

# New opportunities to develop, test and share process models in a common framework

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FABM code



FABM wiki

## FABM: Framework for Aquatic Biogeochemical Models

An open-source Fortran programming framework for models of biogeochemical and ecological processes in marine and freshwater systems

FABM acts as match maker between hydrodynamic and biogeochemical models developed by research groups all over the world.

### Objective 1: portability

- Code your biogeochemical/ecological process once, then reuse in a variety of hydrodynamic models (0D, 1D, 2D, 3D)
- Couple your hydrodynamic model to FABM to access a vast library of state-of-the-art biogeochemical and ecological models

### Objective 2: modularity

- Implement biogeochemical and ecological types and processes as stand-alone modules; mix and match these at runtime to create custom tailored ecosystem models

### NEMO-FABM

The Nucleus for European Modelling of the Ocean is a general 3D model of ocean circulation, used often for basin-scale and global applications.

FABM couplers for NEMO 3.6 and 4.0 are developed by the Plymouth Marine Laboratory (PML). A coupler for NEMO 4.2 is being developed and tested by the Tallinn University of Technology, Bundesamt für Seeschifffahrt und Hydrographie, Mercator Ocean and PML

Gennadi Lessin  
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### ROMS-FABM

The Regional Ocean Modeling System is a 3D structured grid model particularly suited to coastal applications.

ROMS-FABM couplers are available for several flavors of ROMS, e.g., Rutgers, COAWST

Philip Wallhead  
[philip.wallhead@niva.no](mailto:philip.wallhead@niva.no)

### COHERENS-FABM

COHERENS is designed for a wide range of applications in coastal and shelf seas, estuaries, lakes, and reservoirs

Arthur Capet  
[acapet@naturalsciences.be](mailto:acapet@naturalsciences.be)

### HYCOM-FABM

The Hybrid Coordinate Ocean Model is a 3D hybrid isopycnal-sigma-pressure (generalized) coordinate ocean model with both global and regional applications.

Annette Samuelsen  
[Annette.Samuelsen@nersc.no](mailto:Annette.Samuelsen@nersc.no)

### FVCOM-FABM

The Finite Volume Community Ocean Model is a 3D unstructured grid model particularly suited for (but not limited to) coastal applications.

Ricardo Torres  
[rito@pml.ac.uk](mailto:rito@pml.ac.uk)

### SCHISM-FABM

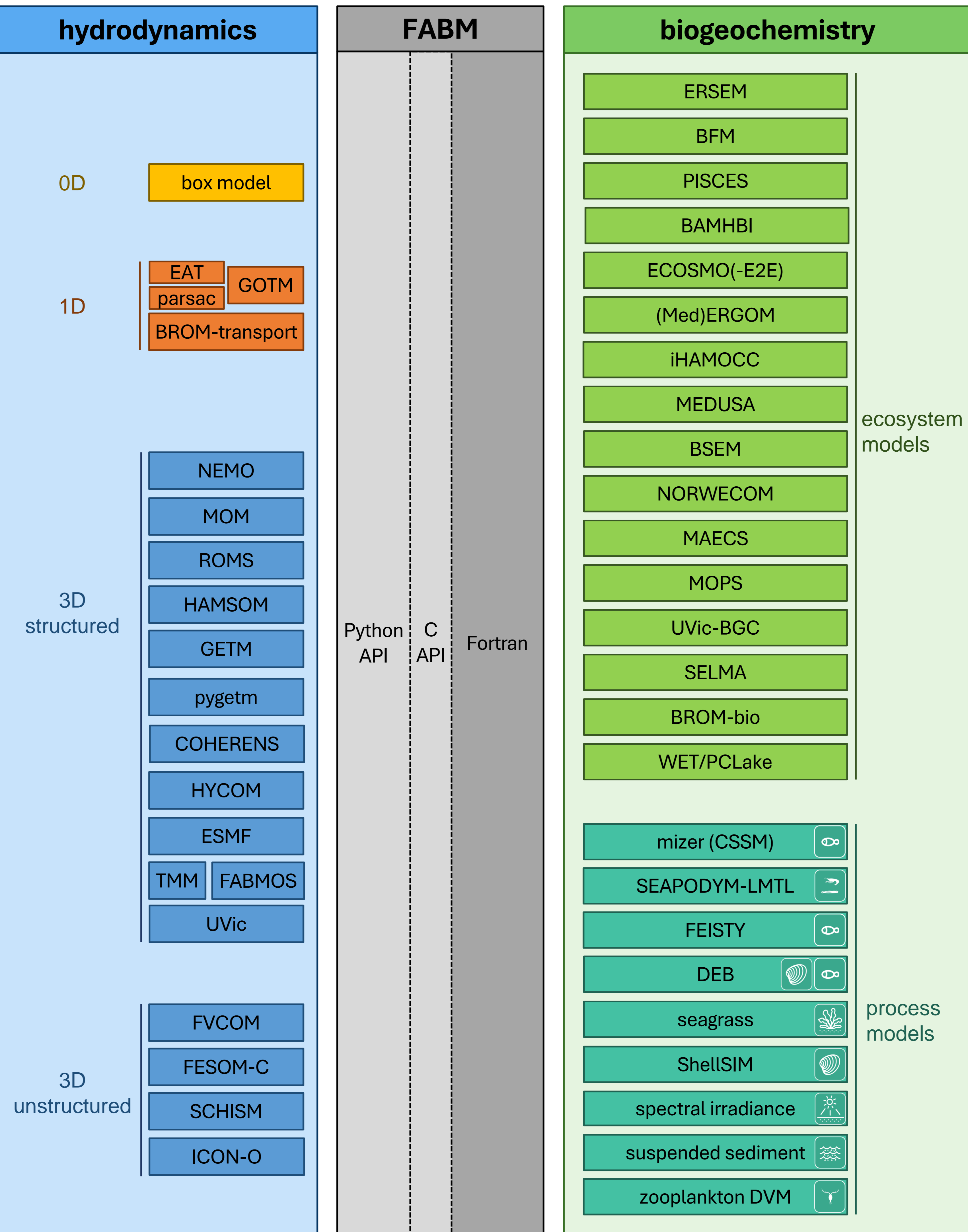
The Semi-implicit Cross-scale Hydroscience Integrated System Model is an open-source community-supported modeling system based on unstructured grids, designed for seamless simulation of 3D baroclinic circulation across creek-lake-river-estuary-shelf-ocean scales.

Johannes Pein  
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### ICON-O-FABM

Global hydrostatic ocean model, on z-levels, using a triangular mesh, part of the ICON framework (MPI-Met and DWD), developed by Peter Korn

Kai Logemann  
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### Operational use

FABM supports all biogeochemical models used in the Copernicus Marine Service:

- PISCES (FABM version by Mercator Ocean, France)
- BFM (OGS, Italy)
- ECOSMO (NERSC, Norway)
- ERGOM (by end 2024; BSH, Germany)
- BAMHBI (by end 2024; University of Liège, Belgium)



### Policy

FABM provides all biogeochemical models in the JRC Marine Modelling Framework:

- ERGOM (IOV, Germany)
- MedERGOM (JRC, EU)
- BSEM (JRC, EU)
- ERSEM (PML, UK)



### Earth System Models (ESMs)

FABM includes several biogeochemical models used for earth system modelling:

- PISCES (FABM version by Mercator Ocean, France)
- BFM (OGS, Italy)
- MEDUSA (FABM version by PML, UK)
- iHAMOCC (FABM version by BB, Denmark)
- MOPS (GEOMAR, Germany)
- UVic (FABM version by BB, Denmark)



### Higher trophic levels (HTLs)

FABM enables two-way coupling between lower and higher trophic levels models. Several HTL models have been implemented to take advantage of this:

- mizer (FABM version by PML, UK)
- ECOSMO-E2E (Hereon, Germany)
- SEAPODYM-LMTL (by end 2024; CLS, France)



### What's new in FABM?



FABM Offline Simulator: **3D simulation testbed** including the Transport Matrix Method



On the **EU Digital Twin of the Ocean**, FABM provides an ensemble of BGC models



**Data assimilation in 1D** with the Ensemble and Assimilation Tool (EAT)

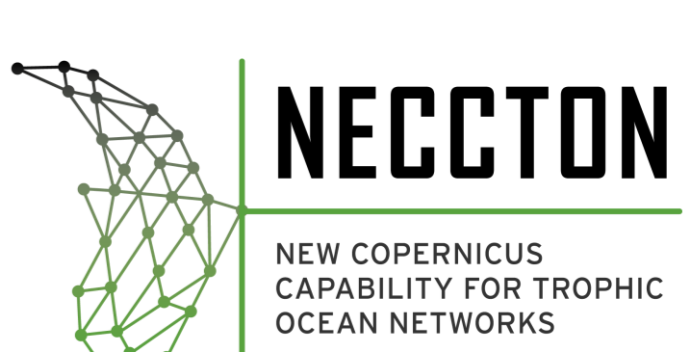


**Built-in support for two-way coupling** between pelagic (lower trophic level) and depth-integrated (higher trophic level) models

**Workshops:** introduction this Friday at AMEMR (3 hours), developer workshop spring 2025 (1 week)



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