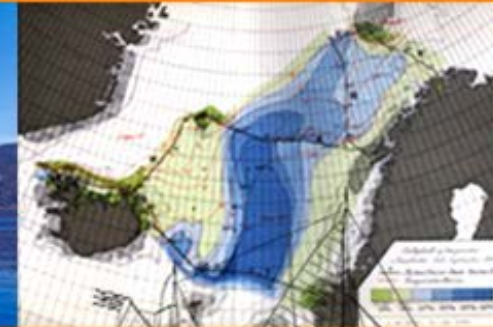
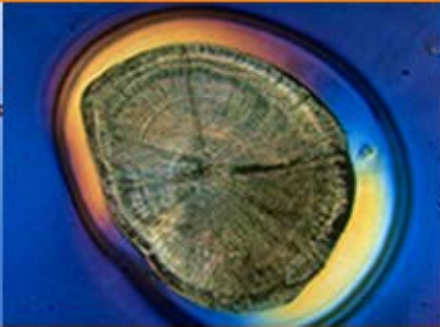




# INSTITUTE OF MARINE RESEARCH



## Validation of the NORWECOM hindcast

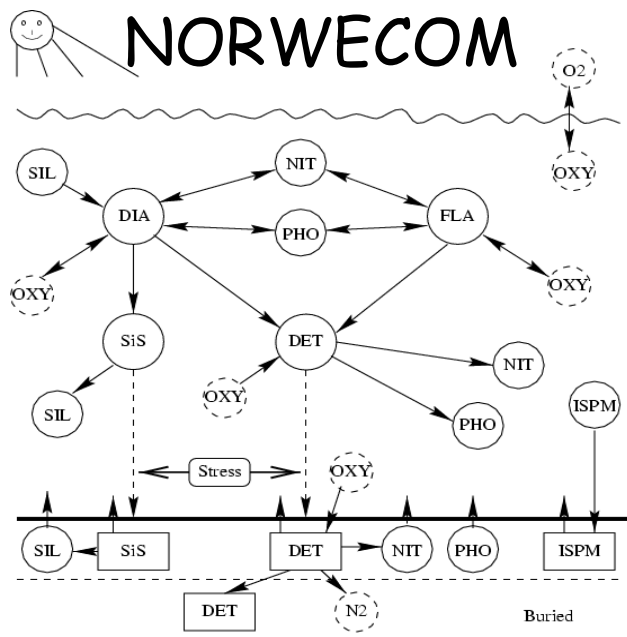
**Morten D. Skogen**

MyOcean WP7, Oslo, Febr-2011

# NORWECOM

- first coupled physical-chemical-biological model for the whole North Sea
- North Sea, North Atlantic, Benguela, Hardangerfjorden
- physics based on POM or ROMS.
- offline version available
- runs operational (7 days forecast) at met.no  
<http://moncoze.met.no>
- environmental status, eutrophication issues, what-if scenarios, climate/fish relations, paleo, .....

- 2 types of phytoplankton (diatoms, flagellates)
- 3 nutrients (N, P, Si)
- Dead org. matter (3 types)
- Oxygen
- meso and micro zoopl. **NEW**
- (IBM *Calanus finm.* + fish migration) **NEW**

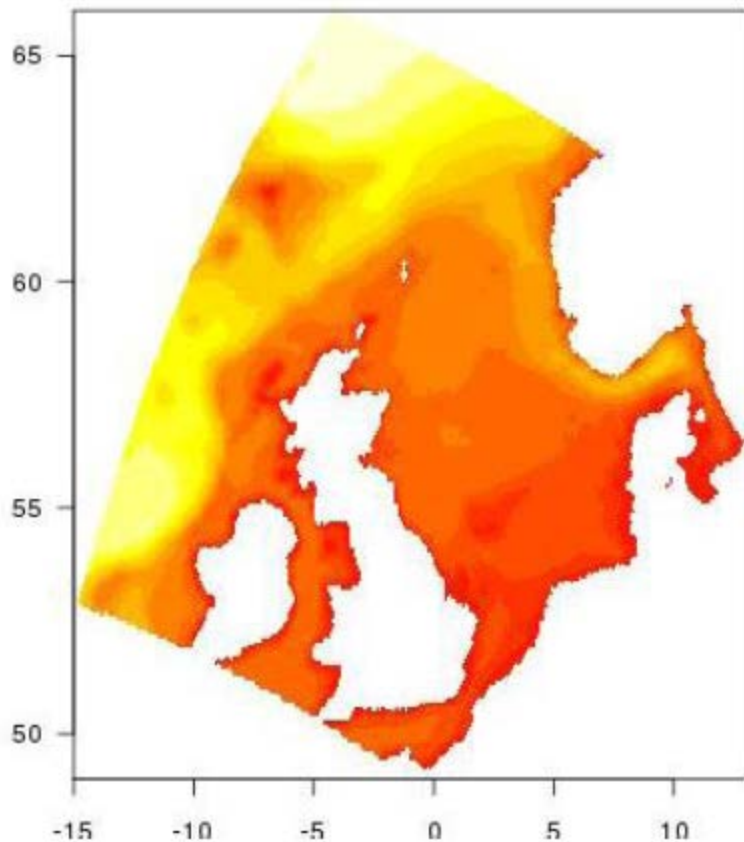


- Primary production
- Respiration
- Algae death
- Regeneration
- Self shading
- Turbidity
- Sedimentation
- Resuspension
- Denitrification

- ECMWF:
  - Wind and Pressure
  - SeaSurfaceRadiation
  - Surface heat flux
  - Precipitation
  - Evaporation
- Tides (M2, S2, K1, O1)
- Freshwater (rivers)
- River nutrients
- Atmospheric N
- Waves (WINCH)
- Offline (U,V,S,T,ETA,SSR,wind)



## Database to MyO (1985-2008):



- Period: 1985-2008
- NORWECOM with updated biology with micro- and meso-zooplankton module from ECOHAM4

<http://talos.nodc.no:8080/opensap/norwecom/>  
(0.1 x 0.1 degree long/latt)



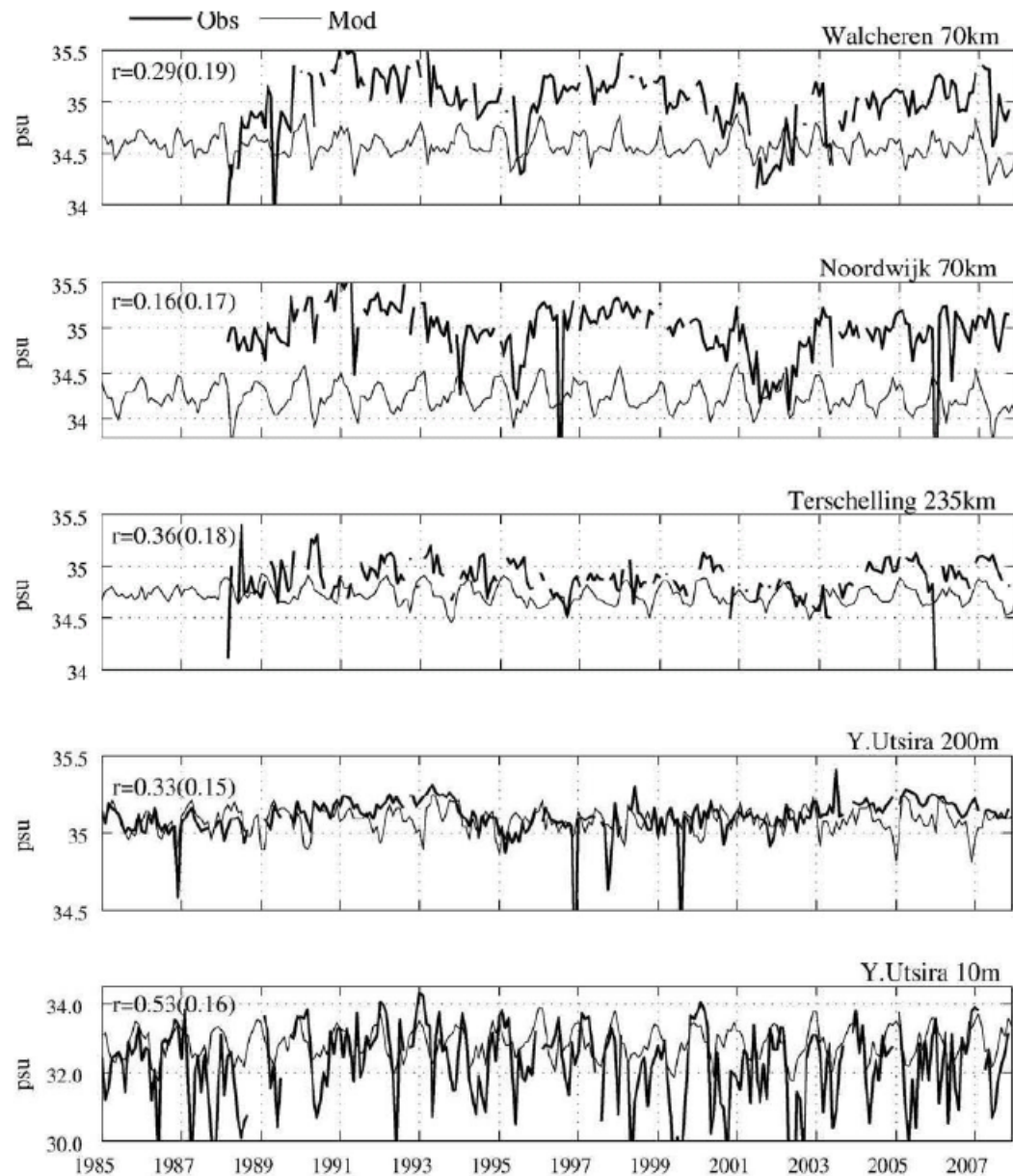


Figure 1. Monthly observed vs. modeled salinity at 3 surface stations in the southwestern North Sea and salinity at 10 and 200m at Ytre Utsira at western Norway. Observations at the southwestern stations were obtained from Ministerie van Verkeer en Waterstaat ([www.waterbase.nl](http://www.waterbase.nl)), and Ytre Utsira from the Institute of Marine Research, Norway.

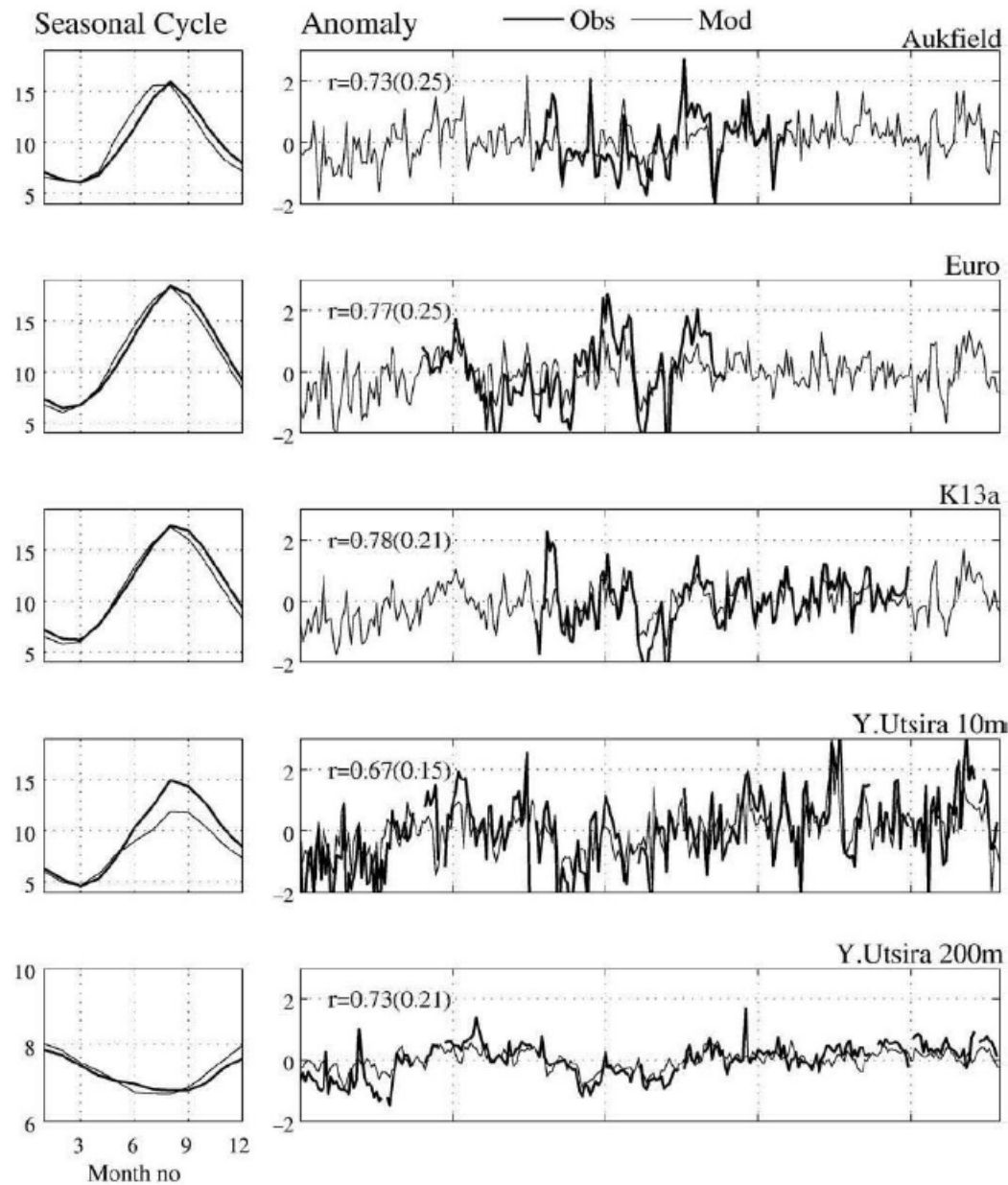


Figure 2. As for figure 1 but for temperature. Left column: mean seasonal cycle. Right column: panel 1–5: Correlation coefficients between observed and modeled time series are denoted by  $r$ , and 1% significance level is denoted in parentheses.

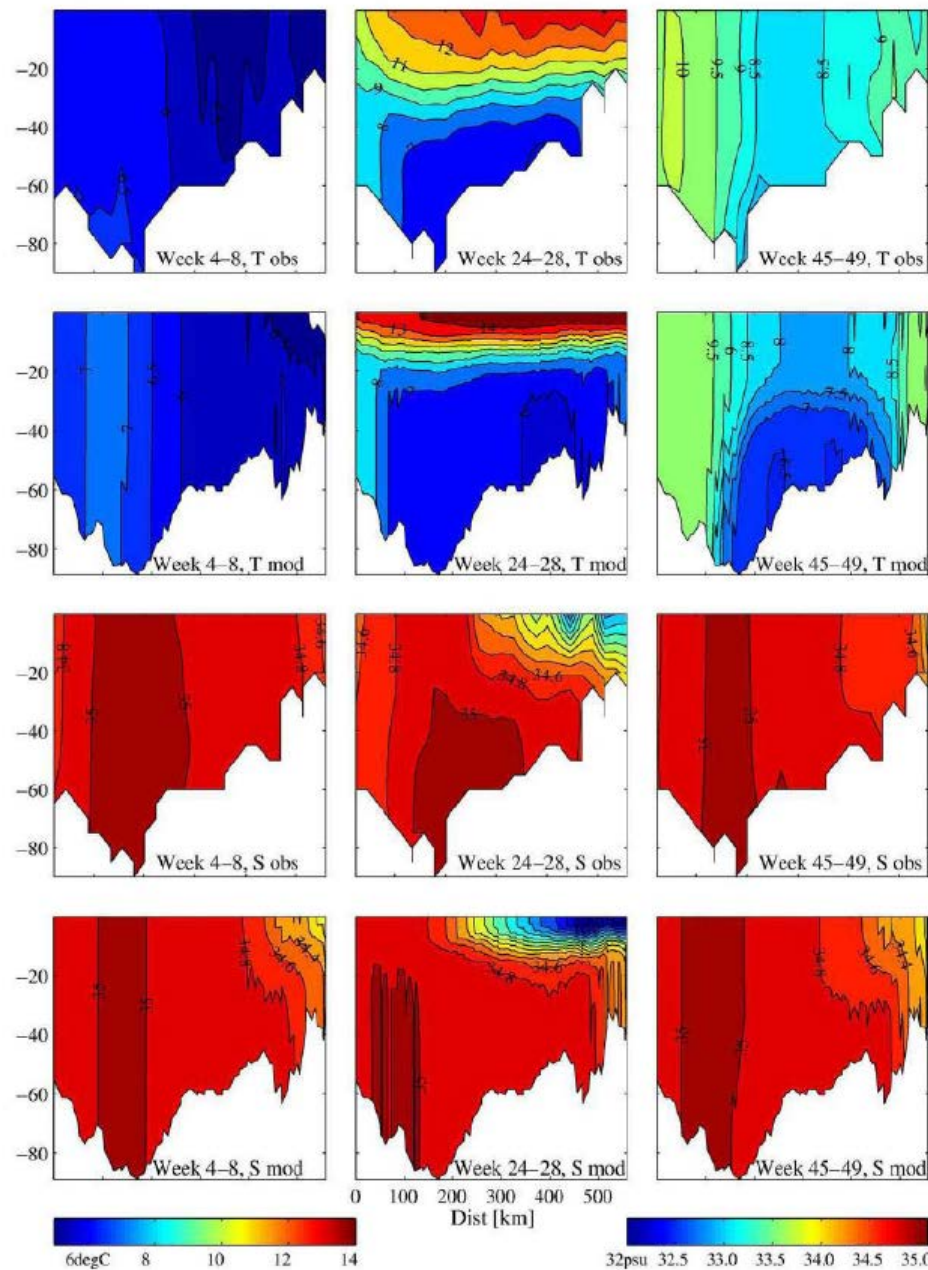


Figure 3. Mean temperature from observations 1980–1999 (first row) and model 1985–1999 (second row) (salinity in row three and four) for the Hanstholm–Aberdeen Section for winter (week 4–8), summer (week 24–28) and autumn (week 45–49). Observations were taken from Kangas et al. (2006). Horizontal axis is the number of kms from the western end of section.

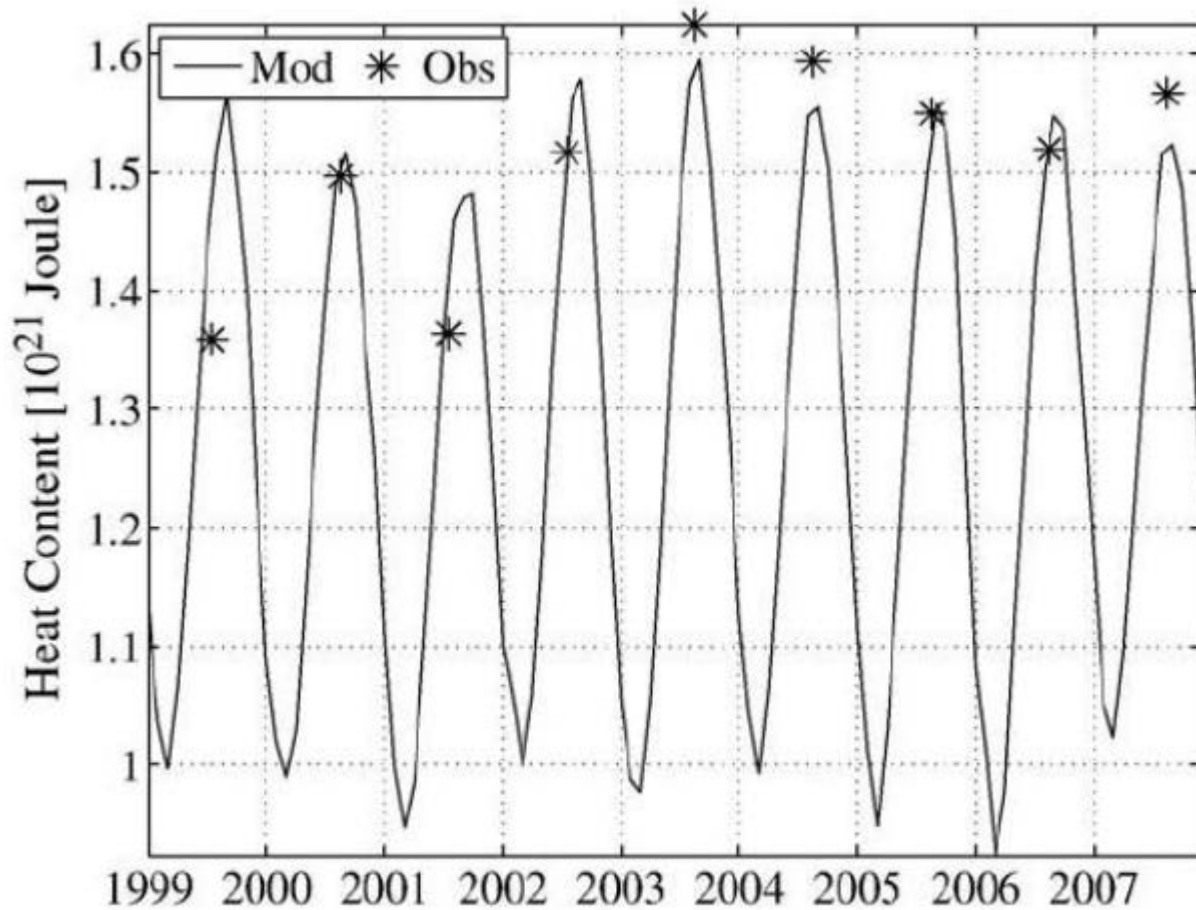


Figure 4. Heat content as estimated from observations (stars) and model (line). Observed heat content estimates are from Gauss cruise observations with vertical CTD profiles and towed CTD systems during 2–3 weeks in July (1999, 2001, 2002) or August (2000, 2003–2007). Replotted from Klein et al. (2007), updated by Alexander Frohse, BSH (pers. comm.).



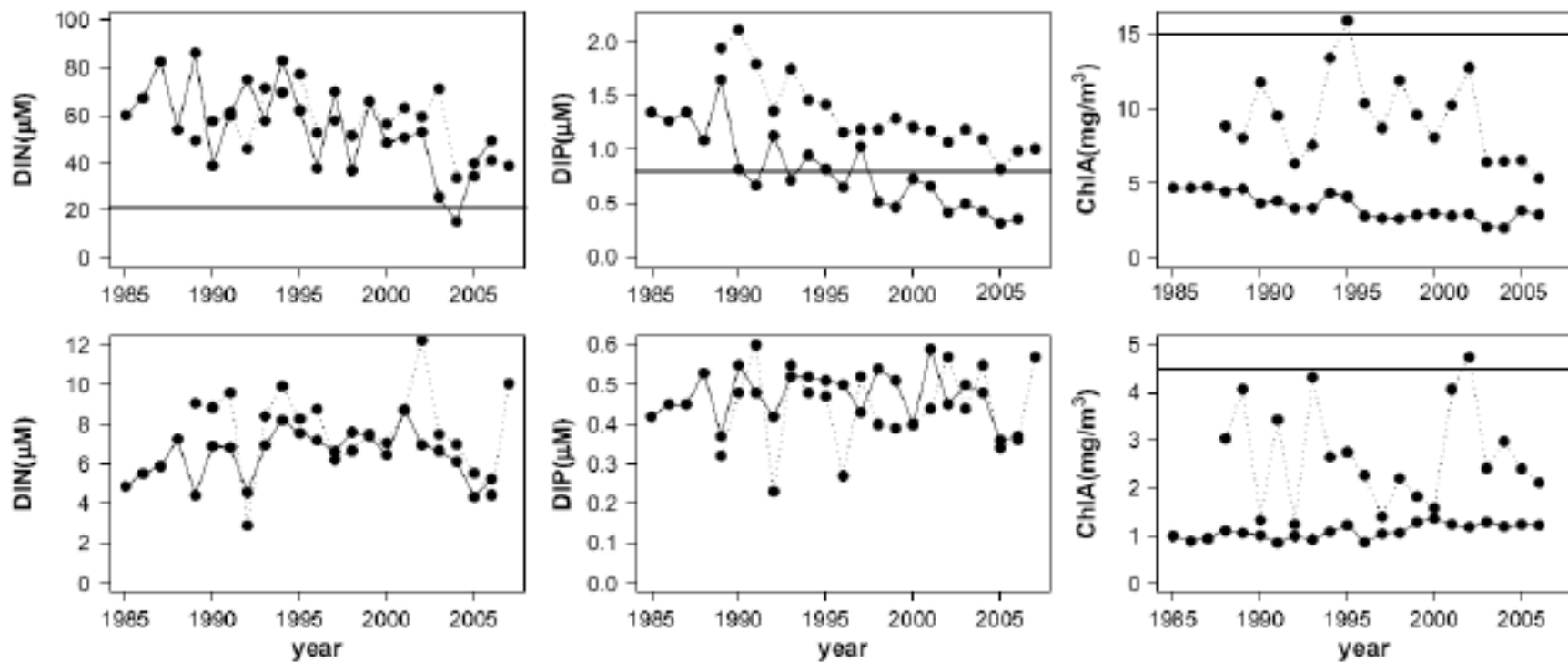


Figure 5. Comparison of winter nutrients and mean growing season chlorophyll at Noordwijk station 10 (coastal water, upper) and 70 (central North Sea water, lower). Model (solid line) and measurements (dotted line). Straight lines are the OSPAR elevated assessment levels.

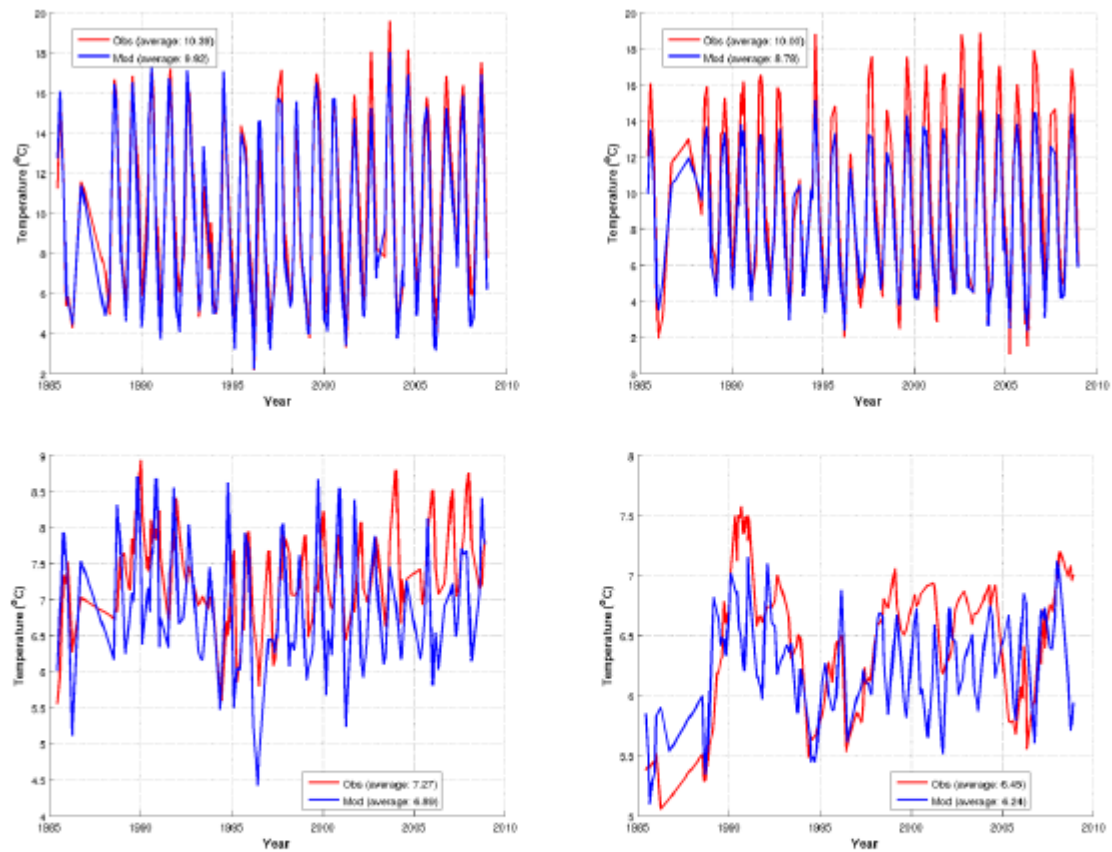


Figure 6. Comparison between modeled and observed temperature in different water masses along the Torungen-Hirtshals transect in Skagerrak. Danish coastal water (upper left), Norwegian coastal water (upper right), Atlantic water (lower left) and bottom water (lower right). Observations from IMR.

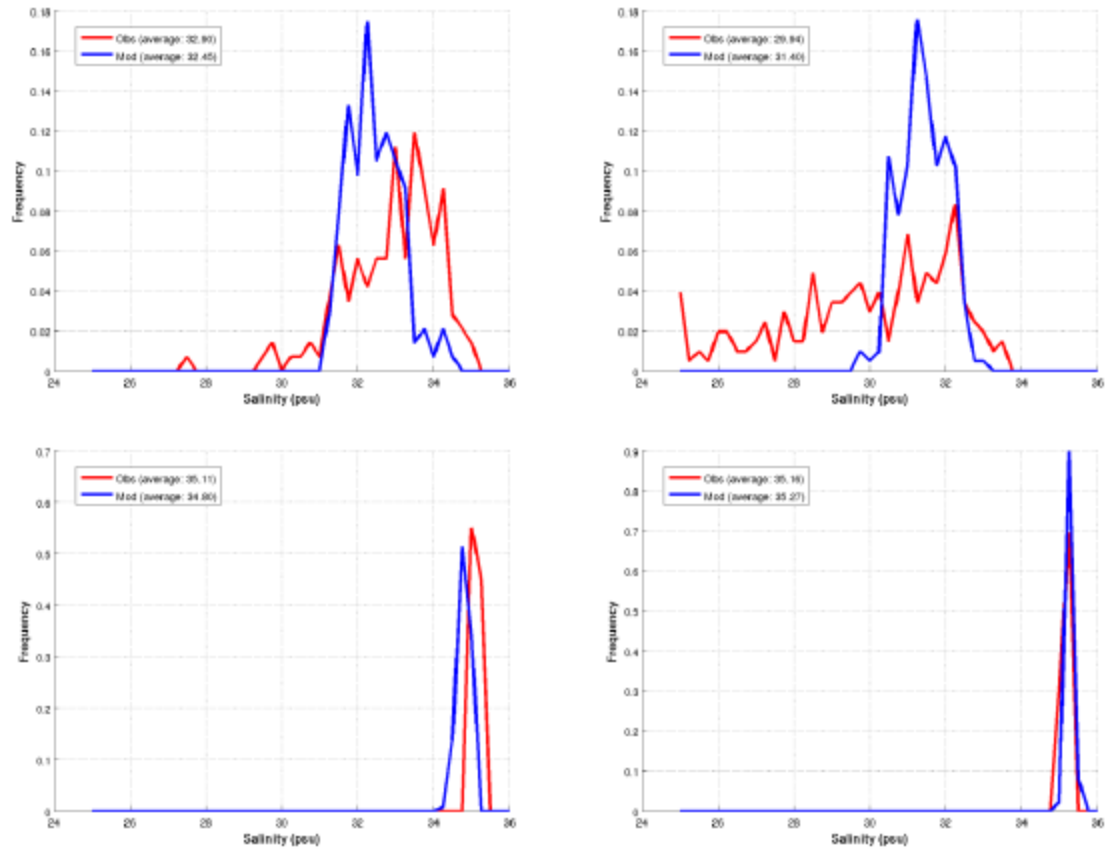


Figure 7. Probability Density Functions of modeled and observed salinity in different water masses along the Torungen-Hirtshals transect in Skagerrak 1985-2009. Danish coastal water (upper left), Norwegian coastal water (upper right), Atlantic water (lower left) and bottom water (lower right). Observations from IMR.

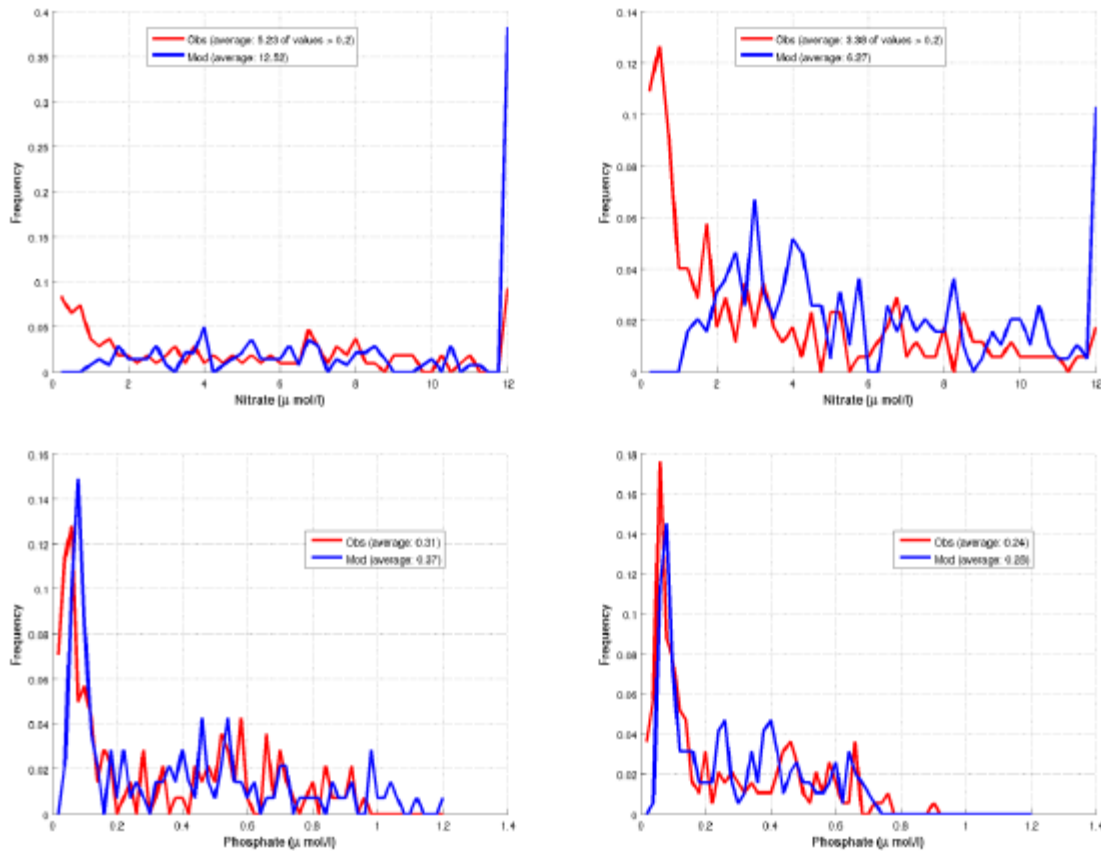


Figure 8. Probability Density Functions of modeled and observed nitrate (upper) and phosphate(lower) in different water masses along the Torungen-Hirtshals transect in Skagerrak 1985-2009. Danish coastal water (left) and Norwegian coastal water (right). Observations from IMR.

THANK YOU FOR YOUR ATTENTION



Bergen seen from Mt. Ulriken

