BALTEX

Baltic Sea Experiment

World Climate Research Programme / Global Energy and Water Cycle Experiment
WCRP GEWEX

Minutes of

7th Meeting of the BALTEX Science Steering Group

at
Hotel Aquamaris
in Juliusruh, Island of Rügen, Germany
26 May 1998

edited by
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International BALTEX Secretariat
Publication No. 12
November 1998

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Printed on 50 % - recycled, chlorine-free bleached paper

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Introduction

The 7th meeting of the BALTEX Science Steering Group (SSG) was held in the course of the 2nd Study Conference on BALTEX at Hotel Aquamaris, Juliusruh, Island of Rügen, Germany. The meeting opened on 26 May 1998 at 8 p.m. and closed at 9.30 p.m. the same day. The participants at this meeting are listed in Appendix 1.

The major topic of this short meeting was to review the present state of the preparations for the main BALTEX modelling and observational phase *BRIDGE*.

1 *BRIDGE*

Dr. Mikko Alestalo, the chairman of the BALTEX Task Force, summarised the preparation activities for *BRIDGE* which were undertaken since the previous SSG meeting in March 1998. Following the suggestion of the SSG at the latter meeting two documents were drafted by the BALTEX Secretariat in close co-operation with members of the Task Force:

- a draft Interim Memorandum of Understanding for the conduct of *BRIDGE*,
- a draft Technical Implementation Plan for *BRIDGE*.

1.1 Interim Memorandum of Understanding (IMOU)

Dr. Alestalo pointed out that the purpose of this IMOU is to summarise the *BRIDGE* strategy as given in the Strategic Plan and to indicate the distribution of activities and responsibilities among the research institutions, agencies and universities (referred to as „Parties" in the following) for the preparation and conduct of *BRIDGE*. The draft version which was presented to the SSG includes those contributions which had been received by SSG members as re-actions to the Strategic Plan at the beginning of 1998. The IMOU has the character of a *letter of intent* where potential contributors to *BRIDGE* confirm their intention to participate in *BRIDGE* and outline their planned activities. The IMOU has a form previously used in other large international experiments and will have to be signed by the Parties. Dr. Alestalo stressed that, while all Parties indicate their firm intention to adhere to the terms of this IMOU, it is well understood that this document has no legal implications and shall in particular not constitute any legally binding obligations among the Parties. Further, the purpose of the IMOU is to demonstrate the necessity of additional resources for the preparation and conduct of *BRIDGE*. The IMOU shall in this context serve particularly as one background document for funding agencies, the latter being on the international level (e.g. EU), national levels or institute levels.

During the discussion of the IMOU SSG members pointed out the usefulness of the IMOU. It was in particular stressed that this document is important to demonstrate the international di-

mension of *BRIDGE*. The SSG suggested a few editorial changes and strongly endorsed the finalisation of the present draft with the following **action time schedule**:

I) during June 1998:

- the Secretariat and the Task Force to contact additional institutions and include contributions into the IMOU;
- the Secretariat to finally edit and arrange a legal check of the IMOU's text part;
- the Secretariat to mail the first official circular of the draft IMOU to Parties together with a cover letter by the SSG Chairman;

II) during July 1998:

- the Secretariat to edit the draft IMOU based on suggestions for additions or corrections as re-actions to the first circular;

III) during first half of August 1998:

- the Secretariat to mail the second circular of the IMOU to Parties together with a cover letter by the SSG Chairman requesting signatures to the IMOU before 15 September.

The SSG noted that the signature deadline of 15 September 1998 is not exclusive. Institutions may join the IMOU also at a later time. It was however stressed, that major contributions to *BRIDGE* shall be documented as quickly as possible in order to have a basic version of the IMOU signed which then may be submitted together with future funding applications for *BRIDGE*. The SSG would appreciate if Parties to the IMOU can manage to stick to the 15 September 1998 as the deadline for signatures since an agreement at a later time could jeopardise the planning schedule of *BRIDGE*. The hope was also expressed that an IMOU signed by a number of Parties may have a stimulating effect for additional institutions to join *BRIDGE*.

Note to the protocol (as of 28 August 1998):

Steps I) to III) of the action time schedule as given above were successfully conducted in close agreement with the time schedule suggested. The second circular of the IMOU has been mailed to 38 potential Parties, accompanied by a cover letter of the SSG chairman requesting signatures to the IMOU before 30 September 1998. The IMOU version as of 25 August 1998 is given in Appendix 2.

1.2 Technical Implementation Plan (TIP) for BRIDGE

Dr. Alestalo introduced the skeleton draft of the TIP. The structure of the draft TIP closely follows that of the FGGE (First GARP Global Experiment, GARP = Global Atmospheric Research Programme) Data Management Plan. As the follow-up document to the published Strategic Plan which contains the scientific justification and aims of *BRIDGE* the present draft TIP foresees to include a detailed description of

- the individual contributions by Services and agencies to *BRIDGE*,
- the observational and model data sets and products to be established during *BRIDGE*,
- the required network enhancements
- the data flow between data suppliers, data centres and data users,
- an operation plan for data centres,
- a time schedule of implementation actions and data exchange procedures,
- further logistical details such as data exchange policies.

The structure of the TIP was confirmed by the SSG. The SSG suggested to include an additional chapter which shall summarise the scientific plan and merits of *BRIDGE* in particular in view of the three disciplines meteorology, oceanography and hydrology involved. This chapter should also outline the *BRIDGE* analysis program.

Action:
The SSG Chairman, Professor Lennart Bengtsson, was asked to write the respective TIP chapter which shall summarise the scientific plan and merits of *BRIDGE* in particular in view of the three disciplines meteorology, oceanography and hydrology involved.

The Task Force and the BALTEX Secretariat were asked to further develop the TIP for *BRIDGE* along the lines of the draft skeleton presented at this meeting.

1.3 Specific oceanographic actions during BRIDGE

The SSG stressed the necessity of co-ordinated observational hydrographic field campaigns with participation of several research vessels from different institutions around the Baltic Sea as regular observational actions („International Baltic Year") during the *BRIDGE* base-line period in order to document the annual cycle of relevant parameters in the Baltic Sea. This issue had already been discussed and endorsed at the previous SSG meeting in Copenhagen. The SSG again noted that the benefits of *BRIDGE* for in particular the oceanographic community needs to be spelled out in more detail. Professor Anders Omstedt pointed out that the oceanographic community, in particular oceanographic research institutions operating research vessels in the Baltic Sea, need to be addressed again in order to get them more closely involved in the planning activities for *BRIDGE*.

Action:
The SSG asked Professor Anders Omstedt to take steps for the planning and co-ordination of the hydrographic measurement programs in the Baltic Sea during the *BRIDGE* period.

1.4 4DDA during BRIDGE

The backbone of the base-line activities during *BRIDGE* will include independent, delayed-mode 4-dimensional data assimilation (4DDA) runs of at least two operational Weather Serv-

ices including data storage and data distribution. Professor Eberhard Müller pointed out that the German Weather Service (DWD) is planning to conduct 4DDA runs which will be performed in addition to the routine operations of the weather forecast service during the entire *BRIDGE* period. Professor Müller continued to point out that the *BRIDGE* 4DDA activities at DWD will require additional resources (in particular extra personal).

Professor Sten Bergström also stressed that the HIRLAM-based 4DDA runs for *BRIDGE* at SMHI are planned as an extra-undertaking to the operational runs. He indicated the wish of SMHI to have other Weather Services, working with HIRLAM, included in the *BRIDGE* 4DDA activities. Dr. Alestalo indicated that FMI, DMI and SMHI are presently investigating a possible share of the *BRIDGE* HIRLAM 4DDA program among several institutions. However further negotiations are needed to arrive at practical solutions.

2 Other Topics

2.1 NOPEX

Both, Professor Eberhard Ruprecht and Professor Sven-Erik Gryning reported on the NOPEX Executive Committee (EC) meeting which was held earlier the same day at Hotel Aquamaris. The EC has suggested to lay down a *letter of understanding* between the BALTEX SSG and the NOPEX EC. This document shall in particular describe the mutual benefits which the two programs expect with respect to joint modelling activities and the exchange of observational data. This *letter of understanding* is planned to in particular address the future data exchange policy as well as possible joint measurement and modelling activities for *BRIDGE*.

The SSG welcomed this activity and confirmed its general preparedness to support such a *letter of understanding*.

Action:
Professor Ruprecht was asked to contribute as a BALTEX representative to the establishment of a draft *letter of understanding* between BALTEX and NOPEX which shall be discussed for approval at the next SSG meeting.

2.2 Baltic - HYCOS

Professor Bergström introduced the plans of WMO (in association with the World Bank) to implement a World Hydrological Cycle Observing System (WHYCOS). WHYCOS shall include several regional components in selected water catchments world-wide. A project profile for a Baltic-HYCOS (Baltic Sea Hydrological Cycle Observing System) has recently been drafted and is presently discussed in the hydrological community (see Appendix 3). Professor Bergström stressed that in particular the planned network of about 100 Date Collection Plat-

forms (DCPs), reporting in a near real-time major hydrological, meteorological and water quality variables, and the appointment of a regional centre with the task to co-ordinate the regional co-operation activities as well as the data exchange and dissemination system may constitute an important infrastructure in context with the planned *BRIDGE*.

The SSG followed Professor Bergström acknowledging the importance of the Baltic-HYCOS in particular for BALTEX and *BRIDGE*. The SSG strongly suggested a BALTEX representative to attend the preparatory Baltic-HYCOS meetings (preliminarily scheduled for September 1998 and September 1999, respectively).

Action:
Professor Bergström was asked to either attend the Baltic-HYCOS preparatory meetings by himself or to appoint another capable scientist to represent BALTEX at these meetings.

2.3 Task Force Membership

Upon suggestion by Dr. Alestalo the SSG appointed Professor Anders Omstedt as a new member of the BALTEX Task Force. Professor Omstedt confirmed his new membership in the BALTEX Task Force.

2.4 Next SSG Meeting

The earlier proposed date for the 8th SSG meeting (30 November to 2 December 1998) collides with the international CLIVAR Conference to be held in Paris, 1 to 4 December 1998. The SSG recommended to shift the meeting date for the 8th SSG meeting by one week. The exact meeting date will be determined and communicated after agreement with the local organiser. The meeting place will remain at the University of Stockholm in Sweden.

Note to the protocol (as of 23 June 1998):

The 8th SSG meeting will be held **8 to 10 December 1998** at Stockholm University (local organisation: Professor Hilding Sundqvist) with the following rough time schedule:

Tuesday, 8 December 1998
Afternoon: Scientific Symposium (Topic to be determined)

Wednesday, 9 December 1998
09.00: Start of the "business" part of the SSG meeting

Thursday, 10 December 1998
12.00: Closing of the SSG meeting

3 Closing

The Chairman thanked all participants for this constructive meeting and closed the meeting at 9.30 p.m.

4 List of Acronyms and Abbreviations

4DDA	4-Dimensional Data Assimilation
BALTEX	Baltic Sea Experiment
Baltic-HYCOS	Baltic Sea Hydrological Cycle Observing System
BRIDGE	The Main BALTEX Experiment, planned for 1999-2001
CLIVAR	Climate Variability
DCP	Data Collection Platform
DMI	Danish Meteorological Institute, Copenhagen, Denmark
DTU	Danish Technical University, Lyngby, Denmark
DWD	German Weather Service, Offenbach, Germany
EU	European Union
EC	Executive Committee
EMHI	Estonian Meteorological and Hydrological Institute, Tallinn, Estonia
FGGE	First GARP Global Experiment
FIMR	Finnish Institute of Marine Research, Helsinki, Finland
FMI	Finnish Meteorological Institute, Helsinki, Finland
GARP	Global Atmospheric Research Programme
GKSS	GKSS Research Centre Geesthacht, Geesthacht, Germany
HIRLAM	High Resolution Limited Area Model
IfMK	Institute for Marine Research, Kiel, Germany
IMOU	Interim Memorandum of Understanding
IOPAS	Institute for Oceanology, Polish Academy of Sciences, Sopot, Poland
MAGS	Mackenzie River GEWEX Study
MIUU	Meteorological Institute at Uppsala University, Uppsala, Sweden
MPIfM	Max-Planck-Institute for Meteorology, Hamburg, Germany
NOPEX	Northern Hemisphere Climate-processes Land-surface Experiment
RSHI	Russian State Hydrological Institute, St.Petersburg, Russia
SMHI	Swedish Meteorological and Hydrological Institute, Norrköping, Sweden
SSG	Science Steering Group
TIP	Technical Implementation Plan
WHYCOS	World Hydrological Cycle Observing System
WMO	World Meteorological Organization

Appendix 1

Participants at the 7th BALTEX SSG meeting 26 May 1998

Name	Institution
1. Pekka Alenius	FIMR Helsinki, Finland
2. Mikko Alestalo	FMI Helsinki, Finland
3. Lennart Bengtsson	MPIfM Hamburg, Germany
4. Sten Bergström	SMHI Norrköping, Sweden
5. Sven-Erik Gryning	Risø National Laboratory, Denmark
6. Hans-Jörg Isemer	GKSS Geesthacht, Germany
7. Sirje Keevallik	EMHI Tallinn, Estonia
8. Angela Lehmann	DWD Offenbach, Germany
9. Henrik Madsen (for Dan Rosbjerg)	DTU Lyngby, Denmark
10.Eberhard Müller	DWD Offenbach, Germany
11.Anders Omstedt	SMHI Norrköping, Sweden
12.Jan Piechura (for Jerzy Dera)	IOPAS Sopot, Poland
13.Ehrhard Raschke	GKSS Geesthacht, Germany
14.Eberhard Ruprecht	IfM Kiel, Germany
15.Ann-Sofi Smedmann	MIUU Uppsala University, Sweden
16.Ronald E. Stewart (representing MAGS)	Environment Downsview, Canada
17.Valery Vuglinsky	RSHI St. Petersburg, Russia

Appendix 1: Participants

Appendix 2

Interim Memorandum of Understanding

for the Conduct of

in the frame of BALTEX

between

the BALTEX Science Steering Group
represented by
the Chairman Professor Dr. Lennart Bengtsson

and

Services, Research Institutions and Universities
contributing to *BRIDGE*

25 August 1998

Preamble

1. The BALTEX Science Steering Group (SSG) has proposed the *BRIDGE* experiment as the main intensive observational and modelling period in the frame of BALTEX. *BRIDGE* is planned for the period **October 1999 to December 2001**.

2. On the basis of the BALTEX Initial Implementation Plan (BALTEX 1995) a Strategic Plan for *BRIDGE* was written by the *BRIDGE* planning group (BALTEX Task Force) during 1996 and 1997; it was approved and endorsed by the SSG in July 1997 (BALTEX 1997b). The Strategic Plan includes the scientific aims and merits of *BRIDGE* as well as recommendations for actions to be taken for the successful conduct of *BRIDGE.*

3. The Strategic Plan includes a great number of requirements and recommendations regarding observational practices and arrangements, model development activities, data collection, checking and retrieval activities and data processing routines. Many of these components are part of the everyday life of the organisations presently participating in BALTEX, but yet a great deal of extra undertakings is required. It is essential that the participating organisations, i.e. national Operational Services in the fields of meteorology, hydrology and oceanography, research institutes and universities commit themselves to fulfil the Strategic Plan. This will require economic, technical and human resources. Only through such investments will *BRIDGE* be successful.

4. Since the publication of the Strategic Plan the SSG has received a number of positive comments on *BRIDGE* from both Operational Services and research institutes in Europe. These comments also indicate that logistical and in particular financial implications related to *BRIDGE* contributions need further clarification and solution.

5. As a step towards the implementation of *BRIDGE* an Interim Memorandum of Understanding (IMOU) has been prepared for the preparatory phase of *BRIDGE*. Together with the Strategic Plan this IMOU will be the basic input document to the first *BRIDGE* Implementation Meeting to be conducted early in 1999. In parallel the Technical Implementation Plan (TIP) for *BRIDGE* containing details on the individual contributions to *BRIDGE* is being established and will continuously be updated throughout the preparatory phase of *BRIDGE.*

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Article 1

Purpose of this Interim Memorandum of Understanding (IMOU)

1. The purpose of this IMOU is to summarise the *BRIDGE* strategy as given in the Strategic Plan and to indicate the distribution of activities and responsibilities among the Parties (see article 2) for the preparation and conduct of *BRIDGE*.

2. It is understood that the realisation of both the preparation and conduct of *BRIDGE* activities will depend on satisfactory solutions of financial, logistical and manpower problems.

3. Based on item 2 the purpose of this IMOU is to demonstrate the necessity of additional resources for the preparation and conduct of *BRIDGE*. It is understood that this IMOU also serves as one *BRIDGE* background document for funding agencies. These funding agencies may be on the international level (e.g. EU), national levels or institute levels.

4. While all Parties have the firm intention to adhere to the terms of this IMOU, it is understood that this document has no legal implications. This IMOU shall in particular not constitute any legally binding obligations among the Parties.

Article 2

Parties to this Interim Memorandum of Understanding

1. The Parties of this IMOU shall be national Hydrometeorological Services, research institutes and universities as listed in Annex 1. Annex 1 constitutes an interim product, it being understood that the final list of contributors to *BRIDGE* may further develop during the preparatory phase or even during the *BRIDGE* period itself.

2. Annex 1 is on the institute or agency level and does not so far further divide into departments or groups.

3. Annex 1 also includes the individual contributions of the Parties as well as the names of the contact persons at the Parties responsible for the individual contributions to *BRIDGE*. It

is again understood that the list of contributions is an interim product and that the final list will evolve during the *BRIDGE* preparatory or executive period.

4. Contributions in Annex 1 reflect necessary actions for a successful conduct of *BRIDGE*, as seen from the viewpoint of the BALTEX SSG and based on the recommendations given in the Strategic Plan. The present status of the individual contributions in Annex 1 is different and may be divided as follows:

4.1. Contributions are based on the Party's commitments, which have been already received by the BALTEX SSG.

4.2. Contributions represent the Party's intentions, the implementation of which is dependent on additional resources (i.e. funding).

Article 3

Annex 1 is an integral part of this IMOU.

Article 4

General Description of *BRIDGE*

4.1 Major Purpose of BRIDGE

BRIDGE will be the main intensive observational and modelling period within the framework of BALTEX. It is presently planned to be conducted during the period from **October 1999 to December 2001**, thus covering two complete annual cycles. Its major purpose is to provide observational and model-based data for detailed analysis of water and energy cycle budgets and processes in the climate system (atmosphere, land surface including rivers and lakes, Baltic Sea, ice) of the entire water catchment area of the Baltic Sea. These data will also be used for the validation of different models such as weather forecast -, climate -, hydrological -, and ocean models, and in particular for coupled models. These models consider processes in the atmosphere, components of land surface processes and runoff over the continents and the dynamics of the Baltic Sea including its sea ice evolution, respectively.

4.2 Observations and Model Output

The two outstanding aspects of *BRIDGE* are the effective use of all relevant observational material and the use of meteorological, oceanographic and hydrological models. The purpose of *BRIDGE* is to aid access to all observations made in the study area and to enhance the use of new experimental data. Observational networks are encouraged to perform at their maximum capacity which will require additional resources from participating institutions.

Another purpose is to assess the performance of current meteorological, oceanographic and hydrological models. This will take place especially through concentrating on better *coupling* of these models, which is a new desired aspect. Important parameters at the interfaces of the model domains include soil moisture, snow cover, sea surface temperature, sea ice, surface fluxes, precipitation and river runoff. The correct treatment of the processes involved with these parameters is seen to be very important and will yield a better usability of all models considered here. This is one of the major highlights of *BRIDGE*, and BALTEX in general.

4.3 Scientific Research

Another basic benefit from *BRIDGE* will be the enhancement of scientific research. A remarkable amount of high-quality analysed and assimilated data will be available together with the up-to-date models. The in-depth analysis of these *BRIDGE* products will require additional time. Hence, the *BRIDGE* analysis period will immediately follow the observational period and is envisaged to continue at least until 2005.

4.4 Division of Activities during BRIDGE

Activities during *BRIDGE* are generally divided into

- **base-line** observational and modelling programmes which will deliver **continuous** observational and model data during the entire 27 months period, and
- specific **enhanced** observational and modelling programmes confined to **limited** periods of typically a few weeks or months.

4.5 Base-line Activities

The backbone of the base-line activities will include independent, delayed-mode 4-dimensional data assimilation (4DDA) runs of at least two operational Weather Services (most probably DWD and a HIRLAM consortium at DMI, FMI and SMHI) including data

storage and data distribution. These 4DDA runs will be performed in addition to the routine operations of the weather forecast service during the entire *BRIDGE* period. In particular the inclusion of additional data sources, the storage of the 4DDA data products and the data distribution will have to be specific with respect to requirements of the BALTEX programme and *BRIDGE* requirements.

Other continuous model runs for the entire *BRIDGE* period (e.g. regional-scale atmospheric models, climate models, hydrological and ocean models including data assimilation in both coupled and un-coupled modes) will be conducted at different modelling centres.

The base-line observational part of *BRIDGE* will rely on

- operational networks and distribution activities (e.g. GTS),
- special efforts to collect supplementary relevant data from existing networks to increase observational densities over the entire Baltic Sea Catchment Area as exemplified during the PIDCAP period,
- special observational activities which are conducted regularly, either permanently or at special observing dates (e.g. hydrographic measurements on research vessel cruises to be done regularly several times per year, or continuous monitoring activities at specific sites such as Östergarnsholm, Lindenberg, Sodankylä, Norunda/Marsta).

4.6 Enhanced, Time-limited Activities

The **enhanced** activities are conducted during **limited** time periods (Enhanced Observational Periods, EOPs) within *BRIDGE*. These actions will include e.g.

- high-resolution, non-hydrostatic atmospheric model runs for specific sub-basins or regions in the Baltic Sea Catchment Area,
- coupled model runs which are too time-consuming for continuous applications during or after the *BRIDGE* period,
- specific field campaigns of limited duration (such as LITFASS, PEP, DIAMIX, BASIS) to provide high-quality observational data, which are needed in process-oriented studies,
- special efforts to enhance observational data densities in particular over the Baltic Sea Catchment Area (e.g. to increase the density of rawinsonde observations) or parts of it.

4.7 Enhancement of Existing Networks

It is important to note that, for a successful conduct of both the base-line observational part and the enhanced, time-limited programs of *BRIDGE,* existing networks are suggested to be enhanced during the *BRIDGE* period. Examples include additional rawinsonde (RS) and

weather radar stations as well as the conduct of additional RS ascents at least as part of enhanced, time-limited activities (see 4.6).

Article 5

Data Availability, Quality and Exchange

1. Free and unrestricted access to all *BRIDGE* data and products (both observations and model) is of vital importance for a successful conduct of *BRIDGE* in general and in particular for the *BRIDGE* analysis programmes. It is emphasized that in particular observational data should be made available for the *BRIDGE* analysis programmes with least possible delay. Specific BALTEX Data Centres and Data Centre Functions are proposed for *BRIDGE* to guarantee an effective data exchange between data suppliers and data users. Data suppliers are in general responsible for maintaining the quality of data and products they are providing, it being understood that additional responsibilities of Data Centres and Data Centre Functions and in particular regulations between data suppliers and user Parties on data quality, warranty, liability, proprietary rights and idemnification issues may require specific additional agreements to be layed down in the future. Examples of the latter include the BALTEX data exchange agreements already in use at the BALTEX Meteorological and Hydrological Data Centers (BMDC and BHDC).

2. In practice, a portion of the data and data products which will be prepared by data suppliers (in particular those from national operational networks) and stored at Data Centres or Data Centre Functions are subject to different property rights or other legalities and, hence, to certain access restrictions. Appropriate mechanisms must be adopted and acknowledged by all Parties to ensure access to all *BRIDGE* data and products. Examples for such mechanisms include

    - Resolution 40 of the 12th Congress of the WMO (June 1995),
    - European conditions attached to the free and unrestricted access to meteorological data and products by research and education, agreed by the Conference of Western Europe Directors of National Meteorological Services (ICWED), April 1998,
    - the BALTEX data exchange policy, see e.g. BALTEX (1997a, appendices 12 and 13) and section 7.3 of the Strategic Plan for *BRIDGE* (BALTEX 1997b).

3. Following in particular the ICWED document the Parties to this IMOU agree that *BRIDGE* data and products may be delivered to registered BALTEX/*BRIDGE* Data Users for non-

commercial research and education activities related to *BRIDGE* and BALTEX in a non-discriminatory manner and without charge. It is understood that these regulations hold true for all *BRIDGE* Parties acting either as data suppliers or Data Centres and Data Centre Functions. Identification and registration of Data Users will follow the presently existent rules of the BALTEX programme. Parties of this IMOU are automatically identified as Data Users.

4. It is stressed by all Parties that an entirely free data exchange without the mentioned regulations - e.g. directly between data suppliers and data users via FTP or other means - is strongly preferred and will be offered in all cases where access to data is unlimited in terms of legal rights or other requirements.

Article 6

Time-line for *BRIDGE*

1. The **base-line** observational and modelling activities are at present foreseen to be executed during

October 1999 to December 2001.

2. The following periods with **enhanced time-limited** activities have been determined (enhanced observational periods, EOP):

- **January/February 2000**
- **August/September 2000**
- **April/May 2001.**

3. The following period will be used as the *BRIDGE* **pilot phase** where observational and modelling activities are tested to the extent necessary:

April 1999 to September 1999.

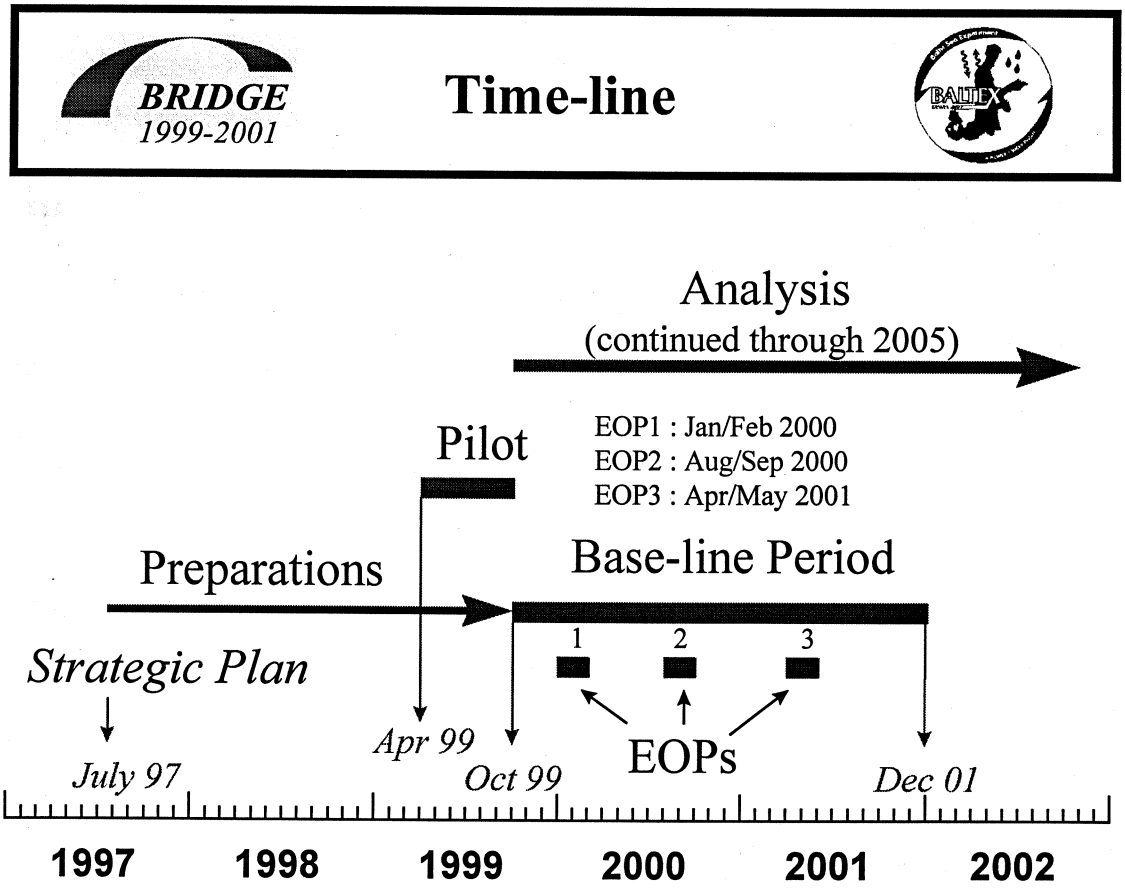
4. The **preparatory phase** for *BRIDGE* has already begun and will continue

until September 1999.

5. The **analysis phase** of *BRIDGE* will already start in parallel to the observational phase and is foreseen to extend to at least **2005**.

Figure 1

Time-line for *BRIDGE*



(EOP = Enhanced Observational Period)

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Agenda for Table 1 (see following pages)

4DDA: Parties conduct independent, delayed-mode four-dimensional data assimilation runs including specific *BRIDGE*-related data storage and data distribution.

Model: Parties conduct either continuous model runs for the entire *BRIDGE* period (e.g. regional-scale atmospheric models, climate models, hydrological and ocean models including data assimilation in both coupled and un-coupled modes) or time-limited model runs during EOPs (such as high-resolution, non-hydrostatic atmospheric model runs for specific sub-basins or regions).

Data Centre: Parties maintain and support a specific BALTEX Data Centre or Data Centre Function for *BRIDGE*.

In-situ Network Data: Parties prepare, process and deliver delayed, additional observational station data (level IIc) such as daily precipitation, daily runoff, soil temperature, snow depth, surface radiation etc. to a BALTEX Data Centre or Data Centre Function. These activities are additional to existing operational distributions such as via GTS.

Remote Sensing Data: Parties receive, process and deliver remote sensing data (such as satellite, radar, GPS) to a BALTEX Data Centre or Data Centre Function.

Field Experiments: Parties organise or contribute to major field experiments or field monitoring campaigns such as NOPEX (NO), DIAMIX (DI), BASIS (BA), LITFASS (LI), PEP (PE) or NOPEX-Sodankylä (SO).

Analysis: Parties conduct major analysis programmes for *BRIDGE*.

Organisation: Parties conduct major preparational and organisational activities for *BRIDGE*.

Table 1:

Overview on Parties of this IMOU and their activities during *BRIDGE*.

See previous page for the table agenda.

Party	4DDA	Model	Data Centre	In-situ Network Data	Remote Sensing Data	Field Experi-ments	Ana-lysis	Organi-sation
UVie		X					X	
CHB				X				
DMI	X	X	X	X			X	
DHI		X		X			X	
EMHI				X	X		X	
EMI		X					X	
FMI	X	X	X	X	X	X (SO)	X	X
FIMR		X	X	X	X	X (BA)	X	
FEI				X				
UHel		X					X	
DWD	X		X	X	X	X (LI)	X	X
FZK					X		X	
GKSS		X	X		X	X	X	X
BfG/GRDC		X	X				X	
UBay						X	X	
IfMK		X			X	X	X	X
IOW						X	X	
LCE		X					X	
MPIfM		X				X	X	X
UHan		X	X			X	X	
TUD			X		X	X	X	
UBon			X		X		X	X
LHA				X				
LHS				X				
KNMI				X	X	X	X	
IMGW		X		X	X		X	
ICM	X	X	X				X	
IOPAS						X	X	X
IGW		X					X	
IMS						X	X	
RSHI		X		X			X	
RSHU		X					X	
SMHI	X	X	X	X	X		X	X
SWECLIM		X					X	
UUpp		X	X			X (NO, PE)	X	
Chalmers				X	X		X	
UGot						X (DI)	X	
SU		X					X	

Acronyms of Parties used in Table 1

UVie	University of Vienna, Institute for Meteorology and Geophysics, Vienna, Austria
CHB	State Committee for Hydrometeorology of Belarus, Minsk, Belarus
DMI	Danish Meteorological Institute, Copenhagen, Denmark
DHI	Danish Hydraulic Institute, Hörsholm, Denmark
EMHI	Estonian Meteorological and Hydrological Institute, Tallinn, Estonia
EMI	Estonian Marine Institute, Tallinn, Estonia
FMI	Finnish Meteorological Institute, Helsinki, Finland
FIMR	Finnish Institute of Marine Research, Helsinki, Finland
FEI	Finnish Environment Institute, Helsinki, Finland
UHel	University of Helsinki, Helsinki, Finland
DWD	German Weather Service, Offenbach, Germany
FZK	Research Center Karlsruhe, Karlsruhe, Germany
GKSS	GKSS Research Centre Geesthacht, Geesthacht, Germany
BfG/GRDC	Federal Institute of Hydrology (BfG), Global Runoff Data Centre (GRDC), Koblenz, Germany
UBay	Bayreuth University, Bayreuth, Germany
IfMK	Institute for Marine Research, Kiel, Germany
IOW	Institute for Baltic Sea Research Warnemünde, Warnemünde, Germany
LCE	Ludwig Consulting Engineers, Karlsruhe, Germany
MPIfM	Max-Planck-Institute for Meteorology, Hamburg, Germany
UHan	University of Hannover, Hannover, Germany
TUD	Dresden University of Technology, Dresden, Germany
UBon	University of Bonn, Bonn, Germany
LHA	Latvian Hydrometeorological Agency, Riga, Latvia
LHS	Lithuanian Hydrometeorological Service, Vilnius, Lithuania
KNMI	Royal Netherlands Meteorological Institute, De Bilt, The Netherlands
IMGW	Institute for Meteorology and Water Management, Warsaw, Poland
ICM	Interdisciplinary Centre for Mathematical and Computational Modelling, University of Warsaw, Warsaw, Poland
IOPAS	Institute for Oceanology, Polish Academy of Sciences, Sopot, Poland
IGW	Institute of Geophysics, Warsaw, Poland
IMS	Institute of Marine Sciences, University of Szczecin, Szczecin, Poland
RSHI	Russian State Hydrological Institute, St.Petersburg, Russia
RSHU	Russian State Hydrometeorological University, St.Petersburg, Russia
SMHI	Swedish Meteorological and Hydrological Institute, Norrköping, Sweden
SWECLIM	Swedish Regional Climate Modelling Programme, Sweden
UUpp	Uppsala University, Uppsala, Sweden
Chalmers	Onsala Space Observatory, Chalmers University of Technology, Chalmers, Sweden
UGot	University of Gothenburg, Gothenburg, Sweden
SU	Stockholm University, Stockholm, Sweden

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The BALTEX Science Steering Group represented by its Chairman, Professor Dr. Lennart Bengtsson

and

.....

(name of the Party)

declare that they agree on the present Interim Memorandum of Understanding for the conduct of *BRIDGE* in the frame of BALTEX.

This agreement has been drawn up in two identical originals, of which the Party and the BALTEX SSG represented by Professor Bengtsson have taken one each.

Signatures

for the BALTEX SSG

.....

(Professor Lennart Bengtsson)

Done

in Hamburg, 25 August 1998
PLACE DATE

for .....

.....

( )

Done

in.....
PLACE DATE

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Annex 1

BRIDGE Parties, their Contributions and Responsible Contact Persons

Parties are grouped according to nationalities, the latter being ordered alphabetically.

Austria

University of Vienna (UVie), Institute for Meteorology and Geophysics, Vienna, Austria

Contributions:

- to provide objective analyses of precipitation over the Baltic Sea catchment with maximum space/time resolution;
- to diagnose three-dimensional convective heat flux field in the atmosphere over the Baltic Sea catchment;
- to validate prognosed fluxes of the forecast models.

Responsible contact person:
M. Hantel

Belarus

State Committee for Hydrometeorology of the Republic of Belarus (CHB), Minsk, Belarus

Contributions:

- to deliver regularly delayed, additional observational station data (level IIc) such as daily (12-hourly and 6-hourly as available) precipitation, daily runoff, soil temperature, snow depth, surface radiation etc. from the national territory in the Baltic Sea Catchment Area to both the BMDC and BHDC;
- to perform the operational GTS dissemination of the full SYNOP surface data telegrams in 3-hourly intervals from all existing stations in both the Baltic Sea Catchment Area and the BALTEX Model Area on the national territory;
- to perform the operational GTS dissemination of the full rawinsonde (RS) data telegrams from all existing stations in both the Baltic Sea Catchment Area and the BALTEX Model Area on the national territory;
- to maintain the national operational precipitation gauge station network in the Baltic Sea catchment region and the data availability, as was achieved during PIDCAP, or to the extent possible;

Responsible contact person:
I. Skuratovich

Denmark

Danish Meteorological Institute (DMI), Copenhagen, Denmark

Contributions:

- to deliver regularly delayed, additional observational station data (level IIc) such as daily (12-hourly and 6-hourly as available) precipitation, soil temperature, snow depth, surface radiation etc. from the national territory in the Baltic Sea Catchment Area to both the BMDC and BHDC;
- to perform the operational GTS dissemination of the full SYNOP surface data telegrams in 3-hourly intervals from all existing stations in both the Baltic Sea Catchment Area and the BALTEX Model Area on the national territory;
- to perform the operational GTS dissemination of the full rawinsonde (RS) data telegrams from all existing stations in both the Baltic Sea Catchment Area and the BALTEX Model Area on the national territory;
- to maintain the national operational precipitation gauge station network in the Baltic Sea catchment region and the data availability, as was achieved during PIDCAP, or to the extent possible;
- to deliver sea level data with the highest possible time resolution from all operating coastal stations at the Baltic Sea on the national territory to the BODC;
- to conduct 6-hourly rawinsonde (RS) ascents at operational stations near to the Baltic Sea (see Table 1 of the *BRIDGE* Strategic Plan); **(*)**
- to deliver (regularly delayed) weather radar data to the BRDC at SMHI;
- to generate, archive and distribute in co-operation with FMI and SMHI continuous 4-dimensional delayed mode atmospheric data assimilation data products; **(*)**
- to run the regional-scale atmospheric model HIRLAM for the entire Baltic Sea Catchment Area, to archive and distribute model output;

Contributions marked by **(*)** will definitely require additional external funding.

Responsible contact person:
L. Laursen

Denmark

Danish Hydraulic Institute (DHI), Hörsholm, Denmark

Contributions:

- to perform preliminary analyses of hydrographic measurements through the Danish Straits (to be carried out within the context of the EC co-financed BASYS project);
- to run the MIKE-SHE hydrological model for selected river catchments, to archive and distribute model output; **(*)**
- to complete the analyses of hydrographic measurements through the Danish Straits, to archive and distribute respective data; **(*)**

Contributions marked by **(*)** will definitely require additional external funding.

Responsible contact person:
J.-C. Refsgaard

Estonia

Estonian Meteorological and Hydrological Institute (EMHI), Tallinn, Estonia

Contributions:

- to deliver regularly delayed, additional observational station data (level IIc) such as daily (12-hourly and 6-hourly as available) precipitation, daily runoff, soil temperature, snow depth, surface radiation etc. from the national territory in the Baltic Sea Catchment Area to both the BMDC and BHDC;
- to perform the operational GTS dissemination of the full SYNOP surface data telegrams in 3-hourly intervals from all existing stations in both the Baltic Sea Catchment Area and the BALTEX Model Area on the national territory;
- to perform the operational GTS dissemination of the full rawinsonde (RS) data telegrams from all existing stations in both the Baltic Sea Catchment Area and the BALTEX Model Area on the national territory;
- to maintain the national operational precipitation gauge station network in the Baltic Sea catchment region and the data availability, as was achieved during PIDCAP, or to the extent possible;
- to deliver sea level data with the highest possible time resolution from all operating coastal stations at the Baltic Sea on the national territory to the BODC;
- to conduct 6-hourly rawinsonde (RS) ascents at operational stations near to the Baltic Sea (see Table 1 of the *BRIDGE* Strategic Plan);
- to deliver (regularly delayed) weather radar data to the BRDC at SMHI; **(*)**

Contributions marked by **(*)** will definitely require additional external funding.

Responsible contact person:
S. Keevallik

Estonia

Estonian Marine Institute (EMI), Tallinn, Estonia

Contributions:

- to run the Baltic Sea model (EMI version of the Bryan-Cox-Killworth model) with increased resolution in the Gulf of Riga region during the *BRIDGE* period, to archive and distribute model output;

Responsible contact person:
J. Elken

Finland

Finnish Meteorological Institute (FMI), Helsinki, Finland

Contributions:

- to deliver regularly delayed, additional observational station data (level IIc) such as daily (12-hourly and 6-hourly as available) precipitation, soil temperature, snow depth, surface radiation etc. from the national territory in the Baltic Sea Catchment Area to both the BMDC and BHDC;
- to perform the operational GTS dissemination of the full SYNOP surface data telegrams in 3-hourly intervals from all existing stations in both the Baltic Sea Catchment Area and the BALTEX Model Area on the national territory;
- to perform the operational GTS dissemination of the full rawinsonde (RS) data telegrams from all existing stations in both the Baltic Sea Catchment Area and the BALTEX Model Area on the national territory;
- to maintain the national operational precipitation gauge station network in the Baltic Sea catchment region and the data availability, as was achieved during PIDCAP, or to the extent possible;
- to conduct 6-hourly rawinsonde (RS) ascents at operational stations near to the Baltic Sea (see Table 1 of the *BRIDGE* Strategic Plan);
- to deliver (regularly delayed) weather radar data to the BRDC at SMHI;
- to co-ordinate field measurements and monitoring programmes at Sodankylä in the frame of NOPEX, to act as a BALTEX Data Centre Function for field data from Sodankylä;
- to generate, archive and distribute in co-operation with SMHI and DMI continuous 4-dimensional delayed mode atmospheric data assimilation data products;
- to run the regional-scale atmospheric model HIRLAM for the entire BALTEX Model Area, to archive and distribute model output;

Responsible contact person:
M. Alestalo

Finland

Finnish Institute of Marine Research (FIMR), Helsinki, Finland

Contributions:

- to maintain and support the BALTEX Oceanographic Data Centre (BODC);
- to deliver sea level data with one hour time resolution from all operating coastal stations at the Baltic Sea on the national territory to the BODC;
- to conduct and organise research vessel cruises for hydrographic and sea ice measurements in the Baltic Sea;
- to contribute to the meteorological sounding program by conducting rawinsonde soundings from a research vessel during expeditions and EOPs;
- to supply automatically interpreted satellite image products about the ice conditions in the Baltic Sea;
- to co-ordinate the field measurements in the frame of BASIS (Baltic Air-Sea-Ice Study);
- to take part in the field campaign DIAMIX;

Responsible contact person:
J. Launiainen

Finland

Finnish Environment Institute (FEI), Helsinki, Finland

Contributions:

- to deliver regularly delayed, daily runoff data from rivers in the Baltic Sea catchment area to the BHDC;
- to deliver regularly delayed observational station data (level IIc) of daily precipitation and areal precipitation values (in co-ordination with FMI) to the BMDC;
- to deliver regularly delayed observational data (level IIc) of water equivalents of snow to the BHDC;

Responsible contact person:
P. Seuna

University of Helsinki (UHel), Helsinki, Finland

Contributions:

- to contribute to the Baltic Sea model runs in particular in the field of sea ice modelling, to archive and distribute model output;
- to contribute to sea ice observational field measurements;
- to contribute to the oceanographic research vessel field campaigns;

Responsible contact person:
M. Leppäranta

Germany

German Weather Service (DWD), Offenbach, Germany

Contributions:

- to generate, archive and distribute continuous 4-dimensional delayed-mode data assimilation data products;
- to deliver regularly delayed, additional observational station data (level IIc) such as daily (12-hourly and 6-hourly as available) precipitation, soil temperature, snow depth, surface radiation etc. from the national territory in the Baltic Sea Catchment Area to both the BMDC and BHDC;
- to perform the operational GTS dissemination of the full SYNOP surface data telegrams in 3-hourly intervals from all existing stations in both the Baltic Sea Catchment Area and the BALTEX Model Area on the national territory;
- to perform the operational GTS dissemination of the full rawinsonde (RS) data telegrams from all existing stations in both the Baltic Sea Catchment Area and the BALTEX Model Area on the national territory;
- to maintain the national operational precipitation gauge station network in the Baltic Sea catchment region and the data availability, as was achieved during PIDCAP, or to the extent possible;
- to conduct 6-hourly rawinsonde (RS) ascents at operational stations near to the Baltic Sea (see Table 1 of the *BRIDGE* Strategic Plan) at least during the EOPs;
- to deliver (regularly delayed) weather radar data to the BRDC at SMHI;
- to maintain and support the BALTEX Meteorological Data Centre (BMDC);
- to maintain and support a Data Centre Function for satellite data (SATOB, SATEM, GTS-BUFR);
- to perform and to co-ordinate field measurements and long-term monitoring activities in the frame of LITFASS and to host a special field experiment at the Lindenberg Observatory;
- to provide access to GPCP products (gridded precipitation analyses based on station networks, satellite data and combined from both);

Responsible contact person:
E. Müller

Germany

Research Center Karlsruhe (FZK), Karlsruhe, Germany

Contributions:

- to determine annual time series of cloud cover and thermal parameters like maximum temperature, diurnal amplitude, cooling during night-time and perform inter-annual change detection of the parameters based on AVHRR and METEOSAT level Ib data;
- to determine cloud cover and type from AVHRR and METEOSAT using established methods to preserve homogeneity in time series, to improve algorithms to take advantage of the extended spectral capabilities of AVHRR/3;
- to determine land surface temperature (LST) and thermal characteristics as model input and for surface model validation from AVHRR and METEOSAT IR measurements;
- to determine interannual changes in thermal characteristics of land surfaces and cloud cover through analysis of time series of AVHRR and METEOSAT derived LSTs;

Responsible contact person:
F.-S. Olesen

Germany

GKSS Research Centre Geesthacht (GKSS), Geesthacht, Germany

Contributions:

- to quantify energy- and water cycle components for the entire BALTEX Model Area during the entire *BRIDGE* period using the regional-scale atmospheric model REMO, to archive and distribute model output;
- to study the hydrological regime of different river systems in the Baltic Sea Catchment Area using the hydrological model SEWAB/HTS during the entire *BRIDGE* period;
- to maintain and support the International BALTEX Secretariat as the managing and monitoring centre for *BRIDGE* activities;
- to participate in *BRIDGE* Enhanced Observing Periods (EOPs), in particular
    1. to take part in field campaigns such as LITFASS, PEP and BASIS (e.g. turbulence measurements, cloud radar, lidar, airborne *in-situ* measurements of clouds and precipitation);
    2. to conduct high-resolution, non-hydrostatic atmospheric model runs for specific regions or sub-basins, to archive and distribute model output;
    3. to maintain and support a Data Centre Function for satellite data (NOAA-AVHRR, TOVS, GERB and SCARAB), to provide regional radiation budget products at the top of the atmosphere and at the surface;
    4. to investigate the detailed water exchange between saline Baltic Sea water and fresh water from lower Odra due to atmospheric forcing;

Responsible contact person:
E. Raschke

Germany

Federal Institute of Hydrology (BfG), Global Runoff Data Centre (GRDC), Koblenz, Germany

Contributions:

- to apply the BfG/GRDC water balance model to BALTEX river test catchments;

Responsible contact person:
W. Grabs

Bayreuth University (UBay), Departement of Micrometeorology, Bayreuth, Germany

Contributions:

- to take part in field campaigns such as LITFASS;
- to develope and improve parameterisations of fluxes between atmosphere and surface;

Responsible contact person:
T. Foken

Germany

Institute for Marine Science (IfMK), Kiel, Germany

Contributions:

- to work on and support the application of satellite observations;
- to conduct and organise research vessel cruises for hydrographic measurements in the Baltic Sea e.g. during PEP, DIAMIX;
- to maintain rain measurements on voluntary observing ships at the Baltic Sea;
- to maintain a station of continuous current and salinity measurements at Fehmarn Belt;
- to run the coupled ice-ocean model during the entire *BRIDGE* period, to archive and distribute model output;
- to contribute to the atmosphere-ice-ocean coupled modelling activities;

Responsible contact person:
E. Ruprecht

Institute for Baltic Sea Research Warnemünde (IOW), Warnemünde, Germany

Contributions:

- to conduct and organise research vessel cruises for hydrographic measurements in the Baltic Sea;
- to take part in field campaigns such as DIAMIX and BASIS;
- to perform continuous hydrographic and meteorological measurements at different IOW measurement sites in the Baltic Sea (Darss Sill, Oder Bank, Arkona Sea);

Responsible contact persons:
U. Lass, W. Matthäus

Germany

Ludwig Consulting Engineers (LCE), Karlsruhe, Germany

Contributions:

- to verify LARSIM as an existing high resolution hydrologic model covering the whole land area of the Baltic Sea catchment area and river network for selected large river basins;
- to improve hydrologic model components for special situations in the Baltic region (e.g. the effects of frozen soils or the effects of the numerous lakes), preferably in co-operation with institution(s) experienced in this field;
- to check the quality of distributed model output types such as runoff, snow cover, soil moisture for further use in atmospheric models;
- to calculate the river runoff from the entire Baltic Sea catchment area on the base of measured climatic data as an essential additional information for oceanographic models;
- to couple LARSIM with the meteorological model REMO for the improved modelling of the terrestrial water regime in a high resolution atmosphere-hydrological model;
- to test flood forecast with the combined hydrometeorological model, based on promising existing operational experiences for larger tributaries of the Rhine river;

Responsible contact person:
K. Ludwig

Germany

Max-Planck-Institute for Meteorology (MPIfM), Hamburg, Germany

Contributions:

- to conduct climate model runs for the support of *BRIDGE* modelling programmes, to archive and distribute model output;
- to run the regional-scale atmospheric model REMO for the entire BALTEX Model Area, to archive and distribute model output;
- to take part in field campaigns such as BASIS and PEP;

Responsible contact person:
L. Bengtsson

University of Hannover (UHan), Hannover, Germany

Contributions:

- to take part in field campaigns such as LITFASS and BASIS;
- to run a high resolution, non-hydrostatic model for specific regions or sub-basins, to archive and distribute model output;

Responsible contact person:
G. Groß

Germany

Dresden University of Technology (TUD), Dresden, Germany

Contributions:

- to maintain and support a Data Centre Function for satellite data (METEOSAT, MSG and AVHRR products);
- to maintain and support a Data Centre Function for surface measurements at „Ankerstation" Tharandter Wald (60 km^2 forest near Dresden, turbulence measurements, radiation);
- to take part in field campaigns such as LITFASS (e.g. turbulence measurements);
- to conduct highly resolved (both temporally and spatially) satellite data analysis to infer surface radiation budgets, to archive and distribute relevant data products;

Responsible contact person:
F. H. Berger

Germany

University of Bonn (UBon), Bonn, Germany

Contributions:

- to maintain and support a Data Centre Function for satellite data (METEOSAT, SSM/I products);
- to perform an intercomparison campaign with groundbased microwave radiometers for the retrieval of water vapor and cloud liquid water (in co-operation with KNMI);
- to organize a network of groundbased microwave measurements from different sensors spread over the Baltic Sea Catchment Area (in co-operation with KNMI);
- to analyse the microwave measurement time series using uniform algorithms to get time series of cloud liquid water (in co-operation with KNMI);
- to participate in EOP3 (April/May 2001) with measurements of the microwave profiler MICCY at Cabauw and/or Lindenberg (in co-operation with KNMI);
- to derive soil moisture fields for the *BRIDGE* period from SSM/I satellite data for low vegetation cover periods (at least from October to May);

Responsible contact person:
C. Simmer

Latvia

Latvian Hydrometeorological Agency (LHA), Riga, Latvia

Contributions:

- to deliver regularly delayed, additional observational station data (level IIc) such as daily (12-hourly and 6-hourly as available) precipitation, daily runoff, soil temperature, snow depth, surface radiation etc. from the national territory in the Baltic Sea Catchment Area to both the BMDC and BHDC;
- to perform the operational GTS dissemination of the full SYNOP surface data telegrams in 3-hourly intervals from all existing stations in both the Baltic Sea Catchment Area and the BALTEX Model Area on the national territory;
- to perform the operational GTS dissemination of the full rawinsonde (RS) data telegrams from all existing stations in both the Baltic Sea Catchment Area and the BALTEX Model Area on the national territory;
- to maintain the national operational precipitation gauge station network in the Baltic Sea catchment region and the data availability, as was achieved during PIDCAP, or to the extent possible;
- to deliver sea level data with the highest possible time resolution from all operating coastal stations at the Baltic Sea on the national territory to the BODC;
- to conduct 6-hourly rawinsonde (RS) ascents at operational stations near to the Baltic Sea (see Table 1 of the *BRIDGE* Strategic Plan);

Responsible contact person:
A. Leitass

Lithuania

Lithuanian Hydrometeorological Service (LHMS), Vilnius, Lithuania

Contributions:

- to deliver regularly delayed, additional observational station data (level IIc) such as daily (12-hourly and 6-hourly as available) precipitation, daily runoff, soil temperature, snow depth, surface radiation etc. from the national territory in the Baltic Sea Catchment Area to both the BMDC and BHDC;
- to perform the operational GTS dissemination of the full SYNOP surface data telegrams in 3-hourly intervals from all existing stations in both the Baltic Sea Catchment Area and the BALTEX Model Area on the national territory;
- to perform the operational GTS dissemination of the full rawinsonde (RS) data telegrams from all existing stations in both the Baltic Sea Catchment Area and the BALTEX Model Area on the national territory;
- to maintain the national operational precipitation gauge station network in the Baltic Sea catchment region and the data availability, as was achieved during PIDCAP, or to the extent possible;
- to deliver sea level data with the highest possible time resolution from all operating coastal stations at the Baltic Sea on the national territory to the BODC;
- to conduct 6-hourly rawinsonde (RS) ascents at operational stations near to the Baltic Sea (see Table 1 of the *BRIDGE* Strategic Plan); **(*)**

Contributions marked by **(*)** will definitely require additional external funding.

Responsible contact person:
P. Korkutis

The Netherlands

Royal Netherlands Meteorological Institute (KNMI), De Bilt, The Netherlands

Contributions:

- to operate and maintain a cloud detection system (CDS) at twelve stations in the Netherlands, to archive and distribute CDS data and products e.g. for model validation purposes;
- to install and operate CDS stations at different locations inside the Baltic Sea catchment area at locations to be determined;
- to analyse the observations of the CDS and to use these for the evaluation of a regional climate model (RACMO);
- to host an intercomparison campaign with ground based microwave radiometers for the retrieval of water vapour and cloud liquid water;
- to provide cloud liquid water fields derived from AVHRR data for the Baltic Sea catchment area for the whole *BRIDGE* period, validated against local point observations (microwave radiometers) (in co-operation with University of Bonn);
- to organise the BALTEX *BRIDGE* Cloud (BBC) campaign during the last EOP (April/May 2001); within this campaign microwave radiometers will be installed at CDS stations; at the central site in Cabauw advanced remote sensing instruments are installed (radar, lidar, etc.) and in-situ aircraft measurements will take place (in co-operation with University of Bonn);
- to organise and conduct field measurements and monitoring activities at Cabauw and archive and distribute Cabauw data; it is planned to conduct a field campaign on the stable nocturnal boundary layer during one of the EOPs;

Responsible contact person:
A.P.M. Baede

Poland

Institute for Meteorology and Water Management (IMGW), Warsaw, Poland

Contributions:

- to deliver regularly delayed, additional observational station data (level IIc) such as daily (12-hourly and 6-hourly as available) precipitation, daily runoff, soil temperature, snow depth, surface radiation etc. from the national territory in the Baltic Sea Catchment Area to both the BMDC and BHDC;
- to perform the operational GTS dissemination of the full SYNOP surface data telegrams in 3-hourly intervals from all existing stations in both the Baltic Sea Catchment Area and the BALTEX Model Area on the national territory;
- to perform the operational GTS dissemination of the full rawinsonde (RS) data telegrams from all existing stations in both the Baltic Sea Catchment Area and the BALTEX Model Area on the national territory;
- to maintain the national operational precipitation gauge station network in the Baltic Sea catchment region and the data availability, as was achieved during PIDCAP, or to the extent possible;
- to deliver sea level data with the highest possible time resolution from all operating coastal stations at the Baltic Sea on the national territory to the BODC;
- to conduct 6-hourly rawinsonde (RS) ascents at operational stations near to the Baltic Sea (see Table 1 of the *BRIDGE* Strategic Plan);
- to deliver (regularly delayed) weather radar data to the BRDC at SMHI;
- to conduct continuous hydrological model runs for the Odra basin, to archive and distribute model output;

Responsible contact person:
A. Dubicki

Poland

Interdisciplinary Centre for Mathematical and Computational Modelling (ICM), University of Warsaw, Warsaw, Poland

Contributions:

- to generate, archive and distribute continuous 4-dimensional data assimilation run data products based on the UKMO Unified Model presently in operation as a NWP tool at ICM;
- to run the regional scale atmospheric model UMPL for the entire BALTEX Model Area, to archive and distribute the model output;
- to conduct high-resolution, non-hydrostatic atmospheric model runs for specific regions or sub-basins, to archive and distribute model output;
- to diagnose and to improve the parameterisation of mixing processes in the boundary layer;

Responsible contact person:
M. Niezgodka

Institute for Oceanology Sopot (IOPAS), Sopot, Poland

Contributions:

- to conduct and organise research vessel cruises for hydrographic measurements in the Baltic Sea;
- to contribute to field measurements in the frame of DIAMIX;

Responsible contact person:
J. Dera

Poland

Institute of Geophysics (IGW), Warsaw, Poland

Contributions:

- to conduct hydrological model runs for different river basins, in particular Odra and Vistula, to archive and distribute model output;

Responsible contact person:
Z. Kaczmarek

Institute of Marine Sciences (IMS), University of Szczecin, Szczecin, Poland

Contributions:

- to organise and conduct research vessel cruises for meteorological and hydrographic measurements (such as temperature, salinity, currents) in the region of the Odra Estuary (Szczecin Bay, Polish coastal areas of the Pomeranian Bay);
- to perform statistical analysis of the research vessel data and to deliver related data products;

Responsible contact person:
H. Kowalewska-Kalkowska

Russia

Russian State Hydrological Institute (RSHI), St. Petersburg, Russia

Contributions:

- to deliver regularly delayed, additional observational station data (level IIc) such as daily runoff to the BHDC;
- to conduct hydrological model runs for the Neva river basin, to archive and distribute model output;

Responsible contact person:
V. Vuglinsky

Russian State Hydrometeorological University (RSHU), St.Petersburg, Russia

Contributions:

- to conduct non-hydrostatic model runs of dense bottom water inflow, its spreading and transformation in the Baltic Sea;

Responsible contact person:
V. Tsarev

Sweden

Swedish Meteorological and Hydrological Institute (SMHI), Norrköping, Sweden

Contributions:

- to maintain and support the BALTEX Hydrological Data Centre (BHDC);
- to maintain and support the BALTEX Weather Radar Data Centre (BRDC);
- to maintain and support a Data Centre Function for satellite data (NOAA-AVHRR, in particular clouds);
- to deliver regularly observational SYNOP data, sea level data and precipitation data from the national gauge station network;
- to deliver regularly measured rawinsonde data including measurements from the island of Gotland (from Gotland at least during the EOP) and AMDAR data;
- to deliver regularly measurements of currents, temperature and salinity from the Öresund;
- to provide sea surface temperature and ice chart information for the Baltic Sea;
- to conduct hydrographic measurements from the Baltic Sea and the Kattegat and deliver data to the BODC;
- to contribute to field campaigns in the frame of PEP, BASIS and DIAMIX;
- to generate, archive and distribute in co-operation with FMI and DMI continuous 4-dimensional delayed mode atmospheric data assimilation data products;
- to conduct HBV-Baltic and PROBE-Baltic model runs, to archive and distribute model output;

Responsible contact person:
J. Nilsson

Sweden

Swedish Regional Climate Modelling Programme (SWECLIM), Sweden

Contributions:

- to conduct climate model runs for the support of the *BRIDGE* modelling programmes, to archive and distribute model output;

Responsible contact person:
E. Källén

University of Uppsala (UUpp), Uppsala, Sweden

Contributions:

- to co-ordinate and contribute to the field campaign PEP in BALTEX;
- to co-ordinate and contribute to the NOPEX field campaign and monitoring activities at Uppsala and Sodankylä;

Responsible contact persons:
A.S. Smedman, S. Halldin

Sweden

Chalmers University of Technology (Chalmers), Chalmers, Sweden

Contributions:

- to receive and process GPS level I data, to maintain a Data Centre Function for GPS-derived water vapour data (level IIb,c);

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Contributions:

- to co-ordinate and contribute to the field campaign DIAMIX;
- to conduct and organise research vessel cruises for hydrographic and dense bottom current measurements in the Baltic Sea;
- to conduct model calculations of net energy, salt and volume exchange through the Baltic Sea entrance area;

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Contribution and responsibilities:

- to conduct and deliver in- and outflow measurements through the Öresund;

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Annex 2

Acronyms and Abbreviations

(For a list of acronyms of the Parties to this IMOU see Table 1)

4DDA	4-Dimensional Data Assimilation
AMDAR	Aircraft Meteorology Data Relay
AVHRR	Advanced Very High Resolution Radiometer
BACAR	Baltic Sea Catchment Area
BALTEX	Baltic Sea Experiment
BAMAR	BALTEX Model Area
BASIS	Baltic Air-Sea-Ice Study
BASYS	Baltic Sea System Study
BBC	BALTEX *BRIDGE* Cloud
BHDC	BALTEX Hydrological Data Centre
BMDC	BALTEX Meteorological Data Centre
BODC	BALTEX Oceanographic Data Centre
BRDC	BALTEX Radar Data Centre
BRIDGE	The Main BALTEX Experiment, planned for 1999-2001
BUFR	Binary Universal Form for Data Representation
CDS	Cloud Detection System
DIAMIX	Diapycnal Mixing in the stratified ocean; Field experiment in BALTEX
EOP	Enhanced Observational Period
EU	European Union
EC	European Commission
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
FTP	File Transfer Program
GERB	Geo-stationary Earth Radiation Budget
GPCP	Global Precipitation Climatology Project
GPS	Global Positioning System
GRDC	Global Runoff Data Centre, Koblenz, Germany
GTS	Global Telecommunication System
HBV	Swedish conceptual hydrological model for runoff simulation
HIRLAM	High Resolution Limited Area Model
HTS	Horizontal Routing (Transport) Scheme
ICWED	Conference of Western Europe Directors of National Meteorological Services
IMOU	Interim Memorandum of Understanding

IR	Infrared
LARSIM	Large Area Runoff Simulation Model
LITFASS	Lindenberg Inhomogeneous Terrain Fluxes between Atmosphere and Surface - a DWD long-term Study 1995 - 2000
LST	Land Surface Temperature
METEOSAT	European Meteorological Satellite Series of EUMETSAT
MICCY	Microwave Radiometer for Cloud Cartography
MIKE-SHE	Distributed physically-based hydrological model
MSG	METEOSAT Second Generation
NOAA	National Oceanic and Atmospheric Administration
NOPEX	Northern Hemisphere Climate-processes Land-surface Experiment
NWP	Numerical Weather Predciction
PEP	Pilot Study of Evaporation and Precipitation in BALTEX
PIDCAP	Pilot Study for Intensive Data Collection and Analysis of Precipitation
PROBE	Program for Boundary Layers in the Environment, 1-dimensional vertical-resolving boundary layer model developed at SMHI
RACMO	Regional Area Climate Model used at KNMI
REMO	Regional Model
RS	Rawinsonde
SATEM	Satellite Temperature
SATOB	Satellite Observation
SCARAB	Scanner for Radiation Budget
SEWAB	Surface Energy and Water Balance model
SSG	Science Steering Group
SSM/I	Special Sensor Microwave/Imager
SST	Sea Surface Temperature
SYNOP	Synoptical Surface Observation
TIP	Technical Implementation Plan
TIROS	Television and Infrared Observation Satellite
TOVS	TIROS Operational Vertical Sounder
UKMO	United Kingdom Meteorological Office
UMPL	Unified Model for Poland
WMO	World Meteorological Organization

Annex 3

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Appendix 3

THE BALTIC SEA HYDROLOGICAL CYCLE OBSERVING SYSTEM PROJECT PROFILE

1. INTRODUCTION

To reconcile the need for good-quality freshwater with environmental protection is one of the greatest challenges humanity is facing at the approach of the 21st century. The most obvious way to success is through improving water management. The Agenda 21 (UNCED, 1992) Chapter 18 on freshwater and the report of the International Conference on Water and the Environment (ICWE, 1992), on which it was based, recognize that knowledge of the water cycle (quantity and quality) is the essential basis for efficient water management. Water resources assessment, monitoring and management are dependent on the existence of reliable water resources information systems, both at national and regional levels, covering not only the collection and analysis of data but also the exchange and dissemination of these data and related information to the users at all levels, from the general public to decision makers. The programme for further implementation of Agenda 21, adopted at the Special Session of the UN General Assembly in June 1997, therefore specifically calls for the *"strengthening of the capability of Governments and international institutions to collect and manage information, including scientific, social and environmental data, in order to facilitate the integrated assessment and management of water resources, and foster regional and international co-operation for information dissemination and exchange through co-operative approaches among United Nations institutions".*

The World Meteorological Organization (WMO), in association with the World Bank, embarked in 1993 to promote a programme called World Hydrological Cycle Observing System (WHYCOS). WHYCOS is a worldwide programme aimed at improving co-operation at river basin, regional and global levels to support the establishment and improvement of consistent and reliable water data information systems for the benefit of sustainable development.

The immediate objectives of WHYCOS are:

- Strengthen the technical and institutional capacities of hydrological services to capture and process hydrological data, and meet the needs of their end users for information on the status and trend of water resources;
- Establish a global network of national hydrological observatories which provide information of a consistent quality, transmitted in real time to national and regional databases, via the Global Telecommunication System of WMO;
- Promote and facilitate the dissemination and use of water-related information, using modern information technology such as the World Wide Web and CD-ROMs.

WHYCOS does not replace existing hydrological observing programmes, but supplements them. An important product of WHYCOS will be regional datasets that are of consistent quality and can be used in preparing products for water resources assessment and management. However, WHYCOS has been conceived, perhaps more importantly, as a vehicle for technology transfer, training and capacity building.

WHYCOS is being implemented through regional operational components, the HYCOSs. Within the framework of a common set of guidelines, each regional HYCOS component is implemented independently from others, in order to better meet the end user's needs as well as to enable the establishment of institutional arrangements and funding mechanisms adapted to the conditions of each region.

The Mediterranean Hydrological Cycle Observing System (MED-HYCOS) is being implemented by WMO, in collaboration with the riverine countries of the sea, with a World Bank's grant. SADC-HYCOS has been designed to cover the eleven countries of the continental part of the Southern Africa Development Community and is being implemented with funds from the European Union with WMO as the supervising agency. At different stage of development are other regional projects, namely: AOC-HYCOS for a West and Central Africa; NILE-HYCOS for the Nile Basin; CARIB-HYCOS for the Caribbean region; IGAD-HYCOS for Eastern Africa; and also those for Central Asia and Latin America.

In this project profile a Baltic Sea HYCOS (or Baltic-HYCOS) is proposed to be installed using the concept of WHYCOS.

2. SITUATION IN THE BALTIC SEA BASIN

The Baltic Sea basin region extends over about 2.1 million km^2, including the drainage area of 1.7 million km^2 and the Baltic Sea itself. It ranges from temperate climate zones in the south to subarctic tundra in the north. The Baltic Sea is the recipient of the flow from approximately 200 rivers. The annual river runoff to the Baltic Sea amounts to about 470 km^3. The Baltic Sea drainage area is shared by as much as 13 countries: Belarus, the Czech Republic, Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia, Slovakia, Sweden, and Ukraine, with population exceeding 143 million. Most of these countries are heavily industrialized, thus creating various environmental and ecological problems.

As a small, cold and stratified water body, the Baltic Sea is characterized by various and variable hydrological conditions. The Baltic Sea is also severely polluted and requires special attention to overcome the related adverse effects. Among major pollutants, deposited to the Sea by the rivers and from the atmosphere, are: pesticides and fertilizers, toxic substances from accidental and other discharges, hydrocarbons from fuels, bacteriological contaminants, radioactive, as well as a postwar military deposits and ammunition.

International actions aiming at mitigation of the degradation of the marine environment of the Baltic, which have been undertaken by the Baltic Sea countries within the Helsinki Commission have not been completely successful yet. Reconstructing the natural conditions of the Baltic Sea waters requires further concerted international actions by all interested countries in the region.

The Baltic Sea surface area (415 266 km^2) is approximately four times smaller than its basin, therefore effects of the continental waters are of particular importance. From a hydrological point of view, it represents a single system, influenced by a number of interrelations between various elements of the water balance. One important feature of the system is an uneven flow of freshwater to the Sea resulting from non uniform distribution of rainfall and snowpack in time and area. In most countries water resources are classified as low and very low. An example is Poland with 1580 m^3/year/person, which is three times less than the European average and Germany with 2000 m^3/year/person. The situation appears to be better for Ukraine and Belarus with, 4000 m^3/y/p and 5500 m^3/y/p respectively, and for the Czech Republic and Slovakia - approximately 5900 m^3/y/p. On the other edge is Sweden with about 19 000 m^3/y/p. Such uneven distribution of water resources leads occasionally to periods of droughts or excess and floods, such as the recent July 1997 flood which affected the Czech Republic, Germany and Poland. The co-operation in the region is of great importance and the exchange of data is necessary for management of transnational water resources, for monitoring the situation and solving problems on transboundary rivers. Both quantity and quality variables are essential. The economy sectors most sensitive on changeable water resources in the region are: agriculture, municipal and industrial consumption, energy production, and navigation.

Development in implementation of modern automatic observing networks and data transmission and processing systems, as well as qualified staff available differ greatly between the Baltic countries. In the developed countries automatic data collection, transmission and

processing are in place, whilst in the countries with economy in transition manual procedures and systems prevail. Most of the countries around the Baltic are suffering cuts in the budget during the last years. Some of the Hydrological (or Hydrometeorological) Services have problems in maintaining the existing networks, and digitizing and making data available in electronic form. Also, policy decisions in some countries regarding commercial activities are causing limitations for the exchange of data and information between countries. In such situation, it is difficult to meet the demands for the timely provision of consistent and reliable hydrological, meteorological and other related data needed for research and decision making, relating to water resources assessment and management on local and regional scales. The assessment of possible effects of anthropogenic climate change leading to changes in hydrological cycle and water availability is another important aspect of the problem.

Currently, assessment and protection of groundwater resources may also be of importance locally in the region because of the use this water for various human needs, e.g. drinking water in urban areas.

3. PROJECT JUSTIFICATION

The rational management of the water resources at the basin level both small catchments and the Baltic Sea basin as a whole is essential for decision-making process leading to socio-economic development and environment protection of the region.

The Baltic Sea must be seen as of common interest among the countries around it. Thus the implementation of a Baltic-HYCOS, in line with the general concept of WHYCOS, is found to build-up a new basis for the integration of management of water resources and related environmental interactions in the Baltic area.

The Baltic-HYCOS will provide a common basis of knowledge of the near real-time situation in some representative rivers in the catchment. The quality, functions and tasks of the system will be the same in all the participating countries. It will be of great value, especially for the newly independent states, to have the same technology in all the countries and the use of new techniques could be transferred as required. The data from the system will be available in near real-time for participating countries.

Further on, models will be used for studying the interaction between meteorology, hydrology and oceanography of the Baltic. The next step would be to work on models dealing with the environment of the Baltic. Good quality hydrological data is needed for the development, validation and implementation of models. Extreme weather events, such as floods and droughts, and their impacts on the environment, will be better monitored and studied.

The Baltic-HYCOS database will further offer new opportunities for validation of models on the continental scale, such as General Circulation Models, or regional models from e.g. the Rossby Centre of Sweden and Max-Planck Institute of Germany.

An expert group of the Helsinki Commission has suggested an oceanographic forecasting Centre for the Baltic Sea to be established. Should this idea be accepted in the future, the database and management of the Baltic-HYCOS would be very relevant and essential to this task.

The implementation of the project will be one of the means to modernize and adapt the national systems to the actual economic situation of the countries to rebuild the national capacity in the water management sector and develop the regional co-operation which is the basis for the integrated management of national and transnational water resources. This is especially essential regarding transboundary rivers.

In terms of socio-economic development, the project will provide a firm and sustainable basis for water resources assessment, monitoring and management in the Baltic Sea countries, and will contribute to the knowledge of hydrological processes in their interaction with the climate and the environment.

4. PROJECT OBJECTIVES

The overall objective of the Baltic-HYCOS is to assist the national hydrological (or hydrometeorological) agencies in the region to improve their services to the users of water data and information and thus contribute to the socio-economic development as well as environment protection. More specifically, the project would promote the improvement of the monitoring, assessment and management of water resources within the region through:

- Improving consistency in data acquisition, transmission, processing and use;
- Achieving of a better understanding of regional hydrometeorological phenomena and environmental trends;
- Promoting exchange of standardized quantitative and qualitative, and consistent data on water resources as well as the environment;
- Providing a basis for more efficient co-operation on transboundary rivers and for rational utilization of transnational water resources;
- Supporting regional approach to extreme events such as floods and droughts, which could benefit all concerned; and
- Fostering international co-operation in capacity building, including training and technology transfer.

These initiatives should allow for the optimal use at country level of the most recent scientific and technological advancement in regional hydrology. They are also expected to improve the partnership between the countries and between the communities within the countries concerned, as well as to increase the efficiency and economy of the use of water locally and regionally, and to protect the Baltic Sea environment.

5. OTHER RELATED PROJECTS AND PROGRAMMES IN THE REGION

At present, there are several initiatives under way in the Baltic Sea area in the field of water resources and the environment, some of which being coordinated by the Helsinki Commission. Baltic-HYCOS is not intended to overlap or substitute these initiatives, but to provide, as necessary, the qualitative and quantitative data needed to implement the other projects/programmes which would benefit from Baltic-HYCOS. Co-operative agreements could be made between programmes to specify the needs and commitments and to strengthen the links. Some of the relevant ongoing projects/programmes are:

Baltic 21 - An initiative taken at the Baltic Sea State Summit 1996 with the purpose of developing a regional Agenda 21 for the Baltic Sea Region.

BALTEX (Baltic Sea Experiment) - A regional project of GEWEX, designed to study the water and energy budget of the Baltic Sea and of its drainage area.

Baltic-Home (Hydrology, Oceanography and Meteorology for the Environment) - An idea from SMHI on the implementation of a Swedish framework for research and development of an operational system related to the environmental conditions of the Baltic Sea, Skagerrak, Kattegat and their respective drainage basins.

Baltic Sea Joint Comprehensive Environmental Action Programme - An action programme for the Baltic Sea environment, approved by the Environment Ministers of the Baltic Sea States, and planned to be implemented during 20 years (1993-2012).

BASYS (Baltic Sea System Study) - A three-year marine research project funded by the EU MAST programme to improve the understanding of the susceptibility of the Baltic Sea to external impact and to improve the quantification of past and present fluxes of natural and anthropogenic substances.

EuroGOOS - An association working on the establishment of a concerted European approach, including the Baltic, to the planning and implementation of the Global Ocean Observing System.

GRDC - The Global Runoff Data Centre (Koblenz, Germany) established under the auspices of WMO with the support of the German Government.

6. EXPECTED RESULTS

The expected results from the Baltic-HYCOS are:

- Agreed standards for hydrological data exchange, including water quality variables/parameters;
- A basic network of about 100 hydrological telemetric stations, some of which would be new, and other would be existing ones to be upgraded, as required, to meet the regional demands and those of the system. They will be equipped with automatic sensors for the measurements and transmission in near real-time of water quantity and quality, as well as some meteorological variables. All data will be transmitted in near real-time to relevant hydrological (or hydrometeorological) agencies of participating countries and to a Regional Centre (see below);
- A Regional Centre coordinating the regional co-operation activities for ensuring the exchange of agreed data and products, taking responsibilities for the training activities, leading pilot studies and promoting multilateral and bilateral co-operation between participating countries;
- Data exchange and dissemination system for the various information needs, using different suitable communication channels;
- Operational, consistent, distributed database aimed at providing consistent and good quality near real-time data from the network;
- A near real-time operational database in connection with a historical database forming a new basis for products of national and regional interest targeted to end-users needs and research, and for decision making and actions related to emergency situations, and management of national and transnational water resources and the environment;
- Agreement on, and commitment to, the exchange of data collected by the system between the participating countries and data centres such as GRDC, and defining the rules for the provision of data for commercial practices;
- Increased public awareness on water related aspects of disaster preparedness, environmental degradation and sustainable development due to utilization of Internet; and
- Modernized, as required, national observing and data transmission systems.

7. TECHNICAL ASPECTS

A basic network of about 100 Data Collection Platforms (DCPs), reporting in a near real-time major hydrological, meteorological and water quality variables, will be installed. The demands of the region will be a decisive factor for designing the network and choosing the variables measured. The way of transmission could be via METEOSAT, GTS or other means as required. In some countries the existing installations and transmission means could be used.

Variables which could be measured comprise: water level, water temperature, conductivity, turbidity, pH (and other water quality parameters as available through automatic measurement), precipitation, air temperature, relative humidity, wind speed and direction, radiation.

Possible products include validated time series (hydrological, meteorological, water quality, etc.), spatial integrated data with possibility to interface with Geographical Information System (GIS) and other tools, statistical estimates and evaluations of trends and fluctuations.

8. PROJECT IMPLEMENTATION

8.1 Preparatory stage

The Baltic-HYCOS Project Profile will be distributed to the 13 countries that indicated their interest to participate. A preliminary agreement by a majority of the countries to proceed with the project must be clearly stated. A preparatory meeting of national experts (focal points) would then be initiated by WMO to and agree further appropriate actions. The meeting would notably:

(a) adopt the project profile which would have been finalized by WMO on the basis of the comments received from the countries;

(b) establish the Terms of Reference (ToR) for the Regional Centre. These ToR would be send to the countries in order to generate candidatures to host the Regional Centre; and

(c) establish the guidelines for the preparation of national reports by the participating countries. These reports should notably identify at the country and regional levels the main problems with respect to Baltic-HYCOS objectives and desirable solutions as well as the possible locations of DCPs.

National reports would serve as a basis for experts from participating countries and WMO for the preparation of a detailed project document for presentation to donors. It would include:

- Justification for the project for presenting the project to governments and prospective donors;
- Technical specifications including operation and maintenance of the system;
- Proposal for the location of a Regional Centre on the basis of the ToR established by the preliminary meeting and candidatures from the participating countries; and
- Estimation of the costs of the implementation of the project and its time schedule.

A second meeting of experts from the participating countries will be arranged to consider the detailed project document.

8.2 Further steps

- Establishing of a Regional Centre taking into account possibilities of maintaining a regional database,
- Defining criteria for DCPs siting,
- Installing DCPs and transmission facilities meeting the project objectives,

- Upgrading national data processing and archiving systems to make them compatible with the Baltic-HYCOS.
- Training on installation, operation and maintenance of the system.

9. COST OF A PREPARATORY PHASE

Initial preparatory meeting of national experts and WMO	30 000 USD	
Preparation of a document in each country by national consultants (6.5 man/month)		26 000 USD
Preparation of a detailed project document by national and WMO experts		
Baltic countries experts 2 man/month	24 000 USD	
WMO staff 1 man/month		12 000 USD
Second regional meeting of experts from countries and WMO		30 000 USD
Communications, report printing and other management cost		10 000 USD
Contingencies		3 000 USD
Total		135 000 USD

10. TENTATIVE TIMEFRAME FOR A PREPARATORY PHASE

September 1998	First preparatory meeting of national experts
January 1999	National reports completed
June 1999	Project document for donors completed
September 1999	Second meeting of national experts.

International BALTEX Secretariat Publication Series

No. 1 : Minutes of First Meeting of the BALTEX Science Steering Group
at GKSS Research Center in Geesthacht, Germany, May 16-17, 1994.
August 1994.

No. 2 : Baltic Sea Experiment BALTEX - Initial Implementation Plan.
March 1995, 84 pages.

No. 3 : First Study Conference on BALTEX, Visby, Sweden,
August 28 - September 1, 1995. Conference Proceedings.
Editor: A. Omstedt, SMHI Norrköping, Sweden. August 1995, 190 pages.

No. 4 : Minutes of Second Meeting of the BALTEX Science Steering Group
at Finnish Institute of Marine Research in Helsinki, Finland, January 25-27, 1995.
October 1995.

No. 5 : Minutes of Third Meeting of the BALTEX Science Steering Group
at Strand Hotel in Visby, Sweden, September 2, 1995.
March 1996.

No. 6 : BALTEX Radar Research - A Plan for Future Action.
October 1996, 46 pages.

No. 7 : Minutes of Fourth Meeting of the BALTEX Science Steering Group
at Institute of Oceanology PAS in Sopot, Poland, June 3-5, 1996.
February 1997.

No. 8 : *Hydrological, Oceanic and Atmospheric Experience from BALTEX.*
Extended Abstracts of the XXII EGS Assembly, Vienna, Austria, April 21-25, 1997.
Editors: M. Alestalo and H.-J. Isemer.
August 1997, 172 pages.

No. 9 : The Main BALTEX Experiment 1999-2001 - ***BRIDGE***. Strategic Plan.
October 1997, 78 pages.

No. 10: Minutes of Fifth Meeting of the BALTEX Science Steering Group
at Latvian Hydrometeorological Agency in Riga, Latvia, April 14-16, 1997.
January 1998.

No. 11: Second Study Conference on BALTEX, Juliusruh, Island of Rügen, Germany,
25-29 May 1998. Conference Proceedings. Editors: E. Raschke and H.-J. Isemer.
May 1998, 251 pages.