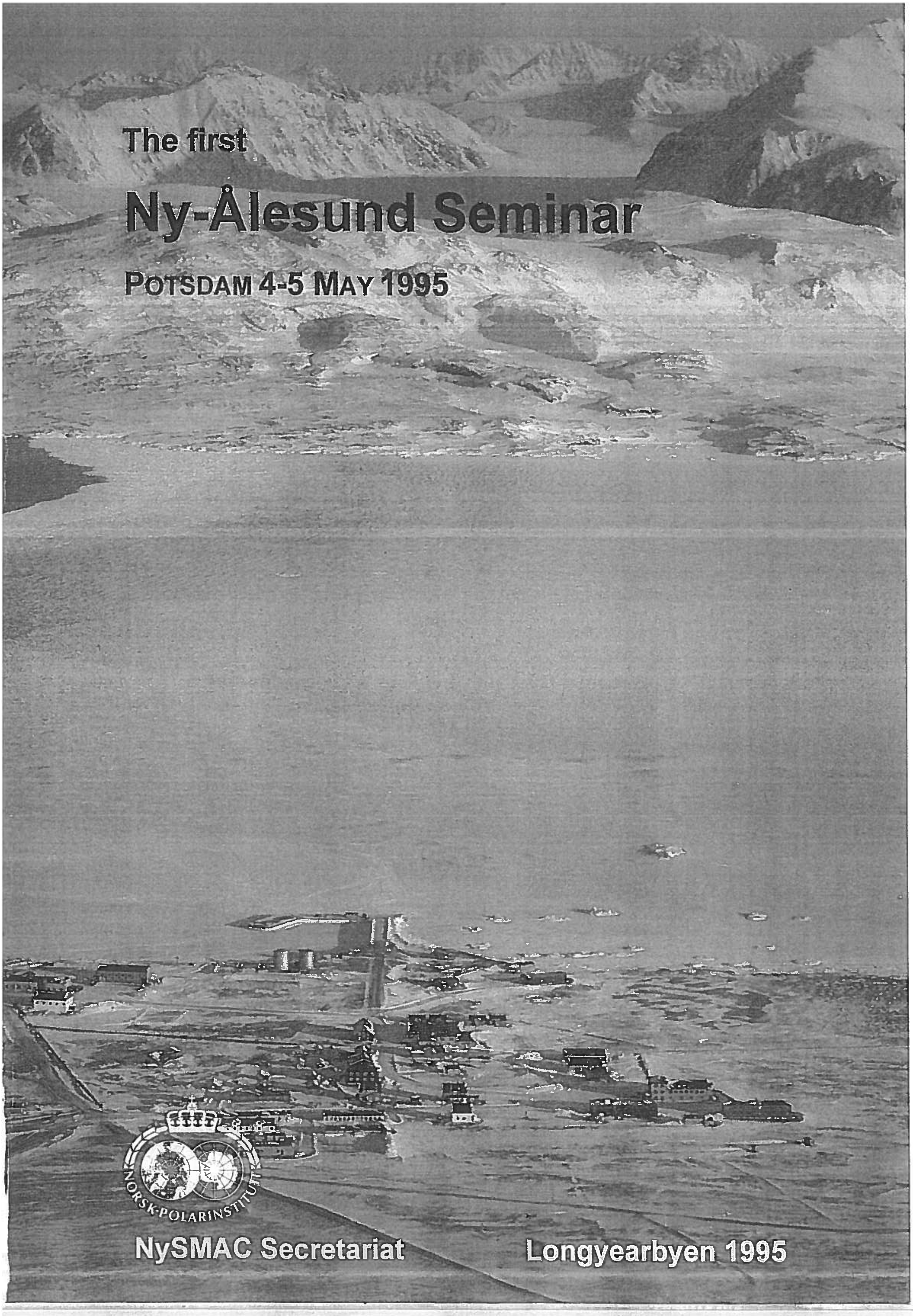
The first

Ny-Ålesund Seminar

POTSDAM 4-5 MAY 1995



NORSK·POLARINSTITUTT

NySMAC Secretariat

Longyearbyen 1995

NY-ÅLESUND

THE EUROPEAN ARCTIC ENVIRONMENTAL RESEARCH AND MONITORING STATION

The polar regions are key areas for studies of global change, and give unique opportunities for fundamental research in several disciplines. The European Arctic is the last large area of Europe with undisturbed ecosystems.

Within the European Arctic, the Ny-Ålesund research station on Svalbard is unique in its combination of high latitude localisation (79° N), easy accessibility (commercial flights almost daily with connection to Norway via Longyearbyen, access by ship much of the year), and well-developed infrastructure with highly specialised research facilities. In addition, Ny-Ålesund has prime location for environmental research such as climate change, long-range transportation of pollutants and conservation biology. The anthropogenic impacts on the surrounding environment are kept at a low level, and the ecosystems are to a large extent intact.

The Svalbard Treaty ensures equality of treatment of scientists from all member nations. Norwegian authorities welcome foreign research institutions to Ny-Ålesund. Germany, Great Britain and Japan have established national stations, and Italy plans to establish a station in 1995/96. Numerous European research groups and institutions run programmes in co-operation with the national stations. At present 150 persons can be accommodated in Ny-Ålesund.

The Norwegian aim is to make Ny-Ålesund into the leading high-Arctic environmental research and monitoring station, where scientists from many different countries and institutions collaborate on research programmes and utilise common research facilities and infrastructure.

Ny-Ålesund was built as a coal mining town 50 years ago. This activity ceased in 1962 after a severe accident in the KBKC mines. The first research station was established by the Norwegian Polar Institute (NP) in 1968, when the European Space Research Organisation (ESRO) opened a satellite telemetry station in Ny-Ålesund. The ESRO-station closed in 1974, and the small NP research station was the only remaining activity, apart from necessary maintenance work carried out by 3-4 persons working for KBKC.

However, research activities increased and NP moved into new facilities in 1982. In 1990, the atmospheric station at the Zeppeliner mountain (460 m a.s.l.) was opened and new buildings were taken into use. The Norwegian Mapping Authority (NMA) has in 1995 established a Geodetic Station in Ny-Ålesund based on GPS and a radio telescope (Very Long Baseline Intereferometry Antenna - VLBI - 25 m in diameter). The Andøya Rocket Launching Station plans to establish a facility at Ny-Ålesund to study the upper atmosphere.

The Alfred Wegener Institute for Polar and Marine Research (AWI), the National Research Council in Great Britain (NERC), and The Japanese National Institute for Polar Research (NIPR) all have their own stations in Ny-Ålesund. AWI has recently moved into a new specially constructed building. Other nations also plan stations, and several institutions from different countries run programmes in co-operation with the national institutions having infrastructure to their disposal. The Norwegian Parliament has decided that Ny-Ålesund shall be the main base for research in Svalbard and that other activities in Ny-Ålesund should be subordinated to research.

Ny-Ålesund offers at present accommodation for up to 150 persons in modern facilities. Available research installations include:

- wet and dry laboratories, and a marine biological laboratory
- electronic workshops and special rooms and buildings for electronic equipment and instruments for ionospheric, stratospheric and tropospheric research
- atmospheric station at mountain location above the inversion layer (gondola access), ensuring minimum impacts from local pollution sources
- radiotelescope for research in astronomy and geodetic observatory
- modern data equipment, with connection to the international data network (internet)
- modern telecommunication connections
- logistic support, i.e. field equipment, boats, snow-mobiles
- offices
- storage rooms

The station has two main purposes:

1. Observatory for long-term registrations of the physical and biotic environment.
2. Laboratory and research facilities for visiting scientists

Ny-Ålesund as an observatory

- **Auroral observatory**: Riometer (Meteorological Institute in Denmark), imaging riometer (University of Nagoya, Japan), VLF recorder (U. Tokyo), fluxate magnetometer (U. Tokyo), Magnetometer (U. Tromsø, Norway), SDRS scintillometer (Phillips laboratory, USA), all-sky camera and video camera (U. Oslo), scanning spectrophotometer (U. Oslo), ionosounder (U. Mass., USA/U. Oslo)

- **Climate and meteorological observatory**: SAOZ - ozon in the stratosphere (Norwegian Institute of Air Research - NILU), sun radiation and albedo, long and short wave at two sites (NP,NIPR, AWI), ultrasonic detector for detection of polar low pressures (NP), Dobson spectrophotometer - ozon in the stratosphere (NP/U. Oslo), ozon sonde once a week (AWI), 2 Lidars for atmospheric research (Network for Detection of Stratospheric Change, AWI), standard meteorological parameters 3 times pr. day approx. at sea level and at 460 m a.s.l. (Meteorological institute of Norway, NIPR, AWI, NILU), aerosols in air (NILU, Meteorological Inst., Stockholm U. - MISU), ozon in the troposphere (NILU), greenhouse gasses: CFC's, NH4, CO2, isotopes of O2 and C (NILU, MISU, U. Boulder, Colorado, NIPR), fog/cloud detector (MISU), cloud radar (NIPR).

- **Long range transportation of pollutants**: Pollutants in precipitation: acidity, SO4, NO3, NH3, Ca, K, Mg, Na, Cl, radionuclides, isotopes of O and C (NILU), radioactivity in air (automatic station), ozon and greenhouse gasses as mentioned above, Hg in air, SO2 in air, aerosols, PANalyzer - peroxyacetyl nitrat in air (all NILU), torpospheric ozone (NIPR), NOX in the stratos- and troposphere, different instruments (NILU, U. Alaska), PUR-samplers for pesticides in air (DDT, PCB,etc., NILU), aldehyde (NILU), aethalometer for countings of soot particles.

- **Others: Seismograph**-station in the international network for detection of earthquakes (U. Bergen, Norway/AWI), reference station for **GPS satellites** (Tromsø satellite telemetry station), reference station for **SPOT satellites** (Institut Geographique National, France), **hydrology** - two stations for registrations of sediments and water flow in rivers (NVE), permafrost (Norwegian Hydrological Laboratory, SINTEF), **arctic fox** physiology (NP), continental drift, tidal water, **geodetic observatory** (NMA).

Many visiting scientists conduct field studies in such disciplines as **biology, hydrology, permafrost, glaciology, geology, sedimentation** throughout the year.

The Ny-Ålesund Science Managers Committee - NySMAC
Due to the extensive research activities and the great interest in using Ny-Ålesund as an international platform for environmental research and monitoring in the Arctic, the need for enhanced co-ordination and co-operation has emerged. To answer this need the Ny-Ålesund Science Managers Committee (NySMAC) was established in August 1994, involving all major parties with vested interests at Ny-Ålesund. NySMAC is a non-bureaucratic body with no mandate to approve or disapprove projects. The Committee has the following purpose:

- Contribute to the development of Ny-Ålesund as an internationally recognised site for Arctic research

- Avoid negative impacts on research programmes from other activities at Ny-Ålesund

- Minimise and mitigate environmental impacts of scientific activity conducted from Ny-Ålesund

- Encourage co-operation between scientists and institutions present at Ny-Ålesund

- Avoid unnecessary overlap of research programmes and negative competition between scientific institutions.

The Ny-Ålesund Seminar
At regular intervals, NySMAC intends to convene a Ny-Ålesund Seminar among scientists running research programmes or having an interest in Ny-Ålesund. The first Ny-Ålesund Seminar in Potsdam May 4-5 1995 is hopefully the first in a row of seminars focusing on research at Ny-Ålesund and contributing to promote the place as an internationally leading Arctic research station.

Future development and challenges
The aim is to make Ny-Ålesund into the internationally recognised Arctic environmental research and monitoring station, where European scientists and research groups can conduct high-quality research and monitoring of the natural environment.

Ny-Ålesund has most of the qualities to achieve this goal:

The high northern latitude is ideal for research on and monitoring of ozone depletion and the greenhouse effect (atmospheric chemistry), and to detect the finger-prints of climate change. Glaciers and sediments are archives of the past climate. Processes of great significance to the European climate, such as fluxes of cold water and ice out from the Polar Basin and creation of deep-bottom water in the Greenland Sea, take place around Svalbard, which is a bifurcation point for the ocean currents.

Ny-Ålesund may be characterised as a modern research station in a clean, natural laboratory. The ecosystems are simple and close to the natural situation, as human effects on the environment are minor. Local pollution sources are near-negligible. The excellent conditions for research on basic ecological and evolutionary processes may provide knowledge that has more general applications in understanding ecological theory and principles.

However, both ocean currents from south and north, riverine input from the Eurasian continent, and mid-altitude atmospheric winds, bring pollution in from the heavy industrialised areas of central Europe and eastern USA. Conditions for research on and monitoring of global pollution (transport, effects and levels) are therefore excellent, as they are in many other fields.

The Svalbard Treaty guarantees individuals from member nations equal rights of access to Svalbard for research purposes. A similar situation does not exist elsewhere in the Arctic. Svalbard's combination of remoteness, high latitude, easy accessibility, well-developed infrastructure and research facilities, and openness to foreign research institutions is unique.

Ny-Ålesund Seminar

Schedule and Programme

Thursday 10.00 to 19.00 on 4 May 1995

10.00 **Opening of the Ny-Ålesund Seminar**
Prof. Dr. M. Tilzer, Director General of AWI

SESSION I

Ny-Ålesund - On-going research, its organisation and administration

chairperson: *Dr. Hajime Ito (NIPR)*

10.15 Ny-Ålesund as an international Arctic station for environmental research and monitoring
Pål Prestrud

10.45 Overview on research activities at Ny-Ålesund
Members of NySMAC

11.15-11.30: Coffee break

11.30 Data bases, standard observations and international networks at Ny-Ålesund (presentations by 10 min. each)

NILU data base and the Network for Detection of Stratospheric Change
Geir Ole Braathen

The meteorological information system at AWI (MISAWI) archiving and accessing data from Ny-Ålesund
Gert König-Langlo

Developing the data bases for meteorological observations, upper air soundings and radiation measurements at Ny-Ålesund
Gert König-Langlo

Ny-Ålesund in the EMEP network (European network for monitoring pollution)
Frode Stordal

Ny-Ålesund in the geodetic network - VLBI
Bjørn R. Pettersen

Ny-Ålesund in the seismological network
Alfons Eckstaller

The geographical information system (GIS) at Ny-Ålesund
Stefan Norris

12.45-13.00: Open discussion on presentations in session 1.

13.00-14.00: Lunch break

Ny-Ålesund Seminar
Schedule and Programme

<u>Thursday 10.00 to 19.00 on 4 May 1995</u>

SESSION II

Ny-Ålesund - Scientific results

II / 1: Atmospheric sciences

chairperson:*Hartwig Gernandt (AWI)*

14.00	Contributions from the Koldewey-Station to the Network for the Detection of Stratospheric Change (NDSC) *Otto Schrems*
14.15	NILU atmospheric research at Ny-Ålesund (tentative title) *Geir Ole Braathen*
14.30	Measurements of tropospheric and stratospheric trace gases by absorption and emission spectroscopy in IR and UV-vis *Justus Notholt*
14.45	Lidar and balloon measurements - Lidar observations over Alaska and Ny-Ålesund (tentative title) *<u>Yasu-Nobu Iwasaka</u>, T. Shibata*
15.00	Lidar observation of Polar Stratospheric Clouds over Ny-Ålesund (tentative title) *<u>Motowo Fujiwara</u>, Yasu-Nobu Iwasaka*
15.15	Multi-wavelength Lidar measurements of stratospheric aerosols *Georg Beyerle*
15.30-15.45:	**Coffee break**
15.45	A Langrangian Approach to Separate Stratospheric Chemical Ozone Loss from Dynamic Effects: Results for the Arctic Winters 91/92 and 94/95 (MATCH) *Markus Rex et al.*
16.00	Tropospheric trace gases (tentative title) *Frode Stordal*
16.15	NIPR atmospheric observations at Ny-Ålesund (tentative title) *Takashi Yamanouchi*
16.30	Aerosol Optical Depth Measurements at Spitsbergen with Sun and Moon as Light Sources *Andreas Herber*
16.45	First BSRN results: Bipolar parameterisation of the downward long-wave radiation at the Earth's surface *Gert König-Langlo*
7.00-17.15:	**Break**

Ny-Ålesund Seminar

Schedule and Programme

Thursday 10.00 to 19.00 on 4 May 1995

SESSION II

Ny-Ålesund - Scientific results

II / 2: Ecosystem studies

chairperson: *Terry V.Callaghan (University of Sheffield)*

17.15	The Terrestrial Ecological Research Program in Svalbard - Studies at Ny-Ålesund *Sven Axel Bengtson*
17.30	Photoinhibition of photosynthesis as an acclimation strategy to high light stress in marine macroalgae *Dieter Hanelt*
17.45	Barnacle Geese at Ny-Ålesund *Maarten J.J.E.Loonen*
18.00	Seabird research at Ny-Ålesund *Geir Wing Gabrielsen*
18.15	Experiences of long-term studies at the marine laboratory (Nansen lab.) at Ny-Ålesund *Michael Schmid*
18.30	Resume on the UK biology activities (tentative title) *Nick Cox or A.C. Stainthorpe*
18.45	Botanical studies in Ny-Ålesund (tentative title) *Terry V. Callaghan*
19.00:	**Reception for seminar participants in the AWI building.**

Ny-Ålesund Seminar
Schedule and Programme

Friday 9.00 to 14.00 on 5 May 1995

SESSION II

Ny-Ålesund - Scientific results

II / 3: Long-range transport of pollutants and geodetic sciences

chairperson: *Frode Stordal (NILU)*

9.00	CO2 variability on Spitsbergen in relation to sources, sinks and long-range transport *Kim Holmen*
9.15	Air-borne persistent organic pollutants in the Arctic *John-Erik Haugen*
9.30	Persistent organic pollutants and heavy metals in the Ny-Ålesund environment *Geir Wing Gabrielsen*
9.45	Initial results of the Space Geodetic Observatory at Ny-Ålesund *Bjørn R. Pettersen*
10.00-10.30:	**Coffee break**

SESSION II

Ny-Ålesund - Scientific results

II / 4: Glaciology and geomorphology

chairperson: *Johan Ludvig Sollid (University of Oslo)*

10.30	Glacial and periglacial geomorphology studies at Ny-Ålesund *Johan Ludvig Sollid*
10.45	Permafrost geophysical studies at Ny-Ålesund *Daniel Vonder Mühll*
11.00	Glacier studies at Ny-Ålesund *Kjetil Melvold*
11.30-12.00:	**Coffee break**

Ny-Ålesund Seminar

Schedule and Programme

Friday 9.00 to 14.00 on 5 May 1995

SESSION III

Future development and challenges

chairperson: *Bjørn Frantzen (NP)*

12.00	National contributions and research topics to the International Arctic Research Centre Ny-Ålesund
	Comments on future plans for development of the Space Geodetic Observatory *Bjørn R. Pettersen*
	Plans for ornithological research *Rudolf Bannasch*
	Other national contributions
12.30	A strategic plan for the development of Ny-Ålesund into a leading international arctic environmental research and monitoring station Ny-Ålesund as a Large Scale Facility and other Proposal to the EU's 4th framework *Pål Prestrud*
13.15	Final discussion
14.00	**End of 1st Ny-Ålesund Seminar**

1st Ny-Ålesund Seminar, Potsdam 4-5 May 1995

List of Participants

Nr.	Name	Institute	Nation
1.	Dr.Bannasch, Rudolf	Technical Univ. Berlin, Ackerstr. 71-76 13355 Berlin	G
2.	Prof. Dr. Bengtson, Sven Axel	Dept. of Zoology, University of Lund Helgonav.3 22362 Lund	S
3.	Dr. Beyerle, Georg	AWI Potsdam	G
4.	Dr. Braathen, Geir Ole	Norwegian Institute for Air Research P.O.Box: 100, Institutveien, 2007-Kjeller	N
5.	Dr. Callahan, Terry	University of Sheffield Sheffield Centre for Arctic Ecology Department of Animal and Plant Sciences Tapton Experimental Gardens 26 Taptonville Road Sheffield SIOSBR	UK
6.	Dr. Cox, Nick	Natural Environmental Research Council Merlewood Research Station Grange- Over- Sands, Cumbria, LAII 6JU	UK
7.	Dr. Eckstaller, Alfons	AWI Bremerhaven	G
8.	Frantzen, Bjørn	Norwegian Poar Institute, P.O. Box: 505 9170-Longyearbyen	N
9.	Prof. Dr Fuhr, Günter	Humboldt-Universität Berlin, Invalidenstr.43 10115 Berlin	G
10.	Prof. Dr. Fujiwara, Motowo	Dept. of Applied Physics, Fukuoka Univ. Jonan-ku, Fukuoka 814-01, Japan	J
11.	Dr. Gabrielsen, Geir Wing	Norwegian Polar Institute, Storgata 25 9001 Tromsö	N
12.	Dr. Gathen, Peter von der	AWI Potsdam	G
13.	Dr. Gernandt, Hartwig	AWI Potsdam	G
14.	Dr. Hanelt, Jürgen	AWI Bremerhaven	G
15.	Hanssen, Hinrich	Institute for Polar Ecology Wischhofstr. 1-3 24148 Kiel	G

16.	Dr. Haugen, John-Erik	Norwegian Institute of Air Research P.O.Box: 100 2007-Kjeller	N
17.	Dr. Herber, Andreas	AWI Potsdam	G
18.	Dr.Holmen, Kim	Dept. of Meteorology, Arrhenius Laborat. Stockholm Univ., 10691-Stockholm	S
19.	Dr.Ito, Hajime	National Institute of Polar Research 1-9-10 Kaga, Itabashi-ku, Tokyo 155	J
20.	Prof. Dr. Iwasaka, Yasu N.	Solar Terrestrial Environment Lab. Nagoya University, Chikusa-ku, Nagoya 464	J
21.	Dr. Kielland, Gabriel	Norwegian Pollution Control Authority, P.O. Box: 8100 Dep. 0032-Oslo	N
22.	Dr. König-Langlo, Gert	AWI Bremerhaven	G
23.	Dr. Kriews, Michael	AWI Bremerhaven	G
24.	Dr. Lehmann, Ralph	AWI Potsdam	G
25.	Lilischkis, Rainer	AWI Potsdam	G
26.	Dr. Loonen, Maarten	Zoological Laboratory, Univ. of Groningen P.B. 14 9750 Groningen	NL
27.	Mayer, Michaela	Institute for Polar Ecology Wischhofstr. 1-3, 24148 Kiel	G
28.	Meier, Arndt	AWI Telegrafenberg	G
29.	Dr. Melvold, Kjetil	Dept. of Physical Geography P.O. Box: 1042 Blindern, 0316 Oslo	N
30.	Dr. Neuber, Roland	AWI Potsdam	G
31.	Norris, Stefan	Norwegian Polar Institute P.O. box 505, 9170 Longyearbyen	N
32.	Dr. Notholt, Justus	AWI Potsdam	G
33.	Dr. Ørbæk, Jon Børre	Norwegian Polar Institute Middelthunsgt. 29, P.O. Box: 5072 Majorstua 0301 Oslo	N
34.	Dr. Pettersen, Bjørn R.	Geodetic Institute , Norwegian Mapping Autority, 3500-Honefoss	N
35.	Dr. Prestrud, Pål	Norwegian Polar Institute, P.O.Box: 5072 Majorstua, 0301-Oslo	N
36.	Rex, Markus	AWI Potsdam	G
37.	Dr. Rinke, Annette	AWI Potsdam	G

38.	Prof. Dr. Rønning, Olaf Inge	University of Trondheim, Botanic Dept. Rognersvingen 3 7055-Dragvoll	N
39.	Dr. Schmid Michael	Institute for Polar Ecology Wischhofstr. 1-3, 24148 Kiel	G
40.	Prof. Dr. Schrems, Otto	Alfred-Wegener-Institute P.O. Box: 12 01 61, 27515 Bremehaven	G
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42.	Dr. Schwarz, Günter	AWI Potsdam	G
43.	Dr. Shibata, Takashi	Solar Terrestrial Environment Nagoya Univ., Chikusa-ku, Nagoya 464	J
44.	Prof. Dr. Sollid, Johann L.	Dept. of Physical Geography P.O. Box: 1042 Blindern, 0316 Oslo	N
45.	Dr. Stackebrandt, Werner	Landesamt für Geowissenschaften und Rohstoffe Brandenburg (Geological Survey of Brandenburg) Stahnsdorfer Damm 77 14532 Kleinmachnow	G
46.	Dr. Stainthorpe, Andy	National Environmeeent Research Council Polaris House, North Star Avenue Swindon, SN 2 IEU	UK
47.	Larsen, Elisabeth Stoltz	Norwegian Polar Institute, P.O. Box: 505, 9170-Longyearbyen	N
48.	Dr. Stordal, Frode	Norwegian Institute for Air Research P.O.Box: 100, Institutveien, 2007-Kjeller	N
49.	Prof. Dr. Tilzer, Max	AWI Bremerhaven	G
50.	Torhaug, Inge Anton	Kings-Bay-Kull Company 9173 Ny Ålesund	N
51.	Dr. Vonder Mühll, Daniel	Versuchsanstalt für Wasserbau, Hydrologie, Glazialogie, VAW A 18, Gloriastr. 37/39 ETH-Zentrum, CH- 8092 Zürich	CH
52.	Wittrock, Folkard	Institute of Environmental Physics Uni Bremen P.O.Box 330440 28334 Bremen	G
53.	Prof. Dr. Yamanouchi, Takashi	National Institute of Polar Research 1-9-10 Kaga, Itabashi-ku, Tokyo 155	J

Opening of the Ny-Ålesund Seminar

by Prof. Dr. Max M. Tilzer, Director of AWI

Welcome to the Alfred Wegener Institute in Potsdam!

Let me first briefly introduce our institute:
The Alfred Wegener Institute was founded in 1980 after Germany had joined the Antarctic Treaty. Starting off as a relatively small facility the institute now has a staff of about 470 people, more of 200 of them scientists. The Institute is funded 90% by the Federal Ministry of Science, Education, Research and Technology and 10% by provincial funds. In 1992 to the Institute which initially only was located in Bremerhaven the Potsdam Branch was added.

The main obligations of the Institute is (1) to conduct research in polar regions, to a small extent also in the ocean (mainly the North Sea), (2) to provide logistic support to other German and international institutions, (3) to give advice to the German government in issues concerning the polar regions. The annual budget is roughly DM 110 Mil. About 30% of the total founds are used for logistic facilities, the research vessels "Polarstern" and "Victor Hensen" and several stations in the Antarctic (Neumayer Station, Dallmann Laboratory, Filchner Station) and in the Arctic (Koldewey Station at Ny-Ålesund on Svalbard). Moreover the Institute has two research aircraft.

The institute conducts environmental research in the broadest sense of the word, the significance of the polar region for the earth system as a whole are in the centre of interest. Most of the research is multidisciplinary, at present the following main issues are being studied:

- The interaction between the atmosphere, the ocean and the kryosphere, especially with respect to the exchange of energy.
- Reconstruction of past climate developments from polar archives (ocean and lake bottom sediments, permafrost soils and polar ice-sheets)
- Polar marine ecosystems
- the polar atmospheres

During the first ten years of its existence emphasis was on the Antarctic regions, since then Arctic research has continuously gained importance. By now there is a rough balance between Arctic and Antarctic research. The important land-based facility for Arctic research is the Koldewey Station at Ny-Ålesund, Svalbard.

The Alfred Wegener Institute is happy to host the first Ny-Ålesund Seminar. Ny-Ålesund is a unique setting for co-ordinated international polar research in that it provides excellent working conditions, gives logistic support and is easily accessible. In order to increase efficiency and reduce costs of Arctic research, it is imperative to co-ordinate our efforts as closely as possible. The aim of our seminar is to give an overview of ongoing and planned research activities in the Ny-Ålesund area and to co-ordinate further research efforts.

The new geopolitical situation after the collapse of the Soviet Union and the increasing significance of research funding by the European Community sets the stage for Arctic research. Land-based research facilities allow long-term observations as well as process-oriented studies both on land and in near-shore marine environments. It is my hope that this will be the first in series of seminars at regular intervals in which the status of ongoing work is discussed as well as future joint research efforts. I would like to thank the organisers of the seminar and wish ourselves success.

SESSION I

On-going research, its organization and administration

Ny-Ålesund Seminar
Potsdam 4-5 May

SESSION I
On-going research, its organization and administration

Ny-Ålesund as an international Arctic station for environmental research and monitoring

Pål Prestrud

MOTIVATION FOR CONDUCTING POLAR RESEARCH

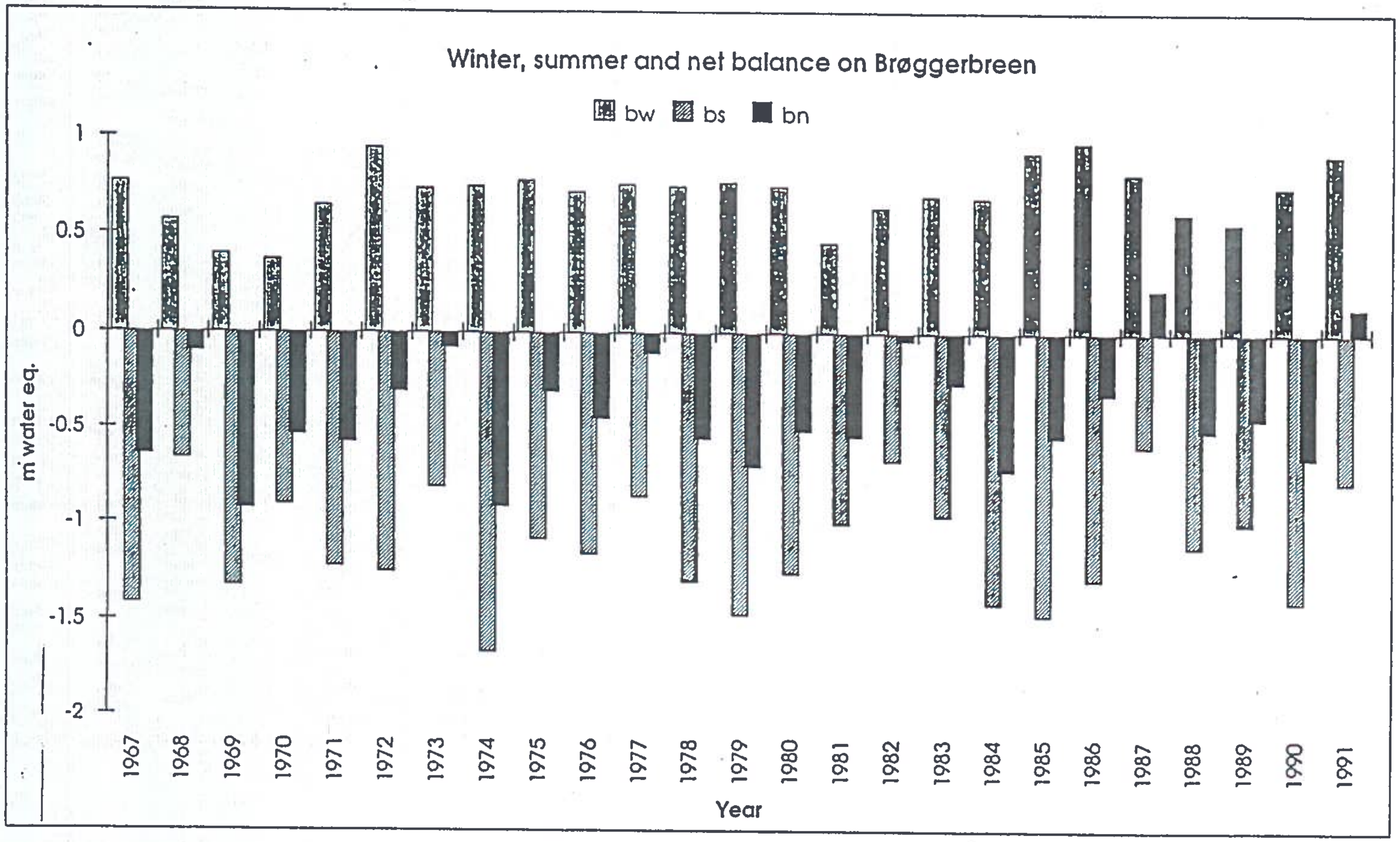
- BASIC/FUNDAMENTAL RESEARCH. ARCTIC AS CLEAN NATURE LABORATORY
- ENVIRONMENTAL CONSERVATION: GLOBAL CHANGE AND PROTECTION OF ARCTIC WILDERNESS AND UNSPOILED ECOSYSTEMS.
- EXPLOITATION OF NATURAL RESOURCES
- JURISDICTIONAL AND MILITARY

QUALITIES OF NY-Å

- Remote, undisturbed location
- Low antropogenic impacts on the natural environment
- Relatively unspoiled ecosystems
- Easy access
- Well-developed infrastructure and research facilities. May accommodate up to 150 persons
- Ideal geographical location for studies in several diciplines
- Modern telecommunications, connections to Internet
- Ny-Å may be characterized as a "Modern research station in a clean natural laboratory"

GEOPHYSICS
CLIMATE CHANGE

- 97% OF ALL ICE AND COLD WATER TRANSPORT OUT FROM THE ARCTIC OCEAN
- DEEP OCEAN WATER IS CREATED BETWEN SVALBARD AND GREENLAND
- SEA-ICE - ATMOSPHERIC INTERACTIONS, ALBEDO, RADIATION BUDGET
- MODELS PREDICT CLIMATIC CHANGES TO BE DETECTED FIRST IN THE POLAR AREAS
- OZONE DEPLETION - UV/UVb
- GREENHOUSE GASSES
- MONITORING PARAMETERS


Winter, summer and net balance on Brøggerbreen
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-0.5
-1
-1.5
-2
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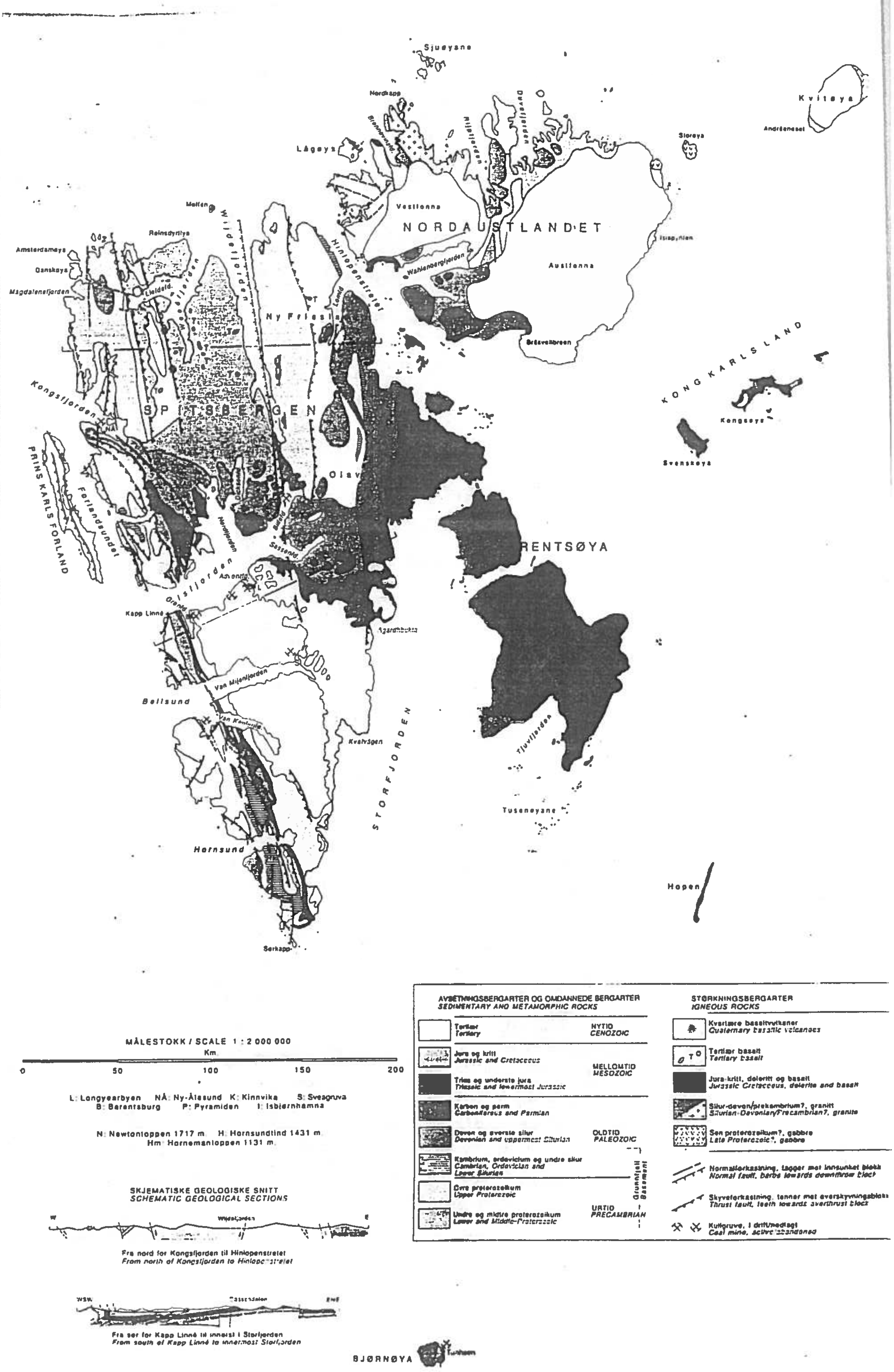

Sjuøyane
Nordkapp
Kvitøya
Andréeneset
Storøya
Lågøya
Vestfonna
NORDAUSTLANDET
Austfonna
Wahlenbergfjorden
Hinlopenstretet
Bråsvellbreen
Moffen
Reinsdyrflya
Amsterdamøya
Danskøya
Magdalenefjorden
Woodfjorden
Wijdefjorden
Ny Friesland
KONG KARLS LAND
Kongsøya
Svenskøya
Kongsfjorden
SPITSBERGEN
PRINS KARLS FORLAND
Forlandsundet
Isfjorden
Sassenfjorden
Kapp Linné
Agardhbukta
BARENTSØYA
Van Mijenfjorden
Bellsund
Van Keulenfjorden
Kvalvågen
STORFJORDEN
Tjuvfjorden
Tusenøyane
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100
150
200
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B: Barentsburg P: Pyramiden I: Isbjørnhamna
N: Newtontoppen 1717 m H: Hornsundtind 1431 m
Hm: Hornemantoppen 1131 m
SKJEMATISKE GEOLOGISKE SNITT
SCHEMATIC GEOLOGICAL SECTIONS
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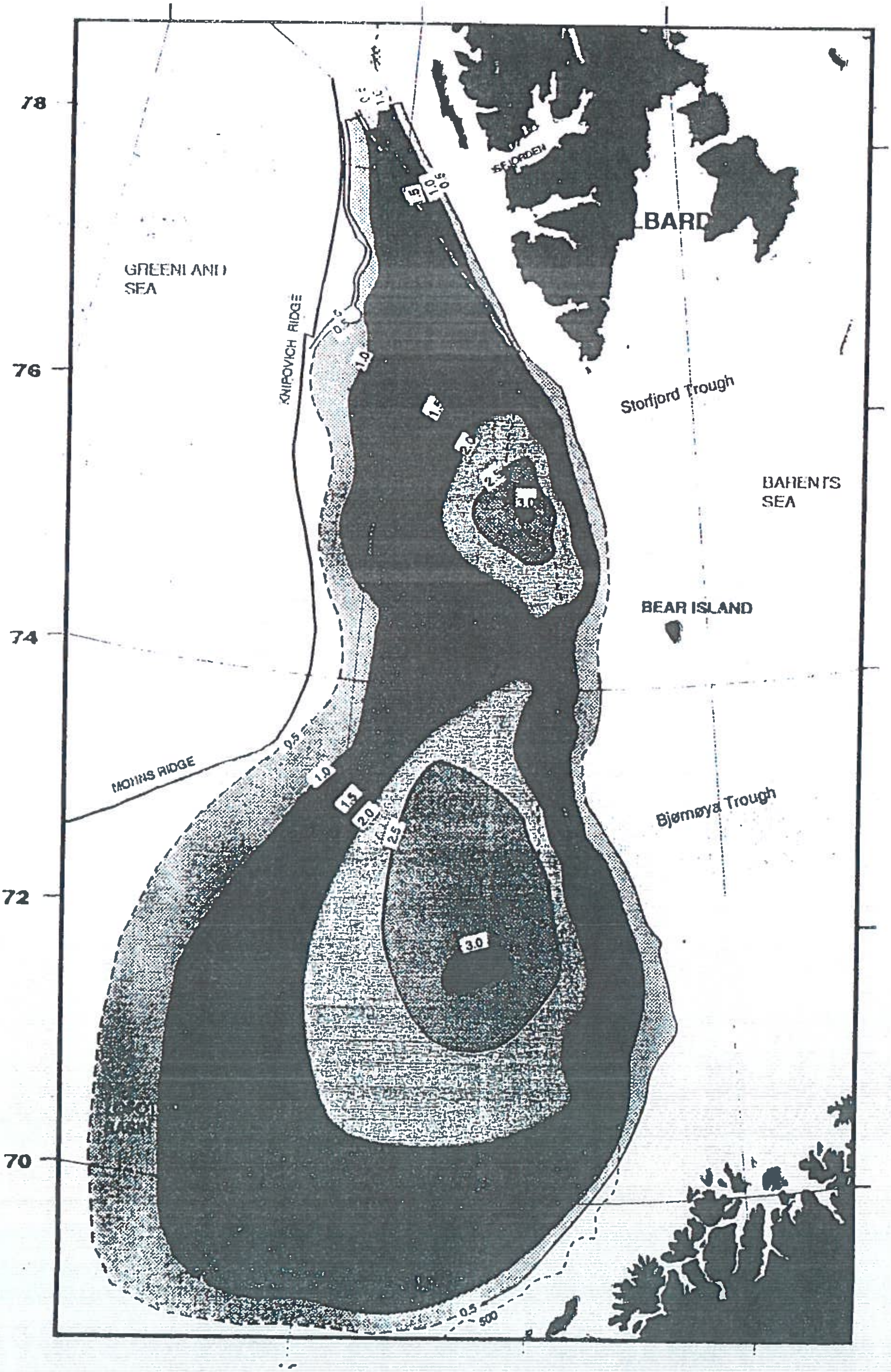
Wijdefjorden
E
Fra nord for Kongsfjorden til Hinlopenstretet
From north of Kongsfjorden to Hinlopenstretet
WSW
ENE
Fra sør for Kapp Linné til innerst i Storfjorden
From south of Kapp Linné to innermost Storfjorden
BJØRNØYA
AVSETNINGSBERGARTER OG OMDANNEDE BERGARTER
SEDIMENTARY AND METAMORPHIC ROCKS
Tertiær
Tertiary
NYTID
CENOZOIC
Jura og kritt
Jurassic and Cretaceous
MELLOMTID
MESOZOIC
Trias og underste jura
Triassic and lowermost Jurassic
Karbon og perm
Carboniferous and Permian
Devon og øverste silur
Devonian and uppermost Silurian
OLDTID
PALEOZOIC
Kambrium, ordovicium og undre silur
Cambrian, Ordovician and Lower Silurian
Grunnfjell
Basement
Øvre proterozoikum
Upper Proterozoic
Undre og midtre proterozoikum
Lower and Middle Proterozoic
URTID
PRECAMBRIAN
STØRKNINGSBERGARTER
IGNEOUS ROCKS
Kvartære basaltvulkaner
Quaternary basaltic volcanoes
Tertiær basalt
Tertiary basalt
Jura-kritt, doleritt og basalt
Jurassic Cretaceous, dolerite and basalt
Silur-devon/prekambrium?, granitt
Silurian-Devonian/Precambrian?, granite
Sen proterozoikum?, gabbro
Late Proterozoic?, gabbro
Normalforkastning, tagger mot innsunket blokk
Normal fault, barbs towards downthrow block
Skyveforkastning, tenner mot overskyvningsblokk
Thrust fault, teeth towards overthrust block
Kullgruve, i drift/nedlagt
Coal mine, active/abandoned


78
76
74
72
70
GREENLAND
SEA
KNIPOVICH RIDGE
MOHNS RIDGE
Storfjord Trough
BARENTS
SEA
BEAR ISLAND
Bjørnøya Trough
LBARD
0.5
1.0
1.5
2.0
2.5
3.0
500

GEOLOGY

- ALL THE GEOLOGICAL TIME PERIODS ARE PRESENT
- SCARCE VEGETATION
- FOSSILS ARE ABUNDANT
- IT IS CENTRAL IN PALEO-CLIMATIC RESEARCH DUE TO ITS LOCATION ON THE MARGIN OF THE ARCTIC OCEAN, GLACIATION, AND DEPOSITS OF MARINE SEDIMENTS

WHY BIOLOGICALLY RICH?

MARINE PRODUCTION IN SURROUNDING OCEANS IS HIGH BECAUSE:

- BARENTS SEA IS A LARGE SHALLOW OCEAN
- CONVECTION: COLLISION OF HUGE WARM AND COLD OCEAN CURRENTS MAKES NUTRIENTS AVAILABLE FOR PRODUCTION
- ICE-EDGE ZONE CREATES FAVOURABLE CONDITIONS FOR PRODUCTION
- MILLIONS OF SEA BIRDS TRANSPORT NUTRIENTS AND ENERGY TO LAND

BIOLOGY

- IN BIOLOGICAL TERMS, THE RICHEST HIGH ARCTIC AREA
- SIMPLE ECOSYSTEMS
- RELATIVELY UNDISTURBED ECOSYSTEMS
- EXTREME LIGHT CONDITIONS AND PHYSICAL ENVIRONMENT

BIOLOGY

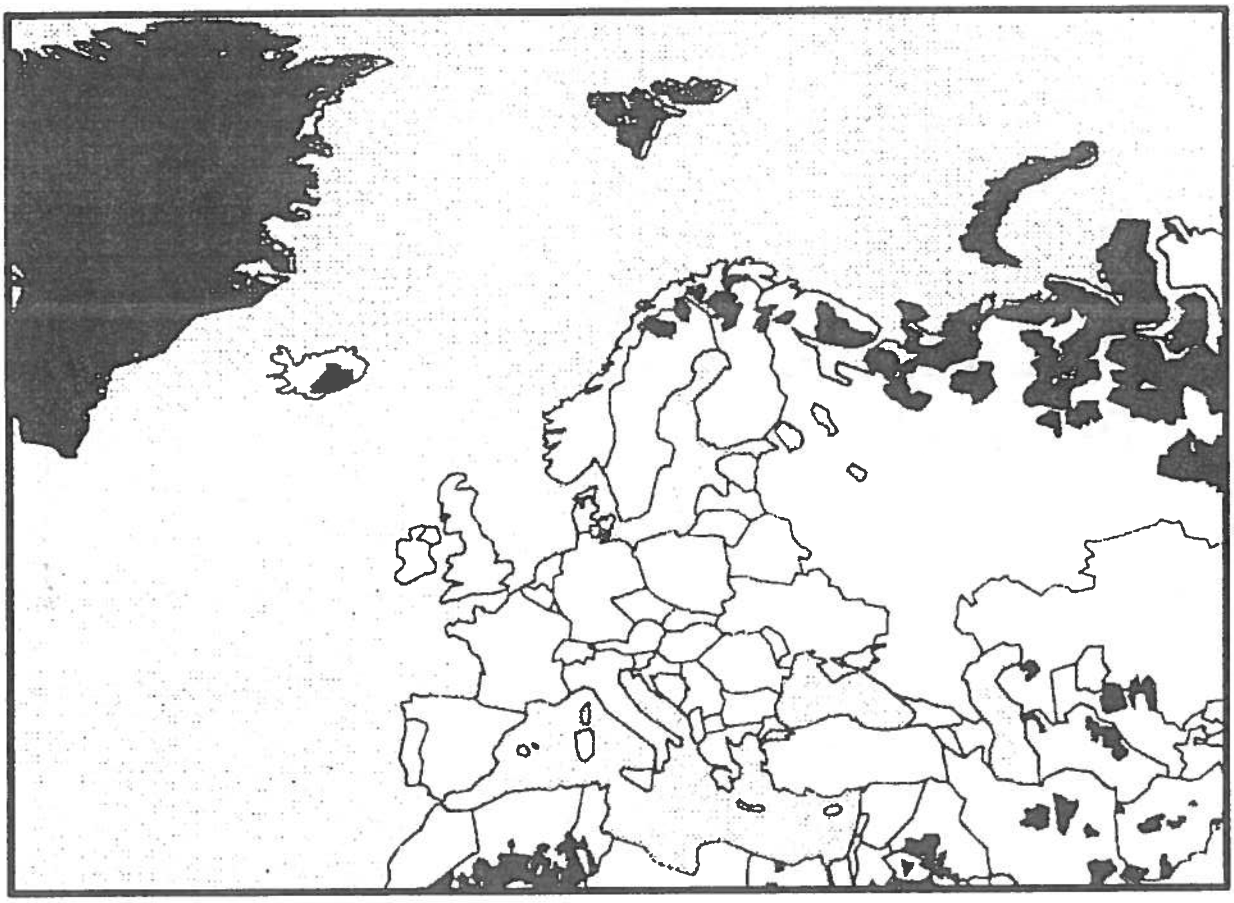
SVALBARD IS IDEAL FOR STUDIES OF:

- FUNDAMENTAL ECOLOGICAL PRINCIPLES (SIMPLE AND UNDISTURBED ECOSYSTEMS)
- FUNDAMENTAL EVOLUTIONARY AND ADAPTIVE MECHANISMS
- APPLIED ECOLOGY: MANAGMENT OF MARINE RESOURCES, WILDLIFE MANAGEMENT

NORSK POLARINSTITUTT

NORWEGIAN POLAR INSTITUTE

THE LAST WILDERNESS LEFT IN EUROPE



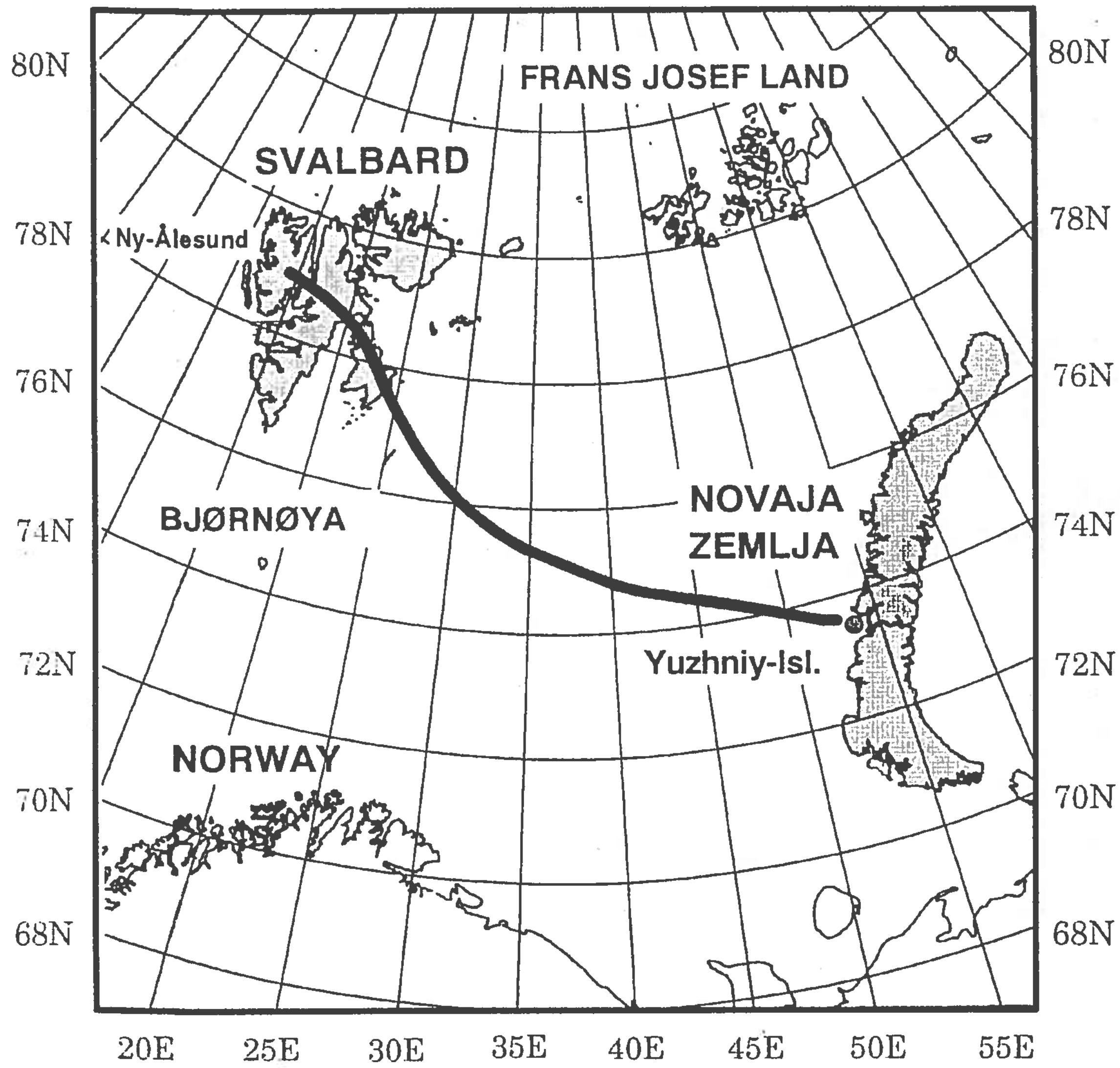
ENVIRONMENTAL RESEARCH

- REFERENCE AREA FOR GLOBAL LONG-RANGE TRANSPORTATION OF POLLUTANTS

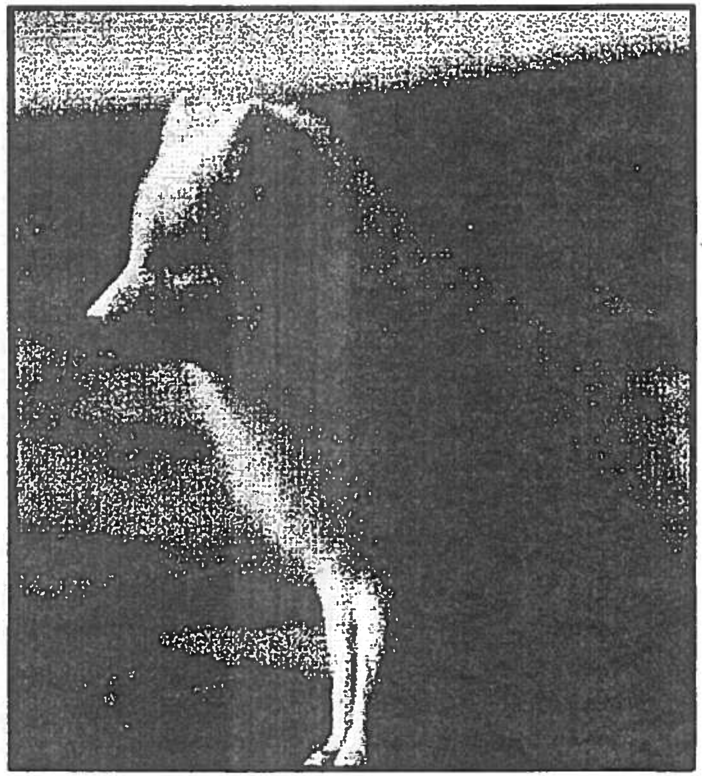
- IDEAL GEOGRAPHICAL LOCATION FOR RESEARCH ON AND MONITORING OF OZON AND CLIMATE CHANGE

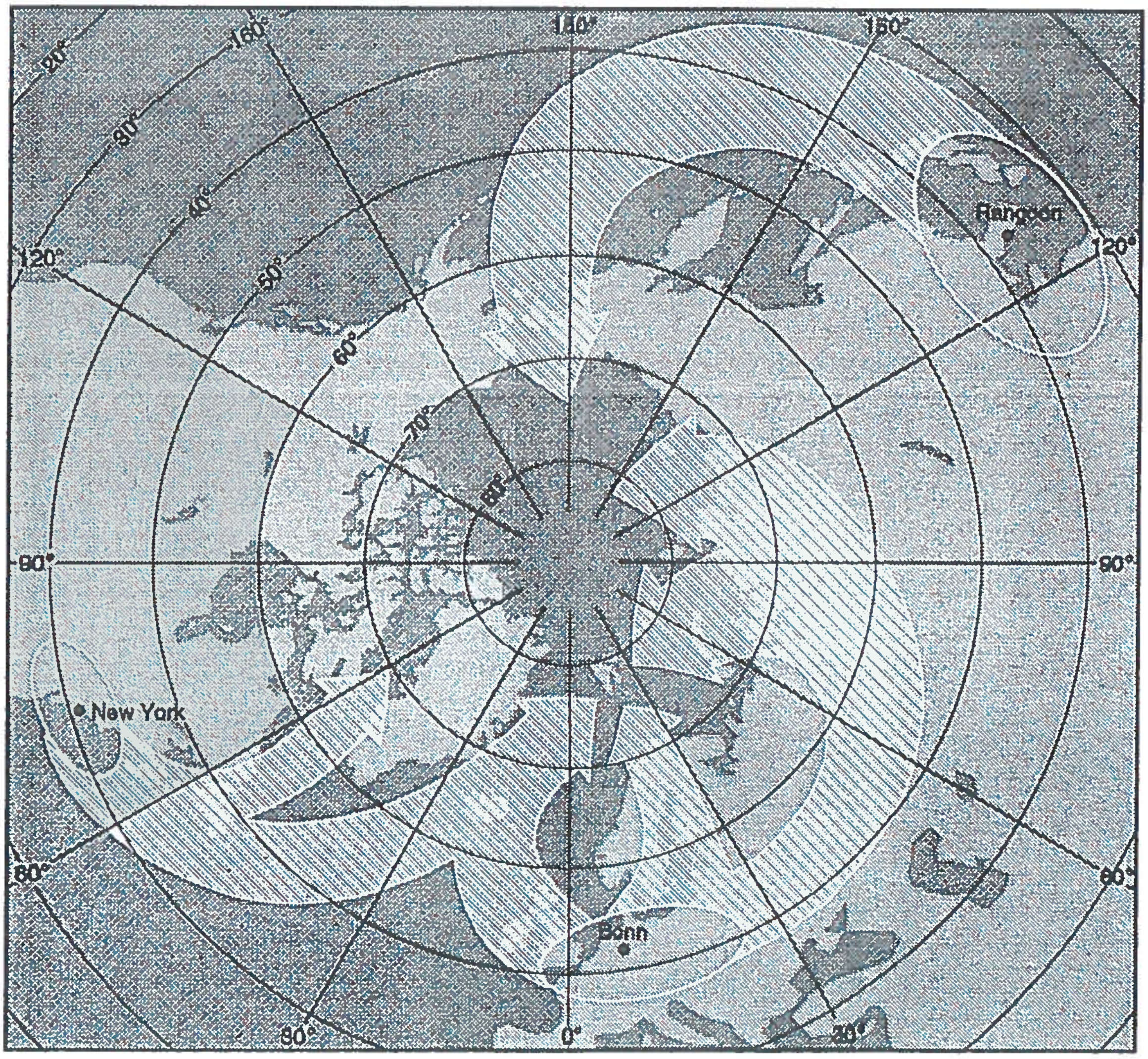
- RESEARCH INTO THE PROTECTION OF A UNIQUE ARCTIC WILDERNESS. BIODIVERSITY, PROTECTED AREAS, MANAGEMENT OF LIVING RESOURCES, EIA

NORSK POLARINSTITUTT
NORWEGIAN POLAR INSTITUTE



MIGRATION
POLAR FOX





180°
160°
150°
120°
90°
80°
60°
30°
0°
30°
40°
50°
60°
70°
80°
Rangoon
New York
Bonn

NY-ÅLESUND - AN INTERNATIONAL ARCTIC ENVIRONMENTAL RESEARCH AND MONITORING STATION

- Beginning of this century: A manned geophysical observatory on the Brøgger peninsula
- Mining town from mid-1920ties: Meteorological observations
- 1957: A French research station east of the town
- 1966: Satellite station for ESRO
- 1968: NP research station was established
- 1990-95: Establishment of German, British, Japanese, and Italian research stations
- 1990-95: Atmospheric station, Geodesi station, laboratories

POLITICAL DECISSIONS

- White paper no. 50, 1991-92: "Ny-Å shall be the main science centre at Svalbard. All other activities must pay due consideration to the needs and demands of the ongoing research"

- White paper no. 42, 1992-93: Confirmed and strengthened the political aims for Ny-Å. In addition: local human environmental impacts should be kept a the lowest possible level.

- 1990: Foreign research inst. were allowed and encouraged to establish their own stations

THE RESEARCH FACILITIES

Ny-Å SERVES TWO PURPOSES:

1) Observatory
2) Field station for visiting scientists

- NP STATION: 1500 sq. m of offices, atmospheric observatory, workshops and rooms for electronic equipment, biological laboratories, storage rooms. Field equipment for rent.
- KOLDEWEY STATION: Platform for radiosondes, lidars, spectro-photometers
- GEODESI STATION: high accuracy GPS, radiotelescope (VLBI)

- **HARLAND HOUSE: laboratories for biological research**
- **NIPR STATION: Atmospheric observatory. Marine and terrestrial biological laboratories**

Statistics

Number of research projects in Svalbard 1992-94.

The total number of projects varies from year to year. Unfortunately there are a number of projects about which we do not receive information before the bulletin is published. The following table shows those which were listed in each year's bulletin.

Table 1. Number of projects in Svalbard depending on discipline.

Year	Total	Biology		Geology		Geophysics		Others	
1992	155	48	(30.96%)	23	(14.84%)	73	(47.10%)	11	(7.10%)
1993	115	51	(44.35%)	12	(10.43%)	48	(41.74%)	4	(3.48%)
1994	126	43	(34.13%)	18	(14.28%)	59	(46.83%)	6	(4.76%)

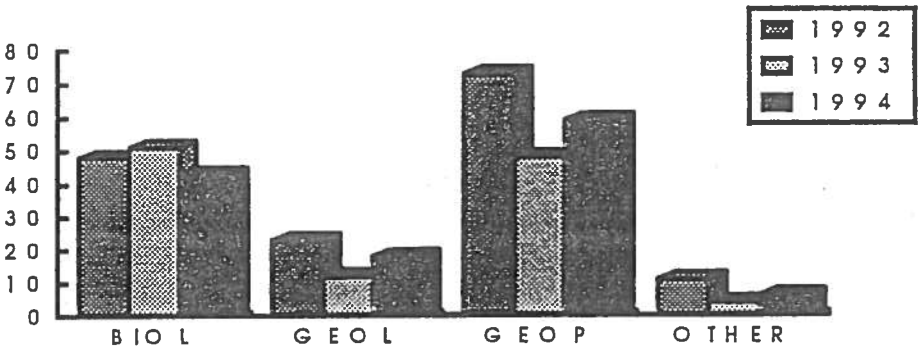


Figure 1. Number of projects in Svalbard depending on discipline.

If we look at the projects located only or partly in Ny-Ålesund, we will see that there is no decrease in research activity in this area. We also notice that the research in Ny-Ålesund is concentrated on biology and geophysics.

Table 2. Number of projects in Ny-Ålesund depending on discipline.

Year	Total	Biology		Geology		Geophysics		Others	
1992	59	24	(40.68%)	4	(6.78%)	28	(47.46%)	3	(5.08%)
1993	38	20	(52.63%)	0	(0.00%)	18	(47.37%)	0	(0.00%)
1994	64	24	(37.50%)	1	(1.56%)	39	(60.94%)	0	(0.00%)

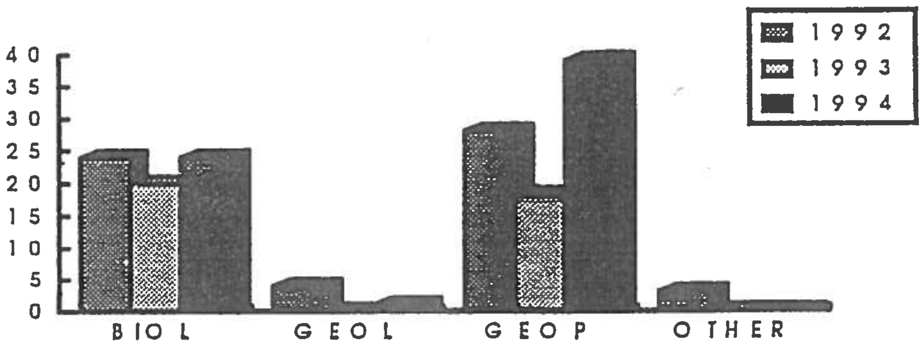


Figure 2. Number of projects in Ny-Ålesund depending on discipline.

SESSION I
On-going research, its organization and administration

Overview on research activites
Members of NySMAC

Ny-Ålesund Seminar
Potsdam 4-5 May

Norwegian Polar Institute - Ny-Ålesund

The Norwegian Research Station:

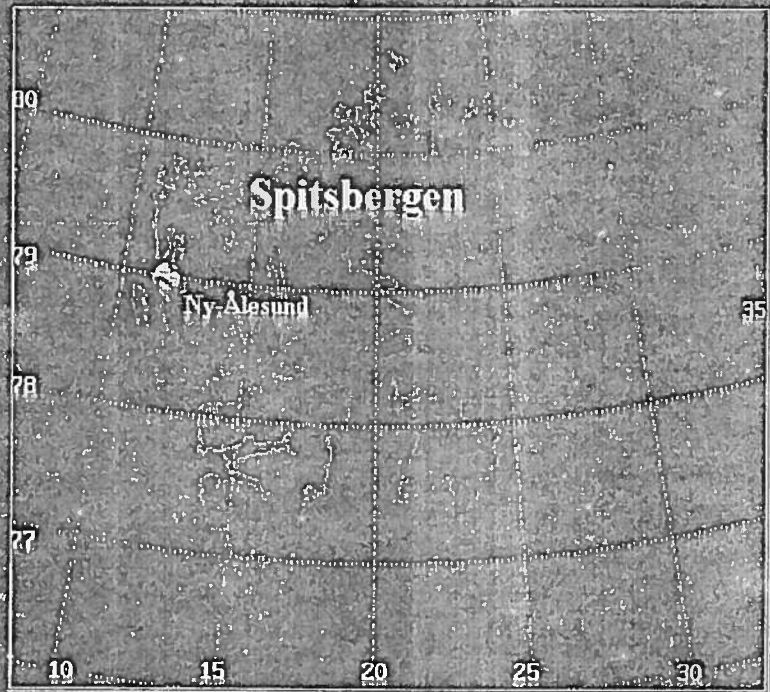
- Supporting Norwegian Research Institutions and Co-operating Foreign Research Programs
- Established 1968 in Ny-Ålesund by NP

- Research and Monitoring:

- Offering Routine Engineering Help, Offices, Laboratories, Platform Place, Computer Facilities, Internet, ...

- Field Base Station:

- Offering Logistical Support for Field Campaigns on the Fjord, Glaciers, ..., such as Scooters, Boats, Clothing, ...



Norwegian Polar Institute - Ny-Ålesund

The Norwegian Research Station - Supporting Arctic Research within:

- Atmospheric Sciences: Meteorology an[illegible]
- Air Research: Trace [illegible] Greenhouse Gases [illegible]
- Str[illegible]spheric C[illegible] Monitoring
- [illegible]
- Ion[illegible]/Magnetos[illegible] Interactions [illegible]
- Re[illegible] Satellite [illegible]
- Geode[illegible] Monitoring [illegible]
- Glaciolog[illegible] Glacier Climate Stud[illegible]
- Ocianography [illegible] Marine Geology [illegible]

Norwegian Polar Institute - Ny-Ålesund

The Norwegian Research Station Facilities:

- The Research Station (NPF):
  - **Offices, Library, Computer Resources, Internet/Email, Meeting and Storage Rooms**
  - **Dry and Wet Laboratories, Instrument room, Electronics Lab., Instrument Platform/Hut**
- The Mountain Station (Zeppelin-station): **- Located above the Inversion layer**
- 2 Engineers + 1 technician: **- Equipment Maintenance and Routine Operation of Instr.**
- Dry Laboratories (Vaskeriet) + Physiology Lab./Instrument Room (Gruvebadet):
  - **Offices, walk-in freezers, dissection lab., dry lab., storage rooms, laundry, drying facilities**
- Marine Biological Laboratory (Gamle Kraftstasjon):
  - **Wet lab. with several aquarium, storage rooms, distilled water tanks**
- Greenhouse: **- Climate Controlled**
- Storage Rooms and Logistical Equipment:
  - **Snowscooters, Aluminium and Rubber Boats, Clothing, Security Equipment, ...**
- Optical Calibration Darkroom / Marine Environmental Effect Lab (planned EU4)

Norwegian Polar Institute - Ny-Ålesund

- Troposphere / Climate Research:

- Surface Radiation Budget Monitoring - NP
  - Roof Platform, Tundra and Mountain Station
  - Components: G, D, DIR, R, Ld, Lu, UV, UV-B, AHF-Calibration
  - International Network Connection - BSRN - AWI/NP
- UV/UVB - Radiation - NP
  - UV-Broadband + Broadband UV-B - NOG
  - UV-Spectrometer + Multichannel UV Filter Rad. - EU4-RADAR - NP/NILU
- Meteorological Observations - DNMI
  - 3 hour SYNOP (Auto + Man.) - GTS
  - Precipitation Analysis - IAEA/WMO
  - Meteorological Observations on Glacier

Norwegian Polar Institute - Ny-Ålesund

- Ionosph./Magnetospheric Interactions / Auroral Research:

- Auroral Observations — - UiO
  - All Sky Video, All Sky Camera, Scanning Photometer
  - ULF + ELF/VLF-emissions
  - Magnetometer — - UiTø
  - Magnetic Micropulsations — - UoTok.
  - Riometer + Imaging Riometer — - DMI + STEL
  - SDRS + JMR Scintillometers — - Ph.Lab. + UCW
  - Ionosoünder — - UoMass.
- SpiRoc (planned) — - NRS
  - Ny-Ålesund - Andøya
- Eiscat - Longyearbyen — - International

Norwegian Polar Institute - Ny-Ålesund

- Remote Sensing:

- DORIS	- SPOT-Reference	- I.G.N.
- COSPAS/SARSAT	- Reference-Tx	- TSS
- DGPS	- SatRef	- SK
- Rx-Station	- Seawifs/NOAA	- NASA

Norwegian Polar Institute - Ny-Ålesund

- Arctic Biota / Terrestrial and Marine Biological Research:

- Reindeer	- Ecology Studies	- NP
- Arctic Fox	- Physiology	- NP
- Bearded Seal	- Energetics	- NP
- Barnacle Geese	- Reproduction Ecology	- NINA
- Eider	- Monitoring	- NP
- Vegetation	- Monitoring	- NP/UiO
- Plant Studies	- Basic Research	- NLH
- Ecotoxicology	- EU4-	- NP/...
- Biodiversity	- EU4-Biodaff	- NP/...

Norwegian Polar Institute - Ny-Ålesund

- Glaciology / Hydrology / Geodesy / Geomorphology:

- Mass Balance of Glaciers	- Monitoring	- NP
- Hydrological Program	- Project	- NVE
- "Bay-elva" + "London-elva" hydrological stations		
- Rabben Hydrological Testbed	- Project	- Sintef
- Ground Water	- Project	- NLH
- Polygon-surface	- Soil Studies	- UoWash.
- Seismic Station	- Monitoring	- UiB
- Geodetic lab.	- Monitoring	- SK
- VLBI, DGPS, Tidewater		

Ny-Ålesund Space Geodetic Observatory
Introductory presentation

Dr. Bjørn Ragnvald Pettersen

Ny-Ålesund Space Geodetic Observatory became operational in January 1995, following planning and construction work in 1992-1995. It is the Arctic research facility of Geodetic Institute, a division of the Norwegian Mapping Authority.

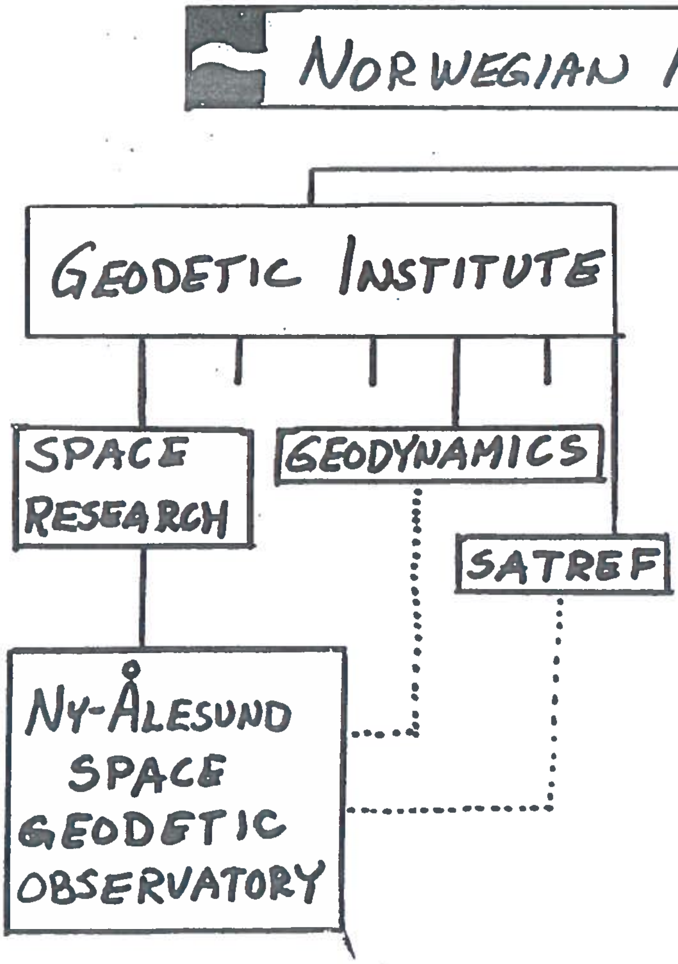
Observations are collected by several space and satellite geodetic techniques and are transferred by satellite data link to the Geodetic Institute in Hønefoss for processing, analysis and scientific interpretation. Internet connections via the satellite data link are made available to other institutions in Ny-Ålesund on a collaborative basis. The geodetic research is connected to global reference systems and space geodesy technique development, as well as geodynamic studies related to plate tectonics and postglacial rebound. Applications are within monitoring of Global Change (i.e. sea level monitoring) and navigation. The infrastructure may also serve astronomical VLBI programs, studies of ionospheric and tropospheric conditions, and telemetry of polar orbit satellites.

Dr. Bjørn Ragnvald Pettersen
Geodetic Institute
Norwegian Mapping Authority
N-3500 Hønefoss
NORWAY

E-mail: bjornrp@gdiv.statkart.no

NY-ÅLESUND SPACE GEODETIC OBSERVATORY

ORGANIZATIONAL AND ADMINISTRATIVE TIES



RESEARCH AREAS

- Geodetic reference systems
- Geodetic technique developm
- Geodynamic studies

APPLICATIONS

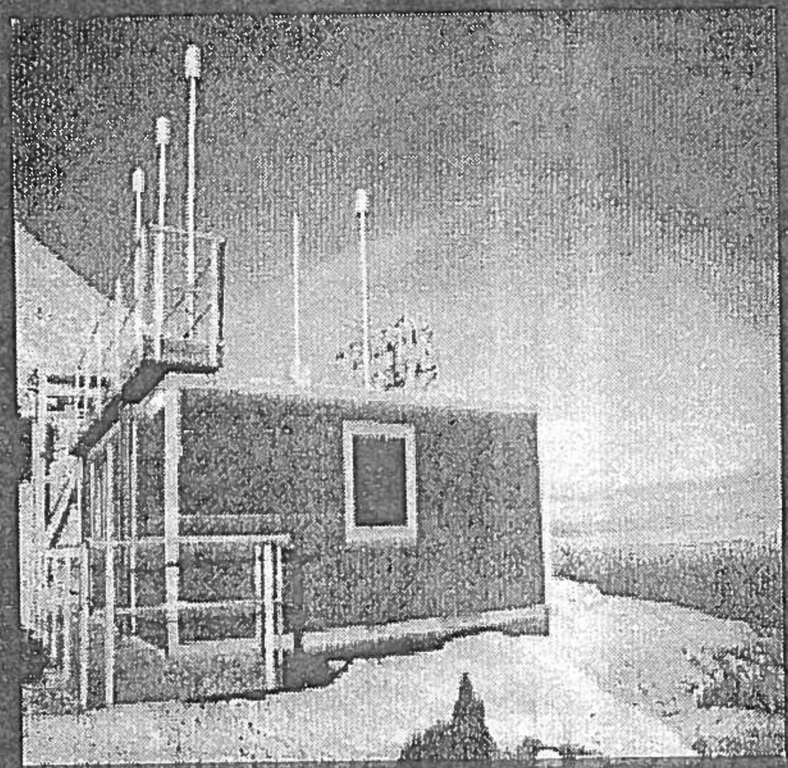
- Monitoring of Global Change
- Navigation

INFRASTRUCTURE FOR OTHER DICIPLINES

- Internet satellite link
- Astronomical VLBI
- Polar orbit satellite telemetry
- Ionospheric and tropospheric conditions

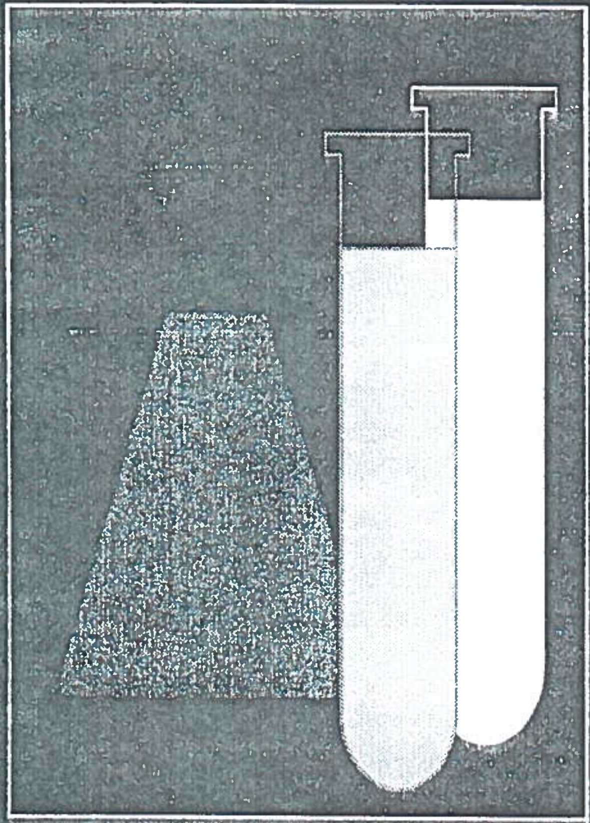
NILU's Arctic Research

- Arctic Haze
- Greenhouse Gases
- Tropospheric Ozone
- Stratospheric Ozone
- Chlorinated Hydrocarbons (PCB etc.)
- Heavy Metals
- Radioactivity Monitoring



NILU

Measurement programmes in Ny-Ålesund



- EMEP:Sulphate,nitrate etc
- TOR & OCTA: O_3, NO_x, NO_y, HC
- Greenhouse gases
- Stockholm University
- Heavy metals
- NDSC, ESMOS, EASOE: Stratospheric species
- Chlorinated HC

NILU

Session 1

Koldewey station / Ny-Ålesund / Svalbard

H.Gernandt
Alfred-Wegener-Institute for Polar and Marine Research (AWI)
Research Unit Potsdam

The Koldewey-Station

The Koldewey Station of the Alfred Wegener Institute for Polar and Marine Research is settled in Ny-Ålesund. The main building, called "Blue House", has rooms in which up to eight scientists can live, work and sleep. In 1995, a new two-storey laboratory building was completed, in which remote sensing equipment is installed. Laboratories for geophysical, chemical, biological research are established in other buildings of the settlement Ny-Ålesund. .
First observations took place in 1988. Since 1991 the station has been permanently manned by a station leader. The permanent personal was completed by an engineer in 1993. The Research Unit Potsdam of the AWI is in charge of scientific management. In 1995 a permanent advisory board has been convened to evaluate the scientific project applications which are to be performed at the station.
Although the regular observations and campaigns are mainly related to atmospheric research other projects related to geophysical and biological research complete the station activities. Such projects are performed by AWI research groups as well as by other researchers from universities and research institutes in Germany.

Atmospheric research objectives

* physical and chemical state of the Arctic stratosphere, its natural variability and change
* optical properties of the Arctic atmosphere and climate forcing by atmospheric aerosols
* impact of Arctic stratospheric processes on mid-latitudes

Global networks

The regular atmospheric observations are considered to provide data for global networks as NDSC (Network for Detection of Stratospheric Changes), BSRN (Baseline Surface Radiation Network), GAW (Global Atmospheric Watch), GO3OS (Global Ozone Observing System) and GTS (Global Telecommunication System of WMO).

Regular observations

Ground-based measurements
Balloon-borne observations
Remote sensing instruments

Topics of atmospheric research in1995

SESAME - phase III (Second European Stratospheric Arctic and Mid-latitude Experiment) from January to April 1995 by remote sensing and balloon-borne observations:
* MATCH as part of SESAME - Coordinated balloon-borne ozone soundings from 35 launching sites in Europe, Canada, Siberia and Japan.
(Coordination by AWI-Potsdam and Meteorological Institute of FU Berlin)

* Aerosol studies by Lidar and balloon-borne backscatter sondes in January 1995.
  AWI and Japanese research group from the Nagoya University

Validation experiments for the GOME instrument
Global Ozone Monitoring Experiment) on board of the ERS 2 satellite since February 1995:
Balloon-borne ozone soundings, ozone Lidar (AWI)
UV/vis DOAS instrument (University of Bremen)

ARCTOC (Arctic Tropospheric Ozone Chemistry) campaign from April to May 1995:
Ground-based DMS and aerosol as well as balloon-borne ozone measurements.
Coordination by University of Heidelberg

Photometer (SP 2H) measurements with moon light in January and February 1995: spectral optical depth of the atmosphere during polar night.

FTIR spectrometer intercomparisons as part of the ESMOS / Arctic project in May 1995
AWI and National Physics Laboratories (UK)

Two channel optical sensor with the high altitude balloon BT 5 in July and August 1995
AWI and Japanese research groups from Tohoku University, ISAS (Institute of Space and Astronautical Science) and NIPR (National Institute of Polar Research).

IN PREPARATION:

Updated information on the KOLDEWEY STATION:

World Wide Web
external home page
http: //www.awi-bremerhaven.de

Regular observations

Ground-based measurements

* Automatic weather station

* Short and long wave radiation

* Aerosol particle counter LAS-X.

* Sampling of aerosols, precipitation, snow and atmospheric trace compounds

Balloon-borne observations

* Radiosonde RS 80 / Digi CORA ground station
  Aerological observations (daily profiles of temperature, humidity, pressure, wind).

* Electrochemical ozone sensor (ECC) and radiosonde RS 80

* Two channel optical sensor and high altitude balloon BT 5

Remote sensing instruments

* Ceilometer for cloud height observations

* Sun photometer SP 2H

* Ozone - LIDAR (DIAL)
  day and night measurements, altitude range 6 -40 km, resolution 0.6 - 3.0 km for 4 h.

* Aerosol - LIDAR and receiver for Raman wavelengths
  night measurements for aerosol and PSC studies,
  altitude range 10 - 50 km, resolution 0.2 km for 0.5 h.
  Part of NDSC and contribution to GAW.

* FT-spectrometer (Bruker IFS 120M) using sun and moon light,
  wavenumbers 600 cm-1 to 5000 cm-1(IR and UV/vis), resolution 0.0035 cm-1.
  Stratospheric and tropospheric trace gases.
  Part of NDSC.

* Microwave radiometer
  for ClO and O3 profiles
  (instrument is run by IFR at University of Bremen)
  Part of NDSC.

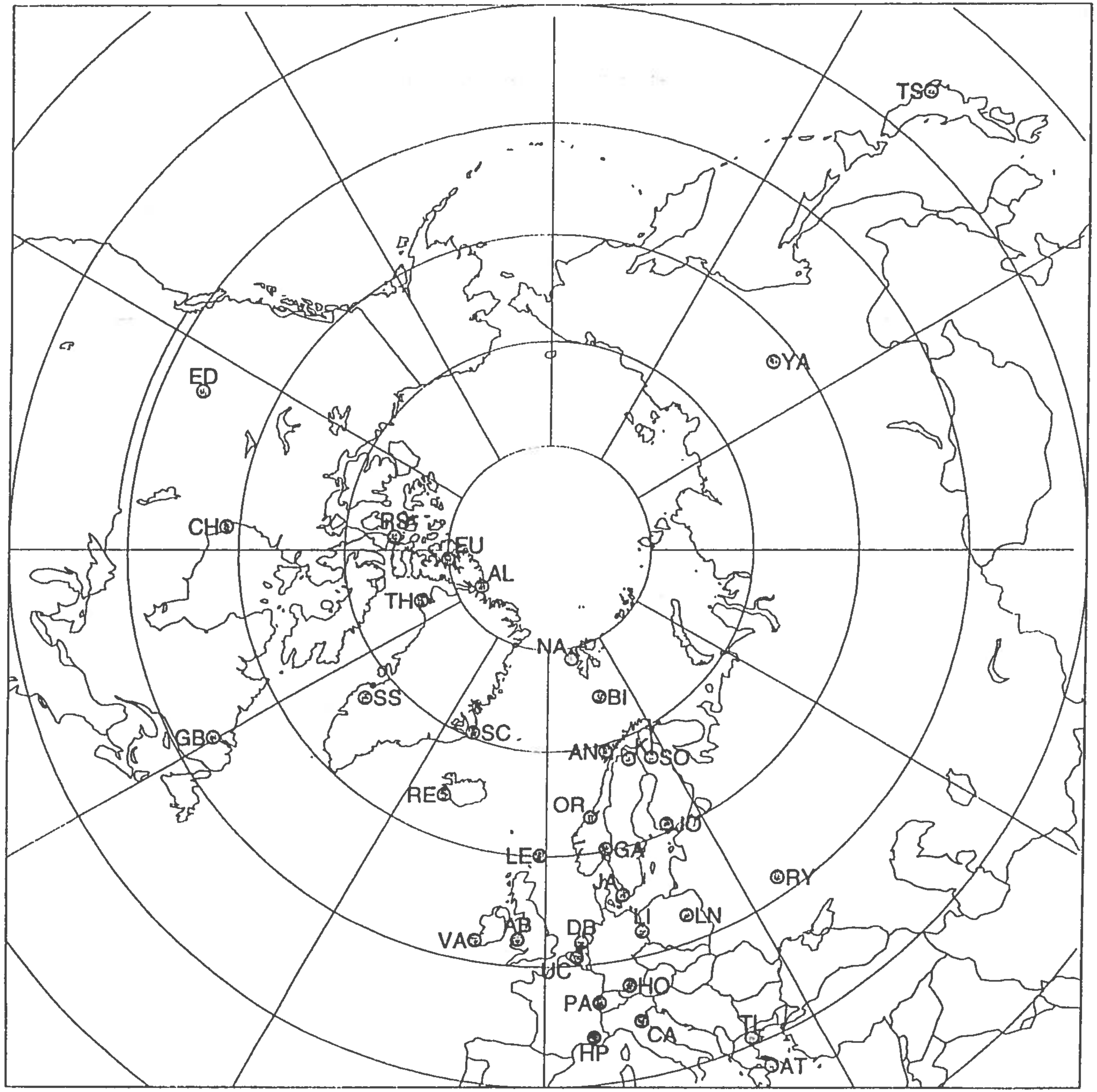
IN PREPARATION

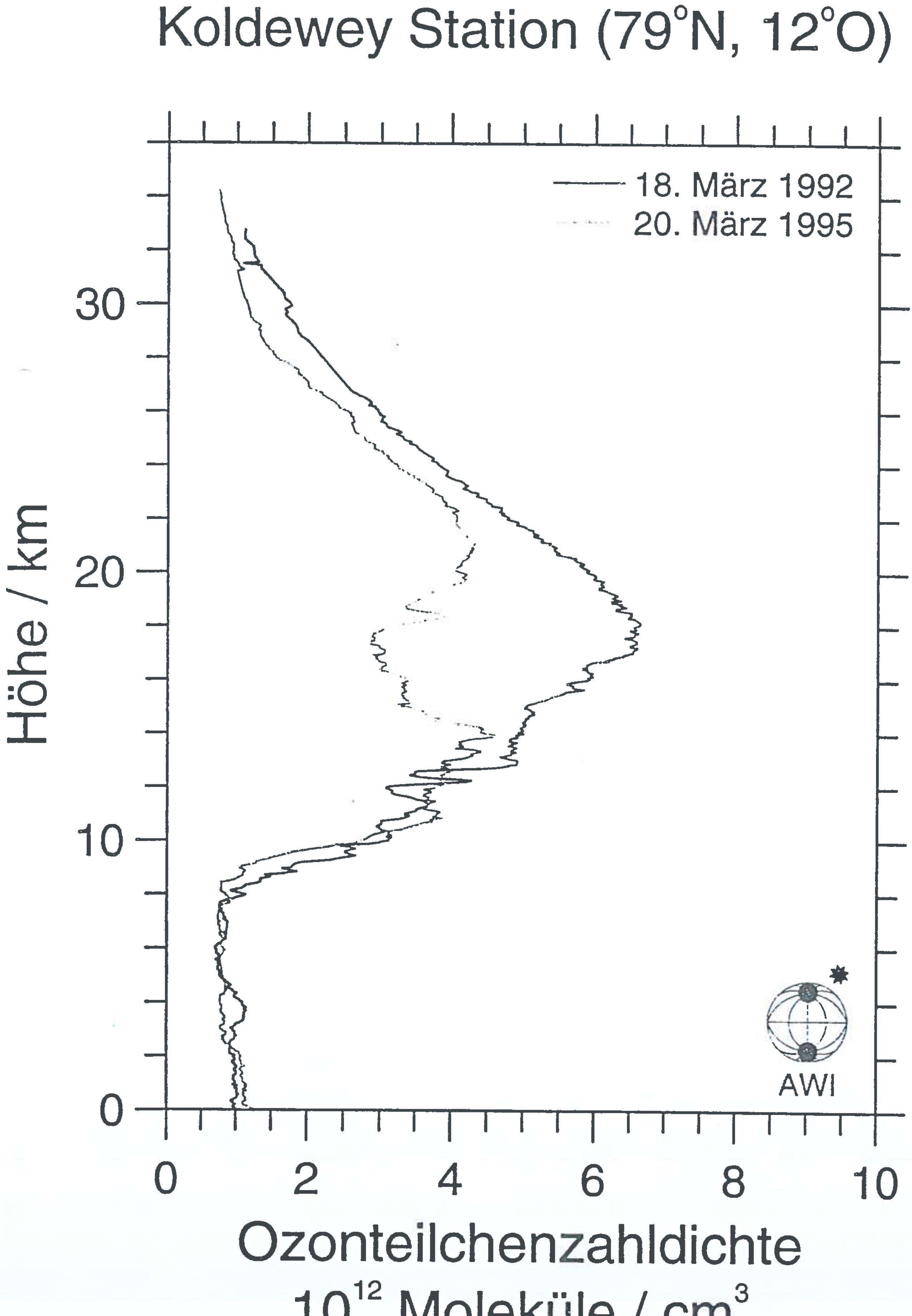
Updated information
on the KOLDEWEY STATION

World Wide Web
AWI external home page:

http: //www.awi-bremerhaven.de

MATCH Winter 94/95 : Participating Ozonesonde Stations




Koldewey Station (79°N, 12°O)
18. März 1992
20. März 1995
Höhe / km
0
10
20
30
0
2
4
6
8
10
Ozonteilchenzahldichte
10^12 Moleküle / cm^3
AWI

KOLDEWEY STATION
Ny-Ålesund / Svalbard

TWO BUILDINGS AND SEVERAL LABORATORIES

FIRST OBSERVATIONS IN 1988

PERMANENT PERSONNEL
STATION LEADER
STATION INGENEER

PERMANENT ADVISORY BOARD FOR PROJECT APPLICATIONS

Although the regular observations and campaigns are mainly related to atmospheric research other projects related to geophysical and biological research complete the station activities. Such projects are performed by AWI research groups as well as by other researchers from universities and research institutes in Germany.

National Institute of Polar Research/ NIPR at Ny-Ålesund
Introductory presentation

Dr. Hajime Ito

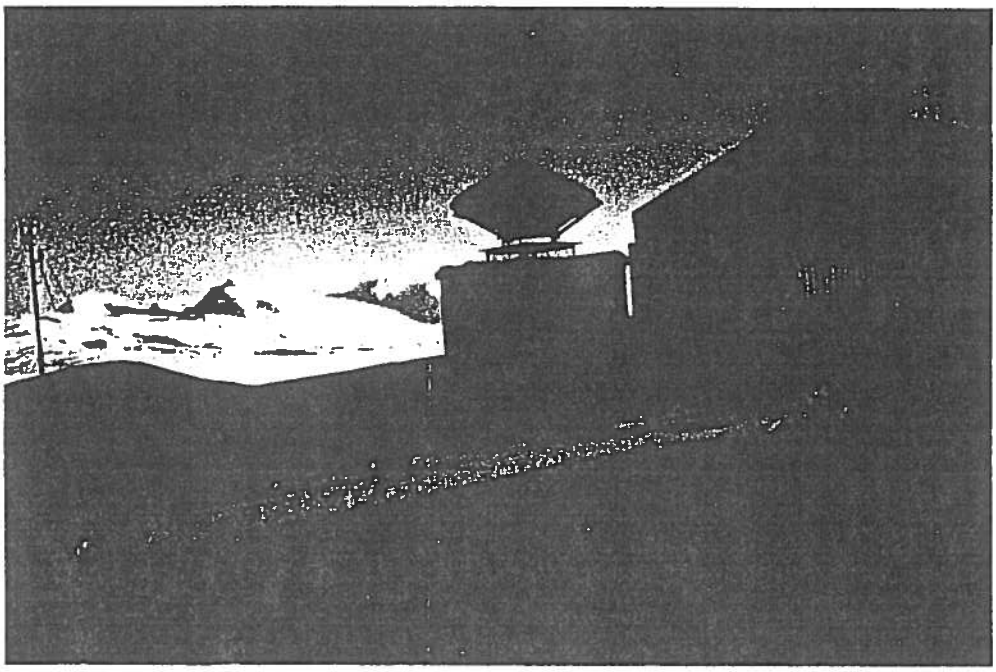
1. NIPR shares a house with the mapping authority and have the following facilities:

Dry and wet labs
Cold lab
Two containers with instruments
Platform on the roof
Equipment for field work

2. NIPR keeps intentionally no permanent staff at the station, but sends the parties in the form of campaigns, which cover various disciplines as glaciology, atmospheric science, marine- and terrestrial biology, oceanography, hydrology, geomorphology.

3. In a year ca. 15 parties work altogether 1000 mandays at Ny-Ålesund.

Dr. Hajime Ito
National Institute of Polar Research (NIPR)
1-9-10 Kaga, Itabashi - Ku
tokyo 173
JAPAN



Natural Environment Research Council/ NERC at Ny-Ålesund Introductory presentation

Dr. Nick Cox

- Station established at Ny-Ålesund in 1991
- Launched an Arctic Terrestrial Ecology Special Topic Program - 5 projects with climate change as central theme
- Station facility "Harland Huset" is open from May to September
- 25 scientists
- This year 8 projects will be carried out from the NERC station.

Dr. Nicholas Cox
Merlewood Research Station
Windermere Road
Grange-over-Sands
Cumbria LA11 6 JU
United Kingdom

NERC

Projects 1995

Aberdeen University Prof Ian Alexander Dr Sarah Woodin Dr John Baddeley	N-Use by salix and dryas in the high Arctic: Impact of atmospheric N deposition.
University of Sheffield, Centre for Arctic Biology Prof T V Callaghan Prof John Lee Jac Potter Dr Clare Robinson Dr Andy Strathdee	Arctic ecosystems and environmental change.
St. Andrews University Prof Bob Crawford Lisa Smith	Indicators of deleterious effects of climate change in arctic plant populations.

1995 Non Special Topic Projects :-

Institute of Hydrology Colin Lloyd Dr Richard Harding Dr Mark Robinson	Tundra soil vegetation atmosphere climate interaction.
Liverpool John Moores Univ. Prof Mike Hambrey Dr Dave Huddart	Geology/glaciology. Kongsvegen, Broggerhalvoya. Transport and deposition by the glacier.
~~University of Newcastle~~ ~~Dr Paul Younger~~	~~Investigation of hydrochemistry and Dynamics of seasonal taliks in Kvadehuken Svalbard.~~
University College London Environmental Change Research Centre. Dr Vivien Jones Dr Nigel Cameron Assistant.	Lake sediment records of recent atmospheric pollution and environmental change on Spitsbergen. Joint project, Prof Birks Bergen University.
British Antarctic Survey Dr Bill Block	Temperature, climate change and environmental constraints on the life history strategies of arctic terrestrial invertebrates.
Bradford University Dr Alisdair Headley	Photosynthetic and respiratory responses to temperature in some arctic plants of varying ranges of latitude.

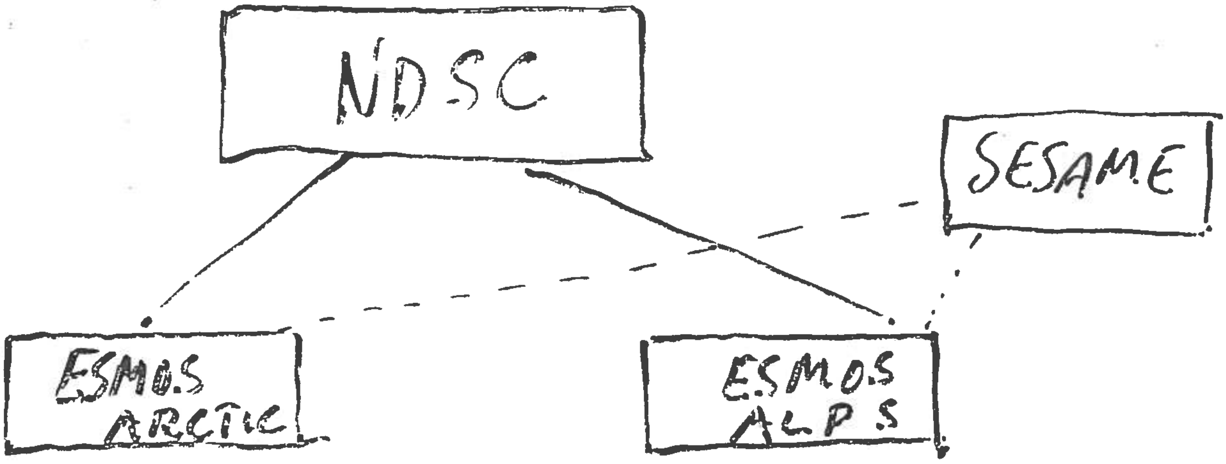
SESSION I
On-going research, its organization and administration

NILU data base and the Network for Detection of Stratospheric Change

Geir O. Braathen

Ny-Ålesund Seminar
Potsdam 4-5 May

NETWORK FOR THE DETECTION OF STRATOSPHERIC CHANGE
NDSC



PRIMARY SITES

1. ARCTIC
   - <u>NY-ÅLESUND</u>
   - THULE
   - EUREKA
2. ALPINE
   - OBS. DE HAUTE PROVENCE
   - JUNGFRAUJOCH
   - PLATEAU DE BURÉ
3. MAUNA LOA AND MAUNA KEA (HAWAII)
4. LAUDER, NEW ZEALAND
5. ANTAR[illegible]

NDSC ; NY-ÅLESUND

INSTRUMENTS

1. AWI

OZONE LIDAR (13-40 km)
AEROSOL AND TEMP. LIDAR (10-45 km)
FT-IR
VAISALA SYSTEM (PTU: 1/DAY, OZONE: 1/WEEK
SUN PHOTOMETER FOR OPT. DENSITY
GLOBAL BASELINE SURFACE RAD. (GBSRN)

2. NILU

DIODE ARRAY UV-VIS (SAOZ)
OZONE SONDES FROM BEAR ISL. (74.5°N)
MONITORING OF MANY TROPOSPHERIC CONSTITUENTS (E.G. CH_4, CFCs, O_3, N_2O, NO_x

3. UNIV. OF BREMEN

MICROWAVE SENSOR FOR O_3 (92/93)
MICROWAVE SENSOR FOR ClO (1994)

4. UNIV. OF OSLO

DOBSON IN ~~LONG~~ NY-ÅLESUND YEAR BYEN

NDSC, NY-ÅLESUND

SPECIES

O_3	COLUMN	SAOZ + DOBSON
O_3	PROFILE	LIDAR (excimer, 13-40km), SONDES MWS
TEMPERATURE		LIDAR (10-45 km) PTU-SONDES (0-30 km)
ClO	PROFILE	MWS
H_2O	PROFILE	— MW: FUTURE?
NO_2	COLUMN	SAOZ + FT-IR
HCl	STRAT. COLUMN	FT-IR
CH_4	STRAT. COLUMN	FT-IR
N_2O	20-50 km	— MWS: FUTURE?
HNO_3	STRAT. COLUMN	FT-IR
$ClONO_2$	STRAT. COLUMN	FT-IR
AEROSOLS		LIDAR (10-45 km)

VALUE OF CENTRAL ARCHIVE

- Gives all the researchers within a scientific community access to the same data.
- Data from many geographical regions can be viewed together, which gives a more total picture.
- Synergy from combination of different data sets.
- On-line archive gives rapid access to data.
- Promotes scientific cooperation.

NILU

Meeting with CEC and NISK 7 March 1994 at NILU
Subject: Scientific data centre

HOW TO ORGANISE ?

- The various research groups must be convinced that a central archive is beneficial to everybody and to the science.

- Need for a data protocol which states the obligations and rights of each Principal Investigator.

- Need for information from the data centre to the users, e.g. in the form of a newsletter.

- Routines for collection of "project data" and ancillary data which can help to interpret the "project data".

- Data dissemination, e.g. on CD-ROM.

NILU

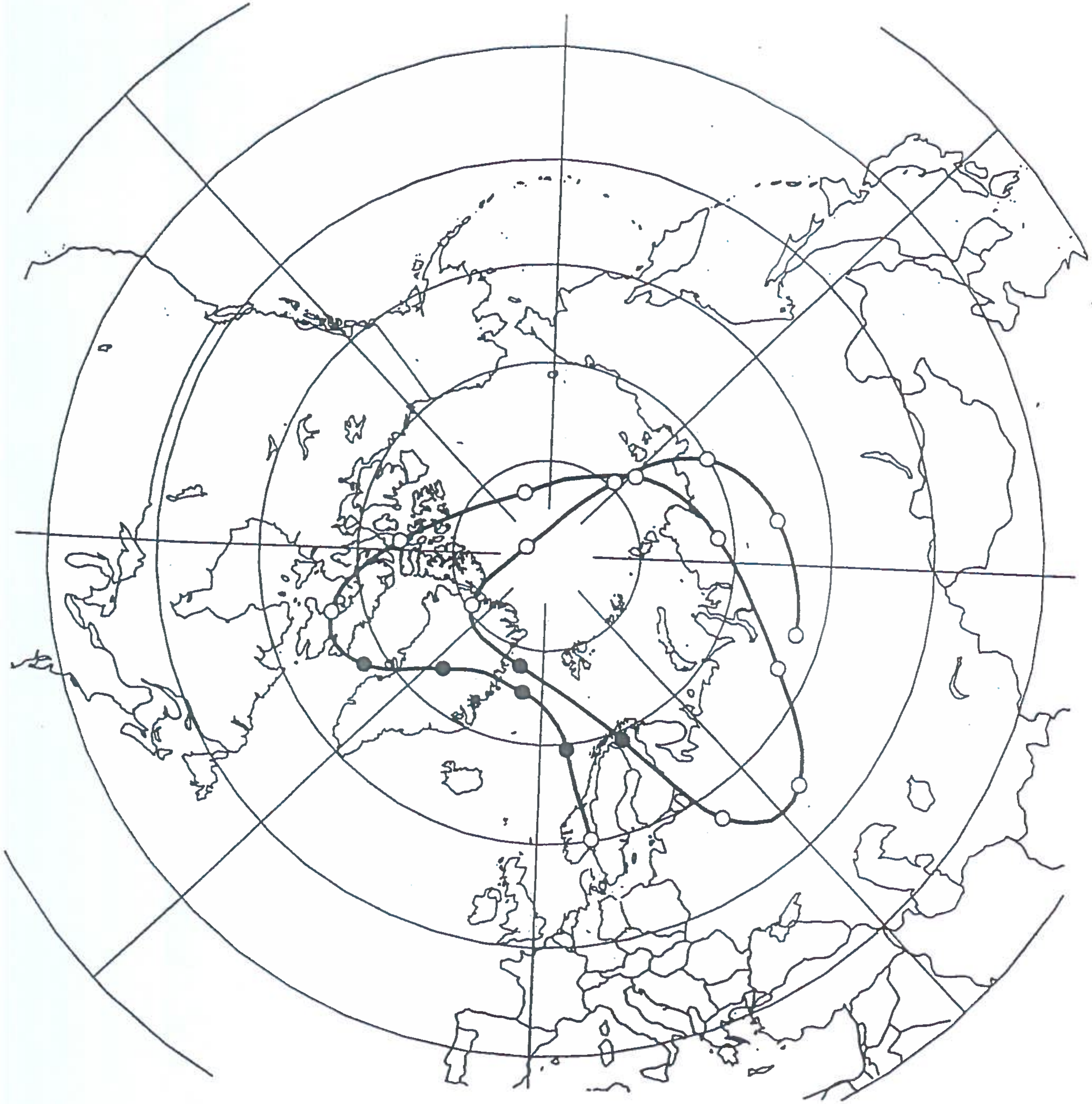
DATA CENTRE JOBS

- EASOE (European Arctic Stratospheric Ozone Experiments).
- SESAME (Second European Stratospheric Arctic and Mid-latitude Experiment).
- SCUVS
- ESMOS
- NDSC
- TOASTE-B
- ESA/GOME
  - Data centre for experimental data from the Global Ozone Monitoring Experiment on board ERS-2.

NILU

- ☞ **OCTA: 1993-95.**
- ☞ **MOSTOZ: 1993-94.**
- ☞ **ARCTOC: 1993-95.**
- ☞ **ALOMAR: 1994-long term**

NILU



ECMWF
TRAJECTORIES

10 days analysis

Hours/mark: 12

(Filled mark if PSC since previous mark)

O End loc: Gardermoen
End date: 20.Jan.1992
Level : 475 K

Plotted at NILU, Mon Mar 2 1992

SESSION I
On-going research, its organization and administration

The meteorological information system at AWI (MISAWI) archivinig and accessing data from Ny-Ålesund

Gert König-Langlo

Ny-Ålesund Seminar
Potsdam 4-5 May

SESSION I
On-going research, its organization and administration

Developing the data bases for meteorological observations, upper air soundings and radiation measurements at Ny-Ålesund

Gert König-Langlo

Ny-Ålesund Seminar
Potsdam 4-5 May

The Meteorological Information System at AWI (MISAWI)

Archiving and Accessing Data from Ny-Ålesund

Dr. Gert König-Langlo, AWI

MISAWI was developed at the Alfred Wegener Institute in order to validate, postprocess, archive and distribute routine meteorological measurements taken from different observatories in polar regions. MISAWI includes data from:

- routine synoptic surface observations,
- upper air soundings (including ozone profiles),
- radiation and mast measurements.

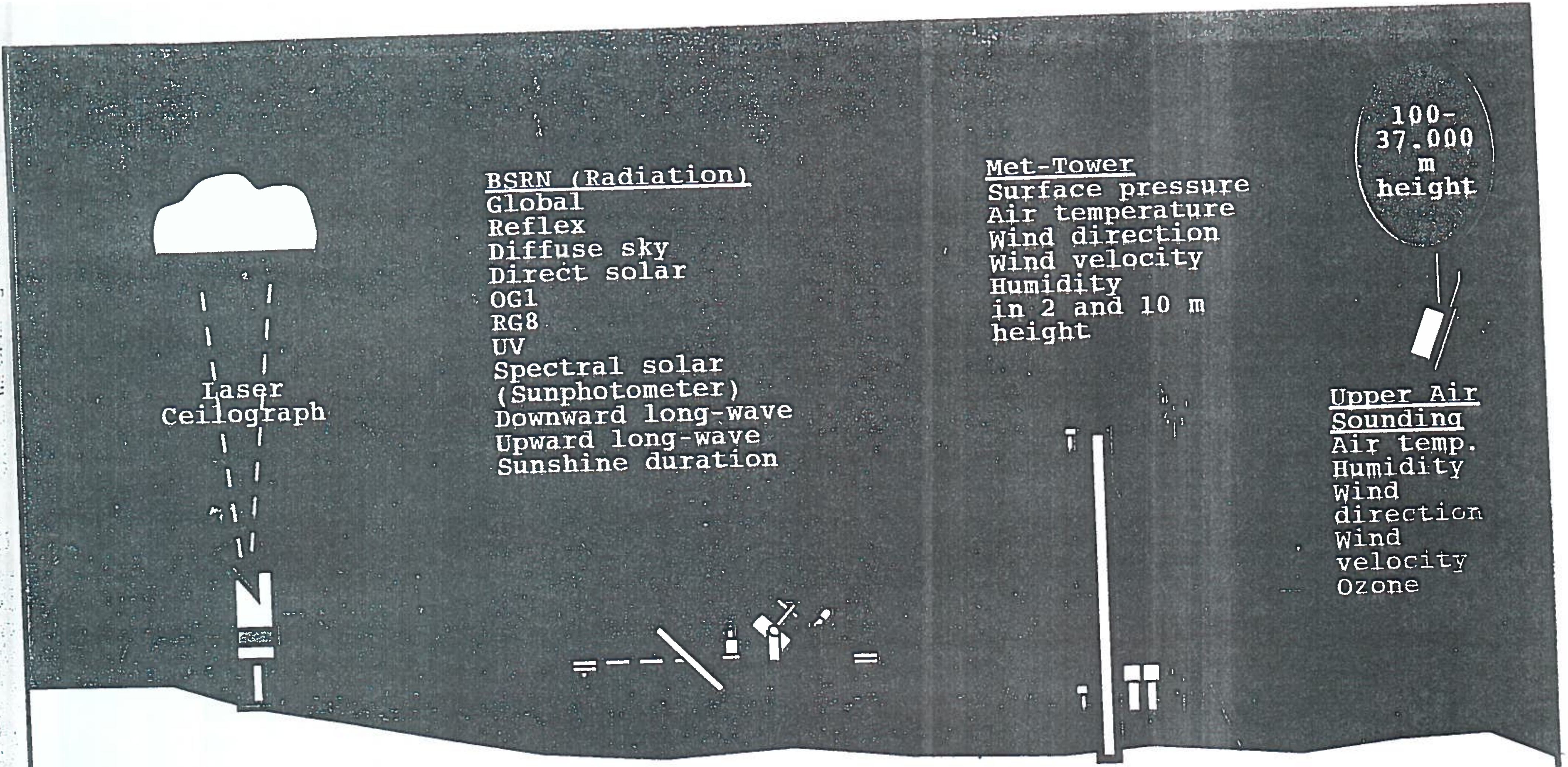
The routine synoptic surface observations are carried out at Ny-Ålesund from the NORSK POLARINSTITUTT every day at 6, 12, 18 UTC. Since September 1990 these data are stored in MISAWI.

The upper air soundings performed about daily at Ny-Ålesund from the Alfred-Wegener-Institute include profiles of pressure, temperature, relative humidity and wind vector. About once a week additional an ozone profile is retrieved as well. Usually the profiles start at the ground (11 m above sea level) and end between 15 and 37 km. Data since January 1991 are stored in MISAWI.

Since July 1992 surface radiation measurements have been carried out at Ny-Ålesund in the framework of the Baseline Surface Radiation Network (BSRN) in cooperation with the NORSK POLARINSTITUTT. All radiation measurements are archived in MISAWI as 5-minute averages and include global radiation, reflected solar radiation, diffuse sky radiation, direct solar radiation, UV radiation, OG1 filtered global radiation, RG8 filtered global radiation, downward long-wave radiation, upward long-wave radiation, sunshine duration. Additional 5-minute averages from station air pressure, relative humidity (2m height), air temperature and wind vector (2 and 10 m height) are available since July 1993.

Full access to any measurements, evaluated values or relations between distinct data archived in MISAWI is possible with the aid of the database language SQL (Structured Query Language). Furthermore, MISAWI offers several standard export formats for ASCII files, which can be provided via e-mail or an anonymous ftp-server. For further information, please contact aherber@awi-potsdam.de or gkoenig@awi-bremerhaven.de.

Additional a Word-Wide-Web interface to MISAWI offers any internet user a direct access to certain meteorological data following the html-pages below http://www.awi-bremerhaven.de/MET/NyAlesund/.



Meteorology Observatory of the Koldewey Station

78°56´N, 11°57´E

The Aim of MISAWI

Data sources

- Synoptic surface observations from different stations and ships.
- Upper air soundings including ozone-profiles from different stations and ships.
- Long-time measurements of meteorolgical parameter (including radiation) with high temporal resolution.

Data amount of main observatories

- Synoptic surface observations: Up to 24 observations per day from:
  - Neumayer since Jan. 1981
  - Polarstern since Jun. 1984
  - Ny-Ålesund since Sept.1990

- Upper air soundings including ozone-profiles: Mainly one sounding per day from:
  - Neumayer since Feb.1983
  - Polarstern since Dec.1982
  - Ny-Ålesund since Jan. 1991

- Long-time measurements of meteorolgical parameter (including radiation) with high temporal resolution (5 or 10 minute averages) from:
  - Neumayer since Mar. 1982
  - Polarstern since May 1994
  - Ny-Ålesund since Jul. 1992

Additional data from:

- Antarctic Research Stations: Georg Forster, Mirny
- Ships: Akademik Fedorov, Haakon Mosby, Valdivia, Polarqueen

Data Management Strategy

- Data should be archived with
  - a minimum of redundancy.
  - a maximum of internal integrity.
  - a maximum of possible relations.
- Data archive should be selfdescribing.
- Data archive access should be hardware independent.
- Data archive access should be possible for user with different rights and views.

File transfer via Internet

The data can be obtained via Internet from an anonymous ftp-server at the Alfred-Wegener-Institute. Further information will be given individually. For information adress:

Dr. Gert König-Langlo
Alfred-Wegener-Institut für Polar- und Meeresforschung
Am Handelshafen 12
D-27570 Bremerhaven

Tel.: 0471/48 31 496
Fax: 0471/48 31 425
e-mail: gkoenig@awi-bremerhaven.de

or

Dr. Andreas Herber
Alfred-Wegener-Institut für Polar- und Meeresforschung
Telegrafenberg A 43
D-14473 Potsdam

Tel.: 0331/288-2128
Fax: 0331-288-2137
e-mail: aherber@awi-potsdam.de

NCSA Mosaic: Document View

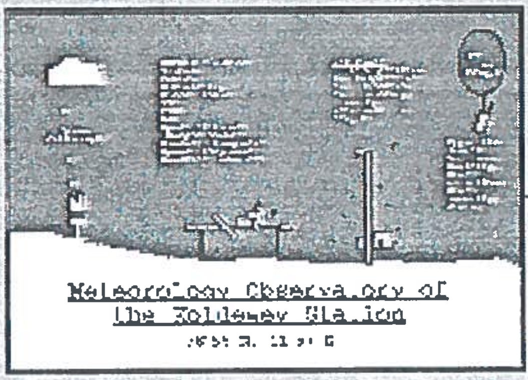
File Options Navigate Annotate Help

Title: Meteorology Measurements at Koldewey

URL: http://www.awi-bremerhaven.de/MET/NyAlesund/

Meteorology Measurements at Koldewey

Since 1992 a meteorological observatory programme is going on at Koldewey station continously. For a bipolar intercomparison the same programme is also carried out at Neumayer in the Antarctic.



The routine programme consists mainly out of 2 parts:

- upper air soundings including ozone profiles and
- surface radiation measurements.

All activities are carried out jointly or in close cooperation with the NORSK POLARINSTITUTT, who kindly provides the

- routine synoptic observations.

Data transfer complete.

Back | Forward | Home | Reload | Open... | Save As... | Clone | New Window

SESSION I
On-going research, its organization and administration

Ny-Ålesund in the EMEP network (European network for monitoring pollution)

Frode Stordal

Ny-Ålesund Seminar
Potsdam 4-5 May

NY-ÅLESUND IN THE EMEP NETWORK

FRODE STORDAL
JAN SCHAUG
ARNE SEMB

NILU

EMEP - UN ECE

COOPERATIVE PROGRAMME FOR MONITORING AND EVALUATION OF LONG-RANGE TRANSMISSION OF AIR POLLUTANTS IN EUROPE

MAIN ELEMENTS

* COLLECTION OF EMISSION DATA
* MEASUREMENT OF AIR AND PRECIPITATION QUALITY
* MODELLING OF ATMOSPHERIC DISPERSION

MEASUREMENT PROGRAMME

GASES AND PARTICLES:

SO_2, SULPHATE

NO_2, NITRATE

AMMONIA, AMMONIUM

OZONE

VOC

RECOMMENDATIONS FOR:

HEAVY METALS

PHOTOCHEMICAL OXIDANTS

PRECIPITATION:

AMOUNT

pH

SULPHATE

NITRATE

AMMONIUM

CALCIUM

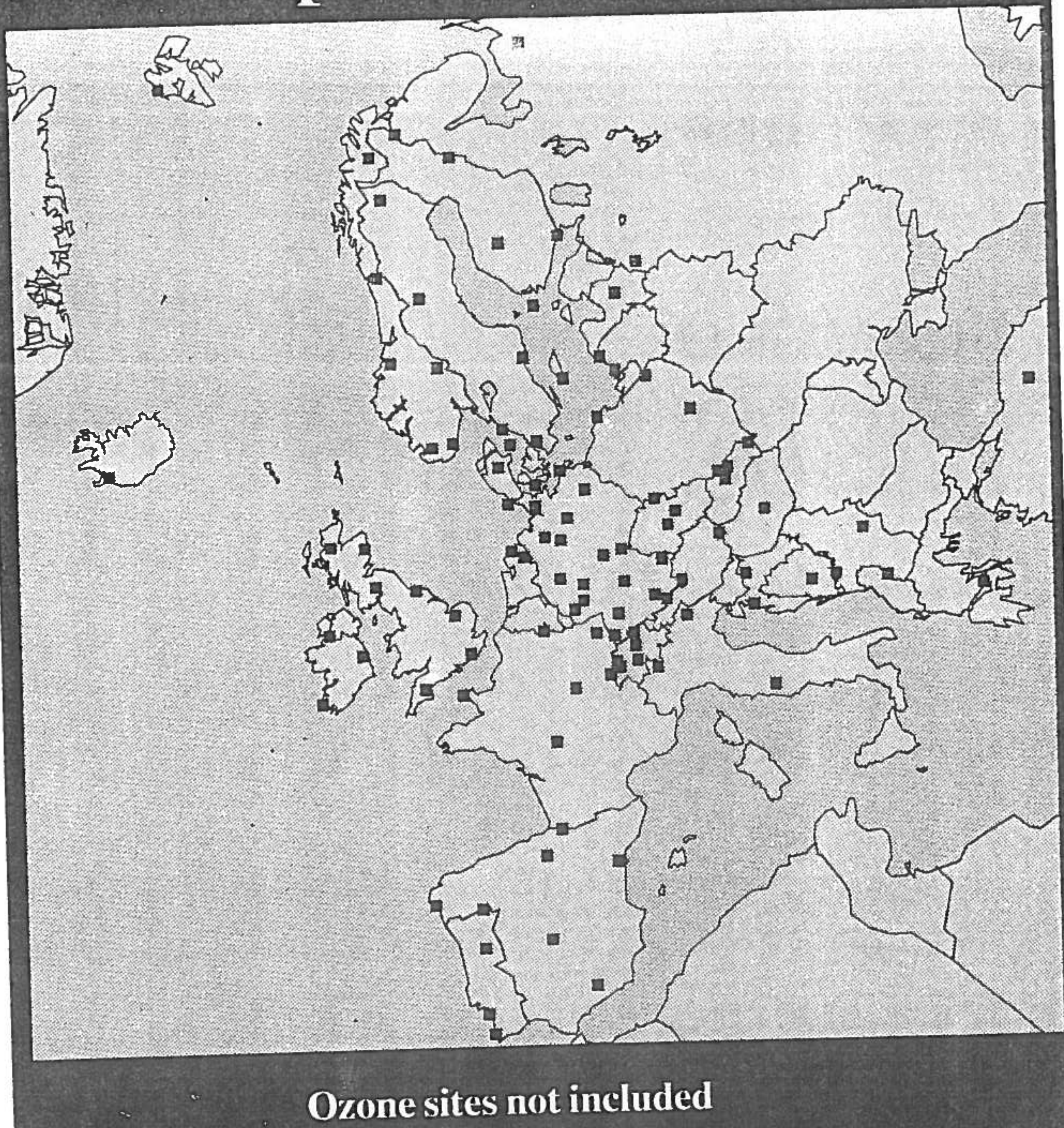
POTASSIUM

CHLORIDE

SODIUM

MAGNESIUM

EMEP
Monitoring sites in operation in 1994



Ozone sites not included

NILU

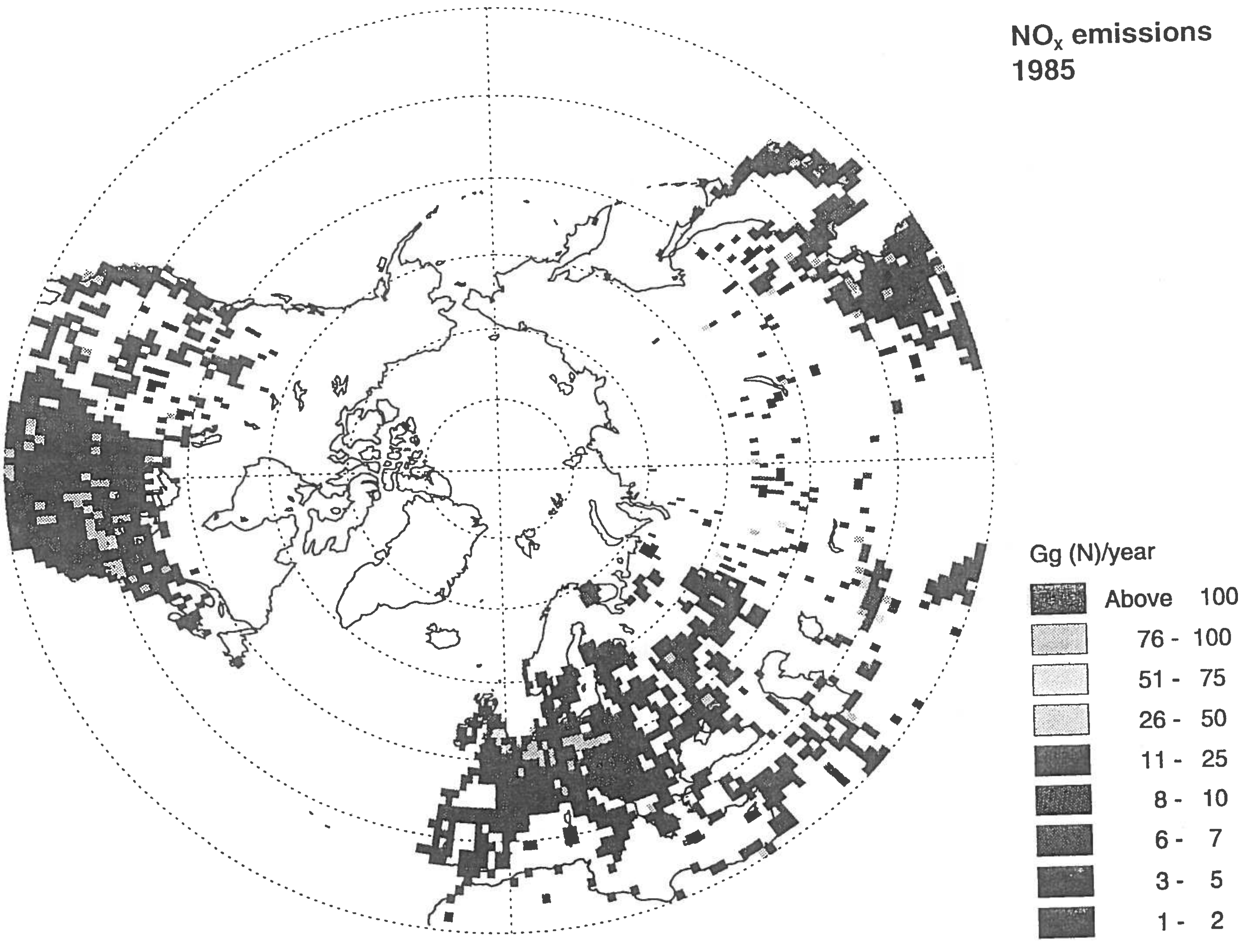
H.DOVLAND: EMEP5.PPT

THE ROLE OF NY-ÅLESUND WITHIN EMEP

* BACKGROUND, REFERENCE STATION

* EMPHASIZE COUPLING BETWEEN REGIONAL (EUROPEAN) AND GLOBAL SCALES

*


NO_x emissions
1985
Gg (N)/year
Above 100
76 - 100
51 - 75
26 - 50
11 - 25
8 - 10
6 - 7
3 - 5
1 - 2

Air and precipitation concentrations in Ny-Ålesund vs. at the Norwegian mainland

1992

	Annual mean concentrations in microgrammes per cubic metre				
	SO_2-S	SO_4-S	NO_2-N	HNO_3-N+NO_3-N	NH_3-N+NH_4-N
NY-ÅLESUND	0.19	0.19	<0.02	0.04	0.08
JERGUL	0.53	0.40	0.28	0.07	0.17
BIRKENES	0.40	0.65	0.69	0.24	0.53

SESSION I
On-going research, its organization and administration

Ny-Ålesund in the geodetic network - VLBI

Bjørn R. Pettersen

Ny-Ålesund in the geodetic network - VLBI

Dr. Bjørn Ragnvald Pettersen

The Ny-Ålesund Space Geodetic Observatory employs several space/ satellite geodetic techniques to obtain very precise observational results. Global networks of observing stations have been established for each technique (e.g. VLBI and GPS). The Arctic location of Ny-Ålesund makes it a unique paricipant which helps tie regional VLBI-networks into a global one, and serves as a GPS tracking station within the IGS-network on a continuous basis. The observatory is also equipped with SYRIUS-A instruments which have been used for experiments wiht the Russian GLONASS satellite system. We hope to try out a PRARE receiver station in connection with ERS-2, in the 1995-96 time frame.

Dr. Bjørn Ragnvald Pettersen
Geodetic Institute
Norwegian Mapping Authority
N-3500 Hønefoss
NORWAY

E-mail: bjornrp@gdiv.statkart.no

NY-ÅLESUND SPACE GEODETIC OBSERVATORY

INSTRUMENT AND TECHNIQUE OVERVIEW

SEVERAL INDEPENDENT
SATELLITE- AND SPACE TECHNIQUES

* **VLBI** — RADIO INTERFEROMETRY
  20 m radio telescope + atomic clock + specialized receiver and recording equipment.

* **GPS** — AMERICAN SATELLITE SYSTEM
  Continuously operating tracking station.

* **GLONASS** — RUSSIAN SATELLITE SYSTEM
  Syrius-A. Experimental use only.

* **PRARE** — EUROPEAN SATELLITE SYSTEM
  ERS-2. Launched 21 April 1995.

NY-ÅLESUND SPACE GEODETIC OBSERVATOR

BENEFITS AND PROPERTIES OF THE MULTIPLE TECHNIQUE APPROACH

* VERY PRECISE RESULTS
  - (sub)-cm level

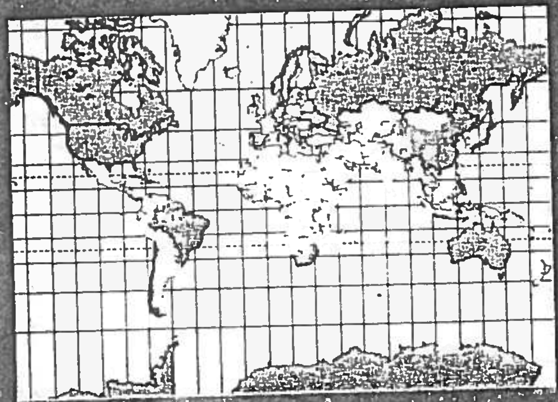
* INTERCOMPARISON OF TECHNIQUES
  - systematic errors identified
  - atmospheric effects corrected

* MULTIPURPOSE INSTRUMENT USE
  - applications to science
  - applications to navigation

* INTERNATIONAL COLLABORATION
  - quality control and standards
  - technology transfer
  - personnel training

GEODETIC VLBI PROGRAM PARTICIPANTS

17 COUNTRIES



INSTITUTIONS

Australia
- University of Tasmania

Brazil
- University of Sao Paolo
- INPE

Canada
- Geodetic Survey of Canada
- Geological Survey of Canada

Chile
- University of Chile, Center for Space Studies

China
- Chinese Academy of Sciences
- Shanghai Observatory
- Urumqi Astronomical Station

Germany
- Institute for Applied Geodesy
- Technical University of Munich
- University of Bonn Geodetic Institute
- Max Planck Institute for Radio Astronomy

Italy
- Italian Space Agency
- Institute of Radio Astronomy
- Telespazio

Japan
- Communications Research Laboratory
- Geographical Survey Institute
- National Astronomy Observatory

Norway
- Norwegian Mapping Authority

Spain
- University of Barcelona
- University of Madrid
- INTA

South Africa
- Hartebeesthoek Radio Astronomy Observatory

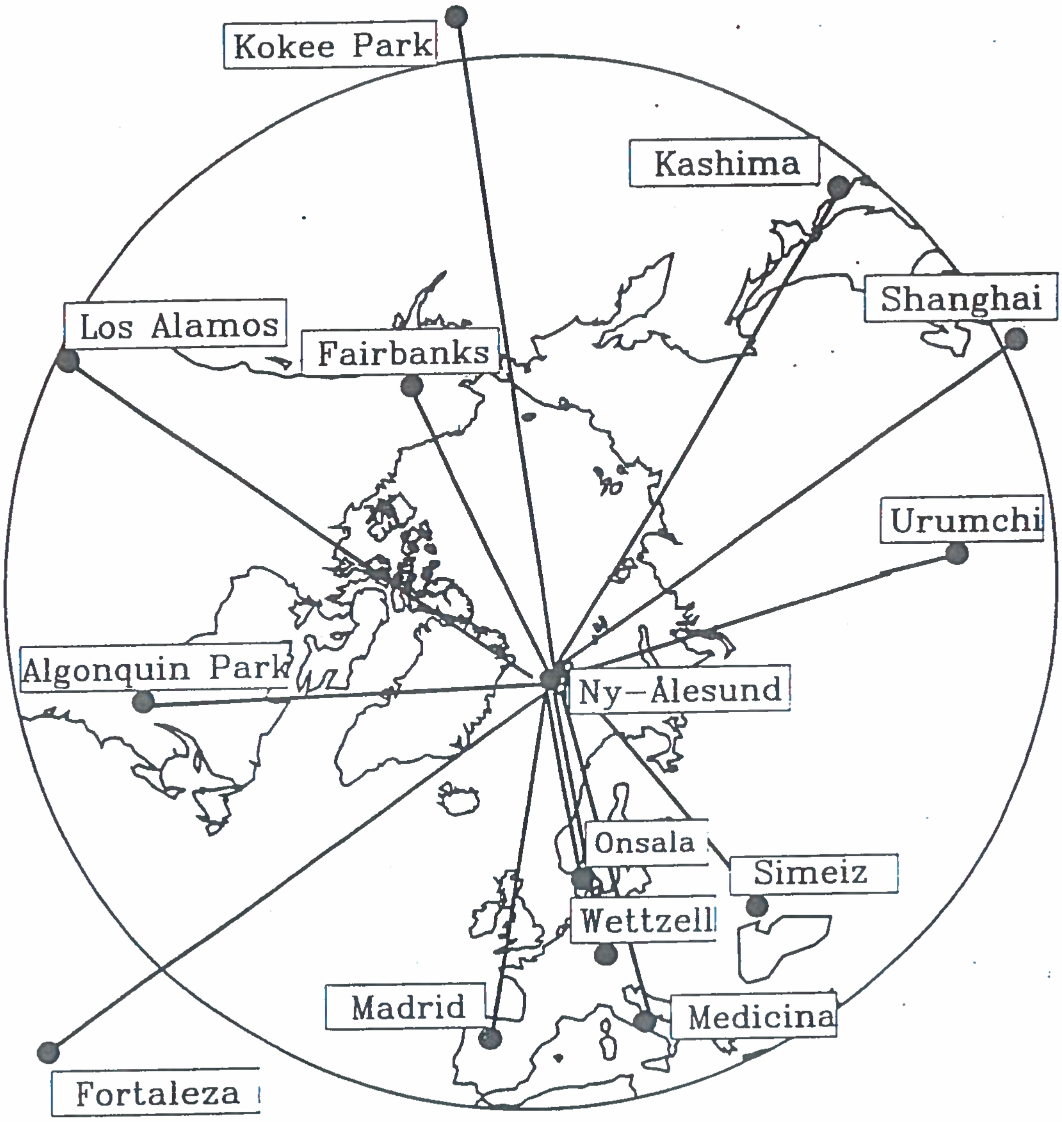
Sweden
- Onsala Space Observatory
- Chalmers University

Russia
- Institute for Applied Astronomy
- Russian Academy of Sciences
- Institute for Cosmic Investigations

Ukraine
- Ukrainian Academy of Sciences
- Main Astronomical Observatory
- Crimean Radio Astrophysical Observatory

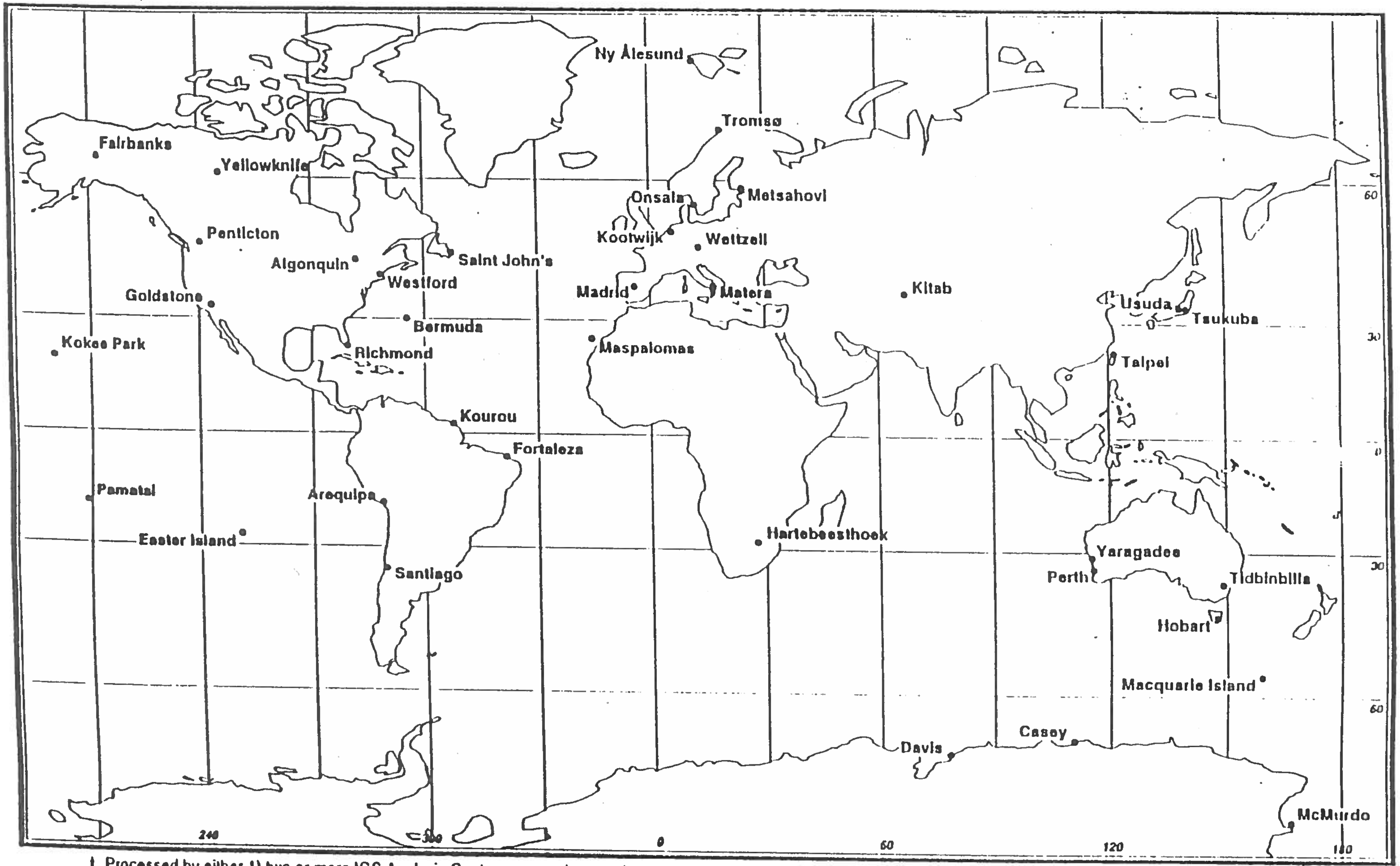
U.S.A.
- NASA/Goddard Space Flight Center
- U.S. Naval Observatory
- National Oceanic and Atmospheric Administration
- Jet Propulsion Laboratory
- Naval Research Laboratory
- Massachusetts Institute of Technology
- Smithsonian Astrophysical Observatory
- National Radio Astronomy Observatory
- Haystack Observatory
- AlliedSignal Technical Services Corp.
- NVI, Inc.
- Hughes STX
- Interferometrics Inc.

STATENS KARTVERK



A Northern Hemisphere VLBI Network

GPS TRACKING NETWORK OF THE INTERNATIONAL GPS SERVICE FOR GEODYNAMICS
GLOBAL STATIONS †



† Processed by either 1) two or more IGS Analysis Centers on another continent or 2) a majority of Analysis Centers.

December 1994

SESSION I
On-going research, its organization and administration

Ny-Ålesund in the seismological network

Alfons Eckstaller

Ny-Ålesund Seminar
Potsdam 4-5 May

A new "Very-Broad-Band" Seismological Station at Ny Ålesund

(Alfons Eckstaller, AWI Bremerhaven)

The new established station is ...

* replacing the former **WWSSN**-station operated by the Institute of Solid Earth Physics of the University of Bergen, Norway.
(WWSSN = **W**orldwide **S**eismographic **N**etwork, established since late 50-ties and early 60-ties)

* a **joint venture project** between following institutions:

the **Institute of Solid Earth Physics, University of Bergen,** together with the **Norsk Polar Institutt,**
IRIS - **I**ncorporated **R**esearch **I**nstitutes for **S**eismology, USA,
USGS - US Geological Survey,
and the **Alfred Wegener Institut**;
additional support came from **GFZ**, the **Geoforschungs-Zentrum** in Potsdam

* incorporated into the international digital **G**lobal **S**eismographic **N**etwork **GSN**, a modern worldwide network of now about 100 operating stations, whose instrumentation and data aquisition and transmission is based on the highest available standard of technology.

Location of the station:
approx. 800 meters south of the Koldewey Station, on a little terrace below the slopes of the Zeppelinfjellet

Coordinates:
78. 9256 ° N, 11.9417 ° E, 77 meters elevation (USGS information)

Operating since 06.11.1994, Station Code is KBS

Principal features of the station ...

* the station is a remote or seperated station, i.e., the seismometers and the main data-acquisition system (digitizer and prepocessor etc.) are installed in a special sheltered vault in some distance from Ny Ålesund. This guarantees a minimum of distortion of the measurements due to man-made noise in Ny Ålesund (traffic, noise from the power plant etc.) The recording systems and the communication facilities are installed in the building of the ·Norsk Polar Institutt. A telephone line links both subsystems.

* the seismometer vault was built into a excavated cavern of approx. 5 meters in depth. The construction of the vault is based on poured reinforced concrete. The socket for the seismometers is founded indepently from the rest of the building to ensure high quality measurements even during control or service visits. The building is covered by a thick layer of gravel to reduce wind-generated noise. This and an extra thermal insulation guarantee proper thermal conditions for the equipment.

* the location of the vault is the only place in the nearer vicinity of Ny Ålesund, where it could be built on more or less solid rock. The vault was constructed on a small outcrop of tertiary sandstone, which is not so heavily weathered and disintegrated due to the perma frost etc. All other places are covered by a thick layer of debris, which is only consolidated due to the perma frost.

* because of the high technological standard of the system almost no maintenance or service work is necessary, except sometimes recentering the seismometers and changing the tape cartridges. Therefore no additional staff is necessary.

* data are stored continously on magnetic tape and an external hard disk. They both can hold continous data of several weeks, depending on the sampling frequency. Continous data on the tape cartridge are regularily scheduled to the USGS / IRIS (Seismological Laboratory Albuquerque). Data retrieval of actual recordings is also done automatically by the USGS / IRIS group.

* <u>the station is an open station</u>, i.e., (almost) everyone interested in the data may have access to the recordings.

The scientific aspects ...

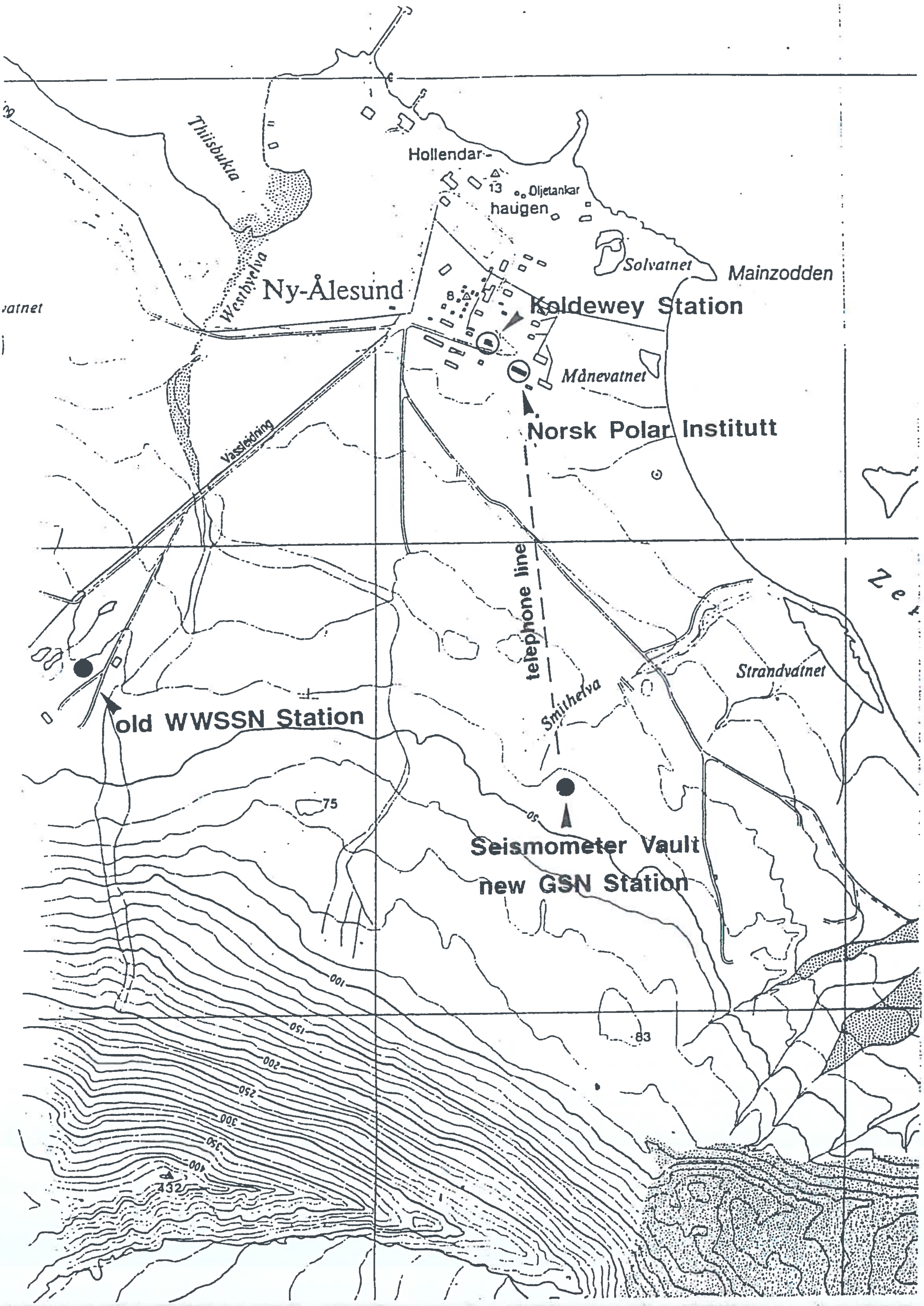
1. The most important reason for establishing a modern very-broad-band station in Ny Ålesund was that until now there was actually no station in operation with that modern high standard. With this new station a large gap in the international GSN-network could be closed.

2. But there are some other topics, which are especially of interest for the Alfred Wegener Institute. With this new station we are able to investigate the following subjects, which are essentially based on data of high quality:

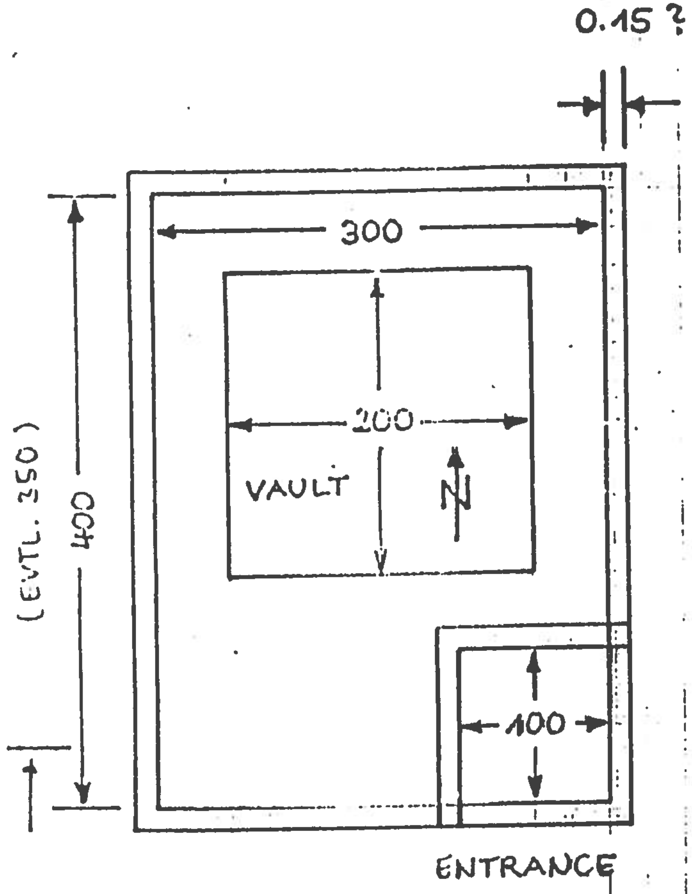
-- calculation of the so called "transfer function" for the deeper earth below Ny Ålesund. This will give us more information about the structure of the crust and the upper lithosphere.

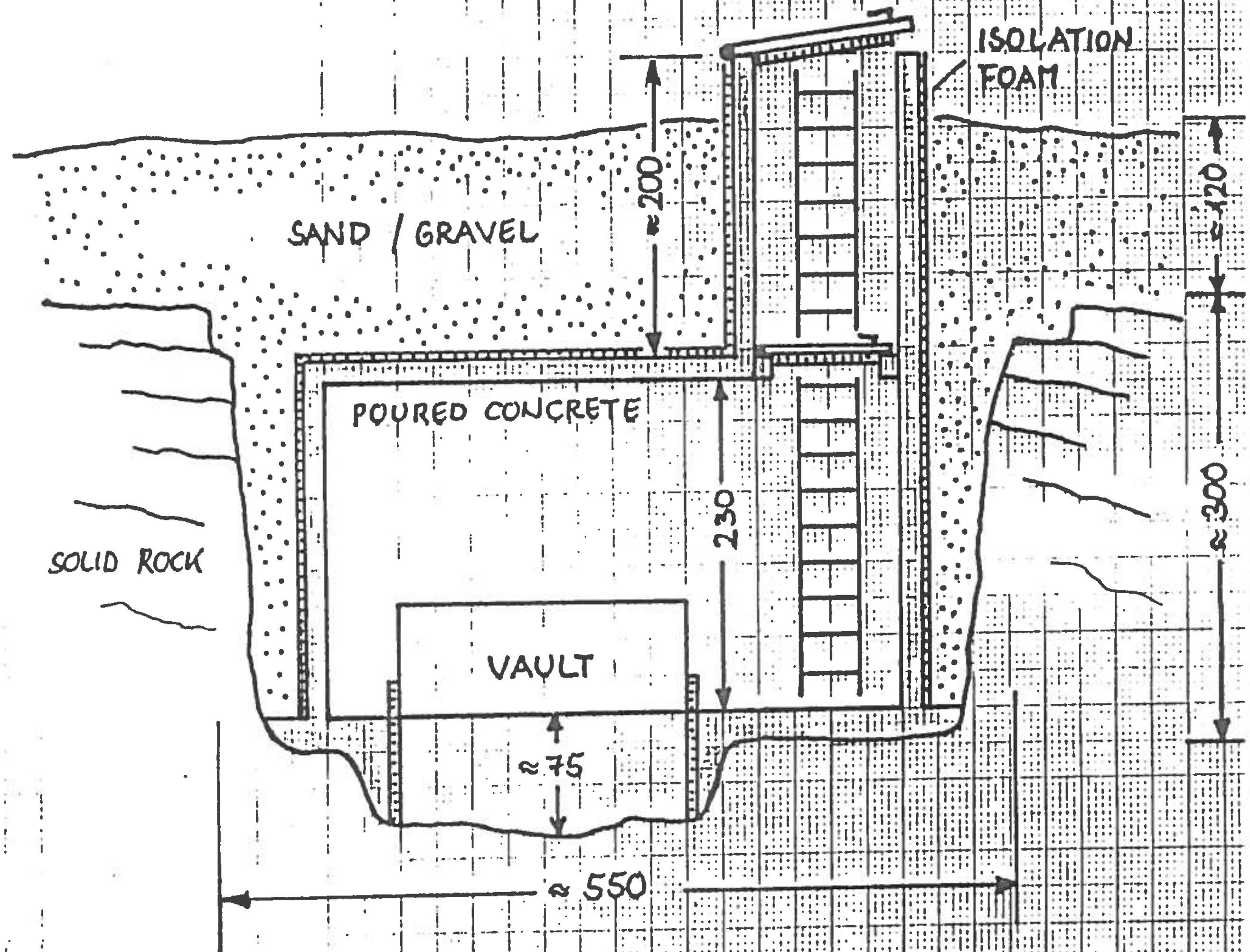
-- the observation of shear wave splitting can be used to estimate the anisotropy in the crust and especialy in the upper mantle, which will give us more knowledge about the tectonophysical development of this part of Svalbard.

-- together with the short-period array near Longyearbyen we have a better possibilty for monitoring the local and regional seismicity in Svalbard. Another important research target is a more detailed monitoring of the earthquake activity at the Mohn and Gakkel ridges in the arctic part of the North Atlantic.



Thiisbukta
Hollendar-
13
Oljetankar
haugen
Solvatnet
Mainzodden
Ny-Ålesund
Westbyelva
Koldewey Station
8
Månevatnet
Norsk Polar Institutt
Vassledning
telephone line
Strandvatnet
Smithelva
old WWSSN Station
75
50
Seismometer Vault
new GSN Station
100
150
200
250
300
350
400
432
83





TOTAL EXCAVATION : ≈ 70 M^3

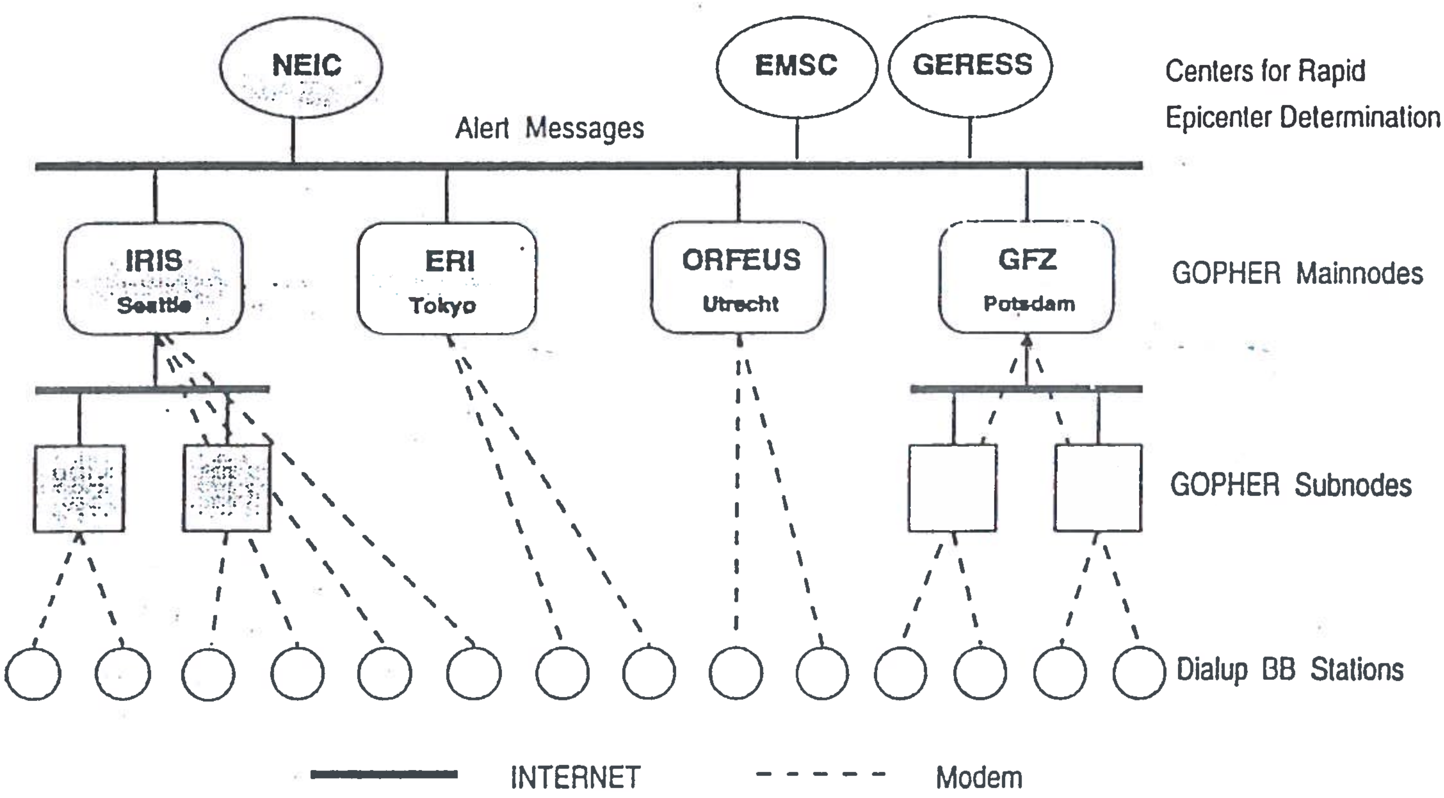
AMOUNT OF CONCRETE : SOCKET / VAULT : ≈ 6 M^3

BUILDING : ≈ 12 M^3

AMOUNT OF GRAVEL : ≈ 30 M^3

sketchmap of the seismometer vault

Global GOPHER / BADGER System



Organisation of access management and data retrieval

1. Certain "Centers for Rapid Epicenter Determination" are permanently monitoring the worlwide seismic activity. In the case of the occurance of a stronger earthquake the preliminary location of this event is calculated. If the magnitude of this earthquake is exceeding a certain magnitude-treshhold an alert message is given to the mainnodes of the different networks via internet. The detection processes are running completely automatically and it takes typically not more than half an hour for a first estimation of the source location.

2. On an alert message the mainnodes are first estimating if the event was strong enough to be recorded with a certain signal strength at the particular network stations, depending on epicentral distance and the magnitude .

3. If this criterion is positive data are automatically retrieved. The amount of data retrieved depends on the strength of the event, the epicentral distance and the frequency range of the recorded data.

4. After completion of data retrieval the whole waveform-data of the selected stations are available at the mainnodes and enable thus a more accurate calculation of the earthquake´s location and other important source parameters than the preliminary ones.

NEIC:	National Earthquake Information Center, USA (using data from different networks)
EMSC:	European Mediterranean Seismological Center, Strasbourg (using data from the MEDNET)
GERESS:	German Experimental Seismic System, Germany (using data from a local seismographic array)

SESSION I
On-going research, its organization and administration

The geographical information system (GIS) at Ny-Ålesund

Stefan Norris

Appendix 1: GIS Project contents

The view 'All themes' in the ArcView project 'Kings Bay' currently (April 1995) consists of the following themes and data:

BASE MAP

Theme name	Description	Source map scale
Contour lines	50m intervals plus the 25m.a.s.l. line.	1:100,000
Lakes	Shapes illustrating lakes. Not linked to information database.	1:100,000
Rivers	Shapes illustrating rivers. Not linked to information database.	1:100,000
Land line features	Lines delimiting sea, land and glaciers.	1:100,000
Land	Shapes illustrating land. Not linked to information database.	1:100,000
Glaciers	Shapes illustrating glaciers. Not linked to information database	1:100,000
Sea	Shapes illustrating the sea. Not linked to information database	1:100,000
Coastline, Ny-Ål.	Line between sea and land.	1:1,000
Contours, Ny-Ål.	1m intervals	1:1,000
Hydrology, Ny-Ål.	Lines of larger water bodies.	1:1,000
Streams, Ny-Ål.	Lines of streams.	1:1,000
Trigonometric points, Ny-Ålesund	Points.	1:10,000

NATURE / CONSERVATION / MANAGEMENT

Theme name	Description	Source map scale
Bird colonies	Points showing location of registered bird colonies. Linked to seabird database.	1:100,000
Protected areas	Shapes illustrating protected areas. Not linked to information database.	1:100,000
Restricted areas	Shapes showing restricted areas around installations and research plots. Not linked to information database.	1:100,000
Vegetation, Brøgger	Detailed vegetation map. Linked to database.	1:10,000
Quartenary geology, Kvadehuken	Detailed geological map. Not linked to information database.	1:10,000
Geomorphology, Kvadehuken	Detailed geomorphologic map. Not linked to information database.	1:10,000
Local bird protection	Shapes illustrating areas of local bird protection in Ny-Ålesund. Not linked to information database.	1:100,000

Scooter routes	Lines illustrating proposed entry and exit routes for snow-mobiles in Ny-Ålesund.	1:100,000

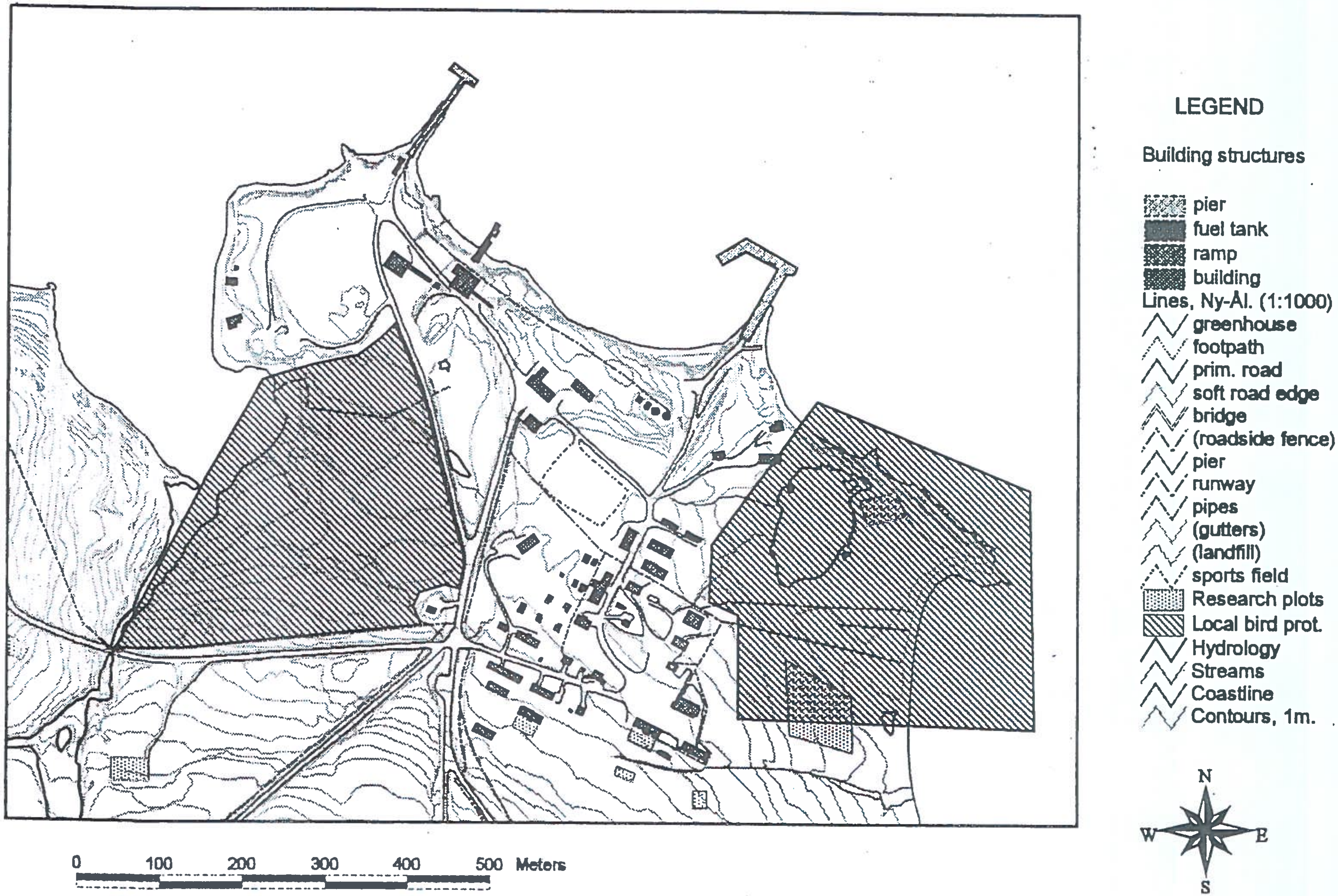
RESEARCH

Theme name	Description	Source map scale
Research plots	Shapes illustrating past and present research plots. Linked to database with information concerning each site.	1:100,000

INFRASTRUCTURE

Theme name	Description	Source map scale
Huts	Points illustrating huts in entire area. Linked to hut database.	1:100,000
Building structures, Ny-Ålesund.	Shapes illustrating buildings and other structures in Ny-Ålesund. Linked to data on each structure.	1:10,000
Point features, Ny-Ålesund	Points illustrating structures in Ny-Ålesund. Not linked to information database.	1:10,000
Line features, Ny-Ålesund	Lines illustrating roads, pipes, etc. in town center. Not linked to information database.	1:1000
Line features, Ny-Ålesund	Lines illustrating roads, pipes, etc. in Ny-Ålesund area. Not linked to information database.	1:10,000

Ny-Ålesund, Town Center



SESSION II

Ny-Ålesund - scientific results

Ny-Ålesund Seminar
Potsdam 4-5 May

SESSION II
Ny-Ålesund -
scientific results

Atmospheric Sciences

Contributions from the Koldewey-Station to the Network for the Detection of Stratospheric Change (NDSC)

Otto Schrems

Ny-Ålesund Seminar
Potsdam 4-5 May

NDSC Network for the Detection of Stratospheric Change

The Arctic NDSC station in Ny-Ålesund

Contributions from the Koldewey station to the Network for the Detection of Stratospheric Change (NDSC)

O. Schrems
Alfred Wegener Institute
for Polar and Marine Research
Bremerhaven

The Koldewey station at Ny-Ålesund (Spitsbergen)

1988 AWI decides to set-up an Arctic research station at Ny-Ålesund.

1989 Start of stratospheric ozone measurements (ozone LIDAR and ozone sondes) by AWI and University of Bremen.

1990 Moving into the "Blue House", establishment of a chemistry laboratory in "the old smith's shop".

1991 Formal opening of the german Arctic station at Ny-Ålesund and naming it "Koldewey station"; setting-up a station for radiation measurements; LIDAR measurements of "Pinatubo-aerosols".

1992 Start with high-resolution FTIR measurements with the sun and moon as light sources; offical acceptance as NDSC station by the NDSC steering committee as a joint German Norwegian project.

1993 Start of construction works for a new NDSC observatory building.

1994 Completion of the new NDSC building; beginning of regular microwave(O_3,ClO) measurements.

1995 Formal opening of the new NDSC building.

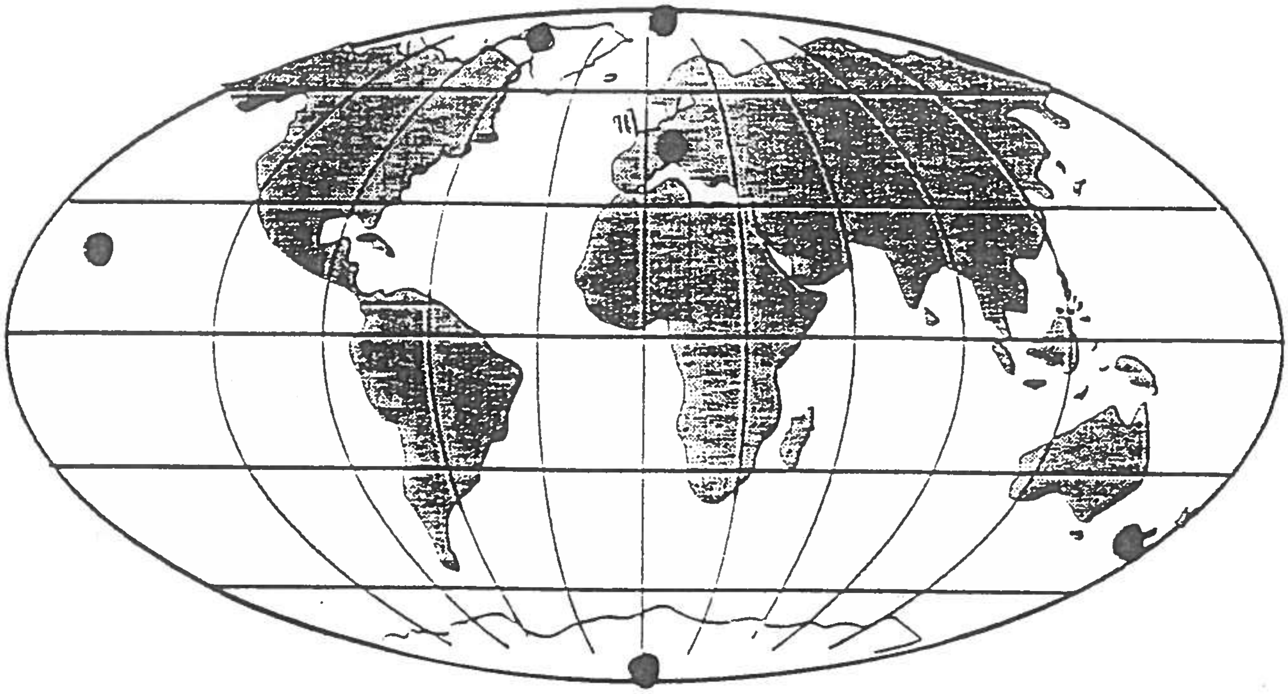
Goals of the NDSC Network

- To make observations through which changes in the physical and chemical state of the stratosphere can be determined and understood. In particular, to make the earliest possible identification of changes in the ozone layer and to discern the cause of the changes.

- To provide an independent calibration of satelllite sensors of the stratosphere.

- To obtain data that can be used to test and improve mulitdimensional stratospheric chemical and dynamical models, therby enhancing confidence in the prdictive and assessment capabilities of these models.

Primary Stations



1. Arctic station: Ny-Ålesund (Spitsbergen, 78.5“N, 12°E)
Thule (Greenland, 76°N, 69°W)
Eureka (Canada, 80°N, 86°W)

2. Alpine station: Observatoire de Haute Provence (44°N, 6°E)
Plateau de Bure (44°N, 6°E)
Jungfraujoch (46°N, 7°E)

3. Mauna Loa and Mauna Kea (20°N, 155°W)

4. Lauder, New Zealand (45°S, 17O°E)

5. Antarctic station: Dome C (74.5°S, 124°E), beginning in 1998
Interim sites at McMurdo (77.8°S, 166° E),
Dumont D'Urville (67°S, 140°E)

Chemical species of interest

The main focus of the NDSC network is to make global measurements in the altitude region from the tropopause to about 50 km. The following measurements have been identified as being of the highest priority to the NDSC:

- Column ozone
- Vertical profile of ozone 80 - 70 km)
- Temperature (0 - 70 km)
- Vertical profile of ClO
- Vertical profile of H_2O
- Vertical distribution of aerosols
- Vertical profile or column of NO_2
- Stratospheric column of HCl
- Vertical profiles of long-lived tracers: CH_4 and N_2O
- Other species (HNO_3, $ClONO_2$, and OH)

These priorities are based on the assumption that existing and planned satellite measurement activities will continue, as will the ground-level monitoring of ozone and long-lived gases by existing networks.

NDSC Network for the Detection of Stratospheric Change

NDSC-Station Ny-Ålesund

Participating institutions:	**Alfred Wegener Institute (AWI)** Bremerhaven & Potsdam
	Institute for Environm. Physics **University of Bremen**
	Norwegian Institute **for Air Research (NILU)**
Steering committee members:	O. Schrems (AWI) K. Künzi (U Bremen) G. Braathen (NILU)
Principal investigators:	**Ozone sondes** (H. Gernandt, P. von der Gathen)
	Ozone Lidar (O. Schrems, R. Neuber)
	Aerosol/Temperature Lidar (O. Schrems, R. Neuber))
	Microwave (ozone) (K. Künzi)
	Microwave (ClO) (K. Künzi)
	FTIR (O. Schrems, J. Notholt)
	UV/VIS (G. Braathen)
NDSC station engineers:	I. Beninga H. Schütt

Instruments in operation at Ny-Ålesund

- Ozone Lidar
- Aerosol- and Temperature Lidar
- High-resolution FTIR (FTUV) spectrometer (sun & moon measurements)
- Balloonborne ozone sondes
- Microwave radiometer (ozone)
- Microwave radiometer (ClO)
- UV/Vis spectrometer
- Meteorological radiosondes
- Sun photometer
- DOAS spectrometer
- Global Baseline Surface Radiation Station

Activities in the near future

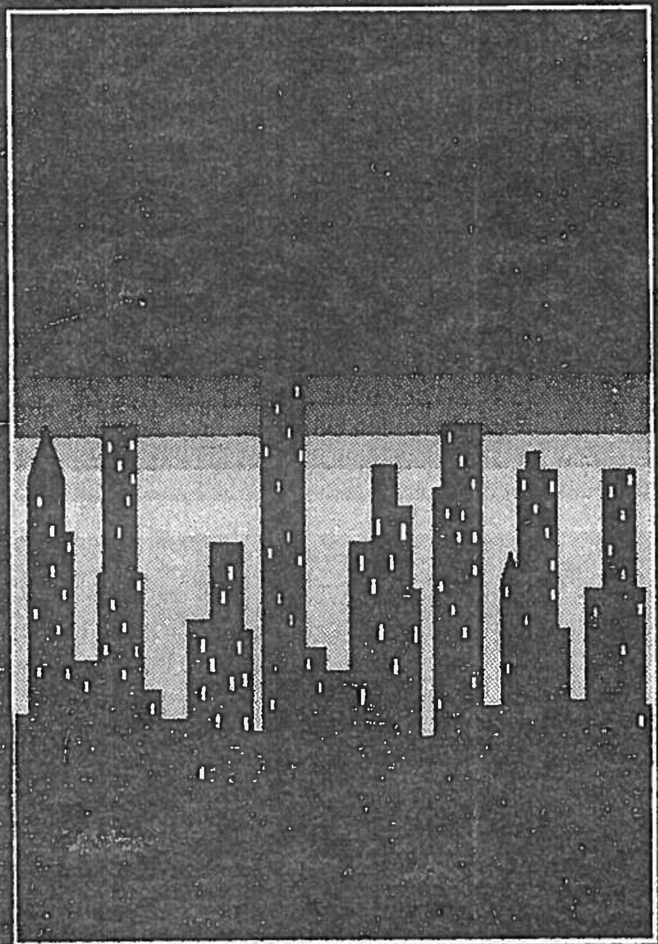
- Beginning ot UV-B measurements (AWI)
- Construction of new UV-Vis spectrometer (NILU)
- Beginning of measurements with star photometer
- intercomparison experiments
  - FTIR
  - microwave
- installation of new Lidar telescope
- installation of a new high-resolution FTIR(UV) spectrometer

SESSION II
Ny-Ålesund -
scientific results
Atmospheric
Sciences

NILU atmospheric research at Ny-Ålesund

Ny-Ålesund Seminar
Potsdam 4-5 May

Why research in Ny-Ålesund?



- Far away from urban pollution
- Listening post for pollution on European and global scale
- The Arctic acts as a reservoir for several components

NILU

Ozone and climate reserach
Background

- The "Ozone hole" is growing
  - Known to be caused by anthropogenic emissions
- Ozone reductions are observed also in the NH
- CFC concentrations will increase until about year 2000
- New threats towards the ozone layer
  - Supersonic aircraft (NO_X, H_2O)
  - Fumigation, gasoline additive (CH_3Br)

NILU

Why research on climate

Global mean temperature has increased by more than 0.5 C over the last 100 years

Future temperature increase will be most pronounced at high latitudes

NILU

Instruments in Ny-Ålesund

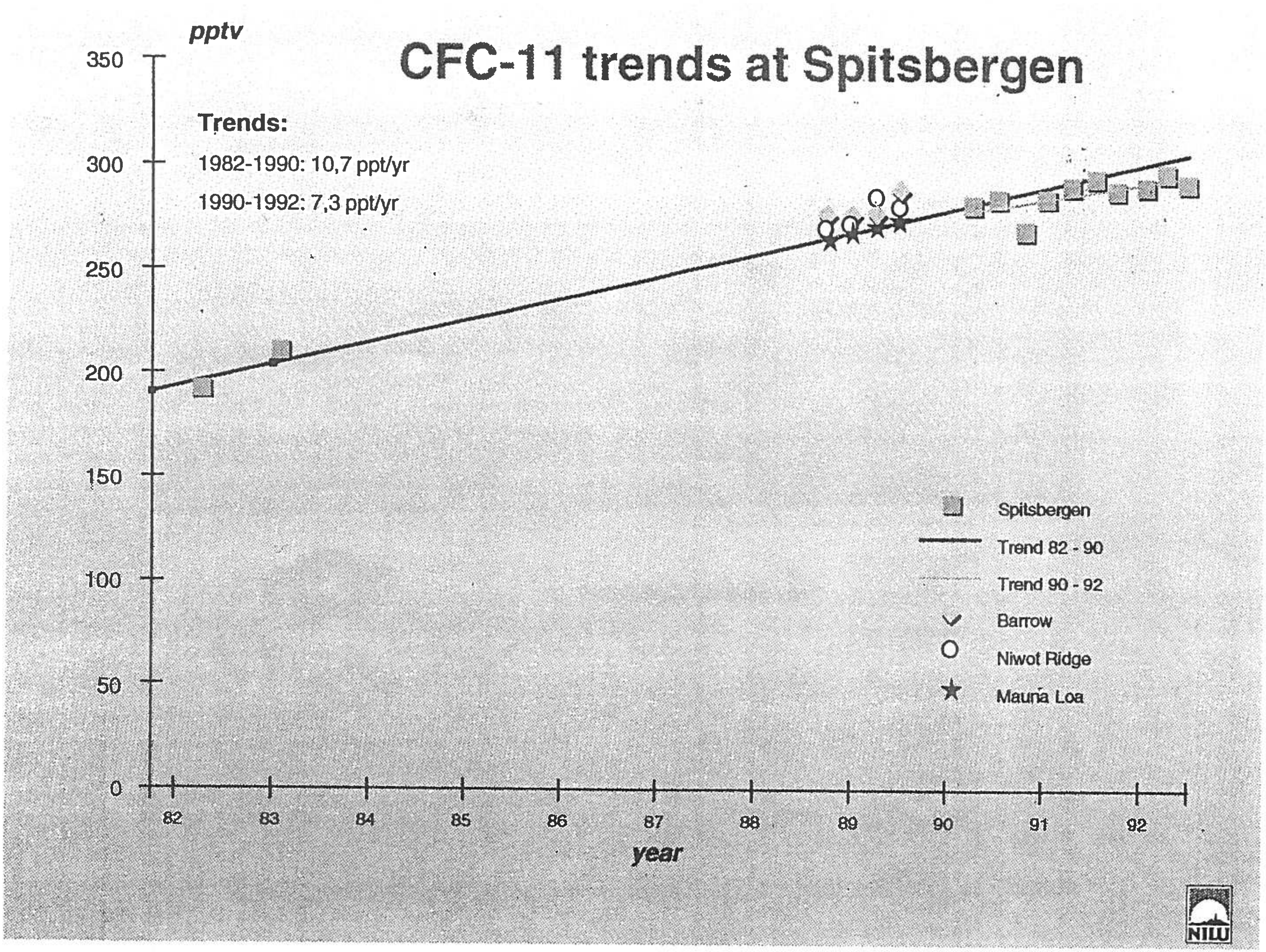
Bath house

- Reuter-Stokes for gross gamma radiation
- Storage room

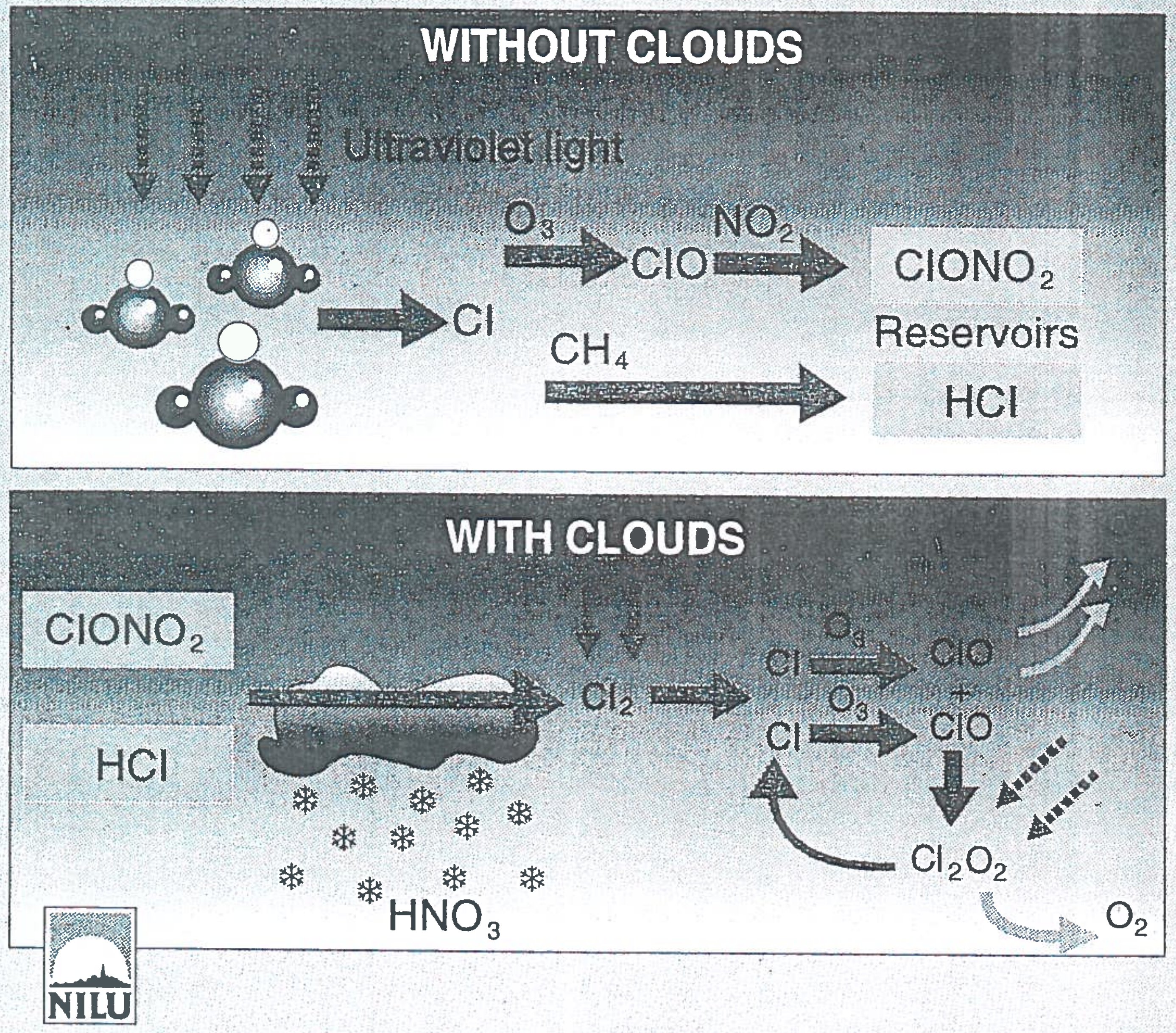
Zeppelin Mt.

- Ozone monitor, continuous.
- Cranox for NO, NO_2, NO_y. Currently NO_y only.
- NOx analyser from Dan Jaffee, Univ. of Alaska.
- PANalyzer: GC for continuous PAN meas.
- CO monitor.
- Photometer for J_{NO_2}
- Aethalometer for black carbon. Loan from NOAA CMDL.
- Filter sampler (FK) for NO2. KI method.
- Filter sampler (EK) for sulphate etc.
- Cascade impactor run by EK.
- Hi-vol sampler, 2 stage, cut-off at 2.5 µm.
- Two PUR plug samplers for PAH and chlorinated HC, respectively.
- Hg sampler, FK inlet.
- Steel flasks, HC, CFCs etc.
- Met. data, Aanderaa weather station.
- Radiation measurements (NP).
- Continuous methane under development.
- Las-X to be installed by AWI.

NILU



CFC-11 trends at Spitsbergen
pptv
Trends:
1982-1990: 10,7 ppt/yr
1990-1992: 7,3 ppt/yr
350
300
250
200
150
100
50
0
82
83
84
85
86
87
88
89
90
91
92
year
Spitsbergen
Trend 82 - 90
Trend 90 - 92
Barrow
Niwot Ridge
Mauna Loa



WITHOUT CLOUDS
Ultraviolet light
O3
ClO
NO2
ClONO2
Reservoirs
HCl
Cl
CH4
WITH CLOUDS
ClONO2
HCl
Cl2
Cl
O3
ClO
+
Cl
O3
ClO
Cl2O2
O2
HNO3
NILU

SESSION II
Ny-Ålesund -
scientific results
Atmospheric Sciences

Measurements of tropospheric and stratospheric trace gases b by absorption and emission spectroscopy in IR and UV-vis

Justus Notholt

Ny-Ålesund Seminar
Potsdam 4-5 May

Measurements of tropospheric and stratospheric trace gases by absorption and emission spectroscopy in the IR and UV/VIS

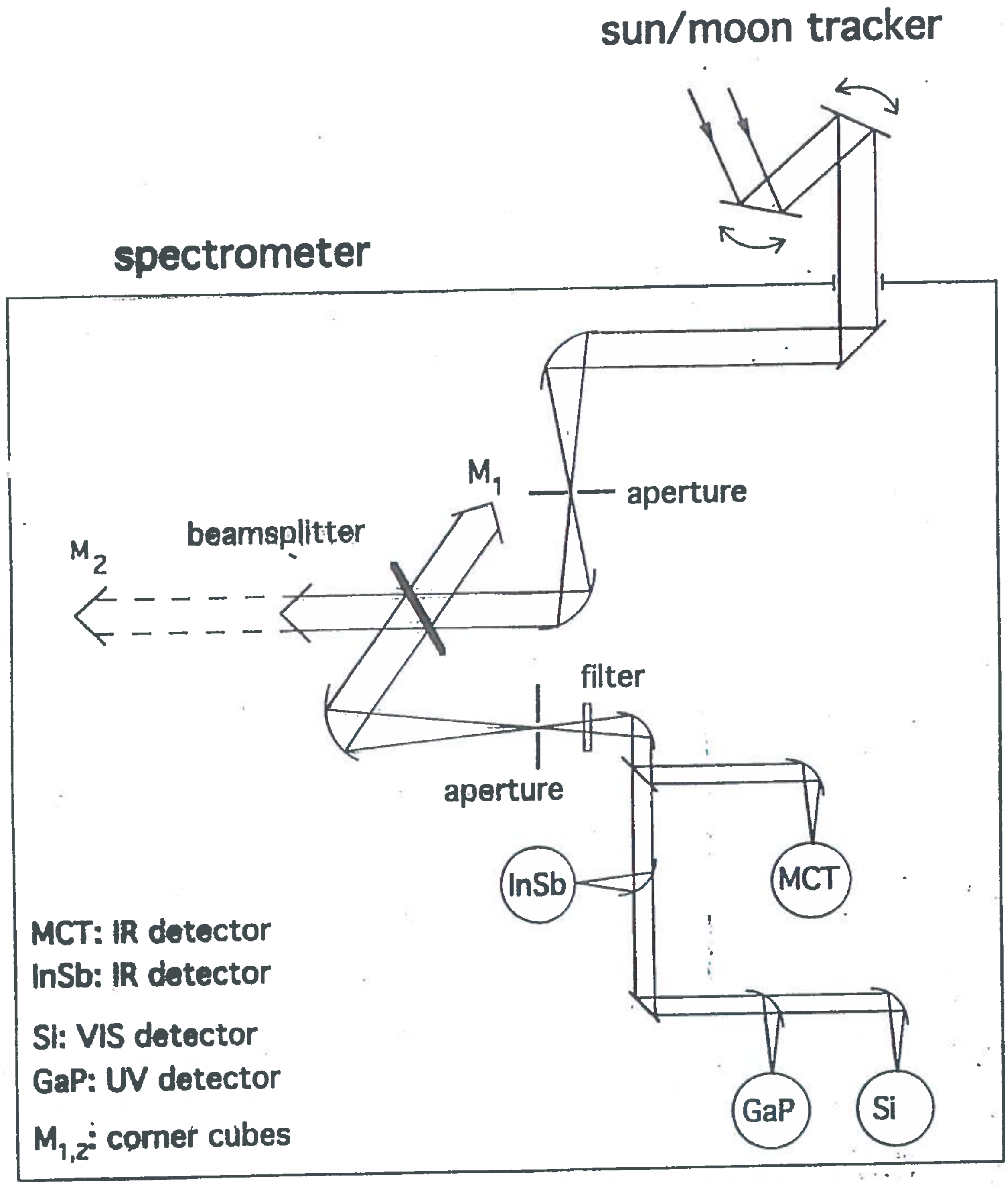
J. Notholt, E. Becker, A. Meier

Alfred Wegener Institut für Polar und Meeresforschung
Potsdam, Germany

Observation site:	Ny-Ålesund, Spitsbergen (79°N, 12°E)
Experimental:	BRUKER IFS120M solar and lunar absorption spectroscopy
Data analysis:	PC based SFIT algorithm (Rinsland, NASA), FASCOD3 RAT (KFK-IMK, Karlsruhe, T. v. Clarmann)
Spectral parameters:	HITRAN 92 database, literature data
Trace gases:	N_2O, HNO_3, NO_2, NO, $ClONO_2$, O_3, HCl, HF, CH_4, C_2H_6, C_2H_2, CO, OCS, HCN CFC-12, CFC-22, H_2O, $H_2{}^{18}O$, $H_2{}^{17}O$, HDO, (SF_6, CFC-11, ClO)

- Emission spectroscopy measurements
  during the polar night between full moon periods
  first analysis for HNO_3, CFC-11

- solar FTUV/VIS measurements
  first analysis NO_2, O_3


sun/moon tracker
spectrometer
M_1
aperture
beamsplitter
M_2
filter
aperture
InSb
MCT
GaP
Si
MCT: IR detector
InSb: IR detector
Si: VIS detector
GaP: UV detector
$M_{1,2}$: corner cubes

SESSION II
Ny-Ålesund - scientific results
Atmospheric Sciences

Lidar and balloon measurements - Lidar observations over Alaska and Ny-Ålesund

Yasu-Nobu Iwasaka

Stratospheric Measurements by Lidar and Balloon at Alaska and Ny Ålesund

· Y. IWASAKA[1], M. Fujiwara[2], T. Shibata[1]

1: STE Lab., NAGOYA UNIV.

2: Dep. Appl. Physics, Fukuoka UNIV.

* **Global Budget and/or Cycle of Atmospheric Constituents**
  Aerosol and others

* **Heterogeneous Chemistry in the Polar Atmosphere**
  PSCs behavior and O_3 loss

Ny Alesund 1993~ (1994 upgrad

Lidar ~ Aerosols

1994~

Balloon ~ Aerosol

Cooperative Meas. Japan and Germa

1994/1993

Alaska Lidar

1991~

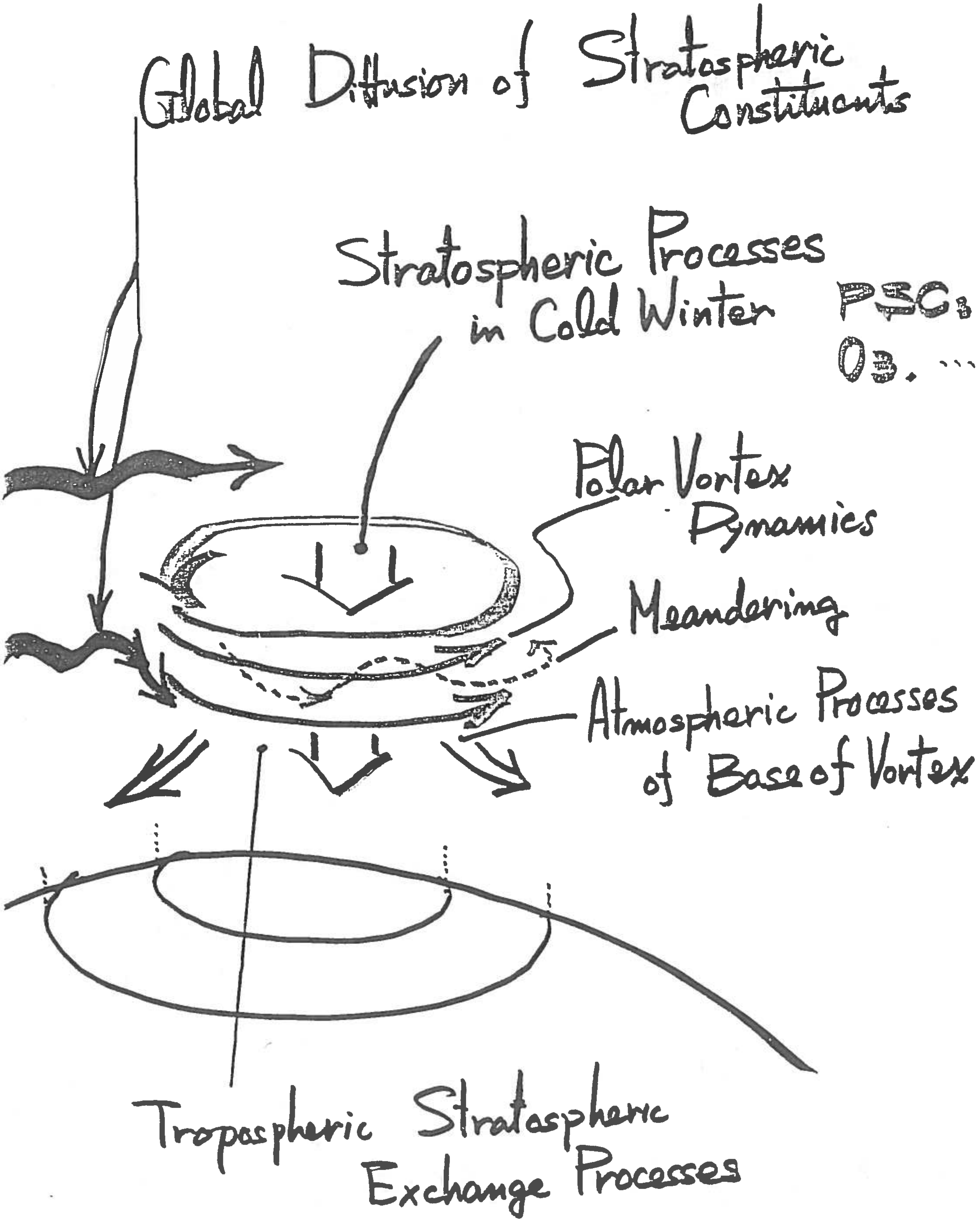
Eureka Lidar

1992~

Global Diffusion

Polar Vortex Effect

Aerosol and O_3


Global Diffusion of Stratospheric Constituents
Stratospheric Processes in Cold Winter
PSCs
O3. ...
Polar Vortex Dynamics
Meandering
Atmospheric Processes of Base of Vortex
Tropospheric Stratospheric Exchange Processes

Microphysical Processes of PSCs

- · PSCs load ~ non sphericity
- · ~ size-number distr.
- · Lower aerosol layer

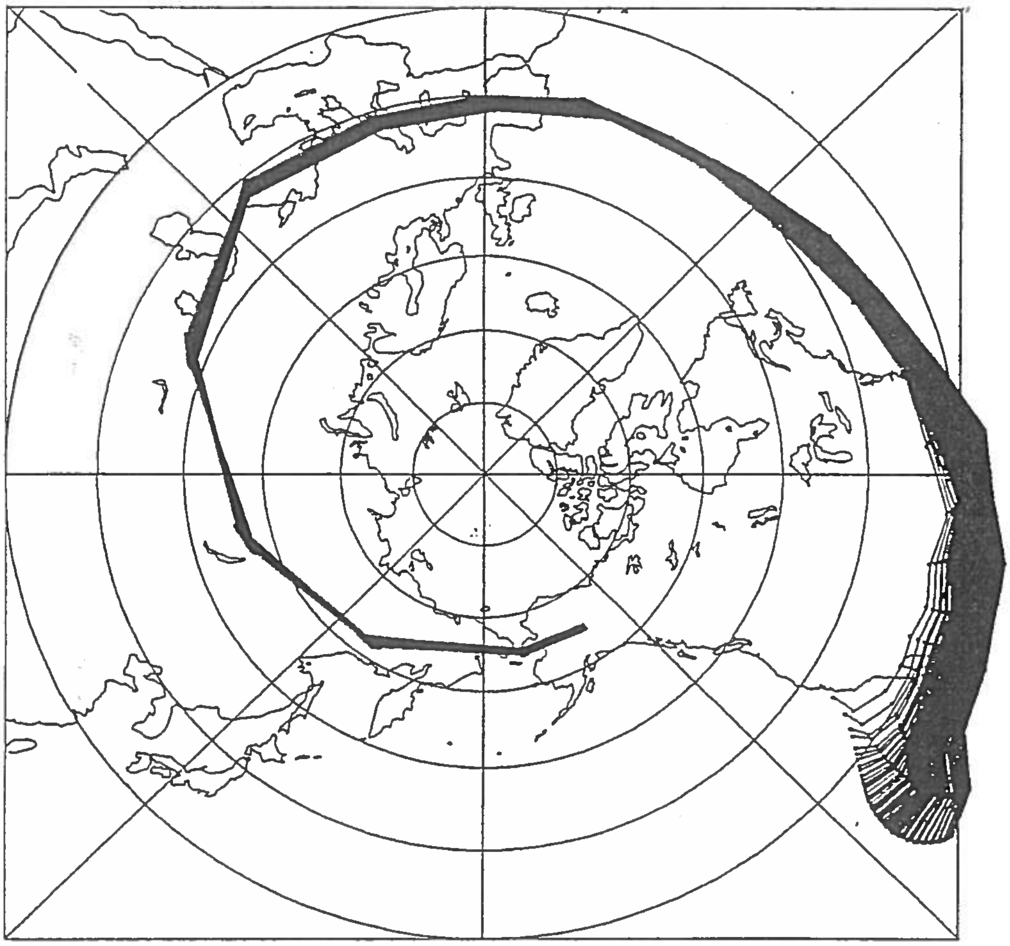
Budget of Stratospheric Constituents

- · Pinatubo volcanic clouds
- · Polar vortex meandering
  Mid latitudes → High
  Polar vortex effects
  on global diffusion
- · Sediments (Stratosphere
  → Troposphere)

Tropospheric Aerosol Processes

- · Soil particle (China → Alaska)
- · Arctic Haze

INITIAL TIME DEC 16 8Z 1991 JMA-WIND
10 DAYS BACKWARD TRAJECTORIES



ADVCIH.Y911216 10 DAYS 25.0KM

SESSION II
Ny-Ålesund -
scientific results
Atmospheric Sciences

Lidar observation of Polar Stratospheric Clouds over Ny-Ålesund

Motowo Fujiwara

Lidar Observations of Polar Stratospheric clouds over Ny-Ålesund

Takashi Shibata , Yasunobu Iwasaka[1] and Motowo Fujiwara[2]

By the lidar observations at Ny-Ålesund, polar stratospheric clouds (PSCs) were frequently found in December 1994 and January 1995. Comparing these observed PSCs with the PSC types by Browell et al. (1990), scattering ratio (R) and depolarisation (δ_a) values are usually smaller than the values of the type la or lb PSCs. Even when these values are large enough and satisfy the defined values of the types, a case was found in which R and δ_a shows the values as type lb, but the wavelength dependence parameter (α) shows opposite tendency or takes smaller values ($\alpha < 1.0$). The PSCs types are usually introduced with a presumption of PSCs micro-physical state, and could misleading us in the understanding of the PSC particles formation processes.

Browell, E.V. et al., GRL, Vol. 17, 385-388, 1990.

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SESSION II
Ny-Ålesund -
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**Atmospheric
Sciences**

Multi-wavelength Lidar measurements of stratospheric aerosols

Georg Beyerle

Ny-Ålesund Seminar
Potsdam 4-5 May

Abstract for Ny-Ålesund Seminar, Potsdam, 4-5 May 1995

MULTIWAVELENGTH LIDAR MEASUREMENTS OF STRATOSPHERIC AEROSOLS

Since November 1991 the aerosol content of the arctic stratosphere is observed by multiwavelength lidar at Koldewey Station, Ny-Ålesund, Spitsbergen (79°N, 11°E). Backscatter coefficients at wavelengths in the UV, visible and near IR (winter 1992/93 only) as well as volume depolarization at one wavelength are measured. Additionally, since November 1993 detection channels for vibrational Raman signals of N_2 are in operation.
The aerosol content of the Arctic stratosphere during winter 1991/92 and 1992/93 is dominated by sulfuric acid aerosols due to the eruption of the Philippine volcano Mt. Pinatubo in June 1991. During winter 1991/92 the polar vortex efficiently isolates the Arctic stratosphere from mid-latitudes above the isentropic level of 500 K. Only after the break-up of the vortex in mid-March 1992 enhanced backscatter ratios were observed above 500 K. The temporal development of the height integrated backscatter coefficient at 532 nm between spring 1992 and spring 1995 follows an exponential decay with an e-folding time of approximately one year. This time constant is consistent with the assumption that gravitational sedimentation is the dominating process for volcanic aerosol removal in the Arctic stratosphere. From the multiwavelength data total number densities, median radii, surface and volume densities are determined. The calculation is based on the assumption that the volcanic aerosols consist of sulfuric acid/water solution in equilibrium with stratospheric water vapour. During winter 1992/93 median radii of 0.2 μm and surface densities of up to 50 $\mu m^2/cm^3$ are found.
In January 1993, March 1994 and January 1995 polar stratospheric clouds (PSC) are observed at altitudes around 475 K potential temperature. By comparing volume depolarization and backscatter ratio the occurrence of type Ia and type Ib PSC are discriminated. Both types of PSC are observed at temperatures -1 to -2 K and -3 to -4 K below the nitric acid trihydrate (NAT) coexistence temperature only. These temperature differences correspond to supersaturations with respect to HNO_3 between 2 and 10. From multiwavelength measurements of type Ib PSCs which are of more spherical shape altitude profiles of total number, surface and volume density are derived. Surface densities of more than 20 $\mu m^2/cm^3$ are observed during January 1993.

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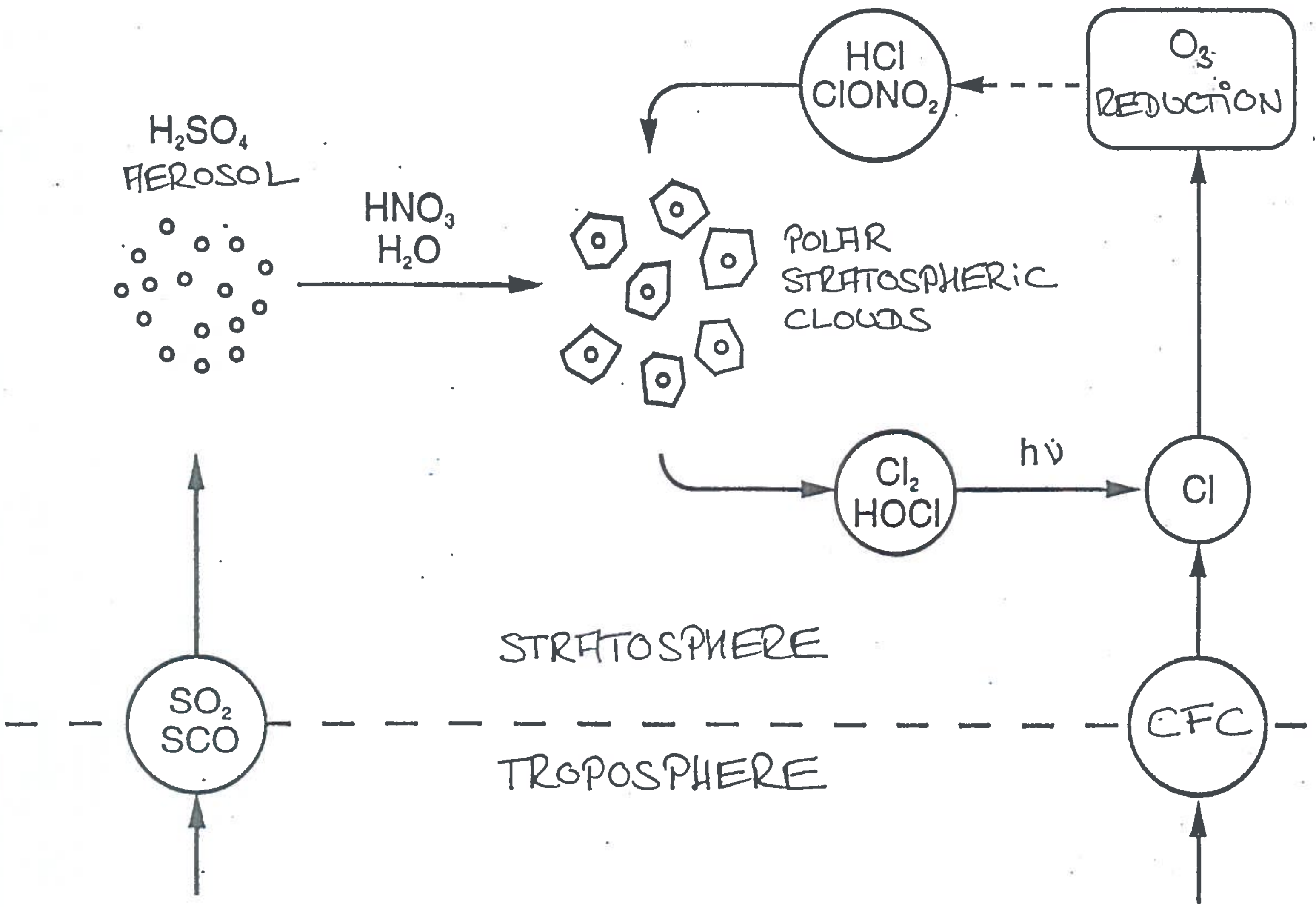
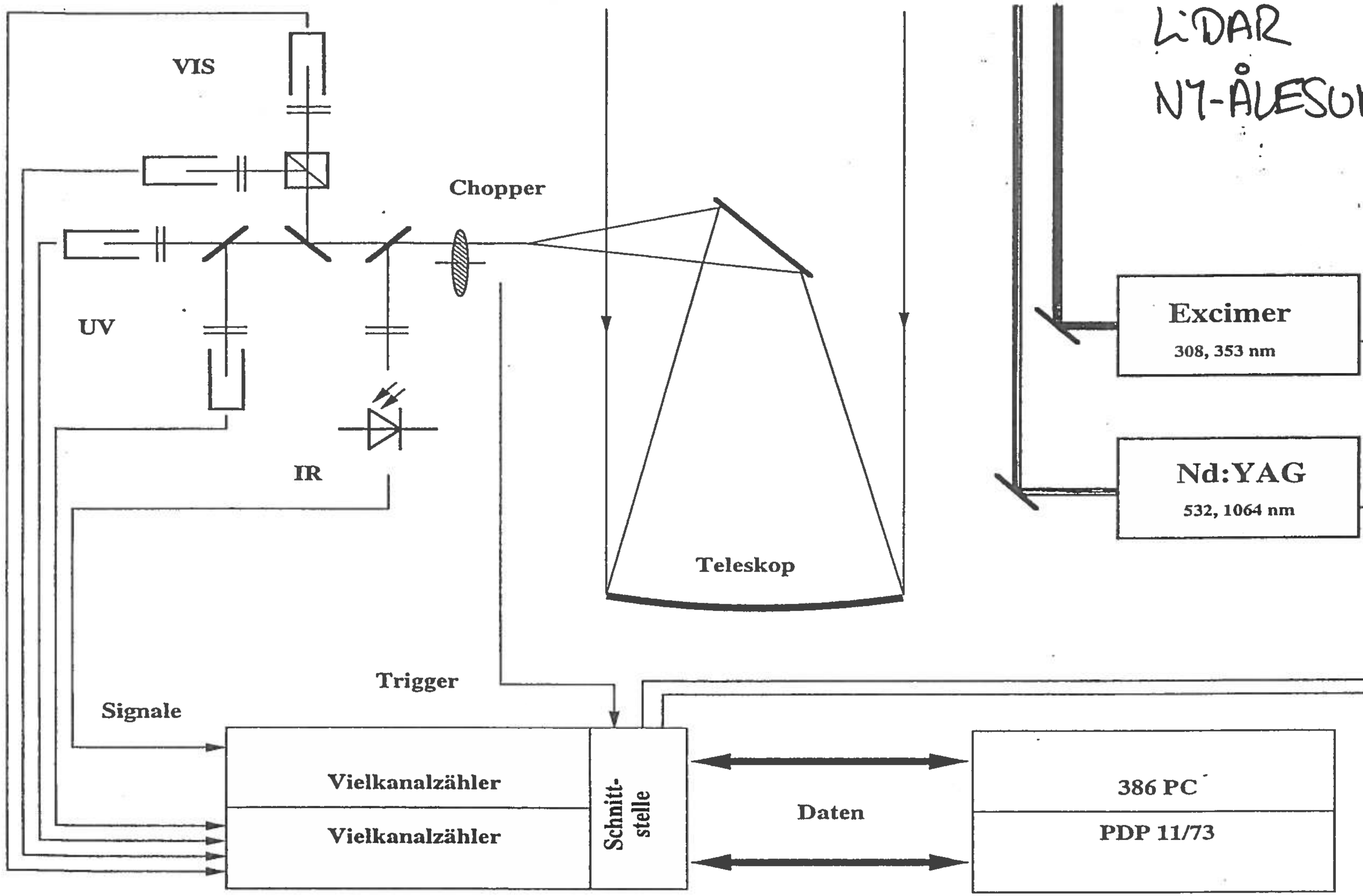


O3-
REDUCTION
HCl
ClONO2
H2SO4
AEROSOL
HNO3
H2O
POLAR
STRATOSPHERIC
CLOUDS
Cl2
HOCl
hν
Cl
STRATOSPHERE
TROPOSPHERE
SO2
SCO
CFC

MULTIWAVELENGTH
AEROSOL
LIDAR
NY-ÅLESUND



Conclusions

- dynamical processes
  - fast meridional transport in lower stratosphere
  - isolation due to polar vortex above 500 K during winter 1991/92

- volcanic aerosol
  - dominating aerosol in winter 1991/92 and 1992/93
  - median radius : ca. 0.2 μm (winter 1992/93)
  - particle surface densities : $< 50\ \mu m^2/cm^3$ (winter 1992/93)
  - e-folding time of $D_B(532\ \mathrm{nm})$: 1.03 ± 0.24 years

- polar stratospheric clouds
  - observations during January 1993, March 1994, January 1995
  - supercooling : -1 to -2 K; adiabatic cooling rate : ca. -2 to -4 K/d $\Longrightarrow$ type Ia
  - supercooling : -3 to -4 K; adiabatic cooling rate : ca. ≤ -6 K/d $\Longrightarrow$ type Ib
  - supersaturation w.r.t. HNO_3 of $2 < S < 10$

SESSION II
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A Langrarian approach to separate stratospheric chemical ozone loss from dynamical effects: Results for the Arctic winters 91/92 and 94/95 (MATCH)

Markus Rex

A Lagrangian Approach to Separate Stratospheric Chemical Ozone Loss from Dynamical Effects: Results for the Arctic Winters 91/92 and 94/95 (Match)

M Rex and P von der Gathen (AWI, Germany), N R P Harris (European Ozone Research Coordinating Unit), E Reimer, A Beck and R Alfier (FU Berlin, Germany), B M Knudsen and I S Mikkelsen (DMI, Denmark), M Chipperfield and D Lucic (Univ. Cambridge, UK), M Allaart (KNMI, Netherlands), H De Backer (KMI/IRM, Belgium), G O Braathen and S Reid (NILU, Norway), H Claude (DWD MOHP, Germany), F O'Connor (Univ. of Wales, UK), H Dier (DWD MOL, Germany), H Fast (AES, Canada), A Gamma (ETH, Swiss), M Gil (INTA, Spain), M Guirlet (CNRS, France), E Kyrö and M Rummukainen (FMI, Finland), Z Litynska and B Kois (Cent. of Aerology, Poland), G Murphy (IRMET, Ireland), F Ravegnani (FISBAT, Italy), C Varotsos (Univ. Athens, Greece), J Wenger (Univ. Dublin, Ireland), V Yushkov and V Dorokhov (CAO, Russia), C Zerefos, D Balis and I Ziomas (Univ. Thessaloniki, Greece)

A new, quantitative Lagrangian approach has been used to assess the degree of chemically-induced ozone loss in the Arctic lower stratosphere. The main advantage of this method is that chemical and dynamical effects can be separated to a high degree. Chemical ozone destruction rates were achieved in temporal and coarse spatial resolution

During the winter 1991/92, about 1400 ozonesondes were launched in the Arctic and sub-Arctic. Isentropic trajectories and modelled diabatic cooling rates were used to identify a large number of air parcels which were probed by two ozonesondes at different points along a trajectory: such a situation is here defined as a MATCH. Matches are omitted in situations where either a large change in potential vorticity along the trajectory, or a steep vertical gradient in ozone mixing ratio near the match level occurs in either ozone profiles. A statistical analysis of the differences in ozone mixing ratio and the period the air parcel spends in sunlight between measurements provides the chemically-induced ozone loss.

Inside the polar vortex, the largest ozone depletion was measured at 475 K (approximately 19-20 km in altitude). It is shown that the observed losses can be explained only by a process operating exclusive in sunlight. Depletion was first detected at the beginning of January in 1992, reaching a maximum loss rate of 0.27 +/-0.05 % per sunlit hour (using 1 standard deviation in the mean) at the end of January. From early to mid February, ozone depletion rates decreased rapidly in the vortex edge region, whereas in the inner vortex they continued to decrease slowly until the end of February. At 500 K, loss rates were smaller than at 475 K by a factor of 4, while at 550 K no chemical ozone loss at all was observed. In the 425-450 K region loss rates were approximately half of the 475 K value, while on lower isentropic levels, detection of ozone loss was not possible due to enhanced statistical errors resulting from strong dynamical influences.

In the winter of 1994/95, the ozonesonde Match experiment was instigated. Releases of more than 1000 ozonesonde launches from around 35 stations were co-ordinated to maximize the number of match events. Clusters of diabatic forecast trajectories were started along the ozonesonde ascent path after each launch. A subsequent ozonesonde was released into the same air mass if the trajectories passed close to a second launch site. The divergence of the different trajectories of one cluster was used to select air parcels which were transported without considerable distortion.

Preliminary data show two periods of ongoing chemical ozone loss in 475 K and 400 K. The first period reached maximum loss rates with about 0.3 % per sunlit hour at the end of January. Then a decrease of ozone loss was observed during February. At the end of February no significant loss could be observed. The second period with significant ozone loss took place between first and twentieth of March reaching maximum loss rates with about 0.2 % per sunlit hour around the tenth of March. In 550 K only some ozone loss could be observed in the first half of January. The ozone loss events coincides and slightly lag periods with temperatures cold enough to form PSCs.

Stratospheric Ozone Chemistry

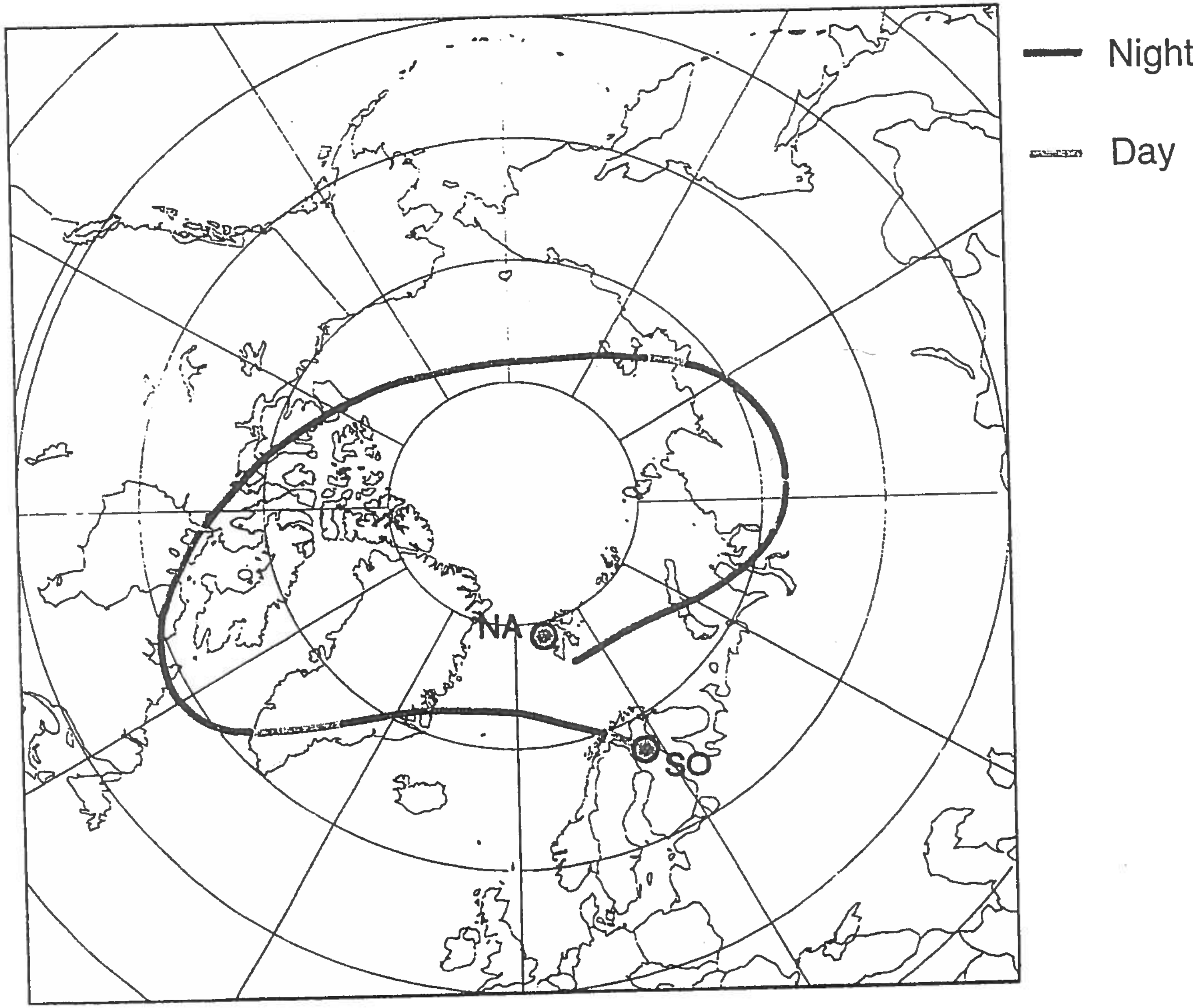
- Summer, autumn: Chlorine in passive form
  => **No ozone depletion**

- Winter: Periods of cold stratospheric temperatures
  => Formation of Polar Stratospheric Clouds (PSC)
  => Activation of chlorine due to the PSCs
  => **In sunlight: active chlorine destroys Ozone**

- Spring: Deactivation of Chlorine due to reactions with other species
  => **Ozone destruction declines**

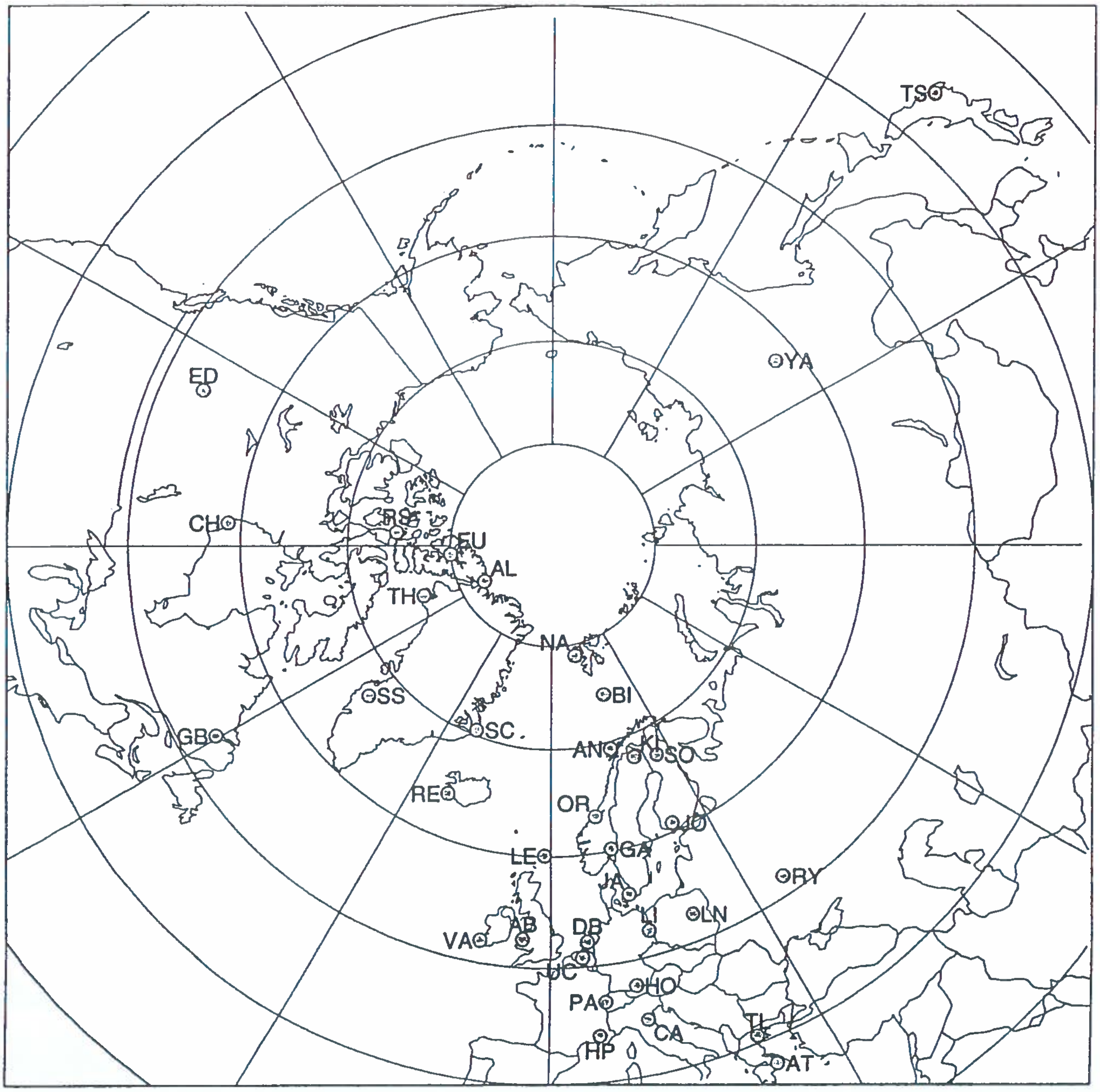
~// 20km altitude

Match in 475 K:
Ny Ålesund Jan 24 / Sodankylä Jan 29



1994/95: Match experiment

- 35 participating Ozonesonde stations
- Over 1000 Ozonesonde launches
- **Online coordination of the launches to achieve the Matches actively**



Selection of Matches

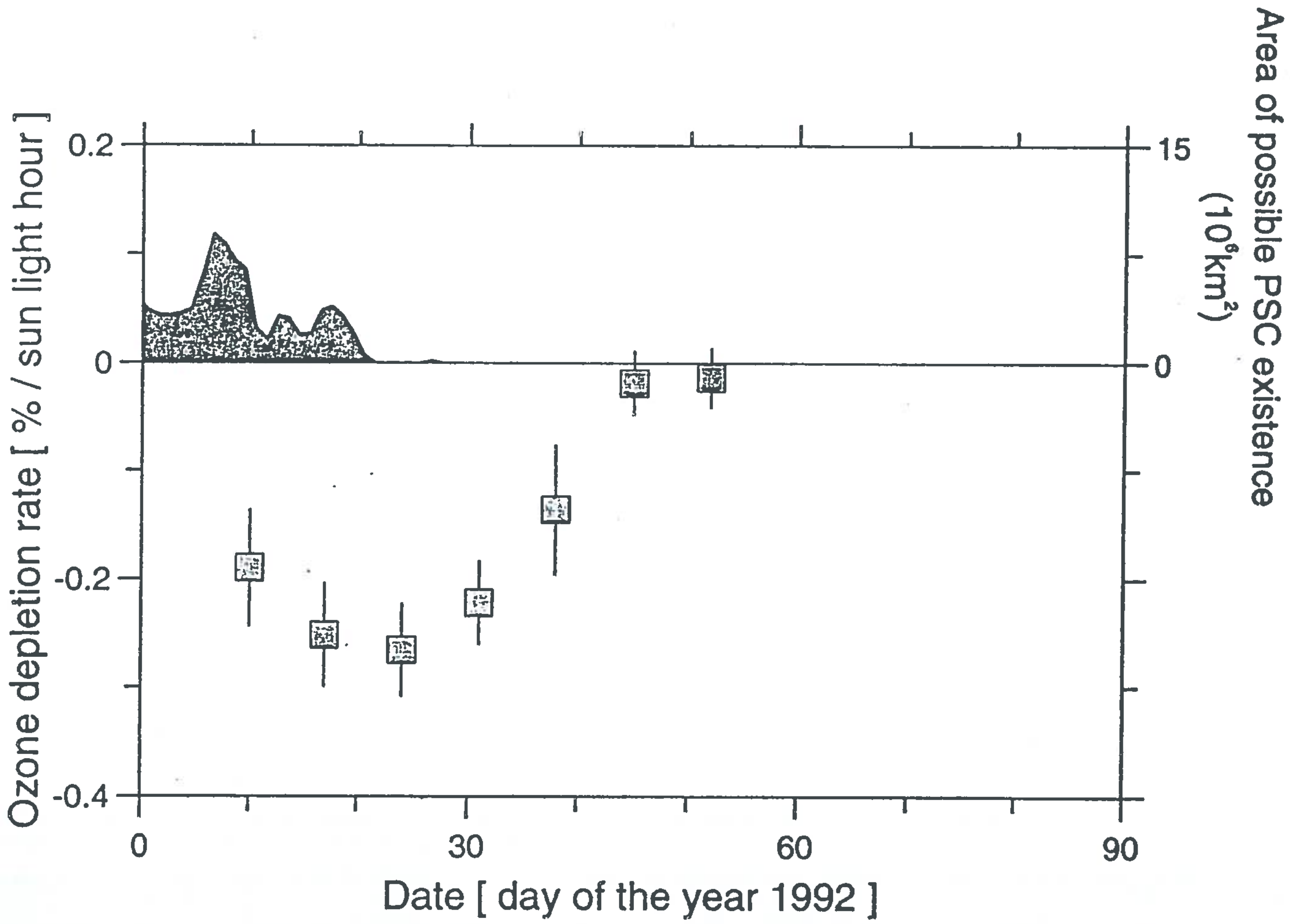
- Matchradius < 500 km
- Horizontal divergence of the flow:
  Distance of cluster trajectories < ~1000 km
- Vertical divergence of the flow:
  Distance of cluster trajectories < ~ 1500 km
- PV change along the trajectory < 30 %
- Vertical gradient in the ozone profile:
  Difference of maximum O_3 and minimum O_3 in a +/- 2 K interval < 15 %
- Gap in the measured profile < 500 m

EASOE 1991/92

Running mean over 14 days respectively

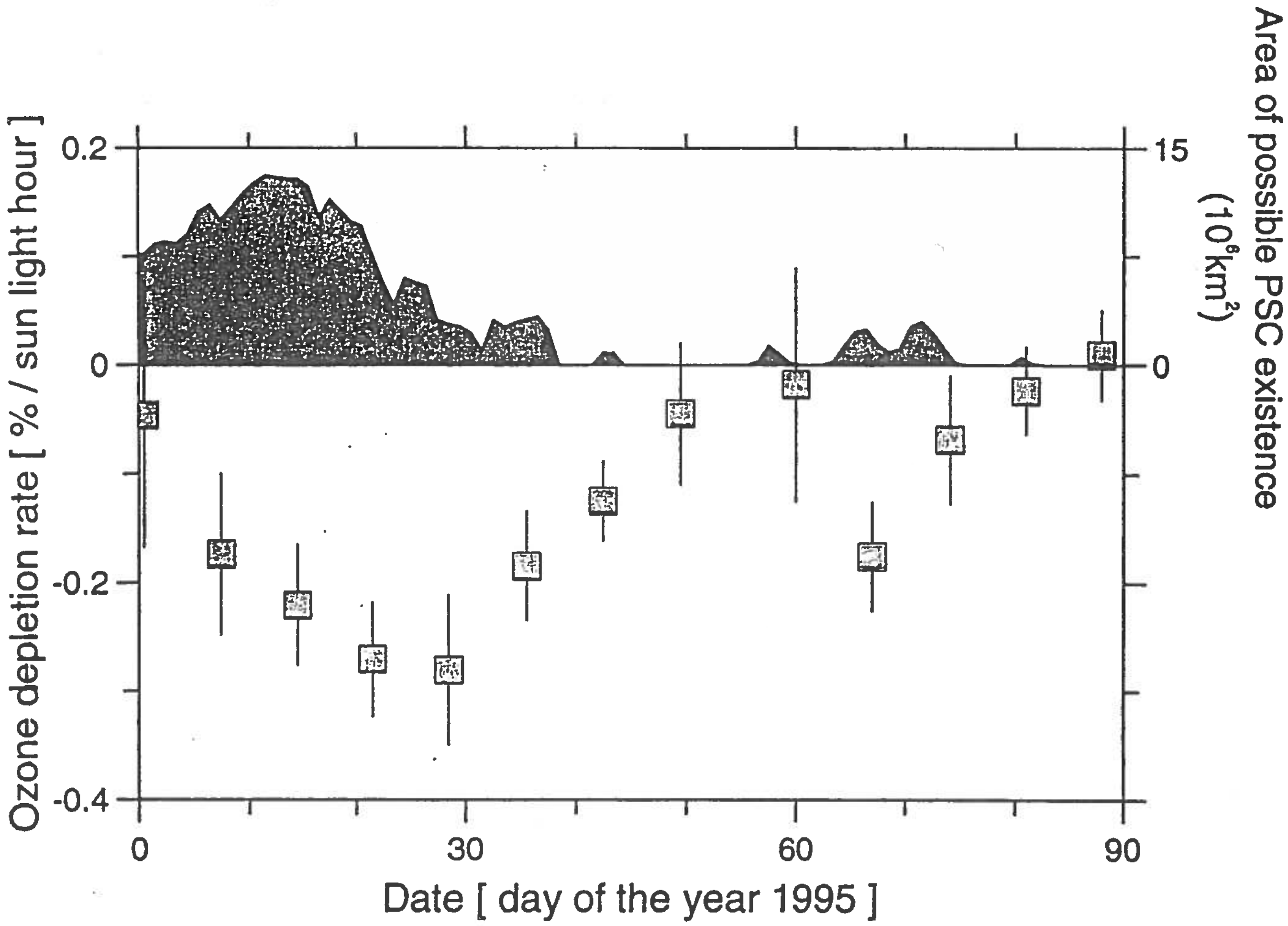
Pot. Temp. : 465 - 485 K

Trajectories inside the vortex / vortex edge (PV > 27 PVU in 475 K)



Match 1994/95

Running mean over 14 days respectively
Pot. Temp. : 465 - 485 K
Trajectories inside the vortex (PV > 36 PVU in 475 K)



SESSION II
Ny-Ålesund -
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Atmospheric Sciences

Tropospheric trace gases
Frode Stordal

Ny-Ålesund Seminar
Potsdam 4-5 May

STUDIES OF SURFACE

OZONE AND RELATED GASES

FRODE STORDAL

SVERRE SOLBERG

NORBERT SCHMIDBAUER

TERJE KROGNES

Ta med
de fire andre
navnene

Tropospheric Ozone

What more do we want to know ?

- What quantitative role does the Arctic play in the hemispheric ozone budget?
- Which chemical processes are responsible for the sudden ozone loss in the spring (april-june)

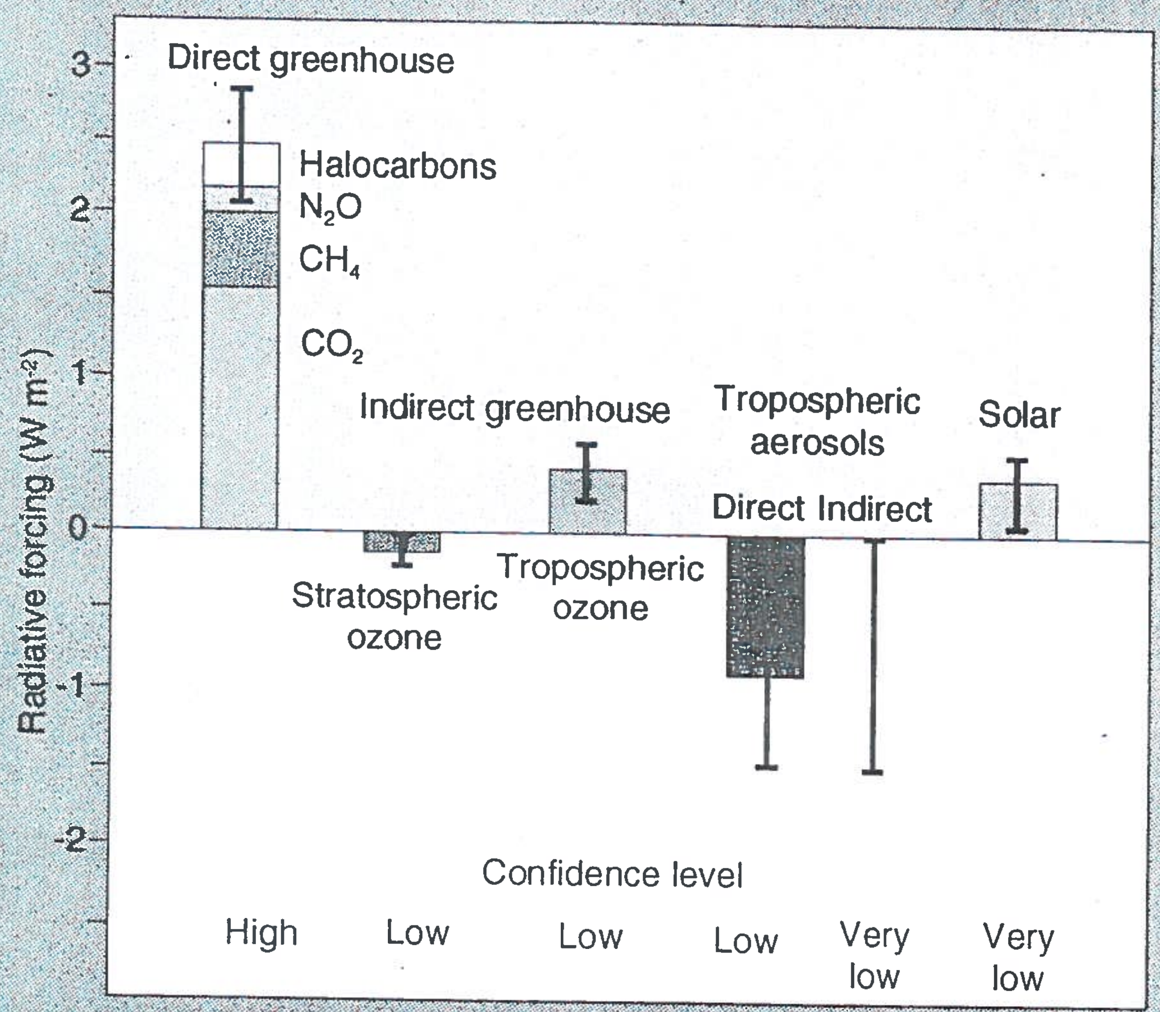
NILU

Tropospheric Ozone
What do we know ?

- Background ozone has doubled in the NH over the last 100 years
- Concentration determined by chemical production and loss and by transport from the stratosphere
- Regional ozone episodes caused by emissions of NO_x and VOC
- Elevated ozone is harmful to vegetation and human health

NILU

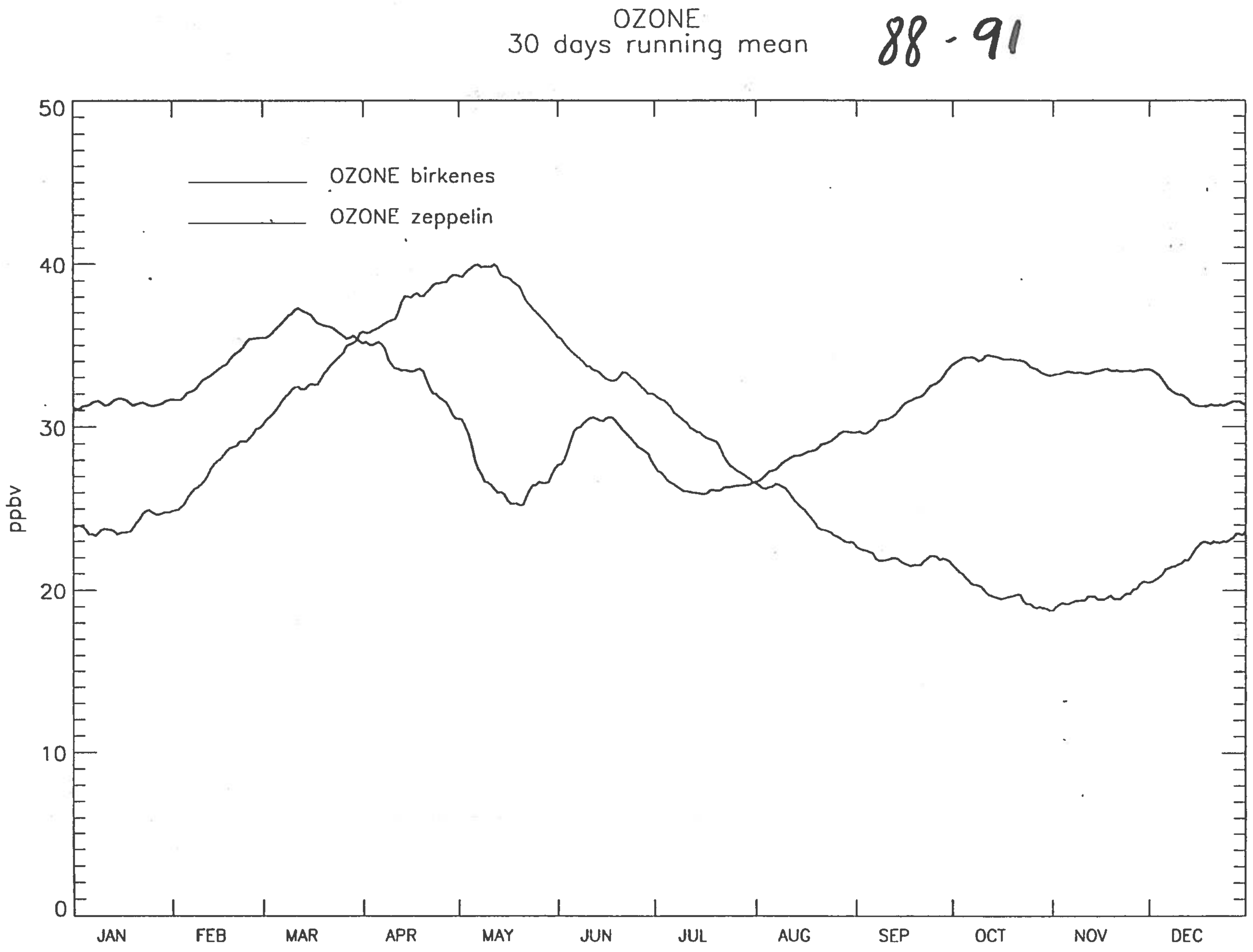
Radiative Forcing of Climate Change



H.DOVLAND. CLIMATE.PPT

85 -91

88 - 91


OZONE
30 days running mean
OZONE birkenes
OZONE zeppelin
ppbv
0
10
20
30
40
50
JAN
FEB
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APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC

SESSION II
Ny-Ålesund -
scientific results
Atmospheric Sciences

NIPR atmospheric observations at Ny-Ålesund

Takashi Yamanouchi

Ny-Ålesund Seminar
Potsdam 4-5 May

NIPR Atmospheric Science Observations at Ny-Ålesund, Svalbard

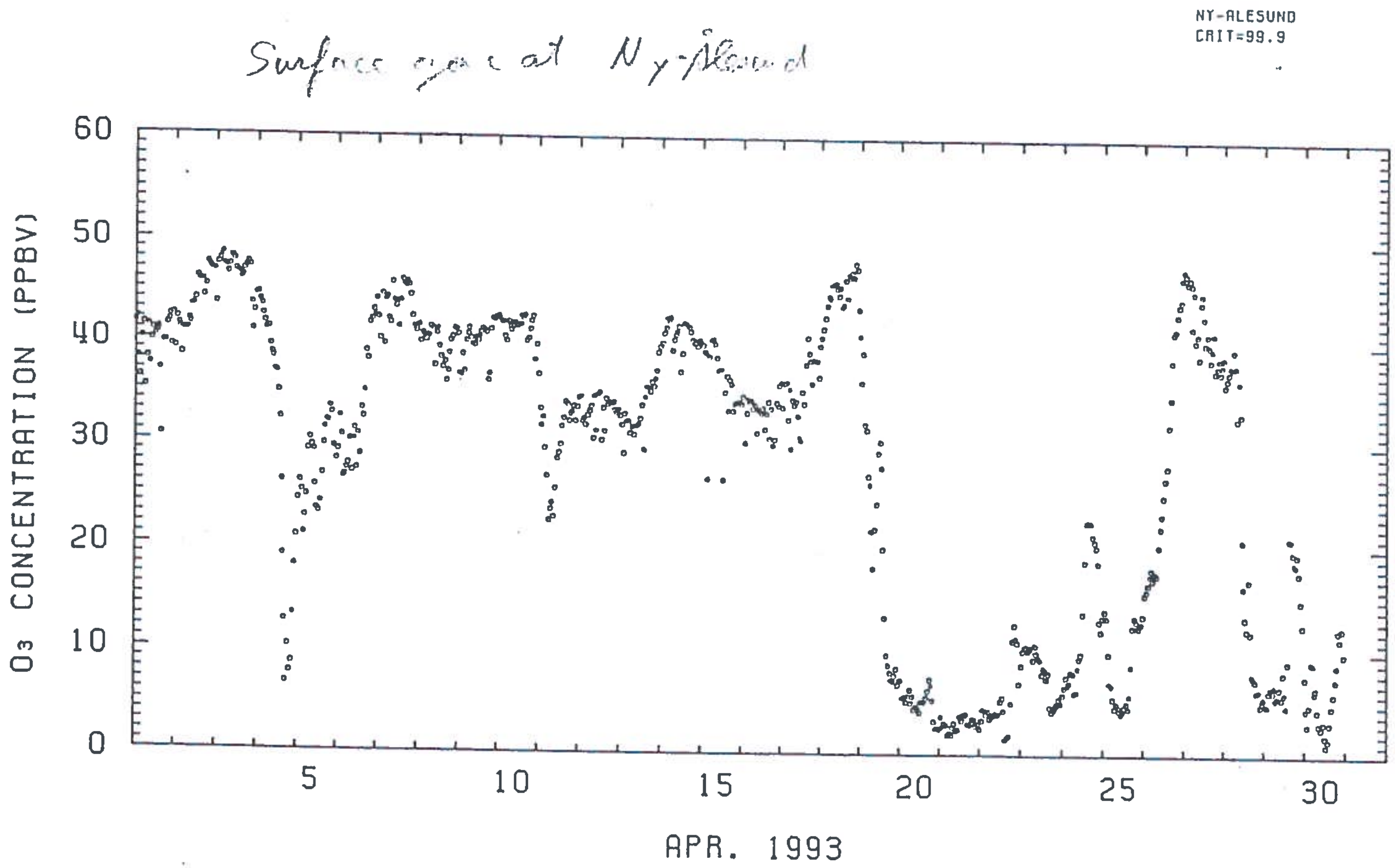
Takashi Yamanouchi, Makoto Wada and Shuhji Aoki
National Institute of Polar Research
1-9-10 Kaga, Itabashi-ku, Tokyo 173, JAPAN

Observations on atmospheric sciences at Ny-Ålesund, Svalbard have been started in 1991 at the Rabben observation station, in order to clarify the global atmospheric change in the Arctic. These observations have been performed under the "International Cooperative Research Project on the Global Environment in the Arctic (1990-1994; 1995-1999)" according to the IASC (International Arctic Science Committee) initiatives following the establishment of the Arctic Environment Research Center at the National Institute of Polar Research. The project is composed of atmospheric sciences, glaciology, marine and terrestrial biology and ocean sciences. Those items of atmospheric components are variation of greenhouse gases including surface ozone, clouds, precipitation and radiation, compared and referenced to the observations in the Antarctic.

Observations of greenhouse gases such as CO_2 and CH_4 are conducted with the air sampling at the site once a week, under the cooperation with the Norwegian Polar Institute. Analysis is made at the home institution, and it is found that the site is suitable for the background monitoring. Large seasonal variation with a peak to peak amplitude of about 18 ppmv and north-south difference of annual mean between Ny-Ålesund and Syowa Station, Antarctica of about 4 ppmv were confirmed for the CO_2 concentration. CH_4 also shows large seasonal variation and larger north-south difference. The surface ozone concentration is measured continuously at the station, and clear seasonal variation and some drastic destruction at the polar sunrise have been revealed. In order to clarify sinks and sources of CO_2, partial pressures of CO_2 in the surface sea water have been measured at Greenland Sea in summer and spring on board Norwegian research vessels.

Observations of clouds and precipitation are made with microwave radiometer of 37 GHz for the column liquid water content, and vertical pointing radar of 10 GHz for the ice water content and precipitation. Monthly variations of clouds and precipitation are obtained and some seasonal difference of cloud properties is described. Discussions with Arctic aerosols are to be made with the comparison to the air and snow chemistry. Analysis of surface radiation data observed for a long time by Norwegian Polar Institute has revealed the characteristics of radiation budget at Ny-Ålesund.

Surface ozone at Ny-Ålesund

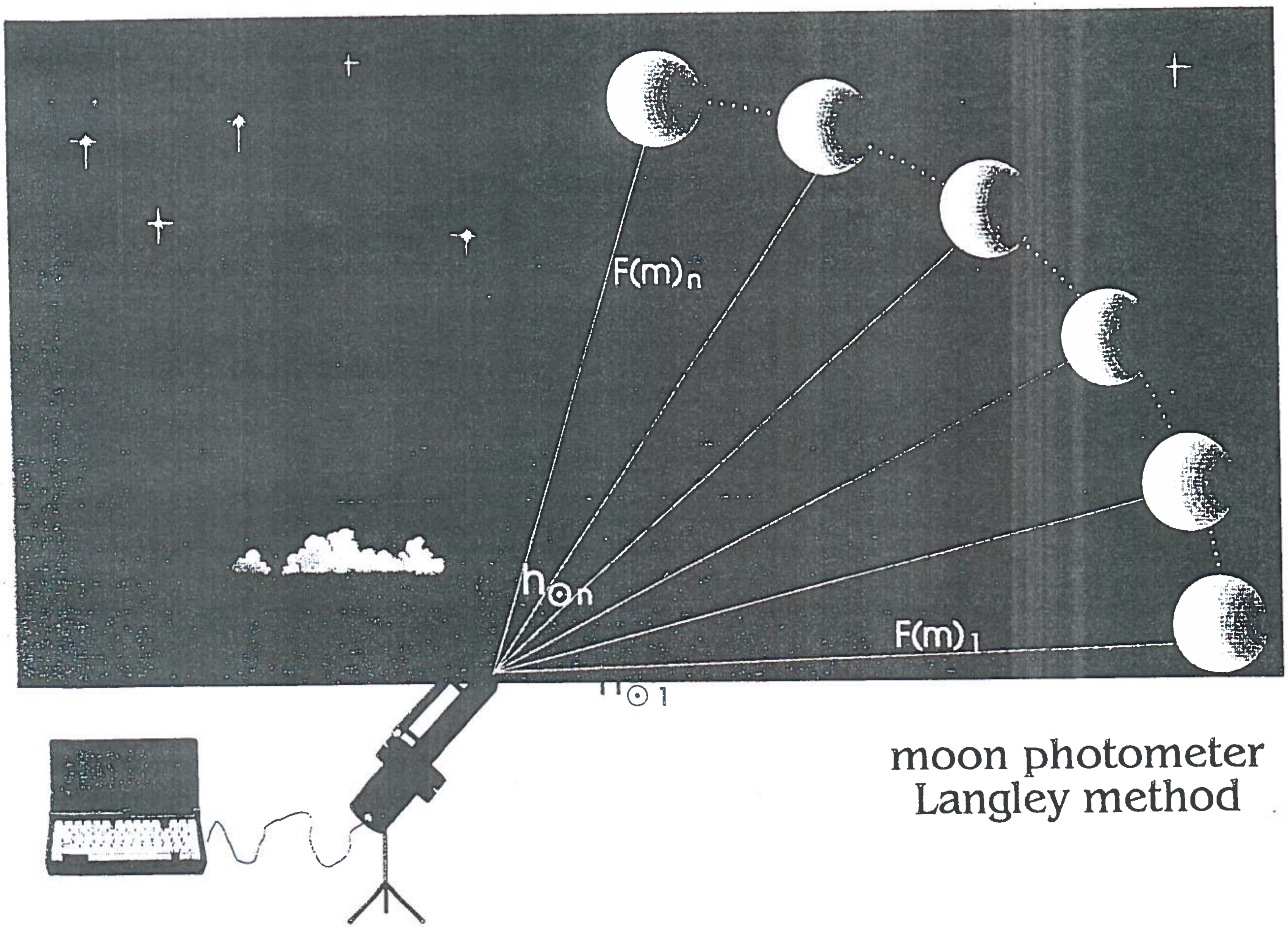


SESSION II
Ny-Ålesund -
scientific results
Atmospheric Sciences

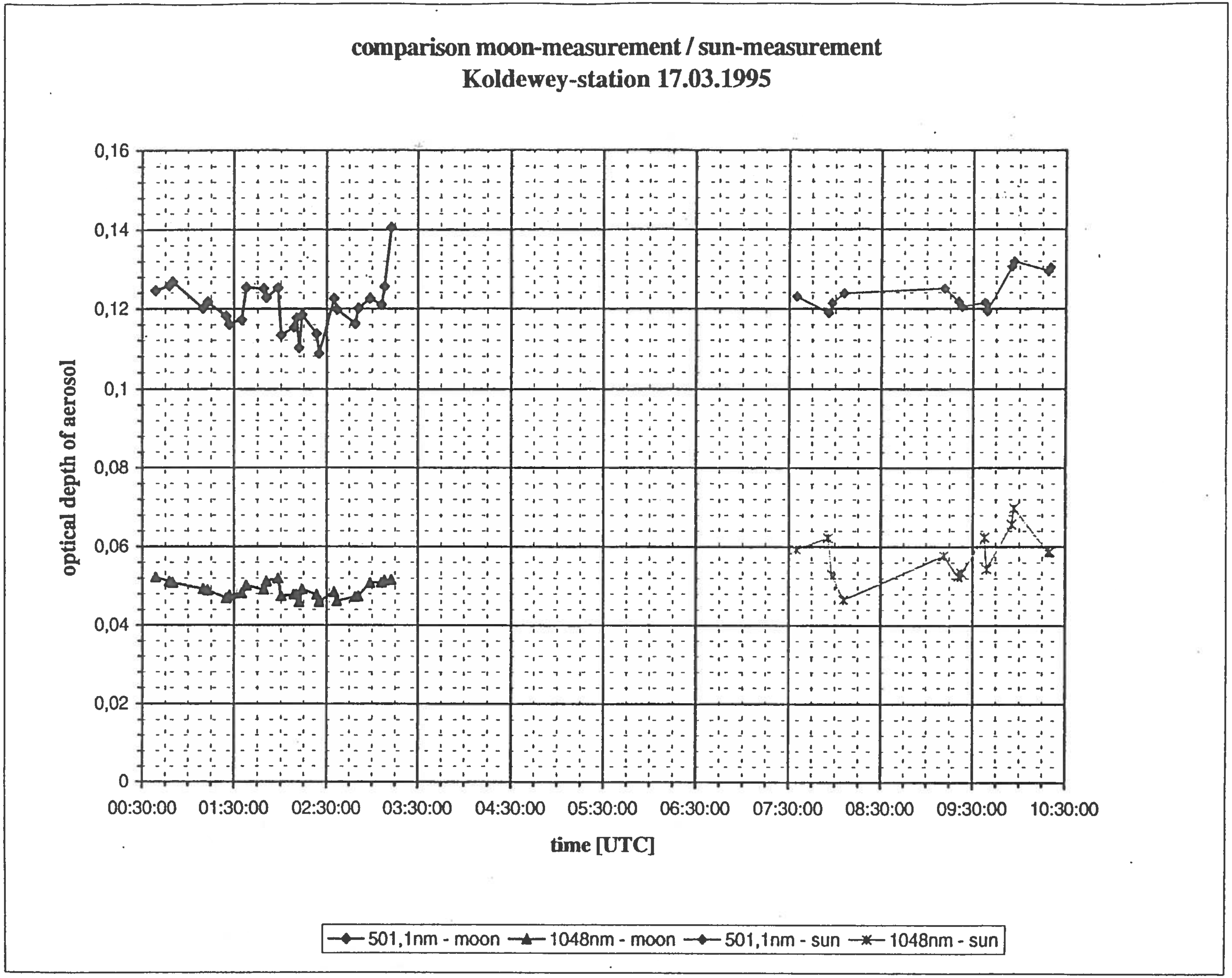
Aerosol optical depth measurements at Spitsbergen with sun and moon as light sources

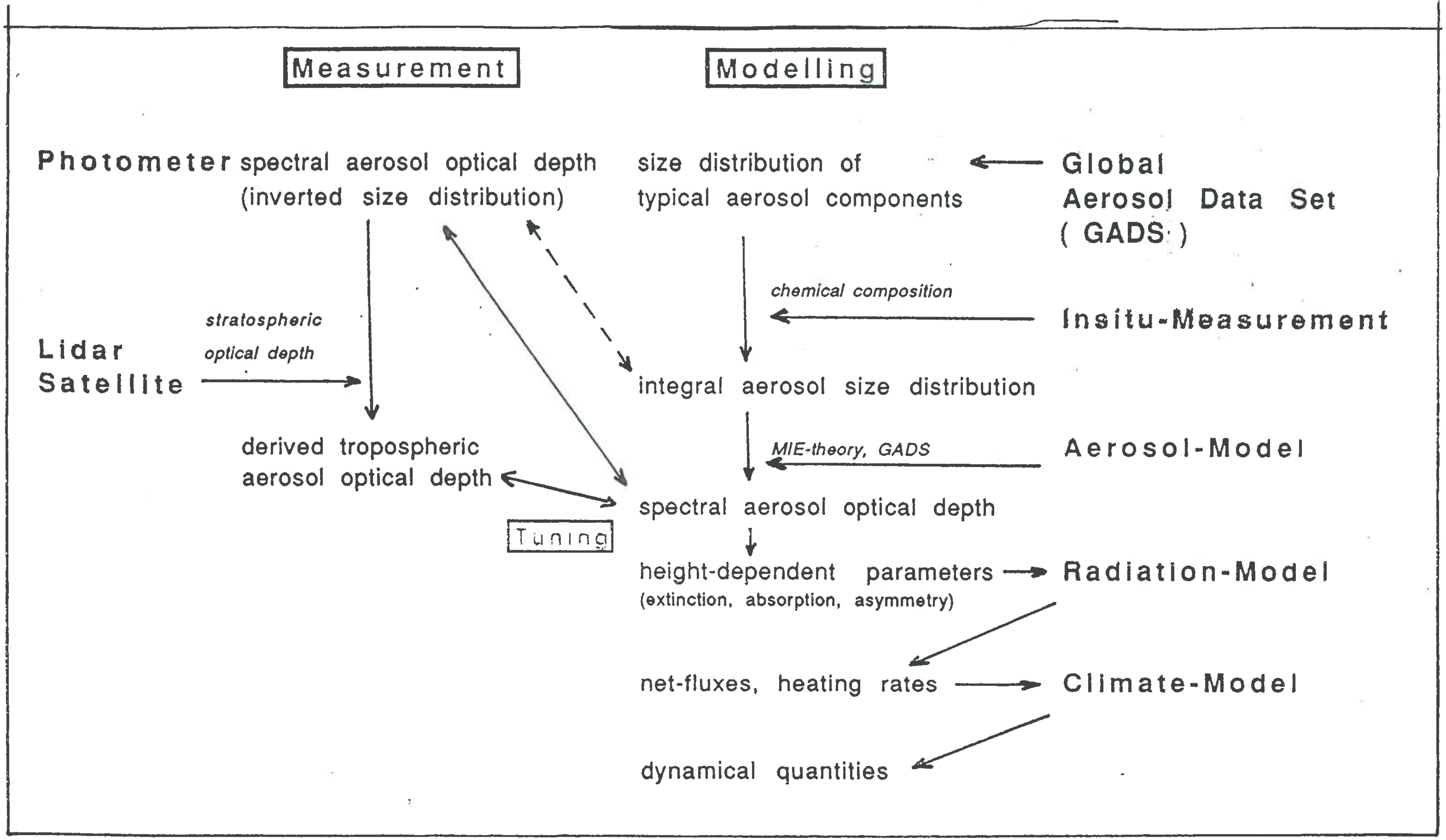
Andreas Herber

light source: moon



moon photometer
Langley method


comparison moon-measurement / sun-measurement
Koldewey-station 17.03.1995
optical depth of aerosol
0,16
0,14
0,12
0,1
0,08
0,06
0,04
0,02
0
00:30:00
01:30:00
02:30:00
03:30:00
04:30:00
05:30:00
06:30:00
07:30:00
08:30:00
09:30:00
10:30:00
time [UTC]
501,1nm - moon
1048nm - moon
501,1nm - sun
1048nm - sun


Measurement
Modelling
Photometer
spectral aerosol optical depth
(inverted size distribution)
size distribution of
typical aerosol components
Global
Aerosol Data Set
(GADS)
chemical composition
Insitu-Measurement
stratospheric
optical depth
Lidar
Satellite
integral aerosol size distribution
derived tropospheric
aerosol optical depth
MIE-theory, GADS
Aerosol-Model
spectral aerosol optical depth
Tuning
height-dependent parameters
(extinction, absorption, asymmetry)
Radiation-Model
net-fluxes, heating rates
Climate-Model
dynamical quantities

SESSION II
Ny-Ålesund -
scientific results
Atmospheric Sciences

First BSRN results: Bipolar parameterisation of the downward long-wave radiation at the Earth's surface

Gert König-Langlo

Ny-Ålesund Seminar
Potsdam 4-5 May

The Baseline Surface Radiation Network (BSRN)

First Results

Dr. Gert König-Langlo, AWI

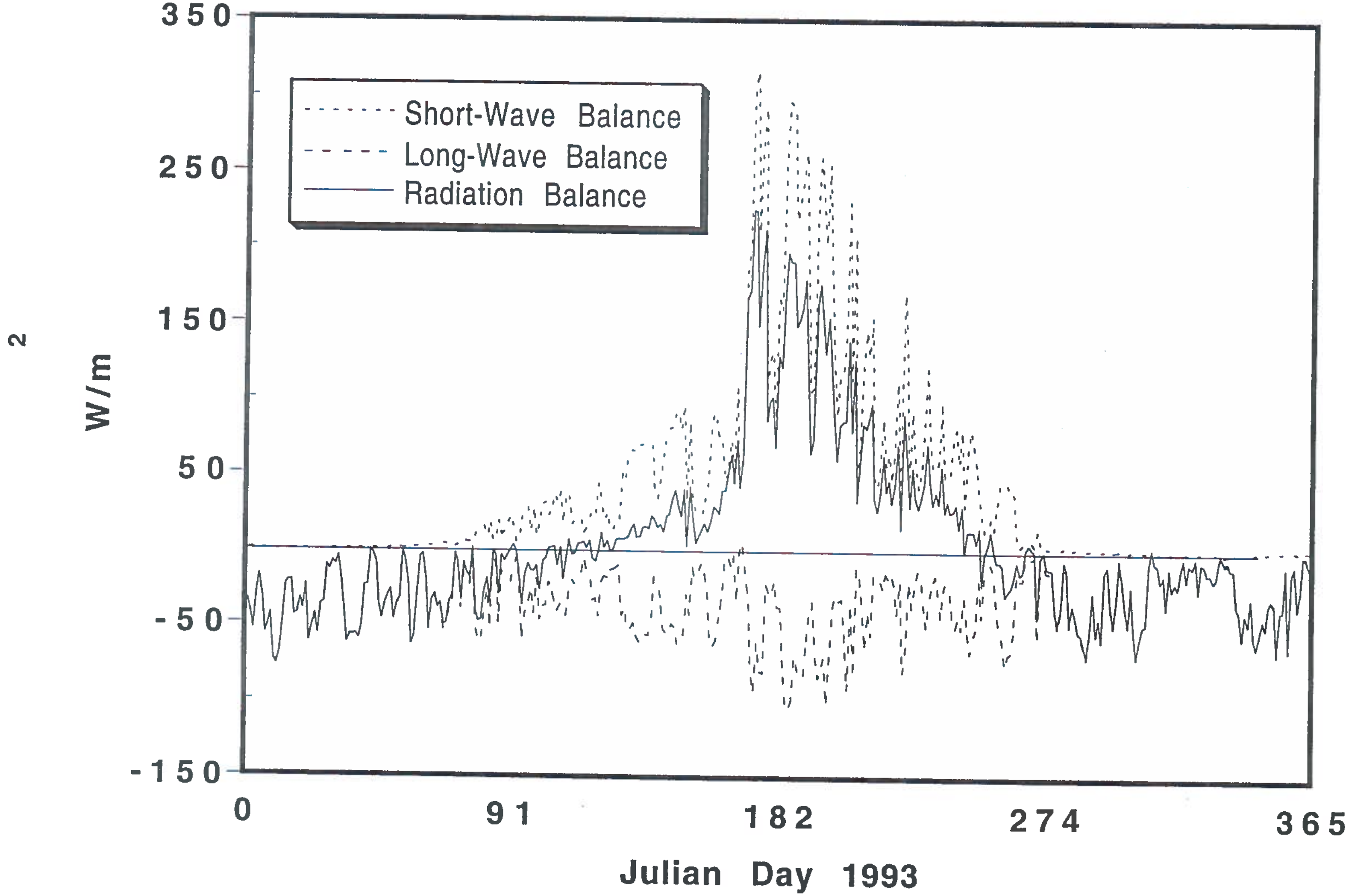
The objective of the BSRN is to provide highest possible quality, high sampling rate observations of the short and longwave radiation fluxes at a small number of selected stations in contrasting climatc zones together with co-located surface and upper-air meteorological data and other supporting observations. The uniform and consistent measurements througout the network are used

- to monitor the background short and longwave radiation components and their changes,
- to provide data for the calibration of satellite-based estimates of the surface radiative fluxes, and
- to provide high qualitiy observational data to be used for validating the theoretical computation of radiation fluxes by models.

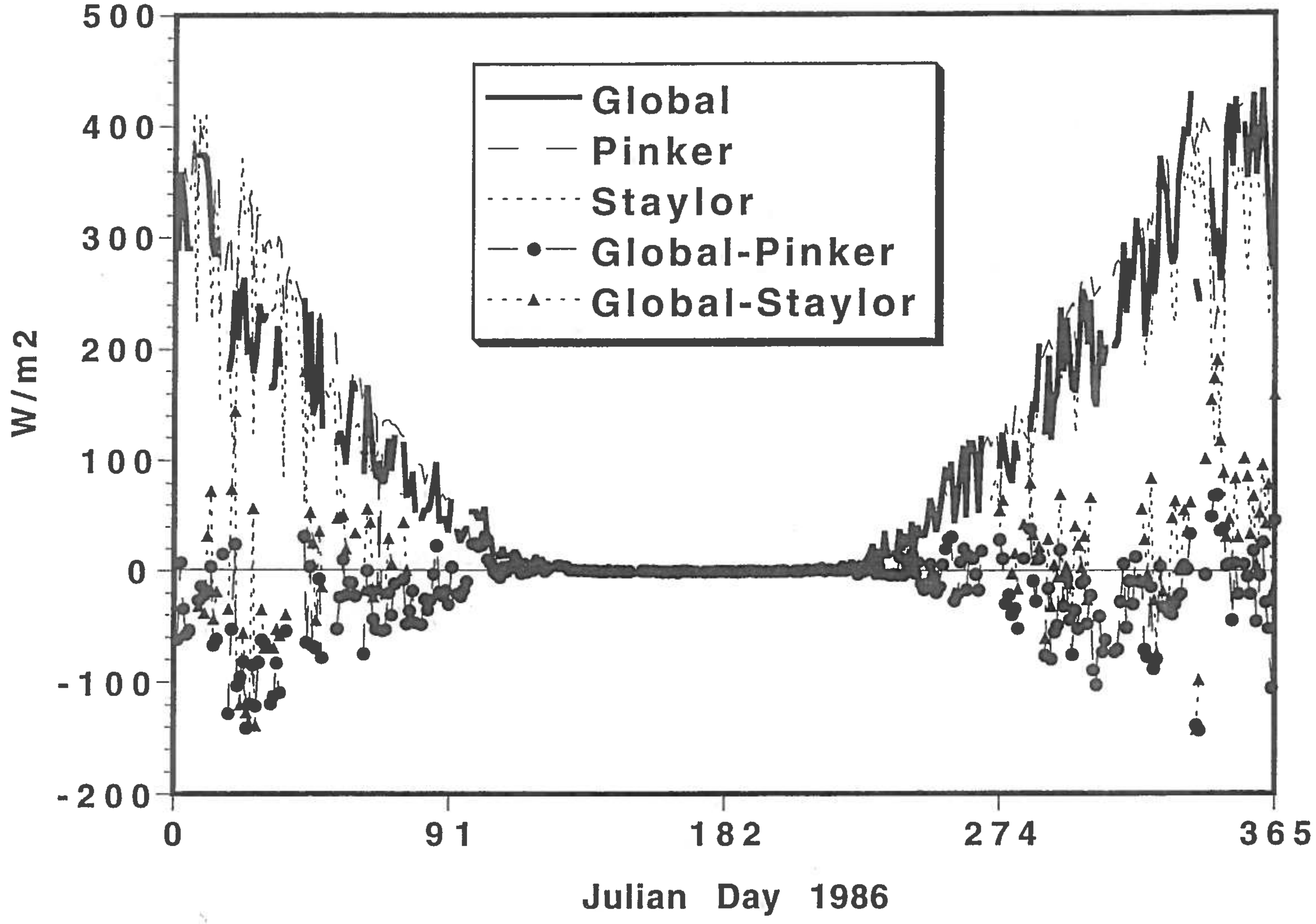
Since 1992 the Alfred-Wegener-Institute runs one BSRN station in the Antarctic (Neumayer) and together with the NORSK POLARINSTITUTT one BSRN station in the Arctic (Ny-Ålesund). Both stations are instrumented identically. All measurements, including the synoptic surface observations, upper air soundings and radiation fluxes are archived at AWI in the meteorological information system MISAWI. The radiation measurements - averaged over 5-minutes - include global radiation, reflected solar radiation, diffuse sky radiation, direct solar radiation, UV radiation, OG1 filtered global radiation, RG8 filtered global radiation, downward long-wave radiation, upward long-wave radiation, sunshine duration. Additional 5-minute averages from station air pressure, relative humidity (2m height), air temperature and wind vector (2 and 10 m height) are available. The whole dataset gets routinely postprozessed and forwarded to the Word Radiation Monitoring Center (WRMC) at ETH Zürich.

First results of a bipolar parameterization of the long-wave radiation at the Earth´s surface, taking data from Ny-Ålesund and Neumayer (published in: Meteorologische Zeitschrift, Vol 6, 1994, Gert Koenig et al.) could be used to quantify shortcuts of parameterization scheems frequently used in model applications. Comparisons between the satellite-based fluxes from the "WCRP Surface Radiation Budget Global Data Sets" and Neumayer measurements show systematic errors in the satellite data over bright surfaces.

Fig. 1: Annual Variation of the Surface Radiation Balance
Koldewey (78°N, 12°E, Svalbard)
Daily Averages 1993



Daily Averaged Global Radiation
Derived From Satellite Data (WCRP Data Sets)
And Ground Measurements From Neumayer Antarctic Station
(70°39´S, 8°15´W)



Downward Long-Wave Radiation
Versus air Temperature at 2 m Height
for Cloud Free Skies at Neumayer and Koldewey

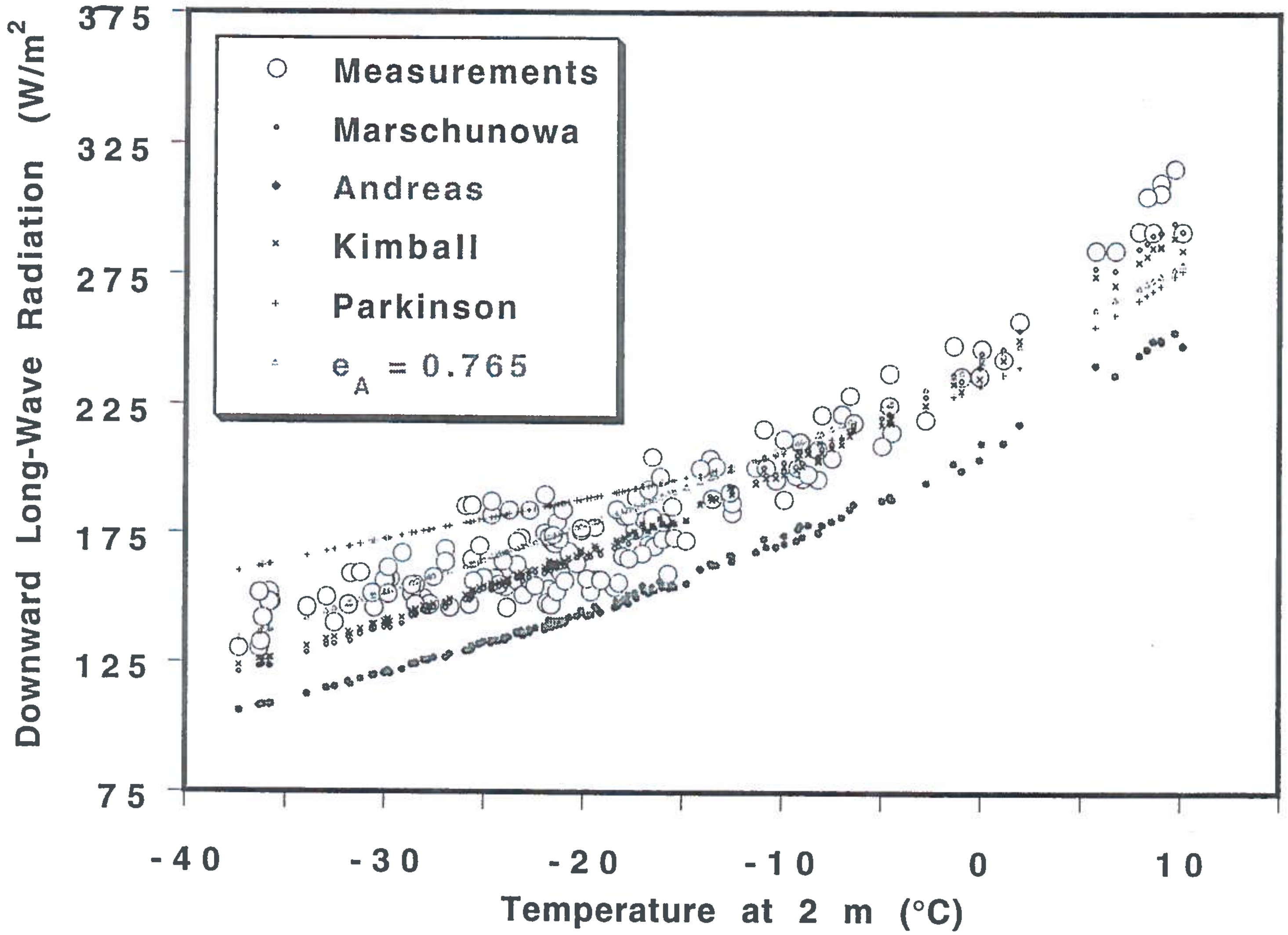
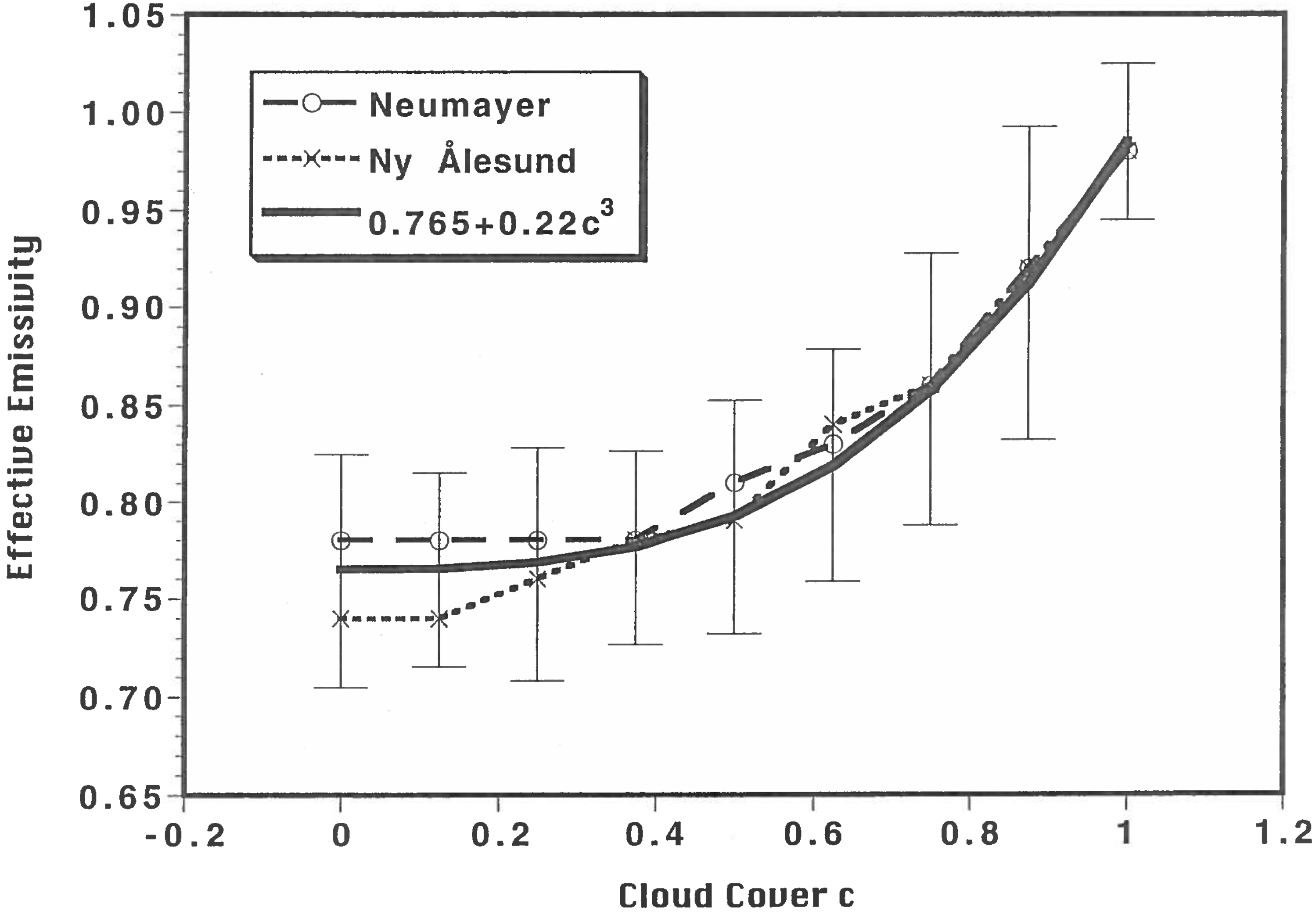


Fig. 8: Mean effective atmospheric emissivities versus total cloud cover c = 0 ≤ c ≤ 1 at Neumayer and Koldewey



SESSION II
Ny-Ålesund - scientific results
Ecosystem studies

The Terrestrial Ecological Research Programme in Svalbard - Studies at Ny-Ålesund

Sven Axel Bengtson

THE TERRESTRIAL ECOLOGICAL RESEARCH PROGRAM IN SVALBARD (TERRØK)

Projects at Ny-Ålesund:

1. The role of microbial (cyanobacteria) populations in terrestrial ecosystems
   (Prof Rolf Arnt Olsen and one Ph-student)

2. Population and feeding ecology of springtails (Collembola) in different terrestrial habitats
   (Dr Hans Petter Leinaas and one Ph-student)

3. The significance of soil fauna (especially Collembola) in Arctic terrestrial ecosystems
   (Prof Lauritz Sømme and one Ph-student)

4. Response of vascular plant species to plant-herbivore interactions
   (Dr Ann Marie Odasz and one Ph-student)

5. Reproduction ecology of Barnacle Geese
   (Dr Geir Wing Gabrielsen and co-workers incl. Ph-students)

Other projects

6. Parasites and the regulation of Svalbard reindeer
   (Dr Rolf Langvatn and co-workers)

7. Population instability and regulation of Svalbard reindeer
   (Dr Nicholas Tyler)

8. The mating systems of the Purple Sandpiper (Calidris maritima) and Dunlin (C. alpina)
   (Ph-student Elin Pierce)

9. Dynamics of spatially structured populations of the common vole (Microtus epiroticus)
   (Prof Rolf Anker Ims and co-workers)

10. Molacular-genetic variation in vascular plants and ecological strategies
    (Dr Christian Brochmann and co-workers)

THE MANDATE

- basic ecological research of relevance to conservation and management

- research increasing the understanding of dynamics and stability of Artic terrestrial ecosystems

- studies of decomposition processes in soil and vegetation

- studies of the influence of the marine environment on terrestrial ecosystems

- research of high international standards

- research promoting a Norwegian build-up of competence

MAJOR THREATS TO ENVIRONMENT IN SVALBARD

Climatic changes

Long-range dispersal of pollutants

Industrial activities

Tourism and recreation

Changes in the marine environment
affecting the terrestrial ecosystems

POPULATION ECOLOGY OF TERRESTRIAL ORGANISMS IN SVALBARD (TERRØK)

Dynamics and life-history strategies

Inter- and intraspecific interactions

Genetic and phenotypic variation

Eco-physiological adaptations

SESSION II
Ny-Ålesund -
scientific results
Ecosystem studies

Photoinhibition of photosynthesis as an acclimation strategy to high stress in marine macroalae

Dieter Hanelt

PHOTOINHIBITION OF PHOTOSYNTHESIS AS AN ACCLIMATION STRATEGY TO HIGH LIGHT STRESS IN MARINE MACROALGAE

Dieter Hanelt, , Alfred-Wegener-Institute for Polar and Marine Research, Am Handelshafen 12, 27515 Bremerhaven, Germany

Dynamic photoinhibition is a regulatory process protecting algal photosynthesis against photodamage caused by in excess absorbed energy. On sunny days light energy is absorbed excessively by the photosynthetic apparatus. In illuminated chloroplast this can damage photosynthesis due to the production of oxygen radicals. Photoinhibition increases thermal energy dissipation and diminishes both the quantum yield and the capacity of photosystem II. Thus, the in excess absorbed energy, which is not utilised in the anabolism of the plant, is converted harmless into heat. In response to fast changes in the photon fluence rate of daylight photoinhibition occurs in the field with fast kinetics. Generally, the course of photosynthetic activity is inverse compared to the course of the fluence rate of daylight, especially if the algae are floating at the water surface or are emerged during low tide. The extent of photoinhibition depends on the level of the water column which is covering the algae. A water column of more than 1 m above the algal beds was effective to cause a significant lower photoinhibitory level of photosynthesis. A comparison of intertidal with subtidal algae showed, that photoinhibition and recovery of photosynthesis occurs in subtidal algae with a slower kinetics and to a lower extent. A relation between algal zonation and the capability to protect photosynthesis by thermal energy dissipation is indicated. Short blue wavelengths and UV was very effective to cause chronic photoinhibition and photodamage in sublittoral red algae. Increasing UV-level due to ozone-depletion would increase UV-transmittance into the water body and, hence, also sublittoral red algae may be exposed to higher UV-irradiance. As result photosynthesis will be chronic damaged and kinetics of repair mechanism will be slowed down.

At the coast of Ny Ålesund the algal community will be screened and effects of PAR and UV will be investigated. With transplantation and UV-exclusion experiments niche occupation of the different algal species will be studied. Prevention of PAR and UV damage in selected macroalgae by dynamic photoinhibiton, effectiveness of damage repair mechanism, production of screening pigments and scavenging of cytotoxic intermediates will be assessed. From the reaction of the macrophytes possible changes in zonation, community structure and geographic distribution will be derived.

Experimental schedule:

1. Measurement of abiotic factors, especially photosynthetic active and UV radiation and temperature, and their tidal, daily and seasonal variations.

2. To screen the community structure of littoral vegetation in order to select representative species for subsequent experimental work.

3. To perform transplantation and UV exclusion experiments in order to assess the responses of individual species to PAR and UV radiation from the viewpoint of occupied niches.

4. To study the influence of PAR and UV radiation on the growth, photosynthesis and nutrient uptake of eu- and sublittoral macrophytes.

5. To assess the prevention of PAR and UV damage in selected macroalgae by dynamic photoinhibition, production of screening pigments and quenching of cytotoxic intermediates.

6. To study the effectiveness of damage repair mechanisms.

7. To derive from the reactions of investigated marine macrophytes to altered environmental conditions possible changes in the zonation and geographic distribution of individual species and changes of community structure.

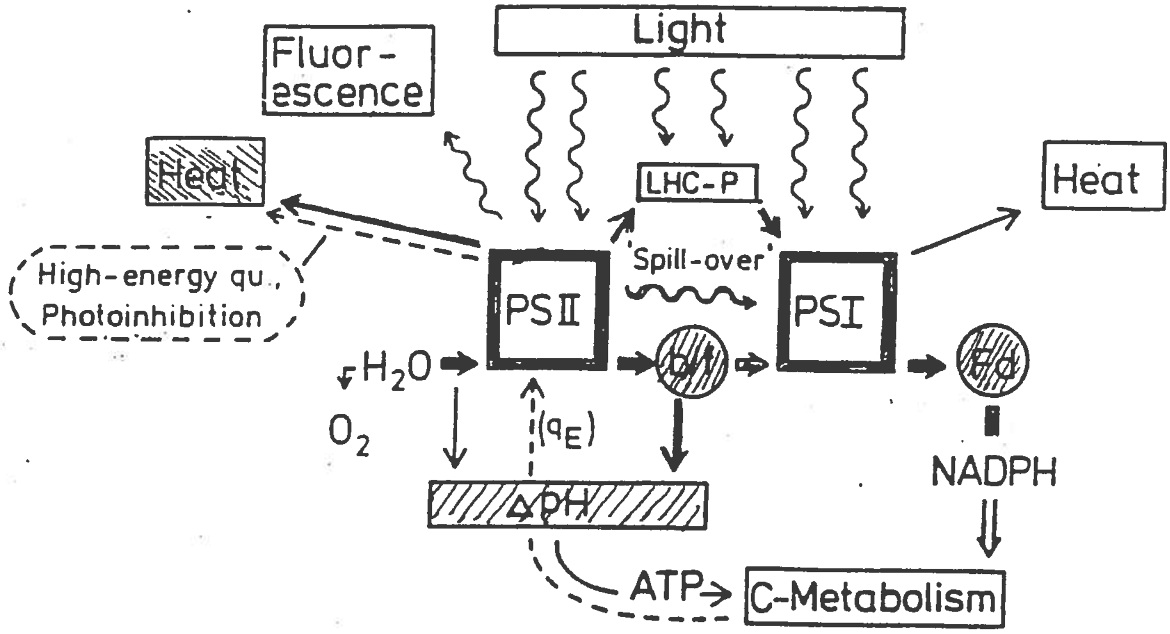
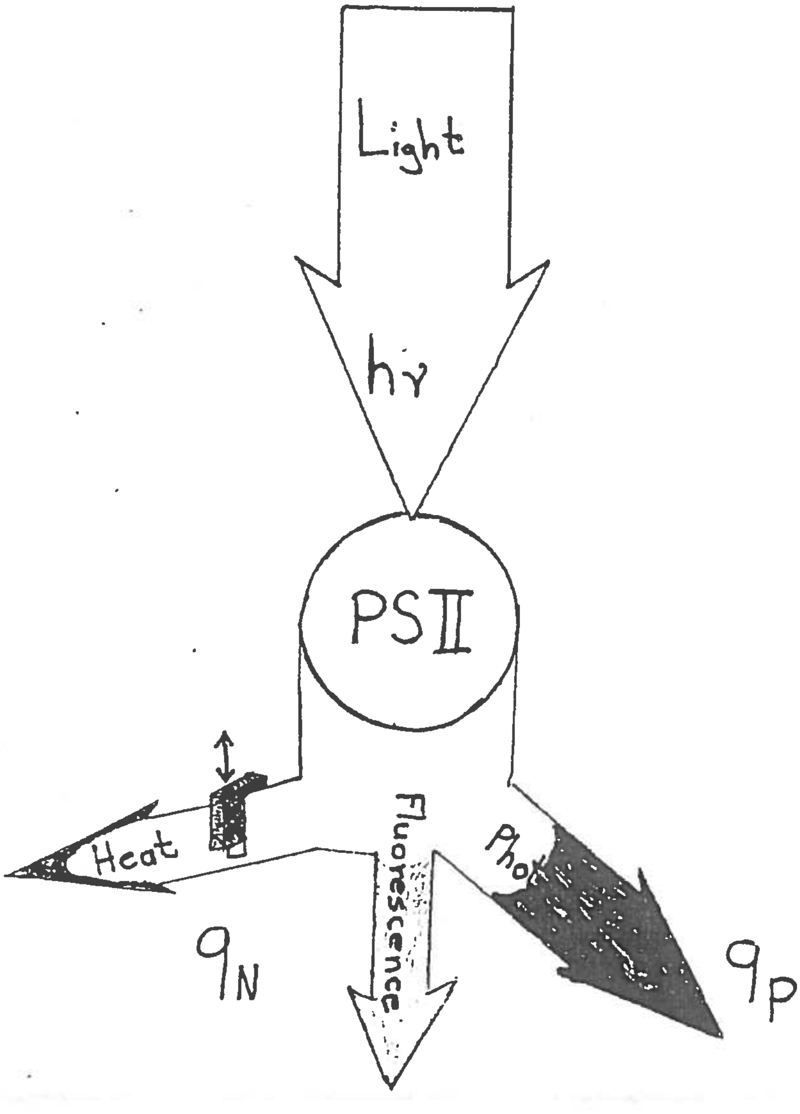


FIGURE 2. Scheme illustrating the relationships between fluorescence emission and other pathways of energy conversion in the photosynthetic apparatus.

REFERENCES (Krause u. Weis 1988)



SESSION II
Ny-Ålesund -
scientific results

Ecosystem studies

Barnacle Geese at Ny-Ålesund

Maarten J.J.E.Loonen

Ny-Ålesund Seminar
Potsdam 4-5 May

Barnacle geese studies at Ny-Ålesund

Dr. Maarten J.J.E. Loonen

During the summer on Spitsbergen, barnacle geese breed, moult and raise goslings and have to prepare for autumn migration. Each period is studied at Ny-Ålesund with a different research team but in close co-operation involving University of Groningen, The Wildfowl and Wetlands Trust, University of Birmingham, NINA Tromsø and Norsk Polar Institutt. Ny-Ålesund is an optimal study site for barnacle geese, because the geese are used to the presence of people. The geese feed close to the town, and the town has optimal facilities for laboratory studies and housing.

While studying the geese intensively, many variables are measured and can be used as a monitoring variable for the local arctic environment. Data from 1991, 1992 and 1993 are given in table 1. In general, the situation became more difficult for the geese in this period of three years.

Table 1. Monitoring the local environment for geese.

plant growth	38.4	28.1	29.5
grazing pressure A	99	120	135
grazing pressure B	7%	16%	40%
fox predation	97%	58%	44%
gosling growth	1254	990	990
migration survival	90%	63%	59%
adult size	150	-3	-147

- plant growth as cumulative leaf production per individually marked shoot over the season (mm).
- grazing pressure A as the amount of geese present near Solvatnet (expressed as kg. geese to combine adults and goslings).
- grazing pressure B as the percentage of sightings of geese made within the village area, which is only visited when all other areas are depleted.
- fox predation as the percentage of goslings disappearing in 1 month period.
- gosling growth as calculated body mass for age 35 days (gram).
- migration survival a the percentage of individually marked goslings seen in Scotland in the subsequent winter.
- adult size as deviation from average adult body mass for geese with known year of birth (gram).

Not monitoring, but a study into mechanisms determining growth and breeding success is the primary aim of our study. There is for instance a positive effect of family size on gosling growth. We are able to construct

a full model of factors which determine this trend. Large families are dominant over small families, and obtain the optimal food spots. But the dominance is directly caused by the family size. When polar fox predation decreases the number of goslings, also the chance for winning a fight decreases. An experimental manipulation, where families were increased and reduced by exchanging goslings between nests at hatch, showed the same trend. A pair with many goslings wins more fights, though the goslings play no active role in the interactions themselves.

Our aim is to continue this study at least for the next 5 years.

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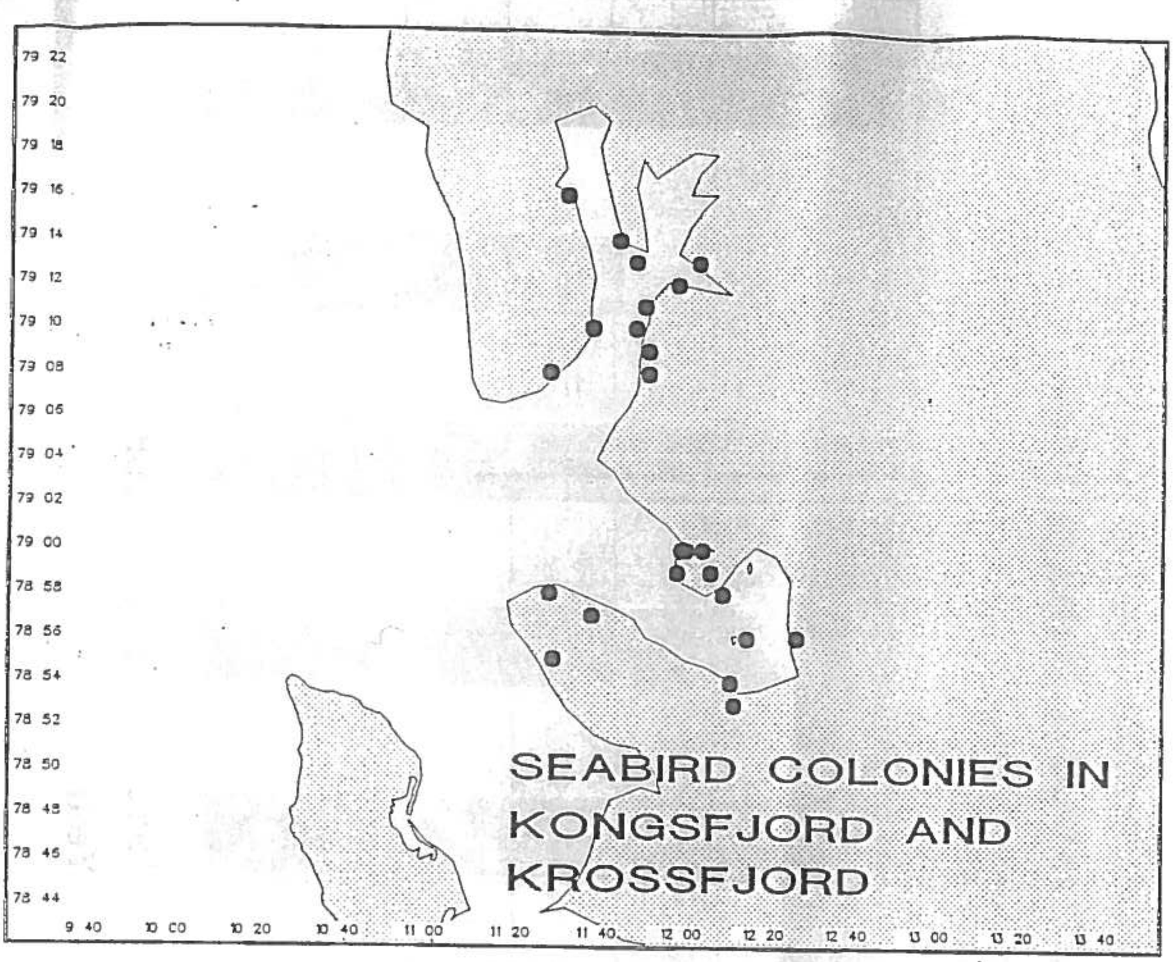
SESSION II
Ny-Ålesund -
scientific results
Ecosystem studies

Seabird research at Ny-Ålesund

Geir W.Gabrielsen

Ny-Ålesund Seminar
Potsdam 4-5 May


SEABIRD COLONIES IN KONGSFJORD AND KROSSFJORD
79 22
79 20
79 18
79 16
79 14
79 12
79 10
79 08
79 06
79 04
79 02
79 00
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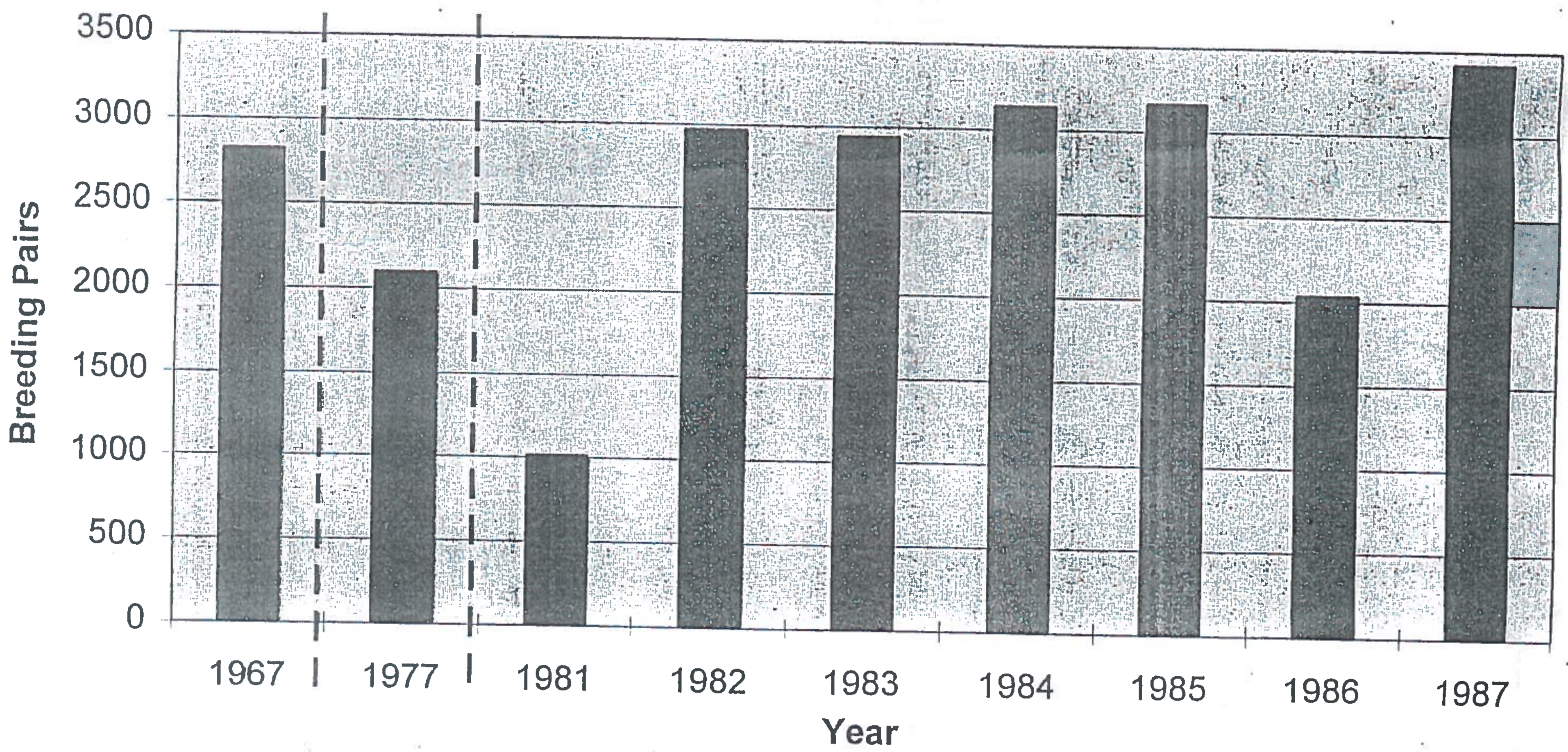
Breeding Common Eiders (*Somateria mollissima*) in Kongsfjorden 1967-1987 (Mehlum 1991/Prestrud & Mehlum 1991)



Prepared by Espen O. Henriksen 27.04.95

SESSION II
Ny-Ålesund -
scientific results
Ecosystem studies

Experiences of long-term studies at the marine laboratory (Nansen lab.) at Ny-Ålesund

Michael Schmid

Ny-Ålesund Seminar
Potsdam 4-5 May

zooplankton and also of water parameters eg. seasonal chlorophyll, temperature and salinity change of the upper water layers. The work of the benthos and fish group was on the other hand very much limited.
We would wish for our oncoming work in Ny Ålesund to have access to a larger boat with a small a-frame and winch to extend our benthos and fish work.

Our first season in NyÅlesund proved to be very succesful and we are convinced that Ny Ålesund is besides the terrestrial biological science an excellent place to conduct marine science as well and we hope that there will be more collegues working there.

Thank you

Experiences of seasonal studies at the marine lab (Nansen laboratory) in Ny Alesund.

Marine biological investigations in polar regions are mainly defined to shipboard work. Of course most scientific questions at least in our field deal with the fauna in deeper waters far from the coast, which makes the use of large ships inevitable. As good as these ships are as research platforms they lack the opportunity to reach the arctic in winter due to severe ice-conditions and to conduct seasonal studies. Winter studies and even more **in-situ seasonal and long-term studies** on the growth and production can only be performed from a **land based station**. In the need of answering questions on the growth and production of zooplankton and benthic organisms and individual metabolism within our project , we took the opportunity to work at the marine laboratory "Nansen Lab" of the Norsk Polar Institutt in Ny Ålesund.
There we found a well equipped marine lab, which even had the facilities to maintain aquatic animals in an aquarium room.

Our research period has been from May 1st to September the 30th, which thus included the late winter situation with a still ice-covered fjord, the summer and early winter.
During this ~~six~~ 5 month the zooplankton, the makrozoobenthos and during summer also fish should be investigated.
The goal of our summer campaign was to investigate:

- growth and production of zooplakton key species
- growth and production of macrobenthic animals such as bivalves, decapods and echinoderms.
- metabolic performance of crustaceans and fish regarding to temperature, salinity and food supply.

→ Dia 5

While the fjord was still ice-covered zooplankton sampling could take place via ice-holes drilled with an ice corer used by ice-biologists. As you can see sometimes the holes had to be larger. To view the under ice fauna and to get an idea of the small-scale distribution patterns in-situ an endoskop-video -system was used.

Soon as the ice cover diminuished the two small boats of the AWI could be used at least to sample zooplankton and with difficulties benthos as well.

The Aquarium room of the lab prooved to be very good to maintain life animals. Water was pumped out of the fjord to a large storage tank and was then fed to the pipe-system of the lab. This made it possible to install a flow through system. Once installed the aquarium was not only used for scientific purpose but was also visited quite often by the "citizens" of Ny Ålesund.

While the laboratory and other facilities proved to be well equipped for marine biological activities, the lack of at least one larger boat (perhaps small local fisher boat) to use the dredge and other nets with also in deeper waters and more regularly has been a big handicap, especially for the benthos work.

Therefore we could take with us good results on the growth and production of

zooplankton and also of water parameters eg. seasonal chlorophyll, temperature and salinity change of the upper water layers. The work of the benthos and fish group was on the other hand very much limited.
We would wish for our oncoming work in Ny Ålesund to have access to a larger boat with a small a-frame and winch to extend our benthos and fish work.

Our first season in NyÅlesund proved to be very succesful and we are convinced that Ny Ålesund is besides the terrestrial biological science an excellent place to conduct marine science as well and we hope that there will be more collegues working there.

Thank you

SESSION II
Ny-Ålesund -
scientific results
Ecosystem studies

Resume on the UK biology activities

A.C. Stainthorpe

Ny-Ålesund Seminar
Potsdam 4-5 May

NERC Arctic Research Station Projects 1991 - 1996

Arctic Terrestrial Ecology Special Topic Programme Projects.

1991 - 1993 Aberdeen University Prof Ian Alexander Dr Sarah Woodin Dr John Baddeley Alison Horsburgh	Effects of elevated nitrogen availability on the growth and mycorrhizal infection of arctic dwarf shrubs.
1991 - 1993 Bradford University Dr Alisdair Headley Lis Cooper	Photosynthetic and respiratory responses to temperature in some arctic plants of varying ranges of latitude.
1991 - 1994 Liverpool Polytechnic Birmingham University, ITE Furzbrook British Antarctic Survey Prof Ian Hodkinson Prof Jeff Bale Dr Nigel Webb Dr Bill Block Dr Steve Coulson Dr Andy Strathdee Roger Worland	Temperature, climate change and environmental constraints on the life history strategies of arctic terrestrial invertebrates.
1991 - 1995 Manchester University, ITE Merlewood Prof T V Callaghan Prof John Lee Dr Malcolm Press Dr Phil Wookey Jac Potter Dr Andy Parsons Dr Clare Robinson Dr Francis Livens Dr Jeff Welker	Arctic ecosystems and environmental change.
1991 - 1995 St. Andrews University Prof Bob Crawford Dr Hazel Chapman Dr Richard Abbott Lisa Smith	*Indicators of deleterious effects of climate change in arctic plant populations.*

Conclusions

1. Relatively few environmental changes, apart from extremes of soil moisture, are likely to affect biodiversity by directly killing plants.
2. Biodiversity is most likely to respond in the long term to changing environmental conditions as a result of altered competitive interactions resulting from species-specific reactions: in manipulation experiments, short-term responses to an individual treatment varied between co-occurring species implying that community structure will change.
3. Competitive interactions leading to changes in biodiversity can be generated by changes in soil nutrient availability, temperature, atmospheric CO_2 and UV-B
4. Effects of soil fertility in determining biodiversity will be particularly important:
   a) when effected through vegetative growth;
   b) in subarctic vegetation;
   but net nutrient mineralisation and corresponding increases in soil fertility could be lower than anticipated because air warming is likely to be followed initially by a proportionally lower warming of the soil, nutrients can be differentially immobilised by soil microorganisms and substrate "quality" can be reduced during increases in temperature, atmospheric CO_2 and UV-B radiation.
5. Direct temperature effects on plant biodiversity will be particularly important:
   a) when effected through reproductive processes;
   b) in vegetation at the highest latitude and altitude;
   but increases in temperature (and nutrients) can reduce plant growth.
6. The constraint on increasing biodiversity varies from seedling recruitment in the Subarctic to seed production in the high Arctic; dispersal distances and migration rates are overall constraints.
7. Initial changes in biodiversity are likely to be subtle with changes only in abundance of existing species or changes in genotypes/ecotypes but more dramatic changes will occur following disturbances or in areas where colonisable bare ground is present i.e. in the high Arctic.

SESSION II
Ny-Ålesund -
scientific results
Ecosystem studies

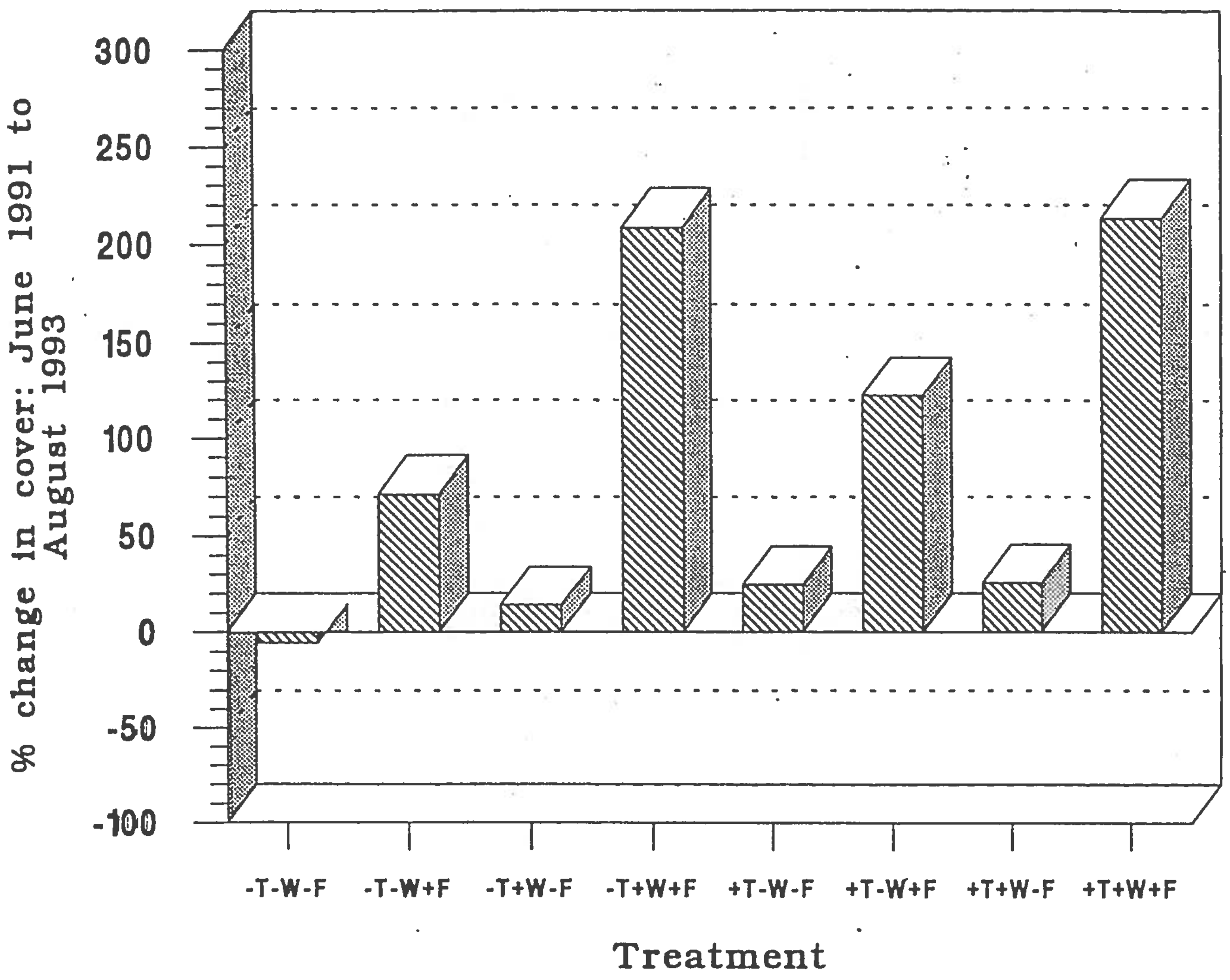
Botanical studies at Ny-Ålesund

Terry V. Callaghan

NORSK·POLARINSTITUTT

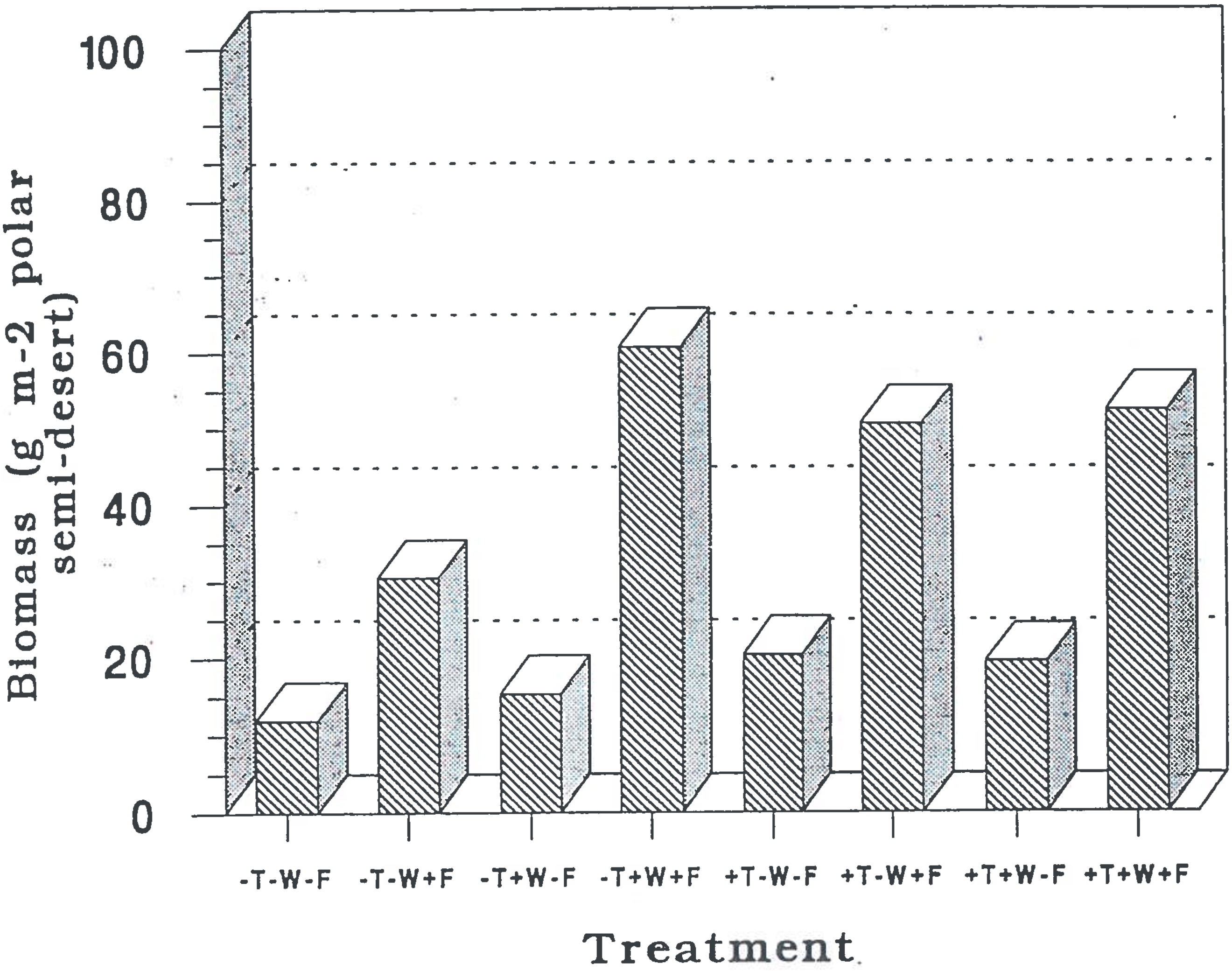
Site and location	Dominant species	Temperature air	Temperature soil	Temperature enhancement air	Temperature enhancement soil	Nutrients (N,P,K) g/m²/yr
1. Temperate uplands Upper Teesdale, U.K. 54°39'N, 2°13'W	*Pteridium aquilinum Calluna vulgaris*	12.2	10.8	0.8	0.1	5, -, -
2. Subarctic forest understorey, Abisko 68°21'N, 18°49'E	*Vaccinium/Empetrum* under *Betula pubescens ssp tortuosa*	11.8	5.3	2.7	-0.3	10, 10, 12.6
3. Subarctic heath above treeline, Abisko 68°21'N, 18°49'E	*Cassiope tetragona Vaccinium, Empetrum Rhododendron, Salix*	11.0	9.1	3.9 2.7	1.0 1.0	10, 2.6, 9
4. Subarctic high altitude fellfield, Abisko, 68°21'N, 18°49'E	*Cassiope tetragona Salix polaris, S.herbacea, Aulacomium sp.*	6.9	7.9	4.8 2.1	1.9 1.2	10, 2.6, 9
5. High Arctic heath Ny Ålesund, Svalbard 78°56'N, 11°50'E	*Cassiope tetragona S. polaris, Racomitrium lanuginosum*	8.0	4.8	2.5	0.3	10, 2.6, 9
6. High arctic polar semidesert, Ny Ålesund Svalbard, 78°56'N, 11°50'E	*Dryas octopetala, S. polaris, Saxifraga oppositifolia*	5.4	6.1	3.5	0.7	10, 10, 15

Change in % cover of Dryas octopetala



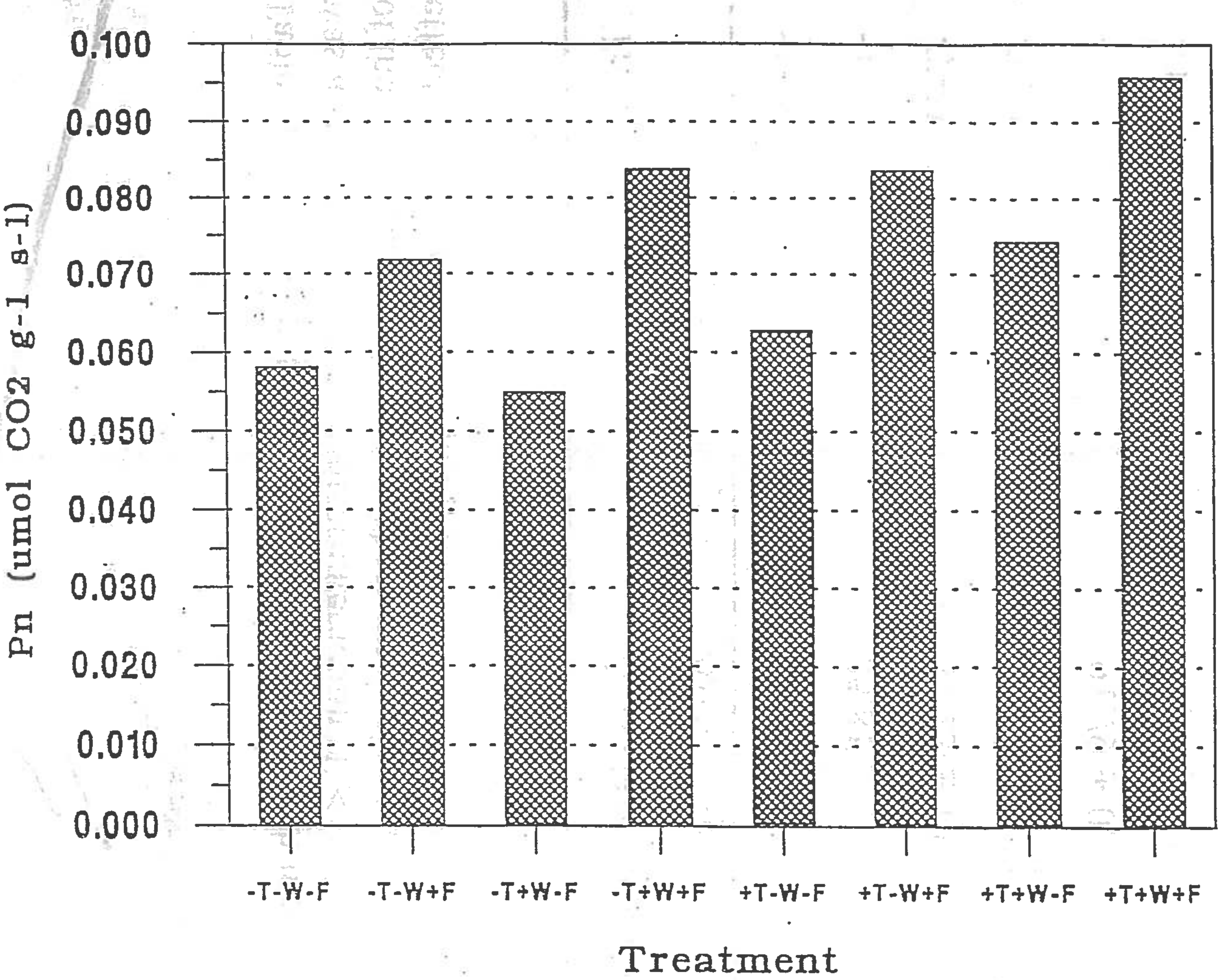
Summary statistics - ANOVA:
Fertilizer P < 0.001 ***
Precipitation P < 0.05 *

Dryas octopetala - green leaf biomass (g) on a 'site' basis



Summary statistics - ANOVA:
Fertilizer P < 0.001 ***
Precipitation P < 0.05 *
T x P interaction P < 0.05 *

Dryas octopetala - instantaneous net photosynthesis

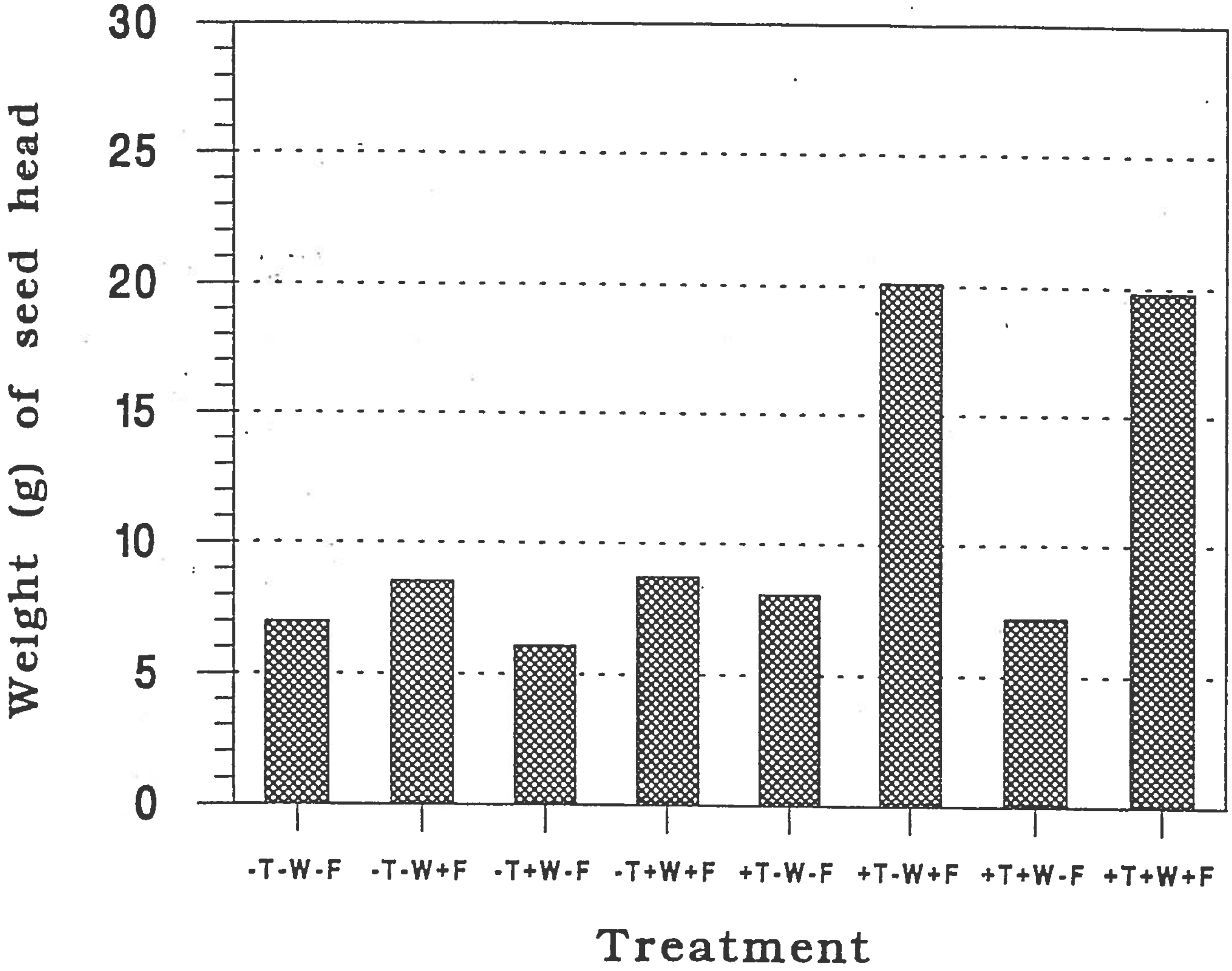


Summary statistics - ANOVA:
Fertilizer P < 0.01 ***

Table 4(a). Decomposition of *Salix polaris* litter in mesh bags at the polar semi-desert site. After 7 weeks there was a significant tent x fertiliser interaction ($P < 0.001$) and a significant main effect ($P < 0.001$, GLM, $n = 24$) of the tent/temperature factor. There were significant tent/temperature ($P < 0.05$) and fertiliser ($P < 0.001$) main effects at the second sampling date.

Treatment	Percentage weight remaining (mean ± S.E., $n = 6$)	
	After 7 weeks	After 13.5 months
-T-W-F	88.04 ± 1.84	87.27 ± 1.09
-T-W+F	85.81 ± 1.06	85.17 ± 1.83
-T+W-F	87.23 ± 1.06	88.10 ± 1.08
-T+W+F	85.08 ± 0.94	83.17 ± 2.89
+T-W-F	91.79 ± 0.72	87.73 ± 1.19
+T-W+F	93.67 ± 0.64	84.81 ± 2.53
+T+W-F	91.85 ± 0.87	89.78 ± 0.97
+T+W+F	92.01 ± 0.97	87.90 ± 1.21

Dryas octopetala - weight of individual seed heads



Summary statistics - ANOVA:
Fertilizer P < 0.001 ***
Temperature P < 0.001 ***
T X F interaction P < 0.01**

SESSION II
Ny-Ålesund -
scientific results

Long-range transport of pollutants and geodetic sciences

CO2 variability on Spitsbergen in relation to sources, sinks and long-range transport

Kim Holmen

Ny-Ålesund Seminar
Potsdam 4-5 May

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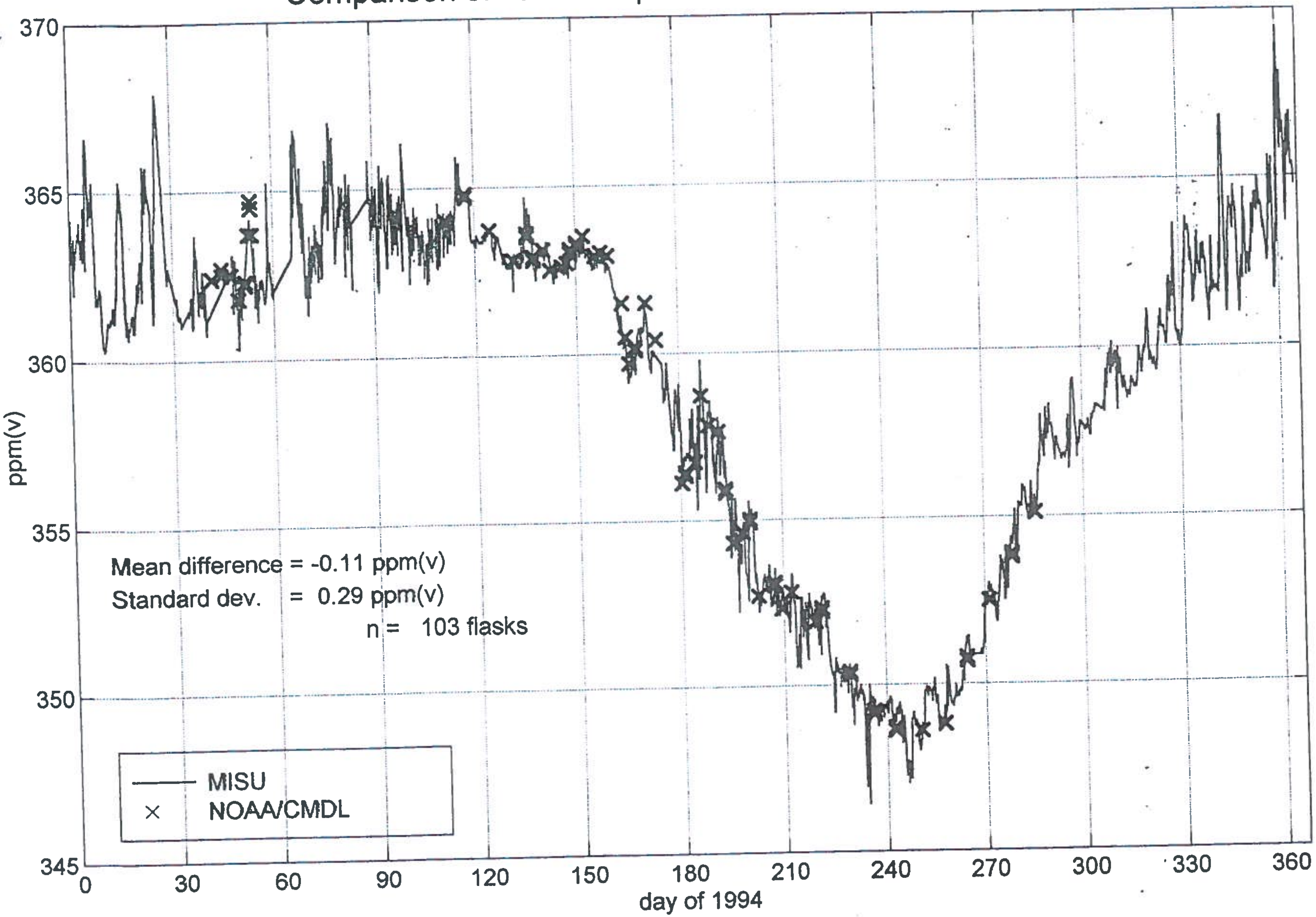
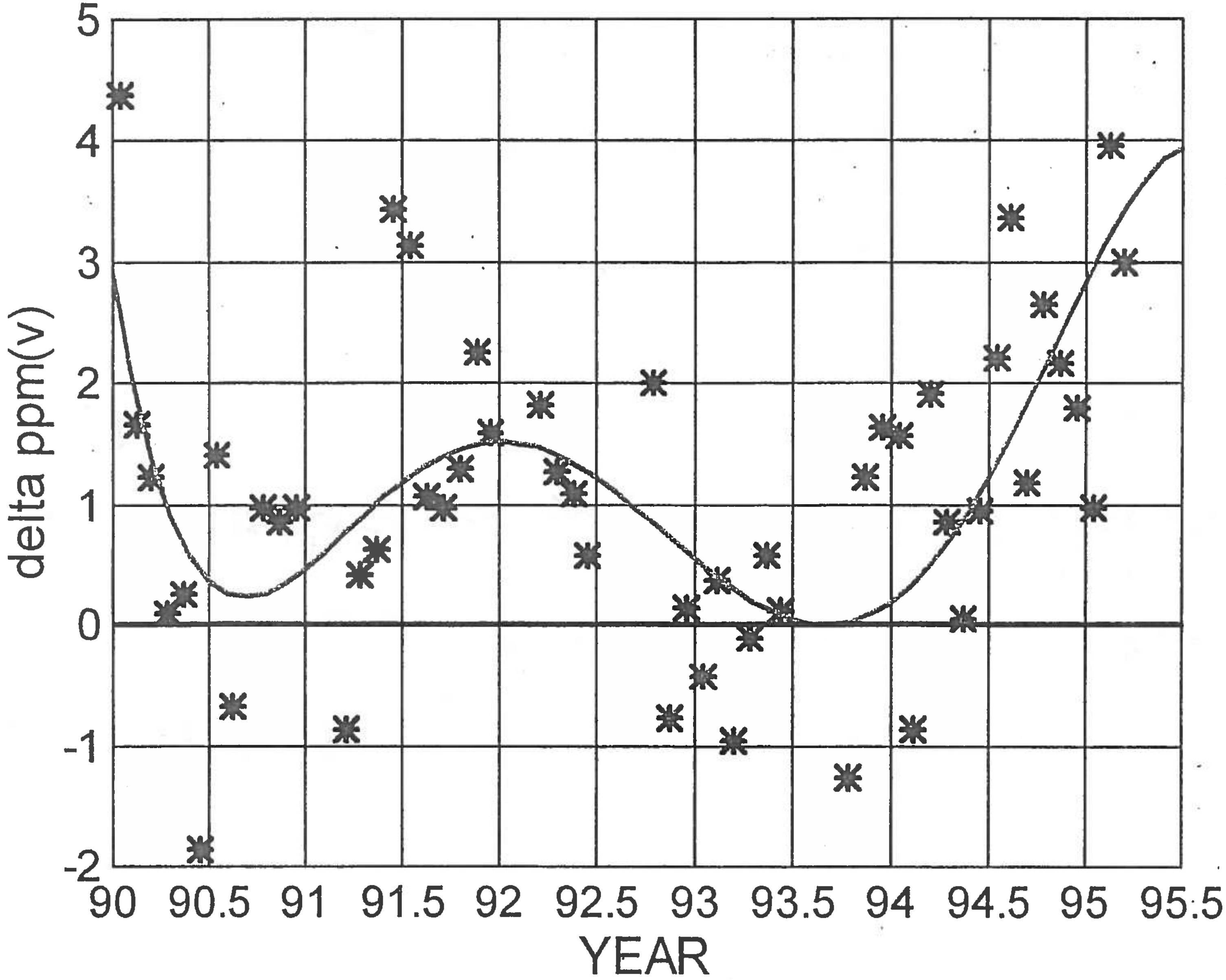
Comparison of flask samples and continuous instrument



Yearly change in monthly mean Carbon-dioxide concentration



Monitoring of climatically active species

on Zeppelinfjellet

A Swedish contribution to the <u>international</u> effort to establish global data coverage of global environmental problems

MISU

continuous measurement program 1994

- Two particle counters
- Nephelometer
- Cloud detector
- Meteorological data
- Carbon-dioxide
- filter samples

48 hour sampling for particle chemistry

SESSION II
Ny-Ålesund -
scientific results

Long-range transport of pollutants and geodetic sciences

Air-borne persistent organic pollutants in the Arctic

John-Erik Haugen

Ny-Ålesund Seminar
Potsdam 4-5 May

Airborne persistent organic pollutants (POP) in the Arctic

John-Erik Haugen
Norwegian Institute for Air Research, P.O.Box 100, N-2007 Kjeller, Norway.

Since the 1970s, evidence has been presented that persistent organic pollutants are deposited in the polar regions and accumulating in the ecosystem (e.g. Holden, 1972). It was postulated that the contaminants found in arctic biota was derived from marine contamination. In the early 1980s it could be demonstrated that measurable quantities of organochlorine compounds were present in arctic air and that more than 90% of the compounds were in the gasphase (Oehme and Manø, 1984). This supported the opposite view that transport of POPs is mainly by air (Ottar, 1981). This was further strengthened when POPs were found in Arctic snow (Gregor and Gummer, 1989). Today it is generally accepted that dispersion of persistent organic pollutants (POP) by long range atmospheric transport from temperate regions is the most important transfer route of POPs into polar regions (AMAP Report 94:1).

Timeseries based on weekly air measurements (organochlorine pesticides, PCBs and PAH) at the arctic Norwegian station on the Zeppelin mountain, Ny-Ålesund, Spitsbergen, will be presented. Spatial and temporal variations of selected pollutants will be discussed. Back trajectory calculations have been used to confirm long range transport episodes from source regions. In some cases however, it is difficult to distinguish between long range transport episodes and local emission due to local activity which may affect the measurements at the Zeppelin mountain.

References

Gregor, D.J. and W.D. Gummer 1989: Evidence of atmospheric transport and deposition of organochlorine pesticides and polychlorinated biphenyls in Canadian arctic snow. *Environ. Sci. Technol.*, 23(5), pp. 561-565.
Holden, A.V. 1972: Monitoring organochlorine contamination of the marine environment by the analysis of residues in seals. In *Marine Pollution and Sea Life*, ed. M. Ruivo, Fishing News Books Ltd, UK, pp. 266-272.
Oehme, M. and S. Manø 1984: The long-range transport of organic pollutants to the Arctic. *Fresenius Z. Anal. Chem.*, 319, pp. 141-146.
Ottar, B. 1981: The transfer of airborne pollutants to the Arctic region. *Atmos. Environ.*, 15, pp. 1439-1445.

What type of organochlorines are problematic concerning atmospheric transport to remote areas?

- Long lifetime in the environment
- Bioaccumulation in the food chain
- Toxic properties at low levels
- Physical-chemical properties which support long range transport

Nearly all compounds which fulfil these conditions belong to the group of:

Persistent polychlorinated compounds (Persistent organochlorines)

NILU

Examples and sources of some important persistent organochlorines

Insecticides such as p,p'-DDT, hexachloro-cyclohexanes (HCH), chlordanes, polychlorinated bornans (Toxaphene).

Can be metabolised:
p,p'-DDT: p,p-DDE/p,p'-DDD. γ-HCH $\Rightarrow$ α-HCH

Sources: Agricultural areas

Polychlorinated aromatic compounds such as chlorobenzenes (hexachlorobenzene, HCB), polychlorinated biphenyls (PCB), polychlorinated dioxins (PCDD) and furans (PCDF) ("Dioxins")

Sources: Industrial applications, combustion (incineration, engines), metallurgical processes (metal reclamation, Mg-production), undesired by-products from chemical synthesis

NILU

Long range transport paths to the Arctic

- **Air:** During the past decade it could be shown that polluted air masses can be easily transported from source areas to the Arctic within 48-72 t

- **Sea currents:** Radionuclide emissions from Sellafield and other sites allowed to estimate the transport time and path from the North Sea to:

  Spitsbergen/West Greenland:
  3-5 years, 1% of North Sea water
  Baffin Bay:
  ca. 8 years, 1 ‰ of North Sea water

NILU

A problem

The transport by sea currents is too slow and cannot explain the levels which have been accumulated in the Arctic.

Atmospheric transport is fast but cannot move large quantities

The solution

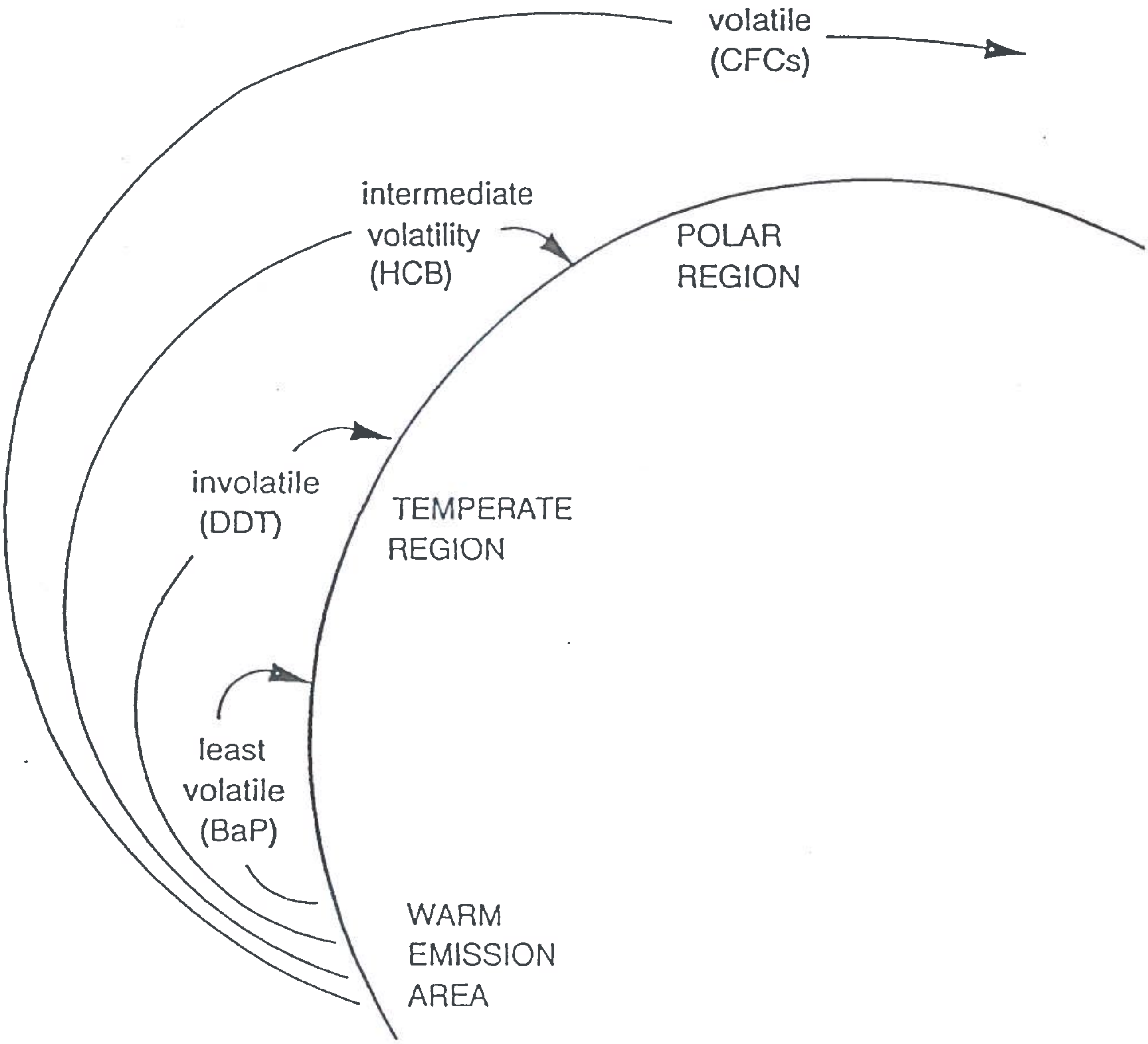
Only the combination atmospheric transport, deposition in the sea followed by revolatilisation and new transport allow to move large quantities: "Global gas chromatography".

Air: Mobile phase
Water: Stationary phase

The temperature gradient along the transport route causes a global "cold finger" effect leading to an accumulation of compounds of moderate volatility in the polar regions

NILU

Fractionation of organic compounds according to their volatility



after Wania and Mackay

Seasonal variation in air concentrations of POP

Winter/early spring
- periodic transfer of air from south into the Arctic
- transport time from 48 hrs up to one week
- low transformation rates (photochemical activity)
- low precipitation (scavenging)

Summer
- transport episodes from south occasionally
- transport time several weeks (month)
- high transformation rates
- precipitation

NILU

Global use/emission of POP

Pesticides 1950-present

	million tonnes
DDT	2,6
HCH	1,3
Toxaphen	1,2

PCBs

	1,3

PAH emisions

Benzo(a)pyren	$1{,}6 - 5{,}1 \cdot 10^{8}$ tn/yr
$\sum$ PAH	$1{,}6 - 5{,}1 \cdot 10^{10}$ tn/yr

Agrees the model prediction with reality?
How to prove?

Study of atmospheric transport to the Arctic and levels in Arctic air

Measuring campaigns in the Norwegian Arctic 1981-1984 and 1992-1996:

General conclusions:

Concentrations of more volatile organochlorines in Arctic air are about the same as in air much closer to source areas:

γ-HCH (Lindan):	Arctic:	40-200 pg/m^3
	Globally:	100-1000 pg/m^3
HCB:	Arctic:	100-400 pg/m^3
	Globally:	50-200 pg/m^3

Different deposition rates and photochemical transformation changes the α- to γ-HCH ratio:

Lista (South Norway):	2:1 (annual average)
Spitsbergen:	10:1 (annual average)

NILU

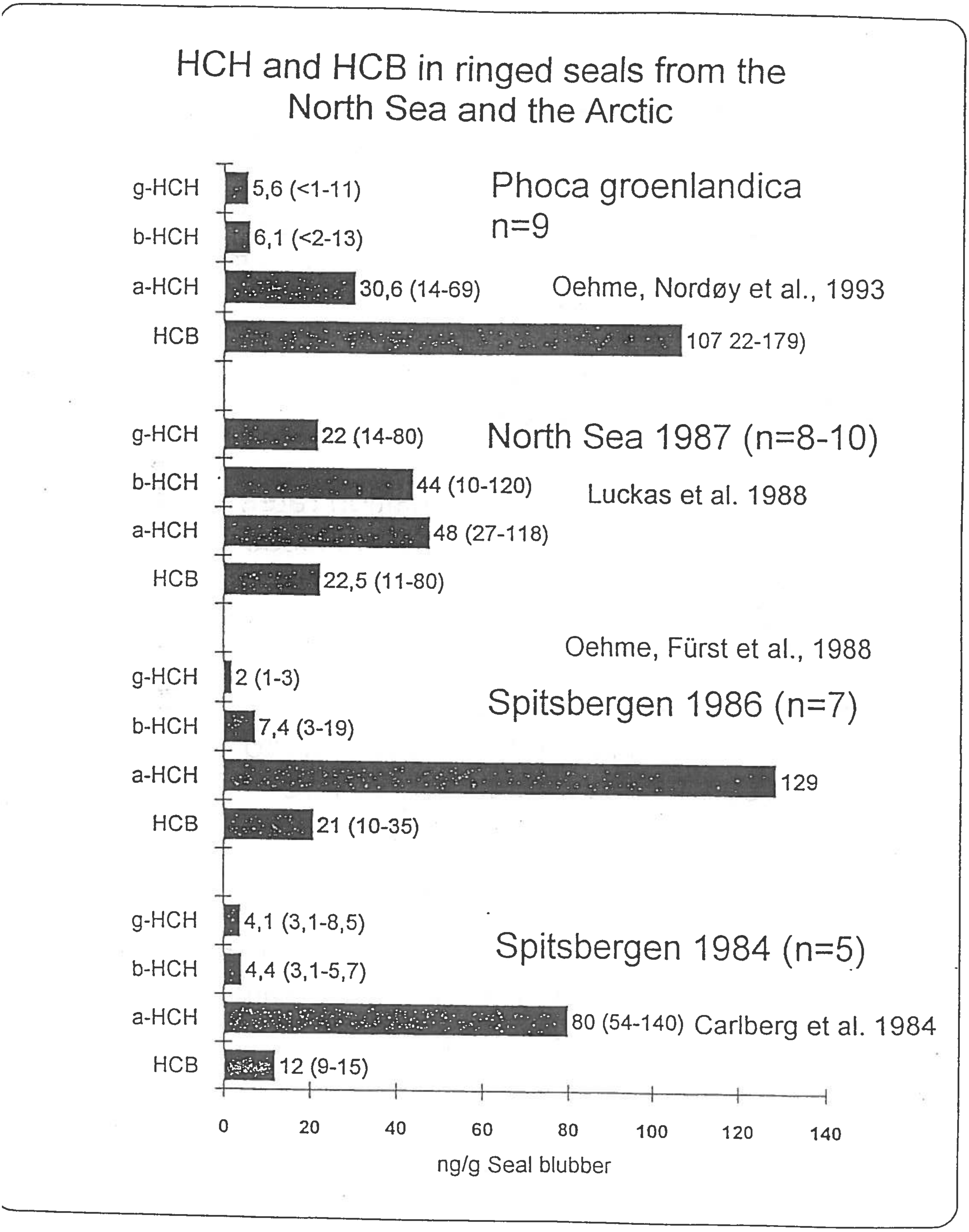
Concentrations of organochlorines in marine biota and marine mammals

1. The levels in ringed seal blubber from the Arctic is for some medium volatile organochlorines higher compared to areas closer to sources. Only for PCB the opposite is found.

2. The concentrations of 2,3,7,8-chlorine-substituted PCDD/PCDF in ringed seal blubber is amazingly high compared to substantially polluted areas such as the Baltic Sea.

3. PCDD/PCDF levels in polar bear milk are comparable to those in human milk. As for humans recommended ADI levels are exceeded by at least one order of magnitude during the nursing period (up to 2-3 years)

NILU


HCH and HCB in ringed seals from the North Sea and the Arctic
Phoca groenlandica
n=9
Oehme, Nordøy et al., 1993
g-HCH
5,6 (<1-11)
b-HCH
6,1 (<2-13)
a-HCH
30,6 (14-69)
HCB
107 22-179)
North Sea 1987 (n=8-10)
Luckas et al. 1988
g-HCH
22 (14-80)
b-HCH
44 (10-120)
a-HCH
48 (27-118)
HCB
22,5 (11-80)
Oehme, Fürst et al., 1988
Spitsbergen 1986 (n=7)
g-HCH
2 (1-3)
b-HCH
7,4 (3-19)
a-HCH
129
HCB
21 (10-35)
Spitsbergen 1984 (n=5)
Carlberg et al. 1984
g-HCH
4,1 (3,1-8,5)
b-HCH
4,4 (3,1-5,7)
a-HCH
80 (54-140)
HCB
12 (9-15)
0
20
40
60
80
100
120
140
ng/g Seal blubber

Conclusions

- Long range atmospheric transport looks to be the most important source of environmental pollution of the Arctic.

- The physical behaviour of organochlorines favours their enrichment in the Arctic.

- Differences in wet and dry deposition rates of compounds and photochemical processes change concentration ratios compared to source areas.

- Levels of organochlorines in marine mammals from the Arctic can be comparable to those in regions closer to sources. More volatile compounds show higher concentrations in the Arctic.

- Nothing is known about the long term consequences of the input of anthropogenic pollutants to a very sensitive ecosystem

NILU

SESSION II
Ny-Ålesund -
scientific results

Long-range transport of pollutants and geodetic sciences

Persistent organic pollutants and heavy metals in the Ny-Ålesund environment

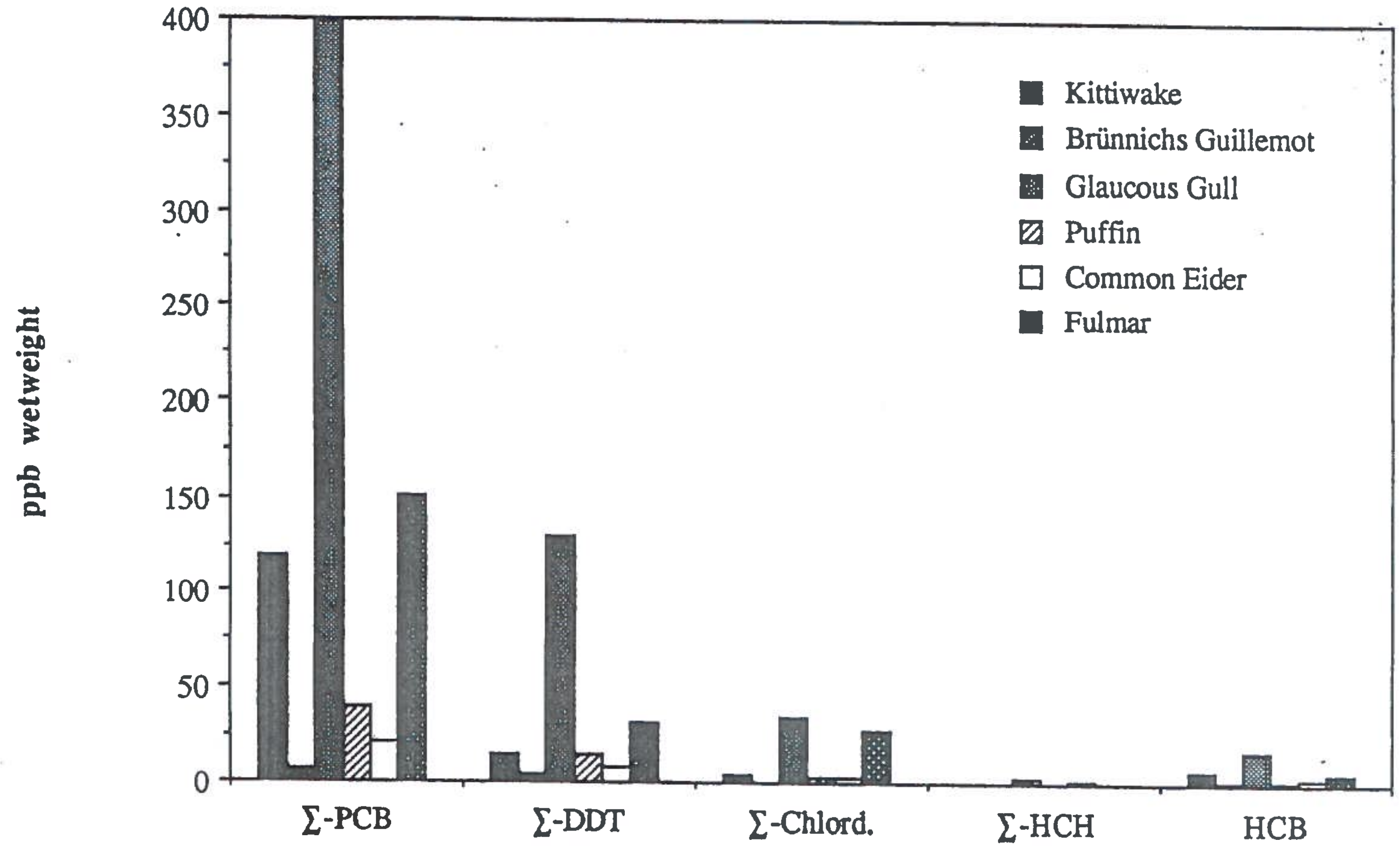
Geir W. Gabrielsen

Ny-Ålesund Seminar
Potsdam 4-5 May

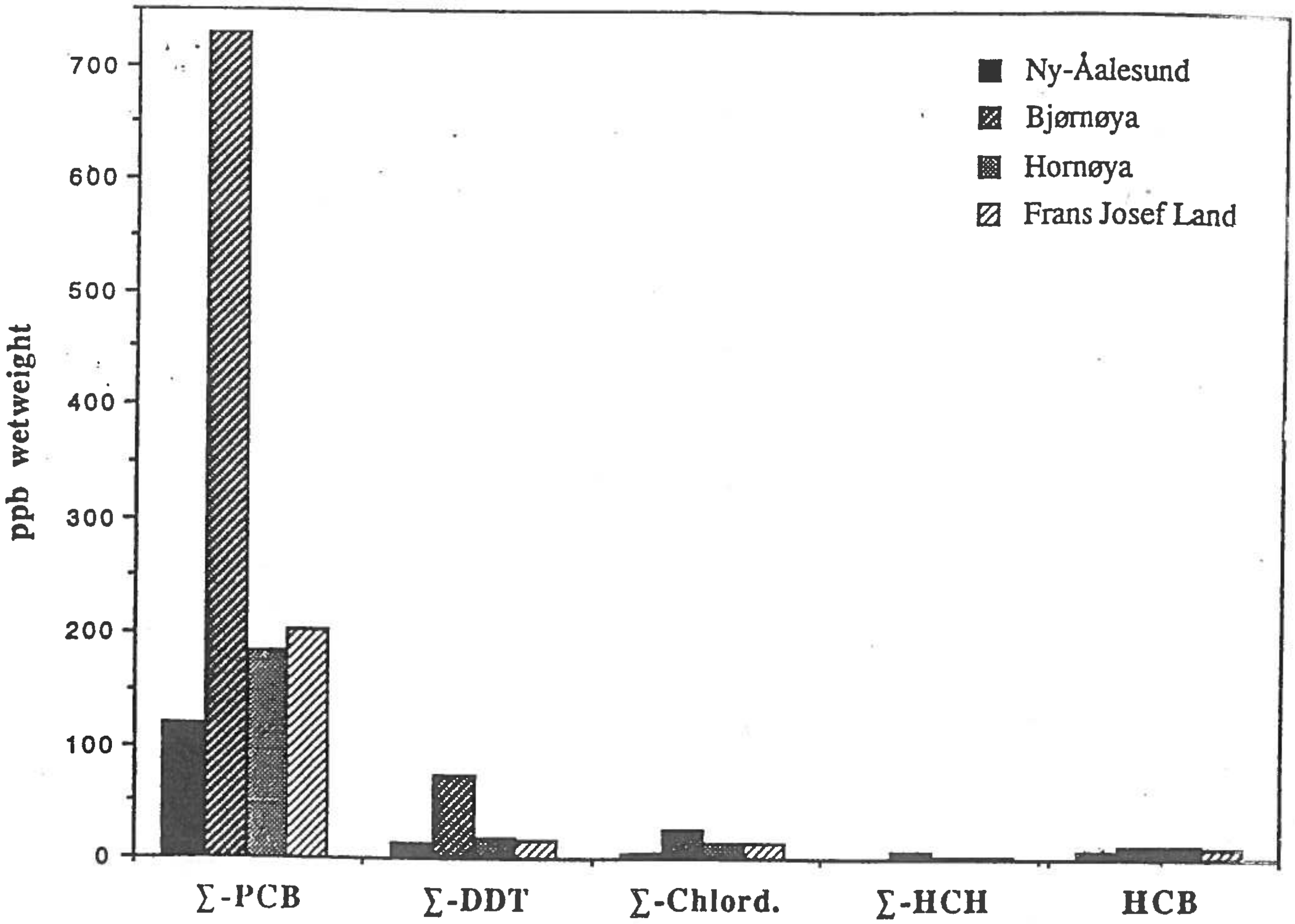
Levels of PAHs and PCBs in sediments from the Svalbard area (ng/g).

Location	Sum PCB	Sum PAH
Kongsfjorden	n.d. - 0.32*	266 - 82 364
Isfjorden		
Longyearbyen	n.d.	3 697 - 4 775
Barentsburg	3.8 - 21.9	2 432 - 3 583
Storfjorden	n.d.	540

Organochlorines in birds liver from Ny-Ålesund 1991.



Organochlorines in kittiwake liver from The Barents Sea July - august 1991.



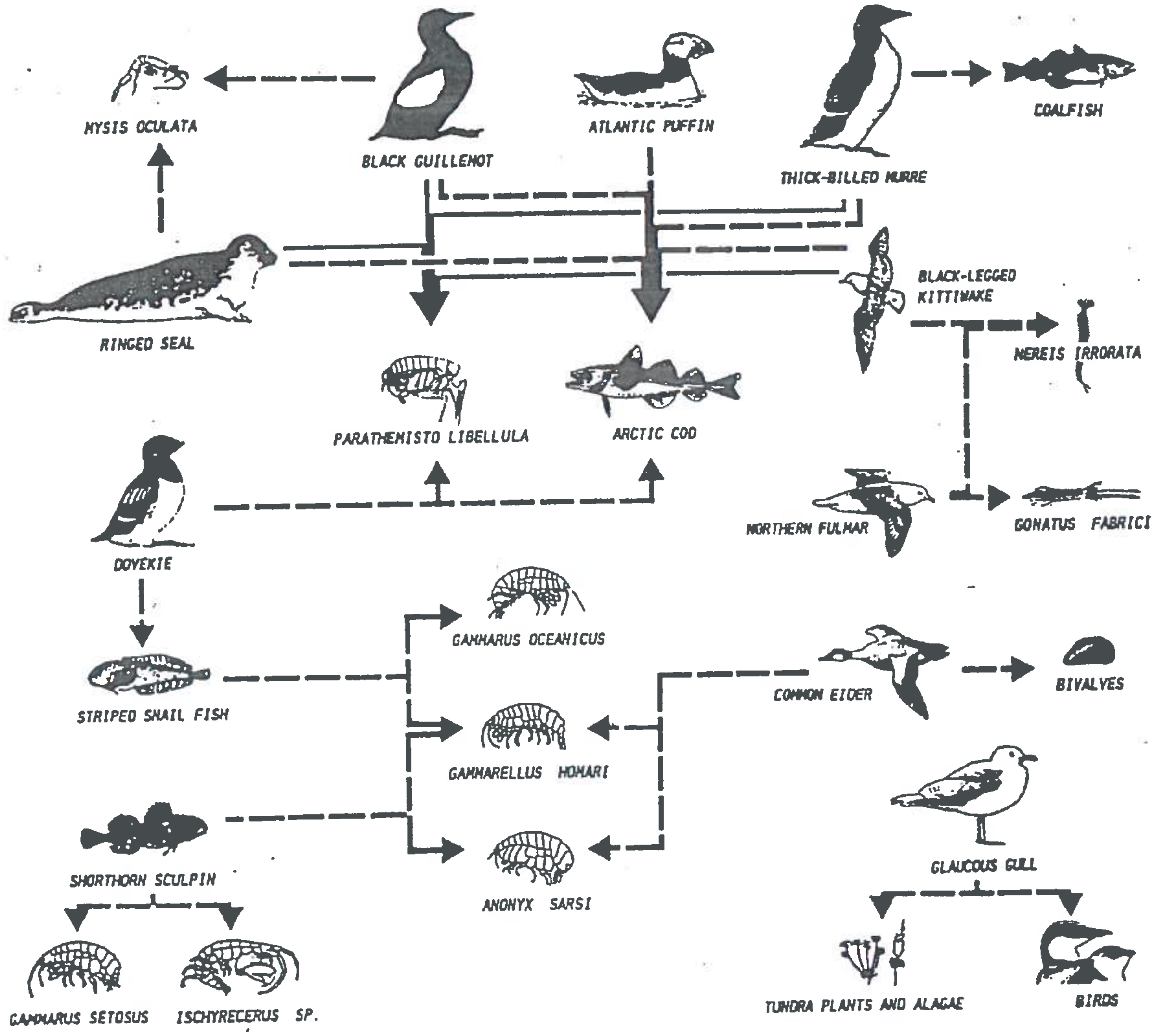
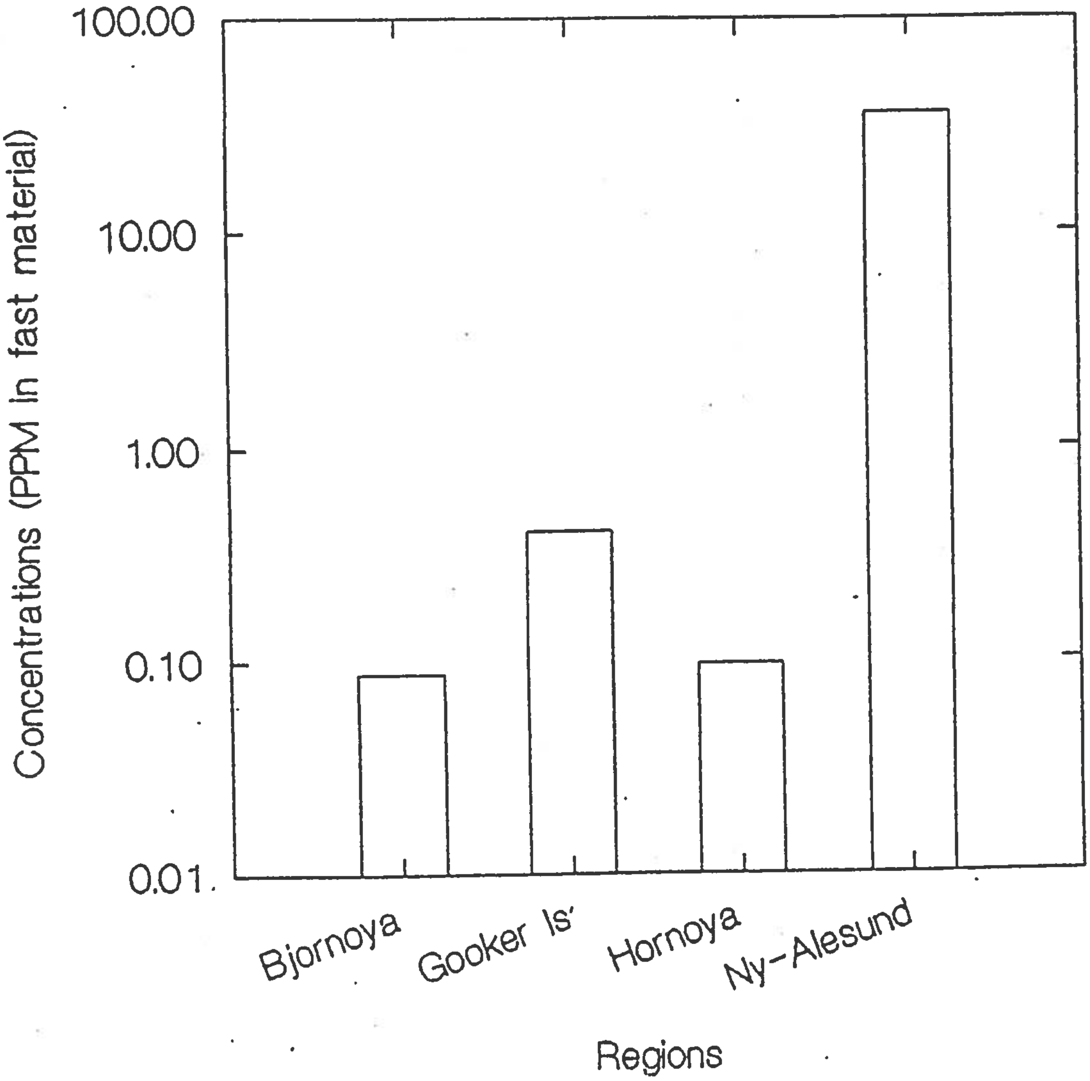

MYSIS OCULATA
BLACK GUILLEMOT
ATLANTIC PUFFIN
THICK-BILLED MURRE
COALFISH
RINGED SEAL
BLACK-LEGGED KITTIWAKE
NEREIS IRRORATA
PARATHEMISTO LIBELLULA
ARCTIC COD
DOVEKIE
NORTHERN FULMAR
GONATUS FABRICI
GAMMARUS OCEANICUS
STRIPED SNAIL FISH
COMMON EIDER
BIVALVES
GAMMARELLUS HOMARI
GLAUCOUS GULL
SHORTHORN SCULPIN
ANONYX SARSI
GAMMARUS SETOSUS
ISCHYRECERUS SP.
TUNDRA PLANTS AND ALAGAE
BIRDS

Fig. 4

Pb in Kittiwake (adult) livers



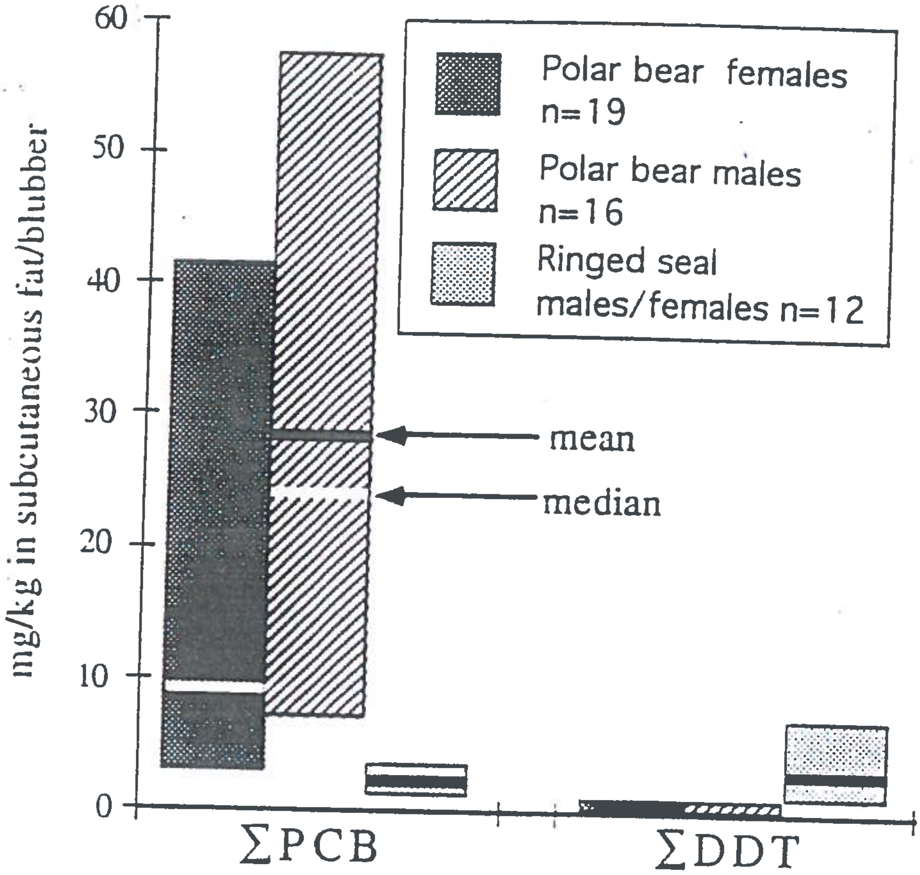


Figure 8: Mean levels (and standard deviation) of ΣPCB, ΣDDT and ΣCHL in subcutaneous fat biopsis of male and female polar bear (mg/kg fat weight) from Svalbard 1992/93 compared to corresponding levels the possible food item: blubber samples of ringed seal (mg/kg wet weight) from the Jarfiord, northern Norway 1990.

SESSION II
Ny-Ålesund -
scientific results

Long-range transport of pollutants and geodetic sciences

Initial results of the Space Geodetic Observatory at Ny-Ålesund

Bjørn R. Pettersen

Ny-Ålesund Seminar
Potsdam 4-5 May

Initial results from Ny-Ålesund Space Geodetic Observatory

Dr. Bjørn Ragnvald Pettersen

Space geodetic techniques are unsurpassed in their ability to accurately determine positions and describe instantaneous and long-term site motions. In the Arctic region both plate tectonics and post glacial rebound effects contribute to horizontal and vertical movements. VLBI measurements have determined first epoch positions in late 1994. These observations will continue for several decades. GPS has been routinely operational since 1992 and initial results reveal a motion of Ny-Ålesund similar to the European continent. Continued time series will allow future comparison with models for post glacial rebound and help refine them.

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OBJECTIVES FOR RESEARCH IN SPACE GEODESY

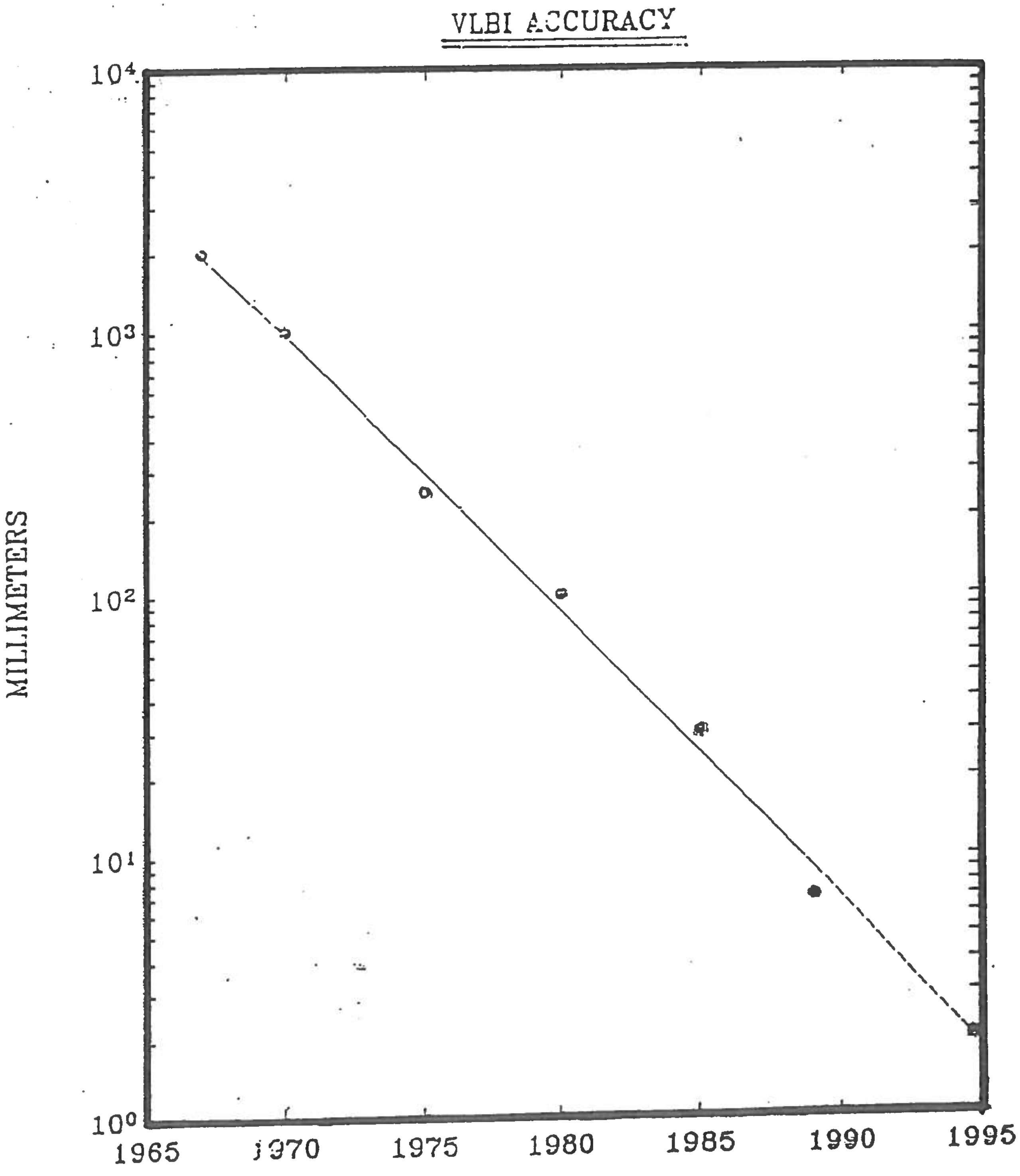
1. Observe and describe instantaneous and long-term site motions

2. Model and explain individual effects contributing to site motions
   - continental plate tectonics
   - postglacial rebound
   - Earth axis nutation

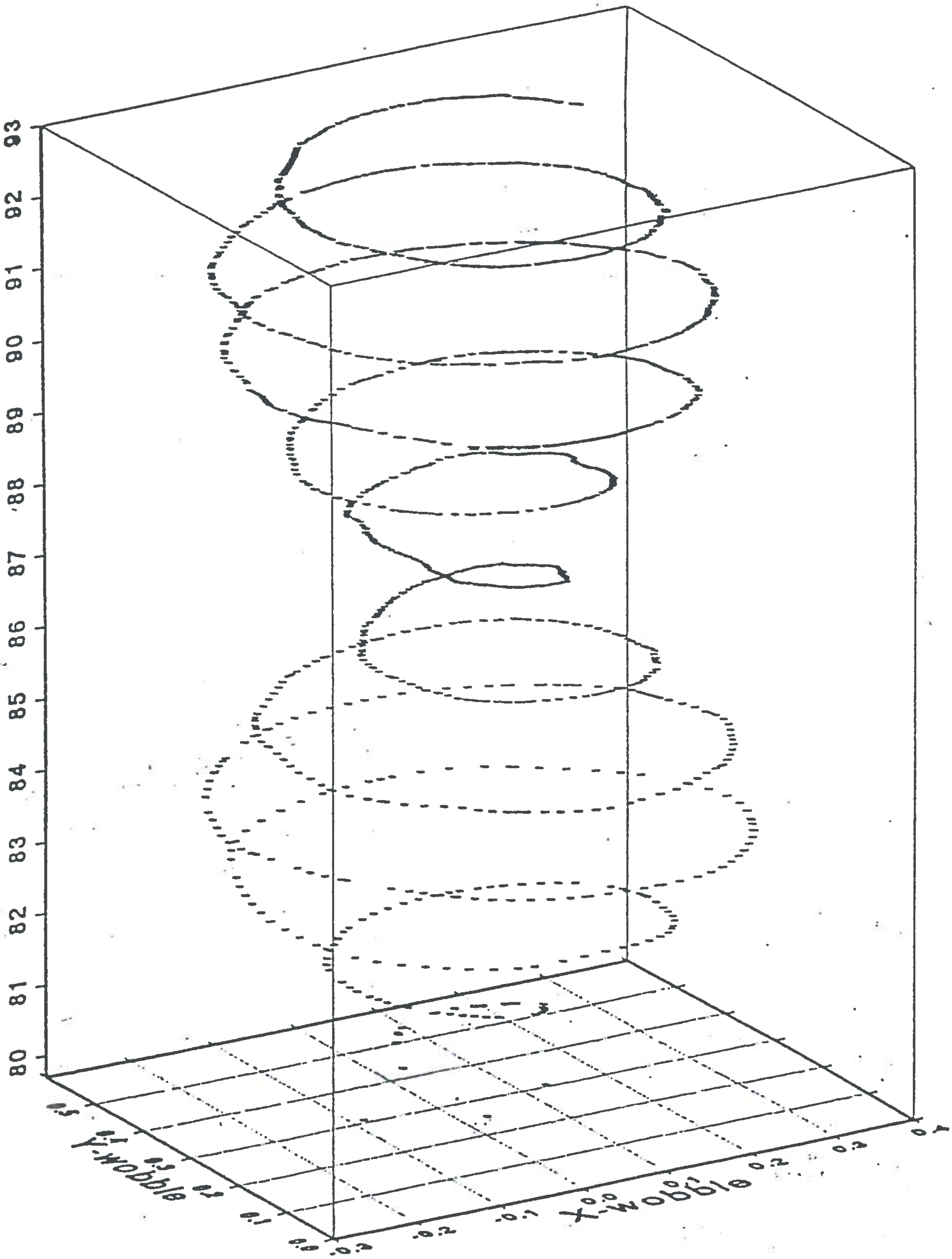
3. Interpret and understand the causes and effects of observed behaviour

4. Analyze and predict effects and consequences on short and long-term perspectives

STATENS KARTVERK



9.1 Polar Motion 1979-92



Global GPS Velocity Field

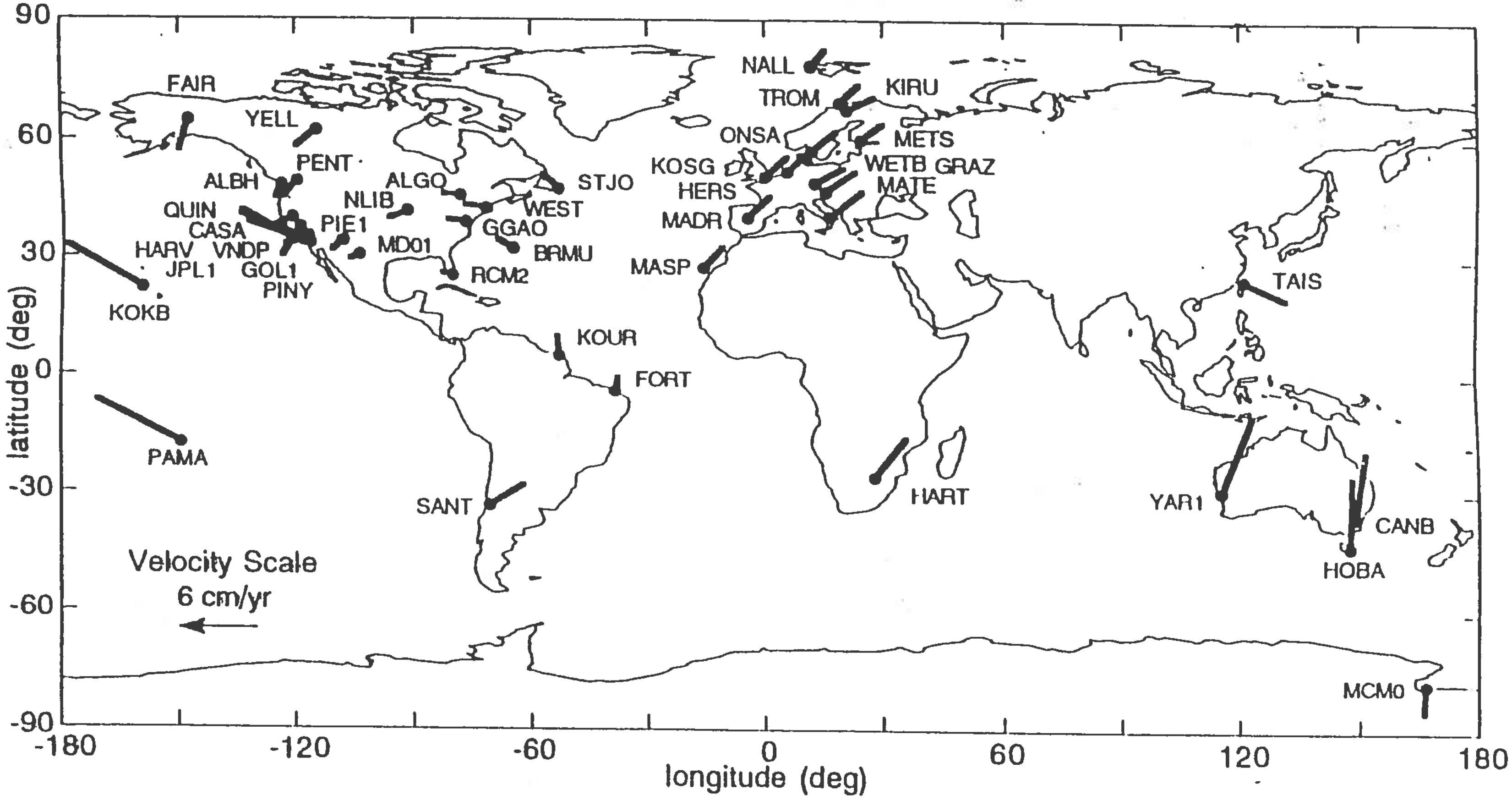
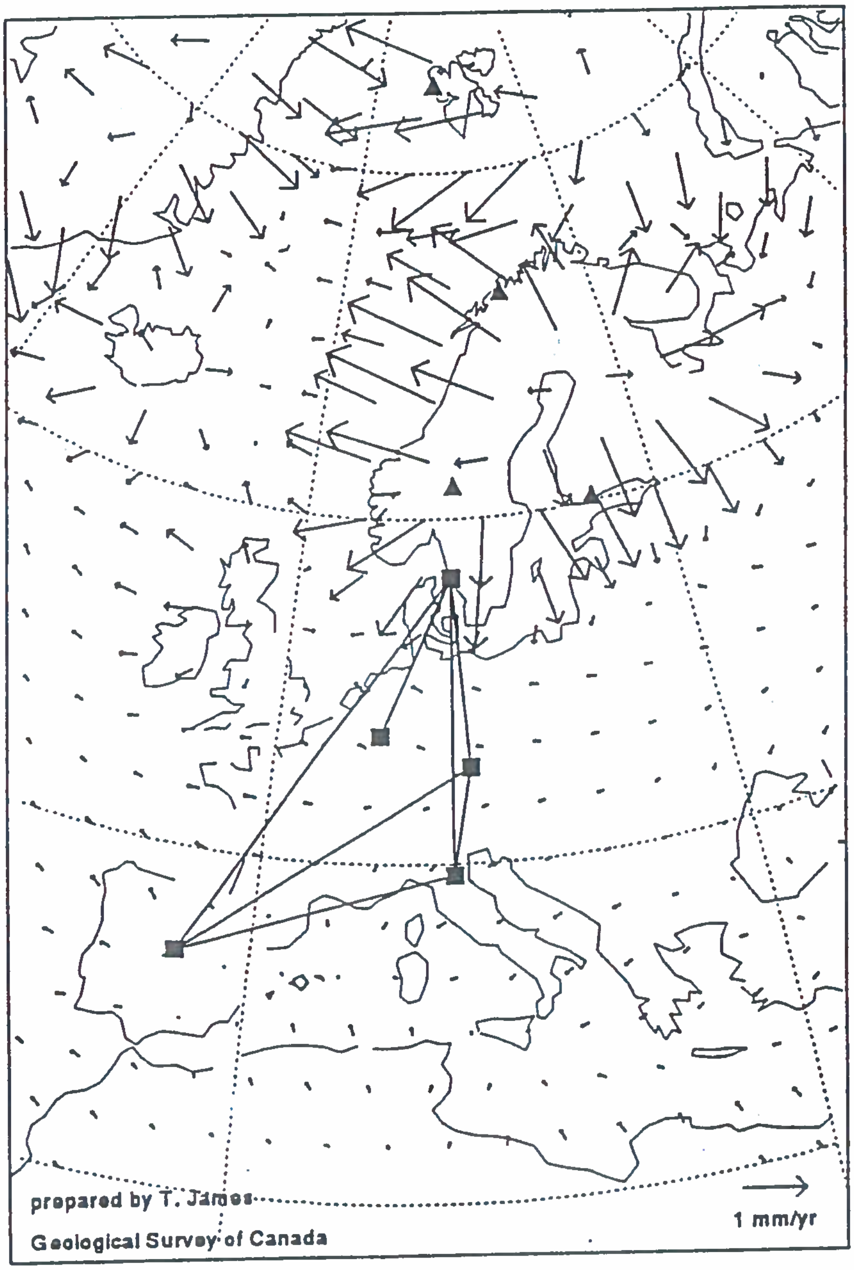


Figure 1. Velocities obtained from GPS data spanning three years from January 22, 1991 to April 1, 1994. Horizontal velocities are represented by the lines extending from each site.

STATENS KARTVERK

Tangential Velocity



SESSION II
Ny-Ålesund -
scientific results

Glaciology and geomorphology

Glacial and periglacial geomorphology studies at Ny-Ålesund

Johan Ludvig Sollid

Studies of Glacial and Periglacial Geomorphology at Ny-Ålesund.

By Johan Ludvig Sollid*

The archipelago of Svalbard is ca 60 000 km^2, 60% of the area is covered with glaciers. Permafrost exists all over except under thick glaciers, and the depth of the permafrost varies between 120-500 m. Svalbard is well fitted for periglacial and glacial studies.

The Research Station of Norwegian Polar Institute in Ny-Ålesund is an excellent base for this type of studies. The Department of Physical Geography at the University of Oslo has used the base for years to train students in Arctic field work and to run long term projects. The cooperation with the Polar Institute has been a greate pleasure. I will mention that in Ny-Ålesund the Kings Bay Kull Company offers service of high standard concerning accommodation and food.

In the mid-80`s I went round the archipelago by helicopter mapping the shore zone for oil spill protection, and I have been responsible for mapping the superficial material and the glacial geomorphology of entire Svalbard. This experience told me that the Ny-Ålesund area is a very good locality for glacial and periglacial studies compared to tre rest of the archipelago. There are well-developed earth circles, well-developed rockglaciers, active glaciers ending on ~~the~~ land and in ~~the~~ sea. The glacier forefields have beautiful ice-cored moraines. Important is the fact that the Norwegian Polar Institute has studied the glaciers in the area since 1968, and established long run climatological series.

Earth circles similar to those at Ny-Ålesund are found in the southern part of Spitsbergen, in the Hornsund area, but not elsewhere in the archipelago. This distributional pattern is due to weathered dolomite residuals, a very fine grained type of material. When this fine material is mixed with coarse shore sediments, it is prepared for creating earth circles. The genesis of the fines, however, is decisive. The fine material highly contributes to make the distributional pattern of the earth circles, also in detail.

The sorting mechanism of the earth circles is not quite understood. The literature widely discusses the mechanism and presents different views. To study earth circles sorting processes at Kvadehuksletta west of Ny-Ålesund a joint project between the Periglacial Laboratory, QRC, University of Washington, and the Department of Physical Geography, University of Oslo, was run for tree-four years. Managers were Dr. Bernard Hallet from the University of Washington and myself from the University of Oslo.

The earth circles are unique in the Kvadehuksletta area. They are may be better developed than in Resolute in Arctic Canada where Dr. Washburn has done his famous studies. Dr. Hallet`s group considered bouancy (convection) as a main factor for the genesis of the earth circles at Kvadehuksletta, and my group considered a diaper mechanism to be important. There are still more research to be done in this field.

By the way, the postglacial uplift of Kvadehuksletta is mapped . This mapping established a time scale useful for the periglacial process studies in the area.

Many researchers have worked on end-moraines in Svalbard. The resent end-moraines are normally ice-cored. The proglacial areas are, if melted, often hummocky with a distinct distal border. The snout of the glaciers is dirty, covered by morainic material brought to the surface by sharing due to the permafrost. The glacier front is frozen to the ground. Belts of hummocky moraines are well known from northern Norway. They exist in the deglaciation areas outside the Younger Dryas end moraine (older than 10 ka). This indicates that the deglaciation of the continental ice sheet here took place under permafrost conditions similar to Spitsbergen today. Ice cored end- moraines are studied at Ny-Ålesund where it is possible to connect the observations of the moraines to glaciological information. That is very important for the interpretation.

Kongsvegen and Kronebreen glaciers end in the fjord at the head of Kongsfjorden. The genesis of De Geer moraines, which are submarine end-moraines, have been investigated to compare them to fossil forms on the Mainland-Norway and in Scandinavia elsewhere. The present is the key to the past.

The glacier Blomstrandsbreen on the northern side of Kongsfjorden terminates in a special way, or more right to say, it did. Until 1991 it crossed a narrow marine sound entering the Blomstrand peninsula. From 1992 there is no peninsula more, and in the glacier forefield clusters of flutes dominate, not hummocks in the way we usually see ahead of glaciers ending on land. Due to the permafrost conditiones flutes are rare on Svalbard. Crossing the marine sound the snout of the Blomstrandsbreen glacier became wet-based and the flute generating processes took place. The genesis of the flutes or streamlined surfaces is much discussed in the literature. Blomstrandbreen makes an excellent study site concerning these problems as the thermal regime of the glacier snout changed from being cold-based to wet-based under nearly controlled conditions.

Near Ny-Ålesund there are many rockglaciers. On Prins Karls Forland they occur more frequently then in any other place in Svalbard. On Brøggerhalvøya good rockglaciers exist at Stuphallet and ahead of austre Brøggerbreen, close to Ny-Ålesund. Svalbard has app. 500 rockglacier all together.

Rockglaciers are of interest for studying the paleo-climate. Dr. Wilfried Haeberli and his group from ETH have published interesting results from the Alps. Ny-Ålesund is a good site for another study to obtain a wider paleo-climate perspective. A better place is difficult to find both from a scientific as well from a logistic point of view. In a joint programme with UoO and NP, Dr. Haeberli intends to start drilling in a rockglacier at Ny-Ålesund already in 1996, if possible. Preliminary geophysical prospecting has already been done. Dr Daniel Vonder Muhll will tell us about these investigations.

An important point is that the rockglaciers ahead of austre Brøggerbreen are situated closely to the glacier that Dr. Olav Liestøl has investigated through tens of years. Dr. Liestøl early realized the importance of a combined study of glaciology and geocryology, the way Dr. Haeberli does it today in the Alps. Ny-Ålesund situated 79°N making the gate to the North Pole, is a unique supplement site to the paleo-climatical studies in the Alps. It is well known that the presence of frozen ground with ice, only sligthly below zero, is a vital factor for its stability. Thawing leads to a rapid loss of strenght and geotechnical instability. There is already some evidence from Switzerland that permafrost temperatures are rising. But because that heat diffusion into the ground is slow, the effects of climate change can be delayed and are not easily detected. Long-term monitoring of permafrost temperature is in its infancy in Europe, yet this will provide critical evidence for the impacts of climate change through the next century.

My conclution is that Ny-Ålesund is a perfect place on earth for glacial and periglacial research in a wide range and within an international frame.

Paper presentation at the Ny-Ålesund Seminar, Potsdam, May 1995.

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SESSION II
Ny-Ålesund -
scientific results
Glaciology and geomorphology

Permafrost geophysical studies at Ny-Ålesund

Daniel Vonder Mühll

Geophysical investigations in the permafrost of Brøgger rock glacier near Ny Ålesund.

Daniel Vonder Mühll, VAW-ETH Zürich, CH - 8092 Zürich

A project under the auspices of the University of Oslo (Physical Geography; Prof. Sollid) and the ETH Zürich (Laboratory of Hydraulics, Hydrology and Glaciology, VAW) was initiated in 1992. At three locations of the Brøggerpenninsula (Brøgger/Mørebreen, Stuphallet and Fuglehukken) DC resistivity soundings were performed (Hoelzle 1993). In the following years, the permafrost of the Brøgger and Stuphallet rock glaciers were investigated by refraction seismics (1993, Wagner in press) and by gravimetry (1994, Vonder Mühll in prep.). These studies are done to get comprehensive information about the structure of the creeping permafrost. Within the next year(s) a drilling is planned on Brøgger rock glacier.

DC resistivity soundings showed an increasing specific resistivity with depth. This is typical for permafrost areas. The active layer with 2 to 8 kΩm is about 1 to 2 m thick. This is comparable to what is observed in the mountain permafrost of the Alps. There, the resistivity is slightly higher because the layer is less wet and often without any vegetation. Underneath, the frozen debris is supersaturated with ice. The resistivity range between 20 up to about 1'000 kΩm is therefore orders of magnitude lower than sedimentary ice from temperate firn zones of glaciers. Bedrock with a resistivity of about 1 - 3 kΩm is encountered in a depth of 20 to 70 m.

With the refraction seismic performed on two rock glaciers (Brøgger and Stuphallet) propagation velocities of the p-waves and the depth of the bedrock are determined. The 1 to 2 m thick active layer is quite inhomogeneous and its velocity ranges between 500 and 1'500 m/s. In frozen debris p-wave velocity is typically 3'800 to 4'200 m/s and the thickness varies between 20 and 60 m. Bedrock (sandstone and limestone) shows seismic velocities of 5'200 to 6'100 m/s, depending of the degree of fracturing.

The gravimetrical investigations confirm that the frozen debris of Brøgger rock glacier is ice rich. The gravity field shows reduced values in the area of the rock glacier. The maximum residual Bouguer Anomaly is 1 mgal. This indicates an ice content of up to 80% by volume.

The results from the geophysical investigations on the permafrost of rock glaciers in Svalbard are very similar to what was found in mountain permafrost of the Alps (Vonder Mühll 1993). In order to compare the inner structure of the creeping permafrost bodies a well equipped borehole is intended to be drilled on the Brøgger rock glacier. Such a borehole was realised in 1987 near Piz Corvatsch (Haeberli et al. 1988). Borehole deformation and temperature are continuously observed since then. At a depth of 10 m temperature increased within the last 7 years by more than 1°C (Vonder Mühll et al. 1994). The monitoring of the permafrost temperature is important with respect to climate changes.

Haeberli, W., Huder, J., Keusen, H.-R., Pika, J. and Röthlisberger, H. (1988): Core drilling through rock glacier-permafrost. Vth International Conference on Permafrost, Trondheim, Norway. Proceedings, 2. 937-942.

Hoelzle, M. (1993): DC resistivity soundings 1992 in North-Western Svalbard.Arbeitsheft. Laboratory of Hydraulics, Hydrology andGlaciology ETH-Zurich. 13. 19.

Vonder Mühll, D. (1993): Geophysikalische Untersuchungen im Permafrost des Oberengadins. Mitteilung der VAW-ETH Zürich, 122. 222.

Vonder Mühll, D. (in prep.): Gravimetric investigations in the permafrost of two rock glaciers near Ny Ålesund, Svalbard. Arbeitsheft der VAW ETH Zürich.

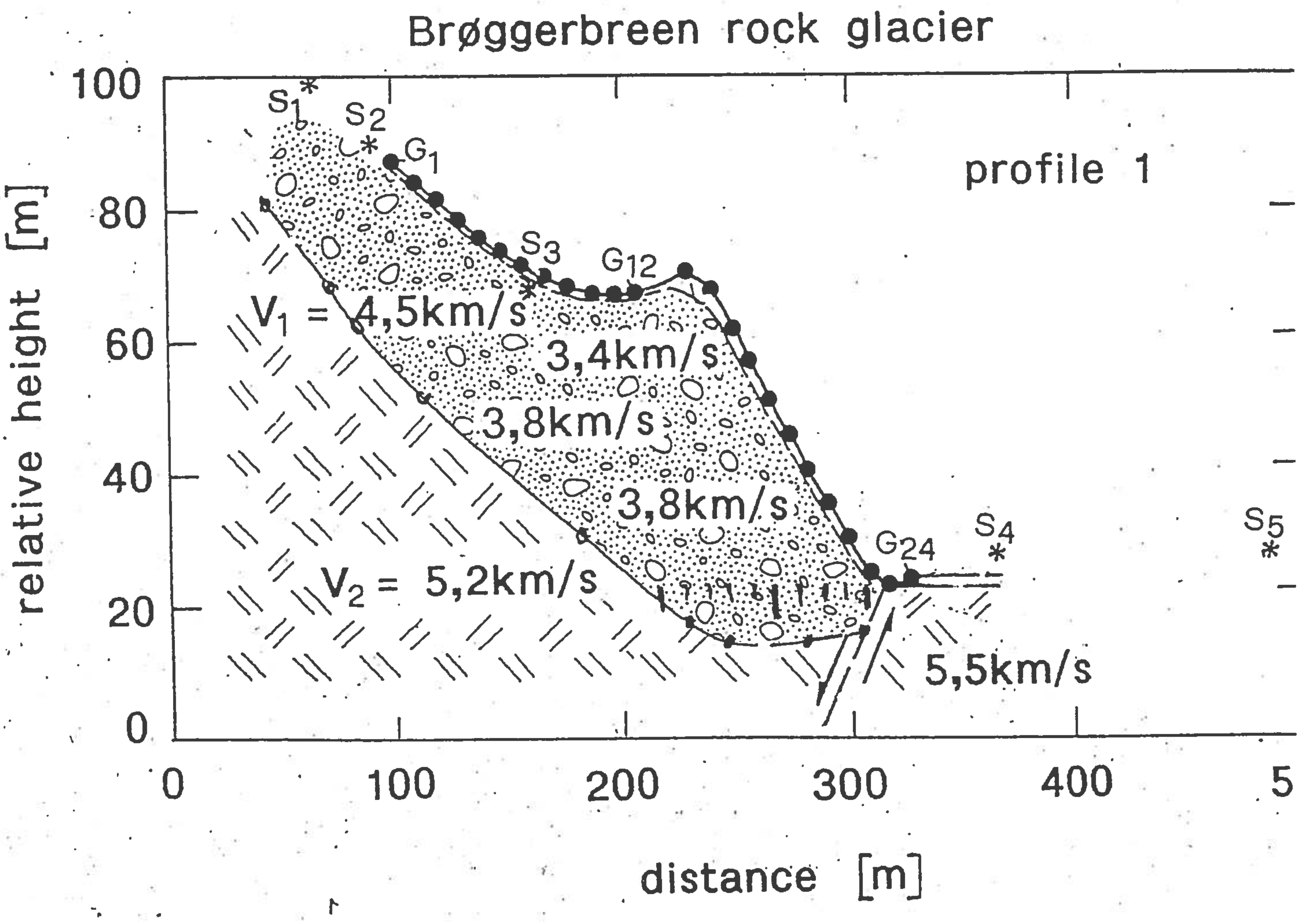
Vonder Mühll, D., Hoelzle, M. und Wagner S. (1994): Permafrost in den Alpen. Die Geowissenschaften, 12 (5-6). 149-153.

Wagner, S. (in press): Seismic refraction sounding 1993 on rock glacier permafrostin North-Western Svalbard. Arbeitsheft der VAW ETH Zürich.

DC resistivity soundings on the rock glacier Brøgger (1992)

- The two sounding curves are typically for permafrost.
- 3 to 4 layers:

Active layer	2 - 8 kΩm	~ 1 - 2 m
Ice rich permafrost	20 - 70 kΩm	20 - 60 m
Bedrock (low ice content)	~ 1 - 3 kΩm	



Brøggerbreen rock glacier
profile 1
relative height [m]
distance [m]
100
80
60
40
20
0
0
100
200
300
400
5
S1
S2
S3
S4
S5
G1
G12
G24
V1 = 4,5km/s
3,4km/s
3,8km/s
3,8km/s
V2 = 5,2km/s
5,5km/s

Geophysical investigations in the permafrost of Brøgger rock glacier near Ny Ålesund.

Gravimetrical measurements on the rock glacier Brøgger (1994)

- 135 Stations on the rock glacier.
- Residual Bouguer Anomaly caused by the ice rich permafrost: ~ 1 mgal.
- Mass deficit approximately 1.5 g/cm^3, corresponding to an ice content of up to 80%.

ETH VAW

Geophysical investigations in the permafrost of Brøgger rock glacier near Ny Ålesund.

Conclusions

- The physical parameters of the rock glacier Brøgger are similar to those investigated in the Alps.
- Underneath a 1 to 2 m thick active layer consisting of coarse blocks, the ice rich permafrost is 20 to 60 m thick.
- The upper decameters of the bedrock are likely to be in the zone with negative Celsius temperatures as well.
- A future borehole on the rock glacier Brøgger should be about 100 m deep. It should be equipped with a slope-indicator tube (horizontal displacement), magnetic rings (vertical displacement) and thermistors (temperature).
- Monitoring the displacement and especially the temperature of the permafrost of rock glacier Brøgger in Svalbard will be important in respect of a climate changes.

SESSION II
Ny-Ålesund -
scientific results
Glaciology and geomorphology

Glacier studies at Ny-Ålesund

Kjetil Melvold

Ny-Ålesund Seminar
Potsdam 4-5 May

Svalbard glaciers in general an overview

About 60 % of Svalbard are covered by glaciers of various types and sizes the total volume of ice is about 11 000 km^3 (Hagen and others, 1993). The equilibrium line attitude, ELA, is only 200 m a.s.l. in the southeast of Spitsbergen, but more than 800 m a.s.l. in the central northern part reflecting a more continental type of climate (Liestøl, 1993).

Gaciological study has been carried out at different glaciers. Mass balance measurements have been carried out mostly on relative small (2-6 km^2) , isolated cirque or valley glaciers close to the coast (fig..). The main parts of these glaciers are below 500 m a.s.l.

Glaciers. Studies in the Ny-Ålesund area

History:

Austre Brøggerbre and Lovènbreen

Mass balance investigation in the Kongsfjorden area was stared by Olav Liestøl at Norsk Polarinstitutt in 1966 on Austre Brøggerbre (6,1 km^2) and one year later on Lovènbreen (5,5 km^2) on the neighbourhood of Ny-Ålesund. These measurements have been carried out by Norsk Polarinstitutt every year since 1966. These two glacier basins are close to research station in Ny-Ålesund. Both accumulation and ablation have been measured by direct glaciological methods: snow sounding profiles, density measurements and stake readings. The main winter accumulation on Austre Brøggerbre during the period 1967-1993 is 0.71 m $\pm$ 0.16 m and on Lovènbreen 0.75 m $\pm$ 0.18 m water equivalents. The annual variations are fairly small (fig.). The mean summer ablation has been -1.15 m $\pm$ 0.31 m on Austre Brøggerbre and -1.09 m $\pm$ 0.29 m water equivalent on Lovènbreen. Ablation measurements show more fluctuations than the winter balance values.
Austre Brøggerbre and Lovènbreen is not in balance with the existing climate since the summer ablation has been greater than the winter accumulation in nearly all years of observations, resulting in steadily decreasing ice masses. The mean annual specific net balance is -0.43 m w. eq. on Austre Brøggerbre and -0.35 m w. eq. on Lovènbreen.

Both Austre Brøggerbre and Lovènbreen are small glaciers at low altitude. Only sporadic measurements have been made on large glacier and ice caps in Svalbard. Therefore, in 1987 mass balance investigations were started on Kongsvegen (105 km^2) these measurements have been carried out every year since.

Kongsvegen

The glacier extent from sea level up to 800 m a.s.l. Kongsvegen is calving in to Kongsfjorden in the inner part of the fjord about 30 km east of Ny-Ålesund. The calving front of Kongsvegen and Kronebreen is among the most active tide-water glaciers in Svalbard. The mean accumulation has been 0,82 m and the mean ablation has been -0,71 m of water equivalents. The summer balances are lower than the values measured at Austre Brøggerbre and Lovènbreen mainly because the main part of Kongsvegen is covering higher altitudes areas. The main net balance of Kongsvegen is

slightly positive, bn = 0,11 m. Thus, the results from eight years of mass balance investigations indicate that the glaciers covering the higher accumulation areas are closer to at steady state than the lower cirque glaciers closer to the coast.
The fluctuation of the calving front of Kongsvegen and Kronebreen has been described by Voigt (1967), Lefauconnier (1987) and Liestøl (1988). These sources show retreats of the glacier interrupt by periods of glacier advances which have been related to surges of either Kongsvegen or Kronebreen or small tributary glaciers. Kronebreen and Kongsbreen surged about 1869 and Kongsvegen just before 1948. During the last 40 year's the glaciers have retreat about 150 m a^{-1} and the glacier front is now ca. 10 km behind the maximum position.

The glaciers in the Kongsfjorden are like most of the glaciers in Svalbard are of a surging type. It is therefore difficult to use the variation in front positions of a single glacier as a climate indicator. Since the motion of most glacier in Svalbard is very low, the front will shrink and retreat in periods between surges. The front position therefore gives little information on whether the ice mass is growing or shrinking. Mass balance measurements and glacier dynamical considerations are therefore necessary to tell the true story about the volume change. Surge is not directly forced by climatic variations, but it plays an important roll because of the large transport masses of ice to lower elevations and thereby cause increased melting and rapid inputs of fresh water into the oceanic system.

Resent research and future plans (Austre Brøggerbre, Lovènbreen and Kongsvegen / Kronebreen)

Masse balance studies
Objective of these studies is to determine the present state of the glacier and their rates of change to climatic changes and to predict future changes.
Methods
Direct measurements of mass balance (snow sounding profiles, density measurements and stake reading). The mass balance should be connected to associated meteorological elements (e.q. precipitation and temperature).
Repeated measurements of surface elevation at fix points and along profiles by kinematic GPS -profiles (Global Positioning System).
Glacier modeling.

Glacier dynamics
The objectives of these studies are to identify and evaluate the state of the glacier and to get a better understanding of physical controls on the dynamics and switching between different flow regimes.

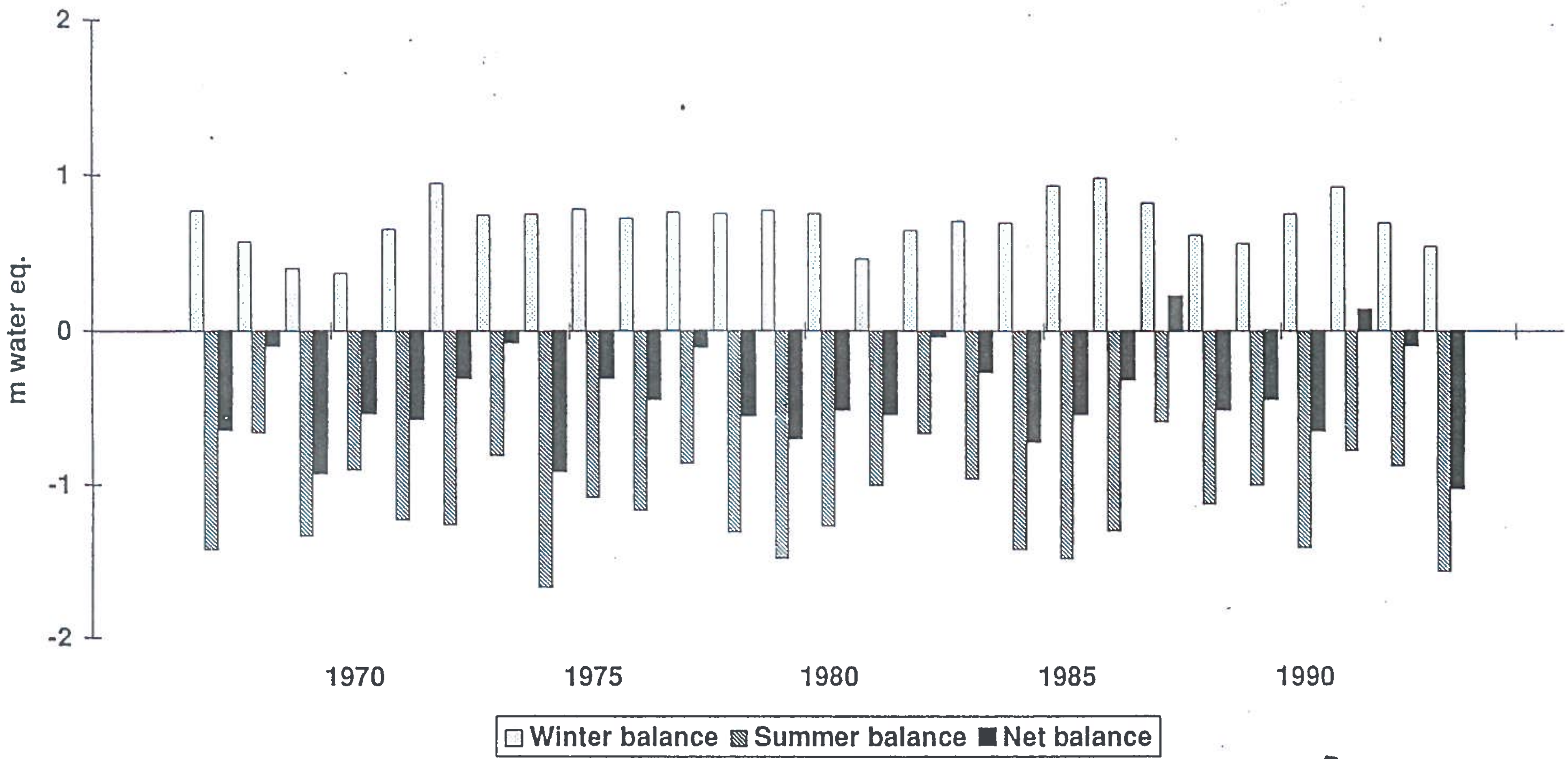
Methods
Surface velocity measurements by teodolite triangulation and terrestrial photogrammetry
Ice thickness and temperature should be measured by radio-echo soundings, and the temperature measurements should be checkout by direct measurements with terminators.

Changes in the geometry of the glaciers.
Photogrammetry can be used to extend volume changes back to 40-50 years in time. With use of the Geographical Information Systems (GIS) we could determine the pattern of changes.

Remote sensing

Use of Synthetic Aperture Radar (ERS-1, EMISAR, RADARSAT) in glaciology: Objectives of these studies are to develop techniques for detection and monitoring of glacier faces, glacier dynamics and glacier accumulation and ablation patterns. The all-weather, day-night imaging capability of radar's offers unique possibilities for shallow glacier measurements on local and regional scales in the Arctic.
Methods ground measurements
- in situ measurements of snow and ice properties.
- ground penetrating radar at 0.5 Ghz.

Brøggerbreen mass balance 1967 - 93



Brøggerbreen $\bar{G}_w = 0{,}71$ m w.eq. $\bar{G}_s = -1.15$ m w.eq $\bar{G}_n = -0{,}43$

Lovénbreen $\bar{G}_w = 0{,}75$ m w.eq. $\bar{G}_s = -1{,}09$ m w.eq $\bar{G}_n = -0{,}35$

SESSION III

Future development and challenges

Ny-Ålesund Seminar
Potsdam 4-5 May

SESSION III
Future development and challenges

National contributions and research topics to the international Arctic Research Centre Ny-Ålesund

Ny-Ålesund Seminar
Potsdam 4-5 May

NATIONAL INSTITUTE of POLAR RESEARCH

FUTURE RESEARCH ACTIVITIES IN NY-ÅLESUND

no permanent staff for the coming 5 years

gradual increase of guest days but no doubling of project groups

<u>contributions to the following research fields:</u>

ATMOSPHERIC SCIENCES — **emphasis to cloud physics**, **long-term observations**

GLACIOLOGY

BIOLOGY

OCEANOLOGY

HYDROLOGY

GEOMORPHOLOGY

ALFRED WEGENER INSTITUTE
FOR POLAR AND MARINE RESEARCH

FUTURE RESEARCH ACTIVITIES
IN NY-ÅLESUND

PERMANENT OPERATION OF THE KOLDEWEY STATION

<u>RESEARCH TOPICS:</u>

ATMOSPHERIC SCIENCES:

*natural variability of the polar atmosphere
*climate impact of arctic aerosols
*stratospheric and tropospheric ozone studies
*studies by station and satellite data
*data interpretation
by using the high resolution limited area model HIRHAM

EXTENSION OF BIOLOGCAL AND GEOPHYSICAL RESEARCH

<u>NETWORK CONTRIBUTIONS:</u> NDSC, BSRN

<u>ADEOS satellite:</u> **ILAS validation and science**
(Improved Limb Atmospheric Sounder)
AWI and National Institute for Environmental Studies / Japan.

<u>INSTRUMENTS AND METHODS</u>

Star photometer
Aerosol sampling system
Extension of Lidar measurements
Emission FT spectrometer
Special balloon soundings
Optical ozone sensors
AWI, ISAS, NIPR and Tohoku University.
Backscatter sondes
Nagoya University and University of Wyoming
Establishment of balloon sounding facilities

GOME: Global Ozone Monitoring Experiment

J. P. Burrows

GOME is the first European UV-visible remote sounding space borne instrument having the global measurement of Ozone (O3) and other trace atmospheric constituents as its primary objective. GOME is an ESA experiment and is a small scale version of SCIAMACHY, which will fly in 1999 on ENVISAT-1.

1. GOME was successfully launched as part of ESA ERS-2 on 20 April 1995.

2. GOME is currently in its commissioning and test phase.

3. GOME measures the back scattered light from the top of the atmosphere between 240 and 790 nm in four spectral channels each having a 1024 diode array detector.

Spectral Resolution	nm
240-400 nm	0.2
400-790	0.4
Spatial Resolution	$40x320\ km^2$ to $40x40\ km^2$

4. Principal Scientific Objectives

Trace gas measurements -
Global Total Columns (TC): O3, NO2, O2, O4, H2O, and BrO;
Perturbed atmosphere TC: ClO and OClO SO2, HCHO

Vertical Profiles of O3;

Aerosol total column and profiles;

Spectral Reflectance and Albedo.

5. Ny-Ålesund has been selected to be one of the most important calibration and validation centres for GOME (University of Bremen, NILU and AWI are all involved).

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U.K. / NERC

FUTURE CHALLENGES AND OPPORTUNITIES

NERC

- NEAR TERM

- ARCTIC TERRESTRIAL ECOLOGY SPECIAL TOPIC 1990 - 1996.

- FUNDING FROM THE EUROPEAN UNION FRAMEWORK PROGRAMME
  ENVIRONMENT AND CLIMATE
  MAST III

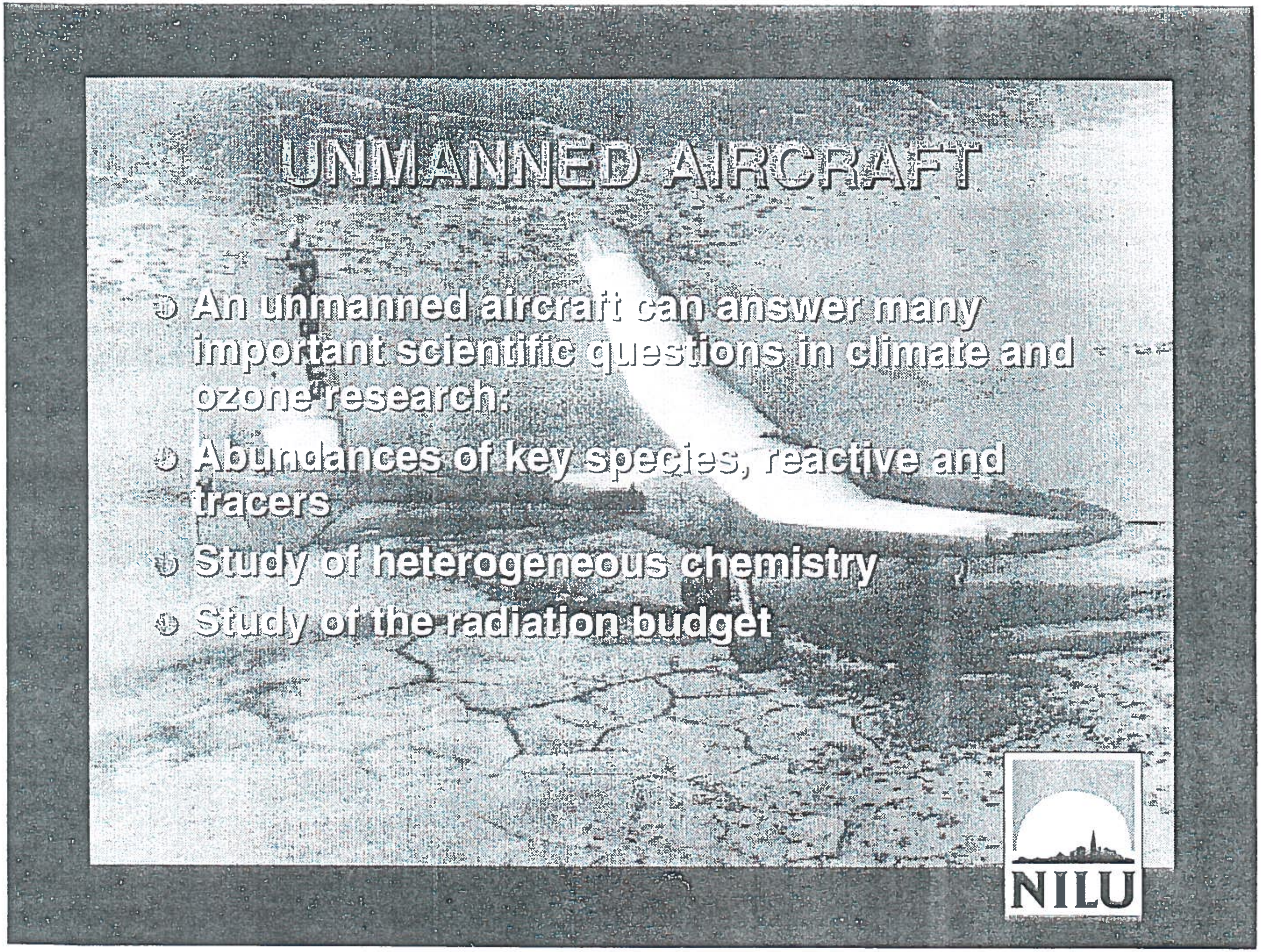
- UK WILL PUBLISH THE POLAR SCIENCES STRATEGY IN 1995: OUTLINES UK STRATEGY FOR ARCTIC AND ANTARCTIC RESEARCH

- FUNDING THROUGH RESPONSIVE MODE TO GROUPS IN UNIVERSITIES

- CONTINUED SUPPORT FOR THE HARLAND HÜSET RESEARCH LABORATORY SIGNED IN 1995

- INTERNATIONAL PROGRAMMES SUCH AS EISCAT

NILU


UNMANNED AIRCRAFT
An unmanned aircraft can answer many important scientific questions in climate and ozone research:
Abundances of key species, reactive and tracers
Study of heterogeneous chemistry
Study of the radiation budget
NILU

NEW DEVELOPMENTS WITHIN ATMOSPHERIC RESEARCH IN NY-ÅLESUND

1. NEED FOR KNOWLEDGE ON THE INVERSION LAYER THICKNESS TETHERED BALLOON, KITE, ETC.

2. WIND MEASUREMENTS ON THE SUMMIT OF THE ZEPPELIN MT. "BINARY" WIND AT THE STATION.

3. REAL TIME DATABASE ON TRAJECTORIES: 6-HOURLY ANALYSES AND FORECASTS NySMAC ↔ ECMWF

4. A SYSTEM FOR CONTINUOUS REAL TIME DETECTION OF THE POWER PLANT PLUME

5. CONTINUOUS MEASUREMENT OF GREENHOUSE GASES.

6. UNMANNED AIRCRAFT FOR TROPOSPHERIC AND STRATOSPHERIC RESEARCH.

HOW TO LIMIT NEGATIVE EFFECTS ?

1. SOME DAYS PER WEEK WITHOUT AIRCRAFT AND SHIP ARRIVALS

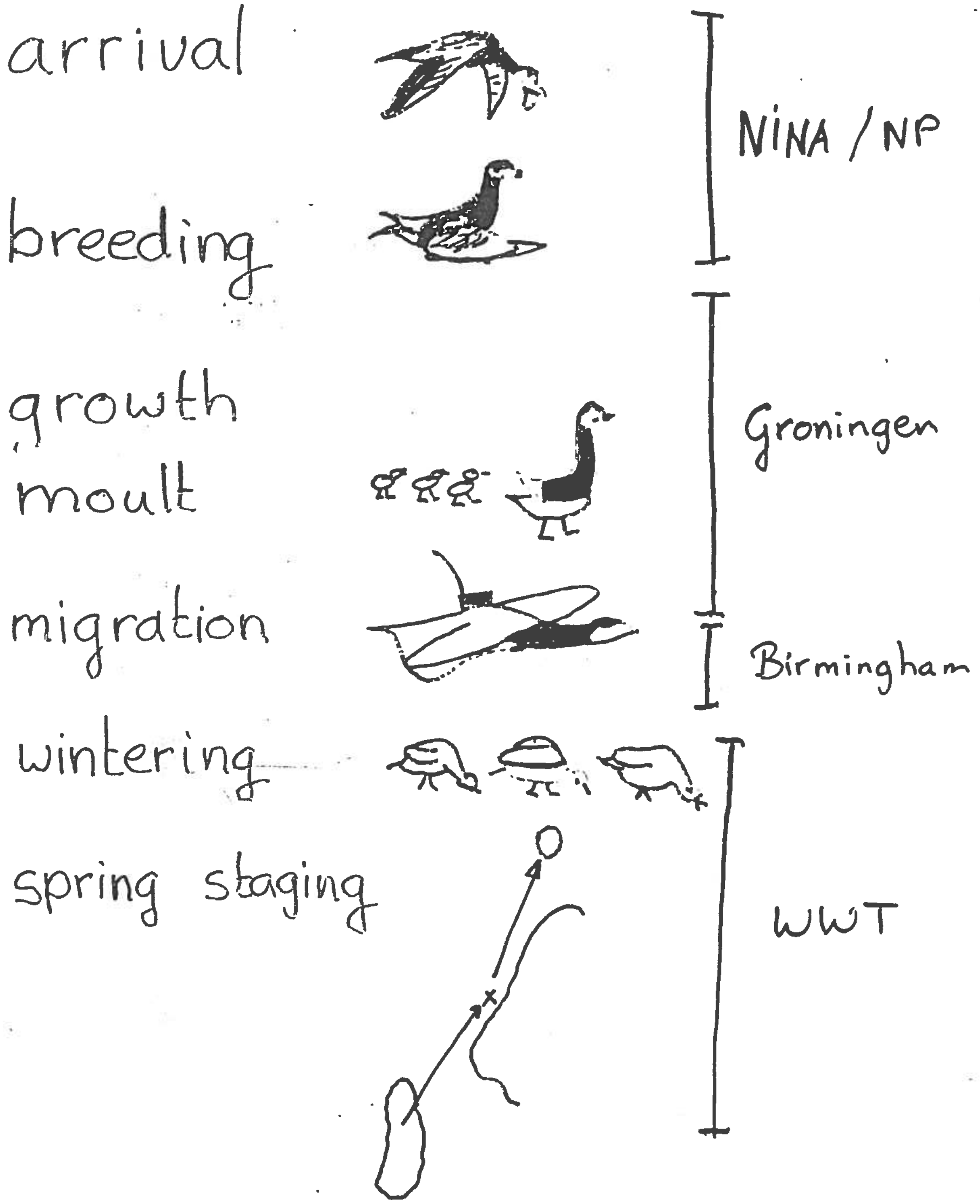
2. SMALL SOURCES CAN BE A SERIOUS PROBLEM, BECAUSE THEIR EFFECT IS NOT OBVIOUS. NEED TO KNOW WHERE VEHICLES GO. ELECTRIC CARS AND SKI-DOOS ?

3. WIND ENERGY WOULD LIMIT THE NEED FOR DIESEL POWERED ENERGY PRODUCTION.

4. DATABASE ON ACTIVITIES, SO THAT AIR MEASUREMENT DATA CAN BE FILTERED

5. ATMOSPHERIC "SANCTUARY" NO SKI-DOOS, NO SMOKING ETC.

6. REDUCE TOURISM TO A VERY MINIMUM.



NINA reprod. strategies
Groningen ecology (everything)
WWT population development / behaviour
Birmingham energetics / techniques
NP energetics / logistic support / mail box
Sysselmannen permission

independent
cooperation
data exchange
prudency
compromise
friendship
stimulation

Ny Ålesund

- prosperity research
- co-existence man-wildlife

stick to the roads
sleep at night (predictability)
do not feed foxes

SESSION III
Future development and challenges

Comments on future plans for development of the Space Geodetic Observatory

Bjørn R. Pettersen

Ny-Ålesund Seminar
Potsdam 4-5 May

Future development of Ny-Ålesund Space Geodetic Observatory

Dr. Bjørn Ragnvald Pettersen

A major technological upgrade of the VLBI data acquisition equipment is planned to start in 1995. It will improve the data storage capacity and increase the data sampling rate to about G bit/sec. Tests and assessment studies will include astronomical VLBI, polar orbit satellite telemetry and PRARE/ERS-2. In collaboration with universities and research organisations we hope to attract doctoral students and scientists to ensure that the full science potentional of the observatory is exploited.

Dr. Bjørn Ragnvald Pettersen
Geodetic Institute
Norwegian Mapping Authority
N-3500 Hønefoss
NORWAY

E-mail: bjornrp@gdiv.statkart.no

DEVELOPMENT OF STRATEGIC ALLIANCES

1. Educational system
   - develop space geodesy program at UNIS, Longyearbyen (M.Sc., Dr.)
   - expand diploma thesis collaboration with NTH, Trondheim (Electronics,..)

2. Research
   - instrument development with NASA, JIVE, EVN
   - orbital analysis with U. of Oslo
   - simultaneous multi-technique analysis with NDRE, Kjeller.
   - VLBI-antenna applications to EISCAT-experiments (assessment)

TECHNOLOGICAL DEVELOPMENT (VLBI)

1. Upgrade of data acquisition equipment
   - increase data storage capacity
   - increase data sampling rate 4-fold to more than 1 Gbit/sec.

2. On-line experimental data transfer to correlator (EU-proposal)

3. Upgrade of instrument laboratories (EU LSF-proposal)

4. Astronomical VLBI
   - method development for source monitoring and educational versatility (UNIS)

5. Polar orbit satellite telemetry
   - S-band tests for NASA
   - assess future activity level

6. PRARE tracking station for ERS-2.
   - install and test equipment
   - assess operational level

SESSION III
Future
development
and challenges

Plans for ornithological research
Rudolf Bannasch

Ny-Ålesund Seminar
Potsdam 4-5 May

Recently, we are planing an Arctic biological research programme starting in summer 1995 at Spitsbergen. As part of the official German Polar Research, this project joins the interest of scientists (ornithologists, botanists, molecular biologists) from three German universities. (TU-Berlin, Humboldt-Universität Berlin, Universität Würzburg)

A first short expedition (supported by DFG) should be conducted in June 1995 to provide a survey of areas and samples appropriate for future studies and to check the working conditions as well as the logistic requirements at the respective sites.

Working programme:

Ornithology:

Field:

Inspection of the bird cliffs;

- identification of sites suitable for high-speed filming of flying birds in special projections (front view, side view) with simultaneous measurements of air velocity and wind direction at the flight level; test-filming using a usual video equipment
- identification of a site suitable for construction of a special swimming tank allowing studies on kinematics and energetics of diving alcids (Uria lomvia and Plautus alle)

Station, laboratory:

- morphometric studies on Uria lomvia and Plautus alle, therefore 10 specimen from each species should be caught and released afterwards)
- anatomical analyses and studies of the fluid-dynamic adaptations in the wind tunnel and water flume (therefore 3 specimen from each species should be collected and transferred to Germany)

Responsibility: Dr. Bannasch, Prof. Rechenberg

Plant physiology:

Field:

- survey and sampling of terrestrial and marine algae in different areas with respect to various microclimates and electrolytic environments (tundra, snow, glacier, bird cliffs); Determination of environmental parameters crucial in view of bio-productivity

Station, laboratory:

- preliminary studies on morphological and functional adaptations in the membrane system of these organisms in view of highly variable temperature, electrolytic and light (UV) regimes
- preparation and conservation of algae for further analyses in Germany

Responsibility: Prof. Fuhr, Prof. Zimmermann

SESSION III
Future development and challenges

A strategic plan for development of Ny-Ålesund into a leading international Arctic environmental research and monitoring station.

Pål Prestrud

FUTURE DEVELOPMENTS

- FACILITY FOR LAUCHING SOUNDING ROCKETS FOR STRATOS- AND IONOSPHERIC RESEARCH
- EXPANDING AND IMPROVING THE BIOLOGICAL LABORATORIES
- A NEW NORWEGIAN RESEARCH STATION. INCREASED NORWEGAIN RESEARCH ACTIVITIES
- SYSTEMATIC MONITORING PROGRAM
- FUNDAMENTAL ECOSYSTEM PROGRAM
- LARGE SCALE FACILITY FOR EUROEPAN RESEARCH. EU PROGRAMS

- Expanding and improving the Atmospheric Station at the Zeppeliner mountain.
- Establishment of Italian and French Stations.
- Improve co-operation among research groups. Use of common facilities and equipment.
- Encourage interdiciplinary research programmes.
- Metadatabase

NORSK POLARINSTITUTT

NORWEGIAN POLAR INSTITUTE

NY-ÅLESUND - THE EUROPEAN ARCTIC ENVIRONMENTAL RESEARCH AND MONITORING STATION

Aim of the Norwegian Government:

Make Ny-Å into a leading international Arctic environmental research and monitoring station

White paper to the parliament 1993: Ny-Å shall be the centre for research in Svalbard. All other activities shall be subject to the needs of research activities

SUB-OBJECTIVES:

1. Norwegian environmental research and monitoring shall be strengthened

2. Improve the coordination and stimulation of international research. NySMAC (Ny-Å Science Managers Committee)

3. The antropogenic impact from Ny-Å on the environment shall be kept at the lowest practical level. "Green" profile.

4. Running and developing the infrastructure in Ny-Å shall support and promote research activities

5. Ny-Å shall be renowned in the national and international research communities through active PR and information sharing

NORSK POLARINSTITUTT
NORWEGIAN POLAR INSTITUTE

EU's 4th framework programme for research and Ny-Å

- ARCFAC - Arctic Large Scale Environmental Research and Monitoring Facilities in Ny-Ålesund, Svalbard. Proposal to the Special Program: Training and Mobility of Researchers
- RADAR - UV-Radiation and its Impact on Arctic Ecosystems
- BIODAF - Biodiversity of Arctic Fjords
- CAM - Contributions of arctic and mid-latitudes aerosols to the hemispheric radiation budget based onm improved observations and modelling
- Application related to the NDSC (Network for Detection of Stratospheric Change)

ESMOS/Arctic: A European Contribution to the main NDSC station ARCTIC

(Project in the ENVIRONMENT programme, 1994-1995)

Coordinator: R. Neuber,
Alfred Wegener Institute, Potsdam

List of participants, location and experiment

at Thule, Greenland:

1) DMI: backscatter sondes and ozone sondes
modelling (PV-fields, trajectories)

2) U. Rome: backscatter LIDAR

at Ny-Ålesund, Spitzbergen:

3) AWI ozone sondes
ozone and aerosol LIDAR
FTIR-spectrometer

4) U. Bremen: Microwave Radiometer for O_3, ClO

5) NILU UV-vis spectrometers:
- SAOZ for column densities O_3, NO_2
- DOAS for OClO and BrO
Modelling

6) NPL FTIR-Intercomparison (in 1995)

a proposal for the Framework IV programme
"Environment and Climate":

ESMOS/Arctic II:
A European Contribution to the Network for Detection of Stratospheric Change, 1996-1998

Coordinator: R. Neuber,
Alfred Wegener Institute, Potsdam

List of participants, location and experiment:

at Thule, Greenland:

1) DMI: backscatter sondes and ozone sondes, ozone lidar, UV/vis spectrometer SAOZ
2) Univ. Rome: aerosol and temperture LIDAR
3) NPL: FTIR intercomparison with NCAR spectrometer

at Ny-Ålesund, Spitzbergen:

4) AWI backscatter sondes and ozone sondes, ozone and aerosol LIDAR, FTIR-spectrometer
5) Univ. Bremen: Microwave Radiometer for O3 and ClO
6) NILU UV-vis spectrometers:
   - SAOZ for O3 column density and NO2
   - DOAS for OClO and BrO

   Modelling

at Andenes, ALOMAR observatory:

7) IAP aerosol and temperature lidar

at Sodankylä observatory

8) FMI UV-vis spectrometer (SAOZ), aerosol sondes and lidar, microwave radiometer for O3, ozone sondes

Main Objectives of ESMOS/Arctic II (1996-1998):

- observe changes in the physical and chemical state of the Arctic stratosphere
- assess latitudinal trends in ozone and tracegasses in the Arctic
- determine the spatio-temporal extend of chemical perturbations in the lower stratosphere
- establish an Arctic network of backscatter sonde and lidar stations (Thule, Ny-Ålesund, Sodankylä, Andenes) for PSC investigations ("Lidar-Match")
- modelling studies of processes which control ozone loss "Chemical Trajectory Model" for case studies

Proposals to Framework IV programme "Environment and Climate":

Contributions of Arctic and Mid-latitude Aerosols to the Hemispheric Radiation Budget based on Improved Observations and Modelling (CAM)

addressing for Arctic latitudes the topics of
- stratosphere/troposphere exchange (in the stratospheric part)
- pollutants removal capacity (in the tropospheric part)

Coordinator: A. Herber
Alfred Wegener Institute

Participants:
AWI-Potsdam, Germany (A. Herber)
University of Athens, Greece (C. Varotsos)
MPI for Meteorology Hamburg, Germany (I. Schult)
Norwegian Polar Institute Oslo, Norway (J.B. Ørbæk)
NILU Kjeller, Norway (J. Pacyna)
University of Wyoming, USA (J. Rosen)

Observation sites:

Navplion, Greece:
ozone sondes, UV radiation (pyranometers), Dobson spectrophotometer No. 118, sun photometer, particle counter

Koldewey-Station, Ny-Ålesund, Spitsbergen:
sun photometer, moon & steller photometer, Lidar and backscatter sondes, aethalometer, particle counter, Dobson spectrometer, pyranometer & pyrgeometer

Modelling:

MIE - optical properties of aerosols
DELED - heating rates, radiative fluxes
HIRHAM (regional) and ECHAM (global) - altitude dependent meteorological variables

Objectives:

- to observe seasonal variations of aerosol concentrations and their optical depth in the Arctic and mid-latitude region

- to estimate the influence of anthropogenic aerosol on the Arctic region

- to calculate the magnitude and the sign of radiative forcing caused by Arctic aerosols and the comparison with the radiative forcing by typical European aerosol at mid-latitudes, regionalization of aerosol forcing

- improvement of the Global Aerosol Data Set (GADS) and application for ECHAM model runs in order to estimate the climate forcing by temporally variable Arctic aerosols

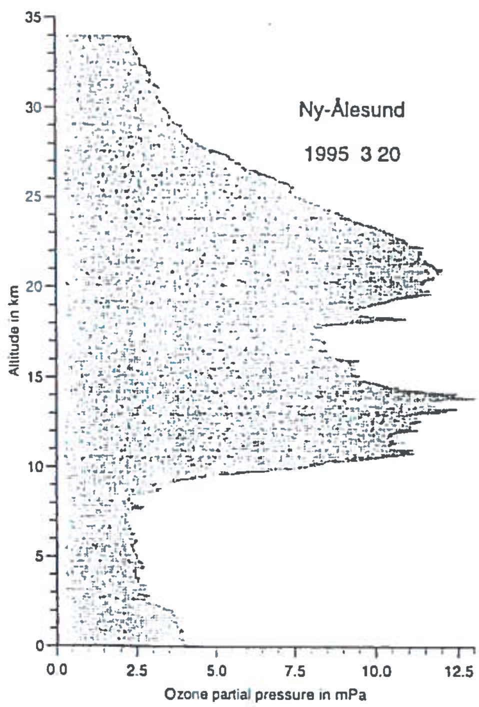
Environment and Climate
1994-1998

Area 1.2.1.1 Stratospheric chemistry and
the depletion of the ozone layer

Proposal

Ozone Soundings as a tool for Detecting Ozone Change

Acronym: OSDOC



Coordinator: Geir O. Braathen, Norwegian Institute for Air Research (NILU)

Contractors: Esko Kyrö, Finnish Meteorological Institute (FMI)
Geraint Vaughan, University of Wales, Aberystwyth (UWA)
Peter von der Gathen, Alfred Wegener Institute (AWI)

Associate contractor: Bjørn Knudsen, Danish Meteorological Institute (DMI)

Proposal to "Environment and Climate":

Observations and Simulations of Cross-Tropopause Fluxes of Air Mass and Ozone: The Arctic Case (CROSSTRAC)

addressing for Arctic latitudes the topics of
- stratosphere/troposphere exchange (in the stratospheric part)
- pollutants removal capacity (in the tropospheric part)

Coordinator: Prof. U. von Zahn, IAP Kühlungsborn, Germany

Participants (alphabethically):
AWI, Germany (R. Neuber, P. von der Gathen)
CNRS, France (A. Hauchecorne)
DMI, Denmark (P. Høeg)
NDRE, Norway (U. Hoppe)
NILU, Norway (G. Hansen)
U. Bonn, Germany (K.H. Fricke)
U. Köln, Germany (A. Ebel, H. Elbern, M. Memmesheimer)

Observation sites: ALOMAR observatory, Andenes, Norway: radar, lidar, balloons
Koldewey-Station, Ny-Ålesund, Spitsbergen: lidar, balloons

Modelling: EURAD for data analysis, process studies
ECMWF and HIRLAM for operational support

Objectives:
- to investigate cross tropopause air mass & tracer fluxes
- to analyse baroclinic waves, tropopause folds, and cut-off lows
- to determine mass balance and the down and upward fluxes of air mass
- to find the predicted correlation between upward motion and tropopause cirrus
- to study the seasonal differences

Recent rojects related to Ny-Ålesund

ESMOS / Arctic
European Stratospheric MOnitoring Stations / Arctic
A European Contribution to the main NDSC station ARCTIC

Coordinator: R. Neuber, AWI-Potsdam
Period: 1994 - 1995

Projekt applications to Framework IV programme "Environment and Climate"

ESMOS / Arctic II
A European Contribution to the Network for Detection of Stratospheric Change
1996-1998
Coordinator: R, Neuber, AWI Potsdam

Contributions od Arctic and Mid-latitude Aerosols to the Hemispheric Radiation Budget based on Improved Observations and Modelling (CAM)
Coordinator: A. Herber, AWI Potsdam

<u>UV Radiation and its Impact on Arctic Ecosystems (RADAR)</u>
Contributions from NPI, NILU, AWI Potsdam
to the workpackage 1 +2: Geophysical Program at Ny-Ålesund

<u>Ozone Soundings as a tool for Detecting Ozone Change (OSDOC)</u>
Coordinator: G. O. Braathen, NILU
Contractors: E. Kyrö, FMI
G. Vaughan, University of Wales, Aberystwyth (UWA)
P. von der Gathen, AWI Potsdam

Associate
contractor: B. Knudsen, DMI

<u>Observations and Simulations of Cross-Tropopause Fluxes of Air Mass and Ozone: The Arctic Case (CROSSTRAC)</u>
Coordinator: U. Von Zahn, IAP Kühlungsborn
Contractors: AWI potsdam (Germany), CNRS (France), DMI (Denmark), NDRE and NILU (Norway), University Bonn and University Köln (Germany)

Influence of the vertical ozone distribution and total ozone content on the qualitative and quantitative changes in the surface UV radiation (IVODOR)
Coordinator: C. Varotsos, University of Athens, Greece
Major
Subcontractor: AWI Potsdam
no more information

Free troposphere-related multiple species measurements by FTIR spectroscopy
Coordinator: R. Zander, Institut D'Astrophysique Liege, Belgique
Participant: AWI Potsdam (R. Notholt)
no more information

SESSION III
Future development and challenges

Final discussion

SESSION III
Final Discussion

- ***Olaf Rønning, University of Trondheim***, mentioned the close link between science carried out at Ny-Ålesund and studies at **UNIS** (The University Studies on Svalbard). The link should be promoted and strengthened - also by the international research community.