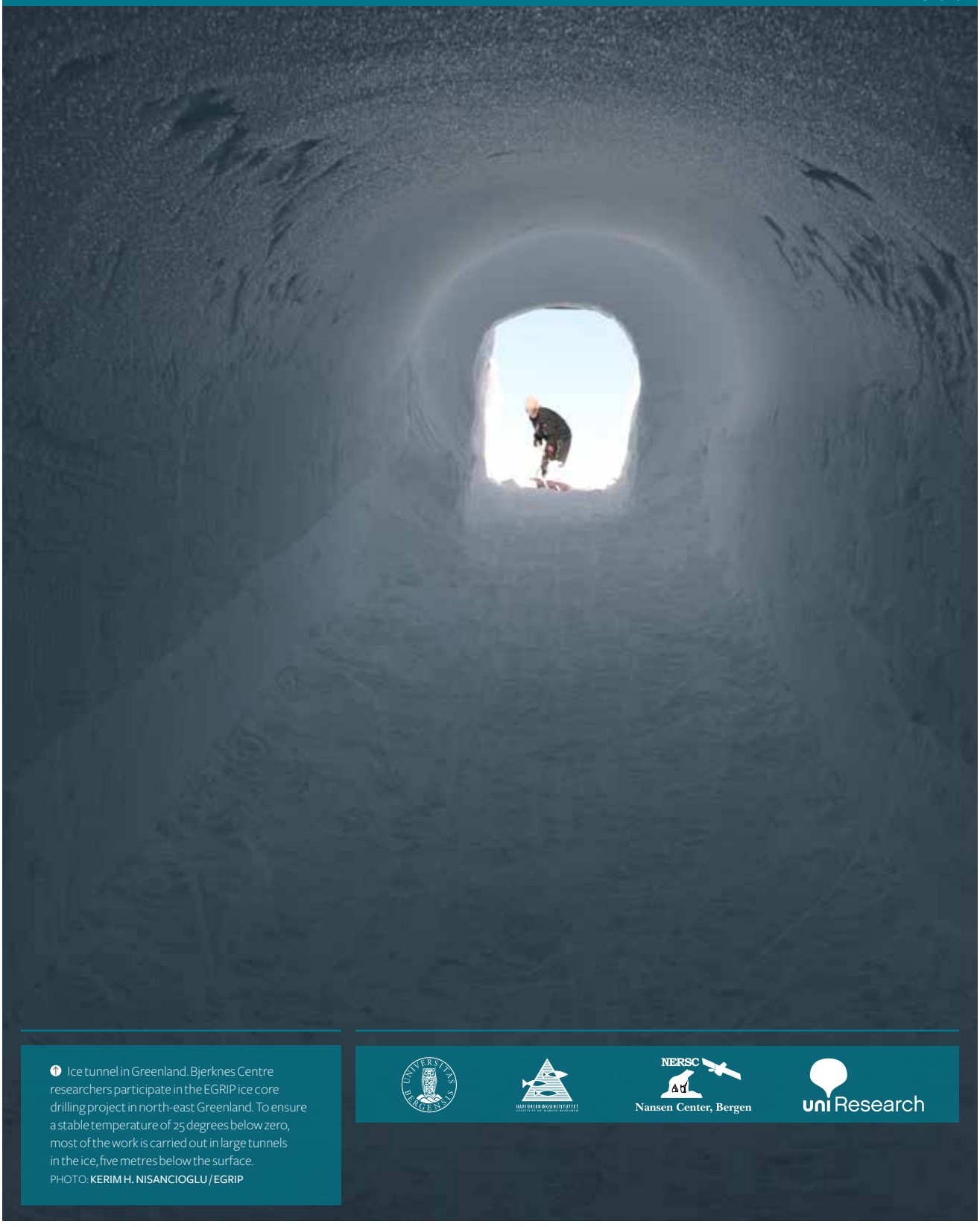
2016

BJERKNES CENTRE
for Climate Research



Ice tunnel in Greenland. Bjerknes Centre researchers participate in the EGRIP ice core drilling project in north-east Greenland. To ensure a stable temperature of 25 degrees below zero, most of the work is carried out in large tunnels in the ice, five metres below the surface.
PHOTO: **KERIM H. NISANCIOGLU / EGRIP**

Nansen Center, Bergen

uni Research

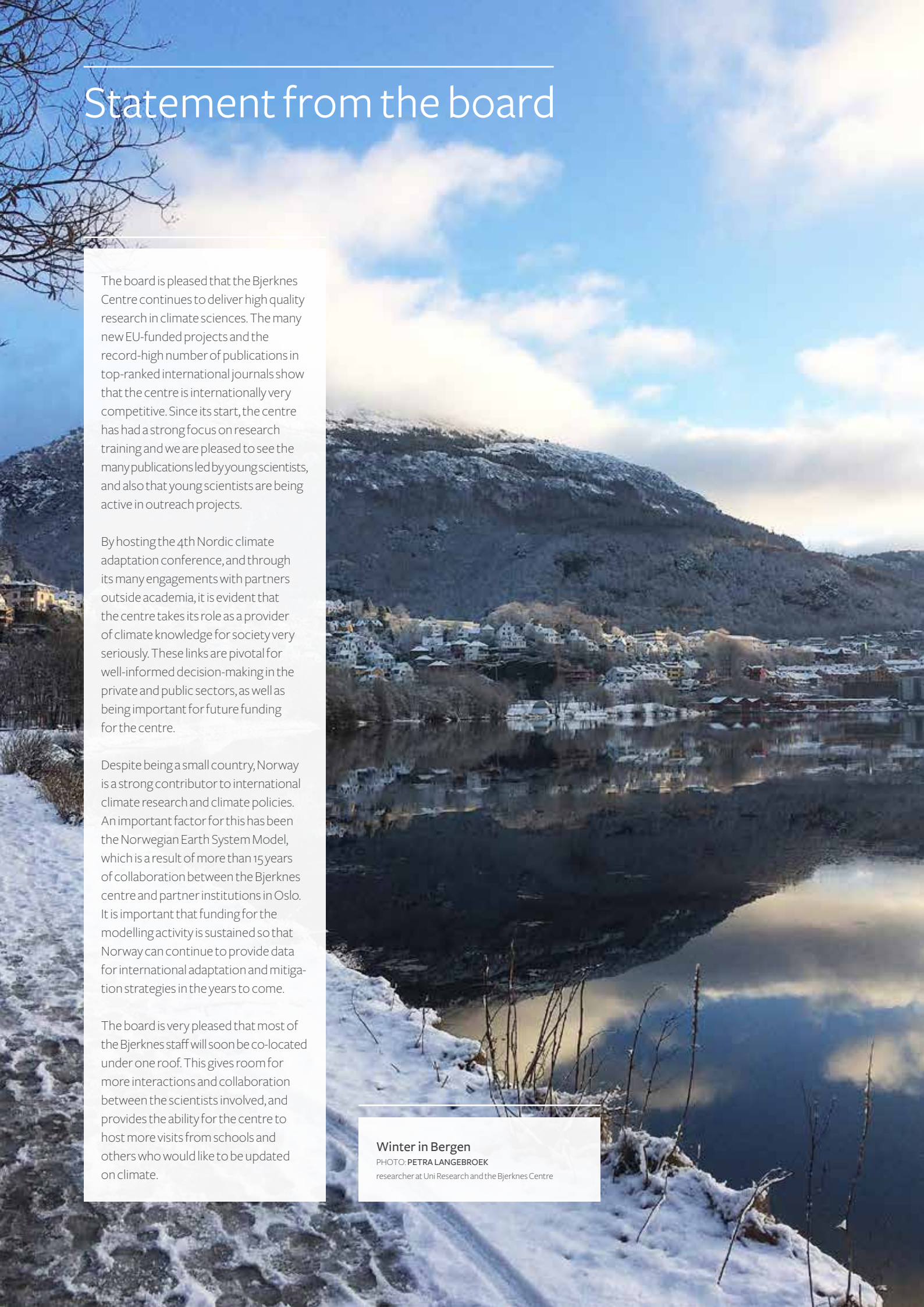
Statement from the board

The board is pleased that the Bjerknes Centre continues to deliver high quality research in climate sciences. The many new EU-funded projects and the record-high number of publications in top-ranked international journals show that the centre is internationally very competitive. Since its start, the centre has had a strong focus on research training and we are pleased to see the many publications led by young scientists, and also that young scientists are being active in outreach projects.

By hosting the 4th Nordic climate adaptation conference, and through its many engagements with partners outside academia, it is evident that the centre takes its role as a provider of climate knowledge for society very seriously. These links are pivotal for well-informed decision-making in the private and public sectors, as well as being important for future funding for the centre.

Despite being a small country, Norway is a strong contributor to international climate research and climate policies. An important factor for this has been the Norwegian Earth System Model, which is a result of more than 15 years of collaboration between the Bjerknes centre and partner institutions in Oslo. It is important that funding for the modelling activity is sustained so that Norway can continue to provide data for international adaptation and mitigation strategies in the years to come.

The board is very pleased that most of the Bjerknes staff will soon be co-located under one roof. This gives room for more interactions and collaboration between the scientists involved, and provides the ability for the centre to host more visits from schools and others who would like to be updated on climate.



Winter in Bergen
PHOTO: **PETRA LANGEBROEK**
researcher at Uni Research and the Bjerknes Centre

Science in focus

TORE FUREVIK, DIRECTOR OF THE BJERKNES CENTRE FOR CLIMATE RESEARCH

The Bjerknes Centre is a centre of gravity for climate sciences in Europe, and this year has been no exception. Due to the successful training of our own candidates as well as international recruitment, we are now close to 240 affiliated members from 38 nations. There is a good balance in terms of age, gender, and discipline.

Most of us depend on 'soft money', requiring continuous efforts in generating project ideas, writing proposals, and acquiring grants. Luckily, we continue to succeed in both the national and international arenas. We see a shift in funding from basic climate system research to more applied solutions-oriented research, and several of our new projects are related to climate prediction, geo hazards, and mitigation measures.

Our scientific production measured in terms of peer-reviewed publications reached is at an all-time high. Among the more than 200 contributions registered, most are published in prestigious international journals, including 10 in *Nature* or *Science*. Several of these had young scientists as first authors, reflecting the focus on recruitment.

Observations, modelling, and theory

The backbone for much of the research at the Centre is a combination of observations, modelling, and theory. We are doing fieldwork in the harshest conditions at sea in the North Atlantic, and in the most remote parts the world, including the high Arctic, Greenland, Antarctica, and the Himalayas. For the first time, we are participating in an ice-core drilling program in Greenland with Bjerknes scientists working on the ice-sheet.

The Norwegian Earth System Model is among the most used and cited climate models in the world, having contributed data to more than 700 peer-reviewed publications. We have some challenges in terms of computer resources and funding that we need to address, so that the model system can be a major provider of climate data in the next IPCC report that will be launched in 2021.

Due to the Gulf Stream, our region is one of few places on the Earth where it seems possible to develop climate forecasts for the years ahead. The Norwegian Climate Prediction Model has been developed exactly for these purposes, and the activity is rapidly growing in terms of funding and people.

Strong expertise in boundary-layer dynamics has been essential for a series of high-profile publications investigating the high-latitude response to increased anthropogenic forcing, and also of the response of storm tracks to the warming in the Arctic. Both are essential for regional climate evolution in northern Europe.

Combining theoretical skills with regional models, one can produce data with sufficiently high resolution to be useful for planning purposes. Several new projects aim at bridging the gap between what the models can provide and what society needs, forming the emerging field of Climate Services.

Education and outreach

The majority of the research training activities is organised under two national research schools we co-ordinate; one soon ending and one just started. A series of courses, training workshops, and summer schools have been arranged, including two courses during the the 9th Bergen Summer Research School in May; the 8th ACDC summer school in Newfoundland, Canada in August; and the 7th Nansen-Zhu summer school in Wuhan, China in October.

A major event of 2016 was the 4th Nordic Conference on Climate Change Adaptation that we organised in Bergen in August. With more than 230 people attending, the conference fulfilled its mission to be a meeting place between the public and private sectors. Partnership in the Norwegian Climate Service Centre and close collaboration with actors such as the Norwegian Climate Foundation and Climate Partners Hordaland, are other examples of our role in the transition towards a low emission and resilient future society.

Exciting year ahead

We have many things to look forward to. There will be replacements in our board, including a new leader, and there are plans for significant changes in the research group structure. In May many of us will move into the refurbished *west wing* of the Geophysical Institute. Several outreach events are planned in Bergen and elsewhere, and last, but not least, we will continue to focus on high-quality climate science for the benefit of society.

Objectives and research

The aim of the Bjerknes Centre is to understand and quantify the climate system for the benefit of society.

The Bjerknes Centre for Climate Research is a collaboration between four partner institutions:

- Uni Research
- University of Bergen
- Institute of Marine Research
- Nansen Environmental and Remote Sensing Centre

The centre engages more than 220 scientists from 38 countries, and is one of the largest climate research units in Europe.

The research is organised into seven research groups, each with specific goals, objectives and implementation plans:

RG1 Climate model development and projections

RG2 Climate predictions from global to regional scales

RG3 Carbon cycle and biogeochemistry

RG4 Large-scale atmosphere-ocean dynamics

RG5 Atmosphere, cryosphere and ocean processes

RG6 Natural climate variability

RG7 Past climate dynamics

The Bjerknes Centre combines observations with theoretical and modelling studies of past, present and future climates.

The Bjerknes Centre will

- Identify processes controlling natural and human-induced climate change.
- Understand large-scale teleconnections and couplings in the atmosphere and ocean.
- Understand and quantify past climate variations at regional and global scales.
- Determine changes in the earth's cryosphere (sea-ice, permafrost, glaciers, ice sheets).
- Understand and quantify global and regional sea-level changes.
- Quantify global biogeochemical cycles and their couplings to the climate system.
- Provide scenarios for future climate at global and regional scales.
- Develop methods for providing seasonal to decadal climate predictions.
- Contribute actively to the climate change mitigation and adaptation processes.
- Play an important role in the training of future generations of climate scientists.
- Communicate research results to stakeholders and society at large.

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Editor
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Frontpage photo
Kerim H. Nisancioglu, professor at the Department of Earth Science at the University of Bergen, and the Bjerknes Centre.

The Disko Bay, or Qeqertarsuup tunua as it is called in Greenlandic, receives icebergs from the famous Jakobshavn Glacier, which is one of the fastest moving bodies of ice on Earth. Some of the icebergs make it into the Davis Strait but quite a few become stranded before getting that far. Once stranded, waves will cut into them and they usually break apart before drifting further. The young, volcanic rocks on Disko Island (Qeqertarsuaq) are the source for the dark, almost black beaches.
PHOTO: **ØYVIND PAASCHE**

At the Polar frontier

In 2016 you could find Bjerknes Centre scientists in the Nordic Seas, on Greenland and in Antarctica, and if you look at our list of 210 published articles on pages 37 to 43, you'll find that a high number of them treat subjects related to the polar regions.

Researchers from the University of Bergen are the seventh most cited among the 170 largest research institutions performing Arctic research, according to a recent study commissioned by the University of the Arctic. Among Norwegian institutions, it is the highest ranked, both in terms of citations and the number of publications on Arctic science. Bjerknes Centre scientists are part of this.

At the polar science frontier new knowledge is hard to obtain but critical, as it becomes evermore clear that changes in the polar regions impact not only areas above 65 degrees north or south, but also lower latitudes. The connectivity of polar climate has long been underestimated, and it is becoming increasingly clear that knowledge of the climate system as a whole is more often than not a pre-requisite for understanding local observations.

Given the harsh environment of the Arctic and Antarctica, extensive collaborations with other institutes and nations are pivotal for success. The Bjerknes Centre collaborates with universities and research institutions globally, and we attract young, talented polar scientists to come and work with us.

The publications presented on the following pages highlight some of the insights we have gained from working in these tough environments. Several of the papers have been spearheaded by young and upcoming scientists with a unique overview of the physical processes at play in these cool regions where climate is changing faster than most other places on Earth.

One of our selected publications explains why climate change warms nights more than days, two treat the connection between a warm Arctic and mid-latitude weather, and one the influence of Arctic climate change on the circulation in the Atlantic Ocean. And, despite the attention given to the future, understanding climate and climate change is as much about exploring the world as it is today. One of our selected studies shows that warm water reaches much farther south than previously thought; possibly influencing Antarctic ice sheets in ways we are not aware of. Another documents the case of a storm that mixed surface water three times as deep as normal. The last of our selected publications goes way back in time, using algae to find out how Arctic temperatures have varied over the last 12,000 years.

Strong mixing increases carbon storage

Scientists on a research cruise to the Irminger Sea in April 2015 collected unique data on ocean mixing. The data set was recently published by Friederike Fröb, PhD student at the University of Bergen and the Bjerknes Centre, together with colleagues from the university, the Bjerknes Centre, and Uni Research as well as Canada. Their observations show that surface water was mixed as deep as 1400 metres. Normally, mixing in winter does not exceed 500 metres. The most important driver was a strong surface cooling, partly a result of exceptionally strong winds near the southern tip of Greenland. As a result of the mixing, depleted oxygen levels at mid-depth were replenished and large amounts of anthropogenic carbon were sequestered to the deep ocean. Anthropogenic carbon storage rates almost tripled compared to observations from 1997 and 2003.

Reference

F. Fröb, A. Olsen, K. Våge, G.W.K. Moore, I. Yashayaev, E. Jeansson & B. Rajasakaren (2016): Irminger Sea deep convection injects oxygen and anthropogenic carbon to the ocean interior. *Nature Communications*, 7, 13244 doi: 10.1038/ncomms13244

Warm current reaches surprisingly far south

Recent observations from Antarctica show that warm ocean water reaches surprisingly far south. Together with a British colleague, researcher Elin Darelius and professor Ilker Fer, both at the Bjerknes Centre and at Uni Research and the University of Bergen, respectively, have found that relatively warm water reaches the large Filchner ice-shelf in the southern part of the Weddell Sea. This is probably not a new phenomenon, but has not been observed before. The Filchner ice-shelf is located in a cold part of Antarctica. The water on the wide continental shelf is close to the surface freezing point of -1.9 degrees Celsius, and melt rates below the ice-shelf are accordingly low. Intrusion of warm water from the north may mean that more melting occurs below the ice than previously thought.

Reference

E. Darelius, I. Fer & K.W. Nicholls (2016): Observed vulnerability of Filchner-Ronne Ice Shelf to wind-driven inflow of warm deep water. *Nature Communications*, 7, 12300 doi: 10.1038/ncomms12300

Atlantic currents stabilised by freshwater in the far north

With climate change, the Arctic receives more freshwater and this is, in general, believed to reduce the circulation in the North Atlantic Ocean. Using a simple model, PhD candidate Erwin Lambert and professors Tor Eldevik and Peter Mosby Haugan at the University of Bergen and the Bjerknes Centre, show that this may not be so. In reality, it is a question of where in the Arctic freshwater will increase the most – in the Polar Ocean or in the Nordic Seas. More freshwater in the Polar Ocean may stabilise the circulation in the North Atlantic.

Reference

E. Lambert, T. Eldevik & P.M. Haugan (2016): How northern freshwater input can stabilize thermohaline circulation. *Tellus A*, 68, 31051 doi: 10.3402/tellusa.v68.31051

Cold winters have natural causes

Scientific studies and the general news media have suggested that extreme weather events in North America and Eurasia may be a result of diminishing sea ice in the Arctic. A study led by Svetlana Sorokina, postdoc at the University of Bergen and the Bjerknes Centre, finds that deviations in the winter temperature during the last 30 years may be explained mainly by natural variations. In this period, the variation in temperature from one winter to another has been more than ten times as great as the long-term climate warming. Even though there is a relationship between the loss of sea ice and cold winters on the continents, one does not cause the other.

Reference

S. Sorokina, C. Li, J. Wettstein & N.G. Kvamstø (2016): Observed atmospheric coupling between Barents Sea ice and the warm-Arctic cold-Siberian anomaly pattern. *Journal of Climate*, 29, 495–511 doi: 10.1175/JCLI-D-15-0046.1

Nights warm up faster

As the world has become warmer, the nights have been warming much faster than the days. A study led by Richard Davy, researcher at the Nansen Centre and the Bjerknes Centre, has shown that the difference is related to the thickness of the boundary layer – the layer of air just above the ground. At night the boundary layer is only a few hundred metres thick, while it may be a few kilometres deep during the day. The build-up of atmospheric carbon dioxide increases the amount of heat added at the surface by the same amount during the day and at night, but because of the thinner boundary layer at night, that heat warms the air more than it does during the day, when the same amount of extra heat is mixed through a greater volume of air.

Reference

R. Davy, I. Esau, A. Chernokulsky, S. Outten & S. Zilitinkevich (2017): Diurnal asymmetry to the observed global warming. *International Journal of Climatology*, 37, 79–93 doi:10.1002/joc.4688

Algae talk about the past

A recently-developed method for analysing algal fat indicates great variations in Arctic summer temperatures over the past 12,000 years. Alkenones—fats produced by a specific class of aquatic algae—manage to retain a stable viscosity under changing temperatures by building or breaking chemical bonds. By measuring the bonds of prehistoric alkenones from lake sediments, Willem van der Bilt and colleagues have reconstructed Arctic temperature changes. The method has been applied to Arctic sediments before, but never this far back in time. Their study is among the first to present changes in Arctic summer temperatures over the period from the end of the last Ice Age.

Reference

W.G. van der Bilt, W.J. D'Andrea, J. Bakke, N.L. Balascio, J.P. Werner, M. Gjerde & R.S. Bradley (2017): Alkenone-based reconstructions reveal four-phase Holocene temperature evolution for High Arctic Svalbard. *Quaternary Science Reviews* doi: 10.1016/j.quascirev.2016.10.006

Climate change 'tug-of-war' keeps scientists guessing on storm tracks

A new review paper explains how conflicting processes linked to human-induced climate change complicates the prediction of storm tracks in the future. Their fate under greenhouse warming will have widespread consequences for some of the most heavily populated areas in the world, yet this fate remains highly uncertain. The storm tracks will undoubtedly change under global warming, but we do not know what these changes will be, explains Camille Li, who is an associate professor at the University of Bergen and the Bjerknes Centre. The future position and intensity of storm tracks depend on how temperature gradients will change as the Earth continues to warm. The complication is that there is no single, simple way that global warming affects temperature gradients. Climate models suggest that warming may lead polar clouds to reflect more solar radiation. This would cool the polar region, increase the temperature gradient and shift the storm tracks poleward. Meanwhile, these same clouds also enhance the greenhouse effect, which warms the polar region and produces an equatorward shift. This is but one example of the opposing influences noted by the authors.

Reference

T.A. Shaw, M. Baldwin, E.A. Barnes, R. Caballero, C.I. Garfinkel, Y.-T. Hwang, C. Li, P.A. O'Gorman, G. Rivière, I.R. Simpson & A. Voigt (2016): Storm track processes and the opposing influences of climate change. *Nature Geoscience* 9, 656–664 doi:10.1038/ngeo2783

Crepuscular rays occur when the sunlight passes through gaps in the clouds, here near Montreux in Switzerland.
PHOTO: **HILARY BIRKS**

Research projects

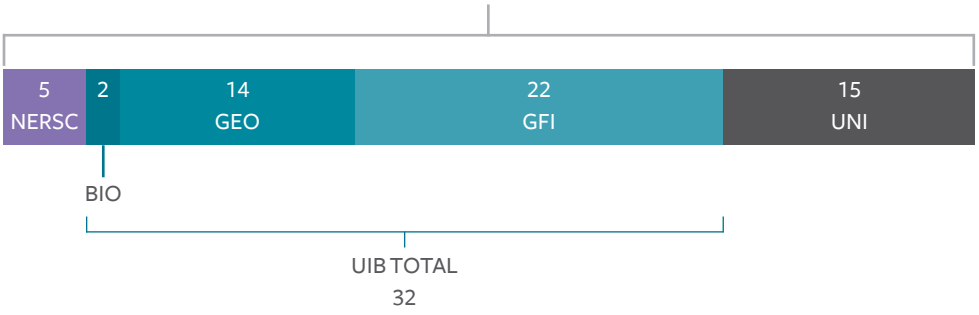
Most of Bjerknes science is carried out through externally-funded research projects. In 2016, Bjerknes scientists were involved in 76 externally-funded research projects, of which 58 are coordinated by the partner institutions.

In 2016, Bjerknes scientists were awarded a total of nine research grants from the Research Council of Norway, all which will start in 2017. At the same time, researchers at Bjerknes are partners in eight new projects funded by the European Commission.

Andreas Born received in December 2016 a Bergen Research Foundation grant for young researchers. Andreas defended his thesis in 2010 on "Ocean circulation and climate at the Eemian and last glacial inception" at UiB and BCCR under the supervision of Professor Kerim H. Nisancioglu, and has returned from Switzerland to Bergen to do his research.

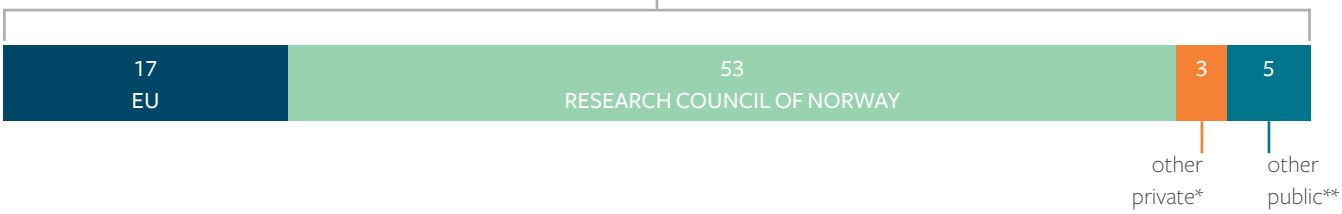
PROJECTS COORDINATED BY BJERKNES PARTNERS

TOTAL
58



FUNDING SOURCES

TOTAL
75



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Bergen Research Foundation
Sparebankstiftelsen DNB

**
Hordaland County Council & Regional Research Fund
European Economic Area-Norway grants
NORAD
NORDFORSK
SIU

New projects granted in 2016

PROJECTS FUNDED BY EU

ACRONYM	TITLE	PERIOD	PROGRAM	Leader*/Partner**
DEMODA	Decadal changes in the Atlantic equatorial mode. Origin and dynamics	2018–19	MSCA	N. Keenlyside **
SDC	Sea data cloud	2016–20	INFRA	B. Pfeil **
SEACRIFROG	Supporting EU-African cooperation on research infrastructure for food security and greenhouse gas observations	2017–20	INFRA	T. Johannesen **
RINGO	Readiness of ICOS for necessities of integrated global observations	2017–20	INFRA	T. Johannesen **
INTERDEC	The potential of seasonal-to-decadal scale inter-regional linkages to advance climate predictions	2016–20	HP2020JPI Climate	N. Keenlyside **
APPLICATE	Advanced predictions in polar regions and beyond: Modelling observing systems and design and linkages associated with a changing Arctic climate	2016–20	SC2-BlueGrowth	H. Drange **
BLUE-ACTION	Arctic impact on weather and climate	2017–21	SC2-BlueGrowth	T. Eldevik **
INTAROS	Integrated Arctic observing system	2016–21	H2020-BG-09	T. Johannesen **

PROJECTS FUNDED BY THE RESEARCH COUNCIL OF NORWAY

ACRONYM	TITLE	PERIOD	PROGRAM	Leader*/Partner**
SNOWPACE	Sources of the Norwegian winter season snow pack constrained by stable water isothopes	2017–20	FRINATEK	H. Soedemann *
UNPACC	Unifying perspectives on atmosphere-sea-ice interactions	2017–20	FRINATEK	T. Spengler *
PATHWAYS	Pathway, processes and impact of polar oceans	2017–20	FRIPRO	M. Årthun *
HAPPIEVA	Changed weather related risk by reducing global warming by half a degree	2017	KLIMAFORSK1.5	C. Heinze **
IMPACT	Impact of Greenland's ice loss on the meridional overturning circulation	2017	KLIMAFORSK	T. Eldevik *
TOBACO	Topographic barriers controlling warm water inflow and Antarctic ice shelf melting	2017–18	POLARFROG	E. Darelius *
SOUTHSPHERE	Past behaviour of the Southern Oceans atmosphere and cryosphere	2017–22	POLARFROG	J. Bakke *
T-TRAC	Tropical temperature reconstruction across 0.5 mill years from cave formation	2017–21	FRIPRO	N. Meckler *
ULTRAMER	Ultra-high resolution marin records from Subarctic Atlantic	2017–20	FRIPRO	M. Miles *
FRASIL	Fractal properies of sea ice leads and their impact on the Arctic physical and biological environments	2017–20	FRIPRO	P. Rampal *
ADNAPROX	Environmental ancient DNA as proxy for sea ice reconstruction	2017–19	FRIKLIM	S. de Schepper *
HIDDENCOSTS	Hidden cost of implementing afforestation as a climate mitigation strategy	2017–20	KLIMAFORSK	H. Lee *

PROJECTS FUNDED BY OTHER SOURCES

ACRONYM	TITLE	PERIOD	PROGRAM	Leader*/Partner**
CONNECTED	Chinese-Norwegian Partnership in teleconnection and prediction	2018–20	SIU-UTFORSK	T. Furevik *
MELT	Modelling Englacial Layers and Tracers in Ice Sheets	2017–21	Bergen Research Foundation	A. Born *
TRACE	The role of the Atlantic in constraining Eurasian climate change	2017	NORDFORSK	N.Keenlyside*

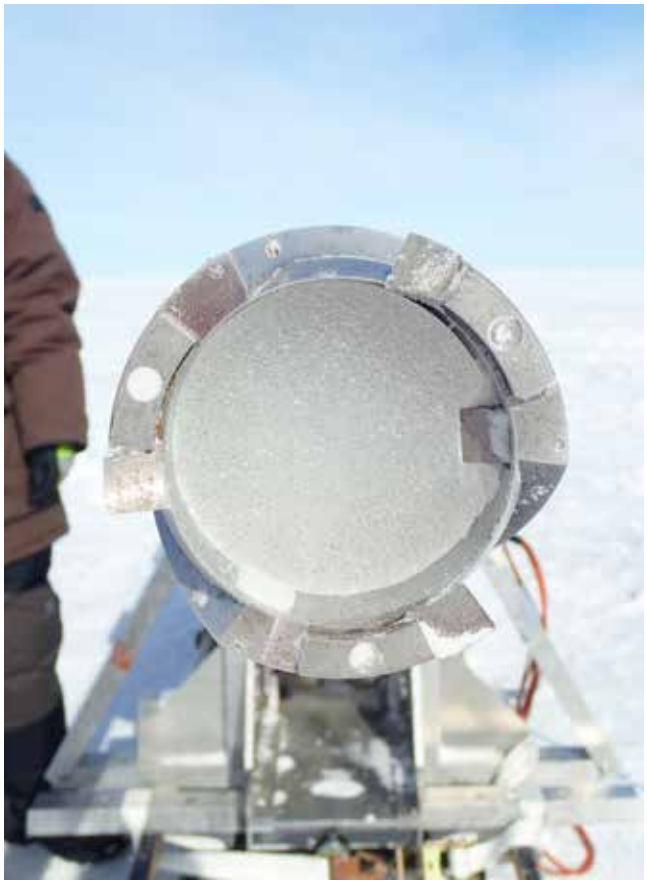
Drilling through the top of the world

It is solid, it is frozen, and from the surface it may seem like an eternally stagnant body of ice. It is not. The ice stream in north-east Greenland moves. It flows, moving ice from the top of Greenland towards the ocean.

In the summer of 2016, scientists from an international project started drilling a 2700-metre long ice core from the surface to the bedrock – the first Greenland ice core from a moving ice stream. Three scientists from the Bjerknes Centre and the University of Bergen were part of the crew: Professor Kerim H. Nisancioglu, Post-doc Sarah Berben, and PhD candidate Mari Fjalstad Jensen.

The ice stream moves toward the coast at a speed of 60 metres per year, discharging the ice as huge icebergs into the ocean. Over the last decade, the ice stream has accelerated, and scientists would like to know whether it will continue to speed up in the future.

When it reaches the bedrock under the ice in 2020, the project, led by the Centre for Ice and Climate at the University of Copenhagen, will have an archive of 100 000 years of climate data. From this, the researchers will retrieve information about the properties of the sediments between the ice and the bedrock, and whether there is water between the rock and the ice.



Below the upper layers, ice was extracted about one metre at a time.
PHOTOS: **KERIM H. NISANCIOGLU / EGRIP**

Drilling in north-east Greenland. Kerim Nisancioglu, UiB and the Bjerknes Centre, and Niccolo Maffezzoli, University of Copenhagen. The first metres of ice were drilled by hand from the surface. The next 70 metres or so were drilled by a mechanical drill giving individual cores of a little more than one metre each.
PHOTO: **EGRIP ICE CORE DRILLING PROJECT**

Tveitafossen near Kinsarvik in Hardanger on a rainy summer day.
PHOTO: **WILLEM VAN DER BILT**

Finances

Income sources of the Bjerknes Centre are a 12-year grant from the Ministry of Research and Education to the Centre for Climate Dynamics (SKD), recruitment positions from the University of Bergen, and research grants from the Research Council of Norway (RCN) and the European Commission (EC), as well as other public and private funds. In 2016 the Centre's overall income was approximately NOK 174 million, an increase of NOK 39 million compared to 2015.

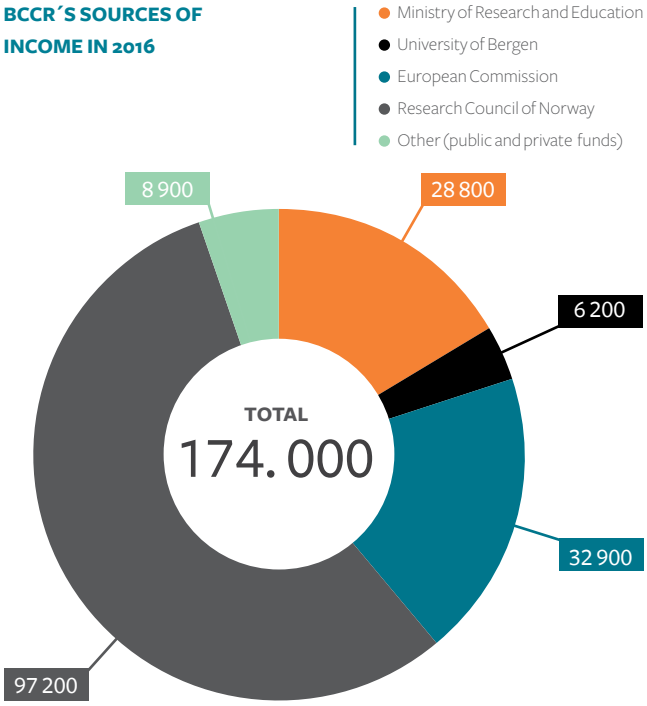
The increase is mostly due to research grants from RCN. The share of RCN funding rose from 50 % in 2015 to 56 % in 2016. The share of EC funding is stable at 19 %.

Grants from the major funding agencies (RCN; EC) account for 75 % of the Centre's total income. The Ministry supported the Centre with NOK 28.8 million, while the University of Bergen – SKD's host – funded seven recruitment positions (5 PhD; 2 postdoc). Other public and private funding, mainly from the Bergen Research Foundation, was stable at 5 % of the total income.

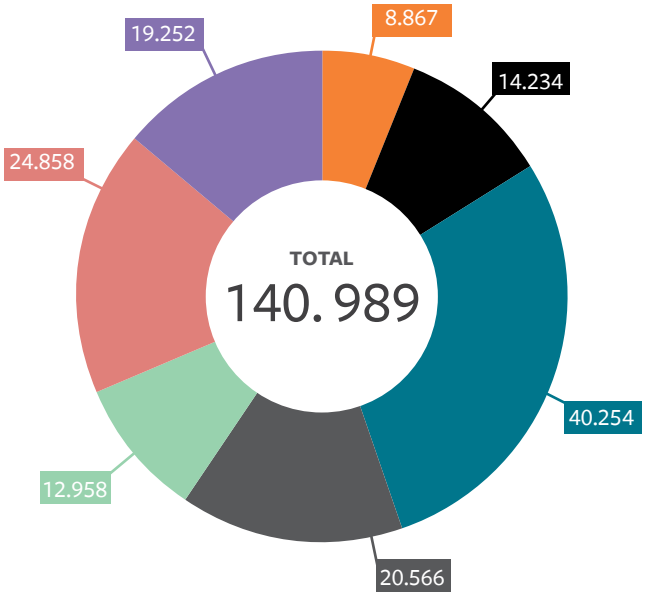
In-kind contributions from partner institutions (e.g. staff salary, ship time, computer resources etc.) are not included in the table.

FUNDING	NOK 1 000,–
Ministry of Research and Education	*28 800*
University of Bergen	*6 200*
European Commission	*32 900*
Research Council of Norway	*97 200*
Other private and public funds	*8 900*
Total income	174 000

BCCR´S SOURCES OF INCOME IN 2016



BCCR´S FUNDING DISTRIBUTION IN 2016



EXTERNAL FUNDING*

The graphic illustrates the funding distribution by strategic research theme at the Bjerknes Centre. Amounts in NOK.

- Climate modelling
- Climate predictions
- Carbon cycle & biogeochemistry
- Large-scale atmosphere-ocean dynamics
- Atmosphere, cryosphere and ocean processes
- Natural climate variability
- Past climate dynamics

* European Commission, Research Council of Norway, and other public and privat funds.

Research training 2016

The Norwegian Research School in Climate Dynamics (ResClim) is now in its final year. For eight years, ResClim has played an important role in educating future climate researchers in Norway. This role has now been taken over by The Norwegian Research School on Changing Climate in the Coupled Earth System (CHESS). CHESS covers a larger set of disciplines than ResClim , including three additional partners. Active ResClim members have been transferred to CHESS. In its last year, ResClim, in collaboration with CHESS, has offered a variety of valuable courses (see list below).

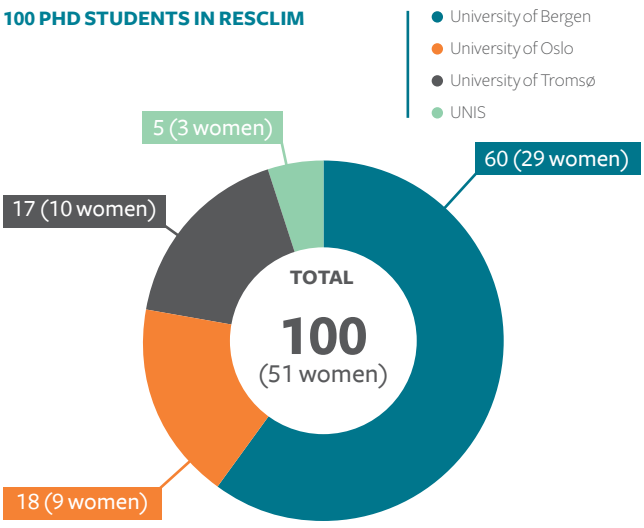
The annual PhD conference has expanded and has now become a Nordic PhD conference, arranged for and by PhD students. Erwin Lambert and Lander R. Crespo from the Bjerknes Centre were in charge of this year's event that took place at Upsete. This conference is exclusive to PhD students where they discuss science without the presence of senior scientists. Is has also become an important platform for networking between early career scientists.

RESCLIM AND CHESS COURSES AND ACTIVITIES 2016

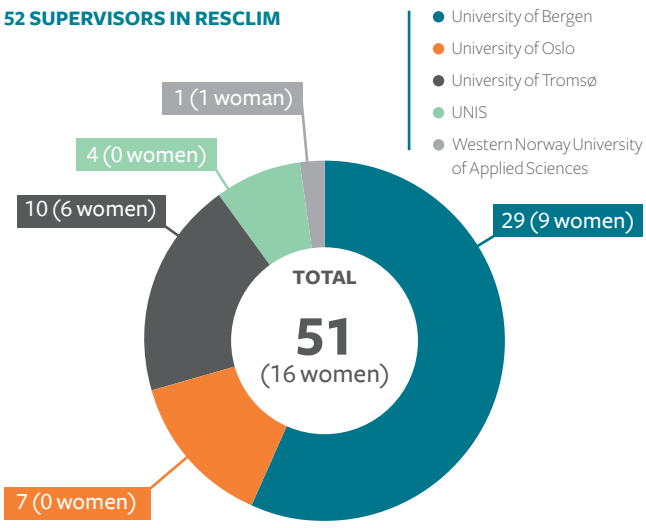
(# = number of attendees)

ACTIVITY	DURATION	LECTURER	LOCATION	#
Creating successful project proposals	18–20 November	Friederike Urbassek Hoffmann	Bergen	9
Large Scale turbulence in atmosphere and ocean	Weeks 6 and 10	Joe Lacasce	Oslo	12
Atmosphere-vegetation-soil interaction: from diurnal to climate time scales	22–24 February	Jordi Vila	Bergen	13
ResClim and CHESS all staff meeting	2 March		Sotra	56
Creating scientific podcasts	12–15 April	Jack Soper	Bergen	10
Academic writing	2–4 May	Daniel Soule	Bergen	21
Ocean/atmosphere time series analysis: Theory and practice	23–27 May	Jonathan Lilly	Oslo	21
Writing workshop	20–24 June	Dallas Murphy	Bergen	11
NCL programming language	8–12 August	Mary Haley and Dennis Shea	Bergen	16
ACDC Summer School - Role of high latitudes in centennial to millennial scale climate variability	8–19 August		Bonne Bay, Newfoundland	26
PhD conference	26–28 September		Upsete	36
Co-sponsored: Field trip AMGG research school, UiT - Fluid emissions, climatic variations at the pliocene-pleistocene boundary, sedimentary processes and messinian evaporites	3–9 October		Sicily	14
Writing successful project proposals From idea to project: Preparing a draft proposal	29–30 November	Friederike Urbassek Hoffmann	Bergen	12
Creating scientific illustrations	6–8 December	Pina Kingman	Bergen	19

100 PHD STUDENTS IN RESCLIM



52 SUPERVISORS IN RESCLIM



Walking up the Winter Hose Brook valley to reach the top of Tablelands where the ACDC summer school participants camped as part of their two-day field trip.
PHOTO: **RAGNA BREINES**

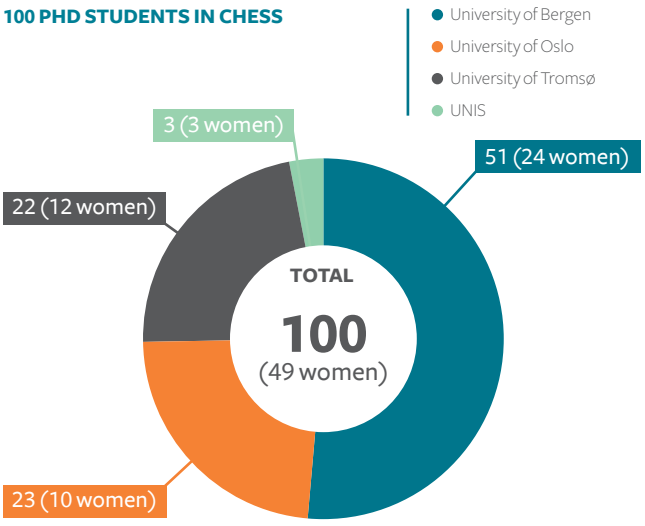
By the mantle in Newfoundland

Advanced Climate Dynamic Courses (ACDC) 2016

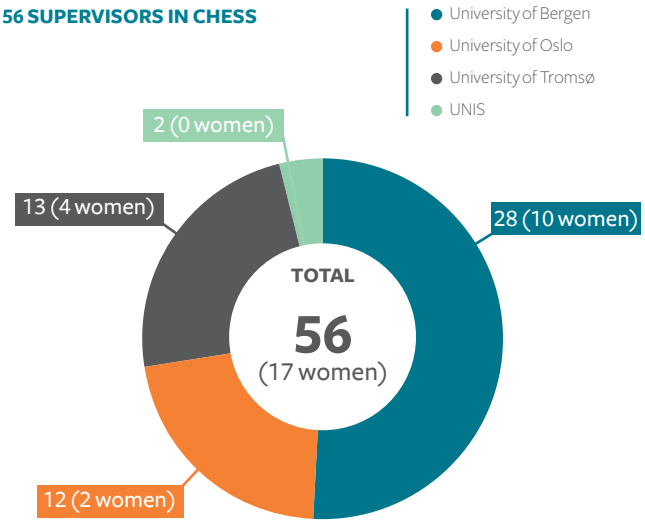
August 2016 was the eighth consecutive year of the Advanced Climate Dynamics Courses with a summer school held for advanced PhDs interested in pursuing an interdisciplinary career in climate dynamics. This year a group of 26 European and US based PhD candidates and postdocs spent two weeks together at the Bonne Bay Marine Station, Newfoundland. As in previous years, the students and lecturers represented fields within dynamical and empirical studies of climate, including atmosphere and ocean dynamics, glaciology, geology, and paleoceanography.

The focus of this year's school was to understand the basic principles and dynamics behind centennial to millennial scale climate variability, as well as their links to past, present, and future changes to high-latitude climate. In addition to fantastic lecturers, hands-on group projects, and discussion sessions there was time for several field trips, including extracting sediment cores from a nearby lake as well as an overnight field excursion to the Tablelands where the Earth's mantle is visible.

100 PHD STUDENTS IN CHESS

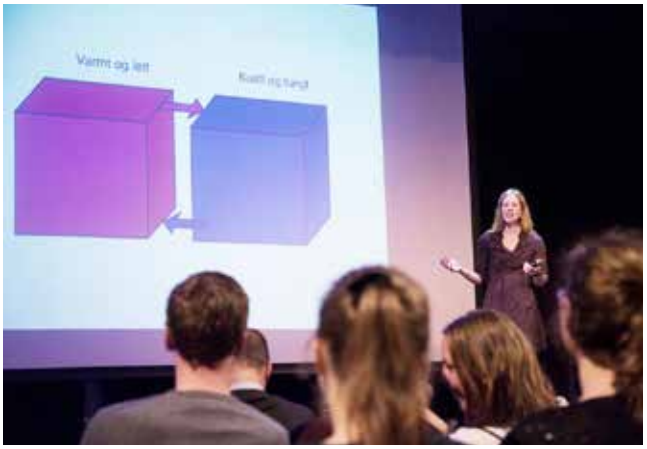


56 SUPERVISORS IN CHESS



Outreach

Throughout the year, Bjerknes Centre scientists have appeared in the media and given talks at conferences, at schools and for organisations. We also organised the Bjerknes day, in cooperation with the Bergen International Film Festival. More than 120 high school students came to learn about ocean acidification, the El Niño phenomenon, and the 1.5 degree target. In the afternoon more than 100 people attended a discussion about climate and energy policy.



Carina Bringedal explaining the mechanisms governing the circulation in the Atlantic.
PHOTO: **THE NORWEGIAN ASSOCIATION OF RESEARCHERS**

Meteorology and oceanography PhD students Kristine Flacké Haualand and Stefanie Semper study their first sediment core from a lake near Upsete.
PHOTO: **ELLEN VISTE**

You observe the weather, but how can you find out what will happen tomorrow? Thomas Spengler explained weather forecasting in his PechaKucha talk.
PHOTO: **THE NORWEGIAN ASSOCIATION OF RESEARCHERS**

Climate class in the field

The eight Bjerknes Centre scientists waiting for the train at Upsete one morning in September had only a vague idea of what to expect. When the train stopped, students from three high school classes flooded the station, ready for a day in the field. As part of the project Turspor, led by Professor Kerim H. Nisancioglu at the University of Bergen and the Bjerknes Centre, climate researchers take school children out into the mountains to learn about weather, climate, and geology. As part of the preparations, senior researchers and PhD students in different disciplines teach each other about their fields. The main responsibility for teaching the high school students is then given to the PhD students. At Upsete this year, the teenagers were taught how ice ages have shaped the landscape, they were taken to the ruins of a cabin destroyed by an avalanche, and they got to see how geologists and botanists use field-work to explore climate history.

Climate chit-chat

When the Norwegian Association of Researchers organised a PechaKucha Night in Bergen in October 2016, three out of the ten speakers came from the Bjerknes Centre.

PechaKucha is a Japanese term meaning chit-chat. It is also a presentation format that has spread around the globe with PechaKucha Nights taking place in 900 cities worldwide. In a PechaKucha you show 20 slides and have exactly 20 seconds to talk about each slide.

Could the Gulf Stream stop? And if so, what would happen to us? Carina Bringedal, postdoc at the University of Bergen and the Bjerknes Centre, showed the audience how currents in the Atlantic Ocean work. Showing how research can have direct implications at a local level, researcher Tobias Wolf-Grosse from the Nansen Center and the Bjerknes Centre talked about air pollution in Bergen. Professor Thomas Spengler from the University of Bergen and the Bjerknes Centre explained how the weather is forecast.

PhD candidate Tamara Trofimova explains how shells are used in climate research.
PHOTO: CARIN ANDERSSON DAHL

The buoy *Gabriel* has a central location in a fjord in Bergen.
PHOTO: MORVEN MUILWIJK

Morven Muilwijk on his way to inspect sensors and remove mussels from *Gabriel*.
PHOTO: MORVEN MUILWIJK

Shells tell the details

Shells can live for several hundred years, and year by year they grow rings, like trees do. Through a microscope, school children and other visitors to Forskningsdagene (the research days) in Bergen last year, could study cross-sections of 300 year old shells from the Norwegian Sea. Principal researcher Carin Andersson Dahl from Uni Research and the Bjerknes Centre explained how she and her colleagues use such shells as an archive of the climate in the past. Whereas sediment cores can rarely give any information about variations from one year to the next, the growth rings of shells can tell how the temperature of the ocean varied year by year 100–150 years ago.

Real science right outside

Not all schools have oceanographic equipment in the schoolyard. From the windows of the Amalie Skram high school in Bergen, the students can look directly at Gabriel, a big, yellow buoy floating in the sea outside. The buoy is part of the project "Ekte data" (real data), where high school students use real scientific data in real time when learning maths, physics, chemistry, and biology. The project is coordinated by Professor Helge Drange, Dr. Øyvind Paasche, and Morven Muilwijk at the University of Bergen and the Bjerknes Centre. Analysing real measurements from the ocean and the atmosphere, as well as land, leaves the students with a better understanding of nature and of the environmental challenges the world faces.

Bjerknes Centre scientists taking sediment cores from the lake Sarsvatnet in Svalbard. Marthe Gjerde and Willem van der Bilt both worked with sediment cores in their PhDs. PHOTO: **MARTHE GJERDE**

Doctoral dissertations 2016

In 2016, BCCR scientists provided supervision and training in climate research to54 PhD candidates. The following defended their dissertations:

December 16. 2016
Tobias Wolf-Grosse
Nansen Environmental and Remote Sensing Center

An Integrated Approach for Local Air Quality Assessment under Present and Future Climate Scenarios.
"In my thesis I studied the temperature inversions in the Bergen valley and their role in local urban air pollution episodes. As a concrete application we used this research to assess the impact of ships in Bergen harbour on these recurring air pollution episodes."

October 28. 2016
Aleksi Nummelin
GFI, University of Bergen

The Arctic Ocean in a Fresh and Warm Future.
"In the future, more heat will be transported into the Arctic by the ocean. Model simulations show that this is mainly because the water will be warmer, as the currents in the far north hardly change with greenhouse warming. Further south, the circulation will slow down, reducing the northward ocean heat transport."

June 3. 2016
Lea Svendsen
Nansen Environmental and Remote Sensing Center

Impacts of Atlantic Multi-Decadal Variability on the Indo-Pacific and Northern Hemisphere Climate.
"I explored how temperature variations in the North Atlantic affect Northern Hemisphere climate, from monsoon rainfall in India to temperatures in the Arctic. The results are useful for predicting climate on decadal timescales."

PhD candidate Tobias Wolf-Grosse filmed by a TV team while measuring air pollution in the harbour of Bergen.
PHOTO: **LASSE H. PETTERSSON**

May 3. 2016
Willem van der Bilt
GEO, University of Bergen

Towards a Process-Based Understanding of Holocene Polar Climate Change Using Glacier-fed Lake Sediments from Arctic Svalbard and Antarctic South Georgia.
"I analysed sedimentological, chemical, and biological traces from lake sediments to unravel the climate history of Earth`s polar areas since the end of the last Ice Age. While previously considered stable, my findings suggest that climate in our planet`s high-latitude regions regularly experienced phases of rapid change during this period. These events provide key analogues for the future."

June 17. 2016
Marthe Gjerde
GEO, University of Bergen

Holocene Variations in Atmospheric Circulation in the North Atlantic Region Reconstructed from Lake Sediments.
"Using sediment cores from lakes, I found that storms became more frequent on Andøya in northern Norway during the Little Ice Age. At the same time, the glacier Ålfotbreen in western Norway advanced. Together, this indicates stronger westerlies at the Norwegian coast."

September 13. 2016
Valerie-Marie Kumer
GFI, University of Bergen

The Potential of LiDAR Measurements for the Characterization of Wind Turbine Wakes.
"To get the most power out of a wind farm, each turbine must operate under minimal interference with wakes generated by upstream turbines. I have explored the use of Light Detection and Ranging (LiDAR) instruments for a better understanding of wakes in the atmosphere."

Engagements 2016

GLOBAL DIMENSION

Argo Programme: Kjell Arne Mork is a member of the Argo Steering Team.

Arctic-Subarctic Ocean Fluxes (ASOF):
Tor Eldevik, Svein Østerhus and Øystein Skagseth are members of the international scientific steering group.

Fixed-point Open Ocean Observatories (FIXO3):
Truls Johannessen is a member of the steering committee.

Forum for Research on Ice Shelf Processes (FRISP):
Elin Darelius is an early-career scientist representative and Svein Østerhus represents Norway.

Framework of Ocean Observing (FOO/GOOS):
Christoph Heinze is a member of the Ocean Observing Panel for Biogeochemistry.

Global Climate Forum (GCF):
BCCR is a member of the Global Climate Forum (GCF), a non-profit organization located at the Potsdam Institute for Climate Impact Research (PIK), Germany.

Global Ocean Acidification Observing Network (GOA-ON):
Benjamin Pfeil is an executive council member.

Intergovernmental Oceanographic Commission of UNESCO (IOC-UNESCO):
- Global Ocean Surface Underway Data (GOSUD): Benjamin Pfeil is a scientific steering group member.
- IOC UNESCO and SCOR's International Ocean Carbon Coordination Project (IOCCP): Are Olsen, Siv Lauvset and Benjamin Pfeil are scientific steering committee members.

International Arctic Science Committee (IASC):
Thomas Spengler is a representative for Norway in the Atmospheric Working Group (AWG) and currently elected as chair of the AWG.

International Commission on Dynamical Meteorology (ICDM):
Thomas Spengler is an elected member.

International Commission on the Middle Atmosphere (ICMA):
Yvan Orsolini is an elected member.

International Council for the Exploration of the Seas (ICES):
- Working Group on Hydrography: Kjell Arne Mork, Svein Østerhus and Øystein Skagseth are members.
- Study Group on Ocean Acidification: Are Olsen is a member.
- Working Group on Modelling Physical/Biological Interactions WGPBI: Corinna Schrum is a member.
- Working Group on Operational Oceanographic Products for Fisheries and Environment WGOOFE: Corinna Schrum is a member.
- Working Group on Integrated Assessments of the North Sea WGNIOSE: Corinna Schrum is a member.

International Eurasian Academy of Science (IEAS):
Igor Esau is an elected full member.

International Geosphere-Biosphere Programme (IGBP) and World Climate Research Programme (WCRP):
- Climate and the Cryosphere Project (CliC): Lars H. Smedsrud is a member of the scientific steering group.
- Integrated Marine Biogeochemistry and Ecosystem Research (IMBER): Ken Drinkwater is co-chair of the regional program Ecosystem Studies of Subarctic Seas (ESSAS).
- Past Global Changes (PAGES): Ulysses Ninnemann is in the scientific steering committee of IMAGES, the marine component of PAGES.
- PAGES Arctic 2k working group: Jostein Bakke is co-leader.
- PAGES EcoRe3: Alistair Seddon is the leader.
- PAGES/CLIVAR joint working group: Eystein Jansen is a member.
- CLIVAR Climate Dynamics Panel: Noel Keenlyside is a member.
- CLIVAR Global Synthesis and Observations Panel: Are Olsen is a member.
- IC3-Climate Centre, Barcelona: Eystein Jansen is a member of the scientific advisory board.
- Working Group for Seasonal to Interannual Predictability (WGSIP): Yvan Orsolini is member of the WMO-WCRP.

International Marine Global Changes Program (IMAGES):
Ulysses S. Ninnemann is the Norwegian representative.

International Ocean Carbon Coordination Project (IOCCP):
Are Olsen and Benjamin Pfeil are scientific steering committee members.

North Atlantic Virtual Institute (NAVIS):
Tor Eldevik is a member of the NSF collaborative project's steering committee.

OceanSITES:
Svein Østerhus is a member of the steering committee.

Pan-Eurasian Experiment (PEEX):
Igor Esau is a member.

PANGAEA – Data Publisher for Earth and Environmental Science:
Benjamin Pfeil is a member of the editorial board.

Southern Ocean Observing System (SOOS):
Benjamin Pfeil is a member of the data committee.

Surface Ocean CO_2 Atlas (SOCAT):
Benjamin Pfeil and Are Olsen are members of the Global Coordination Group. Camilla Landa, Benjamin Pfeil and Are Olsen are members of the SOCAT automation group.

Worldwide Universities Network (WUN) Global Challenges – Responding to Climate Change:
Tore Furevik is in the steering group.

EUROPEAN DIMENSION

Bolin Centre for Climate Research, University of Stockholm: Eystein Jansen is member of the science advisory board.

Coordinated Regional Downscaling Experiments (Euro-CORDEX):
Stefan Sobolowski is co-coordinator and point of contact.

CORDEX Flagship Pilot Studies (CORDEX-FPS):
- Stefan Sobolowski is co-leader of the FPS on Convective processes over Europe and the Mediterranean.
- Stefan Sobolowski is a participant in the FPS on Land use and climate across scales (LUCAS).

COST – European Cooperation in Science and Technology:
- Svein Østerhus is a member of the COST action Everyone's Gliding Observatories management committee.
- Anne Britt Sandø and Laurent Bertino are members of the COST action Evaluation of Ocean Syntheses.

East Greenland ice core drilling project (EGRIP):
Kerim H. Nisancioglu is the Norwegian representative and member of the steering committee.

ECCORD Science Support and Advisory Committee (ESSAC):
Kikki F. Kleiven is the Norwegian national delegate.

John Hulth from the University of Oslo rigging a stilling well for a pressure logger in a stream near Finse. The data will be used to determine streamflow in one of the rivers coming from the glacier Hardangerjøkulen, as part of the EVOGLAC project.
PHOTO: STEFAN SOBOLOWSKI

European Climate Research Alliance (ECRA):

- Lars H. Smedsrud is co-chair of the programme on Arctic Climate Stability and Change.
- J. Even Ø. Nilsen is co-chair of the collaborative programme on Sea Level and Climate Change.
- Eystein Jansen is member of the executive board of ECRA.

European Marine Board:
Kikki F. Kleiven is the Norwegian academic representative.

FORMAS Review Panel Climate Change:
Corinna Schrum is a panel chair.

Joint Programming Initiative (JPI) Climate – Module 1:
Tore Furevik is national representative.

Joint Programming Initiative (JPI) Oceans:
Tor Eldevik is a member of the national reference group.

SeaDataCloud:
Benjamin Pfeil is a member of the scientific committee.

MOSAIC:
Benjamin Pfeil is a team coordinator for data.

NATIONAL DIMENSION

Arctic Frontiers:
Tor Eldevik is member of the steering committee.

COSPAR (Committee for Space Research):
Yvan Orsolini is a national representative.

Notur/Norstore Resource Allocation:
Noel Keenlyside is a member.

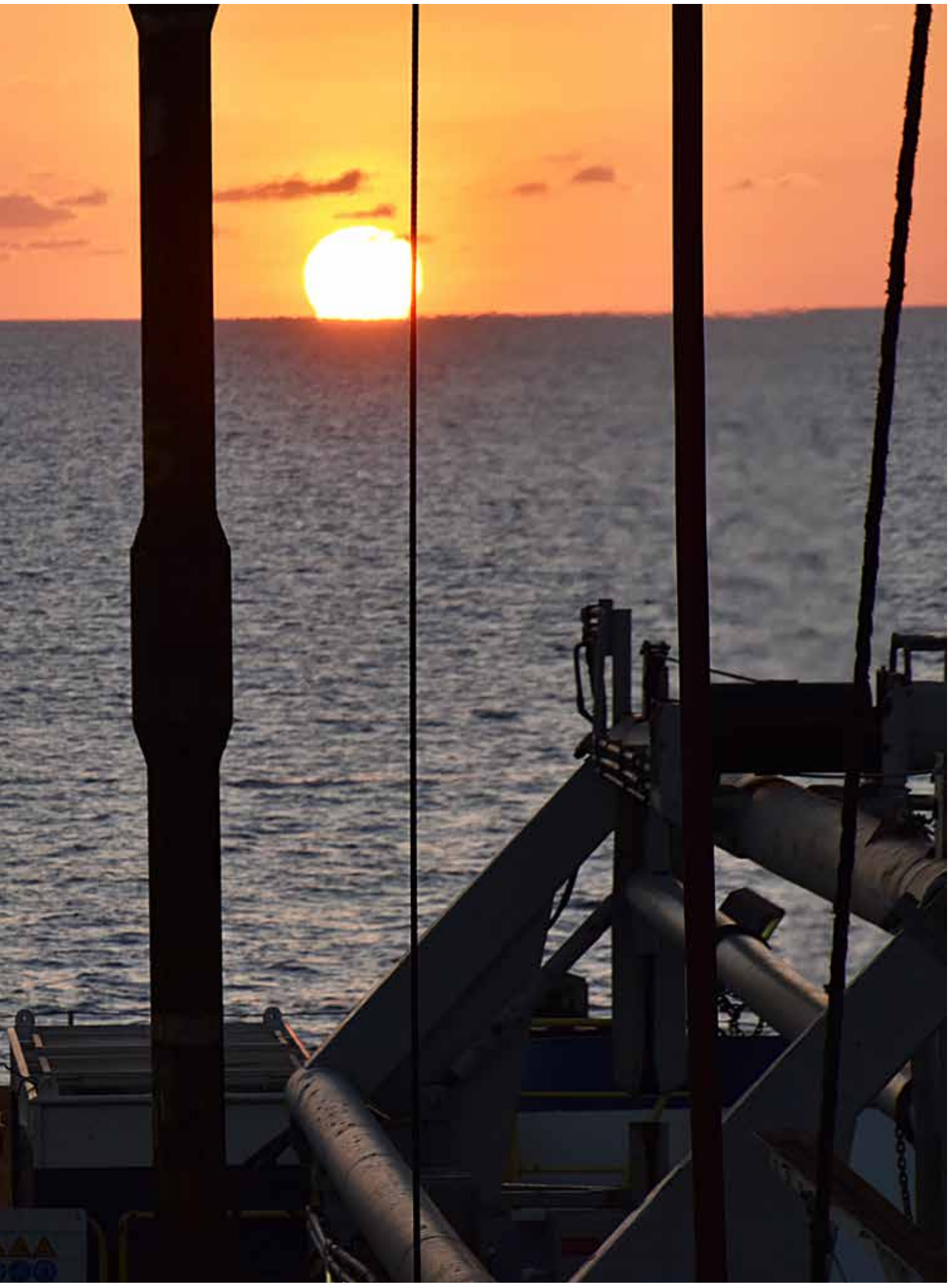
Nansen legacy (Arven etter Nansen) – a national consortium for a coordinated research programme:
Nils G. Kvamstø is a member of the steering committee and Tor Eldevik is Co-PI.

Norwegian Climate Foundation:
Kikki F. Kleiven is on the board of directors.

Research Council of Norway: KLIMAFORSK programme board:
Tore Furevik is vice chairman.

Research Council of Norway: Norway–India Programme Advisory Committee:
Eystein Jansen is a member.

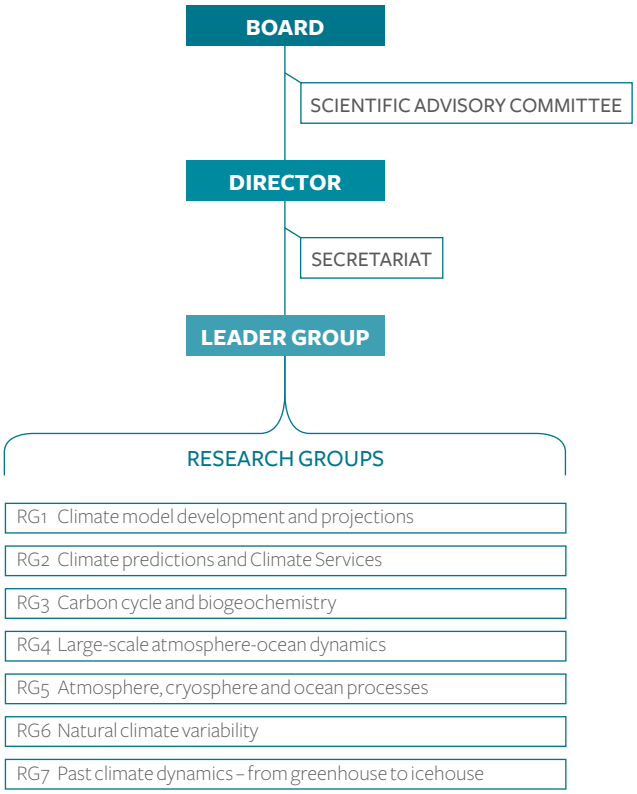
Subsurface CO_2 storage – Critical Elements and Superior Strategy (SUCCESS):
Truls Johannessen is the University of Bergen's board member.



Sunset over the Pacific. From October to December 2016, the research vessel JOIDES Resolution brought an international team of scientists to take cores of deep-sea sediments in the Western Pacific Warm Pool. The warm water in this region has a big impact on global climate and ocean currents.

PHOTO: **NIKLAS MEINICKE**

Organisation



THE LEADER GROUP

The leader group is comprised of the director, head of administration, head of communication, research leaders of the Centre for Climate Dynamics and leaders of the Bjerknes research groups. Their mandate includes the forging and implementation of the Centre's strategic scientific development, and to act as a channel of communication among the partners.

TORE FUREVIK	Professor (Director), Climate dynamics, UiB
TOR ELDEVIK	Professor, Oceanography, UiB
IGOR EZAU	Scientist, Meteorology, NERSC
CHRISTOPH HEINZE	Professor, Carbon cycle modelling, UiB/Uni Research
CAMILLE LI	Associate professor, Atmospheric dynamics, UiB
STEPHANIE MAYER	Scientist, Meteorology, Uni Research
KERIM H. NISANCIOGLU	Professor, Past climate dynamics, UiB
ARE OLSEN	Associate professor, Biogeochemistry, UiB
ODD HELGE OTTERÅ	Scientist, Climate modelling, Uni Research
BJØRG RISEBROBAKKEN	Scientist, Palaeoclimatology, Uni Research
ANNE BRITT SANDØ	Scientist, Oceanography, IMR
GUDRUN SYLTE	Head of Communications, UiB
RAGNHILD STOLT-NIELSEN	Head of Administration, UiB

BJERKNES RESEARCH GROUP

The science strategy is organised in seven research topics led by teams with specific goals, objectives and implementation plans.

RESEARCH GROUPS	LEADER (CO-LEADER)
RG1 Climate model developments and projections	O.H. Otterå (M. Bentsen)
RG2 Climate predictions and Climate Services	S. Mayer (N. Keenlyside)
RG3 Carbon cycle and biogeochemistry	C. Heinze (A. Olsen)
RG4 Large-scale atmosphere-ocean dynamics	C. Li (T. Eldevik)
RG5 Atmosphere, cryosphere and ocean processes	I. Ezau (L.H. Smedsrud)
RG6 Natural climate variability	J. Bakke (A. Bjune)
RG7 Past climate dynamics – from greenhouse to icehouse	B. Risebrobakken (K. Nisancioglu)

BOARD OF DIRECTORS

ANTON ELIASSEN	Director, MET Norway (leader)
ANNE LISE FIMREITE	Pro-Rector, UiB
CARIN A. DAHL	Scientist, Uni Research
JOHNNY JOHANNESSEN	Director, NERSC
GEIR HUSE	Research director, IMR

SCIENTIFIC ADVISORY COMMITTEE

JENS HESSELBJERG CHRISTENSEN	Danish Meteorological Institute, Denmark
DOROTHEE BAKKER	University of East Anglia, UK
MAGDALENA BALMASEDA	ECMWF, UK
COLIN JONES	MET Office, UK
GUNHILD ROSQVIST	Stockholm University, Sweden
TAPIO SCHNEIDER	ETH Zurich, Switzerland
FIAMETTA STRANEO	WHOI, USA
CLAIRE WAELBROECK	LSCE/IPSL, France

SECRETARIAT

RAGNHILD STOLT-NIELSEN	Head of administration
GUDRUN SYLTE	Head of communication
ELLEN GRONG	Senior secretary
ØYVIND PAASCHE	Project leader and senior adviser
QUYNH-GIAO THI DO	Financial officer

Staff

SCIENTISTS

Adakudlu	Muralidhar	India	Uni Research	Atmospheric modelling
Asplin	Lars	Norway	IMR	Oceanography, modelling
Asteman	Irina Polovodova	Russia	Uni Research	Palaeoclimates
Bakke	Jostein	Norway	UiB	Palaeoclimates
Bentsen	Mats	Norway	Uni Research	Climate modelling
Bergh	Jon	Sweden	NERSC	Oceanography & sea ice
Bertino	Laurent	France	NERSC	Data assimilation
Bethke	Ingo	Germany	Uni Research	Climate modelling
Bhatt	Bhuwan	India	Uni Research	Regional modelling
Birks	Hilary	UK	UiB	Palaeoecology
Birks	John	UK	UiB	Palaeoecology
Bjune	Anne	Norway	UiB	Palaeoecology
Budgell	Paul	Canada	IMR	Oceanography, modelling
Carrassi	Alberto	Italy	NERSC	Geophysics & mathematics
Chafik	Leon	Sweden	UiB	Ocean dynamics
Chen	Youmin	China	Uni Research	Meteorology & climate modelling
Chen	Linling	China	NERSC	Meteorology
Chiche	Elin Darelius	Sweden	UiB	Physical oceanography
Ciasto	Laura	USA	UiB	Atmospheric dynamics
Counillon	Francois	France	NERSC	Oceanography
Daewel	Ute	Germany	NERSC	Marine biology
Dahl	Svein Olaf	Norway	UiB	Palaeoclimates
Dahl	Carin Andersson	Sweden	Uni Research	Palaeoclimates
De Schepper	Stijn	Belgium	Uni Research	Palaeoclimates
Demissie	Teferi	Ethiopia	Uni Research	Climate modelling
Dokken	Trond	Norway	Uni Research	Palaeoclimates
Drange	Helge	Norway	UiB	Climate modelling
Drinkwater	Ken	Canada	IMR	Oceanography & marine ecosystems
Dylmer	Christian	Denmark	Uni Research	Palaeoclimates
Eldevik	Tor	Norway	UiB	Oceanography, climate dynamics
Ezau	Igor	Russia	NERSC	Meteorology

Farmer	Elizabeth	UK	Uni Research	Palaeoclimates
Felde	Vivian	Norway	UiB	Palaeoclimates
Fer	Ilker	Turkey	UiB	Physical oceanography
Furevik	Tore	Norway	UiB	Ocean dynamics and modelling
Gao	Yongqi	China	NERSC	Oceanography
Gharamti	Mohamad El	Lebanon	NERSC	Hydrology, Ocean Modelling, Data Assimilation and Forecasting
Goris	Nadine	Germany	Uni Research	Carbon cycle modelling
Guo	Chuncheng	China	Uni Research	Physical oceanography/ocean climate modelling
Gupta	Alok Kumar	India	Uni Research	Climate modelling
Haflidason	Haflidi	Iceland	UiB	Palaeoclimates
Hannisdal	Bjarte	Norway	UiB	Geobiology
Haugan	Peter	Norway	UiB	Polar oceanography
Heinze	Christoph	Germany	UiB	Carbon cycle modelling
Hughes	Anna	UK	UiB	Palaeoclimates
Ilicak	Mehmet	Turkey	Uni Research	Ocean dynamics and modelling
Irvali	Nil	Turkey	UiB	Palaeoclimates
Ivanova	Natalia	Russia	NERSC	Remote sensing and sea ice
Ivanova	Detelina	Bulgaria	NERSC	Climate modelling
Jansen	Eystein	Norway	UiB	Palaeoclimates
Jeansson	Emil	Sweden	Uni Research	Biogeochemistry
Johannessen	Truls	Norway	UiB	Biogeochemistry
Keenlyside	Noel	Australia	UiB	Tropical meteorology
Kimura	Satoshi	Japan	NERSC	Ocean Modelling
King	Martin	Malaysia	Uni Research	Meteorology
Kleiven	Kikki Flesche	Norway	UiB	Palaeoclimates
Kolstad	Erik	Norway	Uni Research	Meteorology
Koseki	Shunya	Japan	UiB	Meteorology
Kristiansen	Trond	Norway	IMR	Physical oceanography
Kvamstø	Nils Gunnar	Norway	UiB	Meteorology
Langebroek	Petra	Netherlands	Uni Research	Palaeoclimates
Langehaug	Helene R.	Norway	NERSC	Palaeoclimates
Lauritzen	Stein Erik	Norway	UiB	Palaeoclimates
Lauvset	Siv	Norway	Uni Research	Biogeochemistry
Lee	Hanna	Korea	Uni Research	Terrestrial biogeochemistry
Li	Camille	Canada	UiB	Atmospheric dynamics
Li	Lu	China	Uni Research	Atmospheric modelling
Lien	Vidar	Norway	IMR	Ocean circulations, climate effects
Linge	Henriette	Norway	UiB	Palaeoclimates
Luo	Yiming	China	UiB	Oceanography

Lygre	Kjetil	Norway	NERSC	Biogeochemistry & modelling
Mangerud	Jan	Norway	UiB	Palaeoclimates
Mayer	Stephanie	Germany	Uni Research	Meteorology
Meckler	Nele	Switzerland	UiB	Palaeoclimates
Mesquita	Michel	Brazil	Uni Research	Atmospheric dynamics
Miles	Martin	USA	Uni Research	Palaeoclimates
Miles	Victoria	Russia	NERSC	Environmental remote sensing
Mork	Kjell Arne	Norway	IMR	Ocean modelling
Nesje	Atle	Norway	UiB	Palaeoclimates
Nilsen	Jan Even Øie	Norway	NERSC	Oceanography
Ninnemann	Ulysses	USA	UiB	Palaeoclimates
Nisancioglu	Kerim Hestnes	Norway	UiB	Past climate dynamics
Olason	Einar	Iceland	NERSC	Sea ice dynamics
Olsen	Are	Norway	UiB	Biogeochemistry
Omar	Abdirahman	Somalia	Uni Research	Biogeochemistry
Otterå	Odd Helge	Norway	Uni Research	Climate modelling
Outten	Stephen	UK	NERSC	Atmospheric dynamics
Perner	Kerstin	Germany	UiB	Paleoceanography, micropaleontology
Rampal	Pierre	France	NERSC	Physical oceanography & glaciology
Reuder	Joachim	Germany	UiB	Meteorology
Risebrobakken	Bjørg	Norway	Uni Research	Palaeoclimates
Samuelsen	Annette	Norway	NERSC	Physical oceanography
Sandø	Anne Britt	Norway	IMR	Ocean modelling
Schwinger	Jörg	Germany	Uni Research	Carbon cycle modelling
Seddon	Alistair	UK	UiB	Palaecology, global change
Shen	Mao-Lin	China	UiB	Meteorology
Simon	Margit	Germany	Uni Research	Palaeoclimates
Skagseth	Øystein	Norway	IMR	Physical oceanography
Skjelvan	Ingunn	Norway	Uni Research	Biogeochemistry
Skogen	Morten	Norway	IMR	Ocean modelling
Skoglund	Rannveig	Norway	UiB	Physical Geography/ Palaeoclimates
Smedsrud	Lars H.	Norway	UiB	Polar oceanography
Sobolowski	Stefan	USA	Uni Research	Atmospheric dynamics
Sodemann	Harald	Germany	UiB	Atmospheric dynamics
Sorteberg	Asgeir	Norway	UiB	Meteorology
Spengler	Thomas	Germany	UiB	Meteorology
Stiller-Reeve	Mathew	UK	Uni Research	Meteorology
Strømsøe	Jørund	Norway	Uni Research	Palaeoclimates
Suo	Lingling	China	NERSC	Meteorology
Svendsen	John-Inge	Norway	UiB	Palaeoclimates

Søiland	Henrik	Norway	IMR	Physical oceanography
Telford	Richard	UK	UiB	Quantitative palaeoecology, palaeoclimatology
Tisserand	Amandine A.	France	Uni Research	Palaeoclimates
Tjiputra	Jerry	Indonesia	Uni Research	Carbon cycle modelling
Toniazzo	Thomas	Italy	Uni Research	Meteorology
Vikebø	Frode	Norway	IMR	Climate & marine ecosystems
Viste	Ellen	Norway	UiB	Meteorology
Våge	Kjetil	Norway	UiB	Physical oceanography
Wehde	Henning	Germany	IMR	Physical oceanography
Williams	Timothy	UK	NERSC	Oceanography
Zhang	Zhongshi	China	Uni Research	Palaeoclimates
Østerhus	Svein	Norway	Uni Research	Physical oceanography
Ådlandsvik	Bjørn	Norway	IMR	Physical oceanography

POSTDOCS

Bakhoday	Mostafa	Iran	UiB	Physical oceanography
Becker	Meike	Germany	UiB	Carbon cycle modelling
Berben	Sarah	Belgium	UiB	Palaeoclimates
Bosse	Anthony	France	UiB	Physical oceanography
Bouillon	Sylvain	Belgium	NERSC	Sea ice dynamics
Brendryen	Jo	Norway	UiB	Palaeoclimates
Bringedal	Carina	Norway	UiB	Mathematics, oceanography
Cheung	Ho Nam	UK	UiB	Atmospheric Science
Davy	Richard	Norway	NERSC	Climate physics
de Fleurian	Basile	France	UiB	Palaeoclimates
Devilliers	Marion	France	UiB	Climate - air quality
Ekici	Altug	Turkey	Uni Research	Permafrost modelling, land modelling, carbon cycle
Fan	Yuanchao	China	Uni Research	Land surf. Modelling, remote sensing
Galaasen	Eirik Vinje	Norway	UiB	Palaeoclimates
Gao	Shuang	China	UiB	Biogeochemistry
Garcia-Ibañes	Maribel	Spain	Uni Research	Marine chemistry
Griewank	Philipp	Germany	NERSC	Ocean Modelling, Data Assimilation & Forecasting
He	Yanchun	China	NERSC	Oceanography/modelling
He	Shengping	China	UiB	Atmospheric Science
Hezel	Paul	USA	UiB	Atmospheric dynamics
Ho	Sze Ling	Malaysia	UiB	Palaeoclimates
Kimmritz	Madlen	Germany	NERSC	Sea ice modelling

Madonna	Erica	Switzerland	UiB	Atmospheric dynamic
Michel	Clio	France	UiB	Meteorology
Myksvoll	Mari S.	Norway	IMR	Physical oceanography
Ogawa	Fumiaki	Japan	UiB	Meteorology
Olafsdottir	Sædis	Iceland	UiB	Palaeoclimates
Omrani	Nour-Eddine	Germany	UiB	Tropical meteorology
Papritz	Lukas	Switzerland	UiB	Meteorology
Pedersen	Vivi	Denmark	UiB	Palaeoclimates
Piasecki	Alison	USA	UiB	Quaternary Earth Systems
Pilskog	Ingjald	Norway	Uni Research	Modellering, biogeochemistry
Reuder	Susana Mendes	Portugal	UiB	Meteorology
Schemm	Sebastian	Switzerland	UiB	Atm, ocean & climate dynamics
Sorokina	Svetlana	Russia	UiB	Meteorology
Spensberger	Clemens	Germany	UiB	Meteorology
Svendsen	Lea	Norway	UiB	Climate dynamics
Vasskog	Kristian	Norway	UiB	Palaeoclimates
Wang	Yiguo	China	NERSC	Statistics
Werner	Johannes	Germany	UiB	Palaeoclimates
Yumruktepe	Caglar	Turkey	NERSC	Oceanography
Årthun	Marius	Norway	UiB	Oceanography, climate dynamics

PHD CANDIDATES

Ali	Elsheikh Bashir	Sudan	UiB	Chemical oceanography
Bachem	Paul	Germany	Uni Research	Palaeoclimates
Bohlinger	Patrik	Germany	UiB	Meteorology
Bonitz	Fabian	Germany	Uni Research	Palaeoclimates
Brakstad	Ailin Dale	Norway	UiB	Physical oceanography
Castaño-Primo	Rocio	Spain	UiB	Physical oceanography
Clotten	Caroline	Germany	Uni Research	Palaeoclimates
Daae	Kjersti	Norway	UiB	Physical oceanography
de Wet	Pierre	South Africa	UiB	Physical oceanography
Dugstad	Johannes	Norway	UiB	Physical oceanography
Eide	Marie	Norway	UiB	Oceanography
Elageed	Salma K.D.E	Sudan	UiB	Chemical oceanography
Faber	Anne-Katrine	Denmark	UiB	Atmospheric science, paleoclimate
Fremme	Astrid	Norway	UiB	Experimental meteorology

Fröb	Friederike	Germany	UiB	Biogeochemistry
Gjerde	Marthe	Norway	UiB	Quaternary geology, palaeoclimates
Gleixner	Stephanie	Germany	UiB	Tropical meteorology
Griem	Lisa	Germany	UiB	Paleoceanography, biogeochemistry
Guernaoui	Omar El	Morocco	UiB	Meteorology
Haualand	Kristine Flacke	Norway	UiB	Dynamic meteorology
Håvik	Lisbeth	Norway	UiB	Physical oceanography
Jensen	Mari Fjalstad	Norway	UiB	Climate dynamics, palaeoclimates
Johansson	Fanny Ekblom	Sweden	UiB	Paleoclimates
Kral	Stephan	Germany	UiB	Experimental meteorology
Kumer	Valerie	Austria	UiB	Meteorology
Lambert	Erwin	Netherlands	UiB	Climate dynamics
Leutert	Thomas	Switzerland	UiB	Palaeoclimates
Lind	Sigrid Gjessing	Norway	IMR	Physical oceanography
Loose	Nora	Germany	UiB	Palaeoclimates
Meinicke	Niklas	Germany	UiB	Quaternary Earth Systems
Moree	Anne	Netherlands	UiB	Biogeochemistry
Muilwijk	Morven	Netherlands	UiB	Arctic oceanography, sea ice
Nummelin	Aleksi	Finland	UiB	Ocean dynamics
Onarheim	Ingrid H.	Norway	UiB	Physical oceanography and sea ice
Oppedal	Lea Toska	Norway	UiB	Palaeoclimates
Pariyar	Sunil Kumar	Nepal	UiB	Tropical meteorology
Petersson	Algot	Norway	UiB	Physical oceanography
Plach	Andreas	Switzerland	UiB	Palaeoglaciology, ice flow modelling
Pontoppidan	Marie	Denmark	Uni Research	Meteorology
Rajasakaren	Balamuralli	India	Uni Research	Biogeochemistry
Rheinlænder	Jonathan	Denmark	UiB	Physical oceanography
Rodriguez-Crespo	Lander	Spain	UiB	Climate dynamics
Røthe	Torgeir	Norway	UiB	Palaeoclimates
Sadatzki	Henrik	Germany	UiB	Palaeoclimates
Sandvik	Mari	Norway	UiB	Meteorology
Semper	Stefanie	Germany	UiB	Physical oceanography
Sessford	Evangeline	Canada	UiB	Palaeoclimates
Smith-Johnsen	Silje	Norway	UiB	Palaeoclimates, Glaciology
Trofimova	Tamara	Russia	Uni Research	Palaeoclimates
Tsopouridis	Leonidas	Greece	UiB	Meteorology
van der Bilt	Willem	Netherlands	UiB	Palaeoclimates
Weng	Yongbiao	China	UiB	Meteorology
Wolf	Tobias	Germany	NERSC	Meteorology
Åkesson	Henning	Sweden	UiB	Palaeoclimates, glaciology

TECHNICAL & ADMINISTRATIVE STAFF

Balino	Beatriz	Norway	UiB	Head of administration, Bjerknes secretariat, until May
Bernard	Christophe	France	UiB	Chief Engineer, data management BCDC
Breines	Ragna	Norway	UiB	Project manager, RESCLIM
de Lange	Tor	Norway	UiB	Senior technician, biogeochemistry
de Vareilles	Mahaut	France	UiB	Project manager, PREFACE
Grong	Ellen	Norway	UiB	Senior secretary, Bjerknes secretariat
Hoffmann	Friederike	Germany	UiB	Science coordinator, Geophysical Institute
Jackson	Kristin	USA	UiB	Engineer, biogeochemistry
Jones	Steve	UK	UiB	surface ocean biogeochemistry
Korablev	Alexander	Russia	UiB	Oceanographic data processing and analysis
Landa	Camilla	Norway	UiB	Engineer, data manager BCCD
Naustdal	Sigve	Norway	UiB	Chief engineer, measurement science
Ostrowski	Marek	Norway	IMR	Physical oceanography
Paasche	Øyvind	Norway	UiB	Project leader and senior adviser, Bjerknes Secretariat
Pfeil	Gerrit Benjamin	Germany	UiB	Senior engineer, data management BCDC
Sandquist	Erik	Norway	Uni Research	Science coordinator, Uni Research
Stolt-Nielsen	Ragnhild	Norway	UiB	Head of administration, Bjerknes secretariat, from May
Støren	Eivind	Norway	UiB	Palaeoclimates
Sylte	Gudrun	Norway	Uni Research	Head of communications , Bjerknes secretariat
Thi Do	Quynh-Giao	Vietnam	UiB	Finances, Bjerknes secretariat

PERSONNEL SUMMARY

Number of scientific personnel, sorted by category and partners

Category	Staff	Foreigners %	Women %
Academics	219	67%	37%
Technicians & administration	20	40%	50%
Total	**239**		

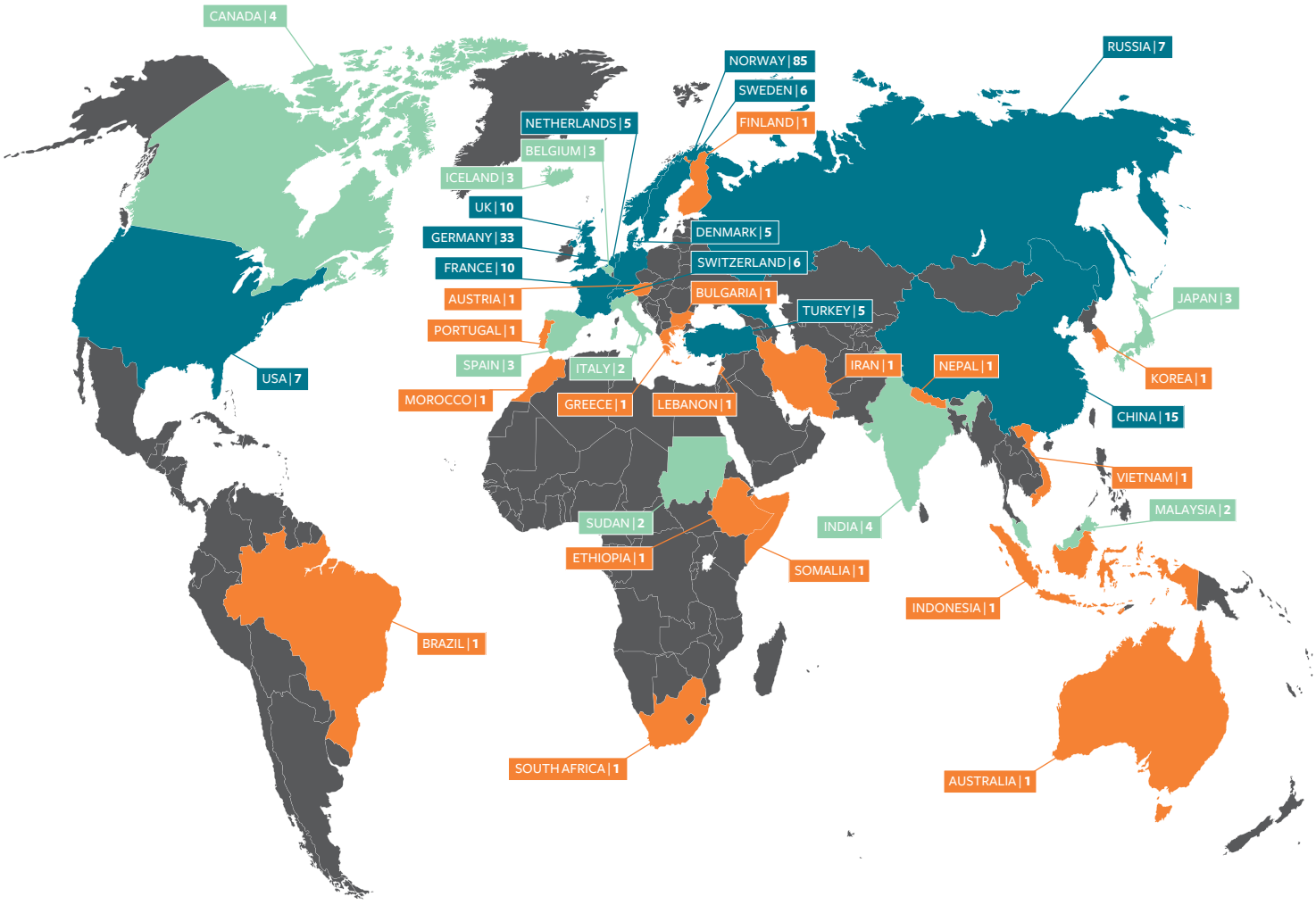
	STAFF						
Category	UiB	Uni Research	NERSC	IMR	Total	Foreigners %	Women %
Scientists	46	39	22	13	120	62%	29%
Postdocs	32	5	7	1	45	78%	40%
PhD candidates	46	6	1	1	54	70%	52%
Total	**124**	**50**	**30**	**15**	**219**		

STAFF BY NATIONALITY

The BCCR encompassed 38 nationalities in 2016

COUNTRY	PERSONNEL
Norway	85
Germany	33
China	15
UK	10
France	10
USA	7
Russia	7
Switzerland	6
Sweden	6
Netherlands	5
Turkey	5
Denmark	5
India	4
Canada	4
Iceland	3
Belgium	3
Spain	3
Japan	3
Italy	2
Malaysia	2
Sudan	2
Vietnam	1
South Africa	1
Somalia	1
Portugal	1
Nepal	1
Morocco	1
Lebanon	1
Korea	1
Iran	1
Indonesia	1
Finland	1
Ethiopia	1
Bulgaria	1
Brazil	1
Austria	1
Australia	1
Greece	1
Total	237

STAFF FROM 38 NATIONALITIES



Publications

Bjerknes scientists are indicated in bold

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11. Birks, H.J.B., Birks, H.H. (2016): Herbert E. Wright Jr (1917-2015). *Quaternary Newsletter*, 139, 3-14.

12. Birks, H.J.B, Felde, V.A., Bjune, A.E., Grytnes, J-A., Seppä, H.,Giesecke, T. (2016): Does pollen-assemblage richness reflect floristic richness? A review of recent developments and future challenges. *Review of Palaeobotany and Palynology*, 228, 1-25. DOI: 10.1016/j.revpalbo.2015.12.011

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15. Birks, H.J.B, Birks, H.H., Ammann, B. (2016): The fourth dimension of vegetation. *Science*, 354, 412-413. DOI: 10.1126/science.aai8737

16. Birks, H.J.B., Felde, V.A., Seddon, A.W.R. (2016): Biodiversity trends within the Holocene. *The Holocene*, 26, 996-1001. DOI: 10.1177/0959683615622568

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❶ Can I have some? Please!
Both scientists and dogs need good food in the field.
PHOTO: **HENRIETTE LINGE**

❷ The glacier Hardangerjøkulen, seen from Finse. Several Bjerknes Centre scientists have projects here.
PHOTO: **STEFAN SOBOLOWSKI**

❸ Participants discuss climate knowledge at a workshop organised by the TRACKS project, in north-east Bangladesh.
PHOTO: **ANNE BLANCHARD**

❹ Members of the scientific crew taking a break on the deck of the research vessel G.O. Sars. This cruise, south-east of Greenland in the summer of 2016, was organised by the Ice2Ice project.
PHOTO: **JØRUND STRØMSØE**

❺ A double rainbow over Bergen.
PHOTO: **HENRIETTE LINGE**