

3-D spatial and temporal structure of Temperature and Salinity fields in the German Bight: comparisons of numerical results with observations

J. Schulz-Stellenfleth, J. Staneva, S. Grayek, R. Riethmüller, E.V. Stanev

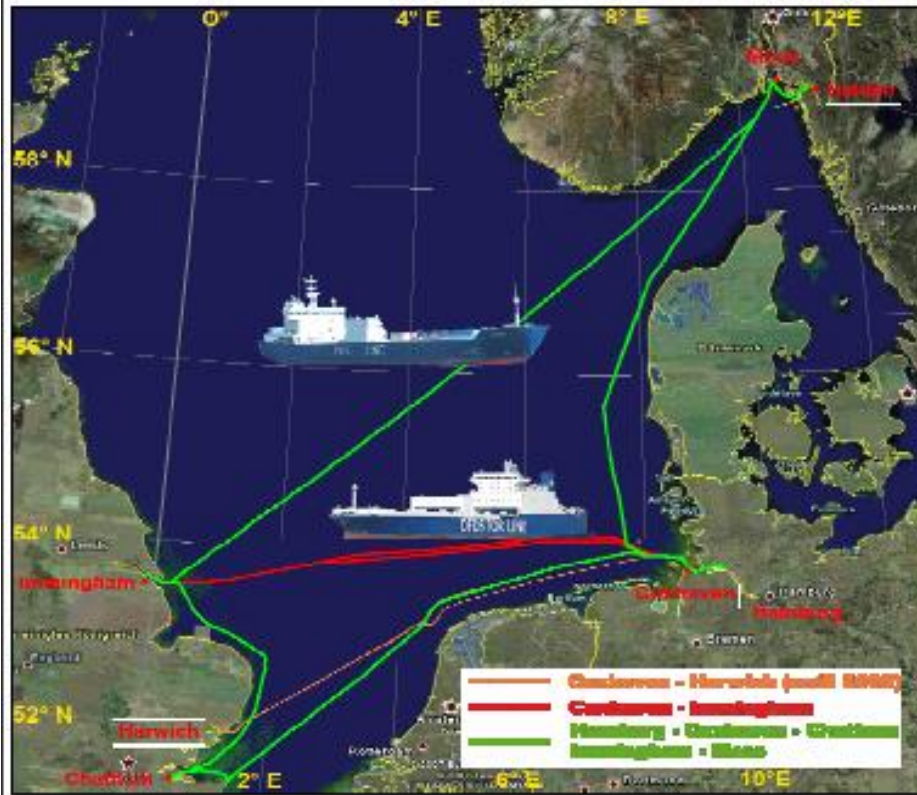
GKSS Research Centre Geesthacht, Germany

- COSYNA Implementation - Moving Systems



North Sea Scale

Regular FerryBox Routes



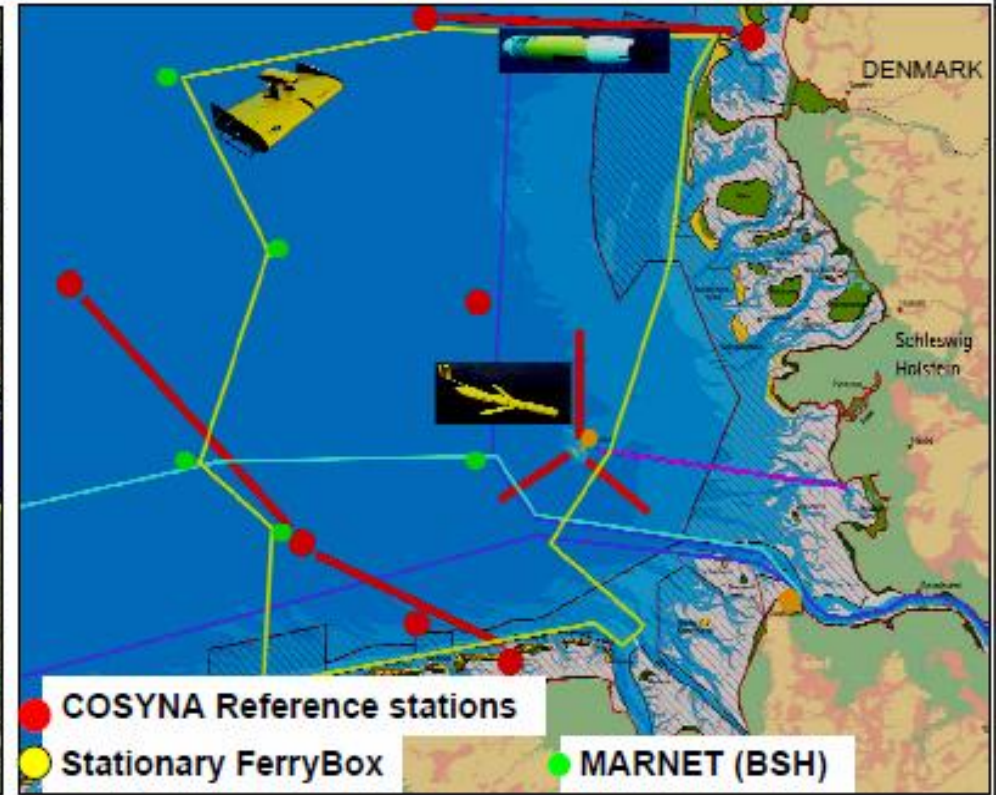
German Bight Scale

Regular transects for fluxes

- at the open boundaries with **AUV**
- inside the bight with **FerryBox**

On demand representativity & internal dynamics

- **Scanfish**
- **Glider**



SCANFISH

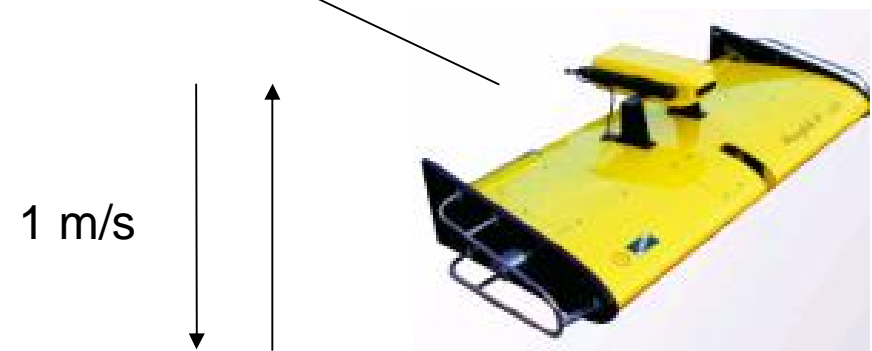


Heincke

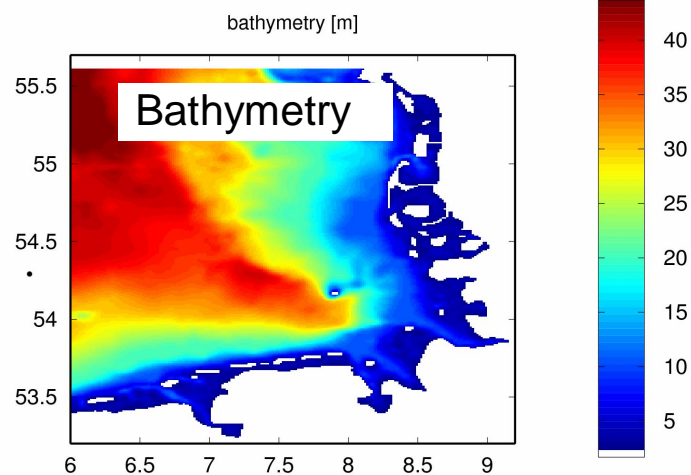
Length: 54 m

← 7 kn

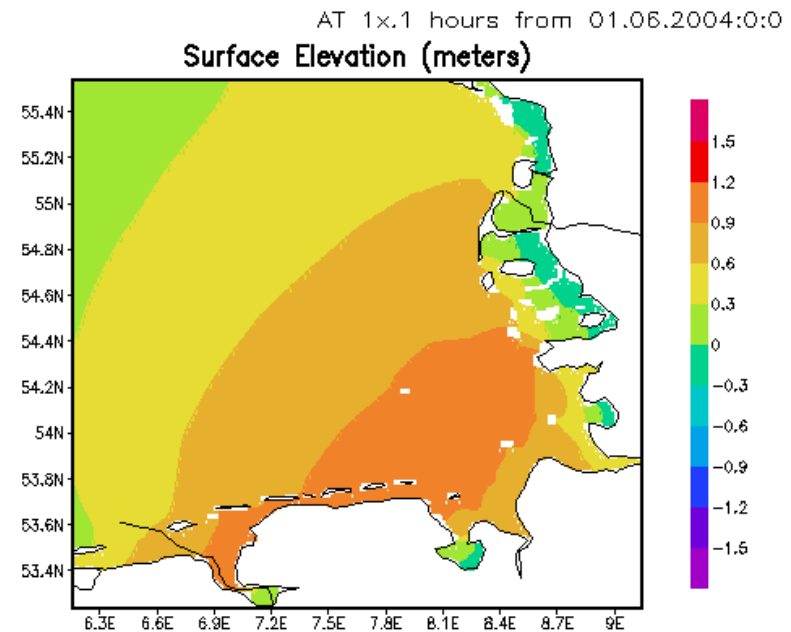
The SCANFISH is towed behind the ship. It is connected by an electrical cable and is fitted with sensors for temperature, conductivity, turbidity and chlorophyll-a-fluorescence.



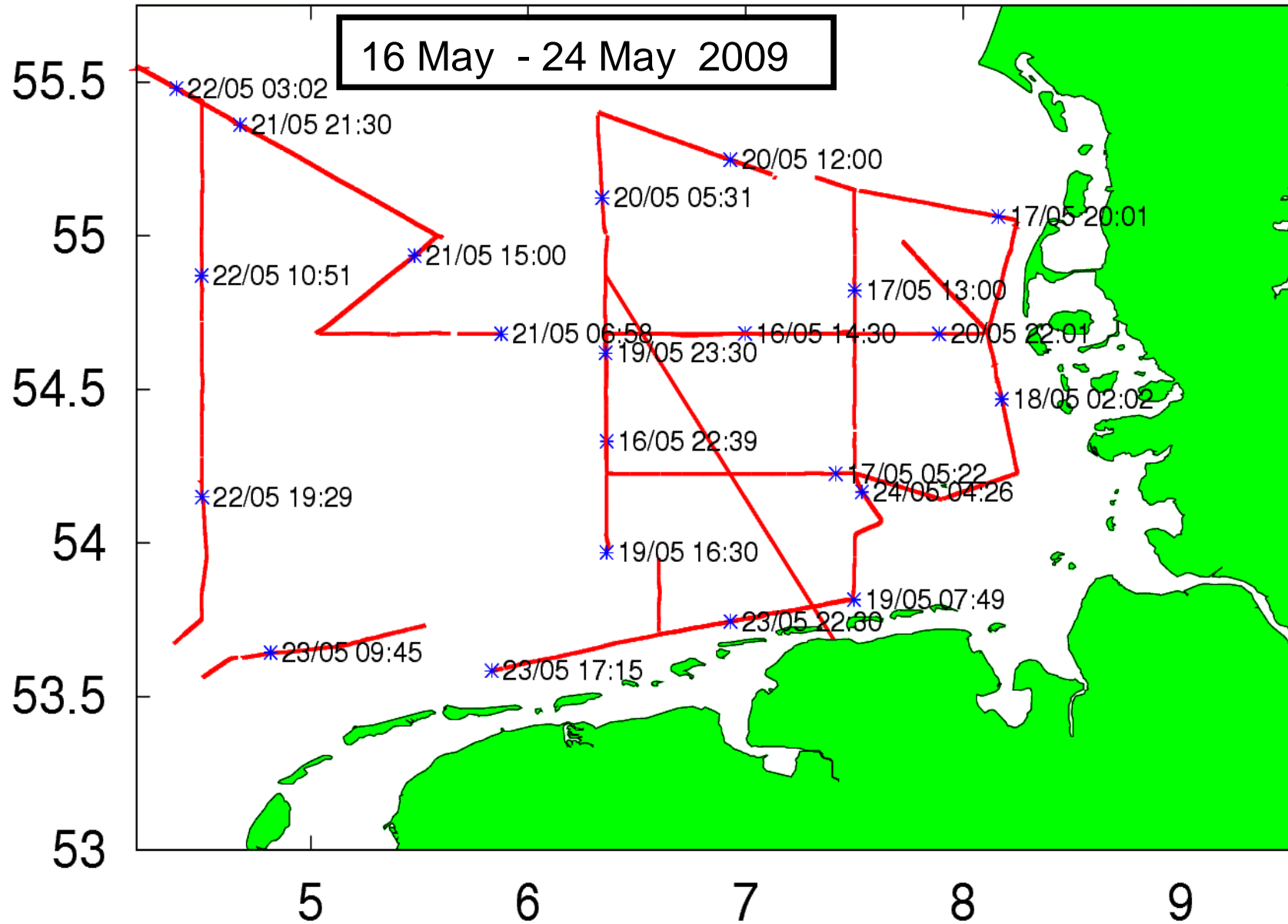
GETM German Bight setup



- 3D primitive equation model
- 1 km resolution
- 21 vertical layers
- DWD meteo forcing
- River input
- Boundary values are provided by a coarser 6 NM North Sea/Baltic model



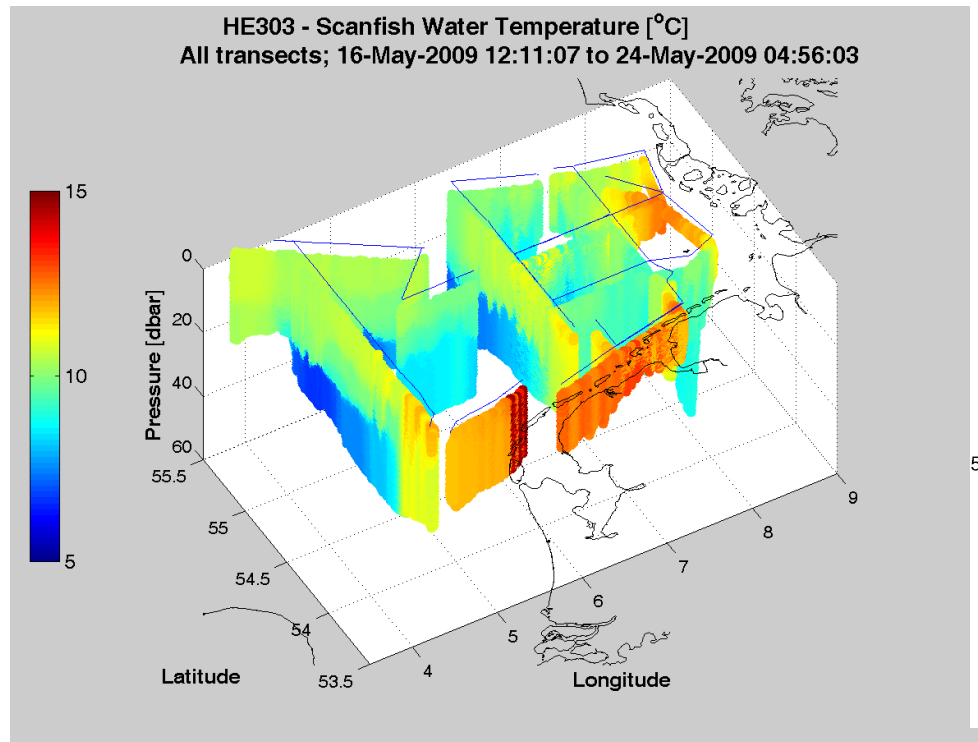
Heincke 303



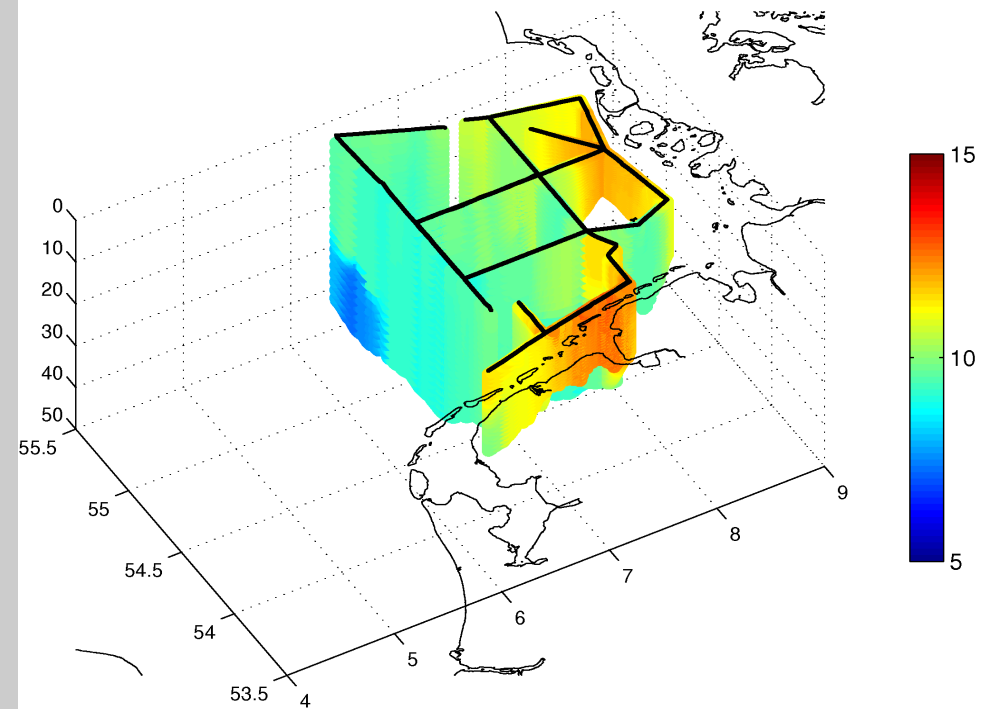
First Comparisons of SCANFISH with numerical model

Heincke 303 campaign

SCANFISH temperature



GETM temperature



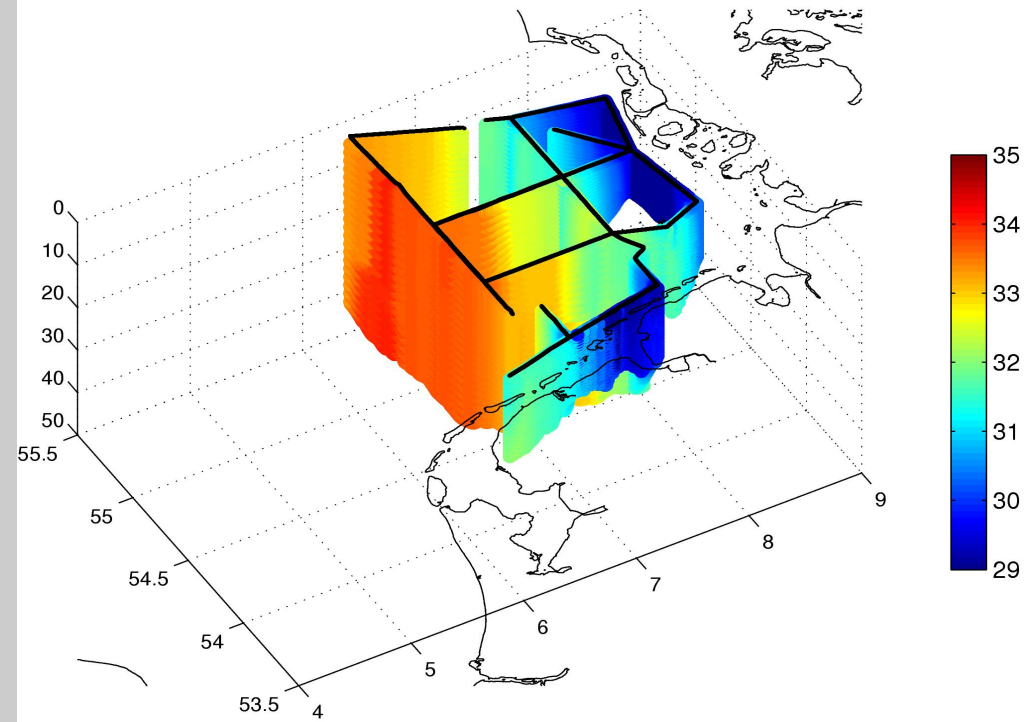
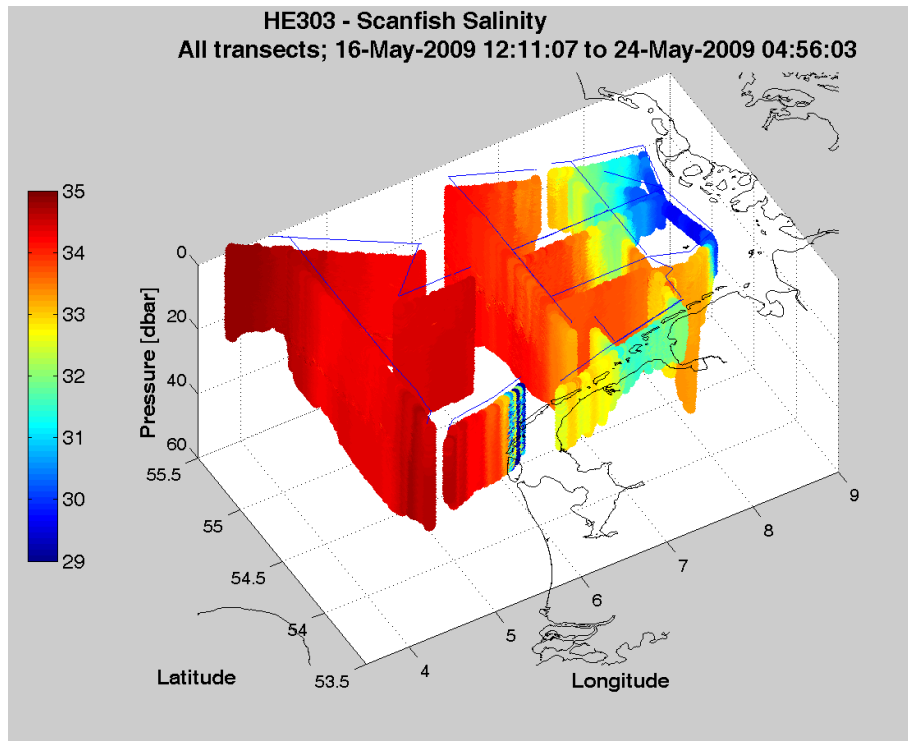
Nearest neighbour co-location with hourly GETM output. Model has 21 sigma layers and 1 km horizontal resolution.

First Comparisons of SCANFISH with numerical model

Heincke 303 campaign

SCANFISH salinity

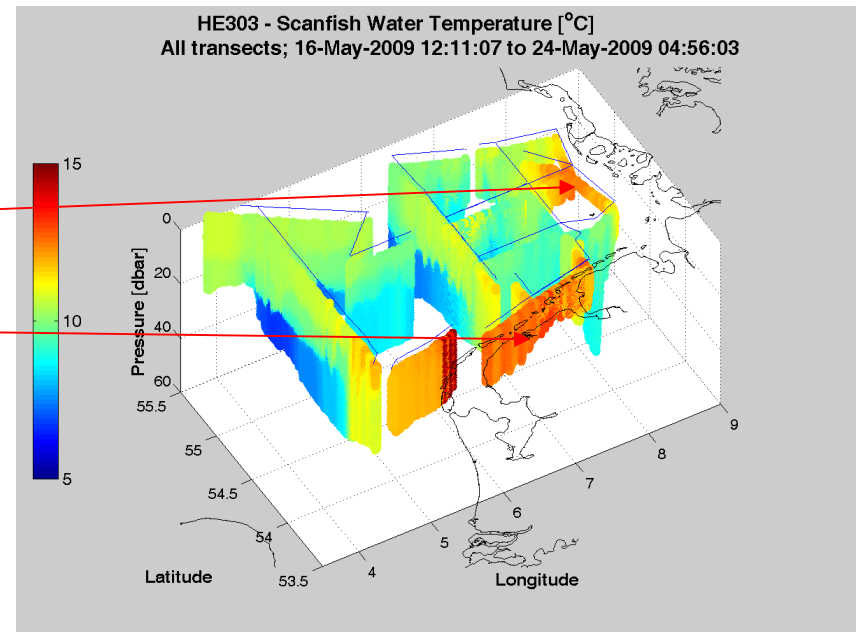
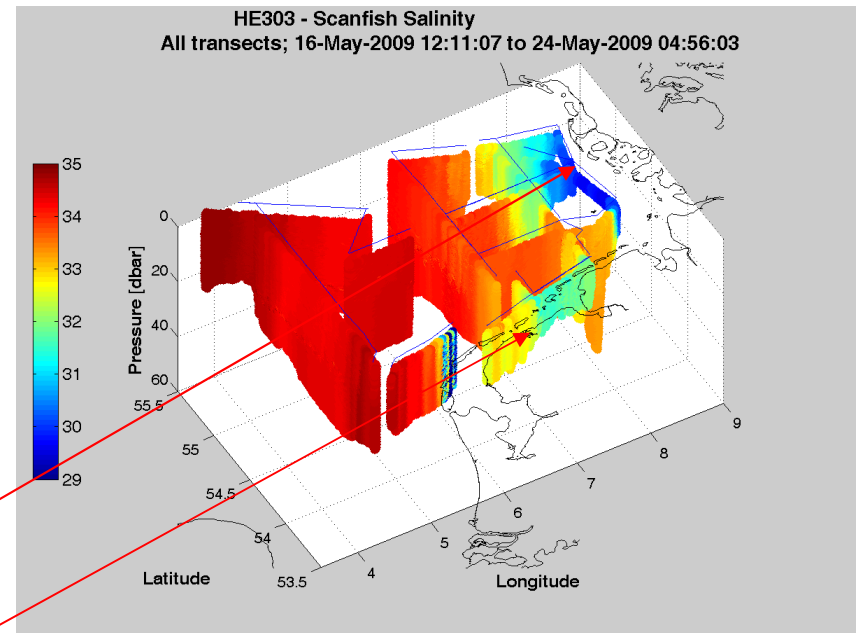
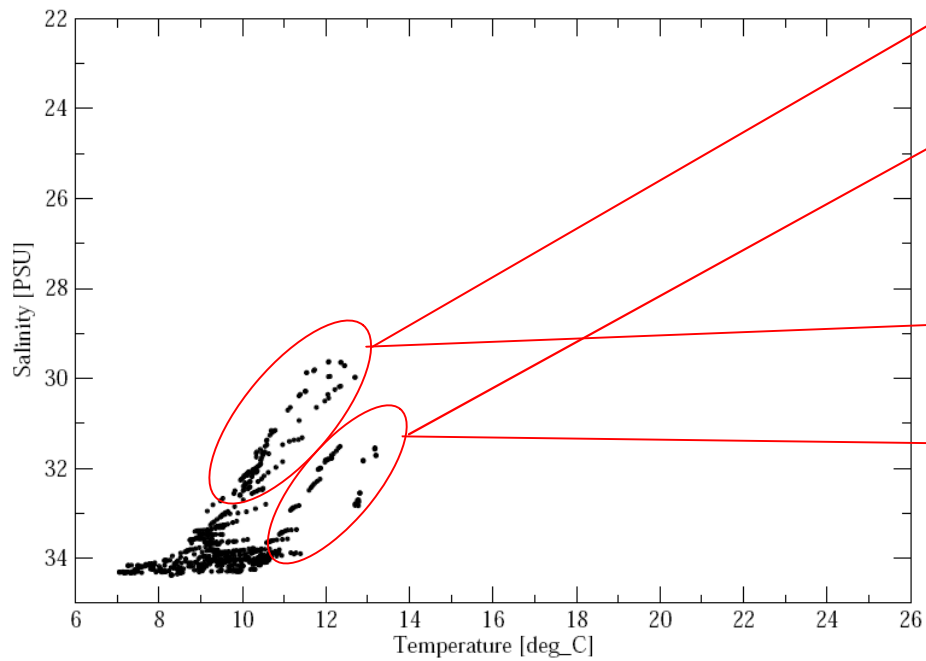
GETM salinity



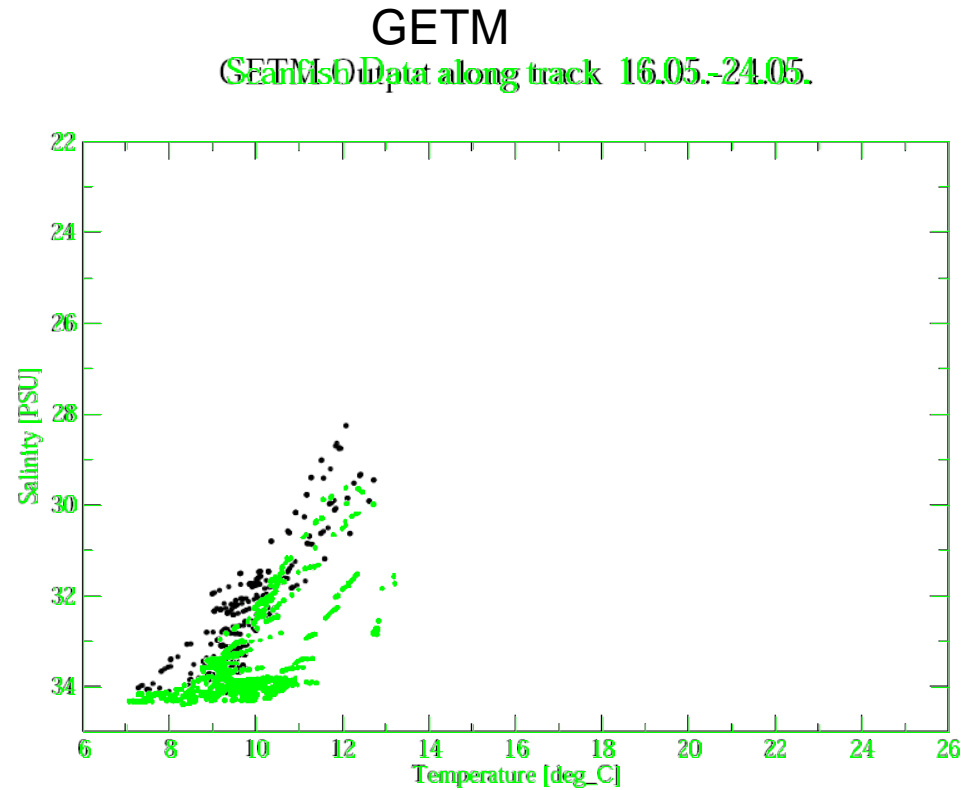
Nearest neighbour co-location with hourly GETM output. Model has 21 sigma layers and 1 km horizontal resolution.

T/S Diagrams

Scanfish Data along track 16.05.-24.05.



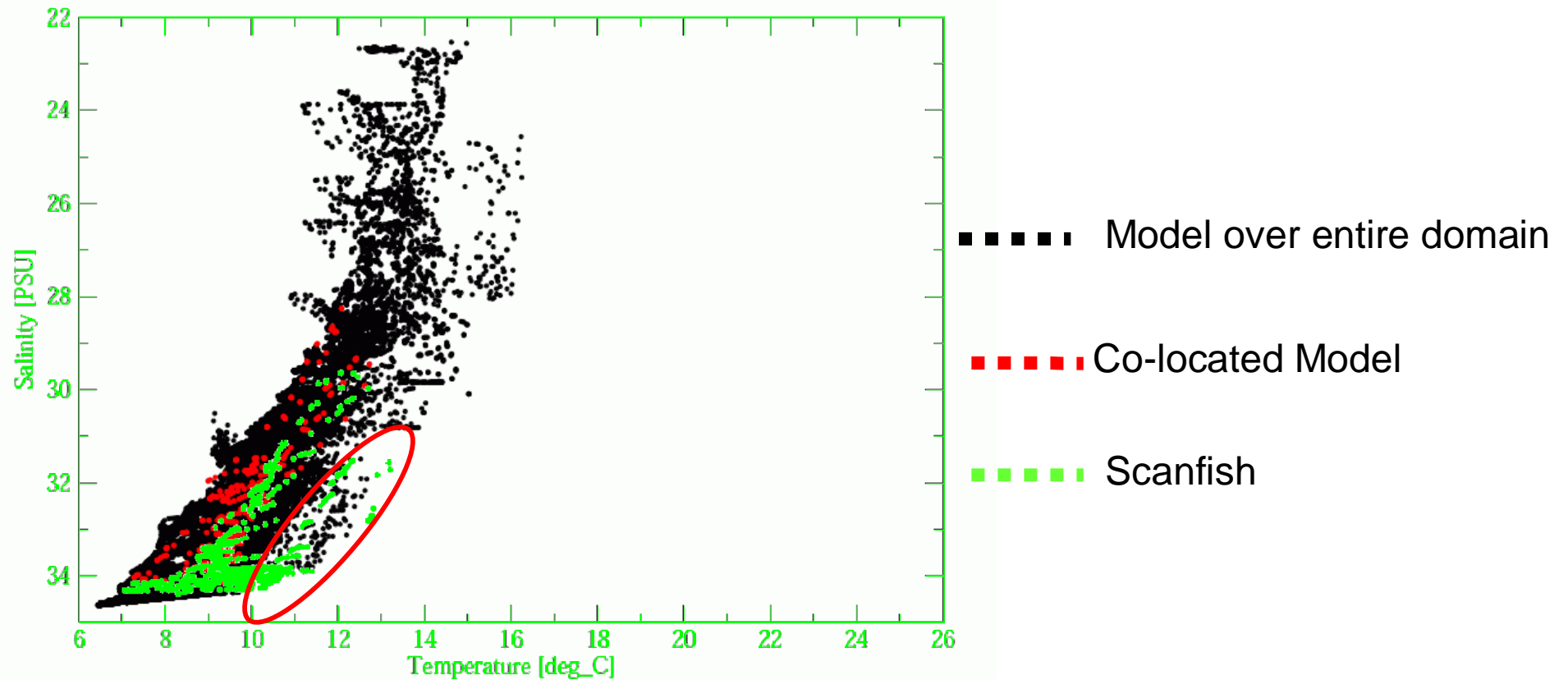
T/S Diagrams



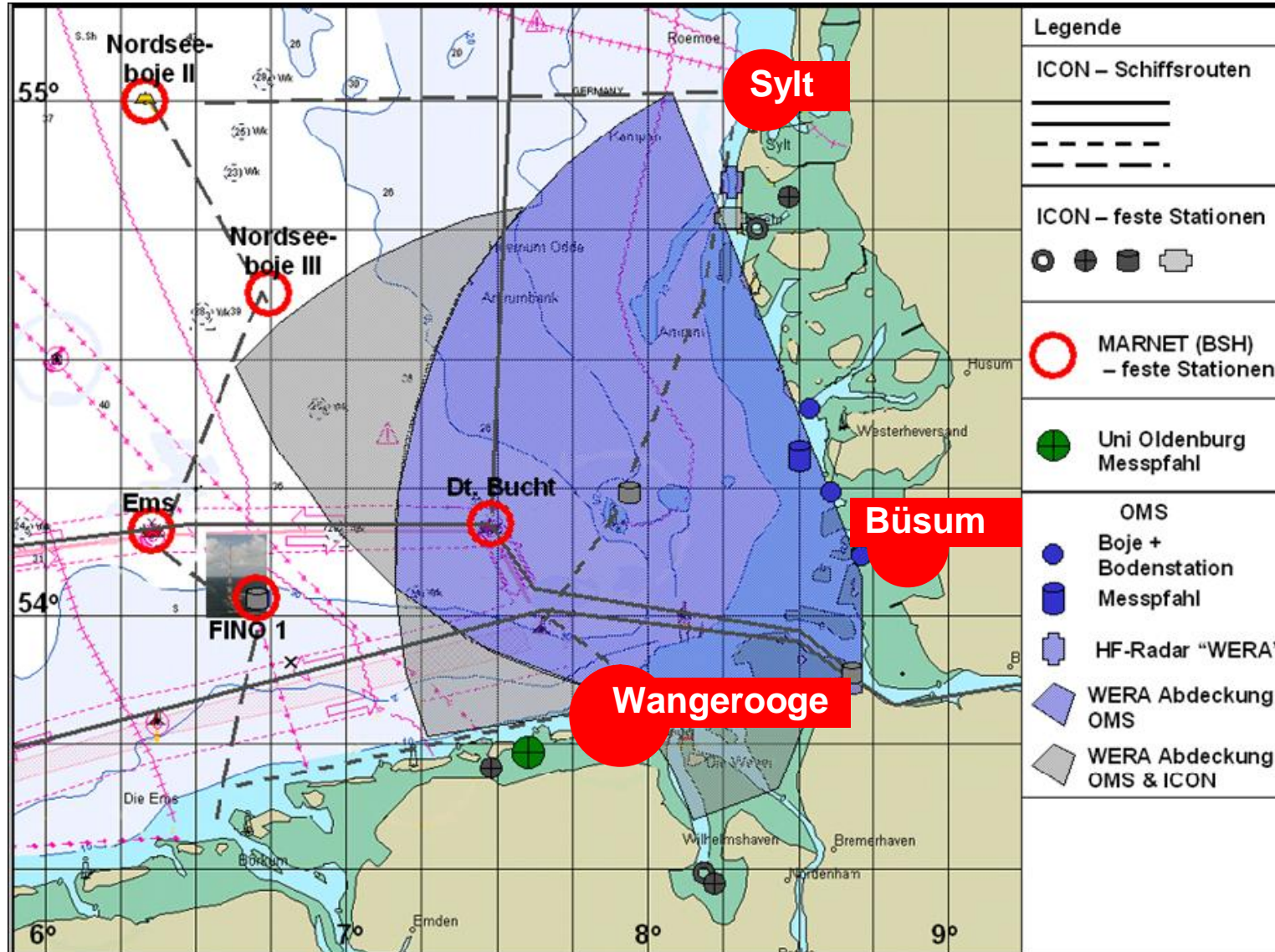
GETM
SCANFISH

T/S Plots

Scanfish Data along track 16.05.10-24.05.10
JGEM Output 16.05.10-24.05.10

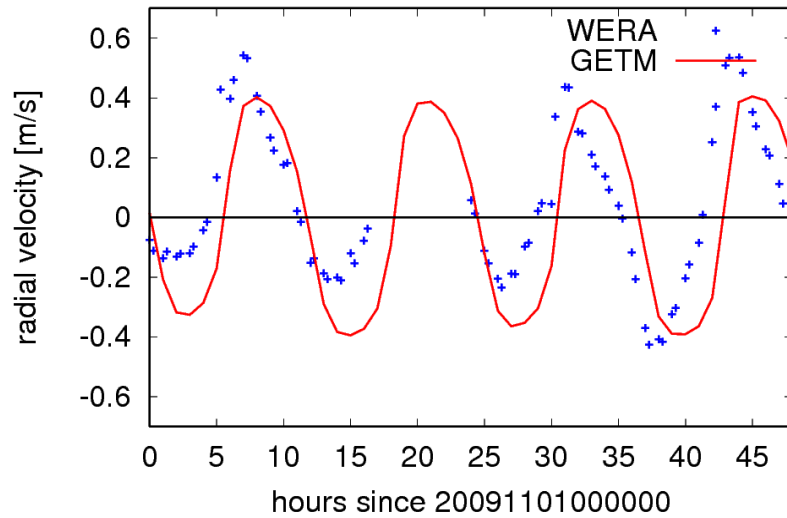


HF Radar Measurements in COSYNA

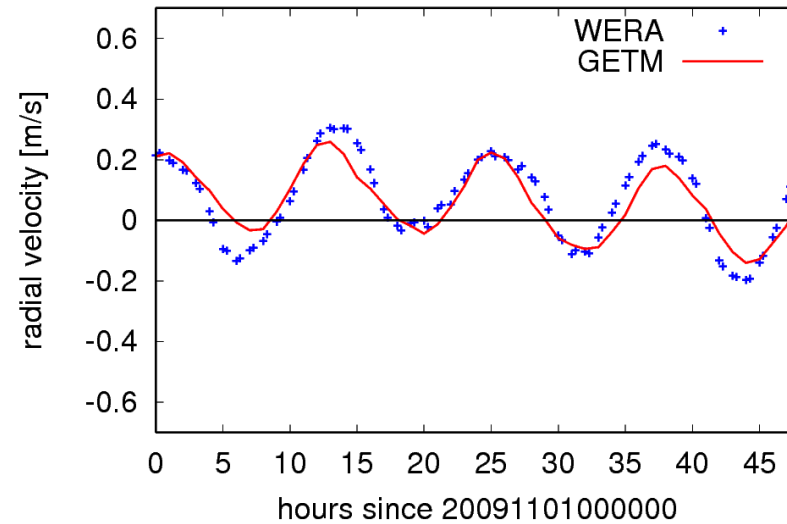


Comparison of HF radar and Model radial surface current components 1/2

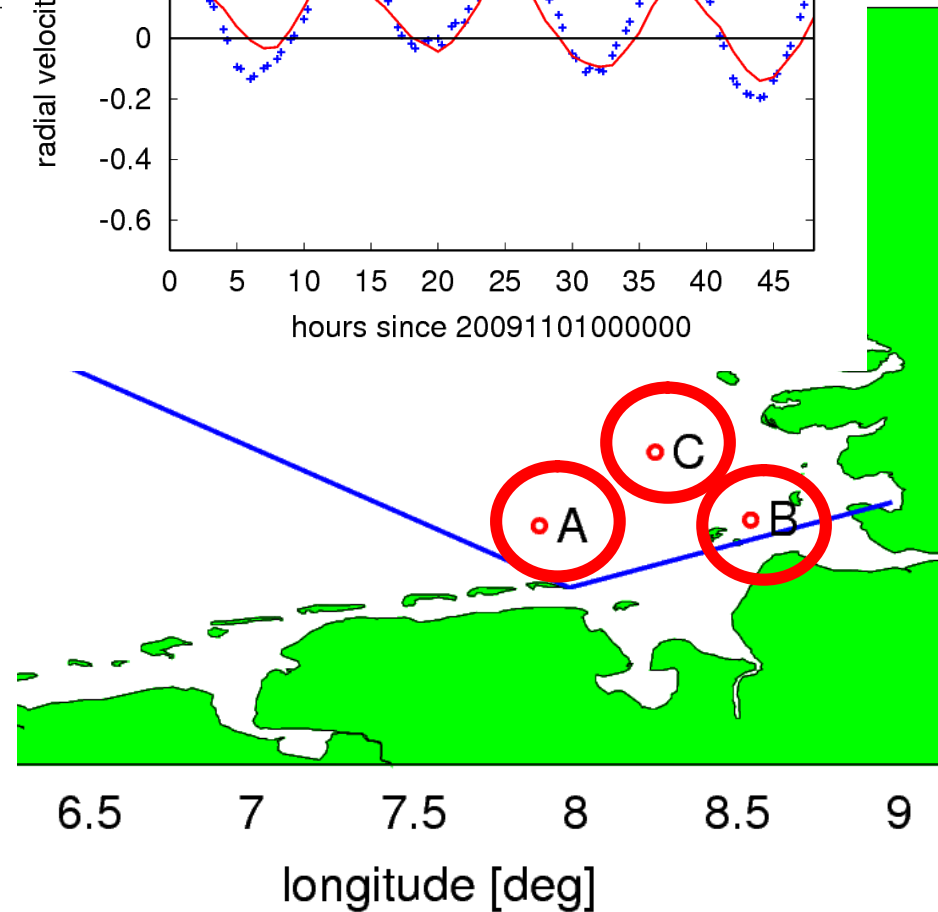
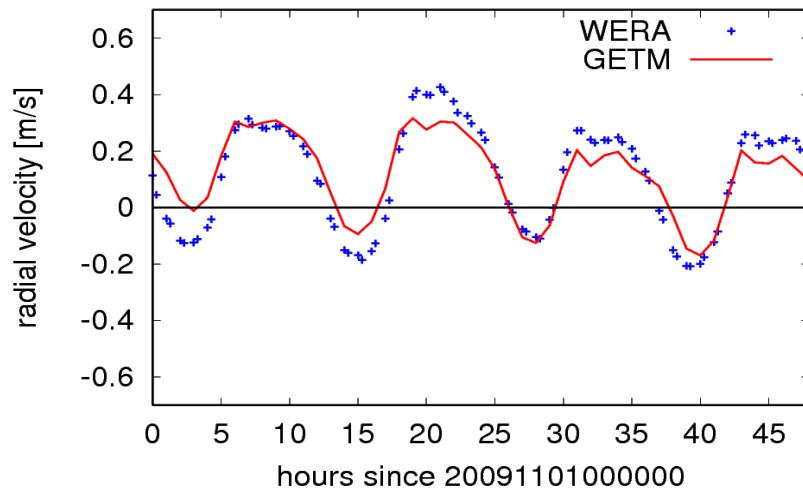
Position B



Position A

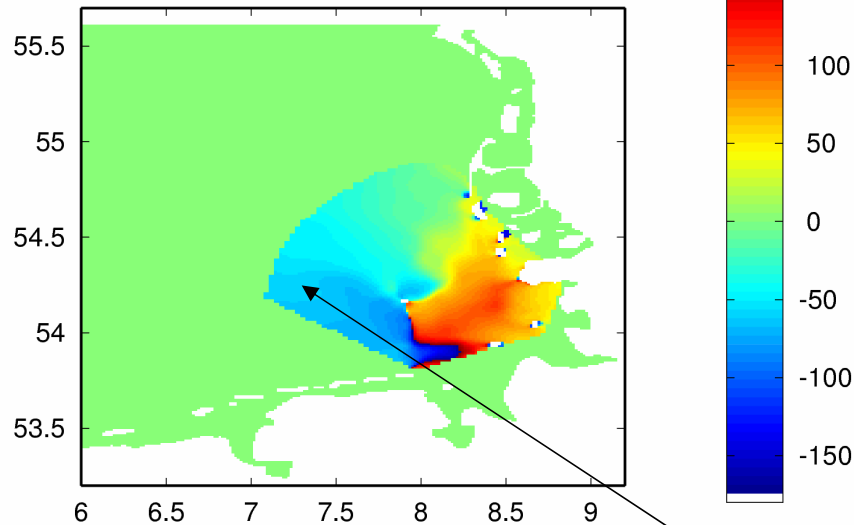


Position C

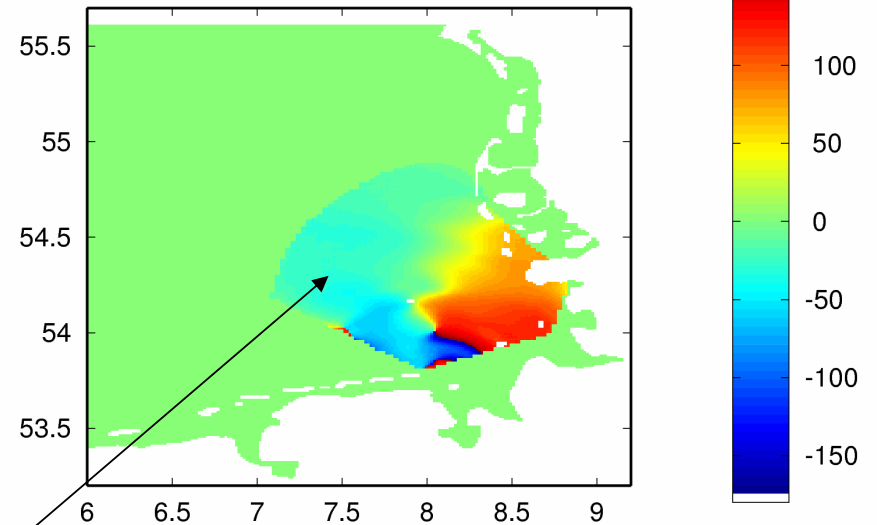


Comparison of HF radar and Model radial surface current components 2/2

M2 Phase radial current GETM [°]

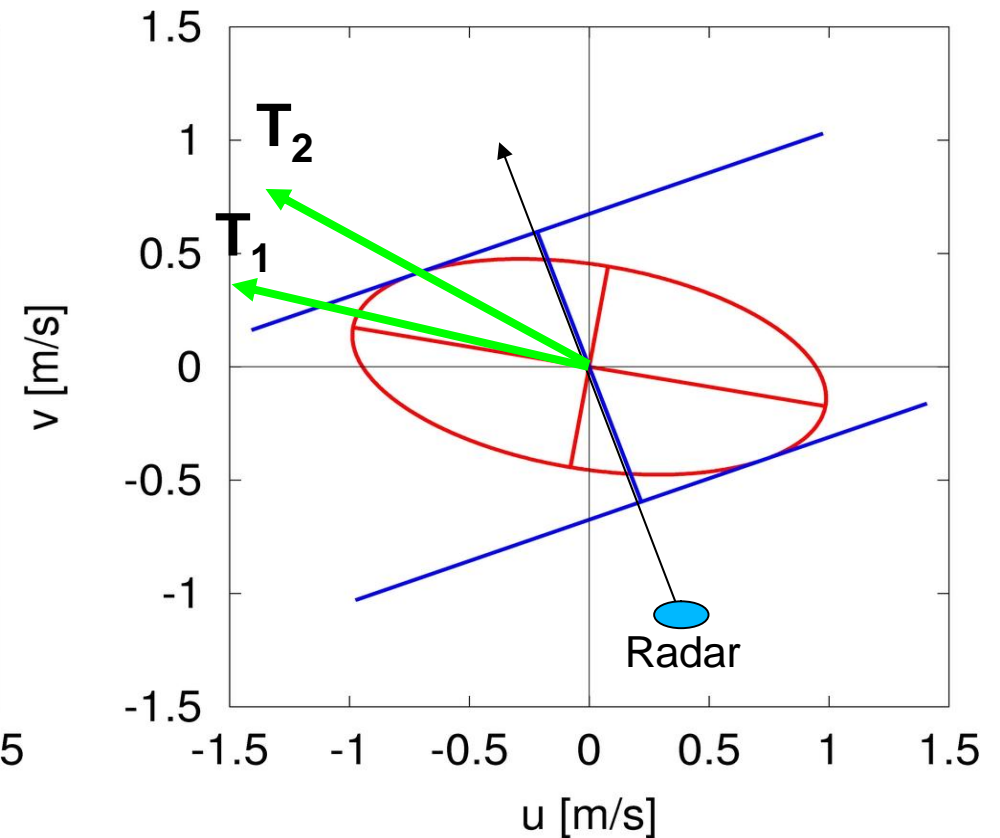
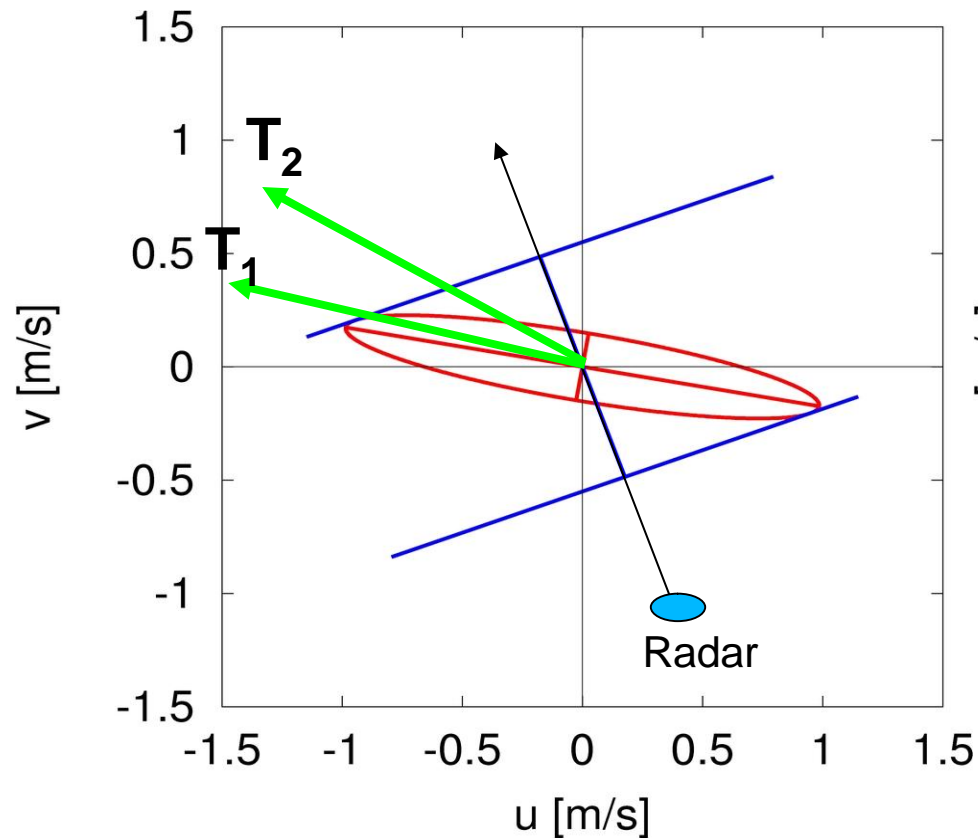


M2 Phase radial current WERA [°]



Maximum of radial component comes later in model

Relationship of current vector phase and radial current phase



Two tidal ellipses with identical major axis. Even if we assume that the current vectors are exactly in phase, the radial components will be phase shifted due to different ellipticities.

Conclusions/Outlook

- Reasonable agreement of spatial salinity and temperature patterns between model and observations
- Basic stratification features reproduced by model
- Lower model salinity values in near coastal areas have to be further investigated
- HF radar radial components in overall good agreement with model
- Phase shifts could be due to errors in ellipticity in the model
- Relationship with errors in salinity will be investigated