

Arctic Regional Ocean Observing System

Arctic ROOS

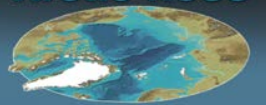
Report from 2013

By

Stein Sandven

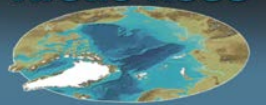
Nansen Environmental and Remote Sensing Center

(www.arctic-roos.org)



Focus in 2013

1. Arctic Marine Forecasting Center, work under MyOcean2,
2. Sea ice monitoring for climate and operational services, promotion towards Arctic operators
3. ESA CCI programme: Sea ice project
4. Contribution to GISC (H. Wehde)
5. FP7 projects, planning of new H2020 projects
6. Cooperation with EMODnet Physics to increase in situ data
7. Annual meeting at DMI, 16 –17 December



Members

Country	Organisation	Contact
Norway	Nansen Environmental and Remote Sensing Center	Stein Sandven
Norway	Norwegian Institute for Water Research	Kaj Sørensen
Norway	Norwegian Meteorological Institute	Lars Petter Røed
Norway	Institute of Marine Research	Henning Wehde
Sweden	Swedish Meteorological and Hydrological Institute	Irene Lake
Finland	Finnish Meteorological Institute	Jari Haapala
Russia	Nansen International Environmental and Remote Sensing Center, St. Petersburg	Leonid Bobylev
France	GIP Mercator Ocean	Pierre Bahurel
France	Institut français de recherche pour l'exploitation de la mer (IFREMER)	Bertrand Chapron
Poland	Institute of Oceanology, Polish Academy of Sciences	Waldemar Walczowski
Germany	Alfred-Wegener-Institut für Polar- und Meeresforschung	Katrin Latarius
Germany	University of Bremen	Georg Heygster
Denmark	Danish Meteorological Institute	Erik Buch
UK	University of Cambridge	Peter Wadhams
Norway	Norwegian Polar Institute	Paul Dodd
Norway	Geophysical Institute, University of Bergen	Svein Østerhus

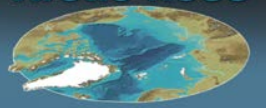
Potential new members

Norway	UNIS	Frank Nilsen
Denmark	Defence Centre for Operational Oceanography	Niels Holt
UK	British Antarctic Survey	Jeremy Wilkinson

Operational Oceanography in Norway

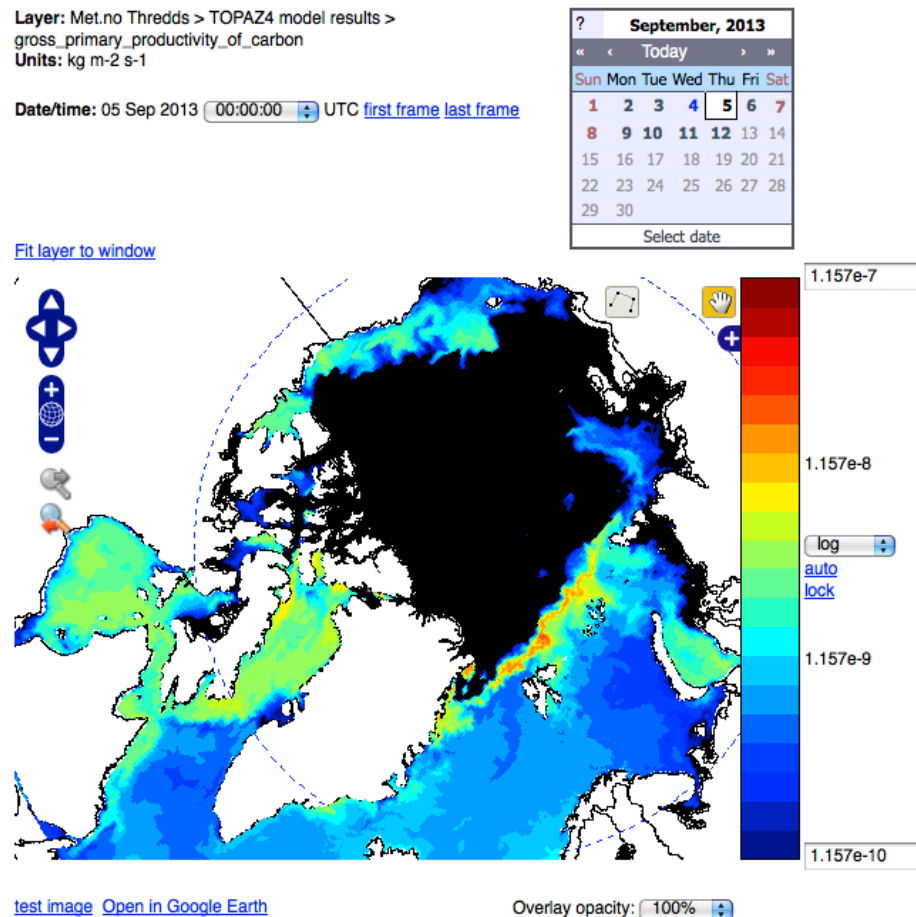


- **Who contributes what?**
 - **IMR:** in situ observations (ship, fixed), bio-model development, data distribution
 - **NERSC:** model development, data assimilation, satellite observations (SAR, OC)
 - **met.no:** forecast production (weather, waves, ocean), satellite observations (SST, ice), data distribution, dissemination of forecasts
 - **NIVA:** in situ observations (Ferrybox, coastal), satellite observations (OC)

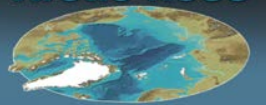


The TOPAZ system

- State of art modeling and data assimilation techniques
 - Data assimilation places the events at the right place at the right time
- The TOPAZ system has been transferred to met.no for operational use
- NERSC developments include the NORWECOM model from IMR
- Further work: Transport of pollutants at sea and impact on ecosystem (NIVA, IMR, NIFES)
 - HavKyst Proposal with GFI & NIFES



Forecast of primary production 5th Sept 2013



Arctic Marine Forecasting Centre

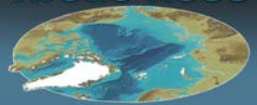


Validation

- Real-time products
 - Validation chain at met.no
 - Replacement for ENVISAT / AMSR-E products
 - SST
 - Ice drift product
- Reanalysis (1991-2010)
 - SST offsets NOAA / OSTIA
 - Ice type classification YI/FYI/MYI
 - Albedo (à la Laine et al 2004)

R&D

- Refinements of existing data
 - Along-swath SST (L2P?)
- New data for assimilation
 - Ice thickness / freeboard
 - CryoSAT, SMOSIce
- New sea ice model developments
 - Ice drift + deformations
 - Ice surface temperature
 - Discrimination MIZ/pack ice

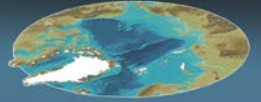


The MET Norway NOWP* system

- Completely rejuvenated as of January 1, 2013:
 - New model: MIPOM → **ROMS**
 - A triply nested grid configuration:
 - *Parent (20 km) → Child1 (4 km) → Child2 (0.8 km)*
 - *Parent need input on lateral boundaries from a global model*
 - *Presently we use FOAM (UK Met Office)*
- Collaboration with IMR on Child2
- Collaboration with Kartverket on water level predictions, in particular tidal elevations

***NOWP = Numerical Ocean Weather Prediction**

October 30, 2013

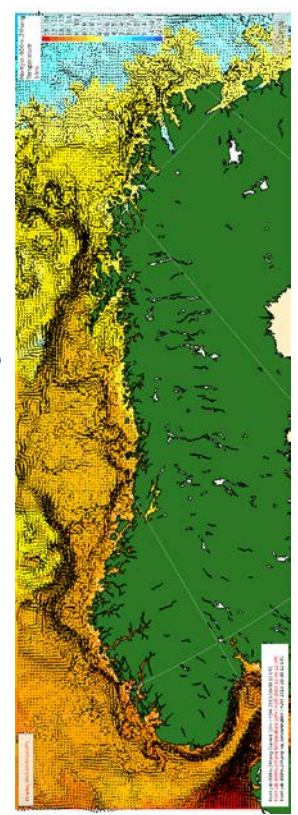
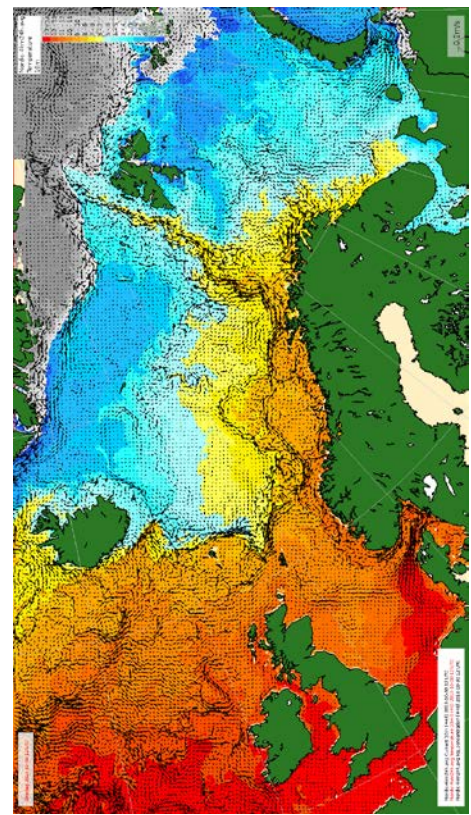
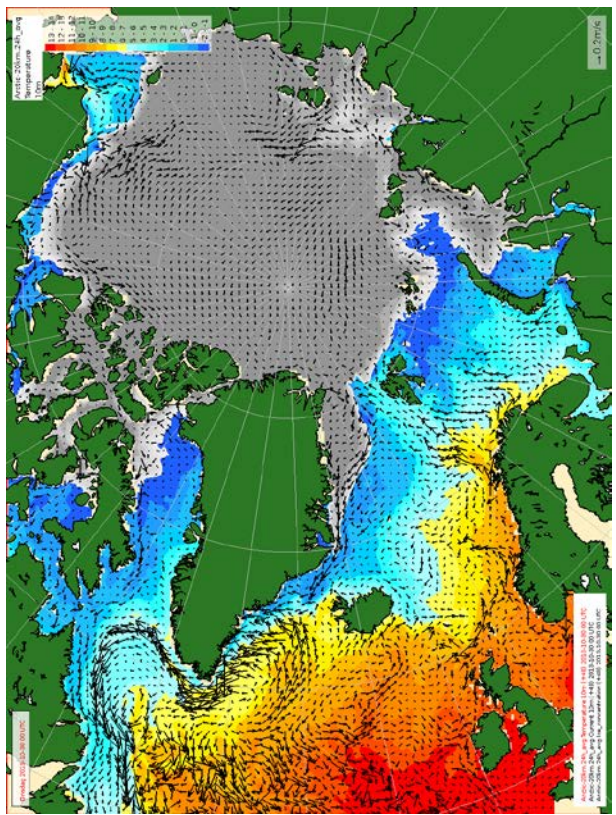


The triply nested grid configuration

A20 (Parent)

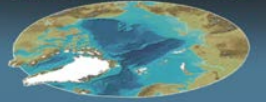
N4 (Child1)

N0.8 (Child2)



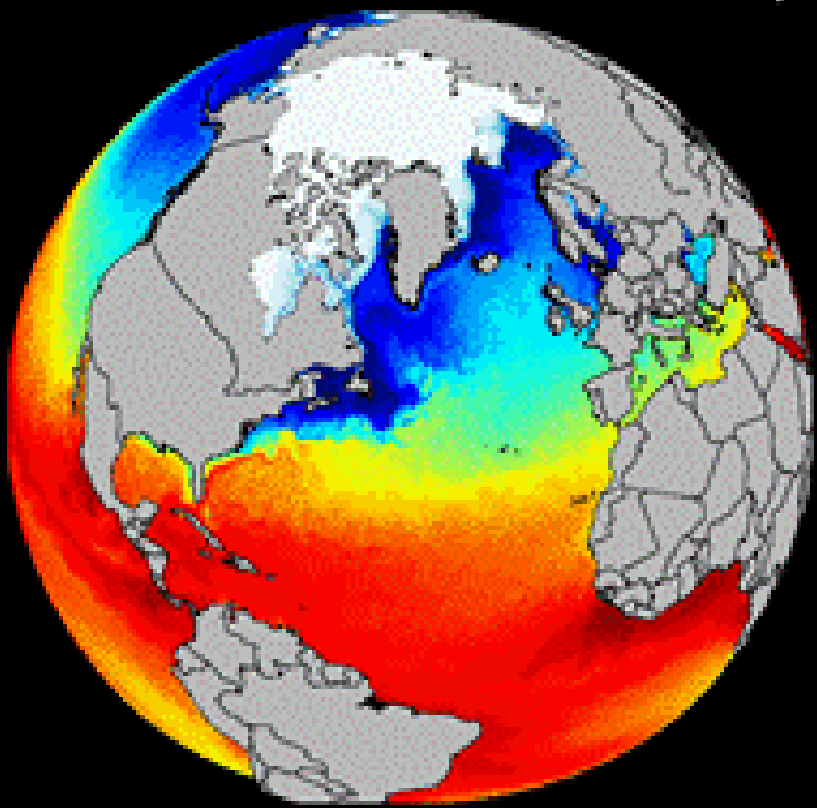
Forecasted 24 h avg SST, SIC and SSC 2013-10-08

October 30, 2013

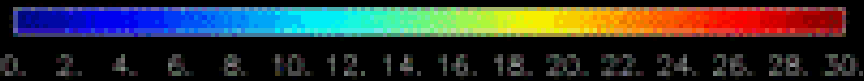


New release of the MyOcean2 global 1/12° operational real-time system in April 2013.

Global 1/12°
2003 January



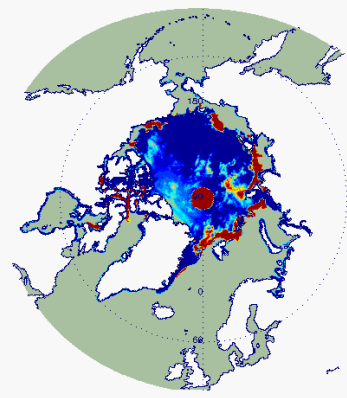
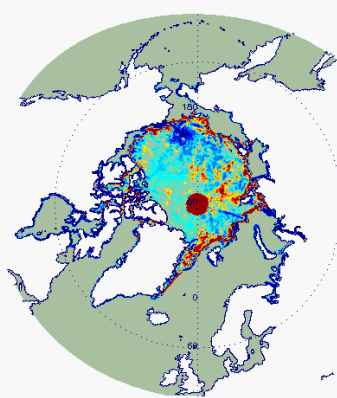
Temperature (°C) & Ice fraction (%)



Assimilation of the sea ice concentration (SIC) in the global 1/4° configuration.

With Assimilation of SIC

Without Assimilation





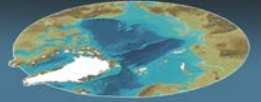
Objective: develop timeseries of sea ice essential variables from satellite data archives according to GCOS requirements

Product name	Sensors	Areas	Spatial grid	Period	Temporal resolution
Sea ice concentration	Passive microwave radiometer	Arctic and Antarctic	L3: 25 x 25 km	1978-2008	Daily
Sea ice thickness	Radar altimeter	Arctic	L3: 100x100 km	1993-2012	Monthly (Oct-April)

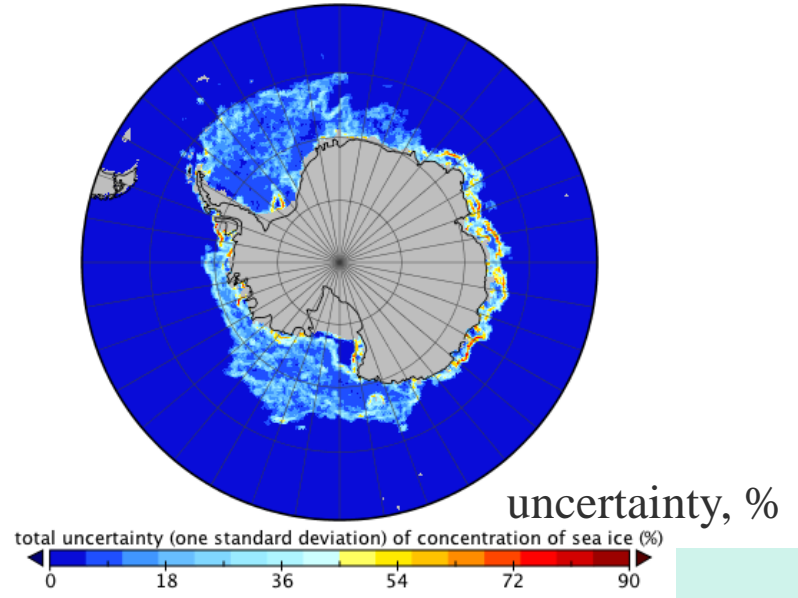
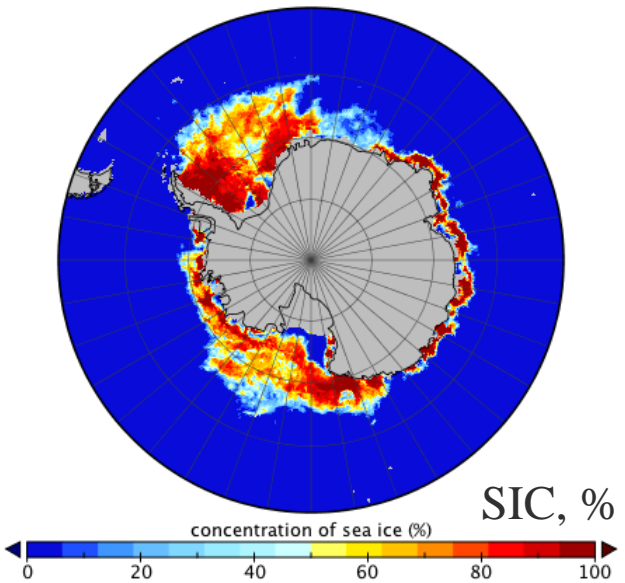
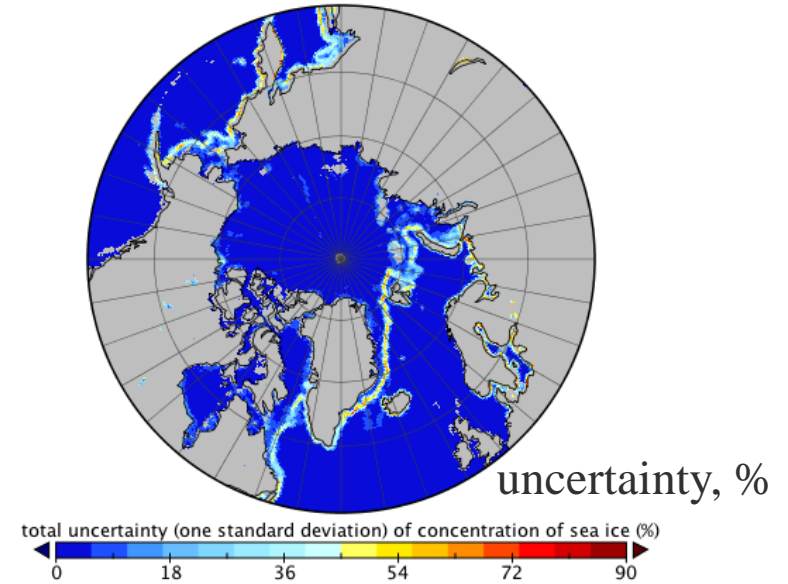
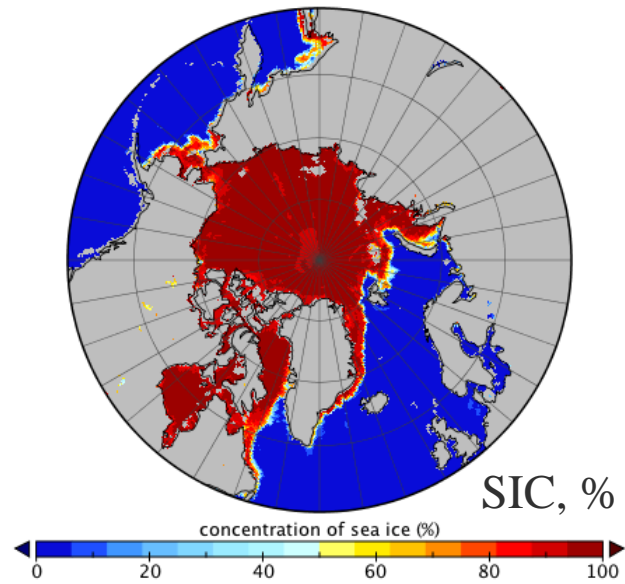
Consortium Members

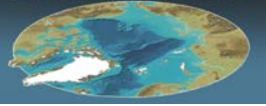


Consortium includes 7 Arctic ROOS members

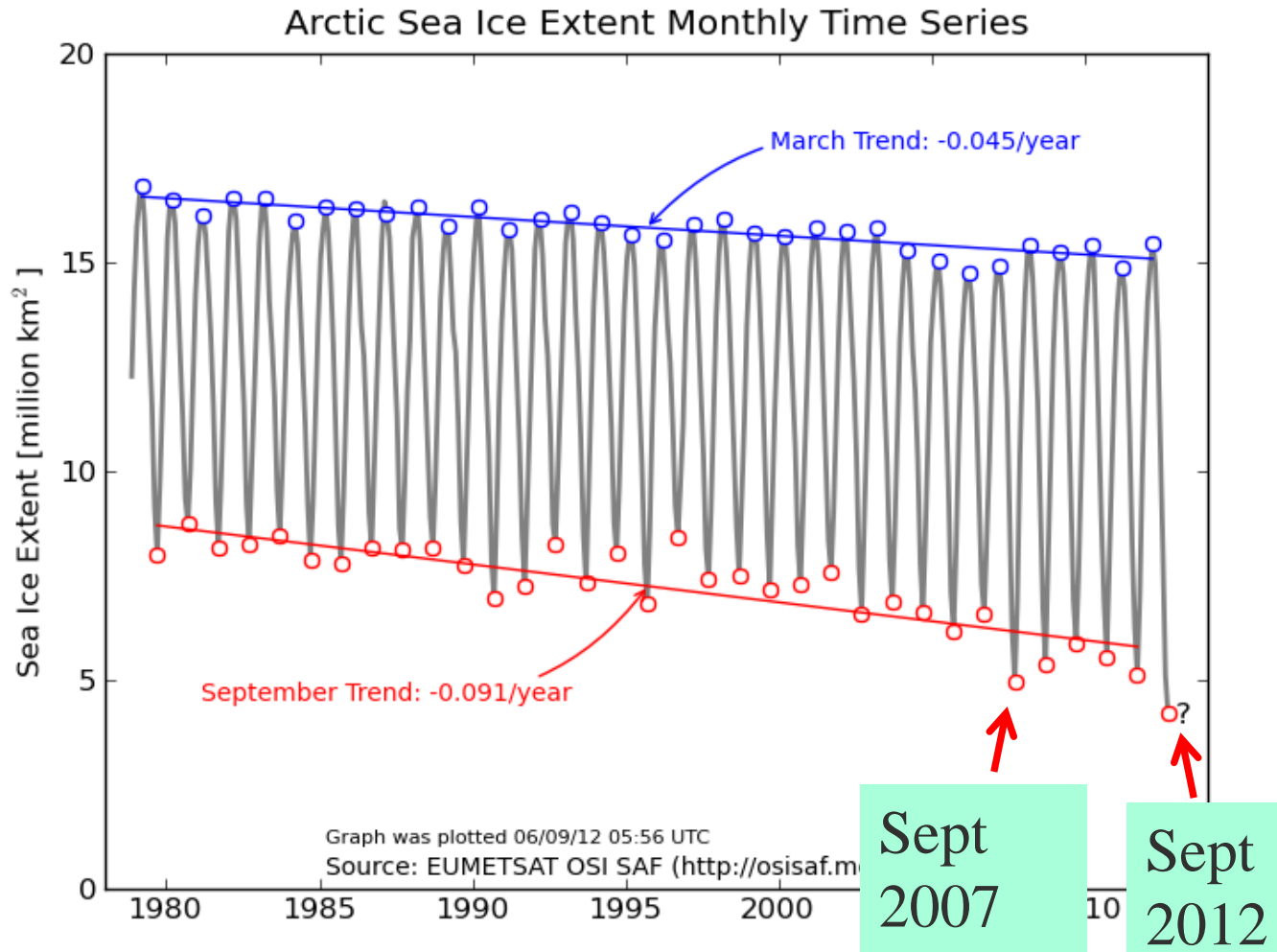


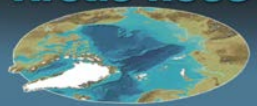
Arctic and Antarctic dataset with uncertainties





Arctic sea ice extent

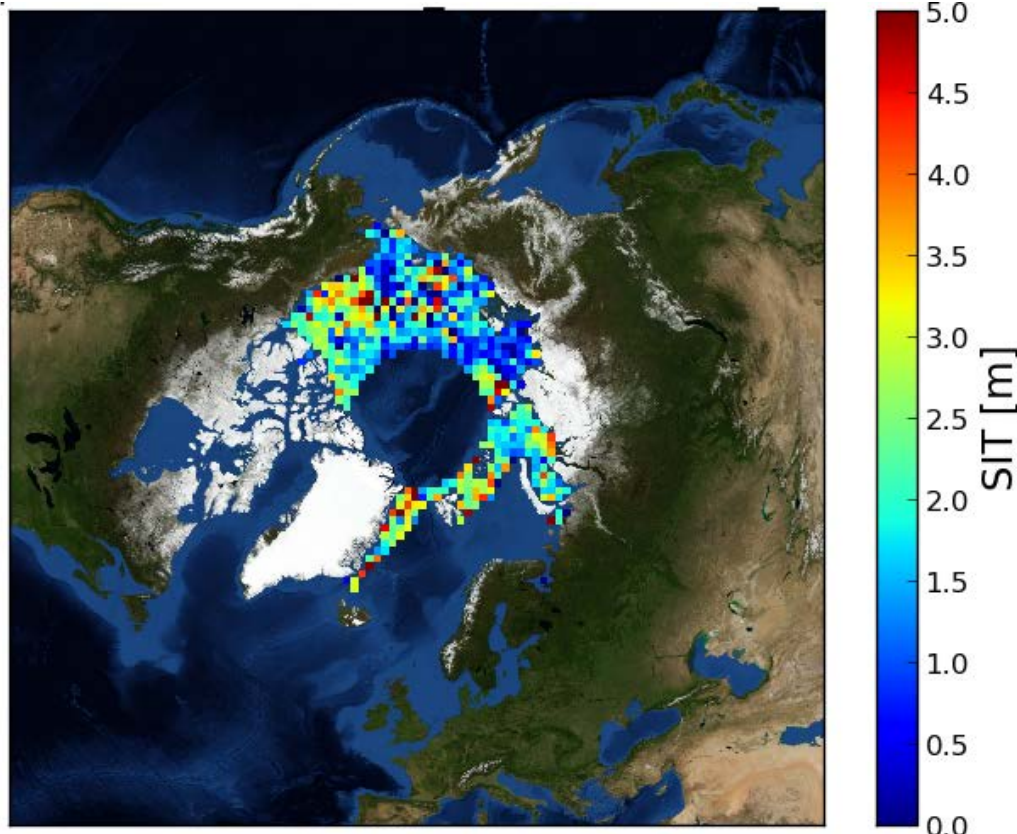




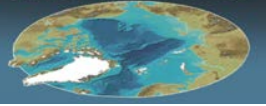
Radar Altimeter Prototype Processor for sea ice thickness

Goal: create monthly sea ice thickness estimates from three different ESA satellite altimeters: ERS-1 RA (1993-1996), ERS-2 RA (1995-2004), ENVISAT RA-2 (2002-2012)

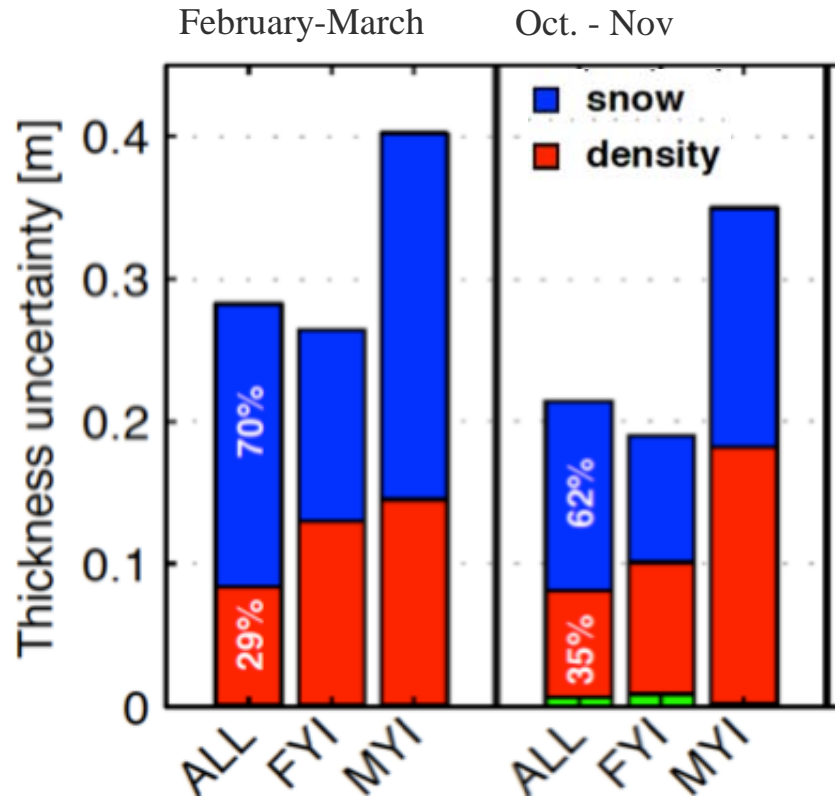
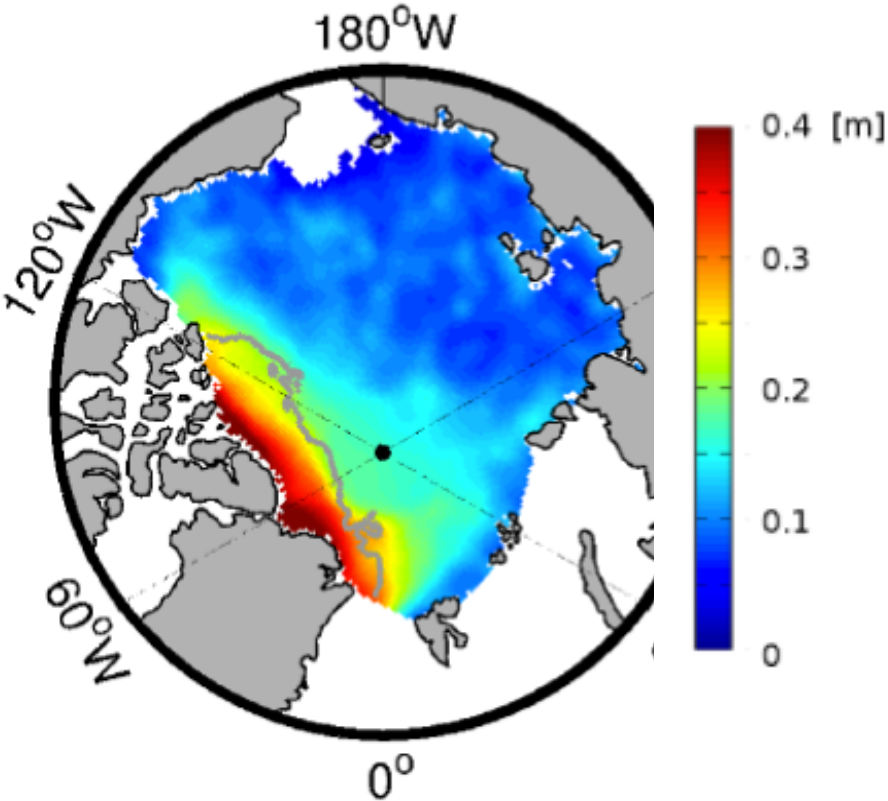
Preliminary results from March 2008



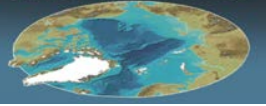
Ref. E. Rinne
FMI



Uncertainty in ice thickness estimation

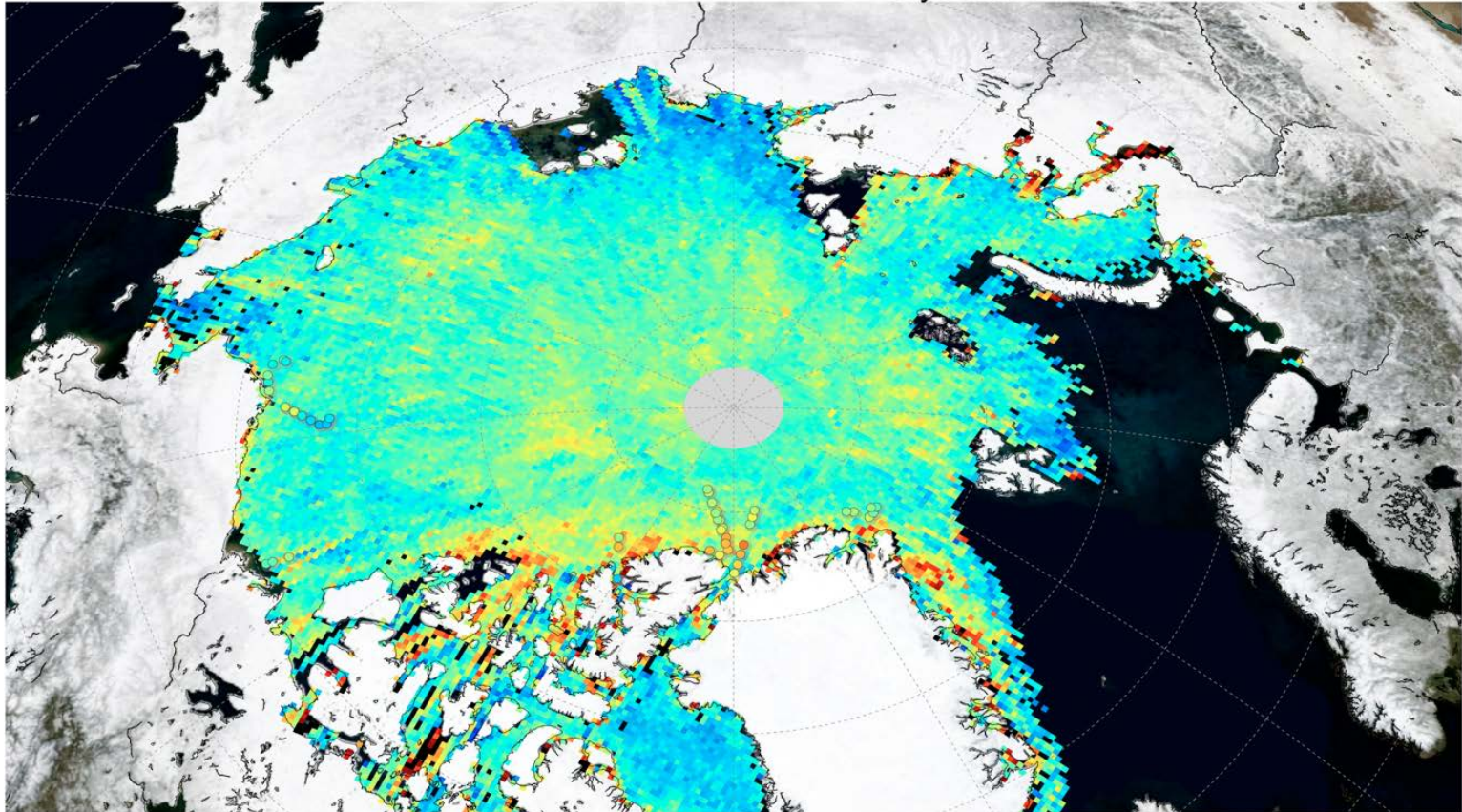


Analysis of IceSat thickness retrieval uncertainty due to ice density and snow cover uncertainty (Zygmuntowska et al. 2014)



Ice thickness from CryoSat from 2010

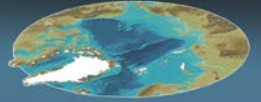
CryoSat-2 - Validation with airborne EM



Total (Ice + Snow) Thickness (m)

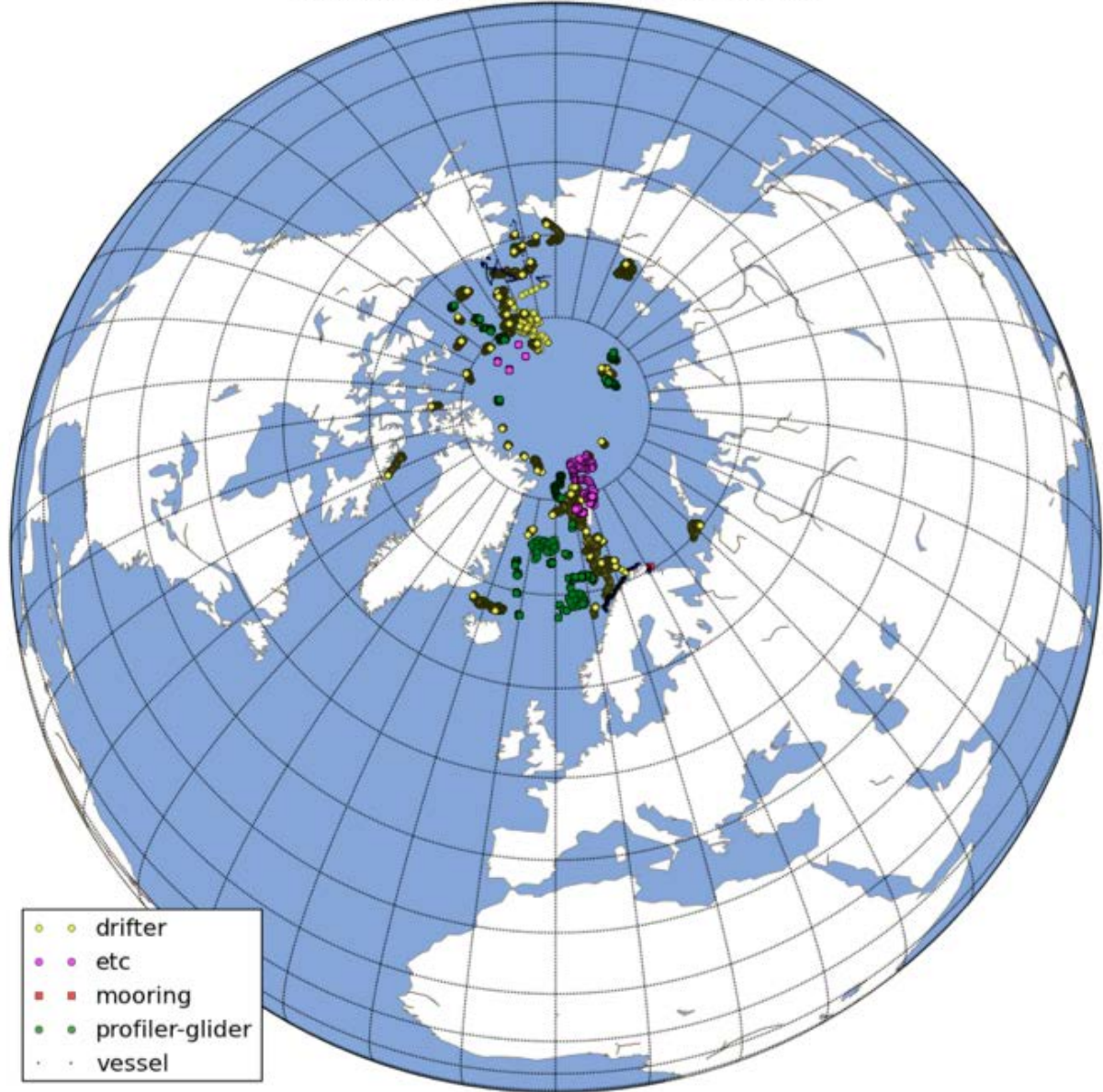
 ALFRED-WEGENER-INSTITUT
HELMHOLTZ-ZENTRUM FÜR POLAR-
UND MEERESFORSCHUNG
S. Hendricks and R. Ricker

Monthly mean estimate for April 2011

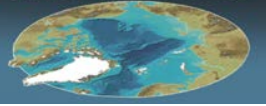


In Situ platforms September 2012

data MyOcean inventory 201209 Arctic area

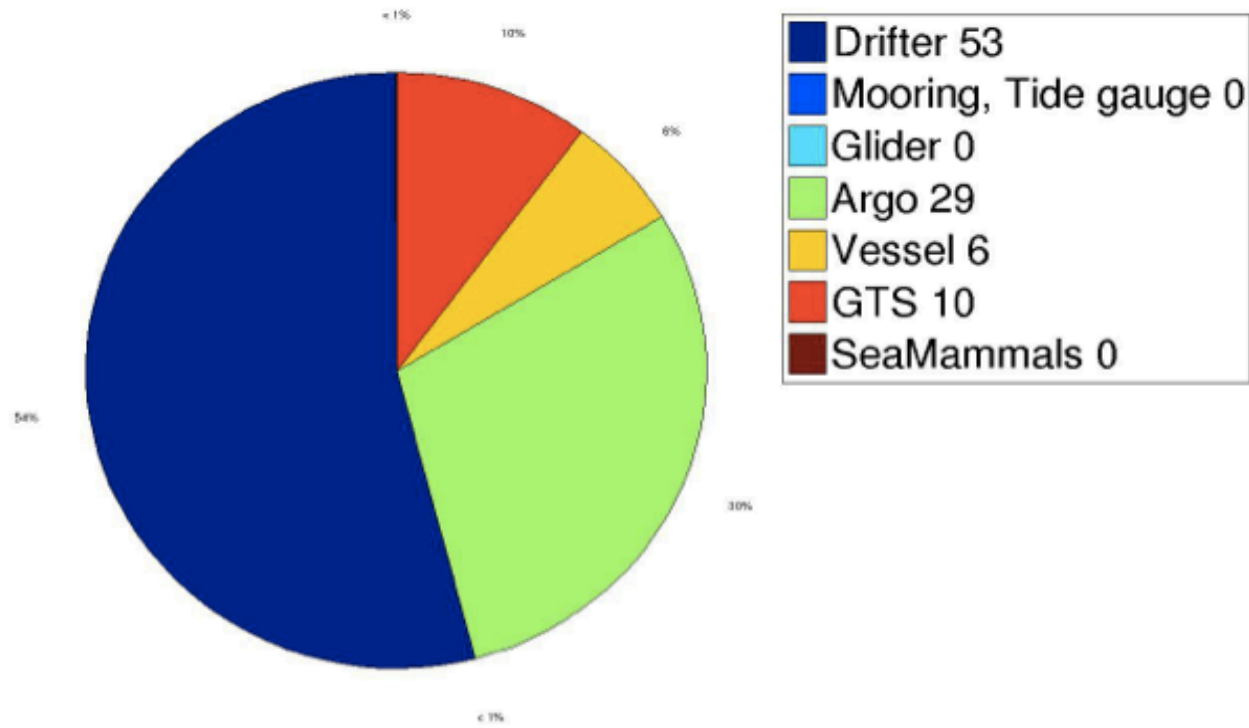


- drifter
- etc
- mooring
- profiler-glider
- vessel



Platforms providing data to In Situ TAC

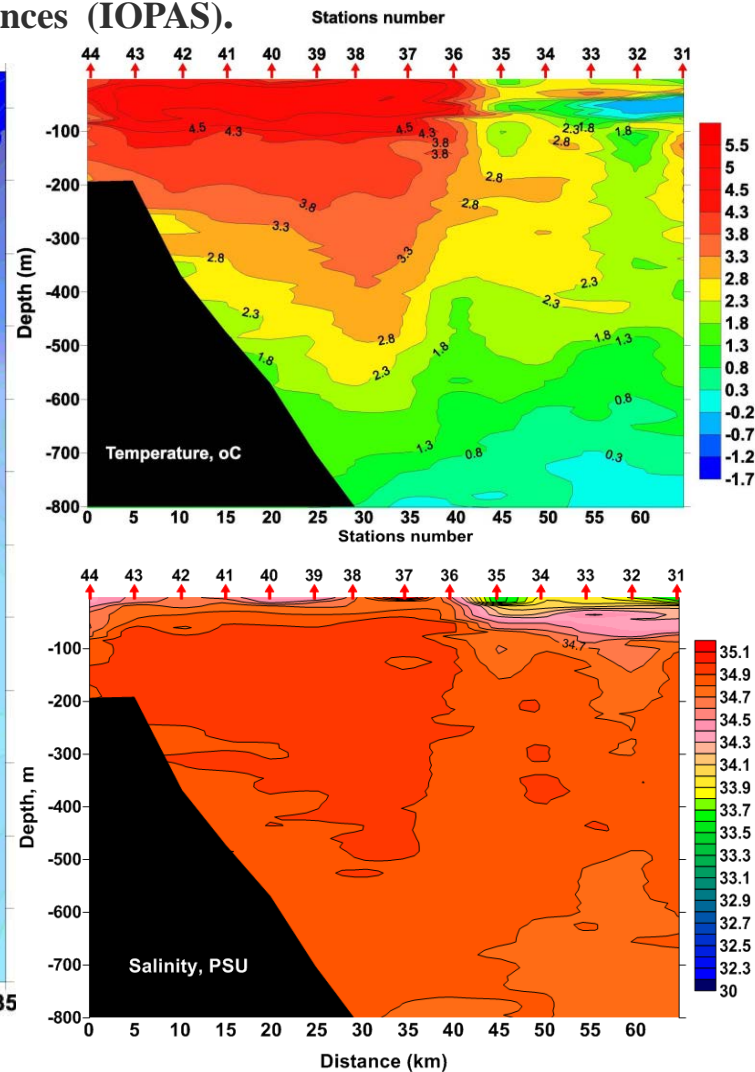
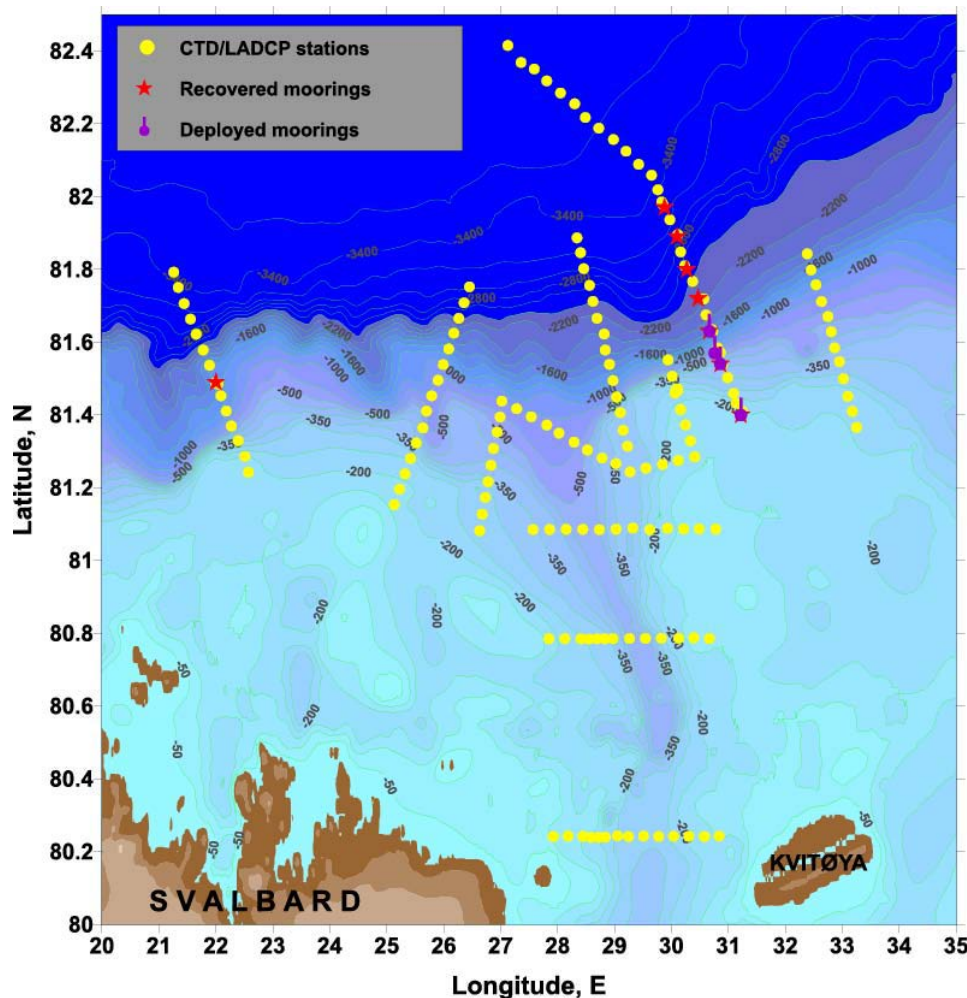
(Status for Arctic region before summer 2012)



Arctic

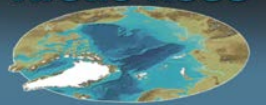
Moorings and sections north of Svalbard

New time series covering the Arctic Waters Mooring line and regional cruises 2012-2013 as cooperation between the Fram Centre, Woods Hole Oceanographic Institution (WHOI) and Institute of Oceanology of the Polish Academy of Sciences (IOPAS).



Map of cruise region N of Svalbard
Sep. 2013 and mooring line location.

Temperature and salinity sections across
slope north of Svalbard ($\sim 22^\circ$ E) from Sep 2013.



Plans for 2014

- Consolidation and improvement of Arctic Marine Forecasting system
- Including more in situ data from partners who are not yet providing data (ships, ice buoys, etc.) – support from EMODnet Physics
- Prepare and submit proposals to Horizon 2020
- New satellite products for sea ice (CryoSat, SMOS, etc.)
- ESA CCI programme: start of Phase 2
- New members interested to sign MoU: UNIS, FOO, BAS
- Arctic ROOS website: data dissemination, data portals
- Annual meeting in November 2014