



**Consiglio Nazionale delle Ricerche (CNR)**  
**National Research Council of Italy**

## **The Italian Scientific Polar Activities**



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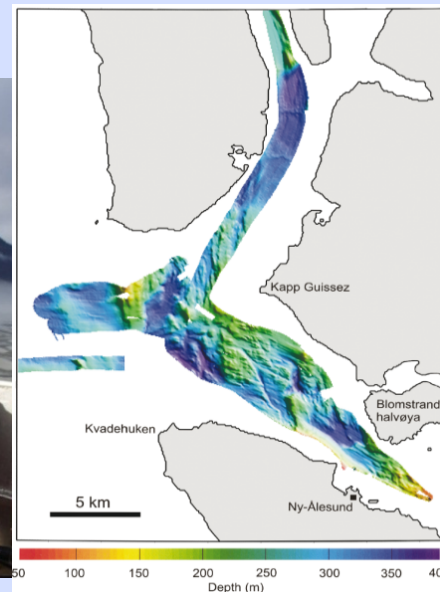
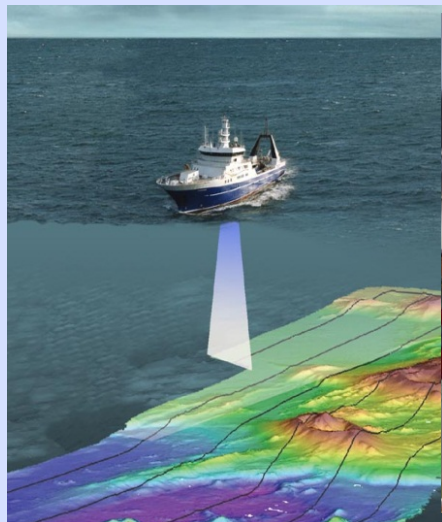
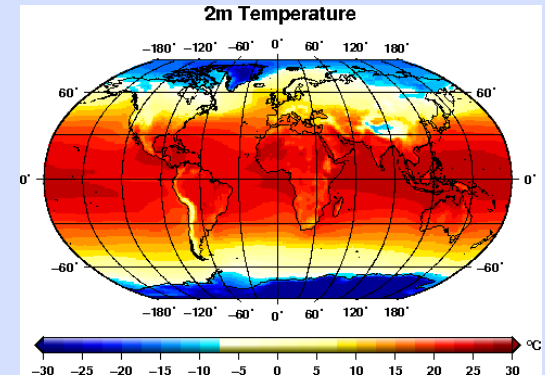
**Department of Earth System Science and  
Environmental Technologies**

**Climate change and future scenarios in the Arctic Region  
11-12 December, 2014 – Venice (S.Servolo)**



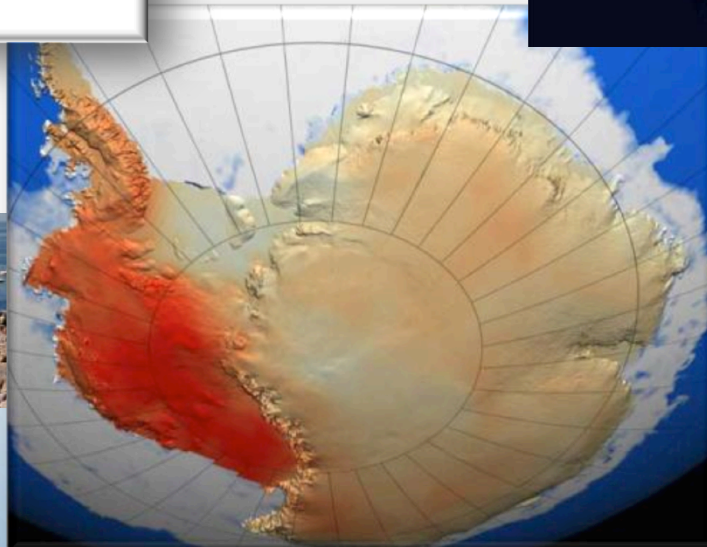
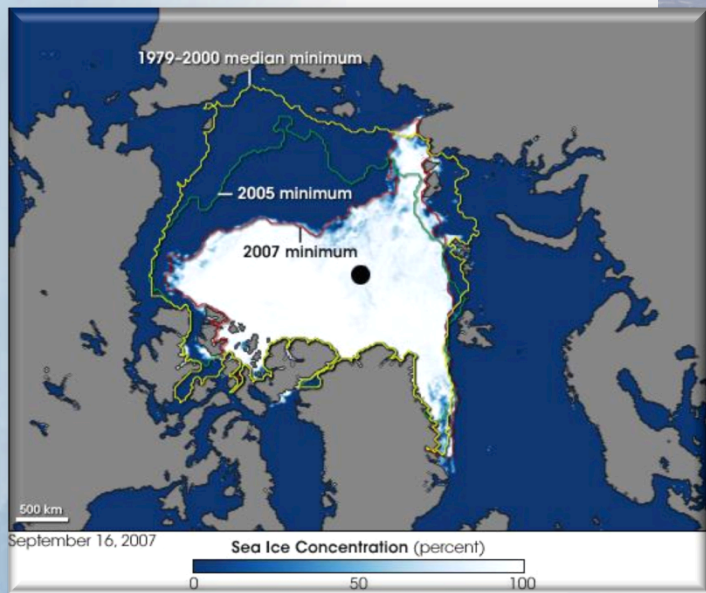
# Earth System Science and Environmental Technologies

- Main topics of investigation  
Climate research, environmental systems, marine research, terrestrial ecosystems, natural and anthropogenic risks – Impacts and mitigation – **Polar Science**





# Italian Polar Science







# Italian National Antarctic Program



**Mario Zucchelli Station and Concordia Station  
in Antarctica**





# The vessel ITALICA



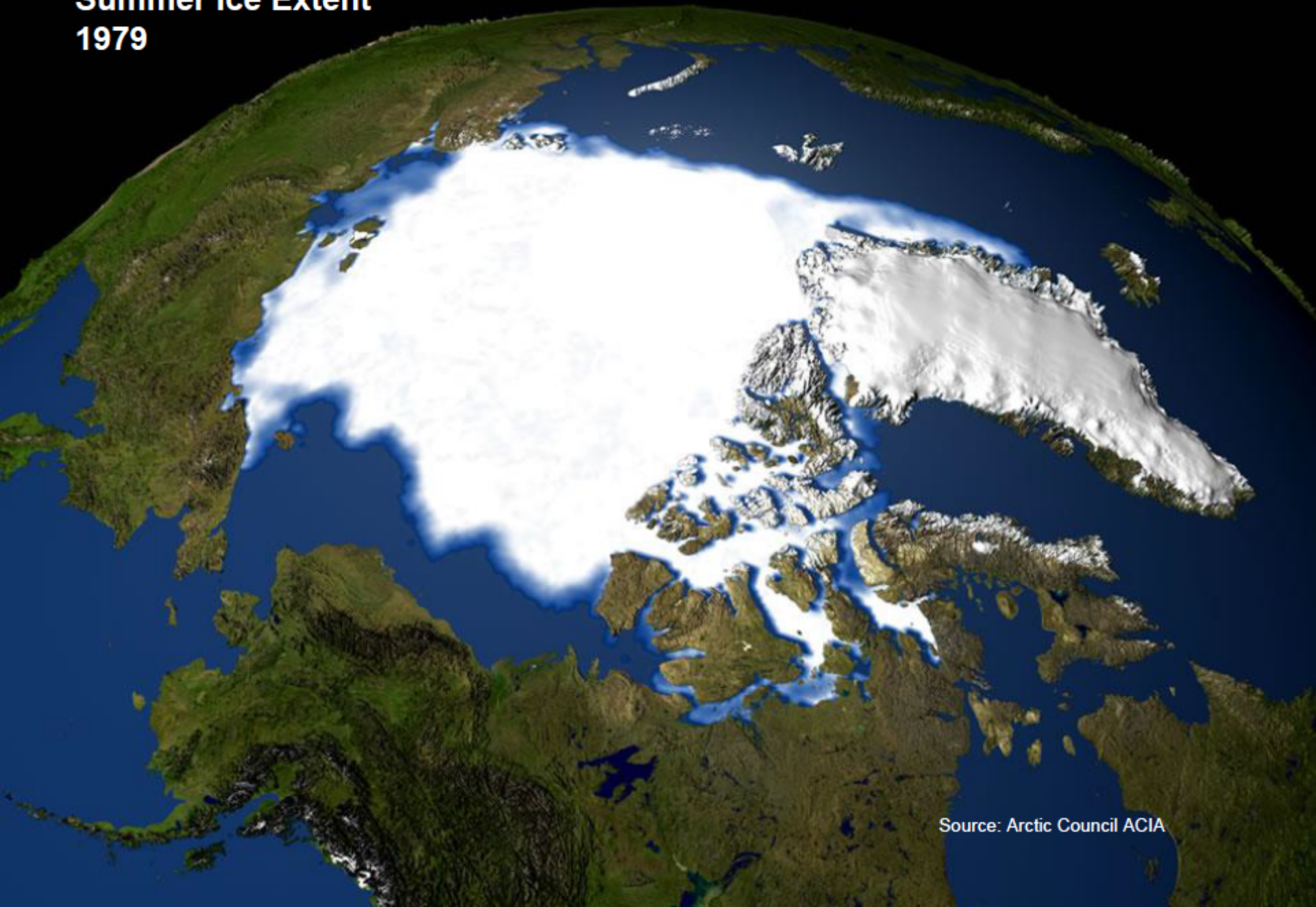
The ship acts as:

- **Cargo: 4.000 cmt**
- **Accommodation: 120 people (92 Expedition members)**
- **Tanker: 800.000 lt Jet A1**
- **Research: 250 sqmt of laboratories**





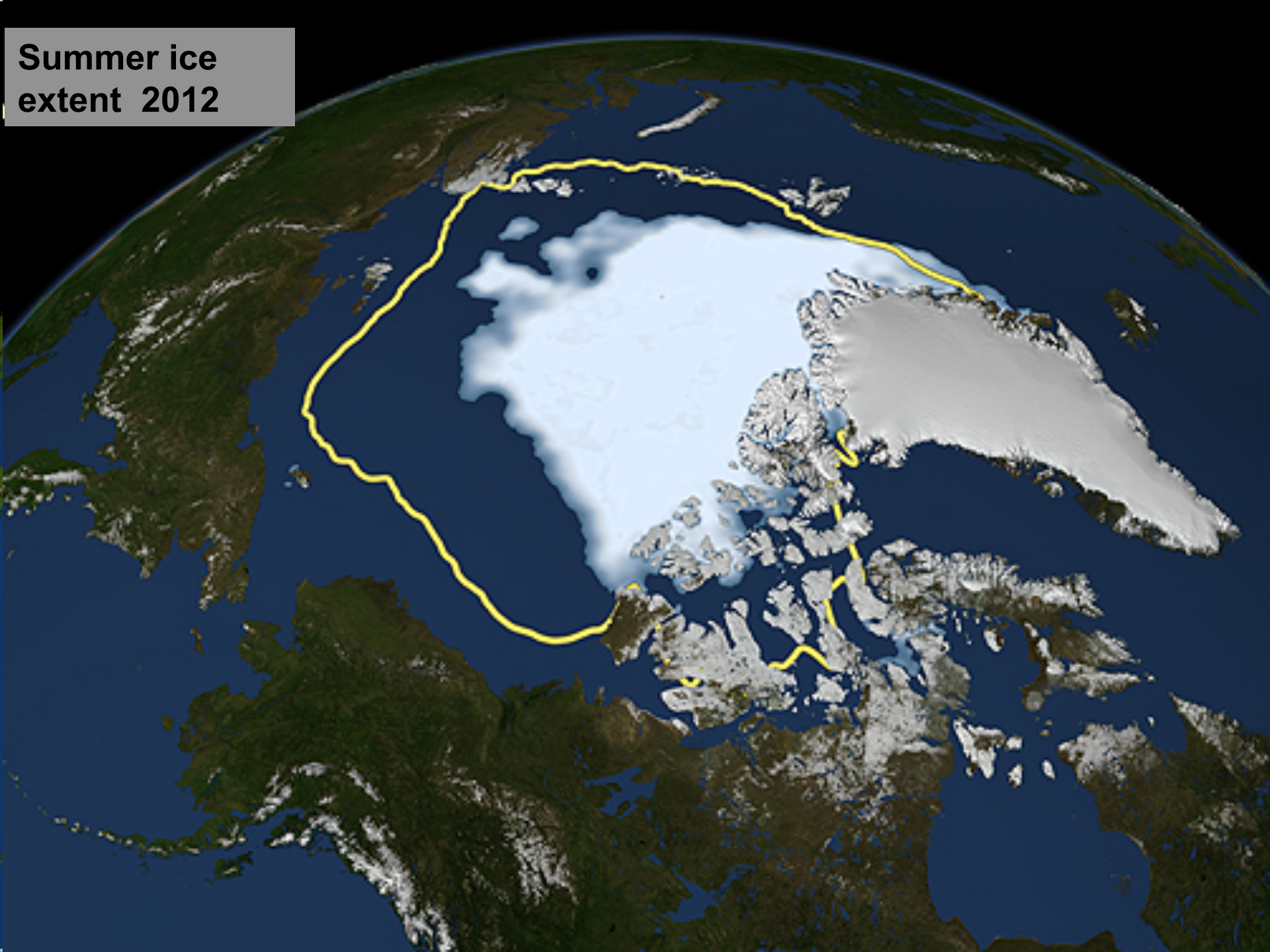
# Summer Ice Extent 1979



Source: Arctic Council ACIA



Summer ice  
extent 2012



# Research in the Arctic



- **Atmospheric and Climate change Studies**
- Boundary Layer Turbulent fluxes
- **Aerosols & air-snow interactions**
- Radiative & energy budget
- Ozone & UV radiation
- Sun-Earth Interactions
- **Earth Observation**
- Auroral Observations
- **Marine science**
- Terrestrial ecosystems
- Microbial communities
- Biophysical coupling – benthos
- **Innovation and benefits for Arctic Indigenous People**  
(Energy, sustainable building, ...)



Climate Change Tower





# Dirigibile Italia Station – Ny-Ålesund (Svalbard)







# Amundsen-Nobile Climate Change Tower and Gruvebadet Aerosol Laboratory

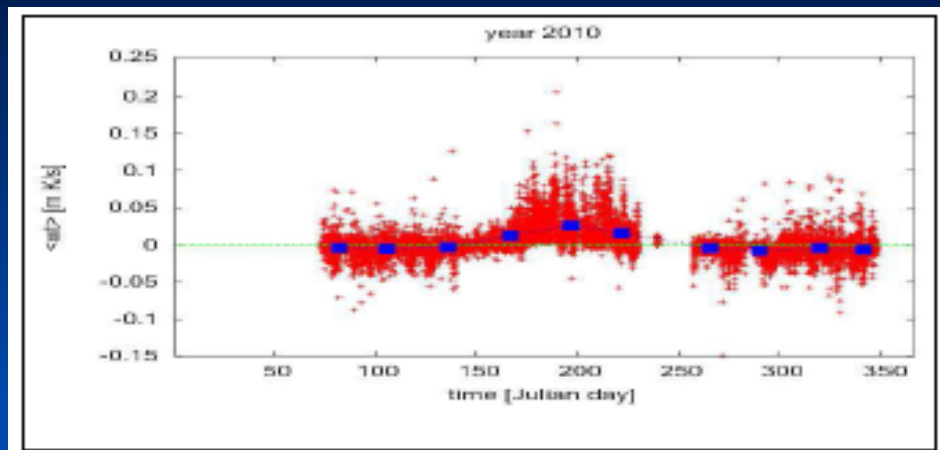


<http://www.isac.cnr.it/~radiclim/CCTower/>

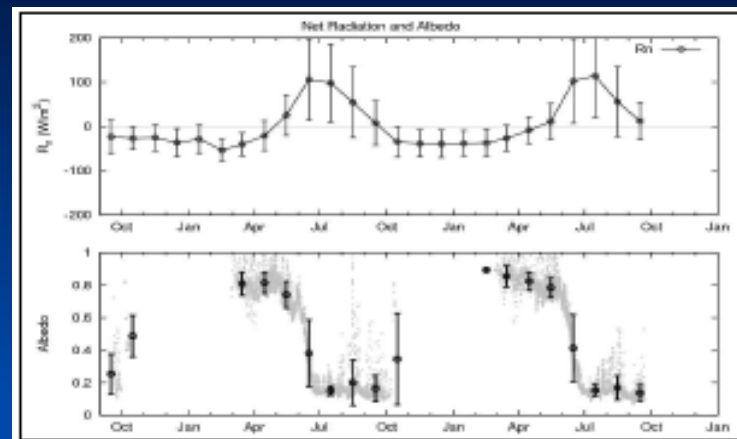




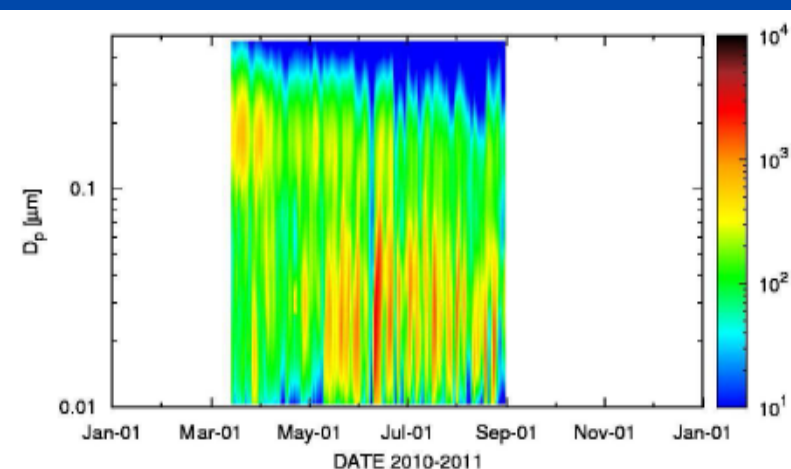
# SEASONAL CYCLE AND PROCESS STUDIES



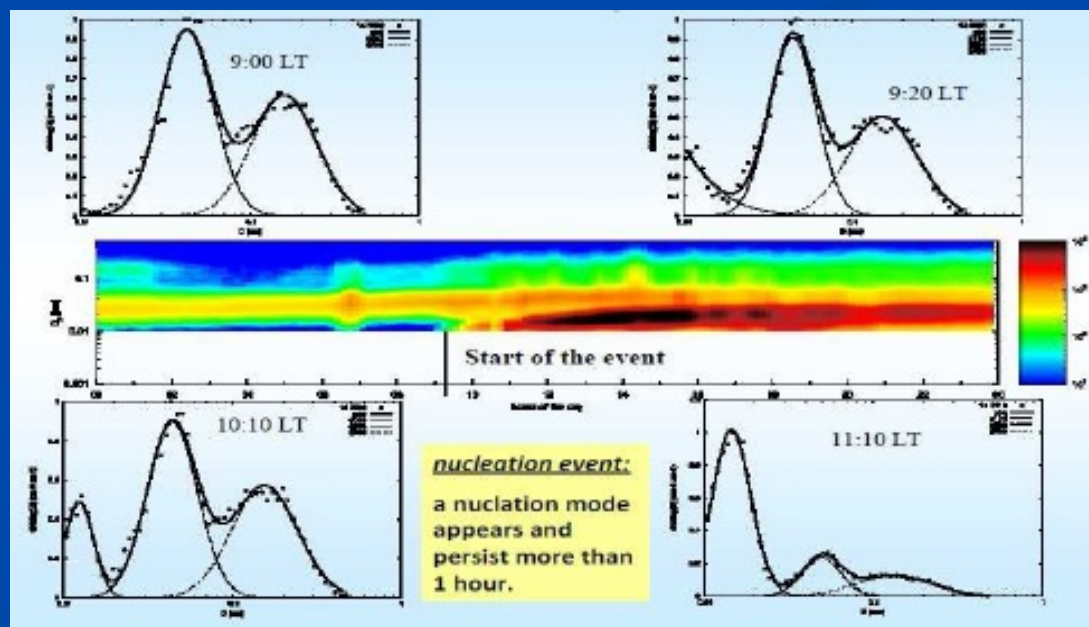
surface heat fluxes (meas. at 7 m)



net radiation & albedo



daily average size distributions





# Gruvebadet Aerosol Laboratory

*Cooperation with:*

Volatility Hygroscopic Tandem Differential Mobility Analyser) to measure Volatility and hygroscopy of monodisperse particles.

National Centre for Antarctic and Ocean Research (NCAOR-India) - measurements by a Nephelometer and a Aethalometer.

Chemical markers of environmental response to climate changes and anthropogenic impact

Characterization, transport processes and transformation mechanisms of chemical species associated with the aerosol in the Arctic region.

## Aerosol sampling

- I. Daily Low Volume PM10 sampling
- II. Aerosol collection in 4 size fraction
- III. Aerosol collection in 12 size fraction
- IV. High Volume PM10 sampling for Metals determination
- V. Low Volume PM10 sampling for EC/OC determination
- VI. High Volume PM10 sampling for organic compounds analysis
- VII. Two Particles counters (APS - SMPS)
- VIII. Nephelometer
- IX. PSAP





## Deployment of the Mooring Dirigibile Italia (MDI) in the Kongsfjorden

L. Langone I. Conese, F. Giglio, S. Miserocchi, S. Aliani (CNR-ISMAR)

AIMS:

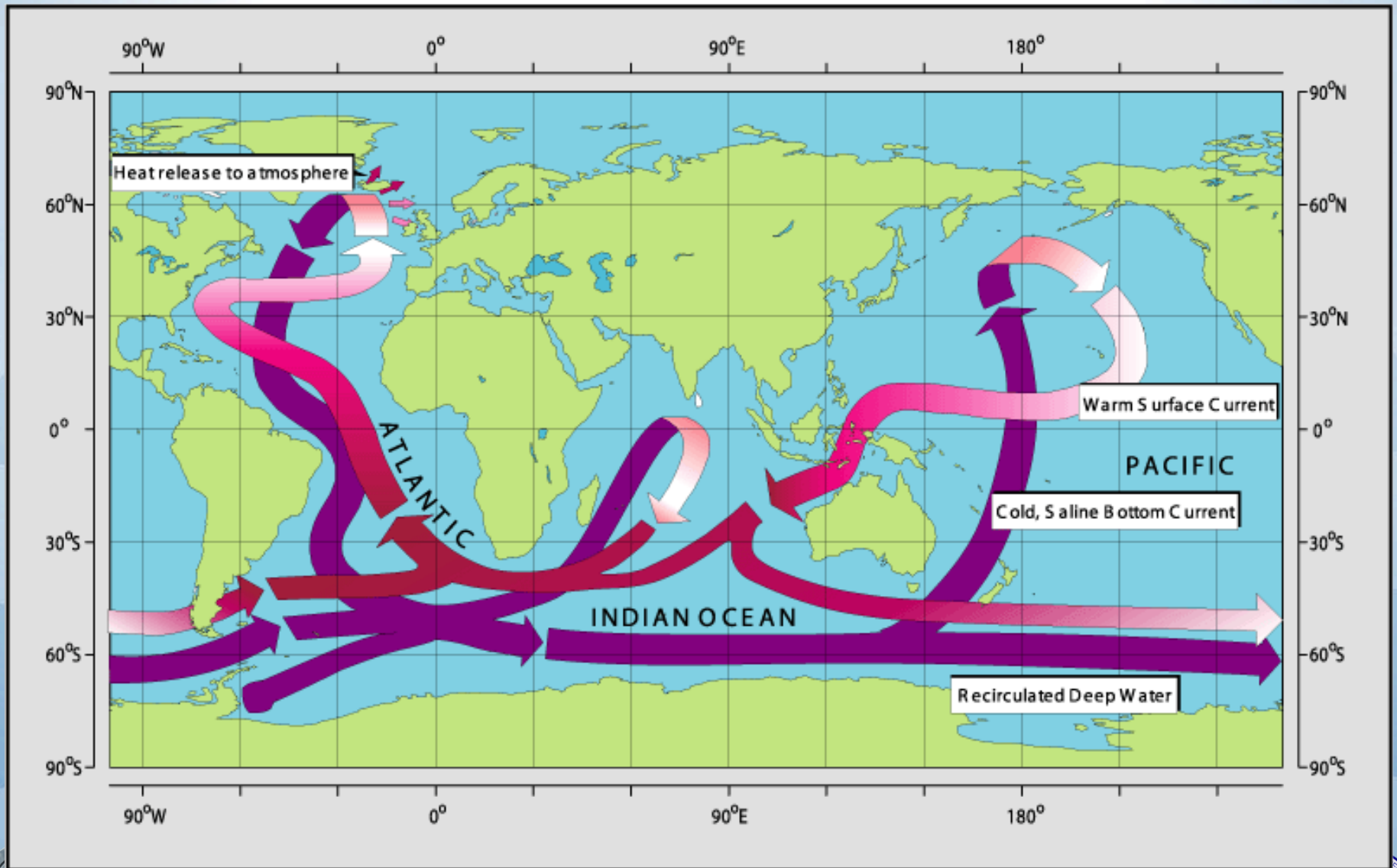
- ✓ Monitoring variations of thermohaline characteristics
- ✓ Temporal variability of particle fluxes and composition

Results from the first year of deployment (Sept. 2010-Sept. 2011).





# La circolazione termoalina degli oceani







# Terrestrial ecosystems

The goal of this experiment is to characterise terrestrial ecosystems around the Climate Change Tower and their **Carbon budget (uptake and emission)**.

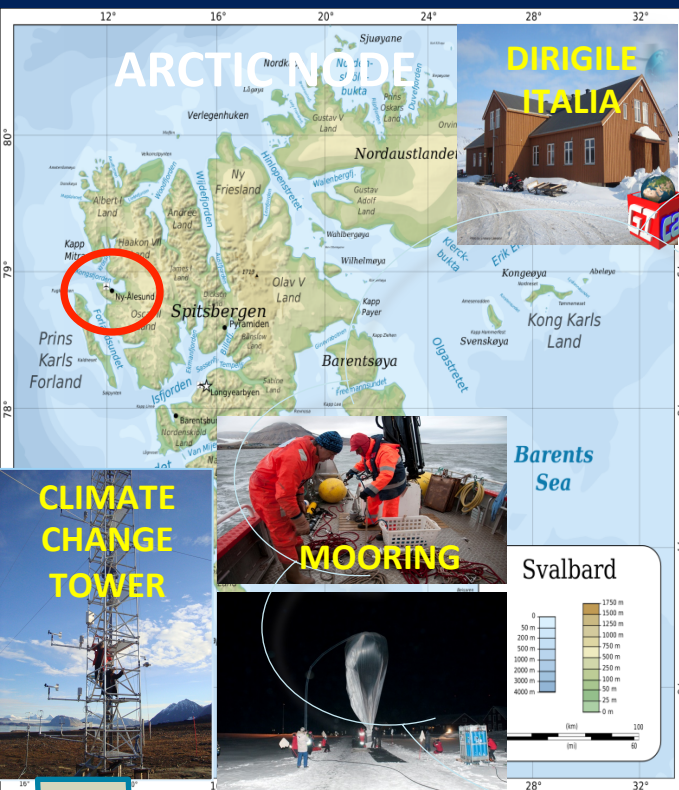
- ◆ Photosynthesis, Isotope composition, Volatile Organic Compounds emission

Measurements of  $\text{CH}_4$ ,  $\text{CO}_2$  and  $\text{H}_2\text{O}$  fluxes at the CCT thanks to a PICARRO analyzer and a Campbell eddy covariance system were then implemented in May 2012.





# ITALIAN ARCTIC DATA CENTER

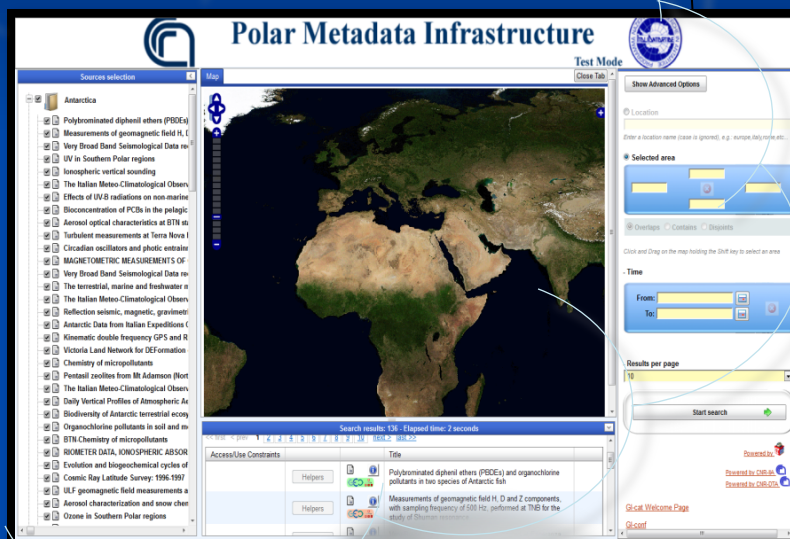


CLIMATE  
CHANGE  
TOWER

MOORING

SOS service allows real-time updates  
on data and metadata directly from  
remote sensors.

MAIN NODE



BROKERED  
CATALOGS



Contributing to SIOS data center





# SOME EUROPEAN AND INTERNATIONAL STRATEGIC ACTIONS

- SIOS
- EMSO
- EUROFLEETS
- ECRA - ARCTIC ECRA
- HERMIONE PROJECT
- SAON and ARCTIC COUNCIL WGs
- BELMONT FORUM (ARCTIC COLLABORATIVE RES. ACTION)
- INTERACT
- NySMAC - Ny-Ålesund Science Managers Committee
- IASC - International Arctic Science Committee
- FARO – Forum of Arctic Research Operators

MoU and Agreements





# Research Results and Perspectives for collaboration

- ◆ Knowledge and prediction of climate change trends and impacts in polar regions
- ◆ Sustainable development for Arctic Communities
- ◆ Research Infrastructures and technology
- ◆ Sharing facilities
- ◆ Sea Floor exploration (EMSO)
- ◆ Decline of Arctic sea ice
- ◆ Increasing loads of Chromophoric Dissolved Organic Matter (CDOM) in the Arctic Ocean
- ◆ Ocean acidification
- ◆ Maritime transport in the polar regions
- ◆ Earth Observation and new developments
- ◆ Sustainable building in the Arctic
- ◆ Modelling

**Collaboration with industries is a priority for success**





Grazie.  
Per l'attenzione

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