

Incorporating the Framework for Aquatic Biogeochemical Models (FABM) into the ocean modelling framework NEMO v4.2.1

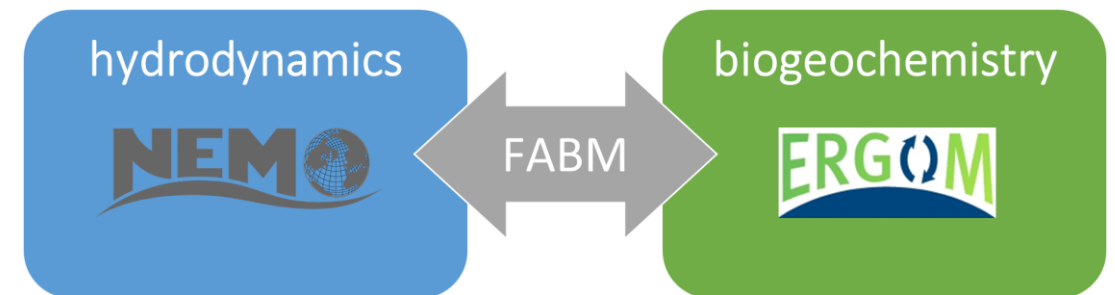
Helen E. Morrison¹,
Lena Spruch¹, Ilja Maljutenko²

¹ Federal Maritime and Hydrographic Agency (BSH), Germany

² Tallin University of Technology, Estonia



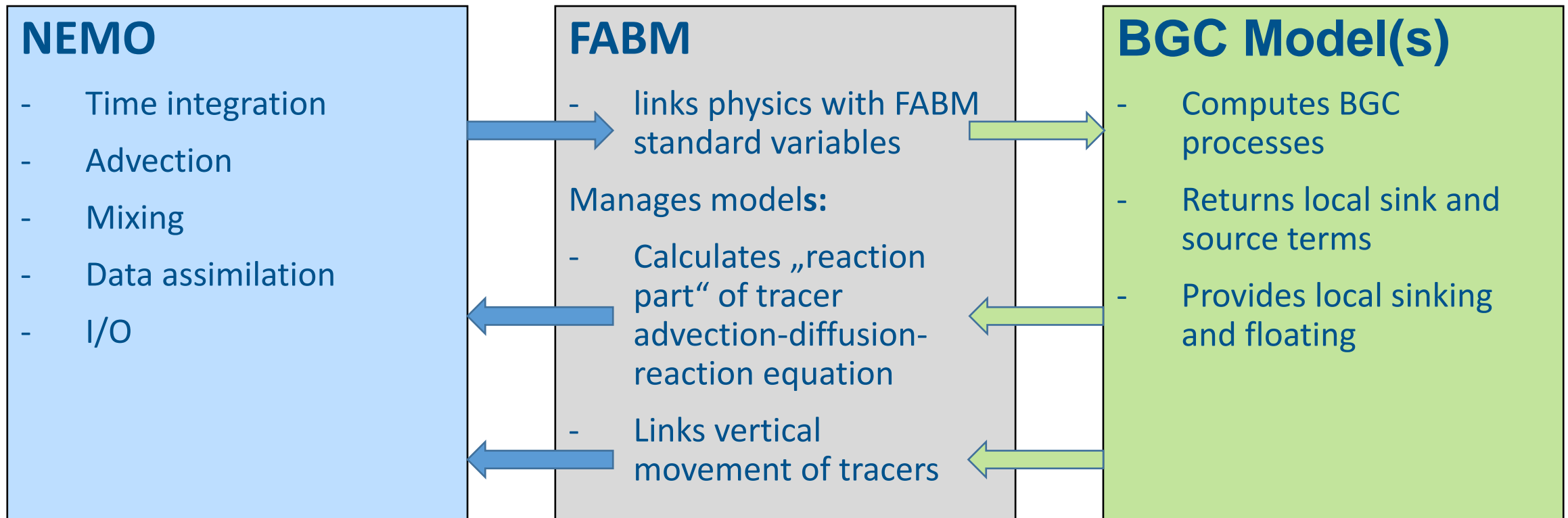
BUNDESAMT FÜR
SEESCHIFFFAHRT
UND
HYDROGRAPHIE



Introduction

- Most Copernicus Marine MFCs rely on NEMO for physical modelling
- BGC models vary due to regional requirements
- Updating either the physical model or the BGC model can be challenging if they are online-coupled
- FABM “acts as match maker between [...] hydrodynamic and biogeochemical models”
(<https://github.com/fabm-model/fabm/wiki>)

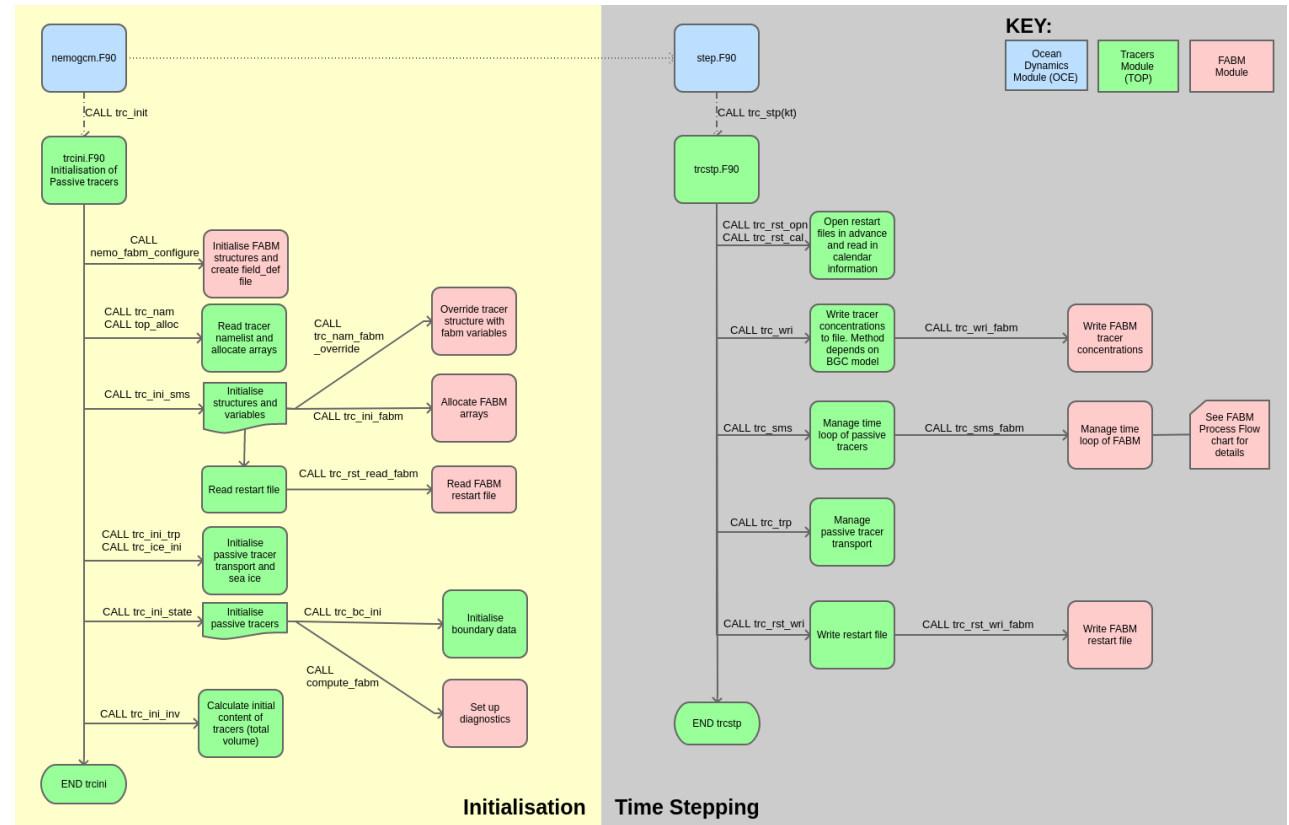
What does what?



Starting ground

The Marine Systems Modelling group at the Plymouth Marine Laboratory (PML) has already successfully coupled NEMO v4.0.0 with FABM:

<https://github.com/pmlmodelling/NEMO4.0-FABM/>



<https://github.com/pmlmodelling/NEMO4.0-FABM/wiki/TOP>

NEMO v4.2.1

NEMO v4.0.0 → v4.2.1

- No more need for I/O routines in TOP
- Modified loop ranges (due to introduction of DO LOOP macro)
- Changes in main array dimensions (introduction of **time-level indices**)

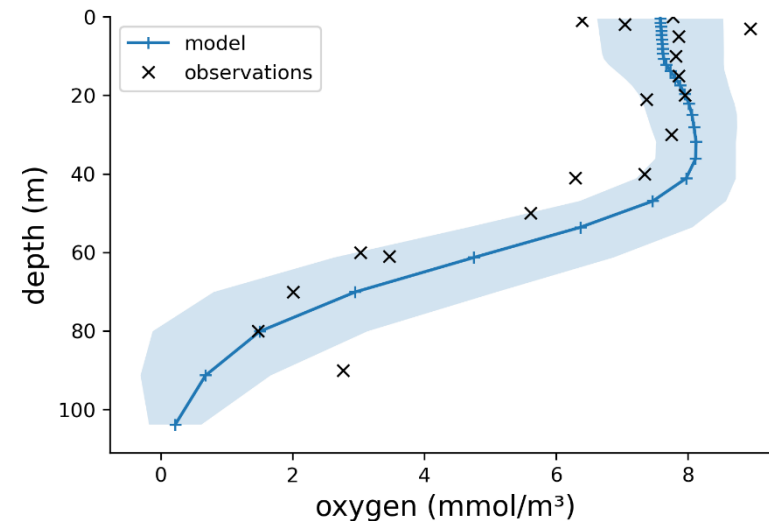
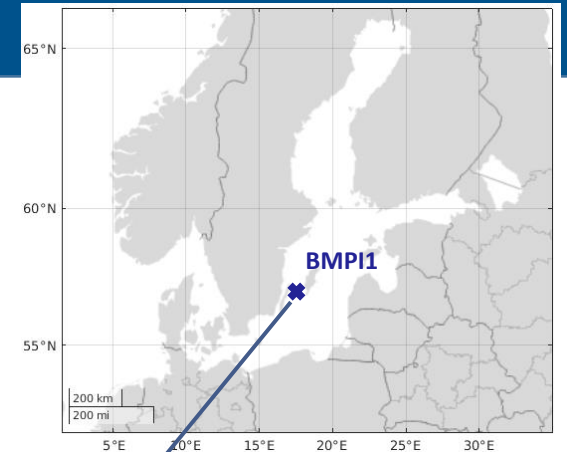
```
-      DO ji=fs_2,fs_jpim1
-          tra(ji,jj,1,jp_fabm_m1+jn) = tra(ji,jj,1,jp_fabm_m1+jn) + flux(ji,jn)/e3t_n(ji,jj,1)
+      DO ji=ntsi,ntei
+          tr(ji,jj,1,jp_fabm_m1+jn, Krhs) = tr(ji,jj,1,jp_fabm_m1+jn, Krhs) + flux(ji,jn)/e3t(ji,jj,1, Kmm)
```

BAL MFC Analysis and Forecast

- New BAL MFC BGC analysis and forecast is based on NEMO v4.2.1 + FABM + ERGOM system
 - Update of both NEMO and ERGOM in one system upgrade
- Anoxic conditions in bottom layers are well represented

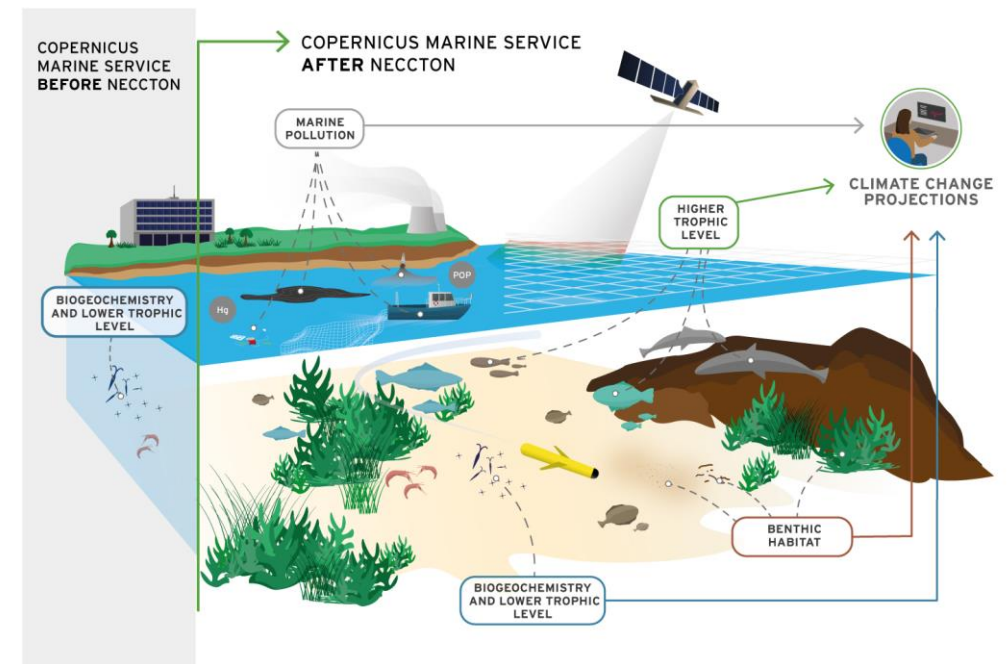


new product
26.11.2024



Relevance

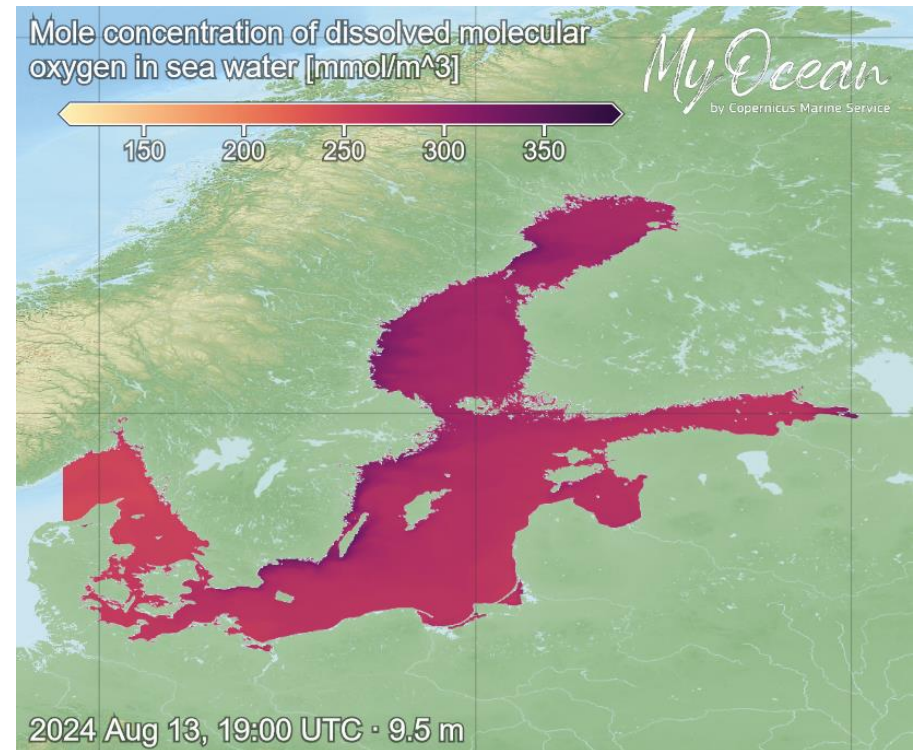
- Facilitates upgrade of BAL (and other) MFC modelling systems
 - NEMO and ERGOM can be independently updated
 - Different behaviour of various BGC models can easily be tested
- NEMO-FABM setup will be used within NECCTON to include and combine various models, e.g. additional higher trophic level models



<https://neccton.eu/>

Summary

- NEMOv4.2.1 has been updated to include FABM
- NEMOv4.21 + FABM + ERGOM forms the basis for the new BAL MFC BGC analysis and forecast
- Currently available within the Nemo-Nordic setup to be published on zenodo soon



Thank you for your attention

Many thanks to all members of the BAL MFC team!

Helen Morrison

helen.morrison@bsh.de

Lena Spruch

[lena.spruch@bsh.de](mailto:lana.spruch@bsh.de)

Ilja Maljutenko

ilja.maljutenko@taltech.ee

www.bsh.de

