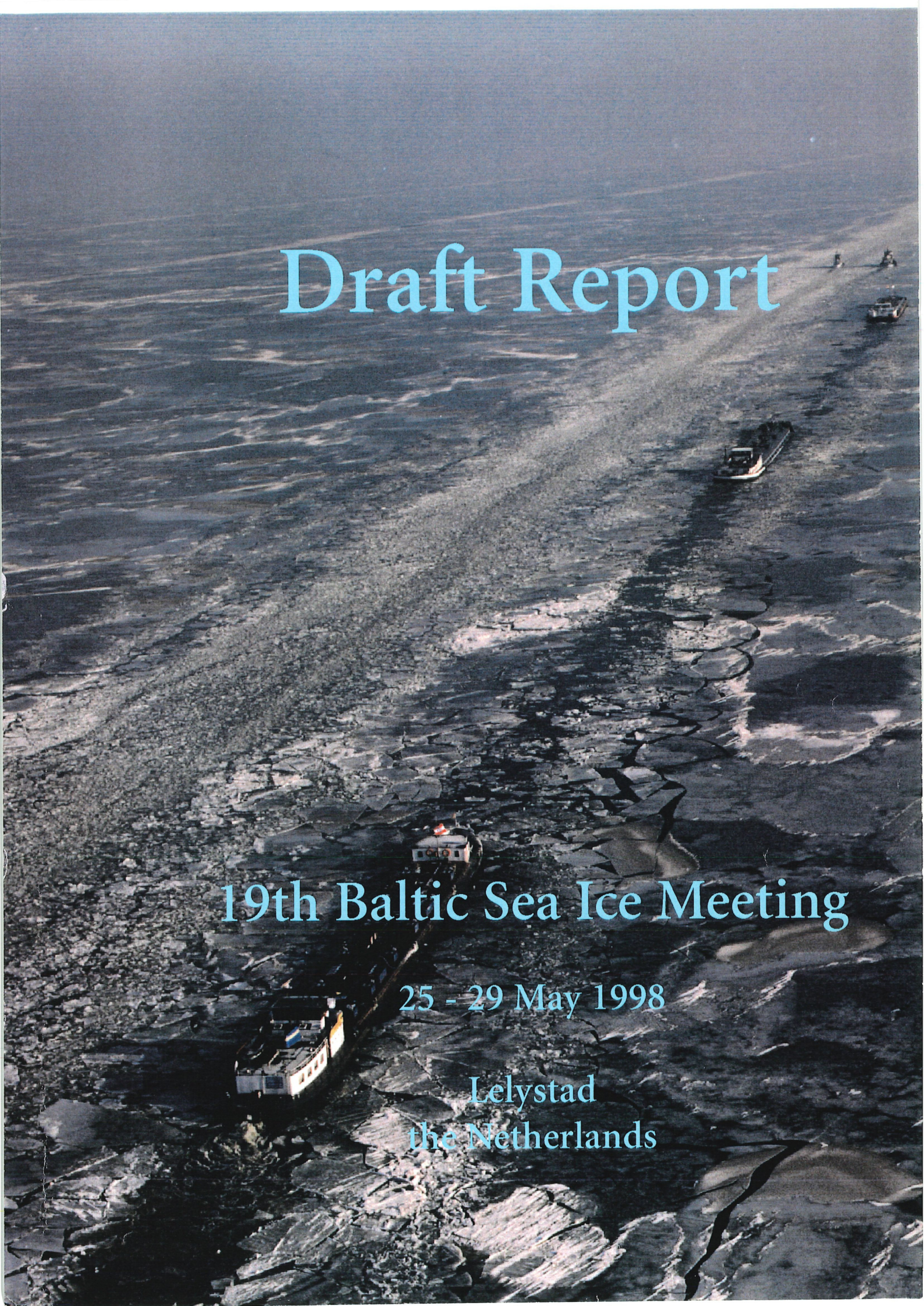

Draft Report

19th Baltic Sea Ice Meeting

25 - 29 May 1998

Lelystad
the Netherlands

19th Baltic Sea Ice Meeting

AGENDA

Monday, 25 May

13.00 Lunch at Hotel Mercure Lelystad

14.00-18.00
1. Opening of the Meeting by Mr W. Cofino, head of the Information and Measurement technology division RIZA
2. Organization of the Meeting
   - 2.1 Election of the chairman
   - 2.2 Adoption of the agenda
   - 2.3 Working arrangements
3. Sea Ice observation techniques and exchange procedures (up-dated information)
   - 3.1 Baltic Sea countries

Tuesday, 26 May

09.00-13.00
- 3.2 Other countries/areas
- 3.3 Exchange procedures
- 3.4 Harmonization: Requirements and possibilities

4. Baltic Sea Ice Code
   - 4.1 Experiences
   - 4.2 Need for further development

14.00-17.30
5. Review of the WMO/CMM sea ice activities
6. Digitizing of sea ice charts for the period from 1960/61
   - 6.1 Status
   - 6.2 Future activities
7. International System for Sea Ice Symbols
   - 7.1 Experiences
   - 7.2 WMO Sea Ice Nomenclature, Symbols and Codes

Presentation Coast Guard, Mr P. Verburg

19.00 Official dinner offered by Mr A. van Bennekom, Director RIZA at the Flevo Marina Harbour.

Wednesday, 27 May

09.00-13.00
8. Ice charts
   - 8.1 New satellite related ice charts
   - 8.2 New production techniques and products
   - 8.3 Transmission techniques
   - 8.4 Joint production
9. Remote Sensing
   - 9.1 ERS data politics
   - 9.2 RadarSat data utilization

14.00-17.00 Visit to the Inland Water and Information Centre and the Ecotoxicological Laboratories of the RIZA
Presentation by Mr A. Dijkstra on Project BC 2000

Thursday, 28 May

09.00-13.00	10. Reports of the Icebreaking Services (co-operation with Ice Services, requirements) 11. Baltic Sea ice climate 12. International activities (data banks, workshops, projects, cooperation
14.00-17.00	Visit to Houtrib Locks and to the Batavia Shipyard in Lelystad

Friday, 29 May

09.00-12.30	13. Other questions 14. Adaption of the draft report 15. Date and place of the next Meeting 16. Closing of the Meeting
13.00	Lunch at Hotel Mercure
14.00	Departure from Lelystad

19th Baltic Sea Ice Meeting

1. OPENING OF THE MEETING

The 19th Baltic Sea Ice Meeting was held from 25 up to and including 29 May 1998, organised by the RIZA (Institute for Inland Water Management and Waste Water Treatment) in Lelystad, the Netherlands.
Twenty-two delegates from nine countries and the representative from the WMO attended the Meeting. The list of participants is given in Annex 1. Mr W. Cofino, head of the Information and Measurement Technology Department RIZA, welcomed the participants and opened the Meeting. He gave an introduction of the RIZA and the specific problems in the Netherlands. He stated to be happy to be host for the Meeting and wished it to be a fruitful and successful one.
The Meeting noticed with regret that the representatives of Lithuania and Norway had not been able to attend the Meeting.

2. ORGANIZATION OF THE MEETING

2.1 Election of the chairman

Everybody agreed with the proposal of Mr K. Wierenga to elect Mr K. Strübing as chairman of the Meeting.

2.2 Adoption of the Agenda

The agenda was adopted and is given in Annex 2.

2.3 Working arrangements

Mr Wierenga, the local organizer of the Meeting, provides technical information for the participants of the Meeting. The chairman welcomed the participants and asked them to introduce themselves and the institute they work for.

3. SEA ICE OBSERVATION TECHNIQUES AND EXCHANGE PROCEDURES (UP-DATED INFORMATION)

3.1 Baltic Sea countries

The participants informed the Meeting about the different methods of obtaining, processing, transmitting and exchanging ice information in the Baltic countries. It was noticed that there are quite some differences. Finland, Germany and Sweden are working with new techniques like ICEMAP which enables services to digitise ice maps, while Denmark makes maps by hand which consumes much time. Mr K. Wierenga states that it must be possible to share information on computer software. Finland and Sweden use RADARSAT which gives very detailed charts.

Quite new is the use of Internet and e-mail. The customer needs to use a code in order to obtain the information. A problem is that the used computer systems have to be compatible.

Russia uses the international ice symbols from the winter 1996/1997 and has begun to exchange ice charts with the ice services of Estonia and Finland by fax.

Most countries transmit the coded ice observations and plain language reports via GTS, Denmark however did not transmit last winter because the weather was very mild.

Mr Lundqvist is of the opinion that Denmark should always send available information to the other countries in order to get information on the development of the ice condition. Mr Moller answers that he is working on that point and that next winter this will be better. Denmark will transmit via GTS next winter.

The costs for producing ice charts has risen due to new techniques. Some countries have received less governmental (money) funds for ice information and ice products.

The meeting stressed that vessels at need should have the ice information, ice charts free of charge. Agencies and commercial users have to pay dome fee.

Mr Lundqvist notices that most developments are related to costs and new techniques. In Sweden there are less shore observers and therefore it is even more important to exchange information between the countries.

There are differences in countries concerning whether the users should pay for the information. On one hand they seem to think that the information should be free of charge and on the other hand governments give less money and since obtaining information and breaking ice cost money it increases the budgets.

Last Meeting it was agreed that every country surrounding the Baltic Sea should send their updated information to the WMO-secretary in order to up-date the publication nr. 574 "Sea Ice Information Services in the World". Mr M. Krasnoperov, the delegate of the WMO, states that various countries have failed to do so and urges these countries to update their available data and to send them directly to the WMO.

3.2 Other countries

Mr Hansen of DMI reported on the Greenland Ice Service. He pointed out that it is very important to have information on the ice conditions in the Arctic area because many ships pass there. Especially satellite data have to be used for this region. The observation centre in Southern Greenland, Ice Patrol Narsarsuaq, uses an helicopter and aircraft fir ice reconnaissance. Every second day new ice maps are made. There are also satellite traced icebergs that show the way the icebergs drift. The positions however, are of limited accuracy. The charts are still a bit old-fashioned but they are working on a new system with RADARSAT-data.
In the northern areas of Greenland ice charts are produced once a week, but more often when there is a navigational need for charts.

It is mentioned that the Canadian reports in clear language have been reduced considerably. But if necessary more details are mentioned in the warning reports.
Some of the activities are overlapping especially with the International Ice Patrol, that is mainly working in the Grand Banks area. Information however is not going further than stating in which area icebergs are to be found, so ships know that they have to be careful.

3.3 Exchange procedures

It is concluded that telefax still is the most effective way to exchange data that are not digitized or data of limited quality. And even e-mail is sometimes delayed. The problem with Internet is that a customer can get the data and send these to other users of Internet, so they get the data free of charge. This problem can not be solved by working with passwords, because one does not know what the user will do with the data afterwards. Therefore most institutes transmit only raw data on Internet. But even then one can ask himself, if the costs matter so much, because the service costs only a small amount of money compared to the whole budget of the institutes. There should be a discussion on European level about costs and charges with respect to future common media as Internet.

Russia regrets to state that the transfer of ice charts via telefax requires certain financial resources. Since there is no possibility to transfer the charts to recipients other than the ice services in Estonia and Finland an offer is made to start the exchange by e-mail. Otherwise Finland offers further distribution via telefax.

It is agreed that telephone numbers, telefax numbers, e-mail addresses from the various institutes and ice services will be listed and added to the list of participants. (Annex 1)

3.4 Harmonization: Requirements and possibilities

The fact whether ships should have detailed ice charts or not was discussed with regard to various aspects. Some participants are of the opinion that captains should have a detailed chart, so they know what to expect. Especially ferries do not need icebreaker assistance if the conditions are not too hard, but then they need a very detailed chart. Mr Stenberg claims the captains should follow the given information and obey the icebreakers. If the captains get a detailed chart, there is a possibility they sail on their own. The position of ships destined for Finnish and Swedish harbours are transferred into the IRIS-system, then they get information and can be tracked. This does not apply to ships with a destination in Russia and Estonia. Furthermore there is a problem with captains that do not have any experience with ice.

4. BALTIC SEA ICE CODE

4.1 Experiences

The present Baltic Sea Ice Code is in use since 1981. The question was whether improvements or alterations are necessary.
The Swedish service uses the code, but not as often as it used to be, because many observation stations have been automated. Besides the codes are difficult to remember and navigators are not familiar with them. Even the experts forget them during the summertime. So most information is given in clear language. However the code is fairly useful and there is no need for changing the figures. It is an agreed instrument that still can be used and the data are essential for studies on ice climatology and statistics for which long time series are necessary.

The WMO Baltic Multilingual List of Sea Ice Terms, based on International Sea Ice Terminology of WMO needs to be updated because of the new Baltic countries. There is no schedule for the publication. This will be done after the WMO has received all the necessary information, preferably by e-mail. The Latvian delegate presented the requested list in the Latvian language. The Estonian version is still in the process of lingual review.

4.2 Need for further development

There is no need for further development.

5. REVIEW OF THE WMO/CMM SEA ICE ACTIVITIES

Mr Krasnoperov informs the Meeting that progress in the implementation of tasks given by the eleventh CMM session to the Sub-group on Sea Ice was carefully reviewed by the twelfth session in Havana in March 1997 and by the informal session of the CMM Sub-group on Sea Ice in Copenhagen, September 1997. Progress has been made to the following subjects:

1. Global Digital Sea Ice Data Bank (GDSIDB)

2. Guidance material for mariners on marine meteorological services in sea ice areas.

3. Internet World Wide Web.

4. Baltic Sea Ice Meeting (BSIM).

5. CMM Sub-group on Sea Ice.

6. CMM Work program in the field of sea ice activities for the next period (1997-2001).

The complete text is given in Annex 3.

The Russian participant Vasily Smolyanitsky provided additional information on the WMO Sub-group on Sea Ice activities. He described the current workplan of the Sub-group for 1997-1998 and in particular the items dealing with Sea ice data exchange schedule for the Arctic, Antarctic and Baltic regions and items related to development of sea ice data processing and dissemination techniques for climatological purposes. Also he presented an outlook of the two future publications of the Sub-group, "Handbook on sea ice data processing and forecast" and "Illustrated glossary of sea ice terms". These publications will be valuable supplements to existing WMO publications in parts of physical and chemical properties of sea ice, sea ice modelling including its interaction with atmosphere-ocean, sea ice distribution peculiarities and they will give the latest views on the nomenclature from Russian and USA experts. These publications are already published in Russian and the English version is planned for 1998-1999.

Vasily Smolyanitski provided information on the WMO/CMM-project "Global Digital Sea Ice Data Bank"(GDSIDB). The main contributors to this bank are AARI and the USA National Snow and Ice Data Centre, that is responsible for the dissemination of USA National Ice Centre (NIC) material. The bank contains strictly information in WMO adopted (standardized) international format for sea data exchange SIGRID for the Arctic (1953-1994) and for the Antarctic (1873-1994) regions. Both AARI and NSIDC parts of GDSIDB elaborated similar techniques to browse sea ice data in a form of map in order to estimate the quality and to make different climatic statistics. By using the developed technique in order to facilitate the access of common users to GDSIDB information a special technique, based on the Internet principle including intensive use of Java, has been developed. (See figures in Annex 4a).

Mr Krasnoperov stressed that the SMM Sub-group on Sea Ice is now open for all participants nominated via the national CMM representatives. The members of the Meeting were encouraged in appropriate action.

6. DIGITIZING OF SEA ICE CHARTS FOR THE PERIOD FROM 1960/1961

6.1 Status

For the Baltic region Finland and Sweden have an Ice Data Bank for the period 1961-1979 in BASIS-format (Baltic Sea Ice System). The data are available for all Baltic countries.

6.2 Future activities

At present WMO GDSIDB already contains information for the Baltic region prepared at NIC, but it is less accurate material than stored in BASIS. The Bank needs data from the Baltic area. Finland and Sweden used the BASIS code for their ice data bank but there is a need to develop a code based on WMO SIGRID. At the moment there is no agreement on how to proceed.

Russia points out that in order to convert data on a global scale, there has to be decided on the best format. SIGRID can describe very much, while SIGRID-2 is more compact, but it lacks codes.

Sweden and Russia have started negotiations in November 1997 on the topic of transfer of data from the old to the new data bank. (Report in Annex 4b)

It is pointed out that this work is in European interest and therefore that should be tried to get funds from EU.

7. INTERNATIONAL SYSTEM FOR SEA ICE SYMBOLS

7.1 EXPERIENCES

In the Baltic countries the egg-symbol is hardly used. Opposite to Canada and the USA where the egg is used very often, the hatched code is preferred in the Baltic region. The egg symbol can be used for scientific work and for some customers.

It is discussed whether the term "crack"should be used on ice charts, since openings of less than one meter do not have to be mapped. It is agreed that the term "crack" will be replaced by the term "crack or fracture", because this covers more the relevant openings wider than one meter.

7.2 WMO Sea Ice nomenclature, Symbols and Codes

It is stated, that there is no special need for any changes.

8. ICE CHARTS

8.1 New satellite related ice charts

Germany can overcome the problem having a locally splitted ice service at the two sites Hamburg and in Rostock by using the ICEMAP-tool to process the ice charts in Rostock and to print them in Hamburg. The basic information comes from the NOAA-satellite. As a standard, quick look NOAA - images are produced automatically as hard copies. They are used to decide the image will be transmitted as digital data set. The standard product is an ice chart for the northern area; in stronger winters as 1996 also charts for the southern region are produced. On special request it is possible to make a detailed, regional chart.

It is discussed whether the data sources should be mentioned at the charts, so the quality of the charts can be judged. The problem is that the satellites are not the only source of information as information is also given by helicopters, icebreakers and ferries. So the list with sources can be very extended. However, this can be harmonized in the way that coastal and icebreaker information is given as a standard and that the type of satellite is added. It is pointed out that in the 1970's Sweden mentioned the fact that there was satellite-information. In later years this became so normal that it was not mentioned anymore. Maybe this can be an option for the official charts but not for the ice charts for icebreakers and the exchange between Finland, Germany and Sweden.

8.2 New production techniques and products

Germany proposes to transmit charts by e-mail on request and to co-operate with respect to regular ice charts for the Baltic Sea with the use of new technical facilities. The charts can be sent by e-mail and then each service can put on his own national information on the chart. It is also possible to transfer the data set by FTP. The problem however is that the computer systems have to be compatible. But this will be no problem between Finland, Germany and Sweden since they use the same systems. Estonia uses another system to produce ice charts, but that is a regional chart that can be useful for special purposes. Sweden considers to make regional ice charts in some years. They are already in the ICEMAP-section.

Estonia points out that it does not make an ice chart for the whole Baltic Sea since other countries make them already. The service takes the charts from other services and distributes them to the icebreakers.

Mr Grönvall, Finland, mentions that there are 9 national ice services in the Baltic Sea region that all make their own ice charts. It would be better to found one centralized ice service for the whole Baltic Sea: Baltic Sea Ice Information Centre. So a wider range of EO-data can be used in a more effective way, more accurate ice products can be made and the distribution to the users can be more effective.

This development should be started actively in due time. The services should find their own solution. Perhaps it is possible to set up a working group trying to find a step-by-step solution in this direction. (see Annex 4). The main task of co-ordination should be at the field of very expensive tools. One gets a better product in case of concentration. But close contact between the national resources stays important.

In Sweden since one year there exists already one meteorological co-ordination and information centre that broadcasts on Navtex. This centre gives also ice reports but needs information from the regional centres. So in whole Scandinavia the same weather models are used. Perhaps it is possible to agree that every service is responsible for an other subject.

This has also advantages to the customer, since he can get all the information needed at one place.

There has to be found out how to get consensus about the cost-aspect. Perhaps this can be arranged via EU.

Poland has a problem with such a centre. The representative points out that she makes regional charts for small boats. She is responsible for the forecast in her region and that forecast is quite different from the forecast in the Baltic area. Besides the matter of costs is different in Poland than in the EC-countries.

Russia agrees with the founding of such a centre at this moment and is ready to consider the possibility to establish such a co-ordination centre in Russia, St. Petersburg.

It is agreed that each representative makes a list with the technical devices, including hard- and software, they use and that may be relevant. Then the present status is known and suggestions for the future can be made. Also it can help in finding a budget for a new system if there is a recommendation from BSIM. Additional information can afterwards be sent.

Finland, Germany and Sweden agree to participate in such a working group.
Mr S. Anderson, SMHI, suggested to ask Michal Ziemianski from Poland to be chairman of this group, which shall evaluate a proposal to harmonize and integrate the various identical or overlapping activities and products. As a first step the co-operation on a regional basis will be further improved. The suggestion was accepted by the Meeting.

9. REMOTE SENSING

9.1 ERS Data politics

During the last Meeting a resolution was accepted that is given in Annex 5. This resolution was presented to ESA, but so far no official response was received. The new data policy of ESA is given in Annex 6.

In Germany it is possible to send a request to use ERS-data for the following month, but this is no solution on an international basis.

ENVISAT, the new ESA earth observation satellite, will be launched in the year 2000. It is possible to request for some data free of charge, but there must be a scientific approach and this request must be made before the end of this month. It is also necessary to ask for data free of charge since the ice services are operational, governmental services. Finland, Germany and Sweden have made a joint proposal for data from RadarSat which is accepted and they get fifteen scenes free of charge, which however is not enough for operational use.

9.2 RadarSat data utilization

At the moment there are four kinds of satellites that can provide data used in ice monitoring.

1. NOAA/TIROS: approved system with reasonable resolution, but cloud dependent
2. ERS: images are too small but good.
3. RadarSat: high resolution and reasonable swath width.
4. DMSP: poor resolution, not for essential use in the Baltic Sea region.

The NOAA-images are good for giving the overall ice situation, but not for use by icebreakers. The ERS-images are of very good quality, too small for operational use. The RadarSat-images cover much larger areas. They are selected, processed, screened and delivered by Tromsö Satellite Station. The problem is that the time between reception and sending to the icebreakers is still too long, five to six hours, (but perhaps this depends on the work stations).
The procedure for receiving the data from RadarSat up to the sending to the icebreaker is described in Annex 7.

There are some difficulties with the automatic interpretation of the radar images, which needs further evaluation. An essential problem with the RadarSat data is that they are very expensive. It may even be cheaper to rent an aeroplane with a SAR-radar to take the images.

As additional option is mentioned the use of an Indian satellite. The data from this satellite are distributed on line in Europe via Euromap as e-mail files. The costs are very low and the processing from data file to the screen takes only one minute. However, the images are taken in the visual bands and the use is therefore dependent on the cloud cover.

With respect to the forthcoming ESA satellite ENVISAT it is decided to have

1. A reasonable price for access to the data and

2. On line access to the data.

Mr Strübing will prepare a relevant resolution and will send this to all the services who are in the ESA-area and to the WMO. Next it will be send to the national delegates in ESA. It is stated that Denmark, Finland, Germany, the Netherlands, Norway and Sweden are already paying for the ESA-ENVISAT-program. (see also Annex 5).

10. REPORTS OF THE ICEBREAKING SERVICES (CO-OPERATION WITH ICE SERVICES, REQUIREMENTS

Since icebreakers are the main customers for the ice services short statements on the work of the services are given.

The relationship between the SMA and the SMHI is very good. The SMA has been involved in the development of the ice service and this service fulfils the requirements of the SMA. This is the same in Finland.

There exists a Finnish-Swedish Ice Navigation Board that is funding research on ice problems.

Sweden has 7 icebreakers of which one has been especially designed for the Vänern Lake. Four icebreakers are modern and large and made for the northern coast. There is a close co-operation with the Finnish fleet and daily they confer about the movements of the icebreakers and decide together.
The Finnish icebreakers receive the same information as the Swedish ones and as the services.

At the moment three new icebreakers are built for the southern part of the Baltic Sea, below the line Stockholm-Helsinki. However, Sweden is not building these ships for the transit of ships from the Danish waters to the Baltic countries, Poland and Russia. All the Baltic states must take their responsibility for their own transit traffic through Kattegat, the Danish waters and in the fairways from Kiel to the Baltic. The Danish, Finnish, German and Swedish icebreakers in these waters are of course available for rescue operations, but they have no obligation for serving the transit traffic to the other Baltic states. There was a formal agreement between the maritime administrations in Denmark, Finland, Sweden and the USSR concerning this problem as long as the USSR existed. Today however there is no such agreement any longer where Estonia, Latvia, Lithuania, Poland and Russia are involved. This problem has to be solved in some way. Otherwise there will be severe delays in the transit traffic when the next severe winter comes.

The Finnish Icebreaking Service belongs to the Traffic department of FMA. During the wintertime 23 ports are kept open and therefore 9 icebreakers can be used. This is difficult in normal and hard winters. Also it costs a large amount of money, US$ 54 million a year, but since the waterways are a part of the infrastructure there is no other choice.

The FMA's mission is to improve and safeguard Finland's maritime infrastructure and conditions favourably for it's shipping, based on the needs of the nation's economic and business interests. To implement this the FMA:

Develops and maintains conditions favourable for safe and efficient navigation on both coastal and inland waters;

Develops and supervises ship's safety;

Improves and ensures conditions for the favourable operation of the nation's merchant shipping;

Develops and supervises safety-related tasks concerning environmental protection;

Develops and ensures transport connections in the Archipelago.

Key action area's of the FMA are:

1. Safeguard and improve maritime resources
   Promote the interests of merchant shipping
   Maintain and improve shipping channels
   Pilotage
   Hydrographic services and charts
   Winter navigation

2. Improve maritime safety:
   Safety of ships
   Protection of the marine environment

3. Management of state-owned shipping

4. Public transport in the Archipelago

5. Improve boating and yachting.

The seaborn transport between Finland and other countries amounts to 75 million tons a year. So it is a problem that there are only 9 icebreakers, but fortunately a part of the ships is very powerful. Old icebreakers ships are sold, for example to Estonia. Now a new icebreaker is built. However this is not powerful enough for the northern part of the Baltic Sea.

It is important for the work that the service receives good RadarSat images with a high resolution. These images cover a large area, so they are easier to work with. The service is interested in receiving them every day and then less helicopter flights have to be made. Also the captains on board of the icebreakers are very satisfied with the images and they will get additional schooling in interpreting these images.

Mr Möller of ADF informs that each year 100.000 ships sail through the Danish waters of which most can not sail through ice. The Danish waters are a bottleneck to and from the Baltic Sea. Denmark has only three operational icebreakers and in the western Limfjord and other inner fairways the icebreaking is done by tugboats. So every winter there is an agreement with ten to fifteen tugboat companies for assistance.
It would be better if there was mutual co-operation and co-ordination between the countries, especially in severe winters.

The Danish service has a budget of DK 20 million a year of which 50% is paid by the harbours and the other 50% by ships that are arriving in Danish harbours. So ships on transit do not pay.

The priorities of the service are:
- ships in distress or danger
- ships with passengers
- ships with livestock
- internal sealines of communication (ferries)
- vital supplies.

It is difficult to make these priorities if many ships are stuck in the ice, only there is such a small capacity.

In Germany the coastline has become much longer since the unification and there are more harbours but less icebreakers.

Germany has three centres for the icebreaking service of which Kiel is the supervising centre. The coast guard has two multipurpose ships that are working in the German Bight and which can be used as icebreakers. The Service has only two old icebreakers along with the use of the multipurpose ships. So sometimes the service has to be reduced or icebreaking ships - if available - have to be chartered in.

The co-operation between the icebreaking services and the BSH is very good.
It is very difficult to make restriction for ships in the western Baltic during wintertime. If ships want to enter a harbour, one can not forbid this. The only alternative is to keep them in the harbour.

What is the use of nine icebreakers in Finland, when ships have to stay in the harbour or get stuck in the ice in the Western Baltic because Denmark and Germany do not have enough icebreakers? For the German Ice Service too it is very important to have actual ice charts every day. As the observation flights by the German Navy have ended last year, there has to be a substitute as reconnaissance. At the moment a RadarSat picture is available only every fifth day and that is not satisfying. So the Service still has to find out what kind of observation has to be used in the future.

The WMO-representative states that this item is very useful, since the co-operation between sea ice information services and icebreaker services is very important. He proposes to invite representatives from icebreaking services from all Baltic Sea ice countries for the next Meeting. Perhaps these countries can provide addresses of these services so they can be invited.

According to Mr Stenberg every year their is a meeting of representatives of the Baltic icebreaking Service. He agrees it is a good idea to invite them and he can provide a list with the addresses which will be included in the mailing list.

It is stated that it would be worthwhile to have the same communication links and technical environment in the southern and northern area. A relevant statement regarding this subject might help to raise a budget for this. It is also important to send headlines from the draft report to the various departments, so the decision makers and politicians will be informed.

11. BALTIC SEA ICE CLIMATE

Annex 8, An overview of the ice investigations in the gulf of Riga, forms a part of this chapter.

The winter of 1996/97 might have been cold in the southern area of the Baltic Sea, it was normal in the northern area and it went the other way around for the last winter. This shows that there is a difference between the northern and the southern part.

Dr Natalia Schmelzer from Germany and Dr Marzena Sztobryn from Poland prepared the description of sea ice conditions on Zalew Szczecinski during 1960-1990. They found only two mild winters, which were classified as mild winter under every classification. This shows also the differences between the various places.

In Poland they tried to make a seasonal forecast by ARIMA model and it appeared that a forecast for two years ahead is better than a forecast for one year ahead. They also found a trend for ice conditions, but the interpretations of the trend is not very useful for the ice services, because the conditions of the ice conditions are very different in the twentieth century.

Different institutes give seasonal forecasts, but they are not very reliable even with respect to the ice extend. And also the conditions can be worse in a mild winter than in a severe winter, so this is no help to the planning of icebreakers.

During the last Meeting the participants discussed about terming the winters, but a decision was not made, although there are seven levels of discrimination.

Sweden states that new ice changes very rapidly if the wind changes. There is no need for classification but there are of ten elements that have to be taken care of like the wind and the period in the winter.

In Estonia new ice is mentioned at the charts as it is in Finland, Germany and Sweden. This is important to indicate that the conditions may become worse.
Anders Omstedt (SMHI) did much research on the ice climate and tried to make a model of the winters from 1981 to 1993. During the following period he has continued and tested the model. He compared this model with the ice extend in the Baltic Sea to understand when the ice will in- or decrease in the coming hundred years. He stated that a temperature raise with one degree during the next twenty years will reduce the ice extend in a normal winter, but also that the ice extend may increase if the climate becomes colder and that one has to rely on the winter from year to year.

The Boba-model shows that the length of the ice period each winter shortened. It is important to know the thickness of the ice along the shore also in connection with the extended traffic.

12 International activities (data banks, workshops, projects, co-operation)

In Annex 9 details about a workshop on sea ice charts of the Arctic are given which will be attended by someone from the institute of Keld Q. Hansen, Vasily Smolyanitsky and Jan-Eric Lundqvist.

The Polish participant invites all other participants to attend a workshop on the Baltic Sea ice climate. It is a good platform to exchange information between research and operational services. She asks for suggestions about a topic and states that there is enough time to give proposals to other researchers. Now it is possible to recommend two topics, classification of severity of winters and seasonal forecast of sea ice conditions. There is asked for the exact date and place.

Mr Krasnoperov informs the Meeting about the following international sea-ice meetings that will take place in 1998:

1. Conference on the Arctic Buoy Programme, 3-4 August, Seattle USA,
2. Workshop on Sea Ice Charts of the Arctic, 5-7 August, Seattle USA,
3. Seventh session of the Steering Group on Sea-Ice, 10-12 August, Boulder USA.

Finland tells about the research and training, which are going on and will be going on. This is mentioned in Annex 10. Most of the research is related to remote sensing. The CEO-training on use of satellite data for sea ice monitoring will only take two or three days.

Finland shows a request for satellite data providers what is in Annex 11.

Annex 12 shows the OSIMS' recommendations for operational ice monitoring and in Annex 13 an example of potential sea ice information presentation on ship's computer is shown, while Annex 14 gives the overall future European ice monitoring system with external information for navigation decision making. Finland and Sweden are developing a new communication and information system (IB-net) which will replace the IRIS-system and will be in use next winter (1998/99).

The Baltic Ferry Guidance System to improve safety of ferry traffic in the Baltic is mentioned. For the ferry between Trelleborg and Warnemünde has been made a voyage forecast that the ferries receive. The ferries have a responder so that always is known where they are (see Annex 15). This voyage forecast is sent by telefax and can include ice information if wanted. This will be extended to other ferry-lines.

A working group from Canada, Finland, Germany, Norway, Russia, Sweden and the USA have been working on a harmonized Polar Code, a classification for polar-classed ships. The report is sent to the IMO to be proved.

13. OTHER QUESTIONS

There are no other questions.

14. ADOPTION OF THE DRAFT REPORT

After some changes the draft report was adopted.

15. DATE AND PLACE OF THE NEXT MEETING

The date of the next Meeting is determined at the last week of September 2000. It will be held in Riga, Latvia.

16. CLOSING OF THE MEETING

Mr Strübing thanked the co-operators and gives them flowers.

He thanked Mr Stenberg who has been a participator of the Baltic Sea Ice Meetings since 1985 and who will retire before the next meeting.

He also thanked Mr Wierenga who has been chairman of the organizing committee.

Mr Wierenga expressed his thanks to Mr Strübing who has been chairman of this Meeting and closed the Meeting at 12.30 hours on 29 May 1998.

ANNEX 16: Report on the negotiations of Finland, Russia and Sweden about the transfer of ice data to SIGRID format.

Ice data have to be delivered to the Global Ice Data Bank. In this bank there is an ice atlas. This work has to be continued but is in basic code. In 1981 the symbols were changed to international symbols and this causes a lost of some details. That is why it has to be decided how detailed the information must be: in basic form or in another form, SIGRID 1 or 2.

If a digital ice chart is used Russia advised to use the basic form up to 1999 and to change it then to SIGRID 2. If more details are needed it is best to use the old basic form. This will further be discussed between Finland and Sweden in order to co-operate.

They can give no advise on how to proceed. However, the most important thing is to know the ice concentration and the ice thickness. As it concerns just small areas in the Danish waters, SIGRID is too large for that area.

Participants 19th Baltic Sea Ice Meeting

25- 29 May 1998

Lelystad, the Netherlands

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Annex 2

19th Baltic Sea Ice Meeting

AGENDA

Monday, 25 May

13.00 Lunch at Hotel Mercure Lelystad

14.00-18.00

1. Opening of the Meeting by Mr W. Cofino, head of the information and Measurementtechnology division RIZA
2. Organization of the Meeting
   - 2.1 Election of the chairman
   - 2.2 Adoption of the agenda
   - 2.3 Working arrangements
3. Sea Ice observation techniques and exchange procedures (up-dated information)
   - 3.1 Baltic Sea countries

Tuesday, 26 May

09.00-13.00

- 3.2 Other countries/areas
- 3.3 Exchange procedures
- 3.4 Harmonization: Requirements and possibilities

4. Baltic Sea Ice Code
   - 4.1 Experiences
   - 4.2 Need for further development

14.00-17.30

5. Review of the WMO/CMM sea ice activities
6. Digitizing of sea ice charts for the period from 1960/61
   - 6.1 Status
   - 6.2 Future activities
7. International System for Sea Ice Symbols
   - 7.1 Experiences
   - 7.2 WMO Sea Ice Nomenclature, Symbols and Codes

Presentation Coast Guard, Mr P. Verburg

19.00 Official dinner offered by Mr A. van Bennekom, Director RIZA at the Flevo Marina Harbour.

Wednesday, 27 May

09.00-13.00	8. Ice charts 8.1 New satellite related ice charts 8.2 New production techniques and products 8.3 Transmission techniques 8.4 Joint production 9. Remote Sensing 9.1 ERS data politics 9.2 RadarSat data utilization
14.00-17.00	Visit to the Inland Water and Information Centre and the Ecotoxicological Laboratories of the RIZA Presentation by Mr A. Dijkstra on Project BC 2000

Thursday, 28 May

09.00-13.00	10. Reports of the Icebreaking Services (co-operation with Ice Services, requirements) 11. Baltic Sea ice climate 11.1 Classification of ice seasons 11.2 International activities (data banks, workshops, projects, cooperation
14.00-17.00	Visit to Houtrib Locks and to the Batavia Shipyard in Lelystad

Friday, 29 May

09.00-12.30	12. Other questions 13. Adaption of the draft report 14. Date and place of the next Meeting 15. Closing of the Meeting
13.00	Lunch at Hotel Mercure
14.00	Departure from Lelystad

Annex 3

REVIEW OF THE WMO/CMM SEA-ICE ACTIVITIES

Navigation in ice-frequented waters for the purposes of trade and commerce, fishing, exploration or research has always been a rather hazardous operation. For this reason, national sea-ice information services have been established in many countries to provide support for such operations through the provision of both climatological and real-time ice analyses and forecasts. Clearly such support, if it is to be most effective for mariners from all nations of the world and in all regional groups such as Baltic countries, should be based on the widest possible availability of information on sea-ice conditions using well-known and standardized nomenclature and symbology. International coordination and cooperation in this activity is essential and WMO assisted in effecting this coordination, principally through the Sub-group on Sea Ice (SGSI) of the WMO Commission for Marine Meteorology (CMM).

Progress in the implementation of tasks given by the eleventh CMM session (Lisbon, 1995) to the Sub-group on Sea Ice was carefully reviewed by the twelfth session which was held in Havana , September 1997, and the informal session of the SGSI (Copenhagen, September 1997).

Progress has been made towards the following subjects:

1.Global Digital Sea Ice Data Bank (GDSIDB)

The GDSIDB is now operational in the National Snow and Ice Data Center (NSIDC), Boulder, USA and the Arctic and Antarctic Institute (AARI), St. Petersburg, Russia. And now this bank contains sets of contributed sea-ice data from Japan, Russia and USA in SIGRID format for:

(i) Arctic (from the AARI for 1953 - 1990);
(ii) Arctic Ocean (from the USA National Ice Centre (NIC) for 1972 - 1994);
(iii) Antarctic (from the NIC for 1973 - 1994);
(iv) Sea of Okhotsk (from the Japan Meteorological Agency (JMA) for 1971-1995)

The last CMM - XII session recognized the direct value of the GDSIDB to the World Climate Programme (WCP) and the World Climate Research Programme (WCRP), as well as to services and other sea-ice activities of Members concerned. The Commission therefore strongly encouraged all Members having historical and /or current sea-ice data in chart and other forms to arrange for them to be digitized in either the complete SGRID 1 or reduced SIGRID 2 format, and submitted to either GDSIDB data centre, in order that the data bank can become as complete as possible, containing data from both north and south polar regions. The Commission recommended that WMO should continue to support the valuable work of the Steering Group for the GDSIDB during the coming intersessional period and agreed the proposed project objectives for this period.

2. Guidance material for mariners on marine meteorological services in sea-ice areas

(i) Handbook on Sea Ice Navigation in the Southern Ocean

The abbreviated version of the Handbook on Sea Ice Navigation in the Southern Ocean had recently been published in the series Marine Meteorology and Related Oceanographic Activities. The CMM expressed its appreciation to the author, Prof A.Romanov (Russian Federation),as well as to all the experts involved in the review and editing process, for their substantial contributions to WMO. It considered that this publication was of considerable value to all countries, their agencies and services, concerned with marine operations in the Antarctic, and therefore recommended that as wide as possible a distribution should be undertaken, including to IMO and IHO.

(ii) Handbook on the Analysis and Forecasting of Sea Ice.

Progress has been made by the Russian Federation and USA experts in the preparation of the Handbook, which has been published in the Russian version and the English version will be soon completed and published by WMO in an appropriate series.

3. Internet World Wide Web

The work for the operational exchange of sea-ice data through the Internet World Wide Web, including the establishment of home pages by both the AARI and the NSIDC devoted to historical sea-ice data has been completed. The Commission strongly supported this work and urged that work continue on standardizing and generalizing procedures for such data exchange.

4. Baltic Sea Ice Meeting (BSIM)

The Commission recognized the importance of the work in the field of regional groups such as the Baltic Sea Ice Meeting. It therefore requested the chairman of the Sub-group, and the Secretariat, to explore ways in which more formal links might be established between these regional groups and Sub-group, and to report on this matter to the next session of the Advisory Working Group. During the last informal SGSI meeting in Copenhagen (September,1997) the member of this Sub-group Mr Lundqvist, as representative from BSIM, informed the meeting on the BSIM members activities and results of cooperation between the BSIM and SGSI

5. CMM Sub-group on Sea Ice

The Commission reiterated the continuing importance of its work on sea-ice, and

agreed to reestablished the Sub-group on Sea Ice. Experts from China, Denmark, France, Iceland, Japan, Poland, Russia, Sweden and USA are the members of the SGSI. The first informal session of this group was held in Copenhagen, 22-26 September 1997. The BSIM was presented by Mr Jan-Eric Lundqvist.

6. CMM Work Programme in the field of sea-ice activities for the next period (1997 - 2001)

The informal SGSI session reviewed and accepted the current and planned cooperation in the field of sea-ice activities. According to the decisions of CMM-XII, it is planned to direct the activity of the Sub-group to solving the following problems and responsible individuals:

(i) coordination of marine climatological requirements (including sea-ice data) with WCP and provision of technical advice on exchange and archival of such data – continuous, D.Bener (USA);

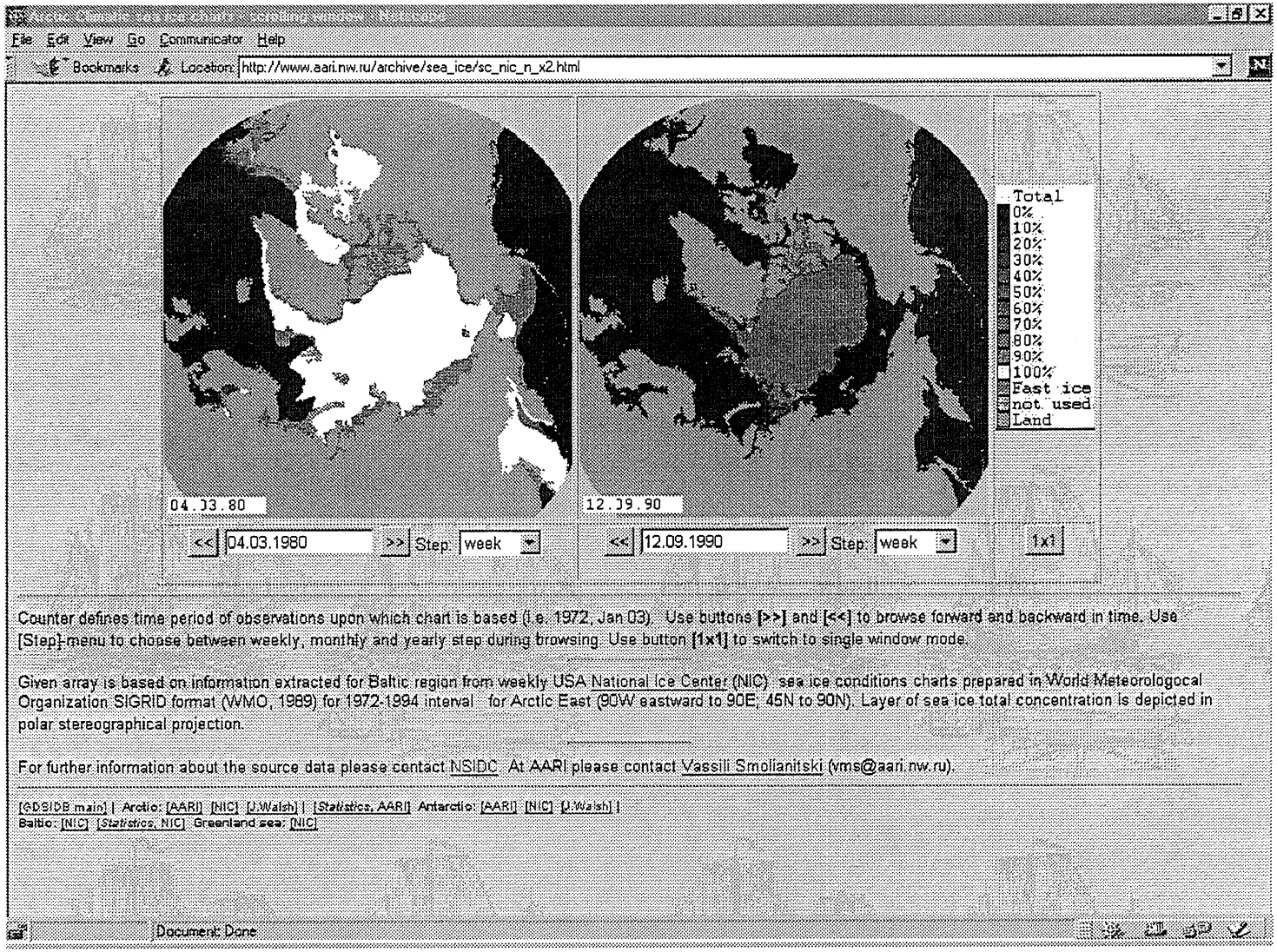
(ii) promote cooperation in improving the methodology for the acquisition exchange, processing, quality control, storage and dissemination of sea-ice data (including remotely-sensed data) – continuous, Y.Kano (Japan) and S.Lapczak (Canada);

(iii) review the formats, nomenclature and quality procedure fore digital sea-ice data – 2001, A.Bushuev (Russia) and H.Valeur (Denmark);

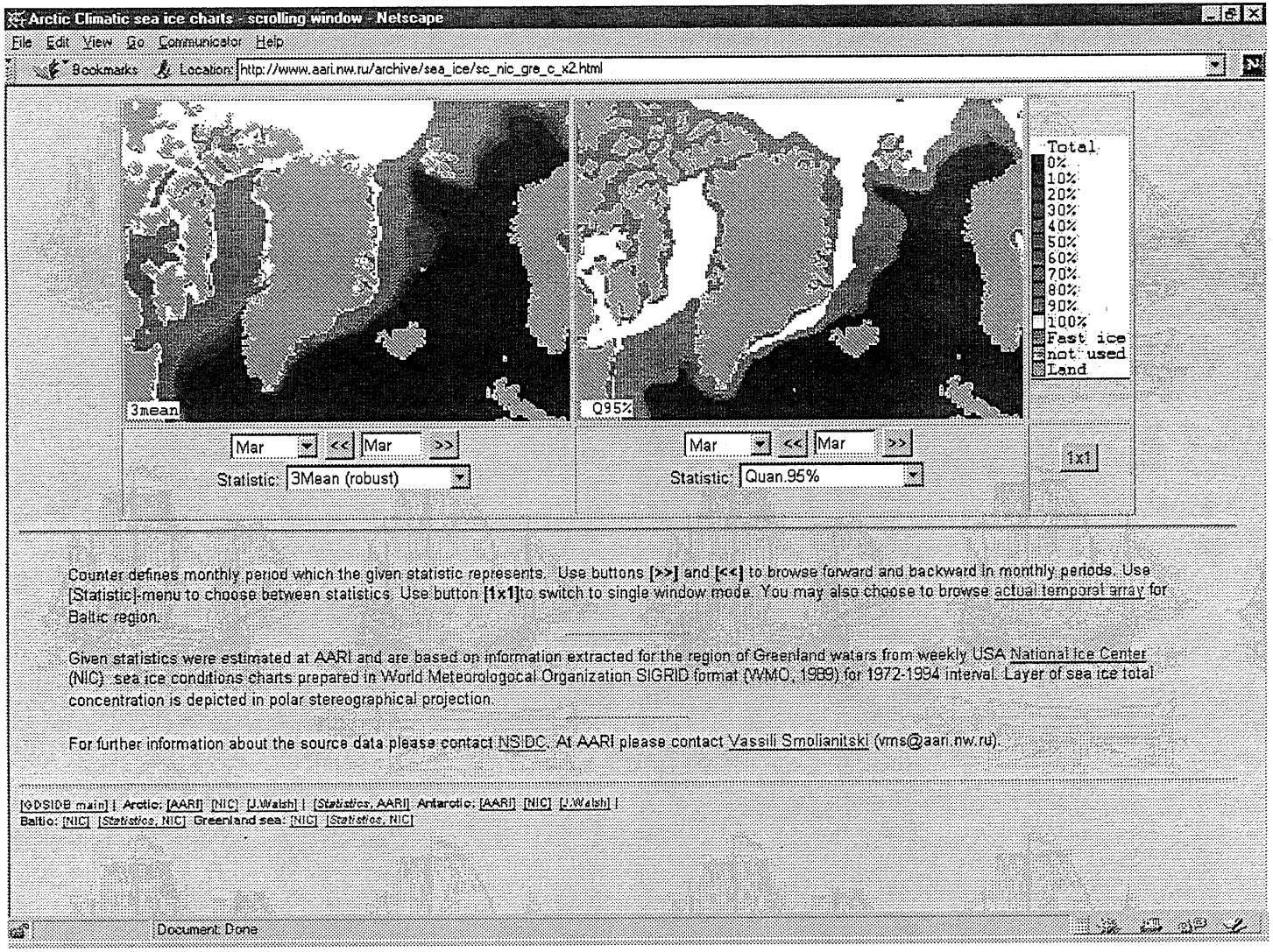
(iv) review and update sea-ice nomenclature and SIGRID data format – 1997, V.Smolianitski (Russia) and J.E. Lundqvist (Sweden/BSIM)

Annex 4

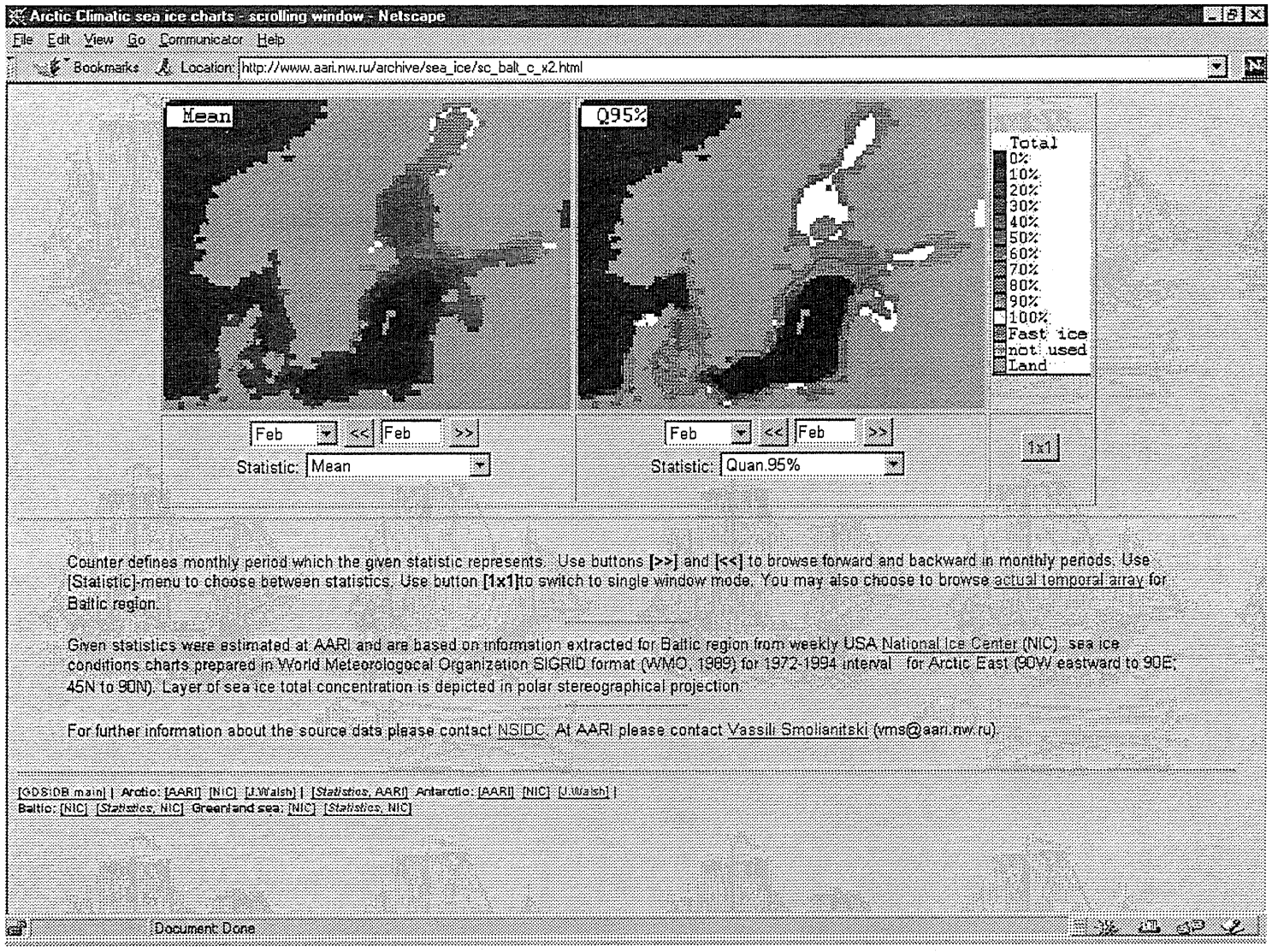
ANNEX 4a



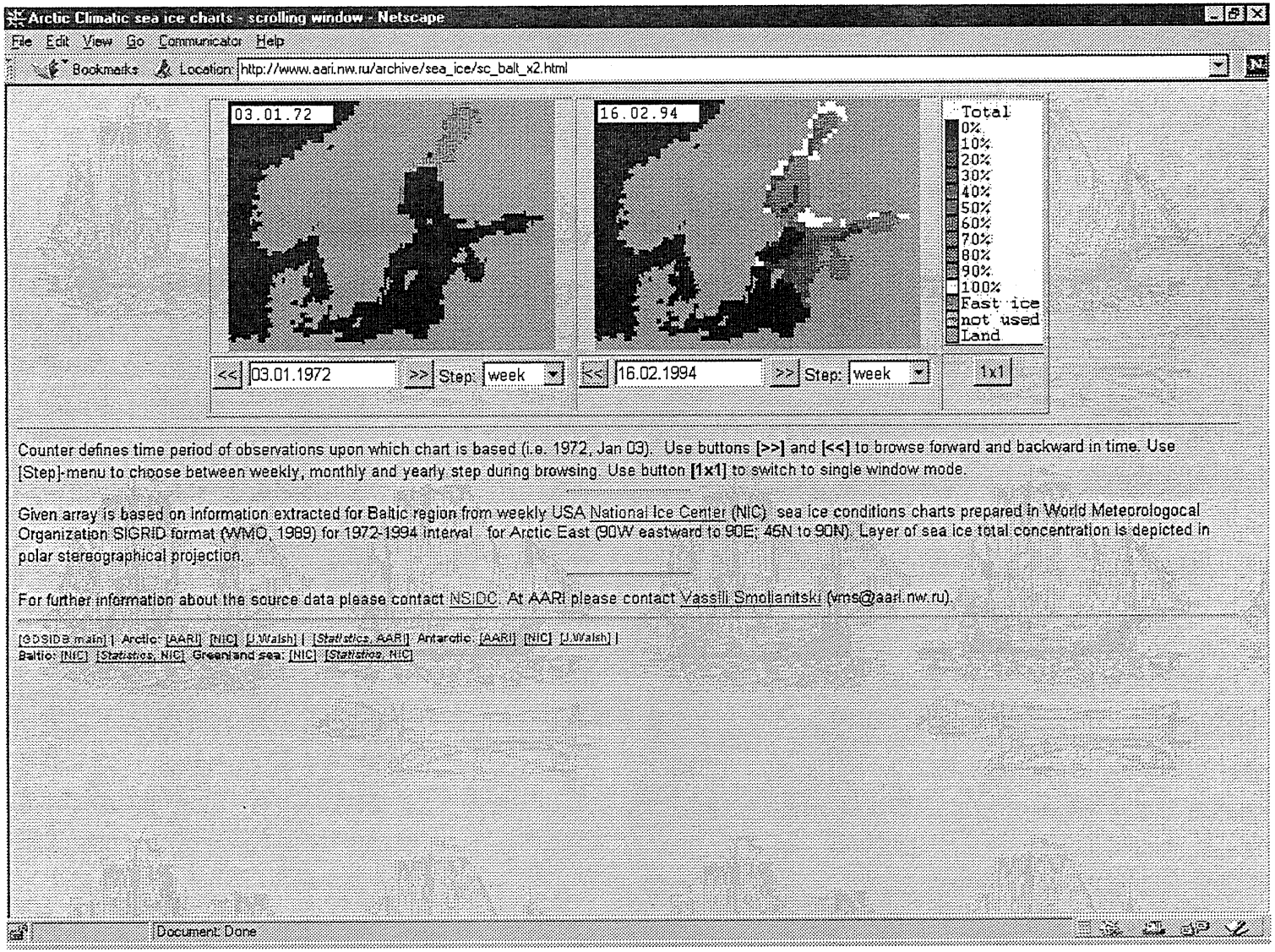
Dual-window WWW-page at AARI web-site for browsing actual sea ice data for Arctic (layer of total concentration). Processing made at AARI on the basis of USA National Ice Center weekly data in SIGRID format for 1972-1994.



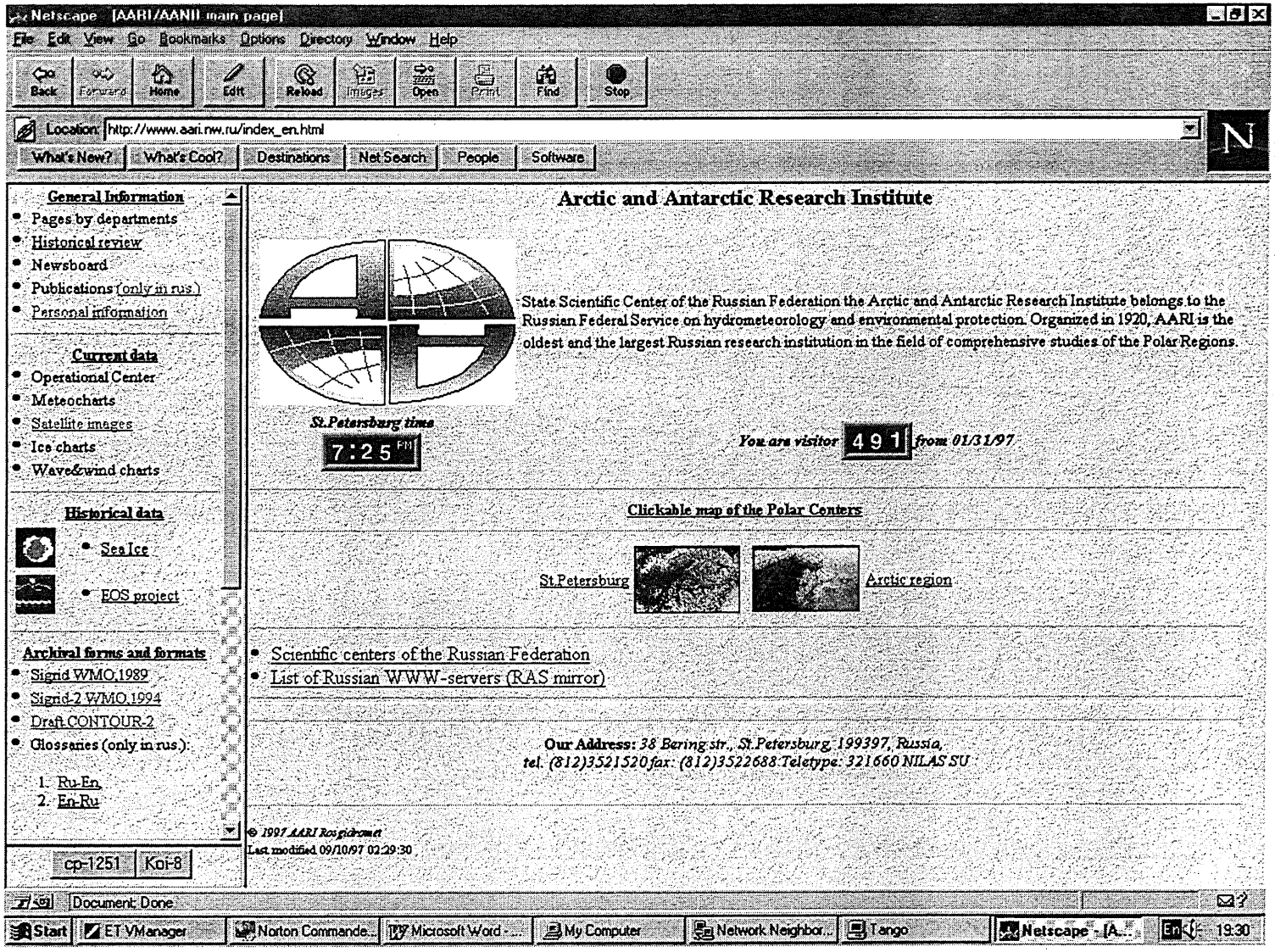
Dual-window WWW-page at AARI web-site for statistics for Greenland Sea (layer of total concentration). Processing made at AARI on the basis of USA National Ice Center weekly data in SIGRID format for 1972-1994.



Dual-window WWW-page at AARI web-site for browsing statistics for Baltic Sea (layer of total concentration). Processing made at AARI on the basis of USA National Ice Center weekly data in SIGRID format for 1972-1994.



Dual-window WWW-page at AARI web-site for browsing actual sea ice conditions for Baltic Sea (layer of total concentration). Processing made at AARI on the basis of USA National Ice Center weekly data in SIGRID format for 1972-1994.



Main page of the AARI web-site (english version)

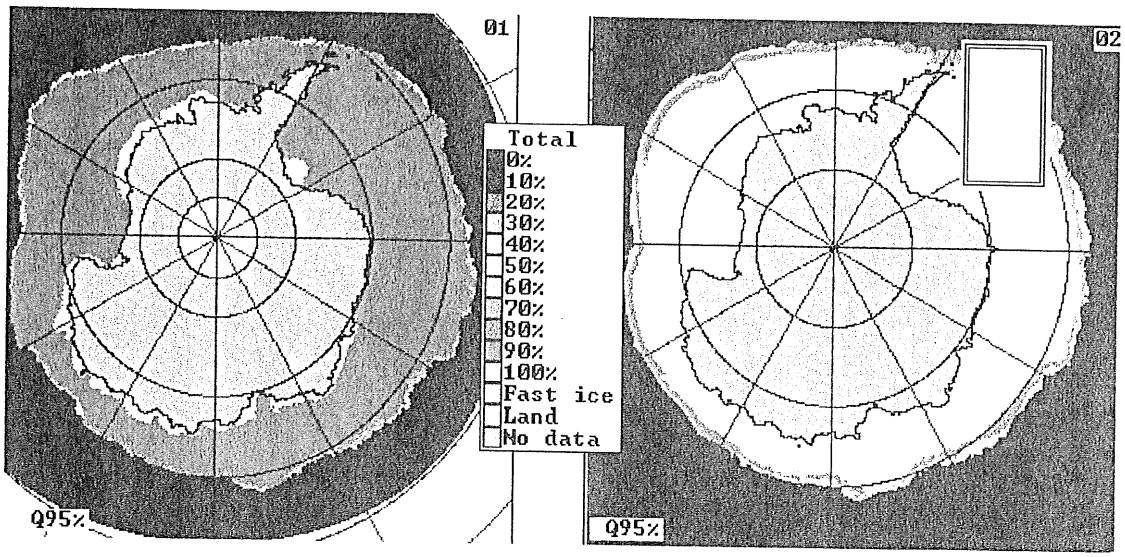


Figure 3. Maximum (quantile 95%) values for total concentration of sea ice for 1990 annual interval, gained on the basis of USA/NSIDC-NIC (left) and Russia/AARI (right) data sets. Enlarged frame is the area of bergs trajectories in the Weddell sea (right top).

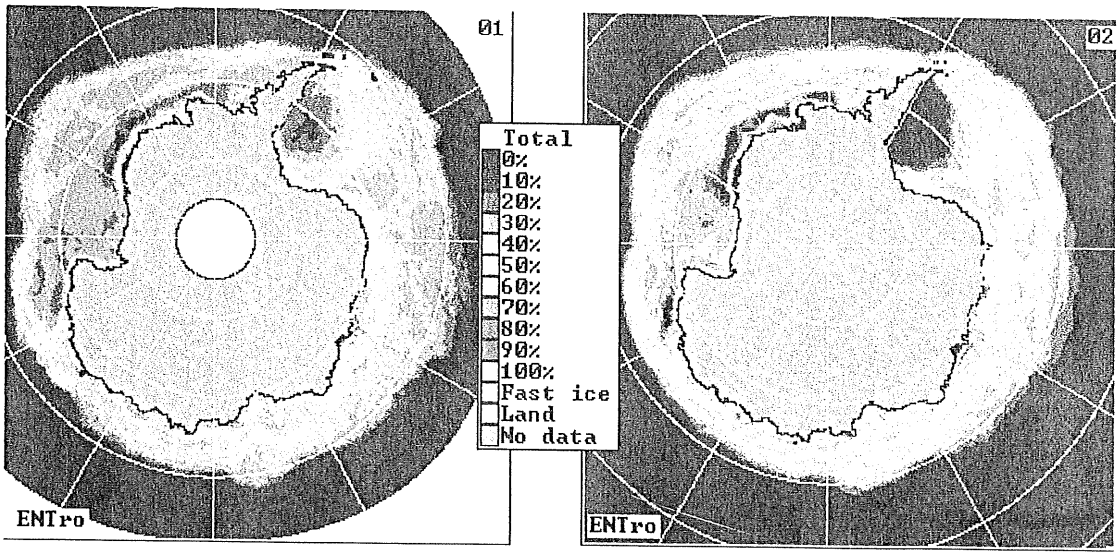
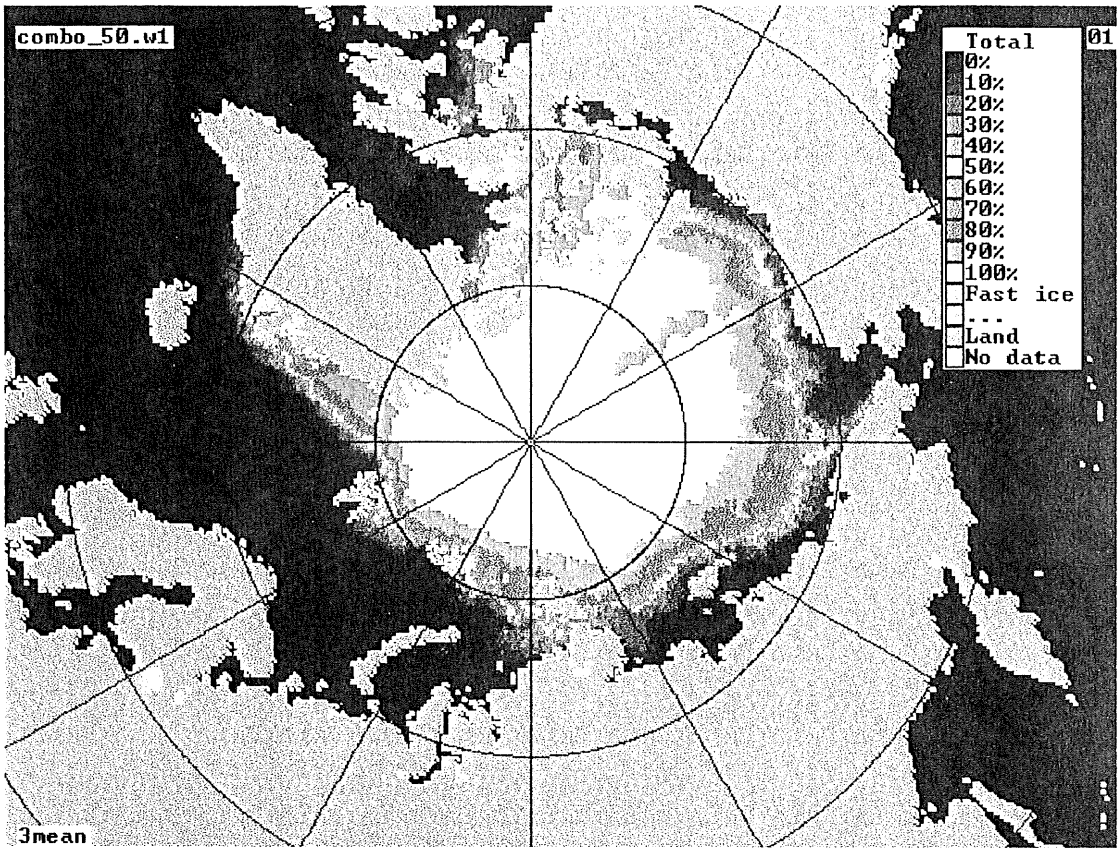
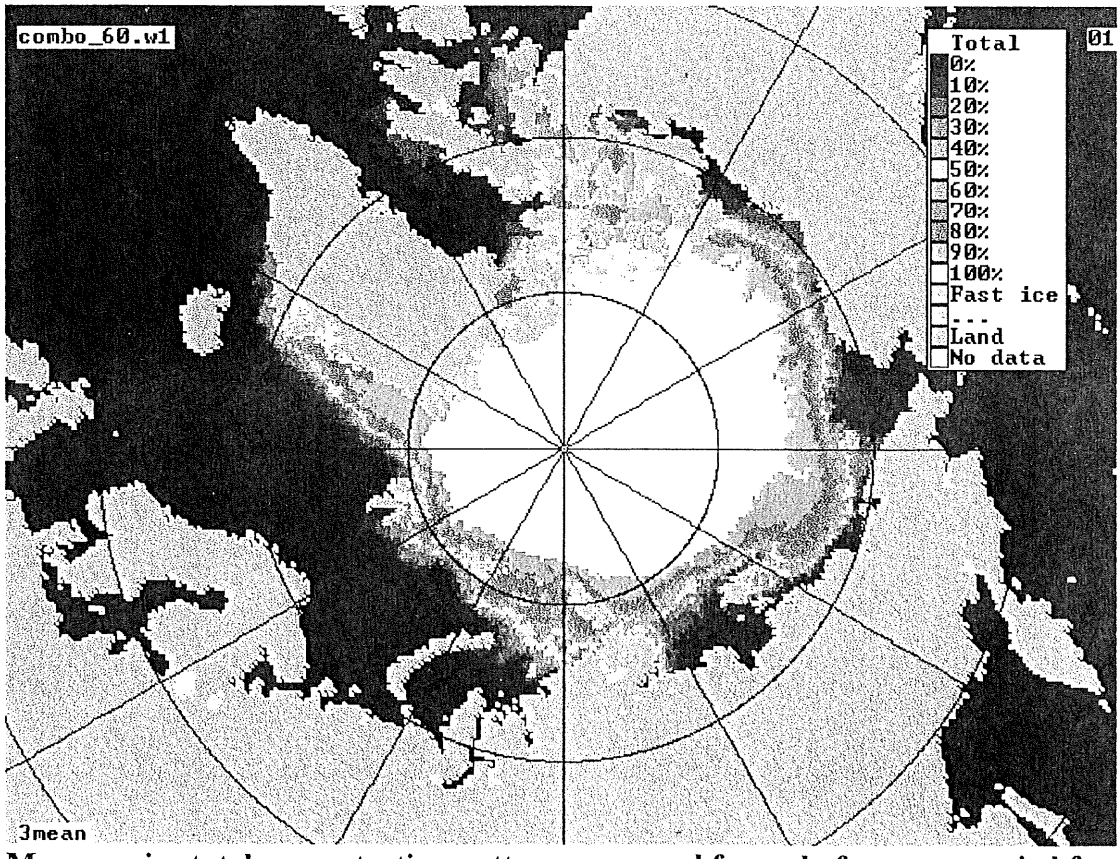


Figure 4. Normalized entropy values (sum of occurrences multiplied by their logarithms, level of variability) for total concentration of sea ice for 1990 annual interval, gained on the basis of USA/NSIDC-NIC (left) and Russia/AARI (right) data sets.





Mean sea ice total concentration patterns averaged for end of summer period for 50s (upper picture) and for 60s (lower). Based on combined AARI 10-days period and J.Walsh monthly data sets.

ANNEX 4b

ANNEX 4b: Report on the negotiations of Finland, Russia and Sweden about the transfer of ice data to SIGRID format.

Ice data have to be delivered to the Global Ice Data Bank. In this bank there is an ice atlas. This work has to be continued but is in basic code. In 1981 the symbols were changed to international symbols and this causes a loss of some details. That is why it has to be decided how detailed the information must be: in basic form or in another form, SIGRID 1 or 2.

If a digital ice chart is used Russia advised to use the basic form up to 1999 and to change it then to SIGRID 2. If more details are needed it is best to use the old basic form. This will further be discussed between Finland and Sweden in order to co-operate. They can give no advise on how to proceed. However, the most important thing is to know the ice concentration and the ice thickness. As it concerns just small areas in the Danish waters, SIGRID is too large for that area.

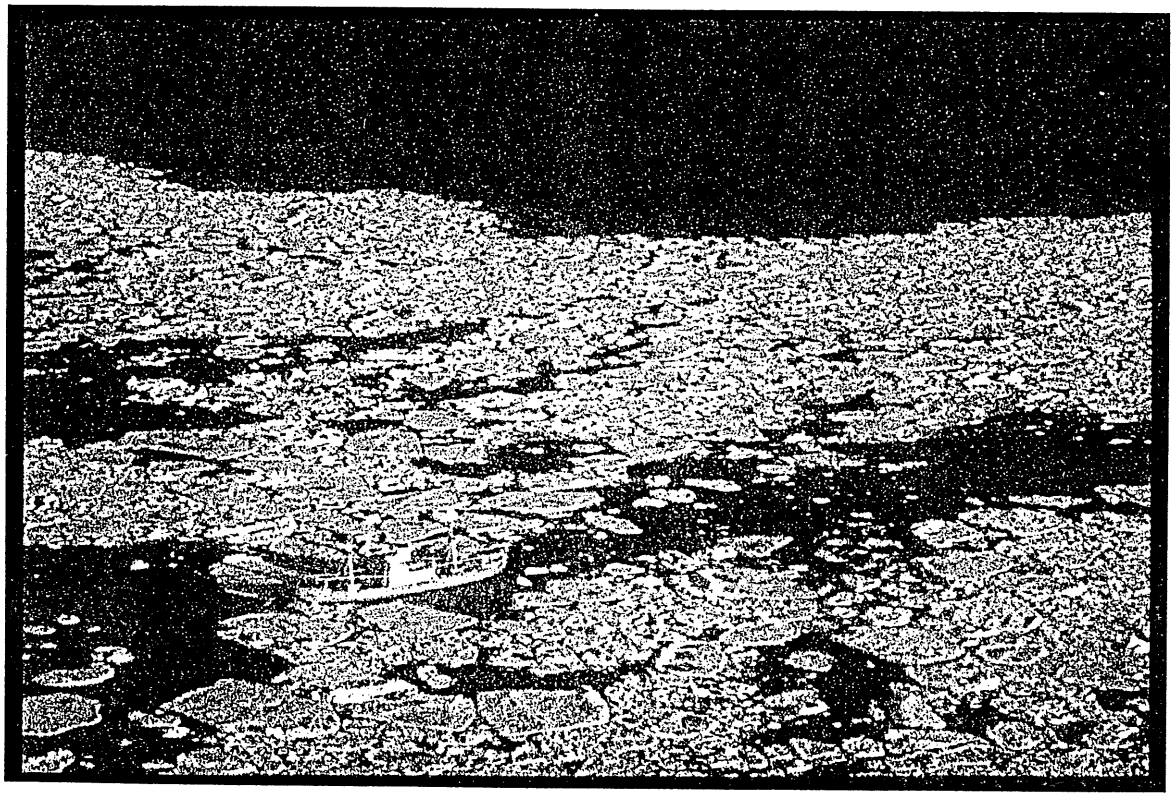
Operational Sea Ice Monitoring by Satellites In Europe

OSIMS REPORT No. 4

DRAFT

FINAL REPORT

NERSC Technical Reports No. 148



European Commission Environment and Climate Programme 1994 - 1998

Theme 3: Space techniques applied to environmental monitoring and research.
Area 3.2:Rresearch and development work for potential future operational activities.

by

S. Sandven (NERSC), H. Grønvall (FIMR), A. Seina (FIMR), H. H. Valeur (DMI),
T. M. Nizrovsky (FIMR), H. Steen Andersen (DMI), V.E. J. Haugen (NERSC)

Contract no. ENV4-CT96-0329
May 1998

data are, however, rather expensive and by starting to use the data more extensively, there are ways of data acquisition which must be decreased. If ice monitoring system would be put into single use of the EO data, reconnaissance flights of fixed wing planes and helicopters could be minimise. Today, however, there is a single operational SAR satellite, Canadian RADARSAT, which is able to confirm the needs of operational ice monitoring. The data of RADARSAT are very good, but if something happens to the satellite, replacements are hard to find. The operators of RADARSAT have announced, that the series will continue, and if the satellite will be damaged, they will launch the replacement in very short time. However, the ice services/centres must have a full guarantee from satellite service providers, that the series will be continued for a long period before they could change their data collection systems radically. Also there must be guarantees that operational applications, like ice monitoring, will be advantaged in data policy compared to non-operational applications. In other words, there must be operational service, daily and under any circumstances.

Table 13. New technologies which are important for operational sea ice monitoring.

	Changes in technology and user demands
Satellite and sensors	SAR-systems: full coverage, daily, all ice covered areas long-term coverage in key areas real-time in specific cases/operations Passive systems: continuos, large scale monitoring SAR receiving stations
Access to data and processing of data.	improved data communication on land and at sea full digitised data analysis tools direct downlink to ice services/centres and users wide range of products satellite communication in Arctic use of electronic charts 24 hour service land-contours and geographical grid streamlined procedures for near real time services shortest possible delivery time modern sat. tel streamline procedure file and fax transfer
Users	role of public versus private sector increased role of private sector: shipping, oil industry, fisheries what are new growing activities which need ice information oil companies oil platforms -harbour authorities consulting and management companies pollution mapping authorities national-inter. agencies and authorities insurance companies -harbour authorities navy and coastal guard - pollution mapping authorities
	everything is digital new training and education.

7.1 European versus regional systems.

Sea ice monitoring in Europe is of regional character, involving countries in the northern part of Europe including Russia. Further development of ice monitoring services will include more co-operation with each of the regions. First of all, in the Baltic region, more co-operation between the countries can be expected to co-ordinate data collection, satellite data, electronic exchange of data, common analysis and display systems, etc. in the Greenland area, DMIs service benefits of co-operation with the Canadian Ice Service and the International Ice Patrol, as well as with the Icelandic Met. Service. Several issues, such as common SAR ground stations, joint SAR data acquisition and

exchange of data can benefit from more co-operation. In the Svalbard area and Barents Sea the Norwegian Ice monitoring service partly overlaps with DMI service in the Greenland Sea and the Russian service in the Barents Sea. Further east, in the Kara Sea and other parts of the Northern Sea Route, the ice is mainly a Russian responsibility. However, it is beneficial with more international co-operation also in the Northern Sea Route, especially in use of satellite data, ground stations and in communications.

A European ice forum, including all institutions and users of sea ice data, could be useful to solve common problems, such as data standardisation, optimal data acquisition from SAR satellites, bulk data orders from satellite data providers, and design new satellites needed in operational sea ice monitoring in the future.

7.2 Baltic region

All the Baltic Sea countries are running the national ice service: Finland, Russia, Estonia, Latvia, Lithuania, Poland, Germany, Denmark and Sweden. The services have been established during 1910-20's, when most data were in situ data of observation stations and communication means were limited. With EO data it is possible to observe the total Baltic Sea in a single image and ice conditions in all individual national areas could be observed in high resolution scale. The evolution of communication technology has been very rapid: today high resolution digital data could be sent to users at sea in reasonable time schedule and moderate costs by using cellular network. A question could be made, is there a need for the national ice services, producing rather similar products, or should a Baltic Sea ice information centre be established for centralised sea ice information collection, combination, analysis, product made and information distribution? On the other hand, good quality and fast made ice monitoring are essential for such countries like Finland, Sweden and Russia, which are hit by sea ice annually. The countries in the southern Baltic Sea are not ice bound annually and their ice season is shorter. In meteorology, regional centres have not break off the national meteorological institutes. However, the increased competition has forced the national meteorological institutes to develop finer scale and other special product.

Similar ice analysis application, IceMap, used in Finnish, Swedish and German ice services could be a start of Baltic Sea ice information exchange in digital format. The IceMap output files are using universal Postscript format, thus it could be input into various systems.

The traffic will increase, e.g. in Finland in 1997 marine transportation was 75 mil. tons, in couple of years it is expected to grow into 100 mil. tons. During the same time the number of icebreakers will not grow significantly. This means, that the icebreakers must be used more effectively in order to be competent of their task of smooth marine traffic in sea ice. The only solution will be better information of the ice conditions, and this could be achieved only by using more extensively and better EO data. Today it seems that better application for sea ice monitoring will be SAR data. The SAR data, however, are not available daily for the total Baltic Sea and it is used only by some ice services.

7.3 Greenland region

This proposed concept is based on information and suggestions gained through the OSIMS user requirement study. With respect to the present application of satellite based ice charts, three important conclusions may be drawn from the study :

7.4 Northern Sea Route

The main problem in the Northern Sea Route is that the Russian Hydrometeorological and sea ice service has been reduced in recent years. There is now severe lack of sea ice information, but the governmental support to the services has been drastically reduced. This opens up new possibilities to offer new concepts in ice monitoring, use4 more data from satellites. However, new services can only be established with support from the provide sector, especially oil industry and shipping companies operating in the Northern Sea Route. New services will therefore be more user-driven and less governmental driven.

The market for ice monitoring is growing due to increased ship traffic and more exploitation of oil - gas and other arctic resources. With new users there will be demand for more ice services. It is foreseen that existing ice centres will reorganise their activities and that there will be opportunities for other service providers to establish new services.

7.5 Standardisation of data exchange

Data exchange between ice services and users

In the Baltic Sea digital products from national ice service are received only by Finnish and Swedish icebreakers and some Finnish merchant vessels. The system needs special application and agreements between data suppliers and users. Sent data have consisted of digital ice charts, satellite images and automatically classified satellite images.

When digital sea charts (Electronic Chart Display and Information System) will be taken into use, there will be demands for digital ice charts for this system. This will bring up a need for standardisation of the data. The resolution of needed data should also discussed. Today the data in standard ice charts are of c. 1 km in resolution. In digital sea charts the user could zoom in and out and thus use the scale which is much more finer than normally used 1 km. This is especially the case of entering the harbours. One of solution could be producing standard ice charts for high sea areas, and high resolution ice charts for near harbour areas. High number of harbours prevents the effective use of traditional mapping methods, and thus automatic classifications of SAR data will be the only effective solution. This would, however, mean that automatic classification of SAR data should be used operationally by the all ice services, and that algorithms must be able to produce similar high quality and reliable results.

Data exchange between ice services

Today the data is mostly exchanged in hard copies by fax. In the Baltic Sea in the Finnish, Swedish and German ice services a standard IceMap application is in use. By using IceMap Postscript chart files, ice information could be copied and pasted to another chart. In general, there is a need for digital data exchange between ice services.

and a variety of different products and processing algorithms, there is a strong need to organise all relevant information and make it readily available to the users.

8.3 Price policy and cost-benefits

The cost-benefits of using satellite data is totally determined by the data policy of the space agencies (ESA, NASA, NASDA, etc.) or national space programmes (NOAA, SPOT, IRS, etc.). Decisions are made by the member states of these organisations on who can receive data free-of-charge, who must pay for the data, and what is the price for different users define the economic framework for the use of satellite data. Satellite systems for earth observation are usually financed by national governments through the space agencies, space programmes or through organisations such as WMO, but commercial space programmes using more dedicated and low-cost satellite systems are expected to become more important in the future.
The national ice services/centres in Europe are the main users of satellite data for ice monitoring. The cost-benefit of satellite data from their point of view are mainly determined by the price they have to pay for the data compared to the price of other sources of information. In many cases, there is a trade-off between use of aircraft surveys and satellite data, especially SAR data. The ice centres have limited budgets and there is often a demand to reduce costs as well as to increase the quality of the ice monitoring service. User payment for the ice information has been introduced for some services, but since basic ice information is a part of the public service it should be available free-of-charge or at a modest cost. It would not be possible to provide a basic ice service without considerable funding from the national governments. A full commercial ice service would only be possible for specific customers such as shipping companies, oil companies and other offshore industry which need more extensive and focused ice information than the basic public service can provide.

Use of SAR data have to a certain extent replaced use of aircraft data in the Baltic region, due to the fact that several countries share the data costs and have a favourable price agreement with the data provider. Acquisition of RADARSAT data for operational services at the nominal price would not be realistic within the budget of the national ice centres.

8.4 The role of the public and private sectors.

Ice monitoring is traditionally a public service financed by the governments through their national ice centres. Users of ice information consider standard ice information products to be free-of-charge or available at a low cost. As the need for more specialised ice information develops, first of all due to requirements from the offshore industry, financing of specialised products by the customers increases.

Today the ice services have the basic governmental funding supplemented by customer funding of up to 50 % of the total budget of the ice services/centres. There is also varying degree of financing from industry and private funding sources.

The general view among the users is that the organisation of ice monitoring services is best taken care of by national ice centres or weather forecasting centres also in the future. The public sector will continue to play the main role in financing of basic ice services, including use of satellite data. But there is also an increasing interest among many users to strengthen the role of the private sector in the financing of special ice services. With growing ship traffic, oil and gas exploitation, fisheries and other economic activities in ice-covered regions, there will be a growing demand for dedicated, specific ice products which are more extensive or more advanced then the standard ice charts

8.5 Regional solutions

The Baltic Sea

In the Baltic Sea area nine national ice services are operating and producing more or less similar products, the quality depending on the available ice monitoring data. A concept would be to establish a single centralised ice service covering the total Baltic Sea, the Baltic Sea Ice Information centre, which be beneficial for the whole region. For example wider range of EO data could be used in more effective ways by a centralised ice centre than many different national ice centres. Also development and testing of automatic classification algorithms for EO data and more effective sea ice models could be done better by a single ice centre. A centralised ice centre could distribute the products to the users more effectively and the users could get all sea ice information from a single place.

- In the Baltic Sea area daily operational ice monitoring the EO data are needed every year at least in Finland, Sweden, Russia and Estonia. During normal and severe ice seasons the ice monitoring must cover the total Baltic Sea which includes 4-5 more countries.
- Spaceborne SAR is replacing aircraft observations more and more, because the SAR system with ground structure covers most of the needs of operational ice monitoring. In the Baltic Sea there is a daily need of images with about 100 m resolution covering the ice areas in the winter season.
- The ship traffic in the Baltic Sea will grow in the future, but number of icebreaker will not grow correspondingly. This means that the ships must navigate more independently inside the ice covered areas. This will be possible only by the extensive use of better EO data.
- When electronic sea charts will be taken into wide use, there will be strong demands for high resolution, near-time EO based ice products to be used in ice navigation.
- It will be necessary to train captains and mates of the merchant vessels as well as other new users in satellite ice monitoring and other aspects of ice navigation to secure safe operations in the future.

Greenland region

Following issues are relevant:

- A new SAR receiving and processing station is needed which covers the important ice areas, possibly in co-operation with Iceland and/or Canada. ^Today, three different ground stations (Canada, Norway and UK) cover different parts of the Greenland sea ice.
- Direct downlink of SAR data to the Ice Central can solve the problems with several SAR stations, but this will be 5-10 years into the future several SAR
- What combination of satellite and aircraft data, to keep the safety of navigation at the same level
- What will be the impact of offshore oil/gas products activities on the requirements for sea ice information
- The presence of icebergs represents a specific problem which is difficult to solve by remote sensing techniques alone.

Northern Sea Route.

The following problems need to be solved:

- Facilitate SAR data, access to Russian users. Today both organisational, financial and technical barriers make SAR data coverage and distribution difficult for Russian users.
- Improve the utilisation of Russian satellite data, which require improved data communication and financing
- A new SAR receiving station is needed in Siberia which can cover the whole Northern Sea Route
- Involvement from key end users (shipping companies, oil companies) to re-establish a cost-efficient ice service for the Northern Sea Route.

9.7 Benefits from new communication systems.

- New communication satellites able to transfer high data rates at reasonable prices is expected in a few years. Providers of sea ice information products should take advantage of new communication technology to secure efficient data distribution to users at sea and in Arctic areas.

9.8 Strengthening of regional co-operation.

Today the ice services are mainly operating on national basis supported by national governments. The concept of regional ice centres instead of national ice centres should be further investigated.

- In the Baltic Sea area a discussion should be started, is there a need for all nine national ice services, or should a single Baltic Sea ice information centre be founded?
- Improved information service should be established on Internet, where all sea ice monitoring information providers would be found, such as contacting addresses, area of coverage, type of data they are using, products, etc.
- A European forum of sea ice information users cold be useful; to take care of interest which are common for users and service providers. The forum could represent the sea ice community towards ESA, EU and other countries which can play important roles in establishing future operational sea ice monitoring satellites.
- In Greenland area more co-operation between DMI, Canadian and Icelandic ice services should be discussed.
- In Russia, organisation of a new re-established ice service should be discussed which can benefit fully from satellite data.

9.9 A European sea ice forum

- Work for the interests of all sea ice users and service providers.
- Push a sea ice mission.

Annex 5

The 18th Baltic Sea Ice Meeting (BSIM-18), Gdynia, Poland 18-22 September 1995, joint by most of the Heads of the Ice Services and Ice-breaker Services around the Baltic Sea

Stressing the importance of the activities and products of the Ice Services for safe and effective navigation in the Baltic Sea with respect to public requirements,

Acknowledging the efforts of ESA to provide ERS SAR data in real-time for sea-ice monitoring

Desiring to ensure that ERS SAR Fast Delivery Products are provided furtheron to the participating states in the ERS Programme

Considering the limited amount of SAR Fast Delivery Products per ice season compared to the all year round Low Bit Rate data service for Meteorological Services

Anticipating that a joint Finnish/German/Swedish data request will be submitted to the ERS Order Desk at ESRIN

Recalling the ESA document ESA/PB-EO(90)57, rev. 6 of 9 May 1994, on the *Principles of the Provision of ERS Data to Users*

strongly recommended **that the governmental Ice Services of participating states are equally classified and treated as the Meteorological Services, i.e. in Category C defined in the mentioned ESA document, in order to receive on the basis of national requirements at least low resolution SAR Fast Delivery Products free of charge.**

K. Strübing, Chairman
BSIM-18

Annex 6

Data Policy

Introduction

The objectives of the Envisat data policy are to maximise the beneficial use of Envisat data and to stimulate a balanced development of science, public utility and commercial applications, consistent with the Envisat mission objectives.

The Agency, on behalf of the Participating States, shall retain title to and ownership of all primary data originating from the Envisat payload together with any derived products to the extent that the contribution of Envisat is substantial and recognizable. ESA shall protect these data through applicable legislation, including law on databases, copyright and other appropriate forms of intellectual property rights.

The conditions attached to the distribution of Envisat data shall depend on the use of the data. The following two categories of use are defined:

Category 1 use: Research and applications development use in support of the mission objectives, including research on long term issues of Earth system science, research and development in preparation for future operational use, certification of receiving stations as part of the ESA functions, and ESA internal use.

Category 2 use: All other uses which do not fall into category 1 use, including operational and commercial use.

Distribution policy

Envisat data shall be available in an open and non-discriminatory way, in accordance with the United Nations Principles on Remote Sensing of the Earth from Space (United Nations Resolution 41/65, 3 December 1986). The Envisat distributing entities shall provide services to users in a fair and non-discriminatory way.

ESA will retain overall policy and programmatic responsibility for distribution of Envisat data for category 1 use and will be the direct provider of the service from its own facilities whenever feasible.

ESA will delegate to distributing entities the responsibility for the marketing and distribution of Envisat products and associated services for category 2 use. ESA will select distributing entities through a combination of two mechanisms:

- tender action

- direct appointment

ESA will grant non-exclusive licences to selected distributing entities for the distribution of Envisat data over well identified areas and for a period of 3 years.

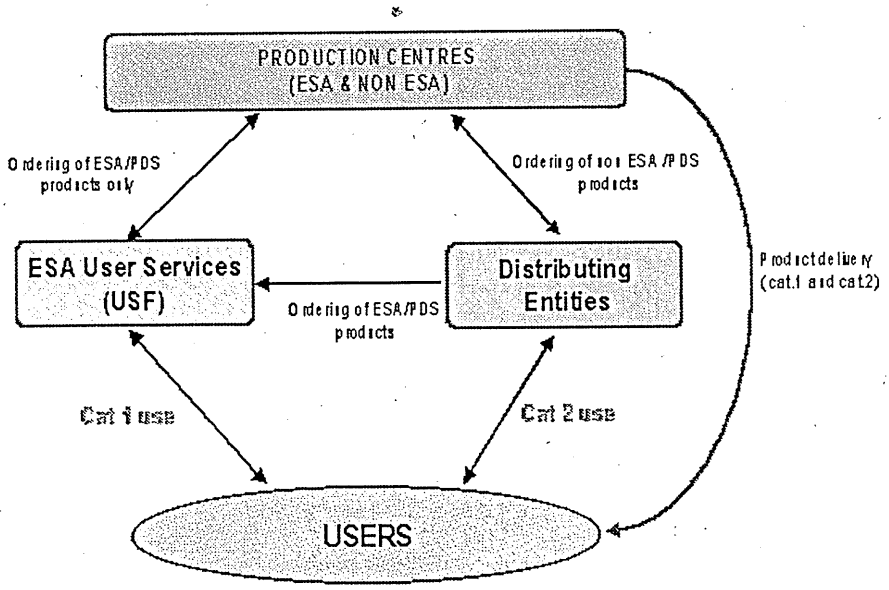
The direct appointment procedure is primarily meant for entities from participating states into the Envisat programme (e.g. operators of national fixed and mobile stations and of processing and archiving centres) and will in general result in licenses of a limited scope (geographic and/or disciplinary).

Appointed distribution entities will ensure equal opportunities of access to ESA standard products and services by all users including the other market operators and in particular service providers and value added operators.

Appointed distributing entities will establish a data distribution scheme by defining prices (see below) and negotiating contracts, agreements and sub-licenses and any other action, including regulation of onward distribution, as required in order to favour the development of applications making maximum beneficial use of data from Envisat.

Foreign stations will be allowed to acquire Envisat high rate data and to generate and distribute Envisat products under conditions established by ESA and provided that a contract has been established with ESA (for category 1 use) or with an appointed distribution entity.

Value Added Operators and Service Providers shall be guaranteed access to Envisat products through the appointed distributing entities as well as the right to sell products and services to users.



The main elements of the distribution for ENVISAT data

Price policy

ESA will fix the price for all Envisat data intended for category 1 use. The price will be set at or near the cost of reproduction of the data.

ESA will waive the category 1 price for approved projects in the Envisat Announcement of Opportunity scheme and in other cases following approval by the Earth Observation Programme Board.

For category 2 use, ESA will fix the price of Envisat standard products and associated services which it provides to the distributing entities. The price

will be set at a level comparable to the price for category 1 use.

Distributing entities will be allowed to set prices for Envisat products and services for category 2 use at or above the price level which ESA charges the distributing entities. For specific purposes, and with the prior agreement of ESA, distributing entities will be allowed to set prices for data products below the price level which ESA charges the distributing entities.

ESA reserves the right to fix a ceiling level for the market price which distributing entities can charge to users for Envisat standard products.

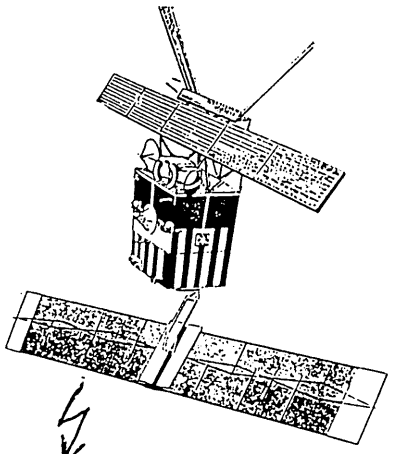
Distributing entities and stations will be required to pay a fee for programming requests for Envisat high rate data acquisition.

Foreign stations will be charged an access fee for the right to receive Envisat high rate data.

Review

The ESA Programme Board for Earth Observation will review the Envisat Data Policy whenever it considers fit and normally every two years.

Annex 7



1998 RADARSAT project for northern Baltic Sweden-Finland

Typical acquisition time: 05 UTC (desc. mode)
20 UTC (asc. mode)

TSS

Raw image processing, ready within 2 hours from satellite passage.

Full image size: 28-35 Mbyte

Internet-based fetch routine
(on demand from SMHI/HFI)

SMHI → Conversion to ICEMAP/Tiff format (not yet implemented)

Post-processing to Prosat format

- Sampling to 500 m resolution (overview image) — Size: 600-700 kByte, 45 min from full Raw image
- Sampling to optional resolution 200/100 m (detailed images) — Size: 150-200 kByte, 10 min

Conversion to Iceplott format (incl compression), Mercator projection — Size: 90-100 kByte, 3-5 min

(via NMT, appox 10 min)

To icebreakers in service

Annex 8

Janis Kostjukovs
Galina Slobodenyuk

An overview of the ice investigations in the gulf of Riga.

The Baltic Sea, a single freezing sea of Europe, and adjacent part of the North Sea and their river basins have always been an area of year-round international trading.

The start of fishing and marine trading in the countries around the Baltic Sea dates back to A.D 500-700. Cruisings often came together with inroading into the seaboard of the neighbouring countries, for robbing and taking prisoners. [1]

Keeping of the year-round trading and traffic with the conquered lands, mostly by water-ways, directly depended on freezing of the water basins. Ice restricted water traffic, and thereby trading, thus effecting commercial and political interests of the states boarding the Baltic.

For those reason, European chronicles, including those of the Baltic states and Russia, contained information on winters when the sea and inflowing rivers were heavily freezed.

By reference to such information, a high accuracy freezing picture may be reproduced for the Baltic Sea basin or any part of it for a fairly long time period. Thus, Peteris Stakle, making use of the ice records, has collected information on the ice break terms (start of navigation) in the Port of Riga beginning with the winter 1529/30 [18].

The Finnish researchers R. Jurva and Palosio involved ship-born, beacon and on shore ice records and indirect evidences of the presence of ice (time of removing beacons, light suppression, etc.) to obtain freezing data for a long period since the winter 1719/20 [6,19]. The same studies have been taken by C. I. H. Speerschneider in the Baltic Sea, at the Danish coast. [33]

The Baltic Sea was the world's first to be covered with ice observations which date back to the middle of the XVI century. At that time, the Swedish Government bound dwellers of the conquered shore-lands to assign individuals to pilot boats, to erect stone pyramids (first navigation marks) on the coast and islands, to mark the known navigable channels.

Before ice cover started to develop, the floating navigation marks had to be removed and erected again as the ice disappeared. The first ice observations were just aimed at establishing the terms of ice appearance and disappearance. This knowledge was of essential importance for navigation and navigation support services.

In the 1860-1870-ies, by order from the Board of Beacons and Sailing Directions, beacons started keeping ice recordings. Some important posts were committed to report (once in two weeks) of the ice type and drifting within sight of the beacons. The most complete information is available from the Vormsa and Verder beacons. A bit later, the Central Hydrographic Service (CHS) issued special record sheets and sent to the beacons for complition. Attention was drawn to ice appearance, freezing and disappearance. Besides, information was requested on the ice thickness, the start and termination of traffic in ice. The completed sheets would be submitted to MHS for checking and, commencing with 1893, have been published in the Hydrometeorological Proceedings.

The under-programme observation had been carried out until 1908, when the CHS's Meteorological Department under Lieutenant-General J.Shokalsky elaborated the new detailed instructions approved by the second All-Russian Meteorological Congress. As prescribed by the instructions, day-to-day ice cover observations should be made, with the separate descriptions of fast and drifting ice. For the latter, movement direction has to be recorded. The extention of fast and drifting ice is evaluated by the reference system of 10, taking 10 to be the length of the sea surface within sight of a station.

Simultaneously with the implementation of the instructions, the number of the ice observation stations had increased: on-shore posts were involved (Fig.1) and naval communication services were quite often located where beacons were absent.

The method of ice observations set forth in the instructions provided the basis of similar instructions on the performance of ice observations in seas.

Germany commenced regular ice observations in the winter 1903/1904. The observations may be divided into two parts complementing each other: the characterization of ice (quality evaluation) and difficulty for shipping.

The first part treats ice conditions according to the system as follows:

A - Ice situation:

0 - Open water;
1 - Loose sludge or young ice;
2 - Covering of ice with thickness less 15cm;
3 - Drift ice;
4 - Compressed sludge or bands of pack-ice;
5 - Rift in the ice, along the coast;
6 - Thick covering of ice with thickness above 15cm;
7 - Heavy drift ice with thickness above 15cm;
8 - Packed ice;
9 - Screwing of the ice;
X - Not known.

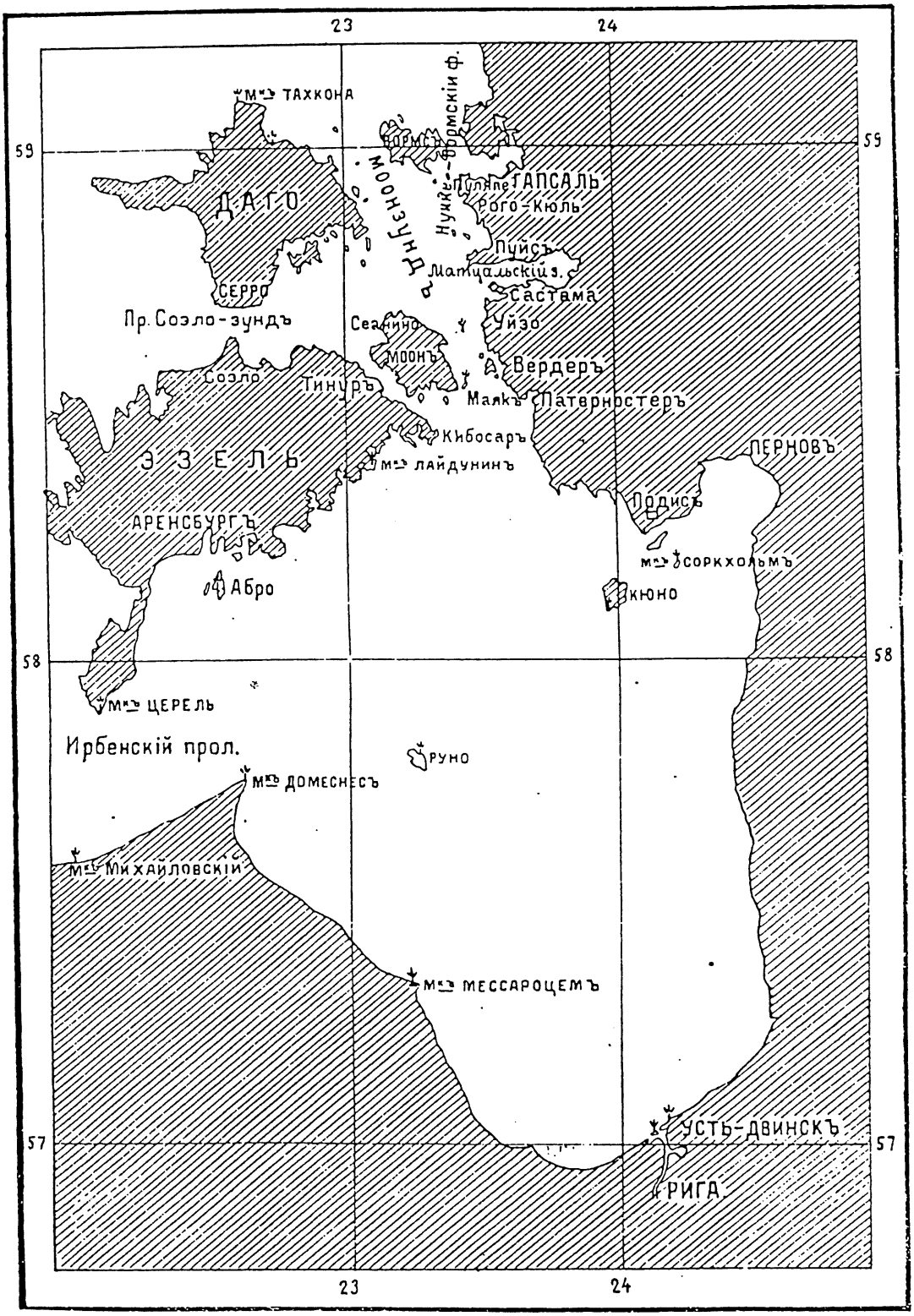


Fig.1. The Gulf of Riga

The second part is dedicated to ice conditions in terms of effect on navigation and provides the following system:

B - Effect on navigation:

0 - Navigation unhindered;
1 - Navigation unhindered for vessels, propelled with engine, difficult for sailing vessels;
2 - Navigation difficult for vessels with weak engine, closed for sailing vessels;
3 - Navigation possible only for large vessels with powerful engine;
4 - Navigation possible only for vessels, strengthened for traffic in the ice;
5 - Navigation kept going by means of ice-breaker;
6 - Open channel through the ice;
7 - Navigation at present interrupted;
8 - Navigation closed;
9 - Conditions of navigation not known, owing to bad visibility;
X - Not known.

The above elements of the ice observations in the Baltic Sea (Baltic Sea Ice Code) were in force also in Finland, Sweden, Norway, Denmark, the free city of Danzig and in Latvia, during the first independent state.

The first generalization of the ice studies covers a 20-40-years period up to 1917 and provides decadal ice recurrence charts [3].

A manuscript by L.Rudovits published in 1918 furnished the detailed characterization of the ice regime in the Gulf of Riga [26]. Data from 25 gulf stations were involved, 4 stations reporting observation results for a period not less than 35 years, 7 stations - not less than 25 years and 14 stations - less than 10 years. (Fig. 1).

Using these materials as the base, the average terms were calculated for the 4 major states of the ice cover: appearance, freezing, breaking, clearing. Recurrence percentage was calculated for the above ice states for 10-days periods as well as the number of days with fast ice on the gulf's surface in sight of each observation post. The symbols of the graphs presented in the book provided information on:
- the average state of ice cover for a station indicated the earliest term of ice appearance;
- freezing and latest breaking and clearing terms;
- the latest appearance, freezing and the earliest breaking and clearing whenever occured during the whole period of the studies.

The latter provides an idea of theoretically possible winters adverse or favourable for navigation in terms of ice conditions. Besides, the charts schematically represent the average extent of fast and drifting ice by the end of each decade by the Gregorian calendar.

During the years of the first independent state of Latvia (1918-1940) the Marine Department was in charge of the ice condition issues in the Gulf of Riga. The results of the ice observations that started in 1920 have been published in the department's and other editions.

Mention should be made of the Marine Department's edition "An overview of the establishing and keeping of water-ways until April 1, 1935. Part I" and 6 special editions on the ice and navigation conditions in the Latvian coastal zone in the period 1934 - 1940 [27-32].

To give the account of all ice studies scattered in different editions, this 19-page edition collects and presents the ice conditions starting with the winter 1921/22 (Fig. 2). The ice observations from each post are compiled to cover the period from the start to the winter 1941/42. Following the pattern of the previous years, the ice conditions are classed as easy, average and hard and are specified in graphs by a line (easy), circle (average) and 2 parallel lines (hard). The time resolution is 5days. The vertical broken line denotes the averaged first and last days with ice for each station, from the start of the observations until the winter 1940/41.

Judging from the graphs, the winters 1939/40 to 1941/42 were obviously severe, with hard ice conditions lingering for long time. The same conditions were observed in the winters 1923/24 and 1928/29.

It is obvious that the winters varied in ice conditions, from long ice cover duration to no ice formation at all. Some years reported hard ice conditions which appear suddenly, depending on the air temperature. On the contrary, easy and average ice conditions lasted relatively long during the first half of the winter. The graphs show that drifting ice (average ice conditions) remained longer in the first half of the winter than in the spring season, when the spell between the hard conditions and ice clearing amounts a few days.

Ice-free winters are frequent in the coastal region of the Baltic Sea proper (Fig. 3) whereas in the Gulf of Riga such winter was observed in 1924/25 alone.

Hard winters, when the "Kr.Valdemars" ice-breaker is needed to assist navigation in the Baltic Sea proper are rare. On the contrary, hard ice conditions in the Irben Strait and the Gulf of Riga are observed during more than a half of the ice period, and assistance of an ice breaker is needed.

Hard ice conditions at the Vidzeme coast restrict navigation for a longer or shorter period each year.

During post-war years, the soviet freezing ports on the Baltic operated several ice-breakers, but they couldn't ensure ship piloting: within the reach to the ports, the ice cover made the passes difficult (or impassable) for ice-breakers. Piloting of transportation ships and the winter operation of the ports

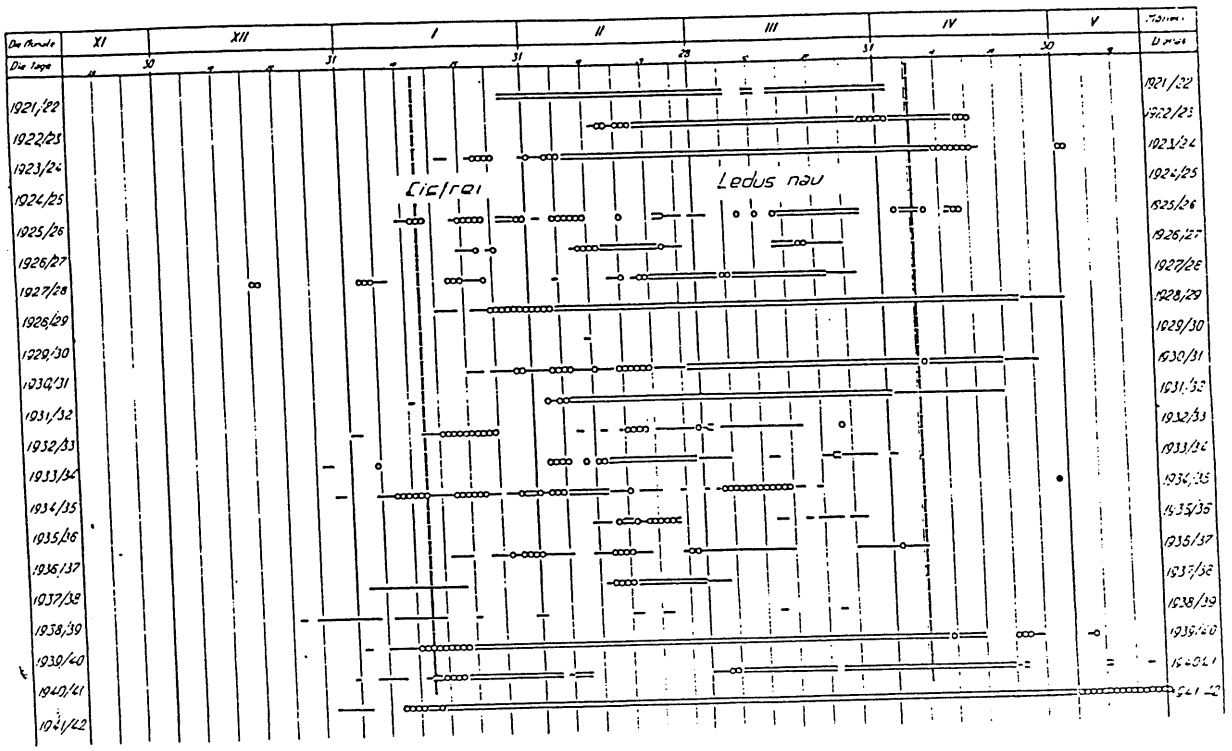


Fig.2. Ice conditions in Daugavgriva - sea

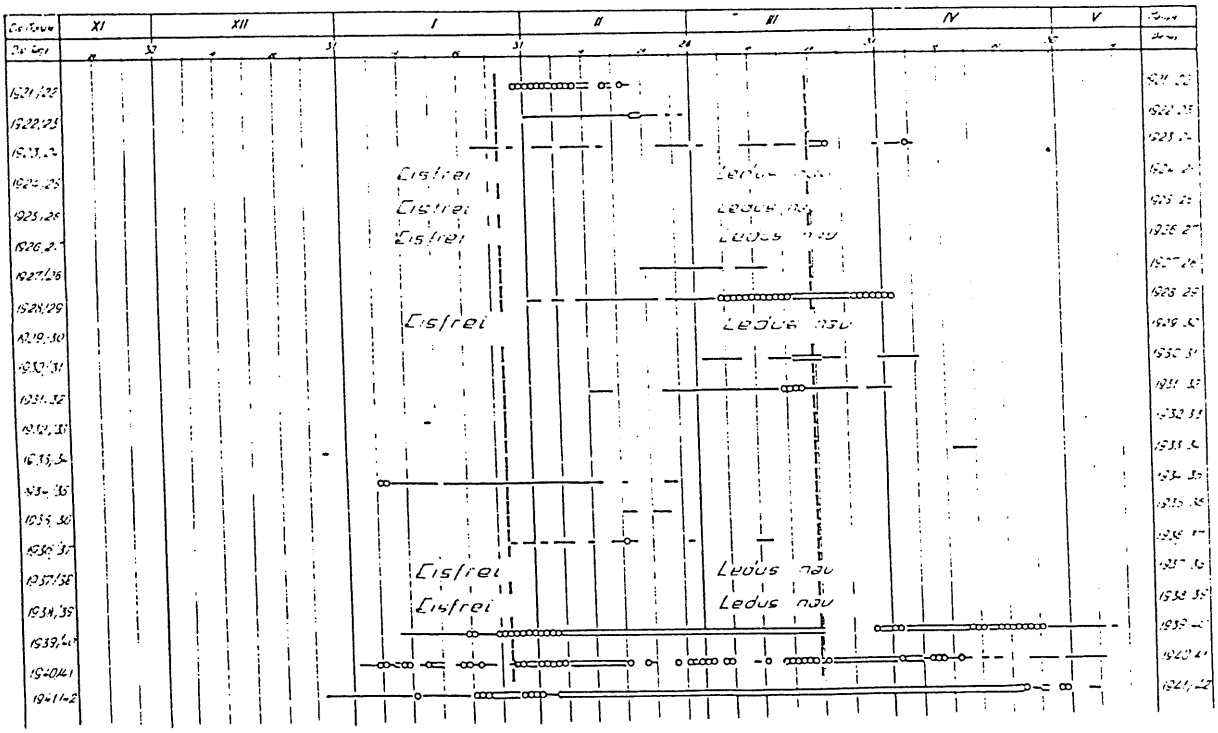


Fig.3. Ice conditions in Ventspils - sea

With the start of regular winter navigation in the Gulf of Riga, systematic ice studies involved aircraft reconnaissance flights performed by the North - Western Department of the State Hydrometeorological Committee. Well before, background ice forecasts covered periods of autumn freezing and spring ice decay. Unfortunately, those forecasts missed important elements of the winter ice state: distribution, thickness, drifting etc. Based on the analysis of long-term ice data and meteorological and hydrological observation results from the network of on- shore and island hydrometeorological stations, the "Ice Atlas of the Baltic Sea" [4], climatological reference- books and other guide-books, mainly of regime character, have come out. The results of the on-shore observations had been complemented by data from air crafts and ice-breakers. That allowed Arvids Pastors to publish a monograph appended by the ice extent atlas of the Gulf of Riga [22]. The contents of the work provided a good information on the ice freezing and breaking dynamics, ice thickness variations as well as on ice reefing, the most typical for the Gulf of Riga.

A reference-book on major hydrological characteristics issued in 1972 [25] contained tabulated long-term results of the hydrological observations in the Gulf of Riga and the Baltic proper within the economic zone of the Latvian SSR.

The reference-book rests upon the observation results of water level, currents, temperature, ice and other characteristics reported from 19 hydrometeorological stations and posts since the beginning of the observations until 1964 inclusive or until the termination of the observations.

As the winter navigation became large-scale and planned, when tens of transportation ships and ice-breakers are simultaneously sailing in ice, the ice conditions illucidated in sailing directions, atlases and reference-books as well as ice forecasts could not be considered adequate. In 1973, the Marine Ministry and the State Hyrometeorological Committee set the Arctic and Antarctic Research Institute and the regional Marine Departments the task of elaborating special manuals to register ice conditions for winter sailing in non-arctic freezing seas.

The work was proceeded by comprehensive investigations into the regime of the sea, variability and related hydrometeorological factors and physico-geographical peculiarities [7]. At that point (1974-1975) the foundations were laid for assessing the ice and hydrometeorological regimes that form the ice conditions in the Baltic Sea for winter navigation [9].

The shipping difficulty coefficient - K_T - was taken as a generalized index of the ice state that restricts the ship traffic. The criteria of K_T values were established for starting and ending operations in ice-covered areas of the Gulf of Riga, as applied to the operation of the "Captain Belousov" and "Vasily Pronchishchev" - type ice breakers. A comparison analysis of the K_T values obtained for route locations allowed to determine the optimum one. The results of the investigations, including procedures of registering ice conditions,

The ice parameters (ice extent, thickness, etc.)and the terms of the processes(start of ice formation, decay etc.) feature large year-to-year variability. From this fact, the notions of average, severe and mild winters had been developed that in turn marked the beginning of active research of the ice peculiarities in severe winter and effect on navigation in the Gulf of Riga [12]. It was believed that effect of the ice conditions during mild winters was insignificant as ice-worthy ships were involved in navigation. Mild winter conditions were considered background for the evaluation of severe winter conditions.

The contemporary information on the ice regime of the Gulf of Riga is set out in the reference-book "The hydrometeorological conditions in the continental shelf of the USSR's seas" [16]. The reference-book provides statistical data of major ice parameters, including the appearance and clearing terms, edge of drifting and fast ice, probable occurance of ice of different density and age. The data were derived from the hydrometeorological observations at stations and aircraft reconnaissance flights performed in the period 1951-1975.

A monograph issued under the "USSR's Seas" project was the latest investigation into the hydrometeorological conditions of the Gulf of Riga, including ice conditions. [17]

The monograph broadly treats the meteorology, climate, hydrological regime and water dynamics in the Gulf of Riga. The complete characterization of the hydrometeorological regime of the Baltic Sea and assessment of its variability related to regime-forming factors are provided. The characterization is based on the analysis *in situ* data by probability methods that give proper weight to the processes studied and data specificity. The data base includes the observation data from on-shore and island stations, arranged in time series, and calculation results.

A data bank has been created for the Baltic Sea ice climate studies [5]. Three particular ice seasons and the climatological normal period 1961-1990 statistics have been chosen for the references. The winters 1983/84, 1986/87 and 1991/92 represent a normal, a severe, a mild ice season. A total of 23 meteorological stations, monthly mean runoff data, water exchange data in the Danish Straits, nine water level stations, five hydrographic stations, eight ice monitoring stations and ice concentration data from satellite images are used to describe the ice season.

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Annex 9

Venue and Accommodations

The conference will be held at the **Battelle Seattle Conference Center**, 4000 N.E. 41st Street, Seattle, WA 98105-5428, USA.

The Center provides full lodging, dining, and meeting facilities and is located about two miles from the University campus. The guest rooms are equipped with study desks, coffee bars, and mini-refrigerators. Room rate is $90 (plus tax) for single occupancy and $115 (plus tax) double occupancy and includes continental breakfast.

Please make your *reservations* at the Battelle as soon as possible by:

Phone: +1 206 528-3455
Fax: +1 206 528-3554
E-mail: confrenz@battelle.sccd.ctc.edu

Registration and Fees: To aid in conference planning, we ask that you register your intent to participate by immediately notifying Tordis Villinger by E-mail to: *tvilling@npolar.no*, by Fax to +47 22 95 96 01 or by mail to ACSYS, PO Box 5072-Majorstua, N-0301 Oslo, Norway. The following registration information is requested:

- Participant name, phone and fax numbers, email and mailing addresses
- Conference name(s)
- Abstract title(s)

Registration fee: **USD 200** (no other currency accepted), payable in advance by credit card to website*: http://shebatoo.apl.washington.edu/database/add_iabp.html*, or money order/bank draft by mail to: University of Washington, Attn: Peggy Hartman, 1013 NE 40th St., Seattle, WA 98105, USA. Please include contact information when paying by mail. The fee covers cost of conference room and supplies, lunches and refreshments.

Call for Papers

ACSYS and the US National Ice Center now call for registration and contributions in the form of posters or oral presentations for this conference.

The final abstract should not exceed two (2) pages, including figures, and must contain name and address of author(s), be written with a true-type font, preferably Times New Roman, no smaller than size 10. Paper size is 8.5x11 or A4 with minimum 1" (2,5 cm) margins all around. Please submit all abstracts electronically in MSWord or *rich text format (rtf)* by **30 June 1998** to:

Tordis Villinger at *tvilling@npolar.no*, or camera-ready version by mail to ACSYS, P.O. Box 5072-Majorstua, N-0301 Oslo, Norway.

Other inquiries may be directed to:

Roger Colony:
E-mail: *acsys@npolar.no*
Phone/Fax: +47 22 95 9605/22 95 9601

Thomas Thompson:
ththomps@online.no (Mar-Nov)
Phone and Fax: +47 38 26 9635 (Mar-Nov)

Please check the ACSYS web site for additional information:
http://www.npolar.no/acsys/seattle98/index.htm

Companion Conference

The conference on The Arctic Buoy Program – Scientific Achievements from the First 20 Years will be held at the Battelle Seattle Conference Center, 5-7 August 1998. The single fee of $200 also covers participation in this conference.

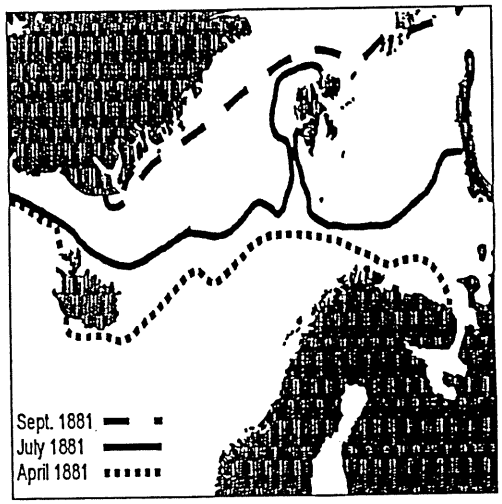
The IABP will hold its 8th annual business and information meeting during 29-31 July 1998.

Second Announcement and Call for Papers

Workshop

Sea Ice Charts of the Arctic

Scientific Achievements from the first 400 years



5-7 August 1998
Battelle Seattle Conference Center
Seattle, Washington
USA

sponsored by

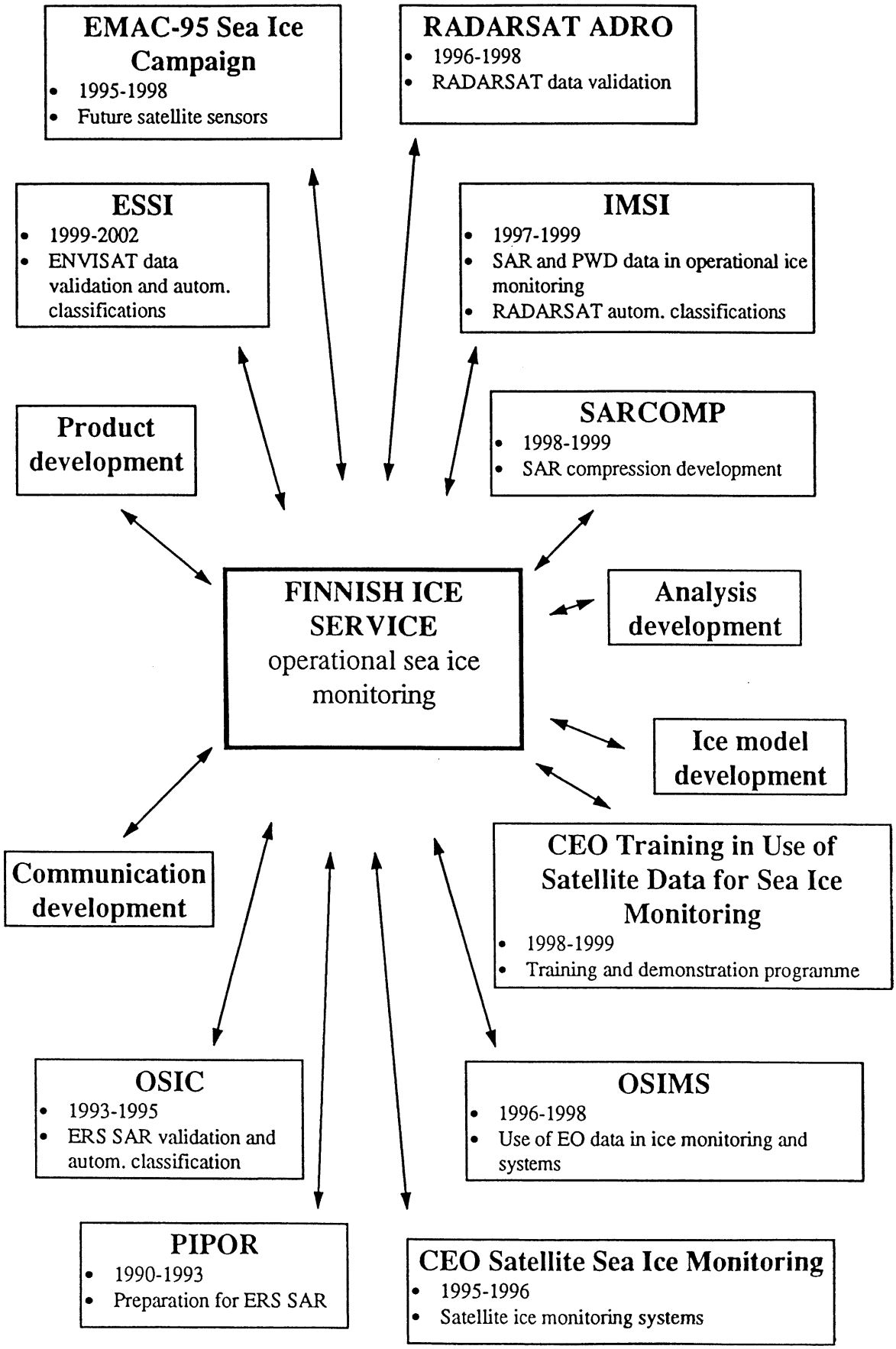
ACSYS
Arctic Climate System Study
of the World Climate Research Programme

and the

US National Ice Center

Annex 10

ICE SERVICE RELATED RESEARCH IN THE FIMR



Annex 11

Request for satellite data providers

SAR data:

Basic SAR

- wide swath
- resolution c. 500-1000 m
- daily

Higher resolution SAR

- c. 300 km swath
- resolution c. 50-100 m
- daily

Coverage:
daily the Baltic Sea
at least 58°-66° N and 16°-31° E

Request for better communication

Delivered in < 2h to the ice service and in < 6h to the vessels

Request for ice services

Ice monitoring information products must be develope

Request for better communication and presentation tools

Data transmission to ships must develop

Ice monitoring presentation systems for ships must be develop

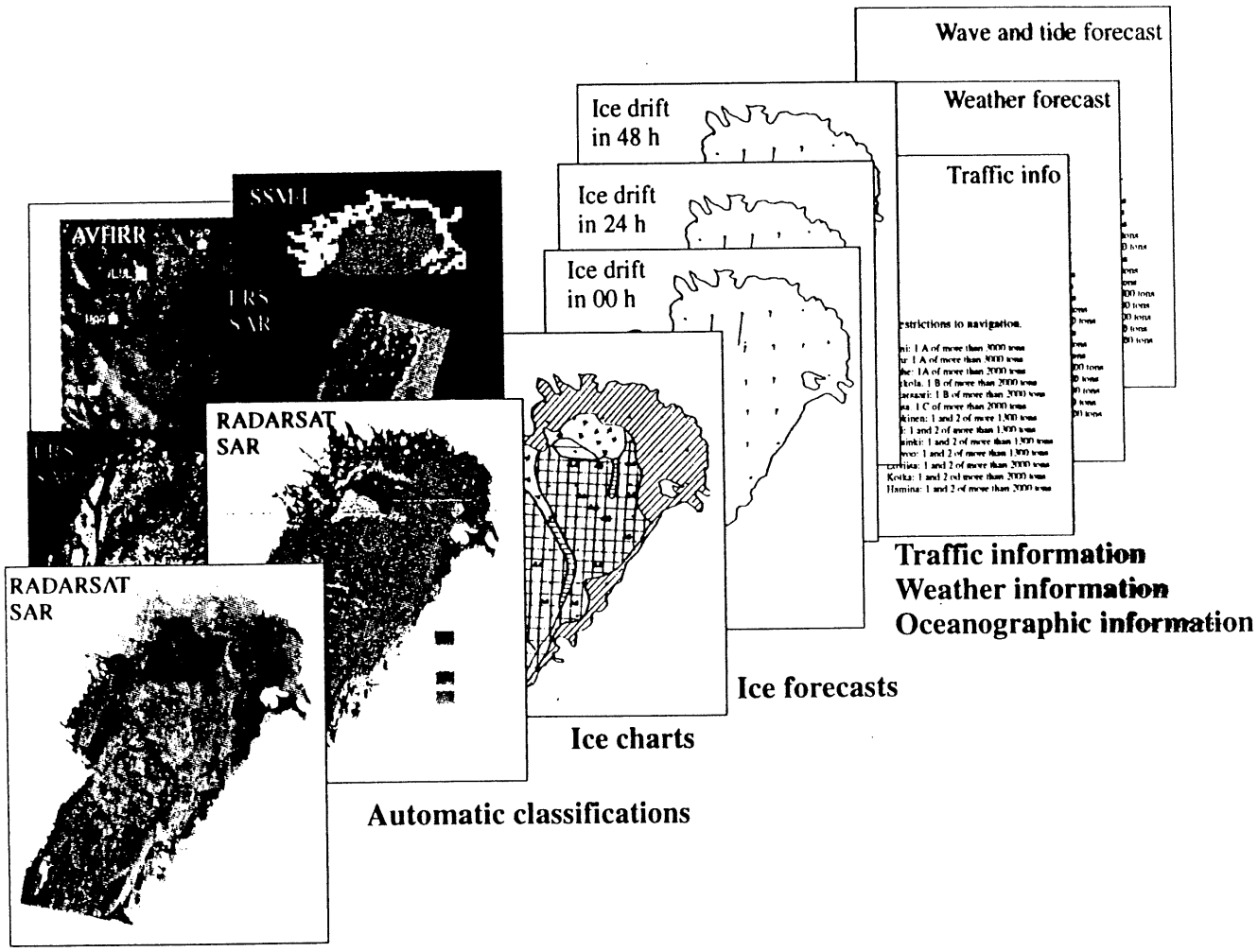
Annex 12

Operational Sea Ice Monitoring by Satellites in Europe
(CEC-DGXII, ENV. Contact no. ENV4-CT96-0329. Partners: NERSC, FIMR, DMI)

OSIMS RECOMMENDATIONS FOR OPERATIONAL ICE MONITORING

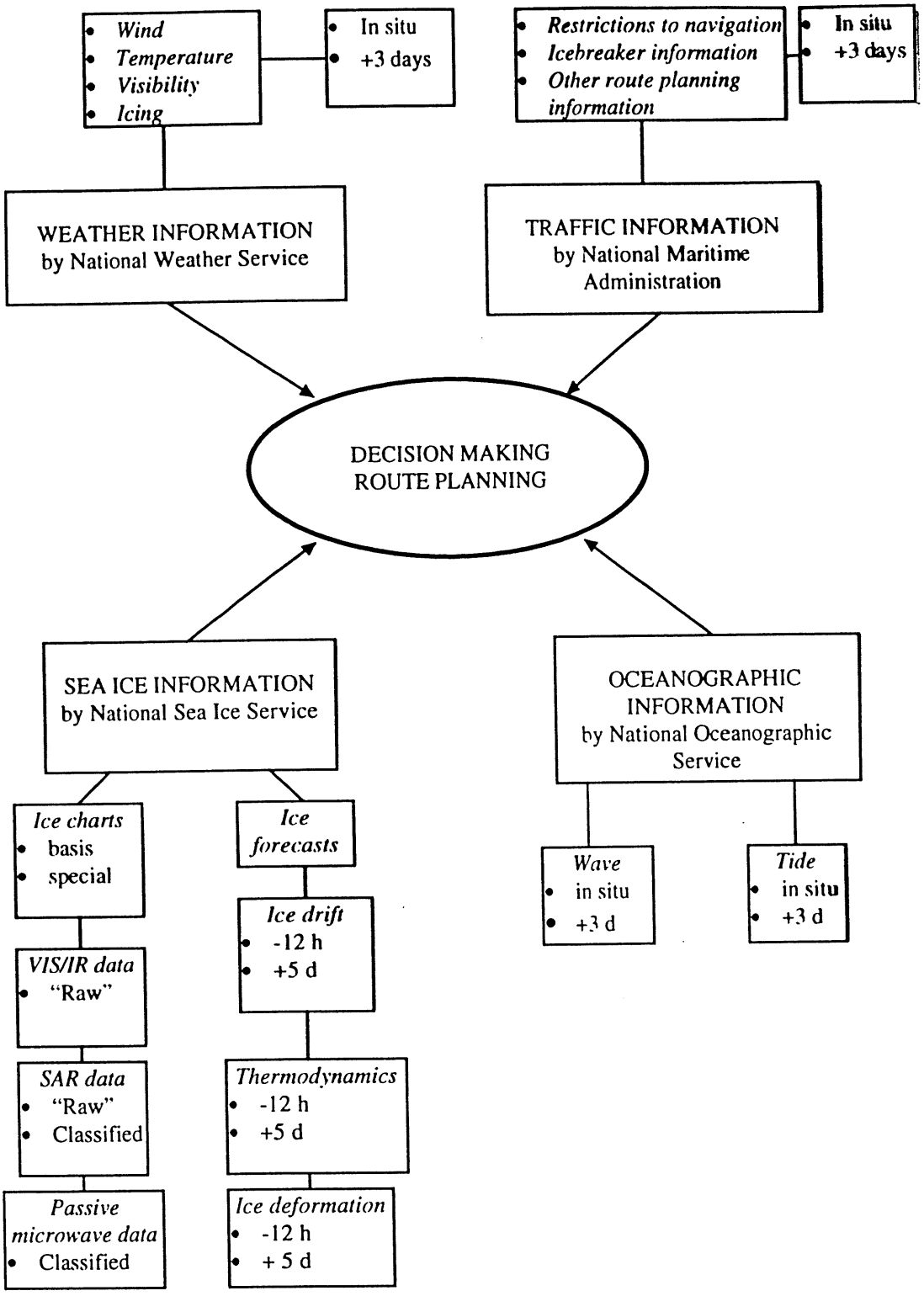
- Access to combination of SAR, optical and passive microwave sensors from satellites
- Long-term access to satellite data
- Number of satellites in orbit sufficient to ensure coverage, i.e. at last once a day
- Sufficient number of receiving stations to ensure real-time SAR data from all ice areas
- High speed computer link from receiving stations and ice centres/services
- Streamlining of SAR processing at receiving stations and ice centres/services
- Possibility of onboard processing and direct downlink of SAR data to users
- Investigate the possibility of including ice information in ECDIS and/or other computer based systems onboard ships
- Standardisation of digital ice products
- Adopt new faster communication systems for distribution of ice products
- Increase co-operation between ice centres/services to ensure optimal data handling and distribution

Annex 13



Example of potential sea ice information presentation on ship's computer.
Original RADARSAT data © Canadan Space Agency/ Agency spatiale canadienne, classification © FIMR, 19
original ERS data © ESA, classification © FIMR, 1997; AVHRR data © NOAA 1997, original SSM/I data
© NASA/ MSFC, classification © TUD, 1998.

Annex 14

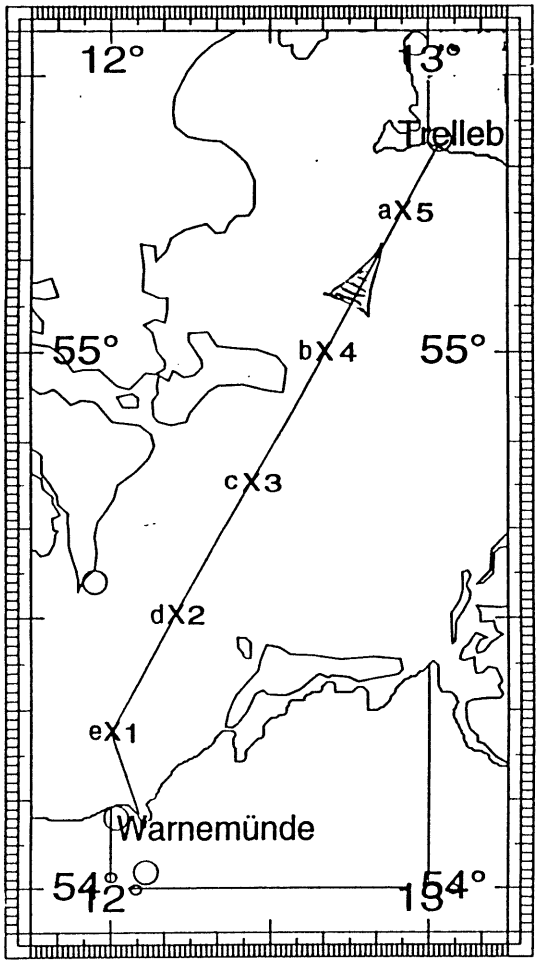


Overall future European ice monitoring system: external information for navigation decision making.

Annex 15

DWD Info System FERRY

Voyage Forecast



MS MECKLENBURG-VORPOMMERN
Departure: Jan 20, 0630 LT, Trelleborg
Arrival ETA: Jan 20, 1210 LT, Warnemünde Mole
Assuming Average Speed 20 kt

No.	Position	Local Time	Wind [kt]	Wind Waves [m]	Swell [m]	Current [kt]
1	55 10 N 12 55 E	Jan 20 0700		1.5 6s/20	2.4 9s/30	4.5
2	54 55 N 12 40 E	Jan 20 0810		1.2 6s/20	2.8 10s/35	1.9
3	54 40 N 12 30 E	Jan 20 0920		1.0 5s/15	2.4 12s/35	0.0
4	54 30 N 12 20 E	Jan 20 1030		0.8 3s/10	1.4 14s/40	0.8
5	54 15 N 12 10 E	Jan 20 1140		0.5 3s/10	0.0	1.7

Based on Numerical Forecasts supplied by DWD and BSH Jan 20, 0000 UTC

Warnings	Traffic	Navigation

- the head of the main department;
- the department manager;
- people from the communication centre;
- any present partners of the participants;
- the conference secretary;
- Margriet Jelgerhuis, PR *RIZA*.

Wednesday afternoon 27 May 14.00h-15.30h.
Visit to *RIZA*'s Communication Centre.

Thursday afternoon 28 May
Sightseeing Lelystad
14.00h - 15.30h Visit to the *Houtribsluizen* (contact *RDIJ* on this, Klaas Wierenga)
15.30h - 17.00h Visit to the *Bataviawerf* under the guidance of English-speaking guides

Transport on Tuesday, Wednesday and Thursday to be arranged by *Congresbureau Flevoland (Vloettax)*

Timetable

09.00h - 10.30h	meeting
10.30h - 11.00h	coffee break
11.00h - 12.30h	meeting
13.00h - 14.00h	lunch
14.00h - 15.45h	meeting
15.45h - 16.45h	coffee break
16.45h - 18.00h	meeting

Conference room
A U-shaped arrangement with sufficient presentation space at the open end of the U.
Conference room is 75m².
Outside the room there is space for a printer and 2 pc's provided with Internet (*RIZA*).
There are copying facilities in the Hotel Mercure and at *Congresbureau Flevoland.*
The conference room will have a logo wall made up by the map of the Baltic Sea area with the logos of the participating institutes (*RIZA*).
A-V aids in the conference room: overhead, slide projection and video projection by means of beamer VHS recorders (2).
All participants will be provided with national flags as well as name plates.
The participants will also receive badges, writing pads and extensive information about Lelystad.
It will be examined whether there is enough space for flags of the countries of origin of the participants.

Invitation
Mr Klaus Strübing will bring the file of participants up to date and will send a preliminary communication mid-November. Herein also the question will be asked whether anybody would like to make any special wishes known with respect to the programme. 11.12.97 ✓
The final invitation will follow by the end of January 1998. In any case will be included:
- information about *RIZA*;
- information public transport and map of Lelystad;

- information Hotel Mercure Lelystad;
- final programme.

Report
Congresbureau Flevoland supplies the conference with a secretary who is able to make a report during these days in such a way (English) that, in cooperation with the chairman, a draft report can be presented on Friday morning. Participants may comment on this protocol till the end of June.

Publicity
Together with Margriet Jelgerhuis (PR *RIZA*) it will be examined how the publicity around the conference can take place. We can think of press releases, for instance *Profiel*, but also of the local and regional press.

Miscellaneous
- In the initial period to the conference Alfred Dijkstra will examine whether it is possible to reserve capacity on the Internet pages of *RIZA* for coverage of the conference..
- Photographs of the participants will be taken at the beginning of the conference to give to them (photographer *RIZA*).

Follow up appointment
At *RIZA* on 12 January 1998 at 13.30h.
Present: - Klaas Wierenga, Margriet Jelgerhuis, Alfred Dijkstra (*RIZA*);
- Marian Balgobind (*Congresbureau Flevoland).*
Subjects: - final invitation;
- publicity;
- budget of the conference.

Marian Balgobind is the contact of *Congresbureau Flevoland*, to be reached by telephone, fax and e-mail of *Congresbureau Flevoland*, telephone Agora (0320 239230), fax Agora (0320 239231) and private telephone/fax (0320 226008).

Bundesamt für Seeschiffahrt und Hydrographie

BSH · Postfach 30 12 20 · 20305 Hamburg

Datum 15. Dezember 1998
Durchwahl (040) 3190 - 3120

To the
Participants
of the
19th Baltic Sea Ice Meeting (BSIM-19)

Aktenzeichen (bitte bei Antwort angeben)
V526/98 M12

Telefax: 49-40-3190-5032
E-Mail: klaus.struebing@bsh.d400.de

Final Report

Dear Colleagues:

Recently you received the **Final Report of BSIM-19, Lelystad, 25 to 29 May 1998** from Mr. Klaas Wierenga of RIZA heading local organizing committee. I would like to thank him and his staff on the opportunity of the time of sending Season Greetings for the extraordinary hospitality and effort on behalf of the Meeting. Nevertheless, it had to be stressed that you really received the final version of the Report, because the cover sheet still says *Draft Report*. As a minor 'Christmas present' I have enclosed a label, by which this can be ... überklebt....

Furthermore, please find attached a Preprint of our report on the ice season 1997/97.

Finally, I would like to wish you and your colleagues and families a

Merry Christmas and a ***Good New Year***

as well as a good ice season 1998/99.

Sincerely

Klaus Strübing,
acting BSIM-18 chairman

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Reference
V526/00 M12

20th Baltic Sea Ice Meeting (BSIM-20)

Dear Sir:

The Baltic Sea Ice Meeting (BSIM) is a long-term institutional meeting of representatives of the Ice and Icebreaker Services of the countries bordering the Baltic Sea including The Netherlands and Norway as well as of the World Meteorological Organization (WMO).

On its 19th Meeting in Lelystad, the participants noticed with appreciation Dr. Janis Kostjukov's informal announcement that the next (20th) Meeting could be performed in Riga by the Latvian Hydrometeorological Agency. To avoid overlapping with other relevant events, the Meeting suggested the last week in September 2000 as preliminary date.

In order to prepare BSIM-20 in due time, I herewith would like to express to you that it will be a great honour and pleasure for BSIM to perform the 20th jubilee meeting in the old and representative HanseCity Riga. An official invitation for the relevant institutions would be welcomed very much.

Personally, I would like to assure any possible assistance to the local organizer in the preparation of the Meeting.

For BSIM
Yours sincerely

Klaus Strübing,
Acting Chairman

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Brief report of the preparatory meeting "Baltic Sea Conference" on 14 November 1997. *RIZA* (Institute for Inland Water Management and Waste Water Treatment) Lelystad

Present: - Klaus Strübing, chairman Baltic Sea working group;
- Klaus Wierenga, *RIZA*;
- Alfred Dijkstra, BC 2000 *RIZA*;
- Marian Balgobind, *Congresbureau Flevoland.*

It is decided to organize the conference from Monday 25 May till Friday 29 May 1998. Arrival on Monday at approx. 13.00h.
Beginning at 13.30h with a welcoming speech by the Head of *RIZA,* Mr A. van Bennekom.
Departure on Friday at approx. 13.00h.

As basic accommodation Hotel Mercure Lelystad, Angoraweg 11, 8224 BZ Lelystad has been chosen, telephone 0320 242444.
Meanwhile 25 rooms have been booked there. A number of rooms allow for double use in case any partners wish to come.

In principle hotel expenses are for account of the guests. *RIZA* pays for the rent of the conference room and catering during the day (A-V aids etc.).
Dinner is for account of the guests.

Representatives of the following countries are invited:
- Norway
- Sweden
- Finland
- Russia
- Estonia
- Latvia
- Lithuania
- Poland
- Germany
- Denmark
- The Netherlands
- The Dutch Coastguard.

The organization is of the opinion that finances should not form an impediment for the participation of Russia, Estonia, Latvia and Lithuania. The accommodation expenses in Hotel Mercure will be paid by the Dutch government. In the final invitation it will be incorporated that reimbursement of travelling expenses may be applied for, if necessary.

Programme

On Tuesday evening 26 May there will be an official dinner in the restaurant of the *Marina Jachthaven* in Lelystad. Participants will be able to make a choice between meat, fish and a vegetarian menu. In addition to the participants the following people will also be invited for dinner:
- the mayor of Lelystad, Mr Chr. Leeuwe;
- the Head of *RIZA*, Mr A. van Bennekom;

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An/To

INSTITUTION:	**Latvian Hydrometeorological Agency, Riga**
z.H./attn:	**Dr. Janis Kostjukov**
REFERENCE:	**Today's E-Mail**
TELEFAX-No.:	**00371 71 45154**

Von/From

NAME: **Klaus Strübing** **TELEFON: -3120**
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REFERENCE: **V5240/00 M12**

DATUM/DATE: **2000-04-12**

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BSIM-20 Activities

Dear Janis:

In addition to my e-mail please find attached the mentioned letter to your director. In order to avoid further time delay I kindly ask you to pass it with my apologies that the ‚yellow mail' did not work. As I have to be off until coming Monday (inclusive), please use my private e-mail in case of urgent problems (anke.u.klaus.struebing@t-online.de). Furthermore I will provide next week a draft agenda.

Best regards

Klaus