Nansen Environmental and Remote Sensing Center (NERSC) Bergen, Norway

a non-profit scientific foundation,
established in 1986
&
affiliated with the University of Bergen

Vision

Understand, monitor and forecast the state and changes of local, regional and global environment and climate, and their impact on society

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The NANSEN Group

- **Nansen Environmental and Remote Sensing Center**, Bergen, Norway, 1986
  - **Coastal and Marine remote sensing**
  - **Polar and Environmental remote sensing**
  - **G.C. Rieber Climate Research Institute,** Bergen - founded in 1996
  - **Mohn-Sverdrup Center for Global Ocean Studies and Operational Oceanography**, Bergen - founded in 2004
- **Nansen International Environmental and Remote Sensing Center,** St. Petersburg, Russia - a non-profit research foundation founded in 1992
- **Nansen Environmental Research Center (India)**, Cochin, India, a non-profit private research company founded in 1998
- **Nansen-Zhu Center,** Bejing, China, founded 2003
- **Ocean Numerics Ltd, Swindon, UK,** a joint company with Fugro GEOS Ltd devoted to met-ocean studies, founded in 2000
- **Arctica**, Bergen - a center for public communication of research

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Staff

Total 62 including 32 scientists and 14 PhDs

Research Areas

- Climate understanding, variability and changes
- Developing and utilizing satellite methods for climate, environmental marine and sea ice studies
- Marine forecasting and operational oceanography
- Socio-economic impacts of global change

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National Partners

IMR, met.no, BCCR, NORUT-IT, NIVA,

Key International Partners

- IFREMER, MERCATOR, CLS, BOOST
- INGV (Italy)
- UK MET OFFICE, NOC
- ESSC, Univ. of Readings
- MAX PLANCK (Germany), (ORS),
- ORSI

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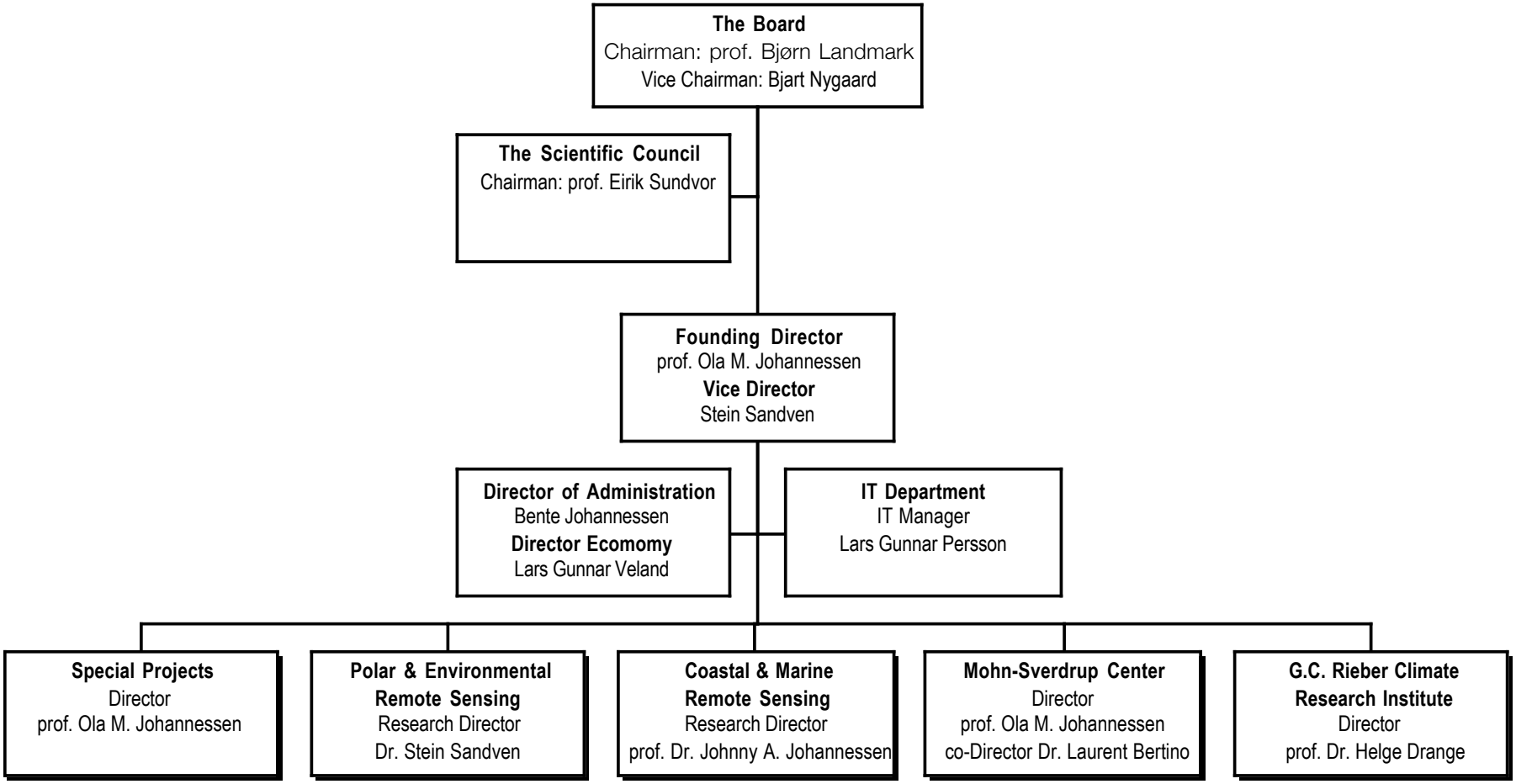
Nansen Center Organisation



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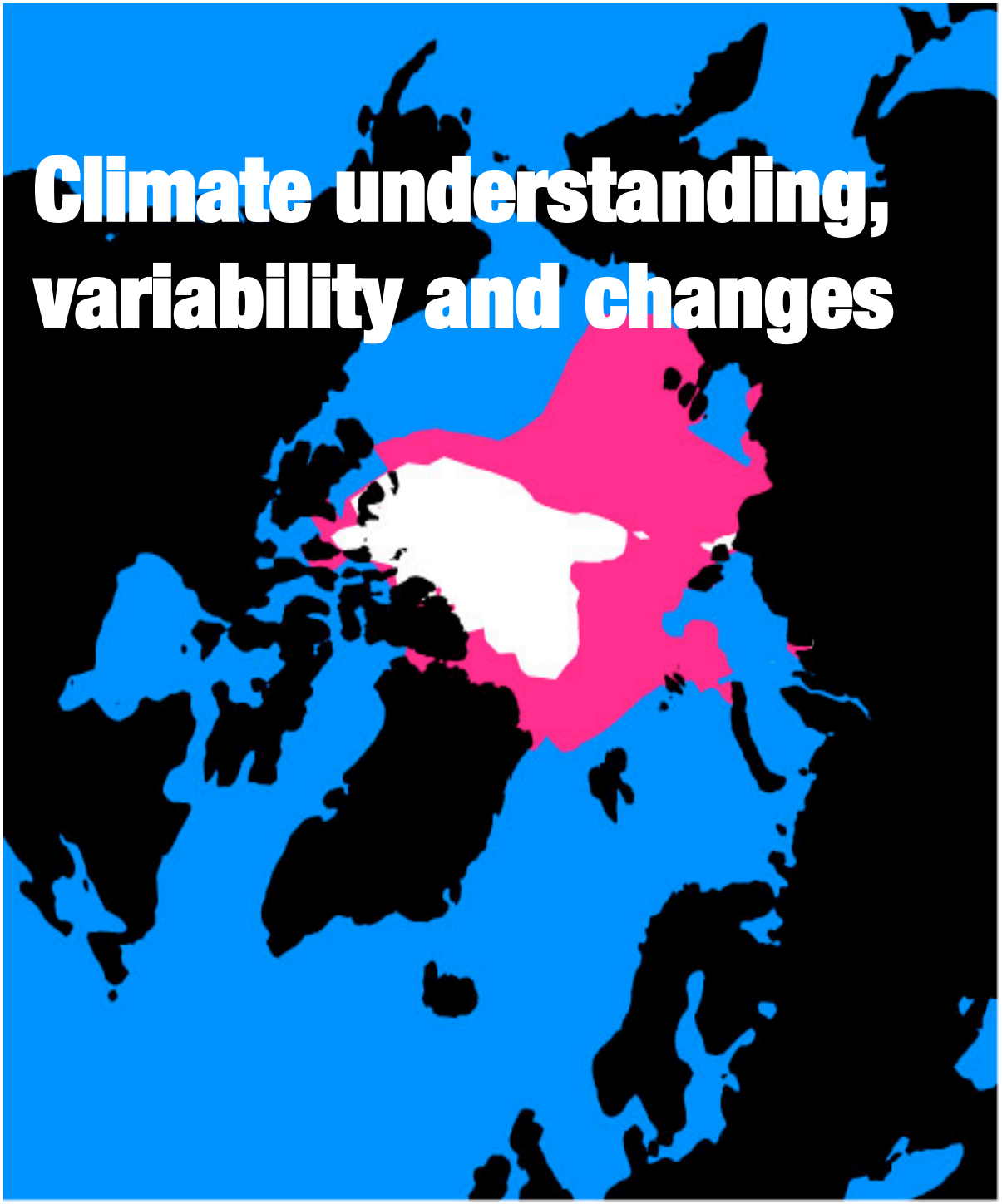

Inter-annual to centennial time scales

Natural and anthropogenic variability

Carbon cycle in the oceans

Predictability on decadal time scales

Teleconnections between the tropics and higher latitudes

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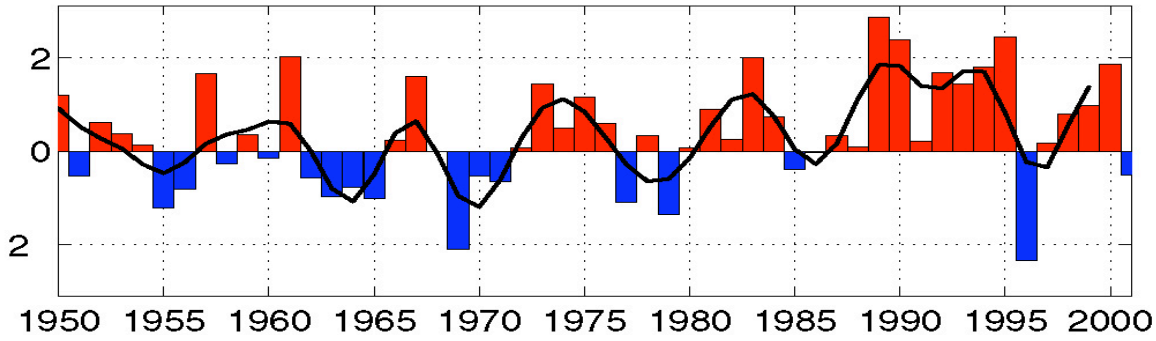
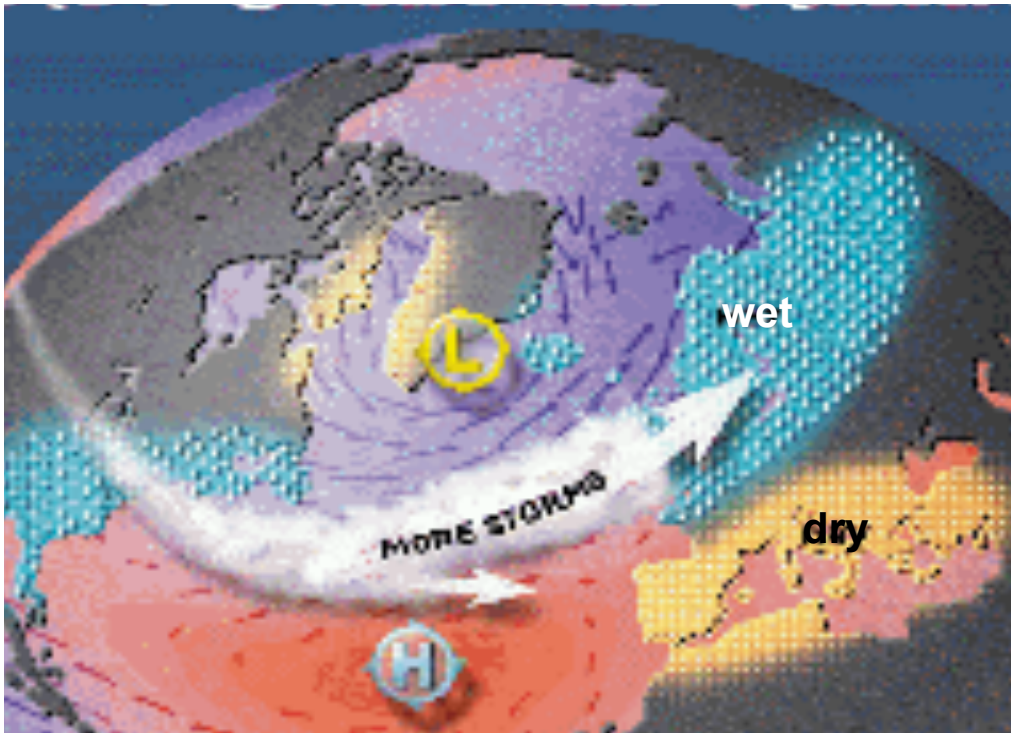
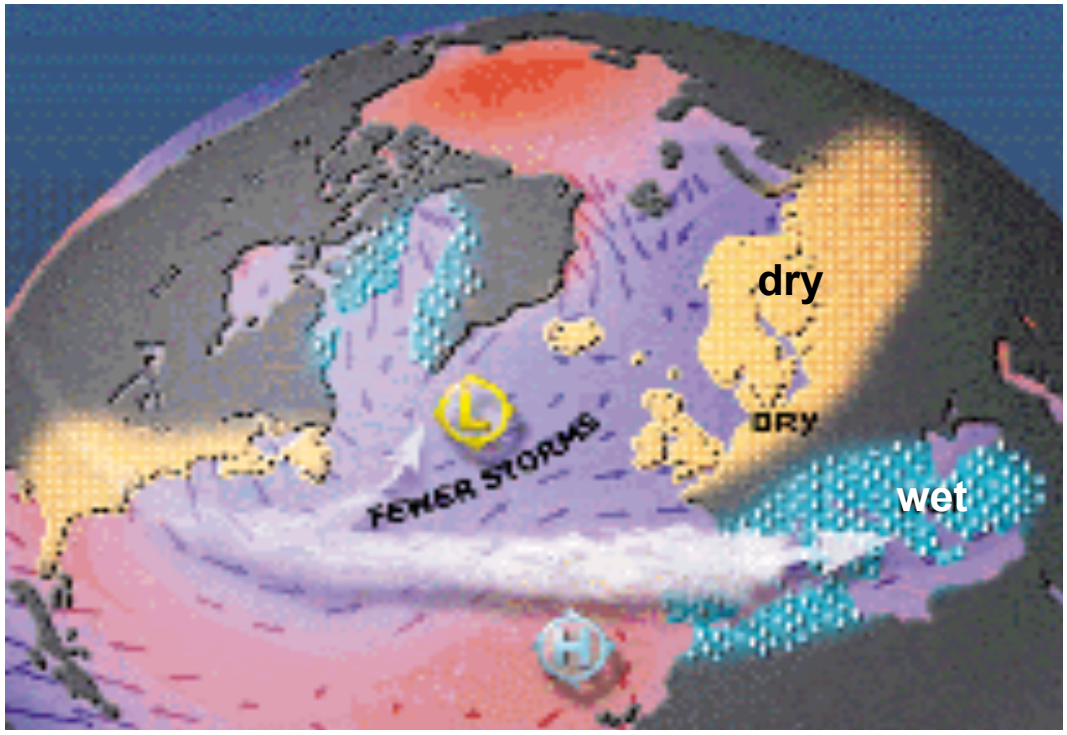
Natural variability: the North Atlantic Oscillation





Positive NAO index



Negative NAO index

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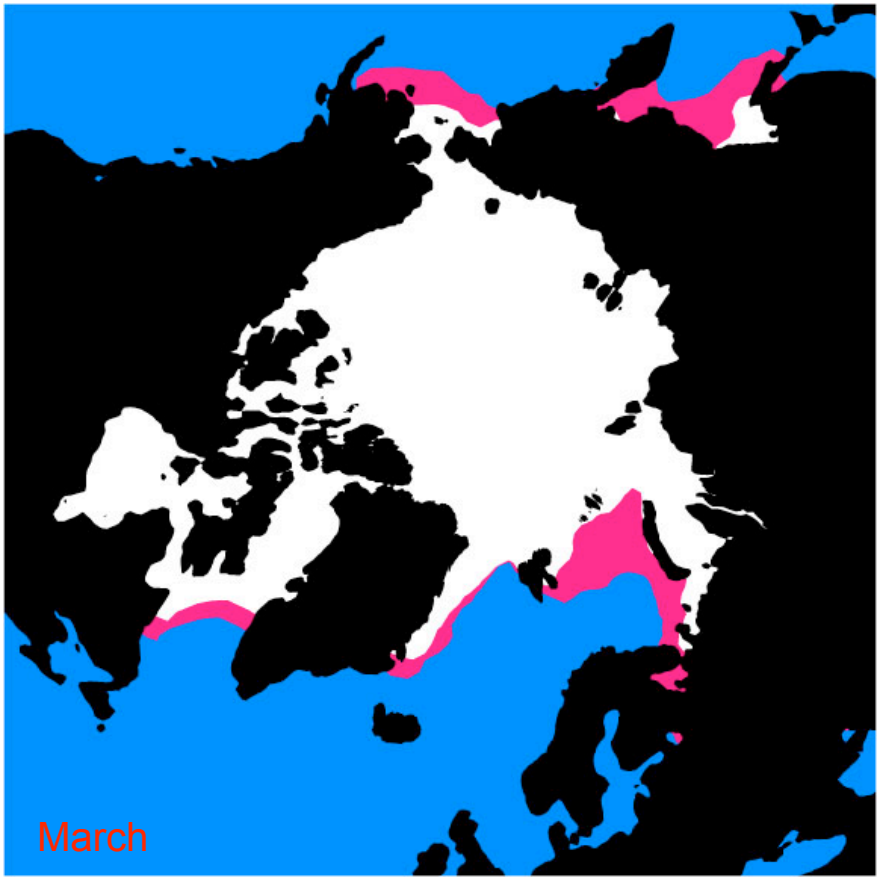
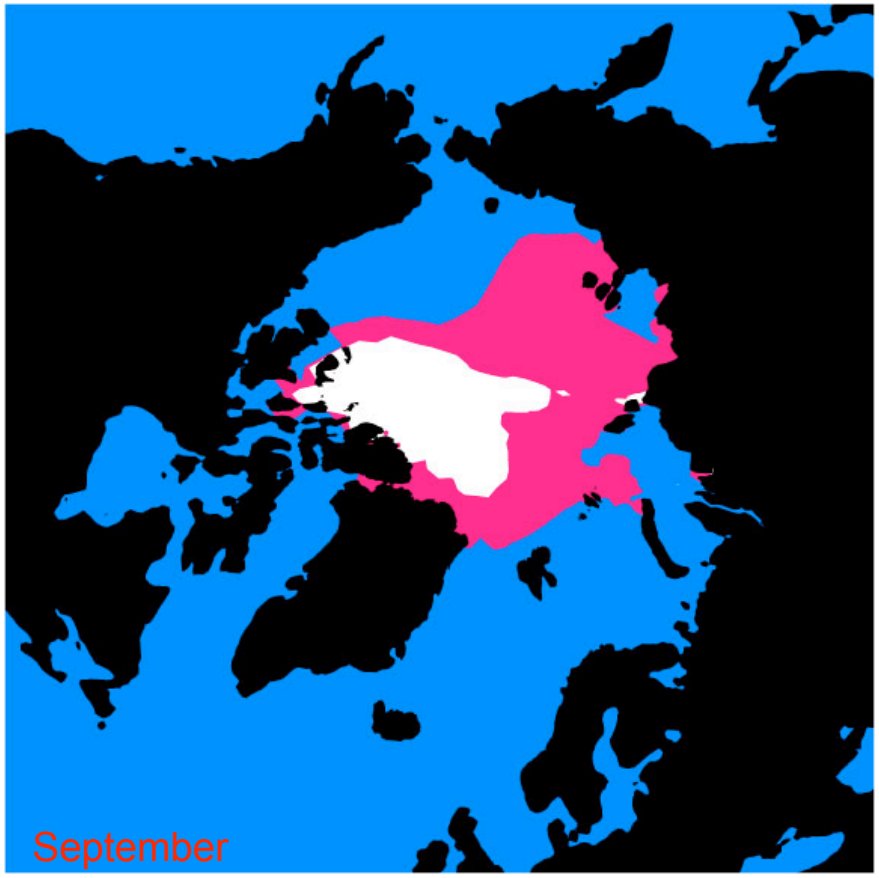
Simulated change in sea ice extent in BCM





Pink *Control run*

White *CO_2 doubling*

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Satellite monitoring of global environment and climate

- sea ice and glaciers
- ocean temperature
- currents
- water quality
- algae blooms
- marine productivity
- snow
- water resources
- tundra
- terrestrial variables

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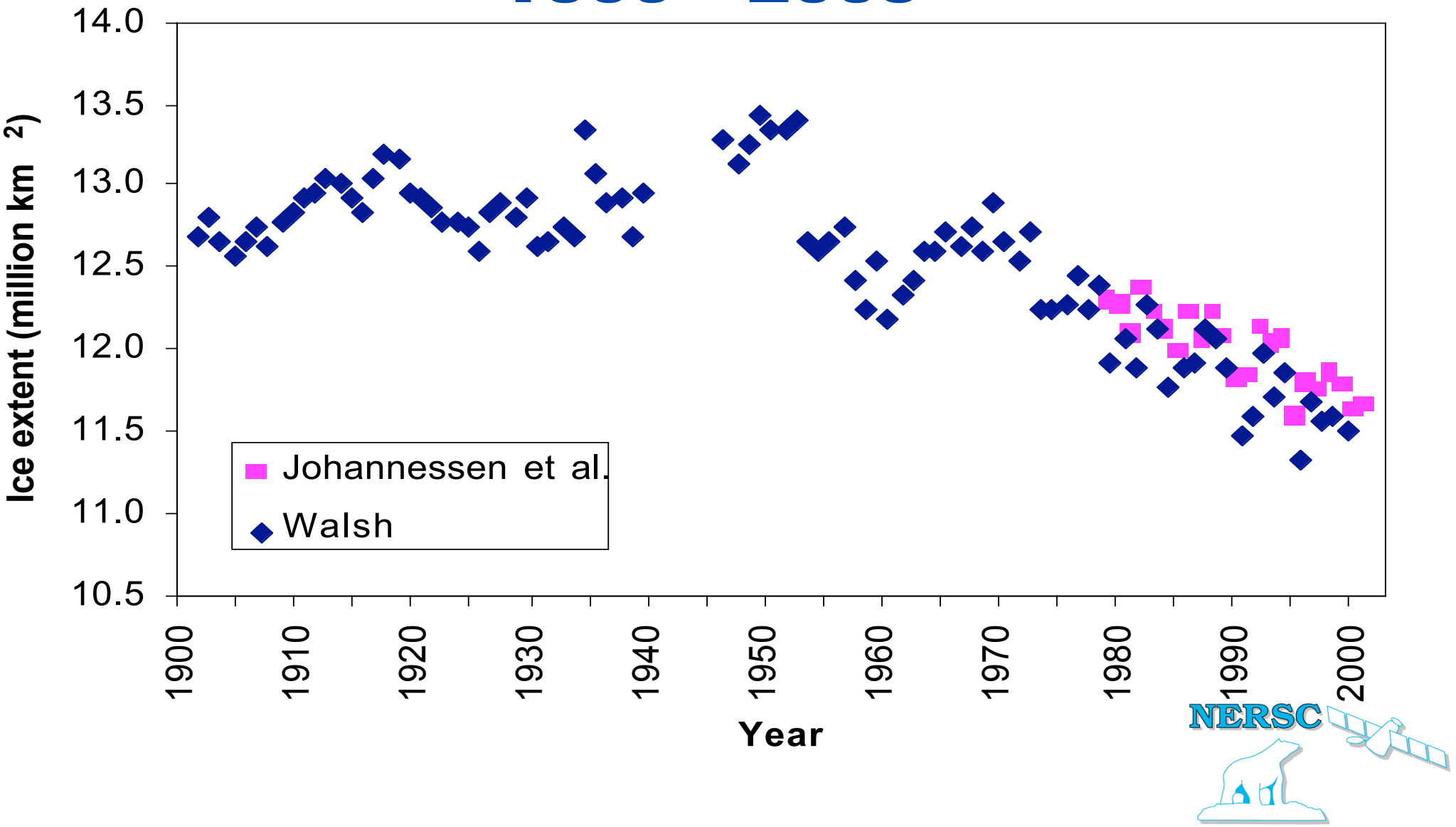
Arctic Sea Ice Extent
1900 - 2003



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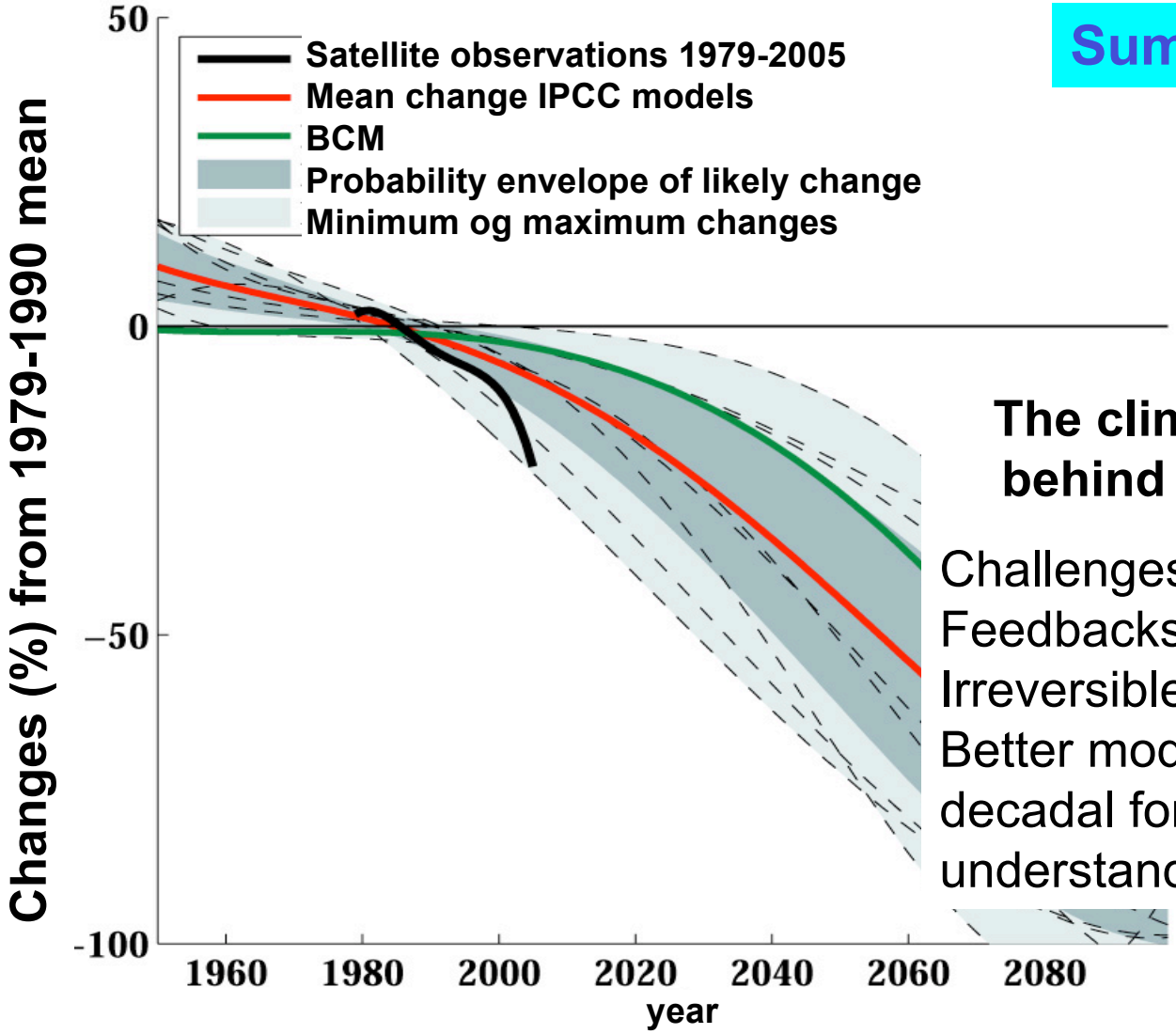
Summer Ice conditions



Courtesy A. Sorteberg

The climate models are 30 years behind observed sea ice retreat

Challenges: -
Feedbacks -
Irreversible changes -
Better models - annual to
decadal forecasting - impact
understanding/simulation

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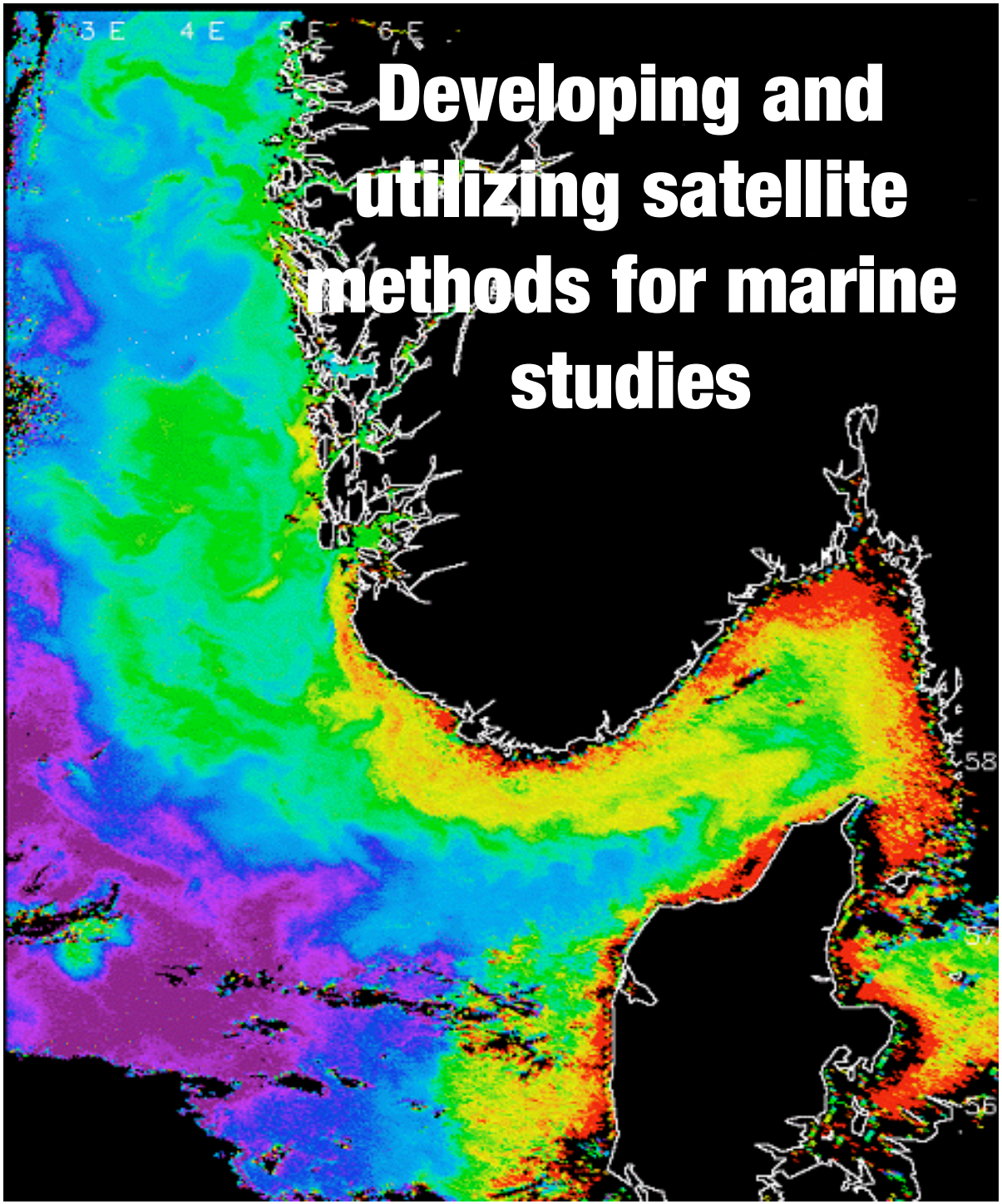
Sorteberg, pers. komm.



Developing and utilizing satellite methods for marine studies

- **Electromagnetic interaction for retrieval of ocean and ice parameters**
- **Bio-optical algorithms**
- **Synergy-applications of operational satellite data**
- **Products from new satellite sensors**
  - **GOCE**
  - **SMOS**
  - **CRYOSAT**

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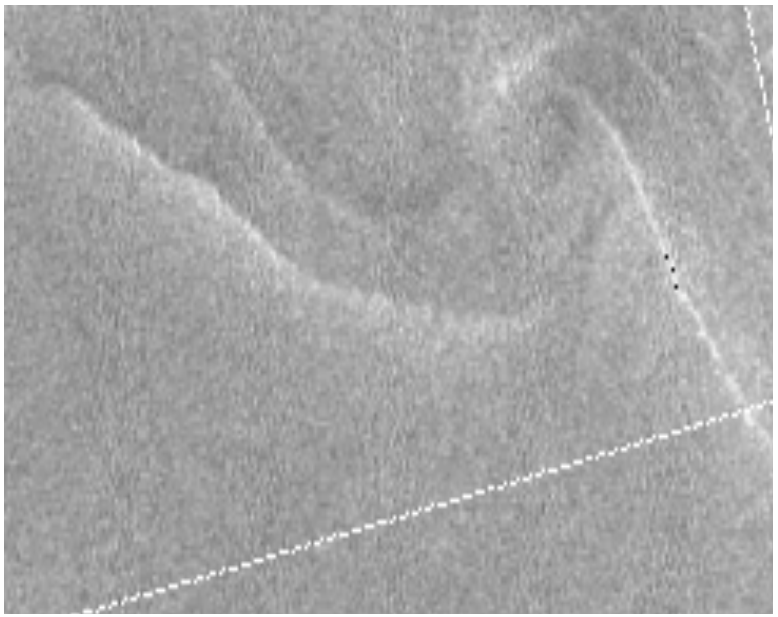

Synthetic Aperture Radar (SAR)

Challenges

- EM-interaction
- Reliable radar models
- Validation

Applications

- Current front detection
- High resolution wind field estimates
- Oil spill monitoring
- Wave-current interaction

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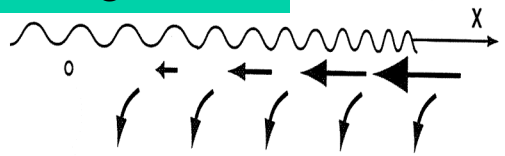
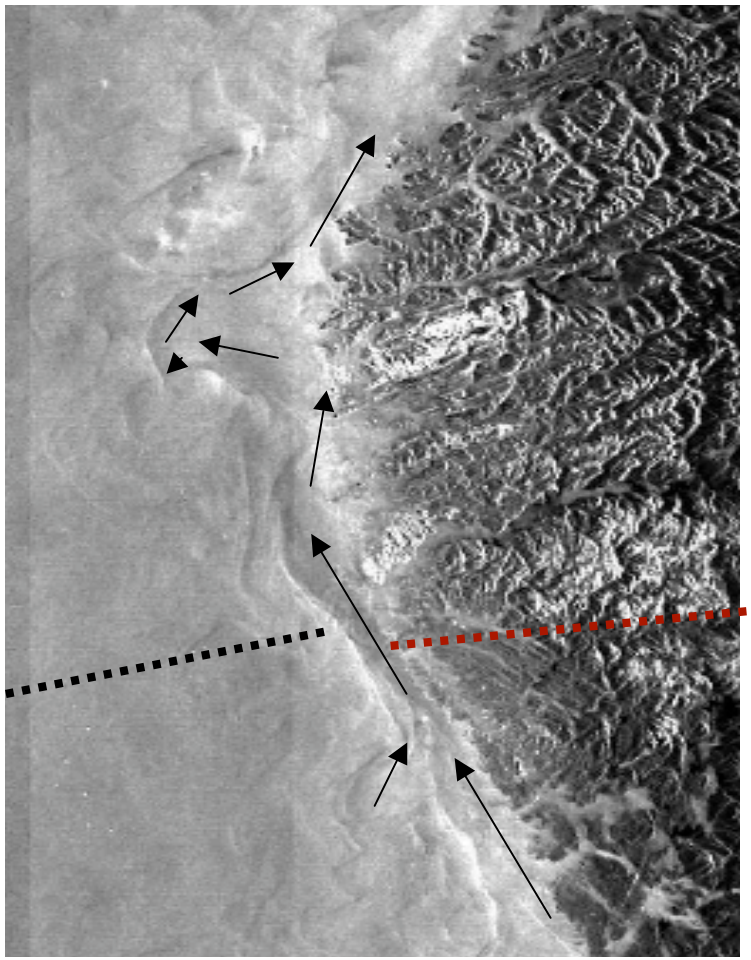
Norwegian Coastal current detection from SAR

Bright bands mark strong current convergence





Arrows mark main current directions

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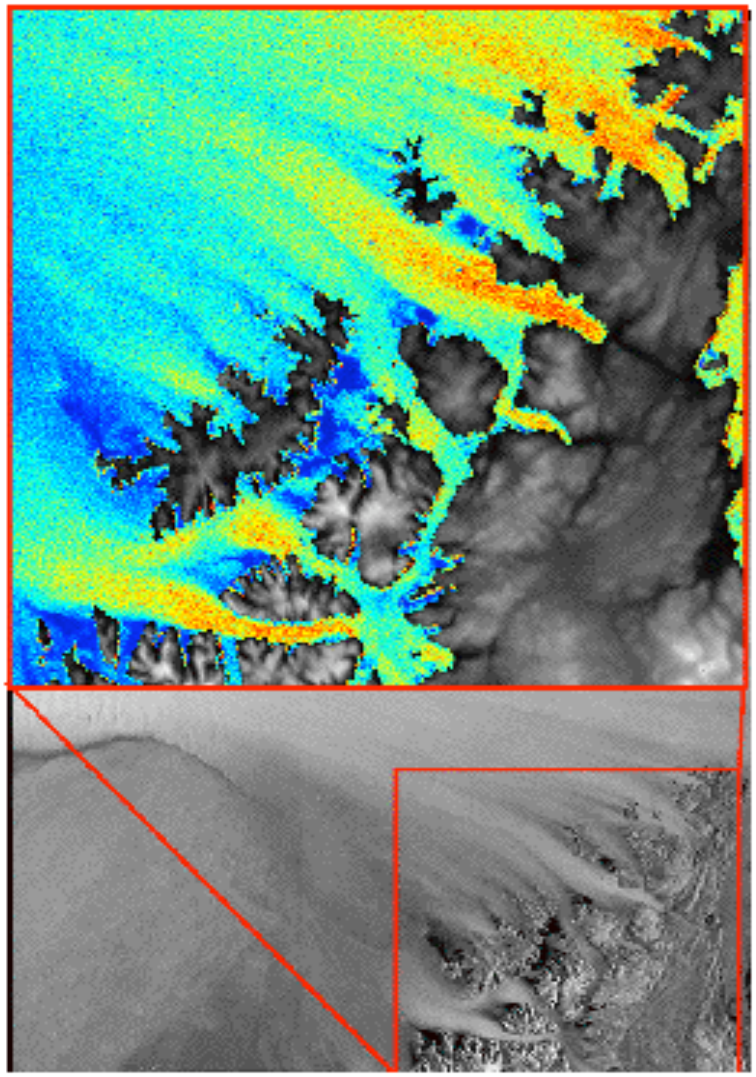
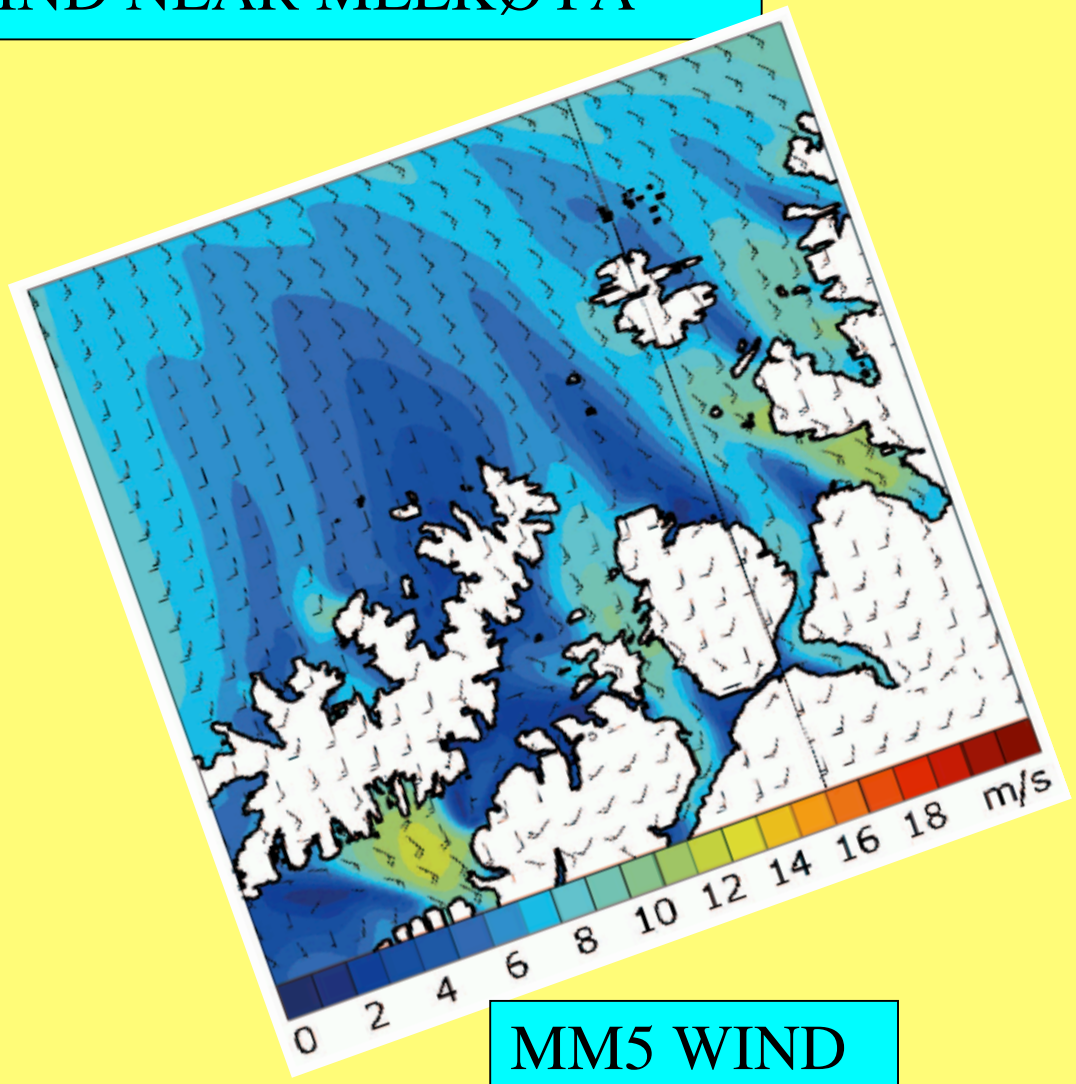
DETAILS OF THE WIND NEAR MELKØYA

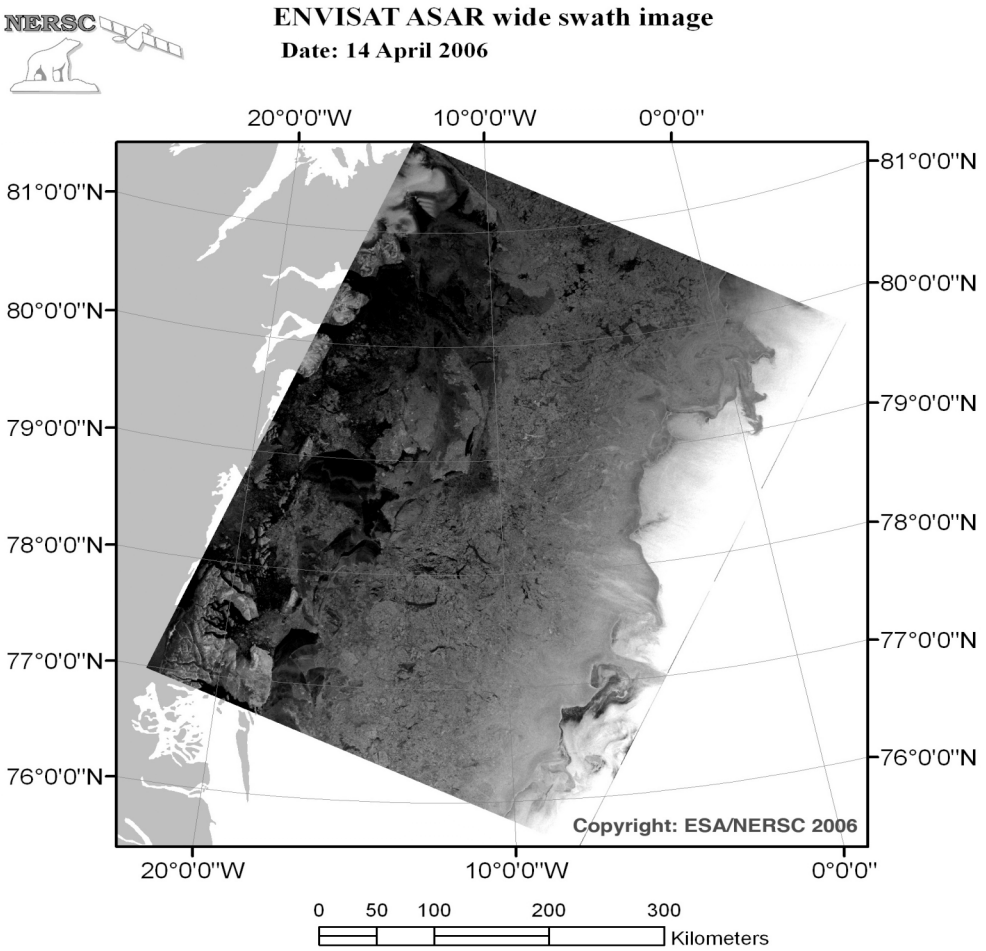


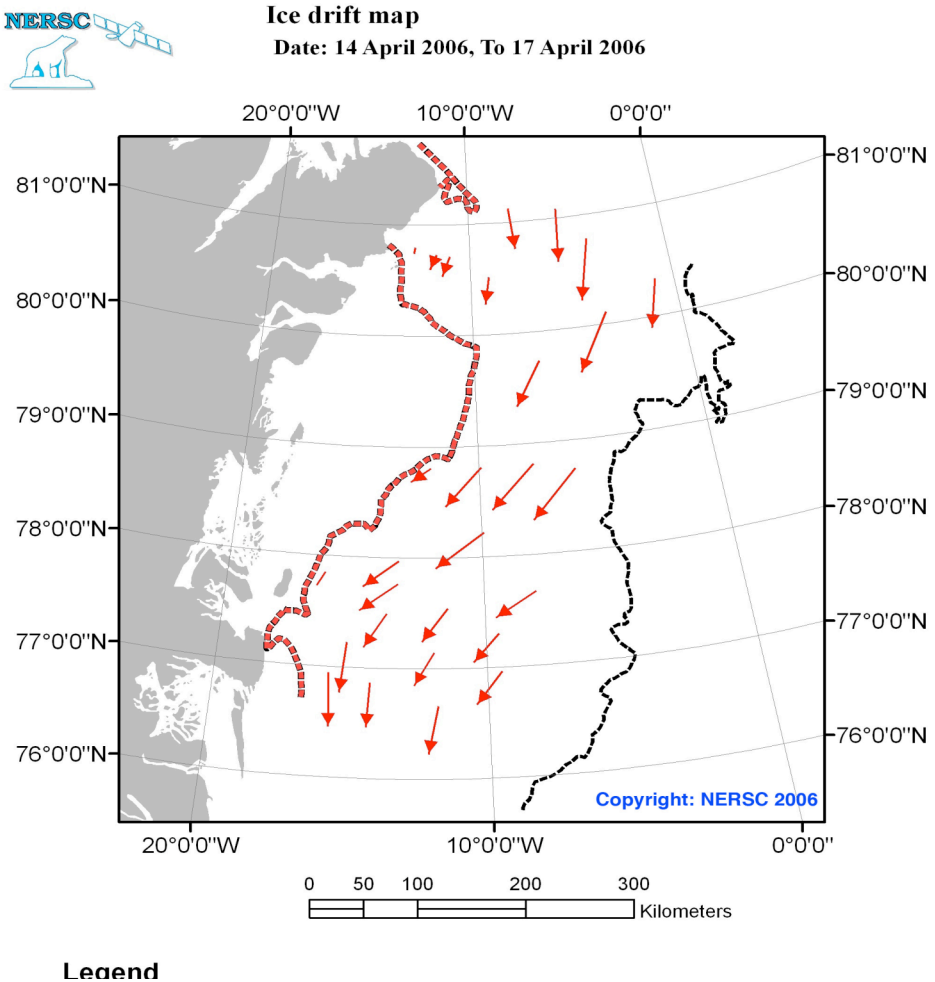
ASAR WIND



MM5 WIND

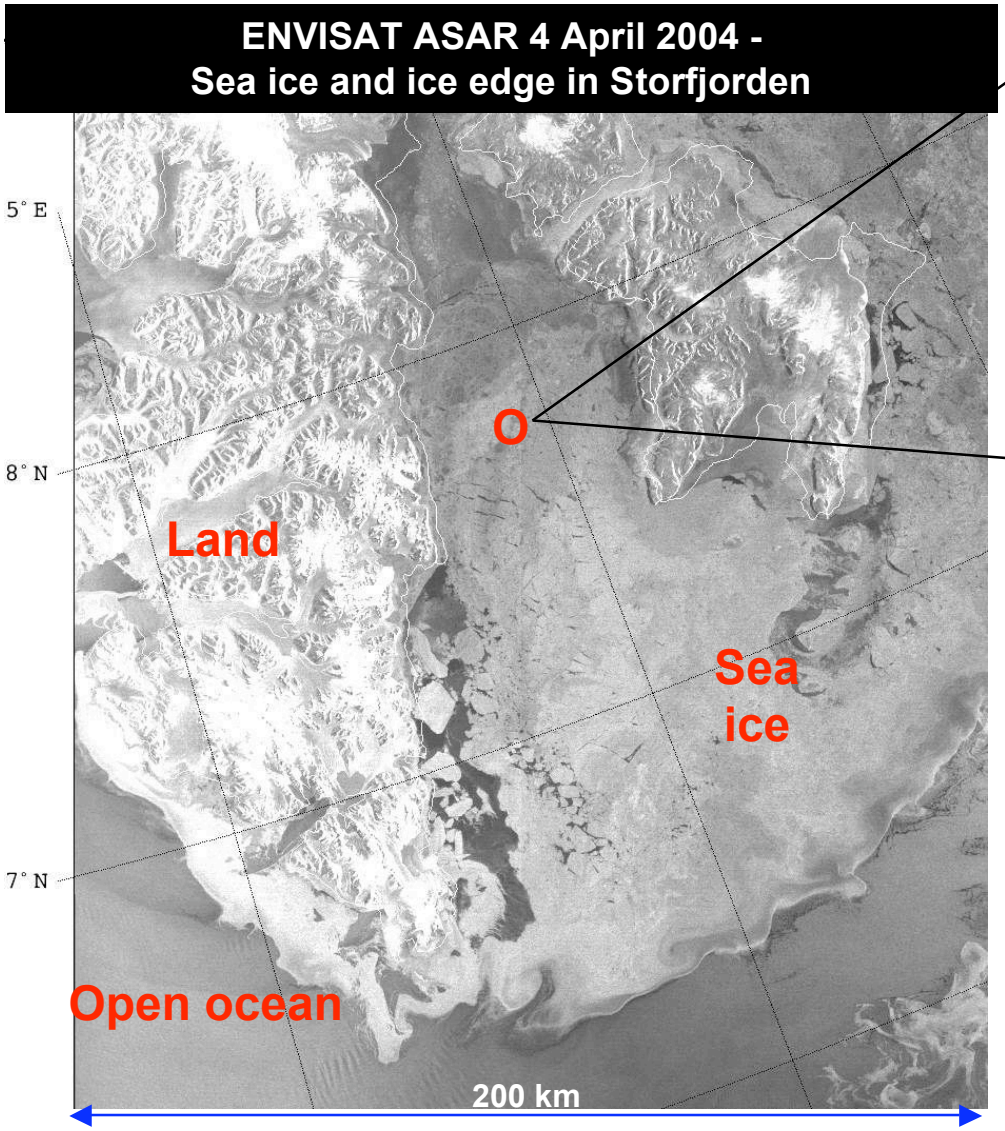
Sea ice drift in the Fram Strait

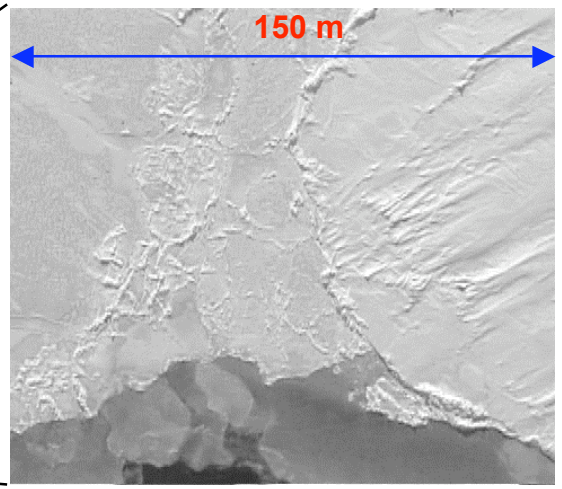




SAR wideswath provide year-round data for ice drift estimation used for 1) calculation of ice flux through the strait, 2) validation of ice model (i.e. TOPAZ) and 3) validation of other satellite ice drift products

Radar monitoring of Sea ice - Spitzbergen





Helicopter video recording

Applications:

- sea ice drift monitoring
- navigation in ice infested waters
- long time series
- sea ice thickness studies
- sea ice deformation monitoring

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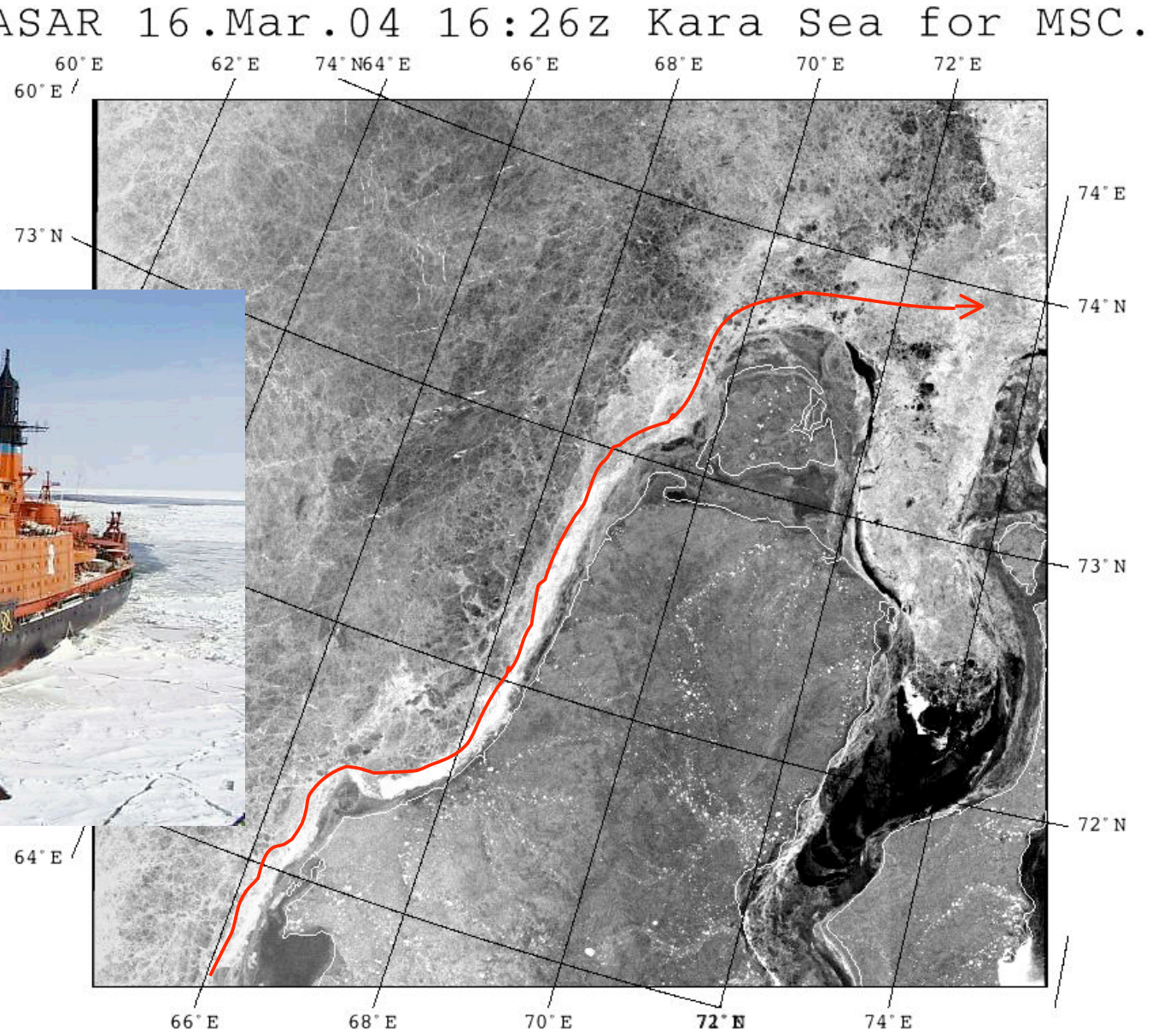
SAR data for ice navigation

Russian Icebreaker in Kara Sea. SAR based ice maps are sent to the ship.



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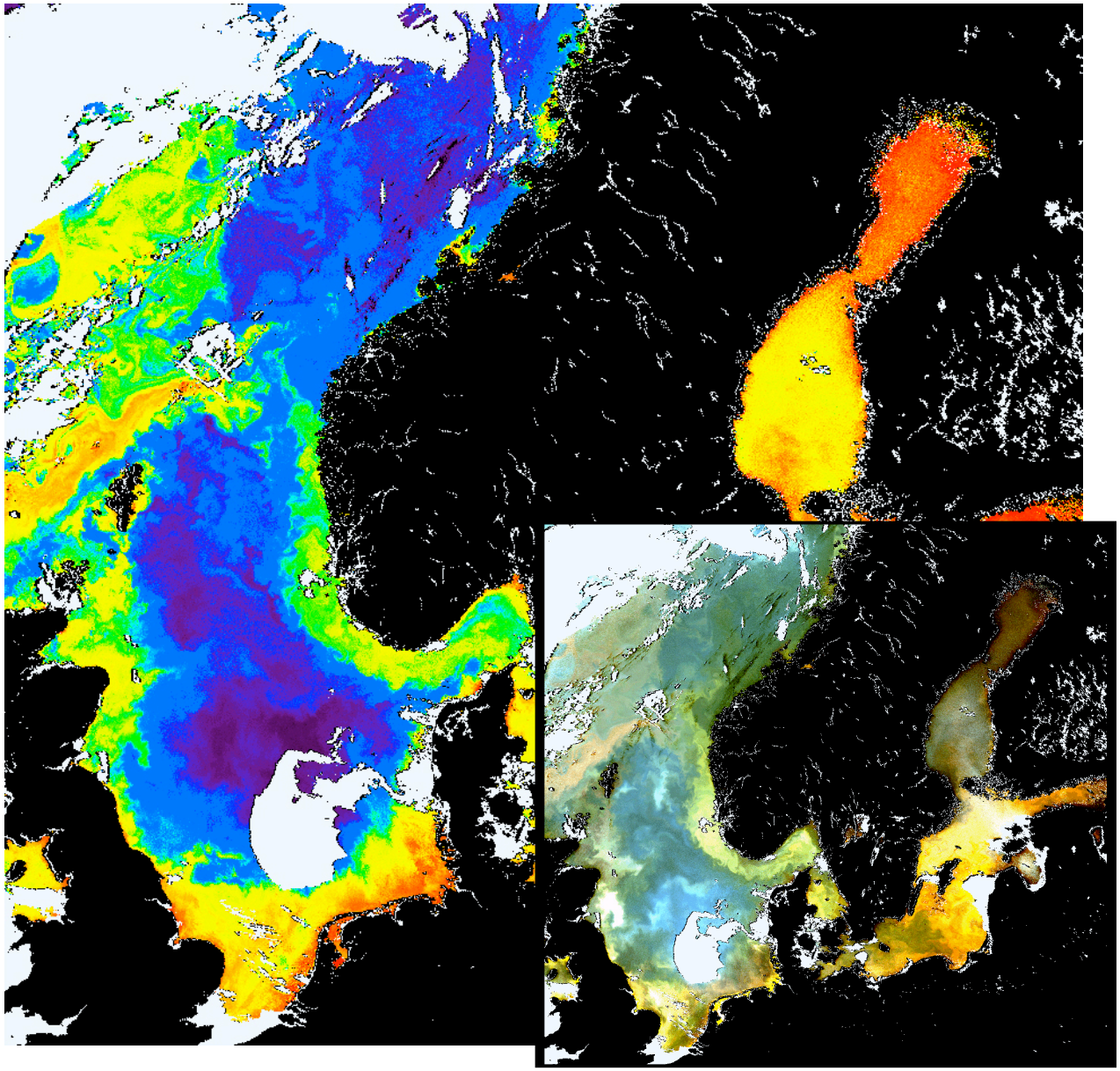

SeaWiFS observes the North Sea ecosystem 16. July, 2003. Copyright: NASA/Orbimage

Ocean Colour Sensors

Challenges:

- Optical Active Components
- Regional validation
- Atmospheric correction
- Cloud cover - time series
- Global primary production
- Algae species determination

Applications:

- Algae bloom monitoring
- Ocean circulation
- Water masses
- Aquaculture and Fisheries
- Marin Primary production
- Pollution and Sediments
- Assimilation in ocean models
- New information Products

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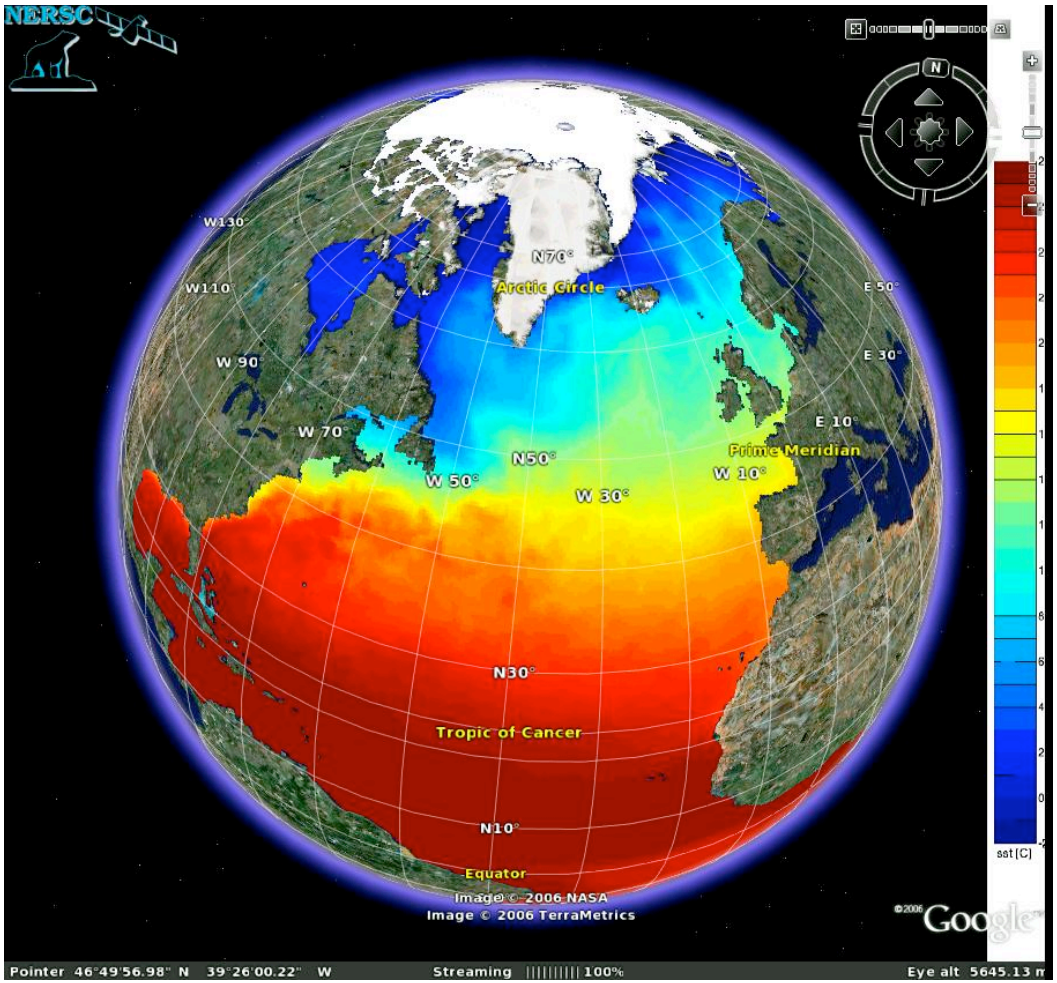
Marine Forecasting and Operational Oceanography



World-wide use of the TOPAZ/HYCOM assimilation/modelling system

Forcasting and services for research, industry and public

Assimilation of satellite data (SST, SLA, SEA ICE)

Improve the ice and ecosystem modules

Contribute to GODAE, MERSEA, MyOcean (GMES MCS)

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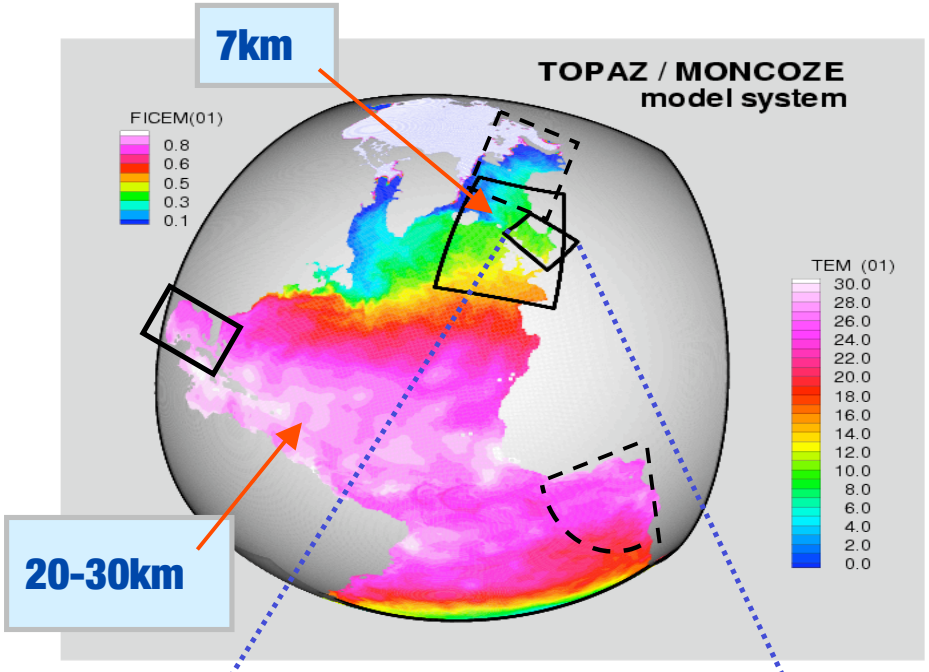
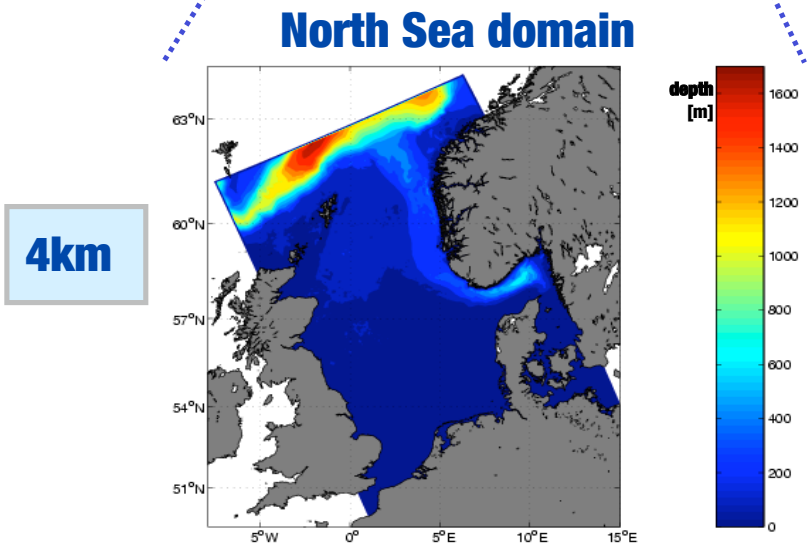
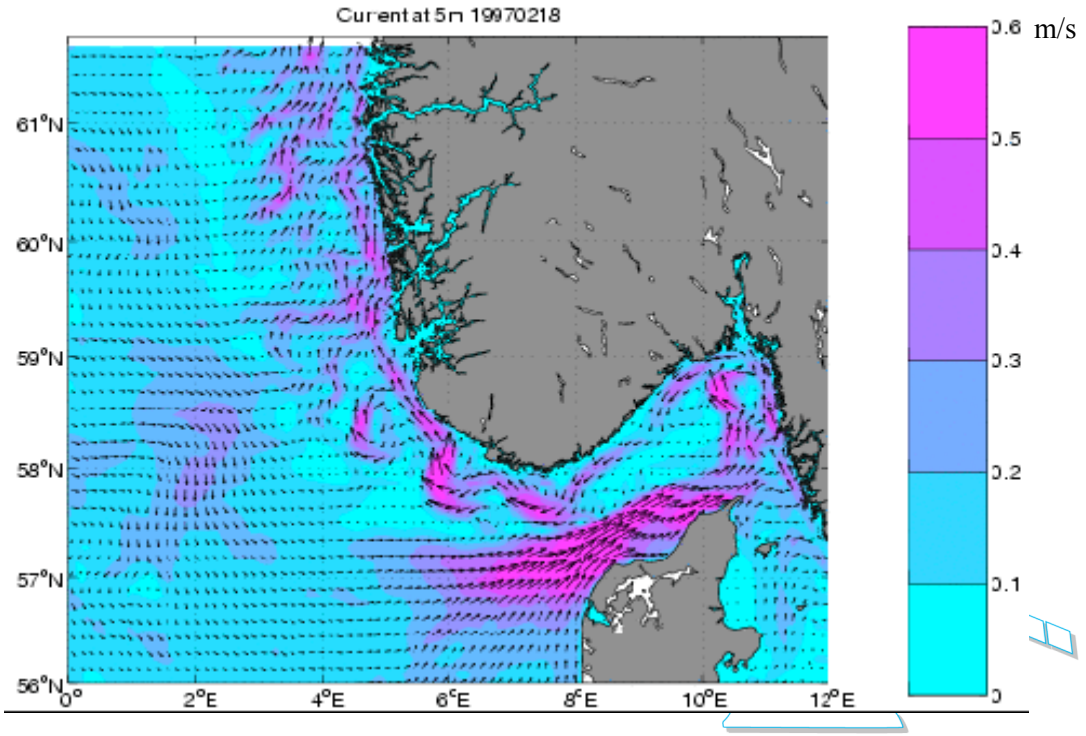
Nested Model and Integration



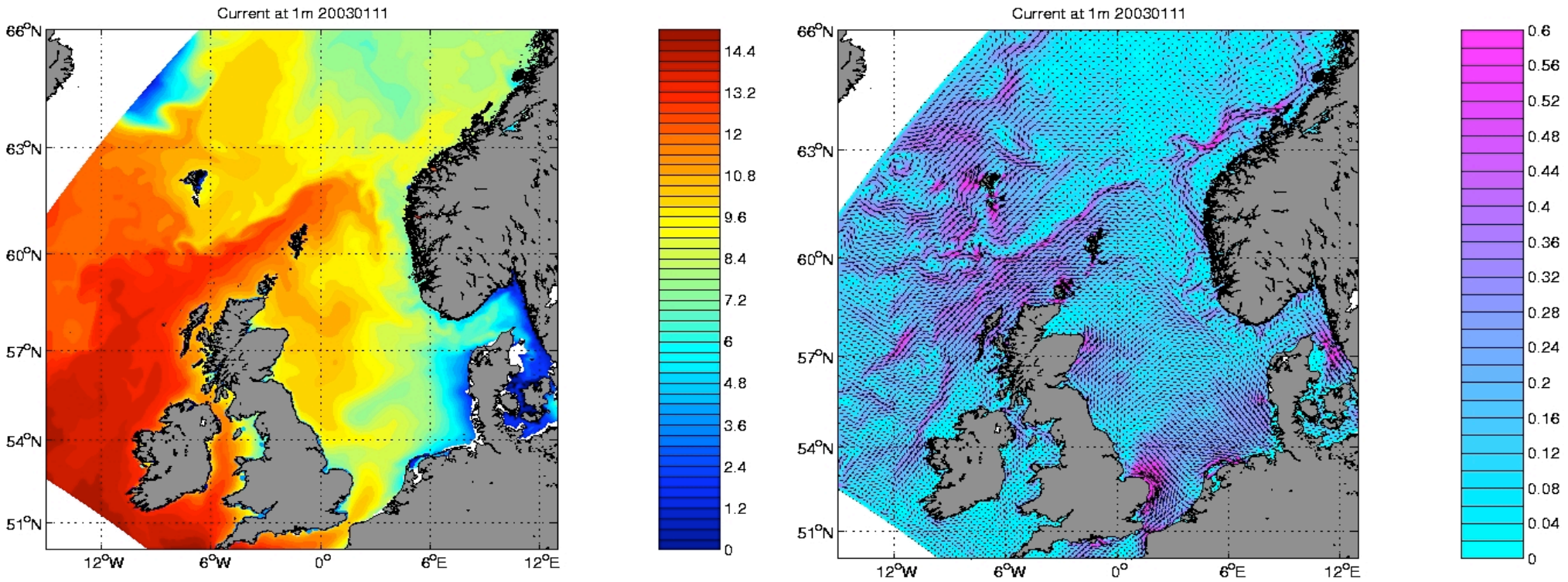


- Nested physical models:
  - ~30km, 7km, and 4km resolution
- Operational products include
  - Currents, SST, salinity, etc.



North Atlantic model (4 km)

- will be extended to cover Nordic Seas



CONMAN – NDP project

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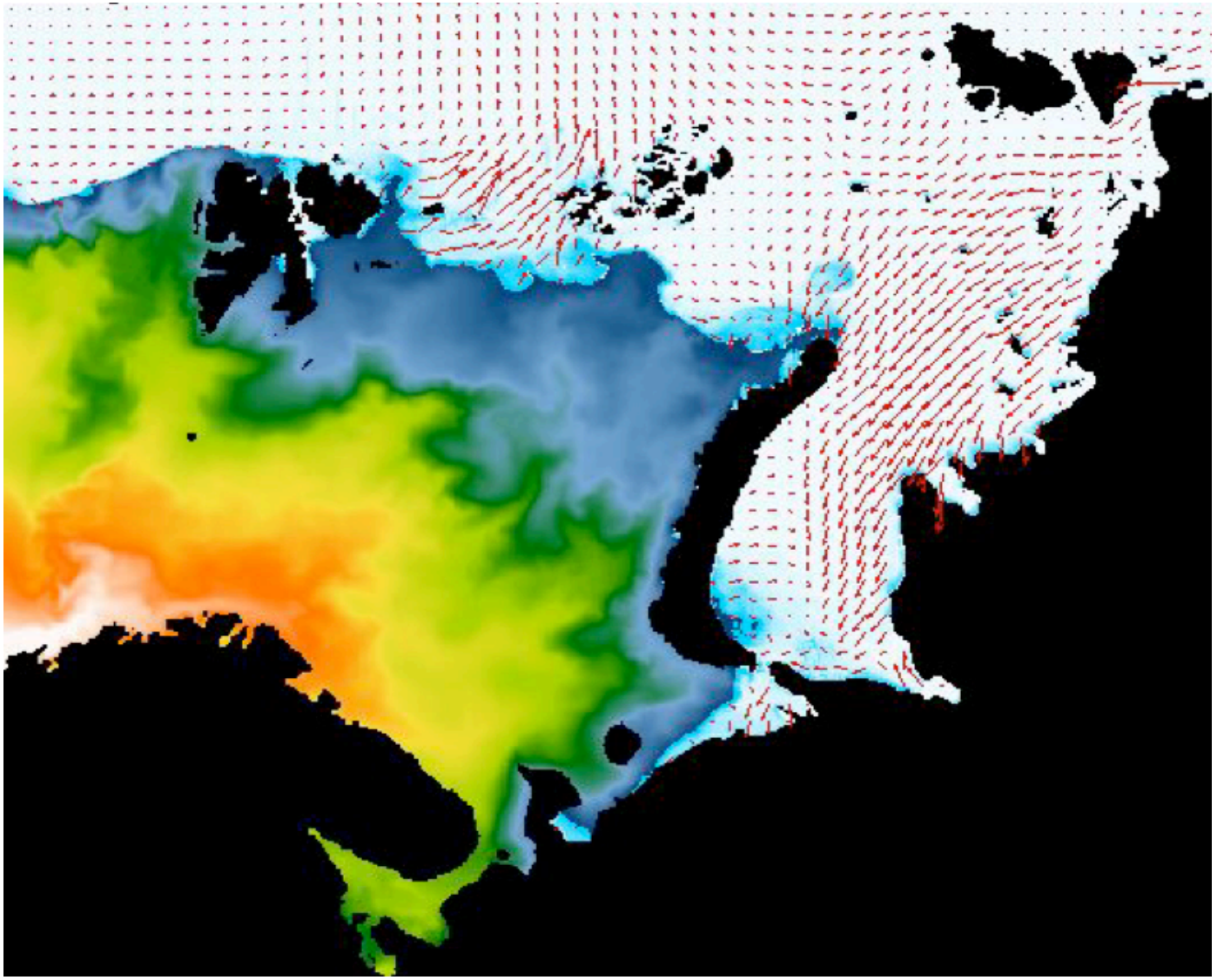
Illustr. C. Hansen

Barents Sea model - Ice edge, drift and SST



Forecasting:

- Ice drift
- Ice concentration
- Ice thickness
- Iceberg trajectories

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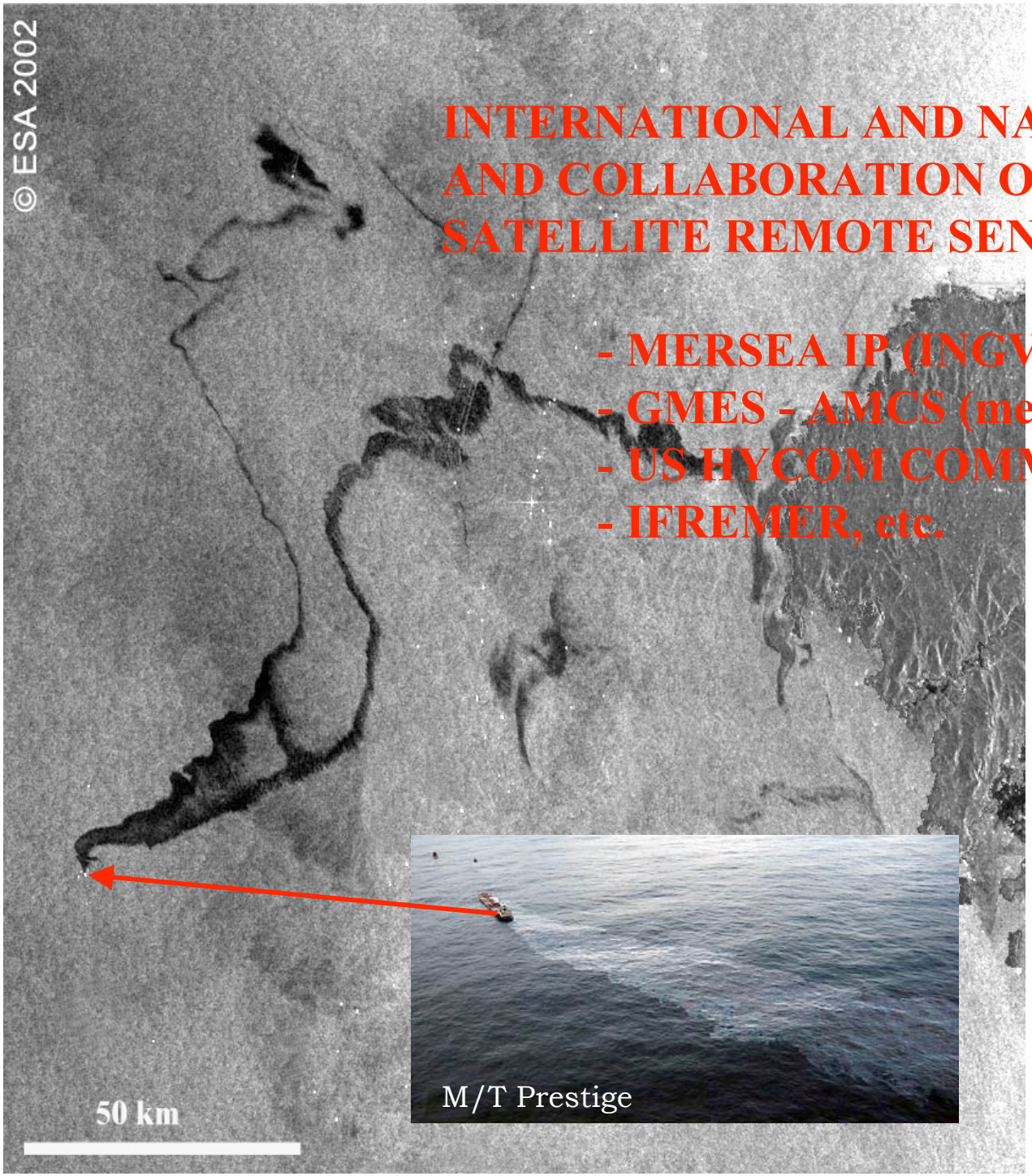

INTERNATIONAL AND NATIONAL NETWORK AND COLLABORATION ON MODELLING AND SATELLITE REMOTE SENSING:

- MERSEA IP (INGV, MERCATOR, UK MET)
- GMES - AMCS (met.no, IMR and NERSC)
- US HYCOM COMMUNITY
- IFREMER, etc.

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At least one scientific paper per scientist

Three PhD dissertations

Presentations at international conferences

Commercialize products

Public outreach

Growth in staff

Operate after sound economical principals

NERSC