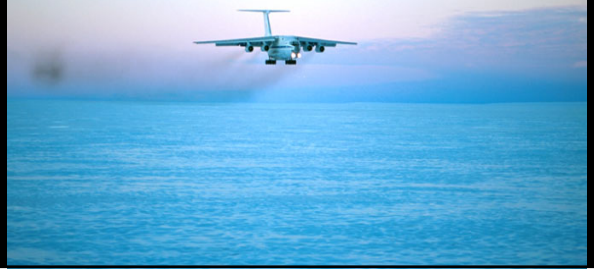
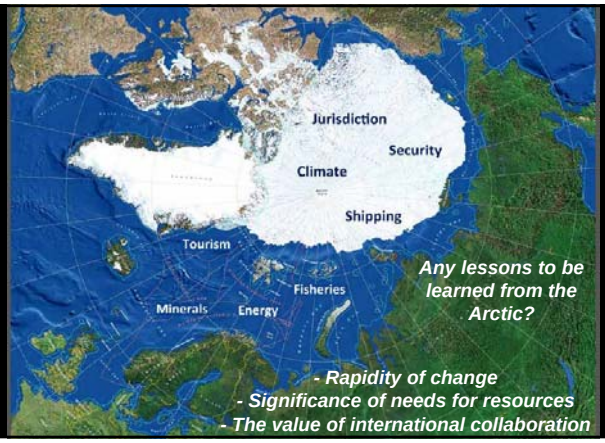
How will the future look like in Antarctic – a NAP perspective?

by
Jan-Gunnar Winther
Director, Norwegian Polar Institute

Environmental, economic and safety concerns will change today's aviation solution. In 20 years, the typical Antarctic intercontinental flight will not refuel in Antarctica





Any lessons to be learned from the Arctic?

- Rapidity of change
- Significance of needs for resources
- The value of international collaboration

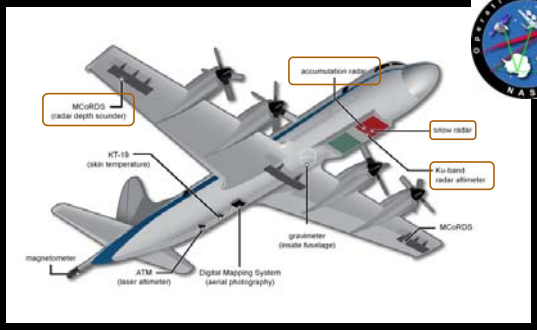
Station design, solutions for energy consumption and operations will continuously be upgraded and modernized

Although, extremely low carbon emissions originate from Antarctica, awareness can have a great symbolic value (e.g. heavy fuel ban on ships)

There will be an increasing pressure to reduce logistical costs and environmental footprint. National operators will seek to pool resources

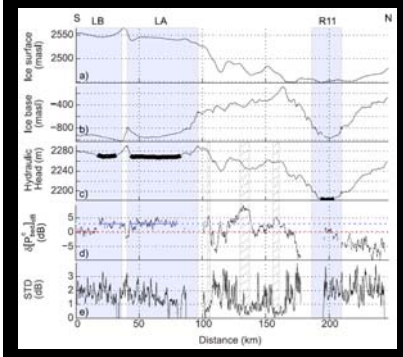
Kronprins Haakon

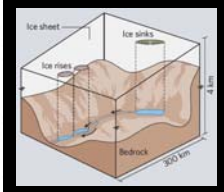
CReSIS radar for IceBridge



http://icebridge.gsfc.nasa.gov/

What are “active lakes”?





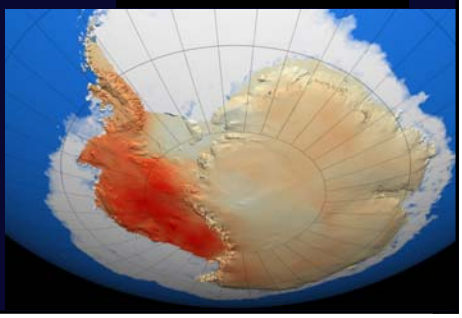
Giles (2006, Nature)

Langley et al. (2011, GRL)

Global need for Antarctic science

Trend from 1957-2006
(degrees C/decade)

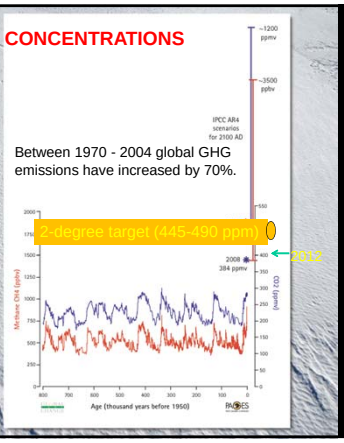
The global value of knowledge generated in Antarctica calls for significantly improved international coordination. Flags need to be lowered in order to act responsible on common needs …



CO_2 AND METHANE CONCENTRATIONS

- Long term climate fluctuations
- Transition from ice age to Holocene

Site-selection issues:
- Bedrock topography
- Ice thickness (i.e. ice mass balance)
- Ice layer structures
- Accumulation pattern
- Basal conditions (incl. subglacial lakes)

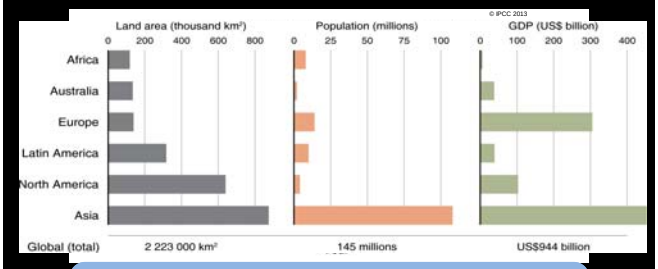


Between 1970 - 2004 global GHG emissions have increased by 70%.

2-degree target (445-490 ppm)

2012

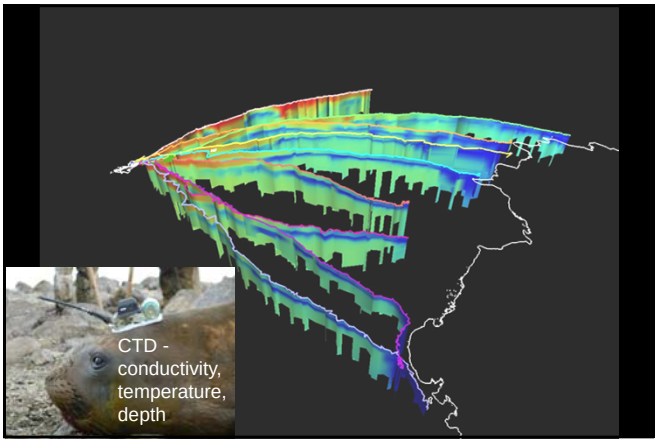
Strategic Priority #1 in NSF's Strategic Vision: Sea Level Rise



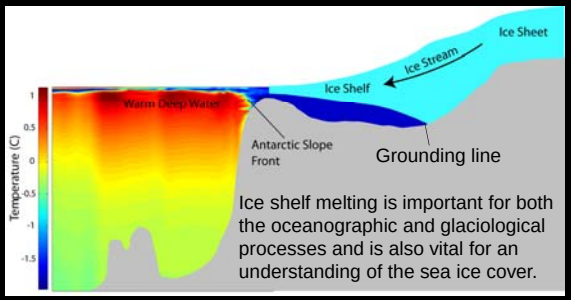
Ice loss from	Glaciers	226 (±60%) Gt yr^{-1}	(1993-2003)
	Greenland	215 (±25%) Gt yr^{-1}	(2002-2011)
	Antarctica	147 (±50%) Gt yr^{-1}	(2002-2011)

100 Gt yr^{-1} of ice loss corresponds to 0.28 mm yr^{-1} of global mean sea level rise

Ground Penetrating Radar

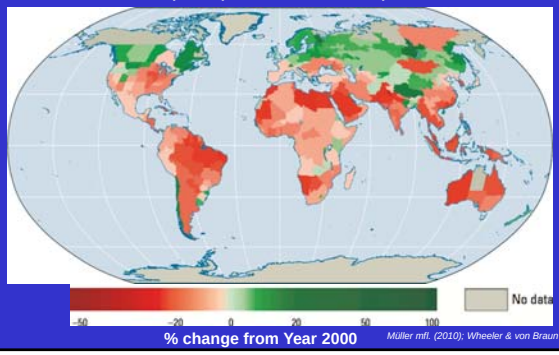


Mass balance and stability



Ice shelf melting is important for both the oceanographic and glaciological processes and is also vital for an understanding of the sea ice cover.

Changes in food production in 2050 versus 2000 (modelled) due to changes in precipitation and temperature



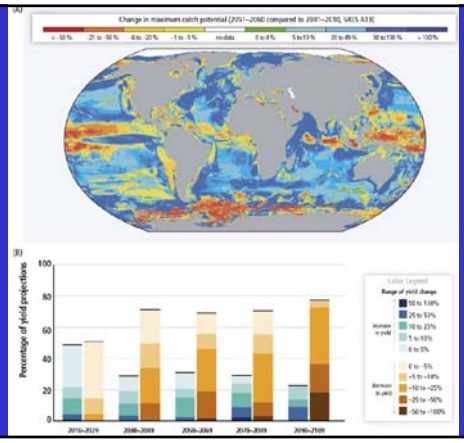
Müller mfl. (2010); Wheeler & von Braun (2013)

What does the SCAR horizon scan say?

Researchers will need to develop **autonomous vehicles and observatories that can reach remote locations** such as beneath ice shelves, the deep sea and under ice sheets. **Miniaturized sensors** deployable on floats, animals and ice tethers must be able **to acquire or transmit data for months** or years.

A wider range of **satellite-borne sensors** is needed to continuously observe the entire region. Expanded **aircraft-based geophysical surveys** are needed to access the continental interior and ice margins. Advanced biogeochemical and biological sensors will be crucial for establishing regional patterns. Databases and repositories that can handle vast quantities of genomic and biodiversity information will be essential.

Future data sets will **require high-speed and high-volume communications** over great distances. Reliable sources of energy to power remote observatories and better ways to store and uplink data will be needed. **Improved computer models are essential for portraying the highly interconnected Antarctic and Earth system** if we are to improve forecasts.



Changes in the fundament, i.e. the Treaty

Until 2048 the Protocol can only be modified by unanimous agreement of all Consultative Parties to the Antarctic Treaty

A modification or amendment proposed at any Review Conference shall be adopted by a majority of the Parties, including ¾ of the States which are Antarctic Treaty Consultative Parties at the time of adoption of this Protocol

New instruments/methodologies

Thank you for your attention!

https://www.environments.aq/

Do not try this at home ...