI. PR-group DMI makes 2 persons who directly are engaged in maintenance in an actual status first of all the information containing on a site. 90 % of an exchange with consumers are carried out through a site.

The basic information (forecasts in text and a kind of images) is placed on a site automatically. Preparation of press releases, or editing of any interesting information acting from divisions DMI, or from users of a site is manually carried out. The information for radio or TV also acts mainly from a site or e-mail after editing. There is a constant interactive process with users of a site.

The main advantage of site DMI, before other sites of such direction is a completeness of the regional information. Basic position of service, freedom in granting the information, i.e. for example radars extend in free using, but only time at 2 o'clock. If you wish to use all completeness of station (i.e. sessions with 10-minute intervals then additional payment is required).

Very interesting approach in job on education of clients of area of understanding and correct application of that information which is given DMI. On each page where various forms of representation of the information are presented is the comment as to use it. Use portable meteorological stations, very compact, which are on sale to simple consumers and everyone can spend at home supervision, at desire the consumer can pass this information in DMI where she will be placed on a site, on a special page. It is absolutely simple data set: temperature, humidity, pressure, a direction and speed of a wind. If you participate in this program if necessary to you will spend checking devices for quality of measurement. These data only for the information, for fund of data they certainly are not used, but the project very interesting.

On a regular basis there is an estimation of amount of visiting, the estimation of is spent what kind the information is necessary for users on a site. Especially in divisions there is no concrete expert for job with information filling a site or for job with PR-group. SMS and MMS transfer is not popular, used a variant of a site for mobile systems (but not WAP) is a way of representation of the information on the contrary is popular. The regular estimation of interaction of job with consumers allows to exclude not used and unpopular forms of representation of the information. For example, the full information is stored only in a variant of the Danish language. The English variant of a site is not full and demands qualitative translation and greater expenses at automation.

NINJO model.

It is system of modelling and complex display of all hydrometeorological information. It is the client-server ú¿ß-SYSTEM, allowing to adjust{set up} the interface of the client under problems{tasks} concrete the expert. The model to be in a stage of development and at the first stage is formed as meteorological system for the forecaster-meteorologist.

Forecasts pay off for 24h, 12 h, 6h, 4h, 3h, 2h, 1h, 30 min, 15 min, 10 min. In a basis HIRLAM data , satellite information METEOSAT and RADARSAT, the information from 3 RADAR stations , and also current and forecasting information from exchange WMO are used. The system in the long term will replenish with an opportunity of calculation of complex model of levels, temperatures, salinity. The system is constructed as graphic system with clear adjustments{options} of the interface of each expert under the tasks.

RESULT

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The interesting information has been as a result received and technological decisions of construction of structures of databases on an example are considered ClimatDB, the organization of interaction with the external consumers, new forms of representation of the information. In connection with installation of a new RADAR station in territory of Leningrad region very much the helpful information on verify raingauge observations by using weather radar data. Questions of interaction on data exchanges of levels in view of perspective opening of 2 new stations in Kaliningrad areas are fulfilled.