

The Arctic 4km model and particle tracking.

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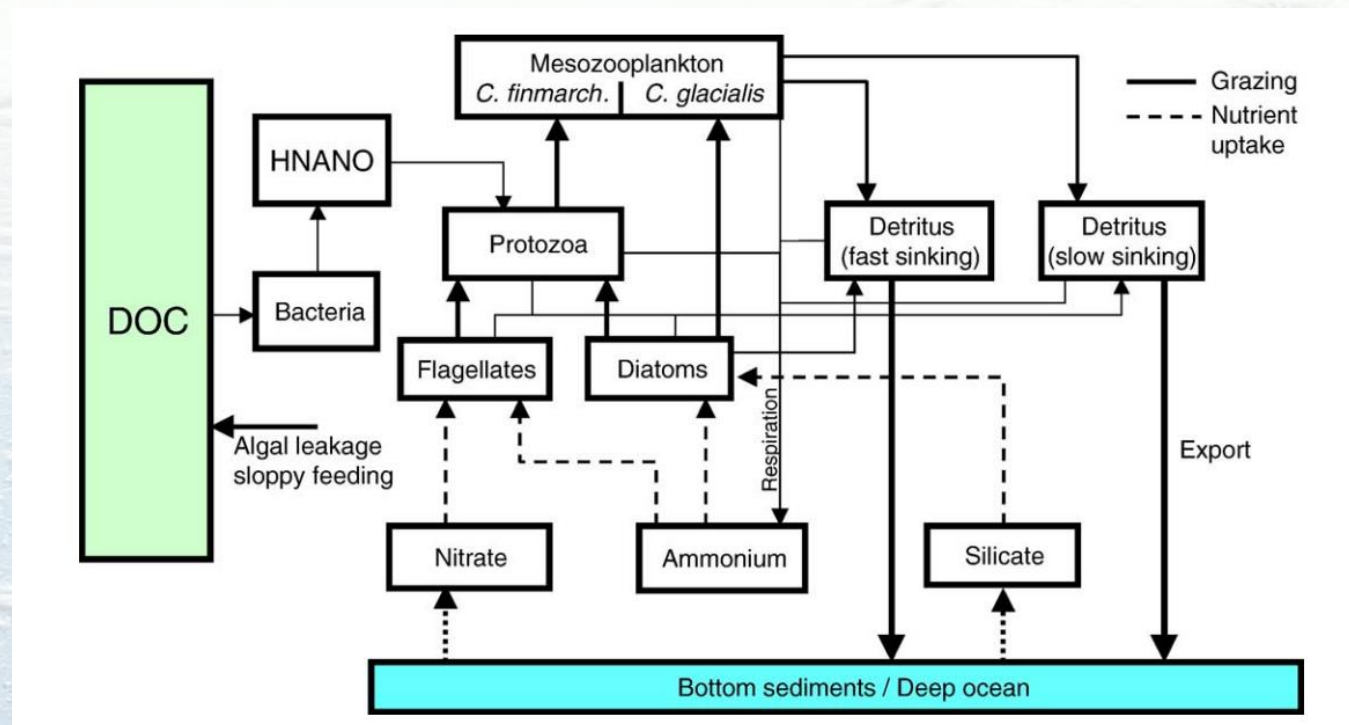
The A4 ocean model

- A ROMS(Reginal Ocean Modelling System) model
- Coupled with the most recent state-of-the-art sea ice model, namely CICE.
- Currently under development to include interaction with the well-stablished SINMOD lower-trophic-level ecosystem module



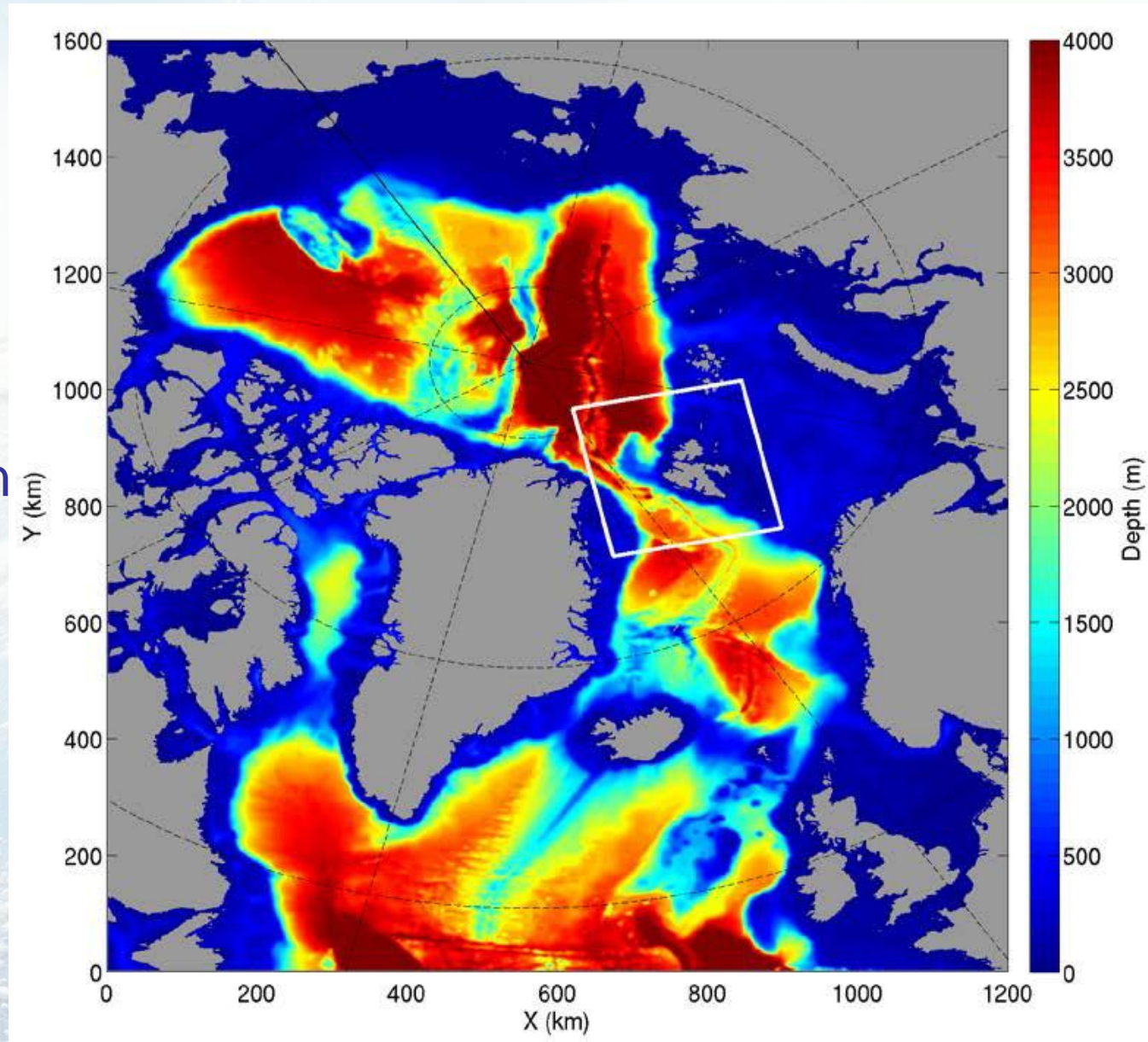
SINMOD ecology model

- SINMOD er en koblet fysisk og biologisk modell
- Simulates biological components “without free will”

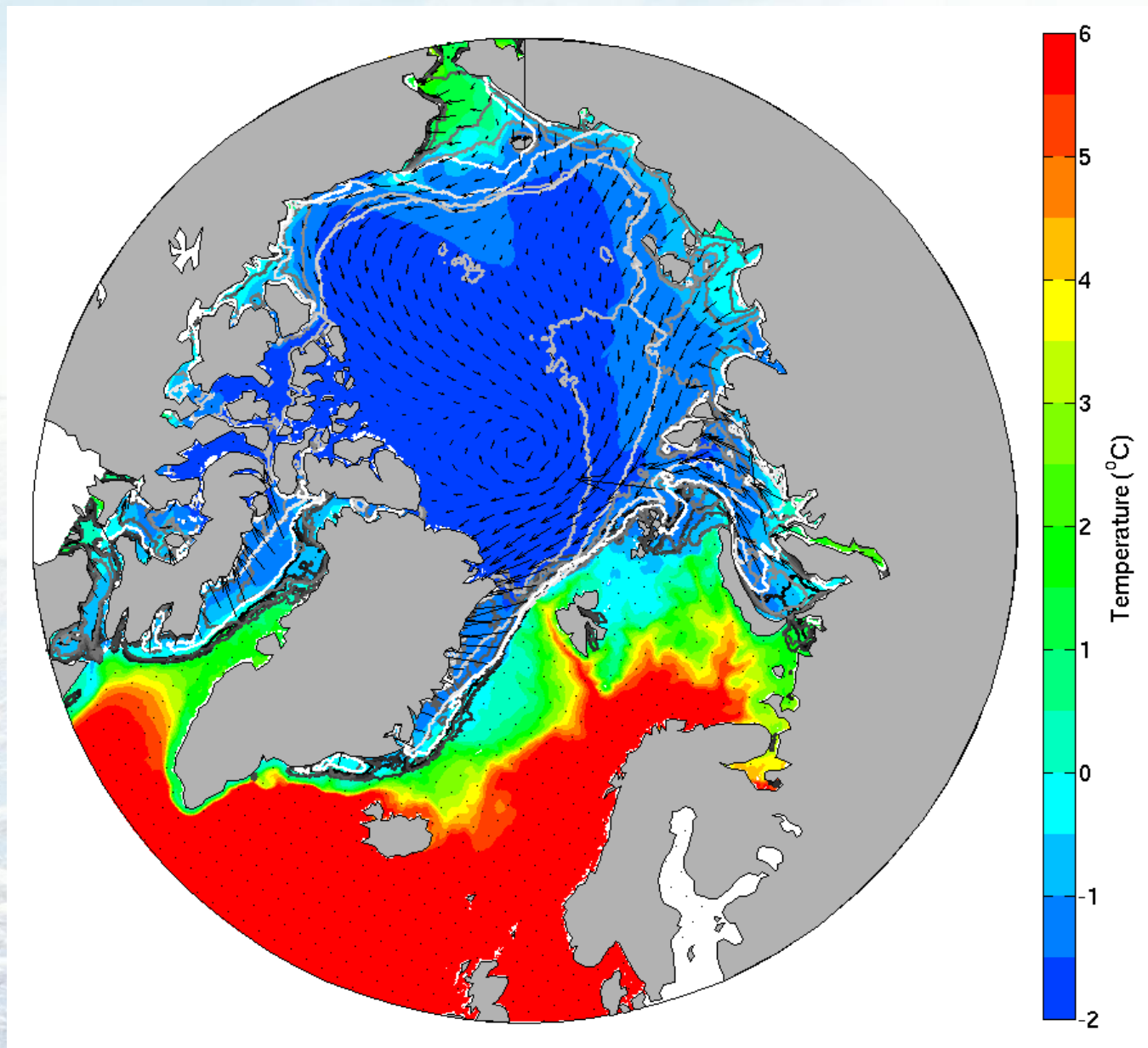


Wassmann, Slagstad, Wexels Riser & Reigstad (2006): Modelling the ecosystem dynamics of the Barents Sea including the marginal ice zone II. Carbon flux and interannual variability. *Journal of Marine Systems* 59 p. 1-24

- The overall resolution is 4x4km
 - This allows the study of mesoscale eddies on large scale circulation
 - Are essential for shaping exchange and transformation of water masses, primary production and zooplankton population
- 800x800m resolution around Svalbard including the Fram Strait (see white box)

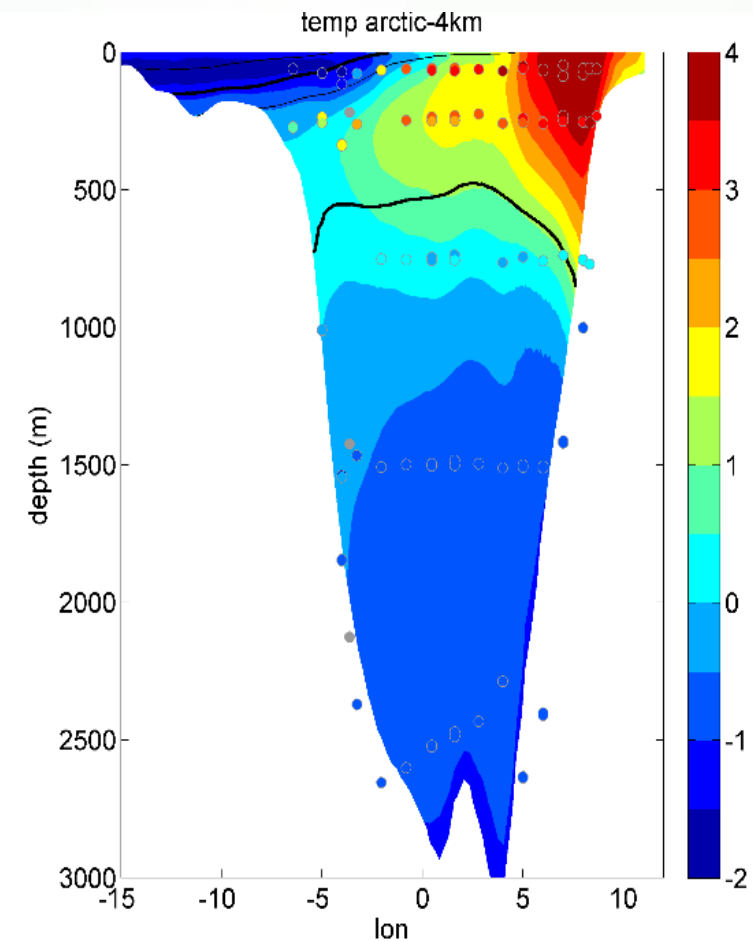
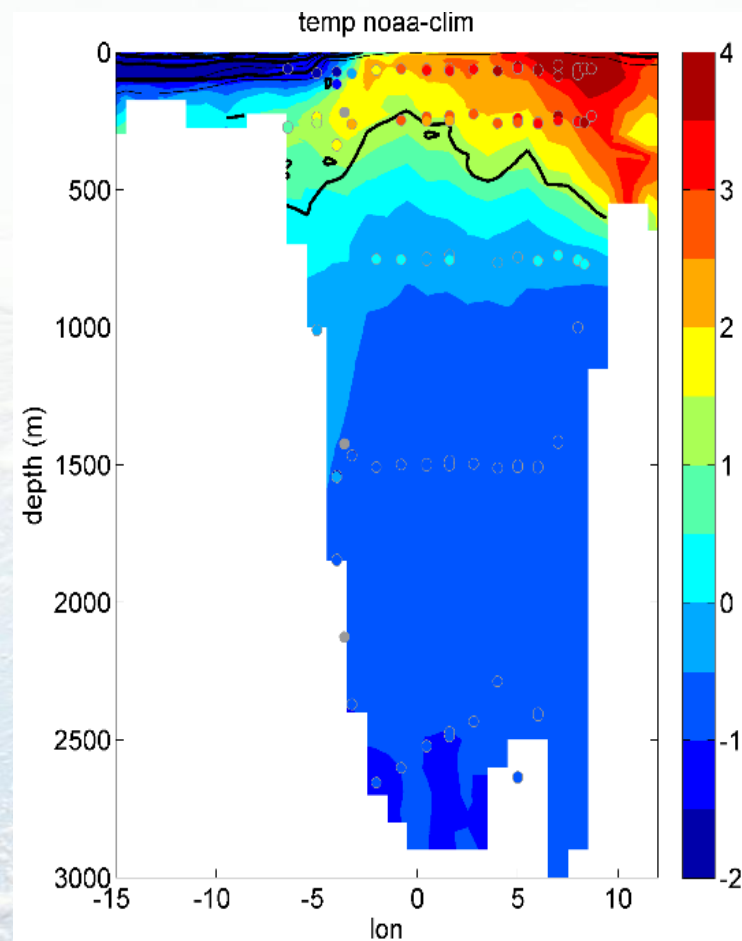


- Currents
- Temperature
- Salinity
- Ice
- Simulation period is 1993-2010
- Forcing data is the ECMWF ERA-interim atmospheric forcing



Model performance

- Interpolated temperature cross section at the Fram Strait
- Promising similarity
- Further validation in progress



Tracmass: Tracking of water masses and transport

- A efficient Lagrangian trajectory model, allowing to effectly convert lagrangian drifter densities to Eulerian tracer concentration to study long term eddy transports
- Runs on the output data of the ocean model.
- Can run both forward and backwards in time
- Emissions can be set at any depth
- The simulated emission can be given certain properties:
 - Can be locked at a prescribed depth
 - Also possible to set a density to mimic certain organisms

Previous application of tracmass

- Simulating salmon lice and virus spreading along the coast of Troms
- Simulated emission from all registered fish-farms in Troms
- Incorporated in an online interactive map, www.stroms.no and www.kart.akvaplan.niva.os together with current and wave data

Tracmass: What we have used it for so far

- Simulate spread of particles given properties similar to that of Salmon lice, ILA (virus)
- Tracking of water masses entering a national laksefjord
- Tracking water masses for a given location back in time, to figure out why this area was so ideal for kelp farming

Summary

- Two models
- High resolution arctic ocean model combined with an efficient particle tracking model
- With good field data about fauna behavior and tendencies, different scenarios can be simulated to provide a better understanding of the movement of fauna in the arctic.

Thank you 😊