VETENSKAPSRÅDET
THE SWEDISH RESEARCH COUNCIL

| Kansliets noteringar<br>Kod | Dnr |
|---|---|
| 2006-16873-36510-47 | |

2006

# *Linnéstöd och Berzelius Center

Area of science
Vetenskapsrådet

Announced grants
Linnaeus Grant

Funds applied for (kSEK)

| 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|
| 5000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 5000 |

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## ORGANISATION


**Organisation**
Stockholms universitet


## DESCRIPTIVE DATA

**Project title, English (max 200 char)**
Climate evolution, variability and sensitivity

**Project description (max 1500 char)**
The overarching aim of this proposal, comprising 26 scientists at four departments, is to further develop climate research at Stockholm University (SU), into a coherent cutting-edge environment consistently operating at the forefront of science. The research will be organized in five cross-disciplinary core themes, each of which brings together scientists from different departments, working on different scales and with complementary methods: 1/ Climate variability; 2/ Atmospheric and oceanic circulation; 3/ Boundary conditions for circulation system modelling; 4/ Small-scale processes with large-scale impacts; 5/ Biogeochemical cycles. The issues we address are of critical importance for an improved assessment of natural climate variability, anthropogenically-induced climate change and simulating future climate. To meet the core theme objectives we will conduct climate modelling experiments firmly rooted in a comprehensive understanding of the underlying processes, natural climatic evolution, and magnitudes of short-term climate variability. We will add critical expertise in key fields of modeling and focus on improved integration and exchange of data and ideas among research groups, improved formulation of scale transformation and upscaling strategies, and identification of critical information gaps that will be filled through field campaigns.

**Abstract language**
English

**Research areas**
*Naturvetenskap

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**Review panel**
VR-N

**Classification codes (SCB) in order of priority**
153304, 153203, 153301

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Kod
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**Date of doctoral exam**
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## CO-OPERATING HEI

**Samverkande universitet**

## ENCLOSED APPENDICES

A, B, C, U, V, S

## BUDGET

**Funding period (planed start and end date)**
2006-07-01 -- 2016-06-30

| **Total funds applied for (kSEK)** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Linnéstöd | 5000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 5000 |
| **Total (kSEK):** | 5000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 5000 |

## POPULAR SCIENCE DESCRIPTION

**Popularscience heading and description (max 4500 char)**
Klimatutveckling, klimatvariationer, och klimatets känslighet.

Forskningsprogrammet syftar till att vidareutveckla klimatforskningen vid Stockholms universitet (SU) till en sammanhållen forskningsmiljö som uthålligt verkar i den absoluta forskningsfronten på klimatområdet. Vid universitetet bedrivs idag klimatforskning på hög internationell nivå vid flera naturvetenskapliga institutioner. Det finns därför mycket goda förutsättningar för att genom extra stöd från VR skapa en verkligt bred och framgångsrik forsknings- och utbildningsmiljö inom klimatområdet. Klimatet är idag

ett högaktuellt, viktigt och spännande forskningsområde. Det som framförallt bidrar till detta är att vi människor genom våra utsläpp av växthusgaser och partiklar tycks påverka jordens klimat. Denna oavsiktliga klimatpåverkan kommer att bli alltmer märkbar och kan få allvarliga konsekvenser under de kommande årtiondena. Det är dock mycket svårt att med säkerhet säga hur stora förändringarna kan bli, vilka konsekvenser som kan befaras och vilka åtgärder som skulle kunna vidtas för att lindra effekterna. För att bättre kunna bedöma dessa fundamentala frågor måste vi skaffa oss bättre kunskap om det globala klimatsystemet. En nyckel till sådan kunskap är att studera hur klimatet har varierat under gångna tider, såväl under de senaste århundradena som under de stora istidssvängningarna den senaste årmiljonen. Forskningen inom programmet organiseras i fem tvärvetenskapliga huvudteman, som vart och ett för samman expertis från olika forskargrupper och institutioner. De forskare som arbetar inom varje tema spänner kompetensmässigt över ett brett register av processer och tidsskalor, och arbetar med komplementära metoder. Programmet initialt kommer att fokusera på: 1/ Klimatets variationer; 2/ Atmosfärs- och oceancirkulation; 3/ Randvillkor för modellering av atmosfärs- och oceancirkulation; 4/ Småskaliga processer med storskaliga klimateffekter; 5/ Biogeokemiska cykler (kolets och vattnets kretslopp)

Dessa fem teman är centrala för klimatmodellering och simulering och avser att kraftfullt bidra till svar på inom klimatforskningen centrala frågor som:

– Hur har klimatet utvecklats och varierat i olika tidsperspektiv? – Vilka mekanismer i klimatsystemet har bidragit till de stora svängningarna i temperaturen mellan istiderna och mellanliggande varmare perioder? – Hur har strömningen i hav och atmosfär, och därmed klimatet, påverkats av landisarnas utbredning och havsbottens topografi? – Är de senaste årtiondenas globala uppvärmning unik i jämförelse med naturliga variationer under det senaste årtusendet? – Varför tycks uppvärmningen vara dubbelt så stor i Arktis som på jorden i dess helhet? – Vilken roll spelar molnen, genom sin reflektion av solstrålning och genom sin växthuseffekt, för det globala klimatet? – Hur påverkas molnen av våra utsläpp av stoftpartiklar?

Dessa och liknande frågor kommer att angripas i ett aktivt och nyskapande samarbete mellan forskare från olika discipliner: naturgeografer, meteorologer, geologer, oceanografer och miljöforskare. Forskningsprogrammet kommer att verkningsfullt överbrygga tidigare forskningsområdesgränser mellan modellerare, processforskare och paleoklimatforskare (som utnyttjar iskärnor, havs- och sjösediment, trädringar, landformer, m.m.). De i forskningsmiljön ingående forskargrupperna arbetar alla i stark internationell samverkan. Klimatforskarna vid SU har ledande roller både inom internationella storprojekt, t.ex. borrningar i inlandsisar och oceanbottnar, och inom svenska satsningar, t.ex. polarforskning. De frågeställningar vi fokuserar på är av central betydelse för kunskapen om naturliga klimatvariationer, liksom om människans påverkan på klimatet. Vi kommer att nyrekrytera seniora forskare med nyckelkompetenser på modelleringsområdet, och i bred samverkan mellan modellerare och empiriker söka svar på grundfrågor kring klimatets utveckling, variationer, och känslighet.

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**Title of research programme**
Climate evolution, variability and sensitivity

# Appendix A

## Research programme


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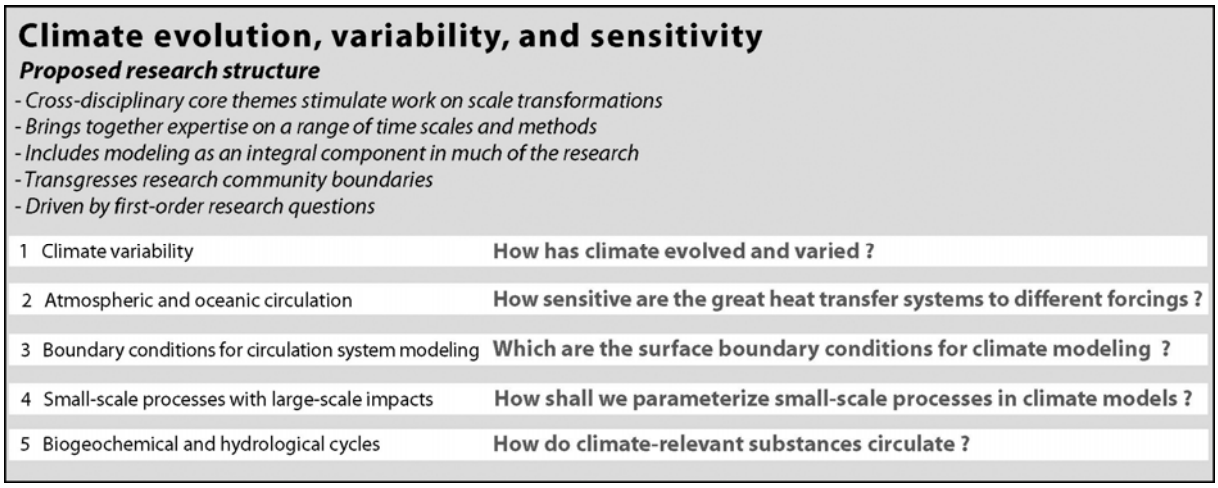
# Climate evolution, variability and sensitivity

Linné-proposal to VR/ Formas 2006





Stockholm University

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Michael Tjernström

Örjan Gustafsson
Anders Moberg
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Karin Holmgren
Peter Kuhry
Peter Lundberg
Arjen Stroeven
Stefan Wastegård

Patrick Crill
Per Holmlund
Erland Källén
Johan Nilsson
Johan Ström

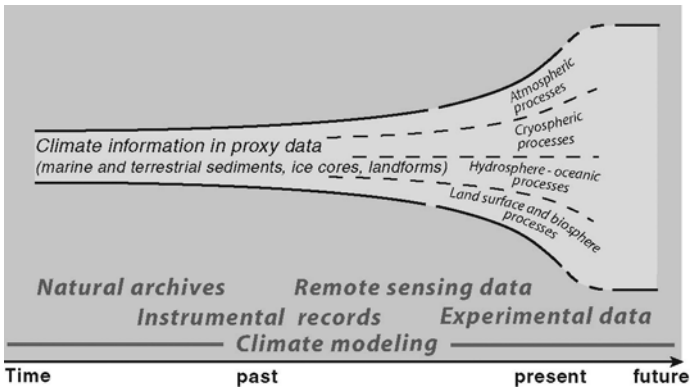
Jörg Gumbel
Clas Hättestrand
Caroline Leck
Gunhild Rosqvist
Gunilla Svensson


Structure of the proposal:

# CLIMATE EVOLUTION, VARIABILITY AND SENSITIVITY

This proposal aims to develop the existing strong climate research at Stockholm University (SU) into an integrated and coherent research environment that will permit us to efficiently address fundamental and outstanding scientific issues concerned with the evolution, variability and sensitivity of the Earth climate system. The climate is dynamic and evolves as complex function of a plethora of variables, some better known than others. Global climate is sensitive to changes in both natural and anthropogenic forcing. The Stockholm professor Svante Arrhenius calculated, a century ago, the expected change in temperature as a function of increased the atmospheric $CO_2$ concentration. His ideas have evolved and are now at the center of ongoing worldwide considerations of how humans will affect climate in the future.

A full comprehension of climate variability and its underlying causes requires a long time perspective, consideration of a wide range of processes, and the use of multiple data sources. On very long timescales, mountain building and changing ocean-continent configurations influence both atmospheric and ocean circulation patterns, and thus the evolution of climate. During the last 2-3 million years, Earth's climate was dominated by shifts between glacial and interglacial states, occurring on timescales 10 000 to 100 000 years, indicating that global climate is sensitive also to other variations in natural forcing, such as solar input driven by Earth's orbital variations.




At centennial to millennial timescales, huge variations in global climate observed in ice cores reflect complex and poorly understood internal amplification processes in the climate subsystems. Ice core studies have contributed to revolutionize our view of the global climate system, because they have (i) documented the long-term co-variability of temperature and greenhouse gas concentrations in the atmosphere, and (ii) demonstrated that the $CO_2$ concentration in recent decades is beyond the norms of the past several hundred thousand years. Terrestrial records provide information about the evolution of ice sheets, changes in sea level, the response of the biosphere, and other environmental changes. Marine sediments provide the longest climate records available, showing that we are currently living in a relatively mild interglacial phase within a long series of warm/cold oscillations.

On human timescales, the global and regional climate is sensitive to changes in atmospheric composition, not only concerning the greenhouse gases but also through aerosol particles that both affect the formation of clouds and act directly on Earth's radiation balance through scattering and reflection of incoming sunlight. However, we still lack crucial knowledge about the natural regulation of both the carbon dioxide and of particles, the feedback processes that amplify or dampen changes in the Earth climate system to changes in energy input, and about many of the limiting processes within climate sub-systems. Scientists working on the evolution, variability and sensitivity of Earth's climate system have a common obligation to provide realistic assessments of possible future climate change.

*The overarching aim of this proposal, comprising 26 scientists at four departments at Stockholm University, is to further enhance the SU climate-research environment. This will facilitate new developments in understanding and quantification of key components within the Earth climate system, the processes involved and their interactions on a range of spatial and temporal scales. The research will initially be organized in the following core themes:*

***1/ Climate variability***
***2/ Atmospheric and oceanic circulation***
***3/ Boundary conditions for circulation system modeling***
***4/ Small-scale processes with large-scale impacts***
***5/ Biogeochemical and hydrological cycles***

*By adding critical expertise in key fields of modeling we will further strengthen the research environment at SU. The core theme structure will lead to improved integration and exchange of data and ideas among research groups, and identification of critical information gaps that will be filled through field campaigns.*

## THE EARTH'S CLIMATE SYSTEM

The Earth's climate system is "an interactive system consisting of five major components: the atmosphere, the hydrosphere, the cryosphere, the land surface, and the biosphere, forced or influenced by various external forcing mechanisms, the most important of which is the Sun. Also the direct effects of human activities on the climate system are considered an external forcing" (Baede *et al.*, 2001). The climate research field is a multi- and cross-disciplinary assembly of all branches of science that deal with one or more among these five components and the different forcings. Because human activities can influence climate, and because human beings are affected by climatic changes, the climate research field also includes social, economic and other human sciences (Scott *et al.*, 2001). There is also an important policy dimension (Bolin, 2002).

Current understanding of the Earth climate system is based on detailed observations of its sub-systems, global observations of key parameters, numerical modeling of either the entire system or parts thereof, and empirical reconstructions of past climate variability. These are all interlinked, with varying degrees of uncertainty. Given the presence of the natural 'background' climate variability, attribution of climate change to anthropogenic causes is a complex statistical signal-in-noise problem (Mitchell *et al.*, 2001). A key aspect here is the time dimension; different climate processes can be active at timescales ranging from millions of years to sub-diurnal time scales. The issue of climate sensitivity to external forcing is also of critical importance (Ramaswamy *et al.*, 2001).

Analysis of climate reconstructions based on proxy data is the only way to obtain a long time perspective on changes and to reveal how the climate system worked in the distant past. Model simulations of past climates under substantially different boundary conditions (e.g. different atmospheric concentrations of greenhouse gases (Spahni *et al*., 2005) or the presence of ice sheets), help paleoclimatologists to understand the relevant processes (Knutti *et al.*, 2004; Bintanja *et al.*, 2005). Model simulations can also shed light on how to evaluate climate reconstructions based on proxy data (von Storch *et al.*, 2004; Mann *et al.*, 2005). Not the least, numerical models are the principal tool for re-analysis data assimilation (Simmons *et al.*, 2004), for analyzing and understanding ongoing climatic processes (Stott *et al.*, 2000), for the undertaking of detection and attribution studies (Barnett *et al.*, 1999), and for the development of scenarios for future climate change (Stainforth *et al.*, 2005).

## THE SU CLIMATE RESEARCH ENVIRONMENT

This climate research proposal is centred on core activities at four departments at Stockholm University: Meteorology (MISU), Physical Geography and Quaternary Geology (INK), Geology and Geochemistry (IGG), and Applied Environmental Research (ITM). Climate research at INK and IGG embraces events from deep geologic times, through climatic cycles of the iceage world to modern day processes of atmosphere–biosphere–cryosphere–hydro-sphere–lithosphere exchange. ITM, which is a young department, has grown into one of the

premier environmental research centers in Europe, with research groups in, for example, atmospheric aerosols, including cloud aerosol interactions, source apportionment, atmospheric life cycle, radiative effects of black carbon aerosols, and soil carbon remobilization. MISU has long played a key role in climate research. The first professor at MISU, the world-renowned Carl-Gustaf Rossby, laid the foundation for the understanding of the large-scale atmospheric and oceanic processes. Bert Bolin, a pioneer in carbon cycle research, was one of the founders of IPCC in 1988 and served as its first chairperson. Paul Crutzen was awarded the 1995 Nobel Prize in Chemistry for SU-based research on stratospheric ozone depletion. In recent years, atmospheric aerosols and their effect on clouds and climate has been one main focus area. Common to all four departments is the highly successful research performed on polar regions, currently manifested in a range of projects proposed for the International Polar Year 2007-08 (IPY).

Prominent recent examples of excellence in many of the different components of climate research at SU are: studies of Eocene glaciation associated with global carbon cycle changes (Coxall *et al.*, 2005; Tripati *et al.*, 2005); evolution and stability of Pleistocene ice sheets (Kleman and Hättestrand, 1999; Polyak *et al.*, 2001; Krinner *et al.*, 2004); reconstruction of climate and atmospheric chemistry over several ice age cycles (Claquin *et al.*, 2003; Andersen *et al.*, 2004**;** EPICA community members, 2004); multi-proxy reconstruction of Northern Hemisphere climate variations for the last two millennia (Moberg *et al.*, 2005); the role of atmospheric chemistry and aerosols for clouds and climate (Rodhe and Crutzen, 1995; Anderson *et al.*, 2003a,b); development of methods for weather forecasting and climate analysis (Stoffelen *et al.*, 2005; Zagar 2005); and the interplay between natural sciences and world-wide politics and economy (Bolin, 1995, 1998, 2002; Bolin and Houghton, 1995; Azar and Rodhe, 1997). A complete list of *Nature* and *Science* publications from the last 10 years by scientists active in the proposed project is provided in a separate reference list.

**ONGOING RESEARCH**

The marine geosciences group addresses climate evolution and variability on time scales longer than any other record can provide. This group represents a lasting stronghold in Swedish and international ocean drilling research, and has occupied leading roles in icebreaker expeditions acquiring geophysical data and sediment cores. The most widely used Digital Bathymetric Models (DBM) among numerical ice modelers working with the seafloor of the Arctic Ocean is IBCAO (International Bathymetric Chart of the Arctic Ocean), which was compiled at SU. Last year's Arctic Coring Expedition succeeded to drill and recover the first extended sediment section from the central Arctic Ocean, a 428 m thick stratigraphic sequence encompassing over **56 million years** of climate history. The Beringia 2005 expedition with the Swedish icebreaker *Oden* and the US icebreaker *Healy* completed the first geological/geophysical transect across the entire Arctic Ocean from Alaska to Svalbard and brought back over 500 m sediment in cores 10-15 m long. For the very first time, we possess long sediment archives from the Arctic Ocean and SU will be at the center of efforts that focus on deciphering the paleoclimate and cryosphere evolution of the central Arctic.

The ice-core research group contributes to successful deep ice core projects, the European cooperation EPICA in Antarctica and NGRIP on Greenland. The new Dome C ice core from Antarctica provides climate and environmental information over almost **1 million years**, much further back in time than any previous ice core. These ice cores permit studies of fundamental processes in the climate system such as variations in Southern Ocean sea ice cover, dimethyl sulphide (DMS) production influencing marine aerosol cloud formation properties, and iron fertilization of the ocean influencing atmospheric $CO_2$ concentrations over eight glacial cycles (Wolff *et al.*, in press). Findings from three SU-led inland traverses (Holmlund *et al.*, 2000) include high variability and strong topographic dependence in snow

accumulation patterns (Richardson-Näslund, 2004) and spatial variations in sulphate aerosol origin revealed by sulphur isotope measurements (Jonsell *et al.*, 2005).

The paleoglaciology group has developed an inversion model for interpreting ice sheet evolution and dynamics in a **100 kyr** time frame, and applied the model to the Fennoscandian (Kleman *et al.*, 1997) and Laurentide ice sheets, reconstructing their evolution through the last glacial cycle. Terrestrial cosmogenic nuclide (Stroeven *et al.*, 2002) and radiocarbon dating are the main age model tools. Work focused on ice-sheet basal thermal regime, a prime control on ice-sheet stability, contributes to the clarification of the relative roles of climate versus internal ice sheet instability for documented extreme glacial events such as the Heinrich events. Our ice sheet reconstructions are used to constrain numerical ice sheet models (Kleman *et al.*, 2002) that provide atmospheric modelers with the topographic input necessary for GCM-modeling of specific time-slices.

Deciphering the causes of rapid centennial- to millennial-scale climate instabilities (Dansgaard-Oeschger oscillations; Heinrich events) during the last glacial cycle is a major issue in Quaternary paleoclimate research. This issue is addressed through establishing time-synchronous correlation among terrestrial, marine and ice core archives, which will sharpen the understanding of the different parts of Earth's environmental system and how these parts interact. In this context, the Quaternary geology group conducts coherent research programs based on tephrochronology, with the aim to refine our understanding of past climate variability in the North Atlantic and northwest Europe region. Current projects focus on the development of better constrained age models for tephra horizons (Wohlfarth *et al.*, in press), and involve analyses of tephra from the Greenland NGRIP ice-core, North Atlantic marine cores (Rasmussen *et al.*, 2003), and terrestrial records (Wastegård *et al.*, 2005).

Research within the paleoclimatology group has contributed to the insight that abrupt climate fluctuations have occurred repeatedly also during the Holocene **(last 10 kyr)**, albeit with smaller amplitudes (Mayewski *et al.*, 2004). Holocene climate evolution is described in quantitative and qualitative terms using glaciological, sedimentological, tree-line, dendro-climatological and palynological methods at annual to decadal temporal resolution, permitting accurate regional scale reconstructions (Grudd *et al.*, 2002; Holmgren *et al.*, 2003; Rosqvist *et al.*, 2003). Regional studies from both hemispheres provide information necessary in order to determine inter-hemispheric synchrony, leads or lags of paleoclimate events, including both temperature and precipitation regimes.

Recent efforts have also focused on the reconstruction of climate variability over the past **2 millennia**. Mapping natural climate variability at decadal to centennial timescales in historical times is necessary to quantify the background variability within which the anthropogenic signal is to be detected. SU scientists contribute to the development of mathematical methods concerning how to combine climate information from low- and high-resolution proxies. In particular, a new Northern Hemisphere temperature reconstruction (Moberg *et al.*, 2005) indicates that substantial natural multi-decadal to centennial variability has occurred in the recent past. Currently, much attention has also been paid to analyse changes in extremes in weather conditions. The main reason is that some weather conditions, regardless if they are related to temperature, precipitation, storms or other aspects of climate, cause loss of life, severe damage and huge economic losses. SU climatologists contribute (Moberg and Jones, 2005) to European efforts to assess past occurrences of weather extremes for the **last century**.

Understanding past climates and establishing future climate projections requires modeling efforts. Without the necessary dedicated resources, SU scientists have not had the possibility of running global climate models. This has instead been possible previously in collaboration with partners at large international institutes such as the Hadley Center and the Max Planck

Institute. **Climate models** constitute a synthesis of the current understanding of all important climate processes where our knowledge is sufficiently mature to be formulated in a globally structured fashion**.** While many climate processes appear on a spatial and/or temporal scale that cannot be directly handled in global numerical models, there is a need to describe these processes parametrically. Numerical simulations of the atmosphere were pioneered by SU scientists, who were the first to perform operational **numerical weather forecasting** in the 1950's. The current Swedish operational weather forecast model HIRLAM (Gustafsson *et al.*, 1998) was also developed in close collaboration with SU scientists, and more recently, they also contributed to develop the atmosphere and ocean components in the Rossby Centre regional coupled atmosphere-ocean model, within the SWECLIM program. Current studies include modeling of regional processes in the Arctic (Tjernström *et al.*, 2005), combining field experiment and model results.

Theories and modeling of the direct effect of **aerosol** particles on Earth's radiation balance and climate were pioneered at SU (Charlson *et al.*, 1991). The interactions between natural aerosols and glacial cycles were studied by Claquin *et al.* (1998) and Mahowald *et al.* (1999). Modeling the aerosol impact on global climate and cloud optical properties has thereafter been expanded to take into account also the indirect effect of aerosols on clouds. These were integrated into the Rossby Centre regional climate model and evaluated for northern Europe, within SWECLIM (Ekman and Rodhe, 2003). Current studies include cloud-resolving modeling with interactive atmospheric chemistry and aerosols to study cloud/aerosol interaction (Ekman *et al.*, 2004).

There is a strong interest in **Arctic** climate change, reflected at SU by its leading roles in the Arctic Climate Impact Assessment (ACIA, 2005) and several recent and ongoing projects. At the Zeppelin station, near Ny Ålesund on Svalbard, $CO_2$ and aerosol particles have been continuously monitored since the late 1980's. Svalbard is located at one of the the main pathways for atmospheric exchange between the mid-latitudes and the Arctic (Treffeisen *et al.*, 2004). During the last decade three international icebreaker-supported atmospheric field experiments in the central Arctic pack ice (e.g. Leck *et al.*, 2004) have generated unique data sets on atmospheric chemistry, aerosol physics (Heintzenberg *et al.*, 2005), chemistry and biology (Leck and Bigg, 2005a), and boundary-layer processes (Tjernström, 2005), and generated a new understanding of natural aerosol formation and its interplay with cloud formation and climate (Leck and Bigg, 2005b). Lately, a state-of-the-art airborne payload for observation of aerosol properties in the Arctic was deployed on Svalbard in the ASTAR project; an execellent example of the synergy between long-term observations and intensive airborne field campaigns (Yamanouchi *et al.*, 2005). Another particular focus at SU is temperature trends and the distribution of water vapor in the mesosphere. This is tied to phenomena like noctilucent clouds in the polar summer mesosphere, that may serve as sensitive indicators of global changes (Thomas, 1996).

The interest in Arctic climate, combined with the acquisition of a Knut and Alice Wallenberg foundation-funded climate computer at the National Supercomputing Centre at Linköping University, has initiated an effort to implement the NCAR CCM3 **global climate model** (Briegleb and Bromwich, 1998). This increased global modeling capacity at SU will link various sub-components in the proposed research programme, facilitating studies of, for example, simulated climate change in terms of changes in predominant atmospheric circulation types (Brandefeldt and Källén, 2004) and potential feedbacks and climate sensitivity related to the description of unresolved physical and chemical processes, for example low-level cloud formation.

Process oriented work by the physical oceanographers at SU has been particularly concerned with water exchanges in the North Atlantic/Nordic Seas, research activities encompassing

observational studies and modeling (Borenäs and Lundberg, 2004; Walin *et al.*, 2004). The investigations on the large-scale ocean circulation include novel approaches concerning the response of the thermohaline circulation to climate change (Nilsson *et al.*, 2003) and study of the Eocene ocean circulation based on fully coupled climate simulations (Huber *et al.*, 2004).

Atmospheric climate processes interact with geosphere and biosphere processes to form a complex interplay that is at the heart of SU research in carbon and hydrological sciences. The **carbon cycle** is inextricably coupled with climate, the hydrological cycle, and terrestrial and marine photosynthetic biomass production (Harding *et al.*, 2002). The hydrologic cycle controls the transport of freshwater and waterborne substances from continents to the oceans and helps regulate the release and sequestration of $CO_2$ and other radiatively important gases.

SU researchers contribute significantly to the quantification and handling of spatial-temporal **hydrologic** variability and randomness in necessary scale transformations from local observations to large-scale model interpretation and prediction of water-tracer (Prieto and Destouni, 2005) and biogeochemical (Malmström *et al.*, 2004; Lindgren and Destouni, 2004) flux partitioning between soil moisture, evapotranspiration, and lateral ground and surface water flows from land to sea. Contributions include combined use of local and remote sensing data, geographic information systems, and dynamic hydrologic isotope, tracer and pollutant monitoring in probabilistic hydrological modeling for flux quantifications over different spatial-temporal scales. SU researchers also specialize in glacier mass balance and runoff quantification from observations, operational modeling and remote sensing (Laudon *et al.*, 2004; Hock and Jansson, 2005). This work has implications for response changes of glacier discharge to future climate change and associated possible sea-level changes.

Finally, SU researchers contribute to the quantification of the stocks and remobilization of Northern Hemisphere soil carbon pools, and their climate feedback effects. This includes studies of carbon interactions and cycling in permafrost soils and peatlands (Harding *et al.*, 2002), compound-specific chlorine and radiocarbon signals and associated source apportionment of greenhouse gas release from soil systems (Martikainen *et al.*, 1993; Christensen *et al.*, 2004), and establishment of the controlling mechanisms of carbon, alkalinity and other solute export from boreal and Arctic rivers to the ocean (Humborg *et al.*, 2004). Another issue concerns the quantification of the two major roles of recalcitrant **Black Carbon** (BC), produced by incomplete combustion of fossil and biomass fuels) in the carbon-climate system. These roles are connected to sediment burial of biomass BC, constituting a net sink of carbon from the atmosphere and biosphere (Gustafsson *et al.*, 1998), and the residence of BC in the atmosphere, significantly affecting Earth's radiative heat balance. SU contributions include methodological developments for quantifying BC in soils and sediments (Gustafsson *et al.*, 2001), and apportionment of BC sources between fossil fuel and biomass combustion (Gustafsson *et al.*, 2001; Mandalakis *et al.*, 2005).

## RESEARCH PROGRAM

Climate projections into the future or climate impact assessments can never be better than our understanding of the underlying processes that control the climate system itself. Credible predictions of a changing climate can only be based on knowledge of the ***processes*** that control the climate on ***different timescales***. In the context of climate research we recognize no logical boundary between paleo- and process-related research. Everything about climate is about processes, they just occur on very different temporal and spatial scales. Some climate-controlling processes occur on long timescales, where process understanding and quantification of variability can be attained only through the study of natural archives, whereas other controlling processes occur on such short time scales that they are within reach of instrumental records and direct experiments. Some outstanding and long-standing climate

issues relate to the four concepts of ***thresholds, feedbacks, amplification and oscillations***. The answers to questions relating to these issues may involve processes or functional relationships of which we today have no, or only scant knowledge. Examples of such questions are:

- Milankovich forcing is responsible for the dominant 20 – 100 kyr climatic pulsebeat, but the magnitude of climatic shift between the glacial and interglacial states is much larger than indicated by the direct insolation changes. Can we identify where in the climatic system the "strong amplifier" resides?
- The largest former ice-sheet, the Laurentide Ice Sheet in North America, has been interpreted to have been an important oscillator in ice-age climate by being prone to cyclic collapses. Can we verify or falsify this oscillator? If verified, is this oscillator of any relevance for the stability of present ice sheets?
- In spite of substantial observed changes in global climate during recent time, the planetary albedo is surprisingly stable. Planetary albedo is very sensitive to clouds and to cryospheric processes, but we have a poor understanding of the processes that govern these. Can we explain this apparent stability in terms of observed changes in clouds or in the variability of snow and ice cover, and how can we model these?

Answers to such key questions may emerge in unsuspected quarters, and improving the chance of breakthrough findings requires a type of organization that is different from what is optimal for more typical "incremental" research. Communication, and contact between fields previously regarded as unrelated, is imperative. Our research programme is designed to meet these scale- and process related challenges. The development of a global modeling capability within this program, described under ongoing research, opens new avenues for improved integration between experimental and theoretical competences. With immediate access to a modeling program, empiricists together with experimental and theoretical experts can test theories in an integrated environment. The proposed research programme is structured around ***five core themes***, all of which involve individual researchers from different departments and several established research groups. Within each core theme we will stimulate research aimed at *identification and quantitative evaluation of* governing processes, thresholds, feedback mechanisms, amplifiers and oscillators in the climate system. The structure is aimed to dismantle established "cultural walls" and to encourage interaction and cross-disciplinary work. The further strengthening of several existing strong climate research groups at SU into an integrated and coherent research environment is proposed to occur through:

- Development of collaboration within and between core themes. For each theme, research will be focused by stimulating colllaboration around one fundamental question, or a tightly knit group of questions. The unifying factor is the *question*, not methods, data types, or established group structure. We strive for analytical depth by bringing together scientists that operate on a broad range of scales and methods.
- increased attention to scale *transformation* and *representativity* issues that presently hampers the utilization of results from detailed process studies in a larger-scale modeling context. This will result in the development of robust *upscaling strategies*.
- identification of *critical information gaps* that must be filled through field campaigns. SU will lead and participate in such campaigns concerning climate processes as well as extraction of climate information from a range of natural archives.

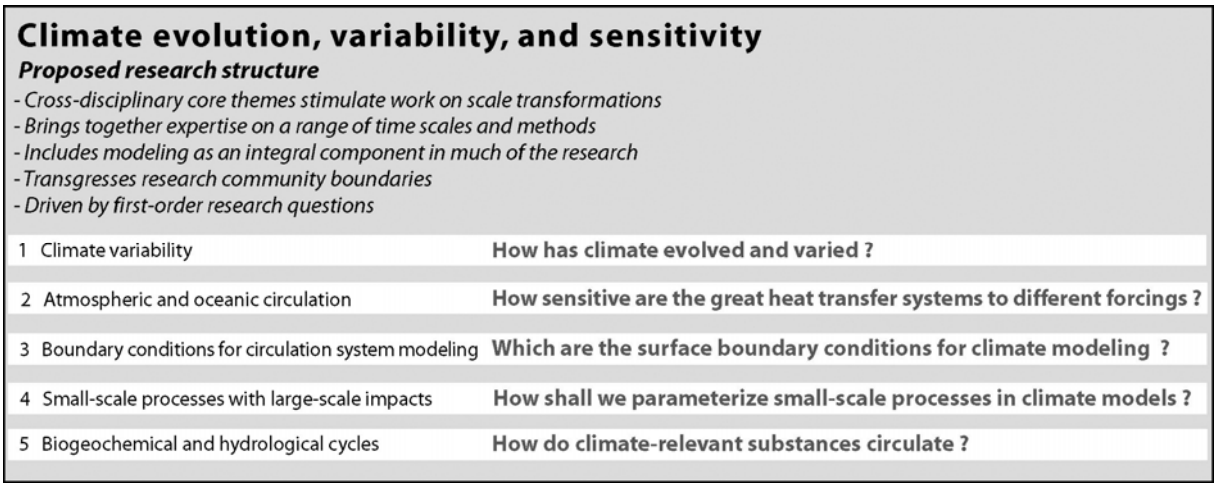



*Figure 1. The proposed research structure represents the focusing of the SU climate research environment into question-driven core themes. This structure is well adapted to tackle an intrinsic problem in climate research; that of bridging an extreme range in temporal and spatial scale while maintaining and developing adequate process understanding on the relevant scales.*

The core themes for the initial 5-year period are**:**

**1. Climate variability**

Our aim is to reconstruct climate change at different time scales using novel archives and methods, and to produce data that can be analyzed in conjunction with model simulations of atmospheric and ocean variability. Of great importance is to define leads and lags in the climate system during transition periods. An outstanding question within this broad theme is whether the present temperature rise is outside the range expected from natural variability.

**2. Atmospheric and oceanic circulation**

We consider the dynamics of the atmosphere-ocean system subjected to the range of environmental conditions characterizing glacial cycles and anthropogenic climate change. One fundamental question concerns the shifts between interglacial and glacial climates; another question concerns the sensitivity of the climate system to external forcing. An overarching aim is to provide dynamical constraints on the natural variability of the atmosphere-ocean system under different conditions.

**3. Boundary conditions for circulation system modeling**

Land- and sea-surface characteristics are necessary input for atmosphere and ocean modeling experiments on all time scales. Hence, we focus on issues that are of such scale and magnitude that improved descriptions are important in a modeling context. Key issues relate to land surface and ice sheet topography, land cover characteristics, sea-ice extent, spatio-temporal continental run-off patterns, sea-level and changing land-ocean patterns.

**4. Small-scale processes with large-scale impacts**

Several important small-scale climate processes cannot be explicitly calculated in coarse-scale global climate models. Cloud and boundary-layer turbulence processes are of vital importance to the climate. We will address questions on feedbacks involving small scale-processes with a special emphasis on the Arctic, in close collaboration between field experimental scientists and modelers. A key question that needs to be answered is why the current global warming appears to have a pronounced maximum in the Arctic.

**5. Biogeochemical and hydrological cycles.**

We here focus on the water and carbon cycles, which play key roles in the dynamics of the

climate system, with large amounts of energy being exchanged as water experiences phase changes and moves from one part of the Earth system to another, regulating in this movement also release and sequestration of $CO_2$ and other radiatively important gases. We will study the roles of Black Carbon both as a biogeospheric C sink and in affecting Earth's radiative properties. We will focus our efforts on the outstanding question of how to upscale such heterogeneous land-surface processes and parameters in regional to global climate models.

**RESEARCH DIRECTIONS**

1. Climate variability.

This core theme aims to determine how the climate system has varied in the past across a range of timescales at different states of the climate system. Various reconstruction techniques and modeling tools will be explored in interplay with the other core themes. Chronological control and the ability to examine the synchrony among records are critical in this context. Therefore, new approaches for geochronology models and correlation of sequences and events (tephrochronology for example) will be explored. Much of the work will be undertaken within large international consortia.

**Arctic Ocean glacial-interglacial circulation variability and sea ice fluctuations on millennial time scales**. We will analyze marine sediment cores from the *Healy-Oden Trans-Arctic Expedition* in 2005. These cores form a complete transect across the central Arctic Ocean, constituting the best recovery so far of sediments encompassing the last 1-2 million years from this region. They are key to a better understanding of Arctic climate sea-ice and shelf-ice evolution. During the IPY 2007 another international expedition is planned with the icebreaker *Oden*, to take sediment cores and carry out geophysical mapping north of Greenland, the least known part of the Arctic Ocean. This, together with the IODP drill core reaching back 56 million years, provides the long-awaited opportunity for systematic investigation of the Arctic's climate variability on time scales reaching beyond ice cores and other terrestrial climate archives. In particular, the variability of the sea-ice cover will be addressed here (see also theme **3**). A key question is whether the current dramatic reduction in sea ice cover has past analogues?

**Climate and the atmospheric composition during the last glacial cycles**. The ice caps on Greenland and Antarctica provide important sources of information about past changes in the content of greenhouse gases and aerosols. These are crucial because of their influence on Earth radiation balance. Our ability to reconstruct past atmospheric concentrations of aerosols is still limited, partially because we lack knowledge on how to interpret the non-soluble particles found in the ice records. We will enhance the knowledge both through deep ice core analyses (on time scales from single years to hundreds of thousands of years) and spatial surveys of surfaces of ice sheets. Specific aims are to determine the spatio-temporal variability of accumulation rate of snow in relation to climate change, and to analyze how variations in the particle properties and chemistry observed in ice cores and snow samples relate to the properties of the atmospheric aerosols (see also **4** and **5**).

**Rapid high-amplitude climatic oscillations** (Dansgaard-Oeschger events, Heinrich events) characterized much of the last glacial period. The causation of these rapid changes, that had profound effects on terrestrial and marine environments, is still unclear. They were likely associated with a redistribution of heat between the hemispheres, where ocean circulation played an important role. To gain more evidence of spatio-temporal details, we will explore various natural archives in both hemispheres. In conjunction with theme **2**, ocean modeling studies will be designed to test hypotheses that could explain the timing and impact of Dansgaard-Oeschger climate variability on the Atlantic Ocean and adjacent European regions.

**The transition from the last glacial into the present interglacial** is characterized by different patterns of warming in the northern and southern hemispheres, and related changes in $CO_2$ concentration and continental glaciation. We seek to decipher the spatial and temporal evolution of climate changes in both hemispheres, to constrain the relative roles of changing thermohaline circulation versus changing atmospheric circulation (linking to **2** and **3**). We will accomplish this by using a multi-proxy approach to produce new high resolution (decadal) regional records of past climate and environment changes for previously identified key sites (e.g. polar regions, Scandinavia and Southern Africa), both for the transition period and for the entire Holocene. An outstanding question here is whether any earlier intervals of the present interglacial period were warmer than today - regionally and/or globally?

**The amplitude of temperature changes for the last one to two millennia** is widely debated. An key question is whether the current large-scale warming is within, or beyond, the range expected from natural variability. The data-rich (both proxy data and long instrumental records) European region offers an unusual opportunity to answer this question from a regional viewpoint. We will therefore work extensively with a European millennial multi-proxy reconstruction, and also analyze the simultaneous climate change in the Southern Hemipshere where much less proxy evidence is available. Particular emphasis will be placed on developing statistical methods to quantify the uncertainty in proxy-based reconstructions. *Main international collaborations in theme* 1: The multi-proxy and climate modeling projects ESF-RESOLuTION and EU-MILLENNIUM, the EPICA and NGRIP ice-sheet/ice-core projects and the International IPY program Arctic Palaeoclimate and its Extremes (APEX).

2. Atmospheric and oceanic circulation

The meridional heat transport in the atmosphere--ocean system serves as the main control of the equator-to-pole temperature difference and indirectly influences also the mean temperature. The underlying physics represent a complex interplay between fluid dynamics, cloud microphysics, and radiative transfer. Here, the focus is on the large-scale circulations that redistribute heat and freshwater over the Earth: their intrinsic variability, spatial patterns, and interaction with the slower components of the climate system. Data in combination with a suite of models, including a global atmosphere-ocean model, will be used to study questions within the following broad themes:

**Is the heat transport controlled by flow-regime dynamics?** Low-frequency atmospheric variability shows a tendency to organize in a few spatially coherent modes, or flow regimes. Current thinking suggests that climate change may entail changes of the probability distributions of the existing modes, rather than spatial alterations; also an issue of relevance for climate reconstructions based on sparsely sampled proxy records (linking to **1**). Enhanced greenhouse forcing can thus, via flow-regime shifts, re-organize the large-scale atmospheric circulation. The Arctic climate system may be highly sensitive to such changes since altered winds impact directly on the sea-ice and the near-surface layer of freshwater in the Arctic Ocean. Locally, this reservoir of ice and freshwater affects the climate by regulating the heat and moisture fluxes to the atmosphere; by feedbacks to the thermohaline circulation the Arctic may also affect the global climate. Conversely, the North Atlantic branch of the thermohaline circulation is sensitive to the remote atmospheric forcing exerted over the Southern and Indo-Pacific Oceans. We want to understand how the heat transport into the Arctic depends on regional as well as global conditions, emphasizing the connection between altered heat transport and climate change.

**Natural variability and boundary conditions**. A challenging aspect of the nonlocal atmosphere-ocean interaction is that the oceanic thermohaline circulation may have multiple equilibria for the same set of boundary conditions: It is conjectured that Heinrich and

Dansgaard-Oeschger events reflect changes between different regimes of the thermohaline circulation. During the Holocene, however, the ocean circulation appears to have operated in a more regular fashion; concurrently the global mean temperature has exhibited only small variations, indicating a remarkable constancy of the planetary albedo. Are there climate amplifiers, in operation during the last glaciation, that have been suppressed during the Holocene? If so, can we identify which aspects of the boundary conditions that serve to curtail the natural climate variability?

**Mechanisms pacing climate oscillations**. It is commonly hypothesized that the rapid climate oscillations during the last glaciation were triggered by freshwater injections caused by massive ice discharge and subsequently amplified by the thermohaline circulation. Were these discharge events stochastic in nature and controlled by ice-sheet dynamics alone, or did feedbacks with the atmosphere--ocean circulation and sea-ice play a synchronizing role? The generally reduced freshwater supply may have destabilized the Arctic Ocean sea-ice cover, resulting in temporarily open waters and intense release of heat and moisture to the atmosphere (see 1, 3**)**. Furthermore, changes in the ice-sheet topography act to re-organize the atmospheric flow, with evident feedbacks to glacier accumulation and ablation as well as to the ocean and the sea ice. In a collaborative effort, we will search for a pacemaker of rapid glacial oscillations.

These research issues are of direct relevance for the stability and sensitivity of the present-day Arctic climate to anthropogenic forcing. Moreover, we will work on model development and on improving model formulations (see also **4)**. In addition to the SU links, these research activities involve cooperation with University of Chicago, MIT and NCAR. The more comprehensive global modeling is planned to be carried out in collaboration with also ECMWF and KNMI.

3. Boundary conditions for circulation system modeling

Numerical modeling with the purpose of simulating and understanding the global climate system is dependent on boundary conditions describing Earth's physical characteristics. Climate modelers need the data in order to provide conditions for, and validate their models, but the model results may also point to critical information gaps to be filled through new field data collection. We seek to provide data that are important in the modeling context on:

- ice cover in the Arctic basin; timing, type (sea-ice, shelf ice) and source areas
- extent, topography and volume of NH ice sheets at different time intervals in the past
- spatio-temporal patterns of ice and freshwater export to the ocean
- changes in vegetation and paleoenvironment during the last glacial cycle (see also **1**)

Common denominators in this work will be the creation of readily transferable databases and state-of-the-art analysis and visualization tools for geospatial data. Rapid response to data needs expressed from core theme **3** will be given priority.

**Sea-ice evolution in the Arctic**. An improved understanding of the global climate requires improved knowledge about the Arctic region. For example, the present perennial Arctic sea-ice cover strongly influences Earth's albedo and exerts an important cooling influence on the global climate system. This sea-ice cover may already be changing in response to global warming, but the natural dynamics of the sea-ice cover is not well understood. Focusing on the peak of the last interglacial, we will address the up-scaling problem and investigate if a spatial sea ice distribution is possible to compile from the sediment core studies. See also **1**.

**Present and past sea-floor topography**: With multibeam echo sounders we now possess the necessary acoustic technology to collect 3D images of the sea floor at unprecedented

resolution, that truly portrays its morphological characteristics, information that is vital for accurate ice-sheet and oceanographic modeling. We aim to assemble available depth measurements, single beam and multibeam echo sounding data, and explore other geophysical measurements to compile the best possible digital models representing the bathymetry of the World Oceans; an extension of the highly successful IBCAO project. We will focus our research towards paleogeographic information from the Arctic region and sea level change data to model the Arctic Ocean bathymetry at different times in the past. Scientific questions will be addressed such as: When did the Arctic Basin physiographic configuration permit the development of a circulation pattern resembling the present? What role does this development of Arctic's large-scale circulation play in the global climate evolution?

**Land-sea cryosphere interaction**: Global distribution of glaciers constitutes a key boundary condition for GCM modeling. This has varied significantly through the Earth's glacial-interglacial cycles with particularly large variations in a 100 000-year rhythm during the past 1 million years. One of the largest unknowns in Earth's glacial history concerns what happened in the Arctic Ocean during ice ages, when huge ice sheets existed at its periphery. We are in a unique position to contribute to synthesizing the spatial extent and understanding the glacial dynamics of past Northern Hemisphere ice sheets. For the marine components of the NH ice sheet complex, we will focus on the LGM and MIS 6 glacial periods through APEX (linking to **1**).

**Ice-sheets during build-up phases:** The moisture sources and transport during ice-sheet inception and build-up, particularly in North America, has long been enigmatic. Deep-sea oxygen isotopes and coral-reef sea-level data indicate several phases of rapid sea-level drop after the last interglacial, but many numerical ice sheet models fail to reproduce the rapidity of build-up phases that is indicated by the proxy data. In collaboration, we will address North American ice sheet configurations, ice surface topography, and atmospheric circulation patterns and moisture transport. The role of SU in this collaboration is to provide geological, geomorphological and geochronological constraints on pre-LGM ice sheet configurations. The proposed strengthening of GCM modeling at SU will give us the possibility to address similar questions for the former ice sheets in Fennoscandia, Northern Eurasia, and Tibet. *International Collaborations***:** IPY programmes Arctic Palaeoclimate and its Extremes (APEX) and Change and Variability of Arctic Systems, Nordaustlandet, Svalbard. *Important bilateral collaboration*: Byrd Polar Research Centre, Ohio, Purdue University, and University of Calgary, Canada, Lamont-Doherty Earth Observatory, Columbia Uiversity, Department of Computer Science, University of Maine.

4. Small-scale processes with large-scale impacts

Atmospheric processes span over many orders of magnitude in scale, but global climate models only explicitly resolve atmospheric processes on scales larger than ~100 km. However, important climate processes occur on much smaller scales. In fact, primary drivers of climate - and of climate change, as well as many feedback processes in the climate system - cannot be directly resolved in these models. Due to strong non-linearity, the climate is sensitive to processes on all scales. Small-scale processes must therefore be described parametrically, as functions of resolved-scale properties; this is known as "parameterization". The characteristics and quality of the parameterizations to a large extent determine both the quality of a model and its climate sensitivity. Parameterization work will intimately combine theory, field experiments and modeling. In this program, this will become possible with the development of a hierarchy of experimental and modeling work on local, regional and global scales. The focus will be on cloud and boundary layer processes, initially with a special emphasis on the Arctic.

**Aerosols and cloud formation processes.** Clouds are the single-most important factor determining the surface energy balance in the Arctic, but constitute a major problem in modeling. In the Arctic, low-level clouds dominate. While similar clouds at lower latitudes have a cooling effect on the surface, in the Arctic with relatively high surface reflectivity even in summer they are typically a warming factor. Each cloud droplet or ice crystal originates from an aerosol particle. Modifications of the number density or cloud forming properties of the aerosol thus have a potentially large impact on the climate, through modification of the clouds and their properties. Observations suggest that clouds in the Arctic are special. In summer aerosol concentration can be very low. In winter, aerosols favoring ice-particle formation are often sparse and consequently even quite cold clouds retain a substantial liquid water fraction. Both effects significantly impact the cloud radiative properties. We aim to study how aerosols form, and the processes controlling their properties and life cycle, thereby furthering the understanding of cloud formation.

**Boundary-layer processes.** The boundary-layer turbulent fluxes are also critical for the surface energy balance. Surface friction is additionally important for larger-scale atmospheric motions, such as the lifetime and strength of weather systems. Today's models over-predict these fluxes, especially in high static-stability conditions common during the Arctic winter. Turbulence under such conditions is poorly understood in general. In long-lived stable conditions prevailing in Arctic winter with a long uninterrupted night, the near-neutral layer typically capping continental nocturnal stable boundary layers is eroded. This allows propagation of internal buoyancy waves, relying on the stable stratification, all the way to the surface. The boundary layer then becomes sensitive to the interaction between turbulence and waves, which is poorly understood. There are also interactions between boundary-layer turbulence and clouds. Turbulence is generated by buoyancy at the top of clouds due to long-wave radiation cooling; this can affect the entire boundary layer and determines the vertical transport of for example aerosols.

This theme links directly to modeling developed in Theme **2**, opening up new avenues to integrate experimental and theoretical specialties with modeling. With direct access to modeling, our experimental and theoretical experts can readily test new theories and parameterizations in an integrated environment. This enables us to develop new process understanding, improve climate models and quantify the sensitivity of the climate system in an integrated framework. The work also links to Theme **1** in assessing past aerosol concentrations from ice cores. *International collaboration*: In USA, CIRES, NOAA/ESRL and NCAR in Boulder, Colorado, University of Washington, in Seattle, and Penn State University, Pensylvania; In Germany, ITF in Leipzig and AWI in Potsdam and Bremerhaven; In Switzerland, ETH in Zurich; In Finland, FMI and University of Helsinki; in the UK, Leeds University.

5. Biogeochemical and hydrological cycles

Central issues are relevant upscalings: i) partitioning of vertical and lateral surface and subsurface water (vapour), biogeochemical and energy fluxes, and ii) account of such flux heterogeneity within and across largely variable land-surface regions. We will analyze different hydrological and biogeochemical fluxes and other variables that affect and interact with climate. Various observations, modeling and upscaling methodologies will be explored in interplay with the other core themes. Much of the work will be undertaken in relevant international collaboration, bilaterally and within large international consortia, as listed below. To begin, we will work with the following set of main questions.

**Scale-transformation of land-surface flux dynamics.** The aim is to reduce key scale-transformation problems and uncertainties associated with large-scale modeling of soil moisture, evapotranspiration and inland-to-coastal water and solute flux dynamics and their carbon-

cycle and climatic effects and feedbacks. We propose to achieve this by novel and innovative combined uses of isotope/tracer-, GIS- and probabilistically based hydrologic flow and biogeochemical transport modeling for interpretation and scenario analysis of compiled information and data in international collaboration within the networks and frameworks of e.g. Arctic-HYDRA and GWSP.

**Hydrologic responses in permafrost/snow/glacier affected basins under a warming climate.** The aim is to significantly improve quantification and prediction of terrestrial cryospheric (snow, glacier, permafrost) and climate change interactions and feedbacks. We propose to achieve this by model development for a) relevant handling and downscaling of climate impacts on runoff in permafrost/snow/glacier affected basins, and b) upscaling and advancement of the cryospheric process representation in land surface schemes of climate models, in international collaboration within the Arctic-HYDRA network.

**Pan-Arctic Soil Carbon: remobilization under a warming climate?** The aim is to reduce the uncertainty of carbon cycling quantification, by specific permafrost environment studies of: (i) total below-ground carbon storage, (ii) landscape carbon distribution along edaphic gradients, (iii) carbon partitioning among permafrost and non-permafrost terrains, (iv) carbon effects of thawing, (v) soil organic matter composition and susceptibility for decay and remobilization, (vi) carbon process upscaling to regional scales, vii) greenhouse gas fluxes from northern soils/peatlands, and viii) fluvial export of terrestrial carbon via northern and Arctic Rivers. The latter two will be addressed with novel and sharp compound-specific isotope mass balance approaches. This research will be carried out in international collaboration within national, EU, IPA, and IPY initiatives.

**Black Carbon (BC): sources, composition, and sinks.** The aim is to significantly improve the scientific understanding of the BC role in and effects on the carbon-climate system. We propose to achieve this by leading a large international BC research consortium to quantitatively establish the BC sinks in the northern-boreal belt and carry out an inventory and source apportionment of BC in the troposphere. A pioneering measurement campaign of low-level $^{14}$C-AMS content of atmospheric BC and of its molecular markers will be executed using station networks in Europe (EU.ALARM) and Asia (Asian Brown Cloud – ABC Program) to constrain the fossil vs biomass sources of BC and their roles in forcing the climate. Paleorecord studies of BC over past glacial cycles will test the hypothesis of less vegetation fires (and thus less atmospheric BC forcing) in a warmer-wetter climate. *Relevant International Collaborations:* The Global Carbon Project (GCP), the Global Water System Project (GWSP), the IPA (International Permafrost Association) CAPP (Belowground Carbon Pools in Permafrost Regions) project, the EU-funded GLIMPSE and ALARM projects. *The IPY Projects:* Arctic Hydrological Cycle Monitoring, Modeling and Assessment Program (Arctic-HYDRA), Land-Shelf-Basin Interactions (Nordic-LSBI), TSP cluster *Important bilateral collaboration*: University of Alaska, Fairbanks, USA, Woods Hole Oceanographic Institution, USA, University of Bonn, Germany, Russian Academy of Sciences.

**ORGANIZATION**

The call for proposals emphasizes strengthening the *research environment*, and also concerns funding in the long time perspective of 10 years. Hence, our proposal differs in structure from a conventional project proposal by focusing with equal weight on *both environment-building and the actual scientific program*. In the following, we use the word ***program*** *as* embracing both these aspects. The program is led by a program steering board, chaired by a program director. Each core theme is led by a coordinator. The project steering board will consist of the project director, the core theme coordinators, the head of the climate research school and two external scientists. Major and long-term decisions within the program are made by the

steering board. Examples of such decisions are first-order resource allocation, selection of postdocs and visiting scientists, descriptions for permanent positions (in collaboration with department heads, thereafter handled by the appropriate bodies within the university), evaluation of progress within the core themes, changes to the core theme structure. The program director is responsible for coherence, management and leadership within the program as a whole, for chairing the program steering board, and for second-order and short-term resource allocation deemed beneficial to the program as a whole. The theme coordinators are responsible for second-order and short-term resource allocation within each core theme, and for continuous leadership and management within their respective themes.

**LEADERSHIP, SUCCESSION AND STAFF**

The program director, professor Johan Kleman, has 10+ years experience as research group leader for the paleoglaciology group, 5 years as deputy head of department, 3 years as head of department for INK 2001-2003, and 6 years as vice chairman of the Earth Science section at SU. He is currently dean of the Earth Science section, chairman of the appointments committee in Earth Sciences, and vice dean of the Natural Science faculty.

The demography within the research environment is such that we foresee no succession problems. Of the 16 professors on this proposal, 11 have been appointed or promoted within the last 5 years. Only 5 out of 26 researchers will reach retirement age within the 10-year period. Each of the themes contains at least three senior scientists and several junior researchers, making the environment robust against retirements or staff changes. In terms of gender, ~ 30% of the senior science staff is female. The generation clustered around the age of 40-45 years already receives the bulk of the external funding.

**BUDGET AND BUDGET MOTIVATION**

| | | | |
|---|---|---|---|
| *1. Intellectual investment:* | | | |
| | New researchers at a senior level, aimed to strengthen and complement the group's modeling and GIS capacity: | | |
| | Climate modeler | 0.8 | |
| | Ice-sheet modeler | 0.8 | |
| | Scale-transformation scientist | 0.8 | **2.4** Mkr |
| | Post-doc grants (to be applied for within the res. environment) | | **1.5** |
| | Visiting scientist program | | **0.8** |
| *2. Basic resources, including management and support staff:* | | | |
| | Management | 0.2 | |
| | Support staff, mobile resource | 0.8 | |
| | Mobile resources (for the five core themes) | 1.5 | **2.5** |
| *3. Workshops and seminars:* | | | 0.2 |
| *4. Overhead costs:* | | | 2.6 |
| ***5. Total annual:*** | | | **10.0 Mkr** |

The rationale for the strategic emphasis on (1) intellectual investment, is our identification of numerical models as prime research tools, and the conviction that a critical mass in modeling competence is best built by simultaneous recruitment of researchers in adjacent fields that are mutually dependent. Postdocs and visiting scientists vitalize the entire program.The rationale for (2) is that the coordinator and theme coordinators must have mobile resources to address needs that call for rapid solutions. For (3) the most important goal is to create a well-organized seminar series with a major contribution from invited international experts.

*First-year size of the research environment:* In terms of staff; 26 teachers/researchers, 18 post-docs, 67 PhD-students, and 12 other staff. In financial terms, >33 Mkr (see appendix U).

**TWO-YEAR GOALS**

- hypothesis formulation within the five core themes which form the basis of this research programme´s first 5-year phase;
- appointment of three new scientists at the level of a VR or KVA Researcher for strengthening modeling capacity and bridging disciplinary gaps
- a systematic rolling program of post-docs that are preferentially targeted at issues of scientific unification and scale transformation
- an increased cross-departmental coordination and use of laboratory resources;
- a series of common seminars, annual thematic workshops and bi-annual full programme conferences;
- establishment of a research school in climate science. The Faculty of Science and the four departments are investing 10 MKR in this school, starting 2006.

***NATURE AND SCIENCE PUBLICATIONS 1995 – 2005, BY PROGRAM MEMBERS (UNDERLINED):***


Andersen, K. K., Azuma, N., Barnola, J. M., Bigler, M., Biscaye, P., Caillon, N., Chappellaz, J., Clausen, H. B., Dahl-Jensen, D., Fischer, H., Fluckiger, J., Fritzsche, D., Fujii, Y., Goto-Azuma, K., Gronvold, K., Gundestrup, N. S., Hansson, M., *et al.* 2004, High-resolution record of Northern Hemisphere climate extending into the last interglacial period: Nature, v. 431, p. 147-151

Anderson, T. L., Charlson, R. J., Schwartz, S. E., Rodhe, H. *et al.*, 2003a, Climate forcing by aerosols - a hazy picture: Science, v. 300, p. 1103-1104.

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Augustin, L., Barbante, C., Barnes, P. R. F., Barnola, J. M., Bigler, M., Castellano, E., Cattani, O., Chappellaz, J., DahlJensen, D., Delmonte, B., Dreyfus, G., Durand, G., Falourd, S., Fischer, H., Fluckiger, J., Hansson, M. E. *et al.* 2004, Eight glacial cycles from an Antarctic ice core: Nature, v. 429, p. 623-628.

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Bjorck, S., Kromer, B., Johnsen, S., Bennike, O., Hammarlund, D., Lemdahl, G., Possnert, G., Rasmussen, T. L., Wohlfarth, B. *et al.*, 1996, Synchronized terrestrial-atmospheric deglacial records around the North Atlantic: Science, v. 274, p. 1155-1160.

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Charlson, R.J., J. Lagner, H. Rodhe, 1990: Sulphate aerosol and climate. Nature, v. 348, p. 22-22.

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De Angelis, H., and Skvarca, P., 2003, Glacier surge after ice shelf collapse: Science, v. 299, p. 1560-1562.

Goulden, M. L., Wofsy, S. C., Harden, J. W., Trumbore, S. E., Crill, P. M. *et al.* 1998, Sensitivity of boreal forest carbon balance to soil thaw: Science, v. 279, p. 214-217.

Kates, R. W., Clark, W. C., Corell, R., Hall, J. M., and Bolin, B. *et al.* 2001, Environment and development - Sustainability science: Science, v. 292, p. 641-642.

Kleman, J., and Hättestrand, C., 1999, Frozen-based Fennoscandian and Laurentide Ice Sheets during the last glacial maximum: Nature, v. 402, p. 63-66.

Krinner, G., Mangerud, M., Jakobsson, M. *et al.*, 2004, Enhancement of ice sheet growth in Eurasia owing to adjacent ice-dammed lakes: Nature, v. 427, p. 429-432.

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Moberg, A., Sonechkin, D. M., Holmgren, K. *et al.*, 2005, Highly variable Northern Hemisphere temperatures reconstructed from low- and high-resolution proxy data: Nature, v. 433, p. 613-617.

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Tripati, A., Backman, J., *et al.*, 2005, Eocene bipolar glaciation associated with global carbon cycle changes, Nature 436: 341-346.

Wolff, E. W., Fischer, H., Fundel, F., Ruth, U., Twarloh, B., Littot, G. C., Mulvaney, R., Röthlisberger, R., de Angelis, M., Boutron, C. F., Hansson, M. *et al.*, in press, Southern Ocean sea ice, DMS production and iron flux over the last eight glacial cycles: Nature.

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Barnett T.P., Hasselmann K., Chelliah M., Delworth T., Hegerl G., Jones P., Rasmussen E., Roeckner E., Ropelewski C., Santer B., and Tett S., 1999: Detection and attribution of climate change: A Status report. *Bull. Am. Met. Soc., v. 12,* p. 2631-2659.

Bintanja, R., van de Wal, R.S.W., and Oerlemans, J., 2005: Modelled atmospheric temperatures and global sea levels over the past million years. *Nature, v. 437,* p. 125-128.

Borenäs, K. and Lundberg, P., 2004: The Faroe-Bank Channel deep-water overflow. *Deep-Sea Res., II, v. 51*, p. 335-350.

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Briegleb, B.P., Bromwich, D.H., 1998: Polar climate simulation of the NCAR CCM3. *J. Climate, v. 11,* p. 1270-1286

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VETENSKAPSRÅDET
THE SWEDISH RESEARCH COUNCIL

Kod
2006-16873-36510-47

**Name of applicant**
Bremer, Kåre

**Date of birth**
480117-1192

**Title of research programme**
Climate evolution, variability and sensitivity

# Appendix B

## Curriculum vitae



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**Climate evolution, variability and sensitivity**

Linné-proposal to VR/ Formas 2006

Appendix B

Curriculum Vitae

Johan Kleman

Jan Backman
Georgia Destouni
Örjan Gustafsson
Margareta Hansson
Martin Jakobsson
Anders Moberg
Henning Rodhe
Michael Tjernström
Barbara Wohlfarth

**Johan Kleman**
Born: March 23, 1953, married, three children
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Stockholm University, S-106 91 Stockholm, Sweden
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**Positions:**

| | |
|---|---|
| Professor in Remote Sensing with Bio-and Geoscientific applications | from July 1, 2001 |
| Professor in Physical Geography | from Febr 1, 2000 |
| Senior lecturer | 1987-2000 (leave 1987-1990) |
| Research associate (forskarassistent) | 1986-1990 |
| Research assistant | 1979-1985 |

All above positions at the Department of Physical Geography, Stockholm University

**Assignments and university service:**
Head of department January 1, 2001 - Dec 31, 2003
Vice head of department 1995-2000.

Elected member of the department board >15 years
Member of the board of the Faculty of Natural Sciences, Stockholm University, 2000-2005, elected also for 2006-2008.
Vice Dean of the Earth Science section of the Faculty of Natural Sciences, Stockholm University, 2000-2005.
Dean of the Earth Science section of the Faculty of Natural Sciences, Stockholm University, 2006 -
Vice Dean of the Faculty of Natural Science 2006 -
Vice chairman of permanent appointments committe, Earth Science Section of the Faculty of Natural Sciences, Stockholm University, 2000-2002.
Chairman of permanent appointments committe, Earth Science Section of the Faculty of Natural Sciences, Stockholm University, 2006 -

**Academic exams and evaluations:**
Docent, Stockholm University 1990
Ph.D., Stockholm University 1985 Physical Geography Supervisor: Leif Wastenson
Thesis: *The spectral reflectance of coniferous tree stands and of barley influenced by stress. An analysis of field measured spectral data*
B.Sc., Stockholm University 1978
University exam as journalist (2-year education.), Stockholm 1974

**Awards:**
The Alfort prize 1989 (for PhD thesis excellence), SSAG, (10.000 Swedish crowns)

**Supervision:**

| | | | |
|---|---|---|---|
| **Arjen Stroeven** | PhD | 1996 | *Late Tertiary Glaciations and Climate Dynamics in Antarctica* |
| **Clas Hättestrand** | PhD | 1997 | *Ribbed Moraines and Fennoscandian Palaeoglaciology* |
| **Krister Jansson** | PhD | 2002 | *The Glacial Geomorph. of North-Central Quebec-Labrador* |
| **Anders Clarhäll** | PhD | 2002 | *Glacial Erosion Zonation - Perspectives on Topography,* |

*Landforms, Processes and Time*

**Hernan De Angelis** started August 2003, on the topic *Canadian Paleo-Ice Streams*
Hättestrand and Jansson had NFR-funded graduate student positions

In addition I have been assistant supervisor for the following licentiate and PhD-students:

| | |
|---|---|
| **Ali Sadeghi-Nad** | Licentiate 1989 |
| **Ingmar Borgström** | PhD 1989 |
| **Karin Holmgren** | PhD 1995 |
| **Annika Dahlberg** | PhD 1997 |
| **Mats Leine** | Licentiate 1999 |
| **Ola Fredin** | PhD 2004 |
| **Gesesse Dessie** | ongoing |
| **Lena Håkansson** | ongoing (Lund University) |

**Other scientific merits:**
Chief scientific editor for volume 28 of *Annals of Glaciology* (1999)
Referee for *Remote Sensing of Environment, International Journal of Remote Sensing, AMBIO, Journal of Glaciology, Boreas, Geografiska Annaler, Earth Surface Processes and Landforms, Annals of Glaciology, Polar Research,Quaternary Science Reviews, Nature*

**International activities:**
Organizer of international **IGS**-conference **"*Glaciers and the glaciated landscape*",** Kiruna, August 1998, jointly with P. Holmlund and P. Jansson. Organizer of international **INCEPTIONS workshop**, Idre June 2002, jointly with Arjen Stroeven, Clas Hättestrand, David Bromwich and David Sugden

**Fieldwork experience:**
Leader of radiometer measurement campaigns, 3-14 days every summer 1978-1986. Glacial geological/geomorphological fieldwork in the *Swedish mountains* 1977,1980,1984, 1987,1988,1989,1990,1991,1992,1993,1994,1997,1998,1999. *McMurdo Dry Valleys*, Antarctica 1992 *Meta Incognita Peninsula*, Baffin Island 1996 (Team leader). *Central Quebec-Labrador*, Canada 1997 (Team leader). *Nimpo Lake area*, British Columbia, Canada 2000,2004, *Varanger Peninsula*, Norway 2001

**Sustained collaboration** (outside SU):
Professor Sidney Hemming, Geochemistry, Lamont-Doherty Earth Observatory
Dr. Neil Glasser, University of Aberystwyth, UK
Professor George Denton, Institute for Quaternary Studies, University of Maine, USA
Professor James Fastook, Computer Science, University of Maine, USA
Dr. Derek Fabel, Glasgow
Professor John Harbor, Purdue University
Professor David Bromwich, Ohio State University

**Jan Backman**
Born: 1948-01-15, married, two children
Address**:** Department of Geology and Geochemistry, Stockholm Univ, S-106 91
Tel. +(46)(0)8-174720; Email: jan.backman@geo.su.se

**Education**:
1974 Fil. kand. Stockholm University (SU)
1980 Ph.D. (SU), General and Historical Geology
*Thesis: Miocene-Pliocene nannofossils and sedimentation rates in the Hatton-Rockall Basin, NE Atlantic Ocean. Research Supervisor: Professor Ivar Hessland*
1985 Docent (SU)

**Professional experience:**
1997- Professor of General and Historical Geology (SU)
1988-97 University Lecturer (SU)
1986-87 University Lecturer, University of Cambridge (UK)
1982-88 Senior Researcher (NFR)
1981 Post-doc fellowship (NFR), hosted by N.J. Shackleton (UK)

**Award:**
1994 Björkénska Prize, University of Uppsala

**Research supervisor for Ph D students:**
(exam year) Otto Hermelin(1985), Gunilla Gard (1988), Alexander Chepstow-Lusty (Cambridge, w/ N.J. Shackleton)(1990), Gunnar Olafsson (1991), Per Bodén (1992), Martin Jakobsson (2000), Chiara Consolaro (Padova, w/ D. Rio) (2004), Richard Gyllencreutz (w/ E. Arnold) (2005).
ongoing Åsa Wallin, Teodora Veres (w/ I. Raffi and J. Henderiks), Claudia Agnini (Padova, w/ E. Fornaciari), Emma Sellén (w/ M. Jakobsson)

**Post-doctoral candidates:**
2002-04 Jorijntje Henderiks (Marie Curie, to VR Junior Researcher)
2002-04 Heiko Pälike (VR grant, to Lecturer, Univ. Southampton)

**Sea-going experience:**
2004 Co-Chief Scientist, Arctic Coring Expedition, I/B *Oden*
2003 Shipboard Scientist, Chukchi Plateau (Arctic), USCGC *Healy*
2001 Shipboard Scientist, ODP Leg 199, D/V *JOIDES Resolution*
1999 Shipboard Scientist, IMAGES Leg 3, R/V *Marion Dufresne*
1996 Shipboard Scientist, SWEDARCTIC 96 (Arctic), I/B *Oden*
1994 Shipboard Scientist, ODP Leg 154, D/V *JOIDES Resolution*
1992 Shipboard Scientist, Cruise Ew9209, R/V *Maurice Ewing*
1991 Shipboard Scientist, Arctic Ocean, FS *Polarstern*
1990 Shipboard Scientist, ODP Leg 130, D/V *JOIDES Resolution*
1987 Co-Chief Scientist, ODP Leg 115, D/V *JOIDES Resolution*
1986 Shipboard Scientist, ODP Leg 108, D/V *JOIDES Resolution*
1981 Shipboard Scientist, DSDP Leg 81, D/V *Glomar Challenger*

**University Service:**
2000-2005 Dean of Earth and Environmental Sciences (SU)
1996-2005 Member of Board, Faculty of Science
2000-2002 Associate Dean, Faculty of Science (SU)
1996-2003 Head of Department (Dept Geology and Geochemistry, SU)

**Other Service:**

| | |
|---|---|
| 2005 | *Editorial Board Member*, Exp. Results, IODP Expedition 302 |
| 2005- | *Member* IODP Science Steering and Evaluation Panel |
| 2005 | *Member* Deutsche Forschungsemeinschaft Review Panel: Assessment of the DFG Res. Centre: Ocean Margins Prog. |
| 2002-03 | *Member* Board, Paleostudies, Univ Bremen |
| 1995- | *Voting Member* Subcommission on Neogene Stratigraphy, IUGS |
| 2003 | *Convenor* Paleoceanography of the Arctic, EGS-AGU-EUG Joint Assem. |
| 2003 | *Convenor* Preparing for scientific drilling in the Arctic: The site survey challenge, JEODI Workshop, Copenhagen |
| 2002 | *Member/Rapporteur* Technical Review Panel, IHP-ARI Action (EU) |
| 2001-03 | *Co-Chair* JEODI WP5: Scientific challenges of the Arctic(EU) |
| 2000-01 | *Chair* Arctic Detailed Planning Group (JOI/ODP) |
| 1999-01 | *Member* Arctic Program Planning Group (JOI/ODP) |
| 1999-01 | *Vice President* European Union of Geosciences (EUG) |
| 2001 | *Member* Human Potential Programme Panel (EU) |
| 1999 | *Convenor* Marine geology and geophysics, EUG X |
| 1999 | *Convenor* Man-made versus natural climate change The Royal Swedish Academy of Sciences |
| 1997-99 | *Secretary* European Union of Geosciences Board |
| 1997-99 | *Member* Swedish Scientific Committee for EUG 10 |
| 1997-03 | *Member* European Union of Geosciences Council |
| 1996-98 | *Member* Org. Committee, 7th Int. Nannoplankton Assoc. Conf., Puerto Rico |
| 1996-97 | *Convenor* Conf. commemorating Swedish Deep-Sea Expedition 1947 48, The Royal Swedish Academy of Sciences |
| 1995-96 | *Co-ordinator* SWEDARCTIC's 1996 expedition |
| 1995 | *Member* ODP International Review Committee, ODP Council |
| 1995-99 | *Member* Large-Scale Facilities Panel, TMR Programme (EU) |
| 1992-95 | *Delegate* (Sweden), Nordic Group for ODP |
| 1992-95 | *Delegate* (Sweden) ESF Scientific Committee for ODP(ESCO) |
| 1992-95 | *Delegate* ODP Ocean History Panel (OHP) |
| 1989-92 | *Alternate* ODP Planning Committee (PCOM) |
| 1989-92 | *Delegate* (Sweden) Nansen Arctic Ocean Drilling (NAD) |
| 1989-94 | *Member* Editorial Board, Geologische Rundschau |
| 1988-95 | *Chair* NFR's Swedish ODP Working Group |
| 1988-91 | *Co-ordinator* International Arctic Ocean Expedition 1991 |
| 1988-89 | *Member* Org. Committee, 5th Int.. Nannoplankton Assoc. Conf., Firenze |
| 1987-92 | *Member* Swedish SCOR committee |
| 1987- | *Member* Editorial Board, Marine Micropaleontology |
| 1987-90 | *Member* Editorial Board ODP Leg 115 Proc. Sci. Results |
| 1981-84 | *Senior Science Editor* Initial Reports, DSDP Leg 81 |
| 1976, '78 | *Guest Investigator* Woods Hole Oceanographic Institution |
| 1975 | *Summer Research Fellow* Woods Hole Oceanographic Inst. |

**Society affiliations:**

American Geophysical Union
Geological Society of America
International Nannoplankton Association

**Georgia Destouni**
Born: 1961; three children, born 1996 (twins) and 1998; ***2 full years maternity leave over period 1996-2000***
Address**:** Department of Physical Geography and Quaternary Geology
Stockholm University, S-106 91 Stockholm, Sweden
Tel. +(46)(0)8-164785; Fax. +(46)(0)8-6747897
Email: georgia.destouni@natgeo.su.se

**Academic preparation and positions:**

- *Professor* of Hydrology, Hydrogeology and Water Resources, Dept. of Physical Geography and Quaternary Geology, SU, October 2005-present (also *Guest Professor* 2003-2005)
- *Professor* of Engineering Hydrology, KTH, 1999-2005
- *Associate professor (Biträdande professor)/Senior Lecturer* of Engineering Hydrology, KTH, 1998-1999
- *Visiting researcher*, Dept. of Agricultural and Biological Engineering, University of Florida, Gainesville, USA, 1994
- *Senior Research Scientist* (*Särskild forskare*) of Hydrological Transport Mechanisms in Heterogeneous Soil, Swedish Natural Science Research Council (NFR), 1992-1998
- *Docent* of Engineering Hydrology, KTH, 1993
- *Ph.D.* in Hydraulic Engineering, KTH, 1991-10-10 (Title: Solute fluxes and travel times in heterogeneous soil; Adviser: Prof. Klas Cederwall)
- *M.Sc.* in Civil Engineering, KTH, 1987

**Honors and commissions of trust (selected recent):**

- Member of the *Royal Swedish Academy of Sciences* (KVA) from 2003, and of the KVA *Craaford geoscience award committee* (2005-), *environmental committee* (2004-), *energy committee* (2004-), *IGBP-WCRP national committee* (2004-)
- Member of the *Royal Swedish Academy of Engineering Sciences* (IVA) from 2003
- Member of the *Environmental Research Board* of the Swedish Environmental Protection Agency (NV), 2005-
- Member of the Board of the *KTH Disaster Resilience Centre*, 2005-
- Member of the Swedish Research Council (VR) *EURYI award evaluation committee*, 2005-2006
- Member of the Swedish Research Council (VR) *Committee for UNESCO's Science Programmes*, and chair of the Swedish joint IHP-IOC sub-committee, 2004-
- European group leader of IAPSO *International Commission on Groundwater-Seawater Interactions* (CGSI), 2003-2005
- Member of US Environmental Protection Agency (EPA) expert panel on *groundwater remediation from DNAPL (Dense Non-Aqueous Phase Liquids)*, 2001-2003
- Personal deputy board member of the *Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning* (FORMAS), 2001-2003
- Vice President of the *Swedish National Water Association* (NKV; national member of IWA), 2000-2005
- Member of the Scientific Council of the *Swedish Agency for Civil Emergency Planning* (ÖCB), 1999-2002

**PhD student guidance:**

*Completed:*

- ***In total 11 PhD students led to PhD and/or Licentiate thesis completion***, as principal adviser in ***Water Resources Engineering*** (***WRE***) at the Royal Institute of Technology (KTH) (5 PhD: Carmen Prieto, 2005; Ursula Salmon, 2003; Eva Simic, 2001; Archana Gupta, 2000; Jerker Jarsjö, 1998; 6 Licentiate: Carmen Prieto, 2001; Ursula Salmon, 2000; Kent Werner, 2000; Charlotta Andersson, 1999; Nils Eriksson, 1996; Mona Sassner, 1995) and ***Quaternary Geology*** at Stockholm University (SU) (1 Licentiate: Yoshihiro Shibuo, 2005), and as co-adviser in ***Inorganic Chemistry*** (IO) and ***Chemical Engineering*** (CE) at KTH (1 PhD: Bo Strömberg, 1997 (IO); 1 Licentiate: Bo Strömberg, 1994 (CE)).

*Ongoing:*

***Currently principal adviser*** for

- ***3 PhD students in Physical Geography*** at SU (Yoshihiro Shibuo, planned PhD thesis 2007; Amélie Darracq, 2007; Fredrik Hannerz, 2007)
- ***2 PhD students in WRE*** at KTH (Georg Lindgren, 2006; Christian Baresel, 2007).

**Postdoctoral collaboration network (selected, main recent):**

Individual collaborations leading to joint scientific publications: *Irina Alekseeva*, University of Hamburg, Germany (2002-); *Steven Banwart*, University of Sheffield, UK (1998-2000); *Sten Berglund*, SKB (2000-); *Vladimir Cvetkovic*, KTH (1998-); *Björn Frostell*, KTH (2003-2005); *Wendy Graham*, University of Florida, USA (1998-2001); *Bengt Hultman*, KTH (2003-2005); *Ing-Marie Gren*, SLU (1998-); *Jerker Jarsjö*, SU (1998-); *Natasha Kotronarou*, National Observatory of Athens (1999-); *Antonis Koussis*, National Observatory of Athens (1999-); *Maria Malmström*, KTH (1999-); *Suresh Rao*, Purdue University, USA (1998-2003); *Corinna Schrum*, University of Bergen, Norway (2002-); *Joshua Schwarz*, Israel ( 1999-2001); *Bo Strömberg*, SKI (1999-2000); *Paul Younger*, University of Newcastle, UK (2001-2004); *Chris Wolkersdorfer*, Bergakademie Freiberg, Germany (2001-2005).

International research consortia: EU Research Project Consortia: *ERMITE* (2001-2004), *WASSER* (1998-2001) and *EU-INTAS Aral Sea Project 1014 and 1003 Clustered Consortia* (2002-2005); International Working Group 112, of the Scientific Committee on Oceanic Research (SCOR), on the *Magnitude of Submarine Groundwater Discharge and its Influence on Coastal Oceanographic Processes* (1998-2002); IPY Project network *Arctic Hydrological Cycle Monitoring, Modelling and Assessment Program* (Arctic-HYDRA; 2005-)

**Societal research communication:**

Several external research projects and various commissions of trust require and include systematic ***research communications and interactions with society***. Main examples are: the EU Research Project Consortium ERMITE (Environmental regulation of mine waters in the European Union), which has included the setup of and systematic interactions with a ***national Swedish stakeholder network*** with representatives for the *mining industry, Ministry of Environment, Environmental Protection Agency, Environmental Courts, Swedish Geological Survey, Environmental Consulting and Law Firms, and Swedish MEPs*; ongoing applied research and collaboration projects with the *Swedish Nuclear Fuel and Waste Management CO (SKB)*, which are to guide the ***site selection and safety assessment*** of the Swedish high-level nuclear waste repository; ongoing national research committee work, which includes joint ***research information and development*** activities with several *Swedish authorities*, the municipal water company organisation *Swedish Water* and the research organisation of power companies *Elforsk*; recent membership in the international expert panel on *groundwater remediation from DNAPL (Dense Non-Aqueous Phase Liquids)* commissioned by the *US Environmental Protection Agency* (EPA), which examplifies also ***international authority interactions***..

**Bernt Örjan Mikael Gustafsson**


Born: 4 January 1968

Address: Stockholm University
Institute of Applied Environmental Research (ITM)
106 91 Stockholm, Sweden
Tel. +(46)(0)8-6747317; Fax. +(46)(0)8-6747638
Email: orjan.gustafsson@itm.su.se


**Education and Degrees:**

| | |
|---|---|
| 2001 | **Docent (Associate Professor),** Stockholm University. |
| 1997 | **Ph.D., Chemical Oceanography**, Massachusetts Institute of Technology (MIT) and Woods Hole Oceanographic Institution (WHOI). |

**Professional Positions:**

| | |
|---|---|
| 2002 – permanent | **VR (The Swedish Research Council) Senior Research Fellow (100%)**, Permanent Lecturer/Group Leader, ITM, Stockholm University |
| 1998 - 2002 | Junior Research Scientist (FoAss), Research Group Leader, Institute of Applied Environmental Research (ITM), Stockholm University |
| 1997-1998 Aug. | **NFR Postdoc, Lab. for Isotope Geol., Swe. Museum Nat. Hist.** |
| 1997, Jan-May | **Lecturer and Postdoctoral Researcher, MIT** |
| 1992-1996 | Graduate Research Assistant, Isotope Geochemistry, WHOI |
| 1991-1996 | Graduate Research Assistant, Environmental Organic Chemistry, MIT |

**Selected Experiences and Scientific Commissions:**

- Referee on grant proposals for the Swedish Research Council (VR), EU Commission (DGXII), US National Science Foundation (NSF), Swiss National Research Council, and European Science Foundation (ESF)
- VR Evaluation Committee "Processes in Soil, Air, and Water" (NT-B), deputy member, 2005-
- External Research Funding: 32 Mill. SEK for 1998-2005 (24 grants) from e.g., VR, EU, MISTRA, FORMAS, K&A Wallenberg, STINT, and other foundations)
- Best Geochemistry Paper 1997, American Chemical Society, Division of Geochemistry
- **Author of 69 papers (19 as first author) since 1996 in international peer-reviewed journals of high impact factors, or in symposium books (two**)
- Author or co-author of > 120 presentations at international scientific meetings
- Selected Invited International Presentations:
  - NATO Advanced Scientific Institute on "Bioavailability of Organic Xenobiotics in the Environment", Jesenik, the Czech Republic, Aug. 1997
  - Gordon Research Conference, Chemical Oceanography, Il Ciocco, Italy, May 1998
  - ESF EURESCO Conference on "Colloids in Natural Waters". Oct. 2002. Belgium
  - SETAC World Conference, Salt Lake City, UT, USA, Nov. 2002
  - EU Commission Workshop on "Contaminated Sediments", Barcelona, Spain, Nov. 2002

- US-NSF Conf. "Future Applications of $^{234}$Th in Aq. Sciences", Woods Hole, USA, Aug 2004
- ESF Conference on "Black Carbon", St. Andrews, Scotland, UK, Sept. 2005
- ESF Conference on "Below-ground carbon pools in Permafrost, Stockholm, Nov 2005

- Convener of Special Symposium on "Black Carbon" at 1999 W.M. Goldschmidt Geochemistry Conference at Harvard University, August 1999
- Member, 3-person Working Group drafting Scientific Framework Plan for Arctic Ocean ODEN Expedition 2001, Swedish Royal Academy of Sciences (1999-2001)
- Chief Scientist, 65 day Arctic Ocean Expedition 2001 (AO-01) aboard ODEN to the high Arctic for "Biogeochemical Fluxes" (20 international participants) July - Sept. 2001
- Participant in about 10 marine research expeditions (week-months each) on American, Russian, German, and Swedish vessels to coastal, continental shelf, and pelagic regimes (severalfold serving as Chief Scientist)
- Invited member of UNESCO-SCOR (Scientific Committee of Oceanic Research) Working Group on "Sediment trap and $^{234}$Th methods for particulate organic carbon export in the upper ocean: current status" 2001-2004
- Ph.D. course in Environmental Organic Chemistry (8 p., Stockholm Univ.), developed course material and course responsible

**Advisorship and Research Group Management:**

Leader of a 10-person research group: responsible for financing and advising at present two international post-doc researchers, four Ph.D. students, and three research technicians.

*Ph.D. advisor to:*

- Anders Jönsson. Ph.D. thesis May 2004
- Jenny Larsson. Lic. thesis Dec. 2002 (terminal)
- Anna Sobek. Lic. thesis 2003; Ph.D. thesis May 2005
- Henry Holmstrand. Lic. thesis May 2004; Ph.D. thesis to be defended 10 May 2006
- Marie Elmquist. Lic. thesis Oct. 2005, Ph.D. thesis to be defended in 2007
- Maria Unger. Ph.D. thesis to be defended in 2008
- Jorien Vonk, Ph.D. thesis to be defended in 2009

*Post-doc host to:*

- Dr. Thomas Bucheli (ETH-Zürich, Switzerland) 1999 –2001
- Dr. Manolis Mandalakis (Univ. Crete, Greece) 2002 – 2004
- Dr. Gerard Cornelissen (Univ. Amsterdam, The Netherlands) 2002 – 2004
- Dr. Laurent Coppola (U. Toulouse, France) 2002 – 2004
- Dr. Hidetoshi Kumata (Tokyo University of Pharmac. and Life Sciences, Japan) 2003-2004
- Dr. Zdenek Zencak (Univ. Basel, Switzerland) 2004-
- Dr. Bart van Dongen (NIOZ; Univ. Utrecht, The Netherlands) 2005-

**Margareta Elisabet Hansson** (born Källström)

Born: February 7, 1962, married, three children born 1991, 1993 and 1997;
***in total 3,5 years maternity leave after PhD over period the 1993-2001***
Address**:** Department of Physical Geography and Quaternary Geology
Stockholm University, S-106 91 Stockholm, Sweden
Tel. +(46)(0)8 - 6747865
Email: margareta.hansson@natgeo.su.se

**Date of doctoral exam:** November 12, 1993
**PhD Thesis:** ***Detecting changes in climate and atmospheric composition with tracers in Arctic ice caps***. Department of Meteorology, Stockholm University.
Supervisors: Bert Bolin, Jost Heintzenberg and Kim Holmén.

**Research visitor:**
1989-1993 Geophysical Institute, Copenhagen University, Denmark.
1990 Rosenstiel School of Marine and Atmospheric Science (RSMAS), University of Miami, U.S.A.

**Docent** (Associate Professor)
2001 Chemical Meteorology, Department of Meteorology, Stockholm University.

**Present position**:
2004- **University lecturer in Environmental Science** at the Department of Physical Geography and Quaternary Geology (DPGQG), Stockholm University (SU). Faculty position with 70% teaching.

**Former positions:**
1986 - 1992 **Postgraduate fellowship** (*Doktorandtjänst*, 100% NFR-funded), Department of Meteorology, SU.
*Parental leave 25-100% within this period*
(1993 *On sick leave due to complications during pregnancy until delivery in July 1993)*
1994 - 1995 **Research scientist** (*Forskare)*, Department of Meteorology, SU.
*Parental leave 50%,* five months of effective work time.
1995 - 2001 **Junior researcher** (*Forskarassistent*, 100% NFR-funded). Department of Meteorology, SU. Four year position.
*Parental leave 25-100% within this period*, four years of effective work time.
2001 - 2004 **University lecturer** (*Lektorsanställningsbidrag*, 75% VR-funded). DPGQG, SU. Three year position**.**

**Parental leave**: In total 3 years and 6 months during 1993-2001 (on 25-100%).

**Scholarship:** Nordic Council of Ministers, scholarship for a 15-months research visit (1989-1990) at Geophysical Institute, Copenhagen University, Denmark.

**Supervision PhD students:**
- Malin Stenberg, Dept. Physical Geography, SU, 2000 (co-supervisor)

- Ulf Jonsell, -2006 *ongoing*
- Torbjörn Karlin, -2009 *ongoing*
- Mattias de Woul -2007 *ongoing* (co-supervisor)

**Collaboration with visiting post-doctoral candidates and guest researchers:**

- Dr. Natalie Mahowald, USA, 1997-1999
- Dr. Martin Werner, Germany, 2000-2002
- Dr. Pierre Biscaye, USA, 2002
- Dr. Barbara Delmonte, Italy, 2006-

Intensive international collaboration with researchers from Belgium, Denmark, France, Germany, Iceland, Italy, Japan, Norway, Switzerland, The Netherlands, UK and USA within the long-term program EPICA and NGRIP.

**Attending international conferences:**
Presentations at scientific conferences, workshops and science meetings about 6 times per year.

**Appointments:**

- Member of the Swedish Polar Research Committee, the Swedish Research Council (*Polarforskningskommittén, Vetenskapsrådet)* 2003-2005
- Board-member, DPGQG, SU, 2003-
- Chair, Committee for Gender Equality (*Jämställdhetsberedningen*) DPGQG, SU, 2003-
- Director of Studies for the undergraduate program in Geoscience, DPGQG, SU, 2005-

**Current membership of international scientific committees and Scientific leadership:**

- Member of the scientific steering committee for the European Project for Ice Coring in Antarctica (EPICA). The Swedish PI. *EU contractor.*
- Member of the scientific steering committee for the North Greenland Ice core Project (NGRIP). The Swedish PI.
- The Swedish PI for the new deep drilling on Greenland (NEEM) with start during IPY.
- Member of International Partnerships in Ice Core Science (IPICS). The Swedish PI.

**Fieldwork experience:**

- One season at the Swedish research station Wasa, Antarctica (air measurements), 2003
- Two seasons at NGRIP (deep ice coring), North Greenland, 2000 and 2001
- Two seasons at Renland (deep ice coring), East Greenland, 1987 and 1988
- Responsible for Swedish research participants in NGRIP and EPICA (14 until now)

**Commissions:**
**Examination PhD thesis** Anne Palmer, University of Tasmania, Australia, 2002
**Reviewer** for international journals, research project applications, and member of PhD and Licentiate thesis committees on a regular basis.
**Scientific editor** Annals of Glaciology 35, 2001
**Organizer** of IGBP/PAGES conference, Stockholm 2002, and organizer of several ice core sample preparation freeze room campaigns
**Evaluation** of the Swedish **national committee** for **IGBP-WCRP** by order of NFR, 1995

**Outreach activities;** extensive media contacts and popular science lectures.

**Martin Jakobsson**
Born: October 13, 1966, married, two children
Address**:** Department of Geology and Geochemistry
Stockholm University, S-106 91 Stockholm, Sweden
Tel. +(46)(0)8-174719; Fax. +(46)(0)8-6747897
Email: martin.jakobsson@geo.su.se

**Academic exams and evaluations:**

2003 *Docent* Docent in Marine Geology and Geophysics, Stockholm University.

2000 *Ph.D.* Ph.D. in General and Historical geology, Stockholm University. Thesis title: "Mapping the Arctic Ocean: Bathymetry and Pleistocene Paleoceanography". Supervisor: Prof. Jan Backman.

1995 *M.Sc.* Master of Science with a major in Earth Sciences, Stockholm University. Thesis title: "Glacial and postglacial development of the Ören glaciofluvial deposit south-west of Torö, southern Stockholm Archipelago, Sweden". Supervisors: Associate Profs. Tom Floden and Thomas Andren.

**Positions:**

2004- Swedish Royal Academy of Sciences Research Fellow position: 80 % research, 20 % teaching and administration.

2004- Senior Lecturer at the Department of Geology and Geochemistry, Stockholm University. (leave of absence due to Research Fellow position above).

2002-2004 Research Scientist II: Center for Coastal and Ocean Mapping/Joint Hydrographic Center, University of New Hampshire, USA.

2000-2001 Postdoctoral position at the Center for Coastal and Ocean Mapping/Joint Hydrographic Center, University of New Hampshire, USA.

1995-2000 Ph.D. research position: Stockholm University.

1994-1995 Field geologist at the Geological Survey of Sweden (SGU) in 1994 (May-October) and 1995 (July-August). The work was carried out onboard the research vessel *Ocean Surveyor*. Marine geologist, Department of Marine Geology, SGU, spring term 1995.

**Honors and Awards:**

2002 Editors choice in the journal Science (Science, Vol 296, 28 June 2002) for the article: Jakobsson, M., 2002, Hypsometry and volume of the Arctic Ocean and its constituent's seas, *Geochemistry Geophysics Geosystems*, v. 3, no. 2.

2000 Award from Högskoleföreningen in Stockholm for best Ph.D. thesis in the Faculty of Mathematical-Natural Sciences year 2000.

2000 Sigfrid Arrhenius stipend for outstanding Ph.D. thesis at Stockholm University's Faculty of Mathematical-Natural Sciences year 2000.

2000 Nominated for Stockholm University's pedagogic teaching award.

1999, 1998 American Geophysical Union (AGU) outstanding student paper award at the AGU meeting (spring meeting 1999 and fall meeting 1998).

**Cruise Experience:**

2005 *Shipboard Scientist* (Swedish scientific team leader), Healy-Oden Trans-Arctic Expedition (HOTRAX). Icebreaker transect of the central Arctic Ocean.

2004 *Shipboard Scientist*, Arctic Coring Expedition (ACEX)*:* Drilling on the Lomonosov Ridge in the central Arctic Ocean.

2003 *Shipboard Scientist*, Marine geophysical mapping of the Chukchi Borderland, Arctic Ocean: Multibeam mapping and subbottom profiling with *USCGC Healy.*

1999- *Shipboard Scientist*, Several short marine geological/geophysical field campaigns, e.g. mapping of Portsmouth Harbor during the fall of 2000, chirp sonar data acquisition in Skagerak during the fall of 1999.

1996 *Shipboard Scientist*, Arctic Ocean 96 expedition with icebreaker *Oden* to the central Arctic Ocean.

1996 *Shipboard Scientist*, FINNARP 95/96: Marine geological expedition with *R/V Aranda* to the eastern Weddell sea, Antarctica.

1994-1995 *Field geologist*, Field mapping with *R/V Ocean Surveyor*: Two field seasons (1994, May-October and 1995, July-August) onboard the Geological Survey of Sweden's research vessel *R/V Ocean Surveyor*.

**Scientific Service:**

2005- *Appointed chairman* for proposed International Polar Year (IPY) 2007/2008 program Arctic Palaeoclimate and its Extremes (APEX)

2005- *Oversight Committee Member* for NSF project AAGRUUK, the Arctic Archive for Geophysical Research.

2004- *Evaluation Committee Member* for NIPPON Foundation of Japan supported project to receive a certificate in Ocean Mapping at the Center for Coastal and Ocean Mapping, University of New Hampshire, USA.

1999- *Scientific Advisor* for General Bathymetric Chart of the Oceans (GEBCO)

1998- *Editorial Board Member* of the International Bathymetric Chart of the Arctic Ocean (IBCAO)

**Professional Societies:**

American Geophysical Union

**Ongoing Collaboration (outside Stockholm University:**

Svante Björck (Lund Univ., Sweden), Trine Dahl-Jensen (GEUS, Denmark), Dennis Darby (Old Dominion Univ., USA), Julian Dowdeswell (Univ. of Cambridge, UK), Margo Edwards (Univ. of Hawaii, USA), Gerhard Krinner (LGGE/CNRS, France), Reidar Lovlie (Univ. of Bergen, Norway), Ron Macnab (CHS, Canada), Jan Mangerud (Univ. of Bergen, Norway), Christian Marcussen (GEUS, Denmark), Larry Mayer (Univ. of New Hampshire, USA), Kate Moran (Univ. of Road Island, USA), Leonid Polyak (Ohio State Univ., USA), John Inge Svendsen (Univ. of Bergen, Norway), Martin Siegert (Bristol Univ., UK), Peter Vogt (Univ. of California at Santa Barbara, USA).

**Research supervisor for Ph.D. students:**

Emma Sellén (planned defense 2010), Benjamin Hell (planned defense 2010)

**Societal research communication:**

Initiated *Stockholm Geo Visualization Lab (SGVL)* during the spring of 2005. This computer visualization lab has a large outreach activity that already included visits by members of the *Swedish Parliament*, *Swedish Geological Survey*, *Technical Museum* of Stockholm and middle and high school students.

**Anders Moberg**
Born: 25 February 1961, Nationality: Swedish
Address**:** Department of Physical Geography and Quaternary Geology
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**PhD:**
1997, Dept. of Physical Geography, Stockholm University, Sweden

**Docent** (associate professor):
2004, Dept. of Meteorology, Stockholm University, Sweden

**Present position:**
Senior Scientist (forskare), Dept. of Physical Geography and Quaternary Geology, Stockholm University. Currently 100% research time. To be changed to 80% research and 20% director of research school during 2006. Current appointment is to Dec 2006. Salary funding is available also for 2007 and 2008.

**Former positions:**
Senior Scientist (forskare) (Nov 2003 - Dec 2005), Dept. of Meteorology, Stockholm University.
Senior Research Associate (Aug 2001 - Oct 2003), Climatic Research Unit, University of East Anglia.
Assistant professor (universitetslektor) (Jan 2001- Jul 2001), Dept. of Physical Geography and Quaternary Geology, Stockholm University. Assistant professor (universitetslektor) (1998-2000), Dept. of Physical Geography, Stockholm University.

**Administration experience:**
Appointment as director of studies for the undergraduate program at Dept. of Physical Geography and Quaternary Geology, Stockholm University (Jan - Jul 2001)

**Collaboration with postdoctoral scientists:**
I have a vast international and national contact network, obtained through my involvement as PI in three EU-projects and other international and national projects since 1998. Twenty-five selected important cooperation partners outside Stockholm University are mentioned below, listed according to the length of cooperation period.

- Phil Jones, Climatic Research Unit, University of East Anglia, UK (1998-present)
- Hans Alexandersson, SMHI, Sweden (1998-)
- Hans Bergström, Earth Sciences - Meteorology, Uppsala University, Sweden (1998-)
- Dmitry Sonechkin, P.P. Shirshov Oceanology Institute, Moscow, Russia (1999-)
- Keith Briffa and Tim Osborn, Climatic Research Unit, University of East Anglia, UK (2001-)
- Deliang Chen, Earth Sciences - Physical Geography, Göteborg University, Sweden (2002-)
- Heinz Wanner and Juerg Luterbacher, Inst. of Geography, University of Bern, Switzerland (2002-)

- Jucundus Jacobeit, Institute of Geography, University of Augsburg, Germany (2002-)
- Manola Brunet-India, Physical Geography, Universitat Rovira i Virgili, Tarragona, Spain (2002-)
- Chris Folland and David Parker, Hadley Centre, Met Office, UK (2002-)
- Pascal Yiou, Laboratoire des Sciences du Climat et de l'Environnement, Gif-sur-Yvette, France (2002-)
- Markku Rummukainen, Rossby Centre, SMHI, Sweden (2004-present)
- Dario Camuffo, Consiglio Nazionale delle Ricerche, Padova, Italy (1998-1999)
- Maurizio Maugeri, Istituto di Fisica Generale Applicata, Milan University, Italy (1998-1999)
- Gaston Demarée, Royal Meteorological Institute of Belgium (1998-1999)
- Jan Esper, Swiss Federal Research Institute, Landscape Dynamics and Management, Birmensdorf, Switzerland (2005-)
- Johan Söderberg, Dept. of Economic History, Stockholm University, Sweden (2005-)
- Danny McCarroll, Dept. of Geography, University of Wales, Swansea, UK (2005-)
- Myles Allen, Department of Physics, University of Oxford, UK (2005-)
- Rudolf Brazdil, Inst. of Geography, Masaryk University, Brno, Czech Republic (2005-)
- Martin Juckes, Rutherford Appleton Laboratory, UK (2005-)
- Eduardo Zorita, GKSS Research Centre, Geesthacht, Germany (2005-)

## Knut Henning Rodhe

| | |
|---|---|
| Born: | February 15, 1941, Uppsala, Sweden |
| Address: | Department of Meteorology<br>Stockholm University, S-106 91 Stockholm<br>Tel: (+46)-8-164342<br>E-mail: rodhe@misu.su.se |


**Academic exams and evaluations:**
Fil Dr (PhD) and Docent 1972 (meteorology), Stockholm University, Sweden

Professor of Chemical Meteorology, Stockholm University, Sweden since 1980. Employment until February 2008 (will hopefully be rehired after retirement)
Ca 50 % time for research

**Previous employments:**

| | |
|---|---|
| 1964-1965 | Assistant Lecturer in mathematics, University of Lund, Sweden |
| 1965-169 | Research Assistant, Department of Meteorology, Stockholm University |
| 1969-1972 | Half-time Senior Lecturer, Department of Meteorology, Stockholm University<br>Half-time Research Scientist, Department of Meteorology, Stockholm University |
| 1972-1975 | Senior Lecturer, Department of Meteorology, University of Nairobi, Kenya |
| 1975-1979 | Associate Professor of Meteorology, Stockholm University, |
| Aug-Dec 1978 | Guest Scientist, National Center for Atmospheric Research (NCAR), Boulder, CO, USA |
| Aug-Dec 1984 | Visiting Professor, Institute of Environmental Studies and Department of Atmospheric Sciences, University of Washington, Seattle, USA |
| Aug 1990-Jan 1991 | Guest Scientist, CSIRO, Division of Atmospheric Research, Mordialloc, Vic., Australia |
| October 1997 | Visiting Professor, Department of Meteorology Florida State University, Tallahassee, USA |
| December 1997 | Visiting Professor, Department of Oceanography University of Hawaii, Honolulu, USA |

**Miscellaneous:**

| | |
|---|---|
| - | Editor of Tellus B, 1982 - |
| - | Secretary of IAMAP's Commission on Atmospheric Chemistry and Global Pollution (CACGP), 1983-1990 |
| - | Member of the Environmental Committee of the Royal Swedish Academy of Sciences, 1975 - 1993 |
| - | Head, Department of Meteorology, Stockholm University 1979-1981, 1988-1990 and 1999 |
| - | Coordinator of the EUROTRAC subproject Global Modelling of Atmospheric Chemistry (GLOMAC), 1987- 1995 |

- Member of the Geosciences Committee of the Swedish Natural Science Research Council 1987 - 1989
- Member of the Royal Swedish Academy of Sciences, 1989 -
- President of IAMAP's Commission on Atmospheric Chemistry and Global Pollution (CACGP), 1990 - 1998
- Director of the International Meteorological Institute (IMI) in Stockholm, 1991-
- Vice Dean of the Faculty of Sciences, Stockholm University, 1991 - 1996
- Member of the Environmental Advisory Council of the Swedish Government, 1991 - 1994
- Invited to give the 1993 Harold Schiff lecture on Atmospheric Chemistry at York University, Toronto, Canada
- Member of Human Rights Committee of the Royal Swedish Academy of Sciences 1995 -
- 1996 ”Aerologist” of the year award from the Nordic Society for Aerosol Research (NOSA)
- Member of the Steering Committee of the International Geosphere - Biosphere Programme 1997 - 1999
- Chairman, Environment Committee of the Royal Swedish Academy of Sciences 1997 -
- Lead Author of one chapter each in four reports of the Intergovernmental Panel on Climate Change (IPCC; 1990, 1992, 1994 and 1995)
- Member of Academia Europaea 1998 -
  Dean, Faculty of Sciences, Stockholm University 2000 - 2005
  Member of the Board of Stockholm University 2000 - 2005
- Chairman, Scientific Advisory Committee (Fachbeirat), Max-Planck-Institute for Biogeochemistry, Jena, Germany, 2001 –
- Vice President of Stockholm University 2003 - 2004
- Received the Björkén prize (2004) from Uppsala University for research on atmospheric chemistry and climate

**Theses supervised:**
19 PhD theses since 1980
Several licentiate theses and exam papers

**Postdocs:**
5 postdocs and several senior visiting scientists

## Michael K. H. Tjernström

Born: 17 August 1955, Solna, Sweden.

Address: Department of Meteorology
Stockholm University, S-106 91 Stockholm
Tel: (+46)-8-163110
E-mail: michaelt@misu.su.se


**Education**: **1988 Ph.D. in Meteorology, Uppsala University.**
1980 Air Force officer, Swedish Air Force Officer Training School.
1980 B.Sc. Stockholm University.

**Professional record:**

**Positions:**

| | |
|---|---|
| **07/2001 – present** | **Professor in Boundary-Layer Meteorology, Stockholm University, time for research 50%.** |
| 05/2000 – 06/2001 | Professor in Meteorology, Uppsala University. |
| 12/1998 – 11/2005 | Senior Scientist [*Särskild Forskare*], Swedish Research Council. |
| 05/1997 – 11/1997 | Research Fellow, Research Department, Swedish Meteorological and Hydrological Institute (SMHI). |
| 07/1994 – 04/2000 | Senior Lecturer [*Lektor*] in Meteorology, Uppsala University |
| 04/1988 – 06/1994 | Assistant Professor [*Forskarassistent*], Meteorology, Uppsala Univ. |
| 09/1983 – 03/1988 | Graduate Student, Department of Meteorology, Uppsala University |
| 01/1980 – 06/1994 | Officer, Swedish Air Force, Armed Forces Weather Service |

**Other:**

| | |
|---|---|
| 10/2005 – 08/2006 | CIRES Visiting Fellow, Colorado University, Boulder, Colorado, USA. |
| **08/2001 – present** | **Partial parental leave.** |
| 02/2003 – 05/2003 | Visiting Scientist, Naval Research Laboratory, Monterey. United States Department of the Navy, USA. |
| 01/2000 – 04/2000 | Visiting Scientist, Naval Research Laboratory, Monterey, USA. |
| 01/1999 – 03/1999 | Visiting Faculty, California Institute of Technology, Pasadena, USA. |
| 06/1996 – 02/1997 | Visiting Faculty, California Institute of Technology, Pasadena, USA. |
| **03/1994** | **Associate Professor [*Docent*] in Meteorology, Uppsala University.** |

**Other significant scientific Visits:**

- 1 – 2/1996; 1 – 2/1998; 1 – 2/1999: Visiting Scientist, Department of Engineering and Applied Physics, Division for Environmental Engineering, California Institute of Technology, Pasadena, California, USA.
- 11/1994: Visiting Scientist, NOAA, Air Resources Lab, Oak Ridge, Tennessee, USA.
- 2 – 3/1992: Visiting Scientist Desert Research Institute, Reno, Nevada, USA.

- 6 – 7/1993: Visiting Scientist, Scripps Institution of Oceanography, San Diego, California, USA.

**Professional Activities:**

- Member of and Chairman for the "Air Quality Committee" for the "Scientific Advisory Board" of the *Swedish Environmental Protection Agency*, 1992 - 1996.
- Member, reference Group for the “International Review of Swedish Research in the Earth Sciences”, *Swedish Natural Research Council*, 1994–1995.
- Subprogram Manager and member of Steering Group, Swedish Regional Climate Modeling Programme, *SWECLIM*, 1998 – 2003.
- Member of the *Swedish National Committee on Geophysics and Geodesy* (SNGG), Swedish Academy of Sciences, 1997 - 2005.
- Subprogram Manager and member of the Scientific Steering Group, *Arctic Ocean Experiment 2001*, 1999 – present.
- Member of the American Meteorological Society (AMS) *Coastal Environment Science and Technology Advisory Committee* (formerly Meteorology and Oceanography of the Coastal Zone), 2003 - present.
- Member and Chairman of the *Swedish National Committee for WCRP and IGBP*, Swedish Academy of Sciences, 2004 - present.
- Member of the Interim Science Committee for *International Study of Arctic Change* (ISAC), appointed by International Arctic Science Committee (IASC) and Arctic Ocean Science Board (AOSB), 2004 - present.

**Awards:** CIRES Visiting Fellowship, 2005/06; CIRES Distinguished Lecturer, 11/2005; AMS Editors Award, 01/2006.

**Ph.D. supervisor (4 completed under lead supervision):**

- Patrick Samuelsson, 1993 – 1999 (*graduated in March 1999*);
- Linda Ström, 1995 – 1999 (*graduated in October 1999*);
- Ragothaman Sundararajan, 1997 – 2001 (*graduated in October 2001*);
- Stefan Söderberg, 1999 – 2004 (*graduated in March 2004*);
- Rune Grand Graverssen, 2003 – planned 2008;
- Additionally: Zhiqiang Cui, 1995 – 1996 (PRC visiting student, *graduated in UK*); Admir Taragino, 2000 – 2002;

**Post-doc. collaborations (3):**

- Dr Branko Grisogono, 1994-1996;
- Dr Patrick Samuelsson, 2000-2002;
- Dr Mark Zagar, 2001 – 2004.

.

## Ulrike Barbara Wohlfarth

Address: Department of Physical Geography and Quaternary Geology
Stockholm University, S-106 91 Stockholm, Sweden
Tel. (+46)-8-164883
E-mail: Barbara@geo.su.se


**PhD in Geology (1986)**

Geological Institute, University of Cologne, Germany.
PhD thesis title: "Das juengere Quartär im westschweizer Seeland"
Supervisors: K. Brunnacker (Köln), C. Schluechter (Bern)

**Post-doc (1991-1993):**

Dept. of Geology, Lund University, Sweden, financed by the Swiss National Science Foundation

**Docent competence (1996):**

Dept. of Quaternary Geology, University of Lund, Sweden

**Present Position:**

Professor, Chair in Quaternary Geology, Dept. of Physical Geography and Quaternary Geology, Stockholm University (75% research and research administration, 20% teaching, 5% administration) (permanent since 2002).

**Employment History:**

| | |
|---|---|
| Associate Professor, Dept. of Geology, Lund University | 2000-2002 |
| Assistant Professor, Dept. of Quaternary Geology, Lund University | 1993-1999 |
| Assistant, Swiss National Climate Programme, Bern, Switzerland (50%) | 1990-1991 |
| Engineering Geologist, Institute of Geotechnics, ETHZ, Switzerland (50%) | 1987-1991 |
| Research assistant, Institute of Prehistory, University of Basel, Switzerland (50%) | 1985-1988 |
| Research assistant, Geological Institute, University of Köln, Germany (50%) | 1983-1985 |
| Research assistant, Institute of Prehistory, University of Basel, Switzerland (50%) | 1981-1983 |

**Parental leave:**

1980 (100%), 1981-1990 (50%)

**Supervision of PhD students:**

| | |
|---|---|
| Jonas Ising (co-supervisor) (1996-2001) | Jonas Bergman (co-supervisor) (2000-2005) |
| Mikkel Sander (1998-2003) | Daniel Veres (2003-) |
| Angelica Feurdean (2002-2004) | Linda Ampel (2004-) |

**Postdoctoral researchers:**

- Dmitry Subetto, 1997 (3 months), 1998 (3 months), 1999 (2 months)
- Ludmila Filimonova, 1998 (2 months)
- Bogdan Onac, 1999 (9 months)
- Pavel Tarasov, 1999 (3 months), now lecturer at the University of Berlin
- Siwan Davies, 2002-2003, now lecturer at the University of Wales, Swansea

- Isabelle Gouirand, 2004-2006
- Li-Yucheng 2005-2007
- Jonas Bergman (2005-)

**Administrative tasks:**
**Board and Committee Member**

- Chairperson Swiss Quaternary Group (S-QUAT) (1987-1990)
- Chairperson Geological Field Club, Lund (1995-1996).
- Member of the Swedish National IGBP & WCRP Board 1996-2003
- Board member, Centre for Women's Studies, Lund University (1996 - 2001)
- Board member, Department of Quaternary Geology, Lund University (1996 - 2002)
- Member of the Swedish National Committee for Geology, 1999-2002
- Member of the Climate Program of the Norwegian Research Council 2001 - 2002
- Member of the Environmental Advisory Council, Swedish Government, 2002 –
- Board member, Department of Physical Geography & Quaternary Geology, Stockholm University (2003-2005)
- Board member and vice-chair recruitment board, Geosciences, Stockholm University (2003-2005)
- Board member, Geosciences section, Stockholm University (2003-2005).
- Deputy-chair, Dept. of Physical Geography and Quaternary Geology, Stockholm University (2004)
- Chairperson of the Swedish UNESCO/IGCP Committee, 2004 –
- President, Geological Society of Sweden, 2005 –
- Coordinator of the ESF Eurocores/Euroclimate Project RESOLuTION
- Regular reviewer for international journals, research project applications, university positions, PhD thesis committee member, research councils.

VETENSKAPSRÅDET
THE SWEDISH RESEARCH COUNCIL

Kod
2006-16873-36510-47

**Name of applicant**
Bremer, Kåre

**Date of birth**
480117-1192

**Title of research programme**
Climate evolution, variability and sensitivity

# Appendix C

## Complete list of publications


Vetenskapsrådet, SE-103 78 Stockholm, tel. +46 (0)8 546 44 000, vetenskapsradet@vr.se

**Climate evolution, variability and sensitivity**

Linné-proposal to VR/ Formas 2006

Appendix C

Publications

Johan Kleman

Jan Backman
Georgia Destouni
Örjan Gustafsson
Margareta Hansson
Martin Jakobsson
Anders Moberg
Henning Rodhe
Michael Tjernström
Barbara Wohlfarth

Publications from 2001-2005. An "(*)" marks the ten most important publications of each applicant during her/his career.

## Johan Kleman:

**Published Refereed Articles:**

1. Stroeven, A.P., J. Harbor, D. Fabel, **J. Kleman**, C. Hättestrand, D. Elmore, D. Fink and O. Fredin 2006: Slow, patchy landscape evolution in northern Sweden despite repeated ice-sheet glaciation. *GSA Special Paper*, **398** (ed. Willett, S.D., Hovius, N., Brandon, M.T., and Fisher, D.): Tectonics, Climate and Landscape Evolution: 387-396.
2. Li, Y., Harbor, J., Stroeven, A.P., Fabel, D., **Kleman, J.** and Fink, D., 2005: Ice sheet erosion patterns in valley systems in northern Sweden investigated using cosmogenic nuclides, *Earth Surface Processes and Landforms*, **30**:1039-1049.
3. Ebert, K. and **Kleman, J.**, 2004: Circular moraine features on the Varanger Peninsula, Northern Norway, and their possible relation to polythermal ice-sheet coverage. *Geomorphology*, **62**:159-168.
4. (*) Hulbe, C.L., MacAyeal, D.R., Denton, G.H., **Kleman, J.** and Lowell, T.H., 2004: Catastrophic Ice-Shelf Breakup as the Source of Heinrich-Event Icebergs. *Paleoceanography*,**19**, PA1004 10.1029/2003PA00890.
5. Jansson, K.N. and **Kleman, J.**, 2004: Early Holocene glacial lake meltwater injections into Labrador Sea and Ungava Bay. *Paleoceanography*, **19**, *PA1001* 10.1029/2003PA000943.
6. Jansson, K.N., Stroeven, A.P. and **Kleman, J.,** 2003: Configuration and timing of Ungava Bay ice streams, Labrador-Ungava, Canada: *Boreas*, **32**: 252-262.
7. Stroeven, A.P., Fabel, D., Harbor, J., Hättestrand, C. and **Kleman, J.**, 2002:Quantifying the erosional impact of the Fennoscandian ice sheet in the Torneträsk-Narvik corridor,northern Sweden. *Geografiska Annaler*, **84A**: 275-287.
8. Stroeven, A., Fabel, D., Harbor, J., Hättestrand, C. and **Kleman, J.**, 2002: Reconstructing the erosion history of glaciated passive margins: Applications of *in-situ* produced cosmogenic nuclide techniques. *Geological Society Special Publication*, **196**:53-168.
9. Hemming, S.R., Vorren, T.O. and **Kleman, J.**, 2002: Provinciality of Ice Rafting in the North Atlantic: Application of $^{40}Ar/^{39}Ar$ Dating of Individual Ice Rafted Hornblende Grains. *Quaternary International*, **95-96**: 75-85.
10. (*) **Kleman, J.**, Fastook, J. and Stroeven, A., 2002: Geologically and geomopholocally constrained numerical model of Laurentide Ice Sheet inception and build-up. *Quaternary International*, **95-96**: 87-98.
11. Fabel, D., Stroeven, A.P., Harbor, J., **Kleman**, J., Elmore, D. and Fink, D., 2002: Landscape preservation under Fennoscandian ice sheets determined from in situ produced $^{10}Be$ and $^{26}Al$. *Earth and Planetary Science Letters*, **201**: 397-406.
12. Jansson, K.N., **Kleman, J.** and Marchant, D., 2002: The succession of ice-flow patterns in north-central Quebec, Canada. *Quaternary Science Reviews*, **21**: 503-523
13. **Kleman, J.**, Marchant, D. and Borgström, I., 2001: Late-glacial ice dynamics on southern Baffin Island and in Hudson Strait. *Arctic, Antarctic and Alpine Research*, **33**: 249-257.
14. (*) **Kleman, J.** and Hättestrand, C., 1999: Frozen-based Fennoscandian and Laurentide ice sheets during the last glacial maximum. *Nature*, **402**: 63-66.
15. (*) **Kleman, J.**, Hättestrand, C. and Clarhäll, A., 1999: Zooming in on frozen-bed patches - Scale-dependent controls on Fennoscandian Ice Sheet basal thermal zonation. *Annals of Glaciology*, **28**: 189-194.
16. (*) Hättstrand, C. and **Kleman, J.**, 1999: Ribbed moraine formation. *Quaternary Science Reviews*, **18**: 43-61.

17. (*) **Kleman, J.** and Stroeven, A.P., 1997: Preglacial surface remnants and Quaternary glacial rgimes in northwestern Sweden. *Geomorphology*, **19**: 35-54.
18. (*) **Kleman, J.**, Hättestrand, C., Borgström. and Stroeven, A.P., 1997: Fennoscandian paleoglaciology reconstructed using a glacial geological inversion model. *Journal of Glaciology*, **43**: 283-299.
19. (*) **Kleman, J.** and Borgström, I., 1996 : Reconstruction of paleo-ice sheets – The use of geomorphological data. *Earth Surface Processes and Landforms*, **21**: 893-909.
20. (*) **Kleman, J.**, Borgström, I. and Hättestrand, C., 1994: Evidence for a relict pre-Late Wisconsinan glacial landscape in Labrador-Ungava. *Palaeogeography, Palaeoclimatlogy, Palaeoecology*, **111**: 217-228.
21. (*) **Kleman, J.**, 1994: Preservation of landforms under ice sheets and ice caps. *Geomorphology*, **9**: 19-32.

**Accepted Refereed Articles:**

22. Harbor, J., A.P. Stroeven, D. Fabel, A. Clarhäll, **J. Kleman**, Y.K. Li, D. Elmore and D. Fink, 2005: Cosmogenic nuclide evidence for minimal erosion across two subglacial sliding boundaries of the late glacial Fennoscandian ice sheet, *Geomorphology.*
23. De Angelis, H. and **Kleman, J.**, in press: Paleo-ice streams in the Northern Keewatin sector of the Laurentide Ice Sheet, *Annals of Glaciology*.

**Book Chapters:**

24. **Kleman, J.**, Hättestrand, C., Stroeven, A.P, Jansson, K.J., De Angelis, H. and Borgström, I. in press : Reconstruction of paleo-ice sheets – inversion of their glacial geomorphological record. (*Glaciology and Earth's Changing Environment*, ed. Peter Knight, Blackwell Publishing) (Accepted)
25. Stroeven, A.P., J. Harbor, D. Fabel, **J. Kleman**, C. Hättestrand, D. Elmore and D. Fink in press: Characteristic cosmogenic nuclide concentrations in relict surfaces of formerly glaciated regions. *Glacier science and environmental change*, Blackwell Publishing Ltd (ed. P.G. Knight).

## Jan Backman:

**Published Refereed Articles:**

1. (*) Raymo, M.E., Ruddiman, W.F., **Backman, J**., Clement, B.M. and Martinson, D.G., 1989. Late Pliocene variation in northern hemisphere ice sheets and North Atlantic deep circulation. *Paleoceanogr.*, **4:** 413-446.
2. (*) Schneider, D.A., **Backman, J**., Chaisson, W.P. and Raffi, I., 1997. A Miocene calibration for calcareous microfossils from low-latitude ODP Sites and the Jamaican conundrum. *Geol. Soc. Am. Bull.*, **109:** 1073-1079.
3. (*) Jakobsson, M., Løvlie, R., Al-Hanbali, H., Arnold, E., **Backman, J**. and Mörth, M., 2000. Manganese and color cycles in Arctic Ocean sediments constrain Pleistocene chronology. *Geology,* **28**: 23-26.
4. (*) Jakobsson, M., Løvlie, R., Arnold, E.M., **Backman, J**., Polyak, L., Knutsen, J.-O., and Musatov, E., 2001. Pleistocene stratigraphy and paleoenvironmental variation from Lomonosov Ridge sediments, central Arctic Ocean. *Global and Planetary Change,* **31:** 1-22.
5. Massari, F., Rio, D., Sgavetti, M., Asioli, A., **Backman, J**., Capraro, L., D'Alessandro, A., Fornaciari, E., and Prosser, G., 2001. The middle Pleistocene of the Crotone Basin. *Mem. Sci. Geol.*, **53:** 85-112.
6. Lyle, M., Wilson, P., Janecek, T., et al., 2002. Leg 199 summary. *In* Lyle, M., Wilson, P.A., Janecek, T.R., et al., *Proc. ODP, Init. Repts.*, 199: College Station TX (Ocean Drilling Program), 1-87.
7. Jakobsson, M., **Backman, J**.,Murray, A., and Løvlie, R., 2003. Optically stimulated luminiscence dating supports central Arctic Ocean cm-scale sedimentation rates. *Geochemistry, Geophysics, Geosystems,* **4 (2):** 1016 (11 p).
8. (*) **Backman, J**., Jakobsson, M., Løvlie, R., Polyak, L., and Febo, L.A., 2004. Is the central Arctic Ocean a sediment starved basin? *Quaternary Science Reviews,* **23:**1435-1454.
9. (*) Moore, T.C., **Backman, J**., Raffi, I., Nigrini, C., Sanfilippo, A., Pälike, H., and Lyle, M., 2004. Paleogene tropical Pacific: Clues to circulation, productivity and plate motion. *Paleoceanography,* **19 (PA3013):** (16 p).
10. (*) Coxall, H.K., Wilson, P.A., Pälike, H., Lear, C.A., and **Backman, J**., 2004. Rapid stepwise onset of Antarctic glaciation and deeper calcite compensation in the Pacific Ocean. *Nature,* **433:** 53-57.
11. Jakobsson, M., Gardner, J.V., Vogt, P., Mayer, L.A., Armstrong, A., **Backman, J**., Brennan, R., Calder, B., Hall, J.K., and Kraft, B., 2005. Multibeam bathymetric and sediment profiler evidence for ice grounding on the Chukchi Borderland, Arctic Ocean. *Quaternary Research*, **63:** 150-160.
12. Gyllencreutz, R., Jakobsson, M., and **Backman, J**., 2005. Holocene sedimentation in the Skagerrak interpreted from chirp sonar and core data. *Journ. Quaternary Science,* **20:** 21-32.
13. Pälike, H., Moore, T., **Backman, J**., Raffi, I., Lanci, L., Parés, J., and Janecek, T., 2005. Integrated stratigraphic correlation and improved composite depth scales for ODP Sites 1218 and 1219. *In* Lyle, M., Wilson, P.A., Janecek, T.R., et al., *Proc. ODP, Sci. Results,* 199: College Station TX (Ocean Drilling Program). 41 pp.
14. (*) Tripati, A., **Backman, J.**, Elderfield, H., and Feretti, P., 2005. Eocene bipolar glaciation associated with global carbon cycle changes. *Nature,* **436:**341-346.
15. Capraro, L., Asiolo, A., Backman, J., Bertoldi, R., Massari, F., and Rio, D., 2005. Climatic patterns revealed by pollen and oxygen isotope records across the Brunhes-

Matuyama Boundary in the central Mediterranean (Southern Italy). *Geol. Soc. London, Spec. Publ.* **247:** 159-182.

16. (*) Raffi, I., **Backman, J.**, and Pälike, H., 2005. Changes in calcareous nannofossil assemblages across the Paleocene/Eocene transition from the paleo-equatorial Pacific Ocean. *Palaeogeogr., Palaeoclimat., Palaeoecol.* **226:** 93-126.
17. (*) Lyle, M., Olivarez-Lyle, A., **Backman, J**., and Tripati, A., 2005. Biogenic sedimentation in the Eocene equatorial Pacific - the stuttering greenhouse and Eocene carbonate compensation depth. *In* Lyle, M., Wilson, P.A., Janecek, T.R., et al., *Proc. ODP, Sci. Results*, 199: College Station TX (Ocean Drilling Program). 35 pp.
18. **Backman, J**., Moran, K., McInroy, D., et al., 2005. IODP Expedition 302, Arctic Coring Expedition (ACEX): A first look at the Cenozoic paleoceanography of the central Arctic Ocean. *Scientific Drilling*, **1**: 12-17.
19. Moran, K., **Backman, J**., Farrell, J., 2006. Deepwater drilling in the Arctic Ocean's permanent sea ice. *In* Backman, J., Moran, K., McInroy, D., Mayer, L.A., and the Leg 302 Scientific Party. *IODP Expedition Reports*, **302** (Texas A&M University, College Station, TX).

**Accepted Refereed Articles:**

20. Fornaciari, E., Giusberti, L., Luciani, V., Tateo, F., Agnini, C., **Backman, J**., Oddone, D., and Rio, D., in press. An expanded Cretaceous-Tertiary transition in a pelagic setting of the southern Alps (central-western Tethys). *Palaeogeogr., Palaeoclimat., Palaeoecol.*

**Books:**

21. Lyle, M., Wilson, P.A., Janecek, T.R., et al., 2002. *Proc. ODP, Init. Repts.,* 199 [Online]. Available from World Wide Web: http://www-odp.tamu.edu/publications/199_IR/199ir.htm.
22. Wilson, P.A., Lyle, M., and Firth, J.V. (Eds.), 2004. *Proc. ODP, Sci. Results,* 199 [Online]. Available from World Wide Web: http://www-odp.tamu.edu/publications/199_SR/199sr.htm.
23. **Backman, J**., Moran, K., McInroy, D., Mayer, L.A., 2006. *IODP Expedition Reports,* **302** (Texas A&M University, College Station, TX).

**Submitted Journal Articles (in review)**

24. Hebbeln, D., Knudsen, K.L., Gyllencreutz, R., Kristensen, P., Klitgaard-Kristensen, D., **Backman, J**., Scheurle, C., Jiang, H., Gil, I., Smelror, M., Jones, P., and Sejrup, H.-P., in review. Late Holocene coastal hydrographic and climate changes in the eastern North Sea. *Holocene*.
25. Sluijs, A., (+14 et alii, incl. **Backman, J.**), in review. Subtropical Arctic Ocean temperatures during the Palaeocene Eocene thermal maximum. *Nature*.
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15. Larsson, J., **Ö. Gustafsson** and J. Ingri, 2002: Optimization of two cross-flow ultrafiltration systems toward isolation of surface water colloids. *Environmental Science and Technology*, 36, 2236-2241.
16. Bärring, H., T.D. Bucheli, D. Broman, and **Ö. Gustafsson**, 2002: Soot-water distribution coefficients for polychlorinated dibenzo-*p*-dioxins, polychlorinated dibenzofurans and polybrominated diphenylethers determined with the soot cosolvency-column method. *Chemosphere*, 49, 515-523.
17. Persson, N.J., **Ö. Gustafsson**, T.D. Bucheli, R. Ishaq, K. Naes, and D. Broman, 2002: Soot-carbon influenced distribution of PCDD/Fs in the marine environment of the Grenlandsfjords, Norway. *Environmental Science and Technology*, 36, 4968-4974.
18. Axelman, J. and **Ö. Gustafsson**, 2002: The global sinks of PCBs: a critical assessment of the vapor-phase hydroxy radical sink emphasizing field diagnostics and model assumptions. *Global Biogeochemical Cycles*, 16 (4), 1111, doi:10.1029/2002GB001904.
19. Sobek, A., **Ö. Gustafsson**, and J. Axelman, 2003: An evaluation of the importance of the sampling step to the total analytical variance – A four-system field-based sampling intercomparison study for hydrophobic organic contaminants in the surface waters of the open Baltic Sea. *Int. J. Environ. Anal. Chem.*, *83*, 177-187.
20. Jönsson, A., **Ö. Gustafsson**, J. Axelman, and H. Sundberg, 2003: Global accounting of PCBs in the continental shelf sediments. *Environmental Science and Technology*, *37*, 245-255.
21. Ribes, S., B. VanDrooge, J. Dachs, **Ö. Gustafsson**, and J.O. Grimalt, 2003: Influence of soot carbon on the soil-air partitioning of polycyclic aromatic hydrocarbons. *Environmental Science and Technology*, *37*, 2675-2680.
22. Mandalakis, M. and **Ö. Gustafsson**, 2003: Optimization of a preparative capillary gas chromatography – mass spectrometry system for the isolation and harvesting of individual PAHs. *J. Chromatogr. A.*, *996*, 163-172.
23. Bucheli, T. D. and **Ö. Gustafsson**, 2003: Soot sorption of non-ortho and ortho-substituted PCBs. *Chemosphere*, *53*, 515-522.
24. Cornelissen, G. and **Ö. Gustafsson**, 2004: Sorption of phenanthrene to environmental black carbon in sediments with and without organic matter and native sorbates. *Environmental Science and Technology*, *38*, 148-155.
25. Palm, A., I. Cousins, **Ö. Gustafsson**, J. Axelman, K. Grunder, D. Broman, and E. Brorström-Lunden, 2004: Evaluation of sequentially-coupled POP fluxes estimated from simultaneous measurements in multiple compartments of an air-water-sediment system. *Environ. Poll.*, *128*, 85-97.
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27. (*) **Gustafsson, Ö.**, P. Andersson, P. Roos, Z. Kukulska, D. Broman, U. Larsson, S. Hajdu, and J. Ingri, 2004: Evaluation of the collection efficiency of upper ocean sub-photic-layer sediment traps: A 24-month in situ calibration in the open Baltic Sea using $^{234}$Th. *Limnology and Oceanography: Methods*, *2*, 62-74.
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30. Holmstrand, H., P. Andersson, and **Ö. Gustafsson**, 2004: Chlorine isotope analysis of sub-μmol organochlorine samples by sealed-tube combustion and thermal-ionization mass spectrometry. *Anal. Chem., 76*, 2336-2342.
31. Sobek, A., and **Ö. Gustafsson**, 2004: Latitudinal fractionation of polychlorinated biphenyls in surface seawater along a &"N- 89N transect from the southern Norwegian Sea to the North Pole area. *Environmental Science and Technology, 38*, 2746-2751. doi: 10.1021/es0353816
32. Cornelissen, G., M. Elmquist, I. Groth, and **Ö. Gustafsson**, 2004: Effect of sorbate planarity on environmental black carbon sorption. *Environmental Science and Technology, 38*, 3574-3580.
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35. Cornelissen, G., Z. Kukulska, S. Kalaitzidis, K. Christanis, and **Ö. Gustafsson**, 2004: Relations between environmental black carbon sorption and geochemical sorbent characteristics. *Environmental Science and Technology, 38*, 3632-3640.
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38. Mandalakis, M., **Ö. Gustafsson**, C. Reddy, and L. Xu, 2004: Radiocarbon apportionment of fossil versus biofuel combustion sources of polycyclic aromatic hydrocarbons in the Stockholm metropolitan area. *Environmental Science and Technology, 38*, 5344-5349.
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40. Ingri, J., S. Nordling, J. Larsson, J. Rönnegård, N. Nilsson, I. Rodushkin, R. Dahlqvist, P. Andersson, **Ö. Gustafsson**, 2004: Size distribution of colloidal trace metals and organic carbon during a coastal bloom in the Baltic Sea. *Marine Chemistry, 91*, 117-130.
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42. Cornelissen, G., and **Ö. Gustafsson**, 2005: Prediction of large variation in BSAFs due to concentration-dependent black carbon adsorption of planar hydrophobic organic compounds. *Environmental Toxicology and Chemistry, 24*, 495-498.
43. Cornelissen, G., and **Ö. Gustafsson**, 2005: The importance of Unburned Coal Carbon, Black Carbon and Amorphous Organic Carbon to Phenanthrene sorption in sediments. *Environmental Science and Technology, 39*, 764-769.
44. (*) Waite, A.M., **Ö. Gustafsson**, O. Lindahl, P. Tiselius, 2005: Linking ecosystem dynamics and biogeochemistry: Sinking fractionation of organic carbon in a Swedish fjord. *Limnology and Oceanography, 50*, 658-671.
45. (*) Mandalakis, M., **Ö. Gustafsson**, T. Alsberg, A.-L- Egebäck, C. Reddy, L. Xu, J. Klanova, I. Holoubek, E.G. Stephanou, 2005: Contribution of biomass burning to atmospheric polycyclic aromatic hydrocarbons at three European background sites. *Environmental Science and Technology, 39*, 2976-2982.

46. **Ö. Gustafsson**, P. Andersson, J. Axelman, T.D. Bucheli, P. Kömp, M. McLachlan, A. Sobek, and J-O. Thörngren, 2005: Observations of the PCB distribution within and in-between ice, snow, ice-rafted debris, ice-interstitial water, and seawater in the Barents Sea marginal ice zone and the North Pole area. *Science of the Total Environment, 342*, 261-279.
47. Persson, N.J., T.D. Bucheli, R. Ishaq, D. Broman, Y. Zebühr, **Ö. Gustafsson**, K. Næs, 2005: Testing common sediment-porewater distribution models for their ability to predict dissolved concentrations of POPs in the Grenlandsfjords, Norway. *Chemosphere*, *59*, 1475-1485.
48. Persson, N.J., **Ö. Gustafsson**, T.D. Bucheli, R. Ishaq, K. Næs, D. Broman, 2005: Distribution of PCNs, PCBs, and other POPs together with soot and other organic matter in the marine environment of the Grenlandsfjords, Norway. *Chemosphere*, *60*, 274-283.
49. Jönsson, A., M. Lindström, R. Carman, C.-M- Mörth, M. Meili, and **Ö. Gustafsson**, 2005: Evaluation of the Stockholm archipelago sediments, northwestern Baltic Sea Proper, as a trap for freshwater-runoff organic carbon. *Journal of Marine Systems*, *56*, 167-178.
50. Cornelissen, G., J. Haftka, J. Parsons and **Ö. Gustafsson**, 2005: Sorption to black carbon of organic compounds with varying polarity and planarity. *Environmental Science and Technology*, 39, 3688-3694.
51. Coppola, L., **Ö. Gustafsson**, P. Andersson, and P. Axelsson, 2005: Fractionation of surface sediment fines based on a coupled sieve-SPLITT (split flow thin cell) method. *Water Res.*, *39*, 1935-1945.
52. Cornelissen, G., **Ö. Gustafsson**, T.D. Bucheli, M.T.O. Jonker, A.A: Koelmans, and P.C.M. vanNoort, 2005: Critical Review: Extensive sorption of organic compounds to black carbon, coal, and kerogen in sediments and soils: mechanisms and consequences for distribution, bioaccumulation, and biodegradation. *Environmental Science and Technology*, doi: 10.1021/es050191b, *39*, 6881-6895.
53. Teuten, E., C.G. Johnson, M. Mandalakis, L. Asplund, **Ö. Gustafsson**, M. Unger, G. Marsh, C.M. Reddy, 2005: Spectral characterization of two bioaccumulated methoxylated polybrominated diphenyl ethers. *Chemosphere*,. doi: 10.1016/j.chemosphere.2005.05.023, published on the web 23 May 2005.
54. Koelmans, A.A., M.T.O. Jonker, G. Cornelissen, T.D. Bucheli, P.C.M. Van Noort, and **Ö. Gustafsson**, 2005: Review: Black Carbon the Reverse of its Dark Side. *Chemosphere*,. doi: 10.1016/j.chemosphere.2005.08.034, published on the web 13 Oct 2005.

**Accepted Refereed Articles:**

55. (*) **Ö. Gustafsson**, J. Larsson, P. Andersson, and J. Ingri, 2005: The POC/$^{234}$Th ratio of settling particles isolated using split flow-thin cell fractionation (SPLITT). *Marine Chemistry*, accepted for publication.
56. K. O. Buesseler, C. R. Benitez-Nelson, S. B. Moran, A. Burd, M. Charette, J. K. Cochran, L. Coppola, N. S. Fisher, S. W. Fowler, W. D. Gardner, L. D. Guo, **Ö. Gustafsson**, C. Lamborg, P. Masque, J. C. Miquel, U. Passow, P. H. Santschi, N. Savoye, G. Stewart, and T. Trull, 2005: An assessment of particulate organic carbon to thorium-234 ratios in the ocean and their impact on the application of $^{234}$Th as a POC flux proxy. *Marine Chemistry*, accepted for publication.
57. M. Rutgers van der Loeff, M.M. Sarin, M. Baskaran, C. R. Benitez-Nelson, K. O. Buesseler, M. Charette, M. Dai, **Ö. Gustafsson**, P. Masque, P. Morris, K. Orlandini, A. Rodriguez y Baena, N. Savoye, S. Schmidt, R. Turnewitsch, I. Vöge, and J. Waples, 2005: $^{234}$Th analysis review: State of the art and new methodologies and techniques. *Marine Chemistry*, accepted for publication.

58. J. Waples, C. R. Benitez-Nelson, N. Savoye, M. Rutgers van der Loeff, M. Baskaran, and **Ö. Gustafsson**, 2005: An introduction to the application and future use of $^{234}$Th in aquatic systems. *Marine Chemistry*, accepted for publication.
59. Holmstrand, H., M. Mandalakis, Z. Zencak, **Ö. Gustafsson**, and P. Andersson, 2005: Chlorine isotope fractionation of a semi-volatile organochlorine compound during preparative megabore-column capillary gas chromatography. *Journal of Chromatography A.*, accepted for publication.

**Conference Abstracts and Presentations:**

Author or co-author of 88 presentations at international scientific meetings for the period 2001-2005.

**Selected Invited Platform Presentations:**

- ESF EURESCO Conference on "Colloids in Natural Waters". Oct. 2002. Belgium
- SETAC World Conference, Salt Lake City, UT, USA, Nov. 2002
- EU Commission Workshop on "Contaminated Sediments", Barcelona, Spain, Nov. 2002
- US-NSF Conf. "Future Applications of $^{234}$Th in Aq. Sciences", Woods Hole, USA, Aug 2004
- ESF Conference on "Black Carbon", St. Andrews, Scotland, UK, Sept. 2005
- ESF Conference on "Below-ground carbon pools in Permafrost, Stockholm, Nov 2005

**Popular Scientific Outlets:**

***Kupolen*** **(**Popular scientific publication of the Swedish Museum of Natural History) issue 2/2000 spring 2000**:** *"Små men betydelsefulla partiklar"* 3-page article about our research on upper ocean particle fluxes in the Baltic Sea.

***Arctic Ocean 2001*** (6-page pamphlet prepared by the Swedish Polar Research Secretariat) Sept. 2000: Detailed description of the 20-person "Biogeochemical Flux" Program that I was leading for the Swedish Arctic Ocean.

***Environmental Science & Technology A Pages*** (large distribution journal of the American Chemical Society) January 1, 2001 (page 10A): *"Environmental News: Does supersorbent soot control PAH fate?"* a 1-page spin-off article based on one of our then recently published research articles (P15; see Publication List).

***Borås Tidning*** (regional Swedish daily newspaper) 8 January 2001: "*Han ska tillbringa sommaren på Nordpolen"* a 2/3 page feature article on myself and Ph.D. student Anna Arvidsson, both from Borås, based on our upcoming Arctic research expedition.

***SR-P1*** (Swedish National Public Radio) 26 June 2001: Interviewed in "morning radio" on departure day for Arctic expedition.

***ABC Nytt*** (Stockholm regional TV News) 26 June 2001: Interviewed and broadcasted onboard Icebreaker ODEN on departure day for Arctic expedition.

***Swedish daily newspapers (Dagens Nyheter, Svenska Dagbladet and many more)*** June-August 2001: Coverage of our Arctic Ocean research expedition.

***TV 2 Aktuellt*** (The major Swedish National TV news) 17 July 2001: Interviewed by a TV team onboard ODEN in the Barents Sea on ocean uptake of carbon and climate change.

***TV 2 Aktuellt*** (The major Swedish National TV news) 19 July 2001: Interviewed by a TV team onboard ODEN in the Barents Sea on the transport ways and biological effects of persistent organic pollutants in the Arctic.

***FIFA Magazine*** (Official outlet of the International Football Association) September-October 2001: "Polar Cup", a feature article on a football tournament on

the ice in the High Arctic as part of a rendez-vous between our research team onboard ODEN, the German counterpart Polarstern, and the U.S. Healy.
***SR P1*** (Swedish National Public Radio) Nov. 2001: Interviewed by author/artist Johan Pettersson on my view on climate change and natural science.
***Polarforskningssekretariatets Årsbok 2001*** (ISBN 91-973879-1-6) (Yearbook of the Swedish Polar Research Secretariat 2001) March 2002: "The Biogeochemistry Programme" A 4-page cruise report/article authored by myself.
***Ny Teknik*** (Sweden's largest technical news magazine) 10 February 2003: "Ny databas kartlägger miljögift: mest PCB I Norra Atlantens bottnar, visar färsk undersökning med GIS-teknik".
***Miljörapporten*** (Monthly Swedish magazine on environmental issues/technology/business; ISSN 1101-4245) 15 April 2004: Selected as one of five "future stars of the environmental arena" in a poll among 300 Swedish companies and organizations. 2-page feature article on Gustafsson and his research on Arctic carbon cycling and management strategies for contaminated sites.
***SR P1*** (Swedish National Public Radio) 16 May 2004: "Anslagen till miljösanering räcker inte" Interviewed on how the decision-making/prioritization of environmental remediation objects may be improved by taking best available science into consideration.

## Margareta Elisabet Hansson:

**Published Refereed Articles:**

1. (*) Jonsell, U., **Hansson, M.E.**, Mörth, C.-M., Torssander, P., 2005: Sulfur isotopic signals in two shallow ice-cores from Dronning Maud Land, Antarctica. *Tellus* 57B, 341-350.
2. Holmlund, P., Onac, B.P., **Hansson, M.**, Holmgren, K., Mörth, M., Nyman, M., Perşoiu, A., 2005: Assessing the paleoclimate potential of cave glaciers: The example of the Scărişoara Ice Cave (Romania). *Geogr. Ann.*87A, 193-201.
3. Castellano, E., Becagli, S., **Hansson, M.**, Hutterli, M., Petit, J.R., Rampino, M.R., Severi, M., Steffensen, J.P., Traversi, R. and Udisti, R., 2005: Holocene volcanic history as recorded in the sulfate stratigraphy of the EPICA-EDC96 ice core (Dome C, Antarctica). *Journal of Geophysical Research* 110, doi:10.1029/2004JD005259.
4. Udisti, R., Becagli, S., Benassai, S., De Angelis, M., **Hansson, M.E.,** Jouzel, J., Schwander, J., Steffensen, J.P., Traversi, R., Wolff, E.*.,* 2005: Sensitivity of chemical species to climatic changes in the last 45 kyrs as revealed by high resolution Dome C (Antarctica) ice core analysis. *Annals of Glaciology* 39, 457-466.
5. (*) **North Greenland Ice-Core Project (NorthGRIP) Members**, 2004: High-resolution record of Northern Hemisphere climate extending into the last interglacial period. *Nature* 431, 147-151.
6. (*) **EPICA community members**, 2004: Eight Glacial Cycles from an Antarctic Ice Core. *Nature* 429, 623-628.
7. Röthlisberger, R., Mulvaney, R., Wolff, E.W., Hutterli, M., Bigler, M., De Angelis, M., **Hansson, M.E.,** Steffensen, J.P., Udisti, R., 2003: Limited dechlorination of sea-salt aerosols during the last glacial period: Evidence from the European Project for Ice Coring in Antarctica (EPICA) Dome C ice core. *Journal of Geophysical Research* 108, D16, 4526, doi:10.1029/2003JD003604.
8. Claquin, T., Roelandt, C., Kohfeld, K.E., Harrison, S.P., Tegen, I., Prentice, I.C., Balkanski, Y., Bergametti, G., **Hansson, M.,** Mahowald, N., Rodhe, H. and Schulz, M., 2003: Radiative forcing of climate by ice-age atmospheric dust. *Climate Dynamics* 20, 193-202.
9. Röthlisberger, R., Hutterli, M., Wolff, E.W., Mulvaney, R., Fischer, H., Bigler, M., Goto-Azuma, K., **Hansson, M.E.,** Ruth, U., Siggaard-Andersen, M.-L., Steffensen, J.P., 2002: Nitrate in Greenland and Antarctic ice cores: a detailed description of post-depositional processes. *Annals of Glaciology* 35, 209-216.
10. Littot, G.C., Mulvaney, R., Röthlisberger, R., Udisti, R., Wolff, E.W., Castellano, E., De Angelis, M., **Hansson., M.E.,** Sommer, S. and Steffensen, J.P., 2002: Comparison of analytical methods used for measuring major ions in the EPICA Dome C (Antarctica) ice core. *Annals of Glaciology* 35, 299-305.
11. Grönlund, A., Nilsson, D., Koponen, I.K., Virkkula, A. and **Hansson, M.E. *(corresponding author).*** 2002: Aerosol dry deposition measured with eddy-covariance technique at Wasa and Aboa, Dronning Maud Land. *Annals of Glaciology* 35, 355-361.
12. (*) **Hansson, M.** and Holmén, K., 2001: High latitude biospheric activity during the last glacial cycle revealed by ammonium variations in Greenland ice cores. *Geophysical Research Letters* 28, No.22, 4239-4242.
13. (*) Unnerstad, L. and **Hansson, M. *(corresponding author).*** 2001: Simulated dust size distributions in Greenland air during Last Glacial Maximum. *Geophysical Research Letters* 28, No.2, 287-290
14. (*) Mahowald, N., Kohfeld, K., **Hansson, M.,** Balkanski, Y., Harrison, S.P., Prentice, I.C., Schulz, M. and Rodhe, H., 1999: Dust sources and deposition during the last glacial

maximum and current climate: A comparison of model results with paleodata from ice cores and marine sediments. *Journal of Geophysical Research* 104, D13, 15895-15916.

15. (*) **Hansson, M.E**., 1994: The Renland ice core: A Northern Hemisphere record of aerosol composition over 120 000 years. *Tellus 46B,* 390-418.
16. (*) **Hansson, M.E.** and Saltzman, E.S., 1993: The first Greenland ice core record of methanesulfonate and sulfate over a full glacial cycle. *Geophysical Research Letters 20*, 1163-1166.
17. (*) Johnsen, S., Clausen, H.B., Dansgaard, W., Gundestrup, N., **Hansson, M.**, Jonsson, P., Steffensen, J.P., Sveinbjörnsdottir, A.E., 1992: A "deep" ice core from East Greenland. *Meddr. Grönland Geosci. 30*, 22pp.

**Accepted Refereed Articles:**

18. (*) Wolff, E.W., Fischer, H., Fundel, F., Ruth, U., Twarloh, B., Littot, G.C., Mulvaney, R., Röthlisberger, R., de Angelis, M., Boutron, C.F., **Hansson, M.,** Jonsell, U., Hutterli, M., Lambert, F., Kaufmann, P., Stauffer, B., Stocker, T.F., Steffensen, J.P., Bigler, M., Siggaard-Andersen, M.L., Udisti, R., Becagli, S., Castellano, E., Severi, M., Wagenbach, D., Barbante, C., Gabrielli, P., Gaspari, V. Southern Ocean sea ice extent, productivity and iron flux over the last eight glacial cycles. *Nature* (in press)
19. Rasmussen, S.O., Andersen, K.K., Svensson, A.M., Steffensen, J.P., Vinther, B.M., Clausen, H.B., Siggaard-Andersen, M.-L., Johnsen, S. J., Larsen, L.B., Bigler, M., Röthlisberger, R., Fischer, H., Goto-Azuma, K., **Hansson, M.E.,** , and Ruth U. A new Greenland ice core chronology for the last glacial termination. *Journal of Geophysical Research* (in press)

**Submitted Articles:**

20. Ruth, U., Bigler, M., Röthlisberger, R., Siggaard-Andersen, M.-L., Kipfstuhl, S., Johnsen, S.J., Steffensen, J.P., **Hansson, M.E.,** Goto-Azuma, K., Lu, H. Synchrony of Asian Monsoon and North Atlantic climate variations during the last glacial period. Submitted to *Nature.*

**Book Chapters**:

21. **Hansson, M.**, 2003: Studier av djupiskärnor i Antarktis. In: *Glaciologi* (eds. P. Holmlund and P. Jansson, *in Swedish*), 143-151.

**Popular Science Articles:**

22. **Hansson, M.** and Jonsell, U., 2005: Drilling to the bedrock at NorthGRIP, again. *Polarforskningssekretariatet Årsbok 2004* (eds. S. Rickberg and J. Viidas), 98-102.
23. **Hansson, M.** and Hörnby, K., 2005: EPICA – European Project for Ice Coring in Antarctica. *Polarforskningssekretariatet Årsbok 2004* (eds. S. Rickberg and J. Viidas), 56-60.
24. Jonsell, U and **Hansson, M**., 2005: High temporal and spatial analysis of snow chemistry in the vicinity of Wasa station, Antarctica. *Polarforskningssekretariatet Årsbok 2004* (eds. S. Rickberg and J. Viidas), 71-73.
25. **Hansson, M.,** Hock, R., Holmén, K. and Noone, K., 2004: Light absorbing aerosols at Wasa in Antarctica – Linking atmosphere, snow surface and ice core data. *Polarforskningssekretariatet Årsbok 2003* (ed. S. Rickberg), 55-58.
26. **Hansson, M.** and Hörnby, K., 2004: EPICA Dome C and EPICA DML – Two parallel deep ice core drillings in Antarctica. *Polarforskningssekretariatet Årsbok 2003* (ed. S. Rickberg), 59-62.

27. **Hansson, M.** and Jonsell, U., 2004: Drilling to the bedrock at NorthGRIP, Greenland. *Polarforskningssekretariatet Årsbok 2003* (ed. S. Rickberg), 91-94.
28. **Hansson, M.** and Nyman, M., 2003: EPICA Dome C – Ice core drilling deep into the past. *Polarforskningssekretariatet Årsbok 2002* (ed. S. Rickberg), 38-40.
29. **Hansson, M.** and Grönlund, A., 2001: NGRIP – Deep ice core drilling on the Greenland ice sheet. *Polarforskningssekretariatets årsbok 2000* (ed. E. Grönlund), 74-76.
30. **Hansson, M.,** Grönlund, A. and Nilsson, D., 2001: Aerosol dry deposition velocity measured at Wasa, Dronning Maud Land, Antarctica. *Polarforskningssekretariatets årsbok 2000* (ed. E. Grönlund), 36-37.

**Outreach activities during the past 5 years:**

31. Invited speaker, YMER-80 25th Anniversary, The Royal Swedish Academy of Science (KVA), Stockholm, November 1, 2005
32. Invited speaker, Invigning av Sektionen för geo- och miljövetenskaper, Stockholm universitet, October 20, 2005
33. Urgammal is ska lösa nutidens klimatgåtor *Svenska Dagbladet* March 6, 2005 (Bengt Jonsson)
34. Hon har borrat sig 900 000 år tillbaka *Projekt Journalisthögskolan*, 2005 (Charlotta Lambertz)
35. Invited speaker, Rotary, Stockholm, November 25, 2004
36. Invited speaker, Swedish Museum of Natural History, Stockholm, September 2004
37. Väderleksrapport från forntida Grönland *Forskning & Framsteg* 8, 15, 2004 (Håkan Borgström)
38. Tinar upp tiden *Sveriges Natur (Tema Klimat)* 5, 26-28, 2004 (Mats Hellmark)
39. Invited speaker, *Geologins dag,* Stockholm, September 2004
40. Is avslöjar allt om Grönlands klimat *Aftonbladet* s. 27, September 9, 2004 (Eva Barkeman)
41. *Göteborgs-Posten* September 2004 (Nina Jansson)
42. Polarisen avslöjar alla tiders väder A*ftonbladet* s.33, June 21, 2004 (Eva Barkeman)
43. Iskärnan avslöjar vårt klimat *Dagens Nyheter* Vetenskap, s.13, June 13, 2004 (Karin Bojs)
44. Ingen istid de närmaste 15 000 åren *Dagens Nyheter* del A, s.6, June 10, 2004 (Karin Bojs)
45. Isen skvallrar om klimatförändringar *Svenska Dagbladet* Vetenskap s.16-17, February 15, 2004, (Bengt Jonsson)
46. Kalla fakta *Populär historia* 8, 46-50, 2003 (Bengt Jonsson)
47. Invited speaker, Symposium on Polar Environmental Research, 30th Anniversary of French and Finnish Polar Research cooperation, Finnish Academy of Science, Helsinki, Finland, June 2003;
48. Invited speaker, *Geologins dag,* Stockholm, September 2002
49. Is klimatarkiv från förr *Dagens Nyheter* Del A, s.8, January 16, 2002 (Karin Bojs)
50. Invited speaker, *Globala miljöfrågor*, *Geoforum,* Stockholm 2001
51. Invited speaker, *Polardagen, Swedish Polar Research Secretariat,* The Royal Swedish Academy of Science (KVA), Stockholm, November 2001
52. Invited speaker, *Paneldebatt Klimatvariationer (Sv. Geofys. För. och Sällskapet Riksdagsmän och Forskare)* Stockholm, May 2001
53. Spännande om klimatets historia *Jönköpingsposten* s.4, March 30, 2001 (Gunlög Andrén)
54. Invited speaker, *Andréemuséet,* Gränna, March 2001

*In addition, several **interviews** about climate research in national/international **TV** and **radio**. Several contributions to **exhibitions** about climate research at mainly museums.*

## Martin Jakobsson:

**Published Refereed Articles:**

1. Darby, D**., Jakobsson, M**., and Polyak, L., 2005, Icebreaker Expedition Collects Key Arctic Sea Floor and Ice Data, *EOS Transactions,* American Geophysical Union, **86** (52): 549-556.
2. (*) **Jakobsson, M**., Gardner, J.V., Vogt, P., Mayer, L.A., Armstrong, A., Backman, J., Brennan, R., Calder, B., Hall, J.K., and Kraft, B., 2005, Multibeam bathymetric and sediment profiler evidence for ice grounding on the Chukchi Borderland, Arctic Ocean, Arctic Ocean, *Quaternary Research*, **63**: 150-160.
3. Skogsheid, R., Haugan, M., and **Jakobsson, M**., 2005, Watermass transformation in Storfjorden, *Continental Shelf Research*, **25**: 667-695.
4. Gyllencreutz, R., **Jakobsson, M**., and Backman, J., 2005, Holocene sedimentation from in the Skagerrak interpreted from chirp sonar and core data, *Journal of Quaternary Science*, **20**: 21-32.
5. (*) Krinner, G., Mangerud, M., **Jakobsson, M**., Crucifix, M., Ritz, C., Svendsen, J.I., and Genthon, C., 2004, Enhancement of ice sheet growth in Eurasia owing to adjacent ice-dammed lakes, *Nature*, **427**: 429-432.
6. Backman, J., **Jakobsson, M**., Løvlie, R., and Polyak, L., 2004, Is the central Arctic Ocean a sediment starved basin?, *Quaternary Science Reviews* special QUEEN volume, **23**: 1435-1454.
7. (*) Mangerud, J**., Jakobsson, M** , Alexanderson, H., Astakov, V., Clarke, G., Henriksen, M., Hjort, C, Krinner, G., Lunkka, J.P., Moller, P., Murray, A., Nikolskaya, O., Saarnisto, M., and Svendsen, J.I., 2004, Ice-dammed lakes and rerouting of the drainage of Northern Eurasia during the last glaciation, *Quaternay Science Reviews* special QUEEN volume, *Quaternary Science Reviews*, **23**: 1313-1332.
8. Svendsen, J.I., Alexanderson, H., Astakhov, V.I., Demidov, I., Dowdeswell, J.A., Henriksen, M., Hjort, C., Houmark-Nielsen, M., Hubberten, H.W., Ingólfson, O**., Jakobsson, M.,** Kjær, K., Larsen, E., Lokrantz, H., Lunkka, J.P., Lysså, A., Mangerud, J., Maslenikova, O., Matioushkov, A., Murray, A., Möller, P., Niessen, F., Saarnisto, M., Siegert, C., Stein, R., Siegert, M.J., Spielhagen, R., 2004, The late Quaternary ice sheet history of Nortern Eurasia, *Quaternay Science Reviews* special QUEEN volume, *Quaternary Science Reviews*, **23**: 1229-1271.
9. Hubberten, H.W., Andreev, A., Astakhov V.I., Demidov, I., Dowdeswell, J.A., Henriksen, M., Hjort, C., Houmark-Nielsen, M**., Jakobsson, M.,** Kuzmina, S., Larsen, E., Lunkka, J.P., Lysså, A., Mangerud, J., Möller, P., Saarnisto, M., Schirrmeister, L., Sher, A.V., Siegert, C., Siegert, M.J., and Svendsen, J-I., 2004, The periglacial environment and climate in Northern Eurasia during the last glaciation, *Quaternary Science Reviews*, **23**: 1333-1357.
10. (*) **Jakobsson, M**., Grantz, A., Kristoffersen, Y., and Macnab, R., 2003, Physiographic provinces of the Arctic Ocean, *GSA Bulletin*, **115**: 1443-1455.
11. **Jakobsson, M**., Mayer, L., and Armstrong, A., 2003, Analysis of data relevant to extending a coastal State's jurisdiction over the seafloor under Law of the Sea Article 76, *International Hydrographic Review*, **4**: 17 pp.
12. **Jakobsson, M.,** Backman, J., Murray, A., and Løvlie, R., 2003, Optically stimulated luminescence dating supports central Arctic Ocean cm-scale sedimentation rates, *Geochemistry Geophysics Geosystems*, **4** (2): 1-11.
13. **Jakobsson, M.**, Calder, B., and Mayer, L., 2002, On the effect of random errors in gridded bathymetric compilations, *Journal of Geophysical Research*, **107**(B12): ETG 14-1 to ETG 14-11.

14. (*) **Jakobsson, M.,** 2002, Hypsometry and volume of the Arctic Ocean and its constituent seas, *Geochemistry Geophysics Geosystems,* **3** (2): 1-18.
15. (*) **Jakobsson, M.,** Løvlie, R., Arnold, E. M., Backman, J., Polyak, L., Knutsen, JO., and Musatov, E., 2001, Pleistocene stratigraphy and paleoenvironmental variation from Lomonosov Ridge sediments, central Arctic Ocean, *Global and Planetary Change,* **31**: 1-21.
16. (*) Mangerud, J., Astakov, V., **Jakobsson, M.** and Svendsen, J. I., 2001, Huge ice-age lakes in Russia, *Journal of Quaternary Science,* **16**: 773-777.
17. (*) Polyak, L., Edwards, M. H., Coakley, B. J. and **Jakobsson, M.**, 2001, Ice shelves in the Pleistocene Arctic Ocean inferred from glaciogenic deep-sea bedforms, *Nature,* **410**: 453-457.
18. (*) **Jakobsson, M.**, Cherkis, N., Woodward, J., Coakley, B., and Macnab, R., 2000, A new grid of Arctic bathymetry: A significant resource for scientists and mapmakers, *EOS Transactions*, American Geophysical Union, 81 (9): 89, 93, 96.
19. (*) **Jakobsson, M.**, Løvlie, R., Al-Hanbali, H., Arnold, E., Backman, J., and Mörth, M., 2000, Manganese and color cycles in Arctic Ocean sediments constrain Pleistocene chronology, *Geology,* **28**: 23-26.
20. **Jakobsson, M.,** 1999, First high-resolution chirp sonar profiles from the central Arctic Ocean reveal erosion of Lomonosov Ridge sediments, *Marine Geology,* **154**: 111-123.

**Accepted Refereed Articles:**

21. **Jakobsson, M.,** Armstrong, A., Calder, B., Huff, L., Mayer, L., and Ward, L., (in press), On the use of Historical Bathymetric Data to Determine Changes in Bathymetry: An Analysis of Errors and Application to Great Bay Estuary, New Hampshire, *International Hydrographic Review*, in press.
22. **Jakobsson, M.,** Flodén, T. and Expedition 302 Scientists, 2006 (in press), ACEX geophysics: Integrating past data with new results, In: Backman, J., Moran, K., McInroy, D.B., Mayer, L., and Expedition 302 Scientists, Proc. IODP, 302:College Station TX (Integrated Ocean Drilling Management International, Inc.), doi:10.2204/iodp.proc.302.102.205.
23. Moore, T.C., and the **Leg 302 Scientific Party**, 2006 (in press). Subsidence history of the Lomonosov Ridge. *In* Backman, J., Moran, K., McInroy, D., Mayer, L.A., and the Leg 302 Scientific Party, in press. *Proc. IODP, 302:* College Station TX (Integrated Ocean Drilling Program Management International, Inc. doi:10.2204/iodp.proc.302.105.2005.
24. Moran, K., Backman, J., Farrell, J., and **IODP Leg 302 Scientific Party**, 2006 (in press). Deepwater drilling in the Arctic Ocean's permanent sea-ice. In Backman, J., Moran, K., McInroy, D., Mayer, L.A., and the Leg 302 Scientific Party, in press. Proc. IODP, 302: College Station TX (Integrated Ocean Drilling Program Management International, Inc. doi:10.2204/iodp.proc.302.106.2005
25. **Jakobsson, M**., and Macnab, R., (in press), A comparison between GEBCO Sheet 5.17 and the International Bathymetric Chart of the Arctic Ocean (IBCAO) version 1.0, *Marine Geophysical Researches*.
26. **Jakobsson, M,** Siegert, M., and Paton, M., (in press), Is grounding of an ice shelf possible in the central Arctic Ocean? A modelling experiment, ICAM-IV, September 30-October 3, 2003, Conference Proceedings.

**Submitted Articles:**

27. Sluijs, A., Schouten, S., Pagani, M., Woltering, M., Pedentchouk, N., Brinkhuis, H., Sinninghe Damsté, J.S., Dickens, G.R., Huber, M., Reichart, G-J., Stein, R., Matthiessen, J., Lourens, L.J., Backman, J., Moran, K., and **the Expedition Scientists**,

2005(submitted), Subtropical Arctic Ocean temperatures during the Palaeocene Eocene thermal maximum, submitted to *Nature*.

28. Kathryn Moran , Jan Backman , Henk Brinkhuis , Steven C. Clemens , Thomas Cronin , Gerald R. Dickens , Frédérique Eynaud , Jérôme Gattacceca , **Martin Jakobsson**, Richard W. Jordan , Michael Kaminski , John King , Nalan Koc , Alexey Krylov , Nahysa, Martinez , Jens Matthiessen , David McInroy , Theodore C. Moore , Jonaotaro Onodera , A. Matthew O'Regan11, Heiko Pälike , Brice Rea , Domenico Rio , Tatsuhiko Sakamoto , David C. Smith11, Ruediger Stein15, Kristen St. John , Itsuki Suto , Noritoshi Suzuki , Kozo Takahashi17, Mahito Watanabe , Masanobu Yamamoto , Martin Frank , Wilfried Jokat15 ,and Yngve Kristoffersen, 2005(submitted), A First Look at the Cenozoic History of the Arctic Ocean, submitted to *Nature*.
29. Brinkhuis, H., Schouten, S., Collinson, M.E., Sluijs, A., Sinninghe-Damsté, J.S., Dickens, G.R., Huber, M., Cronin, T.M., Onodera, J., Takahashi, K., Bujak, J.P., van der Burgh, J.M., Stein, R., Matthiessen, J., Eldrett, J.S., Harding, I.C., Sangiorgi, F., de Leeuw, J.W., Lotter, A.F., and **IODP Leg 302 Expedition Scientists**. Episodic fresh surface waters in the early Eocene Arctic Ocean and adjacent seas, submitted to *Nature*.

**Conference Proceedings:**

30. Macnab, R., McCracken, M., Smith, A.G., **Jakobsson, M.,** 2004, Reclaiming Legacy Arctic Bathymetric Data at the Canadian Hydrographic Service, proceedings of the Canadian Hydrographic Conference 2004, Ottawa, May 24th - 27th, CDROM.
31. Macnab, R., **Jakobsson, M.,** and Varma, H., 2003, The International Bathymetric Chart of the Arctic Ocean (IBCAO) – A new direction for ocean mapmaking, celebration of 100 years of GEBCO, Conference Proceedings.
32. **Jakobsson, M**., Mayer, L., and Andrew Armstrong, 2003, Methodology for an analysis of data relevant to a claim of extended continental margin under Law of the Sea Article 76, U.S. Hydro 2003 Conference-CD, Mars 24-27, Mississippi, USA.
33. **Jakobsson, M.**, and Mayer, L., 2002, Using MGE applications and geomedia in marine geophysical/geological research, Conference Proceeding Geospatial World 2002, Atlanta June 10-12, USA, 16 pp.
34. **Jakobsson, M.,** 2001, Sedimentation in the central Arctic Ocean: What we knew in 1996 and what we know today, Abstract volume: Progress in Arctic Ocean Research over the past decades, The Royal Swedish Academy of Sciences, Stockholm Nov. 5-7, Sweden.
35. **Jakobsson, M.,** Calder, B., Mayer, L., and Armstrong, A., 2001, Error estimation of bathymetric grid models derived from historic and contemporary datasets, Conferences Proceedings U.S. Hydro 2001 conference, Norfolk, USA.

**Book Chapters:**

36. **Jakobsson, M**., 2005, Arctic Ocean; bathymetry and physiography, in: Wille, P.C. (Ed), Sound Images of the Ocean, Springer Berlin, Heidelberg. New York, ISBN-10 3-540-24122-1 and ISBN-13 978-3-540-24122-5.
37. **Jakobsson, M**., Grantz, A., Kristoffersen, Y., and Macnab, R., 2004, Bathymetry and physiography of the Arctic Ocean and its constituent seas, *in:* Stein, R., and Macdonald, R.W. (Eds.), Arctic Ocean Organic Carbon Cycle: Present and Past. Springer-Verlag, Berlin Heidelberg, p. 1-6.

**Popular Science Articles:**

(13 invited talks for a broader audience since 2001, not listed with titles)

38. Jonsson, S., Ebert, K., and **Jakobsson, M**., 2005, Introduktion till Västturkestans geografi, *in:* YMER, Centralasien –Västurkestan, Swedish Society for Anthropology and Geography (SSAG), p. 11-36.
39. Backman, J. and **Jakobsson, M**., 2005, Djuphavet kring Nordpolen och dess geologiska historia, Skärgård, v. 28, no. 3, p. 4-10.
40. Backman, J. and **Jakobsson, M**., 2005, Under Jordens mössa – en titt på det lilla djuphavet runt Nordpolen, *Geologisk Forum*, Geological Society of Sweden, v. 47.
41. Backman, J., Moran, K., McInroy, D., and the **IODP Leg 302 Expedition Scientists**, 2005. IODP Expedition 302, Arctic Coring Expedition (ACEX): A first look at the Cenozoic paleoceanography of the central Arctic Ocean. Scientific Drilling, 1:12-17.
42. **Jakobsson, M**., Mayer, L., and Armstrong, A., 2003, University of New Hampshire GIS maps may help U.S. extend jurisdiction over the seafloor beyond the current Exclusive Economic Zone, Directions Magazine http://www.directionsmag.com/article.php?article_id=316
43. Mangerud, J., Astakov, V., **Jakobsson, M**., Murray, A., and Svendsen, J.I., 2002, Verdens største innsjø er kartlagt, GEO, vol. 5, no. 3, p. 28-32.
44. Edwards, M., Anderson, R., Chayes, D., Coakley, B., Cochran, J., **Jakobsson, M.,** Kurras, G., Polyak, L., and Rognstad, M., 2001, SCICEX sonars chart new topographies, new theories, witness the Arctic, chronicles of the NSF Arctic Sciences Program, v. 9, no. 1, p. 1-2.
45. **Jakobsson, M.,** and Hermelin, O., 2001, Därför ligger Azorerna mitt i Atlanten, Forskning och Framsteg, no. 8, p. 46-49.

**Reports, Report Contributions**

46. **Jakobsson, M.,** Darby, D., Polyak., L., Eriksson, B., Lövlie, R., Sellen, E., and Wallin, Å., Healy-Oden Trans-Arctic Expedition (HOTRAX 2005): The geological program, Polarforskningssekretariatets Årsbok 2005.
47. Backman, J., Moran, K., McInroy, D., and IODP Leg 302 Expedition Scientists, 2005. Arctic Coring Expedition (ACEX): Paleoceanographic and tectonic evolution of the central Arctic Ocean. IODP Prel. Rept., 302 (Texas A&M University, College Station, TX). (www.iodp.org).
48. Backman, J., Moran, K., and the IODP Leg 302 Expedition Scientists, 2005. IODP Leg 302 - Arctic Coring Expedition (ACEX). Polarforskningssekretariatets Årsbok 2004.
49. **Jakobsson, M**., A prototype 1:6 Million map, 2002, *in:* Macnab, R., and Edwards, M. (eds), Bathymetric mapping of the North Polar Seas, Workshop report, University of Hawaii, p. 5-7.
50. **Jakobsson, M**., and Macnab, R., 3D-Visualization of IBCAO, 2002, *in:* Macnab, R., and Edwards, M. (eds), Bathymetry Mapping of the North Polar Seas, Workshop report, University of Hawaii, p. 40-43.
51. **Jakobsson, M**. and Macnab, R., The International Bathymetric Chart of the Arctic Ocean (IBCAO): Activity report for 2002, 2002, General Bathymetric Chart of the Oceans' (GEBCO) Thirteenth Meeting of the GEBCO Officers and the Nineteenth Meeting of the Sub-Committee on Digital Bathymetry, 20-21 May 2002, Durham NH, USA, Annex 4.
52. Macnab, R., and **Jakobsson, M.,** An Antarctic Bathymetric Compilation: a Follow-up to IBCAO? 2002, General Bathymetric Chart of the Oceans' (GEBCO) Thirteenth Meeting of the GEBCO Officers and the Nineteenth Meeting of the Sub-Committee on Digital Bathymetry, 20-21 May 2002, Durham NH, USA, Annex 5.
53. Macnab, R., and **Jakobsson, M**., The Digital Bathymetric Chart (DBC): the Future Shape of GEBCO/IBC? 2002, General Bathymetric Chart of the Oceans' (GEBCO) Thirteenth

Meeting of the GEBCO Officers and the Nineteenth Meeting of the Sub-Committee on Digital Bathymetry, 20-21 May 2002, Durham NH, USA, Annex 8.

54. Mayer, L., **Jakobsson, M.,** and Armstrong, A., 2002, The Compilation and Analysis of Data Relevant to a U.S. Claim Under United Nations Law of the Sea Article 76: A Preliminary Report, University of New Hampshire Report for the US Congress, pp. 1-75 plus Appendices.
55. **Jakobsson, M**., Mayer, L., and Armstrong, 2002, The Compilation and Analysis of Data Relevant to a U.S. Claim Under United Nations Law of the Sea Article 76: Maps, University of New Hampshire Report for the US Congress, 40 Maps.
56. Macnab, R., and **Jakobsson, M**., (eds), 2001, IOC/IASC/IHO Editorial Board for the International Bathymetric Chart of the Arctic Ocean, GSC Open File 4185. p 1-33.
57. **Jakobsson, M.,** 2000, A bathymetric and topographic model of the Arctic Ocean, *in:* IOC/IASC/IHO Editorial Board for the International Bathymetric Chart of the Arctic Ocean, Macnab, R., and Guy, N. (eds), GSC Open File 3893, p. 13.

**Publicly released maps, compilation data and databases:**

58. **Jakobsson, M**., Macnab, R., Cherkis, N., Schenke, H-W., et al., 2004, The International Bathymetric Chart of the Arctic Ocean, map scale 1:6,000,000, World Data Center for Marine Geology & Geophysics, Boulder, Research Publication RP-2.
59. General Bathymetric Chart of the Oceans (GEBCO) Digital Atlas (GDA), 2003. The bathymetric contours and grid models above 64°N included into this global digital atlas are from the IBCAO model (i.e. see publication 19). CD-ROM is available through the British Oceanographic Data Centre (BODC): ( http://www.ngdc.noaa.gov/mgg/gebco )
60. ETOPO2. The region above 64°N is included from the IBCAO model into this global elevation database sub sampled to 2-minute (latitude-longitude) resolution. CD-ROM available through the National Geophysical Data Center (NGDC): (http://www.ngdc.noaa.gov/mgg/fliers/01mgg04.html)
61. The International Bathymetric Chart of the Arctic Ocean (IBCAO). Bathymetric grid models, contours and maps of the Arctic Ocean. Available for download through the National Geophysical Data Center (NGDC): (http://www.ngdc.noaa.gov/mgg/bathymetry/arctic/arctic.html)

**Selected outreach activities during the past 5 years:**

62. Invited speaker: The Swedish Polar Club, title: ” Det fantastiska klimatarkivet Norra ishavet: Exempel från Beringia 2005, etapp 3”, November 9, 2005
63. Invited speaeker: Grand opening of the new section of Geosciences at Stockholm University, title in Swedish: ”Den första geovetenskapliga transekten över Norra Ishavet: Från Alaska till Svalbard via Nordpolen”, October 20, 2005.
64. Invited Speaker: Swedish, Royal Academy of Sciences, title: “Healy-Oden Trans-Arctic Expedition 2005”, October 5, 2005.
65. Invited to TV4 for presentation of “Healy-Oden Trans-Arctic Expedition 2005”, October, 2005.
66. Invited speaker: Onboard the icebreaker Oden for the Swedish Polar Club, title: ”The first deep-sea drilling in the central Arctic Ocean: 55 million years of climate and environmental history”, June 2, 2005.
67. Invited speaker: Swedish Society for Anthropology and Geography annual meeting, his Majesty King Carl XVI Gustaf guest of honour. Title: “The last years of geoscientific discoveries in the Arctic Ocean”, Mars 3, 2005.
68. Invited speaker: Swedish Royal Academy of Sciences, title of presentation: “From the Antarctic to the Arctic”, Feb 23, 2005.

69. Invited speaker: GeoBiosphere Science Centre, Lund University, Sweden. Title: “Recent geoscientific discoveries in the Arctic ocean.”, Dec 6, 2004.
70. Invited speaker: Department of Archaeology, Stockholm University, title translated to English: “Bathymetric surveys and digital data fusion in marine archaeology”, Dec 2, 2004.

**Conference Abstracts and Presentations:**

38 Conference Abstracts since 2001

## Anders Moberg:

**Published Refereed Articles:**

1. (*) **Moberg, A**., Sonechkin, D.M., Holmgren, K., Datsenko, N.M. and Karlén, W. 2005: Highly variable Northern Hemisphere temperatures reconstructed from low- and high-resolution proxy data. *Nature*, **433**: 613-617, doi:10.1038/nature03265.
2. (*) **Moberg, A**. and Jones, P.D. 2005: Trends in indices for extremes in daily temperature and precipitation in central and western Europe 1901-1999. *International Journal of Climatology*, **25***:* 1149-1171
3. (*) Esper, J. Wilson, R.S., Frank, D.C., **Moberg, A**., Wanner, H., Luterbacher, J. 2005: Climate: past ranges and future changes. *Quaternary Science Reviews*, **24**: 2164-2166.
4. (*) **Moberg, A**. and Jones, P.D. 2004: Regional Climate Model simulations of daily maximum and minimum near-surface temperatures across Europe compared with observed station data 1961-1990. *Climate Dynamics*, **23**: 695-715.
5. (*) **Moberg, A**., Alexandersson, H. Bergström, H. and Jones, P.D. 2003: Were Southern Swedish summer temperatures before 1860 as warm as measured? *International Journal of Climatology*, **23**: 1495-1521.
6. Klingbjer, P. and **A. Moberg**: A composite monthly temperature record from Tornedalen in northern Sweden 1802-2002. *International Journal of Climatology*, **23**: 1465-1494.
7. Jones, P.D. and **Moberg, A.** 2003: Hemispheric and large-scale surface air temperature variations: An extensive revision and an update to 2001. *Journal of Climate,* **16**: 206-223.
8. Linderholm, H.W., **Moberg, A**. and Grudd, H., 2002: Peatland pines as climate indicators? A regional comparison of the climatic influences on Scots pine growth in Sweden. *Canadian Journal of Forest Research*, **32**: 1400-1410.
9. Klein Tank, A.M.G., J.B. Wijngaard, G.P. Können, R. Böhm, G. Demarée, A. Gocheva, M. Mileta, S. Pashiardis, L. Hejkrlik, C. Kern-Hansen, R. Heino, P. Bessemoulin, G. Müller-Westmeier, M. Tzanakou, S. Szalai, T. Pálsdóttir, D. Fitzgerald, S. Rubin, M. Capaldo, M. Maugeri, A. Leitass, A. Bukantis, R. Aberfeld, A.F.V. van Engelen, E. Forland, M. Mietus, F. Coelho, C. Mares, V. Razuvaev, E. Nieplova, T. Cegnar, J. Antonio López, B. Dahlström, **A. Moberg**, W. Kirchhofer, A. Ceylan, O. Pachaliuk, L.V. Alexander, P. Petrovic, 2002. Daily dataset of 20th-century surface air temperature and precipitation series for European Climate Assessment (ECA). *International Journal of Climatology*, **22**: 1441-1453.
10. Jones, P.D., Briffa, K.R., Osborn, T.J., **Moberg, A.,** and Bergström, H. 2002: Relationships between circulation strength and the variability of growing season and cold season climate in northern and central Europe, *Holocene*, **12**: 643-656.
11. (*) **Moberg, A**., Bergström, H., Ruiz Krigsman, J and Svanered, O. 2002: Daily air temperature and pressure series for Stockholm (1756-1998), *Climatic Change*, **53**: 171-212.
12. (*) Bergström, H., and **Moberg, A**. 2002: Daily air temperature and pressure series for Uppsala (1722-1998), *Climatic Change*, **53**: 213-252.
13. Yan, Z., P.D. Jones, T.D. Davies, **A. Moberg**, H. Bergström, D. Camuffo, C. Cocheo, M. Maugeri, G. Demaree, T. Verhoeve, M. Barriendos, R. Rodriguez, J. Martin-Vide, C. Yang, 2002: Trends in extreme temperatures in Europe and China based on daily observations, *Climatic Change*, **53**: 355-392.
14. (*) Datsenko, N.M., **Moberg, A**. and Sonechkin, D.M. 2002: Objective time-scale-dependent homogenization of early instrumental temperature series. *Theor. Appl. Climatol.*, **72**: 103-126.

15. Holmgren, K., Tyson, P.D., **Moberg, A.** and Svanered, O. 2001: A preliminary 3000-year regional temperature reconstruction for South Africa. *South African Journal of Science*, **97**: 1-3.
16. Lee-Thorp, J.A., Holmgren, K., Lauritzen, S.-E., Linge, H., **Moberg, A.,** Partridge, T.C., Stevenson, C. and Tyson, P.D. 2001: Rapid climate shifts in the southern African interior throughout the mid to late Holocene. *Geophysical Research Letters,* **28**: 4507-4510.
17. Yan, Z., Jones, P.D. **Moberg, A.,** Bergström, H., Davies, T.D. and Yang, C. 2001: Recent trends in weather and seasonal cycles: An analysis of daily data from Europe and China, *Journal of Geophysical Research – Atmospheres,* **106**, D6: 5123-5138.
18. (*) **Moberg, A.,** P.D. Jones, M. Barriendos, H. Bergström, D. Camuffo, C. Cocheo, T.D. Davies, G. Demarée, J. Martin-Vide, M. Maugeri, R. Rodriguez and T. Verhoeve. 2000: Day-to-day temperature variability trends in 160- to 275-year-long European instrumental records. *Journal of Geophysical Research – Atmospheres*, **105**, D18: 22849-22868.
19. (*) **Moberg, A.** and Bergström, *H.* 1997: Homogenization of Swedish temperature data. Part III: The long temperature records from Stockholm and Uppsala. *International Journal of Climatology,* **17**: 667-699.

**Book Chapters**

20. **Moberg, A**., Tuomenvirta, H.,and Nordli, Ø. 2005: Recent climatic trends. In: Seppälä, M. (Ed.): *Physical Geography of Fennoscandia*. Oxford Regional Environments Series, Oxford University Press, Oxford, 113-133.
21. Jones, P.D., **A. Moberg**, T.J. Osborn and K.R. Briffa, 2003: Surface climate responses to explosive volcanic eruptions seen in long European temperature records and mid-to-high latitude tree-ring density around the Northern Hemisphere. In: *Volcanism and the Earth's Atmosphere*, A. Robock, C. Oppenheimer (eds.) Geophysical Monograph 139. American Geophysical Union, Washington D.C., pp. 239-254.
22. Folland, C.K., T.R. Karl, J.R. Christy, R.A. Clarke, G.V. Gruza, J. Jouzel, M.E. Mann, J. Oerlemans, M.J. Salinger, S.-W. Wang and 141 contributing authors (including **A. Moberg**) 2001: Observed Climate Variability and Change. In: *Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change* [Houghton, J.T.,Y. Ding, D.J. Griggs, M. Noguer, P.J. van der Linden, X. Dai, K. Maskell, and C.A. Johnson (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 881pp.

**Popular scientific journals**

23. **Moberg, A.** and Demarée, G. 2004: Ce que nous apprennent les thermométres. *Le Dossiers de la Recherche* 17, Nov 2004, 42-45.

## Knut Henning Rodhe:

**Published Refereed Articles:**

1. Kuylenstierna, J.C.I., **Rodhe, H**., Cinderby, S. and Hicks, K. 2001. Acidification in Developing Countries: Ecosystem Sensitivity and the Critical Load Approach on a Global Scale, *Ambio,* **30**: 20-28.
2. Lelieveld, J. et al. (27 authors including **Rodhe, H**.) 2001. The Indian Ocean Experiment: Widespread Air Pollution from South and Southeast Asia. *Science,* **291**: 1031-1036.
3. Huebert, B.J., Phillips, C.A., Zhuang, L., Kjellström, E., **Rodhe, H**., Feichter, J. and Land, C. 2001. Long-term measurements of free-tropospheric sulfate at Manua Loa: Comparison with global model simulations. *Journal of Geophysical Research* **106**: 5479-5492.
4. Bergan, T. and **Rodhe, H**. 2001. Oxidation of elemental mercury in the atmosphere; Constraints imposed by global scale modelling. *Journal of Atmospheric Chemistry*, **40**: 191-212.
5. Norman, M., Das, S.N., Pillai, A.G., Granat, L. and **Rodhe, H**. 2001. Influence of air mass trajectories on the chemical composition of precipitation in India. *Atmospheric Environment,* **35**: 4223-4235.
6. Granat, L., Das, S.N., Tharkur, R.S. and **Rodhe, H**. 2001. Atmospheric deposition in a rural area in India - Net and potential acidity. *Water, Air, and Soil Pollution,* **130**: 469-474.
7. **Rodhe, H**., Dentener, F. and Schulz, M. 2002. The Global Distribution of Acidifying Wet Deposition. *Environmenral Science Technol*ogy, **36**: 4382-4388.
8. Werner, M., Tegen, I., Harrison, S.P., Kohfeld, K.E., Prentice, I.C., Balkanski, Y., **Rodhe, H**. and Roelandt, C. 2002. Seasonal and interannual variability of the mineral dust cycle under present and glacial climate conditions. *Journal of Geophysical Research* **108**: 4744, doi:10.1029/2002JD002365
9. Granat, L., Norman, M., Leck, C., Kulshrestha, U. C. and **Rodhe, H.**. 2002. Wet scavenging of sulfur compounds and other constituents during the Indian Ocean Experiment. *Journal of Geophysical Research – Atmospheric*, **107, D19**: Art. No. 8025, doi: 10.1029/2001JD000499.
10. Claquin, T., Roelandt, C., Kohfeld, K.E., Harrison, S.P., Tegen, I., Prentice, I.C., Balkanski, Y., Bergametti, G., Hansson, M., Mahowald, N., **Rodhe, H**. Schulz, M. 2003. Radiative forcing of climate by ice-age atmospheric dust. *Climate Dynamics,* **20**: 193-202, doi: 10.1007/s00382-002-0269-1
11. Anderson, T.L., Charlson, R.J., Schwartz, S.E., Knutti, R., Boucher, O., **Rodhe, H**. and Heintzenberg, J. 2003. Climate Forcing by Aerosols - a Hazy Picture. *Science*, **300**: 1103-1104.
12. Norman, M., Leck, C. and **Rodhe, H**. 2003. Differences across the ITCZ in the chemical characteristics of the Indian Ocean MBL aerosol during INDOEX. *Atmos. Chem. Phys.,* **3**: 563-579.
13. Ekman, A.M.L. and **Rodhe, H**. 2003. Regional temperature response due to indirect sulphate aerosol forcing: Impact of model resolution. *Climate Dynamics,* **21**: 1-10, doi:10.1007/s00382-003-0311-y
14. Anderson, T. L., Charlson, R. J., Schwartz, S. E., Knutti, R., Boucher, O., **Rodhe, H**. and Heintzenberg, J. 2003. Response to "The parasol effect on climate" by P. J. Crutzen and V. Ramanathan. *Science*, **302**: 1680-1681.
15. Momin, G.A., Ali, K., Rao, P.S.P., Safai, P.D., Chate, D.M., Praveen, P.S., **Rodhe, H.** and Granat, L. 2005. Study of chemical composition of rainwater at an urban (Pune) and a rural (Sinhagad) location in India. *Journal of Geophysical Research* **110**: D08302, doi:10.1029/2004JD004789.
16. Gumbel, J., **Rodhe, H**. 2005. Comment on “Thermal pollution causes global warming”, by B. Nordell, *Global and Planetary Change* **47**: 75-76.

17. Kulshrestha, U.C., Granat, L., Engardt, M. and **Rodhe, H**. 2005. Review of precipitation monitoring studies in India – a search for regional patterns. *Atmospheric Environment* **39**: 7403-7419.
18. Bender, F.A-M., **Rodhe, H.**,Charlson, R.J., Ekman, A.M.L. and Loeb, N. 2006. 22 views of the global albedo - comparison between 20 GCMs and two satellites. Accepted for publication in *Tellus B*.

***The 10 most important papers since 1990 of relevance to this application***

19. (*) **Rodhe, H.** 1990. A comparison of the contributions of various gases to the greenhouse effect. *Science* **248**: 1217-1219.
20. (*) Charlson, R.J., Langner, J. and **Rodhe, H.** 1990. Sulphate aerosol and climate. *Nature* **348**: 22.
21. (*) Charlson, R.J., Langner, J., **Rodhe, H.**, Leovy, C.B. and Warren, S.G. 1991. Perturbation of the northern hemisphere radiative balance by backscattering from anthropogenic sulfate aerosols. *Tellus* **B 43 AB**: 152-163.
22. (*) Langner, J. and **Rodhe, H.** 1991. A global three-dimensional model of the tropospheric sulfur cycle. *Journal of Atmpheric Chemistry* **13**: 225-263
23. (*) Engardt, M. and **Rodhe, H**. 1993. A comparison between patterns of temperature trends and sulfate aerosol pollution. *Geophysical Research Letters* **20**: 117-120.
24. (*) Azar, Ch. and **Rodhe, H**. 1997. Targets for Stabilization of Atmospheric $CO_2$. *Science,* **276**: 1818-1819.
25. (*) Roeckner, E., Bengtsson, L., Feichter, J., Lelieveld, J. and **Rodhe, H**. 1998. Transient climate change simulations with a coupled atmosphere-ocean GCM including the tropospheric sulfur cycle. *J. of Climate,* **12**: 3004 –3032.
26. (*) **Rodhe, H**., Charlson, R.J. and Anderson, L. 2000. Avoiding circular logic in climate modeling. *Climatic Change,* **44**: 419-422.
27. (*) Claquin, T., Roelandt, C., Kohfeld, K.E., Harrison, S.P., Tegen, I., Prentice, I.C., Balkanski, Y., Bergametti, G., Hansson, M., Mahowald, N., **Rodhe, H**. Schulz, M. 2003. Radiative forcing of climate by ice-age atmospheric dust. *Climate Dynamics,* **20**: 193-202, doi: 10.1007/s00382-002-0269-1
28. (*) Anderson, T.L., Charlson, R.J., Schwartz, S.E., Knutti, R., Boucher, O., **Rodhe, H**. and Heintzenberg, J. 2003. Climate Forcing by Aerosols - a Hazy Picture. *Science,* **300**: 1103-1104.

**Book chapter:**

29. Wuebbles, D.J., Brasseur, G.P. and **Rodhe, H**. 2003. Changes in the chemical composition of the atmosphere. In Brasseur, G.P., Prinn, R.G. and Pszenny, A.P. (eds.) *Atmospheric Chemistry in a changing world*. Springer Verlag Berlin. 1-17.

**Conference presentations:**

Ca 20 during the past 5 years

**Outreach activities during the past 5 years:**

Ca 10 articles related to the climate issue in major daily Swedish media.

Three articles related to the climate issue in Swedish popular science magazines.

Several interviews in National TV and radio.

## Michael Tjernström:

**Published Refereed Articles:**

1. (*) Samuelsson, P., and **M. Tjernström,** 2001: The effect of a small lake on the mesoscale boundary-layer flow in NOPEX. *Journal of Geophysical Research*, **106**: 12419 - 12435.
2. (*) Söderberg, S., and **M. Tjernström**, 2001: Supercritical channel flow in the coastal atmospheric boundary layer: Idealized numerical simulations. *Journal of Geophysical Research*, **106**: 17811 - 17829.
3. Söderberg, S., and **M. Tjernström**, 2002: Transitions in supercritical flows along mountainous coastlines: On the Diurnal Cycle, *Journal of Atmospheric Sciences*, **59**: 2615-2624.
4. Zagar, M., G. Svensson and **M. Tjernström**, 2003: A method for determining the smallscale variability of the surface turbulent momentum flux seaward of the coast. *Journal of Applied Meteorology*, **42**: 291-307.
5. (*) Brooks, I., S. Söderberg and **M. Tjernström**, 2003: The turbulence structure of the stable atmospheric boundary layer around a coastal headland: Aircraft observations and modeling results. *Boundary-Layer Meteorology*, **107**: 531-559.
6. (*) **Tjernström, M** and Anna Rune, 2003: The turbulence structure of stratocumulus during the ASTEX first Lagrangian experiment. *Quarterly Journal of the Royal Meteorological Society*, **129**: 1071 - 1100.
7. Ström, L., and **M. Tjernström**, 2004. Variability in the summertime coastal marine atmospheric boundary layer off California, *Quarterly Journal of the Royal Meteorological society*, **130**: 423-448.
8. (*) Leck, C., **M. Tjernström**, P. Matrai and E. Swietlicki, 2004: Microbes, clouds and climate: Can marine microorganisms influence the melting of the Arctic pack ice? *EOS Transactions*, **85**: pp 25, 30, 32.
9. **Tjernström**, M., M. Žagar and G. Svensson, 2004: Model simulations of the Arctic atmospheric boundary layer from the SHEBA year. *AMBIO*, **33**: 221 – 227.
10. Rummukainen, M., S. Bergström, G. Persson, J. Rodhe and **M. Tjernström**, 2004: The Swedish regional climate modelling programme: A review, SWECLIM. *AMBIO*, **33**: 176 – 182.
11. (*) **Tjernström, M.**, C. Leck, P. O. G. Persson, M. L. Jensen, S. P. Oncley and A. Targino, 2004: The summertime Arctic atmosphere: Meteorological measurements during the Arctic Ocean Experiment (AOE-2001). *Bulletin of the American Meteorological Society*, **85**: 1322 - 1322.
12. **Tjernström**, M., C. Leck, P. O. G. Persson, M. L. Jensen, S. P. Oncley and A. Targino, 2004: Experimental equipment: A supplement to The summertime Arctic atmosphere: Meteorological measurements during the Arctic Ocean Experiment (AOE-2001). *Bulletin of the American Meteorological Society*, **85**:1322 - 1322.
13. (*) **Tjernström, M.,** M. Žagar, G Svensson, J Cassano, S. Pfeifer, A. Rinke, K. Wyser, K. Dethloff, C. Jones and T. Semmler, 2005: Modeling the Arctic Boundary Layer: An evaluation of six ARCMIP regional-scale models with data from the SHEBA project. *Boundary-Layer Meteorology*, **117**: 337 - 381.

14. (*) **Tjernström**, M., 2005: The summer Arctic boundary layer during the Arctic Ocean Experiment 2001 (AOE-2001). *Boundary-Layer Meteorology*, **117**: 5 - 36.
15. Zagar, M., G. Svensson and **M. Tjernström**, 2005: High spatial and temporal variability of dry deposition in a coastal region. *Environmental Fluid Mechanics*, **5**: 357 - 372.

**Accepted Refereed Articles:**

16. Spokes, L., T. Jickells, K. Weston, B. Gustafsson, M. Johnsson B, Liljebladh, D. Conley, C. Ambelas-Skjødth, J. Brandt, J. Carstensen, T. Christiansen, L. Frohn, G. Geenaert, O. Hertel, B. Jensen, C. Lundsgaard, S. Markager, W. Martinsen B. Møller, B. Pedersen, K. Sauerberg, L. Sørenson, C. Hasager, A. Sempreiva, S. Pryor, L. Søren, **M. Tjernström**, G. Svensson, M. Zagar, 2006: MEAD – An Interdisciplinary study of the marine effects of atmospheric deposition in the Kattegat, *Environmental Pollution*, Accepted.
17. Angevine, W. M., **M. Tjernström** and M. Zagar, 2006: Modeling of the coastal boundary layer and pollutant transport in New England. *Journal of Applied Meteorology*, Accepted.
18. (*) Heintzenberg, J., C. Lec, W. Birmili, B. Wehner, and **M. Tjernström**, 2006: Aerosol number-size distributions during clear and fog periods in the summer high Arctic: 1991, 1996, and 2001. *Tellus*, Accepted.
19. Rinke, A., K. Dethloff, J. Cassano, J.H. Christensen, J.A. Curry, J.-E. Haugen, D. Jacob, C.G. Jones, M. Køltzow, A.H. Lynch, S. Pfeifer, M.C. Serreze, M.J. Shaw, **M. Tjernström**, K. Wyser, M. Zagar, 2006: Evaluation of an Ensemble of Arctic Regional Climate Models: Spatial Patterns and Height Profiles. *Climate Dynamics*, Accepted.

**Submitted Articles:**

20. (*) Prenni, A., J., J. Y. Harrington, **M. Tjernström**, P. J. DeMott, A. Avramov, C. N. Long, S. M. Kreidenweis, P. Q. Olsson, J. Verlinde, 2007: Do aerosols regulate Arctic cloudiness? *Bulletin of the American Meteorological Society*, Submitted.

**Reviews and conference proceedings:**

21. Svensson, G., **M. Tjernström,** M. Zagar, 2001: High-resolution modeling of atmospheric dispersion and turbulent transport in the coastal marine boundary layer. Eurotrac-2, *CAPMAN Annual Report 2000*, 30 - 35.
22. Brooks, I., S. Söderberg and **M. Tjernström,** 2001: The turbulence structure of the stable atmospheric boundary layer around a coastal headland. I Aircraft observations. 4$^{th}$ Conference on Coastal Atmospheric and Oceanic Prediction and Processes in St Petersburg, Florida, 6 - 9 November 2001.
23. Söderberg, S., **M. Tjernström** and I. Brooks, 2001: The turbulence structure of the stable atmospheric boundary layer around a coastal headland. II Model results. 4$^{th}$ Conference on Coastal Atmospheric and Oceanic Prediction and Processes in St Petersburg, Florida, 6 - 9 November 2001.
24. Sundararajan, R., D. Koracin and **M. Tjernström**, 2001: The effect of marine intrusions over coastal California. 4$^{th}$ Conference on Coastal Atmospheric and Oceanic Prediction and Processes in St Petersburg, Florida, 6 - 9 November 2001.
25. **Tjernström**, **M.**, G. Svensson, and R. Sundararajan, 2003: Mesoscale meteorology - is it important and can it be defined?, NATO Advanced Science Workshop on “Air pollution on regional scale”, Kallithea, Greece, 13-15 June 2002.

26. **Tjernström**, **M.**, and A. Rune, 2002: Vertical structure of the ASTEX first Lagrangian cloud and boundary layer. 15th Conference on Boundary Layer and Turbulence, Wageningen, The Netherlands, 14-19 July 2002.
27. Söderberg, S., IM Brooks, and **M. Tjernström**, 2002: Local scaling of turbulence in the stable internal boundary layer around a coastal headland. 15th Conference on Boundary Layer and Turbulence, Wageningen, The Netherlands, 14-19 July 2002.
28. Söderberg, S., **M. Tjernström**, and I. M. Brooks, 2002: Taking a closer look at the turbulence in a higher-order closure mesoscale model. 15th Conference on Boundary Layer and Turbulence, Wageningen, The Netherlands, 14-19 July 2002.
29. Zagar, M., G. Svensson and **M. Tjernström**, 2002: Coastal small-scale variability of the surface turbulent momentum flux. 15th Conference on Boundary Layer and Turbulence, Wageningen, The Netherlands, 14-19 July 2002.
30. **Tjernström**, **M**., M. L. Jensen, S. Oncley, P. O. G. Persson and A. Targino, 2002: The boundary-layer program during the Arctic Ocean 2001 experiment. 15th Conference on Boundary Layer and Turbulence, Wageningen, The Netherlands, 14-19 July 2002.
31. Targino A. and **M. Tjernström**, 2002: The structure of the Arctic surface layer during the AO2001 expedition. 15th Conference on Boundary Layer and Turbulence, Wageningen, The Netherlands, 14-19 July 2002.
32. M. Jensen, **M. Tjernström** and A. Targino, 2002: A new system for airborne measurements of high-resolution 3D winds using a tethered lifting system (TLC). 15th Conference on Boundary Layer and Turbulence, Wageningen, The Netherlands, 14-19 July 2002.
33. Persson, P. O. G., S. Abbott, M. L. Jensen, B. Larsson, V. Leuski, A. Targino, B. Templeman, **M. Tjernström**, and A. B. White, 2002: Remote sensing of the late-summer boundary layer near the north pole. 15th Conference on Boundary Layer and Turbulence, Wageningen, The Netherlands, 14-19 July 2002.
34. Zagar, M., **M. Tjernström** and G. Svensson, 2003: A simulation of the SHEBA year (October 1997 – October 1998) with COAMPS model, European Geophysical Union General Assembly, Nice, 7 - 11 April, 2003.
35. Zagar, M., G. Svensson and **M. Tjernström**, 2003: Estimating the impact of the meteorological model to an environmental application. European Geophysical Union General Assembly, Nice, 7 - 11 April 2003.
36. **Tjernström, M.**, 2003: Boundary-layer structure in the high Arctic during the AOE-2001. 7th Conference on Polar Meteorology and Oceanography, Hyannis, 12-16 May 2003.
37. **Tjernström, M**., M. L. Jensen, S. P. Oncley and P. O. G. Persson, 2003: The AOE-2001 meteotological experiment in the high Arctic. 7th Conference on Polar Meteorology and Oceanography, Hyannis, 12-16 May 2003.
38. **Tjernström, M.** and C. Leck, 2003: Possible feedbacks on Arctic cloud formation: Can the Arctic biosphere affect the melting of the ice? , SEARCH Open Science Meeting, Seattle, 27 - 30 October 2003.
39. **Tjernström, M.** and C. Leck, 2003: The Swedish icebreaker Oden as a research platform: The Arctic Ocean Experiment 2001, SEARCH Open Science Meeting, Seattle, 27 – 30, October 2003.

40. **Tjernström, M.**, 2004: Klimatmodeller och modellklimat - Syntesrapport om klimatmodellering kopplad eller annan - från SWECLIM. Från: *Klimatmodellering och klimatscenarier ur SWECLIM's perspektiv* (ed: G. Persson). *SMHI Reports Meteorology and Climatology* **No. 102**, SMHI, SE-601 76 Norrköping, Sweden, pp. 1 - 28.
41. **Tjernström, M.**, 2004: The Arctic boundary layer in six regional models compared to SHEBA observations. High-resolution climate modeling workshop: Assessment, added value and application, WCRP-workshop in Lund, Sweden, 19 March – 2 April 2004.
42. Söderberg, S., and **M. Tjernström** 2004: Modeling the turbulent structure of the katabatic jet, 16th Symposium on Boundary Layers and Turbulence, Portland, Maine 9 – 13 August 2004.
43. Angevine, W. M., M. Žagar, **M. Tjernström**, C. Senff, and A. White, 2004: Coastal boundary layer transport of urban pollution in New England, 16th Symposium on Boundary Layers and Turbulence, Portland, Maine 9 – 13 August 2004.
44. **Tjernström, M**, M. Zagar, G. Svensson, J. J. Cassano, K. Dethloff, C. G. Jones, S. Pfeifer, A. Rinke, T. Semmler, M. Shaw, and K. Wyser , 2004: The Arctic boundary layer in six regional scale (ARCMIP) models, , 16th Symposium on Boundary Layers and Turbulence, Portland, Maine 9 – 13 August 2004.
45. Zagar, M., **M. Tjernström** and W. M. Angevine , 2004: New England coastal boundary layer modeling, 16th Symposium on Boundary Layers and Turbulence, Portland, Maine 9 – 13 August 2004.
46. **Tjernström**, **M.** and T. Mauritsen , 2004: Variability and vertical structure of the summer Arctic boundary layer, 16th Symposium on Boundary Layers and Turbulence, Portland, Maine 9 – 13 August 2004.
47. **Tjernström**, **M.** and C. Leck, 2004: The swedish icebreaker Oden as a research platform: The arctic ocean experiment 2001, Bjerknes Centennial Symposium, Bergen, 1 – 3 September 2004.
48. **Tjernström**, **M,** M. Zagar, G. Svensson, 2004: How good is the surface energy balance in current atmospheric climate models? , Bjerknes Centennial Symposium, Bergen, 1 – 3 September 2004.
49. Leck, C., and **M. Tjernström,** 2004: Possible feedbacks on arctic cloud formation: can the arctic biosphere affect the melting of the ice? , Bjerknes Centennial Symposium, Bergen, 1 – 3 September 2004.
50. Graversen, R. G, **M. Tjernström**, and E. Källen, 2004: Do changes in the mid-latitude circulation have any impact on arctic surface air temperature trend? , Bjerknes Centennial Symposium, Bergen, 1 – 3 September 2004.
51. **Tjernström**, **M.**, 2005: Coastal and polar atmospheric regional modeling – how good are our models? (Invited Presentation), Joint Session of 6th Conference on Coastal Atmospheric and Oceanic Prediction and Processes, and 8th Conf on Polar Meteorology and Oceanography, San Diego, 9 – 12 January 2005.
52. **Tjernström**, **M.**, M. Zagar and W. M. Angevine , 2005: New England coastal air pollution dispersion modeling. 6th Conference on Coastal Atmospheric and Oceanic Prediction and Processes, San Diego, 9 – 12 January 2005.
53. Leck, C., K. Bigg and **M. Tjernström**, 2005: Sources of biogenic aerosol particles over the central Arctic Ocean associated with the open lead surface microlayer. 8th Conf on Polar Meteorology and Oceanography, San Diego, 9 – 12 January 2005.

54. **Tjernström**, **M.** and T. Mauritsen, 2005: Variability and vertical structure of the summer Arctic boundary layer. 8th Conf on Polar Meteorology and Oceanography, San Diego, 9 – 12 January 2005.

55. **Tjernström**, **M.**, M. Zagar, G. Svensson, A. Rinke, K. Dethloff, J. Cassano, C. Jones, K. Wyser, and M. Shaw, 2005: The Arctic boundary layer in six regional scale (ARCMIP) models. 8th Conf on Polar Meteorology and Oceanography, San Diego, 9 – 12 January 2005.

56. **Tjernström**, **M.**, 2005: So what is so special about Arctic clouds?, CIRES Distinguished Lecture, 11 November, CIRES, Colorado University at Boulder, USA.

57. **Tjernström**, **M.**, 2005: Are coastal atmospheric boundary layers modeled sufficiently well for small-scale coupling to the coastal ocean? NURC Workshop on High Resolution Coupled Coastal Årediction Systems, 28 November – 2 December, La Spezia, Italy.

**Books:**

58. **Tjernström**, **M.**, G. Svensson, and R. Sundararajan, 2003: Mesoscale meteorology - is it important and can it be defined? in "Air pollution on regional scale", D. Melas and D. Syrakov editors, NATO Science Series, Kluwer Academic Publishers, Dordrecth, pp 408.

**Popular science papers and presentations:**
*Not listed here are numerous appearances in the media, mostly related to the climate-change debate: daily and weekly papers as well as national radio and television.*

59. **Tjernström**, **M.**, 2001: Dynamisk nedskalning av ERA-analyser och modellutveckling inom SWECLIM (Dynamical downscaling of ERA-analyses and model development in SWECLIM), *SWECLIM Annual Report 2000*.

60. **Tjernström**, **M**, 2002: Mot ett kopplat synsätt (*Towards a coupled approach*, in Swedish), *SWECLIM Annual Report 2001*.

61. **Tjernström**, **M.** and E. Erixon, 2002: The meteorological department of Stockholm University sailed north for the Arctic Ocean 2001 expedition, *Vaisala News*, **159**.

62. **Tjernström**, **M.** and coauthors, 2003: Växthuseffekten, Klimat, Klimatförändringar, Klimatmodeller etc. flera avsnitt, Svenska Nationalencyklopedin (Greenhouse effect, Climate, Climate change, Climate models etc. several pieces, in Swedish), *Swedish National Encyclopedia*.

63. **Tjernström**, **M.** and P. Samuelsson, 2003: Energibalans i klimatmodeller (*Energy balance in climate models*, in Swedish), *SWECLIM Annual Report 2002*.

64. **Tjernström**, **M.** and C. Leck, 2003: Gränsskiktsmätningar under Arctic Ocean 2001 (Boundary layer measurements during Arctic Ocean 2001, in Swedish). *Polarfront*, **113**, 21 – 25.

65. **Tjernström**, **M.** and G. Svensson, 2004: Klimatet i Arktis - Förr och i framtiden (Arctic climate - Past and future, in Swedish), *Polarfront*, **115**, 5 – 9.

66. **Tjernström**, **M.** and G. Svensson, 2004: Det globala klimatet och det i Arktis – Är det någon skillnad, och kan vi lära oss något av den? (*Global and Arctic climate – Is there a difference and can we learn anything from it?*, in Swedish). *Polarfront*, **117**, 5 - 8.

67. **Tjernström**, **M.** and G. Svensson, 2004: Arktis och det globala klimatet – vill lära oss något av det? (*Arctic and the global climate – Do we want to learn anything from it?*, in Swedish). *Polarfront*, 119, 5 - 8.

68. **Tjernström**, **M.,** 2005: Rätt och fel i klimatdebatten (*Right and wrong in the climate debate*, in Swedish). *Forskning och framsteg*, **2,** 19-20.

69. Hur bra är våra modeller (In Swedish, *How good are our models)*. April 2005, Swedish Air Force Weather Service Annual Research and Development Meeting, Stockholm, Sweden.

70. Varför ändrar sig klimatet – och hur? (*Why is the climate changing – and how?*, in Swedish), Dept. of Environmental Science, Uppsala University.

71. Klimatförändringar som naturkatastrof (*Climate change as a natural disaster*, in Swedish), November 2004, Dept Physical Geography, Stockholm University.

72. Klimatet i Arktis – hur ändrar det sig och varför skall vi bry oss? (*The Arctic climate- how is it changing and why should we care*, in Swedish), November 2004, Swedish Polar Research Secretariat, 20th anniversary.

73. Klimatet i Arktis (In Swedish, *The Arctic climate*), August 2004, The Nobel Summer Research School for senior high-school students, Karlskoga.

74. Klimatförändringar i Sverige (In Swedish, *Climtate change in Sweden*), October 2003, Haninge Rotary.

75. Arctic Ocean 2001. Intryck från en forskningsresa till en mycket märklig – och vacker – plats (In Swedish, *Arctic Ocean 2001. Impressions from a research journey to a very special – and beautiful place*), October 2003, Swedish Meteorological Society, Uppsala.

76. Vad händer med Sveriges klimat (In Swedish, *What happens to the Swedish climate*), August 2003, The Nobel Summer Research School for senior high-school students, Karlskoga.

77. Klimatförändringar ur ett nordiskt perspektiv (In Swedish, *Climate change from a Noridc perspective*), November 2002, Klimat och Miljöforum, Kiruna.

78. Medelvärden eller extremer: Hur kan vi säga om - och hur - klimatet förändras? (In Swedish, *Mean values or extremes. How can we tell if – and how – the climate changes*), November 2002, Spektrum Ångström, Uppsala.

79. Klimatmodeller som arbetsverktyg (In Swedish, *Climate models as a tool*), October 2002, Miljöforum, Norrköping.

80. Intryck från Arktis (In Swedish, *Impressions from the Arctic*). Swedish Air Force Weather Service Annual Research and Development Meeting, Stockholm.

81. Klimatet i Norden (In Swedish, *The Nordic climate*): February 2001, Näringslivets Miljöchefer (Environmental Controlers in Sweden), Naturskyddsverket (Swedish EPA) and World Watch Institute, Stockholm.

82. Resultat från Nopex (In Swedish, *Results from Nopex)*. April 2001, Swedish Air Force Weather Service Annual Research and Development Meeting, Stockholm, Sweden.

83. Sweclim – Svensk klimatmodellering (In Swedish, *Sweclim – Swedish climate modeling)*. April 2001, Swedish Air Force Weather Service Annual Research and Development Meeting, Stockholm, Sweden.

## Ulrike Barbara Wohlfarth:

**Published Refereed Articles:**

1. Björck, S. and **Wohlfarth, B**., 2001: $^{14}C$ chronostratigraphic techniques in paleolimnology. In Last, W. M. and Smol, J. P. (eds): Tracking Environmental Change Using Lake Sediments: Physical and Chemical Techniques. Kluwer Academic Publishers, Dordrecht, The Netherlands, 205-245.
2. Lundqvist, J. and **Wohlfarth, B.,** 2001: Timing and east-west correlation of south Swedish ice marginal lines during the Late Weichselian. *Quaternary Science Reviews*, **20**: 1127-1148.
3. Björck, S. and **Wohlfarth, B**., 2001: $^{14}C$ chronostratigraphic techniques in paleolimnology. In Last, W. M. and Smol, J. P. (eds): Tracking Environmental Change Using Lake Sediments: Physical and Chemical Techniques. Kluwer Academic Publishers, Dordrecht, The Netherlands, 205-245.
4. **Wohlfarth, B.**, Hannon, G., Feurdean A., Ghergari, L., Onac, B. P. and Possnert, G., 2001: Reconstruction of climatic and environmental changes in NW Romania during the early part of the last deglaciation (15,000-13,600 cal years BP). *Quaternary Science Reviews*, **20**: 1897-1914.
5. Onac, B., Björkman, L., Björck, S., Clichici, O., Tamas, T., Peate, D. and **Wohlfarth, B**., 2001: The first dated Eemian lacustrine deposit in Romania. *Quaternary Research*, **56**: 62-65.
6. Björkman, L., Feurdean, A., Cinthio, K., **Wohlfarth, B.** and Possnert, G., 2002: Late Glacial and early Holocene woodland development in the Gutaiului Mountains, NW Romania. *Quaternary Science Reviews,* **21**: 1039-1059.
7. Subetto, D. A., **Wohlfarth, B.**, Davydova, N. N., Sapelko, T. V., Björkman, L., Solovieva, N., Wastegård, S., Possnert, G. and Khomutova, V. I., 2002: Climate and environment on the Karelian Isthmus, northwestern Russia, 13 000-9000 cal yrs BP. *Boreas*, **31**: 1-19.
8. Sander, M., Bengtsson, L., Holmquist, B. and **Wohlfarth, B.,** 2002: The relationship between annual varve thickness and maximum annual discharge (1909-1971 AD). *Journal of Hydrology*, **236**: 23-35.
9. **Wohlfarth, B**., Filimonova, L., Bennike, O., Björkman, L., Brunnberg, L., Lavrova, N., Demidov, I., and Possnert, G., 2002: Late Glacial and early Holocene environmental and climatic change at Lake Tambichozero in south-eastern Russian Karelia. *Quaternary Research,* **58**: 261-272.
10. Björkman, L., Feurdean, A., **Wohlfarth, B**., 2003: Late Glacial and Holocene forest dynamics at Steregoiu in the Gutaiului Mountains, Northwest Romania. *Review of Palaeobotany and Palynology*, **124**: 79-111.
11. Davies, S., Wastegård, S. and **Wohlfarth, B**., 2003: Extending the limits of the Borrobol Tephra to Scandinavia and detection of new early Holocene tephras. *Quaternary Research,* **59**: 345-352.
12. **Wohlfarth, B**., Schwark, L., Bennike, O., Filimonova, L., Tarasov, P., Björkman, L., Brunnberg, L., Demidov, I. and Possnert, G., 2004: Unstable early Holocene climatic and environmental conditions in northwestern Russia derived from a multidisciplinary study of a lake sediment sequence from Pichozero, southeastern Russian Karelia. *The Holocene*, **14**: 732-746.

13. Bergman, J., Wastegård, S., Hammarlund, D., **Wohlfarth, B**. and Roberts, S. J., 2004: Holocene tephra horizons of the Klocka bog, west-central Sweden: Aspects of distribution, deposition and reproducibility. *Journal of Quaternary Science*, **19**: 1-9.
14. Hammarlund, D., Velle, G., Wolfe, B. B., Edwards, T. W. D., Snowball, I., Barnekow, L., Holmgren, S., Lamme, S., **Wohlfarth, B.**, Possnert, G., 2004: Palaeolimnological and sedimentary responses to Holocene forest retreat in the Scandes Mountains, west-central Sweden. *The Holocene*, **14**: 862-876.
15. Davies, S. M., **Wohlfarth, B**., Wastegård, S., Andersson, M., Possnert, G. and Blockley, S., 2004: Were there two Borrobol Tephras during the early Lateglacial period: implications for tephrochronology? *Quaternary Science Reviews*, **23**: 581-589.
16. Clague, J. J., **Wohlfarth, B**., Ayotte, J., Eriksson, M., Hutchinson, I., Mathewes, R. W., Walker, I. R., and Walker, L., 2004: Late Holocene Environmental Change at Treeline in the Northern Coast Mountains, British Columbia, Canada. *Quaternary Science Reviews*, **23**: 2413-2431.
17. **Wohlfarth, B.,** Blaauw, M. Davies, S. M., Andersson, M., Wastegård, S., Hormes, A. and Possnert, G., 2006: Constraining the age of Lateglacial and early Holocene pollen zones and tephra horizons in southern Sweden with Bayesian probability methods. *Journal of Quaternary Sciences*, **21**: 1-14.
18. Bergman, J. Hammarlund, D., Hannon, G., Barnekow, L. and **Wohlfarth, B**., 2005: Deglacial vegetation succession and Holocene tree-limit dynamics in the Scandes Mountains, west-central Sweden: stratigraphic data compared to megafossil evidence. *Review of Paleobotany and Palynology*, **134**: 129-151.

**Accepted Refereed Articles:**

19. **Wohlfarth, B**., Tarasov, P., Bennike, O., Lacourse, T., Subetto, D., Torssander, P. and Romanenko, F.: Late Glacial and Holocene palaeoenvironmental changes in the Rostov-Yaroslavl' area, central-west Russia. *Journal of Paleolimnology* (in press).
20. Davies, S. M., Elmquist, M., **Wohlfarth, B**. and Hammarlund, D.: Developing age models for recent lacustrine sequences spanning the last 200 years: two case studies from west central Sweden. *The Holocene* (accepted).

**Ten most important articles:**

21. (*) **Wohlfarth, B.**, Lemdahl, G., Olsson, S, Persson, T., Snowball, I., Ising, J. and Jones, V., 1995: Early Holocene environment on Björnöya (Svalbard) inferred from multidisciplinary lake sediment studies. *Polar Research*, **14**: 253-275.
22. (*) **Wohlfarth, B.,** 1996: The chronology of the Last Termination: a review of radiocarbon-dated, high resolution terrestrial stratigraphies. *Quaternary Science Reviews*, **15**: 267-284.
23. (*) **Wohlfarth, B.**, Possnert, G. and Skog, G., 1998: Pitfalls in the AMS radiocarbon-dating of terrestrial macrofossils. *Journal of Quaternary Science*, **13**: 137-145.
24. (*) Goslar, T., **Wohlfarth, B.**, Björck, S., Possnert, G. and Björck, J., 1999: Variations of atmospheric $^{14}C$ concentrations over the Allerød - Younger Dryas boundary. *Climate Dynamics*, **15**: 29-42.
25. (*) Israelson, C. and **Wohlfarth, B.,** 1999: Timing of Last Interglacial high sea level on The Seychelles Islands, Indian Ocean. *Quaternary Research*, **51**: 306-316.
26. (*) Lundqvist, J. and **Wohlfarth, B.,** 2001: Timing and east-west correlation of south Swedish ice marginal lines during the Late Weichselian. *Quaternary Science Reviews*, **20**: 1127-1148.

27. (*) Björck, S. and **Wohlfarth, B**., 2001: $^{14}C$ chronostratigraphic techniques in paleolimnology. In Last, W. M. and Smol, J. P. (eds): Tracking Environmental Change Using Lake Sediments: Physical and Chemical Techniques. Kluwer Academic Publishers, Dordrecht, The Netherlands, 205-245.
28. (*) **Wohlfarth, B**., Schwark, L., Bennike, O., Filimonova, L., Tarasov, P., Björkman, L., Brunnberg, L., Demidov, I. and Possnert, G., 2004: Unstable early Holocene climatic and environmental conditions in northwestern Russia derived from a multidisciplinary study of a lake sediment sequence from Pichozero, southeastern Russian Karelia. *The Holocene*, **14**: 732-746.
29. (*) Davies, S. M., **Wohlfarth, B**., Wastegård, S., Andersson, M., Possnert, G. and Blockley, S., 2004: Were there two Borrobol Tephras during the early Lateglacial period: implications for tephrochronology? *Quaternary Science Reviews*, **23**: 581-589.
30. (*) **Wohlfarth, B.,** Blaauw, M. Davies, S. M., Andersson, M., Wastegård, S., Hormes, A. and Possnert, G., 2006: Constraining the age of Lateglacial and early Holocene pollen zones and tephra horizons in southern Sweden with Bayesian probability methods. *Journal of Quaternary Sciences* , **21**: 1-14.

**Book reviews:**

31. Quartäre Vegetationsgeschichte Europas - Methoden und Ergebnisse by Gerhard Lang. *Journal of Quaternary Science*, 13/1, 92-93 (1998).
32. Palaeoecological events during the last 15 000 years, by Berglund, B. E. et al. (eds). *Journal of Quaternary Science*, 13/2, 185-186 (1998).

**Popular science articles:**

33. Wohlfarth, B. and Björck, Å., 2001: Varv på Varv på Varv. NFRs Årsbook 2000.
34. Björck, A. and Wohlfarth, B., 2003: Rumänien sett ur två perspektiv – en ung resenärs betraktelser och en forskares nyfikenhet. In: Ymer 2003: Det bergiga Balkan – konflikternas halvö, p. 49-62.
35. Wohlfarth, B., 2005: Sjöarnas hemlighet. Geologiskt forum, no. 47, 18-23.

**Popular science presentations**

36. Lectures on ‘Quaternary Climatic Change and Greenhouse Gases’ for 10 different south Swedish school classes, March 9-14, 1998
37. Lectures on climate change for Rudolf-Steiner School, Lund, October 1998
38. Lectures for teachers (‘Lärardag’, October 27, 1998): “Kallt-varmt-kallt: vems är felet? (cold-warm-cold: who is to blame?)” and “Kommer Golfströmmen att ändra riktning? (will the Golfstream change direction?)”
39. Lectures for teachers (lärardag, November 1, 2000): ”Bland grizzly björnar och glaciärer – på jakt efter de sista 2000 årens klimathistoria i BC, Canada (among grizzly bears and glaciers – in search for the last 2000 years’ climate history in BC, Canada)”.
40. Regular lectures for school classes at Stockholm University (since 2002)
41. Vetenskapsfestivalen, Göteborg; presentation of PAGES (2004)

VETENSKAPSRÅDET
THE SWEDISH RESEARCH COUNCIL

Kod
2006-16873-36510-47

**Name of applicant**
Bremer, Kåre

**Date of birth**
480117-1192

**Title of research programme**
Climate evolution, variability and sensitivity

# Appendix U



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*Appendix U to Linné-proposal VR/ Formas 2006*

**Climate evolution, variability and sensitivity**

Stockholm University, Kleman et al

# Commitment of Stockholm University

## A financial plan for the whole period

Below is outlined the financial plan for the proposed Linnaeus centre. The plan covers for each of the ten years an estimate of the income, including the grant applied for from the Research Council and the co-funding from Stockholm University, as well as an estimate of the cost of the centre for each year of the funding period.

**Financial plan, Kleman et al, VR/ Formas2006 Linné proposal**

| **Income** | | 2006 | 2007 | 2008 | 2009 | each year 2010-2015 | 2016 |
|---|---|---|---|---|---|---|---|
| Funding here applied for | | 5 000 | 10 000 | 10 000 | 10 000 | 10 000 | 5 000 |
| SU-funded Permanent staff salaries | | 2866 | 5731 | 5731 | 5731 | 5731 | 2866 |
| SU-funded salaries for PhD students | | 2260 | 4521 | 4521 | 4521 | 4521 | 2260 |
| Total SU + Linné funding | | 10 126 | 20 252 | 20 252 | 20 252 | 20 252 | 10 126 |
| Other external funding incl. VR proj. grants (For the 25 listed permanent staff) | | 24391 | 15248 | 9584 | 1341 | | |
| *Other VR-funding:* | | | | | | | |
| Jan Backman | 2004-5212 | 310 | 202 | | | | |
| Patrick Crill | 2004-3277 | 472 | 405 | | | | |
| Georgia Destouni | 2003-2997 | 351 | | | | | |
| Örjan Gustafsson | 2002-2309 | 976 | 976 | | | | |
| | 2004-4039 | 675 | 675 | | | | |
| Karin Holmgren | 2005-4715 | 497 | 416 | 335 | | | |
| Per Holmlund | 2005-5356 | 270 | | | | | |
| Clas Hättestrand | 2004-5287 | 180 | | | | | |
| Martin Jakobsson | 2005-4727 | 554 | 743 | 729 | | | |
| Peter Kuhry | 2005-4246 | 473 | 473 | 432 | | | |
| Caroline Leck | 2005-4258 | 896 | 896 | 896 | | | |
| Anders Moberg | 2005-4874 | 540 | | | | | |
| Henning Rodhe | 2004-4216 | 945 | 945 | 810 | | | |
| Arjen Stroeven | 2005-4972 | 810 | 810 | 608 | | | |
| Johan Ström | 2005-4296 | 608 | 810 | 608 | | | |
| Michael Tjernström | 2004-4271 | 472 | 472 | | | | |
| Stefan Wastegård | 2003-3529 | 608 | | | | | |
| Barbara Wohlfarth | 2003-3607 | 486 | | | | | |
| | 2004-7960 | 710 | 710 | 275 | | | |
| | | 10833 | 8533 | 4693 | | | |
| *Other external funding:* | | | | | | | |
| *(Grants exceeding 300kkr)* | | | | | | | |
| **Formas** | | 1309 | 650 | | | | |
| Space Board | | 2880 | 1026 | 702 | | | |
| EU | | 2815 | 2415 | 2415 | | | |
| SIDA | | 3341 | 1341 | 1341 | 1341 | | |
| Luleå Univ | | 433 | 433 | 433 | | | |
| SGU | | 430 | | | | | |
| SNV | | 850 | 850 | | | | |

| | | | | |
|---|---|---|---|---|
| MISTRA | 1500 | | | |
| | 12249 | 6065 | 4891 | 1341 |

Wallenberg, special equipment grant to M. Jakobsson 16000kkr

**Costs**

*Only staff active within CEVS project is listed*

***Linné-funded staff:***

| | | | | |
|---|---|---|---|---|
| *NN Climate modeler* | MISU | PhD | Permanent | 800 |
| *NN Ice-sheet modeler* | INK or IGG | PhD | Permanent | 800 |
| *NN Scale transformation strategist* | IGG or ITM | PhD | Permanent | 800 |
| *2 Post-docs (2 positions rotating)* | | PhD | | 1500 |
| *Visiting scientists (1 position rotating)* | | | | 800 |

***Other Linné-funded costs:***

| | |
|---|---|
| *Management* | 200 |
| *Temporary support staff* | 800 |
| *Mobile resource (300kkr/core theme)* | 1500 |
| *Workshops , seminars, dissemination of results* | 200 |
| *Rent for CEVS office and lab space* | 1200 |
| *Administration* | 1400 |
| | **10000** |

| ***Externally funded staff:*** | Soc. Sec. Nr. | Dept. | Position | PhD | | % time |
|---|---|---|---|---|---|---|
| Anders Moberg (ext) | 610225-1292 | INK | Associate prof. | 1997 | 2006-12-31* | 30 |
| Örjan Gustafsson (VR) | 680104-5995 | ITM | Associate prof. | 1997 | Permanent | 30 |
| Martin Jakobsson (KVA) | 661013-1234 | IGG | Associate prof. | 2000 | Permanent | 30 |

***SU-funded permanent staff:***

| | | | | | | |
|---|---|---|---|---|---|---|
| Georgia Destouni | 610126-3066 | INK | Professor | 1991 | Permanent | 30 |
| Margareta Hansson | 620207-0022 | INK | Associate prof. | 1993 | Permanent | 30 |
| Karin Holmgren | 590812-1188 | INK | Professor | 1995 | Permanent | 30 |
| Per Holmlund | 560407-0051 | INK | Professor | 1988 | Permanent | 30 |
| Clas Hättestrand | 650722-9315 | INK | Associate prof. | 1997 | Permanent | 30 |
| Johan Kleman | 530323-0014 | INK | Professor | 1985 | Permanent | 30 |
| Peter Kuhry | 580219-0255 | INK | Professor | 1988 | Permanent | 30 |
| Gunhild Rosqvist | 600706-3982 | INK | Associate prof. | 1992 | Permanent | 30 |
| Arjen Stroeven | 631211-2391 | INK | Professor | 1996 | Permanent | 30 |
| Stefan Wastegård | 610117-0212 | INK | Associate prof. | 1995 | Permanent | 30 |
| Barbara Wohlfarth | 560417-0901 | INK | Professor | 1986 | Permanent | 30 |
| Jan Backman | 480115-3216 | IGG | Professor | 1980 | Permanent | 30 |
| Patrick Crill | 520923-3377 | IGG | Professor | 1984 | Permanent | 30 |
| Johan Ström | 630429-1997 | ITM | Professor | 1993 | Permanent | 30 |
| Jörg Gumbel | 650825-0492 | MISU | Associate prof. | 1998 | Permanent | 30 |
| Erland Källén | 540428-3995 | MISU | Professor | 1980 | Permanent | 30 |
| Caroline Leck | 590804-0180 | MISU | Professor | 1989 | Permanent | 30 |
| Peter Lundberg | 480802-1119 | MISU | Professor | 1985 | Permanent | 30 |
| Johan Nilsson | 650513-9318 | MISU | Associate prof. | 1995 | Permanent | 30 |
| Henning Rodhe | 410215-1018 | MISU | Professor | 1972 | Permanent | 30 |
| Gunilla Svensson | 660718-4863 | MISU | Associate prof. | 1995 | Permanent | 30 |
| Michael Tjernström | 550817-1138 | MISU | Professor | 1988 | Permanent | 30 |

(cost for professors set at 50kkr/year, associate professors 35kkr/year)

SU-funded: (prof 15 x 50kkr + Ass. Prof 7 x 35kkr)

x 30% x social cost 1.6 = 5731 kkr/year **5731**

* Salary funding available also for 2007 and 2008

***Research associates, researchers and post-docs:***

| | | |
|---|---|---|
| Helena Alexandersson | 730307-4863 | INK |
| Ian Brown | 710822-1396 | INK |
| Regine Hock | 630912-7220 | INK |
| Steffen Holzkämper | 740220-8719 | INK |
| Krister Jansson | 680508-7613 | INK |
| Jerker Jarsjö | 690221-0118 | INK |
| Jan Seibert | 680105-2116 | INK |
| Jorijntje Henderiks | 731213-7727 | IGG |
| David Bastviken | 711119-6650 | IGG |
| Bart van Dongen | 720519-3431 | ITM |
| Christer Johansson | 560112-6633 | ITM |
| Birgitta Kalinowski | 670514-0140 | ITM |
| Faranaz Khosrawi | 711024-7660 | ITM |
| Markus Meili | 570327-2517 | ITM |
| Douglas Nilsson | 680202-5954 | ITM |
| Peter Tunved | 740412-0433 | ITM |
| Zdenek Zencak | 770406-1238 | ITM |
| Göran Boström | 640420-6275 | MISU |
| Kristofer Döös | 590712-0017 | MISU |
| Annica Ekman | 720414-0086 | MISU |
| Radovan Krejci | 700618-0959 | MISU |

***SU-funded salaries for PhD students:***

Number of PhD-students active within CEVS: 67
Average level of Faculty funding 30% Average teaching 20%
50 PhD-students on "doktorandtjänst",
50 x 0.8 x 0.3 = 12 person-years with 20kkr/month salary **4521**
Students on "utbildningsbidrag" not counted

*List of current PhD students within Climate Research:*

| **INK** | | Started |
|---|---|---|
| Linda Ampel | 791211-2922 | 2004 |
| Sofia Anderson | 750224-5561 | 2004 |
| Amélie Darracq | 790212-6007 | 2003 |
| Hernan de Angelis | 740212-2092 | 2003 |
| Bradley Goodfellow | 710917-9551 | 2004 |
| Fredrik Hannerz | 770207-4993 | 2004 |
| Jakob Heyman | 790807-0217 | 2005 |
| Timothy Johnsen | 710220-9777 | 2004 |
| Ulf Jonsell | 741026-1478 | 2002 |
| Christina Jonsson | 651207-0027 | 2002 |
| Torbjörn Karlin | 620520-7613 | 2005 |
| Katarina Lundblad | 670314-1264 | 2002 |
| Elin Norström | 721025-5985 | 2003 |
| Valentina Radic | 791104-8184 | 2004 |
| Lena Rubensdotter | 720727-2068 | 1999 |
| Maria Ryner | 670315-9423 | 1999 |
| Britta Sannel | 680418-0724 | 2004 |
| Yoshihiro Shibuo | 760217-7052 | 2003 |
| Hanna Sundqvist | 720302-8522 | 2000 |
| Daniel Veres | 770905-7199 | 2003 |
| Helena Öberg | 740210-0585 | 2005 |
| **IGG** | | |
| Louise Björkvald | 731224-6643 | 2003 |
| Johanna Borgendahl | 720918-0129 | 2000 |

| | | |
|---|---|---|
| Jenni Brink | 720414-0441 | 2000 |
| Kristina Bäckstrand | 790204-2923 | 2004 |
| Supriyo Das | 780404-6279 | 2003 |
| Marion Dumont | 780424-7729 | 2003 |
| Susanne Gylesjö | 730408-0349 | 2000 |
| Emma Sellén | 801214-7461 | 2005 |
| Teodora Veres | 790615-4989 | 2005 |
| **MISU** | | |
| Ulf Andrae | 720614-2957 | 1999 |
| Frida Bender | 781110-1901 | 2004 |
| Erik Engström | 760912-0311 | 2004 |
| Ann-Christine Engvall | 760202-0268 | 2003 |
| Allid Ferrow | 810102-1452 | 2005 |
| Rune Grand Graversen | 700904-9516 | 2003 |
| Andreas Grantinger | 711012-7656 | 2004 |
| Jonas Hedin | 760205-6215 | 2004 |
| Bodil Karlsson | 760401-0368 | 2003 |
| Johannes Karlsson | 781117-0476 | 2004 |
| Karl-Göran Karlsson | 500429-4633 | 2005 |
| Hanna Kling | 770223-0546 | 2005 |
| Magnus Lindskog | 720526-2939 | 1998 |
| Stefan Lossow | 770827-9372 | 2004 |
| Linus Magnusson | 800114-2796 | 2005 |
| Jenny Matsson | 710303-3960 | 2003 |
| Thorsten Mauritsen | 770601-2072 | 2002 |
| Linda Megner | 710429-0742 | 2004 |
| Monica Mårtensson | 560909-5582 | 2001 |
| Jenny Nilsson | 780604-3506 | 2003 |
| Admir Targino | 731218-1576 | 2000 |
| Mondheur Zarroug | 780420-2534 | 2005 |
| **ITM** | | |
| Vanja Alling | 780102-1929 | 2005 |
| Camilla Andersson | 790612-1988 | 2005 |
| Frida Edberg | 661113-0144 | 2005 |
| Marie Elmquist | 750924-0524 | 2003 |
| Hanna Eriksson | 751009-3987 | 2005 |
| Eyal Freud | 770425-1276 | 2005 |
| Emma Hedberg-Larsson | 760328-7504 | 2000 |
| Henry Holmstrand | 740702-3352 | 2002 |
| Kim Hultin | 760624-0260 | 2005 |
| Patricia Krecl | 680618-7487 | 2005 |
| Gustavo Olivares | 731204-7231 | 2003 |
| Jorien Vonk | 780120-5761 | 2005 |

## Strategies for stimulating the development of the research environment

The Linnaeus proposals sent by Stockholm University represent our most prominent centres of excellence, and it is of great importance for the university to see to that these centres will develop in the most favourable way possible. In order to stimulate the development of the research environments, the university will identify and remove all obstacles for collaboration between departments and sections within the university. The university will also support the distribution of results of the centres, by providing support in issues regarding publication and documentation, assisting in the compilation of websites, arranging seminars and press conferences etc. General administrative support, including personnel administration, economic and legal issues, will also be provided by the university.

The Vice-Chancellor will delegate a substantial part of the responsibility concerning the development of Linnaeus centres to the faculties. The faculties are expected to support the centres by encouraging intra- and interdisciplinary research cooperation, together with the university management. The faculties will also be expected to assist and support the recruitment of new scientists for the centres. The Vice-Chancellor will closely monitor the development of the centres and visit them regularly.

**The Faculty of Science** will assist in and support recruitment of new scientists, but also in other ways required that will stimulate the development of an vital scientific environment. In particular, the Faculty will try to identify and remove any obstacles to a collaboration across departments and sections within the Faculty of Science, but also within the university if required. The scientists involved in this project including those that are not listed as co-applicants, comprise a unique constellation with outstanding scientific records. It is therefore to be expected that the center will attract other successful scientists which will further and possibly broaden the expertise of the center.

**Within the program** we will emphasize communication, and contact between fields previously seen as unrelated. The five core themes of the program all involve individual researchers from different departments and several established research groups. The structure is aimed to trangress previously existing group structures, and to encourage interaction and cross-disciplinary work. The building of a coherent research environment will occur through development of collaboration within and between core themes, and continued intense international collaboration. For each theme, research will be focused through colllaboration around one overarching question, or a tightly knit group of questions. Of great importance in environment-building is structured activities that physically bring researchers from different subgroups together for discussions. This is a very important aspect also for the proposed research school. We all learn by example; if teachers/researchers communicate and devote time to seminars and joint activities, so will students. We plan the following recurring activities:

*Earth System Science (ESS) Discussion Seminars***.** Researchers at SU have since 5 years met across disciplines and departments to discuss current ”ESS” issues of relevance to global element cycles and climate change. The format encourages discussions rather than just traditional presentations. Our plan is to increase the frequency of the ESS seminars to biweekly gatherings.

*SU Seminars on Climate: Evolution, Variability and Sensitivity.* This new seminar series will be structured similarly to the ESS seminars. It would have a more precise focus on time scales and seek connections between studies of paleoclimatology and present climate system. This Climate seminar series would constitute a natural forum and link between this proposed *Climate* Research Environment and the *Climate* Research School (with the same name), and be an integral part of the latter.

*Community Workshops for the Climate Research Environment.* These workshops will take place once every second year and gather all participants of the involved research groups (plausibly > 100 persons). A format would be chosen to meet the objectives of (a) communicating the benefits and opportunities of the collaborative arrangements; and (b) catalyze identification of mutually beneficial novel collaborations between participating research groups.

*Thematic Exploratory Workshops.* We plan annual workshop retreats with rotating themes seeking to catalyze novel cross-fertilizations between research groups (ca. 20 participants from cross-cutting groups). For each workshop we would also invite a small number of our external collaborators. Possible themes include "climate time scales" and "terrestrial-atmosphere carbon exchange".

*Post-doc bridging.* This is an important tool to facilitate novel collaborations between participating research groups that previously have not collaborated. We announcing post-doc positions, priority will be given to crosscutting post-doc positions.

*A physically concentrated research environment.* Substantial positive changes are planned to occur over the next few years. A move of ITM to the Geoscience building is now in the planning stage. This will bring all four departments in close contact, with indoor access between all participants in the climate research program.

## Administration

The program funding will be adminstered by the Department of Physical Geography and Quaternary Geology. Staff management (in non-scientific sense) will be the responsibility of the departments where persons are employed. The project manager will maintain close contact with the department heads in such matters.

We want to emphasize that the program is firmly anchored at the department, section and faculty levels. Two of the four current department heads are participants in the program, as are four former department heads. The creation of a cross-diciplinary climate research environment has been a long-standing ambition for several researchers in the program. The Earth Science Section has for several years had the creation of a Climate Research Scool as a top priority. The Science Faculty has over the last years expressed strong support for the build-up of a coherent climate research environment, and taken several funding decisions in support of this development.

## Stockholm University's processes for supporting and monitoring the management of the centre

The persistence and continuity of achieved Linnaeus centres will be of greatest importance to Stockholm University, and highest priority will be given to the support and evaluation of the centres and their managements. Several measures will be taken in order to ensure that the centres will have the best possible opportunities to fulfil their aims, that evaluation and accounting requirements will be fulfilled and that the centres and the surrounding university environment will benefit mutually from each other.

Centre directors will be expected to attend an academic leadership course that is regularly offered at Stockholm University. Members of steering boards and other research group leaders will also be encouraged to attend this course. This will ensure that the leading figures of the centres have the adequate qualifications concerning management, the university accounting system etc. Scientists who are recruited to the centres, or promoted to leading positions at a centre during the funding period, will also be offered to attend this course.

Stockholm University will demand an annual evaluation of the activity of each Linnaeus centre. Annual reports will be required describing the financial situation as well as the progress of scientific work, including both scientific publications and public outreach. The compilation process of the annual report of Stockholm University will be a model for the annual reports from the centres: their reports will first be presented to the faculty boards, which consider them and bring them to the attention of the University Council. In addition, there will be regular communication between the directors of the centres and their faculty deans. Special attention will be given to matters related to the management of the centres. If needed, the faculty boards will take appropriate action to rectify problems that may have arisen.

Annual seminars will also be organised, where the results of each project are presented and discussed. These seminars will be open not only to scientists but also to media and the general public.

The Vice-Chancellor will delegate to the faculty boards the formulation of strategies and the planning for the future financing of the centres, and also in other respects the ensuring of the persistence of the centres after the funding period has come to and end.

**University processes for support and follow-up:**

The project director has a long and broad experience in management that will be instrumental in the successful development of the centre. He will together with the proposed project steering board provide a clear and competent leadership with a solid support in the different participating research groups. Furthermore the project director will be expected to attend an academic leadership course. Such courses are offered regularly at Stockholm University. The members of the steering board as well as other research group leaders will also be encouraged to participate in such courses. General administrative support, including personnel administration, economy, legal issues etc., will be provided by Stockholm University.

It is anticipated that Climate Research will continue to receive strong support from the Faculty Board. All senior scientific staff employed with the aid of the financial support of this project will be guaranteed permanent employments by their respective departments.

The Faculty of Science will require annual reports describing the economic situation and the progress of the scientific work, including both scientific publications and public outreach. The Faculty will also organize an annual seminar where the results of the project are presented and discussed. Not only scientists but also media and other interested will be invited to these seminars. The annual reports will be considered by the Faculty Board and also brought to the attention of the Vice-Chancellor and the University Council (“rektorskonseljen”). In addition there will be regular communication between the Project director and the dean of the Faculty. Special attention will be given to matters related to the management.

It is foreseen that the strong research environment, created as the result of this project, will continue to exist and to develop further after the funding period has come to an end. The research profile is strongly supported by four participating departments and we expect that the climate research will be even more competitive regarding external funding at the termination of the 10-year period. We therefore foresee no major transition problems to the post-program period.

VETENSKAPSRÅDET
THE SWEDISH RESEARCH COUNCIL

Kod
2006-16873-36510-47

**Name of applicant**
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**Date of birth**
480117-1192

**Title of research programme**
Climate evolution, variability and sensitivity

# Appendix V



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*Appendix V to Linné-proposal VR/ Formas 2006*

# Climate evolution, variability and sensitivity

Stockholm University, Kleman et al.

## Strategy for outreach and communication

Stockholm University recognizes the importance of communicating the results of the research conducted by its scientists. This communication is a natural feature not only within the scientific community but also in the relation between universities and the general public. The university has a strong record in this latter respect, eg with its tradition of public lectures. The researchers of the climate research program will be actively supported by public relations officers and other relevant staff at different levels of the university, and the results of the project will be disseminated in a number of ways.

The major means of communicating the results obtained within the project will be in international scientific journals with high impact factors. The project will strive to publish in the few really leading journals in each field. A number of the participating scientists already publish in journals like *Nature* and *Science*, and to maintain the status of excellence in the international scientific community such publication is increasingly important. These journals will be the prime target for publishing results that are of broad significance to several science fields. In line with the cross-disciplinary approach of the core themes, the scientists within the project will also strive to increase scientific publication specifically targeted to journals read by the expected scientific *users* of the results, who may often reside in a different scientific subdiscipline than the authors. An example of the latter is publishing of coherent validation data sets in journals primarily aimed at numerical modelers. In some subfields this strategy has already been implemented, to good effect. The production of both high-profile and public outreach articles will be considered an important task within the project, and will be explicitly encouraged and supported by the project director and the theme coordinators.

There is a strong public interest in climate research, and the anthropogenic causes or contributions to climate change in particular. Important and costly political decisions, especially concerning energy policy, are taken on the basis of information from the climate research community. The participators in the project are fully aware that the dissemination of results from climate research, like all controversial research fields, has an ethical dimension, where society and the public has the right to expect fact-based and correct information.

The program will make sustained efforts to disseminate information to a wider audience than the scientific community. Such information will include the results obtained put in a wider, more general perspective. The annual seminar that will be organized by the Faculty of Science for the project is an example of such activities (see Appendix U). The project director will be supported in such activities by experts at the Faculty office, but also by the University Relations Office. The latter will communicate particularly important information to the press and other media. The project director has a two-year university exam in journalism and information, a highly relevant background for leading the development of a coherent information strategy during the first year of the project.

The program will have dedicated webpages on the Stockholm University website and will be able to utilize the in-house staff for public outreach that is available on both section and faculty level. The Earth and Environmental Science section has during a number of years spent considerable resources on public outreach including student recruitment, and will increase these efforts in the coming years. The webpages will be structured and written

differently for the Swedish and English versions. The Swedish webpages will be targeted towards the press, the public, and prospective students in climate research, whereas the English webpages will primarily be targeted towards the international scientific community.

Experience shows that individual researchers often have difficulties in finding time for public outreach work, in competition with the time needed for research and teaching. The project director will work closely with the four department heads to find solutions that will allow individual researchers to temporarily focus on outreach work.

## The relation between the general research strategy of the University and the proposed research environment

### Research and Innovation at Stockholm University

Stockholm University is a centre for higher education and research, organised into four faculties: natural sciences, humanities, social sciences and law. Its 35,000 students and 6,000 employees make Stockholm University one of Sweden's largest educational establishments and one of the largest employers in the Stockholm area.

Extensive research is carried out at the university within all four faculties. The university has a total annual budget for research of about SEK 1.7 billion (equal to about 200 million euro). The university has some 330 full-time professors, 435 senior lecturers and 125 postdoctoral fellows. The share of women professors is comparatively high (approximately 20 percent). Some 2,100 students are registered in graduate studies, and the university awards around 250 PhD degrees every year. About 50 per cent of the students graduating with a PhD are women.

### Strategies of Research

One prime mission of Stockholm University is to conduct research of high international standard. Curiosity-driven basic research has dominated the research carried out at the university and this profile will be preserved, while increasing attention is now being paid to problem-oriented research initiated and motivated by the practical needs of industry, public authorities, etc. Both types of research are considered to be important for a successful scientific environment.

One important strategy of the university is to conduct research within a wide range of areas while achieving international excellence in certain particularly strong fields of research. Consequently, the university has used the past year to identify and communicate its main competence profiles in research. This has been one of the university’s two major strategic goals (the other being internationalisation with particular respect to undergraduate education). Nine research areas within the humanities, social sciences and law fall within the special competence profile of the university:

- Law, especially Commercial Law, Intellectual Property Law, and Law and Information
- Cinema Studies
- Language Research, in particular Linguistics, Bilingualism, and Language Philosophy
- History and Archaeology
- Languages and Cultures of East Asia
- Economics
- Psychology
- Sociology
- Social Anthropology.

Five research areas within the natural sciences fall within the competence profile:

- Astrophysics and Particle Physics
- Biochemistry and Cell Biology, in particular Biological Membranes and DNA/RNA-Metabolism
- Climate and Environmental Research
- Material Chemistry and Organic Chemistry, especially Metal Organic Chemistry
- Theoretical Biology, especially Modelling of Molecules and Biological Systems.

The minimum requirements for selection in this process have been that the research within the area is at the forefront of research in Sweden and enjoy high international status. We believe that striving for international excellence is necessary if the university is to maintain its national and international reputation. On the other hand, a wider approach in which research is also being conducted within a large number of areas is necessary to generate the potential to absorb new thoughts and ideas rapidly, and the possibilities of conducting high-quality basic research would, in the absence of the wide approach, be hampered. The university thus believes in combining excellence with diversity in research.

Another main strategy of the university is to support cross-scientific research and interdisciplinary cooperation, and to eliminate obstacles to such activities. The university encourages its researchers to cooperate not only between faculties but also with other institutions of higher education. We believe that such cooperation stimulates research of high international quality. Cooperation with other institutions of higher education in the Stockholm area is particularly important.

At an international level, the university encourages researchers to engage in projects financed by the EU, and approximately 85 projects are currently receiving such funding. The university stresses the importance of strengthening and multiplying international research contacts. We are currently in the process of reviewing our agreements with other institutions of higher education around the world. We are taking steps to raise the level of internationalisation within research, for example by increasing the number of international publications. We are also working to develop methods to assess the position of the university within the international community of universities. The more prominent university rankings are being monitored and analyzed, and methods such as citation analysis are being introduced to assess the impact of our research at an international level.

Finally, Stockholm University maintains a broad and diversified dialogue with the surrounding community. The geographic location of the university offers unique opportunities for cooperation with government agencies, organisations and industry. The university plans to take further advantage of these opportunities.

**Commercialization and Innovation**

Basic research dominates at Stockholm University, but problem-oriented research in different forms is becoming increasingly important. University income from commissioned research has increased steadily in recent years, and the university intends to strengthen its ties with industry in order to create stronger innovative environments in cooperation with companies and other institutions of higher education. The many industries and institutions of higher education in the Stockholm-Uppsala region offer unique opportunities in this regard.

Stockholm University’s strategic plan states that greater attention should be paid to problem-oriented research and to the practical use of research. The plan calls for new research-based companies to be established. This process has been handled by the university

holding company, SU Holding, which currently supports the development of some 30 projects that are innovations or the fruit of research. This support includes basic commercial guidance, the identification of potential partners, market analyses, economic and legal support, drawing up business plans, help with licensing, and the establishment of companies.

The university board has recently decided to develop the commercialization of research results and to establish more active support for commercialization and innovation. Consequently, we are now in the process of building an administrative support function headed by a new Director of Business Relations. This function will endeavour to initiate new forms of cooperation with industry and to facilitate the commercialisation of research results. Contacts between our scientists and external actors will be established, our scientists will be informed about these issues, and they will be offered professional advice. The scientists will also be supported by the recently created Research Liaison Office, which will assist them in establishing contacts with external partners and potential financiers. The driving force for this process within the university is a desire to strengthen the profile of Stockholm University not only as an institution devoted to basic research, but also as an institution endowed with entrepreneurial potential.

**Research at the Faculty of Science**

The research at the Faculty of Science has an excellent international reputation, and is at the international forefront in several fields. The strategy of the faculty is to further enhance the most competitive research, of which climate research is an important part, while maintaining the wide scope necessary as underpinning for a high-quality undergraduate teaching.

As mentioned above, climate and environmental research is one of the profile areas of research at Stockholm University. Climate research has its stronghold in the Faculty of Science but some projects also involve the other three faculties. Examples of such interfaculty projects include a study of collecting climate information from historical records, and legal and economical aspects of the implementation of the Kyoto protocol.

Within the Faculty of Science the most active climate research is carried out in the departments of Physical Geography and Quaternary Geology, Meteorology, Geology and Geochemistry, Applied Environmental Science, Systems Ecology and the Centre for Trans-Disciplinary Environmental Research. The current strategic five year plan of the Faculty of Science designates climate research as one of three priority areas. The strong emphasis on climate research has led to several earmarked grants from the Faculty Board to support climate-related research and education within the departments mentioned. The present project constitutes a unique effort to efficiently bring the different research activities into even closer collaboration, and in particular to eradicate the previous division into paleo-, process- and modeling research communities.

The building of a coherent climate research environment has over the last few years been the vision of the former Dean of the Science Faculty (H. Rodhe), the former Dean of the Earth Science Section (J. Backman), and the current Dean of the Earth Science Section (J. Kleman, the project director). This vision is now strongly supported by the Science Faculty and firmly anchored in all four departments. The present proposal is an essential component for fulfilling this vision. The Faculty of Science regards the total expertise in climate research as one with an extraordinary potential to become one of the leaders in the international forefront of climate research.

VETENSKAPSRÅDET
THE SWEDISH RESEARCH COUNCIL

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2006-16873-36510-47

Dnr
2006 -

**Co-ordinator/Repr.of University**
Bremer, Kåre

**Date of birth**
480117-1192

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# VR

VR-N

*Linnéstöd och Berzelius Center
*Naturvetenskap
Stockholms universitet
2006-07-01 -- 2016-06-30

# Appendix S

## Signatures

| 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|
| 5000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 10000 | 5000 |

**Repr.of University**

**Date**

**Clarifi cation of signature**

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