BALTEX

Baltic Sea Experiment

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

Minutes of

Second Meeting of the BALTEX Science Steering Group

at
Finnish Institute of Marine Research
in Helsinki, Finland
January 25-27, 1995

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Contents

Summary

- The draft of the BALTEX *Initial Implementation Plan* was approved by the BALTEX Science Steering Group (BSSG). After some final editing the plan will be published in spring 1995.

- Seven research *networks* were defined which form the backbone of the BALTEX research organization. Based on these networks funding applications for BALTEX-related research will be submitted to funding agencies.

- Funding applications for these networks will be submitted on the European level to both the *MAST* and *Environment and Climate* programmes. One co-ordinator was nominated for each network. These co-ordinators are responsible for both monitoring the overall development of the networks, and for funding applications for the networks.

- The BALTEX SSG stressed further the importance of funding for BALTEX on national levels. BSSG emphasized the importance to introduce BALTEX to national funding agencies and explore national funding possibilities for BALTEX.

- PIDCAP (the BALTEX Pilot Study for Intensive Data Collection and Analysis of Precipitation) is being planned as the first BALTEX *Intensive Observational Period*, PIDCAP is scheduled for August to October 1995.

- The *First Study Conference* on BALTEX will be held from 28 August to 1 September 1995 in Visby, Sweden. The Conference has found high international attention. BSSG expects the conference to review the present state of art in modelling and measuring energy and water cycles in the Baltic Sea drainage region.

- Three BALTEX *Data Centers* have been implemented at three national services. Aspects of data management for BALTEX will in future be organized through these data centers, in cooperation with the International BALTEX Secretariat. Therefore, the BALTEX Working Group on data management and data studies was dissolved.

- A BALTEX Radar Working Group was constituted and held its first workshop.

- BALTEX is open for any research group to participate in BALTEX-related research. There will be no formal invitations sent out by BALTEX officials to other countries as such, to ask for participation at BALTEX. Participation in the capacity of institutes, groups, or research individuals will be supported.

- The next BSSG meeting is scheduled following the First Study Conference on BALTEX in Visby, Sweden.

Introduction

The second meeting of the BALTEX Science Steering Group (BSSG) was held at the Finnish Institute of Marine Research in Helsinki, Finland. The meeting started on 25 January, at 2 pm, it was closed on 27 January, at 12.30 pm, 1995.

Participants of the meeting are listed in Appendix 1. The agenda, as agreed upon by the meeting participants, is given as Appendix 2. The item numbers in this protocol refer to the agenda in Appendix 2.

1 Opening of the Meeting, Welcome

Item 1

P. Mälkki, the director of the Finnish Institute of Marine Research (FIMR), which acted as the local organizer, opened the meeting and welcomed all participants.

L. Bengtsson, the Chairman of the BALTEX Science Steering Group (BSSG), also welcomed the participants and thanked P. Mälkki for hosting this meeting at FIMR. The Chairman expressed his appreciation to U. Ehlin, head of the HELCOM (Helsinki Commission) - Secretariat in Helsinki, and E. Jatila, Director of the Finnish Meteorological Institute (FMI), attended this meeting as observers.

U. Ehlin pointed out that HELCOM is among the potential users of future BALTEX results. He indicated his interest in a successful development of BALTEX and recognized the importance of BALTEX, as an international research project, for future environmental work within the HELCOM context. U. Ehlin indicated to request any kind of support for BALTEX from HELCOM and its contracting partners on the next meeting of the Helsinki Commission to be held in March 1995.

E. Jatila recognized the potential benefits of BALTEX for all three disciplines involved. He assured general support of FMI for BALTEX activities and indicated FMI's interest in participating in different BALTEX research activities.

2 Introduction to the Meeting

Item 2

1. The Chairman emphasized, that two central items will have to be discussed thoroughly during this second meeting of the BSSG: the final discussion on the BALTEX Implementation Plan draft, and

2. discussion on and development of future funding application strategies for BALTEX-related research.

He urgently recommended to establish the final version of the BALTEX Implementation Plan during the present meeting in order to have this important document published in early spring 1995. It should be finished soon in order to serve as a background document supporting funding applications on both national and international levels. Hence, part of the afternoon session

on Wednesday, 25 January, is scheduled to provide an overview of recommendations and open questions concerning both items mentioned by the participants of the meeting. A detailed discussion on all recommendations and open problems is foreseen for the morning sessions of Thursday and Friday, respectively, in parallel and/or plenary groups.

BSSG agreed that it is the definite aim of this meeting to, both, establish the final version of the Implementation Plan, and outline the funding strategy for BALTEX during this meeting. As the Implementation Plan is also meant to serve as a background document for funding applications discussions on both items are expected to have feedbacks to the other, respectively.

3 Report of the BALTEX SSG Chairman

Item 3

The Chairman concentrated in his report on the following items (see Appendix 3) :

3.1 BALTEX Implementation Plan

Following the recommendations of the first BSSG meeting in May 1994, a drafting group (for the membership of this group, see Appendix 4) was established by the Chairman of BSSG. During summer and fall 1994 this group prepared a draft of the BALTEX Implementation Plan, which, after some additional editing, was mailed to all BSSG members in December 1994 for further improvements. The Chairman reported that only a few comments on the draft have been submitted so far, details will be discussed later during this meeting. Comments on the draft were also received from H. Grassl, the director of the World Climate Research Programme (WCRP).

The Chairman pointed out the excellent work of the drafting group and expressed his thanks to the members of this group.

3.2 EU Research Application for BALTEX

The Chairman had been in contact with EU representatives about funding possibilities for BALTEX. EU indicated that funding for BALTEX would be most likely through both the 'MAST III'- and the 'Environment and Climate' (ENVCLI)-programmes. Both programmes are open for BALTEX-related research, decision on the organization of the application is entirely up to the BALTEX scientists. Deadlines for applications are 15 March, 1995 for MAST III, and 27 April, 1995 for ENVCLI. In a concerted action, the Institut für Ostseeforschung Warnemünde (IOW) is organizing at least part of the applications to be submitted to MAST III, however, with emphasize on biological and environmental issues. The deadline for this part of applications is 15 June, 1995.

Based on these findings the Chairman proposed a strategic plan for funding applications which was mailed to BSSG members for further discussions in early December 1994 (see Appendix 5). It foresees to apply for seven BALTEX-subprojects, each of them consisting of contributions from different, about five on average, research teams. The suggested division into subprojects is according to the following research areas :

1. Meteorological modelling and experimentation
2. Hydrological modelling and experimentation
3. Ocean modelling and experimentation
4. Cloud / precipitation / air-sea interaction experiment
5. Cloud / precipitation / air-land surface field experiment
6. Atmosphere-ice-ocean experiment
7. Baltic Sea vertical advection and mixing experiment

1. to 3. include primarily modelling, data assimilation, and data diagnostic studies, while 4. to 7. comprise the major BALTEX field experiments. The Chairmen suggested to apply for 1., 2., 4. and 5. under ENVCLI, and for 3., 6. and 7. under MAST III. The Chairman pointed out that the division into subprojects followed the structure of the Implementation Plan draft as given by chapters 3 to 8 of the draft.

3.3 BALTEX Data Policy

A major part of BALTEX-related research will rely on data available through networks of routine services. Hence, data support from national meteorological, hydrological and oceanographic services and agencies is of high importance for a successful outcome of BALTEX. The Chairman contacted the relevant national agencies asking for data support under specific data exchange policy commitments. He informed the BSSG that no principal objections have been submitted by any of the agencies and suggested to include the data policy commitments in the BALTEX implementation plan. These commitments should meet the following guidelines:

1. The data will be used only for research within the BALTEX scientific programme.

2. The data will not be passed on to a third party without permission from the data supplier.

3. The data will not be used for any commercial purposes.

4. The data supplier will be kept informed about scientific findings which are based on the delivered data.

5. Proper acknowledgement of the data source will be given in all publications based on the data.

BSSG agreed with these suggestions. A chapter on BALTEX data management, as recommended by the drafting group, will be part of the Implementation Plan, including the suggested guidelines for commitments. The BALTEX Data Centers are asked to request respective commitments from all national agencies and services in order to guarantee data availability for BALTEX research.

3.4 BALTEX Radar Working Group

Following the suggestions of the first BSSG meeting, a BALTEX Radar Working Group (WGR) was established which held its first meeting in January 1995. The chairman of WGR, Jan Svensson of SMHI, Norrköping, Sweden, will give his report during this meeting (see item 9).

4 Discussion of the Meeting's Agenda

Item 4

The agenda as suggested by the Chairman (see Appendix 2) was accepted by BSSG. Two ad-hoc working groups were formed and convened in separate parallel sessions on Thursday morning to discuss details of the Implementation Plan draft and the BALTEX funding strategy, respectively.

5 Report of the BALTEX Secretariat

Item 5

H.-J. Isemer gave the report of the BALTEX International Secretariat, which is given as Appendix 6 to these minutes. BSSG acknowledged the work of the Secretariat. The requests for advice were answered by BSSG as follows:

Item 4 of the report: BSSG pointed out that physio-geographic data sets (e.g. topography, land use, soil type) are needed for an extended region in Europe. For some large-scale modelling activities, such data sets are needed even on a hemispheric or global scale. In order to use homogeneous data sets, BSSG recommended to contact such activities or programmes which are primarily establishing and offering physio-geographic data sets on a European, hemispheric, or even global scale. BSSG suggested to contact the GEWEX SSG, or a respective GEWEX working group, for further information on the availability of global physio-geographic data sets.

Item 5 of the report: The objectives of PIDCAP (the BALTEX Pilot Study for Intensive Data Collection and Analysis of Precipitation) include

- the collection and analyse of measured and estimated precipitation from different data sources,
- the intercomparison of different precipitation data sets against each other in order to identify and establish reliable standards for model validation,
- the validation of the output of different regional models against such precipitation data sets, and
- the development, test and establishment of necessary data management and analysis procedures (especially the co-operation between different research groups and the BALTEX Meteorological Data Center) for future comprehensive studies in the framework of BALTEX.

The observation period of PIDCAP is scheduled for August to October 1995, the area of interest is primarily the BALTEX region south of about 60N, with the possibility of further extension, if necessary. PIDCAP is a *pilot* study because of its time restriction (the time period in late summer means restriction to the investigation of rain events only), and because of its areal limitations. Precipitation data sets to be compared will include standard data (gauge land stations) and non-standard data (research vessel, especially equipped ships of opportunity, from SSM/I and radar stations). Modelling groups at MPIfM, GKSS, DMI and SMHI will perform model runs with different regional models for the same period.

BSSG acknowledged PIDCAP as the first co-ordinated Intensive Observation Period in the framework of BALTEX. PIDCAP should adequately be mentioned as such a pilot study in the Implementation Plan. BSSG recommended any further participation to develop PIDCAP into an international pilot study for BALTEX.

E. Jatila pointed out that FMI and possibly other Finnish research groups might be willing to participate at PIDCAP.

Item 8 of the report: BSSG supported the Secretariat's offer for guest scientist visits at the Secretariat. It is a means to ensure the international character of the BALTEX Secretariat at GKSS Geesthacht and will maintain and further develop its potential as a science-organizing office for BALTEX. The possibility for guest visits should be announced and promoted on national levels in the participating countries.

6 Discussion of the BALTEX Implementation Plan Draft

Items 6, 8.1, and 14

In this section of the meeting the BSSG members formulated their general impression on, and major recommendations for improvements to the Implementation Plan draft. All these recommendations including the comments of the director of WCRP, H. Grassl, were thoroughly considered in the discussions. Suggestions for minor, detailed improvements were submitted to an ad-hoc working group which met on next Thursday's morning. The task of this ad-hoc WG was to include these suggestions into the draft. Open questions from the ad-hoc working group session and further problems were again discussed in plenary under item 14.

The major findings, comments and recommendations from these discussions under items 6, 8.1 and 14 are summarized as follows :

6.1
All BSSG members considered the draft as a well-written document, with respect to both structure and content. Most of the recommendations for improvements were minor. All BSSG members appreciated the efforts and success of the drafting group.

6.2
The Implementation Plan needs a more detailed time-planning of the individual research activities. BSSG agreed upon integrating a time-schedule for the major modelling, data assimilation and process studies activities.

6.3
At present, a detailed planning of the individual field experiments, which are scheduled to start in 1996 or later, is difficult to assess. Hence, the Implementation Plan will be updated in future in more or less regular intervals, integrating the most recent planning and implementation activities. In this sense, the present version constitutes an *Initial* Implementation Plan. Upon suggestion by the Chairman, BSSG decided to indicate this in the title and to publish the revised draft as the *BALTEX Initial Implementation Plan.*

6.4
A *foreword* and an *executive summary* will be drafted by the Chairman and will be mailed for approval to all BSSG members immediately after this meeting. The executive summary should especially point out the importance of BALTEX as a concerted, interdisciplinary research effort which combines modelling activities, field experiments and process studies, and data diagnostic studies.

6.5
The following two general aspects of BALTEX have to be formulated more distinctly in the Initial Implementation Plan as necessary pre-requisites for the desired success of BALTEX:
(i) Integration of three sciences, meteorology, hydrology, and oceanography, into one interdisciplinary project, and, (ii) a combined strategy and implementation of modelling work, field experiments, and data diagnostic studies.

6.6
The chapter on satellite remote sensing needs further specification, especially with regard to remote sensing applications over the Baltic Sea. The BALTEX Secretariat was asked to organize the preparation of a revised version of this chapter immediately after the BSSG meeting.

6.7
The importance of both diagnostic and model type investigations on the role of sea ice in the water and energy cycles of the Baltic Sea catchment region needs to be pointed out more clearly.

6.8
Commitments of national agencies and research facilities concerning the support of BALTEX should be included in the Implementation Plan, as far as they are available at present. This is especially needed for the implementation of the three planned BALTEX Data Centers at SMHI (Norrköping, Sweden), FIMR (Helsinki, Finland), and DWD (Offenbach, Germany).

Further changes in the draft were decided upon during the discussion on item 7.

7 Discussion on Funding Application Strategies for BALTEX

Items 7, 8.2, and 15

Discussions under items 7, 8.2, and 15 are summarized in this section.

The BALTEX SSG noted two principal possibilities for funding of BALTEX-related research:

1. on national levels
2. on the European level.

7.1 Funding on National Levels

The German Research Ministry launched a special research programme „Water Cycles" where a number of national German BALTEX-projects are already funded for the period 1994 to 1996. In Sweden, SMHI provided support for a number of post-doc positions dedicated to BALTEX research. In Sweden, Denmark and Finland applications for funding of BALTEX-related research have been submitted to national agencies, or are currently being prepared. The Danish BALTEX committee envisaged to receive about 50 % of the funding for national BALTEX contributions from national Danish sources. No funding on a national level was reported from the East European countries.

BSSG noted the importance of national funding for BALTEX and emphasized the importance for each BSSG member to introduce BALTEX to national funding agencies and explore national funding possibilities for BALTEX.

7.2 Funding on the EU Level

There are two EU-programmes with deadlines in 1995 both of which are open for BALTEX-related applications in general: MAST-III and *Environment and Climate* (ENVCLI). The discussion on funding strategy for BALTEX on the EU level followed the preparations and suggestions made by L. Bengtsson in his report (see the report of the Chairman, item 3.2, and Apendices 3 and 5). The major findings and results of this discussion are summarized in the following. This includes the work and results of an ad-hoc working group, which was formed by BSSG and convened on the morning of January 26 for a separate meeting.

7.2.1
BSSG agreed to apply for funding in both the MAST-III and ENVCLI EU programmes.

7.2.2
Following the suggestions of the Chairman, BSSG agreed to prepare a number of co-ordinated applications dedicated to BALTEX research areas or subprojects. BSSG emphasized that the specific structure of the BALTEX-related EU funding strategy must be clearly visible in the Initial Implementation Plan. Following both the latter emphasis and the suggestions outlined by the Chairman in his December letter (Appendix 5), BSSG defined seven BALTEX *research networks*. They form the present backbone of the BALTEX research and comprise the programme elements and subprojects defined and outlined in the Implementation Plan. These networks are entitled as follows:

1. Full-scale studies of the energy and water cycle
2. High-resolution process studies with the emphasis on hydrological modelling
3. Coupled modelling of the Baltic Sea
4. Cloud / precipitation / air-sea interaction field experiment
5. Cloud / precipitation / air-land surface field experiment
6. Atmosphere-ice-ocean field experiment
7. Baltic Sea vertical advection / mixing field experiment

A more detailed overview is given in Appendix 7.

7.2.3
For each of these network at least one funding-application will be sent to the EU, either in 1995 or later. One co-ordinator was assigned to each of the networks.
The tasks of the co-ordinators are
- to monitor the overall development of the network, and
- to seek for support and promotion for the network and the realization of the projects in the network. In particular, they will be responsible for funding applications on the EU level.

The co-ordinators will work in close co-operation with the BALTEX SSG.

7.2.4
Following the earlier suggestions by the Chairman BSSG decided to advice the co-ordinators to apply for networks 1., 2., 4. and 5. under ENVCLI, and for networks 3., 6. and 7. under MAST III.

7.2.5
BSSG decided to introduce an additional chapter to the Implementation Plan which is designed to summarize the organization of BALTEX research. This chapter will contain
- a time schedule for BALTEX research projects, and
- an overview on the BALTEX research networks.

BSSG pointed out that this does not imply any re-organization or re-definition of the Implementation Plan, but is a comprehension of chapters 3 to 8 of the draft. The new chapter will be included as chapter 9.

The time schedule for BALTEX research projects (see Appendix 8) was worked out in the ad-hoc working groups (see also item 6.3).

7.2.6
BSSG noted that the definition of BALTEX research networks is in accordance with the publication of an *Initial* BALTEX Implementation Plan. The network structure reflects BSSG's present view of the research organization and strategy for BALTEX which might be changed at a later stage, if necessary.

7.2.7
BSSG adviced the co-ordinators to make clear and unique reference to the BALTEX network structure as outlined in chapter 9 of the Initial Implementation Plan, when applying for BALTEX funding. Each application should be easily identified as a BALTEX-related research contribution. BSSG asked the Chairman to write a letter of endorsement to be submitted together with the individual applications. Also, copies of the Implementation Plan should be submitted together with the application.

7.2.8
BSSG realized that, although both MAST-III and ENVCLI allow contributions from groups in non-EU countries to the projects funded by EU, these programmes, however, do not foresee financial support to research groups in non-EU countries. This would exclude a number of countries presently engaged in the preparation of BALTEX from EU funding of BALTEX-related research. BSSG suggested to investigate other funding programmes for funding possibilities. Especially, the network co-ordinators are requested to search for funding possibilities of research groups in East European countries.

Further discussion on this item is needed on the next BSSG meeting.

8 Reports from BALTEX Countries

Item 9

8.1 Denmark
The Danish national BALTEX committee prepared a document entitled *Danish BALTEX Profile* which summarizes the research potentials for BALTEX in Denmark. The document outlines suggested Danish projects and relates them to the scientific objectives of BALTEX. Main issues include studies on the flow through the Danish Straits, and integrated meteorological and hydrological modelling and process studies. The *Danish profile* includes plans for co-operation with East European BALTEX partners, especially the transfer of environmental technology. About 50 % of the funding of Danish BALTEX contributions is envisaged to come from Danish national sources, the other half will have to be applied for from sources on the European level, especially the MAST-III and ENVCLI programmes.

The *Danish BALTEX Profile* was distributed to the BSSG members (see Appendix 9).

8.2 Sweden
Sweden is organizing the First Study Conference on BALTEX, scheduled for summer 1995 (see item 12).
SMHI at Norrköping approved four PhD positions for BALTEX in the field of coupled modelling research.
Recent snow modelling applications to Swedish authorities make extensive reference to BALTEX.
Further national applications for funding of BALTEX-related research is being prepared.

8.3 Finland
A national BALTEX committee and a national BALTEX secretariat was established in Finland.
No application for BALTEX funding were submitted so far.

8.4 Russia

Four institutions have been taken part in BALTEX so far: the State Hydrological Institute (acts as co-ordinator), St.Petersburg Regional Hydrometeorological Authority, Main Geophysical Observatory St.Petersburg, and the St.Petersburg Branch of the Russian State Oceanographic Institute.
Data collection and preparation under contract with the BALTEX Secretariat (see item 5) were started. This data collection is problematic because most of the data exist only on paper and need to be digitized.
Model development for the Neva river basin was started for BALTEX.
Russia will participate in the Gulf of Finland Year 1996 project.
A national Russian BALTEX committee was established, chaired by V. Vouglinsky.

BSSG recommended to appoint Dr.Melechkov as member of the BALTEX Working Group on Numerical Experimentation.

8.5 Belarus

Data collection and preparation under contract with the BALTEX Secretariat (see item 5) were started in Belarus. Data sets for 1886/87 and 1992/93 will be completed until the end of 1995. A written report was presented to BSSG (see Appendix 10). The Hydrometeorological Agency of Belarus is ready to provide necessary data sets for the PIDCAP period.

8.6 Estonia

In Estonia, a national BALTEX workshop was held in fall 1994, with high national resonance. A meeting report will be sent to BSSG soon.
A meso-climate classification scheme for the Estonian territory was established at the Estonian Meteorological and Hydrological Institute (EMHI). This scheme will be further developed in co-operation with technical universities in Estonia.

8.7 Latvia

Latvia established a national BALTEX committee.
Data digitizing under contract with the BALTEX Secretariat was started. BALTEX data sets are completely prepared for May/June 1993. Digitizing of precipitation and river runoff data as well as of oceanographic data from the Gulf of Riga for the BALTEX key periods 1986/87 and 1992/93 is currently being performed. A written report was presented to BSSG (see Appendix 11).

8.8 Lithuania

No representative of Lithuania could attend the BSSG meeting.

8.9 Poland

A BALTEX task force was established in Poland. A number of Polish BALTEX activities and research proposals for BALTEX are summarized in a comprehensive written report presented to the BSSG (see Appendix 12).

8.10 Germany

In Germany, about 25 BALTEX projects are currently being funded by the German Ministery of Research, this funding is approved until 1996. A number of national workshops and meetings took place in order to co-ordinate these projects. The overall scientific strategy and progress of these projects is supervised by a national German GEWEX committee.
Additional funding for BALTEX is available through some individual research institutions.
Recently, a meeting was held in Hamburg in order to establish connections between BALTEX and BAHC (Biospheric Aspects of the Hydrological Cycle), a subproject of IGBP, and co-ordinate activities of both programmes on the national German level.

9 Reports of BALTEX Working Group Chairmen

Item 10

9.1 BALTEX Working Group on Numerical Experimentation (WGN)

There was no meeting of WGN held since the preceding BSSG meeting (see Minutes of the First BSSG meeting, Appendices 13 and 14).

BSSG recommended WGN to organize and undertake a BALTEX model intercomparison. Especially, flux estimates of different regional atmospheric models should be compared for the BALTEX region, or extended European or Northern Hemisphere regions. There are similar intercomparison activities underway at present, guided and reviewed by the CAS/JSC Working Group of Numerical Experimentation, WGNE (e.g. PILPS, the GEWEX Project for Intercomparison of Land-surface Parameterization Schemes, or AMIP, the Atmospheric Model Intercomparison Project). GEWEX recently established a Numerical Experimentation Panel, which, among other activities, plans to conduct a comparison of coupled hydrological models for selected river basins. Contacts to, and co-ordination with both WGNE and the GEWEX Panel seem appropriate when preparing for BALTEX model intercomparison studies.

BSSG asked WGN to define and further specify the data requirements for BALTEX modelling activities.

The membership of WGN was changed. M.Leppäranta of Helsinki University was appointed member of WGN. O. Brink-Kjär (DMI Copenhagen) resigned his membership in WGN. BSSG recommended to ask J. Pietrzak of DMI in Copenhagen to become a member of WGN instead. Also, BSSG recommended to ask C. Fortelius of the University of Helsinki, Finland, to become a member of WGN.

The next meeting of WGN is scheduled to take place at Visby, Sweden in connection with the first Study Conference on BALTEX.

9.2 BALTEX Working Group on Data Management and Data Studies (WGD)

L. Laursen (DMI Copenhagen), the chairman of WGD, summarized the status of WGD's activities. His written report is given in Appendix 13. There was no meeting of WGD held since the preceding BSSG meeting (see Minutes of the First BSSG meeting, Appendix 16).

Among the main tasks of WGD was the establishment of a comprehensive data inventory related to the requirements of BALTEX research. WGD successfully initiated an international activity to obtain the necessary information from the respective national services and data agencies in the BALTEX countries.

Upon request of the chairman of WGD, BSSG agreed to transfer the completion of this inventory and future activities related to data management problems to the established BALTEX Data Centers.

BSSG further suggested that the activities of the BALTEX Data Centers should in future be monitored and co-ordinated by the BALTEX Secretariat. Both, E. Raschke and H.-J. Isemer pointed out that this additional task can only be fulfilled at the Secretariat providing that at least two new scientist positions in the Secretariat will be funded, as are currently applied for by E.Raschke (see the report of the BALTEX Secretariat, Appendix 6). Although no definite decision on the applications was available, E. Raschke indicated his optimistic view that at least support for one position might be obtainable from German sources.

Noting both the implementation of the three BALTEX Data Centers and the likelihood of the future engagement of the Secretariat, and in agreement with the chairman of WGD, BSSG took the view that, at present, there is no need for a BALTEX working group on data management. BSSG decided to dissolve WGD and asked L. Laursen to inform the members of WGD about the end of WGD's work. BSSG thanked the members and the chairman of WGD for their contributions to the development of BALTEX.

9.3 BALTEX Working Group on Process Studies (WGP)

WGP held its second meeting at DMI in Copenhagen, 20/21 September, 1994, in due time for the chairman of WGP, E. Ruprecht, to provide necessary input in the drafting process of the Implementation Plan. BSSG accepted the report of the chairman of WGP and acknowledged the work of WGP. The detailed written report and the WGP meeting minutes are given in appendices 14 and 15.

The main focus of the work of WGP was on

- the definition and specification of the general objectives of the future BALTEX field experiments,
- the definition and specification of specific objectives for the BALTEX field experiments,
- the nomination of co-ordinators for the preparation of BALTEX field experiments,
- definition of the tasks of these co-ordinators,
- review present and planned field experiment activities in the Baltic Sea catchment region, which are of relevance for BALTEX.

The BALTEX field experiments constitute a major scientific activity in the BALTEX framework. Four out of seven established BALTEX research networks, as discussed under items 7 and 8, are basically field experiments :

Network D:
Cloud / Precipitation / Air - Sea Interaction Field Experiment
Network E:
Cloud / Precipitation / Air - Land Surface Field Experiment
Network F:
Atmosphere - Ice - Ocean Field Experiment
Network G:
Baltic Sea Vertical Advection and Mixing Field Experiment

BSSG agreed to apply for EU funding for networks D and E at the ENVCLI programme while proposals for networks F and G will be submitted to the MAST programme. E.Ruprecht pointed out that only network D might be able to meet the deadline in 1995 (27 April), the proposals for networks E, F and G need more time for a thorough preparation and will wait for the second call of both programmes in 1996 and 1997, respectively.

BSSG asserted the view that modelling studies should be conducted in close co-ordination with the field experiments. The design of the latter will benefit from preparatory numerical experiments. In this sense, BSSG recommended application for funding of pilot numerical studies order to e.g. decide on the most useful experiment arrangements in the field, as part or precursor of funding proposal for BALTEX field experiments.

E. Ruprecht indicated that co-operation between BALTEX and NOPEX in both organizing and applying funds for the air-land surface field experiment is envisaged, however, determination of the terms of this co-operation needs further future discussion.

WGP learned about details on oceanographic measurements which have been performed by a Danish company since a number of years in both the Great Belt and the Öresund. This data set is considered as very important for BALTEX because independent constraints for the water balance of the entire Baltic Sea are expected to be estimated from these measurements. The data set is stored at DHI in Copenhagen and is available in general for scientific purpose, it seems however unpractical to move the complete set to e.g. the BALTEX Oceanographic Data Center. Instead, meta information will have to be stored at the Oceanographic Data Center and the BALTEX Secretariat.

Both H. Sundquist and E. Kuusisto resigned their membership in WGP because they are also engaged as member of BSSG and WGN, respectively. BSSG appointed J.C. Refsgaard, DHI Hörsholm, Denmark as a new member of WPG.

WGP will again convene together with the co-ordinators of the field experiments in early March 1995 in order to detail time-schedules for the field experiments and prepare for funding applications.

9.4 BALTEX Radar Working Group (WGR)

The report on the activities of the BALTEX Radar Working Group (WGR) was given by the chairman of WGR, Jan Svensson (SMHI, Norrköping, Sweden). A status report on WGR had been submitted to the chairman of the BSSG, and was distributed to the BSSG members at the beginning of this meeting (see Appendix 15).

J. Svensson recalled that in contrast to the other BALTEX WGs the Radar WG had been implemented quite recently. The first meeting of WGR took place on 18 January, 1995, at SMHI, Norrköping. The main results of this meeting are

- an inventory of existing radar stations especially for the Scandinavian countries, Germany and Poland, and
- the re-definition of the terms of WGR in close connections with the future work of WGR.

For the minutes of this meeting see Appendix 16.

The chairman of WGR reviewed the present coverage of the BALTEX region by radar:

- Coverage of the BALTEX region with radar data is incomplete.

- Even the Baltic Sea is not yet entirely covered by radar, gaps exist in particular in the eastern part and some areas in the north. At present, at least 22 radar stations are in operation.

- The weather radars in Finland, Norway and Sweden are now organised and linked together in NORDRAD - the Nordic Weather Radar Network, which consists at present of one station in Norway, 9 stations in Sweden, and five stations in Finland. A complete coverage of the Baltic Sea may require additional six radar stations. NORDRAD has no central organisation, nor does it provide a NORDRAD central data set. Permission to use data from this network has to be asked for at the national weather services of the participating countries. NORDRAD is an operational network, it is not necessarily optimal for research purposes Data are not stored operationally. No quantitative estimates of precipitation amounts are produced operationally.

- Radar stations in Denmark are not included in NORDRAD, except the data from the station in Kastrup, which, however, may be used for operational purposes only in Sweden at present.

Kastrup is an important station for BALTEX because it covers large areas of the western Baltic Sea e.g. in the Belt Sea region and the Kattegat.

- Two German stations (Berlin and Rostock, the latter will be operational in the first half of 1995) are important for the coverage of the BALTEX region.

- In Poland, one station operates in Legionowo near Warzsawa. A modern doppler radar will be implemented during 1995 and will cover the source catchments of both the rivers Odra and Vistula.

- Information on operational radar stations in the Baltic States, in Russia and Belarus is sparse. WGR will have to contact the national hydro-meteorological services in order to gain information about the present radar situations in these countries.

The draft version of the terms of reference of WGR, which outline the major future tasks of WGR, were approved by BSSG (see Appendix 17).

S. Bergström (SMHI) mentioned a meso-scale analysis project for precipitation, which is currently being developed at SMHI. This method combines information on precipitation from different sources, specifically radar data from NORDRAD, synoptic and direct rain estimates and measurements, satellite data and HIRLAM precipitation forecast fields. This analysis scheme will become operational soon at SMHI.

After discussion on data quality and data availability for research purposes the BSSG stated

- that further research work on the use of radar data is strongly recommended and that the use of existing stations and networks for BALTEX-related research should be made feasible, WGR is asked to initiate related action,
- that existing radar networks need to be enlarged, especially to cover the entire Baltic Sea region,
- that ways of data exchange for research purposes in BALTEX need to be worked out, WGR is asked to initiate related action.

The BSSG recommended in particular to ensure the participation of groups or scientists, who have access to NORDRAD data, at PIDCAP, the BALTEX Pilot Study for Intensive Data Collection and Analysis of Precipitation. It was estimated that the full 3-dimensional radar data set from the NORDRAD network amounts to approximately 4.5 Gbyte per month. S.Bergström (SMHI) was asked to investigate whether storage of the 3-dimensional radar data from NORDRAD will be feasible for the PIDCAP-period August to October 1995 and further future intensive observation periods in BALTEX. E.Müller (DWD) was asked to investigate data storage capacities at the Rostock radar in order to ensure the storage of 3-dimensional radar data for PIDCAP and future BALTEX observation periods.

BSSG pointed out the importance of radar data in particular for obtaining area estimates of precipitation over the Baltic Sea. All efforts should be undertaken to arrive at a complete radar coverage of the Baltic Sea and a homogeneous radar data set for this region, which should be available freely for research purposes. Having in mind the successful implementation of NORDRAD, the present network of radar stations for parts of Scandinavia and parts of the Baltic Sea, the establishment of a similar network covering the entire Baltic Sea - and the entire water catchment area of the Baltic Sea at a later stage - is regarded as a desirable and most useful future development to meet the scientific objectives of BALTEX. At the same time, it is expected to be beneficial for e.g. weather forecast purposes and other operational duties in meteorology and hydrology in a number of countries in the region.

BSSG thanked J. Svensson and the members of WGR for their work.

10 Status of the BALTEX Data Centers

Item 11

10.1 BALTEX Meteorological Data Center

E. Müller reported that two full time positions are now available in the BALTEX Meteorological Data Center (BMDC) at DWD, Offenbach, Germany. One position is delegated from the permanent DWD staff, the other is funded for three years by the German Ministery of Research.

BMDC was actively engaged in the preparation and evaluation of the data inventory initiated by WGD.

BMDC agreed to take care also for topographic data sets.

The outstanding task of BMDC, among others, will be to make precipitation data from all existing stations in the BALTEX region available.

DWD intends to start a dedicated data assimilation project for the BALTEX region in January 1996. The *Europa* model of DWD will be used. This project will be performed in delayed mode, separated from the operational mode, and is related especially to research aspects of BALTEX.

BMDC will act as both metacenter and data center, depending on size and formats of the relevant data sets.

BMDC will actively take part in PIDCAP in order to prepare for major future BALTEX research projects.

10.2 BALTEX Hydrological Data Center

SMHI, Norrköping, Sweden is prepared to host the BALTEX Hydrological Data Center (BHDC). A special duty of BHDC, among others, will be to make the runoff data from all available runoff stations in the BALTEX region accessible. BHDC is expected to be assigned to the operational service of SMHI.

A person at SMHI will be nominated as a contact person for data problems and requests concerning BALTEX.

BSSG asked S. Bergström to explore whether SMHI is willing to act as both a metacenter and an actual holder of data sets.

A re-analysis project, especially related to BALTEX, for the winter 1992/93 is presently conducted at SMHI using a research version of the operational HIRLAM model.

10.3 BALTEX Oceanographic Data Center

FIMR, Helsinki, Finland is prepared to host the BALTEX Oceanographic Data Center (BODC). BODC is expected to be assigned to the operational service of FIMR.

A person at FIMR will be nominated as a contact person for data problems and requests concerning BALTEX.

P. Mälkki assured that FIMR will act at least as a metacenter.

10.4
BSSG noted the formal implementation of three BALTEX Data Centers. BSSG further noted and appreciated that all three BALTEX Data Centers committed to act at least as metacenters, where all important up-to-date information on the actual data (e.g. originator, formats, availability, accuracy) will be stored. These commitments will be mentioned in the BALTEX Implementation Plan.

As discussed under item 9.2, BSSG suggested close co-operation between the BALTEX Secretariat and the BALTEX Data Centers.

BSSG asked the BALTEX Data Centers to prepare for data exchange commitments according to the guidelines outlined under item 3.3 in order to guarantee an open approach to the exchange of data relevant for BALTEX.

11 First Study Conference on BALTEX

Item 12

S. Bergström reported on the progress of the preparation of the First Study Conference for BALTEX. The Conference is organized by a Swedish local organization committee at SMHI and a scientific committee composed of seven members of the BSSG. After the first conference announcement, a second circular was disseminated at the end of 1994. The Conference is scheduled for 28 August to 1 September, 1995. More than 60 proposals for scientific papers were received so far. All invited speakers confirmed participation and contributions. The director of WCRP, H. Grassl, will attend and will give a paper on the importance of GEWEX for WCRP. Representatives of the other GEWEX regional projects will give introductions to these experiments.

Deadline for submitting abstracts is February 28. A conference proceedings containing the abstracts and full papers of invited contributions will be prepared before the meeting. It is planned to publish the proceedings as a BALTEX Secretariats report, in co-operation with the BALTEX Secretariat.

H. Sundquist confirmed that a special issue of TELLUS will be dedicated to the BALTEX Study Conference. The deadline for submitting papers is 15 October, 1995. Appearance of this BALTEX issue is scheduled approximately for September 1996.

BSSG expressed concern about the high conference fee for participation at the Conference. S. Bergström indicated that there might be possibilities to lower the conference fee.

BSSG, noting with satisfaction the high international acceptance of the First Study Conference on BALTEX, appreciated the excellent preparation performed by the organizing committees. BSSG expressed the hope that the Conference will give the possibility to review the present state of art in modelling and measuring energy and water cycles in the Baltic Sea drainage region.

12 Participation of Further Countries to BALTEX

Item 13

BSSG took note on a proposal by the Chairman on the participation of further countries to BALTEX (Appendix 19) and agreed on the following text:

- BALTEX is open for any research group to participate in BALTEX-related research.
- There will be no formal invitations sent out by BALTEX officials to other countries as such, to ask for participation at BALTEX. Participation in the capacity of institutes, groups, or research individuals will be supported. Further participation of the latter should be promoted primarily by personal contacts.
- Especially those further contributions are welcome, and should be seeked, which are instrumental to complete existing research facilities, programmes, or experiments in BALTEX. Contributions by, and hence, access to comprehensive measurement devices (e.g. aircrafts) or modelling tools, which are not frequently available inside the BALTEX community, are encouraged, in order to share resources and increase the probability of solving the scientific tasks of BALTEX.
- Inclusion of other institutions may be a means to strengthen applications to e.g the EU.

13 Membership of BSSG

BSSG appointed J.C. Refsgaard of DHI Hörsholm, Denmark, as a new member of the BALTEX Science Steering Group.

14 Next Meeting of BSSG

Next meeting of BSSG is scheduled to take place in Visby, Sweden, in connection with the first BALTEX Study Conference.

15 Closing of the Meeting

The Chairman expressed his gratitude to all participants of this BSSG meeting for their contributions. Especially, appreciation was expressed to P. Mälkki and his co-workers at FIMR for preparing and supporting this meeting.

List of Appendices

Appendix 1

Participants
at
Second Meeting of the BALTEX Science Steering Group

Pekka Alenius	FIMR Helsinki, Finland
Lennart Bengtsson	MPIfM Hamburg, Germany
Sten Bergström	SMHI Norrköping, Sweden
Jerzy Dera	Institute of Oceanology Sopot, Poland
Ulf Ehlin	HELCOM Secretariat Helsinki, Finland (part-time)
Eero Holopainen	Helsinki University, Finland
Hans-Jörg Isemer	BALTEX Secretariat, GKSS Gesthacht, Germany
Erkki Jatila	FMI Helsinki, Finland (part-time)
Peeter Karing	EMHI Tallinn, Estonia
Wolfgang Krauß	IfM Kiel, Germany
Esko Kuusisto	NBWE Helsinki, Finland
Leif Laursen	DMI Copenhagen, Denmark
Matti Leppäranta	Helsinki University, Finland
Pentti Mälkki	FIMR Helsinki, Finland
Eberhard Müller	DWD Offenbach, Germany
Kai Myrberg	FIMR Helsinki, Finland
Ehrhard Raschke	GKSS Geesthacht, Germany
Jens Christian Refsgaard	DHI Hörsholn, Denmark
Eberhard Ruprecht	IfM Kiel, Germany
Ivan M. Skouratovich	MAH Minsk, Belarus
Anders Stigebrandt	Göteborg University, Sweden
Hilding Sundquist	Stockholm University, Sweden
Jan Svensson	SMHI Norrköping, Sweden (part-time)
Evgenij Zaharchenko	LHA Riga, Latvia
Sergei Zhuravin	RSHI St.Petersburg, Russia

Appendix 2

Second meeting of the
BALTEX Science Steering Group
January 25-27, 1995 in Helsinki

Agenda

Wednesday, January 25, 1995

2.00 pm
1. Opening, Welcome (Mälkki)
2. Introduction to the meeting (Bengtsson)
3. Report of the SSG chairman (Bengtsson)
4. Discussion of the meeting's agenda

2.45 pm
5. Report of the BALTEX Secretariat (Isemer)

3.30 pm
6. 1st discussion of the BALTEX Implementation Plan draft
Review of recommendations of BALTEX SSG members,

4.45 pm
7. 1st discussion on funding application strategies for BALTEX,
Review of recommendations of BALTEX SSG members,

6.00 pm
Reception at Vaisala company

Thursday, January 26, 1995

8.30 am
(parallel sessions)
8.1 Meeting of ad-hoc Working Group on BALTEX Implementation Plan

8.2 Meeting of ad-hoc Working Group on Funding Strategy

10.30 am
(plenary)

9. Reports from BALTEX countries
   - Denmark
   - Sweden
   - Finland
   - Russia
   - Belarus
   - Estonia
   - Latvia
   - Poland
   - Germany

Thursday, January 26, 1995

12.15 am	10. Reports of Working Group Chairmen WG Numerical Experimentation (Krauß for Willebrand) WG Process Studies (Ruprecht)
1.00 pm	Lunch
2.00 pm	10. Reports of Working Group Chairmen (continued) WG Data Management and Data Studies (Laursen) WG Radar (Svensson)
3.00 pm	11. Status of BALTEX Data Centers
3.30 pm	12. First BALTEX Conference in Visby, summer 1995 Report of the organizing committee (Bergström)
4.00 pm	13. Discussion on participation of further countries to BALTEX
5.00 pm	14. BALTEX Implementation Plan Discussion of and work on the final version
6.30 pm	Dinner

Friday, January 27, 1995

9.00 am	14. BALTEX Implementation Plan (continued) Discussion of and work on the final version
10.00 am	15. Funding application strategy for BALTEX Discussion
11.00 am	16. Summary and review of the meeting Calendar of future activities
12.30 pm	Closing of the meeting

Appendix 3

Report by the BALTEX SSG Chairman

(distributed at the SSG meeting)

1. Preparation of the BALTEX Implementation Plan

This has been the main task of my activity since the last Steering Group meeting. The drafting group met 1 - 4 November at hotel Fredensborg on Bornholm where the major part of the work was carried out. The plan was then edited by Dr. Isemer and myself before being submitted to the members of the SSG last month. Only a few comments have been received so far, and I hope this meeting should be able to agree on the final plan. Following some minor updates and additional editorial work, we should be able to have the plan ready during the course of next month. I would like to thank the members of the drafting group for the excellent work.

2. EU research application for BALTEX

Following precious contacts with EU in March 94 when a principal support for BALTEX was expressed by the representatives of EU, a strategic plan for application for funds has been worked out and will be discussed at a special point during this meeting. The general question whether the applications will fall under the MAST - or the Environment programme has been explored with Prof. Hempel and his staff at Warnemünde, the co-ordinator for a Baltic Sea project under the Mast-III. They will now concentrate on biological and environmental issues and I believe consequently that the most rational for BALTEX is to concentrate on the Environmental programme.

The deadline for final application is now 27 April so the preparation of applications will have to start as soon as possible.

3. BALTEX data policy

Following the last SSG meeting, I have consulted the national agencies responsible the provision of routine observations. No principal objectives have so far been expressed by the services, and it appears therefore that the data policy (see BALTEX Implementation Plan draft, sect. 9.1) is agreeable.

4. A BALTEX Radar working group

As agreed at the last SSG meeting a radar working group has been established. The chairman of the group, Mr. Svensson, will report from the first meeting of the group, two weeks ago.

Appendix 4

BALTEX Implementation Plan Drafting Group Membership

Lennart Bengtsson	MPIfM Hamburg, Germany
Sten Bergstöm	SMHI Norrköping, Sweden
Hans-Jörg Isemer	GKSS Geesthacht, Germany
Leif Laursen	DMI Copenhagen, Denmark
Arthur Magnuszewski	Warzsaw University, Poland
Anders Omstedt	SMHI Norrköping, Sweden
Ehrhard Raschke	GKSS Geesthacht, Germany
Jens Christian Refsgaard	DHI Hörsholm, Denmark
Eberhard Ruprecht	IfM Kiel, Germany
Jürgen Willebrand	IfM Kiel, Germany

BALTEX Science Steering Group
- The Chairman -
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2 December 1994

Dear Colleague,

EU research applications for Baltex

Following contacts with Ib Troen (Environment) and Jean Boissonnas (Mast) I would like to inform you of the following.

1) The most likely deadline for applications is now 15/6 95. This will be valid for Environment as well as for those part of Mast which are related to Environment, as for example Baltex.
   According to Boissonnas "the game is very open" and it is left to us to do what we think is best. In principle all applications can be done within Environment.(Boissonnas proposed Klaus Günther Barthel as contact person for Mast)

2) My proposal for Baltex is the following:
   I believe the most rational approach is to split the application for funding onto several subprojects, each subprojects consisting in the average of the order of, say, five research teams. One of the projects will be given the task of an overall planning for the whole Baltex project.
   The data-assimilation work and the numerical experimentation could most conveniently be split up into three projects. The four field experiments will each be treated as separate projects.

After every project, listed below, I have suggested the institute or individual who could take the lead. Project 1,2,4 and 5 clearly fall into Environment and probably also 3. 6 and 7 on the other hand could be applied for within Mast.

Please let me have your general comments at your earliest convenience.

Best regards,

Lennart Bengtsson

1) **Meteorological modelling and experimentation**
(MPI, Hamburg, Germany is prepared to take the lead)

Meso-scale atmospheric reanalysis
Atmospheric modelling experimentation
Intercomparison of atmospheric models
Water and energy budget over the BALTEX region from atmospheric models
Coupled air/sea/land models
Use of hydrological models and observations to validate the hydrological components of atmospheric models.

2) **Hydrological modelling and experimentation**
(DHI alt SMHI to take the lead)

Hydrological data assimilation
Development of a complete hydrological model for the Baltic Sea area
Development of hydrological models for selected river basins

3) **Ocean modelling and experimentation**
(IfM Kiel to take the lead)

Oceanographic data assimilation
Asimilation of current data from the Danish Straits
Baltic response to atmospheric and hydrological forcing
Thermo-haline circulation and long term variability of the Baltic Sea
Development of a sea-ice model for the Baltic Sea

Field experiments

4) **Cloud, precipitation,air-sea interaction experiment**
(Prof Högström,Uppsala Uni., Sweden)

5) **Cloud, precipitation, evapotranspiration experiment**
(GKSS, Geesthacht,Germany)

6) **Atmosphere-ice-ocean experiment**
(Prof Launianien,Finnish Inst of Marine Research,Helsinki,Finland)

7) **Baltic sea vertical advection/mixing experiment**
(Prof Stigebrandt,Göteborg Uni., Sweden)

Appendix 6

Report of the BALTEX Secretariat
(distributed at the SSG meeting)

1. Promotion for BALTEX has been strengthend by the production and distribution of a BALTEX Logo and, quite recently, a BALTEX leaflet. A BALTEX Secretariat report series was initiated, the first issue contains the minutes of the first SSG meeting.

2. At its last regional meeting (XI. RA VI) WMO has taken notice of BALTEX. The meeting report (item 7.4.2) recommends co-operation between the WMO-Climate of the Baltic Sea Basin (CBSB) project and BALTEX. The CBSB rapporteur, Dr.Mietus, Poland, has contacted the Secretariat asking for details of the co-operation. SSG is asked for advice.

3. Contracts between hydrometeorological services of 6 countries in the eastern BALTEX area and GKSS have been signed. Part of the work under contract which is currently being performed is the collection and preparation of meteorological and hydrological observations, especially precipitation and river runoff data for BALTEX. Data collection and preparation is concentrated so far on the following periods:
i) May/June 1993
ii) 1992/93
iii) 1986/87
iv) August to October 1995 (PIDCAP)

Two BALTEX workshops in Vilnius (June 1994) and Minsk (November 1994) were performed to co-ordinate this BALTEX-related work. The next workshops are scheduled for late spring 1995 (St.Petersburg ?) and fall 1995 (Poland).

4. The Basic Geographic Information of the Baltic Drainage Basin (BGIS) Project has published a feasibility report. There might be a possibility for a BALTEX representative to become a member of the BGIS steering group. SSG is asked for advice.

5. Together with IfM Kiel (L.Hasse) the Secretariat co-ordinated preparational steps of the first BALTEX Pilot Study for Intensive Data Collection and Analysis of Precipitation (PIDCAP). A meeting was held in Kiel on October 10, 1994. Project descriptions of groups interested to participate in PIDCAP were collected. A draft project description is distributed to members of the BALTEX SSG. SSG is asked for advice.

6. A meeting of the Implementation Plan drafting group was prepared at Rönne, Bornholm in the first week of November 1994. The BALTEX Secretariat took part at that meeting and provided for the final editing and distribution of the present draft version of the BALTEX Implementation Plan after the meeting.

7. The Secretariat attended two BALTEX WG meetings (WG Process Studies at DMI, September 1994, WG Radar at SMHI, January 1995).

8. Guest scientists from Sweden, Estonia and Germany have been working or are currently working at the BALTEX Secretariat. The Secretariat would like to establish and develop guest visits in future. We offer all necessary logistics for a research working place, however, expect in general that the visiting scientists should bring along their own salary funds.

9. A Voluntary Observing Ship data set (COADS) for the Baltic and North Seas has been archived at the Secretariat. Time series and longterm statistics of surface meteorological parameters and energy fluxes for the Baltic Sea may be calculated from this data set. The data set covers the period 1880 until 1992.

10. Applications for funding of two new positions in the BALTEX Secretariat have recently been submitted to German authorities by Prof. Raschke

11. The Secretariat received numerous requests concerning travel funding for BALTEX representatives (SSG members, WG members). This problem should be discussed by SSG. SSG is asked for advice

12. In general, it is my feeling that the Secretariat is well accepted within the scientific community. Connections inside BALTEX are well established.

H.-J. Isemer
24 January, 1995

Appendix 7

BALTEX Research Networks

Network A: **Full - scale Studies of the Energy and Water Cycle**
Co-ordinator: L. Bengtsson, MPIfM, Hamburg, Germany.

This network basically connects the BALTEX research projects 1.1, 2.1, 2.5, 2.6, parts of 2.7 and 2.9, 3.1 and 3.2 (see Table 9).
Therefore it includes the following topics:
- Meteorological data assimilation
- Meso-scale atmospheric reanalysis
- Water and energy budgets of the BALTEX region
- Intercomparison of atmospheric models
- Full hydrological model for the BALTEX region
- Use of hydrological models and observations to validate the hydrological components of the meteorological models
- Preparation of a fully coupled atmosphere/ocean/land surface model
- Input to the Cloud/Precipitation/Air-Sea Interaction Experiment on field data requirements
- Input to the Cloud/Precipitation/Air-Land Surface Interaction Experiment on field data requirements.

Network B: **High - resolution Process Studies with the Emphasis on Hydrological Modelling**
Co-ordinator: J.C. Refsgaard, DHI, Hørsholm, Denmark.

This network basically connects the BALTEX research projects 1.3, parts of 2.7, 2.8, 2.9, and project 3.2 (see Table 9).
It thus includes the following topics:
- Hydrological data assimilation (integration of remote sensing data and distributed hydrological models)
- Development of physically-based models
- Validation on selected river basins
- Preparation of a fully coupled atmospheric/ocean/land surface model
- Input to the Cloud/Precipitation/Air-Land Surface Interaction Experiment on field data requirements.

Network C: **Coupled Modelling of the Baltic Sea**
Co-ordinator: W. Krauß, IfM, Kiel, Germany.

This network basically connects the BALTEX research projects 1.2, 1.4, 2.2, 2.3, 2.4, parts of 2.9, 3.3 and 3.4 (see Table 9).
Therefore it includes the following topics:
- Oceanographic data assimilation
- Transports through the Danish Straits
- Baltic Sea response to atmospheric and hydrological forcing
- Development of a sea-ice model for the Baltic Sea
- Thermohaline circulation and long-term variability of the Baltic Sea
- Preparation of a fully coupled atmosphere/ocean/land surface model
- Input to F and G (BALTEX projects 3.3 and 3.4) on field data requirements
- Input to process studies and field experiments of the Atmosphere - Ice - Ocean Experiment on field data requirements
- Input to process studies and field experiments of the Baltic Sea Vertical Advection and Mixing Field Experiment on field data requirements.

Network D: **Cloud / Precipitation / Air - Sea Interaction Field Experiment**
Co-ordinator: A. Smedman, Uppsala University, Sweden.

This network includes all components of project 3.1 (see Table 9):
- Investigation of the development of clouds and precipitation over the open sea
- Validation of methods to estimate evaporation at sea
- Intercomparison of the different methods to measure precipitation, such as ship-borne rain gauges, radar, and satellite remote sensing methods
- Input to networks A and B.

Network E: **Cloud / Precipitation / Air - Land Surface Field Experiment**
Co-ordinator: to be determined.

This network includes all components of project 3.2
(see Table 9):
- Investigation of the influence of topography and land types on cloud and precipitation development
- Validation of methods to estimate evapotranspiration
- Investigation of the interactions between the atmosphere and the land surface
- Development and validation of data assimilation techniques for integration of remote sensing data and distributed hydrological data
- Evaluation of the spatial variability of hydrological variables and processes and their importance for coupled atmospheric - hydrological models
- Input to networks A and B.

Network F: **Atmosphere - Ice - Ocean Field Experiment**
Co-ordinator: J. Launiainen, FIMR, Helsinki, Finland.

This network includes all components of project 3.3 (see Table 9):
- Investigation of the air-ice, air-sea, sea-ice interaction processes
- Investigation of the ocean boundary layer beneath the ice
- Investigation of the atmospheric boundary layer at the sea-ice margin
- Validation of ice models
- Input to networks A and C.

Network G: **Baltic Sea Vertical Advection and Mixing Field Experiment**
Co-ordinator: A. Stigebrandt, Göteborg University, Sweden.

This network includes all components of project 3.4 (see Table 9):
- Investigation of the physical processes maintaining the stratification in the Baltic Sea
- Investigation of vertical mixing processes which transport saline water upwards and fresh water downwards
- Investigation of the diapycnal mixing below the seasonal pycnocline
- Understanding of the distribution of saline water entering the Baltic Sea through the Danish Straits
- Input to network C.

Appendix 8

Project	Year 94	95	96	97	98	99	00	01
1. Data Assimilation Projects								
1.1 Meso-scale Meteorological Re-analysis		****	****	****				
1.2 Oceanographic Data Assimilation	**	****	****	****	****	****		
1.3 Hydrological Data Assimilation			****	****	****	****	****	
1.4 Transports through the Danish Straits	**	****	****	****	****			
2. Modelling Projects								
2.1 Water and Energy Budgets over the BALTEX Region		****	****	****	****	****	****	
2.2 Baltic Sea Response to Atmospheric and Hydrological Forcing	****	****	****	****	****	****	****	
2.3 Development of a Sea Ice Model for the Baltic Sea Model		****	****	****	****	****	****	
2.4 Thermohaline Circulation and Long-term Variability of the Baltic Sea			****	****	****	****	****	
2.5 Intercomparison of Atmospheric Models			****	****	****			
2.6 Full Hydrological Model for the BALTEX Region	****	****	****					
2.7 Validation of the Hydrological Components of the Meteorological Models			****	****	****	****	****	
2.8 Development and Intercomparison of Hydrological Models for selected River Basins			****	****	****	****	****	
2.9 Coupled Atmosphere/Ocean/Land Surface Model					****	****	****	****
3. Field Experiments - Process Studies								
3.1 Cloud/Precipitation/Air-Sea Interaction			**	****	****	**		
3.2 Cloud/Precipitation/Air-Land Surface Interaction				**	****	****	**	
3.3 Atmosphere - Ice - Ocean				**	****	****	**	
3.4 Baltic Sea Vertical Advection and Mixing			**	****	****	**		
3.5 Front Modification					**	****	****	
	94	95	96	97	98	99	00	01

BALTEX

- Danish profile

June 1994

Prepared by the Danish national committee for BALTEX

1. BACKGROUND

An international research programme, BALTEX, is planned to be carried out during the coming decade within the drainage basin of the Baltic Sea. BALTEX is a subprogramme under the World Climate Research Programme and comprises meteorology, hydrology and oceanography.

The objective of the present note is briefly to describe the planned BALTEX programme and, in particular, the possible Danish contribution to BALTEX. The aim of the note is to inform potential Danish funding agencies about BALTEX.

The note has been prepared by the self-established Danish national committee for BALTEX.

2. INTRODUCTION

2.1 What is BALTEX

Global modelling of the present climate and of future climate scenarios requires a good understanding of energy and water cycles in the climate system. Considerable deficits still exist in this respect. Further, several environmental investigations related to atmospheric transport, water resources and oceanography suffer from these insufficiencies.

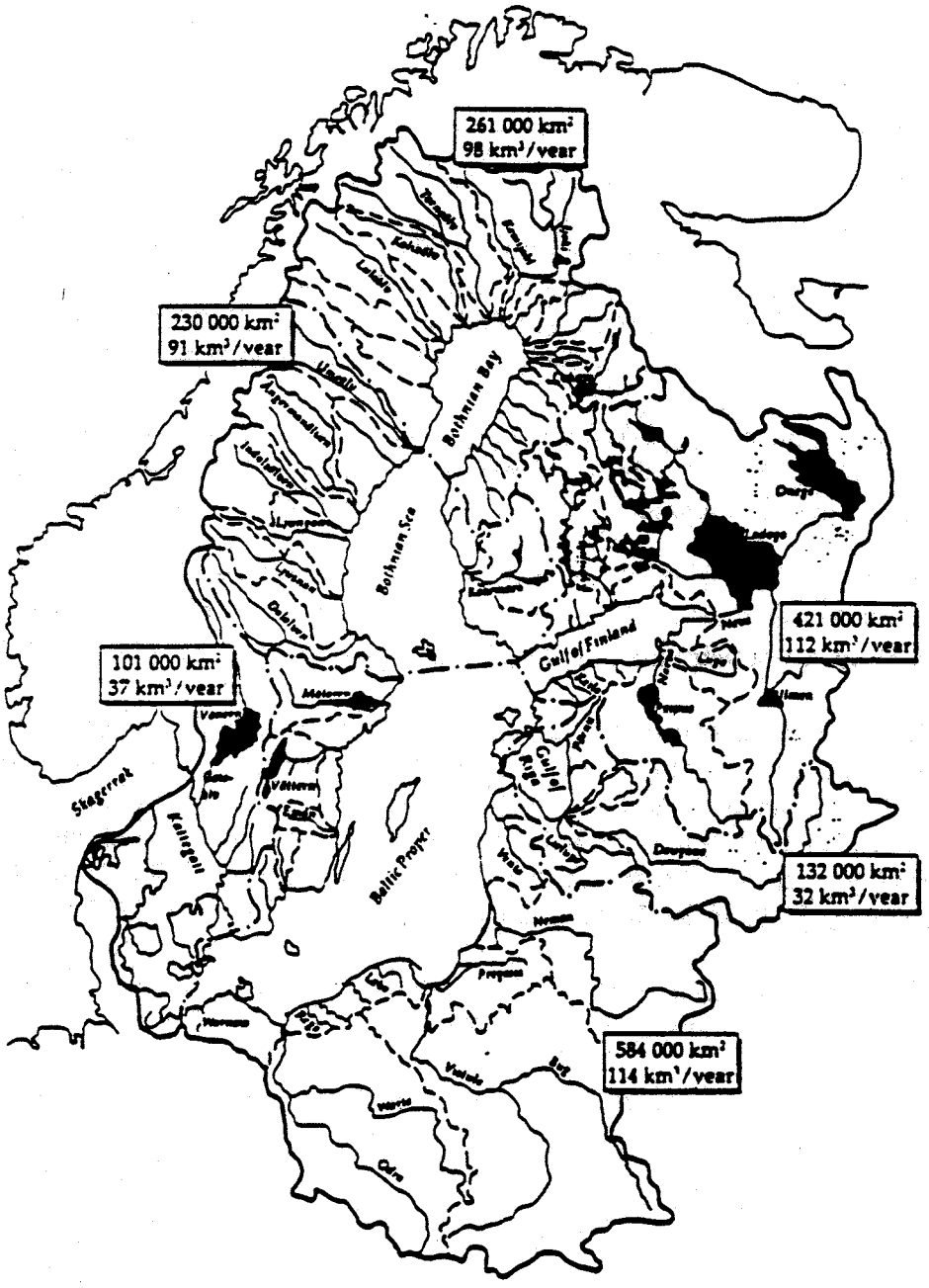

Fig. 1 The drainage basin of the Baltic Sea, the Danish Sounds and Kattegat.

Therefore, within the World Climate Research Programme (WCRP) a specific programme, Global Energy and Water Cycle Experiment (GEWEX), has been defined to improve present means to model and measure energy and water transfer in the climate system.

Within GEWEX, regional experimental programmes are now being planned. One of these is the BALTEX programme (Raschke, 1992). The principal scientific objectives of BALTEX have been defined by an international working group (BALTEX, Scientific Plan for the Baltic Sea Experiment. Editor: E. Raschke, 1992):

* To determine the various mechanisms governing the space and time variability of energy and water budgets of the BALTEX area (Baltic Sea plus drainage area) and their interactions with surrounding regions.

* To relate them to the large-scale circulation systems in the northern atmosphere and oceans.

The Baltic Sea with its drainage area (Figure 1) forms an excellent test basin for energy and water balance studies. The large seasonal, annual and interannual variations in the system and the close coupling between atmosphere, land and sea are important to understand both from climate and environmental points of view. 10 countries are located within the drainage basin of the Baltic Sea, and more than 70 million people living in the area are dependent on the environment and the climate.

It is the intention of the BALTEX programme that research groups from all 10 countries should be actively involved and contribute as equal partners to the execution of the programme.

2.2 Why is Danish participation in BALTEX important

The BALTEX programme can create new knowledge with regard to physical processes within meteorology, hydrology and oceanography. This is important for an improved understanding and modelling of ecological processes required for an accurate assessment of the environmental management possibilities for the Baltic Sea. Furthermore, such new knowledge will be generally beneficial for the society, e.g. for fishery, agriculture and navigation.

It is of utmost importance that Danish research groups be involved in the BALTEX programme for the following main reasons:

* An increasing part of research in meteorology, hydrology and oceanography takes place within international research programmes. Danish research groups only gain access to important cooperation with the best international research groups through active participation in such international programmes.

* The various programmes within GEWEX have attracted many of the best international research groups, in such a way that their general research

activities related to data collection techniques, process studies and modelling now takes place within the framework of such climate research programmes. Obviously, although it has been "labelled" under climate research, most of these activities are very important for much broader purposes than just climate research. Therefore, if Danish groups are not involved in BALTEX, they will lack access to research cooperation on topics which have importance far beyond climate issues.

* Comprehensive data bases comprising new data types, which are not available in other contexts, are being gathered within BALTEX. Danish research groups will only get access to these data through active participation in BALTEX.

* Danish research groups are able to give significant contributions to BALTEX.

Thus, it is understood that the activities in the BALTEX programme can not be carried out by Danish institutes alone. It is on the other hand very important that the Danish institutes identify the areas in which they hold an international position and continously work on strengthening of these positions.

2.3 Danish national BALTEX committee

In order to initiate and coordinate Danish activities within the BALTEX programme a Danish national committee has been formed by representatives from the following institutions:

* Danish Meteorological Institute (DMI)
* Danish Hydraulic Institute (DHI)
* Technical University of Denmark (DTU)
* Danish Institute of Fisheries and Marine Research (DIFMAR)
* National Environmental Research Institute (DMU)
* Royal Danish Administration of Navigation and Hydrography (FV)
* Danish Land Development Service (DDH)
* RISØ National Laboratory (RISØ)
* Geological Survey of Denmark (DGU)

The members of the committee are listed in Appendix A.

The BALTEX programme is formulated with a wide scope allowing many different activities to be integrated. It is the opinion of the Danish national committee that Danish BALTEX activities should be concentrated around a few key areas, where Denmark already has a strong international position and hence can contribute substantially.

Furthermore, the committee finds it very important that research groups from Estonia, Latvia, Lithuania, Russia, Beylorussia and Poland get opportunities of participating in real cooperations with groups in the richer countries Germany, Denmark, Sweden and Finland.

The present note has been prepared by the Danish national BALTEX committee with the aims of outlining the areas. where the Danish BALTEX activities should be concentrated. and of presenting these ideas for potential national funding agencies.

3. DANISH PROFILE IN BALTEX

The following three areas have been identified as the key ones for Danish contribution to BALTEX:

* Measurements. process studies and modelling of flow through the Danish Straits.

* Integrated meteorological and hydrological modelling and process studies.

* Transfer and application of environmental technology to East European BALTEX partners enabling them to contribute actively to the execution of BALTEX.

The motivation and main content of these are further discussed below.

3.1 Flow through the Danish Straits

Justification

The Danish sea area: the Kattegat. the Belts and the Sound - is part of the Baltic Sea and oceanographically forms the transition area between the Baltic Proper and the North Sea, e.g. bathymetry and dynamics of the areas are of great importance for the water exchange between the Baltic Proper and the North Sea. The sea areas are characterised by narrow, shallow channels, and the water masses by a large vertical and horizontal salinity gradient.

* The water and matter exchange between the Baltic Proper and the North Sea through the Danish sea areas is a key element for the understanding of the BALTEX area and needs to be investigated further.

* Oceanographical models developed during the 80's and early 90's makes it possible to improve our knowledge concerning A) the long-term exchange using long-term light vessel data, B) the importance of the meteorological forcing, and C) the importance of stratification processes using short-term data.

Present Danish position

DMI, DHI, DMU and FV have great experience and high international standard in measuring oceanographical data and the following database handling. DHI has developed increasingly sophisticated oceanographical models since the 1960's and used the models worldwide. DHI, DTU, DMU and FV have performed a great number of oceanographical process studies in the Danish sea area.

* DMI has collected and stored long-term oceanographical data: observed current, salinity and temperature: since the 1880's at light vessels and coastal stations. The data are crucial in determining the long-term exchange.

* DHI, DMU, DIFMAR and FV have collected and stored short-term oceanographical data: current, salinity, temperature, turbidity and several biological parameters: since the 1960's.

* DMI operates one of the most ambitious storm surge warning systems in the area. This system has been developed jointly with DHI. These two institutes also hold strong positions on data assimilation in oceanographic models.

* RISØ has extensive experience with description of air-sea interaction processes.

Of special interest is the data collected by DHI in connection with the planning of the Great Belt and the Sound link. In both cases a monitoring system is used that has been functioning on-line for several years. The continuation of the measurement programme at the Great Belt is, however, uncertain. The monitoring systems included temperature, salinity, oxygen, turbidity and current measurements. The current measurements were made both from fixed stations and from ships using Acoustic Doppler Current Profilers (ADCP's). The data are crucial for the study of oceanographical dynamics and processes, and the monitoring technics developed is of high international standard.

During summer 1994 FV is planning to establish three permanent ADCP's in the Great Belt and one in the Darss and Drogden sills, respectively. These data may provide a basis for calculating the present exchange of water and matter between the Baltic Proper and the North Sea.

Key issues

* Long-term exchange of water and matter between the Baltic Proper and the North Sea.

* Major inflows to the Baltic Sea.

* Dynamics of the sill areas.

* Vertical exchange processes.

* The hydraulic controls in Belts and the Sound.

* Dynamics of the Skagerrak-front.

* The high- and intermediate-saline inflow to the central Baltic Proper.

* Air-sea interaction.

* Transfer and application of monitoring and acoustic technology to East European BALTEX partners.

The long-term goal of the research is to develop or further improve: A) the coupling between meteorological and oceanographical models: B) hind-cast oceanographical models for management, pollution studies and ecological modelling etc. and C) operational oceanographical models for storm surge prediction, environmental monitoring programmes, oil-spill events, shipping routings, toxic algae blooms etc.

Outline of suggested projects

The suggested projects are to a large extent based on identification and analysis of data and simulation with the three-dimensional oceanographical models. The models are used in combination with both long-term and short-term data collected in the Danish sea areas, and an important issue is to analyse the results of the simulations. The purpose of the projects is two-fold: A) to improve the turbulence description in the 3D models, so that the models are able to satisfactorily outline the studied phenomena; and B) to improve our physical knowledge of the studied phenomena.

* The long-term exchange of water and matter between the Baltic Proper and the North Sea will be studied by combined use of long-term meteorological, hydrological and oceanographical data, analysis of data, and finally of the BALTEX project simulated by models. The final determination of the exchange is dependent on the improvements considering the oceanographical processes.

* The major inflows to the Baltic Sea are caused by both meteorological, hydrological and oceanographical influences. Selected major inflows with high data coverage are identified, analysed and simulated. The key factors forcing a major inflow are identified.

* The Darss and Drogden sill areas behave as salt traps keeping high-saline water inside the Baltic Sea. Precise understanding of the sill dynamics is crucial in the determination of the long-term exchange. The dynamics of the sills are outlined mainly by use of data collected in connection with the Great Belt and Sound link monitoring, and the flows in the sill areas analysed and simulated.

* Internal hydraulic controls are observed in the Great Belt and in the Sound. The importance of these hydraulic controls has not yet been investigated. Data for studying the hydraulic controls are identified and treated. Layered and 3D models are used to simulate the controls, and the importance of the controls identified.

* The Skagerrak-front separates the outflowing Baltic Sea water and the inflowing North Sea water. The frontal dynamics determines the exchange between the North Sea and the Baltic Sea in the northern Kattegat. Data from the region are identified. The data collection in connection with the Skagex project and by DMU during two 14-day period in the front area may

be important. The dynamics of the frontal area are analysed.

* The high- and intermediate-saline water inflow to the central Baltic Proper are of crucial importance to the ecosystem. Data for studying the inflow are identified and treated. The data collection in connection with a 10 day survey in the Bornholm Basin by DHI with R/V Dana may be important. Layered and 3D models are used to simulate the controls. and the importance of the controls identified.

3.2 Integrated meteorological and hydrological modelling and process studies

Justification

* There are important gaps in the present knowledge within meteorological and hydrological process understanding and modelling.

* There is not yet any experience in coupling of meteorological and hydrological modelling, which is of particular importance for studying feedback mechanisms.

* The existing models presently available for predicting the impacts of climate change on water resources are rather uncertain because they have been developed and tested for other purposes and lack apparently important process descriptions. The knowledge gained under the BALTEX programme will form the basis for improved models for impact assessments.

Present Danish position

* DMI has comprehensive experience with development and application of one of the internationally most advanced meteorologal models, HIRLAM meteorological model. HIRLAM is, amongst others, being used operationally as the basis for the daily weather forecasts.

* DHI has comprehensive experience in hydrological modelling. DHI's MIKE SHE is recognised internationally as probably the most advanced hydrological modelling system existing today.

* DTU has comprehensive experience at state-of-the-art international level in research studies of hydrological processes.

* RISØ has large experience with the description of fluxes between the troposphere and homogeneous and inhomogeneous surfaces.

* DDH has recent experience at testing and improvements of hydrological models, with special emphasis on evapotranspiration, snowmelt and glacier mass balance submodels. Analysis of climate variability and climatic trends

of hydrological records on regional level.

Key issues

* Synoptic scale forcing and the forcing from inhomogeneous surfaces on mesoscale processes in the atmosphere.

* Development of non-hydrostatic meteorological model. including coupling to hydrological models.

* The role of land surface variability on the hydrological cycle.

* Cloud and precipitation processes.

Outline of suggested projects

(a) Improvements of process descriptions in meteorological models

These activities will be centred around DMI's HIRLAM with regard to the following aspects:

* The forcing on the atmosphere from the inhomogeneous land and water surfaces of the Baltic Sea area generates mesoscale (i.e. < 100 km length scale) secondary circulation systems, land- and sea-breezes, as well as secondary modifications of synoptic scale circulations. These mesoscale phenomena strongly influence the geographical distribution of e.g. precipitation and need to be further investigated by means of model simulations and observational campaigns.

* Convective storms on local scales (i.e. < 10 km length scale) cannot be described in the existing meteorological models, because they are assuming hydrostatic pressure conditions in the vertical. The convective phenomena, which are strongly influenced by land surface - atmosphere processes, will be studied and a non-hydrostatic models will be developed.

* An intercomparison of the HIRLAM meteorological model, which is being used operationally amongst others in Denmark, Sweden and Finland and a similar model used by Deutsche Wetter Dienst, and also covering the Baltic Sea region, will be carried out.

(b) Improvement of process descriptions in hydrological models.

These activities will be centred around distributed, physically based hydrological model with regard to the following aspects:

* The land surface shows great variability with different vegetation and land use. Therefore the energy and water balance is highly variable. Studies will be made of this sub-grid variability and its representation in atmospheric and hydrological models.

* Experimental studies will be conducted for combining new sources of spatially distributed data with information from distributed. physically based hydrological models for a couple of large river basins using distributed, physically based modelling techniques. Remote sensing techniques will be applied such as radar and satellites, e.g. for assessing soil moisture/evaporation and lake temperature. Remote sensing data will be incorporated in the hydrological models by use of data assimilation techniques.

* An intercomparison of results obtained by the distributed, physically based models and the much simpler lumped, conceptual models will be made, especially with regard to snow accumulation and melt, evapotranspiration, lake evaporation and interaction between surface waters and groundwater. Attention will be given to the description of the spatial variation of the hydrological processes and to the possibility of coupling to atmospheric models.

* Studies of the interaction between surface water and groundwater will be made with special emphasis on recharge mechanisms and their sensitivities to climate variability and climatically generated changes in land surface.

For conduction of the above studies a couple of large river basins will be identified. At present one of the working groups under BALTEX has tentatively suggested three rivers, namely Torneälven (Sweden, Finland), Wistula (Poland) and the Daugava (Latvia, Russia). The Danish national committee finds Wistula and Daugava suitable for the Danish contribution, which obviously has to be made in close cooperation with research groups from other countries.

(c) Coupled air-sea-land model

As an ultimate modelling goal it is intended to couple an atmospheric model, an oceanographic model and a hydrological model. Special emphasis will be given to studies of various feedback mechanisms.

3.3 Environmental technology to East European BALTEX partners

Justification

* It is crusial for the succesfull execution of the BALTEX programme that

research groups from all nine countries participate actively.

* East European partners from Poland, Lithuania, Latvia, Estonia, Russia and Byelorussia need to upgrade their technology in order to enable them to participate actively in the BALTEX scientific programme. Without such upgradation, there is a significant risk that the role of these six countries may be reduced to delivery of data and to individual scientists working as visiting scientist at West European institutions.

* East European countries are at the same time faced with very large environmental problems, which need urgently to be dealt with during the coming decade. In order to handle these environmental problems they need to upgrade their technology - to a very large entent in the same fields as required in BALTEX context.

Present Danish position

* Danish research and consultancy organisations have in general significant cooperation with relevant institutions in Poland, Lituania, Latvia, Estonia and Russia in areas related to water resources and marine environment. This is mainly funded by the Danish government from a variety of Eastern European/Baltic environmental programmes. However, several projects have also been funded through international agencies such as EU and World Bank.

Key issues

* Development, transfer and application of monitoring technology within oceanography.

* Development, transfer and application of technology for measuring and processing surface water data.

* Development, transfer and application for measuring meteorological data.

* Development, transfer and application of modelling technology within hydrology, oceanography and meteorology.

* Institutional strengthening and human resource development within the fields of hydrology, oceanography and meteorology.

4. TIME PLAN AND ORGANIZATION

The full international BALTEX programme will cover about 10 years (Raschke, 1992). It starts with a build-up phase during 1993-96, followed by an observational phase in 1997-98. The final years will be concerned with analyses and presentation of the results.

The Danish national BALTEX committee offers to coordinate the Danish activities and ensure a further coordination with the international BALTEX programme through participation in the international Steering Group for BALTEX and in the three international working groups on Data Management and Data Studies, Numerical Experimentation and Process Studies.

It should be mentioned that the present proposed Danish BALTEX profile fits well into the international BALTEX programme.

5. FUNDING

It is envisaged that the BALTEX programme be implemented through funding partly from international sources and partly from national sources.

It is expected that substantial research funds can be obtained through applications to EU's IV framework research programmes "Environment and Climate" and "MAST". Thus 50% of the funds for the Environment and Climate programme is planned to be allocated to topics of direct relevance to BALTEX. Preliminary contacts have already been successfully established between members of the BALTEX Steering Group and the respective officers in DGXII, Brussels.

Furthermore, it is envisaged that Nordisk Ministerråd may be able to provide some support for the programme.

Nevertheless, national funding sources will be required under all circumstances. Some of the international funding will only be partial funding (EU cover only about 50% of project costs), and it will be required with national funding to close the gaps in the programme, where it turns out not to be possible to obtain international funding.

In Sweden and Germany national fundings specifically for the BALTEX programme have been allocated from 1994 onwards.

APPENDIX A: The Danish National Committee for Baltex

Danish Meteorological Institute (DMI) Lyngbyvej 100 DK-2100 Copenhagen Ø	Leif Laursen Niels Woetmann Nielsen Ole Brink-Kjær
Danish Hydraulic Institute (DHI) Agern Allé 5 DK-2970 Hørsholm	Jacob Steen Møller Jens Chr. Refsgaard
Technical University of Denmark (DTU) Bldg. 115 DK-2800 Lyngby	Dan Rosbjerg
Danish Institute of Fisheries and Marine Research (DIFMAR) Charlottenlund Slot DK-2920 Charlottenlund	Ole Vagn Olsen
National Environmental Research Institute (DMU) Frederiksborgvej 399 DK-4000 Roskilde	Gunni Ærtebjerg
Royal Danish Administration of Navigation and Hydrography (FV) Overgaden o. Vandet 62B P. O. Box 1919 DK-1023 Copenhagen K	Erik Buch
Danish Land Development Service (DDH) Ringstedvej 20 P. O. Box 9 DK-4000 Roskilde	Thorkild Thomsen Torben Lundsgaard
RISØ National Laboratory (RISØ) P. O. Box 49 DK-4000 Roskilde	Svend Erik Gryning Søren Larsen
Geological Survey of Denmark (DGU) Thoravej 8 DK-2400 Copenhagen NV	Bjarne Madsen

INFORMATION
ON BALTEX PROJECT PROGRESS IN BELARUS

1. The map-schemes and grid points for 9 x 9 km areas for the West Bug, Nieman and West Dvina river basins have been identified.
2. Methodological recomendations have been made on determining heights (h mean, h max, h min), forestation (percentage of areas covered with forests) (Cf) and urbanization (Ct) at the grid points.
3. The date on the 9x9 km areas have been determined and registered into the input medium: mean, maximum and minimum heights,forestation and urbanization factors. The works have been carried out on the 1:200 000 scale maps.
4. The list of the main rivers has been determined (the rivers with the watershed area >200 square kilometres) and baundaries between the watersheds within the basins of West Dwina, Neman and West Bug rivers have been marked into the topographic maps.

It is planned in 1995

— to prepare and register into the input media the meteorological and hydrological information on observation points in 1992-93 and 1986-87.

— to finsh the work on formation the information file on airgraphy of the needed territory of the Republic.

— participation in BALTEX Pilot Study for Intensive Date Collection and Analysis of Precipitation (PIDCAP) August-September 1995.

PROGRESSIVE REPORT ON THE BALTEX DATA BASE ESTABLISHING IN THE REPUBLIC OF LATVIA

Under the Research Agreement between the Latvian Hydrometeorological Agency and GKSS signed on behalf of the Latvan side by Mrs. Gaida Matisone, the Director of the LHMA, July 29, 1994 the main steps made were :
- purchasing of a PC -486 at a price of 5.025 DM for the BALTEX data base,
- commensement of geographical and hydrometeorological data digitizing.

Using the software from the GKSS, the entire territory of Latvia was broken down to GRIDNET with a spacial resolution of 18x18 km. In setting up the Geographical Information System (GIS), topographical maps of a scale of 1:50.000 are being used. To obtain the 9x9 km spacial resolution required for GRIDNET, the squares of 18x18 km were broken down to 4 squares each, and in the point sites of each 9x9 km squares of the maps readings were taken and introduced into the computer. The information is being introduced in the amounts provided in ANNEX 2 to the Research Agreement. The work is being carried out in co-operation with the Latvian Academy of Agriculture.

In parellel with the GIS establishing, digitizing of the hydrometeorological data is being made for the periods 1986-1987 and 1992-1993. The following hydrometeorological data were introduced in the computer:
- tide-gauge hourly sea level data for all the Latvian coastal stations which have mareographs(Liepaja, Ventspils, Jurmala, Daugavgriva,Skulte) for the periods 1986-1987 and 1992-1993;
- river discharge daily values from all the hydrological stations for the period 1992-1993 and from 16 stations for the period 1986-1987;
- precipitation 12-hour values for the period 1992-1993 from all the stations and posts; from 16 stations for the period 1986-1987.
- oceanographic data from the Gulf of Riga and the Latvian economical zone in the Baltic Sea for the periods 1986-1987 and 1992-1993;
- all needed meteorological data for the second tested period of 1993 from all the meteorological station and posts

The work on the GIS establishing is scheduled to end late in February 1995. As to establishing the hydrometeorological data base, interpolation methods should be carried out common for all the BALTEX members as well as their temporal resolution.

BALTEX ACTIVITIES IN POLAND

JUNE- DECEMBER 1994

(A report to the Second Meeting of BSSG
Helsinki 25-27 January 1995)

1. The **BALTEX Task Force** was organised in a framework of Polish National Committee for international Hydrological Programs.

The members of the Task Force are:

* Prof. Dr. Zdzisław Kaczmarek (**chairman**)
  Institute of Geophysics PAS, Warsaw

* Dr. Artur Magnuszewski (**secretary**)

* Prof. Dr. Jerzy Dera
  Institute of Oceanology PAS, Sopot

* Doc. Dr. Alfred Dubicki
  Institute of Meteorology and Water Management, Wrocław

* Prof. Dr. Wojciech Majewski
  Technical University, Gdańsk

* Prof. Dr. Marek Nawalany
  Technical University, Warsaw

* Doc. Dr. Jan Parfiniewicz
  Institute of Meterology and Water Management, Warsaw

* Doc. Dr. Andrzej Wróblewski
  Institute of Oceanology PAS, Sopot

* Representative Maritime Branch of IMWM , Gdynia

2. Polish representatives participated in meetings and workshops organised by various BALTEX working groups:

   * Vilnius (data collection)

   * Mińsk (data collection)

   * Roenne-Bornholm (Implementation Plan Drafting Group)

3. The draft of the BALTEX Implementation Plan was distributed among oceanographic and hydro-meteorological institutions, and offers of research contributions have been registered by the Polish BALTEX Task Force.

4. A number of Polish papers will be submitted for the First Study Conference on BALTEX (Visby, August-September 1995). (10 papers)

5. In many Institutes following research studies and measurements have been performed :

   5.1. The Institute of Meteorology and Water Management is preparing a list of climatic and hydrological observing stations in Poland for use in the BALTEX Project (in response to a letter of Prof. Bengtsson to heads of national hydrologic and meteorological services).

   5.2. Data needed for the first phase of validation of the atmospheric model (V-VI 1993) will be prepared under a separate contract signed by IMWM and GKSS.

   5.3. Statistical analysis of trends in long series of hydrological and climatic data for Poland and adjacent regions were done at the Institute of Geophysics in Warsaw (several papers published in scientific journals).

   5.4. A meso-scale hydrological model CLIRUN was developed and tested at the Institute of Geophysics in Warsaw (published paper).

   5.5. An analysis of available methods for spatial interpolation of precipitation and solar radiation data has been implemented by the Wrocław Branch of IMWM.

5.6. Environmental conditions in the Polish Zone of the Southern Baltic Sea during 1993 was published by the Maritime Branch of IMWM., Gdynia.

5.7. Baltic Sea Atlas (geology, climate, hydrology, pollution, biology, maritime economy) was published by the Maritime Branch of IMWM., Gdynia.

5.8. Atlas of ice and navigation conditions along the polish coastal zone is in preparation at the Maritime Branch of IMWM, Gdynia.

5.9. A probabilistic forecast method of the mean and maximum sea levels was worked out on the assumption that the sea level will continue to rise to the year 2100 (in press), by the Institute of Oceanology PA S , Sopot.

5.10. Several sea-air interaction and solar radiation studies were performed at the Institute of Oceanology PAS (the results are published or in press).

Polish Oceanographic Proposals of Contribution to BALTEX

Institute of Oceanology Polish Academy of Sciences in Sopot

Fields of studies:

1. Empirical investigations of the solar energy influx to the Baltic under different weather conditions - data collection for validation of models and remote sensing methods.

2. Stochastic model of the influence of the North Sea mean level and wind field on the water exchange through the Danish Straits and on the Baltic water volume.

3. Cruise studies of the dynamics of inflowing waters in the Baltic.

4. Empirical studies of mass and energy fluxes at the sea-air interface.

Institute of Hydroengineering of Polish Academy of Sciences in Gdańsk

Fields of studies:

1. Measurements and numerical 2-D and 3-D models of hydrodynamical conditions and water quality processes in estuaries and coastal areas together with in situ measurements of currents, salinity and water temperature.

2. Measurements and analysis of mass and energy exchange between the Baltic Sea and atmosphere. Measurements by the use automatic meteorological station including following parameters: wind, air temperature and humidity, solar and atmospheric radiation, evaporation.

3. Monitoring in Maritime Coastal Laboratory in Lubiatowo including following parameters : wind , waves , sea level . Morphodynamic monitoring encompassing the measurements of shoreline variability along 3 km.

Institute of Meteorology and Water Management, Maritime Branch in Gdynia

Fields of studies:

1. Interrelations between atmospheric circulation over Europe and climate anomalies in Poland.

2. Mesoscale climate scenarios: Central Europe.

3. Statistical analyses of long-term series of hydrological observations for the southern part of the BALTEX region.

4. Impact of sea level variations on dynamics of water exchange between the Baltic and the North Sea.

5. Investigation of mass and energy fluxes between the Baltic Sea and the atmosphere.

6. Dynamics and physical properties of Baltic waters.

7. Ice processes in the Southern Baltic, estuaries and lower parts of Polish rivers.

University of Gdańsk, Institute of Oceanography

Fields of studies:

1. Contemporary changes of water balance of the Baltic Sea. Long-term changes of the river inflow to the Baltic (years 1901-1995).

2. Investigation of the impact of upwellings on the heat fluxes between the surface of Baltic and the atmosphere using satellite images.

3. Changes in the heat contents in the surface layer of water in Southern Baltic estimated from satellite images.

Statusreport from the chairman of the Working Group on Data Management and Data Studies.

The BALTEX Scientific Steering Group decided in 1993 to establish three working groups to work with different aspects of BALTEX. The Working Group on Data Management and Data Studies was given the following terms of reference:

- to identify all data which are relevant to BALTEX
- to specify contents of data bases
- to consider technical aspects of data storage
- to consider data exchange within BALTEX
- to consider data exchange with associated international programs
- to initiate and co-ordinate relevant diagnostic studies
- to keep the Steering Group informed and co-ordinate with other working groups.

The BALTEX Scientific Steering Group also decided to nominate the following as members of the working group:

- Mr. Leif Laursen. Danish Meteorological Institute. Denmark
- Dr. Pekka Alenius. Finnish Institute of Marine Research. Finland
- Dr. Alfred Dubicki. Institute of Meteorology and Water Management. Poland
- Dr. Erdmann Heise. Deutscher Wetterdienst. Germany
- Dr. Karl-Göran Karlson. Swedish Meteorological and Hydrological Institute. Sweden
- Dr. Petras Korkutis. Lithuanian Board for Hydrometeorology. Lithuania
- Dr. Joachim Neisser. Deutscher Wetterdienst. Germany
- Dr. R. H. Reitenbach. All Russian Research Institute. Russia
- Dr. Heinrich Woick. EUMESAT. Germany.

The working group had its first and up to now only meeting in January 1994 in Copenhagen.

It was noted. that the rather demanding tasks assigned to the working group could have been described and that expectations by the other working groups would have been helpful.

An important contribution of the WG would be an inventory of existing data. As the amount of possible data was considered very large it was decided to concentrate on 1987.1992 and 1993. The importance of long homogeneous series for selected variables was noted by the WG. However, it was realised that the character of existing networks and archives is rather different for the three disciplines involved in BALTEX meteorology/oceanography/hydrology. Thus it was found appropriate to separate the work into the three disciplines and the responsibility for making a questionnaire was taken by

- Karlson. SMHI, Hydrology
- Heise, DWD, Meteorology
- Alenius, FIMR, Oceanography.

The three institutions are considered as BALTEX data centres. For hydrology and meteorology a first inventory has been made on the basis of available answers to the distributed questionnaires. These first versions are available from SMHI and DWD, respectively. No special effort has been done to collect an oceanographic data inventory for BALTEX. Dr. Alenius, who was responsible for doing the inventory, has pointed out that there exist general inventories of data regularly done by international oceanographic organisations. ICES (International Council of Exploration of the Sea) and IOC (Intergovernmental Oceanographic Commission).

Generally there has been some hesitation to put too much effort into these tasks before a more detailed description of the data needs become available on other working groups.

The WG noted that the storage media should be considered, but found it difficult to make good advice's, except from the very important aspect of having data transferred to electronic media.

The working group noted the value of very well equipped sites which may serve as reference stations to be used in connection with satellite and radar measurements. Such a station is for instance the Meteorologishes Observatorium Lindenberg in Germany.

Dr. Woick from EUMESAT has provided a description of the comprehensive archives of METEOSAT data. And further there are brochures describing other centres were satellite data may be obtained.

The working group noted the importance of radar's in BALTEX and that this area needs special care. The BSSG has later established a. separate working group for radar's.

The WG further has noted that in many areas the free exchange of data has been hampered by the increasing commercialisation. However, these more political issues has been considered by the Chairman of BSSG.

Report of the chairman of the BALTEX Working Group on Process Studies

Since the last SSG–meeting the WG has met once at September 19–20 in Copenhagen.
The aim of this meeting was to define and discuss the planned experiments in more detail. In addition the WG was informed about ongoing experiments and measurements within the BALTEX area.

For the latter the WG listened to the three reports

1. K. Mose Paulsen, Storebaelt Great Belt A/S, Copenhagen
   and
   Dr. J. Steen Möller, DHI, Copenhagen
   introduced to the WG the activities in the Great Belt and Öresund in connection with the planned bridge constructions. Hydrographic, current and meteorological measurements are carried out since 1987 at up to 16 stations in the Great Belt and 8 stations in the Öresund. The data are processed until November 1993. The number of stations are now reduced and the company is looking for support to continue the observations.
   The WG agrees that this data set is a very valuable one for the investigation of the processes determining the exchange between the Baltic Sea and the Cattegat. It was decided that the data should be made available to all BALTEX scientists who study these processes. Mr. Isemer was asked to discuss with the company the procedure how to receive the data. Information about the data can be received from the BALTEX secretariat.
2. Dr. U. Lass reported about the activities of the Institute at Warnemünde. A chain of moorings is placed at the Darss Sill to measure the water exchange through the Danish Straits. In a pilot study for the EU MAST III programme the Gotland Basin Experiment (GOBEX) is carried out with ship cross–sections measuring hydrographic and biological parameters.
3. L.–C. Lundin, Uppsala gave a status report about NOPEX.
   The WG agreed that this experiment is a valuable compliment to a BALTEX field experiment over land.

There are a number of experiments planned for the near future as was reported by

1. Dr. A.–S. Smedman, Uppsala University
   The group at the Uppsala University plans a field experiment at and around the islet Östergarnsholm east of Gotland to investigate air–sea interaction and processes within the maritime atmospheric boundary layer.
   The WG agreed that this field experiment can be the nucleus for the BALTEX Cloud/Precipitation/Air–Sea Interaction Experiment.

2. Dr. H.-J. Isemer
   He presented the plans for a pilot study to validate rainfall measurements and estimation methods over the BALTEX area during August to October 1995.
3. Prof. L. Hasse, Kiel
   He informed the WG group about a two week field campaign by the Institute at Kiel with the research vessel "Alkor" in the central Baltic Sea. The goal is to study precipitation and its measurement methods over the sea and to carry out oceanographic observations for the validation of the oceanic numerical model developed at Kiel.
4. Prof. J. Launiainen, Helsinki
   He explained his plans for an Air-Ice-Ocean Field Experiment in the Gulf of Bothnia. The processes in the atmosphere and ocean at the ice margin zone should be investigated.
   The WG agreed that this experiment can be the basis for the proposed BALTEX Atmosphere-Ice-Ocean Experiment.
5. Dr. H.-J. Isemer
   He presented plans developed at GKSS for an experiment over land to validate the results of numerical models and test parametrizations concerning the hydrological cycle. The experiment is planned around Lindenberg, a central station of the German Weather Service SE of Berlin.
   The WG agreed that such an experiment could be the nucleus for an Cloud/Precipitation/Evapotranspiration Experiment.

The WG then discussed the scientific objectives and plans of the proposed field experiments. The members agreed on the following: The WG will develop plans to study those processes which determine the hydrological and energy cycle over the BALTEX area; in this view the (spatial, temporal) size is mesoscale and smaller. The general and specific objectives of the field experiments agreed on are found in Annex I.
The WG agreed that each of the field experiments should be coordinated by one person. The tasks of the coordinators are given in Annex II.

For three experiments coordinators were named and they accepted:

- Prof. Dr. U. Högström, Dr. A.-S. Smedman, Uppsala University
  Cloud/Precipitation/Air-Sea Interaction Experiment

- Prof. Dr. J. Launiainen, Finnish Institute for Marine Research, Helsinki
  Atmosphere-Ice-Ocean Experiment

- Prof. Dr. A. Stigebrandt, Göteborg University
  Baltic Sea Vertical Advection and Mixing Experiment

- For the Cloud/Precipitation/Evapotranspiration Interaction Experiment the GKSS, Geesthacht will name a coordinator of one of its scientists. And for the Frontal Modification Experiment pre-studies are needed before a detail planning is possible, so that a coordinator will be named later.

The WG plans to have its next meeting in March 1995 at Uppsala to discuss the further planning of the experiments together with the coordinates.

General Objectives of the field experiments

1. investigation of the processes which determine the hydrological and energy cycle

2. investigation of the processes which are specific for the BALTEX area

3. validation of the numerical models and their parametrizations

4. validation of observation methods, e.g. algorithms of remote sensing methods

Specific Objectives for the five proposed field experiments

1. Cloud and Precipitation Experiments

a) over the sea
- investigation of the development of clouds and precipitation over the open sea
- validation of methods to estimate evaporation of the sea
- intercomparison of different methods to measure precipitation, e.g. ship-borne gauges, RADAR, satellite remote sensing methods

b) over land
- investigation of the influence of the topography and different land types on cloud and precipitation development
- validation of the methods to estimate evapotranspiration
- understanding of the effects of snow accumulation and melting for river run-off

2. Atmosphere-ice-ocean Experiment

- investigation of the air-ice, air-sea, sea-ice interactions
- investigation of the marine boundary layer beneath the ice
- investigation of the atmospheric boundary layer at sea-ice margin

3. Baltic Sea vertical advection / mixing Experiment

- investigation of the physical processes maintaining the stratification
- investigation of vertical mixing processes which transport saline water upwards and fresh water downwards
- investigation of the diapycnal mixing below the seasonal pycnocline
- understanding the distribution of saline water entering the Baltic Sea through the Danish Straits

4. Frontal Modification Experiment

- investigation of the changes of an atmospheric front passing the very inhomogeneous BALTEX area
- validation of the numerical results in order to find out whether the topographic effects can be simulated sufficiently
- understanding the process of the development of intensive cyclones over the Baltic Sea

Tasks of the coordinators of the BALTEX field experiments which they should carry out in-close cooperation and support by the WG are the following:

- work out a detailed experiment plan,
- gather proposals from groups intended to participate after publication of the experiment plans by the BALTEX Secretariat,
- secure that the submitted proposals cover all experimental parts so that the important objectives are obtained, activate further groups if necessary,
- organize the experimental field phase,
- secure that the data exchange is sufficiently handled,
- secure that the results are published e.g. special meeting.

BALTEX - Working Group on Process Studies

Sept. 19 - 20, 1994, DMI, Copenhagen

New Agenda

Monday, Sept. 19

14.00	Welcome (E. Ruprecht)
14.15	E. Ruprecht: Acceptance of the Agenda or additional items
14.25	H.-J. Isemer: Report by the BALTEX Secretariat
14.45	E. Ruprecht: Report on the Science Steering Group Meeting on May 16-18, 94
15.00	Discussion about the proposed experiments: Scientific objectives
15.45	- Coffee break -
16.15	K. Mose Poulsen, Storebaelt Great Belt A/S, Copenhagen: Oceanographic measurements in the Great Belt and Öresund
17.00	H.U. Lass: Planned activities at the Institut für Ostseeforschung, Warnemünde, concerning an EU-Baltic Sea Projekt (MAST III)
17.30	Cooperation with ongoing or planned field experiments (all WG members)

Tuesday, Sept. 20

9.00	Prof. Dr. U. Högström, Uppsala University: Swedish field experiment near the islet of Östergarnsholm
9.30	Proposed Experiments: Organization
10.30	- Coffee break -
10.45	Discussion of the draft layout of the BALTEX Implementation Plan
11.45	- Lunch at DMI -
12.30	Continuation of the discussion
13.30	Further plans and meetings
14.00	End of the meeting

Minutes of the

2. Meeting of the BALTEX WG on Process Studies
19.-20. September 1994
DMI, Copenhagen

Participants:
1. WG members:
M. Claußen, L. Hasse, H.U. Lass, J. Launiainen, A. Omstedt, E. Ruprecht, N. Woetmann Nielsen

2. Permanent guests:
H.-J. Isemer (BALTEX Secretariat)
L. Laursen (WG - Data Management)

3. Guests:
Prof. Dr. Ann-Sofi Smedman, Uppsala University
Dr. L.-C. Lundin, NOPEX Central Office
K. Mose Poulsen, Storebaelt Great Belt A/S, Copenhagen
Dr. J. Steen Möller, DHI, Copenhagen
(last two only on Monday afternoon)

Beginning: 14.00

1. The chairman welcomed all participants and introduced the guests. He informed the WG members that the BSSG has decided that Prof. Dr. Wojcieck Majewski, Technical University of Gdansk, Poland should be member of this WG. Prof. Majewski is hydrologist. He accepted the invitation but he was unable to attend this meeting. The two member H. Sundquist and S. Halldin were also unable to come, Dr. Lundin came in place of S. Halldin.
2. The agenda was accepted (see Annex (I)).
3. H.-J. Isemer gave a short overview about the recent BALTEX activities and plans. This included a few facts from the BSSG meeting in May at Geesthacht. The chairman completed Mr. Isemer's report about the BSSG meeting. He emphasized the decision about the proposal field experiments which should be carried out during the coming years in the BALTEX area (Annex (II)).
4. The discussion about the scientific objectives of the field experiment started with debate about the processes which should be studied. The WG agreed on the following :
   The WG will develop plans to study those processes which determine the hydrological and energy cycle over the BALTEX area; in this view the (spatial, temporal) size are mesoscale and smaller.

After this determination the general objectives of the proposed field experiments were defined (Annex (III)).

5. K. Mose Poulsen and Dr. J. Steen Möller gave a report about the measurements in the Great Belt and Öresund in connection with the planned bridge constructions. Hydrographic and meteorological measurements are carried out since 1987 at up to 16 stations in the Great Belt and 8 stations in the Öresund. The data are processed until November 1993. The number of stations are now reduced and the company is looking for support of further measurements. The WG agreed that this data set is very valuable for the investigation of the processes determining the exchange between Baltic Sea and Cattegat and which are responsible for the salt intrusion into the Baltic Sea. It was decided that the data should be made available to all BALTEX scientists, who study these processes. Mr. Isemer were asked to discuss with the company the procedure how to receive the data. Information about the data and about the receiving procedure will be available from the BALTEX secretariat at Geesthacht.

6. The WG was informed by different speakers about ongoing or planned field experiments relevant to BALTEX:

   a) Mrs. A.-S. Smedman described the field experiment planned by her and her husband (Prof. Dr. U. Högström) at Uppsala University. The aim of the experiment is to investigate air-sea interaction and the maritime atmospheric boundary layer over the Baltic Sea. The experimental site will be around the very low and isolated islet Östergarnsholm east of Gotland. A 30m mast will be located at the islet and a 3D Wave Rider Buoy south of the islet. The measurement program is expeded to be in operation by spring 1995.
   The WG agreed that this field experiment can be the nucleus for a BALTEX Cloud and Precipitation Experiment over the sea.

   b) J. Launiainen explained his plans for an Air-Ice-Ocean Field Experiment (a detailed description were sent to each WG member in advance). The goal of the experiment is to investigate the processes at the ice margin at the Gulf of Bothnia. The WG approved these plans and agreed this experiment as basis for the proposed Atmosphere-Ice-Ocean Experiment.

   c) Mr. H.-J. Isemer reported about German BALTEX activities to validate rainfall measurement methods over the BALTEX area during summer 1995 and invited other groups to participate, he asked in particular for data of the radar system NORDRAD.

   d) Mr. L. Hasse reported that in August/September 1995 a two week field campaign is planned by the Institute at Kiel with

the research vessel "Alkor" in the central Baltic Sea. The goal is to study precipitation and its measurement methods over the sea and to carry out oceanic observations for the validation of the oceanic numerical model developed at Kiel.

e) Mr. L.-C. Lundin gave a status report about NOPEX.
The WG agreed that this experiment is a good compliment to a BALTEX field campaign over land.

f) Mr. H. U. Lass reported about the activities of the institute at Warnemünde. A chain of moorings is placed at the Darss Sill to measure the water exchange through the Danish Straits. In a pilot study for the EU MAST (III) programme the Gotland Basin Experiment (GOBEX) is carried out with ship cross-sections measuring hydrographic and biological parameters.

g) Mr. H.-J. Isemer explained the plan developed at GKSS, Geesthacht for a land surface experiment. It is planned for validation of the results of numerical models and test of parametrizations which are use to simulate the water and energy cycle over land areas. For the experiment it is planned to use the facilities of the central station Lindenberg of the German weather service.
The WG agreed that this experiment can become the nucleus for the BALTEX Cloud and Precipitation Experiment over land.

7) Based on earlier discussions and on these reports about field campaigns in the BALTEX area organizational aspects of the proposed BALTEX field experiments were discussed.
The WG agreed to name coordinators for each of the proposed BALTEX field experiments:

1a) Cloud and Precipitation Experiment over the sea:
Prof. Dr. U. Högström / Prof. Dr. A.-S. Smedman, Uppsala University, Sweden

1b) Cloud and Precipitation Experiment over land:
GKSS, Geesthacht, Germany (n.u.)

2) Atmosphere-Ice-Ocean Experiment:
Finnish Institute of Marine Research, Prof. Dr. J. Launiainen, Helsinki, Finland

3) Baltic Sea Vertical Advection / Mixing Experiment:
Prof. Dr. Stigebrandt, Göteborg University, Göteborg, Sweden

For the other two experiments, which are planned to be carried out not before 1998 coordinators will be named later. The tasks of the coordinators were discussed.

The chairman defined in detail the tasks. The results were sent to all WG members who agreed with these definitions.

Tasks of the coordinators of the BALTEX field experiments which they should carry out in-close cooperation and support by the WG are the following:

- work out a detailed experiment plan,
- gather proposals from groups intended to participate after publication of the experiment plans by the BALTEX Secretariat,
- secure that the submitted proposals cover all experimental parts so that the important objectives are obtained, activate further groups if necessary,
- organize the experimental field phase,
- secure that the data exchange is sufficiently handled,
- secure that the results are published e.g. special meeting.

The WG agreed on the time periods and areas for the four experiments:

1a)	Central Baltic	summer 1996
1b)	around Lindenberg a central station of the Deutscher Wetterdienst	May / June 1997
2)	Gulf of Bothnia	February / March 1997
3)	Gotland Basin	to be determined (1996)

When the coordinators have agreed to accept their task the WG will together with the coordinators work out detailed plans for the field campaigns. Such a meeting is proposed for March 1995 at Uppsala.

The meeting was closed at 14.00 on Tuesday, September 20.

Status report - BALTEX Working Group on Radar

The Working Group on Radar (WRG) has just startad their work. A first meeting was held in Norrköping at January 18, 1995. The meteorological institutes from Germany, Poland and Sweden were represented. Due to lack of travel fundings, the Finnish Meteorological Institute were not representated. The lack of travel fundings may be a problem for the group in the future.

Considering the fact that we have different radar hardware and software in the region, one important issue is to simplify the exchange of radar data. During the next year, we have to

. propose the types of products to be exchanged,
. propose the data formats for the radar data.

It is very important that all radar data producers could agree on and implement the proposed products and formats. We urge all institutes with operational radars in the BALTEX area to participate in the work of the WRG. It should be pointed out that we do not nescessarily have to exchange radar data in real time. It is enough to store the radar data in archives and made them available for the research community within BALTEX.

The WRG will maintain an inventory of digitized radars in the BALTEX area. A coverage map of those radars are shown in the Implementation Plan. The radar facilities in Russia, Belarus, Estonia, Latvia and Lithuania are not so well-known in the group. We will seek more information about the radar situation in this countries.

During the next years the group are planning to suggest radar related projects including enhanced observational periods. At the moment there exists some embryos to weather radar project proposals. It is supposed that in order to get so much information as possible from weather radar, a joint effort from modellers and radar people is needed.

There exists two Weather radars groups in Europe, of interest for BALTEX WRG

. COST75 - a research projects on advanced weather radars,
. LGOEWRN - Liason Group on European Weather Radar Network which treats the practical problems in regards to radar networking.

The BALTEX WRG intends to work in close contact with this groups. The members of the WRG are either member of one of above mentioned groups or have some nearby collegue working in COST75 and/or LGOEWRN.

Minutes
of the
First Workshop
of the
BALTEX Radar Working Group (WGR)
held at
SMHI, Norrköping, Sweden,
on January 18, 1995

Participants:
T.Andersson, Sweden
Z. Dziewit, Poland
H.-J. Isemer (BALTEX Secretariat)
J. Riedl, Germany
J. Svensson, Sweden (chairman of WGR)

The meeting opens at 9 a.m.

1. The chairman, Jan Svensson, welcomes the participants at SMHI. He informs the participants that not all persons who agreed to become a member of WGR have been able to attend this first meeting. Invitations to potential WGR members had been sent out earlier in fall 1994 by the BALTEX Secretariat, in close co-operation with the BALTEX SSG, which, on its first meeting in May 1994 in Geesthacht, Germany, suggested to install this BALTEX Radar WG. Jan Svensson agreed to act as the chairman of WGR and invited the WGR members for this first meeting. In addition to the WGR members attending this meeting the following persons are not present:
J.Koistinen, Finland, cannot attend due to travel funding problems. He submitted suggestions for the work of WGR by e-mail (appendix 1), which were distributed to the participants and considered during the discussions. He indicated his willingness to further participate in the work of WGR providing that the financial situation will allow him to attend the future WGR workshops.
V.Melnikov, Russia, did not respond to the invitation of the chairman, although he agreed earlier to become a member of WGR.
S.Overgaard, Denmark, will not be on the group. A letter of the director of DMI, sent to the WGR chairman before this meeting indicated general problems with future Danish contributions to WGR.
WGR stressed the importance of a Danish representative in WGR. The chairman of the BALTEX SSG will be asked by the WGR chairman and the Secretariat to investigate possible future Danish contributions to WGR.

2. H.-J.Isemer reviews the objectives and the present status of BALTEX. He points out the importance of radar data and radar-related research in order to meet the objectives of the BALTEX science programme, especially for the estimation of area precipitation amounts over the Baltic Sea. At present, the BALTEX Implementation Plan (BIP) is being worked out. A BIP drafting group prepared a first draft version of the BIP in November 1994 which is currently being reviewed by the SSG members. The final version of the BIP will be discussed on the second meeting of the BALTEX SSG scheduled for the end of January 1995 in Helsinki. WGR is asked for further input to the BIP. Especially, a review on existing radar stations and their potential for BALTEX is needed. H.-J. Isemer further introduced the planned BALTEX Pilot Study for Intensive Data Collection and Analysis of Precipitation (PIDCAP, see appendix 2). PIDCAP is among the first co-ordinated pilot studies in BALTEX. It originates from a German initiative but is open to interested groups or institutions from other countries as well, especially those already co-operating in BALTEX. Participation of groups or scientists who have access to radar data of the NORDRAD-network is especially useful and important for PIDCAP.

In the following, the participants review some of the national radar networks and stations with considerable detail. Details are given in appendices, only major information is summarised here.

3. J.Riedl reviews the present German radar network (appendix 3) :

- A new doppler station is being installed in Rostock. It will be operational for PIDCAP, quantitative and qualitative rain estimates will be possible within a radius of 100 km and 230 km, respectively.
- There are now 10 radar stations in the German network, doppler stations are in Emden, Neuhaus, Hannover and Rostock, stations relevant for BALTEX are Rostock and Berlin.
- This network produces qualitative reflectivity maps on a routine base every 15 minutes. In the precipitation mode, one radar scan at a low elevation angle is performed. The data resolution, in polar coordinates, is 1 degree and 1 km within a 100 km radius, these data are summed into hourly data (DH-data) and daily values (DD-data), using Z/R relations. These data are operationally not adjusted by measured ground truth, this procedure needs still a lot of manual work which may amount to one week for a one day data set. However it will be possible to perform the detailed adjustments at least during enhanced observation periods (e.g. at Rostock during PIDCAP).
- DWD is currently in negotiation with DMI about the inclusion of radar data from the Danish station on the island of Römö into the German network.
- DWD provided Lithuania with two radar stations. Details have to be obtained from the Lithuanian Hydromet Service, or from Dr.Steinhorst at DWD (T12), Offenbach.

4. Z.Dziewit reviews the Polish radar stations (details see appendix 4):

- At present, there is one non-doppler radar station in operation at Legionowo. A new doppler station will be operational in 1995 in Ramza (near Kattowice). This station will cover the source catchment areas of both Odra and Vistula, which is important for BALTEX.
- An identification scheme for different precipitation phenomena derived by Moskowicz is used in Legionowo. A network of 7 rain gauges in a limited catchment (230 km^2) inside the Legionowo station area exists which was e.g. used by Moskowicz in a study to estimate uncertainties of both radar and gauge data.

- There are plans for 6 further radar stations in Poland, however, due to financial problems implementation of these stations is unlikely before the year 2000. Two of these stations are planned for Szczecin and Gdansk, implementation of these stations would fill a gap in the eastern part of the Baltic Sea and would be very important for BALTEX.

5. J.Svensson gives a report on the Nordic NORDRAD network with special emphasis on the facilities in Sweden and at Norrköping (see also appendix 5):

- The three countries Sweden, Finland and Denmark are running NORDRAD. At present NORDRAD consists of one station in Norway, 9 stations in Sweden, and 5 stations in Finland. All stations are doppler radars except those in Rovaniemi and Masku (Finland). The Danish station in Kastrup is included in the routinely produced composites, however, products including Kastrup data may at present only be distributed to Swedish customers. The inclusion of Kastrup is very important for BALTEX, negotiations with DMI are necessary to obtain permission to use the Kastrup data also for research purposes within BALTEX.
- Different composites are produced in Norrköping (for Swedish customers), in Norway and Finland. The performance of the Swedish radar stations, data transmission from the radar stations to Norrköping and establishment of various products is controlled and automatically done in Norrköping. SMHI is calculating monthly availability statistics for all radars, as is done at FMI and DMI. Only at Norrköping a composite covering the whole NORDRAD area is produced every 30 minutes.
- At present, composites of radar reflectivities are produced from the NORDRAD data, no rain intensities are distributed operationally.
- At present, no data are stored within the operational service, however, for research purposes the composites of radar reflectivity are stored for certain periods at SMHI. The 3d volume data are neither stored nor even transmitted to Norrköping.
- NORDRAD products are distributed to customers in Norway, Finland, and Sweden on a commercial base. NORDRAD is an operational system, it is not primarily designed for research purposes, however, it may be feasible to use NORDRAD for research purposes like BALTEX. Additional funding for e.g. the establishment of suitable storage media and their control may be necessary.
- Financial support for the radar stations in Sweden comes from SMHI, governmental sources, military sources and the national road administration. One station is a private one. Three more stations will be installed in Sweden in the western and north-western parts (in 1995, 1996 and later), in order to completely cover the Swedish territory by weather radar survey.
- One additional station is planned in Finland at the northern boundary of the NORDRAD area.
- Earlier plans, to offer radar stations to the Baltic countries are not likely to be performed due to funding restrictions.
- A comprehensive technical description of NORDRAD data formats and the data handling within NORDRAD was distributed to the participants of the workshop.

6. There is no information available on the present coverage and technical standard of radar stations in the Baltic states, in Russia and Belarus. The weather services of these countries will have to be directly asked to provide information. J.Svensson prepared a computer map (appendix 6) showing the presently available radar stations and the radar coverage around the Baltic Sea. A slightly updated version will be presented at the second BALTEX SSG meeting in Helsinki to be included in the BALTEX Implementation Plan (BIP).

7. T.Andersson describes the radar research activities at SMHI. They may be divided into 4 research areas:

- Combined meso-scale precipitation analysis based on radar data, synoptic and direct rain estimates, and HIRLAM precipitation forecast fields. An analysis scheme is presently developed at SMHI which integrates information from all the three mentioned sources. It will become operational soon. This analysis scheme is considered a useful contribution to PIDCAP.
- 3h-precipitation forecast based on radar data. The procedure is based on a static extrapolation of radar detected precipitation fields using the 700 hPa wind field from the HIRLAM model.
- Investigation of anomalous radar signal propagation and sea clutter problems.
- Derivation of vertical profiles of wind speed (using the VAD method). Depending on atmospheric conditions profiles up to 6-8 km height over the radar station are obtained. At present profiles are derived hourly at four stations (Gothenburg, Stockholm, Norrköping, and Gotland).

8. The terms of the BALTEX WGR were discussed in detail and reformulated (appendix 7). The new version will be presented for discussion on the BALTEX SSG meeting. Part of the terms written in the earlier version (especially the network establishment and technical developments) are presently being covered by both the COST75 project and the Liaison Group on Operational European Weather Radar Networking (LGOEWRN). The terms of these projects were reviewed (appendix 8). The BALTEX WGR intends to keep close contacts with both projects. This is facilitated by the fact that some participants at the WGR workshop are members in these projects.

9. Although the group felt somehow unhappy with the present radar section in the BIP no revised more detailed version could be worked out due to lack of time. The chairman will correct errors in the present version and present the latter to the BALTEX SSG in Helsinki for discussion. Some recommendations for improvements and general suggestions are given in the contribution by J.Koistinen (appendix 1).

10. It was agreed upon inviting radar specialists from especially the Baltic states and Belarus to become member of WGR if radar stations are in operation in these countries.

The workshop closed at 6.30 p.m.

Hans-Jörg Isemer
January 19, 1995
revised March 17, 1995
accepted by participants April 10, 1995

Appendix 1

to Minutes of WGR Workshop

From: LURCH::"Jarmo.KoistinenÉfmi.fi" 17-JAN-1995 17:43:50.28
To: jan.svensson
CC: jarmo.koistinenÉfmi.fi
Subj: BALTEX WGR/koistinen

Dear Jan,

I am sorry not to be able to travel to the meeting. If financial support from BALTEX is not given, this can be the situation also in the future. However, I am willing to be a member in the Working group and participate via e- and conventional mail.

I read through the Draft Version of the Implementation Plan of BALTEX (dated 5 Dec. 1994), the letter from prof. Raschke (dated 13 Oct.), the letter from H. Isemer (dated 14 Dec.) and your letter of 19 Dec. I have some notes to these:

In my opinion BALTEX should not take care of radar network establishment but of agreeing methods how to get and use precipitation information from the existing radar networks. Similarly BALTEX should not take care of technical development of radar systems as they are already handled in COST 75 and GORN. Instead, the following themes are probably important:

1. To decide and formulate the BALTEX radar objectives in cooperation with the other WG:s and SSG in order to establish concrete plans for radar-related research. In the Implementation Plan Draft radar is often mentioned on a general level, but the concrete way of using it to get some benefits remains somewhat diffuse.

2. To agree which radar products (dBZ, intensities, cumulative amounts) will be used, what is the time-space resolution needed,time periods and areas of interest.

3. To agree or follow how the optimization of quantitative precipitation products is done in each radar e.g. calibration, reflectivity profile corrections, gauge adjustment methods, clutter cancellation. In this respect, WGR might recommend the terminology which is used unanimously in COST 75: Calibration denotes electrical calibration of radar hardware and Adjustment denotes tuning radar estimates of precipitation to agree with ground based (e.g. gauge) measurements. "Radar calibration" is quite commonly used in the hydrological community to denote the latter fact.

4. To agree how radar data will be collected and archived for the purposes of BALTEX. From the point of FMI, with no financial support from BALTEX, it is quite obvious that minor efforts are possible in producing special data for BALTEX. On the other hand it is probable that BALTEX may use any real time Finnish radar data transmitted operationally to NORDRAD. Hence, NORDRAD should accept all relevant BALTEX products and BALTEX should be ready to collect data from NORDRAD.

Other comments:

In the Implementation Plan, Section 5.4, last paragraph (Still...) should be deleted as it is nonsense. In Finland we produce operationally cumulative radar snowfall of 1 hour, 6 hours and 12 hours up to range of 120 km by using wavelength 5.4 cm in Doppler-radars. The product gives the same relative areal distribution of snowfall amounts as gauges do and is essentially not worse than the respective products in liquid precipitation (of course a constant bias in abslute terms exists, but that is normal in all radar measurements and can be removed e.g. by using gauge adjustment and profile correction). At present we have not made large gauge comparison of the snowfall products but I have good examples.

Fig. 5.4 on page 40 has 170 km radius around each radar instead of the 120 km mentioned in the Figure caption. This gives somewhat too optimistic impression of the radar coverage (at least in winter).

>From the old MRL-5 radars we are just getting ready a report (in Finnish only) which shows, after the removal of a large range-dependent bias, that the areal 12 h or 24 h cumulative liquid precipitation estimate is accurate if the area of interest is larger than about 200 km2.

I would greatly appreciate if you disseminate this information to the WGR and express my best wishes to the group.

Sincerely

Jarmo Koistinen

Appendix 2

to Minutes of WGR Workshop

Announcement

of a

BALTEX Pilot Study

for Intensive Data Collection and Analysis of Precipitation (PIDCAP)

scheduled for the period

August to October 1995

A number of challenging tasks for BALTEX, as outlined in the Scientific Plan for BALTEX, will adequately be solved only in close cooperation between scientists and groups from different research directions or disciplines. At a recent national BALTEX workshop in Germany the need for intense cooperation between different national groups within the German BALTEX contribution and with BALTEX groups in other countries was noted. As a consequence plans for cooperation and interaction between groups have been outlined during this BALTEX workshop. An ad-hoc working group on problems of precipitation measurements pointed out the urgent need for an organized initiative to collect rain data from different sources for comparison and validation purposes.

The workshop suggested to organize a BALTEX Pilot Study for Intensive Data Collection and Analysis of Precipitation (PIDCAP). The objectives of this pilot study are

- to collect and analyse measured and estimated precipitation from different data sources,
- to compare different precipitation data sets against each other in order to identify and establish reliable standards for model validation,
- to validate the output of the BALTEX Regional Model against such precipitation data sets,
- to develop, test and establish necessary data management and analysis procedures (especially the cooperation between different research groups and the BALTEX Meteorological Data Center) for future comprehensive studies in the framework of BALTEX.

The key data collection and modeling period of PIDCAP will be **August to October 1995.** At present, the area of interest has been defined as the southern BALTEX region south of about 60N.

We hereby invite interested groups to participate at this pilot study.

/...

.../

The following groups are presently involved in planning the pilot study. They are introduced in the following by shortly noting i) Senior Scientist of the group and affiliation, ii) the principle rain estimation technique or data source used.

1) i) B.Rockel, GKSS Research Center Geesthacht
   ii) BALTEX Regional Model output

2) i) L. Hasse, Institute of Marine Sciences Kiel
   ii) Ship rain gauges on ferry boats and on a research vessel

3) i) E.Ruprecht, Institute of Marine Sciences Kiel
   ii) SSM/I data and radiative transfer model

4) i) J.Riedl, German Weather Service (DWD), Hohenpeissenberg
   ii) RADAR data from the German station in Rostock

5) i) A.Lehmann, BALTEX Meteorological Data Center at DWD, Offenbach
   ii) Rain measurements at land stations, daily values

6) i) B.Rudolf, Global Precipitation Climatology Center at DWD, Offenbach
   ii) Monthly climatological rain estimates

The nordic HIRLAM modeling group and the RADAR network NORDRAD already indicated their willingness to participate at PIDCAP. A first coordinating meeting for PIDCAP took place on October 10, 1994 at Institut of Marine Sciences in Kiel. A preliminary experiment plan will be presented at the meeting of the BALTEX Implementation Plan Drafting Goup at the beginning of November. The final version of this plan should be presented at the next meeting of the BALTEX Science Steering Group in January 1995. The next meeting of PIDCAP participants is scheduled for February 1995.

For further information, please, contact or send your indication of interest to

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Appendix 3

to Minutes of WGR Workshop

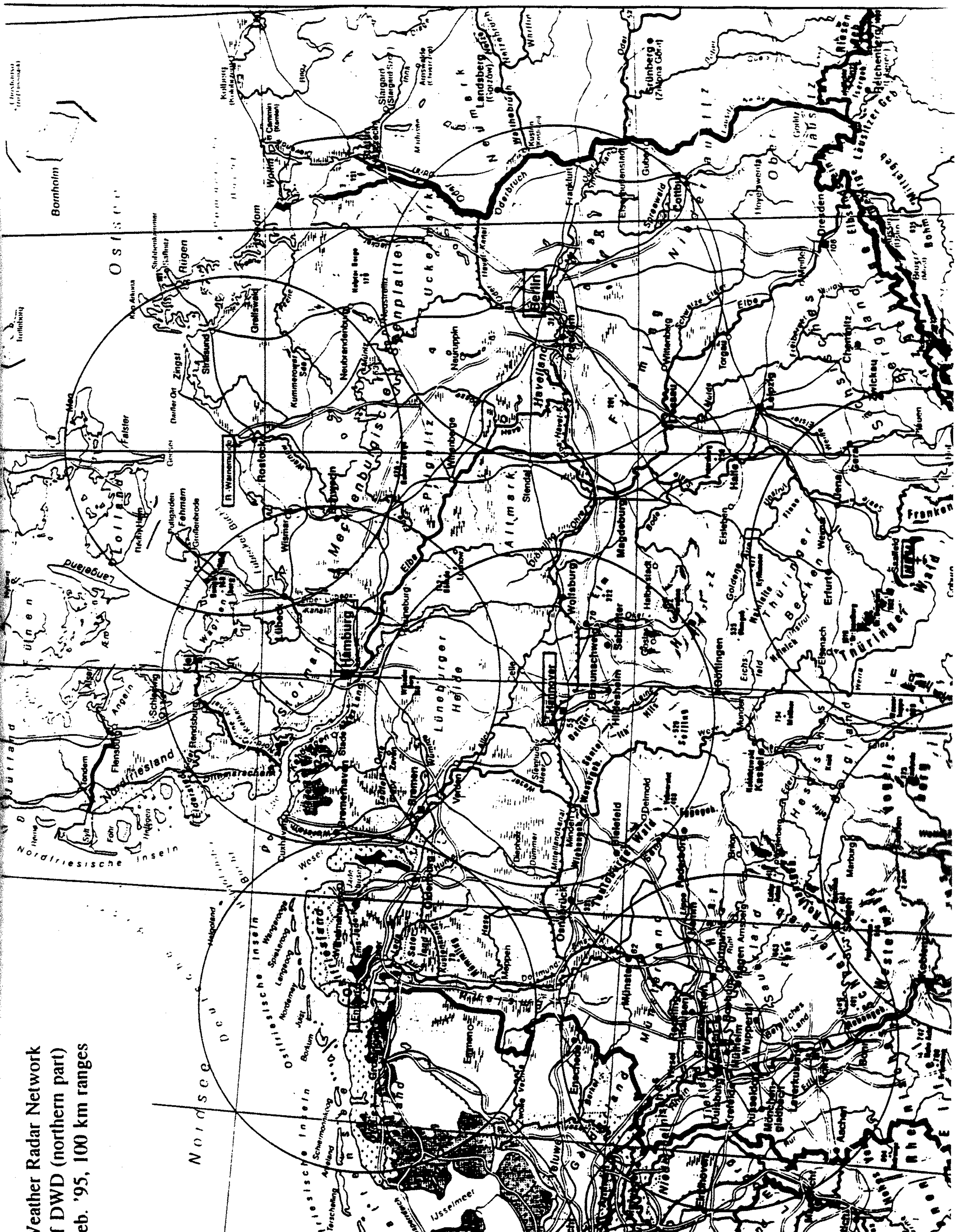
Deutscher Wetterdienst
Meteorological Observatory Hohenpeißenberg

Weather Radar Network of the Deutscher Wetterdienst (DWD)

Presently (January 18th, 1995), the German radar network consists of 9 stations. The installation of station No. 10 (Rostock-Warnemünde) will be finished end of January 1995. After final calibration and parameter tuning it will be available für PIDCAP. The site locations and 100 km range circles of the northern part of the network are shown in the attached figure. The radar systems at Emden, Rostock-Warnemünde, Hannover, and Neuhaus are new Doppler systems. Especially the radars at Rostock-Warnemünde, Berlin (and Hamburg) are relevant for the BALTEX area.

Qualitative image products (2 x 2 km resolution) of the radar reflectivity distribution in the 230 km range (comparable to the NORDRAD products) are generated at each radar every 15 minutes. The image products are transmitted to the Central Office at Offenbach for composite generation. Every hour, a composite image is redistributed to the users.

Quantitative precipitation estimates are generated hourly and daily and stored on magnetic tapes (DAT tapes). These estimates (1° x 1 km resolution) are based on samplings every 5 minutes at a low elevation angle adaptable to the orography. Up to now, there is no on-line adjustment; the adjustment of the radar precipitation data by aid of ground stations is performed off-line in the Hydrometeorological Section of the Central Office.



Weather Radar Network of DWD (northern part) Feb. '95, 100 km ranges

Appendix 4

to Minutes of WGR Workshop

INSTITUTE OF METEOROLOGY AND WATER MANAGEMENT
61. Podleśna St., 01-673 Warsaw Poland

16 January, 1995

Weather Radar Network in Poland

The existing and planned weather radar network in Poland is presented on the enclosed map. At present only one fully digital MRL-5 radar in Legionowo (near Warsaw) is in operation. It works with X band channel, 24 hours a day, all the year round. The scans are actually made every 10 minutes, but there exist some possibilities to shorten the time between scans even to 5 minutes. The scan contains 14 tilts (standard, but another schedule is possible). The system creates the following products:

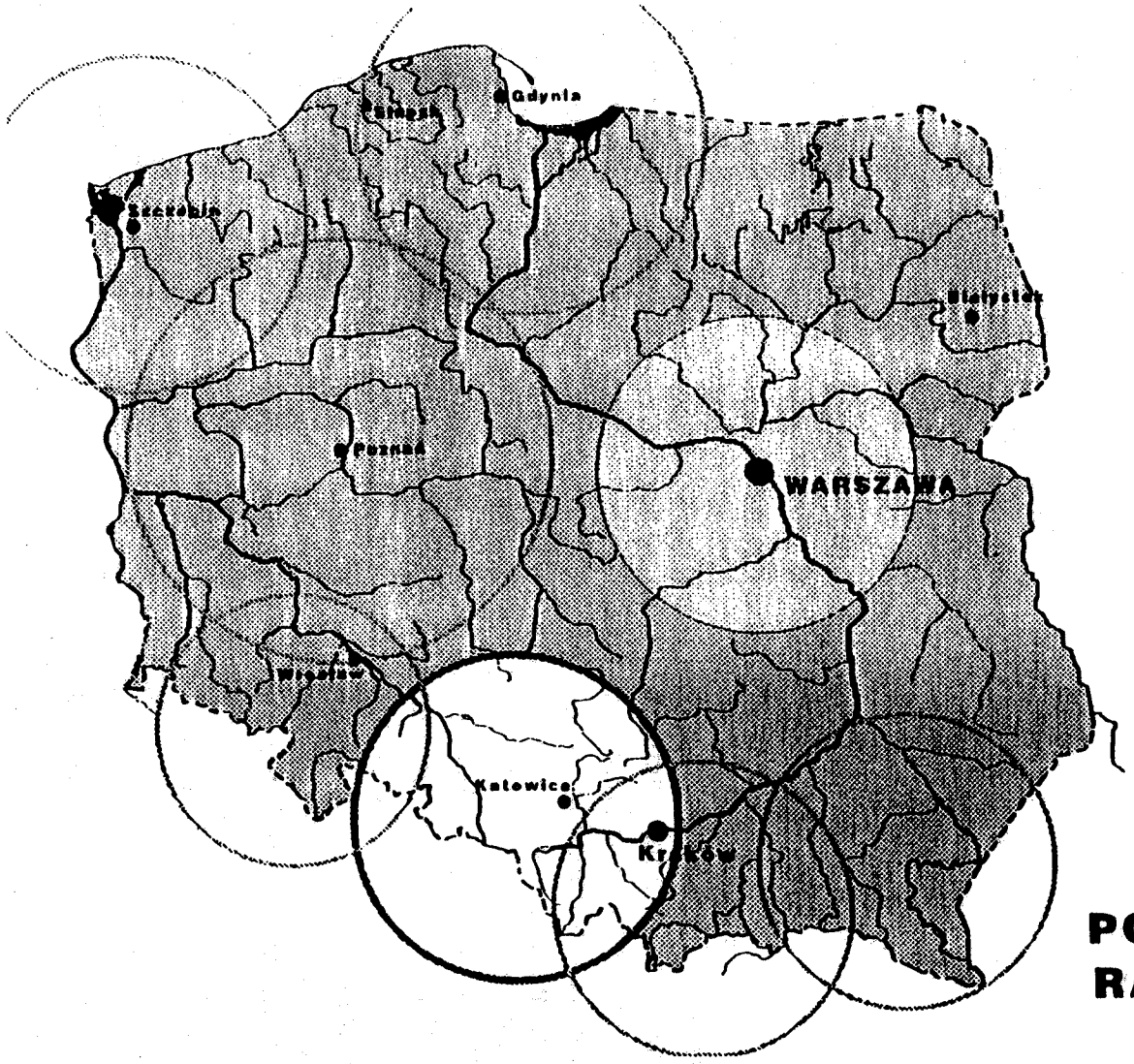
- CAPPI's at 6 levels (700m, 1, 2, 3, 4 and 5 km)
- echo tops
- precipitation intensity (CAPPI from 700m level converted with M-P relation)
- storm map containing results of statistical recognition of the following meteorological phenomena: 1) hail, 2) thunderstorm, 3) convective snow, 4) convective snow with rain, 5) shower, 6) convective cloud without precipitation, 7) stratiform snow, 8) stratiform snow with rain, 9) stratiform rain, 10) stratiform cloud without precipitation
- map of eliminated AP echoes (for control)
- vertical cross-section at chosen azimuth (on request)
- animation of any map (on request)

The maps may be displayed with horizontal resolution of 4 km (to the range of 200 km) or 2 km (100 km). We archive all of our raw radar data. The telecommunication facilities are as follows: the full volume scan data is transmitted to our Bureau of Forecast for Aviation at Warsaw Airport, some reduced information (maps of precipitation, storm and echo tops) are distributed to many users by means of TV teletext using a special interface card between a TV set and IBM PC computer. For a few weeks we are connected to X/25 network of IMWM and to main polish telecommunication computer (GTS). Now we start to learn sending data using BUFR code.

The next radar (C band Gematronic Doppler Radar) of the network will be installed in spring 1995 in Orzesze (near Katowice - Upper Silesia), which will cover the source regions of Wisła and Odra rivers. After having implemented we will construct our composite radar map.

The next radars are planed: near Wrocław (to South), on Baltic shore (near Szczecin or Gdańsk).

The exact terms for following radar's installation are not yet determined. They will obviously depend on our financial possibilities. We expect to construct the network in next 10 years.



existing weather radar

recent planned weather radars

future locations

POLISH WEATHER RADAR NETWORK

Appendix 5

to Minutes of WGR Workshop

NORDRAD
Agreements regarding operation and maintenance

1. NORDRAD nodes and radar nodes shall use UTC-time with a maximum difference of 30 seconds.

2. Each country decides on the lowest elevation for the radar scans. These lowest elevations shall be reported to the swedish representative in 'Operation and maintenance group'

3. A scan is started with the lowest elevation (bottom-to-top)

4. The radars shall start scanning with normal mode (if the terms normal and doppler mode are applicable; the Gematronik radars in Finland combines normal and doppler mode) at the minutes 00, 15, 30 and 45 (those are the radar sample times). The doppler mode shall start immediately after the normal mode. A difference less than or approximately equal to 30 seconds is allowed. Such a difference may occur if high priority scan is used at an Ericsson-radar in Norway or Sweden.

5. Pseudo-CAPPI (500 m above the local radar) reflectivity in normal mode shall be the first product generated for NORDRAD.

6. A reflectivity product in normal mode for the CAPPI-level 1500 m above sea level will be produced during winter time and the corresponding product at CAPP-level 3500 m above sea level will be produced during summer time. The shift in CAPPI-levels is done during the week after the change from summer to winter time and vice versa. During this week both CAPPI-levels shall be produced.

7. Pseudo-CAPPI reflectivity in normal mode shall be adviced to the other national nodes not later than 5 minutes after the radar sample time and not later than 12 minutes after the radar sample time for the same product in doppler mode. The radars in Rovaniemi and Masku will not fulfill these requirements.

8. The following products shall be made available for each radar on demand from other countries

Pseudo-CAPPI reflectivity 500 m normal mode	Note 1
Pseudo-CAPPI reflectivity 500 m doppler mode	Note 2
CAPPI reflectivity 1500 or 3500 m normal mode	
Vertical maximum intensity of reflectivity	
Horizontal maximum intensity of reflectivity	
Height to the max reflectivity	
Echo top	
Radial winds	

Note 1: Gematronik radars in Finland combine normal and doppler mode.

Note 2: Rovaniemi and Masku do not have a doppler mode.

9. Each country shall keep an updated list of the products they want to have adviced from the other countries in order to avoid unnecessary production of unused products.

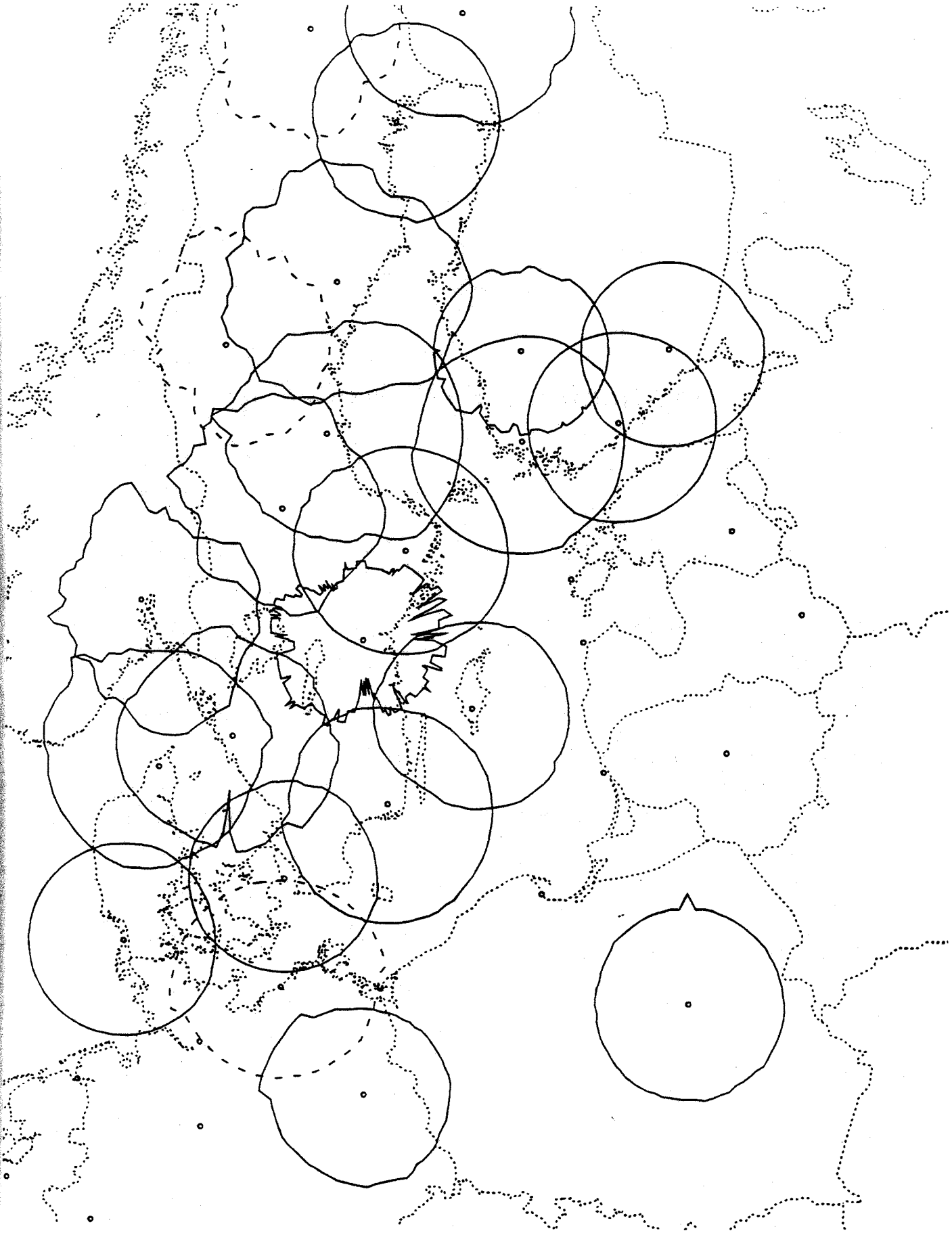
10. In case of absence of an individual radar, the other countries shall be informed as soon as possible and not later than 2 hours after the failure of the radar. The other countries shall be regularly informed about estimated time for the restart of the absent radar.

11. Error reports for the NORDRAD software to AU-System are normally made by SMHI. In case of errors of category 3 (that means serious errors) or consultations. each institute may contact AU-System directly. Each institute is responsible that the person, who makes the error report or the consultation, is aware of the maintenance contract and its implications. Those error reports and consultations shall be reported to the swedish representative in the 'Operation and maintenance group' and the other national representatives shall be informed (e g by mail). Each institute will pay AU-System for the travel costs.

12. Each country makes monthly statistics of availability percentage for each radar, which is treated in the national node. DNMI will make statistics for the radars in Oslo and Gothenburg. The monthly statisticss are distributed to the other national representatives.

COST-73 WEATHER RADAR COVERAGE

no se sf dk xx



Appendix 7

to Minutes of WGR Workshop

Terms of the BALTEX Radar Working Group

Draft to be presented to the BALTEX SSG meeting in Helsinki

The terms of reference of the BALTEX Working Group on Radar are

- to establish and maintain a structure for the exchange of radar data (not necessarily in real-time) covering the BALTEX region, by proposing (i) the type of products to be exchanged and the priorities for their implementation, considering the needs of research in meteorology, hydrology and oceanography, and (ii) exchange formats for the radar data in the BALTEX region,

- to maintain an inventory of radars installed in the BALTEX region, and recommend ways to extend the radar coverage over the entire BALTEX region in order to meet the scientific objectives of BALTEX,

- to recommend radar-related research and enhanced observational periods to meet the scientific objectives of BALTEX,

- to regularly inform and advice the BALTEX SSG about ongoing developments and progress,

- to keep close contact with the other BALTEX working groups.

The BALTEX WGR intends to work closely together with both the Liaison Group on Operational European Weather Radar Networking (LGOEWRN) and the working groups in the COST-75 project.

Appendix 8

to Minutes of WGR Workshop

Terms of Reference for the
Liaison Group on Operational European Weather Radar Networking

1. The Liaison Group will establish and maintain a European Network structure, including regional compositing centres by:-

- agreeing the type of products to be exchanged and priorities for their implementation considering the needs of operational meteorology,

- proposing standards for data formats, resolution, projections, timeliness etc. of radar data for exchange,

- improving data compression methods,

- defining, testing and implementing the appropriate communications channels and dissemination procedures,

- proposing standards of observational and quality control practices,

- maintaining an inventory of radars installed in Europe and their characteristics.

2. The Liaison Group, which will meet no more than two times a year, will report to the Conference of Western European Directors.

PROPOSED NEW COST PROJECT ON ADVANCED RADAR SYSTEMS

7.01 It was recommended in Section 6 that a follow-on COST project should be established. The scope of this research project should include all or part of the following:

(i) **Electronically scanning (phased array) weather radars:**

- assessment of the flexibility of such systems to satisfy several users (aviation, forecasting/hydrology) simultaneously;
- consideration of how scanning strategies may include the ability to concentrate in particular areas where interesting weather is occurring;
- development of procedures by which scanning may be optimised for ground clutter elimination;
- assessment of the ease with which a multi-parameter (including Doppler) capability can be included;
- definition of wavelength and antenna dimensions which will provide the basis of a practical operational system;
- assessment of the costs of a practical operational system;
- assessment of the degree of interest in such radar systems throughout Europe;
- drafting the outline specification for such a system.

(ii) **Multi-parameter (including Doppler) radar:**

- re-assessment of the potential of such radars using as a starting point the work carried out in COST 73 and identify the most useful parameters;
- development of an outline specification for an operational radar system incorporating multi-parameter specifications;
- a review of the uses to which measurements by multi-parameter radars can be put;
- identification of the specific applications that such systems are likely to be used to satisfy;
- assessment of the potential market for these radars over the next ten years both within Europe and worldwide.

(iii) **Pulse compression techniques and frequency agility:**

- reduction of acquisition-time of volumetric scans;
- optimisation of the waveform and bandwidth to be used in operational systems;
- definition of the operational specification for the system to be used simultaneously in several applications.

with multi-parameter (including Doppler) radar data,

- assessment of the need to develop algorithms to process electronically scanning radar data;
- a review and recommendations of algorithms used for combining multi parameter (including Doppler) radar data with conventional radar data;
- a review and recommendations of algorithms for use in processing three-dimensional reflectivity data;
- investigation of the use of artificial intelligence systems to recognise precipitation type and, possibly, provide automatic moderation of radar scanning procedures and algorithms.
- consideration of how to introduce observations from electronically scanning radar, multi-parameter (including Doppler) radar into data bases comprising conventional data;
- a review of differential attenuation techniques for the early detection of hail

(v) **Operational Aspects:**

- carrying out of trials to produce new products in real time and to assess their utility;
- recommendations on the operational introduction of advanced radar technologies;
- to propose and specify how the European radar network should be developed to include a small number of advanced radar systems.

LGOEWRN 10/94

Rules for setting up radar products for international exchange within Europe

1. PRODUCT 1 is the INSTANTANEOUS RAINFALL INTENSITY image.

2. Data should be one pixel value in one byte.

3. The Intensity scale will be agreed within about the next month.

4. Composite areas must be composed of "square" pixels but may be oriented freely.

5. The number of pixels in each row and column must be given.

6. Formulae must be provided which express the latitude and longitude of the centre of a pixel in terms of the pixel co-ordinate (row, column).

7. Row means the vertical co-ordinate from the top of the image starting at 0 for the first row. Column means the horizontal co-ordinate from the left of the image starting at 0 for the first column.

8. The co-ordinates (latitude, longitude) of the corners of the image must be given, i.e. the outside edges of the corner pixels.

9. Overlays such as maps, coastlines, roads, text, colour scales, must not be included in the image.

10. Pixels must be presented in order from the top left, row by row , to the bottom right (first pixel is row_0, $column_0$; last pixel is row_{max-1}, $column_{max-1}$).

11. Data must not include line markers, i.e. it must be a plain byte stream.

12. Nominal observation times are H+00, H+15, H+30 and H+45, where H is hours UTC.

13. Observation window recommendation is nominal time + or - 2 minutes. The observation time is defined according to the COST73 recommendation.

14. Time shown in the GTS header is the time of message compilation at the originating centre.

Appendix 18

Terms of the BALTEX Working Group Radar

The terms of reference of the BALTEX Working Group Radar are

- to establish and maintain a structure for the exchange of radar data (not necessarily in real-time) covering the BALTEX region, by proposing

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Appendix 19

Invitation to other countries to participate in BALTEX

Paper by L.Bengtsson

1. Background

With the completion of the initial implementation plan and with the recognition of Baltex as a formally approved subprogramme of GEWEX, it now seems appropriate to invite other countries to participate in BALTEX. Informal contacts have been made by United States and Canada to participate at least in the numerical experimentation programme. The Netherland (KNMI) is interested to participate in both the observational as the numerical experimentation programme. Other contacts has been taken by individual scientists, for example by prof. Hantel in Vienna who would like to undertake diagnostic calculations of the hydrological cycle. Consequently, for both scientific and formal cooperative reasons within the WCRP, it therefore seems appropriate to now consider the best strategy to open up BALTEX to a wider scientific community.

2. Procedure

The following general principles could be considered. Preference, if at all, to be given to other EU members (related to the financing issue) and to participants in the other GEWEX subprogrammes (with the understanding of a two-way exchange).

3. Invitation to participate in the numerical experimentation programme

There is a clear advantage if several advanced high resolution limited area models are being used and systematically being intercompared. Hence an open policy here will only be to our advantage. An example of an interesting external model to use, is the NCAR limited area model. Additional examples are the models used in the other GEWEX subprogrammes. Alternatively the BALTEX modellers should participa*te* in the other GEWEX programmes.

4. Invitation to participate in the observational programme

Here external participation would be of greatest importance. Examples are research aircrafts, remote sensing eqipment etc. In view of the unique opportunity to measure precipitation over a reasonable large open sea area, probably representative for high latitude ocean areas in general, I would anticipate a broad interest from external groups. Other areas of wider interests are the sea ice programme in BALTEX.

List of Acronyms and Abbreviations

AMIP	Atmospheric Model Intercomparison Project
BAHC	Biospheric Aspects of the Hydrological Cycle
BALTEX	Baltic Sea Experiment
BGIS	Basic Geographic Information of the Baltic Drainage Basin-Project
BHDC	BALTEX Hydrological Data Center
BMBF	German Research Ministry
BMDC	BALTEX Meteorological Data Center
BODC	BALTEX Oceanographic Data Center
BSSG	BALTEX Science Steering Group
CAS/JSC	Commission for Atmospheric Sciences of WMO
COST	Co-operation in Science and Technology
DHI	Danish Hydraulic Institute, Hørsholm
DMI	Danish Meteorological Institute, Copenhagen
DWD	Deutscher Wetterdienst, Offenbach
EMHI	Estonian Meteorological and Hydrological Institute, Tallinn
ENRICH	European Network for Research in Global Change
ENVCLI	Environment and Climate
EU	European Union
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
FIMR	Finnish Institute of Marine Research, Helsinki
FMI	Finnish Meteorological Institute, Helsinki
GAME	GEWEX Asian Monsoon Experiment
GCIP	GEWEX Continental-Scale International Project
GEWEX	Global Energy and Water Cycle Experiment
GKSS	GKSS Research Center, Geesthacht
GPCC	Global Precipitation Climatology Center, Offenbach
GPCP	Global Precipitation Climatology Project
GVaP	GEWEX Water Vapour Project
HDC	Hydrological Data Center
HELCOM	Helsinki Commission
IfM	Institut für Meereskunde, Kiel
ICSU	International Council of Scientific Unions
IGBP	International Geosphere Biosphere Programme
IGPO	International GEWEX Project Office

INTAS	International Association for the Promotion of Cooperation with Scientits from the Independent State of the Former Soviet Union
IOS	Institute of Oceanology, Sopot
IOW	Institut für Ostseeforschung, Rostock-Warnemünde
JSC	Joint Scientific Comittee of ICSU
LAMBADA	Large-scale Atmospheric Moisture Balance of Amazonia using Data Assimilation
LGOEWRN	Liaison Group on Operational European Weather Radar Networking
LHA	Latvian Hydrometeorological Agency
MAGS	Mackenzie River GEWEX Study
MAH	Main Administration of Hydrometeorology, Minsk
MAST	Marine Science and Technology
MDC	Meteorological Data Center
MGO	Main Geophysical Observatory, St. Petersburg
MPIfM	Max Planck Institut für Meteorologie, Hamburg
NOPEX	Nordic Pilot Experiment
NORDRAD	Nordic Weather Radar Network
ODC	Oceanographic Data Center
NBWE	National Board of Waters and the Environment, Helsinki
PIDCAP	Pilot Study for Intensive Data Collection and Analysis of Precipitation
PILPS	Project for Intercomparison of Land-Surface Parameterization Schemes
RSHI	Russian State Hydrological Institute, St. Petersburg
SMHI	Swedish Meteorological and Hydrological Institute, Norrköping
SSG	Science Steering Group
WCRP	World Climate Research Programme
WGD	Working Group on Data Management and Data Studies
WGNE	Working Group on Numerical Experimentation
WGP	Working Group on Process Studies
WGR	Radar Working Group
WMO	World Meteorological Organization