



# Inspirational talk

- innovation and environmentally  
sound monitoring

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**Svalbard:**

**Norwegian  
Arctic**

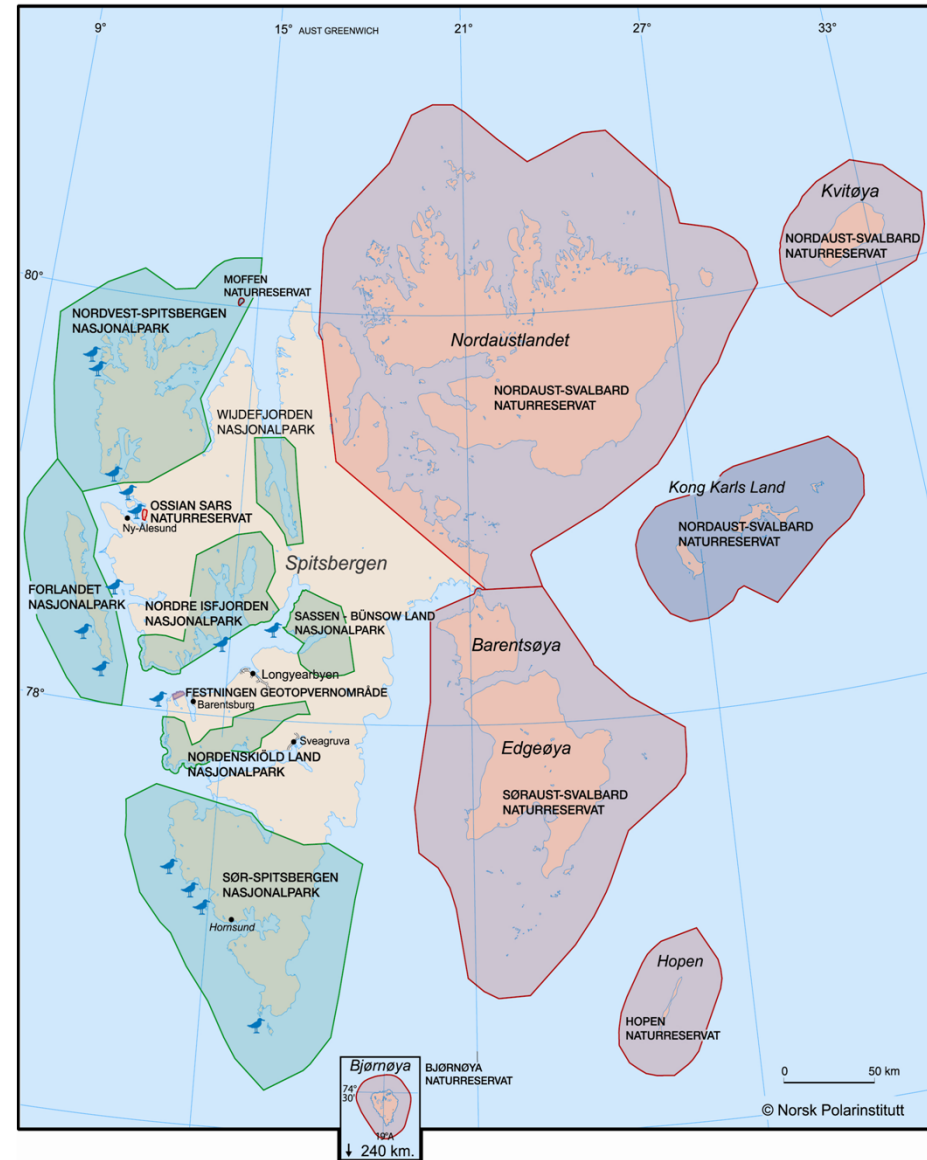


# Protected Areas

65% av land area

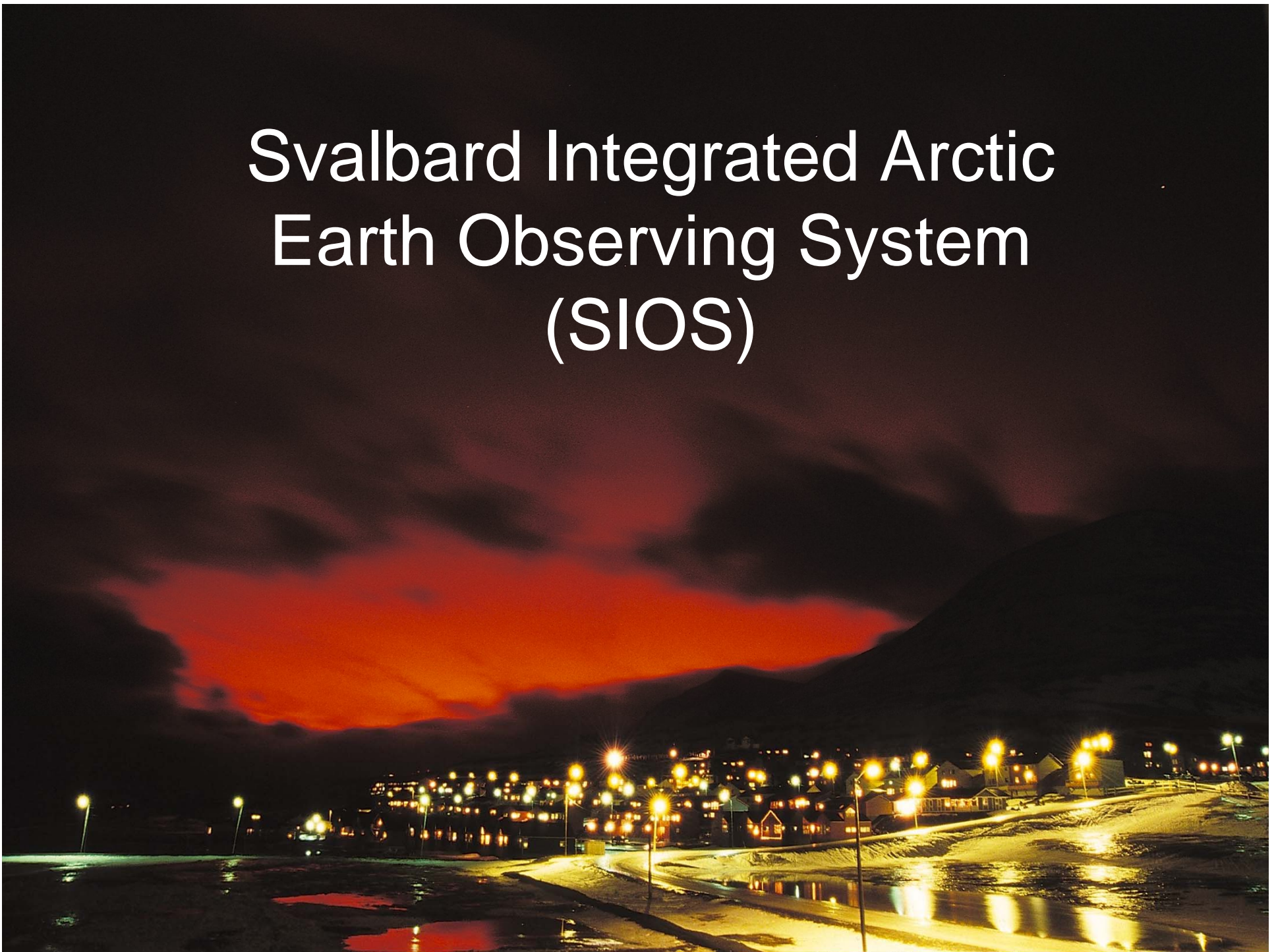
87% av sea

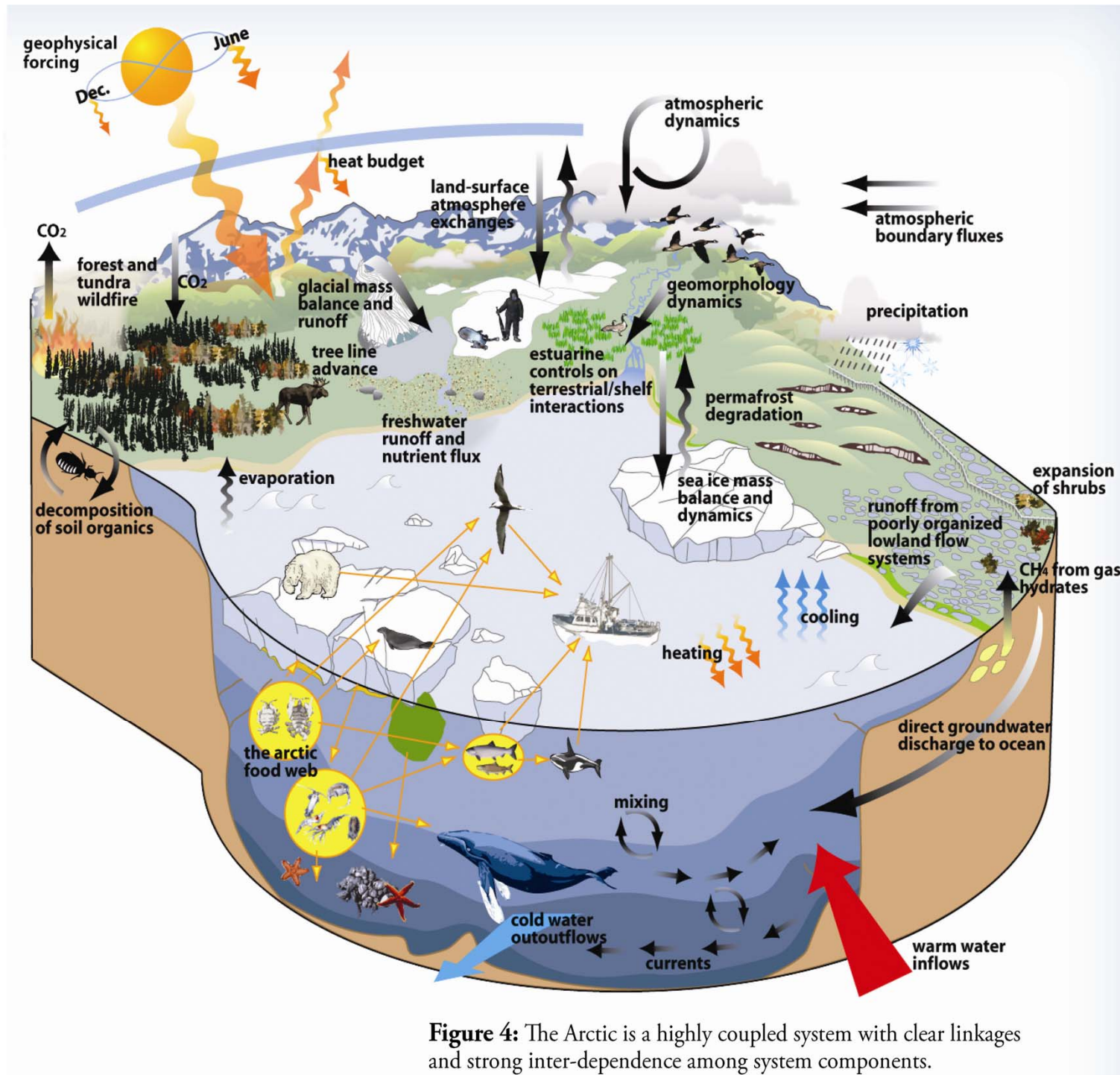
- 21 nature reserves (including 15 bird sanctuaries)
- 7 national parks
- One geotopic sanctuary



- NATURRESERVAT / NATURE RESERVE
- NASJONALPARK / NATIONAL PARK
- GEOTOPVERNOMRÅDE / PROTECTED GEOTOP
- 🐦 FUGLERESERVAT / BIRD SANCTUARY

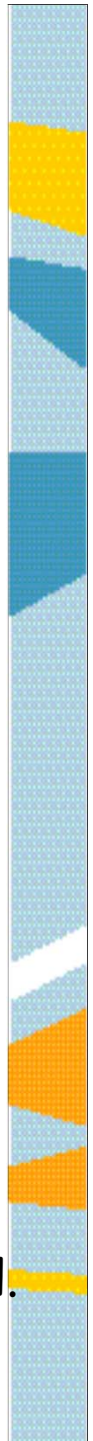
# Svalbard Integrated Arctic Earth Observing System (SIOS)





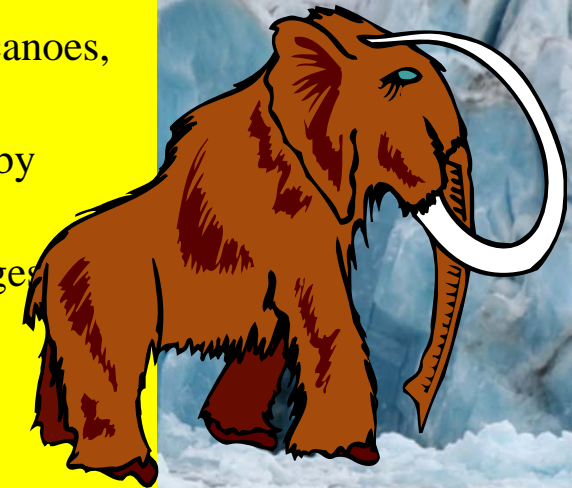
Roberts et al.  
2010

**Figure 4:** The Arctic is a highly coupled system with clear linkages and strong inter-dependence among system components.



# CLIMATE CHANGE ?

- Detection
  - Is climate changing?
  - Are these changes unique?
- Attribution
  - What is causing the changes?
    - Natural variation (Sun, volcanoes, etc.)
    - Greenhouse gases released by mankind
    - Other human induced changes
- Future change
  - Models
- Effects of climate change
  - Ecosystems
  - Society
    - Agriculture
    - Infrastructure
  - Combined effects



1922



1939

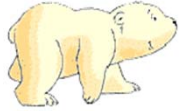


2002



June 21, 2010







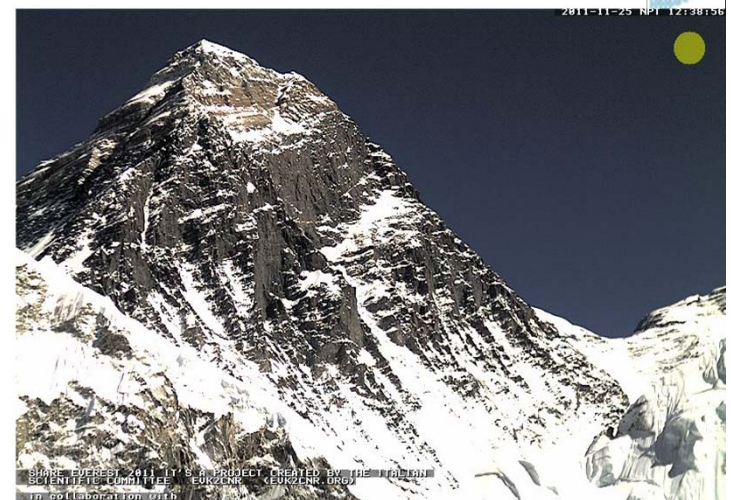
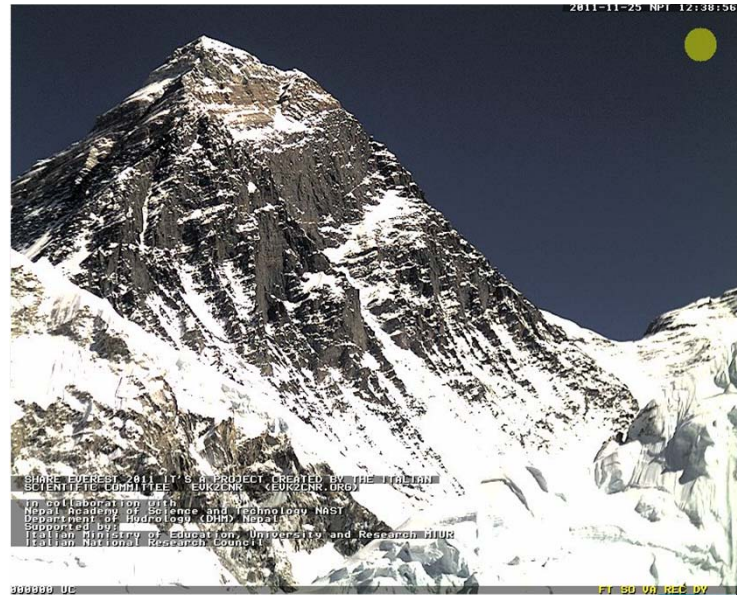
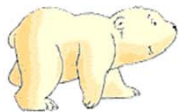
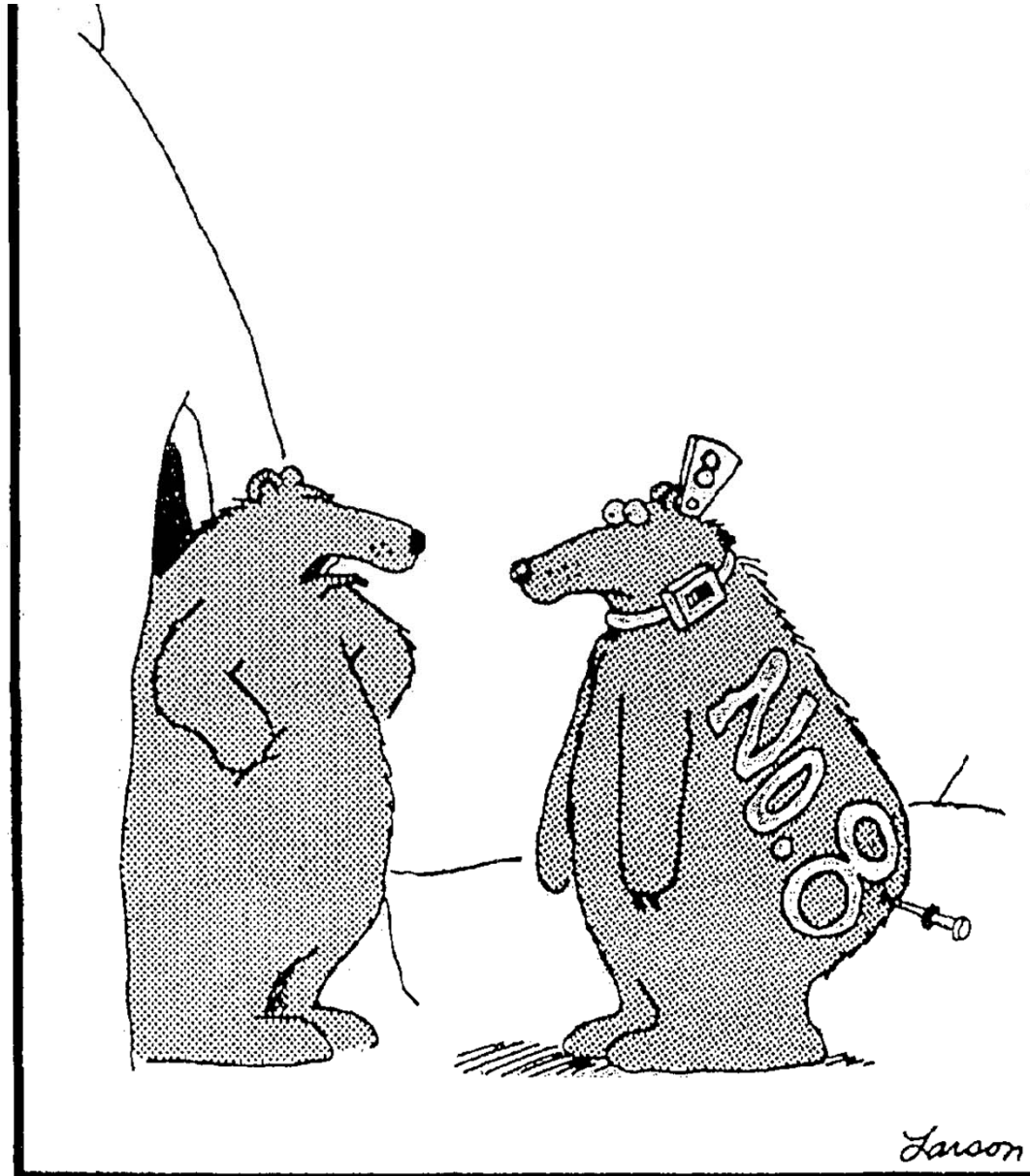




Foto: Jon Aars



***It's 9 o'clock. You BETTER have a good excuse!***





So?





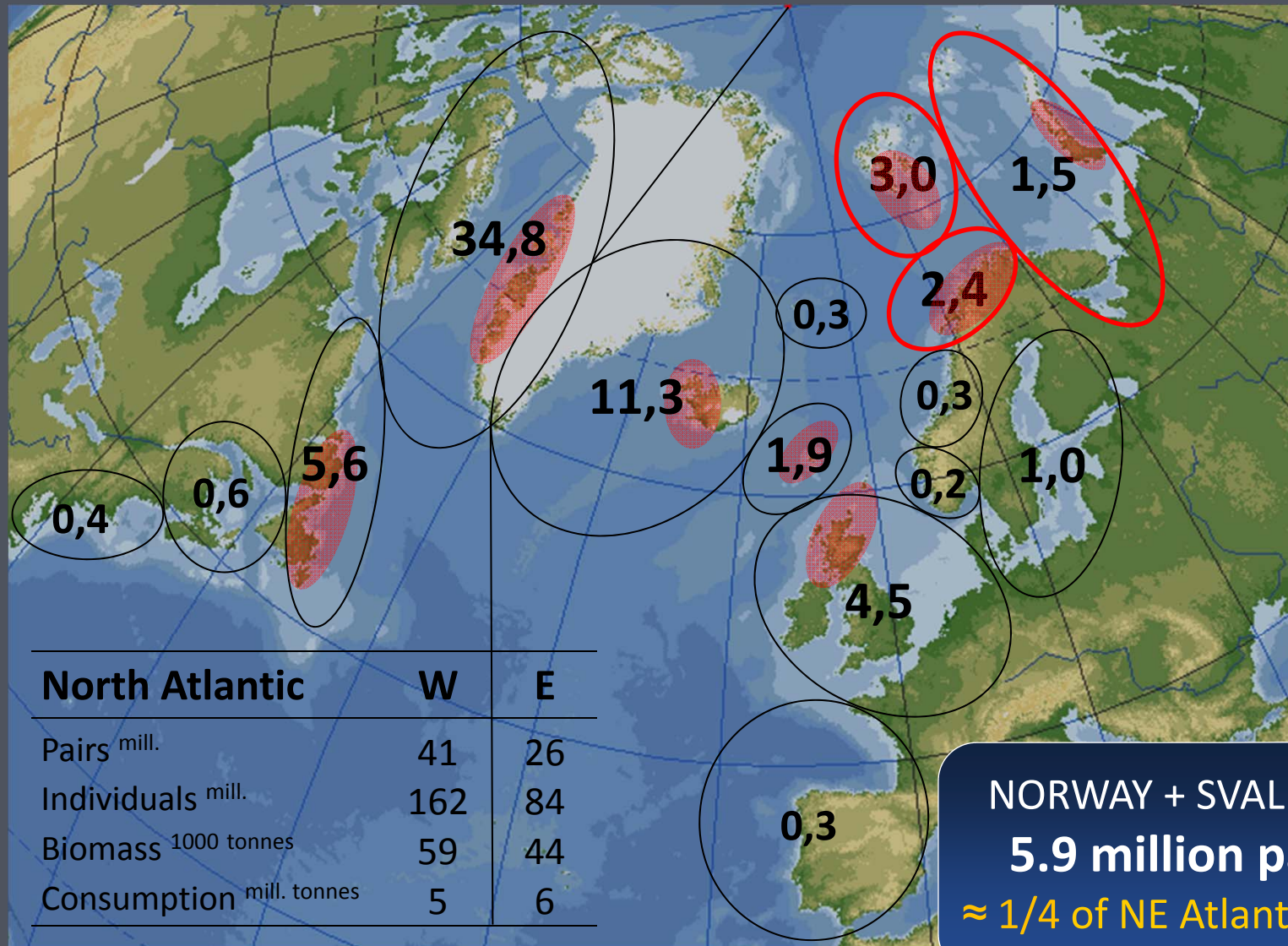


Hans E.F. Amundsen (EPX) - AMASE Expedition Leader





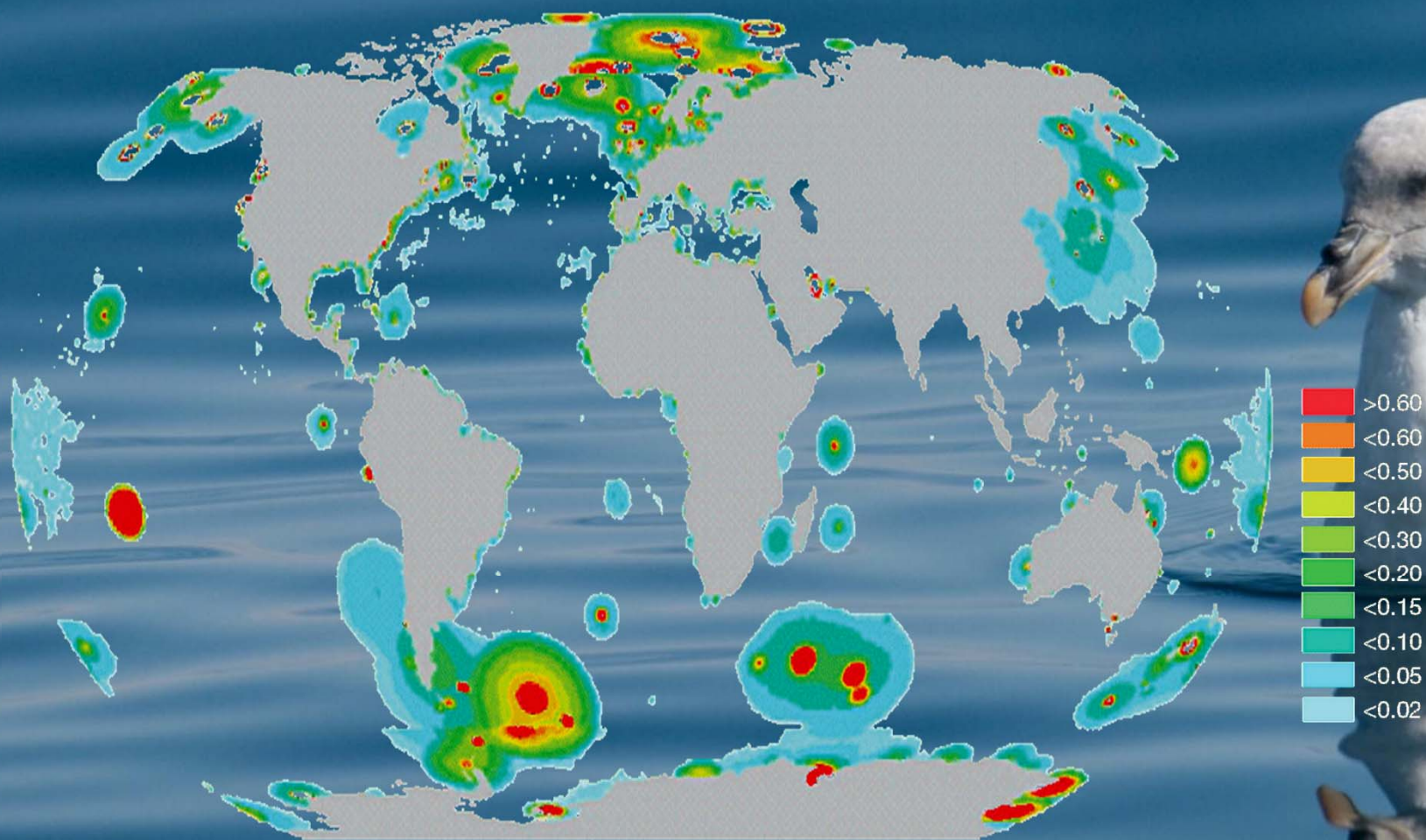
# Million breeding pairs



Barrett et al. (2006) Atlantic Seabirds  
 Barrett et al. (2006) ICES J. Mar. Sci.

**NORWAY + SVALBARD**  
**5.9 million pairs**  
 ≈ 1/4 of NE Atlantic pop.

# Million foraging seabirds per km<sup>2</sup>



Karpouzi *et al.* (2007) *Mar Ecol Prog Ser*





# Automatic systems





# What happens at sea?



GPS-loggers



Sat. transmitters



GLS - loggers



# AMINOR

## -Advanced Environmental Studies in the North

A research school for the integration of monitoring,  
research and management

Rolf Ims UiT

Nigel Yoccoz UiT

Kim Holmén NPI

Per Fauchald NINA/UiT

# Why monitoring?

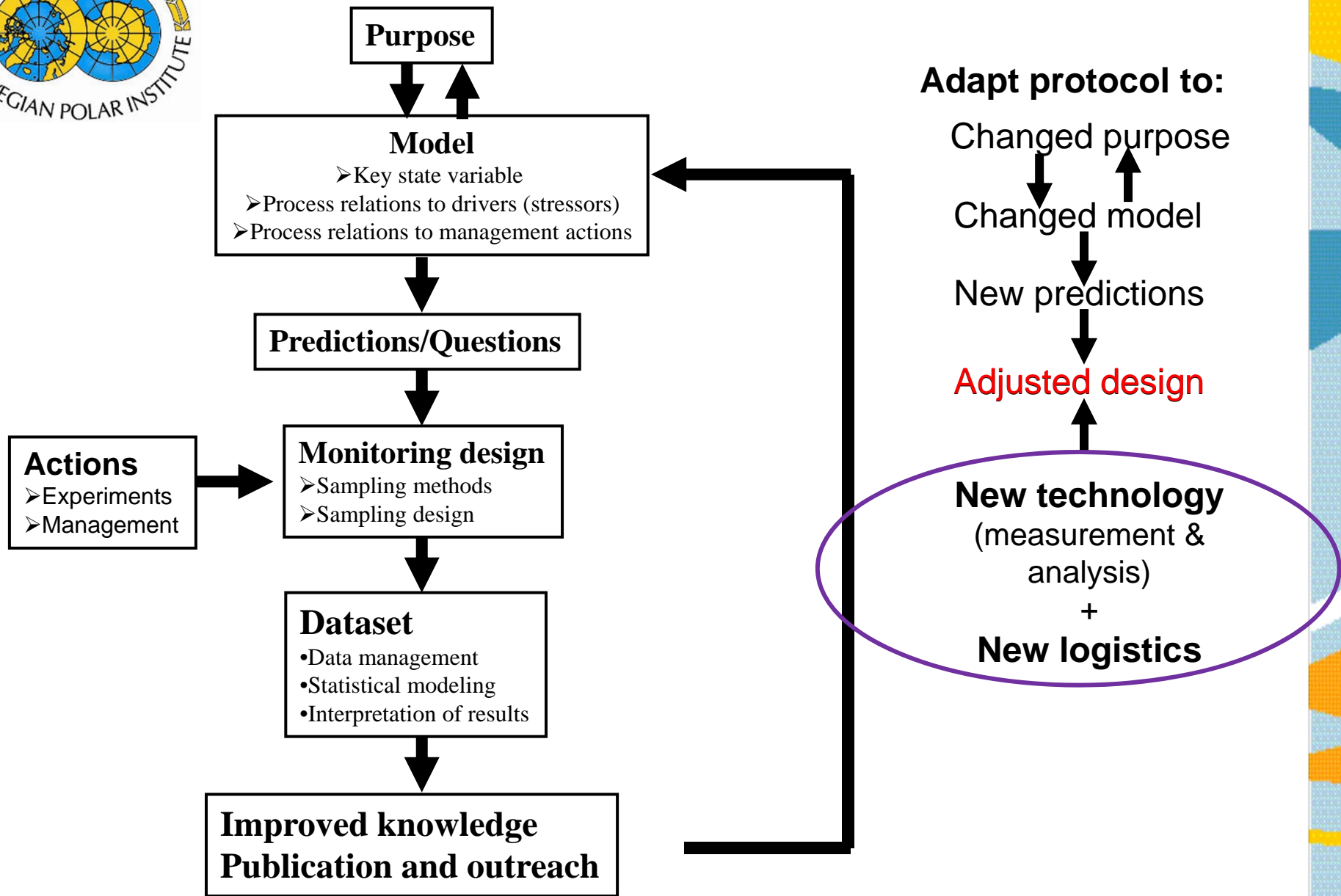
Monitoring involves complex systems...

- Interdisciplinary
  - Chemistry/physical science
  - Biology
  - Social science
- Complex interdisciplinary questions

 Focus on small fragmented parts



# Protocol for adaptive (model-based) monitoring





# Interdisciplinary

- Between scientific fields
- Between scientists and engineers
  - Scientists define the needs
  - Technologist can see new possibilities
- Between scientists and logistic operators
  - Scientists define the needs
  - Operators open new horizons



A new idea comes

suddenly

- and in a rather intuitive way.
- But intuition is nothing but the outcome of earlier intellectual experience

Einstein, 1949





*Thanks for your attention !*

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*Thanks for your attention !*

