

CP Arctic Climate Change

Arctic ECRA:

A Collaborative Programme of the European
Climate Research Alliance

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Who we are...

25 participating institutions from 10 European countries

Denmark	 	Finland		FINNISH METEOROLOGICAL INSTITUTE
France	    			
Germany	 	Italy	 	Italian National Agency for New Technologies, Energy and Sustainable Economic Development
Norway	    			
Sweden		The Netherlands	 	Royal Netherlands Meteorological Institute Ministry of Infrastructure and the Environment
United Kingdom	   			

Our strengths...

- Breadth of expertise including observations, modelling, theory and logistics
- Leading role in various national and international committees
- Flexible and responsive to new ideas
- Access to large-scale infrastructures (research icebreaker, polar stations, aircraft, ...)
- Availability of some of the most advanced regional and global earth system models

Our mission...

Mission statement:

Advancing Arctic climate research in Europe for the benefit of society...

... through

- international cooperation (e.g. shared infrastructure),
- Identification of key topics (research priorities), and
- providing advice (policy makers, funding agencies...)

Selected activities...

- Arctic ECRA workshops (4 since 2012)
- Arctic ECRA documents
 - Briefing documents
 - Strategy and Work Plan
- High-level side events
- Parliamentary lunchtime events
- Organisation and co-sponsoring of conferences and meetings

Conferences



International workshop on *Polar-lower latitude linkages and their role in weather and climate prediction*. 10-12 December 2014, Barcelona; Spain

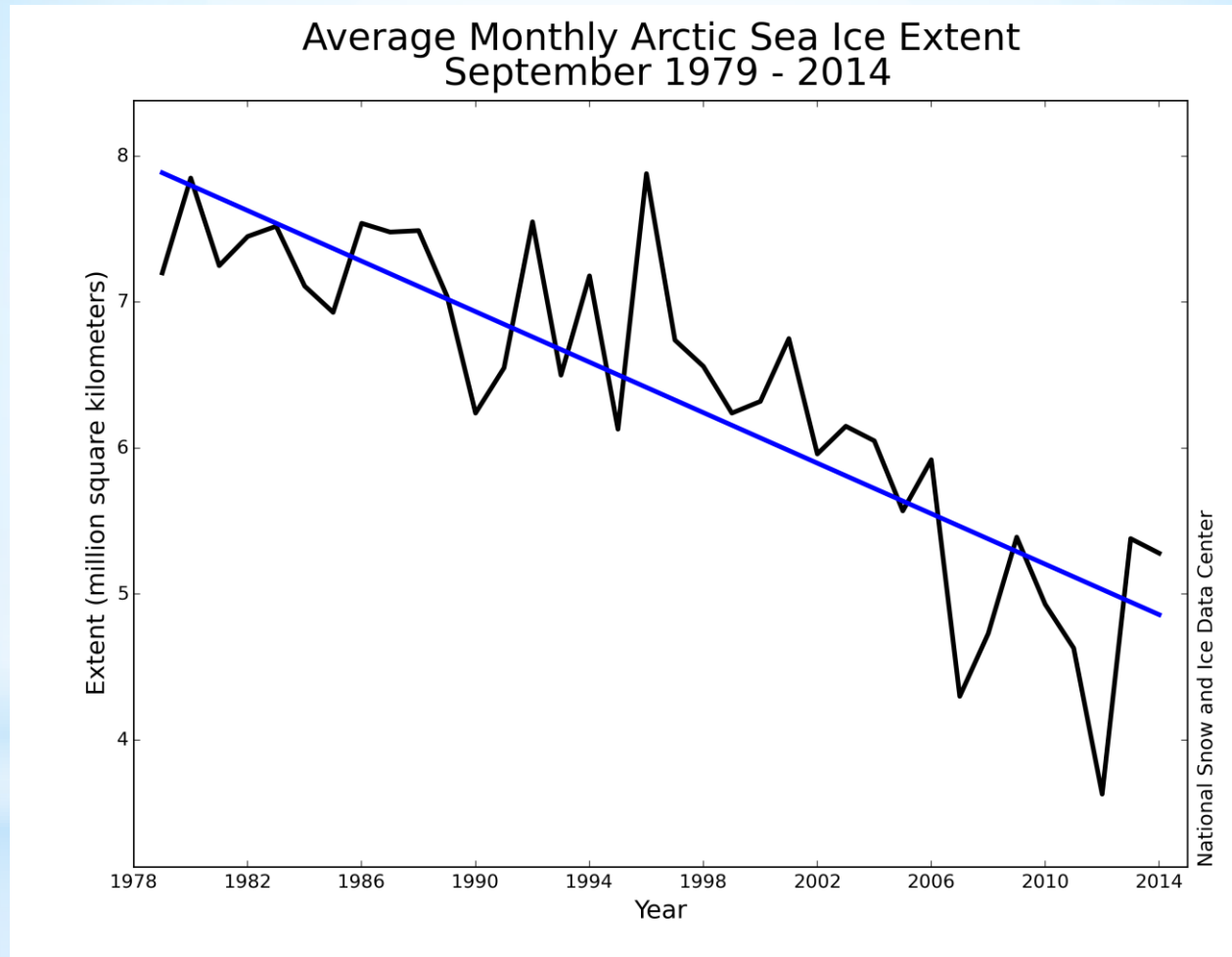
What we do...

- Arctic ECRA workshops (4 since 2012)
- Arctic ECRA documents
 - Briefing documents
 - Strategy and Work Plan
- High-level side events
- Parliamentary lunchtime events
- Organisation and co-sponsoring of conferences and meetings
- Contribution to the implementation of the Galyway statement ➔ Coordination of the theme *Arctic-Atlantic interplay*

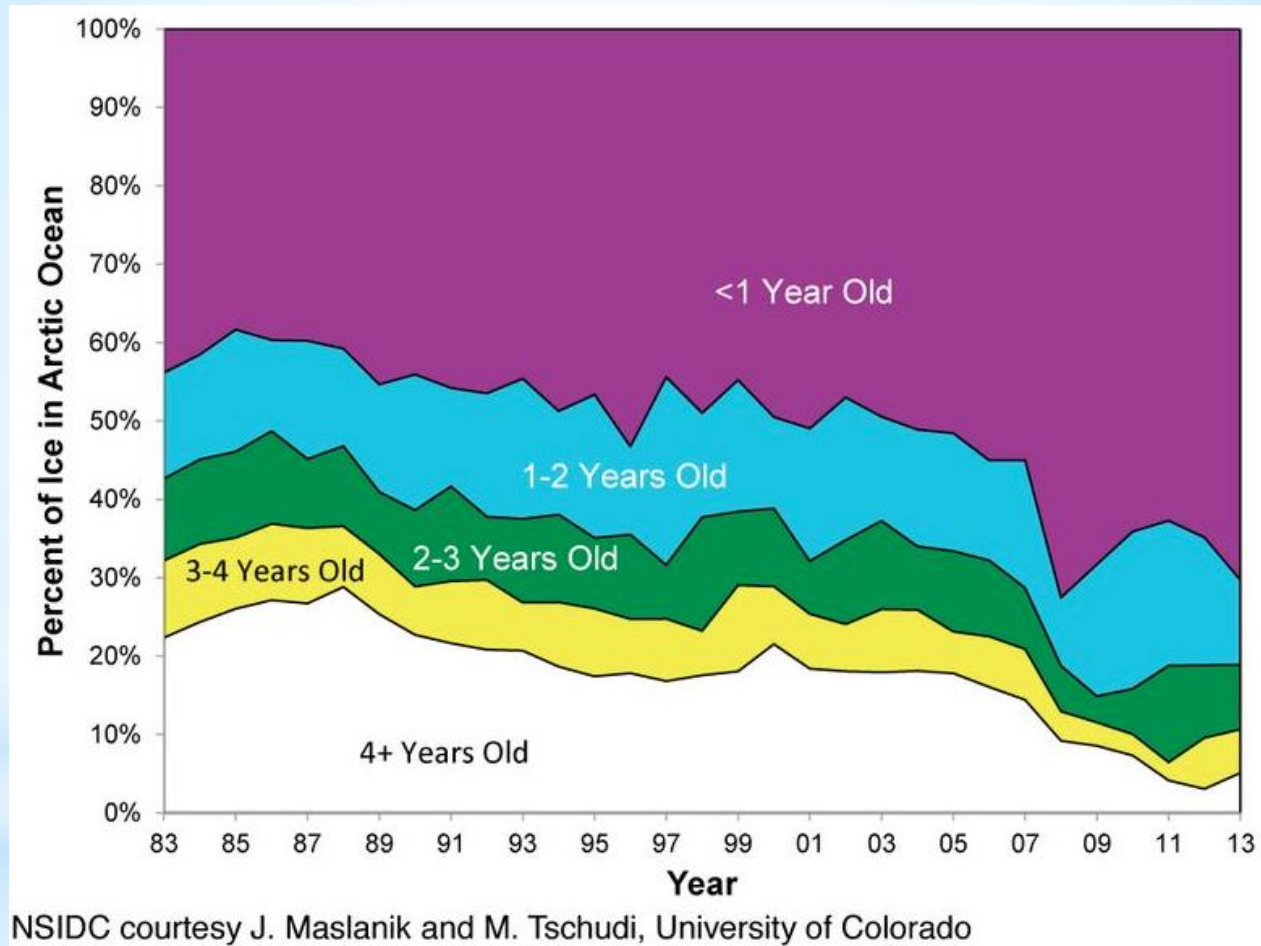
Scientific key-questions

- Why is Arctic sea ice declining so rapidly?
- What are the local and global consequences of Arctic climate change?
- How can polar prediction capabilities be improved?

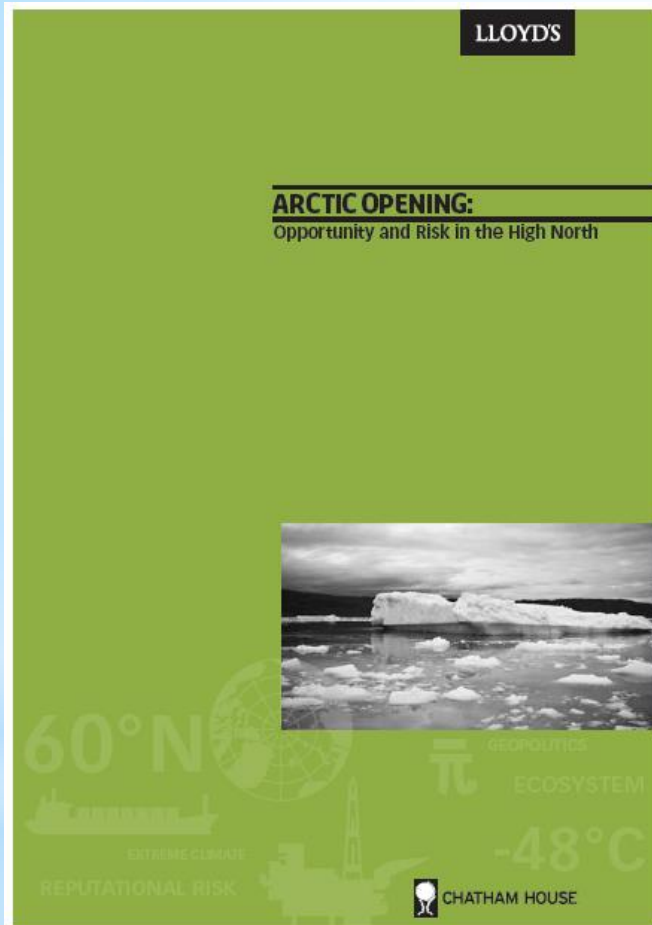
Arctic sea ice decline



Arctic sea ice decline

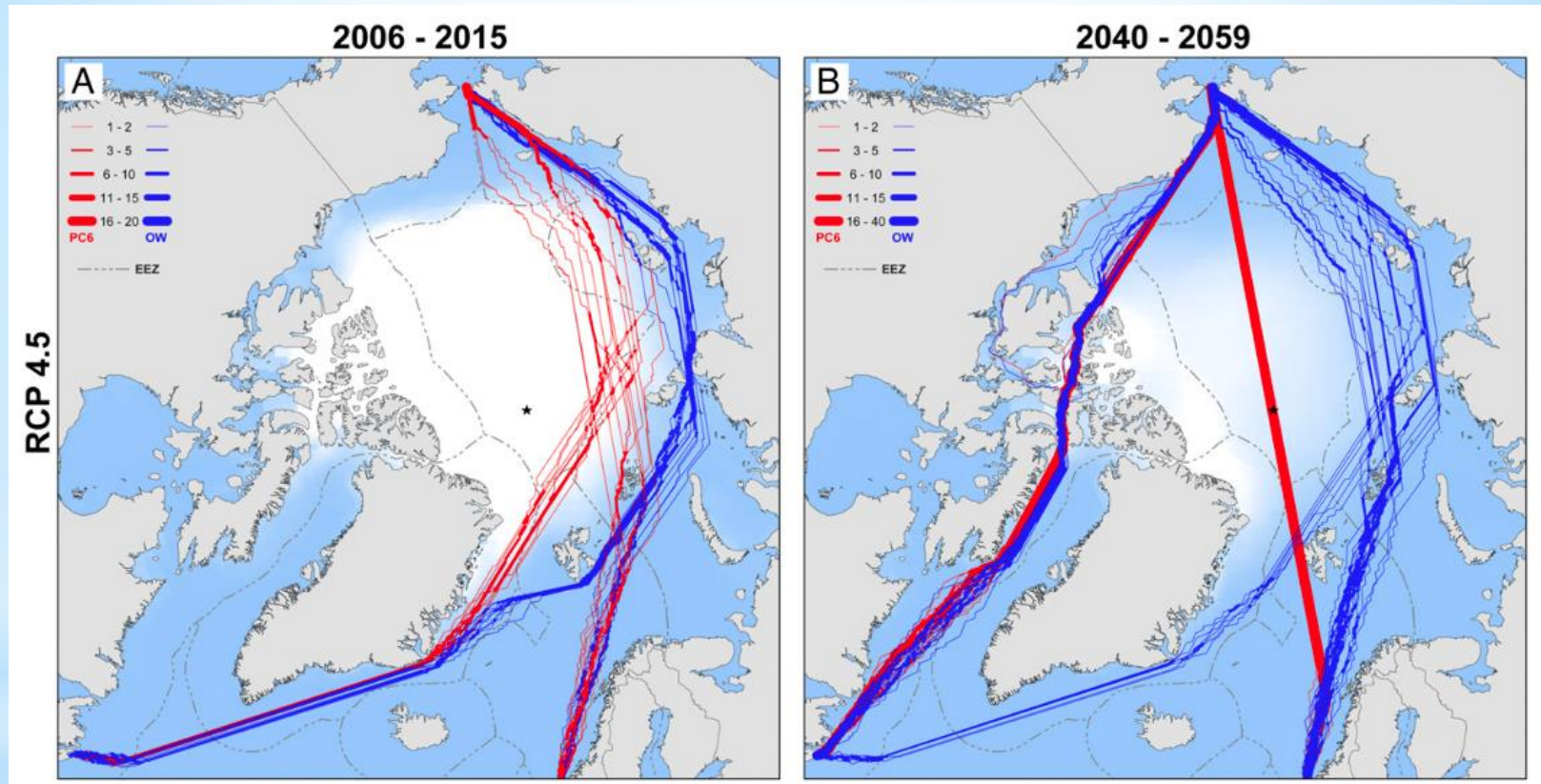


Local consequences



18	2. Opportunity and uncertainty: Charting the Arctic's economic and political future
19	2.1 Arctic mineral resources
19	2.1.1 Arctic oil and gas
26	2.1.2 Mining
27	2.2 Fisheries
29	2.3 Shipping and logistics
31	2.4 Arctic tourism
32	2.5 Arctic politics
32	2.5.1 Who owns what? Who controls what?
33	2.5.2 The geopolitics of Arctic energy
34	2.5.3 Arctic governance

Trans-Arctic shipping routes

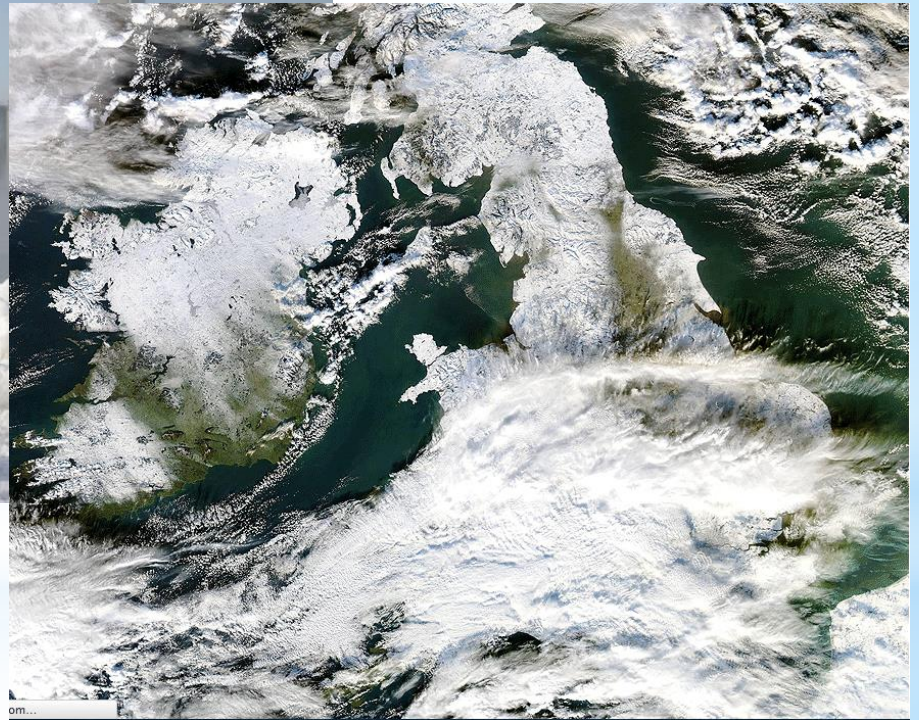


Open water vessels
Polar class 6 vessels

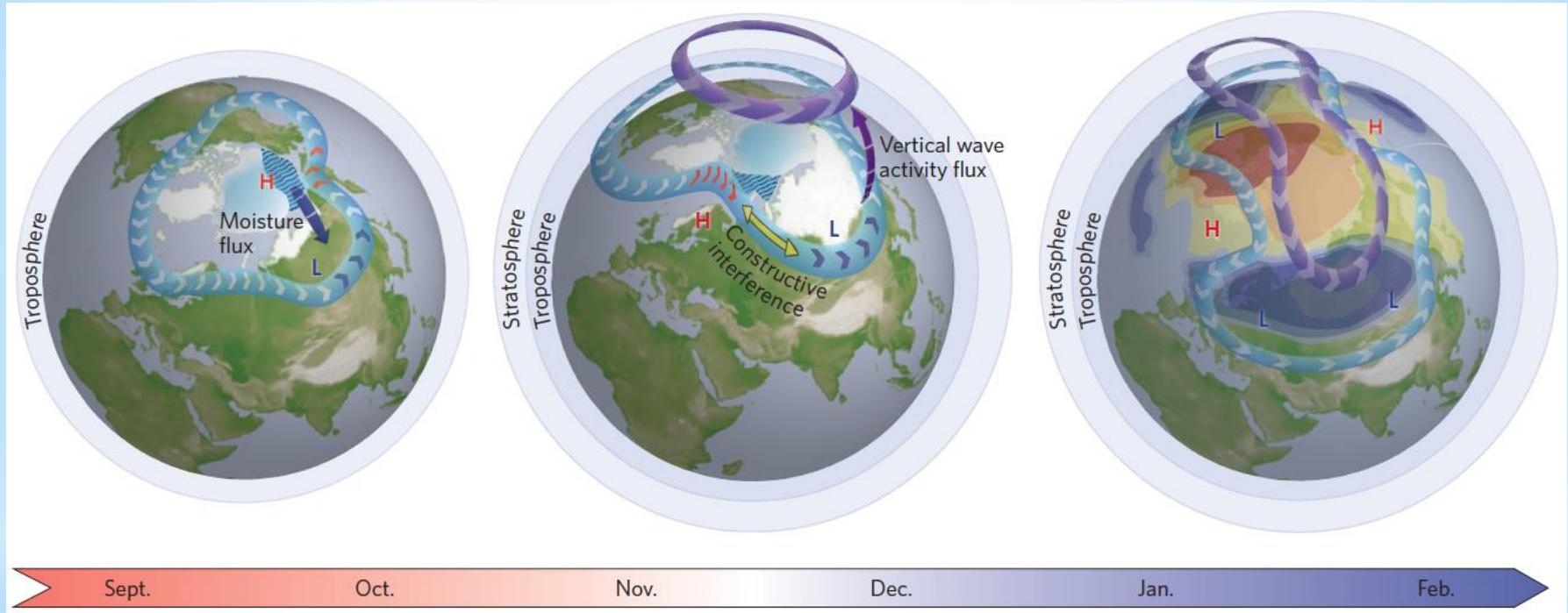
Smith and Stephenson (2013)

Remote consequences

„What happens at the poles does not stay at the poles...”



Remote consequences



Cohen et al. (2014), Nature Geoscience

Sea ice prediction



Tactical use

Operation planning

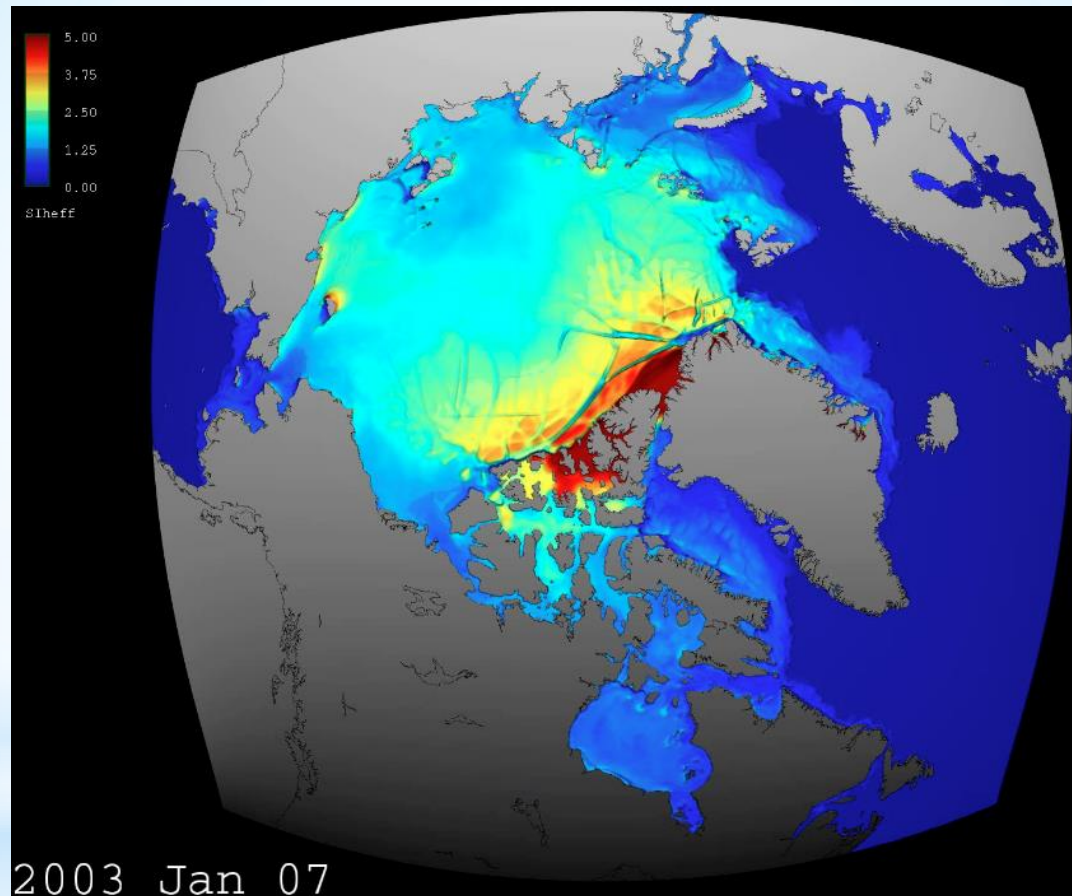
Strategic planning

Hours to 2 weeks

subseasonal to interannual

decades

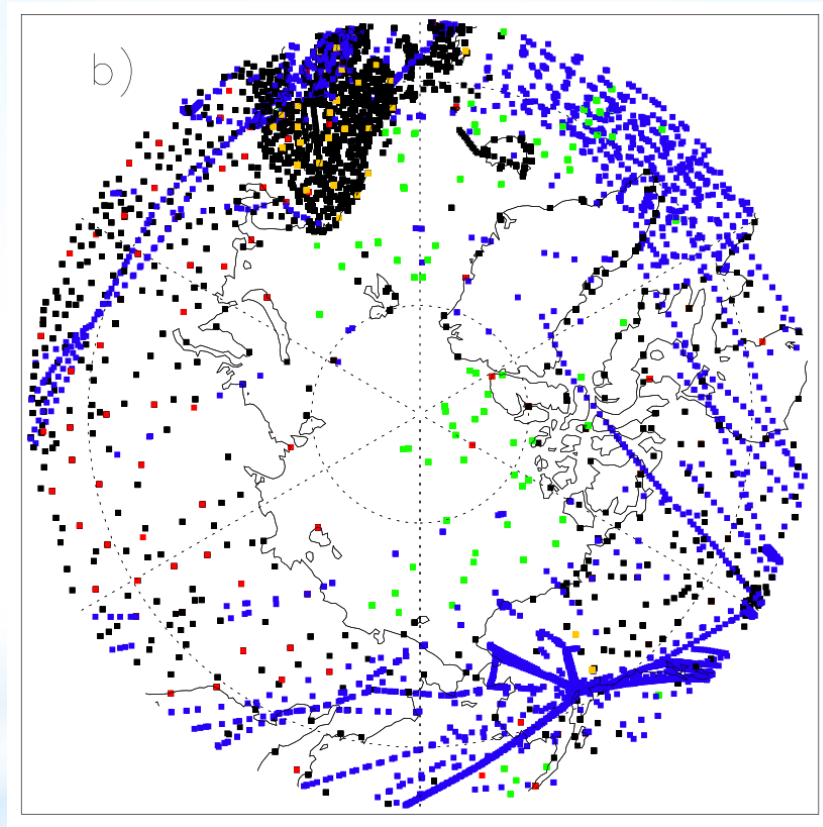
Sea ice prediction



MITgcm @ 4 km resolution, Nguyen et al. (2012)

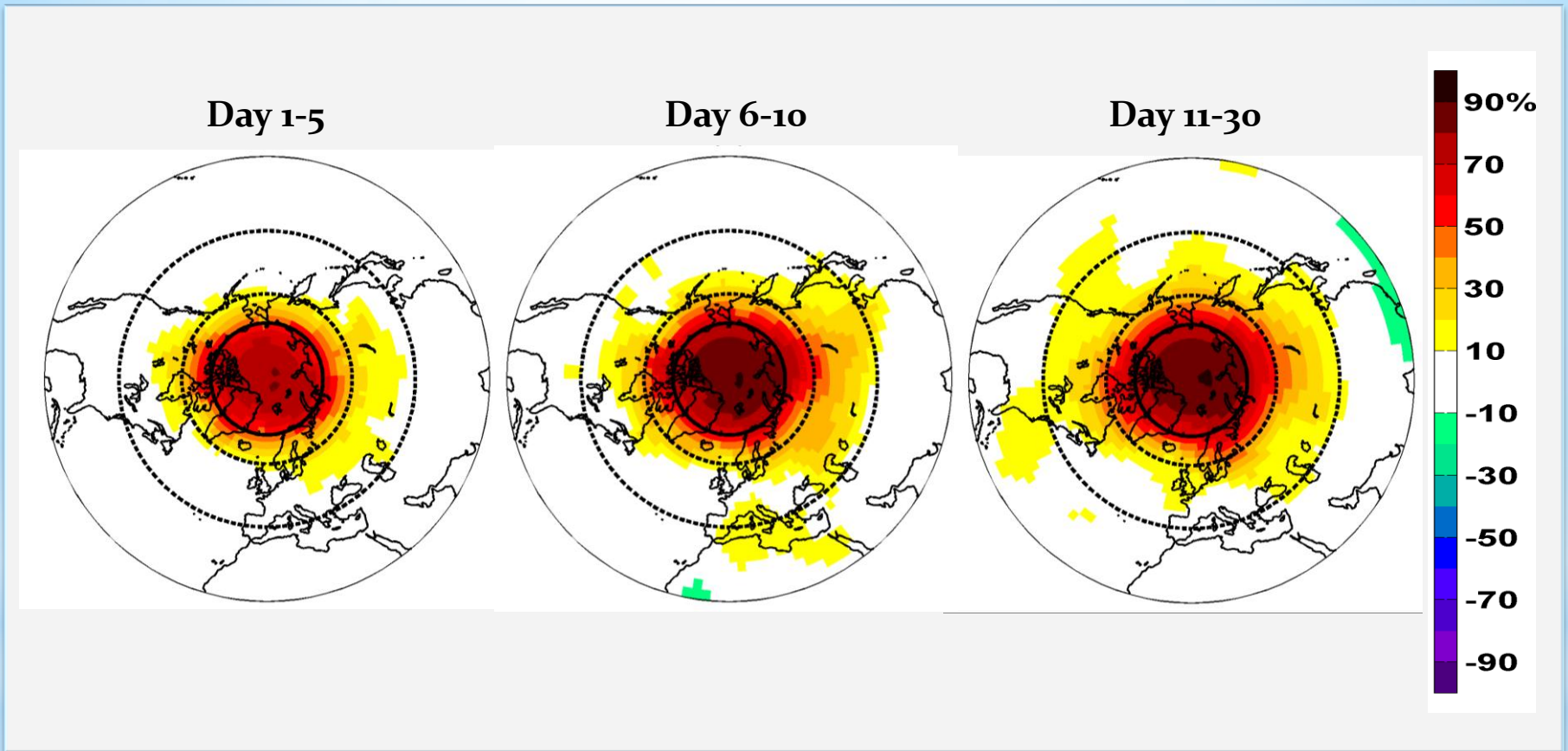
Global observing system

Synop
AIREP
DRIBU
TEMP
PILOT



Peter Bauer (ECMWF)

Arctic-lower latitude linkages



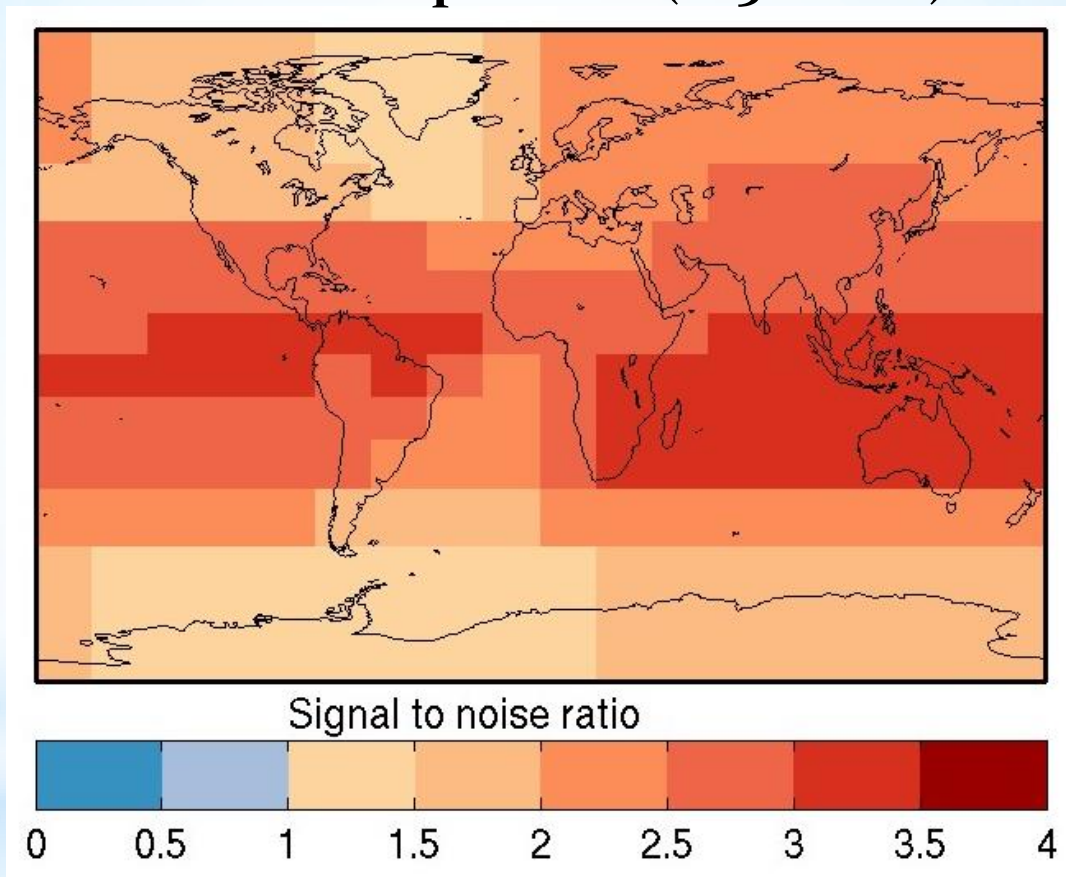
Jung et al. (2014)

Summary

- Arctic ECRA is a network of some of the leading climate research institutions and operational centres in Europe
- Arctic ECRA is very much alive
- Arctic sea ice is melting at unprecedented rates
- Anthropogenic greenhouse gases are a major factor
- Deeper understanding requires a holistic view
- The impacts of Arctic climate change are profound (in the Arctic and beyond)
- To manage the opportunities and risks prediction capacity has to be developed across time scales

Climate change uncertainty

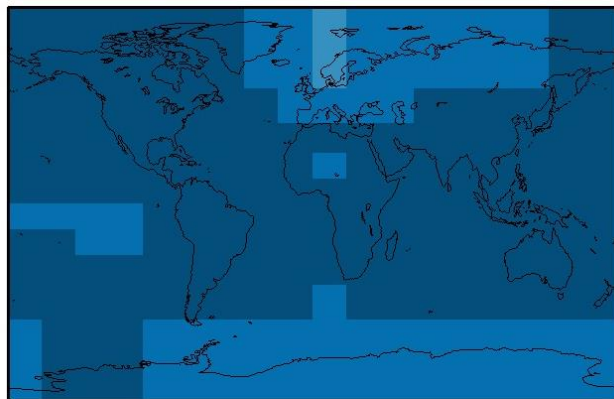
Surface Temperature (2050-2060)



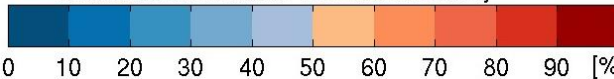
Hawkins and Sutton (2009)

Sources of uncertainty (2050-2060)

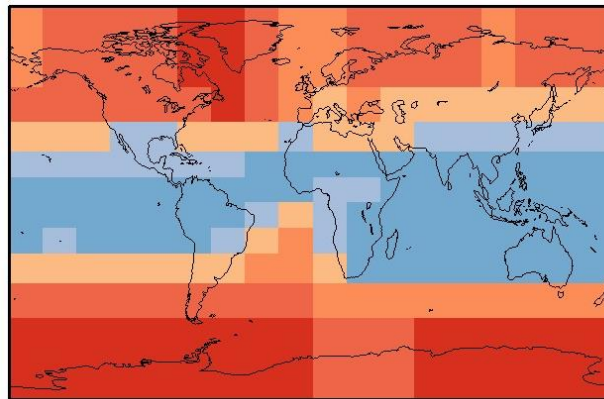
Internal variability



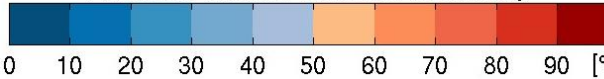
Fractional variance for internal variability



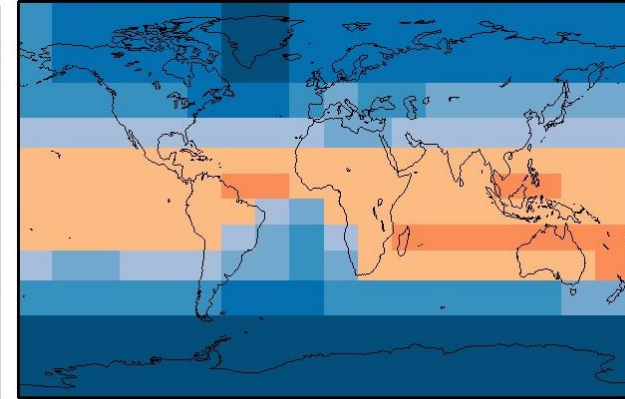
Model uncertainty



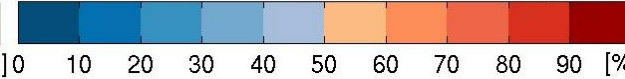
Fractional variance for model uncertainty



Scenario uncertainty



Fractional variance for scenario uncertainty



Hawkins and Sutton (2009)