POLAR INSIGHTS FOR CLIMATE ACTION

Arctic science contributions to implementing the Paris Agreement

Warming at almost twice the global average rate, the Arctic is a key region for understanding wider climate change impacts. Mitigation and adaptation strategies in the Arctic are thus an integral part of the EU's wider efforts to combat climate change and to implement the Paris Agreement. This session provided up-to-date and policy-relevant information on Arctic change and its global implications.

15th November 2017
11:45—13:00
EU Pavilion
COP23 Bonn Zone

Moderation - Jonathan Bamber (European Geosciences Union)

Impact of the EU's investment in Arctic science
Andrea Tilche (European Commission)

Arctic impacts on global atmosphere and ocean circulation
Dirk Notz (MPI Hamburg)

The impacts of Arctic sea ice decline
Jeremy Wilkinson (British Antarctic Survey)

Melting glaciers and ice sheets and their impacts on global sea level rise
Sebastian H. Mernild (Nansen Environmental & Remote Sensing Center)

The consequences of permafrost thaw
Margareta Johannsson (Lund University)

A Side Event hosted by the EU Arctic Cluster

The EU Arctic Cluster is a network of currently funded Horizon2020 projects, which merges the most up-to-date findings on Arctic change and its global implications. Its objective is to provide guidance and policy-relevant information and to support the EU in advancing international cooperation, in responding to the impacts of climate change on the Arctic's fragile environment, and on promoting and contributing to sustainable development.

www.eu-arcticcluster.eu

EU-PolarNet BLUE ACTION INTAROS NUNATARYUK APPLICATE Arctic Research Icebreaker Cons. ARICE ICE-ARC INTER = ACT

Impact of the EU's Investments in Arctic Science

Andrea Tilche

Head of Unit "Climate action and Earth observation"
Directorate-General for Research and Innovation European Commission

Photo: Alfred-Wegener-Institut / Stefan Hendricks (CC-BY 4.0)

Why focus on the Arctic?

- Arctic changes are due to global drivers, vice versa Arctic changes influence the climate system and sea levels worldwide.
- Arctic science is of global responsibility and international scientific cooperation is essential.
- Arctic research and observation are fundamental means for understanding and predicting the rapid evolution of these changes.

The EU's investment in Arctic science

- The EU is a major investor and is deeply involved in Arctic research and observations.
- The EU also supports the development and the international access to Arctic research infrastructures throughout the whole region.
- Over the first half of the Horizon 2020 Programme the EU has already funded more than 45 Arctic related projects worth more than 120 Million Euro.

Spending in Arctic research and observations is not a cost but an investment that generates benefits.

The EU Arctic Cluster

The currently funded Arctic projects together build the EU Arctic Cluster – a network, which merges the most up-to-date findings on Arctic change and its global implications.

- EU-PolarNet – Strategic framework and coordination
- ICE-ARC – Impact of Arctic sea ice loss (FP7)
- INTAROS – Integrated Arctic Observing System
- APPLICATE & BLUE-ACTION – Impacts on global weather
- NUNATARYUK – Permafrost melting and coastal regions
- INTERACT – Transnational access to research stations
- ARICE – Transnational access research icebreakers

Better predictive capabilities, but also earlier warning of what is happening to the planet is needed, for triggering greater urgency in deploying decarbonisation solutions globally.

Future activities: 65-80 M€ in 2018-20

- Ice sheet/glacier dynamics and contributions to global sea-level change;
- Changes in Arctic biodiversity and related impacts;
- Sustainable opportunities in a changing Arctic;
- The development of Arctic Standards for technologies and services;
- Tipping points and climate processes;
- Arctic observations (GEOCRI);
- Polar climate.

Arctic science and observations are part of the 3.3 billion € Focus Area "Building a low-carbon, climate-resilient future" that characterises the Horizon 2020 2018-2020 Work Programme.

The European Commission aims at establishing a sustained transnational cooperation – and the associated funding – for securing an integrated Arctic observing system. The objective is to provide a number of Arctic Essential Variables and to ensure greater shared access to Arctic research infrastructures for scientist from everywhere.

The EU took commitments of sustaining its investments through its Arctic policy documents, and is maintaining its commitments.

Second Arctic Science Ministerial

The European Commission, the Republic of Finland and the Federal Republic of Germany will co-host the 2nd Arctic Science Ministerial (Berlin, 25-26 Oct 2018)

- To promote the results of the deliverables presented at the first Arctic Science Ministerial.
- To further enable the capability to respond to major societal challenges in the Arctic.
- To foster scientific cooperation among a wide number of countries and representatives of indigenous peoples.

Melting glaciers and ice sheets and their impacts on global sea-level rise

Sebastian H. Mernild

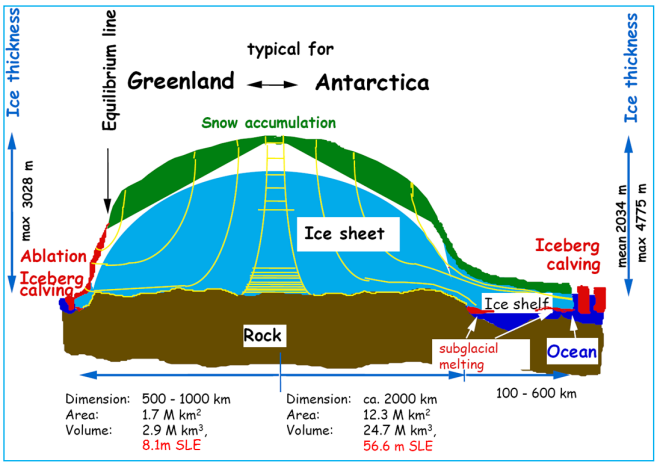
Director of Nansen Environmental & Remote Sensing Center, Norway

Key messages

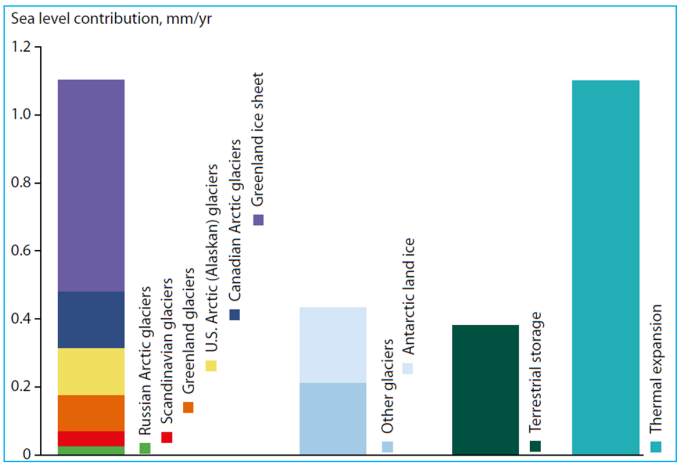
- Glaciers in the Arctic are reducing their area, volume, and facing margin retreat.
- Glaciers in the Arctic and globally are facing negative mass-balances, that will say they are losing more mass than they are gaining.
- Increasing mass loss from Greenland Ice Sheet, circa 350 Giga tons per year through Surface Mass Balance (difference between the snow accumulated in the winter and the snow and ice melted over the summer) and calving.
- Present sea-level change lies at ca. 3,2 mm per year.
- Ice mass-loss contributions to global sea-level rise:
  - 1/3 from Arctic land-ice,
  - 1/3 from Antarctica land-ice and other glaciers,
  - 1/3 from thermal expansion.

Photo: K. Milters

Photo: S.H. Mernild



Graph: S.H. Mernild



Graph: SWIPA, 2017

Coordinated by the Nansen Environmental & Remote Sensing Center

INTAROS: Integrated Arctic Observation System

The objective of the project is to extend, improve and unify existing and evolving observing systems in different parts of the Arctic. The INTAROS systems includes: atmosphere, ocean and seafloor, sea ice, marine ecosystem, glaciology, terrestrial themes, natural hazards, and community-based monitoring. INTAROS includes 49 partners from 20 countries.

Further reading

Snow, Water, Ice, Permafrost in the Arctic Report (SWIPA), AMAP
www.amap.no/swipa

Arctic Report Card, NOAA
www.arctic.noaa.gov/Report-Card

world glacier monitoring service
http://wgms.ch

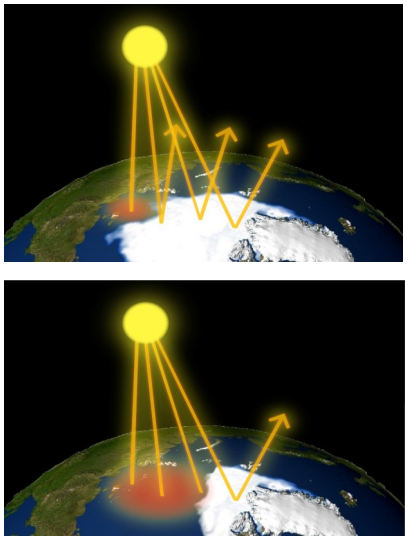
Arctic impacts on global atmosphere and ocean circulation

Dirk Notz

Max Planck Institute for Meteorology Hamburg, Germany

Key messages

- The Arctic is the early-warning system of our planet.
- Human-induced climate change in the Arctic is clearly visible today. For example, 3 m^2 of Arctic summer sea ice are lost per ton of CO_2 emission.
- Changes in the Arctic can affect mid-latitude weather patterns, in particular in North America and Northern Asia. We still lack robust understanding.
- Changes in the Arctic will very likely weaken the global ocean circulation. We still lack a robust quantification.

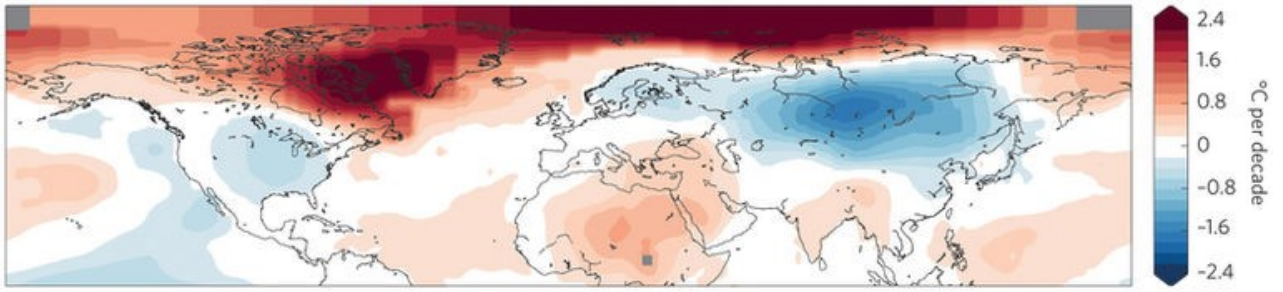


Graphs: D. Notz

Arctic amplification

Sea ice helps to keep the Arctic atmosphere cold. Its whiteness reflects much of the Sun's energy back to space, and it physically insulates the Arctic atmosphere from the underlying Arctic Ocean. With less sea ice, the refrigerator door is left open: more dark open water is exposed, which readily absorbs the Sun's energy in summer, heating the ocean and leading to even more melt.

(*Source: NSIDC*)



Northern hemisphere temperature change during the period 1990–2013

Graph: Cohen et al., Nature Geoscience, 2014

Ongoing research

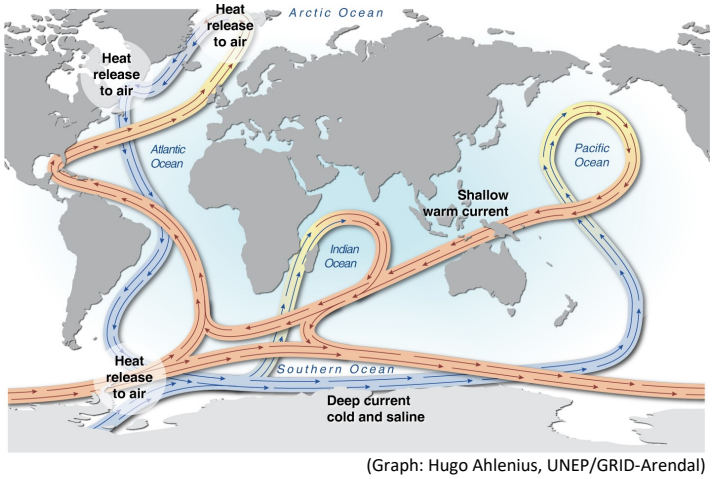
EU Horizon 2020 funds leading projects to investigate the links between observations and models:
APPLICATE and BLUE ACTION.

APPLICATE

The objective of APPLICATE is to develop enhanced predictive capacity for weather and climate in the Arctic and beyond, and to determine the influence of Arctic climate change on Northern Hemisphere mid- latitudes, for the benefit of policy makers, businesses and society.

BLUE ACTION

Blue-Action seeks to understand the linkages between the Arctic and the global climate systems to improve weather and climate modelling and prediction, to improve forecasting of hazardous conditions and climate extremes, and to co-design targeted climate services with relevant stakeholders.



(Graph: Hugo Ahlenius, UNEP/GRID-Arendal)

The graph shows a simplified overview of the global ocean circulation. Models suggest that global warming might lead to some reduction in Atlantic ocean circulation. However, the models might overestimate the stability of the circulation as they disagree with observations on the direction of the net salt transport in the Atlantic Ocean.

The impacts of Arctic sea ice decline

Jeremy Wilkinson

ICE-ARC Project Coordinator, British Antarctic Survey, United Kingdom

Key messages

- Polar regions are at the forefront of climate change. Sea ice is changing rapidly. Loss of around 50% in area of summer sea ice since late 1970s. Sea ice thickness has reduced by about 40%.
- Sea ice related feedbacks, generally enhance rather than reduce global warming.
- Transitioned from a multi-year ice region to a first year ice region.
- Better monitoring of sea ice, leads to better parameterisations, which leads to better predictions. This is essential to evaluate if we are on course to limit a rise of 1.5 to 2 C. Sea ice is a key climate indicator.
- Changes in sea ice has impacts in many sectors other than climate, thus a interdisciplinary approach is needed. EU science delivers this.

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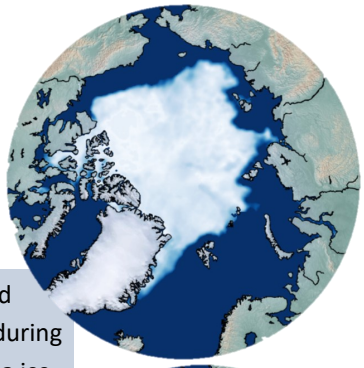

Sea ice extend in the Arctic during the annual sea ice minimum in September.

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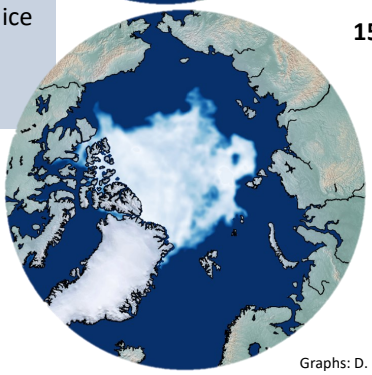


Graphs: D. Notz

Both photos: ICE-ARC fieldwork in Greenland (BAS)

Multifaceted impacts of sea ice loss

- Loss of traditional way of life of local and indigenous communities
- Enhanced coastal erosion
- Loss of habitat and species
- Increased ocean acidification
- Change in ocean properties
- Increased shipping, oil and gas exploration, fisheries and tourism
- Global extreme events link to sea ice loss
- Homeland, energy and food security is affected
- Sea ice loss has economic costs

Scientific insights

ICE-ARC is a EU Framework Programme 7 project that brings together experts in the fields of economics, natural and social sciences, and technology in order to directly assess the environmental, social and economic impact of Arctic sea ice loss. These trans-disciplinary programmes are essential if we are to continue to strengthen the links between science and society.

ICE-ARC
ICE • CLIMATE • ECONOMICS

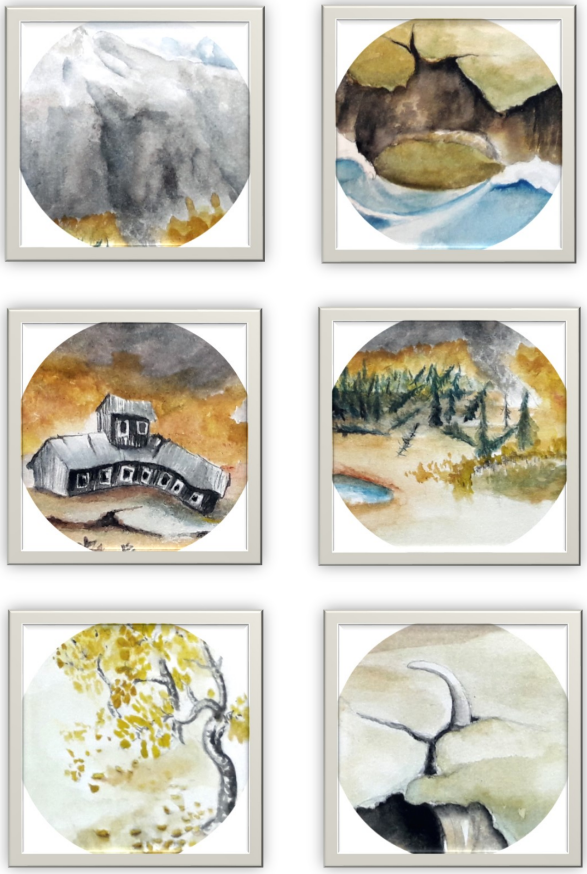
Why should we care about thawing permafrost?

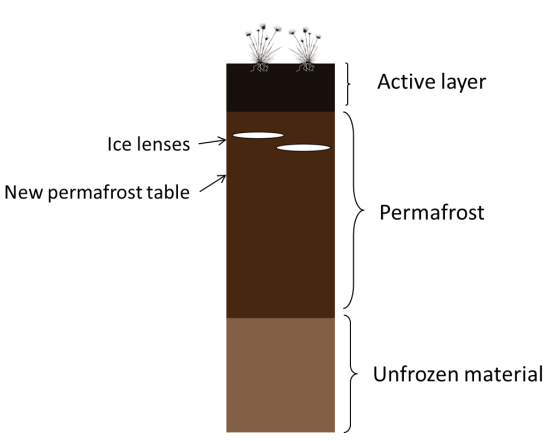
Margareta Johansson

INTERACT Project Coordinator, Lund University, Sweden

Key messages

- Thawing permafrost leads to unstable mountain slopes and coastal erosion— e.g. threatening human settlements.
- Thawing permafrost damages infrastructures as the ground underneath them gets unstable—unstable transportation routes and costly.
- Hydrology changes with thawing permafrost, e.g. lakes form and disappear — life depends on water.
- Thawing permafrost changes the carbon storage — more greenhouse gases are released into the atmosphere.
- As organic matter, which has been frozen over long time spans, thaws, old diseases can be brought back to life—threating human and animal health.
- Local changes in permafrost have even regional and global impacts.
- At a large scale, the ground temperatures (permafrost "to be or not to be") are decided by air temperatures – reductions in GHG emissions are necessary.





Graph: Margareta Johansson

Illustrations: Susanna Olsson

Ongoing research

NUNATARYUK will develop quantitative understanding of the fluxes and fates of organic matter released from thawing coastal and subsea permafrost; assess risks posed by thawing coastal permafrost, to infrastructure, indigenous and local communities and peoples health; use this understanding to estimate the long-term impacts of permafrost thaw on global climate and the economy.