

# 50 YEARS OF ACID RAIN RESEARCH AND CONTROL

## 6-7 NOVEMBER SYMPOSIUM

### PROGRAMME

The Royal Swedish Academy of Forestry and Agriculture  
Stockholm

#### SUPPORTING ORGANISATIONS



Norwegian Ministry  
of Climate and Environment



SWEDISH ENVIRONMENTAL  
PROTECTION AGENCY



Norsk institutt for luftforskning  
Norwegian Institute for Air Research



Nordic Council  
of Ministers



Norwegian  
Meteorological  
Institute



## *Welcome*

It is a great pleasure to welcome you to the Acid Rain 50 years Symposium. We are convinced that the symposium will be a manifestation of the scientific findings and the policy development that has occurred since Svante Odén wrote his alarming article that moved the problem from scattered scientific observations to a problem of international political dimensions. We also hope that the programme will give you a possibility to reflect over the large progress that has occurred in terms of international scientific collaboration and joint political efforts. And not the least discuss how our experience can be used to meet future challenges.

Even if we have a long list of speakers and panelists, there are several of you participating in the Symposium that have your own history and your own views of the history and its importance. Don't hesitate to take part in the discussions but keep short. If you want to comment in written form, you are also welcome. Our intention is to document as much as we can of the symposium and make it publically available.

It's a tight schedule for the two days. We hope that everyone is keeping to the time given and questions and comments should be kept short.

The symposium will be streamed and it will also be available to download from the web afterwards. In addition to a symposium report, to be published in the beginning of 2018, we also plan to put together the main presentations in a special issue of a journal. The form and time plan will be further discussed during the symposium.

Finally and not the least we will thank the organisations that have made this Symposium possible. They have all played an important role in the history of Acid Rain; scientifically, politically and not the least as platforms for international collaboration. In particular we want to bring forward our thanks to the Nordic Council of Ministers, which has been involved as a collaboration and financing partner all the way back since 1970.

Once again welcome to the journey that started these days 50 years ago.

Stockholm November 2017

Peringe Grennfelt

Anna Engleryd

Martin Forsius

Øystein Hov

Henning Rodhe

## *Organising committee*

Anna Engleryd - anna.engleryd@naturvardsverket.se

Martin Forsius - martin.forsius@ymparisto.fi

Peringe Grennfelt - peringe.grennfelt@ivl.se

Øystein Hov - Oystein.Hov@met.no

Henning Rodhe - rodhe@misu.su.se

## *Conference administration*

Ann-Sofie G Vetander - ann-sofie.gvetander@ivl.se

Anders Wikman - anders.wikman@ivl.se

# 50 YEARS OF ACID RAIN RESEARCH AND CONTROL

## SYMPOSIUM ON TRANSBOUNDARY AIR POLLUTION DURING 50 YEARS

### PROGRAMME

#### NOVEMBER 6TH

08:45	REGISTRATION OPENS
	HOW DID IT HAPPEN? CHAIR: PERINGE GRENNFELT AND ØYSTEIN HOV
09:30	<b>Welcome:</b> - Swedish Environmental Protection Agency, <b>Björn Risinger</b> - UN ECE, <b>Anna Engleryd</b>
09:45	The early discoveries. The legacy of Svante Odén. <b>Henning Rodhe</b>
10:05	How science formed a breakthrough for international acid rain policies. <b>Lars Walløe</b>
10:25	Science and policy interactions in Europe over 50 years. <b>Peringe Grennfelt</b>
10:45	<i>Coffe/tea break</i>
11:05	The North American perspective – science and policy. <b>Ellis Cowling</b>
11:35	The science, politics and policy of air pollution diplomacy. <b>Karin Bäckstrand</b>
11:55	Discussion. Introduction. <b>Göran Persson</b>
12.30	LUNCH
	SCIENCE FOR POLICY. WHAT HAVE WE LEARNED? CHAIR: HARALD DOVLAND
13:20	The scientific landscape. Threats and opportunities. <b>Øystein Hov</b>
13:40	The policy landscape. Old bodies and new initiatives. <b>Anna Engleryd</b>
14:00	Blame Matrix and Gap Closure: Useful concepts. <b>Anton Eliassen</b>
14:20	Science-based prescriptive policies. Integrated assessment modelling. <b>Markus Amann</b>
14:40	<i>Coffe/tea break</i>

# 50 YEARS OF ACID RAIN RESEARCH AND CONTROL

## SYMPOSIUM ON TRANSBOUNDARY AIR POLLUTION DURING 50 YEARS

*(Programme continued from 6th November afternoon)*

- 15:00      The importance of science for policy development. Air pollution in an international and historical context.
- Introduction: Swedish Minister of Environment **Karolina Skog**
- Panel discussion between some representatives from key organisations acting in the field:
- Swedish Ministry of Environment, **Karolina Skog**
  - IIASA, **Markus Amann**
  - CLRTAP, **Anna Engleryd**,
  - European Commission, **Carsten Larsen**
  - Norwegian Ministry of Environment, **Jan Thompson**
  - AirClim, **Christer Ågren**
- 16:15      *Short break*
- 16:25      Acid rain – Controversies and breakthroughs. During the 80s there were intense discussions on the role of science as a basis for control measures. How important were these discussions for the international political acceptance of the problem and what can we learn?
- Panel discussion: introduction by **Harald Dovland**
- **David Fowler**
  - **Bedrich Moldan**
  - **Jan Nilsson**
  - **Arne Tollan**
- 17:15      END
- 18:30      DINNER AT THE ROYAL SWEDISH ACADEMY OF ENGINEERING SCIENCES (IVA),  
GREV TUREGATAN 16, STOCKHOLM

# 50 YEARS OF ACID RAIN RESEARCH AND CONTROL

## SYMPOSIUM ON TRANSBOUNDARY AIR POLLUTION DURING 50 YEARS

### NOVEMBER 7TH

EXPERIENCE AND FUTURE CHALLENGES. CHAIR: ALEC ESTLANDER.

- 09:00 Opening. **Alec Estlander**
- 09:05 Dead fish in lakes and streams. **Brit Lisa Skjelkvåle**
- 09:25 Forest die back – Scientific findings, public debate and policy response. **Karl Josef Meiwes**
- 09:45 The recovery in Eastern Europe. **Jakub Hruska**
- 09:55 Coordinated monitoring brings countries together. **Kjetil Tørseth**
- 10:15 Critical Loads - Link between Science and Policy. **Max Posch**
- 10:35 *Coffe/tea break*
- 10:55 From the urban to the global scale. **Laurence Rouil**
- 11:15 Ecosystems - evidence of recovery but still under threat. **Isaura Rabago**
- 11:35 Acid rain in an East Asian perspective. **Xiaobin Xu**
- 11:55 Discussion
- 12.25 LUNCH

LESSONS LEARNED AND THE WIDER PERSPECTIVE.  
CHAIR: ANNA ENGLERYD

- 13.15 Health effects from acid rain and air pollution. **Elisabeth Lindgren**
- 13.35 Air pollution, climate change and food. **David Fowler**
- 13.55 Sulphate, soot and climate. **Annica Ekman**
- 14.15 Ecosystem effects of N and S deposition in the future: **Filip Moldan** and **Julian Aherne**
- 14.45 *Coffe/tea break*
- 15.10 Lessons learned and ways forward. Introduction: **Øystein Hov**
- 15.25 Panel discussion: Chair **Stefan Nyström**  
- **Julian Aherne**  
- **Xiaobin Xu**  
- **Laurence Rouil**  
- **Annica Ekman**  
- **Åke Iverfeldt**
- 16.15 Summing up. Conclusions. **John Munthe**
- 16:30 END OF THE SYMPOSIUM

## 50 YEARS OF ACID RAIN RESEARCH AND CONTROL

### SYMPOSIUM ON TRANSBOUNDARY AIR POLLUTION DURING 50 YEARS

#### SHORT PRESENTATIONS OF SPEAKERS, CHAIRS AND PANELISTS

**Julian Aherne**, Associate Professor, School of environmental, Trent University, Canada. Julian is an ecosystem modeler with a focus on understanding the impacts of air pollutants on the environment. He is particularly focused on modelling of biogeochemistry in forest ecosystems.

**Markus Amann** is Program Director for 'Mitigation of Air Pollution and Greenhouse Gases' at the International Institute for Applied Systems Analysis (IIASA), Laxenburg, Austria. He is coordinating the policy analyses on cost-effective emission control strategies for the clean air and climate policy proposals of the European Commission and the Convention on Long-range Transboundary Air Pollution. He has been leading the development and application of the RAINS and GAINS models in connection with the development CLRTAP protocols and EU strategies.

**Karin Bäckstrand** is a Professor in Environmental Social Science at the Department of Political Science at Stockholm University with a PhD in political science from Lund University. Her research revolves around global environmental politics, the role of science in international air pollution diplomacy, and the politics and policy of climate change. She has held positions as a Wallenberg Fellow for Environment and Sustainability at the Massachusetts Institute of Technology and as a visiting professor at Department of International Relations at the University of Oxford. Her latest books are *The Research Handbook on Climate Governance* (with Eva Lövbrand, Edward Elgar, 2015) and *Rethinking the Green State: Environmental Governance towards Climate and Sustainability Transition* (with Annica Kronsell, Routledge, 2015).

**Ellis Cowling** is a forest biologist at North Carolina State University who became a world leader in environmental research. He completed PhD degrees in Plant Pathology and Biochemistry at the University of Wisconsin in 1959 and in Physiological Botany at the University of Uppsala in Sweden in 1970. He was elected to membership in the US National Academy of Sciences in 1973. During a sabbatical year in Sweden in 1970-71 he shifted his personal research to "acid rain" and other impacts of airborne chemicals on terrestrial and aquatic ecosystems. In 1975-83 he provided leadership for development of the National Atmospheric Deposition Program (NADP) and in 1978-79 he was one of four scientists who provided an initial outline for the National Acid Precipitation Assessment Program (NAPAP).

**Harald Dovland** worked for more than twenty years at the Norwegian Institute for Air Research (NILU), mainly on issues related to long-range transport of air pollutants and was its managing director from 1988 to 1995. He then moved to the Norwegian Ministry for the Environment where he worked mainly on climate change issues. He was Head of the Norwegian delegation to the negotiations under the UNFCCC until 2007. He has been actively working under the CLRTAP. From 2000 to 2005, he served as chairman of the Executive Body of the CLRTAP. After retirement in 2011 he has been working with issues related to climate change.

**Annica Ekman** is a professor in meteorology at Stockholm University and the Bolin Centre for Climate Research. Her research focuses on aerosol particles in the atmosphere and how they affect radiation, clouds, precipitation and climate. To study these processes, she develops numerical models on scales ranging from local to global.

## 50 YEARS OF ACID RAIN RESEARCH AND CONTROL

### SYMPOSIUM ON TRANSBOUNDARY AIR POLLUTION DURING 50 YEARS

**Anton Eliassen** has been involved in transboundary air pollution issues since the early 1970s, in particular with respect to the development and application of atmospheric dispersion models for various air pollutants. These models have been central for the CLRTAPs policy work, in particular for so called source – receptor matrices. He retired as director of the Norwegian Meteorological Institute in 2016.

**Anna Engleryd** works at the Swedish Environmental Protection Agency and is since many years involved in international negotiations on air pollution. Since December 2014 she is Chair of the Executive Body to the Convention on Long Range Transboundary Air Pollution.

**Alec Estlander** started his air career at Finnish Meteorological Institute, where he built up the EMEP network in Finland. He was involved in the preparations for the CLRTAP in the Nordic context and in Geneva. He was vice chairman of EMEP for some time. He joined the Ministry of the Environment in 1983 in charge of air pollution matters. Six years later he started working as a consultant and in 1999 he joined the Finnish Environment Institute heading the department for environmental loading. All his active years he was heavily involved in Nordic cooperation. He was awarded the honorary title Environmental Councillor after his retirement.

**David Fowler**, Trained in Environmental Physics and Nottingham University, and completed a PhD at AERE Harwell on the Dry Deposition of sulphur dioxide to terrestrial surfaces. Joining the Centre for Ecology and Hydrology (CEH) in Edinburgh in 1975 and working on the land-atmosphere exchange of pollutants gases and aerosols and their effects on ecosystems over the subsequent 42 years. In addition to publications in his specialist field he focussed on the policy applications of the research with UK and International Agencies. Elected to the Royal Society of Edinburgh in 1999 and the Royal Society of London in 2002.

**Peringe Grennfelt**, IVL Swedish Environmental Research Institute since 1969. His main scientific areas have been air pollution and interactions between air pollution and policy. He has been working with international air pollution issues his entire career and been involved in UNECE work as a national expert since 1985 and served as chair for the Working Group on Effects between 2011 and 2016.

**Øystein Hov** is currently Secretary General at The Norwegian Academy of Science and Letters. He is also a part time adviser to the Director of the Norwegian Meteorological Institute, and is the president of the Commission for Atmospheric Sciences in WMO. He is a meteorologist and atmospheric chemist.

**Jakub Hruška** (1964) graduated in chemistry from Charles University, Prague, in 1988. Since the beginning of his career at the Czech Geological Survey, he has taken interest in acid rain effects on soil, water and forests in the so called „Black Triangle“ region of Central Europe. He has been working mostly on acidification recovery, its biogeochemical modelling, and DOC/acidity relationship. He spent his post-doc at SLU in Umea (1997-1998) and has been a Professor of Environmental Sciences at Charles University since 2015. He also organized ACID RAIN conference 2005 in Prague.

**Åke Iverfeldt**, CEO of Mistra since 2013. Previously Vice Executive Director of IVL and before that an atmospheric chemist working internationally with long-range transport of mercury.

## 50 YEARS OF ACID RAIN RESEARCH AND CONTROL

### SYMPOSIUM ON TRANSBOUNDARY AIR POLLUTION DURING 50 YEARS

**Karl Josef Meiwes** is a soil scientist. He has worked at University of Göttingen (together with Prof. B. Ulrich), at the Forest Research Station of Lower Saxony, Göttingen, and then as Senior Soil Scientist at the North West German Forest Research Station, Göttingen. Scientific background: Soil chemistry, forest nutrition, biogeochemistry of forest ecosystems, intensive monitoring of forest ecosystems (level II), forest management and nutrient cycling, fertilization.

**Bedřich Moldan** Professor in environmental science at the Charles University in Prague where he teaches, He is also a founder the Environment Center and was its Director from 1991 to 2014. Between 2004 and 2010 he served as the Senator of the Parliament of the Czech Republic. His experience includes research on indicators of sustainable development and various aspects of science-policy interface. In 2010 he received the SCOPE-Zhongyu Environmental Award for lifetime achievement. He was for many years deeply involved in the acid rain problem and was the key organiser of the Acid Rain Conference in Prague 2005.

**Filip Moldan**, Ph D, is scientist at IVL Swedish Environmental Research Institute who works with effects of air pollution, land use and climate change on soils, waters and forests. He works with large scale ecosystem experiments, with dynamic models and with monitoring. Filip is also involved in Swedish reporting to ICP Modelling and Mapping and to ICP Integrated Monitoring and is chair of Joint Expert Group on Dynamic Modeling under the CLRTAP.

**John Munthe**, Vice President, Research at IVL, has more than 25 years' experience of research and consulting on environmental pollution including mercury, organic contaminants and air pollutants. He is currently program manager for the SCAC program, funded by the Swedish Environmental Protection Agency and focused on providing scientific support for policy development in air pollution and climate.

**Jan Nilsson**, Retired since 14 years. He was research director at the Swedish EPA for 15 years and programmes director at Mistra (the Foundation for Strategic Environmental Research) for 10 years. Initiated the concept "critical load".

**Stefan Nyström**, economist, Director of the Climate department at the Swedish Environmental Protection Agency since 2016. He has before that been Secretary General of the Swedish Anglers Association (2001-2014) and head of the All Party Committee on Environmental Objectives (2014-2016)

**Göran A Persson**. Managing director at Mistra Foundation 1994-1999 and deputy minister of Environment and Natural Resources 1991-93. He worked with the Swedish Environmental Protection Agency between 1967 and 1991, for many years in leading positions and as deputy director general between 1988 and 1991. He was deeply involved in the early development of international research and collaboration on acid rain and initiated several international initiatives i.a. the OECD project on Long Range Transport of Transboundary Pollutants. He is chairing the Energy and Environment Committee at the Royal Academy of Engineering Sciences.

**Maximilian Posch** holds a Ph.D. in physics and a master's degree in mathematics from the Technical University of Vienna. He worked at IIASA in Laxenburg (Austria) between 1981 and 89 on the integrated assessment of acidification in Europe (the RAINS model). 1990–1994 he worked at the Finnish Water and Environment Research Institute on the environmental impacts of acid deposition and agricultural practices. Since



## 50 YEARS OF ACID RAIN RESEARCH AND CONTROL

### SYMPOSIUM ON TRANSBOUNDARY AIR POLLUTION DURING 50 YEARS

1995 he is senior researcher at the Coordination Centre for Effects (CCE) at the Dutch National Institute for Public Health and the Environment (RIVM).

**Isaura Rabago** is a senior researcher at CIEMAT (Research Centre on Energy, Environment and Technology) working at the Unit of Modelling and Ecotoxicology of Air Pollution. Currently she chairs the Working Group on Effects of the UNECE-LRTAP Convention since 2016.

**Björn Risinger** is since 2015 Director General For the Swedish Environmental Protection Agency. He was before that Director General for the Swedish Agency for Marine and Water Management and the National Board of Fisheries. He has also been holding leading positions in the county administrations.

**Henning Rodhe**, Royal Swedish Academy of Sciences; Henning Rodhe is a professor emeritus (Chemical Meteorology) at the Department of Meteorology and the Bolin Center for Climate Research at Stockholm University, Sweden. His main research focus has been atmospheric aerosol particles and their impact on ecosystems and climate.

**Laurence Rouil** is the head of the “Environmental modelling and decision making” department at INERIS. She received her Ph.D in 1995 in the field of applied mathematics. Her main area of experience is air quality modelling. For more than 15 years she has developed skills and competence being the leader of research activities closely linked to operational applications within air pollution modelling and forecasts. Since September 2014, she chairs the EMEP Steering Body of the UNECE Convention on Long Range Transboundary Air pollution.

**Brit Lisa Skjelkvåle** has a PhD in geology (geochemistry). Her research is focused on the effects of LRTAP on freshwater systems. She was responsible for the monitoring of freshwater in the Norwegian national monitoring program and also led the program center of ICP Waters from 1996-2013. She has worked 25 years as a researcher at the Norwegian Institute for Water research, and the last four years as Head of Department at the Dept of Geoscience at the University of Oslo.

**Karolina Skog** is Minister of Environment and Energy in the Swedish Government since 2016. Before that she was municipal commissioner in the city of Malmö with responsibility for urban development.

**Arne Tollan**. MSc in geosciences 1961 from Oslo University. Ass. director of the SNSF research programme on acid rain 1976-80. Ass. director of Norwegian Water Research Institute, NIVA. Head of Air pollution div., UNECE, Geneva, 1983-85. Director of Hydrology Dept. NVE 1986-1998. Secondment at European Environment Agency, EEA, Brussels 1992-93. Participation in numerous projects within water resources development in Asia and Africa. Retired from NVE 2008.

**Jan T. Thompson** is an economist by training, has a professional background mainly from the Ministry for the Environment, where he served as Director General for the Department of International and Polar Affairs from 1985 until 1996. His area of responsibility included i.a. cooperation on transboundary air pollution. He was for 11 years Chairman of the Executive Body for the CLRTAP and took actively part in the negotiations on the Convention on Climate Change. He was among the founders of Nordic Environment Finance Corporation, NEFCO, where he is a member of the Board of Directors. He is at present a Senior Advisor in

## 50 YEARS OF ACID RAIN RESEARCH AND CONTROL

### SYMPOSIUM ON TRANSBOUNDARY AIR POLLUTION DURING 50 YEARS

the Norwegian Ministry of Climate and Environment, focusing on environmental financing.

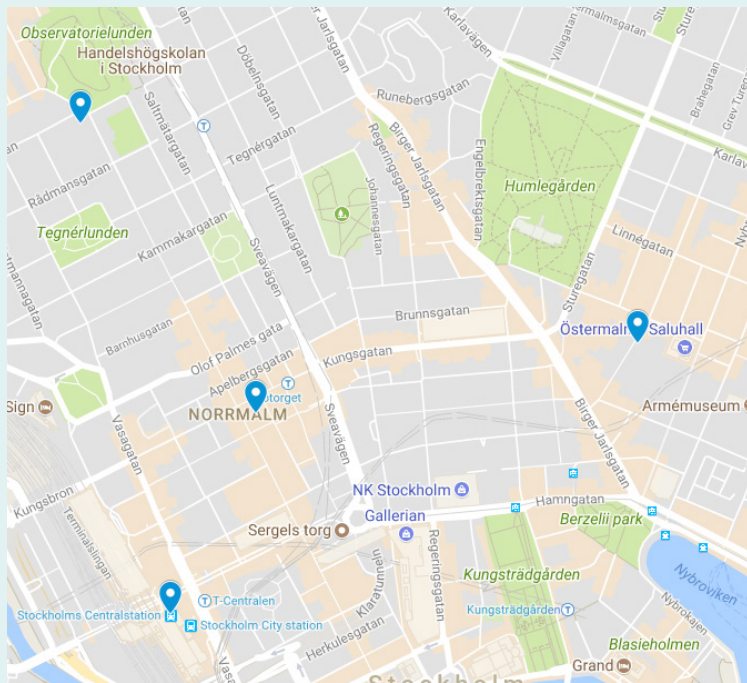
**Kjetil Tørseth** is director of Atmospheric and Climate research at NILU. His PhD addressed deposition fluxes of sulphur and nitrogen components, and he has been central in the mapping of critical load exceedances in Norway. He has been engaged in the Norwegian monitoring of long-range transported air pollutants since 1992, and has since 2000 served as head of the EMEP Chemical Coordinating Centre. He is also engaged in WMO Global Atmosphere Watch, and has participated in many international research projects.

**Lars Walløe**, Professor of Physiology (Faculty of Medicine, University of Oslo) 1988-2008, now Professor emeritus. Previously Professor of Informatics (Faculty of Science, University of Oslo) 1978-1988. Director of the Norwegian research on Acid Rain (SNSF) 1976-80. Member of the Management group of the UK-Scandinavian Surface Waters Acidification Programme (SWAP) 1984-90. President and Vice-President of the Norwegian Academy of Science and Letters alternate years 1997-2004. President of Academia Europaea 2008-2014. Chairman of many different Norwegian and European research bodies. Currently Chair of the Environment steering panel of EASAC (European Academies Science Advisory Council).

**Xiaobin Xu**, PhD Laboratory for Atmospheric Chemistry, Centre for Atmosphere Watch and Services, Chinese Academy of Meteorological Sciences, China Meteorological Administration Beijing China.

**Christer Ågren**. Representing the Air Pollution and Climate Secretariat (AirClim), Christer Ågren has more than 35 years of experience of working with air pollution, including being an NGO-observer to the Air Convention (CLRTAP), the International Maritime Organisation, and to the air quality policy processes of the European Union. Additional work experience includes being Head of Section at the Swedish Ministry of Environment and designated expert to the Environment Directorate of the European Commission, with the main tasks to develop an EU Strategy to Combat Acidification. More information: [www.airclim.org](http://www.airclim.org).

## MAP OF STOCKHOLM



[Click here for specifik Google map to this symposium](#)

KSLA/Royal Swedish Academy of Forestry and Agriculture: Drottninggatan 95B, 113 86 Stockholm

IVA/Royal Swedish Academy of Engineering Sciences: Grev Turegatan 16, 114 46 Stockholm

Haymarket by Scandic: Hötorget 13-15, 111 57 Stockholm

Stockholm Railway Station: Centralplan 15, 111 20 Stockholm, Sverige

### *Organising committee*

Anna Engleryd - [anna.engleryd@naturvardsverket.se](mailto:anna.engleryd@naturvardsverket.se)

Martin Forsius - [martin.forsius@ymparisto.fi](mailto:martin.forsius@ymparisto.fi)

Peringe Grennfelt - [peringe.grennfelt@ivl.se](mailto:peringe.grennfelt@ivl.se)

Øystein Hov - [Oystein.Hov@met.no](mailto:Oystein.Hov@met.no)

Henning Rodhe - [rodhe@misu.su.se](mailto:rodhe@misu.su.se)

### *Conference administration*

Ann-Sofie G Vetander - [ann-sofie.gvetander@ivl.se](mailto:ann-sofie.gvetander@ivl.se)

Anders Wikman - [anders.wikman@ivl.se](mailto:anders.wikman@ivl.se)

## SUPPORTING ORGANISATIONS



Norwegian Ministry  
of Climate and Environment



SWEDISH ENVIRONMENTAL  
PROTECTION AGENCY



Norsk institutt for luftforskning  
Norwegian Institute for Air Research



Nordic Council  
of Ministers



Norwegian  
Meteorological  
Institute



THE NORWEGIAN ACADEMY  
OF SCIENCE AND LETTERS  
Det Norske Videnskaps-Akademi