

The grand puzzle of climate research

At the Bjerknnes Centre for Climate Research, more than 100 climate scientists work to study the climate – past, present, and future.

TEXT JENS HELLELAND ÅDNANES PHOTO EIVIND SENNESET

The Bjerknnes Centre for Climate Research celebrates its first decade in 2012 and has established itself as the leading natural sciences climate centre in the Nordic region. Eystein Jansen is head of research and was heavily involved in the es-

tablishment of the centre in 2002. Today the centre has more than 100 scientific staff, about half of whom are from outside of Norway.

– Over the last decade, the Bjerknnes Centre has been recognised as a major academic participant in

climate research. But just as important is the fact that we have been recognised for our work in society outside of academia as well. We provide knowledge that is useful. It has always been our aim to be relevant and this is particularly obvious in our basic research, says Jansen.

He believes there is one particular reason why the research at Bjerknnes is of such high quality.

– It's the people here. We simply enjoy working together. There is diversity and a lot of interdisciplinary action, which means that the research expands into new areas all the time. Our research demands heavy-hitting teams with broad expertise across disciplines, he says.

« Like a large puzzle, the scientists, working in five interdisciplinary groups, create a bigger and clearer picture of climate change. »

Solving the puzzle

Like a large puzzle, the scientists, ▶



CLIMATE TIME-TRAVEL: Researchers Camille Li and Bjørg Risebrobakken at the Bjerknnes Centre for Climate Research.



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RESEARCHING PAST CLIMATES: Camille Li and Bjørg Risebrobakken lead the DYNAWARM project, which seeks to improve our understanding of the climate system in a warmer world, and to learn more about the present and future climate by looking at warmer periods thousands of years ago.

working in five interdisciplinary groups, create a bigger and clearer picture of climate change – past, present, and future. The overall goal is to understand and quantify regional climate change as part of the global climate system.

Geologist Bjørg Risebrobakken and atmospheric scientist Camille Li are two of the centre's best puzzle solvers. Together, the two lead

the four-year project *DYNAWARM: Dynamics of Past Warm Climates* at the Centre for Climate Dynamics (SKD), a Bjerknnes offshoot.

A physicist by training, Camille Li decided to go into atmospheric sciences after her bachelor's degree. She has worked at Uni Research and Bjerknnes for approximately a year, and before that for three years at UiB. She chose to join Bjerknnes because

« Fossil remains have been found of forests in the Arctic and Antarctica, and hippopotamus teeth in the arctic regions of Canada.

» Bjørg Risebrobakken, geologist

the expertise in paleoclimatology and physical oceanography would allow for exciting interdisciplinary work.

– There's a great enthusiasm and wide expertise at SKD and the Bjerknnes Centre. It's a mix of people from different disciplines, and the effort we've put into understanding one another and working together is well worth it, she says.

She believes the interdisciplinary work methods at Bjerknnes are unique.

– I've worked in other projects where we wanted to do this, but didn't quite succeed. I think Eystein has established an environment where cooperation between disciplines is possible. He's seen how important it is for climate research to move in this direction, Li suggests.

Prize-winning research

In 2014, the Intergovernmental Panel on Climate Change (IPCC) presents its Fifth Assessment Report. The Bjerknnes Centre is heavily involved with the report.

TEXT JENS HELLELAND ÅDNANES

On the walls of Eystein Jansen's cramped office, partly hidden behind a door, hangs a prize. It is a copy of the Nobel Peace Prize that the IPCC and Al Gore shared in 2007 for «their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures that are needed to counteract such change».

Jansen received his copy of the prize based on his role as a co-ordinating lead author in the IPCC's Fourth Assessment Report from 2007. The Bjerknnes provided the coordinating lead author, lead author, and several contributing authors.

Comprehensive work

The centre is once again heavily involved

with the next report, which is to be presented in 2013 and 2014, with four lead authors and several contributing authors, mostly in Working Group 1 which deals with the natural science basis for climate change.

Jansen himself is in the midst of work on the next report. The responsibility of the lead authors of IPCC reports is to assess

Bjørg Risebrobakken agrees that the interdisciplinary approach taken at the Centre strengthens the research at Bjerknes and the DYNAWARM project.

– At Bjerknes we have teams with different skills, that are able to view things from several angles and provide us with a larger picture, she says.

Hippo teeth and palm trees

By extracting columns of sediment from the bottom of the ocean, the DYNAWARM researchers explore how climate has changed through the ages. There is every indication that there have been periods when the entire planet, including the polar regions, was very warm.

– Fossil remains have been found of forests in the Arctic and Antarctica, and hippopotamus teeth in the arctic regions of Canada. The climate certainly must have been quite different from what it is today, Risebrobakken suggests.

According to Risebrobakken, the objective of the project is to understand how and why these warm climate periods existed, and develop an increased awareness of the interplay between the atmosphere, the oceans, and the cryosphere. Many different

factors can contribute to climate change, such as variations in solar radiation, atmospheric greenhouse gas concentrations, sea level, and tectonic regimes.

The past helps to predict the future

Knowledge of climate in a historical perspective is crucial if we are to understand the complexity of the climate changes currently taking place, and to distinguish between natural variations and human-made climate change.

– Right now, the Earth's climate is warming at a very fast rate. The last time atmospheric CO₂ concentrations were this high was 2.5 to 3 million years ago. Looking into past climates can give us an idea of what might happen in the future, says Li.

– What will happen if the global temperature rises by 3° C? Our research gives us insight into long time scale processes and lets us see what climate conditions were like when the global temperature actually was 3° C higher than today. Not only is this exciting material to work on, it is also essential work. It is a puzzle, where we find small bits here and there and put them together to see the bigger picture, Risebrobakken says. ◦

available information about climate change drawn mainly from the peer-reviewed and published scientific and technical literature.

After a number of meetings and surveys, the first draft has now been out for expert review. An IPCC report is comprehensive work.

– We have had 2,000 comments so far in my chapter. This is as many as in the whole process the last time around. All comments must receive a written reply. I doubt that you will find a more thorough research work than this, says Jansen.

The report will go through several drafts and reviews before a final plenary session of the IPCC between government representatives and the authors, for Working Group 1 in 2013 and the rest in 2014. Researchers

and representatives of the UN's member states will review the final summary report line by line.

– Certain myths do exist about researchers taking dictation from politicians, but people who think so don't have a clue about how researchers view the world. There may be some political tug of war involved in the process, but we have the final say, Jansen points out.

Change comes quickly

Jansen believes that the fifth IPCC report will stress the gravity of the climate situation to an even greater extent than previous reports.

– We are in an altogether extraordinary situation as far as climate change is

FACTS

The Bjerknes Centre for Climate Research

- Consists of four partners: the University of Bergen, Uni Research, the Institute of Marine Research, and the Nansen Environmental and Remote Sensing Center.
- The scientific staff consist of more than 120 researchers and scholars, hailing from Norway and several other European countries, the United States, Canada, China, and a number of countries in Africa, Asia, and South America.
- The Centre had more authors in the last IPCC report than any other Nordic research institution, and is one of four European centres that contributed climate scenarios to the report.
- The Centre coordinates Norwegian activities for developing climate models/earth system models in advance of the next IPCC report.
- A benchmarking of international climate centres in 2008 placed the Bjerknes Centre as number two, ranging ahead of many known climate centres in the US, Europe, Asia, and Australia.
- The centre is named after Vilhelm Bjerknes and his son Jacob Bjerknes, who were the leading figures of the «Bergen School» of the physics of atmosphere and ocean.

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concerned, where changes take place more rapidly than nature is accustomed to on the global level.

Although there is every indication that addressing climate change is urgent, one doesn't always get the impression that the powers that be implement the required measures. Jansen does not however lose heart.

– My motivation is to figure things out. That is my driving force. Research results that are of importance for the whole planet must be presented in public. And even if the message from climate researchers has been known for years, we need to keep repeating this urgent message, Jansen makes clear. ◦



CLIMATE RESEARCH FOR THE WORLD: Eystein Jansen is head of research at the Bjerknes Centre for Climate Research and a member of the IPCC climate panel. PHOTO: WALTER N. WEHUS